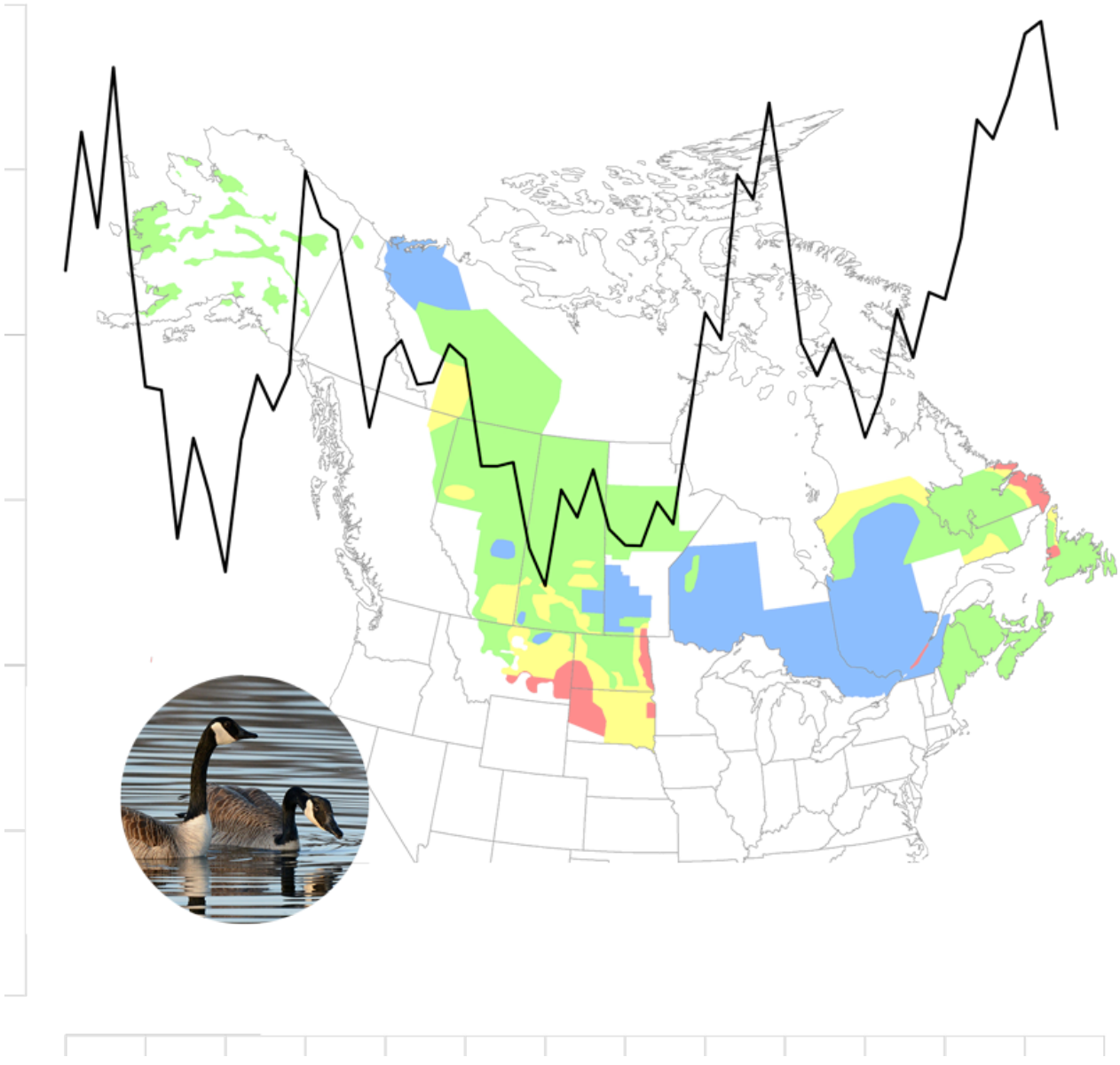
U.S. Fish & Wildlife Service

Waterfowl

Population Status, 2017



Waterfowl Population Status, 2017

August 15, 2017

In the United States the process of establishing hunting regulations for waterfowl is conducted annually. This 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 (USFWS), the Canadian Wildlife Service (CWS), various state and provincial conservation agencies, and private conservation organizations. In addition to providing current information on the status of populations, this report is intended to aid the development of waterfowl harvest regulations in the United States for the 2018–2019 hunting season.

Acknowledgments

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 Dirección General de Conservación Ecológica 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. Appendix A.1 provides a list of individuals responsible for the collection and compilation of data for the "Status of Ducks" section of this report. Appendix A.2 provides a list of individuals who were primary contacts for information included in the "Status of 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.

This report was compiled by the U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Population and Habitat Assessment and Migratory Bird Surveys branches. The principal authors are Joshua Dooley, Walt Rhodes, and Nathan Zimpfer. The preparation of this report involved substantial efforts on the part of many individuals. Support for the processing of data and publication was provided by Emily Silverman, Guthrie Zimmerman, and John Sauer. Pamela Garrettson, James Dubovsky, and others provided helpful comments on earlier drafts. Kathy Fleming and Phil Thorpe provided the maps.

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All Division of Migratory Bird Management reports are available from our website (http://www.fws.gov/birds/surveys-and-data/reports-and-publications.php).

Executive Summary

This report summarizes the most recent information about the status of North American waterfowl populations and their habitats to facilitate the development of harvest regulations. The annual status of these populations is monitored and assessed through abundance and harvest surveys. This report details abundance estimates; 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.

In general, habitat conditions during the 2017 Waterfowl Breeding and Population Habitat Survey (WBPHS) were similar to or improved relative to 2016, with a few exceptions. Much of the Canadian Prairies experienced above-average precipitation between June 2016 and the start of the survey. Abundant moisture delayed 2017 agricultural activities, and much of the 2016 crops remained unharvested, particularly in southern Saskatchewan. The Canadian parklands, while drier than areas further south, still benefited from wet conditions in previous years. The U.S. prairies experienced average to above-average precipitation, but conditions there were more variable. Habitat conditions were generally better in the more northern portions of the U.S. prairies, mainly due to a better frost seal. The total pond estimate (Prairie Canada and U.S. combined) was 6.1 ± 0.2 million, which was 22% above the 2016 estimate of 5.0 ± 0.2 million, and 17% higher than the long-term average of 5.2 ± 0.03 million. The 2017 estimate of ponds in Prairie Canada was 4.3 ± 0.2 million. This estimate was 24% above the 2016 estimate of 3.5 ± 0.1 million and 23% above the long-term average (3.5 ± 0.02 million). The 2017 pond estimate for the northcentral U.S. was 1.8 ± 0.09 million, which was 16% above the 2016 estimate of 1.5 ± 0.05 million and similar to the long-term average (1.7 ± 0.02 million). Spring phenology and the timing of ice-out were near normal elsewhere in the traditional survey area. Alaska and the western boreal regions of the traditional survey area experienced near-normal temperatures and average to above-average precipitation. Ice and snow melt timing was early in southwestern Alaska, later than average in northern Alaska, and near average across most other parts of the state. Good to excellent waterfowl production was expected across the region.

Conditions in much of the eastern survey area were improved relative to 2016. The region experienced average winter temperatures and average to above-average snowfall. Spring phenology and the timing of ice-out were generally average, but later than average in western Ontario and in the northern portion of the survey area in Quebec. Conditions in Maine, the Canadian Maritime provinces, and Newfoundland and Labrador were generally good, although some coastal areas were rated as poor due to late spring phenology and persisting ice conditions. Overall, conditions for waterfowl production were good to excellent, with only localized areas negatively affected by a late thaw or flooding.

Spring phenology was advanced in portions of the eastern Subarctic and slightly delayed in the eastern Arctic. Ice and snow melt timing was early in some portions of the west-central Arctic and near average across most other areas of the central Arctic and Subarctic. Above-average to average nesting conditions were expected in many Subarctic areas and portions of the west and central Arctic, and average to below-average nesting conditions were expected in the eastern Arctic.

Summary of Duck Populations

In the traditional survey area, which includes strata 1-18, 20-50, and 75-77, the total duck population estimate (excluding scoters [*Melanitta* spp.], eiders [*Somateria* spp., and *Polysticta* spp.], long-tailed

ducks [*Clangula hymenalis*], mergansers [*Mergus* spp. and *Lephodytes cucullatus*], and wood ducks [*Aix sponsa*]) was 47.3 ± 0.8 million birds. This estimate was similar to the 2016 estimate of 48.4 ± 0.8 million and 34% higher than the long-term average (1955–2016). Estimated mallard (*Anas platyrhynchos*) abundance was 10.5 ± 0.3 million, which was 11% lower than the 2016 estimate of 11.8 ± 0.4 million but 34% above the long-term average of 7.9 ± 0.04 million. The 2017 estimate for blue-winged teal (*A. discors*; 7.9 ± 0.4 million) was 18% above the 2016 estimate and 57% above the long-term average of 5.0 ± 0.04 million. Estimated abundances of gadwall (*A. strepera*; 4.2 ± 0.2 million) and northern shovelers (*A. clypeata*; 4.4 ± 0.2 million) were similar to last year's estimates and were 111% and 69% above their long-term averages of 2.0 ± 0.02 million and 2.6 ± 0.02 million, respectively. The estimated abundance of green-winged teal (*A. crecca*) was 3.6 ± 0.2 million, which was 16% below the 2016 estimate, and 70% above the long-term average (2.1 ± 0.02 million). Estimated abundance of American wigeon (*A. americana*; 2.8 ± 0.2 million) was 19% below the 2016 estimate but similar to the long-term average of 2.6 ± 0.02 million. Northern pintail (*A. acuta*) abundance (2.9 ± 0.2 million) was similar to the 2016 estimate and 27% below the long-term average of 4.0 ± 0.03 million. Abundance estimates for redheads (*Aythya americana*; 1.1 ± 0.09 million) and canvasbacks (*A. valisineria*; 0.7 ± 0.06 million) were similar to their 2016 estimates and were 55% and 25% above their long-term averages of 0.7 ± 0.01 million and 0.6 ± 0.01 million, respectively. The combined estimate of lesser and greater scaup (*A. affinis* and *A. marila*; 4.4 ± 0.2 million) was 12% below the 2016 estimate and 13% below the long-term average of 5.0 ± 0.04 million.

In the eastern survey area, the estimated abundance of mallards was 0.4 ± 0.1 million, which was similar to the 2016 estimate and 1990–2016 average. The estimate of goldeneyes (common and Barrow's [*Bucephala clangula* and *B. islandica*]) was 0.4 ± 0.07 million, which was similar to the 2016 estimate and the 1990–2016 average. The green-winged teal estimate (0.2 ± 0.04 million) was similar to its 2016 estimate and 1990–2016 average. The estimate of mergansers (0.5 ± 0.05 million) was 15% above 2016 and the 1990–2106 average. Ring-necked ducks (*A. collaris*; 0.5 ± 0.07 million) were 19% below the 2016 estimate but similar to the 1990–2016 average. A time series for assessing changes in American black duck population status is provided by the breeding waterfowl surveys conducted by the U.S. Fish and Wildlife Service and Canadian Wildlife Service in the eastern survey area. The 2017 estimate of American black ducks (*Anas rubripes*) in the eastern survey area was 0.5 ± 0.04 million, which was similar to last year's estimate of 0.6 ± 0.05 million but 12% below the 1990–2016 average.

Summary of Goose Populations

Of the 27 applicable goose and tundra swan populations included in this year's report, the primary population monitoring indices for eight of these populations had significant ($P < 0.05$) positive trends (% change per year) during the most recent 10-year period: the Western Prairie and Great Plains Population (+4%), Dusky (+8%), and Aleutian (+7%) Canada geese, Pacific Flyway Population light geese (+6%), Wrangel Island Population lesser snow geese (+11%), Mid-continent Population white-fronted geese (+5%), emperor geese (+6%), and Eastern Population tundra swans (+2%). No population had a significant negative 10-year trend. Of the 16 populations for which primary indices included variance estimates, the most recent estimate for two populations significantly decreased from the previous estimate: Central Flyway Arctic Nesting (–50%) and greater snow geese (–18%). Of the 12 populations for which primary indices did not include variance estimates, ten population counts were higher than prior counts, and two population counts were lower: Mississippi Flyway Giant (+16%) and Mississippi Flyway Interior (+10%) Population Canada geese, Pacific (+59%), Mid-continent (–1%), and Western Central Flyway (–9%) Population light geese, Wrangel Island Population lesser snow geese (+17%), Pacific (+7%) and Mid-continent (+2%) Population

white-fronted geese, Atlantic (+2%) and Pacific (+11%) brant, and Western (+4%) and Eastern (+5%) Population tundra swans.

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Status of Ducks

This section summarizes the most recent information about the status of North American duck populations and their habitats. The annual status of these populations is assessed using databases resulting from surveys which include estimates of the size of breeding populations and harvest. This report details abundance estimates; 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

Waterfowl Breeding Population and Habitat Survey (WBPHS)

Federal, provincial, and state agencies conduct surveys each spring to estimate the size of breeding waterfowl populations and to evaluate habitat conditions. These surveys are conducted using airplanes 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 covers approximately 1.3 million square miles (Appendix B). Specifics for the survey design are provided in Smith 1995. The eastern survey area (strata 51–54, 56–72) 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 (Appendix B). In 2012, stratum 55 was discontinued primarily because it overlapped with an existing ground survey plot. In Prairie and Parkland Canada and the northcentral U.S., aerial waterfowl counts are corrected annually for visibility bias by conducting ground counts along a subsample of survey segments. In some northern regions of the traditional survey area, visibility corrections were derived from past helicopter surveys. In 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 strata (except 57–59 and 69) in the eastern survey area; however, some portions of the eastern survey area have been surveyed since 1990. In the traditional survey area, visibility-corrected 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. Unless otherwise noted, z-tests were used for assessing statistical significance, with alpha levels set at 0.1; 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 airplanes in portions of the eastern survey area, similar to those in the traditional survey area, to estimate 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 abundances for eastern North America are estimated using

a hierarchical-modeling approach that combines USFWS and CWS data (Zimmerman et al. 2012). In cases where the USFWS has traditionally not recorded observations to the species level (i.e., mergansers, goldeneyes), estimates are produced for multi-species groupings. Survey-wide composite estimates for the eastern survey area presented in this report currently correspond only to strata 51, 52, 63, 64, 66–68, and 70–72. These strata contain either (1) both USFWS airplane survey transects and CWS helicopter plots or (2) only helicopter plots (strata 71 and 72).

For widely distributed and abundant species including American black ducks (*Anas rubripes*), mallards (*A. platyrhynchos*), green-winged teal (*A. crecca*), ring-necked ducks (*Aythya collaris*), goldeneyes (common [*Bucephala clangula*] and Barrow's [*B. islandica*]) and mergansers (common [*Mergus merganser*], red-breasted [*M. serrator*], and hooded [*Lophodytes cucullatus*]), composite estimates of abundance were constructed using a hierarchical model (Zimmerman et al. 2012) which estimated the mean count per unit area surveyed for each stratum, year, and method (i.e., airplane or helicopter). These mean counts were then extrapolated over the area of each stratum to produce a stratum/year/method-specific population estimate. Estimates from the airplane surveys were adjusted for visibility bias by multiplying them by the total CWS helicopter survey estimates for all years divided by the total USFWS airplane survey estimates for all years that the two surveys overlapped. For strata containing both CWS and USFWS surveys (51, 52, 63, 64, 66–68, and 70), USFWS estimates were adjusted by visibility-correction factors derived from CWS plot estimates, and the CWS and adjusted USFWS estimates were then averaged to derive stratum-level estimates. No visibility adjustments were made for strata with only CWS plots (strata 71 and 72). For two species groups, goldeneyes and mergansers, for which there are many survey units with no observations, a zero-inflated Poisson distribution (Martin et al. 2005) was used to fit the model. Using this technique, the binomial probability of encountering the species on a transect or a plot is modeled separately. This modified modeling approach was not adequate for the following species that occur at lower densities and are more patchily distributed in the eastern survey area: scaup (lesser [Aythya affinis] and greater [A. marila]), scoters (black [*Melanitta americana*], white-winged [*M. fusca*], and surf [*M. perspicillata*]), bufflehead (*Bucephala albeola*), and American wigeon (*Anas americana*). We will continue to investigate methods that might allow us to estimate abundance of these rarer species within a hierarchical-modeling framework.

To produce a consistent index for American black ducks, total indicated pairs are calculated using the CWS method of scaling observed pairs. 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 two males. Thus, observed black duck pairs are scaled by 1.5 rather than the 1.0 scaling traditionally applied by the USFWS. These indicated pairs are then used to calculate indicated birds based on the USFWS protocol. For all other species, the USFWS definitions are used to calculate indicated pairs and indicated birds (see Zimmerman et al. 2012 for further details). This model-based approach and changes in analytical procedures for some species may preclude comparisons with results from previous reports.

Survey Coverage in 2017

In the eastern survey area, strata 57–59 were not flown. However, strata 57-59 are not currently part of existing estimation frameworks. In addition, stratum 54 was discontinued due to increased aviation hazards such as wind turbines and power lines.

Total Duck Species Composition

In the traditional survey area, our estimate of total ducks excludes scoters, eiders (common [*Somateria mollissima*], king [*S. spectabilis*], spectacled [*S. fisheri*], and Steller's [*Polysticta stelleri*]), long-tailed ducks (*Clangula hyemalis*), mergansers, and wood ducks (*Aix sponsa*) because the traditional survey area does not include

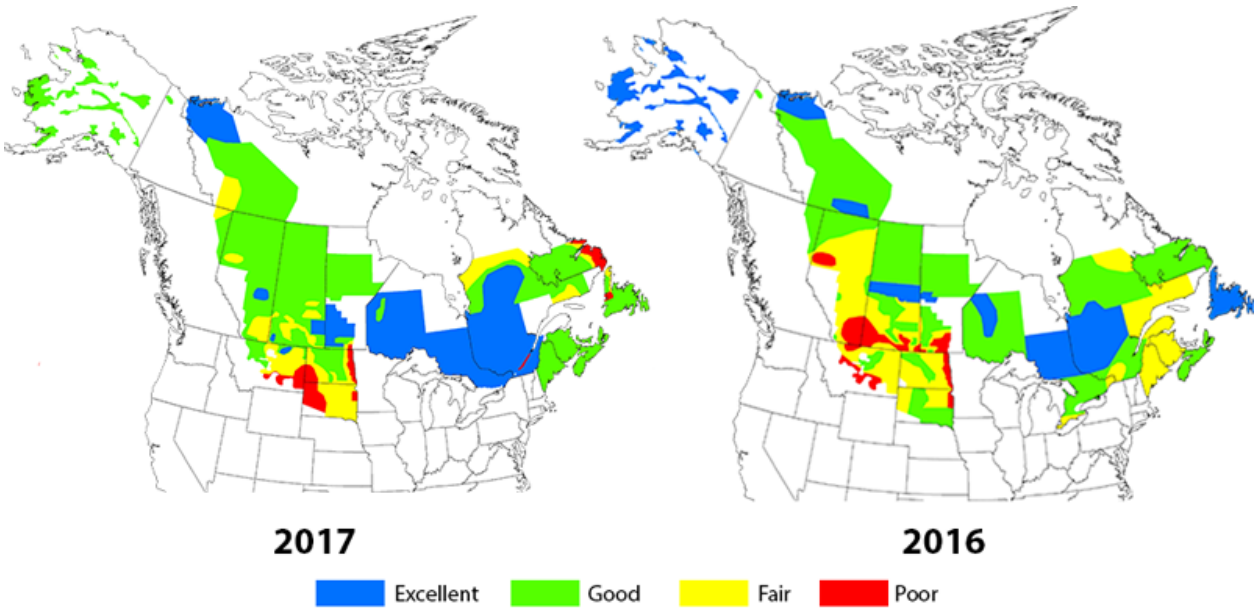

Figure 1. Breeding waterfowl habitat conditions during the 2016 and 2017 Waterfowl Breeding Population and Habitat Surveys, as judged by U.S. Fish and Wildlife Service and Canadian Wildlife Service biologists.

a large portion of their breeding ranges (Smith 1995).

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 has historically been composed of mallards originating from the WBPHS traditional survey area, as well as Michigan, Minnesota, and Wisconsin. However, since 2008, the status of western mallards has been considered separately in setting regulations for the Pacific Flyway, and thus Alaska–Yukon mallards (strata 1–12) have been removed from the mid-continent stock. The fall-flight index is based on the mallard models used for adaptive harvest management and considers breeding population size, habitat conditions, adult summer survival, and the projected fall age ratio (young/adult). The projected fall age ratio is predicted from models that depict how age ratios vary with changes in spring population size and Canadian 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 2016).

Results and Discussion

2017 Overall Habitat Conditions and Population Status

In general, habitat conditions during the 2017 WBPHS were similar to or improved, with a few exceptions, relative to 2016 (Figure 1). Much of the Canadian prairies experienced above-average precipitation and temperatures since June 2016. Abundant moisture delayed spring 2017 agricultural activities, and many crops planted in 2016 remained unharvested, particularly in southern Saskatchewan. The Parklands, while drier than areas farther south, were still benefitting from wet conditions in previous years. The U.S. prairies experienced average to above-average precipitation but had more variable conditions. Habitat conditions generally improved northward, mainly due to a good frost seal. The total pond estimate (Prairie

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

			Change from 2016			Change from LTA	
Region	2017	2016	%	*P*	LTA[a]	%	*P*
Prairie & Parkland Canada							
S. Alberta	1,168	758	+54	<0.001	767	+52	<0.001
S. Saskatchewan	2,449	2,088	+17	0.044	2,083	+18	0.003
S. Manitoba	713	649	+10	0.406	661	+8	0.413
Subtotal	4,330	3,494	+24	<0.001	3,510	+23	<0.001
Northcentral U.S.							
Montana & western Dakotas	561	672	−17	0.045	575	−2	0.720
Eastern Dakotas	1,205	846	+42	<0.001	1,121	+7	0.322
SubTotal	1,766	1,518	+16	0.020	1,696	+4	0.458
Total	6,096	5,012	+22	<0.001	5,216	+17	<0.001

[a] Long-term average. Prairie and and Parkland Canada, 1961–2016; northcentral U.S. and Total 1974–2016.

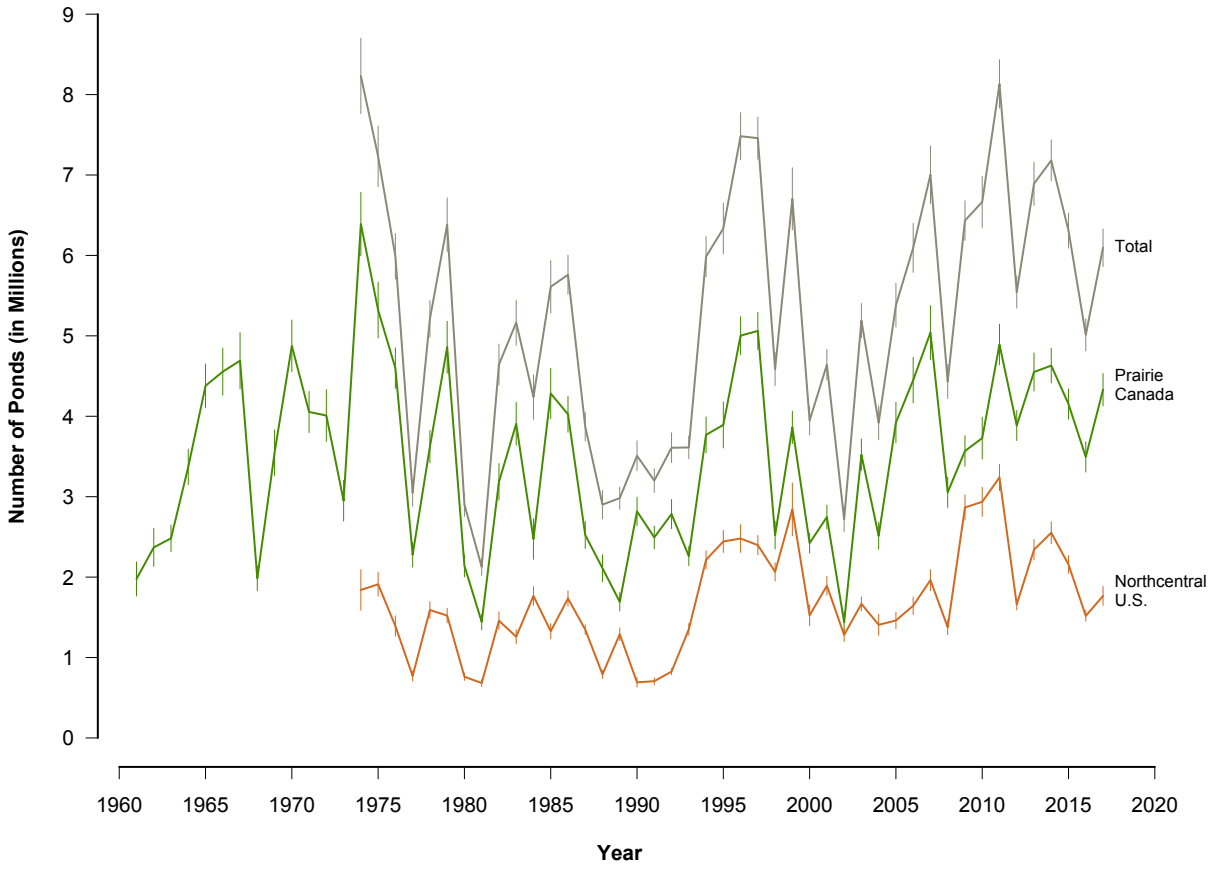

Figure 2. Number of ponds in May and 90% confidence intervals in Prairie Canada, the northcentral U.S., and both areas combined (Total ponds).

Table 2. Total duck[a] breeding population estimates (in thousands) for regions in the traditional survey area.

			Change from 2016			Change from LTA	
Region	2017	2016	%	*P*	LTA[b]	%	*P*
Traditional Survey Area							
Alaska–Yukon Territory–Old Crow Flats	3,987	4,327	−8	0.271	3,698	+8	0.193
C. & n. Alberta–n.e. British Columbia–NWT	11,423	14,041	−19	<0.001	7,394	+54	<0.001
N. Saskatchewan–n. Manitoba–w. Ontario	2,561	3,246	−21	0.008	3,459	−26	<0.001
S. Alberta	6,444	5,032	+28	<0.001	4,314	+49	<0.001
S. Saskatchewan	12,152	10,753	+13	0.006	7,922	+53	<0.001
S. Manitoba	1,748	1,777	−2	0.844	1,551	+13	0.052
Montana & western Dakotas	2,207	2,229	−1	0.920	1,729	+28	0.001
Eastern Dakotas	6,744	6,957	−3	0.599	5,095	+32	<0.001
Total	47,266	48,363	−2	0.333	35,163	+34	<0.001
Other regions							
British Columbia	351	319	+10	0.214	330	+6	0.302
California	394	418	-5	0.691	560	−29	<0.001
Michigan	684	521	+31	0.183	630	+8	0.541
Northeast U.S.[c]	1,331	1,241	+7	0.697	1,370	−2	0.857
Oregon	240	214	+12	0.401	263	−8	0.316
Washington	242	121	+99	<0.001	167	+44	<0.001
Wisconsin	479	390	+22	0.190	441	+8	0.469

[a] Includes 10 species in Appendix C.3, plus American black ducks, ring-necked ducks, goldeneyes, bufflehead, and ruddy ducks (*Oxyura jamaicensis*); excludes eiders, long-tailed ducks, scoters, mergansers, and wood ducks.
[b] Long-term average for regions in the traditional survey area, 1955–2016; years for other regions vary (see Appendix C.2)
[c] Includes all or portions of CT, DE, MD, MA, NH, NJ, NY, PA, RI, VT, and VA.

Canada and northcentral U.S. combined) was 6.1 ± 0.2 million, which was 22% above the 2016 estimate of 5.0 ± 0.2 million and 17% higher than the long-term average of 5.2 ± 0.03 million (Table 1, Figure 2). The 2017 estimate of ponds in Prairie Canada was 4.3 ± 0.2 million. This estimate was 24% above the 2016 estimate of 3.5 ± 0.1 million and 23% above the long-term average (3.5 ± 0.02 million). The 2017 pond estimate for the northcentral U.S. was 1.8 ± 0.09 million, which was 16% above the 2016 estimate of 1.5 ± 0.05 million and similar to the long-term average (1.7 ± 0.02 million). Spring phenology and timing of ice-out was near normal elsewhere in the traditional survey area. Alaska and the western boreal portions of the traditional survey area experienced near-normal temperatures and average to above-average precipitation. The combination of normal spring phenology, wet conditions, and no major flooding should lead to good-to-excellent waterfowl production across the region.

Conditions in much of the eastern survey area improved relative to 2016. The region experienced average winter temperatures and average to above-average snowfall. Spring phenology and ice-out was generally normal to later-than-normal, the latter occurring primarily in western Ontario and northern Quebec. Conditions for waterfowl production were generally considered

Table 3. Mallard breeding population estimates (in thousands) for regions in the traditional and eastern survey areas, and other regions.

			Change from 2016			Change from LTA	
Region	2017	2016	%	*P*	LTA[a]	%	*P*
Traditional Survey Area							
Alaska–Yukon Territory–Old Crow Flats	538	584	−8	0.584	383	+40	0.003
C. & n. Alberta–n.e. British Columbia–NWT	1,837	2,524	−27	0.011	1,132	+62	<0.001
N. Saskatchewan–n. Manitoba–w. Ontario	1,074	1,669	−36	0.009	1,148	−6	0.596
S. Alberta	1,291	1,488	−13	0.173	1,091	+18	0.049
S. Saskatchewan	2,725	2,784	−2	0.770	2,108	+29	<0.001
S. Manitoba	587	470	+25	0.195	392	+50	0.012
Montana & western Dakotas	658	629	+5	0.726	530	+24	0.021
Eastern Dakotas	1,777	1,644	+8	0.491	1,069	+66	<0.001
Total	10,488	11,793	−11	0.009	7,855	+34	<0.001
Eastern survey area	445	413	+7	−−[b]	399	+11	−−[b]
Other regions							
British Columbia	71	74	−4	0.748	80	−10	0.234
California	198	264	−24	0.171	346	−42	<0.001
Michigan	298	278	+7	0.744	346	−13	0.196
Minnesota	214	250	−14	0.498	228	−6	0.660
Northeast U.S.[c]	448	551	−18	0.072	720	−37	<0.001
Oregon	72	87	−17	0.122	91	−21	0.002
Washington	103	60	+72	<0.001	80	+29	0.022
Wisconsin	181	164	+10	0.611	182	0[d]	0.971

[a] Long-term average. Traditional survey area 1955–2016; eastern survey area 1990–2016; years for other regions vary (see Appendix C.2).
[b] *P*-values not provided because these data were analyzed using Bayesian methods.
[c] Includes all or portions of CT, DE, MD, MA, NH, NJ, NY, PA, RI, VT, and VA.
[d] Rounded values mask change in estimtes.

good to excellent with only localized areas affected by a late thaw or flooding.

In the traditional survey area, the total duck population estimate was 47.3 ± 0.8 million birds. This estimate was similar to the 2016 estimate of 48.4 ± 0.8 million and 34% higher than the long-term average (1955–2016). In the eastern Dakotas, total duck numbers were similar to the 2016 estimate but 32% above the long-term average. The total duck estimate in southern Alberta was 28% above last year's estimate and 49% above the long-term average. The total duck estimate was 13% higher than last year's in southern Saskatchewan and 53% above the long-term average. In southern Manitoba, the total duck population estimate was similar to last year's estimate and 13% above the long-term average. The total duck estimate in central and northern Alberta–northeastern British Columbia–Northwest Territories was 19% lower than last year's estimate but 54% above the long-term average. The estimate in the northern Saskatchewan–northern Manitoba–western Ontario survey area was 21% below the 2016 estimate and 26% below

the long-term average. The total duck estimate in the Montana–western Dakotas area was similar to the 2016 estimate but 28% above the long-term average. In the Alaska–Yukon Territory–Old Crow Flats region, the total duck estimate was similar to last year's estimate and the long-term average.

Several states and provinces conduct breeding waterfowl surveys in areas outside the geographic extent of the WBPHS (estimates are provided in the Regional Popluation and Habitat Status section of this report and in Appendix C.2). In California, Oregon, Washington, British Columbia, Wisconsin, Michigan, and the northeast U.S., measures of precision for estimates of total duck numbers are available (Table 2). The total duck estimate in California was similar to the 2016 estimate and 29% below the long-term average. In Washington the total duck estimate was 99% higher than the 2016 estimate, and 44% above the long-term average (2010–2016). Oregon's 2017 total duck estimate was similar to 2016 and the long-term average. British Columbia's total duck estimate was similar to the 2016 estimate and the long term average. Wisconsin's 2017 total duck estimate was similar to the 2016 estimate and to the long-term average. In Michigan, the total duck estimate was similar to the 2016 estimate and to the long-term average. The total breeding duck estimate in the northeast U.S. was similar to the 2016 estimate and the long-term average. In Minnesota, which does not have a measure of precision for total duck numbers, the 2017 estimate of total ducks was 19% lower than the 2016 estimate.

Trends and annual breeding population estimates for 10 principal duck species for the traditional survey area are provided in this report (Tables 3–12, Figure 3, Appendix C.3). Percent change was computed prior to rounding of estimates and therefore may not match the rounded estimates presented in the tables and text. Estimated mallard abundance was 10.5±0.3 million, which was 11% lower than the 2016 estimate of 11.8 ± 0.4 million but 34% above the long-term average of 7.9 ± 0.04 million (Table 3). In the eastern Dakotas, the mallard estimate was similar to last year's count and 66% above the long-term average. The mallard estimate in southern Alberta was similar to last year's estimate and 18% above the long-term average. In the Montana–western Dakotas survey area, the mallard estimate was similar to 2016 and 24% above the long-term average. In the central and northern Alberta–northeastern British Columbia–Northwest Territories region, the mallard estimate was 27% lower than the 2016 estimate and 62% above the long-term average. In the northern Saskatchewan–northern Manitoba–western Ontario survey area, the mallard estimate was 36% below the 2016 estimate and similar to the long-term average. Mallard numbers were similar to the 2016 estimate and 40% above their long-term average in the Alaska–Yukon Territory–Old Crow Flats region. In the southern Manitoba survey area, the mallard estimate was similar to last year and 50% above the long-term average. In southern Saskatchewan, mallard numbers were similar to the 2016 estimate and 29% above the long-term average.

In the eastern survey area, the estimated abundance of mallards was 0.4 ± 0.1 million, which was similar to the 2016 estimate and 1990–2016 average. The value for mallards in the eastern survey area is a composite estimate of CWS and USFWS data in several Canadian strata, and is not comparable to the eastern mallard estimate used for AHM (U.S. Fish and Wildlife Service 2016), which is based on data from the northeast U.S. plot survey and USFWS transect data from strata 51–53 and 56. Mallard abundances with estimates of precision are also available for other areas where surveys are conducted (California, Nevada, Washington, British Columbia, Oregon, Wisconsin, the northeast U.S., Michigan, and Minnesota; Table 3). Mallard numbers in California were similar to last year but 42% below the long-term average (1992–2016). In Washington, mallard numbers were 72% above than the 2016 estimate and 29% above the long-term average (1978–2016). The Oregon mallard estimate was similar to 2016 and 21% below the long-term average (1994–2016). British Columbia mallard numbers were similar to last year and the long-term average (2006–2016). Wisconsin mallard numbers were similar to from last year's estimate and the long-term average (1973–2016). In Michigan, the

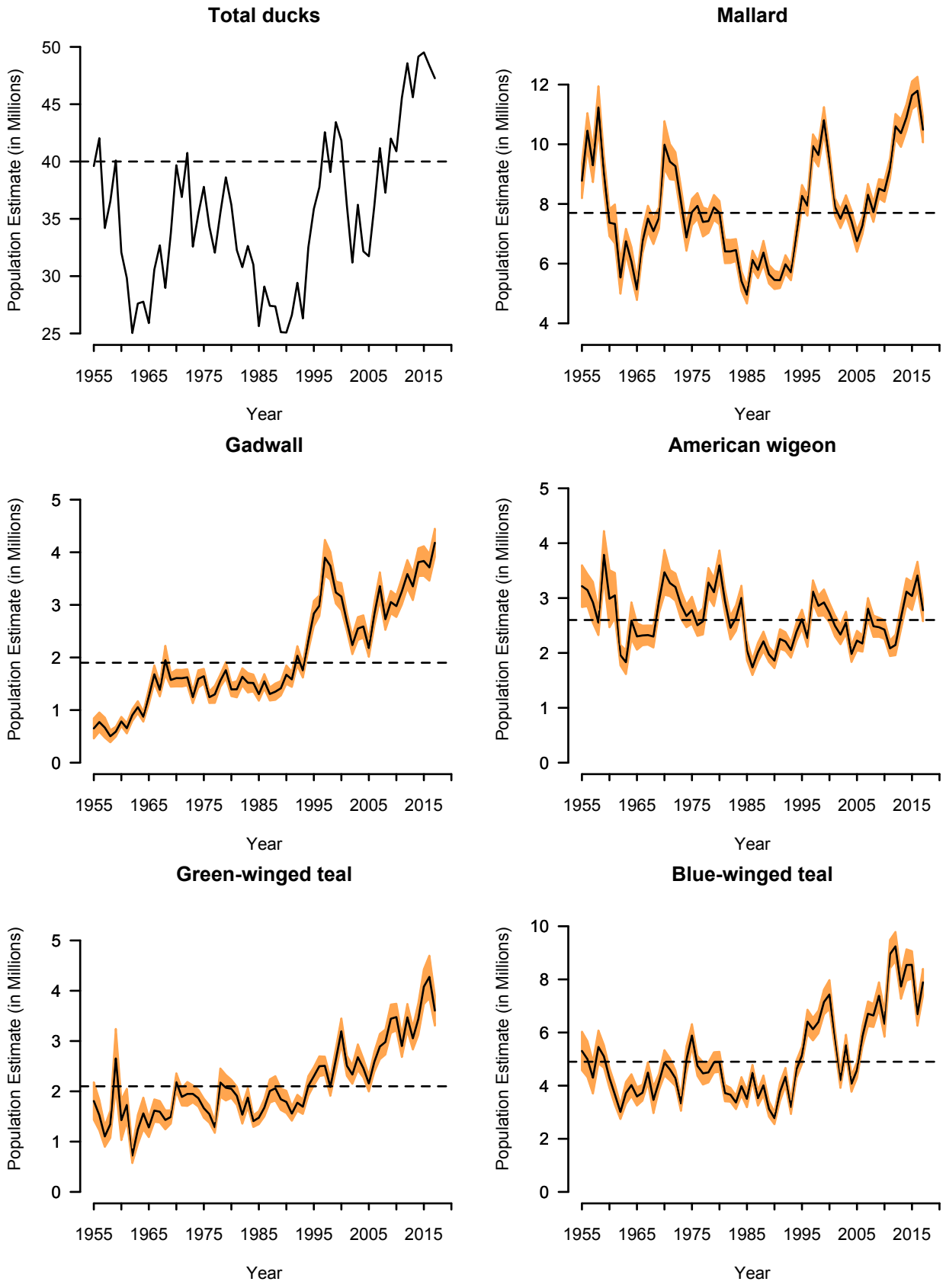

Figure 3. Breeding population estimates, 90% confidence intervals, and North American Waterfowl Management Plan population goals (dashed line; North American Waterfowl Management Plan Committee 2014) for selected species in the traditional survey area (strata 1–18, 20–50, 75–77).

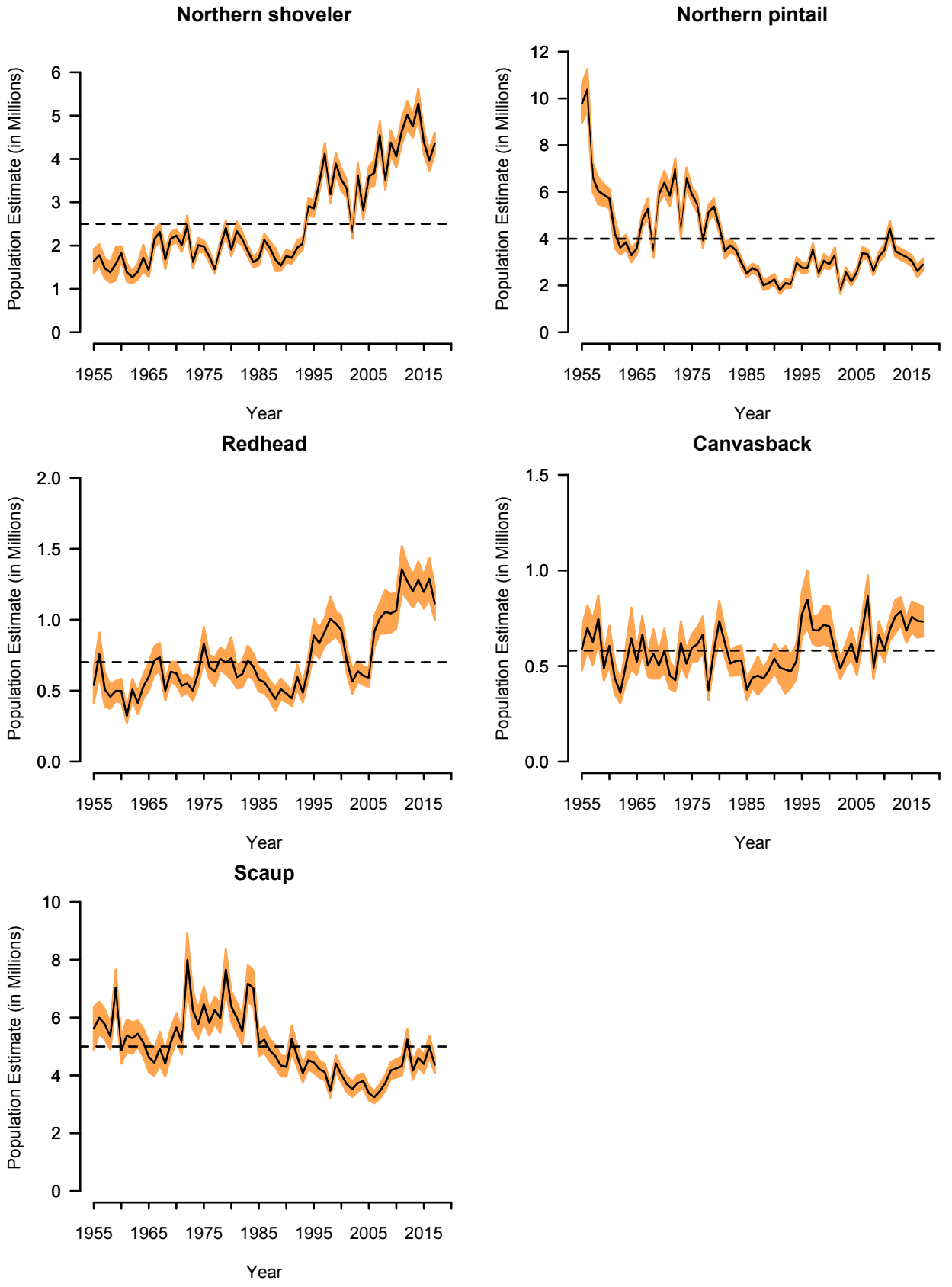

Figure 3. Continued.

2017 mallard estimate was similar to the 2016 estimate and the long-term average (1991–2016). The northeast U.S. mallard estimate was 18% below the 2016 estimate and 37% below the long-term average (1993–2016). In Minnesota, the 2017 mallard estimate was similar last year's estimate and the long-term average (1968–2016). In Nevada, the mallard estimate was 55% below the 2016 estimate and 16% below the long-term average (2009–2016).

In the traditional survey area the 2017 estimate for blue-winged teal (7.9 ± 0.4 million) was 18% above the 2016 estimate and 57% above the long-term average of 5.0 ± 0.04 million (Table 7). Estimated abundances of gadwall (*Anas strepera*; 4.2 ± 0.2 million) and northern shovelers (*A. clypeata*; 4.4 ± 0.2 million) were similar to last year's estimates and were 111% and 69% above their long-term averages of 2.0 ± 0.02 million and 2.6 ± 0.02 million, respectively (Table 4 and Table 5). The estimated abundance of green-winged teal was 3.6 ± 0.2 million, which was 16% below the 2016 estimate of 4.3 ± 0.3 million and 70% above the long-term average (2.1 ± 0.02 million; Table 6). Estimated abundance of American wigeon (2.8 ± 0.2 million) was 19% below the 2016 estimate but similar to the long-term average of 2.6 ± 0.02 million (Table 8). Northern pintail (*Anas acuta*) abundance (2.9 ± 0.2 million) was similar to the 2016 estimate and 27% below the long-term average of 4.0 ± 0.03 million (Table 9). Abundance estimates for redheads (*Aythya americana*; 1.1 ± 0.09 million) and canvasbacks (*A. valisineria*; 0.7 ± 0.06 million) were similar to their 2016 estimates and were 55% and 25% above their long-term averages of 0.7 ± 0.01 million and 0.6 ± 0.01 million, respectively (Table 10 and Table 11). The combined estimate of lesser and greater scaup (4.4 ± 0.2 million) was 12% below the 2016 estimate and 13% below the long-term average of 5.0 ± 0.04 million (Table 12).

In the eastern survey area, the estimate of goldeneyes was 0.4 ± 0.07 million, which was similar to the 2016 estimate and the 1990–2016 average. The green-winged teal estimate (0.2 ± 0.04 million) was similar to its 2016 estimate and 1990–2016 average. The estimate of mergansers (0.5 ± 0.05 million) was 15% above 2016 and the 1990–2016 average. Ring-necked ducks (0.5 ± 0.07 million) were 19% below the 2016 estimate but similar to the 1990–2016 average (Table 13, Figure 4, Appendix C.5). A time series for assessing changes 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, Figure 4). The 2017 estimate of American black ducks in the eastern survey area was 0.5 ± 0.04 million, which was similar to last year's estimate of 0.6 ± 0.05 million but 12% below the 1990–2016 average. In addition, black duck population estimates for northeastern states from New Hampshire south to Virginia were also available from the Atlantic Flyway Breeding Waterfowl Survey. The 2017 estimate of 31,200 was similar to the 2016 estimate and 47% lower than the long-term (1993–2016) average of 59,400.

Trends in wood duck populations are available from the North American Breeding Bird Survey (BBS). The BBS, a series of roadside routes surveyed during May and June each year, provides the only long-term range-wide breeding population index for this species. Wood ducks are encountered with low frequency along BBS routes, which limits the amount and quality of available information (Sauer and Droege 1990). However, hierarchical analysis of these data (J. Sauer, U.S. Geological Survey Biological Resources Division, unpublished data) incorporated adjustments for spatial and temporal variation in BBS route quality, observer skill, and other factors that may affect detectability (Link and Sauer 2002). This analysis also produces annual abundance indices and measures of variance, in addition to the trend estimates (average % change per year) and associated 95% credible intervals (LCL, UCL in parentheses following trend estimates) presented here. In the Atlantic and Mississippi flyways combined, the BBS wood duck index increased by an average of 1.21% (0.65%, 1.70%) per year over the entire survey period (1966–2016), 1.71% (0.99%, 2.43%) over the past 20 years (1997–2016), and 2.15% (0.87%, 3.45%) over the most recent (2007–2016) 10-year period. The Atlantic Flyway wood duck index increased 1.06% (0.34%, 1.74%) annually over

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

			Change from 2016			Change from LTA	
Region	2017	2016	%	*P*	LTA[a]	%	*P*
Alaska–Yukon Territory–Old Crow Flats	1	11	−87	0.236	2	−34	0.610
C. & n. Alberta–n.e. British Columbia–NWT	59	107	−45	0.030	51	+16	0.566
N. Saskatchewan–n. Manitoba–w. Ontario	7	21	−67	0.020	26	−73	<0.001
S. Alberta	873	653	+34	0.103	331	+164	<0.001
S. Saskatchewan	1,496	1,473	+2	0.883	673	+122	<0.001
S. Manitoba	125	135	−7	0.801	79	+59	0.006
Montana & western Dakotas	558	282	+98	0.006	217	+157	<0.001
Eastern Dakotas	1,060	1,031	+3	0.861	602	+76	<0.001
Total	4,180	3,712	+13	0.103	1,981	+111	<0.001

[a] Long-term average, 1955–2016.

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

			Change from 2016			Change from LTA	
Region	2017	2016	%	*P*	LTA[a]	%	*P*
Alaska–Yukon Territory–Old Crow Flats	644	724	−11	0.429	559	+15	0.160
C. & n. Alberta–n.e. British Columbia–NWT	1,424	1,788	−20	0.078	926	+54	<0.001
N. Saskatchewan–n. Manitoba–w. Ontario	71	92	−22	0.373	229	-69	<0.001
S. Alberta	188	237	−21	0.281	279	−33	<0.001
S. Saskatchewan	296	215	+37	0.064	399	−26	0.003
S. Manitoba	6	5	+36	0.305	52	-88	<0.001
Montana & western Dakotas	54	198	−73	<0.001	113	−52	<0.001
Eastern Dakotas	95	153	−38	0.348	59	+61	0.304
Total	2,777	3,411	−19	0.011	2,617	+6	0.309

[a] Long-term average, 1955–2016.

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

			Change from 2016			Change from LTA	
Region	2017	2016	%	*P*	LTA[a]a	%	*P*
'Alaska–Yukon Territory–Old Crow Flats	617	779	−21	0.230	415	+49	0.003
C. & n. Alberta–n.e. British Columbia–NWT	1,816	2,337	−22	0.141	874	+108	<0.001
N. Saskatchewan–n. Manitoba–w. Ontario	136	116	+17	0.486	201	−32	0.009
S. Alberta	342	300	+14	0.691	205	+67	0.092
S. Saskatchewan	472	468	+1	0.950	276	+71	<0.001
S. Manitoba	75	140	−47	0.017	56	+34	0.047
Montana & western Dakotas	27	36	−27	0.347	41	−35	0.058
Eastern Dakotas	121	100	+22	0.477	60	+103	0.007
Total	3,605	4,275	−16	0.097	2,126	+70	<0.001

[a] Long-term average, 1955–2016.

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

			Change from 2016			Change from LTA	
Region	2017	2016	%	*P*	LTA[a]	%	*P*
Alaska–Yukon Territory–Old Crow Flats	0	0	NA		1	−100	<0.001
C. & n. Alberta–n.e. British Columbia–NWT	579	447	+30	0.315	278	+108	0.005
N. Saskatchewan–n. Manitoba–w. Ontario	47	135	−65	0.032	231	−80	<0.001
S. Alberta	1,644	898	+83	0.008	627	+162	<0.001
S. Saskatchewan	2,820	2,104	+34	0.015	1,432	+97	<0.001
S. Manitoba	300	332	−10	0.641	377	−20	0.091
Montana & western Dakotas	528	639	−17	0.470	309	+71	0.009
Eastern Dakotas	1,970	2,136	−8	0.503	1,780	+11	0.291
Total	7,889	6,689	+18	0.022	5,035	+57	<0.001

[a] Long-term average, 1955–2016.

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

			Change from 2016			Change from LTA	
Region	2017	2016	%	*P*	LTA[a]	%	*P*
Alaska–Yukon Territory–Old Crow Flats	434	560	−23	0.160	297	+46	0.012
C. & n. Alberta–n.e. British Columbia–NWT	584	786	−26	0.080	237	+146	<0.001
N. Saskatchewan–n. Manitoba–w. Ontario	19	17	+11	0.782	39	−51	0.001
S. Alberta	872	461	+89	<0.001	429	+103	<0.001
S. Saskatchewan	1,501	1,207	+24	0.094	788	+91	<0.001
S. Manitoba	126	119	+6	0.792	113	+11	0.408
Montana & western Dakotas	218	209	+4	0.855	172	+27	0.196
Eastern Dakotas	600	608	−1	0.939	494	+21	0.199
Total	4,353	3,967	+10	0.163	2,568	+69	<0.001

[a] Long-term average, 1955–2016.

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

			Change from 2016			Change from LTA	
Region	2017	2016	%	*P*	LTA[a]	%	*P*
Alaska–Yukon Territory–Old Crow Flats	757	816	−7	0.747	922	−18	0.278
C. & n. Alberta–n.e. British Columbia–NWT	675	799	−15	0.489	367	+84	<0.001
N. Saskatchewan–n. Manitoba–w. Ontario	10	16	−37	0.233	36	−73	<0.001
S. Alberta	301	168	+79	0.004	656	−54	<0.001
S. Saskatchewan	561	289	+94	<0.001	1,122	−50	<0.001
S. Manitoba	31	19	+59	0.202	98	−69	<0.001
Montana & western Dakotas	106	135	−21	0.414	257	−59	<0.001
Eastern Dakotas	449	378	+19	0.477	507	−12	0.520
Total	2,889	2,618	+10	0.351	3,966	-27	<0.001

[a] Long-term average, 1955–2016.

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

			Change from 2016			Change from LTA	
Region	2017	2016	%	*P*	LTA[a]	%	*P*
Alaska–Yukon Territory–Old Crow Flats	0	1	−100	0.290	1	−100	<0.001
C. & n. Alberta–n.e. British Columbia–NWT	46	87	−47	0.068	40	+14	0.486
N. Saskatchewan–n. Manitoba–w. Ontario	12	11	+6	0.943	25	−52	0.029
S. Alberta	221	219	+1	0.973	129	+71	0.049
S. Saskatchewan	528	637	−17	0.341	235	+125	<0.001
S. Manitoba	131	145	−9	0.805	75	+75	0.007
Montana & western Dakotas	2	20	−89	0.059	11	−81	<0.001
Eastern Dakotas	175	170	+3	0.894	200	−13	0.288
Total	1,115	1,289	−13	0.240	718	+55	<0.001

[a] Long-term average, 1955–2016.

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

			Change from 2016			Change from LTA	
Region	2017	2016	%	*P*	LTA[a]	%	*P*
Alaska–Yukon Territory–Old Crow Flats	87	78	+11	0.844	84	+3	0.948
C. & n. Alberta–n.e. British Columbia–NWT	110	144	−23	0.490	77	+44	0.184
N. Saskatchewan–n. Manitoba–w. Ontario	37	35	+4	0.947	51	−28	0.321
S. Alberta	64	72	−12	0.715	66	−4	0.832
S. Saskatchewan	295	256	+15	0.454	201	+47	0.012
S. Manitoba	77	68	+13	0.598	56	+37	0.094
Montana & western Dakotas	14	20	−32	0.603	10	+41	0.533
Eastern Dakotas	50	63	−21	0.377	43	+17	0.460
Total	733	736	−1	0.966	587	+25	0.019

[a] Long-term average, 1955–2016.

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

			Change from 2016			Change from LTA	
Region	2017	2016	%	*P*	LTA[a]	%	*P*
Alaska–Yukon Territory–Old Crow Flats	781	653	+20	0.306	897	−13	0.264
C. & n. Alberta–n.e. British Columbia–NWT	2,238	2,805	−20	0.074	2,526	−11	0.110
N. Saskatchewan–n. Manitoba–w. Ontario	315	349	−10	0.568	544	−42	<0.001
S. Alberta	266	257	+4	0.876	330	−19	0.103
S. Saskatchewan	477	433	+10	0.665	417	+14	0.426
S. Manitoba	70	102	−31	0.233	126	−44	<0.001
Montana & western Dakotas	24	15	+60	0.457	47	−50	<0.001
Eastern Dakotas	200	376	−47	0.025	128	+57	0.091
Total	4,372	4,992	−12	0.099	5,016	−13	0.006

[a] Long-term average, 1955–2016.

the entire time series (1966–2016), 1.95% (0.91%, 2.97%) over the past 20 years (1997–2016), and 2.35% (0.43%, 4.32%) from 2007 to 2016. In the Mississippi Flyway, the corresponding BBS wood duck indices increased by 1.30% (0.56%, 1.93%, 1966–2016), 1.59% (0.67%, 2.50%, 1997–2016), and 2.03% (0.44%, 3.72%, 2007–2016; J. Sauer, U.S. Geological Survey Biological Resources Division, unpublished data). An independent wood duck population estimate was available from the Atlantic Flyway Breeding Waterfowl Survey for the northeast states from New Hampshire south to Virginia. The 2017 survey estimate of 396,400 (SE=36,100) was similar to the 2016 (430,600, SE=37,500) and 1993–2016 average (384,300, SE=7,000) estimates.

Regional Habitat and Population Status

A description of habitat conditions and duck populations for each of the major breeding areas follows. In the past this information was taken from more detailed reports of specific regions. Although these reports are no longer produced, habitat and population status for each region will continue to be summarized in this report. More detailed information on regional waterfowl and habitat conditions during the May waterfowl survey is also available on USFWS Division of Migratory Bird Management website (http://www.fws.gov/birds/surveys-and-data/population-surveys/aerial-ground-crew-blog.php).

Southern Alberta (strata 26–29, 75–76)
reported by Jim Bredy

Summer and fall of 2016 had above-normal precipitation throughout most of the region. There was normal to above-normal winter precipitation. The precipitation continued into spring 2017, which helped recharge many wetland basins. Spring arrived early with high temperatures in the 20°C range by late March and early April. By mid-April, colder temperatures and freezing precipitation returned. Ground reconnaissance by the Canadian Wildlife Service during the last week of April noted some large flocks of staging northern pintails in the region east of the Edmonton International Airport.

Habitat conditions during the 2017 survey were a starkly different from last year's dry conditions. All areas showed improvement. Much of the shortgrass prairie region of southeastern Alberta had the least improvement and was in fair condition. The quality of wetland and upland habitat conditions rapidly improved moving farther north. The aspen-parkland

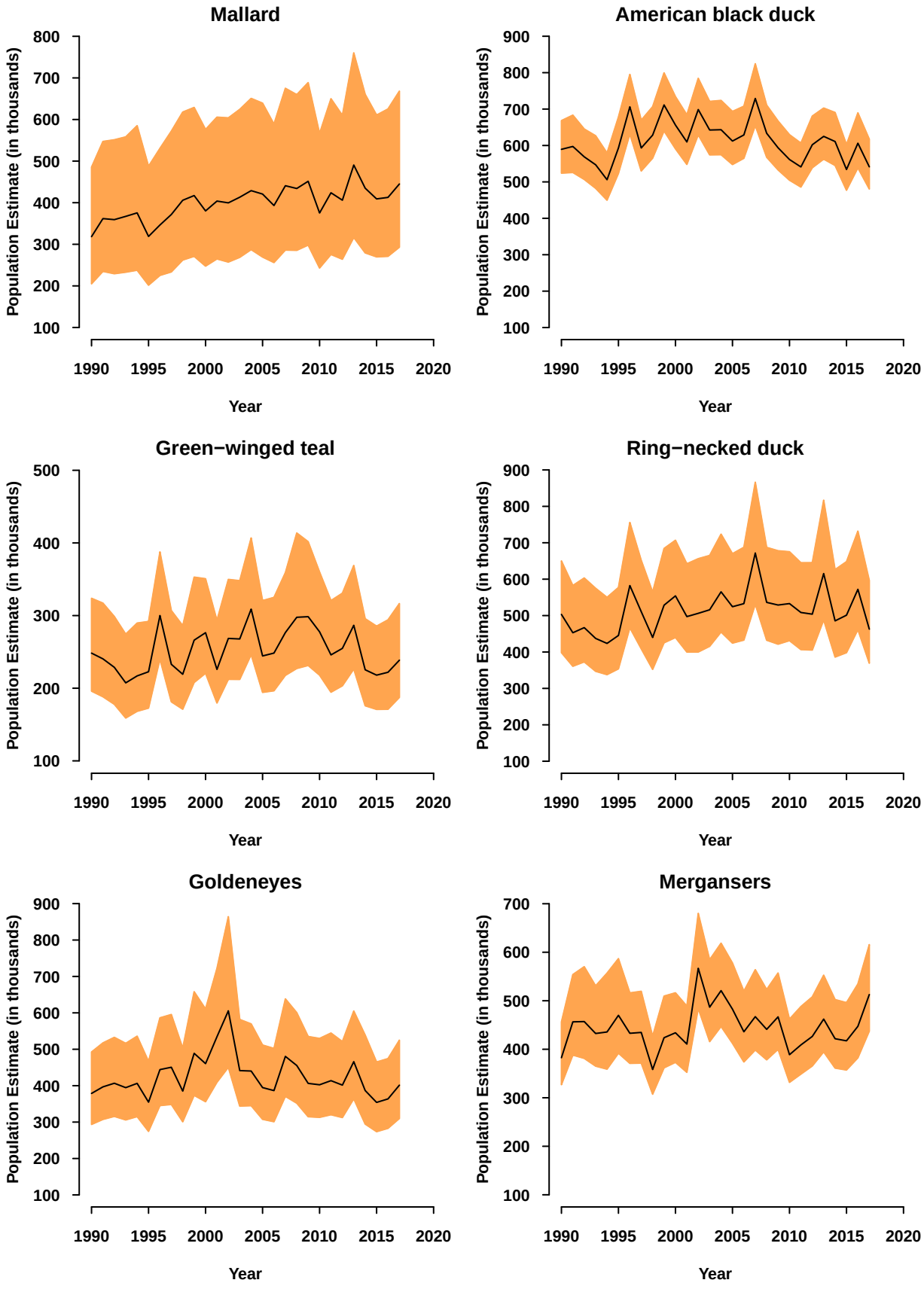

Figure 4. Breeding population estimates and 90% credible intervals from Bayesian hierarchical models for species in the eastern survey area (strata 51, 52, 63, 64, 66–68, 70–72).

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

	2017	2016	% Change from 2016	Average[b]	% Change from average
Mallard	445	413	+7	399	+11
American black duck	541	606	−11	614	−12[c]
Green-winged teal	239	222	+8	253	−6
Ring-necked duck	463	572	−19[c]	516	−11
Goldeneyes (common & Barrow's)	401	364	+10	426	−7
Mergansers (common, red-breasted, and hooded)	513	447	+15[c]	443	+15[c]

[a] Estimates derived using FWS and CWS data from strata 51, 52, 63, 64, 66–68, 70–72.
[b] Average for 1990–2016.
[c] Indicates significant change. Significance ($P \leq 0.10$) determined by non-overlap of Bayesian credibility intervals.

habitats between Red Deer, Edmonton, and east to the Saskatchewan border were in good-to-excellent condition. Many wetland basins were flooded. The aspen-parkland and boreal forested areas between Edmonton, Cold Lake, and Lesser Slave Lake also had improved habitat conditions compared to 2016. The "Peace" region between Lesser Slave Lake, Grande Prairie, Ft. St. John, and Peace River was very wet. The central part of the Peace region is adversely impacted by intense agriculture practices. The previous dry periods in this area allowed farming through many wetland basins, leaving little critical nesting vegetation for waterfowl along the margins. Duck numbers seemed to respond positively to the overall improved wetland and habitat conditions. Improved production is expected in 2017 in the survey area of southern and central Alberta.

May ponds were 54% above the 2016 estimate and 52% above the long-term average. The total duck estimate was 28% above the 2016 estimate and 49% above the long-term average. The mallard estimate was similar to 2016 and 18% above the long-term average. Gadwalls were similar to their 2016 estimate and 164% above their long-term average. The American wigeon estimate was similar to last year but 33% below the long-term average. Green-winged teal were similar to the 2016 estimate and 67% above the long-term average. The blue-winged teal estimate was 83% above the 2016 estimate and 162% above the long-term average. The northern shoveler estimate was 89% and 103% above the 2016 estimate and long-term average, respectively. Northern pintails were 79% above 2016, but 54% below the long-term average. Redheads were similar to 2016 and 71% above the long-term average. Canvasbacks and scaup were similar to their 2016 estimates and their long-term averages.

Southern Saskatchewan (strata 30–33)
reported by Phil Thorpe

Late summer and fall of 2016 were wetter and warmer than average across the agricultural belt of Saskatchewan. The above-normal precipitation consisted of rain and an early October record snowstorm. Winter and spring in the crew area were drier and remained mild (above-average temperatures) right up to the start of the survey. Seeding was delayed in 2017 because of late-April snow and rain. Many farmers were still picking up last year's crops because above-normal precipitation from last summer and fall created wet fields and prevented equipment from accessing them. Across the province more than one million acres of the 2016 crop remained in the field in early May, the majority in the west-central and northeastern regions of the province. These delays may have impacted ducks that use agricultural fields for nesting. Unharvested fields could attract some species of ducks that normally may not nest in the usual stubble fields

encountered in the spring but would find the tall cover of unharvested crops appealing. These fields will eventually be harvested and possibly reseeded or fallowed leading to higher possible nest losses than in a normal year. Phenology of vegetation appeared normal to slightly ahead of normal and timing of the survey appeared good.

The majority of the survey area had fair-to-good production potential for waterfowl. The southern grasslands were wet this year and waterfowl, particularly northern pintails, returned to the area after the brief dry spell in 2016. Given the dry conditions in the Dakotas, especially in South Dakota, it is possible that some overflight of ducks may have occurred. The grasslands have fair-to-good production and recruitment potential, with a small pocket of excellent conditions in the southwest shortgrass prairie. The northeast Parklands were drier and received less precipitation over the winter and into the spring. However wetlands remained flooded out of their boundaries, primarily from carry-over water from previous years, and should provide good brood habitat throughout the summer. As a result, fair-to-good production was expected from the northeast Parklands. The northwest Parklands should have good production potential with normal wetland levels and good upland cover. Overall, it should be a fair-to-good year for waterfowl recruitment in the southern Saskatchewan survey area.

The 2017 May pond estimate in this survey area was 17% above the 2016 estimate and 16% above the long-term average. Total duck abundance was 13% above last year and 53% above the long-term average. Mallards were similar to their 2016 estimate but 29% above the long-term average. Green-winged teal were similar to last year and 71% above their long-term average. Blue-winged teal were 34% above their 2016 estimate and 97% above the long-term average. Northern shovelers were 24% and 91% above their 2016 estimate and the long-term average, respectively. The gadwall estimate was similar to last year and 122% above the long-term average. American wigeon were 37% above last year's estimate but 26% lower than the long-term average. Northern pintails were 94% above last year but remained 50% below the long-term average. Redheads were similar to 2016 and 125% above their long-term average. The canvasback estimate was similar to the 2016 and 47% above the long-term average. Scaup were similar to their 2016 estimate and long-term average.

Southern Manitoba (strata 34–40; includes southeast Saskatchewan)
reported by Sarah Yates

Habitat conditions in southern Manitoba and southeastern Saskatchewan were significantly improved in 2017 relative to the drier conditions observed in 2016. Above-average precipitation during summer and fall of 2016 provided significant water throughout the region that lasted into winter. Winter precipitation continued to improve conditions in the crew area, and ranged from below average in the northern strata to above average in more southern areas of Manitoba and southeastern Saskatchewan. Some areas of southern Manitoba had precipitation accumulations 20–40 mm above average, while southeastern Saskatchewan saw slightly above-average accumulations (5–20 mm). Winter precipitation was below-average in the more western areas of stratum 35 and near Regina. Spring precipitation was below average (20–50 mm) throughout the majority of the crew area. Temperatures were above average during the fall and winter months, with November temperatures as much as 5°C above normal. Above-average temperatures (1–2°C) continued into January and February 2017. Temperatures were below average in March but then a warming trend continued through April 2017.

A noticeable increase in water was observed in most strata. Strata 35 and 39, which were drastically drier in 2016, were approaching normal water levels in 2017. Seasonal wetlands were more abundant and semi-permanent wetlands have rebounded in both strata from the drought experienced last year. Similar to previous years, stratum 34 remained wet, particularly in the Yorkton area. However, segments farther west near Regina were drier, which was expected due to decreased precipitation in the area as well as an increase in agricultural activity. Northern strata 36, 37, and 40 were wetter in 2017.

Conditions appear to be optimal for waterfowl nesting in the crew area, especially if average precipitation continues into the summer months.

The 2017 May pond estimate in this crew area was similar to the 2016 estimate and the long-term average. The total duck estimate was similar to 2016 and 13% above the long-term average. Mallard numbers were similar to 2016 and 50% higher than the long-term average. The gadwall estimate was similar to last year and 59% above the long-term average. American wigeon were similar to their 2016 estimate and 88% below the long-term average. The blue-winged teal estimate was similar to last year and 20% below the long-term average. Green-winged teal were 47% below the 2016 estimate yet 34% above the long-term average. Northern pintails were unchanged from 2016 and 69% below the long-term average. The northern shoveler estimate was similar to last year's estimate and to the long-term average. Redheads were similar to 2016 and 75% above the long-term average. The canvasback estimate was similar to last year's estimate and 37% above the long-term average. Scaup were similar to their 2016 estimate but 44% below their long-term average.

Montana and western Dakotas (strata 41–44)
reported by Rob Spangler

Over the past water year, the Montana and the western Dakotas crew area was characterized by average to above-average precipitation. Fall precipitation averaged 100–200% of normal in North Dakota and approximately 150–200% of normal in South Dakota. The exception was an area near Bismarck that only averaged 10–25% of normal precipitation for September. Montana started wet in September. However, the area just east of Malta received less precipitation (50% of normal) as winter began. Winter precipitation was greater than 200% of normal over most of the area. As spring progressed, conditions dried out in the Dakotas, especially in eastern South Dakota where precipitation dropped to 10–50% of normal. Areas near the border of Montana and South and North Dakota and south-central Montana received approximately 50% of normal precipitation. North Dakota fared better near the Missouri River, with frequent precipitation through March and April. Precipitation was well above normal (150–200%) near Malta and in the northwest portion of the crew area just west of Havre to Cut Bank.

Wetland conditions in western South Dakota (stratum 44) were mostly poor, with some fair areas near the Missouri River. The above-average precipitation that some regions received this water year was not enough to overcome the dry conditions over the past several years. Ponds and streams in this stratum averaged just 20–50% of capacity. Conditions improved somewhat in western North Dakota (stratum 43), varying widely from poor in the west to good in the east near the Missouri River. Wetland conditions in the southern half of Montana (stratum 42) were poor near the Montana and Wyoming border. Generally, conditions improved moving northward, except for a pocket of poor habitat near Glendive and Sydney. Two years of higher-than-normal precipitation has improved habitat in the western portions of stratum 42 near Great Falls and Cut Bank. Near Malta, where precipitation has been the greatest, habitat conditions were excellent. Wetlands had flooded grassland habitat, providing good nesting cover and giving wetland primary production a needed boost. Mostly good conditions were noted along the Montana and Canada border.

The 2017 May pond count in this crew area was 17% below last year's estimate but similar to the long-term average. Total duck numbers were unchanged from 2016 but were 28% higher than the long-term average. The mallard estimate was similar to 2016 and 24% above the long-term average. Gadwall numbers were 98% and 157% above their 2016 estimate and long-term average, respectively. Green-winged teal were similar to last year and 35% below their long-term average. Northern shoveler and canvasback estimates were similar to their 2016 estimates and long-term averages. The American wigeon estimate was 73% below the 2016 estimate and 52% below the long-term average. The blue-winged teal estimate was similar to last year and 71% higher than the long-term average. The northern pintail estimate was similar to 2016 and 59% lower than the long-term average. Redhead numbers fell

89% from 2016 and were 81% below the long-term average. The scaup estimate was similar to last year but 50% lower than the long-term average.

Eastern Dakotas (strata 45–49)
reported by Terry Liddick

On the whole, as in 2016, conditions in the eastern Dakota crew area in 2017 were fair at best. Winter 2016 and spring 2017 precipitation was at or below average across much of South Dakota, with the exception of areas southeast of Mitchell and near Sioux Falls. This was similar to conditions in 2016 and continues a trend that began in 2012. Upland vegetation was advanced again this year and many trees were already leafed out in early May.

In strata 48 and 49 in South Dakota, conditions were fair. Portions of the coteau had dry basins and the drift plain of both strata were considerably drier than 2016. Many semi-permanent wetland basins were dry, as were most of the ephemeral wetlands north of Huron. Few if any wetlands were more than 50% full, except in the coteau regions. All streams and rivers were well within their banks. Farming activities were advanced due to the average winter and spring temperatures and lack of spring precipitation. Most of eastern South Dakota was extremely dry during the survey, and without adequate spring and summer precipitation, beneficial conditions for brood rearing will be limited. Production should be average in the coteau regions of South Dakota but probably well below average in the drift plain regions.

Conditions improved moving northward in strata 45 and 46 in North Dakota, with most of the state considered good, particularly in the coteau regions. This was a moderate improvement over 2016. Regions of central North Dakota experienced average to above-average snowfall. Many basins contained adequate water but most were not near capacity. All of the permanent wetland basins in the coteau regions were at least 80% full but vegetation margins were present. The drift plain portions of North Dakota were better than we have observed in the past five years. The Souris and James Rivers were well within their banks and Devil's Lake and Lake Sakakawea had exposed beach areas, similar to 2016. There were few intact wetlands remaining in stratum 47 and most of the segments were again devoid of wetlands and waterfowl.

Overall, the coteau regions of both states were rated good, and should produce average numbers of waterfowl. Although portions of the drift prairie improved, regions rated poor in 2016 remained the same in 2017. Stratum 47 in eastern North Dakota remained poor due to the extensive drainage that has occurred.

In the eastern Dakotas, the 2017 May pond estimate was 42% higher than 2016 and similar to the long-term average. The total duck estimate was similar to that of last year and 32% above the long-term average. Mallard numbers were similar to 2016 and 66% higher than the long-term average. The gadwall estimate was similar to 2016 and 76% above the long-term average. Green-winged teal were similar to their 2016 estimate and 103% higher than their long-term average. American wigeon, blue-winged teal, northern shovelers, northern pintails, redheads, and canvasbacks were similar to last year estimates and the long-term averages. Scaup numbers were 47% lower than last year but 57% above their long-term average.

Northern Saskatchewan, northern Manitoba, and western Ontario (strata 21–25, 50)
reported by Walt Rhodes and Jim Wortham

Northern Saskatchewan and northern Manitoba experienced a cool fall and spring and warmer-than-average temperatures during winter. Precipitation was above average, with most coming during the late winter and spring of 2017. Temperatures were as much as 3°C below average during October 2016 but were more than 5°C above average in November 2016. December 2016 was similar to October, and January and February 2017 were similar to November. Spring of 2017 had temperatures 2–4°C below average. There was average to well-above-average precipitation (>200%, mostly in northern Manitoba) during October 2016, whereas November

2016 through January 2017 was below average (<85% of normal). Spring of 2017 had above-average to well-above-average precipitation, although far northern Saskatchewan and Manitoba were below average (<40% of normal). Locals said the lack of snow insulation in early winter led thicker-than-normal ice, which was slow to melt due to a cold spring. Another indicator of the wet and cooler conditions was the lack of any forest fires in the crew area during the survey. Spring phenology seemed only slightly later and the abundant precipitation should help recharge parched boreal wetlands. In some instances in northern Manitoba, streams and rivers were outside of their banks. The Parklands continued to exhibit wetland basins flooded beyond historic margins. Overall, good habitat conditions were expected across the crew area.

It was an odd year in western Ontario (stratum 50). Winter was characterized by average precipitation and temperatures, but there were several periods of significantly warmer temperatures, resulting in large areas of snowmelt. In northern areas, the melt reduced winter ice-road traffic due to deteriorated road conditions. Lakes were slow to thaw in the spring and ice persisted well into May. Upon inception of normal spring temperatures, habitats were characterized by favorable water levels and widespread occupation by beavers.

The 2017 total duck estimate in this survey area was 21% below the 2016 estimate and 26% below the long-term average. The mallard estimate was 36% lower than last year and similar to the long-term average. Gadwall numbers fell by 67% relative to 2016 and were 73% below the long-term average. The American wigeon estimate was similar to 2016 and 69% lower than the long-term average. Green-winged teal were similar to last year and 32% lower than the long-term average. Blue-winged teal estimates were 65% below the 2016 estimate and 80% lower than the long-term average. Northern shovelers were similar to last year but 51% lower than the long-term average. Northern pintails were similar to last year and 73% below their long-term average. The redhead estimate was similar to 2016 but 52% below the long-term average. The canvasback estimate was similar to 2016 and the long-term average. The scaup estimate was similar to 2016 and 42% below the long-term average.

Central and northern Alberta, northeastern British Columbia, and Northwest Territories (strata 13–18, 20, 77)
reported by Brian Lubinski

Good-to-excellent habitat conditions were observed throughout the crew area in 2017. Overall, there was an abundance of water on the landscape and ice cover was not restrictive except at higher elevations. Water levels were normal to relatively high, with black spruce inundated in numerous areas. One small area in stratum 17 was rated fair due to lower water levels. Ice cover within the most northerly strata (stratum 13 and transects 1–4 in stratum 14) was noticeably more widespread at elevations 300 meters and above, with all of the largest lakes covered in ice and large ring of open water between the shoreline and ice cover. Habitat conditions within the productive Mackenzie River Delta (stratum 13) were excellent. No habitat was in poor condition.

In this survey area, the total duck estimate for 2017 was 19% lower than the 2016 estimate but 54% higher than the long-term average. Mallard numbers were 27% below the 2016 estimate and 62% above the long-term average. The American wigeon estimate was 20% lower than last year but 54% higher than the long-term average. Gadwalls were 45% lower than the 2016 estimate and similar their long-term average. Both green- and blue-winged teal were similar to their 2016 estimates and 108% above their long-term averages. Northern shovelers were 26% below the 2016 estimate but 146% above the long-term average. The Northern pintail estimate was similar to 2016 and 84% higher than the long-term average. Redhead numbers declined 47% from the 2016 estimate yet remained similar to the long-term average. Canvasbacks were similar to last year and the long-term average. The scaup estimate was 20% below last year and similar to its long-term average.

Alaska, Yukon Territory, and Old Crow Flats (strata 1–12)
reported by Debbie Groves

Spring timing in Alaska and the Old Crow Flats was average in 2017. River breakup and leaf-out dates were average in most areas, except in southwestern Alaska where breakup occurred 3–4 days early. Only minimal flooding of rivers or streams occurred in a few localized areas. The ice-melt phenology of lakes and ponds was also about average, although below-normal temperatures in mid May in the west-central part of the state slightly delayed ice-out. Our survey timing relative to ice-melt was typical in most strata; some large lakes, especially at higher elevations, were partially or mostly frozen. We encountered slightly more ice than normal in stratum 6, where some of the smaller lakes were also partially frozen. Water levels in lakes and ponds appeared normal in the tundra strata (8–11) and slightly below normal in the boreal forest strata (1–7). Habitat conditions were good in all strata in 2017.

The 2017 total duck estimate in this survey area was similar to 2016 and the long-term average. Mallard numbers were similar to last year and 40% higher than the long-term average. Gadwalls, American wigeon, northern pintails, canvasbacks, and scaup were similar to their 2016 estimates and long-term averages. Green-winged teal were similar to last year's estimate and 49% above their long-term average. The northern shoveler estimate was similar to the 2016 estimate and 46% higher than the long-term average. Blue-winged teal and redheads are uncommon in this crew area.

Eastern survey area (strata 51–72)
reported by Stephen Earsom, Mark Koneff, and Jim Wortham

The majority of southern Ontario and southern Quebec experienced near- to above-average precipitation between 1 November 2016 and 31 March 2017. However, April 2017 was a very wet month for most of the crew area, and relatively high water levels carried over into May. Snow and ice-melt timing was similar to last year in most areas and earlier than last year in the higher elevation regions of stratum 68. All streams, beaver ponds, and string bogs across Ontario and Quebec were near full-capacity during the survey due to the April precipitation. Many permanent lakes were noticeably higher than in past years. For example, Lake Ontario at Kingston was approximately 4-feet above normal according to locals, and bleached rocks along lake shorelines throughout the survey area were underwater. Reservoir levels often inundated shoreline trees. We intentionally started the survey later this year, both because stratum 54, the first stratum flown, was permanently dropped from the survey due to widespread urbanization, wind energy development, and the preponderance of powerlines, and to ensure that stratum 68 would not have a significant amount of ice left on the smaller water bodies. Tree leaf-out was well underway when we began surveys on 9 May in stratum 53. Ice was not present on any of the Great Lakes. Many tree species were leafing out in both strata 52 and 53 and in lower elevation areas of stratum 56, but not so much as to preclude observation of waterfowl. With good survey weather and no mechanical issues, we were able to catch up with the phenology. Timing on all strata, including 68, the last flown, was appropriate. Only the largest lake in stratum 68, Mistassini, still had significant amounts of ice. With the exception of the lower St. Lawrence River Valley, where high quality riparian wetlands were flooded, all of the survey area merited an excellent rating, and habitat should not be a widespread limiting factor for waterfowl production in 2017.

Habitats in northern Quebec (stratum 69) were characterized by well-charged wetlands. Ice persisted well into May at all elevations but melted rapidly during the month. This resulted in good habitat for late-arriving species but left some concerns for production of early nesters.

Winter 2016–2017 in the Maine and Atlantic Canada Region had near-normal temperatures, with slightly below-average temperatures early and late in the winter, and slightly above-average temperatures midwinter. Snowfall was above average across Maine but slightly below average in the Canadian Maritimes, especially eastern sections of New Brunswick and Nova Scotia.

Snow and ice persisted into spring of 2017 longer than in 2016 across the crew area, and ice breakup was slow. Much of Maine and the Maritimes entered the winter under drought conditions or abnormally dry. A drying trend had persisted for the past several years; however, in Maine and western New Brunswick, significant winter and spring precipitation alleviated dry conditions and wetlands were recharged in spring 2017. An atmospheric-blocking pattern known as an "omega block" kept the region cool and wet throughout early to mid-May and contributed to local flooding, particularly in northern Maine and the St. John River Valley of New Brunswick. Substantial snow fell across Newfoundland during the winter of 2016–2017 and spring phenology was delayed several weeks, with ice and snow particularly persistent in interior and higher-elevation regions. By late May, all water bodies were ice free, even in the higher elevations of southwestern Newfoundland. Habitat conditions were good across Newfoundland at the time of the survey with the exception of higher elevations on the northern peninsula where deep snows and ice lingered into late May. Persistent wet and cold weather will likely reduce production.

Labrador interior habitats were largely ice free, even at higher elevations, and phenology appeared about normal. Coastal habitats, especially the southeast coast, were still largely ice covered, resulting in poor-to-fair conditions.

The estimated abundance of mallards in the eastern survey area (0.4 ± 0.1 million) was similar to the 2016 estimate and 1990–2016 average. Estimated abundance of American black ducks was 0.5 ± 0.04 million, which was similar to last year's estimate of 0.6 ± 0.05 million but 12% below the 1990–2016 average (Table 13). The 2017 goldeneye estimate was 0.4 ± 0.07 million, which was similar to the 2016 estimate and 1990–2016 average. The green-winged teal estimate (0.2 ± 0.04 million) was similar to its 2016 estimate and its 1990–2016 average. The estimate of mergansers (0.5 ± 0.05 million) was 15% above 2016 and the 1990–2016 average. Ring-necked ducks (0.5 ± 0.07 million) were 19% below the 2016 estimate but similar to the 1990–2016 average.

Other areas

Above-average snowfall and average to above-average winter and spring rains at lower elevations greatly improved breeding waterfowl habitat conditions in the Pacific Flyway for 2017. California's habitat conditions continued to improve. Good habitat conditions were noted across the survey area due to abundant precipitation (both rain and snow). Localized flooding was a concern and despite continuing habitat improvement lower-than-expected duck numbers were recorded in many areas, possibly due to late flooding of rice and conversion of pasture habitats to tree crops. The 2017 California total duck estimate was similar to 2016 but 29% lower than the long-term average. The 2017 mallard estimate was similar to 2016 but 42% lower than the long-term average. Habitat conditions in Oregon were much improved relative to the past several years and were good to excellent in all surveyed areas. Some areas of southcentral and southeastern Oregon had basins and playas with water for the first time in a decade or more. Many playas and dugout ponds throughout the High Desert were flooded as well. The 2017 Oregon total duck estimate was similar to 2016 and the long-term average. The 2017 mallard estimate was similar to 2016 but 21% below the long-term average. In Washington, overall water availability was the among wettest seen in 20 years according to state wildlife area staff and others, particularly through the Potholes and Channeled Scablands region, where potholes and ponds were plentiful. Reservoirs throughout eastern Washington were at or above 100% capacity with associated flooding of fields and pastures. In early May, significant snowmelt runoff was still occurring throughout the Okanogan and Northeast Highlands. The estimate for total ducks in Washington (242,200) was 99% above the 2016 estimate (121,500) and 44% above the long-term average of 167,400. The mallard estimate in Washington was 103,400, which was 72% higher than last year's estimate of 60,000, and 29% above the long-term average. Slightly below-average temperatures were recorded in British Columbia during winter 2016–2017. Lower-than-average precipitation fell from December 2016

to February 2017 but was higher than average from February to May 2017. April 2017 was cool and wet, which increased snowpack and delayed snowmelt. Snow and ice were common at mid and low elevations in early May, reducing the wetland habitats available to breeding waterfowl relative to previous years. In general, May 2017 habitat conditions were fair to good in the prime breeding waterfowl areas in southern British Columbia and good in the northern Interior. The 2017 British Columbia total duck estimate was 350,500, which was similar to the 2016 estimate and the long-term average (2006–2016). The 2017 mallard estimate (70,900) was similar to 2016 and the long-term average. Water conditions throughout the surveyed area of Nevada were excellent. The mallard estimate in Nevada of 6,300 was 55% below the 2016 estimate and 16% below the long-term average.

The midwestestern U.S. had average to above-average precipitation and temperatures since the fall of 2016, with early-spring temperatures well above normal. Minnesota wetland conditions improved in spring of 2017. During early May, no portion of the state was under a drought designation. The number of permanent or semi-permanent wetlands was 20% above the 2016 estimate and 5% above the long-term average. Ice-out was extremely early in the southern part of the state, with many lakes at or near the earliest dates on record. Ice-out dates in northern Minnesota were later but still 1- to 2-weeks earlier than median dates. The Minnesota total duck population, excluding scaup, was 636,000, 19% below last year's index of 787,000 and 3% above the long-term average (1968–2016) of 619,800. The 2017 estimated mallard breeding population was similar to 2016 and the long-term average. Michigan habitat conditions were improved in 2017. Pond estimates in the northern forest and farm-urban strata increased 30% and 15%, respectively. Additionally, Great Lakes water levels, which have been correlated with breeding mallard abundance, were favorable. Michigan breeding waterfowl habitat conditions were excellent statewide. Michigan total duck and breeding mallard estimates were similar to 2016 and the long-term averages. Warm weather arrived in March in Wisconsin, which triggered migration and breeding activity by mallards and Canada geese. Average to above-average temperatures continued into the spring of 2017. Fall and winter precipitation was 19% above average statewide and the wet conditions continued into spring of 2017, with precipitation 39% above normal. Usual high-density duck nesting areas in southern and eastern Wisconsin had normal or above-normal water conditions. The 2017 Wisconsin total breeding duck and mallard population estimates were similar to 2016 and the long-term averages. Conditions in the Nebraska Sandhills were again good to excellent this spring and early summer, with abundant precipitation in May and beyond. Duck production was expected to be above average. Nebraska has not conducted a spring waterfowl survey in recent years.

Atlantic Flyway Breeding Waterfowl survey states experienced a mild winter in 2016–2017. Drought conditions in the northeast were somewhat alleviated by early and abundant spring rains. Some states reported heavy spring rains and flooding that was expected to produce localized reduced waterfowl nesting. Mid-Atlantic States also had average to above-average spring rainfall, with a rapid spring green-up, then near-normal spring phenology. The total duck estimate from the 2017 Atlantic Flyway Breeding Waterfowl survey was 1.3 million, which was similar to the 2016 estimate of 1.2 million and similar to the long-term (1993–2016) average of 1.4 million. Mallard numbers (448,500) were similar to the 2016 estimate of 551,300 and 37% below the long-term average of 720,000.

Mallard Fall-flight Index

The mid-continent mallard population is composed of mallards from the traditional survey area (revised in 2008 to exclude mallards from Alaska and the Old Crow Flat area of the Yukon Territory), Michigan, Minnesota, and Wisconsin, and was estimated to be 12.9 ± 1.2 million birds in 2017 (Figure 5). This is similar to the 2016 estimate of 13.5 ± 1.4 million.

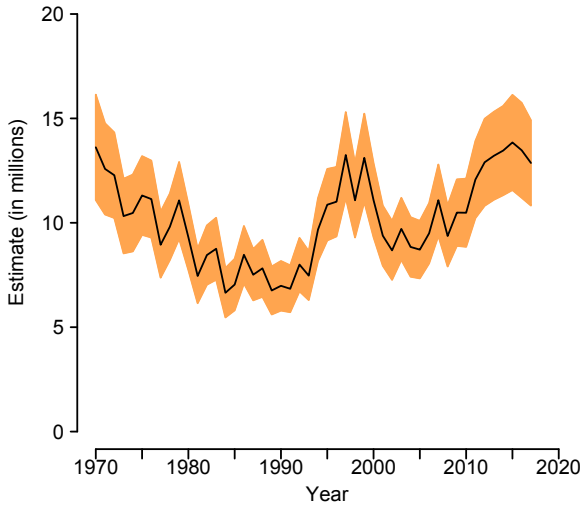

Figure 5. Estimates and 90% confidence intervals for the predicted size of the mallard population in the fall.

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Status of Geese and Swans

This section summarizes information regarding the status and productivity of goose and 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 and Subarctic regions of Alaska and northern Canada (Figure 6), but several Canada goose populations nest in temperate regions of the United States and southern Canada ("temperate-nesting" populations). Arctic-nesting geese rely predominantly on stored reserves for egg production. Thus, 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, productivity is generally less variable among years, but recruitment can be affected by local factors such as drought or weather 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, revised 1 November 2013 (78 FR 65844). Some of the goose populations described herein are composed of more than one subspecies, and some light goose populations contain two species (i.e., snow and Ross's geese). Population estimates for geese (Appendices D.1, D.2, and D.3) are derived from a variety of surveys conducted by biologists from federal, state, and provincial agencies, or from universities (Appendices A.2). Surveys include the Midwinter Survey (conducted each December or January in wintering areas), the Waterfowl Breeding Population and Habitat Survey (WBPHS, see Status of Ducks section of this report), the Yukon–Kuskokwim Delta (YKD) Coastal Zone Survey, the Arctic Coastal Plain (ACP) Survey, and surveys that are specifically designed for various goose populations. Where survey methodology allowed, 95% confidence intervals are presented in parentheses following population estimates. Trends of population estimates were calculated by regressing the natural logarithm of survey results on year, and slope coefficients were presented and tested for equality to zero (t-statistic). Changes in population indices between the most recent and previous year were calculated and where possible, assessed with a two-tailed z-test using the sum of sampling variances for the two estimates. All statistical tests and analyses were conducted using an alpha level of 0.05. Primary abundance indices used as management plan population objectives are described first in population sections and graphed. Because this report was completed prior to final goose and swan reproduction reports and based on preliminary assessments for some populations, information is the best available at the time of finalizing the report but can differ from final estimates or observed conditions. Information on habitat conditions and productivity were primarily based on observations made during various waterfowl surveys and information from field biologists. These reports provide reliable information for specific locations, but may not provide accurate assessments over the vast geographic range of waterfowl populations.

Figure 6. Important goose and swan nesting areas in Arctic and Subarctic North America.

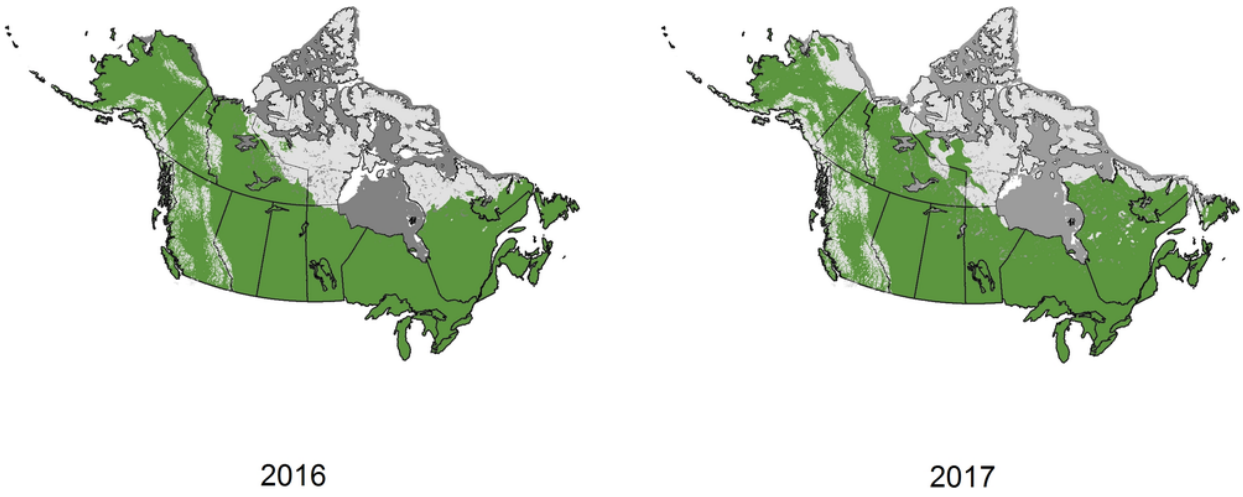

Figure 7. The extent of snow (light gray) and ice (dark gray) cover in North America on 2 June 2016 and 2 June 2017 (National Ice Center 2017).

Results and Discussion

Conditions in the Arctic and Subarctic

Production of Arctic-nesting geese depends heavily upon the annual timing of snow and ice melt. In 2017, ice and snow melt timing was early in southwestern Alaska and portions of the west-central Arctic, later than average in northern Alaska, and near average across most other areas of Alaska and portions of the central Arctic and Subarctic. Spring phenology was advanced or average in portions of the eastern Subarctic and slightly delayed in the eastern Arctic. In many areas with later-than-average ice break-up, spring conditions advanced rapidly, resulting in relatively good conditions with the onset of nesting. The snow and ice cover graphics (Figure 7) illustrate that ice or snow cover on 2 June 2017 was similar in many areas on the same date in 2016, but more extensive along the north coast of Alaska and portions of the western Arctic and less extensive in portions of the central and eastern Subarctic (National Ice Center 2017). Based on these early conditions, above-average nesting conditions were expected for goose and swan populations in southwestern Alaska and Subarctic areas. Average nesting conditions were expected for most other portions of Alaska and the western and central Arctic, and average to below-average nesting conditions were expected in the eastern Arctic.

Conditions in Southern Canada and the United States

Conditions that influence the productivity of Canada geese vary less from year to year in temperate regions than in the Arctic and Subarctic. Given adequate wetland numbers and the absence of flooding, temperate-nesting Canada geese are reliably productive. Many temperate-nesting goose populations remain above management objective levels, despite efforts to reduce abundance. In 2017, habitat conditions in many portions of the western U.S. and Pacific Flyway states continued to improve from drought conditions in recent years, but some localized areas within western provinces and U.S. states experienced below-average late season precipitation. Within the Central Flyway, habitat conditions in much of the Canadian prairies and portions of northern and central North Dakota were improved from last year, with good-to-excellent conditions and early spring phenology. Conditions in other portions of North Dakota and throughout South Dakota were rated as either fair or poor. Other Central Flyway states experienced average spring conditions, although some late flooding events occurred in Kansas and Oklahoma. Mississippi Flyway biologists generally reported above-average or average nesting conditions, and habitat conditions in southern Manitoba and Ontario were excellent

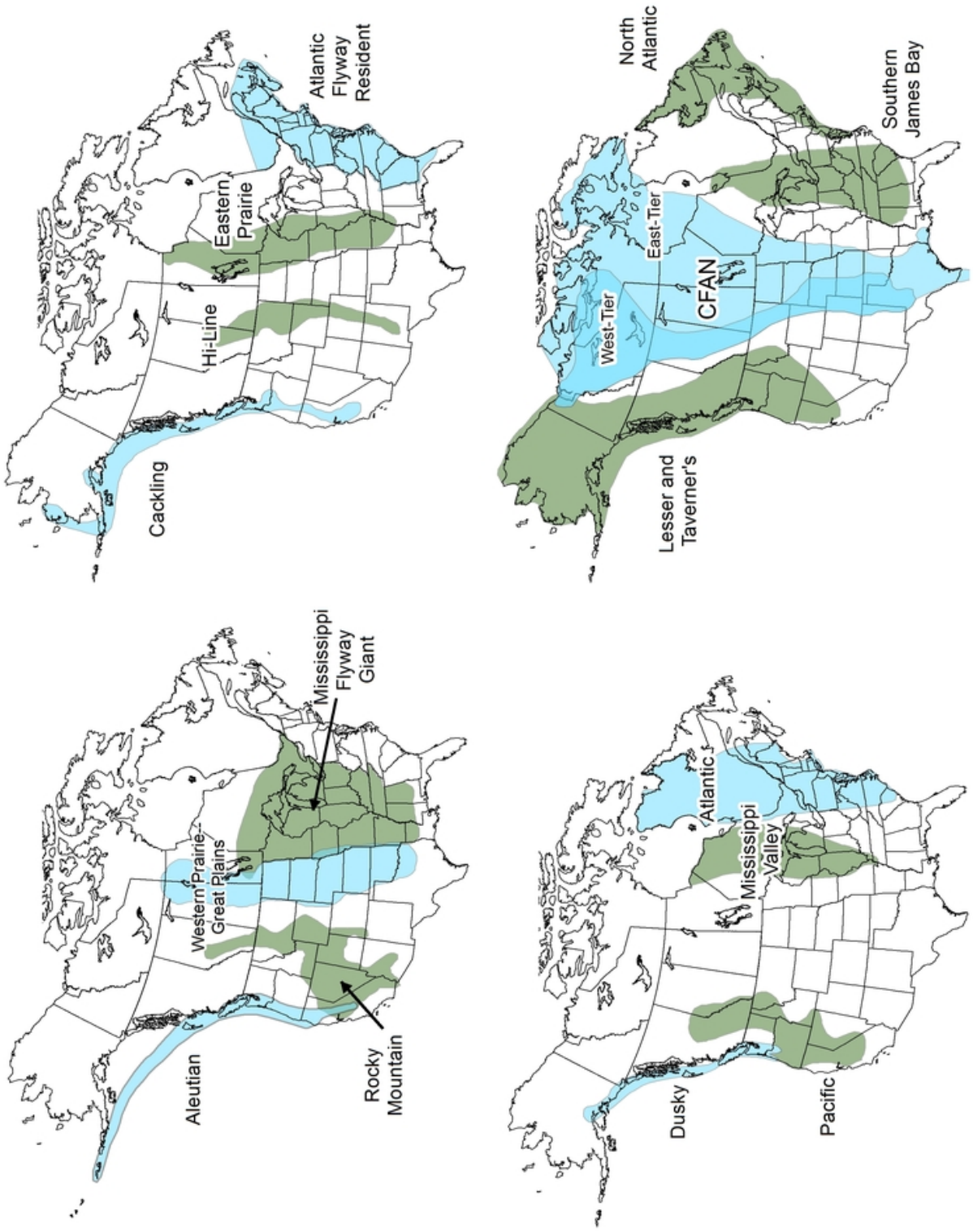

Figure 8. Approximate ranges of Canada goose populations in North America.

Table 14. Canada goose indices (in thousands) from primary monitoring surveys.

	Estimate/Count		Change from 2016		10-year Trend	
Population	2017	2016	%	*P*	%/yr[a]	*P*
North Atlantic	47	50	−5	0.826	0	0.479
Atlantic	161	192	−16	0.317	−1	0.594
Atlantic Flyway Resident	933	950	−2	0.879	−1	0.356
Mississippi Flyway Interior[b]	72	65	+10	–	–	–
Mississippi Flyway Giant	1,776	1,529	+16	–	+1	0.275
Western Prairie and Great Plains	1,353	1,518	−11	0.185	+4	0.009
Central Flyway Arctic Nesting[c]	1,892	3,761	−50	0.008	−1	0.752
Hi-Line	375	454	−17	0.200	+3	0.193
Rocky Mountain	188	252	−25	0.111	+3	0.312
Pacific	298	313	−5	0.730	+4	0.107
Dusky	14	13	+2	0.899	+8	0.011
Cackling	290	328	−11	0.182	+3	0.174
Lesser	3	7	−57	0.095	−9	0.058
Taverner's	46	55	−17	0.340	−2	0.563
Aleutian	169	155	+9	0.568	+7	0.003

[a] Rounded values mask change in estimates.
[b] Estimates of the mainland survey area only; Akimiski Island estimates are not included.
[c] Years presented refer to year–2.

with early spring phenology. In the Atlantic Flyway, northeastern and mid-Atlantic states experienced a mild winter, near average spring temperatures, and improved conditions overall compared to last year. Some areas received abundant spring rains, which helped to alleviate drought conditions, but flooding in some locations may have reduced nesting. Conditions in Canadian Maritime provinces and Newfoundland and Labrador were mostly rated good, although some coastal areas were rated poor due to late spring phenology and persisting ice conditions.

Status of Canada Geese

North Atlantic Population (NAP)

NAP Canada geese principally nest in Newfoundland and Labrador. They commingle during winter with other Atlantic Flyway Canada goose populations, although NAP geese have a more coastal distribution than other populations (Figure 8). In 2016, biologists revised the index used to monitor this population to a composite estimate that combines data from both the Canadian Wildlife Service (CWS) helicopter plot survey and the WBPHS (strata 66, 67, and 70; (Figure 9). The new composite time series is updated annually due to the estimation procedure. Estimates presented are median and 2.5% and 97.5% Bayesian credible intervals. In 2017, the composite estimate of total indicated pairs was 46,900 (34,600–67,200), similar to the 2016 estimate of 49,500 (37,000–69,800; $P \geq 0.826$). During the past 10 years, these estimates did not have a significant trend ($P = 0.479$). Habitat conditions in 2017 were generally good within interior portions of Newfoundland and Labrador and improved from last year; however, southeast coastal areas were poor due to late spring phenology and persisting ice conditions.

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 (Figure 10). This population winters from New England to South Carolina, but the largest concentrations occur

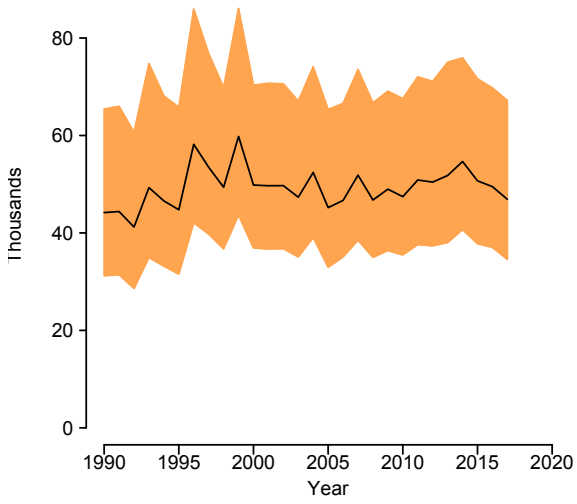

Figure 9. Estimated numbers (and 95% confidence intervals) of North Atlantic Population (indicated pairs) Canada geese.

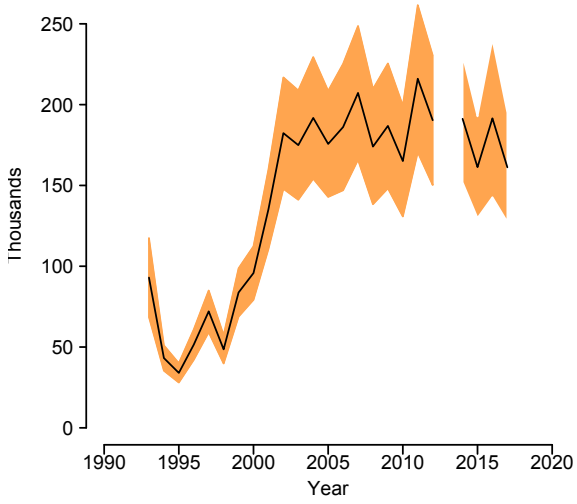

Figure 10. Estimated numbers (and 95% confidence intervals) of Atlantic Population (breeding pairs) Canada geese.

on the Delmarva Peninsula (Figure 8). This population is monitored by a spring survey of the Ungava Peninsula in northern Quebec (Atlantic Flyway Council 2008). The breeding pair estimate was 161,200 (127,400–195,000), similar to ($P = 0.317$) last year's estimate of 191,500 (142,700–240,300). The total population estimate (breeding pairs and grouped birds) was 705,900 (562,600–849,200), which was similar to the 2016 estimate of 663,500 (506,500–820,500; $P = 0.696$). During the past 10 years, breeding pair estimates have not shown a significant trend ($P = 0.594$), but total population estimates have decreased 4% per year ($P = 0.016$). The total population estimate may contain large numbers of non AP geese that have migrated there to molt and should be interpreted cautiously. Spring phenology was earlier than average in northern and central Quebec, and habitat conditions were above average for nesting. Most lakes and ponds were open and little snow cover remained in mid-June. A high proportion of single geese usually forecasts above-average production, and the proportion of indicated pairs observed as single geese was 69% in 2017, the highest recorded for the history of the survey and above the long-term average of 52% (1993–2017; range = 34–69%). However, a model that uses May temperatures and June snowfall to predict recruitment indicated slightly below-average production (J. Stiller, NY Department of Environmental Conservation, unpublished data).

Atlantic Flyway Resident Population (AFRP)

AFRP Canada geese were introduced and established throughout the Atlantic Flyway during the early 20^{th} century and are comprised of various subspecies. This population of large Canada geese inhabits all states of the Atlantic Flyway and southern portions of Quebec and the Maritime provinces (Figure 8). The breeding population is estimated during the spring via the Atlantic Flyway Breeding Waterfowl Plot Survey (Atlantic Flyway Council 1999). A breeding population of 933,300 (788,300–1,078,300) AFRP Canada geese was estimated during the spring of 2017, similar to the 2016 estimate of 950,000 (792,900–1,107,000; $P = 0.879$; Figure 11). The 10-year trend for these estimates was not significant ($P = 0.356$). Northeastern and mid-Atlantic provinces and states experienced a mild winter, and spring temperatures were near average across much of the survey area. Northeastern states had been experiencing drought conditions in some areas, and these conditions

Figure 11. Estimated numbers (and 95% confidence intervals) of Atlantic Flyway Resident Population (breeding adults) Canada geese.

were alleviated due to early and abundant spring rains; however, flooding may have reduced waterfowl nesting in some areas. Following a mild winter and average or above-average early spring rainfall, most mid-Atlantic states experienced rapid spring green-up and then near-normal phenology and rainfall totals.

Mississippi Flyway Interior Population (MFIP)

In 2016, biologists modified the monitoring surveys for the Southern James Bay Population (SJBP; Mississippi and Atlantic Flyway Councils 2008), Mississippi Valley Population (MVP; Mississippi Flyway Council 1998), and Eastern Prairie Population (EPP; Mississippi Flyway Council 2008) of Canada geese (Figure 8). Biologists now conduct a combined survey along the south and west portions of the Hudson and James Bays and report indices for the Mississippi Flyway Interior Population of Canada geese (MFIP). MFIP Canada geese nest in the Hudson Bay Lowlands, Akimiski Island, and along the eastern and southern portions of Hudson and James Bays and concentrate during fall and winter throughout Manitoba, Ontario, and the Mississippi Flyway states. The 2017 preliminary estimate of MFIP Canada geese on the mainland portion of the survey area was 71,600, 10% greater than the 2016 estimate of 65,100. Estimates from Akimiski Island were not available when this report was published. Spring phenology along the western Hudson and James Bays in 2017 was later than average, and early observations in some areas indicated slightly below-average productivity.

Mississippi Flyway Giant Population (MFGP)

MFGP Canada geese nest in the Mississippi Flyway states and in southern Ontario and southern Manitoba. Giant Canada geese were reestablished or introduced in all Mississippi Flyway states, and they now represent a large proportion of all Canada geese in the Mississippi Flyway (Figure 8). The total population is estimated during spring surveys within the Mississippi Flyway states and provinces (Mississippi Flyway Council 1996). In 2017, biologists counted 1,776,000 MFGP geese, 16% greater than the 2016 count of 1,528,800 (Figure 12). There has been no trend in these indices during the past 10 years ($P = 0.275$). Nesting conditions were generally excellent or good across most of the states and provinces of the MFGP range. Southern Manitoba and Ontario experienced excellent habitat conditions with earlier-than-average spring phenology. Biologists from Indiana noted high numbers of flocked young geese, whereas below-average conditions were reported

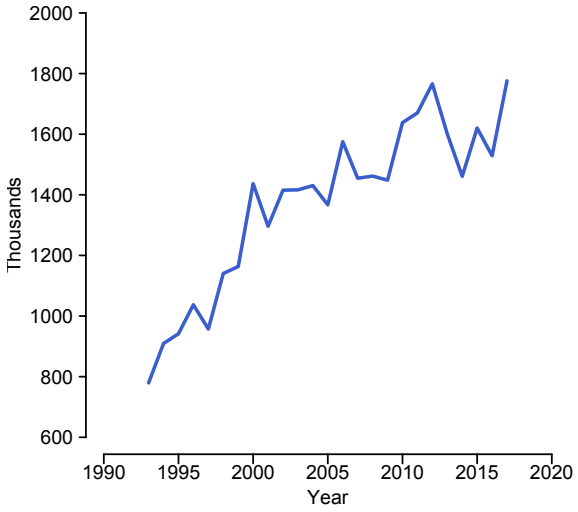

Figure 12. Numbers of Mississippi Flyway Giant Population (breeding adults) Canada geese.

in Illinois and Mississippi due to flooding.

Western Prairie and Great Plains Populations (WPP/GPP)

WPP Canada geese nest in eastern Saskatchewan and western Manitoba. GPP Canada geese are composed of large Canada geese resulting from restoration efforts in Saskatchewan, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. These two populations are managed jointly. Geese from these breeding populations commingle during migration and winter with other Canada geese (Figure 8). The WBPHS (strata 21–25, 31, 34–40, 43–49) and Midwinter Survey provide an index of this population within its primary breeding and wintering ranges, respectively. The WBPHS strata included in the spring index were modified in 2017, and the entire time series was updated; thus, the indices presented are not comparable to past reports. In 2017, the estimated spring population was 1,352,800 (1,186,600–1,519,00) geese, similar to last year's estimate of 1,517,700 (1,339,000–1,696,400; $P = 0.185$; Figure 13). The WBPHS estimates have increased 4% per year since 2008 ($P = 0.009$). During the 2017 Midwinter Survey, 608,700 WPP/GPP geese were counted, 13% greater than the 538,200 recorded in 2016. Midwinter Survey indices have shown no trend from 2008 to 2017 ($P = 0.691$). Southern Manitoba and southeastern Saskatchewan habitat conditions were excellent to fair in 2017 and wetter than conditions in 2016. Habitat conditions in North Dakota were good to fair in the central part of the state but poor in the eastern and southwestern portions. Conditions were drier in South Dakota compared to last year, with most parts of the state either fair or poor. Biologists in North Dakota, South Dakota, and Nebraska expected average to above-average goose production across most of the state. In Kansas and Oklahoma spring conditions were early but there were some late flooding events, which may result in average to below-average production.

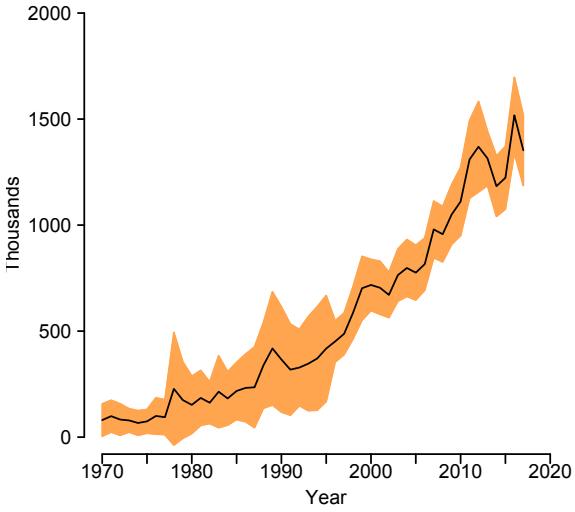

Figure 13. Estimated numbers (and 95% confidence intervals) of Western Prairie/Great Plains Population Canada geese (spring index).

Central Flyway Arctic Nesting Canada Geese (CFAN)

CFAN were previously managed separately as the Short Grass Prairie (SGPP) and Tall Grass Prairie (TGPP) Populations of Canada geese, which are now referred to as West-tier and East-tier CFAN, respectively (Central and Mississippi Flyway Councils 2013). East-tier CFAN 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. East-tier CFAN winter mainly in Oklahoma, Texas, and northeastern Mexico (Figure 8). West-tier CFAN 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 (Figure 8). Alternative nomenclature and delineation is used by the Mississippi Flyway, the Canadian Wildlife Service, and others in reference to the subspecies *Branta hutchinsii hutchinsii*. These geese are referred to as Mid-continent cackling geese and defined as geese breeding north of the tree line in Canada, or above latitude 60°N. Lincoln estimates of the adult cohort are the primary management indices for this population. Lincoln estimates are derived from

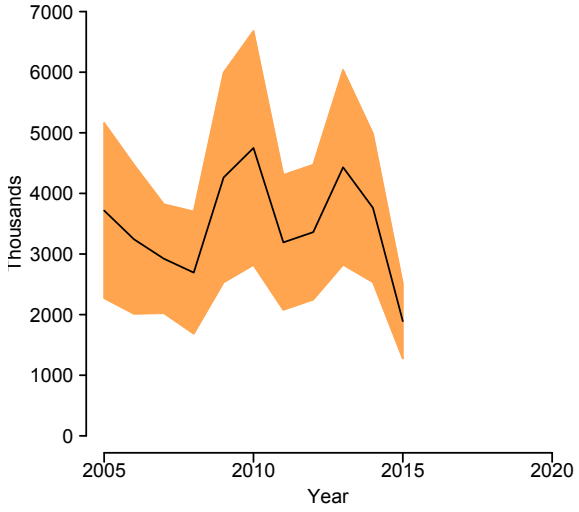

Figure 14. Estimated numbers (and 95% confidence intervals) of adult Central Flyway Arctic Nesting Canada geese (Lincoln estimate).

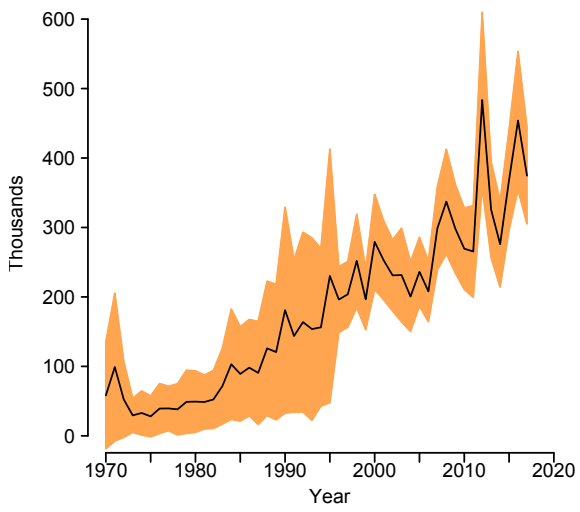

Figure 15. Estimated numbers (and 95% confidence intervals) of Hi-line Population Canada geese (spring index).

annual harvest and band recovery data and represent an indirect measure of population size. Due to the methodology, Lincoln estimates are typically not available from the most recent years. The 2015 adult Lincoln estimate was 1,892,000 (1,274,600–2,509,400), 50% less than the 2014 estimate of 3,761,100 (2,536,00–4,986,300; $P = 0.008$). During the past 10 years, there was no trend in these estimates ($P = 0.752$; Figure 14). The Midwinter Survey provides an index of CFAN within their winter range of the Central Flyway. In 2017, 691,000 CFAN were counted during the Midwinter Survey, 11% greater than the 2016 index of 625,200. Over the past 10 years, Midwinter Survey counts have not exhibited a significant trend ($P = 0.551$). A portion of the West-tier CFAN breeding range is covered by the WBPHS in the Northwest Territories (strata 13–18). In 2017, the estimated spring abundance of West-tier CFAN from the WBPHS was 152,600 (104,400–200,900), similar to last year's estimate of 251,800 (163,400–340,100; $P = 0.054$). There was no trend in these estimates from 2008 to 2017 ($P = 0.214$). In 2017, conditions were generally average or above average across most areas within the breeding range of this population. Habitat conditions were rated excellent in coastal areas of the Northwest Territories.

Hi-line Population (HLP)

HLP Canada geese nest in southeastern Alberta, southwestern Saskatchewan, eastern Montana and Wyoming, and Colorado. This population winters in these states and New Mexico (Figure 8). A breeding index of HLP geese is based on the WBPHS estimates from portions of Alberta (strata 26–29), Saskatchewan (strata 30, 32, 33), and Montana (strata 41–42), and state surveys in Wyoming. A winter index of HLP geese is based on Midwinter Survey counts in portions of Montana, Wyoming, Colorado, New Mexico, Nebraska, Alberta, and Saskatchewan (Central Flyway Council 2010). Most (> 97%) HLP geese are counted on the WBPHS strata, and Wyoming discontinued their spring survey in 2016; thus, beginning in 2017, we only report the WBPHS estimates for HLP geese, and the entire time series was updated. The indices presented are not comparable to past reports. The 2017 WBPHS estimate for HLP geese was 374,600 (305,100–444,100), similar to last year's estimate of 453,900 (354,400–553,400; $P = 0.200$; Figure 15). There was no significant trend in these indices during 2008–2017 ($P = 0.193$). The 2017 Midwinter Survey index for HLP geese was 286,700, 2% greater than last year's count of 280,200. Over the past 10 years, Midwinter Survey indices for

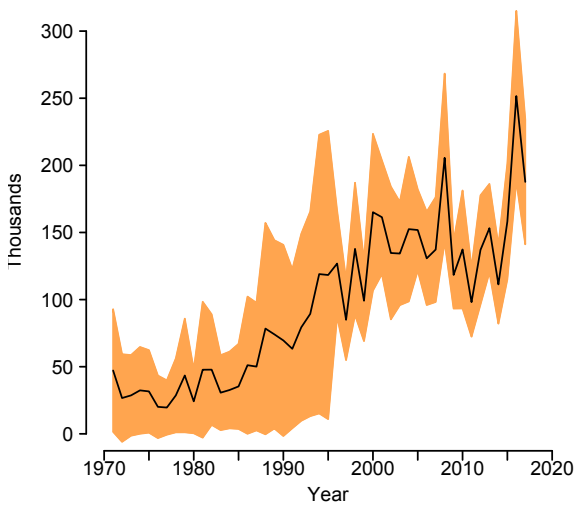

Figure 16. Estimated numbers (and 95% confidence intervals) of Rocky Mountain Population (spring index) Canada geese.

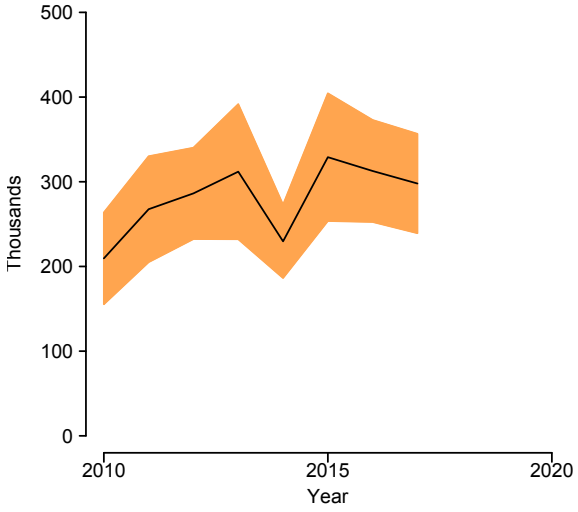

Figure 17. Estimated numbers (and 95% confidence intervals) of Pacific Population (spring index) Canada geese.

this population have not shown a significant trend ($P = 0.406$). Habitat conditions in southern Alberta and Saskatchewan were fair to excellent, and improved from last year. Spring phenology was near average or slightly advanced. In Montana, habitat conditions near the Rocky Mountains and Canadian border were wet and rated fair to excellent, whereas the central and southern portions of the state were rated poor due to below-average precipitation.

Rocky Mountain Population (RMP)

RMP Canada geese nest in southern Alberta and western Montana, and the inter-mountain regions of Utah, Idaho, eastern Nevada, Wyoming, and Colorado. This population winters mainly in central and southern California, Arizona, Nevada, Utah, Idaho, and Montana (Figure 8). An index of breeding RMP geese is based on WBPHS estimates from portions of Alberta (strata 26–29) and Montana (strata 41–42), plus state surveys in Arizona, Colorado, Idaho, Nevada, Utah, and Wyoming (Pacific Flyway Council 2000*b*). Most (> 95%) RMP geese are counted on the WBPHS strata, and some states have discontinued or modified their spring survey; thus, beginning in 2017, we only report the WBPHS estimates for RMP geese, and the entire time series was updated. The indices presented are not comparable to past reports. In 2017, the WBPHS estimate for RMP geese was 187,700 (141,200–234,200), similar to last year's estimate of 251,600 (188,200–315,100; $P = 0.111$; Figure 16). The WBPHS estimates for RMP geese have not shown a significant trend during the past ten years ($P = 0.312$). Habitat conditions were fair to good in southern Alberta and western Montana and improved from last year. Habitat conditions were also improved in other U.S. states within the range of this population, with spring precipitation levels near average.

Pacific Population (PP)

PP Canada geese nest and winter west of the Rocky Mountains from northern Alberta and British Columbia to California (Figure 8). Historically, a total PP Canada goose index was derived from WBPHS estimates in portions of Alberta (WBPHS strata 76–77) and additional surveys in British Columbia, Washington, Oregon, California, Nevada, Idaho, and Montana (Pacific Flyway Council 2000*a*). However, most (>99%) PP Canada geese are counted in Alberta, British Columbia, Washington, Oregon, California, and the other states have discontinued or modified their spring survey. British Columbia, Washington, Oregon, and California all established standardized transect surveys, the last

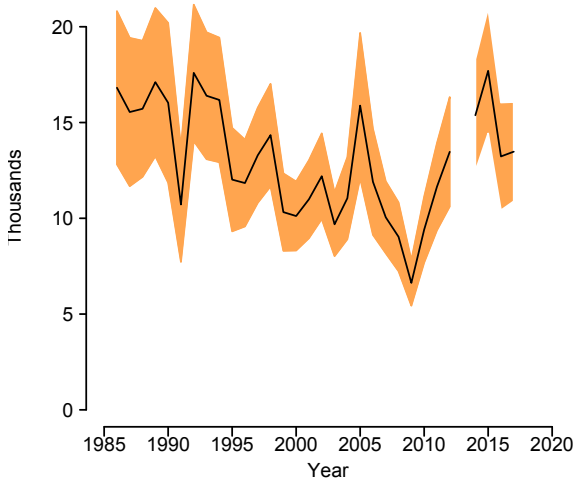

Figure 18. Estimated numbers (and 95% confidence intervals) of Dusky Canada geese (breeding index).

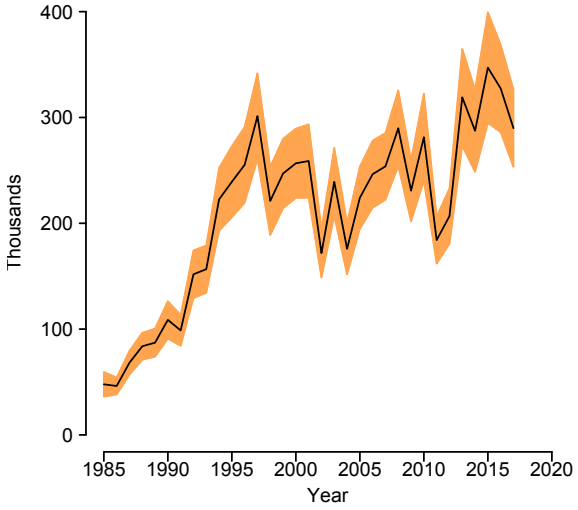

Figure 19. Predicted fall population (and 95% confidence intervals) of Cackling Canada geese.

being British Columbia in 2010. Thus, beginning in 2017, we only report estimates from strata 76–77 in Alberta and the standardized surveys in British Columbia, Washington, Oregon, and California for PP Canada geese, and the entire time series was updated. The indices presented are not comparable to past reports. The PP goose estimate in 2017 was 297,900 (239,300–356,600), similar to ($P = 0.730$) the 312,700 (252,500–372,900) reported in 2016 (Figure 17). There was no trend in these indices from 2010 to 2017 ($P = 0.107$). Habitat conditions in most areas within the range of PP Canada geese continued to improve compared to past drought conditions in recent years, although some localized areas within western provinces and U.S. states experienced below-average late season precipitation.

Dusky Canada Geese

Dusky Canada geese nest on the Copper River Delta of southcentral Alaska and winter in the Willamette and Lower Columbia River Valleys of Oregon and Washington (Figure 8). Dusky Canada geese are surveyed on their breeding grounds on the Copper River Delta and Middleton Island, Alaska (Pacific Flyway Council 2015; Figure 18). In 2017, the Dusky Canada goose population index was 13,500 (10,900–16,100), which was similar to ($P = 0.899$) the 2016 estimate of 13,200 (10,400–16,000). During the past 10 years, these estimates have increased 8% per year ($P = 0.011$). In 2017, southcentral Alaska experienced a warm and early spring compared to most years. For the fourth year in a row, no snow was observed on the survey area, which contrasts with past surveys where snow and ice were usually observed.

Cackling Canada Geese

Cackling Canada geese nest on the YKD of western Alaska and primarily winter in the Willamette and Lower Columbia River Valleys of Oregon and Washington (Figure 8). The total fall population is estimated from counts of adults during the YKD Coastal Zone Survey during the spring, expanded by a ratio derived from neck-collared individuals observed in the fall and winter (Pacific Flyway Council 2016*a*). In 2016, the expansion ratio was updated, and the entire time series was revised. The 2017 fall estimate was 289,900 (253,300–326,500) geese, similar to last year's estimate of 327,500 (286,100–368,800; $P = 0.182$). Over the 2008–2017 time series, no significant trend ($P = 0.174$) was observed (Figure 19). Early spring phenology and good-to-excellent habitat conditions were observed on the YKD in 2017, similar to 2016. The YKD Coastal

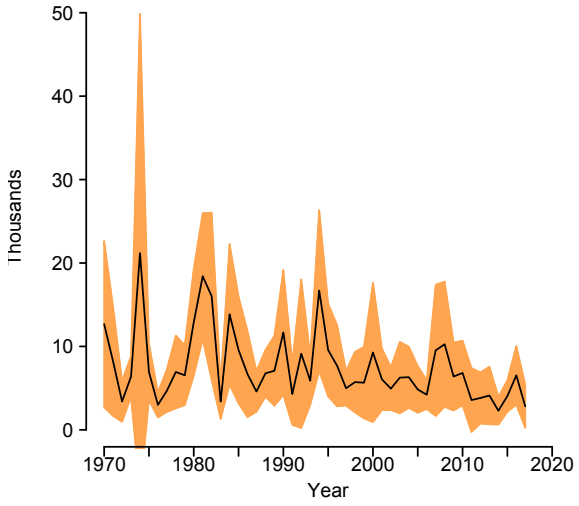

Figure 20. Estimated numbers (and 95% confidence intervals) of Lesser (spring index) Canada geese.

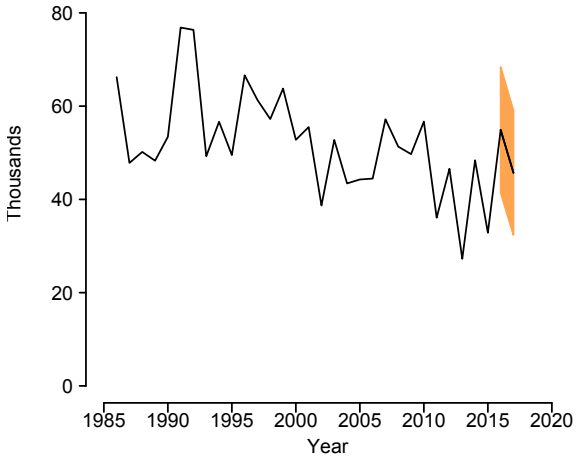

Figure 21. Numbers of Taverner's (spring index) Canada geese.

Zone Survey started on the second earliest date recorded since the survey began in 1985 due to the early snow melt, ice breakup, and nest initiation.

Lesser and Taverner's Canada Geese

Lesser and Taverner's Canada geese nest throughout Alaska and winter in Washington, Oregon, and California (Figure 8). Nesting Taverner's geese are more associated with tundra areas of the North Slope and western Alaska, whereas lesser Canada geese nest in Alaska's interior and south-central regions. Population indices for lesser Canada geese are based on WBPHS estimates in stratum 1 (Kenai-Susitna), stratum 2 (Nelchina), stratum 3 (Tanana-Kuskokwim), stratum 4 (Yukon Flats), and stratum 12 (Old Crow Flats). The 2017 lesser Canada goose indicated total bird index was 2,800 (200–5,400), similar to ($P = 0.095$) the 2016 index of 6,500 (3,000–10,000; Figure 20). These indices did not have a significant trend from 2008 to 2017 ($P = 0.058$). Population indices for Taverner's Canada geese are based on counts from three breeding survey efforts: the Arctic Coastal Plain Survey, the Yukon–Kuskokwim Delta (YKD) Coastal Zone Survey, and the WBPHS (stratum 9 [inland portions of the YKD], stratum 10 [Seward Peninsula], and stratum 11 [Kotzebue Sound]). The 2017 Taverner's goose indicated total bird index was 45,700 (32,400–59,000), which was similar to ($P = 0.340$) the 2016 index of 54,900 (41,400–68,400; Figure 21). Indices did not have a significant trend during the past 10 years ($P = 0.563$). In 2017, spring phenology in Alaska was early in southwestern areas, later than average in northern areas, and near average across most other areas of the state. Habitat conditions in Alaska were good to excellent.

Aleutian Canada Geese

Aleutian Canada geese nest primarily on the Aleutian Islands and winter along the Pacific Coast as far south as central California (Figure 8). The Aleutian Canada goose was listed as endangered under the Endangered Species Act (ESA) in 1967 when abundance was less than 1,000 individuals. As abundance increased, it was downgraded to threatened in 1990 and removed from protection under the ESA in 2001. The total Aleutian Canada goose population during the fall and winter is estimated from mark-resight observations of neck-banded geese (Pacific Flyway Council 2006*a*). Because of the estimation procedure, the time series is revised annually. The population estimate in 2017 was 168,500 (128,700–208,400) geese, similar to the

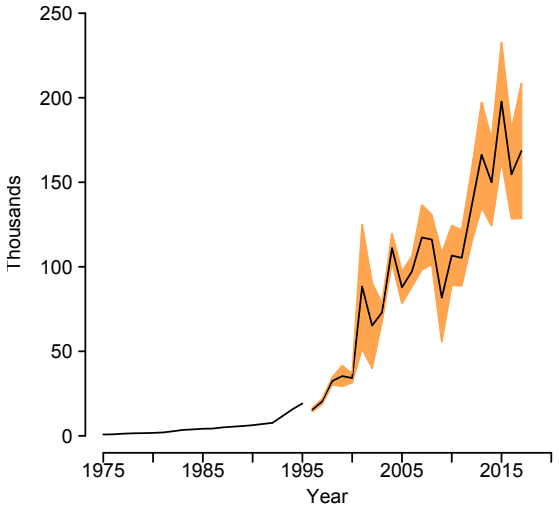

Figure 22. Estimated numbers (and 95% confidence intervals beginning in 1996) of Aleutian Canada geese (fall-winter population).

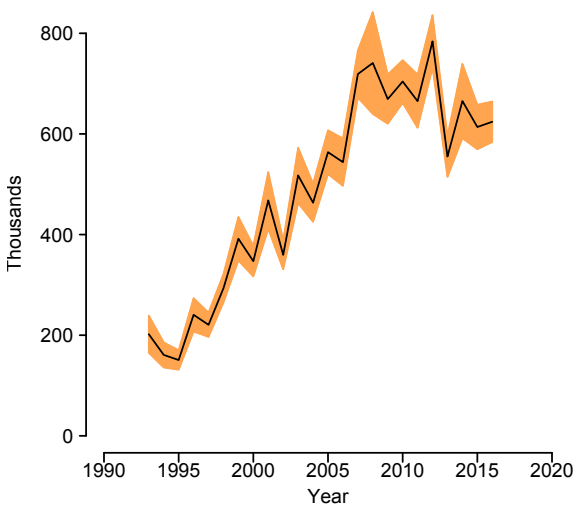

Figure 23. Estimated numbers (and 95% confidence intervals) of Ross's geese at the Karrak Lake colony, Nunavut (nesting adults).

2016 estimate of 154,700 (128,500–180,900; $P = 0.568$; Figure 22). These estimates have increased 7% per year since 2008 ($P = 0.003$). Spring phenology and habitat conditions were near average on the Alaska Peninsula and Aleutian Islands.

Status of Light Geese

The term light geese collectively refers to Ross's (*Chen rossii*) geese and both the lesser (*C. caerulescens caerulescens*) and greater (*C. c. atlantica*) snow goose subspecies (including all hybrids and both white and blue color phases). There are three populations of lesser snow geese based on their breeding ranges (Wrangel Island, Western Arctic, and Mid-continent) and one population based upon winter distribution (Western Central Flyway). Lesser snow geese and Ross's geese occur in many wintering areas together and are not typically differentiated during the Midwinter Survey, so we report indices of light geese from this survey.

Ross's Geese

Ross's geese nest primarily in the Queen Maud Gulf region, but increasing numbers are nesting in other areas of the central and eastern Arctic and along the western coast of Hudson Bay. Ross's geese primarily winter in California, New Mexico, Texas, and Mexico, with increasing numbers wintering in other portions of the Central and Mississippi Flyways (Figure 24). Ross's geese are annually surveyed at Karrak Lake in the Queen Maud Gulf region, their largest nesting colony. Estimates from Karrak Lake are typically not available until after the publication of this report, so we present the previous year's estimate. The 2016 estimate of nesting Ross's geese at Karrak Lake was 624,100 (583,900–664,400), which was similar to the 2015 estimate of 613,800 (569,600–658,000; $P = 0.734$; Figure 23). There was not a significant trend in these estimates during 2007–2016 ($P = 0.079$). In 2017, ice breakup (28 May) and first observation of goslings (21 June) at Karrak Lake were the earliest dates recorded in the past decade and over a week earlier than average (11 June and 30 June, respectively); however, nest densities were lower than average, likely due to low production the past few years, and early nest success appeared to be about average.

Mid-continent Population (MCP)

The MCP includes lesser snow geese and Ross's geese from the central and eastern Arctic. Mid-continent lesser snow geese nest on Baffin

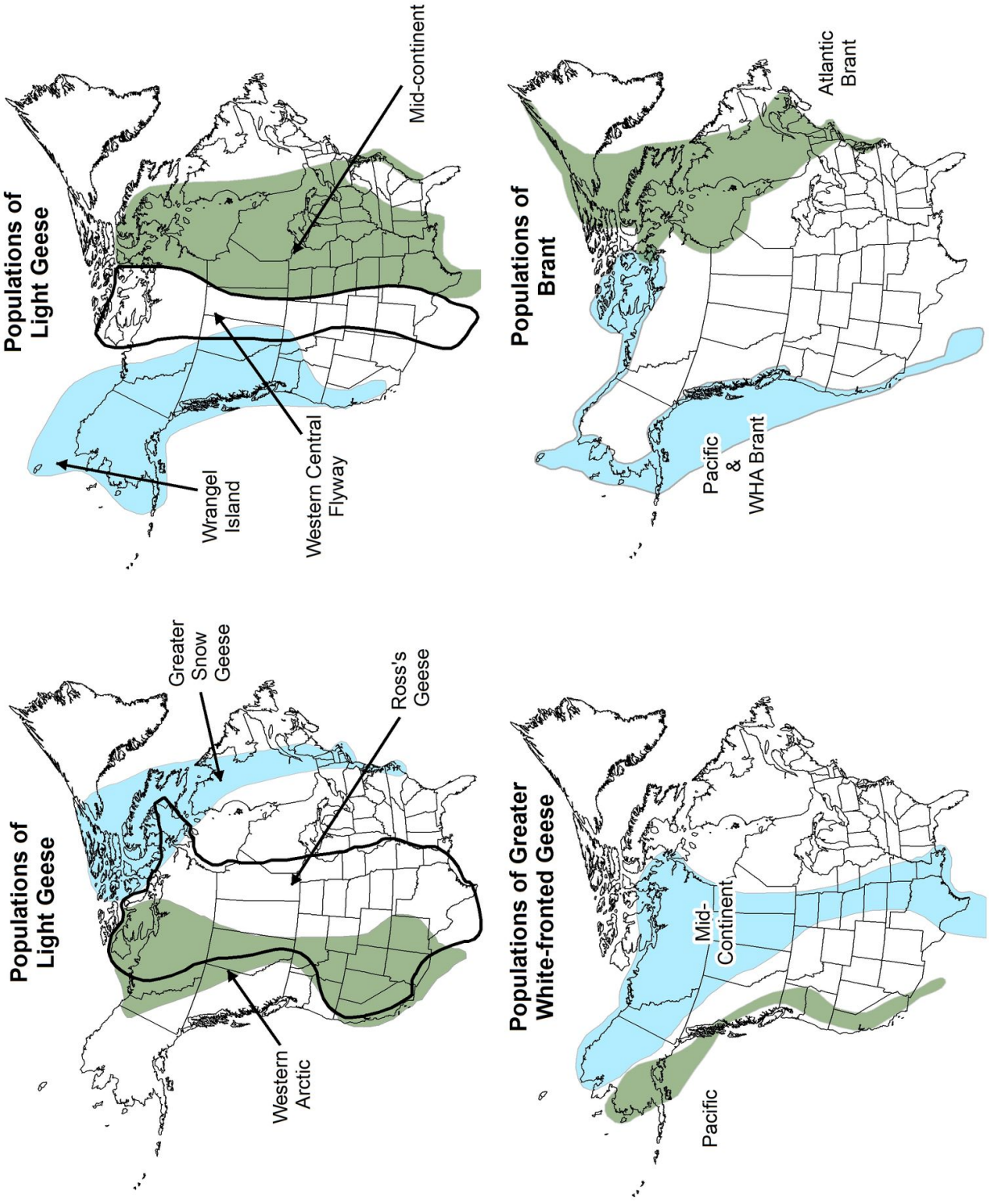

Figure 24. Approximate ranges of brant and snow, Ross's, and white-fronted goose populations in North America.

Table 15. Light goose (Ross's goose and lesser and greater snow goose) indices (in thousands) from primary monitoring surveys.

	Estimate/Count		Change from 2016		10-year Trend	
Population	2017	2016	%	*P*	%/yr	*P*
Ross's geese[a]	624	614	+2	0.734	−2	0.079
Mid-continent Population light geese	3,417	3,453	−1	–	+4	0.072
Western Central Flyway Population light geese	214	237	−9	–	+1	0.708
Pacific Flyway Population light geese	1,907	*n/s*	–	–	+6	0.026
Wrangel Island lesser snow geese	352	300	+17	–	+11	0.000
Greater snow geese	747	915	−18	0.009	−1	0.707

[a] Years presented refer to year–1.
n/s = No survey was conducted or survey data were not available.

and Southampton Islands, along the west coast of the Hudson Bay, throughout the Queen Maud Gulf region, and in other areas of the central and eastern Arctic (Figure 24). These geese winter primarily in southern states of the Central and Mississippi Flyways and are indexed by the Midwinter Survey. In 2017, biologists counted 3,417,100 light geese, a 1% decrease relative to the 2016 index of 3,452,600 (Figure 25). There was no significant trend in MCP winter indices during 2008–2017 ($P = 0.072$). Indirect estimates of population size and other breeding survey data for lesser snow geese are reported in the "Population Status of Migratory Game Birds in Canada" annual report (Canadian Wildlife Service Waterfowl Committee 2015). Breeding conditions were generally average across most of the central and eastern Arctic in 2017, with average-to-above-average early productivity reported in areas within the Queen Maud Gulf region, Southampton Island and Hudson Bay, and Baffin Island.

Western Central Flyway Population (WCFP)

The WCFP includes lesser snow geese and Ross's geese wintering in the western Central Flyway portions of southeastern Colorado, New Mexico, the Texas Panhandle, and the northern highlands of Mexico. Most of these geese nest in the western and central Arctic, with large nesting colonies near the Queen Maud Gulf and on Banks Island (Figure 24). WCFP geese wintering in the U.S. portion of their range are surveyed annually by the Midwinter Survey. Their entire winter range, including Mexico, was typically surveyed every three years, but Mexico surveys have not been conducted since 2009. During the 2017 Midwinter Survey in the U.S. portion of the WCFP range, 214,200 light geese were counted, 9% less than the 236,600 counted in 2016 (Figure 26). These indices did not have a significant trend during 2008–2017 ($P = 0.708$). In 2017, spring phenology was earlier than average in portions of the west-central Arctic, with average early productivity reported in areas within the Queen Maud Gulf region.

Western Arctic (WA) and Wrangel Island (WI) Populations

Lesser snow geese in the Pacific Flyway originate from nesting colonies in the western and central Arctic and on Wrangel Island, Russia. WA lesser snow geese nest primarily on Banks Island, with smaller colonies in coastal areas of the Northwest Territories, and along the Alaskan Arctic Coastal Plain. WI lesser snow geese nest on Wrangel Island, Russia. WA and WI lesser snow geese mix during winter and also occur with MCP lesser snow geese and Ross's geese. WA lesser snow geese primarily winter in central and southern California, the western Central Flyway, and the northern highlands of Mexico. WI lesser snow geese principally winter in the Skagit-Fraser River Deltas in British Columbia

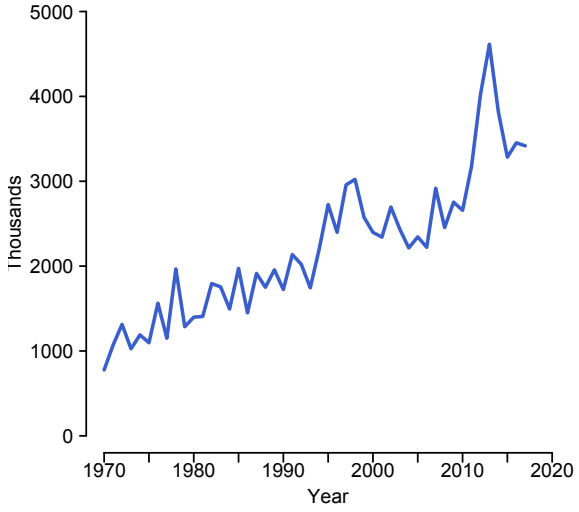

Figure 25. Numbers of Mid-continent Population light geese (winter index).

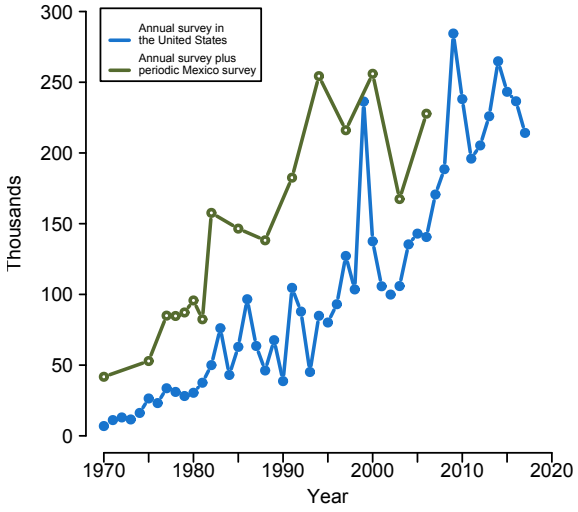

Figure 26. Numbers of Western Central Flyway Population light geese (winter index).

and Washington and in northern and central California (Figure 24). Light geese in the Pacific Flyway (Pacific Flyway Population) are indexed by fall and winter surveys in California, Oregon, Washington and British Columbia. Comprehensive surveys were not conducted during 2015. The 2016 Pacific Flyway Population light goose count was 1,906,800, 59% greater than the 2014 estimate of 1,199,600. Pacific Flyway Population light goose indices increased 6% per year during 2007–2016 ($P = 0.026$). Breeding ground surveys are periodically conducted for WA (Pacific Flyway Council 2013) and WI lesser snow geese (Pacific Flyway Council 2006*b*), and indirect estimates of population size for WA and WI lesser snow geese are reported in the "Population Status of Migratory Game Birds in Canada" annual report. The 2017 WI lesser snow goose estimate from the breeding ground survey on Wrangel Island, Russia was 352,000, 17% greater than the 2016 estimate of 300,000 (Figure 27). These indices increased 11% per year since 2008 ($P < 0.001$). In 2017, the lesser snow goose total bird index from the Arctic Coastal Plain survey was 58,300 (16,400–100,100), which was similar to ($P = 0.156$) the 2016 estimate of 25,800 (9,800–41,900). These indices increased 17% per year since 2008 ($P < 0.019$). A photographic breeding colony survey for WA lesser snow geese was last conducted in 2013 and recorded 419,800 lesser snow geese. Spring phenology was delayed compared to recent years across much of northern Alaska and on Wrangel Island, Russia, but advanced in some areas of the western Arctic. However, in northern Alaska and the western Arctic, conditions advanced rapidly in June, and nest initiation and hatch timing were near average. Preliminary estimates of early nest success at Wrangel Island, Russia and at Colville River, Alaska were lower than average.

Greater Snow Geese

Greater snow geese nest on Bylot, Axel Heiberg, Ellesmere, and Baffin Islands, and in Greenland, and winter along the Atlantic coast from New Jersey to North Carolina (Figure 24). This population is monitored on spring staging areas near the St. Lawrence Valley in Quebec from an annual aerial photographic survey (Atlantic Flyway Council 2009). The preliminary 2017 spring survey estimate was 747,000 (674,000–820,000) geese, a 18% decrease ($P = 0.009$) from the 2016 estimate of 915,000 (812,000–1,018,000; Figure 28). Spring estimates of greater snow geese have shown no trend over the past 10 years ($P = 0.707$). Nesting phenology of greater snow geese at Bylot Island was near average, despite later-than-average spring phenology due to thick winter snow pack and cool weather in June. Mean nest initiation

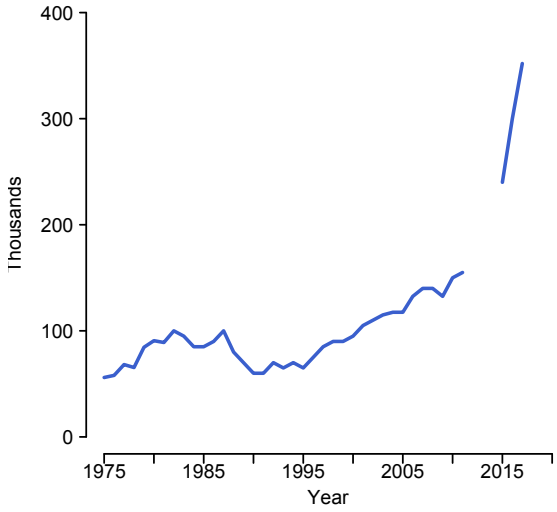

Figure 27. Numbers of Wrangel Island Population lesser snow geese (total breeding ground index).

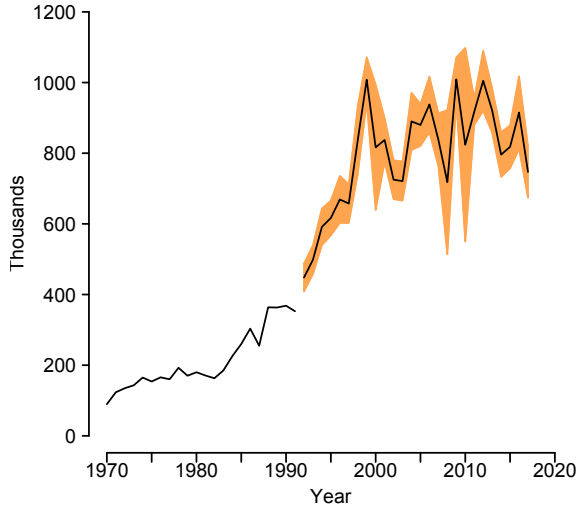

Figure 28. Estimated numbers (and 95% confidence intervals beginning in 1991) of greater snow geese (spring index).

date (12 June) and mean hatching date (8 July) were similar to the prior 20-year averages (12 June and 9 July, respectively). However, colony density and clutch size were lower than average. Predation levels were high during egg laying due to decreased lemming numbers, and mean clutch size was 3.4 eggs/nest in 2017, slightly lower than the 20-year average of 3.7.

Status of Greater White-fronted Geese

Pacific Population White-fronted Geese

Pacific Population white-fronted geese (*Anser albifrons*) primarily nest on the YKD in Alaska and winter in the Central Valley of California (Figure 24). This population is monitored using a predicted fall population index, which is based on the number of indicated total birds from the YKD Coastal Zone Survey and the WBPHS in the Bristol Bay area (stratum 8) and interior portions of the YKD (stratum 9) and expanded by a factor derived from the correlation of these indices with past fall counts in Oregon and California (Pacific Flyway Council 2003). The 2017 predicted fall population index was 735,600, 7% greater than the 2016 estimate of 685,500 Figure 29). The prior 10-year trend was not significant ($P = 0.498$). Early spring phenology and good-to-excellent habitat conditions were observed on the YKD and in southwestern Alaska in 2017, similar to 2016.

Mid-continent Population White-fronted Geese

Mid-continent Population white-fronted geese nest from central and northwestern Alaska to the Foxe Basin on Baffin Island. This population concentrates in southern Saskatchewan and Alberta during the fall and in southern Central and Mississippi Flyway states and Mexico during the winter (Figure 24). This population is monitored by a fall staging survey in Saskatchewan and Alberta and the Midwinter Survey in Central and Mississippi Flyway states (Central, Mississippi, and Pacific Flyway Councils 2015). Indirect estimates of population size for Mid-continent Population white-fronted geese are also reported in the "Population Status of Migratory Game Birds in Canada" annual report (Canadian Wildlife Service Waterfowl Committee 2015). In 2016, 1,000,100 geese were counted during the fall staging survey, a 2% increase from the 2015 count of 977,100 (Figure 29). During 2007–2016, fall survey counts increased 5% per year ($P = 0.014$). The 2017 Midwinter Survey index in Central and Mississippi Flyway states was 508,800, a 14% decrease from the 2016 count of 589,600. There was not a significant trend in Midwinter Survey indices during the

Table 16. White-fronted goose, emperor goose, brant, and tundra swan indices (in thousands) from primary monitoring surveys.

	Estimate/Count		Change from 2016		10-year Trend	
Population	2017	2016	%	*P*	%/yr	*P*
Pacific Population white-fronted geese	736	686	+7	–	+1	0.498
Mid-continent Population white-fronted geese[a]	1,000	977	+2	–	+5	0.014
Atlantic brant	162	158	+2	–	−1	0.598
Pacific and Western High Arctic brant	156	140	+11	–	−1	0.262
Emperor geese	30	34	−12	0.211	+6	0.005
Western swans	71	*n/s*	–	–	−3	0.348
Eastern swans	119	114	+5	–	+2	0.001

[a] Years presented refer to year–1.
n/s = No survey was conducted or survey data were not available.

past 10 years ($P = 0.099$). In 2017, breeding conditions were generally average across most of the breeding range of Mid-continent Population white-fronted geese, and increased productivity was noted in some areas of the western Arctic.

Status of Brant

Atlantic Brant (ATLB)

Atlantic brant (*Branta bernicula bernicula*) primarily nest on islands of the eastern Canadian Arctic and winter along the Atlantic Coast from Massachusetts to North Carolina. The Midwinter Survey provides an index of this population within its winter range in the Atlantic Flyway (Atlantic Flyway Council 2002; Figure 24). The 2017 Midwinter Survey index was 161,700 brant, 2% greater than the 2016 count of 157,900 (Figure 30). These indices did not exhibit a significant trend during 2008–2017 ($P = 0.598$). Productivity from the previous year is estimated by the proportion of juveniles in the population during November and December. Juveniles comprised 25% of the population in 2016, which was greater than the long-term average of 18% and the first time in 4 years that the estimate was greater than 10%. In 2017, breeding conditions were average to slightly below average across most of the eastern Arctic; however, average to above-average early productivity was reported on Southampton Island.

Pacific Brant (PACB) and Western High Arctic Brant (WHAB)

PACB (*B. b. nigricans*) nest across Alaska's YKD and North Slope, Banks Island, other islands of the western and central Arctic, the Queen Maud Gulf, and Russia. They stage during fall at Izembek Lagoon, Alaska, and winter as far south as Mexico (Figure 24). WHAB nest on the Parry Islands of the Northwest Territories and Nunavut (Figure 24). They stage during fall at Izembek Lagoon, Alaska, and 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. For many years PACB and WHAB were surveyed and managed separately. However, they cannot be reliably distinguished while on staging and wintering grounds, and they are typically indexed together. The primary management index for brant in the Pacific Flyway is based on fall and winter surveys in the U.S., Canada, and Mexico. This time series was revised in 2016 and now includes PACB and WHAB together. In addition, historical estimates were updated, and ground counts in Mexico replaced those previously obtained from aerial surveys (Olson 2016). In 2017, fall and winter surveys recorded 155,700 brant, which was 11% greater than the 2016 estimate of 140,000 (Figure 30). The prior 10-year trend of these indices was not significant

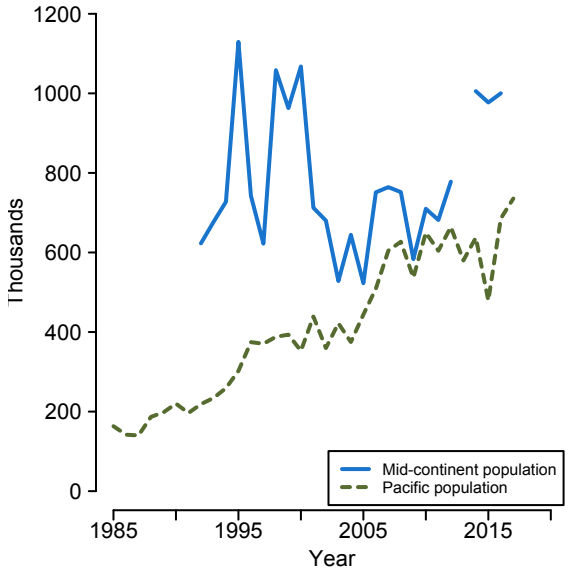

Figure 29. Numbers of Mid-continent Population (fall index) and Pacific Population (predicted fall population) white-fronted geese.

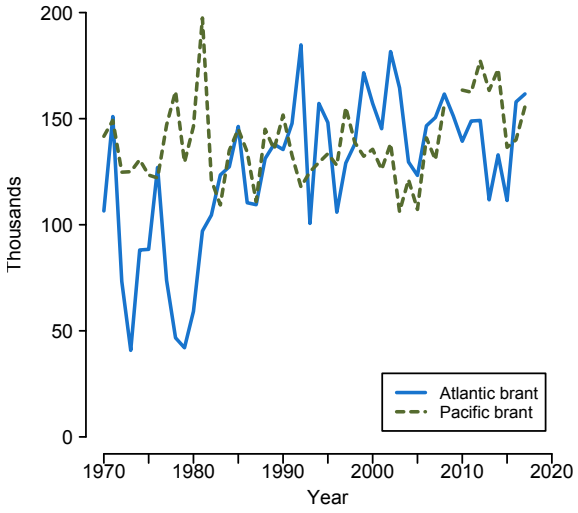

Figure 30. Numbers of Atlantic and Pacific brant (winter index).

($P = 0.262$). Pacific brant are also monitored by various breeding ground surveys. Abundance of the 5 primary breeding colonies on the YKD from photographic surveys in 2016 was 11,700 brant, a 41% increase from the 2015 estimate of 8,300 brant. The total indicated brant index from the 2017 YKD Coastal Zone Survey was 21,600 (16,100–27,100), similar to ($P = 0.069$) the 2016 index of 30,000 (22,700–37,200). The total indicated brant index from the 2017 Arctic Coastal Plain Survey was 18,200 (10,600–25,800), similar to ($P = 0.987$) the 2016 index of 18,100 (9,300–26,900). These three indices have not shown a significant trend during the past ten years ($P = 0.165$, 0.989, and 0.066, respectively). Spring phenology and breeding conditions were variable throughout Alaska and the western Arctic in 2017, with below-average to above-average breeding conditions reported within the breeding range of this population.

Status of Emperor Geese

Emperor geese (*C. canagica*) breed along coastal areas of the Bering Sea, with the largest concentration on the YKD in Alaska. Emperor geese stage along the Alaska Peninsula during the fall and spring and winter along the Aleutian Islands (Figure 31). In 2016, the primary management index was changed from a spring staging survey to the total indicated bird index from the YKD Coastal Zone Survey (Pacific Flyway Council 2016*b*), and the spring staging survey was discontinued. In 2017, the emperor goose total indicated bird index from the YKD Coastal Zone Survey was 30,100 (26,100–34,100), similar to ($P = 0.211$) the 2016 index of 34,100 (29,200–39,000). During the past ten years, these indices increased 6% per year ($P = 0.005$; Figure 32). Early spring phenology and good-to-excellent habitat conditions were observed on the YKD and in southwestern Alaska in 2017, similar to 2016.

Status of Swans

Western Population Tundra Swans

Western Population tundra swans (*Cygnus columbianus*) nest along the coastal lowlands of western Alaska, and the YKD is a primary breeding area. Western Population tundra swans primarily winter in California, Utah, and the Pacific Northwest. The Midwinter Survey provides an index of this population within its winter range of the Pacific Flyway (Pacific Flyway

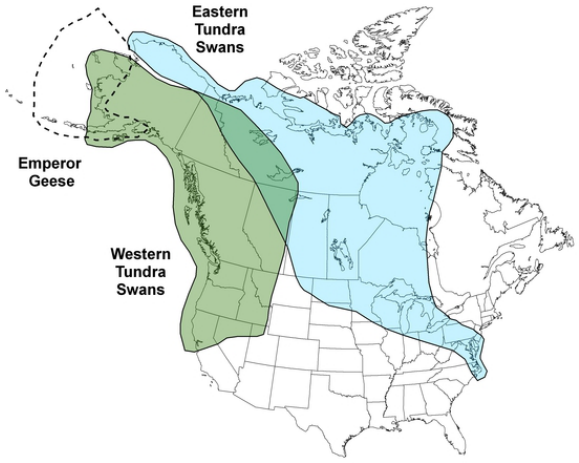

Figure 31. Approximate ranges of emperor geese, and Eastern and Western Populations of tundra swans in North America.

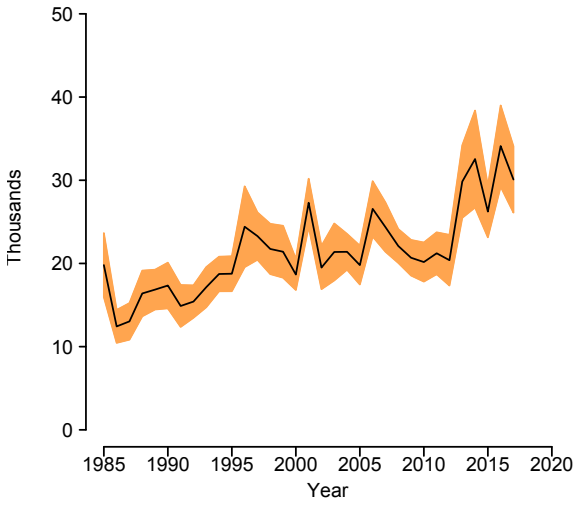

Figure 32. Estimated numbers (and 95% confidence intervals) of emperor geese (total breeding ground index).

Council 2001; Figure 31). A comprehensive Midwinter Survey was not conducted during 2016. The 2017 Midwinter Survey index was 70,800 swans, 4% greater than the 2015 index of 68,200 (Figure 33). Midwinter Survey indices exhibited no significant trend during 2008–2017 ($P = 0.348$). The total swan index from the 2017 YKD Coastal Zone Survey was 28,700 (18,600–38,800), which was similar to the 2016 index of 31,300 (19,600–42,900; $P = 0.748$). A total swan index that also includes WBPHS stratum 9 (inland portions of the YKD), stratum 10 (Seward Peninsula), and stratum 11 (Kotzebue Sound) was 131,600 (78,300–184,800) in 2017, similar to the 2016 index of 116,300 (73,600–159,100; $P = 0.661$). During the past 10 years, neither of these indices showed a significant trend ($P = 0.328$ and 0.488, respectively). Southwestern Alaska experienced an early spring in 2017, and habitat conditions were generally good across the state.

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 River Delta and adjacent areas in the Northwest Territories are of particular importance. This population predominantly winters in coastal areas from Maryland to North Carolina (Figure 31). The Midwinter Survey provides an index of this population within its winter range of the Atlantic and Mississippi Flyways (Atlantic, Mississippi, Central, and Pacific Flyway Councils 2007). During the 2017 Midwinter Survey, 119,300 swans were observed, 5% more than the 113,600 counted in 2016 (Figure 33). These indices increased 2% per year since 2008 ($P = 0.001$). Productivity from the previous year is estimated by the proportion of juveniles in the population during November and December. Juveniles comprised 11% of the population in 2016, which was slightly below the long-term average of 13%. In 2017, average-to-early spring phenology and good-to-excellent breeding conditions were observed across Alaska, Yukon Territory, and the Northwest Territories in many important nesting areas for Eastern Population tundra swans. Habitat conditions on the Mackenzie River were excellent, although high water levels may have negatively affected nesting habitat in some localized areas.

Trumpeter Swans

Trumpeter swans (*C. buccinator*) nest in Alaska south of the Brooks Range and east of the Yukon-Kuskokwim Delta, and within localized areas of Yukon Territory, western Northwest

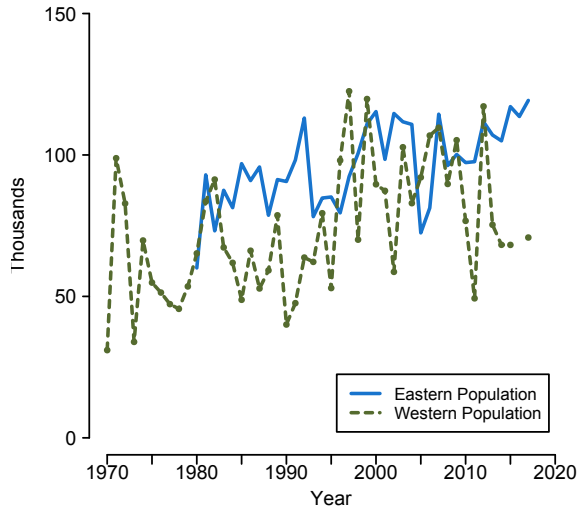

Figure 33. Numbers of Eastern and Western Populations of tundra swans (winter index).

Territories, from British Columbia to Quebec, and some northern U.S. states from Washington to New York. There are three recognized North American populations: the Pacific Coast, Rocky Mountain, and Interior Populations. Trumpeter swan abundance and productivity is comprehensively monitored through the North American Trumpeter Swan Survey. This range-wide survey was first conducted in 1968, repeated in 1975, and has continued at 5-year intervals thereafter. The first survey in 1968 recorded 2,600 adult and subadult trumpeter swans. The most recent survey was completed in 2015, and 63,000 adult and subadult trumpeter swans were observed. Information from this, and other, trumpeter swan surveys can be found at: http://www.fws.gov/birds/surveys-and-data/reports-and-publications.php.

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Pacific Flyway Council. 2016*b*. Management Plan for the Emperor Goose.

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[d]Other Organization
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Flyway-wide and Regional Survey Reports

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Information from the Waterfowl Breeding Population and Habitat Survey

See Appendix A.1

Atlantic Population of Canada Geese

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Atlantic Flyway Resident Population of Canada Geese

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Mississippi Flyway Interior Population of Canada Geese

S. Badzinski[a] and R. Brook[b]

Mississippi Flyway Population Giant Canada Geese

B. Avers[b], J. Benedict[b], R. Brook[b], J. Brunjes[b], F. Baldwin[b], S. Cordts[b], R. Domazlicky[b], M. Ervin[b], J. Feddersen[b], T. Finger[b], H. Havens[b], O. Jones[b], J. Leafloor[a], D. Luukkonen[b], S. Maddox[b] L. Naylor[b], A. Phelps[b], A. Radeke[b], L. Reynolds[b], and R. Smith[b]

Central Flyway Arctic Nesting Canada Geese

K. Dufour[a] and J. Leafloor[a]

Dusky Canada Geese

E. Cooper[d], M. Gabrielson[d], N. Docken[d], D. Marks, and H. Wilson

Aleutian Canada Geese

D. Brazil[d], A. Brickey, B. Henry[d], E. Hopson, E. Nelson, S. Olson, A. Raquel[d], B. Reishus[b], H. Renner, D. Safine, T. Sanders, J. Sands, D. Skalos[b], S. Stephensen, and M. Weaver[b]

Greater Snow Geese

G. Gauthier[d] and J. Lefebvre[a]

Western Arctic/Wrangel Island Population of Lesser Snow Geese

V. Baranyuk[d], J. Hupp[d], D. Kraege[b], V. Patil[d], and E. Reed[a]

Ross's Geese

R. Alisauskas[a] and D. Kellett[a]

Mid-continent Population White-fronted Geese

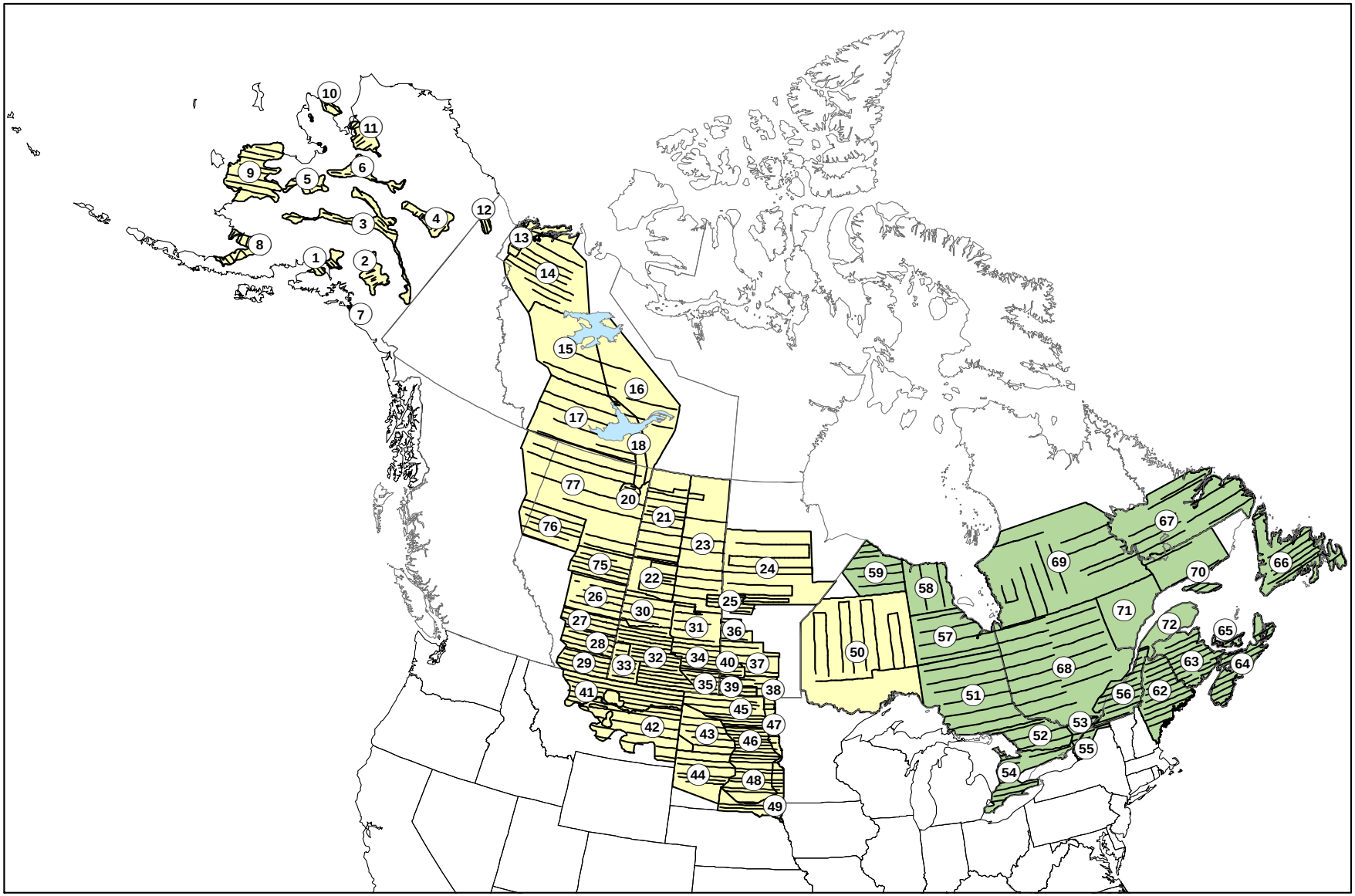
B. Bartzen[a], J. Jackson[b], K. Kraii[b], T. Liddick, R. Spangler, K. Warner[a], and J. Whitaker[b]

Atlantic Brant and Eastern Population of Tundra Swans

P. Padding, A. Roberts, and personnel from U.S. Fish and Wildlife Service Refuges, Canadian Wildlife Service, Environmental Stewardship Branch[a], Connecticut Dept. of Environmental Protection, Delaware Dept. of Natural Resources and Environmental Control, Maryland Dept. of Natural Resources, Wildlife and Heritage Service, New Jersey Division of Fish and Wildlife, New York State Dept. of Environmental Conservation, North Carolina Wildlife Resources Commission, Ontario Ministry of Natural Resources and Forestry, Pennsylvania Game Commission, Rhode Island Division of Fish and Wildlife, South Carolina Dept. of Natural Resources, Virginia Dept. of Game and Inland Fisheries[b]

[a]Canadian Wildlife Service
[b]State, Provincial or Tribal Conservation Agency
[c]Ducks Unlimited Canada
[d]Other Organization
[e]U.S. Fish and Wildlife Service Retired
All others–U.S. Fish and Wildlife Service

B. Waterfowl Breeding Population and Habitat Survey map



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

C. Historical estimates of May ponds and regional waterfowl populations

Table C.1. 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	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
1961	1,977.20	165.40				
1962	2,369.10	184.60				
1963	2,482.00	129.30				
1964	3,370.70	173.00				
1965	4,378.80	212.20				
1966	4,554.50	229.30				
1967	4,691.20	272.10				
1968	1,985.70	120.20				
1969	3,547.60	221.90				
1970	4,875.00	251.20				
1971	4,053.40	200.40				
1972	4,009.20	250.90				
1973	2,949.50	197.60				
1974	6,390.10	308.30	1,840.80	197.20	8,230.90	366.00
1975	5,320.10	271.30	1,910.80	116.10	7,230.90	295.10
1976	4,598.80	197.10	1,391.50	99.20	5,990.30	220.70
1977	2,277.90	120.70	771.10	51.10	3,049.10	131.10
1978	3,622.10	158.00	1,590.40	81.70	5,212.40	177.90
1979	4,858.90	252.00	1,522.20	70.90	6,381.10	261.80
1980	2,140.90	107.70	761.40	35.80	2,902.30	113.50
1981	1,443.00	75.30	682.80	34.00	2,125.80	82.60
1982	3,184.90	178.60	1,458.00	86.40	4,642.80	198.40
1983	3,905.70	208.20	1,259.20	68.70	5,164.90	219.20
1984	2,473.10	196.60	1,766.20	90.80	4,239.30	216.50
1985	4,283.10	244.10	1,326.90	74.00	5,610.00	255.10
1986	4,024.70	174.40	1,734.80	74.40	5,759.50	189.60
1987	2,523.70	131.00	1,347.80	46.80	3,871.50	139.10
1988	2,110.10	132.40	790.70	39.40	2,900.80	138.10
1989	1,692.70	89.10	1,289.90	61.70	2,982.70	108.40
1990	2,817.30	138.30	691.20	45.90	3,508.50	145.70
1991	2,493.90	110.20	706.10	33.60	3,200.00	115.20
1992	2,783.90	141.60	825.00	30.80	3,608.90	144.90
1993	2,261.10	94.00	1,350.60	57.10	3,611.70	110.00
1994	3,769.10	173.90	2,215.60	88.80	5,984.80	195.30
1995	3,892.50	223.80	2,442.90	106.80	6,335.40	248.00
1996	5,002.60	184.90	2,479.70	135.30	7,482.20	229.10

Table C.1. Continued.

	Prairie Canada		Northcentral U.S.[a]		Total	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
1997	5,061.00	180.30	2,397.20	94.40	7,458.20	203.50
1998	2,521.70	133.80	2,065.30	89.20	4,586.90	160.80
1999	3,862.00	157.20	2,842.20	256.80	6,704.30	301.20
2000	2,422.50	96.10	1,524.50	99.90	3,946.90	138.60
2001	2,747.20	115.60	1,893.20	91.50	4,640.40	147.40
2002	1,439.00	105.00	1,281.00	63.40	2,720.00	122.70
2003	3,522.30	151.80	1,667.80	67.40	5,190.10	166.10
2004	2,512.60	131.00	1,407.00	101.70	3,919.60	165.80
2005	3,920.50	196.70	1,460.70	79.70	5,381.20	212.20
2006	4,449.50	221.50	1,644.40	85.40	6,093.90	237.40
2007	5,040.20	261.80	1,962.50	102.50	7,002.70	281.20
2008	3,054.80	147.60	1,376.60	71.90	4,431.40	164.20
2009	3,568.10	148.00	2,866.00	123.10	6,434.00	192.50
2010	3,728.70	203.40	2,936.30	142.30	6,665.00	248.20
2011	4,892.70	197.50	3,239.50	127.40	8,132.20	235.00
2012	3,885.10	146.50	1,658.90	52.70	5,544.00	155.60
2013	4,550.50	185.50	2,341.20	99.00	6,891.70	210.20
2014	4,629.90	168.30	2,551.30	106.50	7,181.20	199.20
2015	4,151.00	146.30	2,156.80	86.00	6,307.70	169.70
2016	3,494.50	147.20	1,518.00	52.70	5,012.50	156.40
2017	4,330.30	157.70	1,765.70	92.20	6,096.00	182.70

[a] No comparable survey data available for the northcentral U.S. during 1961–1973.

Table C.2. Breeding population estimates (in thousands) for total ducks[a] and mallards for states, provinces, or regions that conduct spring surveys.

	British Columbia		California		Michigan		Minnesota	
Year	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards
1955								
1956								
1957								
1958								
1959								
1960								
1961								
1962								
1963								
1964								
1965								
1966								
1967								
1968							321.0	83.7
1969							323.2	88.8
1970							324.2	113.9
1971							277.1	78.5
1972							217.2	62.2
1973							389.5	99.8
1974							281.6	72.8
1975							471.6	175.8
1976							684.1	117.8
1977							501.1	134.2
1978							462.5	146.8
1979							552.4	158.7
1980							690.6	172.0
1981							439.8	154.8
1982							465.2	120.5
1983							367.1	155.8
1984							529.7	188.1
1985							562.9	216.9
1986							520.8	233.6
1987							589.0	192.3
1988							725.2	271.7
1989							813.6	273.0
1990							807.9	232.1
1991					408.4	289.3	753.7	225.0
1992			497.4	375.8	867.5	385.8	973.3	360.9
1993			666.7	359.0	742.8	437.2	837.2	305.8
1994			483.2	311.7	683.1	420.5	1,115.6	426.5
1995			589.7	368.5	791.9	524.1	797.1	319.4
1996			843.7	536.7	680.5	378.2	889.1	314.8
1997			824.3	511.3	784.0	489.3	868.1	407.4
1998			706.8	353.9	1,068.5	523.0	693.1	368.5
1999			851.0	560.1	744.6	466.1	680.5	316.4

Table C.2. Continued.

	British Columbia		California		Michigan		Minnesota	
Year	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards
2000			562.4	347.6	793.9	427.2	747.8	318.1
2001			413.5	302.2	497.8	324.2	716.4	320.6
2002			392.0	265.3	742.5	323.2	1,171.5	366.6
2003			533.7	337.1	535.4	298.9	721.8	280.5
2004			412.8	262.4	624.5	342.0	1,008.3	375.3
2005			615.2	317.9	468.3	258.1	632.0	238.5
2006	407.8	101.1	649.4	399.4	412.2	244.6	521.1	160.7
2007	384.1	101.5	627.6	388.3	641.9	337.7	488.5	242.5
2008	375.1	80.6	554.3	297.1	437.5	200.5	739.6	297.6
2009	350.1	73.1	510.8	302.0	493.6	258.9	541.3	236.4
2010	339.6	81.2	541.3	367.9	595.3	338.3	530.7	241.9
2011	278.1	70.1	558.6	314.7	471.4	258.6	687.5	283.3
2012	322.0	83.3	529.7	387.1	860.1	439.3	468.6	225.0
2013	330.6	82.7	451.3	298.6	678.6	288.4	682.9	293.2
2014	352.7	82.6	448.7	238.7	395.3	230.1	474.4	257.0
2015	363.3	81.3	315.6	173.9	431.1	237.8	524.2	206.2
2016	318.7	73.9	417.8	263.8	502.6	278.1	787.1	250.2
2017	350.5	70.9	393.7	198.4	684.5	298.1	636.0	213.6

[a] Species composition for the total duck estimate varies by region.

Table C.2. Continued.

	Nevada[b]	Northeast U.S.[c]		Oregon		Washington		Wisconsin	
Year	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards
1955									
1956									
1957									
1958									
1959	2.1								
1960	2.1								
1961	2.0								
1962	1.7								
1963	2.2								
1964	3.0								
1965	3.5								
1966	3.4								
1967	1.5								
1968	1.2								
1969	1.4								
1970	1.5								
1971	1.1								
1972	0.9								
1973	0.7							412.7	107.0
1974	0.7							435.2	94.3
1975	0.6							426.9	120.5
1976	0.6							379.5	109.9
1977	1.0							323.3	91.7
1978	0.6							271.3	61.6
1979	0.6					98.6	32.1	265.7	78.6
1980	0.9					113.7	34.1	248.1	116.5
1981	1.6					148.3	41.8	505.0	142.8
1982	1.1					146.4	49.8	218.7	89.5
1983	1.5					149.5	47.6	202.3	119.5
1984	1.4					196.3	59.3	210.0	104.8
1985	1.5					216.2	63.1	192.8	73.9
1986	1.3					203.8	60.8	262.0	110.8
1987	1.5					183.6	58.3	389.8	136.9
1988	1.3					241.8	67.2	287.1	148.9
1989	1.3					162.3	49.8	462.5	180.7
1990	1.3					168.9	56.9	328.6	151.4
1991	1.4					140.8	43.7	435.8	172.4
1992	0.9					116.3	41.0	683.8	249.7
1993	1.2	1,158.1	686.6			149.8	55.0	379.4	174.5
1994	1.4	1,297.3	856.3	323.6	116.4	123.9	52.7	571.2	283.4
1995	1.0	1,408.5	864.1	215.9	77.5	147.3	58.9	592.4	242.2
1996	1.7	1,430.9	848.6	288.4	102.2	163.3	61.6	536.3	314.4

Table C.2. Continued.

	Nevada[b]	Northeast U.S.[c]		Oregon		Washington		Wisconsin	
Year	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards
1997	2.5	1,423.5	795.2	359.5	121.2	172.8	67.0	409.3	181.0
1998	2.1	1,444.0	775.2	345.1	124.9	185.3	79.0	412.8	186.9
1999	2.3	1,522.7	880.0	320.0	125.6	200.2	86.2	476.6	248.4
2000	2.1	1,933.5	762.6	314.9	110.9	143.6	47.7	744.4	454.0
2001	2.0	1,397.4	809.4			146.4	50.5	440.1	183.5
2002	0.7	1,466.2	833.7	364.6	104.5	133.3	44.7	740.8	378.5
2003	1.7	1,266.2	731.9	246.1	89.0	127.8	39.8	533.5	261.3
2004	1.7	1,416.9	805.9	229.8	82.5	114.9	40.0	651.5	229.2
2005	0.7	1,416.2	753.6	210.4	74.1	111.5	40.8	724.3	317.2
2006	1.8	1,384.2	725.2	251.2	81.1	135.4	45.5	522.6	219.5
2007	2.1	1,500.1	687.6	319.1	92.5	128.3	46.1	470.6	210.0
2008	1.9	1,197.1	619.1	224.3	75.4	120.9	50.6	626.9	188.4
2009	12.7	1,271.1	666.8	186.0	72.6	116.5	47.5	502.4	200.5
2010	8.9	1,302.0	651.7	205.1	66.8	197.8	91.8	386.5	199.1
2011	2.3	1,265.0	586.1	158.4	61.6	157.1	71.4	513.7	187.9
2012	4.1	1,309.9	612.6	263.5	88.8	168.9	89.4	521.1	197.0
2013	8.8	1,281.8	604.2	251.7	84.3	156.5	74.1	527.3	181.2
2014	4.2	1,343.8	634.6	315.2	85.3	117.2	86.5	395.1	158.7
2015	5.5	1,197.2	540.1	279.7	87.4	193.1	86.4	372.8	176.2
2016	14.4	1,240.8	551.3	213.6	87.3	121.5	59.9	390.5	164.1
2017	6.4	1,330.8	448.5	239.9	71.7	242.2	103.4	479.1	180.9

[b] Survey redesigned in 2009, and not comparable with previous years.

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

Table C.3. 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	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
1955	8,777.3	457.1	651.5	149.5	3,216.8	297.8	1,807.2	291.5	5,305.2	567.6
1956	10,452.7	461.8	772.6	142.4	3,145.0	227.8	1,525.3	236.2	4,997.6	527.6
1957	9,296.9	443.5	666.8	148.2	2,919.8	291.5	1,102.9	161.2	4,299.5	467.3
1958	11,234.2	555.6	502.0	89.6	2,551.7	177.9	1,347.4	212.2	5,456.6	483.7
1959	9,024.3	466.6	590.0	72.7	3,787.7	339.2	2,653.4	459.3	5,099.3	332.7
1960	7,371.7	354.1	784.1	68.4	2,987.6	407.0	1,426.9	311.0	4,293.0	294.3
1961	7,330.0	510.5	654.8	77.5	3,048.3	319.9	1,729.3	251.5	3,655.3	298.7
1962	5,535.9	426.9	905.1	87.0	1,958.7	145.4	722.9	117.6	3,011.1	209.8
1963	6,748.8	326.8	1,055.3	89.5	1,830.8	169.9	1,242.3	226.9	3,723.6	323.0
1964	6,063.9	385.3	873.4	73.7	2,589.6	259.7	1,561.3	244.7	4,020.6	320.4
1965	5,131.7	274.8	1,260.3	114.8	2,301.1	189.4	1,282.0	151.0	3,594.5	270.4
1966	6,731.9	311.4	1,680.4	132.4	2,318.4	139.2	1,617.3	173.6	3,733.2	233.6
1967	7,509.5	338.2	1,384.6	97.8	2,325.5	136.2	1,593.7	165.7	4,491.5	305.7
1968	7,089.2	340.8	1,949.0	213.9	2,298.6	156.1	1,430.9	146.6	3,462.5	389.1
1969	7,531.6	280.2	1,573.4	100.2	2,941.4	168.6	1,491.0	103.5	4,138.6	239.5
1970	9,985.9	617.2	1,608.1	123.5	3,469.9	318.5	2,182.5	137.7	4,861.8	372.3
1971	9,416.4	459.5	1,605.6	123.0	3,272.9	186.2	1,889.3	132.9	4,610.2	322.8
1972	9,265.5	363.9	1,622.9	120.1	3,200.1	194.1	1,948.2	185.8	4,278.5	230.5
1973	8,079.2	377.5	1,245.6	90.3	2,877.9	197.4	1,949.2	131.9	3,332.5	220.3
1974	6,880.2	351.8	1,592.4	128.2	2,672.0	159.3	1,864.5	131.2	4,976.2	394.6
1975	7,726.9	344.1	1,643.9	109.0	2,778.3	192.0	1,664.8	148.1	5,885.4	337.4
1976	7,933.6	337.4	1,244.8	85.7	2,505.2	152.7	1,547.5	134.0	4,744.7	294.5
1977	7,397.1	381.8	1,299.0	126.4	2,575.1	185.9	1,285.8	87.9	4,462.8	328.4
1978	7,425.0	307.0	1,558.0	92.2	3,282.4	208.0	2,174.2	219.1	4,498.6	293.3
1979	7,883.4	327.0	1,757.9	121.0	3,106.5	198.2	2,071.7	198.5	4,875.9	297.6
1980	7,706.5	307.2	1,392.9	98.8	3,595.5	213.2	2,049.9	140.7	4,895.1	295.6
1981	6,409.7	308.4	1,395.4	120.0	2,946.0	173.0	1,910.5	141.7	3,720.6	242.1
1982	6,408.5	302.2	1,633.8	126.2	2,458.7	167.3	1,535.7	140.2	3,657.6	203.7
1983	6,456.0	286.9	1,519.2	144.3	2,636.2	181.4	1,875.0	148.0	3,366.5	197.2
1984	5,415.3	258.4	1,515.0	125.0	3,002.2	174.2	1,408.2	91.5	3,979.3	267.6
1985	4,960.9	234.7	1,303.0	98.2	2,050.7	143.7	1,475.4	100.3	3,502.4	246.3
1986	6,124.2	241.6	1,547.1	107.5	1,736.5	109.9	1,674.9	136.1	4,478.8	237.1
1987	5,789.8	217.9	1,305.6	97.1	2,012.5	134.3	2,006.2	180.4	3,528.7	220.2
1988	6,369.3	310.3	1,349.9	121.1	2,211.1	139.1	2,060.8	188.3	4,011.1	290.4
1989	5,645.4	244.1	1,414.6	106.6	1,972.9	106.0	1,841.7	166.4	3,125.3	229.8
1990	5,452.4	238.6	1,672.1	135.8	1,860.1	108.3	1,789.5	172.7	2,776.4	178.7
1991	5,444.6	205.6	1,583.7	111.8	2,254.0	139.5	1,557.8	111.3	3,763.7	270.8
1992	5,976.1	241.0	2,032.8	143.4	2,208.4	131.9	1,773.1	123.7	4,333.1	263.2
1993	5,708.3	208.9	1,755.2	107.9	2,053.0	109.3	1,694.5	112.7	3,192.9	205.6
1994	6,980.1	282.8	2,318.3	145.2	2,382.2	130.3	2,108.4	152.2	4,616.2	259.2
1995	8,269.4	287.5	2,835.7	187.5	2,614.5	136.3	2,300.6	140.3	5,140.0	253.3
1996	7,941.3	262.9	2,984.0	152.5	2,271.7	125.4	2,499.5	153.4	6,407.4	353.9

Continued.

	Mallard		Gadwall		American wigeon		Green-winged teal		Blue-winged teal	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
1997	9,939.7	308.5	3,897.2	264.9	3,117.6	161.6	2,506.6	142.5	6,124.3	330.7
1998	9,640.4	301.6	3,742.2	205.6	2,857.7	145.3	2,087.3	138.9	6,398.8	332.3
1999	10,805.7	344.5	3,235.5	163.8	2,920.1	185.5	2,631.0	174.6	7,149.5	364.5
2000	9,470.2	290.2	3,158.4	200.7	2,733.1	138.8	3,193.5	200.1	7,431.4	425.0
2001	7,904.0	226.9	2,679.2	136.1	2,493.5	149.6	2,508.7	156.4	5,757.0	288.8
2002	7,503.7	246.5	2,235.4	135.4	2,334.4	137.9	2,333.5	143.8	4,206.5	227.9
2003	7,949.7	267.3	2,549.0	169.9	2,551.4	156.9	2,678.5	199.7	5,518.2	312.7
2004	7,425.3	282.0	2,589.6	165.6	1,981.3	114.9	2,460.8	145.2	4,073.0	238.0
2005	6,755.3	280.8	2,179.1	131.0	2,225.1	139.2	2,156.9	125.8	4,585.5	236.3
2006	7,276.5	223.7	2,824.7	174.2	2,171.2	115.7	2,587.2	155.3	5,859.6	303.5
2007	8,307.3	285.8	3,355.9	206.2	2,806.8	152.0	2,890.3	196.1	6,707.6	362.2
2008	7,723.8	256.8	2,727.7	158.9	2,486.6	151.3	2,979.7	194.4	6,640.1	337.3
2009	8,512.4	248.3	3,053.5	166.3	2,468.6	135.4	3,443.6	219.9	7,383.8	396.8
2010	8,430.1	284.9	2,976.7	161.6	2,424.6	131.5	3,475.9	207.2	6,328.5	382.6
2011	9,182.6	267.8	3,256.9	196.9	2,084.0	110.1	2,900.1	170.7	8,948.5	418.2
2012	10,601.5	324.0	3,585.6	208.7	2,145.0	145.6	3,471.2	207.9	9,242.3	425.1
2013	10,371.9	360.6	3,351.4	204.5	2,644.3	169.2	3,053.4	173.7	7,731.7	363.2
2014	10,899.8	347.6	3,811.0	206.0	3,116.7	190.4	3,439.9	247.4	8,541.5	461.9
2015	11,643.3	361.8	3,834.1	219.4	3,037.0	199.2	4,080.9	269.8	8,547.3	401.1
2016	11,792.5	367.4	3,712.0	197.3	3,411.3	196.4	4,275.4	329.8	6,689.4	340.1
2017	10,488.5	333.9	4,180.0	209.0	2,777.1	156.0	3,605.3	233.3	7,888.9	395.8

Continued.

	Northern shoveler		Northern pintail		Redhead		Canvasback		Scaup	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
1955	1,642.8	218.7	9,775.1	656.1	539.9	98.9	589.3	87.8	5,620.1	582.1
1956	1,781.4	196.4	10,372.8	694.4	757.3	119.3	698.5	93.3	5,994.1	434.0
1957	1,476.1	181.8	6,606.9	493.4	509.1	95.7	626.1	94.7	5,766.9	411.7
1958	1,383.8	185.1	6,037.9	447.9	457.1	66.2	746.8	96.1	5,350.4	355.1
1959	1,577.6	301.1	5,872.7	371.6	498.8	55.5	488.7	50.6	7,037.6	492.3
1960	1,824.5	130.1	5,722.2	323.2	497.8	67.0	605.7	82.4	4,868.6	362.5
1961	1,383.0	166.5	4,218.2	496.2	323.3	38.8	435.3	65.7	5,380.0	442.2
1962	1,269.0	113.9	3,623.5	243.1	507.5	60.0	360.2	43.8	5,286.1	426.4
1963	1,398.4	143.8	3,846.0	255.6	413.4	61.9	506.2	74.9	5,438.4	357.9
1964	1,718.3	240.3	3,291.2	239.4	528.1	67.3	643.6	126.9	5,131.8	386.1
1965	1,423.7	114.1	3,591.9	221.9	599.3	77.7	522.1	52.8	4,640.0	411.2
1966	2,147.0	163.9	4,811.9	265.6	713.1	77.6	663.1	78.0	4,439.2	356.2
1967	2,314.7	154.6	5,277.7	341.9	735.7	79.0	502.6	45.4	4,927.7	456.1
1968	1,684.5	176.8	3,489.4	244.6	499.4	53.6	563.7	101.3	4,412.7	351.8
1969	2,156.8	117.2	5,903.9	296.2	633.2	53.6	503.5	53.7	5,139.8	378.5
1970	2,230.4	117.4	6,392.0	396.7	622.3	64.3	580.1	90.4	5,662.5	391.4
1971	2,011.4	122.7	5,847.2	368.1	534.4	57.0	450.7	55.2	5,143.3	333.8
1972	2,466.5	182.8	6,979.0	364.5	550.9	49.4	425.9	46.0	7,997.0	718.0
1973	1,619.0	112.2	4,356.2	267.0	500.8	57.7	620.5	89.1	6,257.4	523.1
1974	2,011.3	129.9	6,598.2	345.8	626.3	70.8	512.8	56.8	5,780.5	409.8
1975	1,980.8	106.7	5,900.4	267.3	831.9	93.5	595.1	56.1	6,460.0	486.0
1976	1,748.1	106.9	5,475.6	299.2	665.9	66.3	614.4	70.1	5,818.7	348.7
1977	1,451.8	82.1	3,926.1	246.8	634.0	79.9	664.0	74.9	6,260.2	362.8
1978	1,975.3	115.6	5,108.2	267.8	724.6	62.2	373.2	41.5	5,984.4	403.0
1979	2,406.5	135.6	5,376.1	274.4	697.5	63.8	582.0	59.8	7,657.9	548.6
1980	1,908.2	119.9	4,508.1	228.6	728.4	116.7	734.6	83.8	6,381.7	421.2
1981	2,333.6	177.4	3,479.5	260.5	594.9	62.0	620.8	59.1	5,990.9	414.2
1982	2,147.6	121.7	3,708.8	226.6	616.9	74.2	513.3	50.9	5,532.0	380.9
1983	1,875.7	105.3	3,510.6	178.1	711.9	83.3	526.6	58.9	7,173.8	494.9
1984	1,618.2	91.9	2,964.8	166.8	671.3	72.0	530.1	60.1	7,024.3	484.7
1985	1,702.1	125.7	2,515.5	143.0	578.2	67.1	375.9	42.9	5,098.0	333.1
1986	2,128.2	112.0	2,739.7	152.1	559.6	60.5	438.3	41.5	5,235.3	355.5
1987	1,950.2	118.4	2,628.3	159.4	502.4	54.9	450.1	77.9	4,862.7	303.8
1988	1,680.9	210.4	2,005.5	164.0	441.9	66.2	435.0	40.2	4,671.4	309.5
1989	1,538.3	95.9	2,111.9	181.3	510.7	58.5	477.4	48.4	4,342.1	291.3
1990	1,759.3	118.6	2,256.6	183.3	480.9	48.2	539.3	60.3	4,293.1	264.9
1991	1,716.2	104.6	1,803.4	131.3	445.6	42.1	491.2	66.4	5,254.9	364.9
1992	1,954.4	132.1	2,098.1	161.0	595.6	69.7	481.5	97.3	4,639.2	291.9
1993	2,046.5	114.3	2,053.4	124.2	485.4	53.1	472.1	67.6	4,080.1	249.4
1994	2,912.0	141.4	2,972.3	188.0	653.5	66.7	525.6	71.1	4,529.0	253.6
1995	2,854.9	150.3	2,757.9	177.6	888.5	90.6	770.6	92.2	4,446.4	277.6
1996	3,449.0	165.7	2,735.9	147.5	834.2	83.1	848.5	118.3	4,217.4	234.5
1997	4,120.4	194.0	3,558.0	194.2	918.3	77.2	688.8	57.2	4,112.3	224.2

Continued.

	Northern shoveler		Northern pintail		Redhead		Canvasback		Scaup	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
1998	3,183.2	156.5	2,520.6	136.8	1,005.1	122.9	685.9	63.8	3,471.9	191.2
1999	3,889.5	202.1	3,057.9	230.5	973.4	69.5	716.0	79.1	4,411.7	227.9
2000	3,520.7	197.9	2,907.6	170.5	926.3	78.1	706.8	81.0	4,026.3	205.3
2001	3,313.5	166.8	3,296.0	266.6	712.0	70.2	579.8	52.7	3,694.0	214.9
2002	2,318.2	125.6	1,789.7	125.2	564.8	69.0	486.6	43.8	3,524.1	210.3
2003	3,619.6	221.4	2,558.2	174.8	636.8	56.6	557.6	48.0	3,734.4	225.5
2004	2,810.4	163.9	2,184.6	155.2	605.3	51.5	617.2	64.6	3,807.2	202.3
2005	3,591.5	178.6	2,560.5	146.8	592.3	51.7	520.6	52.9	3,386.9	196.4
2006	3,680.2	236.5	3,386.4	198.7	916.3	86.1	691.0	69.6	3,246.7	166.9
2007	4,552.8	247.5	3,335.3	160.4	1,009.0	84.7	864.9	86.2	3,452.2	195.3
2008	3,507.8	168.4	2,612.8	143.0	1,056.0	120.4	488.7	45.4	3,738.3	220.1
2009	4,376.3	224.1	3,225.0	166.9	1,044.1	106.3	662.1	57.4	4,172.1	232.3
2010	4,057.4	198.4	3,508.6	216.4	1,064.2	99.5	585.2	50.8	4,244.4	247.9
2011	4,641.0	232.8	4,428.6	267.9	1,356.1	128.3	691.6	46.0	4,319.3	261.1
2012	5,017.6	254.2	3,473.1	192.4	1,269.9	99.2	759.9	68.5	5,238.6	296.8
2013	4,751.0	202.3	3,335.0	188.4	1,202.2	90.5	787.0	57.6	4,165.7	250.8
2014	5,278.9	265.3	3,220.3	179.7	1,278.7	102.5	685.3	50.7	4,611.1	253.3
2015	4,391.4	219.0	3,043.0	182.5	1,195.9	92.9	757.3	63.3	4,395.3	252.5
2016	3,966.9	189.0	2,618.5	204.2	1,288.8	115.4	736.5	68.8	4,991.7	297.6
2017	4,353.1	202.3	2,889.2	206.2	1,115.4	91.8	732.5	61.7	4,371.7	228.7

Table C.4. Total breeding duck estimates for the traditional survey area, in thousands.

	Traditional Survey Area[a]	
Year	$\widehat{N}$	$\widehat{SE}$
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

Table C.4. Continued.

	Traditional Survey Area[a]	
Year	$\widehat{N}$	$\widehat{SE}$
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
2008	37,276.5	638.3
2009	42,004.8	701.9
2010	40,893.8	718.4
2011	45,554.3	766.5
2012	48,575.3	796.8
2013	45,607.3	749.8
2014	49,152.2	831.1
2015	49,521.7	812.1
2016	48,362.8	827.6
2017	47,265.6	773.6

[a] Total ducks in the traditional survey area include species in Appendix C.3 plus American black ducks, ring-necked duck, goldeneyes, bufflehead, and ruddy duck.

Table C.5. Breeding population estimates and 90% credibility intervals (in thousands) for the six most abundant species of ducks in the eastern survey area, 1990–2017[a].

	Mallard		American black duck		Green-winged teal		Ring-necked duck		Goldeneyes[b]		Mergansers[c]	
Year	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI
1990	318.4	(204.9, 485.4)	589.5	(524.1, 668.3)	248.3	(196.0, 323.8)	503.2	(398.3, 650.1)	378.7	(293.5, 492.4)	382.6	(327.0, 456.2)
1991	361.8	(234.8, 547.2)	597.3	(525.8, 683.3)	240.4	(188.3, 317.2)	452.8	(360.8, 582.6)	396.7	(307.3, 517.5)	456.5	(388.0, 554.0)
1992	359.3	(229.2, 551.3)	568.9	(506.8, 645.3)	228.8	(177.9, 298.7)	466.9	(372.8, 603.3)	406.6	(315.6, 532.7)	457.1	(381.2, 570.2)
1993	367.1	(232.9, 558.2)	547.1	(482.3, 626.7)	207.4	(159.0, 274.5)	437.3	(346.9, 575.0)	394.6	(305.9, 516.3)	432.5	(365.2, 530.7)
1994	375.5	(237.6, 585.2)	506.0	(449.7, 579.5)	216.9	(168.2, 289.7)	423.5	(337.8, 550.1)	406.3	(315.0, 536.0)	435.6	(359.0, 556.9)
1995	318.8	(201.7, 487.5)	593.2	(523.3, 678.2)	222.7	(172.6, 291.9)	445.4	(353.7, 577.1)	354.7	(274.4, 466.7)	470.0	(391.9, 586.9)
1996	346.4	(225.2, 530.6)	706.2	(631.5, 795.3)	300.1	(240.0, 387.7)	582.5	(466.6, 755.8)	444.2	(345.3, 586.4)	432.9	(370.9, 516.2)
1997	371.6	(233.5, 571.9)	593.2	(529.9, 669.6)	232.9	(181.3, 306.9)	510.7	(408.8, 651.8)	450.6	(348.4, 595.5)	434.7	(371.4, 519.5)
1998	405.9	(262.1, 617.9)	628.5	(565.1, 706.7)	219.2	(171.1, 286.1)	439.9	(352.2, 564.6)	385.1	(300.8, 503.2)	358.3	(307.3, 426.9)
1999	417.1	(271.0, 629.0)	711.4	(639.9, 799.5)	266.1	(207.9, 353.0)	528.5	(425.2, 684.3)	488.8	(373.3, 658.0)	423.8	(361.7, 509.6)
2000	380.2	(247.5, 576.1)	656.0	(590.9, 734.2)	276.4	(220.5, 350.7)	554.1	(439.7, 706.9)	460.5	(356.0, 610.8)	434.0	(373.0, 516.4)
2001	403.9	(264.8, 605.7)	609.7	(547.9, 684.4)	225.9	(179.6, 293.4)	497.2	(399.8, 642.3)	534.4	(409.3, 722.0)	410.7	(352.4, 489.0)
2002	399.6	(257.2, 603.9)	698.7	(629.2, 784.5)	268.6	(212.2, 349.8)	506.2	(399.9, 656.3)	605.6	(450.4, 864.1)	566.9	(484.1, 680.2)
2003	413.2	(268.6, 624.4)	642.5	(574.2, 721.1)	267.8	(212.1, 348.0)	515.9	(415.5, 665.2)	441.4	(343.9, 581.8)	486.8	(415.7, 584.6)
2004	429.0	(287.2, 650.8)	643.3	(574.6, 723.8)	308.9	(246.2, 406.9)	565.3	(454.9, 723.7)	440.2	(345.1, 569.6)	520.9	(447.0, 618.7)
2005	420.8	(269.3, 639.3)	612.1	(547.6, 693.5)	244.4	(194.2, 320.6)	524.3	(424.4, 670.1)	394.7	(307.6, 511.6)	482.6	(412.3, 577.8)
2006	393.2	(256.1, 589.0)	628.9	(564.8, 707.9)	248.4	(196.5, 325.1)	532.7	(432.7, 687.6)	386.5	(301.0, 502.3)	436.0	(373.8, 519.7)
2007	440.8	(286.1, 675.1)	729.2	(654.6, 824.5)	276.6	(217.7, 359.1)	671.9	(531.1, 866.3)	480.5	(370.6, 638.5)	467.2	(398.4, 564.1)
2008	434.1	(285.4, 659.8)	633.5	(567.8, 710.8)	297.7	(227.1, 413.7)	536.2	(432.4, 687.3)	455.4	(351.8, 600.6)	441.0	(378.2, 523.2)
2009	451.5	(298.0, 688.7)	593.7	(532.9, 667.1)	298.5	(231.3, 401.7)	528.9	(421.4, 678.1)	406.3	(314.7, 535.0)	466.8	(399.8, 557.2)
2010	375.3	(242.9, 566.4)	561.5	(504.6, 629.6)	277.6	(218.0, 360.0)	532.9	(431.1, 675.3)	402.5	(312.9, 529.7)	388.8	(331.7, 462.1)
2011	423.9	(275.5, 650.0)	541.1	(485.8, 606.6)	245.9	(194.5, 320.7)	508.5	(406.6, 645.1)	413.7	(320.1, 544.5)	408.9	(348.7, 488.0)
2012	406.0	(264.0, 610.0)	602.0	(538.8, 680.8)	254.8	(203.3, 330.8)	503.9	(405.3, 645.3)	401.5	(312.4, 521.1)	426.4	(365.5, 508.0)
2013	490.5	(316.3, 760.2)	625.1	(562.6, 702.8)	286.6	(226.4, 369.0)	615.4	(487.9, 816.9)	465.9	(364.0, 605.0)	462.2	(394.6, 552.7)
2014	434.9	(279.4, 660.5)	610.9	(545.1, 690.6)	225.4	(175.8, 295.7)	485.5	(386.0, 626.3)	386.6	(294.5, 538.8)	421.7	(361.2, 502.4)
2015	409.1	(269.7, 610.7)	534.1	(477.0, 602.5)	218.0	(170.8, 285.5)	501.1	(398.1, 648.1)	354.0	(273.7, 464.9)	417.4	(357.2, 496.1)
2016	412.7	(271.0, 625.4)	606.2	(538.6, 689.7)	221.9	(171.0, 294.1)	572.1	(461.3, 732.0)	363.6	(282.8, 474.4)	447.3	(382.3, 534.6)
2017	445.0	(293.0, 668.2)	541.3	(480.4, 617.2)	238.6	(187.4, 316.5)	462.8	(369.2, 596.4)	401.4	(310.0, 525.0)	512.8	(437.4, 615.7)

[a] Estimates for mallards, American black ducks, green-winged teal, ring-necked duck, goldeneyes, and mergansers from Bayesian hierarchical analysis using FWS and CWS data from strata 51, 52, 63, 64, 66–68, 70–72.

[b] Common and Barrow's.

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

D. Historical estimates of goose and swan populations

Table D.1. Abundance indices (in thousands) for North American Canada goose populations, 1969–2017.

Year	North Atlantic[a,b]	Atlantic[a,b]	Atlantic Flyway Resident[a]	Mississippi Flyway Giant[a]	W. Prairie & Great Plains[a]	Central Flyway Arctic Nesting[c]	Hi-line[a]
1969/70					80.4		58.3
1970/71					98.9		99.0
1971/72					83.0		52.4
1972/73					78.8		29.5
1973/74					66.8		32.9
1974/75					74.4		28.0
1975/76					99.9		39.3
1976/77					94.0		39.4
1977/78					227.9		38.1
1978/79					174.7		48.9
1979/80					152.1		49.3
1980/81					184.9		48.7
1981/82					162.1		52.4
1982/83					214.2		71.5
1983/84					182.4		103.1
1984/85					217.7		89.1
1985/86					232.1		98.2
1986/87					235.0	1,080.4	90.6
1987/88					338.9	1,114.2	126.0
1988/89					418.3	1,215.6	120.6
1989/90	44.2				366.3	1,157.8	180.9
1990/91	44.4				318.2	1,736.3	143.7
1991/92	41.2				328.1	1,980.5	163.8
1992/93	49.3	93.0		779.4	346.5	1,084.5	153.7
1993/94	46.6	43.2		909.4	371.0	3,515.2	156.2
1994/95	44.8	34.0		941.6	417.7	1,076.3	230.3
1995/96	58.2	51.5		1,037.3	451.4	904.6	196.2
1996/97	53.5	72.1		957.0	487.3	3,908.1	203.7
1997/98	49.4	48.6		1,140.5	587.1	5,523.8	252.0
1998/99	59.8	83.7		1,163.3	702.1	2,876.1	196.6
1999/00	49.8	95.8		1,436.7	717.7	5,095.5	279.3
2000/01	49.7	135.2		1,296.3	704.5	3,208.0	252.8
2001/02	49.7	182.4		1,415.2	670.9	4,162.4	231.0
2002/03	47.3	174.9	1,126.7	1,416.3	764.1	2,825.3	231.5
2003/04	52.4	191.8	1,073.1	1,430.4	797.7	3,043.0	200.5
2004/05	45.2	175.7	1,167.1	1,367.0	775.6	3,717.1	236.2
2005/06	46.7	186.1	1,144.0	1,575.2	816.1	3,242.4	208.0
2006/07	51.9	207.3	1,128.0	1,454.7	979.6	2,922.3	298.8
2007/08	46.8	174.0	1,024.9	1,461.7	957.1	2,693.2	337.3
2008/09	49.0	186.8	1,006.1	1,448.3	1,049.7	4,262.6	298.4

Table D.1. Continued.

Year	North Atlantic[a,b]	Atlantic[a,b]	Atlantic Flyway Resident[a]	Mississippi Flyway Giant[a]	W. Prairie & Great Plains[a]	Central Flyway Arctic Nesting[c]	Hi-line[a]
2009/10	47.4	165.1	977.1	1,638.0	1,111.1	4,749.6	269.5
2010/11	50.9	216.0	1,015.1	1,670.3	1,309.9	3,191.8	265.4
2011/12	50.4	190.3	879.8	1,766.2	1,369.6	3,360.3	483.6
2012/13	51.8		951.9	1,600.7	1,314.7	4,430.9	325.5
2013/14	54.7	191.2	1,084.9	1,461.0	1,183.4	3,761.1	275.9
2014/15	50.7	161.3	963.8	1,620.4	1,223.1	1,892.0	368.5
2015/16	49.5	191.5	950.0	1,528.8	1,517.7		453.9
2016/17	46.9	161.2	933.3	1,776.0	1,352.8		374.6

[a] Surveys conducted in spring.
[b] Number of breeding pairs.
[c] Lincoln estimate.
[d] Fall-winter indices.

Table D.1. Continued.

Year	Rocky Mountain[a]	Pacific[a]	Dusky[a]	Cackling[d]	Lesser[a]	Taverner's[a]	Aleutian[d]
1969/70					12.7		
1970/71	47.2				8.2		
1971/72	26.7				3.4		
1972/73	28.6				6.4		
1973/74	32.4				21.2		
1974/75	31.6				6.9		0.8
1975/76	20.1				3.0		0.9
1976/77	19.6				4.7		1.3
1977/78	28.6				6.9		1.5
1978/79	43.5				6.5		1.6
1979/80	24.2				12.9		1.7
1980/81	47.8				18.4		2.0
1981/82	47.8				16.0		2.7
1982/83	30.7				3.4		3.5
1983/84	32.7				13.8		3.8
1984/85	35.3			47.8	9.6		4.2
1985/86	51.1		16.8	46.2	6.7	66.2	4.3
1986/87	50.1		15.5	68.2	4.6	47.8	5.0
1987/88	78.4		15.7	83.7	6.8	50.2	5.4
1988/89	74.1		17.1	87.2	7.1	48.3	5.8
1989/90	69.6		16.0	108.7	11.7	53.4	6.3
1990/91	63.3		10.7	98.7	4.3	76.9	7.0
1991/92	79.3		17.6	151.8	9.1	76.4	7.7
1992/93	89.4		16.4	156.6	5.9	49.3	11.7
1993/94	119.0		16.2	222.6	16.7	56.7	15.7
1994/95	118.3		12.0	239.2	9.6	49.5	19.2
1995/96	126.8		11.8	255.3	7.7	66.6	15.5
1996/97	85.0		13.3	301.3	5.0	61.3	20.4
1997/98	137.8		14.3	221.1	5.7	57.2	32.4
1998/99	99.1		10.3	247.0	5.7	63.8	35.3
1999/00	165.1		10.1	256.7	9.3	52.8	34.2
2000/01	161.4		11.0	258.8	6.1	55.5	88.3
2001/02	134.7		12.2	171.8	4.9	38.7	65.2
2002/03	134.3		9.7	239.1	6.3	52.8	73.0
2003/04	152.5		11.0	175.9	6.3	43.4	111.1
2004/05	151.8		15.9	224.1	4.8	44.3	87.8
2005/06	130.7		11.9	246.4	4.2	44.5	97.2
2006/07	137.2		10.1	253.8	9.5	57.2	117.3
2007/08	205.6		9.0	289.8	10.3	51.3	116.1

Table D.1. Continued.

Year	Rocky Mountain[a]	Pacific[a]	Dusky[a]	Cackling[d]	Lesser[a]	Taverner's[a]	Aleutian[d]
2008/09	118.4		6.6	230.8	6.4	49.7	81.8
2009/10	137.3	209.5	9.4	281.3	6.8	56.7	106.7
2010/11	98.1	267.6	11.6	184.1	3.6	36.1	105.3
2011/12	137.0	286.3	13.5	206.7	3.8	46.6	135.9
2012/13	153.2	311.9	0.0	319.0	4.1	27.3	166.3
2013/14	111.3	229.6	15.4	287.4	2.3	48.4	150.0
2014/15	158.2	329.0	17.7	347.1	4.0	32.8	197.7
2015/16	251.6	312.7	13.2	327.5	6.5	54.9	154.7
2016/17	187.7	297.9	13.5	289.9	2.8	45.7	168.5

[a] Surveys conducted in spring.
[b] Breeding pairs.
[c] Lincoln estimate.
[d] Fall-winter indices

Table D.2. Abundance indices (in thousands) for snow, Ross's, white-fronted, and emperor goose populations, 1969–2017.

	Snow and Ross's geese					White-fronted geese		
Year	Ross's goose[a]	Greater snow geese[a]	Mid-continent[b]	Western Central Flyway[b]	Pacific Flyway[b]	Mid-continent[b]	Pacific[b]	Emperor geese[a]
1969/70		89.6	777.0	6.9				
1970/71		123.3	1,070.2	11.1				
1971/72		134.8	1,313.4	13.0				
1972/73		143.0	1,025.3	11.6				
1973/74		165.0	1,189.8	16.2				
1974/75		153.8	1,096.6	26.4				
1975/76		165.6	1,562.4	23.2				
1976/77		160.0	1,150.3	33.6				
1977/78		192.6	1,966.4	31.1				
1978/79		170.1	1,285.7	28.2				
1979/80		180.0	1,398.1	30.4	528.1			
1980/81		170.8	1,406.7	37.6	204.2			
1981/82		163.0	1,794.1	50.0	759.9			
1982/83		185.0	1,755.5	76.1	354.1			
1983/84		225.4	1,494.5	43.0	547.6			
1984/85		260.0	1,973.0	62.9	466.3		163.2	19.8
1985/86		303.5	1,449.4	96.6	549.8		141.9	12.4
1986/87		255.0	1,913.8	63.5	521.7		140.0	13.0
1987/88		363.8	1,750.7	46.2	525.3		186.7	16.4
1988/89		363.2	1,956.2	67.6	441.0		198.1	16.9
1989/90		368.3	1,724.3	38.7	463.9		220.0	17.3
1990/91		352.6	2,135.8	104.6	708.5		196.5	14.9
1991/92		448.1	2,021.9	87.9	690.1		218.8	15.4
1992/93	201.9	498.4	1,744.1	45.1	639.3	622.9	234.1	17.1
1993/94	160.8	591.4	2,200.8	84.9	569.2	676.3	258.9	18.7
1994/95	150.7	616.6	2,725.1	80.1	478.2	727.3	302.2	18.8
1995/96	240.5	669.1	2,398.1	93.1	501.4	1,129.4	374.6	24.4
1996/97	220.6	657.5	2,957.7	127.2	366.3	742.5	370.5	23.3
1997/98	293.3	836.6	3,022.2	103.5	416.4	622.2	388.0	21.7
1998/99	391.7	1,008.0	2,575.7	236.4	354.3	1,058.3	393.4	21.4
1999/00	347.1	816.5	2,397.3	137.5	579.0	963.1	352.7	18.7
2000/01	467.8	837.4	2,341.3	105.8	656.8	1,067.6	438.9	27.3
2001/02	359.7	725.0	2,696.1	99.9	448.2	712.3	359.7	19.5
2002/03	517.5	721.0	2,435.0	105.9	596.8	680.2	422.0	21.4
2003/04	463.3	890.0	2,214.3	135.4	587.8	528.2	374.9	21.4
2004/05	563.7	880.0	2,344.2	143.0	750.3	644.3	443.9	19.8
2005/06	543.9	938.0	2,221.7	140.6	710.7	522.8	509.3	26.6
2006/07	718.9	838.0	2,917.1	170.6	799.7	751.3	604.7	24.4
2007/08	741.0	718.0	2,455.1	188.5	1,073.5	764.3	627.0	22.1
2008/09	669.2	1,009.0	2,753.4	284.4	957.4	751.7	536.7	20.7
2009/10	704.1	824.0	2,657.5	238.1	901.0	583.2	649.8	20.2
2010/11	665.1	917.0	3,175.2	196.0	863.8	709.8	604.3	21.2
2011/12	784.0	1,005.0	4,021.2	205.3	1,097.9	681.7	664.2	20.4
2012/13	555.1	921.0	4,614.0	225.9	881.4	777.9	579.9	29.8
2013/14	665.4	796.0	3,814.7	264.8	1,351.2		637.2	32.6
2014/15	613.8	818.0	3,284.1	243.3	1,199.6	1,005.6	479.1	26.2
2015/16	624.1	915.0	3,452.6	236.6		977.1	685.5	34.1
2016/17		747.0	3,417.1	214.2	1,906.8	1,000.1	735.6	30.1

[a] Surveys conducted in spring.

[b] Fall-winter indices

Table D.3. Abundance indices (in thousands) of North American brant and swan populations from January surveys, 1969–2017.

	Brant		Tundra swans	
Year	Atlantic	Pacific[a]	Western	Eastern
1969/70	106.5	141.7	31.0	
1970/71	151.0	149.2	98.9	
1971/72	73.3	124.8	82.8	
1972/73	40.8	125.0	33.9	
1973/74	88.1	130.7	69.8	
1974/75	88.4	123.4	54.9	
1975/76	127.0	122.0	51.4	
1976/77	73.8	147.0	47.3	
1977/78	46.7	162.9	45.6	
1978/79	42.0	129.4	53.5	
1979/80	59.2	146.4	65.2	60.1
1980/81	97.0	197.5	83.6	93.0
1981/82	104.5	121.0	91.3	73.2
1982/83	123.5	109.3	67.3	87.5
1983/84	127.3	135.0	61.9	81.4
1984/85	146.3	145.1	48.8	96.9
1985/86	110.4	134.2	66.2	90.9
1986/87	109.4	110.9	52.8	95.8
1987/88	131.2	145.0	59.2	78.7
1988/89	137.9	135.6	78.7	91.3
1989/90	135.4	151.7	40.1	90.6
1990/91	147.7	132.7	47.6	98.2
1991/92	184.8	117.8	63.7	113.0
1992/93	100.6	125.0	62.2	78.2
1993/94	157.2	129.3	79.4	84.8
1994/95	148.2	133.5	52.9	85.1
1995/96	105.9	128.0	98.1	79.5
1996/97	129.1	155.3	122.5	92.4
1997/98	138.0	138.8	70.0	100.6
1998/99	171.6	132.3	119.8	111.0
1999/00	157.2	135.6	89.6	115.3
2000/01	145.3	126.0	87.3	98.4
2001/02	181.6	138.2	58.7	114.7
2002/03	164.5	106.1	102.7	111.7
2003/04	129.6	121.3	83.0	110.8
2004/05	123.2	107.2	92.1	72.5
2005/06	146.6	141.0	106.9	81.3
2006/07	150.6	130.6	109.6	114.4
2007/08	161.6	157.0	89.7	96.2
2008/09	151.3		105.2	100.2
2009/10	139.4	163.5	76.7	97.3
2010/11	148.9	162.5	49.3	97.6
2011/12	149.2	177.3	117.2	111.7

Table D.3. continued.

	Brant		Tundra swans	
Year	Atlantic	Pacific[a]	Western	Eastern
2012/13	111.8	163.3	75.3	107.1
2013/14	132.9	173.3	68.2	105.0
2014/15	111.4	136.5	68.2	117.1
2015/16	157.9	140.0		113.6
2016/17	161.7	155.7	70.8	119.3

[a] Beginning in 1986, counts of Pacific brant in Alaska were included with the Pacific flyway.

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