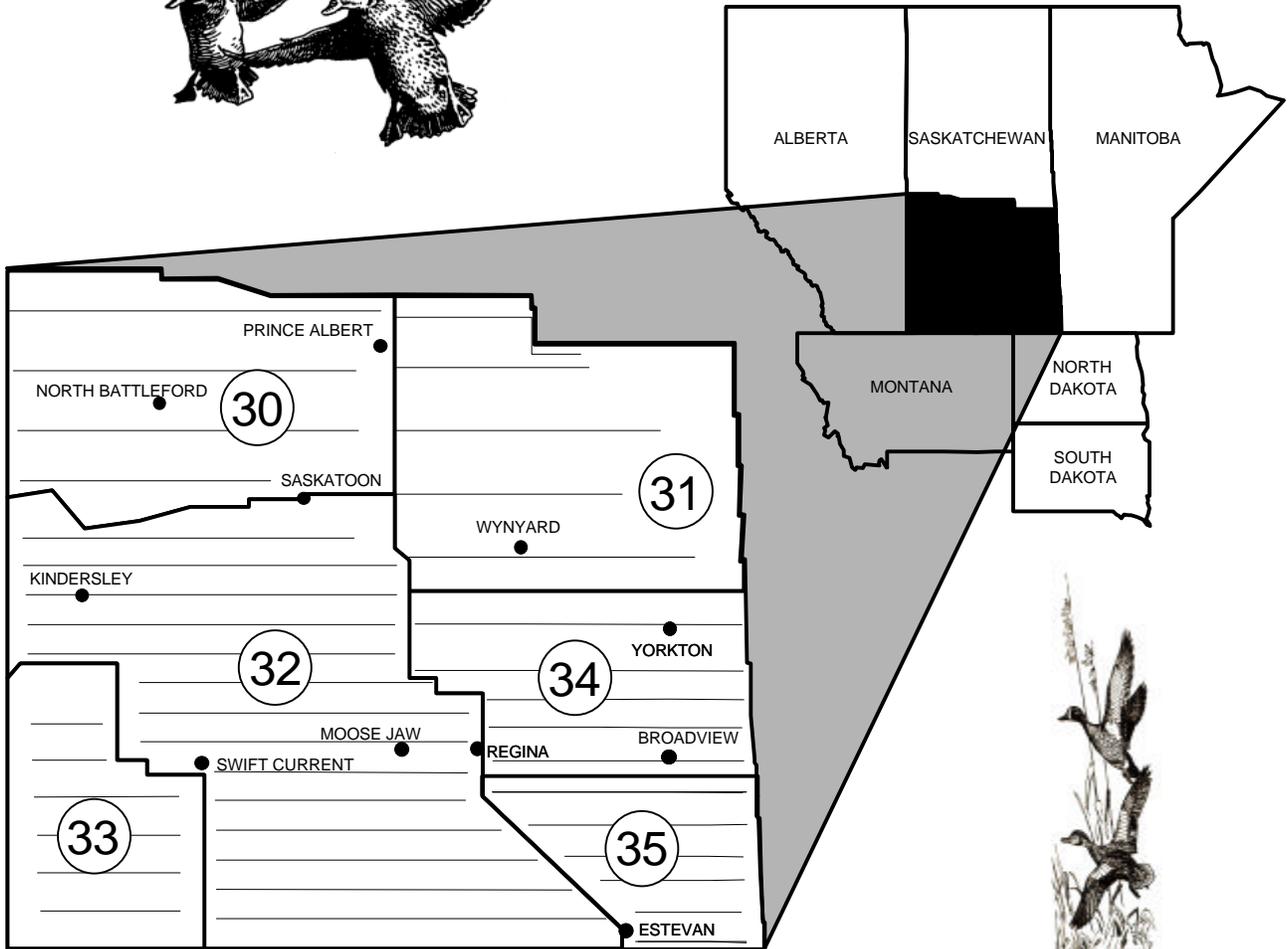
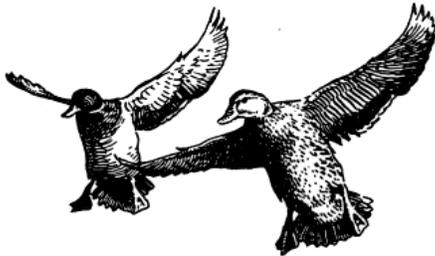


WATERFOWL BREEDING POPULATION SURVEY

SOUTHERN SASKATCHEWAN

2003



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

AND

ENVIRONMENT CANADA
CANADIAN WILDLIFE SERVICE



TITLE: Waterfowl Breeding Population Survey for Southern Saskatchewan

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

DATES: May 8 – May 29, 2003

DATA SUPPLIED BY: United States Fish and Wildlife Service (USFWS)
Canadian Wildlife Service (CWS)

Strata 30, 31, 32, and 33

Aerial Crew

Pilot/Observer
Observer

Philip Thorpe, Flyway Biologist, USFWS
Thomas Lewis, Wildlife Biologist, USFWS

Ground Crew

Crew Leaders:

Dan Nieman, Wildlife Biologist, CWS
Jack Smith, Wildlife Technician, CWS
Keith Warner, Wildlife Technician, CWS

Assistants:

Ted Barney, Student Technician, CWS
Jan Clark, Contractor, Ducks Unlimited Canada
Chris Downie, Student Technician, CWS
Phyllis Nieman, Volunteer, CWS
Chad Park, Student Technician, CWS
Amanda Williams, Student Technician, CWS

Strata 34 and 35

Aerial Crew

Pilot/Observer:
Observer:

Rod King, Flyway Biologist, USFWS
Burr Fisher, Wildlife Biologist, USFWS

Ground Crew

Crew Leaders:

Dale Caswell, Wildlife Biologist, CWS
Jim Leafloor, Wildlife Biologist, CWS
Pat Rakowski, Wildlife Biologist, CWS
Marc Schuster, Wildlife Technician, CWS

Assistants:

James Galbraith, Student Technician, CWS
Cory Lindgren, Wildlife Technician, Ducks Unlimited Canada
Cam Meuckon, Student Technician, CWS
Darcy Pisiak, Wildlife Technician, CWS

ABSTRACT: The 2003 Waterfowl Breeding Population and Habitat Survey of Southern Saskatchewan was conducted 8-29 May and was consistent in design and coverage to previous years. Above normal precipitation and runoff in the southern part of the survey area improved wetland habitat conditions dramatically from 2002; however, the northern grainbelt received below normal precipitation, especially in the northwest, and the drought continues in this part of the Province. The May pond estimate was 237.5% higher than the 2002 estimate, 7.7% higher than the 10-year mean, and 9.3% higher than the long-term mean. The total duck population estimate (9,298,600) was 161.9%, 29.3%, and 26.8% higher than the 2002 estimate, the 10-year mean, and the long-term mean, respectively. Percent changes for selected species compared to 2002, the 10-year mean, and the long-term mean are as follows: mallards, +74.1%, +11.5%, +1.1%; blue-winged teal, +187.5%, +37.8%, +60.3%; northern pintail, +446.3%, +58.6%, -20.3%; canvasbacks, +165.9%, -7.0%, +6.0%; scaup (greater and lesser), +67.9%, -28.1%, -40.9%. Although good production is expected from the grasslands portion of the survey area; the northern Parklands are still dry and waterfowl production will likely be poor from these areas.

METHODS: The procedures used in conducting this year's annual survey are described in the Standard Operating Procedures for Aerial Waterfowl Breeding Population and Habitat Surveys in North America, Section III (A), (revised 1987). No changes were made this year in survey methodology or aerial coverage (Table 1).

A survey program (written by John I. Hodges, USFWS-Alaska) provided the basis for recording observations and transcribing data into electronic format. This software integrates point locations {from the aircraft Global Positioning System unit (GPS)} with each bird or pond observation (See Thorpe 2000 for a more detailed description of the survey program).

Air-ground comparison transects (36 in strata 30-33; 16 in strata 34-35) were used to provide visibility correction factors for waterfowl, American coot, and pond numbers. The following air-grounds with their associated strata were not completed by the ground crew because of personnel shortages: Environ, 30; Elfros, 31; Hendon, 31; Grand Coulee 32; Gravelbourg, 32; Kincaid, 32; Neidpath, 32; Eastend, 33. In addition, Midnight Lake (30), Peterson (31), and Lawson (32) air-grounds were shortened from 17 miles to 11 miles, 18 miles to 8 miles, and 18 miles to 10 miles, respectively. All air-grounds were completed in strata 34 and 35.

Aerial crew changes occurred in all strata. Thom Lewis was the new observer in strata 30-33 and Burr Fisher, who observed in western Ontario during 2001-02, was the new observer in strata 34-35. Personnel changes were also made in both ground crews (i.e., 1 crew member in 30-33 and 2 new crew members in 34-35), but key crew leaders remained the same. All new personnel were provided initial training in duck identification, pond classification, and survey procedures. All were closely monitored for accuracy in identification and compliance with established procedures throughout the survey.

The survey was initiated 8 May and was completed 29 May. Two Cessna 206s (1 on amphibian floats in strata 34-35) were used as survey aircraft in all strata. Approximately 75 and 23 hours of flight time were required to complete the survey within strata 30-33 and strata 34-35, respectively. Weather related delays amounted to 4 days and a 1/2-day in strata 30-33 and strata 34-35, respectively.

WEATHER AND HABITAT CONDITIONS: Fall precipitation was well above normal in the west and central regions of the survey area, normal in the northeast, and normal to below normal

in the northwest (Agriculture and Agri-food Canada 2003). Winter precipitation was below to well below normal in the northwest, west, and southwest and normal through the central and eastern parts of the survey area. Spring precipitation was close to normal over most of the survey area except in the northwest where below average precipitation was received and in the southwest and central regions where snow and rain contributed to above normal levels.

Heavy snowfall in early April created a second runoff in Southern Saskatchewan that filled most dugouts, lakes, and reservoirs and improved conditions early enough to keep ducks in the Province (Saskatchewan Watershed Authority 2003). Unfortunately, the northwest and west-central parts of the survey area did not benefit from the early April snowstorm.

Temperatures varied through the fall (September – November) and winter (December – March) of 2002-03. The fall began cooler than normal with the largest departures from normal in October (5-6+°C below normal) (Agriculture and Agri-food Canada 2003). Temperatures were above normal (2-7 °C) from November through January, especially in the southwest. December was the warmest winter month with temperatures averaging 5-7 °C above normal. February and March were 1-3 °C below normal with the eastern grain belt having the coolest temperatures (>3 °C below normal). No temperature data were available for April or May.

Wetland habitat in the grassland portion of the survey area (strata 32-33) improved from 2002 and the majority of the basins in the southwest and central grasslands were full during the survey. Ephemeral and temporary wetlands (sheetwater) were abundant in areas of the southwest and central grasslands, but were absent from the northern grasslands. Seasonal wetlands were also abundant, especially in the southern parts of the grassland survey area and, if they last into July, should provide good habitat for broods. Three large basins that we record wet-dry status for in the western and central grasslands were wet for the first time since 1999.

The northwest Parklands (stratum 30) were dry and some areas were worse than 2002. Parts of the stratum showed signs of recovery (water in basins), but all areas in the stratum had poor habitat for waterfowl nesting and brood rearing.

Wetland and upland habitat in the northeast Parklands (stratum 31) showed improvement in the southern and eastern portions of the stratum. The northern areas of the stratum were still dry and in poor condition. Late summer and fall rains provided late-season grass growth prior to winter, and residual cover used by nesting waterfowl in the spring looked favorable to nesting in the southern part of the stratum.

The May pond estimate (2,143,000) was 237.5% higher than the 2002 estimate (634,900), 7.7% higher than the 10-year mean, and 9.3% higher than the long-term mean (Table 4, Figure 1). Overall, the 2003 May pond estimate was close to the average for the 43 years of record. However, the estimates varied widely by individual stratum. Stratum 33 had the highest pond estimate on record and the estimate for stratum 32 was the 3rd highest recorded for the survey. Contrary to the grasslands strata, the pond estimate for stratum 30 in the Parklands was the 2nd driest on record.

BREEDING POPULATION ESTIMATES: The 2003 total duck population estimate for Southern Saskatchewan increased 161.9% from the 2002 estimate, 29.3% from the 10-year mean, and 26.8% from the long-term mean (Table 3). The 2003 total dabbling duck population estimate increased 164.7% from 2002 and was the 12th highest on record (Table 3, Appendix 1). The mallard population estimate was 74.1% higher than the 2002 estimate and was 11.5% higher than the 10-year mean (Table 3). The gadwall estimate was 199.3% higher than the 2002 estimate, 100.3% higher than the long-term mean, and was the 3rd highest estimate since 1955.

Blue-winged teal and northern shoveler estimates also rebounded and were 187.5% and 363.6% higher than the 2002 estimate and were the 8th highest and 2nd highest on record, respectively. The 2003 northern pintail estimate increased 446.3% from the 2002 estimate and was the largest percent increase of any surveyed species in 2003. However, the northern pintail estimate remains 20.3% below the long-term mean (Table 3, Figure 1). Although the Southern Saskatchewan American wigeon estimate was 25.4% higher than the 2002 estimate, it remains 50.1% below the long-term mean (Table 3, Appendix 1).

The total diving duck population estimate was 146.4% higher than the 2002 estimate (Table 3). Redhead, canvasback, and scaup estimates were all well above their 2002 estimates, but canvasback and scaup remained below the 10-year mean and the scaup estimate was 40.9% lower than the long-term mean (Table 3). The redhead estimate, which was the 4th lowest on record in 2002, was the 9th highest on record in 2003 (Appendix 1).

Although the American coot estimate was 106.6% higher than the 2002 estimate and 43.5% higher than the long-term mean; it was 8.2% lower than the 10-year mean (Table 3). The Canada goose estimate was the highest on record and increased 35.7% from the 2002 estimate. (Appendix 1).

CONCLUSIONS:

The amount and timing of precipitation and runoff in Southern Saskatchewan is critical to how and where ducks settle in the prairies during the breeding season. This year, the timing of both precipitation and runoff in early April was ideal; the southern grasslands were wet and large numbers of ducks settled into the southern grainbelt.

The pintail estimate showed the largest increase of all surveyed species in Southern Saskatchewan; not surprising given the increase in pond numbers in the grasslands. The last several years pintails have been over-flying the drought stricken prairies to nest in the more stable wetland habitat of the boreal forest. This year, large numbers of pintails settled in Southern Saskatchewan because the shallow basins preferred by them were present upon their arrival. Much of the short and mixed-grass prairie is gone from the survey area and pintails now tend to nest in crop stubble. This year, farmers were about 2-weeks behind in seeding crops because of cool, wet weather. Most seeding was completed by 5 June and farmers were making the transition to summer fallow operations by mid-June (Saskatchewan Agriculture, Food, and Rural Revitalization 2003). Hopefully, the 2-week delay provided enough time for early nesting species, such as pintails, to successfully hatch nests in stubble fields before farmers seeded or fallowed them. Topsoil moisture was rated as good in the southern grainbelt and that should accelerate crop growth and provide additional nesting cover for renesting and later nesting species.

American coots are known for their ability to “predict” semi-permanent and permanent water. Last year, coots were almost absent from stratum 32 and 33. This year the Southern Saskatchewan coot estimate was 106.6% higher than the 2002 estimate and about 16 times higher than the 2002 estimate in stratum 32. If the coot’s predictions are correct, water should remain long enough into the summer for young coots to fledge. This also bodes well for the increased populations of ducks that were present in the survey area this year.

Predictions regarding nest success and production are hard to make in any year without extensive ground surveys. This year was more difficult because the survey area had water and ducks but habitat appeared to still be in the recovery stage from several years of drought. Residual nesting cover appeared to be in poor condition over much of the survey area and several

years of low water levels have allowed farmers to till the vegetation in and around wetlands. Although the pond estimate was at record levels in some strata, many of these ponds were not ideal for breeding or brood rearing, and therefore, only some areas were expected to have good production. Many factors need to be considered in nest success and recruitment and few of these can be evaluated adequately from the air. Reports from the ground indicate that nesting cover in the central and southwest grasslands was in good condition and that ground crews were finding lots of nests, mostly in cropland (J. H. Devries, Ducks Unlimited Canada, personal communication). In addition, informal brood surveys were observing “numerous” duck broods by late June (D. J. Nieman, Canadian Wildlife Service, personal communication). If nest success is high this year, ducks have the wetland numbers to support broods and the southern grasslands could have the best recruitment it’s seen in a number of years. Waterfowl habitat in the Parklands is still in poor condition and production from most of the northern Parkland’s survey area is expected to be poor. The exceptions to this are areas in stratum 31 south of the Quill Lakes, which had good water levels and residual nesting cover and have the potential for good waterfowl production.

ACKNOWLEDGMENTS

The survey would be a failure without the continued hard work and cooperation of the Canadian Wildlife Service ground crew - thanks. Dan Nieman and Tim Moser helped improve this report.

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Submitted by: Philip Thorpe
Date: July 1, 2003

Table 1. Survey design and May 2003 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	153.0	144.0	571.5	90.0	175.5	126.0	1,260.0
Square miles in sample- 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	121.373	146.431	66.336	126.056	75.009	71.778	
May 2003 coverage:							
Square miles in sample- waterfowl	153.0	144.0	571.5	90.0	175.5	126.0	1260.0
Square miles in sample- 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	121.373	146.431	66.336	126.056	75.009	71.778	

Table 2. Long-term trend in adjusted May pond estimates (thousands) by stratum with comparisons to the previous year, the previous 10-year mean, and the long-term mean for Southern Saskatchewan (1961-2003).

Year	Stratum						Total
	30	31	32	33	34	35	
1961	142.2	219.4	252.2	80.3	58.9	41.8	794.9
1962	160.3	383.4	311.1	45.2	269.4	59.9	1229.3
1963	145.0	198.5	268.9	43.3	239.1	129.7	1024.5
1964	196.9	357.3	322.6	64.7	481.8	394.0	1817.2
1965	327.9	439.9	610.1	112.2	435.1	332.2	2257.4
1966	350.8	587.3	595.1	133.0	569.7	388.5	2624.3
1967	282.3	642.1	688.8	194.9	545.1	299.0	2652.2
1968	231.4	329.6	404.2	65.1	123.6	58.5	1212.5
1969	386.7	469.7	781.8	140.0	267.1	179.6	2225.0
1970	278.1	603.7	733.4	102.6	721.3	518.1	2957.1
1971	294.3	407.0	495.3	120.4	608.7	391.7	2317.4
1972	349.1	646.2	357.2	63.1	546.0	302.8	2264.4
1973	266.8	466.6	326.8	85.7	227.6	117.0	1490.4
1974	427.6	836.7	755.0	122.9	943.1	460.9	3546.3
1975	395.3	806.1	785.7	192.7	763.9	480.9	3424.7
1976	201.9	399.0	553.4	96.8	656.6	670.8	2578.5
1977	176.1	254.7	265.7	44.5	338.7	170.3	1250.0
1978	274.1	393.6	566.4	161.6	545.5	280.7	2221.8
1979	433.4	697.5	660.4	130.2	667.8	480.9	3070.1
1980	265.4	311.3	358.2	48.1	273.3	137.2	1393.6
1981	145.9	160.5	126.2	28.4	97.3	52.6	611.0
1982	283.6	629.7	704.5	119.0	247.5	210.4	2194.7
1983	384.9	715.4	711.9	96.0	464.6	323.3	2696.2
1984	283.1	548.3	266.9	35.2	260.3	131.9	1525.8
1985	622.3	737.1	722.9	108.0	560.4	207.8	2958.5
1986	343.8	402.5	615.2	112.8	529.1	346.3	2349.6
1987	223.8	260.9	347.5	150.9	251.5	184.3	1418.9
1988	217.6	378.7	149.1	37.1	213.8	63.4	1059.8
1989	208.1	220.6	222.9	71.1	63.9	73.1	859.7
1990	213.0	284.9	277.1	56.8	453.6	97.4	1382.8
1991	194.8	213.2	437.3	157.1	257.8	144.8	1405.1
1992	247.9	376.4	349.8	34.5	378.3	229.1	1615.9
1993	167.7	189.6	337.3	94.0	203.0	96.3	1087.9
1994	407.3	564.7	742.9	178.0	472.3	288.0	2653.1
1995	344.9	680.9	343.5	52.7	561.0	331.4	2314.4
1996	408.3	666.9	1041.4	197.6	573.0	381.6	3268.9
1997	461.6	497.4	972.1	163.4	578.1	319.5	2992.0
1998	146.5	284.6	345.0	49.3	403.0	241.8	1470.2
1999	313.1	344.4	807.0	93.5	614.9	362.3	2535.3
2000	214.4	272.9	322.5	36.6	348.1	209.2	1403.7
2001	139.7	202.4	378.9	42.0	480.1	292.8	1535.7
2002	72.9	127.4	193.8	68.5	157.3	15.1	634.9
2003	136.8	275.5	851.1	258.7	333.6	287.2	2143.0
10-year Mean	267.6	383.1	548.4	97.6	439.1	253.8	1989.6
Long-term Mean	276.9	433.5	488.3	96.0	415.5	249.9	1960.1
Percent Change:							
From 2002	87.8%	116.3%	339.2%	277.7%	112.1%	1801.0%	237.5%
From 10-year Mean	-48.9%	-28.1%	55.2%	165.2%	-24.0%	13.2%	7.7%
From Long-term Mean	-50.6%	-36.5%	74.3%	169.7%	-19.7%	14.9%	9.3%

Table 3. Status of waterfowl breeding population estimates (thousands, adjusted for visibility bias) by species and stratum with comparisons to the previous year, the previous 10-year mean, and the long-term mean for Southern Saskatchewan, May 2003.

Species/Ponds	Stratum						% Change From						
	30	31	32	33	34	35	2003 Total	2002 Total	10-Year mean	Long- term mean	2002	10-Year mean	Long- term mean
Dabbling ducks													
Mallard	222.5	397.5	723.4	153.2	355.1	259.0	2110.7	1212.5	1892.5	2088.0	74.1%	11.5%	1.1%
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.0	0.5	0.2	--	73.9%	378.9%
Gadwall	130.6	145.4	526.9	75.9	120.9	76.8	1076.6	359.7	783.4	537.6	199.3%	37.4%	100.3%
Am. wigeon	34.1	26.9	110.4	15.0	17.5	15.0	218.9	174.5	280.8	438.4	25.4%	-22.0%	-50.1%
Am. green-winged teal	23.8	61.5	70.6	1.8	40.8	74.1	272.6	127.3	261.0	228.1	114.0%	4.4%	19.5%
Blue-winged teal	82.3	280.3	830.6	177.9	264.3	282.8	1918.3	667.1	1391.7	1196.7	187.5%	37.8%	60.3%
N. shoveler	69.0	296.1	676.0	163.6	116.2	116.8	1437.7	310.2	870.2	614.4	363.6%	65.2%	134.0%
N. pintail	31.2	35.4	570.2	185.4	90.4	80.8	993.4	181.8	626.4	1245.9	446.3%	58.6%	-20.3%
Subtotal	593.5	1243.0	3508.1	772.7	1005.4	906.1	8028.8	3033.2	6106.4	6349.3	164.7%	31.5%	26.5%
Diving ducks													
Redhead	18.9	49.5	78.6	7.9	62.6	53.8	271.3	94.9	241.5	188.9	185.9%	12.3%	43.6%
Canvasback	26.8	25.0	60.7	5.6	42.5	34.1	194.8	73.3	209.4	183.8	165.9%	-7.0%	6.0%
Scaup	32.3	47.8	121.4	12.5	26.6	10.8	251.4	149.7	349.7	425.4	67.9%	-28.1%	-40.9%
Ring-necked duck	0.4	9.6	6.6	0.0	5.6	5.1	27.2	29.7	42.3	27.6	-8.3%	-35.6%	-1.4%
Goldeneyes	36.1	10.4	0.5	0.0	2.4	15.4	64.8	21.4	37.0	21.6	202.5%	75.1%	200.5%
Bufflehead	34.5	49.9	4.3	0.0	4.5	6.2	99.4	75.4	70.1	33.4	31.9%	41.7%	197.4%
Ruddy Duck	4.8	61.7	154.0	8.0	93.8	35.9	358.2	70.0	125.4	97.3	412.1%	185.6%	268.3%
Subtotal	153.8	253.9	426.0	33.9	238.1	161.2	1267.0	514.2	1075.5	978.0	146.4%	17.8%	29.6%
Miscellaneous													
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	--	-100.0%	-100.0%
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	--
Scoters	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.8	3.3	--	-60.0%	-90.7%
Mergansers	2.4	0.0	0.0	0.0	0.0	0.0	2.4	3.0	6.7	4.9	-18.0%	-63.5%	-50.3%
Subtotal	2.7	0.0	0.0	0.0	0.0	0.0	2.7	3.0	7.5	8.2	-7.6%	-63.6%	-66.7%
Total ducks	750.1	1496.9	3934.1	806.6	1243.5	1067.3	9298.6	3550.3	7189.4	7335.5	161.9%	29.3%	26.8%
Canada goose	77.2	123.3	97.4	14.6	47.3	32.2	391.9	288.9	253.0	93.0	35.7%	54.9%	321.5%
Am. coot	22.4	40.6	281.8	35.4	134.0	119.6	633.9	306.8	690.2	441.7	106.6%	-8.2%	43.5%
Ponds	136.8	275.5	851.1	258.7	333.6	287.2	2143.0	634.9	1989.6	1960.1	237.5%	7.7%	9.3%

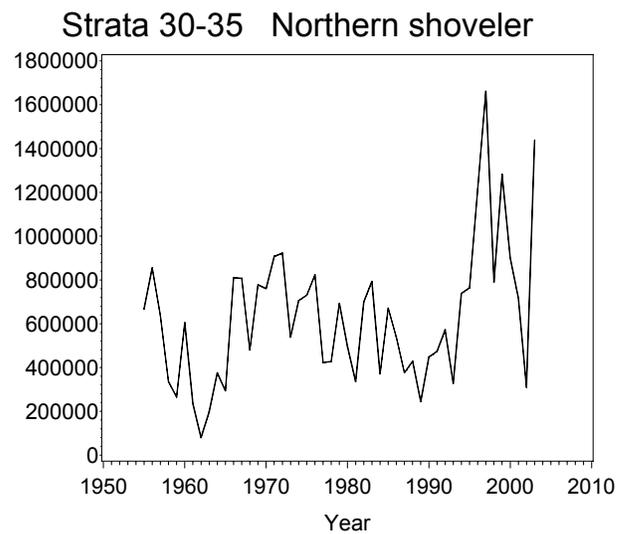
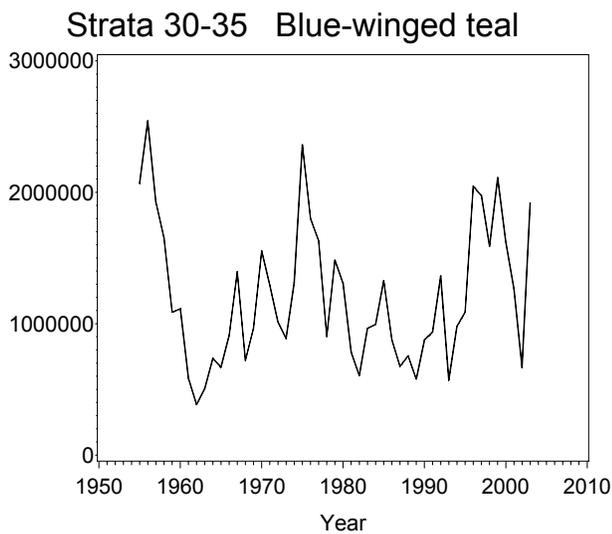
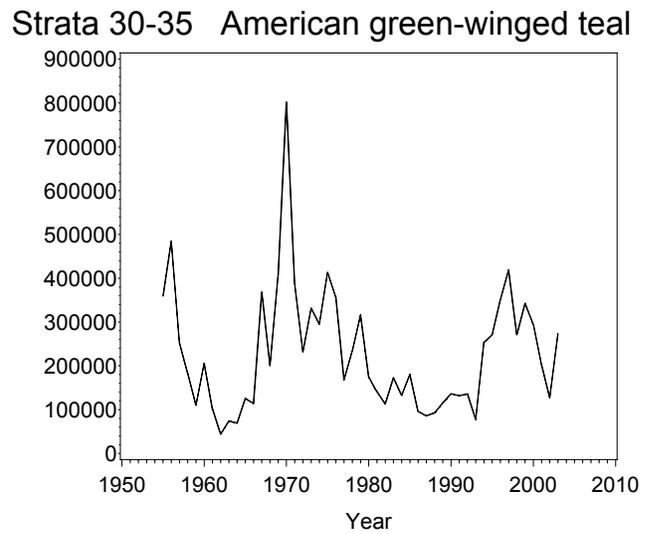
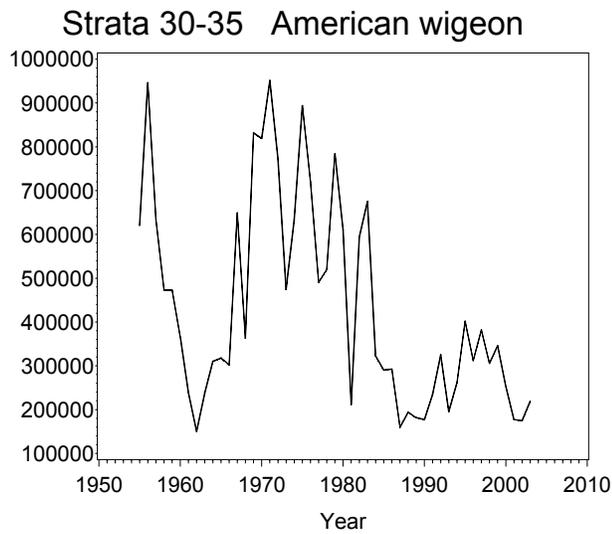
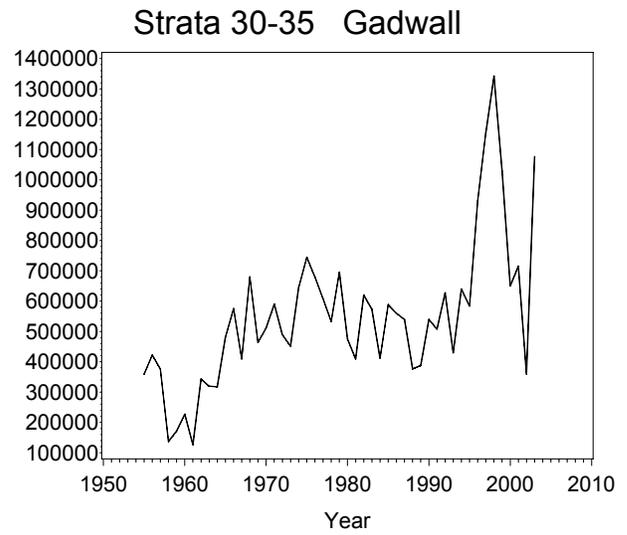
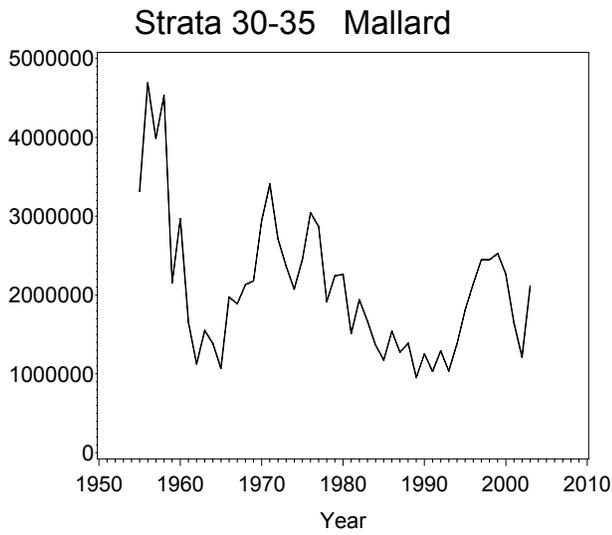


Figure 1. Breeding Population estimates for selected species and ponds surveyed in Southern Saskatchewan.

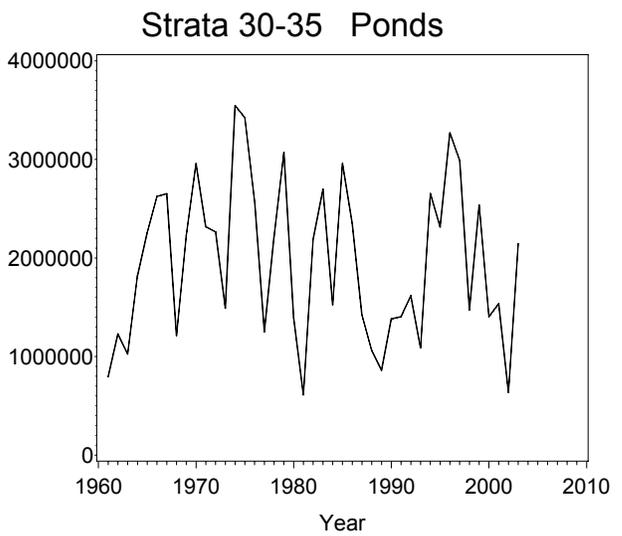
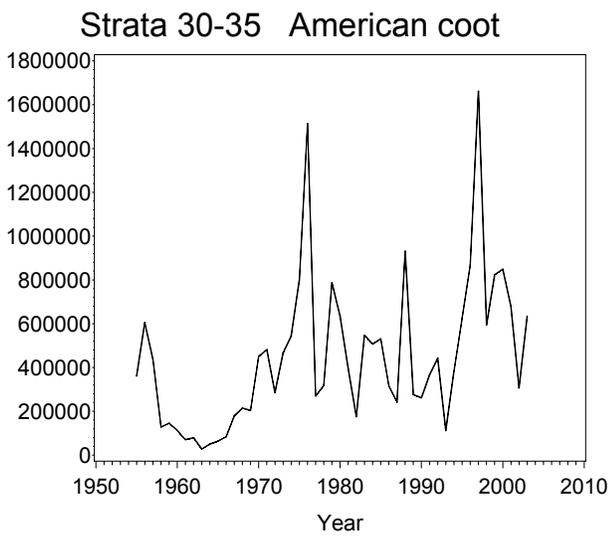
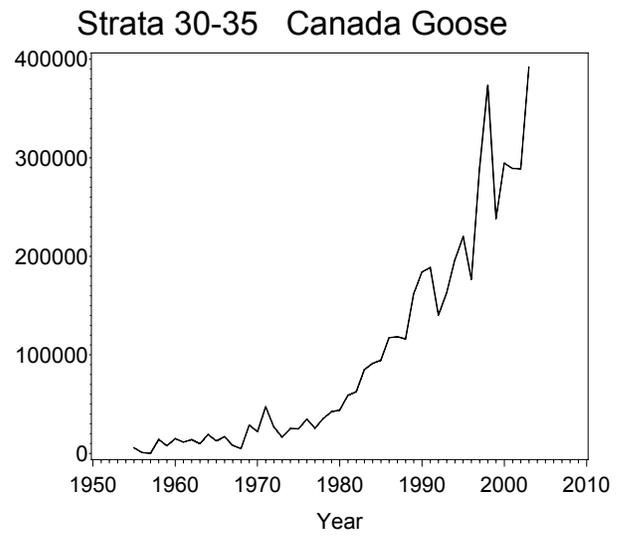
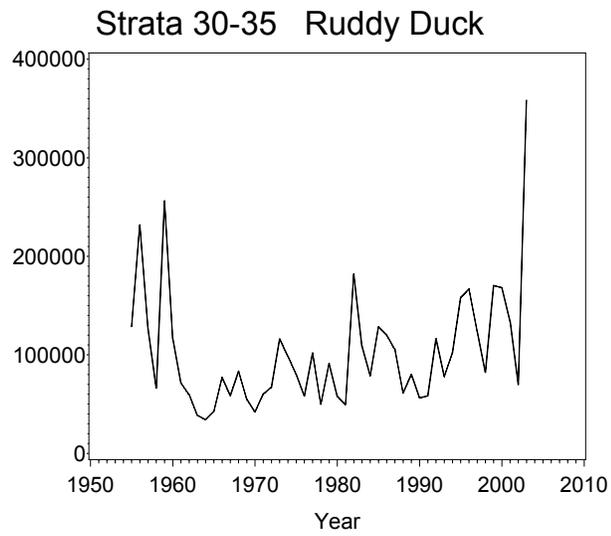
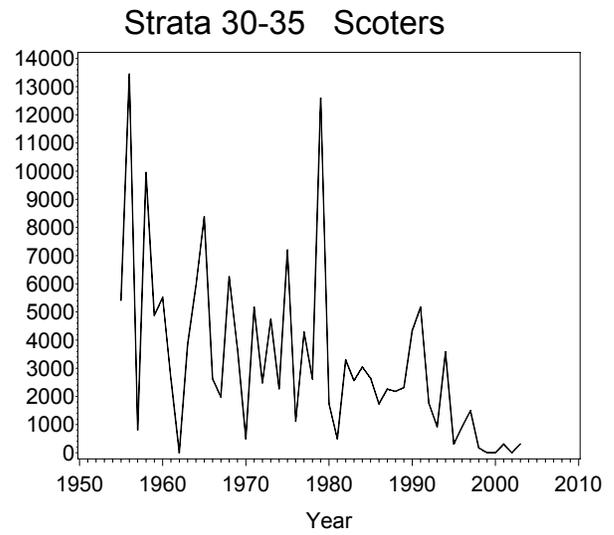
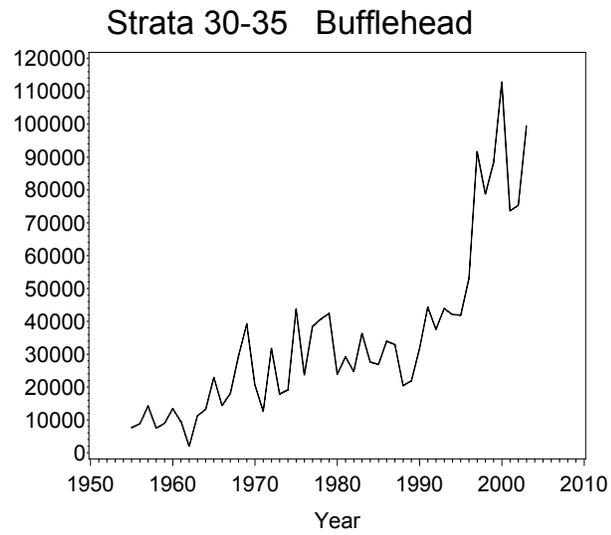


Figure 1. Continued.

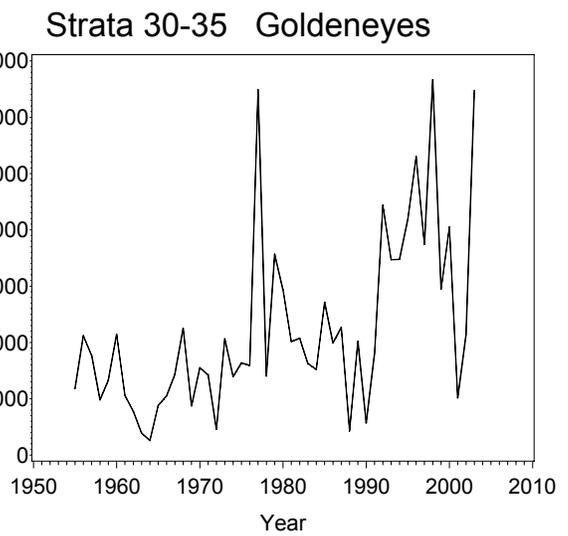
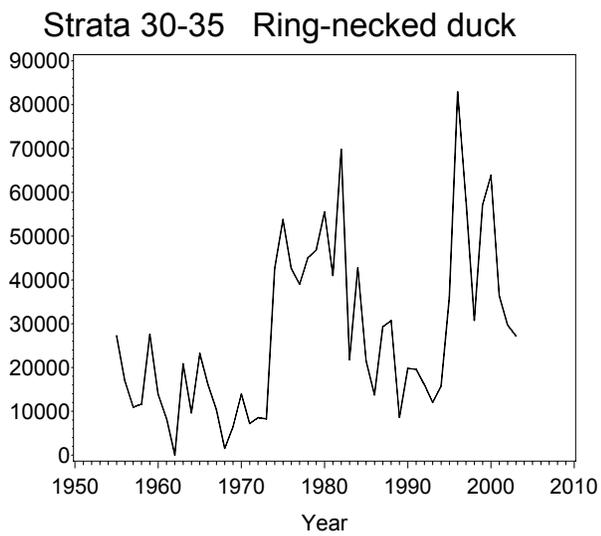
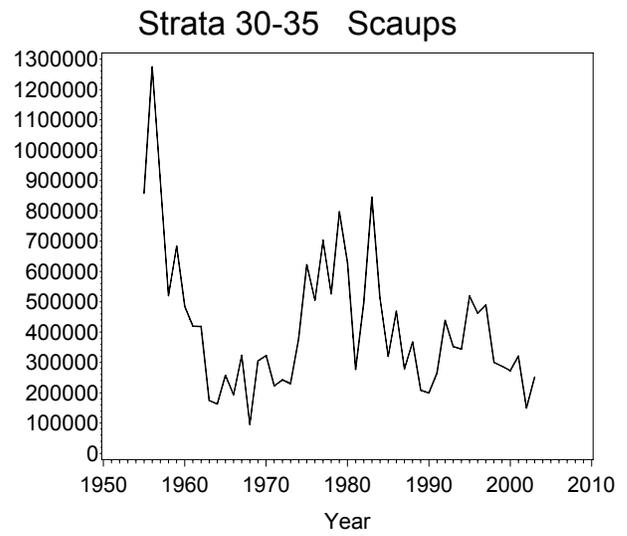
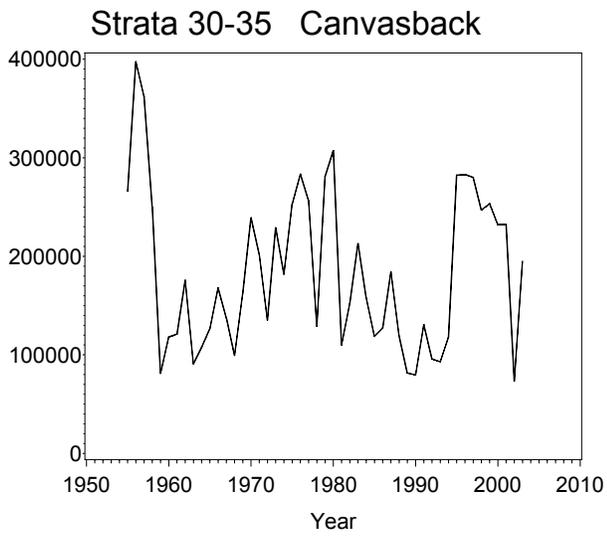
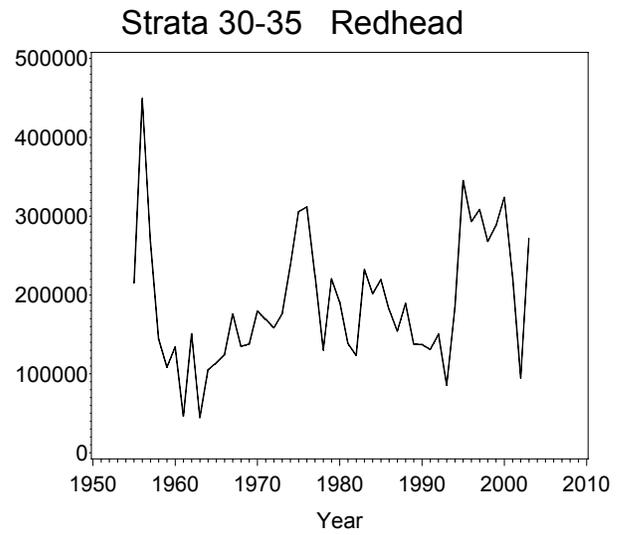
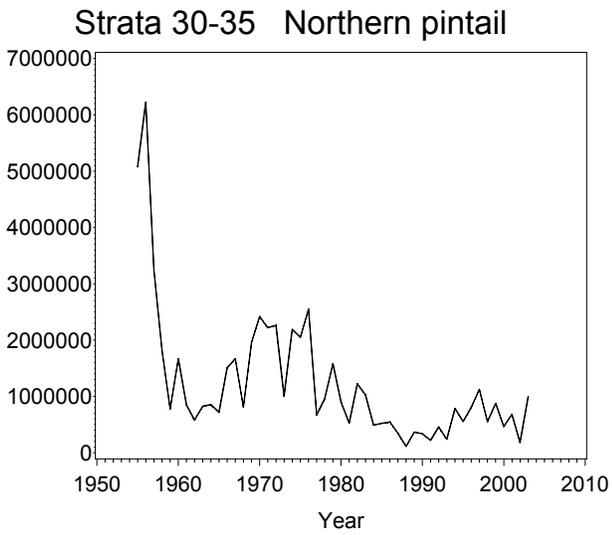


Figure 1. Continued.

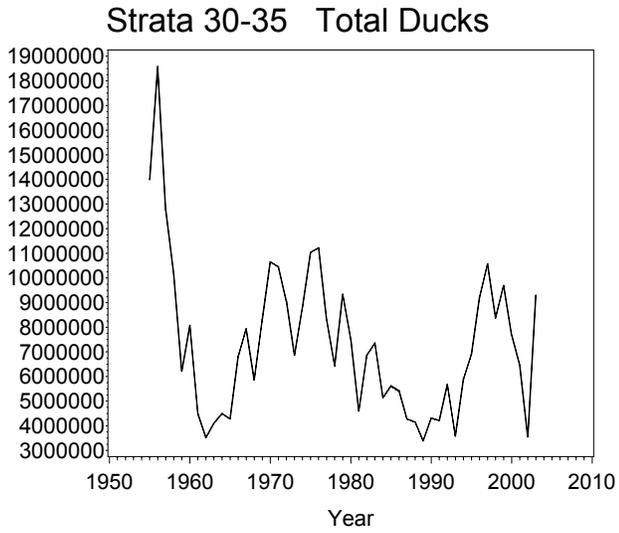
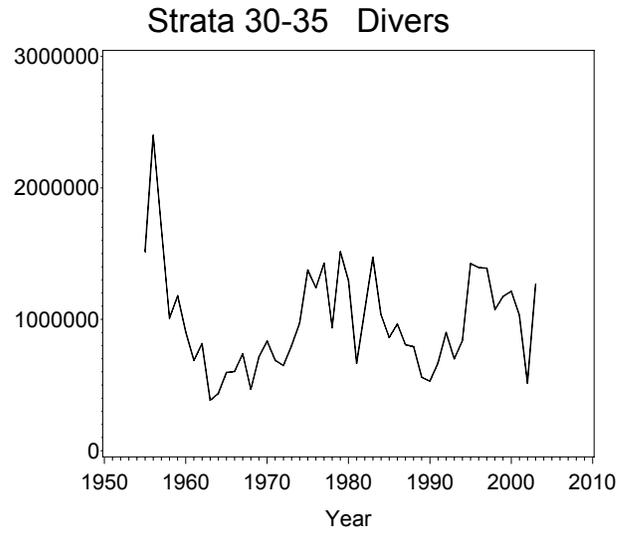
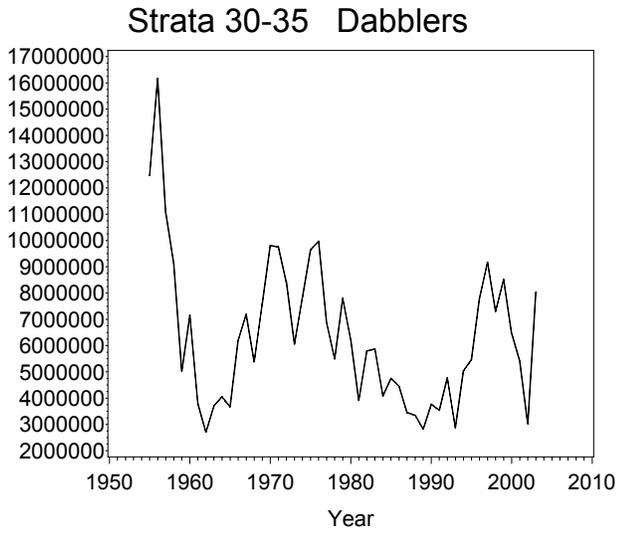


Figure 1. Continued.

Appendix 1. Long-term trend in adjusted waterfowl breeding population estimates (thousands) for Southern Saskatchewan.

Species/Ponds	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Dabbling ducks										
Mallard	3317.2	4691.4	3987.9	4534.0	2152.2	2967.5	1649.7	1125.9	1551.4	1387.3
Am. black duck	0.3	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	359.0	422.1	375.7	136.7	171.4	227.0	126.8	342.7	319.4	317.6
Am. wigeon	620.4	946.2	634.0	473.1	472.6	365.2	238.0	150.2	237.3	310.1
Am. green-winged teal	359.6	484.3	252.0	182.3	110.0	205.5	101.7	44.2	73.8	69.1
Blue-winged teal	2068.5	2542.7	1924.3	1650.7	1087.0	1112.8	583.0	383.8	504.9	735.8
N. shoveler	667.1	854.4	637.9	335.4	264.5	604.3	233.9	79.8	196.9	375.3
N. pintail	5076.5	6222.2	3245.9	1813.0	775.0	1665.5	846.7	581.1	823.9	853.4
Subtotal	12468.6	16163.3	11058.3	9125.2	5032.7	7147.9	3779.8	2707.7	3707.6	4048.5
Diving ducks										
Redhead	215.4	449.1	266.8	143.5	108.6	134.2	46.6	150.7	44.6	105.3
Canvasback	266.2	397.4	362.0	249.7	81.2	118.1	121.0	175.7	90.9	107.7
Scaup	858.3	1274.7	898.1	520.0	683.1	484.5	419.5	418.8	174.4	162.9
Ring-necked duck	27.2	16.9	10.9	11.7	27.6	13.8	8.4	0.0	20.8	9.6
Goldeneyes	11.8	21.2	17.7	9.8	13.3	21.4	10.6	7.8	3.9	2.6
Bufflehead	7.6	8.8	14.2	7.5	9.0	13.4	9.5	2.0	11.2	13.2
Ruddy Duck	128.7	231.8	126.1	66.2	256.1	116.8	71.4	59.6	38.5	34.3
Subtotal	1515.3	2399.9	1695.9	1008.4	1178.8	902.1	686.9	814.5	384.4	435.5
Miscellaneous										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	5.4	13.4	0.8	10.0	4.9	5.5	2.6	0.0	3.8	5.9
Mergansers	0.5	0.0	0.0	0.0	0.4	11.4	2.6	0.0	9.4	2.4
Subtotal	5.9	13.4	0.8	10.0	5.3	16.9	5.2	0.0	13.2	8.3
Total ducks	13989.9	18576.6	12755.0	10143.5	6216.9	8066.8	4471.9	3522.2	4105.2	4492.3
Canada goose	5.6	0.8	0.0	14.2	7.8	15.0	11.4	13.9	9.9	19.2
Am. coot	360.7	604.7	438.8	127.5	145.3	112.0	70.5	79.0	27.4	50.5
Ponds							794.9	1229.3	1024.5	1817.2

Species/Ponds	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Dabbling ducks										
Mallard	1069.9	1975.6	1888.4	2132.2	2180.0	2945.5	3407.2	2711.5	2369.1	2073.8
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Gadwall	481.2	575.4	409.2	679.9	463.5	511.5	590.2	488.8	451.5	644.7
Am. wigeon	317.7	302.1	649.1	362.8	831.7	819.3	951.4	772.3	474.4	633.2
Am. green-winged teal	125.3	114.2	367.7	200.7	408.8	801.4	386.9	232.2	331.2	295.4
Blue-winged teal	669.1	909.7	1395.7	720.2	966.6	1552.6	1291.4	1012.9	887.9	1312.2
N. shoveler	293.6	809.9	807.7	479.4	777.4	760.7	907.7	921.9	538.4	705.2
N. pintail	716.6	1504.8	1671.1	809.2	1956.2	2417.2	2222.0	2261.6	1006.3	2186.0
Subtotal	3673.4	6191.7	7188.9	5384.3	7584.0	9808.1	9757.0	8401.2	6058.7	7850.5
Diving ducks										
Redhead	114.1	124.6	176.0	134.9	137.8	179.6	169.3	158.6	176.3	237.6
Canvasback	126.5	167.8	137.5	99.5	162.4	238.9	202.1	135.3	228.9	181.8
Scaup	257.3	193.5	323.4	95.6	305.0	322.8	222.4	242.6	230.4	377.9
Ring-necked duck	23.2	16.0	10.4	1.5	6.5	13.9	7.2	8.5	8.2	42.6
Goldeneyes	8.8	10.5	14.3	22.5	8.7	15.5	14.3	4.6	20.6	13.9
Bufflehead	22.9	14.4	18.1	29.5	39.2	20.5	12.6	31.7	17.9	19.1
Ruddy Duck	42.6	77.1	58.7	83.3	55.0	42.1	60.2	67.2	116.0	98.5
Subtotal	595.4	603.9	738.3	466.9	714.6	833.4	688.0	648.4	798.3	971.4
Miscellaneous										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	8.4	2.6	2.0	6.2	3.7	0.5	5.2	2.5	4.7	2.3
Mergansers	5.2	0.0	0.0	1.0	1.4	8.8	1.3	0.0	2.2	0.5
Subtotal	13.6	2.6	2.0	7.2	5.1	9.3	6.4	2.5	6.9	2.7
Total ducks	4282.4	6798.2	7929.2	5858.5	8303.7	10650.8	10451.5	9052.1	6864.0	8824.6
Canada goose	12.8	16.9	8.0	4.9	28.6	22.1	47.3	26.7	16.4	25.2
Am. coot	63.6	83.4	179.0	214.3	203.8	450.3	481.5	284.9	465.9	544.3
Ponds	2257.4	2624.3	2652.2	1212.5	2225.0	2957.1	2317.4	2264.4	1490.4	3546.3

Appendix 1 (continued). Long-term trend in adjusted waterfowl breeding population estimates (thousands) for Southern Saskatchewan.

Species/Ponds	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Dabbling ducks										
Mallard	2449.2	3044.7	2869.3	1917.6	2244.2	2263.0	1509.8	1941.1	1670.1	1364.7
Am. black duck	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Gadwall	744.6	679.4	607.5	532.9	695.5	474.6	409.5	619.7	573.3	411.8
Am. wigeon	893.7	720.1	490.7	519.9	784.1	610.4	211.7	594.3	675.0	322.3
Am. green-winged teal	412.8	356.5	168.1	233.9	316.0	174.3	140.9	112.9	172.4	132.7
Blue-winged teal	2360.2	1799.6	1631.3	902.4	1482.8	1307.2	781.5	605.9	963.2	993.6
N. shoveler	730.3	822.9	422.7	426.7	692.4	494.7	335.3	699.0	792.8	370.9
N. pintail	2050.3	2549.6	672.5	961.8	1579.9	897.6	526.2	1222.0	1029.4	492.1
Subtotal	9641.5	9972.8	6862.2	5495.0	7795.1	6221.8	3914.8	5795.0	5876.3	4088.1
Diving ducks										
Redhead	305.7	311.7	224.3	130.3	220.5	190.9	138.4	123.4	232.2	201.6
Canvasback	252.9	283.3	256.5	129.0	280.9	307.2	110.1	151.9	212.7	157.7
Scaup	622.2	504.6	702.2	526.2	796.5	629.0	277.1	496.6	844.8	510.2
Ring-necked duck	53.8	42.6	39.0	45.1	46.8	55.5	41.0	69.8	21.8	42.7
Goldeneyes	16.4	15.9	64.8	14.0	35.7	29.4	20.1	20.8	16.2	15.2
Bufflehead	43.7	23.8	38.5	40.7	42.4	23.9	29.2	24.7	36.2	27.6
Ruddy Duck	80.3	58.4	101.8	50.0	91.1	57.9	49.7	181.9	108.5	78.9
Subtotal	1374.9	1240.3	1427.2	935.2	1514.0	1293.8	665.7	1069.1	1472.5	1033.8
Miscellaneous										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	7.2	1.1	4.3	2.6	12.6	1.7	0.5	3.3	2.6	3.0
Mergansers	7.5	5.3	3.4	6.5	13.0	6.8	14.6	3.4	5.9	17.7
Subtotal	14.7	6.4	7.6	9.1	25.6	8.6	15.0	6.7	8.5	20.8
Total ducks	11031.1	11219.5	8297.0	6439.4	9334.7	7524.2	4595.6	6870.8	7357.3	5142.7
Canada goose	25.0	34.8	25.6	35.3	42.4	44.0	59.0	62.5	85.0	91.3
Am. coot	799.8	1513.0	269.4	317.8	787.2	634.2	395.1	175.4	546.7	507.4
Ponds	3424.7	2578.5	1250.0	2221.8	3070.1	1393.6	611.0	2194.7	2696.2	1525.8

Species/Ponds	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Dabbling ducks										
Mallard	1173.3	1542.6	1273.3	1389.2	951.7	1253.7	1031.1	1293.4	1036.4	1380.3
Am. black duck	0.0	0.0	0.9	0.0	0.0	0.0	0.5	0.3	0.0	0.0
Gadwall	588.4	559.9	539.1	376.2	387.9	539.5	507.7	626.9	429.6	639.8
Am. wigeon	290.1	292.3	159.4	194.1	181.4	177.3	234.3	324.9	195.2	261.0
Am. green-winged teal	179.9	95.9	85.8	92.7	115.5	135.7	131.8	135.6	77.8	253.2
Blue-winged teal	1327.3	876.5	674.8	755.3	578.4	875.5	936.7	1362.4	570.1	980.2
N. shoveler	671.0	538.8	375.8	428.3	243.8	447.8	473.4	571.9	327.4	737.5
N. pintail	520.6	545.9	343.8	113.8	363.7	336.7	221.0	456.9	240.4	785.2
Subtotal	4750.7	4451.8	3453.1	3349.6	2822.5	3766.1	3536.4	4772.4	2876.8	5037.1
Diving ducks										
Redhead	219.6	181.6	154.3	189.3	137.8	137.2	131.1	150.3	85.7	183.5
Canvasback	118.8	127.2	184.2	119.0	81.5	79.7	130.5	95.7	93.0	117.7
Scaup	319.8	468.9	278.2	366.9	208.1	199.3	265.4	438.6	352.1	343.9
Ring-necked duck	21.4	13.7	29.3	30.7	8.6	19.8	19.6	16.1	12.0	15.7
Goldeneyes	27.1	19.9	22.7	4.3	20.2	5.7	18.0	44.4	34.7	34.8
Bufflehead	26.9	33.9	32.9	20.4	21.9	31.7	44.3	37.6	43.9	42.1
Ruddy Duck	128.3	120.2	105.6	61.2	80.1	56.2	58.5	116.1	78.1	102.2
Subtotal	861.8	965.5	807.1	791.9	558.2	529.7	667.4	898.7	699.5	839.8
Miscellaneous										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.6
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	2.6	1.7	2.3	2.2	2.3	4.3	5.2	1.8	0.9	3.6
Mergansers	1.9	0.0	6.9	5.8	3.7	7.9	6.5	3.8	3.5	2.3
Subtotal	4.5	1.7	9.1	8.0	6.0	12.3	11.6	5.6	4.8	6.5
Total ducks	5617.0	5419.1	4269.3	4149.5	3386.6	4308.1	4215.4	5676.7	3581.0	5883.3
Canada goose	94.7	117.3	118.4	116.2	162.2	184.0	188.7	140.5	163.1	196.6
Am. coot	530.6	315.0	241.7	930.7	276.2	261.5	366.6	442.6	111.8	383.3
Ponds	2958.5	2349.6	1418.9	1059.8	859.7	1382.8	1405.1	1615.9	1087.9	2653.1

Appendix 1 (continued). Long-term trend in adjusted waterfowl breeding population estimates (thousands) for Southern Saskatchewan.

Species/Ponds	1995	1996	1997	1998	1999	2000	2001	2002	2003
Dabbling ducks									
Mallard	1808.5	2142.7	2450.8	2448.7	2528.6	2266.7	1649.7	1212.5	2110.7
Am. black duck	0.4	0.0	0.0	3.3	0.4	0.4	0.0	0.0	0.8
Gadwall	583.6	930.1	1155.3	1342.0	1028.7	650.0	715.4	359.7	1076.6
Am. wigeon	401.8	311.8	381.9	305.5	345.5	253.1	177.3	174.5	218.9
Am. green-winged teal	271.3	351.2	418.5	271.2	342.2	294.8	202.3	127.3	272.6
Blue-winged teal	1088.4	2046.6	1974.4	1589.0	2110.9	1622.4	1267.5	667.1	1918.3
N. shoveler	763.9	1212.8	1660.7	790.5	1281.3	899.8	718.1	310.2	1437.7
N. pintail	554.2	807.4	1123.9	551.8	875.2	463.6	680.0	181.8	993.4
Subtotal	5472.2	7802.8	9165.4	7302.2	8512.9	6450.9	5410.3	3033.2	8028.8
Diving ducks									
Redhead	345.1	293.2	308.5	268.1	288.3	323.8	224.3	94.9	271.3
Canvasback	282.3	283.0	280.1	246.9	253.4	232.2	232.2	73.3	194.8
Scaup	518.6	462.5	489.5	300.2	287.4	272.8	320.6	149.7	251.4
Ring-necked duck	36.0	82.9	58.1	30.8	57.2	63.9	36.3	29.7	27.2
Goldeneyes	41.9	53.0	37.4	66.7	29.5	40.5	10.2	21.4	64.8
Bufflehead	41.9	53.0	91.6	78.8	88.4	112.8	73.7	75.4	99.4
Ruddy Duck	158.1	166.7	124.1	82.3	170.3	168.2	134.3	70.0	358.2
Subtotal	1423.9	1394.2	1389.2	1073.7	1174.5	1214.2	1031.5	514.2	1267.0
Miscellaneous									
Long-tailed duck	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
Scoters	0.3	0.9	1.5	0.2	0.0	0.0	0.3	0.0	0.3
Mergansers	7.5	4.0	6.5	6.8	2.6	9.2	21.2	3.0	2.4
Subtotal	7.9	4.9	7.9	6.9	2.6	9.2	21.5	3.0	2.7
Total ducks	6903.9	9201.9	10562.5	8382.9	9690.0	7674.2	6463.3	3550.3	9298.6
Canada goose	220.0	176.8	289.6	373.3	238.4	294.4	289.1	288.9	391.9
Am. coot	625.2	868.1	1661.1	594.3	823.7	848.5	679.2	306.8	633.9
Ponds	2314.4	3268.9	2992.0	1470.2	2535.3	1403.7	1535.7	634.9	2143.0