Population Status of Migratory Game Birds in Canada

(and Regulation Proposals for Overabundant Species)

November 2001

Canadian Wildlife Service
Waterfowl Committee

CWS Migratory Birds Regulatory Report Number 4

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Canada

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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 country-wide 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 (Quebec) to Nova Scotia (Fig. 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 2000. Preliminary results for the 2000 survey are presented below.

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 (2001), Bordage (2001), and Ross (2001).

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 (Fig. 2). The number of black ducks counted in both flyways in winter 2001 (276,000) was 6% higher than the previous year (260,000), and is 2% below the 1991-2000 average (282,800) (Peterson 2001; Serie and Raftovich 2001). However, 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. The mixing of populations from diverse areas combine to limit the potential of such efforts. 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 1991-2001 period (Fig. 3 and Tables 1 and 2; Collins 2001). Breeding populations have increased significantly in all survey strata ($P < 0.05$), except in the western portion of the Boreal Shield region where no trend was detected. Compared to last year, the estimated number of indicated breeding pairs in the entire survey area in 2001 decreased by 18% to 255,000 ± 18,600 (SE) compared to 2000. Note that the method for estimating the number of indicated breeding pairs of black ducks was improved once again in 2000 and that,

consequently, estimates have been revised for all survey years (B. T. Collins, CWS, pers. comm.).

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 1985-1999 period (Bateman and Dibblee, 2000). 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 the 1985-2000 period (Table 3). Since this survey is not conducted annually, the 2000 survey results are the most recent data. The decline in the abundance of black ducks was also documented by Dennis et al. (1989) for the 1971-1987 period. The number of breeding pairs also shows a decline over the 1985-2000 period (Table 3). At the same time, a significant increase in mallards suggests that habitat previously used by black ducks is now occupied by mallards.

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.

Other Inland Duck Species

Because all waterfowl species are counted during the Black Duck Breeding Ground Survey of eastern Canada, this survey also 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*), 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 1991-2001 period (Collins 2001). No significant trend was detected for Green-winged Teal (*Anas crecca*) during the same period. The breeding population of Mallards was estimated at 72,900 ± 15,500 (SE) indicated pairs in 2001, that of Green-winged Teal at 43,700 ± 5,950, Wood Ducks at 36,100 ± 12,200, and Ring-necked Ducks at 124,100 ± 12,500.

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 1985-1999 period (Bateman and Dibblee 2000). 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 (2000).

Results of the breeding waterfowl surveys in southern Ontario suggest a decline in the breeding population of Green-winged Teal between 1971 and the 1985-2000 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 2000, 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 in the Canadian Prairies and in Western Boreal Canada (northwestern Ontario to Old Crow Flats in the Yukon), as well as in the northcentral U.S. (U.S. Prairies) and parts of Alaska, are monitored annually through the Waterfowl Breeding Population and Habitat Survey (Department of the Interior and Environment Canada 1987; Fig. 6). This survey has been conducted since 1955 by the U.S. Fish and Wildlife Service (USFWS) and CWS using fixed-wing aircraft, in combination with ground counts. 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 Caswell et al. (2001).

Breeding Habitat Conditions in the Prairie Pothole Region

In the prairie pothole region (Canadian and U.S. Prairies; Fig. 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, had been generally improving since the early 1990s (Fig. 7), however, there has been a significant decrease (P

< 0.05) in May pond numbers in the Canadian Prairies during the last five years. Pond numbers did not show significant trends over the last ten years or over the long term (Table 4). The estimated number of May ponds in 2001 in the Canadian Prairies increased by 13% to 2.75 ± 0.12 (SE) million ponds compared to last year (Fig. 7). The increase occurred in Manitoba and Saskatchewan but decreased in Alberta (Caswell et al. 2001). Pond numbers were 19% below the ten-year average and 20% below the long-term average (1961-2000). The estimated number of May ponds also increased in the U.S. Prairies compared to last year (Fig. 7; USFWS 2001). Pond numbers increased by 24% to 1.89 ± 0.09 million ponds compared to 2000. 2001 May ponds were 24% higher than the long term average (1974-2000). Trends for the U.S. Prairies and the Canadian and U.S. Prairies combined are also shown in Table 4.

Total Ducks

The total duck population in 2001 was estimated at 10.8 ± 0.3 (SE) million ducks in the Canadian Prairies (Caswell and Schuster 2001), a decrease of 15% compared to 2000. In Western Boreal Canada, the estimated breeding population of all ducks was 9.7 ± 0.4 million ducks, a decrease of 19% compared to 2000. The total duck population in the entire traditional survey area decreased by 13%to 37.9 ± 0.7 (SE) million ducks compared to last year. Note that, contrary to the method of reporting used by the USFWS (2001), total ducks here include all species of ducks observed during the surveys, including sea ducks. Trends in the estimated total duck breeding population are presented in Table 4.

Total Waterfowl Production in the Canadian Prairies

In contrast to the decrease in the total duck population and in the quality of spring habitat conditions, the overall production of young in the Canadian Prairies by all species of ducks combined (called the brood index) increased by 9% in 2001 compared to last year, as measured by the July Brood Survey (M. Schuster, pers. comm.). Waterfowl production increased by 44% in southern Manitoba and 5% in southern Saskatchewan, and remained the same in southern Alberta, compared to 2000 (Fig. 8a). Production rates (brood index per 100 ducks) also increased in all three provinces (M. Schuster, pers. comm.; Fig. 8b).

Mallard

The Mallard breeding population in the traditional survey area recovered from the decline seen in the 1980s, but dropped below the NAWMP goal of 8.20 million Mallards for the first time in five years (Fig. 9). In 2001, the total breeding population was estimated at 7.9 ± 0.23 million birds, which represents a 17% decrease compared to last year. This population shows a significant ($P < 0.05$) decrease over the last five years, a significant increase over the last ten years and no significant trend over the long term (Table 4). The breeding population estimate for Mallards in the Canadian Prairies in 2001 decreased by 18% to 2.84 ± 0.13 (SE) million birds compared to 2000 (Caswell and Schuster 2001), and remains below (-35%) the NAWMP goal of 4.37 million birds for the region (Fig. 9). The Mallard breeding population shows a significant ($P < 0.05$) decrease during the last five years, a significant ($P < 0.05$) increase over the last ten years, and no significant long term trend (Table 4). In Western Boreal Canada, the Mallard breeding population also decreased compared to 2000 (down 32% to 1.6 ± 0.08 million birds), the second lowest population level recorded (Fig. 9). This population is below the NAWMP goal of 2.36 million ducks. However, over the last five years, ten years, and long term were not significant (Table 4).

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 2000 (Fig. 10). However, overall production increased in these three provinces in 2001 (Fig. 8a).

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 gradually increased to 3.56 ± 0.19 (SE) million birds by 1997 (Fig. 11). In 2001, the population was estimated at 3.30 ± 0.56 million birds, an increase of 14% from last year. Although the population has been increasing significantly over the last ten years ($P < 0.05$), it is still far below the NAWMP population goal of 5.60 million birds, and the long-term trend still indicates a significant decline in the population ($P < 0.05$, Table 4). Because the Northern Pintail breeding population in the Canadian Prairies during the 1970s accounted for about half of the pintail abundance in the traditional survey area, this long-term decline reflects in large part the decline in that region's breeding population, and to a smaller extent the declines in the U.S. Prairies and Western Boreal Canada (Fig. 11). Population declines over the long term in these three regions are all significant ($P < 0.05$, Table 4). The reasons for the decline of Northern Pintails are not known, and the status of pintail populations remains a management concern.

In the Canadian Prairies, the breeding population of Northern Pintails remains low (Fig. 11). In 2001, it

numbered only 843,000 ± 111,000 birds, a 21% increase compared to last year (Caswell and Schuster 2001), but it remains far below the NAWMP population goal of 3.30 million. This population shows a significant decrease ($P < 0.05$) over the last five years, and over the long term (Table 4). There were no significant trends over the last 10 years. Northern Pintail numbers in Western Boreal Canada decreased by 27% to 202,000 ± 29,000 birds in 2001 (Fig. 11). This population remains below the NAWMP goal of 407,000 pintails for that region. No significant trend was detected over the last five and ten years, and the population has significantly declined ($P < 0.05$) over the long term.

Other Dabbling Ducks

Of the other dabbling duck species monitored during the Waterfowl Breeding Population and Habitat Survey (American Wigeon [*Anas americana*], Gadwall [*A. strepera*], Green-winged Teal, Blue-winged Teal, and Northern Shoveler [*A. clypeata*]), all have generally increased significantly ($P < 0.05$) or do not show any significant trend over the long-term and the last ten years in the survey regions as well as the entire survey area, except for American Wigeon in the Canadian Prairies (Table 4; Fig. 12). Similarly, all of these species either do not show any significant population trend or, they have increased significantly ($P < 0.05$) during the last five years, except for Gadwall, Green-winged Teal, and Northern Shoveler in the Canadian Prairies, and American Wigeon in Western Boreal Canada (Table 4; Fig. 12). All of these species remain above NAWMP population objectives when considering breeding population abundance over the entire traditional survey area, except for American Wigeon (Fig. 12). American Black Ducks are also monitored during this survey, but breeding population estimates are relatively low and imprecise, and mostly limited to the eastern part of Western Boreal Canada.

The American Wigeon breeding population in the traditional survey area has decreased from previous levels (Fig. 12a). Overall breeding numbers remain slightly below the NAWMP population goal. In the Canadian Prairies, breeding numbers have declined significantly ($P < 0.05$) over the long-term (Table 4). There were no significant trends over the five and ten year time periods. This population has not yet recovered to its previous levels and remains far below the NAWMP goal of 1.16 million for the region. In Western Boreal Canada, the breeding population of American Wigeon shows decreasing population trends over the last five years, but no trend over the last 10 years or over the long term (Table 4); in 2001, it was below the NAWMP goal.

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 (Fig. 13; Table 4). Table 4 shows that breeding numbers have declined significantly ($P < 0.05$) over the long term. Trends of this species were not significant over the last five or ten years. In 2001, the scaup population decreased by 7% to 3.69 ± 0.21 (SE) million birds, and remains well below the NAWMP goal of 6.30 million. Since Greater and Lesser Scaup in Western Boreal Canada account for more than half of the total number of scaup, the population long term decline in the traditional survey area reflects mostly the significant long term decline ($P < 0.05$) of that region's breeding population (Fig. 13; Table 4). This population decreased by 7% to 1.83 ± 0.15 million birds in 2001, and remains well below the NAWMP population goal of 4.26 million birds. The scaup breeding population in the Canadian Prairies show a significant ($P < 0.05$) over the last five years, but no significant trend over the last ten years or over the long term (Fig. 13; Table 4). This population remains well below the NAWMP goal of 1.05 million. In 2001, the breeding population was estimated at 596,000 ± 94,000 birds, which is similar (-4%) to last year's estimate (Caswell and Schuster 2001). The reasons for the decline of Scaup breeding populations are not known.

The USFWS recently completed a review of the status of Greater and Lesser Scaup in North America (Allen et al. 1999). In this review, strata from the Waterfowl Breeding Population and Habitat Survey were partitioned according to whether they were expected to support mainly Lesser or Greater Scaup. It was assumed that scaup found in tundra habitats in Alaska and the Northwest Territories (strata 8, 9, 10, 11, and 13; Fig. 6) were predominantly Greater Scaup and those in other strata Lesser Scaup. Results of this analysis indicated that there was no population trend for Greater Scaup between 1955 and 1998, while Lesser Scaup declined during that period (Allen et al. 1999). Although there is little doubt that Lesser Scaup have declined, the status of Greater Scaup needs to be clarified. Some authorities suggest that the Greater Scaup population is also declining, despite the stable population indicated by this analysis (J. E. Hines, CWS, pers. comm.). Therefore, field work to confirm the proportion of Lesser and Greater Scaup present in each stratum is needed, as is a more detailed review of all available information on the distribution of the two species (J. E. Hines, pers. comm.).

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) on Greater and Lesser Scaup in September 1998, to provide biologists the opportunity to share information and to discuss research needs and opportunities for collaboration. The participants reviewed the current status of knowledge of Greater and Lesser Scaup, examined

problems facing the species, identified information and research needs, and formulated a strategy for addressing some of these needs. In Canada, several research programs are currently being conducted or are planned to increase our current understanding of Lesser and Greater Scaup. In particular, a research project is monitoring the numbers and productivity of Lesser Scaup on a 38 km^2 area of boreal forest near Yellowknife, N.W.T. (Hines and Fournier 1998). The results of this study and of a parallel study of Greater and Lesser Scaup on nearby Great Slave Lake have shown both long-term and significant annual variations in local numbers and reproductive success of scaup.

Other Diving Ducks

Of the other diving duck species monitored during the Waterfowl Breeding Population and Habitat Survey (Canvasback [*Aythya valisineria*], Redhead [*A. americana*], Ring-necked Duck, and Ruddy Duck [*Oxyura jamaicensis*]), all have either increased significantly ($P < 0.05$) or do not show any significant trend over the three time periods in the survey regions as well as the entire survey area (Table 4; Fig. 14). All of these species remain above NAWMP population objectives when considering breeding population abundance over the entire traditional survey area (Fig. 14).

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 is currently slightly below this goal at 320,000 ± 41,000 birds in 2001. This is a reduction (-13%) compared to last year's estimate (Caswell and Schuster 2001) (Fig. 14a). This population has increased significantly ($P < 0.05$) during the last ten years, but it does not show any significant trend over the long term or during the last five years (Table 4). The breeding population of Canvasbacks in Western Boreal Canada shows no significant trend over the three time periods and remains slightly above the NAWMP goal of 93,000 (Fig. 14a).

Southern Yukon

The southern Yukon is surveyed through the Cooperative Roadside Waterfowl Breeding Population Survey (Hawkings and Hughes 2001). This was the eleventh year of this cooperative waterfowl survey. A total of 178 wetlands were surveyed at least once along the road system in the southern Yukon. Of these, 134 were surveyed five times during the same five-week period in both 2000 and 2001. Spring in the Yukon was variable with April drier than average, near normal temperatures in both June and August with July lowering the average. Rainfall was near normal in the southern areas of the Yukon with Whitehorse and Beaver Creek receiving 133% of normal summer rainfall. Water levels were very high in most lakes and rivers for the second summer in a row, which may have caused some flooding of nests.

Of the common species of dabbling and diving ducks (sea ducks excluded), there was no consistent difference in indicated breeding pairs across species between 2000 and 2001. The number of Mallard indicated breeding pairs remained the same between 2000 and 2001. Green-Winged Teal increased by 46%; Northern Shoveler increased by 6%; and Northern Pintail increased by 4%. In contrast, American Wigeon decreased by 33%; Scaup species decreased by 10%; and Ring-Necked Duck decreased by 33%. Breeding pair numbers over the ten-year period are quite variable, but no trend is evident for most species (Fig. 15). Green-winged Teal show a slight increasing trend during the ten-year period, while scaup numbers have decreased, reflecting the decline seen in Western Boreal Canada (see earlier section).

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 2001). 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 and, therefore, this allows long-term comparisons of waterfowl abundance over a fixed amount of habitat.

Breeding habitat conditions were below average this year and worse than in the three previous years. The spring was cold and dry. Water levels were low, and many vegetated portions of the wetlands were exposed (i.e. on dry land). Of the common dabbling ducks, most showed a decrease in the number of breeding pairs in 2001 compared to 2000 (Breault and Watts 2001; Fig. 16). Blue-winged Teal decreased by 32%, Northern Shovelers by 33%, Cinnamon Teal by 14%, Mallards by 5%, and Green-winged Teal by 16%. Gadwall increased by 20% and American Wigeon increased by 7%. Breeding pair numbers of two species of common diving duck decreased and one species increased in 2001 compared to 2000. Redheads decreased by 29%, Scaup decreased by 6%, while Ring-necked Ducks increased by 25%.

Figure 16 shows that breeding pair numbers are quite variable over the period covered by this survey (1987-2001). Nevertheless, there seems to be a decreasing trend in the number of breeding pairs of American Wigeon, Cinnamon Teal and scaup, while Gadwall seems to be increasing. Breault and Watts (2001) reported that four species of dabbling ducks had breeding pair numbers

in 2001 that were below the long-term average (1988-2000), including Green-winged Teal (-42%), Cinnamon Teal (-37%), American Wigeon (-13%), and Mallard (-10.5%). Two species exceeded the long-term average, Blue-winged Teal (+20%) and Gadwall (+41%). Among the diving ducks Redhead was below the long term average (-22%), while Scaup (+5%) and Ring-necked Duck (+12%) were both above the long term average (Breault and Watts 2001).

Interpretation of the results of the 2001 survey should be done with caution given the early migration observed this year and the weather patterns of recent years (2001 was the third consecutive year with a drying trend). Because the wetlands surveyed year after year are mostly permanent and semi-permanent ponds, waterfowl abundance is underestimated in wet years (waterfowl redistribute to the small and temporary wetlands that have become available), while the bias is low in dry years (when most remaining wetlands are semi-permanent or permanent water bodies). Usually, the survey window effectively catches the peak nesting period for most species but a number of areas were surveyed later than usual this year. This might have led to an artificially lower count of both total birds and breeding pairs for early migrants and to increased counts of late migrants (total and breeders) (Breault and Watts 2001).

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 took into account the distribution and availability of wetlands in various ecological units of the province (namely ecosections), 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 the last three years, helicopter surveys have been conducted in 4 of the 68 ecosections present in British Columbia. Preliminary analyses suggest the presence of upwards of 40,000 breeding pairs of Mallards in these 4 ecosections. The linkage between the transects and the B.C. Watershed Atlas allows for the survey results to be expressed either in terms of waterfowl density per unit of land surveyed (the traditional method), as waterfowl density per unit of water surveyed (more sensitive to wetland availability within ecological units) or as waterfowl density per wetland size (more sensitive to availability and use of wetlands of different size classes). The preliminary analyses conducted thus far suggest that population projections for each ecosection vary extensively depending on which method of calculation is used. Discussions are under way to review the population estimates produced by each method. 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 British Columbia (A. Breault, CWS, pers. comm.).

Harvest of Inland Ducks

In Canada, the harvest of inland ducks is estimated through the National Harvest Survey, while in the U.S. harvest estimates are produced from the Waterfowl Hunter Questionnaire Survey. Harvest estimates for selected species for the 1974-2000 period are presented in Table 5. Except for American Black Ducks, most of the harvest of these species occurs in the United States. Lévesque and Collins (1999) provide harvest estimates in Canada for other species and information on hunter activity as well as harvest age and sex ratios.

American Black Duck

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 5a). In 1989 and 1990, however, Canada successfully implemented more rigid black duck hunting restrictions in order to protect local breeding populations. The average continental harvest (1995-2000 period) is now 47% below the average harvest during the five years (1979-1983) prior to the introduction of restrictive regulations. The estimated continental harvest in 2000 was 335,200 black ducks, which is similar (+2%) to 1999. In Canada, the harvest of American Black Ducks in 2000 decreased by 11% to 154,900, while it increased by 17% in the U.S. to 180,200.

Mallard

In response to declining prairie waterfowl populations during the 1980s, restrictive hunting regulations were initiated in Canada and the U.S. in 1985, and additional restrictions were applied in 1988. By 1994, the breeding populations of Mallards and most other ducks had increased sufficiently in the prairie pothole region to allow for relaxation in the level of harvest-rate reductions in the Canadian Prairies and throughout the United States.

The continental harvest of Mallards during the last several years increased considerably compared to the late 1980s and early 1990s (Table 5b), 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 2000, it was estimated that 5.64 million Mallards were killed in the U.S., a level similar (+2%) to the previous year, while in Canada the estimated harvest increased by 9% to 686,200.

Overall, the continental harvest of Mallards remained unchanged (6.33 million; +2%) compared to 1999.

Northern Pintail

The total annual harvest of Northern Pintails decreased considerably with the declining population, but it too gradually increased during the early and mid 1990's (Table 5c), reflecting the gradual increase in pintail numbers during the same period. However, with the decrease in population abundance, the harvest of pintails decreased in the last several years. In 2000, the continental harvest was estimated at 520,400 pintails, a decrease of 11% compared to the previous year. In the U.S., it was estimated that 478,600 pintails were harvested in 2000, a decrease of 9% compared to 1999. Likewise, the estimated harvest in 2000 in Canada decreased by 25% to 41,800.

Canvasback

The Prairie provinces, as well as British Columbia and Ontario, implemented special restrictions for several years when the Canvasback population was low, but these were relaxed in Saskatchewan in 1993, and in Alberta, Manitoba, and Ontario in 1995. In the U.S., the hunting season for Canvasback was closed for one year in the Pacific Flyway (1988) and from 1986 to 1994 (when a limited season was reopened) in the other three flyways. With the relaxation of hunting restrictions in Canada and the reopening of seasons in the U.S., the Canvasback harvest has returned to levels seen prior to the implementation of restrictive regulations (Table 5d). However, most of the increase in harvest has occurred in the U.S., while in Canada it remains low. In 2000, the harvest of Canvasbacks in the U.S. increased by 21% to 140,600, while in Canada the Canvasback harvest was estimated at 9,800, an increase of 23% compared to 1999. Overall, the continental harvest of Canvasbacks in 2000 increased by 20% to 114,400 birds.

Scaup

The harvest of Lesser and Greater Scaup in Canada has declined considerably over the years (Tables 5e and 5f), possibly reflecting the decline of scaup populations. In 2000, the harvest of Lesser and Greater Scaup was estimated at 28,300 and 9,000 birds, respectively, which in both cases represents a decline compared to 1999 (-33% and -40% respectively). Scaup harvest has been quite variable in the U.S. (Tables 5e and 5f). Nonetheless, harvest of Lesser Scaup declined sharply in the late 1980s and early 1990s, but increased considerably from 1994 to 1998. In 2000, the harvest of Lesser Scaup showed a sharp increase of 69%, to 351,000 from 207,400. Greater Scaup harvest also declined over the years in the U.S., but showed a small increase from 1994 to 1997. In 2000, the harvest increased by 23%, to 42,900 from 34,800. Overall, the total harvest of Lesser and Greater Scaup in 2000 was estimated at 379,100 and 52,000, respectively, an increase of 52% and 13% compared to 1999.

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 (harvest/breeding population size) in Canada for Lesser Scaup was about 2-3%, and for Greater Scaup about 14%. In 2000, the harvest rates for both species were about 1%. In the U.S., however, the harvest rate for Lesser Scaup was about 6% in 1975, but by 1998 had increased to about 19%. In contrast, the harvest rate for Greater Scaup declined from about 20% in 1975 to 9% in 1998. In 2000, harvest rates declined sharply to only 10% and 7% for Lesser and Greater Scaup, respectively. Note that the estimates of breeding population size used to calculate harvest rates were obtained from the analysis of Allen et al. (1999) discussed in the Scaup section above.

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 most 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 and sustainability 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 that breed in Canada, the Canadian Wildlife Service Waterfowl Committee held a special workshop in April 1997 to discuss strategies for sea duck conservation. Federal, state, and provincial agencies, as well as non-governmental conservation organizations, together proposed that an international Sea Duck Joint Venture be created to address the decline of these birds. The creation of the Sea Duck Joint Venture was approved by the NAWMP Committee in 1998; although no financial resources exist within Canada to implement it to date.

Sea ducks are not well covered by any of the current breeding and wintering waterfowl surveys. Thus, 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, eight 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.

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 35 King Eiders tagged with satellite transmitters on Victoria Island and Banks Island, N.W.T., and Prudhoe Bay, Alaska. The results show the majority of western King Eiders moult and winter off the east coast of Russia which has implications for management of the population (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).

Pacific Common Eider

There is also 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 to in 2001 determine the cause of 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. Yet, fewer than 1000 nests had ever been reported in the region. 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. Based on these surveys, 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 transmitters were put on 14 Pacific Common Eiders near Bathurst Inlet, Nunavut in June 2001 and their movement is currently being tracked by satellites to determine molting, staging and wintering areas of eiders nesting in central arctic Canada.

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.

Strong historical data exists for the colonies in Ungava Bay (Chapdelaine et al. 1986) and repeated surveys will provide the first meaningful population trend data of Northern Common Eiders in Canada (G. Gilchrist, pers. comm.). Thus, the colonies in the western portion of Ungava Bay were resurveyed in 2000. Preliminary results indicate an increase in the number of eiders for three archipelagos and a decrease in the most northern archipelago compared to the early 1980s (J.-P. L. Savard, CWS, pers. comm.). The small Northern Common Eider colonies in Digges Sound (located off the northwest tip of Quebec) 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 have shown 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 are required to quantify this variation (J-P Savard, CWS).

A recent study reviewed the band recovery data of Common Eiders banded in the eastern Canadian Arctic and west Greenland. Links between breeding populations and their affinities to specific wintering areas in Greenland and maritime Canada were determined. In addition, 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).

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 international management implications because they confirm that the majority of eiders harvested in Greenland during winter breed in Canada . Population and harvest data of the northern common eider were integrated in a simulation model (Gilliland et al. 2001), and results suggested that the Greenland harvest of northern eiders was not sustainable. In response, an International Eider Conservation and Management Plan is now being drafted by Canada and Greenland (G. Gilchrist, CWS).

Approximately 80,000 Northern Eiders winter in the gulf of St. Lawrence (Bordage et al. 1998). Numbers wintering in Newfoundland seem to have decreased in recent years but quantitative surveys are lacking (S. Gilliland, CWS Atlantic).

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 Quebec. 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 (Roberston 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.

Historical breeding data for this subspecies only exists for the Belcher Islands. These were resurveyed in 1997. Results from the survey showed that the breeding population had declined by 70% since the late 1980s, apparently due to a winter-kill in 1992 (Robertson and Gilchrist 1998). The Canadian Wildlife Service initiated research of the winter ecology of Hudson Bay common eiders in 1998. The last 3 winters have been moderate, with large expanses of open ocean available to foraging flocks. There have been no further winter kill events and the eider population appears to be recovering. This will be quantified by colony surveys planned for the summer of 2003 (G. Gilchrist, CWS).

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, the Maritimes and the eastern United States. Population numbers have fluctuated over the past two decades and are now possibly increasing. The cause of these fluctuations is currently unknown (J.-P. L. Savard, pers. comm.). In recent years, the frequency of colonisation of islands by foxes has increased in the St. Lawrence which has affected reproduction on several islands. Special measures for yearly fox removal may prove necessary if this trend continues (J.-P.L. Savard, pers. comm.). 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. There are also a significant number of eiders wintering on the islands of St. Pierre and Miquelon, and the numbers have increased from about 2,000 birds in 1994 to between 6,000 and 12,000 birds in 2000 (S. Gilliland, pers. comm.).

Analysis of traditional mid-winter survey data showed that American Common Eiders had increased significantly ($P \leq 0.001$) since the 1960's (Kehoe 1996). Moreover, results from the Atlantic Coast Sea Duck Survey suggest an increase in the numbers of American Common Eiders wintering along the Atlantic coast over the last ten years (Table 6).

Aerial counts conducted along the Labrador coast have shown increases in breeding populations of American and Northern Common eiders of about 5% per annum over the period studied (Gilliland 1994). Similarly, ground counts of American Common Eiders over the last decade show the number of eiders increasing between 4% and 12% per annum (S. Gilliland, CWS, pers. comm.). Although these were promising signs, eider populations breeding in insular Newfoundland remain critically low. Despite increases observed in some areas, the general feeling among experts is that the race may in fact be declining (J.-P. L. Savard, pers. comm.).

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

There is great concern about the status of the eastern North American population of the Harlequin Duck, which 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). Overhunting, 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 in 2001, the status of the eastern population was downgraded to a population of special concern.

Recent satellite telemetry studies have indicated the existence of two Harlequin Duck populations: one which breeds in northern Quebec 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., in prep). 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). Some birds also 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 Quebec North Shore. At least 32 Harlequin Ducks on 5 rivers in Quebec 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, CWS, 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

A total of 6,825 Harlequin Ducks were counted in the course of a midwinter survey conducted in the northern Strait of Georgia in the 1999-2000 winter. The largest number of birds was observed on the east coast of Vancouver Island (33% of total) while the mainland coast accounted for ca. 2% of the total birds observed (M. Rodway and H. Regehr, pers. comm.). Large aggregations involving several thousand Harlequin Ducks gathered on the northeast side of Hornby Island, B.C. during herring spawn. Repeated counts and identification of individually marked birds were conducted before (January and February), during (March), and after (April) herring spawn during the winters of 1998-2001 to determine the use of spawn sites by individuals and by the overall wintering population. An estimated 45-75% of the mid-winter population in the northern Strait of Georgia spent time at Hornby Island, and an estimated 70-81% of the entire mid-winter population of Harlequin Ducks

exploits herring spawn in the northern portion of the Strait of Georgia (M. Rodway, pers. comm.).

Harlequin Duck movements between nearshore feeding areas and offshore resting areas were studied at Hornby Island, B.C. in the fall and winters of 1998, 1999, and 2000. Birds arrived at nearshore feeding areas a few minutes later and departed almost an hour earlier relative to sunrise and sunset when spawn was available than before or after. Cloud cover and high winds resulted in earlier departures from the foraging areas, especially during spawning. Arriving and departing, and offshore groups consisted most frequently of two ducks, and birs showed little tendency to synchronize movements or to form dense flocks when nesting. These results indicate that Harlequin Ducks avoid crepuscular and nocturnal periods near shore when not constrained by food availability and the length of daylight in which to feed (Rodway and Cooke, *in press*).

Harlequin Ducks feces were studied in the Strait of Georgia in the winters of 1998 and 1999 to determine the seasonal changes in resource use during moult (September), mid-winter (January), herring spawn (early March) and spring (end of March and April). Snails, crabs, limpets and chitons were the overall main prey items (both based on % occurrence and volume) while crabs and snails dominated the moult and winter diets. Herring eggs and algae increased during herring spawn while the frequency and relative abundance of other food types decreased. Although fecal analysis failed to adequately quantify the use of herring eggs, the method was effective in documenting seasonal changes in Harlequin Duck winter diet (Rodway, pers. comm.).

Evidence was collected in coastal B.C. that Harlequin Duck broods accompany their mothers from breeding streams to coastal molting or wintering areas. Banded females and their offsprings departed from the breeding areas together and family members were subsequently sighted on the coast near one another, suggesting that they had arrived together. Family groups were seen on the wintering areas in August and September but they tended to separate quickly although some individuals maintained contact for over five months (Regehr et al., 2001).

A study of the rate of losses and effects of nasal tags and colored leg bands on the activity patterns of Harlequin Ducks was conducted in the Strait of Georgia on Harlequin Ducks banded during wing moult (July to September) from 1994 to 2000 (H. Regehr and M. Rodway, pers. comm.). Individuals marked with nasal discs were seen more frequently than those marked only with leg bands and nasal disc retention declined in linear fashion, with a predicted life span of 31 months. Nasal discs did not affect the proportion of time spent in feeding, resting, maintenance, locomotion, defense and courtship behaviours. Sightings of leg bands decreased with band age due to band wear and maximum life span was estimated at 12 years. Pairing success of males with nasal discs was greatly reduced relative to that of males without discs. For females, nasal discs did not affect pairing success although fewer females with discs reunited with previous mates than banded females without discs (H. Regehr and M. Rodway, pers. comm.). Further work is being conducted in coastal British Columbia to characterise the survival and dispersal of adult and juveniles on the B.C. coast (H. Regehr, pers. comm.), investigate mate selection and pairing success to determine whether female mate choice on the wintering grounds controls the timing of pair formation (M. Rodway, pers. comm.), and determine appropriate methodology for estimating winter age-ratios and recruitment (M. Rodway and H. Regehr, pers. comm.).

Scoters

Three species of scoters breed in Canada – the Black Scoter (*Melanitta nigra*), Surf Scoter (*M. perspicillata*), and White-winged Scoter (*M. fusca*). Black Scoters breeding in this country belong almost entirely to the eastern population whose breeding ground is centered in northern Quebec; the western population is centered in Alaska (Bordage and Savard 1995). Scoters are the least known group of sea ducks. However, research efforts in recent years have brought 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) provide useful reviews of recent information on scoters.

Based on traditional mid-winter and 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 scoter species are not differentiated during these surveys as it is difficult to discriminate among them from fixed-winged aircraft. Mid-winter survey data suggested a decline in scoter numbers between 1954 and 1994; however, the trend was not significant (Kehoe 1996). In eastern North America, breeding population estimates declined significantly at an approximate average annual rate of 1% between 1955 and 1992 (USFWS 1993). In the traditional survey area of the Waterfowl Breeding Population and Habitat Survey, scoter breeding population estimates have declined significantly ($P < 0.05$) over the long term (1961- 2001) (Table 7, Fig. 17). The overall population estimate of 820,800 individuals in 2001 was a decrease of 13% compared to the 2000 population estimate. The traditional survey area of the Waterfowl Breeding Population and Habitat Survey (Fig. 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 comprised only of White-winged Scoters, while populations in Western Boreal Canada include White-winged and Surf Scoters. All three species are present in Alaska. In the Canadian Prairies, scoter numbers have sharply declined ($P < 0.05$) over the last ten years and over the long term (no five-year trend could be calculated;

Table 7). Scoter numbers have also declined significantly ($P < 0.05$) over the long term in Western Boreal Canada. The population estimate of 629,900 individuals in 2001 was similar to last year's (Fig. 17). In 2001, no scoters were reported in the U.S. Prairies, and there was no trend over the long term in Alaska (Fig. 17, Table 7). Trend data should be interpreted with caution, however, as these surveys are not well adapted for estimating scoter numbers (Savard et al. 1998). The reasons for the decline in scoter abundance are not well understood.

Some short-term data is also available for the individual 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). On the other hand, wintering numbers of Black and Surf Scoters seem to be increasing (Table 6). The 2001 results from the Atlantic Coast Sea Duck Survey are not available at this time.

The Dalhousie area of New Brunswick has long been thought to be a major spring staging area for scoters. However numbers and duration of migration period were not documented. 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.).

The shellfish industry of British Columbia is in a phase of rapid expansion and a study is being undertaken in coastal B.C. to evaluate the effects of the industry on wintering Scoter populations. The objectives of the study are to : i) determine whether populations of scoters in the Strait of Georgia are limited by food or space, ii) characterize how scoters respond to variations in food supply and iii) determine what aspects of scoter foraging ecology are potential mechanisms leading to population limitation. The study will be conducted across a range of intensity of aquaculture activities and it will involve: i) tracking the distribution and abundance of scoters at various sites, ii) monitoring movements of individually marked birds (radio implants) across habitats and sites and iii) assessing disturbance levels at various sites. Survey data will be geo-referenced (GIS) and associated with site characteristics (water depth, substrate type, distance to and type of aquaculture operation, prey abundance, etc.). These data will be modeled to identify the habitat characteristics correlated with scoter density and the effects of aquaculture operations on scoter activity. The effect of scoters on intertidal clams will be assessed from a bioenergetic model of bivalve prey consumption and from proposed exclosure experiments. Preliminary surveys of scoters at aquaculture sites have been conducted over the last two winters and further surveys are proposed for the 2001-2002 winter (D. Esler, SFU and S. Boyd CWS, pers. comm.).

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. The final line of study will be to investigate the use of winter age ratios as an index of recruitment 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.)

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 are for Surf Scoters as nearly 80,000 birds were counted there (J.-P.L Sarvard, 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. L. 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.). A survey of sea ducks moulting on the mainland coast of British Columbia was flown in early August 1998 from Vancouver to Alaska and produced an estimate of 9,000 to 10,000 moulting Surf Scoters (all located in the northern half of B.C.). The north end of Observatory Inlet held the largest scoter concentrations in the province. Scoter numbers and distribution in the area were very similar to what had been observed in 1986, suggesting that moulting sites are probably highly traditional locations used year after year (S. Boyd and A. Breault, CWS, pers. comm.).

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 only 4,500 birds (M. Robert, pers. comm.). This corresponds to a breeding population of about 1,400 pairs (30% of birds are adult females). Nearly all of the eastern population (3,500 to 4,000 individuals) winters in Quebec, mainly along the St. Lawrence River Estuary (2,500) and, to a lesser extent, along the Gulf of St. Lawrence (1,000-1,500). 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. Because the population is concentrated in a few areas in winter, it is highly vulnerable to oil spills or other disasters. Because hunting also poses a threat to Barrow's Goldeneyes, most areas where wintering and staging birds concentrate have been closed to hunting in Canada. Small harvests occur outside the closed areas. The number of birds harvested each fall in eastern North America is low, but it is important to maintain careful watch because even a small continuous harvest could impact a small population. 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 Quebec 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, Quebec. Three other broods were subsequently observed that same year about 60 km northwest of Sept-Îles, Quebec (Robert et al. 2000). At least 10 other broods were discovered 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; CWS-QC, unpubl.). Two moulting areas (Tasiujaq and Tuttutuuq River, Ungava Bay) identified while tracking males with satellite telemetry were surveyed 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 other area.

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 is available for this population from the breeding waterfowl surveys of the southern Yukon and the interior of B.C. (Fig. 18 and 19). In 2001, the number of breeding pairs of Barrow's Goldeneye decreased by 8% in the southern Yukon (Hawkings and Hughes 2001), but increased by 2% in the interior of B.C. (Breault and Watts 2001) compared to 2000. Breeding pair numbers during the 10 years of the southern Yukon survey do not show any obvious trend. On the other hand, breeding pairs of Barrow's Goldeneye show a substantial decline in the interior of B.C. over the time period covered (1987-2001) by the breeding waterfowl survey. Breeding pair numbers were 27% below the long-term average (1988-2000) in 2001 but 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).

Female Barrow's Goldeneyes have been banded in central B.C. since 1998 in the course of 2 separate studies. Results from the studies establish that Barrow's Goldeneye females do not moult with their brood or on the breeding grounds and that they can aggregate into small groups for their wing moult. Two different moult migrations are therefore occurring in central B.C.: the local breeders depart for an unknown destination while birds of unknown origin come in and replace the local breeders. 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 might lead to the design of new monitoring programs targeting females (A. Breault, pers. comm.).

A graduate research program was undertaken in 1997 to determine nesting and brood-rearing habitat requirements of Barrow's Goldeneye and Bufflehead in central B.C. The objective of the study was to document habitat selection and reproductive performance of those species in habitats subjected to intensive logging, with the intent of providing species-specific recommendations on the management of riparian areas to provincial land management agencies. In contrast to previous studies that have involved artificial nest boxes, this study focused on birds nesting in natural cavities. This work has documented the location, physical characteristics and nesting parameters of 41 Barrow's Goldeneye nests and preliminary analyses indicate large differences in the reproductive parameters (e.g. clutch size, nesting success, sources of predation) between individuals nesting in boxes and those in tree cavities. This study is also examining the relationship between pond productivity, duckling growth rates and the probability that ducklings survive and return the following year. Results of this work indicate that ducklings on more productive ponds have faster growth rates and larger body weights at age 45 days. Return rates also show that ducklings reared on more productive ponds are more likely to return to the study site each year (M. Evans, pers. comm.).

Other Sea Ducks

Information on other sea duck species from the Waterfowl Breeding Population and Habitat Survey and the Black Duck Breeding Ground Survey are also presented in Tables 7 and 8. Information from the roadside surveys in the Yukon and the interior of British Columbia are presented in Figures 18 and 19.

Results from the Atlantic Coast Sea Duck Survey do not show any clear trend in the numbers of Long-tailed Ducks over from 1991 to 2000 (Table 6). The results for the 2001 Atlantic Sea Duck survey are not yet available. In particular, Long-tailed Ducks (previously Oldsquaw, *Clangula hyemalis*), showed no significant population trend in the traditional mid-winter counts ($P = 0.30$) between 1954 and 1994 (Kehoe 1996). Furthermore, In contrast, results from the Waterfowl Breeding Population and Habitat Survey show a significant long-term decline ($P < 0.05$) in the breeding population of Long-tailed Ducks in the entire traditional survey area (Table 7). Significant trends were not detected, however, during the last ten and five years.

Harvest of Sea Ducks

In this section, we present partial harvest information for eiders and results of traditional harvest surveys in Canada and the United States for scoters (harvest data for scoters for the 1974-2000 period are given in Table 9). Lévesque and Collins (1999) provide harvest estimates in Canada for some of the other species and information on hunter activity as well as harvest age and sex ratios. Note that harvest estimates are imprecise for many species due to small sample sizes. Furthermore, a special sea duck harvest survey in Newfoundland and Labrador for eiders, scoters, and Long-tailed Duck has been conducted by H. Lévesque and B. T. Collins (CWS) covering the last three 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

Nearly all (99%) of the harvest of western Arctic eiders within Canada occurs near the community of Holman on western Victoria Island, N.W.T. (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. Crippling loss rate was highly variable (3% to >20%), depending on whether the hunt occurred over ice or from boats in open water. 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.).

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 known.

Embedded shot studies and band recoveries of American Common Eiders in Newfoundland and Labrador support the contention that these populations are heavily hunted. Fifty-four percent and 39% of breeding females examined at colonies in Labrador and Newfoundland, respectively, had embedded shot (P. Hicklin and W. A. Barrow 1997, unpubl.). Also, an eider enhancement program has resulted in the release of about 2,500 birds. In northern Newfoundland, the direct recovery rate of hand-reared ducklings was high (5%) when compared with a rate of ~1% for adult females reported by Krementz et al. (1996). The differences in direct recovery rates may be due to differences in vulnerabilities between juvenile and adult birds, and their hand-reared status. However, when we account for band reporting rates of 30 to 50% and crippling losses of about 50% (S. Pihl, pers. comm.) then a large portion of these birds (20-36%) may have been harvested.

Scoters

In response to the apparent decline in scoter numbers (see above), 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 (Table 9). The 2000 continental harvest estimate of Black Scoters was 6,103, a 43% decrease compared to 1999; the estimate of White-winged Scoters was 4,800, a decrease of 17%; Surf Scoter harvest index was 15,000, a decrease of 30%. Note that harvest estimates are imprecise for this species group due to small sample sizes.

Population Status of Geese

Breeding Conditions in the Canadian Arctic and Subarctic Regions in 2001

Spring arrived early in the Eastern Arctic but relatively late in the Western Arctic in 2001. Ice and snow cover departed about two weeks earlier than normal on Southern Baffin Island and on Southampton Island (M. Mallory et al. 2001). The northern part of Quebec (Harvey and Rodrigue 2001) and the Queen Maud Gulf area of the central Arctic (USFWS 2001) also experienced

an early spring this year. In southern Hudson and James bays (Manitoba, Ontario and Akimiski Island [Nunavut]), snow melt and river break-up were earlier than normal (Abraham, Leafloor and Walton, 2001). However, spring was late coming to Banks Island in the western Arctic (D. Caswell and J.E. Hines pers. comm.) and on Bylot Island in the northern part of the eastern arctic (due to exceptionally heavy snow cover) (J. Hughes, pers. comm.).

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 (USFWS 1999). During migration, the whole population stages in Quebec in the marshes and agricultural lands of the St. Lawrence River Valley.

The growth of the Greater Snow Goose population from a few thousand 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 (Reed and Gauthier 2001). However, the geese have expanded their use of agricultural habitats considerably and even this survey has been unable, in recent years, to account for all of the geese staging in Québec in spring (J. Hughes, CWS, pers. comm.). Researchers from CWS and Université du Québec à Montréal attempted to correct this problem by estimating the number of geese missed during the survey using a sample of radio-marked birds. This technique provided a correction factor for the population estimate in 1998 and 2000, however it was not successful in 1999 due to technical problems. This approach was not repeated in 2001 because of the high cost associated with the large number of radio-marked birds and the intensive ground-based tracking program that was required. Instead, in 2001, the original aerial photographic survey was enhanced by using more than one aircraft simultaneously and completing each of two surveys in a single day. The 2001 spring population estimate is 837,000 geese, the highest un-corrected estimate ever (J. Hughes, CWS, pers. comm.).

For the third consecutive year, breeding conditions were unfavourable on Bylot Island (where the largest known breeding colony is found) (Reed and Gauthier 2001). In 2001, snow cover was the heaviest recorded since studies began in 1989 (J. Hughs, pers. comm.). The timing of nesting was near normal. However, both nesting effort and mean clutch size were below average. Nest success was also below average (52%), due mainly to predation by Arctic foxes and avian predators which was relatively high despite an abundance of lemmings. The reduced reproductive effort and high predation pressure are expected to result in below average production of young (but much higher than the record low of 1999) (J. Hughes, pers. comm.). Nonetheless, due to the high population level, a large fall flight is expected.

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 (Abraham and Jefferies 1997). The increasing number of Lesser Snow Geese in the eastern and central Arctic (see below) 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 (Sharp and Moser 2001; Peterson 2001; Fig. 21). The 2001 midwinter count decreased to 2.35 million geese. 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

CWS coordinated in 1997 a series of photographic inventories of major Lesser Snow Goose nesting colonies in the eastern Arctic, last documented 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. When these areas were first surveyed in 1973, there were only 446,600 and 155,800 nesting birds respectively (R. H. Kerbes, CWS, unpubl.), and the area where nests were found was much smaller. As in the past, population and production surveys were again conducted on Baffin Island in 2001. Spring arrived early on southern Baffin Island and on Southampton Island. Reports from Southampton Island indicate that goose production is at normal to above normal levels. It is not know how representative these conditions are of those throughout the eastern arctic, particularly for the major goose colony on the Great Plain

of the Koukdjuak on southwestern Baffin Island (M. Mallory, pers comm.).

On west Hudson Bay, the 1997 helicopter surveys reported 153,500 nesting birds in the McConnell River area. However, the colony is still well below the high level of 436,400 nesting birds observed there in 1985 (R. H. Kerbes, unpubl.). This decline may be due to destruction of habitat through feeding by geese and emigration of geese to other colonies (Abraham and Jefferies 1997). In 2001, conditions were favourable and an increase in the number of nests was observed (USFWS 2001).

On south Hudson Bay, the 1997 helicopter surveys produced an estimate of 430,000 birds nesting from La Perouse Bay (Man.) to Cape Henrietta Maria (Ont.) (K. Ross, CWS, pers. comm.). On Cape Henrietta Maria, the Lesser Snow Goose breeding population was estimated at approximately 320,000 birds (160,000 pairs), a considerable increase compared to 1973 when the nesting population was estimated at 59,200 breeding adults (R. H. Kerbes, unpubl.). The results of surveys conducted between 1996 and 2000 at this colony (no survey conducted in 1998) show that the number of nesting pairs was now declining. However, indices of breeding snowed geese at the Cape Henrietta Maria colony increased to 129,000 in 2001, up 47% from last year (K Ross, pers. comm.). At La Perouse Bay, the 1997 helicopter surveys produced an estimate of 66,000 breeding birds, ten times the number estimated in 1973 (5,600 nesting birds) (R. H. Kerbes, unpubl.). This year at the La Perouse Bay colony, a reconnaissance flight was conducted from the Whale River to the Broad River. Nesting snow geese were found at low densities over the region, using areas that have not been used for the past few years. Based on the ratios of blue:white geese, the birds are thought to represent a re-distribution of individuals from the local area. At the La Perouse Bay nesting colony, the phenology was described as average, with a bi-modal distribution of hatch dates, with peak dates separated by 8-12 days. Clutch sizes were large. Production at hatch was good, but the subsequent cold and snowy weather may have had an effect on gosling survival (K.F. Abraham and R Rockwell, pers. comm.).

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. F. Abraham, pers. comm.). The number of breeding pairs on Akimiski Island increased in 2001 (USFWS 2001). Spring phenology was beneficial to nesting geese. Snow-fall accumulations in the Hudson Bay Lowland were relatively light and April temperatures were relatively warm (Abraham et al. 2001)

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). Preliminary information from a photographic inventory conducted in 1998 indicates that the snow goose population is now in excess of 1 million scattered over 80 colonies (R. H. Kerbes, unpubl.). This suggests that the population has at least tripled since the last photo inventory. Nest success at Karrak Lake in the Queen Maud Gulf was 66 percent in 2001, 12 percent lower than the ten-year average. This appeared to be a result of increased nest abandonment by adults due to very severe weather conditions throughout incubation (Alisauskas 2001).

Western Arctic Colonies

More than 95% of Lesser Snow Geese in the western Canadian Arctic nest on Banks Island and recent surveys indicate that this population (and hence the overall western Arctic population) has increased tremendously since the 1960s. The total nesting population increased from around 105,000 birds in 1960, to 165,000 in 1976, to 479,000 in 1995 (Kerbes et al. 1999). The 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 of Banks Island (J. E. Hines, pers. comm.). In June 2001, ground counts were conducted on Banks Island for comparison with the 2001 air photo survey. Snow Goose nesting was delayed and a larger than normal proportion of the birds were non-breeders. Spring was very late on Banks Island (D. Caswell and J.E. Hines, pers. comm.).

The remaining birds 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. Because of the late spring that occurred throughout the western arctic in 2001, nesting effort by these two populations was somewhat delayed and reduced (J. E. 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). In 2001, the spring breeding population of Lesser Snow Geese was estimated at 105,000 individuals, about 10,000 birds more than in 2000 and 15,000 more than in 1999. Breeding conditions were very good this year. About 25,000 pairs nested and 87% of those nests were successful. The fall flight should include an estimated 67,250 goslings leaving the colony in 2001, 10% less than in 2000 (V. Baranyuk, pers. comm.). Should gosling survival be high, up to 70 000 Snow Geese might frequent the Fraser and Skagit river deltas in 2001, which would represent 20,000 more geese than in 2000 (S. Boyd, pers comm.).

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*" (Abraham and Jefferies 1997) 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 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 permanently inhospitable. 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 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 Quebec and Manitoba. The dates and locations where special conservation measures were implemented were determined through consultation with the provincial governments, other organizations and local communities. Beginning in spring 2001, Saskatchewan and Nunavut also implemented special conservation measures. The regulatory proposal for 2002 consists of small adjustments to the dates as well as a provision allowing the use of electronic snow goose calls during the regular fall seasons in Quebec, Manitoba, Saskatchewan and Nunavut.

Evaluation

Evaluation plans have been developed which will track progress toward the goals of reduced population growth and, ultimately, recovery by plant communities. For example, across the Arctic in 2000, close to 6,500 Lesser Snow Geese and 3,300 Ross' Geese were marked with neck bands, bringing the total number of birds banded to 14,500 Lesser Snow Geese and 10,300 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 2001 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 begun in 1999 have been successful in increasing harvest rates for Snow Geese. For Greater 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 in effect in Canada only) were 14, 18 and 24%, respectively, for the 1998-1999, 1999-2000, and 2000-2001 seasons. These rates are much higher than 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. If the special conservation seasons were excluded, the harvest rate of adults would have been about 10% (G. Gauthier, CWS, unpubl.). For Lesser Snow Geese, the harvest rate in Canada was much less than that achieved for Greater Snow Geese. About 1,200 additional birds were taken by sport hunters in each year as part of the conservation measures. The continental program, however, has been successful in increasing harvest rates to about double that achieved prior to the

implementation of special measures (J. Kelley, USFWS, pers. comm.).

The analyses indicate that progress is being made to control the growth of Greater and Lesser Snow goose populations through use of the special conservation measures, and that continuation of these measures will be necessary in the short term to help achieve desired population and habitat goals. **Note that the regulatory proposals for 2002 are presented in Appendix A.**

Ross' Goose

About 95% of all Ross' Geese (*Chen rossii*) nest in the Queen Maud Gulf area in the central Canadian Arctic, but some nest on Banks Island and also in the eastern Arctic along the western coast of Hudson Bay and on Baffin Island (Kerbes 1994). 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 northern and central California, New Mexico, Mexico, and along the Gulf Coast of Texas (USFWS 1999).

The 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). The number of Ross' Geese breeding in the sanctuary increased to about 982,000 in 1998 (Alisauskas et al. 1998). Recent surveys at other Lesser Snow Geese colonies in the eastern Arctic have reported 40,000 Ross' Geese at the McConnell River colony, on west Hudson Bay, and 1,000 on western Baffin Island (Abraham and Jefferies 1997). Surveys in 1998 indicated that Ross' Geese on Baffin Island were increasing in number, as numerous groups of adults with young were noted, and more than 2,000 adults were estimated (D. Caswell, CWS, pers. comm.). In Queen Maud Gulf, higher numbers nested compared to 2000, but cold, windy, wet conditions through incubation resulted in poor nest success (R.T. Alisauskas, pers. comm.).

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 seemed to do 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. E. 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 Mid-continent Greater White-fronted Goose population (Warner and Nieman 1999). Preliminary results for 2001 indicate a total of 712,000 geese in fall 2001, which represents a 33% decrease compared to 2000 (Fig. 22) (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 23.

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 Quebec (including Anticosti Island) (Fig. 23).

The provincial, state and federal management agencies are devising a harvest strategy for the North Atlantic Population of Canada Geese. The available data from the breeding grounds of this population are equivocal. Breeding ground surveys include intensive fixed-wing surveys carried out in 1993, 1994, 1998 and 1999 by the Canadian Wildlife Service; less intensive fixed-wing surveys by the U.S. Fish and Wildlife Service each year between 1996 and 2001; and helicopter plot surveys by the Canadian Wildlife Service over part of the range between 1990-2001. The results from the helicopter plot survey for stratum 2 (Newfoundland-Labrador and eastern Quebec) 1990-2001 show a significant ($P < 0.05$) increase in indicated pairs and no trend in total individuals (M. Bateman, pers. comm.). Additional plots were surveyed in 2001 and will give better coverage of the NAP breeding range in future years. Results from the intensive fixed-wing surveys indicate a higher population number in 1998 and 1999 than in earlier years; and the USFWS fixed-wing survey results for 1996-2001 fluctuate widely among years. Results from the USFWS survey in Newfoundland-Labrador showed indicated pairs similar to 2000 and total indicated birds down 26% from 2000 (129,000 from 175,800) (Bidwell and Drut 2001).

Age ratios from geese in Newfoundland-Labrador, Nova Scotia and Prince Edward Island have been low since 1996. The age ratio was the same in 2000 as it was

in 1999 (0.5 immatures per adult) The ten year average is 0.89 immatures per adult. Results in recent years may be confounded by temperate-breeding geese in the harvest (M. Bateman, pers. comm.).

Atlantic Population (AP) Canada Goose

Atlantic Population Canada Geese (composed largely of *B. c. interior)* nest throughout northern Quebec, especially along Ungava Bay, the eastern shore of Hudson Bay, and in the interior of the Ungava Peninsula (Fig. 23).

In 1993, an annual breeding ground survey was implemented in northern Quebec with the objective of monitoring the status of the Atlantic Population of Canada Geese by estimating the number of breeding pairs on the Ungava Peninsula (Harvey and Rodrigue 2001). 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 have been 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. A fourth region situated in the taiga and boreal forest to the south, where densities of breeding geese are lower, is surveyed at intervals.

In 2001, the number of Canada Geese observed as pairs or as single birds (indicated breeding pairs) was 146,662 ± 16,185 (SE), which represents an increase of 57% compared to 2000 (Harvey and Rodrigue 2001; Fig. 25). The number of pairs breeding on the Hudson Bay coast was much higher than last year, while numbers breeding on the Ungava Bay coast were lower than previously. The number of non-breeding geese decreased by 20% on Hudson Bay and increased by 16% along Ungava Bay. However, this result may have been confounded by the presence of large numbers of moult-migrants (Harvey and Rodrigue 2001).

In contrast to last year, conditions in 2001 were very good; spring was early as the snow cover was lighter than during the past two years and the weather in late May was warmer than usual (Hughes 2001). Peak hatching was on about June 24 one day earlier than the mean of the previous four years. On both sides of the Ungava Peninsula, clutch size was about average and with some exceptions, predation was relatively low. At several sites visited in the Hudson Bay area and some sites in the Ungava Bay area, nest densities increased by approximately 50 percent compared to previous years. This probably represents recruitment of large numbers of first-time breeders from 1998 when breeding conditions were excellent and restrictions on sport hunting were severe (J. Hughes, pers. comm.).

Canada Geese are also counted during the Black Duck Breeding Ground Survey of eastern Canada. The region covered by this survey is at the southern limit of the nesting range of AP Canada Geese, and most of the geese in stratum 3 (central portion of the Boreal Shield region) and part of those in stratum 4 (western portion of the Boreal Shield region) belong to this population. The number of indicated breeding pairs of AP Canada Geese observed in Quebec in 2001 was the thirdhighest recorded since the beginning of the survey in 1990 (Bordage 2001; Fig. 26). The estimate of 22,100 ± 5,200 (SE) represents a decrease of 14% compared to last year's record high of 25,600 pairs.

Giant Canada Goose in Southern Ontario

This population of Canada geese is called Giant as they have developed mainly from genetic stock of the Giant type (*B. c. maxima*). These geese often migrate to James Bay and Hudson Bay to Moult and many winter in Virginia or as far South as Georgia (N. North pers. comm.). With the successful re-establishment of local Canada Goose populations beginning in the late 1960s, an increasing number have remained to winter in the province.

Populations of Giant Canada Geese have been expanding dramatically throughout southern Ontario (and have begun to increase in southern Quebec as well). By 1970, Canada Geese still did not commonly nest in southern Ontario. However, surveys in 1977 and 2000 have shown a population increase from approximately 20,000 to 400,000 Canada Geese in the "fall flight" from southern Ontario (Dennis et al. 2000; N. North, CWS pers. comm.).

Southern James Bay Population (SJBP) Canada Goose

This population nests on Akimiski Island in James Bay and in the adjacent lowlands to the south and west. It winters from southern Michigan to Mississippi, Alabama, Georgia, and South Carolina (USFWS 1999; Fig. 23).

For some years now, there has been concern about the status of this population. From 1985 to 1988, mid-winter counts averaged about 154,000 birds, but in 1990 a spring breeding ground survey reported only about half that number. The 2001 spring survey of SJBP Canada Geese on Akimiski Island and the adjacent lowlands of southern James Bay produced a population estimate of 102,671 geese, a increase of 15% compared with last year's population estimate (J. Leafloor and K. Ross, CWS, unpubl.; Fig. 27). Few moult-migrants were present during the survey and are not considered to be a confounding factor in the 2001 results. Compared with 2000, the number of breeding pairs (9200) on Akimiski Island increased by about 8%. On the mainland, breeding pairs decreased by 18% compared with last year, and are slightly lower than 1995-1998 numbers. Overall, the total spring population was equal to the ten-year average (1990-2000) (J. Leafloor and K. Ross, unpubl.).

There is evidence that increasingly large numbers of moult-migrant "Giant" Canada Geese are moving 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, especially in the coastal lowlands west of James Bay and south of Hudson Bay. This population winters in Illinois and southern Wisconsin (USFWS 1999; Fig. 23).

The spring population estimate in 2001 was 470,000 geese, a 56% decrease from 2000 (J. Leafloor, K. Ross, CWS, unpubl.; Fig. 28). The estimated number of nests (176,600) was 5% lower than in 2000. Flocks of moult migrants were observed at Moosonee beginning on 24 May, but major movements did not occur until early June. Surveys along the coast for non-breeding birds were not conducted this year. A fall flight of about 697,000 was expected, a reduction of 46% from last year's forecast (J. Leafloor, K. Ross, unpubl.). Nesting began early, and production is expected to be good to excellent based on ground studies at Burntpoint Creek along the Hudson Bay coast (J. Leafloor, 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 1999; Fig. 23).

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 1999 indicate a population of about 100,000 breeding birds. In the past eight 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.). Spring breakup was early during 2001 on Southampton Island, and expected to be early on Baffin Island. Based on the early spring phenology, production should be good this year (USFWS 2001).TGPP Canada Geese mix with other Canada Geese on wintering grounds, which makes it difficult to estimate population size. The January 2000 mid-winter survey produced an estimate of 149,100 geese, which was much lower than in 2000 (295,700 geese) (USFWS, 2001).

Eastern Prairie Population (EPP) Canada Goose

This population nests in the Hudson Bay lowlands of Manitoba and winters throughout Missouri (USFWS 1999; Fig. 23).

Spring surveys of EPP Canada Geese have been flown annually since 1972, providing good baseline data for this population. In 2001, the spring population was estimated at 215,400 ± 28,400 (95% CI), a reduction of 12% from the 2000 estimate, which was the highest estimate on record (Humburg et al. 2001; Fig. 29). As in several recent years, large numbers of geese in groups (93,100 ± 23,500) accounted for much of the total population estimate (43%). Neither geese in pairs (83,600 ± 13,300) nor represented by singles (38,600 ± 8,800 increased in 2001. In addition, the number of geese represented by singles and pairs (93,100 ± 23,500) did not increase from the 2000 estimate. Despite a decline in the EPP, production will likely be greater than in 2000. An early nesting season, higher clutch size, and local increases in nesting densities should offset the lower EPP. However, the fall flight in 2001, although comprised of a greater proportion of immatures, should be no higher than in 2000 (Humberg et al. 2001).

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 (USFWS 1999; Fig. 23).

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 2001 count of 682,700 geese was 15% higher than that of last year. This population index has significantly increased over the last ten years (USFWS 2001). 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 eastcentral Saskatchewan indicated that the spring waterfowl surveys provide a good measure of trends in populations (Nieman et al., 2000), and that they could be used on an annual basis to assess the abundance of the various populations of large Canada Geese breeding on the prairies (D. J. Nieman, CWS, 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). Spring waterfowl surveys in the Dakotas, Saskatchewan, and Manitoba estimated 558,700 WPP/GPP geese in 2001, which represents a decrease of 30% compared to 2000 (USFWS 2001). At present, WPP/GPP Canada Geese should remain above population goals. Habitat conditions throughout the breeding range this year were very good during the nesting period. The production of geese was expected to

be at least average and the fall flight larger than that of last year (USFWS 2001).

Hi-Line Population (HLP) Canada Goose

Hi-Line Population Canada Geese nest in southeastern Alberta, southwestern Saskatchewan, eastern Montana and Wyoming, and in northcentral Colorado. This population winters in northcentral Colorado and in central New Mexico (USFWS 1999; Fig. 23).

In January 2001, the estimated number was 252,900 a 7% reduction from the 2000 survey (USFWS 2001). Based on mid-winter surveys, the number of HLP Canada Geese has increased (P = 0.05) an average of 7% per year since the beginning of the surveys (USFWS 2001). HLP Canada Geese are 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). Spring waterfowl surveys in Saskatchewan, Alberta, and Montana provided an estimate of 252,800 HLP Canada Geese in 2001, a 9% decrease compared to 2000 (USFWS 2001). The trend over the last ten years indicates a significant (P = 0.002) increase of 6% per year in the spring population. Nesting conditions were poor to fair throughout much of the breeding range. Production was reduced due to drought in most areas, and spring storms and flooding in Colorado. The fall flight of HLP geese is expected to be reduced from that of last year (USFWS 2001).

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 (USFWS 1999; Fig. 23). 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 (Hines et al., in press). 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).

In January 2001, 160,000 Canada Geese were counted during the mid-winter surveys, which is 18% lower than last year. This index has declined 11% per year since 1992 (P = 0.03). The spring 2001 waterfowl surveys in the Western part of the Northwest Territories and northern Alberta 2001 estimated 116,600 geese, a 110% increase from 2000. This estimate showed no trend since 1992.

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, Colorado, Utah, Idaho, and Montana (USFWS 1999; Fig. 23).

In January 2001, 110,600 geese were counted during the mid-winter surveys, which represents a 8% increase compared to 2000. Based on mid-winter surveys, the number of RMP Canada Geese has significantly increased since the beginning of the surveys; however, no trend was detected over the last 10 years (USFWS 2001). RMP Canada Geese are 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 508% between 1970 and 1999 (Nieman et al. 2000). Spring waterfowl surveys in southern Alberta, southwestern Saskatchewan, and Montana provided an estimate of 161,400 geese in 2001, which was 3% lower than last year's estimate. In contrast with the mid-winter surveys, spring population numbers have significantly increased by approximately 7% in the last ten years (USFWS 20001). Most RMP breeding areas experienced drought in 2001, but low snowpack also reduces spring flooding in inter-mountain areas. Biologists expect near average production in most areas and a large fall flight similar to last year (USFWS 2001).

Pacific Population (PP) Canada Goose

The Pacific population nests and winters west of the Rocky Mountains (USFWS 1999; Fig. 23). 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 is steadily increasing. The B.C. Cooperative Waterfowl survey indicates that the total number of PP Canada Geese observed in central B.C. was 4% higher in May 2001 than in 2000 and 52% above the long-term (1988-2000) average (Breault and Watts 2001). 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.).

In the U.S., the number of nesting pairs in California was down 26%, and production was reduced by 14% compared to 2000. In Nevada and Washington, production was predicted to be low due to dry conditions. However, nesting indices in Washington this spring were 10% higher than last year and production was expected to be average to above average in Montana and Oregon. (USFWS 2001).

Lesser Canada Goose

Lesser Canada Geese breed throughout much of Alaska and migrate along the Pacific coast to winter in Washington, Oregon, and California (USFWS 1999; Fig. 23). As they winter with other populations of Canada Geese, there is no reliable mid-winter index for this population. The spring population survey estimates 272,500 geese, 14% higher than last year but showing no trend in the last ten years (USFWS 2001). Spring came relatively late in western and northwestern Alaska but areas to the southeast experienced normal spring phenology (USFWS 2001).

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 is comprised of the subspecies *B. b. hrota* and 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 (Fig. 30a; Serie and Raftovich 2001). In 2001, the mid-winter population index was 145,300 Brant, which is 8% lower than in 2000. No significant trend in population size was detected over the last ten years (USFWS 2001). Spring breakup in 2001 was early in the eastern Arctic; up to two weeks earlier than average on Southampton Island. The advanced phenology is expected to increase production on the northern breeding grounds of Brant. A larger fall flight than last year is expected (USFWS 2001)

Eastern High Arctic Brant

This group is also comprised of the subspecies *B. b. hrota* and 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). The 2001 census estimates a population of 22,000 wintering birds in Ireland (J. Robinson, U.K., pers. comm.).

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 have declined since the early 1960s (Fig. 30b; Drut and Trost 2001). The January 2001 mid-winter index count was 125,000 birds, 8% lower than in 2000, but similar to the ten-year 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. In Alaska, spring breakup was later than in recent years and clutch sizes were smaller than normal. Nesting effort at five colonies accounting for ca. 80% of all nesting in Alaska was 60% below the record-high 2000 effort. Therefore, overall productivity is expected to be very poor this year (B. Leedy, pers. comm.).

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.E. Hines, unpublished data).

During spring migration, part of the Black Brant population stages along the coast of British Columbia. It is estimated that between 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 steadily since 1992 and the peak winter population was estimated at 1,254 birds during the 2000-2001 winter, which represents an increase of 1.3% from last year's peak value. (K. Hagmeier and S. Boyd, pers. comm.). An additional 10-12 Brant have been observed wintering on the east coast of Vancouver Island over the last four years 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 sports 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*, but is thought by some biologists to be a unique subspecies. It breeds on islands of the western high Arctic and winters in Puget Sound (Wash.) (Reed et al. 1998b). Based on mid-winter counts, there is relatively great fluctuation in the population size of Western High Arctic Brant (Fig. 30b). The Western High Actic index count from Washington State was 4881 Brant, 38% lower than 2000 (D. Kraege, pers comm.). An additional 200 Western High Actic Brant were estimated to winter in B.C. in 2001, 16% lower than in 2000 (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.).

Harvest of Geese

In this section, we present results of harvest surveys in Canada and the United States for Snow Geese and Canada Geese for the 1974-2000 period (harvest data are given in Table 10). Lévesque and Collins (1999) provide harvest estimates in Canada for other species and information on hunter activity as well as harvest age and sex ratios. We also present results of the special conservation season for Greater Snow Geese in Quebec and Lesser Snow Geese in Manitoba, Saskatchewan and Nunavut.

Greater Snow Goose

In Canada, the 2000 harvest was estimated at 104, 500 (Table 10a), a value nearly triple the 1999 harvest. This is the highest number of geese harvested on record. In the U.S., the harvest was estimated at45,500, an increase of 16% compared to 1999. In 1998, the U.S. harvest estimate was the highest ever recorded and reflected an important increase in Snow Goose hunters in the eastern United States that year, particularly in Delaware, New Jersey, Maryland, and North Carolina. This may have been related to the publicity surrounding overabundant Snow Geese and bigger daily bag limits (P. Padding, USFWS, pers. comm.). The Canadian estimate in 2000 was the highest on record. Most of the Canadian Greater Snow Goose harvest occurs in Quebec.

During the special conservation season in Quebec, an estimated 49,770 ± 5,895 were harvested in spring 2001. This is similar to numbers harvested in the two previous conservation seasons (1999: 44,800 and 2000: 54,600). The estimated number of hunters participating in the special conservation season was 5,173 ± 289, a decrease of 45% compared to the number participating in 2000 (B. T. Collins, unpubl.). The special conservation measures undertaken in the United States did not include opportunities to hunt Greater Snow Geese.

Lesser Snow Goose

In the United States, Lesser Snow Geese are harvested in all four flyways, but mostly in the Mississippi and Central flyways. In 2000, the U.S. Harvest showed the first decline since 1994. The harvest estimate was 453,462 geese, a decrease of 52% compared to the record high estimate of 1999 (Table 10b). In Canada, the estimated harvest in 2000 (122,725) was 21% lower than the 1997-1999 harvest estimates.

In 2001, a special conservation season was initiated in Saskatchewan and Nunavut, and was conducted once again in Manitoba. In Saskatchewan, an estimated 512 ± 269 geese were harvested by an estimated 104 ± 24 participating hunters (B. T. Collins, unpubl.). There were very few permits sold in Manitoba and Nunavut. Consequently, the number of geese harvested was not estimated in the spring of 2001.

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.; Fig. 31). The harvest for the 2000 hunting season was estimated at 1577.

Canada Goose

Table 10c 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 in both countries can not 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.

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 2001 mid winter survey estimate of 90,300 swans was virtually unchanged from the 2000 estimate of 89, 600 swans. However, this population index has been increasing at an average rate of 5% since 1992. The mid winter index for the eastern population showed a 5% decline in 2001 (98,200 swans) from 2000 (103,100 swans). There is no significant trend in this estimate over the last ten years (USFWS 2001).

In the Mackenzie Delta region, which probably is the most important breeding area for Tundra Swans in Canada, a low percentage of the pairs produced broods and the productivity was very low this past year. This area accounts for perhaps 1/3 of the eastern population, so a further decline might be expected in this year's wintering counts. Also, because of the late spring elsewhere in the Canadian Arctic, breeding conditions were poor throughout most of the range of the eastern population (J. E. Hines, pers. comm.).

In the U.S. in 2000, 892 swans from the western population were killed and retrieved, a 36% decrease from 1999, and a 46% decrease from 1998.. The number of swans killed and retrieved from the eastern population (3,593) remained the same as the previous two years (3,601 in 1999 and 3,543 in 1998)(Sharp and Moser 2001). There are no open seasons for Tundra Swans in Canada.

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.

A survey was conducted in 2001 on a number of lakes in the Grande Prairie, Alberta area (Rocky Mountain Population) but did not cover the whole area surveyed in 2000. In the wetlands surveyed, there were 247 adults (an increase of 49% compared to 2000), and 41 cygnets (a decrease of 24% compared to 2000) (G. Beyersbergen, pers comm.).

Population Status of Other Hunted Migratory Birds

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 overharvested, 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.).

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 normal regulatory approaches.

American Woodcock

The status of American Woodcock (*Scolopax minor*) in North America is monitored through the Singing-ground Survey, which consists in 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 2001). 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 Quebec and in the Maritimes are part of the Eastern Population.

The number of American Woodcock displaying during the 2001 singing ground survey in the eastern region was not significantly different ($P > 0.05$) from the 2000 level. The number of Woodcock displaying in the central region decreased significantly ($P < 0.05$) from 2000 levels (Kelley 2001; Fig. 32). Over the 1991-2001 period, counts have decreased significantly ($P < 0.01$) in both regions (-2.6% in the Eastern Region and -2.5%in the Central Region). Long-term trends (1968-2000) indicate a significant decline ($P < 0.01$) of woodcock breeding populations in the Eastern (-2.5%) and Central (-1.6%) regions. In Canada, the number of American Woodcock displaying during the 2001 Singing-ground Survey differed significantly ($P < 0.05$) from 2000only in Manitoba (-14%) (Kelley 2001). Counts over the 1990-2000 period show a significant decline in woodcock breeding populations in Quebec (-3.9%; $P < 0.05$) Ontario (-3.1%; $P < 0.01$) and Manitoba (-2.0%; $P < 0.05$). Trends over the long-term (1968-2000) in the number of woodcock displaying show a significant decline in Ontario (–1.4%; $P < 0.01$) and Manitoba (-1.1%; $P < 0.05$) (note that Manitoba began participating in the Singing-ground Survey only in 1990). In addition, the 2000 singing ground indices showed a decrease of 24% in P.E.I., a decrease of 58% in Nova Scotia and a decrease of 29% in New Brunswick (Bateman 2001). 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 2001).

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 recruitment indices for the 1999 breeding season in the U.S. portion of the Eastern and Central Regions were 1.4 and 1.2 immatures per adult female, respectively. These values are low compared to historical records. In the Eastern Region, the recruitment index was 18% below the long-term (1963-2000) regional average, while in the Central Region it was 29% below the long-term average (Kelley 2001).

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. 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 (1966-2000). Populations in the Boreal Plains, Great Basin and Northern Rockiesecozones do not show any significant trend over that time period. During the last ten years, only the 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 ($P < 0.05$) (E.H. Dunn and B. McBride, pers comm).

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, et al. 2001). 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. In all three management units, the number of Mourning Doves heard per route declined significantly ($P < 0.05$) over the most recent 10 years (1992-2001; -1.0% to -.-2.5%) and over the long-term (1966-2001; -0.4% to -2.2%).

Common Snipe

Common Snipe (*Gallinago gallinago*) in Canada are also monitored through the Breeding Bird Survey. Populations of Common Snipe in the Prairie and Boreal Hardwood Ecozones have increased significantly ($P < 0.05$) over the long-term (1966-2000). Populations in Boreal Plains, Boreal Softwood Shield, Great Basin, Northern Rockies, and Atlantic Forest ecozones, as well

as in the entire country, do not show any significant trend over that time period. On the other hand, snipe populations in the Boreal Softwood Shield and Prairie Pothole ecozones and in the country as a whole have increased significantly ($P < 0.05$) over the last ten years, while no trends were detected in the other ecozones (E.H. Dunn and B. McBride, pers comm.).

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 north-westward 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. 1997).

The Mid-continent Population of Sandhill Cranes is monitored on the wintering grounds through a spring aerial transect survey. Indices corrected for visibility bias are available since 1982. The most recent population index available is for 2000 and indicate a 37%increase in the population compared to 1999 (Sharp and Moser 2001; Fig. 33). Overall, there does not seem to be any trend in population abundance since 1982.

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 indicate a significant ($P < 0.05$) long term (1966-2000) decline in the population (E.H. Dunn and B. McBride, pers. comm.) 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 of those sites (in the Fraser Valley) from June to August 2001 to assess current use of each mineral site. The results of this survey will be used to design and implement a Flyway-wide (i.e. California, Washington, Oregon and British Columbia) operational survey of Band-tailed pigeons at mineral sites (Casazza and Breault, pers. comm.).

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 (Fig. 34). In recent years, however, the population has maintained itself at levels substantially higher than seen during the 1980s and early 1990s. The 2001 population estimate of 1.2 million coots decreased by 32% compared to 2000.

Rails

Rails are counted during the Breeding Bird Survey, 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). Trends are not reliable for the Yellow Rail (*Coturnicops noveboracensis*), because of relatively low numbers of counts. For Virginia Rails and Sora, no significant long-term (1966-2000) or short-term (1991-2000) population trends were indicated in any ecozone or in the country as a whole. (E.H. Dunn and B. McBride, pers. comm.). 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, CWS, pers. comm.).

Harvest 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 waterfowl hunters in the U.S. (Waterfowl Hunter Questionnaire Survey). Because in the U.S. waterfowl hunters only constitute about 1/3 of other migratory game birds hunters, U.S. estimates underestimate actual harvest levels (P. Padding, pers. comm.). Murre harvest is estimated through special surveys.

Murres

The annual murre harvest has been estimated 12 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 has been 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 current total annual harvest of murres is currently assessed at about 250,000 to 300,000 birds, compared to 600,000 to 900,000 birds prior to hunting restrictions.

American Woodcock

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. In 2000, there were 51,243 woodcock harvested in Canada, a 17% decrease from last year (Fig. 35). In the U.S., the 2000 harvest was estimated at 211,000 woodcock, a 14% percent decrease compared to last year.

Mourning Dove

In Canada, Mourning Doves are hunted only in British Columbia. The harvest has varied considerably from year to year, ranging from an estimated high of 5,391 doves killed in 1977 to less than 500 in 1993 and onward (H. Lévesque and B. T. Collins, unpubl.). 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 2000 was 11.8 million doves, an increase of 6% compared to the 1999 harvest (E. M. Martin, USFWS, unpubl.).

Common Snipe

The harvest of Common Snipe in Canada has also been declining over the years. However, the harvest of Common Snipe is increasing after a long period of decline in the U.S. (Fig. 36). In 2000, there were 15,826 snipe harvested in Canada, an increase of 5% compared to 1999. The estimated harvest in the U.S increased by 53% to 323,800 this year.

Sandhill Crane

The harvest of Mid-continent Sandhill Cranes has been increasing in the U.S. over the years. The crane harvest in Canada has been quite variable (Fig. 37). The overall Canadian harvest of Mid-continent Sandhill Cranes in 2000 (Saskatchewan and Manitoba) increased by 13% to 9443 birds compared to 1999 (Fig. 37). The crane harvest in the U.S. decreased by 12% to 15500 in 2000 compared to last year. The Canadian hunting season for Mid-continent Sandhill Cranes is currently open only in Manitoba, Saskatchewan, and the Yukon Territory. No cranes have been reported in the Yukon harvest, except in 1998 (<10 birds). It is estimated that cranes can sustain only about a 5% harvest rate, because of their late age of maturation and low reproductive rate. The current harvest in all jurisdictions is close to the 5% level. The Sandhill Crane season in the southern Prairies is closed temporarily when whooping cranes are in the same area. Although the population of whooping cranes is slowly recovering, they are still listed as Endangered.

Band-tailed Pigeon

In 1990, the daily bag limit in B.C. was decreased from 10 birds to 5, and the season shortened by one-half, but declines in numbers continued. The Canadian hunting season for this species has been closed since 1994. The U.S. still has an open season for Band-tailed pigeons. The harvest estimate for 2000 was 13,610 birds, a 57% increase compared to 1999 (Drut and Trost 2001).

American Coot

The harvest of American Coots in Canada has decreased considerably over the years. In2000, the American Coot harvest was estimated at 4126 birds (H. Lévesque and B. T. Collins, unpubl.), an 8% decrease compared to last year.

Rails

The only province with an open season for hunting rails is Ontario (excluding King Rails [*Rallus elegans*]). 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 Quebec 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. The first five years of data show a steady decline in the harvest of rails; no rail harvest has been reported since 1994.

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Figures

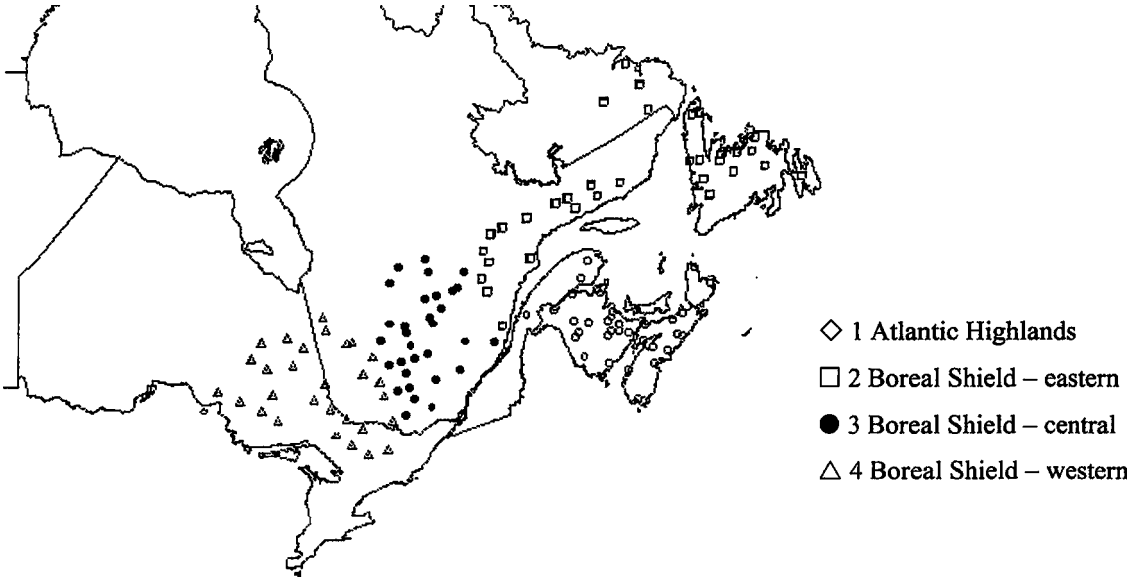


Figure 1. Survey area of the Black Duck Breeding Ground Survey of eastern Canada.

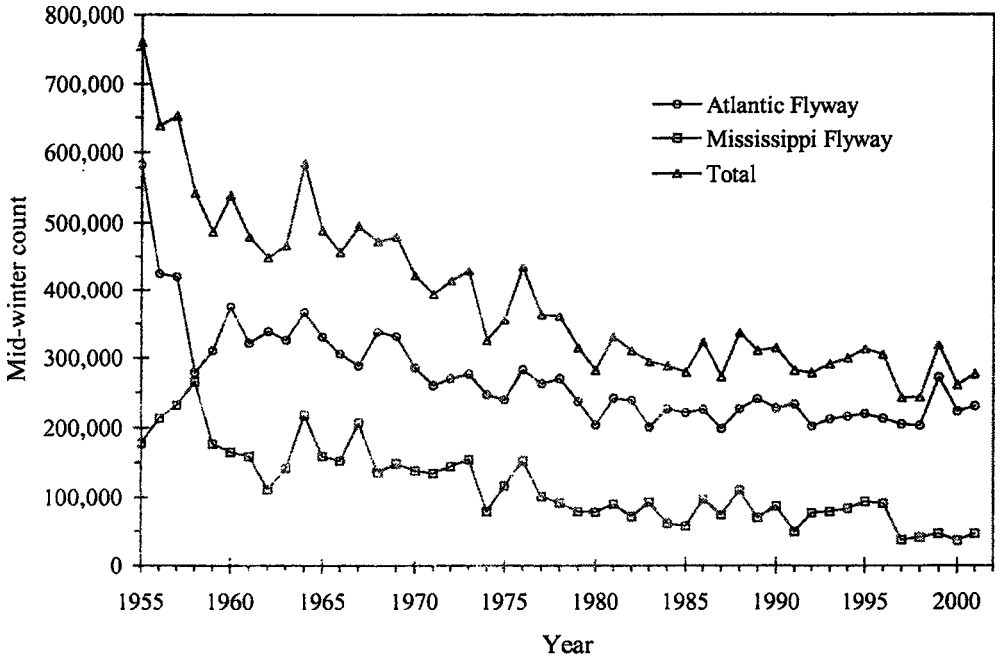


Fig. 2. Mid-winter survey of American Black Ducks in the Atlantic and Mississippi flyways. Survey results in the Atlantic Flyway for 2001 and in the Mississippi Flyway for 1993 and 1997 were incomplete in some states.

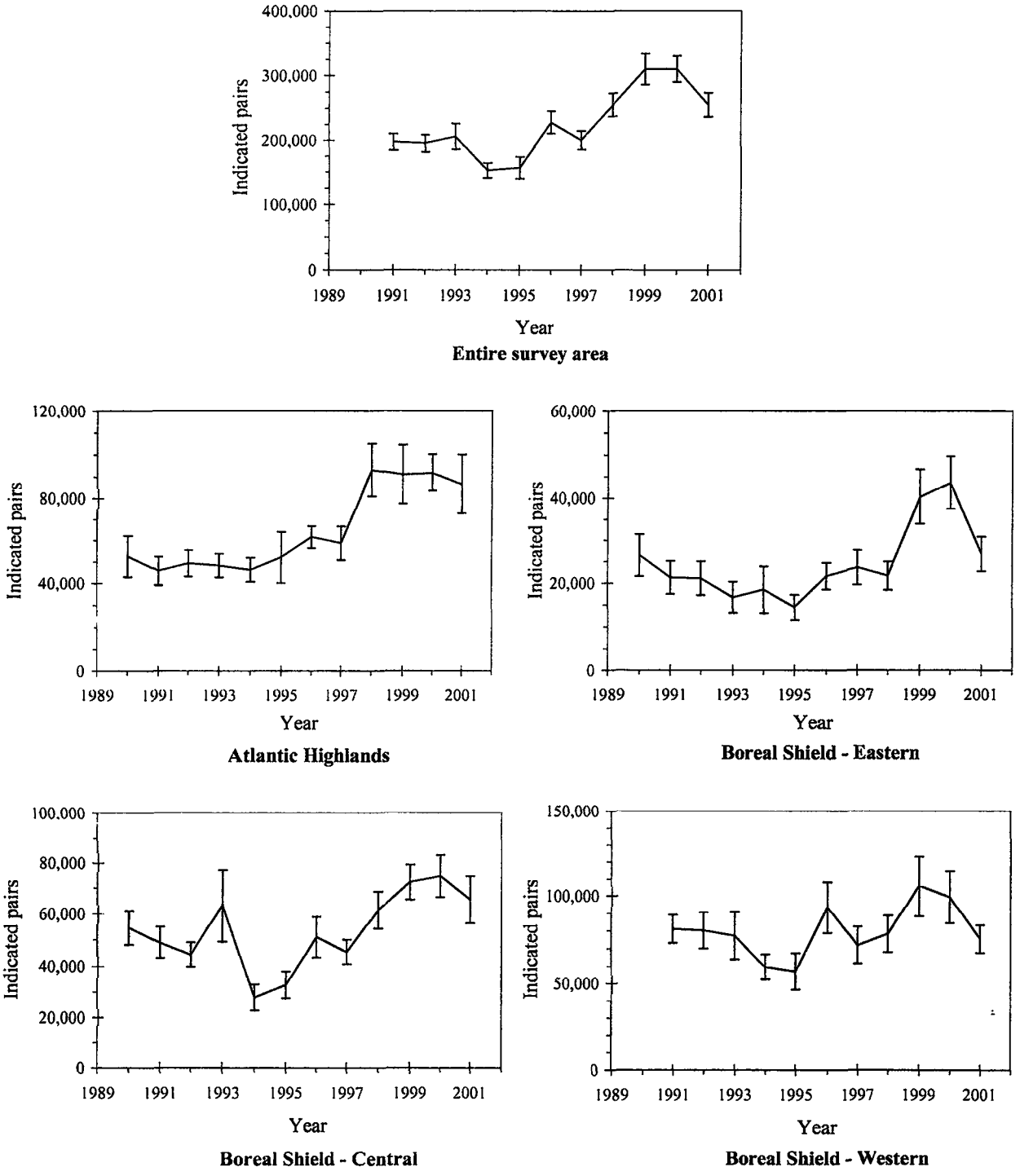


Fig. 3. Estimated number of indicated breeding pairs (± 1 SE) of American Black Ducks in the Black Duck Breeding Ground Survey area of eastern Canada (Collins 2001). The 1990 data in the western portion of the boreal shield region were not comparable with other years and were therefore excluded.

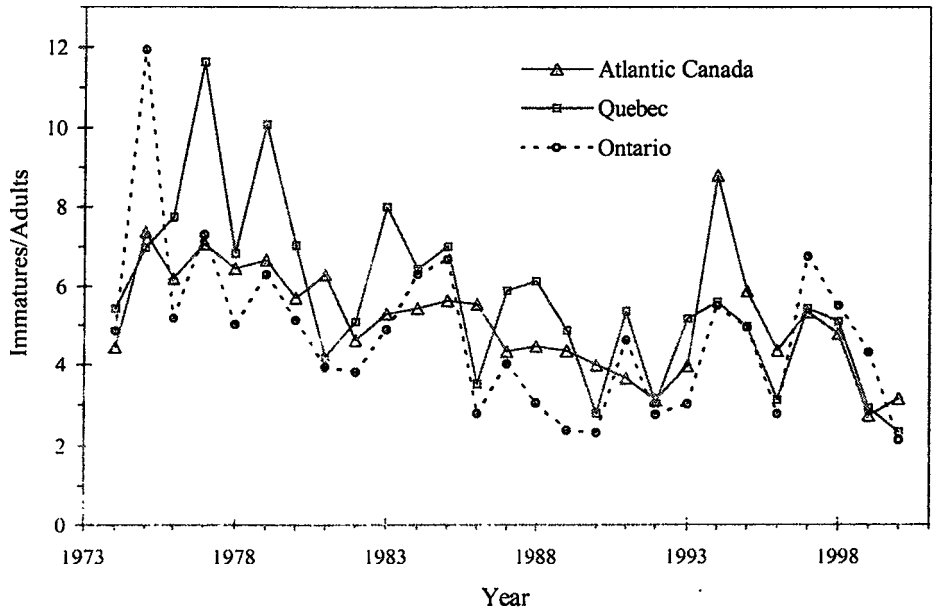


Fig. 4. Age ratios of American Black Ducks in the eastern Canada harvest (H. Lévesque and B. T. Collins, CWS, unpubl.). Age ratios are not adjusted for differential vulnerability to harvest of juveniles and adults.

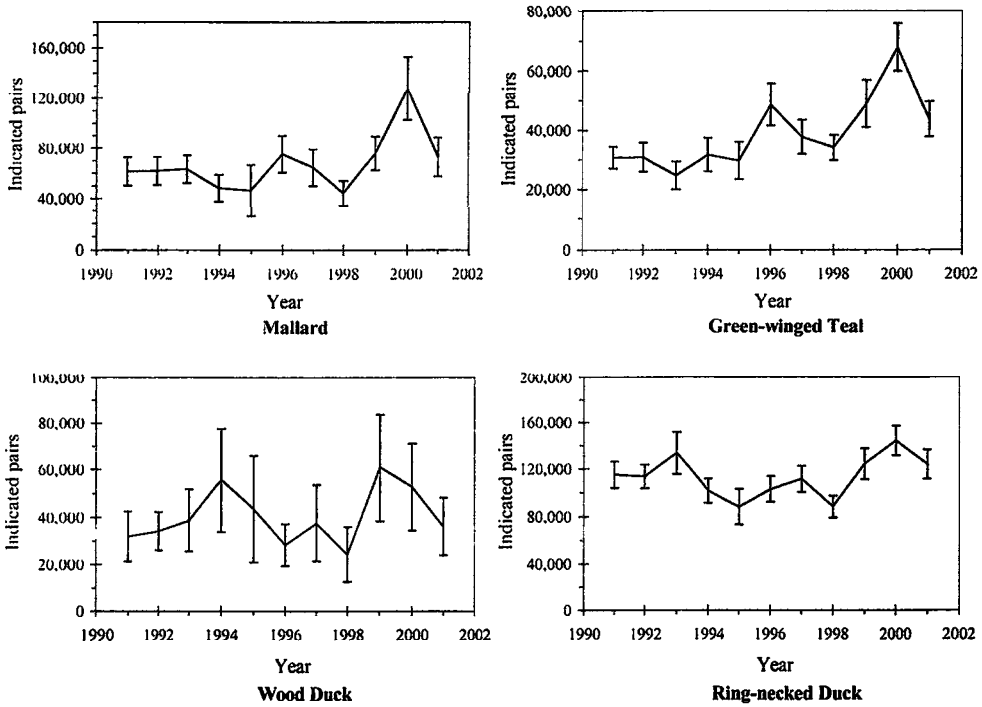


Fig. 5. Estimated number of indicated breeding pairs (± 1 SE) of the most abundant inland duck species in the entire survey area of the Black Duck Breeding Ground Survey of eastern Canada (Collins 2001). The 1990 data in the western portion of the boreal shield region were not comparable with other years and were therefore excluded.

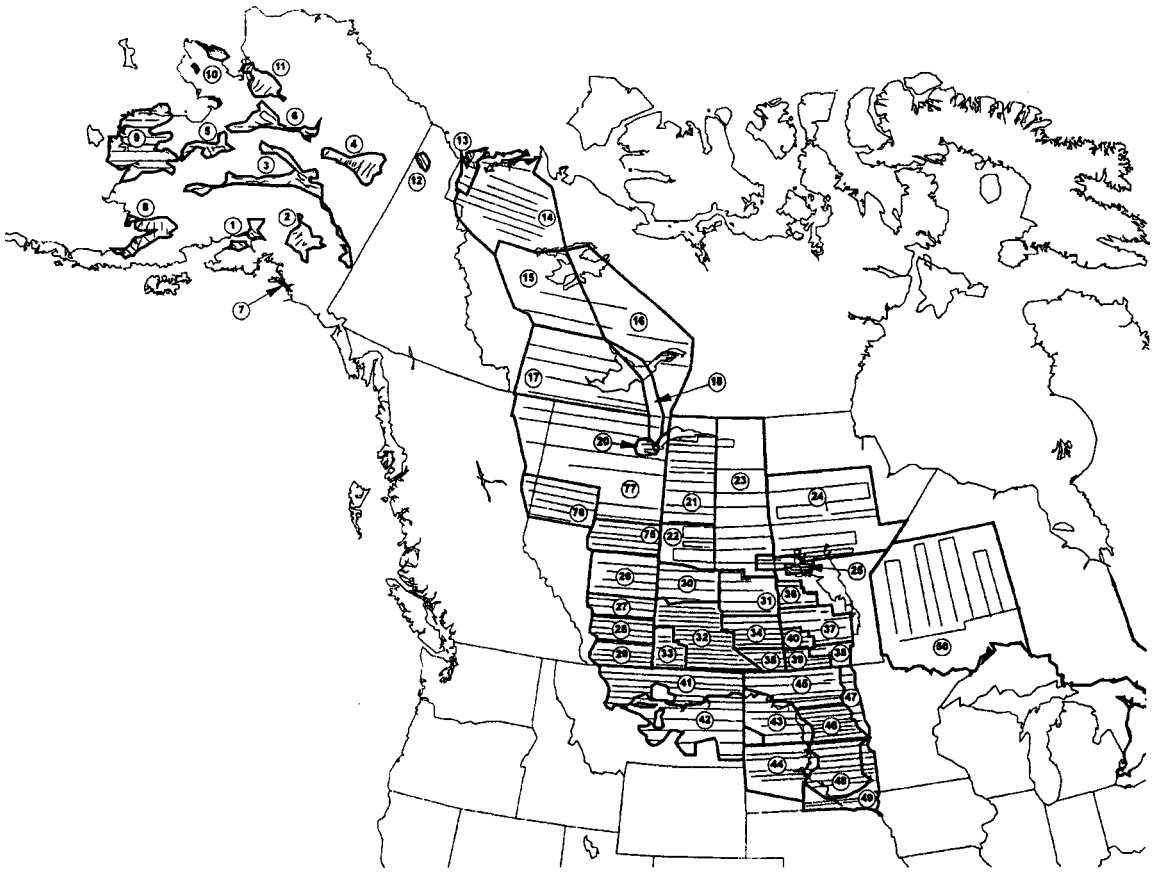


Fig. 6. Traditional survey area of the Waterfowl Breeding Population and Habitat Survey of Western Canada and United States (Department of the Interior and Environment Canada 1987). The traditional survey area is composed of four regions: Alaska (strata 1-11), Western Boreal Canada (strata 12-25, 50, 75-77), Canadian Prairies (strata 26-40), and U.S. Prairies (strata 41-49).

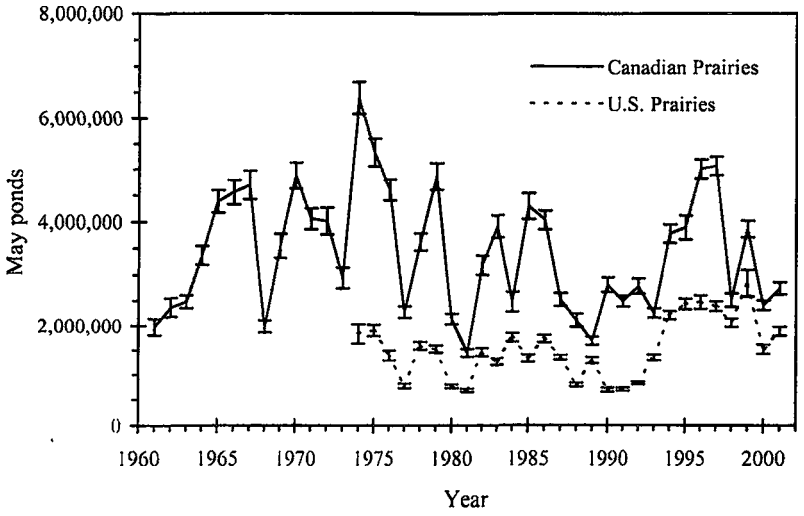
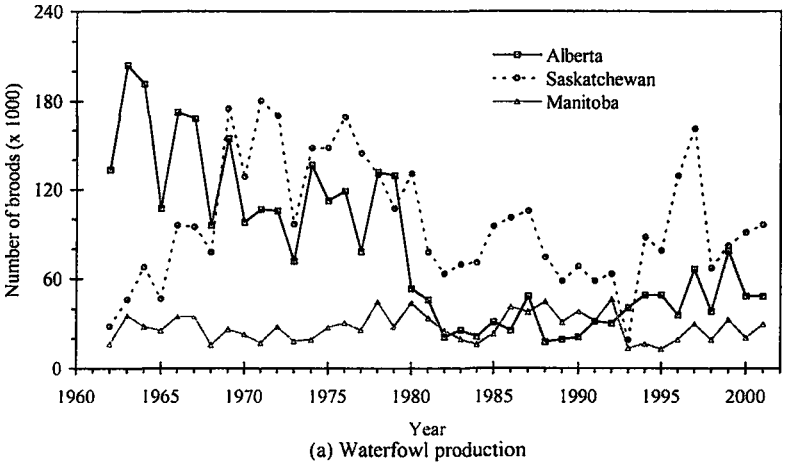


Fig. 7. Estimated number of May ponds (± 1 SE) in the Canadian and U.S. Prairies.



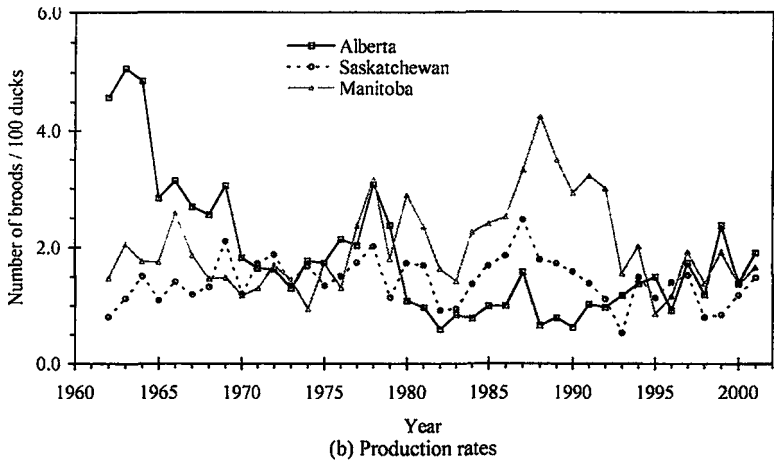


Fig. 8. Waterfowl production and production rates (all species of ducks combined) in the Canadian Prairies (Caswell and Schuster 2001).

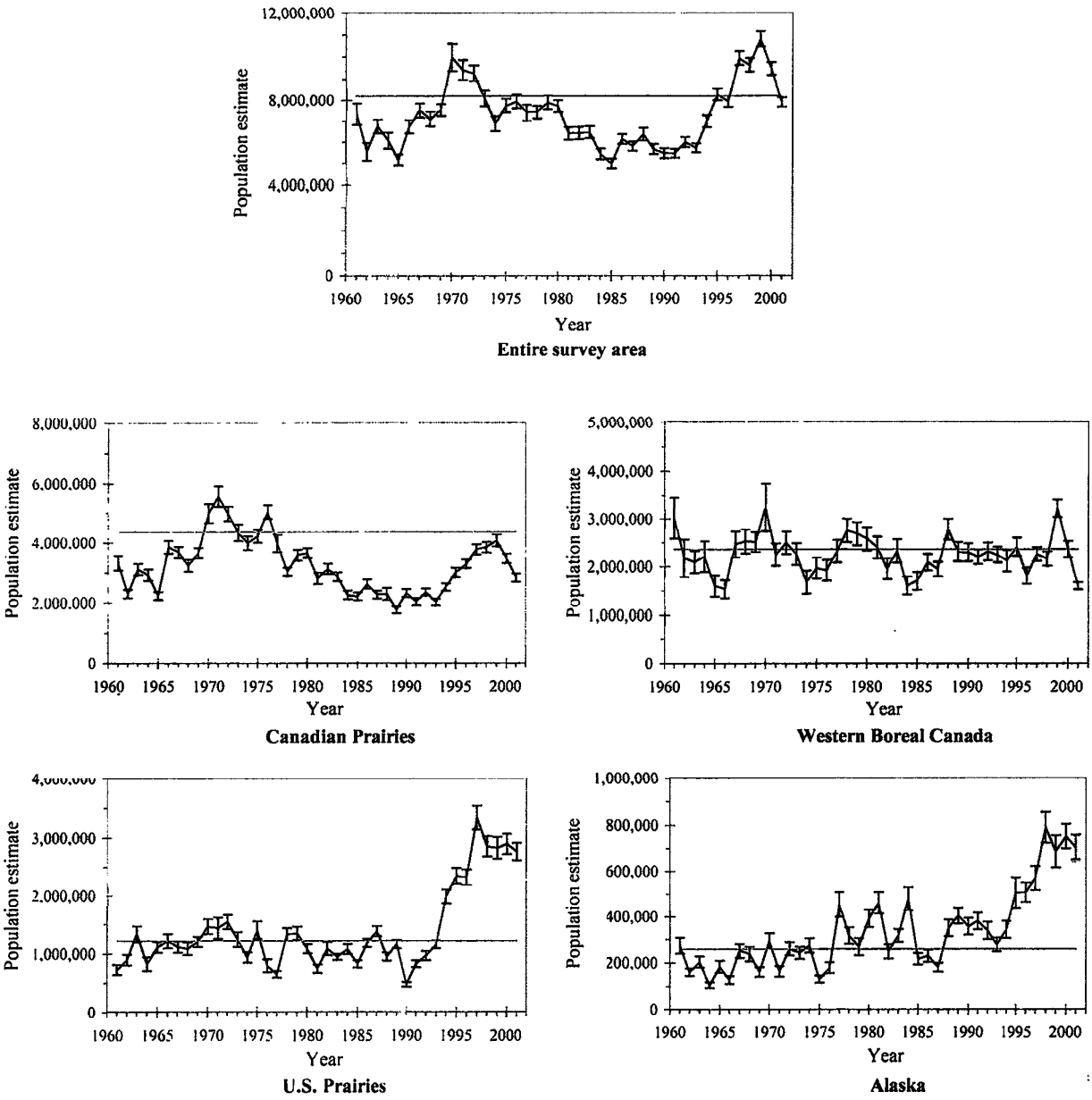


Fig. 9. Mallard breeding population estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal (provided by R. Bazin, CWS).

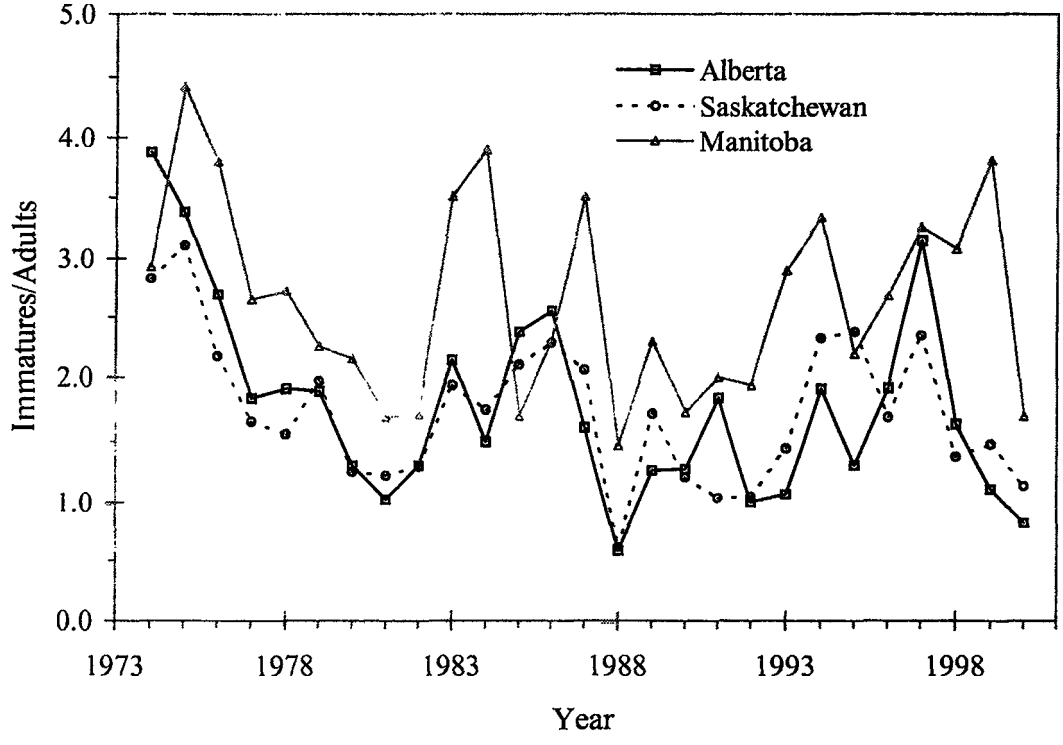


Fig. 10. Age ratios of Mallards in the Prairie Canada harvest (H. Lévesque and B. T. Collins, CWS, unpubl.). Age ratios are not adjusted for differential vulnerability to harvest of juveniles and adults.

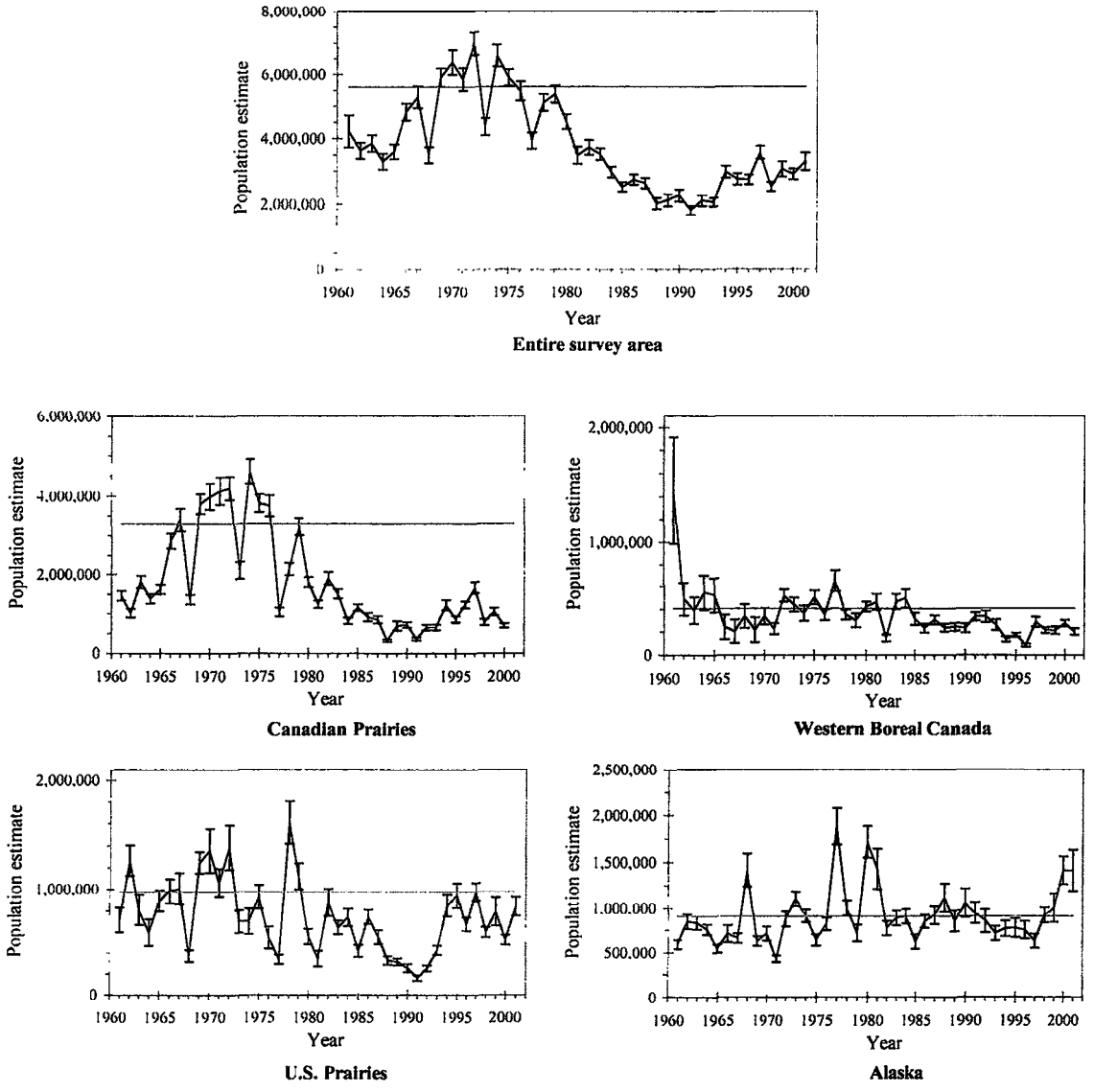
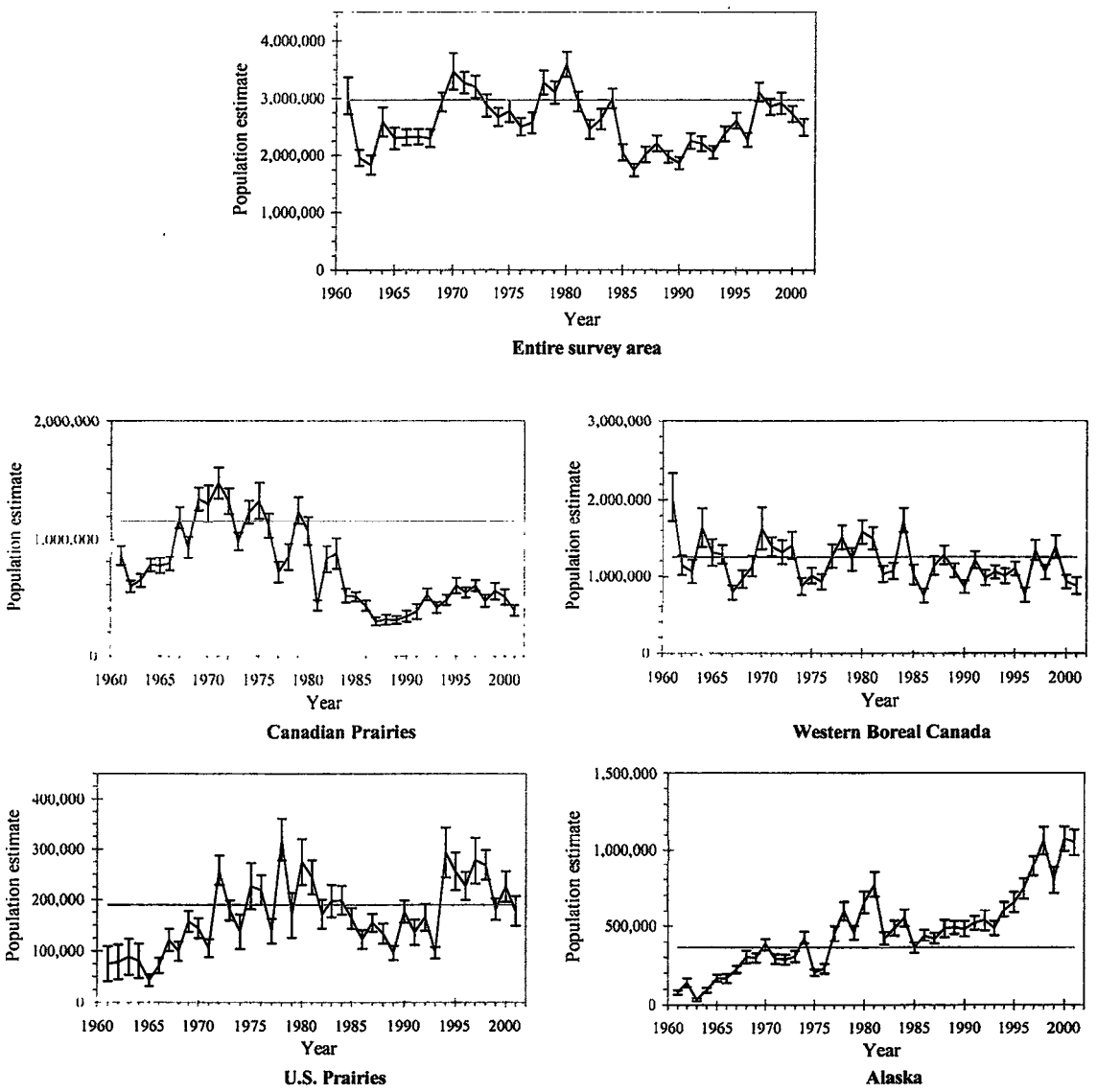
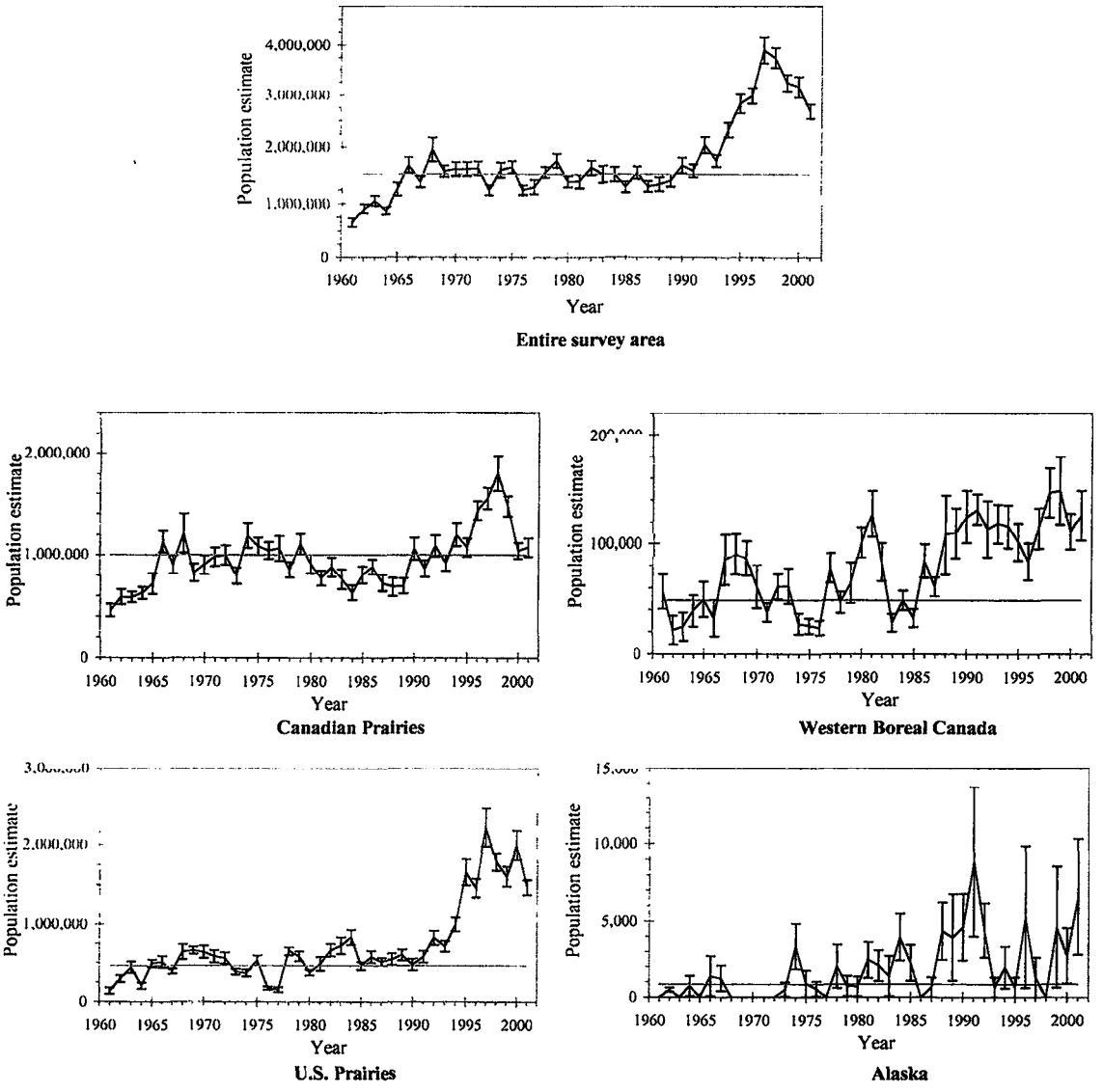


Fig. 11. Northern Pintail breeding population estimates (± 1 SE) in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal (provided by R. Bazin, CWS).



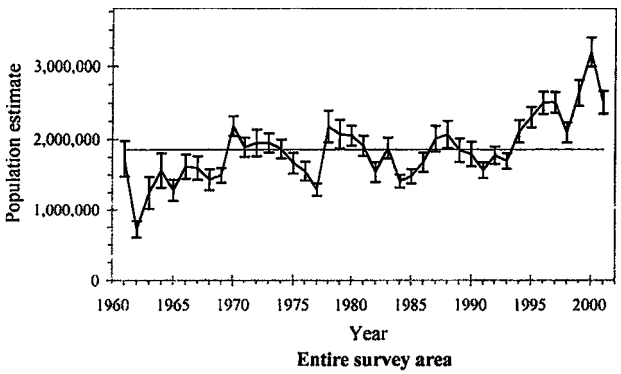
(a) American Wigeon

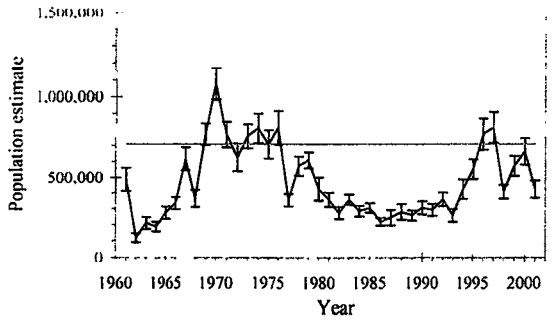
Fig. 12. Breeding population estimates (± 1 SE) for other dabbling ducks in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal (provided by R. Bazin, CWS).

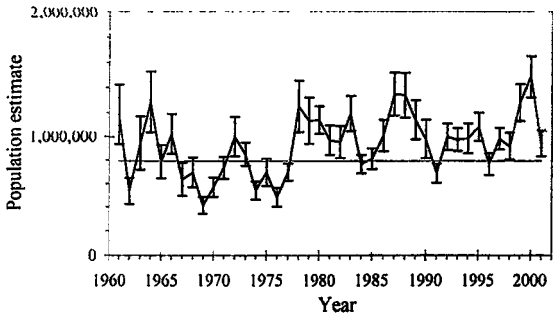


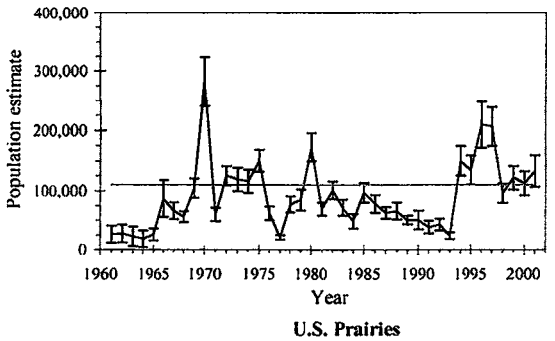
(b) Gadwall

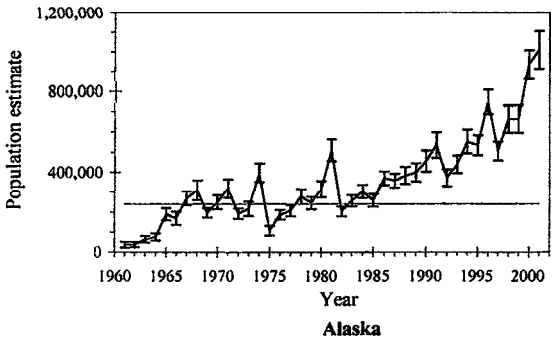
Fig. 12. Continued.





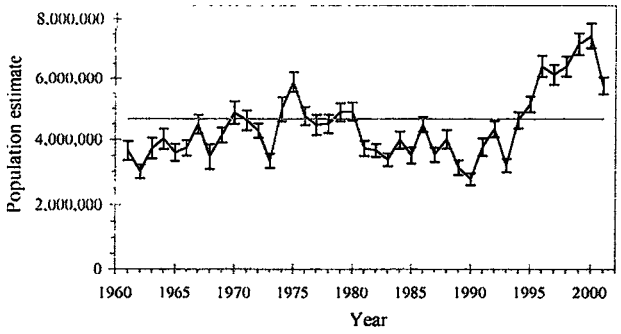




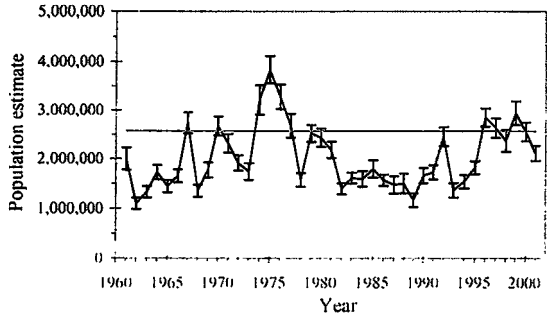


(c) Green-winged Teal

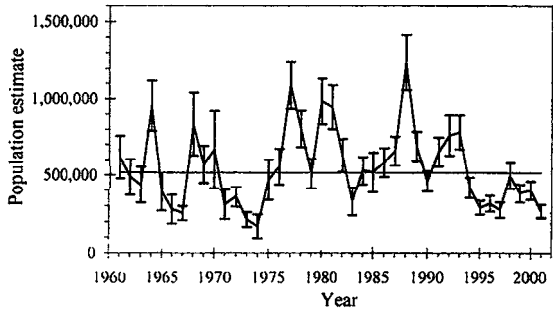
Fig. 12. Continued.



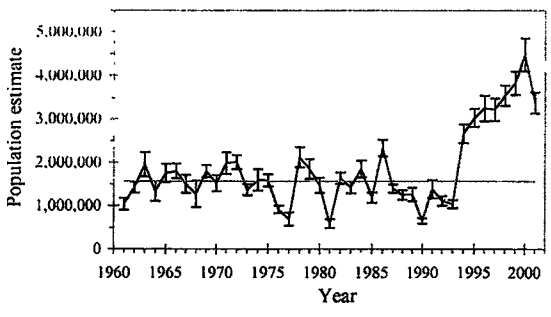
Entire survey area



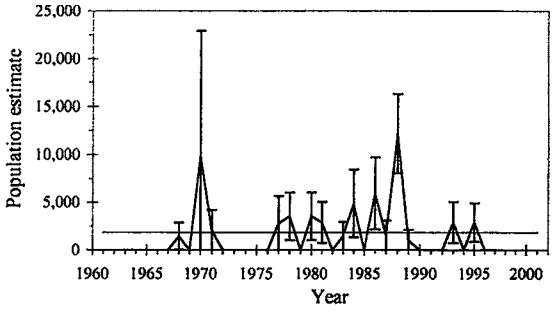
Canadian Prairies



Western Boreal Canada



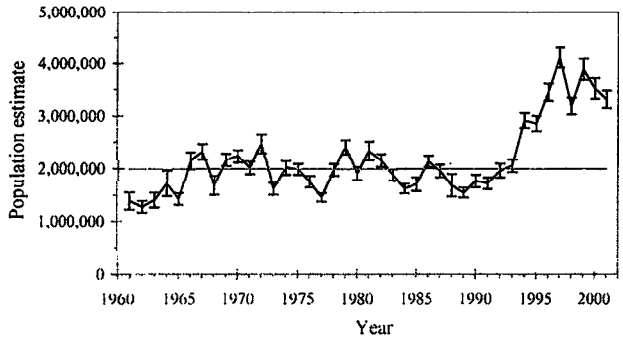
U.S. Prairies



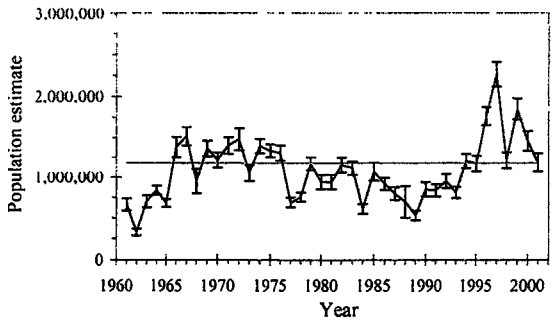
Alaska

(d) Blue-winged Teal

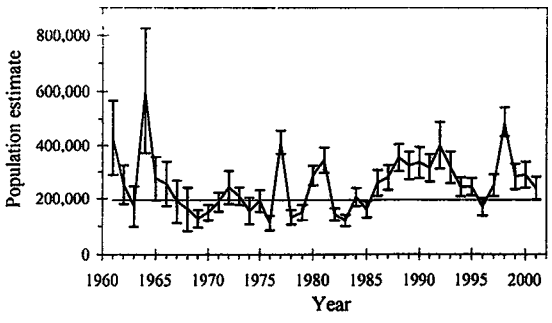
Fig. 12. Continued.



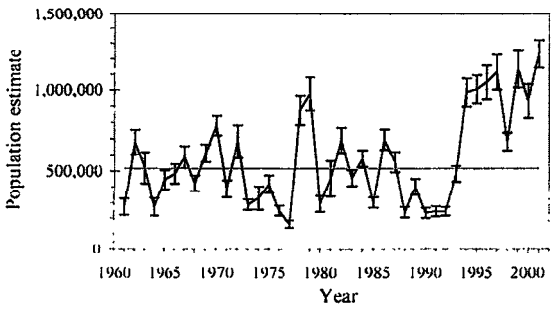
Entire survey area



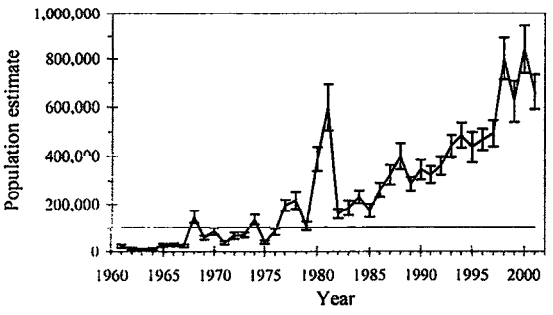
Canadian Prairies



Western Boreal Canada



U.S. Prairies



Alaska

(e) Northern Shoveler

Fig. 12. Continued.

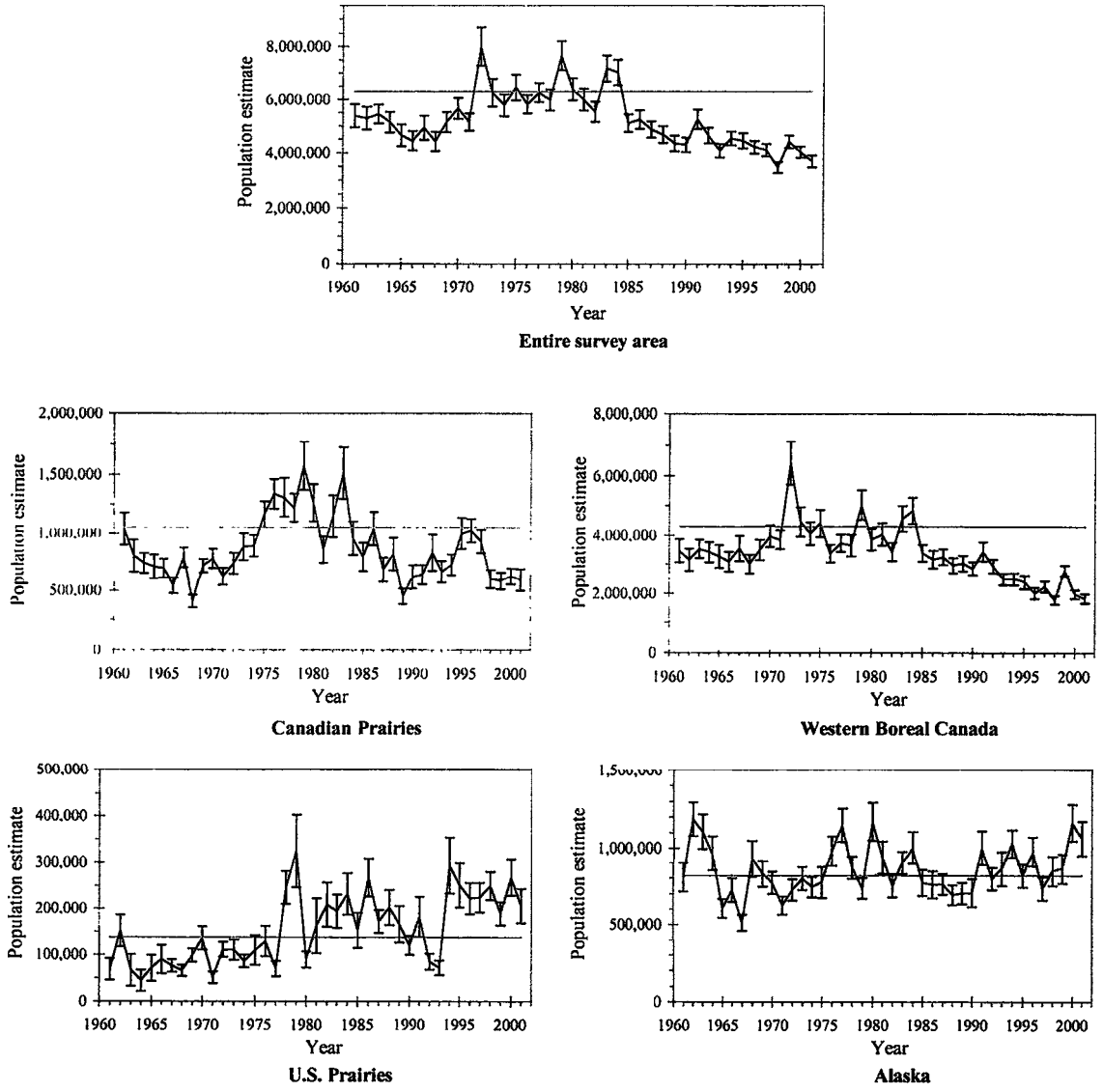
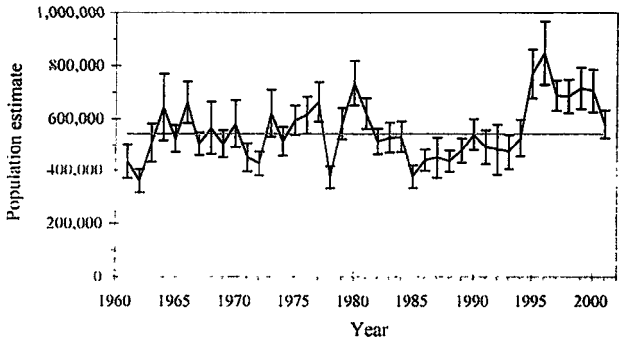
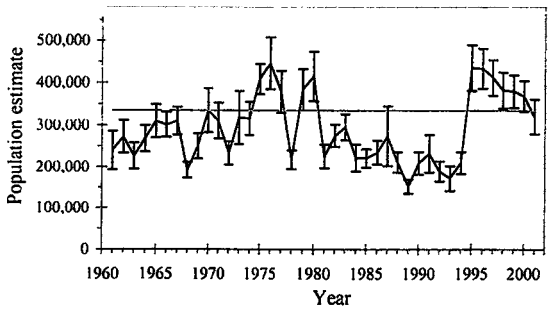


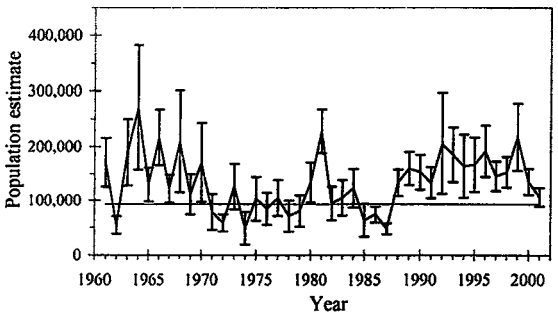
Fig. 13. Breeding population estimates (± 1 SE) for Scaup spp. in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal (provided by R. Bazin, CWS).



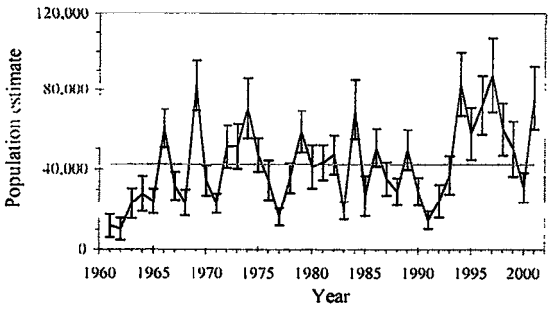
Entire survey area



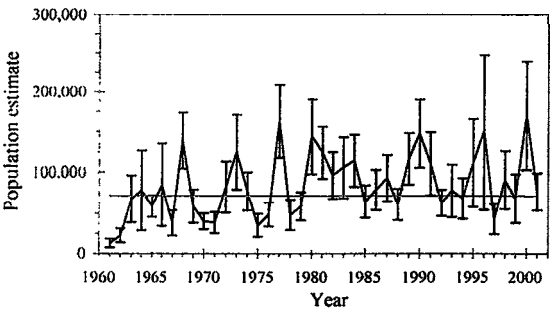
Canadian Prairies



Western Boreal Canada



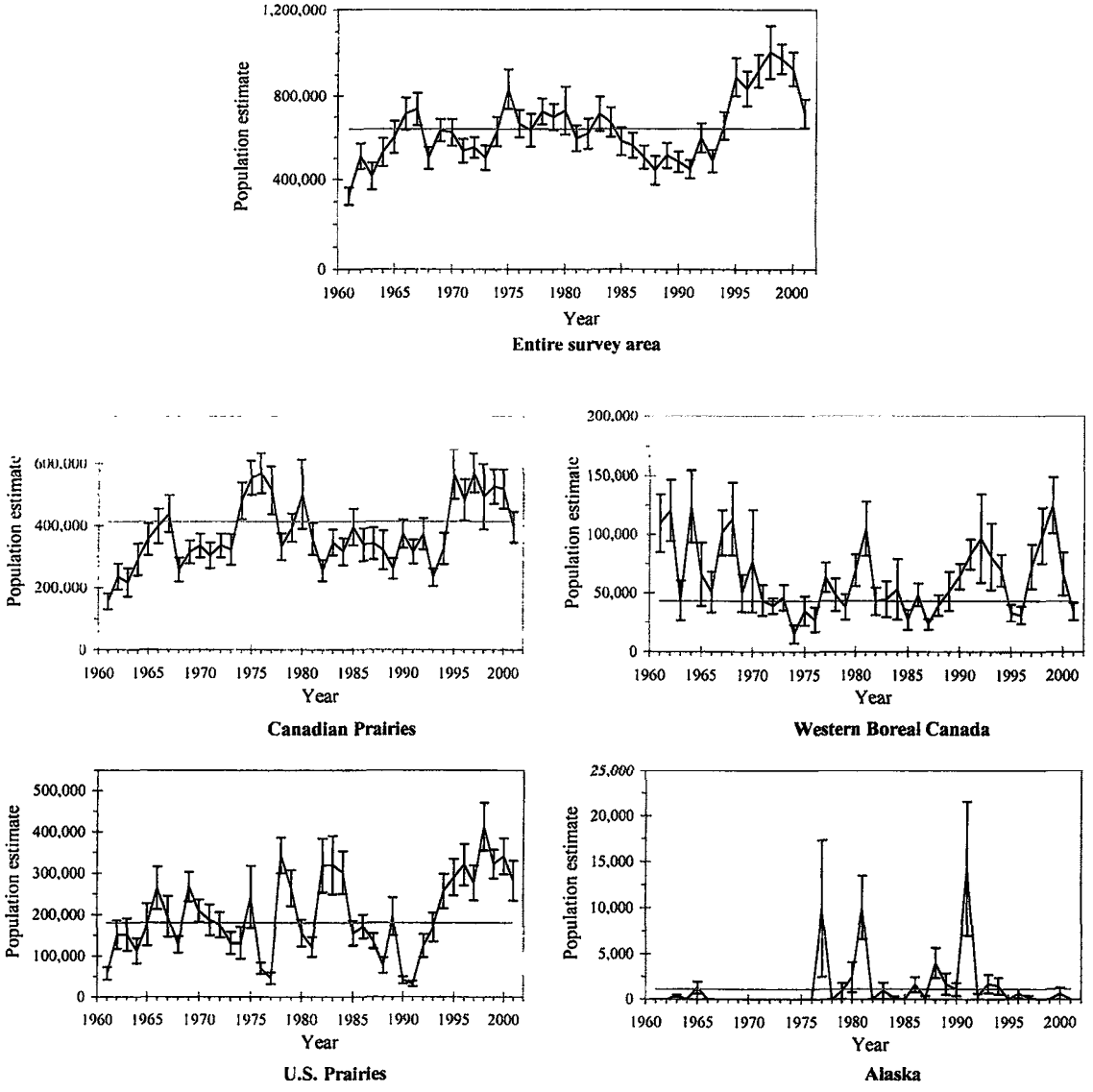
U.S. Prairies



Alaska

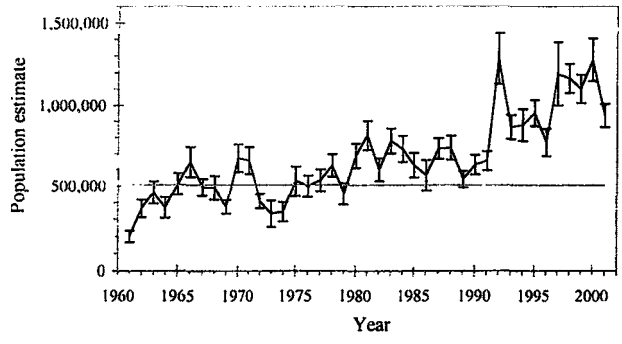
(a) Canvasback

Fig. 14. Breeding population estimates (± 1 SE) for other diving ducks in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey. The horizontal line represents the NAWMP population goal (provided by R. Bazin, CWS).

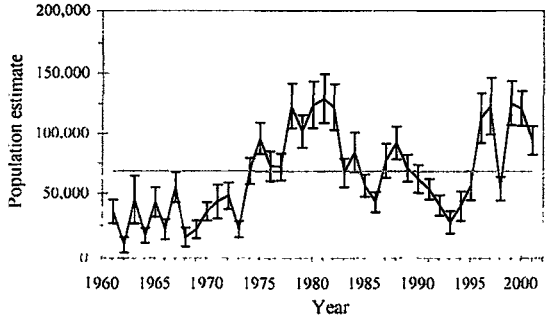


(b) Redhead

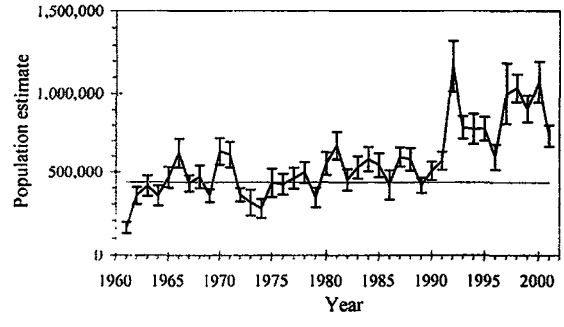
Fig. 14. Continued.



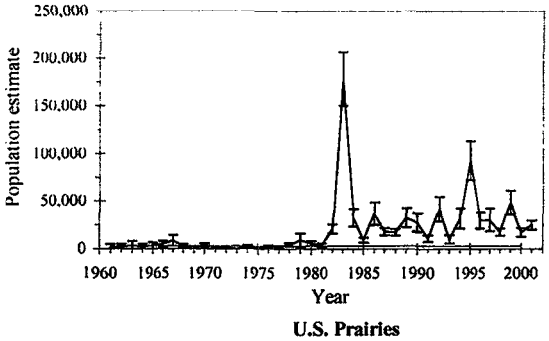
Entire survey area



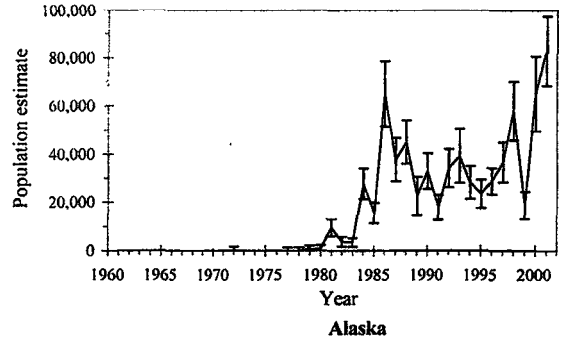
Canadian Prairies



Western Boreal Canada



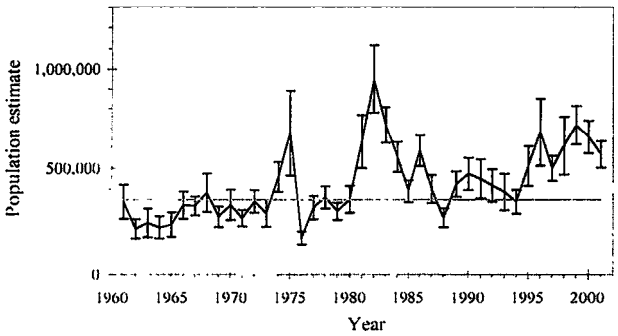
U.S. Prairies



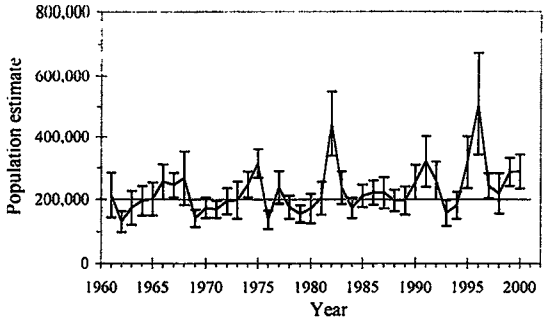
Alaska

(c) Ring-necked Duck

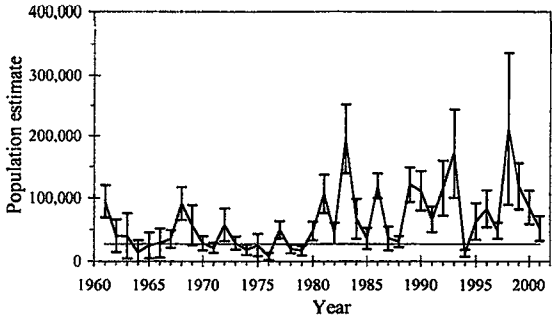
Fig. 14. Continued.



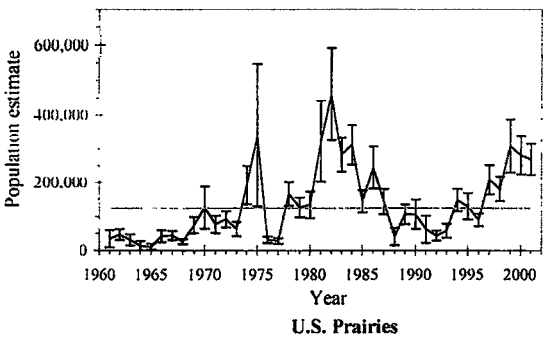
Entire survey area



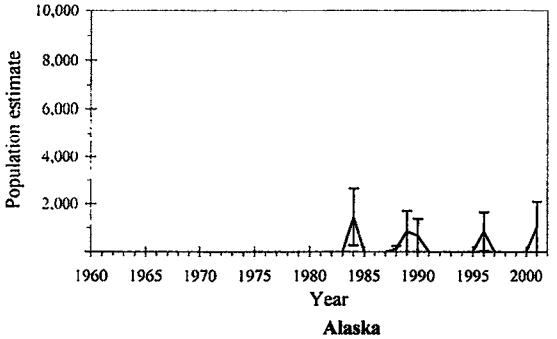
Canadian Prairies



Western Boreal Canada



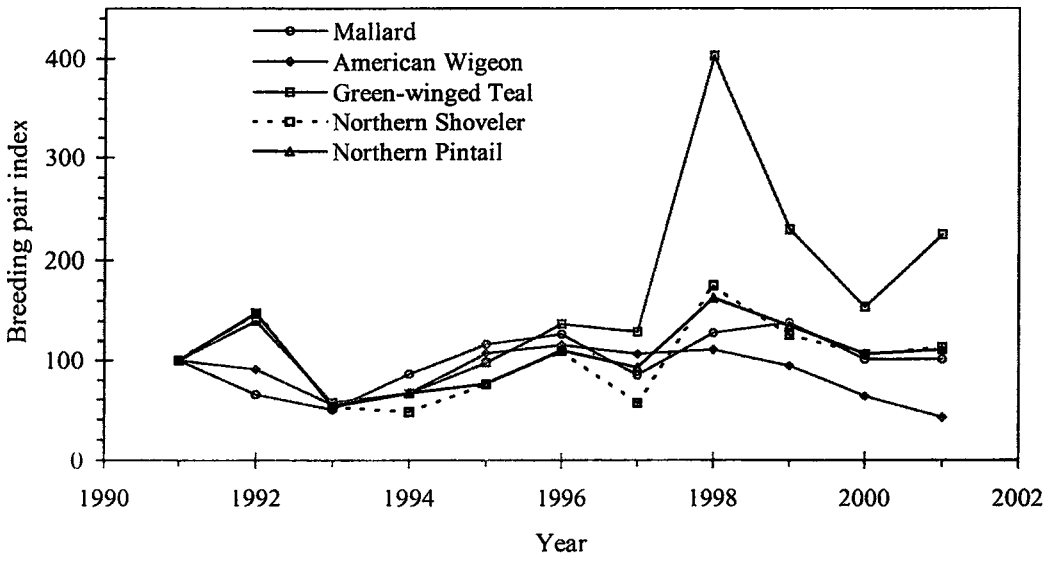
U.S. Prairies



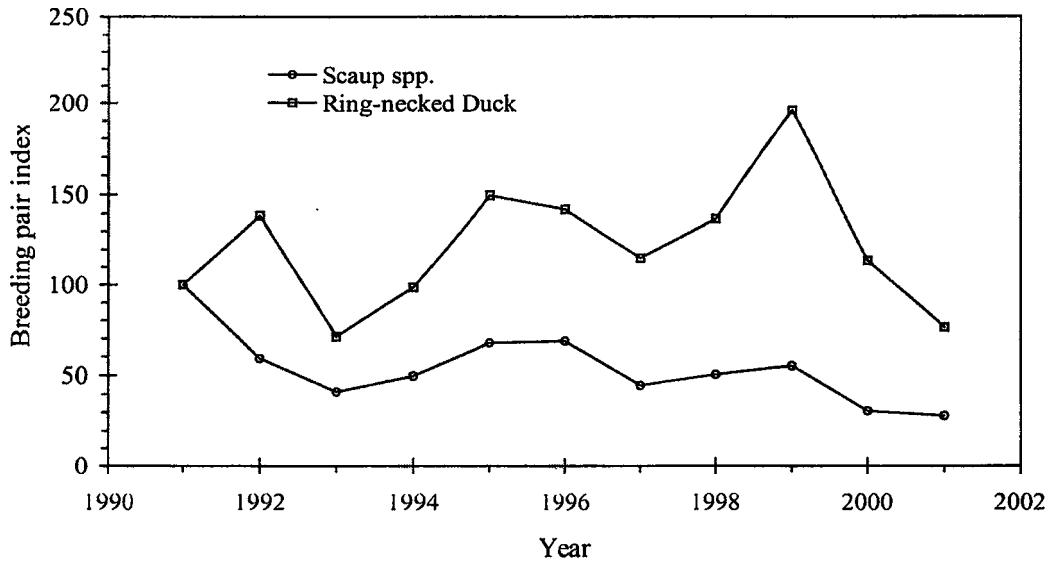
Alaska

(d) Ruddy Duck

Fig. 14. Continued.

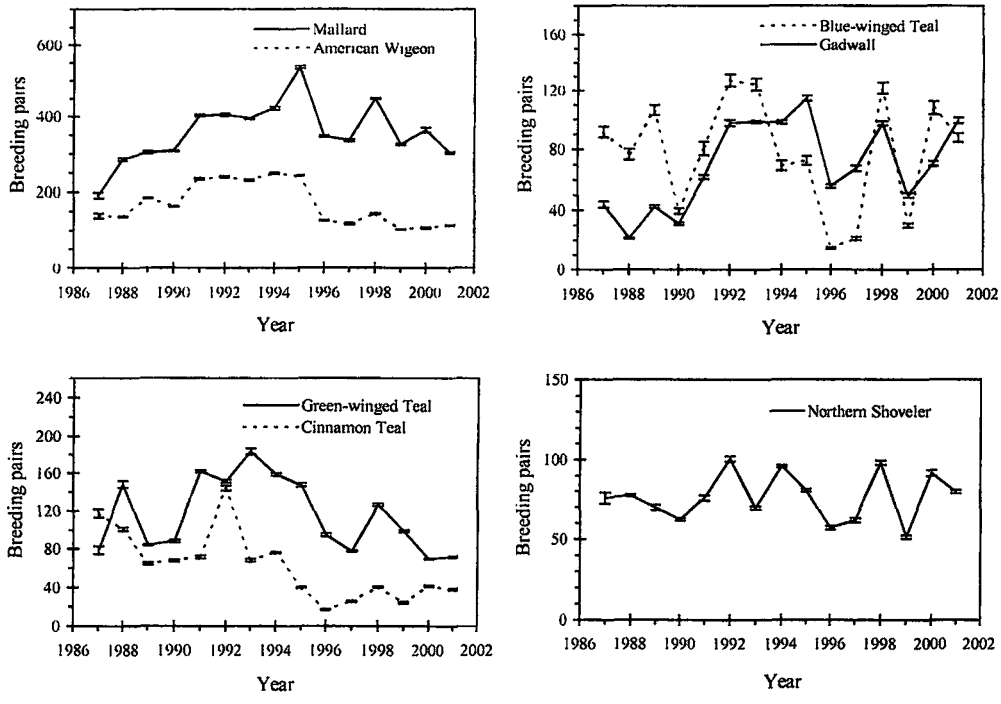


(a) Dabbling ducks

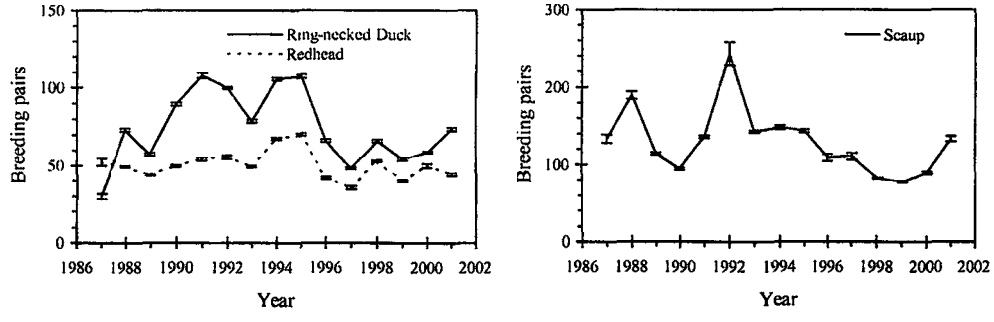


(b) Diving ducks

Fig. 15. Trends in indicated breeding pairs of common dabbling and diving ducks in the southern Yukon (Hawkings and Hughes 2001).



(a) Dabbling ducks



(b) Diving ducks

Fig. 16. Mean number (± 1 SE) of breeding pairs of common dabbling and diving ducks seen on roadside surveys in the interior of British Columbia (Breault and Watts 2001).

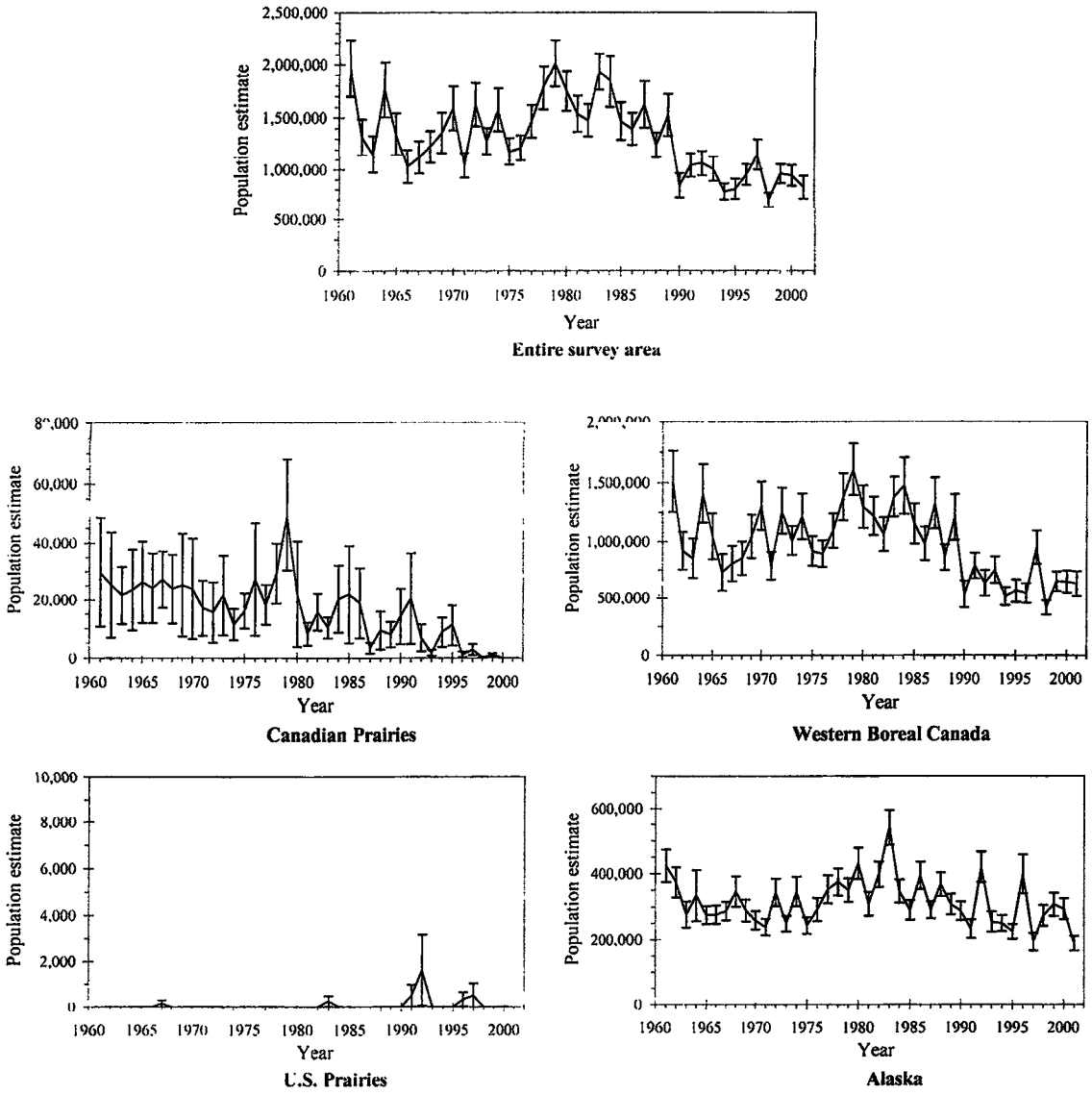


Fig. 17. Breeding population estimates (± 1 SE) of Scoter spp. in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey.

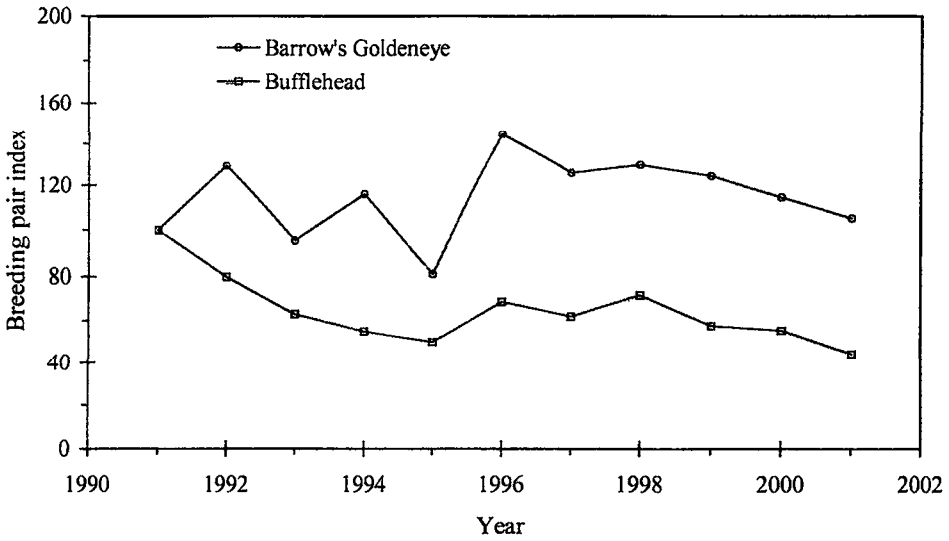


Fig. 18. Trends in indicated breeding pairs of common sea ducks in the southern Yukon (Hawkings and Hughes 2001).

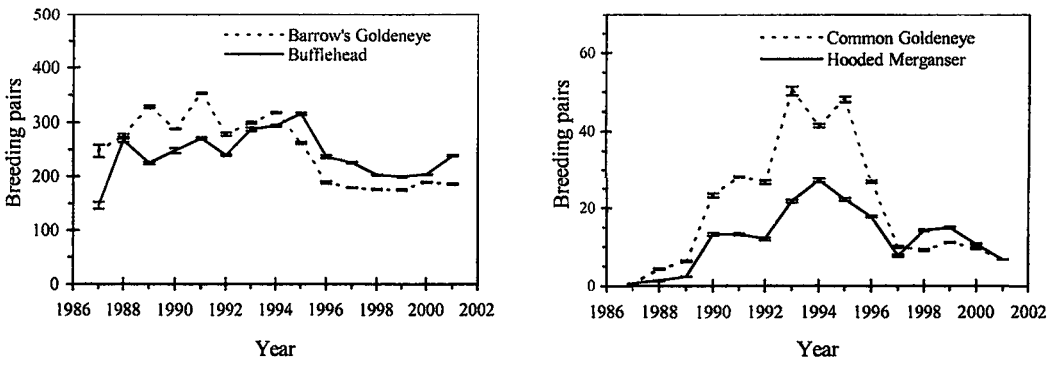


Fig. 19. Mean number (± 1 SE) of breeding pairs of common sea ducks seen on roadside surveys in the interior of British Columbia (Breault and Watts 2001).

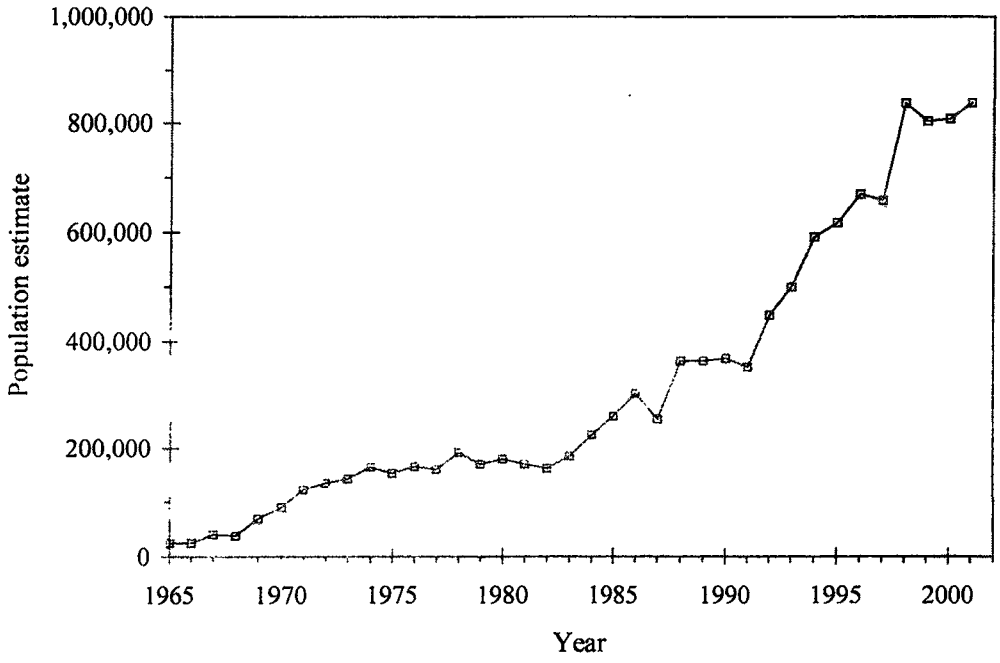


Fig. 20. Spring population estimates of Greater Snow Geese in the St. Lawrence River Valley (Reed and Gauthier 2001). A correction factor was applied to the 1998 and 2000 estimates to account for greater dispersal of geese (see text; A. Reed, unpubl.).

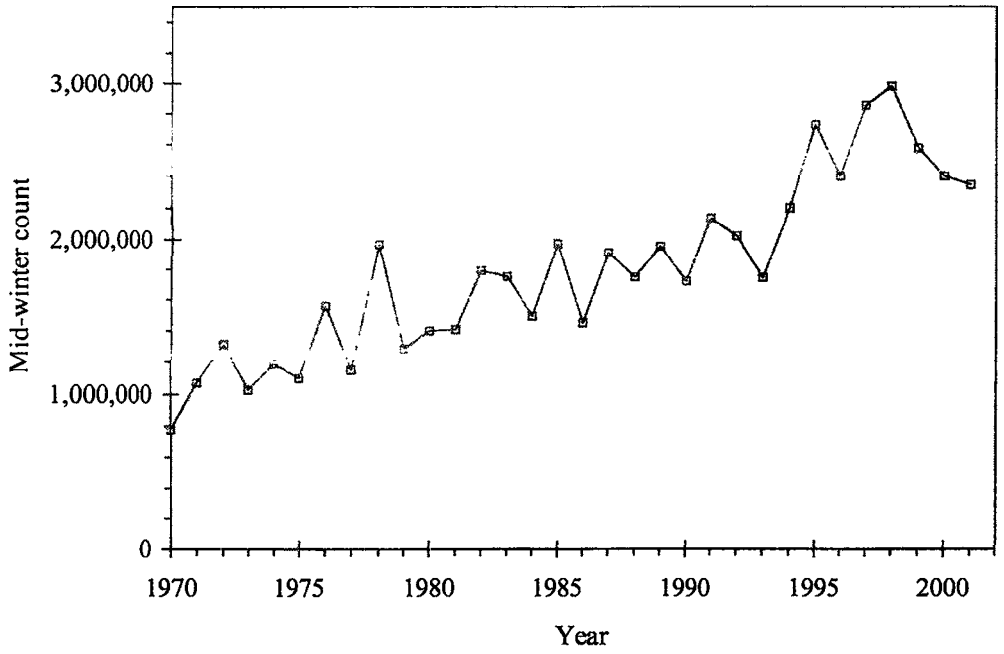


Fig. 21. Mid-winter survey of Mid-continent Lesser Snow Geese (counts include some Ross' Geese) (Sharp and Moser 2001; Peterson 2001).

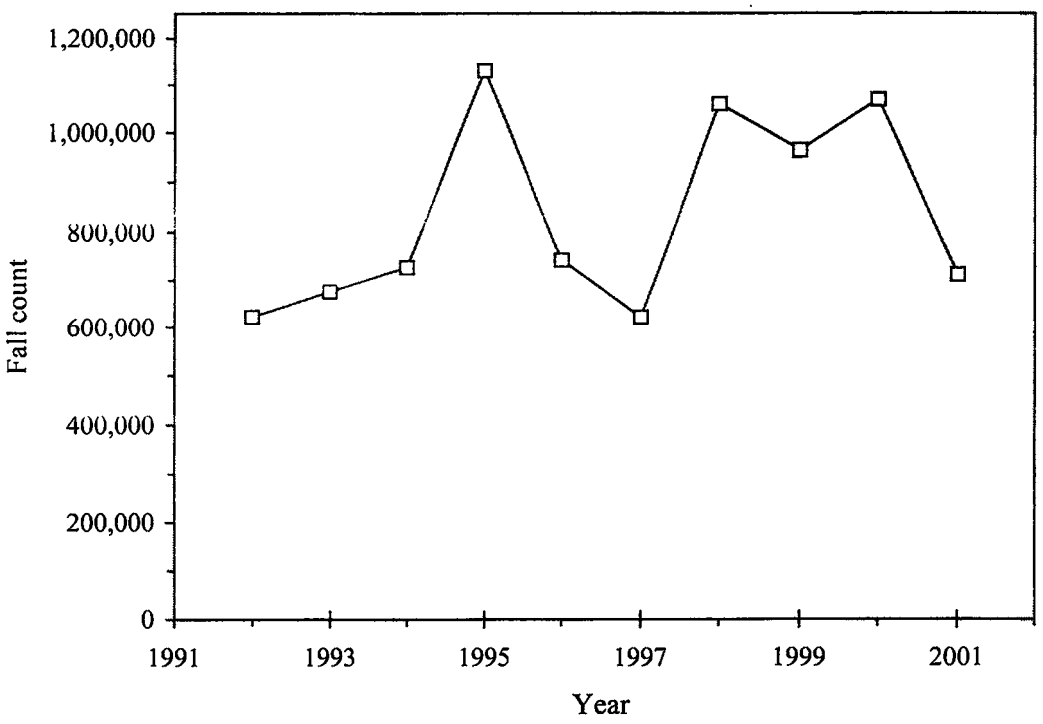


Fig. 22. Fall survey of Mid-continent Greater White-fronted Geese on staging areas in Saskatchewan and Alberta (Warner and Nieman 1999; D. Nieman et al, 2001.).

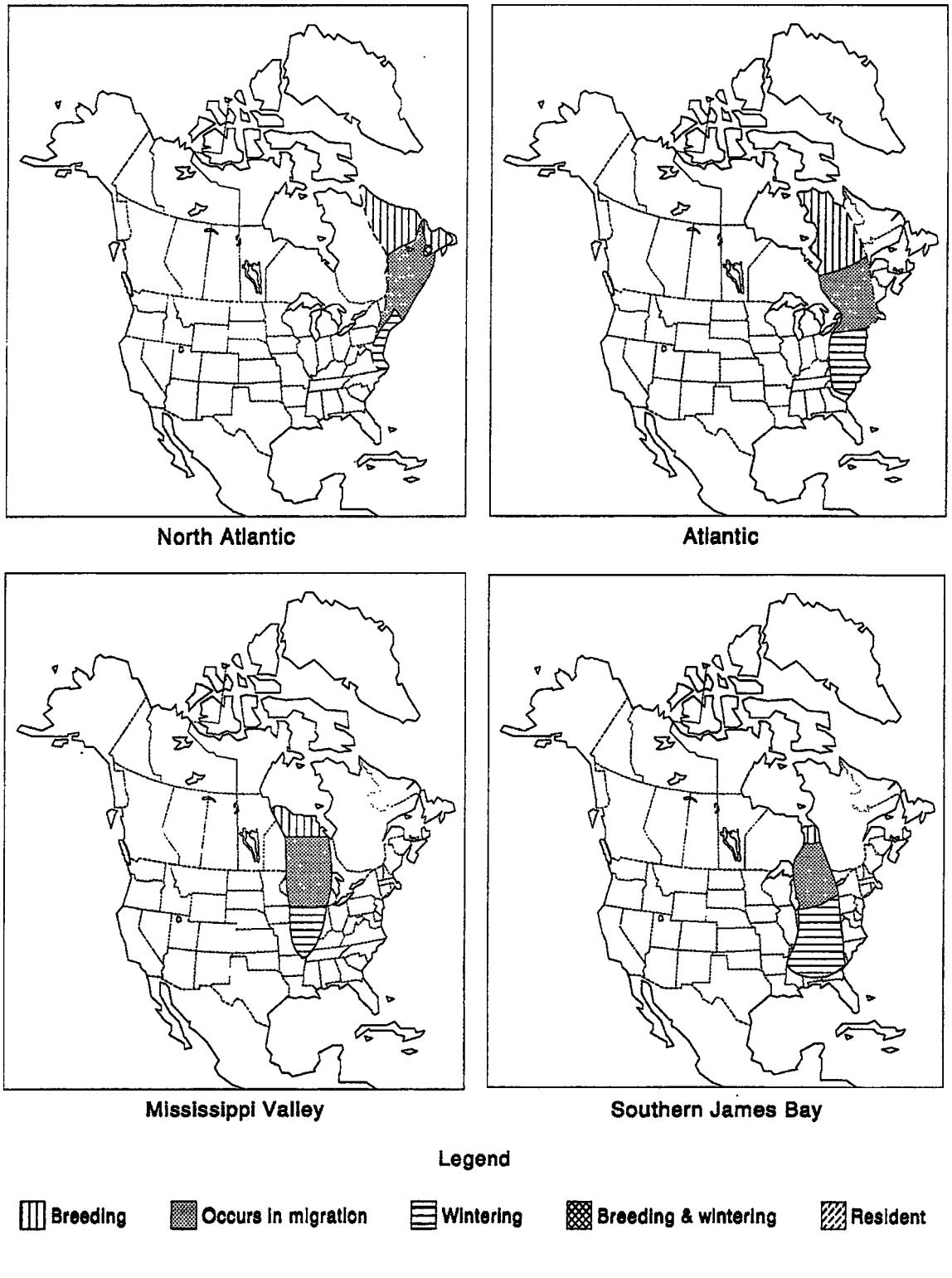


Fig. 23. Approximate range of Canada Goose populations in North America.

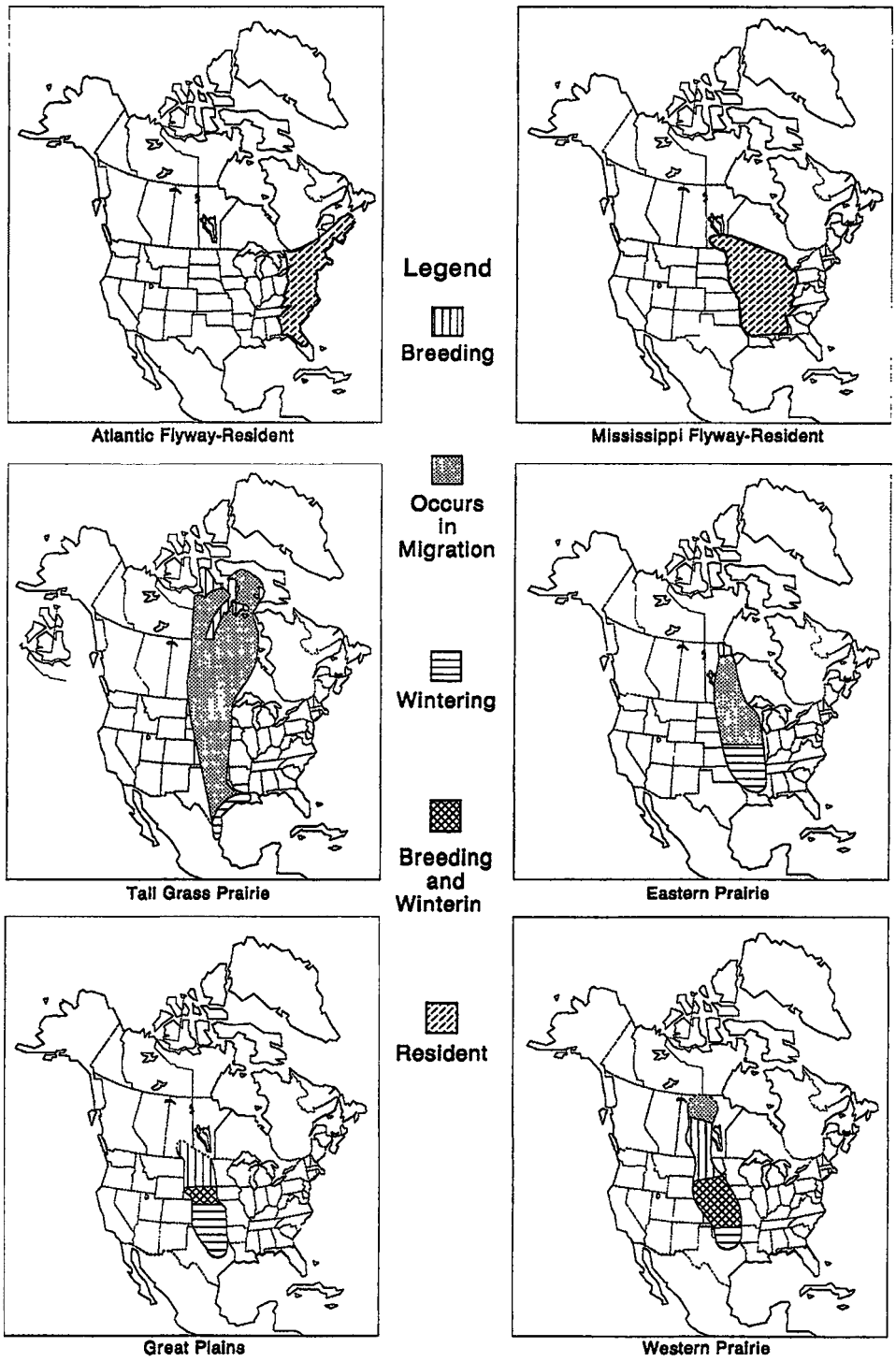

Legend
Breeding
Occurs in Migration
Wintering
Breeding and Winterin
Resident
Atlantic Flyway-Resident
Mississippi Flyway-Resident
Tall Grass Prairie
Eastern Prairie
Great Plains
Western Prairie

Fig 23. Cont.

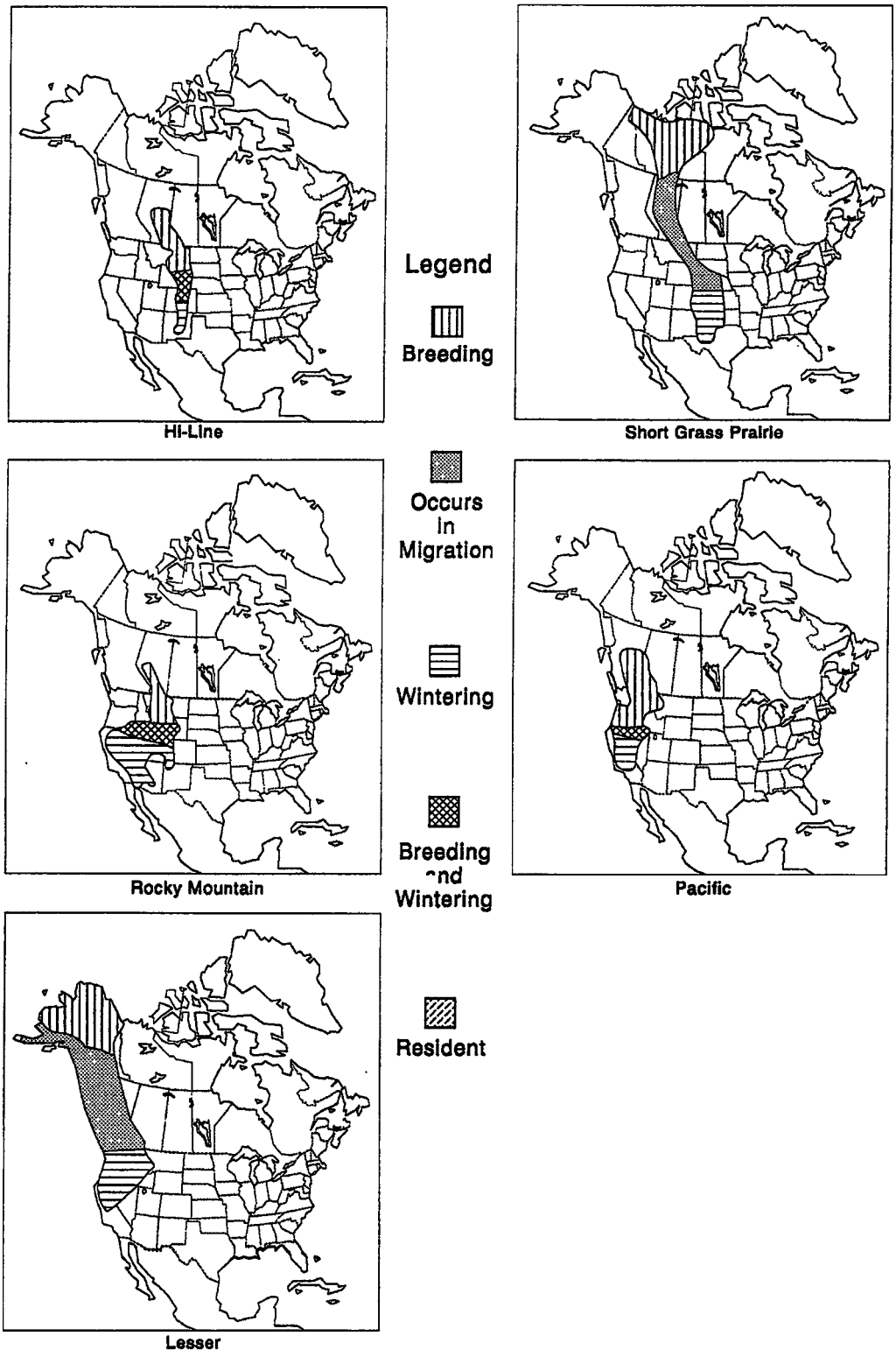

Hi-Line
Short Grass Prairie
Legend
Breeding
Occurs in Migration
Wintering
Breeding and Wintering
Resident
Rocky Mountain
Pacific
Lesser

Fig. 23. Cont.

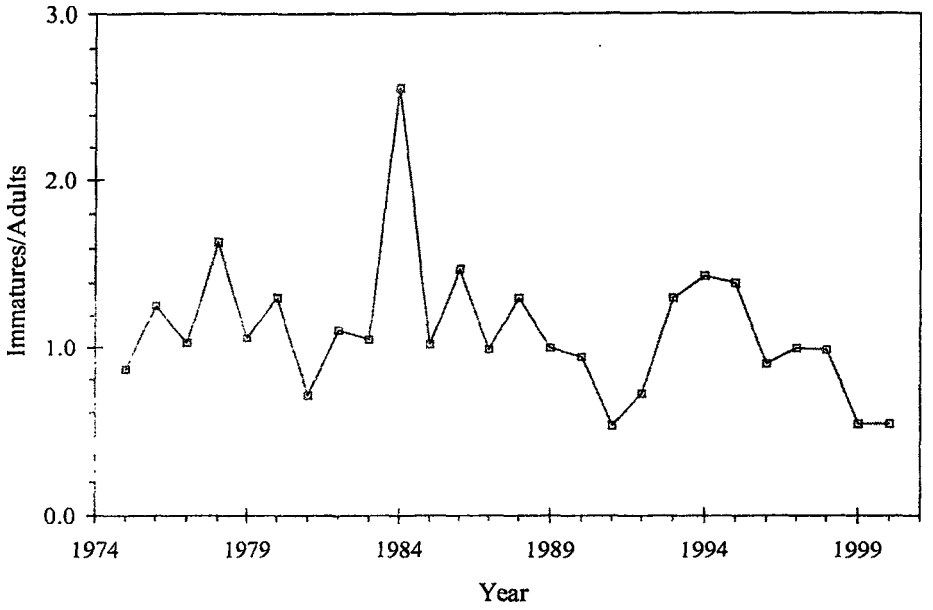


Fig. 24. Age ratios of NAP Canada Geese in the Atlantic Canada harvest (Nfld., P.E.I., N.S., and N.B.) (H. Lévesque and B. T. Collins, CWS, unpubl.).

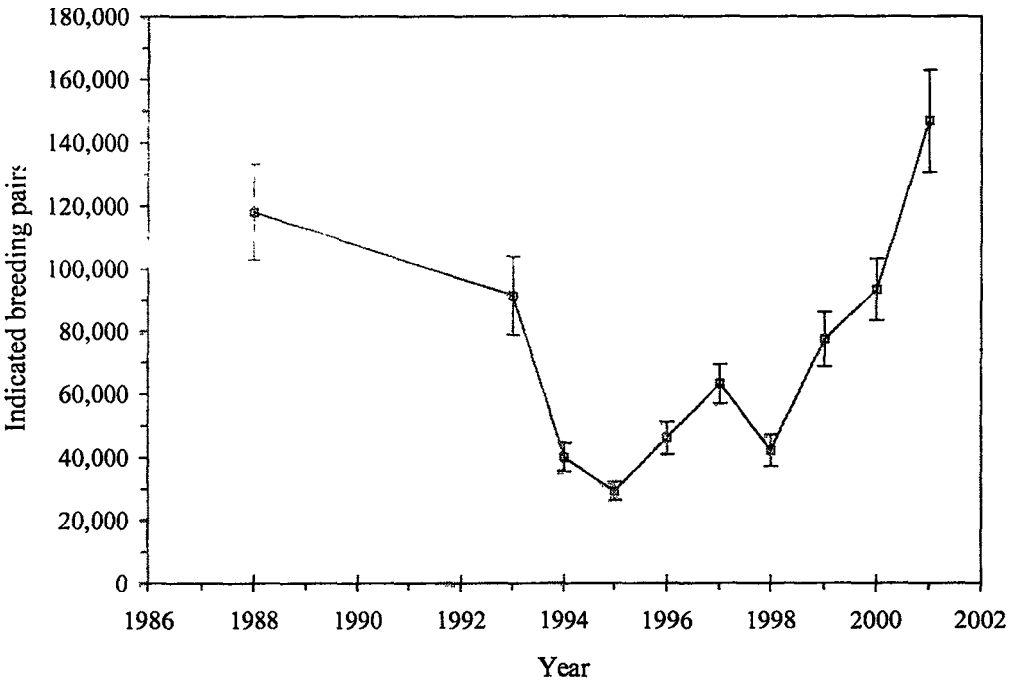


Fig. 25. Number of indicated breeding pairs (±1 SE) of AP Canada Geese in the Ungava Peninsula of northern Quebec (Harvey and Rodrigue 2001). No surveys were conducted in 1989-1992.

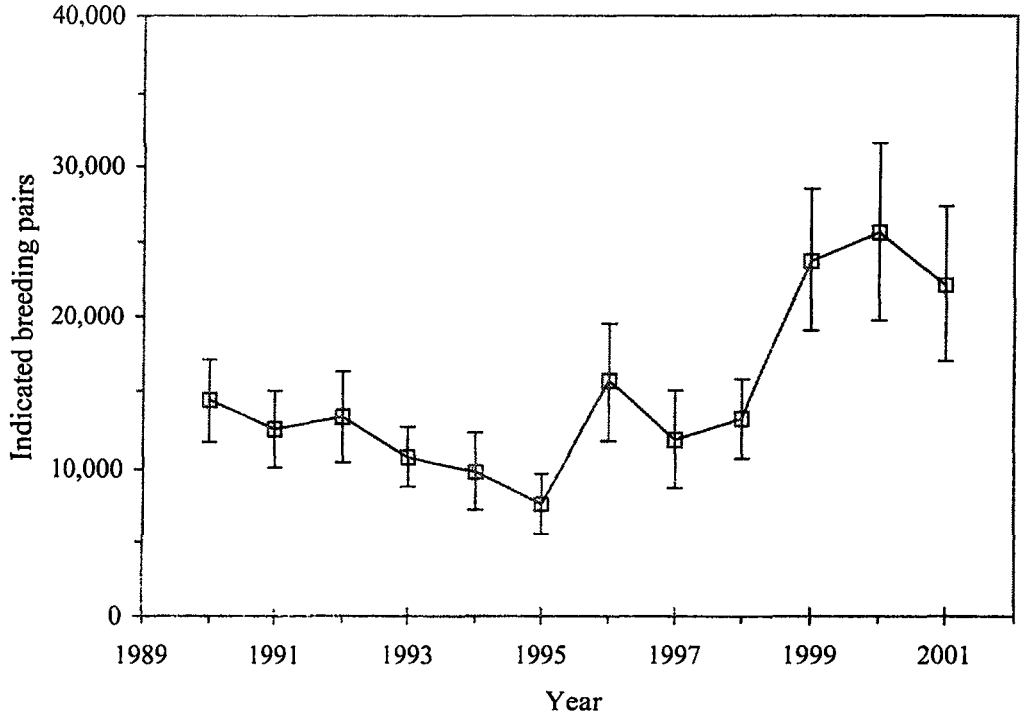


Fig. 26. Estimated number of indicated breeding pairs (±1 SE) of AP Canada geese in Quebec (Bordage 2001). Population estimates do not refer to all of Quebec.

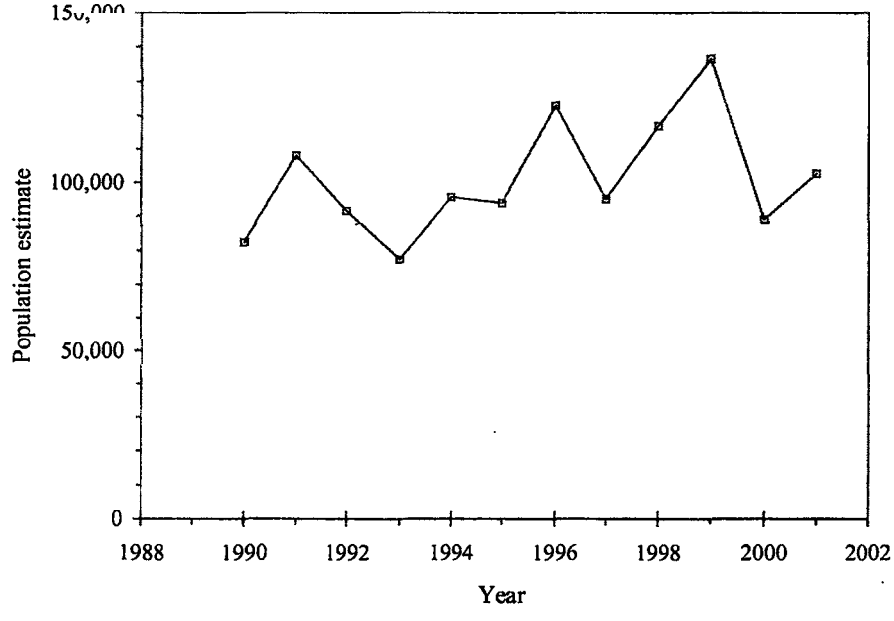


Fig. 27. Spring population estimates of SJBP Canada Geese (J. Leafloor and D. Fillman, CWS, unpubl.).

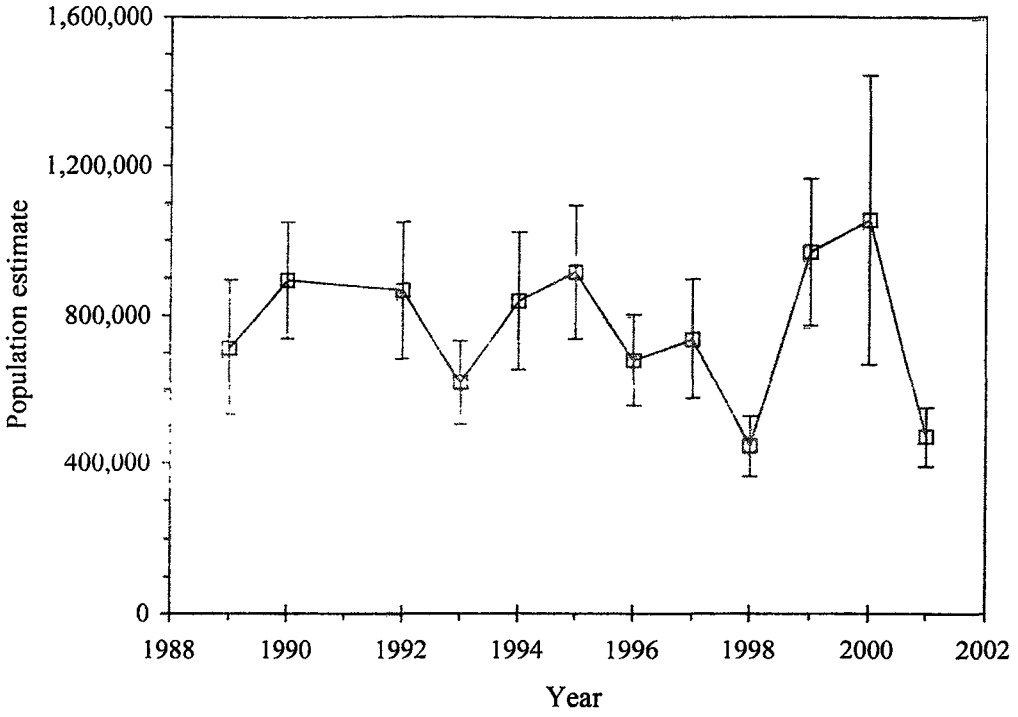


Fig. 28. Spring population estimates (± 95% CI) of MVP Canada Geese (J. Leafloor, K. Ross, and D. Fillman, CWS, unpubl.).

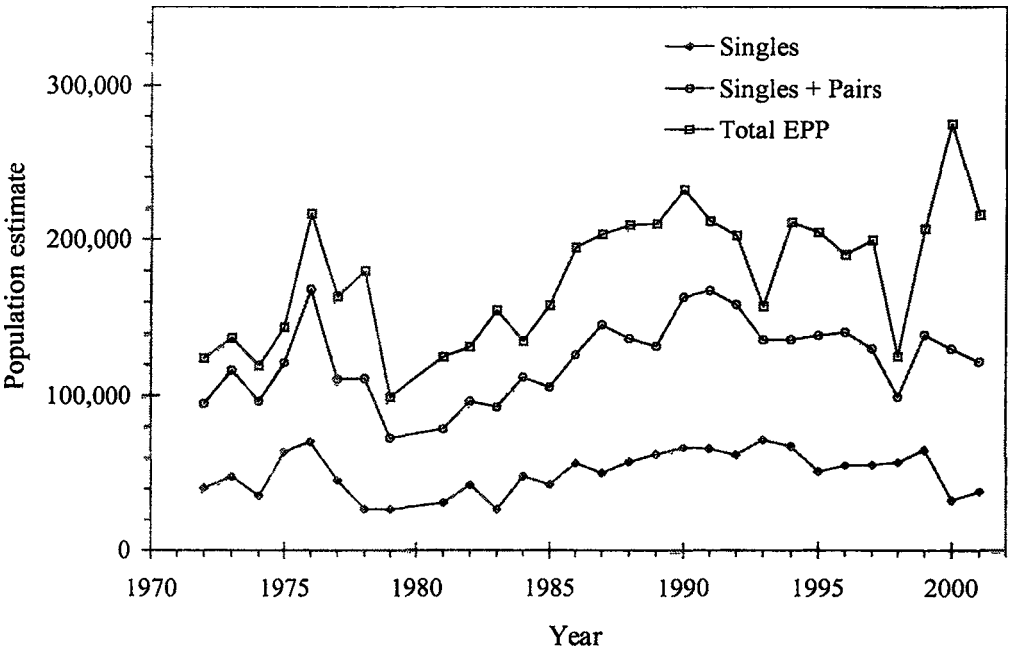


Fig. 29. Spring population estimates of EPP Canada Geese (Humburg et al. 2001). No survey was conducted in 1980.

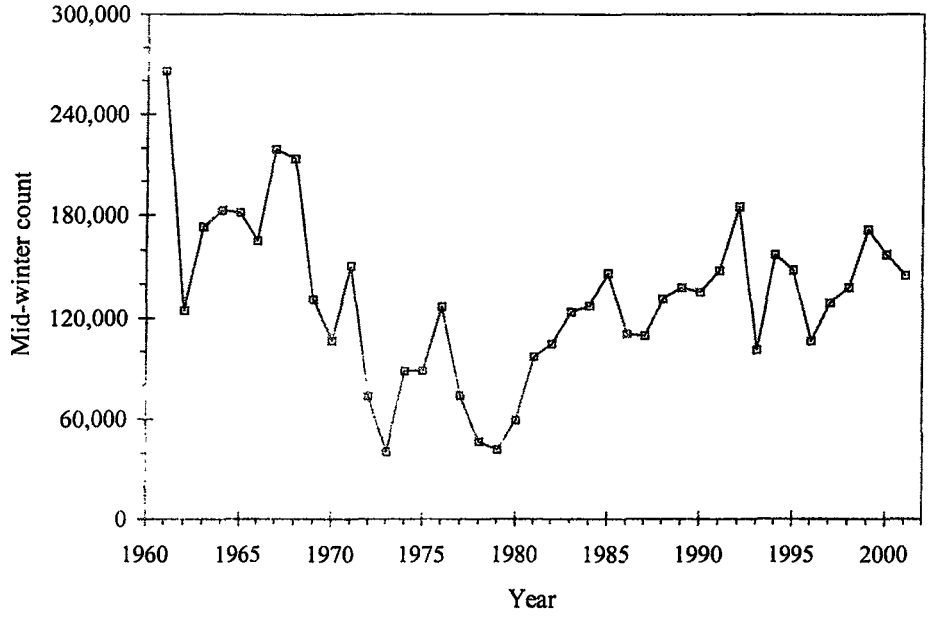


Fig. 30a. Mid-winter inventory of Atlantic Brant in the Atlantic Flyway (Serie and Raftovich 2001).

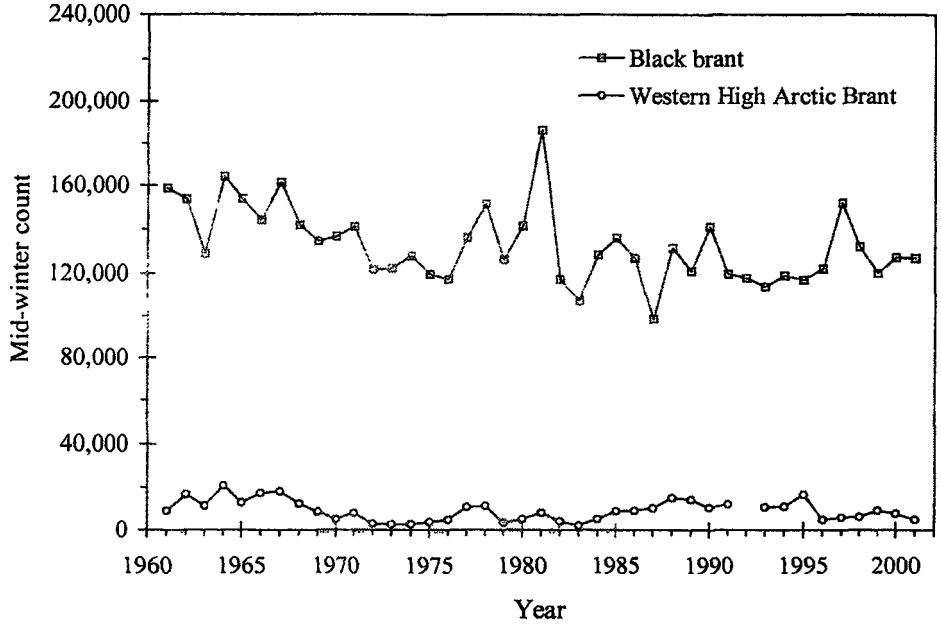


Fig. 30b. Mid-winter inventory of Black Brant and Western High Arctic Brant in the Pacific Flyway. Note that beginning in 1986 Black Brant numbers include counts along the B.C. and Alaska coasts (range of 5,000 to 14,000 birds).

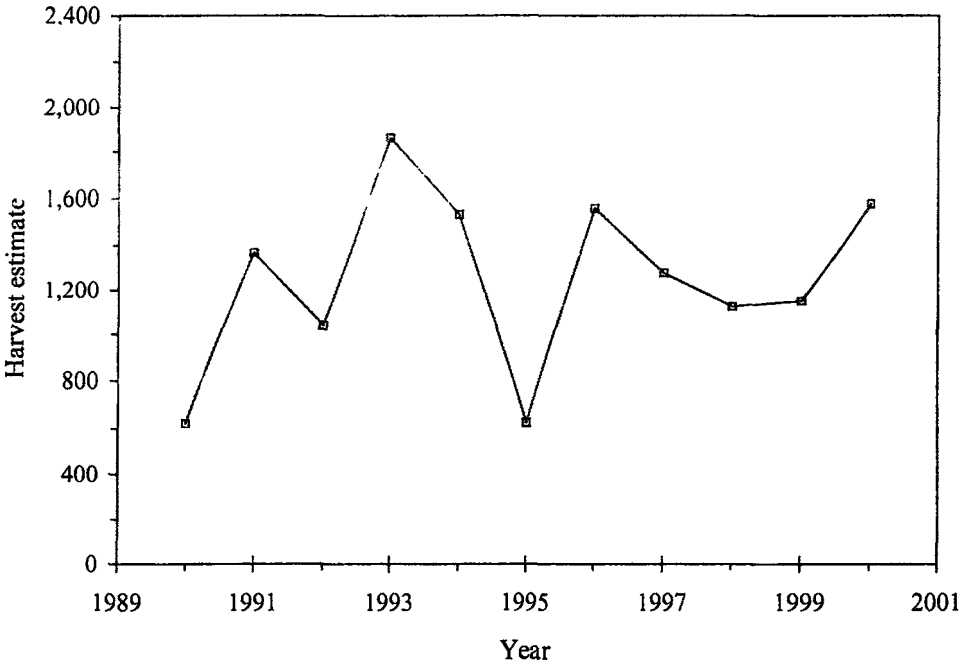


Fig. 31. Harvest estimates of Lesser Snow Geese from the Wrangel Island population (A. Breault, CWS, unpubl.).

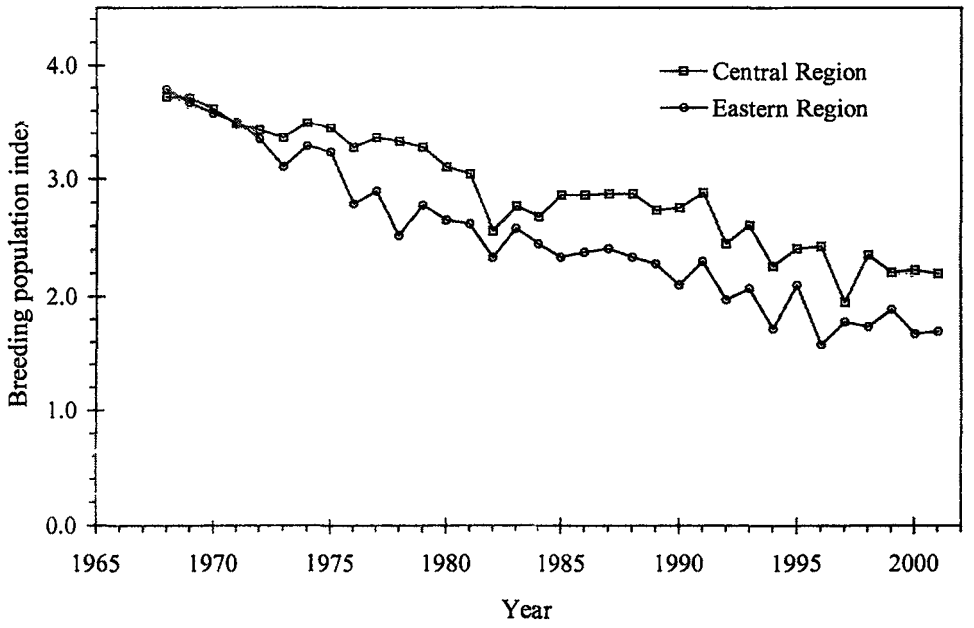


Fig. 32. Breeding population indices for American Woodcock from the Singing-ground Survey (Kelley 2001).

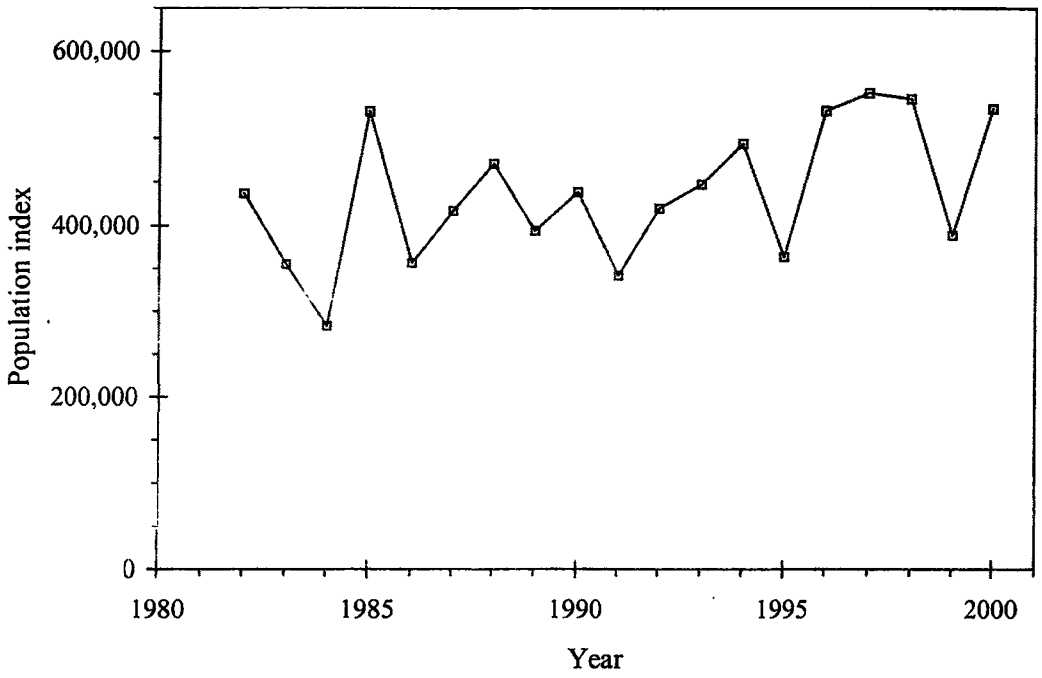


Fig. 33. Spring population indices for the Mid-continent Population of Sandhill Cranes (Sharp and Moser 2001).

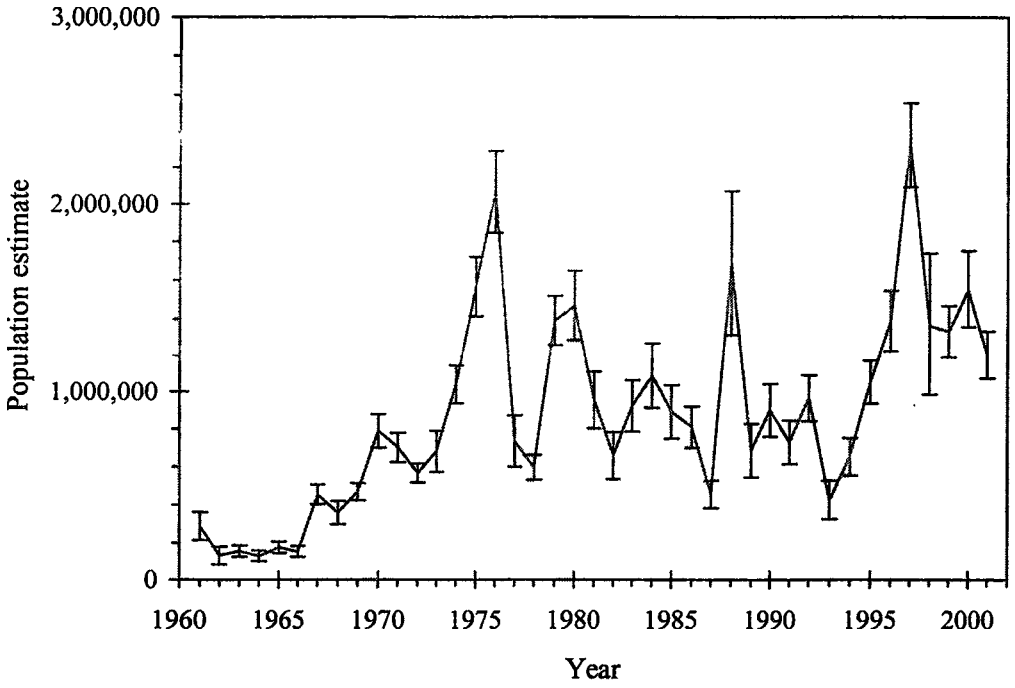


Fig. 34. American Coot breeding population estimates (± 1 SE) in the Canadian Prairies (Waterfowl Breeding Population and Habitat Survey).

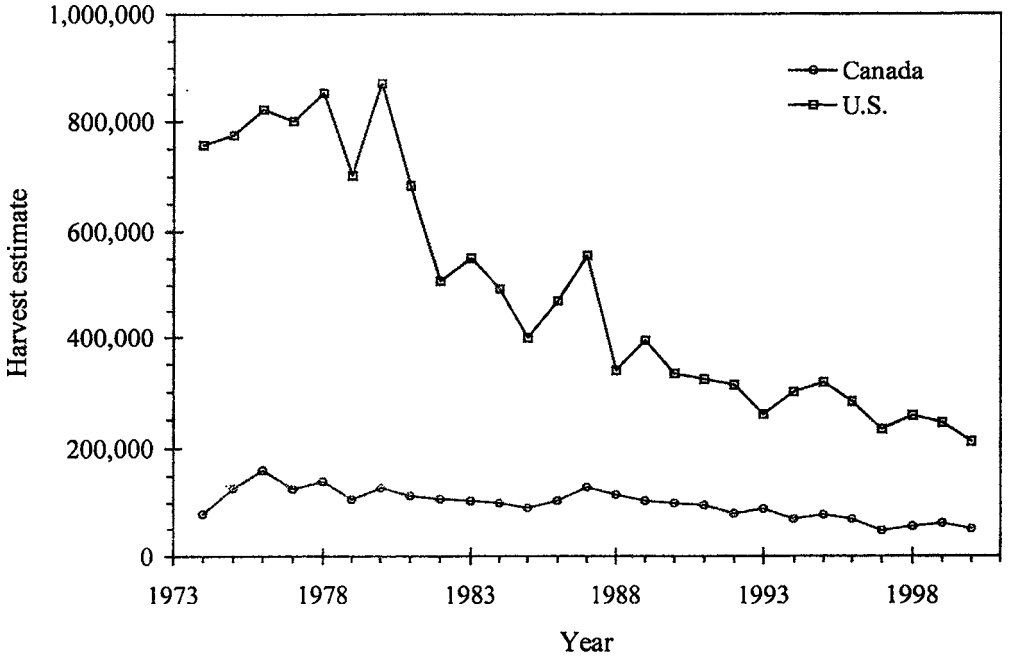


Fig. 35. Harvest estimates of American Woodcock in Canada (H. Lévesque and B. Collins, CWS) and the United States (E. M. Martin, USFWS).

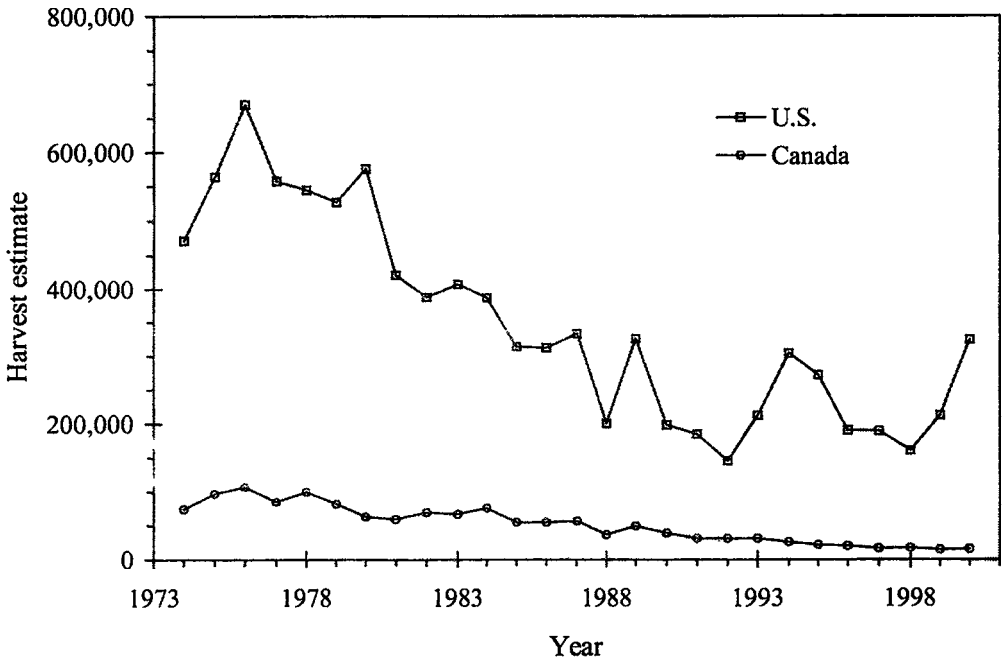


Fig. 36. Harvest estimates of Common Snipe in Canada (H. Lévesque and B. Collins, CWS) and the United States (E. M. Martin, USFWS).

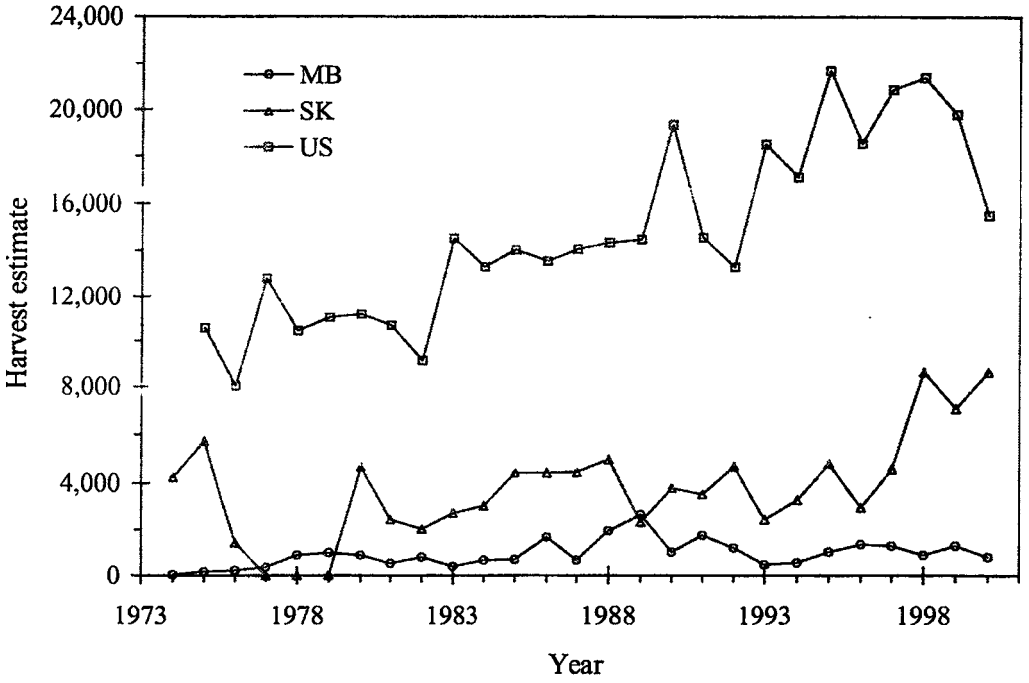


Fig. 37. Harvest estimates of Sandhill Cranes in Canada (H. Lévesque and B. Collins, CWS) and the United States (Sharp and Moser 2001).

Tables

Table 1. Estimated number of indicated breeding pairs (SE) of the most abundant inland duck species in the Black Duck Breeding Ground Survey area of eastern Canada (Collins 2001). The 1990 data in the western portion of the boreal shield region were not comparable with other years and were therefore excluded.

Species/Year	Region									
	Atlantic highlands		Boreal shield - eastern		Boreal shield - central		Boreal shield - western		Entire survey area	
Black Duck										
1990	52606	(9596)	26566	(4932)	54565	(6439)				
1991	45853	(6647)	21321	(3832)	48972	(6005)	81014	(7936)	197160	(12567)
1992	49277	(6196)	21152	(3897)	44365	(4689)	80306	(10167)	195099	(13377)
1993	48340	(5532)	16744	(3589)	63304	(13962)	77297	(13351)	205686	(20413)
1994	46323	(5613)	18529	(5383)	27774	(5139)	59588	(7205)	152215	(11782)
1995	52216	(11946)	14452	(2907)	32690	(5186)	57007	(10466)	156365	(16958)
1996	61712	(5241)	21611	(3090)	51020	(7859)	93256	(14556)	227599	(17625)
1997	58786	(7914)	23669	(3975)	45416	(4708)	72003	(10275)	199873	(14358)
1998	93100	(12175)	21730	(3292)	61411	(7143)	78292	(10296)	254532	(17779)
1999	91149	(13537)	40375	(6444)	72385	(6892)	105618	(17480)	309527	(24038)
2000	91859	(8552)	43636	(6090)	74720	(8348)	99329	(15109)	309543	(20204)
2001	86543	(13708)	26784	(4065)	65847	(8990)	75473	(7829)	254647	(18616)
Mallard										
1990	883	(399)	0	(0)	3441	(1020)				
1991	968	(441)	138	(137)	1767	(873)	58636	(11308)	61509	(11351)
1992	665	(284)	151	(150)	2458	(1036)	58636	(11067)	61909	(11120)
1993	432	(318)	368	(367)	2594	(1264)	59828	(10991)	63222	(11074)
1994	432	(243)	0	(0)	1475	(1073)	46426	(10555)	48333	(10612)
1995	346	(345)	602	(601)	1648	(1196)	43623	(20508)	46219	(20554)
1996	1419	(725)	331	(330)	5371	(1525)	68099	(14511)	75219	(14612)
1997	1773	(903)	323	(225)	4437	(1858)	58123	(14458)	64655	(14607)
1998	1241	(429)	162	(161)	4670	(1734)	38170	(9803)	44243	(9966)
1999	5143	(1556)	158	(157)	6772	(2057)	63761	(13145)	75833	(13396)
2000	6207	(2117)	166	(165)	3036	(1126)	118414	(24916)	127822	(25032)
2001	2804	(981)	144	(143)	4437	(1797)	65496	(15365)	72881	(15502)
Green-winged Teal										
1990	6769	(2263)	3946	(1326)	8111	(2114)				
1991	6501	(1754)	4830	(1358)	8078	(1581)	11331	(2513)	30739	(3706)
1992	6118	(1710)	5420	(1181)	6882	(2871)	12464	(3434)	30883	(4935)
1993	4034	(1262)	5520	(2287)	3632	(1337)	11487	(3710)	24673	(4730)
1994	5475	(1421)	4476	(1255)	7865	(3290)	13880	(4242)	31696	(5693)
1995	6224	(1934)	4215	(2156)	4395	(1624)	14871	(5336)	29706	(6285)
1996	9221	(2063)	4306	(1172)	9107	(1988)	26025	(6341)	48658	(7056)
1997	9931	(2147)	4847	(1176)	5604	(1326)	17350	(5171)	37731	(5873)
1998	9576	(2114)	6786	(1779)	5604	(1695)	12145	(2836)	34111	(4306)
1999	14541	(3213)	6466	(2629)	5371	(1488)	22555	(6551)	48933	(7897)
2000	11704	(1794)	6127	(1610)	20081	(4865)	29929	(5777)	67841	(7928)
2001	12337	(2905)	7488	(2336)	10041	(2198)	13880	(4082)	43745	(5949)
Wood Duck										
1990	736	(377)	0	(0)	1966	(941)				
1991	830	(468)	0	(0)	505	(351)	30593	(10520)	31927	(10536)
1992	1995	(788)	0	(0)	492	(342)	31726	(8040)	34212	(8086)
1993	865	(441)	0	(0)	0	(0)	37811	(13073)	38676	(13080)
1994	1585	(552)	0	(0)	2458	(1998)	51691	(21716)	55734	(21815)
1995	3804	(1697)	0	(0)	4945	(1979)	34700	(22329)	43449	(22481)
1996	2305	(686)	166	(165)	701	(699)	25158	(8813)	28329	(8869)
1997	1596	(779)	323	(225)	1401	(533)	34266	(16017)	37586	(16046)
1998	2660	(1355)	0	(0)	934	(651)	20820	(11529)	24414	(11627)
1999	3547	(1716)	631	(303)	1868	(1258)	55086	(22501)	61132	(22603)
2000	2483	(930)	331	(330)	2335	(1282)	47713	(18202)	52861	(18274)
2001	2056	(1030)	0	(0)	2802	(1012)	31230	(12071)	36088	(12157)
Ring-necked Duck										
1990	16922	(3164)	14939	(2947)	31461	(5394)				
1991	15907	(3302)	17112	(3563)	22214	(3929)	60052	(9164)	115285	(11091)
1992	13167	(2403)	12646	(2814)	19417	(3626)	68550	(8669)	113780	(10099)
1993	15705	(3420)	15640	(3760)	41511	(11837)	60785	(12603)	133641	(18022)
1994	14985	(3201)	11279	(3016)	25071	(4842)	50255	(7978)	101589	(10317)
1995	16598	(5452)	6925	(1969)	26921	(5708)	37674	(12546)	88119	(14953)
1996	15783	(2910)	10267	(2422)	20081	(3885)	56821	(9304)	102952	(10770)
1997	19152	(3920)	10340	(3051)	32223	(4904)	49881	(8578)	111596	(11059)

Table 2. Trends in indicated breeding pairs of the most abundant inland duck species in the Black Duck Breeding Ground Survey area of eastern Canada for the 1991-2001 period (Collins 2001). Trends are expressed as an annual percentage change; the number of plots used in the analysis is given in parentheses.

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)	
American Black Duck	9.1*	(75)	7.1*	(78)	7.0*	(80)	2.3	(64)	6.4*	(297)
Mallard	50.3*	(19)	-	-	6.6	(25)	5.3*	(54)	7.0*	(100)
Green-winged Teal	10.3*	(55)	3.5	(42)	4.2	(43)	4.0	(46)	5.5	(186)
Wood duck	22.8*	(19)	-	-	-	-	5.6*	(26)	6.2*	(54)
Ring-necked duck	12.7*	(60)	7.0*	(56)	2.5	(70)	-1.2	(55)	3.9*	(242)

* 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 3. Number of indicated breeding pairs of inland duck species observed during breeding waterfowl surveys on ground plots in southern Ontario.

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

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

Table 4. Trends in May pond estimates and breeding population estimates for the most abundant inland duck species 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]	1974-2001	N/A		N/A		-0.3	(15)	2.0	(9)	-0.1	(24)
	1992-2001	N/A		N/A		-0.5	(15)	4.0	(9)	1.1	(24)
	1997-2001	N/A		N/A		-13.5*	(15)	-7.1	(9)	-11.0*	(24)
Total ducks[2]	1961-2001	1.8*	(11)	-0.3	(17)	-0.5	(15)	2.1*	(9)	0.3	(52)
	1992-2001	6.7*	(11)	-0.8	(17)	3.3	(15)	9.2*	(9)	3.9*	(52)
	1997-2001	10.5*	(11)	-3.5*	(17)	-7.7*	(15)	1.3	(9)	-2.5	(52)
Mallard	1961-2001	3.5*	(11)	-0.1	(17)	-0.7	(15)	2.6*	(9)	0.3	(52)
	1992-2001	11.0*	(11)	-0.1	(17)	5.0*	(15)	9.8*	(9)	5.3*	(52)
	1997-2001	3.2	(11)	-4.8	(17)	-6.1*	(15)	-3.9	(9)	-4.4*	(52)
Gadwall	1961-2001	6.3	(8)	3.8	(17)	1.3*	(15)	4.7*	(9)	2.8*	(49)
	1992-2001			2.3	(16)	2.2	(15)	8.3*	(9)	5.3*	(41)
	1997-2001			2.3	(14)	-11.8*	(15)	-7.5	(9)	-9.0*	(39)
American Wigeon	1961-2001	4.4*	(11)	-0.7	(17)	-2.4*	(15)	1.9	(9)	-0.2	(52)
	1992-2001	9.0*	(11)	0.3	(17)	-0.7	(15)	1.6	(9)	2.8*	(52)
	1997-2001	3.4	(11)	-9.3*	(17)	-7.6	(15)	-10.4	(9)	-4.9	(52)
Green-winged Teal	1961-2001	5.0*	(11)	0.9*	(17)	-0.1	(15)	1.6*	(9)	1.4*	(52)
	1992-2001	10.0*	(11)	2.5	(17)	4.6	(15)	6.3*	(8)	5.2*	(52)
	1997-2001	19.0*	(11)	4.4	(17)	-9.1*	(15)	-9.5	(8)	4.4	(51)
Blue-winged Teal	1961-2001			-0.2	(15)	0.3	(15)	2.3*	(9)	1.0*	(43)
	1992-2001			-9.9	(12)	3.8	(15)	11.6*	(9)	6.6*	(37)
	1997-2001			-3.3	(12)	-3.3	(15)	3.3	(9)	0.3	(36)
Northern Shoveler	1961-2001	7.7*	(11)	0.6	(17)	0.9	(15)	2.0*	(9)	1.9*	(52)
	1992-2001	8.4*	(11)	-1.7	(16)	4.8*	(15)	8.6*	(9)	5.9*	(51)
	1997-2001	5.7	(11)	-7.4	(16)	-11.6*	(15)	4.7	(9)	-3.7	(51)
Northern Pintail	1961-2001	0.6*	(11)	-2.7*	(17)	-3.3*	(15)	-1.4*	(9)	-1.9*	(52)
	1992-2001	7.9*	(11)	-1.0	(16)	0.9	(15)	4.5	(9)	3.9*	(51)
	1997-2001	21.8*	(11)	-5.9	(16)	-16.9*	(15)	-4.7	(9)	-0.8	(51)
Redhead	1961-2001	2.8	(8)	-0.5	(17)	1.0*	(15)	1.6	(9)	1.1*	(49)
	1992-2001			-1.4	(15)	4.3*	(15)	7.5	(9)	4.9*	(42)
	1997-2001			-10.7	(12)	-6.4	(15)	-1.9	(8)	-5.2	(35)
Canvasback	1961-2001	1.5*	(11)	0.2	(17)	0.3	(15)	1.6	(9)	0.6	(52)
	1992-2001	4.1*	(9)	-5.4	(16)	6.3*	(15)	3.0	(9)	2.6	(49)
	1997-2001	18.3	(9)	-6.3	(15)	-5.2	(14)	-8.6	(9)	-2.9	(48)
Scaup spp.	1961-2001	0.2	(11)	-1.2*	(17)	-0.2	(15)	2.9*	(9)	-0.7*	(52)
	1992-2001	2.4*	(11)	-3.7*	(17)	-3.5	(15)	6.1	(9)	-1.9	(52)
	1997-2001	11.2*	(11)	-2.8	(17)	-9.4*	(15)	-0.9	(9)	-0.7	(52)
Ring-necked Duck	1961-2001	12.3*	(11)	2.6*	(17)	2.4*	(15)	6.5*	(9)	2.9*	(52)
	1992-2001	10.8*	(9)	0.0	(17)	13.4*	(15)	-4.6	(8)	1.2	(49)
	1997-2001	21.8*	(9)	-4.8	(17)	0.9	(15)	-2.9	(8)	-3.2	(49)
Ruddy Duck	1961-2001			3.1*	(16)	1.1	(15)	3.1*	(9)	2.0*	(42)
	1992-2001			-1.7	(13)	1.9	(15)	19.2*	(9)	6.5	(38)
	1997-2001			-10.5	(8)	3.1	(15)	9.7	(8)	3.4	(31)

* 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 5a. Harvest estimates of American Black Ducks in Canada and the United States.

	Canada													United States[1]			
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	Total
1974	19,543	11,684	29,594	14,008	75,534	61,702	511						212,576	294,565	93,254	1,000	388,819
1975	35,354	14,620	59,467	21,876	90,593	85,070	262	118					307,360	274,857	80,981	1,197	357,036
1976	23,770	21,891	48,624	23,342	120,622	96,761	180	586	143	64			335,983	327,422	97,959	837	426,217
1977	38,835	18,044	46,186	20,568	129,618	82,886	727	547		48			337,459	194,970	78,864	249	274,083
1978	49,008	19,660	47,874	34,598	130,379	89,818	379			66			371,782	262,295	74,780		337,075
1979	44,658	12,732	33,687	24,339	112,926	87,557	242	363	256	266			317,026	230,954	68,319		299,273
1980	32,316	21,568	67,341	28,094	120,602	91,503	2,171	268					363,863	309,038	87,059	750	396,847
1981	38,047	16,133	58,692	26,460	105,733	76,298	337	213		41			321,954	230,734	58,862	505	290,101
1982	26,961	25,771	47,447	32,130	117,514	86,650	161	426					337,060	186,709	48,938		235,647
1983	32,956	25,049	57,725	31,007	101,637	60,454	259						309,087	139,461	58,905	317	198,683
1984	26,119	23,256	51,880	33,283	106,868	64,272	327		518				306,523	147,851	53,991		201,841
1985	28,556	18,535	44,397	32,261	110,998	64,692	427	135					300,001	148,142	41,704	180	190,026
1986	27,278	18,650	46,612	27,896	114,493	60,461	367	260	151				296,168	140,485	37,332	442	178,260
1987	20,184	18,114	39,138	27,218	129,612	61,176							295,442	135,463	36,775	112	172,349
1988	20,137	20,364	44,311	30,193	127,134	58,840		151	92				301,222	124,677	29,048	512	154,237
1989	29,299	11,548	47,322	25,582	99,675	47,518	144						261,088	148,689	44,838	326	193,853
1990	22,663	11,369	38,012	26,743	105,277	38,357	106	621	286	103			243,537	110,923	32,276	422	143,621
1991	15,073	14,499	39,295	20,122	85,220	48,670	1,189	312	1,329	229			225,938	126,182	41,064	440	167,686
1992	13,487	8,043	41,079	23,090	82,134	38,228	138	239	73				206,511	97,703	37,912	106	135,721
1993	13,133	10,741	36,298	19,591	87,869	34,556	1,125						203,313	105,401	41,008	66	146,475
1994	16,507	10,221	32,670	23,389	67,440	24,774	254	169				35	175,459	101,598	28,809	265	130,672
1995	15,461	13,355	40,546	29,332	54,776	33,470		204		17			187,161	126,617	42,327		168,945
1996	19,447	9,469	39,759	20,418	49,219	25,289							163,601	83,948	34,651		118,599
1997	18,816	12,982	32,666	17,966	56,103	26,309	265	147	215				165,469	108,795	41,325	79	150,199
1998	22,410	6,789	33,852	22,802	49,065	23,091	165		81	124			158,379	119,622	56,069	236	175,927
1999	19,058	10,782	44,658	22,445	51,385	26,579	36						174,943	112,080	41,505		153,585
2000[2]	21,605	6,980	43,922	18,083	43,476	19,995	222	653					154,936	128,395	51,823		180,218

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

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

Data source: H. Lévesque and B. Collins (CWS), and P. Padding (USFWS).

Table 5b. Harvest estimates of Mallards in Canada and the United States.

	Canada													United States[1]				
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total
1974	154	130	406	761	50,036	191,532	105,723	366,291	488,448	62,595			1,266,076	383,592	2,244,840	809,749	1,166,662	4,604,843
1975	774	405	972	583	57,791	296,173	159,143	567,985	521,935	122,725	1,698	797	1,730,981	409,328	2,518,122	935,086	1,158,934	5,021,469
1976	770	256	753	748	71,851	322,047	204,600	606,239	609,576	114,198	3,229	898	1,935,165	478,378	2,409,567	975,674	1,226,349	5,089,969
1977	836	196	1,155	992	81,835	268,878	165,267	391,986	510,396	131,066	3,073	584	1,556,264	388,103	2,270,182	789,692	987,868	4,435,846
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	442,362	2,257,066	1,059,719	1,265,529	5,024,676
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	437,734	2,346,065	923,878	1,065,681	4,773,358
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	435,020	2,347,969	786,891	1,081,531	4,651,411
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	444,598	2,063,585	784,395	1,051,540	4,344,117
1982	438	410	1,406	1,792	93,288	335,813	148,864	241,734	296,124	92,492	1,552		1,213,913	396,068	1,782,212	683,064	1,047,037	3,908,381
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	417,382	2,019,594	772,537	1,211,502	4,421,013
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	382,673	1,798,350	742,791	1,002,898	3,926,712
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	319,933	1,535,194	510,738	957,840	3,323,705
1986	2,933	755	3,135	2,526	84,303	265,491	112,363	151,384	182,748	72,263	811	433	879,145	362,619	1,550,915	586,585	870,866	3,370,985
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	340,399	1,460,472	612,428	792,918	3,206,217
1988		902	2,304	1,620	83,748	233,556	64,217	75,853	139,565	63,700	2,543	412	668,420	257,049	874,604	324,685	532,928	1,989,266
1989	1,280	925	4,339	2,246	79,419	263,152	70,064	75,645	188,516	57,269	438	773	744,066	321,517	1,094,617	335,185	582,128	2,333,448
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	266,837	1,091,091	326,957	602,498	2,287,383
1991	949	1,106	3,712	4,582	84,483	229,026	60,933	70,050	122,105	51,458	94	641	629,139	317,698	1,189,696	587,437	553,581	2,648,412
1992	863	199	6,407	5,243	87,824	196,647	65,992	68,765	94,795	52,172	605	298	579,810	294,036	1,250,954	366,491	627,179	2,538,660
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	312,268	1,338,179	398,048	687,828	2,736,323
1994	795	864	3,305	2,894	107,222	197,833	57,924	88,848	113,068	50,412	2,042	205	625,412	328,546	1,524,694	510,985	744,386	3,108,611
1995	532	751	4,822	5,131	83,307	176,680	74,206	104,296	111,048	40,782	1,509	278	603,342	424,175	2,347,590	694,371	940,226	4,406,362
1996	351	1,024	4,286	4,044	82,201	176,869	91,266	121,608	115,668	42,447	1,326		641,090	407,686	2,494,017	764,184	1,185,443	4,851,331
1997	1,461	417	8,047	5,371	77,594	178,169	107,379	133,017	151,167	55,513	437	126	718,698	473,056	2,852,099	886,093	1,161,313	5,372,561
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	445,510	2,762,726	953,337	1,428,030	5,589,603
1999	1,188	667	6,305	4,866	69,568	131,901	82,639	182,714	105,126	48,002		220	633,196	441,111	3,058,454	863,495	1,127,102	5,490,163
2000[2]	1,320	1,915	5,481	5,999	81,655	162,352	67,469	197,400	110,163	51,925	512	72	686,263	501,562	3,032,542	1,072,976	1,035,969	5,643,049

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

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

Data source: H. Lévesque and B. Collins (CWS), and P. Padding (USFWS).

Table 5c. Harvest estimates of Northern Pintails in Canada and the United States.

	Canada													United States[1]				
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total
1974	939	820	659	790	14,043	8,296	7,545	39,226	69,214	14,281			155,813	34,680	122,979	162,514	928,363	1,248,536
1975	1,092	431	612	787	21,999	9,644	20,611	55,909	81,637	23,758	72	417	216,969	41,095	206,500	273,519	1,045,430	1,566,543
1976	1,507	651	2,663	352	27,578	17,112	17,545	34,693	59,532	38,626	385	277	200,921	42,373	157,050	194,905	928,045	1,322,373
1977	2,438	1,653	1,717	607	39,581	14,333	11,243	20,469	69,905	29,464	137	313	191,860	50,636	213,624	179,902	540,736	984,899
1978	824	829	1,892	1,039	21,298	13,077	21,072	14,051	38,039	22,830	698	216	135,865	35,737	210,658	239,436	851,654	1,337,485
1979	1,693	579	1,056	382	14,958	9,326	19,745	30,588	48,505	17,735	691	287	145,545	48,462	213,601	228,947	829,302	1,320,313
1980	905	510	757	1,384	16,722	13,248	12,872	16,868	44,003	21,392		108	128,769	38,869	215,811	193,244	633,307	1,081,232
1981	1,536	747	951	1,144	17,437	11,977	16,099	2,430	39,745	18,658	91	148	110,963	27,891	207,864	151,023	403,865	790,643
1982		1,531	1,009	1,479	20,791	10,946	13,290	12,598	29,130	14,021			104,795	38,632	126,568	158,994	467,575	791,768
1983	2,805	523	694	303	15,867	10,767	11,195	17,056	27,154	13,385	1,864	175	101,788	18,636	187,365	139,077	465,087	810,166
1984	1,698	1,047	717	908	9,253	10,132	13,131	12,343	34,016	19,661	168	337	103,411	34,658	153,680	165,804	312,488	666,630
1985	1,459	748	1,460	1,817	16,486	15,345	9,668	8,117	24,051	11,244		810	91,205	21,685	124,920	83,914	292,708	523,227
1986	634	565	846	1,841	13,163	9,057	6,988	9,077	8,632	8,885		296	59,984	19,033	90,350	72,071	274,953	456,408
1987	807	2,218	632	1,017	11,864	6,020	5,478	8,386	19,668	10,945		158	67,193	15,788	88,305	122,420	311,406	537,918
1988	1,998	1,449	486	715	12,160	8,019	13,779	5,320	14,667	10,831			69,424	7,447	39,225	36,387	116,304	199,363
1989	1,421	660	344	1,406	15,460	11,511	7,560	4,326	11,766	8,549	45		63,048	14,588	65,055	43,594	139,507	262,744
1990	4,114	450	653	1,707	19,568	8,231	5,279	10,087	13,483	7,750	281	41	71,644	10,493	49,487	43,206	133,154	236,340
1991	351	542	901	844	9,357	4,742	4,407	4,023	5,689	4,179	112	73	35,220	14,201	40,319	57,374	126,404	238,299
1992		910	79	464	6,221	4,861	5,236	2,126	6,914	6,393	136	77	33,417	12,207	56,296	31,506	116,238	216,247
1993	1,090	1,336	852	706	11,401	5,156	5,172	3,253	4,025	4,701	61		37,753	12,946	52,339	42,482	140,609	248,376
1994	934	765	1,163	1,136	11,307	4,649	4,866	7,302	7,518	4,738		64	44,442	17,954	81,066	61,278	150,352	310,650
1995	1,727	454	965	1,240	7,831	4,552	8,974	6,521	7,573	4,476			44,313	32,702	136,329	94,348	259,341	522,720
1996	1,246	478	897	1,234	5,043	4,011	10,323	14,477	9,621	5,367			52,697	19,326	124,061	95,337	281,618	520,342
1997	785	139	116	493	7,423	5,560	13,248	13,656	13,883	5,422	37		60,762	23,859	144,980	186,298	339,776	694,912
1998	1,026		653	757	7,735	6,361	14,347	11,099	11,119	6,462	19	276	59,854	33,054	176,729	123,388	238,668	571,839
1999	390	1,137	755	1,790	8,956	6,457	9,830	10,610	10,304	5,464		0	55,693	28,983	170,313	136,088	192,986	528,371
2000[2]	470	509	499	581	6,480	5,397	2,633	13,468	9,448	2,240	38		41,763	22,622	161,054	133,664	161,253	478,593

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

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

Data source: H. Lévesque and B. Collins (CWS), and P. Padding (USFWS).

Table 5d. Harvest estimates of Canvasbacks in Canada and the United States.

	Canada													United States[1]				
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total
1974					1,461	7,530	3,904	5,647	3,344	773			22,659	689	16,112	19,280	38,766	74,848
1975					2,116	18,757	8,205	9,065	4,262	1,051		17	43,473	1,629	30,558	15,897	45,660	93,743
1976				20	2,117	17,817	5,321	7,454	3,773	1,360			37,862	23,221	33,907	18,000	51,796	126,925
1977					1,036	6,162	2,770	4,019	2,076	198		44	16,305	6,950	24,761	10,831	32,487	75,029
1978					3,293	11,996	4,596	4,544	2,424	233			27,086	5,452	20,353	7,004	31,088	63,898
1979					3,769	14,208	7,922	7,585	2,239				35,723	9,249	39,387	17,322	26,026	91,985
1980					3,301	10,966	4,746	1,420	5,431	1,269			27,133	8,182	27,332	7,800	23,129	66,443
1981					625	8,327	3,883	1,066	5,193	534			19,628	8,143	20,007	4,897	24,929	57,976
1982					1,440	6,223	7,669	3,236	344				18,912	3,094	13,945	8,130	19,820	44,990
1983					400	10,970	6,696	2,638	4,040	240			24,984	14,286	30,977	14,207	21,601	81,071
1984					214	8,279	1,819	4,716	3,620	210		37	18,895	8,531	23,015	14,215	25,548	71,308
1985					1,435	8,673	3,349	3,617	1,427	201			18,702	9,021	23,061	10,417	37,309	79,807
1986	216		461		1,082	14,385	3,145	5,242	3,951	956	53		29,491	204	594	1,064	22,118	23,980
1987					503	6,158	2,945	638	709	463			11,416	76	802	784	17,713	19,375
1988					504	2,153	2,744	1,491	385	230			7,507	82	141	190	436	849
1989						3,636	1,255	219	869	45	45		6,069	226	508	333	9,748	10,814
1990						5,902	1,392	508	697		23		8,522	104	311	334	7,068	7,817
1991					198	4,206	473	2,473	1,855	98			9,303		237	720	7,162	8,120
1992					134	3,194	788	282	194	35			4,627		199	93	11,189	11,481
1993					88	1,602	2,505	1,862	570	25			6,652	27	173	257	12,764	13,222
1994						1,331	3,695	1,141	1,843	164			8,174	4,603	31,332	13,350	20,034	69,319
1995						5,444	4,016	1,303	1,542	119			12,424	13,140	59,928	19,481	15,748	108,297
1996					74	4,219	2,965	3,914	1,385				12,557	20,065	49,682	17,850	21,665	109,263
1997						7,585	5,802	1,708	1,387	55			16,537	12,187	59,913	22,730	25,804	120,634
1998						5,266	2,012	392	663	83	233		8,649	7,457	36,763	21,639	27,108	92,967
1999						2 133	5 065		787	51			8 036	6 184	40 329	21 073	19 481	87 067
2000[2]					111	3 085	4 801	587	1 123	51	13		9 771	16 628	45 046	25 374	17 599	104 647

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

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

Data source: H. Lévesque and B. Collins (CWS), and P. Padding (USFWS).

Table 5e. Harvest estimates of Lesser Scaup in Canada and the United States.

	Canada													United States[1]				
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total
1974	3,601	37	688	731	22,326	43,359	16,244	10,698	9,432	1,612			108,728	35,822	330,743	58,853	23,574	448,993
1975	6,323	166	1,450	943	28,681	43,739	21,748	10,861	18,870	2,661	369	661	136,472	33,216	250,469	48,732	24,455	356,872
1976	656	89	1,139	238	34,714	50,152	27,108	16,747	14,470	2,243	169	386	148,111	59,049	326,767	96,291	49,008	531,115
1977	1,033	61	3,552	146	31,895	46,505	11,010	7,250	8,363	3,474	799	237	114,325	198,948	364,464	75,719	45,311	684,442
1978	1,666	43	1,857		23,451	26,854	14,537	10,400	13,551	3,114	215	341	96,029	39,643	177,363	59,232	38,781	315,019
1979	241		751	51	26,706	35,097	15,433	7,646	10,827	1,799	571		99,122	19,566	144,930	46,927	40,580	252,002
1980	2,844	73	662	746	28,850	55,807	27,541	4,910	13,112	1,906	599		137,050	21,010	154,392	34,617	25,957	235,976
1981	1,607		704	735	31,991	58,463	18,807	3,225	8,980	1,224	507	148	126,391	97,085	325,062	92,566	33,140	547,851
1982	126		387	309	20,981	37,287	27,394	6,655	13,226	1,721			108,086	38,965	240,955	45,835	31,037	356,792
1983	471	104	550	575	19,171	42,320	22,289	9,122	6,551	103		78	101,334	34,206	154,495	36,870	43,475	269,046
1984	1,695	31	352	912	17,696	53,451	18,336	10,861	5,435	975	98	74	109,916	83,668	380,902	151,239	45,751	661,560
1985	874		365	951	25,866	61,409	15,356	2,498	6,604	1,240	831		115,994	80,590	305,839	71,561	28,488	486,478
1986	1,839		430	1,646	23,080	47,546	14,674	5,382	5,974	1,191	170		101,932	20,772	164,023	44,449	18,908	248,153
1987	339	290	615	541	11,981	34,512	10,400	7,129	5,458	1,140		12	72,417	23,096	97,098	44,634	20,408	185,235
1988		87	943	544	22,429	32,983	6,885	5,019	3,341	496	424		73,151	26,165	84,876	28,416	9,201	148,658
1989	2,063	52	1,237	1,119	26,710	42,316	7,296	1,347	3,073	608	179		86,000	25,223	69,128	24,097	8,635	127,082
1990	1,757	35	1,051	1,696	24,047	25,772	6,592	2,557	3,888	778	191		68,364	13,306	58,788	17,035	12,991	102,120
1991	272		481	455	18,402	31,204	9,226	3,864	2,464	428	37		66,833	11,364	102,599	41,279	15,547	170,789
1992	1,004		171	116	15,249	24,587	8,227	778	2,320	650	33		53,135	13,188	132,387	28,884	12,710	187,170
1993	2,231		401	690	20,912	35,173	6,228	2,196	1,628	452	35	40	69,986	13,226	63,754	15,689	13,671	106,340
1994	510	99	445	244	11,479	27,137	12,344	2,742	3,247	378		52	58,677	20,454	101,903	34,340	20,231	176,927
1995			334	730	8,705	27,465	14,185	2,263	2,926	242			56,850	26,787	188,982	37,874	31,644	285,288
1996	178		331	156	7,460	17,344	9,258	2,415	2,800	1,162	331		41,435	35,677	293,748	92,118	38,165	459,708
1997	232		512	782	6,529	19,843	5,185	4,262	4,863	1,302	431		43,941	41,496	359,782	80,579	28,174	510,032
1998	1,455		223	1,300	11,513	16,069	5,400	6,287	2,695	311			45,253	61,474	319,267	149,431	30,136	560,309
1999	470		131	110	8,339	19,599	10,233	2,143	939	181			42,145	71,300	80,196	34,263	21,645	207,405
2000[2]	26			49	5,071	9,781	9,819	1,302	1,834	185	77	130	28,274	32,490	209,023	84,477	24,882	350,872

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

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

Data source: H. Lévesque and B. Collins (CWS), and P. Padding (USFWS).

Table 5f. Harvest estimates of Greater Scaup in Canada and the United States.

	Canada													United States[1]				
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total
1974	1,788	314	1,620	488	20,243	18,172	572	532		1,039			44,768	29,149	23,881	1,560	9,823	64,413
1975	1,321		2,401	283	25,353	36,056	1,136	176	1,215	2,986	69		70,996	64,738	24,343	1,160	10,488	100,729
1976	3,095		3,522	478	28,190	37,526	1,140	291		1,297			75,539	55,250	20,426	780	11,056	87,512
1977	2,436	217	1,895	244	21,126	44,900				617		64	71,499	71,412	26,695	3,778	29,156	131,041
1978	1,611		502	141	17,811	20,465	1,782			320		77	42,709	28,502	20,673	1,787	7,802	58,764
1979	637		959	97	20,315	26,367	677			1,391			50,443	17,766	13,521	386	7,442	39,115
1980	3,052	147	738	384	18,922	29,535	720			739			54,237	34,536	17,661	1,660	11,517	65,374
1981	344		170	818	22,891	23,762	1,139			548			49,672	72,971	27,832	4,138	19,712	124,652
1982	1,476	63	411	584	15,678	15,797				230			34,239	22,837	11,800	1,381	4,712	40,730
1983	427		1,289	574	13,443	38,628				924			55,285	27,920	30,965	623	13,453	72,962
1984	2,565	31	1,098	1,125	18,999	22,538	419	561	133	907			48,376	31,791	23,415	2,745	13,170	71,122
1985	2,423	428	759	272	17,880	28,128	1,022			134		63	51,109	36,479	21,171	1,517	5,627	64,795
1986	5,095	404	2,213	1,456	11,638	30,320	970	214	151	1,112			53,573	17,964	10,308	845	7,612	36,729
1987	1,103		672	1,323	6,941	13,103	746	131		318			24,337	23,103	11,445	1,449	8,817	44,815
1988	920		3,221	585	13,622	13,859				212			32,419	12,098	6,677	1,380	5,842	25,998
1989	5,264	51	2,547	1,498	9,380	14,701			182	242			33,865	14,406	6,620	316	3,844	25,187
1990	3,684	79	1,609	420	9,284	11,959	383		195	81			27,694	7,136	12,257	1,306	5,844	26,543
1991			1,657	267	6,314	9,815	626	474	387	153			19,693	6,503	5,542	3,859	4,706	20,610
1992	1,360		805	898	4,830	9,913	298			87			18,191	6,098	7,946	1,216	4,101	19,361
1993	5,959	176	1,161	362	8,589	8,651	163				21		25,082	8,494	11,520	1,037	5,993	27,044
1994	706		1,501	307	6,550	8,329	306			26			17,725	6,425	13,146	2,936	6,476	28,984
1995	508	82	920	542	5,080	12,861	268			97			20,358	14,490	19,757	5,205	13,455	52,907
1996	596	65	772	914	5,839	7,653	286		297				16,422	11,894	21,392	2,871	13,572	49,729
1997	677	83	919	1,119	3,627	6,002	157			379			12,963	9,572	23,484	12,688	16,864	62,607
1998	1,703	169	256	1,878	4,055	4,274	165		162				12,662	12,580	15,352	5,375	12,384	45,691
1999	1,377		332	55	4,171	4,671	929					3	11,538	10,929	8,886	3,270	11,718	34,803
2000[2]	1,075		1,157	659	2,961	3,190							9,042	12,910	15,996	1,880	12,154	42,940

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

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

Data source: H. Lévesque and B. Collins (CWS), and P. Padding (USFWS).

Table 6. Sea duck densities per 100 km^2 of survey area along the Atlantic Coast of Canada and the United States. No surveys were conducted in 1993 and 1996.

Species	1991	1992	1994	1995	1997	1998	1999	2000
Black Scoter	88	65	94	131	256	396	171	255
Surf Scoter	55	109	114	249	233	569	101	341
White-winged Scoter	40	17	13	117	85	35	127	13
Total Scoters[1]	1162	358	226	507	576	1000	466	621
Long-tailed Duck	114	114	311	173	108	167	188	170

[1]Total scoters includes unidentified species.
Data source: J. R. Goldsberry and J. Wortham (USFWS).

Table 7. Trends in breeding population estimates for the most abundant sea duck species 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)	
Mergansers	1961-2001	7.1*	(11)	1.9*	(17)	2.7	(14)	5.8*	(8)	2.2*	(51)
	1992-2001	3.9	(11)	0.1	(17)	9.2*	(13)	21.2	(7)	1.0	(48)
	1997-2001	4.5	(11)	1.8	(17)	-5.7	(11)	8.0	(7)	1.5	(46)
Goldeneyes	1961-2001	-0.4	(11)	1.6*	(17)	3.0*	(15)	0.5	(8)	1.5*	(51)
	1992-2001	3.3	(11)	4.3	(17)	4.1	(15)			4.2*	(42)
	1997-2001	9.5	(10)	5.0	(14)	-7.3	(14)			3.7	(41)
Bufflehead	1961-2001	0.0	(10)	1.8*	(17)	3.9*	(15)	4.8*	(8)	1.9*	(52)
	1992-2001	4.6*	(10)	0.1	(17)	5.3	(15)	-11.3	(8)	1.1	(48)
	1997-2001	4.9	(10)	-4.7*	(17)	-3.0	(14)	10.2	(7)	-4.3*	(48)
Long-tailed Duck	1961-2001	-1.3	(11)	-3.4*	(12)					-2.6*	(25)
	1992-2001	0.2	(10)	-0.7	(9)					-0.3	(17)
	1997-2001	11.7	(10)	-13.7*	(7)					-1.7	(17)
Scoter spp.	1961-2001	-0.3	(11)	-1.3*	(17)	-4.1*	(11)			-1.1*	(40)
	1992-2001	-3.5	(11)	-0.1	(17)	-21.4*	(7)			-1.3	(34)
	1997-2001	0.4	(11)	-6.9	(17)					-4.9	(29)

* Trend significant at $P < 0.05$.

Table 8. Trends in indicated breeding pairs of the most abundant sea duck species in the Black Duck Breeding Ground Survey area of eastern Canada for the 1990-2001 period (Collins 2001). Trends are expressed as an annual percentage change; the number of plots used in the analysis is given in parentheses.

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	9.2	(47)	4.7	(45)	-1.9	(68)	-1.3	(48)	-0.1	(202)
Hooded Merganser	24.4*	(19)	23.1	(11)	16.3*	(41)	0.9	(49)	5.2*	(119)
Common Goldeneye	15	(13)	5.2*	(66)	1.2	(68)	5.2*	(43)	4.6*	(187)

* 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 9a. Harvest estimates of Black Scoters in Canada and the United States.

	Canada													United States[1]				
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total
1974	2,239		1,300	17	5,555	3,646							12,757	20,905	3,266	52		24,223
1975	126		2,789		11,105	11,628					23		25,671	16,152	2,687		246	19,085
1976	2,712		344	5,131	17,218	6,855							32,260	8,972	2,159	169	274	11,573
1977	5,212	95	96	2,572	25,494	3,672				90	198		37,429	15,272	4,368	133	142	19,917
1978	366			1,423	6,352	1,999				92			10,232	7,883	242			8,126
1979	1,832		134	1,234	11,456	1,974					86	108	16,824	11,840	1,095	69		13,004
1980	1,197		1,104		12,065	914							15,280	5,552	2,430			7,982
1981	3,406		5,230	166	11,436	2,885				55			23,178	8,585	3,212	185	145	12,127
1982	6,211		2,769		6,574	968							16,522	4,018	1,068	355		5,440
1983	879		2,307	49	5,390	2,305				37			10,967	3,383	580		154	4,117
1984	2,021		1,536		7,756	2,074	331			58			13,776	10,541	750	94	206	11,591
1985	892	210	1,094		7,035	3,493							12,724	13,390	2,298	76		15,764
1986	580		3,126		2,314	2,796						34	8,850	6,838	412			7,250
1987	584		1,359	679	7,196	843	415						11,076	9,707	228			9,935
1988	152		1,098	371	3,456	714							5,791	5,547	198			5,745
1989	445		642		5,000	708							6,795	5,275	1,366		50	6,691
1990	359		1,119	204	3,896	1,454							7,032	12,139	148		35	12,321
1991	784		2,331	94	3,255	908							7,372	6,482				6,482
1992	970		1,770		1,478	670						24	4,912	4,448	315			4,764
1993	571		1,166		4,883	657	619						7,896	3,092	634	41	49	3,816
1994	299		3,217	54	2,299	549	972			30		165	7,585	5,597	1,197	54		6,848
1995	1,544		1,978	149	680	564							4,915	2,894	100			2,995
1996	569		1,000	33	1,598	379							3,579	4,734	463	203	211	5,610
1997	0		1,325	44	2,204	205							3,778	4,548	941	105	123	5,717
1998	1,214	14	985	52	2,754	186							5,205	3,198	688			3,886
1999	526		1,003		1,621	465							3,615	5,860	1,261	50		7,172
2000[2]	29		1,354		678	499							2,560	2,750	793			3,543

[1]AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway.
2000 Harvest data for the U.S. are preliminary.
Data source: H. Lévesque and B. Collins (CWS), and P. Padding (USFWS).

Table 9b. Harvest estimates of White-winged Scoters in Canada and the United States.

	Canada													United States[1]				
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total
1974		113	1,105	46	9,676	4,611	291		251	174			16,267	26,619	6,393		424	33,435
1975			1,744	233	4,936	4,278	141		357	143		55	11,887	33,021	1,944	117	125	35,206
1976	95	205	357	1,775	8,246	4,124	397		648	61		164	16,072	18,190	497	565	1,010	20,262
1977				766	10,265	4,395	183		118	57		248	16,032	12,123	2,342	257	1,531	16,252
1978	1,106	153	871	250	5,042	3,313		382	334	266			11,717	12,290	205		3,534	16,029
1979	565		259	431	8,019	5,843		365	173				15,655	9,945	965		748	11,658
1980	3,482		3,497	189	10,829	3,144				103			21,244	16,140	2,283	34	792	19,249
1981	728		1,231	114	7,831	2,512				690	116		13,222	11,926	1,643	126	1,172	14,867
1982	792		1,459	151	7,800	2,003			1,485	1,260			14,950	13,712	1,269		172	15,153
1983	710		1,417	199	7,843	2,471		517		162			13,319	9,560	2,339		177	12,076
1984	1,644	31	2,253		11,052	3,636					408		19,024	27,921	2,283		3,970	34,174
1985	1,031		791	97	7,792	2,899	284		253	67	1,661		14,875	19,271	2,074	36	425	21,806
1986	216		401	46	2,357	1,445		214		297			4,976	10,157	1,142		276	11,575
1987			1,091	91	6,950	3,619			107	79			11,937	20,374	2,886	101	1,019	24,379
1988	2,236		1,979	61	7,082	1,389				53			12,800	17,343	1,086		134	18,563
1989	200		1,517	131	8,078	1,865							11,791	7,045	1,196	70	43	8,354
1990	930		2,202	142	5,319	805	792						10,190	12,616	545		238	13,399
1991			465	90	2,505	1,096							4,156	16,306	1,036	625	88	18,055
1992	283		1,638		5,214	441							7,576	8,909	660	151		9,720
1993	544	379	1,238	123	4,417	2,044	163				35		8,943	6,416	380		247	7,043
1994	345		2,132		5,934	1,344							9,755	3,654	737	111	240	4,742
1995			1,847		1,796	672							4,315	6,058	314		239	6,611
1996	89		1,035		2,464	1,177							4,765	7,987	3,478	119	361	11,944
1997	58		1,191		2,307	471							4,027	6,782	568		500	7,850
1998	598		758	199	3,364	291							5,210	4,738	602		786	6,126
1999	42		413		1,338	260						3	2,056	3,440		55	229	3,724
2000[2]	48		313		528	104					26		1,019	3,761		39		3,800

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

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

Data source: H. Lévesque and B. Collins (CWS), and P. Padding (USFWS).

Table 9c. Harvest estimates of Surf Scoters in Canada and the United States.

	Canada													United States[1]				
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	AF	MF	CF	PF	Total
1974	1,074	34	2,714	243	9,757	2,648				322			16,792	22,273	4,380	59	746	27,458
1975		53	1,424	393	15,603	10,372	360	498		51			28,754	30,481	4,208		63	34,752
1976	4,359	714	1,395	7,312	20,036	8,685	567			78	70	42	43,258	16,289	442	308	1,117	18,156
1977	1,655	655	1,942	3,473	17,590	7,910							33,225	22,816	2,405	528	5,502	31,251
1978	672	55	2,064	1,525	8,843	3,119				209	45		16,532	14,789	512		1,842	17,143
1979	674		600	1,778	12,280	7,909							23,241	10,011	1,013		1,591	12,616
1980	1,570		4,191	655	10,321	5,164	90			103	634		22,728	9,689	874	201	1,056	11,820
1981	1,247		6,390	193	12,826	1,532	496			294	95		23,073	22,713	1,142		1,178	25,033
1982	9,999		2,776	356	14,879	1,287	261			171			29,729	5,855	635	633	952	8,074
1983	4,745		1,078		4,118	871	351		190	74	148		11,575	5,810	708	284	1,274	8,075
1984	4,141		2,955	153	7,943	3,065	285			307	113		18,962	18,231	1,981		7,092	27,304
1985	1,379		3,678	153	6,417	598	284			67	831		13,407	17,588	1,653		723	19,963
1986	2,344	82	2,456	186	2,061	1,996				29	125	34	9,313	19,394	844	295	344	20,876
1987	579		3,031	196	6,889	2,051		131		265			13,142	17,120	791		1,529	19,440
1988	961		2,375	230	7,370	639							11,575	6,202	241	79	2,094	8,616
1989	2,577		4,759		5,085	2,897				40			15,358	15,843	958		1,215	18,016
1990	3,457		7,557	436	5,194	1,153	705						18,502	14,837	300	131	632	15,899
1991	950		1,319	477	1,822	2,099	587	514					7,768	11,158	151	256	188	11,752
1992	655		1,399		3,480	579							6,113	11,306	378	124	221	12,028
1993	1,290	95	4,917	261	3,890	916	1,125			25	35	6	12,560	8,354	694	63	807	9,918
1994	3,602		7,683	70	6,892	670						35	18,952	15,924	787	141	46	16,899
1995	2,879		4,687	594	3,449	972				34			12,615	6,540	2,924	221	776	10,461
1996	315		1,355	88	2,971	759							5,488	11,351	1,901	311	1,198	14,761
1997	326		2,695	291	3,031	442							6,785	9,363	457		2,152	11,972
1998	983	1,216	6,704	327	2,401	311					76		12,018	15,053	542	25	1,521	17,142
1999	2 215		4 642	120	2 837	44	286						10 144	8 768	2 857	143	466	12 234
2000[2]	653		726	601	1 098	62							3 140	10 966	328	104	478	11 876

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

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

Data source: H. Lévesque and B. Collins (CWS), and P. Padding (USFWS).

Table 10a. Harvest estimates of Greater Snow Geese 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	9,170	9,170	40,032
1976					27,854	108							27,962	12,276	12,276	40,238
1977														22,463	22,463	22,463
1978					41,748	1,263		276	295				43,582	20,050	20,050	63,632
1979					23,619								23,619	29,369	29,369	52,988
1980					55,847	151							55,998	27,484	27,484	83,482
1981			25		24,170	110							24,305	13,647	13,647	37,952
1982			47		40,462	655	148	352					41,664	21,725	21,725	63,389
1983														41,185	41,185	41,185
1984	166				44,983	589	3,111	784					49,633	38,735	38,735	88,368
1985					24,370								24,370	14,775	14,775	39,145
1986				72	10,536								10,608	9,035	9,035	19,643
1987					756								756	28,612	28,612	29,368
1988					41,365			93					41,458	25,226	25,226	66,684
1989					43,529	249							43,778	17,567	17,567	61,345
1990	287				60,647				204				61,138	21,772	21,772	82,910
1991					47,697		724						48,421	26,897	26,897	75,318
1992				295	26,984	926	759	215					29,179	10,628	10,628	39,807
1993					97,534	429	1,938	2,282					102,183	30,717	30,717	132,900
1994					35,903	112							36,015	18,254	18,254	54,269
1995			21		50,267	252	391						50,931	19,487	19,487	70,418
1996	60		62	1,859	66,111	111	115						68,318	31,990	31,990	100,308
1997					55,056	164							55,220	35,144	35,144	90,364
1998			90	412	86,791	64			118				87,475	110,865	110,865	198,340
1999				774	36,821	105			86				37,786	39,192	39,192	76,978
2000[2]					103,615			554	334				104,503	45,506	45,506	150,009

[1]AF: Atlantic Flyway.

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

Data source: H. Lévesque and B. Collins (CWS), and P. Padding (USFWS).

Table 10b. Harvest estimates of Lesser Snow Geese 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]			
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	MF	CF	PF	Total
1975					5,578	15,742	51,708	12,692	16,339	2,972	324		105,355	167,619	350,042	92,869	610,531
1976					192	11,519	31,449	20,721	30,741	1,102	177		95,901	102,336	256,487	144,009	502,832
1977					19,653	8,000	31,850	12,151	30,731	576			102,961	126,776	306,300	81,839	514,915
1978			30		542	6,201	39,770	11,619	16,819	401			75,382	133,929	189,012	30,924	353,865
1979					5,379	10,576	99,151	12,981	10,752	1,917	552		141,308	165,581	338,387	32,628	536,595
1980			50		12,762	8,710	91,968	16,172	9,498	1,725			140,885	144,437	251,759	35,765	431,961
1981					408	6,576	88,124	15,339	13,780	3,378			127,605	110,763	289,863	61,110	461,736
1982					1,712	2,666	82,094	22,845	6,010	2,666			117,993	124,365	241,740	33,073	399,179
1983					45,351	1,820	82,602	33,377	6,802				169,952	187,150	245,744	46,829	479,724
1984					2,503	1,205	76,472	31,919	8,265	2,700			123,064	101,544	292,792	64,425	458,761
1985			49		497	1,913	105,719	33,311	11,362	3,972			156,823	98,968	216,863	82,220	398,051
1986						2,335	49,587	32,129	9,679				93,730	69,736	149,887	37,383	257,006
1987					19,137	6,169	70,849	22,976	3,980	2,329			125,440	56,463	182,580	38,235	277,278
1988					3,864	2,231	71,733	24,321	9,583	1,556			113,288	51,707	251,828	42,131	345,665
1989					1,169	5,654	92,720	27,321	11,274	926			139,064	97,274	286,254	32,953	416,481
1990				448	2,293	2,742	54,027	32,541	10,504	137	339	407	103,438	92,832	211,750	32,285	336,867
1991					2,645	2,799	66,254	22,224	5,600	2,619			102,141	110,741	496,110	30,998	637,850
1992			58		592	590	26,778	21,240	9,123	467			58,848	60,162	149,475	29,282	238,918
1993					7,641	2,543	51,301	19,674	5,303	2,094			88,556	71,733	270,213	55,290	397,235
1994					5,855	657	56,221	30,258	6,987	2,174	105		102,257	99,029	270,488	29,409	398,927
1995					855	1,286	61,603	31,323	8,680	1,589	306		105,642	191,247	331,950	37,805	561,002
1996					3,486	1,028	46,163	34,546	4,185	2,863			92,271	231,127	299,206	59,041	589,374
1997					8,853	336	69,683	62,635	9,261				150,768	239,021	348,981	35,428	623,430
1998				16	16,732	954	52,121	68,985	14,890	1,797			155,495	408,911	325,761	52,393	787,066
1999					6,747	115	14,150	116,313	15,416	1,990			154,731	406,037	486,197	44,874	937,108
2000[2]					5,686	1,350	31,699	68,377	12,881	2,687	45		122,725	226,612	181,976	44,264	452,852

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

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

Data source: H. Lévesque and B. Collins (CWS), and P. Padding (USFWS).

Table 10c. Harvest estimates of Canada Geese (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	338,746	288,892	133,131	188,409	949,178	949,178
1975	8,185	6,382	8,836	2,182	12,791	33,441	94,330	96,197	85,708	8,913		142	357,107	357,944	330,393	172,706	181,392	1,042,435	1,399,542
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	366,749	340,603	172,463	172,166	1,051,982	1,369,754
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	466,076	357,622	158,867	185,205	1,167,769	1,499,145
1978	12,743	11,972	6,571	3,412	66,437	53,019	83,032	70,426	77,647	10,800		338	396,397	327,020	425,873	200,813	252,887	1,206,592	1,602,989
1979	13,401	10,827	5,261	2,614	50,012	64,249	94,496	79,544	79,636	12,931		289	413,260	296,919	325,393	185,735	187,390	995,437	1,408,697
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	474,927	316,334	187,172	187,919	1,166,352	1,621,038
1981	10,202	14,264	7,384	3,744	25,291	49,902	57,927	84,914	95,051	15,843		233	364,755	328,727	309,219	206,741	194,997	1,039,685	1,404,440
1982	11,186	13,296	5,409	2,584	29,680	69,828	73,788	87,249	97,569	14,479		0	405,068	383,542	290,168	213,539	206,561	1,093,810	1,498,878
1983	13,652	15,768	9,534	7,370	37,429	69,648	71,671	127,184	108,097	14,877		397	475,627	490,987	288,860	233,440	230,174	1,243,462	1,719,089
1984	14,086	13,963	6,465	3,019	22,906	63,187	88,745	95,993	96,065	15,841		267	420,537	408,814	310,287	235,779	199,421	1,154,300	1,574,837
1985	9,669	17,226	6,829	4,071	28,132	76,234	103,441	88,407	103,077	18,510		96	455,692	360,900	336,081	289,658	200,853	1,187,491	1,643,183
1986	16,770	21,912	8,794	5,660	39,193	83,746	91,603	80,714	88,943	14,853		190	452,378	413,729	336,957	212,894	147,104	1,110,683	1,563,061
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	359,284	319,651	198,221	162,733	1,039,889	1,580,369
1988	9,379	24,906	9,676	3,377	20,454	76,537	56,025	80,044	99,376	15,266		174	395,214	268,960	446,252	240,777	163,219	1,119,208	1,514,422
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	318,480	579,814	273,306	149,193	1,320,793	1,833,217
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	302,010	510,396	282,865	201,497	1,296,768	1,804,721
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	306,278	543,647	552,767	174,941	1,577,632	2,051,587
1992	6,436	11,640	4,288	5,350	27,188	79,880	57,470	81,009	91,104	15,961		154	380,480	247,537	484,202	223,596	196,784	1,152,119	1,532,599
1993	9,759	19,168	13,295	6,916	40,609	83,889	73,581	79,823	93,614	13,509		94	434,257	286,895	598,994	319,437	223,375	1,428,701	1,862,958
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	306,245	644,449	382,784	259,020	1,592,497	2,006,717
1995	9,527	16,967	8,306	5,467	9,560	88,140	49,639	82,155	114,818	11,297		128	396,004	143,715	771,737	483,307	239,082	1,637,842	2,033,846
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	219,366	814,791	610,055	268,303	1,912,515	2,412,620
1997	5,165	16,769	7,542	6,105	11,748	89,680	107,304	104,934	125,629	14,602		0	489,478	292,616	833,485	563,854	242,760	1,932,715	2,422,193
1998	9,746	23,781	10,802	6,225	16,882	109,731	94,033	136,736	104,831	18,586		0	531,353	330,603	738,972	693,446	272,542	2,035,562	2,566,915
1999	5 464	32 944	12 633	6 079	38 702	100 751	68 822	146 112	137 527	16 093	25	90	565 242	344 901	796 581	517 155	234 175	1 892 812	2 458 054
2000[2]	8 223	25 932	13 507	8 418	38 941	125 308	74 632	167 929	132 609	14 999	13		610 511	375 708	904 364	712 069	310 616	2 302 757	2 913 268

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

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

Data source: H. Lévesque and B. Collins (CWS), and P. Padding (USFWS).

Appendices

Appendix A: Special Conservation Measures – Proposals for 2001

In 2002, amendments to adjust season dates in Quebec, Manitoba, Saskatchewan and Nunavut are proposed. In addition, it is proposed to replace section 15 (1) c) by the following: c) by use or aid of recorded bird calls; except as permitted in any part of Schedule 1. To ensure that your comments are received in time to be considered, please send your comments by January 15, 2002, to the Director General at the address given at the beginning of the report.

Proposed conservation measures in Quebec concerning overabundant species

Item	Column 1 Area	Column 2 Period during which Snow Geese may be taken	Column 3 Additional hunting method or equipment
1.	District A	May 1 to June 30 September 1 to December 10	Recorded bird calls (e) (g)
2.	District B	September 21 to December 26	Recorded bird calls (e) (g)
3.	District C	April 1 to May 31 (a) September 6 to September 20 (a) September 21 to December 26	Recorded bird calls (e) (g)
4.	District D	April 1 to May 31 (a) September 6 to September 20 (a) September 21 to December 26	Recorded bird calls (e) (g)
5.	District E	April 1 to May 31 (a) September 21 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 27 (a) (d) September 28 to December 26	Recorded bird calls (e) (g) and bait or bait crop area (f)
7.	District J	September 28 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 St. Lawrence river and north of 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 north shore of St. Lawrence river, no person shall hunt north of St. Lawrence river and south of a line located at 1 000 meters north of highway 40 between Montée St-Laurent and Maskinongé river. On south shore of St. Lawrence river, no person shall hunt south of St. Lawrence river and north of the rail road right of way located close to Route #132 between 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 bird calls, decoys must be white

Proposed conservation measures in Manitoba 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.	Zone 1	April 1 to May 31 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.

Proposed conservation measures in Nunavut concerning overabundant species

Article	Column 1 Area	Column 2 Period during which Snow Geese may be taken	Column 3 Hunting method or equipment allowed
1.	Throughout Nunavut	May 1 to 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.

Proposed conservation measures in Saskatchewan 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 No. 1 (North)	April 1 to May 4	Recorded bird calls (a)
2.	District No. 2 (South)	April 1 to May 4	Recorded bird calls (a)

(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.