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TRENDS IN DUCK BREEDING POPULATIONS, 1955-2005

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Administrative Report – July 14, 2005



50 Years & Still Counting

This report summarizes information about the status of duck populations and wetland habitats during spring 2005, focusing on areas encompassed by the U.S. Fish and Wildlife (USFWS) and Canadian Wildlife Services' (CWS) Waterfowl Breeding Population and Habitat Survey. The estimates do 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 31.7 ± 0.6 [SE] million birds, similar to last year's estimate of 32.2 ± 0.6 million birds but 5% below the 1955-2004 long-term average^a. Mallard (*Anas platyrhynchos*) abundance was 6.8 ± 0.3 million birds, which was 9% below last year's estimate of 7.4 ± 0.3 million birds and 10% below the long-term average. Blue-winged teal (*A. discors*) abundance was 4.6 ± 0.2 million birds. This value was similar to last year's estimate of 4.1 ± 0.2 million birds and the long-term average. Of the other duck species, gadwall (*A. strepera*; 2.2 ± 0.1 million) was 16% below that of 2004, while estimates of northern pintails (*A. acuta*; 2.6 ± 0.1 million; +17%) and northern shovelers (*A. clypeata*; 3.6 ± 0.2 million; +28%) were significantly above 2004 estimates. The estimate for northern shovelers was 67% above the long-term average for this species, as were estimates of gadwall (+30%) and green-winged teal (*A. crecca*; 2.2 ± 0.1 million; +16%). Northern pintails remained 38% below their long-term average despite this year's increase in abundance. Estimates of American wigeon (*A. americana*; 2.2 ± 0.1 million; -15%) and scaup (*Aythya affinis* and *A. marila* combined; 3.4 ± 0.2 ; -35%) also were below their respective long-term averages; the estimate for scaup was a record low.

^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.

Abundances of redheads (*A. americana*) and canvasbacks (*A. valisineria*) were unchanged from last year's counts and long-term averages.

Habitat conditions at the onset of the survey in May were variable, with some areas improved from last year and others remaining or becoming increasingly dry. Habitat on the U.S. prairies was in fair to poor condition due to a dry fall, winter, and early spring and warm winter temperatures. Nesting habitat was particularly poor in South Dakota because of below average precipitation resulting in degraded wetland conditions and increased tilling and grazing of wetland margins. Birds may have overflowed the state for wetter conditions to the north. Water levels and upland nesting cover were relatively better in North Dakota and eastern Montana and wetland conditions in these regions improved markedly during June, with the onset of well-above average precipitation amounts. The 2005 pond estimate for north-central U.S. (1.5 ± 0.1 million) was similar to last year's estimate (Fig. 2).

The prairies of southern Alberta and southwestern Saskatchewan were also quite dry in May. The U.S. and Canadian prairies received substantial rain in late May and during the entire month of June that recharged wetlands and encouraged growth of vegetation. While this improved habitat quality on the Prairies, it probably came too late to benefit early-nesting species or prevent overflight. This heavy rain likely benefited late nesting species and renesting efforts.

In contrast, the Canadian Parklands were much improved compared to last year, due to a combination of several years of improving nesting cover and above-normal precipitation last fall and winter. These areas were in good-to-excellent condition. Record high levels of rain flooded the lower elevation prairie areas of central Manitoba during April to date, producing fair or poor nesting conditions for breeding waterfowl. Overall, pond counts in the Canadian prairies and the Canadian and U.S. prairies combined increased over last year. The estimate of ponds in Prairie Canada was 3.9 ± 0.2 million. This was a 56% increase relative to last year's estimate of 2.5 ± 0.1 million ponds and 17% higher than the long-term average of 3.3 ± 0.3 million ponds. The total pond estimate (Prairie Canada and the U.S. combined) was 5.4 ± 0.2 million ponds. This was 37% greater than last year's estimate of 3.9 ± 0.2 million ponds and 12% higher than the long-term average of 4.8 ± 0.1 million ponds.

Portions of Northern Manitoba and Northern Saskatchewan also experienced flooding, resulting in only fair conditions for breeding waterfowl. By contrast, dry conditions in parts of the Northwest Territories and Northern Alberta made for low water levels in lakes and ponds and the complete drying of some wetlands. Therefore, habitat was also classified as fair in these areas. However, most of the Northwest Territories was in good condition due to adequate water and a timely spring break up that made habitat available to early-nesting species. Alaska was in mostly excellent condition, with an early spring and good water, except for a few flooded river areas and the North Slope where spring was late.

In the Eastern survey area (strata 51-72), biologists reported that habitat conditions were good due to adequate water and relatively mild spring temperatures. The exceptions were the coast of Maine and the Maritimes, where May temperatures were cool and some flooding occurred along the coast and major rivers. Also, below-normal precipitation left some habitats in fair to poor condition in southern Ontario. However, precipitation in southern Ontario after survey completion improved habitat conditions in the region. Population estimates of four species were below 2004 levels as determined by non-overlap of Bayesian 95% credibility levels. These species were American black ducks (*Anas rubripes*; 0.8 million; -24%), mallards (0.4 million; -36%), mergansers (common *Mergus merganser*, red-breasted *M. serrator*, and hooded *Lophodytes cucullatus*; all 3 species pooled 0.8 million; -25%), and green-winged teal (0.4 million; -46%). All species were similar to 1999-2004 averages.

In 2005, the USFWS and CWS took initial steps toward the integration of 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 in eastern North America. For these reasons, population estimates presented in this report for the Eastern survey area are not directly comparable with estimates presented in previous reports. Additionally, composite estimates are presently available only for 1999-2005. In future reports, composite estimates will be presented for a longer time-span. Changes in methods and results will be presented in greater detail in the 2005 Waterfowl Status Report. We anticipate that composite estimates for the Eastern survey area will change in the coming years as the USFWS and CWS refine the integrated survey design and analytical methods.

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 J. Allen

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

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

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Ground P. Pryor^a, K. Froggatt^b, S. Barry^a, E. Hofman^b, M. Barr^c, N. Clements^a,
J. Going^a, R. Hunka^c, T. Mathews^c, I. McFarlane^c, B. Peers^c, R. Russell^b, J.
Spent^c, S. Tucker^a, and E. Whelan^a

Southern Saskatchewan (Strata 30-35):

Air P. Thorpe, T. Lewis, R. King, and S. Frazer
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M. Schuster^a, K. Dufour^a, C. Downie^a, P. Nieman^a, N. Weibe^a, C. Wilkinson^a,
A. Williams^c, J. Caswell^a, F. Baldwin^a, C. Meuckon^a, L. Beaudoin^a, and S.
Lawson^c

Southern Manitoba (Strata 25 and 36-40):

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L. Beaudoin^a, J. Caswell^a, J. Galbraith^a, S. Lawson^c, and C. Meuckon^a

Montana and Western Dakotas (Strata 41-44):

Air R. Bentley and H. Woods
Ground K. Richkus and T. Wilkendorf

Eastern Dakotas (Strata 45-49):

Air J. Solberg and M. Rich
Ground P. Garrettson, K. Kruse, and E. Lang

Central Quebec (Strata 68 and 69):

Air J. Wortham, D. Fronczak, and H. Obrecht
Helicopter D. Bordage^a, C. Lepage^a, S. Orichefsky^a, G. Gagnon^d, M. Samson^d, D. Dubé^d,
J. Vallières^d

New York, Eastern Ontario, Western James Bay Lowlands, and Southern Quebec
(Strata 52-58):

Air M. Koneff, M. Jones, and R. Raftovich
Helicopter K. Ross^a, D. McNichol^a, D. Fillman^a, B. Collins^a, and G. Ertel^d

Central and Western Ontario (Strata 50 and 51):

Air K. Bollinger and G. Foulks

Helicopter K. Ross^a, D. McNichol^a, D. Fillman^a, B. Collins^a, and G. Ertel^d,

Maine and Maritimes (Strata 62-67):

Air J. Bidwell, M. Drut, and J. Goldsberry^d

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Habitat information was provided by U.S. Fish and Wildlife Service and Canadian Wildlife Service biologists.

Analysis of Eastern survey data by John R. Sauer, U.S. Geological Survey.

^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

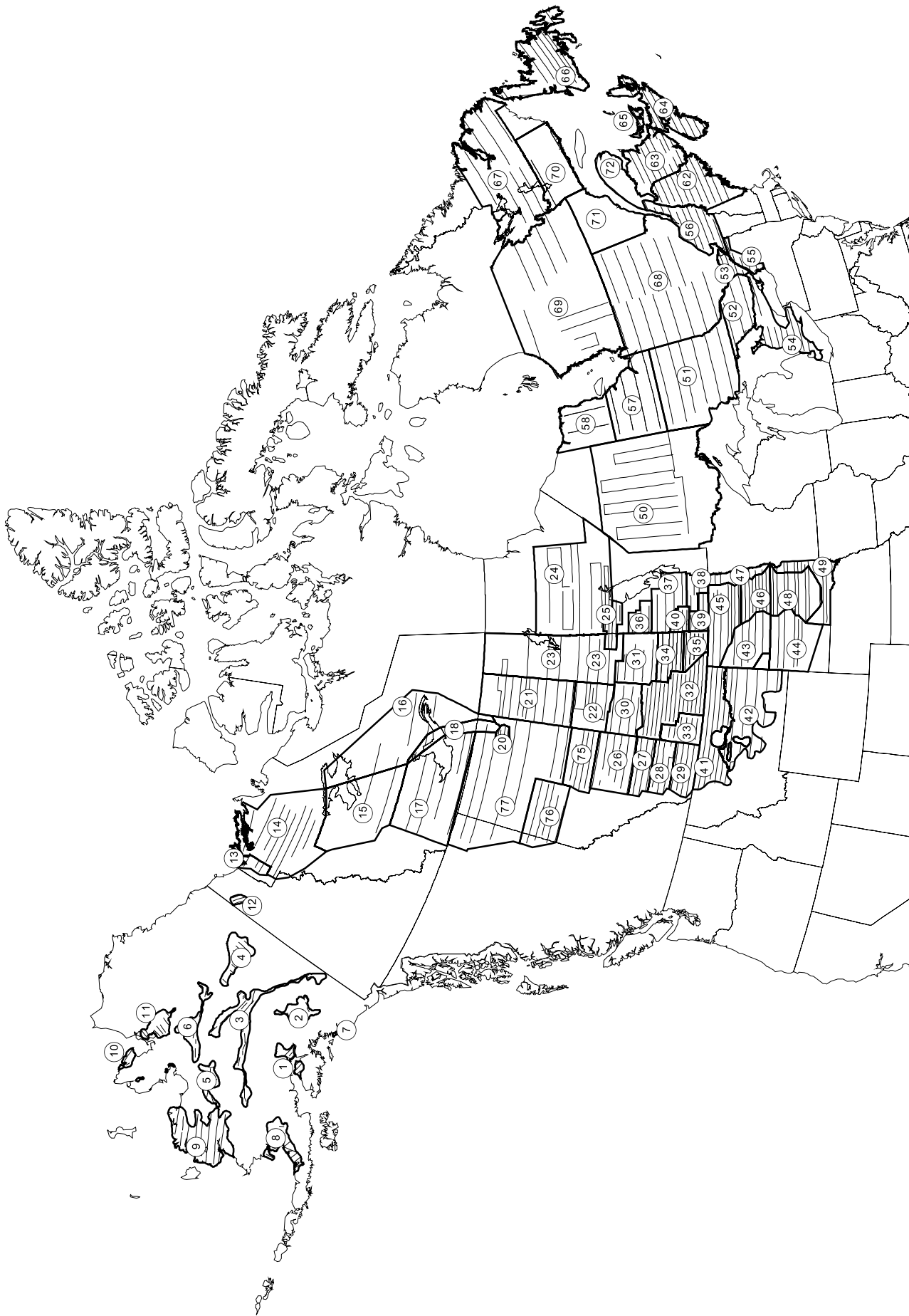


Table 1. Duck breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2005	2004	Change from 2004		LTA ^a	Change from LTA	
			%	<i>P</i>		%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	5,114	5,456	-6	0.194	3,519	+45	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	4,713	5,882	-20	0.001	7,202	-35	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	3,223	4,085	-21	0.007	3,564	-10	0.099
S. Alberta	3,178	2,499	+27	0.002	4,305	-26	<0.001
S. Saskatchewan	7,967	5,783	+38	<0.001	7,336	+9	0.024
S. Manitoba	1,627	1,474	+10	0.172	1,542	+5	0.287
Montana and western Dakotas	1,290	1,615	-20	0.006	1,620	-20	<0.001
Eastern Dakotas	4,623	5,370	-14	0.022	4,193	+10	0.067
Total ^b	31,735	32,164	-1	0.593	33,281	-5	0.006

^a Long-term average, 1955-2004.

^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.

Region	2005	2004	Change from 2004		LTA	Change from LTA	
			%	<i>P</i>		%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	703	811	-13	0.199	350	+101	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	533	776	-31	0.025	1,097	-51	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	937	1,283	-27	0.143	1,163	-19	0.165
S. Alberta	671	600	+12	0.460	1,107	-39	<0.001
S. Saskatchewan	1,729	1,609	+7	0.515	2,079	-17	0.007
S. Manitoba	455	393	+16	0.194	377	+21	0.054
Montana and western Dakotas	387	495	-22	0.160	502	-23	0.017
Eastern Dakotas	1,340	1,456	-8	0.520	836	+60	<0.001
Total	6,755	7,425	-9	0.092	7,510	-10	0.008

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

Region	2005	2004	Change from 2004		LTA	Change from LTA	
			%	<i>P</i>		%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	3	2	+42	0.734	2	+43	0.705
C. & N. Alberta – N.E. British Columbia - Northwest Territories	77	138	-44	0.083	46	+66	0.050
N. Saskatchewan- N. Manitoba - W. Ontario	19	22	-16	0.772	28	-32	0.133
S. Alberta	338	290	+17	0.492	308	+10	0.612
S. Saskatchewan	723	752	-4	0.847	553	+31	0.052
S. Manitoba	120	148	-18	0.362	65	+84	<0.001
Montana and western Dakotas	187	205	-9	0.614	194	-4	0.797
Eastern Dakotas	712	1,033	-31	0.006	486	+46	0.001
Total	2,179	2,590	-16	0.052	1,683	+30	<0.001

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

Region	2005	2004	Change from 2004		LTA	Change from LTA	
			%	<i>P</i>		%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	873	897	-3	0.790	504	+73	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	583	565	+3	0.889	919	-36	0.002
N. Saskatchewan- N. Manitoba - W. Ontario	174	149	+17	0.568	254	-31	0.013
S. Alberta	125	117	+8	0.728	300	-58	<0.001
S. Saskatchewan	294	128	+130	0.002	428	-31	0.006
S. Manitoba	34	3	+893	0.002	62	-45	0.006
Montana and western Dakotas	67	66	+2	0.926	110	-39	<0.001
Eastern Dakotas	73	56	+30	0.405	48	+53	0.114
Total	2,225	1,981	+12	0.177	2,624	-15	0.005

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

Region	2005	2004	Change from 2004		LTA	Change from LTA	
			%	<i>P</i>		%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	713	819	-13	0.289	351	+103	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	437	835	-48	0.002	759	-42	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	310	375	-17	0.262	195	+59	0.002
S. Alberta	159	98	+61	0.138	195	-18	0.291
S. Saskatchewan	359	124	+189	<0.001	227	+58	0.027
S. Manitoba	55	27	+103	0.007	52	+7	0.686
Montana and western Dakotas	83	104	-20	0.395	39	+113	0.008
Eastern Dakotas	42	79	-47	0.079	45	-8	0.742
Total	2,157	2,461	-12	0.114	1,861	+16	0.021

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

Region	2005	2004	Change from 2004		LTA	Change from LTA	
			%	<i>P</i>		%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	3	2	+25	0.876	1	+105	0.626
C. & N. Alberta – N.E. British Columbia - Northwest Territories	247	401	-38	0.116	271	-9	0.704
N. Saskatchewan- N. Manitoba - W. Ontario	139	60	+130	0.102	268	-48	0.007
S. Alberta	649	360	+80	0.009	608	+7	0.665
S. Saskatchewan	1,597	1,155	+38	0.026	1,210	+32	0.002
S. Manitoba	339	282	+20	0.206	383	-12	0.207
Montana and western Dakotas	286	320	-10	0.508	263	+9	0.467
Eastern Dakotas	1,325	1,493	-11	0.427	1,496	-11	0.275
Total	4,586	4,073	+13	0.126	4,499	+2	0.720

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

Region	2005	2004	Change from 2004		LTA	Change from LTA	
			%	<i>P</i>		%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	666	643	+4	0.806	259	+158	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	213	247	-14	0.554	213	0	0.992
N. Saskatchewan- N. Manitoba - W. Ontario	29	33	-13	0.683	43	-34	0.016
S. Alberta	548	385	+42	0.133	356	+54	0.018
S. Saskatchewan	1,314	784	+68	0.001	634	+107	<0.001
S. Manitoba	211	143	+47	0.176	105	+100	0.004
Montana and western Dakotas	148	200	-26	0.204	149	-1	0.959
Eastern Dakotas	464	377	+23	0.212	388	+19	0.170
Total	3,591	2,810	+28	0.001	2,149	+67	<0.001

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

Region	2005	2004	Change from 2004		LTA	Change from LTA	
			%	<i>P</i>		%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	905	927	-2	0.856	913	-1	0.939
C. & N. Alberta – N.E. British Columbia - Northwest Territories	108	193	-44	0.073	384	-72	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	8	10	-18	0.672	42	-80	<0.001
S. Alberta	282	161	+75	0.049	730	-61	<0.001
S. Saskatchewan	858	474	+81	0.009	1,225	-30	<0.001
S. Manitoba	68	40	+71	0.042	113	-40	<0.001
Montana and western Dakotas	75	132	-43	0.031	273	-73	<0.001
Eastern Dakotas	256	247	+4	0.860	463	-45	<0.001
Total	2,561	2,185	+17	0.079	4,142	-38	<0.001

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

Region	2005	2004	Change from 2004		LTA	Change from LTA	
			%	<i>P</i>		%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	<1	2	-91	0.044	1	-84	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	49	73	-33	0.304	38	+30	0.530
N. Saskatchewan- N. Manitoba - W. Ontario	13	31	-57	0.136	28	-53	<0.001
S. Alberta	91	79	+16	0.648	117	-22	0.170
S. Saskatchewan	226	131	+72	0.02	189	+19	0.251
S. Manitoba	98	102	-4	0.900	71	+37	0.338
Montana and western Dakotas	3	25	-89	0.102	10	-70	0.002
Eastern Dakotas	112	161	-31	0.102	170	-34	0.002
Total	592	605	-2	0.858	625	-5	0.536

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

Region	2005	2004	Change from 2004		LTA	Change from LTA	
			%	<i>P</i>		%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	95	161	-41	0.207	91	+4	0.887
C. & N. Alberta – N.E. British Columbia - Northwest Territories	98	109	-11	0.768	72	+35	0.416
N. Saskatchewan- N. Manitoba - W. Ontario	39	50	-21	0.578	56	-30	0.253
S. Alberta	43	50	-15	0.758	64	-33	0.104
S. Saskatchewan	162	121	+34	0.181	183	-11	0.425
S. Manitoba	48	70	-32	0.344	56	-15	0.518
Montana and western Dakotas	5	12	-60	0.046	8	-39	0.095
Eastern Dakotas	31	44	-28	0.275	33	-5	0.817
Total	521	617	-16	0.247	563	-8	0.433

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

Region	2005	2004	Change from 2004		LTA	Change from LTA	
			%	<i>P</i>		%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	961	982	-2	0.865	914	+5	0.593
C. & N. Alberta – N.E. British Columbia - Northwest Territories	1,361	1,624	-16	0.232	2,653	-49	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	349	582	-40	<0.001	592	-41	<0.001
S. Alberta	127	124	+2	0.948	358	-65	<0.001
S. Saskatchewan	381	185	+106	0.008	417	-9	0.595
S. Manitoba	60	31	+91	0.019	137	-56	<0.001
Montana and western Dakotas	16	28	-41	0.309	54	-70	<0.001
Eastern Dakotas	132	251	-47	0.034	96	+37	0.162
Total	3,387	3,807	-11	0.136	5,220	-35	<0.001

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

Survey Area	2005	2004	Change from 2004		LTA ^a	Change from LTA		
			%	<i>P</i>		%	<i>P</i>	
Prairie Canada								
S. Alberta	750	511	+47	0.007	721	+4	0.689	
S. Saskatchewan	2415	1,461	+65	<0.001	1,953	+24	0.009	
S. Manitoba	755	541	+40	0.001	671	+13	0.101	
Subtotal	3,921	2,513	+56	<0.001	3,346	+17	0.004	
Northcentral U.S.								
Montana and western Dakotas	663	597	+11	0.354	524	+27	0.016	
Eastern Dakotas	798	810	-1	0.913	1,000	-20	<0.001	
Subtotal	1,461	1,407	+4	0.678	1,524	-4	0.440	
Grand Total	5,381	3,920	+37	<0.001	4,813	+12	0.008	

^aLong-term average. Prairie and parkland Canada, 1961-2004; northcentral U.S. and Grand Total, 1974-2004.

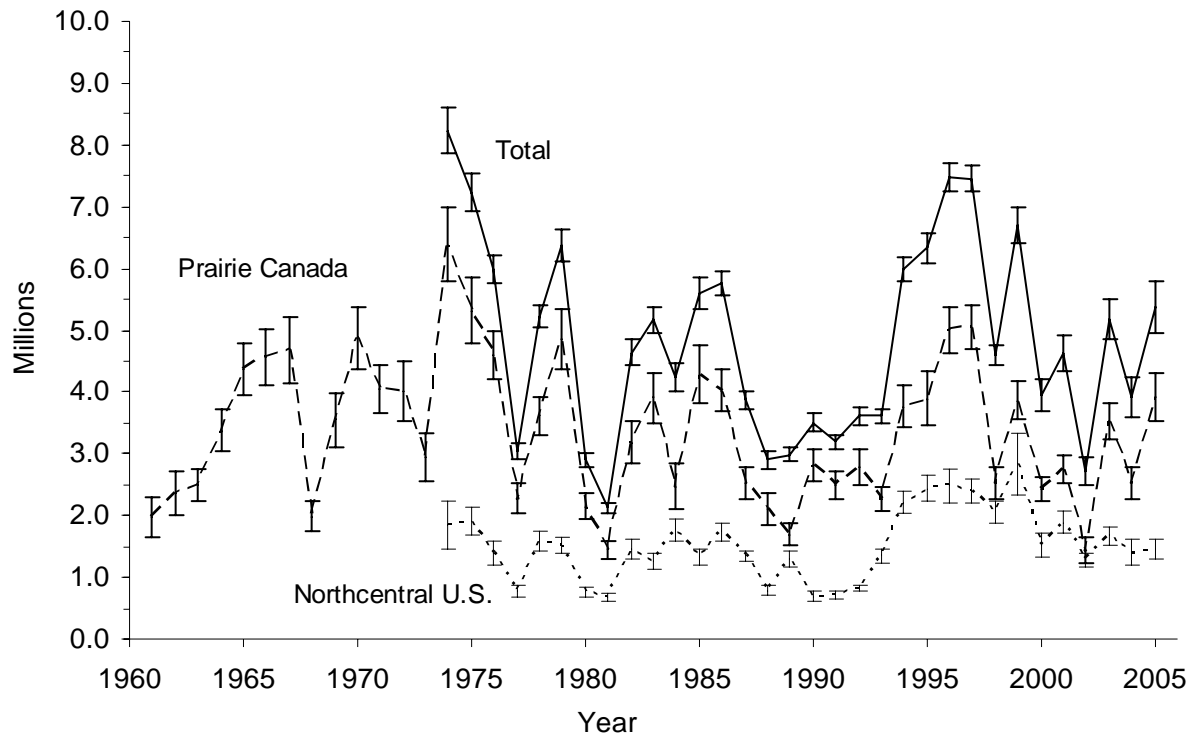


Figure 2. Number of ponds in May and 95% confidence intervals in prairie and parkland Canada and the northcentral U.S.

Table 13. Duck breeding population estimates (median, in thousands) for 6 species in the eastern survey area.

Species	2005	2004	% Change from 2004	Average ^a	% Change from average
Mergansers (common, red-breasted, & hooded)	753	995	-25 ^b	825	-9
Mallard	412	646	-36 ^b	546	-25
American black duck	827	1093	-24 ^b	1002	-18
Green-winged teal	423	776	-46 ^b	521	-19
Ring-necked duck	883	1257	-30	1032	-14
Goldeneye (common & Barrow's)	715	748	-5	901	-21

^a Average for 1999-2004.

^b Significant ($P < 0.05$) determined by non-overlap of Bayesian credibility intervals.

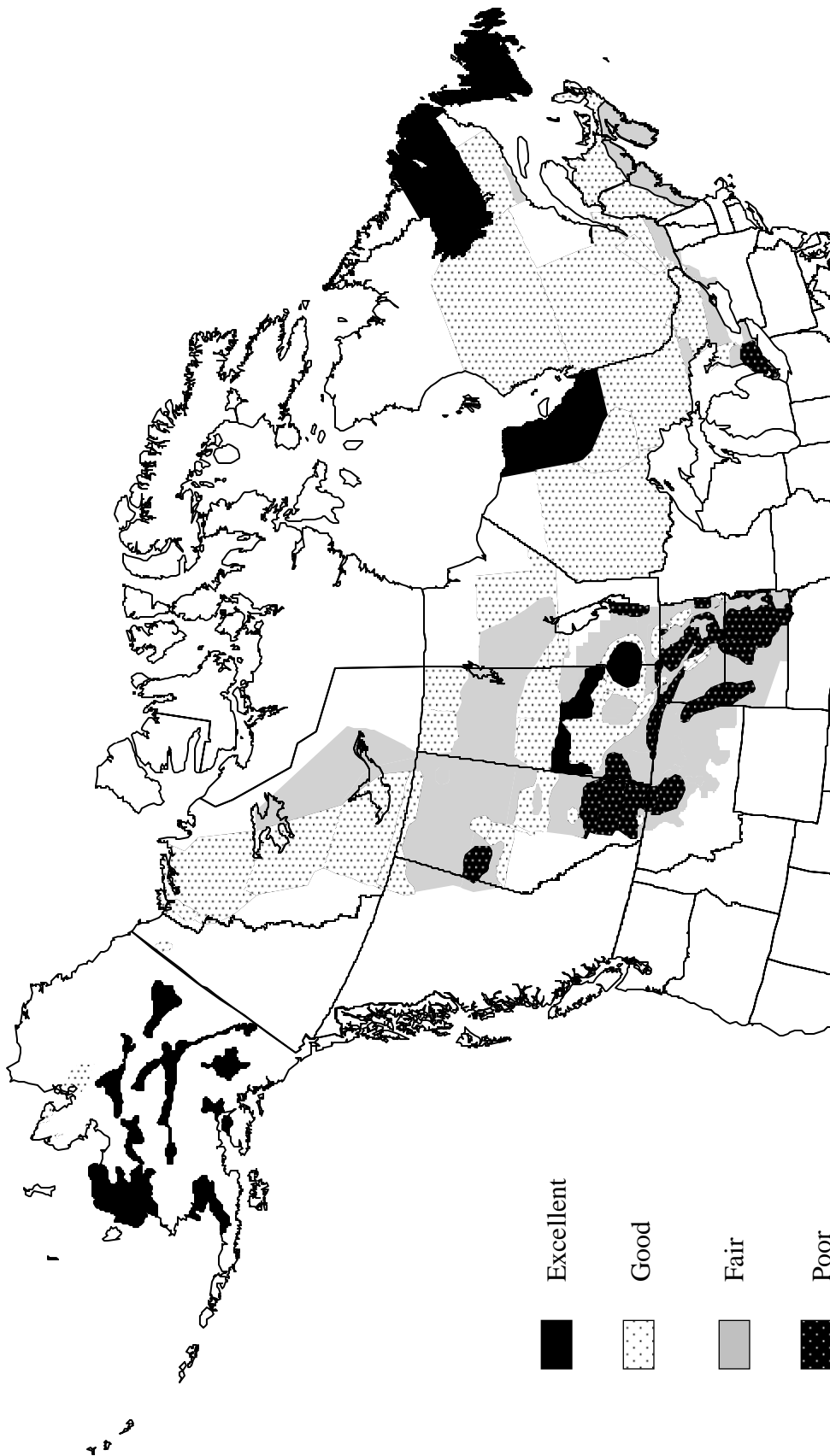


Figure 3. Breeding waterfowl habitat conditions during the 2005 Waterfowl Breeding Population and Habitat Survey, as judged by U.S. Fish and Wildlife Service Flyway Biologists. Changes in conditions due to additional precipitation following completion of survey efforts are described in the narrative.

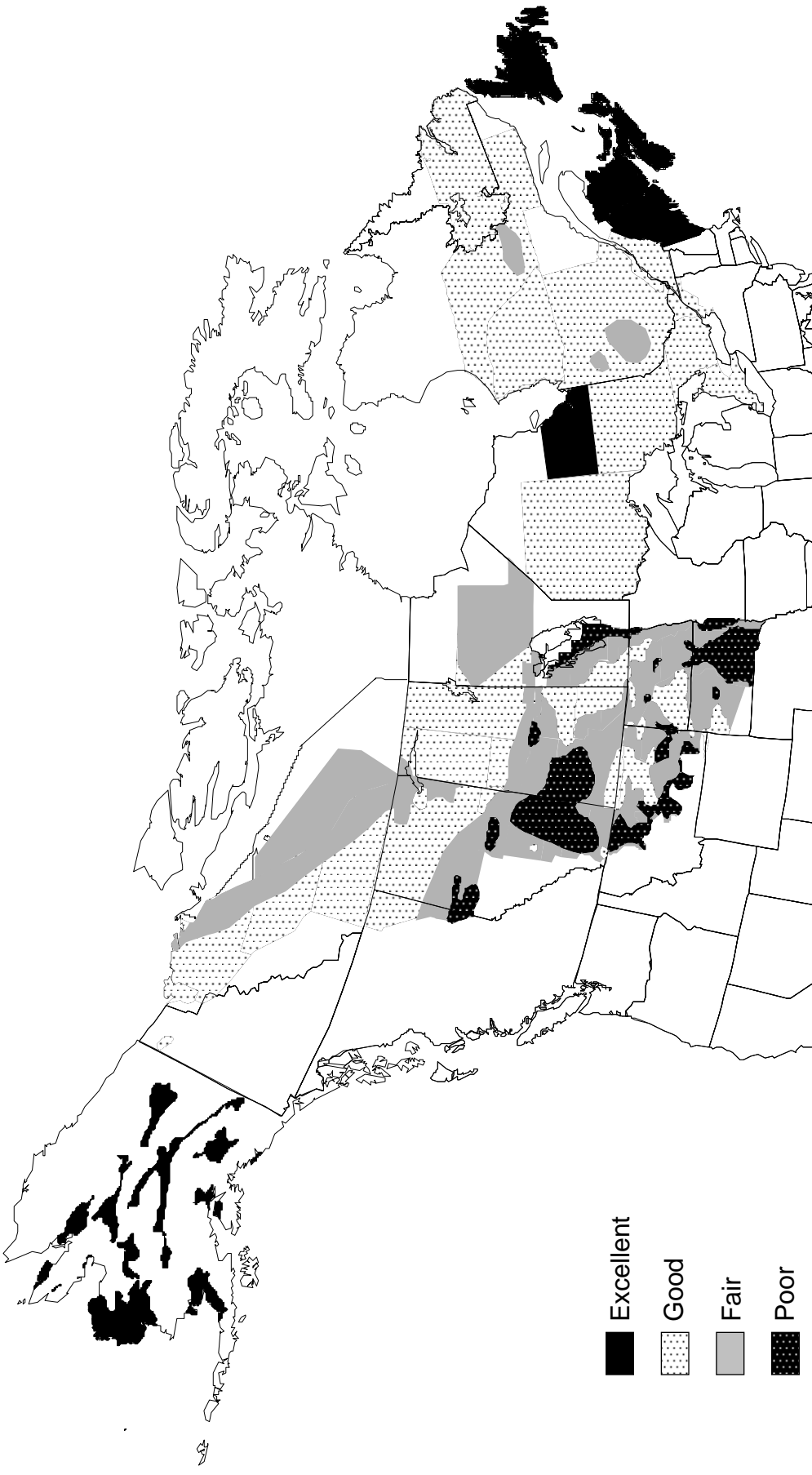


Figure 4. Breeding waterfowl habitat conditions during the 2004 Waterfowl Breeding Population and Habitat Survey, as judged by U.S. Fish and Wildlife Service Flyway Biologists.

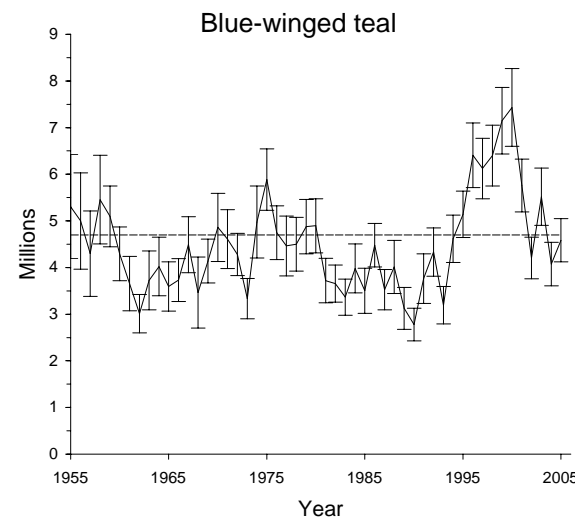
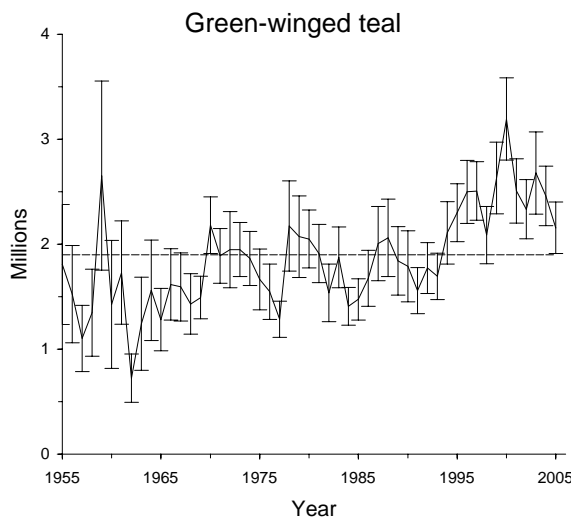
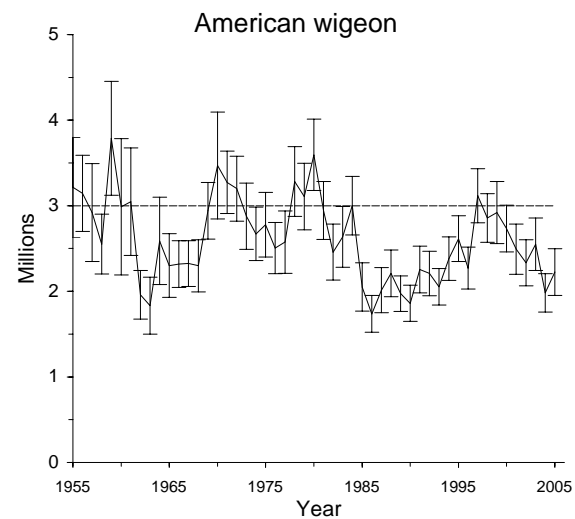
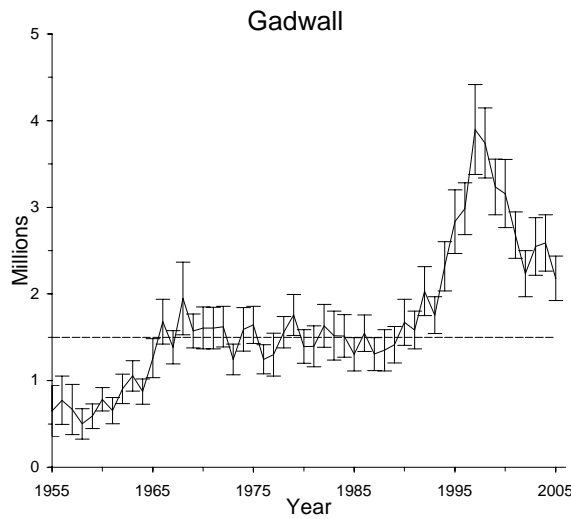
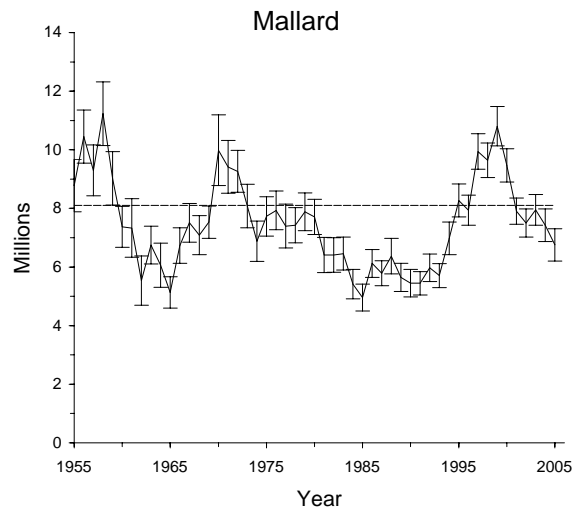
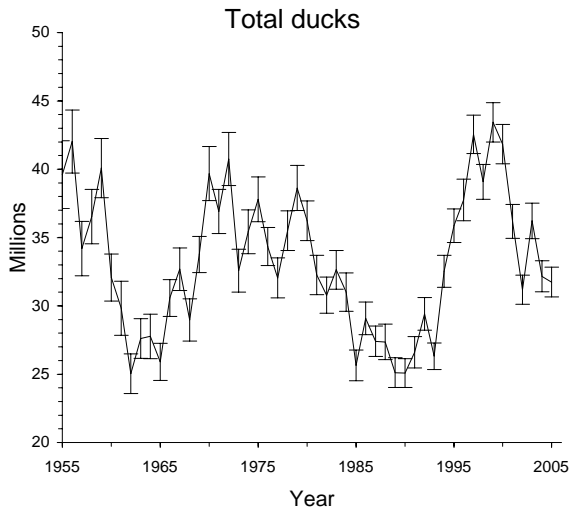


Figure 5. Breeding population estimates, 95% confidence intervals, and North American Waterfowl Management Plan population goal (dashed line) for selected species in the traditional survey area (strata 1-18, 20-50, 75-77).

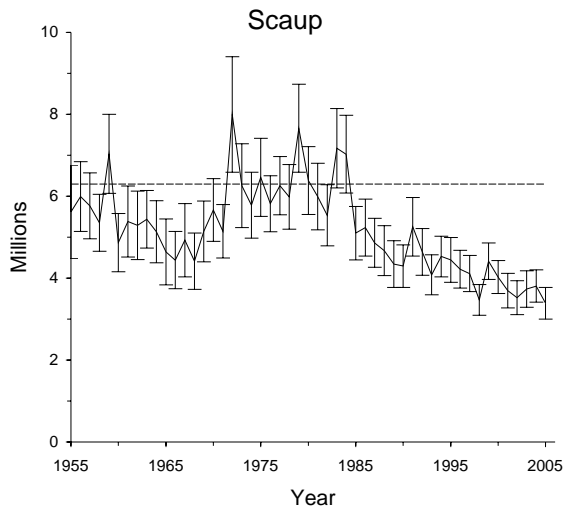
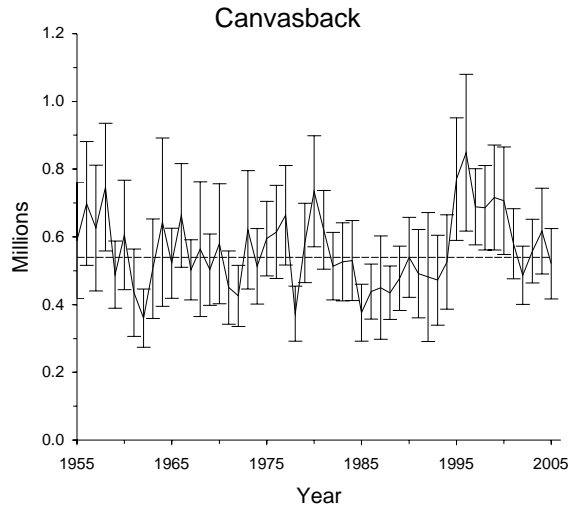
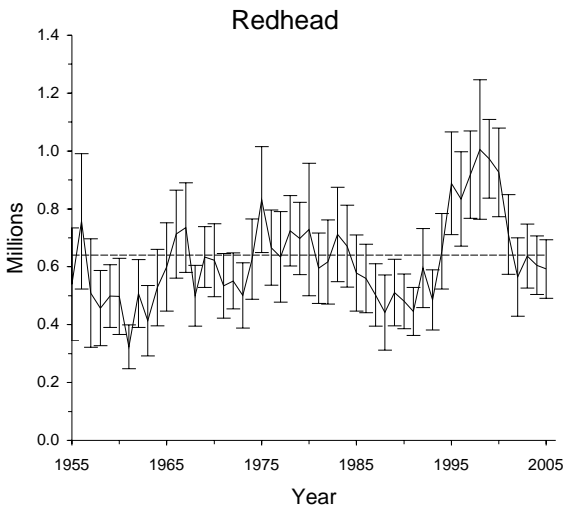
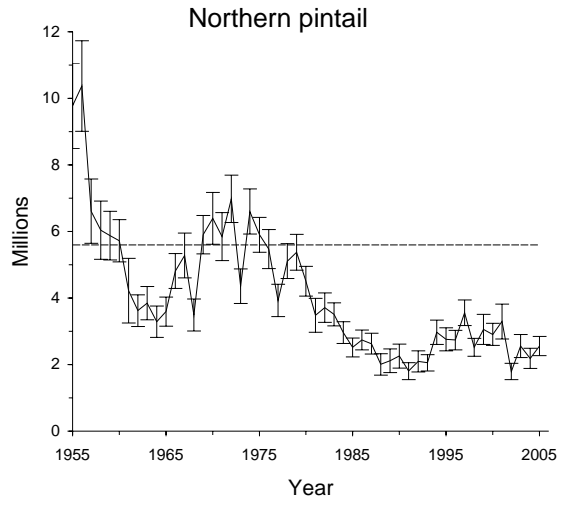
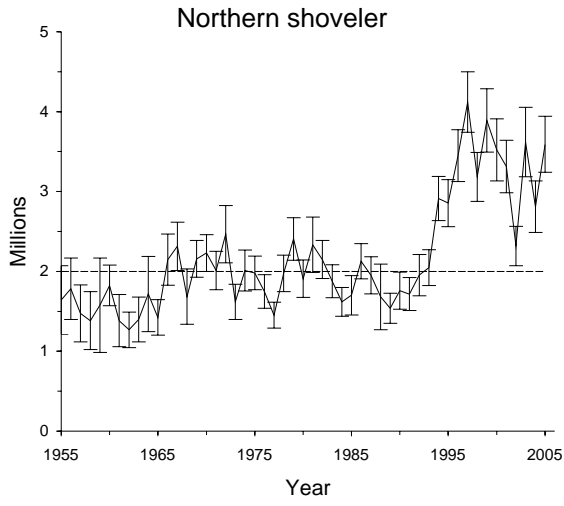


Figure 5 (continued).

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
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

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
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

Appendix B. Breeding population estimates (median, in thousands) and 95% credibility intervals (CI) for 6 species of ducks in the eastern survey area, 1999-2005.

Year	<u>Mergansers</u>		<u>Mallard</u>		<u>American black duck</u>		<u>Green-winged teal</u>		<u>Ring-necked duck</u>		<u>Goldeneyes</u>	
	\hat{N}	CI	\hat{N}	CI	\hat{N}	CI	\hat{N}	CI	\hat{N}	CI	\hat{N}	CI
1999	602.7	(422 - 951)	554.1	(369 - 901)	1,018.0	(732 - 1,362)	627.6	(329, 1,613)	905.3	(583 - 1,560)	821.1	(449 - 2,075)
2000	653.3	(462 - 1,007)	443.8	(306 - 656)	885.9	(638 - 1,206)	347.9	(201, 771)	1,342.0	(765 - 3,241)	778.7	(424 - 2,048)
2001	636.4	(440 - 1,039)	465.0	(321 - 704)	864.9	(603 - 1,206)	265.9	(136, 761)	838.6	(562 - 1,361)	1,118.0	(566 - 3,155)
2002	1,170.0	(809 - 1,930)	517.5	(355 - 769)	1,174.0	(770 - 1,708)	588.8	(254, 2,350)	834.9	(590 - 1,267)	970.3	(507 - 2,656)
2003	890.8	(622 - 1,414)	648.1	(437 - 1,122)	976.2	(675 - 1,389)	521.1	(262, 1,571)	1,012.0	(697 - 1,550)	968.4	(495 - 2,747)
2004	995.0	(704 - 1,547)	645.5	(438 - 1,114)	1,093.0	(739 - 1,571)	775.7	(344, 2,629)	1,257.0	(839 - 2,090)	747.8	(440 - 1,587)
2005	752.8	(529 - 1,173)	411.7	(281 - 635)	826.5	(582 - 1,137)	422.9	(195, 1,256)	883.1	(572 - 1,691)	714.7	(371 - 2,078)