TRENDS IN DUCK BREEDING POPULATIONS, 1955-2006

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This report summarizes information about the status of duck populations and wetland habitats during spring 2006, focusing on areas encompassed by the U.S. Fish and Wildlife (USFWS) and Canadian Wildlife Services' (CWS) Waterfowl Breeding Population and Habitat Survey. This report does not include information from surveys conducted by State or Provincial agencies. In the traditional survey area, which includes strata 1-18, 20-50, and 75-77 (Fig. 1), 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 ± 0.6 [SE] million birds. This was 14% greater than last year's estimate of 31.7 ± 0.6 million birds and 9% above the 1955-2005 long-term average[a] (Tables 1-12; Appendix A). Mallard (*Anas platyrhynchos*) abundance was 7.3 ± 0.2 million birds, which was similar to last year's estimate of 6.8 ± 0.3 million birds and the long-term average. Blue-winged teal (*A. discors*) abundance was 5.9 ± 0.3 million birds. This value was 28% greater than last year's estimate of 4.6 ± 0.2 million birds and 30% above the long-term average. The estimated abundance of green-winged teal (*A. crecca;* 2.6 ± 0.2 million) was 20% greater than last year and 39% above the long-term average. The estimated number of gadwall (*A. strepera*; 2.8 ± 0.2 million) was 30% greater than last year and was 67% above the long-term average, whereas the estimated number of redheads (*Aythya americana*; 0.9 ± 0.1 million) increased 55% over 2005 and was 47% above the long-term average. The abundance of canvasbacks (*A. valisineria*; 0.7 ± 0.1 million) increased 33% over last year and was 23% over the long-term average. Northern shovelers (*Anas clypeata*; 3.7 ± 0.2 million) were 69% above their long-term average. Although the abundances of most species increased over last year and were greater than their long-term averages, American wigeon (*A. americana*; 2.2 ± 0.1 million) and scaup (*Aythya affinis* and *A. marila* combined; 3.2 ± 0.2 million) were 17% and 37% below their long-term averages, respectively. The estimate for scaup was a record low for the second consecutive year. The abundance of northern pintails (*Anas acuta*; 3.4 ± 0.2

[a] Populations are considered to have changed from the previous year or long-term average if observed significance value associated with change is ≤ 0.10. Actual p-values are given in tables.

million) was 18% below the 1955-2005 average, although this year's estimate was 32% greater than that of last year.

Despite a very warm winter, the quality of habitat for breeding waterfowl in the U.S. and Canada is slightly better this year than last year. Improvements in Canadian and U.S. prairie habitats were primarily due to average to above-average precipitation, warm spring temperatures, and carry-over effects from the good summer conditions of 2005. Improved habitat conditions were reflected in the higher number of ponds counted in Prairie Canada this year compared to last year. The 2006 estimate of ponds in Prairie Canada was 4.4 ± 0.2 million ponds, a 13% increase from last year's estimate of 3.9 ± 0.2 million ponds and 32% above the 1955-2005 average (Table 12; Figure 2). The parkland and northern grassland regions of Manitoba and Saskatchewan received abundant rain in March and April, which created good to excellent habitat conditions. Higher water tables prevented farm activities in wetland basins and excellent residual nesting cover remained around the potholes. Many of the wetlands flooded beyond their normal basins and into the surrounding uplands. Deeper water in permanent and semi-permanent wetlands, coupled with increased amounts of flooded emergent vegetation and woodland, likely benefited diving ducks and overwater- and cavity-nesting species. However, spring precipitation in the grasslands of southern Saskatchewan and extreme southwestern Manitoba was insufficient to fill seasonal and semi-permanent wetlands or create temporary wetlands for waterfowl, leaving these regions in fair or poor condition at the time of the survey. Above-average precipitation in the fall and spring in parts of southern Alberta improved conditions in this historically important pintail breeding region. This region has been dry since 1998, with the exception of 2003. However, central Alberta remained dry.

Habitat conditions in the U.S prairies were more variable than those in the Canadian prairies. The 2006 pond estimate for the north-central U.S. (1.6 ± 0.1 million) was similar to last year's estimate and the long-term average. The total pond estimate (Prairie Canada and U.S. combined) was 6.1 ± 0.2 million ponds. This was 13% greater than last year's estimate of 5.4 ± 0.2 million and 26% higher than the long-term average of 4.8 ± 0.1 million ponds. Habitat quality improved minimally in the easternmost regions of North and South Dakota relative to 2005. Small areas of the Eastern Dakotas were in good-to-excellent condition, helped by warm April temperatures and spring rains that advanced vegetation growth by about 2 weeks. However, most of the Drift Prairie, the Missouri Coteau, and the Coteau Slope remained in fair to poor condition due to lack of temporary and seasonal water and the deteriorated condition of semi-permanent basins. Permanent wetlands and dugouts were typically in various stages of recession. The Western Dakotas were generally in fair condition. Most wetland and upland habitats in Montana benefited modestly from average to above-average fall and winter precipitation and improvements in nesting habitat last year. Spring precipitation in Montana during March and April also helped to mitigate several years of drought. A large portion of central Montana was in good condition due to ample late winter and early spring precipitation. Biologists also noted improvements in upland vegetation over previous years. In this central region, most pond basins were full and stream systems were

flowing. However, nesting habitat was generally fair to poor for most of the northern portion of Montana.

Habitat conditions in most northern regions of Canada were improved over last year due to an early ice break-up, warm spring temperatures, and good precipitation levels. In northern Saskatchewan, northern Manitoba, and western Ontario, winter snowfall was sufficient to recharge most beaver ponds and small lakes. Larger lakes and rivers tended to have higher water levels than in recent years. Conditions in the smaller wetlands were ideal. However, in northern Manitoba and northern Saskatchewan, some lakes associated with major rivers were flooded, with some flooded well into the surrounding upland vegetation. The potential for habitat loss due to flooding caused biologists to classify this region as good. In Alberta, water levels improved to the north, except for the Athabasca Delta, where wetlands, especially seasonal wetlands, generally had low water levels. Most of the Northwest Territories had good water levels. Exceptions were the southern part of the Territory where heavy rains in May caused some flooding of nesting habitat, and a dry swath across the central part of the province. In contrast to most of the survey region and to the past few years, spring did not arrive early in Alaska this year. Overall, a more normal spring phenology occurred throughout most of Alaska and the Yukon Territory, with ice lingering in the following regions: the outer coast of the Yukon Delta, the northern Seward Peninsula, and on the Old Crow Flats. Some flooding occurred on a few major rivers. Overall, good waterfowl production is anticipated this year from the northwestern continental area if temperatures remain seasonable.

Spring-like conditions also arrived early in the East, with an early ice break-up and relatively mild temperatures. Biologists reported that habitat conditions were generally good across most of the survey area. Most regions had a warm, dry winter and a dry start to spring. Extreme southern Ontario was relatively dry during the survey period and habitats were in fair to poor condition. However, precipitation after survey completion improved habitat conditions in this region. Abundant rain in May improved water levels in Maine, the Maritimes, southern Ontario, and Quebec, but caused some flooding in southern Ontario and Quebec and along the coast of Maine, New Brunswick, and Nova Scotia. In Quebec, a very early spring assured good habitat availability. Despite the early spring and the abundance of spring precipitation, a dry winter still left most of the marshes and rivers drier than in past years. Many bogs were noticeably drier than past years or dry entirely in a few cases. Winter precipitation increased to the west and north, resulting in generally good levels in central and northern Ontario. Conditions were good to excellent in central and northern Ontario due to the early spring phenology, generally good water levels, and warm spring temperatures.

In 2005, the USFWS and CWS began to integrate several previously-independent waterfowl surveys of eastern North America. Specifically, new analytical methods were used to generate composite estimates from USFWS and CWS survey data, total indicated bird definitions for American black ducks were modified to provide a common index across the surveys, and adjustments were made to the geographic stratification of eastern North America. Additional refinements to analytical methods occurred this year and are incorporated in the estimates presented in this report. For these reasons, population

estimates presented in this report for the eastern survey area (that encompasses strata 51-72) are not directly comparable with estimates presented in previous reports. Specifically, composite estimates are presented for only a portion of the eastern survey area and include data only from strata 51, 52, 63, 64, 66, 67, 68, 70, 71, and 72. These strata were chosen for composite estimation since at least one survey was conducted for each of these strata for the full period of record of the eastern survey (1990-2006) and this area corresponds to the region traditionally surveyed by the CWS helicopter plot survey. In cases where the USFWS has traditionally not recorded observations to the species level (i.e., scoters, mergansers, goldeneyes), only CWS plot survey data were used in estimation. Results for these species are presented as groups for consistency with previous reports. However estimates for these individual species are available: surf scoter (*Melanitta perspicillata*) black scoter (*M. nigra*), hooded merganser (*Lophodytes cucullatus*), common merganser (*Mergus merganser*), red- breasted merganser (*M. serrator*), common goldeneye (*Bucephela clangula*), Barrow's goldeneye (*B. islandica*), and greater and lesser scaup. Changes in methods and results will be presented in greater detail in the 2006 Waterfowl Status Report. We anticipate additional refinements to composite estimates for the eastern survey area in the coming years as the USFWS and CWS work toward a final integrated survey design and analytical methods. Population estimates for most species were similar to last year and to the 1990-2005 averages (Table 13; Figures 6-7). The exceptions were American wigeon and bufflehead (*B. albeola*), both of which declined >50% from 2005 estimates.

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

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

Northern Alberta, Northeastern British Columbia, and Northwest Territories (Strata 13-18, 20, and 77): C. Ferguson and D. Benning [d]

Northern Saskatchewan and Northern Manitoba (Strata 21-24): F. Roetker and B. Fortier

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

Air	E. Huggins and C. Pyle
Ground	P. Pryor [a], K. Froggatt [b], S. Barry [a], E. Hofman [b], M. Barr [c], D. Chambers [c], N. Clements [a], N. Fontaine [c], J. Going [a], R. Hunka [c], T. Mathews [c], I. McFarlane [c], B. Peers [c], C. Pinto [b], and R. Talbot [c]

Southern Saskatchewan (Strata 30-35):

Air	P. Thorpe, T. Lewis, R. King, and S. Frazer
Ground	D. Nieman [a], J. Smith [a], K. Warner [a], D. Caswell [a], J. Caswell [a], J. Leafloor [a], P. Rakowski [a], M. Schuster [a], B, Bartzen [a], K. Dufour [a], C. Downie [a], P. Nieman [a], L. Sitter [a], R. Spencer [a], A. Williams [c], F. Baldwin [a], L. Beaudoin [a], S. Lawson [c], C. Meuckon [a], N. Wiebe [a], and K. Wilkins

Southern Manitoba (Strata 25 and 36-40):

Air	R. King and S. Frazer
Ground	D. Caswell [a], G. Ball [b], J. Caswell [a], J. Leafloor [a], P. Rakowski [a], M. Schuster [a], F. Baldwin [a], L. Beaudoin [a], S. Lawson [c], C. Meuckon [a], N. Wiebe [a], and K. Wilkins

Montana and Western Dakotas (Strata 41-44):

Air	R. Bentley and K. Richkus
Ground	P. Garrettson and M. Carpenter

Eastern Dakotas (Strata 45-49):

Air	J. Solberg and M. Rich
Ground	K. Kruse, M. Grovijahn [b], B. McDermott, and D. Whittington

Central Quebec (Strata 68-70):

Air	J. Wortham, D. Fronczak, and G. Boomer
Helicopter	D. Holtby [b] and G. Boomer

New York, Eastern Ontario, Hudson and James Bay Lowlands of Ontario, and Southern Quebec (Strata 52-59):

Air	M. Koneff, M. Jones, and R. Raftovich

Central and Western Ontario (Strata 50 and 51):
Air K. Bollinger and J. Bredy

Maine and Maritimes (Strata 62-67):
Air J. Bidwell, H. Obrecht, and J. Goldsberry [d]

Canadian Wildlife Service helicopter plot survey
Quebec: D. Bordage [a], C. Lepage [a], S. Orichefsky [a], Y. Côté [d], M. Dubé [d], G. Gagnon [d], and M. Samson [d]

Ontario: K. Ross [a], D. Fillman [a], and D. McNicol [a]

New Brunswick and Nova Scotia: B. Pollard [a]

Labrador and Newfoundland: S. Gilliland [a]

Habitat information was provided by U.S. Fish and Wildlife Service and Canadian Wildlife Service biologists. Analysis of eastern survey data by John Sauer, U.S. Geological Survey.

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[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

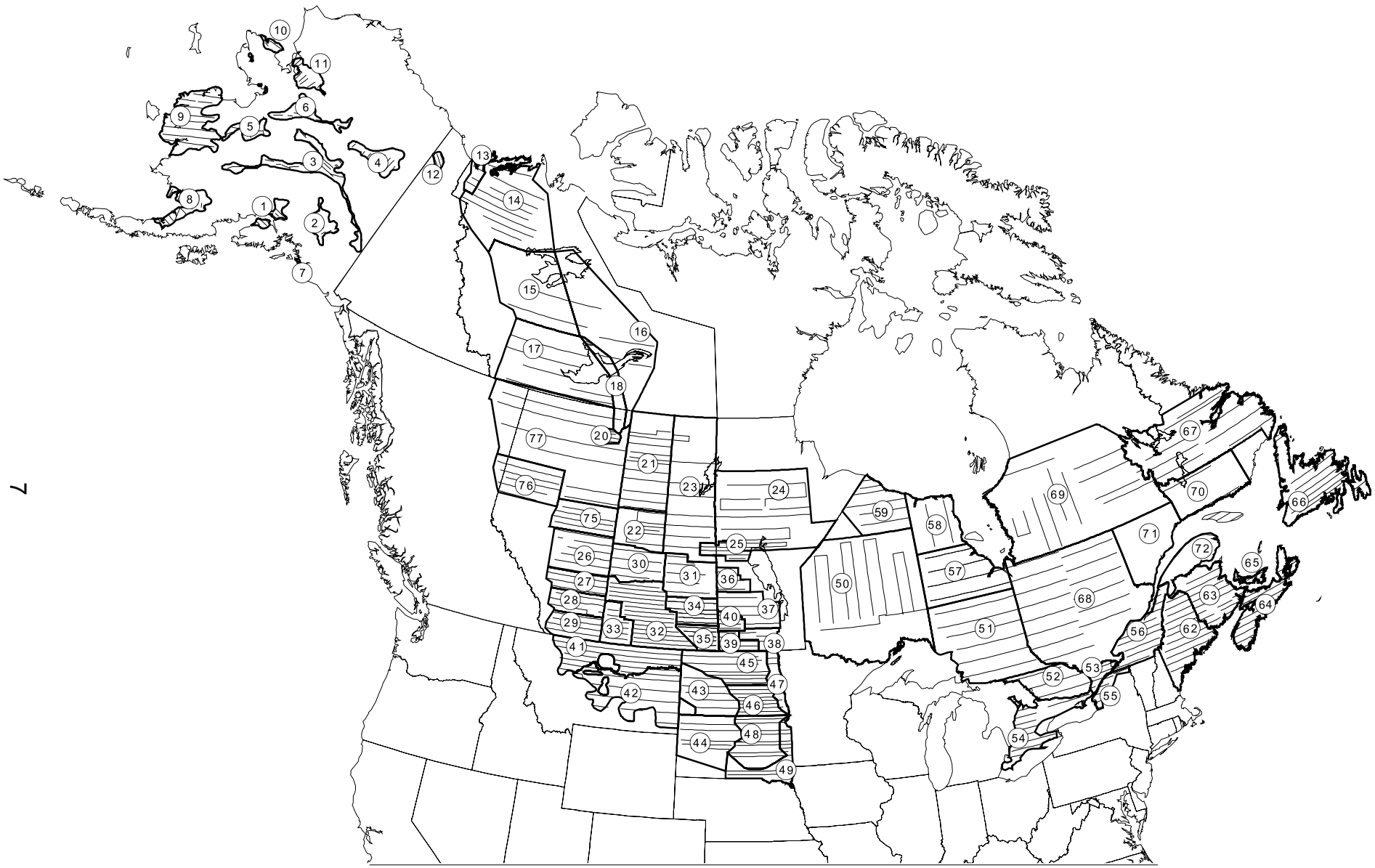


Figure 1. Strata and transects of the Waterfowl Breeding Population and Habitat Survey.

Table 1. Duck breeding population estimates (in thousands) for regions in the traditional survey area.

			Change from 2005			Change from LTA	
Region	2006	2005	%	*P*	LTA [a]	%	*P*
Alaska-Yukon Territory – Old Crow Flats	4,755	5,114	-7	0.149	3,550	+34	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	5,132	4,713	+9	0.222	7,153	-28	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	2,711	3,223	-16	0.047	3,557	-24	<0.001
S. Alberta	4,581	3,178	+44	<0.001	4,283	+7	0.121
S. Saskatchewan	10,096	7,967	+27	<0.001	7,348	+37	<0.001
S. Manitoba	1,796	1,627	+10	0.137	1,544	+16	0.003
Montana and western Dakotas	1,910	1,290	+48	<0.001	1,613	+18	0.001
Eastern Dakotas	5,181	4,623	+12	0.073	4,201	+23	<0.001
Total [b]	36,160	31,735	+14	<0.001	33,251	+9	<0.001

[a] Long-term average, 1955-2005.
[b] Includes 10 species in Appendix A plus American black duck, ring-necked duck, goldeneyes, bufflehead, and ruddy duck; excludes eiders, long-tailed duck, scoters, mergansers, and wood duck.

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

			Change from 2005			Change from LTA	
Region	2006	2005	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	516	703	-27	0.009	357	+44	0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	558	533	+5	0.818	1,086	-49	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	656	937	-30	0.116	1,159	-43	<0.001
S. Alberta	901	671	+34	0.006	1,099	-18	<0.001
S. Saskatchewan	1,832	1,729	+6	0.530	2,072	-12	0.021
S. Manitoba	511	455	+12	0.351	378	+35	0.004
Montana and western Dakotas	679	387	+76	<0.001	499	+36	0.002
Eastern Dakotas	1,624	1,340	+21	0.140	846	+92	<0.001
Total	7,277	6,755	+8	0.147	7,496	-3	0.338

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

			Change from 2005			Change from LTA	
Region	2006	2005	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	2	3	-29	0.739	2	0	0.998
C. & N. Alberta – N.E. British Columbia - Northwest Territories	135	77	+75	0.102	47	+187	0.006
N. Saskatchewan- N. Manitoba - W. Ontario	16	19	-14	0.747	27	-41	0.042
S. Alberta	455	338	+35	0.152	309	+47	0.010
S. Saskatchewan	1,202	723	+66	0.006	556	+116	<0.001
S. Manitoba	125	120	+4	0.820	67	+88	<0.001
Montana and western Dakotas	216	187	+16	0.474	194	+11	0.476
Eastern Dakotas	673	712	-6	0.642	491	+37	<0.001
Total	2,825	2,179	+30	0.003	1,692	+67	<0.001

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

			Change from 2005			Change from LTA	
Region	2006	2005	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	822	873	-6	0.552	511	+61	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	570	583	-2	0.921	912	-38	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	105	174	-40	0.080	253	-58	<0.001
S. Alberta	189	125	+50	0.025	296	-36	<0.001
S. Saskatchewan	282	294	-4	0.845	425	-34	<0.001
S. Manitoba	16	34	-53	0.086	62	-74	<0.001
Montana and western Dakotas	120	67	+79	0.008	109	+10	0.531
Eastern Dakotas	67	73	-8	0.767	48	+39	0.140
Total	2,171	2,225	-2	0.766	2,617	-17	<0.001

Table 5. Green-winged teal breeding population estimates (in thousands) for regions in the traditional survey area.

			Change from 2005			Change from LTA	
Region	2006	2005	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	780	713	+9	0.471	358	+118	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	751	437	+72	0.018	752	0	0.990
N. Saskatchewan- N. Manitoba - W. Ontario	303	310	-2	0.896	197	+54	0.001
S. Alberta	178	159	+12	0.720	194	-8	0.709
S. Saskatchewan	401	359	+12	0.632	230	+75	0.007
S. Manitoba	65	55	+19	0.448	52	+27	0.215
Montana and western Dakotas	34	83	-59	0.005	40	-15	0.364
Eastern Dakotas	75	42	+81	0.164	45	+67	0.164
Total	2,587	2,157	+20	0.031	1,867	+39	<0.001

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

			Change from 2005			Change from LTA	
Region	2006	2005	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	0	3	-100	0.339	1	-100	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	316	247	+28	0.456	270	+17	0.515
N. Saskatchewan- N. Manitoba - W. Ontario	82	139	-41	0.237	265	-69	<0.001
S. Alberta	864	649	+33	0.126	609	+42	0.015
S. Saskatchewan	2,228	1,597	+40	0.019	1,218	+83	<0.001
S. Manitoba	426	339	+26	0.117	382	+11	0.329
Montana and western Dakotas	346	286	+21	0.240	263	+32	0.047
Eastern Dakotas	1,598	1,325	+21	0.171	1,492	+7	0.418
Total	5,860	4,586	+28	0.001	4,501	+30	<0.001

Table 7. Northern shoveler breeding population estimates (in thousands) for regions in the traditional survey area.

			Change from 2005			Change from LTA	
Region	2006	2005	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	409	666	-39	0.003	267	+53	0.002
C. & N. Alberta – N.E. British Columbia - Northwest Territories	193	213	-10	0.690	213	-10	0.498
N. Saskatchewan- N. Manitoba - W. Ontario	12	29	-59	0.016	43	-72	<0.001
S. Alberta	701	548	+28	0.190	360	+95	<0.001
S. Saskatchewan	1,612	1,314	+23	0.210	648	+149	<0.001
S. Manitoba	178	211	-16	0.430	107	+66	<0.001
Montana and western Dakotas	163	148	+10	0.612	149	+9	0.514
Eastern Dakotas	414	464	-11	0.477	389	+6	0.594
Total	3,680	3,591	+2	0.765	2,177	+69	<0.001

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

			Change from 2005			Change from LTA	
Region	2006	2005	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	1,041	905	+15	0.310	913	+14	0.174
C. & N. Alberta – N.E. British Columbia - Northwest Territories	126	108	+16	0.662	378	-67	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	6	8	-31	0.470	41	-86	<0.001
S. Alberta	611	282	+116	<0.001	721	-15	0.107
S. Saskatchewan	1,024	858	+19	0.343	1,218	-16	0.203
S. Manitoba	57	68	-16	0.480	112	-49	<0.001
Montana and western Dakotas	264	75	+252	<0.001	269	-2	0.907
Eastern Dakotas	257	256	+1	0.968	459	-44	<0.001
Total	3,386	2,561	+32	0.001	4,111	-18	<0.001

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

			Change from 2005			Change from LTA	
Region	2006	2005	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	10	<1	+4000	0.106	1	+622	0.154
C. & N. Alberta – N.E. British Columbia - Northwest Territories	59	49	+19	0.679	38	+54	0.143
N. Saskatchewan- N. Manitoba - W. Ontario	5	13	-61	0.050	28	-82	<0.001
S. Alberta	154	91	+69	0.074	116	+33	0.214
S. Saskatchewan	435	226	+93	0.007	190	+129	0.001
S. Manitoba	102	98	+4	0.903	72	+42	0.127
Montana and western Dakotas	12	3	+315	0.054	9	+25	0.573
Eastern Dakotas	139	112	+25	0.389	169	-17	0.284
Total	916	592	+55	0.001	624	+47	0.001

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

			Change from 2005			Change from LTA	
Region	2006	2005	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	73	95	-23	0.542	91	-20	0.475
C. & N. Alberta – N.E. British Columbia - Northwest Territories	109	98	+12	0.771	73	+50	0.177
N. Saskatchewan- N. Manitoba - W. Ontario	13	39	-67	0.068	55	-77	<0.001
S. Alberta	76	43	+79	0.105	64	+20	0.440
S. Saskatchewan	287	162	+76	0.026	182	+57	0.037
S. Manitoba	87	48	+84	0.166	56	+56	0.221
Montana and western Dakotas	12	5	+157	0.121	8	+58	0.321
Eastern Dakotas	33	31	+5	0.875	33	0	1.000
Total	691	521	+33	0.051	562	+23	0.067

Table 11. Scaup (greater and lesser combined) breeding population estimates (in thousands) for regions in the traditional survey area.

			Change from 2005			Change from LTA	
Region	2006	2005	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	884	961	-8	0.500	915	-3	0.680
C. & N. Alberta – N.E. British Columbia - Northwest Territories	1,169	1,361	-14	0.316	2,627	-55	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	335	349	-4	0.816	587	-43	<0.001
S. Alberta	214	127	+69	0.071	353	-39	0.001
S. Saskatchewan	391	381	+3	0.918	416	-6	0.714
S. Manitoba	97	60	+61	0.146	135	-28	0.103
Montana and western Dakotas	19	16	+14	0.723	53	-65	<0.001
Eastern Dakotas	138	132	+5	0.854	97	+42	0.097
Total	3,247	3,387	-4	0.586	5,184	-37	<0.001

Table 12. Estimated number (in thousands) of May ponds in portions of prairie and parkland Canada and the northcentral U.S.

			Change from 2005			Change from LTA	
Survey Area	2006	2005	%	*P*	LTA [a]	%	*P*
Prairie Canada							
S. Alberta	996	750	+33	0.020	722	+38	<0.001
S. Saskatchewan	2,719	2,415	+13	0.250	1,963	+38	<0.001
S. Manitoba	735	755	-3	0.805	673	+9	0.351
Subtotal	4,450	3,921	+13	0.074	3,358	+32	<0.001
Northcentral U.S.							
Montana and western Dakotas	615	663	-7	0.512	528	+16	0.064
Eastern Dakotas	1,030	798	+29	0.011	994	+4	0.625
Subtotal	1,644	1,461	+13	0.116	1,522	+8	0.159
Grand Total	6,094	5,381	+13	0.025	4,830	+26	<0.001

[a]Long-term average. Prairie and parkland Canada, 1961-2005; northcentral U.S. and Grand Total, 1974-2005.

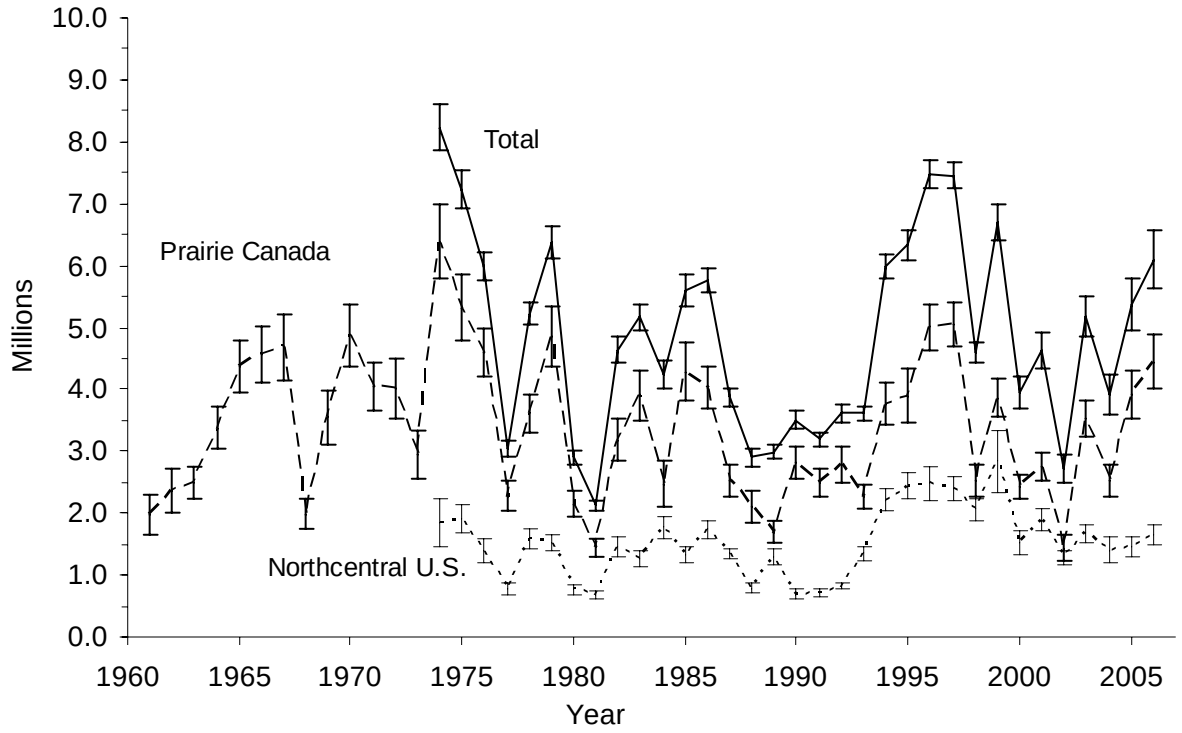


Figure 2. Number of ponds in May and 95% confidence intervals in prairie Canada and the northcentral U.S.

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

Species	2006	2005	% Change from 2005	Average [b]	% Change from average
Mergansers (common, red-breasted, and hooded)	448	418	+7	373	+20
Mallard	371	402	-7	364	+1
American black duck	490	472	+4	458	+7
American wigeon	8	16	-51[c]	11	-28
Green-winged teal	223	223	<1%	219	+2
Scaup (greater and lesser)	72	14	+428	24	+198
Ring-necked duck	522	509	+2	484	+7
Goldeneyes (common and Barrow's)	246	320	-23	285	-14
Bufflehead	10	23	-58[c]	20	-51
Scoters (black and surf)	65	96	-32	86	-24

[a] Estimates for mallards, American black ducks, green-winged teal, and ring-necked duck from Bayesian hierarchical analysis using FWS and CWS data from strata 51, 52, 63, 64, 66-68, 70-72. All others were computed as harmonic means of FWS and CWS estimates for strata 51, 52, 63, 64, 66-68, 70-72.

[b] Average for 1990-2005.

[c] Significance (P<0.05) determined by non-overlap of Bayesian credibility intervals or confidence intervals.

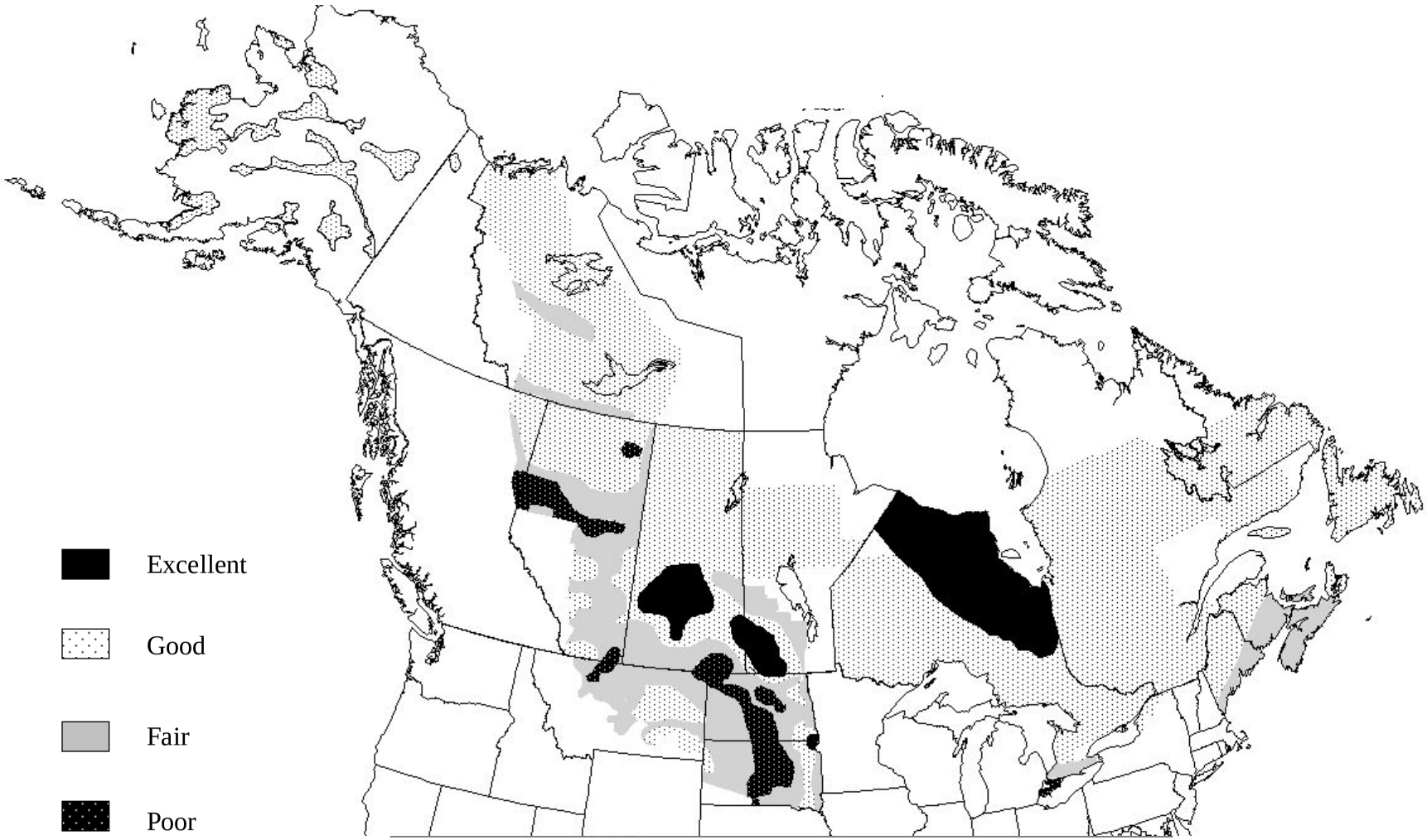


Figure 3. Breeding waterfowl habitat conditions during the 2006 Waterfowl Breeding Population and Habitat Survey, as judged by U.S. Fish and Wildlife Service Flyway Biologists.

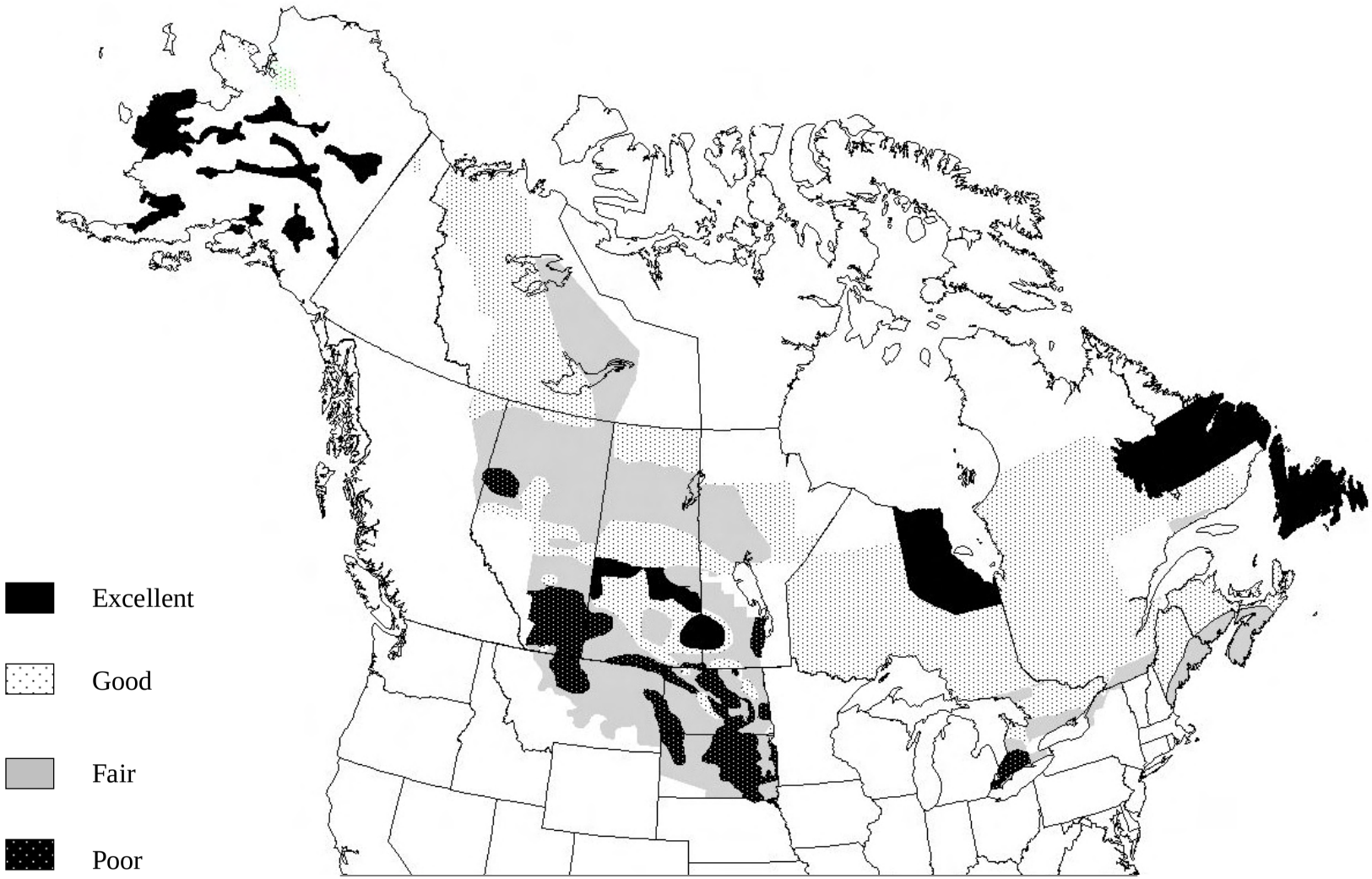


Figure 4. Breeding waterfowl habitat conditions during May and June 2005, as judged by U.S. Fish and Wildlife Service Flyway Biologists.

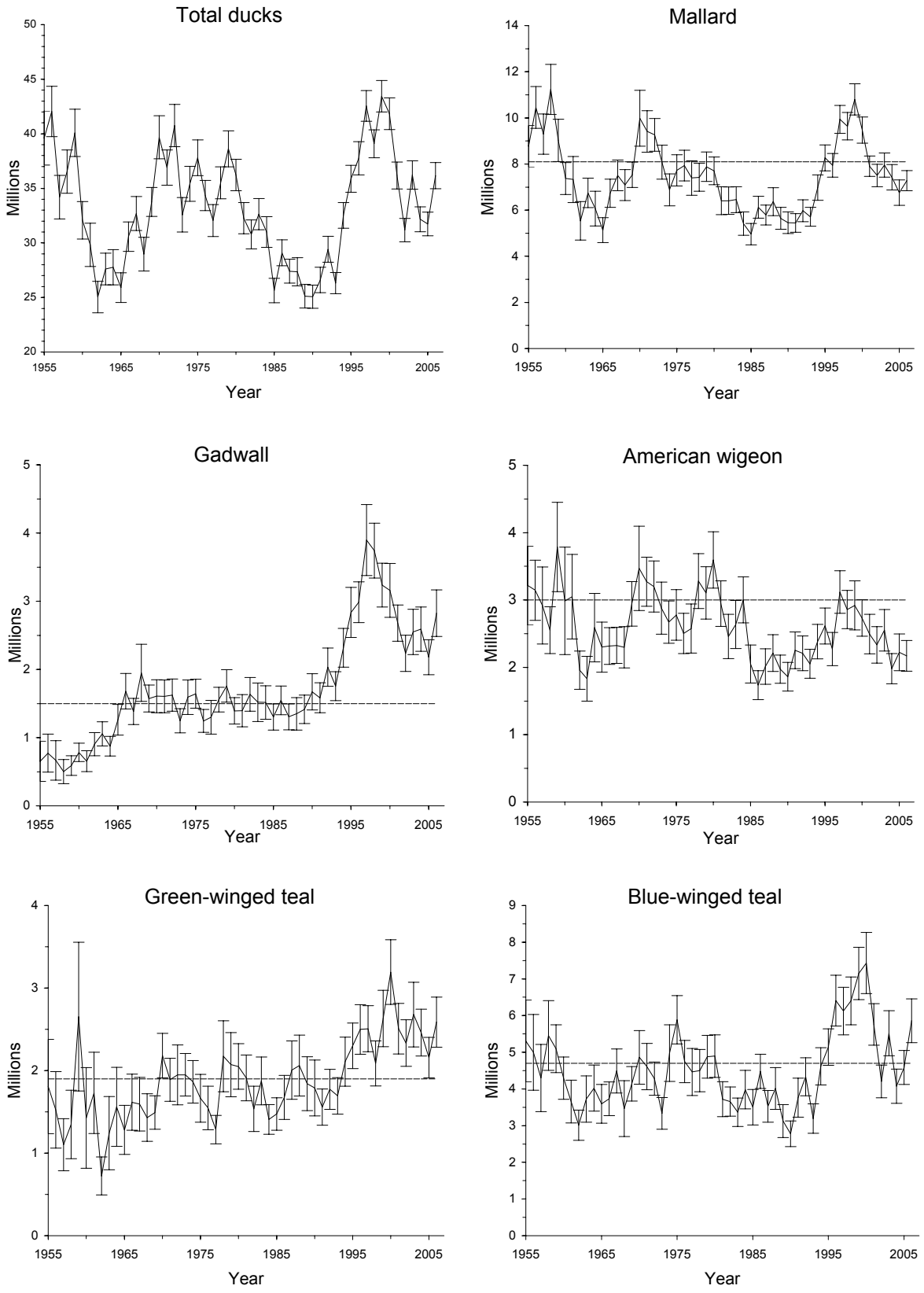
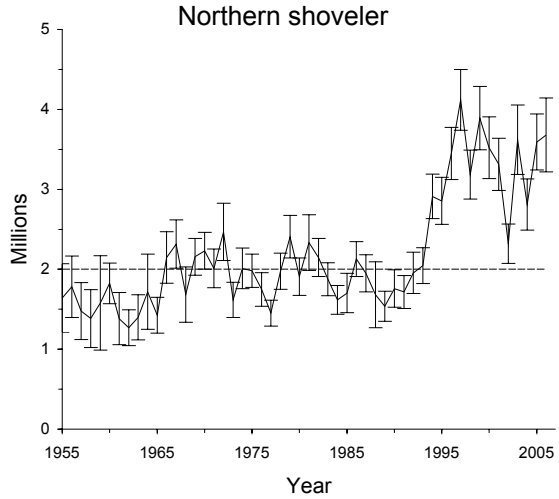
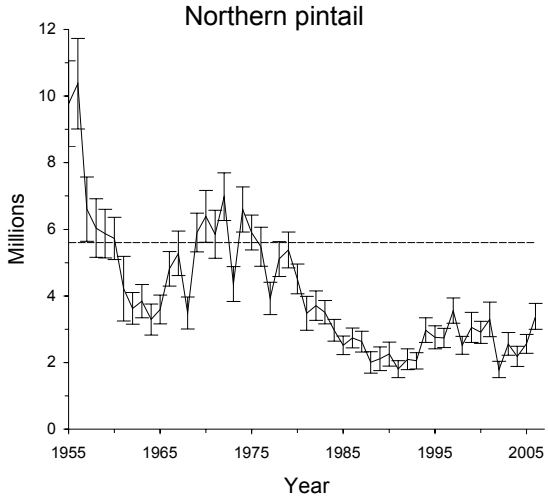
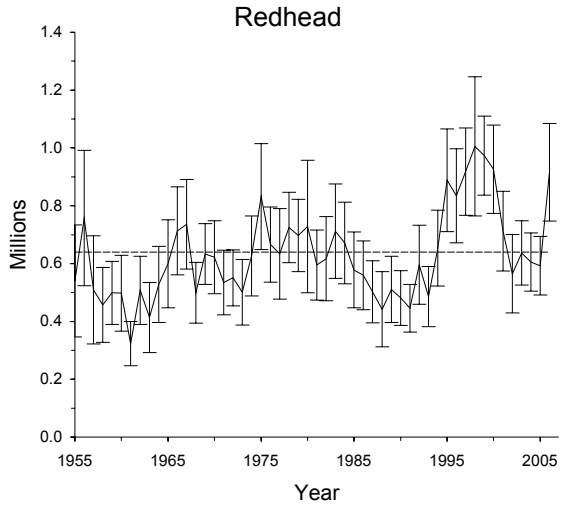
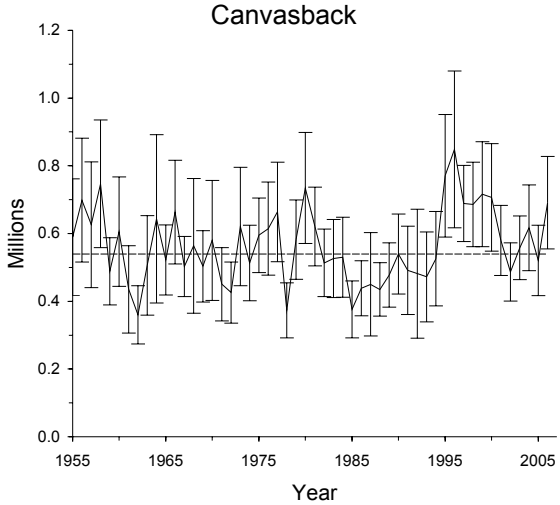


Figure 5. Breeding population estimates, 95% confidence intervals, and North American Waterfowl Management Plan population goal (dashed line) for selected species in the traditional survey area (strata 1-18, 20-50, 75-77).









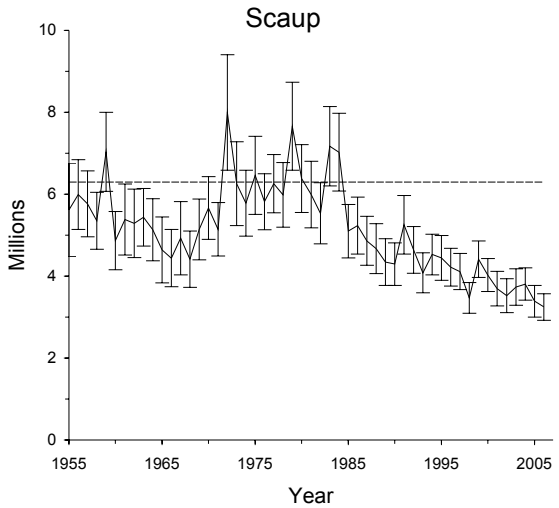


Figure 5 (continued).

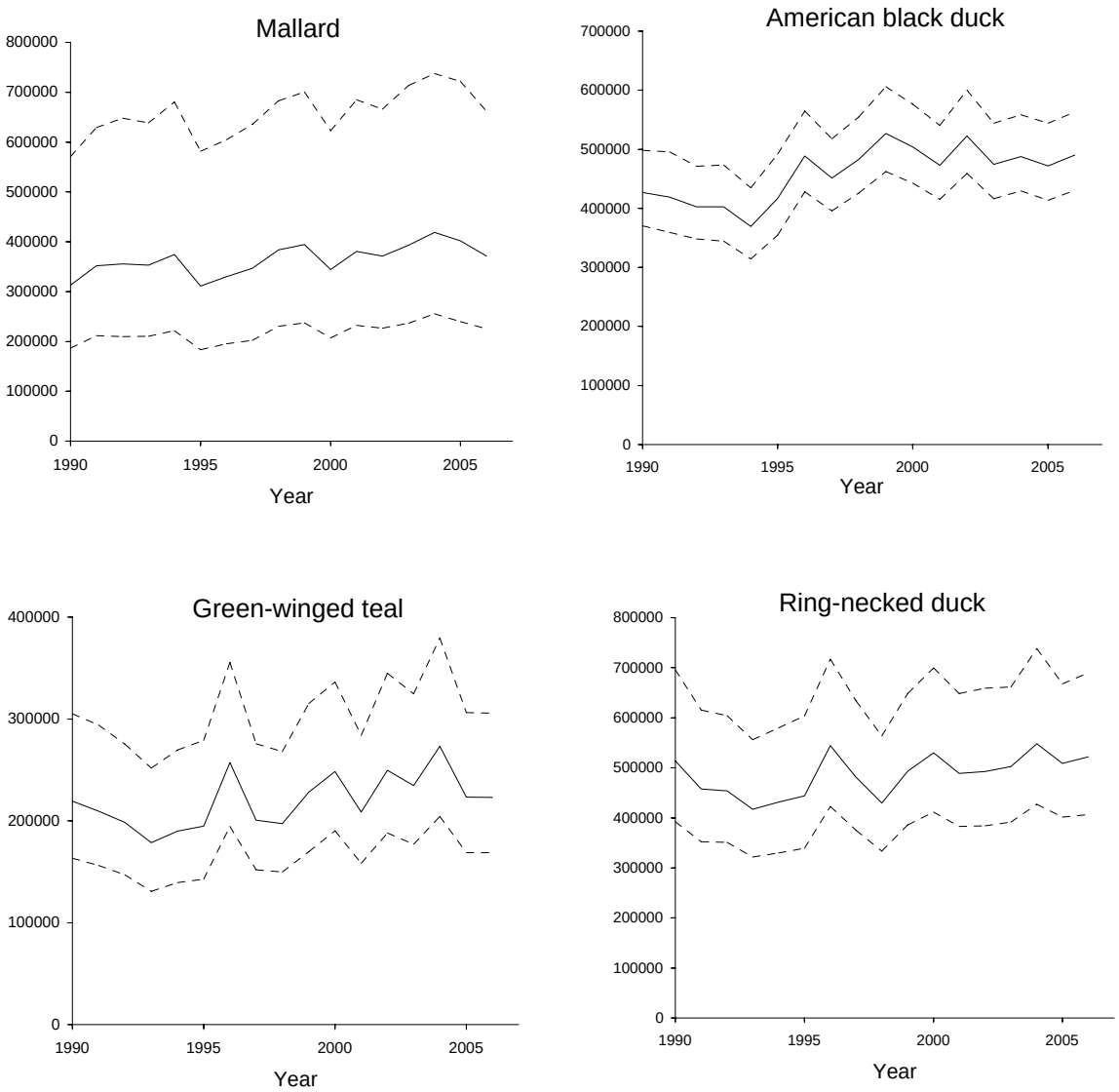


Figure 6. Breeding population estimates (from Bayesian hierarchical models) and 95% credibility intervals for selected species in the eastern survey area (strata 51, 52, 63, 64, 66-68, 70-72).

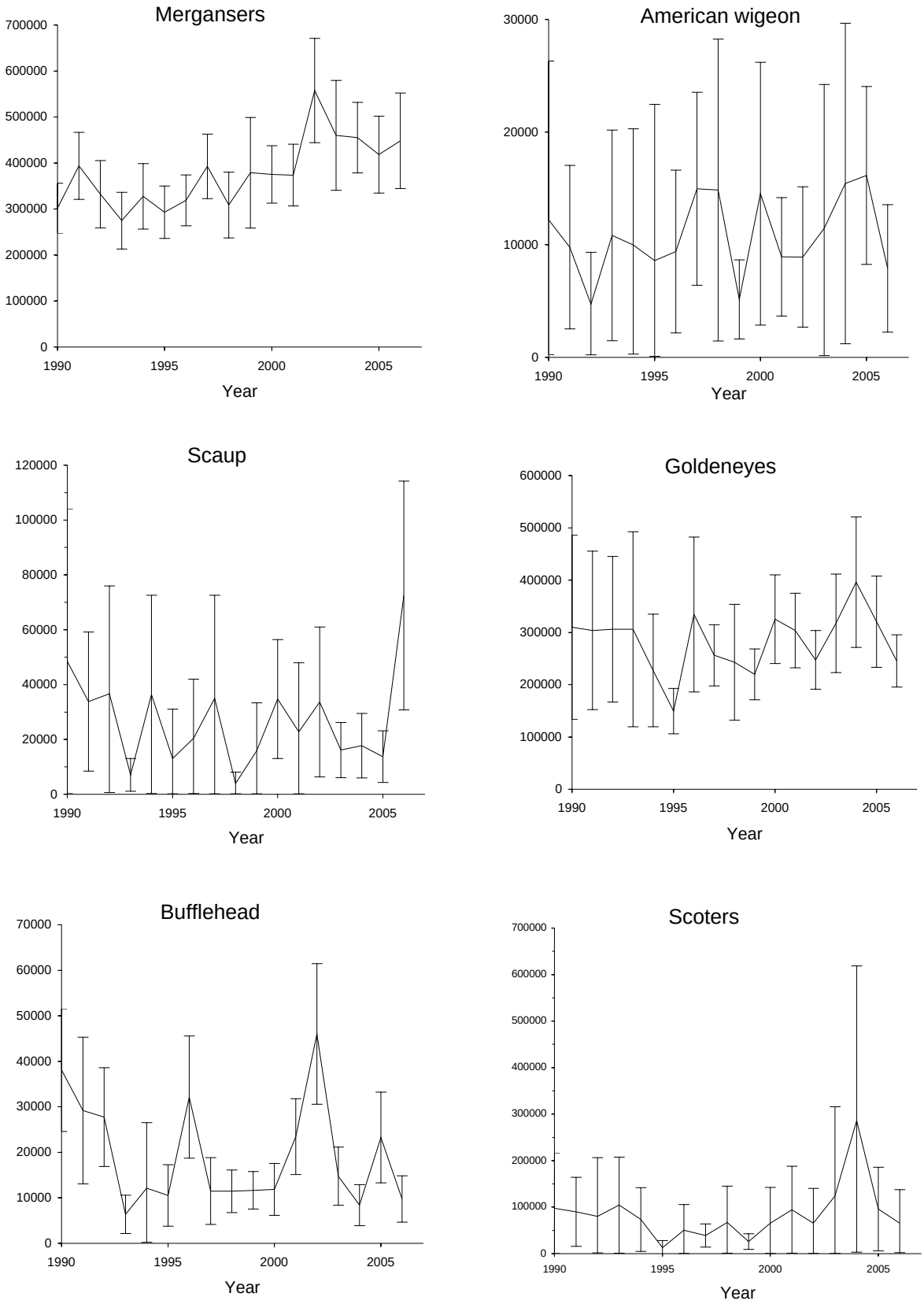


Figure 7. Breeding population estimates (harmonic means) and 95% confidence intervals for selected species in the eastern survey area (strata 51, 52, 63, 64, 66-68, 70-72).

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).

	Mallard		Gadwall		American wigeon		Green-winged teal		Blue-winged teal	
Year	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$
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
2004	7425.3	282.0	2589.6	165.6	1981.3	114.9	2460.8	145.2	4073.0	238.0
2005	6755.3	280.8	2179.1	131.0	2225.1	139.2	2156.9	125.8	4585.5	236.3
2006	7276.5	223.7	2824.7	174.2	2171.2	115.7	2587.2	155.3	5859.6	303.5

Appendix A (continued).

	Northern shoveler		Northern pintail		Redhead		Canvasback		Scaup	
Year	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$
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
2004	2810.4	163.9	2184.6	155.2	605.3	51.5	617.2	64.6	3807.2	202.3
2005	3591.5	178.6	2560.5	146.8	592.3	51.7	520.6	52.9	3386.9	196.4
2006	3680.2	236.5	3386.4	198.7	916.3	86.1	691.0	69.6	3246.7	166.9

Appendix B. Breeding population estimates and 95% confidence intervals or credibility intervals (CIs; in thousands) for the 10 most abundant species of ducks in the eastern survey area, 1990-2006 [a].

	Mergansers [b]		Mallard		American black duck		American wigeon		Green-winged teal	
Year	$\hat{N}$	95% CI	$\hat{N}$	95% CI	$\hat{N}$	95% CI	$\hat{N}$	95% CI	$\hat{N}$	95% CI
1990	301.7	(247.4, 356.0)	312.8	(186.3, 570.8)	426.9	(370.4, 498.1)	12.2	(0.0, 26.3)	219.2	(163.3, 305.1)
1991	393.9	(320.8, 467.0)	352.0	(211.4, 628.8)	419.1	(359.2, 495.6)	9.8	(2.5, 17.1)	209.5	(156.1, 293.9)
1992	332.4	(259.3, 405.5)	355.5	(209.8, 648.2)	402.5	(348.1, 471.4)	4.7	(0.0, 9.4)	198.6	(147.0, 275.2)
1993	274.7	(213.2, 336.2)	353.1	(210.3, 638.5)	402.5	(344.3, 473.6)	10.8	(1.4, 20.2)	178.5	(130.7, 251.9)
1994	327.5	(256.4, 398.6)	374.1	(221.4, 680.3)	369.3	(314.3, 434.9)	10.0	(0.0, 20.4)	190.0	(139.4, 269.5)
1995	293.0	(236.2, 349.8)	311.4	(183.4, 581.8)	416.7	(354.6, 491.6)	8.6	(0.0, 22.5)	194.9	(142.8, 278.9)
1996	318.8	(263.3, 374.3)	329.7	(195.3, 604.5)	488.7	(427.9, 564.6)	9.4	(2.1, 16.7)	257.3	(194.5, 355.5)
1997	392.9	(322.7, 463.1)	347.1	(202.4, 635.1)	451.1	(395.6, 517.9)	15.0	(6.4, 23.6)	200.6	(152.0, 275.5)
1998	308.7	(237.0, 380.4)	384.0	(230.2, 682.9)	482.7	(425.7, 554.9)	14.9	(1.6, 28.2)	197.2	(149.7, 267.9)
1999	378.9	(258.6, 499.2)	394.3	(237.1, 700.3)	526.8	(462.4, 605.8)	5.2	(1.7, 8.7)	228.2	(169.8, 315.2)
2000	375.3	(313.0, 437.6)	344.2	(207.4, 622.9)	504.2	(442.9, 576.2)	14.5	(2.7, 26.3)	248.5	(190.1, 336.4)
2001	373.8	(306.8, 440.8)	380.8	(232.3, 684.6)	472.7	(415.3, 540.3)	8.9	(3.6, 14.2)	208.5	(158.4, 284.0)
2002	557.4	(444.1, 670.7)	371.1	(226.7, 666.1)	522.6	(459.3, 599.9)	8.9	(2.6, 15.2)	249.6	(188.2, 345.0)
2003	460.1	(340.7, 579.5)	393.4	(236.8, 713.7)	474.4	(416.4, 544.0)	11.5	(0.0, 24.2)	234.5	(177.0, 324.8)
2004	455.2	(378.6, 531.8)	418.6	(255.1, 737.4)	487.8	(429.4, 558.3)	15.4	(1.1, 29.7)	273.2	(204.2, 379.4)
2005	418.4	(334.9, 501.9)	401.8	(239.8, 721.9)	472.0	(413.9, 544.2)	16.2	(8.4, 24.0)	223.3	(168.9, 306.3)
2006	448.2	(344.3, 552.1)	371.0	(225.6, 661.9)	490.3	(430.4, 563.2)	7.9	(2.2, 13.6)	223.0	(168.8, 305.6)

	Scaup [c]		Ring-necked duck		Goldeneyes [d]		Bufflehead		Scoters [e]	
Year	$\hat{N}$	95% CI	$\hat{N}$	95% CI	$\hat{N}$	95% CI	$\hat{N}$	95% CI	$\hat{N}$	95% CI
1990	48.4	(0.0, 104.1)	513.7	(392.4, 695.7)	309.8	(134.0, 485.6)	38.1	(24.6, 51.6)	97.4	(0.0, 216.8)
1991	33.8	(8.3, 59.3)	457.7	(352.2, 615.3)	303.7	(152.0, 455.4)	29.2	(13.1, 45.3)	89.8	(15.5, 164.1)
1992	36.7	(0.0, 76.1)	454.2	(350.9, 604.2)	306.1	(166.7, 445.5)	27.7	(16.9, 38.5)	80.4	(0.0, 206.4)
1993	7.1	(1.0, 13.2)	417.4	(321.5, 555.9)	306.2	(119.6, 492.8)	6.4	(2.3, 10.5)	104.4	(1.3, 207.5)
1994	36.4	(0.3, 72.5)	431.8	(329.9, 579.7)	227.2	(119.6, 334.8)	12.1	(0.0, 26.4)	73.5	(4.7, 142.3)
1995	13.1	(0.0, 31.1)	444.0	(339.5, 603.3)	149.6	(106.3, 192.9)	10.5	(3.8, 17.2)	13.1	(0.0, 28.0)
1996	20.4	(0.0, 42.0)	544.3	(422.5, 716.9)	334.2	(185.8, 482.6)	32.1	(18.8, 45.4)	50.4	(0.0, 105.5)
1997	35.1	(0.0, 72.7)	481.4	(375.2, 633.9)	256.3	(197.7, 314.9)	11.5	(4.1, 18.9)	38.8	(13.9, 63.7)
1998	4.0	(0.0, 8.1)	429.4	(333.3, 563.5)	243.1	(132.4, 353.8)	11.4	(6.7, 16.1)	67.1	(0.0, 145.3)
1999	15.9	(0.0, 33.3)	493.4	(385.7, 648.7)	219.6	(170.8, 268.4)	11.6	(7.5, 15.7)	26.0	(9.1, 42.9)
2000	34.7	(12.9, 56.5)	529.7	(411.4, 699.6)	325.2	(240.3, 410.1)	11.9	(6.2, 17.6)	65.3	(0.0, 142.5)
2001	22.8	(0.0, 47.9)	488.7	(382.9, 648.5)	303.6	(232.3, 374.9)	23.4	(15.0, 31.8)	94.5	(1.2, 187.8)
2002	33.7	(6.5, 60.9)	492.7	(384.2, 659.0)	247.4	(191.1, 303.7)	46.0	(30.5, 61.5)	65.8	(0.0, 140.1)
2003	16.2	(6.2, 26.2)	502.5	(391.6, 661.7)	317.5	(223.2, 411.8)	14.7	(8.2, 21.2)	124.3	(0.0, 315.8)
2004	17.7	(5.9, 29.5)	548.0	(426.9, 738.1)	396.2	(271.5, 520.9)	8.4	(3.9, 12.9)	286.0	(0.0, 618.6)
2005	13.7	(4.3, 23.1)	509.1	(401.7, 667.8)	320.4	(233.4, 407.4)	23.2	(13.2, 33.2)	95.9	(5.7, 186.1)
2006	72.5	(30.8, 114.2)	521.9	(406.3, 689.7)	245.5	(195.5, 295.5)	9.7	(4.6, 14.8)	65.3	(0.0, 137.4)

[a] Estimates for mallards, American black ducks, green-winged teal, and ring-necked duck from Bayesian hierarchical analysis using FWS and CWS data from strata 51, 52, 63, 64, 66-68, 70-72. All others were computed as harmonic means of FWS and CWS estimates for strata 51, 52, 63, 64, 66-68,70-72.

[b] Common, red-breasted, and hooded.

[c] Greater and lesser.

[d] Common and Barrow's.

[e] Black and surf.