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## TRENDS IN DUCK BREEDING POPULATIONS, 1955-2002

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# TRENDS IN DUCK BREEDING POPULATIONS, 1955-2002

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

Administrative Report<sup>a</sup> – July 3, 2002



This report summarizes information about the status of duck populations and their habitats during spring 2002, 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  $31.2 \pm 0.5$  [SE] million birds, 14% below ( $P < 0.001$ ) last year's estimate of  $36.1 \pm 0.6$  million birds, and 6% below ( $P < 0.001$ ) the 1955-2001 long-term average. Mallard abundance was  $7.5 \pm 0.2$  million birds, which was similar to last year's estimate of  $7.9 \pm 0.2$  million ( $P = 0.23$ ) and essentially identical to the 1955-2001 average ( $P = 1.00$ ). Blue-winged teal abundance was estimated to be  $4.2 \pm 0.2$  million birds. This value was 27% below ( $P < 0.001$ ) last year's estimate of  $5.8 \pm 0.3$  million, but unchanged ( $P = 0.22$ ) from the 1955-2001 average. Gadwall ( $2.2 \pm 0.1$  million, -17%), shovelers ( $2.3 \pm 0.1$  million, -30%), and pintails ( $1.8 \pm 0.1$  million, -46%) were below 2001 estimates ( $P \leq 0.02$ ). Wigeon ( $2.3 \pm 0.1$  million), green-winged teal ( $2.3 \pm 0.1$  million), redheads ( $0.6 \pm 0.1$  million), canvasbacks ( $0.5 \pm 0.1$  million), and scaup ( $3.5 \pm 0.2$  million) were unchanged from 2001 estimates. Gadwall (+37%), green-winged teal (+28%), and shovelers (+10%) all remained above their long-term averages, whereas wigeon (-12%), pintails (-58%), canvasbacks (-14%), and scaup numbers (-34%) were below long-term averages. The counts for pintails and scaup were the lowest and second lowest on record, respectively. The number of redheads was similar to the long-term average ( $P = 0.38$ ).

The eastern survey area is comprised of strata 51-56 and 62-69. The 2002 total-duck population estimate for this area was  $4.4 \pm 0.3$  million birds. This estimate is 32%

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higher than that of last year ( $3.3 \pm 0.3$  million birds,  $P = 0.01$ ), and 41% higher than the 1996-2001 average ( $P < 0.001$ ). Numbers of most individual species were similar to those of last year, with the exception of mergansers ( $815 \pm 98$  thousand, +90%,  $P < 0.001$ ) and green-winged teal ( $604 \pm 129$  thousand, +174%,  $P = 0.01$ ), which increased compared to last year. Mergansers (+68%) and green-winged teal (+102%) were also above their 1996-2001 averages, as were scoters ( $314 \pm 76$  thousand, +178%,  $P = 0.01$ ). Estimates for all other species were similar to those of last year and long-term averages.

Below average winter and spring precipitation in the prairies and parklands and cold spring temperatures in the East resulted in generally poorer habitat conditions for breeding waterfowl this year than in 2001. These dry conditions were reflected in the numbers of ponds counted this year. The estimate of May ponds (U. S. prairies and prairie and parkland Canada combined) of  $2.7 \pm 0.1$  million is the second lowest total pond count on record since 1974. This value was 41% below last year's estimate of  $4.6 \pm 0.1$  million ( $P < 0.001$ ), and 45% below ( $P < 0.001$ ) the long-term average ( $4.9 \pm 0.1$  million). Ponds in Canada ( $1.4 \pm 0.1$  million) and the U.S. ( $1.3 \pm 0.1$  million) were below 2001 estimates (-48% in Canada and -32% in the U.S.;  $P < 0.001$ ) and their long-term averages (-58% in Canada and -16% in the U.S.;  $P < 0.001$ ). The pond estimate for prairie and parkland Canada was the lowest recorded since surveys began in 1961.

In both the traditional and eastern survey areas, most regions entered into the spring of 2002 with a water deficit remaining from winter. Spring rains helped recharge wetlands in most of the Northeast, but conditions remained very dry in the West. Conditions in western Montana, southern Saskatchewan, and much of southern Manitoba and southern and central Alberta were hardest hit by drought. Lower numbers of ponds available to nesting birds caused crowding on remaining ponds. A bright spot in the prairies was the Dakotas, where permanent wetlands remained in good condition from the wet period of 1993-2001. Survey results show that many prairie-nesting species, such as mallards, shovelers, pintails, and blue-winged teal, flew over the prairies and parklands to the boreal forest where wetland conditions are more stable.

The cold spring temperatures were another negative impact on nesting waterfowl this year. Winter-like conditions hit the entire surveyed area in early May, when snowstorms and cold temperatures caused birds to halt migration for several weeks. Snow and cold may have caused some nest loss in the prairies and parklands. Spring ice break-up was several weeks late in much of the northern survey areas. Break-up was so late in parts of the northeastern survey areas that survey biologists predicted little nesting activity in these areas. Conditions in northern Canada were generally good, but the cold temperatures likely had a negative impact on early nesting species such as mallards, green-winged teal, and pintails. The only region where habitat conditions for breeding waterfowl improved over last year is Alaska, due to warmer post-thaw temperatures this year than last year. However, rapid ice melt may have caused nests to be flooded in parts of Alaska, as well as in Labrador.

Since the breeding surveys were flown, water conditions have improved Montana, the western Dakotas, southern Saskatchewan, and southern Alberta. In mid-June, these areas received from several inches to a foot or more of rain and/or snow. However, most biologists think that the rain was probably too late to help nesting waterfowl this year.

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.H. Stinson

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

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Ground D. Duncan<sup>a</sup>, P. Pryor<sup>a</sup>, K. Froggatt<sup>b</sup>, S. Barry<sup>a</sup>, E. Hofman<sup>b</sup>, R. Arbuckle<sup>c</sup>, L. Crowe<sup>a</sup>, R. Hunka<sup>c</sup>, T. Matthews<sup>c</sup>, M. Nieman<sup>a</sup>, B. Peers<sup>c</sup>, D. Pisiak<sup>c</sup>, C. Procter<sup>a</sup>, R. Russell<sup>b</sup>, J. Spent<sup>a</sup>, S. Witham<sup>c</sup>

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Ground G. Ball<sup>b</sup>, D. Caswell<sup>a</sup>, J. Caswell<sup>a</sup>, J. Leafloor<sup>a</sup>, C. Lindgren<sup>c</sup>, P. Rakowski<sup>a</sup>, M. Schuster<sup>a</sup>, F. Baldwin Jr.<sup>a</sup>, T. Barney<sup>a</sup>, A. Dupuis<sup>a</sup>, J. Galbraith<sup>a</sup>

Montana and Western Dakotas (Strata 41-44):

Air J. Voelzer and R. Bentley  
Ground A. Arnold<sup>d</sup> and S. McFall

Central and Eastern Dakotas (Strata 45-49):

Air J. W. Solberg and S. Thomas  
Ground G.T. Allen, P.R. Garrettson, T. Menard, and F. Prellwitz

Central Quebec (Strata 68 and 69): J. Wortham and M. Fernandez

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 B. Fisher

Maine and Maritimes (Strata 62-67): J. Bidwell and M. Drut

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<sup>a</sup> Canadian Wildlife Service

<sup>b</sup> State, Provincial, or Tribal Conservation Agency

<sup>c</sup> Ducks Unlimited - Canada

<sup>d</sup> 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	2001	2002	Change from 2001		LTA <sup>a</sup>	Change from LTA		
			%	<i>P</i>		%	<i>P</i>	
<b>Prairie Canada</b>								
S. Alberta	426	477	+12	0.288	728	-35	<0.001	
S. Saskatchewan	1536	635	-59	<0.001	1992	-68	<0.001	
S. Manitoba	786	327	-58	<0.001	687	-52	<0.001	
Subtotal	2747	1439	-48	<0.001	3408	-58	<0.001	
<b>Northcentral U.S.</b>								
Montana and Western Dakotas	346	347	0	0.968	529	-34	<0.001	
Eastern Dakotas	1548	934	-40	<0.001	1003	-7	0.247	
Subtotal	1893	1281	-32	<0.001	1531	-16	<0.001	
<b>Grand Total</b>	<b>4640</b>	<b>2720</b>	<b>-41</b>	<b>&lt;0.001</b>	<b>4906</b>	<b>-45</b>	<b>&lt;0.001</b>	

<sup>a</sup>Long-term average. Prairie Canada, 1961-2001; northcentral U.S. and Grand Total, 1974-2001.

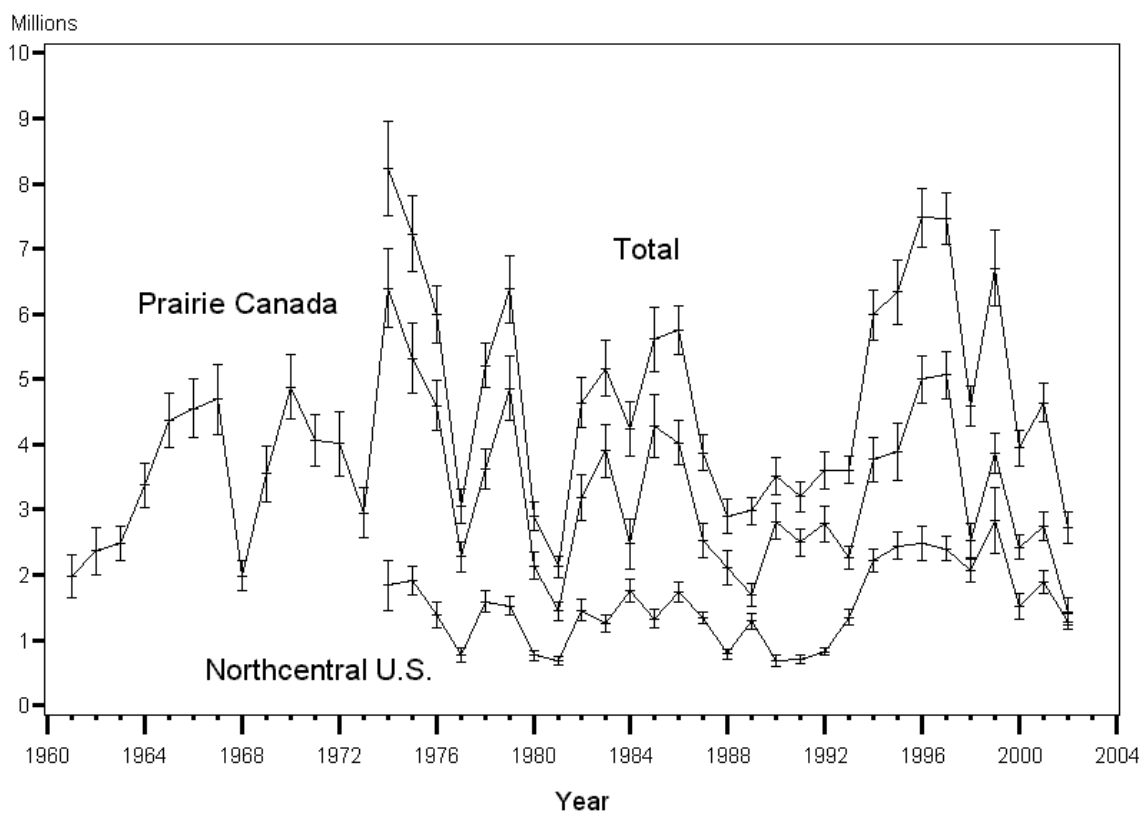


Figure 1. Number of ponds in May and 95% confidence intervals for Prairie Canada and the Northcentral U.S.

Table 2. Duck breeding population estimates <sup>a</sup> (in thousands) for regions in the traditional survey area.

Region	2001	Change from 2001			Change from LTA		
		2002	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	6427	4961	-23	<0.001	3401	+46	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	5489	6584	+20	0.003	7259	-9	0.020
N. Saskatchewan- N. Manitoba - W. Ontario	2656	4502	+70	<0.001	3533	+27	<0.001
S. Alberta	2521	2364	-6	0.489	4419	-47	<0.001
S. Saskatchewan	6442	3547	-45	<0.001	7408	-52	<0.001
S. Manitoba	1793	1304	-27	<0.001	1548	-16	0.001
Montana and Western Dakotas	1588	1334	-16	0.037	1624	-18	0.001
Eastern Dakotas	9261	6585	-29	<0.001	4096	+61	<0.001
<b>Total</b>	<b>36177</b>	<b>31181</b>	<b>-14</b>	<b>&lt;0.001</b>	<b>33287</b>	<b>-6</b>	<b>&lt;0.001</b>

<sup>a</sup> Includes black duck, ring-necked duck, goldeneye, bufflehead, and ruddy duck; excludes eider, long-tailed duck, wood duck, scoter, merganser, and wood duck.

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

Region	2001	Change from 2001			Change from LTA		
		2002	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	718	667	-7	0.492	323	+106	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	979	1182	+21	0.158	1107	+7	0.546
N. Saskatchewan- N. Manitoba - W. Ontario	603	1115	+85	<0.001	1163	-4	0.673
S. Alberta	744	793	+7	0.689	1135	-30	0.001
S. Saskatchewan	1650	1213	-26	0.002	2107	-42	<0.001
S. Manitoba	446	401	-10	0.371	373	+7	0.306
Montana and Western Dakotas	463	428	-8	0.573	503	-15	0.085
Eastern Dakotas	2301	1704	-26	<0.001	792	+115	<0.001
<b>Total</b>	<b>7904</b>	<b>7504</b>	<b>-5</b>	<b>0.232</b>	<b>7503</b>	<b>0</b>	<b>0.998</b>

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

Region	2001	Change from 2001			Change from LTA		
		2002	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	7	1	-85	0.146	2	-46	0.280
C. & N. Alberta – N.E. British Columbia - Northwest Territories	111	162	+46	0.168	41	+292	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	15	27	+84	0.157	28	-2	0.929
S. Alberta	257	333	+30	0.205	309	+8	0.666
S. Saskatchewan	715	360	-50	0.002	541	-34	0.016
S. Manitoba	106	132	+24	0.237	62	+114	<0.001
Montana and Western Dakotas	403	187	-54	0.002	194	-4	0.849
Eastern Dakotas	1066	1034	-3	0.784	456	+127	<0.001
Total	2679	2235	-17	0.021	1633	+37	<0.001

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

Region	2001	Change from 2001			Change from LTA		
		2002	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	1106	1036	-6	0.561	473	+119	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	728	673	-8	0.703	933	-28	0.009
N. Saskatchewan- N. Manitoba - W. Ontario	100	202	+103	0.006	259	-22	0.067
S. Alberta	187	77	-59	0.016	312	-75	<0.001
S. Saskatchewan	177	174	-2	0.942	444	-61	<0.001
S. Manitoba	18	22	+20	0.535	65	-67	<0.001
Montana and Western Dakotas	88	47	-46	0.093	114	-59	<0.001
Eastern Dakotas	90	102	+14	0.621	46	+123	0.002
Total	2494	2334	-6	0.434	2646	-12	0.027

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

Region	2001	Change from 2001			Change from LTA		
		2002	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	1029	631	-39	<0.001	320	+97	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	742	928	+25	0.221	753	+23	0.126
N. Saskatchewan- N. Manitoba - W. Ontario	181	339	+87	0.011	186	+83	0.006
S. Alberta	190	147	-23	0.395	199	-26	0.060
S. Saskatchewan	202	127	-37	0.073	230	-45	<0.001
S. Manitoba	31	25	-19	0.551	53	-52	<0.001
Montana and Western Dakotas	64	79	+25	0.500	36	+123	0.005
Eastern Dakotas	69	56	-19	0.633	45	+24	0.592
<b>Total</b>	<b>2509</b>	<b>2333</b>	<b>-7</b>	<b>0.410</b>	<b>1821</b>	<b>+28</b>	<b>&lt;0.001</b>

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

Region	2001	Change from 2001			Change from LTA		
		2002	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	0	0	-	-	1	-100	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	119	304	+154	0.003	266	+14	0.492
N. Saskatchewan- N. Manitoba - W. Ontario	148	307	+107	0.010	273	+12	0.546
S. Alberta	368	244	-34	0.100	627	-61	<0.001
S. Saskatchewan	1267	667	-47	<0.001	1208	-45	<0.001
S. Manitoba	484	230	-52	<0.001	388	-41	<0.001
Montana and Western Dakotas	158	249	+58	0.063	259	-4	0.832
Eastern Dakotas	3212	2206	-31	0.001	1471	+50	<0.001
<b>Total</b>	<b>5757</b>	<b>4206</b>	<b>-27</b>	<b>&lt;0.001</b>	<b>4493</b>	<b>-6</b>	<b>0.218</b>



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

Region	2001	Change from 2001			Change from LTA		
		2002	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	666	581	-13	0.356	235	+147	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	204	371	+82	0.018	207	+79	0.005
N. Saskatchewan- N. Manitoba - W. Ontario	28	38	+38	0.367	44	-13	0.530
S. Alberta	268	274	+2	0.934	355	-23	0.040
S. Saskatchewan	718	310	-57	<0.001	621	-50	<0.001
S. Manitoba	199	100	-50	0.002	104	-4	0.750
Montana and Western Dakotas	152	136	-10	0.653	146	-7	0.699
Eastern Dakotas	1079	507	-53	<0.001	386	+31	0.043
<b>Total</b>	<b>3314</b>	<b>2318</b>	<b>-30</b>	<b>&lt;0.001</b>	<b>2100</b>	<b>+10</b>	<b>0.087</b>

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

Region	2001	Change from 2001			Change from LTA		
		2002	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	1426	942	-34	0.050	913	+3	0.787
C. & N. Alberta – N.E. British Columbia - Northwest Territories	175	187	+7	0.787	397	-53	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	10	11	+15	0.836	44	-74	<0.001
S. Alberta	66	73	+10	0.740	766	-90	<0.001
S. Saskatchewan	680	182	-73	<0.001	1269	-86	<0.001
S. Manitoba	97	32	-67	0.001	118	-73	<0.001
Montana and Western Dakotas	161	102	-37	0.027	283	-64	<0.001
Eastern Dakotas	680	260	-62	<0.001	479	-46	<0.001
<b>Total</b>	<b>3296</b>	<b>1790</b>	<b>-46</b>	<b>&lt;0.001</b>	<b>4268</b>	<b>-58</b>	<b>&lt;0.001</b>

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

Region	2001	Change from 2001			Change from LTA		
		2002	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	0	5	-	-	1	+250	0.063
C. & N. Alberta – N.E. British Columbia - Northwest Territories	26	38	+44	0.248	37	+1	0.949
N. Saskatchewan- N. Manitoba - W. Ontario	8	28	+249	0.010	28	0	0.997
S. Alberta	54	113	+109	0.264	118	-5	0.911
S. Saskatchewan	224	95	-58	0.001	191	-50	<0.001
S. Manitoba	117	58	-51	0.193	71	-19	0.634
Montana and Western Dakotas	13	16	+26	0.702	9	+83	0.280
Eastern Dakotas	269	212	-21	0.297	170	+25	0.120
<b>Total</b>	<b>712</b>	<b>565</b>	<b>-21</b>	<b>0.135</b>	<b>626</b>	<b>-10</b>	<b>0.378</b>

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

Region	2001	Change from 2001			Change from LTA		
		2002	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	89	135	+52	0.197	89	+52	0.095
C. & N. Alberta – N.E. British Columbia - Northwest Territories	63	121	+93	0.031	70	+74	0.031
N. Saskatchewan- N. Manitoba - W. Ontario	32	38	+19	0.681	57	-34	0.108
S. Alberta	32	14	-55	0.264	65	-78	<0.001
S. Saskatchewan	232	73	-68	<0.001	186	-61	<0.001
S. Manitoba	56	63	+12	0.714	56	+13	0.655
Montana and Western Dakotas	6	6	+7	0.900	8	-18	0.630
Eastern Dakotas	70	35	-50	0.054	33	+8	0.761
<b>Total</b>	<b>580</b>	<b>487</b>	<b>-16</b>	<b>0.174</b>	<b>563</b>	<b>-14</b>	<b>0.088</b>

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

Region	2001	Change from 2001			Change from LTA		
		2002	%	<i>P</i>	LTA	%	<i>P</i>
Alaska-Yukon Territory – Old Crow Flats	1148	792	-31	0.006	914	-13	0.075
C. & N. Alberta – N.E. British Columbia - Northwest Territories	1476	1784	+21	0.144	2712	-34	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	267	378	+41	0.265	601	-37	<0.001
S. Alberta	202	146	-27	0.575	371	-61	0.005
S. Saskatchewan	321	150	-53	0.025	431	-65	<0.001
S. Manitoba	74	50	-33	0.373	143	-65	<0.001
Montana and Western Dakotas	42	50	+17	0.650	55	-10	0.676
Eastern Dakotas	164	174	+6	0.830	90	+94	0.008
<b>Total</b>	<b>3694</b>	<b>3524</b>	<b>-5</b>	<b>0.572</b>	<b>5318</b>	<b>-34</b>	<b>&lt;0.001</b>

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

Region	2001	Change from 2001			Change from LTA		
		2002	%	P	LTA	%	P
Mergansers	429	815	+90	0.001	485	+68	0.003
Mallard	286	295	+3	0.867	303	-3	0.857
American Black Duck	422	603	+43	0.068	474	+27	0.153
American Wigeon	77	87	+12	0.772	64	+36	0.402
Green-winged teal	220	604	+174	0.004	299	+102	0.020
Lesser Scaup	204	136	-33	0.517	68	+99	0.185
Ring-necked duck	353	416	+18	0.367	503	-17	0.205
Goldeneye (common & Barrow's)	1032	955	-7	0.791	708	+35	0.268
Bufflehead	95	84	-12	0.701	55	+51	0.201
Scoters	179	314	+76	0.136	113	+178	0.010
<b>Total</b>	<b>3337</b>	<b>4399</b>	<b>+32</b>	<b>0.007</b>	<b>3119</b>	<b>+41</b>	<b>&lt;0.001</b>

<sup>a</sup> Includes gadwall, northern shoveler, northern pintail, and scaup. Excludes eider species, long-tailed duck, wood duck, redhead, canvasback, and ruddy duck.

<sup>b</sup> Long-term average from 1996.

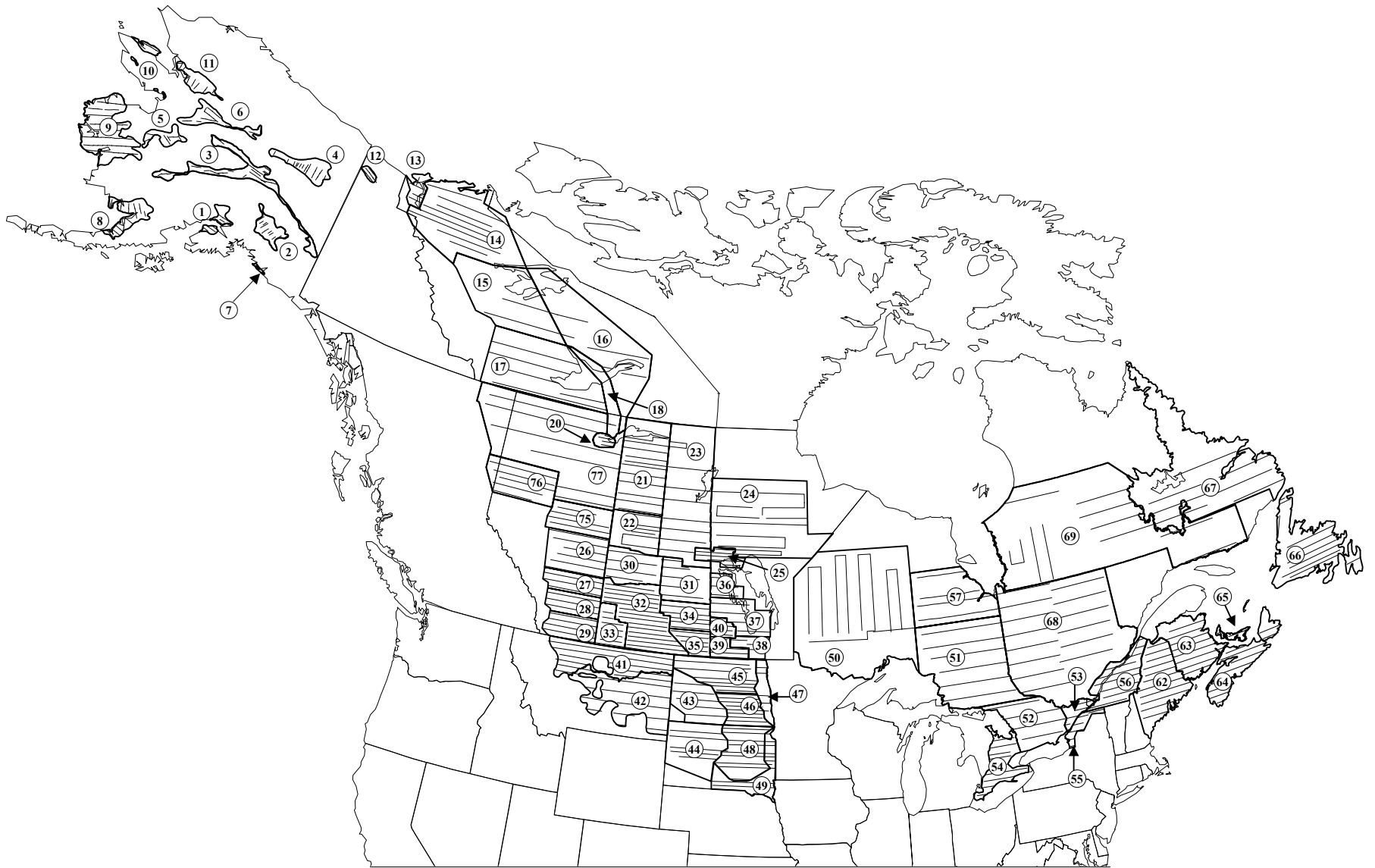


Figure 2. Transects and strata for areas of the Breeding Waterfowl and Habitat Survey (Traditional and Eastern).

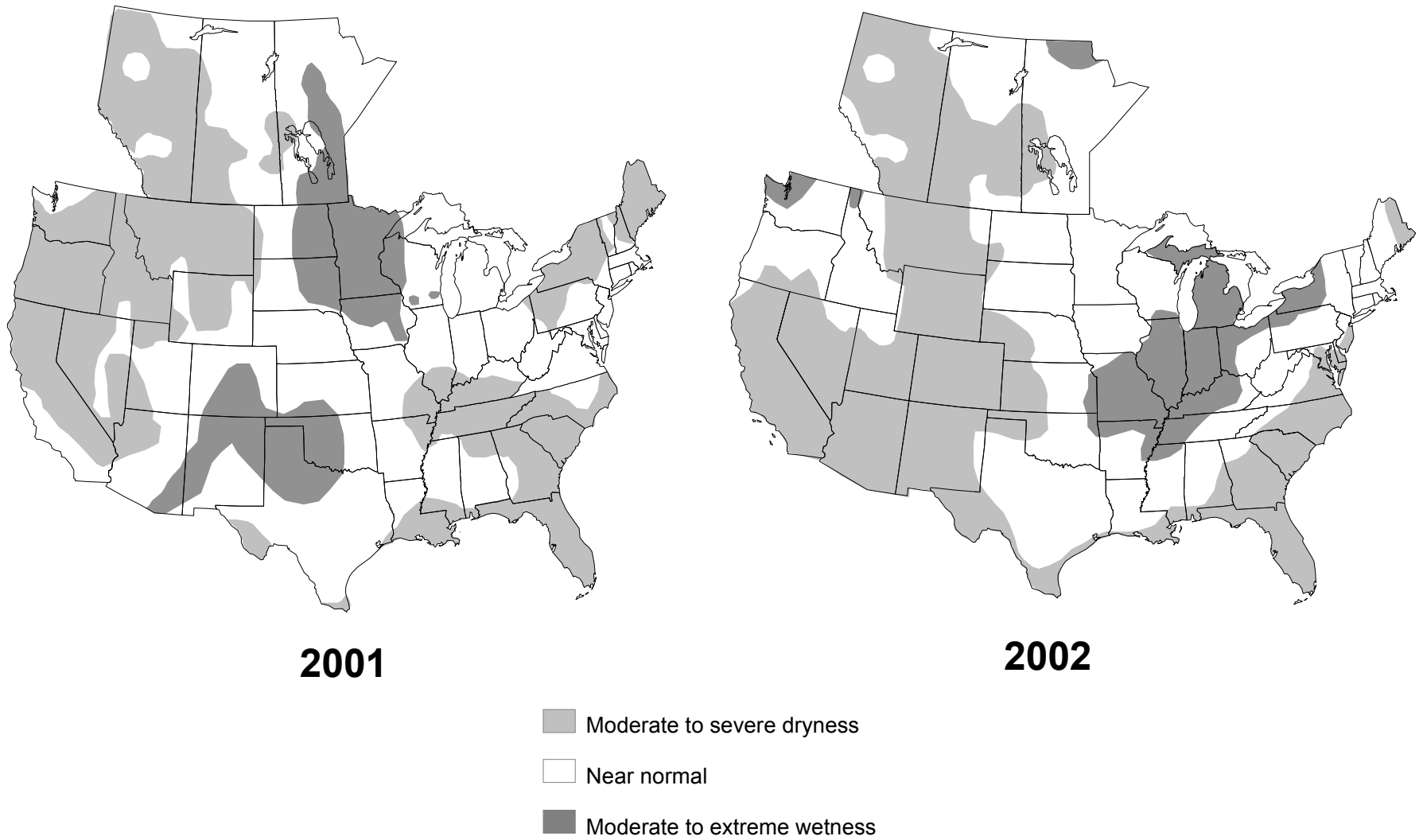


Figure 3. Palmer long-term drought indices (PDI) for the contiguous U.S. and provinces of Canada for which data were available. U.S. PDI map from Weekly Weather and Crop Bulletin May 30, 2001 and May 29, 2002; Canadian PDI map from Environment Canada May 2001 and May 2002.

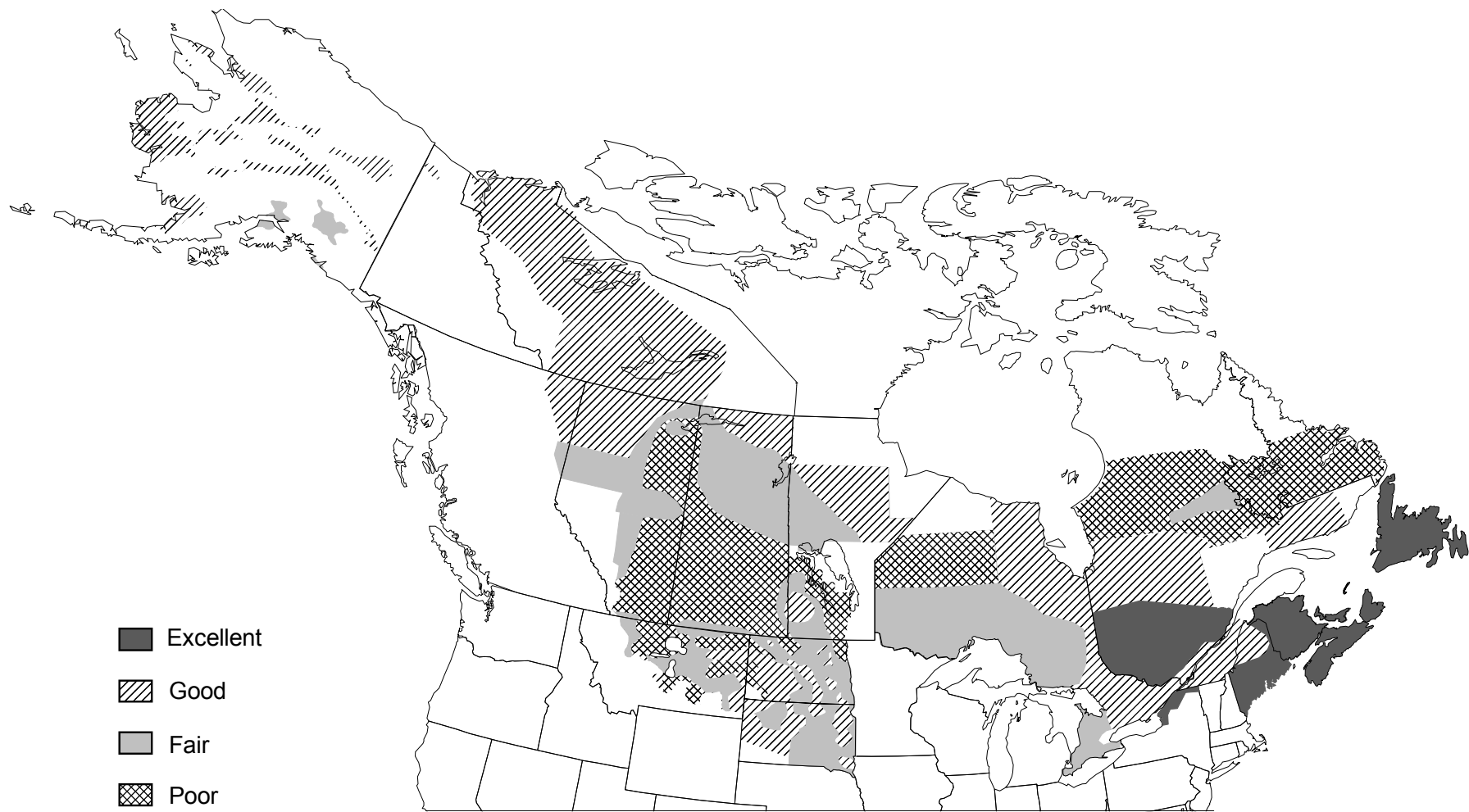
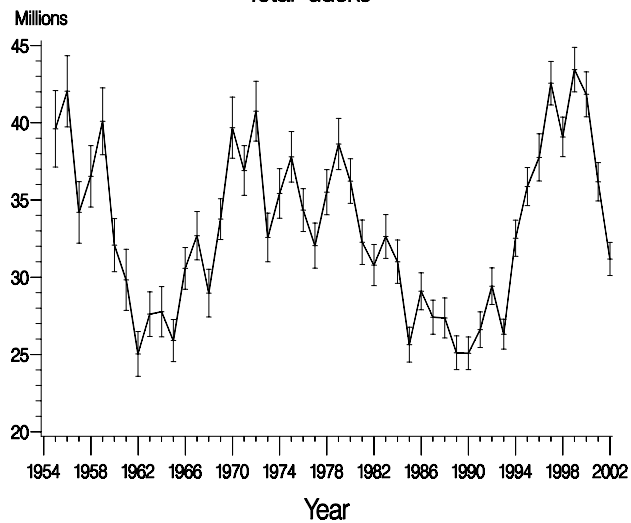
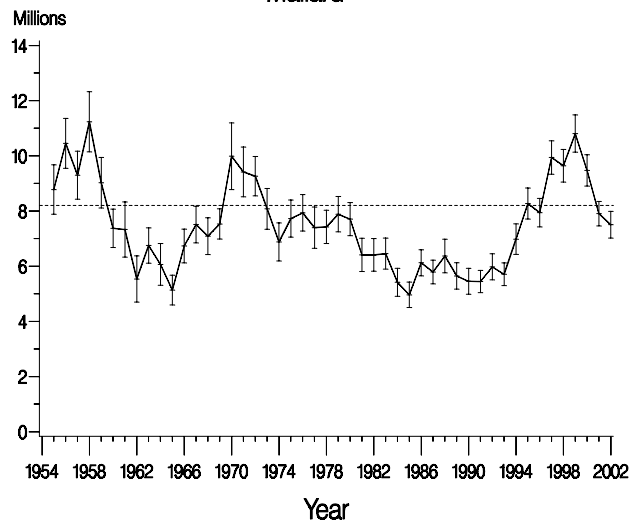


Figure 4. Preliminary breeding waterfowl habitat conditions during May and June 2002, as judged by U.S. Fish & Wildlife Service Flyway Biologists.

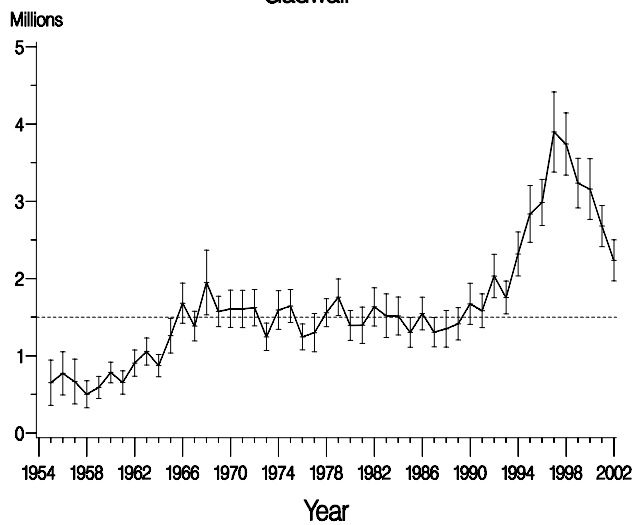
Total ducks



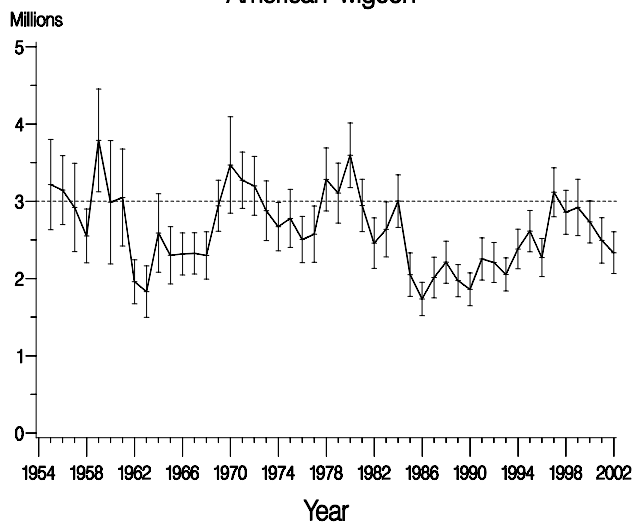
Mallard



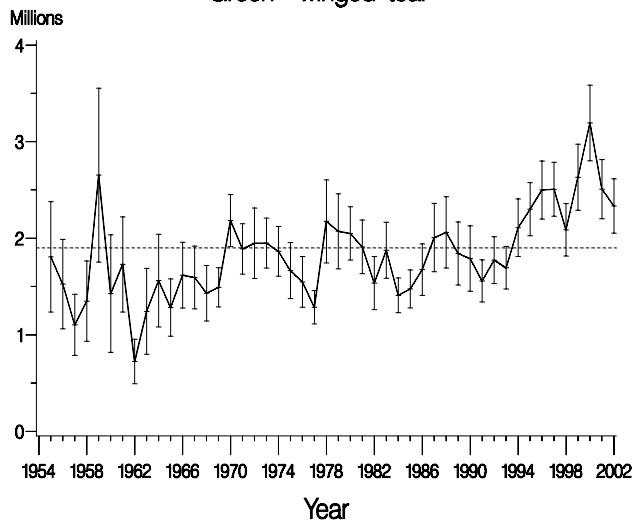
Gadwall



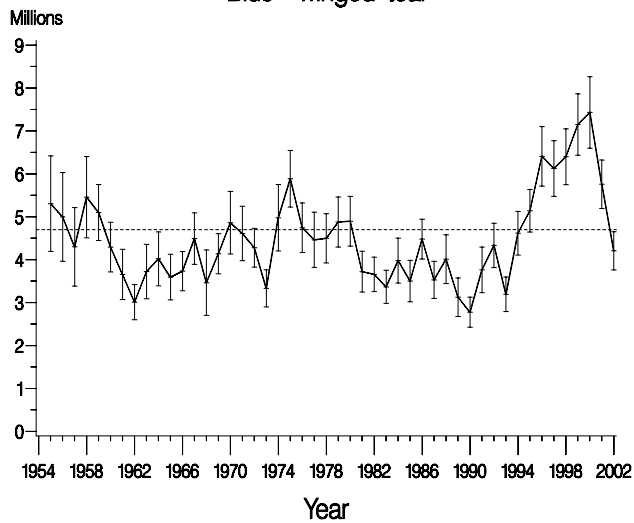
American wigeon



Green-winged teal

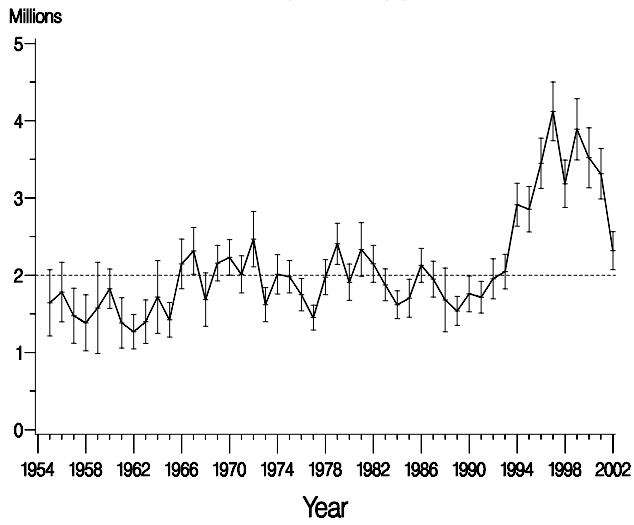


Blue-winged teal

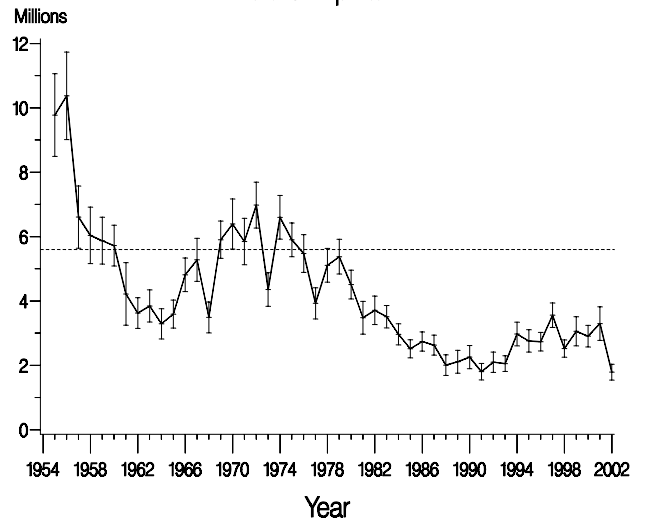




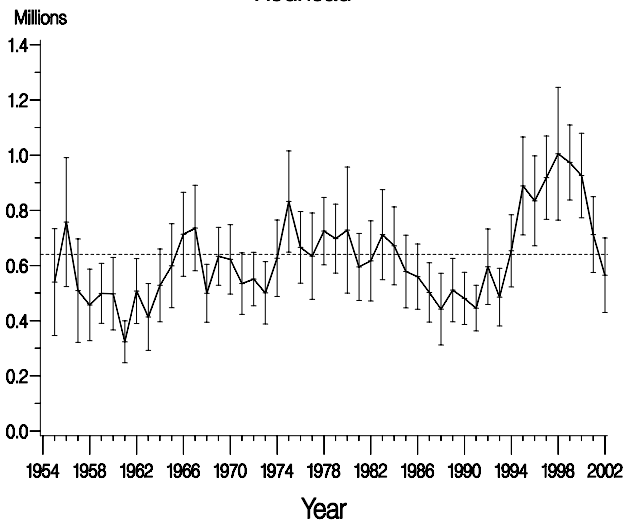
Northern shoveler



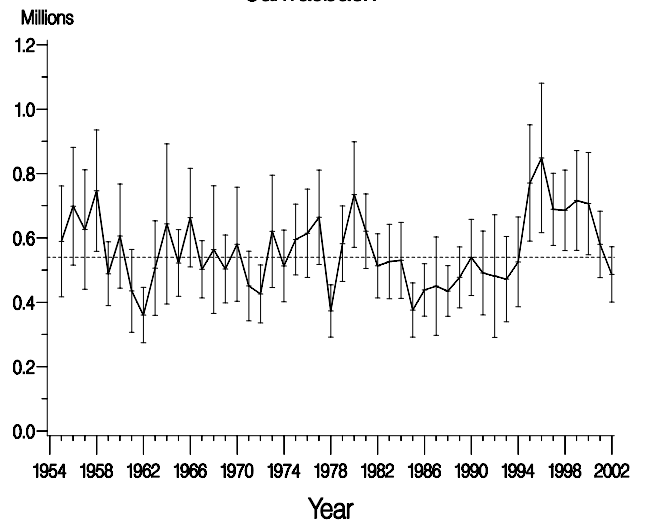
Northern pintail



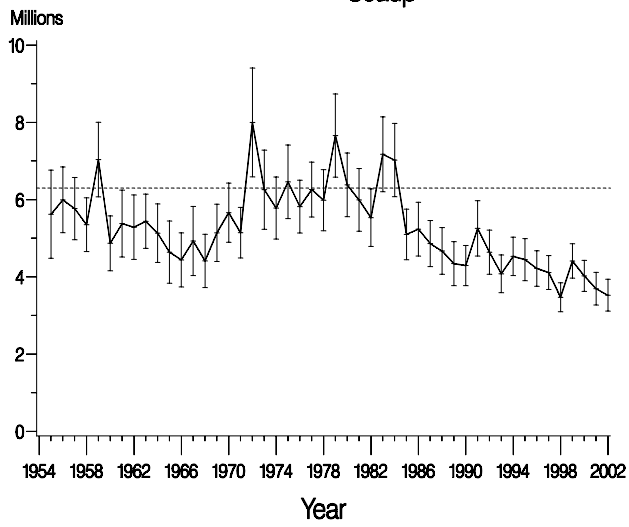
Redhead



Canvasback



Scaup



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

## 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	2138.2	125.6	1789.7	125.2	564.8	69.0	486.6	43.8	3524.1	210.3

Appendix B. Breeding population estimates and standard errors (in thousands) for the 10 most abundant species of ducks in the eastern survey area, 1990-2002 <sup>a</sup>.

Year	Mergansers		Mallards		American Black Duck		American Wigeon		Am. Green-winged teal		Lesser Scaup		Ring-necked duck		Goldeneye spp.		Bufflehead		Scoter spp.	
	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$
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

<sup>a</sup> 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.