U.S. Fish & Wildlife Service

Waterfowl

Population Status, 2022

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August 19, 2022

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 2023–2024 hunting season.

Cover: 2022 winning artwork from the Junior Duck Stamp Conservation and Design Program, by Madison Grimm of South Dakota, used with permission from the Federal Duck Stamp Office

Acknowledgments

Waterfowl Population and Habitat Information: The information contained in this report is the result of the efforts of numerous individuals and organizations. Principal contributors include the Canadian Wildlife Service, U.S. Fish and Wildlife Service, state wildlife conservation agencies, 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 John Sauer. 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.

In general, habitat conditions during the 2022 Waterfowl Breeding Population and Habitat Survey (WBPHS) deteriorated relative to 2019, the last survey year due to the COVID-19 (SARS-COV-2) pandemic. Much of the Canadian prairies were in drought status prior to spring 2022, particularly southern Alberta and southern Saskatchewan. Fall 2021 was warm and had below-average precipitation. The precipitation deficit continued into winter for most of the region except in central and eastern Manitoba. Following a cold December, the west moderated whereas Saskatchewan and Manitoba experienced well-below-average winter temperatures. The boreal regions tended to be cold as well and had average to above-average precipitation. It was a cool spring on the prairies and most regions had below-average precipitation until May, when significant precipitation fell between Regina, Saskatchewan and Winnipeg, Manitoba. The U.S. prairies experienced similar conditions, with most of Montana remaining dry like southern Alberta to the north whereas North Dakota received beneficial spring precipitation. Habitat conditions in South Dakota improved in a northerly direction, particularly along the eastern portion. In 2022, spring phenology was later than average in the eastern Arctic and average or variable in many areas of the central and western Arctic and Subarctic. Many areas across the Arctic and Subarctic experienced above-average temperatures during late May or June. The total pond estimate (Prairie Canada and northcentral U.S. combined) was 5.5 ± 0.2 million, which was 9% higher than the 2019 estimate of 5.0 ± 0.2 million and similar to the long-term average of 5.2 ± 0.03 million. The 2022 estimate of ponds in Prairie Canada was 3.5 ± 0.2 million. This estimate was 21% above the 2019 estimate of 2.9 ± 0.1 million and similar to the long-term average (3.5 ± 0.02 million). The 2022 pond estimate for the northcentral U.S. was 2.0 ± 0.1 million, which was similar the 2019 estimate (2.1 ± 0.1 million) and 16% above 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 34.2 ± 0.6 million birds. This estimate was 12% below the 2019 estimate of 38.9 ± 0.7 million, which was the last year a survey was conducted and 4% below the long-term average (1955–2019). Estimated mallard (*Anas platyrhynchos*) abundance was 7.2 ± 0.2 million, which was 23% below the 2019 estimate of 9.4 ± 0.3 million and 9% below the long-term average of 7.9 ± 0.04 million. In the traditional survey area the 2022 estimate for blue-winged teal (*Spatula discors*; 6.5 ± 0.3 million) was 19% above the 2019 estimate and 27% above the long-term average of 5.1 ± 0.04 million. Estimated abundance of gadwall (*Mareca strepera*; 2.7 ± 0.1 million) was 18% below the 2019 estimate and 30% above the long-term average of 2.0 ± 0.2 million. The 2022 northern shoveler (*Spatula clypeata*) estimate of 3.0 ± 0.2 million was 17% below the 2019 estimate of 3.6 ± 0.2 million and 15% above the long-term average of 2.6 ± 0.02 million. The estimated abundance of green-winged teal (*Anas crecca*) was 2.2 ± 0.2 million, which was 32% below the 2019 estimate of 3.2 ± 0.2 million and similar to the long-term average, while the canvasback (*Aythya valisineria*) estimate of 0.6 ± 0.05 million was similar to the 2019 estimate and the long-term average. Estimated abundance of redheads (*A. americana*; 1.0 ± 0.1 million) was 35% higher than the 2019 estimate and 36% higher than the long-term average of 0.7 ± 0.01 million. Northern pintail (*Anas acuta*) abundance (1.8 ± 0.2 million) was 21% below the 2019 estimate of 2.3 ± 0.1 million and 54% below the long-term average of 3.9 ± 0.03 million. The abundance estimate for American wigeon (*Mareca americana*; 2.1 ± 0.1 million) was 25% below the 2019 estimate and 19% below the long-term average of 2.6 ± 0.02 million. The combined estimate of lesser and greater scaup (*A. affinis* and *A. marila*; 3.6 ± 0.2 million) was similar to the 2019 estimate and 28% lower than the long-term average of 5.0 ± 0.04 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 0.7 ± 0.2 million, which was similar to the 2019 estimate and 1998–2019 average. Ring-necked ducks (0.6 ± 0.1 million) and green-winged teal (0.3 ± 0.07 million) were similar to their 2019 estimates and the long-term averages. The estimate of mergansers was 0.9 ± 0.1 million, which was 13% above the 2019 estimate and 19% above the long-term average. The 2022 estimate of American black ducks in the eastern survey area was 0.8 ± 0.09 million, which was similar to the 2019 estimate of 0.7 ± 0.07 million and the 1998–2019 average. The black duck estimate at the plot survey scale, which is used for management, was 0.57 ± 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 2022 was 1.2 ± 0.16 million, which was 15% above the 2019 estimate and similar to the long-term average.

Summary of Goose and Swan Populations

Of the 20 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 ($P < 0.05$) positive trends (% change per year) during the most recent 10-year period: Western Prairie and Great Plains Populations (+4%) and Hi-line Population (+5%) Canada geese (*Branta canadensis*). Two populations had a significant negative 10-year trend: Cackling/minima (−6%) Cackling Geese (*Branta hutchinsii*) and Eastern Population (−3%) tundra swans. Of the 7 populations for which primary indices included variance estimates, the most recent estimate significantly increased from the prior year's estimate for one population: emperor geese (*Anser canagica*; +19%). Of the 3 populations for which primary indices did not include variance estimates, the most recent count was greater than the prior count for Pacific (+5%) brant (*Branta bernicla*) and Eastern Population (+10%) tundra swans and less than the prior count for Mississippi Flyway Giant Population (−12%) Canada geese.

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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 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 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

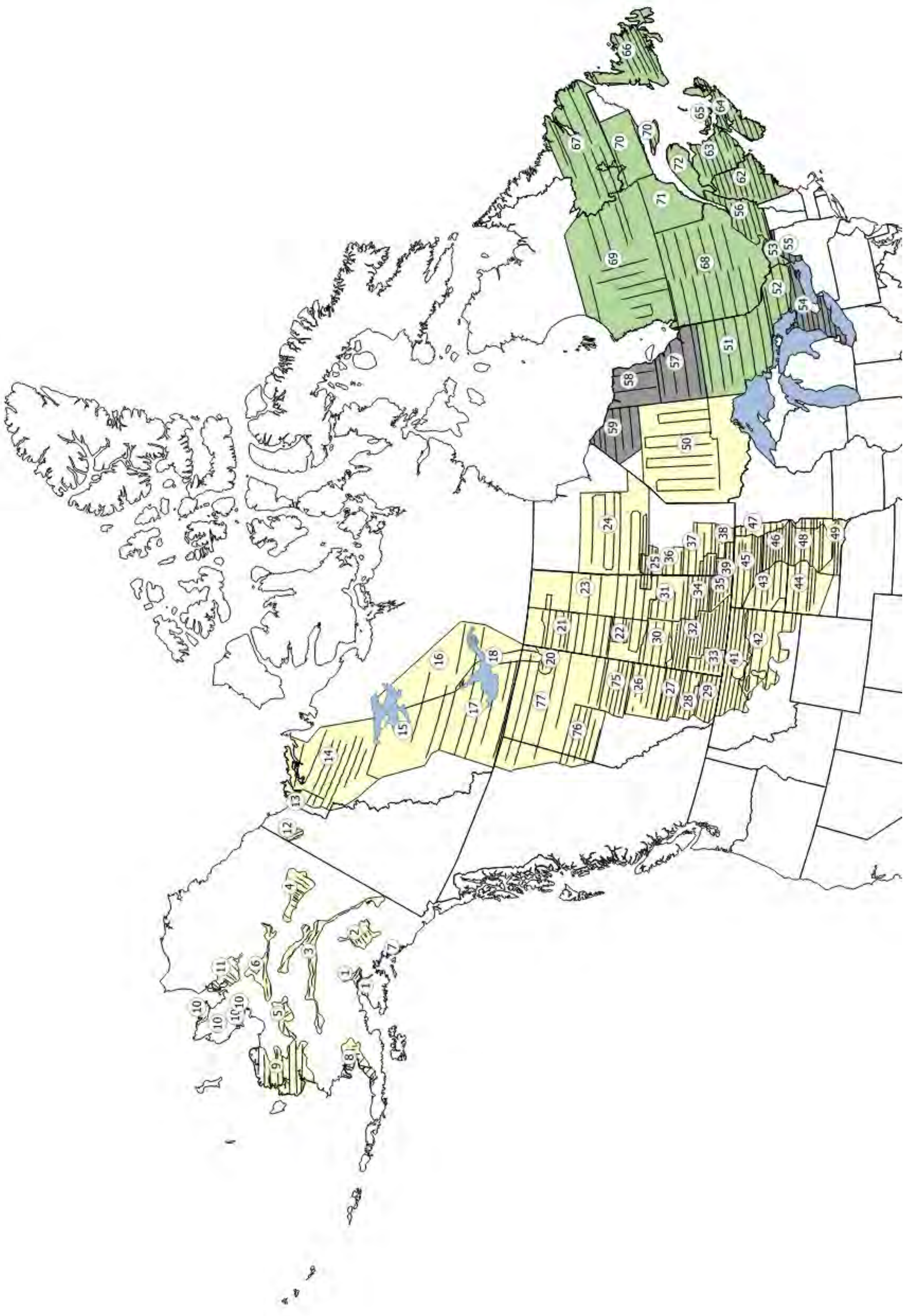

Figure 1. Strata and transects of the Waterfowl Breeding Population and Habitat Survey (yellow = traditional survey area, green = eastern survey area, grey = discontinued strata).

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.

To produce a consistent index for American black ducks, total indicated pairs are calculated using the CWS method of scaling observed pairs. The CWS scaling is based on sex-specific observations collected during 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 are then used to calculate indicated birds based on the USFWS protocol. For all other species, the USFWS definitions are used to calculate indicated pairs and indicated birds (see Zimmerman et al. 2012 for further details).

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).

Mallard Fall-flight Index

The mallard fall-flight index is a prediction of the size of the fall abundance of mallards originating from the mid-continent region of North America. For management purposes, the mid-continent population has historically been composed of mallards originating from the WBPHS traditional survey area, as well as Michigan, Minnesota, and Wisconsin. However, since 2008, the status of western mallards has been considered separately in setting regulations for the Pacific Flyway, and thus Alaska–Yukon mallards (strata 1–12) have been removed from the mid-continent stock. The fall-flight index is based on the mallard models used for adaptive harvest management and considers breeding population size, habitat conditions, adult summer survival, and the projected fall age ratio (young/adult). The projected fall age ratio is predicted from models that describe how age ratios vary with changes in spring population size and Canadian pond abundance. The fall-flight index represents a weighted average of the fall flights predicted by the four alternative models of mallard population dynamics used in adaptive harvest management (U.S. Fish and Wildlife Service 2021).

Results and Discussion

2022 Overall Habitat Conditions and Population Status

In general, habitat conditions during the 2022 WBPHS deteriorated relative to 2019, the last survey year due to the COVID-19 (SARS-CoV-2) pandemic (Figure 3). Much of the Canadian prairies were in drought status prior to spring 2022, particularly southern Alberta and southern Saskatchewan. Fall 2021 was warm and had below-average precipitation. The precipitation deficit continued into winter for most of the region except in central and eastern Manitoba. Following a cold December, the west moderated whereas Saskatchewan and Manitoba experienced well-below-average winter temperatures. The boreal regions tended to be cold as well and had average to above-average precipitation. It was a cool spring on the prairies and most regions had below-average precipitation until May, when significant precipitation fell between Regina, Saskatchewan and Winnipeg, Manitoba. The U.S. prairies experienced similar conditions, with most of Montana remaining dry like southern Alberta to the north; North Dakota received beneficial spring precipitation. Habitat conditions in

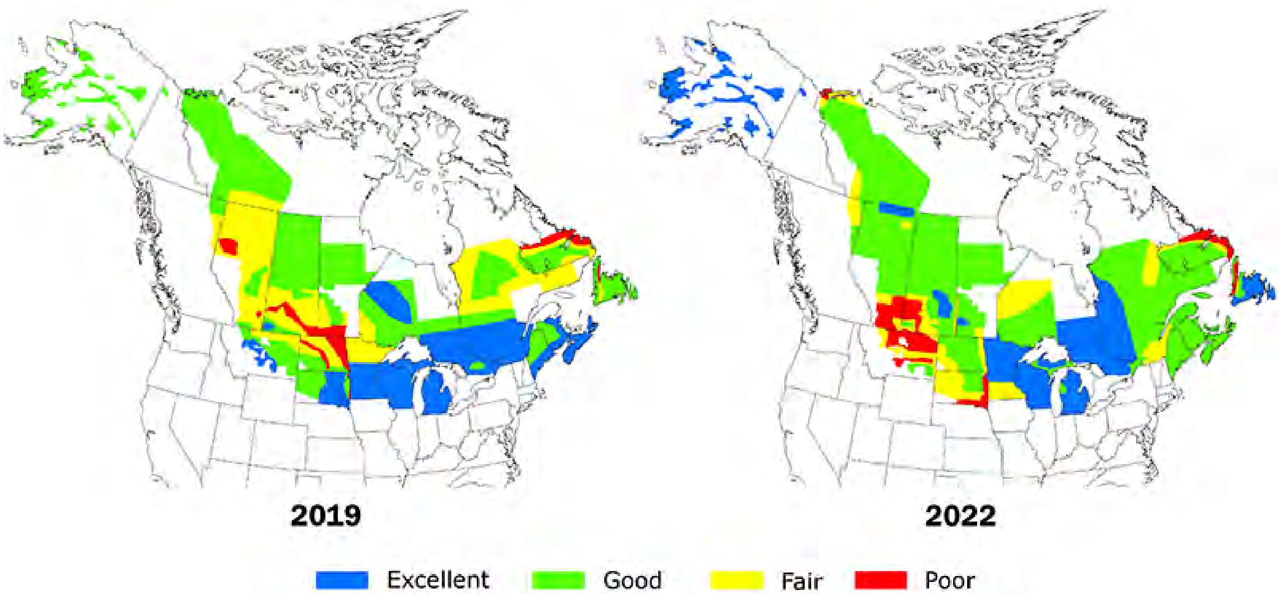

Figure 2. Breeding waterfowl habitat conditions during the 2019 and 2022 Waterfowl Breeding Population and Habitat Surveys, as judged by U.S. Fish and Wildlife Service and Canadian Wildlife Service biologists.

South Dakota improved in a northerly direction, particularly along the eastern portion. The total pond estimate (Prairie Canada and northcentral U.S. combined) was 5.5 ± 0.2 million, which was 9% higher than the 2019 estimate of 5.0 ± 0.2 million and similar to the long-term average of 5.2 ± 0.03 million (Table 1, Figure 3). The 2022 estimate of ponds in Prairie Canada was 3.5 ± 0.2 million. This estimate was 21% above the 2019 estimate of 2.9 ± 0.1 million and similar to the long-term average (3.5 ± 0.02 million). The 2022 pond estimate for the northcentral U.S. was 2.0 ± 0.1 million, which was similar the 2019 estimate (2.1 ± 0.1 million) and 16% above the long-term average of 1.7 ± 0.01 million.

In the WBPHS traditional survey area, the total duck population estimate was 34.2 ± 0.6 million birds. This estimate was 12% below the 2019 estimate of 38.9 ± 0.6 million which was the last year a survey was conducted and 4% below the long-term average (1955–2019). In the eastern Dakotas, total duck numbers were 12% below the 2019 estimate and 49% above the long-term average. The total duck estimate in the southern Alberta and southern Saskatchewan regions were 35% and 10% below the 2019 estimate and 32% and 27% below their long-term averages, respectively. In southern Manitoba, the total duck population estimate was 35% above the 2019 estimate and similar to the long-term average. The total duck estimate in central and northern Alberta–northeastern British Columbia–Northwest Territories was 26% below the 2019 estimate and similar the long-term average. The estimate in the northern Saskatchewan–northern Manitoba–western Ontario survey area was similar to the 2019 estimate and 19% below the long-term average. The total duck estimate in the Montana–western Dakotas area was 29% below the 2019 estimate and similar to the long-term average. In the Alaska–Yukon Territory–Old Crow Flats region, the total duck estimate was 47% above the 2019 estimate and similar to 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 2019

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

					Change from LTA	
Region	2022	2019	% Change	LTA[a]	%	*P*
Prairie & Parkland Canada						
S. Alberta	711	947	−25	784	−9	0.335
S. Saskatchewan	2,032	1,372	+48	2,074	−2	0.754
S. Manitoba	724	536	+35	657	+10	0.066
Subtotal	3,467	2,856	+21	3,515	−1	0.761
Northcentral U.S.						
Montana & western Dakotas	549	1,099	−50	590	−7	0.317
Eastern Dakotas	1,434	1,036	+38	1,114	+29	<0.001
Subtotal	1,983	2,135	−7	1,705	+16	0.005
Total	5,450	4,990	+9	5,230	+4	0.241

[a] Long-term average. Prairie and and Parkland Canada, 1961–2019; northcentral U.S. and Total 1974–2019.

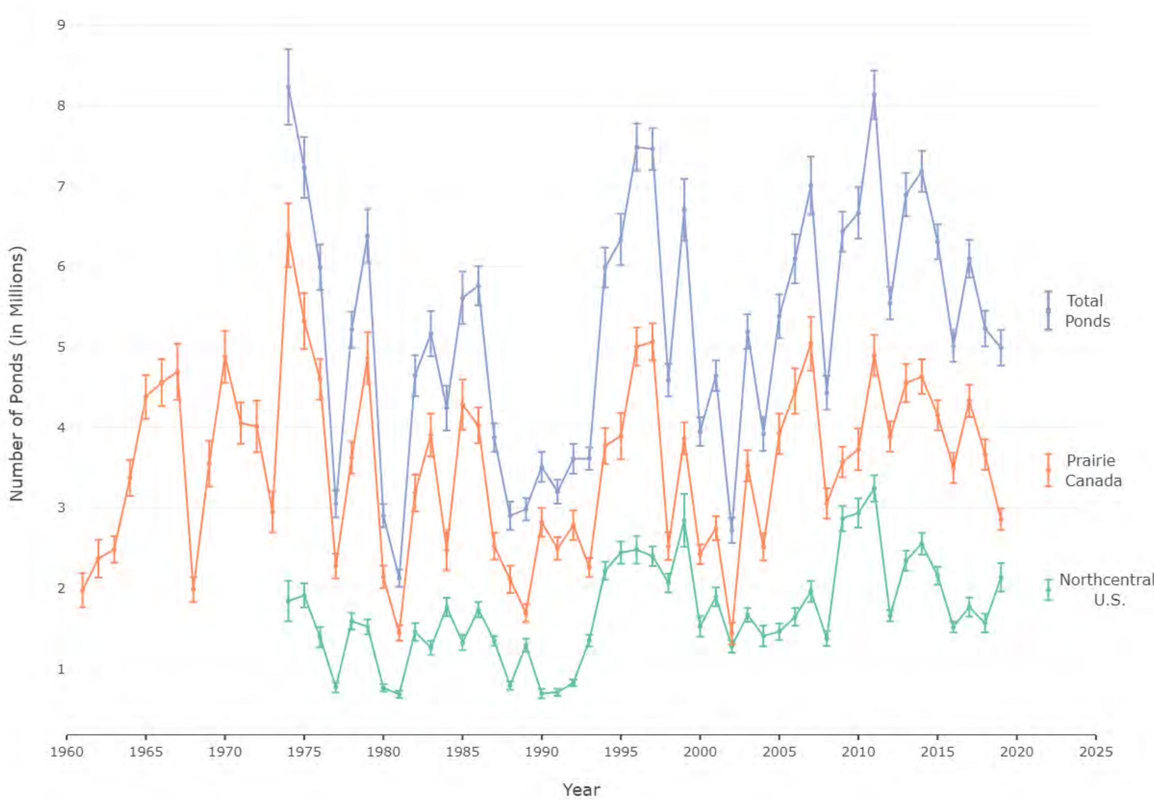

Figure 3. Number of ponds in May and 90% confidence intervals in Prairie Canada, the northcentral U.S., and both areas combined (Total ponds).

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

Region	2022	2019	% Change	LTA[b]	Change from LTA %	Change from LTA P
Alaska–Yukon Territory–Old Crow Flats	3,831	2,612	+47	3,681	+4	0.429
C. & N. Alberta–N.E. British Columbia–NWT	7,656	10,377	−26	7,540	+2	0.736
N. Saskatchewan–N. Manitoba–W. Ontario	2,788	2,460	+13	3,425	−19	<0.001
S. Alberta	2,993	4,575	−35	4,370	−32	<0.001
S. Saskatchewan	5,809	6,479	−10	7,974	−27	<0.001
S. Manitoba	1,655	1,222	+35	1,551	+7	0.186
Montana & Western Dakotas	1,716	2,404	−29	1,755	−2	0.773
Eastern Dakotas	7,762	8,771	−12	5,203	+49	<0.001
Total	34,209	38,899	−12	35,499	−4	0.037
Other regions						
British Columbia	391	409	−5	349	+12	0.565
California	380	471	−19	550	−31	0.001
Michigan	202	973	−79	627	−68	<0.001
Oregon	345	251	+37	263	+31	0.114
Washington	220	248	−12	195	+13	0.230
Wisconsin	647	585	+11	444	+46	0.048

[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, 1955–2019; years for other regions vary (see Appendix B.2)

estimate, but was 31% below the long-term average (1992–2019). Oregon's 2022 total duck estimate was 37% above the 2019 of 251,000 and similar the long-term average (1994–2019). In Washington, the total duck estimate was unchanged from the 2019 estimate and the long-term average (2010–2019). In Michigan, the total duck estimate was 79% below the 2021 estimate and 68% below the long-term average (1991–2021). Wisconsin's 2022 total duck estimate was similar to the 2021 estimate and 46% above the long-term average (1973–2021). British Columbia's total duck estimate was similar to the 2019 estimate and the long-term average (2006–2019). In Minnesota, which does not have a measure of precision for total duck numbers, the 2022 estimate of total ducks was 13% lower than the 2019 estimate and 1% below the long-term average (1968–2019).

Trends and annual breeding population estimates for 10 principal duck species for the traditional survey area are provided in this report (Tables 3–12, Figure 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 7.2 ± 0.2 million, which was 23% below to the 2019 estimate of 9.4 ± 0.3 million and 9% below the long-term average of 7.9 ± 0.04 million (Table 3). In the eastern Dakotas, the mallard estimate was 1.4 ± 0.1 million, which was 39% below the 2019 estimate of 2.4 ± 0.1 million and 31% above the long-term average of 1.1 ± 0.01 million. The

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

					Change from LTA	
Region	2022	2019	% Change	LTA[a]	%	P
Alaska–Yukon Territory–Old Crow Flats	614	361	+70	387	+59	0.001
C. & N. Alberta–N.E. British Columbia–NWT	1,219	1,701	−28	1,158	+5	0.589
N. Saskatchewan–N. Manitoba–W. Ontario	1,088	1,105	−2	1,149	−5	0.652
S. Alberta	670	972	−31	1,096	−39	<0.001
S. Saskatchewan	1,210	1,712	−29	2,111	−43	<0.001
S. Manitoba	478	441	+8	397	+20	0.080
Montana & Western Dakotas	494	771	−36	536	−8	0.218
Eastern Dakotas	1,450	2,360	−39	1,107	+31	0.001
Total	7,223	9,423	−23	7,941	−9	0.003
Other regions						
British Columbia	81	75	+9	80	+2	0.963
California	179	240	−25	334	−46	<0.001
Michigan	139	310[b]	−55	335	−59	<0.001
Minnesota	231	286	−19	230	0[c]	0.985
Oregon	79	84	−5	91	−12	0.204
Washington	87	126	−31	92	−5	0.603
Wisconsin	186	147[b]	+26	182	+2	0.871

[a] Long-term average. Traditional survey area 1955–2019; eastern survey area 1990–2019; years for other regions vary (see Appendix B.2).
[b] Estimate from a survey conducted in 2021.
[c] Rounded values mask change in value.

mallard estimate in southern Alberta (0.7 ± 0.06 million) was 31% and 39% below the 2019 estimate and the long-term average, respectively. In the central and northern Alberta–northeastern British Columbia–Northwest Territories region, the mallard estimate was 1.2 ± 0.1 million, which was 28% below the 2019 estimate of 1.7 ± 0.1 million and similar the long-term average. The estimated abundance of mallards in the Montana–western Dakotas survey area was 36% below the 2019 estimate and similar to the long-term average. In northern Saskatchewan–northern Manitoba–western Ontario survey area the mallard estimate was similar to the 2019 estimate and the long-term average. In southern Manitoba survey area, the estimate of mallards was similar to the 2019 estimate and 20% above the long-term average of 0.4 ± 0.01 million. Mallard numbers in southern Saskatchewan were 29% below the 2019 estimate and 43% below the long-term average. In the Alaska–Yukon Territory–Old Crow Flats survey area, the mallard estimate of 0.6 ± 0.07 million was 70% above the 2019 estimate and 59% above the long-term average of 0.4 ± 0.01 million.

The estimated abundance of mallards in eastern North America was 1.2 ± 0.16 million, which was 15% higher than the 2019 estimate and similar 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 (California, Oregon, Washington, British Columbia, Minnesota, Michigan, and Wisconsin; Table 3). Mallard numbers in California were similar to 2019 and 46% below the long-term average (1992–2019). The Oregon mallard estimate was similar to the 2019 estimate and to the long-term average (1994–2019). In Washington, mallard numbers were 31% below the 2019 estimate and similar the long-term average (2010–2019). British Columbia mallard numbers were similar to the 2019 estimate and the long-term average (2006–2019). Minnesota mallard numbers were similar to last year and unchanged from the long-term average (1968–2019). In Michigan, the 2022 mallard estimate was 55% below the 2021 estimate and 59% below the long-term average (1991–2021). Wisconsin mallard numbers were 26% higher than the 2021 estimate and similar to the long-term average (1973–2021). Mallard estimates are generally provided for Nevada, however, logistical constraints prevented a survey from being conducted in 2022.

In the traditional survey area the 2022 estimate for blue-winged teal (6.5 ± 0.3 million) was 19% above the 2019 estimate and 27% above the long-term average of 5.1 ± 0.04 million (Table 7). Estimated abundance of gadwall (2.7 ± 0.1 million) was 18% below the 2019 estimate and 30% above the long-term average of 2.0 ± 0.2 million (Table 4). The 2022 northern shoveler estimate of 3.0 ± 0.2 million was 17% below the 2019 estimate of 3.6 ± 0.2 million and 15% above the long-term average of 2.6 ± 0.02 million (Table 8). The estimated abundance of green-winged teal was 2.2 ± 0.2 million, which was 32% below the 2019 estimate of 3.2 ± 0.2 million and similar to the long-term average (Table 6), while the canvasback estimate of 0.6 ± 0.05 million was similar to the 2019 estimate and the long-term average (Table 11). Estimated abundance of redheads (1.0 ± 0.1 million) was 35% higher than the 2019 estimate and 36% higher than the long-term average of 0.7 ± 0.01 million (Table 10). Northern pintail abundance (1.8 ± 0.2 million) was 21% below the 2019 estimate of 2.3 ± 0.1 million and 54% below the long-term average of 3.9 ± 0.03 million (Table 9). The abundance estimate for American wigeon (2.1 ± 0.1 million) was 25% below the 2019 estimate and 19% below the long-term average of 2.6 ± 0.02 million (Table 5). The combined estimate of lesser and greater scaup (3.6 ± 0.2 million) was similar to the 2019 estimate and 28% lower than the long-term average of 5.0 ± 0.04 million (Table 12).

In the eastern survey area, the estimate of goldeneyes was 0.7 ± 0.2 million, which was similar to the 2019 estimate and the 1998–2019 average. Ring-necked ducks (0.6 ± 0.1 million) and green-winged teal (0.3 ± 0.07 million) were similar to their 2019 estimates and the long-term averages. The estimate of mergansers was 0.9 ± 0.1 million, which was 13% above the 2019 estimate and 19% above the long-term average (Table 13, Figure 5, Appendix B.5). The 2022 estimate of American black ducks in the eastern survey area was 0.8 ± 0.09 million, which was similar to the 2019 estimate of 0.7 ± 0.07 million and the 1998–2019 average. The black duck estimate at the plot survey scale, which is used for management, was 0.57 ± 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 52,500, which was 26% above the 2021 estimate and 8% below the long-term (1993–2021) average of 56,700. These northeastern state estimates for American black ducks are not explicitly integrated with the eastern survey area as is done for mallards. The USFWS and black duck joint venture are currently working on integrating these data to derive a more comprehensive estimate of population status.

Trends in wood duck populations are available from the North American Breeding Bird Survey (BBS). The BBS, a series of roadside routes surveyed during May and June each year, provides the only long-term range-wide breeding population index for this species. Wood ducks are encountered with low frequency along BBS routes, which limits the amount and quality of available information (Sauer and Droege 1990). However, hierarchical analysis of these data (J. Sauer, U.S. Geological Survey Biological Re-

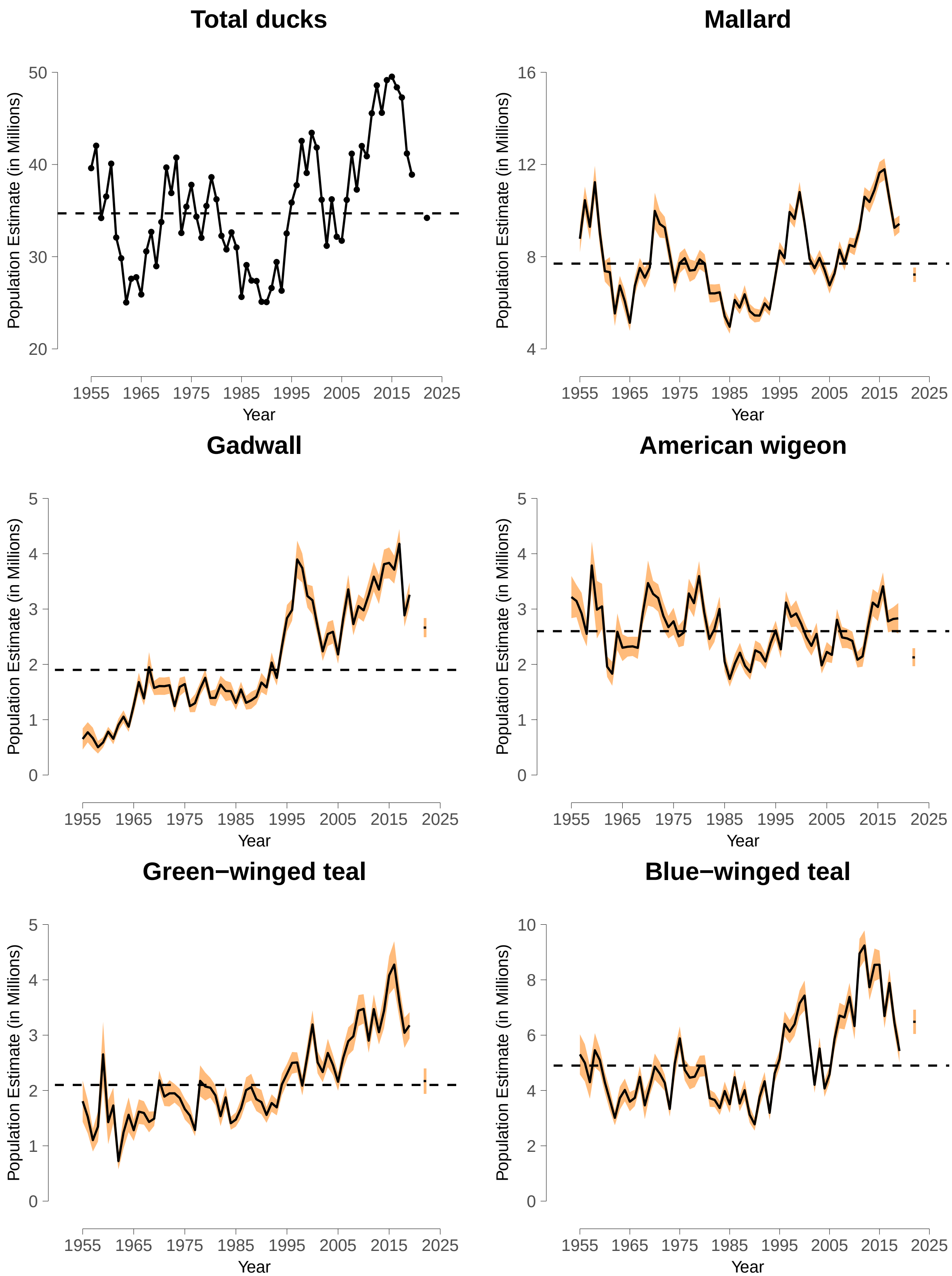

Figure 4. Breeding population estimates, 90% confidence intervals, and North American Waterfowl Management Plan population goals (dashed line; North American Waterfowl Management Plan Committee 2014) for selected species in the traditional survey area (strata 1–18, 20–50, 75–77).

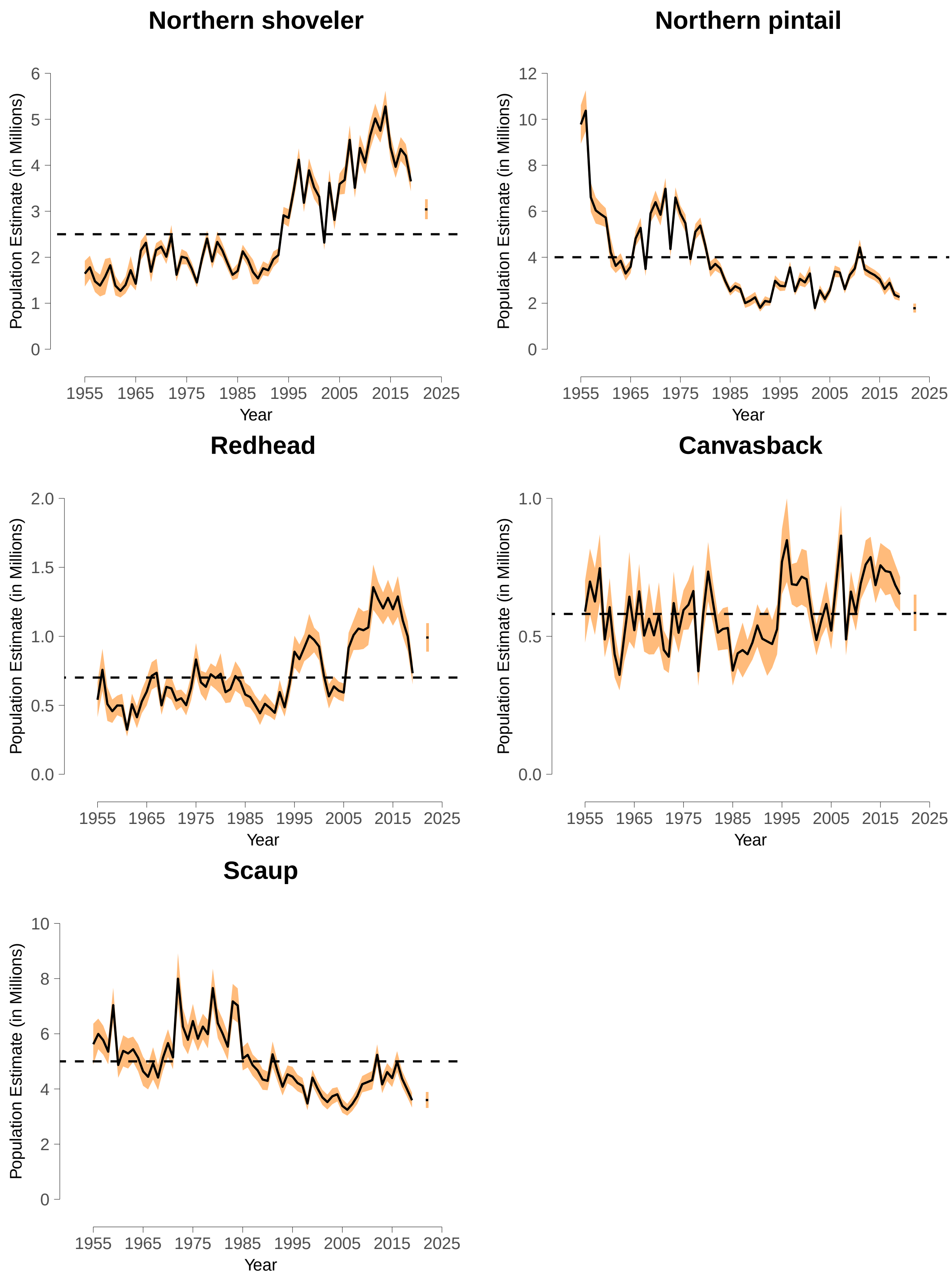

Figure 4. Continued.

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

Region	2022	2019	% Change	LTA[a]	Change from LTA %	Change from LTA *P*
Alaska–Yukon Territory–Old Crow Flats	17	0	*n/a*	2	+781	0.011
C. & N. Alberta–N.E. British Columbia–NWT	101	77	+31	52	+96	0.043
N. Saskatchewan–N. Manitoba–W. Ontario	11	4	+152	25	−57	0.008
S. Alberta	416	592	−30	345	+21	0.229
S. Saskatchewan	852	1,107	−23	700	+22	0.023
S. Manitoba	143	140	+2	81	+77	<0.001
Montana & Western Dakotas	218	409	−47	228	−5	0.759
Eastern Dakotas	906	928	−2	615	+47	0.001
Total	2,665	3,259	−18	2,048	+30	<0.001

[a] Long-term average, 1955–2019.

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

Region	2022	2019	% Change	LTA[a]	Change from LTA %	Change from LTA *P*
Alaska–Yukon Territory–Old Crow Flats	734	398	+84	558	+31	0.004
C. & N. Alberta–N.E. British Columbia–NWT	740	1,555	−52	950	−22	0.032
N. Saskatchewan–N. Manitoba–W. Ontario	205	107	+92	223	−8	0.642
S. Alberta	158	251	−37	276	−43	<0.001
S. Saskatchewan	140	240	−42	393	−64	<0.001
S. Manitoba	13	13	+5	50	−73	<0.001
Montana & Western Dakotas	81	152	−47	112	−28	0.155
Eastern Dakotas	56	116	−52	62	−10	0.570
Total	2,127	2,832	−25	2,626	−19	<0.001

[a] Long-term average, 1955–2019.

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

Region	2022	2019	% Change	LTA[a]	Change from LTA %	Change from LTA P
Alaska–Yukon Territory–Old Crow Flats	331	416	−21	419	−21	0.066
C. & N. Alberta–N.E. British Columbia–NWT	1,075	1,681	−36	912	+18	0.308
N. Saskatchewan–N. Manitoba–W. Ontario	213	219	−3	200	+6	0.683
S. Alberta	175	301	−42	208	−16	0.497
S. Saskatchewan	236	277	−15	279	−15	0.184
S. Manitoba	41	72	−43	57	−28	0.004
Montana & Western Dakotas	68	45	+52	41	+66	0.096
Eastern Dakotas	32	167	−81	64	−51	<0.001
Total	2,170	3,178	−32	2,179	0[b]	0.961

[a] Long-term average, 1955–2019.
[b] Rounded values mask change in value.

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

Region	2022	2019	% Change	LTA[a]	Change from LTA %	Change from LTA P
Alaska–Yukon Territory–Old Crow Flats	11	0	*n/a*	1	+751	0.348
C. & N. Alberta–N.E. British Columbia–NWT	670	711	−6	293	+129	0.001
N. Saskatchewan–N. Manitoba–W. Ontario	75	5	+1,339	222	−66	<0.001
S. Alberta	454	707	−36	652	−30	0.002
S. Saskatchewan	1,210	932	+30	1,450	−17	0.037
S. Manitoba	351	158	+123	372	−6	0.570
Montana & Western Dakotas	440	198	+122	312	+41	0.256
Eastern Dakotas	3,273	2,717	+20	1,805	+81	<0.001
Total	6,485	5,428	+19	5,107	+27	<0.001

[a] Long-term average, 1955–2019.

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

					Change from LTA	
Region	2022	2019	% Change	LTA[a]	%	P
Alaska–Yukon Territory–Old Crow Flats	374	322	+16	300	+24	0.056
C. & N. Alberta–N.E. British Columbia–NWT	410	335	+23	247	+66	0.123
N. Saskatchewan–N. Manitoba–W. Ontario	15	20	−25	38	−60	<0.001
S. Alberta	343	716	−52	449	−24	0.009
S. Saskatchewan	732	820	−11	803	−9	0.350
S. Manitoba	141	60	+134	113	+26	0.086
Montana & Western Dakotas	234	309	−24	178	+31	0.151
Eastern Dakotas	792	1,067	−26	509	+55	<0.001
Total	3,041	3,649	−17	2,638	+15	0.017

[a] Long-term average, 1955–2019.

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

					Change from LTA	
Region	2022	2019	% Change	LTA[a]	%	P
Alaska–Yukon Territory–Old Crow Flats	786	431	+83	908	−13	0.369
C. & N. Alberta–N.E. British Columbia–NWT	297	530	−44	376	−21	0.066
N. Saskatchewan–N. Manitoba–W. Ontario	14	3	+328	35	−59	0.003
S. Alberta	69	133	−48	637	−89	<0.001
S. Saskatchewan	92	164	−44	1,086	−92	<0.001
S. Manitoba	17	14	+20	95	−82	<0.001
Montana & Western Dakotas	89	373	−76	255	−65	<0.001
Eastern Dakotas	418	622	−33	506	−18	0.057
Total	1,783	2,268	−21	3,898	−54	<0.001

[a] Long-term average, 1955–2019.

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

					Change from LTA	
Region	2022	2019	% Change	LTA[a]	%	P
Alaska–Yukon Territory–Old Crow Flats	9	0	*n/a*	1	+513	0.059
C. & N. Alberta–N.E. British Columbia–NWT	84	61	+39	41	+103	0.129
N. Saskatchewan–N. Manitoba–W. Ontario	12	4	+210	24	−51	0.004
S. Alberta	122	172	−29	133	−8	0.710
S. Saskatchewan	233	173	+35	239	−3	0.831
S. Manitoba	95	31	+208	76	+25	0.481
Montana & Western Dakotas	26	8	+215	11	+132	0.349
Eastern Dakotas	410	283	+45	201	+103	<0.001
Total	991	732	+35	728	+36	0.001

[a] Long-term average, 1955–2019.

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

					Change from LTA	
Region	2022	2019	% Change	LTA[a]	%	P
Alaska–Yukon Territory–Old Crow Flats	32	78	−60	84	−62	<0.001
C. & N. Alberta–N.E. British Columbia–NWT	119	106	+12	78	+52	0.083
N. Saskatchewan–N. Manitoba–W. Ontario	22	25	−13	50	−57	0.001
S. Alberta	74	133	−45	67	+10	0.757
S. Saskatchewan	190	160	+19	201	−5	0.734
S. Manitoba	79	56	+41	57	+39	0.153
Montana & Western Dakotas	14	30	−54	10	+34	0.440
Eastern Dakotas	55	64	−13	43	+28	0.280
Total	585	652	−10	591	−1	0.896

[a] Long-term average, 1955–2019.

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

Region	2022	2019	% Change	LTA[a]	Change from LTA %	Change from LTA P
Alaska–Yukon Territory–Old Crow Flats	678	499	+36	886	−23	0.001
C. & N. Alberta–N.E. British Columbia–NWT	1,803	1,793	+1	2,502	−28	<0.001
N. Saskatchewan–N. Manitoba–W. Ontario	407	259	+57	532	−23	0.051
S. Alberta	271	352	−23	328	−17	0.379
S. Saskatchewan	250	353	−29	417	−40	0.001
S. Manitoba	55	69	−21	124	−56	<0.001
Montana & Western Dakotas	23	30	−25	47	−51	<0.001
Eastern Dakotas	112	235	−53	133	−16	0.243
Total	3,599	3,591	0[b]	4,968	−28	<0.001

[a] Long-term average, 1955–2019.
[b] Rounded values mask change in value.

sources Division, unpublished data) incorporated adjustments for spatial and temporal variation in BBS route quality, observer skill, and other factors that may affect detectability (Link and Sauer 2002). This analysis also produces annual abundance indices and measures of variance, in addition to the trend estimates (average % change per year) and associated 95% credible intervals (LCL, UCL in parentheses following trend estimates) presented in this report. In the Atlantic and Mississippi flyways combined, the BBS wood duck index increased by an average of 1.19% per year (0.79%, 1.59%) over the entire survey period (1966–2021), 0.68% (-0.07%, 1.48%) over the past 20 years (2002–2021), and 1.4% (0.01%, 2.95%) over the most recent (2012–2021) 10-year period. The Atlantic Flyway wood duck index increased 0.83% (0.25%, 1.36%) annually over the entire time series (1966–2021), 0.73% (-0.29%, 1.79%) over the past 20 years (2002–2021), and 1.06% (-0.91%, 3.12%) from 2012 to 2021. In the Mississippi Flyway, the corresponding BBS wood duck indices increased by 1.4% (0.86%, 1.93%, 1966–2021), 0.64% (-0.35%, 1.69%, 2002–2021), and 1.56% (-0.29%, 3.60%, 2012–2021; J. Sauer, 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 2022 estimate of wood ducks in the Atlantic Flyway was 1.0 ± 0.02 million which was similar to the long-term average of 0.9 ± 0.06 million.

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/2022-waterfowl-breeding-population-and-habitat-surveys-field-reports).

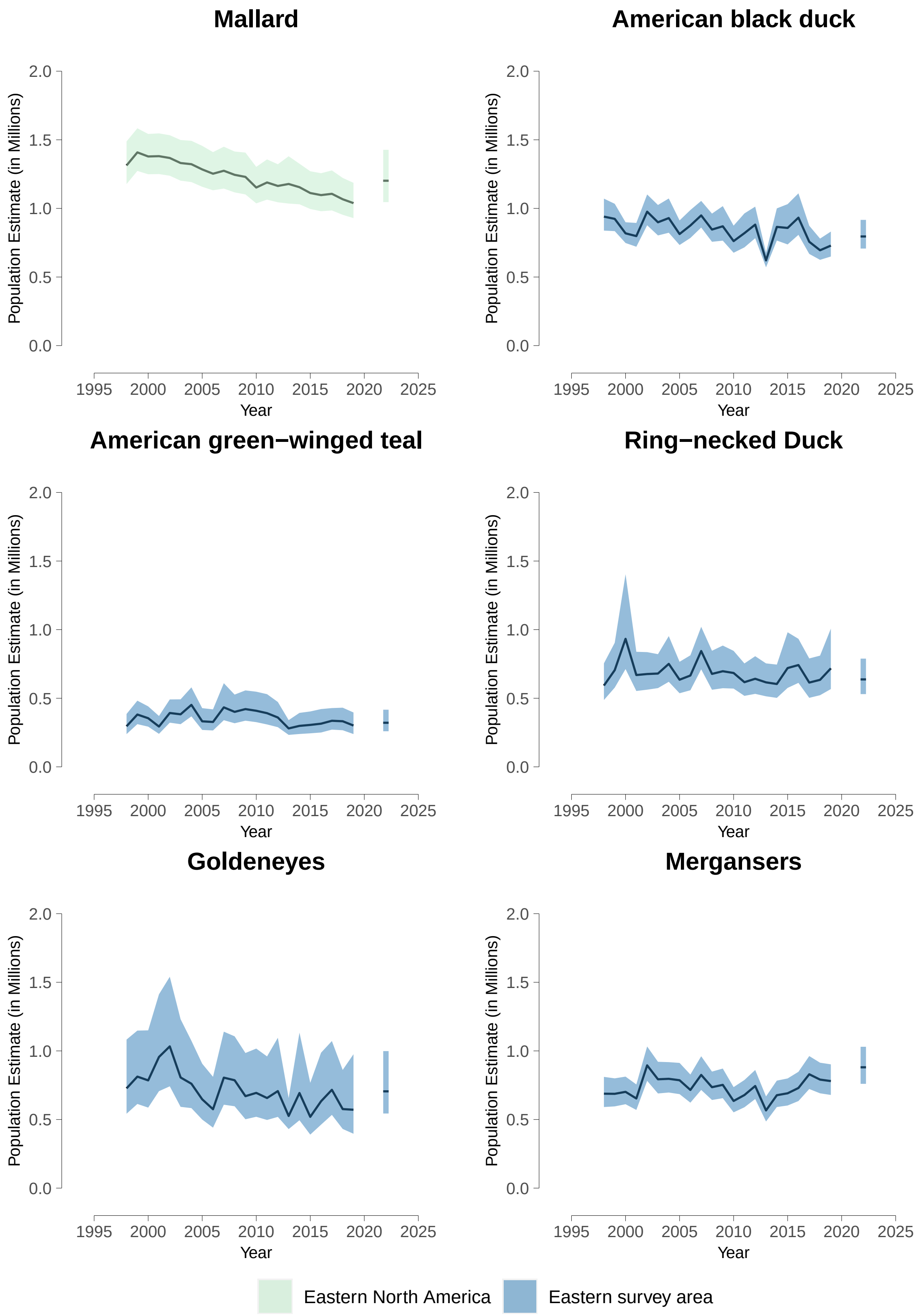

Figure 5. Breeding population estimates and 90% credible intervals from Bayesian hierarchical models for species in the eastern survey area. Time series are presented for two spatial scales: eastern survey area (Blue; strata 51–53, 56, 62–72 for black ducks, green-winged teal, ring-necked ducks, goldeneye,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

	2022	2019	% Change from 2019	Average[a]	% Change from average
Mallard	1,202	1,038	+15[b]	1,229	−3
American black duck	796	729	+9	844	−7
American green-winged teal	321	301	+7	354	−10
Ring-necked duck	637	718	−11	687	−8
Goldeneyes (common and Barrow's)	705	571	+23	712	−1
Mergansers (common, red-breasted, and hooded)	880	780	+13[b]	734	+19[b]

[a] Average for 1998–2019
[b] Indicates significant change. Significance ($P \leq 0.10$) determined by non-overlap of Bayesian credibility intervals.

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

Fall 2021 began in southern Alberta with drought conditions. Eastern areas of the province experienced between 40–75% of normal precipitation whereas western areas were average in October 2021. Through the rest of fall 2021 into spring 2022 there was a north-south precipitation pattern, with a division around Edmonton. Areas south of Edmonton received less than 40% of normal precipitation. South and east of Calgary had the lowest precipitation. Precipitation north of Edmonton was average to well-above average (100–200%+). Precipitation was greatest in the vicinity of Grand Prairie where above-average precipitation fell October 2021–March 2022. Fall temperatures were average to above average followed by a brutally cold December 2021. Temperatures moderated in January and remained around average until spring when they were slightly below average (−4 to 0°C). Overall, waterfowl habitat improved in a northerly direction from the Canada/US border. Habitat conditions were considered poor for southern Alberta and east of Calgary in strata 27–29. Areas to the north of Calgary in strata 27 and 26 south of Edmonton improved to fair based on a modest increase in moisture, although many wetlands were less than 50% full. Good habitat was observed west and north of Edmonton and continued north near Lac la Biche and Grand Prairie.

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

Drought conditions greeted the southern Saskatchewan crew upon their long-awaited return to the province. Below-average precipitation fell from August 2021 through February 2022. Average to above-average precipitation was recorded from late winter into spring 2022 but only provided localized relief. Temperatures were slightly above-average (0–2°C) from late summer through fall 2021. Below-average temperatures (−2 to −5°C) were recorded in December 2021 and January 2022 was average. The rest of winter and all of spring had below- to well-below-average temperatures (−2 to greater than −5°C) across the crew area. Phenology was delayed about 7 to 10 days. Snow drifts in ravines and north-facing slopes are common at the start of the survey but persisted through the entire survey due to the below-average temperatures. Severe to extreme drought was observed in the western half of the province. No ephemeral or temporary wetlands were present and the more seasonal and semi-permanent wetlands in the Missouri Coteau were also very low to dry. Spring rains did add sheetwater and provide seasonal wetlands on the Regina Plain but these conditions came too late to benefit the majority of pintails. Semi-permanent wetlands and even some permanent lakes were visibly low. Poor to fair production was expected over most of the western and central grasslands. The long-term drought has created a large moisture deficit that only continuous above-average precipitation can moderate. The Parklands were in better shape and good production can be expected, with a pocket of excellent conditions in the northeast Parklands that benefited from spring precipitation. Wetland drainage continued across the province but was particularly evident in the northeast Parklands. Clearing trees and opening the eastern aspen forests to agricultural fields also appeared to be more widespread.

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

Southern Manitoba and southeastern Saskatchewan were recovering from severe drought conditions experienced in recent years. Most areas were no longer in drought status; however, some areas along the Saskatchewan-Manitoba border and northwestern areas of southern Manitoba, north of Brandon, remained abnormally dry. Fall and winter precipitation ranged from average to above average in some areas, with areas in eastern Manitoba greater than 200% above normal during February 2022. Winter temperatures were generally below average (−4 to 0°C), but February and March were well-below average (greater than 5°C) in some locations. Ice persisted on many waterbodies, including Lake Manitoba and Lake Winnipeg, throughout May and snowfall was recorded into mid-May. Spring precipitation was above average (150–200%) in most areas and spring temperatures continued to be well-below average (greater than 5°C). Spring precipitation in stratum 38 and the Red River Valley was 300% above average, which resulted in extensive flooding. Stratum 39 has greatly improved, and conditions are good to excellent due to plentiful seasonal wetlands, full semi-permanent wetlands with decent vegetative margins, and full dugouts. Similar improved habitat conditions continued into southeastern Saskatchewan (stratum 35), but some drier areas remained near the Saskatchewan-Manitoba border. Seasonal wetlands and sheetwater were plentiful, even in the normally drier areas south of Regina. Extensive clearing of wetlands during the drought occurred in northeastern areas of stratum 35 near the border of Manitoba, limiting available waterfowl habitat. Stratum 34 was rated excellent with extensive semi-permanent and permanent wetlands and an increased presence of seasonal wetlands and sheetwater. Overall, conditions have improved and delayed agricultural activities should benefit breeding waterfowl.

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 below-average precipitation since fall 2021. October and November were especially dry (25–50%). Conditions improved slightly in December 2021, but January 2022 was another below-average month (<75%). Great Falls and Malta received near-average precipitation during February and March 2022; however, other areas again were below average (50–75%). Above-average precipitation was recorded east of Malta during April, but areas to the west received well-below-average rainfall (<50%). Generally, very few areas consistently recorded enough precipitation to improve drought conditions. Poor habitat conditions were exacerbated by the hold-over drought from 2021. Many wetlands were either dry or below 20% capacity. April and May storms increased wetland numbers near the Missouri River but it came too late to benefit breeding waterfowl. Poor waterfowl production was expected in stratum 41.

Moderate to extreme drought persisted across southern Montana (stratum 42) from summer 2021 through May 2022. Several blizzards and rain in late April across the very southeast corner of the stratum brought some relief to drought conditions. Sheetwater and full stock ponds were observed, providing good waterfowl nesting and brood-rearing habitat conditions. With grazing the primary land-use type through the middle of the stratum, upland nesting cover was available. This area was rated fair because stock ponds had some water remaining. The northern third of the stratum had dry stock ponds and creeks and was rated poor.

Western portions of the Dakotas (strata 43 & 44) remained in some level of drought. Habitat conditions improved substantially with April 2022 snowfall and rainfall into May. While conditions were not as good west of the Missouri River as to the east, continued spring precipitation should vastly improve habitats. Fair production was predicted in these strata.

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

Habitat conditions in the eastern Dakotas crew area improved in a northerly direction. Much of the two-state region had been in severe to extreme drought over the past three years but recent precipitation benefited conditions. Precipitation since fall 2019 was well below average in South Dakota. Two severe blizzards occurred in April 2022 and above-average rainfall continued into May, filling many eastern South Dakota wetlands. Stratum 49 had experienced severe flooding in 2018 and 2019 but now is the driest area of the state despite recent moisture. Winter temperatures were average to above average whereas below-average temperatures were recorded from April 2022 through the survey. A good frost seal and average to above-average snowfall and spring rains dramatically improved eastern North Dakota habitats. Many wetlands north of Interstate 94 that were low or dry in 2019 were nearly or completely full. Similar conditions occurred in the coteau and improvement was noted in the drift plain region of North Dakota. Seasonal wetlands in both states, however, have been plowed during the drought period, offering little quality waterfowl habitat.

In strata 48 and 49 in South Dakota, conditions were good west of the James River and fair to the east. Most wetlands were >50% full and all streams and rivers were flowing, with some flooding along the James, Vermillion, and Big Sioux rivers. Dry conditions persisted south of Huron, improved between Huron and Aberdeen, and improved considerably around Aberdeen and farther north. Production should be average to above average in South Dakota.

Conditions were considerably wetter moving northward in strata 45 and 46 in North Dakota, with most of the state considered good. Permanent and semi-permanent wetlands were 50–100% full, and Devil's Lake and Lake Sakakawea had exposed beaches, an improvement from extreme flooding a few years ago. Stratum 47 remained dismal as most segments were void of wetlands and waterfowl.

Overall, the eastern Dakotas crew area was rated good. The coteau regions of both states were rated good and should produce average numbers of waterfowl. While North Dakota improved greatly to good and should produce average to above-average production, South Dakota ranged from poor to good and will have mixed production.

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

Northern Saskatchewan and norther Manitoba (strata 21–25) generally experienced below-average temperatures and varied precipitation amounts since September 2021. With the exception of above-average temperatures (0–3°C) in October and November 2021, winter temperatures ran below average, with December 2021–February 2022 extremely cold (−3 to −5°C), and remained slightly below average through May 2022. It was cooler than normal during the survey and phenology and waterfowl migration was slightly delayed. There seemed to be more snow geese staging in the Parklands and some swan flocks were observed in stratum 25. The region received generally average fall precipitation in Saskatchewan with lower amounts farther east into Manitoba. Winter precipitation was well-above average (100–200%), especially in the southern boreal region, and was only below average (60–85%) in the far northeast around Gillam, MB. Spring 2022 started out dry with slightly-below to well-below average precipitation but May 2022 was substantially wetter (150–200%+), except through north-central Saskatchewan from La Ronge north to Key Lake, which was below average. Forest fires were non-existent during the survey. Boreal wetland water levels seemed to have improved since 2019 and the Parklands continued to exhibit good wetland conditions. Overall, good habitat conditions were expected across the crew area.

Western Ontario (stratum 50) started off warm and dry before cold and wet conditions prevailed. Fall 2021 was generally warm and much of the region had below-average precipitation (40–85%). Only northern Ontario had average to above-average fall precipitation. Winter started off with average temperatures, but from January through April temperatures were below average (−3 to 0°C), with February 2022 extremely cold (below −5°C). Winter precipitation was mainly average, except closer to Lake Superior where well-above-average precipitation (greater than 200%) was recorded. Spring was cool and the wet conditions continued. Ice persisted on many northern lakes and phenology was delayed, which resulted in only fair conditions. The western portion of the stratum was rated fair also due to flooding. Despite abundant precipitation in the southern and eastern areas, this region was considered good.

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

Northern Alberta and Northwest Territories generally received average to above-average precipitation and varied temperatures since fall 2021. Following an extremely warm October 2021 (greater than 5°C) with below-average precipitation, November temperatures were generally average before an extremely cold December was recorded (greater than −5°C). January 2022 moderated to average temperatures but another cold spell similar to December hit in February. Spring temperatures were slightly cooler (0–4°C) and phenology appeared slightly delayed. Winter precipitation was well-above average (greater than 150%) whereas spring precipitation was average to above average. Between Fort Chipewyan, AB, and Hay River, NT, above-average precipitation led to full wetlands and widespread riverine flooding. The Peace-Athabasca Delta was impacted significantly, resulting in marginal waterfowl-nesting habitat conditions. The Mackenzie River Delta, despite experiencing normal weather conditions, suffered due to the abundant precipitation farther downstream. River levels were well-above normal, causing deep flooding that offered little suitable waterfowl nesting habitat. Conditions in the far southwestern region of the crew area were a contrast. Fort Nelson, BC, residents bemoaned the drier conditions and were bracing for potential wildfires. Many temporary wetland were dry and semi-permanent wetlands had low water levels, with conditions rated as poor.

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

Alaska experienced above-average snowfall and a very dry spring 2022. Near record-low precipitation was recorded for interior Alaska in April and May 2022 precipitation in western and south-central Alaska was among the five lowest on record. April and May temperatures were generally below normal statewide but by the end of May had increased rapidly in western and south-central regions. The second-warmest June was recorded in south-central Alaska. Interior Alaska remained below average during spring and phenology was slightly delayed. Only strata 11 and 12 still had frozen lakes during the survey but many smaller wetlands were open. Moderate flooding was observed in some regions but did not limit nesting habitat. Wildfire activity started in April and progressed rapidly due to dry and windy conditions and rising temperatures. Waterfowl production was expected to be good across the region.

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

The majority of south-central and northeastern Ontario experienced average precipitation (85–115%) between 1 November 2021 and 31 March 2022. Some pockets along the Lake Superior eastern shoreline had above-average precipitation (115–150%) while central stratum 52 was below average (60–85%). Southern areas had above-average precipitation (115–150%) in April while the leeward side of Georgian Bay received well-above-average precipitation (115–200%), with extremely high precipitation (greater than 200%) along the Lake Superior eastern shoreline. May was near normal, with pockets of below-average precipitation (60–85%) in the southern areas of stratum 52 and above average (115–150%) along western portions of stratum 51, where localized flooding was observed. Spring temperatures were generally average (0–2°C) but above average in northeastern stratum 51. No ice remained on ponds, lakes, and wetlands on any plots with flowing creeks and outflows and little leaf-out. Habitat conditions were considered excellent.

Strata 53 and 56 conditions were similar but stratum 56 had a wetter spring. Fall 2021 was very dry (40–85%) and temperatures were average to 3–4°C above average. December 2021 had average precipitation and slightly above-average temperatures (0–3°C). January was dry (40–85%) with below-average temperatures (2–4°C) in both strata. February through April was much wetter (115–200%) overall in both strata but March was average in stratum 53 whereas stratum 56 had pockets of well-above-average precipitation (150-greater than 200%) in March and April. Stratum 53 was rated as good whereas 56 was considered fair.

Fall 2021 in southern Quebec (strata 68, 71–72) was generally warm with below-average precipitation (40–85%), except the east was average to slightly above average (85–115%). Winter was very cold (−2 to −5°C) with above-average to well-above-average precipitation (115-greater than 200%). March was particularly snowy, especially in Saugenay—Lac-Saint-Jean and the North Shore. Below-average temperatures (−2 to 0°C) in April delayed snow melt into May. April 2022 snow cover (214mm) was one of the highest. Water levels were high when breeding waterfowl arrived and survey timing was adjusted to fit the local late spring melt.

It was a late spring in northern Quebec (stratum 69). Solid ice cover persisted on all lakes until last weeks of May. Despite lighter-than-average snowfall, wetlands in the middle and western of the stratum were well charged and rated as good. The east was drier, and habitats were considered fair. Excellent habitat conditions were recorded in the southwest corner of the stratum.

Winter and spring precipitation helped reverse two years of abnormally dry wetland conditions throughout the Maine and Atlantic Canada crew area. Habitats in Maine and the Maritime Provinces were generally good. Newfoundland and Labrador had average to above-average snowfall (85–200%). With the exception of higher elevations of the northern peninsula, Newfoundland habitats were ice free and were rated as generally excellent, with higher water levels in the northern portion of the island. Wintery conditions persisted across Labrador during the survey. Eastern and southeastern coastal as well as the northernmost reaches of the survey stratum still had heavy snow cover and many wetlands and lakes remained ice covered in early June. Waterfowl production in these areas was characterized as poor—fair. Even with delayed phenology interior Labrador was ice free and flooding into forested margins of creeks and lakes was observed, resulting in mostly good conditions.

Other areas

Pacific Flyway breeding-waterfowl habitat conditions improved due to late-winter and spring precipitation in some areas but remained dire elsewhere. Northwest Oregon habitat conditions were excellent following above-average late-winter and spring precipitation. The northeast portion benefited as well and was rated as good, however, central and southeast Oregon improved

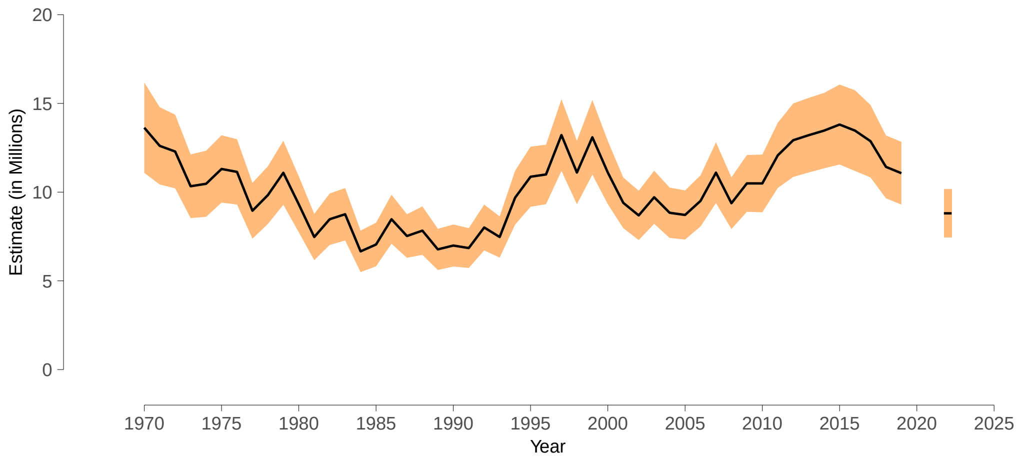

Figure 6. Estimates and 90% confidence intervals for the predicted size of the mallard population in the fall.

slightly from 2021 but remained fair to poor. California remained in a multi-year drought. Winter and spring precipitation was as much as 89% below average. Snowpack was below normal and water allocations were expected to be significantly reduced, resulting in poor habitat conditions. Conditions across British Columbia this year were very delayed with lots of snow remaining on the landscape and many of the ponds at higher elevations still frozen. Estimates of mallards in California, Oregon, and British Columbia were similar to their 2019 estimates and their long-term averages. The estimate of mallards in Washington was 31% below the 2019 estimate, but remained similar to their long-term average.

The midwestern U.S. was generally wet with colder-than-normal spring temperatures across the northern regions. Minnesota recorded the fourth wettest year on record since waterfowl surveys began in 1968. Spring thaw was near median date for the southern one third of the state but as much as two- to three-weeks late across the remainder of the state. Despite the late thaw, northern habitat conditions were rated as excellent, and the south was fair. Michigan habitat conditions remained excellent. The statewide wetland index declined slightly but remained 2% above its long-term average. Great Lakes water levels remained above their long-term average but had declined slightly from 2021. Wisconsin experienced wet conditions similar to elsewhere in the Great Lakes. Wetland abundance increased nearly statewide from 2021 and all regions remained above the long-term average. Excellent production was expected.

In the northeast U.S., the winter of 2022 had above average temperatures but was much drier than average. New England was four inches below normal precipitation for the year by May 1, and April was one inch below normal. Dry conditions continued through mid-April in the mid-Atlantic. April temperatures fluctuated markedly but were predominantly cool resulting in spring chronology that was 7–10 days late. Rainfall after mid-April was about average with water levels below average in the south to average in the north. Despite this, overall habitat conditions were good. Melting snow combined with frequent early spring (March) rains recharged most of the water bodies.

Mallard Fall-flight Index

The mid-continent mallard population is composed of mallards from the traditional survey area (revised in 2008 to exclude mallards from Alaska and the Old Crow Flat area of the Yukon Territory), Michigan, Minnesota, and Wisconsin. The predicted fall flight for 2022 was estimated to be 8.8 ± 0.8 million birds (Figure 6). This was similar to the 2019 prediction of 11.0 ± 1.1

million.

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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 7), 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 16 April 2020 (85 FR 21286). 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 2022, spring phenology was later than average in the eastern Arctic and average or variable in many areas of the central and western Arctic and Subarctic. Many areas across the Arctic and Subarctic experienced above-average temperatures during late May or June. The snow

Figure 7. Important goose and swan nesting areas in Arctic and Subarctic North America.

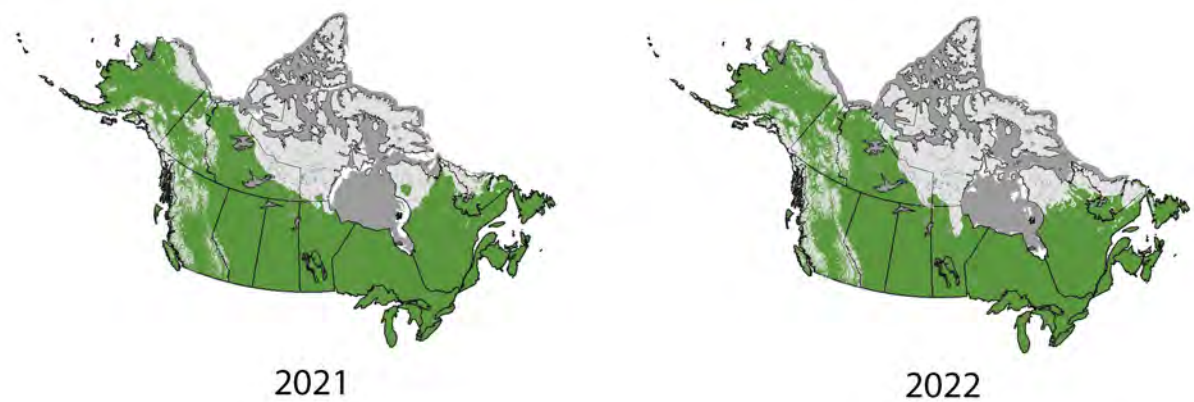

Figure 8. The extent of snow (light gray) and ice (dark gray) cover in North America on 2 June 2021 and 2 June 2022 (National Ice Center 2022).

and ice cover graphics (Figure 8) illustrate that ice or snow cover on 2 June 2022 compared to the same date in 2021 was more extensive in the eastern Arctic but similar among other areas (National Ice Center 2022).

Conditions in Southern Canada and the United States

Drought conditions remained throughout many western and central areas of southern Canada and the United States, and, in some areas, late spring phenology and localized spring flooding events also occurred. Biologists noted below-average production in some states of the Pacific and Central Flyways. Habitat conditions were variable, or more similar to average conditions, in many areas of the Mississippi and Atlantic Flyways.

Description of Populations and Primary Monitoring Surveys

Canada and Cackling Geese

See Figure 11, 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 9). 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 9). 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 9). 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 9). 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 2017).

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 9), 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 2017).

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 9). 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 9). 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 9). 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 9). 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 9). 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 9). 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 9). 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 9). 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 9). 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 9). 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 12, 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 10). The management plan for Ross's geese was updated in 2021 (Mississippi Flyway Council 2021), 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 10). 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 10). 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 10). 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 13, 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 10). 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 10). This population is monitored via a fall staging survey in Saskatchewan and Alberta (Central, Mississippi, and Pacific Flyway Councils 2015).

Brant

See Figure 13, Table 16, and Appendices C.3.

Atlantic Brant (ATLB)

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 10). The Midwinter Survey provides an index of this population within its winter range in the Atlantic Flyway (Atlantic Flyway Council 2002).

Pacific Brant (PACB)

PACB include black brant (BLBR; *B. b. nigricans*) and western high arctic brant (WHAB; *B. b. hrota*). BLBR 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. WHAB 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 10). Fall and winter counts in the U.S., Canada, and Mexico are the primary management indices for PACB (Pacific Flyway Council 2018).

Emperor Geese

See Figure 13, Table 16, and Appendices C.3.

Emperor geese (*A. canagica*) breed along coastal areas of the Bering Sea, with the largest concentration on the YKD in Alaska. Emperor geese stage along the Alaska Peninsula during the fall and spring and winter along the Aleutian Islands (Figure 10). This population is monitored during spring by the YKD Coastal Zone Survey (Pacific Flyway Council 2016*b*).

Swans

See Figure 13, 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 10). 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 10). 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 survey information can be found at: https://fws.gov/species/trumpeter-swan-cygnus-buccinator.

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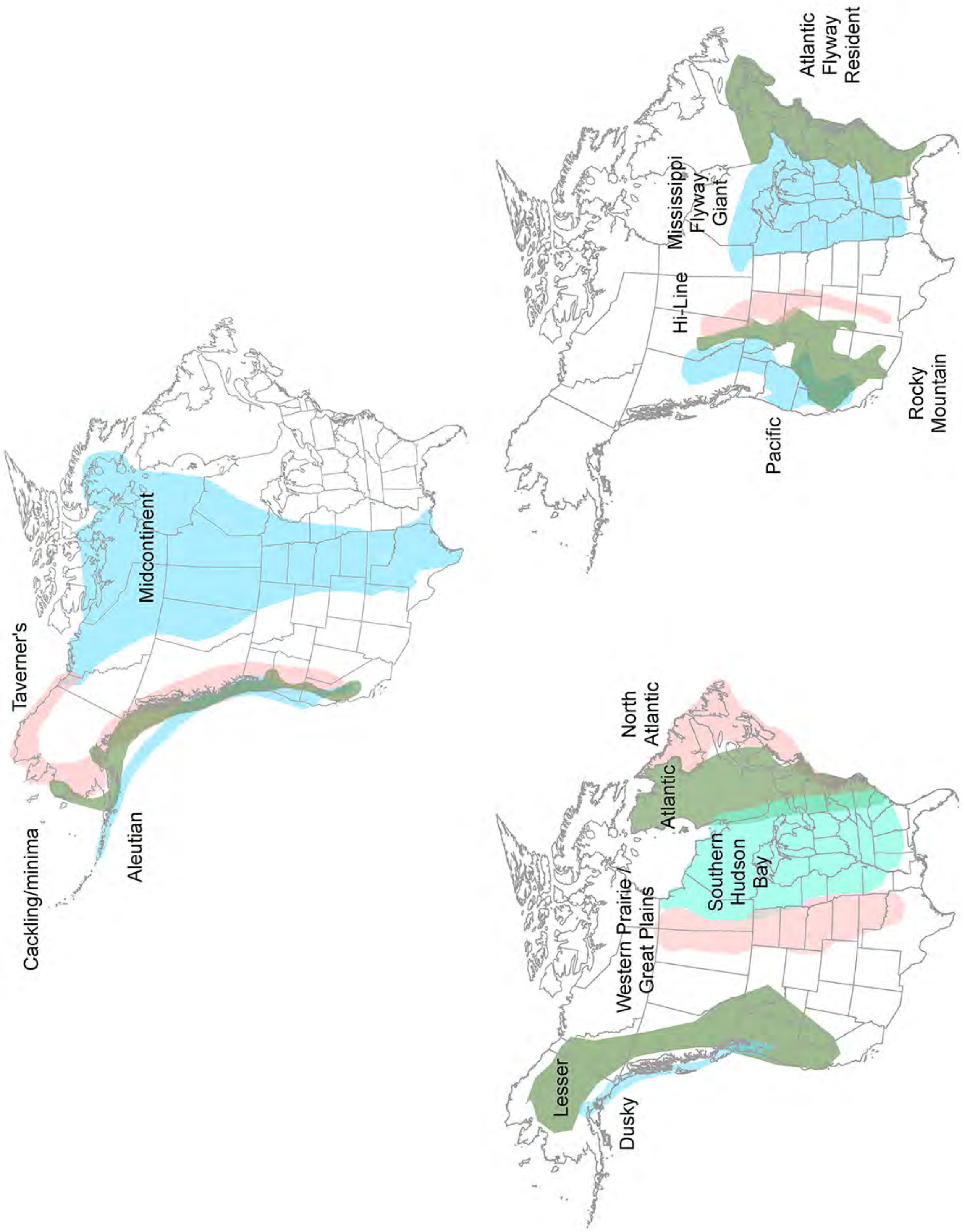

Figure 9. Approximate ranges of Canada and cackling goose populations in North America.

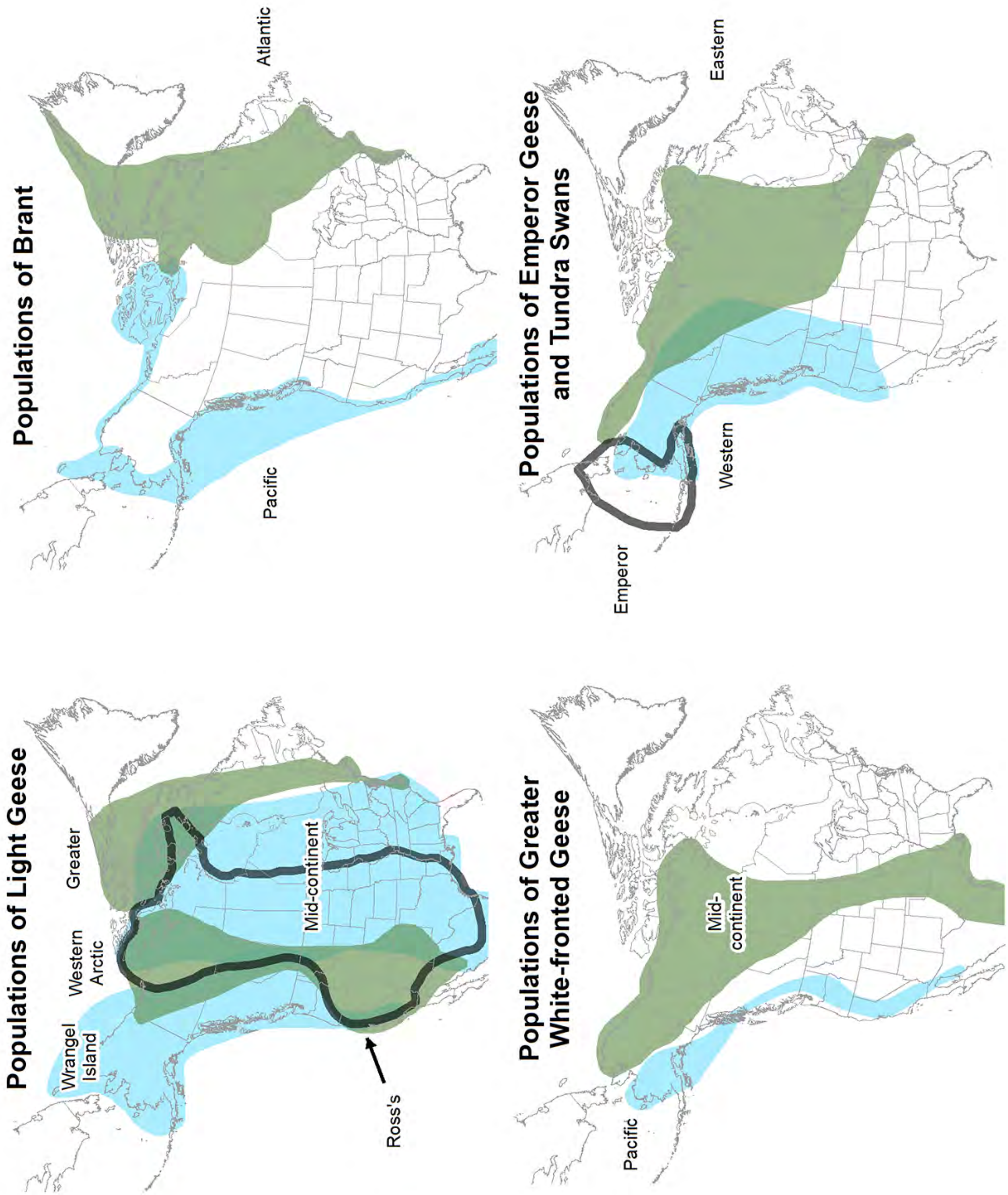

Figure 10. Approximate ranges of light goose, brant, greater white-fronted goose, emperor goose, and tundra swan populations in North America.

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

	Estimate/Count		Change from 2021		10-year Trend	
Population	2022	2021	%	*P*	%/yr[a]	*P*
North Atlantic	51	-	-	-	−1	0.263
Atlantic	164	-	-	-	−3	0.328
Atlantic Flyway Resident	1,019	1,015	0	0.971	+1	0.268
Southern Hudson Bay	-	120	-	-	-	-
Mississippi Flyway Giant	1,467	1,665	−12	-	+1	0.292
Western Prairie and Great Plains	1,783	-	-	-	+4	0.014
Mid-continent[b]	-	2,325	-	-	-	-
Hi-Line	493	-	-	-	+5	0.031
Rocky Mountain	245	-	-	-	+7	0.077
Pacific	310	-	-	-	+2	0.286
Dusky	13	13	+1	0.943	−2	0.352
Cackling/minima	238	207	+15	0.100	−6	0.018
Lesser	5	-	-	-	+4	0.703
Taverner's	46	-	-	-	+4	0.149
Aleutian	215	182	+18	0.339	+1	0.572

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

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

	Estimate/Count		Change from 2021		10-year Trend	
Population	2022	2021	%	*P*	%/yr	*P*
Ross's geese[a]	-	1,582	-	-	-	-
Mid-continent Population lesser snow geese[a]	-	7,131	-	-	-	-
Pacific Flyway Population light geese	-	-	-	-	-	-
Wrangel Island Population lesser snow geese	-	624	-	-	-	-
Greater snow geese	753	-	-	-	−2	0.139

[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 2021		10-year Trend	
Population	2022	2021	%	P	%/yr	P
White-fronted geese						
Pacific Population	664	504	+32	0.068	−2	0.379
Mid-continent Population	-	-	-	-	-	-
Brant						
Atlantic	109	-	-	-	0	0.958
Pacific	159	151	+5	-	0	0.663
Emperor geese	29	24	+19	0.004	−2	0.100
Tundra swans						
Western	101	120	−16	0.348	0	0.862
Eastern	96	87	+10	-	−3	0.037

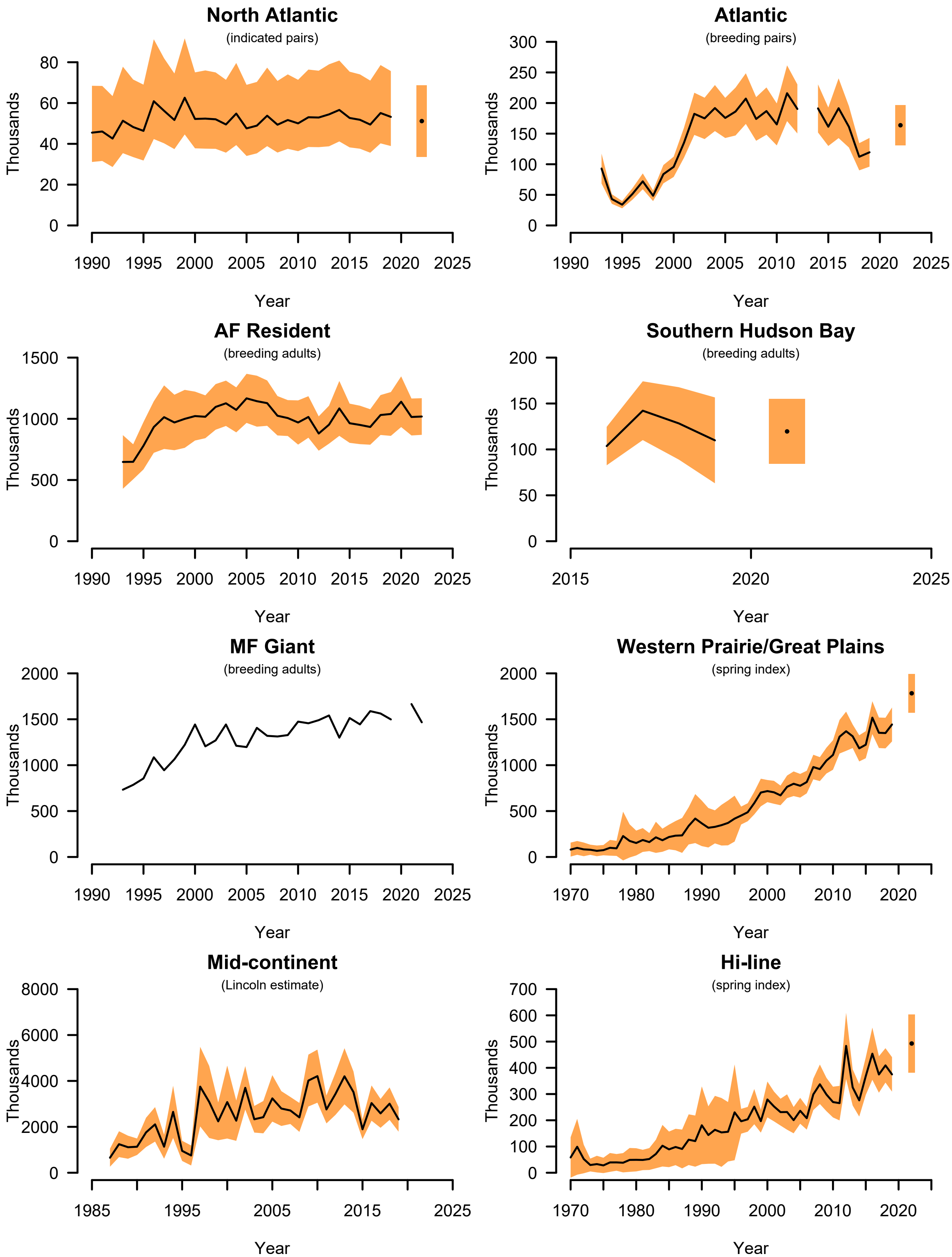

Figure 11. Abundance indices (and 95% confidence intervals, where applicable) of Canada and cackling goose populations based on primary management surveys.

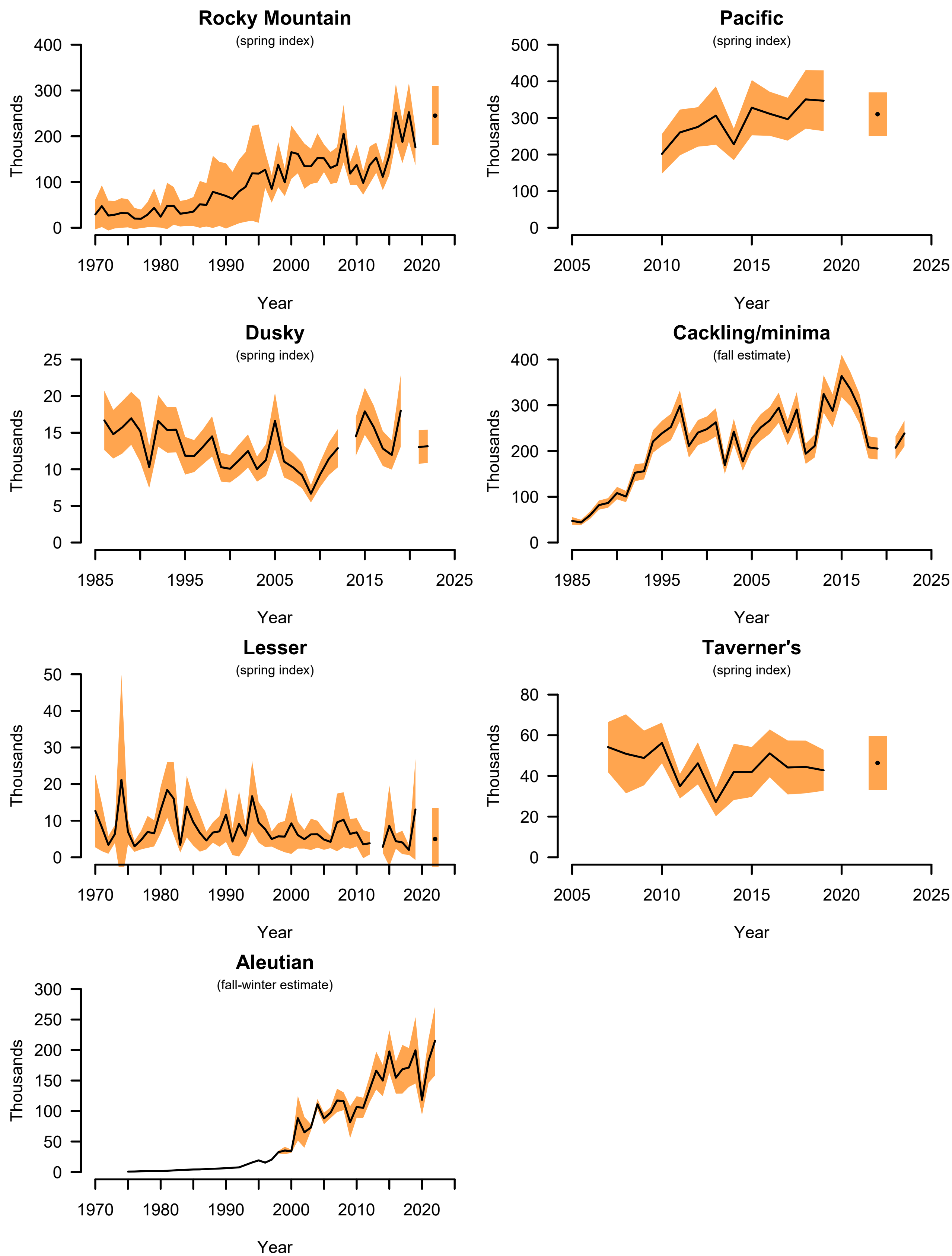

Figure 11. Continued.

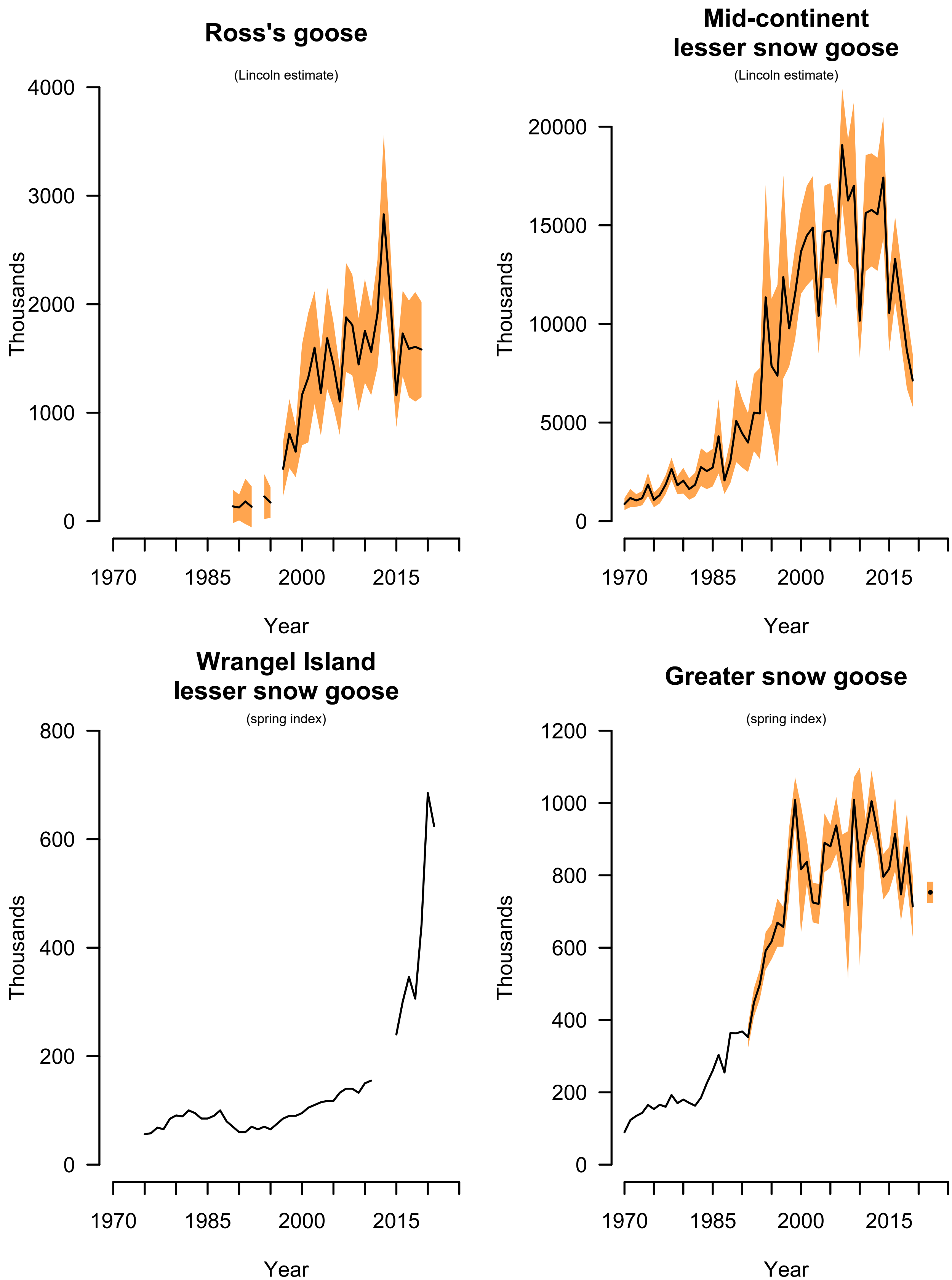

Figure 12. Abundance indices (and 95% confidence intervals, where applicable) of light goose (Ross's goose and lesser and greater snow goose) populations based on primary management surveys.

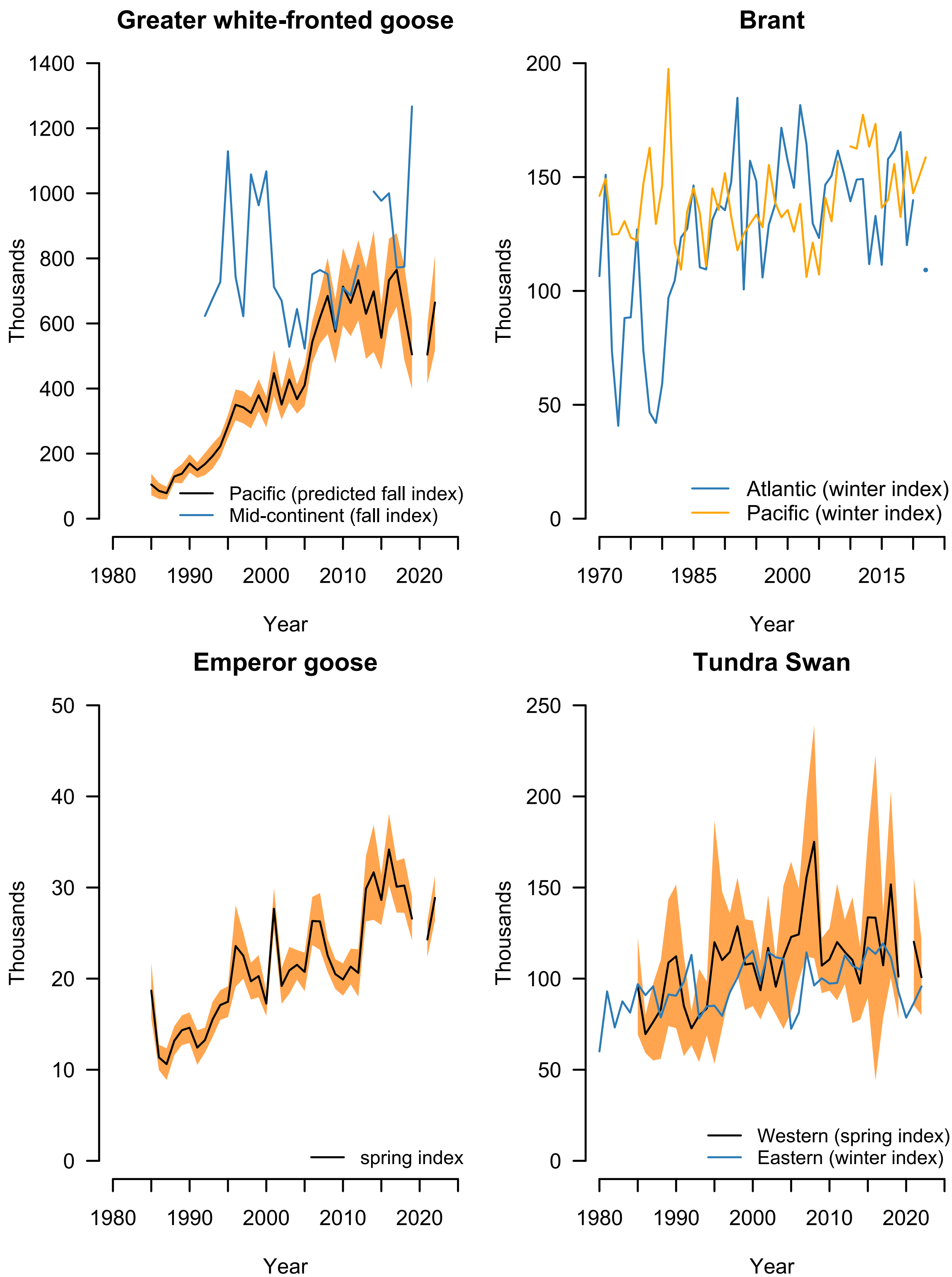

Figure 13. Abundance indices (and 95% confidence intervals, where applicable) of greater white-fronted goose, brant, emperor goose, and tundra swan populations based on primary management surveys.

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 T. Zeller
Air	H. Wilson and D. Marks
Air	H. Wilson, D. Marks, and W. Larned[e]

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], N. Hak[a], J. Bisschop[a], N. Clements[a]

Southern Manitoba (Strata 34–40)

Air	S. Yates and R. Viegut
Ground	M. Schuster[a], J. Leafloor[a], F. Baldwin[a], P. Bergen[a], L. Neufeld[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	S. Catino, D. Collins, T. Cooper, and S. Vassallo

Eastern Dakotas (Strata 45–49)

Air T. Liddick and D. Fronczak

Ground S. Olson, S. Czapka, and R. Vanausdall[d]

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

Air J. Rayfield and A. Roberts

Air J. Rayfield and J. Wortham

Air M. Koneff 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 J. Bidwell[e]

Air M. Koneff and P. Stinson

Canadian Wildlife Service helicopter plot survey

Quebec C. Lepage[a], C. Marcotte[a], S. Orichefsky[a], and M. Tétreault[a]

Ontario S. Meyer[a], R. Wood[a], D. Sadler[a], and C. Sharp[d]

New Brunswick & Nova Scotia B. Pollard[a] and T. Barney[a]

Newfoundland & Labrador S. Gilliland[a], M. English[a], C. Roy[a], P. Ryan[a], A. Hanson[d], and R. Martin[d]

California

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

Helicopter O. Rocha[b] and R. Carrothers[b]

Michigan

Air B. Barlow[b], B. Dybas-Berger[b], C. Eckloff[b], B. Dybas-Berger[b], J. Heise[b], N. Kalejs[b], and T. McFadden[b]

Minnesota

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

Ground W. Brininger, N. Yates, J. Riens, B. Davis[b], G. Dehmer, B. Rigby, J. Strege[b], G. Kemper, K. Mattson, J. Gehrt, K. Spaeth, K. Jenson, T. Langston, and G. Smith

Oregon

Air B. Reishus[b], K. Walton[b], R. Klus[b], T. Collom[b], and J. Russell[b], and helicopter service provided by JL Aviation Inc.[d]

Washington

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

Wisconsin

Air	L. Waskow[b], T. Finger[b], and P. Eyers[b]
Ground	K. Bolder[b], J. Borchardt[b], E. Borchert[b], M. Carlisle[b], N. Christel[b], J. Christopoulos[b], J. Cotter[b], E. Doden[b], S. Easterly[b], E. Feltes[b], A. Fischer[b], A. Gerrits[b], D. Goltz[b], M. Gross[b], T. Hamilton[b], S. Hartman[b], W. Hirt[b], J. Hopp[b], D. Johnson[b], T. Klein[b], Z. Knab[b], C. Knab[b], M. Kramschuster[b], E. Kroening[b], C. Mogen[b], P. Napierala[b], A. Nelson[b], J. Olson[b], G. Patz[b], B. Rochefort[b], R. Roe[b], P. Samerdyke[b], A. Seitz[b], M. Sparrow-Lein[b], J. Spiegel[b], H. Stanley[b], B. Stefanski[b], M. Struble[b], B. Woodall[b], B. Woodbury[b], and C. Young[b]
Data	J. Rees Lohr[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

B. Harvey[b], C. Lepage[a], J. Lefebvre[a],and R. Spangler

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], 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

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

Mid-continent Population White-fronted Geese

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

[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 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.

	Prairie Canada		Northcentral U.S.[a]		Total	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
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	3,466.9	157.7	1,983.4	98.2	5,450.3	185.7

[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.

Year	British Columbia		California		Michigan		Minnesota	
	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	*Mallards*
1955								
1956								
1957								
1958								
1959								
1960								
1961								
1962								
1963								
1964								
1965								
1966								
1967								
1968							321.0	83.7
1969							323.2	88.8
1970							324.2	113.9
1971							277.1	78.5
1972							217.2	62.2
1973							389.5	99.8
1974							281.6	72.8
1975							471.6	175.8
1976							684.1	117.8
1977							501.1	134.2
1978							462.5	146.8
1979							552.4	158.7
1980							690.6	172.0
1981							439.8	154.8
1982							465.2	120.5
1983							367.1	155.8
1984							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	1,116	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	489.4	868.1	407.4
1998			706.8	353.9	1,068	523.0	693.1	368.4
1999			851.0	560.1	744.6	466.1	680.5	316.4

Table B.2. Continued.

Year	British Columbia Total ducks	British Columbia Mallards	California Total ducks	California Mallards	Michigan Total ducks	Michigan Mallards	Minnesota Total ducks	Minnesota Mallards
2000			562.4	347.6	793.9	427.2	747.8	318.1
2001			413.5	302.2	497.8	324.2	716.4	320.6
2002			392.0	265.3	742.5	323.2	1,171.5	366.6
2003			533.7	337.1	535.4	298.9	721.8	280.5
2004			412.8	262.4	624.5	342.0	1,008.3	375.3
2005			615.2	317.9	468.3	258.1	632.0	238.5
2006	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

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

Table B.2. Continued.

	Nevada[b]	Oregon		Washington		Wisconsin	
Year	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards
1955							
1956							
1957							
1958							
1959	2.1						
1960	2.1						
1961	2.0						
1962	1.7						
1963	2.2						
1964	3.0						
1965	3.5						
1966	3.4						
1967	1.5						
1968	1.2						
1969	1.4						
1970	1.5						
1971	1.1						
1972	0.9						
1973	0.7					412.7	107.0
1974	0.7					435.2	94.3
1975	0.6					426.9	120.5
1976	0.6					379.5	109.9
1977	1.0					323.3	91.7
1978	0.6					271.3	61.6
1979	0.6					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	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards
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						585.0	147.4
2022		344.6	79.4	219.7	87.4	647.1	185.6

[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), 1955–2022.

	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										
2022	7,223.4	240.5	2,664.7	134.8	2,126.6	125.8	2,170.4	179.1	6,484.6	337.4

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	3,040.9	167.8	1,782.8	150.1	991.3	80.1	584.7	51.0	3,598.6	221.4

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

	Traditional Survey Area[a]	
Year	$\widehat{N}$	$\widehat{SE}$
1955	39,603.6	1,264.0
1956	42,035.2	1,177.3
1957	34,197.1	1,016.6
1958	36,528.1	1,013.6
1959	40,089.9	1,103.6
1960	32,080.5	876.8
1961	29,829.0	1,009.0
1962	25,038.9	740.6
1963	27,609.5	736.6
1964	27,768.8	827.5
1965	25,903.1	694.4
1966	30,574.2	689.5
1967	32,688.6	796.1
1968	28,971.2	789.4
1969	33,760.9	674.6
1970	39,676.3	1,008.1
1971	36,905.1	821.8
1972	40,748.0	987.1
1973	32,573.9	805.3
1974	35,422.5	819.5
1975	37,792.8	836.2
1976	34,342.3	707.8
1977	32,049.0	743.8
1978	35,505.6	745.4
1979	38,622.0	843.4
1980	36,224.4	737.9
1981	32,267.3	734.9
1982	30,784.0	678.8
1983	32,635.2	725.8
1984	31,004.9	716.5
1985	25,638.3	574.9
1986	29,092.8	609.3
1987	27,412.1	562.1
1988	27,361.7	660.8
1989	25,112.8	555.4
1990	25,079.2	539.9
1991	26,605.6	588.7
1992	29,417.9	605.6
1993	26,312.4	493.9
1994	32,523.5	598.2
1995	35,869.6	629.4
1996	37,753.0	779.6

Table B.4. Continued.

	Traditional Survey Area[a]	
Year	$\widehat{N}$	$\widehat{SE}$
1997	42,556.3	718.9
1998	39,081.9	652.0
1999	43,435.8	733.9
2000	41,838.3	740.2
2001	36,177.5	633.1
2002	31,181.1	547.8
2003	36,225.1	664.7
2004	32,164.0	579.8
2005	31,734.9	555.2
2006	36,160.3	614.4
2007	41,172.2	724.8
2008	37,276.5	638.3
2009	42,004.8	701.9
2010	40,893.8	718.4
2011	45,554.3	766.5
2012	48,575.3	796.8
2013	45,607.3	749.8
2014	49,152.2	831.1
2015	49,521.7	812.1
2016	48,362.8	827.6
2017	47,265.6	773.6
2018	41,193.2	662.1
2019	38,898.9	658.3
2020	No Survey	
2021	No Survey	
2022	34,209.2	610.1

[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, 1998–2022[a].

	Mallard		American black duck		Green-winged teal		Ring-necked duck		Goldeneyes[b]		Mergansers[c]	
	$\widehat{N}$	90% CI	$\widehat{N}$	90% CI	$\widehat{N}$	90% CI	$\widehat{N}$	90% CI	$\widehat{N}$	90% CI	$\widehat{N}$	90% CI
1998	1,313.0	(1,177.4, 1,488.1)	940.2	(838.4, 1,071.2)	295.7	(238.6, 385.6)	592.4	(487.2, 754.4)	726.8	(542.1, 1,082.6)	688.0	(590.9, 810.6)
1999	1,408.3	(1,273.2, 1,583.7)	923.8	(834.4, 1,033.6)	381.4	(311.3, 482.3)	705.0	(577.5, 904.5)	812.6	(613.3, 1,147.9)	687.2	(595.6, 800.0)
2000	1,378.5	(1,248.7, 1,542.6)	818.2	(747.9, 899.2)	354.6	(293.1, 440.9)	933.1	(712.8, 1,403.7)	785.1	(586.7, 1,149.7)	701.6	(611.4, 812.6)
2001	1,380.8	(1,250.2, 1,546.7)	798.2	(720.6, 894.0)	293.7	(240.7, 370.8)	669.1	(553.0, 838.5)	955.7	(706.4, 1,412.3)	653.1	(569.8, 755.5)
2002	1,367.4	(1,238.0, 1,533.4)	976.2	(877.2, 1,101.7)	392.7	(322.0, 491.2)	676.6	(562.4, 836.2)	1,032.9	(741.7, 1,540.2)	894.6	(781.6, 1,032.0)
2003	1,330.7	(1,202.2, 1,498.4)	898.9	(803.0, 1,025.0)	382.9	(311.0, 492.1)	680.1	(573.9, 821.3)	806.1	(592.2, 1,230.6)	793.0	(689.7, 920.6)
2004	1,322.3	(1,191.9, 1,492.6)	929.5	(822.7, 1,072.3)	451.8	(368.0, 579.4)	750.7	(619.9, 952.9)	760.7	(582.9, 1,073.6)	796.5	(696.7, 918.1)
2005	1,284.2	(1,157.6, 1,456.0)	813.2	(733.3, 912.4)	331.9	(269.1, 427.9)	635.2	(536.5, 765.8)	647.2	(499.6, 906.7)	786.1	(684.7, 912.4)
2006	1,252.8	(1,132.0, 1,410.2)	875.4	(784.4, 988.2)	327.2	(265.3, 419.1)	665.7	(558.4, 812.9)	574.8	(440.7, 811.0)	715.5	(622.7, 827.8)
2007	1,274.4	(1,144.6, 1,449.6)	948.9	(860.5, 1,054.7)	433.7	(340.2, 609.7)	844.3	(711.0, 1,020.7)	805.0	(607.7, 1,140.1)	825.1	(715.4, 960.9)
2008	1,244.8	(1,116.7, 1,414.7)	845.9	(756.8, 962.1)	400.9	(318.0, 526.6)	677.6	(562.0, 846.2)	786.2	(596.5, 1,106.1)	735.5	(642.3, 849.1)
2009	1,229.5	(1,101.9, 1,406.9)	869.7	(765.0, 1,016.6)	421.1	(336.5, 557.3)	697.0	(573.2, 884.0)	670.0	(501.7, 984.7)	752.5	(655.3, 871.3)
2010	1,152.0	(1,036.7, 1,302.8)	761.6	(676.7, 874.4)	408.8	(325.9, 547.8)	684.2	(570.5, 845.4)	693.9	(519.8, 1,016.9)	635.1	(552.2, 736.0)
2011	1,189.0	(1,063.9, 1,357.1)	819.6	(715.9, 963.4)	391.3	(309.1, 529.9)	617.2	(517.5, 753.8)	656.6	(496.7, 959.8)	678.2	(589.0, 787.9)
2012	1,163.6	(1,044.6, 1,321.9)	881.8	(783.1, 1,012.9)	359.8	(289.3, 472.8)	642.0	(532.1, 806.5)	707.0	(519.1, 1,095.5)	744.2	(649.4, 860.8)
2013	1,178.0	(1,035.3, 1,380.0)	621.0	(570.7, 677.8)	280.1	(233.1, 340.6)	615.8	(514.2, 754.1)	525.7	(430.0, 655.9)	566.2	(485.6, 668.2)
2014	1,154.5	(1,030.0, 1,325.7)	865.3	(765.8, 1,000.1)	298.7	(239.6, 393.4)	603.8	(502.7, 745.3)	693.1	(494.6, 1,132.9)	676.9	(590.8, 783.3)
2015	1,112.1	(995.7, 1,270.7)	857.6	(737.5, 1,031.1)	305.7	(244.5, 403.8)	720.2	(575.4, 980.8)	519.4	(389.9, 767.2)	691.0	(602.0, 799.2)
2016	1,096.9	(979.3, 1,256.5)	932.6	(807.3, 1,109.7)	314.8	(250.4, 421.2)	742.0	(612.1, 933.1)	633.1	(462.4, 986.9)	729.6	(634.6, 847.6)
2017	1,106.5	(985.1, 1,276.9)	756.7	(668.2, 873.6)	335.8	(271.4, 428.5)	614.4	(503.1, 790.2)	716.5	(533.6, 1,071.8)	829.6	(722.2, 962.4)
2018	1,066.8	(953.4, 1,222.2)	695.0	(625.0, 780.0)	332.4	(266.9, 431.3)	634.3	(522.2, 810.7)	576.0	(431.1, 861.1)	790.8	(690.8, 913.9)
2019	1,038.3	(929.3, 1,186.4)	729.0	(649.4, 831.3)	301.3	(239.1, 396.3)	718.0	(567.1, 1,007.5)	571.1	(396.2, 975.7)	779.9	(678.9, 901.9)
2020	No Survey											
2021												
2022	1,201.7	(1,045.9, 1,427.1)	795.6	(707.5, 916.3)	321.3	(259.5, 416.6)	637.4	(530.2, 788.8)	705.3	(543.7, 998.4)	880.4	(760.0, 1,030.1)

[a] Estimates 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 are at the eastern North America scale (eastern survey area plus northeastern states from Virginia north to New Hampshire.)

[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, 1969–2022.

	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	45.5	9.5							
1990/91	46.1	9.4							
1991/92	42.6	8.9							
1992/93	51.3	10.9	93.0	12.5	647.5	111.8			732.7
1993/94	48.2	9.7	43.2	4.0	648.7	73.0			785.7
1994/95	46.4	9.5	34.0	3.0	780.0	98.8			855.2
1995/96	60.9	12.5	51.5	4.8	932.7	107.4			1,085.8
1996/97	56.2	10.6	72.1	6.6	1,013.3	132.5			944.8
1997/98	51.7	9.5	48.6	4.5	970.1	115.7			1,064.4
1998/99	62.6	12.1	83.8	7.6	999.5	120.8			1,221.2
1999/00	52.2	9.5	95.8	8.4	1,022.3	101.9			1,443.1
2000/01	52.4	9.8	135.2	12.5	1,016.6	89.3			1,205.2
2001/02	52.0	9.6	182.4	17.6	1,097.1	95.1			1,269.9
2002/03	49.5	9.2	174.9	17.2	1,126.7	94.5			1,443.2
2003/04	54.8	10.3	191.8	19.2	1,073.1	93.8			1,211.5
2004/05	47.6	8.9	175.7	16.7	1,167.1	102.3			1,197.2
2005/06	48.9	9.0	186.1	20.0	1,144.0	106.2			1,406.4
2006/07	53.8	9.9	207.3	21.1	1,128.0	94.5			1,319.5
2007/08	49.4	9.0	174.0	18.2	1,024.9	82.1			1,312.6
2008/09	51.7	9.3	186.8	19.7	1,006.1	74.8			1,327.7

Table C.1. Continued.

	North Atlantic[a,b]		Atlantic[a,b]		Atlantic Flyway Resident[a]		Southern Hudson Bay[a]		Mississippi Flyway Giant[a]
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$
2009/10	50.0	8.9	165.1	17.5	969.9	92.1			1,474.3
2010/11	53.0	9.7	216.0	23.2	1,015.1	86.5			1,456.4
2011/12	52.9	9.6	190.3	20.4	879.8	71.6			1,490.2
2012/13	54.4	10.3			951.9	79.1			1,541.4
2013/14	56.6	10.2	191.2	20.1	1,084.9	114.4			1,299.7
2014/15	52.7	9.5	161.3	16.0	963.8	81.7			1,513.4
2015/16	51.8	9.3	191.5	24.9	950.0	80.1	103.6	10.7	1,444.3
2016/17	49.4	9.1	161.1	17.2	933.3	74.0	142.2	16.3	1,588.7
2017/18	55.1	9.8	112.2	11.3	1,030.9	83.2	128.3	20.1	1,562.8
2018/19	53.2	9.4	119.5	12.0	1,039.5	91.3	109.9	23.9	1,498.4
2019/20					1,139.6	105.6			
2020/21					1,014.8	77.0	119.6	18.0	1,665.4
2021/22	51.2	8.9	163.7	16.7	1,018.7	76.4			1,467.0

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

Table C.1. Continued.

Year	W. Prairie & Great Plains[a]		Mid-continent[c]		Hi-line[a]		Rocky Mountain[a]		Pacific[a]	
	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
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.

Year	W. Prairie & Great Plains[a] $\widehat{N}$	W. Prairie & Great Plains[a] $\widehat{SE}$	Mid-continent[c] $\widehat{N}$	Mid-continent[c] $\widehat{SE}$	Hi-line[a] $\widehat{N}$	Hi-line[a] $\widehat{SE}$	Rocky Mountain[a] $\widehat{N}$	Rocky Mountain[a] $\widehat{SE}$	Pacific[a] $\widehat{N}$	Pacific[a] $\widehat{SE}$
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

[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			47.2	4.3	9.6	3.3			4.2	
1985/86	16.7	2.1	43.9	3.0	6.7	2.6			4.3	
1986/87	14.8	1.7	59.8	4.1	4.6	1.2			5.0	
1987/88	15.7	1.8	81.8	5.1	6.8	1.4			5.4	
1988/89	17.0	1.8	86.5	5.3	7.1	2.1			5.8	
1989/90	15.2	2.2	108.0	6.9	11.7	3.8			6.3	
1990/91	10.3	1.5	100.5	6.3	4.3	1.9			7.0	
1991/92	16.6	1.8	152.6	9.4	9.1	4.5			7.7	
1992/93	15.4	1.6	155.7	9.0	5.9	1.5			11.7	
1993/94	15.4	1.6	220.7	12.5	16.7	4.9			15.7	
1994/95	11.9	1.3	238.6	13.9	9.6	2.8			19.1	
1995/96	11.8	1.1	252.5	14.8	7.7	2.5			15.5	0.6
1996/97	13.1	1.2	298.8	17.2	5.0	1.1			20.4	0.8
1997/98	14.5	1.4	211.1	13.1	5.7	1.9			32.4	1.1
1998/99	10.3	1.0	240.2	14.0	5.7	2.2			35.3	3.1
1999/00	10.1	1.0	247.8	14.2	9.3	4.3			34.2	1.3
2000/01	11.2	1.1	262.7	15.7	6.1	1.9			88.3	18.7
2001/02	12.5	1.2	169.3	9.8	4.9	1.3			65.2	12.9
2002/03	10.0	0.9	242.5	14.2	6.3	2.2			73.0	2.8
2003/04	11.3	1.1	177.1	10.3	6.3	1.9			111.1	4.4
2004/05	16.6	2.0	227.9	13.5	4.8	1.4			87.8	4.8
2005/06	11.1	1.1	251.6	14.8	4.2	0.9			97.2	4.5
2006/07	10.3	1.0	267.0	15.0	9.5	4.0	54.2	6.3	117.3	9.8
2007/08	9.2	0.9	294.6	16.9	10.3	3.8	50.9	9.9	116.1	7.4

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	6.7	0.6	240.2	14.0	6.4	2.1	48.8	6.9	81.8	13.3
2009/10	9.2	0.9	290.7	19.2	6.8	2.0	56.2	5.1	106.7	9.0
2010/11	11.4	1.1	194.1	11.3	3.6	2.0	34.9	3.1	105.3	8.4
2011/12	12.9	1.3	210.9	12.8	3.8	1.6	46.2	5.3	135.9	10.9
2012/13			324.7	21.0			27.2	3.6	166.3	15.9
2013/14	14.5	1.4	287.7	18.5	2.8	0.8	42.0	7.1	150.0	13.1
2014/15	17.9	1.6	364.1	23.6	8.6	5.6	42.0	6.3	197.7	17.8
2015/16	15.7	1.5	334.5	19.0	4.4	1.1	51.1	6.0	154.7	13.4
2016/17	12.8	1.2	292.0	16.5	4.0	1.6	44.2	6.8	168.5	20.3
2017/18	12.0	1.0	208.1	12.3	2.0	0.7	44.4	6.6	171.3	16.2
2018/19	18.0	2.5	205.3	12.2	13.1	7.0	42.8	5.1	199.5	27.8
2019/20									118.4	12.7
2020/21	13.0	1.2	206.9	12.7					182.4	18.4
2021/22	13.2	1.2	238.5	14.4	5.0	4.3	46.4	6.7	215.2	29.0

[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 goose and lesser and greater snow goose) populations, 1969–2022.

			Snow Geese					
	Ross's geese[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.

			Snow Geese					
	Ross's geese[a]		Mid-continent[a]		Pacific Flyway[b]	Wrangel Island[c]	Greater [c]	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{N}$	$\widehat{N}$	$\widehat{SE}$
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					1,599.6	685.1		
2020/21						624.0		
2021/22							753.0	14.8

[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, 1969–2022.

	White-fronted geese			Brant				Tundra swans		
	Pacific[a]		Mid-continent[a]	Atlantic[a]	Pacific[a]	Emperor geese[b]		Western[b]		Eastern[a]
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{N}$	$\widehat{N}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$
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				127.0	122.0					
1976/77				73.8	147.0					
1977/78				46.7	162.9					
1978/79				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	105.0	16.8		146.3	145.1	18.7	1.6	96.0	13.6	96.9
1985/86	85.3	12.6		110.4	134.2	11.4	0.7	69.5	5.3	90.9
1986/87	78.5	10.1		109.4	110.9	10.6	0.9	76.1	10.7	95.8
1987/88	129.7	9.9		131.2	145.0	13.2	0.8	83.1	13.8	78.7
1988/89	138.5	15.2		137.9	135.6	14.3	0.8	108.8	17.8	91.3
1989/90	169.9	14.4		135.4	151.7	14.6	0.9	112.2	20.1	90.6
1990/91	149.4	12.2		147.7	132.7	12.4	1.0	85.2	14.1	98.2
1991/92	167.8	17.4	622.9	184.8	117.8	13.3	0.7	72.7	4.7	113.0
1992/93	192.3	19.7	676.3	100.6	125.0	15.5	1.0	79.8	13.1	78.2
1993/94	222.7	17.2	727.3	157.2	129.3	17.1	0.8	83.6	7.5	84.8
1994/95	283.8	18.0	1,129.4	148.2	133.5	17.5	0.9	120.0	34.0	85.1
1995/96	349.9	24.2	742.5	105.9	128.0	23.6	2.3	110.2	19.2	79.5
1996/97	342.2	25.2	622.2	129.1	155.3	22.5	1.3	114.6	10.9	92.4
1997/98	325.0	24.4	1,058.3	138.0	138.8	19.7	1.0	128.8	13.6	100.6
1998/99	379.2	25.4	963.1	171.6	132.3	20.3	1.2	107.7	12.7	111.0
1999/00	328.3	24.1	1,067.6	157.2	135.6	17.3	0.7	108.4	12.0	115.3
2000/01	447.6	36.5	712.3	145.3	126.0	27.7	1.2	93.6	8.2	98.4
2001/02	350.7	23.6	669.7	181.6	138.2	19.2	1.0	116.8	14.8	114.7
2002/03	427.8	35.7	528.2	164.5	106.1	20.9	1.3	95.6	7.7	111.7
2003/04	367.3	22.8	644.3	129.6	121.3	21.5	0.8	111.7	20.1	110.8
2004/05	410.2	32.3	522.8	123.2	107.2	20.7	1.1	122.9	21.1	72.5
2005/06	543.4	33.0	751.3	146.6	141.0	26.3	1.3	124.3	12.9	81.3
2006/07	617.8	40.9	764.3	150.6	130.6	26.3	1.6	155.5	22.1	114.4
2007/08	684.8	59.8	751.7	161.6	157.0	22.5	0.9	175.1	32.6	96.2

Table C.3. continued.

	White-fronted geese			Brant				Tundra swans		
	Pacific[a]		Mid-continent[a]	Atlantic[a]	Pacific[a]	Emperor geese[b]		Western[b]		Eastern[a]
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{N}$	$\widehat{N}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$
2008/09	574.8	50.0	583.2	151.3		20.5	0.8	107.2	7.7	100.2
2009/10	713.3	60.8	709.8	139.3	163.5	19.9	0.9	110.5	8.8	97.3
2010/11	663.1	52.1	685.7	148.9	162.5	21.3	1.0	120.1	16.3	97.6
2011/12	733.0	62.9	777.9	149.2	177.3	20.6	1.3	114.6	9.0	112.7
2012/13	629.7	70.8		111.8	163.3	29.9	1.8	110.2	17.6	107.1
2013/14	698.9	95.1	1,005.6	132.9	173.3	31.7	2.7	97.3	10.2	105.0
2014/15	556.0	50.1	977.1	111.4	136.5	28.6	1.4	133.6	22.5	117.1
2015/16	732.8	65.1	1,000.1	157.9	140.0	34.2	2.0	133.4	45.6	113.6
2016/17	764.7	57.6	771.6	161.7	155.7	30.1	1.4	107.3	14.7	119.3
2017/18	632.5	73.6	774.1	169.7	132.4	30.2	1.5	151.7	26.2	111.6
2018/19	504.9	54.1	1,266.9	120.1	161.2	26.6	1.2	101.1	11.8	92.8
2019/20				139.9	142.9					78.6
2020/21	504.4	46.4			150.6	24.3	1.0	120.2	17.8	86.7
2021/22	664.4	74.6		109.2	158.7	28.9	1.2	100.8	10.6	95.7

[a] Fall-winter indices.
[b] Surveys conducted in spring.

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