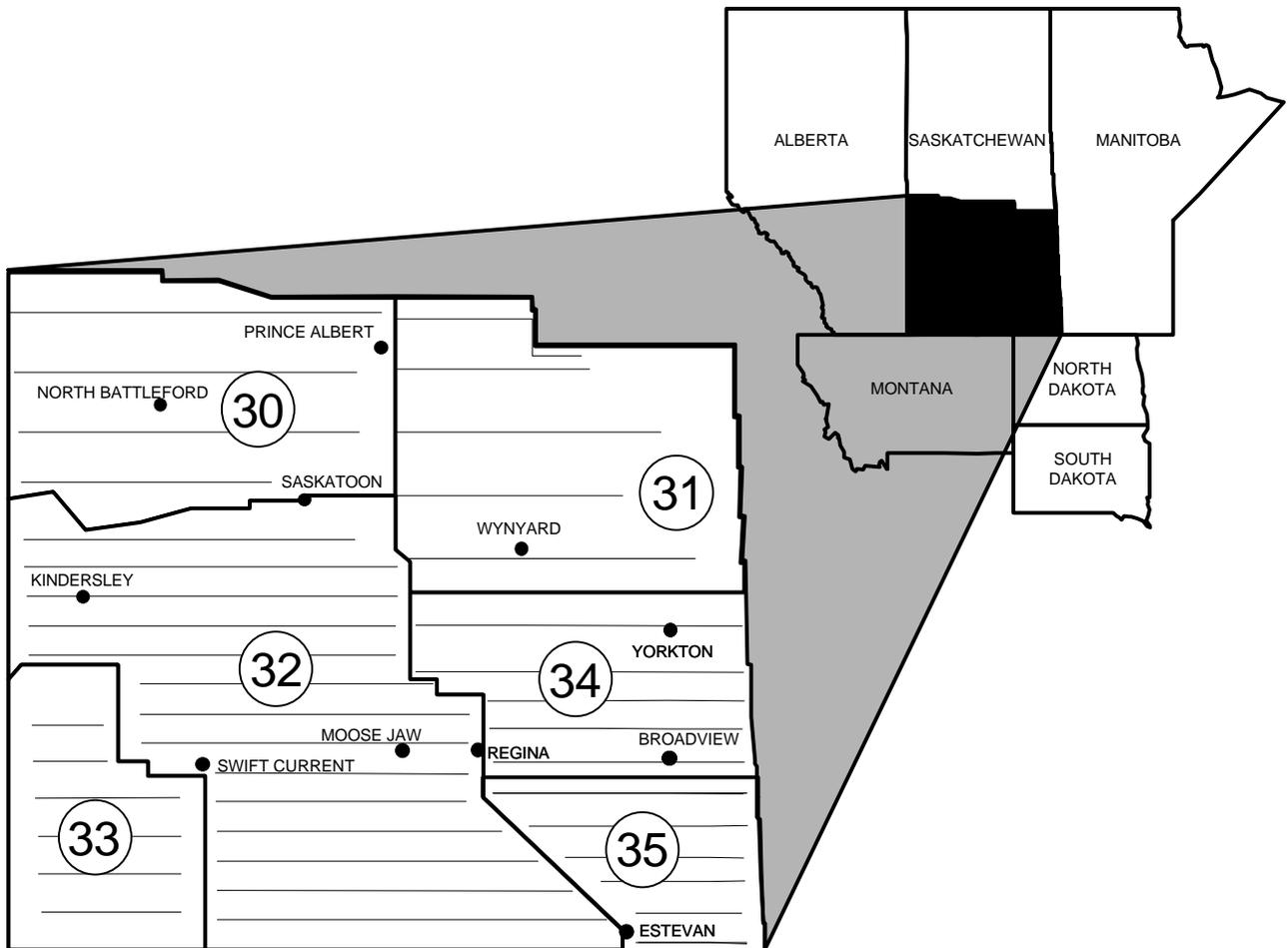


WATERFOWL PRODUCTION SURVEY

SOUTHERN SASKATCHEWAN

2002



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

TITLE: Waterfowl Production and Habitat Survey for Southern Saskatchewan

STRATA SURVEYED: 30, 31, 32, 33, 34, and 35

DATES: July 6 - 20, 2002

DATA SUPPLIED BY: United States Fish and Wildlife Service

Air Crew

Strata 30, 31, 32, and 33

Pilot/Observer: Philip P. Thorpe, Flyway Biologist, USFWS

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Strata 34 and 35

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ABSTRACT: Average to well-above average precipitation fell across the southern third of the Southern Saskatchewan survey area during June but the northern two-thirds of the survey area remained in a severe drought with little to no precipitation received during June or July. Pond indices were 23%, 45%, and 25% lower than 2001, the 10-year, and the long-term means, respectively. The overall brood index was 68% lower than 2001, 64% lower than the 10-year mean, and 75% lower than the long-term mean. The late-nesting index was 2% higher than 2001, but 5% and 17% lower than the 10-year mean and the long-term mean, respectively. Overall, poor recruitment is expected out of most of southern Saskatchewan with possibly fair duck recruitment coming out of the south-central and southeast.

METHODS: The procedures followed in conducting the July Waterfowl Production and Habitat Survey are described in the Standard Operating Procedures for Aerial Waterfowl Breeding Population and Habitat Surveys in North America, Section IV, revised 1987. There were no changes made this year in operating procedures. Survey coverage was complete and all data are considered comparable to previous years (Table 1). A Cessna 206 and a Cessna 206 equipped with amphibious floats were used to survey strata 30-33 and strata 34-35, respectively. A GPS/voice recording system was used to collect data (Thorpe 2000). During the period 6-20 July, approximately 65 and 17 hours of flight time were required to complete the transect flights in strata 30-33 and 34-35, respectively. The crew surveying strata 30-33 were delayed 6 days due to equipment problems. The strata 34-35 crew did not have any delays.

WEATHER AND HABITAT CONDITIONS: Despite June rains, which flooded areas in the south and southwest parts of the survey area, conditions remain poor for waterfowl production and recruitment. Most (northern two-thirds) of the survey area had received below (60-85% of normal) to well-below average (40-60% of normal) precipitation for June (Agriculture and Agri-food Canada 2002). Isolated thunderstorms were the only source of precipitation in July. For conditions to improve in time for next year, record rain and snowfall has to fall and a good frost

seal needs to form, which will ensure runoff collects in wetlands where birds can use it in April and May.

The drought is evident in some areas when comparing the percent change from May ponds to July ponds (Table 2). The most severely affected parts of the survey area remain in the northwest (stratum 30) and northeast (stratum 31). Both areas changed very little from May revealing just how dry the spring was in Saskatchewan. June rains improved wetland conditions in the southern third of the survey area and strata 32, 33, and 35 all had pond estimates greater than their respective May estimates (Table 2). The estimate for stratum 33 was actually the fourth highest pond estimate on record. Overall, the combined pond index was 23% lower than July 2001, 45% lower than the 10-year mean, and 25% lower than the long-term mean (Table 2).

According to the July 15 Crop Report (Saskatchewan Agriculture and Food 2002), topsoil, pasture, and hayland was rated as poor over most of the central and northern survey area and fair to good in the south-central, southwest, and southeast. Ranchers in the northern grainbelt were struggling to feed livestock and had resorted to cutting crops for feed; much of the hay crop in the north this year will not be cut because of the poor conditions. Temperatures during June and July were generally above normal.

PRODUCTION INDICES: The overall brood index was 68%, 64%, and 75% lower than 2001, the 10-year mean, and the long-term mean, respectively, and was the third lowest estimate since 1955 (Table 3, Appendix 1). The composition of duck broods ($n = 204$) by age class (Gollup and Marshall 1954) was as follows: Class I, 32.5% ($n = 63$); Class II, 45.9% ($n = 89$); Class III, 21.6% ($n = 42$); unclassified, 5.2% ($n = 10$). The overall number of broods counted this year was down 65% from 2001 ($n = 590$). The weighted average brood size among the intact Class II and III broods observed ($n = 105$) during our survey was 5.3, which is lower than 2001 ($\bar{x} = 5.5$) and the 10-year mean ($\bar{x} = 5.6$), but about the same as the long-term mean ($\bar{x} = 5.2$) (Table 3). The coot brood index was 96% lower than the 2001 index, and 94% and 95% below the 10-year and long-term means, respectively (Table 3). The 2002 coot brood index was the lowest on record (Appendix 1).

LATE-NESTING INDICES: The late-nesting index (LNI) is a rough measure of re-nesting effort, or potential broods that will hatch after our survey (Henny et al. 1972). This year's total LNI was about the same as 2001 but was 17% below the long-term mean (Table 3). The dabbling species LNI was 20% higher than 2001 and about the same (-5%) as the long-term mean. The total LNI for diving ducks was 59%, 60%, and 65% lower than 2001, the 10-year mean, and the long-term mean. When the brood index and total LNI are combined (101.4), 2002 ranks as the ninth lowest estimate since 1955 (Appendix 1). A low brood index and an average late-nesting index probably will lead to poor recruitment from southern Saskatchewan.

DISCUSSIONS: A combination of poor habitat conditions and a late spring, which delayed nesting, will result in another year of poor production and recruitment from southern Saskatchewan. Severe drought conditions across the survey area limited habitat choices for ducks. Many moved out of the Saskatchewan survey area altogether, remaining birds were crowded on larger wetlands in a situation not conducive to breeding. June rains improved conditions in the south and it was evident that a good late-nesting attempt was in progress during the survey in the Southern Saskatchewan survey area. It is likely that older, more experienced birds will be the only successful breeders this year. However, the number of broods observed

was down 65% from 2001 and even late nesting and renesting won't improve the overall outlook for poor production and low recruitment this year.

ACKNOWLEDGEMENTS: Thanks to the Manitoba crew for data collection in strata 34-35.

Submitted by Philip P. Thorpe, July 25, 2002

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Table 1. Survey design and July 2002 coverage for Southern Saskatchewan.

	Stratum						Total
	30	31	32	33	34	35	
Survey design:							
Square miles in stratum	18,570	21,086	37,911	11,345	13,164	9,044	111,120
Square miles in sample- waterfowl/ponds	76.50	72.00	285.75	45.00	87.75	63.00	630.00
Linear miles in sample	612	576	2,286	360	702	504	5,040
Number of transects in sample	4	5	14	6	5	6	40
Number of segments in sample	34	32	127	20	39	28	280
Expansion factor	242.745	292.861	132.672	252.111	150.017	143.556	
July 2002 coverage:							
Square miles in sample- waterfowl/ponds	76.50	72.00	285.75	45.00	87.75	63.00	630.00
Linear miles in sample	612	576	2,286	360	702	504	5,040
Number of transects in sample	4	5	14	6	5	6	40
Number of segments in sample	34	32	127	20	39	28	280
Expansion factor	242.745	292.861	132.672	252.111	150.017	143.556	

Table 2. Long-term trend in July pond estimates¹ (thousands) by stratum with comparisons against the previous year, the 10-year mean (1992-2001), the long-term mean (1955-2001), and May 2002 pond estimates² for Southern Saskatchewan.

Year	Stratum						Total
	30	31	32	33	34	35	
1955	138.6	332.1	374.5	120.5	668.5	449.0	2,083.2
1956	120.9	186.8	210.1	34.8	346.5	216.2	1,115.3
1957	59.0	136.8	127.6	18.9	260.8	77.4	680.5
1958	57.0	82.8	69.1	18.4	127.9	46.1	401.3
1959	40.1	95.9	123.0	31.5	155.6	74.1	520.2
1960	47.3	104.0	136.8	16.9	229.7	102.5	637.2
1961	41.0	35.6	51.1	10.3	32.8	22.4	193.2
1962 ³	29.9	40.0	62.6	12.4	-	-	144.8
1963	93.0	97.2	227.8	41.6	177.5	89.4	726.5
1964	33.5	82.5	99.2	13.1	141.9	144.3	514.5
1965	112.4	188.7	289.1	88.7	167.5	69.5	915.9
1966	149.0	320.8	239.9	72.9	164.3	105.2	1,052.1
1967	86.4	136.5	192.6	44.6	101.1	50.2	611.6
1968	66.3	96.2	88.5	15.9	41.1	20.2	328.2
1969	125.4	151.8	357.0	63.0	86.6	159.2	943.1
1970	278.3	365.8	568.2	70.1	219.3	209.6	1,711.4
1971	159.1	277.5	335.9	41.9	171.7	91.6	1,077.7
1972	116.5	189.7	154.8	25.2	108.0	107.4	701.6
1973	153.1	442.7	145.3	21.7	103.5	52.4	918.6
1974	262.5	309.9	455.3	57.5	252.5	175.0	1,512.7
1975	216.7	299.6	391.1	69.1	282.5	281.9	1,540.8
1976	165.1	254.5	414.3	55.2	266.7	211.5	1,367.3
1977	101.6	187.4	183.0	19.9	154.1	72.2	718.1
1978	82.1	177.8	240.1	50.4	165.3	135.7	851.4
1979	159.6	230.8	274.2	46.9	169.2	155.8	1,036.4
1980	77.3	109.8	90.4	21.9	63.0	32.7	395.1
1981	75.7	87.0	96.3	22.9	52.2	29.6	363.7
1982	130.9	197.1	372.5	122.0	86.0	55.4	963.9
1983	134.8	313.9	237.5	44.1	366.3	99.1	1,195.7
1984	126.8	218.8	140.1	21.7	103.4	41.9	652.6
1985	186.2	292.9	173.8	20.9	177.5	55.8	907.1
1986	188.0	218.8	170.0	36.3	171.3	90.0	874.3
1987	126.8	183.3	123.7	27.7	115.1	63.0	639.6
1988	120.4	126.5	94.1	36.6	41.3	23.4	442.2
1989	101.2	108.4	129.6	36.3	51.6	31.9	459.0
1990	101.2	135.0	135.5	21.7	96.3	48.8	538.5
1991	187.4	210.6	722.3	165.6	228.5	177.1	1,691.5
1992	87.6	101.6	132.5	24.5	135.5	77.4	559.1
1993	237.9	271.5	301.0	47.6	281.1	136.8	1,276.0
1994	248.8	314.5	501.6	74.1	256.5	110.4	1,506.0
1995	122.1	252.7	237.6	77.9	261.8	115.4	1,067.6
1996	227.2	306.0	464.4	82.4	380.1	206.4	1,666.6
1997	158.8	271.8	430.8	86.0	310.4	169.8	1,427.5
1998	158.0	325.7	311.9	73.4	476.2	320.0	1,665.2
1999	201.2	405.6	684.6	47.4	205.5	149.4	1,697.1
2000	124.1	201.5	299.9	52.1	446.5	313.8	1,437.9
2001	70.6	103.4	160.4	23.7	319.5	263.3	940.9
2002	68.7	99.9	237.2	110.4	111.3	98.6	726.1
10-year mean	163.6	255.4	352.5	58.9	307.3	186.3	1324.1
Long-term mean	131.7	207.4	255.6	48.2	200.4	124.6	967.9
Percent Change from:							
2001	-3%	-3%	48%	366%	-65%	-63%	-23%
10-year mean	-58%	-61%	-33%	87%	-64%	-47%	-45%
long-term mean	-48%	-52%	-7%	129%	-44%	-21%	-25%
May ponds 2002	72.9	127.4	193.8	68.5	157.3	15.1	635.0
Percent change:							
May to July 2002	-6%	-22%	22%	61%	-29%	553%	14%

¹ July ponds are raw counts multiplied by an expansion factor (Table 1) and are not adjusted for visibility bias.² May ponds are raw counts multiplied by an expansion factor (Table 1) and are adjusted using a visibility correction factor of 1.05 for strata 30-33 and 0.70 for strata 34-35.³ Incomplete coverage, not included in long-term mean calculation.

Table 3. Status of waterfowl brood and late-nesting indices (thousands, unadjusted for visibility bias) by stratum with comparisons against the previous year, the 10-year mean (1991-2001)¹, and the long-term mean (1955-2002)² for Southern Saskatchewan, July 2002.

Species	Stratum						2002 total	2001 total	10-year mean	Long-term mean	Percent Change from:		
	30	31	32	33	34	35					2001	10-year mean	Long-term mean
Broods:													
Duck brood index	4.9	6.4	9.3	0.3	5.6	4.6	31.0	96.4	85.3	123.6	-68%	-64%	-75%
Average brood size ³	5.50	5.70	5.53	-	4.43	5.44	5.3	6.3	5.6	5.2	-15%	-4%	3%
Coot brood index	0.0	0.0	0.1	0.0	0.8	0.6	1.5	34.9	26.4	27.9	-96%	-94%	-95%
Late nesting index (LNI):⁴													
Dabblers:													
Mallard	0.7	2.1	10.2	3.8	9.6	9.5	35.9	25.2	23.1	27.5	42%	55%	30%
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	0%	0%
Gadwall	0.0	0.0	2.1	1.0	1.1	1.7	5.9	5.4	9.4	9.3	9%	-37%	-36%
Am. wigeon	0.0	0.0	0.5	0.3	0.8	0.9	2.4	2.9	3.1	4.5	-18%	-24%	-47%
Green-winged teal	0.0	0.3	0.9	0.0	0.3	1.3	2.8	3.3	4.0	3.0	-14%	-30%	-6%
Blue-winged teal ⁵	0.5	0.9	3.1	0.5	2.4	3.6	10.9	8.3	11.7	12.1	31%	-7%	-10%
N. shoveler	0.0	0.0	0.4	0.0	0.2	0.4	1.0	2.5	2.7	3.7	-61%	-64%	-74%
N. pintail	0.0	0.0	1.5	0.8	1.1	1.9	5.1	5.5	3.7	7.0	-7%	39%	-26%
Subtotal:	1.2	3.2	18.7	6.3	15.3	19.2	64.0	53.1	57.8	67.1	20%	11%	-5%
Divers:													
Redhead	0.0	0.3	0.1	0.0	0.0	0.1	0.6	1.1	1.8	2.3	-49%	-68%	-75%
Canvasback	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.2	0.8	1.3	-11%	-82%	-90%
Scaups	0.2	0.6	0.4	0.0	0.3	0.3	1.8	4.4	2.9	6.4	-58%	-38%	-72%
Ring-necked duck	0.0	0.0	0.1	0.0	0.5	0.1	0.7	1.6	1.0	0.8	-54%	-28%	-9%
Goldeneyes	0.0	0.3	0.0	0.0	0.0	0.0	0.3	1.4	0.5	0.2	-80%	-38%	31%
Bufflehead	0.0	0.3	0.0	0.0	0.2	0.0	0.4	0.5	0.6	0.6	-17%	-24%	-21%
Ruddy duck	0.0	0.0	0.4	0.0	0.6	1.3	2.3	6.1	8.1	6.3	-62%	-72%	-64%
Subtotal:	0.2	1.5	1.2	0.0	1.5	1.9	6.3	15.3	15.6	17.9	-59%	-60%	-65%
Miscellaneous:													
Long-tailed duck	0.0	0.0	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	0%	0%	0%
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0%	-100%	-100%
Mergansers	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.8	0.2	0.1	-83%	-40%	43%
Subtotal	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.8	0.3	0.3	-83%	-51%	-57%
Total LNI	1.5	4.7	20.0	6.3	16.8	21.1	70.4	69.2	73.8	85.3	2%	-5%	-17%

¹ Excludes 1999, data in strata 34-35 was not collected using correct survey methodology.

² Excludes 1962, which had incomplete coverage, and 1999 because of incorrect data collection in strata 34-35.

³ Calculated using only Class II and III broods observed and assumed to be complete.

⁴ Only observed adult pairs and singles used.

⁵ Includes cinnamon teal.

Appendix 1. Long-term trend in waterfowl brood and late-nesting indices (thousands, unadjusted for visibility bias) by species in Southern Saskatchewan, 1955-2002.

Species/Year	1955	1956	1957	1958	1959	1960	1961	1962 ¹	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Broods:																				
Duck brood index	236.2	368.6	588.7	275.5	103.8	121.0	71.9	28.5	46.2	67.8	46.8	95.9	94.6	77.8	175.0	128.7	180.2	170.2	96.7	148.3
Average brood size ²	6.7	6.0	6.2	4.2	4.1	4.7	4.6	5.5	5.4	5.8	6.0	5.8	5.4	5.0	5.6	5.3	5.2	5.2	4.7	5.0
Coot brood index	18.9	65.0	208.0	21.6	5.9	15.1	5.8	0.0	1.9	9.0	6.8	8.0	11.6	11.9	20.7	22.4	35.6	25.6	21.4	40.6
Late nesting index (LNI): ³																				
Dabblers:																				
Mallard	90.4	52.3	27.1	49.7	23.6	40.8	5.7	5.9	15.4	10.9	29.8	25.8	14.8	12.4	30.5	65.4	37.0	25.6	33.1	37.2
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	11.9	9.2	2.1	4.4	1.3	9.7	0.3	1.3	5.8	2.2	13.1	9.5	8.9	4.8	18.9	23.0	10.8	6.2	9.2	16.6
Am. wigeon	10.5	8.9	2.7	7.6	4.4	5.9	0.3	1.3	2.0	0.1	5.5	3.7	4.0	2.1	11.5	24.2	9.0	6.2	5.4	4.4
Green-winged teal	3.0	2.5	0.4	1.4	0.3	0.4	0.0	0.0	0.6	0.0	1.6	1.7	1.9	3.2	2.9	11.8	7.4	5.2	4.8	1.0
Blue-winged teal ⁴	35.3	30.6	6.1	18.5	18.4	12.7	1.0	0.7	5.2	3.8	11.4	13.9	14.3	4.3	14.6	17.5	15.4	9.2	7.7	14.0
N. shoveler	10.6	7.2	1.4	3.8	1.2	3.9	0.4	0.3	1.7	1.1	6.7	2.7	3.6	1.4	6.9	13.2	6.1	1.8	3.8	6.2
N. pintail	23.9	11.1	3.8	8.6	1.1	3.6	0.8	2.3	4.3	0.8	4.7	6.3	5.4	3.2	19.0	41.1	24.0	8.0	5.0	11.9
Subtotal:	185.6	121.7	43.6	93.9	50.3	77.1	8.4	11.8	35.0	19.0	72.8	63.7	52.9	31.3	104.4	196.3	109.8	62.3	69.1	91.2
Divers:																				
Redhead	4.2	5.5	0.9	2.4	0.4	1.7	0.0	0.3	1.0	1.1	2.3	2.1	2.8	1.5	2.1	3.5	1.9	2.6	2.1	2.7
Canvasback	5.6	2.6	0.5	1.8	0.9	0.4	0.2	0.0	0.5	0.3	0.7	0.3	1.1	1.4	0.5	3.9	2.2	1.1	2.7	1.7
Scaups	18.4	11.9	12.3	10.2	3.9	5.2	0.8	0.3	1.9	4.0	2.3	5.1	1.7	1.4	6.8	13.7	8.3	7.4	6.4	6.6
Ring-necked duck	2.4	0.1	0.2	0.8	0.7	0.0	0.1	0.0	1.1	0.0	0.5	0.3	0.3	0.0	0.1	0.5	0.0	0.2	0.9	1.9
Goldeneyes	0.0	0.0	0.0	0.0	0.2	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.4	0.0
Bufflehead	0.8	0.0	0.0	0.0	0.2	0.0	0.3	0.0	0.0	0.1	0.6	1.6	0.6	0.5	2.1	0.5	0.5	0.2	0.4	0.7
Ruddy duck	10.8	9.5	3.0	5.3	3.0	3.9	0.1	0.4	2.7	1.7	2.7	6.3	5.4	3.7	3.5	3.4	12.3	6.7	5.6	10.5
Subtotal:	42.3	29.7	16.8	20.6	9.4	12.0	1.7	0.9	7.2	7.2	9.0	15.6	12.0	8.5	15.1	27.1	25.1	18.3	18.4	24.1
Miscellaneous:																				
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	1.7	0.2	0.0	0.2	0.5	0.7	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Mergansers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0
Subtotal	1.7	0.2	0.0	0.2	0.5	0.7	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.2	0.0
Total LNI	229.6	151.7	60.4	114.7	60.2	89.8	10.0	12.7	43.1	26.3	81.9	79.3	64.9	39.9	119.9	223.4	134.9	80.6	87.8	115.4

¹ Incomplete survey coverage.

² Calculated using only class II and III broods observed and assumed to be complete.

³ Only observed adult pairs and singles used.

⁴ Includes cinnamon teal.

Appendix 1 (continued).

Species/Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Broods:																				
Duck brood index	148.2	169.0	144.6	130.0	107.2	130.6	77.9	63.3	69.5	70.6	94.9	100.9	105.4	74.3	58.4	68.3	58.5	63.2	19.2	87.8
Average brood size ²	4.7	4.5	5.2	4.7	5.3	4.6	4.3	4.8	4.5	4.7	5.3	5.7	5.2	4.6	4.7	4.3	5.4	5.1	4.8	6.2
Coot brood index	45.0	46.0	24.8	28.3	34.0	34.2	12.5	14.8	15.6	21.6	34.9	54.3	32.9	11.6	6.4	18.9	7.2	29.5	3.8	12.5
Late nesting index (LNI): ³																				
Dabblers:																				
Mallard	45.7	40.3	36.1	26.4	51.9	14.2	15.4	34.6	32.1	16.2	20.7	13.3	7.9	5.4	8.9	10.7	23.7	19.6	13.7	19.5
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	17.6	25.3	20.3	15.6	19.2	4.3	7.2	17.1	8.6	1.1	6.5	6.0	1.3	0.1	1.8	3.4	16.5	10.5	6.3	4.5
Am. wigeon	7.0	6.8	4.9	4.5	8.9	1.0	2.4	6.3	2.8	1.4	2.2	1.7	0.3	1.5	0.8	0.9	5.9	3.7	3.4	2.7
Green-winged teal	4.8	7.4	2.6	2.9	6.9	2.1	2.7	3.1	3.8	1.5	1.8	2.8	0.3	0.8	0.5	1.2	3.0	0.7	0.5	1.9
Blue-winged teal ⁴	12.1	21.4	22.4	9.3	21.6	8.7	8.9	13.4	14.4	12.2	7.5	9.8	1.6	4.6	2.2	3.3	13.0	6.8	6.6	6.3
N. shoveler	9.4	14.9	4.8	3.0	5.7	1.2	2.7	4.8	4.4	0.1	1.7	0.9	0.3	0.7	0.1	1.1	4.5	1.6	1.1	1.6
N. pintail	15.2	15.3	13.8	8.1	9.1	4.4	4.1	4.3	4.8	2.7	3.4	1.4	0.7	1.5	0.4	0.8	3.0	3.0	1.3	2.4
Subtotal:	111.8	131.4	104.8	69.7	123.4	35.9	43.5	83.7	70.8	35.3	43.7	35.9	12.2	14.5	14.6	21.3	69.6	45.9	33.1	38.9
Divers:																				
Redhead	7.1	8.1	4.4	2.9	5.5	3.2	1.5	2.7	3.7	0.6	1.9	0.4	0.1	0.2	0.0	0.7	1.4	3.1	0.5	1.3
Canvasback	2.2	2.8	5.7	1.6	2.0	1.0	0.6	0.3	1.3	1.0	0.7	0.8	1.0	0.0	0.0	0.1	0.7	0.6	1.1	0.3
Scaups	10.1	12.4	13.7	11.2	24.6	3.7	5.1	12.4	13.7	8.7	6.5	3.1	2.2	0.6	1.4	1.8	1.5	3.9	1.9	1.8
Ring-necked duck	1.1	1.9	1.2	1.6	3.1	0.8	0.3	1.0	0.9	0.0	1.0	0.5	0.4	0.8	0.0	0.9	0.0	0.5	0.8	0.5
Goldeneyes	0.0	0.0	0.0	0.2	0.6	0.0	0.2	0.0	0.9	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0	1.5	0.6	0.3
Bufflehead	1.6	1.8	1.7	0.7	2.1	0.5	0.0	0.6	0.7	0.0	0.1	0.2	0.0	0.5	0.0	0.0	0.0	0.4	0.4	0.3
Ruddy duck	10.6	16.0	9.9	5.4	13.0	2.5	2.7	5.2	13.9	3.5	7.0	6.9	2.3	1.5	1.9	1.4	6.4	7.4	4.2	5.2
Subtotal:	32.7	42.9	36.6	23.6	50.8	11.6	10.4	22.2	35.1	13.8	17.5	11.9	6.2	3.6	3.3	4.9	10.0	17.4	9.5	9.7
Miscellaneous:																				
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	1.1	0.0	0.8	1.4	0.7	0.7	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Mergansers	0.0	0.0	0.0	0.3	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.2
Subtotal	1.1	0.0	0.8	1.6	0.7	1.1	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.3	0.0	0.0	0.2	0.2
Total LNI	145.6	174.2	142.3	94.9	174.9	48.6	53.9	106.0	105.9	49.1	61.2	47.9	18.6	18.1	17.9	26.6	79.5	63.3	42.8	48.8

¹ Incomplete survey coverage.² Calculated using only class II and III broods observed and assumed to be complete.³ Only observed adult pairs and singles used.⁴ Includes cinnamon teal.

Appendix 1 (continued).

Species/Year	1995	1996	1997	1998	1999 ⁵	2000	2001	2002
Broods:								
Duck brood index	78.9	129.3	161.3	67.3	82.3	91.5	96.4	31.0
Average brood size ²	5.6	5.9	5.6	5.5	6.6	5.4	6.3	5.3
Coot brood index	6.7	63.5	48.5	19.8	41.5	37.3	34.9	1.5
Late nesting index (LNI):³								
Dabblers:								
Mallard	11.8	34.0	23.8	26.6	106.8	33.2	25.2	35.9
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	7.5	17.7	5.5	11.1	36.8	9.1	5.4	5.9
Am. wigeon	2.1	4.6	1.7	1.9	3.6	2.5	2.9	2.4
Green-winged teal	1.3	10.1	4.2	9.1	16.5	5.9	3.3	2.8
Blue-winged teal ⁴	7.6	31.9	10.2	15.0	37.0	11.5	8.3	10.9
N. shoveler	2.4	5.7	1.8	2.4	11.7	3.8	2.5	1.0
N. pintail	3.0	3.8	5.9	4.3	6.6	4.6	5.5	5.1
Subtotal:	35.7	107.9	53.0	70.4	219.0	70.6	53.1	64.0
Divers:								
Redhead	1.5	3.1	1.8	2.7	10.4	1.3	1.1	0.6
Canvasback	0.9	0.5	1.3	0.7	0.9	1.3	0.2	0.1
Scaups	2.3	4.4	2.0	2.8	7.2	4.2	4.4	1.8
Ring-necked duck	1.3	2.1	0.2	0.2	3.8	2.9	1.6	0.7
Goldeneyes	0.0	0.4	0.5	0.0	0.3	0.0	1.4	0.3
Bufflehead	0.0	0.5	0.5	0.7	0.0	2.5	0.5	0.4
Ruddy duck	7.1	13.6	9.4	8.0	31.6	13.6	6.1	2.3
Subtotal:	13.1	24.8	15.7	15.1	54.2	25.9	15.3	6.3
Miscellaneous:								
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Mergansers	0.0	0.2	0.3	0.2	0.4	0.5	0.8	0.1
Subtotal	0.0	0.2	0.3	0.5	0.4	0.5	0.8	0.1
Total LNI	48.8	133.0	69.0	86.0	273.6	97.1	69.2	70.4

¹ Incomplete survey coverage.² Calculated using only class II and III broods observed and assumed to be complete.³ Only observed adult pairs and singles used.⁴ Includes cinnamon teal.⁵ Late nesting data for strata 34 and 35 was not collected according to survey methodology, 1999 data are not used in averages or comparisons.