U.S. Fish & Wildlife Service

Waterfowl

Population Status, 2023

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August 18, 2023

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 made available for 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 2024–2025 hunting season.

Cover: 2023 winning artwork from the Junior Duck Stamp Conservation and Design Program, by Mila Tong of Virginia, used with permission from the Federal Duck Stamp Office.

Acknowledgments

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, and provincial conservation agencies from Canada. 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.

This report was compiled by the U.S. Fish and Wildlife Service, Division of Migratory Bird Management, branches of Assessment and Decision Support, Monitoring and Data Management, and Migratory Bird Surveys. 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, Anthony Roberts, John Yeiser, and Jeff Hostetler. Kathy Fleming and Phil Thorpe provided the maps.

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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 those most currently available when this report was written. Future analyses may yield slightly different results as databases are updated and new analytical procedures become available.

Habitat conditions during the 2023 Waterfowl Breeding Population and Habitat Survey (WBPHS) generally declined over a large portion of the surveyed area relative to 2022. Much of the Canadian prairies were in abnormally dry to extreme drought, and the dry conditions extended into the eastern provinces. Most of the U.S. prairies had improved since 2022. Fall 2022 was generally warm before giving way to below-average temperatures over the winter. The prairies remained cooler-than-average whereas eastern Canada and the boreal regions were warmer, particularly starting in May when extreme temperatures and dry conditions sparked wildfires across Canada. Precipitation was average to slightly-below average in eastern Canada since fall 2022 and below average across the Canadian prairies. Habitat conditions in the Dakotas and Montana improved, aided by near-record snowfall in North Dakota. In 2023, spring phenology was very early in the central Arctic, early or average in other areas of the Canadian Arctic and Subarctic, and later than average in Alaska. Many areas across the Arctic and Subarctic experienced above-average temperatures during May or June. The total pond estimate (Prairie Canada and northcentral U.S. combined) was 5.0 ± 0.1 million, which was 9% lower than the 2022 estimate of 5.5 ± 0.2 million and 5% below the long-term average of 5.2 ± 0.03 million. The 2023 estimate of ponds in Prairie Canada was 3.3 ± 0.1 million. This estimate was similar to the 2022 estimate of 3.5 ± 0.2 million and 6% below the long-term average (3.5 ± 0.02 million). The 2023 pond estimate for the northcentral U.S. was 1.7 ± 0.08 million, which was 16% below the 2022 estimate (2.0 ± 0.01 million) and similar to the long-term average of 1.7 ± 0.01 million.

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 hyemalis*], mergansers [*Mergus* spp. and *Lophodytes cucullatus*], and wood ducks [*Aix sponsa*]) was 32.3 ± 0.6 million birds. This estimate was 7% below the 2022 estimate of 34.7 ± 0.6 million and 9% below the long-term average of 35.5 ± 0.09 million. Estimated mallard (*Anas platyrhynchos*) abundance was 6.1 ± 0.2 million, which was 18% below the 2022 estimate of 7.4 ± 0.2 million and 23% below the long-term average of 7.9 ± 0.3 million. The estimate for blue-winged teal (*Spatula discors*; 5.3 ± 0.3 million) was 19% below the 2022 estimate of 6.5 ± 0.3 million and similar to the long-term average of 5.1 ± 0.04 million. Estimated abundance of gadwall (*Mareca strepera*; 2.6 ± 0.1 million) was similar to the 2022 estimate and 25% above the long-term average of 2.1 ± 0.02 million. The 2023 estimates of green-winged teal (*Anas crecca*), northern shoveler (*Spatula clypeata*), and canvasbacks (*Aythya valisineria*) were 2.5 ± 0.3 million, 2.9 ± 0.2 million, and 0.6 ± 0.06 million, respectively. All were similar to their 2022 estimates and their long-term averages. Estimated abundance of redheads (*A. americana*; 0.9 ± 0.08 million) was similar to the 2022 estimate and 27% above the long-term average of 0.7 ± 0.01 million. The Northern pintail

(*Anas acuta*) estimate was 2.2 ± 0.1 million, which was 24% above the 2022 estimate of 1.8 ± 0.2 million and 43% below the long-term average of 3.9 ± 0.03 million. The abundance estimate for American wigeon (*Mareca americana*; 1.9 ± 0.2 million) was similar to the 2022 estimate and 28% below the long-term average of 2.6 ± 0.02 million. The combined estimate of lesser and greater scaup (*Aythya affinis* and *A. marila*; 3.5 ± 0.2 million) was similar to the 2022 estimate and 29% lower than the long-term average of 5.0 ± 0.4 million.

A time series for assessing changes in green-winged teal, ring-necked duck (*A. collaris*), goldeneye (*Bucephala clangula* and *B. islandica*), merganser, and American black duck (*A. rubripes*) population status in the eastern survey area is provided by breeding waterfowl surveys conducted by the U.S. Fish and Wildlife Service (USFWS) and Canadian Wildlife Service (CWS) in Maine and eastern Canada. The estimate of goldeneyes was 0.8 ± 0.2 million, which was 28% above the 2022 estimate and 28% above the long-term average. Ring-necked ducks (0.7 ± 0.1 million) and green-winged teal (0.4 ± 0.1 million) were similar to their 2022 estimates and the long-term averages. The estimate of mergansers was 0.9 ± 0.1 million, which was similar to the 2022 estimate and 24% above the long-term average. The 2023 estimate of American black ducks in the eastern survey area was 0.7 ± 0.07 million, which had not changed from the 2022 estimate and the long-term average. The black duck estimate at the plot survey scale, which is used for management, was 0.5 ± 0.04 million. Eastern mallard population status is derived by integrating data from the eastern survey area and ground plot surveys conducted in the northeastern U.S. states of Virginia north to New Hampshire. The estimated abundance of mallards in eastern North America was 1.2 ± 0.15 million, which was similar to the 2022 estimate and the long-term average.

Summary of Goose and Swan Populations

Of the 21 applicable goose and tundra swan (*Cygnus columbianus*) populations included in this year's report with updated estimates, the primary monitoring indices for 2 of these populations had significant ($P < 0.05$) negative trends (% change per year) during the most recent 10-year period: Cackling/minima cackling geese (*Branta hutchinsii*; −7%) and emperor geese (*Anser canagica*; −3%). Of the 15 populations for which primary indices included variance estimates, the most recent estimate significantly decreased from the prior year's estimate for 10 populations: Atlantic Population (−30%), Western Prairie and Great Plains Populations (−42%), Hi-line Population (−34%), and Dusky (−27%) Canada geese (*Branta canadensis*); Cackling/minima (−33%) and Taverner's (−36%) cackling geese; greater snow geese (*Anser caerulescens atlantica*; −22%); Pacific Population greater white-fronted geese (*A. albifrons*; −36%); emperor geese (−17%); and Western Population tundra swans (−28%). Of the 4 populations for which primary indices did not include variance estimates, the most recent count was greater than the prior count for Atlantic brant (*Branta bernicla*; +11%) and Eastern Population tundra swans (+44%) and less than the prior count for Mississippi Flyway Giant Population Canada geese (−6%) and Pacific brant (−24%).

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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 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 by ground (Atlantic Flyway Breeding Waterfowl Survey; Sauer et al. 2014) or by 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 (Figure 1). Specifics on the survey design are provided in Smith (1995). The eastern survey area (strata 51–53, 56, and 62–72) includes parts of Ontario, Quebec, Labrador, Newfoundland, Nova Scotia, Prince Edward Island, New Brunswick, and Maine, covering an area of approximately 0.7 million square miles (Figure 1). Historically, surveys in the east were also conducted in strata 54, 55, and 57–59. Surveys in strata 57–59 were discontinued in 2011 due to a reduction in aviation staff. In 2012, stratum 55 was discontinued primarily because it overlapped with an existing ground survey. In 2017, stratum 54 was discontinued due to increased aviation hazards such as wind turbines and power lines. None of the discontinued strata in the eastern survey are part of existing management frameworks. 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 comparisons between airplane and 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 the eastern survey area (except stratum 69); however, some portions of the eastern survey area have been surveyed since 1990 (strata 51–53, 56, 63–64, 66–68, 70–72). 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 for calculation of measures of precision for their estimates. Information about habitat conditions was supplied primarily by biologists working in those 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

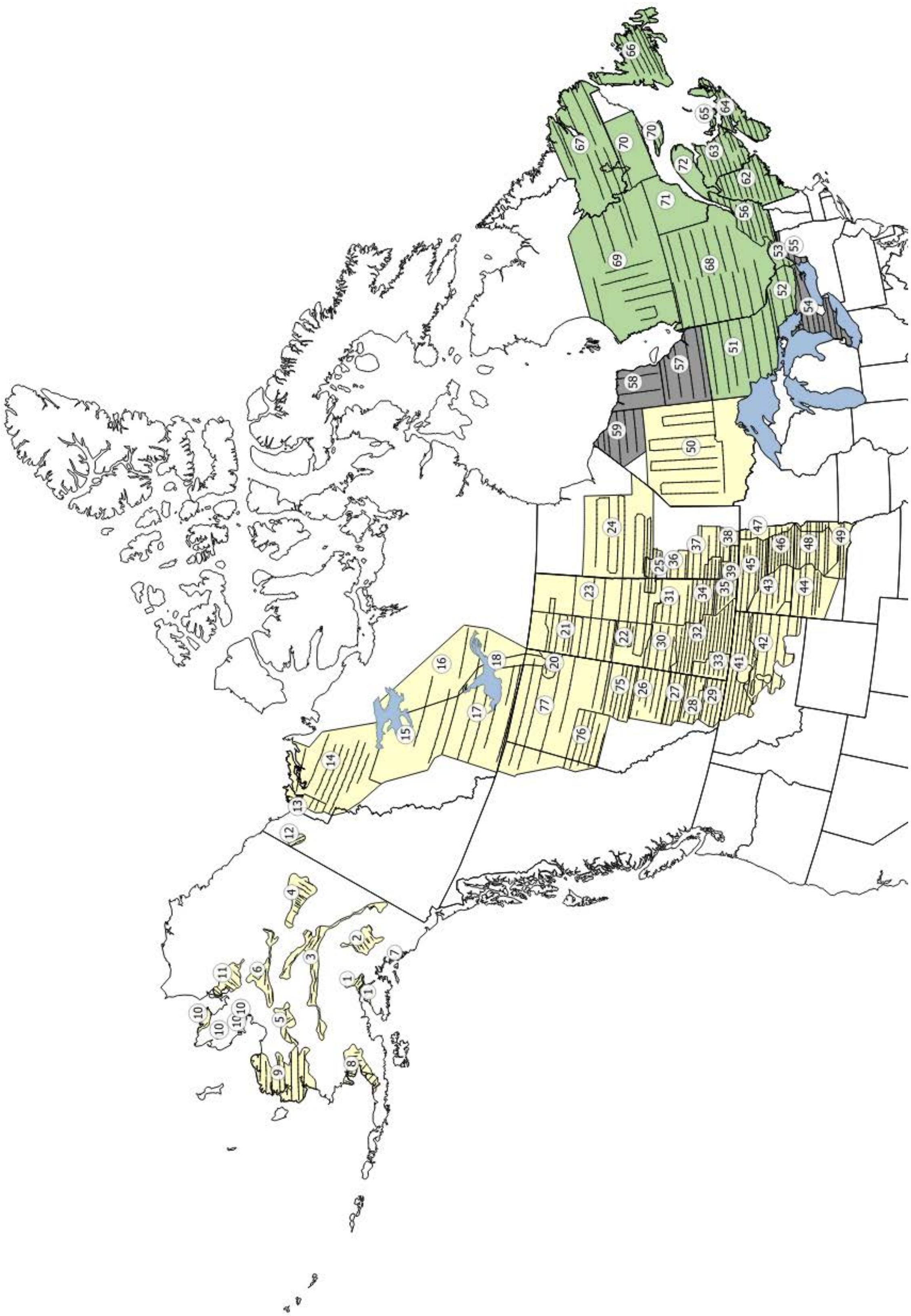

Figure 1. Strata and transects of the Waterfowl Breeding Population and Habitat Survey (yellow = traditional survey area, green = eastern survey area, grey = discontinued strata).

conducted a helicopter-based aerial plot survey in core American black duck breeding regions of Ontario, Quebec, and the Atlantic Provinces. Initially, 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, since 2005, waterfowl abundances for eastern North America have been 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 (e.g., mergansers, goldeneyes), estimates are produced for multi-species groupings. Previously, this report provided composite estimates for the eastern survey area using only data collected in strata 51, 52, 63, 64, 66–68, and 70–72, which corresponds to the area covered by the CWS plot survey. These strata contain either (1) both USFWS airplane survey transects and CWS helicopter plots or (2) only helicopter plots (strata 71 and 72). Since 2018, eastern breeding waterfowl population estimates have been presented at the full eastern survey scale (strata 51–53, 56, 62–72) or eastern North America scale, depending on the breeding distribution of the species. The eastern North America scale includes the full eastern survey area plus data from the Atlantic Flyway Breeding Waterfowl Survey (AFBWS, Sauer et al. 2014). The AFBWS is a ground-based survey conducted annually from Virginia north to New Hampshire. The time series at these larger scales is shorter (1998–present) but provides a more complete assessment of the status of waterfowl in the east.

For widely distributed and abundant species including American black ducks, mallards, green-winged teal, ring-necked ducks, goldeneyes (common and Barrow's) and mergansers (common, red-breasted, and hooded), 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. For strata containing just USFWS surveys (strata 53, 56, 62, 65, and 69) visibility-correction factors based on the ratio of counts from helicopters to fixed-wing aircraft along selected segments were used to adjust counts (Zimmerman et al. 2012). 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. Not enough green-winged teal, ring-necked ducks, goldeneyes, and mergansers were counted in the AFBWS to fit the models for those species at the eastern North America scale. Black duck and mallard counts were adequate to fit the model to the AFBWS data and derive breeding population estimates at the eastern North America scale. However, due to differences in how the indicated pairs are calculated between the eastern survey area and the AFBWS for American black ducks (described below), we did not combine data from these two surveys for this species. Therefore, we present estimates for American black ducks, green-winged teal, ring-necked ducks, goldeneyes, and mergansers at the eastern survey scale, and estimates for mallards at the eastern North America scale. The zero-inflated Poisson 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. deglandi*], and surf [*M. perspicillata*]), bufflehead (*Bucephala albeola*), and American wigeon (*Anas americana*). This model-based approach and changes in analytical procedures for some species may preclude comparisons with results from previous reports. We will continue to investigate methods that might allow us to estimate abundance of these rarer species within a hierarchical-modeling framework.

Since the implementation of the Eastern Breeding Waterfowl and Habitat Survey and associated composite estimation procedure (Zimmerman et al. 2012), American black duck total indicated pairs were calculated using the CWS method of scaling. The CWS scaling is based on sex-specific observations collected during previous CWS helicopter surveys in eastern Canada, which indicated 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 were then used to calculate indicated birds based on the USFWS protocol. The Black Duck Joint Venture completed a review of this estimation procedure using updated observation data from Quebec and New Jersey for the period 1990–2009. The results indicated the majority of 2-bird observations consisted of female/male pairings in similar proportions to mallards and green-winged teal. Therefore, starting in 2023 the time series for black duck total indicated pairs are estimated using the standard USFWS protocols that 2 birds equal 1 breeding pair. Further, total indicated birds are calculated using standard USFWS protocols.

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

Results and Discussion

2023 Overall Habitat Conditions and Population Status

Habitat conditions during the 2023 WBPHS generally declined over a large portion of the surveyed area relative to 2022 (Figure 2). Much of the Canadian prairies were in abnormally dry to extreme drought, and the dry conditions extended into the eastern provinces. Most of the U.S. prairies had improved since 2022. Fall 2022 was generally warm before giving way to below-average temperatures over the winter. The prairies remained cooler-than-average whereas eastern Canada and the boreal regions were warmer, particularly starting in May when extreme temperatures and dry conditions sparked wildfires across Canada. Precipitation was average to slightly-below average in eastern Canada since fall 2022 and below average across the Canadian prairies. Habitat conditions in the Dakotas and Montana improved, aided by near-record snowfall in North Dakota.

The total pond estimate (Prairie Canada and northcentral U.S. combined) was 5.0 ± 0.1 million, which was 9% lower than the 2022 estimate of 5.5 ± 0.2 million and 5% below the long-term average of 5.2 ± 0.03 million (Table 1, Figure 3). The 2023 estimate of ponds in Prairie Canada was 3.3 ± 0.1 million. This estimate was similar to the 2022 estimate of 3.5 ± 0.2 million and 6% below the long-term average (3.5 ± 0.02 million). The 2023 pond estimate for the northcentral U.S. was 1.7 ± 0.08 million, which was 16% below the 2022 estimate (2.0 ± 0.01 million) and similar to the long-term average of 1.7 ± 0.01 million. In the WBPHS traditional survey area, the total duck population estimate was 32.3 ± 0.6 million birds. This estimate was 7% below the 2022 estimate of 34.7 ± 0.6 million and 9% below the long-term average of 35.5 ± 0.09 million. In the eastern Dakotas, total duck numbers were 25% below the 2022 estimate and 12% above the long-term average. The total duck estimate in the

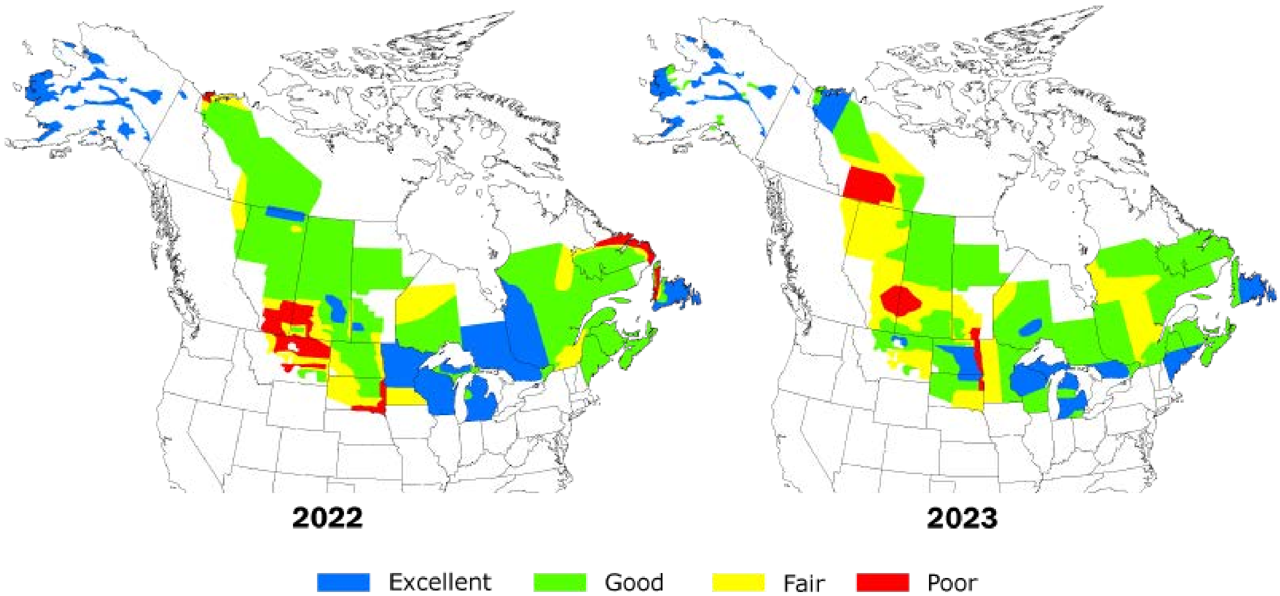

Figure 2. Breeding waterfowl habitat conditions during the 2022 and 2023 Waterfowl Breeding Population and Habitat Surveys, as judged by U.S. Fish and Wildlife Service and Canadian Wildlife Service biologists.

southern Alberta and southern Saskatchewan regions were similar to their 2022 estimates and 27% and 18% below their long-term averages, respectively. In southern Manitoba, the total duck population estimate was 34% below the 2022 estimate and 26% below the long-term average. The total duck estimate in central and northern Alberta–northeastern British Columbia–Northwest Territories was similar to the 2022 estimate and 11% above the long-term average. The estimate in the northern Saskatchewan–northern Manitoba–western Ontario survey area was similar to the 2022 estimate and 8% below the long-term average. The total duck estimate in the Montana–western Dakotas area was 23% above both the 2022 estimate and the long-term average. In the Alaska–Yukon Territory–Old Crow Flats region, the total duck estimate was 50% below the 2022 estimate and 48% below 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 Appendix B.2). Where possible we report year-over-year changes relative to the last year surveyed. In California, Oregon, Washington, British Columbia, Michigan, and Wisconsin, measures of precision for estimates of total duck numbers are available (Table 2). The total duck estimate in California was similar to the 2022 estimate and the long-term average (1992–2022). Oregon's 2023 total duck estimate was 43% below the 2022 estimate of 345,000 and 26% below the the long-term average (1994–2022). In Washington, the total duck estimate was unchanged from the 2022 estimate and the long-term average (2010–2022). In Michigan, the total duck estimate was 33% below the 2022 estimate and 78% below the long-term average (1991–2022). Wisconsin's 2023 total duck estimate was 22% below the 2022 estimate and was similar to the long-term average (1973–2022). British Columbia's total duck estimate was similar to the 2022 estimate and the long-term average (2006–2022). In Minnesota, which does not have a measure of precision for total duck numbers, the 2023 estimate of total ducks was 18% lower than the 2022 estimate and 20% below the long-term average (1968–2022).

Trends and annual breeding population es-

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

			Change from 2022			Change from LTA	
Region	2023	2022	%	*P*	LTA[a]	%	*P*
Prairie & Parkland Canada							
S. Alberta	642	711	−10	0.422	779	−18	0.002
S. Saskatchewan	2,117	2,035	+4	0.616	2,118	0	0.991
S. Manitoba	554	727	−24	0.005	627	−12	0.158
Subtotal	3,314	3,473	−5	0.411	3,524	−6	0.071
Northcentral U.S.							
Montana & Western Dakotas	602	549	+10	0.314	589	+2	0.709
Eastern Dakotas	1,059	1,434	−26	<0.001	1,121	−6	0.364
Subtotal	1,661	1,983	−16	0.009	1,711	−3	0.521
Total	4,975	5,457	−9	0.037	5,235	−5	0.063

[a] Long-term average. Prairie and Parkland Canada, 1961–2022; northcentral U.S. and Total 1974–2022.

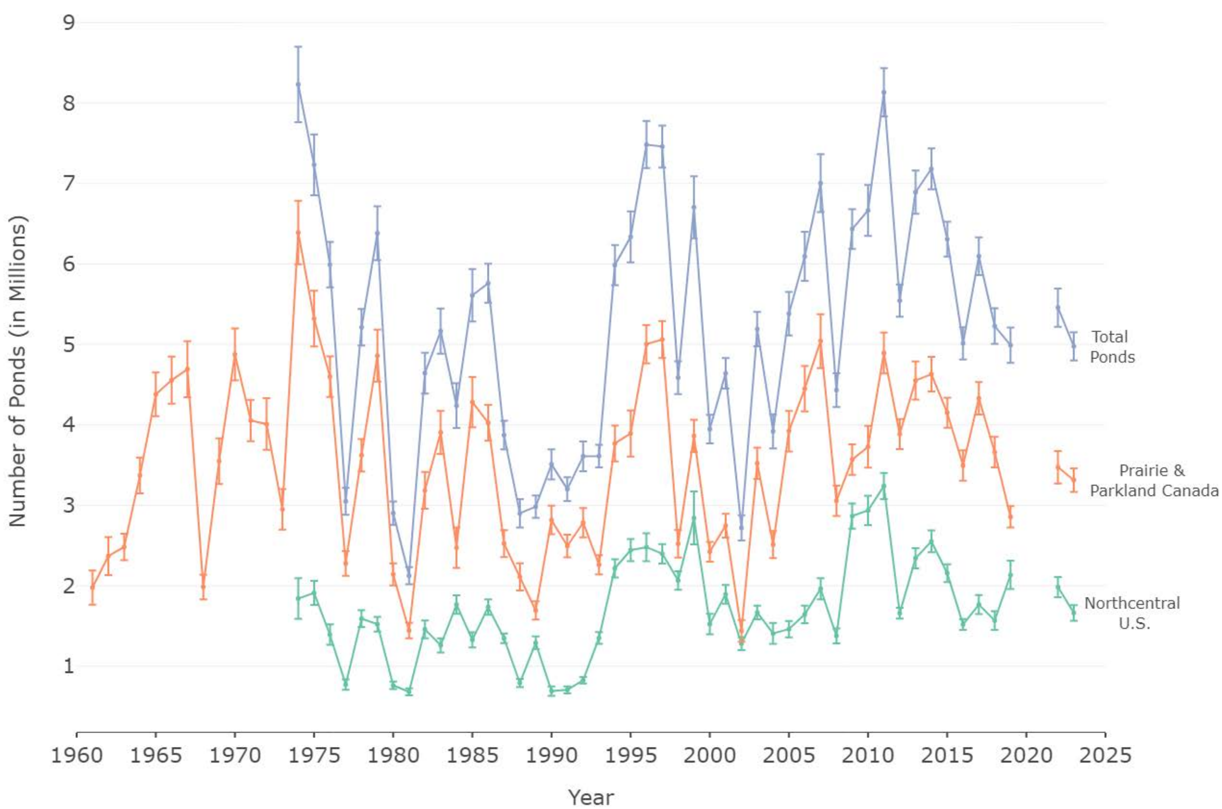

Figure 3. Number of ponds in May and 90% confidence intervals in Prairie and Parkland Canada, the northcentral U.S., and both areas combined (Total ponds).

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

			Change from 2022			Change from LTA	
Region	2023	2022	%	P	LTA[b]	%	P
Alaska Yukon Territory–Old Crow Flats	1,920	3,831	−50	<0.001	3,683	−48	<0.001
C. & N. Alberta–N. E. British Columbia–NWT	8,363	7,656	+9	0.201	7,542	+11	0.063
N. Saskatchewan–N. Manitoba–W. Ontario	3,139	2,788	+13	0.124	3,416	−8	0.080
S. Alberta	3,192	3,010	+6	0.402	4,349	−27	<0.001
S. Saskatchewan	6,508	5,994	+9	0.131	7,944	−18	<0.001
S. Manitoba	1,152	1,744	−34	<0.001	1,554	−26	<0.001
Montana & Western Dakotas	2,161	1,751	+23	0.019	1,755	+23	<0.001
Eastern Dakotas	5,884	7,883	−25	<0.001	5,243	+12	0.011
Total	32,320	34,657	−7	0.008	35,486	−9	<0.001
Other Regions							
British Columbia	369	391	−6	0.467	352	+5	0.390
California	495	380	+30	0.395	545	−9	0.700
Michigan	135	202	−33	0.020	613	−78	<0.001
Oregon	198	345	−43	0.009	266	−26	0.003
Washington	205	220	−7	0.562	197	+4	0.626
Wisconsin	505	647	−22	0.031	448	+13	0.172

[a] Includes 10 species in Appendix B.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, 1955–2022; years for other regions vary (see Appendix B.2)

timates for 10 principal duck species for the traditional survey area are provided in this report (Tables 3–12, Figure 4, Appendix B.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 6.1 ± 0.2 million, which was 18% below the 2022 estimate of 7.4 ± 0.2 million and 23% below the long-term average of 7.9 ± 0.3 million (Table 3). In the eastern Dakotas, the mallard estimate was 1.0 ± 0.07 million, which was 36% below the 2022 estimate of 1.5 ± 0.1 million and 13% below the long-term average (1.1 ± 0.01 million). The mallard estimate in southern Alberta (0.7 ± 0.06 million) was similar to the 2022 estimate and 32% below the long-term average of 1.1 ± 0.1 million. In the central and northern Alberta–northeastern British Columbia–Northwest Territories region, the mallard estimate was 1.1 ± 0.1 million, which was similar to the 2022 estimate and the long-term average. The estimated abundance of mallards in the Montana–western Dakotas survey area (0.5 ± 0.04 million) was similar to their 2022 estimate and the long-term average. In the northern Saskatchewan–northern Manitoba–western Ontario survey area, the mallard estimate (0.9 ± 0.1 million) was similar to their 2022 estimates and 19% below the long-term average of 1.1 ± 0.02 million. In the southern Manitoba survey area, the estimate of mallards (0.3 ± 0.02 million) was 50% below the 2022 estimate (0.5 ± 0.05 million) and 36% below the long-term average of 0.4 ± 0.05 million. Mallard numbers in southern Saskatchewan were similar

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

Region	2023	2022	Change from 2022 %	Change from 2022 P	LTA[a]	Change from LTA %	Change from LTA P
Alaska Yukon Territory–Old Crow Flats	381	614	−38	0.004	390	−2	0.831
C. & N. Alberta–N. E. British Columbia–NWT	1,063	1,219	−13	0.308	1,159	−8	0.371
N. Saskatchewan–N. Manitoba–W. Ontario	929	1,088	−15	0.346	1,148	−19	0.041
S. Alberta	740	687	+8	0.542	1,090	−32	<0.001
S. Saskatchewan	1,266	1,294	−2	0.812	2,099	−40	<0.001
S. Manitoba	256	513	−50	<0.001	399	−36	<0.001
Montana & Western Dakotas	530	514	+3	0.764	536	−1	0.892
Eastern Dakotas	965	1,504	−36	<0.001	1,113	−13	0.049
Total	6,129	7,434	−18	<0.001	7,934	−23	<0.001
Other regions							
British Columbia	71	81	−13	0.230	80	−11	0.156
California	202	179	+13	0.578	329	−39	<0.001
Michigan	82	139	−41	0.004	328	−75	<0.001
Minnesota	222	231	−4	0.887	230	−4	0.869
Oregon	69	79	−14	0.332	90	−23	0.003
Washington	102	87	+17	0.256	91	+12	0.320
Wisconsin	167	186	−10	0.523	182	−9	0.474

[a] Long-term average, 1955–2022

to the 2022 estimate and 40% below the long-term average (2.1 ± 0.2 million). In the Alaska–Yukon Territory–Old Crow Flats survey area, the mallard estimate of 0.4 ± 0.04 million was 38% below the 2022 estimate and similar to the long-term average.

The estimated abundance of mallards in eastern North America was 1.2 ± 0.15 million, which was similar to the 2022 estimate and the long-term average (Table 13). Estimates of mallards from the AFBWS have been integrated into the estimate of mallards for eastern North America since 2018, and are no longer reported separately. Mallard abundances with estimates of precision are also available for other areas where surveys are conducted (British Columbia, California, Michigan, Minnesota, Oregon, Washington, and Wisconsin; Table 3). In Washington, Minnesota, Wisconsin, and British Columbia, estimates of mallards were similar to their 2022 estimates and their respective long-term averages. The California and Oregon mallard estimates were similar to the 2022 estimate and 39% and 23% below their long-term averages (California: 1992–2022, Oregon: 1994–2022). In Michigan, the 2023 mallard estimate was 41% below the 2022 estimate and 75% below the long-term average (1991–2022). Mallard estimates are generally provided for Nevada, however, logistical constraints prevented a survey estimates from being reported.

In the traditional survey area the 2023 estimate for blue-winged teal (5.3 ± 0.3 million) was 19% below the 2022 estimate of 6.5 ± 0.3 million and similar to the long-term average of 5.1 ± 0.04 million (Table 7). Estimated abundance of gadwall (2.6 ± 0.1 million) was similar to the 2022 estimate and 25% above the long-term average of 2.1 ± 0.02 million (Table 4). The 2023 estimates of green-winged teal, northern shoveler, and canvasbacks were 2.5 ± 0.3 million, 2.9 ± 0.2 million, and 0.6 ± 0.06 million, respectively (Tables 6, 8, and 11). All were similar to their 2022 estimates and their long-term averages. Estimated abundance of redheads (0.9 ± 0.08 million) was similar to the 2022 estimate and 27% above the long-term average of 0.7 ± 0.01 million (Table 10). The Northern pintail estimate was 2.2 ± 0.1 million, which was 24% above the 2022 estimate of 1.8 ± 0.2 million and 43% below the long-term average of 3.9 ± 0.03 million (Table 9). The abundance estimate for American wigeon (1.9 ± 0.2 million) was similar to the 2022 estimate and 28% below the long-term average of 2.6 ± 0.02 million (Table 5). The combined estimate of lesser and greater scaup (3.5 ± 0.2 million) was similar to the 2022 estimate and 29% lower than the long-term average of 5.0 ± 0.4 million (Table 12).

In the eastern survey area, the estimate of goldeneyes was 0.8 ± 0.2 million, which was 28% above the 2022 estimate and 28% above the long-term average. Ring-necked ducks (0.7 ± 0.1 million) and green-winged teal (0.4 ± 0.1 million) were similar to their 2022 estimates and the long-term averages. The estimate of mergansers was 0.9 ± 0.1 million, which was similar to the 2022 estimate and 24% above the long-term average (Table 13, Figure 5, Appendix B.5). The 2023 estimate of American black ducks in the eastern survey area was 0.7 ± 0.07 million, which was unchanged from the 2022 estimate and the long-term average. The black duck estimate at the plot survey scale, which is used for management, was 0.5 ± 0.04 million. 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. For the northeastern states the estimate of black ducks was 21,500, which was 59% below the 2022 estimate and 62% below the long-term (1993–2022) average of 56,600. These northeastern state estimates for American black ducks are not explicitly integrated with the eastern survey area as is done for mallards.

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. Hostetler, 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 (lower, upper credible interval in parentheses following trend estimates) presented in this report. In the Atlantic and Mississippi flyways combined, the BBS wood duck index increased by an average of 0.94% per year (0.53%, 1.33%) over the entire survey period (1966–2022), 0.31% (−0.42%, 1.08%) over the past 20 years (2003–2022), and 0.56% (−0.81%, 2.01%) over the most recent (2013–2022) 10-year period. The Atlantic Flyway wood duck index increased 0.68% (0.11%, 1.22%) annually over the entire time series (1966–2022), 0.51% (−0.46%, 1.56%) over the past 20 years (2003–2022), and 0.47% (−1.36%, 2.38%) from 2013 to 2022. In the Mississippi Flyway, the corresponding BBS wood duck indices increased by 1.09% (0.56%, 1.60%, 1966–2022), 0.21% (−0.74%, 1.21%, 2002–2022), and 0.58% (−1.20%, 2.48%, 2013–2022; J. Hostetler, U.S. Geological Survey Biological Resources Division, unpublished data). A model-based estimate of wood duck populations using data from the Atlantic Flyway which incorporates the Atlantic Flyway Breeding Waterfowl Survey data for the northeast states from New Hampshire south to Virginia with the Breeding Bird Survey. The 2023 estimate of wood ducks in the Atlantic Flyway was 1.0 ± 0.1 million which was similar to the long-term average of 0.9 ± 0.6 million.

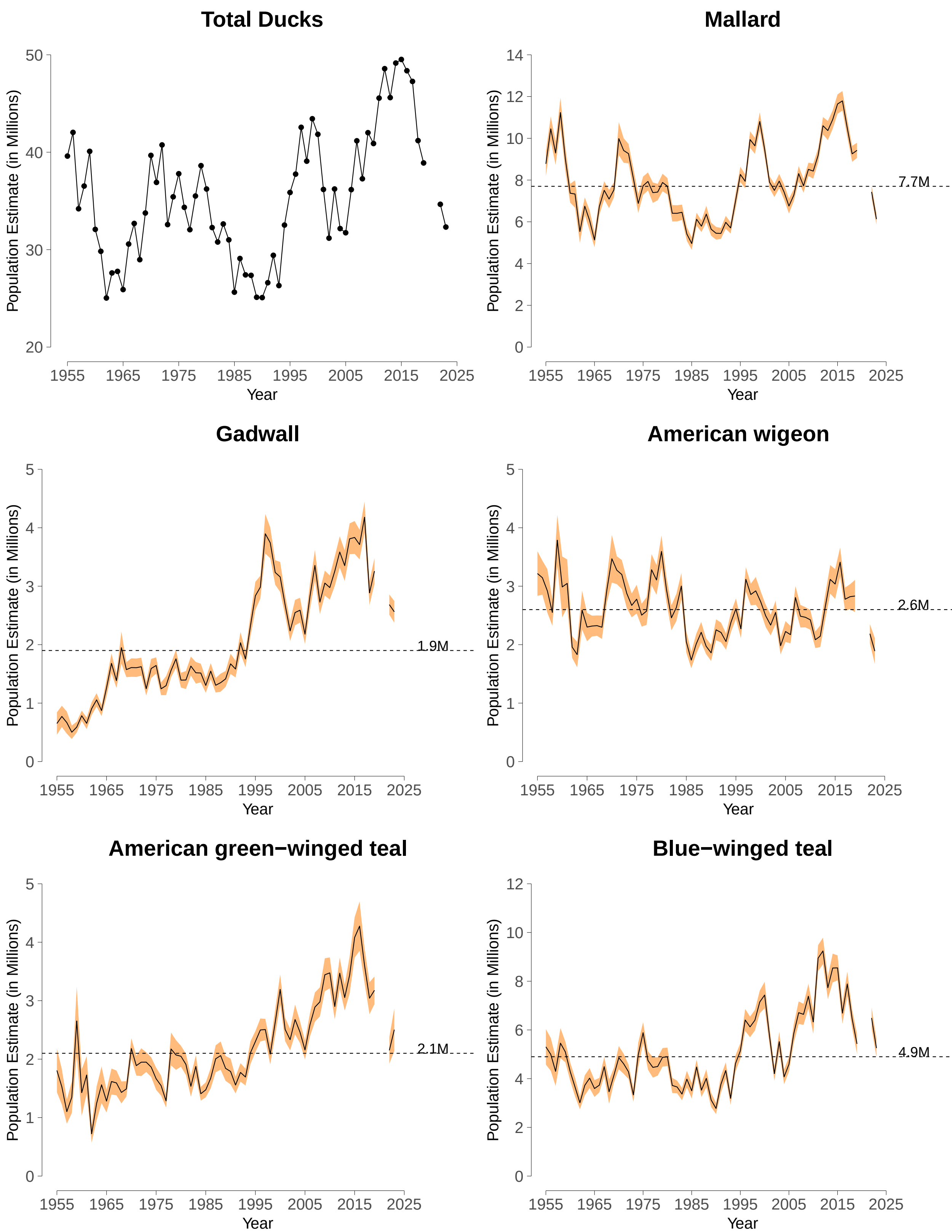

Figure 4. Breeding population estimates, 90% confidence intervals, and North American Waterfowl Management Plan population goals (dashed line; North American Waterfowl Management Plan Committee 2014) for selected species in the traditional survey area (strata 1–18, 20–50, 75–77).

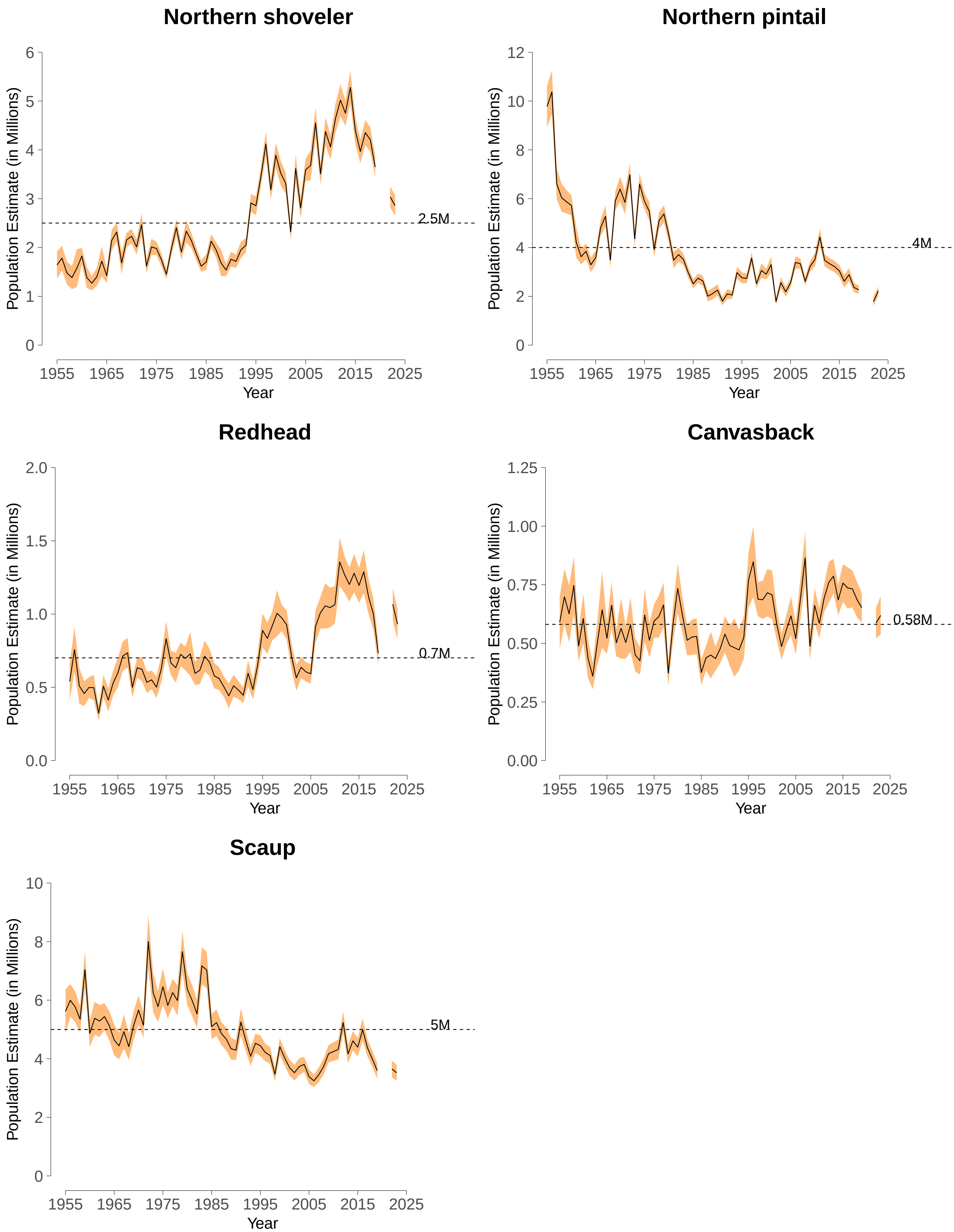

Figure 4. Continued.

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

			Change from 2022			Change from LTA	
Region	2023	2022	%	*P*	LTA[a]	%	*P*
Alaska Yukon Territory– Old Crow Flats	0	17	−100	0.004	2	−100	<0.001
C. & N. Alberta–N. E. British Columbia–NWT	61	101	−40	0.190	52	+17	0.634
N. Saskatchewan– N. Manitoba–W. Ontario	18	11	+69	0.600	25	−26	0.626
S. Alberta	442	429	+3	0.891	346	+28	0.153
S. Saskatchewan	967	856	+13	0.345	703	+38	0.007
S. Manitoba	109	145	−25	0.179	82	+34	0.195
Montana & Western Dakotas	278	220	+27	0.245	228	+22	0.178
Eastern Dakotas	687	906	−24	0.056	620	+11	0.339
Total	2,562	2,685	−5	0.536	2,058	+25	<0.001

[a] Long-term average, 1955–2022

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

			Change from 2022			Change from LTA	
Region	2023	2022	%	*P*	LTA[a]	%	*P*
Alaska Yukon Territory– Old Crow Flats	111	734	−85	<0.001	561	−80	<0.001
C. & N. Alberta–N. E. British Columbia–NWT	1,029	740	+39	0.127	947	+9	0.614
N. Saskatchewan– N. Manitoba–W. Ontario	251	205	+23	0.399	223	+13	0.469
S. Alberta	156	164	−5	0.778	275	−43	<0.001
S. Saskatchewan	112	139	−20	0.298	389	−71	<0.001
S. Manitoba	6	13	−52	0.073	50	−87	<0.001
Montana & Western Dakotas	117	100	+18	0.614	112	+5	0.768
Eastern Dakotas	107	92	+17	0.596	63	+71	0.043
Total	1,890	2,187	−14	0.169	2,619	−28	<0.001

[a] Long-term average, 1955–2022

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

Region	2023	2022	Change from 2022 %	Change from 2022 P	LTA[a]	Change from LTA %	Change from LTA P
Alaska Yukon Territory–Old Crow Flats	126	331	−62	<0.001	417	−70	<0.001
C. & N. Alberta–N. E. British Columbia–NWT	1,583	1,075	+47	0.112	914	+73	0.016
N. Saskatchewan–N. Manitoba–W. Ontario	276	213	+30	0.177	200	+38	0.035
S. Alberta	165	156	+6	0.874	207	−20	0.206
S. Saskatchewan	187	234	−20	0.210	279	−33	<0.001
S. Manitoba	31	41	−25	0.226	57	−46	<0.001
Montana & Western Dakotas	72	63	+14	0.696	41	+74	0.051
Eastern Dakotas	64	38	+70	0.113	64	+1	0.965
Total	2,504	2,151	+16	0.292	2,179	+15	0.254

[a] Long-term average, 1955–2022

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

Region	2023	2022	Change from 2022 %	Change from 2022 P	LTA[a]	Change from LTA %	Change from LTA P
Alaska Yukon Territory–Old Crow Flats	0	11	−100	0.287	1	−100	<0.001
C. & N. Alberta–N. E. British Columbia–NWT	572	670	−15	0.561	298	+92	0.034
N. Saskatchewan–N. Manitoba–W. Ontario	61	75	−18	0.617	220	−72	<0.001
S. Alberta	451	454	−1	0.974	649	−31	0.007
S. Saskatchewan	1,405	1,214	+16	0.329	1,446	−3	0.796
S. Manitoba	204	353	−42	<0.001	371	−45	<0.001
Montana & Western Dakotas	551	440	+25	0.409	314	+75	0.002
Eastern Dakotas	2,009	3,273	−39	<0.001	1,827	+10	0.334
Total	5,253	6,491	−19	0.006	5,128	+2	0.676

[a] Long-term average, 1955–2022

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

			Change from 2022			Change from LTA	
Region	2023	2022	%	P	LTA[a]	%	P
Alaska Yukon Territory–Old Crow Flats	128	374	−66	<0.001	301	−58	<0.001
C. & N. Alberta–N. E. British Columbia–NWT	420	410	+2	0.943	249	+69	0.045
N. Saskatchewan–N. Manitoba–W. Ontario	33	15	+122	0.170	38	−11	0.727
S. Alberta	299	326	−8	0.655	447	−33	0.002
S. Saskatchewan	924	741	+25	0.139	802	+15	0.217
S. Manitoba	83	148	−44	0.001	113	−26	0.012
Montana & Western Dakotas	282	231	+22	0.351	179	+57	0.009
Eastern Dakotas	689	792	−13	0.360	514	+34	0.028
Total	2,859	3,036	−6	0.450	2,644	+8	0.197

[a] Long-term average, 1955–2022

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

			Change from 2022			Change from LTA	
Region	2023	2022	%	P	LTA[a]	%	P
Alaska Yukon Territory–Old Crow Flats	546	786	−31	0.136	906	−40	<0.001
C. & N. Alberta–N. E. British Columbia–NWT	390	297	+31	0.243	375	+4	0.829
N. Saskatchewan–N. Manitoba–W. Ontario	8	14	−47	0.334	35	−78	<0.001
S. Alberta	152	68	+126	0.003	629	−76	<0.001
S. Saskatchewan	286	94	+203	<0.001	1,071	−73	<0.001
S. Manitoba	11	17	−37	0.102	93	−88	<0.001
Montana & Western Dakotas	183	89	+106	0.009	253	−28	0.026
Eastern Dakotas	643	418	+54	0.011	505	+27	0.075
Total	2,219	1,784	+24	0.039	3,866	−43	<0.001

[a] Long-term average, 1955–2022

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

			Change from 2022			Change from LTA	
Region	2023	2022	%	P	LTA[a]	%	P
Alaska Yukon Territory–Old Crow Flats	0	9	−100	0.024	1	−100	<0.001
C. & N. Alberta–N. E. British Columbia–NWT	40	84	−53	0.144	42	−6	0.840
N. Saskatchewan–N. Manitoba–W. Ontario	4	12	−67	0.075	24	−84	<0.001
S. Alberta	155	134	+16	0.655	133	+16	0.501
S. Saskatchewan	295	263	+12	0.563	240	+23	0.233
S. Manitoba	130	114	+13	0.777	77	+69	0.212
Montana & Western Dakotas	35	27	+27	0.700	12	+200	0.018
Eastern Dakotas	272	423	−36	0.026	205	+33	0.066
Total	931	1,067	−13	0.252	734	+27	0.015

[a] Long-term average, 1955–2022

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

			Change from 2022			Change from LTA	
Region	2023	2022	%	P	LTA[a]	%	P
Alaska Yukon Territory–Old Crow Flats	56	32	+76	0.245	83	−33	0.114
C. & N. Alberta–N. E. British Columbia–NWT	86	119	−28	0.317	79	+9	0.770
N. Saskatchewan–N. Manitoba–W. Ontario	19	22	−13	0.799	50	−62	<0.001
S. Alberta	60	71	−16	0.652	67	−12	0.620
S. Saskatchewan	243	193	+26	0.389	201	+21	0.396
S. Manitoba	82	83	0[b]	0.999	57	+44	0.182
Montana & Western Dakotas	16	13	+18	0.705	10	+54	0.235
Eastern Dakotas	58	55	+6	0.837	43	+34	0.207
Total	619	587	+6	0.688	591	+5	0.664

[a] Long-term average, 1955–2022
[b] Rounded values mask change in estimates

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

Region	2023	2022	Change from 2022 %	Change from 2022 P	LTA[a]	Change from LTA %	Change from LTA P
Alaska Yukon Territory–Old Crow Flats	477	678	−30	0.011	883	−46	<0.001
C. & N. Alberta–N. E. British Columbia–NWT	1,842	1,803	+2	0.883	2,491	−26	<0.001
N. Saskatchewan–N. Manitoba–W. Ontario	426	407	+5	0.811	530	−20	0.041
S. Alberta	291	283	+3	0.928	327	−11	0.517
S. Saskatchewan	238	275	−14	0.586	415	−43	<0.001
S. Manitoba	52	55	−7	0.808	123	−58	<0.001
Montana & Western Dakotas	58	25	+130	0.053	46	+26	0.454
Eastern Dakotas	136	128	+6	0.815	133	+2	0.935
Total	3,519	3,655	−4	0.659	4,948	−29	<0.001

[a] Long-term average, 1955–2022

Regional Habitat Conditions

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 the USFWS website (`https://www.fws.gov/library/collections/waterfowl-breeding-population-and-habitat-survey-field-reports`).

Southern Alberta (strata 26–29, 75–76)
reported by biologist-pilot Rob Spangler

Drought conditions have continued over nearly all of southern Alberta. Below- to well-below-average precipitation (less than 40% to 85%) had fallen from October 2022 through April 2023, except south and east of Lethbridge. Here, above- to well-above average (150–200%) fall and early winter precipitation greatly improved wetland conditions. This contrasts with 2022 when this area received less than 40% of normal precipitation. Conditions were drier moving north and east of Calgary where precipitation was below normal (60–80%). It was even drier near Edmonton where well-below normal precipitation (40–60%) was recorded. The areas to the east towards the Saskatchewan border were the driest with the poorest habitat conditions. The number of wetlands counted in the Greenglade area near Wainright were the lowest observed since 2010. Precipitation and habitat conditions improved somewhat moving north towards Cold Lake and Grand Prairie but the area was still abnormally dry. Except for a small area south and east of Lethbridge with good habitat conditions, Alberta wetland habitat was considered mostly fair with poor habitat found in the east-central portion of the province.

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

Southern Saskatchewan had a mix of wetland conditions compared to 2022. Habitat improved in the southeast but deteriorated in the central and western grasslands as well as the Parklands. Below-average precipitation (60–85%), with even some well-below-average pockets (40–60%), was recorded from September 2022 through April 2023. Fall started with above-

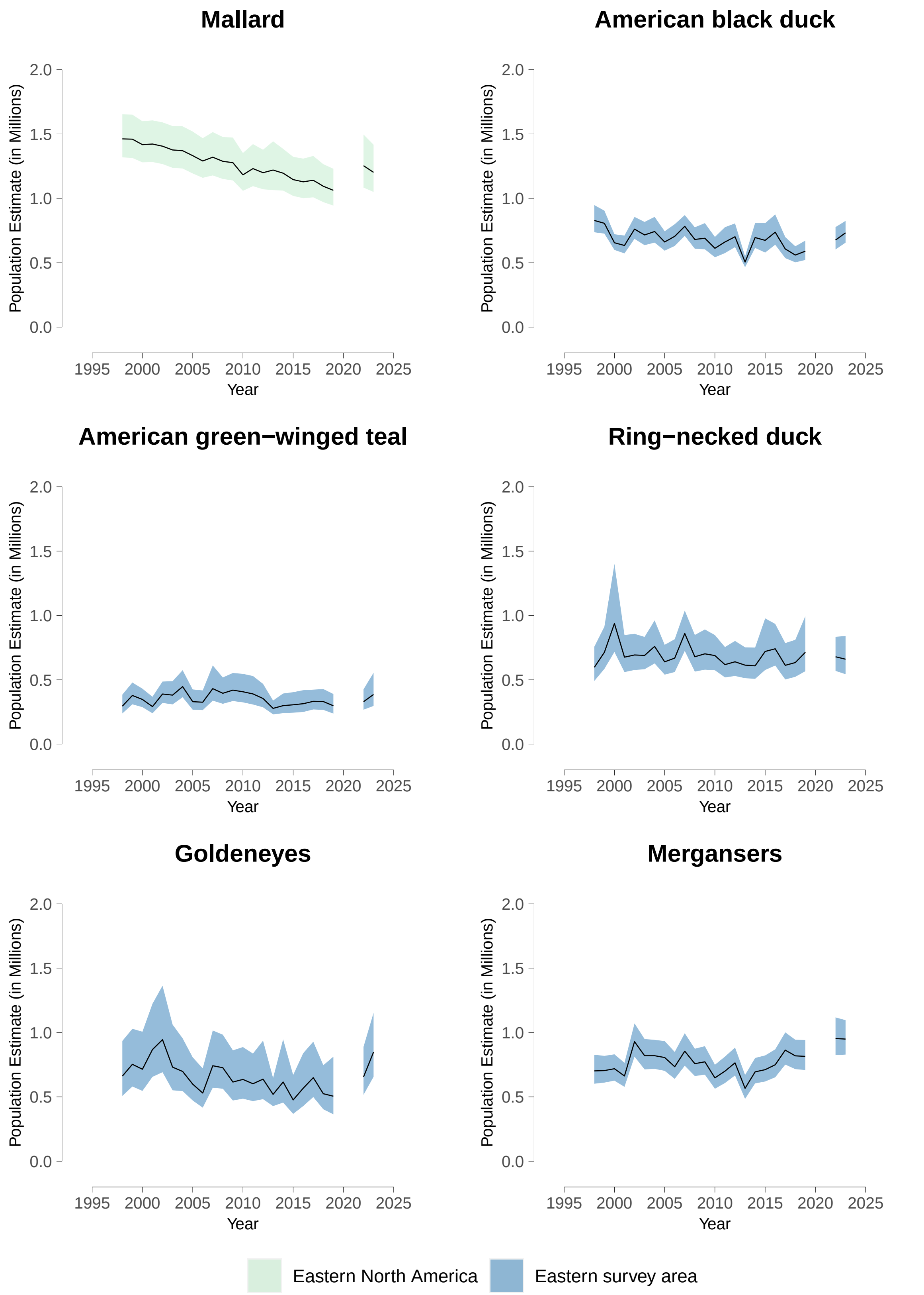

Figure 5. Breeding population estimates and 90% credible intervals from Bayesian hierarchical models for species in the eastern survey area. Time series are presented for two spatial scales: eastern survey area (Blue; strata 51–53, 56, 62–72 for black ducks, green-winged teal, ring-necked ducks, goldeneye, and mergansers) and eastern North America (Light green; eastern survey area plus the northeastern states from Virginia north to New Hampshire for mallards).

Table 13. Duck breeding population estimates (in thousands) for the six most abundant species in the eastern survey area. Estimates for black ducks, green-winged teal, ring-necked ducks, goldeneye, and mergansers are at the eastern survey scale (strata 51–53, 56, 62–72) and mallards at the eastern North America scale (eastern survey area plus Virginia north to New Hampshire).

	2023	2022	% Change from 2022	Average[a]	% Change from average
Mallard	1,202	1,254	−4	1,273	−6
American black duck	732	676	+8	682	+6
American green-winged teal	386	330	+17	351	+9
Ring-necked duck	660	679	−3	691	−5
Goldeneye (common and Barrows's)	848	655	+28[b]	651	+28[b]
Merganser (common, red-breasted, and hooded)	949	954	−1	764	+24[b]

[a] Average for 1990–2022.
[b] Indicates significant change. Significance ($P \leq 0.10$) determined by non-overlap of Bayesian credibility intervals.

average temperatures (2 to 4°C) in October 2022 but were below average (−2 to greater than −5°C) in November and December 2022. January 2023 had well-above-average temperatures (2 to 4°C) whereas February through spring were below to well-below average (−2 to greater than −5°C). Some spring precipitation helped existing wetlands but were not enough to recharge dry wetlands, especially in the western grasslands. Areas of good waterfowl habitat were observed in the extreme southwest, the Regina Plain, and southeast of Regina. The late-April rain and snow will likely benefit northern pintails with water that should last until broods have fledged. The Parklands were drier than 2022. The northeastern part was still rated fair to good but the northwestern area, which received only 40–60% of normal precipitation, was considered poor. Poor waterfowl recruitment also was predicted over most of the central and western grasslands where no ephemeral or temporary ponds were observed, and seasonal and semi-permanent wetlands were significantly lower. Above-average temperatures (3 to 5°C) in late May across the province will not be helpful to preserving grassland brood habitats.

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

Southern Manitoba and southeastern Saskatchewan have experienced abnormally dry conditions. Below-average precipitation (40–85%) fell from September 2022 through April 2023. Fall and winter temperatures were slightly below-average (−2 to 0°C), with only January 2023 slightly above-average (0–2°C). Below- (40–65%) to well-below-average (<40%) fall and winter precipitation was recorded but some small areas of Saskatchewan had average precipitation. Spring temperatures were well-below average (−4 to greater than −6°C) across the crew area. Southern Manitoba remained dry (40–85%) through April 2023 whereas southeastern Saskatchewan had average to above-average precipitation (85–200%), mostly from snow. Despite mainly dry conditions since 2022, semi-permanent wetlands still had water and the majority of dugouts contained water but there was a lack of seasonal wetlands and sheetwater and ditches were dry. Strata 36 and 37 in northern portion of the crew area were very dry and rated as fair. Stratum 38 and the Red River Valley, which recorded flooding in 2022, was dry and again rated as poor due to intensive agricultural activities. Dry conditions in Strata 39 and 40 allowed earlier agricultural activity;

however, abundant semi-permanent wetlands should lead to good waterfowl production with some pockets of fair conditions. Southeastern Saskatchewan (Strata 34 and 35) received more precipitation than elsewhere and was rated as good over a much larger area. Conditions were drier overall than the deluge experience in 2022 but most basins continue to hold water. Stalled fronts and resulting precipitation during the survey should help to improve later-breeding waterfowl efforts.

Montana and western Dakotas (strata 41–44)
reported by biologist-pilots Terry Liddick, Rob Spangler, and Phil Thorpe

Most of Montana north of the Missouri River (stratum 41) received above-average precipitation since fall 2022. Although September was dry, a steady procession of storms began in October that resulted in average to above-average precipitation (100–300%) by the end of December. Dry conditions returned in January but the precipitation increased again in February with many areas receiving 100–200% of normal precipitation. Generally, spring precipitation was normal to above normal throughout the stratum. The above-average precipitation had drastically improved wetland conditions. Good waterfowl production was expected in stratum 41, except in the vicinity of Havre where production was rated as excellent due to numerous full permanent and seasonal wetlands.

Average to above-average precipitation fell across stratum 42 during fall and winter 2022–23. Late spring rain and snow expanded the area of above-average precipitation in the northeast portion of the stratum, and improved habitat conditions for early-nesting species. Overall, most of the central and southeast portion of the stratum was rated as fair whereas a few locations in the south, northeast, and west were rated as good.

Western portions of the Dakotas (strata 43 and 44) remained in drought status. Habitat conditions improved substantially with winter snow and upwards of 8 inches of rain during early May. While conditions were not as good west of the Missouri River as to the east, wetland conditions have improved. Good production was predicted in the strata.

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

Habitat conditions in the eastern Dakotas crew area once again improved from south to north. Although much of the two-state region had drought conditions in recent years and drier areas remained. However, abundant precipitation continued to improve habitats. South Dakota improved in early spring 2022 but below-average moisture fell from June to December 2022. Well-above-average snowfall and below-average winter temperatures across the state benefitted conditions. Even with below-average spring precipitation and temperatures, nearly all wetland basins were full, especially north of Huron. North Dakota has drastically improved. The state experienced well-above-average snowfall, with central and southeastern regions having record amounts. Above-average May rain in central and northwest North Dakota further recharged wetlands. Nearly all basins east of the Missouri Coteau and south of Devil's Lake were full as was the coteau itself. The drift plain region significantly improved as well but vacant habitats were observed. North and northeast of Devil's Lake remained dry due to drainage activity. Seasonal wetlands in both states had been plowed during the drought and only now were starting to recover with more moisture.

In strata 48 and 49 in South Dakota, conditions were good west of the James River and fair to poor to the east. Most wetlands were >50% full in stratum 48 and all streams and rivers were flowing, with some flooding in portions of the James, Vermillion, and Big Sioux rivers. Wetland conditions were dry south of Mitchell, improved north around Huron, and were excellent in the Aberdeen area. Production should be average to slightly above average in South Dakota.

Conditions were considerably better northward in strata 45 and 46 in North Dakota, with most of the state rated as good or excellent. Permanent and semi-permanent wetlands were 70–100% full, and the drift plain region was as good as it's been in recent years. The upper

James and Red rivers were flooding, and the western stretch of Lake Sakakawea had higher levels but exposed beaches remained. Stratum 47 remained poor as expected.

Overall, the eastern Dakotas crew area was rated good to excellent. The coteau regions of both states were rated as good and should produce average numbers of waterfowl. South Dakota was fair south of Interstate 90, fair from Interstate 90 north to Huron, and good to excellent from Huron to the North Dakota border. North Dakota continued to improve, and should have good to excellent production.

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

Northern Saskatchewan and northern Manitoba (strata 21–25) generally experienced varied temperatures and below-average precipitation amounts since September 2022. Temperatures were above average (0–3°C) in September and October 2022, average in November, average to below average (–5 to 0°C) in December and moderated in January 2023 to well-above average (>5°C). February and March had well-below-average temperatures (–2 to –5°C), with April being average before well-above-average temperatures (>5°C) returned in May. The crew area generally received below-average precipitation in Saskatchewan and average to well-above average in Manitoba. The overall higher spring temperatures, especially in May, led to an extremely early spring. No ice was observed on larger water bodies, such as Lake Athabasca and Reindeer Lake, and fewer snow geese were seen staging in the Parklands. The warm, dry conditions in Saskatchewan led to a massive outbreak of wildfires right at the start of the survey. Manitoba was spared due to wetter conditions. Boreal and Parkland wetlands were lower but an early spring with no flooding possible will lead to good conditions outside of areas impacted by wildfires.

Western Ontario (stratum 50) had average temperatures and below-average snowfall (40–85%). Spring arrived late along a broad swath from Lake Superior to James Bay, with many lakes remaining frozen until the third week of May. While habitat was judged good to excellent just north of Lake Superior, dry conditions were evident in western Ontario along the border with Manitoba.

Central and northern Alberta, northeastern British Columbia, and Northwest Territories (strata 13–18, 20, 77)
reported by biologist-pilot Garrett Wilkerson

Northern Alberta, northeastern British Columbia and southern Northwest Territories had varied temperatures and precipitation since fall 2022. Following an extremely warm (3 to 5°C) and dry (<60%) October 2022, November had average temperatures but remained dry. December was cold (–3 to –5°C) with average to above-average precipitation (85–200%). January 2023 moderated to well-above-average temperatures (greater than 5°C) with average precipitation but another cold spell similar to December hit in February. Spring precipitation was well-below average (<60%) and well-above-average temperatures (8–16°C) in May led to earlier ice breakup and widespread massive wildfires. Many seasonal wetlands were dry and most semi-permanent wetlands were low, with conditions rated as poor to fair in strata 16, 17, and 77. The Peace-Athabasca Delta (stratum 20) and Canadian shield portion of the stratum had more normal temperatures and precipitation compared to last year. With seasonal wetlands full and little flooding, habitat conditions were considered good. Northern strata (13–15) had mainly average temperatures since last fall until the spring heat dome that led to just a slightly earlier ice out. There was no flooding in the Mackenzie River Delta like in 2022 and waterfowl production was expected to be good to excellent.

Alaska, Yukon Territory, and Old Crow Flats (strata 1–12)
reported by biologist-pilots Heather Wilson and Tamara Zeller

Alaska experienced a late spring in 2023. Above-average winter precipitation, combined with below-average spring temperatures, led to a late snowmelt and ice breakup across the state. Large waterbodies on the Seward Peninsula (stratum 10) remained 75–100% ice covered while other larger lakes elsewhere were ice covered but had open shorelines. An above-average snowpack and rapidly warm spring temperatures caused major flooding in Interior Alaska. Most affected areas were along the Yukon and Kuskokwim, rivers (strata 3–5, 9). Flooding was observed elsewhere as well. Western Alaska (strata 9, 10) experienced typhoon Merbok remnants that brought high winds, major flooding, and saltwater intrusion across a large swath of coastline. Waterfowl habitat and production impacts are unknown, especially in the Yukon-Kuskokwim Delta. Despite a delayed ice break-up and flooding continuing in some areas, waterfowl production was expected to be good.

Eastern survey area (strata 51–72)
reported by biologist-pilots Mark Koneff, John Rayfield, and Jim Wortham, and CWS personnel Christine LePage, Ted Barney, and Scott Gilliland

The Great Lakes remained largely open over winter whereby providing moisture for storms. Central and southern Ontario (strata 51 and 52) experienced average precipitation (85–115%) between 1 November 2022 and 31 March 2023 but the eastern shore of Lake Superior experienced well-above-average (150–200%) precipitation during December 2022. Average temperatures prevailed since fall 2022, except for January 2023 that was well-above average (4–5°C). Spring phenology was normal, wetlands were full to overflowing, Great Lakes shorelines were partially flooded, and major river systems were experiencing flood levels. No ice remained on large lakes, with the exception of high-elevation areas in the northwest. Habitat conditions were considered good to excellent.

Strata 53 and 56 conditions were similar. Wetlands were full and flooded fields from spring snowmelt persisted along the Saint Lawrence River. Both strata were rated as good.

Southern Quebec (strata 69, 71–72) also experienced average temperatures since October 2022, with December slightly warmer than other areas and January recording the same well-above-average temperatures (4–5°C). Winter precipitation was average. Spring precipitation was also average in the west but was well-below average (less than 40%) in Stratum 72, which resulted in extreme forest fires near the end of the survey. Waterfowl production was expected to be good to excellent due to early phenology and suitable wetland water levels but localized fair conditions are possible in areas that received less precipitation and experienced wildfires.

It was an early spring in northern Quebec (stratum 69). Below-average winter precipitation (60–85%) along James and Hudson bays left wetlands habitats insufficiently charged for some species. Waterfowl nesting habitat improved eastward towards Labrador but this area remains affected by previous hot wildfires. Northwestern Quebec was considered fair while the northeastern portion of the crew area was rated good, particularly for Canada geese and black ducks.

Average winter precipitation throughout the Maine and Atlantic Canada crew area helped maintain breeding-waterfowl habitat. Southern and coastal Maine, which received average spring precipitation, had excellent wetland conditions. Spring precipitation was well-below to below average (40–85%) across northern Maine, the Maritimes, especially in New Brunswick and Prince Edward Island, and north to Labrador and Newfoundland, resulting in drying wetlands. However, spring phenology was advanced, as much as three weeks in Labrador, and wetlands and lakes were largely ice free. Despite drier spring conditions, good waterfowl production was expected due to an early spring.

Other areas

Pacific Flyway breeding-waterfowl habitat conditions were generally good to excellent but northern regions were drier than areas to the south. Oregon snowpack was excellent, and depending on the watershed, peaked in April 2023 between 150–265% above normal. Western Oregon habitat conditions are less affected by snowpack but are typically correlated with low-elevation rain that charges Willamette Valley wetlands. Good habitat conditions were expected. The estimate of mallards in Oregon was similar to the 2022 estimate and 23% below the long-term average. No habitat conditions were reported from California, however, the estimate of mallards was similar to the 2022 estimate and 39% below the long-term average. Conditions across Washington were below normal but wetter than 2022. The driest regions, with 67–100% of the area classified as moderate drought to abnormally dry, were the Chehalis, northeast Highlands, and South Puget Lowlands strata. Only about a third of Hood Canal and North Puget Lowlands strata had a similar classification. The wettest regions were irrigated and potholes strata, with only 12% or less in those classifications. British Columbia experienced an early spring with wetter habitat conditions. Mallard estimates in British Columbia and Washington were similar to 2022 and the long-term average. The midwestern U.S. was generally wet with colder-than-normal spring temperatures across the northern regions. Minnesota recorded a late spring across the entire state and ice-out dates were 10–15 days later than median ice-out days on most lakes. Despite the late spring, wetland habitat conditions were favorable in May and early indications are that production (number of young birds hatched) will be good. Michigan habitat conditions remained excellent across most of the state. However little rainfall throughout June has resulted in moderate and severe drought conditions and dry wetland basins throughout much of the Lower Peninsula. The statewide wetland index declined 7% and 6% from the 2022 estimate and the long-term average. Great Lakes water levels remained above their long-term average and very near 2022 levels. Wisconsin experienced similar wet conditions as elsewhere in the Great Lakes. Wetland abundance declined slightly from 2022 across most of the state, but all remain above their long-term average. Excellent production was expected across most of the state.

Across the northeast U.S. the winter of 2023 had above average temperatures and was much drier than average. In New England spring began earlier than normal, but a cold spell in early May resulted in a hard frost in many inland areas. Many wetlands in New England started the year at low levels. Much of the mid-Atlantic received abundant precipitation starting the last week of April after the dry winter, while New England stayed dry through the survey period. Notable in southern New Jersey and surrounding areas were the driest encountered in April since the survey began 3 decades ago. A low-pressure system covered the east coast from April 30 to May 5 resulting in abundant rain, persistent winds, and exceptionally high tides, likely impacting waterfowl nesting effort in tidal areas.

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Status of Geese and Swans

This section summarizes information on the status 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 (*Branta canadensis*) 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 above 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 initiation is 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 common nomenclature for various goose and swan 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 31 July 2023 (88 FR 49310). 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 C.1, C.2, and C.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 Waterfowl Breeding Population and Habitat Survey (WBPHS), the Midwinter Survey (MWS), 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 logarithms 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 recently available and previous years 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, graphed, and included in appendices. Beginning in 2019, we only report the primary abundance indices for goose populations. Other survey information can be found in the Flyway Databooks at: `https://fws.gov/library/collections/migratory-bird-flyway-data-books`. Information was the best available at the time of finalizing this report but can differ from final estimates or observed conditions.

Results and Discussion

Conditions in the Arctic and Subarctic

In 2023, spring phenology was very early in the central Arctic, early or average in other areas of the Canadian Arctic and Subarctic, and later than average in Alaska. Many areas across the Arctic and Subarctic experienced above-average temperatures during May or June. The snow and ice cover graphics (Figure 7) illustrate that ice or

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

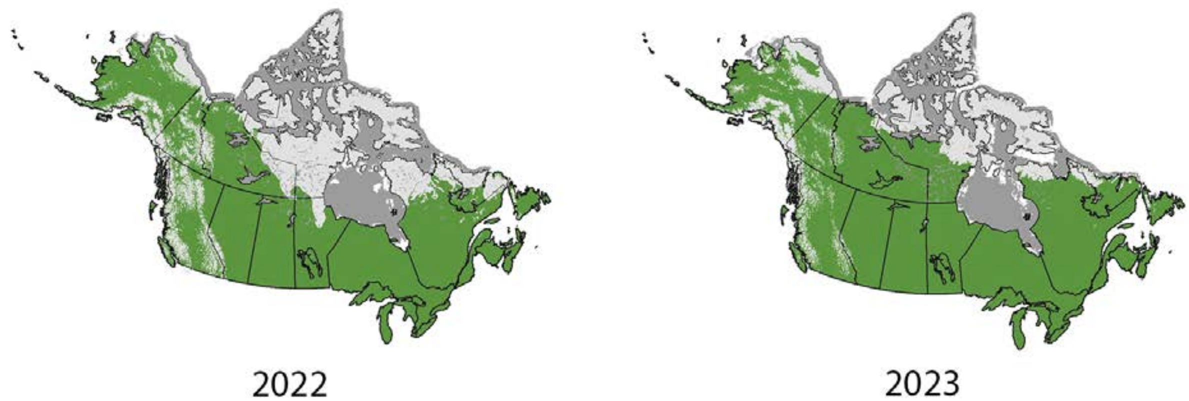

Figure 7. The extent of snow (light gray) and ice (dark gray) cover in North America on 2 June 2022 and 2 June 2023 (National Ice Center 2023).

snow cover on 2 June 2023 compared to the same date in 2022 was slightly more extensive in areas of Alaska but less less extensive in most areas of the Canadian Arctic and Subarctic (National Ice Center 2023).

Conditions in Southern Canada and the United States

Some drought conditions remained throughout portions of the Canadian prairie provinces and in the western, central, and midwestern portions of the United States, although habitat conditions in many western states were improved from 2022. Biologists noted late spring phenology or localized spring flooding events in some areas of the Pacific, Central, and Mississippi Flyways. Habitat conditions were variable in the Atlantic Flyway, with biologists noting early spring phenology in northern areas and some drought conditions and localized flooding.

Description of Populations and Primary Monitoring Surveys

Canada and Cackling Geese

See Figure 10, Table 14, and Appendices C.1.

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 Canada 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). The new composite time series is updated annually due to the estimation procedure. Estimates presented are mean and 2.5% and 97.5% Bayesian credible intervals.

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

Atlantic Flyway Resident Population (AFRP)

AFRP Canada geese were introduced and established throughout the Atlantic Flyway during the early 20^{th} century and are composed 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).

Southern Hudson Bay Population (SHBP)

SHBP Canada geese nest in the Hudson Bay Lowlands, on Akimiski Island, and along the eastern and southern portions of Hudson and James Bays, and they concentrate during fall and winter throughout Manitoba, Ontario, and the Mississippi Flyway states (Figure 8). SHBP Canada geese are comprised of the former Southern James Bay, Mississippi Valley, and Eastern Prairie Populations of Canada geese. In 2016 a new aerial survey was developed to monitor SHBP Canada geese along the south and west coastal areas of the Hudson and James Bays (Mississippi Flyway Council 2021*a*).

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 (Figure 8), and they now represent a large proportion of all Canada geese in the Mississippi Flyway. The total population is estimated during spring surveys within the Mississippi Flyway states and provinces (Mississippi Flyway Council 2021*a*).

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 Canada geese from other populations (Figure 8). The WBPHS (strata 21–25, 31, 34–40, 43–49) provides indices of this population within its primary breeding range.

Mid-continent Cackling Geese

Mid-continent cackling geese (*B. hutchinsii*) nest across the Canadian Arctic and winter throughout the Central and Mississippi Flyways (Figure 8). Lincoln estimates of the adult cohort are the primary management indices for this population. Lincoln estimates are derived from annual estimates of total harvest and harvest rate and represent an indirect measure of abundance. Due to the methodology, Lincoln estimates are typically not available from the most recent years. Alternative nomenclature, Central Flyway Arctic Nesting geese (Central and Mississippi Flyway Councils 2013), has also been used for this population.

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; (Central Flyway Council 2010).

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). A breeding index of RMP geese is based on WBPHS estimates from portions of strata 26–29 in Alberta and strata 41–42 in Montana (Pacific Flyway Council 2000*b*).

Pacific Population (PP)

PP Canada geese nest and winter west of the Rocky Mountains from northern Alberta and British Columbia to California (Figure 8). An index of breeding PP geese is based on WBPHS estimates from strata 76–77 in Alberta and the standardized surveys in British Columbia, Washington, Oregon, and California (Pacific Flyway Council 2000*a*).

Dusky Canada Geese

Dusky Canada geese nest on the Copper River Delta of south-central 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).

Cackling/minima Cackling Geese

Cackling/minima cackling 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*).

Lesser Canada Geese

Lesser Canada geese nest throughout interior and south-central Alaska and winter in Washington, Oregon, and California (Figure 8). Population indices 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).

Taverner's Cackling Geese

Taverner's cackling geese nest throughout tundra areas of the North Slope and western Alaska and winter in Washington, Oregon, and California (Figure 8). Population indices are derived from three breeding survey efforts: the Arctic Coastal Plain Survey, the YKD Coastal Zone Survey, and the WBPHS (stratum 9 [inland portions of the YKD], stratum 10 [Seward Peninsula], and stratum 11 [Kotzebue Sound]).

Aleutian Cackling Geese

Aleutian cackling geese nest primarily on the Aleutian Islands and winter along the Pacific Coast as far south as central California (Figure 8). The total population during the fall and winter is estimated from mark-resight observations of neck-banded geese (Pacific Flyway Council 2006*a*).

Light Geese

See Figure 11, Table 15, and Appendices C.2.

The term light geese collectively refers to Ross's geese (*Anser rossii*) and both the lesser (*A. caerulescens caerulescens*) and greater (*A. 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). 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 9). The management plan for Ross's geese was updated in 2021 (Mississippi Flyway Council 2021*b*), and Lincoln estimates of the adult cohort are now the primary management indices.

Mid-continent Population (MCP)

MCP lesser snow geese winter in the Central and Mississippi Flyways and nest primarily from Banks Island in the western Arctic to Baffin Island in the eastern Arctic (Figure 9). The management plan for MCP lesser snow geese was updated in 2018 and replaced prior management guidelines for MCP and Western Central Flyway Population (WCFP; wintering population) lesser snow geese (Mississippi Flyway Council 2018, Central Flyway Council 2018). Lincoln estimates of the adult cohort are now the primary management indices.

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. 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 and Washington and in northern and central California (Figure 9). Light geese in the Pacific Flyway (Pacific Flyway Population) are indexed by fall and winter surveys in California, Oregon, Washington and British Columbia. Breeding ground surveys are periodically conducted for WA (Pacific Flyway Council 2013) and WI lesser snow geese (Pacific Flyway Council 2006*b*).

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 9). This population is monitored on spring staging areas near the St. Lawrence Valley in Quebec by an annual aerial photographic survey (Atlantic Flyway Council 2009).

Greater White-fronted Geese

See Figure 12, Table 16, and Appendices C.3.

Pacific Population White-fronted Geese

Pacific Population white-fronted geese (*A. albifrons*) primarily nest on the YKD in Alaska and winter in the Central Valley of California (Figure 9). 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).

Mid-continent Population White-fronted Geese

Mid-continent Population white-fronted geese nest from central and northwestern Alaska to the west coast of Hudson Bay and the Melville Peninsula. 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 9). The management plan for this population was updated in 2023, and Lincoln estimates of the adult cohort are now the primary management indices (Central, Mississippi, and Pacific Flyway Councils 2023).

Brant

See Figure 12, Table 16, and Appendices C.3.

Atlantic Brant

Atlantic brant (*B. bernicla hrota*) primarily nest on islands in the eastern Canadian Arctic and winter along the Atlantic Coast from Massachusetts to North Carolina (Figure 9). The Midwinter Survey provides an index of this population within its winter range in the Atlantic Flyway (Atlantic Flyway Council 2002).

Pacific Brant

Pacific brant include black brant (*B. b. nigricans*) and western high arctic brant (*B. b. hrota*). Black brand nest across the YKD and North Slope in Alaska, 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. Western high arctic brant nest on the Parry Islands of the Northwest Territories and Nunavut. They stage during fall at Izembek Lagoon, Alaska, and predominantly winter in the Padilla, Samish, and Fidalgo Bays of Washington and near Boundary Bay, British Columbia, although some individuals have been observed as far south as Mexico (Figure 9). Fall and winter counts in the U.S., Canada, and Mexico are the primary management indices for PACB (Pacific Flyway Council 2018).

Emperor Geese

Emperor geese (*A. canagica*; Figure 12, Table 16, and Appendices C.3) 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 9). This population is monitored during spring by the YKD Coastal Zone Survey (Pacific Flyway Council 2016*b*).

Swans

See Figure 12, Table 16, and Appendices C.3.

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 (Figure 9). The management plan for Western Population tundra swans was updated in 2017, and the primary management indices are derived from the YKD Coastal Zone Survey and the WBPHS (stratum 8 [Bristol Bay], stratum 9 [inland portions of the YKD], stratum 10 [Seward Peninsula], and stratum 11 [Kotzebue Sound]; Pacific Flyway Council 2017).

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 9). 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).

Trumpeter Swans

Trumpeter swans (*C. buccinator*) nest south of the Brooks Range and east of the YKD in Alaska and within localized areas of Yukon Territory, western Northwest Territories, southern Canadian provinces 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 information can be found at: `https://www.fws.gov/species/trumpeter-swan-cygnus-buccinator`.

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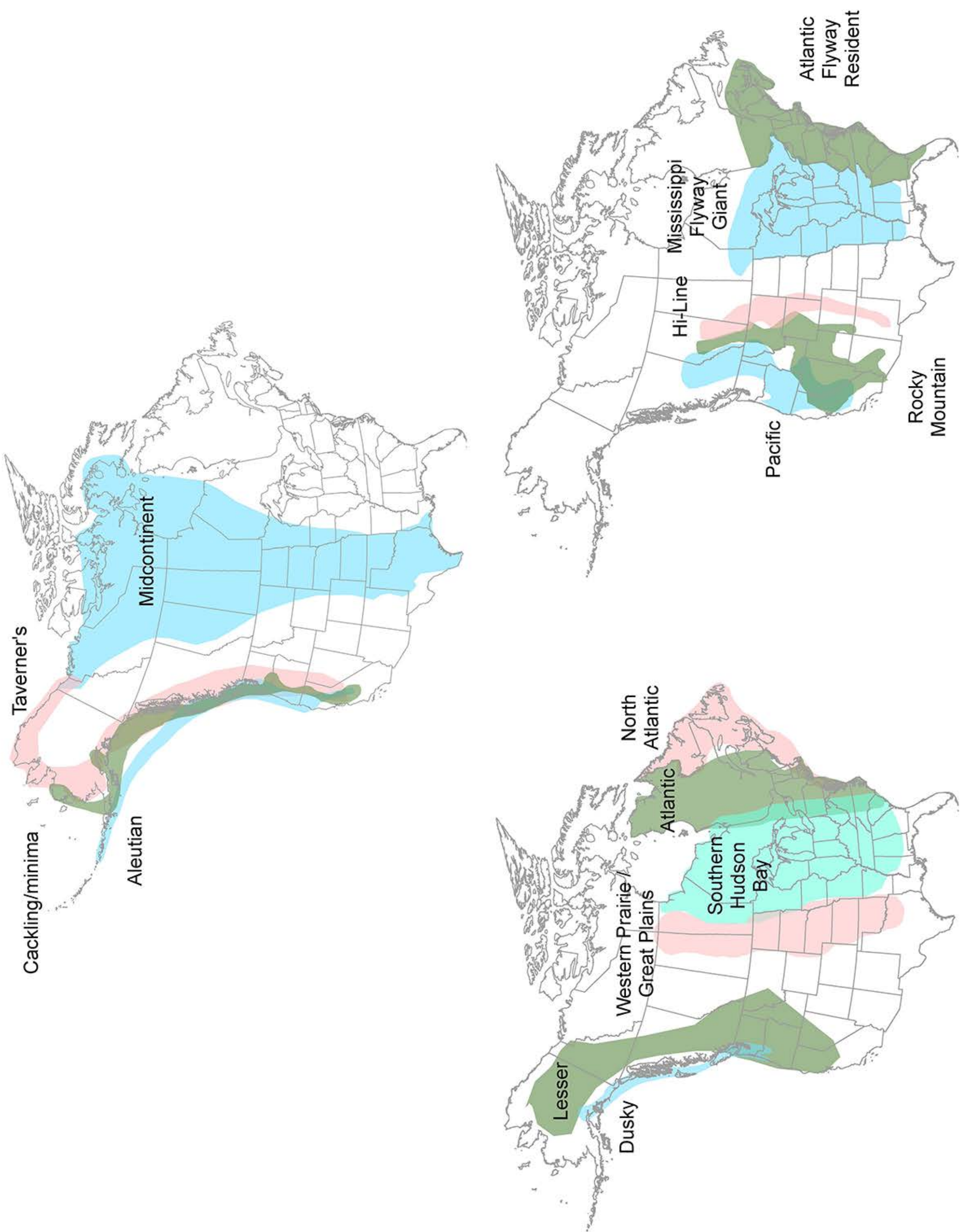

Figure 8. Approximate ranges of Canada and cackling goose populations in North America.

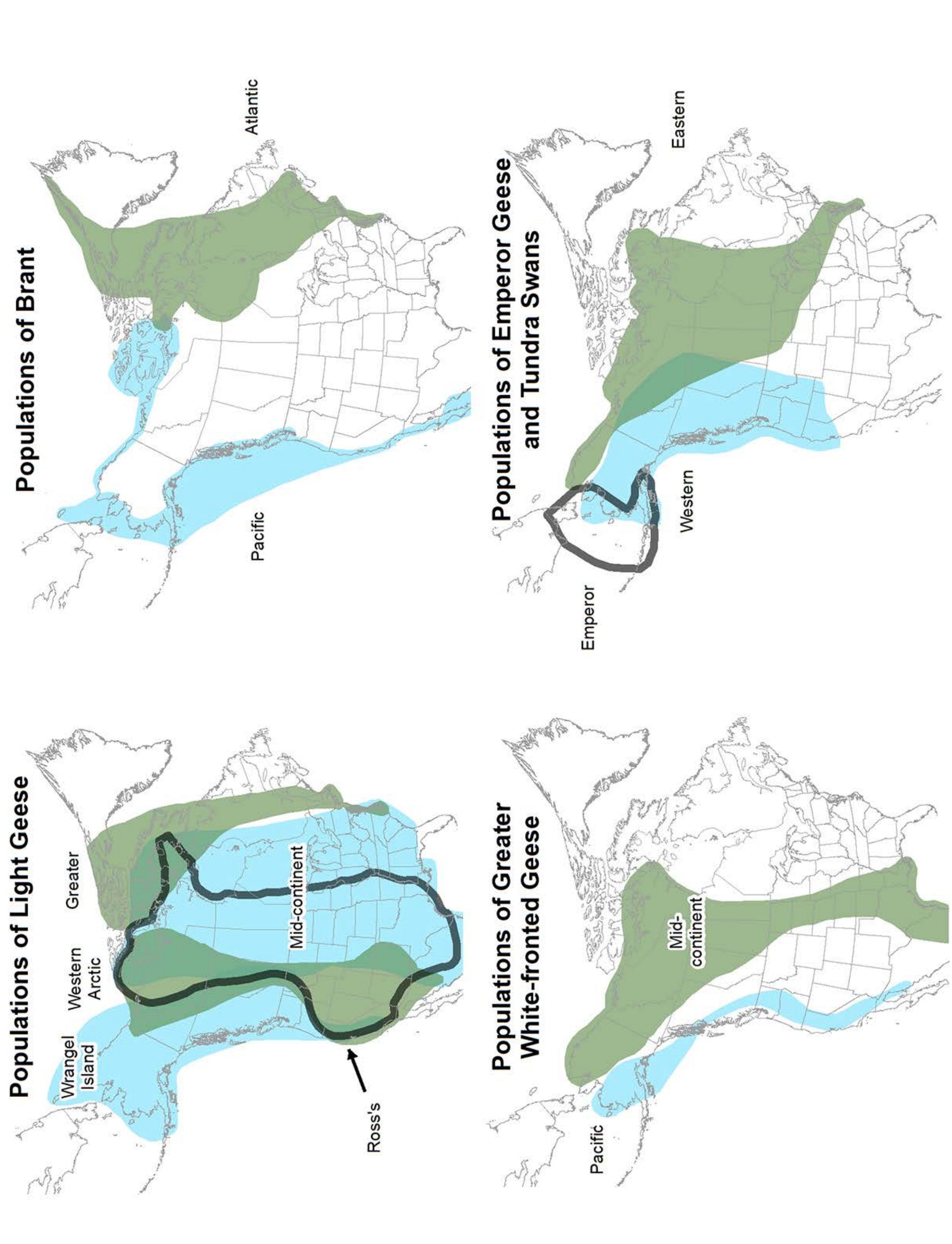

Figure 9. Approximate ranges of light goose, brant, greater white-fronted goose, emperor goose, and tundra swan populations in North America.

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

Population	Estimate/Count		Change from 2022		10-year Trend	
	2023	2022	%	*P*	%/yr[a]	*P*
North Atlantic	48	50	−4	0.860	−1	0.127
Atlantic	115	164	−30	0.019	−4	0.121
Atlantic Flyway Resident	948	1,019	−7	0.546	0	0.934
Southern Hudson Bay	–	113	–	–	–	–
Mississippi Flyway Giant	1,342	1,426	−6	–	0	0.625
Western Prairie and Great Plains	1,028	1,783	−42	<0.001	+1	0.800
Mid-continent[b]	–	–	–	–	–	–
Hi-Line	325	493	−34	0.011	+2	0.454
Rocky Mountain	184	245	−25	0.115	+4	0.250
Pacific	297	310	−4	0.792	+1	0.429
Dusky	10	13	−27	0.022	−4	0.079
Cackling/minima	161	238	−33	<0.001	−7	0.006
Lesser	–	5	–	–	–	–
Taverner's	30	46	−36	0.035	−3	0.188
Aleutian	212	219	−3	0.871	+2	0.387

[a] Rounded values mask change in estimates.
[b] Years presented refer to year – 2.

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

Population	Estimate/Count		Change from 2022		10-year Trend	
	2023	2022	%	*P*	%/yr	*P*
Ross's goose[a]	–	–	–	–	–	–
Mid-continent Population lesser snow goose[a]	–	–	–	–	–	–
Pacific Flyway Population light goose	1,270	–	–	–	0	0.950
Wrangel Island Population lesser snow goose	–	750	–	–	–	–
Greater snow goose	585	753	−22	<0.001	−3	0.054

[a] Years presented refer to year – 2.

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

	Estimate/Count		Change from 2022		10-year Trend	
Population	2023	2022	%	*P*	%/yr	*P*
White-fronted goose						
Pacific Population	422	664	−36	0.005	−4	0.089
Mid-continent Population[a]	3,139	–	–	–	−2	0.488
Brant						
Atlantic	122	109	+11	–	−2	0.412
Pacific	120	159	−24	–	−1	0.350
Emperor goose	24	29	−17	0.020	−3	0.028
Tundra swan						
Western	73	101	−28	0.045	−3	0.178
Eastern	138	96	+44	–	−1	0.598

[a] Years presented refer to year − 2.

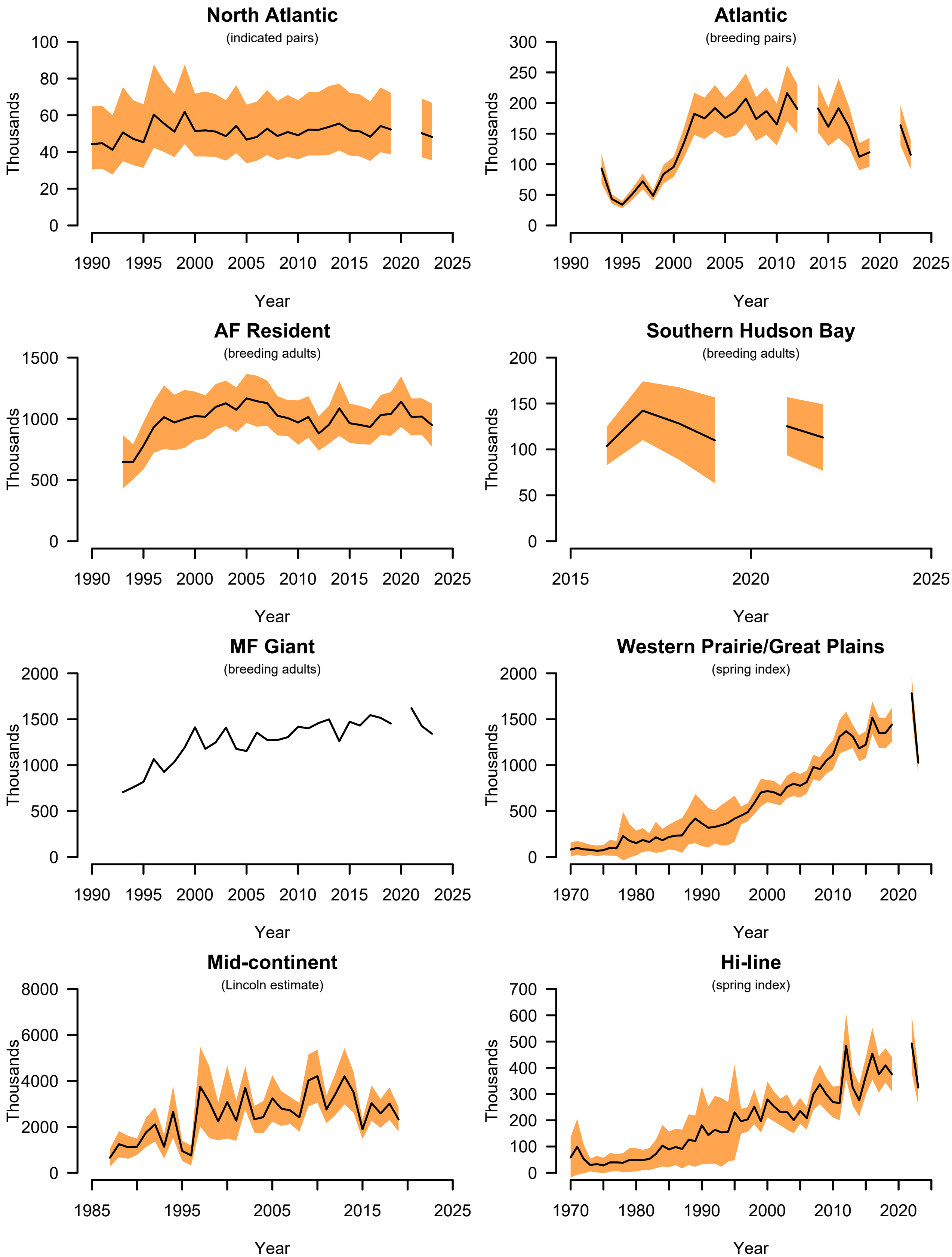

Figure 10. Abundance indices (and 95% confidence intervals, where applicable) of Canada and cackling goose populations based on primary management surveys.

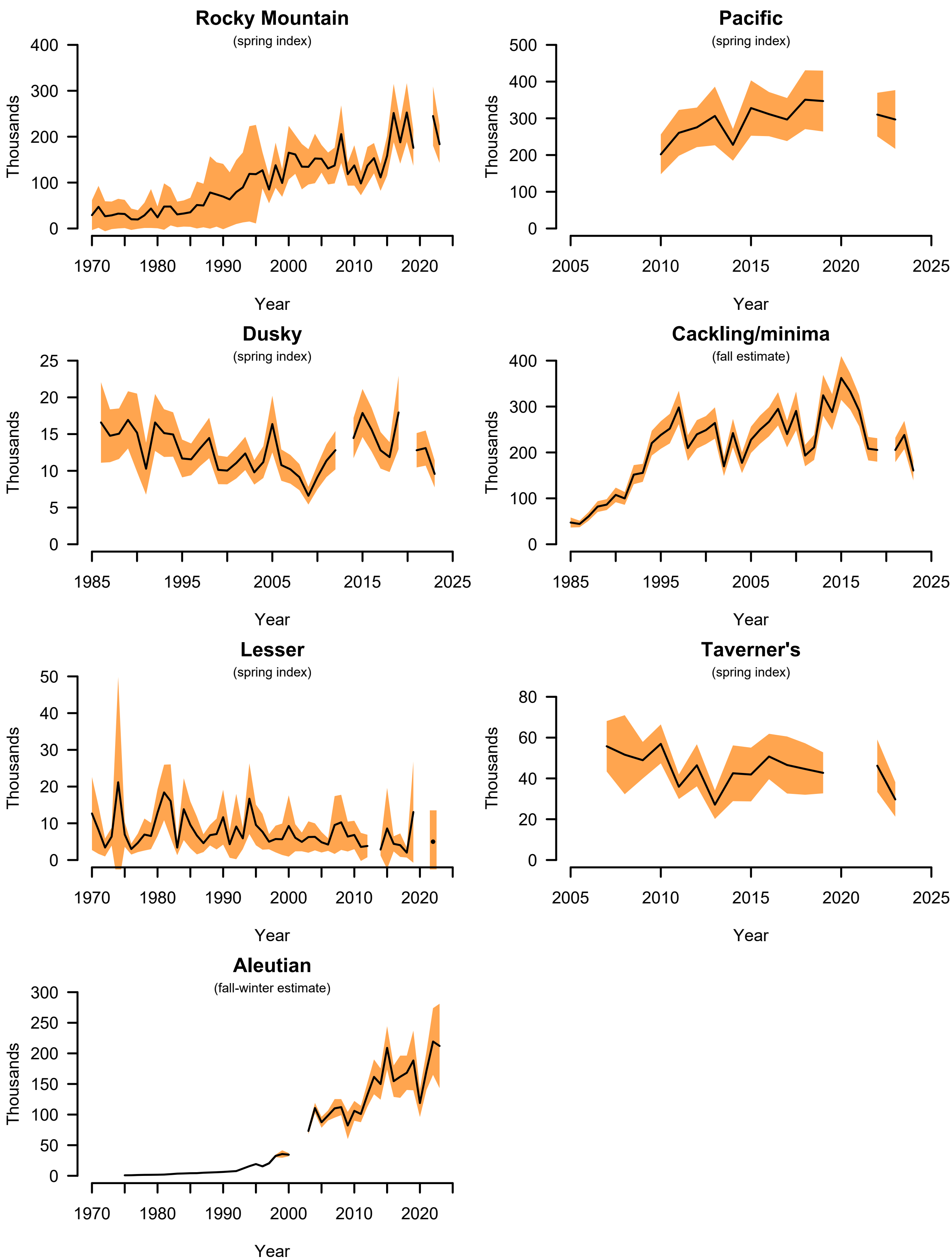

Figure 10. Continued.

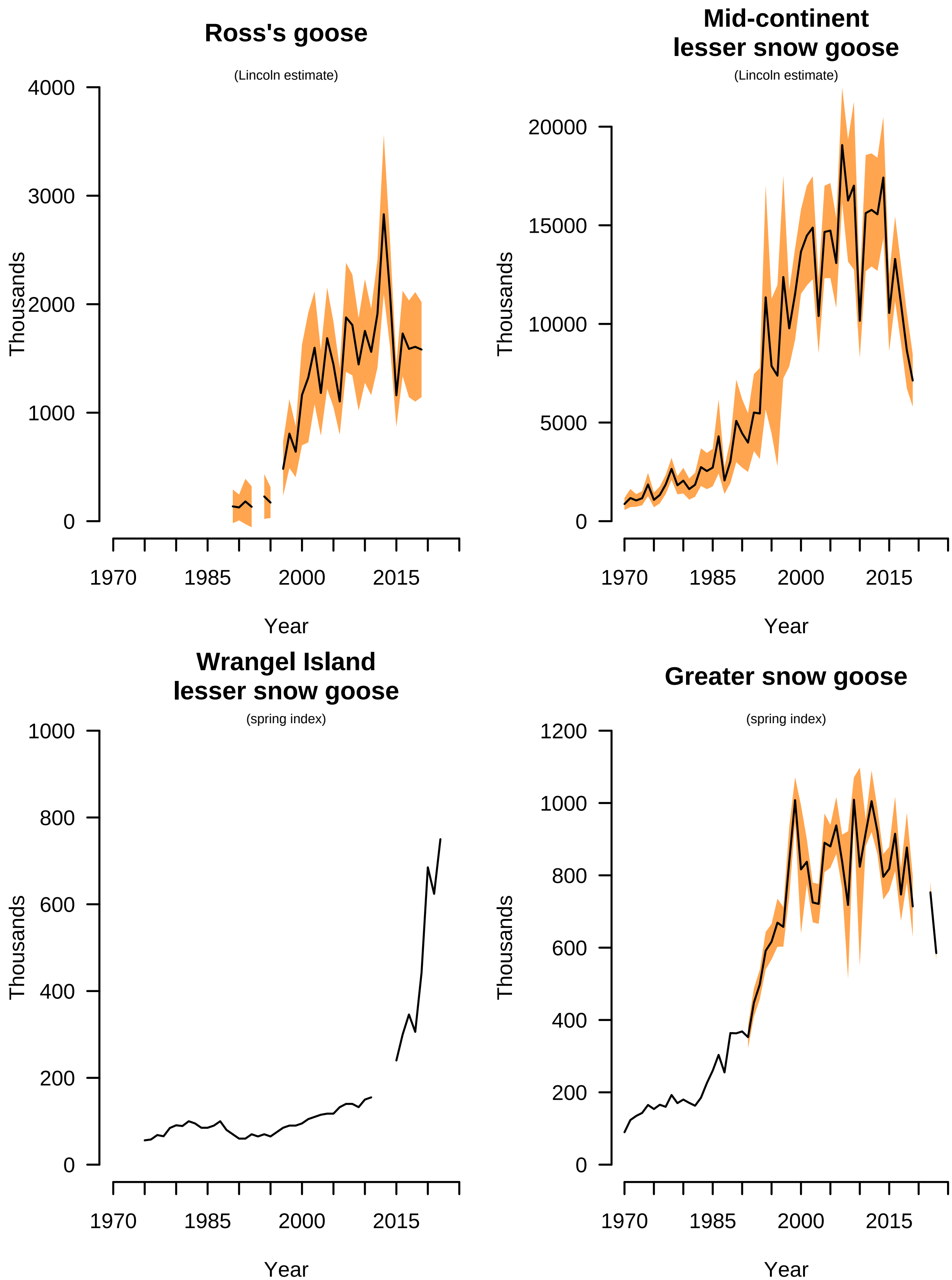

Figure 11. Abundance indices (and 95% confidence intervals, where applicable) of light goose (Ross's and snow goose) populations based on primary management surveys.

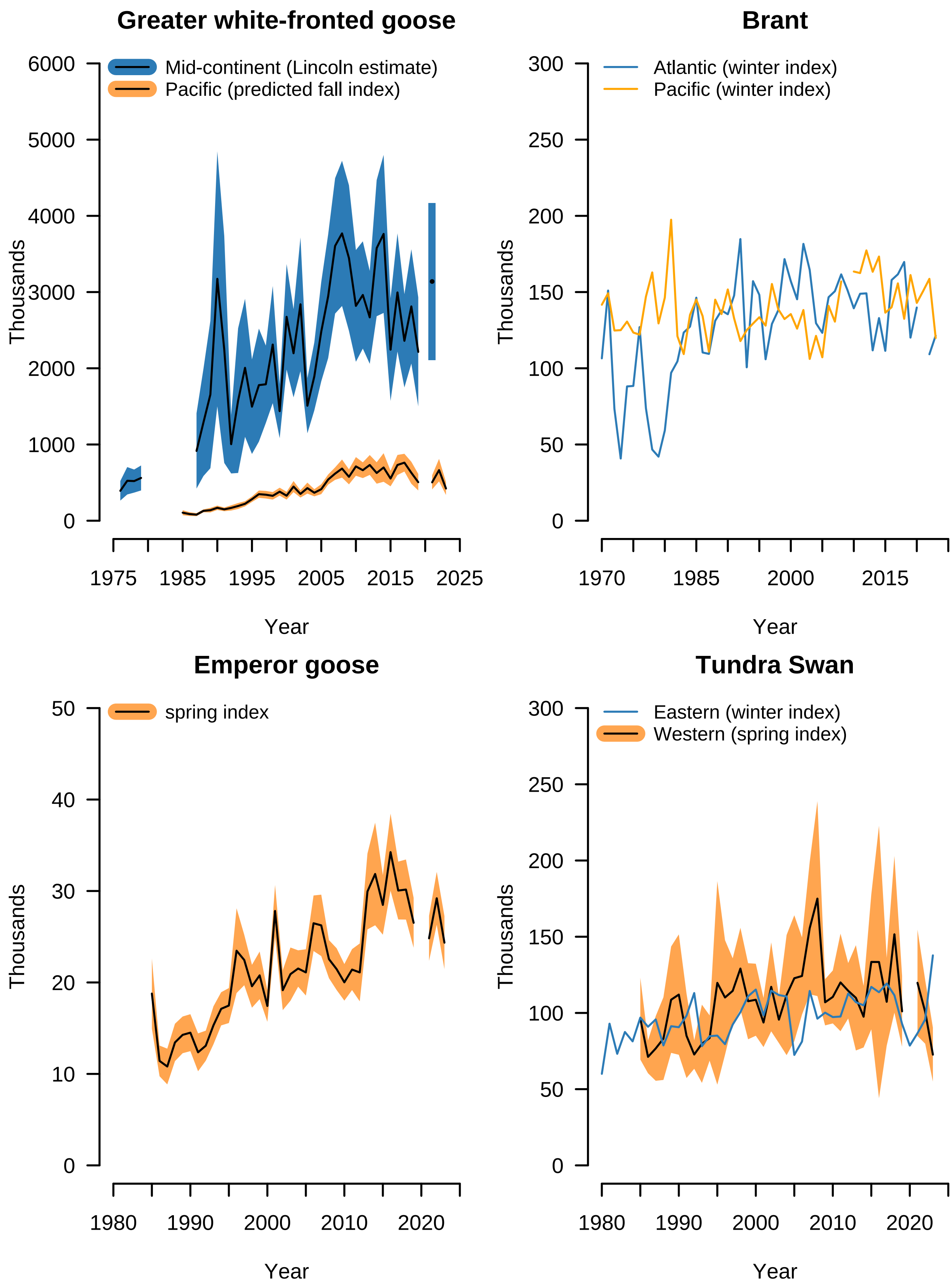

Figure 12. Abundance indices (and 95% confidence intervals, where applicable) of greater white-fronted goose, brant, emperor goose, and tundra swan populations based on primary management surveys.

A. Individuals who supplied information for the generation of this report

A.1: Individuals who supplied information on the status of ducks.

Alaska, Yukon Territory, and Old Crow Flats (Strata 1–12)

Air	H. Wilson and D. Safine
Air	B. Nigus and T. Zeller

Northern Alberta, Northeastern British Columbia, and Northwest Territories (Strata 13–18, 20, and 77)

Air	G. Wilkerson and F. Roetker[e]

Northern Saskatchewan and Northern Manitoba (Strata 21–25)

Air	W. Rhodes and C. Cain

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

Air	R. Spangler and J. Sands
Ground	G. Raven[a], M. Watmough[a], J. Caswell[b], E. Beck[a], G. Mack[b], D. Gettis[a], and B. Manning[a]

Southern Saskatchewan (Strata 30–33)

Air	P. Thorpe and S. Chandler
Ground	B. Bartzen[a], K. Dufour[a], K. Warner[a], C. DeMeyer[a], J. Raccio[a], J. Bisschop[a], J. Nelson[d], F. Moore[a]

Southern Manitoba (Strata 34–40)

Air	S. Yates and S. Salvevold
Ground	M. Schuster[a], J. Leafloor[a], F. Baldwin[a], P. Bergen[a], R. Bruce[a], O. Andrushuk[a], H. Singer[c]

Montana and Western Dakotas (Strata 41–44)

Air	P. Thorpe and S. Chandler
Air	R. Spangler and J. Sands
Air	T. Liddick and D. Fronczak
Ground	D. Collins and T. Cooper

Eastern Dakotas (Strata 45–49)

Air	T. Liddick and D. Fronczak
Ground	S. Catino, A. Walter, W. Moody, and A. Zilka[d]

Western Ontario and Central Quebec (Strata 50, 69–70)

Air	J. Wortham and P. Stinson

Eastern Ontario and Southern Quebec (Strata 53, 56, 69)

Air	J. Rayfield and A. Roberts

Maine and Atlantic Canada (Strata 62–67)

Air M. Koneff and R. Viegut

Canadian Wildlife Service helicopter plot survey

Quebec	C. Lepage[a], S. Orichefsky[a], M. Tétreault[a], and Y. Gingras[d]
Ontario	S. Meyer[a], R. Wood[a], D. Sadler[a], C. Sharp[a], and Y. Delage[d]
New Brunswick & Nova Scotia	T. Barney[a], M. English[a], R. Johnstone[a], A. Hicks[a], and D. Johnston[d]
Newfoundland & Labrador	S. Gilliland[a], C. Ward[a], R. Wells[a], R. Johnstone[a], and J. Townley[d]

California

Fixed-wing M. Weaver[b] and C. Brady[b]

Michigan

Air B. Barlow[b], B. Dybas-Berger[b], C. Eckloff[b], c. Fedewa[b], N. Kalejs[b], N. Levitte[b], T. McFadden[b], J. Robison[b], and H. Shaw[b]

Minnesota

Air B. Geving[b] and S. Cordts[b]

Ground W. Brininger, N. Yates, J. Riens, B. Davis[b], G. Dehmer, A. Lawyer, K. Mattson, J. Wolke, K. Spaeth, T. Cooper, T. Langston, G. Smith, and A. Sidle-Slettdahl

Oregon

Air B. Reishus[b], K. Walton[b], J. Journey[b], J. Thompson[b], T. Collom[b], Z. Slick[b], C. Bottom[b], C. Crossley[b], and helicopter and helicopter service provided by JL Aviation Inc.[d]

Washington

Air J. Evenson[b], M. Hamer[b], M. Wilson[b], and C. Baker[d]

Wisconsin

Air L. Waskow[b], T. Finger[b], P. Eyers[b] and S. Burns[b]

Ground T. Aldred[b], K. Bolder[b], E. Borchert[b], B. Breaker[b], M. Carlisle[b], N. Christel[b], J. Christopher[b], J. Christopoulos[b], J. Cotter[b], S. Easterly[b], C. Erickson[b], J. Fastner[b], A. Gerrits[b], D. Goltz[b], T. Hamilton[b], E. Hansen[b], J. Hopp[b], D. Johnson[b], A. Kakatsch[b], T. Klein[b], C. Knab[b], E. Kroening[b], M. Sparrow-Lein[b], D. Mittelstaedt[b], C. Mogen[b], A. Nelson[b], A. Seitz[b], T. Shaurette[b], B. Stefanski[b], B. Woodall[b], B. Woodbury[b], M. Worth[b], C. Young[b], and Z. Zuleger[b]

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

A.2: Individuals who supplied information on the status of geese and swans.

Flyway and Regional Survey Reports

J. Fischer, D. Fronczak, C. Frost, D. Groves, D. Marks, S. Olson, E. Osnas, A. Roberts, D. Safine, T. Sanders, M. Swaim, and H. Wilson

Information from the Waterfowl Breeding Population and Habitat Survey

See Appendix A.1

Atlantic Population Canada Geese

J. Lefebvre[a], R. Spangler, and F. St-Pierre[a]

Southern Hudson Bay Population Canada Geese

R. Brook[b]

Mississippi Flyway Population Giant Canada Geese

O. Jones[b]

Mid-continent Cackling Geese

F. Baldwin[a], J. Leafloor[a], R. Raftovich, A. Smith[a], and L. Walker[c]

Ross's Geese and Mid-continent Lesser Snow Geese

R. Alisauskas[a]

Wrangel Island Population Lesser Snow Geese

V. Baranyuk[c]

Greater Snow Geese

J. Lefebvre[a]

Mid-continent Population White-fronted Geese

J. Fischer, D. Marks, V. Patil[c], R. Raftovich, G. Raven[a], A. Smith[a], and L. Walker[c]

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

B. Historical estimates of May ponds and regional waterfowl populations

Table B.1. Estimated number of May ponds and standard errors (in thousands) in portions of Prairie and Parkland 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	1,977.2	165.4				
1962	2,369.1	184.6				
1963	2,482.0	129.3				
1964	3,370.7	173.0				
1965	4,378.8	212.2				
1966	4,554.5	229.3				
1967	4,691.2	272.1				
1968	1,985.7	120.2				
1969	3,547.6	221.9				
1970	4,875.0	251.2				
1971	4,053.4	200.4				
1972	4,009.2	250.9				
1973	2,949.5	197.6				
1974	6,390.1	308.3	1,840.8	197.2	8,230.9	366.0
1975	5,320.1	271.3	1,910.8	116.1	7,230.9	295.1
1976	4,598.8	197.1	1,391.5	99.2	5,990.3	220.7
1977	2,277.9	120.7	771.1	51.1	3,049.1	131.1
1978	3,622.1	158.0	1,590.4	81.7	5,212.4	177.9
1979	4,858.9	252.0	1,522.2	70.9	6,381.1	261.8
1980	2,140.9	107.7	761.4	35.8	2,902.3	113.5
1981	1,443.0	75.3	682.8	34.0	2,125.8	82.6
1982	3,184.9	178.6	1,458.0	86.4	4,642.8	198.4
1983	3,905.7	208.2	1,259.2	68.7	5,164.9	219.2
1984	2,473.1	196.6	1,766.2	90.8	4,239.3	216.5
1985	4,283.1	244.1	1,326.9	74.0	5,610.0	255.1
1986	4,024.7	174.4	1,734.8	74.4	5,759.5	189.6
1987	2,523.7	131.0	1,347.8	46.8	3,871.5	139.1
1988	2,110.1	132.4	790.7	39.4	2,900.8	138.1
1989	1,692.7	89.1	1,289.9	61.7	2,982.7	108.4
1990	2,817.3	138.3	691.2	45.9	3,508.5	145.7
1991	2,493.9	110.2	706.1	33.6	3,200.0	115.2
1992	2,783.9	141.6	825.0	30.8	3,608.9	144.9
1993	2,261.1	94.0	1,350.6	57.1	3,611.7	110.0
1994	3,769.1	173.9	2,215.6	88.8	5,984.8	195.3
1995	3,892.5	223.8	2,442.9	106.8	6,335.4	248.0
1996	5,002.6	184.9	2,479.7	135.3	7,482.2	229.1

Table B.1. Continued.

Year	Prairie Canada $\widehat{N}$	Prairie Canada $\widehat{SE}$	Northcentral U.S.[a] $\widehat{N}$	Northcentral U.S.[a] $\widehat{SE}$	Total $\widehat{N}$	Total $\widehat{SE}$
1997	5,061.0	180.3	2,397.2	94.4	7,458.2	203.5
1998	2,521.7	133.8	2,065.3	89.2	4,586.9	160.8
1999	3,862.0	157.2	2,842.2	256.8	6,704.3	301.2
2000	2,422.5	96.1	1,524.5	99.9	3,946.9	138.6
2001	2,747.2	115.6	1,893.2	91.5	4,640.4	147.4
2002	1,439.0	105.0	1,281.0	63.4	2,720.0	122.7
2003	3,522.3	151.8	1,667.8	67.4	5,190.1	166.1
2004	2,512.6	131.0	1,407.0	101.7	3,919.6	165.8
2005	3,920.5	196.7	1,460.7	79.7	5,381.2	212.2
2006	4,449.5	221.5	1,644.4	85.4	6,093.9	237.4
2007	5,040.2	261.8	1,962.5	102.5	7,002.7	281.2
2008	3,054.8	147.6	1,376.6	71.9	4,431.4	164.2
2009	3,568.1	148.0	2,866.0	123.1	6,434.0	192.5
2010	3,728.7	203.4	2,936.3	142.3	6,665.0	248.2
2011	4,892.7	197.5	3,239.5	127.4	8,132.2	235.0
2012	3,885.1	146.5	1,658.9	52.7	5,544.0	155.6
2013	4,550.5	185.5	2,341.2	99.0	6,891.7	210.2
2014	4,629.9	168.3	2,551.3	106.5	7,181.2	199.2
2015	4,151.0	146.3	2,156.8	86.0	6,307.7	169.7
2016	3,494.5	147.2	1,518.0	52.7	5,012.5	156.4
2017	4,330.3	157.7	1,765.7	92.2	6,096.0	182.7
2018	3,660.2	147.6	1,567.2	90.2	5,227.4	173.0
2019	2,855.6	103.8	2,134.7	137.3	4,990.3	172.1
2020	No Survey					
2021	No Survey					
2022	3,473.5	157.5	1,983.4	98.2	5,456.9	185.6
2023	3,313.6	114.2	1,661.5	75.2	4,975.1	136.7

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

Table B.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 duck	Mallard	Total duck	Mallard	Total duck	Mallard	Total duck	Mallard
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							528.7	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	368.4
1999			851.0	560.1	744.6	466.1	680.5	316.4

Table B.2. Continued.

	British Columbia		California		Michigan		Minnesota	
Year	Total duck	Mallard	Total duck	Mallard	Total duck	Mallard	Total duck	Mallard
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	364.5	90.4	649.4	399.4	412.2	244.6	521.1	160.7
2007	383.9	98.8	627.6	388.3	641.9	337.7	488.5	242.5
2008	377.1	81.1	554.3	297.1	437.5	200.5	739.6	297.6
2009	349.7	72.5	510.8	302.0	493.6	258.9	541.3	236.4
2010	339.2	81.1	541.4	367.9	595.3	338.3	530.7	241.9
2011	277.8	69.7	558.5	314.7	471.4	258.6	687.5	283.3
2012	313.7	75.6	529.7	387.1	860.1	439.3	468.6	225.0
2013	333.6	82.9	451.3	298.6	678.6	288.4	682.9	293.2
2014	355.8	82.6	448.7	238.7	395.3	230.1	474.4	257.0
2015	365.8	81.4	315.6	173.9	431.1	237.8	524.2	206.2
2016	321.3	74.0	417.8	263.8	520.6	278.1	787.1	250.2
2017	351.3	70.9	393.7	198.4	684.5	298.1	636.0	213.6
2018	346.3	79.3	549.2	272.9	452.4	251.4	692.6	295.4
2019	409.2	74.5	470.8	239.8	333.9	179.2	694.8	286.4
2020								
2021					973.1	310.0		
2022	390.6	80.9	379.9	179.4	202.0	138.7	606.9	231.1
2023	369.1	70.8	495.4	202.1	135.3	82.2	496.0	222.2

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

Table B.2. Continued.

	Nevada[b]	Oregon		Washington		Wisconsin	
Year	Mallard	Total duck	Mallard	Total duck	Mallard	Total duck	Mallard
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					265.7	78.6
1980	0.9					248.1	116.5
1981	1.6					505.0	142.8
1982	1.1					218.7	89.5
1983	1.5					202.3	119.5
1984	1.4					210.0	104.8
1985	1.5					192.8	73.9
1986	1.3					262.0	110.8
1987	1.5					389.8	136.9
1988	1.3					287.1	148.9
1989	1.3					462.5	180.7
1990	1.3					328.6	151.4
1991	1.4					435.8	172.4
1992	0.9					683.8	249.7
1993	1.2					379.4	174.5
1994	1.4	332.6	116.4			571.2	283.4
1995	1.0	215.9	77.5			592.4	242.2
1996	1.7	288.4	102.2			536.3	314.4
1997	2.5	359.5	121.2			409.3	181.0
1998	2.1	345.1	124.9			412.8	186.9
1999	2.3	320.0	125.6			476.6	248.4

Table B.2. Continued.

	Nevada[b]	Oregon		Washington		Wisconsin	
Year	Mallard	Total duck	Mallard	Total duck	Mallard	Total duck	Mallard
2000	2.1	314.9	110.9			744.4	454.0
2001	2.0					440.1	183.5
2002	0.7	264.6	104.5			740.8	378.5
2003	1.7	246.1	89.0			533.5	261.3
2004	1.7	229.8	82.5			651.5	229.2
2005	0.7	210.4	74.1			724.3	317.2
2006	1.8	251.2	81.1			522.6	219.5
2007	2.1	319.1	92.5			470.6	210.2
2008	1.9	224.3	75.4			626.9	188.4
2009	12.7	186.0	72.6			502.4	200.5
2010	8.9	205.1	66.8	200.9	92.9	386.5	199.1
2011	2.3	158.4	61.6	157.1	71.4	513.7	187.9
2012	4.1	263.5	88.8	169.0	89.5	521.1	196.9
2013	8.8	251.7	84.3	157.2	74.4	527.3	181.2
2014	4.2	315.2	85.3	177.0	86.3	395.1	158.7
2015	5.5	279.7	87.4	193.1	86.4	372.8	176.2
2016	14.4	213.6	87.3	121.5	59.9	390.5	164.1
2017	6.3	239.9	71.7	242.2	103.4	479.1	180.9
2018	13.9	293.9	97.1	281.1	124.9	439.4	216.7
2019	10.0	251.4	83.9	248.3	126.2	413.7	204.3
2020							
2021		260.1	76.3			585.0	147.4
2022		344.6	79.4	219.7	87.4	647.1	185.6
2023		198.0	68.6	204.9	102.0	504.6	166.7

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

Table B.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), 1955–2023.

	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
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

Table B.3. Continued.

Year	Mallard		Gadwall		American wigeon		Green-winged teal		Blue-winged teal	
	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
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
2018	9,255.2	298.9	2,885.9	161.7	2,820.4	166.5	3,042.7	213.9	6,450.5	307.7
2019	9,423.4	284.5	3,258.7	173.5	2,832.1	215.8	3,178.2	184.4	5,427.6	318.8
2020	No Survey									
2021	No Survey									
2022	7,434.3	243.3	2,684.7	135.3	2,186.9	128.7	2,150.9	178.2	6,491.1	337.5
2023	6,129.2	206.1	2,562.0	145.1	1,889.9	173.3	2,504.0	284.1	5,252.8	297.1

Table B.3. 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
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

Table B.3. Continued.

Year	Northern shoveler		Northern pintail		Redhead		Canvasback		Scaup	
	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
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
2018	4,207.9	196.5	2,365.3	150.2	999.0	85.3	686.1	59.1	3,989.3	212.5
2019	3,649.2	169.0	2,268.5	123.3	732.2	63.7	651.9	49.1	3,590.8	207.0
2020	No Survey									
2021	No Survey									
2022	3,036.3	167.1	1,783.6	150.1	1,066.6	87.1	586.6	50.6	3,655.1	223.8
2023	2,858.7	165.1	2,218.8	148.3	930.6	80.6	619.4	63.9	3,519.0	211.9

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

Year	Traditional Survey Area[a]	
	$\widehat{N}$	$\widehat{SE}$
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 B.4. Continued.

Year	Traditional Survey Area[a]	
	$\widehat{N}$	$\widehat{SE}$
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
2018	41,193.2	662.1
2019	38,898.9	658.3
2020	No Survey	
2021	No Survey	
2022	34,657.2	613.6
2023	32,320.0	633.1

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

Table B.5. Breeding population estimates and 90% credibility intervals (in thousands) for the 6 most abundant species of ducks in the eastern survey area, 1998–2023[a].

	Mallard		American black duck		Green-winged teal		Ring-necked duck		Goldeneyes[b]		Mergansers[c]	
Year	$\widehat{N}$	90% CI	$\widehat{N}$	90% CI	$\widehat{N}$	90% CI	$\widehat{N}$	90% CI	$\widehat{N}$	90% CI	$\widehat{N}$	90% CI
1998	1,462.2	(1,318.8, 1,652.9)	828.5	(736.6, 947.7)	294.9	(238.5, 384.5)	597.0	(491.1, 757.0)	661.1	(507.1, 934.4)	701.7	(602.2, 827.3)
1999	1,459.9	(1,314.0, 1,650.7)	806.2	(726.2, 904.7)	378.2	(309.4, 479.0)	713.3	(584.5, 913.0)	752.9	(580.5, 1,029.0)	704.3	(610.9, 818.6)
2000	1,417.4	(1,279.9, 1,599.2)	655.2	(599.5, 721.2)	347.4	(287.5, 430.9)	937.3	(716.1, 1,399.9)	714.6	(546.5, 1,006.3)	718.6	(626.2, 830.5)
2001	1,422.1	(1,282.4, 1,606.0)	634.0	(572.6, 711.0)	291.7	(239.8, 368.2)	675.9	(560.0, 847.8)	867.8	(655.5, 1,223.6)	662.4	(577.9, 764.8)
2002	1,405.4	(1,266.8, 1,590.6)	761.2	(685.4, 855.9)	389.5	(320.3, 486.4)	692.9	(576.4, 857.0)	944.6	(691.7, 1,363.8)	929.0	(812.4, 1,070.8)
2003	1,376.2	(1,237.4, 1,562.1)	715.7	(636.5, 816.9)	380.9	(309.1, 489.4)	689.4	(582.0, 833.2)	730.9	(550.9, 1,061.8)	819.8	(713.4, 949.5)
2004	1,370.4	(1,232.0, 1,559.5)	742.4	(656.4, 856.1)	446.9	(364.2, 574.5)	759.4	(627.1, 961.5)	697.6	(545.1, 954.8)	819.8	(717.3, 942.9)
2005	1,332.0	(1,193.5, 1,519.4)	661.2	(593.7, 744.6)	330.0	(267.7, 425.1)	639.6	(540.1, 771.9)	599.1	(472.1, 807.6)	805.7	(702.3, 933.5)
2006	1,290.5	(1,159.7, 1,467.7)	705.0	(630.2, 799.0)	325.7	(264.2, 417.4)	668.4	(560.3, 815.3)	529.6	(416.1, 721.1)	734.4	(640.1, 849.2)
2007	1,319.9	(1,178.4, 1,515.0)	782.8	(708.6, 870.0)	431.2	(338.1, 611.6)	859.6	(724.4, 1,038.0)	742.0	(571.2, 1,015.9)	855.0	(742.0, 994.7)
2008	1,287.8	(1,150.5, 1,477.0)	681.0	(608.6, 775.3)	395.3	(313.5, 518.1)	679.0	(563.8, 848.5)	726.5	(563.3, 983.1)	757.9	(661.8, 873.9)
2009	1,277.4	(1,139.3, 1,472.3)	690.0	(604.3, 807.6)	419.5	(335.0, 553.0)	701.8	(578.8, 891.1)	615.3	(471.7, 861.3)	772.3	(672.7, 893.9)
2010	1,182.7	(1,058.7, 1,352.7)	612.3	(542.2, 700.2)	407.1	(324.9, 546.2)	688.4	(574.0, 847.5)	635.6	(485.7, 887.1)	647.7	(563.1, 749.6)
2011	1,231.2	(1,094.9, 1,421.4)	661.0	(574.7, 776.1)	390.2	(308.0, 529.3)	618.0	(518.8, 754.5)	602.0	(467.0, 836.4)	699.8	(607.5, 812.7)
2012	1,199.6	(1,070.8, 1,378.0)	701.8	(621.6, 805.4)	354.9	(286.4, 468.4)	639.8	(529.5, 802.1)	637.7	(482.0, 936.7)	764.4	(666.5, 883.2)
2013	1,219.9	(1,064.3, 1,443.2)	505.2	(464.9, 549.4)	278.0	(231.6, 339.0)	613.8	(512.7, 752.2)	519.5	(428.3, 646.2)	566.4	(484.0, 670.1)
2014	1,195.8	(1,060.2, 1,384.8)	695.5	(615.0, 808.6)	299.1	(240.6, 393.2)	608.8	(507.2, 750.6)	615.5	(455.6, 947.1)	694.3	(604.7, 802.3)
2015	1,145.7	(1,019.2, 1,322.9)	673.7	(579.1, 807.3)	305.9	(244.6, 403.7)	720.2	(576.4, 977.0)	476.4	(367.9, 669.9)	711.3	(619.5, 822.1)
2016	1,128.6	(1,001.6, 1,308.9)	736.9	(639.6, 875.2)	314.2	(250.1, 419.2)	741.0	(610.8, 934.4)	567.2	(428.5, 839.7)	749.4	(652.1, 868.9)
2017	1,140.8	(1,008.0, 1,329.6)	606.9	(535.8, 699.3)	332.4	(269.7, 423.5)	612.5	(502.6, 785.2)	649.2	(498.5, 928.8)	863.1	(750.9, 1,001.1)
2018	1,094.2	(970.9, 1,265.6)	559.6	(503.1, 627.7)	330.9	(266.4, 428.0)	633.8	(523.1, 810.6)	524.4	(403.5, 746.1)	818.8	(715.6, 943.8)
2019	1,062.5	(943.6, 1,230.0)	589.8	(521.2, 672.1)	298.1	(237.5, 389.7)	713.9	(566.8, 995.4)	505.0	(364.4, 812.1)	814.5	(708.7, 941.9)
2020	No Survey											
2021												
2022	1,254.0	(1,083.8, 1,496.1)	676.3	(602.8, 776.8)	330.0	(267.5, 426.2)	679.0	(569.2, 834.1)	654.9	(516.2, 889.2)	953.7	(824.2, 1,117.6)
2023	1,202.2	(1,050.0, 1,416.8)	732.0	(656.1, 825.3)	385.7	(297.0, 554.9)	659.9	(543.5, 840.1)	848.3	(656.0, 1,153.4)	948.9	(828.6, 1,095.9)

[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.

C. Historical estimates of goose and swan populations

Table C.1. Abundance indices (in thousands) for North American Canada and cackling goose populations, 1969–2023.

	North Atlantic[a,b]		Atlantic[a,b]		Atlantic Flyway Resident[a]		Southern Hudson Bay[a]		Mississippi Flyway Giant[a]
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$
1969/70									
1970/71									
1971/72									
1972/73									
1973/74									
1974/75									
1975/76									
1976/77									
1977/78									
1978/79									
1979/80									
1980/81									
1981/82									
1982/83									
1983/84									
1984/85									
1985/86									
1986/87									
1987/88									
1988/89									
1989/90	44.3	8.8							
1990/91	44.8	8.8							
1991/92	41.2	8.3							
1992/93	50.7	10.4	93.0	12.5	647.5	111.8			705.5
1993/94	47.1	9.1	43.2	4.0	648.7	73.0			758.6
1994/95	45.3	8.9	34.0	3.0	780.0	98.8			818.0
1995/96	60.4	11.7	51.5	4.8	932.7	107.4			1,065.8
1996/97	55.4	9.9	72.1	6.6	1,013.3	132.5			926.1
1997/98	51.1	8.8	48.6	4.5	970.1	115.7			1,035.7
1998/99	61.9	11.1	83.8	7.6	999.5	120.8			1,193.5
1999/00	51.4	8.8	95.8	8.4	1,022.3	101.9			1,412.4
2000/01	51.8	9.1	135.2	12.5	1,016.6	89.3			1,178.0
2001/02	51.1	8.8	182.4	17.6	1,097.1	95.1			1,248.0
2002/03	48.6	8.4	174.9	17.2	1,126.7	94.5			1,408.3
2003/04	54.2	9.6	191.8	19.2	1,073.1	93.8			1,177.2
2004/05	46.8	8.2	175.7	16.7	1,167.1	102.3			1,154.2
2005/06	48.2	8.3	186.1	20.0	1,144.0	106.2			1,355.3
2006/07	52.7	9.1	207.3	21.1	1,128.0	94.5			1,275.2
2007/08	48.7	8.3	174.0	18.2	1,024.9	82.1			1,273.7
2008/09	50.9	8.6	186.8	19.7	1,006.1	74.8			1,304.9

Table C.1. Continued.

Year	North Atlantic[a,b]		Atlantic[a,b]		Atlantic Flyway Resident[a]		Southern Hudson Bay[a]		Mississippi Flyway Giant[a]
	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$
2009/10	49.1	8.2	165.1	17.5	969.9	92.1			1,418.7
2010/11	52.2	8.9	216.0	23.2	1,015.1	86.5			1,401.3
2011/12	52.1	8.8	190.3	20.4	879.8	71.6			1,459.8
2012/13	53.7	9.6			951.9	79.1			1,498.6
2013/14	55.5	9.3	191.2	20.0	1,084.9	114.4			1,261.9
2014/15	51.8	8.8	161.3	16.0	963.8	81.7			1,473.0
2015/16	51.2	8.7	191.5	24.9	950.0	80.1	103.6	10.7	1,431.7
2016/17	48.3	8.4	161.1	17.2	933.3	74.0	142.2	16.3	1,544.7
2017/18	54.2	9.0	112.2	11.3	1,030.9	83.2	128.3	20.1	1,515.6
2018/19	52.3	8.6	119.5	12.0	1,039.5	91.3	109.9	23.9	1,453.3
2019/20					1,139.6	105.6			
2020/21					1,014.8	77.0	125.3	16.2	1,621.6
2021/22	50.2	8.2	163.7	16.7	1,018.7	76.4	112.9	18.5	1,425.6
2022/23	48.2	8.0	115.3	12.2	947.5	89.6			1,342.2

Table C.1. Continued.

Year	W. Prairie & Great Plains[a] $\widehat{N}$	$\widehat{SE}$	Mid-continent[c] $\widehat{N}$	$\widehat{SE}$	Hi-line[a] $\widehat{N}$	$\widehat{SE}$	Rocky Mountain[a] $\widehat{N}$	$\widehat{SE}$	Pacific[a] $\widehat{N}$	$\widehat{SE}$
1969/70	80.4	38.8			58.3	39.2	29.1	16.7		
1970/71	98.9	38.3			99.0	54.3	47.2	23.3		
1971/72	83.0	38.0			52.4	27.8	26.7	16.7		
1972/73	78.8	28.2			29.5	12.5	28.6	15.3		
1973/74	66.8	29.7			32.9	16.2	32.4	16.5		
1974/75	74.4	28.5			28.0	14.9	31.6	15.7		
1975/76	99.9	43.7			39.3	18.3	20.1	11.9		
1976/77	94.0	42.0			39.4	16.3	19.6	10.3		
1977/78	227.9	135.4			38.1	18.8	28.6	14.0		
1978/79	174.7	92.0			48.9	23.2	43.5	21.6		
1979/80	152.1	69.0			49.3	22.5	24.2	12.1		
1980/81	184.9	66.2			48.7	19.8	47.8	25.8		
1981/82	162.1	50.1			52.4	21.3	47.8	21.0		
1982/83	214.2	86.5			71.5	27.7	30.7	14.2		
1983/84	182.4	64.2			103.1	40.5	32.7	14.6		
1984/85	217.7	68.7			89.1	34.6	35.3	16.2		
1985/86	232.1	81.3			98.2	35.4	51.1	26.1		
1986/87	235.0	97.1	654.8	199.9	90.6	37.8	50.1	24.2		
1987/88	338.9	103.3	1,244.3	287.6	126.0	49.3	78.4	40.2		
1988/89	418.3	136.2	1,112.0	256.1	120.6	49.7	74.1	35.8		
1989/90	366.3	126.5	1,132.7	183.5	180.9	75.6	69.6	36.3		
1990/91	318.2	109.6	1,758.6	325.8	143.7	55.9	63.3	30.2		
1991/92	328.1	91.9	2,108.4	383.4	163.8	66.0	79.3	35.5		
1992/93	346.5	113.1	1,133.4	266.1	153.7	67.0	89.4	38.9		
1993/94	371.0	124.5	2,653.0	580.1	156.2	57.8	119.0	53.0		
1994/95	417.7	127.5	953.0	224.4	230.3	93.1	118.3	54.8		
1995/96	451.4	49.8	751.4	222.2	196.2	24.1	126.8	20.1		
1996/97	487.3	50.0	3,752.1	884.7	203.7	24.1	85.0	15.3		
1997/98	587.1	63.0	3,083.9	801.4	252.0	34.3	137.8	25.1		
1998/99	702.1	76.8	2,239.1	419.8	196.6	22.3	99.1	15.3		
1999/00	717.7	61.6	3,079.1	810.6	279.3	34.9	165.1	29.8		
2000/01	704.5	63.8	2,267.8	448.1	252.8	29.0	161.4	21.6		
2001/02	670.9	54.6	3,699.7	483.2	231.0	26.1	134.7	25.2		
2002/03	764.1	62.8	2,330.1	295.8	231.5	34.4	134.3	19.6		
2003/04	797.7	68.5	2,421.3	359.4	200.5	25.6	152.5	27.5		
2004/05	775.6	65.9	3,239.9	516.5	236.2	25.2	151.8	15.4		
2005/06	816.1	62.8	2,796.8	386.8	208.0	22.2	130.7	17.7		
2006/07	979.6	68.3	2,712.7	300.6	298.8	30.5	137.2	19.9		

Table C.1. Continued.

	W. Prairie & Great Plains[a]		Mid-continent[c]		Hi-line[a]		Rocky Mountain[a]		Pacific[a]	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
2007/08	957.1	66.5	2,411.3	321.7	337.3	38.4	205.6	32.0		
2008/09	1,049.7	71.8	4,016.9	576.7	298.4	32.5	118.4	12.8		
2009/10	1,111.1	82.0	4,208.9	590.3	269.5	29.9	137.3	22.4	201.9	27.7
2010/11	1,309.9	93.4	2,757.8	310.5	265.4	33.6	98.1	13.1	260.4	31.9
2011/12	1,369.6	109.0	3,434.0	466.4	483.6	64.4	137.0	20.7	275.4	27.5
2012/13	1,314.7	65.5	4,201.5	624.9	325.5	35.3	153.2	16.8	306.4	40.7
2013/14	1,183.4	72.8	3,512.3	458.2	275.9	31.5	111.3	14.9	227.8	22.0
2014/15	1,223.1	75.3	1,893.5	219.2	368.5	36.6	158.2	22.0	328.0	38.5
2015/16	1,517.7	91.2	3,035.3	392.3	453.9	50.8	251.6	32.4	311.4	30.7
2016/17	1,352.8	84.8	2,586.4	320.5	374.6	35.4	187.7	23.7	296.7	29.9
2017/18	1,349.7	85.2	3,009.4	360.8	409.2	33.4	252.7	32.7	350.7	40.9
2018/19	1,443.4	94.4	2,325.1	273.8	374.9	33.5	175.7	20.0	347.0	42.3
2019/20										
2020/21										
2021/22	1,783.0	107.5			492.7	56.5	245.0	32.9	310.2	30.3
2022/23	1,028.1	68.6			324.8	34.1	183.6	20.9	296.8	40.8

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

Table C.1. Continued.

	Dusky[a]		Cackling/minima[d]		Lesser[a]		Taverner's[a]		Aleutian[d]	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
1969/70					12.7	5.1				
1970/71					8.2	3.3				
1971/72					3.4	1.2				
1972/73					6.4	1.3				
1973/74					21.2	14.6				
1974/75					6.9	1.7			0.8	
1975/76					3.0	0.8			0.9	
1976/77					4.7	1.3			1.3	
1977/78					6.9	2.2			1.5	
1978/79					6.5	1.8			1.6	
1979/80					12.9	3.3			1.7	
1980/81					18.4	3.9			2.0	
1981/82					16.0	5.1			2.7	
1982/83					3.4	1.1			3.5	
1983/84					13.8	4.3			3.8	
1984/85			47.4	5.6	9.6	3.3			4.2	
1985/86	16.6	2.8	44.2	3.7	6.7	2.6			4.3	
1986/87	14.8	1.8	60.8	4.8	4.6	1.2			5.0	
1987/88	15.1	1.8	82.1	6.0	6.8	1.4			5.4	
1988/89	16.9	2.0	86.4	6.1	7.1	2.1			5.8	
1989/90	15.2	2.7	107.5	8.1	11.7	3.8			6.3	
1990/91	10.3	1.8	99.9	7.1	4.3	1.9			7.0	
1991/92	16.6	2.0	151.6	10.6	9.1	4.5			7.7	
1992/93	15.1	1.7	155.6	10.0	5.9	1.5			11.7	
1993/94	14.9	1.5	220.3	13.8	16.7	4.9			15.7	
1994/95	11.7	1.3	238.1	15.3	9.6	2.8			19.1	
1995/96	11.6	1.1	252.0	16.5	7.7	2.5			15.5	0.6
1996/97	13.1	1.2	298.1	18.5	5.0	1.1			20.4	0.8
1997/98	14.5	1.4	209.6	14.3	5.7	1.9			32.4	1.1
1998/99	10.1	1.0	239.4	15.8	5.7	2.2			35.6	3.1
1999/00	10.0	1.0	248.6	15.6	9.3	4.3			34.5	1.4
2000/01	11.1	1.1	264.2	17.4	6.1	1.9				
2001/02	12.4	1.2	169.7	10.7	4.9	1.3				
2002/03	9.8	0.9	242.2	15.7	6.3	2.2			73.2	2.7
2003/04	11.2	1.1	177.4	11.4	6.3	1.9			110.7	4.3
2004/05	16.4	2.0	227.6	14.6	4.8	1.4			87.4	4.6
2005/06	10.8	1.1	249.5	15.7	4.2	0.9			98.6	4.2
2006/07	10.2	1.0	267.0	16.2	9.5	4.0	55.8	6.3	110.2	7.7
2007/08	9.1	0.9	294.9	18.5	10.3	3.8	51.6	9.9	112.2	6.7

Table C.1. Continued.

	Dusky[a]		Cackling/minima[d]		Lesser[a]		Taverner's[a]		Aleutian[d]	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
2008/09	6.6	0.6	240.1	14.8	6.4	2.1	48.9	4.6	82.2	11.3
2009/10	9.2	0.9	290.5	21.6	6.8	2.0	56.9	4.9	106.1	8.3
2010/11	11.4	1.1	193.2	11.9	3.6	2.0	35.9	3.1	101.0	6.9
2011/12	12.8	1.3	211.2	14.0	3.8	1.6	46.4	5.3	132.4	10.0
2012/13			324.5	22.7			27.1	3.6	161.6	14.5
2013/14	14.5	1.4	287.9	19.9	2.8	0.8	42.5	7.0	149.9	13.0
2014/15	17.9	1.7	362.3	24.3	8.6	5.6	41.9	6.7	209.1	18.1
2015/16	15.6	1.5	332.8	20.1	4.4	1.1	50.7	5.7	154.6	13.1
2016/17	12.8	1.3	290.7	17.3	4.0	1.6	46.6	7.1	161.8	17.6
2017/18	11.9	1.0	208.2	13.0	2.0	0.7	44.6	6.4	168.3	14.3
2018/19	17.9	2.5	205.5	13.1	13.1	7.0	42.7	5.1	188.4	24.9
2019/20									118.8	11.7
2020/21	12.8	1.2	205.4	13.6					171.5	15.9
2021/22	13.1	1.2	238.1	15.6	5.0	4.3	46.2	6.6	219.4	27.8
2022/23	9.6	0.9	160.6	11.0			29.7	4.3	212.1	35.2

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

Table C.2. Abundance indices (in thousands) for light goose (Ross's and snow goose) populations, 1969–2023.

			Snow Goose					
	Ross's goose[a]		Mid-continent[a]		Pacific Flyway[b]	Wrangel Island[c]	Greater [c]	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{N}$	$\widehat{N}$	$\widehat{SE}$
1969/70			870.6	156.4			89.6	
1970/71			1,172.4	235.0			123.3	
1971/72			1,051.4	164.0			134.8	
1972/73			1,164.1	182.8			143.0	
1973/74			1,859.4	301.6			165.0	
1974/75			1,080.7	191.4		56.0	153.8	
1975/76			1,328.1	219.2		58.0	165.6	
1976/77			1,857.1	246.4		68.2	160.0	
1977/78			2,650.1	286.0		65.4	192.6	
1978/79			1,821.0	234.1		84.5	170.1	
1979/80			2,054.1	333.1	528.1	90.7	180.0	
1980/81			1,628.3	274.4	204.2	89.0	170.8	
1981/82			1,845.8	311.3	759.9	100.0	163.0	
1982/83			2,740.9	488.9	354.1	95.0	185.0	
1983/84			2,542.5	468.6	547.6	85.0	225.4	
1984/85			2,716.1	486.4	466.3	85.0	260.0	
1985/86			4,300.4	959.2	549.8	90.0	303.5	
1986/87			2,065.6	349.4	521.7	100.0	255.0	
1987/88			3,033.0	562.6	525.3	80.0	363.8	
1988/89	136.5	79.1	5,084.9	1,068.8	441.0	70.0	363.2	
1989/90	126.6	60.8	4,453.6	886.8	463.9	60.0	368.3	
1990/91	181.9	106.5	3,984.5	758.7	708.5	60.0	352.6	15.7
1991/92	132.7	96.4	5,507.5	995.8	690.1	70.0	448.1	20.1
1992/93			5,459.7	1,176.9	639.3	65.0	498.4	20.8
1993/94	227.7	105.5	11,348.0	2,901.1	569.2	70.0	591.4	26.5
1994/95	171.7	72.6	7,863.4	1,743.2	478.2	65.0	616.6	25.1
1995/96			7,377.7	2,345.1	501.4	75.0	669.1	33.9
1996/97	482.5	128.1	12,378.3	2,623.1	366.3	85.0	657.5	28.0
1997/98	807.1	162.2	9,776.0	986.5	416.4	90.0	836.6	49.2
1998/99	640.4	120.0	11,516.2	1,183.7	354.3	90.0	1,008.0	32.3
1999/00	1,163.3	236.7	13,661.7	1,089.4	579.0	95.0	816.5	90.5
2000/01	1,324.1	305.1	14,478.3	1,290.1	656.8	105.0	837.4	31.6
2001/02	1,598.7	265.4	14,882.5	1,332.1	448.2	110.0	725.0	28.0
2002/03	1,181.9	200.9	10,400.6	964.8	596.8	115.0	721.0	28.2
2003/04	1,686.7	238.5	14,663.1	1,196.6	587.8	117.5	890.0	41.4
2004/05	1,444.4	200.9	14,731.8	1,228.9	750.3	117.5	880.0	30.2
2005/06	1,103.5	156.7	13,086.3	1,162.9	710.7	132.5	938.0	40.2
2006/07	1,878.5	256.6	19,068.4	1,487.6	799.7	140.0	838.0	38.1
2007/08	1,808.7	237.0	16,254.1	1,579.6	1,073.5	140.0	718.0	104.1

Table C.2. continued.

	Ross's goose[a]		Snow Goose: Mid-continent[a]		Snow Goose: Pacific Flyway[b]	Snow Goose: Wrangel Island[c]	Snow Goose: Greater [c]	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{N}$	$\widehat{N}$	$\widehat{SE}$
2008/09	1,444.8	218.1	17,009.9	2,172.4	957.4	132.5	1,009.0	31.6
2009/10	1,753.9	244.1	10,160.6	962.4	901.0	150.0	824.0	139.8
2010/11	1,560.9	203.7	15,616.1	1,503.3	863.8	155.0	917.0	18.9
2011/12	1,913.2	254.1	15,780.7	1,462.5	1,097.9		1,005.0	43.4
2012/13	2,828.7	375.2	15,557.9	1,463.8	881.4	160.0	921.0	32.1
2013/14	2,092.9	249.3	17,420.0	1,571.6	1,351.2		796.0	32.1
2014/15	1,160.6	149.1	10,556.9	992.4	1,199.6	240.0	818.0	31.1
2015/16	1,730.3	201.1	13,293.7	1,096.9		300.0	915.0	52.6
2016/17	1,588.2	227.3	11,023.7	1,018.6	1,906.8	346.0	747.0	37.2
2017/18	1,607.2	257.5	8,652.4	983.4	1,355.2	306.0	877.0	49.0
2018/19	1,582.1	223.8	7,130.9	678.1	1,413.8	442.0	714.0	42.9
2019/20						685.1		
2020/21						624.0		
2021/22						750.0	753.0	14.8
2022/23					1,269.6		585.0	9.2

[a] Lincoln estimates of adults.
[b] Fall-winter indices.
[c] Surveys conducted in spring.

Table C.3. Abundance indices (in thousands) of North American greater white-fronted goose, brant, emperor goose, and tundra swan populations, 1969–2023.

	White-fronted goose				Brant				Tundra swan		
	Pacific[a]		Mid-continent[b]		Atlantic[a]	Pacific[a]	Emperor goose[c]		Western[c]		Eastern[a]
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{N}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$
1969/70					106.5	141.7					
1970/71					151.0	149.2					
1971/72					73.3	124.8					
1972/73					40.8	125.0					
1973/74					88.1	130.7					
1974/75					88.4	123.4					
1975/76			392.4	65.5	127.0	122.0					
1976/77			523.9	91.8	73.8	147.0					
1977/78			520.2	77.2	46.7	162.9					
1978/79			561.1	83.6	42.0	129.4					
1979/80					59.2	146.4					60.1
1980/81					97.0	197.5					93.0
1981/82					104.5	121.0					73.2
1982/83					123.5	109.3					87.5
1983/84					127.3	135.0					81.4
1984/85	105.4	16.9			146.3	145.1	18.8	2.0	96.3	13.7	96.9
1985/86	87.1	12.7			110.4	134.2	11.4	0.9	71.2	5.5	90.9
1986/87	79.4	10.2	915.8	252.1	109.4	110.9	10.8	1.0	76.7	10.8	95.8
1987/88	129.5	9.9	1,289.6	358.9	131.2	145.0	13.4	1.0	83.2	13.8	78.7
1988/89	138.2	15.3	1,656.0	493.5	137.9	135.6	14.3	1.0	108.7	17.8	91.3
1989/90	169.5	14.6	3,174.0	853.7	135.4	151.7	14.5	1.0	112.0	20.1	90.6
1990/91	149.0	12.4	2,247.2	759.7	147.7	132.7	12.4	1.1	85.0	14.1	98.2
1991/92	167.9	17.6	1,004.0	195.9	184.8	117.8	13.1	0.8	72.7	4.8	113.0
1992/93	193.1	19.9	1,575.4	484.2	100.6	125.0	15.3	1.1	79.8	13.1	78.2
1993/94	222.0	17.4	2,006.0	462.0	157.2	129.3	17.1	0.9	83.5	7.6	84.8
1994/95	282.1	18.4	1,496.1	316.5	148.2	133.5	17.5	1.0	119.7	34.1	85.1
1995/96	348.4	24.5	1,779.0	378.4	105.9	128.0	23.5	2.4	110.1	19.2	79.5
1996/97	341.1	25.4	1,789.8	259.0	129.1	155.3	22.5	1.4	114.5	10.9	92.4
1997/98	326.5	25.2	2,311.5	392.1	138.0	138.8	19.6	1.2	129.1	13.7	100.6
1998/99	381.1	26.6	1,437.4	181.0	171.6	132.3	20.8	1.3	107.7	12.7	111.0
1999/00	328.3	26.1	2,675.3	353.1	157.2	135.6	17.4	0.9	108.7	12.1	115.3
2000/01	447.8	37.1	2,197.0	295.2	145.3	126.0	27.8	1.4	93.7	8.2	98.4
2001/02	351.8	24.5	2,839.6	447.6	181.6	138.2	19.2	1.1	117.1	14.9	114.7
2002/03	427.7	36.7	1,508.6	184.6	164.5	106.1	20.9	1.5	95.6	7.8	111.7
2003/04	366.9	24.0	1,894.1	227.7	129.6	121.3	21.5	1.0	111.7	20.1	110.8
2004/05	413.5	33.2	2,481.0	332.8	123.2	107.2	21.1	1.3	122.8	21.1	72.5
2005/06	540.5	33.8	2,946.1	414.2	146.6	141.0	26.5	1.5	124.2	12.9	81.3
2006/07	617.8	41.8	3,605.9	453.2	150.6	130.6	26.2	1.7	155.6	22.1	114.4
2007/08	684.0	60.6	3,769.8	486.0	161.6	157.0	22.6	1.1	175.0	32.6	96.2

Table C.3. continued.

	White-fronted goose				Brant				Tundra swans		
	Pacific[a]		Mid-continent[b]		Atlantic[a]	Pacific[a]	Emperor goose[c]		Western[c]		Eastern[a]
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{N}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$
2008/09	575.7	50.3	3,445.6	487.4	151.3		21.5	1.2	107.0	7.7	100.2
2009/10	712.4	62.4	2,818.5	374.0	139.3	163.5	20.0	1.0	110.5	8.9	97.3
2010/11	662.6	52.7	2,962.1	359.1	148.9	162.5	21.4	1.1	120.0	16.3	97.6
2011/12	731.3	66.5	2,667.9	310.8	149.2	177.3	21.1	1.6	114.5	9.3	112.7
2012/13	626.4	71.7	3,576.3	455.8	111.8	163.3	29.9	2.1	109.9	17.6	107.1
2013/14	698.4	95.7	3,763.0	528.9	132.9	173.3	31.9	2.9	97.5	10.3	105.0
2014/15	553.5	52.1	2,244.4	343.3	111.4	136.5	28.5	1.7	133.5	22.6	117.1
2015/16	731.3	67.1	2,995.2	395.6	157.9	140.0	34.2	2.1	133.4	45.6	113.6
2016/17	761.7	59.4	2,360.4	312.3	161.7	155.7	30.0	1.6	107.3	14.7	119.3
2017/18	628.9	73.7	2,811.7	382.6	169.7	132.4	30.2	1.7	151.6	26.2	111.6
2018/19	505.3	55.4	2,215.0	365.1	120.1	161.2	26.5	1.4	101.0	11.9	92.8
2019/20					139.9	142.9					78.6
2020/21	503.3	47.2	3,138.9	525.8		150.6	24.8	1.3	119.8	17.8	86.7
2021/22	663.9	75.3			109.2	158.7	29.2	1.5	100.7	10.7	95.7
2022/23	422.4	43.2			121.5	119.9	24.3	1.5	72.6	9.0	137.8

[a] Fall-winter indices.
[b] Lincoln estimates of adults.
[c] Surveys conducted in spring.

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