Population Status of Migratory Game Birds in Canada

(and Regulation Proposals for Overabundant Species)

November 2003

Canadian Wildlife Service
Waterfowl Committee

CWS Migratory Birds Regulatory Report Number 10

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Background

Canadian hunting regulations for migratory game birds are reviewed annually by Environment Canada, with input from the provinces and territories, and a range of other interested stakeholders. As part of this process, the Canadian Wildlife Service (CWS) produces three reports each year. The November report "Population Status of Migratory Game Birds in Canada" contains population and other biological information on migratory game birds, and thus provides the scientific basis for management. The December report "Proposals to Amend the Canadian Migratory Birds Regulations" outlines the proposed changes to the annual hunting regulations, as well as other proposed amendments to the Migratory Birds Regulations. These two documents are distributed to organizations and individuals with an interest in migratory game bird conservation, to provide an opportunity for input to the development of hunting regulations in this country. The third report "Migratory Game Bird Hunting Regulations in Canada", issued in July summarizes the hunting regulations for the upcoming hunting season.

Data presented in the November report come from a variety of sources. Breeding population estimates and trends for inland ducks are derived from large-scale systematic aerial surveys conducted annually in eastern and western Canada, and parts of the United States. Additional small-scale, usually annual, breeding waterfowl surveys are also conducted in other parts of this country. Information on sea duck populations comes mainly from surveys limited to a few key locations or a small area of the species range, during the breeding, moulting, or wintering period. Goose population estimates and trends are derived mainly from specific annual or occasional surveys carried out during the breeding season or, in some cases, during migration. Additional information on waterfowl populations is also provided by mid-winter surveys on the wintering grounds conducted annually in the four U.S. flyways. Population information on swans and other migratory game birds is derived from specific breeding or wintering surveys, or countrywide breeding bird surveys. Harvest levels of migratory game birds in Canada and the United States are estimated through national harvest surveys and, in some cases, through species-specific surveys.

Population Status of Inland Ducks

Eastern Canada

In eastern Canada, breeding waterfowl populations are monitored annually through the Black Duck Breeding Ground Survey. This systematic helicopter survey covers the Boreal Shield region from northeastern Ontario to Newfoundland, and the Atlantic Highlands region from the Gaspé Peninsula (Québec) to Nova Scotia (Figure 1). This survey was designed primarily to provide breeding population estimates and trends for the American Black Duck, an early-nesting species. The survey has been conducted by CWS since 1990, as part of the Black Duck Joint Venture of the North American Waterfowl Management Plan (NAWMP).

Additional breeding population surveys are also conducted in other parts of eastern Canada not covered by the Black Duck Breeding Ground Survey. In Prince Edward Island, an annual breeding waterfowl survey on ground plots has been in place since 1985, and is done cooperatively by CWS and the PEI Fish and Wildlife Division. In southern Ontario, a breeding waterfowl survey on ground plots has been conducted at intervals since 1971 by CWS, and was repeated in 2003.

In this section, we summarize information on inland duck populations in eastern Canada. Discussion per province of results from the Black Duck Breeding Ground Survey can be found in Bateman and Hicks (2003), Bordage, Lepage and Orichefsky (2003), and Ross (2003).

American Black Duck

There is some concern over the population abundance of American Black Ducks (*Anas rubripes*) in North America. Mid-winter inventories in the Atlantic and Mississippi flyways have shown an important decline in the continental population between 1955 and the early 1980s, when numbers stabilized at a low level (Figure 2). The number of black ducks counted in both flyways in winter 2003 (249,000) was 15% lower than the previous year (295,000), and is 12% below the 1993-2002 average (284,000) (Fronczak 2003; Serie and Raftovich 2003). Survey results in the Atlantic Flyway for 2001, and in the Mississippi Flyway for 1993 and 1997, were incomplete in some states and are, therefore, not comparable with other years.

Surveys of American Black Ducks on their wintering areas are useful for studying overall population trends, but they are not very effective for evaluating the status of breeding populations, because of the mixing of populations from diverse areas. In the area covered by the Black Duck Breeding Ground Survey, the number of indicated breeding pairs of American Black Ducks has increased significantly ($P < 0.05$) over the 1990-2003 period (Figure 3 and Tables 1 and 2; Collins, 2003). Breeding populations have increased significantly in

all survey strata ($P < 0.05$), except in the western portion of the Boreal Shield region where the trend is also positive and approaches significance (Table 2). However, compared to 2002, the estimated number of indicated breeding pairs in the Entire Survey Area declined by 25% to 264,000 ± 18,500 (SE). This decline was seen in all survey strata (Bateman and Hicks 2003, Bordage, Lepage and Orichefsky 2003, Ross 2003). The reason for the decline is not clear.

On Prince Edward Island, breeding waterfowl surveys show a significant increase ($P < 0.05$) in the number of indicated pairs of American Black Ducks over the 1985-2002 period (Bateman and Dibblee, 2003). This suggests an increasing breeding population of black ducks on the island.

The long-term decline in the counts of American Black Ducks in mid-winter inventories is paralleled by a decline in the number of indicated breeding pairs observed during breeding waterfowl surveys in southern Ontario between 1971 and 2003 (Table 3) (North and Vanos, CWS, pers. comm.). At the same time, a significant increase in mallards suggests mallards now occupy the area previously used by black ducks.

Additional information on the status of breeding waterfowl populations can be obtained by studying changes in the proportion of immatures to adults (age ratios) in fall populations. Age ratios of fall waterfowl populations are an index to the reproductive success of the species in the previous summer (Bellrose 1980). Figure 4 shows that age ratios of American Black Ducks in the eastern Canada harvest have fluctuated greatly. To be more meaningful, the age ratios in the harvest should be corrected for the higher vulnerability of young birds. Nonetheless, there was a gradual decline in the proportion of immatures in the fall population until about 1990. There has been no apparent trend in age ratios since then, however a new low was reached for the Atlantic Canada population in 1999 and the Québec and Ontario populations in 2000.

The decline of American Black Ducks on their wintering grounds prompted Canada in 1984 and the United States in 1983 to initiate a joint reduction in the harvest of black ducks. Between 1984 and 1988, the harvest in the U.S. gradually decreased, while it remained relatively the same in Canada (Table 4). In 1989 and 1990, however, Canada successfully implemented more rigid black duck hunting restrictions in order to protect local breeding populations. The average harvest is Canada over the past five years was 147,000 birds, which is 50% of the harvest during the five years (1979-1983) prior to the introduction of restrictive regulations. The estimated continental harvest in 2002 was 300,000 black ducks, which is the third lowest value since CWS began estimating harvests in Canada in 1974 (Table 4). No doubt, at least part of the decline in harvest is also related to decreasing number of hunters. In Canada, the harvest of American Black Ducks in 2002 was about the same as the previous year. In the U.S. the harvest increased by 50,000 birds in comparison to 2001.

Other Inland Duck Species

The Black Duck Breeding Ground Survey of eastern Canada, provides quantitative information on other inland duck species that can be used to evaluate the status of breeding populations. Trends in the number of indicated breeding pairs of the most abundant species are presented in Table 2 and breeding population estimates in Figure 5 (data per region are presented in Table 1). For Mallards (*Anas platyrhynchos*), Green-winged Teal (*Anas crecca*), Wood Ducks (*Aix sponsa*), and Ring-necked Ducks (*Aythya collaris*), the number of indicated breeding pairs has increased significantly ($P < 0.05$) in the Entire Survey Area over the 1990-2003 period (Collins, 2003). The breeding population of Mallards was estimated at 95,100 ± 17,800 (SE) indicated pairs in 2003, that of Green-winged Teal at 45,700 ± 7,200, Wood Ducks at 62,100 ± 23,100, and Ring-necked Ducks at 160,900± 17,400.

On Prince Edward Island, breeding waterfowl surveys indicate an increasing breeding population of Green-winged Teal and a stable breeding population of Ring-necked Ducks for the 1985-2002 period (Bateman and Dibblee 2003). In contrast, survey results suggest a declining breeding population of Blue-winged Teal (*Anas discors*) since 1990. Data on less abundant species are also presented in Bateman and Dibblee (2003).

Results of the breeding waterfowl surveys in southern Ontario suggest a decline in the breeding population of Green-winged Teal between 1971 and the 1985-2003 period, and an increase in the breeding populations of Wood Ducks and Mallards during the same period (Table 3). No data for Blue-winged Teal are available for 1971. The number of indicated breeding pairs of Mallards and Wood Ducks did not show any particular trend between 1985 and 2003, whereas it has increased for Green-winged Teal. In contrast, the number of indicated breeding pairs of Blue-winged Teal declined during the same period, although it has remained relatively stable since the 1995 survey (Table 3).

Canadian Prairies and Western Boreal Canada

Breeding waterfowl populations are monitored annually through the Waterfowl Breeding Population and Habitat Survey (Department of the Interior and

Environment Canada 1987). The traditional area of the survey encompasses the Canadian Prairies and Western Boreal Canada (northwestern Ontario to Old Crow Flats in the Yukon), as well as the north central U.S. (U.S. Prairies) and parts of Alaska (Figure 6). The U.S. Fish and Wildlife Service (USFWS) and CWS have been conducting this survey, using fixed-wing aircraft in combination with ground counts, since 1955. Breeding population estimates have been corrected for visibility bias since 1961. The southern portion of the survey area is covered again later in the summer to provide indices of overall waterfowl production. This survey, conducted by the USFWS, is known as the July Brood Survey.

In this section, we summarize information on inland duck populations in the Canadian Prairies and Western Boreal Canada. Summaries of results per province and territory can be found in Canadian Wildlife Service, Prairie and Northern Region, 2003).

Breeding Habitat Conditions in the Prairie Pothole Region

In the prairie pothole region (Canadian and U.S. Prairies; Figure. 6), weather has a strong influence on waterfowl breeding habitat conditions and, consequently, on the abundance of waterfowl populations. Drought in the late 1980s and early 1990s created particularly difficult breeding conditions for ducks. Spring habitat conditions, (as measured by the number of ponds in May), improved into the late 1990s from the low levels during the drought of the late 80s and early 90s (Figure 7). Water levels have been declining again in recent years, but rebounded strongly in 2003. The estimate of 5.2 million ponds in the prairie pothole region represented an increase of 91% from 2002 (USFWS 2003). This value was 7% above the long-term average. The increase was particularly striking in the Canadian Prairies, where the number of ponds was up by 145% compared to last year (Canadian Wildlife Service, Prairie and Northern Region, 2003). This value was 7% above the 10-year average, and 5% above the long-term average. Nevertheless, analysis of trends showed a continued long-term decline in pond numbers (Table 5).

Total Ducks

The total duck population for the Canadian Prairies (southern portions) in 2003 was estimated at 13.6 million ducks (Canadian Wildlife Service, Prairie and Northern Region, 2003), a large increase over the 7.2 million estimated in 2002. Last year in Western Boreal Canada, the estimated breeding population of all ducks was 13.1 ± 0.4 million ducks, a value that decreased to just over 10.0 million in 2003. This decrease may be a result of birds responding to improved water conditions in the Canadian Prairies. Table 5 shows that although the total duck population in the traditional survey area declined over the most recent five year period, there was no trend in the long term. Note that, contrary to the method of reporting used by the USFWS (2003), total ducks here include all species of ducks observed during the surveys, including sea ducks.

Mallard

The Mallard breeding population in the traditional survey area had recovered from the decline seen in the 1980s, but in 2001, for the first time in five years, it dropped below the NAWMP goal of 8.20 million (Figure 8), with continued decline the following year. There was modest recovery in 2003, with an estimated total breeding population of 7.95 ± 0.27 million birds. The five-year decline is significant (at $P < 0.05$), but there is no trend over the long term (Table 5).

The Canadian Prairie breeding population increased in 2003 by 35% to 3.2 ± 0.16 (SE) million birds compared to 2002 (Canadian Wildlife Service, Prairie and Northern Region, 2003), but was still well below the NAWMP goal of 4.37 million birds for the region (Figure 8). The five-year and long-term decreases are significant ($P < 0.05$) (Table 5). In Western Boreal Canada, the Mallard breeding population declined in comparison to last year, to an estimated 1.97 ± 0.16 million birds (Figure 8). Long and short term trends, although negative, were not significant (Table 5).

The July Brood Survey provides a measure of overall duck productivity; however, it is not possible to differentiate the brood as to species. Species-specific information on productivity can be obtained by studying changes in age ratios in the fall harvest of the species. As mentioned earlier, age ratios of fall waterfowl populations can be used as an index to the reproductive success of the species in the previous summer (Bellrose 1980). Based on the harvest survey, the proportion of juveniles in the Mallard harvest decreased in each of the Prairie Provinces in 2002 (Figure 9), which was a very dry year.

The continental harvest of Mallards during the last several years increased considerably compared to the late 1980s and early 1990s (Table 6), reflecting the large increase in the mallard population. This increase in harvest has occurred entirely in the U.S., whereas in Canada harvest levels have stabilized. In 2002, it was estimated that 4.9 million Mallards were killed in the U.S., a decline of 9% from the previous year. In Canada the estimated harvest decreased again by 8% to 547,000. Overall, when compared to 2002, the continental harvest of Mallards declined by 9%, to

5.44 million.

Northern Pintail

Following the dramatic decline in abundance in the 1980s, the breeding population of Northern Pintails (*Anas acuta*) in the entire traditional survey area showed some signs of recovery, increasing to 3.56 ± 0.19 (SE) million birds by 1997 (Figure 10). However, since the late 1990's the numbers have again been in decline. In 2003, the continental breeding population increased sharply to 2.56 ± 0.17 million birds; a significant increase of 43% from the estimated 1.79 million birds last year (the lowest estimate recorded since CWS and USFWS began tracking the levels in 1961). The long-term decline is significant for the Entire Survey Area of the Waterfowl Breeding Population and Habitat Survey ($P < 0.05$, Table 5). The population size continues far below the NAWMP population goal of 5.60 million birds (Figure 10). The status of this species is the focus of NAWMP's Northern Pintail Action Group, which hopes to identify and mitigate the key factors driving the declining trend.

During the 1970s, the Canadian Prairies supported about half of the pintails in the traditional survey area. The decline of that region's breeding population has therefore had major repercussions for the size of the continental breeding population, and has been compounded by declines in the smaller populations of the U.S. Prairies and of Western Boreal Canada (Figure 10). Long-term population declines in all three regions are significant ($P < 0.05$, Table 5), as is the long-term decline for the entire traditional survey area.

However, in 2003 the breeding population of the Canadian Prairies rebounded strongly (Figure 10); to an estimated 1.28 ± 0.15 million birds – more than 300% increase over 2002 (Canadian Wildlife Service, Prairie and Northern Region, 2003). Nevertheless it remains far below the NAWMP population goal of 3.30 million. Northern Pintail numbers in Western Boreal Canada decreased by 15% to 193,000 ± 25,000 birds in 2003 (Figure 10). This population remains below the NAWMP goal of 407,000 pintails for that region, and shows a significant decline ($P < 0.05$) over the long term period.

The total annual harvest of Northern Pintails dropped with the decline in the population that began in the 1980s. The harvest gradually increased during the mid 1990's (Table 7), reflecting the increase in estimated pintail numbers during the same period. Since 1999 the estimated numbers for the breeding population and the harvest have again dropped. In 2002, the continental harvest was estimated at 369,600 birds, a decrease of 20% compared to the previous year. In the U.S., it was estimated that 312,000 pintails were harvested in 2002, a decrease of 26% compared to 2001. The estimated harvest in Canada in 2002 increased by 43% to 57,700 birds. The low value estimated for 2001 seems to have been anomalously low.

Other Dabbling Ducks

Other dabbling duck species monitored during the Waterfowl Breeding Population and Habitat Survey are American Wigeon [*Anas americana*], Gadwall [*A. strepera*], Green-winged Teal, Blue-winged Teal, and Northern Shoveler [*A. clypeata*]. All of these species increased in 2003 compared to 2002 (Figures 11a through 11e). All but American Wigeon show significant long term trends (Table 5) and are at or above the NAWMP population goals.

In all cases there were significant increases in the 2003 population estimates for the Canadian Prairies. For Blue-winged Teal, Green-winged Teal and Gadwall, these increases were made at the expense of the Western Boreal Canada and U.S. Prairie regions.

The American Wigeon is unusual within this group in that it showed a relatively modest response to increased water levels on the Canadian Prairies, and it also increased in Canada's Western Boreal region. This species shows significant declining trends in the Canadian Prairies in the short, medium and long term periods (Table 5). The Canadian Prairies population of American Wigeon has not recovered to the levels seen in the 70s and at 366,000 ± 38,000 birds remains far below the NAWMP goal of 1.16 million for the region.

Scaup

Lesser Scaup (*Aythya affinis*) and Greater Scaup (*A. marila*) are not differentiated during the Waterfowl Breeding Population and Habitat Survey, as it is difficult to distinguish between the two species from fixed-winged aircraft. However, Lesser Scaup are the much more abundant species (Austin et al. 1999). Scaup breeding populations are in decline in the traditional survey area (Figure 12; Table 5). Table 5 shows that breeding numbers have declined significantly ($P < 0.05$) over the long and short term periods. In 2003, the scaup population increased by 6% to 3.73 ± 0.23 (SE) million birds, but remained well below the NAWMP goal of 6.30 million. The population in Western Boreal Canada of Greater and Lesser Scaup accounts for more than half of the continental total. The declining trend for the entire traditional survey area is largely a result of the significant decline in that region's breeding population ($P < 0.05$) (Figure 12; Table 5). The number of scaup in Western Boreal Canada continues to remain well below the NAWMP

population goal of 4.3 million birds. The Canadian Prairies scaup breeding population show significant ten and five-year declines ($P < 0.05$) (Figure 12, Table 5). This population also remains well below the NAWMP goal of 1.05 million. In 2003, the Canadian Prairie breeding population was estimated at 472,000 ± 63,000 an increase of 36% over last year's estimate (Canadian Wildlife Service, Prairie and Northern Region, 2003). The reasons for the decline of Scaup breeding populations are not known. Concerns over the abundance of scaup populations prompted the U.S. Geological Survey's Northern Prairie Wildlife Research Center to host a workshop (Austin et al. 1999) in September 1998, to provide biologists the opportunity to share information and to discuss research needs and opportunities for collaboration. The harvest of Lesser and Greater Scaup has declined considerably in Canada over the years (Tables 8 and 9), possibly reflecting the decline of scaup populations. In 2002, the harvest of Lesser and Greater Scaup was estimated at 32,900 and 11,500 birds, respectively, which in both cases represents an increase over 2001 (5% and 30% respectively). Scaup harvest has been quite variable in the U.S. (Tables 8 and 9). Harvest of Lesser Scaup declined sharply in the late 1980s and early 1990s, but increased considerably from 1994 to 1998. The 2002 Lesser Scaup harvest in the U.S. of 389,000 birds is an increase of 7% compared to 2001 and comes on top of the sharp increase of 69% recorded for 2000 over that of 1999, when the harvest stood at 210,000 birds. Greater Scaup harvest also declined over the years in the U.S., but showed a large increase in 2003. The estimated harvest was 71,000 birds, substantially higher than the average harvest estimate of 37,000 since 1999. The continental harvest of Lesser Scaup increased by 7% to 422,000 for the year 2002 and nearly doubled for Greater Scaup to 83,000.

Except for Lesser Scaup harvested in the U.S., hunting pressure for the two species has decreased in Canada and the United States. In 1975, when breeding populations of scaup were relatively large, the harvest rate index (harvest/breeding population size) in Canada for Lesser Scaup was about 2-3%, and for Greater Scaup about 14%. In 2002, the harvest rate indices for both species were 1 - 2%. In the U.S., the harvest rate indices for Lesser Scaup was about 6% in 1975, but in 2002 had increased to about 11%. In contrast, the harvest rate index for Greater Scaup declined from about 20% in 1975 to 13% in 2002.

Other Diving Ducks

The other diving duck species monitored during the Waterfowl Breeding Population and Habitat Survey are the Canvasback [*Aythya valisineria*], Redhead [*A. americana*], Ring-necked Duck, and Ruddy Duck [*Oxyura jamaicensis*].

The Canvasback shows no trend in the traditional survey area over the long term in any stratum, but there was a significant decrease for the last ten-year period (Table 5, Figure 13a)). The entire survey area showed a significant decline over the recent ten-year period, reflecting a parallel decrease in the Canadian Prairie population, but at 558,000 ± 48,000 remains slightly above NAWMP goal (Table 5; Figure 13a). The breeding population of Canvasbacks in the Canadian Prairies recovered from the population decline seen during the 1980s and early 1990s. This population remained above the NAWMP goal of 335,000 ducks between 1995 and 2000, and in 2002 was at 90% of the NAWMP goal at 306,000 ± 30,000 birds. This is an increase (103%) compared to last year's estimate (Canadian Wildlife Service, Prairie and Northern Region, 2003), but was partially offset by declines in other strata. This pattern can also be seen with the Canadian Prairie and Western Boreal Canada populations of Redheads (Figure 13b), suggesting that last year the birds moved farther north in search of breeding grounds as a result of the severe drought.

The Ring-necked Duck population for the entire survey area showed a significant increase for the ten-year and long-term periods for the Entire Survey Area (Table 5; Figure 13c). The only significant trends ($P < 0.05$) for the Ruddy Duck are increases over all time periods in the U.S. Prairies strata (Table 5; Figure 13d).

Southern Yukon

The southern Yukon is surveyed through the Cooperative Roadside Waterfowl Breeding Population Survey (Hawkings and Hughes 2003). This year was the thirteenth year of this cooperative waterfowl survey. A total of 179 wetlands were surveyed at least once along the road system in the southern Yukon. Of these, 167 were surveyed five times during the same five-week period in both 2002 and 2003. Spring was cool and generally dry in the Yukon. April was slightly cooler and much drier than average, though much warmer than last year's near record lows. Several stations reported no precipitation for the month. May continued to be cooler and drier than average, setting daily minimum temperature records, and was the second driest May on record in the Whitehorse area. June was also cooler and drier than normal. In July, the Yukon was warmer than normal, with the Whitehorse area slightly drier than normal and the remainder of the Yukon generally wetter than normal.

Total number and indicated breeding pairs of all

waterfowl (ducks, geese, swans, loons and grebes) increased by 6% (to 1069 birds) and increased by 26% (to 546 pairs), respectively, in 2003 compared to 2002 values (Hawkings and Hughes, 2003). The total number of dabbling ducks decreased by 7% and indicated pairs of dabblers increased by 14%. There was an increase of 24% in the total number of diving ducks, while indicated pairs of divers increased by 38% (Hawkings and Hughes 2003). Indicated breeding pairs of dabblers and divers are now at 65% and 55% of 1991 levels, respectively. Breeding pairs of most common duck species increased from 2002 to 2003 (Figure 14a and 14b), a change from the decreases of the previous 2 to 3 years The exception was the Northern Shoveler, which declined (Hawkings and Hughes 2003).

There were notable increases in total American Wigeon (+32%), scaup (+21%), RIngnecked Ducks (+39%) and Barrow's Goldeneye (+21%). In contrast, Northern Shoverler (-42%), Northern Pintail (-34%) and Canvasback (-30%) all declined (Hawkings and Hughes, 2003). Decreases in the latter may represent re-distribution to the Canadian prairies which were wet in 2003 following several years of increasing drought.

Interior British Columbia

Breeding waterfowl populations in the interior of British Columbia have been monitored since 1987 through a roadside survey conducted cooperatively by CWS and several partners (Breault and Watts, 2003). One of the objectives of this survey is to assess trends in the abundance of breeding waterfowl on a large number of wetlands in interior B.C. Approximately 290 wetlands have been monitored fairly consistently since 1988, allowing for long-term comparisons of waterfowl abundance over a fixed amount of habitat.

The spring 2003 breeding habitat conditions were among the worst encountered since the surveys were initiated. Much of the Interior BC plateau experienced below or far below winter snowpacks in 2002-2003 and this was the 5th consecutive year with dry conditions in Central BC. The winter was generally mild at low altitudes and the spring was very dry throughout the Interior. Those conditions resulted in a record number of dry wetlands. Dabbling duck counts (breeding pairs and total birds) were below average while diving ducks (breeding pairs and total birds) remained above long-term average. These numbers likely represent the effects of the loss of shallow and seasonal wetlands used primarily by dabbling ducks (Breault and Watts, 2003).

The total number of dabbling duck pairs was 10% lower than in 2002 and 27% below the long-term average (Breault and Watts 2003). Among dabbler species and compared to 2002, Gadwall pairs increased by 14% and American Wigeon pairs increased by 3%. Showing declines in 2003 numbers from 2002 were Blue-winged Teal pairs which decreased by 50%, Green-winged Teal pairs down by 13%, Cinnamon Teal pairs down by 45%, Mallard pairs by 4% and Northern Shoverler pairs down by 28%. Figure 15 shows that breeding pair numbers are quite variable over the period covered by this survey (1987-2003). In 2003 only Gadwall pair counts were above their long-term average (by 56%). The 2003 pair counts were below the long term average for all other common dabbling duck species; Green-winged Teal, (-22%), Blue-winged Teal (-55%), American Wigeon (-18%), Cinnamon Teal (-69%), Mallard (-34%) and Northern Pintail (-77%) and Northern Shoveler (-24.5%) (Breault and Watts, 2003).

Fewer diving ducks were observed in 2003 compared to 2002 (-4%), but the 2003 numbers were 21% above the long term average. The number of diving duck breeding pairs was up by 2% compared to 2002, and 5% higher than the long-term average. Compared to last year, the number of breeding pairs of Barrow's Goldeneye was up by 11%, Ringnecked Duck increased by 20%, and Bufflehead increased by 1%, while Redhead breeding pairs declined by 13% and Scaup pairs decreased by 17%, Compared to the long-term averages, breeding pair numbers of Bufflehead were up by 22%, Ringnecked Duck up by 16%, while scaup species were at their long-term average. Showing declines in breeding pair numbers in comparison to their long-term averages were Barrow's Goldeneye, which were down by 8%, Redhead (-24%) (Breault and Watts, 2003)

In interpreting the results of this survey it should be kept in mind that most of the wetlands are semi-permanent or permanent ponds. This means waterfowl abundance is underestimated in wet years (as waterfowl redistribute to the small and temporary wetlands that have become available), while estimates will be more accurate in dry years (when most remaining wetlands are semi-permanent or permanent water bodies). The timing of the survey is meant to capture the peak nesting period for most species but a mild winter and a warm and early spring might have resulted in earlier nesting and earlier or faster migration for some species. For those species, this might have led to an artificially lower count of both total birds and breeding pairs (Breault and Watts 2003).

CWS and the Pacific Flyway Council initiated an additional waterfowl survey in 1999 to assess the abundance of waterfowl breeding in British Columbia, particularly Mallards. The survey design uses a Geographical Information System (GIS) and

takes into account the distribution and availability of wetlands in various ecological units of the province. In order to estimate the waterfowl value of wetlands of different sizes, breeding waterfowl surveys are referenced and compiled by wetland size and ecological unit (eco-sections), as indicated by the B.C. Watershed Atlas (a digital compendium of aquatic features in the province). The GIS was used to determine the coverage of the random transects with respect to percentage of wetland area intercepted and coverage of wetlands of various size classes. Over half of the wetlands cover an area of less than one hectare. There are still many gaps in quantifying the value of different wetlands and different habitats; but this survey has led to a preliminary estimate of over 750,000 pairs of breeding waterfowl in the province. In 2003 the surveys were extended into three new ecological units; Chilcotin Upland, Chilcotin Plateau and Liard Plains ecosections. Over the last 5 years, helicopter surveys have been conducted in 14 of the 115 ecosections found in the province. Preliminary analyses indicate that those ecosections alone support well over 60,000 breeding pairs of Mallards. More helicopter surveys are planned for the spring of 2004. This survey will fill important gaps in the population assessment and monitoring programs of both CWS and the Pacific Flyway Council, and will improve our understanding of waterfowl abundance and species composition in B. C. (A. Breault, pers. comm.).

Population Status of Sea Ducks

There is concern about the population status of most of the sea duck species (tribe *Mergini*) that breed in North America. Because many breed at low densities in remote parts of the continent and cover a broad geographic area, it is difficult to gather adequate information on their ecology and population dynamics. Consequently, sea ducks are poorly known and few reliable population indices or estimates of annual productivity exist for any of the species. Harvest levels are also poorly known. In comparison to other waterfowl, sea ducks have low reproductive rates, which means that population growth is highly sensitive to adult mortality. Therefore, there is limited potential for quick population recovery. Because of the increasing concern about the status of sea ducks, the NAWMP Committee created the Sea Duck Joint Venture in 1998.

The USFWS initiated in 1991 an aerial transect survey to provide wintering distribution and relative density information for sea ducks along the Atlantic Coast (Goldsberry 1997). The Atlantic Coast Sea Duck Survey is conducted in late January or early February from Chedabucto Bay, Nova Scotia, south to the Georgia-Florida state line. To date, ten years of data have been collected. Despite the limitations of traditional mid-winter surveys of waterfowl for monitoring sea ducks (mid-winter surveys are only conducted in the U.S. portion of the Atlantic and they do not cover off-shore areas where sea ducks winter, and consequently they do not provide a comprehensive index to overall abundance), these surveys can still provide, however, long-term data for some sea duck species for a broad geographic area. Kehoe (1996) examined trends in eastern sea duck populations using the traditional mid-winter surveys.

Harvest information is estimated through the traditional harvest surveys in Canada and the United States. Harvest estimates are imprecise for many species due to small sample sizes. In addition a special sea duck harvest survey in Newfoundland and Labrador for eiders, scoters, and Long-tailed Duck has been conducted by CWS over the last four hunting seasons. This special survey was designed to try to overcome limitations of the National Harvest Survey, notably the lack of coverage for late season harvest.

Eiders

There is little information on the population dynamics and ecology of Arctic-breeding eiders. Considerable concern exists over the status of eiders breeding in the Arctic, where these birds are hunted throughout their range (G. Gilchrist, CWS, pers. comm.). Reviews by Suydam (2000), Gilchrist and Dickson (1999), and Dickson (1996 and 1997) provide useful summaries of what is known about eider species that breed in Canada – the King Eider (*Somateria spectabilis*) and Common Eider (*S. mollissima*). King Eiders breeding in the Canadian Arctic winter both east and west of the continent. Since King Eiders form pairs on the wintering areas, there may be two distinct populations, although genetic differences have not been identified to date (L. Dickson, CWS, pers. comm.). For Common Eiders breeding in northern Canada, three subspecies are recognized: the Pacific subspecies *v-nigra* (western and central Arctic), the northern subspecies *borealis* (eastern Arctic), and the Hudson Bay subspecies *sedentaria* (Hudson Bay and James Bay). A fourth race, the American subspecies *dresseri*, breeds in Atlantic Canada.

King Eider

Western Arctic Population

There is growing evidence that the western Arctic population of King Eiders has declined considerably in the last few decades. Spring counts

of eiders migrating past Point Barrow, Alaska, indicate that the King Eiders breeding on the Arctic coastal plain of Alaska and in the western and central Canadian Arctic declined by more than 50% between 1976 (count of 800,000 birds) and 1996 (350,000) (Suydam 2000). Aerial surveys conducted in the western Canadian Arctic in 1991-1994, together with the work by Alisauskas (1992) in the Queen Maud Gulf, have provided a breeding population estimate of about 200,000 to 260,000 King Eiders in the western and central Canadian Arctic (Dickson et al. 1997). This estimate is considerably lower than the estimate of 900,000 of Barry (1960) 40 years ago, which suggests a substantial decline in abundance of the western Arctic population (Dickson et al. 1997). Reasons for the decline are unknown.

Movement between nesting, moulting and wintering areas has been documented for 42 King Eiders tagged with satellite transmitters on Victoria Island and Banks Island, NWT, and Prudhoe Bay, Alaska. The results show the majority of western King Eiders moult and winter off the east coast of Russia (L. Dickson, pers. comm.). King eiders banded in the central arctic, in the Queen Maud Gulf, have been recovered near Alaska as well as near Greenland (R. Alisauskas, pers. comm.)

Nearly all (99%) of the harvest of western Arctic eiders within Canada occurs near the community of Holman on western Victoria Island, NWT (Fabijan et al., 1997). A three-year study was conducted at Holman to further our understanding of the impact of the Holman subsistence harvest on that area's eider subpopulations. Holman hunters harvested an estimated 4 to 7% of the King Eider subpopulation and less than 1% of the Common Eider subpopulation available to the community. The present levels of harvest at Holman are likely sustainable. However, more information on recruitment rates and mortality, including harvest in Russia, is needed to confirm this (L. Dickson, pers. comm.).

Eastern Arctic Population

A review of available data on the wintering grounds in Greenland has shown a substantial decrease in the numbers of wintering and moulting King Eiders and suggests that the eastern Arctic population is declining. It is not known if this apparent decline represents a shift in distribution due to human disturbance (Suydam 2000). In the Rasmussen Lowlands (Nunavut), however, a significant decline in the numbers of King Eiders was seen between 1974-1975 and 1994-1995 (Gratto-Trevor et al. 1998), which supports the concerns expressed by hunters in the area that numbers are declining (Johnston et al. 2000).

In the eastern Arctic, available harvest data for eiders is limited. However, the harvest of eiders (King and Common eiders combined) in southwest Greenland is estimated at over 100,000 birds annually. A large proportion of this harvest must consist of Canadian breeders, since the breeding population of Common Eiders in west Greenland consists of only 20,000 pairs based upon recent surveys (G. Gilchrist, pers. comm.). The effects of this level of harvest on populations remain poorly understood.

Pacific Common Eider

There is evidence based on migration counts at Point Barrow that the population of Pacific Common Eider has declined considerably in recent years. Counts during spring migration show a decline of more than 50% between 1976 and 1996 (Suydam et al. 2000). Reasons for the decline are unknown. A study in Bathurst Inlet of the reproductive ecology and survival of Pacific Common Eider, including identification of the factors affecting productivity and survival, was initiated in 2001 to determine if conditions on the breeding grounds are contributing to the recent declines (L. Dickson, pers. comm.).

Surveys during spring migration in the late 1980's suggested that more than 80% of the Pacific Common Eiders that breed in Canada nest in Dolphin and Union Strait, Coronation Gulf, and Queen Maud Gulf. To document the size and location of nesting colonies, provide a breeding population estimate for the region, and establish a baseline for monitoring Pacific Common Eider populations in future, aerial and ground surveys were conducted over three years beginning in 1995. The breeding population for the central Arctic was estimated at about 37,000, and the primary nesting areas were identified as southeastern Dolphin and Union Strait, outer Bathurst Inlet, Melville Sound, Elu Inlet and central Queen Maud Gulf (L. Dickson, pers. comm.).

Satellite telemetry of 47 eiders from a nesting colony near Bathurst Inlet, Nunavut, indicate these eiders winter off the southeast coast of Chukotka Peninsula, Russia (L. Dickson, pers. comm.). About one-third of the males also moult off Russia. Harvest information for eastern Russia is limited, but suggests a substantial take of eiders. A rough estimate of the subsistence harvest in 2001 in Chukotka was 115,000 eiders (includes 4 species) (Evgeny Syroechkovski, Jr, pers. comm.). However, it is unknown what percentage of this take is Pacific Common Eiders from Canadian breeding grounds. Subsistence harvest of Pacific Common Eiders in Canada and Alaska is an estimated 2500 birds per year (Fabijan et al. 1997

Northern Common Eider

The northern subspecies of the Common Eider breeds throughout the coastal areas of the eastern Canadian Arctic and Greenland, and winters along the coasts of Labrador, Newfoundland and southwest Greenland. This race of eider is subjected to heavy subsistence and sport harvest throughout its breeding, staging, and wintering grounds, especially in Greenland (see harvest section below) (F. Merkel, Greenland Institute of Nature, pers. comm.). Reliable data on population status does not exist and few key habitat sites have been identified; historical data only exists for three sites, Ungava Bay, Hells Gate (high Arctic), and Digges Sound. Recent surveys in Greenland indicate that dramatic population declines have occurred since the 1970s.

Historical data exists for the colonies in Ungava Bay (Chapdelaine et al. 1986) and repeated surveys conducted in 2000 provided the first meaningful population trend data for Northern Common Eiders in Canada. Preliminary results indicated an increase in the number of eiders for three archipelagos and a decrease in the most northern archipelago compared to the early 1980s (Falardeau et al., 2003). The small Northern Common Eider colonies in Digges Sound (located off the northwest tip of Québec) were resurveyed in 1999. The survey did not show any significant population trend since the early 1980s (M. Hipfner et al., submitted.). These field studies showed that annual variation in colony attendance of Common Eider ducks (e.g. low attendance due to heavy ice conditions) make the interpretation of survey data difficult. Long term annual monitoring of a subset of colonies is required to quantify this variation (J-P Savard, CWS, pers. comm.).

A recent review of the band recovery data of Common Eiders banded in the eastern Canadian Arctic and west Greenland showed links between breeding populations and their affinities to specific wintering areas in Greenland and maritime Canada. The majority of bands recovered from eiders banded on Southampton Island, Nunavut since 1996 have been recovered in west Greenland during winter (G. Gilchrist, pers. comm.). Recent satellite telemetry of eiders during both spring and fall migration also clearly demonstrate that large proportions of the Canadian breeding population winter in west Greenland (A. Mosbech, Danish Department of Environment and G. Gilchrist, CWS, pers. comm.).

Collectively, these findings show that the majority of Northern Common Eiders winter in southwest Greenland rather than in Canada, as was previously thought. These recent findings have important management implications because they confirm that the majority of eiders harvested in Greenland during winter are part of the breeding population in Canada. Population and harvest data of the northern common eider were integrated in a simulation model (Gilliland et al. *submitted*), and results suggested that the Greenland harvest of northern eiders was not sustainable, while the total Canadian harvest appears to be sustainable at current levels. In response, an International Eider Conservation and Management Plan was drafted by Canada and Greenland (Gilchrist et al. 2002.).

Approximately 80,000 Northern Eiders winter in the Gulf of St. Lawrence (Savard et al. 1998). Numbers wintering in Newfoundland seem to have decreased in recent years but baseline surveys are lacking (S. Gilliland, CWS Atlantic, pers. comm.). In 2003, for the first time ever, the entire wintering range of Northern Eiders in eastern Canada (and St. Pierre and Miquelon (*borealis*?)) was surveyed from fixed-wing aircraft in 2003. The data analysis is not completed yet (Gilliland, Bordage and Lepage, pers. comm.).

Hudson Bay Common Eider

The Hudson Bay subspecies of the Common Eider breeds within Hudson Bay and winters in open water leads near the Belcher Islands and off the west coast of Québec. This is one of the only waterfowl species in the world that spends the entire year in Arctic waters. Mass die-offs can occur in winter when large proportions of the population are concentrated in open water leads that sometimes freeze (Robertson and Gilchrist 1998). The frequency and magnitude of these die-offs and the impact that they have on the Hudson Bay eider population is unknown.

Breeding data for this subspecies only exists for a couple of locations; the Belcher Islands and in the area of LaPerouse Bay, MB. The Belcher Islands, first surveyed in the 1980s, were resurveyed in 1997. Results showed that the breeding population had declined by 70% since the late 1980s, apparently due to a winterkill in 1992 (Robertson and Gilchrist 1998). The Canadian Wildlife Service initiated research of the winter ecology of Hudson Bay common eiders in 1998. The following 3 winters were moderate, with large expanses of open ocean available to foraging flocks. There have been no significant winterkill events and the eider population appears to be recovering. This will be quantified by breeding colony surveys planned for the summer of 2004 (G. Gilchrist and G. Robertson, pers. comm.).

American Common Eider

American Common Eiders are the most abundant species of sea duck breeding along the East Coast of North America. Their nests are exploited for down in the St. Lawrence estuary and birds are heavily hunted in Québec, Atlantic Canada and the eastern United States. R. Milton (NSDNR,

unpubl.) reviewed information about the American subspecies of Common Eider. Based on surveys conducted in the last two decades, breeding populations were estimated at approximately 18,000 pairs in Labrador, 3,000 in Newfoundland, 26,000 in the Gulf of St. Lawrence and St. Lawrence Estuary, and 18,000 to 22,000 in Nova Scotia and New Brunswick. More recent information from CWS, Québec Region indicated 32,000 in the St. Lawrence Estuary and 10,000 in the Gulf of St. Lawrence (CWS Québec Region, unpubl.) There are also a significant number of eiders wintering on the islands of St. Pierre and Miquelon, and the numbers have increased over the 7 years of surveys, from about 2,000 birds in 1994 to at least 12,000 birds in 2003 (B. Letournel, ONCFS, St-Pierre et Miquelon, pers. comm.).

In June of 2002, CWS reported a massive number of dead Common Eiders in the islands of the St. Lawrence Estuary between Rivière-du-Loup and Rimouski, Québec. The dead birds were found during down harvest in the breeding colonies. The exact count is unknown, but is at least 5,400 birds (J. Rodrigue, pers. comm.). Approximately 80% were adult breeding females. Analysis confirmed Avian cholera to be the cause. There have been three previous events of Common Eider mass mortality in the Estuary: 1985, 1964-66 and 1947-48. Although the breeding population of Common Eiders in the St. Lawrence Estuary appears to be stable or increasing, the 2002 impact of Avian cholera was severe. Observation during the laying period in May 2003 suggested that Avian cholera did not occur in the islands devastated in 2002. Preliminary reports from estimates of down harvest show no significant decrease of breeding females in the most important colonies of St. Lawrence estuary (CWS-QC unpubl.).

The total harvest for Canada between 1998-2002 averaged 14,600 birds. The average number of eiders harvested in Québec is estimated at 2,900 birds annually. The average Nova Scotia harvest was estimated at 4,200 birds. The largest harvest of common eiders in Canada takes place in Newfoundland, where the average over the same period was 7,800 birds. (Collins and Gobeil, 2003). Harvest of common eiders in the Atlantic Flyway averaged 27,000 birds (1999-2002), with Maine and Massachusetts reporting the bulk of the harvest (Serie and Raftovich, 2003).

Harlequin Duck

Until recently, there was little knowledge of the ecology of Harlequin Ducks (*Histrionicus histrionicus*) in North America. However, research efforts are now being made to understand the life history, population status and movements of many harlequin populations on both coasts (Robertson and Goudie 1999). Robertson and Goudie (1999) provide a review of available information on the Harlequin Duck.

Eastern Population

The eastern North American population of the Harlequin Duck was listed as endangered in Canada in 1990. As a consequence, hunting of this species was closed throughout the Atlantic Flyway. In the late 1980s, the population wintering in eastern North America was estimated at less than 1,000 individuals (Goudie 1991). Over hunting, disturbance, and habitat loss are believed to have played a role in the decline of the eastern population of Harlequin Ducks (Robertson and Goudie 1999). As a result of new information, which indicated the number of birds breeding in eastern Canada to be significantly larger than suspected, the status of the eastern population was downgraded to a population of Special Concern.

Recent satellite telemetry studies suggested the existence of two Harlequin Duck populations: one which breeds in northern Québec and Labrador and winters in southwest Greenland, and one which breeds in southern Labrador, Newfoundland, New Brunswick, and the Gaspé Peninsula, and winters mostly in Maine (Brodeur et al., 2002). Genetic studies support the existence of two populations with minimal gene flow (Scribner et al., 2000). The extent to which these populations overlap on their breeding and wintering areas is unknown. The size of the harlequin population wintering in Greenland that originates in Canada is not known, but 6,200 moulting harlequins were estimated along the western coast of Greenland during surveys in 1999 (Boertmann and Mosbech in prep.). The population of Harlequin Ducks wintering in eastern North America has been increasing in recent years and is now estimated at about 1,800 birds, with most (~1,000) wintering in Maine at a single location (Robertson and Goudie 1999). Smaller numbers winter in Atlantic Canada. Counts of Harlequin Ducks wintering in Newfoundland showed small increases in 1996 and again in 1997. This was encouraging given the dramatic decline that occurred there through the 1980's and early 1990's.

An aerial survey in May 2000 of 30 rivers of the Québec North Shore and Labrador (rivers draining into the Gulf of St. Lawrence) discovered the first evidence of harlequins breeding on the Québec North Shore. At least 32 Harlequin Ducks on 5 rivers in Québec and 2 in Labrador were observed. All harlequins were seen in pairs and found in potential breeding habitats, and were therefore considered as breeding individuals (M. Robert, pers. comm.). An estimated 286 Harlequin Ducks bred in the north peninsula of Newfoundland. This represents at least 20% of the eastern North American breeding population and highlights the importance of the North

Peninsula as a breeding area for this population (Gilliland, pers. comm.). There is also evidence of Harlequins breeding in southeastern Newfoundland at Bay du Nord River (S. Gilliland, pers. comm.). In addition, there is evidence of Harlequin Ducks breeding on Baffin Island, Nunavut (M. Mallory, pers. comm.).

Western Population

Reflecting conservation concern for Harlequin Ducks, considerable attention has focused on western populations, particularly in the Strait of Georgia, over the past decade (S. Boyd and D. Esler, pers. comm.). These efforts by Canadian Wildlife Service and Simon Fraser University collaborators have revealed much about the ecology and conservation of Harlequin Ducks; in fact, Harlequin Ducks in the Strait of Georgia are frequently highlighted as a sea duck for which we have an unprecedented understanding of ecology and demography. In brief, recent findings include: (1) the Strait of Georgia provides non-breeding habitat for > 10,000 Harlequin Ducks, (2) concentrations of Harlequin Ducks in the Strait of Georgia during herring spawn in the spring number in the thousands, which is a globally unique aggregation, (3) Harlequin Ducks wintering in British Columbia breed across a wide range of mountain streams throughout the province and beyond, (4) they show very strong fidelity to wintering and molting sites, which may make local aggregations demographically discrete and vulnerable to local habitat change, (5) at least some young Harlequin Ducks follow their mothers to wintering areas, further contributing to formation of distinct, independent population segments, (6) annual survival of adults is high and sustainable, and (7) production of young birds appears to be insufficient to maintain stable population numbers (S. Boyd and D. Esler, pers. comm.).

Focused studies of Harlequin Ducks in the Strait of Georgia are coming to a close. Continuing and future work will focus on the important results derived from previous studies. Surveys of productivity, based on counts of male age ratios during winter, will be continued to document annual variation and derive long-term means. Also, a research program was initiated by the Centre for Wildlife Ecology, Simon Fraser University to evaluate factors that might explain the insufficient recruitment observed over the past decade. This study, conducted in the Coast Mountains of BC, will evaluate the roles of habitat quality, acquisition of nutrients for clutch formation, and interactions with insect-eating fish as potential mechanisms that could lead to broad-scale, long-term reductions in Harlequin Duck productivity (S. Boyd and D. Esler, pers. comm.).

Scoters

The three species of scoters that breed in Canada are Black Scoters (*Melanitta nigra*), Surf Scoters (*M. perspicillata*), and White-winged Scoters (*M. fusca*). Almost all Black Scoters breeding in this country belong to the eastern population whose breeding ground is centered in northern Québec. Western Black Scoters have a breeding ground centered in Alaska (Bordage and Savard 1995). Less is known of Scoters than any other group of sea ducks. Research efforts in recent years have brought us to a better understanding of the breeding, moulting, and wintering ecology of this group. Bordage and Savard (1995), Brown and Fredrickson (1997), and Savard et al. (1998) all provide useful reviews of the information available on scoters.

Based on traditional spring waterfowl breeding surveys, scoters as a group seem to have declined in North America over the long term (Savard et al. 1998). The three species of scoter are not differentiated during these surveys, as it is difficult to discriminate among them from fixed-winged aircraft. The traditional survey area of the Waterfowl Breeding Population and Habitat Survey (Figure 6) covers a large part of the breeding area of White-winged Scoters, and a good part of the Surf Scoter range. Based on the extent of known breeding distributions, scoter populations in the Canadian Prairies should be White-winged Scoters only, while populations in Western Boreal Canada include White-winged and Surf Scoters. All three species are present in Alaska. However, these data should be interpreted with caution, as the surveys are not well adapted for estimating scoter numbers (Savard et al. 1998).

Some short-term data is available for the individual scoter species. Results from the Atlantic Coast Sea Duck Survey do not show any clear trend in White-winged Scoters wintering along the Atlantic coast over the last ten years (however, there is considerable variation from year to year) (Table 11). On the other hand, wintering numbers of Black and Surf Scoters were increasing in the late 1990's, but have leveled off.

The Dalhousie area of New Brunswick has long been thought to be a major spring staging area for scoters. During the spring of 2000, counts were made along the Restigouche River estuary. Spring staging numbers peaked at 95,000, with 80 to 85% of them being Black Scoter and 15 to 20% Surf Scoter. The counts are considered to be conservative (M. Lushington, J. Clifford, and P. Hicklin, unpubl.).

In Eastern Canada, in mid-May of 1998, surveys in the St. Lawrence Estuary and Gulf yielded over 200,000 scoters (mostly Black and Surf Scoters). Recent surveys in September and October indicated that the St. Lawrence estuary was an important fall

staging area for Surf Scoters as nearly 80,000 birds were counted there (J.-P.L Savard, pers. comm.). Moult surveys in late July and early August of that year indicated that around 50,000 scoters (mostly male Surf and White-winged Scoters) moulted within the St. Lawrence Estuary (J.-P. Savard, pers. comm.). Also, between 50,000 and 62,000 moulting scoters (mostly male Surf Scoters) were located along the Labrador coast in 1998 and 1999 (S. Gilliland, pers. comm.).

Based on the results of the Waterfowl Breeding Population and Habitat Survey, in the Canadian Prairies, scoter numbers have declined over the long term (Figure 16 and Table 12). Compared to last year, the 2003 numbers represent a decline of 68%. Scoter numbers have also declined over the long term in Western Boreal Canada. However, 2003 saw a 21% increase in the population estimate to 805,000 ± 107,000 individuals (Figure 16). In Alaska estimated numbers increased by 26% over 2002 to 1.13 ± 0.11 million birds.

More detailed examination of trends in various strata showed intriguing results. Alisauskas et al. (submitted – b) showed that, contrary to the overall declining trend, scoters increased over the past decade in northern Manitoba and Saskatchewan, but continued to decline in northern Alberta and the NWT. Their research, making use of reverse-time capture histories, at Redberry Lake, Saskatchewan shows the long term decline of the local population has now been arrested. Interestingly, this occurred as a result of increased recruitment through immigration of adult females (Alisauskas *et al*. submitted – b).

Important concentrations of Surf Scoters and White-winged Scoters are found in Coastal British Columbia in habitats that also support shellfish aquaculture, an industry that has the potential to expand dramatically. Simon Fraser University and CWS are conducting a study of the interactions between scoter populations and the shellfish industry with the intent of evaluating potential effects, either detrimental or beneficial, of shellfish aquaculture on scoter population sustainability, at local and regional scales over different time frames.

A number of other research studies have also been recently completed or are currently underway. A study of the demographics and behaviour of Surf Scoters in the Strait of Georgia, British Columbia was initiated in the fall of 1999 to assess the use of winter age ratios to determine recruitment and population demography. The morphological differences between juvenile and adult males have been described and the plumage characteristics have been successfully used in the field to age male Surf Scoters. A second field of investigation will determine how behavioural interactions within flocks influence the age and sex structure of foraging flocks. In addition, a study was initiated in 2002-2003 to document winter age ratios as an index of recruitment for several sea duck species and to determine the spatial/geographic scales at which sampling must be conducted in order to be representative of overall population structure (S. Iverson, pers. comm.). We hope to continue these surveys for the next 4-5 years to establish a baseline data set and to evaluate annual variability (A. Breault, pers. comm.). In a related study, scoters were marked with both VHF transmitters (75 birds) and satellite transmitters (13 birds) to track movements in spring to herring spawn locations, to determine timing of migration and arrival at breeding areas, and to describe affiliations between the winter area (Baynes Sound) and breeding grounds in the north (see the following web page for migration maps: http://www.seaduckjv.org/sts_bc_maps.html).

In response to the apparent decline in scoter numbers, reductions were made in 1993 in the bag limits of scoters in both the United States and Canada. Harvest of all three scoter species in Canada and the United States has declined considerably since the 1970s (Tables 13 -15).

Barrow's Goldeneye

Eastern Population

Until recently, little was known of the eastern North American population of the Barrow's Goldeneye (*Bucephala islandica*), which is believed to be composed of no more than 4,500 birds (Robert et al., 2003). This corresponds to a breeding population of about 1,400 pairs (30% of birds are adult females). Nearly all of the eastern population winters in Québec, mainly in the St. Lawrence River Estuary (>50%) and, to a lesser extent, in the Gulf of St. Lawrence (Robert et al. 2003). About 400 individuals winter in the Atlantic Provinces and in Maine. Although there is no precise data to document a trend, it is believed that the population declined during the last century and that it could still be declining. In 2001, the eastern population was listed by COSEWIC as being of Special Concern.

This small population faces several threats on its breeding and wintering grounds. As it is concentrated in a few areas in winter, it is highly vulnerable to oil spills or other disasters (Robert et al. 2003). Because hunting could otherwise pose a threat to Barrow's Goldeneyes, most areas where wintering and staging birds concentrate have been closed to hunting in Canada. Because the Barrow's Goldeneye is an arboreal species, forest exploitation is an important threat on the breeding grounds. Logging affects goldeneyes by directly destroying nests during harvesting operations and by reducing the availability of potential nest sites (Robert et al., 1999; M. Robert, pers. comm.).

Recent studies by the Canadian Wildlife Service in Québec have identified the main breeding area of the eastern population of the Barrow's Goldeneye. It consists mainly of the small lakes of the high plateaus north of the St. Lawrence River from the Saguenay River east to at least Mingan (Robert et al., 2000). It is probable that part of the population also breeds on the high plateaus west of the Saguenay River (Savard and Dupuis, 1999). The first official breeding record for the eastern population was obtained in 1998 when a brood was sighted on Lac des Polices in ZEC Chauvin, a few dozen kilometers northwest of Tadoussac, Québec. Since then, several broods were observed about 60 km northwest of Sept-Îles, Québec (Robert et al. 2000) and in the ZEC Chauvin area in 1999 (CWS-QC, unpubl.). Satellite tracking data show that at least some Barrow's Goldeneyes wintering along the St. Lawrence corridor breed inland along the north shore of the St. Lawrence Estuary and Gulf. In fact, high numbers of pairs and lone males detected in aerial and ground surveys conducted from 1990 to 1998 indicate that this area is probably the core breeding area for the eastern population of the Barrow's Goldeneye (Robert et al., 2000).

In eastern North America, the only known moulting sites of adult male Barrow's Goldeneyes are located in the coastal waters of Hudson, Ungava, and Frobisher (Baffin Island) bays, and in a few coastal inlets of northern Labrador (Robert et al., 1999, Robert et al. 2002). Two moulting areas (Tasiujaq and Tuttutuuq River, Ungava Bay) were identified while tracking males with satellite telemetry in July 2000. At least 200 goldeneyes (mostly Barrow's) were at the first location, while at least 3,000 goldeneyes (mostly Common) were in the latter area (CWS, unpubl. data). Barrow's Goldeneye spent up to 4 months in the moulting locations, highlighting the importance of these areas in the annual cycle (Robert et al., 2002).

Western Population

There are no accurate population estimates or trend for the western population of the Barrow's Goldeneye. However, it is believed to be stable or slightly declining. Some short-term data are available for this population from the breeding waterfowl surveys of the southern Yukon and the interior of B.C. (Figure 17 and 18). Compared to last year, in 2002, the number of breeding pairs of Barrow's Goldeneye increased by 44% in the southern Yukon (Hawkings and Hughes 2003), and increased by 11% in the interior of B.C. (Breault and Watts 2003). While breeding pair numbers during the 13 years of the southern Yukon survey do not show any overall trend, breeding pairs of Barrow's Goldeneye in the interior of B.C show a decline of 8% from the long term average (1987-2002). This decrease is likely indicative of the gradual abandonment of nest box programs (resulting in reduced nest site availability) for central interior B.C. (Breault and Watts 2001).

A graduate research program was undertaken from 1997 to 2001 to determine nesting and brood-rearing habitat requirements of Barrow's Goldeneye and Bufflehead in central B.C. (Evans, 2003). Barrow's Goldeneye nests were found primarily in abandoned Pileated Woodpecker cavities located in large Aspen trees and over 90% of all cavities were within 200m of a body of water. Barrow's Goldeneyes appeared to select more productive wetlands and invertebrate abundance within a wetland was positively correlated with duckling masses at day 40, pre-fledging survival and first year return rates.

Moulting female Barrow's Goldeneyes have been banded since 1988 in central B.C. in an area where the breeding population has also been banded. Survey and recapture data indicate that Barrow's Goldeneye females do not moult locally (with or without their broods) and that they can aggregate into small groups for the wing moult (A. Breault, pers. comm.). The differences in composition between the breeding and moulting populations indicate the Central B.C. experiences two different moult migrations : the local breeders depart for an unknown destination while birds of unknown origin come in and replace local breeders on breeding ponds. The geographic extent of the female Barrow's Goldeneye moult and the number of females involved is currently unknown. The tracking of moulting females might provide information on female survival rate and this approach could lead to the design of new monitoring programs targeting females (A. Breault, pers. comm.).

A second study investigated natal return and survival rates for known-age Barrow's Goldeneye in central BC (S. Boyd and M. Evans, pers. comm.). Over 800 hatch-year local ducklings were marked with nasal discs from 1995 to 2000 and surveys were conducted weekly from April to August 1996 to 2002 to record the presence of marked birds. Average first year return rate was estimated at 33% (range = 18-53%) for females but only 6% (range = 0-19%) for males. Using the program MARK, the local annual survival was estimated at 34% for females in three of the four years but 73% for the other year (1997 to 1998). Male survival rate was estimated at only 8% and 55% for those same years. The reason for the high variability in survival rates is unknown. Marked females were encountered 2-3 times more often than marked males on the study area in their second year and they were recorded on twice as many ponds. These observations suggest that, although young males return to their natal area, they are much more transient than females. This may partially account

for the lower apparent return and survival rates of males compared to females.

Other Sea Ducks

Information on other sea duck species from the Waterfowl Breeding Population and Habitat Survey and the Black Duck Breeding Ground Survey is presented in Tables 12 and 16. Information on Goldeneye species, Bufflehead and Hooded Merganser from the roadside surveys in the Yukon and the interior of British Columbia is presented in Figures 17 and 18.

Results from the Atlantic Coast Sea Duck Survey indicate Long-tailed Ducks to be increasing in the period from 1991 to 2002 (Table 11). Historically, studies in this region indicated that Long-tailed Ducks (*Clangula hyemalis*, previously Oldsquaw) showed no significant population trend in the traditional mid-winter counts (P = 0.30) between 1954 and 1994 (Kehoe 1996). The Waterfowl Breeding Population and Habitat Survey shows no trend for Long-tailed Ducks (Table 12).

Population Status of Geese

Breeding Conditions in the Canadian Arctic and Sub arctic Regions in 2003

Spring arrived slightly later than usual on Banks Island in the western Canadian Arctic, but was about average on the northwestern Canadian mainland (J. Hines, pers. comm.). In the Queen Maud Gulf, despite the heavy winter snow cover, the melt was rapid and nesting began early (R. Alisauskas, pers. comm.). In the eastern arctic, including west Hudson Bay, the Foxe Basin and Bylot Island, the arrival of spring was average to early (D. Caswell, G. Gilchrist, M. Mallory, G. Gauthier, pers. comm.). Further south, in the Hudson Bay Lowlands (K. Abraham pers. comm.), northern Québec (J. Rodrigue, pers. comm.) and Labrador; spring-like conditions were average to slightly late in arriving. Breeding conditions were expected to be average to good for most goose populations in 2003.

Snow Goose

Greater Snow Goose

Greater Snow Geese (*Chen caerulescens atlanticus*) breed in the eastern Arctic around northern Foxe Basin, northern Baffin, Bylot, Axel-Heiberg, and Ellesmere islands, and northern Greenland. They winter along the mid-Atlantic coast from New Jersey to North Carolina. During migration, the entire population stages in Québec in the marshes and agricultural lands of the St. Lawrence River Valley.

The growth of the Greater Snow Goose population from a few thousand birds in the 1930s to over 500 thousand in spring migratory flights in the early 1990s has been well documented (Reed et al. 1998a). The rate of increase has been especially rapid during the past decade. Spring aerial surveys of the main staging area in the St. Lawrence River Valley, which generate more reliable population estimates than mid-winter surveys, have been conducted since 1965 (Hughes et al., 2002). However, the geese have expanded their use of agricultural habitats considerably and even this survey was unable, in recent years, to account for all of the geese staging in Québec in spring. In the late 1990s an experimental technique using a sample of radio-marked birds was employed to correct the population estimate for geese missed during the survey. While the technique was successful in two of the three years it was employed, it was abandoned after 2000 due to it's high cost and logistical demands. The original aerial photographic survey was enhanced beginning in 2001, by using three aircraft simultaneously and completing each of two surveys in a single day, one at the end of April and the second at the beginning of May.

The estimate in the spring of 2003 was for 678,000 ± 55,241 birds, which was essentially unchanged from last year. The estimates of the past two years were lower than during the peak years of 1998 through 2001, when there were more than 800,000 birds estimated (Figure 19).

The study of reproductive ecology continued at the Bylot Island breeding colony in 2003 (Gauthier, pers. comm.). The spring arrived early, and snow melt was rapid. The breeding effort was strong, and predation was low. In addition weather conditions were excellent during incubation, hatch and early brood-rearing. These factors were expected to result in above average production of young for 2003 (G. Gauthier, pers. comm.). Age ratio counts during October show on average 25% young, and the preliminary estimate for 2003 is between 26 and 28% (A. Reed, pers. comm.). The record minimum from 1999 was 2% (P. Brousseau, pers. comm.).

In Canada, the 2002 fall harvest was estimated at 46,800 (Table 17), which is lower than average. In the U.S., the harvest was estimated at 39,200, which is also relatively low. The low hunter success was most likely a result of the poor production of young birds in 2002.

During the special conservation season in Québec, an estimated 22,635 ± 3,242 birds were harvested in spring 2003 (Collins, Gobeil and Brousseau, unpubl data). This is the smallest harvest taken during the five conservation seasons since 1999 (Figure 20). The special conservation

measures undertaken in the United States did not include opportunities to hunt Greater Snow Geese.

Lesser Snow Goose

Lesser Snow Geese (*Chen caerulescens caerulescens*) nest in colonies throughout much of the coastal areas of the Canadian Arctic. These colonies can be grouped according to three regions: the eastern Arctic (Southampton and Baffin islands, and the western and southern shores of Hudson Bay), the central Arctic (mainland from Coppermine in the west to Gjoa Haven in the east, and western Victoria Island) and the western Arctic (Banks Island, and the Anderson and Mackenzie River deltas).

Breeding ground surveys have shown substantial growth of Lesser Snow Goose populations at several colonies and the establishment of new colonies in recent years (Batt 1998). CWS is coordinating a series of photographic inventories of major Lesser Snow Goose nesting colonies, and these results are reported below.

The increasing number of Lesser Snow Geese in the eastern and central Arctic is also shown by surveys on wintering areas (these geese are also referred to as the Mid-continent Lesser Snow Geese). Mid-winter counts increased from 0.78 million geese in 1970 to 3.0 million in 1998 (Kruse and Sharp, 2002; Peterson 2001; Figure 21). The 2003 mid-winter count was about 2.43 million geese (Fronczak 2003) . These counts include some Ross' Geese and probably a small proportion of Lesser Snow Geese originating in western Arctic colonies. Mid-winter counts however, underestimate actual population levels, increasingly so as populations have grown (Mowbray et al., 2000).

Eastern Arctic Colonies

In 1997, a photographic inventory of the major Lesser Snow Goose nesting colonies in the eastern arctic was conducted, for comparison to an earlier count in the early 1970s. The Great Plain of the Koukdjuak (on Baffin Island) and Southampton Island supported an estimated 1.77 and 0.72 million nesting birds respectively in 1997. When these areas were first surveyed in 1973, there were only 446,600 and 155,800 nesting birds respectively (R. Kerbes, unpubl.), and the area where nests were found was much smaller.

In the Hudson Bay lowlands, surveys conducted between 1996 and 2001 showed the number of nesting pairs to be declining from the high recorded in 1997 when 430,000 birds were estimated nesting in the area between La Perouse Bay (Man.) and Cape Henrietta Maria (Ont.) (K. Ross, pers. comm.). In 2001 the Cape Henrietta Maria breeding population was estimated to be approximately 129,000 pairs, and a comparable survey in 2003 indicated no change (128,000). These data represent a considerable increase compared to 1973 when the nesting population was estimated at 59,200 breeding adults (R. Kerbes, unpubl.).

In James Bay, nesting at the small Akimiski Island colony was intermittent until 1967, and became annual beginning in 1968. Breeding numbers were usually less than 200 pairs until 1974, but increased tenfold since then (Abraham et al. 1999b). Between 1998 and 2000, the colony consistently had an estimated 900 breeding pairs (K. Abraham, pers. comm.) but increased to about 1500 pairs in 2001, and was about the same in 2003

Throughout the eastern arctic in 2003, production of young snow geese was expected to be at least average.

Central Arctic Colonies

The central Arctic breeding population, concentrated in the Queen Maud Gulf, grew more slowly than the eastern population before the 1980s, but now appears to be increasing rapidly. Part of the rapid growth may be due to immigration of eastern Arctic birds. In 1976, there were 30 colonies with nearly 56,000 nesting Lesser Snow Geese. By 1988, the number of colonies had increased to 57 with about 280,000 nesting Lesser Snow Geese (Kerbes 1996). Information from a photographic inventory conducted in 1998 indicated that the snow goose population was in excess of 1 million scattered over 80 colonies (R. Kerbes, unpubl.). This suggests that the population had at least tripled since the last photo inventory.

At Karrak Lake in the Queen Maud Gulf, the area used by nesting Ross and Lesser Snow Geese has been increasing exponentially. In 2003 the area of terrestrial habitat occupied by nesting geese at Karrak Lake increased from 165 km^2 to 177 km^2. Similarly, at the East McNaughton colony of light geese, about 90 km east of Karrak Lake, the area of terrestrial habitat occupied by nesting geese increased from 151 km^2 to 173 km^2 (R. Alisauskas, pers. comm.).

In 2003, production of lesser snow geese was expected to be about average.

Western Arctic Colonies

More than 95% of Lesser Snow Geese in the western Canadian Arctic nest on Banks Island. This population increased substantially between the 1960s and 2002. The total nesting population increased from around 105,000 birds in 1960, to 165,000 in 1976, to over 479,000 in 1995 (Kerbes et al. 1999). In 2002, a photographic inventory of the colony was conducted, and indicated well over 500,000 nesting birds. In 2003, residents indicated that spring was somewhat late arriving, and so

production is expected to be average at best (J. Hines, pers comm.).

Ongoing investigations initiated by CWS are evaluating whether the Banks Island population has grown to the point where it may be necessary to stabilize its growth to prevent habitat problems associated with grubbing and grazing. In 1999, a habitat study was initiated to evaluate the impact that Snow Geese are having on the lowland tundra and on the numbers of non-game birds on Banks Island (J. Hines, pers. comm.).

The remaining birds of the Western Arctic Population nest at small colonies on the mainland at the Anderson River and Kendall Island migratory bird sanctuaries. Snow Goose numbers at Kendall Island appear to be stable, while numbers at the Anderson River colony seem to be declining. At least part of the reason for the decline at Anderson River is probably related to high levels of egg depredation by grizzly bears (J. Hines, pers. comm.).

Lesser Snow Geese that breed on Wrangel Island, Russia, are also of great interest to Canada, because this population migrates through Western Canada in fall and spring, and more than half of the population winters in the Fraser Delta (B.C.) and the nearby Skagit Delta (Wash.). The present colony of Lesser Snow Geese on Wrangel Island is all that remains of the large colonies in Siberia a century ago. Russian biologists monitoring the population have documented a decline from 120,000 nesting birds in 1970 (total population of 150,000 geese) to fewer than half that number in the 1990s (total population of 60,000-70,000 geese) (Kerbes et al., 1999).

2003 was reported to be a good year, as the main colony had 25,000 to 30,000 nests, and high nest success (V. Baranyuk, pers. comm.). If recruitment is indeed as high as expected, this would be the 7th consecutive year that the Wrangel population has not experienced a complete reproductive failure which is very different from the norm (on average, a complete failure once every 3 years) and we would therefore estimate that between 80-90,000 Snow Geese will winter on the Fraser and Skagit river deltas in 2003-2004 (S. Boyd, pers. comm.). This would represent a record-high number since the counts started in 1948 and an increase over 2002, which at an estimated 73,000 birds was the previous recorded high (S. Boyd, unpubl). Aerial photo surveys are planned for December 2003 and January 2004 to determine the number of Snow Geese wintering on the Fraser and Skagit river deltas (S. Boyd, pers. comm.).

To manage this population (i.e. maintain control of numbers so it does not increase exponentially like the mid-continent white geese), hunting regulations were changed for 2003-04 by extending the fall hunt period on the Fraser Delta from 3 December to 4 January, providing an additional 25 days for the fall season. This should increase harvest and help reduce total numbers on the Fraser and Skagit deltas.

Harvest of Lesser Snow Geese

In the United States, Lesser Snow Geese are harvested in all four flyways, but mostly in the Mississippi and Central flyways. In 2002, the total U.S harvest estimate was 512,000 geese, an decrease of 27% compared to 2001 (Table 18). In Canada, the 2002 estimated harvest was 126,000, about 14% lower than in 2001. The decline in harvest success may be related to the relatively poor production of young birds in 2002.

Since 1990, CWS Pacific and Yukon Region has conducted a special annual harvest survey of Lesser Snow Geese from the Wrangel Island population. Harvest estimates have varied from a low of 623 in 1990 to a high of 1860 in 1993 (A. Breault, unpubl.; Figure 22). The harvest for the 2002 hunting season was estimated at 1858, essentially the same as the record high of 1993 (A. Breault, pers. comm.). These figures do not include adjustment for crippling loss, which is estimated at 20%.

Management of Overabundant Snow Geese

Issue

The rapid growth of most Snow Goose populations is of great concern. Assessments of the environmental effects of the rapidly growing populations of Mid-continent Lesser Snow Geese and of Greater Snow Geese were completed by working groups of Canadian and American scientists. Their analyses are contained in the comprehensive reports entitled "*Arctic Ecosystems in Peril – Report of the Arctic Goose Habitat Working Group*" (Batt 1998) and "*The Greater Snow Goose – Report of the Arctic Goose Habitat Working Group*" (Batt 1998). The working groups concluded that the primary causes of the increase of Snow Goose populations were human induced. Improved nutrition from agricultural practices and safety in refuges have resulted in increased survival and reproductive rates of Snow Geese. These populations have become so large that they are affecting the vegetation communities on which they and other species rely at staging areas and on the breeding grounds. Grazing and grubbing by geese not only permanently removes vegetation, but also changes soil salinity, nitrogen dynamics and moisture levels. The result is the alteration or elimination of the plant communities, which in all likelihood will not be restored. Although the Arctic is vast, the areas that support breeding geese and other companion species are limited in extent and some areas are likely to become

inhospitable for decades. Increasing crop damage is also an important consequence of the growing populations.

Regulation

Several management actions are being undertaken concurrently to curtail the rapid population growth and reduce population size to a level consistent with the carrying capacity of the habitat. One action involves increasing the mortality rate of Snow Geese by two to three times the rate achieved prior to the introduction of habitat conservation measures. Beginning in 1999 an amendment to the Migratory Birds Regulations created special conservation measures during which hunters were encouraged to take overabundant species for conservation reasons and, in some cases and subject to specific controls, to use special methods and equipment such as electronic calls and bait. The 1999 and 2000 regulations applied in selected areas of Québec and Manitoba. Beginning in spring 2001, special conservation measures were also implemented in Saskatchewan and Nunavut. The dates and locations where special conservation measures were implemented were determined through consultation with the provincial governments, other organizations and local communities. The Ontario Ministry of Natural Resources recently proposed adoption of special conservation measures in Ontario's Hudson-James Bay District. The feasibility and effectiveness of this will be examined over the next year.

Evaluation

Evaluation plans are being implemented to track progress toward the goals of reduced population growth and, ultimately, recovery by plant communities. For example, across the Arctic in 2002, over 6,800 Lesser Snow Geese and 2,200 Ross' Geese were marked with neck bands, bringing the total number of birds neck-banded to 28,500 Lesser Snow Geese and 14,760 Ross Geese since 1997 (D. Caswell, pers. comm.). The main objectives are to obtain colony specific estimates of harvest and survival rates, document timing and pattern of fall and spring migration, and obtain population and production estimates. Investigations of the condition of staging and breeding habitats continued in 2003 along the west coast of Hudson Bay, where the effects of geese on habitats are well documented. Assessments were also carried out at other major Snow Goose colonies.

The special conservation measures appear to be successful in increasing harvest rates for Snow Geese. The estimated harvest rates of adults (based on regular-season harvest in Canada and the U.S., and including the special conservation seasons which are in effect in Canada only) ranged from 12 to 14% in each of the five seasons held to date. These are much higher than the rates achieved during 1985-1997 (average harvest rate of 6%), a period of rapid population growth, and higher than harvest rates during 1975-1984 (11%) when the population was relatively small and stable (G. Gauthier, unpubl.).

For Lesser Snow Geese, the harvest rate in Canada was much less than that achieved for Greater Snow Geese. Sport hunters took about 5,000 to 7,000 additional birds in each year as part of the conservation measures. However, the continental program as a whole shows signs of success; preliminary analyses indicate that the survival rates of mid-continent Lesser Snow Geese were reduced during the years of special conservation measures. Since 1999, adult survival rates at most mid-continent colonies were between 60 and 70 per cent. In contrast, the survival rate was over 80 per cent at a western colony not affected by the special measures.

Proposal for 2004-2005

For 2004/05, it is proposed that the special measures be maintained in Québec, Manitoba, Saskatchewan and Nunavut. A minor change to the dates in Saskatchewan are proposed. There is also a proposal to, in Québec, permit the use of decoys representing white phase snow geese (white adults and pale gray young) when using electronic snow goose calls, The latter proposal would not apply in northern and western Canada where the possibility of increased harvest rates for other species must be avoided (there all decoys must be white). (See Appendix A for the proposed changes).

Ross' Goose

About 95% of all Ross' Geese (*Chen rossii*) nest in the Queen Maud Gulf area in the central Canadian Arctic. Increasing numbers are being found along the western coast of Hudson Bay, on Baffin Southampton, and Banks islands, at La Perouse Bay, Manitoba and Cape Henrietta Maria, Ontario (Kerbes 1994, D. Caswell, pers. comm., K. Abraham, pers. comm.). Ross' Goose nesting colonies are usually interspersed with those of Lesser Snow Geese and, thus, it is difficult to accurately evaluate the size of Ross' Goose populations. Ross' Geese winter in California, New Mexico, Texas and Mexico.

Ross' Goose was considered a rare species in the early 1900s. In 1931, when legislation was passed to prohibit hunting, it had an estimated population of only 5,000 to 6,000 birds. By 1988, the breeding population had increased to more than 188,000 birds in the Queen Maud Gulf Migratory Bird

Sanctuary (Kerbes 1994; Ryder and Alisauskas 1995), and to about 982,000 in 1998 (Alisauskas et al. 1998). Helicopter surveys in 2001 on Baffin Island, in conjunction with the banding in August, indicated that the breeding population of Ross' geese along the coast has continued to increase from an estimated 2000 in 1998 to in excess of 4000 by 2001 (D. Caswell, pers. comm.). Surveys from the late 1990s at other Lesser Snow Geese colonies in the eastern Arctic reported 40,000 Ross' Geese at the McConnell River colony, on west Hudson Bay (Batt, 1998.). More recently, information gathered while banding lesser snow geese near Cape Henrietta Maria, ON, indicated that the Ross goose population there may now be as large as 2250 pairs (Abraham, 2002). The largest colony of Ross' goose is near Karrak Lake in the Queen Maud Gulf, where an estimated 479,400 nested in 2001 (Alisauskas, 2001). As for most arctic-nesting geese, production in 2003 was expected to be at least average (R. Alisauskas, pers. comm.)

A recent analysis by Alisauskas et al. (submitted - a) described changes in the geographic distribution of Ross geese in winter. Over the past decade the wintering populations, and the harvest, have shifted eastward, matching the eastward expansion of the breeding populations. They also found that the continental harvest of Ross geese began to increase in about 1994, when liberalizations were made to the normal hunting seasons. Prior to 1994, the survival rate for adults was at least 0.91, but since then have declined to about 0.80. Alisauskas et al. (submitted – a) concluded that at the current rate of annual survival, the Ross goose population should at a minimum remain stable, or even continue to grow.

Greater White-fronted Goose

In the past, Greater White-fronted Goose (*Anser albifrons*) surveys were conducted in early spring, but these counts were problematic when geese were too widely spread along their migration route to allow for good counts. As numbers of Mid-continent Lesser Snow Geese increased in the important count areas, the surveys became even more problematic, and so they were abandoned in 1992. However, until the early to mid-1980s, the surveys did a good job of tracking the trend in Greater White-fronted Goose numbers, and indicated that the overall population grew from the late 1950s to the early 1980s (J. Hines, pers. comm.).

In 1992, a fall survey of the staging areas in Saskatchewan and Alberta was implemented, with the objective of providing an annual index of the population size of Mid-continent Greater White-fronted Geese. Because it is unlikely that significant numbers of geese are present outside the survey area in most years (based on historical migration and distribution data, as well as experimental surveys), this fall inventory accounts for a consistent and significant proportion of the population (Nieman et al 2001). Preliminary results for the fall of 2003 indicate a total of 528,000 geese, which represents a decrease compared to 2002 (the 2002 count was 635,600) (Figure 23). The index is cause for concern with regard to the status of Mid-Continent White-fronted Geese. The 2000 inventory, due to very difficult survey conditions, may have provided an over-estimate of true population size. If so, 2003 would mark the fifth consecutive year that this population has declined. The three-year running average has decreased 22% from 805,700 (2000-2002) to 625,900 (2001-2003) (D. Nieman, pers. comm.).

Banding of Mid-continent White fronted Geese, begun in 1990 in the Queen Maud Gulf Migratory Bird Sanctuary is providing new information about these birds and their movement, providing evidence for informed decisions about population management. Annual survival declined over this period, from a maximum of 87% in 1993 to the lowest estimate of less than 70% in 2000. Mean estimated lifespan has also decreased. At its maximum it was 7.8 years, but with survival rate equivalent to that estimated in 2000, would now be closer to 3.7 years (Alisauskas, 2002a).

The estimated Canadian harvest for 2002 is 51,700, a 44% drop from last year (Table 19). The relatively low harvest in 2002 may reflect the poor production of young birds last year, although this was less apparent in the U.S. harvest. There, the harvest in 2002 was about 219,000 birds, slightly less than the previous year. Decreases in the annual population index, combined with increasing harvest and evidence of declining survival, are cause for caution with regard to the international management of mid-continent white-fronted geese (D. Nieman, pers. comm.).

Canada Goose

In Canada, the many different races of Canada Geese (*Branta canadensis*) that have part of their breeding range in this country are grouped into 15 different management populations. The distribution of these Canada Goose populations is shown in Figure 24.

Table 20 presents overall harvest estimates in Canada and the United States. However, the Canada Goose harvest in many provinces, territories and states consists of birds from more than one population. Harvest surveys cannot differentiate among Canada Geese coming from different populations and, therefore, these surveys alone are not able to estimate the harvest level of each

population. Partitioning of the harvest requires comprehensive banding programs or analysis of molecular markers. Harvest of Canada Geese has been on the rise, with the harvests for 2002 for Canada, the U.S. and the Continental total, each being the highest on record.

North Atlantic Population (NAP) Canada Goose

Canada Geese belonging to the North Atlantic Population, which is thought to be primarily composed of the subspecies *B. c. canadensis*, breed in Labrador, insular Newfoundland, and eastern Québec (including Anticosti Island) (Figure 24). The breeding population is surveyed by two methods each spring: the BDJV helicopter plot survey and the USFWS fixed-wing transect survey. An expanded helicopter plot survey was initiated in 2001 when it became evident that neither the original BDJV plot distribution nor the fixed-wing transects adequately covered the breeding range of this population. The additional plots were not included in the most recent analysis of BDJV data because of the few years available. Results from the BDJV plots in Stratum 2, which covers a portion of the NAP breeding range, continue to show an increasing number of pairs (Figure 25). However, the lack of long term trend data for the NAP breeding population remains an important data gap.

Atlantic Population (AP) Canada Goose

Atlantic Population Canada Geese (composed largely of *B. c interior)* nest throughout northern Québec, especially along Ungava Bay, the eastern shore of Hudson Bay, and in the interior of the Ungava Peninsula. They winter from New England to South Carolina, with the largest concentration occurring on the Delmarva Peninsula (Figure 24).

In 1993, an annual breeding ground survey was implemented in northern Québec with the objective of estimating the number of breeding pairs on the Ungava Peninsula (Harvey and Rodrigue 2003). Estimates produced by this survey are not adjusted for visibility bias and thus represent an index to the population. This survey covers the three regions that were shown previously to include the highest densities of nesting geese: the region of inland tundra, the region of flat coastal tundra (coastal Ungava Bay and Hudson Bay), and the region of taiga.

In 2003, the number of Canada Geese observed as pairs or as single birds (together representing the number of indicated breeding pairs) was 156,937 $\pm$ 12,273 (SE), which is essentially unchanged from last year (Harvey and Rodrigue 2003; Figure 26). The population has recovered substantially from 1995 when it was at the record low level of about 30,000 breeding pairs. The lack of growth in the most recent years may be the result of relatively poor production in 2 of the past 3 years. Harvey and Rodrigue (2003) noted that since 2001 the Hudson Bay coast supports about double the number of breeding pairs found in Ungava Bay, and that average productivity may also be higher along Hudson Bay.

The final year of the intensive study of reproductive ecology took place in 2003. At the primary study area, near Povungnituk in northern Québec, the season was excellent (Cotter et al., 2003). Peak hatch occurred 27 June, and weather was good during hatching. It seemed that 2003 was a peak year for lemmings. The estimate of nest predation rate (gulls, foxes) was 24%. There were 675 nests found, which gives the highest nest density since the study began. The median clutch size was about 4.5 eggs, which is at the high end of the range of values seen so far. More nests were found at 5 of the 7 satellite sites than since the study began. In the Ungava Bay region, 220 nests were found at 5 satellite study areas, and the mean clutch size was estimated at 4.39, compared to 3.99 in 2002 (Brousseau *et al.* 2003).

In the boreal forest, where Canada Geese are counted as part of an annual helicopter survey program supported by the Black Duck Joint Venture, the number of breeding pairs observed in 2003 was higher than last year, but within the range of high values observed over the past 5 years (Figure 27; Bordage, Lepage, and Orichefsky, 2003). The region covered by the BDJV surveys is at the southern limit of the nesting range of AP Canada Geese.

Temperate-breeding Canada Goose in eastern Canada

This population of Canada geese nests in southern Ontario and southwestern Québec. It grew from the intentional re-establishment of local Canada Goose populations beginning in the late 1960s. They are sometimes referred to as “resident”, but many migrate to spend the moulting period as far north as James and Hudson bays and northern Québec, and may winter as far south as Virginia. The population has grown quickly and expanded in range. As the population has grown, an increasing number have remained to spend the winter in southern Ontario. In addition to the growing numbers breeding in Canada, temperate-breeding Canada Geese in the eastern United States have also increased rapidly, and large numbers of sub-adults and failed breeders move to Canada to spend the moulting period.

As recently as 1970, Canada Geese did not commonly nest in southern Ontario. However, surveys in 1977 and 2003 showed a population increase from approximately 20,000 to 400,000 Canada Geese in the fall flight from southern Ontario. This year, CWS conducted the first ever

survey to describe the distribution and abundance of temperate-breeding Canada Geese in southern Québec (J. Rodrigue, pers. comm.).

Southern James Bay Population (SJBP) Canada Goose

The SJBP nest on Akimiski Island in James Bay and in the adjacent lowlands to the south and west. It winters from southern Ontario and Michigan to Mississippi, Alabama, Georgia, and South Carolina (Figure 24).

For some years there has been concern about the status of this population. From 1985 to 1988, mid-winter indices averaged about 154,000 birds, but in 1990 a spring breeding ground survey reported only about half that number. The spring population has been surveyed annually since then, and there has been no real change in the number of breeding pairs during the survey period (Figure 28). The 2003 spring survey on Akimiski Island and the adjacent lowlands of southern James Bay produced a population estimate of 106,511 Canada Geese, an increase of 40% compared with last year which was the lowest in the history of the survey (Walton et al. 2003; Figure 28). Although the overall population showed this large increase, the population on Akimiski Island did not change. Once again, few moult-migrants were present during the survey and are not considered to be a confounding factor in the results since 2000.

The peak hatching date in 2003 was around 15 June, which was one of the latest dates on record. This is consistent with observations from Cree hunters from Moosonee to Attawapiskat who observed geese arriving a week or two later than normal. The clutch size was consistent with a late year and remained similiar to last year, however, predation rates were lower. Preliminary results suggested a slightly below average production year (Walton et al., 2003).

There is evidence that increasingly large numbers of moult-migrant temperate-breeding Canada Geese move to Akimiski Island and to adjacent areas of mainland James Bay and eastern Hudson Bay. On breeding areas they may compete for food resources with SJBP goslings and, as a result, contribute to the high gosling mortality that is observed there and the decline of the SJB population (Abraham et al. 1999a).

Mississippi Valley Population (MVP) Canada Goose

The breeding range for the Mississippi Valley Population is northern Ontario and extreme northwest Manitoba, from the Nelson River to the Attawapiskat River. This population winters largely in Wisconsin, Illinois, western Kentucky and Tennessee. Early in 2002 a redefinition of the range of this population along the southern boundary was made that has resulted in a slightly lower population estimate (USFWS 2002; Figure 24).

The spring population estimate in 2003 was 477,000 geese, a decrease of 12% from 2002 (Walton et al 2003, Figure 29). The estimated number of nests was about the same as last year. As happened last year, flocks of moult migrants were observed at Moosonee beginning on 28 May, but major movements did not occur until early June and so are not thought to affect the estimate. Breeding phenology was intermediate between the late year of 2002 and the early year of 2001. Peak hatch in a coastal area near Peawanuck was on June 21st. Nest success and production were better than in 2002, however, nest density did not change. Weather during hatch was good, but variable, and gosling to adult ratios at 35-45 days after hatch indicate an average production year (L. Walton, pers. comm.).

Tall Grass Prairie Population (TGPP) Canada Goose

This population nests on Baffin Island (on the Great Plain of the Koukdjuak), Southampton and King William islands, and on the Nunavut mainland primarily near the McConnell and Maguse rivers (western Hudson Bay). It winters in Oklahoma, Texas, and northeastern Mexico (USFWS 2002; Figure 24).

Aerial surveys of TGPP Canada Geese were initiated in 1992 (Rusch et al. 1996) and, unlike other spring surveys, are conducted during the brood-rearing period. Population estimates available from Baffin Island from 1993 through 2003 indicate a population of about 100,000 breeding birds. In the past ten years of study, there were three years when almost no young were produced (1992, 1996, and 1999). However, 1997 and 1998 were both good years for production with about 70-80% of the >100,000 geese identified as breeding birds (D. Caswell, pers. comm.). TGPP Canada Geese are also counted on the wintering grounds, but because they mix with other populations of Canada Geese on wintering grounds, it is difficult to estimate population size. The 2003 mid-winter survey counted 611,800,geese (USFWS, 2003).

Eastern Prairie Population (EPP) Canada Goose

This population nests in the Hudson Bay lowlands of Manitoba. The birds winter in Manitoba, Minnesota and Missouri (USFWS 2002; Figure 24). Spring surveys of EPP Canada Geese have been flown annually since 1972, providing good baseline data for this population.

In 2003, the spring population was estimated at 229,200 ± 33,500 (95% CI), virtually unchanged from the previous two years and similar to most years since the mid-1980s (Raedeke et al., 2003; Figure

30). The number of geese in pairs was relatively low, while the number represented by singles was about the same as last year. Together, the pairs and singles were estimated at 122,400 ± 18,100, which is near the EPP Plan threshold for restrictive regulations. The number of geese in groups increased to 106,800 ± 29,700, the second highest value since 1972.

The breeding phenology in 2003 was much earlier than last year and similar to 2001, 1999, and 1998. Range-wide, vegetation phenology and snow and ice conditions all reflected an early nesting season.

Western Prairie Population (WPP)/Great Plains Population (GPP) Canada Geese

The Western Prairie Population breeds in eastern Saskatchewan and western Manitoba, while the Great Plains Population results from restoration efforts in Saskatchewan, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. Both populations winter with other Canada Geese along the Missouri River in South Dakota, and on reservoirs from southwestern Kansas to Texas (Figure 24).

Separate indices for these two populations are not available from mid-winter surveys, as the fall and winter ranges of the WPP and GPP overlap. The January 2003 count was 561,000 geese, 21% lower than that of last year. This winter population index has increased an average of 9% per year since 1993 (USFWS 2003).

Canada Geese on the Canadian Prairies are also counted during the Waterfowl Breeding Population and Habitat Survey. A comparison of results from this survey and those of smaller-scale surveys in east central Saskatchewan indicated that the spring waterfowl surveys provide a good measure of trends in populations (Nieman et al., 2000). These could be used on an annual basis to assess the abundance of the various populations of large Canada Geese breeding on the prairies (D. Nieman, pers. comm.). Results from spring waterfowl surveys in the Canadian Prairies indicated considerable increases in the populations of WPP and GPP Canada Geese of 1027% and 2117%, respectively, between 1970 and 1999 (Nieman et al. 2000). The spring surveys estimated 662,400 WPP/GPP geese in 2003, which represents an increase of 16% compared to 2002 (USFWS 2003). Improved water conditions on the Canadian Prairies, in comparison to last year, should lead to a larger fall flight in 2003 (USFWS, 2003).

Hi-Line Population (HLP) Canada Goose

Hi-Line Population are large Canada Geese that nest in southeastern Alberta, southwestern Saskatchewan, eastern Montana and Wyoming, and in Colorado. This population winters in Colorado and in central New Mexico (Figure 24).

In January 2003, the estimated number was 205,900 geese, a 5% reduction from the 2002 survey. Based on these mid-winter surveys, the number of HLP Canada Geese has increased an average of 4% (P = 0.13) per year since the beginning of the surveys (USFWS, 2003).

HLP Canada Geese are also counted during the Waterfowl Breeding Population and Habitat Survey. Results from the surveys in the Canadian Prairies indicated a considerable increase in the population of 1089% between 1970 and 1999 (Nieman et al, 2000). In 2003, the population index of 231,500 was unchanged from last year. This population is expected to benefit from the improved water conditions present in 2003.

Short-grass Prairie Population (SGPP) Canada Goose

The Short-grass Prairie Population of Canada Geese breeds in the western Arctic on Victoria and Jenny Lind islands, and on the Nunavut and N.W.T. mainland from Queen Maud Gulf to the Mackenzie River and south into northern Alberta. They winter in the dry agricultural lands of southeastern Colorado and northeastern New Mexico, and in the Oklahoma and Texas panhandles (Figure 24). This population is thought to be comprised of two subspecies, the lesser Canada Goose (*B. c. parvipes*) and Richardson's Canada Goose (*B. c. hutchinsii*) (Hines et al., 2000).

Aerial transect surveys, covering much of the breeding range of this Canada Goose population in the Inuvialuit Settlement Region (ISR) on the mainland, and on Victoria and Banks Islands, were conducted in June 1989-1994 (Hines et al., 2000). The aerial counts indicated that there were more than 70,000 SGPP Canada Geese in or near the survey area. However, the survey did not cover all of the breeding range of Canada Geese in the ISR. It was suspected that 5,000-10,000 Canada Geese might not have been counted. Canada Geese on Victoria Island and Banks Island have apparently increased in numbers and possibly have extended their breeding range northward over the past few decades. In contrast, results of spring waterfowl surveys suggested that SGPP Canada Geese in the boreal forest and taiga of the Northwest Territories, Yukon, and eastern Alaska had remained relatively stable since the 1960's (Hines et al., 2000).

The 2003 mid-winter survey gave a count of 156,700 SGPP Canada Geese, 3% fewer than the 2002 count. This index has declined 17% per year since 1994 (P = 0.001) (USFWS, 2003). The spring 2003 waterfowl surveys in the Western part of the Northwest Territories and northern Alberta 2002 estimated 85,000 (± 37,900 geese, a 39% decrease from 2002. This estimate has declined at an

average of 1% per year since 1994 (USWFS 2003). Spring conditions were normal to average throughout the range of the SGPP, thus production is expected to be average (J. Hines, per. comm.). A recent analysis by Alisauskas (2002b) suggested that the mean expected lifespan of the SGPP has been on a decline since the 1992 high of 7.1 years, to a 2000 estimate of 3.4 years. Annual survival has also dropped over that time period from 87% to 74%.

Rocky Mountain Population (RMP) Canada Goose

This population of Canada Goose nests in southern Alberta, the inter-mountain regions of Utah, Idaho, Nevada, Colorado, and Wyoming, and in western Montana. They winter in central and southern California, Arizona, Nevada, Utah, Idaho, and Montana (Figure 24).

In January 2003, 124,700 geese were counted during the mid-winter surveys, which represents an 11% increase compared to 2002. Based on mid-winter surveys, the number of RMP Canada Geese has significantly increased by 1% annually since 1994 (P=0.242) (USFWS, 2003). RMP Canada Geese are also counted during the Waterfowl Breeding Population and Habitat Survey. Spring waterfowl surveys in southern Alberta, southwestern Saskatchewan, and Montana provided an estimate of 134,300 geese in 2003, which was unchanged from last year's estimate. Results from the surveys in the Canadian Prairies indicated a considerable increase in the population of 508% between 1970 and 1999 (Nieman et al. 2000). Spring population numbers for RMP have significantly increased, by approximately 4% per year in the past decade (USFWS, 2003).

Pacific Population (PP) Canada Goose

The Pacific population nests and winters west of the Rocky Mountains from British Columbia south through the Pacific Northwest to California (Figure 24). In Canada, this Canada Goose population breeds in central and southern British Columbia and it comprises both migratory and non-migratory (resident) segments. The breeding segment appears to have stabilized, at least in some areas. The B.C. Cooperative Waterfowl survey indicates that the total number of PP Canada Geese observed in central B.C. was 1% lower in 2003 than in 2002 and 32% higher than the long-term (1988-2002) average (Breault and Watts, 2003). The non-migratory segment is concentrated in the urban and suburban areas of southwestern British Columbia (particularly the greater Vancouver and greater Victoria areas) and nearby agricultural lands (A. Breault, pers. comm.). Problem populations of resident and urban Canada Geese are primarily controlled by municipalities and through federal hunting regulations. Key management practices include egg addling (operational in the lower mainland of B.C. for over 10 years), prevention of nesting, landscape management and relocation of moulting flocks to areas where they can be subjected to hunting mortality. Split hunting seasons have been successful in increasing the number of Canada Geese harvested in some agricultural areas and special permits are issued to protect crops and property (A. Breault, pers. comm.).

Lesser Canada Goose

Lesser Canada Geese breed throughout much of Alaska and migrate along the Pacific coast to winter in Washington, Oregon, and California (Figure 24). As they winter with other populations of Canada Geese, there is no reliable mid-winter index for this population. Although the index is not reliable, it is estimated that numbers for 2003 were up by 20% compared to 2002 (USFWS, 2003).

Brant

Based on breeding and wintering ranges, as well as on genetic differentiation, there are four distinct populations of Brant (*Branta bernicla*) recognized in North America (Reed et al. 1998b; see below). Compared to most other geese, Brant are more vulnerable to sporadic heavy losses from starvation and periodic nesting failures, because of their strong dependence on specific forage plants and of the harsh environments where some populations live. This vulnerability requires careful regulation of hunting and monitoring of the status of populations (Reed et al. 1998b). Reed et al. (1998b) provide a review of the information available on this species in North America.

Atlantic Brant

This population of the subspecies *B. b. hrota* nests around Foxe Basin in the eastern low Arctic. It winters along the Atlantic Coast from Massachusetts to N. Carolina (Reed et al. 1998b). Based on mid-winter counts in the Atlantic Flyway, there is great fluctuation in the population size of Atlantic Brant (Figure 31; Serie and Raftovich 2003). In 2003, the mid-winter population survey gave an estimate of 164,500 Atlantic Brant, which remains above the long term average. The estimate has shown an average annual increase of 3% over the period of 1994-2002 (P=0.14) (USFWS, 2003). Unlike last year, when Atlantic Brant were very late arriving on the breeding grounds because of the cold, frozen conditions along the migration route, satellite tracking of individuals marked in the winter of 2003 showed about average dates for major movements. Subsequent surveys in late June and mid August

suggest average production for 2003.

To follow the satellite tracking project, see http://njfishandwildlife.com/brant03/main.htm

Eastern High Arctic Brant

This group of *B. b. hrota* breeds on islands of the eastern high Arctic. It migrates via Greenland and Iceland to winter in Ireland (Reed et al. 1998b). The number of eastern high Arctic Brant is estimated on the wintering grounds in Ireland, where it varied from less than 10,000 birds during the late 1960s to more than 19,000 in the late 1980s (the data cover the 1961-1996 period; Reed et al. 1998b). In fall 2002, a total of 20,253 birds was recorded from a survey of 34 wintering sites in Ireland. Accounting for missing counts at three other relatively important sites, an additional 660 birds may not have been counted (based on the averages of previous annual autumn peaks). For the first time, aerial and ground-coverage of staging sites in Iceland were attained at the same time, and only 34 birds were recorded. The total population estimate, including Icelandic counts and those Irish sites not covered, was about 20,900 (Colhoun and Robinson, 2003). The 2003 counts were not completed at the time of writing. Initial information indicates that the breeding success in 2003 was low. Productivity, based on an aged sample of 11,082 birds, was estimated at 1.8% (mean brood size 2.2). To learn more about the satellite tracking of these birds, see http://www.wwt.org.uk/brent/index.asp.

Black Brant

This population of Brant (*B. b. nigricans*) nests in the central and western low Arctic, in Alaska and western Russia. It winters along the Pacific Coast, but mainly in Mexico (Reed et al. 1998b). Based on mid-winter counts in the Pacific Flyway, numbers of Black Brant are lower than in the early 1960s (Figure 32; Trost and Drut, 2003). The January 2003 mid-winter index count was 101,000 birds, 20% fewer than in 2002,, and somewhat below the long term average. Note that Black Brant numbers are obtained by subtracting Western High Arctic Brant counts in north Puget Sound (Padilla, Samish, and Fidalgo bays [Wash.]; D. Kraege, unpubl.) from the total mid-winter counts in the Pacific Flyway. Nonetheless, Black Brant counts still include a small proportion of Western High Arctic Brant. This year brant nesting effort on the Yukon Delta was reduced, with high predation rates; the fall flight is expected to be smaller than 2002 (USFWS, 2003).

There are no annual surveys of the breeding grounds, but aerial surveys of Black Brant were conducted in June 1995-1998 in the Inuvialuit Settlement Region. Preliminary results suggested that the total population for the Mackenzie Delta, Tuktoyaktuk Peninsula and Liverpool Bay likely exceeded 6,000 birds (Wiebe and Hines 1998). Results from a banding program at Tuktoyaktuk Peninsula, Campbell Island, Smoke-Moose Delta and Anderson River during 1990-1998 suggested that annual reproductive success is quite variable and sometimes low (the proportion of young birds in the population varied greatly from year to year, from 8% to 54% young) (Wiebe and Hines 1998). Preliminary mark-recapture estimates suggest that survival rates of adult brant are relatively high, however (J. Hines, unpublished data).

Part of the Black Brant population stages along the coast of British Columbia during spring migration. It is estimated that 3,000 to 7,000 brant stop over in the Queen Charlotte Islands on their way to northern breeding grounds. Historically, large numbers of brant (1,000 to 10,000) also wintered in British Columbia. The current wintering population is estimated at over 1,500 individuals and is limited to two locations. An estimated 600 to 700 individuals winter in the Queen Charlotte Islands (Goudie and Hearne, 1997). In the Boundary Bay and Robert's Banks area of the Fraser River Delta, the wintering Brant population has been increasing since 1992 and the peak winter population was estimated at 1103 birds (WHA and Black Brant) during the 2002-2003 winter. This represents a decrease of 26% from last year's record peak value of 1483 birds (K. Hagmeier and A. Breault, pers. comm.). Over 20 additional Brant wintered on Vancouver Island over the last two winters and this small wintering population might also be on the increase (A. Breault, pers. comm.). The cause of the increase in number of Brant wintering in the Fraser River Delta is unknown and it is unclear as to whether it reflects increased recruitment in the local population, re-distribution of birds from other wintering areas, a reduction in sport harvest or an influx of Western High Arctic Brant (S. Boyd, pers. comm.).

Western High Arctic Brant

This population (also known as Gray-bellied Brant) is intermediate in appearance between *B. b. nigricans* and *B. b. hrota*, and is thought by some biologists to be a unique subspecies. It breeds on islands of the western high Arctic and winters in Puget Sound (WA) (Reed et al. 1998b). Based on mid-winter counts, there is relatively great fluctuation in the population size of Western High Arctic Brant (Figure 32). The population is estimated to be down compared to last year, possibly related to the complete bust in production in 2002. The Western High Arctic index count from Washington State for 2002 was only 4,800 birds compared to 8,964 in the previous winter. An additional 229 Western High Arctic Brant were estimated to winter in B.C. in 2002-03, 14% lower

than the 267 birds observed in 2001-02 (K. Hagmeier, pers comm.).

Western High Arctic Brant are of high management concern given their limited number, potentially unique subspecies status, and restricted winter distribution. A study is currently under way to test the degree of genetic distinctness of the Western High Arctic Brant from other brant stocks breeding and wintering in North America (S. Boyd, pers. comm.). Other proposed and ongoing projects aim at improving the monitoring and assessment of this Brant population and at providing the demographic data necessary to quantify its dynamics (S. Boyd, pers. comm.). Information on many activities is summarized on the web site http://www.washingtonbrant.org/tracking/tracking.html. The site includes migration and movement maps, photos of Melville Island, capture and banding methods along with sightings of radioed birds

Population Status of Swans

Two species of swans are native to Canada: the Tundra (*Cygnus columbianus*) and Trumpeter (*C. buccinator*) swans.

Tundra Swan

There are two populations of Tundra Swans. The western population breeds along the coastal lowlands of western Alaska and migrates through Western Canada and along the Pacific Coast. This population winters primarily in California, Utah, and the Pacific Northwest. The eastern population of Tundra Swans breeds from the Seward Peninsula of Alaska to the northeast shore of Hudson Bay and Baffin Island, and migrates through the Prairie Provinces and eastern Canada. This population winters in coastal areas from Maryland to North Carolina along the mid-Atlantic coast.

The 2003 mid winter survey estimate of Eastern Population Tundra Swans was 108,200, up 4% from 2002. These estimates have increased annually by an average of 3% over the last 10 years ($P < 0.01$) (USFWS, 2003).

The Mackenzie Delta region is probably the most important breeding area for Tundra Swans in Canada accounting for perhaps 1/3 of the eastern population. In 2003, surveys in this region indicated a good nesting effort for swans, in contrast to the past two years of relatively low production (J. Hines, pers. comm.)

The number of swans killed and retrieved in the US from the eastern population for 2002 was 3,472, similar to the last five years (3,533 birds on average since 1998) (Kruse and Sharp, 2003). In 2002, 743 swans from the western population were killed and retrieved, below the average of 1,075 birds killed annually in the past five years (Kruse and Sharp, 2003). There are no open seasons for Tundra Swans in Canada.

For information on a migration study conducted by the USFWS and USGWS in 2001 and 2002, see: http://www.dnr.cornell.edu/research/tundraswan/tswan.html. An earlier migration study (Petrie and Wilcox, 2003) demonstrated that eastern tundra swans migrated between the wintering areas on the Atlantic coast and staging points in the northern prairies along a narrow corridor passing through the southern Great Lakes. From there, three major routes were followed to breeding areas in western Hudson Bay, the central High Arctic and the Mackenzie River delta. Migration was of long duration, and the birds spent half the annual cycle on staging areas.

Trumpeter Swan

There are three populations of Trumpeter Swans: the Pacific Coast Population, the Rocky Mountain Population, and the Interior Population. The size of each of those populations is assessed at 5-year intervals across their entire range in North America and the most recent of those surveys was conducted in August-September 2000. The sizes of each of the three populations grew to record high levels in 2000. The Pacific Coast Population remains the largest at 17,751 birds, which is 8% higher than the 1995 estimate. The Rocky Mountain Population increased 46% since 1995 to 3,666 swans while the Interior Population now numbers 2,340 individuals, a 150% increase over 1995 (USFWS Trumpeter Swan Population Status 2000). Refer to the 2000 version of this report for a complete summary of the 2000 Trumpeter Swan survey.

Over 40% of the continental population of Pacific Coast Trumpeter Swans winters over the coastline, wetlands and agricultural fields of Vancouver Island and the Fraser River valley, which is the largest wintering Trumpeter Swan population in North America. Air surveys of the area's Pacific Coast Population are conducted every 3 years over this entire area, to identify regional and habitat-specific trends in swan use. Estuaries, coastal marshes, farmland and freshwater lakes were the most important wintering sites on Vancouver Island and swans were distributed almost equally between tidal marshes and upland habitats in the Fraser River Valley. The survey conducted in January 2002 estimated a total of 6775 swans around Vancouver Island and in the Fraser River valley, a 4.7% decrease over the 7111 swans observed in 1998-1999. During the 2002/03 survey of Snow Geese in the Fraser River Delta, swan groups were either

counted (if less than roughly 20) or photographed. Pictures were subsequently analyzed for total count and percent young. The 2002/03 surveys identified 295 (15.3% young) swans in the Fraser River Delta, 72% lower than in the previous year, and 56% below the long term average (1987-2001) 0f 669 swans. Tundra and Mute Swans each accounted for less than 0.5% of all the swans seen (CWS and Ducks Unlimited Canada unpubl. data). The next scheduled survey is planned for the 2004-2005 winter.

Since 1999, at least 868 Trumpeter Swans have died of lead poisoning in the Fraser River valley and in adjacent areas of Washington State. Lead poisoning losses are responsible for some of the decline in the number of wintering trumpeter swans observed since 1998. International efforts overseen by the Washington Department of Fish and Game and the Canadian Wildlife Service were initiated in 2001 to locate the source(s) of lead. These efforts have focused on population surveys conducted by volunteers, trapping and telemetry of banded birds to characterise habitat use, monitoring of roost sites to track and collect sick birds and post-mortem examinations of dead birds to confirm the cause of death. The work this winter will include the placement of 200 new radio collars on swans, the collection of blood samples from some individuals and the taking of x-rays to determine the presence of shot in live birds.

Trumpeter Swans were captured in the Yukon and British Columbia in July 2003 under a collaborative project involving the Trumpeter Swan Society, the US Fish and Wildlife Service, Ducks Unlimited (Canada), the Alsek Renewable Resource Council, the Champagne/Aishihik First Nation, the Teslin Renewable Resource Council, the Teslin Tlingit Council, the White River First Nation and the Canadian Wildlife Service (Prairie and Northern and Pacific and Yukon Region). The objective of the banding was to i) identify migration routes, wintering areas and key habitats of Trumpeter Swans that summer in the Yukon and British Columbia; ii) determine the western limits of the summer range of Trumpeter Swans that winter in the greater Yellowstone region and the eastern limits of the summer range of Trumpeter Swans that migrate through central British Columbia to other wintering areas; and iii) gather genetic samples to help clarify the relationships among Trumpeter Swan breeding populations.

A total of 28 flightless moulting swans were captured along a transect extending from Beaver Creek, Yukon to Fort St. John, British Columbia (a linear distance of approximately 1400 km). Eight adult birds were fitted with satellite transmitters mounted on neckbands and the others were equipped with colored neck bands. The 2003 captures took place to the south and west of the 2002 capture efforts. The satellite and ground resightings should complement our understanding of the affiliation of various breeding groups to specific wintering locations and assist with a better identification of the Trumpeter Swan populations. Radio locations and other information will be provided on the Shadow-A-Swan website (http://www.uen.org/swan/).

Population Status of Other Hunted Migratory Birds

Except for murres, the harvest of other migratory game birds is estimated through annual questionnaire surveys sent to MGBHP holders in Canada (National Harvest Survey) and to migratory bird hunters in the U.S. (Harvest Information Program (HIP))>Waterfowl Hunter Questionnaire Survey).

Thick-Billed and Common Murres

Thick-billed Murres (*Uria lomvia*) and Common Murres (*U. aalge*) have traditionally been hunted off the coast of Newfoundland and Labrador. Murres have a limited ability to rebuild their numbers, as they first breed only at the age of four or five and then lay only one egg each year. If over harvested, murre populations would take a long time to recover. An analysis in the early 1990s of the demography of murres and the impacts of harvesting suggested that the annual harvest was unsustainable at that time. The number of Thick-billed Murres in the northwest Atlantic has been estimated to be 1.5 million breeding pairs in the Canadian Arctic and 375,000 breeding pairs in Greenland (S. Gilliland, pers. comm.). The number of Common Murres breeding in Newfoundland and Labrador had been estimated to be 500,000 pairs (S. Gilliland, pers. comm.).

Since the 1970s, Thick-billed Murre numbers in selected colonies in the Eastern Canadian Arctic have been monitored by counts of occupied breeding sites on fixed study plots scattered throughout. The trend from 2000 to 2002 indicates a sharp drop, with indices at two colonies falling by 25% ($P < 0.01$) and 9% ($P < 0.05$) since 2000. The cause of the current population downturn is not known, but is probably related to events in the wintering grounds rather than the breeding grounds. During the period 1976-2000, trends in these monitoring counts were generally either stable or positive (+1-2% / year, $P < 0.01$), except for a sharp fall in numbers in 1989 and 1990 ($P < 0.01$) (T. Gaston, pers. comm.).

Beginning in the 1993-1994 hunting season, CWS implemented restrictions on murre hunting in Newfoundland and Labrador. The restrictions were

designed to reduce the harvest of murres by up to 50%, to eliminate excessive kills that lead to illegal sale, and to provide additional protection to other seabirds such as razorbills (*Alca torda*). These interim restrictions had been taken while steps were underway to amend the Migratory Birds Convention between Canada and the United States. Beginning with the 2000-2001 hunting season, an amendment to the Convention now enables murres to be managed through the usual regulatory approaches.

The annual murre harvest has been estimated several times since the 1977-1978 hunting season, using a special survey mailed to Migratory Game Bird Hunting Permit holders. Overall, murre harvest has declined since the late 1970s, with the lowest estimates from the last three surveys, which followed the imposition of hunting restrictions. Excluding the very high estimate for 1982-1983, the average harvest estimate for permit holders prior to hunting restrictions was about 400,000 birds per year, compared to 134,000 birds per year after hunting restrictions. Thus, the annual harvest was reduced by about 66%, exceeding the target of 50%. Accounting for murre hunters who, until 2000, were not required to purchase a hunting permit, the total annual harvest of murres was assessed at about 250,000 to 300,000 birds between 1996 and 1998, compared to 600,000 to 900,000 birds prior to hunting restrictions.

The hunting season of 2001/02 was the first year when all murre hunters were required to purchase a hunting permit, and hence the first year that total murre harvest could be estimated. The results indicated that there were about 6,400 murre hunters in Newfoundland and Labrador in 2001/02, of which about 18% bought permits just to hunt murres. This year, the estimate was essentially unchanged at about 6,500 hunters. The total estimated harvest for 2001/02 was about 186,000 murres, while this year it was about 158,000 ± 6,600. These estimates are considerably lower than expected.

American Woodcock

The status of American Woodcock (*Scolopax minor*) in North America is monitored through the Singing-ground Survey, which consists of a spring count of male courtship displays at dusk. Counts of singing males provide indices to American Woodcock populations and can be used to monitor annual population changes (Kelley, 2003). The survey covers the central and northern portions of the woodcock breeding range. Analyses of band recoveries indicate that there are two relatively discrete populations, and as a result, American Woodcock are managed on the basis of two regions, Eastern and Central. In Canada, woodcock breeding in Manitoba and Ontario belong to the Central Population, while those breeding in Québec and in the Maritimes are part of the Eastern Population.

The numbers of American Woodcock displaying during the 2003 singing ground survey in both the Eastern and Central Regions were not significantly different ($P > 0.1$) from the 2002 level (Kelley 2003; Figure 33). Over the 1993-2003 period, counts have decreased significantly ($P < 0.01$) in both regions (-1.3% in the Eastern Region and -1.6% in the Central Region). Long-term trends (1968-2003) indicated a significant decline ($P < 0.01$) of woodcock breeding populations in the Eastern (-2.3% per year) and Central (-1.8%) regions (Kelley, 2003).

In Canada, the number of American Woodcock displaying during the 2003 Singing-ground Survey did not differ significantly from 2002 (Kelley, 2003) (however, note that these results are based solely on information submitted by May 30). Counts over the 1993-2003 period showed a significant decline in woodcock breeding populations in Québec (-2.9%; $P < 0.05$) and Manitoba (-4.0%; $P < 0.05$). Trends over the long-term (1968-2003) showed a significant decline in Ontario (-1.6%; $P < 0.01$) and Manitoba (-3.5%; $P < 0.05$) (note that Manitoba began participating in the Singing-ground Survey in 1990). The major causes of American Woodcock population declines are believed to be degradation and loss of suitable habitat on both the wintering and breeding grounds (Kelley, 2003).

An indirect measurement of recruitment, or annual productivity, of woodcock breeding populations is derived from age ratios of wings collected in the harvest (Wing-collection Survey). The 2002 recruitment index of 1.4 for the Eastern region has been the same since 2000, but was 18% below the long-term (1963-2003). The index of 1.6 for the Central Region was slightly higher than last year, and was similar to the long-term average (1963-2003) (Kelley, 2003).

The harvest of American Woodcock in Canada and the U.S. has been declining over the years; this decline, however, has been much more pronounced in the United States (Figure 34). In 2002, there were 49,100 ± 3,700 woodcock harvested in Canada, about the same as during the past three years (Figure 34). Bateman and Hicks (2003) indicated that the number of woodcock hunters is undergoing a long term decline, but the harvest per hunter is increasing. In the U.S., the 2002 harvest was estimated at 320,000 woodcock, a 75% percent increase compared to last year. This substantial change in estimated harvest should be treated with caution, as it may be related to the revised Harvest Information Program.

Mourning Dove

Mourning Doves (*Zenaida macroura*) are among the most widely distributed and abundant birds in North America, and are monitored in Canada through the Breeding Bird Survey (http://www.cws-scf.ec.gc.ca/birds/Trends/disclaimer_e.cfm). Dove populations in the Prairie potholes, Boreal Hardwood Transition, Lower Great Lakes/ St. Lawrence Plain ecozones, and Atlantic Northern Forest as well as the entire country have increased significantly ($P < 0.05$) over the long-term (1968-2002). Populations in the Boreal Plains, Great Basin and Northern Rockies ecozones do not show any significant trend over that time period. During the last ten years, mourning doves in the Boreal-Hardwood Transition, Great Lakes/ St. Lawrence Plain, and the Atlantic Northern Forest, as well as the entire country have been significantly increasing ($P < 0.05$). Populations in the Boreal Plains have been significantly decreasing ($P < 0.05$).

In the U.S., Mourning Dove populations are monitored through the Mourning Dove Call-count Survey, which has been developed to provide an annual index to population size during the breeding season (Dolton and Rau, 2003). Mourning Doves in the U.S. are managed on the basis of the three regions where dove populations are largely independent. These areas are referred to as the Eastern, Central, and Western Management Units. Over the long term (1966-2003) there was no trend for doves in the Eastern or Central Units, but there was a decline in the Western Unit. Over the recent decade, no trend was evident in any of the three Management Units (Dolton and Rau, 2003).

Dove hunting is permitted in 12 of the 14 states in the Central Management Unit, while all seven states that comprise the Western Management Unit permit the hunting of Mourning Doves (D. Dolton and R.D. Holmes, 2003). In Canada, Mourning Doves are hunted only in British Columbia. The harvest there has varied considerably from year to year, ranging from an estimated high of 5,391 doves killed in 1977 to 327 ± 147 during the 2002 season. The long-term decline in Mourning Doves in southern British Columbia resulted in the implementation of hunting restrictions beginning in 1994. The estimated harvest in the U.S. in 2002 was 22.7 million, which was about the same as last year (Dolton and Rau, 2003).

Common Snipe

Common Snipe (*Gallinago gallinago*) in Canada are also monitored through the Breeding Bird Survey (http://www.cws-scf.ec.gc.ca/birds/Trends/disclaimer_e.cfm). Populations of Common Snipe in the Prairie Ecozone have increased significantly ($P < 0.05$) over the long-term (1968-2002). Populations in the Great Basin and Atlantic Forest ecozones showed a significant decline over that time period. Elsewhere in the country there was no trend indicated. The harvest of Common Snipe in Canada has also been declining over the years (Figure 35). In 2002, there were 14,120 ± 1,470 snipe harvested in Canada. The estimated harvest in the U.S for 2002 decreased by 16% to 126,700 from the previous year.

Sandhill Crane

The Mid-continent Population of Sandhill Cranes is the largest of all North American crane populations. This population is comprised of approximately two-thirds Lesser (*Grus canadensis canadensis*), one-fourth Canadian (*G. c. rowani*), and the remainder Greater Sandhill Cranes (*G. c. tabida*). Mid-continent Sandhill Cranes breed from southern Ontario northwestward through the Arctic, Alaska, and into eastern Siberia. This population winters in western Oklahoma, eastern New Mexico, Texas, southward into Mexico, and westward into Arizona (Sharp et al., 2003).

The Mid-continent Population of Sandhill Cranes is monitored through a spring aerial transect survey. Indices corrected for visibility bias are available since 1982. The population index in spring 2003 (not yet corrected for visibility) was 317,000 birds (Sharp et al., 2003) (Figure 36). Overall, there does not seem to be any trend in population abundance since 1982.

The Canadian hunting season for Mid-continent Sandhill Cranes is currently open only in Manitoba, Saskatchewan, and the Yukon Territory. The crane harvest in Canada has been quite variable, tending to increase in Saskatchewan (Figure 37). The overall Canadian harvest of Mid-continent Sandhill Cranes was 7,900 in 2002 (Saskatchewan and Manitoba combined); a decrease of 10% compared to 2001 (Figure 37). The harvest of Mid-continent Sandhill Cranes has been increasing in the U.S. over the years. The crane harvest in the U.S. increased by 10% to 17,780 in 2002 compared to 2001 (Sharp et al., 2003). Twenty-eight cranes were estimated harvested in the Yukon in 2002.

Band-tailed Pigeon

We have little information on the status of Band-tailed Pigeons (*Columba fasciata*), which are found in forested habitats in coastal British Columbia. This species has a very low reproductive rate of one egg per pair, and some nest twice each season. Results from the Breeding Bird Survey (http://www.cws-scf.ec.gc.ca/birds/Trends/disclaimer_e.cfm) indicate a non-significant long-term (1968-2002) decline in the population, which is consistent with the declines

seen throughout the Pacific Flyway.

In British Columbia, the presence of Band-tailed Pigeons was assessed at over 15 mineral sites for which there were historic records of pigeon use in 2001. Weekly counts were conducted at four heavily used sites in the Fraser Valley from June to August 2001 and 2002 to assess current use of each mineral site. These surveys have since been integrated into a Flyway-wide mineral site index covering California, Washington, Oregon and British Columbia (Casazza and Pacific Flyway Band-tailed Pigeon Sub-committee, pers. comm.). Preliminary analysis of the data collected at 5 mineral in British Columbia in 2003 suggest a 62% decline compared to the 2002 numbers (Grigg and Breault, pers. comm.). The Canadian hunting season for this species was closed from 1994 through 2001. Population increases in Washington State were primarily responsible for the limited opening implemented in British Columbia in 2001 (where bag limit was decreased from 10 birds to 5 and the season length decreased from 30 to 15 days). An estimated 188 pigeons were harvested during the September 2002 hunting season. The US harvest estimate for 2002 was not available at the time of writing. In 2001 the harvest there was 11,870 birds, a 14% decrease from 2000 (Trost and Drut 2002).

American Coot

During the Waterfowl Breeding Population and Habitat Survey, American Coots (*Fulica americana*) are also recorded in the Canadian Prairies. Results of this survey show that American Coot population estimates have greatly fluctuated (Figure 38). In recent years, however, the population has maintained itself at levels substantially higher than seen during the 1980s and early 1990s. The 2003 population estimate of 963,500 coots was about the same as the previous year (929,600).

The harvest of American Coots in Canada has decreased considerably over the years. In 2002, the American Coot harvest was estimated at 1988 ± 528 birds, a decline of 24% from the previous year.

Rails

Rails are counted during the Breeding Bird Survey (BBS), but there is trend information only for Virginia Rails (*Rallus limicola*; country as a whole, and over the long term only) and Sora (*Porzana carolina*; Boreal Shield, Boreal Plains, Prairies, and Montane Cordillera ecozones, as well as the country as a whole) (http://www.cws-scf.ec.gc.ca/birds/Trends/disclaimer_e.cfm). Trends are not reliable for the Yellow Rail (*Coturnicops noveboracensis*), because of relatively low numbers of counts.

For Virginia Rails there were no significant long-term (1968-2002) or short-term (1993-2002) population trends indicated in any ecozone or in the country as a whole. Soras showed a significant increase in the Atlantic Northern Forest ecozone in the long term. Because rails are often secretive and do not call often, they are more likely to be missed during the BBS, and therefore results of trend analyses should be used with caution (C. Downes, pers. comm.).

The only province with an open season for hunting rails is Ontario (excluding King Rails [*Rallus elegans*] and Yellow Rails [*Coturnicops noveboracensis*]). Previously there were seasons in other provinces but they have been closed in recent years. The rail hunting season was closed in Alberta in 1990, in Québec and the Yukon Territory in 1992, and in Manitoba and the Northwest Territories in 1993. The collection of harvest data for rails began in 1989 as part of the National Harvest Survey. About 100 to 4000 rails are harvested annually.

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Appendices

APPENDIX A - ***Special Conservation Measures - Proposals for 2004/05***

For 2004/05, it is proposed that special conservation measures be maintained in Québec, Manitoba, Saskatchewan and Nunavut. Minor changes to the dates in Saskatchewan are proposed, as shown below. In addition, the use of decoys representing white phase snow geese (white adults and pale gray young birds) are proposed for use in Québec.

MEASURES IN QUÉBEC CONCERNING OVERABUNDANT SPECIES

Item	Column 1 Area	Column 2 Period during which Snow Geese may be killed	Column 3 Additional hunting method or equipment
1.	District A	May 1 to June 30 and September 1 to December 10	Recorded bird calls (*e*)(*g)*
2.	District B	September 18 to December 26	Recorded bird calls (*e*) (*g)*
3.	District C	April 1 to May 31 (*a*), September 6 to September 17 (*a*) and September 18 to December 26	Recorded bird calls (e) *(g)*
4.	District D	April 1 to May 31 (*a*), September 6 to September 17 (*a*) and September 18 to December 26	Recorded bird calls (*e)* (*g*)
5.	District E	April 1 to May 31 (*a*), September 6 to September 17 (*a*) and September 18 to December 26	Recorded bird calls (*e*)(g) and bait or bait crop area (*f*)
6	District F,G,H,I	April 1 to May 31 (*a*),(*b*),(*c*) September 6 to September 24(*a*),(*d*) and September 25 to December 26	Recorded bird calls (e)(g) and bait or bait crop area (f)
7.	District J	September 25 to December 26	Recorded bird calls (e)(g)

(a) Hunting is allowed only on farmland.
(b) In District F, no person shall hunt south of the St. Lawrence River and north of the road right-of-way of Route #132 between Forgues Street at Berthier-sur-Mer and the eastern limit of Cap St-Ignace municipality.
(c) In District G, on the north shore of the St. Lawrence River, no person shall hunt north of the St. Lawrence River and south of a line located at 1 000 m north of highway no. 40 between Montée St-Laurent and the Maskinongé River. On the south shore of the St. Lawrence River, no person shall hunt south of the St. Lawrence River and north of the

railroad right-of-way located near Route #132 between the Nicolet River in the east and Lacerte Road in the west.

(d) In District G, north of route #138 and south of route #132, hunting is allowed only on farmland.

(e) "Recorded bird calls" refers to bird calls of a species referred to in the heading of column 2.

(f) Hunting with bait or in a bait crop area is permitted if the Regional Director has given consent in writing pursuant to section 23.3.

(*g*) If using decoys when hunting with recorded snow goose calls, decoys must represent white phase snow geese.

MEASURES IN MANITOBA CONCERNING OVERABUNDANT SPECIES (NO CHANGES)

Item	Column 1 Area	Column 2 Period during which Snow Geese may be killed	Column 3 Additional hunting method or equipment
1.	Zone 1	April 1 to May 31 and August 15 to August 31	Recorded bird calls (*a*)*(b)*
2.	Zone 2	April 1 to May 31	Recorded bird calls (*a*)*(b)*
3.	Zone 3	April 1 to May 31	Recorded bird calls (*a*)(*b)*
4.	Zone 4	April 1 to May 31	Recorded bird calls (*a*)(*b)*

(a) "Recorded bird calls" refers to bird calls of a species referred to in the heading of column 2.

(b) If using decoys when hunting with recorded bird calls, decoys must be white.

MEASURES IN SASKATCHEWAN CONCERNING OVERABUNDANT SPECIES (DATE CHANGE)

Item	Column 1 Area	Column 2 Period during which Snow Geese may be killed	Column 3 Additional hunting method or equipment
1.	East of 106° W Longitude	April 1 to May 31	Recorded bird calls (*a*) (b)
2.	West of 106° W Longitude	April 1 to April 30	Recorded bird calls (*a*) (b)

(a) "Recorded bird calls" refers to bird calls of a species referred to in the heading of column 2.
(b) If using decoys when hunting with recorded bird calls, decoys must be white.

MEASURES IN NUNAVUT CONCERNING OVERABUNDANT SPECIES (NO CHANGES)

Item	Column 1 Area	Column 2 Period during which Snow Geese may be killed	Column 3 Additional hunting method or equipment
1.	Throughout Nunavut	May 1 - June 7	Recorded bird calls (*a*)(b)

(a) "Recorded bird calls" refers to bird calls of a species referred to in the heading of column 2.
(b) If using decoys when hunting with recorded bird calls, decoys must be white.

Figures

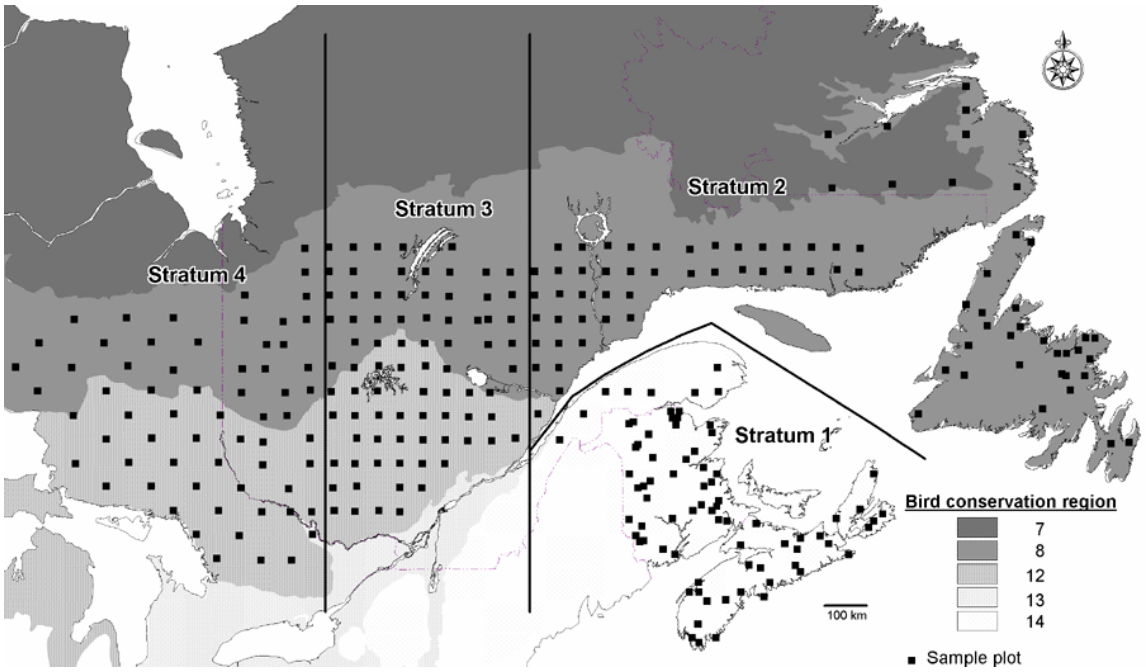


Figure 1. Black Duck Breeding Ground Survey Area of Eastern Canada.
(provided by C. Lepage et M. Melançon)

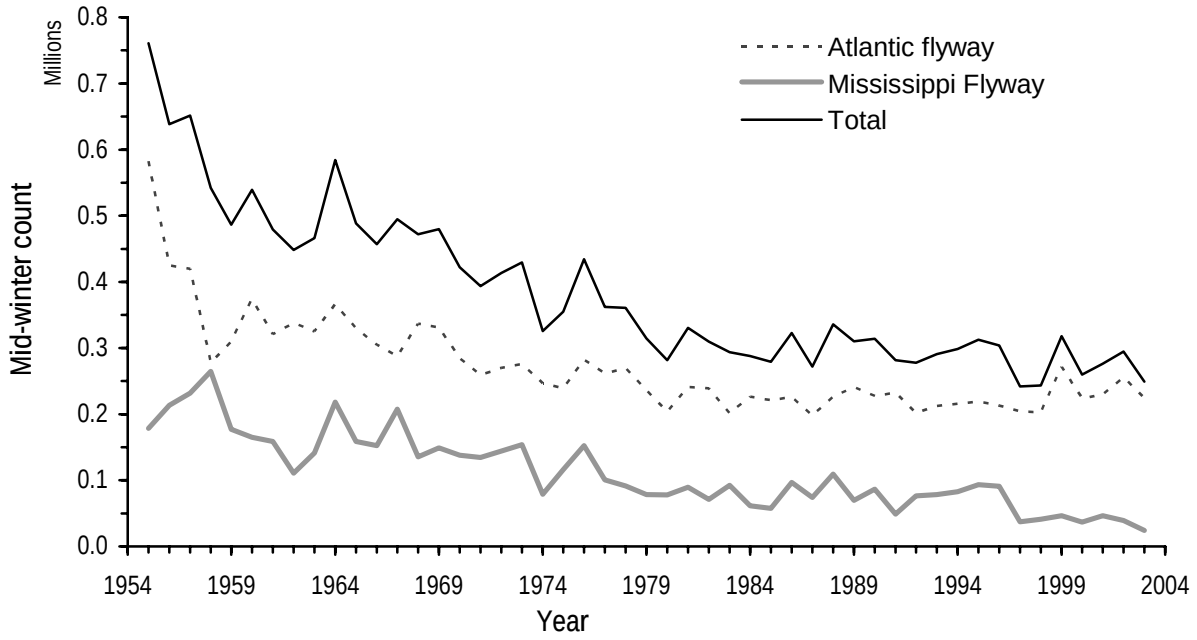


Figure 2. American Black Ducks in the Atlantic and Mississippi Flyways in Mid-winter.

Survey results in the Atlantic Flyway for 2001 and in the Mississippi Flyway for 1993 and 1997 were incomplete in some states.

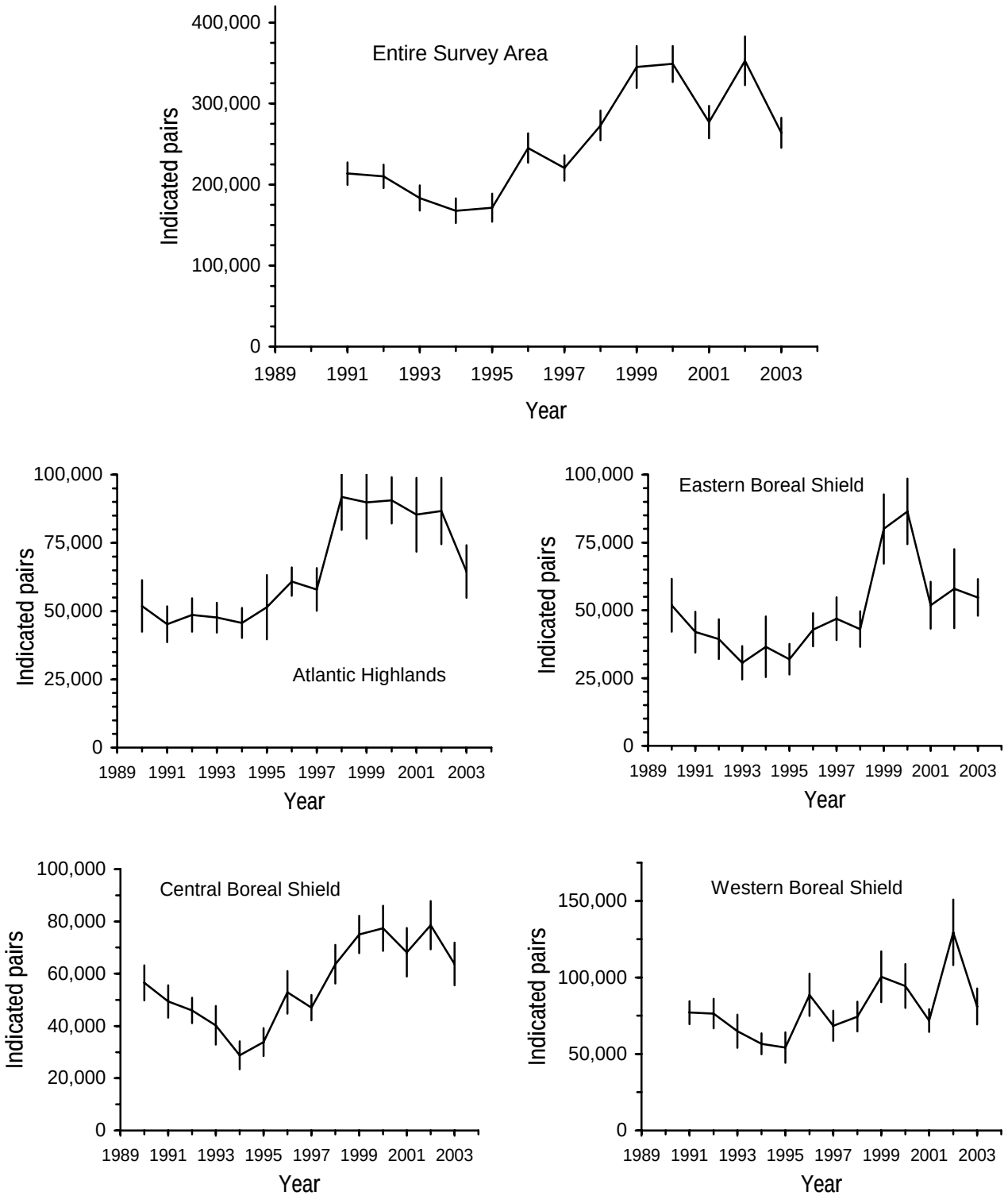


Figure 3. American Black Ducks in the Black Duck Breeding Ground Survey Area of Eastern Canada; Breeding Pairs.

Estimated number of indicated pairs (± 1 SE) (Collins 2003). The 1990 data in the western portion of the boreal shield region were not comparable with other years and were therefore excluded.

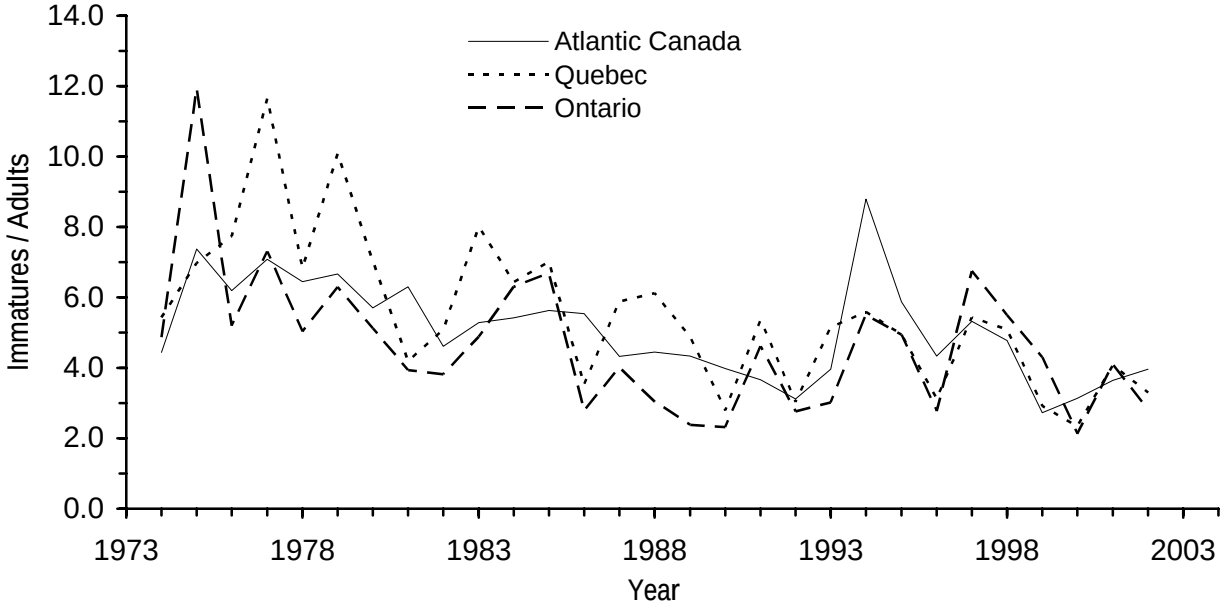


Figure 4. Black Duck Age Ratios in Eastern Canada Harvest.

Age ratios are not adjusted for differential vulnerability to harvest of juveniles and adults

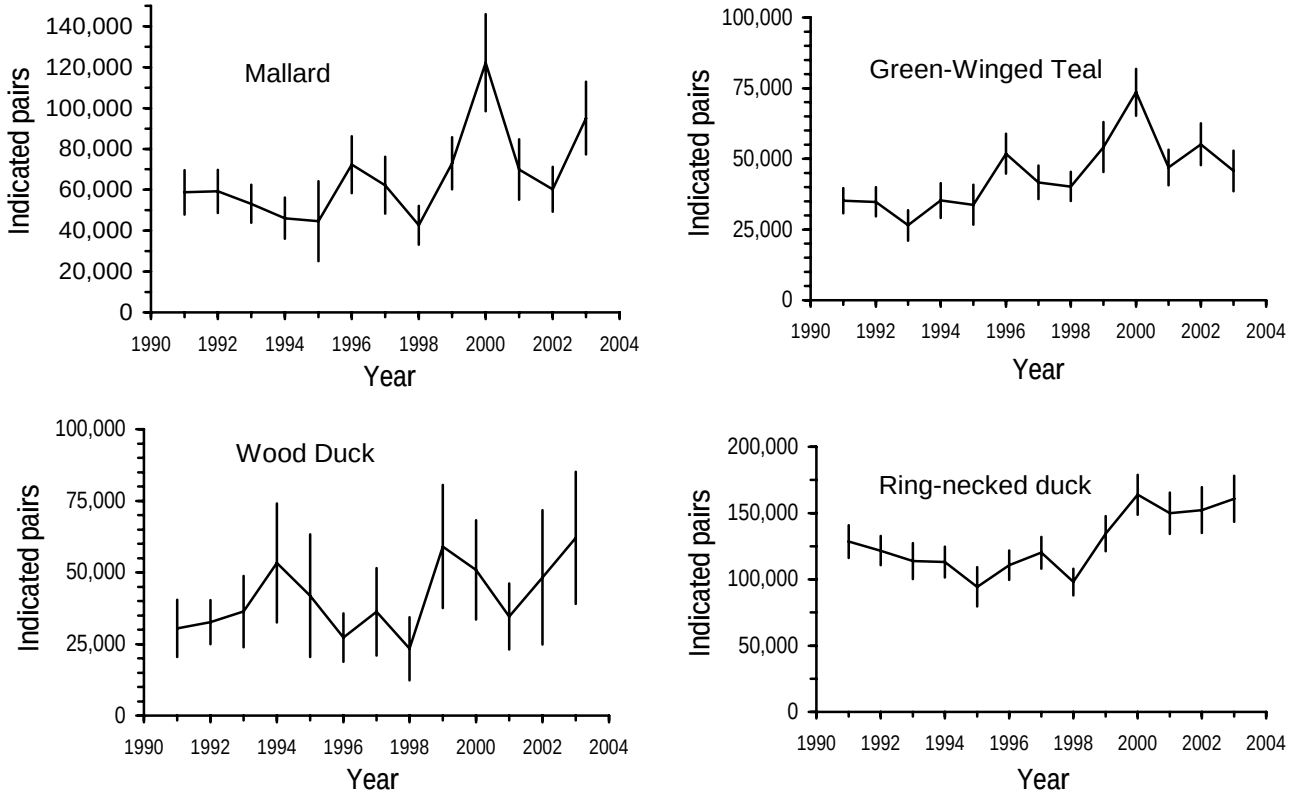
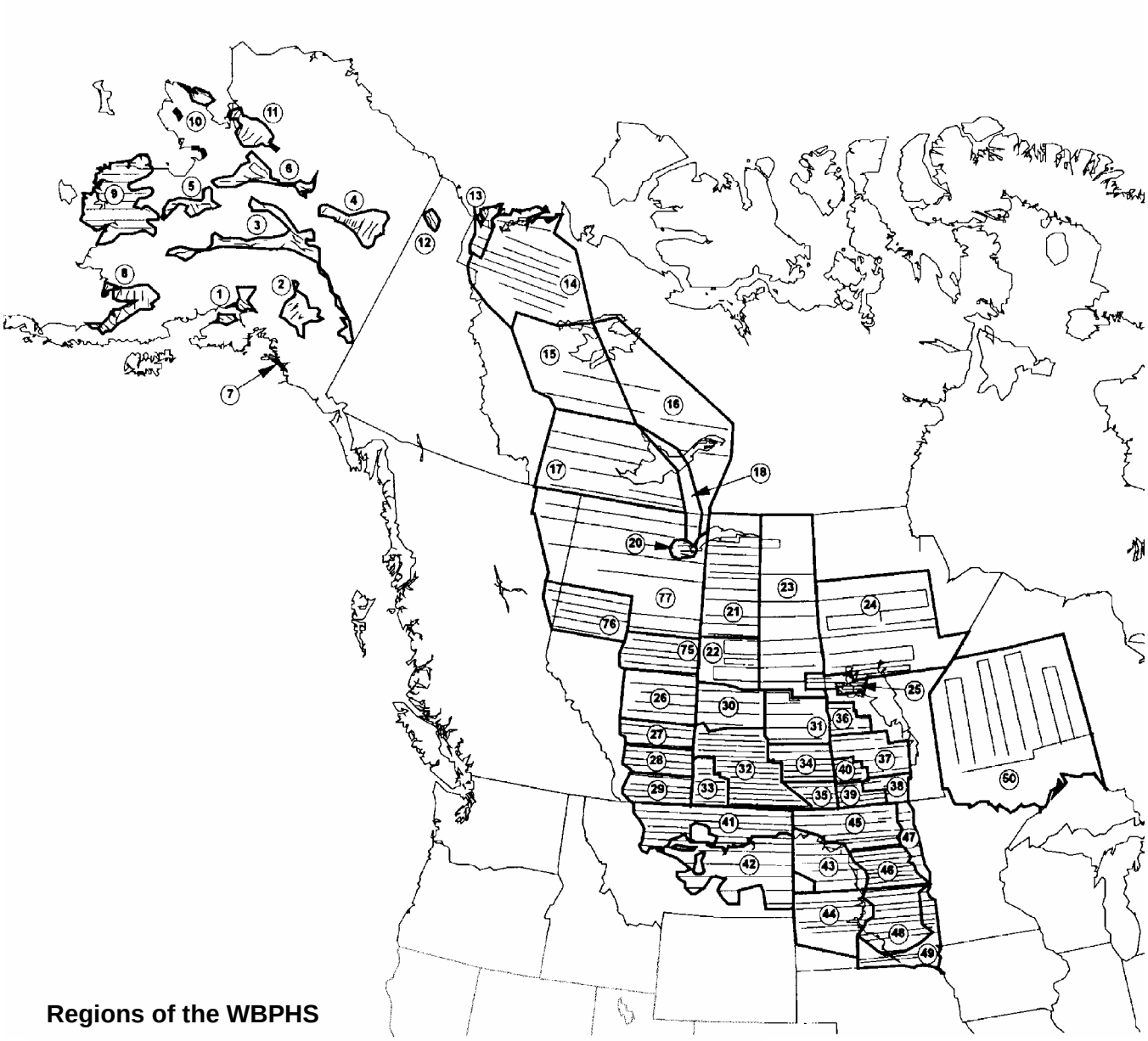


Figure 5. Other abundant Inland Ducks of the Black Duck Breeding Ground Survey Area.

Estimated number of indicated pairs (± 1 SE) in the entire survey area of the Black Duck Breeding Ground Survey of Eastern Canada (Collins 2003). The 1990 data in the western portion of the boreal shield region were not comparable with other years and were therefore excluded.



Regions of the WBPHS

1.	Strata 1-11	Alaska
2.	Strata 12 –25, 50, 75-77	Western Boreal Canada
3.	Strata 26-40	Canadian Praires
4.	Strata 41-49	U.S. Prairies

Figure 6. Waterfowl Breeding Population and Habitat Survey of Western Canada, traditional survey area of Western Canada and the United States.

(US Department of the Interior and Environment Canada)

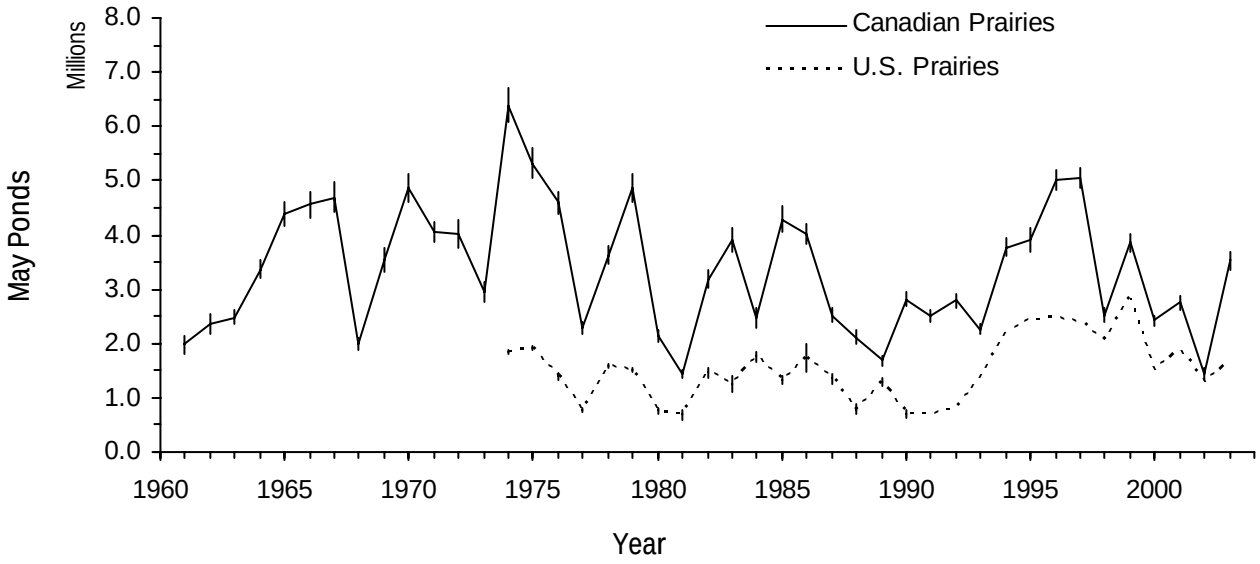


Figure 7. May Ponds in the Canadian and U.S. Prairies.

Estimated number of ponds ± 1 SE.

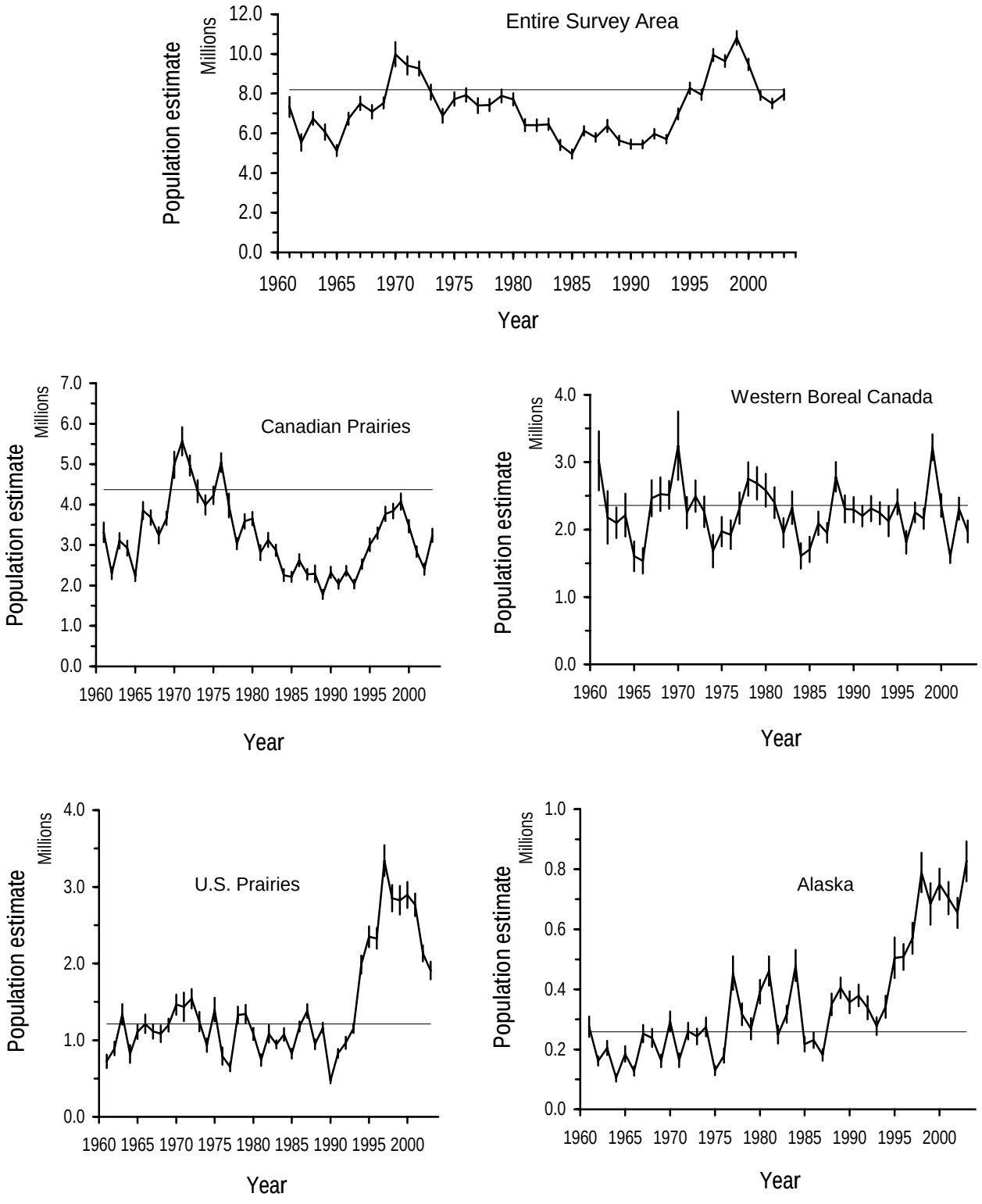


Figure 8. Mallard Breeding Population in the Survey Area of the Waterfowl Breeding Population and Habitat Survey.

Estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal.

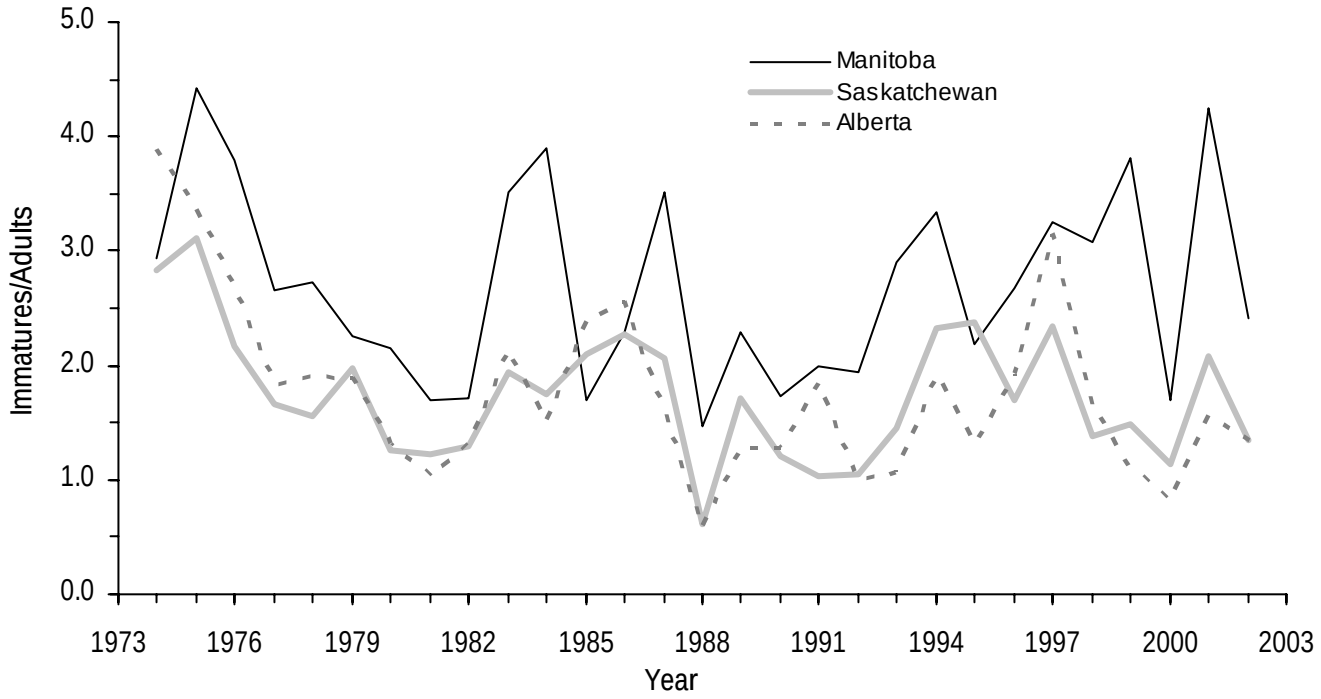


Figure 9. Mallard Age Ratios in the Harvest in the Canadian Prairies.

Age ratios are not adjusted for the differential vulnerability to harvest of juveniles and adults. (J.F. Gobeil and B.T. Collins, CWS, unpublished).

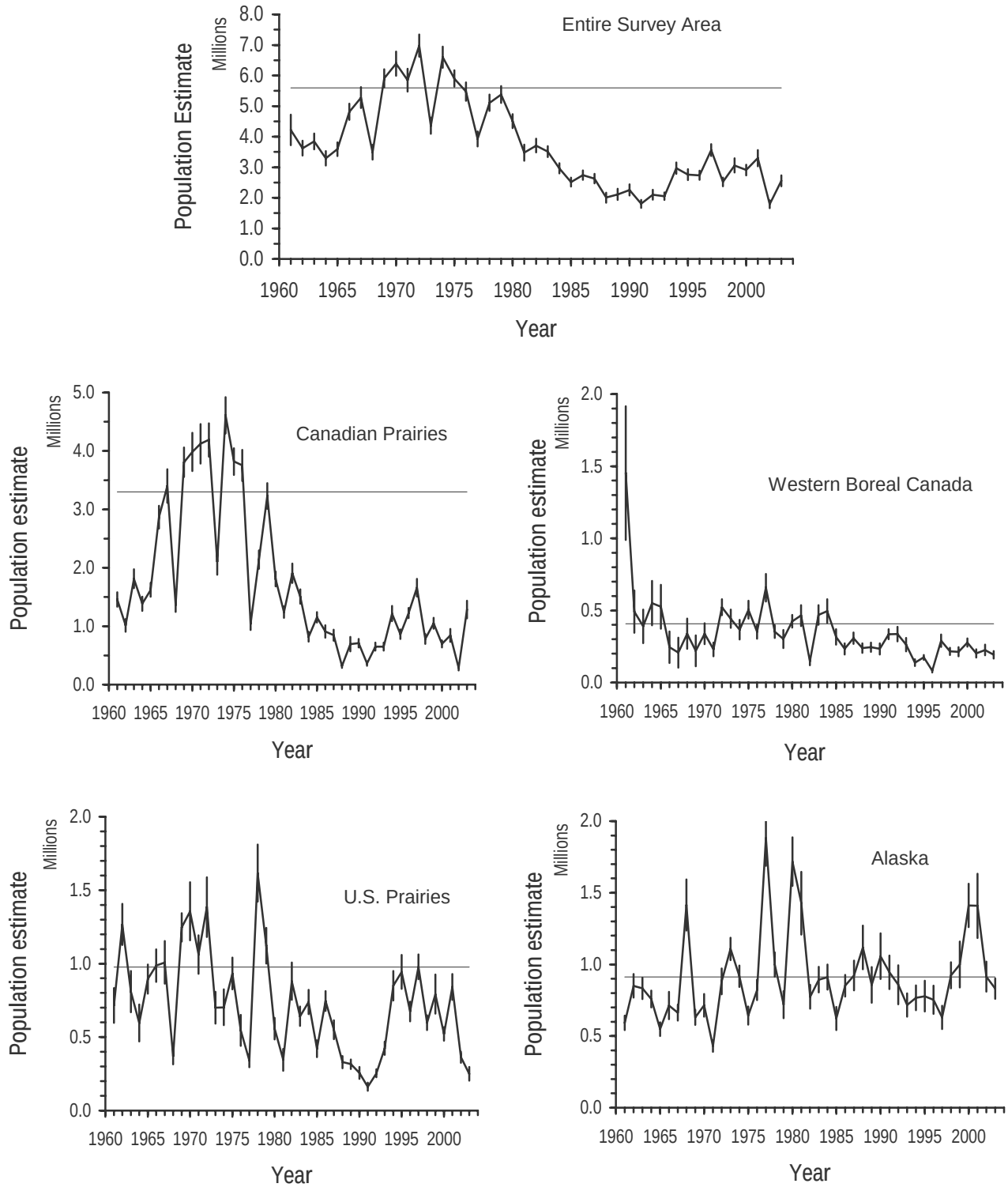


Figure 10. Northern Pintail Breeding Population in the Survey Area of the Waterfowl Breeding Population and Habitat Survey.

Estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal.

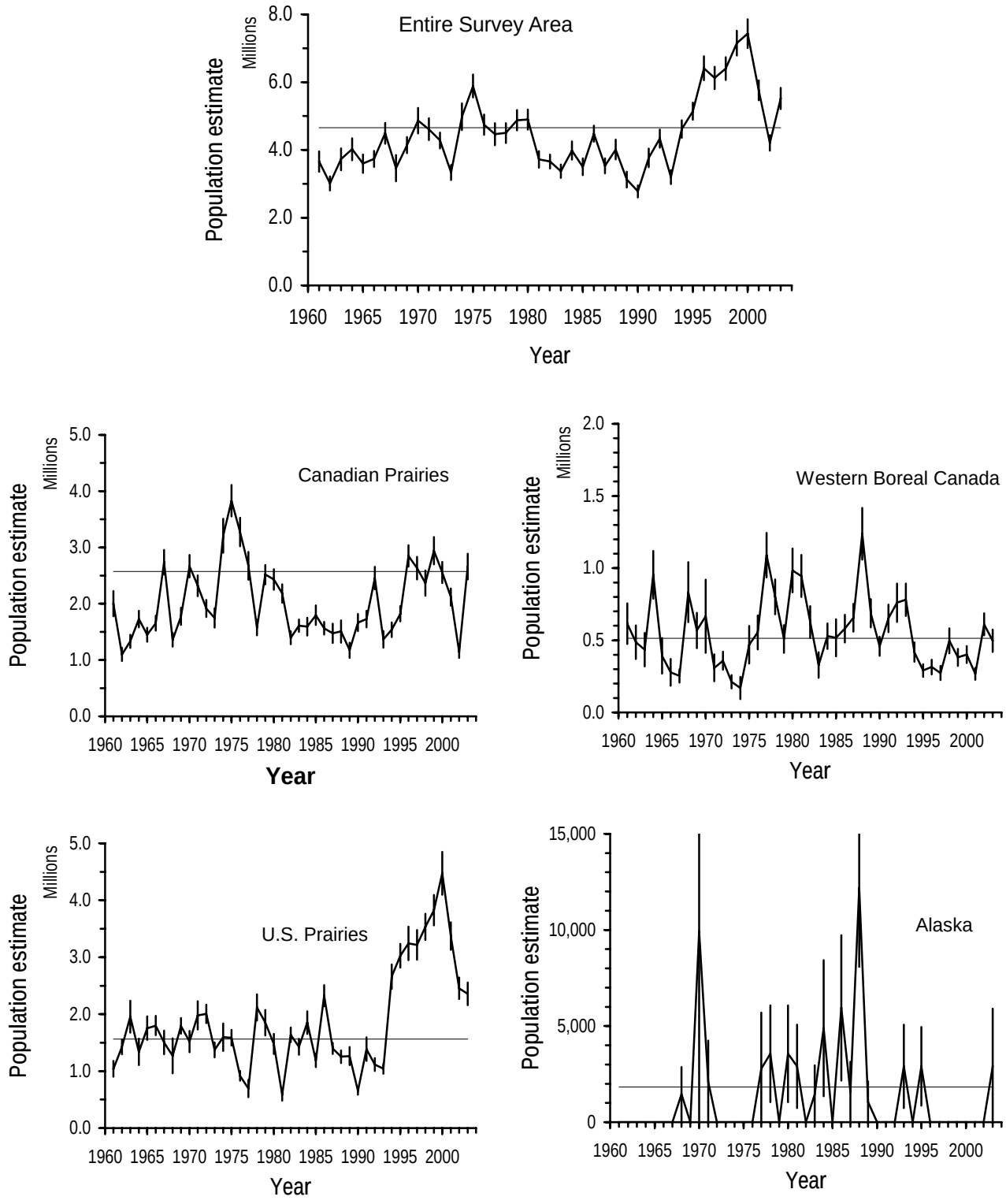


Figure 11 a. Blue-winged Teal Breeding Populations in the Survey Area of the Waterfowl Breeding Population and Habitat Survey.

Estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal.

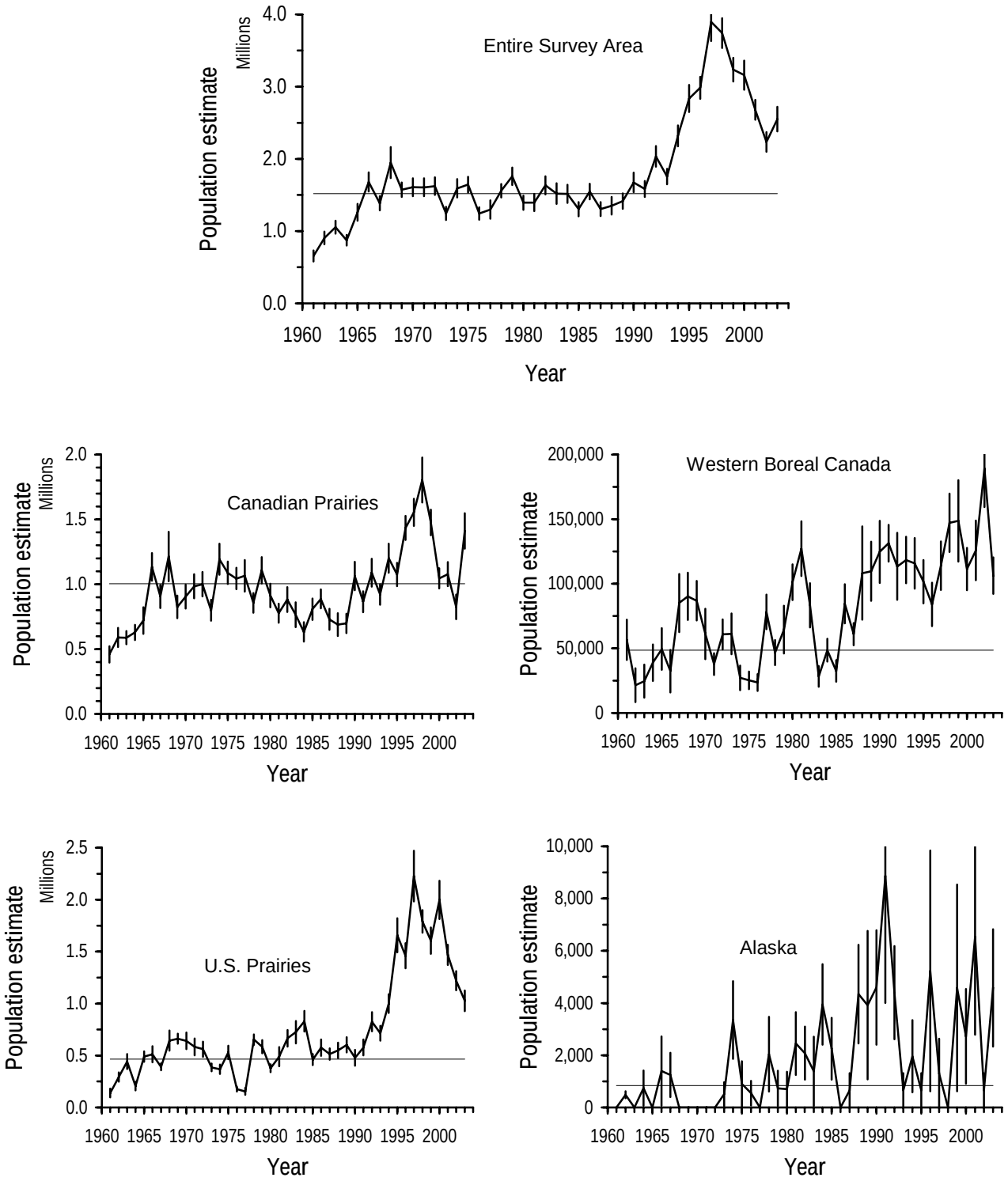


Figure 11 b. Gadwall Breeding Populations in the Survey Area of the Waterfowl Breeding Population and Habitat Survey.

Estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal.

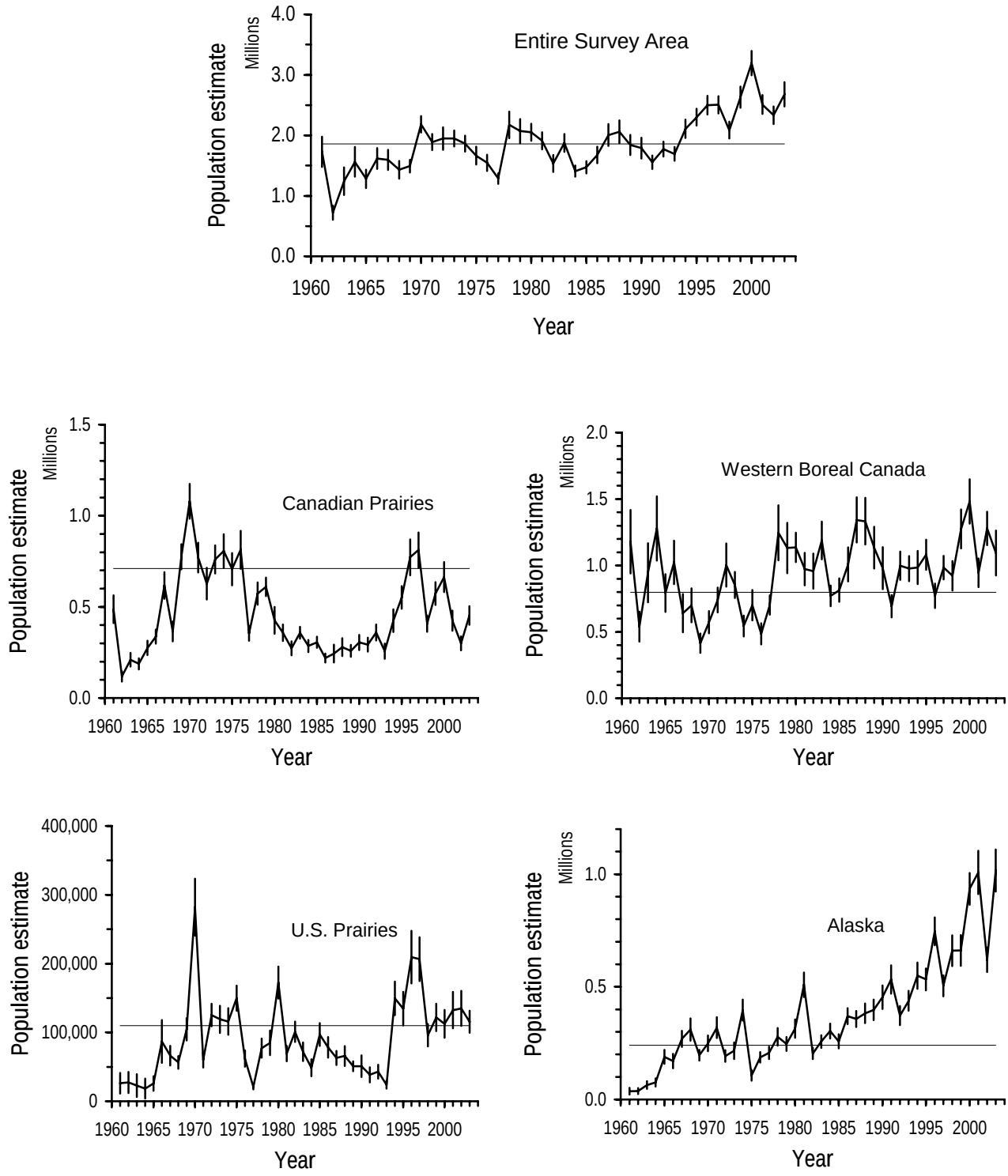


Figure 11 c. Green-winged Teal Breeding Populations in the Survey Area of the Waterfowl Breeding Population and Habitat Survey.

Estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal .

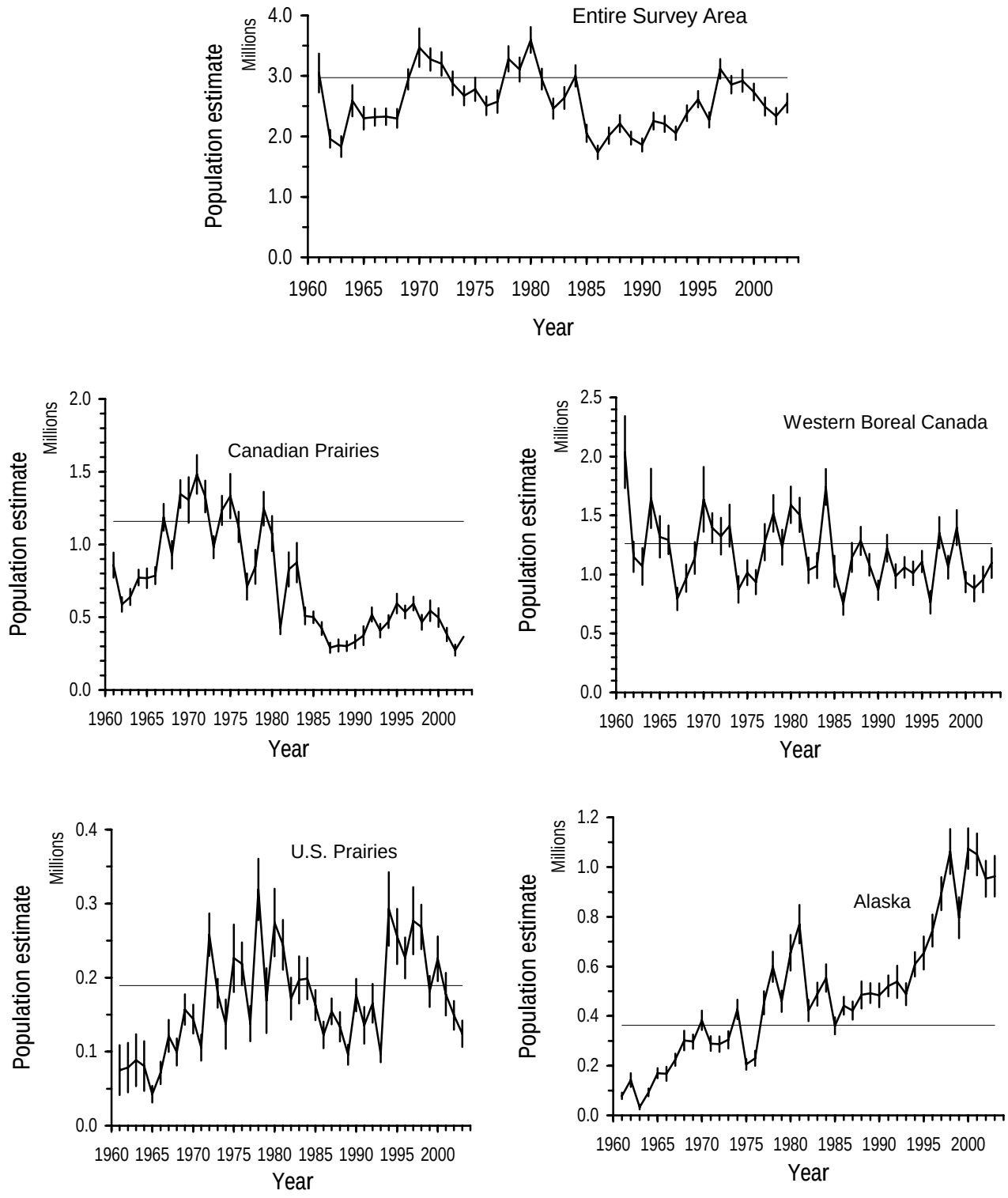


Figure 11 d. American Wigeon Breeding Populations in the Survey Area of the Waterfowl Breeding Population and Habitat Survey.

Estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal.

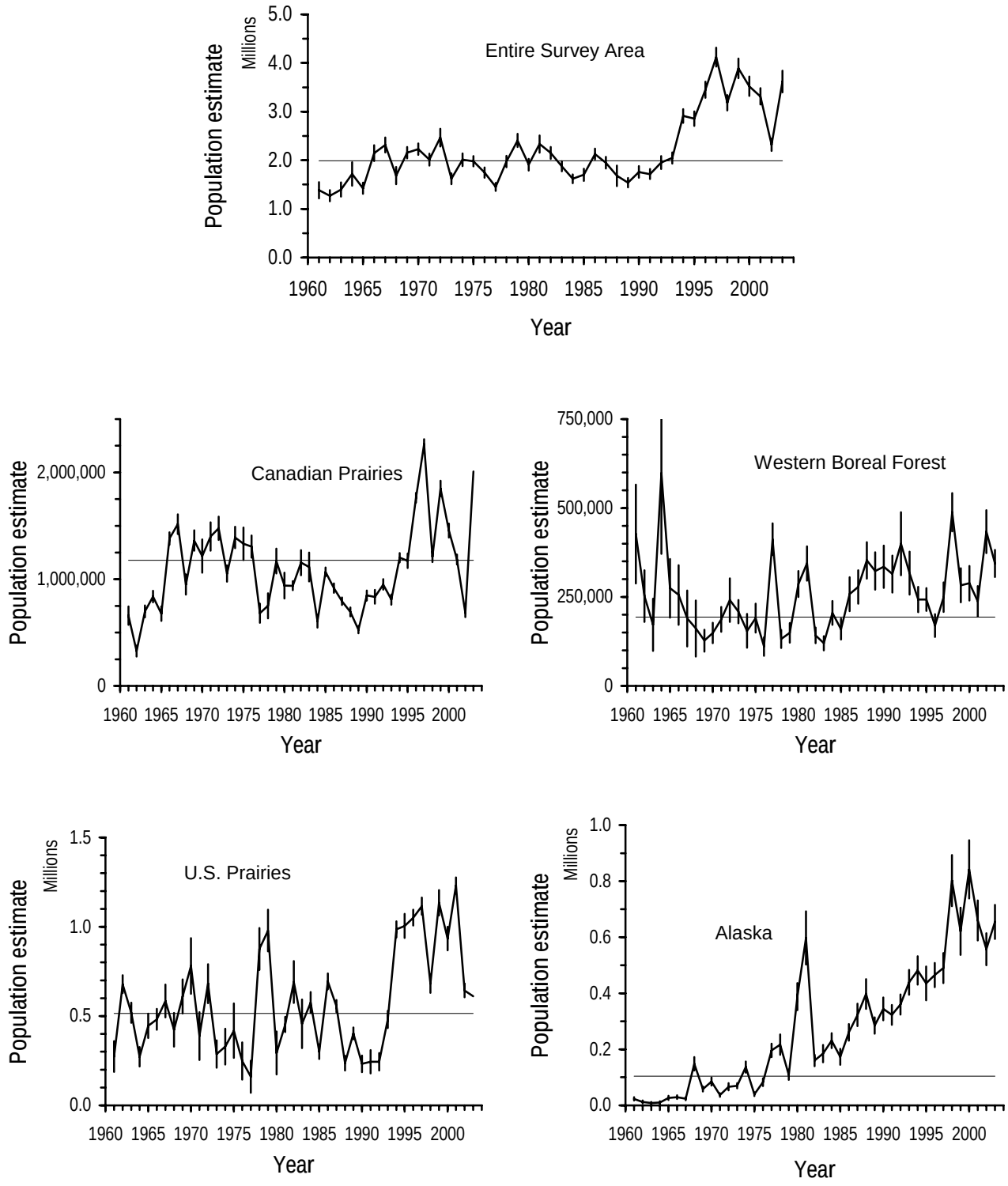


Figure 11 e. Northern Shoveler Breeding Populations in the Survey Area of the Waterfowl Breeding Population and Habitat Survey.

Estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal.

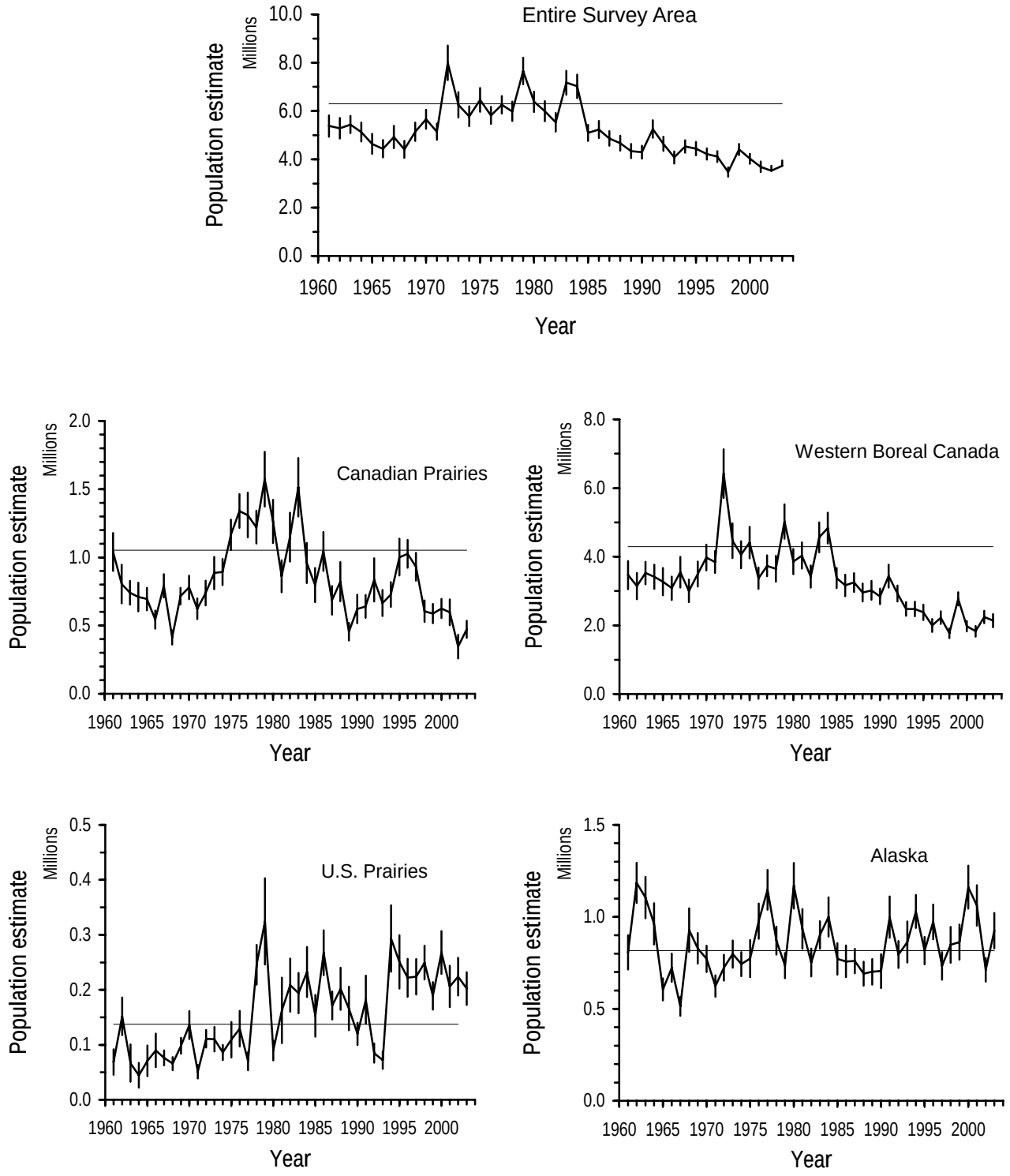


Figure 12. Scaup spp. Breeding Populations in the Survey Area of the Waterfowl Breeding Population and Habitat Survey.

Estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal.

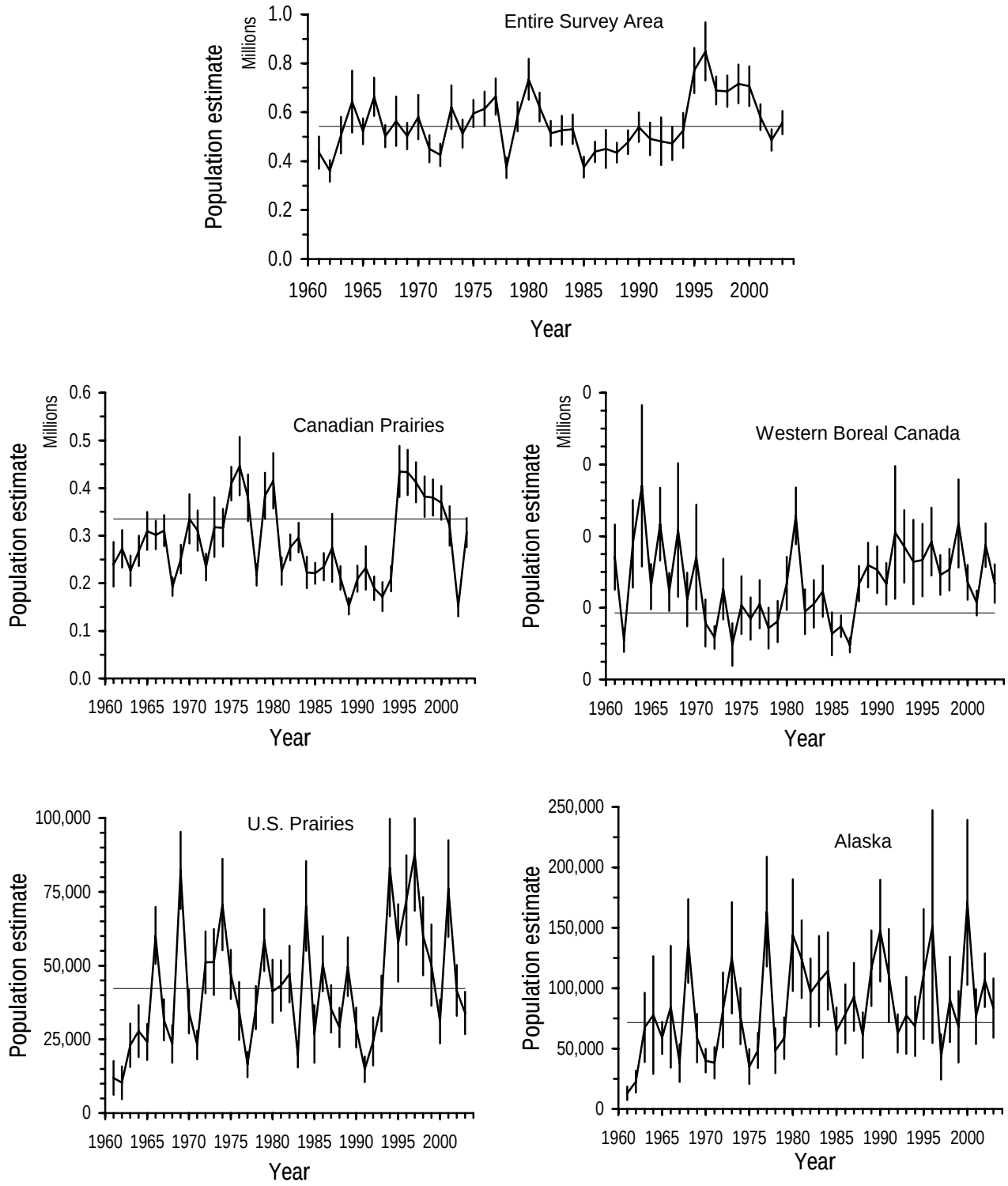


Figure 13 a. Canvasback Breeding Populations in the Survey Area of the Waterfowl Breeding Population and Habitat Survey.

Estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal.

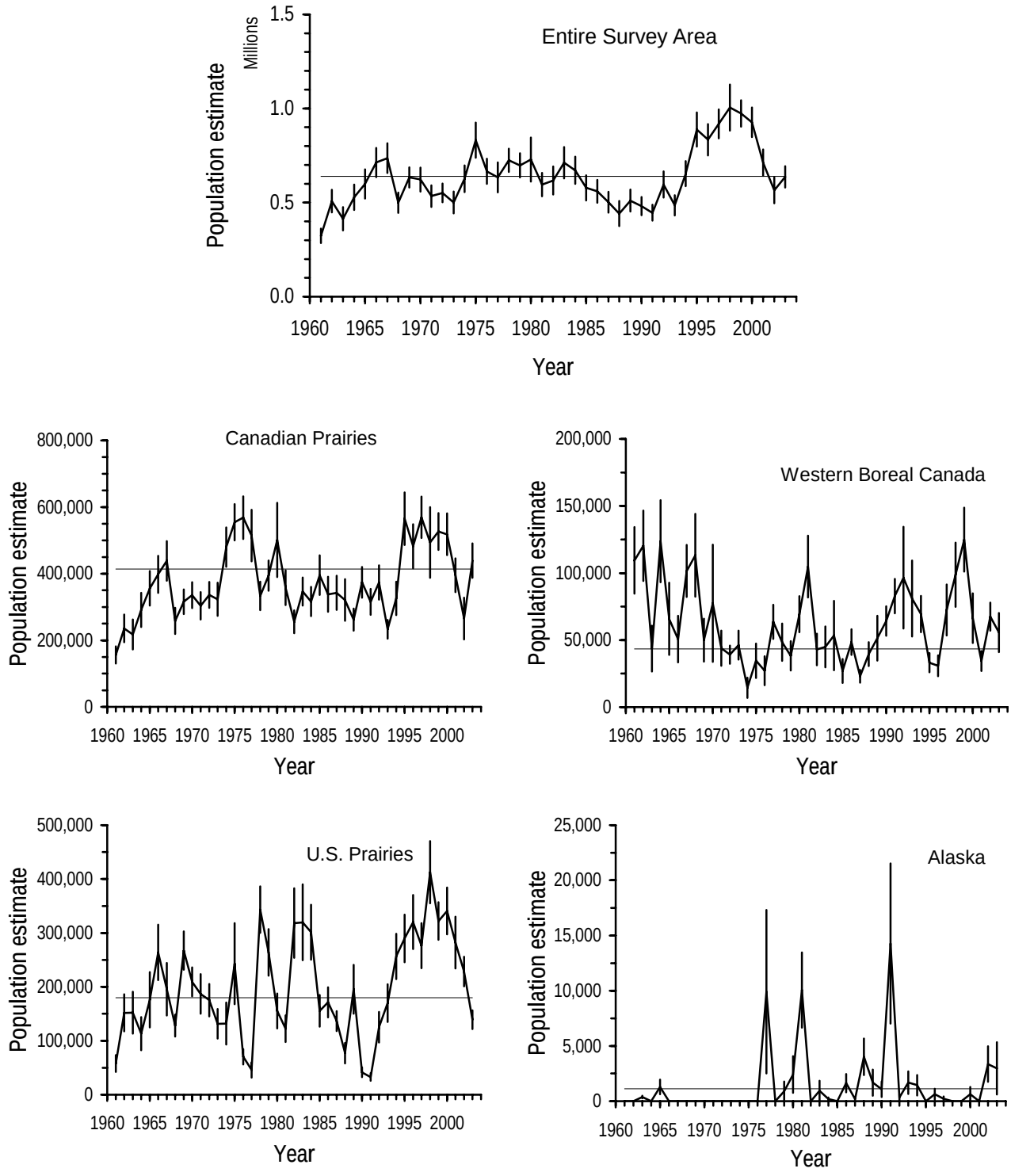


Figure 13 b. Redhead Breeding Populations in the Survey Area of the Waterfowl Breeding Population and Habitat Survey.

Estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal.

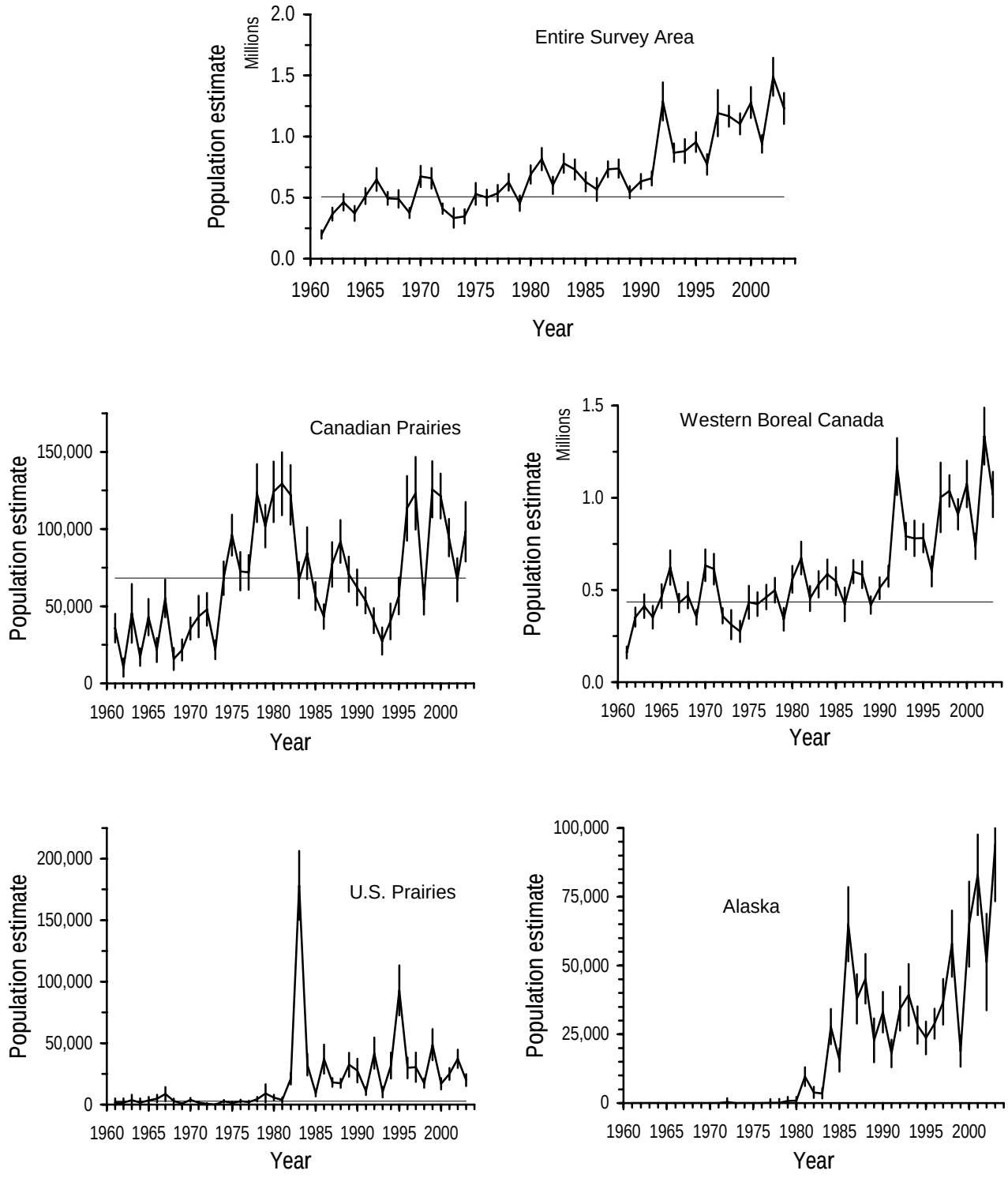


Figure 13 c. Ring-necked Duck Breeding Populations in the Survey Area of the Waterfowl Breeding Population and Habitat Survey.

Estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal.

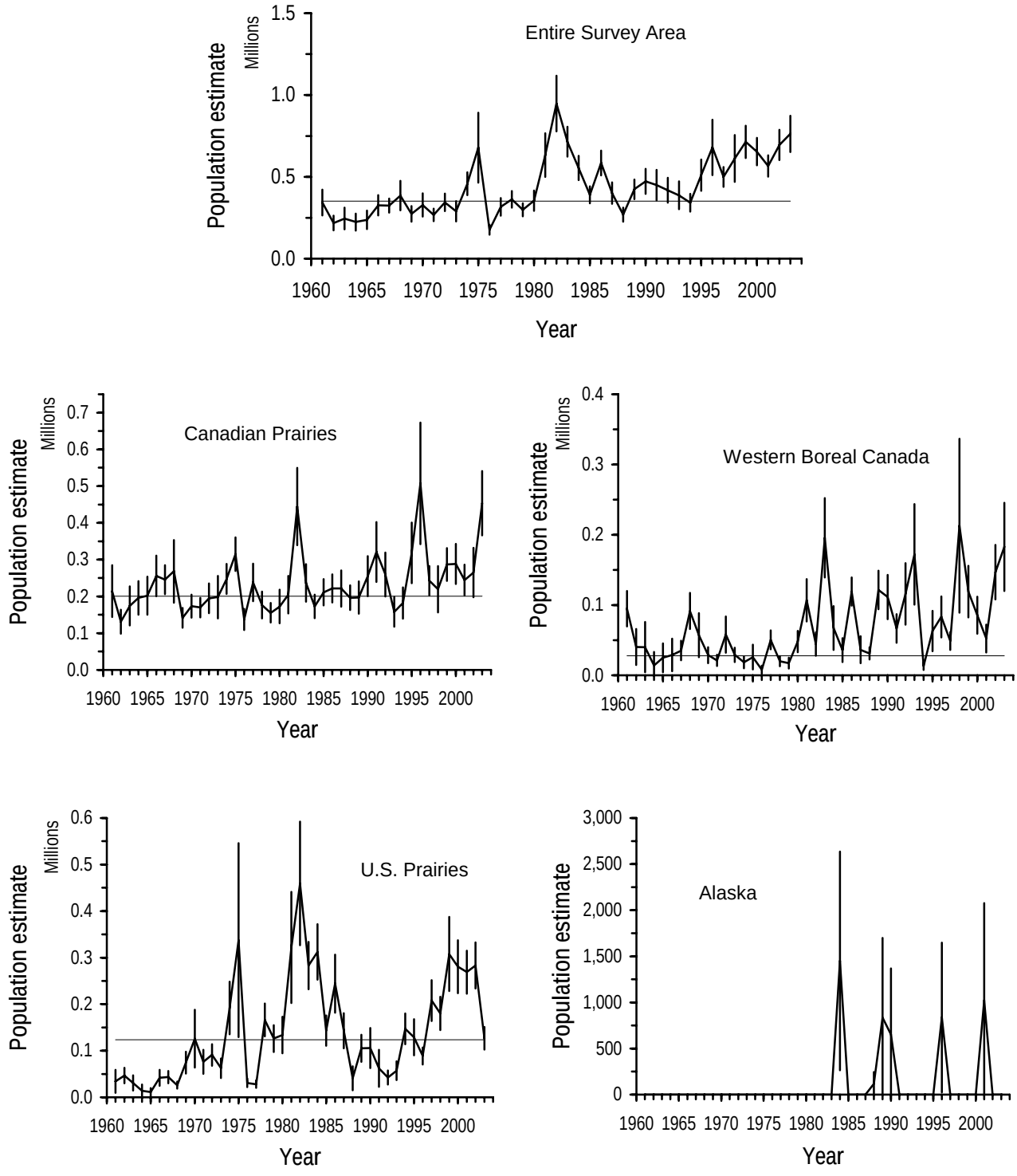


Figure 13 d. Ruddy Duck Breeding Populations in the Survey Area of the Waterfowl Breeding Population and Habitat Survey.

Estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal.

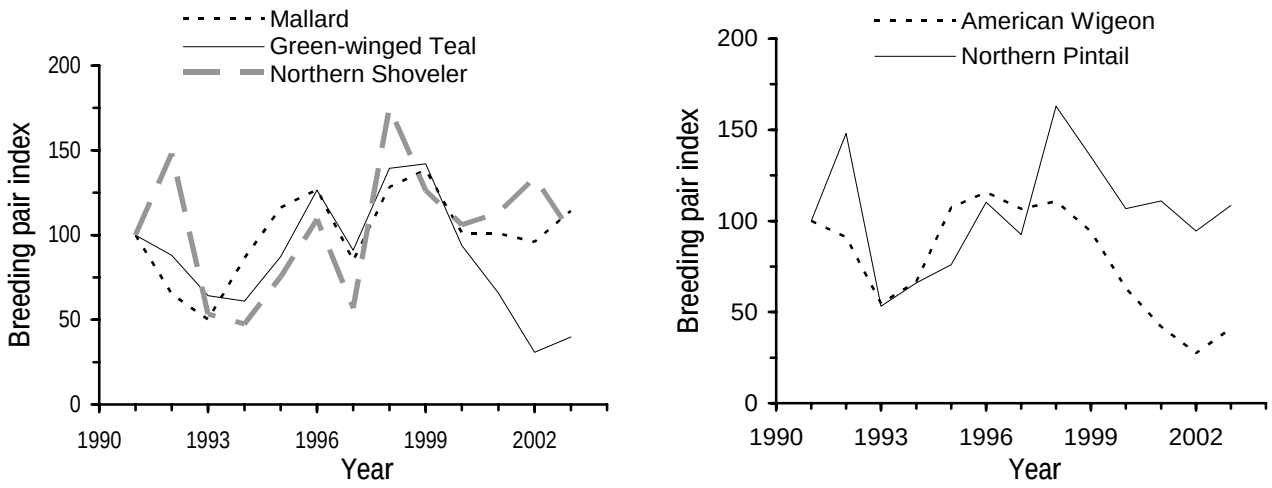


Figure 14 a. Common Dabbling Ducks in the Southern Yukon.

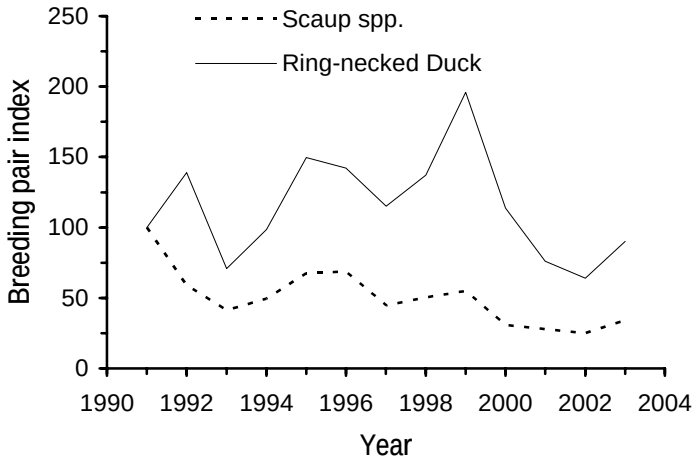


Figure 14 b. Common Diving Ducks in the Southern Yukon.

Trends in indicated breeding pairs (Hawkings and Hughes, 2003).

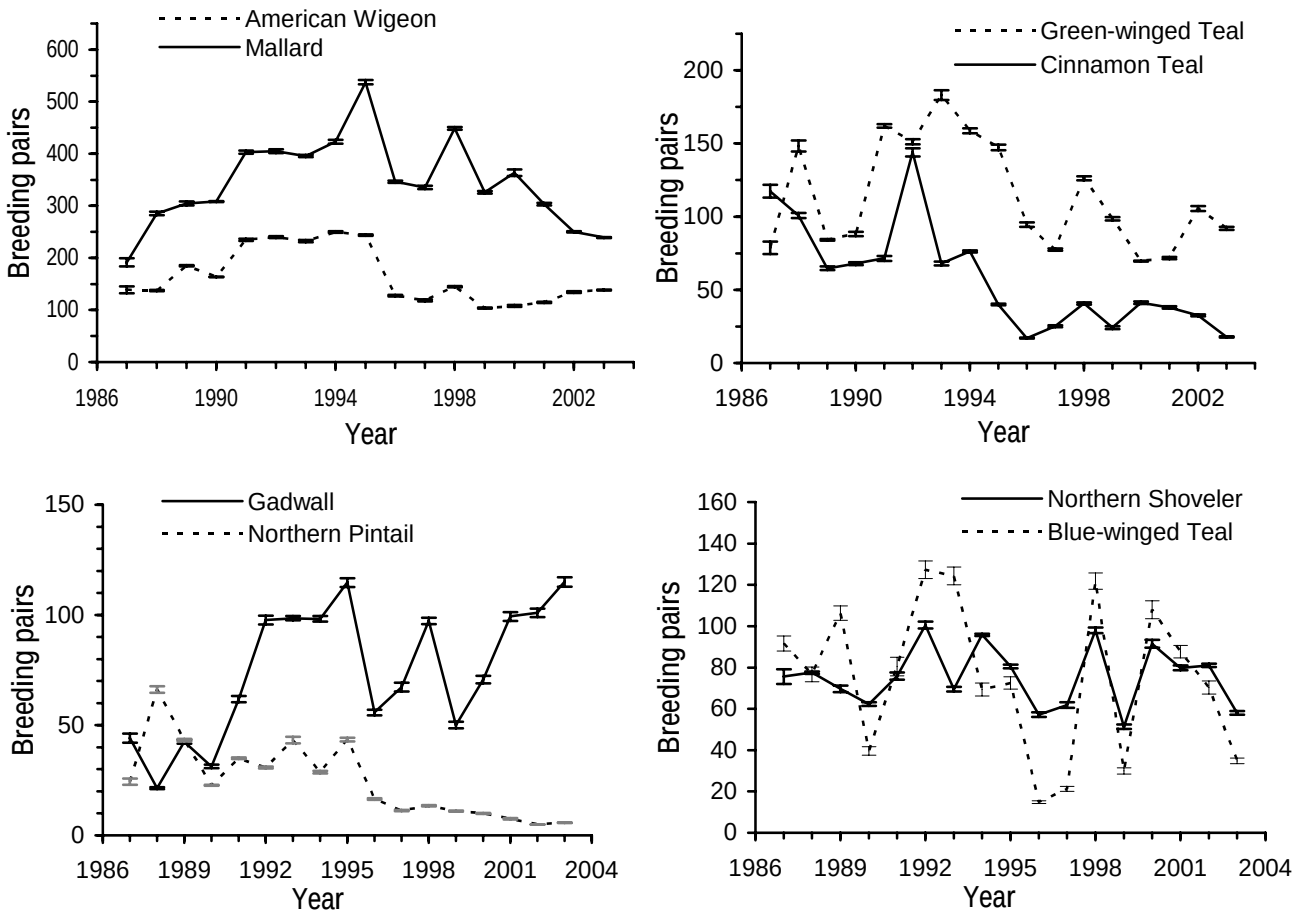


Figure 15 a. Common Inland Dabbling Ducks in the Interior of British Columbia

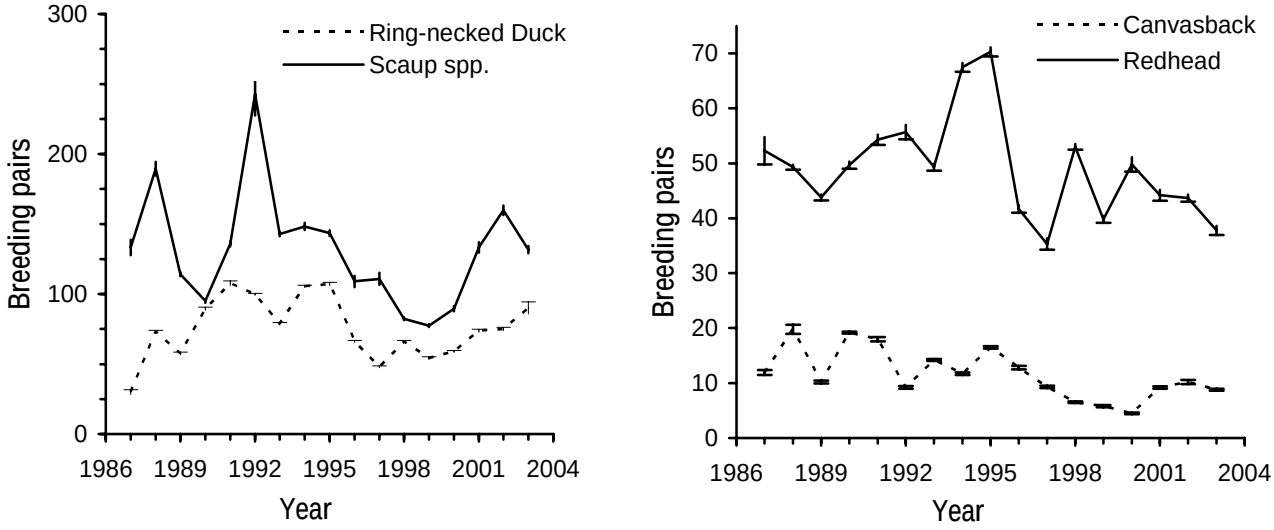


Figure 15 b. Common Inland Diving Ducks in the Interior of British Columbia.

Mean number (± 1 SE) of breeding pairs as seen on roadside surveys in the interior of British Columbia (Breault and Watts, 2003).

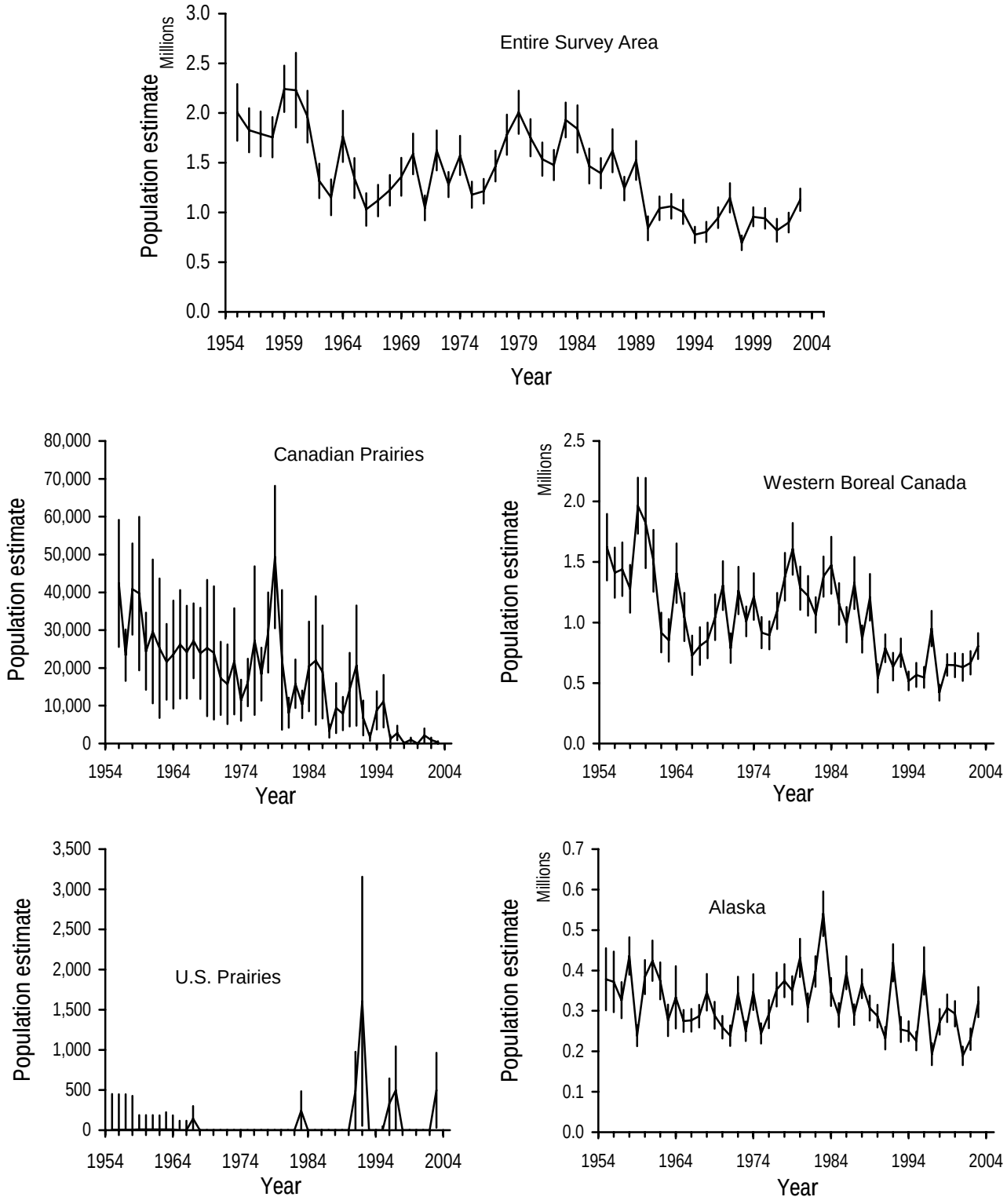


Figure 16. Scoter spp. Breeding Population Estimates in the Survey Area of the Waterfowl Breeding Population and Habitat Survey.

Breeding population estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey.

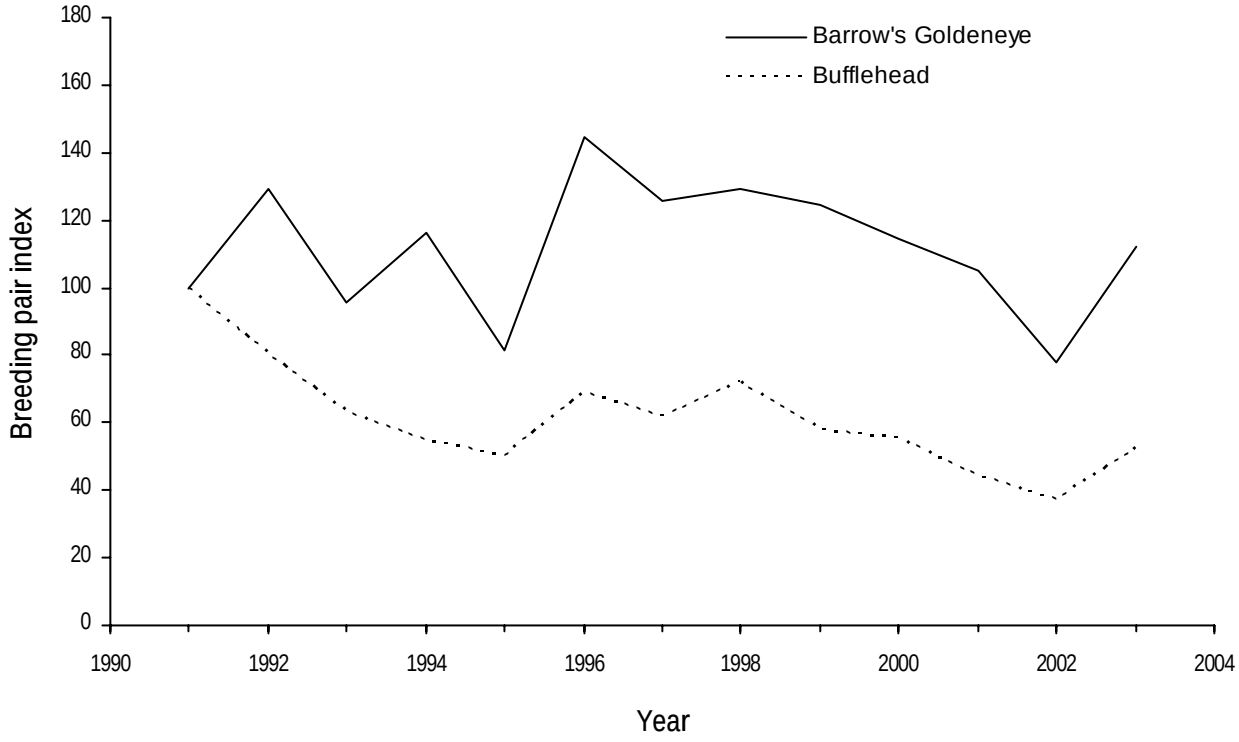


Figure 17. Common Sea Ducks of the Southern Yukon.

Trends in indicated breeding pairs (Hawkings and Hughes,2003).

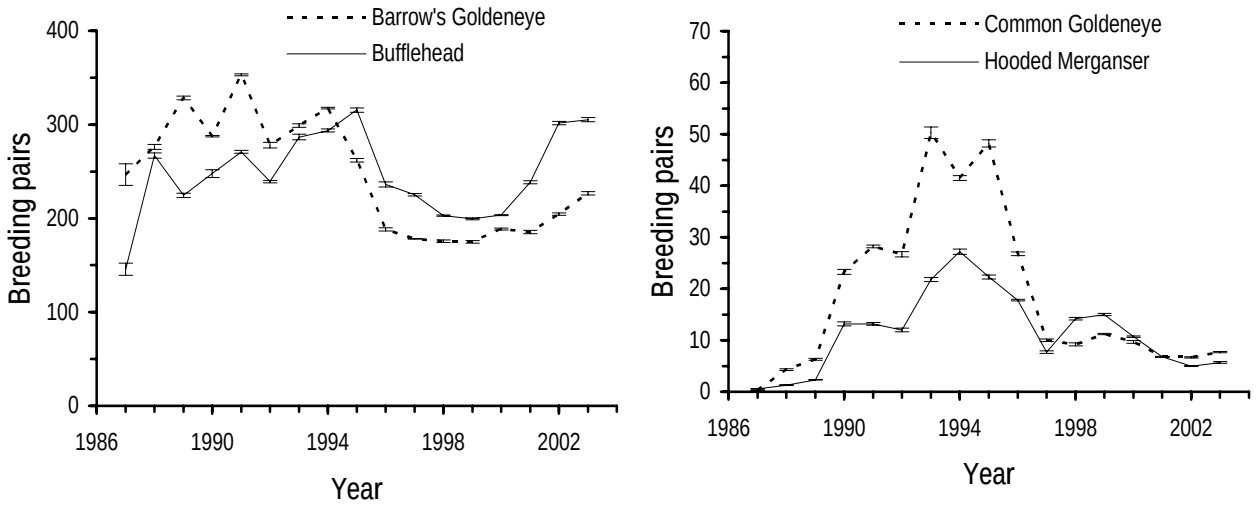


Figure 18. Common Sea Ducks in the Interior of British Columbia.

Mean number (± 1 SE) of breeding pairs as seen on roadside surveys in the interior of British Columbia (Breault and Watts, 2003).

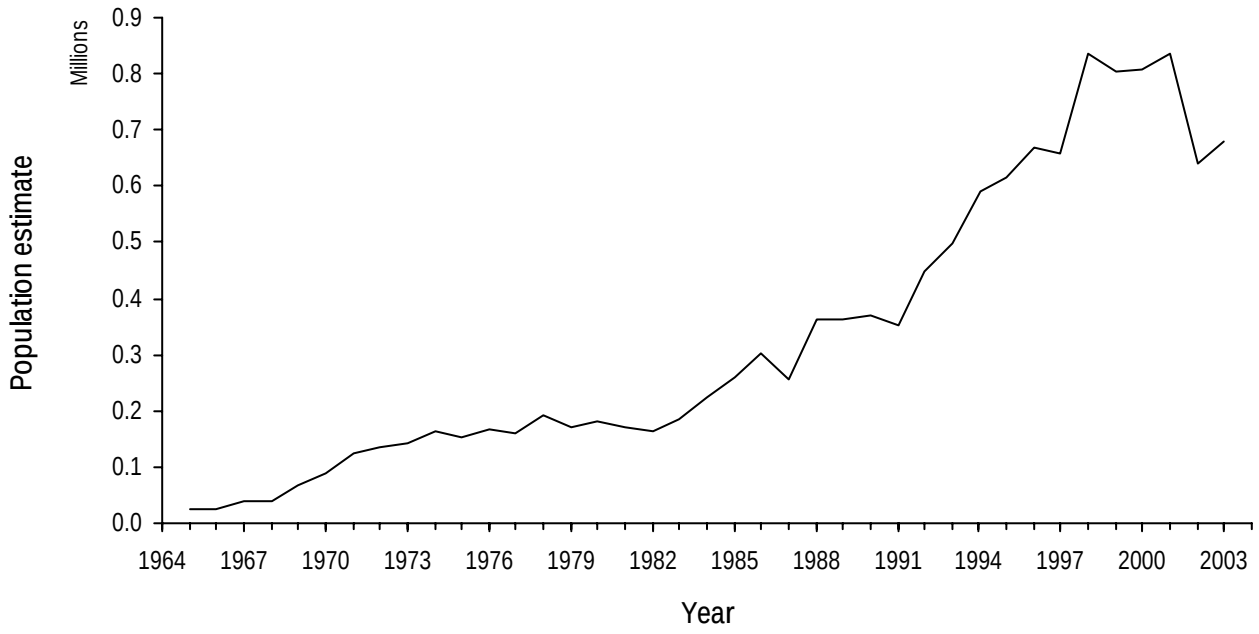


Figure 19. Greater Snow Geese Spring Population in the St. Lawrence River Valley.

A correction factor was applied to the 1998 and the 2000 estimates to account for greater dispersal of geese. Geese were also dispersed in 2002, but no correction factor has been applied.

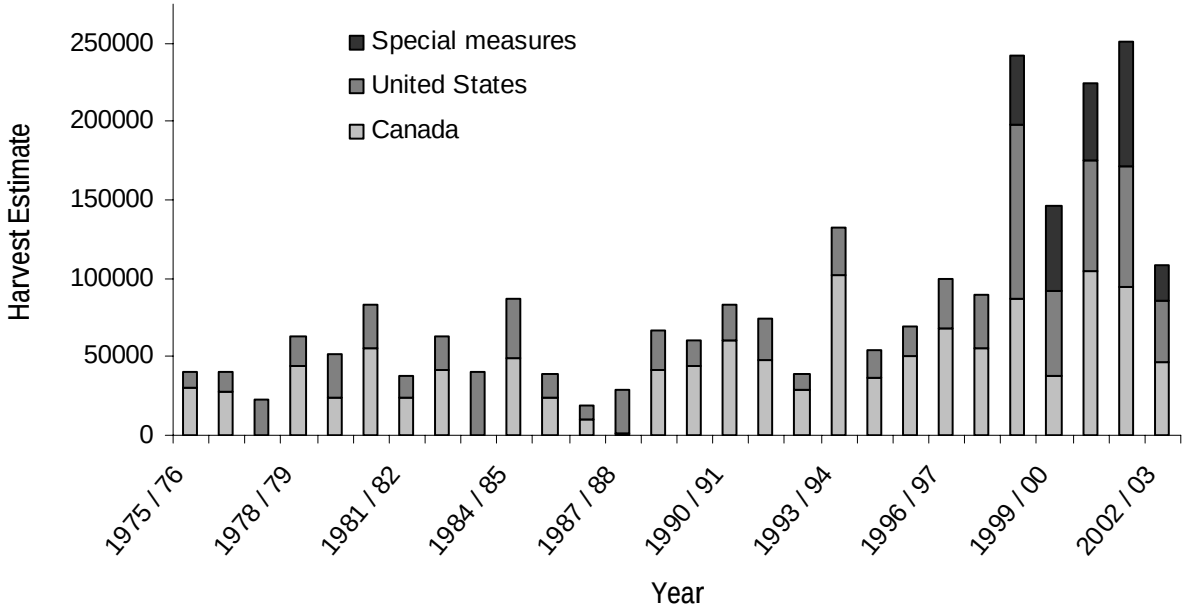


Figure 20. Harvest of Greater Snow Geese during the fall hunting season, and beginning in the spring of 1999, also includes the harvest during special conservation measures.

Data presented for the United States beginning in 1999 was based on the new "Harvest Information Program", and is not directly comparable to the estimates of earlier years.

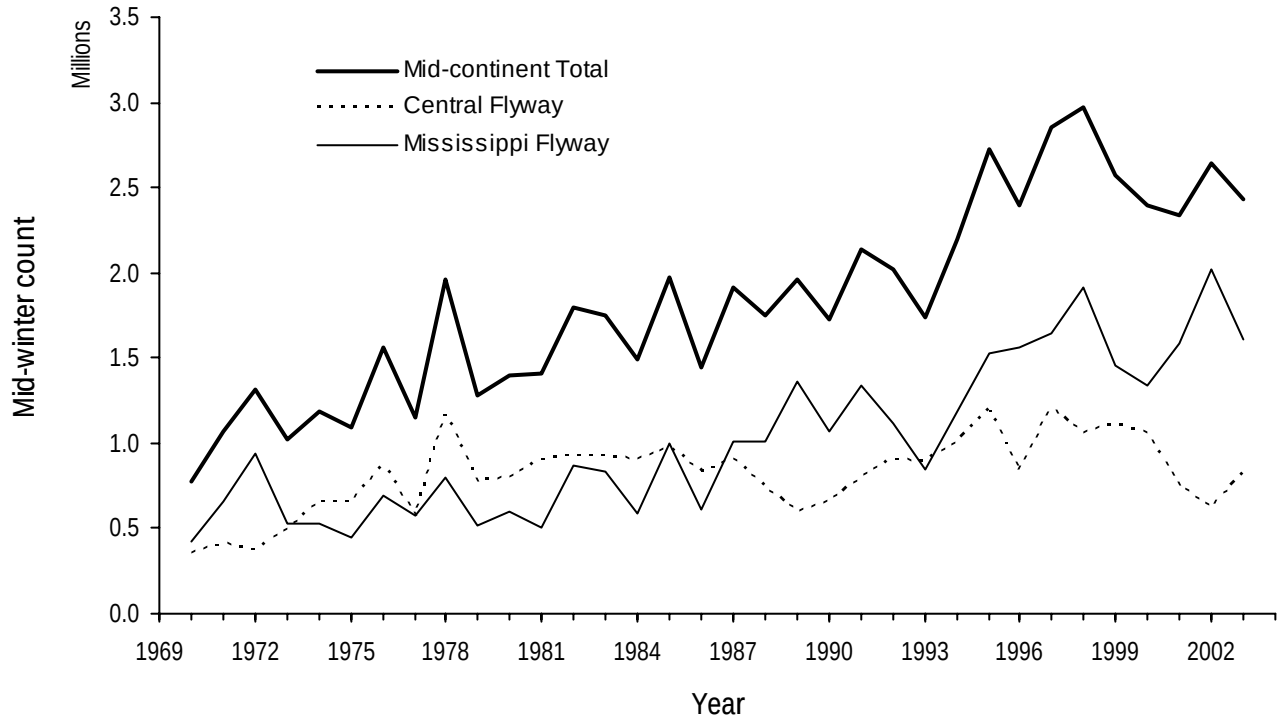


Figure 21. Mid-continent Lesser Snow Geese Populations in Mid-winter.
Counts include some Ross' Geese. (Fronczak, 2003)

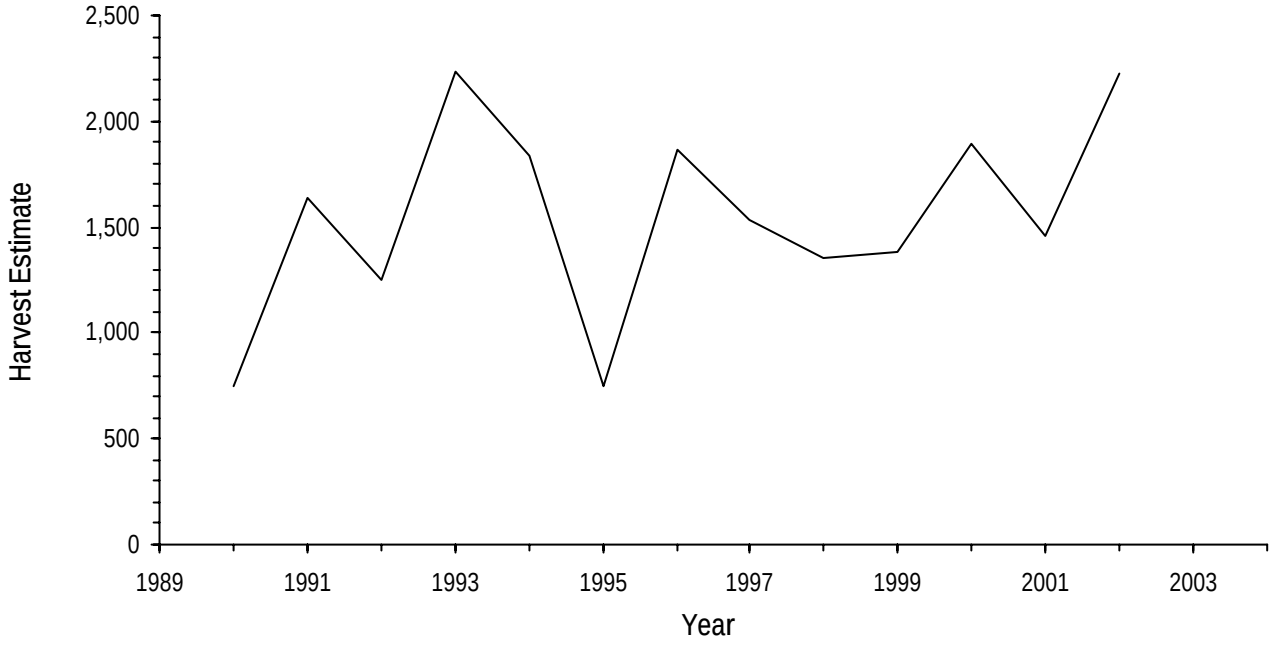


Figure 22. Lesser Snow Geese Harvest Estimates for the Wrangel Island Population.
Estimates include adjustment for cripple loss (A. Breault, CWS, unpublished).

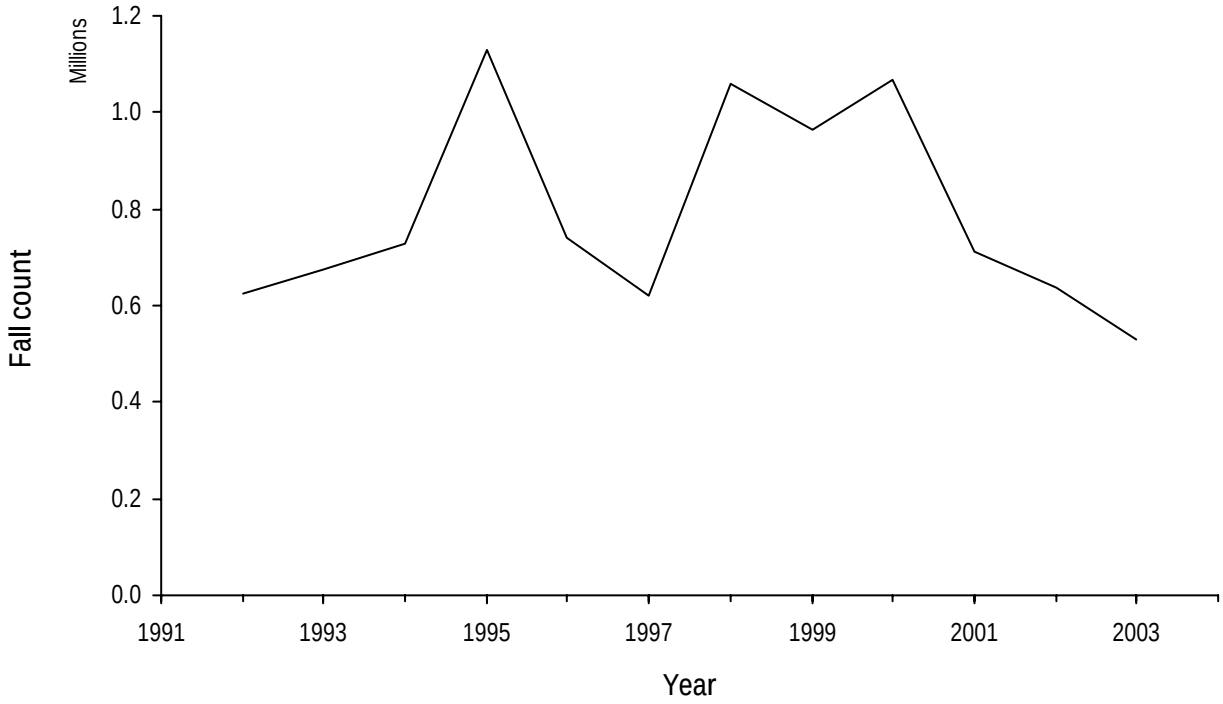


Figure 23. Greater White-fronted Geese of the Mid-Continent.

Fall survey on staging areas in Saskatchewan and Alberta (D. Nieman et al., 2003).

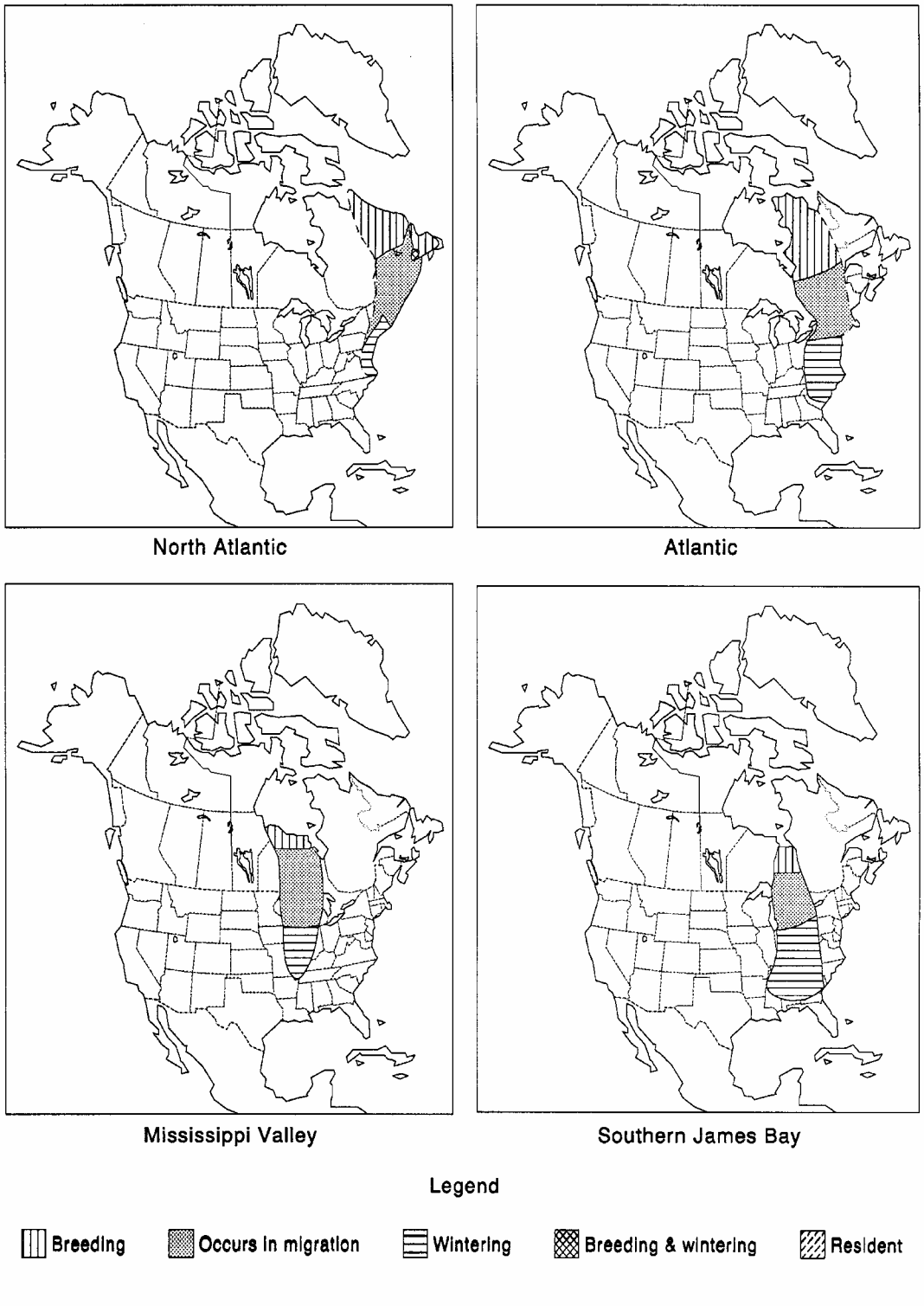


Figure 24 a. Canada Goose Populations in North America: NAP, AP, MVP and SJBP.

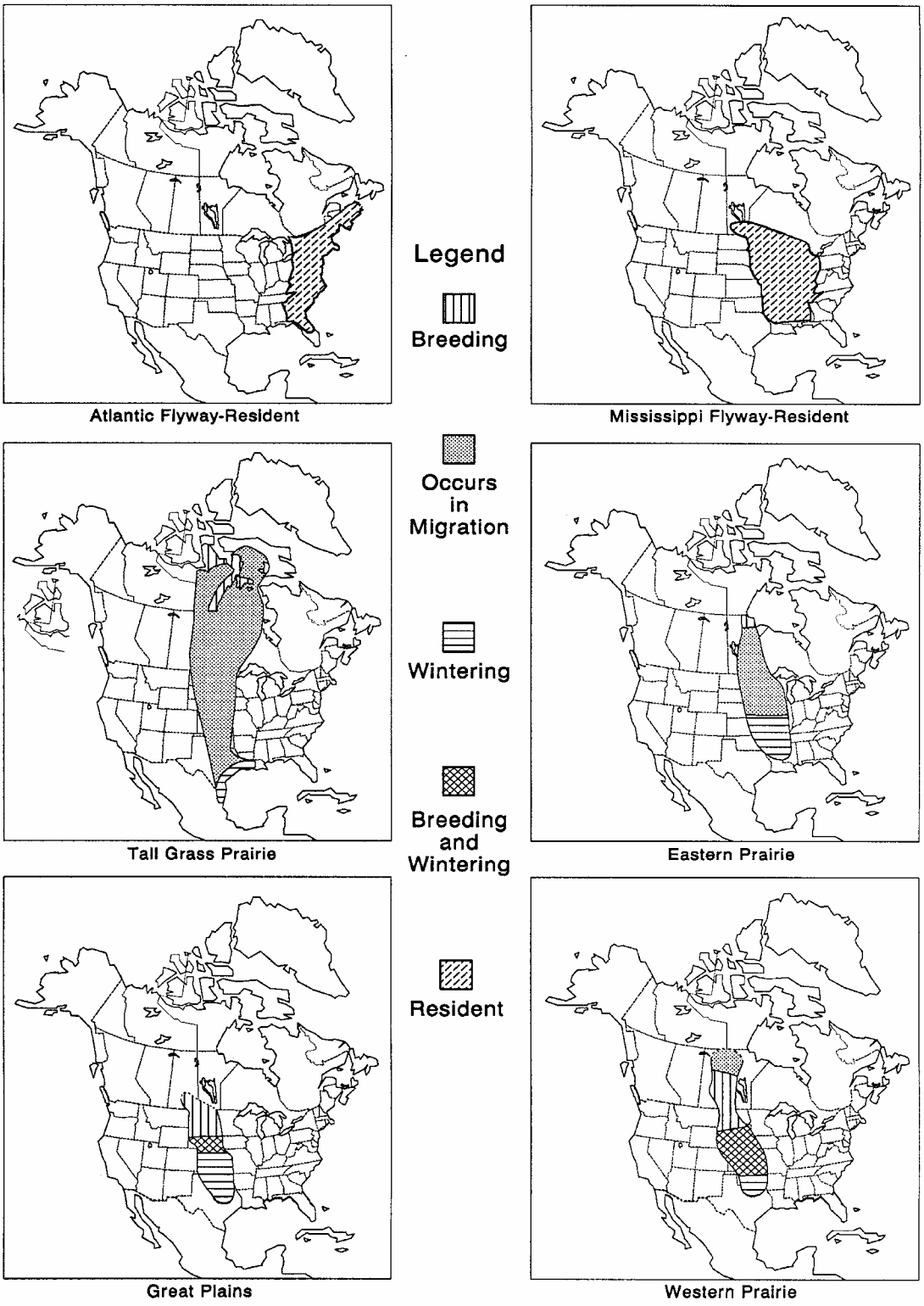


Figure 24 b. Canada Goose Populations in North America: AFRP, MFRP, TGPP, EPP, GPP and WPP.

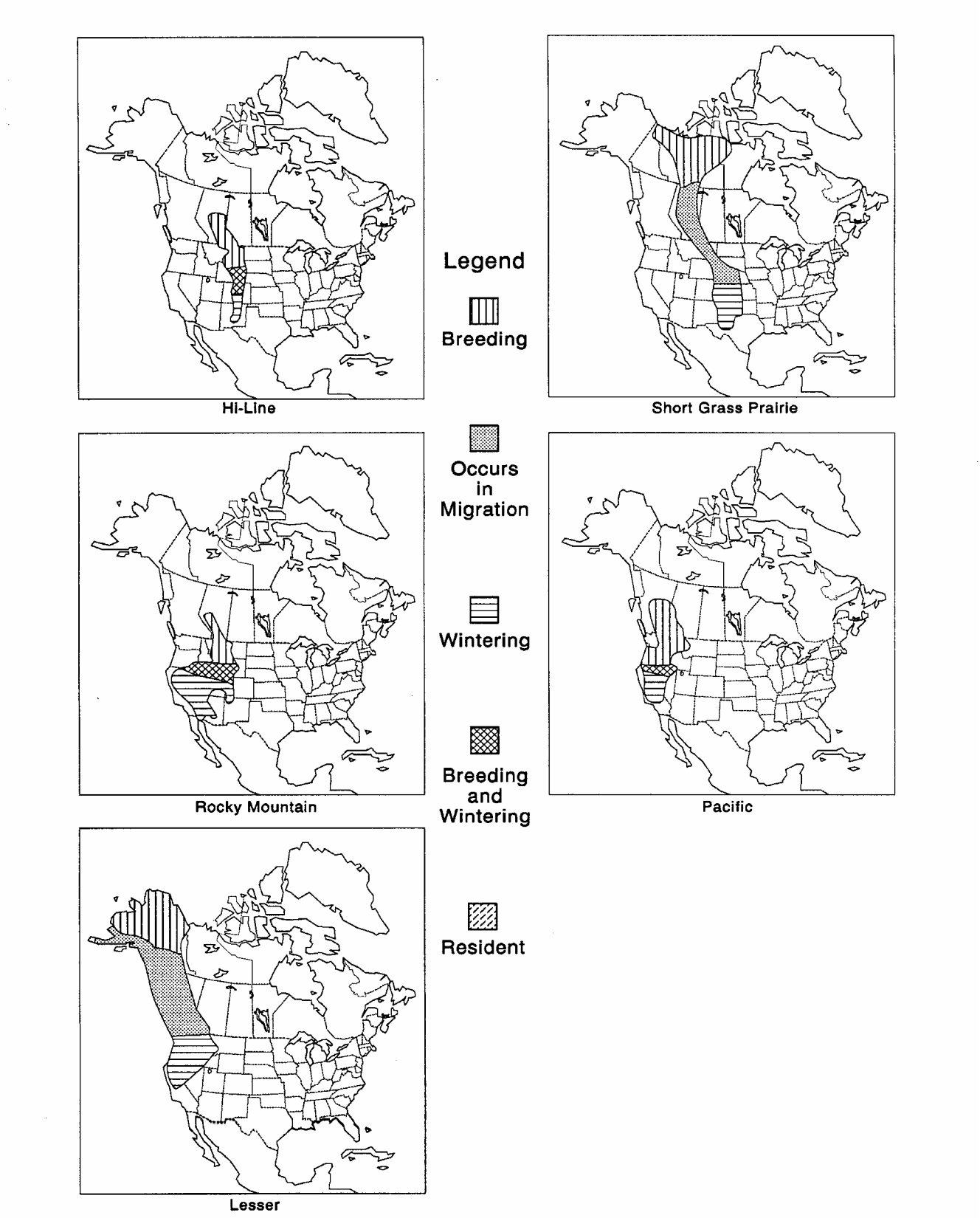


Figure 24 c. Canada Goose Populations in North America: HLP, SGPP, RMP, PP and LP.

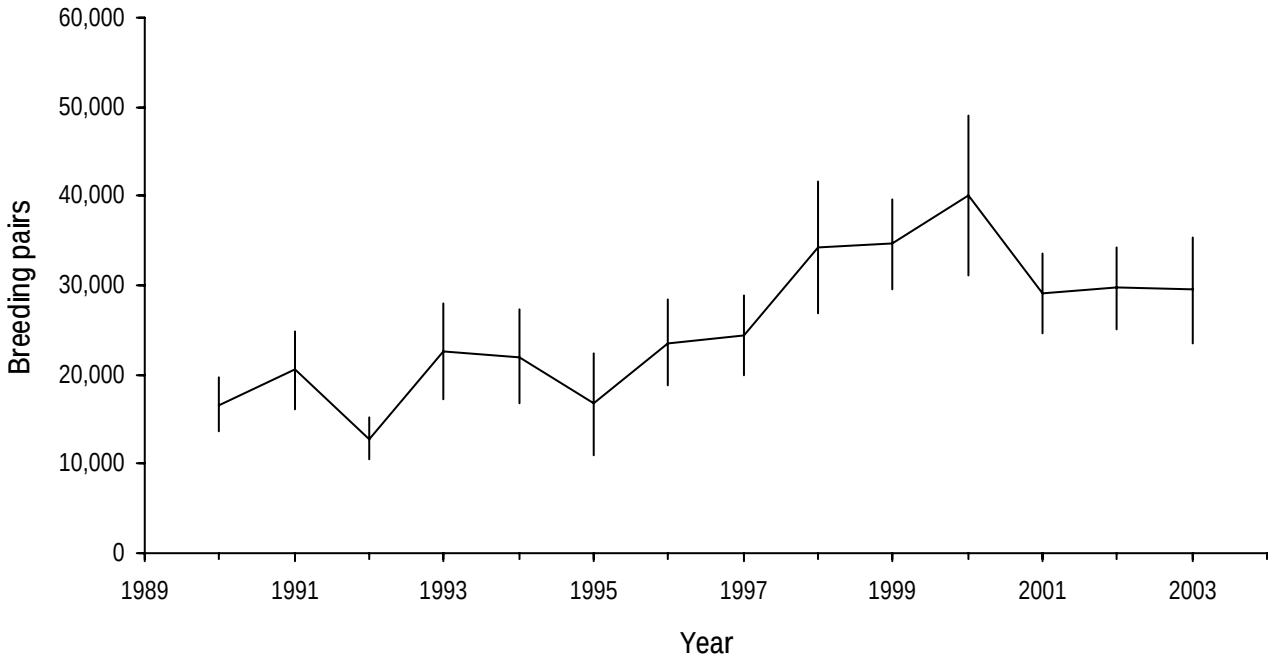


Figure 25. Breeding Pairs of the North Atlantic Population Canada Geese in stratum 2 of the Black Duck Breeding Ground Survey area (Figure 1).

Breeding pairs ± 1SE

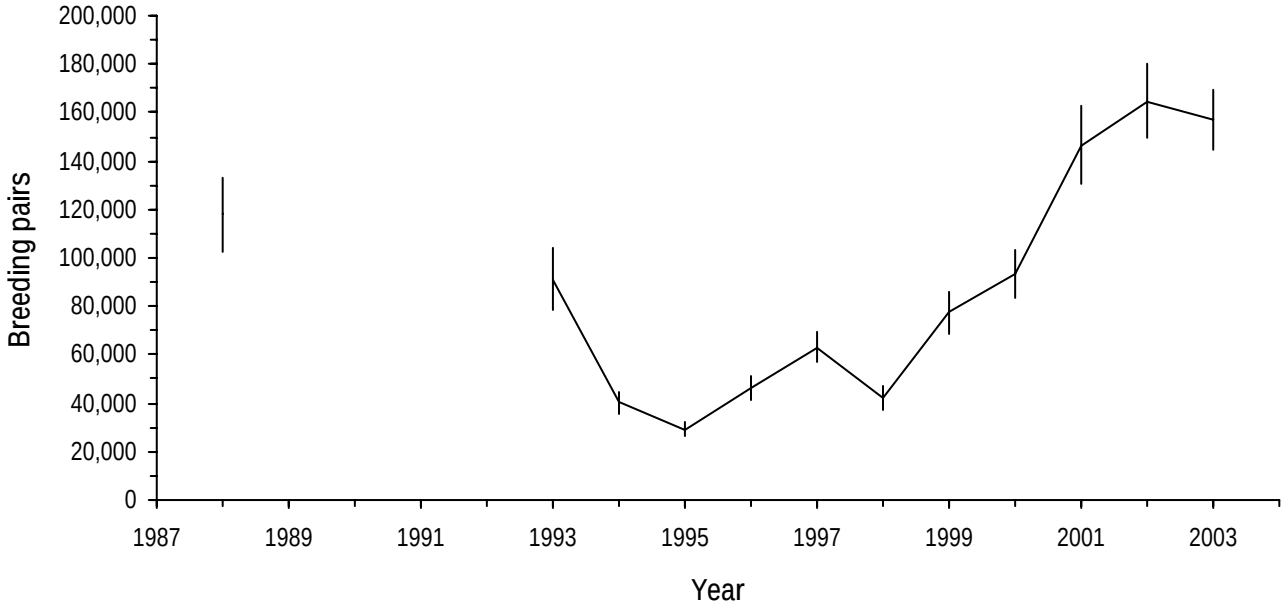


Figure 26. Breeding Pairs of the Atlantic Population Canada Geese in the Ungava Peninsula of northern Quebec.

Breeding pairs ± 1SE (Harvey and Rodrigue, 2003). No surveys were conducted from 1989-1992.

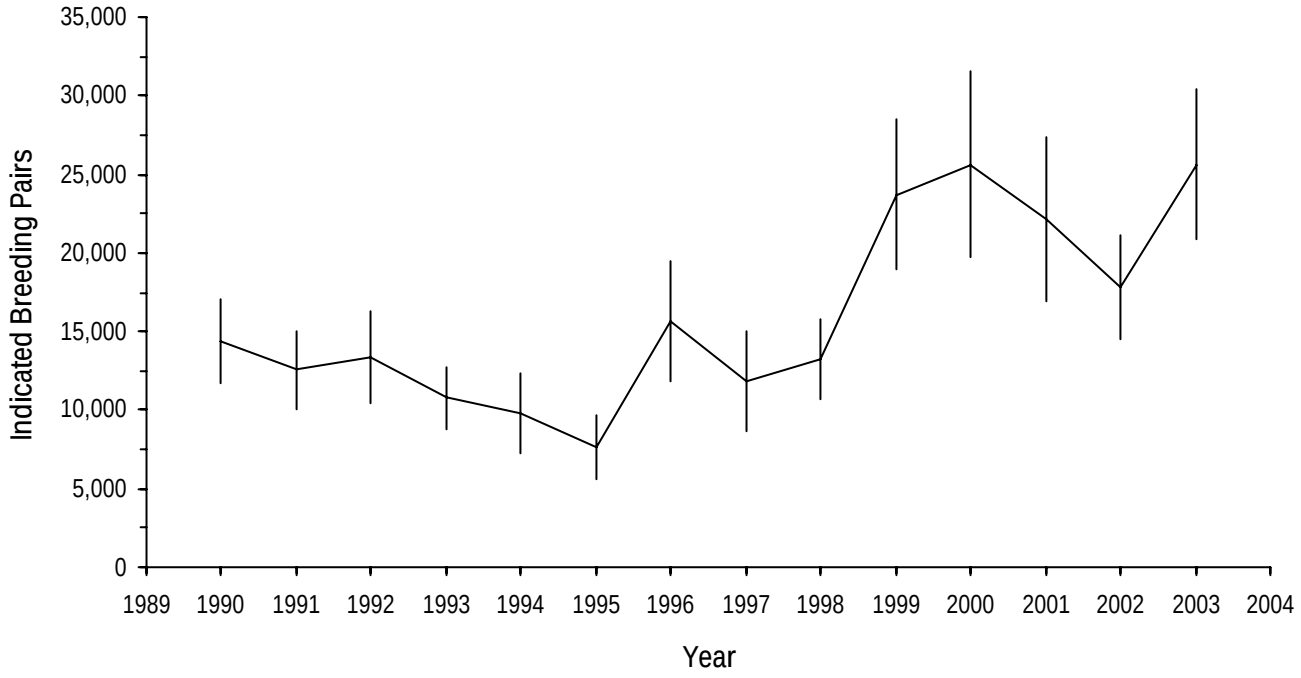


Figure 27. Breeding Pairs of the Atlantic Population Canada Geese in Quebec in the Black Duck Breeding Ground Survey Area.

Population estimates of breeding pairs (±1SE) refer only to that part of Quebec covered by the BDJV survey (see Figure 1), (Bordage et Lepage, 2003).

Figure 28. Southern James Bay Population Canada Geese spring estimates.

2002-2003 data, ± 1 SE. (Walton et al., 2003a)

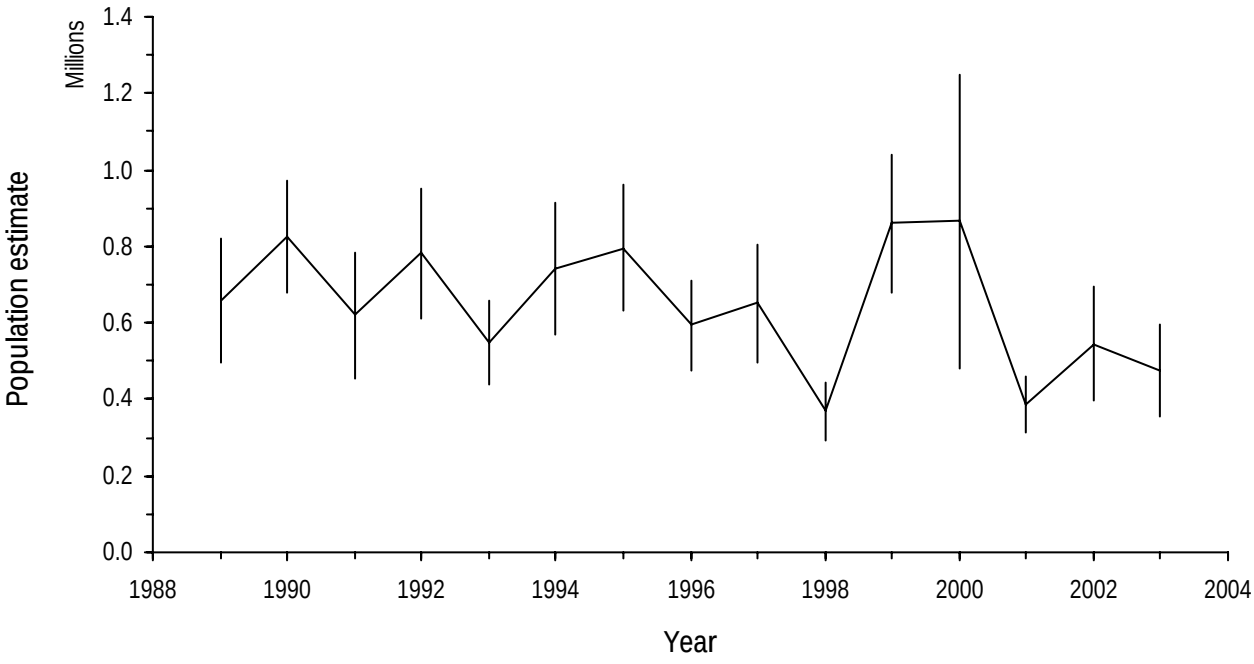


Figure 29. Canada Geese; Mississippi Valley Population spring estimates.

Population estimates ± 95% CI (Walton et al., 2003b)

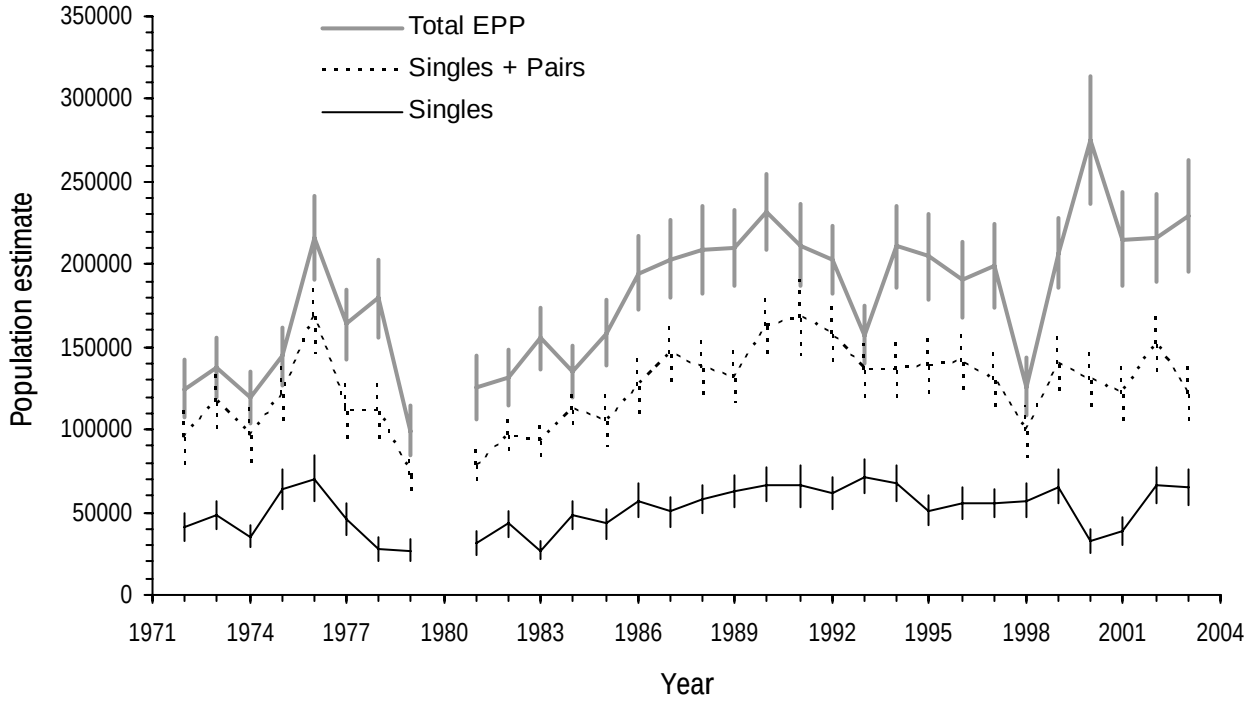


Figure 30. Eastern Prairie Population Canada Geese spring estimates.

±95% C.I. No survey was conducted in 1980. (Raedeke et al., 2003)

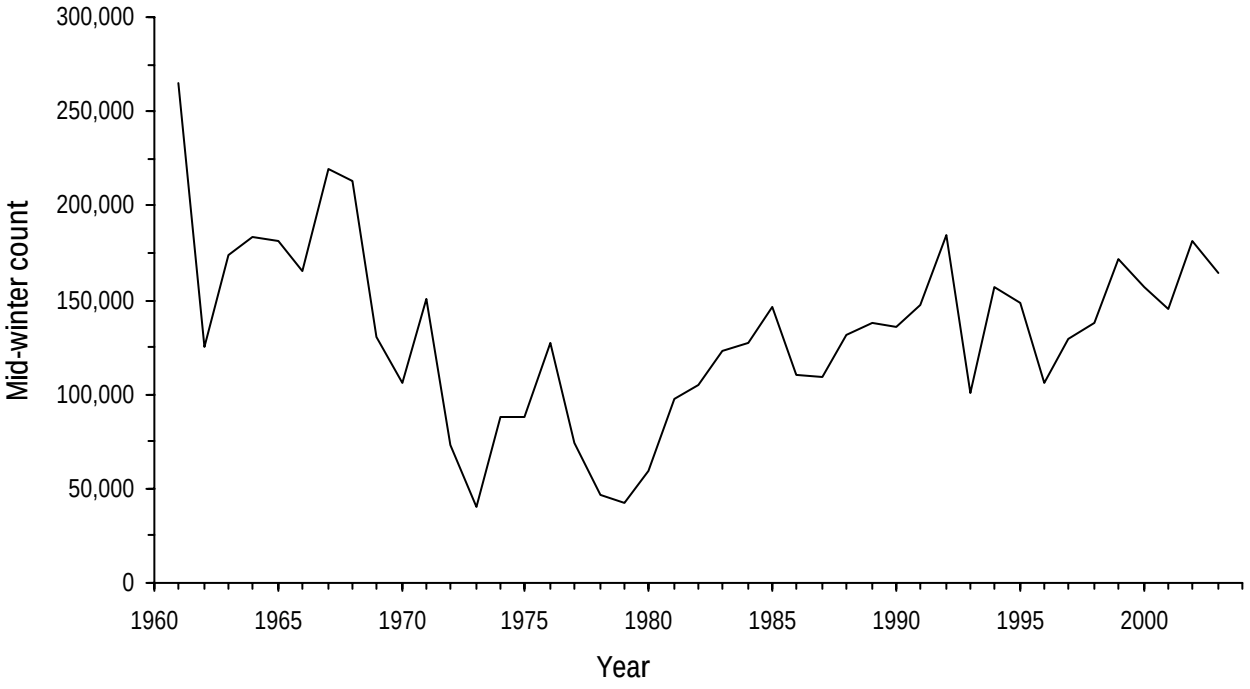


Figure 31. Mid-winter inventory of Atlantic Brant in the Atlantic Flyway.

(Serie and Raftovich, 2003)

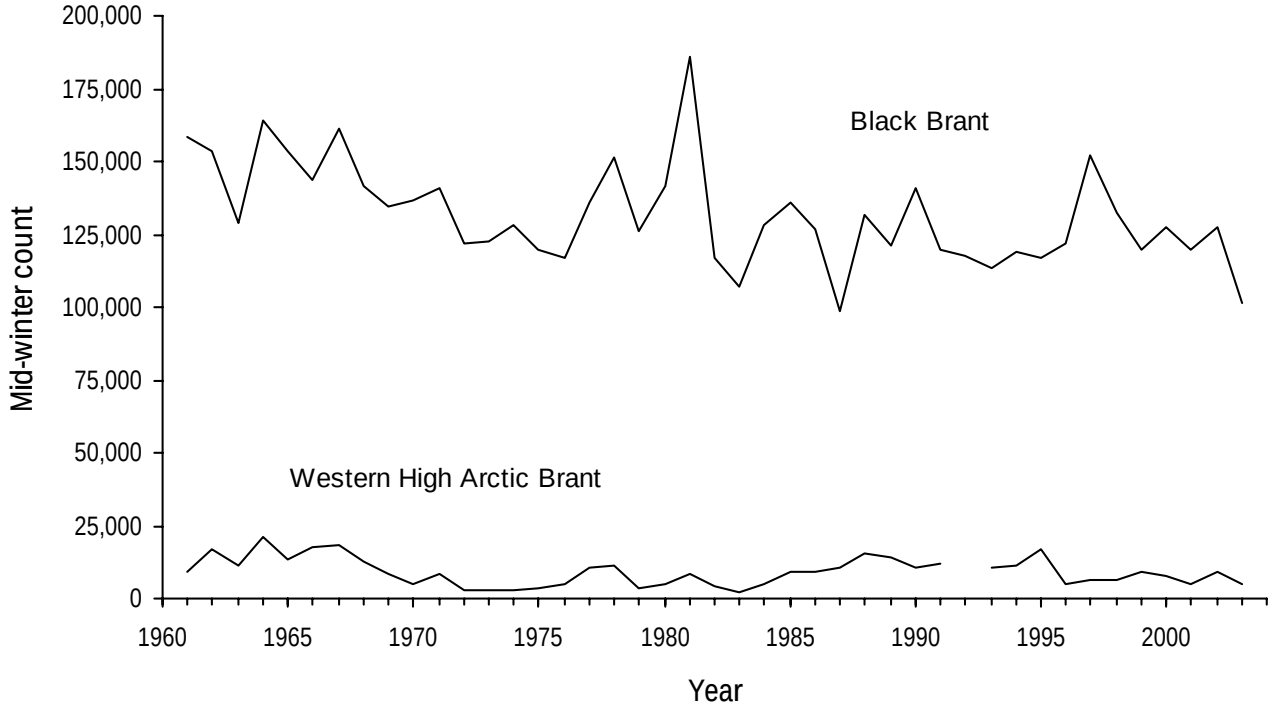


Figure 32. Mid-winter inventory of Black and Western High Arctic Brant.

Note that beginning in 1986 Black Brant numbers include counts along the B.C. and Alaska coasts (range of 5,000 to 14,000 birds).

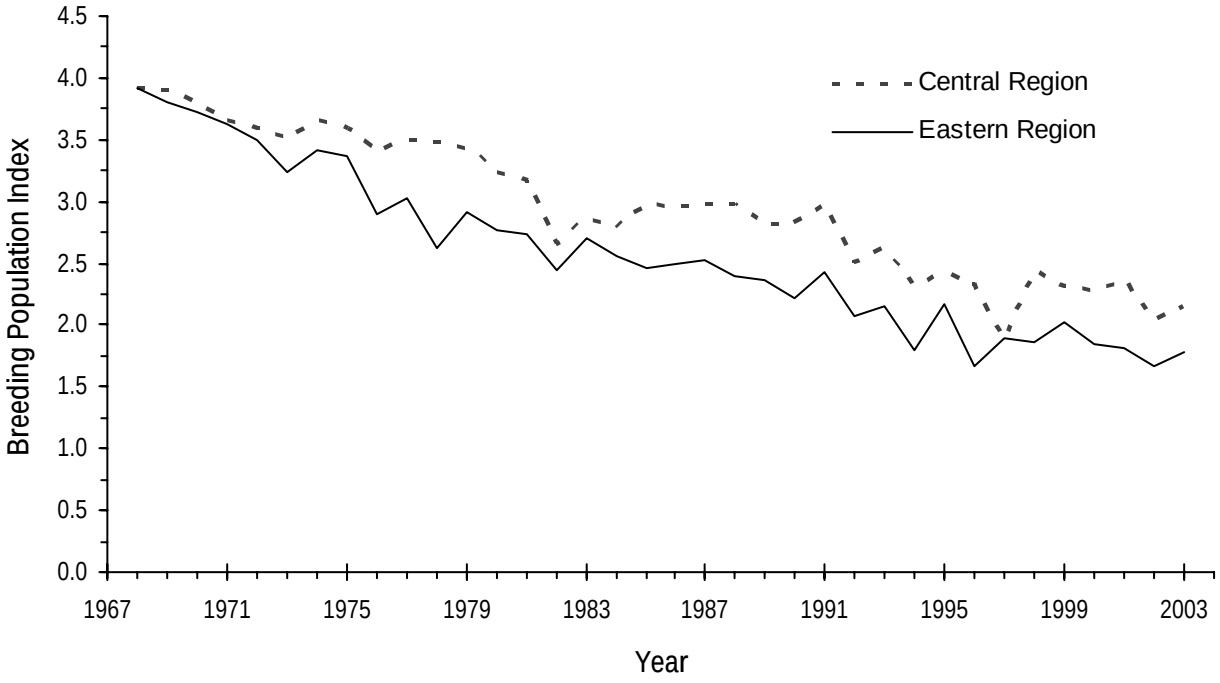


Figure 33. American Woodcock Breeding Population Indices.

Indices (singing males per route) from the Singing-ground Survey (Kelley, 2003)

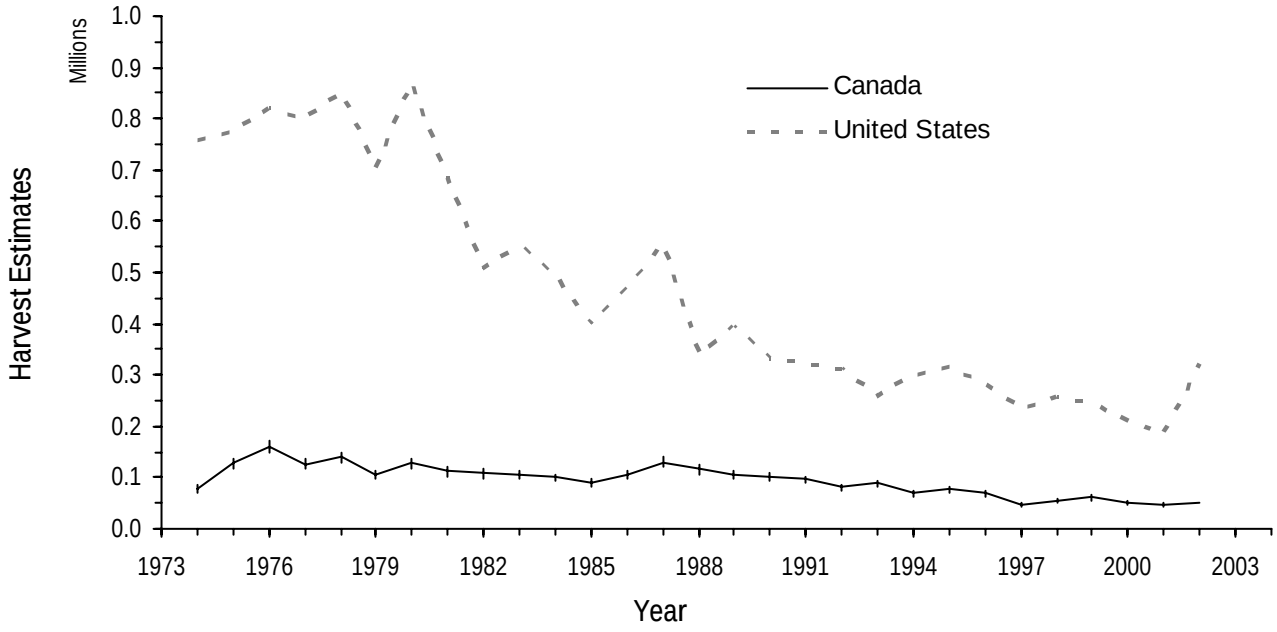


Figure 34. American Woodcock Harvest in Canada and the United States.

(B. Collins, J.F. Gobeil ,CWS and P. Padding, USFWS)

The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

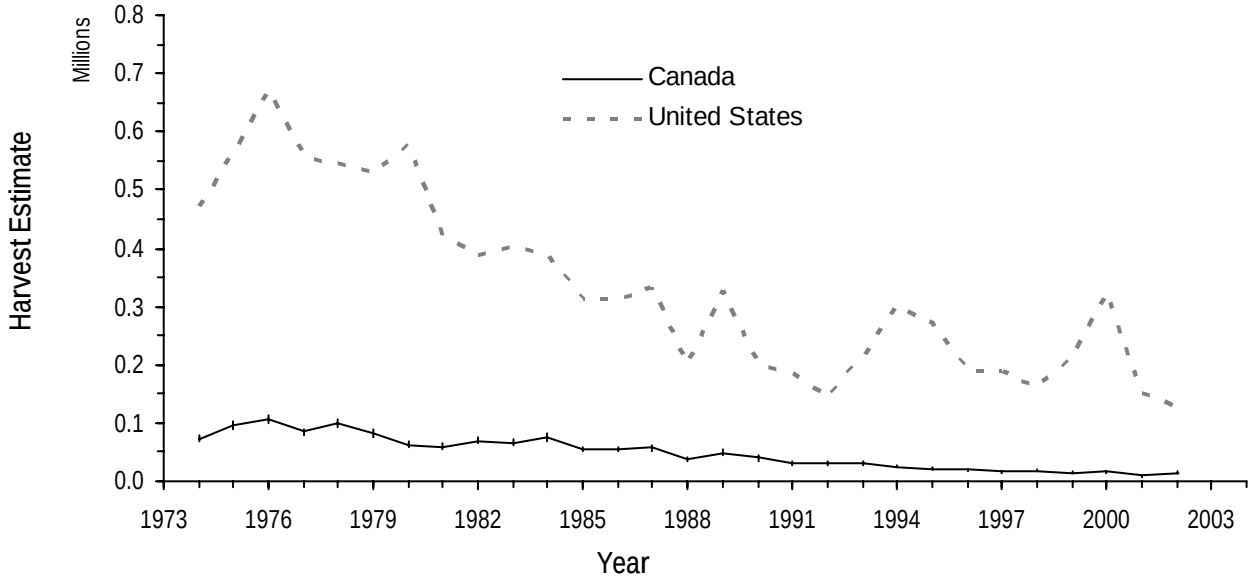


Figure 35. Common Snipe Harvest Estimates in Canada and the United States.

(B. Collins, J.F. Gobeil, CWS and P. Padding, USFWS)

The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

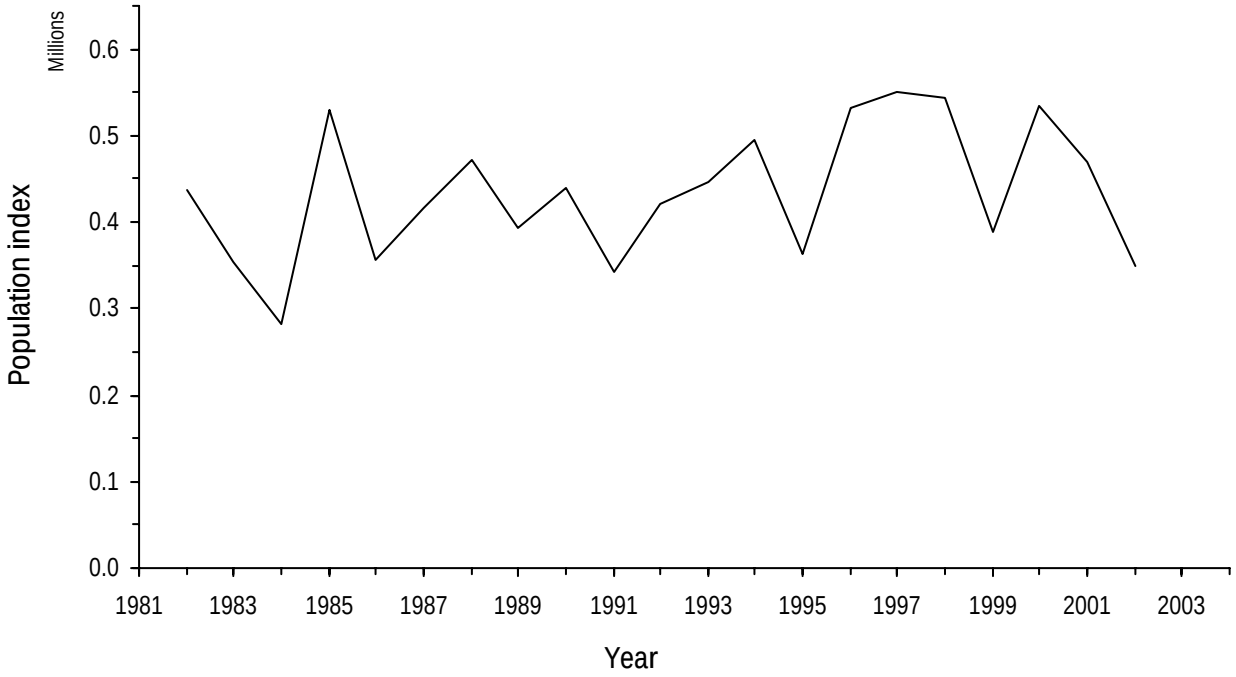


Figure 36. Mid-continent Population Sandhill Cranes Spring Indices.

(Sharp et al., 2003)

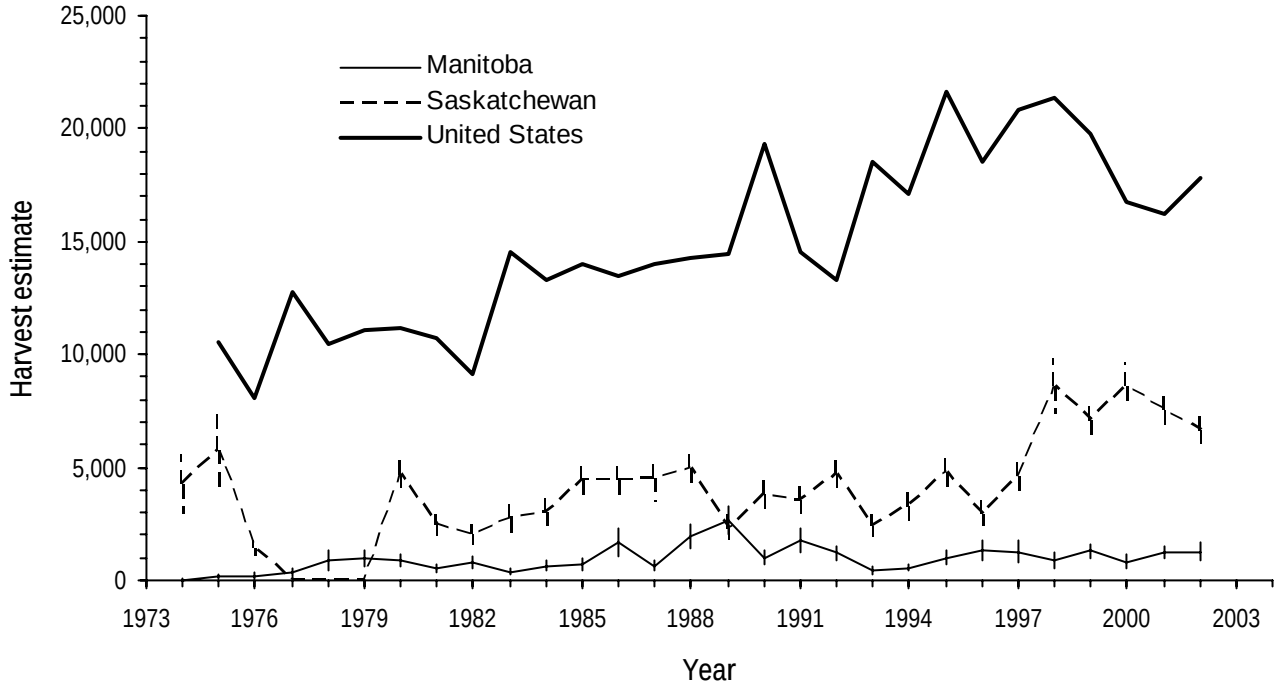


Figure 37. Harvest Estimates of Sandhill Cranes in Canada and the United States.

Canadian harvest estimates ±1 SE (J.-F. Gobeil and B. Collins CWS), U.S. harvest estimates (Sharp et al., 2003).

The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

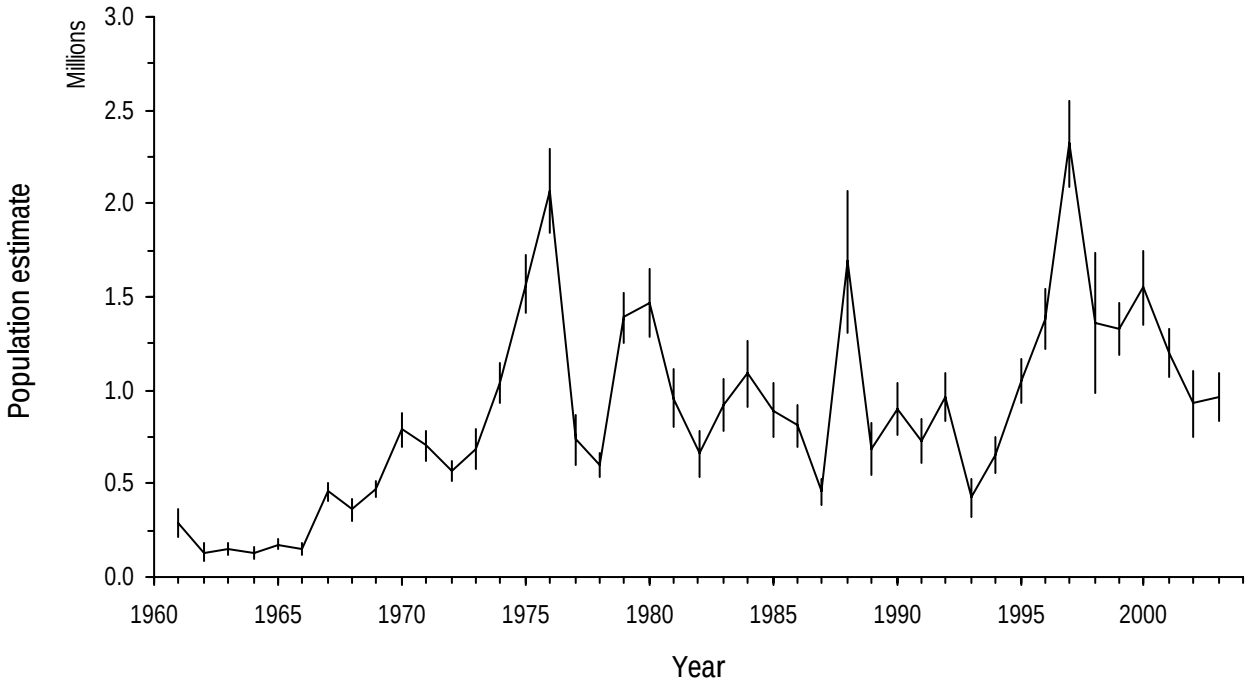


Figure 38. American Coot Breeding Population in the Canadian Prairies.

(± 1 SE) Waterfowl Breeding Population and Habitat Survey.

Tables

Table 1. Most abundant inland duck species in the Black Duck Breeding Ground Survey area of eastern Canada; estimated number of indicated breeding pairs (SE) (Collins 2003).

Species/Year	Region									
	Atlantic highlands		Boreal shield - eastern		Boreal shield - central		Boreal shield - western		Entire survey area	
Black Duck										
1990	51,869	(9,461)	51,804	(9,760)	56,518	(6,670)				
1991	45,211	(6,554)	41,963	(7,503)	49,390	(6,199)	77,026	(7,545)	213,590	(13,950)
1992	48,587	(6,109)	39,366	(7,327)	45,953	(4,858)	76,353	(9,666)	210,258	(14,423)
1993	47,663	(5,455)	30,618	(6,166)	40,225	(7,437)	64,846	(10,849)	183,352	(15,518)
1994	45,674	(5,534)	36,529	(11,189)	28,768	(5,323)	56,655	(6,850)	167,626	(15,201)
1995	51,485	(11,778)	31,910	(5,662)	33,860	(5,371)	54,201	(9,951)	171,456	(17,281)
1996	60,848	(5,167)	42,810	(6,130)	52,846	(8,141)	88,666	(13,838)	245,170	(17,946)
1997	57,963	(7,803)	46,887	(7,887)	47,041	(4,876)	68,458	(9,769)	220,350	(15,566)
1998	91,797	(12,005)	43,046	(6,531)	63,609	(7,399)	74,438	(9,789)	272,890	(18,366)
1999	89,874	(13,347)	79,981	(12,786)	74,976	(7,139)	100,419	(16,618)	345,250	(25,860)
2000	90,573	(8,432)	86,441	(12,081)	77,395	(8,647)	94,439	(14,365)	348,847	(22,320)
2001	85,332	(13,516)	51,848	(8,632)	68,204	(9,312)	71,757	(7,444)	277,141	(19,983)
2002	86,676	(12,162)	57,955	(14,560)	78,604	(9,235)	129,493	(21,416)	352,728	(30,064)
2003	64,520	(9,636)	54,728	(6,754)	63,730	(8,149)	81,036	(11,771)	264,014	(18,532)
Mallard										
1990	871	(393)	-	-	3,564	(1,057)				
1991	955	(434)	273	(273)	1,782	(881)	55,750	(10,750)	58,760	(10,798)
1992	656	(280)	279	(279)	2,546	(1,073)	55,750	(10,521)	59,230	(10,583)
1993	426	(314)	729	(728)	1,528	(831)	50,512	(9,254)	53,194	(9,325)
1994	426	(240)	-	-	1,528	(1,112)	44,141	(10,035)	46,095	(10,099)
1995	341	(340)	1,193	(1,192)	1,707	(1,239)	41,476	(19,498)	44,717	(19,576)
1996	1,399	(714)	656	(655)	5,563	(1,580)	64,747	(13,796)	72,364	(13,920)
1997	1,749	(891)	640	(446)	4,595	(1,924)	55,261	(13,746)	62,245	(13,916)
1998	1,224	(423)	320	(320)	4,837	(1,796)	36,291	(9,320)	42,672	(9,507)
1999	5,071	(1,534)	312	(312)	7,014	(2,131)	60,623	(12,497)	73,020	(12,773)
2000	6,120	(2,087)	328	(328)	3,144	(1,167)	112,585	(23,688)	122,177	(23,811)
2001	2,765	(967)	320	(320)	4,595	(1,861)	62,272	(14,608)	69,952	(14,761)
2002	2,871	(1,136)	-	-	5,805	(1,756)	51,550	(10,806)	60,226	(11,006)
2003	4,896	(1,518)	640	446	8,707	(3,202)	80,830	(17,424)	95,073	(17,786)
Green-winged Teal										
1990	6,674	(2,231)	7,654	(2,582)	8,401	(2,190)				
1991	6,410	(1,730)	9,841	(2,879)	8,147	(1,609)	10,773	(2,389)	35,171	(4,425)
1992	6,032	(1,686)	9,772	(2,199)	7,128	(2,974)	11,850	(3,265)	34,783	(5,213)
1993	3,978	(1,244)	11,299	(4,615)	2,546	(1,246)	8,646	(2,097)	26,469	(5,367)
1994	5,399	(1,401)	8,512	(2,791)	8,147	(3,408)	13,197	(4,033)	35,254	(6,135)
1995	6,137	(1,907)	8,947	(4,260)	4,553	(1,682)	14,139	(5,074)	33,776	(7,096)
1996	9,092	(2,034)	8,529	(2,324)	9,432	(2,059)	24,744	(6,028)	51,798	(7,080)
1997	9,792	(2,117)	9,601	(2,334)	5,805	(1,374)	16,496	(4,916)	41,694	(5,999)
1998	9,442	(2,084)	13,442	(3,529)	5,805	(1,756)	11,547	(2,696)	40,236	(5,210)
1999	14,338	(3,167)	12,809	(5,216)	5,563	(1,542)	21,445	(6,228)	54,155	(8,855)
2000	11,540	(1,769)	12,794	(3,199)	20,800	(5,040)	28,456	(5,492)	73,589	(8,302)
2001	12,164	(2,864)	11,202	(3,379)	10,400	(2,277)	13,197	(3,881)	46,962	(6,314)
2002	13,279	(4,087)	13,747	(4,441)	11,609	(2,568)	16,496	(3,451)	55,131	(7,412)
2003	9,967	(2,570)	7,041	(2,051)	10,158	(2,609)	18,558	(5,825)	45,724	(7,179)

Table 1 cont'd. Most abundant inland duck species in the Black Duck Breeding Ground Survey area of eastern Canada; estimated number of indicated breeding pairs (SE), (Collins, 2003).

Species/Year	Region									
	Atlantic highlands		Boreal shield - eastern		Boreal shield - central		Boreal shield - western		Entire survey area	
Ring-necked Duck										
1990	16,685	(3,120)	28,978	(5,718)	32,587	(5,587)				
1991	15,684	(3,255)	33,352	(7,105)	22,404	(4,007)	57,096	(8,712)	128,536	(12,371)
1992	12,983	(2,369)	23,452	(5,661)	20,112	(3,756)	65,176	(8,242)	121,723	(10,941)
1993	15,485	(3,372)	26,608	(7,129)	23,422	(6,019)	48,236	(9,235)	113,752	(13,554)
1994	14,775	(3,156)	24,471	(6,565)	25,968	(5,016)	47,781	(7,585)	112,995	(11,651)
1995	16,366	(5,375)	14,315	(3,651)	27,885	(5,912)	35,820	(11,929)	94,385	(14,814)
1996	15,562	(2,869)	20,339	(4,806)	20,800	(4,025)	54,024	(8,845)	110,725	(11,214)
1997	18,884	(3,865)	20,483	(6,053)	33,376	(5,080)	47,426	(8,155)	120,169	(11,995)
1998	21,157	(3,548)	22,403	(5,221)	21,042	(3,296)	33,404	(7,102)	98,006	(10,057)
1999	30,249	(6,102)	23,744	(4,194)	35,069	(6,190)	45,364	(9,281)	134,427	(13,390)
2000	24,479	(3,867)	41,334	(10,176)	43,534	(5,691)	54,437	(8,932)	163,784	(15,188)
2001	26,908	(4,930)	50,247	(10,951)	30,232	(5,290)	42,477	(8,510)	149,865	(15,640)
2002	23,329	(4,003)	50,613	(12,305)	16,446	(3,774)	61,860	(10,872)	152,248	(17,317)
2003	21,332	(4,037)	32,965	(6,123)	38,939	(6,554)	67,633	(14,324)	160,869	(17,376)
Wood Duck										
1990	725	(372)	-	-	2,037	(974)				
1991	818	(461)	-	-	509	(354)	29,087	(10,001)	30,414	(10,018)
1992	1,967	(777)	-	-	509	(354)	30,164	(7,644)	32,640	(7,691)
1993	852	(435)	-	-	-	-	35,495	(12,466)	36,347	(12,474)
1994	1,563	(544)	-	-	2,546	(2,070)	49,147	(20,646)	53,255	(20,757)
1995	3,751	(1,673)	-	-	5,122	(2,050)	32,992	(21,230)	41,864	(21,394)
1996	2,273	(676)	328	(328)	726	(724)	23,919	(8,379)	27,246	(8,444)
1997	1,574	(768)	640	(446)	1,451	(552)	32,580	(15,227)	36,244	(15,263)
1998	2,623	(1,336)	-	-	967	(674)	19,795	(10,961)	23,385	(11,063)
1999	3,497	(1,692)	1,250	(601)	1,935	(1,303)	52,375	(21,392)	59,056	(21,507)
2000	2,448	(917)	656	(655)	2,419	(1,328)	45,364	(17,305)	50,886	(17,392)
2001	2,027	(1,016)	-	-	2,902	(1,048)	29,693	(11,476)	34,622	(11,569)
2002	2,153	1,091	625	(624)	2,177	(946)	43,302	(23,422)	48,257	(23,475)
2003	3,147	1,025	640	(639)	2,660	(1,146)	55,674	(23,003)	62,122	(23,064)

Table 2. Most abundant inland duck species in the Black Duck Breeding Ground Survey area of Eastern Canada; trends in indicated breeding pairs from 1990-2003.

Trends are expressed as an annual percentage change; the number of plots used in the analysis is given in parentheses (Collins 2003).

Species	Region				
	Atlantic highlands (78 plots)	Boreal shield Eastern (82 plots)	Boreal shield Central (80 plots)	Boreal shield Western (64 plots)	Entire Survey Area (304 plots)
Mallard	19 * (38)		8.4 * (50)	5.1 * (63)	5.2 * (160)
American Black Duck	5.6 * (75)	4.3 * (80)	4.4 * (80)	2.2 n (64)	4.3 * (299)
American Wigeon	-7 (19)			14.0 (15)	6.5 (36)
Green-winged Teal	7.5 * (68)	1.9 (64)	4.9 * (69)	5.1 n (60)	5.2 * (259)
Blue-winged Teal	-5 (23)			-8.3 * (30)	-9.2 * (56)
Northern Pintail					-2.9 (16)
Wood Duck	13 * (40)		8.7 n (26)	5.0 * (42)	5.2 * (118)
Total Scaup species			-16.0 (21)		-7.5 (43)
Ring-necked Duck	5.0 * (69)	4.1 * (74)	0.7 (79)	1.5 (61)	3.0 * (282)

* Trend significant at P < 0.05.

'n' Trends close to significant at P < 0.05

Note: a minimum of 10 plots with at least 2 years with non-zero counts were needed to perform the trend analysis.

Table 3. Inland duck species in southern Ontario; indicated breeding pairs observed during breeding waterfowl surveys on ground plots in southern Ontario.

Species	1971	1985	1987	1992	1995	1998	2000	2003
Black duck	60	16	18	28	15	9	6	9
Mallard	173	251	300	296	292	288	288	293
Wood duck	29	79	90	103	102	107	75	89
Green-winged teal	48	11	12	26	27	17	33	18
Blue-winged teal	-	56	48	33	15	15	12	12

Data source: N. North and J. Vanos (CWS).

Note: *Values shown above are "adjusted totals", i. e. not all plots are used for comparison among years.*

Table 4. Harvest estimates of American Black Ducks in Canada and the United States.

	Canada													United States[1]				Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	Total	Total
1974	19,543	11,684	29,594	14,008	75,534	61,702	511						212,576	294,700	93,300	999	388,999	601,575
1975	35,354	14,620	59,467	21,876	90,593	85,070	262	118					307,360	275,000	81,000	1,197	357,197	664,557
1976	23,770	21,891	48,624	23,342	120,622	96,761	180	586	143	64			335,983	327,500	97,800	837	426,137	762,120
1977	38,835	18,044	46,186	20,568	129,618	82,886	727	547		48			337,459	194,900	78,900	249	274,049	611,508
1978	49,008	19,660	47,874	34,598	130,379	89,818	379			66			371,782	262,200	74,600	0	336,800	708,582
1979	44,658	12,732	33,687	24,339	112,926	87,557	242	363	256	266			317,026	231,000	68,300	0	299,300	616,326
1980	32,316	21,568	67,341	28,094	120,602	91,503	2,171	268					363,863	309,200	87,100	751	397,051	760,914
1981	38,047	16,133	58,692	26,460	105,733	76,298	337	213		41			321,954	230,900	59,000	505	290,405	612,359
1982	26,961	25,771	47,447	32,130	117,514	86,650	161	426					337,060	186,700	48,400	0	235,100	572,160
1983	32,956	25,049	57,725	31,007	101,637	60,454	259						309,087	139,100	58,800	317	198,217	507,304
1984	26,119	23,256	51,880	33,283	106,868	64,272	327		518				306,523	147,800	53,900	0	201,700	508,223
1985	28,556	18,535	44,397	32,261	110,998	64,692	427	135					300,001	148,100	41,700	180	189,980	489,981
1986	27,278	18,650	46,612	27,896	114,493	60,461	367	260	151				296,168	140,700	37,400	442	178,542	474,710
1987	20,184	18,114	39,138	27,218	129,612	61,176							295,442	135,400	36,700	112	172,212	467,654
1988	20,137	20,364	44,311	30,193	127,134	58,840		151	92				301,222	124,600	29,000	512	154,112	455,334
1989	29,299	11,548	47,322	25,582	99,675	47,518	144						261,088	148,800	44,600	326	193,726	454,814
1990	22,663	11,369	38,012	26,743	105,277	38,357	106	621	286	103			243,537	110,600	32,300	422	143,322	386,859
1991	15,073	14,499	39,295	20,122	85,220	48,670	1,189	312	1,329	229			225,938	126,400	40,900	220	167,520	393,458
1992	13,487	8,043	41,079	23,090	82,134	38,228	138	239	73				206,511	97,700	37,900	106	135,706	342,217
1993	13,133	10,741	36,298	19,591	87,869	34,556	1,125						203,313	105,400	41,200	66	146,666	349,979
1994	16,507	10,221	32,670	23,389	67,440	24,774	254	169				35	175,459	101,600	28,600	266	130,466	305,925
1995	15,461	13,355	40,546	29,332	54,776	33,470		204		17			187,161	126,500	42,300	0	168,800	355,961
1996	19,447	9,469	39,759	20,418	49,219	25,289							163,601	84,000	34,500	0	118,500	282,101
1997	18,816	12,982	32,666	17,966	56,103	26,309	265	147	215				165,469	110,200	41,500	79	151,779	317,248
1998	22,410	6,789	33,852	22,802	49,065	23,091	165		81	124			158,379	119,600	56,100	236	175,936	334,315
1999[2]	19,058	10,782	44,658	22,445	51,385	26,579	36						174,943	111,400	42,200	0	153,600	328,543
2000	21,605	6,980	43,922	18,083	43,476	19,995	204	653					154,918	127,500	52,000	0	179,500	334,418
2001	16,800	9,465	26,729	12,879	38,717	19,185	293						124,068	94,559	30,636	0	125,195	249,263
2002[3]	0	6,214	28,310	14,449	36,346	19,130		76	89				122,635	128,620	47,465	453	176,538	299,173

[1]AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway.

[2]The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

[3]Harvest data for the U.S. are preliminary.

Data source: J.-F. Gobeil and B. Collins (CWS), and P. Padding (USFWS).

Table 5. May Pond and Most Abundant Inland Duck Species breeding population trend estimates in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey.

Trends were calculated using the estimating equations technique (Link and Sauer 1994) and are expressed as an annual percentage change; the number of strata is given in parentheses (a minimum of 5 strata was deemed necessary to perform a trend analysis).

Species	Time period	Region											
		Alaska (11 strata)		Western Boreal Canada (17 strata)		Canadian Prairies (15 strata)		U.S. Prairies (9 strata)		Entire survey area (52 strata)			
May ponds[1]	1974-2003	N/A		N/A		-0.5	* (15)	1.6	(9)	-0.4		(24)	
	1994-2003	N/A		N/A		-6.2	* (15)	-5.1	* (9)	-5.8	*	(24)	
	1997-2003	N/A		N/A		-5.8	(15)	-13.3	* (9)	-8.8	*	(24)	
Total ducks[2]	1961-2003	1.0	(11)	-0.2	(17)	-0.6	* (15)	1.3	* (9)	0.1		(52)	
	1994-2003	1.7	(11)	1.4	(17)	-2.5	(15)	-3.2	(9)	-1.0		(52)	
	1999-2003	-4.4	(11)	-4.8	(17)	-4.4	(15)	-12.1	* (9)	-7.0	*	(52)	
Mallard	1961-2003	3.5	* (11)	-0.6	(17)	-1.6	* (14)	1.1	(9)	-0.2		(51)	
	1994-2003	6.7	* (10)	-1.2	(16)	-14.7	(11)	-7.4	* (6)	-3.4		(43)	
	1999-2003	0.9	(10)	-10.7	(15)	-45.5	* (7)			-14.4	*	(36)	
Gadwall	1961-2003	6.1	(6)	3.8	(17)	1.2	* (15)	4.3	* (9)	2.6	*	(47)	
	1994-2003			3.2	(15)	-1.7	(15)	-1.5	(9)	-1.4		(40)	
	1999-2003			-2.7	(13)	-3.0	(15)	-12.5	* (9)	-8.1	*	(38)	
American Wigeon	1961-2003	-3.0	(7)	1.6	(13)	-2.5	* (14)	2.2	(9)	-1.1		(43)	
	1994-2003			-4.6	(5)	-5.5	* (13)	-7.7	(8)	-5.7	*	(27)	
	1999-2003					-13.6	* (13)	-10.8	(8)	-18.1	*	(26)	
Green-winged Teal	1961-2003	5.2	* (11)	0.9	* (17)	-0.6	(15)	2.7	* (9)	1.5	*	(52)	
	1994-2003	6.5	* (11)	2.9	(17)	-4.2	(13)	-7.7	* (7)	1.9		(48)	
	1999-2003	4.8	(11)	-4.8	(17)	-13.6	* (12)	-10.5	(7)	-3.6		(47)	
Blue-winged Teal	1961-2003			0.2	(15)	0.6	(15)	1.8	* (9)	1.0	*	(43)	
	1994-2003			3.6	(12)	-0.2	(13)	-5.4	* (8)	-2.6	*	(34)	
	1999-2003			12.1	(10)	-11.2	* (13)	-27.9	* (8)	-18.2	*	(31)	
Northern Shoveler	1961-2003	-3.0	(10)	1.0	(17)	0.9	(15)	1.8	* (9)	1.2	*	(51)	
	1994-2003			7.6	(14)	-0.4	(15)	-3.3	(9)	-0.7		(40)	
	1999-2003			23.8	(11)	-2.9	(15)	-13.9	* (9)	-4.7		(37)	
Northern Pintail	1961-2003	1.3	* (11)	-2.5	* (17)	-3.3	* (15)	-1.6	* (9)	-1.8	*	(52)	
	1994-2003	4.8	* (10)	5.5	(16)	-4.8	* (14)	-8.5	* (9)	-2.0		(49)	
	1999-2003	-7.4	* (10)	-6.4	(13)	1.2	(13)	-20.7	* (9)	-7.7	*	(45)	
Redhead	1961-2003	3.5	(8)	-3.1	* (17)	0.6	(15)	1.3	(9)	0.6		(49)	
	1994-2003			10.2	(14)	-3.4	(15)	-3.5	(9)	-2.9		(40)	
	1999-2003			21.4	(7)	-10.7	(14)	-17.8	* (8)	-12.4	*	(30)	
Canvasback	1961-2003			-1.0	(13)	0.4	(14)	1.4	(7)	0.2		(37)	
	1994-2003			-11.3	* (8)	-2.8	(13)			-4.7	*	(25)	
	1999-2003			-16.0	(5)	-10.8	* (12)			-11.2	*	(21)	
Scaup spp.	1961-2003	0.1	(11)	-1.3	* (17)	-0.5	(15)	2.0	(9)	-0.8	*	(52)	
	1994-2003	-0.1	(10)	2.4	(17)	-9.8	* (15)	-3.1	(7)	-0.9		(49)	
	1999-2003	-3.3	(10)	-5.9	(16)	-13.3	* (15)	-0.9	(6)	-6.1	*	(47)	
Ring-necked Duck	1961-2003	11.8	* (11)	2.6	* (17)	2.1	* (14)	5.9	* (8)	3.0	*	(50)	
	1994-2003	15.9	* (8)	6.0	* (17)	2.3	(14)	-9.8	(7)	5.6	*	(46)	
	1999-2003	25.5	(8)	10.6	(16)	-14.9	(12)	-15.3	(5)	6.4		(41)	
Ruddy Duck	1961-2003			0.6	(16)	-1.4	(14)	2.8	* (8)	0.5		(40)	
	1994-2003			16.6	(10)	8.3	(10)	10.7	* (7)	10.1		(27)	
	1999-2003			84.3	* (6)	55.4	(8)	-5.1	(6)	18.6		(20)	

* Trend significant at $P < 0.05$.

[1] Adjusted May pond estimates for the U.S. Prairies are only available since 1974; pond estimates from strata 75 and 76 (Western Boreal Canada) which are counted since 1989 were excluded from the analysis.

[2] Total ducks include all species of ducks observed during the survey, including sea ducks.

Table 6. Harvest estimates of Mallards in Canada and the United States.

	Canada													United States[1]					Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total	Total
1974	154	130	406	761	50,036	191,532	105,723	366,291	488,448	62,595			1,266,076	383,600	2,245,000	809,469	1,166,691	4,604,760	5,870,836
1975	774	405	972	583	57,791	296,173	159,143	567,985	521,935	122,725	1,698	797	1,730,981	409,200	2,518,100	934,916	1,158,971	5,021,187	6,752,168
1976	770	256	753	748	71,851	322,047	204,600	606,239	609,576	114,198	3,229	898	1,935,165	478,400	2,409,400	975,705	1,226,374	5,089,879	7,025,044
1977	836	196	1,155	992	81,835	268,878	165,267	391,986	510,396	131,066	3,073	584	1,556,264	388,400	2,270,200	789,526	987,899	4,436,025	5,992,289
1978	850	259	2,659	452	61,507	322,006	239,299	395,276	382,319	115,038	2,098	1,290	1,523,053	442,500	2,257,000	1,059,753	1,265,553	5,024,806	6,547,859
1979	555	465	3,077	725	70,597	266,018	245,016	419,509	485,014	117,176	1,182	1,673	1,611,007	437,600	2,346,100	923,077	1,065,704	4,772,481	6,383,488
1980		948	3,056	1,436	82,027	290,941	210,153	355,042	480,188	104,768	2,551	2,473	1,533,583	435,100	2,347,500	786,838	1,081,558	4,650,996	6,184,579
1981	2,945	1,461	2,536	2,491	91,946	279,541	175,127	231,119	392,273	114,672	1,703	1,033	1,296,847	444,600	2,062,000	784,424	1,051,566	4,342,590	5,639,437
1982	438	410	1,406	1,792	93,288	335,813	148,864	241,734	296,124	92,492	1,552		1,213,913	395,900	1,781,600	683,066	1,047,074	3,907,640	5,121,553
1983	1,067	937	4,044	2,557	87,349	297,944	160,522	284,403	364,000	121,758	2,417	603	1,327,601	417,400	2,017,900	772,567	1,211,534	4,419,401	5,747,002
1984	1,097	738	2,120	1,668	67,432	284,128	117,208	183,300	306,234	89,453	4,501	1,366	1,059,245	382,700	1,796,100	742,790	1,002,926	3,924,516	4,983,761
1985	794	1,149	3,310	3,258	97,037	293,333	87,214	158,302	180,117	81,943	4,153	914	911,524	319,900	1,532,900	510,761	957,871	3,321,432	4,232,956
1986	2,933	755	3,135	2,526	84,303	265,491	112,363	151,384	182,748	72,263	811	433	879,145	362,700	1,550,100	586,619	870,893	3,370,312	4,249,457
1987	1,020	728	3,692	3,141	116,452	315,101	136,678	154,961	211,929	75,591	1,120	192	1,020,605	340,300	1,458,800	612,465	792,950	3,204,515	4,225,120
1988		902	2,304	1,620	83,748	233,556	64,217	75,853	139,565	63,700	2,543	412	668,420	257,200	874,500	324,709	532,958	1,989,367	2,657,787
1989	1,280	925	4,339	2,246	79,419	263,152	70,064	75,645	188,516	57,269	438	773	744,066	321,400	1,094,500	335,216	582,170	2,333,286	3,077,352
1990	1,162	1,028	3,557	3,183	86,524	261,267	60,847	79,494	175,921	60,395	866	290	734,534	267,000	1,091,000	326,984	602,541	2,287,525	3,022,059
1991	949	1,106	3,712	4,582	84,483	229,026	60,933	70,050	122,105	51,458	94	641	629,139	317,600	1,189,600	293,744	553,618	2,354,562	2,983,701
1992	863	199	6,407	5,243	87,824	196,647	65,992	68,765	94,795	52,172	605	298	579,810	294,100	1,250,400	366,488	627,239	2,538,227	3,118,037
1993	1,025	1,178	5,029	3,755	100,032	202,647	42,969	50,351	83,094	45,181	1,178	560	536,999	312,500	1,338,200	398,079	687,879	2,736,658	3,273,657
1994	795	864	3,305	2,894	107,222	197,833	57,924	88,848	113,068	50,412	2,042	205	625,412	328,500	1,524,700	510,957	744,432	3,108,589	3,734,001
1995	532	751	4,822	5,131	83,307	176,680	74,206	104,296	111,048	40,782	1,509	278	603,342	424,100	2,347,100	694,402	940,265	4,405,867	5,009,209
1996	351	1,024	4,286	4,044	82,201	176,869	91,266	121,608	115,668	42,447	1,326		641,090	408,000	2,493,900	764,215	1,185,491	4,851,606	5,492,696
1997	1,461	417	8,047	5,371	77,594	178,169	107,379	133,017	151,167	55,513	437	126	718,698	478,900	2,852,000	886,166	1,161,510	5,378,576	6,097,274
1998	1,628	1,011	5,440	7,512	76,320	164,431	104,470	129,461	119,826	52,663	881	276	663,919	445,500	2,762,800	953,367	1,428,079	5,589,746	6,253,665
1999[2]	1,188	667	6,305	4,866	69,568	131,901	82,639	182,714	105,126	48,002		220	633,196	438,000	3,060,800	878,434	1,121,810	5,499,044	6,132,240
2000	1,511	1,915	5,481	5,999	81,655	162,352	65,130	195,276	107,203	49,272	510	72	676,376	499,100	3,041,100	1,112,643	1,025,082	5,677,925	6,354,301
2001	600	1,192	5,720	7,046	79,895	166,628	92,114	107,411	94,698	35,574	642	229	591,749	467,064	2,768,031	1,151,367	997,216	5,383,678	5,975,427
2002[3]	299	2,175	6,498	6,001	66,532	147,844	77,991	118,856	80,706	37,370	1,701	609	546,582	554,703	2,423,134	1,003,381	914,724	4,895,942	5,442,524

[1]AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway.

[2]The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

[3]Harvest data for the U.S. are preliminary.

Data source: J.-F. Gobeil and B. Collins (CWS), and P. Padding (USFWS).

Table 7. Harvest estimates of Northern Pintails in Canada and the United States.

	Canada													United States[1]					Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total	Total
1974	939	820	659	790	14,043	8,296	7,545	39,226	69,214	14,281			155,813	34,500	122,900	162,518	928,387	1,248,305	1,404,118
1975	1,092	431	612	787	21,999	9,644	20,611	55,909	81,637	23,758	72	417	216,969	41,200	206,500	273,525	1,045,461	1,566,686	1,783,655
1976	1,507	651	2,663	352	27,578	17,112	17,545	34,693	59,532	38,626	385	277	200,921	42,200	157,100	194,803	928,063	1,322,166	1,523,087
1977	2,438	1,653	1,717	607	39,581	14,333	11,243	20,469	69,905	29,464	137	313	191,860	50,700	213,700	179,906	540,749	985,055	1,176,915
1978	824	829	1,892	1,039	21,298	13,077	21,072	14,051	38,039	22,830	698	216	135,865	35,800	210,600	239,442	851,665	1,337,507	1,473,372
1979	1,693	579	1,056	382	14,958	9,326	19,745	30,588	48,505	17,735	691	287	145,545	48,670	213,600	228,806	829,316	1,320,392	1,465,937
1980	905	510	757	1,384	16,722	13,248	12,872	16,868	44,003	21,392		108	128,769	38,600	215,600	193,055	633,316	1,080,571	1,209,340
1981	1,536	747	951	1,144	17,437	11,977	16,099	2,430	39,745	18,658	91	148	110,963	27,900	208,000	151,027	403,876	790,803	901,766
1982		1,531	1,009	1,479	20,791	10,946	13,290	12,598	29,130	14,021			104,795	38,600	126,500	158,668	467,585	791,353	896,148
1983	2,805	523	694	303	15,867	10,767	11,195	17,056	27,154	13,385	1,864	175	101,788	18,600	187,200	138,918	465,099	809,817	911,605
1984	1,698	1,047	717	908	9,253	10,132	13,131	12,343	34,016	19,661	168	337	103,411	34,600	153,500	165,663	312,492	666,255	769,666
1985	1,459	748	1,460	1,817	16,486	15,345	9,668	8,117	24,051	11,244		810	91,205	21,700	125,000	83,916	292,714	523,330	614,535
1986	634	565	846	1,841	13,163	9,057	6,988	9,077	8,632	8,885		296	59,984	19,000	90,200	72,074	274,961	456,235	516,219
1987	807	2,218	632	1,017	11,864	6,020	5,478	8,386	19,668	10,945		158	67,193	15,800	88,300	122,425	311,417	537,942	605,135
1988	1,998	1,449	486	715	12,160	8,019	13,779	5,320	14,667	10,831			69,424	7,200	39,200	36,392	116,308	199,100	268,524
1989	1,421	660	344	1,406	15,460	11,511	7,560	4,326	11,766	8,549	45		63,048	14,500	65,100	43,595	139,517	262,712	325,760
1990	4,114	450	653	1,707	19,568	8,231	5,279	10,087	13,483	7,750	281	41	71,644	10,500	49,400	43,207	133,164	236,271	307,915
1991	351	542	901	844	9,357	4,742	4,407	4,023	5,689	4,179	112	73	35,220	14,200	40,400	28,687	126,414	209,701	244,921
1992		910	79	464	6,221	4,861	5,236	2,126	6,914	6,393	136	77	33,417	12,200	56,200	31,508	116,250	216,158	249,575
1993	1,090	1,336	852	706	11,401	5,156	5,172	3,253	4,025	4,701	61		37,753	13,000	52,300	42,486	140,620	248,406	286,159
1994	934	765	1,163	1,136	11,307	4,649	4,866	7,302	7,518	4,738		64	44,442	18,000	81,100	61,088	150,361	310,549	354,991
1995	1,727	454	965	1,240	7,831	4,552	8,974	6,521	7,573	4,476			44,313	32,700	136,200	94,351	259,351	522,602	566,915
1996	1,246	478	897	1,234	5,043	4,011	10,323	14,477	9,621	5,367			52,697	19,200	124,000	95,340	281,630	520,170	572,867
1997	785	139	116	493	7,423	5,560	13,248	13,656	13,883	5,422	37		60,762	23,800	145,000	186,191	340,419	695,410	756,172
1998	1,026		653	757	7,735	6,361	14,347	11,099	11,119	6,462	19	276	59,854	33,100	177,000	123,391	238,677	572,168	632,022
1999[2]	390	1,137	755	1,790	8,956	6,457	9,830	10,610	10,304	5,464		0	55,693	28,900	166,000	136,287	195,770	526,957	582,650
2000	470	509	499	581	6,480	5,397	6,849	16,168	13,603	5,825	50		56,431	22,400	161,300	136,597	159,250	479,547	535,978
2001	137		400	610	4,910	3,708	9,215	7,050	8,730	4,806	18	59	39,643	19,276	122,522	134,680	146,101	422,579	462,222
2002[3]	1,153	77	542	702	5,526	9,908	13,878	13,053	7,640	4,549			57,028	17,089	102,481	60,469	132,089	312,128	369,156

[1]AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway.

[2]The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

[3]Harvest data for the U.S. are preliminary.

Data source: J.F.Gobeil and B. Collins (CWS), and P. Padding (USFWS).

Table 8. Harvest estimates of Lesser Scaup in Canada and the United States.

	Canada													United States[1]					Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total	Total
1974	3,601	37	688	731	22,326	43,359	16,244	10,698	9,432	1,612			108,728	35,900	330,800	58,855	23,575	449,130	557,858
1975	6,323	166	1,450	943	28,681	43,739	21,748	10,861	18,870	2,661	369	661	136,472	33,200	250,400	48,734	24,456	356,790	493,262
1976	656	89	1,139	238	34,714	50,152	27,108	16,747	14,470	2,243	169	386	148,111	59,100	326,700	96,295	49,009	531,104	679,215
1977	1,033	61	3,552	146	31,895	46,505	11,010	7,250	8,363	3,474	799	237	114,325	199,100	364,400	75,724	45,312	684,536	798,861
1978	1,666	43	1,857		23,451	26,854	14,537	10,400	13,551	3,114	215	341	96,029	39,500	177,300	59,233	38,782	314,815	410,844
1979	241		751	51	26,706	35,097	15,433	7,646	10,827	1,799	571		99,122	19,500	144,600	46,798	40,581	251,479	350,601
1980	2,844	73	662	746	28,850	55,807	27,541	4,910	13,112	1,906	599		137,050	21,100	154,300	34,618	25,958	235,976	373,026
1981	1,607		704	735	31,991	58,463	18,807	3,225	8,980	1,224	507	148	126,391	97,000	325,200	92,567	33,140	547,907	674,298
1982	126		387	309	20,981	37,287	27,394	6,655	13,226	1,721			108,086	39,000	241,000	45,835	31,038	356,873	464,959
1983	471	104	550	575	19,171	42,320	22,289	9,122	6,551	103		78	101,334	34,000	154,500	36,870	43,476	268,846	370,180
1984	1,695	31	352	912	17,696	53,451	18,336	10,861	5,435	975	98	74	109,916	83,900	380,800	151,243	45,752	661,695	771,611
1985	874		365	951	25,866	61,409	15,356	2,498	6,604	1,240	831		115,994	80,600	305,800	71,563	28,489	486,452	602,446
1986	1,839		430	1,646	23,080	47,546	14,674	5,382	5,974	1,191	170		101,932	20,700	164,000	44,452	18,909	248,061	349,993
1987	339	290	615	541	11,981	34,512	10,400	7,129	5,458	1,140		12	72,417	23,100	97,100	44,633	20,408	185,241	257,658
1988		87	943	544	22,429	32,983	6,885	5,019	3,341	496	424		73,151	26,100	84,900	28,418	9,202	148,620	221,771
1989	2,063	52	1,237	1,119	26,710	42,316	7,296	1,347	3,073	608	179		86,000	24,900	69,200	24,097	8,636	126,833	212,833
1990	1,757	35	1,051	1,696	24,047	25,772	6,592	2,557	3,888	778	191		68,364	13,300	58,900	17,035	12,992	102,227	170,591
1991	272		481	455	18,402	31,204	9,226	3,864	2,464	428	37		66,833	11,400	102,600	20,639	15,549	150,188	217,021
1992	1,004		171	116	15,249	24,587	8,227	778	2,320	650	33		53,135	13,200	132,300	28,886	12,712	187,098	240,233
1993	2,231		401	690	20,912	35,173	6,228	2,196	1,628	452	35	40	69,986	13,200	63,700	15,691	13,673	106,264	176,250
1994	510	99	445	244	11,479	27,137	12,344	2,742	3,247	378		52	58,677	20,400	102,000	34,342	20,232	176,974	235,651
1995			334	730	8,705	27,465	14,185	2,263	2,926	242			56,850	26,900	189,000	37,875	31,645	285,420	342,270
1996	178		331	156	7,460	17,344	9,258	2,415	2,800	1,162	331		41,435	35,700	293,800	92,121	38,166	459,787	501,222
1997	232		512	782	6,529	19,843	5,185	4,262	4,863	1,302	431		43,941	41,600	359,800	80,581	28,189	510,170	554,111
1998	1,455		223	1,300	11,513	16,069	5,400	6,287	2,695	311			45,253	61,500	319,300	149,241	30,138	560,179	605,432
1999[2]	470		131	110	8,339	19,599	10,233	2,143	939	181			42,145	70,900	82,900	34,358	21,991	210,149	252,294
2000	26			49	5,071	9,781	9,521	1,284	1,768	178	74	130	27,882	32,400	206,900	85,845	24,798	349,943	377,825
2001	414		60	138	5,082	13,530	8,117	1,777	861	119	128	8	30,234	97,228	165,746	71,646	29,515	364,135	394,369
2002[3]	1,436	548	412	843	5,576	14,259	6,007	1,524	1,791	383		174	32,953	84,399	185,381	84,695	34,657	389,132	422,085

[1]AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway.

[2]The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

[3]Harvest data for the U.S. are preliminary.

Data source: J.F.Gobeil and B. Collins (CWS), and P. Padding (USFWS).

Table 9. Harvest estimates of Greater Scaup in Canada and the United States.

	Canada													United States[1]					Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total	Total
1974	1,788	314	1,620	488	20,243	18,172	572	532		1,039			44,768	41,800	23,882	1,559	9,823	77,064	121,832
1975	1,321		2,401	283	25,353	36,056	1,136	176	1,215	2,986	69		70,996	29,400	24,342	1,160	10,488	65,390	136,386
1976	3,095		3,522	478	28,190	37,526	1,140	291		1,297			75,539	64,800	20,426	780	11,056	97,062	172,601
1977	2,436	217	1,895	244	21,126	44,900				617		64	71,499	55,300	26,696	3,778	29,157	114,931	186,430
1978	1,611		502	141	17,811	20,465	1,782			320		77	42,709	71,400	20,673	1,787	7,802	101,662	144,371
1979	637		959	97	20,315	26,367	677			1,391			50,443	28,400	13,523	385	7,442	49,750	100,193
1980	3,052	147	738	384	18,922	29,535	720			739			54,237	17,900	17,660	1,661	11,518	48,739	102,976
1981	344		170	818	22,891	23,762	1,139			548			49,672	34,600	27,834	4,137	19,712	86,283	135,955
1982	1,476	63	411	584	15,678	15,797				230			34,239	73,000	11,799	1,381	4,712	90,892	125,131
1983	427		1,289	574	13,443	38,628				924			55,285	22,800	30,966	623	13,454	67,843	123,128
1984	2,565	31	1,098	1,125	18,999	22,538	419	561	133	907			48,376	27,900	23,416	2,746	13,170	67,232	115,608
1985	2,423	428	759	272	17,880	28,128	1,022			134		63	51,109	31,700	21,169	1,517	5,627	60,013	111,122
1986	5,095	404	2,213	1,456	11,638	30,320	970	214	151	1,112			53,573	36,400	10,307	844	7,612	55,163	108,736
1987	1,103		672	1,323	6,941	13,103	746	131		318			24,337	18,000	11,445	1,450	8,817	39,712	64,049
1988	920		3,221	585	13,622	13,859				212			32,419	12,300	6,678	1,381	5,843	26,202	58,621
1989	5,264	51	2,547	1,498	9,380	14,701			182	242			33,865	14,300	6,620	317	3,845	25,082	58,947
1990	3,684	79	1,609	420	9,284	11,959	383		195	81			27,694	7,200	12,257	1,305	5,844	26,606	54,300
1991			1,657	267	6,314	9,815	626	474	387	153			19,693	6,700	5,541	1,930	4,706	18,877	38,570
1992	1,360		805	898	4,830	9,913	298			87			18,191	6,100	7,947	1,217	4,101	19,365	37,556
1993	5,959	176	1,161	362	8,589	8,651	163				21		25,082	8,600	11,522	1,036	5,994	27,152	52,234
1994	706		1,501	307	6,550	8,329	306			26			17,725	6,700	13,146	2,936	6,477	29,259	46,984
1995	508	82	920	542	5,080	12,861	268			97			20,358	14,600	19,758	5,204	13,456	53,018	73,376
1996	596	65	772	914	5,839	7,653	286		297				16,422	11,900	21,391	2,871	13,572	49,734	66,156
1997	677	83	919	1,119	3,627	6,002	157			379			12,963	9,700	23,636	12,687	16,860	62,883	75,846
1998	1,703	169	256	1,878	4,055	4,274	165		162				12,662	12,600	15,353	5,375	12,384	45,712	58,374
1999[2]	1,377		332	55	4,171	4,671	929					3	11,538	10,900	9,138	3,282	12,016	35,336	46,874
2000	1,075		1,157	659	2,961	3,190							9,042	12,800	15,644	1,912	12,097	42,453	51,495
2001	1,210		234	1,492	1,537	4,276	747			18			9,514	7,582	8,060	1,811	15,249	32,702	42,216
2002[3]	1,125	77	437	1,517	2,725	4,816	690				151		11,538	17,809	30,216	3,591	19,881	71,497	83,035

[1] AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway.

[2] The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

[3] Harvest data for the U.S. are preliminary.

Data source: J.-F. Gobeil and B. Collins (CWS), and P. Padding (USFWS).

Table 10. Harvest estimates of Canvasbacks in Canada and the United States.

	Canada													United States[1]					Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total	Total
1974					1,461	7,530	3,904	5,647	3,344	773			22,659	700	16,200	19,281	38,768	74,949	97,608
1975					2,116	18,757	8,205	9,065	4,262	1,051		17	43,473	1,700	30,500	15,898	45,663	93,761	137,234
1976				20	2,117	17,817	5,321	7,454	3,773	1,360			37,862	23,200	34,000	18,002	51,799	127,001	164,863
1977					1,036	6,162	2,770	4,019	2,076	198		44	16,305	7,100	24,700	10,831	32,486	75,117	91,422
1978					3,293	11,996	4,596	4,544	2,424	233			27,086	5,600	20,400	7,003	31,089	64,092	91,178
1979					3,769	14,208	7,922	7,585	2,239				35,723	9,200	39,300	17,320	26,027	91,847	127,570
1980					3,301	10,966	4,746	1,420	5,431	1,269			27,133	8,200	27,200	7,800	23,129	66,329	93,462
1981					625	8,327	3,883	1,066	5,193	534			19,628	8,200	20,000	4,898	24,932	58,030	77,658
1982					1,440	6,223	7,669	3,236	344				18,912	3,200	13,900	8,130	19,820	45,050	63,962
1983					400	10,970	6,696	2,638	4,040	240			24,984	14,300	31,000	14,207	21,601	81,108	106,092
1984					214	8,279	1,819	4,716	3,620	210		37	18,895	8,500	23,000	14,215	25,548	71,263	90,158
1985					1,435	8,673	3,349	3,617	1,427	201			18,702	9,000	23,200	10,417	37,309	79,926	98,628
1986	216		461		1,082	14,385	3,145	5,242	3,951	956	53		29,491	200	600	1,064	22,119	23,983	53,474
1987					503	6,158	2,945	638	709	463			11,416	100	800	783	17,714	19,397	30,813
1988					504	2,153	2,744	1,491	385	230			7,507	100	100	190	436	826	8,333
1989						3,636	1,255	219	869	45	45		6,069	300	500	333	9,749	10,882	16,951
1990						5,902	1,392	508	697		23		8,522	100	400	334	7,069	7,903	16,425
1991					198	4,206	473	2,473	1,855	98			9,303	0	200	360	7,163	7,723	17,026
1992					134	3,194	788	282	194	35			4,627	0	300	91	11,190	11,581	16,208
1993					88	1,602	2,505	1,862	570	25			6,652	0	200	257	12,765	13,222	19,874
1994						1,331	3,695	1,141	1,843	164			8,174	4,700	31,300	13,351	20,035	69,386	77,560
1995						5,444	4,016	1,303	1,542	119			12,424	13,200	59,800	19,482	15,749	108,231	120,655
1996					74	4,219	2,965	3,914	1,385				12,557	20,100	49,600	17,851	21,666	109,217	121,774
1997						7,585	5,802	1,708	1,387	55			16,537	12,200	59,800	22,731	25,905	120,636	137,173
1998						5,266	2,012	392	663	83	233		8,649	7,500	36,800	21,639	27,109	93,048	101,697
1999[2]						2 133	5 065		787	51			8 036	6,200	41,100	21 221	19 650	88 171	96 207
2000					111	3 085	4 696	588	1 095	0	12		9 587	16,500	44,100	25 485	17 570	103 655	113 242
2001						896	4 223	411	464	136			6 130	1,546	11,334	13 855	9 490	36 225	42 355
2002[3]						951	3 195	756	253	95			5 250	0	604	1 152	953	2 709	7 959

[1]AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway.

[2]The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

[3]Harvest data for the U.S. are preliminary.

Data source: J.F Gobeil and B. Collins (CWS), and P. Padding (USFWS).

Table 11. Sea duck densities of survey area along the Atlantic Coast of Canada and the United States.

Densities measured per 100 km$^{2.}$ No surveys were conducted in 1993, 1996 and 2003.

Species	1991	1992	1994	1995	1997	1998	1999	2000	2001	2002
Black Scoter	88	65	94	131	256	396	171	255	202	201
Surf Scoter	55	109	114	249	233	569	101	341	193	166
White-winged Scoter	40	17	13	117	85	35	127	13	64	87
Total Scoters[1]	1162	358	226	507	576	1000	466	621	497	574
Long-tailed Duck	114	114	311	173	108	167	188	170	222	224
Common Eider	812	775	752	913	678	1419	1181	1717	675	823

[1]Total scoters includes unidentified species.

Data source: J. R. Goldsberry and J. Wortham (USFWS).

Table 12. Most abundant sea duck species in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey; Trends in breeding population estimates.

Trends were calculated using the estimating equations technique (Link and Sauer 1994) and are expressed as an annual percentage change; the number of strata is given in parentheses (a minimum of 5 strata was deemed necessary to perform a trend analysis).

Species	Time Period	Region								Entire Survey Area	
		Alaska (11 strata)		Western Boreal Canada (17 strata)		Canadian Prairies (15 strata)		U.S. Prairies (9 strata)		(52 strata)	
Mergansers	1961-2002			4.6 *	(12)	3.1 *	(14)	6.4 *	(8)	4.2 *	(37)
	1993-2002			8.4	(10)	2.0	(11)	4.3	(7)	2.7	(30)
	1998-2002			67.2	(9)	-25.1	(10)	-35.9	(6)	10.6	(27)
Goldeneyes	1961-2002	12.4 *	(5)	2.8 *	(16)	6.5 *	(10)	0.8	(5)	3.2 *	(36)
	1993-2002			2.2	(13)	1.3	(9)			1.2	(27)
	1998-2002			1.2	(13)	19.8	(6)			-0.7	(23)
Bufflehead	1961-2002	-0.2	(11)	1.8 *	(17)	2.8 *	(14)	3.7 *	(8)	1.8 *	(50)
	1993-2002	1.8	(10)	3.4	(17)	1.4	(14)	-10.3	(7)	2.7	(48)
	1998-2002	2.3	(8)	17.6	(15)	8.4	(13)			14.0	(40)
Long-tailed Duck	1961-2002	-1.0	(6)	-2.1	(10)					-2.0	(16)
	1993-2002			-4.2	(6)					-4.7	(9)
	1998-2002			-8.7	(5)					-9.5	(7)
Scoter spp.	1961-2002	-2.3	(7)	-0.2	(15)	-4.2	(5)			-1.1	(27)
	1993-2002	22.2	(5)	3.9	(15)					7.2	(23)
	1998-2002	1.3	(5)	8.5	(13)					5.1	(21)

* Trend significant at $P < 0.05$.

Table 13. Black Scoters Harvest estimates in Canada and the United States.

	Canada													United States[1]					Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total	Total
1974	2,239		1,300	17	5,555	3,646							12,757	21,000	3266	52	0	24,318	37,075
1975	126		2,789		11,105	11,628					23		25,671	16,100	2687	0	246	19,033	44,704
1976	2,712		344	5,131	17,218	6,855							32,260	8,900	2159	169	274	11,502	43,762
1977	5,212	95	96	2,572	25,494	3,672				90	198		37,429	15,300	4368	133	142	19,943	57,372
1978	366			1,423	6,352	1,999				92			10,232	7,900	242	0	0	8,142	18,374
1979	1,832		134	1,234	11,456	1,974					86	108	16,824	11,800	1095	69	0	12,964	29,788
1980	1,197		1,104		12,065	914							15,280	5,400	2430	0	0	7,830	23,110
1981	3,406		5,230	166	11,436	2,885				55			23,178	8,700	3213	185	145	12,243	35,421
1982	6,211		2,769		6,574	968							16,522	4,100	1068	355	0	5,523	22,045
1983	879		2,307	49	5,390	2,305				37			10,967	3,600	580	0	154	4,334	15,301
1984	2,021		1,536		7,756	2,074	331			58			13,776	10,600	749	94	206	11,649	25,425
1985	892	210	1,094		7,035	3,493							12,724	13,500	2299	76	0	15,875	28,599
1986	580		3,126		2,314	2,796						34	8,850	6,800	412	0	0	7,212	16,062
1987	584		1,359	679	7,196	843	415						11,076	9,900	228	0	0	10,128	21,204
1988	152		1,098	371	3,456	714							5,791	5,500	198	0	0	5,698	11,489
1989	445		642		5,000	708							6,795	5,400	1365	0	50	6,815	13,610
1990	359		1,119	204	3,896	1,454							7,032	12,000	148	0	35	12,183	19,215
1991	784		2,331	94	3,255	908							7,372	6,600	0	0	0	6,600	13,972
1992	970		1,770		1,478	670						24	4,912	4,600	315	0	0	4,915	9,827
1993	571		1,166		4,883	657	619						7,896	3,000	634	41	49	3,724	11,620
1994	299		3,217	54	2,299	549	972			30		165	7,585	5,700	1198	54	0	6,952	14,537
1995	1,544		1,978	149	680	564							4,915	3,000	100	0	0	3,100	8,015
1996	569		1,000	33	1,598	379							3,579	4,800	463	203	211	5,677	9,256
1997	0		1,325	44	2,204	205							3,778	4,500	940	105	123	5,668	9,446
1998	1,214	14	985	52	2,754	186							5,205	3,200	688	0	0	3,888	9,093
1999[2]	526		1,003		1,621	465							3,615	5,900	1262	50	0	7,212	10,827
2000	29		1,354	678	499	261							2,821	2,800	847	0	0	3,647	6,468
2001	928		2,646		947	682							5,203	3,600	526	0	0	4,126	9,329
2002[3]	838	158	1,462	72	610	243							3,383	10,822	799	0	0	11,621	15,004

[1]AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway.

[2] The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

[3] Harvest data for the U.S. are preliminary.

Data source: J.-F. Gobeil and B. Collins (CWS), and P. Padding (USFWS).

Table 14. White-winged Scoters Harvest estimates in Canada and the United States.

	Canada													United States[1]					Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total	Total
1974		113	1,105	46	9,676	4,611	291		251	174			16,267	26,700	6393	0	424	33,517	49,784
1975			1,744	233	4,936	4,278	141		357	143		55	11,887	33,000	1944	117	125	35,186	47,073
1976	95	205	357	1,775	8,246	4,124	397		648	61		164	16,072	18,100	497	565	1,010	20,172	36,244
1977				766	10,265	4,395	183		118	57		248	16,032	12,200	2341	257	1,531	16,329	32,361
1978	1,106	153	871	250	5,042	3,313		382	334	266			11,717	12,100	205	0	3,534	15,839	27,556
1979	565		259	431	8,019	5,843		365	173				15,655	8,730	966	0	748	10,444	26,099
1980	3,482		3,497	189	10,829	3,144				103			21,244	13,900	2284	34	792	17,010	38,254
1981	728		1,231	114	7,831	2,512				690	116		13,222	11,900	1644	126	1,172	14,842	28,064
1982	792		1,459	151	7,800	2,003			1,485	1,260			14,950	13,900	1269	0	172	15,341	30,291
1983	710		1,417	199	7,843	2,471		517		162			13,319	9,600	2339	0	177	12,116	25,435
1984	1,644	31	2,253		11,052	3,636					408		19,024	27,800	2283	0	3,970	34,053	53,077
1985	1,031		791	97	7,792	2,899	284		253	67	1,661		14,875	19,300	2074	36	425	21,835	36,710
1986	216		401	46	2,357	1,445		214		297			4,976	9,300	1142	0	276	10,718	15,694
1987			1,091	91	6,950	3,619			107	79			11,937	20,300	2885	101	1,019	24,305	36,242
1988	2,236		1,979	61	7,082	1,389				53			12,800	17,500	1086	0	134	18,720	31,520
1989	200		1,517	131	8,078	1,865							11,791	7,100	1197	70	43	8,410	20,201
1990	930		2,202	142	5,319	805	792						10,190	14,690	546	0	238	15,474	25,664
1991			465	90	2,505	1,096							4,156	18,391	1036	312	88	19,827	23,983
1992	283		1,638		5,214	441							7,576	10,992	661	151	0	11,804	19,380
1993	544	379	1,238	123	4,417	2,044	163				35		8,943	8,293	380	0	247	8,920	17,863
1994	345		2,132		5,934	1,344							9,755	5,594	738	111	240	6,683	16,438
1995			1,847		1,796	672							4,315	7,995	314	0	239	8,548	12,863
1996	89		1,035		2,464	1,177							4,765	9,996	3478	119	361	13,954	18,719
1997	58		1,191		2,307	471							4,027	6,800	568	0	499	7,867	11,894
1998	598		758	199	3,364	291							5,210	4,700	632	0	787	6,119	11,329
1999[2]	42		413		1,338	260						3	2,056	3,400	0	55	229	3,684	5,740
2000	48		313		528	104					24		1,017	3,500	0	39	0	3,539	4,556
2001	72		227	199	1,021	379	159	157		26			2,240	8,700	836	0	329	9,865	12,105
2002[3]		158	680	52	1,179	282							2,351	7,285	838	217	839	9,179	11,530

[1] AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway.

[2] The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

[3] Harvest data for the U.S. are preliminary.

Data source: J.-F. Gobeil and B. Collins (CWS), and P. Padding (USFWS).

Table 15. Surf Scoters Harvest Estimates in Canada and the United States.

	Canada													United States[1]					Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total	Total
1974	1,074	34	2,714	243	9,757	2,648				322			16,792	22,200	4381	59	746	27,386	44,178
1975		53	1,424	393	15,603	10,372	360	498		51			28,754	30,300	4207	0	63	34,570	63,324
1976	4,359	714	1,395	7,312	20,036	8,685	567			78	70	42	43,258	16,300	442	308	1,117	18,167	61,425
1977	1,655	655	1,942	3,473	17,590	7,910							33,225	22,800	2405	528	5,502	31,235	64,460
1978	672	55	2,064	1,525	8,843	3,119				209	45		16,532	14,700	512	0	1,842	17,054	33,586
1979	674		600	1,778	12,280	7,909							23,241	10,200	1013	0	1,591	12,804	36,045
1980	1,570		4,191	655	10,321	5,164	90			103	634		22,728	9,800	874	201	1,056	11,931	34,659
1981	1,247		6,390	193	12,826	1,532	496			294	95		23,073	22,800	1142	0	1,178	25,120	48,193
1982	9,999		2,776	356	14,879	1,287	261			171			29,729	5,800	635	633	952	8,020	37,749
1983	4,745		1,078		4,118	871	351		190	74	148		11,575	5,800	709	284	1,274	8,067	19,642
1984	4,141		2,955	153	7,943	3,065	285			307	113		18,962	18,300	1980	0	7,092	27,372	46,334
1985	1,379		3,678	153	6,417	598	284			67	831		13,407	18,700	1653	0	723	21,076	34,483
1986	2,344	82	2,456	186	2,061	1,996				29	125	34	9,313	19,100	844	295	344	20,583	29,896
1987	579		3,031	196	6,889	2,051		131		265			13,142	18,100	790	0	1,529	20,419	33,561
1988	961		2,375	230	7,370	639							11,575	6,300	241	79	2,094	8,714	20,289
1989	2,577		4,759		5,085	2,897				40			15,358	15,600	957	0	1,215	17,772	33,130
1990	3,457		7,557	436	5,194	1,153	705						18,502	14,900	301	131	632	15,964	34,466
1991	950		1,319	477	1,822	2,099	587	514					7,768	11,400	151	128	188	11,867	19,635
1992	655		1,399		3,480	579							6,113	11,200	377	124	221	11,922	18,035
1993	1,290	95	4,917	261	3,890	916	1,125			25	35	6	12,560	8,500	694	63	807	10,064	22,624
1994	3,602		7,683	70	6,892	670						35	18,952	16,100	787	141	46	17,074	36,026
1995	2,879		4,687	594	3,449	972				34			12,615	6,600	2916	221	777	10,514	23,129
1996	315		1,355	88	2,971	759							5,488	11,400	1901	311	1,198	14,810	20,298
1997	326		2,695	291	3,031	442							6,785	9,700	457	0	2,157	12,314	19,099
1998	983	1,216	6,704	327	2,401	311					76		12,018	15,100	542	25	1,521	17,188	29,206
1999[2]	2,215		4,642	120	2,837	44	286						10,144	8,700	2887	143	466	12,196	22,340
2000	653		726	601	1,098	62							3,140	10,700	348	103	445	11,596	14,736
2001	520		806	108	1,549								2,983	11,800	191	88	1,016	13,095	16,078
2002[3]	1,951	158	922	72	2,314	70				42			5,529	20,126	973	124	2,732	23,955	29,484

[1] AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway.

[2] The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

[3] Harvest data for the U.S. are preliminary.

Data source: J.-F. Gobeil and B. Collins (CWS), and P. Padding (USFWS).

Table 16. Abundant sea duck species in the Black Duck Breeding Ground Survey area of Eastern Canada; trends in indicated breeding pairs for the 1990-2003 period.

Trends are expressed as an annual percentage change; the number of plots used in the analysis is given in parentheses (Collins 2003).

Species	Region									
	Atlantic highlands (78 plots)		Boreal shield - eastern (82 plots)		Boreal shield - central (80 plots)		Boreal shield - western (64 plots)		Entire survey area (304 plots)	
Common Merganser	3.2	(65)	2.5	(70)	-0.9	(77)	0.8	(57)	1.2	(268)
Red-breasted Merganser	14.9	(19)	-4.6	(21)					-2.6	(49)
Hooded Merganser	25.0 *	(41)	3.3	(22)	6.3 *	(62)	2.8 *	(59)	4.7 *	(180)
Common Goldeneye	8.8	(32)	2.1 n	(75)	2.3 n	(79)	3.9 *	(52)	4.1 *	(235)
Barrow's Goldeneye			-10.6	(25)					-11.6	(26)
Bufflehead					-0.1	(27)	-5.8 *	(38)	-7.5 *	(66)
Surf Scoter			10.2 *	(28)	-4.3	(15)			10.3 *	(47)

* Trend significant at $P < 0.05$.

Note: a minimum of 10 plots with at least 2 years with non-zero counts were needed to perform the trend analysis.

Table 17. Greater Snow Geese Harvest estimates in Canada and the United States.

An unknown proportion of the U.S. harvest is comprised of Lesser Snow Geese (harvest estimates of Snow Geese are combined in the U.S..

	Canada													United States[1]		Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	Total	Total
1975					30,708		154						30,862	9,200	9200	40,062
1976					27,854	108							27,962	12,100	12100	40,062
1977														22,200	22200	22,200
1978					41,748	1,263		276	295				43,582	20,100	20100	63,682
1979					23,619								23,619	28,000	28000	51,619
1980					55,847	151							55,998	27,300	27300	83,298
1981			25		24,170	110							24,305	13,500	13500	37,805
1982			47		40,462	655	148	352					41,664	21,700	21700	63,364
1983														40,400	40400	40,400
1984	166				44,983	589	3,111	784					49,633	37,600	37600	87,233
1985					24,370								24,370	14,800	14800	39,170
1986				72	10,536								10,608	8,900	8900	19,508
1987					756								756	28,500	28500	29,256
1988					41,365			93					41,458	24,900	24900	66,358
1989					43,529	249							43,778	17,100	17100	60,878
1990	287				60,647				204				61,138	21,500	21500	82,638
1991					47,697		724						48,421	26,400	26400	74,821
1992				295	26,984	926	759	215					29,179	10,400	10400	39,579
1993					97,534	429	1,938	2,282					102,183	30,400	30400	132,583
1994					35,903	112							36,015	17,600	17600	53,615
1995			21		50,267	252	391						50,931	18,800	18800	69,731
1996	60		62	1,859	66,111	111	115						68,318	31,400	31400	99,718
1997					55,056	164							55,220	34,700	34700	89,920
1998			90	412	86,791	64			118				87,475	110,900	110900	198,375
1999[2]				774	36,821	105			86				37,786	39,100	39100	76,886
2000					103,615			554	334				104,503	47,000	47000	151,503
2001					94,009				67				94,076	77,802	77802	171,878
2002[3]				225	45,888			531	219				46,863	39,295	39295	86,158

[1] AF: Atlantic Flyway.

[2] The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

[3] Harvest data for the U.S. are preliminary.

Data source: J.-F. Gobeil and B. Collins (CWS), and P. Padding (USFWS).

Table 18. Lesser Snow Geese Harvest Estimates of in Canada and the United States.

In the U.S., an unknown proportion of Lesser Snow Geese are also harvested in the Atlantic Flyway and are included with the Greater Snow Goose estimates (Table 10a).

	Canada												United States[1]					Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	MF	CF	PF	Total	Total
1975					5,578	15,742	51,708	12,692	16,339	2,972	324		105,355	167,700	350,057	92,871	610,628	715,983
1976					192	11,519	31,449	20,721	30,741	1,102	177		95,901	102,500	256,490	144,011	503,001	598,902
1977					19,653	8,000	31,850	12,151	30,731	576			102,961	126,800	306,302	81,841	514,943	617,904
1978			30		542	6,201	39,770	11,619	16,819	401			75,382	133,900	189,015	30,925	353,840	429,222
1979					5,379	10,576	99,151	12,981	10,752	1,917	552		141,308	165,600	338,391	32,628	536,619	677,927
1980			50		12,762	8,710	91,968	16,172	9,498	1,725			140,885	144,600	251,765	35,766	432,131	573,016
1981					408	6,576	88,124	15,339	13,780	3,378			127,605	110,900	289,869	61,109	461,878	589,483
1982					1,712	2,666	82,094	22,845	6,010	2,666			117,993	124,200	241,744	33,074	399,018	517,011
1983					45,351	1,820	82,602	33,377	6,802				169,952	187,300	245,748	46,829	479,877	649,829
1984					2,503	1,205	76,472	31,919	8,265	2,700			123,064	101,800	292,798	64,426	459,024	582,088
1985			49		497	1,913	105,719	33,311	11,362	3,972			156,823	99,200	216,868	82,223	398,291	555,114
1986						2,335	49,587	32,129	9,679				93,730	69,700	149,889	37,384	256,973	350,703
1987					19,137	6,169	70,849	22,976	3,980	2,329			125,440	56,400	182,585	38,236	277,221	402,661
1988					3,864	2,231	71,733	24,321	9,583	1,556			113,288	51,700	251,836	42,134	345,670	458,958
1989					1,169	5,654	92,720	27,321	11,274	926			139,064	97,300	286,271	32,955	416,526	555,590
1990				448	2,293	2,742	54,027	32,541	10,504	137	339	407	103,438	92,900	211,758	26,802	331,460	434,898
1991					2,645	2,799	66,254	22,224	5,600	2,619			102,141	110,900	249,950	30,999	391,849	493,990
1992			58		592	590	26,778	21,240	9,123	467			58,848	60,100	149,484	29,281	238,865	297,713
1993					7,641	2,543	51,301	19,674	5,303	2,094			88,556	71,800	270,235	55,293	397,328	485,884
1994					5,855	657	56,221	30,258	6,987	2,174	105		102,257	99,100	270,502	29,410	399,012	501,269
1995					855	1,286	61,603	31,323	8,680	1,589	306		105,642	191,200	331,957	37,807	560,964	666,606
1996					3,486	1,028	46,163	34,546	4,185	2,863			92,271	231,100	299,215	59,042	589,357	681,628
1997					8,853	336	69,683	62,635	9,261				150,768	239,000	348,989	35,501	623,490	774,258
1998				16	16,732	954	52,121	68,985	14,890	1,797			155,495	394,700	295,774	52,395	742,869	898,364
1999[2]					6,747	115	14,150	116,313	15,416	1,990			154,731	314,400	370,844	45,175	730,419	885,150
2000					5,686	1,350	31,699	68,377	12,881	2,559	45		122,597	173,600	165,996	44,322	383,918	506,515
2001					4,425	981	25,334	100,521	13,365	2,354			146,980	315,508	345,033	44,678	705,219	852,199
2002[3]					2,699	696	24,250	85,929	9,610	2,536			125,720	197,296	268,290	46,479	512,065	637,785

[1]MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway.

[2]The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

[3]Harvest data for the U.S. are preliminary.

Data source: J.-F. Gobeil and B. Collins (CWS), and P. Padding (USFWS).

Table 19. Canada Geese Harvest Estimates (all populations combined) in Canada and the United States.

	Canada													United States[1]					Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total	Total
1974													0	338,700	289,000	133,136	188,413	949,249	949,249
1975	8,185	6,382	8,836	2,182	12,791	33,441	94,330	96,197	85,708	8,913		142	357,107	357,900	330,400	172,717	181,394	1,042,411	1,399,518
1976	8,443	17,961	11,024	6,699	25,242	37,595	65,152	70,643	67,964	6,848	36	165	317,772	366,700	340,600	172,467	172,169	1,051,936	1,369,708
1977	12,578	18,788	8,563	2,451	52,300	57,626	44,236	66,429	59,302	8,758	218	127	331,376	465,900	357,600	158,871	185,209	1,167,580	1,498,956
1978	12,743	11,972	6,571	3,412	66,437	53,019	83,032	70,426	77,647	10,800		338	396,397	327,000	425,800	200,815	252,894	1,206,509	1,602,906
1979	13,401	10,827	5,261	2,614	50,012	64,249	94,496	79,544	79,636	12,931		289	413,260	296,900	325,300	185,740	187,396	995,336	1,408,596
1980	10,938	19,137	8,230	2,594	52,076	73,794	73,810	96,446	100,045	16,656	435	525	454,686	474,900	316,300	187,176	187,925	1,166,301	1,620,987
1981	10,202	14,264	7,384	3,744	25,291	49,902	57,927	84,914	95,051	15,843		233	364,755	328,800	308,900	206,747	195,003	1,039,450	1,404,205
1982	11,186	13,296	5,409	2,584	29,680	69,828	73,788	87,249	97,569	14,479		0	405,068	383,700	290,100	213,544	206,567	1,093,911	1,498,979
1983	13,652	15,768	9,534	7,370	37,429	69,648	71,671	127,184	108,097	14,877		397	475,627	491,000	288,800	233,447	230,178	1,243,425	1,719,052
1984	14,086	13,963	6,465	3,019	22,906	63,187	88,745	95,993	96,065	15,841		267	420,537	408,900	310,400	235,786	199,428	1,154,514	1,575,051
1985	9,669	17,226	6,829	4,071	28,132	76,234	103,441	88,407	103,077	18,510		96	455,692	360,800	336,100	289,670	200,861	1,187,431	1,643,123
1986	16,770	21,912	8,794	5,660	39,193	83,746	91,603	80,714	88,943	14,853		190	452,378	413,900	337,000	212,901	147,111	1,110,912	1,563,290
1987	12,509	21,387	10,942	3,015	80,270	87,481	78,007	106,528	124,796	14,830	550	165	540,480	359,300	319,700	198,227	162,742	1,039,969	1,580,449
1988	9,379	24,906	9,676	3,377	20,454	76,537	56,025	80,044	99,376	15,266		174	395,214	268,900	446,200	240,786	163,230	1,119,116	1,514,330
1989	8,845	23,143	15,666	6,629	55,852	101,581	77,752	84,582	121,589	16,418	367	0	512,424	318,500	580,100	273,324	149,204	1,321,128	1,833,552
1990	6,379	25,177	6,570	7,285	54,740	97,556	73,645	96,272	125,398	14,835	96	0	507,953	302,000	510,400	282,879	184,871	1,280,150	1,788,103
1991	5,885	21,459	9,850	5,229	52,837	83,804	72,184	91,645	112,050	18,227	275	510	473,955	306,200	543,600	276,400	174,951	1,301,151	1,775,106
1992	6,436	11,640	4,288	5,350	27,188	79,880	57,470	81,009	91,104	15,961		154	380,480	247,400	484,300	223,610	196,798	1,152,108	1,532,588
1993	9,759	19,168	13,295	6,916	40,609	83,889	73,581	79,823	93,614	13,509		94	434,257	286,900	598,900	319,462	223,384	1,428,646	1,862,903
1994	6,924	28,216	6,935	5,820	15,879	85,233	60,302	82,753	107,925	14,072	21	140	414,220	306,400	644,400	382,799	259,035	1,592,634	2,006,854
1995	9,527	16,967	8,306	5,467	9,560	88,140	49,639	82,155	114,818	11,297		128	396,004	144,000	771,800	483,322	239,096	1,638,218	2,034,222
1996	7,503	22,451	8,758	4,470	10,822	87,781	93,437	111,467	137,440	15,477	417	82	500,105	219,400	814,800	610,074	268,314	1,912,588	2,412,693
1997	5,165	16,769	7,542	6,105	11,748	89,680	107,304	104,934	125,629	14,602		0	489,478	296,200	833,400	546,274	242,559	1,918,433	2,407,911
1998	9,746	23,781	10,802	6,225	16,882	109,731	94,033	136,736	104,831	18,586		0	531,353	330,600	738,900	672,326	272,552	2,014,378	2,545,731
1999[2]	5,464	32,944	12,633	6,079	38,702	100,751	68,822	146,112	137,527	16,093	25	90	565,242	342,800	813,400	493,320	234,350	1,883,870	2,449,112
2000	8,223	25,932	13,507	8,418	38,941	125,308	74,632	167,929	132,609	16,544	13		612,056	371,000	896,400	662,562	315,925	2,245,887	2,857,943
2001	5,553	25,135	10,554	5,614	67,760	148,703	102,031	146,827	111,748	13,072			636,997	687,904	858,422	627,052	279,469	2,452,847	3,089,844
2002[3]	6,743	22,125	10,831	4,961	87,175	160,472	108,303	125,583	108,757	15,069		239	650,258	716,689	906,351	587,253	265,273	2,475,566	3,125,824

[1] AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway.

[2] The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

[3] Harvest data for the U.S. are preliminary.

Data source: J.-F. Gobeil and B. Collins (CWS), and P. Padding (USFWS).

Table 20. White-fronted Goose Harvest Estimates in Canada and the United States.

	Canada													United States[1]					Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total	Total
1974															10,102	34,623	41,592	86,317	86,317
1975			280				451	45686	14343	387	121	141	61,409		29,282	47,621	38,485	115,388	176,797
1976							824	51876	9300			44	62,044		22,248	32,959	46,010	101,217	163,261
1977								43339	15860	82		1	59,282		18,660	49,154	35,566	103,380	162,662
1978							379	50985	11342	246		121	63,073		33,376	44,179	38,021	115,576	178,649
1979							100	47197	12092	71		247	59,707		29,119	54,655	24,395	108,169	167,876
1980							2308	56164	20036	60			78,568	105	28,097	74,884	20,874	123,960	202,528
1981							1503	36780	14647	301		4	53,235		94,871	80,886	22,851	198,608	251,843
1982							263	39822	15434				55,519	486	51,421	63,017	16,772	131,696	187,215
1983							118	46945	5633		569		53,265	257	61,646	51,828	17,137	130,868	184,133
1984						152	115	38794	14365	126		36	53,588	67	67,160	78,197	8,306	153,730	207,318
1985								37604	12481	277		64	50,426	77	46,812	51,473	15,671	114,033	164,459
1986					23		497	37750	20597				58,867		34,016	33,891	8,836	76,743	135,610
1987							125	36854	11184	84			48,247		32,148	55,016	10,962	98,126	146,373
1988								21642	18125	101			39,868		33,802	61,721	6,385	101,908	141,776
1989			42			44	119	34372	18737	47			53,361		47,655	80,462	11,479	139,596	192,957
1990	294						110	26848	16524	115	96		43,987		70,202	73,011	8,395	151,608	195,595
1991			51		82		548	31648	11538	65			43,932		72,199	54,510	11,658	138,367	182,299
1992							622	22098	8649	23			31,392		54,500	41,207	14,219	109,926	141,318
1993			49			171		21822	7016				29,058		42,000	64,830	13,839	120,669	149,727
1994								30198	9606	79			39,883		87,700	61,771	14,131	163,602	203,485
1995							79	45010	14886	41			60,016		68,600	60,880	13,523	143,003	203,019
1996			251			68	924	57674	17939	137			76,993		117,000	75,875	21,642	214,517	291,510
1997					179		296	37324	15009			36	52,844		122,400	59,913	27,205	209,518	262,362
1998							1045	51202	26669	242			79,158		108,800	51,225	25,294	185,319	264,477
1999[2]								47314	15032				62,346		111,434	114,010	29,458	254,902	317,248
2000								86586	19963	187			106,736		100,610	182,344	25,018	307,972	414,708
2001								61389	31722	79			93,190		108,928	91,438	29,307	229,673	322,863
2002[3]							1048	39870	10690	60		5	51,673		108,685	77,367	32,936	218,988	270,661

[1]AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway.

[2]The USFWS recently implemented an improved national harvest survey. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

[3]Harvest data for the U.S. are preliminary.

Data source: J.-F. Gobeil and B. Collins (CWS), and P. Padding (USFWS).