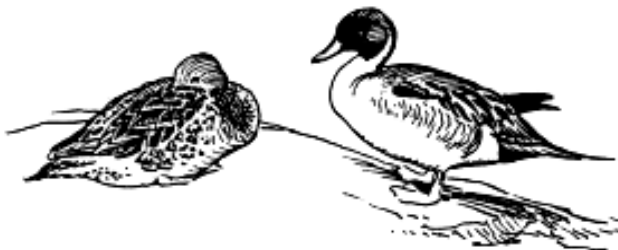


TRENDS IN DUCK BREEDING POPULATIONS, 1955-2003

K. A. Wilkins and M. C. Otto

U.S. Fish and Wildlife Service
Division of Migratory Bird Management
11500 American Holly Drive
Laurel, MD 20708-4016

Administrative Report^a – July 3, 2003



This report summarizes information about the status of duck populations and their habitats during spring 2003, and focuses on areas encompassed by the Breeding Waterfowl and Habitat Survey. These estimates do not include information from State or Provincial agency surveys. The traditional survey area includes strata 1-18, 20-50, and 75-77. In the traditional survey area, the total duck population estimate (excluding scoters [*Melanitta* spp.], eiders [*Somateria* and *Polysticta* spp.], long-tailed ducks [*Clangula hyemalis*], mergansers [*Mergus* and *Lophodytes* spp.], and wood ducks [*Aix sponsa*]) was 36.2 ± 0.7 [SE] million birds, 16% above ($P < 0.001$) last year's estimate of 31.2 ± 0.5 million birds, and 9% above ($P < 0.001$) the 1955-2002 long-term average. Mallard abundance was 7.9 ± 0.3 million birds, which was similar to last year's estimate of 7.5 ± 0.2 million birds ($P = 0.220$) and the long-term average ($P = 0.100$). Blue-winged teal abundance was estimated to be 5.5 ± 0.3 million birds. This value was 31% above last year's estimate of 4.2 ± 0.2 million birds ($P < 0.001$) and 23% above the long-term average ($P = 0.001$). Estimates of shovelers (3.6 ± 0.2 million; +56%) and pintails (2.6 ± 0.2 million; +43%) were above 2002 estimates ($P < 0.001$), while estimates of gadwall (2.5 ± 0.2 million), wigeon (2.6 ± 0.2 million), green-winged teal (2.7 ± 0.2 million), redheads (0.6 ± 0.1 million), canvasbacks (0.6 ± 0.1 million), and scaup (3.7 ± 0.2 million) were unchanged from 2002 estimates ($P \geq 0.149$). Gadwall (+55%) and shovelers (+72%) were above their 1955-2002 averages ($P < 0.001$), as were green-winged teal (+46%; $P < 0.001$), which were at their second highest level since 1955. Pintails (-39%) and scaup (-29%) remained well below their long-term averages ($P < 0.001$). Estimates of wigeon, redheads, and canvasbacks were unchanged from their long-term averages ($P \geq 0.582$).

The eastern survey area is comprised of strata 51-56 and 62-69. The 2003 total-duck population estimate for this area was 3.5 ± 0.3 million birds. This estimate is 21% lower than that of last year (4.4 ± 0.3 million birds, $P = 0.025$), but is similar to the 1996-

^a This report is intended for administrative use only and is not for publication without the permission of the Director, U.S. Fish and Wildlife Service.

2002 average ($P = 0.531$). Numbers of the individual species were similar to those of last year and the 1996-2002 average, with the exception of mergansers (0.6 ± 0.1 million), which decreased 30% from the 2002 estimate ($P = 0.035$).

Habitat conditions for breeding waterfowl have greatly improved over last year in most of the prairie survey areas. These improved conditions are reflected in the numbers of ponds counted this year. The estimate of May ponds (U.S. Prairies and Prairie and parkland Canada combined) of 5.2 ± 0.2 million is 91% higher than last year ($P \leq 0.001$) and 7% above the long-term average ($P = 0.034$). Numbers of ponds in Canada (3.5 ± 0.2 million) and the U.S. (1.7 ± 0.1 million) were above 2002 estimates (+145% in Canada and +30% in the U.S.; $P < 0.001$). Canadian ponds were similar to the 1974-2002 average ($P = 0.297$), while ponds in the U.S. were 10% above the 1974-2002 average ($P = 0.037$).

Most prairie areas had warm temperatures and abundant rain this spring. Two areas of dramatic improvement over the past several years were south-central Alberta and southern Saskatchewan, where conditions went from poor to good after much needed precipitation relieved several years of drought. Other areas in the prairies also improved over 2002, but to a lesser extent. However, years of dry conditions in parts of the U.S. and Canadian prairies, combined with agricultural practices, have reduced the quality and quantity of residual nesting cover and overwater nest sites in many regions. This could potentially limit production for both dabbling and diving ducks, if the warm spring temperatures and good moisture of 2003 do not result in rapid growth of new cover. Eastern South Dakota was the one area of the prairies where wetland habitat conditions were generally worse than last year, mostly due to low soil moisture, little winter precipitation, and no significant rains in April. This region received several inches of rain in May, but most birds had probably flown to other regions with more favorable wetland conditions.

In the northern part of the traditional survey area, habitat was in generally good condition and most areas had normal water levels. The exception was northern Manitoba, where low water levels in small streams and beaver ponds resulted in overall breeding habitat conditions that were only fair. Warm spring temperatures arrived much earlier this year than the exceptionally late spring last year. However, a cold snap in early May may have hurt early nesting species such as mallards and pintails, particularly in the northern Northwest Territories.

Habitat conditions in the eastern survey area ranged from excellent to fair. In the southern and western part of this survey area, water and nesting cover were plentiful and temperatures were mild this spring. Habitat quality decreased to the north, especially in northern and western Quebec, where many shallow marshes and bogs were either completely dry or reduced to mudflats. Beaver pond habitat was also noticeably less common than normal. To the east in Maine and most of the Maritime provinces, conditions were excellent, with adequate water, vegetation, and warm spring temperatures.

The data in this report were contributed by the following individuals:

Alaska, Yukon Territory, and Old Crow Flats (Strata 1-12): B. Conant and D. Groves

Northern Alberta, Northeastern British Columbia, and Northwest Territories (Strata 13-18, 20, and 77):
C. Ferguson and A. Straughn

Northern Saskatchewan and Northern Manitoba (Strata 21-24): F. Roetker and P. Stinson

Southern and Central Alberta (Strata 26-29, 75, and 76):

Air E. Buelna and D. Roach
Ground P. Pryor^a, K. Froggatt^b, S. Barry^a, E. Hofman^b, C. Procter^a, M. Barr^c, R. Engler^c,
N. Fontaine^c, R. Hunka^c, T. Lang^a, K. Lumbis^c, D. Matheson^c, T. Mathews^c,
M. Nieman^a, B. Peers^c, R. Russell^b, K. Zimmer^a

Southern Saskatchewan (Strata 30-35):

Air P. Thorpe, T. Lewis, R. King, and B. Fisher
Ground D. Nieman^a, J. Smith^a, K. Warner^a, T. Barney^a, J. Clark^c, C. Downie^a, P. Nieman^a,
C. Park^a, A. Williams^a, D. Caswell^a, J. Leafloor^a, P. Rakowski^a, M. Schuster^a,
J. Galbraith^a, C. Lindgren^c, C. Meuckon^a, D. Pisiak^a

Southern Manitoba (Strata 25 and 36-40):

Air R. King and B. Fisher
Ground D. Caswell^a, J. Leafloor^a, P. Rakowski^a, M. Schuster^a, F. Baldwin^a, G. Ball^b,
J. Caswell^a, J. Galbraith^a, C. Lindgren^c, C. Meuckon^a, D. Pisiak^a

Montana and Western Dakotas (Strata 41-44):

Air J. Voelzer and R. Bentley
Ground P. Garrettson, K. Richkus, and L. Ridenour

Eastern Dakotas (Strata 45-49):

Air J. Solberg and S. Thomas
Ground G. Allen, K. Kruse, T. Menard, and T. Thorn

Central Quebec (Strata 68 and 69):

Air J. Wortham and D. Fronczak
Helicopter D. Holtby^b and S. Boomer

New York, Eastern Ontario, and Southern Quebec (Strata 52-56): M. Koneff and C. Kitchens-Hayes

Central and Western Ontario (Strata 50 and 51): W. Butler and K. Bollinger

Maine and Maritimes (Strata 62-67):

Air J. Bidwell and M. Drut
Helicopter H. MacRae^d and B. Raftovich

^a Canadian Wildlife Service

^b State, Provincial, or Tribal Conservation Agency

^c Ducks Unlimited - Canada

^d Other organization

All others – U.S. Fish and Wildlife Service

Table 1. Estimated number (in thousands) of May ponds in portions of Prairie Canada and the northcentral U.S.

Survey Area	2002	2003	Change from 2002		LTA ^a	Change from LTA		
			%	<i>P</i>		%	<i>P</i>	
Prairie Canada								
S. Alberta	477	888	+86	<0.001	722	+23	0.008	
S. Saskatchewan	635	2143	+238	<0.001	1960	+9	0.185	
S. Manitoba	327	491	+50	0.031	679	-28	<0.001	
Subtotal	1439	3522	+145	<0.001	3361	+5	0.297	
Northcentral U.S.								
Montana and Western Dakotas	347	480	+38	0.001	523	-8	0.136	
Eastern Dakotas	934	1188	+27	0.002	1000	+19	0.003	
Subtotal	1281	1668	+30	<0.001	1523	+10	0.037	
Grand Total	2720	5190	+91	<0.001	4830	+7	0.034	

^aLong-term average. Prairie Canada, 1961-2002; northcentral U.S. and Grand Total, 1974-2002.

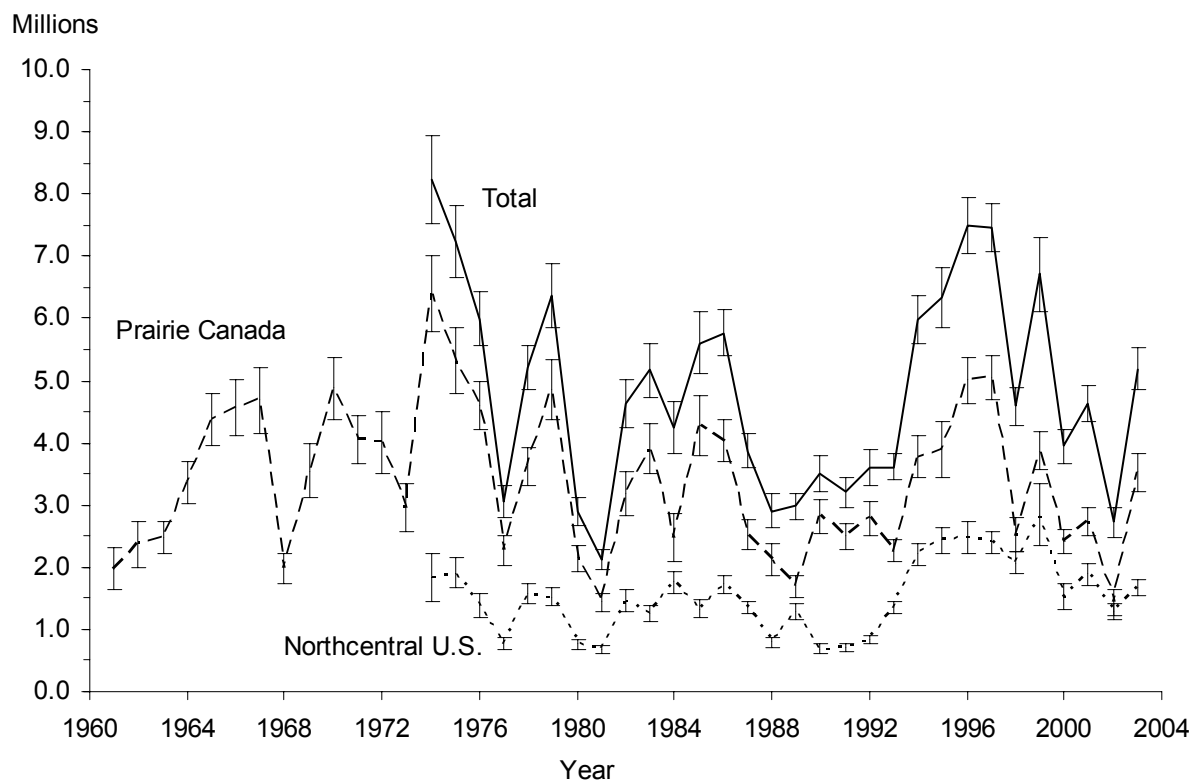


Figure 1. Number of ponds in May and 95% confidence intervals in Prairie Canada and the Northcentral U.S.

Table 2. Duck breeding population estimates ^a (in thousands) for regions in the traditional survey area.

Region	2002	Change from 2002			Change from LTA		
		2003	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	4961	5705	+15	0.006	3433	+66	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	6584	6461	-2	0.775	7245	-11	0.017
N. Saskatchewan- N. Manitoba - W. Ontario	4502	3564	-21	0.003	3553	0	0.959
S. Alberta	2364	2696	+14	0.117	4376	-38	<0.001
S. Saskatchewan	3547	9296	+162	<0.001	7327	+27	<0.001
S. Manitoba	1304	1582	+21	0.012	1543	+3	0.650
Montana and Western Dakotas	1334	1731	+30	0.003	1618	+7	0.305
Eastern Dakotas	6585	5190	-21	<0.001	4147	+25	<0.001
Total	31181	36225	+16	<0.001	33243	+9	<0.001

^a Includes 10 species in Appendix A plus black duck, ring-necked duck, goldeneye, bufflehead, and ruddy duck; excludes eiders, long-tailed duck, scoters, mergansers, and wood duck.

Table 3. Mallard breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2002	Change from 2002			Change from LTA		
		2003	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	667	843	+26	0.036	330	+155	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	1182	852	-28	0.027	1108	-23	0.004
N. Saskatchewan- N. Manitoba - W. Ontario	1115	1103	-1	0.949	1162	-5	0.679
S. Alberta	793	627	-21	0.147	1128	-44	<0.001
S. Saskatchewan	1213	2111	+74	<0.001	2088	+1	0.880
S. Manitoba	401	505	+26	0.048	374	+35	0.005
Montana and Western Dakotas	428	506	+18	0.257	502	+1	0.938
Eastern Dakotas	1704	1402	-18	0.031	811	+73	<0.001
Total	7504	7950	+6	0.220	7503	+6	0.100

Table 4. Gadwall breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2002	Change from 2002			Change from LTA		
		2003	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	1	5	+364	0.128	2	+154	0.219
C. & N. Alberta – N.E. British Columbia - Northwest Territories	162	76	-53	0.007	44	+73	0.009
N. Saskatchewan- N. Manitoba - W. Ontario	27	30	+12	0.740	28	+10	0.722
S. Alberta	333	241	-28	0.140	310	-22	0.025
S. Saskatchewan	360	1077	+199	<0.001	538	+100	<0.001
S. Manitoba	132	94	-29	0.095	63	+49	0.022
Montana and Western Dakotas	187	206	+10	0.705	194	+6	0.734
Eastern Dakotas	1034	821	-21	0.090	468	+75	<0.001
Total	2235	2549	+14	0.149	1646	+55	<0.001

Table 5. American wigeon breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2002	Change from 2002			Change from LTA		
		2003	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	1036	1020	-2	0.885	485	+110	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	673	850	+26	0.253	928	-8	0.529
N. Saskatchewan- N. Manitoba - W. Ontario	202	191	-5	0.815	258	-26	0.077
S. Alberta	77	132	+70	0.066	307	-57	<0.001
S. Saskatchewan	174	219	+25	0.328	438	-50	<0.001
S. Manitoba	22	16	-27	0.301	64	-76	<0.001
Montana and Western Dakotas	47	43	-8	0.760	112	-61	<0.001
Eastern Dakotas	102	81	-21	0.362	47	+71	0.033
Total	2334	2551	+9	0.299	2639	-3	0.582

Table 6. Green-winged teal breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2002	Change from 2002			Change from LTA		
		2003	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	631	1035	+64	<0.001	327	+217	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	928	767	-17	0.412	757	+1	0.951
N. Saskatchewan- N. Manitoba - W. Ontario	339	308	-9	0.664	189	+63	0.010
S. Alberta	147	132	-10	0.709	198	-33	0.036
S. Saskatchewan	127	273	+114	0.002	228	+19	0.262
S. Manitoba	25	48	+90	0.024	52	-7	0.621
Montana and Western Dakotas	79	85	+7	0.768	37	+134	<0.001
Eastern Dakotas	56	30	-45	0.264	45	-33	0.166
Total	2333	2678	+15	0.161	1832	+46	<0.001

Table 7. Blue-winged teal breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2002	Change from 2002			Change from LTA		
		2003	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	0	3	-	-	1	+123	0.596
C. & N. Alberta – N.E. British Columbia - Northwest Territories	304	314	+4	0.897	267	+18	0.474
N. Saskatchewan- N. Manitoba - W. Ontario	307	182	-41	0.071	274	-33	0.038
S. Alberta	244	323	+32	0.253	619	-48	<0.001
S. Saskatchewan	667	1918	+188	<0.001	1197	+60	0.001
S. Manitoba	230	420	+82	0.003	384	+9	0.539
Montana and Western Dakotas	249	419	+68	0.027	258	+62	0.013
Eastern Dakotas	2206	1939	-12	0.310	1487	+30	0.018
Total	4206	5518	+31	0.001	4487	+23	0.001

Table 8. Northern shoveler breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2002	Change from 2002			Change from LTA		
		2003	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	581	671	+16	0.292	242	+177	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	371	318	-14	0.435	211	+51	0.005
N. Saskatchewan- N. Manitoba - W. Ontario	38	10	-74	0.003	44	-77	<0.001
S. Alberta	274	448	+64	0.005	354	+27	0.053
S. Saskatchewan	310	1438	+364	<0.001	614	+134	<0.001
S. Manitoba	100	123	+23	0.282	104	+18	0.283
Montana and Western Dakotas	136	247	+81	0.025	146	+69	0.018
Eastern Dakotas	507	365	-28	0.051	389	-6	0.587
Total	2318	3620	+56	<0.001	2104	+72	<0.001

Table 9. Northern pintail breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2002	Change from 2002			Change from LTA		
		2003	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	942	848	-10	0.459	914	-7	0.368
C. & N. Alberta – N.E. British Columbia - Northwest Territories	187	170	-9	0.686	392	-57	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	11	6	-51	0.402	43	-87	<0.001
S. Alberta	73	252	+245	<0.001	752	-66	<0.001
S. Saskatchewan	182	993	+446	<0.001	1246	-20	0.085
S. Manitoba	32	39	+24	0.486	116	-66	<0.001
Montana and Western Dakotas	102	122	+19	0.579	279	-56	<0.001
Eastern Dakotas	260	128	-51	0.006	474	-73	<0.001
Total	1790	2558	+43	<0.001	4216	-39	<0.001

Table 10. Redhead breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2002	Change from 2002			LTA	Change from LTA		
		2003	%	<i>P</i>		%	<i>P</i>	
Alaska-Yukon Territory – Old Crow Flats	5	3	-35	0.592	1	+118	0.501	
C. & N. Alberta – N.E. British Columbia - Northwest Territories	38	29	-23	0.375	37	-22	0.228	
N. Saskatchewan- N. Manitoba - W. Ontario	28	26	-7	0.891	28	-7	0.874	
S. Alberta	113	97	-14	0.772	118	-18	0.289	
S. Saskatchewan	95	271	+186	0.001	189	+44	0.070	
S. Manitoba	58	71	+22	0.686	71	0	0.996	
Montana and Western Dakotas	16	22	+37	0.536	9	+146	0.054	
Eastern Dakotas	212	117	-45	0.002	171	-32	0.001	
Total	565	637	+13	0.420	625	+2	0.838	

Table 11. Canvasback breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2002	Change from 2002			LTA	Change from LTA		
		2003	%	<i>P</i>		%	<i>P</i>	
Alaska-Yukon Territory – Old Crow Flats	135	89	-34	0.207	90	-1	0.970	
C. & N. Alberta – N.E. British Columbia - Northwest Territories	121	115	-5	0.868	71	+63	0.098	
N. Saskatchewan- N. Manitoba - W. Ontario	38	13	-65	0.038	57	-77	<0.001	
S. Alberta	14	70	+381	<0.001	64	+9	0.677	
S. Saskatchewan	73	195	+166	<0.001	184	+6	0.685	
S. Manitoba	63	42	-34	0.234	56	-25	0.069	
Montana and Western Dakotas	6	11	+81	0.224	8	+48	0.235	
Eastern Dakotas	35	23	-36	0.221	33	-31	0.122	
Total	487	558	+15	0.275	562	-1	0.931	

Table 12. Scaup (greater and lesser combined) breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2002	2003	Change from 2002		LTA	Change from LTA	
			%	<i>P</i>		%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	792	970	+22	0.130	911	+6	0.549
C. & N. Alberta – N.E. British Columbia - Northwest Territories	1784	1736	-3	0.846	2693	-36	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	378	354	-6	0.757	597	-41	<0.001
S. Alberta	146	172	+17	0.777	366	-53	<0.001
S. Saskatchewan	150	251	+68	0.067	425	-41	<0.001
S. Manitoba	50	49	-2	0.936	141	-65	<0.001
Montana and Western Dakotas	50	35	-29	0.405	55	-36	0.102
Eastern Dakotas	174	167	-4	0.868	92	+82	0.006
Total	3524	3734	+6	0.495	5281	-29	<0.001

Table 13. Duck breeding population estimates (in thousands, for the 10 most abundant species) for the eastern survey area.

Species	2002	2003	Change from 2002		LTA ^a	Change from LTA	
			%	<i>P</i>		%	<i>P</i>
Mergansers (common, red-breasted, & hooded)	815	570	-30	0.035	532	+7	0.626
Mallard	295	383	+30	0.201	302	+27	0.176
American Black Duck	603	522	-13	0.430	493	+6	0.635
American Wigeon	87	56	-35	0.447	67	-16	0.742
Green-winged teal	604	393	-35	0.216	342	+15	0.658
Lesser Scaup	136	101	-26	0.507	78	+30	0.383
Ring-necked duck	416	395	-5	0.781	490	-19	0.106
Goldeneye (common & Barrow's)	955	714	-25	0.413	743	-4	0.894
Bufflehead	84	66	-21	0.521	59	+12	0.699
Scoters (surf, black, & white-winged)	314	237	-25	0.447	142	+67	0.171
Total ^b	4399	3485	-21	0.025	3301	+6	0.531

^a LTA = Long-term average (1996-2002).

^b Includes species in table plus gadwall, northern shoveler, northern pintail, and scaup. Excludes eiders, long-tailed duck, wood duck, redhead, canvasback, and ruddy duck.

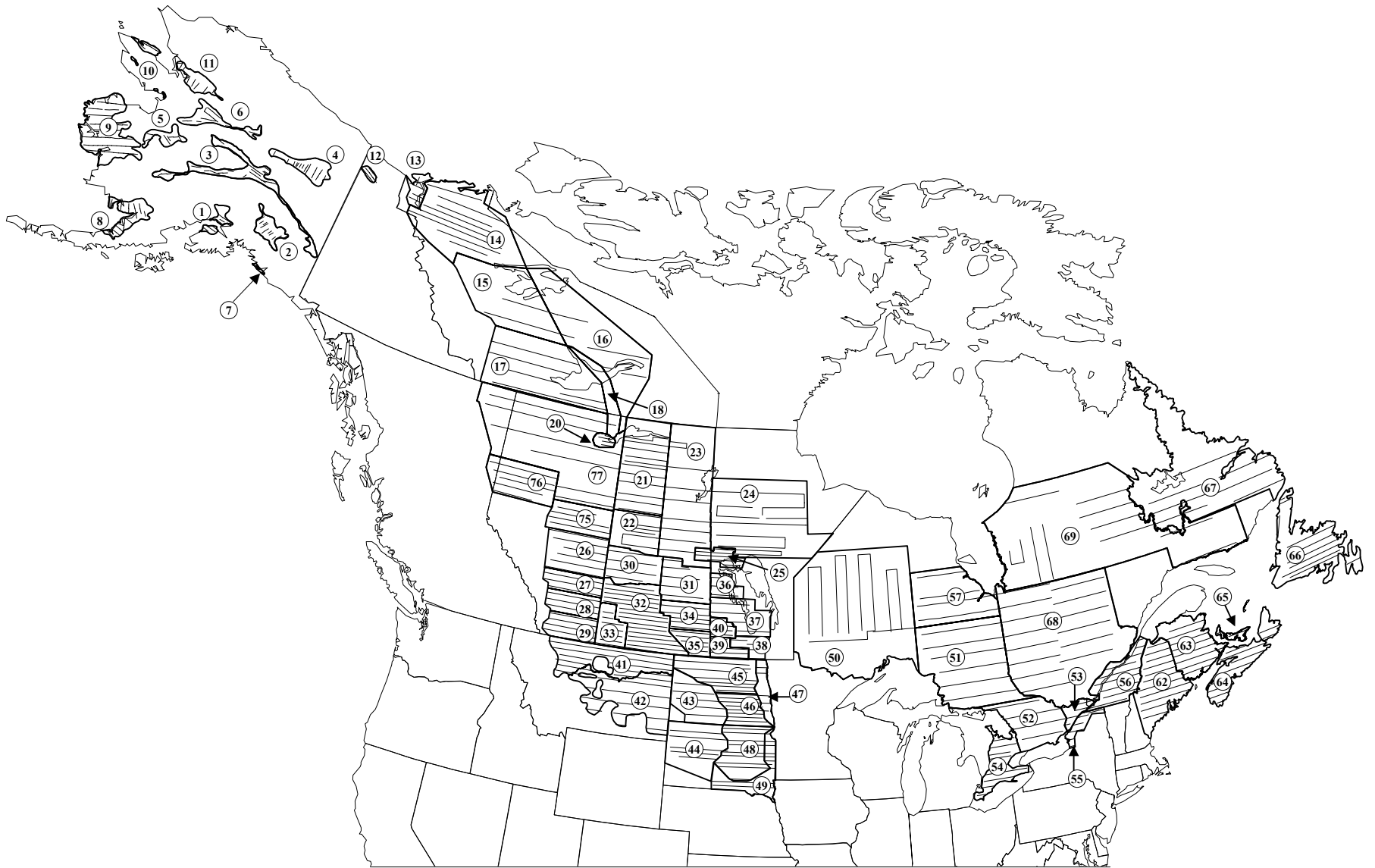


Figure 2. Transects and strata for areas of the Breeding Waterfowl and Habitat Survey (stratum 57 is experimental and survey counts are not included in this report).

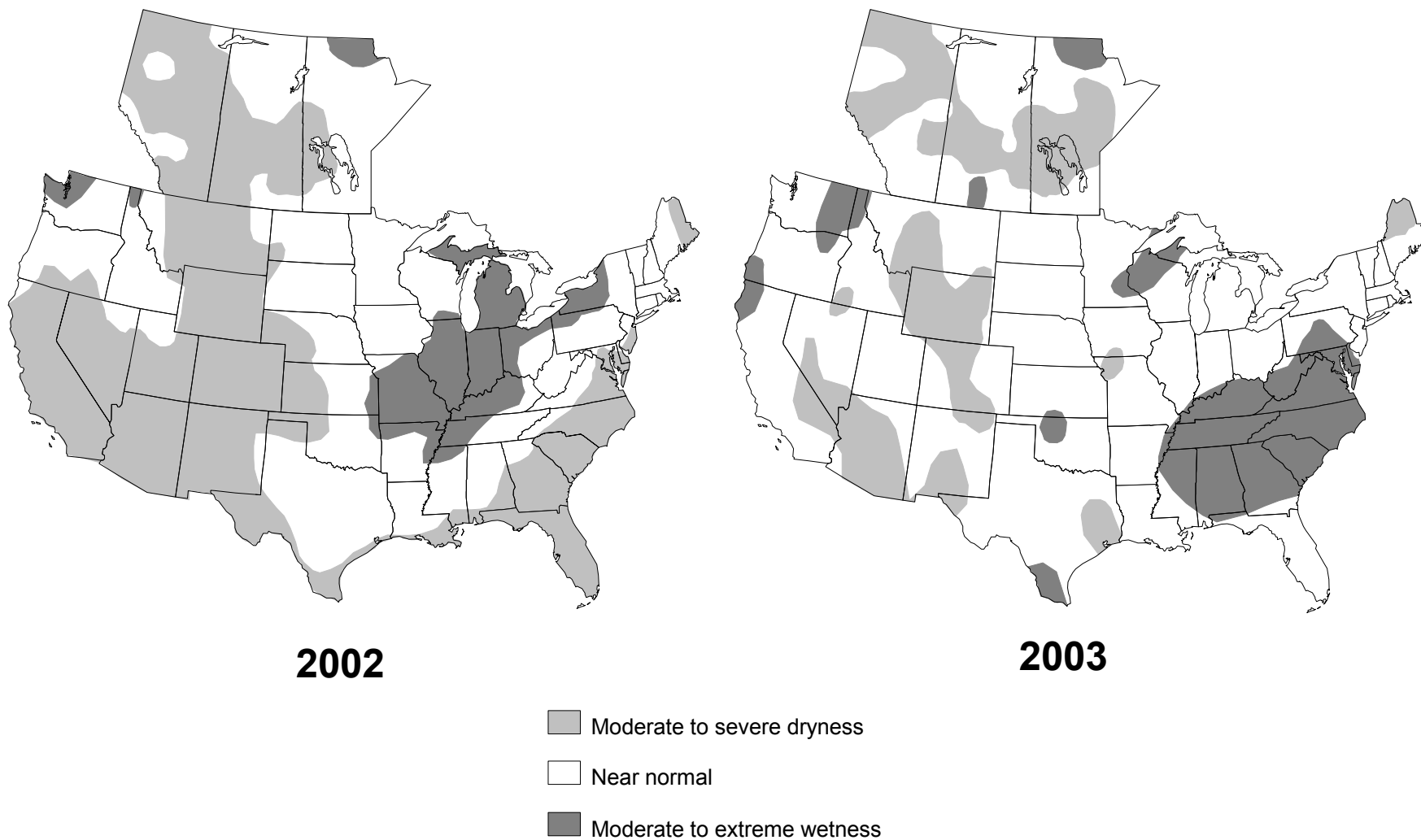


Figure 3. Palmer long-term drought indices (PDI) for the contiguous U.S. and provinces of Canada for which data were available. U.S. PDI map from Weekly Weather and Crop Bulletin - May 29, 2002 and May 28, 2003; Canadian PDI map from Environment Canada - May 2002 and May 2003.

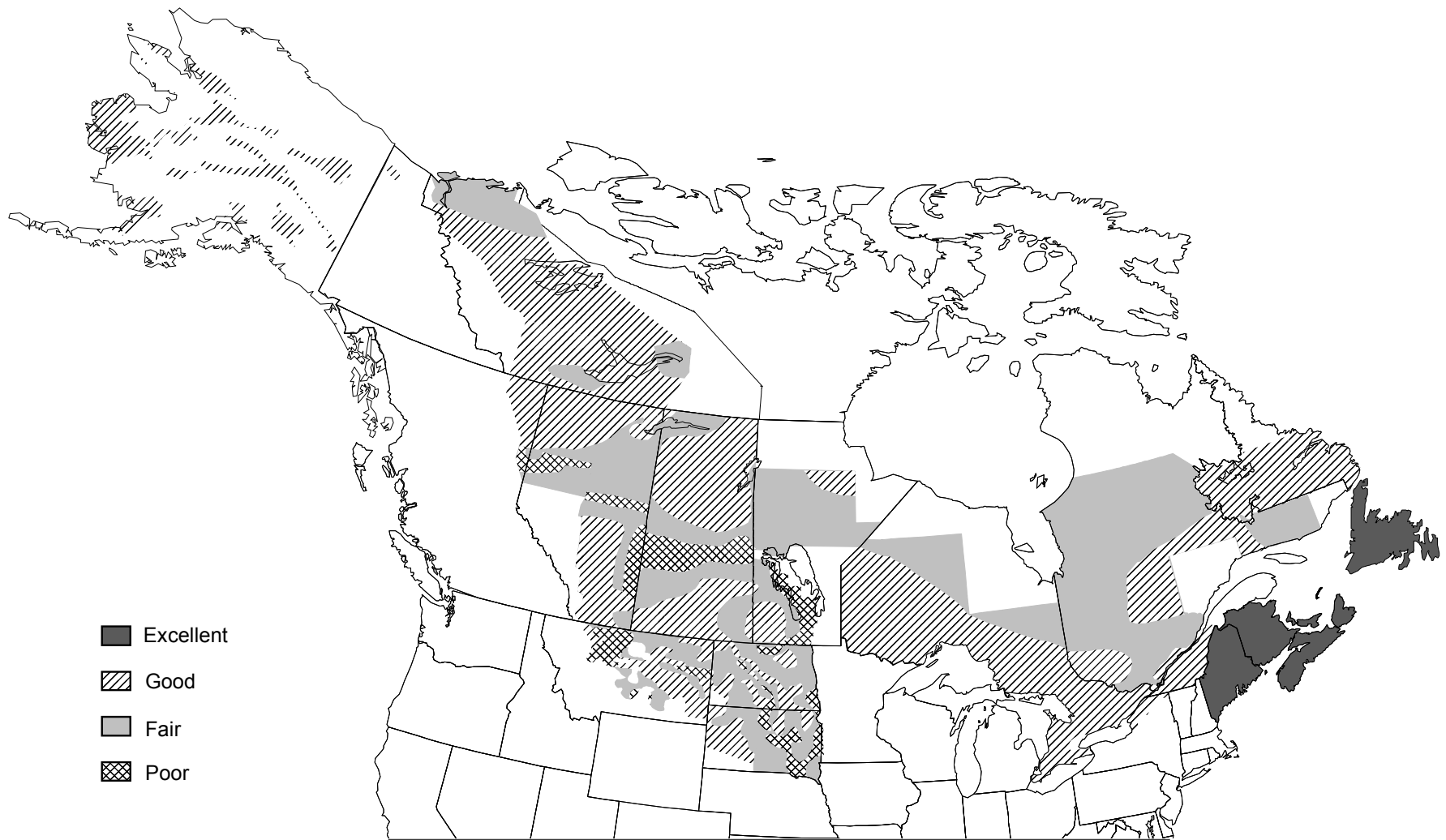


Figure 4. Breeding waterfowl habitat conditions during May and June 2003, as judged by U.S. Fish & Wildlife Service Flyway Biologists.

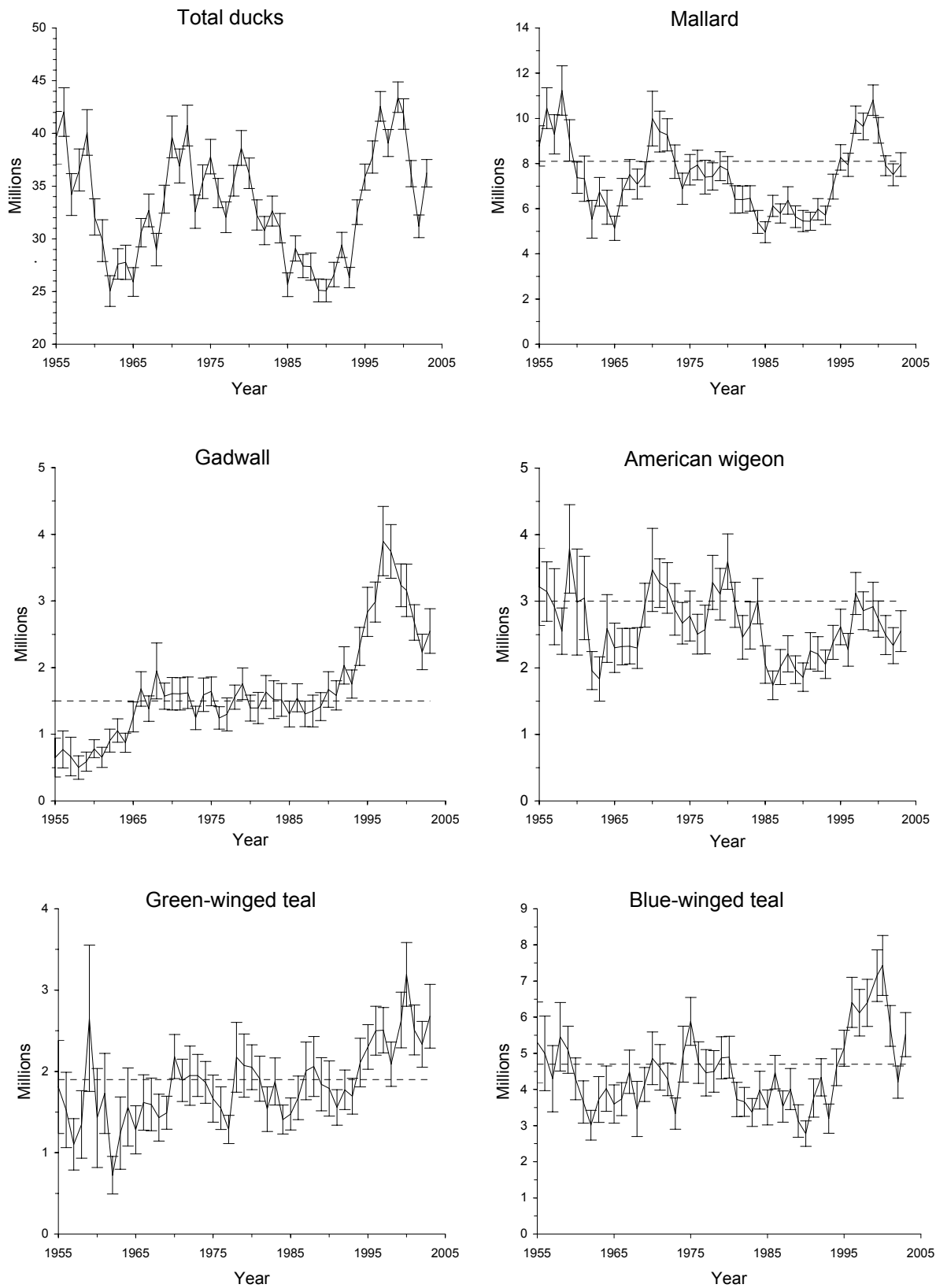


Figure 5. Breeding population estimates, 95% confidence intervals, and North American Waterfowl Management Plan population goal (dashed line) for selected species in the traditional survey area (strata 1-18, 20-50, 75-77).

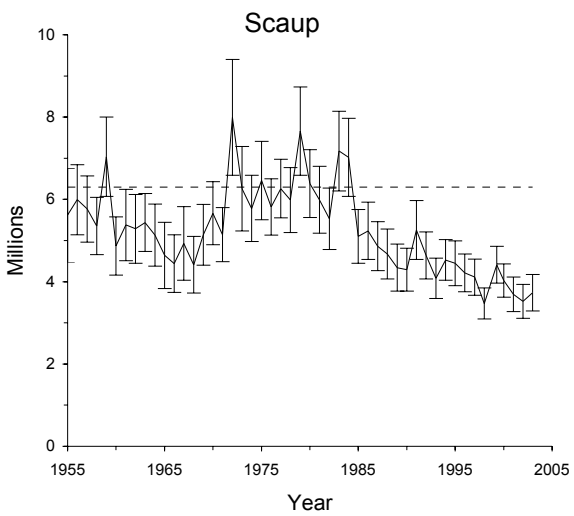
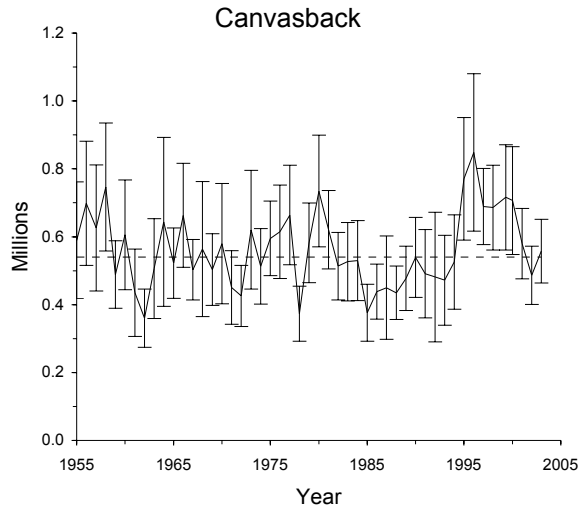
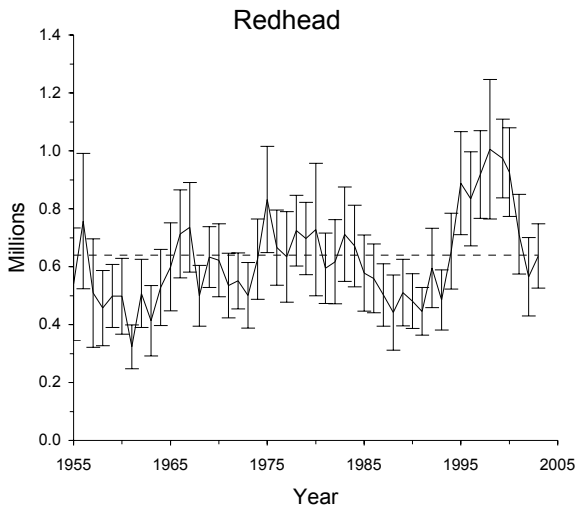
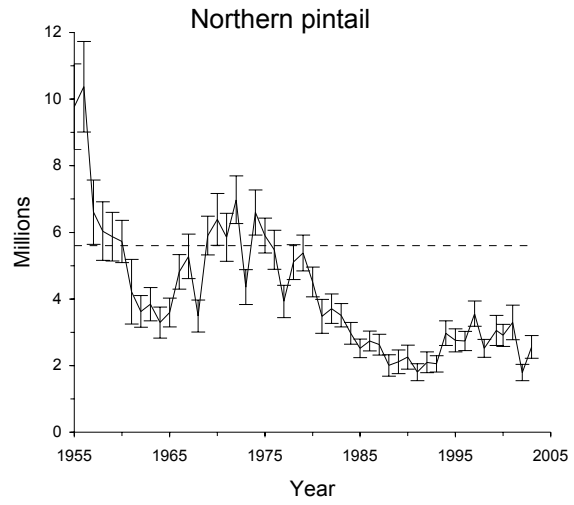
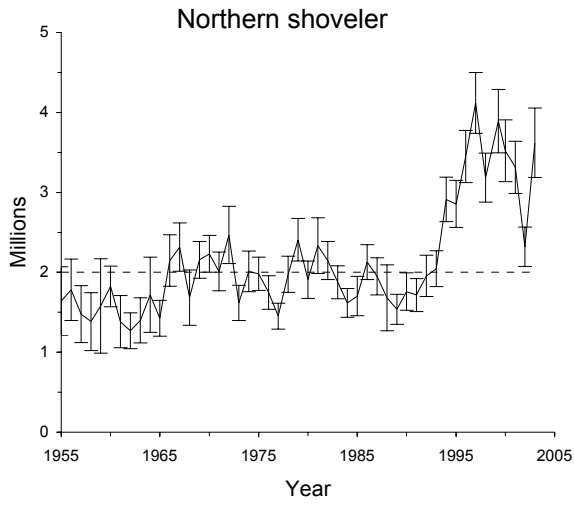


Figure 5, continued.

Appendix A. Breeding population estimates and standard errors (in thousands) for 10 species of ducks from the traditional survey area (strata 1-18, 20-50, 75-77).

Year	Mallard		Gadwall		American wigeon		Green-winged teal		Blue-winged teal	
	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}
1955	8777.3	457.1	651.5	149.5	3216.8	297.8	1807.2	291.5	5305.2	567.6
1956	10452.7	461.8	772.6	142.4	3145.0	227.8	1525.3	236.2	4997.6	527.6
1957	9296.9	443.5	666.8	148.2	2919.8	291.5	1102.9	161.2	4299.5	467.3
1958	11234.2	555.6	502.0	89.6	2551.7	177.9	1347.4	212.2	5456.6	483.7
1959	9024.3	466.6	590.0	72.7	3787.7	339.2	2653.4	459.3	5099.3	332.7
1960	7371.7	354.1	784.1	68.4	2987.6	407.0	1426.9	311.0	4293.0	294.3
1961	7330.0	510.5	654.8	77.5	3048.3	319.9	1729.3	251.5	3655.3	298.7
1962	5535.9	426.9	905.1	87.0	1958.7	145.4	722.9	117.6	3011.1	209.8
1963	6748.8	326.8	1055.3	89.5	1830.8	169.9	1242.3	226.9	3723.6	323.0
1964	6063.9	385.3	873.4	73.7	2589.6	259.7	1561.3	244.7	4020.6	320.4
1965	5131.7	274.8	1260.3	114.8	2301.1	189.4	1282.0	151.0	3594.5	270.4
1966	6731.9	311.4	1680.4	132.4	2318.4	139.2	1617.3	173.6	3733.2	233.6
1967	7509.5	338.2	1384.6	97.8	2325.5	136.2	1593.7	165.7	4491.5	305.7
1968	7089.2	340.8	1949.0	213.9	2298.6	156.1	1430.9	146.6	3462.5	389.1
1969	7531.6	280.2	1573.4	100.2	2941.4	168.6	1491.0	103.5	4138.6	239.5
1970	9985.9	617.2	1608.1	123.5	3469.9	318.5	2182.5	137.7	4861.8	372.3
1971	9416.4	459.5	1605.6	123.0	3272.9	186.2	1889.3	132.9	4610.2	322.8
1972	9265.5	363.9	1622.9	120.1	3200.1	194.1	1948.2	185.8	4278.5	230.5
1973	8079.2	377.5	1245.6	90.3	2877.9	197.4	1949.2	131.9	3332.5	220.3
1974	6880.2	351.8	1592.4	128.2	2672.0	159.3	1864.5	131.2	4976.2	394.6
1975	7726.9	344.1	1643.9	109.0	2778.3	192.0	1664.8	148.1	5885.4	337.4
1976	7933.6	337.4	1244.8	85.7	2505.2	152.7	1547.5	134.0	4744.7	294.5
1977	7397.1	381.8	1299.0	126.4	2575.1	185.9	1285.8	87.9	4462.8	328.4
1978	7425.0	307.0	1558.0	92.2	3282.4	208.0	2174.2	219.1	4498.6	293.3
1979	7883.4	327.0	1757.9	121.0	3106.5	198.2	2071.7	198.5	4875.9	297.6
1980	7706.5	307.2	1392.9	98.8	3595.5	213.2	2049.9	140.7	4895.1	295.6
1981	6409.7	308.4	1395.4	120.0	2946.0	173.0	1910.5	141.7	3720.6	242.1
1982	6408.5	302.2	1633.8	126.2	2458.7	167.3	1535.7	140.2	3657.6	203.7
1983	6456.0	286.9	1519.2	144.3	2636.2	181.4	1875.0	148.0	3366.5	197.2
1984	5415.3	258.4	1515.0	125.0	3002.2	174.2	1408.2	91.5	3979.3	267.6
1985	4960.9	234.7	1303.0	98.2	2050.7	143.7	1475.4	100.3	3502.4	246.3
1986	6124.2	241.6	1547.1	107.5	1736.5	109.9	1674.9	136.1	4478.8	237.1
1987	5789.8	217.9	1305.6	97.1	2012.5	134.3	2006.2	180.4	3528.7	220.2
1988	6369.3	310.3	1349.9	121.1	2211.1	139.1	2060.8	188.3	4011.1	290.4
1989	5645.4	244.1	1414.6	106.6	1972.9	106.0	1841.7	166.4	3125.3	229.8
1990	5452.4	238.6	1672.1	135.8	1860.1	108.3	1789.5	172.7	2776.4	178.7
1991	5444.6	205.6	1583.7	111.8	2254.0	139.5	1557.8	111.3	3763.7	270.8
1992	5976.1	241.0	2032.8	143.4	2208.4	131.9	1773.1	123.7	4333.1	263.2
1993	5708.3	208.9	1755.2	107.9	2053.0	109.3	1694.5	112.7	3192.9	205.6
1994	6980.1	282.8	2318.3	145.2	2382.2	130.3	2108.4	152.2	4616.2	259.2
1995	8269.4	287.5	2835.7	187.5	2614.5	136.3	2300.6	140.3	5140.0	253.3
1996	7941.3	262.9	2984.0	152.5	2271.7	125.4	2499.5	153.4	6407.4	353.9
1997	9939.7	308.5	3897.2	264.9	3117.6	161.6	2506.6	142.5	6124.3	330.7
1998	9640.4	301.6	3742.2	205.6	2857.7	145.3	2087.3	138.9	6398.8	332.3
1999	10805.7	344.5	3235.5	163.8	2920.1	185.5	2631.0	174.6	7149.5	364.5
2000	9470.2	290.2	3158.4	200.7	2733.1	138.8	3193.5	200.1	7431.4	425.0
2001	7904.0	226.9	2679.2	136.1	2493.5	149.6	2508.7	156.4	5757.0	288.8
2002	7503.7	246.5	2235.4	135.4	2334.4	137.9	2333.5	143.8	4206.5	227.9
2003	7949.7	267.3	2549.0	169.9	2551.4	156.9	2678.5	199.7	5518.2	312.7

Appendix A. Continued.

Year	Northern shoveler		Northern pintail		Redhead		Canvasback		Scaup	
	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}
1955	1642.8	218.7	9775.1	656.1	539.9	98.9	589.3	87.8	5620.1	582.1
1956	1781.4	196.4	10372.8	694.4	757.3	119.3	698.5	93.3	5994.1	434.0
1957	1476.1	181.8	6606.9	493.4	509.1	95.7	626.1	94.7	5766.9	411.7
1958	1383.8	185.1	6037.9	447.9	457.1	66.2	746.8	96.1	5350.4	355.1
1959	1577.6	301.1	5872.7	371.6	498.8	55.5	488.7	50.6	7037.6	492.3
1960	1824.5	130.1	5722.2	323.2	497.8	67.0	605.7	82.4	4868.6	362.5
1961	1383.0	166.5	4218.2	496.2	323.3	38.8	435.3	65.7	5380.0	442.2
1962	1269.0	113.9	3623.5	243.1	507.5	60.0	360.2	43.8	5286.1	426.4
1963	1398.4	143.8	3846.0	255.6	413.4	61.9	506.2	74.9	5438.4	357.9
1964	1718.3	240.3	3291.2	239.4	528.1	67.3	643.6	126.9	5131.8	386.1
1965	1423.7	114.1	3591.9	221.9	599.3	77.7	522.1	52.8	4640.0	411.2
1966	2147.0	163.9	4811.9	265.6	713.1	77.6	663.1	78.0	4439.2	356.2
1967	2314.7	154.6	5277.7	341.9	735.7	79.0	502.6	45.4	4927.7	456.1
1968	1684.5	176.8	3489.4	244.6	499.4	53.6	563.7	101.3	4412.7	351.8
1969	2156.8	117.2	5903.9	296.2	633.2	53.6	503.5	53.7	5139.8	378.5
1970	2230.4	117.4	6392.0	396.7	622.3	64.3	580.1	90.4	5662.5	391.4
1971	2011.4	122.7	5847.2	368.1	534.4	57.0	450.7	55.2	5143.3	333.8
1972	2466.5	182.8	6979.0	364.5	550.9	49.4	425.9	46.0	7997.0	718.0
1973	1619.0	112.2	4356.2	267.0	500.8	57.7	620.5	89.1	6257.4	523.1
1974	2011.3	129.9	6598.2	345.8	626.3	70.8	512.8	56.8	5780.5	409.8
1975	1980.8	106.7	5900.4	267.3	831.9	93.5	595.1	56.1	6460.0	486.0
1976	1748.1	106.9	5475.6	299.2	665.9	66.3	614.4	70.1	5818.7	348.7
1977	1451.8	82.1	3926.1	246.8	634.0	79.9	664.0	74.9	6260.2	362.8
1978	1975.3	115.6	5108.2	267.8	724.6	62.2	373.2	41.5	5984.4	403.0
1979	2406.5	135.6	5376.1	274.4	697.5	63.8	582.0	59.8	7657.9	548.6
1980	1908.2	119.9	4508.1	228.6	728.4	116.7	734.6	83.8	6381.7	421.2
1981	2333.6	177.4	3479.5	260.5	594.9	62.0	620.8	59.1	5990.9	414.2
1982	2147.6	121.7	3708.8	226.6	616.9	74.2	513.3	50.9	5532.0	380.9
1983	1875.7	105.3	3510.6	178.1	711.9	83.3	526.6	58.9	7173.8	494.9
1984	1618.2	91.9	2964.8	166.8	671.3	72.0	530.1	60.1	7024.3	484.7
1985	1702.1	125.7	2515.5	143.0	578.2	67.1	375.9	42.9	5098.0	333.1
1986	2128.2	112.0	2739.7	152.1	559.6	60.5	438.3	41.5	5235.3	355.5
1987	1950.2	118.4	2628.3	159.4	502.4	54.9	450.1	77.9	4862.7	303.8
1988	1680.9	210.4	2005.5	164.0	441.9	66.2	435.0	40.2	4671.4	309.5
1989	1538.3	95.9	2111.9	181.3	510.7	58.5	477.4	48.4	4342.1	291.3
1990	1759.3	118.6	2256.6	183.3	480.9	48.2	539.3	60.3	4293.1	264.9
1991	1716.2	104.6	1803.4	131.3	445.6	42.1	491.2	66.4	5254.9	364.9
1992	1954.4	132.1	2098.1	161.0	595.6	69.7	481.5	97.3	4639.2	291.9
1993	2046.5	114.3	2053.4	124.2	485.4	53.1	472.1	67.6	4080.1	249.4
1994	2912.0	141.4	2972.3	188.0	653.5	66.7	525.6	71.1	4529.0	253.6
1995	2854.9	150.3	2757.9	177.6	888.5	90.6	770.6	92.2	4446.4	277.6
1996	3449.0	165.7	2735.9	147.5	834.2	83.1	848.5	118.3	4217.4	234.5
1997	4120.4	194.0	3558.0	194.2	918.3	77.2	688.8	57.2	4112.3	224.2
1998	3183.2	156.5	2520.6	136.8	1005.1	122.9	685.9	63.8	3471.9	191.2
1999	3889.5	202.1	3057.9	230.5	973.4	69.5	716.0	79.1	4411.7	227.9
2000	3520.7	197.9	2907.6	170.5	926.3	78.1	706.8	81.0	4026.3	205.3
2001	3313.5	166.8	3296.0	266.6	712.0	70.2	579.8	52.7	3694.0	214.9
2002	2318.2	125.6	1789.7	125.2	564.8	69.0	486.6	43.8	3524.1	210.3
2003	3619.6	221.4	2558.2	174.8	636.8	56.6	557.6	48.0	3734.4	225.5

Appendix B. Breeding population estimates and standard errors (in thousands) for the 10 most abundant species of ducks in the eastern survey area, 1990-2003 ^a.

Year	<u>Mergansers</u>		<u>Mallard</u>		<u>American black duck</u>		<u>American wigeon</u>		<u>Am. green-winged teal</u>		<u>Lesser scaup</u>		<u>Ring-necked duck</u>		<u>Goldeneyes</u>		<u>Bufflehead</u>		<u>Scoters</u>	
	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}	\hat{N}	\hat{SE}
1990	157.5	48.3	208.6	47.7	160.9	33.5	31.0	22.6	47.1	8.6	135.7	56.2	92.1	28.3	73.3	22.2	99.9	22.9	1.9	1.9
1991	263.9	78.6	169.8	34.5	126.0	35.3	45.4	21.8	42.2	14.4	43.5	16.4	158.1	30.2	138.4	44.3	94.1	32.1	6.4	5.3
1992	128.1	24.3	362.2	54.1	160.3	33.1	15.4	9.3	43.8	13.9	65.6	23.2	251.6	62.3	241.0	55.2	59.0	13.7	3.0	2.3
1993	164.9	23.7	333.8	49.7	124.6	25.6	9.4	7.4	47.4	9.9	288.6	235.3	248.1	65.1	90.2	32.6	13.1	3.6	0.0	0.0
1994	358.4	91.8	238.6	28.8	116.3	20.7	18.9	9.6	169.2	24.0	81.9	31.7	163.5	62.6	55.0	17.4	33.4	14.0	18.3	9.7
1995	376.3	89.7	212.6	41.1	234.5	46.6	13.8	7.9	96.2	14.1	62.0	20.5	195.6	51.0	9.2	3.7	26.5	8.8	5.0	4.8
1996	1083.1	279.6	387.6	63.6	562.2	97.1	34.7	17.0	436.2	86.9	38.5	15.1	611.9	98.7	410.3	169.7	50.6	12.5	23.6	10.5
1997	379.1	53.0	287.6	44.8	434.5	63.1	22.5	11.2	211.5	31.3	16.7	7.2	617.6	151.1	220.6	54.8	22.3	6.7	88.9	50.2
1998	327.4	38.8	363.2	71.3	542.1	55.4	83.6	24.6	299.5	81.1	20.1	10.6	361.8	53.8	715.7	124.7	44.6	10.3	159.4	47.1
1999	290.0	39.4	280.8	39.2	488.7	51.3	121.1	45.6	422.4	62.3	44.9	20.5	453.2	76.0	920.0	167.3	70.5	20.8	47.0	17.7
2000	400.0	54.0	212.3	31.3	396.9	53.9	41.7	20.4	201.6	28.7	19.8	9.1	618.8	71.3	946.5	318.7	49.3	11.3	182.1	59.0
2001	428.7	62.8	285.7	40.8	422.0	48.8	77.5	18.2	220.3	33.5	203.5	92.2	352.8	39.6	1032.2	202.4	95.0	20.9	178.6	49.4
2002	815.2	97.9	295.1	38.1	602.8	86.1	86.6	25.5	604.1	129.0	136.1	48.2	416.0	57.8	954.9	209.2	83.6	21.2	314.4	76.4
2003	569.7	62.7	383.1	57.3	521.8	55.6	56.2	30.6	393.2	111.7	101.2	21.2	394.9	49.3	713.6	207.7	66.3	16.7	237.1	66.9

^a Maine estimates were included beginning in 1995. Quebec estimates were included beginning in 1996. Therefore, estimates are only comparable within year groups 1990-94, and 1996-present.