U.S. Fish and Wildlife Service

Waterfowl

Population Status, 2007

WATERFOWL POPULATION STATUS, 2007

July 25, 2007

In North America the process of establishing hunting regulations for waterfowl is conducted annually. In the United States the process involves a number of scheduled meetings in which information regarding the status of waterfowl is presented to individuals within the agencies responsible for setting hunting regulations. In addition the proposed regulations are published in the *Federal Register* to allow public comment. This report includes the most current breeding population and production information available for waterfowl in North America and is a result of cooperative efforts by the U.S. Fish and Wildlife Service (FWS), the Canadian Wildlife Service (CWS), various state and provincial conservation agencies, and private conservation organizations. This report is intended to aid the development of waterfowl harvest regulations in the United States for the 2007-2008 hunting season. We note that the preliminary report entitled, Trends in Breeding Duck Populations 1955-2007, initially released on July 11, 2007, included several errors. These errors have been corrected in this report. We have also amended the Trend Report to reflect these changes, and posted a new version, now dated July 20, 2007, on the Division of Migratory Bird Management's web page (http://www.fws.gov/migratorybirds), along with a copy of this Waterfowl Status Report.

Cover: 2007-2008 Duck stamp. Ring-necked duck by Richard Clifton, winner of the 2006 Federal Duck Stamp design competition.

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Waterfowl Population and Habitat Information: The information contained in this report is the result of the efforts of numerous individuals and organizations. Principal contributors include the Canadian Wildlife Service, U.S. Fish and Wildlife Service, state wildlife conservation agencies, provincial conservation agencies from Canada, and Direccion General de Conservacion Ecologica de los Recursos Naturales, Mexico. In addition, several conservation organizations, other state and federal agencies, universities, and private individuals provided information or cooperated in survey activities. Some habitat and weather information was taken from the NOAA/USDA Joint Agriculture Weather Facility (http://www.cpc.ncep.noaa.gov/index.html), Environment Canada (http://www.pnr-rpn.ec.gc.ca/index.en.html), and Waterfowl Population Surveys reports (http://migratorybirds.fws.gov/reports/reports.html). Appendix A provides a list of individuals responsible for the collection and compilation of data for the Ducks section of this report. Appendix B provides a list of individuals who were primary contacts for information included in the Geese and Swans section. We apologize for any omission of individuals from these lists, and thank all participants for their contributions. Without this combined effort, a comprehensive assessment of waterfowl populations and habitat would not be possible.

Authors: This report was prepared by the U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Population and Habitat Assessment Branch. The principal authors are Pamela R. Garrettson, Timothy J. Moser, and Khristi A. Wilkins. The authors compiled information from the numerous sources to provide an assessment of the status of waterfowl populations.

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STATUS OF DUCKS

Abstract: In the Waterfowl Breeding Population and Habitat Survey traditional survey area (strata 1-18, 20-50, and 75-77), the total duck population estimate was 41.2 ± 0.7 [SE] million birds. This was 14% greater than last year's estimate of 36.2 ± 0.6 million birds and 24% above the 1955-2006 long-term average. Mallard (*Anas platyrhynchos*) abundance was 8.3 ± 0.3 million birds, which was 14% above last year's estimate of 7.3 ± 0.2 million birds and 11% above the long-term average. Blue-winged teal (*A. discors*) estimated abundance was 6.7 ± 0.4 million birds, the third highest since 1955, 14% greater than last year's estimate of 5.9 ± 0.3 million birds, and 48% above the long-term average. Estimated abundances of gadwall (*A. strepera*; 3.4 ± 0.2 million) and Northern shovelers (*A. clypeata*; 4.6 ± 0.2 million) were also higher than those of last year (+19% and +24%, respectively) and well above their long-term averages (+96% and +106%, respectively). Estimated abundance of American wigeon (*A. americana*; 2.8 ± 0.2 million) was 29% greater than last year but similar to the long-term average. Estimated abundances of green-winged teal (*A. crecca*; 2.9 ± 0.2 million), redheads (*Aythya americana;* 1.0 ± 0.08 million), and canvasbacks (*A. valisineria*; 0.9 ± 0.09 million) were similar to last year's, but were each >50% above their long-term averages. Abundances of Northern shovelers, redheads, and canvasbacks were the highest ever estimated in this survey area, and the abundance of green-winged teal was the second highest estimated for this region. Estimates for Northern pintails (*Anas acuta*; 3.3 ± 0.2 million) and scaup (*Aythya affinis* and *A. marila* combined; 3.5 ± 0.2 million) were unchanged from those of 2006, and remained below long-term averages (-19% and -33%, respectively). Overall, habitat conditions for breeding waterfowl in 2007 were similar or slightly improved relative to 2006. The total pond estimate (Prairie Canada and U.S. combined) was 7.0 ± 0.3 million ponds, 15% greater than last year's estimate of 6.1 ± 0.2 million ponds and 44% higher than the long-term average of 4.9 ± 0.03 million ponds. The 2007 estimate of ponds in Prairie Canada was 5.0 ± 0.3 million. This was a 13% increase from last year's estimate (4.4 ± 0.2 million), 49% above the 1955-2006 average (3.4 ± 0.03 million), and the fourth highest on record. The 2007 pond estimate for the north-central U.S. (2.0 ± 0.1 million) was 19% greater than last year's estimate (1.6 ± 0.09 million) and 29% above the long-term average (1.5 ± 0.02 million). The projected mallard fall flight index was 11.4 ± 1.0 million, similar to the 2006 estimate of 9.9 ± 0.9 million birds. The eastern survey area was restratified in 2005, is now composed of strata 51-72, and efforts at integrating US Fish and Wildlife Service and Canadian Wildlife Service surveys are ongoing. Estimated abundance of mallards, scaup, scoters (black [*Melanitta nigra*], white-winged [*M. fusca*], and surf [*M. perspicillata]*), green-winged teal, American wigeon, and buffleheads (*B. albeola*) were all similar to 2006 estimates and to long-term averages. American black duck (*A. rubripes,* 568,700 ducks*)* and ring-necked duck (*Aythya collaris,* 651,000 ducks) estimates were 14% and 19% higher than those of 2006, and 22% and 27% above their 1990-2006 averages, respectively. The merganser (red-breasted [*Mergus serrator*], common [*M. merganser*], and hooded [*Lophodytes cucullatus*]) estimate of 400,100 was 27% higher than last year's, and the goldeneye (common [*Bucephala clangula*] and Barrow's [*B. islandica*]) count of 319,000 was 49% higher than that of 2006, but both these species were similar to their long-term averages.

This section summarizes the most recent information about the status of North American duck populations and their habitats to facilitate the development of harvest regulations in the U.S. The U.S. Fish and Wildlife Service and its partners conduct a variety of surveys to collect information on ducks. The annual status of these populations is assessed using databases resulting from these surveys, which include estimates of the size of breeding populations, production, and harvest. This report details abundance estimates and production outlooks; harvest survey results are discussed in separate reports. The data and analyses were the most current available when this report was written. Future analyses may yield slightly different results as databases are updated and new analytical procedures become available.

METHODS

Breeding Population and Habitat Survey

Federal, provincial, and state agencies conduct surveys each spring to estimate the size of breeding populations and to evaluate habitat conditions. These surveys are conducted using fixed-wing aircraft and helicopters, and cover over 2.0 million square miles that encompass principal breeding areas of North America. The traditional survey area

(strata 1-18, 20-50, and 75-77) comprises parts of Alaska, Canada, and the northcentral U.S., and includes approximately 1.3 million square miles (Appendix C). The eastern survey area (strata 51-72) includes parts of Ontario, Quebec, Labrador, Newfoundland, Nova Scotia, Prince Edward Island, New Brunswick, New York, and Maine, covering an area of approximately 0.7 million square miles.

In Prairie and Parkland Canada and the north-central U.S., aerial waterfowl counts are corrected annually for visibility bias by conducting ground counts. In the northern portions of the traditional survey area and the eastern survey area, duck estimates are adjusted using visibility correction factors derived from a comparison of airplane and helicopter counts. Annual estimates of duck abundance are available since 1955 for the traditional survey area and since 1996 for all strata (except 57-59, 69) in the eastern survey area. However, portions of the eastern survey area have been surveyed since 1990. In the traditional survey area, estimates of pond abundance in Prairie Canada are available since 1961 and in the northcentral U.S. since 1974. Several provinces and states also conduct breeding waterfowl surveys using various methods; some have survey designs that allow calculation of measures of precision for their estimates. Information about habitat conditions was supplied primarily by biologists working in the survey areas. However, much ancillary weather information was obtained from agricultural and weather internet sites (see references). Unless otherwise noted, z-tests were used for assessing statistical significance, with alpha levels (*P*-value) set at 0.1; actual *P*-values are given in tables along with wetland and waterfowl estimates.

Since 1990 the U.S. Fish and Wildlife Service (USFWS) has conducted aerial transect surveys using fixed-wing aircraft in eastern Canada and the northeast U.S., similar to those used in the mid-continent, for estimating waterfowl abundance. Additionally, the Canadian Wildlife Service (CWS) has conducted a helicopter-based aerial plot survey in core American black duck breeding regions of Ontario, Quebec, and the Atlantic Provinces. Historically, data from these surveys were analyzed separately, despite overlap in geographic areas of inference. In 2004, the USFWS and CWS agreed to integrate the two surveys, produce composite estimates from both sets of survey data, and expand the geographic scope of the survey in eastern North America.

Consequently, as of 2005, waterfowl population sizes for eastern North America (strata 51-72) are estimated using a hierarchical modeling approach that combines USFWS and CWS data 2005. For strata containing both CWS and USFWS data (51, 52, 63, 64, 66, 67, 68, and 70), visibility-adjusted USFWS data were combined with plot data, whereas single survey results were used as the estimates for strata containing only one source of information (53, 54, 56, 57, 58, 59, 62, 65, and 69 for transects; 71 and 72 for plots). In cases where the USFWS has traditionally not recorded observations to the species level (i.e., scoters mergansers, and goldeneyes), estimates were produced only for multi-species groupings in 2007. We are presently investigating methods to produce species-specific estimates in these cases based solely on CWS survey data from the region encompassed by the CWS helicopter plot survey. While estimates were generated for all strata in the eastern survey area, survey-wide composite estimates for this region (Table 13) currently correspond only to strata 51, 52, 63, 64, 66, 67, 68, 70, 71, and 72. These strata coincide with the geographic extent of the CWS helicopter plot survey.

For widely-distributed and abundant species (American black ducks, mallards, green-winged teal, and ring-necked duck), composite estimates of population size were constructed using a hierarchical model (e.g., Link and Sauer 2002). The model estimates the mean count per unit area surveyed for each stratum, year, and method (i.e., fixed-wing or CWS helicopter). These mean counts were then extrapolated to the area of each stratum to produce a stratum/year/method-specific population estimate. Estimates for the fixed-wing surveys were adjusted for visibility bias by multiplying them by the total CWS helicopter survey population estimates for all years divided by the total USFWS fixed-wing survey population estimates for all years. The composite estimate was calculated as the average of the CWS estimate and adjusted USFWS estimate to provide estimated total indicated birds for each stratum and year. This modeling approach was not suitable for species that occur at lower densities and are more patchily distributed in the eastern survey area; estimates for these species were the means of CWS and visibility-adjusted FWS survey averages weighted by their precision, such that more precise estimates were given higher weights. We will continue to investigate methods that will allow us to estimate populations of these rarer species within the hierarchical modeling framework.

To produce a consistent index for American black ducks, total indicated birds were calculated using the CWS method of scaling observed pairs. Observed black duck pairs were scaled by 1.5 rather than the 1.0 scaling traditionally applied by the USFWS to

estimate the number of observed individual birds. The CWS scaling is based on sex-specific observations collected during the CWS survey in eastern Canada, which indicate that approximately 50% of black duck pair observations are actually 2 drakes. For other species, the standard USFWS definition of total indicated birds was used.

Changes in indices, procedures, geographic stratification, and the area sampled by composite surveys result in changes in estimated population totals; therefore, survey results for eastern North America presented in this report are not directly comparable to those presented in reports prior to 2006. We anticipate additional refinements to the survey design and analysis for eastern North America during the coming years, and composite estimates are subject to change in the future.

Production and Habitat Survey

For the past four years, we have had no traditional July Production and Habitat Survey to verify the early predictions of our biologists in the field, due to severe budget constraints within the migratory bird program. However, the pilot-biologists responsible for several survey areas (southern Alberta, southern Saskatchewan, the Dakotas, and Montana) returned in early July for a brief flight over representative portions of their survey areas as a rough assessment of habitat changes since May and resultant duck production. This information, along with reports from local biologists in the field, helped formulate an overall perspective on duck production this year.

Total Duck Species Composition

In the traditional survey area, our estimate of total ducks excludes scoters, eiders (*Somateria* and *Polysticta* spp.), long-tailed ducks (*Clangula hyemalis*), mergansers, and wood ducks (*Aix sponsa*), because the traditional survey area does not include a large portion of their breeding range.

Mallard Fall-flight Index

The mallard fall-flight index is a prediction of the size of the fall abundance of mallards originating from the mid-continent region of North America. For management purposes, the mid-continent population is composed of mallards originating from the traditional survey area, as well as Michigan, Minnesota, and Wisconsin. The index is based on the mallard models used for Adaptive Harvest Management, and considers breeding population size, habitat conditions, adult summer survival, and projected fall age ratio (young/adult). The projected fall age ratio is predicted from a model that depicts how the age ratio varies with changes in spring population size and pond abundance. The fall-flight index represents a weighted average of the fall flights predicted by the four alternative models of mallard population dynamics used in Adaptive Harvest Management (U. S. Fish and Wildlife Service 2007).

RESULTS AND DISCUSSION

2006 in Review

Despite a very warm winter, breeding waterfowl habitat quality in the U.S. and Canada was slightly better in 2006 than in 2005. 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 in 2006 compared to 2005. The 2006 estimate of ponds in Prairie Canada was 4.4 ± 0.2 million ponds, a 13% increase over the 2006 estimate of 3.9 ± 0.2 million ponds, and 32% above the 1955-2005 average. The parkland and northern grassland regions of Manitoba and Saskatchewan received abundant rain in March and April of 2006, which created good to excellent habitat conditions. Higher water tables prevented farm activities in wetland basins and excellent residual nesting cover remained around many potholes. Many wetlands flooded beyond their normal basins and into 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, 2006 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 fall 2005 and spring 2006 in parts of southern Alberta improved conditions in this historically important pintail breeding region. That region had been dry since 1998, with the exception of 2003, and central Alberta remained dry as of spring 2006.

In 2006, habitat conditions on the U.S prairies were more variable than those on the Canadian prairies. The 2006 pond estimate for the north-central U.S. (1.6 ± 0.1 million) was similar to the 2005 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

similar to that of 2005, but remained 34% above its long-term average.

Several states and provinces conduct breeding waterfowl surveys in areas outside the geographic extent of the Waterfowl Breeding Population and Habitat Survey of the USFWS and CWS. In British Columbia, California, the northeastern U.S., Oregon, and Wisconsin, measures of precision for survey estimates are available. In 2006, total duck estimates in California and the northeastern U.S. were similar to those of 2005 and to long-term averages. In Oregon, the total duck estimate was 17% higher than in 2005, but 11% lower than the long-term average. In British Columbia, total duck numbers did not differ from their 2005 estimate, or their long-term average. In Wisconsin, the total duck estimate was 28% below that of 2005, but remained 22% above the long-term average. In the states without measures of precision for total duck numbers, estimates decreased in Minnesota and Michigan relative to 2005, and increased in Nevada and Washington.

Weather and habitat conditions during the summer months can influence waterfowl production. Good wetland conditions increase renesting effort and brood survival. In general, 2006 July habitat conditions over most of the traditional survey area were similar to those observed in May. While no formal July surveys were flown in 2006, experienced crew leaders in Montana and the western Dakotas, the eastern Dakotas, southern Alberta, and southern Saskatchewan returned to their May survey areas in early July to qualitatively assess habitat changes between May and July. Biologists from other survey areas communicated with local biologists to get their impressions of 2006 waterfowl production and monitored weather conditions. Habitat over most of the prairies remained stable between May and July because of adequate summer rain. The exception was the eastern Dakotas survey area, where wetland conditions deteriorated. Habitat conditions in the northern and eastern areas tend to be more stable because of the deeper, more permanent water bodies there. In 2006, the outlook for production was rated fair to good in the northern Prairie Provinces and good to excellent in the eastern survey area.

2007 Breeding Habitat Conditions, Populations, and Production

Overall Habitat and Population Status

Overall, habitat conditions for breeding waterfowl in 2007 were similar or slightly improved compared to conditions in 2006. The total pond estimate (Prairie Canada and U.S. combined) was 7.0 ± 0.3 million ponds. This was 15% greater than last year's estimate of 6.1 ± 0.2 million ponds and 44% higher than the long-term average of 4.9 ± 0.03 million ponds. For the third year in a row, habitat conditions were good or excellent in the northern grasslands and parklands of southern Saskatchewan and southern Manitoba. Three years of plentiful precipitation has generally maintained or improved the quality of the wetland and upland vegetation in this region. The 2007 estimate of ponds in Prairie Canada was 5.0 ± 0.3 million. This was a 13% increase from last year's estimate (4.4 ± 0.2 million), 49% above the 1955-2006 average (3.4 ± 0.03 million), and the fourth highest number of Canadian ponds on record (Table 1, Figure 1). However, some areas of the parklands of southern Saskatchewan experienced severe flooding due to record high spring runoff, and some nests may have flooded. The southern grasslands of Saskatchewan and Manitoba remained dry, and were in fair to poor condition. Conditions in southern Alberta, which have generally been either fair or poor for much of the last decade, improved for the second consecutive year, largely due to melting of large snowpacks and wet soil conditions.

Habitat conditions in U.S. prairies were highly variable, generally ranging from good to poor. The 2007 pond estimate for the north-central U.S. of 2.0 ± 0.1 million was 19% greater than last year's estimate (1.6 ± 0.09 million) and 29% above the long-term average of 1.5 ± 0.02 million. The drought conditions seen last year in the Eastern Dakotas were improved by abundant fall and winter precipitation, especially in eastern South Dakota. Exceptionally heavy rain events during May helped to improve conditions in eastern Montana and parts of the Dakotas. Unfortunately, the area affected by this rain did not include the high quality duck habitat of the Missouri Coteau region in the Eastern Dakotas. Although this precipitation occurred after many ducks had moved through the survey area, it probably benefited renesting birds and improved vegetation quality in wetlands and uplands, thereby aiding brood survival.

Habitat in the bush regions of the traditional survey area (Alaska, northern Manitoba, northern Saskatchewan, western Ontario) was largely classified as good due to a normal spring ice break-up and generally good water conditions in the beaver ponds, river deltas, and small lakes and ponds characteristic of this region. Western Ontario was rated excellent over the northern two-thirds of the region. Spring phenology and water levels varied slightly in local areas. For example, spring was slightly late in the Old Crow Flats, slightly early in the Yukon Delta, and slightly drier in the Yukon Flats compared to other regions in Alaska, but habitat conditions were still generally good across the bush region. Exceptions were the somewhat drier

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

			Change from 2006			Change from LTA	
Survey area	2007	2006	%	*P*	LTA [a]	%	*P*
Prairie Canada							
S. Alberta	1,225	996	+23	0.175	728	+68	0.001
S. Saskatchewan	3,000	2,719	+10	0.318	1,980	+52	<0.001
S. Manitoba	815	735	+11	0.413	674	+21	0.054
Subtotal	5,040	4,450	+13	0.085	3,382	+49	<0.001
Northcentral U.S.							
Montana and Western Dakotas	740	615	+20	0.147	531	+39	0.004
Eastern Dakotas	1,223	1,030	+19	0.058	995	+23	0.002
Subtotal	1,963	1,644	+19	0.017	1,525	+29	<0.001
Grand total	7,003	6,094	+15	0.014	4,869	+44	<0.001

[a]Long-term average. Prairie and parkland Canada, 1961-2006; northcentral U.S. and Grand total, 1974-2006.

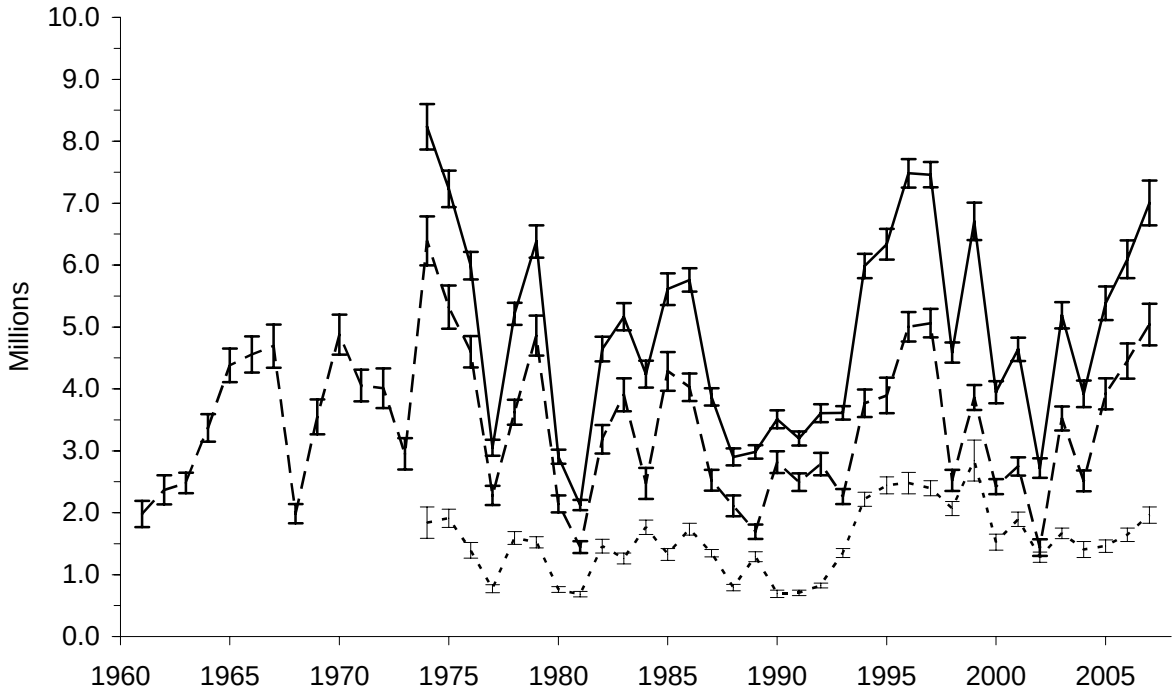


Figure 1. Number of ponds in May and 90% confidence intervals in prairie Canada and the northcentral U.S.

conditions in northwest Saskatchewan and central Alberta and the potential for some flooding in northern Saskatchewan and Manitoba.

The boreal forests of the eastern survey area were generally in good or excellent condition this spring, except for a few drier patches in northern Quebec that were in fair condition. Spring arrived early in the James and Hudson Bay Lowlands for the 3rd consecutive year, and habitat conditions were classified as excellent. In eastern and southern Ontario, the winter snowpack was below normal; however, a good frost seal, spring runoff, and spring storms left this region in good condition at the time of the survey. Storms following the survey period produced local flooding of some nesting habitat. Wetland basins in Quebec were adequately charged and spring temperatures were near normal. There was some potential for flooding of nests in Maine and the Maritimes due to heavy rain during mid-May, but this was not as problematic as it had been during the past few years. Newfoundland and Labrador experienced a late spring compared to the last 5 years, with the northernmost part of the survey region in Labrador still frozen in late May. However, this region was still considered in good condition.

In the traditional survey area, the total duck population estimate (excluding scoters, eiders, long-tailed ducks, mergansers, and wood ducks) was 41.2 ± 0.7 million birds. This was 14% greater than last year's estimate of 36.2 ± 0.6 million birds and 24% above the 1955-2006 long-term average of 33.3 ± 0.1 million (Table 2, Appendix G).

In the eastern Dakotas, total duck numbers were 52% higher than last year's estimate, and 86% above the long-term average. The total duck estimate in southern Alberta was similar to last year's count, and to the long-term average. The total-duck estimate was similar to that of 2006 in southern Saskatchewan and remained 49% above the long-term average. The total duck count in southern Manitoba was 26% below the 2006 estimate, and 15% below its long-term average. The total duck estimate in central and northern Alberta, northeastern British Columbia and the Northwest Territories was 20% higher than in 2006, but still 14% below the long-term average (Table 2). The estimate in the northern Saskatchewan--northern Manitoba--western Ontario area was 18% higher than that of 2006, but similar to the long-term average. Total ducks in the western Dakotas--Eastern Montana area were 15% below their 2006 estimate, and similar to their long-term average. In the Alaska--Yukon Territory--Old Crow Flats region the total duck estimate was 20% above last year's, and 59% above its long-term average.

Several states and provinces conduct breeding waterfowl surveys in areas outside the geographic extent of the Waterfowl Breeding Population and Habitat Survey of the USFWS and CWS. In California, the northeastern U.S., Oregon, and Wisconsin, measures of precision for survey estimates are available. In Oregon, the total duck estimate was 27% higher than last year's, but similar to the long-term average. Total duck estimates in California, Wisconsin, and the northeastern U.S. were similar to those of 2006 and to long-term averages. Of the states without measures of precision for total duck numbers, the estimate in Michigan was nearly double that of 2006, and decreased slightly in Minnesota relative to last year's count. Estimates increased in Washington and Nevada relative to 2006.

Trends and annual breeding population estimates for 10 principal duck species from the traditional survey area are provided in Figure 2, Tables 3-12, and Appendix F. Mallard abundance was 8.3 ± 0.3 million, 14% higher than last year's estimate of 7.3 ± 0.2 million, and 11% above the long-term average (Table 3). The mallard estimate in southern Alberta was similar to last year's but remained 24% below the long-term average. In the Eastern Montana-Western Dakotas survey area, mallard counts were similar to the 2006 estimate and the long-term mean. The mallard estimate was 59% higher than last year's, but 17% below the long-term average in the central and northern Alberta--northeastern British Columbia--Northwest Territories region. In the northern Saskatchewan--northern Manitoba--western Ontario survey area, the mallard estimate was similar to that of 2006, but 25% below the long-term average. Mallard numbers were similar to the 2006 estimate and 61% above their long-term average in the Alaska--Yukon Territory--Old Crow Flats region. In southern Manitoba the mallard estimate was 24% below last year's, but similar to its long-term average. In the Eastern Dakotas, mallard counts were 26% higher than last year's estimate and 138% above the long-term mean for the area. The mallard estimate was 18% higher than last year's count, and similar to the long-term average in southern Saskatchewan. In other areas where surveys are conducted and measures of precision for estimates are provided (the same states as for total ducks, as well as Michigan and Minnesota), mallard abundance remained unchanged relative to 2006, except for Minnesota (+51%), Michigan (+41%), and the northeastern U. S. (-5%). Mallard estimates were below the long-term average in Michigan (-27%) and the northeastern U. S. (-14%). The Minnesota mallard estimate was 9% above the long-term average, but a test statistic for this estimate was unavailable. In the states without estimates of precision, mallards increased in

Washington, and decreased in Nevada relative to 2006

Blue-winged teal abundance was estimated at 6.7 ± 0.4 million birds, 15% higher than last year's estimate of 5.9 ± 0.3 million birds and 48% higher than the 1955-2006 average. Gadwall (3.4 ± 0.2 million) were 19% higher than their 2006 estimate, and 96% above their long-term average. American wigeon (2.8 ± 0.2 million) numbers increased 29% relative to last year, and are now at their long-term average. The estimate for Northern pintails (3.3 ± 0.2 million) was similar to that of 2006, and 19% below their long-term average. The Northern shoveler (4.6 ± 0.2 million) estimate was 24% higher than last year's, and 106% above the long-term average. Green-winged teal (2.9 ± 0.2 million), redhead (1.0 ± 0.08 million), and canvasback (0.9 ± 0.09 million) estimates were all similar to their 2006 estimates and 54%, 60% and 53% above long-term averages, respectively. The scaup estimate (3.5 ± 0.2 million) was also similar to last year's, but 33% below the long-term average for this species.

Of the 10 most abundant species in the eastern survey area (Table 13, Figures 3 and 4, Appendix H), American black duck (569,000*)* and ring-necked duck (651,000) estimates were 14% and 19% higher than those of 2006, and 22% and 27% above their 1990-2006 averages, respectively. Estimates of mergansers (400,000) and goldeneyes (319,000) were 27% and 49% higher than those of 2006, respectively, but both these species were similar to their 1990-2006 averages. Estimates of all other species were similar to last year's and to long-term averages for the eastern survey area.

The longest time-series of data available to assess the status of the American black duck (*Anas rubripes*) is provided by the midwinter surveys conducted in January in states of the Atlantic and Mississippi Flyways. Measures of precision are not available for the midwinter surveys. Midwinter counts of American black ducks (204,100) in both flyways combined decreased 5% relative to 2006 counts (214,800), and remained 19% lower than the 10-year mean (252,900). In the Atlantic Flyway, the midwinter index of 188,100 was 1% lower than the 2006 count of 190,700, and was 14% below the most recent 10-year mean (219,400). In the Mississippi Flyway, the American black duck mid-winter index decreased 34% from 24,200 in 2006 to 16,000, which is 52% below the 10-year mean (33,600). A shorter time series for assessing change in American black duck population status is provided by the breeding waterfowl surveys conducted by the USFWS and CWS in the eastern survey area (Table 13, Fig. 3). In the eastern survey area, the 2007 estimate for breeding American black ducks (569,000) was greater than the 2006 estimate (499,000) and to the 1990-2006 average (465,000).

Trends in wood duck populations are monitored by the North American Breeding Bird Survey (BBS), a series of roadside routes surveyed during May and June each year. Wood ducks are encountered with low frequency along BBS routes, limiting the amount and quality of available information for analysis (Sauer and Droege 1990). However, the BBS provides the only long-term indices of this species' regional populations. Trend analysis suggested that wood duck numbers have increased 3.3% per year over the entire survey period (1966-2006) and 2.8% over the past 30 years (1977-2006), in the Atlantic and Mississippi Flyways combined. Specifically, for the Atlantic Flyway, the BBS indicated a 4.1% annual increase in wood ducks over the entire 41 years of the survey (1966-2006), and a 4.3% annual increase over the past 30 years (1977-2006). In the Mississippi Flyway, the 41-year BBS trend indicated a 2.7% annual increase, and 30-year trend showed annual growth of 1.8%. Analysis of wood duck BBS data over the past 10-year (1997-2006), and 20-year (1987-2006) periods yielded no significant short-term trend for the Atlantic or Mississippi Flyways, or the two flyways combined (J. Sauer, U. S. Geological Survey/Biological Resources Division, unpublished data).

Weather and habitat conditions during the summer months can influence waterfowl production. Good summer wetland conditions increase renesting effort and improve brood survival. While no formal July surveys were flown this year, experienced crew leaders in Montana and the western Dakotas, the eastern Dakotas, southern Alberta, southern Manitoba, and southern Saskatchewan returned to their May survey areas in early July to qualitatively assess habitat changes between May and July. Biologists from other survey areas monitored weather conditions and communicated with local biologists for assessments of 2007 waterfowl production. As of early July 2007, habitat conditions over most of the traditional survey area had either improved or remained stable since May. Above-average production was generally expected in the eastern Dakotas, southern Saskatchewan, and southern Alberta, with the exception of the southernmost areas of Saskatchewan and Alberta, which were only rated fair. Normal production was predicted in the western Dakotas, with slightly above normal production expected in eastern Montana. Summer rains improved wetland conditions in Southern Manitoba, improved the production outlook in some areas. However, late rains cannot "rescue" areas that were very dry and where few ducks settled in May. Habitat conditions in the northern and eastern areas tend to

Table 2. Total duck [a] breeding population estimates (in thousands).

			Change from 2006			Change from LTA	
Region	2007	2006	%	*P*	LTA [b]	%	*P*
Alaska-Yukon Territory – Old Crow Flats	5,690	4,755	+20	<0.001	3,574	+59	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	6,137	5,132	+20	0.006	7,114	-14	0.001
N. Saskatchewan- N. Manitoba - W. Ontario	3,212	2,711	+18	0.051	3,541	-9	0.108
S. Alberta	4,293	4,581	-6	0.290	4,289	0	0.983
S. Saskatchewan	11,036	10,096	+9	0.128	7,401	+49	<0.001
S. Manitoba	1,322	1,796	-26	<0.001	1,549	-15	0.001
Montana and Western Dakotas	1,625	1,910	-15	0.036	1,619	0	0.951
Eastern Dakotas	7,857	5,181	+52	<0.001	4,220	+86	<0.001
Total [b]	41,172	36,160	+14	<0.001	33,307	+24	<0.001
Other regions							
California	628	649	-3%	0.821	604	+4%	0.742
Northeastern U.S. [c]	1500	1392	+8%	0.521	1427	+5	0.622
Oregon	335	263	+27	0.047	293	+15	0.218
Wisconsin	471	523	-10	0.476	432	+9	0.454

[a] Excludes eider, long-tailed duck, wood duck, scoter, and merganser in traditional survey area; excludes eider, long-tailed duck, wood duck, redhead, canvasback, and ruddy duck in eastern survey area; species composition for other regions varies.
[b] Long-term average. Traditional survey area 1955-2006; years for other regions vary (see Appendix E).
[c] Includes all or portions of CT, DE, MD, MA, NH, NJ, NY, PA, RI, VT, and VA.

Table 3. Mallard breeding population estimates (in thousands).

			Change from 2006			Change from LTA	
Region	2007	2006	%	*P*	LTA [a]	%	*P*
Alaska-Yukon Territory – Old Crow Flats	581	516	+13	0.364	360	+61	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	887	558	+59	0.002	1,075	-17	0.025
N. Saskatchewan- N. Manitoba - W. Ontario	864	656	+32	0.118	1,149	-25	0.010
S. Alberta	830	901	-8	0.364	1,095	-24	<0.001
S. Saskatchewan	2,155	1,832	+18	0.076	2,067	+4	0.567
S. Manitoba	387	511	-24	0.038	381	+2	0.870
Montana and Western Dakotas	553	679	-19	0.124	503	+10	0.413
Eastern Dakotas	2,049	1,624	+26	0.050	861	+138	<0.001
Total	8,307	7,277	+14	0.005	7,491	+11	0.005
Eastern survey area	443	405	+9	[b]	398	+11	[b]
Other regions							
California	388	399	-3%	0.888	375	+4%	0.810
Michigan	293	208	+41	0.057	400	-27%	0.030
Minnesota	242	161	+51	0.034	222	+9	[d]
Northeastern U.S. [c]	688	725	-5	0.573	795	-14	0.028
Oregon	101	88	+15	0.189	108	-7	0.371
Wisconsin	210	219	-4	0.829	180	+16	0.332

[a] Long-term average. Traditional survey area 1955-2006; eastern survey area 1990-2006; years for other regions vary (see Appendix E).
[b] P-values not appropriate because these data were analyzed with Bayesian methods.
[c] Includes all or portions of CT, DE, MD, MA, NH, NJ, NY, PA, RI, VT, and VA.
[d] Value for test statistic was not available.

be more stable because of the deeper, more permanent water bodies there. The outlook for production was rated good through most of the northern Prairie Provinces, except for a portion of central Alberta, and the northwest corner of Saskatchewan, which were only fair. Good conditions also prevailed in the eastern survey area, except for eastern Ontario, which was rated excellent, and two areas in Quebec to the east of James Bay that were rated fair.

Regional Habitat and Population Status

A description of habitat conditions, populations, and production for each for the major breeding areas follows. More detailed reports of specific regions are available in *Waterfowl Population Surveys* reports, located on the Division of Migratory Bird Management's home page. Some of the habitat information that follows was taken from those reports (http://www.fws.gov/migratorybirds/reports/reports.html).

Southern Alberta: The outlook for this crew area (strata 26-29, 75-76) was good for the second year in a row, following a number of drought years. Fall precipitation was below normal over most of the northern one-third of the province, including the Medicine Hat-Brooks-Lethbridge area, Drumheller, and most mountain and foothill regions, but above normal precipitation was recorded in the plains and some foothills areas of Central Alberta, and in the Cypress Hills. Winter precipitation was above to much above normal on the northwest side of the province, in most mountain areas, in the Cold Lake-Fort McMurray region, and in areas between Edmonton and Red Deer, Calgary and High River, and Medicine Hat and the Cypress Hills. Below normal to normal winter precipitation was recorded for the rest of the province. Spring run-off was above to much above average in most areas of the North Saskatchewan, Red Deer, Bow, and Oldman River basins. However, runoff in the Milk River basin was below normal.

Overall, May ponds were similar to the 2006 estimate, and 68% above the long-term average. Total duck, blue-winged teal and green-winged teal estimates were similar to those of 2006 and to long-term averages. Mallard, American wigeon, and scaup estimates were similar to those of 2006, but these species remained 24%, 42%, and 48% below their long-term averages, respectively. Northern pintail numbers declined 47% relative to 2006, and were 55% below their long-term average for this crew area. The gadwall estimate was 25% lower than last year's, but similar to the long-term average. Northern shoveler numbers increased 39% relative to 2006, and were 167% above the long-term average. Redhead and canvasback estimates were similar to their 2006 counts and were 55% and 99% above their long-term averages, respectively.

As of July, waterfowl habitat conditions were good to excellent through most of southern Alberta, with the exception of the southern region, which was only fair, with isolated areas of marginal habitat. The eastern half of strata 27 and 28 from Red Deer to the SK border had good wetland densities, nesting cover, and brood habitat, with over 80% of basins holding water. Good to excellent conditions also prevailed north toward Lloydminster and west toward Edmonton. In the region from Calgary north to Whitecourt, as well as in the western portions of strata 75 and 76 excellent conditions for late nesting and brood survival were also observed. Broods were observed in all surveyed strata (N= 24), and most (70%) were older age classes (II or III), which suggests good brood survival.

Southern Saskatchewan: During the 2007 survey, Southern Saskatchewan generally had good to excellent waterfowl habitat in the northern grasslands and Parkland region. Conditions were poor to fair in the southern grasslands, with the exception of the southwestern grasslands and Missouri Coteau, which had good wetland and upland conditions. Spring runoff peaked in late-April and was average in the south and above average in the north. Record high runoff in the northeast Parklands caused lakes to overflow their banks, with widespread flooding of structures, fields, and roads in this region. During the fall of 2006 the southern Saskatchewan survey area experienced record high precipitation in the north and northeast and very high precipitation levels across the remainder of the region, except for the southwest and southeast, which were below average. Winter precipitation in the Province was above average in the central grainbelt, below average in the southwest grasslands, and average to slightly above average across the remainder of the Province. Spring precipitation was average to slightly above average across most of the Province, above average in the southwestern and eastern areas of the grainbelt.

The May pond estimate was similar to last year's, and was 52% above the long-term average. Total ducks were similar their 2006 estimate, and 49% higher than their long-term average. The mallard estimate was 18% higher than that of 2006 and was similar to the long-term average. Estimates for all

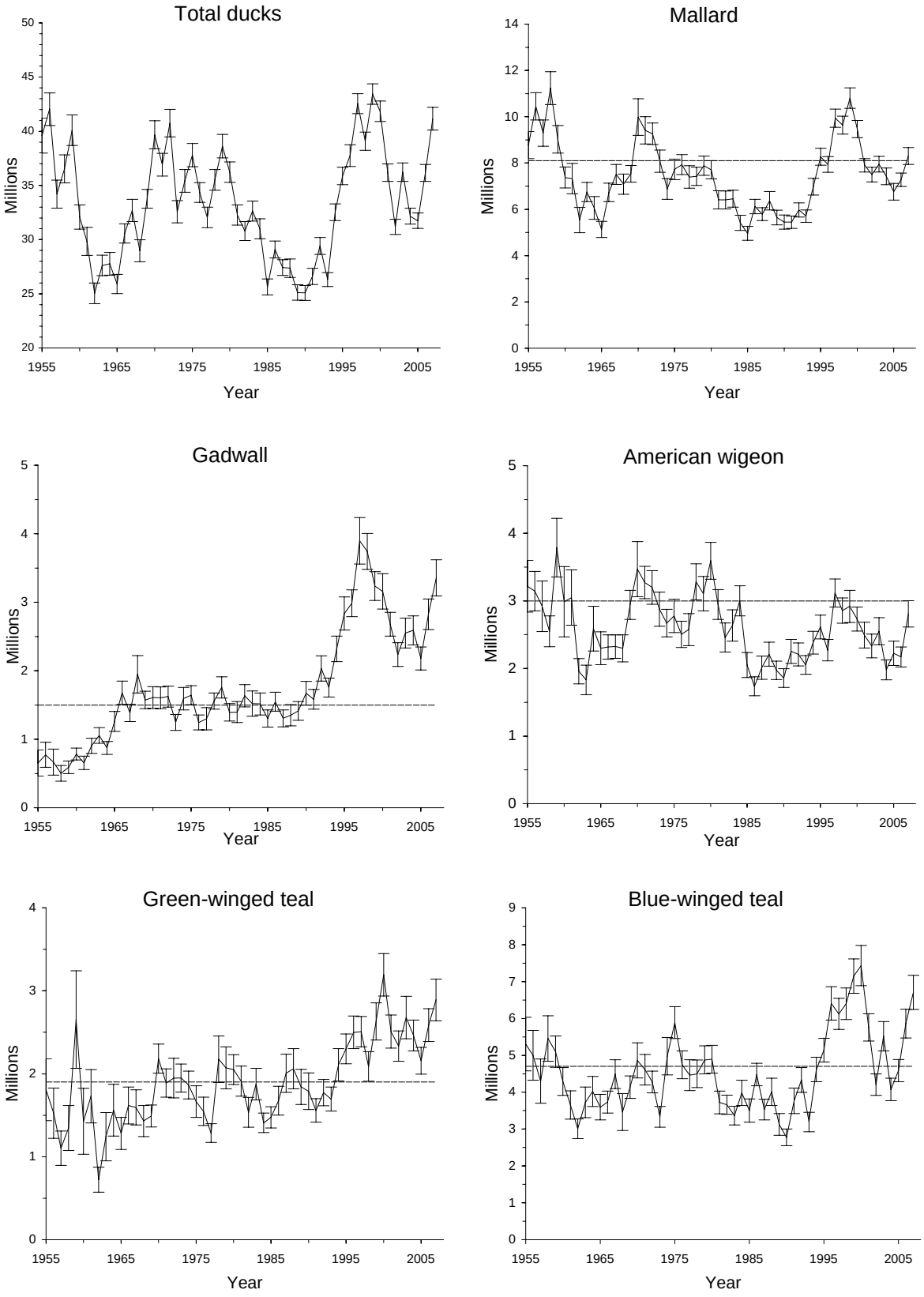
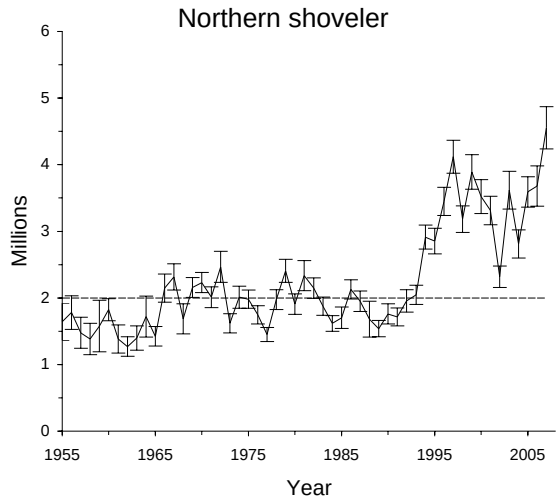
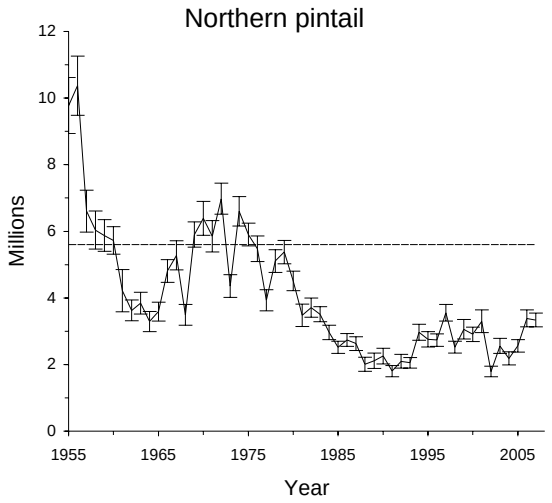
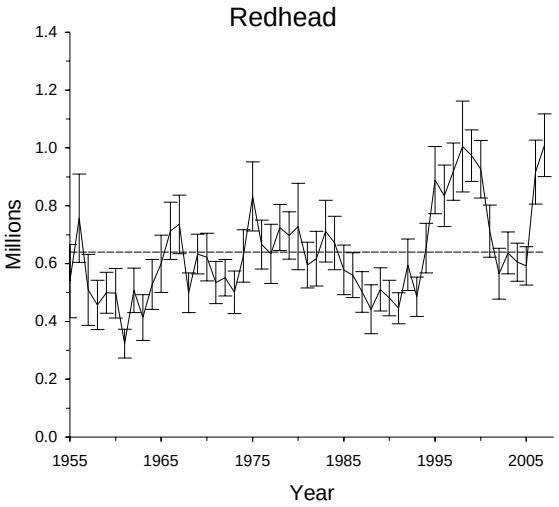
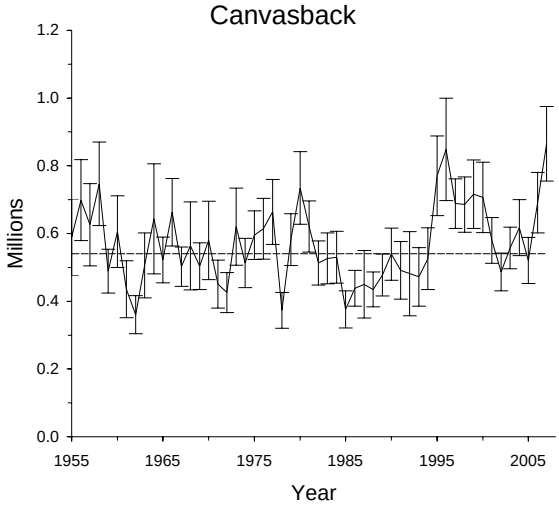


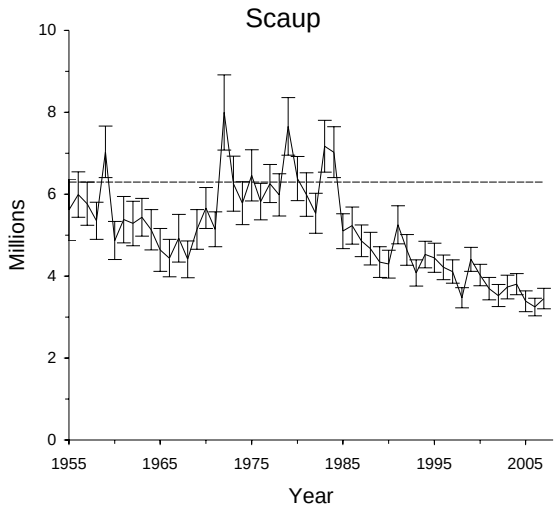
Figure 2. Breeding population estimates, 90% confidence intervals, and North American Waterfowl Management Plan population goal (dashed line) for selected species in the traditional survey area (strata 1-18, 20-50, 75-77).











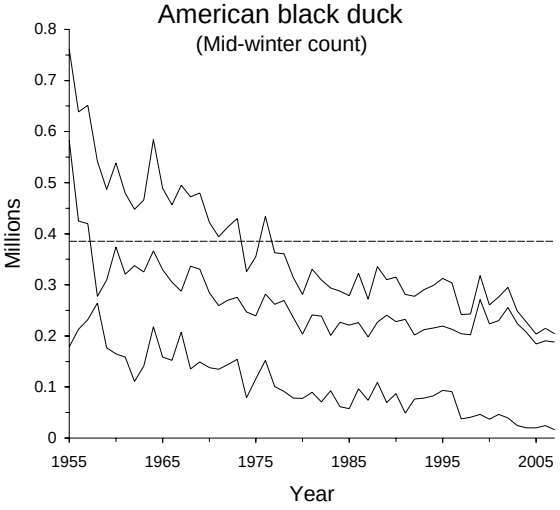


Figure 2 (continued).

other duck species were similar to 2006 estimates. Gadwall (+132%), blue-winged teal (+92%), green-winged teal (+113%) redhead (+113%), canvasback (+76%), and Northern shoveler (+149%) estimates were all well above long-term averages for this crew area. Scaup (-27%), American wigeon (-23%), Northern pintail (-21%), estimates all remained below their long-term averages.

July conditions in southern Saskatchewan were generally good to excellent with the exception of the southern grasslands, which remained dry. The southwestern grasslands of stratum 33 dried out more than normal since May, causing the few good areas there to be downgraded to fair. Dry conditions were typical in stratum 35 (southeastern Saskatchewan), despite summer rains that recharged some wetlands that were dry during May. This improvement occurred too late for most nesting birds, so this area was still rated poor for waterfowl production. The northern and western grasslands in stratum 32 remained similar to conditions seen in May, though some wetlands have dried out in the northern and eastern portions of the stratum. However, the western portions of stratum 32 were wetter than in May and remain good to excellent for production. The western portion of stratum 30 was wetter than in May and had excellent brood habitat as did the remainder of the stratum, which was as wet, or wetter than it was in May. Stratum 31, in the northeast parklands, remains very wet and continues to have excellent brood rearing habitat. As of July 2007, flooding continued to hamper farming operations there. Excellent waterfowl production was also forecast in stratum 34.

Southern Manitoba: In much of southern Manitoba (strata 36-40) conditions in May had improved relative to the previous year. Many areas in strata 36, 37, and the northern portions of 34 and 40 were in good to excellent condition. Water basins had abundant emergent vegetation, and were full, but not high enough to flood potential nesting sites. Rain in early May increased sheet water and delayed most farming activities in strata 25, 36 and 37. By contrast, most small ponds in south-central Manitoba were dry and had little emergent vegetation, and many appeared to have been cultivated.

The May pond count was similar to the 2006 estimate and 21% above the long-term average. Redheads and canvasbacks were similar to their 2006 estimates and long-term averages. Total duck numbers were 26% below last year's and 15% below the long-term average. Mallards (-24%) and Northern shovelers (-35%) decreased relative to 2006, but were similar to their long-term averages. The gadwall estimate was similar to last year's, but 63% above the long-term average. Estimates for several species were lower than their 2006 estimates and long-term averages for this crew area: American wigeon (-47%, -86% LTA), green-winged teal (-49%, -36% LTA), blue-winged teal (-36%, -28% LTA), Northern pintail (-74%, -87% LTA), and scaup (-48%, -63% LTA).

Since May, almost weekly precipitation in southern Manitoba recharged most wetlands and increased the wetland base throughout the summer, so in most areas brood habitat was in good to very good condition as of July. In strata 36 and 37 July conditions were rated uniformly excellent. In strata 39 and 40, conditions were more variable, fair to good near the Saskatchewan border, good to excellent east of Shoal Lake, north of Brandon, and around Minnedosa, important areas for breeding diving ducks. Conditions improved in stratum 38 from May to July, but were also variable. The area immediately southeast of Brandon was rated excellent. Most wetlands held water, and many, including Whitewater Lake, were flooded outside their basins. West of Whitewater Lake, conditions were only fair, and the southeastern most corner of the province was rated poor to fair.

Montana and Western Dakotas (strata 41-44): Conditions in this crew area were variable, which is typical, as the vagaries of spring storm tracks can lead to large differences in habitat quality even over small scales. Overall, habitat quality for the crew area was similar to that of 2006; spring precipitation during and after the survey improved many areas, but may have come too late to help the earliest nesters. The outlook for South Dakota west of the Missouri River (Stratum 44) typified this variability and was rated at fair to good with depending on recent precipitation. The area between Pierre and Rapid City in southern stratum 44 had experienced below average precipitation since last year's surveys, and habitat quality was fair to poor. The northern portion of stratum 44 was much improved relative to the south; the region west of Mobridge exhibited robust growth of upland and emergent vegetation, good stream flows, and most basins were at levels adequate for nesting. This trend continued into western North Dakota (Stratum 43), as areas south and northeast of Dickinson were rated fair, and isolated spots above average, for production. However, the northern border of the stratum 43 showed evidence of moderate drought, and conditions there were rated poor. Eastern Montana north of the Missouri River (Stratum 41) experienced

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

			Change from 2006			Change from LTA	
Region	2007	2006	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	3	2	+71	0.556	2	+71	0.508
C. & N. Alberta – N.E. British Columbia - Northwest Territories	100	135	-26	0.336	49	+106	0.003
N. Saskatchewan- N. Manitoba - W. Ontario	15	16	-10	0.805	27	-46	0.001
S. Alberta	343	455	-25	0.081	311	+10	0.307
S. Saskatchewan	1,317	1,202	+10	0.580	568	+132	<0.001
S. Manitoba	110	125	-12	0.562	68	+63	0.034
Montana and Western Dakotas	266	216	+23	0.365	194	+37	0.129
Eastern Dakotas	1,201	673	+78	<0.001	494	+143	<0.001
Total	3,356	2,825	+19	0.049	1,714	+96	<0.001

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

			Change from 2006			Change from LTA	
Region	2007	2006	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	1,113	822	+35	0.004	517	+115	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	843	570	+48	0.050	906	-7	0.579
N. Saskatchewan- N. Manitoba - W. Ontario	143	105	+36	0.278	250	-43	<0.001
S. Alberta	170	189	-10	0.574	294	-42	<0.001
S. Saskatchewan	325	282	+15	0.455	422	-23	0.023
S. Manitoba	9	16	-47	0.063	61	-86	<0.001
Montana and Western Dakotas	121	120	+1	0.965	109	+11	0.598
Eastern Dakotas	83	67	+23	0.462	49	+70	0.047
Total	2,807	2,171	+29	0.001	2,608	+8	0.197

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

			Change from 2006			Change from LTA	
Region	2007	2006	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	823	780	+5	0.670	366	+125	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	862	751	+15	0.541	752	+15	0.448
N. Saskatchewan- N. Manitoba - W. Ontario	307	303	+1	0.929	199	+54	0.002
S. Alberta	283	178	+59	0.179	193	+46	0.176
S. Saskatchewan	495	401	+24	0.347	233	+113	0.001
S. Manitoba	33	65	-49	0.007	52	-36	<0.001
Montana and Western Dakotas	44	34	+30	0.356	40	+10	0.650
Eastern Dakotas	43	75	-43	0.192	46	-7	0.810
Total	2,890	2,587	+12	0.226	1,881	+54	<0.001

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

			Change from 2006			Change from LTA	
Region	2007	2006	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	9	0	-	-	1	+588	0.264
C. & N. Alberta – N.E. British Columbia - Northwest Territories	369	316	+17	0.597	271	+36	0.191
N. Saskatchewan- N. Manitoba - W. Ontario	121	82	+49	0.271	262	-54	<0.001
S. Alberta	669	864	-23	0.263	613	+9	0.697
S. Saskatchewan	2,380	2,228	+7	0.652	1,237	+92	<0.001
S. Manitoba	274	426	-36	0.005	383	-28	0.001
Montana and Western Dakotas	277	346	-20	0.235	265	+4	0.790
Eastern Dakotas	2,610	1,598	+63	<0.001	1,494	+75	<0.001
Total	6,708	5,860	+14	0.073	4,527	+48	<0.001

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

			Change from 2006			Change from LTA	
Region	2007	2006	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	580	409	+42	0.027	269	+115	<0.001
C. & N. Alberta – N.E. British Columbia - Northwest Territories	346	193	+80	0.044	213	+62	0.062
N. Saskatchewan- N. Manitoba - W. Ontario	28	12	+137	0.161	42	-34	0.200
S. Alberta	977	701	+39	0.009	367	+167	<0.001
S. Saskatchewan	1,656	1,612	+3	0.880	666	+149	<0.001
S. Manitoba	116	178	-35	0.007	109	+6	0.569
Montana and Western Dakotas	169	163	+3	0.887	150	+13	0.547
Eastern Dakotas	682	414	+65	0.001	390	+75	<0.001
Total	4,553	3,680	+24	0.011	2,206	+106	<0.001

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

			Change from 2006			Change from LTA	
Region	2007	2006	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	1,135	1,041	+9	0.473	915	+24	0.018
C. & N. Alberta – N.E. British Columbia - Northwest Territories	234	126	+86	0.056	374	-37	0.006
N. Saskatchewan- N. Manitoba - W. Ontario	5	6	-7	0.899	40	-87	<0.001
S. Alberta	324	611	-47	<0.001	719	-55	<0.001
S. Saskatchewan	960	1,024	-6	0.724	1,214	-21	0.011
S. Manitoba	15	57	-74	<0.001	111	-87	<0.001
Montana and Western Dakotas	118	264	-55	<0.001	269	-56	<0.001
Eastern Dakotas	544	257	+111	<0.001	455	+19	0.187
Total	3,335	3,386	-2	0.841	4,098	-19	<0.001

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

			Change from 2006			Change from LTA	
Region	2007	2006	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	2	10	-83	0.176	2	+10	0.886
C. & N. Alberta – N.E. British Columbia - Northwest Territories	80	59	+35	0.345	39	+106	0.016
N. Saskatchewan- N. Manitoba - W. Ontario	10	5	+93	0.326	28	-64	<0.001
S. Alberta	179	154	+16	0.571	117	+53	0.051
S. Saskatchewan	414	435	-5	0.831	195	+113	0.001
S. Manitoba	72	102	-30	0.273	72	-1	0.962
Montana and Western Dakotas	6	12	-51	0.249	9	-39	0.260
Eastern Dakotas	247	139	+78	0.013	168	+47	0.021
Total	1,009	916	+10	0.443	630	+60	<0.001

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

			Change from 2006			Change from LTA	
Region	2007	2006	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	92	73	+25	0.615	91	+1	0.980
C. & N. Alberta – N.E. British Columbia - Northwest Territories	139	109	+27	0.487	73	+89	0.048
N. Saskatchewan- N. Manitoba - W. Ontario	34	13	+167	0.109	55	-37	0.123
S. Alberta	127	76	+67	0.141	64	+99	0.039
S. Saskatchewan	324	287	+13	0.642	184	+76	0.029
S. Manitoba	77	87	-12	0.739	57	+37	0.220
Montana and Western Dakotas	17	12	+36	0.503	8	+113	0.069
Eastern Dakotas	54	33	+66	0.141	33	+66	0.090
Total	865	691	+25	0.117	565	+53	0.001

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

			Change from 2006			Change from LTA	
Region	2007	2006	%	*P*	LTA	%	*P*
Alaska-Yukon Territory – Old Crow Flats	1,191	884	+35	0.022	914	+30	0.014
C. & N. Alberta – N.E. British Columbia - Northwest Territories	1,261	1,169	+8	0.603	2,599	-51	<0.001
N. Saskatchewan- N. Manitoba - W. Ontario	271	335	-19	0.288	582	-53	<0.001
S. Alberta	182	214	-15	0.538	351	-48	<0.001
S. Saskatchewan	302	391	-23	0.339	416	-27	0.079
S. Manitoba	50	97	-48	0.064	134	-63	<0.001
Montana and Western Dakotas	15	19	-20	0.535	53	-72	<0.001
Eastern Dakotas	179	138	+30	0.256	98	+83	0.003
Total	3,452	3,247	+6	0.424	5,147	-33	<0.001

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

Species	2007	2006	% Change from 2006	Average [b]	% Change from average
Mergansers (common, red-breasted, and hooded)	400	315	+27 [c]	328	+22
Mallard	443	405	+9	398	+10
American black duck	569	499	+14 [c]	465	+22 [c]
American wigeon	14	12	+22	20	-29
Green-winged teal	254	229	+11	228	+11
Scaup (greater and lesser)	25	30	-17	36	-31
Ring-necked duck	651	545	+19 [c]	510	+27 [c]
Goldeneyes (common and Barrow's)	319	215	+49 [c]	259	+23
Bufflehead	16	13	+25	25	-35
Scoters (black, white-winged , and surf)	103	79	+31	81	+28

[a] Estimates for mallard, American black duck, 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 the variance-weighted means of FWS and CWS estimates for strata 51, 52, 63, 64, 66-68, 70-72.

[b] Average for 1990-2006.

[c] Significance (*P*<0.10) determined by non-overlap of Bayesian credibility intervals or confidence intervals.

the 2005 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 in 2006 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 subsequent improvement in nesting habitat last year. Spring precipitation in Montana during March and April also helped mitigate several years of drought. Much of central Montana was in good condition due to ample late winter and early spring precipitation. Biologists there also noted improvements in upland vegetation over recent years. In the 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.

In 2006, habitat conditions in most northern regions of Canada were improved relative to 2005 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. The exception was the southern portion, where heavy May rains flooded some nesting habitat, as well as a dry swath across the central part of the province. In contrast to most other northern areas and to the past few years, spring did not arrive early in Alaska in 2006. Overall, a normal spring phenology occurred throughout most of Alaska and the Yukon Territory, and ice persisted late 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. Good waterfowl production was anticipated in 2006 from the northwestern continental area.

Spring-like conditions also arrived early in the East, with an early ice break-up and relatively mild temperatures reported in 2006. Biologists reported that habitat conditions were generally good across most of the survey area. Most regions had a warm, dry winter and a dry early 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 of 2006 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 in 2006 than in recent years. Many bogs were noticeably drier than recent years or dry entirely in a few cases. Winter precipitation increased to the west and north, which resulted in generally good water levels in central and northern Ontario. Conditions were good to excellent in central and northern Ontario in 2006 due to the early spring phenology, generally good water levels, and warm spring temperatures.

In the traditional survey area, the 2006 total duck population estimate (excluding scoters, eiders, long-tailed ducks, mergansers, and wood ducks) was 36.2 ± 0.6 [SE] million birds. This was 14% greater than the 2005 estimate of 31.7 ± 0.6 million birds and 9% above the 1955-2005 long-term average. In the eastern Dakotas, total duck numbers were 12% higher than the 2005 estimate, and 23% above the long-term average. Counts in southern Alberta were 44% higher than in 2005, and similar to their long-term average. The total-duck estimate increased 27% relative to 2005 in southern Saskatchewan and was 37% above the long-term average. The total duck count in southern Manitoba was similar to the 2005 estimate, but 16% above its long-term average. The total duck estimate in central and northern Alberta, northeastern British Columbia and the Northwest Territories was similar to that of 2005, and 28% below the long-term average. The estimate in the northern Saskatchewan—northern Manitoba--western Ontario area was 16% below that of 2005, and 24% below the long-term average. Total ducks in the western Dakotas--Eastern Montana area were 48% above their 2005 estimate, and 18% above their long-term average. In the Alaska--Yukon Territory--Old Crow Flats region the total duck estimate was

a mild winter with near normal precipitation, and average conditions for waterfowl nesting were observed in May. Some areas improved relative to recent years while some regions continued in moderate drought. Artificial impoundments, seasonal wetlands and streams were in good condition in the region bounded by Malta and Havre east to Sidney and the North Dakota border. In contrast the high line from Plentywood west through Front Range was much less favorable with many dry basins, fragmented stream channels, and stock dams with little or no adjacent vegetation despite a few bright spots near Medicine Lake. Eastern Montana south of the Missouri River (Stratum 42) experienced a relatively mild winter, then a significant snow fall in April, which improved conditions in some areas. However, an unseasonably warm May partially countered this improvement. Native prairie vegetation was robust particularly southeast and northeast of Lewistown, and south and east of Miles City. In contrast the eastern portion of the stratum near the North Dakota border remained in moderate drought.

Overall in Montana and the Western Dakotas, May pond counts were similar to the 2006 estimate, and 39% higher than the long-term average. Total ducks were 15% lower than their 2006 estimate, and similar to their long-term average. Canvasback numbers were similar to last year's estimate, and 113% above the long-term average. The Northern pintail estimate was 55% lower than that of 2006, and 56% below the long-term average for the crew area. Scaup counts were similar to last year's estimate, and 72% below their long-term average. Estimates for mallards, American wigeon, redheads, green-winged teal, blue-winged teal, gadwall, and Northern shovelers were similar to those of 2006, and to long-term averages.

In July, the general condition of waterfowl habitat in eastern Montana (Strata 41 and 42) was similar to that observed in May. The area north and east of Malta was good; pond density improved had improved relative to recent years, and brood habitat had developed well in artificial impoundments and natural wetlands, and June precipitation had produced good upland cover. The western portions of stratum 41 and 42 continued to exhibit drier conditions, and areas near Havre, Cut Bank and Great Falls were all rated fair to poor, and the Front Range remained below average. Although the western half of strata 41 and 42 were only average, conditions to the east looked good, so production over the entire regions was predicted to be slightly above average. Late nesting was evident, as pairs and single drakes were seen. Most broods observed were class 2 or 3, which suggested good success of first nest attempts. Conditions in the western Dakotas (strata 43 and 44) showed some improvement since May, and production was expected to be near normal and similar to 2006. Most broods seen were near fledging, and unlike eastern Montana, there was little evidence of late nesting, likely due to the drier conditions in the western Dakotas. Recent rains have either maintained these strata in fair condition or upgraded some areas from poor to fair, with the exception of the region near Rapid City which remained in moderate drought and was rated poor.

Eastern Dakotas: Winter snowfall and spring rains received throughout much of the eastern Dakotas (Strata 45-49) resulted in improved wetland conditions this spring compared to last year. At the end of April, most of the crew area had normal to above normal soil moisture, with the exception of northcentral and northwestern North Dakota, which were in moderate drought. The start of the survey was delayed by a large storm system that dropped as much as 9 inches of rain on parts of the crew area. Unfortunately, these spring rains fell most heavily on intensely farmed areas, and came after many breeding pairs had already passed through the area. Nonetheless, the improved conditions were still expected to benefit ducks in the form of increased renesting propensity, improved wetland and upland nesting cover, and increased brood and duckling survival. As of May 2007, much of eastern South Dakota was rated good to excellent, while conditions in North Dakota were more variable. The Red River Valley, as well as a swath from central through northwestern North Dakota were rated poor, while the region between Devils Lake and the Canadian border, as well as the area south of Valley City near the South Dakota border were rated good to excellent. The rest of the state was rated fair.

May ponds were 19% higher than the 2006 estimate, and 23% above the long-term average. The total duck estimate was 52% higher than the 2005 count and 86% above the long-term average. Estimates for mallards (+26%, +138% LTA), gadwall (+78%, +143% LTA), blue-winged teal (+63%, +75% LTA), Northern shovelers (+65%, +75% LTA), and redheads (+78%, +47% LTA) were all well above 2006 estimates and long-term averages for this crew area. Northern pintail numbers were 111% higher than last year's estimate, and but similar to the long-term average. Estimates for American wigeon, canvasbacks and scaup were similar to last year's, but 70%, 66%, and 83% higher than their long-term averages, respectively. Green-winged teal were similar to their 2006 estimate and their long-term average.

From May through mid-June, South and North Dakota experienced average or cooler than average temperatures, and many areas received above average rainfall. Conditions improved more in North Dakota than in South Dakota between May and July. As of July 2007, general expectations were for above average production in North and South Dakota. Conditions the western portion of east river South Dakota (the coteau slope and the western edge of the drift plain) deteriorated between May and July, with even large wetlands receded or day. The majority of the South Dakota drift plain, as well as the southern extent of the Missouri Coteau (Leola Hills) was considered fair. By contrast, the northeast quarter of the South Dakota survey area from Redfield north to North Dakota and east to the Minnesota line was rated good to excellent, as a higher than normal proportion of wetland basins were full or overflowing for that time of year, and wetland and upland cover looked good. As in South Dakota, the North Dakota Coteau Slope region, adjacent to the Missouri River, showed little improvement since the May survey and remained quite dry. Wetland densities are low, and artificial wetlands made up most of the little available water. However, upland cover was in good condition due to June rains. The Missouri Coteau was rated good to excellent in the southern third of the state, and these conditions prevailed northwest nearly to the Canada border though the width of this swath of good conditions narrowed to the north. As in northeastern South Dakota, seasonal wetlands that are typically gone by July were present in many areas. Good to excellent conditions also prevailed in the southeastern portion of the state and as of July, extended from the Canadian border as far south as Jamestown. The remainder of eastern North Dakota crew area was in fair condition with only minor pockets of poor habitat.

Northern Saskatchewan, Northern Manitoba, and Western Ontario: In northern Saskatchewan and northern Manitoba (strata 21-25) spring break-up was more normal this year after an exceptionally early break-up in spring 2006. Like last year, winter snowfall was plentiful enough across both provinces to recharge most beaver ponds and small lakes. The normal spring and good water conditions across the landscape bode well for waterfowl production. Similar to 2006, larger lakes and rivers tended to be higher than other recent years. Floodwater often extended into the vegetation along shorelines in both provinces. However, in Manitoba, the lakes associated with the Nelson River drainage were not as high and muddy as in 2006. Loafing areas and many expanses of nesting cover were not flooded and appeared to support to numerous nesting waterfowl. Conditions in the smaller wetlands, beaver ponds, and creeks appeared ideal across the entire area with the exception of extreme northwestern Saskatchewan where conditions were drier. Given a normal spring break-up, some flooding uncertainty, and ideal beaver pond habitat; the overall rating for the area was good.

Spring temperatures were normal across the majority of western Ontario (stratum 50); however, precipitation rates varied from slightly above average in areas along the Manitoba border, to below average in areas along the northern border with Quebec and along the James Bay lowlands. Within Stratum 50, all the basins were well charged, but fortunately, water levels were not high enough to push the birds out of emergent vegetation and up into the trees. The timely arrival of spring-like conditions allowed more than adequate time for ice to thaw and provide good access to nesting cover and resources, so most of the area was rated excellent for production.

The total-duck estimate was 18% above the 2006 estimate, and similar to the long-term average. All the major species estimates in this crew area were similar to last year's. Green-winged teal remained 54% above their long-term average. Northern shoveler and canvasback estimates were similar to those of 2006 and to long-term averages. Estimates for all other species were below long-term averages for the crew area. Mallards, gadwall, American wigeon, and blue-winged teal were 25%, 46%, 43%, and 54% below their long-term averages, respectively. Two species of concern, scaup (-53%) and Northern pintails (-87%), were well below long-term averages for the survey area, as were redheads (-64%).

As of July, conditions were rated good throughout of northern Saskatchewan and northern Manitoba, and good to excellent in western Ontario.

Northern Alberta, Northeastern British Columbia, and Northwest Territories (strata 13-18, 20, 77): In strata 15-18, 20, and 77, winter conditions were generally mild through the first half, with much colder and more seasonal temperatures during the second half. Spring began earlier than normal, but was delayed during late April and early May, with below freezing temperatures and up to four inches of snow which fell during the second week of May. All lakes and flowages were open with the exception of the higher elevation areas (Horn Plateau, Caribou Mountains, Birch Mountains, and areas northeast of Yellowknife), but even these lakes held sufficient water around the edges. Mallard nesting chronology, as indicated by the pair/drake ratio, was normal for the survey timing.

Winter snowfall amounts were above average for most of the surveyed area. The late spring precipitation, along with the melting winter snowpack produced above average water levels in most drainage basins, stream flood plains, beaver flowages, shallow wooded swamps, sloughs, small lakes, and semi-permanent wetlands, and there were no dry areas noted within these six strata. The Athabasca Delta flooded late and at above average levels. Some diver species that nest over or near water may have been adversely affected by the higher spring water levels, and some early nesting dabbler species could have been adversely affected by subfreezing temperatures and snowfall during the middle of May in the southern portion of the Northwest Territories and northern Alberta. Overall, spring breeding conditions were the best observed over the past several years. All six strata were rated as good. Flights later in June indicated that conditions in the McKenzie River Delta and the boreal taiga strata (13 and 14) also were good for duck production.

Total-duck numbers were 20% higher than the 2006 estimate, but still 14% below the long-term average for the survey area. Counts of several species were higher than last year's. Mallard numbers were 59% higher than last year's estimate, but still 17% below their long-term average. Likewise, Northern pintails were 86% higher than their 2006 estimate, but remained 37% below their long-term average. Northern shovelers were 80% above last year's estimate and 62% higher than their long-term average. American wigeon were 48% higher than last year's estimate, but similar to the long-term average. Estimates for gadwall and redheads were similar to those of 2006, and both were 106% above their long-term averages for the survey area. Canvasbacks and scaup were also similar to last year's estimates, but were 89% above, and 51% below, their long-term averages, respectively. Green-winged and blue-winged teal numbers were similar to 2006 estimates and their long-term averages.

As of July, habitat conditions and the production outlook for this survey area remained unchanged since the survey was flown.

Alaska, Yukon Territory, and Old Crow Flats: In Alaska, the Yukon Territory, and Old Crow Flats (strata 1-12), breeding conditions depend largely on the timing of spring phenology, because wetland conditions are less variable than on the prairies. In general, the timing of the arrival of spring-like conditions in Alaska was normal in 2007. In stratum 7 (Copper River Delta) the phenology was normal and conditions good. Spring came early in stratum 1 (Kenai-Susitna) and conditions there were also good. Stratum 3 (Tanana-Kuskokwim), stratum 4 (Yukon Flats), stratum 6 (Koyukuk), and stratum 5 (Innoko) all experienced early springs, but were drier than normal. Stratum 8 (Bristol Bay) was early to normal and good. Stratum 9 (Yukon Delta) was slightly early and good. Spring came slightly late in stratum 10 (Seward Pen) and conditions were icy, but good. In stratum 11 (Kotzebue Sound) spring arrival was normal and conditions good. Phenology in stratum 12 (Old Crow Flats) was slightly late, and with some ice, but conditions were still good. Stratum 2 (Nelchina) was normal and good. No flooding was observed in the interior, which was very dry compared to some years, but conditions there were still good for the birds.

The total duck estimate was 20% higher than that of 2006, and 59% above the long-term average. Estimates for American wigeon (+35%, +115% LTA), Northern shovelers (+42%, +115% LTA), and scaup (+35%, +30% LTA) were all higher than those of 2006 and their long-term averages. Mallard, Northern pintail, and green-winged teal numbers were similar to last year's but 61%, 24%, and 125% above their long-term averages, respectively. Estimates of gadwall, redheads, and canvasbacks were similar to those of 2006 and to their long-term averages. This crew area was the only one in which the Northern pintail estimate was above its long-term average. This survey area is not an important breeding area for breeding blue-winged teal (last year's count was essentially zero), but this year's count of 9,000 was nearly 9 times higher than the long-term average, though not statistically significant.

Lower than average production was expected on the Copper River Delta. Spring conditions were normal at most locations in south-central Alaska. River breakup occurred on or near the average date, with no major flooding. The Alaska peninsula experienced a very cold winter and a slow spring warm-up. March and April precipitation was below average, and in May, slightly above average. On the Yukon-Kuskokwim Delta above-average production was expected. In the interior of Alaska, good waterfowl production was anticipated due to an early spring, lack of flooding and early ice breakup. Average production was expected on the North Slope. Overall the forecast for production was unchanged from May, and good waterfowl production was expected.

Eastern Survey Area: The boreal forests of the eastern survey area (strata 51-72), were generally in good or excellent condition this spring, except for a

few drier patches in Northern Quebec that were in fair condition. Conditions were good to excellent in Southern Ontario and Quebec (strata 52-59). Spring arrived early in the James and Hudson Bay Lowlands for the 3rd consecutive year, and habitat conditions were classified as excellent. In eastern and southern Ontario, the winter snowpack was below normal; however, a good frost seal, spring runoff, and spring storms left this region in good condition at the time of the survey. Storms following the survey period produced local flooding of some nesting habitat. Spring temperatures were near average across central Quebec (stratum 68), but precipitation had been slightly below normal in the northern portions of the stratum. The central portion of stratum 68 was drier than normal, particularly in higher elevation areas between the Ontario border and the center of Quebec. Wetland basins were charged and ice-free, except those above 2100 feet in elevation in the extreme northeastern portions of the stratum. Spring temperatures and precipitation were average to slightly below average across northern Quebec (stratum 69). As a result, wetland basins are adequately charged and provided good nesting cover. Wetlands were ice-free by the beginning of June and were available to breeding birds. Maine and the Maritimes (strata 62-67) experienced above normal temperatures and dry conditions during the first week of May. By mid May, however, below-normal temperatures and heavy precipitation (including snowfall in northern Maine, New Brunswick and Cape Breton Nova Scotia) produced conditions more typical of early spring. There was some potential for flooding of nests due to the heavy rain during mid-May, but this was not as problematic as it had been during the past few years. Newfoundland and Labrador (strata 66 and 67) experienced a late spring compared to the last 5 years, with the northernmost part of the survey region in Labrador still frozen in late May. However, this region was still considered in good condition.

American black duck and ring-necked duck estimates were 14% and 19% higher than those of 2006, and 22% and 27% above their 1990-2006 averages, respectively. The merganser estimate of was 27% higher than last year's, and the goldeneye count was 49% higher than that of 2006, but both these species were similar to their long-term averages. Estimates for mallards, scoters, scaup, American wigeon, buffleheads, and green-winged teal were all similar to their 2006 estimates and long-term averages (Table 13). As of July, habitat conditions in the eastern survey area appeared unchanged since surveys were flown.

Other areas: Wetland conditions many areas along the West Coast of the U.S. and Canada were drier than 2006, but still improved relative to the dry conditions that prevailed in recent previous years. In Oregon, total mallards in the breeding population were estimated at 101,000, similar to last year's count of 88,000 and to the long-term average. The estimate for total ducks (335,000) was up 27% relative to 2006, and similar to the long-term average.

In California, winter-through-spring precipitation was below average. Average to good conditions prevailed in the northeastern part of the state where normal production was expected. Elsewhere, duck production was expected to be lower than normal. The total-duck estimate in 2007 was 627,600, not different from last year's estimate or their long-term average of 604,300. The mallard estimate in 2007 was 388,300, also similar to the 2006 estimate and their long-term average (374,800). Breeding waterfowl populations in eastern Washington were at sustainable levels, similar to those of the 1990s. In 2007, eastern Washington was still benefiting from the exceptionally wet spring of 2006 that filled precipitation-dependent potholes. The eastern Washington pond index from the Potholes strata was 6,660, down 30% from 2006 similar to the LTA. Pond counts in the Douglas, Okanogan, and Omak transects were all above average. Counts in the Lincoln and Far East transects remained below average following several years of drought. The index for total breeding ducks was 128,300, down 5% from 2006, and 8% below the long-term average (1961-2006). The total mallard index was estimated at 46,100, similar to 2006, and 13% below the LTA. Gadwall were still at near-record numbers (17,200), 5% below 2006 levels, and 37% above the LTA. Combined blue-winged and cinnamon teal counts (12,000) were up 26% from 2006, but 56% below the LTA. Of those species commonly detected in the survey, lesser scaup (-33%), ring-necked duck (-25%), and bufflehead (-56%) counts were the most reduced relative to last year. Winter and spring precipitation was very low in Nevada this year thus runoff within the Truckee, Carson, Walker and Humboldt systems was below average. However, many wetlands still remained high following good precipitation last year. The total duck index was 14,500, and the mallard index was 1,500.

In Nebraska, water conditions were slightly improved over 2006, and generally improved throughout nesting season. Production was expected to be slightly above average.

Conditions were variable in the Great Lakes states. In Minnesota, pond numbers increased 24%

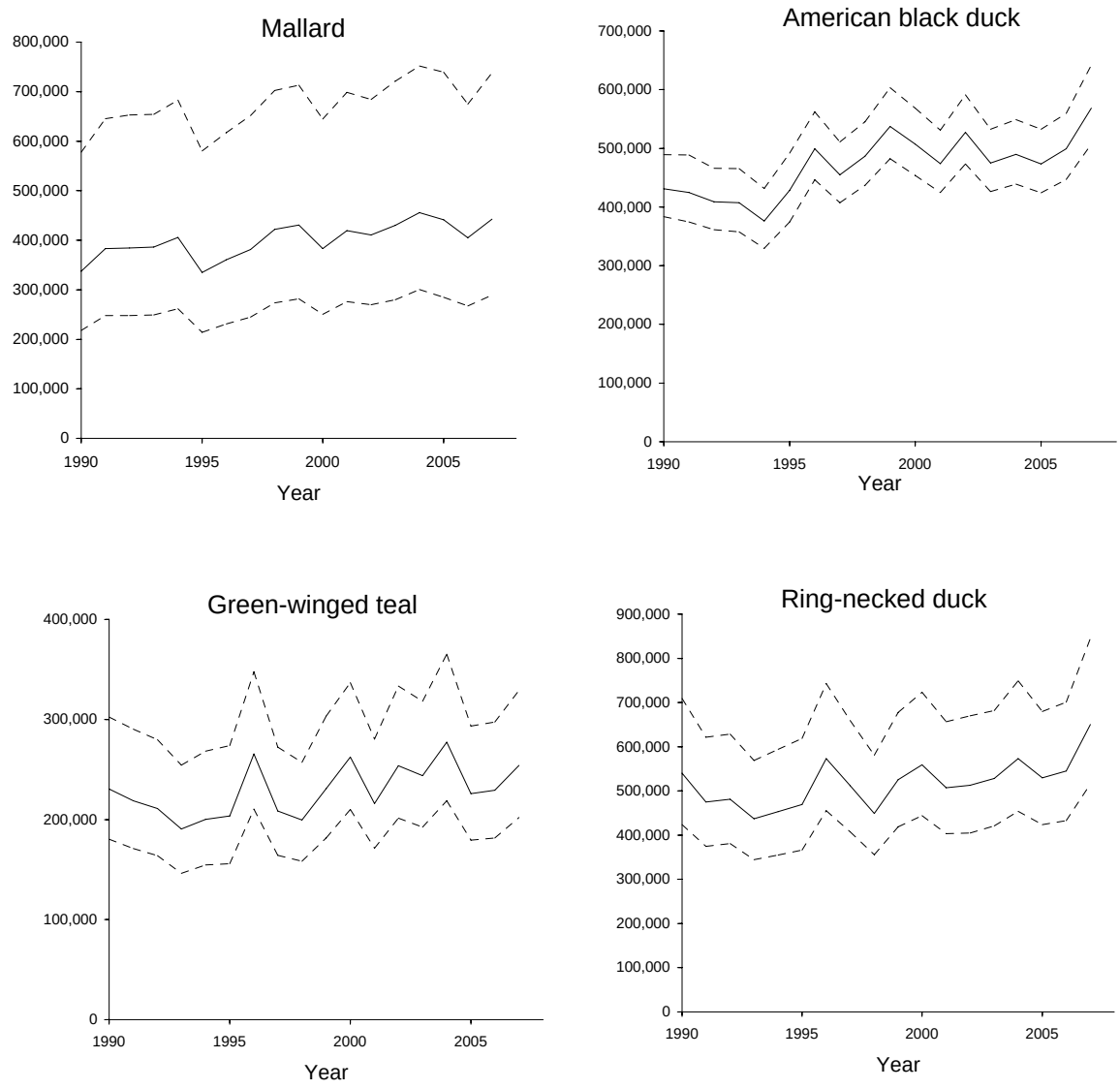


Figure 3. Breeding population estimates (from Bayesian hierarchical models) and 90% credibility intervals for selected species in the eastern survey area (strata 51, 52, 63, 64, 66-68, 70-72).

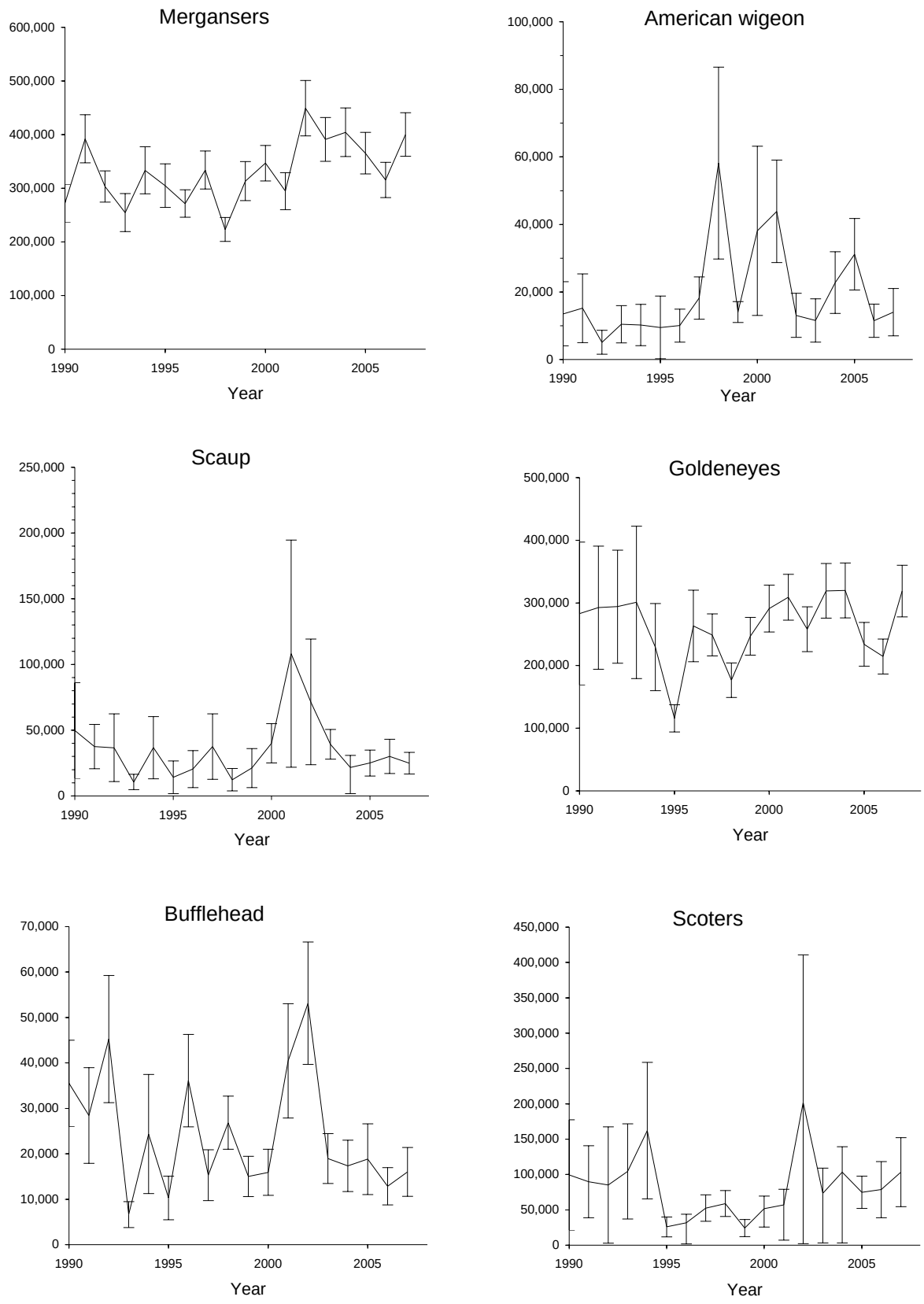


Figure 4. Breeding population estimates (variance-weighted means) and 90% confidence intervals for selected species in the eastern survey area (strata 51, 52, 63, 64, 66-68, 70-72).

compared to 2006 and were 7% above the long-term average. Estimated numbers of temporary wetlands decreased 43% from 2006, and remained 55% below the long-term average. The mallard breeding population index (242,000) increased by 51% relative to 2006 (161,000). Mallard numbers remained 23% below the 10-year average but were above the long-term average (+9%). The blue-winged teal breeding population index (124,000) was 29% below the 2006 estimate (174,000) and both the 10-year (-45%) and long-term (-46%) averages. Wetland conditions in spring 2007 were similar to those of 2006. Ice out on most lakes across the state was near average for the northern regions of the state but 5-10 days early in the southern regions. April temperatures averaged 1.0°F below normal statewide; regional temperatures ranged from 2.7°F below average in west-central Minnesota to 0.1°F below average in east-central Minnesota. Wetland conditions were quite variable in Wisconsin, with wet conditions in the south and east, somewhat dry in the southwest and very dry in the north. Overall, breeding and brood rearing habitat in the southern and eastern portions of Wisconsin was expected to be good but below average in the remainder of the state. More permanent water basins in the northern regions should reduce the negative impact of the dry conditions on duck production somewhat. The total duck estimate was 495,600, and the mallard estimate was 242,500 ± 30,000. Wisconsin total duck numbers were similar to the 2006 estimate and the 1974-2006 average. Mallard numbers were similar to their 2006 level, and similar to the long-term mean. In Michigan, the number of ponds observed during aerial surveys was similar to last year, but 9% below the 16-year average and 30% below the peak pond count. After May, dry conditions resulted in reduced brood rearing habitat for dabbling ducks throughout most of the state. The mallard estimate of 293,000 was 41% higher than that of 2006, but still 27% below the 1992-2006 average, and the total duck index of 685,200 was nearly double that of 2006.

In the Atlantic Flyway states along the East Coast of the U.S., habitat conditions were generally reported as good for nesting waterfowl. However, cool temperatures and heavy rains likely caused much nest loss for early-nesting Canada geese and mallards. Nesting phenology was also delayed in some portions of the survey area. Production will likely be slightly below average to average, depending on the intensity and duration of rains and the duration of cold weather. In particular, Canada goose production could be affected by these weather patterns. Last year, field biologists' reports suggested that 2006 production could be reduced due to poor habitat and weather conditions. Mallard numbers (333,000) from the 2007 Atlantic Flyway's Breeding Waterfowl survey were 54% below their 2006 estimate, and 58% below their long-term average. However, 2007 total duck numbers (1.5 million) were similar to the 2006 estimate, and to their 1993-2006 average.

Mallard Fall-flight Index

The mid-continent mallard population is composed of mallards from the traditional survey area, Michigan, Minnesota, and Wisconsin, and was estimated to be 9.1 ± 0.3 million. This was similar to the 2006 estimate of 7.9 ± 0.2 million. The projected mallard fall flight index was 11.4 ± 1.0 million, similar to the 2006 estimate of 9.9 ± 0.9 million birds (Fig. 5). These indices were based on revised mid-continent mallard population models, and therefore, differ from those previously published (USFWS Adaptive Harvest Management Report 2007, Runge et al. 2002).

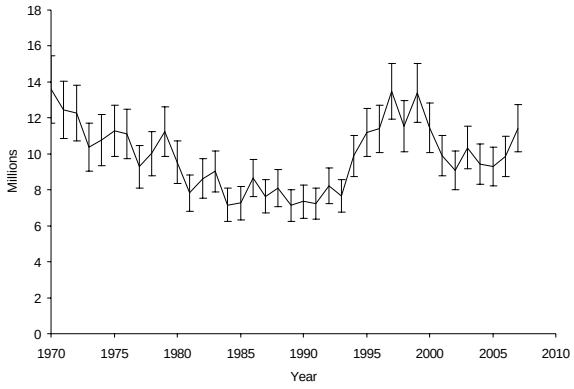


Fig. 5. Estimates and 90% confidence intervals for the size of the mallard population in the fall.

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STATUS OF GEESE AND SWANS

Abstract: We provide information on the population status and productivity of North American Canada geese (*Branta canadensis*), brant (*B. bernicla*), snow geese (*Chen caerulescens*), Ross' geese (*C. rossii*), emperor geese (*C. canagica*), white-fronted geese (*Anser albifrons*), and tundra swans *(Cygnus columbianus*). In 2007, a large area of the eastern Canadian Arctic experienced a much colder than average spring. Delayed nesting activities and reduced production of waterfowl occurred widely from Queen Maud Gulf to northern Quebec, and will impact goose and swan populations migrating through the Continent's 3 eastern Flyways. In contrast, waterfowl nesting in subarctic areas around Hudson and James Bays and Alaska's Yukon Delta experienced favorable nesting conditions. Primary abundance indices in 2007 increased from 2006 levels for 17 goose populations and decreased for 5 goose populations. Primary abundance indices in 2007 for both populations of tundra swans increased from 2006 levels. The following populations displayed significant positive trends during the most recent 10-year period ($P < 0.05$): Mississippi Flyway Giant, Atlantic, and Aleutian Canada geese; Western Arctic/Wrangel Island snow geese, and Pacific white-fronted geese. Only the Eastern Population of tundra swans showed a significant negative 10-year trend. The forecast for the production of geese and swans in North America in 2007 is regionally variable, but production for many populations will be reduced from the excellent production experienced in 2006.

This section summarizes information regarding the status, annual production of young, and expected fall flights of goose and tundra swan populations in North America. Information was compiled from a broad geographic area and is provided to assist managers in regulating harvest.

Most populations of geese and swans in North America nest in the Arctic or subarctic regions of Alaska and northern Canada (Fig. 1), but several Canada goose populations nest in temperate regions of the United States and southern Canada ("temperate-nesting" populations). The annual production of young by northern-nesting geese is influenced greatly by weather conditions on the breeding grounds, especially the timing of spring snowmelt and its impact on the initiation of nesting activity (i.e., phenology). Persistent snow cover reduces nest site availability, delays nesting activity, and often results in depressed reproductive effort and productivity. In general, goose productivity will be better than average if nesting begins by late May in western and central portions of the Arctic, and by early June in the eastern Arctic. Production usually is poor if nest initiations are delayed much beyond 15 June. For temperate-nesting Canada goose populations, recruitment rates are less variable, but productivity is influenced by localized drought and flood events.

METHODS

We have used the most widely accepted nomenclature for various waterfowl populations, but they may differ from other published information. Species nomenclature follows the List of Migratory Birds in Title 50 of the Code of Federal Regulations, Section 10.13. Some of the goose populations described herein are comprised of more than 1 subspecies and some light goose populations contain 2 species (i.e., snow and Ross' geese).

Population estimates for geese are derived from a variety of surveys conducted by biologists from federal, state, and provincial agencies, and universities (Appendices B, I, and J). Surveys include the Midwinter Survey (MWS, conducted each January in wintering areas), the Waterfowl Breeding Population and Habitat Survey (WBPHS, see Duck section of this report), surveys that are specifically designed for various populations, and others. When survey methodology allowed, 95% confidence intervals were presented with population estimates. The 10-year trends of population estimates were calculated through regression of the natural logarithm of survey results on year, and slope coefficients were presented and tested for equality to zero (*t*-test). Changes in population indices between the current and previous years were calculated and, where possible, assessed with a *z*-test using the sum of sampling variances for the 2 estimates. Primary abundance indices, those related to management plan population objectives, are described first in population-specific sections and graphed when data are available.

Because this report was completed prior to the final annual assessment of goose and swan reproduction, the annual productivity of most populations is only predicted qualitatively. Information on habitat conditions and forecasts of productivity were based primarily on observations made during various waterfowl surveys and on interviews with field biologists. These reports provide reliable information for specific locations, but may not provide accurate assessment for the vast geographic range of waterfowl populations.

Fig. 1. Important goose nesting areas in Arctic and subarctic North America.

RESULTS AND DISCUSSION

Conditions in the Arctic and Subarctic

In 2007, a large area of the eastern Canadian Arctic experienced a much colder than average May. Several important areas reported substantial snowfall prior to, or during nesting which in some cases further impacted nesting. Delays in snowmelt and nesting phenology were most severe from the Queen Maud Gulf east to northern Quebec. Production of young by many populations of geese and swans will be reduced to varying degrees in 2007. In contrast, waterfowl that nested in subarctic areas around Hudson and James Bays and Alaska's Yukon Delta experienced favorable spring conditions. In most other areas, nesting conditions were reported as near average. The snow and ice cover graphic (Fig. 2, National Oceanic and Atmospheric Administration) illustrates few differences in the progression of snowmelt by 2 June in 2007 and 2006 except in northern Quebec.

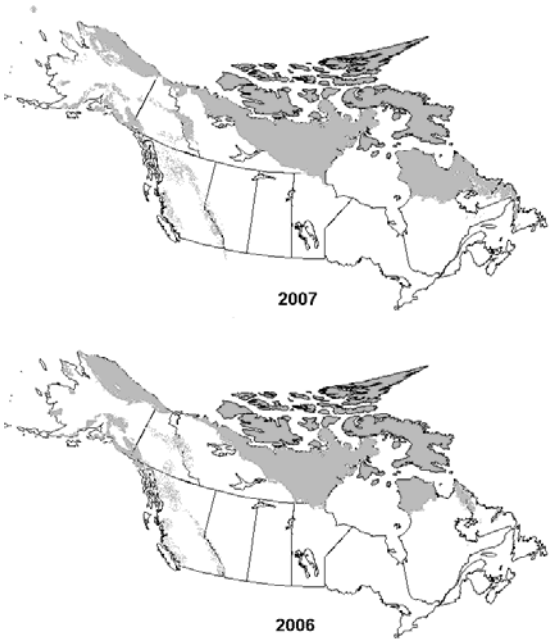


Fig. 2. The extent of snow and ice cover in North America on 2 June 2007 and 2 June 2006 (data from National Oceanic and Atmospheric Administration).

Conditions in Southern Canada and the United States

Conditions that influence the productivity of Canada geese vary less from year to year in these temperate regions than in the Arctic and subarctic. Given adequate wetland numbers and the absence of flood events, temperate-nesting Canada geese are reliably productive. Wetland abundance increased in many northern prairie and deciduous forest areas in 2007 and may have benefited nesting geese. Spring wetland conditions in many areas of the southern and western United States however had declined from spring 2006. Many eastern areas reported cool and rainy periods, or short-lived freezing temperatures, early in the 2007 nesting period. Although production of temperate-nesting Canada geese may be reduced in some localized areas, overall production of most populations is expected to be near average in 2007.

Status of Canada Geese

North Atlantic Population (NAP): NAP Canada geese principally nest in Newfoundland and Labrador. They generally commingle during winter with other Atlantic Flyway Canada geese, although NAP geese have a more coastal distribution than other populations (Fig. 3).

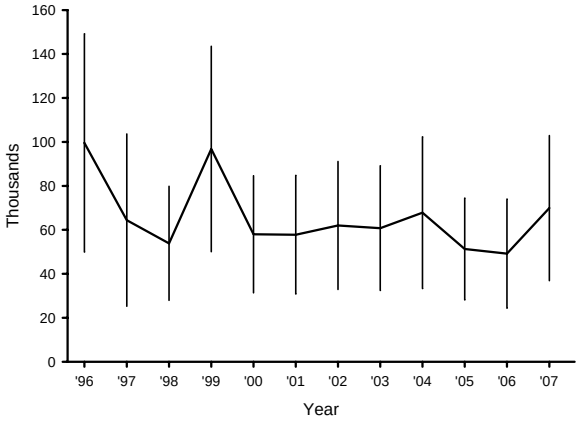


Fig. 4. Estimated number (and 95% confidence intervals) of North Atlantic Population Canada geese breeding pairs during spring.

Biologists are considering revising the index used to monitor this population to one combining the WBPHS transect and the Canadian helicopter plot survey data, but we continue to present interim indices until that new index is adopted. During the 2007 WBPHS, biologists estimated 69,900 (± 33,000) indicated pairs (singles plus pairs) within NAP range (strata 66 and 67), 42% more than in 2006 (P = 0.326, Fig. 4). Indicated pair estimates have declined an average of 2% per year during 1998-2007 (P = 0.502). The 2007 estimate of 166,800 (± 77,600) total NAP Canada geese was 41% higher than last year's estimate (P = 0.323). Preliminary information from the CWS helicopter plot surveys indicated that goose numbers in strata 66 and 67 increased about 10% from 2006 levels. The timing of spring snowmelt was

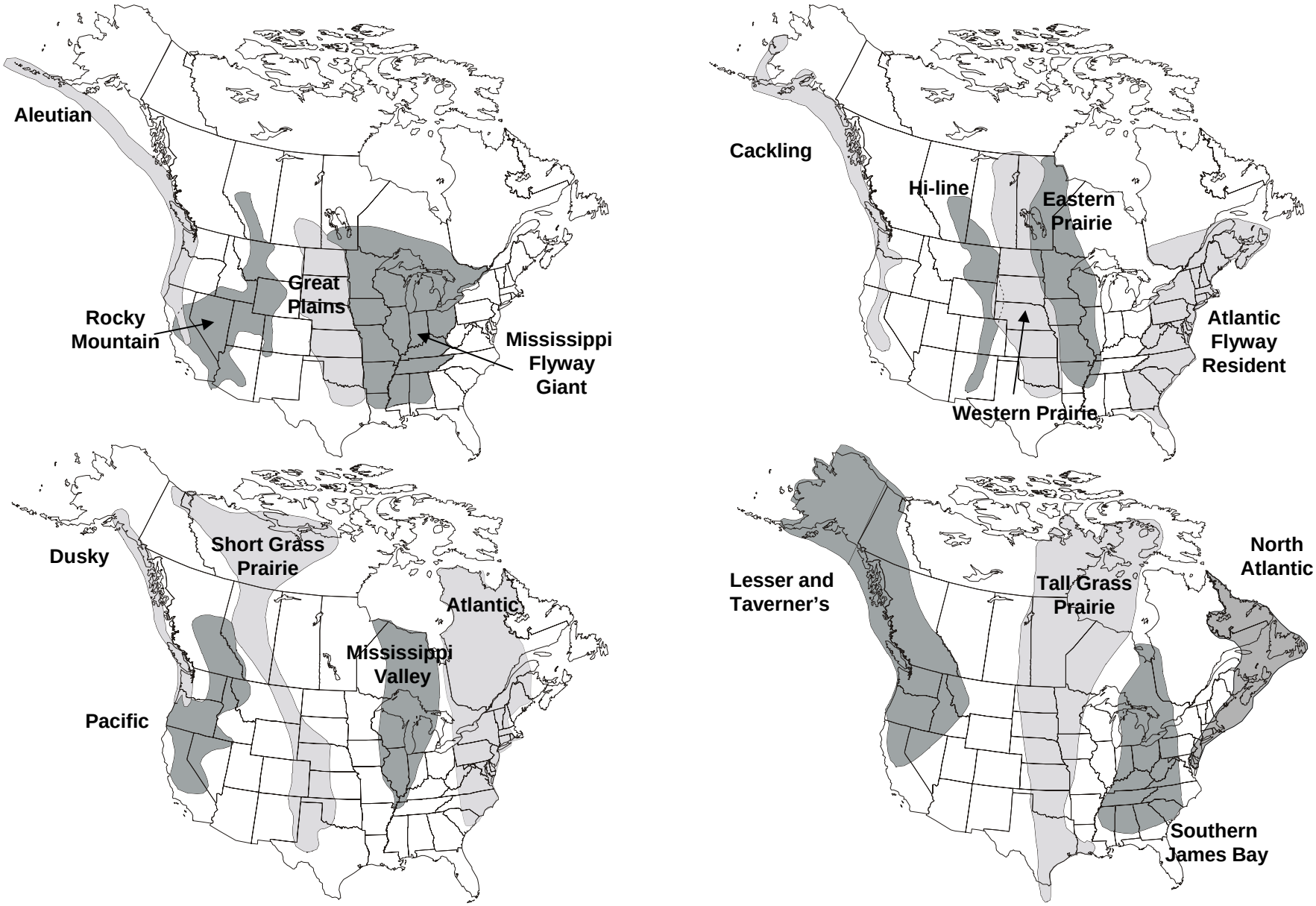


Fig. 3. Approximate ranges of Canada goose populations in North America.

late in Newfoundland and Labrador in 2007 and higher altitudes and latitudes had remaining snow and ice cover during the surveys. However, wetland habitats were in good condition and a fall flight increased from that of 2006 is expected.

Atlantic Population (AP): AP Canada geese nest throughout much of Quebec, especially along Ungava Bay, the eastern shore of Hudson Bay, and on the Ungava Peninsula. The AP winters from New England to South Carolina, but the largest concentrations occur on the Delmarva Peninsula (Fig. 3).

Spring surveys in 2007 yielded an estimate of 195,700 (± 32,600) indicated breeding pairs, 22% more than in 2006 (P = 0.127, Fig. 5). Breeding pair estimates have increased an average of 13% per year during 1998-2007 (P = 0.002). The estimated total spring population of 1,221,800 (± 204,200) geese in 2007 was 8% higher than in 2006 (P = 0.589). The proportion of indicated pairs observed as singles was 42% this year, well below the 15-year average and suggested a poor breeding effort. Spring temperatures in 2007 were colder than average, and coastal areas remained snow-covered until early June. Nesting studies on the Ungava Peninsula in 2007 indicated the average hatch date was the second latest on record since 1996. Nest studies also indicated depressed nest densities, and far below average clutch sizes. A fall flight no larger than that of last year is expected.

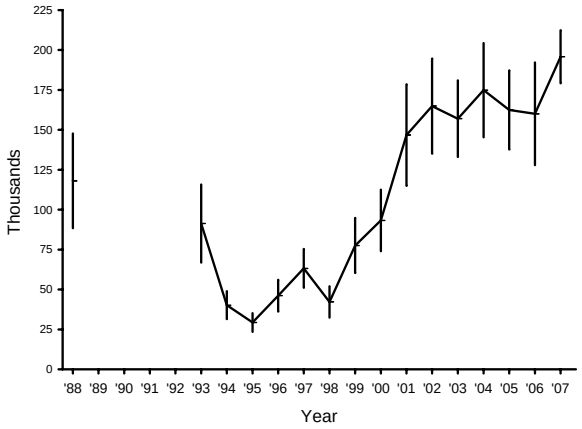


Fig. 5. Estimated number (and 95% confidence intervals) of Atlantic Population Canada goose breeding pairs in northern Quebec.

Atlantic Flyway Resident Population (AFRP): This population of large Canada geese inhabits southern Quebec, the southern Maritime provinces, and all states of the Atlantic Flyway (Fig. 3).

Surveys during spring 2007 estimated 1,128,000 (± 185,300) Canada geese in this population, 1% fewer than in 2006 (P = 0.911, Fig. 6, the calculation method of this index was modified in 2003). These new indices have increased an average of 1% per year during the last 5 years (P = 0.565). Cool spring temperatures and heavy rainfall likely caused some early nest losses in many areas of AFRP range. The 2007 fall flight is expected to be similar to that of 2006.

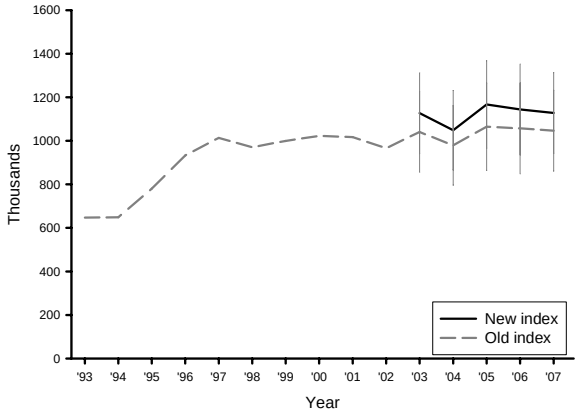


Fig. 6. Estimated number (and 95% confidence intervals) of Atlantic Flyway Resident Population Canada geese during spring.

Southern James Bay Population (SJBP): This population nests on Akimiski Island and in the Hudson Bay Lowlands to the west and south of southern James Bay. The SJBP winters from southern Ontario and Michigan to Mississippi, Alabama, Georgia, and South Carolina (Fig. 3).

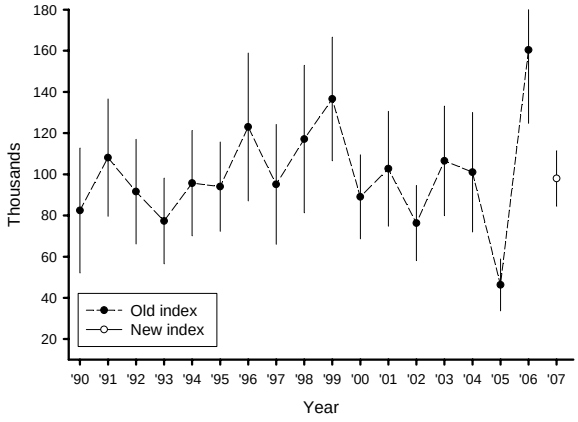


Fig. 7. Estimated total population (and 95% confidence intervals) of Southern James Bay Population Canada geese during spring.

In 2007, the SJBP breeding ground survey was modified with a redistribution of transects and a reduction in survey area, yielding population estimates not directly comparable with previous estimates. The 2007 survey indicated a spring population of 98,000 (± 26,300) Canada geese (Fig. 7). The estimate of breeding pairs in 2007 was 32,400 (± 9,100). Transect level analyses of this year's breeding pair estimates on Akimiski Island

appeared similar to the previous 5 years, but the 2007 estimates on the mainland appeared lower than the previous 5 years (P = 0.052). Surveys in 2007 were conducted with the traditionally used aircraft and within the target period. Below-average winter snowfall contributed to the third consecutive year of early nesting phenology for SJBP geese. On Akimiski Island, a record-high number of nests were found and clutch sizes were above average. Nest success there appeared to be near average. Biologists anticipate the fall flight in 2007 to be above average.

Mississippi Valley Population (MVP): The principal nesting range of this population is in northern Ontario, especially in the Hudson Bay Lowlands, west of Hudson and James Bays. MVP Canada geese primarily concentrate during fall and winter in Wisconsin, Illinois, and Michigan (Fig. 3).

Breeding ground surveys conducted in 2007 indicated the presence of 402,600 (± 51,400) MVP breeding adults, 5% more than in 2006 (P = 0.663), and the highest number recorded since 1999. Estimates of breeding adults have increased an average of 1% per year during 1998-2007 (P = 0.683). Surveys indicated a total population of 681,000 (± 164,100) Canada geese, a 3% decrease from 2006 (P = 0.827, Fig. 8). Nesting phenology in MVP range was far earlier than average for the third consecutive year. Phenology in 2007 was the earliest on record except for 2006. Nest densities were higher than average in all 3 survey strata. Favorable spring conditions and higher than average nest densities indicate the 2007 fall flight will be at least as large as that of 2006.

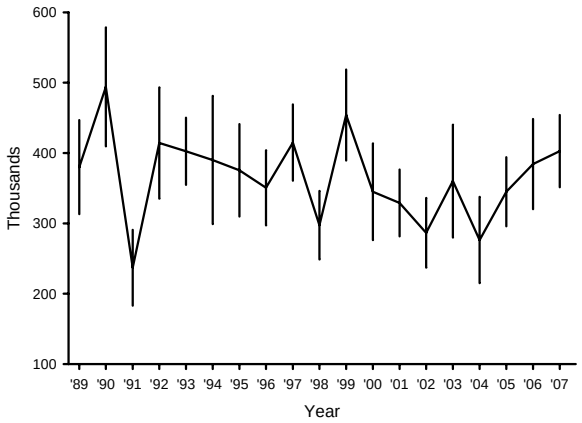


Fig. 8. Estimated number (and 95% confidence intervals) of Mississippi Valley Population breeding Canada geese during spring.

Eastern Prairie Population (EPP): These geese nest in the Hudson Bay Lowlands of Manitoba and concentrate primarily in Manitoba, Minnesota, and Missouri during winter (Fig. 3).

The 2007 spring estimate of EPP geese was 217,500 (± 22,900), 17% higher than the 2006 estimate (P = 0.098, Fig. 9). Spring estimates have increased an average of 3% per year over the last 10 years (P = 0.292). The 2007 survey estimate of singles and pairs was 153,400 (± 18,600), 14% higher than last year (P = 0.167). Estimates of these population components have increased an average of 3% per year during 1998-2007 (P = 0.042). The estimated number of productive geese in 2007 increased from 2006 and reached a record-high level. For the second consecutive year, warmer than average April temperatures accelerated spring snowmelt and led to early nesting chronology throughout EPP range. This year, biologists on Cape Churchill observed a median hatch date of 17 June, the same as in 2006 and about 1 week earlier than the long-term average (1976-2006). Nest density in 2007 was the highest recorded since 1990 and mean clutch size (4.3) was well above the long-term average (3.9). The estimated nest success was 58%, slightly lower than the long-term average. Estimated gosling production at the Cape Churchill study area in 2007 was slightly below that of 2006, but similar to the average in this area since the mid-1990s. A fall flight similar to that of 2006 is expected.

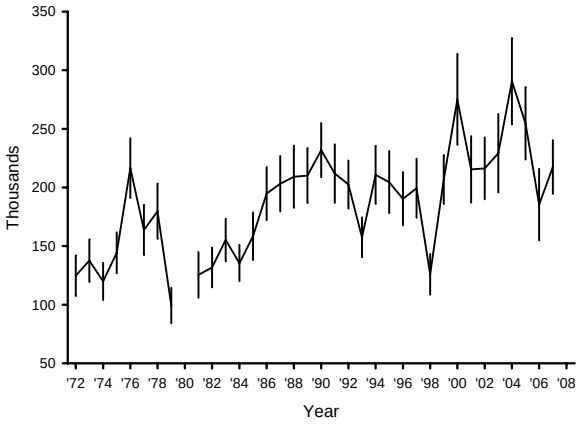


Fig. 9. Estimated number (and 95% confidence intervals) of Eastern Prairie Population Canada geese during spring.

Mississippi Flyway Giant Population (MFGP): Giant Canada geese have been reestablished or introduced in all Mississippi Flyway states. This subspecies now represents a large proportion of all Canada geese in the Mississippi Flyway (Fig. 3).

During spring 2007 biologists tallied 1,642,500 MFGP geese, 5% fewer than the final 2006 estimate (Fig. 10). These estimates have increased an

average of 3% per year since 1998 (P = 0.002). Most MFGP states expected overall average production in 2007, although cold and snow caused some egg loss in April in upper Midwest states (MN, WI, and MI), some flooding was reported at mid-latitude states (IA, MO, and AR), and Alabama experienced a severe drought. However, near-average conditions during the remainder of the season and goose renesting efforts suggest the 2007 fall flight will be similar to that of 2006.

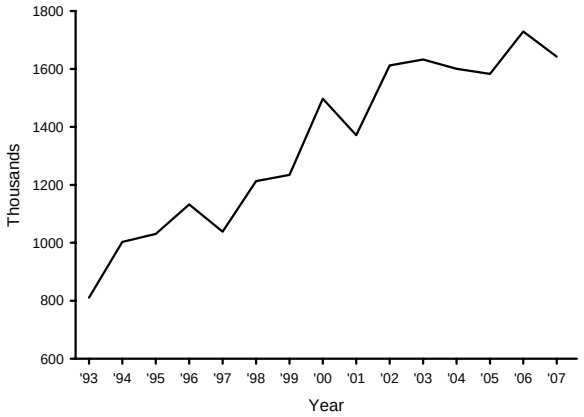


Fig. 10. Estimated number of Mississippi Flyway Giant Population Canada geese during spring.

Western Prairie and Great Plains Populations (WPP/GPP): The WPP is composed of mid-sized and large Canada geese that nest in eastern Saskatchewan and western Manitoba. The GPP is composed of large Canada geese resulting from restoration efforts in Saskatchewan, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. Geese from these breeding populations commingle during migration with other Canada geese along the Missouri River in the Dakotas and on reservoirs from southwestern Kansas to Texas (Fig. 3). These 2 populations are managed jointly and surveyed during winter.

During the 2007 MWS, 446,000 WPP/GPP geese were counted, very similar to last year's 444,400 (Fig. 11). These indices have decreased 2% per year during 1998-2007 (P = 0.369). In 2007, the estimated spring population in the portion of WPP/GPP range included in the WBPHS was 907,900 (± 66,300) geese, 24% more than last year (P = 0.050). The WBPHS estimates have increased an average of 3% per year since 1998 (P = 0.027). Wetland conditions in the Canadian WPP range were quite favorable in 2007. However, gosling production is expected to be reduced slightly in GPP states. Oklahoma and North Dakota entered the nesting season still affected by drought. Abundant rainfall in May and June recharged many breeding and brood habitats but may have caused some flooding of nests and gosling mortality across the entire range. Several states experienced freezing temperatures in April which may have caused some egg mortality. A fall flight similar to that of last year is expected.

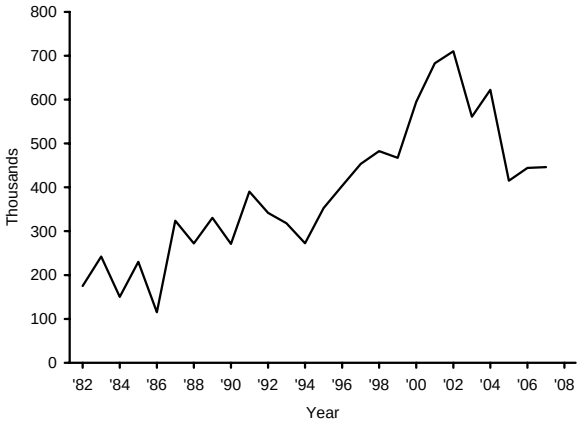


Fig. 11. Estimated number of Western Prairie Population/Great Plains Population Canada geese during winter.

Tall Grass Prairie Population (TGPP): These small Canada geese nest on Baffin (particularly on the Great Plain of the Koukdjuak), Southampton, and King William Islands; north of the Maguse and McConnell Rivers on the Hudson Bay coast; and in the eastern Queen Maud Gulf region. TGPP Canada geese winter mainly in Oklahoma, Texas, and northeastern Mexico (Fig. 3). These geese mix with other Canada geese on wintering areas, making it difficult to estimate the size of the winter population.

During the 2007 MWS in the Central Flyway, 680,300 TGPP geese were counted, a record-high index and 36% more than in 2006 (Fig. 12). These estimates have increased an average of 7% per year during 1998-2007 (P = 0.191). May temperatures throughout most of TGPP nesting range in 2007 were far below average. Biologists report that spring snowmelt was delayed by low temperatures and spring snowstorms. Extensive aerial surveys during 22–25 June indicated snow cover near the Queen Maud Gulf to be about 5%, with most lakes and ponds still ice-covered. Nesting phenology in the Queen Maud Gulf Sanctuary was the latest recorded since 1991. Spring break-up was approximately 2 weeks later than the recent average at the McConnell River and biologists on Southampton Island reported heavy snowfall and that phenology was delayed by at least 2.5 weeks beyond average. Spring conditions were also expected to be unfavorable for geese on southwestern Baffin Island. The available information suggests that the production of TGPP Canada geese will be poor in 2007.

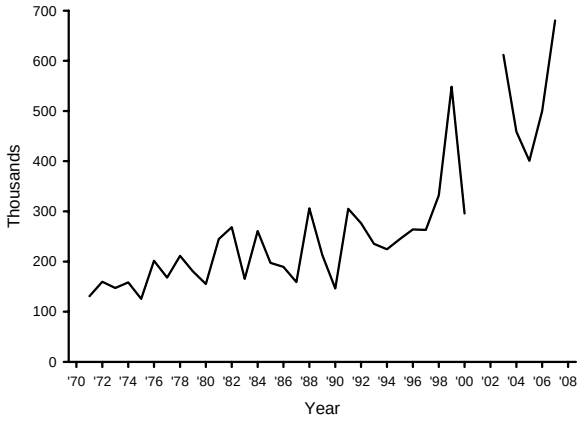


Fig. 12. Estimated number of Tall Grass Prairie Population Canada geese in the Central Flyway during winter.

Short Grass Prairie Population (SGPP): These small Canada geese nest on Victoria and Jenny Lind Islands and on the mainland from the Queen Maud Gulf west and south to the Mackenzie River and northern Alberta. These geese winter in southeastern Colorado, northeastern New Mexico, and the Oklahoma and Texas panhandles (Fig. 3).

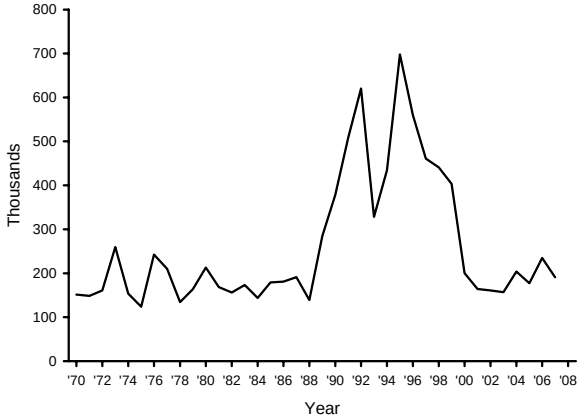


Fig. 13. Estimated number of Short Grass Prairie Population Canada geese during winter.

The MWS index of SGPP Canada geese in 2007 was 190,500, 19% lower than in 2006 (Fig. 13). These indices have declined an average of 6% per year since 1998 ($P = 0.092$). In 2007, the estimated spring population of SGPP geese in the Northwest Territories (WBPHS strata 13-18) was 181,000 (± 120,400), a 107% increase from 2006 ($P = 0.143$). WBPHS estimates have increased an average of 7% per year since 1998 ($P = 0.039$). Spring break-up was delayed by a much colder than average May in eastern portions of SGP range. Extensive aerial surveys during 21-23 June indicated snow cover near the Queen Maud Gulf and Victoria Island to be about 5% with most lakes and ponds still ice-covered. Nesting phenology in the Queen Maud Gulf Sanctuary was the latest recorded since 1991. Farther west, spring conditions were less adverse. Phenology in coastal Northwest Territories was estimated to be about 1 week later than average, but goose nesting efforts there appeared to be strong. Wetland conditions in the boreal forest nesting areas were assessed as favorable**.** Although specific information is limited at this time, production from SGPP geese is expected to be below average in 2007.

Hi-line Population (HLP): These large Canada geese nest in southeastern Alberta, southwestern Saskatchewan, eastern Montana and Wyoming, and in Colorado. They winter in these states and central New Mexico (Fig. 3).

The 2007 MWS indicated a total of 180,200 HLP Canada geese, 27% fewer than last year's estimate (Fig. 14). The MWS estimates have increased an average of 2% per year since 1998 ($P = 0.549$). The WBPHS yields an estimate of the HLP spring population in Saskatchewan, Alberta, and Montana. The 2007 WBPHS estimate was 298,800 (± 59,900), 43% higher than the 2006 estimate ($P = 0.016$). The WBPHS population estimates have shown no annual trend during 1998-2007 ($P = 0.884$). The state estimate of the HLP breeding population in Wyoming was 21,400, an increase of 13% from 2006. Wetland conditions were fair to good throughout most of HLP range, but cool and wet weather during nesting and hatching may have reduced production in Wyoming and other states. The fall flight of HLP geese is expected to be similar to or slightly above that of 2006.

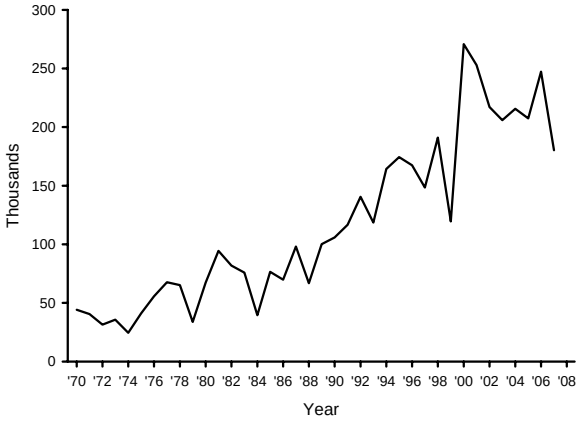


Fig. 14. Estimated number of Hi-line Population Canada geese during winter.

Rocky Mountain Population (RMP): These large Canada geese nest in southern Alberta and western Montana, and the inter-mountain regions of Utah, Idaho, Nevada, Wyoming, and Colorado. They winter mainly in central and southern California, Arizona, Nevada**,** Utah, Idaho, and Montana (Fig. 3).

Spring population estimates from RMP states and provinces in 2007 totaled 142,100, 1% more than in 2006 (Fig. 15). These estimates have decreased an average of 1% per year during the last 10 years (P = 0.480). Population indices in 2007 increased in Alberta, Montana, and Utah, but decreased in Wyoming and Nevada. Wetland conditions in Alberta and Montana improved since 2006 which may increase goose production there. The fall flight of RMP geese is expected to be similar to that of last year.

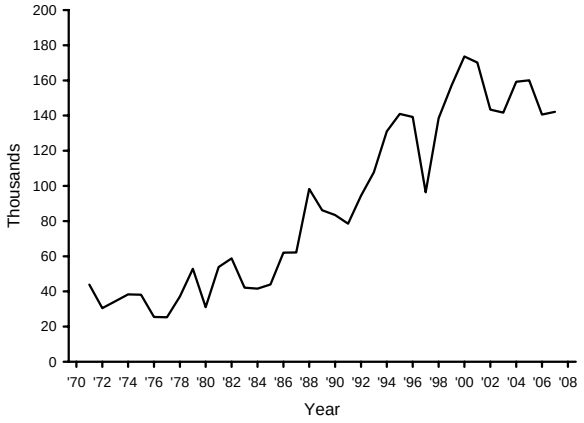


Fig. 15. Estimated number of Rocky Mountain Population Canada geese during spring.

Pacific Population (PP): These large Canada geese nest and winter west of the Rocky Mountains from northern Alberta and British Columbia south through the Pacific Northwest to California (Fig. 3).

Most PP geese are surveyed in Alberta and Oregon. In 2007, survey indices in Alberta (WBPHS strata 76-77) and Oregon were 79,300 (± 30,300) and 50,500 (± 10,500), respectively. These indices represent an increase of 8% (P = 0.821) and 20% (P = 0.203), respectively, from indices in 2006. The 2007 index of statewide nesting effort in Washington declined 13% from the long-term average (since 1974). Indices of breeding effort increased in Nevada in 2007 to well above that of last year and the long-tem average. Breeding effort decreased in California in 2007 from the 2006 level. Habitat conditions were favorable in northern Alberta and abundant rain fell in California, Washington, Oregon, and Nevada this spring. A fall flight larger than that of 2006 is expected.

Dusky Canada Geese (DCG): These mid-sized Canada geese predominantly nest on the Copper River Delta of southeastern Alaska, and winter principally in the Willamette and Lower Columbia River Valleys of Oregon and Washington (Fig. 3).

The official population index of DCG has changed from a wintering mark-resight method to a direct count of geese on DCG breeding areas. The 2007 population estimate was 10,000 DCG, but is not directly comparable with previous indices. Preliminary results from the 2007 spring survey at the Copper River Delta indicate DCG there declined by 18% from 2006. In 2007, the Copper River Delta experienced a cold spring that delayed snowmelt and nesting phenology by about 1 week. The spawning of hooligan (a common prey fish of eagles) was also delayed, which usually results in increased eagle predation of DCG. A fall flight somewhat lower than that of last year is expected.

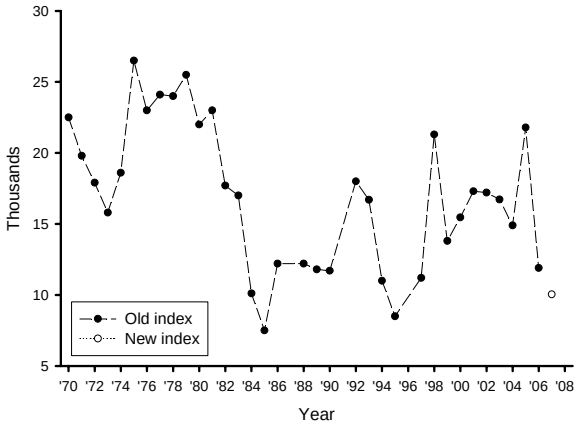


Fig. 16. Estimated number of dusky Canada geese during winter (old index) and during spring (new index).

Cackling Canada Geese: Cackling Canada geese nest on the Yukon-Kuskokwim Delta (YKD) of western Alaska. They primarily winter in the Willamette and Lower Columbia River Valleys of Oregon and Washington (Fig. 3).

Since 1999, the primary index of this population has been an estimate of the fall population derived from the previous spring counts of adults on the YKD. The fall estimate for 2007 is 173,400 geese, 2% higher than that of 2006. These estimates have shown no trend since 1998 (P = 0.940, Fig. 17). Surveys in the coastal zone of the YKD during spring 2007 indicated increases of 8% and 4% in the numbers of indicated pairs and total geese, respectively, from 2006 estimates. Spring snowmelt on the YKD was about 1 week earlier than average and average hatch of cackling geese was about 5 days earlier than average. Yukon Delta nesting surveys indicated that nest density, nest success, and clutch sizes in 2007 were all improved over 2006. Very good production and a fall flight larger than that of last year is expected.

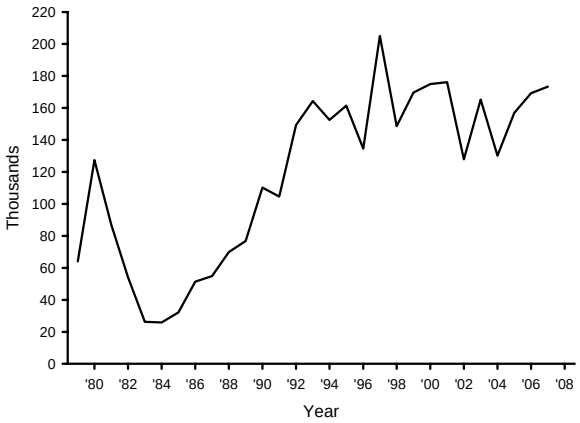


Fig. 17. Number of cackling Canada geese estimated from fall and spring surveys.

Lesser and Taverner's Canada Geese: These subspecies nest throughout much of interior and south-central Alaska and winter in Washington, Oregon, and California (Fig. 3). Taverner's geese are more associated with the North Slope and tundra areas, while lesser Canada geese tend to nest in Alaska's interior. However, these subspecies mix with other Canada geese throughout the year and reliable estimates of separate populations are not presently available.

The 2007 estimate of Canada geese within WBPHS strata predominantly occupied by these subspecies (strata 1-6, 8, 10-12) was 74,400, 21% higher than the 2006 estimate. These estimates have declined an average of 4% per year since 1998 ($P = 0.018$). In Alaska's interior, spring break-up was earlier than average and flooding was minimal. Production of lesser Canada geese in the interior is expected to be good. Spring snowmelt on the North Slope was about 1 week later than average but water levels were average by mid-June. Production of Taverner's geese there is expected to be near average.

Aleutian Canada Geese (ACG): The Aleutian Canada goose was listed as endangered in 1967 (the population numbered approximately 800 birds in 1974) and was de-listed in 2001. These geese now nest primarily on the Aleutian Islands, although historically they nested from near Kodiak Island, Alaska to the Kuril Islands in Asia. They now winter along the Pacific Coast to central California (Fig. 3).

The population estimate for these geese has been based on observations of neck-banded geese in California since 1996. These estimates have been recalculated using new analytical methods. The preliminary population estimate during the winter of 2006-2007 was 118,700 (± 36,600), 13% higher than the previous winter ($P = 0.722$, Fig. 18). These estimates have increased an average of 14% per year during the last 10 winters ($P < 0.001$). A fall flight similar to that of last year is expected.

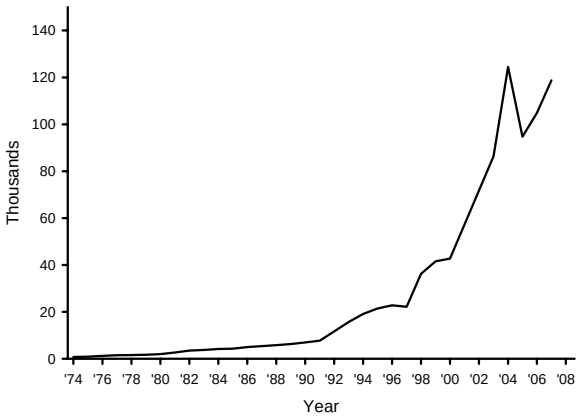


Fig. 18. Number of Aleutian Canada geese estimated from winter estimates and mark-resight methods.

Status of Light Geese

The term light geese refers to both snow geese and Ross' geese (including both white and blue color phases), and the lesser (*C. c. caerulescens)* and greater (*C. c. atlantica*) snow goose subspecies. Another collective term, mid-continent light geese, includes lesser snow and Ross' geese of 2 populations: the Mid-continent Population and the Western Central Flyway Population.

Ross' Geese: Most Ross' geese nest in the Queen Maud Gulf region, but increasing numbers nest along the western coast of Hudson Bay, and Southampton, Baffin, and Banks Islands. Ross' geese are present in the range of 3 different populations of light geese and primarily winter in California, New Mexico, Texas, and Mexico, with increasing numbers in Louisiana and Arkansas (Fig. 19).

Ross' geese are annually surveyed at only 2 of their numerous nesting colonies. More comprehensive aerial photography inventories and groundwork (to identify proportions of snow and Ross' geese within colonies) are conducted periodically. The largest Ross' goose colonies are in the Queen Maud Gulf Sanctuary. Biologists there estimated that 697,700 adult Ross's geese nested at the Karrak Lake colony in 2006, a 27% increase from 2005 and a record high (Fig. 20). These estimates have increased an average of 10% during 1997-2006 ($P < 0.001$). Colony 10, about 60 miles to the east of Karrak Lake, has grown to contain similar or higher numbers of Ross' geese. At the McConnell River colony on the west coast of Hudson Bay in 2007, biologists estimated the presence of 80,000 (± 25,500) nesting

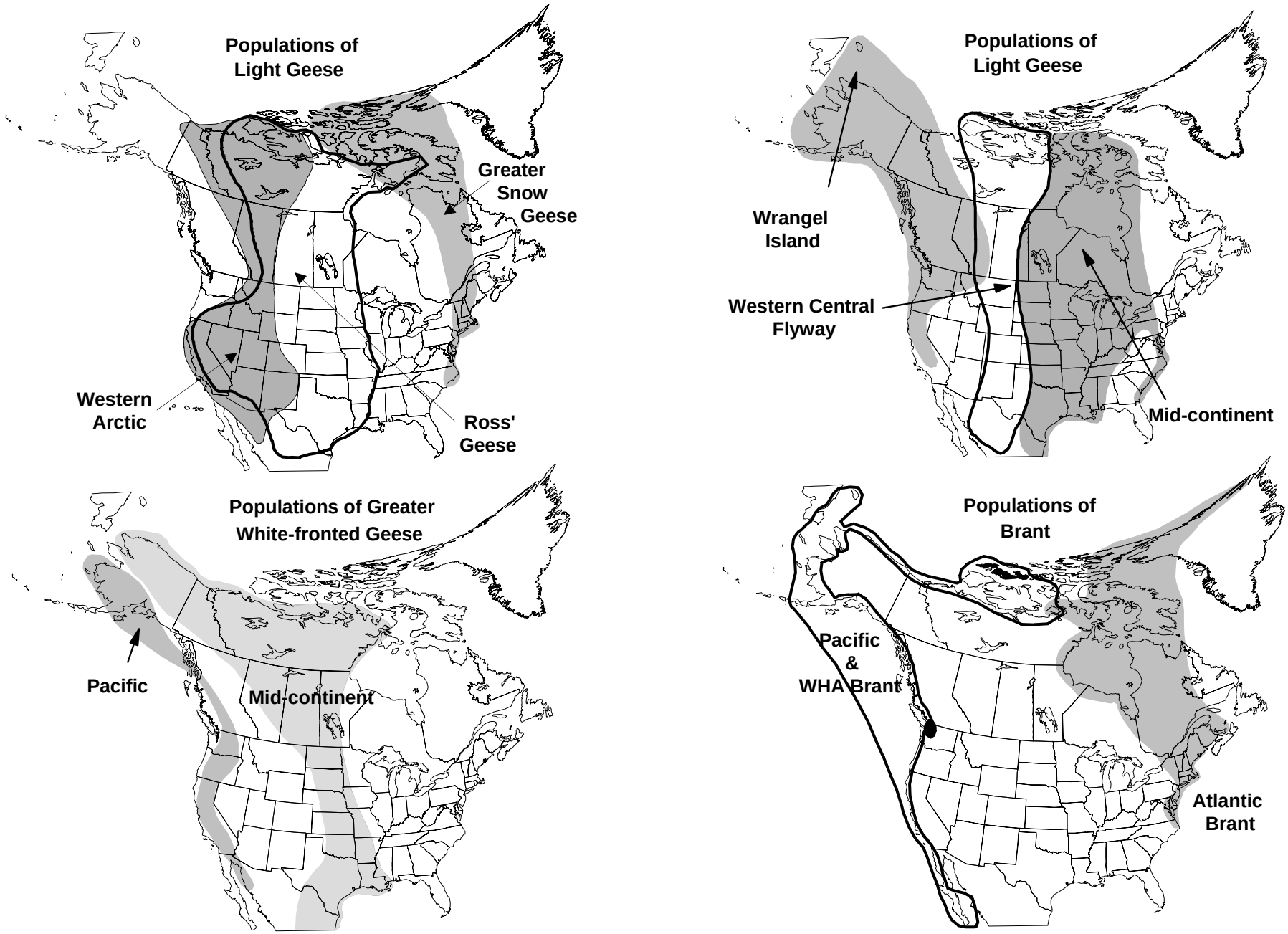


Fig. 19. Approximate ranges of brant and snow, Ross', and white-fronted goose populations in North America.

Ross' geese, about 2% fewer than in 2006. The estimates of Ross' geese at the McConnell have been increasing by 8% per year since 2003 (P = 0.010). A large area of the central and eastern Canadian Arctic experienced a much colder than average May. Persistent snow cover and additional snowfall delayed nesting in the Queen Maud Gulf, McConnell River, Southampton Island, and other areas. Extensive aerial surveys during 17–22 June found the Queen Maud Gulf about 5% snow covered on average, but most lakes and ponds still ice-covered. Mean Ross' goose nest initiation at Karrak Lake was the latest on record since 1991. Although nest success there is expected to be high, overall production will be well below average. Spring break-up was approximately 2 weeks later than the recent average at the McConnell River and contributed to a lower than expected nesting effort there. The widespread harsh conditions this spring will result in poorer than average Ross' goose production.

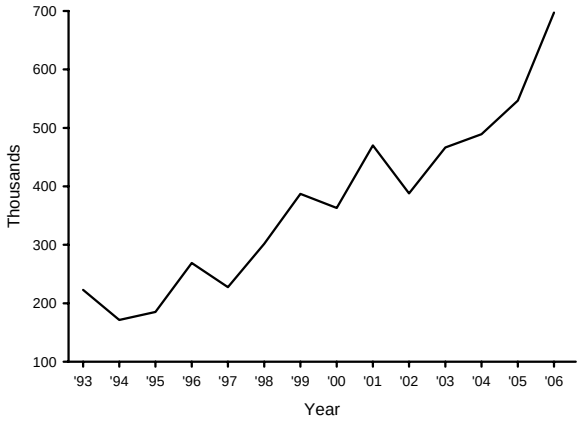


Fig. 20. Estimated number adult Ross' geese nesting at the Karrak Lake colony, Nunavut.

Mid-continent Population Light Geese (MCP): This population includes lesser snow geese and increasing numbers of Ross' geese. Geese of the MCP nest on Baffin and Southampton Islands, with smaller numbers nesting along the west coast of Hudson Bay (Fig. 19). These geese winter primarily in eastern Texas, Louisiana, and Arkansas.

During the 2007 MWS, biologists counted 2,917,100 light geese, 31% more than in 2006, and the second highest level recorded (since 1969, Fig. 21). Winter indices during 1998-2007 indicated no annual trend in this population (P = 0.43). Climate records indicate Baffin and Southampton experienced a much colder than average May in 2007. Biologists on Southampton Island reported heavy spring snowfall and cold temperatures delayed nesting phenology by 2-3 weeks. They believed nesting effort would be depressed there. Local Inuit reported that harvested geese were in poor condition. Spring phenology at smaller colonies on Cape Henrietta Maria and at La Perouse Bay was earlier than average for a third consecutive year. Biologists surveyed the Cape Henrietta Maria colony in 2007 and believed nest numbers were slightly lower than during the last survey in 2005. Production in 2007 will be much lower than in 2006. A smaller fall flight than that of last year is expected.

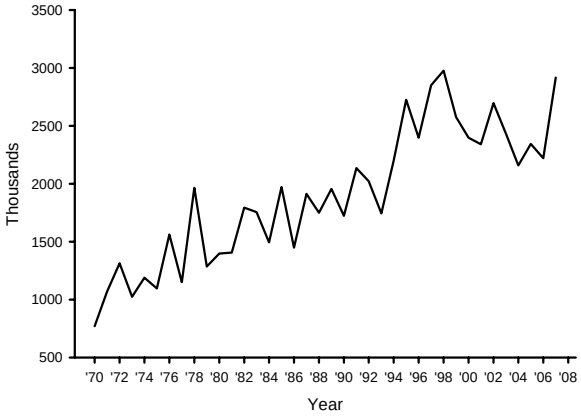


Fig. 21. Estimated number of Mid-continent Population light geese (lesser snow and Ross' geese) during winter.

Western Central Flyway Population (WCFP): This population is composed primarily of snow geese, but includes a substantial proportion of Ross' geese. Geese of the WCFP nest in the central and western Canadian Arctic, with large nesting colonies near the Queen Maud Gulf and on Banks Island. These geese stage during fall in eastern Alberta and western Saskatchewan and concentrate during winter in southeastern Colorado, New Mexico, the Texas Panhandle, and the northern highlands of Mexico (Fig. 19).

WCFP geese wintering in the U.S. portion of their range are surveyed annually, but the entire range, including Mexico, is surveyed only once every 3 years. In the U.S. portion of the survey, 170,600 geese were counted in January 2007, 21% more than in 2006 (Fig. 22). These population indices have increased 1% per year during 1998-2007 (P = 0.728). Spring snowfall and persistent snow cover delayed goose nesting activities in the Queen Maud Gulf. Extensive aerial surveys during 21–23 June indicated snow cover near the Queen Maud Gulf to be about 5%, with most lakes and ponds still ice-covered. Nesting phenology at the Karrak Lake colony in the Queen Maud Gulf was about 8 days later than average, and the latest on record (since 1991). Banks Island experienced more average temperatures than eastern Arctic areas and phenology was thought to be about 1 week later than average. Observers conducting a photoinventory survey on Banks Island reported a good nesting

effort there. Overall, production is expected to be below average for this population.

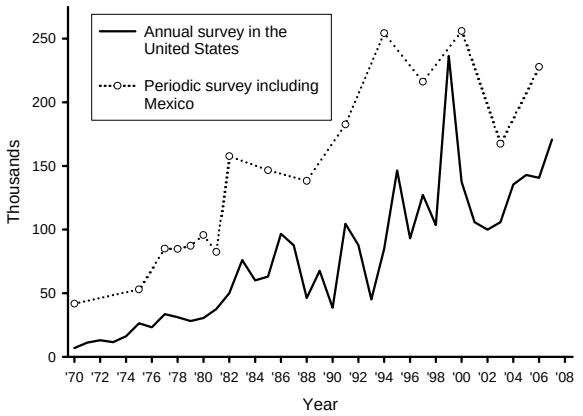


Fig. 22. Estimated number of Western Central Flyway Population light geese counted during winter.

Western Arctic/Wrangel Island Population (WAWI): Most of the snow geese in the Pacific Flyway originate from nesting colonies in the western and central Arctic (WA: Banks Island, the Anderson and Mackenzie River Deltas, and the western Queen Maud Gulf region) or Wrangel Island (WI), located off the northern coast of Russia. The WA segment of the population winters in central and southern California, New Mexico, and Mexico; the WI segment winters in the Puget Sound area of Washington and in northern and central California (Fig. 19). In winter, WA and WI segments commingle with light geese from other populations in California, complicating surveys.

The fall 2006 estimate of WAWI snow geese was 734,400, 3% higher than last year, and near the record high estimated in 2004 (Fig. 23). Fall estimates have increased 7% per year during 1997-2006 (P = 0.005). Nesting phenology on Banks Island was reportedly about 1 week later than average. Observers conducting a photoinventory survey there reported a good nesting effort and production is expected to be at least average. Snow goose nesting effort at the small Anderson River and Kendall Island colonies appeared stronger than the last several years. Goose production near the western Queen Maud Gulf is expected to be below average due to a cold spring and delayed nesting phenology in that region. Nesting conditions at Wrangel Island's Tundra River colony were not as favorable as the last 2 years due to heavy winter snowfall that persisted into May. However, preliminary estimates from Wrangel Island include a spring population of 140,000 adults, the second highest on record (since 1970). Estimates of the Wrangel Island spring population have increased an average of 5% per year since 1998 (P < 0.001). In 2007, biologists estimated the presence of 35,000 nests with an average clutch of 4.0 eggs and nest success of 85%. Biologists expect good production from Wrangel Island and average production from Banks Island in 2007. A cumulative fall flight similar to that of last year is expected.

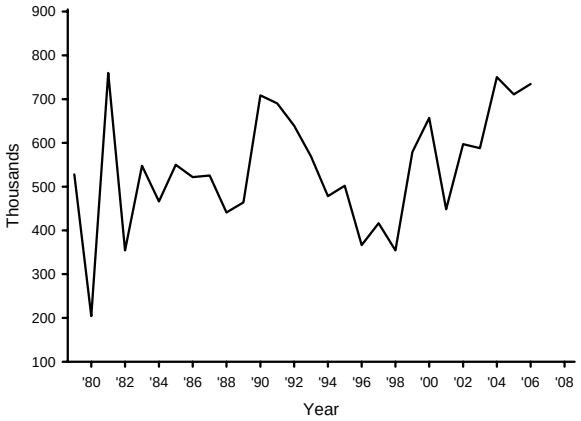


Fig. 23. Estimated number of Western Arctic/Wrangel Island Population light geese during fall.

Greater Snow Geese (GSG): This subspecies principally nests on Bylot, Axel Heiberg, Ellesmere, and Baffin Islands, and on Greenland. These geese winter along the Atlantic coast from New Jersey to North Carolina (Fig. 19).

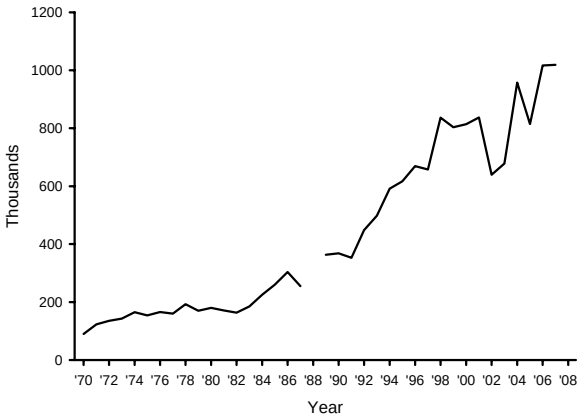


Fig. 24. Estimated number of greater snow geese during spring.

This population is monitored on their spring staging areas near the St. Lawrence Valley in Quebec. Using the same methodology since 2004, the preliminary estimate from spring 2007 was 1,019,000 (± 75,100) geese, 2,000 more than last year's estimate (P = 0.970, Fig. 24). Spring estimates of greater snow geese have increased an average of 2% per year since 1998 (P = 0.179). The number of snow geese counted during the 2007 MWS in the Atlantic Flyway was 490,600, a 28% increase from the previous survey**.** Midwinter counts have increased an average of 2% per year during 1998-2007 (P = 0.353). The largest known greater snow

goose nesting colony is on Bylot Island. In 2007, snowmelt occurred early on Bylot Island but geese arrived much later than average. Goose migration was apparently delayed by retarded snow melt in northern Quebec and Baffin Island. Nest phenology was 4-5 days later than average on Bylot Island, but nesting effort appeared to be strong, and clutch size was slightly higher than the 3.7 egg average. Through mid-incubation stage, the nest predation rate has been moderately low. Moderately good production and a fall flight similar to that of 2006 is expected.

Status of Greater White-fronted Geese

Pacific Population White-fronted Geese (PP): These geese primarily nest on the Yukon-Kuskokwim Delta (YKD) of Alaska and winter in the Central Valley of California (Fig. 19).

The index for this population was a fall estimate from 1979-1998. Since 1999, the index has been a fall population estimate derived from spring surveys of adults on the YKD and Bristol Bay. The 2007 fall estimate is 604,700, 19% higher than the 2006 estimate (Fig. 25**).** These estimates have increased an average of 4% per year since 1998 (P = 0.032). The spring estimate of total PP white-fronted geese in 2006 was 209,200, an increase of 22% from 2006, and a third consecutive record high (1985-2007). Spring snowmelt on the YKD was more than a week earlier than average, and goose nesting phenology was about 5 days ahead of average. The YKD nesting surveys indicated that white-fronted goose nest density, clutch size, and nest success were all above 2006 and the recent 10-year average levels. Good production and a fall flight larger than that of last year is expected.

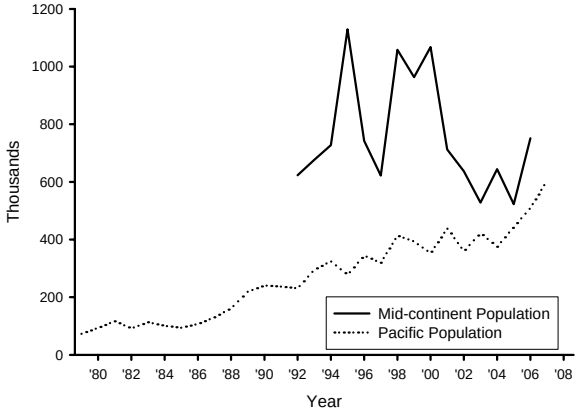


Fig. 25. Estimated number of Mid-continent and Pacific Population greater white-fronted geese during fall.

Mid-continent Population White-fronted Geese (MCP): These white-fronted geese nest across a broad region from central and northwestern Alaska to the central Arctic and the Foxe Basin. They concentrate in southern Saskatchewan during the fall and in Texas, Louisiana, Arkansas, and Mexico during winter (Fig. 19).

During the fall 2006 survey in Saskatchewan and Alberta, biologists counted 751,300 MCP geese, 43% more than the previous year (Fig. 25). During 1997-2006, these estimates have declined an average of 5% per year (P = 0.127). A large area of the central and eastern Canadian Arctic from the Queen Maud Gulf to the Rasmussen Lowlands experienced a much colder than average May. Spring snows and persistent snow cover likely delayed goose nesting activities in the Queen Maud Gulf, Victoria Island, and the Rasmussen Lowlands. Extensive aerial surveys during 19–26 June indicated snow cover near the Queen Maud Gulf and Victoria Island to be about 5%**,** with most lakes and ponds still ice-covered. Nesting phenology in the Queen Maud Gulf (measured at the Karrak Lake colony) was about 8 days later than average, and the latest on record (since 1991). Production there is expected to be below average. Nesting phenology near the Mackenzie River Delta appeared to be about 1 week later than average, but surveys indicated a good nesting effort and production there is expected to be at least average. In Alaska's interior, spring snowmelt was early and timing of goose arrival was near average. The early snowmelt and minimal flooding should contribute to good production there. Spring snowmelt on Alaska's North Slope was about a week later than average but goose production is expected to be near average. Production of MCP white-fronted geese in 2007 is expected to be lower than in 2006 and a fall flight similar to that of last year is expected.

Status of Brant

Atlantic Brant (ATLB): Most of this population nests on islands of the eastern Arctic. These brant winter along the Atlantic Coast from Massachusetts to North Carolina (Fig. 19).

The 2007 MWS estimate of brant in the Atlantic Flyway was 150,600, 3% higher than the 2006 estimate (Fig. 26). These estimates have declined an average of 1% per year during the most recent 10-year period (P = 0.404). Climate records indicate a large area of the central and eastern Canadian Arctic from eastern Victoria Island to Southampton, Baffin, and Devon Islands experienced a much colder than average May. Biologists on Southampton Island reported heavy spring snowfall

and cold temperatures delayed nesting phenology by 2-3 weeks. They believed nesting effort would be depressed in this area. However, spring breakup in important staging areas in James Bay was earlier in 2007 than average. Indications of delayed spring phenology in the eastern Arctic in 2007 suggest that Atlantic brant production will be reduced this year.

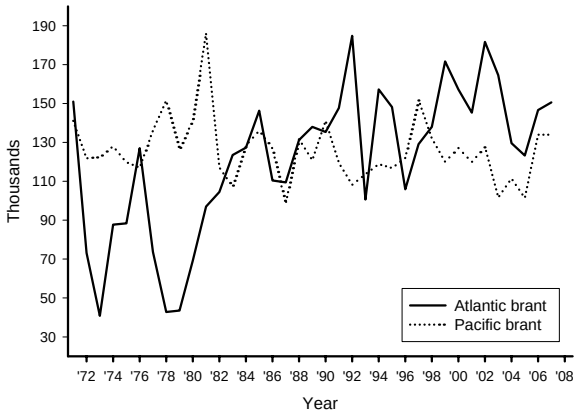


Fig. 26. Estimated number of Atlantic and Pacific Population brant during winter.

Pacific Brant (PACB): These brant nest across Alaska's Yukon-Kuskokwim Delta (YKD) and North Slope, Banks Island, other islands of the western and central Arctic, the Queen Maud Gulf, and Wrangel Island. They winter as far south as Baja California and the west coast of Mexico (Fig. 19).

The 2007 MWS estimate of brant in the Pacific Flyway and Mexico was 133,900, unchanged from the estimate in 2005 (Fig. 26). These estimates have shown no annual trend during 1998-2007 (P = 0.744). Spring breakup on the YKD was more than a week earlier than average, and goose nesting phenology was about 5 days ahead of average. However, production indices at 5 major YKD brant nesting colonies varied from below average (3 colonies) to average (1 colony) to above average (1 colony). Spring phenology was delayed about 1 week on Banks Island, near the Queen Maud Gulf, and on Alaska's North Slope. Climate data indicated colder than average May temperatures on Victoria and Devon Islands. Production of brant from the YKD is expected to be reduced from 2006. The fall flight is expected to be similar to that of last year.

Western High Arctic Brant (WHA): This population of brant nests on the Parry Islands of the Northwest Territories. The population stages in fall at Izembek Lagoon, Alaska. They predominantly winter in Padilla, Samish, and Fidalgo Bays of Washington and near Boundary Bay, British Columbia, although some individuals have been observed as far south as Mexico.

This population is monitored during the MWS in 3 Washington state counties. The 2007 MWS indicated 6,100 brant, 36% fewer than in 2006. These estimates have increased an average of 1% per year during 1998-2007 (P = 0.738). Satellite imagery from Melville, Prince Patrick, and Englinton Islands suggest that production in 2007 will be near average.

Status of Emperor Geese

The breeding range of emperor geese is restricted to coastal areas of the Bering Sea, with the largest concentration on the Yukon-Kuskokwim Delta (YKD) in Alaska. Emperor geese migrate relatively short distances and primarily winter in the Aleutian Islands (Fig. 28). Since 1981, emperor geese have been surveyed annually on spring staging areas in southwestern Alaska.

The spring 2007 emperor goose survey estimate was 77,500 geese, 2% higher than in 2006 (Fig. 27). These estimates have increased an average of 4% per year during 1998-2007 (P = 0.175). Spring indices of breeding pairs from the YKD coastal survey declined 17% from 2006 levels. Spring snowmelt on the YKD was about 1 week earlier than average, and emperor geese nested about 3 days earlier than the long-term average. Indices of emperor goose clutch size and nest success on the YKD appeared to well above average. A fall flight similar to that of 2006 is expected.

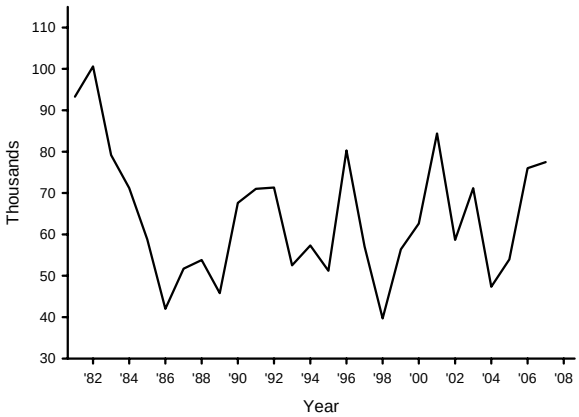


Fig. 27. Estimated numbers of emperor geese present during May surveys.

Status of Tundra Swans

Western Population Tundra Swans: These swans nest along the coastal lowlands of western Alaska, particularly between the Yukon and Kuskokwim Rivers. They winter primarily in California, Utah, and the Pacific Northwest (Fig. 28).

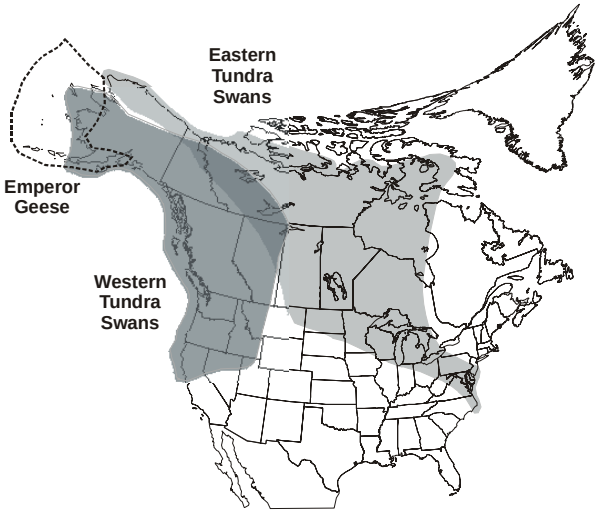


Fig. 28. Approximate range of emperor geese, and eastern and western tundra swan populations in North America.

The 2007 MWS estimate of 109,400 swans was 2% higher than the 2006 estimate (Fig. 29). These estimates have increased by an average of 2% per year during the last 10 years (*P* = 0.375). Spring snowmelt on the YKD was about 1 week earlier later than average**,** and swans nested an average of 3 days early. Surveys in the coastal zone of the YKD during spring 2007 indicated slight decreases in total swans (3%), singles and pairs (8%), and swan nests (4%) from respective estimates in 2006. Clutch sizes and nest success were improved from 2006 levels. Production should be very good on the Delta and a fall flight similar to that of last year is expected.

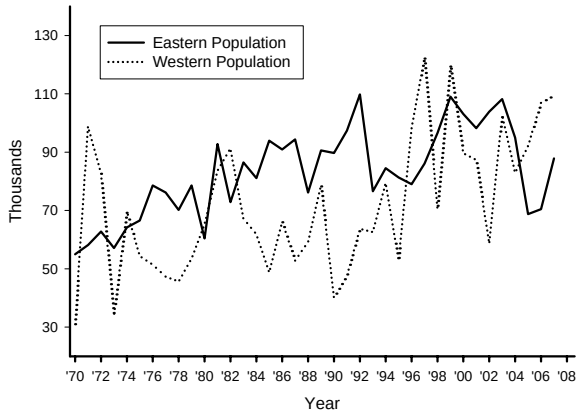


Fig. 29. Estimated numbers of Eastern and Western Population tundra swans during winter.

Eastern Population Tundra Swans: Eastern Population tundra swans nest from the Seward Peninsula of Alaska to the northeast shore of Hudson Bay and Baffin Island. The Mackenzie Delta and adjacent areas are of particular importance. These birds winter in coastal areas from Maryland to North Carolina (Fig. 28).

During the 2007 MWS, 87,800 eastern population tundra swans were observed, 25% more than last year (Fig. 29). These estimates have decreased an average of 4% per year during 1998-2007 (*P* = 0.036). A large area of the central and eastern Canadian Arctic experienced a much colder than average May. Persistent snow and additional storms delayed nesting in the Queen Maud Gulf and Victoria, King William, Southampton, and Baffin Islands. Areas to the west of Victoria Island, including near the Mackenzie Delta and Alaska's North Slope seemed to be less impacted by the cold spring. In the western portion of this population's range, swan production is expected to be near average; in the east production will likely be poor. Overall, production of eastern population tundra swans in 2007 is expected to be below average.

Appendix A. Individuals who supplied information on the status of ducks.

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

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 P. Yakupzack

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

Air	E. Huggins and J. Mitchell
Ground	J. Leafloor [a], F. Baldwin [a], K. Froggatt [b], E. Hofman [b], M. Barr [c], D. Chambers [c], N. Clements [a], C. Downie [a], T. Gunderson [a], S. Leach [a], T. Matthews [c], I. McFarlane [c], B. Peers [c], J. Pierce [c], C. Twerdoclib [a], and N. Wiebe [a]

Southern Saskatchewan (Strata 30-35):

Air	P. Thorpe, T. Lewis, B. Larned, and G. Zimmerman
Ground	D. Nieman [a], K. Dufour [a], K. Warner [a], A. Williams [a], D. Caswell [a], M. Schuster [a], G. Ball [b], J. Caswell [c], P. Rakowski [a], B, Bartzen [a], L. Brennan [c], A. Crosby [a], P. Nieman [a], D. Paslowski [a], L. Sitter [a], K. Wilkins, N. Astleford [a], M. Gillespie [b], C. Meuckon [a], D. Routhier [a], and D. Walker [a]

Southern Manitoba (Strata 25 and 36-40):

Air	B. Larned and G. Zimmerman
Ground	D. Caswell [a], M. Schuster [a], G. Ball [b], J. Caswell [c], P. Rakowski [a], N. Astleford [a], M. Gillespie [b], C. Meuckon [a], D. Routhier [a], and D. Walker [a]

Montana and Western Dakotas (Strata 41-44):

Air	R. Bentley and P. Fasbender
Ground	P. Garrettson, K. Fleming, and E. Silverman

Eastern Dakotas (Strata 45-49):

Air	J. Solberg and R. Cox [d]
Ground	K. Kruse, S. Beauchaine, J. Gleason, M. Grovijahn [b], and J. Hoskins

Western Ontario and Central Quebec (Strata 50, 68-70):

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

Central and Eastern Ontario, Hudson and James Bay Lowlands of Ontario, and Southern Quebec (Strata 51-54, 56-59):
M. Koneff, D. Forsell, and R. Raftovich

Maine and Maritimes (Strata 62-67, 70): J. Bidwell and J. Goldsberry [d]

Canadian Wildlife Service helicopter plot survey
Quebec: D. Bordage [a], C. Lepage [a], and S. Orichefsky [a]
Ontario: R. Ross [a], D. Fillman [a], D. McNicol [a], and J. Bionda [d]
New Brunswick and Nova Scotia: B. Pollard [a]
Labrador and Newfoundland: S. Gilliland [a]

California:

Air	D. Yparraguirre [b], M. Weaver [b], and S. Oldenburger [b]
Ground	D. Loughman [d] and J. Laughlin [d]

Michigan: D. Luukkonen [b], B. Barlow [b], S. Chadwick [b], K. Cleveland [b], E. Dunton [b], E. Flegler [b], C. Hanaburgh [b], A. Karr [b], J. Kleitch [b], T. Maples [b], T. McFadden [b], J. Niewoonder [b], and J. Robison [b]

Minnesota:

Air	T. Pfingsten [b] and S. Cordts [b]
Ground	S. Kelly, W. Brininger, J. Holler, J. Kelley, D. Hertel, R. Papasso, T. Rondeau, S. Zodrow, K. Bousquet, L. Deede, D. Johnson, and M, Hanan

Nebraska: M. Vrtiska [b]

Northeastern U.S.:

Data Analysis	R. Raftovich
Connecticut	M. Huang [b] and K. Kubik [b]
Delaware	No survey
Maryland	L. Hindman [b], B. Martin [b], D. Brinker [b], T. Decker [b], B. Evans [b], C. Harris [b], D. Heilmeier [b], R. Hill [b], B. Joyce [b], R. Norris [b], D. Price [b], G. Timko [b], and D. Webster [b]
Massachusetts	Massachusetts Division of Fisheries and Wildlife personnel and cooperators.
New Hampshire	E. Robinson [b], K. Bordeau [b], J. Kelley [b], E. Orff [b], K. Rhines [b], J. Robinson [b], W. Staats [b], A. Timmins [b], and T. Walski [b]
New Jersey	T. Nichols [b], P. Castelli [b], A. Burnett [b], M. DeLeeuw [b], A. Dubour [b], J. Garris [b], B. Kirkpatrick [b], K. Korth [b], S. Petzinger [b], J. Powers [b], S. Predl [b], L. Widjeskog [b], and D. Wilkinson [b]
New York	Staff of New York Department of Environmental Conservation
Pennsylvania	Biologists from the Research Division of the Bureau of Wildlife Management and Pennsylvania Game Commission Region Biologists
Rhode Island	J. Osenkowski [b], L. Gibson [b], B. Teft [b], and C, Brown [b]
Vermont	B. Crenshaw [b], M. Adler [b], T. Appleton [b], J. Austin [b], J. Buck [b], J. Gobeille [b], F. Hammond [b], J. Mlcuch [b], K. Royar [b], D. Sausville [b], and R. Smith [b]
Virginia	G. Costanzo [b] and T. Bidrowski [b]

Nevada: C. Mortimore [b] and K. Neill [b]

Oregon: B. Bales [b], T. Collom [b], J. Journey [b], M. Kirsch [b], R. Klus [b], E. Miguez [b], B. Reishus [b], N. Saake [d], M. St. Louis [b], and Brim Aviation [d]

Washington: M. Moore [b], D. Base [b], J. Bernatowicz [b], J. Cotton [b], H. Ferguson [b], S. FItkin [b], R. Finger [b], P. Fowler [b], T. Hames [b], J. Heinlen [b], E. Krausz [b], M. Livingston [b], T. McCall [b], W. Moore [b], J. Tabor [b], and D. Volsen [b]

Wisconsin:

Air	D. Cardinal [b], P. Beringer [b], C. Cold [b], B. Glenzinski [b], C. Milestone [b], M. Weinfurter [b], and L. Wuest [b]
Ground	T. Aldred [b], K. Benton [b], J. Carstens [b], M. Cipiti, [b] C. Cole [b], J. Curry [b], P. David [d], G. Dunsmoor [b], B. Folley [b] H. Halverson [b], B. Hill [b], J. Huff [b], T. Issendorf [b], A. Kitchen, S. Krultz [b], R. Krueger, S, Krueger, J. Lutes, D. Matheys [b], R. McDonough [b], C. Mogen [b], K. Morgan [b], K. Morgan [d], D. North [b], S. Otto, J. Pritzl [b], J. Robaidek [b], J. Ruwaldt, M. Streblow [d], K. Van Horn [b], G. Van Vreede, M. Windsor [b], and D. Wyman [b]

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

[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

Appendix B. Individuals who supplied information on the status of geese and swans.

Flyway-wide and Regional Survey Reports: K. Bollinger, D. Caswell[a], B. Conant, W. Eldridge, J. Fischer, D. Fronczak, J. Gleason, J. Kelley, K. Kruse, J. Leafloor[a], R. Oates, M. Otto, P. Padding, R. Raftovich, E. Reed[a], D. Sharp, and R. Trost

Information from the Breeding Population and Habitat Survey: see Appendix A

North Atlantic Population of Canada Geese: J. Bidwell, and S. Gilliland[a]

Atlantic Population of Canada Geese: J. Bidwell, P. Castelli[b], R. Cotter[a], W. Harvey[b], L. Hindman[b], J. Lefebvre[a], and P. May[d]

Atlantic Flyway Resident Population of Canada Geese: P. Castelli[b], G. Costanzo[b], W. Crenshaw[b], J. Dunn[b], H. Heusmann[b], L. Hindman[b], M. Huang[b], K. Jacobs[b], J. Osenkowski[b], R. Raftovich, E. Robinson[b], and T. Whittendale[b]

Southern James Bay Population of Canada Geese: K. Abraham[b], R. Brook[b], J. Hughes[a], and M. Koneff

Mississippi Valley Population of Canada Geese: K. Abraham[b], R. Brook[b], J. Hughes[a], and M. Koneff

Mississippi Flyway Population Giant Canada Geese: K. Abraham[b], D. Graber[b], M. Gillespie[b], R. Helm[b], J. Hopper[b], J. Hughes[a], D. Luukkonen[b], R. Marshalla[b], S. Maxson[b], A. Phelps[b], R. Pritchert[b], M. Shieldcastle[b], K. Van Horn[b], and G. Zenner[b]

Eastern Prairie Population of Canada Geese: D. Andersen[d], M. Gillespie[b], B. Lubinski, A. Raedeke[b], M. Reiter[d], and J. Wollenberg[b]

Western Prairie and Great Plains Populations of Canada Geese: M. Johnson[b], R. King, M. Kraft[b], D. Nieman[a], M. O'Meilia[b], F. Roetker, J. Solberg, P. Thorpe, S. Vaa[b], M. Vritiska[b]

Tall Grass Prairie Population of Canada Geese: R. Alisauskas[a], J. Caswell[d], G. Gilchrist[a], D. Groves, R. Macdonald, E. Mallek, and T. Moser

Short Grass Prairie Population of Canada Geese: R. Alisauskas[a], D. Benning, J-F Dufour[a], C. Ferguson, D. Groves, J. Hines[a], R. Macdonald, E. Mallek, and T. Moser

Hi-Line Population of Canada Geese: R. Bentley, J. Dubovsky, J. Gammonley[b], J. Hansen[b], E. Huggins, D. Nieman[a], L. Roberts[b], and P. Thorpe

Rocky Mountain Population of Canada Geese: T. Aldrich[b], R. Bentley, J. Bohne[b], J. Dubovsky, E. Huggins, C. Mortimore[b], R. Northrup[b], L. Roberts[b], J. Gammonley[b], and D. Yparraguirre[b]

Pacific Population of Canada Geese: A. Breault[a], B. Bales[b], C. Ferguson, T. Hemker[b], E. Huggins, D. Kraege[b], C. Mortimore[b], R. Northrup[b], B. Reishus[b], M. Weaver[b], and D. Yparraguirre[b]

Dusky Canada Geese: B. Eldridge, B. Larned, D. Logan[d], P. Meyers[d], and T. Rothe[b]

Lesser and Taverner's Canada Geese: C. Dau, B. Larned, E. Mallek, R. Platte, and R. Platte

Cackling Canada Geese: M. Anthony[d], C. Dau, B. Eldridge, and M. Wege

Aleutian Canada Geese: V. Byrd and T. Sanders

Greater Snow Geese: J. Lefebvre[a], G. Gauthier[d], and A. Reed[a]

Mid-continent Population Light Geese: K. Abraham[b], R. Brook[b], J. Caswell[d], G. Gilchrist[a], B. Lubinski, A. Raedeke[b], R. Rockwell[d], and J. Wollenberg[b]

Western Central Flyway Population Light Geese: R. Alisauskas[a], J. Hines[a], K. Kraai[a], K. Kruse, T. Moser, and P. Thorpe

Appendix B. Continued.

Western Arctic/Wrangel Island Population of Lesser Snow Geese: V. Baranuk[d], S. Boyd[a], J. Hines[a], and D. Kraege[b]

Ross' Geese: R. Alisauskas[a], J. Caswell[d], J. Leafloor[a], and P. Thorpe

Pacific Population White-Fronted Geese: C. Dau, B. Eldridge, D. Groves, and R. Platte

Mid-continent Population White-fronted Geese: R. Alisauskas[a], J-F Dufour[a], D. Groves, J. Hines[a], S. Kovach, B. Larned, D. Lobpries[b], N. Lyman[b], R. Macdonald, E. Mallek, D. Nieman[a], F. Roetker, J. Smith[a], J. Solberg, M. Spindler, R. Walters[b], and K. Warner[a]

Pacific Brant: M. Anthony[d], B. Eldridge, and R. King

Atlantic Brant: I. Butler[d], and G. Gilchrist[a]

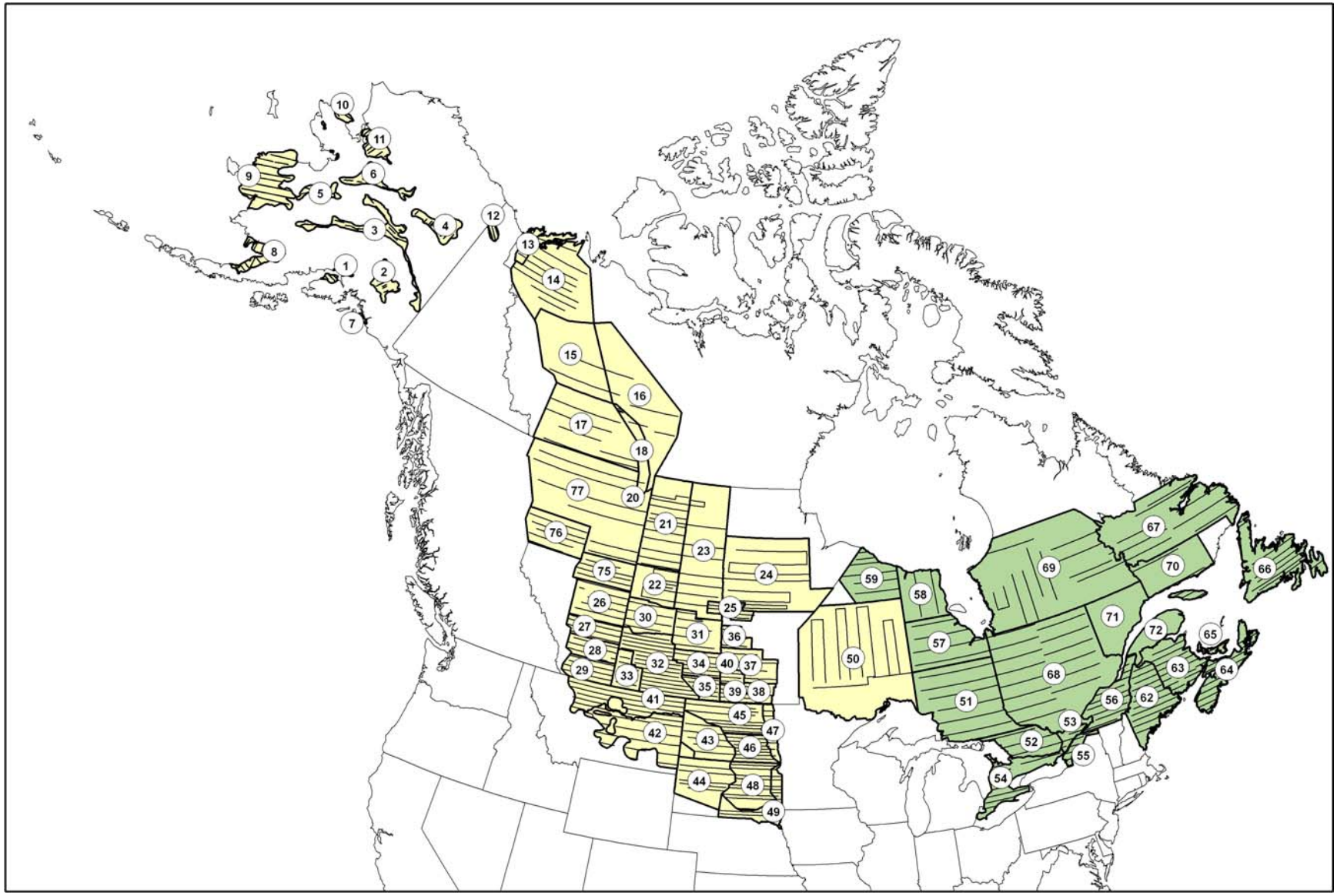
Western High Arctic Brant: D. Kraege[b]

Emperor Geese: C. Dau, B. Eldridge, R. King, and E. Mallek

Western Population of Tundra Swans: C. Dau, and B. Eldridge

Eastern Population of Tundra Swans: C. Dau, J. Hines[a], B. Larned, and E. Mallek

[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.



Appendix C. Strata and transects of the Waterfowl Breeding Population and Habitat Survey (yellow = traditional survey area, green = eastern survey area).

Appendix D. Estimated number of May ponds and standard errors (in thousands) in portions of Prairie Canada and the northcentral U.S.

	Prairie Canada		Northcentral U.S. [a]		Total	
Year	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$
1961	1977.2	165.4				
1962	2369.1	184.6				
1963	2482.0	129.3				
1964	3370.7	173.0				
1965	4378.8	212.2				
1966	4554.5	229.3				
1967	4691.2	272.1				
1968	1985.7	120.2				
1969	3547.6	221.9				
1970	4875.0	251.2				
1971	4053.4	200.4				
1972	4009.2	250.9				
1973	2949.5	197.6				
1974	6390.1	308.3	1840.8	197.2	8230.9	366.0
1975	5320.1	271.3	1910.8	116.1	7230.9	295.1
1976	4598.8	197.1	1391.5	99.2	5990.3	220.7
1977	2277.9	120.7	771.1	51.1	3049.1	131.1
1978	3622.1	158.0	1590.4	81.7	5212.4	177.9
1979	4858.9	252.0	1522.2	70.9	6381.1	261.8
1980	2140.9	107.7	761.4	35.8	2902.3	113.5
1981	1443.0	75.3	682.8	34.0	2125.8	82.6
1982	3184.9	178.6	1458.0	86.4	4642.8	198.4
1983	3905.7	208.2	1259.2	68.7	5164.9	219.2
1984	2473.1	196.6	1766.2	90.8	4239.3	216.5
1985	4283.1	244.1	1326.9	74.0	5610.0	255.1
1986	4024.7	174.4	1734.8	74.4	5759.5	189.6
1987	2523.7	131.0	1347.8	46.8	3871.5	139.1
1988	2110.1	132.4	790.7	39.4	2900.8	138.1
1989	1692.7	89.1	1289.9	61.7	2982.7	108.4
1990	2817.3	138.3	691.2	45.9	3508.5	145.7
1991	2493.9	110.2	706.1	33.6	3200.0	115.2
1992	2783.9	141.6	825.0	30.8	3608.9	144.9
1993	2261.1	94.0	1350.6	57.1	3611.7	110.0
1994	3769.1	173.9	2215.6	88.8	5984.8	195.3
1995	3892.5	223.8	2442.9	106.8	6335.4	248.0
1996	5002.6	184.9	2479.7	135.3	7482.2	229.1
1997	5061.0	180.3	2397.2	94.4	7458.2	203.5
1998	2521.7	133.8	2065.3	89.2	4586.9	160.8
1999	3862.0	157.2	2842.3	256.8	6704.3	301.1
2000	2422.2	96.1	1524.5	99.9	3946.9	138.6
2001	2747.2	115.6	1893.2	91.5	4640.4	147.4
2002	1439.0	105.0	1281.1	63.4	2720.0	122.7
2003	3522.3	151.8	1667.8	67.4	5190.1	166.1
2004	2512.6	131.0	1407.0	101.7	3919.6	165.8
2005	3920.5	196.7	1460.7	79.7	5381.2	212.2
2006	4449.5	221.5	1644.4	85.4	6093.9	237.4
2007	5040.0	261.8	1962.5	102.5	7002.7	281.2

[a] No comparable survey data available for the northcentral U.S. during 1961-73.

Appendix E. Breeding population estimates (in thousands) for total ducks[a] and mallards for states, provinces, or regions that conduct spring surveys.

	British Columbia[b]		California		Michigan		Minnesota		Nebraska	
Year	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards
1955									101.5	32.0
1956									94.9	25.8
1957									154.8	26.8
1958									176.4	28.1
1959									99.7	12.1
1960									143.6	21.6
1961									141.8	43.3
1962									68.9	35.8
1963									114.9	37.4
1964									124.8	66.8
1965									52.9	20.8
1966									118.8	36.0
1967									96.2	27.6
1968							368.5	83.7	96.5	24.1
1969							345.3	88.8	100.6	26.7
1970							343.8	113.9	112.4	24.5
1971							286.9	78.5	96.0	22.3
1972							237.6	62.2	91.7	15.2
1973							415.6	99.8	85.5	19.0
1974							332.8	72.8	67.4	19.5
1975							503.3	175.8	62.6	14.8
1976							759.4	117.8	87.2	20.1
1977							536.6	134.2	152.4	24.1
1978							511.3	146.8	126.0	29.0
1979							901.4	158.7	143.8	33.6
1980							740.7	172.0	133.4	37.3
1981							515.2	154.8	66.2	19.4
1982							558.4	120.5	73.2	22.3
1983							394.2	155.8	141.6	32.2
1984							563.8	188.1	154.1	36.1
1985							580.3	216.9	75.4	28.4
1986							537.5	233.6	69.5	15.1
1987	2.7	0.2					614.9	192.3	120.5	41.7
1988	4.9	0.6					752.8	271.7	126.5	27.8
1989	4.6	0.5					1021.6	273.0	136.7	18.7
1990	4.7	0.5					886.8	232.1	81.4	14.7
1991	5.9	0.6					868.2	225.0	126.3	26.0
1992	6.2	0.6	497.4	375.8	665.8	384.0	1127.3	360.9	63.4	24.4
1993	5.7	0.5	666.7	359.0	813.5	454.3	875.9	305.8	92.8	23.8
1994	6.6	0.6	483.2	311.7	848.3	440.6	1320.1	426.5	118.9	17.5
1995	6.5	0.8	589.7	368.5	812.6	559.8	912.2	319.4	142.9	42.0
1996	6.4	0.5	843.7	536.7	790.2	395.8	1062.4	314.8	132.3	38.9
1997	5.7	0.5	824.3	511.3	886.3	489.3	953.0	407.4	128.3	26.1
1998	7.3	0.9	706.8	353.9	1305.2	567.1	739.6	368.5	155.7	43.4
1999	8.5	0.9	851.0	560.1	824.8	494.3	716.5	316.4	251.2	81.1
2000	8.2	0.8	562.4	347.6	1121.7	462.8	815.3	318.1	178.8	54.3
2001	7.8	0.8	413.5	302.2	673.5	358.2	761.3	320.6	225.3	69.2
2002	9.0	0.6	392.0	265.3	997.3	336.8	1224.1	366.6	141.8	50.6
2003	8.6	0.6	533.7	337.1	587.2	294.1	748.9	280.5	96.7	32.9
2004	6.6	0.6	412.8	262.4	701.9	328.8	1099.3	375.3	69.9	23.2
2005	5.6	0.5	615.2	317.9	442.6	238.5	681.3	238.5	117.1	29.3
2006	7.8	0.4	649.4	399.4	353.5	207.8	529.4	160.7		
2007			627.6	388.3	685.2	293.2	495.6	242.5		

[a] Species composition for the total duck estimate varies by region.
[b] Index to waterfowl use in prime waterfowl producing areas of the province.

Appendix E. Continued.

	Nevada		Northeastern U.S. [c]		Oregon		Washington		Wisconsin	
Year	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards
1955										
1956										
1957										
1958										
1959	14.2	2.1								
1960	14.1	2.1								
1961	13.5	2.0								
1962	13.8	1.7								
1963	23.8	2.2								
1964	23.5	3.0								
1965	29.3	3.5								
1966	25.7	3.4								
1967	11.4	1.5								
1968	10.5	1.2								
1969	18.2	1.4								
1970	19.6	1.5								
1971	18.3	1.1								
1972	19.0	0.9								
1973	20.7	0.7							412.7[f]	107.0
1974	17.1	0.7							435.2	94.3
1975	14.5	0.6							426.9	120.5
1976	13.6	0.6							379.5	109.9
1977	16.5	1.0							323.3	91.7
1978	11.1	0.6							271.3	61.6
1979	12.8	0.6					98.6	32.1	265.7	78.6
1980	16.6	0.9					113.7	34.1	248.1	116.5
1981	26.9	1.6					148.3	41.8	505.0	142.8
1982	21.0	1.1					146.4	49.8	218.7	89.5
1983	24.3	1.5					149.5	47.6	202.3	119.5
1984	24.0	1.4					196.3	59.3	210.0	104.8
1985	24.9	1.5					216.2	63.1	192.8	73.9
1986	26.4	1.3					203.8	60.8	262.0	110.8
1987	33.4	1.5					183.6	58.3	389.8	136.9
1988	31.7	1.3					241.8	67.2	287.1	148.9
1989	18.8	1.3					162.3	49.8	462.5	180.7
1990	22.2	1.3					168.9	56.9	328.6	151.4
1991	14.6	1.4					140.8	43.7	435.8	172.4
1992	12.4	0.9					116.3	41.0	683.8	249.7
1993	14.1	1.2	1158.1	686.6			149.8	55.0	379.4	174.5
1994	19.2	1.4	1297.3	856.3	335.6	124.1	123.9	52.7	571.2	283.4
1995	17.9	1.0	1408.5	864.1	227.3	85.3	147.3	58.9	592.4	242.2
1996	26.4	1.7	1430.9	848.6	298.0	107.8	163.3	61.6	536.3	314.4
1997	25.3	2.5	1423.5	795.2	370.3	127.3	172.8	67.0	409.3	181.0
1998	27.9	2.1	1444.0	775.2	357.0	132.3	185.3	79.0	412.8	186.9
1999	29.9	2.3	1522.7	880.0	333.4	133.1	200.2	86.2	476.6	248.4
2000	26.1	2.1	1933.5	762.6	324.0	115.9	143.6	47.7	744.4	454.0
2001	22.2	2.0	1397.4	809.4			146.4	50.5	440.1	183.5
2002	11.7	0.7	1466.2	833.7	275.3	111.7	133.3	44.7	740.8	378.5
2003	21.1	1.7	1266.2	731.9	258.7	96.9	127.8	39.8	533.5	261.3
2004	12.0	1.7	1416.9	805.9	245.0	91.9	114.9	40.0	651.5	229.2
2005	10.7	0.7	1416.2	753.6	225.3	83.0	111.5	40.8	724.3	317.2
2006	13.0	0.9	1392.1	725.2	263.5	87.9	135.4	45.5	522.6	219.5
2007	14.5	1.5	1500.4	687.6	335.4	101.0	128.3	46.1	470.6	210.2

[c] Includes all or portions of Connecticut, Delaware, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia.

Appendix F. 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
2007	8307.3	285.8	3355.9	206.2	2806.8	152	2890.3	196.1	6707.6	362.2

Appendix F (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
2007	4552.8	247.5	3335.3	160.4	1009.0	84.7	864.9	86.2	3452.2	195.3

Appendix G. Total breeding duck estimates for the traditional survey area, in thousands.

	Traditional survey area [a]	
Year	$\hat{N}$	$\hat{SE}$
1955	39,603.6	1,264.0
1956	42,035.2	1,177.3
1957	34,197.1	1,016.6
1958	36,528.1	1,013.6
1959	40,089.9	1,103.6
1960	32,080.5	876.8
1961	29,829.0	1,009.0
1962	25,038.9	740.6
1963	27,609.5	736.6
1964	27,768.8	827.5
1965	25,903.1	694.4
1966	30,574.2	689.5
1967	32,688.6	796.1
1968	28,971.2	789.4
1969	33,760.9	674.6
1970	39,676.3	1,008.1
1971	36,905.1	821.8
1972	40,748.0	987.1
1973	32,573.9	805.3
1974	35,422.5	819.5
1975	37,792.8	836.2
1976	34,342.3	707.8
1977	32,049.0	743.8
1978	35,505.6	745.4
1979	38,622.0	843.4
1980	36,224.4	737.9
1981	32,267.3	734.9
1982	30,784.0	678.8
1983	32,635.2	725.8
1984	31,004.9	716.5
1985	25,638.3	574.9
1986	29,092.8	609.3
1987	27,412.1	562.1
1988	27,361.7	660.8
1989	25,112.8	555.4
1990	25,079.2	539.9
1991	26,605.6	588.7
1992	29,417.9	605.6
1993	26,312.4	493.9
1994	32,523.5	598.2
1995	35,869.6	629.4
1996	37,753.0	779.6
1997	42,556.3	718.9
1998	39,081.9	652.0
1999	43,435.8	733.9
2000	41,838.3	740.2
2001	36,177.5	633.1
2002	31,181.1	547.8
2003	36,225.1	664.7
2004	32,164.0	579.8
2005	31,734.9	555.2
2006	36,160.3	614.4
2007	41,172.2	724.8

[a] Total ducks in the traditional survey area include species in Appx. F plus black duck, ring-necked duck, goldeneyes, bufflehead, and ruddy duck.

Appendix H. Breeding population estimates and 90% confidence intervals or credibility intervals (CIs; in thousands) for the 10 most abundant species of ducks in the eastern survey area, 1990-2007 [a].

	Mergansers [b]		Mallard		American black duck		American wigeon		Green-winged teal	
Year	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI
1990	272.3	(237.1, 307.5)	337.3	(217.7, 577.7)	431.3	(383.3, 489.0)	13.5	(4.0, 23.0)	230.4	(180.4, 302.3)
1991	392.2	(347.5, 436.9)	383.2	(248.2, 645.1)	425.0	(374.4, 488.5)	15.2	(5.0, 25.4)	218.9	(171.0, 290.2)
1992	303.2	(274.1, 332.3)	384.5	(247.7, 652.7)	408.8	(361.5, 465.7)	5.1	(1.5, 8.7)	210.9	(163.8, 279.7)
1993	254.7	(219.4, 290.0)	386.2	(249.3, 654.4)	407.1	(357.8, 465.5)	10.4	(4.9, 15.9)	190.6	(146.1, 254.3)
1994	333.4	(289.5, 377.3)	405.5	(261.4, 683.2)	376.3	(329.4, 431.4)	10.2	(4.1, 16.3)	200.3	(154.6, 268.2)
1995	304.8	(264.2, 345.4)	335.2	(213.8, 580.1)	428.7	(374.6, 491.8)	9.5	(0.3, 18.7)	203.5	(155.9, 273.8)
1996	271.6	(246.1, 297.1)	360.6	(231.2, 617.4)	499.2	(446.4, 562.1)	10.0	(5.1, 14.9)	265.6	(210.5, 347.7)
1997	334.0	(298.7, 369.3)	381.5	(244.6, 651.8)	454.9	(407.1, 510.8)	18.2	(11.9, 24.5)	208.6	(164.3, 272.2)
1998	223.1	(200.8, 245.4)	421.8	(273.6, 702.5)	486.4	(436.8, 545.0)	58.2	(29.8, 86.6)	199.4	(158.2, 257.1)
1999	313.4	(277.0, 349.8)	430.8	(281.6, 712.7)	537.5	(482.5, 603.5)	14.0	(10.9, 17.1)	230.7	(181.6, 303.4)
2000	346.7	(313.5, 379.9)	382.8	(250.1, 644.6)	507.3	(453.9, 568.5)	38.1	(13.0, 63.2)	262.4	(210.0, 336.9)
2001	294.7	(260.3, 329.1)	419.4	(276.3, 698.7)	473.9	(424.9, 531.2)	43.9	(28.8, 59.0)	216.1	(171.2, 280.5)
2002	449.4	(397.8, 501.0)	410.5	(269.9, 684.0)	527.2	(473.6, 591.0)	13.1	(6.6, 19.6)	253.9	(201.3, 333.3)
2003	391.1	(350.4, 431.8)	429.8	(280.0, 720.9)	475.1	(426.4, 532.5)	11.6	(5.2, 18.0)	243.7	(192.5, 318.1)
2004	404.3	(359.0, 449.6)	455.7	(300.2, 752.1)	489.5	(438.9, 548.7)	22.8	(13.7, 31.9)	277.4	(218.7, 365.4)
2005	365.5	(326.6, 404.4)	441.4	(285.0, 739.4)	473.3	(424.2, 532.3)	31.2	(20.6, 41.8)	225.9	(179.4, 293.4)
2006	315.5	(282.7, 348.3)	405.1	(267.5, 675.0)	499.0	(446.7, 559.4)	11.5	(6.6, 16.4)	229.4	(181.6, 297.5)
2007	400.1	(359.7, 440.5)	442.8	(289.3, 738.0)	568.7	(507.4, 642.1)	14.0	(7.0, 21.0)	254.1	(201.9, 328.9)

	Scaup [c]		Ring-necked duck		Goldeneyes [d]		Bufflehead		Scoters [e]	
Year	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI
1990	49.8	(13.4, 86.2)	540.0	(423.7, 709.3)	283.1	(169.1, 397.1)	35.5	(26.0, 45.0)	99.5	(21.5, 177.5)
1991	37.6	(20.7, 54.5)	474.7	(374.6, 621.6)	292.6	(194.3, 390.9)	28.4	(17.9, 38.9)	89.8	(39.0, 140.6)
1992	36.7	(11.0, 62.4)	481.5	(381.2, 628.3)	294.1	(204.0, 384.2)	45.3	(31.3, 59.3)	85.2	(2.9, 167.5)
1993	10.6	(4.8, 16.4)	436.9	(344.5, 568.8)	300.9	(179.4, 422.4)	6.6	(3.8, 9.4)	104.4	(37.2, 171.6)
1994	36.7	(13.1, 60.3)	453.0	(354.6, 594.3)	229.5	(160.0, 299.0)	24.3	(11.1, 37.5)	162.2	(65.7, 258.7)
1995	14.2	(1.8, 26.6)	469.2	(366.3, 618.8)	115.6	(93.8, 137.4)	10.3	(5.6, 15.0)	25.9	(11.7, 40.1)
1996	20.4	(6.3, 34.5)	573.1	(455.4, 742.6)	263.2	(206.2, 320.2)	36.1	(26.0, 46.2)	31.6	(19.6, 43.6)
1997	37.5	(12.7, 62.3)	512.0	(407.4, 659.5)	248.9	(215.2, 282.6)	15.3	(9.7, 20.9)	52.5	(33.8, 71.2)
1998	12.3	(3.9, 20.7)	448.9	(355.5, 580.5)	176.7	(149.1, 204.3)	26.8	(20.9, 32.7)	58.9	(40.5, 77.3)
1999	21.2	(6.4, 36.0)	525.2	(418.5, 677.3)	246.7	(216.6, 276.8)	15.0	(10.5, 19.5)	24.2	(12.2, 36.2)
2000	40.1	(25.1, 55.1)	558.9	(443.8, 722.9)	291.0	(253.8, 328.2)	15.9	(10.8, 21.0)	51.7	(33.9, 69.5)
2001	108.2	(21.7, 194.7)	507.3	(403.7, 656.6)	309.2	(272.6, 345.8)	40.5	(28.0, 53.0)	57.0	(34.7, 79.3)
2002	71.5	(23.8, 119.2)	512.8	(404.9, 670.0)	258.1	(222.4, 293.8)	53.2	(39.8, 66.6)	202.1	(0.0, 410.9)
2003	39.3	(28.0, 50.6)	528.1	(421.2, 681.6)	319.3	(275.5, 363.1)	18.9	(13.4, 24.4)	73.3	(37.5, 109.1)
2004	21.7	(12.5, 30.9)	573.3	(453.9, 749.1)	320.0	(276.1, 363.9)	17.3	(11.7, 22.9)	103.3	(67.5, 139.1)
2005	25.0	(15.1, 34.9)	529.7	(423.9, 679.8)	233.7	(198.8, 268.6)	18.8	(11.0, 26.6)	74.8	(52.0, 97.6)
2006	30.0	(16.9, 43.1)	544.7	(432.5, 700.5)	214.6	(186.7, 242.5)	12.9	(8.8, 17.0)	78.7	(38.9, 118.5)
2007	24.9	(16.7, 33.1)	650.5	(515.3, 845.0)	318.9	(277.6, 360.2)	16.0	(10.6, 21.4)	103.2	(54.4, 152.0)

[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 variance-weighted 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, white-winged, and surf.

Appendix I. Abundance indices (in thousands) for North American Canada goose populations, 1969-2007.

	Canada goose population														
Year	North Atlantic[a,b]	Atlantic[a,b]	Atlantic Flyway Resident[a]	Southern James Bay[a]	Miss. Valley[a]	Miss. Flyway Giant[a]	Eastern Prairie[a]	W. Prairie & Great Plains[c]	Tall Grass Prairie[c,g]	Short Grass Prairie[d]	Hi-line[d]	Rocky Mountain[a]	Dusky[h]	Cackling[e]	Aleutian[h]
1969/70										151.2	44.2		22.5		
1970/71									131.1	148.5	40.5	43.9	19.8		
1971/72							124.7		159.6	160.9	31.4	30.5	17.9		
1972/73							137.6		147.2	259.4	35.6	34.4	15.8		
1973/74							119.9		158.5	153.6	24.5	38.3	18.6		0.8
1974/75							144.4		125.6	123.7	41.2	38.1	26.5		0.9
1975/76							216.5		201.5	242.5	55.6	25.4	23.0		1.3
1976/77							163.8		167.9	210.0	67.6	25.2	24.1		1.5
1977/78							179.7		211.3	134.0	65.1	37.1	24.0		1.6
1978/79							99.4		180.5	163.7	33.8	52.9	25.5	64.1	1.7
1979/80									155.2	213.0	67.3	31.0	22.0	127.4	2.0
1980/81							125.5		244.9	168.2	94.4	53.9	23.0	87.1	2.7
1981/82							131.8	175.0	268.6	156.0	81.9	58.7	17.7	54.1	3.5
1982/83							155.1	242.0	165.5	173.2	75.9	42.1	17.0	26.2	3.8
1983/84							135.6	150.0	260.7	143.5	39.5	41.6	10.1	25.8	4.2
1984/85							158.4	230.0	197.3	179.1	76.4	43.9	7.5	32.1	4.3
1985/86							194.8	115.0	189.4	181.0	69.8	62.1	12.2	51.4	5.0
1986/87							203.2	324.0	159.0	190.9	98.1	62.1		54.8	5.4
1987/88		118.0					209.2	272.1	306.1	139.1	66.8	98.2	12.2	69.9	5.8
1988/89					380.0		210.2	330.3	213.0	284.8	100.1	86.1	11.8	76.8	6.3
1989/90					494.0		231.8	271.0	146.5	378.1	105.9	83.4	11.7	110.2	7.0
1990/91					237.0		211.8	390.0	305.1	508.5	116.6	78.5		104.6	7.7
1991/92					414.2		202.5	341.9	276.3	620.2	140.5	94.5	18.0	149.3	11.7
1992/93		91.3			402.4	810.9	157.5	318.0	235.3	328.2	118.5	107.7	16.7	164.3	15.7
1993/94		40.1			390.0	1002.9	210.8	272.5	224.2	434.1	164.3	131.0	11.0	152.5	19.2
1994/95		29.3			375.3	1030.6	204.6	352.5	245.0	697.8	174.4	141.0	8.5	161.4	21.4
1995/96	99.6	46.1			350.5	1132.4	190.4	403.3	264.0	561.2	167.5	139.2		134.6	22.8
1996/97	64.4	63.2			414.7	1038.7	199.3	453.4	262.9	460.7	148.5	96.4	11.2	205.1	22.2
1997/98	53.9	42.2			297.5	1212.7	125.9	482.3	331.8	440.6	191.0	138.5	21.3	148.6	36.2
1998/99	96.8	77.5			454.0	1234.1	206.7	467.2	548.2	403.2	119.5	157.1	13.8	169.6	41.6
1999/00	58.0	93.2			345.0	1497.4	275.1	594.7	295.7	200.0	270.7	173.6	15.5	175.0	42.8
2000/01	57.8	146.7			329.0	1371.3	215.4	682.7	149.1[h]	164.1	252.9	170.2	17.3	176.2	
2001/02	62.0	164.8			286.5	1612.3	216.3	710.3	504.7[h]	160.9	217.1	143.4	17.2	127.9	
2002/03	60.8	156.9	1126.7		360.1	1635.0	229.2	561.0	611.9	156.7	205.9	141.7	16.7	165.2	86.4
2003/04	67.8	174.8	1048.7		276.3	1600.7	290.7	622.1	458.7	203.6	215.6	159.2	14.9	130.2	124.5
2004/05	51.3	162.4	1167.1		344.9	1583.1	254.7	415.1	400.8	177.2	207.4	160.1	21.8	156.9	94.7
2005/06	49.2	160.2	1144.0		384.4	1729.6	185.4	444.4	499.8	234.7	247.3	140.6	11.9	169.3	104.8
2006/07	69.9	195.7	1128.0	98.0	402.6	1642.5	217.5	446.0	680.3	190.5	180.2	142.1	10.0[a]	173.4	118.7[h]

[a] Surveys conducted in spring.
[b] Number of breeding pairs.
[c] Surveys conducted in December until 1998; in 1999 a January survey replaced the December count.
[d] Surveys conducted in January.
[e] Surveys conducted in fall through 1998; from 1999 to present a fall index is predicted from breeding ground surveys (total indicated pairs).
[f] Survey incomplete.
[g] Only Tall Grass Prairie Population geese counted in Central Flyway range are included.
[h] Indirect or preliminary estimate.

Appendix J. Abundance indices (in thousands) for light goose, greater white-fronted goose, brant, emperor goose, and tundra swan populations during 1969-2007.

	Light geese				White-fronted geese		Brant			Emperor geese[a]	Tundra swans	
Year	Greater snow geese[a]	Mid-continent[b]	Western Central Flyway[c]	Western Arctic & Wrangel[d]	Mid-continent[d]	Pacific[e]	Atlantic[c]	Pacific[c, f]	Western high Arctic[c]		Western[c]	Eastern[c]
1969/70	89.6	777.0	6.9					136.6	5.1		31.0	55.0
1970/71	123.3	1070.2	11.1				151.0	141.1	8.1		98.8	58.2
1971/72	134.8	1313.4	13.0				73.2	121.8	3.0		82.8	62.8
1972/73	143.0	1025.3	11.6				40.8	122.4	2.7		33.9	57.1
1973/74	165.0	1189.8	16.2				87.7	128.0	2.7		69.7	64.2
1974/75	153.8	1096.6	26.4				88.4	119.7	3.7		54.3	66.6
1975/76	165.6	1562.4	23.2				127.0	117.1	5.0		51.4	78.6
1976/77	160.0	1150.3	33.6				73.6	136.1	10.9		47.3	76.2
1977/78	192.6	1966.4	31.1				42.8	151.5	11.4		45.6	70.2
1978/79	170.1	1285.7	28.2			73.1	43.5	126.2	3.2		53.5	78.6
1979/80	180.0	1398.1	30.5	528.1		93.5	69.2	141.3	5.1		65.2	60.4
1980/81	170.8	1406.7	37.6	204.2		116.5	97.0	186.1	8.1	93.3	83.6	92.8
1981/82	163.0	1794.1	50.0	759.9		91.7	104.5	117.1	4.0	100.6	91.3	72.9
1982/83	185.0	1755.4	76.1	354.1		112.9	123.5	107.2	2.1	79.2	67.3	86.5
1983/84	225.4	1494.5	60.1	547.6		100.2	127.3	128.4	5.1	71.2	61.9	81.1
1984/85	260.0	1973.0	63.0	466.3		93.8	146.3	136.0	8.8	58.8	48.8	93.9
1985/86	303.5	1449.3	96.6	549.8		107.1	110.4	126.9	9.4	42.0	66.2	90.9
1986/87	255.0	1913.9	87.6	521.7		130.6	109.4	98.5	10.4	51.7	52.8	94.4
1987/88		1750.7	46.2	525.3		161.5	131.2	131.6	15.3	53.8	59.2	76.2
1988/89	363.2	1956.2	67.6	441.0		218.8	138.0	120.9	14.3	45.8	78.7	90.6
1989/90	368.3	1724.3	38.6	463.9		240.8	135.4	141.1	10.5	67.6	40.1	89.7
1990/91	352.6	2135.8	104.6	708.5		236.5	147.7	119.5	12.2	71.0	47.6	97.4
1991/92	448.1	2021.9	87.8	690.1		230.9	184.8	108.2	9.5	71.3	63.7	109.8
1992/93	498.4	1744.1	45.1	639.3	622.9	295.1	100.6	113.6	10.8	52.5	62.6[g]	76.6
1993/94	591.4	2200.8	84.9	569.2	676.3	324.8	157.2	118.8	11.2	57.3	79.4	84.5
1994/95	616.6	2725.1	146.4	478.2	727.3	277.5	148.2	116.8	16.9	51.2	52.9[g]	81.3
1995/96	669.1	2398.1	93.1	501.9	1129.4	344.1	105.9	122.0	4.9	80.3	98.1	79.0
1996/97	657.5	2850.9	127.2	366.3	742.5	319.0	129.1	151.9	6.0	57.1	122.5	86.1
1997/98	836.6	2977.2	103.5	416.4	622.2	413.1	138.0	132.1	6.3	39.7	70.5	96.6
1998/99	803.4	2575.7	236.4	354.3	1058.3	393.4	171.6	120.0	9.2	54.6	119.8	109.0
1999/00	813.9	2397.3	137.5	579.0	963.1	352.7	157.2	127.1	7.9	62.6	89.6	103.1
2000/01	837.4	2341.3	105.8	656.8	1067.6	438.9	145.3	119.9	4.9	84.4	87.3	98.2
2001/02	639.3	2696.1	99.9	448.1	712.3	359.7	181.6	127.8	9.0	58.7	58.7	103.8
2002/03	678.0	2435.0	105.9	596.9	637.2	422.0	164.5	101.7	4.9	71.2	102.7	108.2
2003/04	957.6	2159.1[g]	135.4	587.8	528.2	374.9	129.6	111.5	7.7	47.4	83.0	95.0
2004/05	814.6	2344.2	143.0	750.3	644.3	443.9	123.2	101.4	10.0	54.0	92.1	68.7
2005/06	1017.0	2221.7	140.6	710.7	522.8	509.3	146.6	133.9	9.5	76.0	106.9	70.5
2006/07	1019.0	2917.1	170.6	734.4	751.3	604.7	150.6	133.9	6.1	77.5	109.4	87.8

[a] Surveys conducted in spring.
[b] Surveys conducted in December until 1997/98; surveys since 1998/99 were conducted in January.
[c] Surveys conducted in January.
[d] Surveys conducted in autumn.
[e] Surveys conducted in fall through 1998; from 1999 to present a fall index is predicted from breeding ground surveys (total indicated birds).
[f] Totals exclude Western High Arctic brant. Beginning in 1986, counts of Pacific brant in Alaska were included with remainder of Flyway.
[g] Survey was incomplete

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