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POPULATION STATUS OF MIGRATORY GAME BIRDS IN CANADA

November 2017

Canadian Wildlife Service
Waterfowl Committee

CWS Migratory Birds Regulatory Report
Number 49

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1. Table of Contents

1.	Table of Contents.....	v
2.	Executive Summaries	1
3.	Background.....	6
3.1	Monitoring Migratory Game Birds in Canada	6
3.1.1	Population Surveys	7
3.1.2	Waterfowl Banding	16
3.2	Trend Analysis	16
3.3	2017 Breeding Habitat Conditions.....	17
3.3.1	Prairie Pothole Region	17
3.3.2	Western Boreal Forest	18
3.3.3	Central British Columbia	19
3.3.4	Canadian Arctic and Subarctic Regions	19
3.3.5	Eastern Canada (Ontario, Quebec and Atlantic Provinces)	19
3.4	Management of Overabundant Geese	20
3.4.1	Conservation Issue.....	20
3.4.2	Management Response	20
3.4.3	Effectiveness of Special Conservation Measures	21
3.5	Trends in the Sale of Migratory Game Bird Hunting Permits in Canada.....	21
4.	Population Status of Inland Dabbling Ducks	23
4.1	American Black Duck (<i>Anas rubripes</i>).....	23
4.1.1	Abundance and Trends.....	23
4.1.2	Harvest	26
4.1.3	Management and Conservation Concerns	28
4.2	Mallard (<i>Anas platyrhynchos</i>).....	29
4.2.1	Abundance and Trends.....	29
4.2.2	Harvest	37
4.2.3	Management and Conservation Concerns	37
4.3	Northern Pintail (<i>Anas acuta</i>)	39
4.3.1	Abundance and Trends.....	39
4.3.2	Harvest	42
4.3.3	Management and Conservation Concerns	42

4.4	Green-Winged Teal (<i>Anas crecca</i>)	44
4.4.1	Abundance and Trends	44
4.4.2	Harvest	51
4.4.3	Management and Conservation Concerns	51
4.5	Blue-Winged Teal (<i>Spatula discors</i>)	53
4.5.1	Abundance and Trends	53
4.5.2	Harvest	57
4.5.3	Management and Conservation Concerns	57
4.6	American Wigeon (<i>Mareca americana</i>)	59
4.6.1	Abundance and Trends	59
4.6.2	Harvest	63
4.6.3	Management and Conservation Concerns	63
4.7	Gadwall (<i>Mareca strepera</i>)	65
4.7.1	Abundance and Trends	65
4.7.2	Harvest	68
4.7.3	Management and Conservation Concerns	68
4.8	Northern Shoveler (<i>Spatula clypeata</i>)	70
4.8.1	Abundance and Trends	70
4.8.2	Harvest	73
4.8.3	Management and Conservation Concerns	73
4.9	Wood Duck (<i>Aix sponsa</i>)	75
4.9.1	Abundance and Trends	75
4.9.2	Harvest	77
4.9.3	Management and Conservation Concern	77
5.	Population Status of Inland Diving Ducks	79
5.1	Greater Scaup (<i>Aythya marila</i>) and Lesser Scaup (<i>Aythya affinis</i>)	79
5.1.1	Abundance and Trends	79
5.1.2	Harvest	83
5.1.3	Management and Conservation Concerns	86
5.2	Ring-Necked Duck (<i>Aythya collaris</i>)	87
5.2.1	Abundance and Trends	87
5.2.2	Harvest	93
5.2.3	Management and Conservation Concerns	93
5.3	Redhead (<i>Aythya americana</i>)	95

5.3.1	Abundance and Trends	95
5.3.2	Harvest	97
5.3.3	Management and Conservation Concerns	99
5.4	Canvasback (<i>Aythya valisineria</i>)	100
5.4.1	Abundance and Trends	100
5.4.2	Harvest	103
5.4.3	Management and Conservation Concerns	103
5.5	Ruddy Duck (<i>Oxyura jamaicensis</i>)	105
5.5.1	Abundance and Trends	105
5.5.2	Harvest	107
5.5.3	Management and Conservation Concerns	107
6.	Population Status of Sea Ducks	109
6.1	Eiders.....	109
6.2	Common Eider (<i>Somateria mollissima</i>)	110
6.2.1	Abundance and Trends	110
6.2.2	Harvest	113
6.2.3	Management and Conservation Concerns	116
6.3	King Eider (<i>Somateria spectabilis</i>)	117
6.3.1	Abundance and Trends	117
6.3.2	Harvest	117
6.3.3	Management and Conservation Concerns	118
6.4	Harlequin Duck (<i>Histrionicus histrionicus</i>)	119
6.4.1	Abundance and Trends	119
6.4.2	Harvest	120
6.4.3	Management and Conservation Concerns	120
6.5	Scoters.....	121
6.5.1	Abundance and Trends	121
6.6	Black Scoter (<i>Melanitta americana</i>).....	123
6.6.1	Abundance and Trends	123
6.6.2	Harvest	123
6.6.3	Management and Conservation Concerns	125
6.7	Surf Scoter (<i>Melanitta perspicillata</i>).....	126
6.7.1	Abundance and Trends	126
6.7.2	Harvest	129

6.7.3	Management and Conservation Concerns	129
6.8	White-Winged Scoter (<i>Melanitta fusca</i>)	131
6.8.1	Abundance and Trends	131
6.8.2	Harvest	131
6.8.3	Management and Conservation Concerns	131
6.9	Barrow's Goldeneye (<i>Bucephala islandica</i>).....	133
6.9.1	Abundance and Trends	133
6.9.2	Harvest	136
6.9.3	Management and Conservation Concerns	136
6.10	Common Goldeneye (<i>Bucephala clangula</i>)	137
6.10.1	Abundance and Trends	137
6.10.2	Harvest	141
6.10.3	Management and Conservation Concerns	141
6.11	Long-Tailed Duck (<i>Clangula hyemalis</i>).....	143
6.11.1	Abundance and Trends	143
6.11.2	Research Highlights	143
6.11.3	Harvest	143
6.11.4	Management and Conservation Concerns	145
6.12	Bufflehead (<i>Bucephala albeola</i>).....	146
6.12.1	Abundance and Trends	146
6.12.2	Harvest	150
6.12.3	Management and Conservation Concerns	152
6.13	Common Merganser (<i>Mergus merganser</i>)	153
6.13.1	Abundance and Trends	153
6.13.2	Harvest	154
6.13.3	Management and Conservation Concerns	156
6.14	Red-Breasted Merganser (<i>Mergus serrator</i>).....	157
6.14.1	Abundance and Trends	157
6.14.2	Harvest	158
6.14.3	Management and Conservation Concerns	158
6.15	Hooded Merganser (<i>Lophodytes cucullatus</i>)	160
6.15.1	Abundance and Trends	160
6.15.2	Harvest	162
6.15.3	Management and Conservation Concerns	162

7.	Population Status of Geese	164
7.1	Snow Goose	165
7.2	Greater Snow Goose (<i>Anser caerulescens atlantica</i>)	165
7.2.1	Abundance and Trends	166
7.2.2	Harvest	167
7.2.3	Management and Conservation Concerns	170
7.2.4	Research Highlight	170
7.3	Lesser Snow Goose (<i>Anser caerulescens caerulescens</i>)	171
7.3.1	Abundance and Trends	171
7.3.2	Harvest	177
7.3.3	Management and Conservation Concerns	179
7.4	Ross's Goose (<i>Anser rossii</i>)	181
7.4.1	Abundance and Trends	181
7.4.2	Harvest	183
7.4.3	Management and Conservation Concerns	184
7.5	Greater White-Fronted Goose (<i>Anser albifrons</i>)	186
7.5.1	Abundance and Trends	186
7.5.2	Harvest	188
7.5.3	Management and Conservation Concerns	189
7.6	Cackling Goose (<i>Branta hutchinsii</i>)	190
7.6.1	Abundance and Trends	190
7.6.2	Harvest	191
7.6.3	Management and Conservation Concerns	192
7.7	Canada Goose (<i>Branta canadensis</i>)	193
7.7.1	Subarctic Breeding Populations	193
7.7.2	Temperate-breeding Populations	200
7.7.3	Harvest	205
7.7.4	Management and Conservation Concerns	207
7.8	Brant (<i>Branta bernicla</i>)	208
7.8.1	Abundance and Trends	208
7.8.2	Harvest	211
7.8.3	Management and Conservation Concerns	212
8.	Population Status of Swans	214
8.1	Tundra Swan (<i>Cygnus columbianus</i>)	214

8.1.1	Abundance and Trends.....	215
8.1.2	Harvest	215
8.1.3	Management and Conservation Concerns	215
8.2	Trumpeter Swan (<i>Cygnus buccinator</i>).....	217
8.2.1	Abundance and Trends.....	218
8.2.2	Harvest	220
8.2.3	Management and Conservation Concerns	220
9.	Population Status of other Hunted Species	221
9.1	Murres.....	221
9.1.1	Abundance and Trends.....	221
9.1.2	Harvest	221
9.1.3	Management and Conservation Concerns	222
9.2	American Woodcock (<i>Scolopax minor</i>)	223
9.2.1	Abundance and Trends.....	223
9.2.2	Harvest	226
9.2.3	Management and Conservation Concerns	226
9.3	American Coot (<i>Fulica americana</i>).....	227
9.3.1	Abundance and Trends.....	227
9.3.2	Harvest	228
9.3.3	Management and Conservation Concerns	229
9.4	Common Gallinule (<i>Gallinula galeata</i>).....	230
9.4.1	Abundance and Trends.....	230
9.4.2	Harvest	230
9.4.3	Management and Conservation Concerns	230
9.5	Mourning Dove (<i>Zenaida macroura</i>).....	232
9.5.1	Abundance and Trends.....	232
9.5.2	Harvest	234
9.5.3	Management and Conservation Concerns	234
9.6	Wilson's snipe (<i>Gallinago delicata</i>).....	235
9.6.1	Abundance and Trends.....	235
9.6.2	Harvest	235
9.6.3	Management and Conservation Concerns	236
9.7	Sandhill Crane (<i>Grus canadensis</i>).....	237
9.7.1	Abundance and Trends.....	237

9.7.2	Harvest	239
9.7.3	Management and Conservation Concerns	240
9.8	Band-Tailed Pigeon (<i>Patagioenas fasciata</i>)	241
9.8.1	Abundance and Trends	241
9.8.2	Harvest	241
9.8.3	Management and Conservation Concerns	242
9.9	Rails	243
9.9.1	Abundance and Trends	243
9.9.2	Harvest	244
9.9.3	Management and Conservation Concerns	244
10.	References	245

2. Executive Summaries

American Black Duck (*Anas rubripes*)

The American Black Duck breeds primarily in the eastern part of North America and was historically one of the most abundant duck species encountered in this region; however, the species declined in abundance over the middle of the last century with the most pronounced decline in the Mississippi Flyway. Causes for this decline are thought to be the result of changes in breeding and wintering habitat quality, overharvesting, and interactions (competition, hybridization) with Mallards. The Black Duck population has remained relatively stable since the 1990s as has the harvest since 2000. The species remains one of the most sought-after waterfowl by hunters in both Canada and the U.S.

American Coot (*Fulica americana*)

The American Coot breeds from British Columbia to Ontario, with the highest densities in the Prairie provinces. In the early 1900s, wetland loss and overhunting were thought to have led to significant population declines, but the population has since recovered and is increasing. In Canada, the harvest of American Coot has diminished over the years, whereas it has remained relatively constant in the U.S.

American Wigeon (*Mareca americana*)

The American Wigeon's breeding range is centred in western Canada. After major declines in the 1980s, resulting in part from prolonged periods of drought, numbers have been increasing steadily throughout most of the species' range, particularly in the Canadian Prairies and in the Western Boreal Forest. Elsewhere in Canada, where the species is less abundant, its population has remained relatively stable or has shown a slight decline. The Canadian harvest of this species has remained stable since the 1980s.

American Woodcock (*Scolopax minor*)

There are two management units for the American Woodcock in Canada: the Central Population, which includes the individuals breeding in Manitoba and Ontario, and the Eastern Population, which encompasses breeding birds in Quebec and the Maritimes. Both populations appear to have undergone a moderate decline relative to the early 1970s. A possible reason for the decline is the loss of suitable wintering and breeding habitat. The American Woodcock is a popular migratory game bird in Canada but is particularly sought after in the United States. Since the 1970s the harvest of American Woodcock has declined in Canada and especially in the U.S.

Band-tailed Pigeon (*Patagioenas fasciata*)

In Canada, the Band-tailed Pigeon is found only in the forested habitats of coastal southern British Columbia. This species' population has shown a large decline since the 1970s due in part to overhunting and habitat loss. Harvest has been severely limited in Canada for the past 20 years, in agreement with the management plan for the species. The Band-tailed Pigeon was listed in 2011 as a species of Special Concern under the federal *Species at Risk Act*.

Barrow's Goldeneye (*Bucephala islandica*)

Two geographically isolated populations of Barrow's Goldeneye are found in Canada: a small Eastern Population and a much larger Western Population. The Eastern Population was listed in 2003 as a species of Special Concern under the federal *Species at Risk Act*. As a result, the daily bag limit was restricted to one bird per day, in agreement with the species management plan. The Western Population has shown a stable long-term trend over the past 20 years. Due to its localized distribution and the small number of hunters sampled during the National Harvest Survey in the Eastern Population region, it is not possible to provide accurate Canadian harvest estimates for this species.

Blue-winged Teal (*Spatula discors*)

The Blue-winged Teal breeds throughout much of Canada, with its core breeding range located in the Prairie Pothole Region. While its population has been significantly increasing since the early 1990s, the

number of breeding pairs of this species in southern Ontario and Quebec has shown a slow decline in the last two decades, following even more dramatic declines between the early 1970s and the mid-1990s. Agricultural development and habitat destruction in eastern Canada are possible reasons for the species' decline; consequently, restrictive regulations have been implemented in Quebec, although the harvest across Canada has remained relatively stable since the 1980s. Generally, fewer Blue-winged Teal are harvested in Canada compared to Green-winged Teal.

Brant (*Branta bernicla*)

Brant are Arctic-nesting geese. There are four distinct populations of Brant recognized in North America: Atlantic Brant, the Eastern High Arctic Population, Black Brant and the Western High Arctic Population. Estimates of population size for Atlantic Brant averaged approximately 200 000 birds from 2012-2016. Eastern High Arctic Brant population numbers are indexed through counts on wintering grounds; the 2013 count was approximately 35 000 birds. Black Brant and the Western High Arctic population are assessed from winter surveys, when it is difficult to distinguish the two types of Brant and, therefore, to estimate the size of each species' population separately. The combined population has shown a stable trend since the 1960s and winter counts were approximately 155 000 birds in 2017 (Pacific Flyway unpubl. data 2017). Harvest of Atlantic Brant occurs mainly in the U.S., while the combined subsistence harvest of Atlantic and Eastern High Arctic Brant likely represents, at most, a few thousand birds annually in Canada. In British Columbia, Black Brant and Western High Arctic Brant are harvested during a short and late hunting season that was established in 1977 to reduce harvest on the local Brant population and to help increase local numbers of wintering birds.

Bufflehead (*Bucephala albeola*)

The Bufflehead, which nests in tree cavities, is the smallest of the North American sea ducks. The species is found from coast to coast, but is more abundant in the western regions of Canada. Overall, the continental population has been increasing since the 1960s. Since 2000, the Canadian harvest has remained relatively stable but is considerably lower than levels observed in the 1970s.

Cackling Goose (*Branta hutchinsii*)

In 2004, the American Ornithologists' Union identified two species of geese from the one species previously referred to as the "Canada Goose": the Canada Goose and the Cackling Goose. In Canada, the Mid-continent Population of Cackling Geese includes all Cackling Geese nesting in the Arctic ecozone north of the tree line; these mostly migrate through the prairie provinces and winter mainly in areas of the Central and Mississippi Flyways. Numbers of Midcontinent Cackling Geese have increased greatly since the 1970s, and Lincoln estimates of population size averaged about 3.2 million adults from 2012-2016.

Canada Goose (*Branta canadensis*)

Canada Geese are grouped into different management populations based on their breeding and wintering ranges. Most subarctic-breeding populations have remained relatively stable since the early 2000s. The temperate-breeding populations, however, have grown so quickly in size that they have caused conflicts with humans, crop damage and even hazards in some areas (e.g., airports). Over the past 30 years, hunting regulations for temperate-breeding Canada goose populations have been gradually liberalized to mitigate these issues. Other management practices, including egg addling, prevention of nesting, and landscape management, have complemented the liberalized harvest. In Canada, the harvest of Canada Geese has been steadily increasing since the 1970s.

Canvasback (*Aythya valisineria*)

The core breeding area for Canvasback is in the Prairie provinces, but the species is found as far south as the U.S. Prairies and as far north as the Northwest Territories. Canvasbacks are not abundant in Canada, but the population has increased since the beginning of the 1990s. Much of the inter-annual population fluctuations can be explained by annual changes in water levels, which impacts the amount of wetland breeding habitat in the Prairies. Since 2001, the majority of Canvasbacks have been harvested in the Prairie provinces, but harvest in Ontario has historically represented about half of the Canadian harvest for this species.

Common Eider (*Somateria mollissima*)

The Common Eider inhabits Arctic and Subarctic coastal marine habitats and has a circumpolar distribution that includes Russia, Alaska, Canada and Greenland. The species spends its entire life cycle in marine environments: it nests in large colonies, mostly on marine islands, and forms large aggregations in inshore coastal regions outside of the breeding season. There are four subspecies of Common Eider worldwide. Information on population size and trends for the Common Eider, as for most sea ducks, is largely unreliable because of the remoteness of the breeding and wintering areas, as well as the lack of regular population surveys. In Arctic Canada, Common Eiders are harvested for Aboriginal subsistence purposes (adults, eggs and down). They are also harvested recreationally, and their down is collected for commercial purposes. Data suggest there may be significant declines in some regions; the harvest must be carefully monitored to ensure the long-term sustainability of the population. The harvest of this species in Canada has been highly variable since the 1990s, although there is an overall gradual decline in harvesting rates.

Common Gallinule (*Gallinula galeata*)

The Common Gallinule is a secretive marsh bird that is primarily found in southern Ontario and southwestern Quebec, but with some individuals also found in eastern New Brunswick and western Nova Scotia. Population estimates are not available for all of Canada, but data from Ontario suggest a significant population decline. Consequently, in 2012, CWS–Ontario Region, in partnership with the Ontario Ministry of Natural Resources and Forestry, initiated a pilot banding project of gallinules in Ontario. The species has been listed as a priority species in Ontario, with the objective of reversing its decline. There are no annual harvest estimates for Common Gallinules available in Canada, but the harvest is likely small.

Common Goldeneye (*Bucephala clangula*)

In North America, the Common Goldeneye breeds in tree cavities across the boreal forest regions of Canada and Alaska. The western Canadian population has shown a stable or decreasing trend in the last two decades following a long-term increase between the 1960s and the 1990s. The population trend in eastern Canada has remained stable over this period. The harvest of Common Goldeneyes has been decreasing since the 1980s, with most of the harvest taking place in eastern Canada.

Common Merganser (*Mergus merganser*)

The Common Merganser is the largest of the three North American merganser species. It breeds across Canada wherever trees are large enough to support suitable nesting cavities. The population size and trend for mergansers are not reliably known, as many aerial surveys do not distinguish between Common and Red-breasted Mergansers, whose breeding range overlap extensively. An important part of the species' breeding range is not covered very well by current surveys. However, the three merganser species can be reliably identified during helicopter-based plot surveys such as those conducted in eastern Canada. In eastern Canada, Common Merganser numbers appear to have remained stable since the survey first began in the 1990s. Overall, this species is not heavily harvested by hunters. The harvest of Common Mergansers has been decreasing since the 1980s, with most of the harvest occurring in eastern Canada.

Gadwall (*Mareca strepera*)

The Gadwall is a common duck species in Canada, with its core breeding area located in the Prairies. Following a prolonged drought in the 1980s, the species' population has shown a dramatic increase in most of its range and has doubled in size since the 1990s, mainly because of improved wetland conditions in the Prairies. Harvest has been relatively stable over the past 30 years, despite the population increase. In Canada, the majority of the Gadwall harvest takes place in the Prairie provinces and Canadian harvest is much smaller than that in the U.S.

Greater Scaup (*Aythya marila*) and Lesser Scaup (*Aythya affinis*)

Two Scaup species occur in North America: the Greater Scaup and the Lesser Scaup. These two closely related species are nearly identical in their overall appearance, which can cause difficulties in distinguishing them. The status of the breeding population of Scaup (Greater and Lesser Scaup combined) in North America became a conservation concern due to apparent declines in the population size of these species compared to the historically high levels observed in the 1970s. Their populations have not yet fully recovered; research to understand the cause of the decline is ongoing.

The Greater Scaup is the larger of the two species and is widely distributed across Arctic and Subarctic regions. The Lesser Scaup is the smaller of the two Scaup species and is the most abundant and widespread diving duck in North America. The core breeding area for the Lesser Scaup is the Western Boreal and Prairie and Parkland regions, but it also nests at lower densities in eastern Canada.

The Lesser Scaup is the more abundant of the two Scaup species, and the harvest for this species represents about two thirds of the combined harvest for Canada. The harvest of Lesser Scaup and Greater Scaup in Canada has declined considerably since the 1970s and appears to have stabilized between 50 000 and 75 000 birds annually since 2000.

Greater Snow Goose (*Anser caerulescens atlantica*)

The Greater Snow Goose breeds in the Canadian Eastern High Arctic, with the largest nesting colony on Bylot Island, Nunavut. During migration, the entire population stages in the marshes and agricultural lands of southern Quebec, and a small part of the population has begun to migrate through eastern Ontario and northern New Brunswick. The Greater Snow Goose population underwent a dramatic increase from a few thousand individuals in the 1930s to one million birds in 1999. The Greater Snow Goose has been designated as “overabundant” and has been subject to special conservation measures to control the numbers. In fact, harvest regulations were liberalized and a spring conservation season was established in Quebec in 1998; it was subsequently extended in 2012 to southeastern Ontario. Since the implementation of special conservation measures, the population has remained relatively stable, fluctuating annually between approximately 700 000 and 1 million birds. The harvest of Greater Snow Geese has increased since the end of the 1980s and has more than doubled since the introduction of special conservation measures in Canada and the U.S.

Greater White-fronted Goose (*Anser albifrons*)

The Greater White-fronted Goose has one of the largest ranges of any species of goose in the world. In North America, it breeds across a broad region of the Arctic, from Alaska to the west coast of Hudson Bay. White-fronted Geese that breed in Canada belong to the Mid-continent population, which has increased substantially since the 1970s. Lincoln estimates of population size averaged about 2.3 million adults from 2012-2016. Most Mid-continent White-fronted Geese migrate through Alberta and Saskatchewan in the fall, where most of its Canadian harvest takes place. The combined Canadian and U.S. harvest has more than doubled since the 1970s.

Green-winged Teal (*Anas crecca*)

The Green-winged Teal is a widely distributed and relatively abundant species in Canada. Unlike that of many other dabbling ducks, this species' core breeding range is not in the Prairie Pothole Region but rather in the boreal forest. In western Canada, Green-winged Teal numbers have increased steadily since the early 1990s, whereas in eastern Canada, they have remained relatively stable over the same period. The Green-winged Teal is the most hunted duck species in Canada after the Mallard and the Black Duck, although the harvest level has been declining steadily since the 1970s but especially so in the last decade. Most of the Canadian harvest takes place in Ontario and Quebec, and the Canadian harvest represents only a fraction of the continental harvest.

Harlequin Duck (*Histrionicus histrionicus*)

Until the 1990s, little was known of the ecology of Harlequin Ducks in North America. However, research efforts have since improved our understanding of this species, including with respect to its distribution and

threats. For management purposes, there are two distinct populations of Harlequin Ducks in North America: the Western Population along the Pacific coast, and the much smaller Eastern Population. The Western Population trend appears to be stable, with estimates ranging from 150 000 to 250 000 birds. The Western Population of Harlequin Duck is hunted, but under restrictive regulations: the best available information indicates that the annual harvest is probably in the low hundreds in Canada. The Eastern Population declined in the 1980s, likely because of overharvesting. In 2003, the Eastern Population of the Harlequin Duck was listed as a species of Special Concern under the Canadian *Species at Risk Act*. The population has increased, reaching approximately 6 800 individuals in the mid-2000s, in part because hunting of this population has been prohibited in eastern Canada since 1990.

Hooded Merganser (*Lophodytes cucullatus*)

The Hooded Merganser is the smallest of the three merganser species and is the only one that occurs solely in North America. The species breeds mostly in eastern Canada, where it is found in the highest densities in the Great Lakes Region in southern Ontario and Quebec. The species is also found in southeast Saskatchewan, southern Manitoba, and the Maritimes. Its population status and numbers are difficult to determine accurately, due to the species' secretive nature, its association with forested wetlands, and the fact that it nests in tree cavities. Furthermore, the Hooded Merganser is difficult to detect during fixed-wing aerial surveys, and an important part of its breeding range in the boreal forest is not covered very well by current surveys. Overall, mergansers are not heavily harvested by hunters. However, the Hooded Merganser is the most harvested of the three merganser species, and its harvest levels in Canada have slightly declined since the 1970s to approximately 11 000 birds annually during the last decade.

King Eider (*Somateria spectabilis*)

The King Eider has a circumpolar distribution. Among the sea ducks, this species is among the most northerly nesting. There are two populations of King Eider: the Western Arctic and the Eastern Arctic populations. Based on limited data, both populations appear to be locally stable or, in some areas, declining. Subsistence Aboriginal harvest in Canada, Greenland, Alaska, and Russia represents the majority of the take for this species. Information on population trends and harvest is limited.

Lesser Snow Goose (*Anser caerulescens caerulescens*)

Lesser Snow Geese nest in colonies ranging from a few hundred to over a million birds in coastal and inland areas of the Arctic. There are three populations of Lesser Snow Geese that nest in or migrate through Canada: the Mid-continent Population, the Western Arctic Population and the Wrangel Island Population. The Mid-continent Population of Lesser Snow Geese has increased dramatically from just below 2 million in the 1970s to more than 12 million adults in the last decade. This population was designated as overabundant in 1999, and has since then been subjected to special measures to increase harvest in an attempt to control the population size and growth. The Western Arctic Population has also increased significantly, from approximately 300,000 in the 1970's to over 1,200,000 in 2016. In 2014, the Western Arctic Population was also designated as overabundant and special conservation measures to control the population were implemented in Alberta and the Northwest Territories. In recent years, the harvest of Lesser Snow Geese has slightly increased compared to harvest levels in the 1970s, although it appears to have stabilized in the last decade despite the implementation of special conservation measures.

Long-tailed Duck (*Clangula hyemalis*)

The Long-tailed Duck has a circumpolar distribution and, in North America, breeds at low densities in remote Arctic and Subarctic areas. During most of the year, this species is found primarily in coastal marine waters, often far offshore. Despite indications of long-term population declines, the Long-tailed Duck remains the most abundant Arctic sea duck in North America. The population appears to have remained relatively stable since the early 1990s. The Long-tailed Duck is not commonly harvested by non-Indigenous hunters in Canada. However, it is believed to be an important species in the Aboriginal subsistence harvest.

Mallard (*Anas platyrhynchos*)

The Mallard is the most abundant and most widely distributed dabbling duck species in Canada, and is most abundant in the Prairie provinces. Mallards have been spreading eastward for decades and are now well established in the Maritimes, though they remain rare in Newfoundland and Labrador. The species' population size has remained relatively stable or has increased since the drought periods of the 1980s. Mallard harvest levels have declined in the 1970s to the 1980s but have since stabilized. It remains the most extensively hunted duck species across the country.

Mourning Dove (*Zenaida macroura*)

The Mourning Dove is one of the most familiar and most heavily harvested migratory game bird in North America. Additionally, it is also one of the most abundant and most widespread bird species. This species is a common breeder in urban and rural areas across southern Canada, reaching its highest breeding densities within the Lower Great Lakes/St. Lawrence Plain Region of Ontario and Quebec in the east, and within the Prairie Pothole Region of Manitoba, Saskatchewan and Alberta in the west. The Mourning Dove is monitored in Canada through the Breeding Bird Survey (BBS). Results from this survey indicate that the population has increased markedly since 1970 but has levelled off during the most recent decade. An annual Mourning Dove hunting season has taken place in British Columbia since 1960, but harvest levels are a small fraction of their historical levels. A hunting season was opened in 2013 in Ontario and in 2016 in Quebec.

Murres: Common Murre (*Uria aalge*) and the Thick-billed Murre (*Uria lomvia*)

There are two species of Murres: the Common Murre (*Uria aalge*) and the Thick-billed Murre (*Uria lomvia*). In Canada, both species are most abundant on the Atlantic coast, with small numbers of Common Murres breeding in B.C. and small numbers of Thick-billed Murres breeding in the western Arctic. Numbers for both species have been drastically reduced over the last century because of human disturbance, overharvesting, oil pollution and probably commercial fisheries development. Murres are hunted by residents of Newfoundland and Labrador and by Aboriginal people. Newfoundland residents were granted hunting rights soon after they entered Confederation in 1949. Harvest levels decreased significantly following the implementation of hunting regulations in 1994 but have since shown a significant increase. Approximately 120 000 Murres were harvested in Newfoundland in 2016, the most harvested since the survey began in 2010.

Northern Pintail (*Anas acuta*)

The Northern Pintail is found across the country, with its core breeding range located in the Prairie Pothole Region of western Canada. Annual nesting success and productivity estimates are closely correlated with precipitation levels in the Prairies: periods of extended drought have led to dramatic population declines. Since 1990, the population has been slowly increasing, but it has yet to recover completely. In Canada, the Northern Pintail harvest has remained relatively stable since 1990.

Northern Shoveler (*Spatula clypeata*)

In Canada, the core breeding range of the Northern Shoveler is the Prairie Pothole and Parkland Region of Saskatchewan, Alberta and Manitoba. The continental population has seen a significant increase since the 1990s, following a period of drought in the Prairies in the 1980s. Despite an increase in this species' population size, the Canadian harvest of this species has remained relatively stable.

Rails

Two species of rails are hunted in Canada, namely, the Virginia Rail (*Rallus limicola*) and Sora (*Porzana carolina*). Rails are secretive marsh birds that breed and stage in many wetlands in Canada. Most often, they remain hidden in dense emergent vegetation, which makes surveying their populations and hunting individuals challenging. In Canada, the Virginia Rail population appears to be increasing, while the Sora population appears to be stable. The harvest for these two species is allowed in Ontario and Yukon, although it is thought to be very low.

Red-breasted Merganser (*Mergus serrator*)

The Red-breasted Merganser has a wide distribution in North America and is known to breed at high latitudes (up to 75°N). It is thought to be one of the least abundant species of sea ducks in Canada, but its population status and size are difficult to determine accurately due to the species' secretive nature, the remoteness of parts of its breeding range, and its habit of nesting in tree cavities. Both short- and long-term trends for this species appear to be increasing. Overall, mergansers are not heavily harvested by hunters, and the Red-breasted Merganser is the least harvested of the three species.

Redhead (*Aythya americana*)

The Redhead breeds exclusively in North America, primarily in the Prairie Pothole Region of Canada and the U.S. The continental population is increasing and has largely recovered since its decline following periods of drought in the 1980s. The vast majority of Redheads are harvested in the U.S., where harvest levels have increased since the 1970s. In Canada, harvest levels have been low compared to other duck species, averaging approximately 23 000 birds per year in the last decade.

Ring-necked Duck (*Aythya collaris*)

The Ring-necked Duck is a common diving duck that breeds throughout the boreal forest in Canada. Its range extends from southern Yukon to Newfoundland. Its population has been steadily increasing in the Prairie provinces since the 1990s, whereas it has remained stable in eastern Canada. The harvest of Ring-necked Ducks in Canada has declined over the last 20 years, but the species continues to be sought after by hunters. A much larger harvest occurs in the U.S.

Ross's Goose (*Anser rossii*)

Ross's Geese mainly breed in the Queen Maud Gulf Region in the central Canadian Arctic, but numbers are increasing along the western coast of Hudson Bay, and on Southampton and Baffin Island. Their wintering range has also expanded eastward from historical wintering areas in California. Considered a rare species in the early part of the last century, Ross's Geese have shown increasing numbers since the 1960s, and are among the fastest growing populations of arctic-nesting geese in recent years. Ross's geese were declared overabundant in the midcontinent region of the United States in 1999 and in western Canada in 2014. Lincoln estimates of population size averaged almost 1.9 million adults from 2012-2016. The harvest of Ross's Geese in Canada and the U.S. increased slowly from the 1960s to the 1980s and then more rapidly through the 1990s.

Ruddy Duck (*Oxyura jamaicensis*)

The Ruddy Duck is not an abundant species in Canada. Approximately 86% of the breeding population breeds in the Prairie Pothole Region of Canada. Ruddy Duck numbers are stable or increasing throughout most of the species' North American breeding range. The species is not an important game bird species in Canada, with harvest numbers averaging approximately 1 500 birds annually over the last 10 years.

Sandhill Crane (*Antigone canadensis*)

Three Sandhill Crane populations breed in Canada, namely the Central Valley Population, the Mid-continent Population and the Eastern Population. The Central Valley Population breeds mainly in California, but its range extends to the lower Fraser Valley and northern Vancouver Island in British Columbia. The Mid-continent Population, which is the larger of the two, breeds across Canada from eastern British Columbia to western Ontario, south to the Prairies and north to Yukon and the Northwest Territories. Its population is stable and above the North American Waterfowl Management Plan population objective. The Eastern Population of Sandhill Crane breeds in eastern Ontario, around the Great Lakes, as far north as James Bay, and in western to central Quebec. This population's numbers show a long-term increasing trend and are above the population objective. In Canada, the harvest of Sandhill Cranes is allowed only in Manitoba, Saskatchewan and Yukon. The harvest has been variable, but it has increased slightly over the years.

Scoters

The three species of scoters that breed in Canada are the Black Scoter (*Melanitta americana*), the Surf Scoter (*M. perspicillata*) and the White-winged Scoter (*M. fusca*). Less is known about scoters than about any other group of sea ducks, but among the three species, the White-winged Scoter is the species for which the most information is available. Research efforts in recent years have led to a better understanding of the breeding, moulting and wintering ecology of this group of species. There are currently no surveys that provide good population or trend estimates for scoters. However, based on the available data, scoter numbers in western Canada for all three species have remained stable over the last twenty years but are lower than the population levels in the 1960s. Additional information is needed to better assess the status of scoter populations in Canada. Overall, scoters are not heavily harvested by hunters, with harvest levels averaging less than 7 000 birds annually over the last decade.

Trumpeter Swan (*Cygnus buccinator*)

There are three populations of Trumpeter Swans in North America: the Pacific Coast Population, the Rocky Mountain Population, and the Interior Population. The Pacific Coast population breeds mainly in Alaska, but also in Yukon and northwestern British Columbia. The Rocky Mountain Population breeds mainly in Alberta, northeastern British Columbia, western Saskatchewan, and southern Yukon and the Northwest Territories. The Interior Population breeds primarily in Ontario, but small numbers have become established in eastern Saskatchewan and in Manitoba. The three populations have reached or exceeded their population objectives and are increasing. Hunting Trumpeter Swans is illegal in Canada and no state in the U.S. has a hunting season for this species of swan.

Tundra Swan (*Cygnus columbianus*)

The Tundra Swan is the most abundant and widespread of the two swan species native to the continent (the Mute Swan is an introduced species). Tundra Swans are managed as two distinct populations—the Eastern Population and the Western Population, primarily based on affiliations for each population with the major traditional wintering areas, along the Atlantic and Pacific coasts. Numbers for the Eastern Population appear to have increased slightly over the last decade, while the population trend for the Western Population appears stable. Historically, the Eastern Population has been slightly larger in size than the Western Population: the population sizes have averaged 100 000 and 85 000 swans, respectively, in the last decade. The hunting of Tundra Swans is legal but regulated in the U.S. and prohibited in Canada.

Wilson's Snipe (*Gallinago delicata*)

The Wilson's Snipe is one of the most abundant and widespread shorebirds in North America. However, due to its elusive nature, it is difficult to monitor. Nevertheless, its overall numbers appear to have been slightly increasing since the late 1960s and early 1970s. The species is hunted at low levels both in Canada and the U.S. In both countries, the harvest levels had shown a gradual decline since the end of the 1970s but appear to have stabilized in the last decade.

Wood Duck (*Aix sponsa*)

The Wood Duck is a secretive cavity-nesting species commonly found in swamps, marshes and riparian habitats in Canada. In Canada, it breeds primarily in the eastern provinces, including in Ontario, Quebec and New Brunswick. In western Canada, the breeding population is small and scattered in locations between southern British Columbia and the extreme southwest of Alberta. Once threatened with extinction, the population of this species is now stable or increasing in Canada. As a result of this population recovery, the Wood Duck now ranks as one of the most abundant duck species in both southern Ontario and southern Quebec. The species is sought after by hunters, and an average of 68 000 birds have been taken annually in Canada over the past 10 years. Harvest levels have declined compared to levels in the 1970s and 1980s but have been stable in the last decade.

3. Background

Environment and Climate Change Canada is responsible for the conservation of migratory birds in Canada and the management of the sustainable hunting of these birds. The hunting regulations for migratory game birds are reviewed and amended biennially by Environment and Climate Change Canada, with input from provinces and territories, as well as from various other stakeholders. The population status of migratory game birds is assessed on an annual basis to ensure that the regulations are appropriate, and amendments can be made between review periods, if necessary, for conservation reasons. As part of the regulatory process to amend the hunting regulations, the Canadian Wildlife Service (CWS) produces a series of regulatory reports.

The first report, Population Status of Migratory Game Birds in Canada (commonly called the “November Report”), contains population and other biological information on migratory game birds, and thus provides the scientific basis for informing management decisions that ensure the long-term sustainability of their population. Environment and Climate Change Canada reviews hunting regulations every two years, and publishes the November Report to evaluate the status of migratory game birds on a biennial basis as well. Additionally CWS analyzes population trends on a yearly basis.

The second report, Proposals to Amend the Canadian Migratory Birds Regulations (the “December Report”), outlines the proposed changes to the hunting regulations, as well as proposals to amend the overabundant species regulations and other proposed amendments to the *Migratory Birds Regulations*. Proposals for hunting regulations are developed in accordance with the Objectives and Guidelines for the Establishment of National Regulations for Migratory Bird Hunting. The December report is published every second year, concurrently with the revision of hunting regulations.

The third report, Migratory Birds Regulations in Canada (commonly called the “July Report”), summarizes the hunting regulations that were approved for the next two hunting seasons. The July Report is published every second year, concurrently with the revision of hunting regulations.

The three reports are distributed to organizations and individuals with an interest in migratory bird conservation, to provide an opportunity for input on the development of hunting regulations in Canada. They are also available on the Environment and Climate Change Canada website (www.canada.ca/en/environment-climate-change/services/migratory-game-bird-hunting/consultation-process-regulations/report-series.html).

3.1 Monitoring Migratory Game Birds in Canada

Environment and Climate Change Canada’s Canadian Wildlife Service (CWS) supports a variety of surveys to monitor migratory birds in their breeding, wintering, staging and moulting areas. The monitoring programs include surveys of breeding waterfowl to estimate population size and productivity, banding programs to estimate survival, harvest rates, population size, and to assess movements and distribution of harvest. Harvest surveys are used to estimate the size of the harvest and assess the impacts of hunting regulations on populations. The data obtained from these monitoring programs are used in this report to assess the status of migratory birds in Canada, thus providing the scientific basis for the management of waterfowl and the implementation of sustainable hunting regulations. This information ensures that hunting does not jeopardize the sustainability of the waterfowl populations that are harvested.

3.1.1 Population Surveys

DABBING AND DIVING DUCKS SURVEYS

Breeding duck populations are monitored at the continental level by the Waterfowl Breeding Population and Habitat Survey (WBPHS). This is the most extensive waterfowl survey in Canada and covers parts of most provinces in western Canada, the Northwest Territories and parts of or entire provinces in eastern Canada. British Columbia and Yukon are not covered by the WBPHS but have their own breeding waterfowl surveys (see below). While these surveys are designed primarily to monitor dabbling and diving ducks, they also provide information on other bird species.

LARGE-SCALE WATERFOWL SURVEYS

WBPHS is coordinated by the United States Fish and Wildlife Service (USFWS) and Environment and Climate Change Canada's CWS, and is conducted annually. The survey has two components: one covering much of central and western Canada and the northwestern U.S. (hereafter "WBPHS in western Canada and the northwestern U.S."), and the other covering much of eastern Canada and the northeastern U.S. (hereafter "Eastern Waterfowl Breeding Ground Survey"; northeastern U.S. survey area results are not presented in this report) [Figure 3.1-1].

1) WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

The WBPHS in western Canada and the northwestern U.S. consists of extensive aerial transects to estimate the number of breeding waterfowl and to assess habitat conditions for waterfowl (number of ponds). The survey is conducted annually between May and June and covers the Canadian Prairies and Parkland, Western Boreal Canada (northwestern Ontario, northern part of the Prairie provinces, northeast corner of British Columbia, western Northwest Territories, and Old Crow Flats in Yukon), the north-central U.S. (U.S. Prairies), and parts of Alaska (Figure 3.1-1). The survey, which uses fixed-wing aircraft, has been conducted since 1955. Breeding population estimates derived from this survey have been corrected for visibility bias (proportion of waterfowl that are not detected from the air) since 1961, with correction factors provided by the CWS. Those correction factors are obtained from ground counts made by the CWS on a subset of transects in the Canadian Prairies and by the USFWS on a subset of transects in the northern U.S. Estimates of total breeding population sizes derived from this survey provide the most important information used to set regulations for duck hunting in both Canada and the U.S., and they provide a long-term data series for effective conservation planning.

2) EASTERN WATERFOWL BREEDING GROUND SURVEY

The Eastern Waterfowl Breeding Ground Survey has been conducted annually since 1990. The survey has two components: a helicopter plot survey and a fixed-wing transect survey. CWS carries out the helicopter plot survey in the Boreal Shield Regions (from northeastern Ontario to Newfoundland and Labrador) and in the Atlantic Highlands Region (Gaspé Peninsula in Quebec, as well as New Brunswick and Nova Scotia; Figure 3.1-2). The USFWS conducts the airplane transect survey (fixed-wing aircraft) in parts of eastern Canada and the northeastern U.S. (Figures 3.1-1 and 3.1-2). Though originally designed to survey American Black Ducks and Mallards in eastern Canada, as part of the Black Duck Joint Venture, the survey also provides quantitative information on other duck species (such as ring-necked ducks, goldeneyes and mergansers), which can be used to evaluate the status of breeding populations. Historically, the data from the two components of this survey (CWS helicopter plot survey and USFWS fixed-wing transect survey) were analyzed separately, despite some overlap in geographic coverage. The two components were integrated into one survey in 2004. Population estimates obtained from the Eastern Waterfowl Breeding Ground Survey are used to establish hunting regulations in Canada and the U.S., and they provide a long-term time data series essential to effective conservation planning. These data are also used to inform the Black Duck International Harvest Strategy.

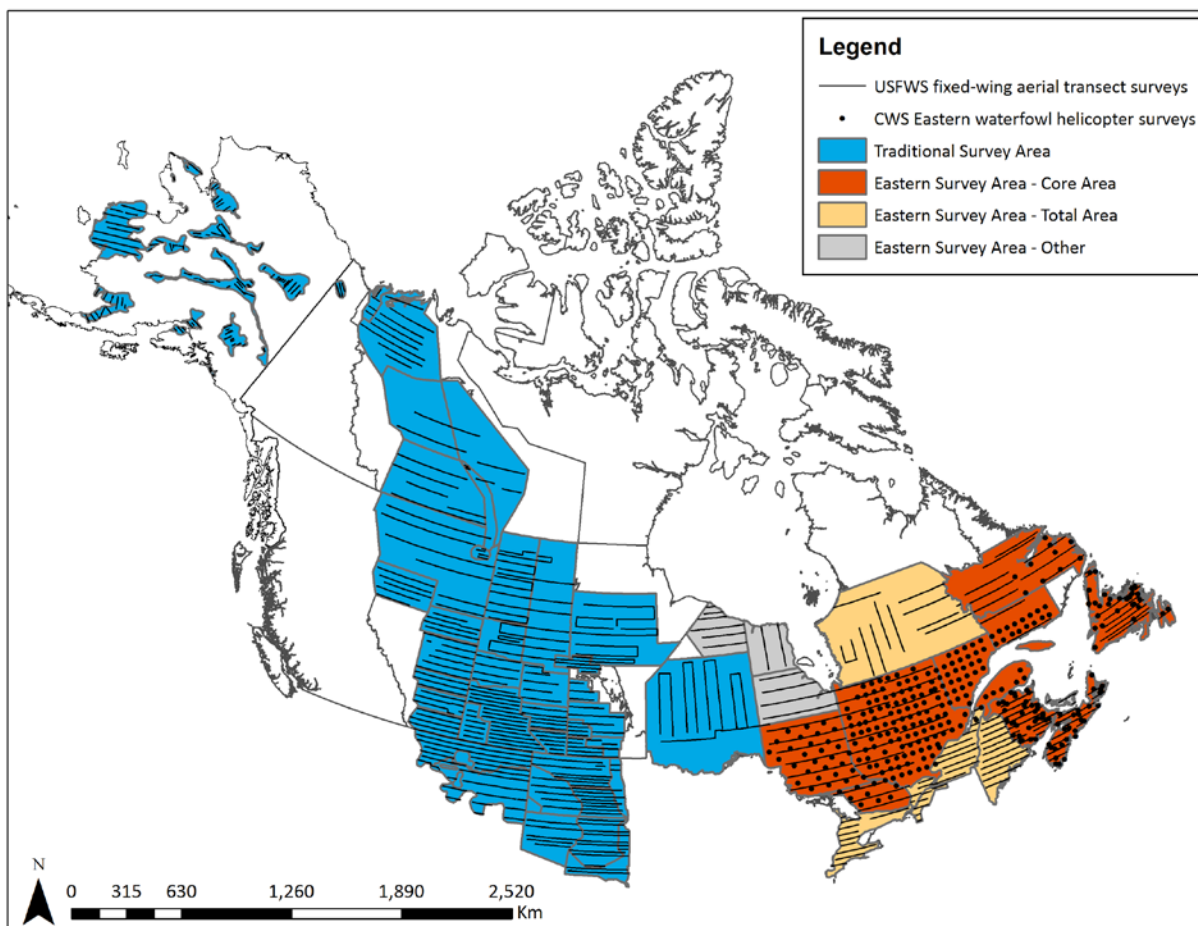


Figure 3.1-1 The Waterfowl Breeding Population and Habitat Survey in the Survey Area of Western Canada and the Northwestern United States (blue), and the Eastern Waterfowl Survey (orange, yellow, and grey) [Source: USFWS 2017].

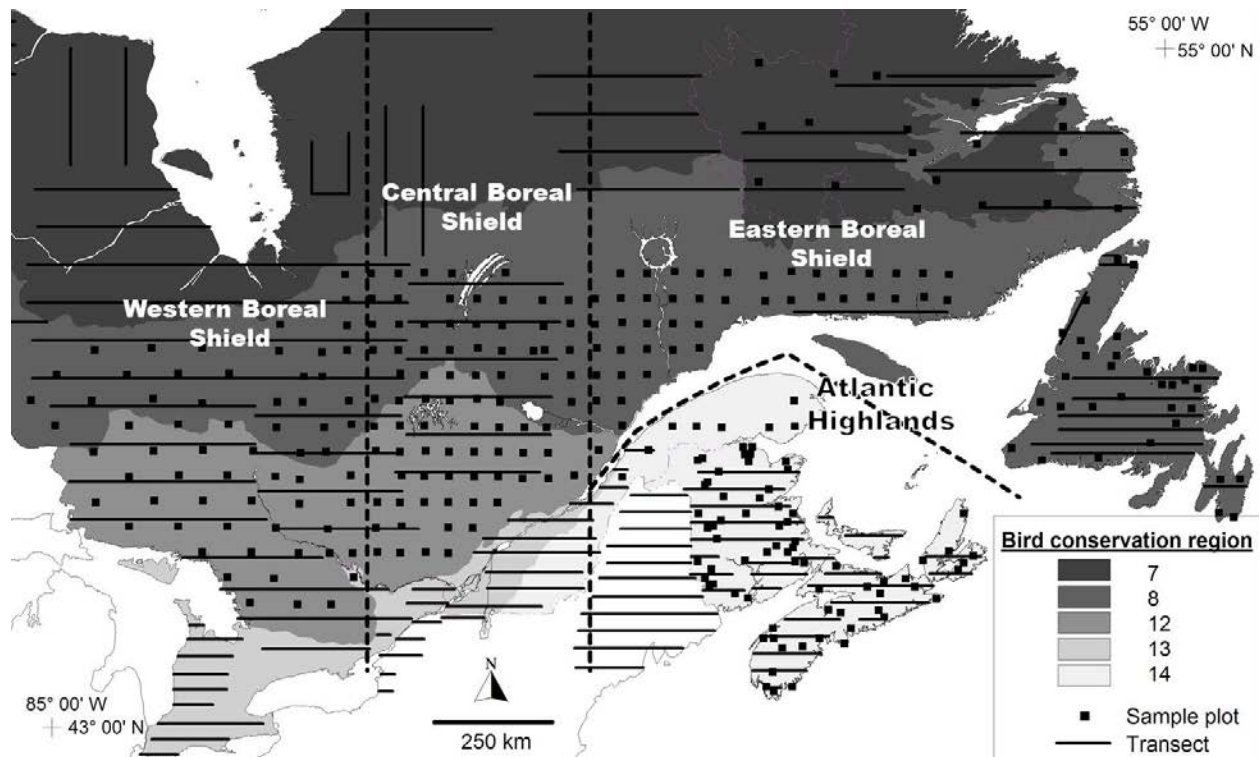


Figure 3.1-2 Regions of the Waterfowl Breeding Population and Habitat Survey in the Eastern Canada Survey Area. Fixed-wing survey transects are represented by black lines and helicopter plot survey by black dots squares.

SMALLER-SCALE WATERFOWL SURVEYS

Other smaller-scale breeding waterfowl surveys are conducted in other parts of Canada to evaluate waterfowl populations found outside of the geographic extent of the WBPHS. In addition, local waterfowl surveys are required in some areas to monitor population segments that are at higher risk due to anthropogenic factors (e.g., in urban areas).

1) WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

Breeding waterfowl populations in the central interior of British Columbia (Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C.) have been monitored annually since 2006, cooperatively by the CWS, Ducks Unlimited Canada and the USFWS, through a helicopter survey. The survey takes place over eight eco-sections covering a total of 11 million hectares. The survey is accomplished by helicopter using a technique similar to that of the continental WBPHS, except that all waterfowl sightings are geo-referenced and associated with a unique habitat type (i.e., stream, wetland, river, lake, agricultural field) to subsequently allow for the determination of habitat-species relationships and the development of landscape habitat-use models.

2) COOPERATIVE YUKON ROADSIDE WATERFOWL BREEDING POPULATION SURVEY

Waterfowl populations were monitored in wetlands located along the road system in southern Yukon. This survey has been done cooperatively by ECCC's CWS, the Yukon territorial government and Yukon College since 1991. The survey consisted of counts conducted 4 or 5 times between early May and mid-June in a sample of wetlands. The 2016 survey sample included approximately 235 wetlands along the southern Yukon road system. The program was discontinued after the 2016 field season. Survey

wetlands are adjacent to the road and the wetland selection was determined non-random and not representative of the available off-road habitat.

In 2017, a pilot study was initiated to combine waterfowl and landbird monitoring programs in the Yukon. Aerial surveys were conducted on wetlands in the Klondike Plateau Ecoregion using a randomized design that aligns with a proposed national boreal monitoring strategy. A major challenge of the program is the need to monitor sparsely distributed populations of waterfowl and other waterbirds across a relatively inaccessible boreal landscape (M. Campbell, CWS- Pacific Region, pers. comm. 2017).

3) NORTHWEST TERRITORIES BOREAL WATERFOWL AND WATERBIRDS SURVEY

The Canadian Wildlife Service has gathered information on abundance and productivity of waterfowl and other water birds near Yellowknife, Northwest Territories, since 1985. Data are collected on the Yellowknife Study Area (YKSA), a 38-km² study area that borders the Yellowknife Highway #3. Since 2008, surveys have been done every second year. Surveys are conducted from the ground with all wetlands within the study area visited four times during the summer: two pair surveys timed for early and late-nesting species, and two brood surveys (early and late-nesting species) to assess productivity. All species of waterfowl, waterbirds and predators are recorded during the survey. There is a severe lack of information on the ecology of northern ducks and other aquatic birds such as grebes and loons, and the contribution of boreal populations to the overall North American populations of aquatic birds is largely unknown.

4) SOUTHERN ONTARIO WATERFOWL PLOT SURVEY

In southern Ontario, a plot survey was initiated in 1971 to monitor the status and trends of early nesting duck populations and their habitat. Surveys are primarily ground-based, but some remote locations are surveyed by helicopter. The survey consists of 351 plots, each 0.64 km² in area. Data from this survey have been important in monitoring the population of temperate breeding Canada Geese in southern Ontario.

5) ST. LAWRENCE LOWLANDS BREEDING WATERFOWL SURVEY, QUEBEC

The St. Lawrence Lowlands have been surveyed since 2004 by helicopter to estimate the abundance, distribution and trends of breeding waterfowl in the St. Lawrence Valley in Quebec. The survey consists of 144 plots (2 km by 2 km) that are systematically distributed throughout a 29 000 km² study area. Data from this survey have been important in monitoring the American Black Duck population in agricultural landscapes (under heavy human pressures) and the progression of the now-established population of temperate breeding Canada Geese in southern Quebec.

SEA DUCKS SURVEYS

Most sea ducks breed in remote northern areas and spend the remainder of the year in marine and nearshore environments, making this group of birds difficult to survey. Information on sea duck populations comes mainly from localized studies (conducted in key locations or in a small portion of the species' range). Most breeding waterfowl surveys in Canada are designed to monitor dabbling and diving ducks, which generally breed farther south. Sea ducks tend to breed later than other groups of waterfowl, so even where surveys cover part of their breeding range, sea ducks are not monitored very well.

The following are surveys designed specifically to monitor sea duck populations.

EASTERN POPULATION BARROW'S GOLDENEYE WINTER SURVEY

Established in 1999, this helicopter survey is carried out by Environment and Climate Change Canada's CWS every three years to monitor the population trend of this species of Special Concern. It is conducted when there is significant ice cover—between late January and mid-February—and covers all coastal habitats suitable for the Eastern Population of Barrow's Goldeneye (*Bucephala islandica*), including the St. Lawrence Estuary and the western portion of the Gulf of St. Lawrence (Quebec and the Dalhousie area in New Brunswick). The survey presents several significant challenges, particularly in distinguishing

Barrow's Goldeneyes in mixed flocks that also include Common Goldeneyes (*Bucephala clangula*) and Red-breasted Mergansers (*Mergus serrator*), as the three species appear very similar when seen from the air. High-resolution photos to confirm species identification and counts have been added in the recent years.

COMMON EIDER WINTER SURVEY

Initiated in 2003, the Common Eider Winter Survey is conducted every three years by Environment and Climate Change Canada's CWS using fixed-wing aircraft, when the ice cover is at its maximum (usually in mid-February). This survey is set up like a census, with the objective of covering all suitable habitats for the *borealis* subspecies of the Common Eider (*Somateria mollissima*), although some portions of the habitat of the American subspecies (*S. m. dresseri*) are also included in the survey. The study area, which is covered in a single overflight, comprises the entire Gulf of St. Lawrence (North Shore, Anticosti Island, Magdalen Islands and the Gaspé Peninsula), the southern coast of Labrador, large parts of Newfoundland's coasts, and Saint-Pierre and Miquelon (France). A ratio estimator is used to relate visual estimates of all eider flocks with counts of a certain number of flocks from photographs.

CENTRAL CANADIAN ARCTIC PACIFIC COMMON EIDER SURVEY

Aerial surveys of pacific Common Eiders (*Somateria mollissima* v. *nigra*) have been conducted intermittently by Environment and Climate Change Canada's CWS since 1995 in the Bathurst Inlet and Queen Maud Gulf areas of Nunavut. This area is thought to include 25% of the Canadian breeding population. The survey, flown by helicopter, is timed to occur when eiders aggregate around colonies at the onset of nesting and generally occur in late June and early July. This survey is a census of the two sites and since 2006 has employed a double-observer approach to allow population estimates to be corrected for the proportion of birds missed by observers.

LONG-TERM NESTING STUDIES OF SEA DUCKS

CWS biologists and other scientists, with assistance from volunteers, collect information about laying date, hatch date, clutch size and nest success of King Eiders (*Somateria spectabilis*) at Karrak Lake, Nunavut (1995 to current); Long-tailed Ducks (*Clangula hyemalis*) at Karrak Lake, Nunavut (1998 to current); and White-winged Scoters (*Melanitta fusca*) at Redberry Lake and Thickwood Hills, Saskatchewan (2000 to present). In addition to estimating breeding parameters, as part of the survey nesting hens and local ducklings are marked and recaptured, thus providing information on local population dynamics, annual survival, recruitment age and other vital parameters

GOOSE SURVEYS

Goose population estimates and trends in abundance are often derived from specific annual or occasional surveys carried out during the breeding season or, in some cases, during the migration or in wintering areas. Population estimates and trends in abundance can also be calculated from band recovery data and harvest estimates when sufficient banding data are available. Table 3.1-1 shows the main goose surveys in Canada.

Table 3.1-1. Goose Population Surveys in Canada					
Species	Survey	Year Initiated and Frequency	Time of Year	Geographic Coverage in Canada	Survey Method
Greater Snow Goose	Spring Greater Snow Goose Survey	Annually since 1965 Conducted by the CWS	Spring migration	Quebec and Ontario: spring staging areas in southern Quebec (from Lake Champlain (south) to Lac St. Jean (north), and from eastern Ontario to Chaleur Bay (east))	Fixed-wing survey: five aircraft are used simultaneously for complete coverage during a one-day survey; all flocks are photographed for subsequent photo analysis
Greater Snow Goose	Long-term Nesting Studies of Arctic Geese	Annually since 1989 Conducted by Université Laval and the CWS	Breeding	Nunavut (Bylot Island)	Capture and banding of goose families, nest monitoring, vegetation monitoring
Lesser Snow Goose	Mid-winter Waterfowl Survey	Annually since 1935 Conducted by the USFWS	Winter	Central and Mississippi flyway area	Fixed-wing transect survey
Lesser Snow Goose	Long-term Nesting Studies of Arctic Geese	Since 1968 Conducted by the Hudson Bay Project Team	Breeding	Manitoba (La Pérouse Bay and Cape Churchill area)	Long-term transects, protected plots, recovery plots, short-term biomass plots, transplant experiments, and remote sensing and satellite imagery assessments
Lesser Snow Goose (Wrangel Island Population)	Fraser-Skagit Mid-winter Lesser Snow Goose Count	Annually since 1987	Mid-winter	B.C.: Fraser River delta U.S.: Skagit River delta of Washington State	Aerial photo count

Table 3.1-1. Goose Population Surveys in Canada					
Species	Survey	Year Initiated and Frequency	Time of Year	Geographic Coverage in Canada	Survey Method
Canada Goose and Lesser Snow Goose	Long-term Nesting Studies of Arctic Geese	Since 1993 (Nun.), and in 2001–2003 and 2007–current (Ont.) Conducted by the Ontario Ministry of Natural Resources	Breeding	Nunavut: Akimiski Island; Ontario: Burntpoint Creek and Polar Bear Provincial Park	Collection of information about laying date, hatch date, clutch size and nest density of nesting geese
Mid-continent Population White-fronted Geese	Fall Inventory of Mid-continent White-fronted Geese	Annually since 1992 Conducted cooperatively by the CWS and the USFWS	Fall migration	Saskatchewan and Alberta	Fixed-wing transect
Cackling Goose	Mid-winter Waterfowl survey	Annually since 1970	Winter	Conducted in Central and Mississippi Flyway wintering areas	Fixed-wing transect survey
North Atlantic Population Canada Goose	WBPHS–eastern Canada (Quebec’s north shore and N.L. part of the survey)	Annually since 1990	Breeding	WBPHS–eastern Canada (stratum 2)	Helicopter plot and fixed wing survey
Atlantic Population Canada Goose	A Breeding Pair Survey of Canada Geese in Northern Quebec	Annually since 1993 Conducted cooperatively by the CWS and the USFWS	Breeding	Coastal and interior areas of Ungava and Hudson bays of northern Quebec	Fixed-wing transect survey
Southern Hudson Bay Population Canada Goose	Spring Population Survey for Southern Hudson Bay Population Canada Geese	Annually since 2016	Breeding	Coastal areas along western and southern James Bay (including Akimiski Island, Nunavut) and southern Hudson Bay and in the adjacent interior lowland muskeg of Ontario and Manitoba	Fixed-wing transect survey

Table 3.1-1. Goose Population Surveys in Canada					
Species	Survey	Year Initiated and Frequency	Time of Year	Geographic Coverage in Canada	Survey Method
Temperate-breeding Canada Goose – Maritimes	WBPHS – eastern Canada; Eastern Habitat Joint Venture (agricultural plots)	Annually since 1990	Breeding	New-Brunswick and Nova Scotia	Helicopter plot survey/ Fixed-wing
Temperate-breeding Canada Goose – Quebec	St. Lawrence Lowlands Breeding Waterfowl Survey, Quebec	Annually since 2004	Breeding	St. Lawrence lowlands	Helicopter plot survey
Temperate-breeding Canada Goose – Ontario	Southern Ontario Waterfowl Plot Survey	Every 2–5 years from 1971 to 2005; annually, in a rotational survey since 2005. Conducted by CWS	Breeding	Southern Ontario	Ground (with some aerial) plot survey
Temperate-breeding Canada Goose – Prairies	WBPHS – western survey area	Annually since 1955 Conducted by the CWS and the USFWS	Breeding	Southern Prairie provinces	Fixed-wing transect survey
Temperate-breeding Canada Goose – Southern British Columbia	Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C.	Annually since 2006 -Cooperative survey conducted by the CWS, Ducks Unlimited and the USFWS	Breeding	Southern British Columbia	Helicopter transect survey
Atlantic, Black and Western High Arctic Brant	USFWS Mid-winter Survey; CWS Ground Counts (Black and WHA Brant)	Annually since 1992	Wintering	Wintering areas in the U.S. Fraser Valley, B.C.	Fixed-wing transect survey; ground counts

SURVEYS FOR OTHER SPECIES

Additional information on waterfowl populations is provided by Mid-Winter Waterfowl Surveys that are conducted on the wintering grounds in Ontario and the U.S. The Mid-Winter Surveys provide population indices for most species of ducks and geese. It has been conducted annually since 1935. The Mid-Winter Survey is not based on a statistical sampling plan, and some wintering habitats are not covered, so results are best used for the evaluation of relative abundance and distribution in wintering habitats.

Band-tailed Pigeons, Wilson's Snipes, Rails and Mourning Doves are surveyed through the North American BBS [www.ec.gc.ca/reom-mbs/]. The BBS is an international avian survey conducted annually since 1966 in the U.S. and Canada. It is designed to monitor trends in relative abundance of North American breeding birds at the continental, national and regional level. The BBS focuses on landbirds and is the main source of information on long-term population change for these species in North America.

Rails and Common Gallinules are also monitored by the Great Lakes Marsh Monitoring Program.

The Mineral Site Survey (MSS) for **Band-tailed Pigeons** is conducted in the Pacific Flyway to provide an index of abundance. The survey is a coordinated effort among state and provincial wildlife agencies in California, Oregon, Washington, and British Columbia, and the USFWS and CWS. The MSS involves a visual count of Band-tailed Pigeons at 52 mineral sites throughout the population's range during July (Seamans 2017).

Tundra Swans are counted on their wintering areas during the Mid-Winter Waterfowl Survey by CWS in Ontario and the USFWS in the U.S.

First conducted in 1968, repeated in 1975, and then conducted every five years since then, the North American **Trumpeter Swan** Survey estimates the population size and productivity of Trumpeter Swans from counts on the species' breeding grounds in Canada (Yukon, Northwest Territories, British Columbia, Alberta and Ontario) and the U.S. The survey is coordinated by the USFWS and Environment and Climate Change Canada's CWS, with the help of many other partners. In Yukon, the Northwest Territories, British Columbia and Alberta, biologists count adults and young from the air during the late summer. In Ontario, CWS staff count adults and cygnets from the air during late summer while volunteers with the Ontario Trumpeter Swan Restoration Group conduct a ground-based survey. Across Canada, anyone who sees a banded Trumpeter Swan can report it to Environment and Climate Change Canada's Bird Banding Office and to the Trumpeter Swan Society.

There is no formal survey to monitor **Murre** populations, although Murres in some specific colonies are counted. High-resolution photos are used to confirm species identification and counts. Special surveys are conducted occasionally to estimate Murre harvest.

The status of the **American Woodcock** in North America is monitored through the Singing-ground Survey in Canada and the U.S., which consists of a spring count of male courtship displays at dusk.

The Mid-continent Population of **Sandhill Cranes** is monitored through a spring aerial transect survey. The Eastern Population has been monitored since 1979 by a fall staging survey in the U.S.; in Ontario, CWS initiated a fall staging survey in 2013. Estimates for the southern portion of the breeding range are also derived from the Eastern Waterfowl Breeding Ground Survey (helicopter plot survey only).

The **American Coot** is monitored in Canada through the WBPHS, and the BBS estimates the population at a continental level.

CANADIAN AND U.S. HARVEST SURVEYS

In Canada, the National Harvest Survey (NHS) was initiated in the late 1960s to document the annual harvest of waterfowl and other migratory game birds, as well as determine trends in hunter activity across Canada annually. Coordinated by Environment and Climate Change Canada's CWS, the survey uses data from hunters to determine the geographic distribution of the hunt and to estimate the number of birds

of each species that are harvested each year. Participants (hunters) are randomly selected, and responses are voluntary. The survey has two components: the Harvest Questionnaire Survey, which is used to estimate the total number of ducks and geese taken by hunters, and the Species Composition Survey, which helps determine the proportion of each species in the total harvest. Harvest estimates are generated by integrating the results of these two surveys (see www.ec.gc.ca/reom-mbs/), and the data are used in harvest management decisions. Supplemental surveys are undertaken to estimate the numbers of geese harvested during the Snow Goose Spring Conservation Hunt, a special conservation measure put in place to control overabundant snow geese.

From 1952 through to 2001, estimates of waterfowl harvest in the U.S. were derived from the USFWS's Mail Questionnaire Survey. A new survey, however—the Migratory Bird Harvest Information Program—was fully implemented in 1999. In addition to waterfowl data, it gathers information on species and groups of migratory game birds such as woodcocks, doves and snipes. This survey also includes a species composition survey (Waterfowl Parts Survey), and the results of both surveys are combined to calculate harvest estimates. It should be noted that harvest estimates obtained from the two surveys (before 1999 and after 1999) cannot be directly compared.

In this report, harvest data are presented in detail for each province and territory of Canada. More information on the distribution of the harvest in the U.S. may be found on the USFWS Migratory Bird Program website: www.fws.gov/migratorybirds.

3.1.2 Waterfowl Banding

Band recovery data provide consistent information to assess survival and harvest rates, temporal and geographic distribution of the harvest, and in some cases population size.

DUCK AND GOOSE BANDING PROGRAMS

The Canadian Duck Banding Program began over 100 years ago. As part of this program, ducks are caught on their breeding grounds at the end of the breeding season but before the hunting season begins, either when they swim into baited traps or by an airboat. CWS staff carefully extracts ducks from the traps, band each duck on one leg, collect information about age, sex, and species, and then quickly release the birds. This program targets adult and juvenile ducks of multiple species.

Arctic goose banding programs have been conducted in Canada since the 1930s. Geese are banded in the Northwest Territories, Nunavut, Manitoba, Ontario and Quebec. Snow Geese, Ross's Geese, Cackling Geese, Greater White-fronted Geese and Brant are banded on their northern breeding grounds. Canada Geese are banded on their subarctic and temperate breeding grounds. The birds are banded after they have been carefully herded into an enclosure during the post-breeding season, when the adults are moulting their flight feathers and before the young can fly. CWS staff applies individually numbered metal bands, which can be used to track individual birds, to the legs of the captured birds.

Marking programs—which typically use leg-bands, neck collars or transmitters (radio or satellite)—are also part of the waterfowl monitoring program.

If a person encounters a banded bird, or if a hunter shoots a banded bird, they are encouraged to report it to Environment and Climate Change Canada Bird Banding Office, via telephone at 1-800-327-BAND (2263) or online at www.reportband.gov. Biologists use the information from banded birds to assess survival rate, harvest rate and distribution. The data also feed into harvest management decisions.

3.2 Trend Analysis

Trends in the numbers of May ponds and duck breeding populations in western Canada estimated from the WBPBS are calculated using the estimating equations technique (Link and Sauer 1994).

Overall, habitat conditions during the WBPHS survey were either similar to those of the previous year or slightly improved compared to the previous year, with a few exceptions in the Canadian and U.S. Prairie regions. A total of 47.3 million ducks was estimated in the survey area in 2017. This estimate is similar to the estimate for 2016 (48.4 million birds) but remains 34% greater than the 1955–2017 long-term average (USFWS 2017).

3.3 2017 Breeding Habitat Conditions

3.3.1 Prairie Pothole Region

Wetlands in the Canadian and U.S. prairies are sensitive to weather variability (Larson 1995; Roy 2015) and the region is characterized by a very distinct wet-drought cycle (Johnson *et al.* 2005). Nesting effort, nest success, and duckling survival in the prairies have all been linked to the wetlands conditions (Greenwood *et al.* 1995; Howerter *et al.* 2014) and the abundance of waterfowl populations is strongly linked to the abundance of wetlands in the spring during the previous year (Johnson and Grier 1988; Viljugrein *et al.* 2005). Since 1961, spring habitat conditions have been assessed based on an estimate of the number of ponds in May (Figure 3.2-1). In 2017, the total pond estimate (Prairie Canada and U.S. combined) was of 6.1 million ponds. This was 19% below the 2014 estimate of 7.5 million ponds, but 17% above the long-term average of 5.2 million ponds (USFWS 2017). The 2017 estimate in the Canadian Prairies was of 4.3 million ponds, a 23% increase from 2016 (3.5 million; Figure 3.3-1). An analysis of trends showed significant increases in the number of ponds in the Canadian Prairie Pothole Region between 1961 and 2017 (Figure 3.3-1).

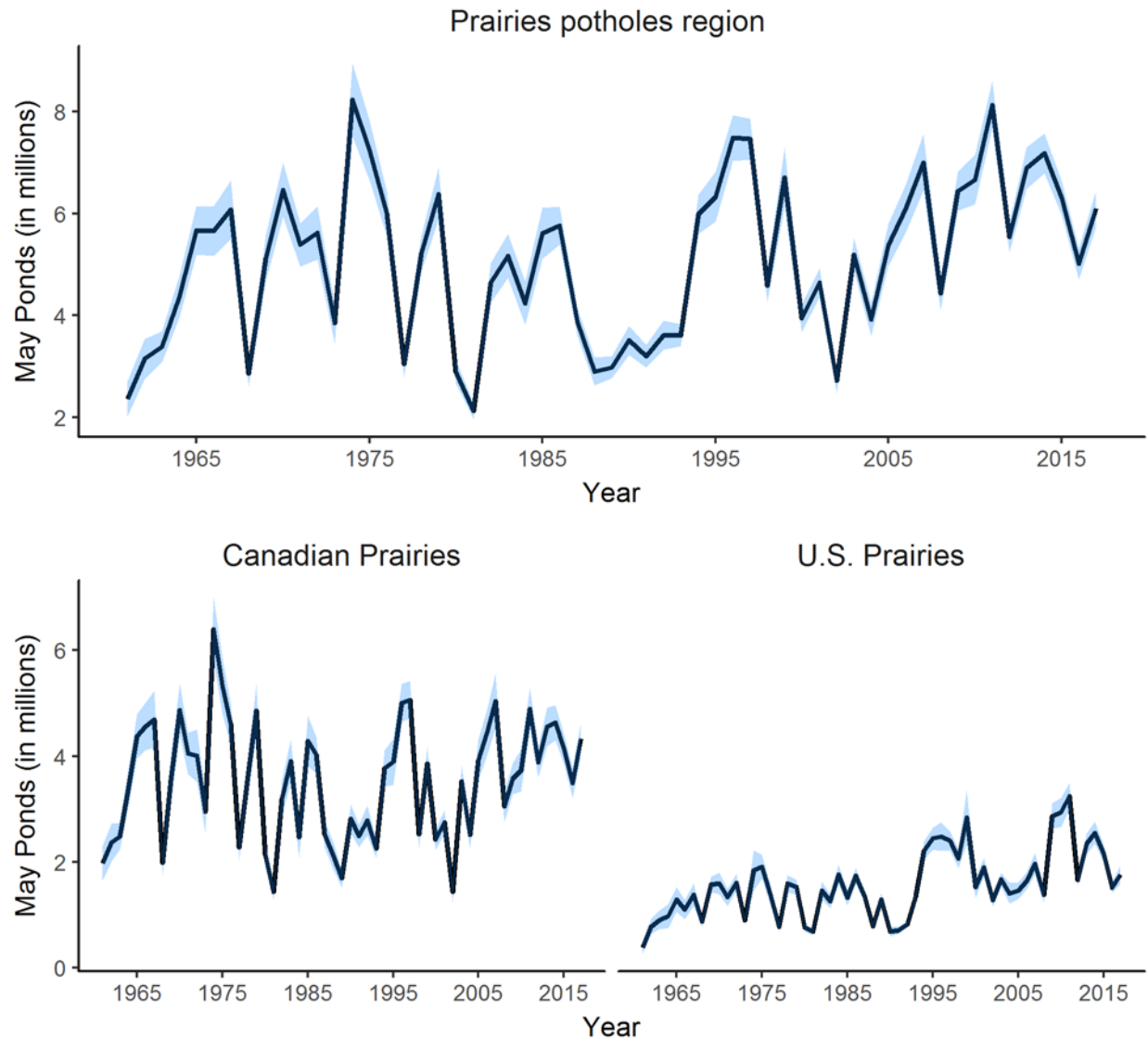


Figure 3.3-1 Estimated Number of May Ponds in the Canadian and U.S. Prairies, black line represents the estimated mean numbers of ponds and the shaded area represents the 95% Confidence Intervals.

3.3.2 Western Boreal Forest

Breeding conditions varied within the Western Boreal Forest, with conditions somewhat drier than average, but were good overall in this portion of the traditional survey area. The boreal region and Alaska experienced drier than average conditions. An early spring and the absence of flooding in most areas likely contributed to good production for waterfowl species.

In the North Slave region of the Northwest Territories, snowfall amount was equal to the long-term average (2016-17: 62.6 inches; LTA: 62.1). This amount of snowfall, although close to that observed in 2015-2016, was the highest on record since 2008-2009. April was colder than average, leading to a protracted spring thaw. By May 15, most medium to large water bodies were still covered with ice. Water levels were slightly above 2016 levels.

3.3.3 Central British Columbia

Slightly below average temperatures were observed in the B.C. Interior during the 2016-2017 winter. Precipitations were lower than average from December 2016 to February 2017 and higher than average from February to May 2017 (BC Water Supply and Snow Survey Reports, <http://bcrcfc.env.gov.bc.ca/>). April was cool and wet, which led to increases in snowpacks and to a delayed snowmelt. Snow and ice were common at mid and low elevations in early May and this resulted in less wetland habitat available to waterfowl than in previous years. Wetland water levels were generally average to good in the Southern Interior and good in the Northern Interior. In general, the May 2017 habitat conditions were fair to good in the prime waterfowl areas of the southern part of the B.C. Interior and good in the northern portion of the B.C. Interior (A. Breault, CWS – Pacific Region, pers. comm. 2017) .

3.3.4 Canadian Arctic and Subarctic Regions

Habitat conditions in spring and summer of 2017 varied considerably between regions of the Canadian Arctic. The timing of the ice and snow melt was early in the low arctic where most geese nest, and juvenile to adult ratios at banding suggested good production in all areas observed. Age ratios in flocks of lesser snow geese, Ross's geese, and white-fronted geese observed during fall migration in Saskatchewan were among the highest recorded in the last decade, confirming observations from nesting areas (R. Alisauskas, ECCC - S&T, pers. comm. 2017). On Bylot Island, the main Greater Snow Goose colony had a thick snowpack at the end of the winter and snowmelt was delayed due to cool and overcast weather in June. The percentage of young in the greater snow geese fall flight was slightly below average which suggests weather had been better in other parts of the breeding range (J. Lefebvre, CWS – Québec Region, pers. comm.). At Southern Hudson Bay and southwestern James Bay, spring phenology was about 6 days later than average due to winter 2016-17 snowpack depths that ranged from average to well above average throughout the region, spring blizzards and a prolonged period of below freezing spring temperatures; June was relatively dry with below average precipitation and cooler than average temperatures throughout the region (Brook and Badzinski 2017).

3.3.5 Eastern Canada (Ontario, Quebec and Atlantic Provinces)

In the Maritimes this year, ice out appeared to be somewhat delayed again in most areas of the survey. The ice cover was still significant and extensive in most areas at the time the survey began (early May), and the survey crew noted that ice conditions were the most extensive observed in the last 10 years or so of the survey. The ice cover remained extensive in the Cape Breton Highlands National Park and on large lakes in the northern portion of the province, but birds were seen taking advantage of available open water even in these areas. In the northern part of insular Newfoundland and most of Labrador, a large proportion of the ponds and lakes were partially ice covered and most of the forested areas had deep snow cover, delaying the start of the WBPHS in this region for a week compared to previous years (S. Gilliland, CWS – Atlantic Region, pers. comm.).

Flooding appeared to be minimal in New Brunswick, but localized areas of south-central Nova Scotia remained flooded at the time of the survey, which may have contributed to nest loss for early ground-nesting species such as the American Black Duck (B. Pollard, CWS – Atlantic Region, pers. comm.).

April 2017 was very rainy in the region of Quebec, with record high precipitations in the southwestern part, and flooding occurring along the St. Lawrence River and its major tributaries. As a result, survey of the St. Lawrence Lowlands was delayed and conducted only in early May (rather than late April); still, many agricultural fields were flooded at the time of survey, which made it difficult to assess the breeding status (local breeders or migrants) of waterfowl pairs seen. In this landscape, high risk of nest flooding for early ground-nesting species such as the American Black Duck, the Mallard and the Canada Goose was expected. The boreal forest was less affected by these abnormally wet conditions. However, because May experienced colder temperatures than usual, the higher altitude eastern half of the surveyed area in the province consequently had a larger proportion of ponds and lakes partially ice covered; nevertheless,

breeding pairs were seen taking advantage of available open water even in these areas (C. Lepage, CWS – Québec Region, pers. comm.).

In southern and central Ontario, spring was generally about average. Mild spring temperatures began in mid to late February and continued off and on into March. Water levels were also higher than normal throughout the survey area with all areas in southern and central Ontario experiencing flooding in late April to early May after heavy rainfalls. This resulted in nest flooding for many Canada geese. For ducks, however, breeding habitat conditions were generally excellent in southern and central Ontario. Northeastern Ontario was less affected by heavy spring rainfall but breeding habitat conditions were generally above average except in areas with high beaver activity where conditions were excellent (S. Meyer, CWS – Ontario Region, pers. comm.).

3.4 Management of Overabundant Geese

3.4.1 Conservation Issue

The Snow Goose and Ross's Goose populations are well above their population objectives (NAWMP 2012). Such a situation becomes an important conservation issue when the rapid growth and increasing abundance affects the habitats on which they, and other species, depend. This issue was first highlighted 20 years ago, through comprehensive assessments of the environmental effects of the rapidly growing populations of Mid-continent Lesser Snow Geese (*Chen caerulescens caerulescens*) and Greater Snow Geese (*Chen caerulescens atlantica*). The analyses, completed by Canadian and American experts, are contained in the reports *Arctic Ecosystems in Peril—Report of the Arctic Goose Habitat Working Group* (Batt 1997) and *The Greater Snow Goose—Report of the Arctic Goose Habitat Working Group* (Batt 1998).

These working groups concluded that the increase in Snow Goose populations was primarily human-induced. Changing farming practices supplied a reliable, highly nutritious food source for migrating and wintering geese. Combined with the safety found in refuges, this improved nutritional status led to increased survival and reproductive rates for Snow Geese. These populations have become so large that in staging areas and on breeding grounds, they are affecting the plant communities on which they and other species rely. Grubbing by geese not only permanently removes vegetation, but it can also change soil salinity, nitrogen dynamics and moisture levels. The result is the alteration or even elimination of plant communities. Although the Arctic is vast, the areas that support migrating and breeding geese and other companion species are limited in extent, and some areas are likely to become inhospitable for decade-long periods. Increasing crop damage is another undesirable consequence of the growing goose populations.

3.4.2 Management Response

Initial management efforts focused on the Mid-continent Lesser Snow Geese and Greater Snow Geese populations where there was strong evidence of detrimental effects on some habitats. Canada, the U.S. and Mexico agreed that the habitat changes being caused were of significant conservation concern, and that the populations were overabundant. More recent efforts have targeted Western Arctic Lesser Snow Geese and Ross' Geese. As a result, several concurrent management measures to curtail the rapid population growth and reduce population size to a level consistent with the carrying capacity of the habitat were initiated. Population models showed that, of all the potential management techniques available, the most successful approach to controlling population growth involved reducing survival rates for adult geese.

Therefore, beginning in 1999, Canada amended its *Migratory Birds Regulations* and created new tools that could be used to help manage overabundant species. These included special conditions that encourage hunters to increase their harvest during the regular hunting season as well as during the spring conservation harvest season and, in some cases and subject to specific controls, that allowed hunters to

use exceptional methods and equipment, such as electronic calls and bait. The special conservation measures for Snow Geese were implemented in 1999 in Quebec and Manitoba, and were expanded in 2001 to Saskatchewan and Nunavut, in 2012 to southeastern Ontario, in 2015 to the Northwest Territories and Alberta and in 2016 to the Yukon. The dates and locations of application of these special conservation measures were determined in consultation with the provincial governments, other organizations and local communities.

3.4.3 Effectiveness of Special Conservation Measures

The evaluation report shows that the special conservation measures have had mixed success. In the case of Greater Snow Geese, the measures were successful in reducing the annual survival rate of adults from 83% to about 72.5% (Calvert and Gauthier 2005). Adult survival rate is the parameter to which population growth is the most sensitive. The combined implementation of special conservation measures in Canada, including the spring conservation harvest, the liberalization of hunting regulations, and the Conservation Order in the U.S. appears to be working efficiently to control population levels, as the species experienced a declining population trend between 2012 and 2017 (Lefebvre *et al.* 2017).

For Mid-continent Lesser Snow Geese, the evaluation concluded that the population had continued to grow through 2009, although perhaps at a reduced rate (Alisauskas *et al.* 2011; Leafloor, Moser and Batt 2012). It also concluded that, although the annual harvest increased as a result of the conservation measures, it failed to reduce the population size, which was actually much larger than previously thought. While it is clear that measures implemented to date were not successful in reducing the Mid-continent population, the population also appears to have levelled off in recent years, probably due to declining recruitment (Alisauskas *et al.* 2017). This may be a result of density-dependent reductions in forage availability on northern staging areas, coupled with negative effects of climate change on gosling growth and survival in the Arctic (Ross *et al.* 2017).

3.5 Trends in the Sale of Migratory Game Bird Hunting Permits in Canada

Information on the sale of Migratory Game Bird Hunting (MGBH) permits is available since 1966 (Figure 3.5-1). Annual sales peaked in 1978 (524 946 permits sold) and subsequently declined almost every year until 2005, when sales were down to 165 678 permits, the lowest number ever recorded. For several years, the number of permits sold annually remained at around 170 000. Sales, however, increased slightly in recent years, with a total of 181 908 permits sold in 2016.

In August 2014, Environment and Climate Change Canada launched a new online e-Permitting ordering system to improve hunters' access to MGBH permits. Originally, this system allowed hunters to purchase a permit online, and the permit (along with the Canadian Wildlife Habitat Conservation [CWHC] stamp) would then be mailed to the hunter within 3 to 5 business days. As of August 2015, hunters can purchase their MGBH stamp and CWHC stamp online, receive electronic copies of the stamp and permit by email and print these documents. The e-Permitting system is accessible to hunters 24 hours a day, 7 days a week. In 2016, 28 314 hunters purchased their permit online, an 81% increase compared to the 15 635 e-Permits sold in 2015.

The MGBH e-Permitting purchasing system makes it easier for hunters to respond to the questions on the permit application, which helps to inform the National Harvest Survey. Data from this and other CWS surveys are used to assess the status of migratory game bird populations in Canada, their productivity, survival rates and amount of harvest they can sustain. This information also provides data to inform hunting regulations and harvest management plans for future years.

For more information on MGBP permit sales in Canada, please visit: www.ec.gc.ca/reom-mbs/default.asp?lang=en&n=C9046964.

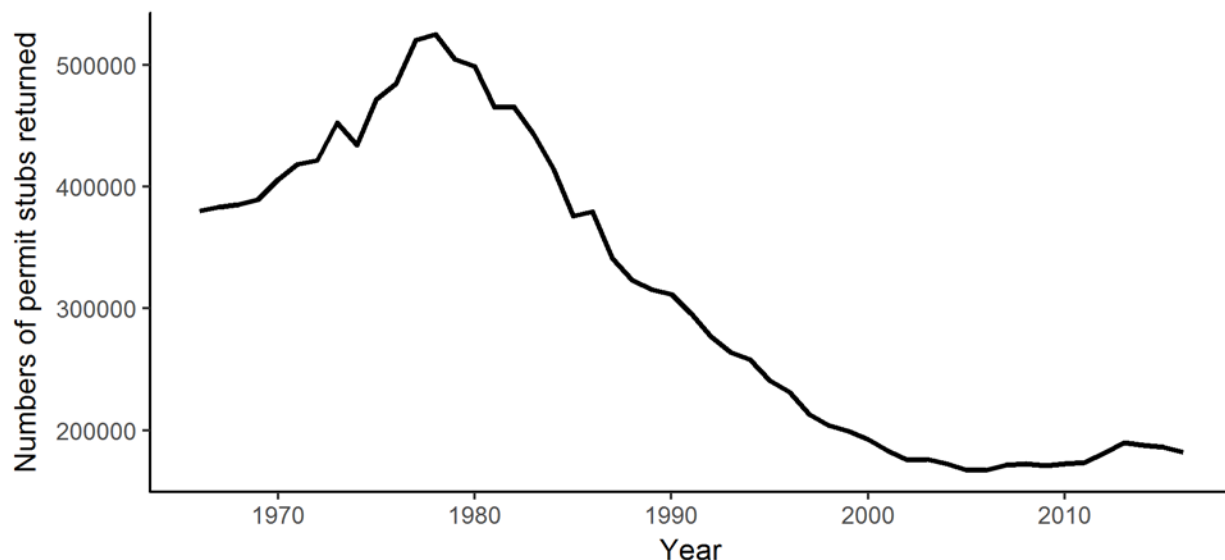


Figure 3.5-1 Number of Migratory Bird Hunting Permit Stubs Returned to Environment and Climate Change Canada. Permits that were sold, but for which the stubs were not returned to Environment and Climate Change Canada, are excluded from the totals.

Various reasons have been put forth to explain the decline in the number of hunters in Canada, including limited access to hunting areas, increasing hunting-related expenses, gun control measures, increasing urbanization, and general societal changes. Environment and Climate Change Canada is supportive of migratory bird hunting and fully recognizes the value of hunters and anglers to conservation. Environment and Climate Change Canada has implemented a number of measures to recognize this contribution of hunters and Canadians more generally, including through the establishment of Waterfowler Heritage Days, a country-wide event aimed at promoting the mentoring of young hunters in a safe environment.

4. Population Status of Inland Dabbling Ducks

4.1 American Black Duck (*Anas rubripes*)

The American Black Duck breeds primarily in northeastern North America where it has always been one of the most abundant duck species (Longcore *et al.* 2000). However, the species' abundance declined starting in the 1950s. Causes of this decline are thought to include, changes in breeding and wintering habitat quality, overharvesting, and interactions (competition, hybridization) with Mallards (Conroy *et al.* 2002). Black Duck numbers appear to have stabilized over the last 20–30 years.

4.1.1 Abundance and Trends

The core breeding range of the Black Duck is located in eastern Canada. The Black Duck breeding population is monitored annually through the Eastern Waterfowl Breeding Ground Survey (Figure 4.1-1, Monitoring section). Black Duck numbers are also monitored through other smaller-scale breeding waterfowl surveys such as the Southern Ontario Waterfowl Plot Survey and the St. Lawrence Lowlands Breeding Waterfowl Survey.

LARGE-SCALE WATERFOWL SURVEY

EASTERN WATERFOWL BREEDING GROUND SURVEY

Black Duck breeding population estimates in the four regions of the survey area are presented in Table 4.1-1 and Figure 4.1-1. The Black Duck long term population trend is stable in the core breeding area. However the population increased significantly in the Atlantic Highlands (1990–2017) and decreased significantly in the Western Boreal Shield (1990–2017). The total population in the core survey area in 2017 was approximately 541 000 ducks.

Table 4.1-1 Black Duck Breeding Population Estimates with 95% Credible Intervals (CI) and Trend Estimates Based on the Eastern Waterfowl Breeding Ground Survey (The estimates are based on the combined results of helicopter and fixed-wing aircraft surveys. Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
EWS—Eastern Waterfowl Breeding Ground Survey	Breeding Population Estimates in Core Area (in thousands)		Trends in Numbers of Breeding Birds in Core Area		
	2016	2017	1990–2017	2008–2017	2013–2017
Eastern Survey Area	606 (526 - 708)	541 (470 - 630)	-0.02	-1.08*	-0.94
Atlantic Highlands	110 (89 - 143)	94 (77 - 120)	1.33*	-2.29	-2.77
Eastern Boreal Shield	156 (130 - 199)	132 (111 - 167)	0.00	-0.80	-0.99
Central Boreal Shield	133 (103 - 192)	132 (99 - 188)	0.26	-0.62	0.10
Western Boreal Shield	202 (162 - 266)	180 (145 - 234)	-0.81*	-0.86	-0.48

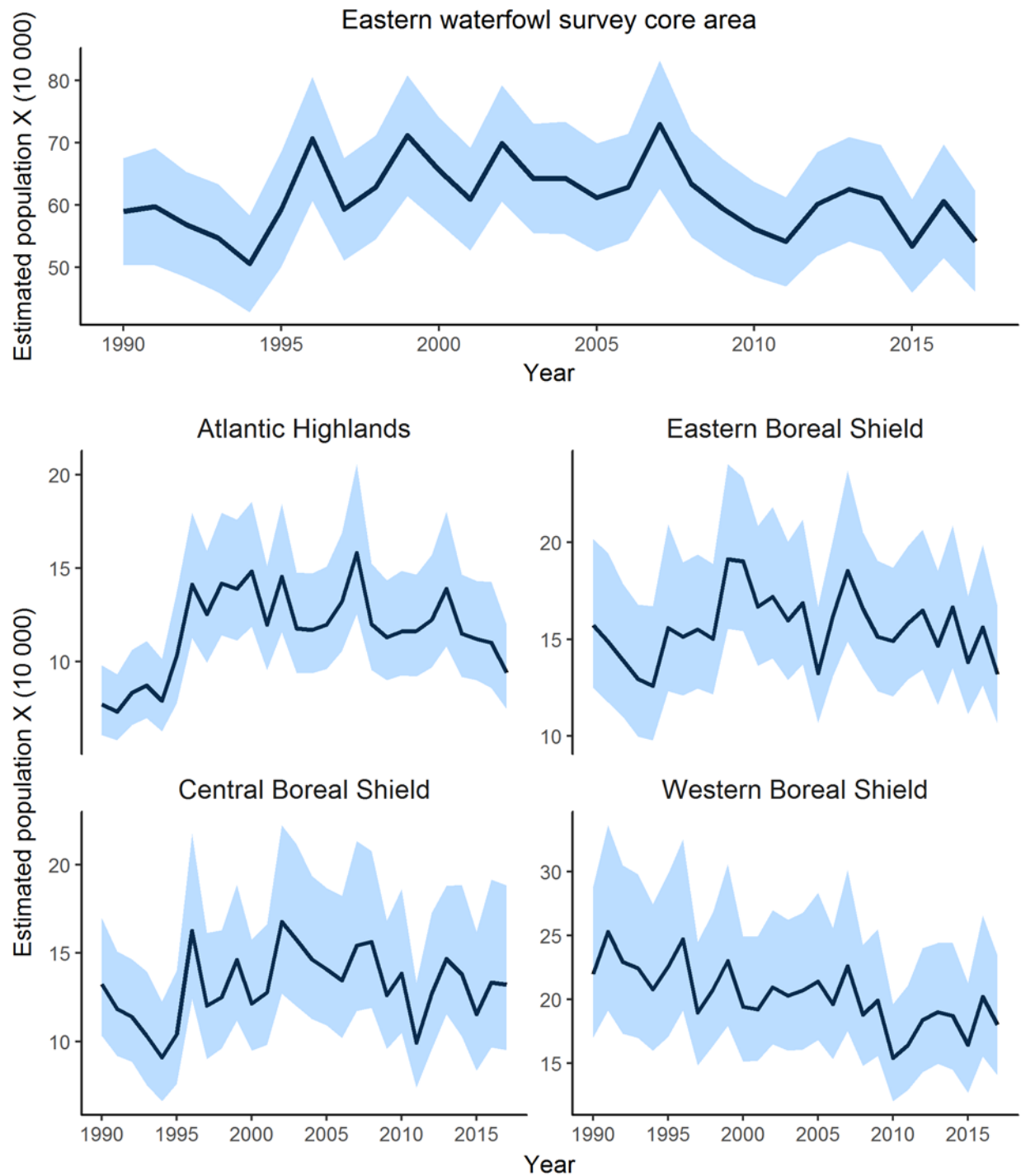


Figure 4.1-1 Black Duck Breeding Population Estimates Based on the Eastern Waterfowl Breeding Ground Survey, black line represents the population estimate while the shaded area represents the 95% Credible Interval (The figures represent the combined results of helicopter and fixed-wing aircraft surveys.)

SMALL-SCALE WATERFOWL SURVEYS

Table 4.1-2 American Black Duck Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])

Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	Long-term	2008–2017	2013–2017
Southern Ontario	8.15 (0.00-16.30)	13.98 (0.00-27.97)	-2.25	0.30	4.55
St. Lawrence Lowlands	4.22 (1.73-6.71)	3.35 (1.23-5.48)	-2.02	-1.17	-4.27

SOUTHERN ONTARIO WATERFOWL PLOT SURVEY

The Black Duck population in southern Ontario declined substantially in the early 1970s, and numbers have fluctuated considerably since then. The 2017 estimate of 14 000 pairs is above the 10-year average of approximately 9 800 pairs and is considerably higher than the 2013 estimate of approximately 3 600 pairs, which was the lowest estimate ever recorded since the survey started in 1971 (Figure 4.1-2).

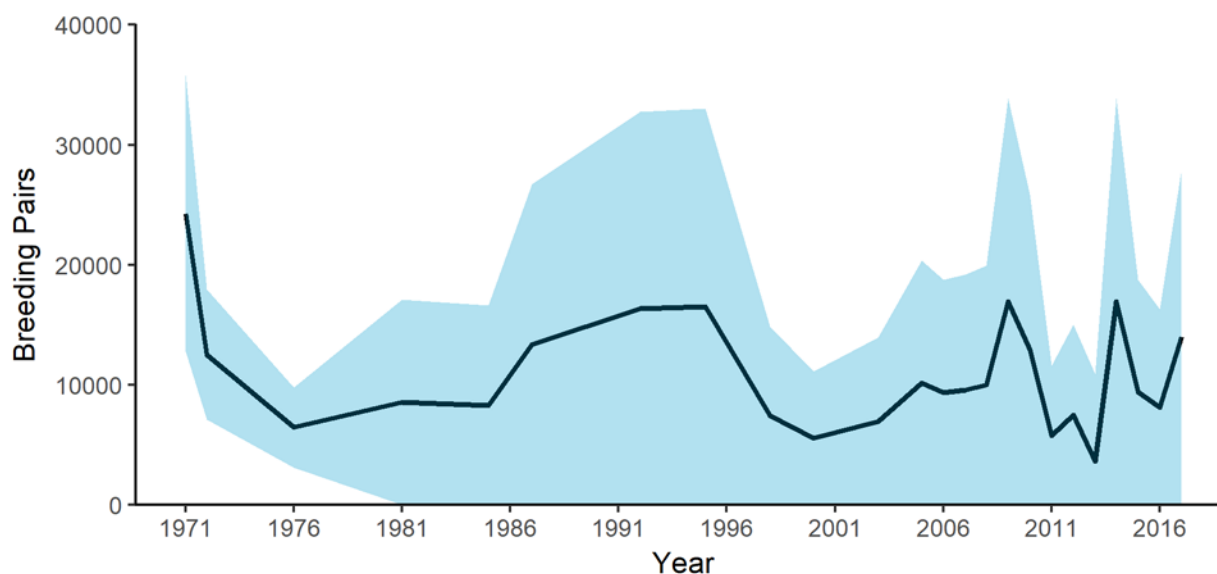


Figure 4.1-2 Indicated Breeding Pair of American Black Ducks in Southern Ontario, 1971–2017, black line represents the breeding pair estimate while the shaded area represents the 95% Confidence Intervals.

ST. LAWRENCE LOWLANDS BREEDING WATERFOWL SURVEY, QUEBEC

In 2015, and again in 2017, the Black Duck—usually second in abundance behind the Mallard—was bypassed by the Wood Duck; therefore, it fell off as the third most abundant species in this landscape. Historically, the Black Duck was the dominant dabbling duck species in the St. Lawrence lowlands, but the St. Lawrence Lowlands Waterfowl Survey shows that the Black Duck has been definitely replaced by the Mallard as the most abundant breeding duck species in this area.

The St. Lawrence lowlands host an average of approximately 4 100 breeding pairs of Black Duck annually for the period of 2013–2017. The 2017 estimate of 3 354 breeding pairs is amongst the lowest ones since 2004 (Figure 4.1-3). Despite the fact that long-term and short-term trends for this species are declining, none does at a significant level (Table 4.1-2); therefore, the Black Duck population is considered to have remained quite stable in this landscape between 2004 and 2017 (Figure 4.1-3).

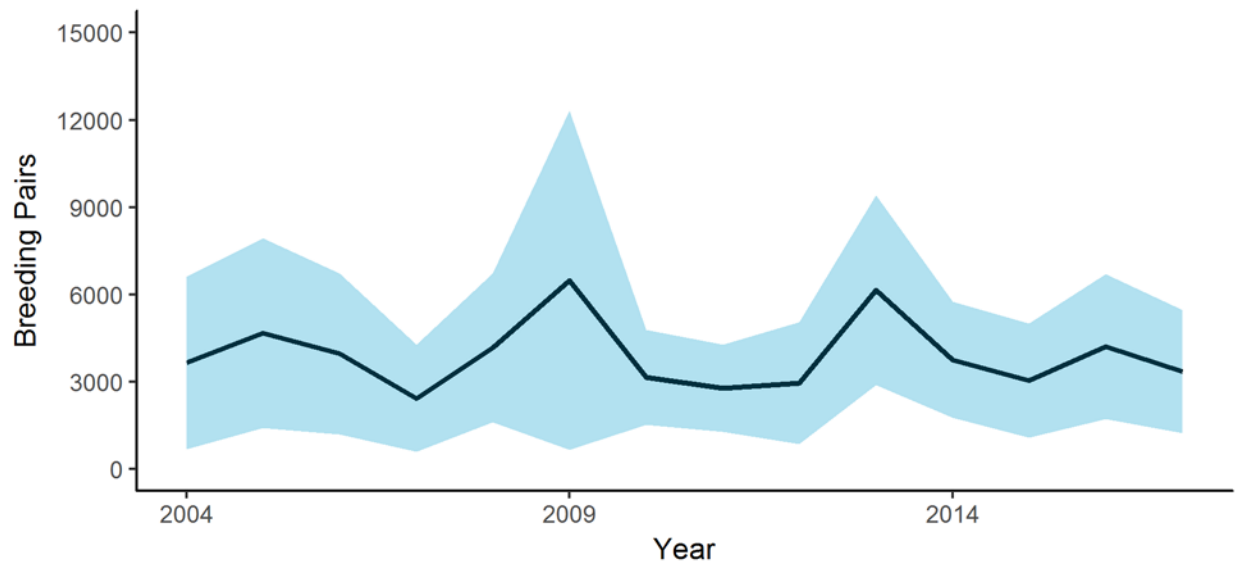


Figure 4.1-3 Indicated Breeding Pair Estimates of American Black Ducks in the St. Lawrence Lowlands, Quebec, 2004–2017, black line represents the breeding pair estimate while the shaded area represents the 95% Confidence Intervals.

4.1.2 Harvest

Declines in Black Duck numbers observed on the wintering grounds during the Mid-Winter Waterfowl Survey prompted the U.S. government to initiate a program to reduce the harvest of the species in 1983. Canada joined the initiative in 1984 by imposing restrictions on harvest. Between 1984 and 1988, the harvest in the U.S. decreased gradually, but it remained stable in Canada. In 1989 and 1990, Canada implemented more restrictive hunting regulations to protect local Black Duck breeding populations. The annual Canadian Black Duck harvest declined by approximately 3% between 1990 and 2010, compared to an average decrease of 1% in the U.S. (Figure 4.1-4). The introduction of more restrictive harvest regulations, combined with a decline in the number of waterfowl hunters, are thought to be responsible for the decreased Black Duck harvest and the stabilization of the population in the last few decades. Black Duck population declines in the western portion of the species' breeding range likely contributed to reducing the number of birds available to hunters. Nevertheless, in some areas, there are indications that hunting may be exerting an unsustainable pressure on segments of the Black Duck population, for example in the St. Lawrence Lowlands (Cousineau *et al.* 2014; Roy *et al.* 2015).

Historically, the harvest of Black Ducks in the U.S. and in Canada has approached parity (Figure 4.1-4). The number of Black Ducks harvested in Canada in 2016 was one of the lowest numbers on record (Figure 4.1-4).

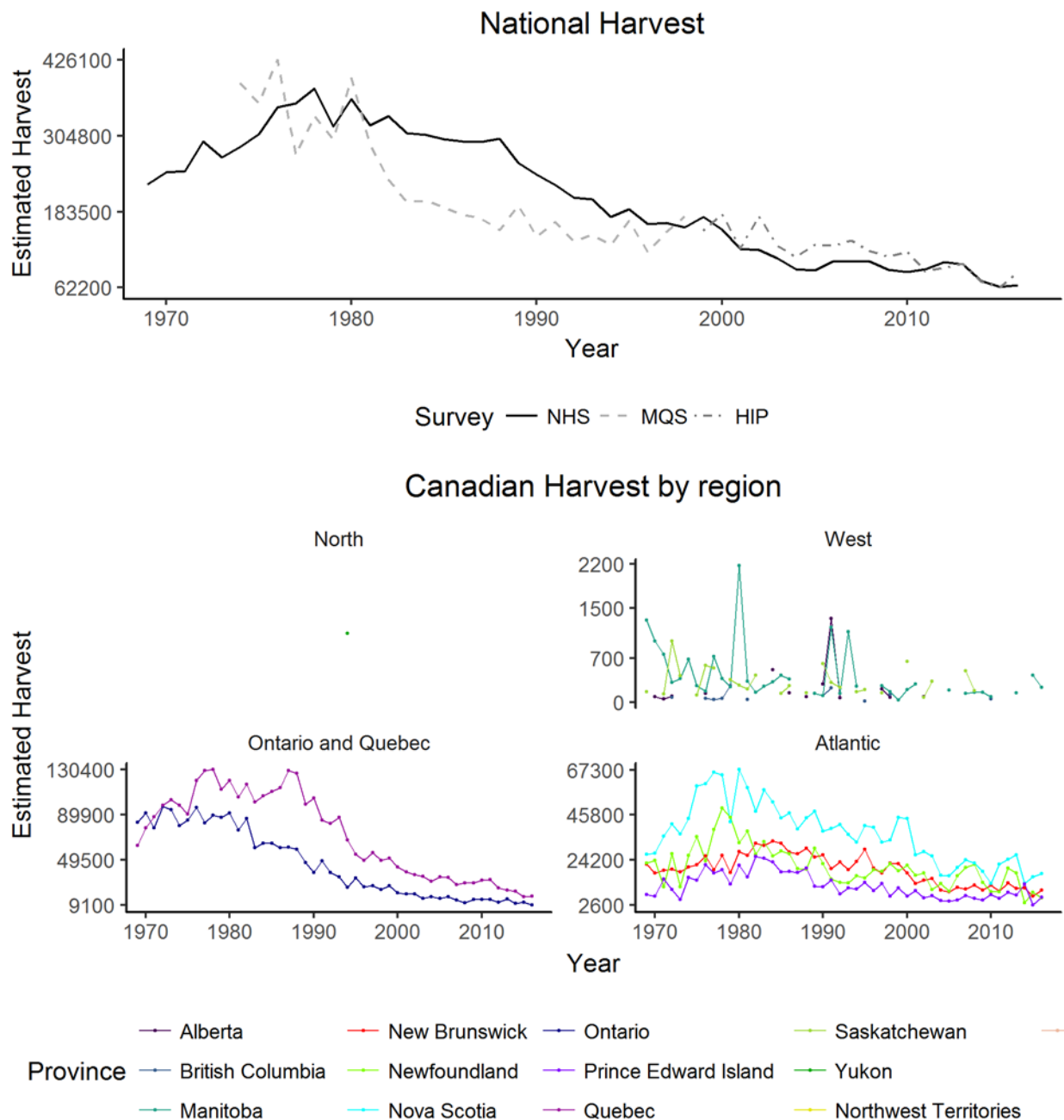


Figure 4.1-4 Estimated harvest for the American Black Duck in U.S. and Canada, (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

4.1.3 Management and Conservation Concerns

Mid-Winter Waterfowl Surveys conducted by the USFWS in the Atlantic and Mississippi Flyway States, which do not cover all of the Black Duck's wintering range, suggested that Black Duck numbers declined by half from the 1950s to the 1980s. This apparent decline in the population resulted in the implementation of restrictive harvest regulations aimed at protecting the species. Since then, winter population numbers have remained relatively stable, but only about half as many Black Ducks are counted in wintering areas in the U.S. now compared to the early 1950s. There has been a concurrent shift in the winter distribution with an increased number of Black Ducks wintering in Canada in recent years which could explain in part the decline observed in the mid-winter surveys (Brook *et al.* 2009; Robertson *et al.* in press). Three factors have been hypothesized to explain the decline in the Black Duck population: habitat loss (i.e., loss of carrying capacity) caused by urban and agricultural development—on both the breeding and wintering grounds; competition with mallards—whose population size and distribution are expanding in eastern Canada; and harvest, which has been addressed through the implementation of restrictive harvest regulations (Conroy *et al.* 2002).

Because of the limitations of the winter surveys, a large-scale aerial survey (the Eastern Waterfowl Breeding Ground Survey) was initiated in 1990 by the Black Duck Joint Venture to monitor Black Duck numbers on their breeding grounds (Atlantic provinces, boreal forest in Quebec and northeastern Ontario) and improve the tracking and estimation of the Black Duck population (Figure 3.1-2, Monitoring section). Data from this survey show that the population has remained relatively stable for several decades.

Management concerns for the Black Duck population prompted the CWS and the USFWS to adopt, in 2012, an International Black Duck Harvest Strategy with the objectives of maintaining sustainable population levels and equitable access to the Black Duck resource between the two countries. This adaptive management approach is designed to identify appropriate harvest levels in both Canada and the U.S. based on harvest objectives and population levels of Black Ducks and sympatric Mallards. In Canada, four regulatory packages have been developed with the moderate alternative defined as the 1997 to 2010 average harvest rate. Harvest regulations under this strategy were first implemented in 2013–2014 under a liberal approach. Moderate levels of harvest were implemented for the hunting seasons between 2014–2017 and a liberal strategy has been proposed for the 2018-2019 and 2019-20 hunting seasons. Hunting regulations, as well as the Black Duck harvest management approach, are published annually by Environment and Climate Change Canada in the *Migratory Birds Regulations in Canada* report.

4.2 Mallard (*Anas platyrhynchos*)

The Mallard is the most abundant, most widely distributed, and most heavily harvested dabbling duck species in Canada. Mallards are most abundant in Ontario and the Prairie provinces. Mallards have been expanding eastward for decades and are now well established in the Maritimes, but continue to remain rare in Newfoundland and Labrador (Drilling *et al.* 2002).

4.2.1 Abundance and Trends

The Mallard is monitored in its core breeding range through the WBPHS in western Canada and the northwestern U.S., the Eastern Waterfowl Breeding Ground Survey, as well as the Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C. The species is also monitored by other smaller-scale breeding waterfowl surveys across the country, including the Southern Ontario Waterfowl Plot Survey, the St. Lawrence Lowlands Breeding Waterfowl Survey, and formerly the Cooperative Yukon Roadside Waterfowl Breeding Population Survey.

LARGE-SCALE WATERFOWL SURVEYS

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

The Mallard breeding population in the area covered by this survey had recovered from the decline observed in the 1980s, but dropped again in 2001, and below the NAWMP goal of 8.2 million birds (NAWMP 2012, Figure 4.2-1), where it remained until 2006. Between 2007 and 2009, the Mallard breeding population index in the survey area oscillated around the NAWMP goal, and since then has been above the NAWMP goal (10.48 million birds in 2017). There are significant positive 10-year and long-term trends in the traditional survey area (Table 4.2-1).

The estimated abundance of Mallards in the Canadian Prairies in 2017 (4.6 million birds) is slightly above the NAWMP goal of 4.4 million birds for the fourth time since the mid-1970s (Figure 4.2-1). In western boreal Canada, the Mallard breeding population was 30% lower this year compared to the previous year, with an estimated 2.9 million birds (Table 4.2-1). There are significant increasing 10-year and long-term trends in both Canadian regions of the survey, and a 5-year significant increase in the western boreal forest. Consecutively

Table 4.2-1. Mallard Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])

WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	11 793 (11 072-12 513)	10 488 (9834- 11 143)	0.90*	3.71*	0.63
Alaska	573 (445 - 700)	522 (420 - 623)	1.50*	0.04	7.93*
Western Boreal Canada	4205 (3646 - 4763)	2927 (2517 - 3338)	0.34*	5.04*	6.06*
Canadian Prairies	4742 (4393 - 5092)	4603 (4222 - 4985)	0.81*	4.53*	2.26
U.S. Prairies (North Central)	2273 (2012 - 2534)	2436 (2115 - 2757)	2.19*	1.75*	7.66*

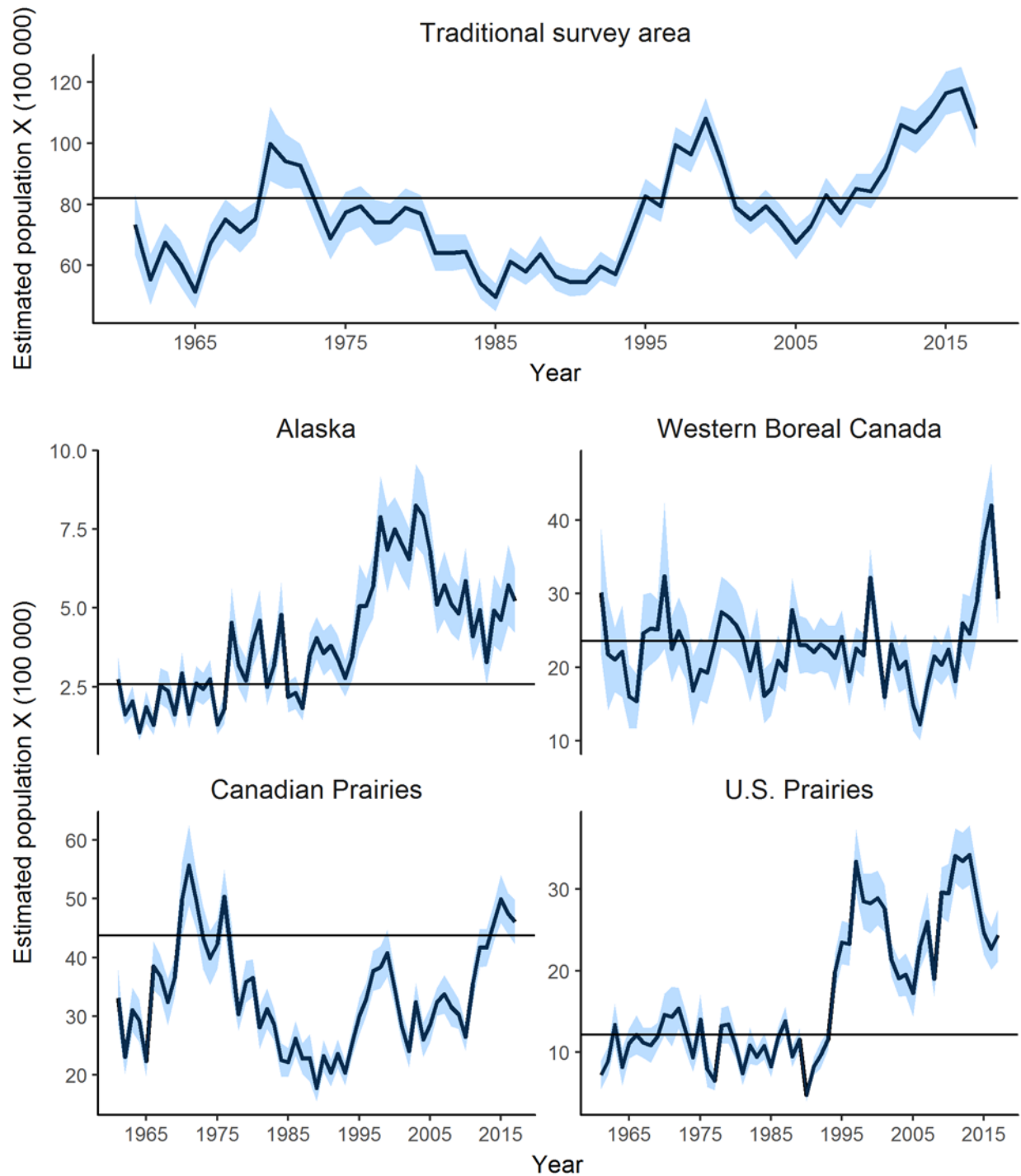


Figure 4.2-1 Mallard Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Interval (Horizontal lines represent the NAWMP goal in each region of the survey)

EASTERN WATERFOWL BREEDING GROUND SURVEY

The estimated abundance of Mallards in the core survey area increased by 7.6% in 2017 compared to 2016 (Table 4.2-2). Mallard numbers continue to exhibit increasing or stable trends in all areas surveyed (Figure 4.2-2).

Table 4.2-2. Mallard Breeding Population Estimates with 95% Credible Intervals (CI) and Trend Estimates Based on the Eastern Waterfowl Breeding Ground Survey (Results from combined data from the helicopter and fixed-winged aircraft surveys. Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
EWS—Eastern Waterfowl Breeding Ground Survey	Breeding Population Estimates in Core Area (in thousands)		Trends in Numbers of Breeding Birds in Core Area		
	2016	2017	1990–2017	2008–2017	2013–2017
Eastern Survey Area	413 (253 - 668)	445 (271 - 724)	1.14	0.84	0.98
Atlantic Highlands	22 (13 - 41)	20 (13 - 35)	7.31*	5.51*	6.63
Eastern Boreal Shield	2 (1 - 4)	1 (1 - 3)	1.30	0.05	0.67
Central Boreal Shield	10 (6 - 19)	21 (12 - 38)	1.15	-1.10	-0.03
Western Boreal Shield	379 (237 - 629)	401 (253 - 676)	0.99	0.72	0.76

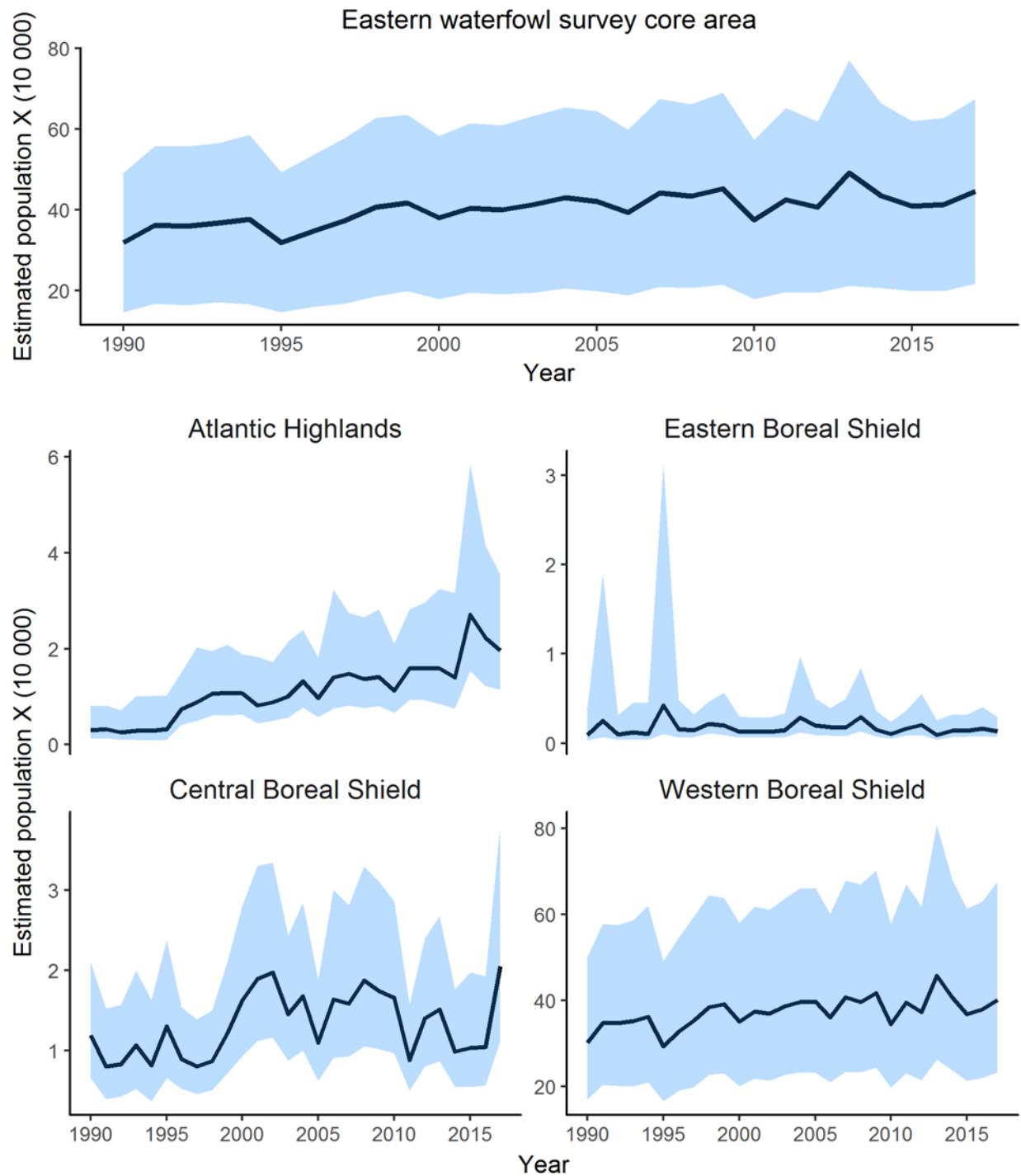


Figure 4.2-2 Mallard Breeding Population Estimates Based on the Eastern Waterfowl Breeding Ground Survey, black line represents the population estimate while the shaded area represents the 95% Credible Interval (The figures represent the combined results of helicopter and fixed-wing aircraft surveys.)

SMALL-SCALE WATERFOWL SURVEYS

Table 4.2-3. Mallard Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	Long-term	2008–2017	2013–2017
Central Interior Plateau of BC	73.87 (61.61-86.14)	70.87 (57.27-84.48)	-2.43*	-0.62	-1.76
Southern Ontario	160.46 (106.26-214.65)	156.05 (110.56-201.53)	2.35*	0.63	1.41
St. Lawrence Lowlands	16.26 (13.62-18.90)	13.01 (10.47-15.55)	-0.04	-1.42	-5.74

COOPERATIVE YUKON ROADSIDE WATERFOWL BREEDING POPULATION SURVEY

In southern Yukon, the Mallard population index for 2016 decreased slightly compared to 2015. Despite considerable variation, the long-term trend for the population has been increasing (Figure 4.2-3).

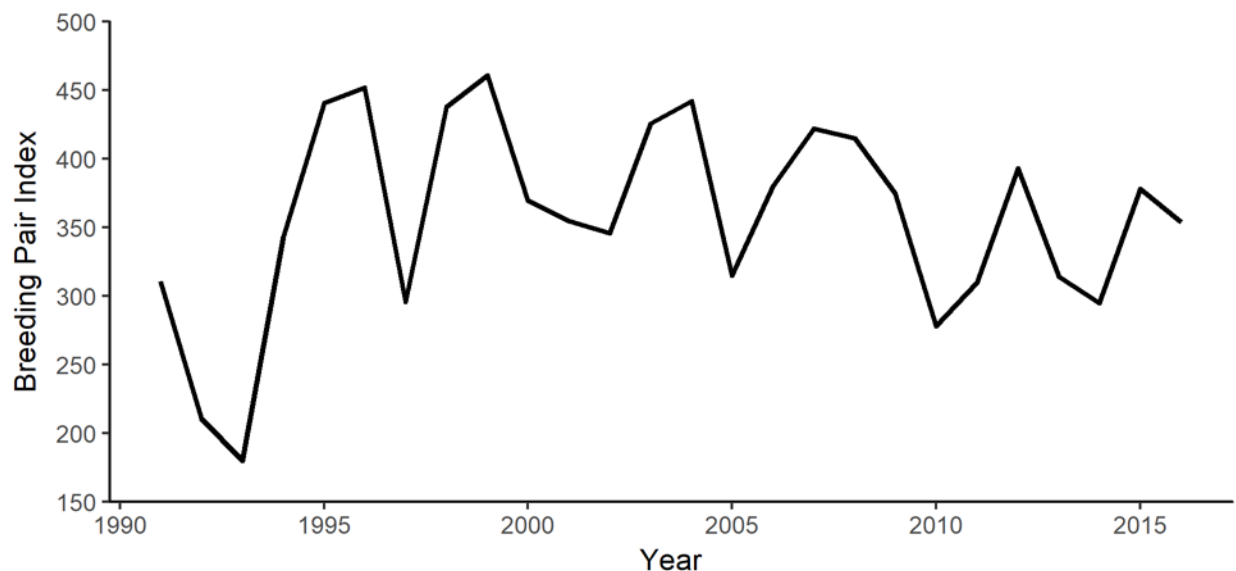


Figure 4.2-3 Breeding Pair Index for Mallards in Southern Yukon, 1991–2016.

NORTHWEST TERRITORIES BOREAL WATERFOWL AND WATERBIRDS SURVEY

Mallard were the most abundant duck in the Northwest Territories Boreal survey region in 2016 and the number of pairs observed was the highest on record (Figure 4.2-4). Numbers of Mallards are variable from year-to-year but the long-term trend has been stable.

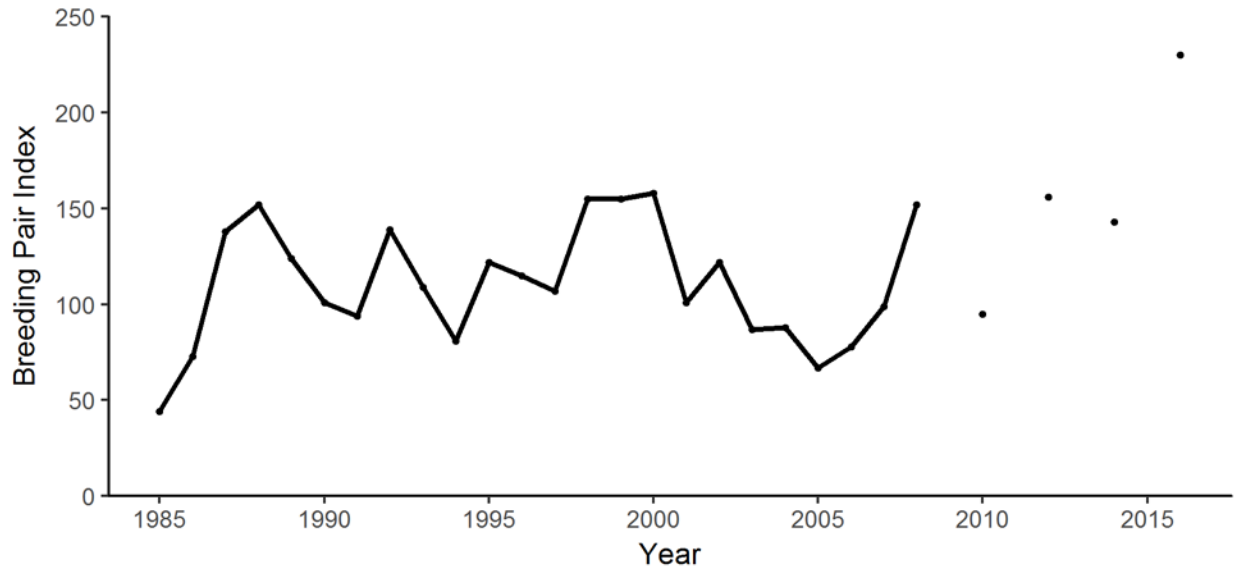


Figure 4.2-4 Total Number of Breeding Pairs for the Mallard observed in the Northwest Territories Boreal Waterfowl and Waterbirds Survey, 1985-2016. Since 2008, surveys have been done every second year.

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

The Mallard is the most abundant waterfowl species in central British Columbia. However, the species is experiencing a significant decline over the long-term trend (-2.4%; Table 4.2-3, Figure 4.2-5).

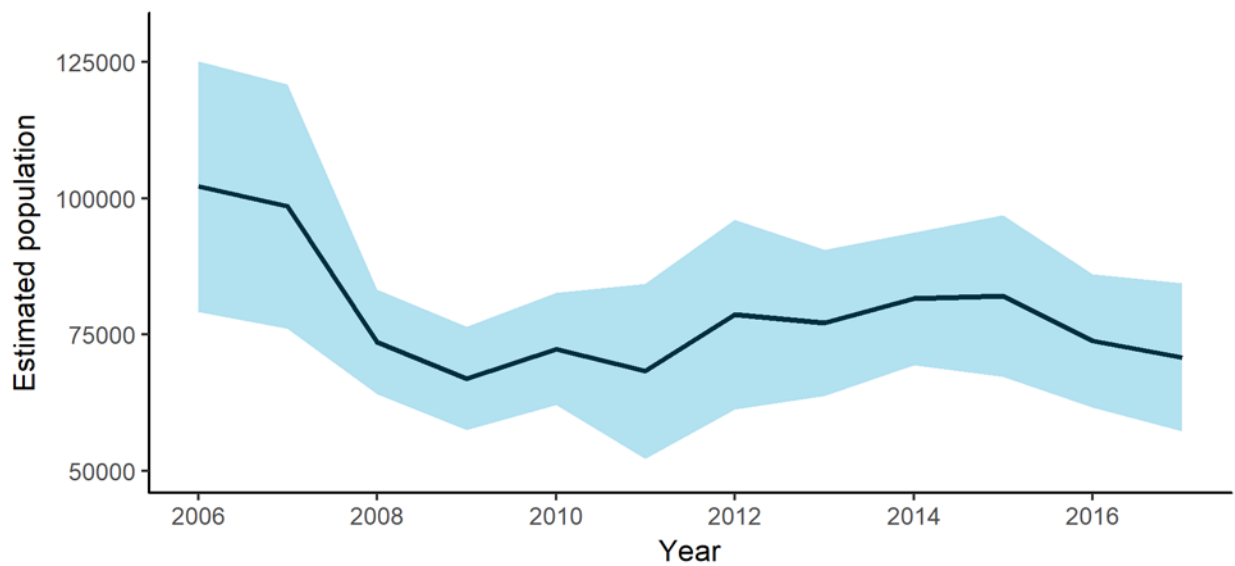


Figure 4.2-5 Total Spring Breeding Population Estimates for the Mallard in the British Columbia Central Plateau, 2006-2017, black line represents the population estimate while the shaded area represents the 95% Confidence Interval.

SOUTHERN ONTARIO WATERFOWL PLOT SURVEY

Breeding numbers for the Mallard, the most abundant duck species in southern Ontario, have increased since the early 1980s. In 2017, there were approximately 156 000 breeding pairs in southern Ontario, higher than the 10-year average of approximately 148 000 pairs (Figure 4.2-6).

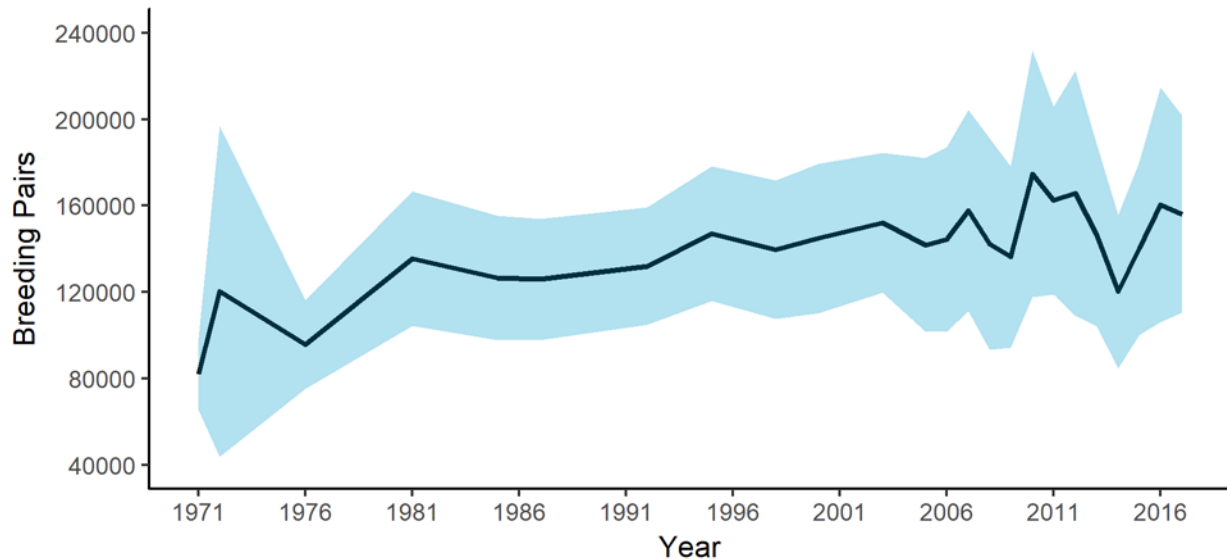


Figure 4.2-6 Indicated Breeding Pair of Mallards in Southern Ontario, 1971–2017, black line represents the breeding pair estimate while the shaded area represents the 95% Confidence Interval.

ST. LAWRENCE LOWLANDS BREEDING WATERFOWL SURVEY, QUEBEC

The Mallard is by far the most abundant species in the St. Lawrence Lowlands (4 times more abundant than the Black Duck) with the 2017 estimate reaching 13 000 indicated breeding pairs, below the 5-year average of 16 130. The species has experienced a relatively stable long-term trend since 2004, but shows a declining 5-year trend although not significant (Figure 4.2-7 and Table 4.2-3).

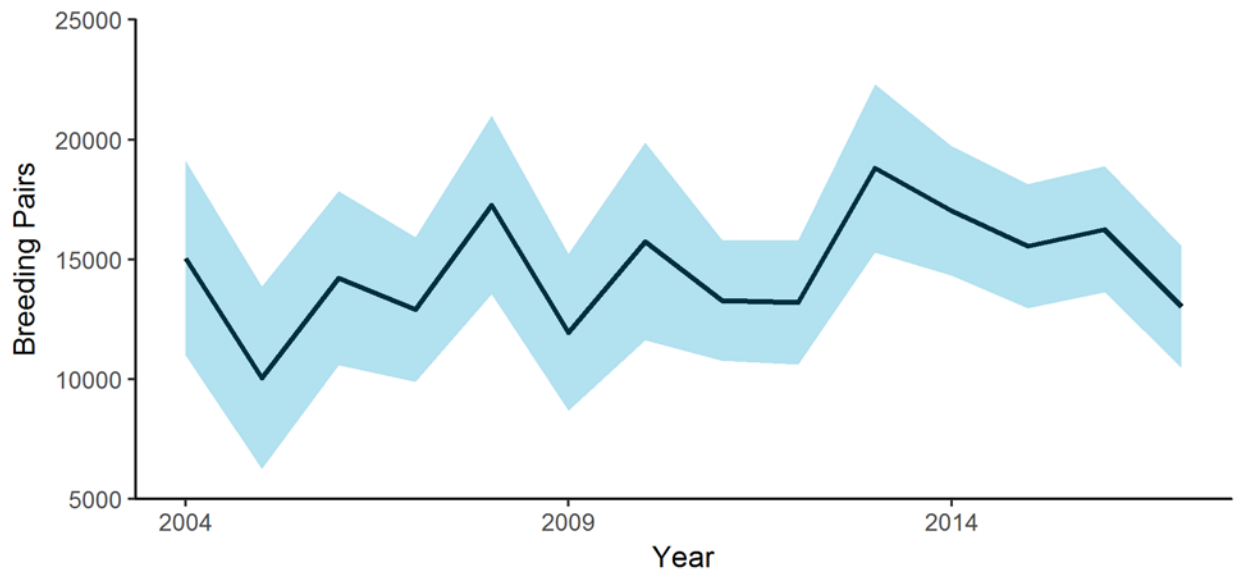


Figure 4.2-7 Indicated Breeding Pair Estimates for the Mallard in the St. Lawrence Lowlands, Quebec, 2004–2017, black line represents the breeding pair estimate while the shaded area represents the 95% Confidence Interval.

4.2.2 Harvest

The Canadian Mallard harvest has declined over time concomitantly with the number of waterfowl hunters, reaching an all-time low in 2010 (Figure 4.2-8). The U.S. harvest has also declined over time, but only slightly. Nevertheless, the Mallard remains the most harvested duck species in Canada and accounts on average for more than 40% of the total duck harvest. In 2016, the total estimated harvest for this species in Canada was 471 923 birds.

4.2.3 Management and Conservation Concerns

Mallards are among the most heavily hunted waterfowl species in North America (Boomer *et al.* 2013). They are widely distributed and adaptable, breeding in habitats as diverse as the boreal forest and large cities. Mallards are the most studied waterfowl species, and more effort has been directed towards their management than for any other North American duck species (Drilling *et al.* 2002). There is increasing hybridization between the Mallard and the Black Duck, in part due to the eastward expansion of the Mallard's range, and this hybridization is believed to be one of the main contributing factors to the decline of the Black Duck population (Conroy *et al.* 2002). Consequently, the management of Mallards plays a key role in the management of the Black Duck population.

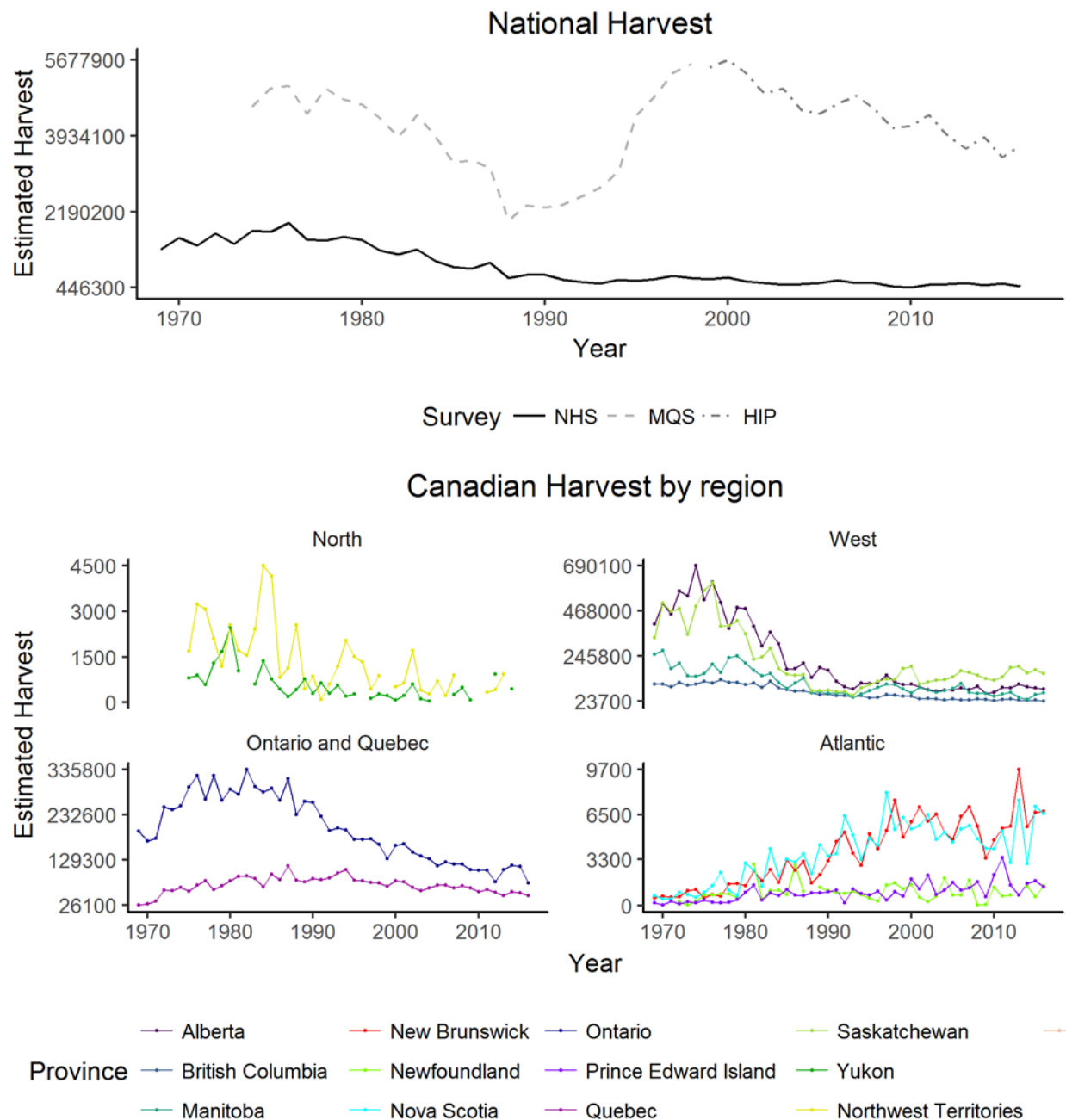


Figure 4.2-8. Estimated harvest for the Mallard in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

4.3 Northern Pintail (*Anas acuta*)

The Northern Pintail is found breeding across the country but its core breeding range in Canada is in the Prairie Pothole Region (Clark *et al.* 2014). Annual nest success and productivity vary with water conditions in the Prairies (Johnson and Grier 1988; Hestbeck 1995). As such, periods of extended drought have caused dramatic population declines, most notably in the Canadian Prairies.

4.3.1 Abundance and Trends

The Northern Pintail breeding population is monitored annually in western Canada through the WBPHS, as well as the Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C. Northern Pintail numbers were also formerly monitored outside of the WBPHS survey area by the Cooperative Yukon Roadside Waterfowl Breeding Population Survey.

LARGE-SCALE WATERFOWL SURVEY

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

After a sharp decline in the 1980s and early 1990s, in the late 1990s the breeding population of Northern Pintail in the WBPHS survey area showed signs of a recovery, increasing to 3.6 million birds by 1997 (Figure 4.3-1). Pintail numbers subsequently declined again, reaching a historic low of 1.8 million birds in 2002, before rebounding to 4.4 million birds in 2011. In 2017, the population estimate was of 2.9 million birds (Table 4.3-1), still well below the NAWMP goal of 5.6 million birds.

The 2017 breeding population estimate in the Canadian Prairies (892 448 birds) almost doubled compared to the 2016 population estimate (Table 4.3-1). The Canadian Prairie population estimate still remains well below the NAWMP goal of 3.3 million birds in this region (NAWMP 2012). In the Western Boreal Region, Northern Pintail numbers decreased by 17% compared to 2016 (Table 4.3-1), but still significantly exceed the NAWMP goal of 407 000 birds for this region.

Table 4.3-1. Northern Pintail Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])

WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	2618 (2218 - 3019)	2889 (2485 - 3293)	-0.45*	1.23	-3.53*
Alaska	788 (588 - 988)	742 (446 - 1039)	0.41*	-4.28*	-3.95
Western Boreal Canada	842 (524 - 1160)	699 (551 - 848)	-0.53	9.30*	26.82*
Canadian Prairies	476 (383 - 569)	892 (750 - 1035)	-0.87*	1.77	-8.72*
U.S. Prairies (North Central)	512 (410 - 614)	555 (374 - 736)	-0.51	3.39*	-12.11*

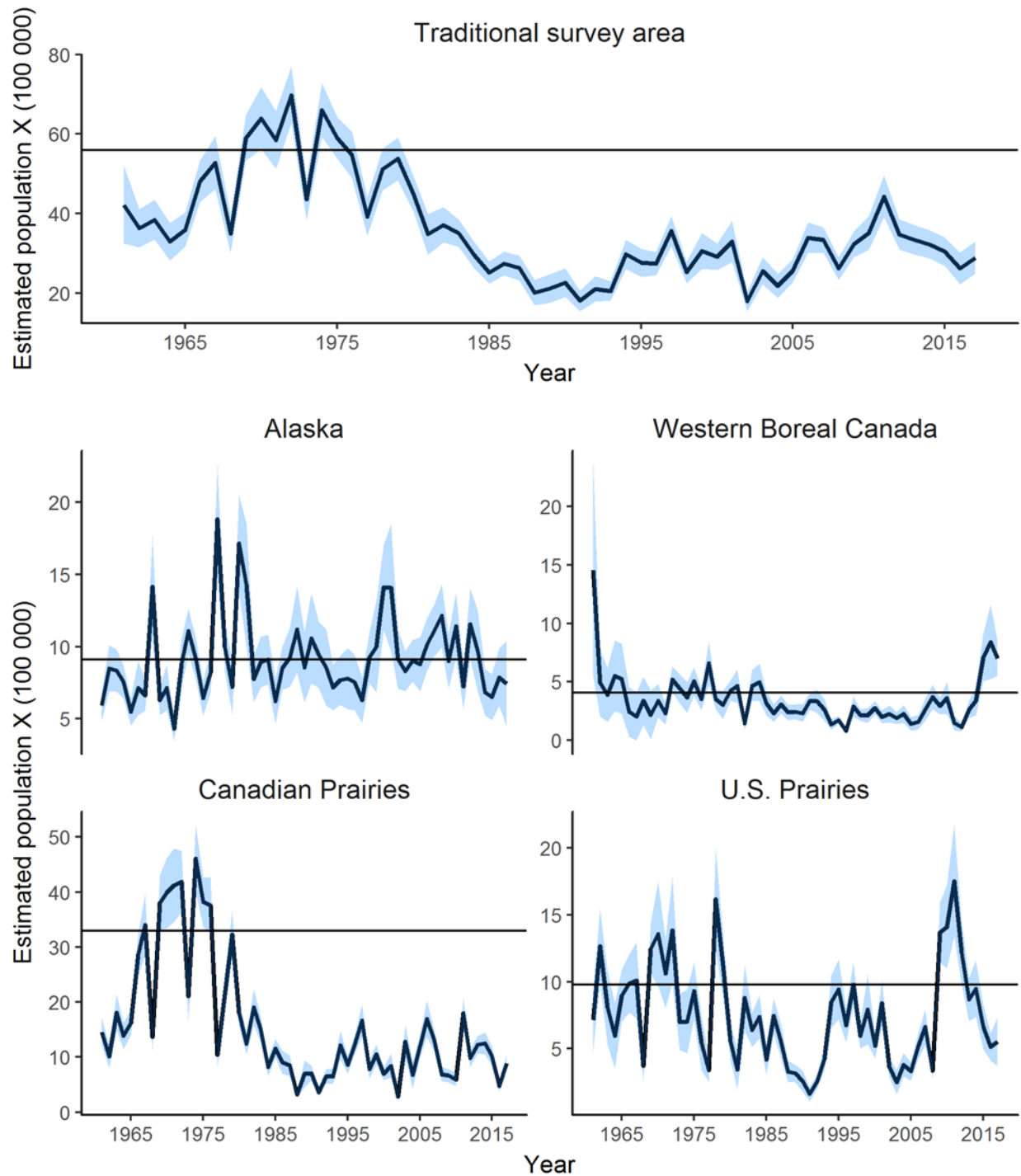


Figure 4.3-1 Northern Pintail Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Interval (Horizontal lines represent the NAWMP goal in each region of the survey)

SMALL-SCALE WATERFOWL SURVEYS

Table 4.3-2. Northern Pintail Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])

Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	2006–2017	2008–2017	2013–2017
Central Interior Plateau of BC	1.60 (0.66-2.54)	3.63 (1.61-5.65)	-3.26	5.50	0.60

COOPERATIVE YUKON ROADSIDE WATERFOWL BREEDING POPULATION SURVEY

Northern Pintail numbers have shown a stable long-term trend in the southern Yukon since the beginning of the survey in 1991 (Figure 4.3-2).

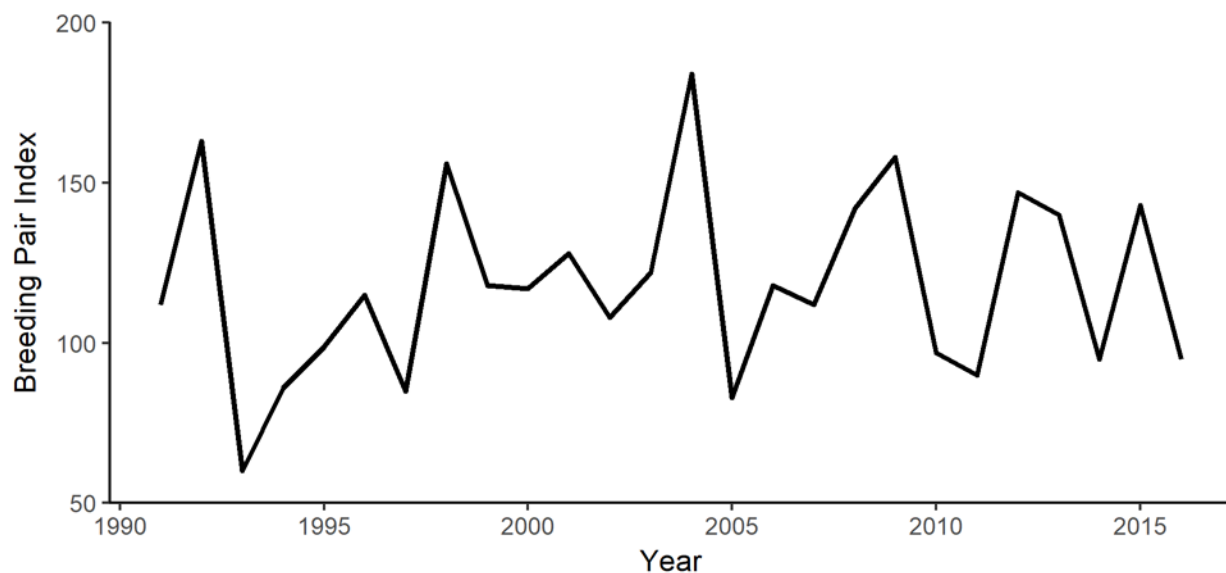


Figure 4.3-2 Breeding Pair Index for Mallards in Southern Yukon, 1991–2016

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

Despite important inter-annual variation, the Northern Pintail population in the central interior plateau of B.C. has remained stable since the beginning of the survey, in 2006 (Figure 4.3-3).

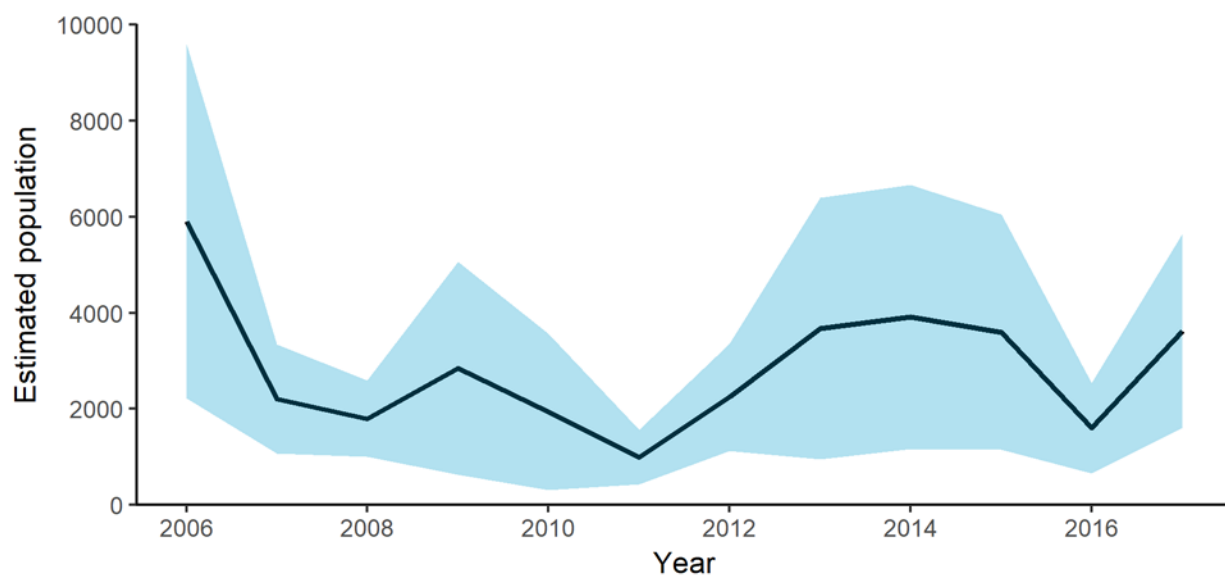


Figure 4.3-3 Population Estimates of Northern Pintails in British Columbia Central Plateau, 2006-2017, black line represents the population estimate while the shaded area represents the 95% Confidence Interval.

4.3.2 Harvest

In Canada, the Northern Pintail harvest has decreased by approximately 70–80% since the 1980s. This decline is consistent with the decrease in abundance observed for the population, as well as in hunter numbers (Figure 4.3-4).

4.3.3 Management and Conservation Concerns

Although the species is not considered to be threatened, population numbers for the Northern Pintail have remained below the NAWMP continental goal for several decades and have not fully recovered despite several years of favourable water conditions on the Prairies. This suggests that the habitat carrying capacity was significantly reduced on a continental scale (NAMWP 2012). Furthermore, the expansion of agriculture and changes in farming practices likely contribute to the disappearance of breeding habitat (Podruzny *et al.* 2002).

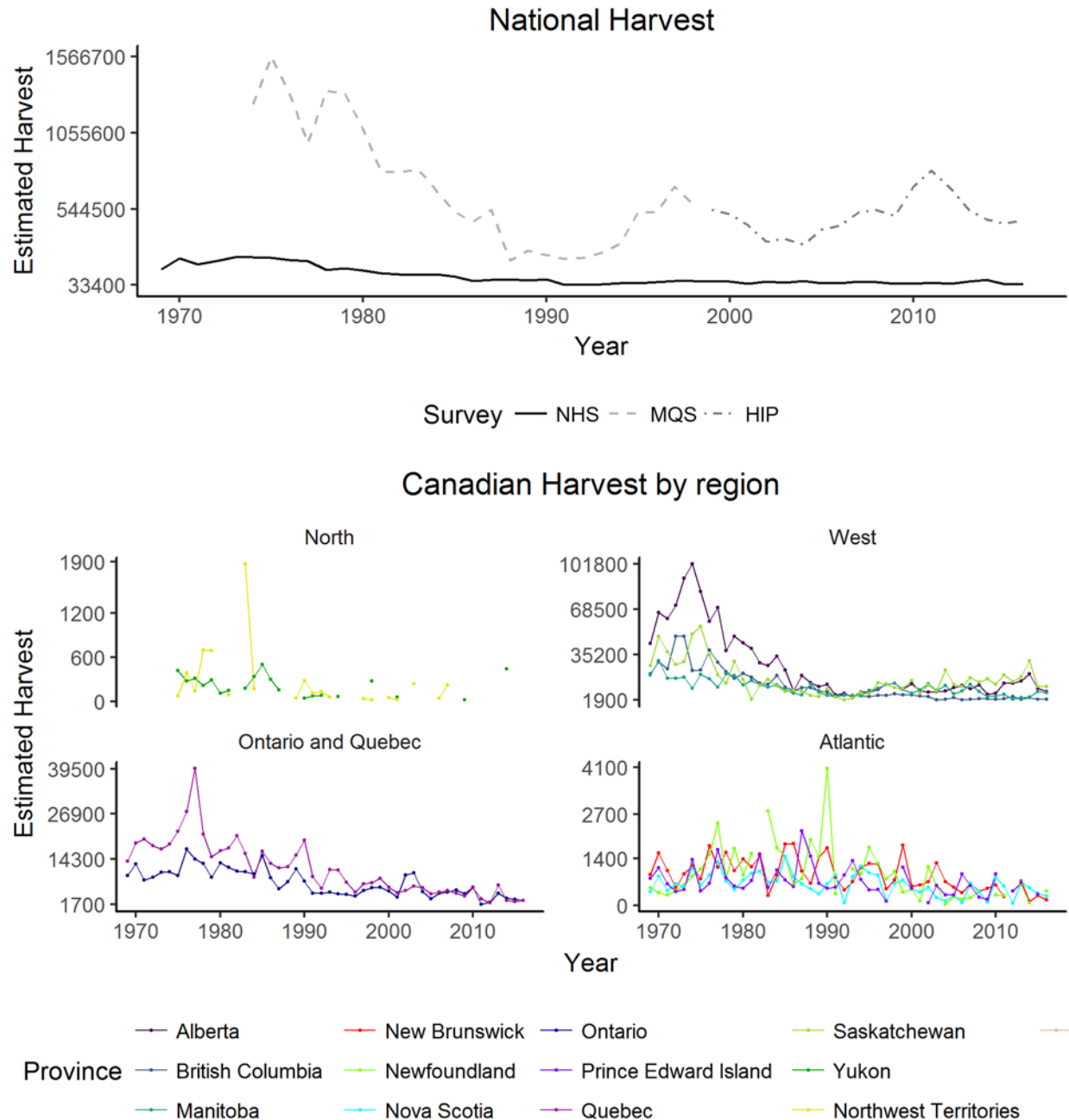


Figure 4.3-4 Estimated harvest for the Northern Pintail in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

4.4 Green-Winged Teal (*Anas crecca*)

In Canada, the Green-winged Teal has a vast breeding range that extends from the tree line in the north to Newfoundland and Labrador. In the north, its breeding range extends to the tree line. Unlike many other dabbling ducks, the species has its core breeding range outside the Prairie Pothole Region, in the boreal forest. The Green-winged Teal is the most harvested duck species in Canada after the Mallard and the Black Duck.

4.4.1 Abundance and Trends

In western Canada, Green-winged Teal numbers have increased steadily since the early 1990s, whereas in eastern Canada, they have remained relatively stable over the same period. The Green-winged Teal population is monitored on its core breeding range through the WBPHS in western Canada, the Eastern Waterfowl Breeding Ground Survey, as well as the Cooperative Yukon Roadside Waterfowl Breeding Population Survey, the Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C. The species is also monitored outside its core breeding range by the Southern Ontario Waterfowl Plot Survey, and the St. Lawrence Lowlands Breeding Waterfowl Survey.

LARGE-SCALE WATERFOWL SURVEYS

WATERFOWL BREEDING POPULATIONS AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

The population shows a significant long-term increase in the traditional survey area (Table 4.4-1) and exceeds the NAWMP population objective of 1.9 million birds (NAWMP 2012; Figure 4.4-1). The 2017 estimates for the Canadian and U.S. Prairies are similar to the 2016 estimates, while those for the boreal region of Canada show significant population increases over the last 5 years (Table 4.4-1 and Figure 4.4-1). In all regions of the survey area, the long-term (1961–2017) population trends are significant and suggest that the Green-winged Teal population is increasing.

Table 4.4-1. Green-Winged Teal Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])

WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	4271 (3624 - 4917)	3605 (3148 - 4063)	1.65*	2.74*	4.47*
Alaska	765 (537 - 993)	603 (470 - 735)	3.82*	-0.90	4.89
Western Boreal Canada	2467 (1890 - 3044)	1966 (1575 - 2357)	1.38*	5.04*	6.41*
Canadian Prairies	907 (732 - 1083)	889 (698 - 1079)	1.41*	1.10	0.90
U.S. Prairies (North Central)	131 (90 - 172)	148 (101 - 195)	2.35*	2.57	0.36

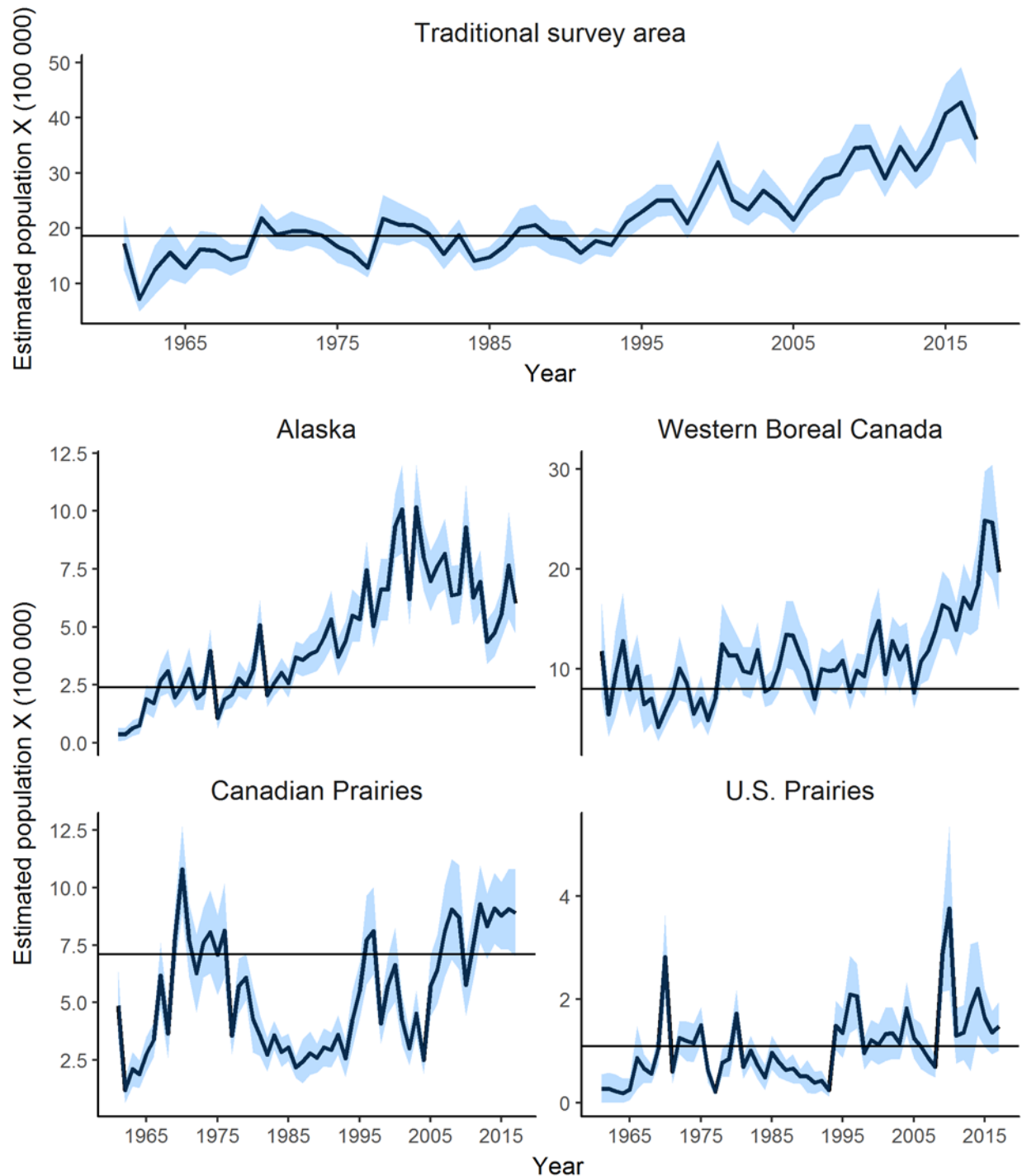


Figure 4.4-1 Green-Winged Teal Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Interval (Horizontal lines represent the NAWMP goal in each region of the survey)

EASTERN WATERFOWL BREEDING GROUND SURVEY

The estimated abundance of Green-winged Teals in the core survey area in 2017 is similar to the 2016 estimate, at approximately 239 000 ducks (Table 4.4-2). This species exhibits overall relatively stable trends in the core area of the Eastern Waterfowl Breeding Ground Survey (Figure 4.4-2).

Table 4.4-2. Green-Winged Teal Breeding Population Estimates with 95% Credible Intervals (CI) Based on the Eastern Waterfowl Breeding Ground Survey (The estimates are based on the combined results of helicopter and fixed-wing aircraft surveys. Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
EWS—Eastern Waterfowl Breeding Ground Survey	Breeding Population Estimates in Core Area (in thousands)		Trends in Numbers of Breeding Birds in Core Area		
	2016	2017	1990–2017	2008–2017	2013–2017
Eastern Survey Area	222 (163 - 311)	239 (181 - 339)	0.04	-0.99	-1.65
Atlantic Highlands	34 (22 - 56)	40 (28 - 64)	2.10*	-0.82	-1.16
Eastern Boreal Shield	95 (65 - 162)	95 (65 - 162)	0.36	0.30	0.47
Central Boreal Shield	19 (10 - 40)	23 (12 - 48)	-1.62	-5.36	-9.53
Western Boreal Shield	68 (46 - 116)	75 (51 - 130)	-0.42	-0.69	-1.01

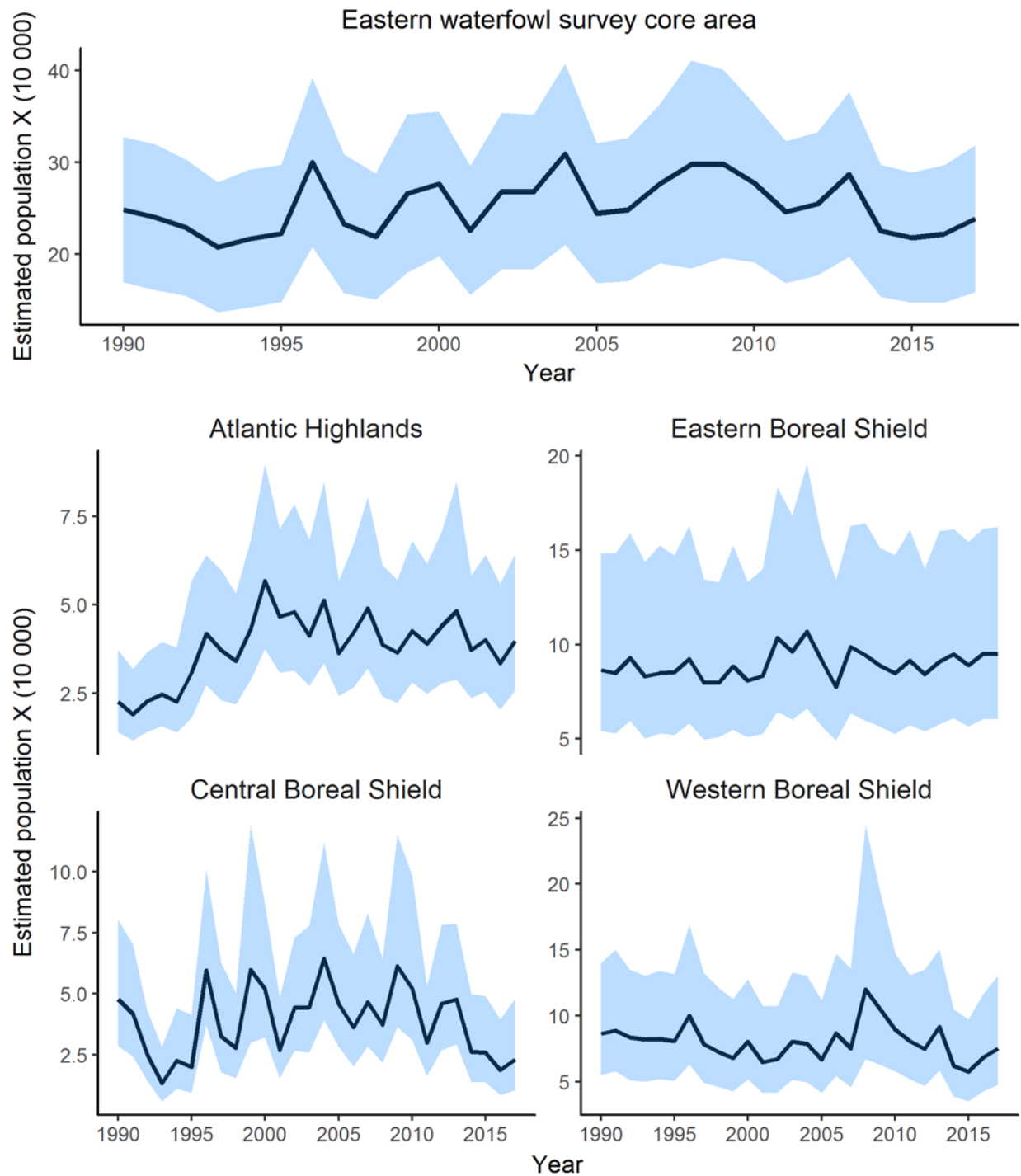


Figure 4.4-2 Green-Winged Teal Breeding Population Estimates Based on the Eastern Waterfowl Breeding Ground Survey, black line represents the population estimate while the shaded area represents the 95% Credible Interval (The figures represent the combined results of helicopter and fixed-wing aircraft surveys.)

SMALL-SCALE WATERFOWL SURVEYS

Table 4.4-3. Green Winged Teal Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)

Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	Long-term	2008–2017	2013–2017
Central Interior Plateau of BC	28.41 (22.93-33.88)	33.28 (25.07-40.86)	-2.01	1.32	3.69
Southern Ontario	27.48 (0.00-58.00)	18.61 (5.34-31.89)	1.39	2.04	14.93
St. Lawrence Lowlands	3.56 (2.12-5.00)A	3.35 (1.24-5.46)	1.72	1.83	1.38

COOPERATIVE YUKON ROADSIDE WATERFOWL BREEDING POPULATION SURVEY

The Green-winged Teal breeding pair index has shown significant year-to-year variations, but population estimates suggest a relatively stable long-term trend since 1991, when the survey was initiated (Figure 4.4-3).

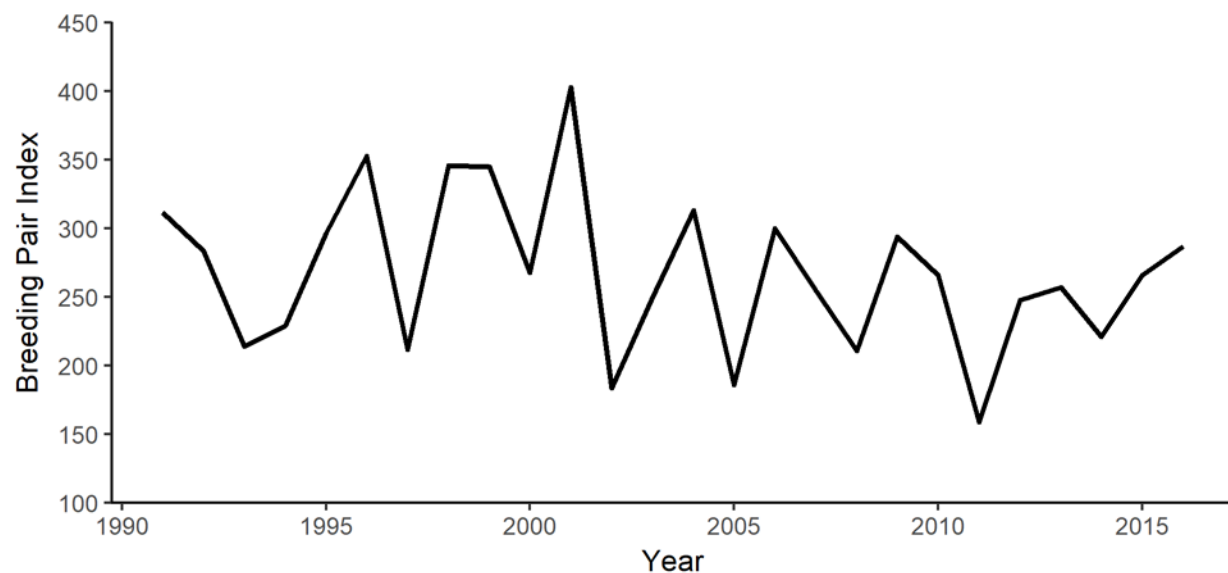


Figure 4.4-3 Breeding Pair Index for the Green-winged Teal in Southern Yukon, 1991–2016

NORTHWEST TERRITORIES BOREAL WATERFOWL AND WATERBIRDS SURVEY

Green-winged Teal numbers vary annually but the long-term trend has been stable (Figure 4.4-4). Numbers of pairs were slightly above the long-term average in 2016.

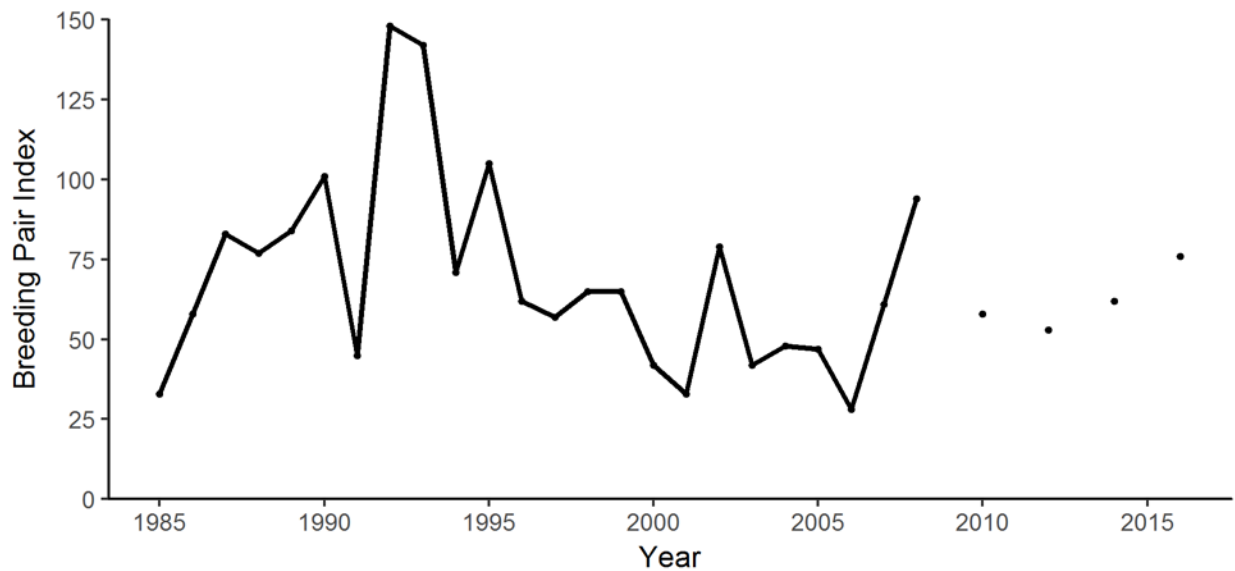


Figure 4.4-4 Total Number of Breeding Pairs for the Green-Winged Teal observed in the Northwest Territories Boreal Waterfowl and Waterbirds Survey, 1985-2016. Since 2008, surveys have been done every second year.

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

Green-winged Teal numbers have fluctuated between 25 000 and 45 000 individuals between 2006 and 2017. They declined between 2006 and 2011 but have gradually increased since 2011 (Figure 4.4-5).

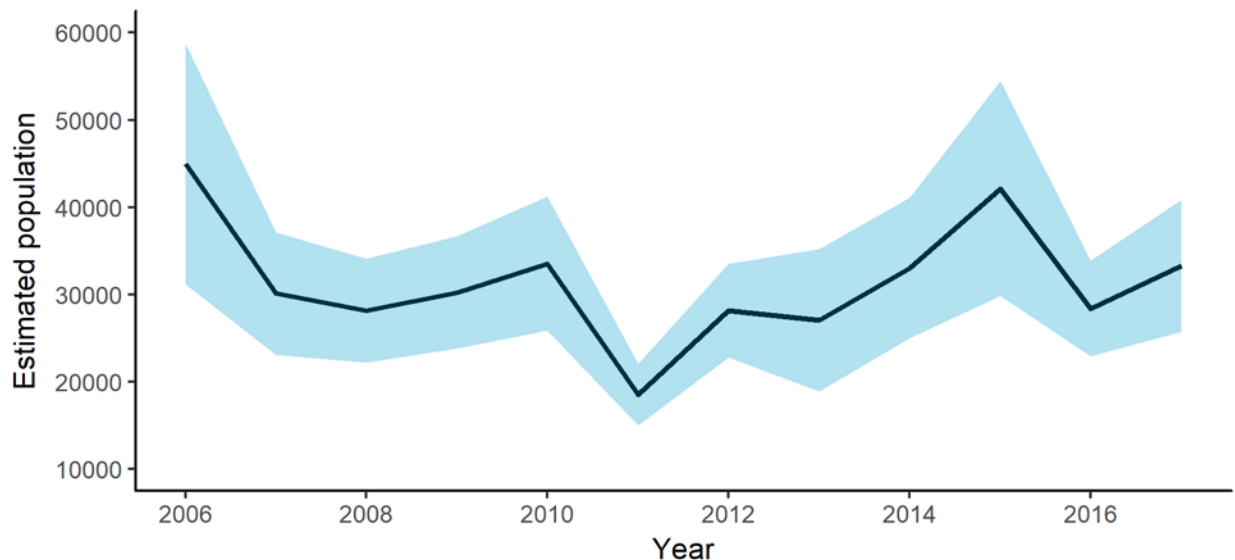


Figure 4.4-5 Population Estimates of Green-winged Teal in British Columbia Central Plateau, 2006–2017, black line represents the population estimate while the shaded area represents the 95% Confidence Interval.

SOUTHERN ONTARIO WATERFOWL PLOT SURVEY

Breeding pair estimates for the Green-winged Teal often show significant year-to-year variability, mainly because of the species' generally low abundance within the survey area (Figure 4.4-6). However, the Green-winged Teal shows an overall stable trend in southern Ontario.

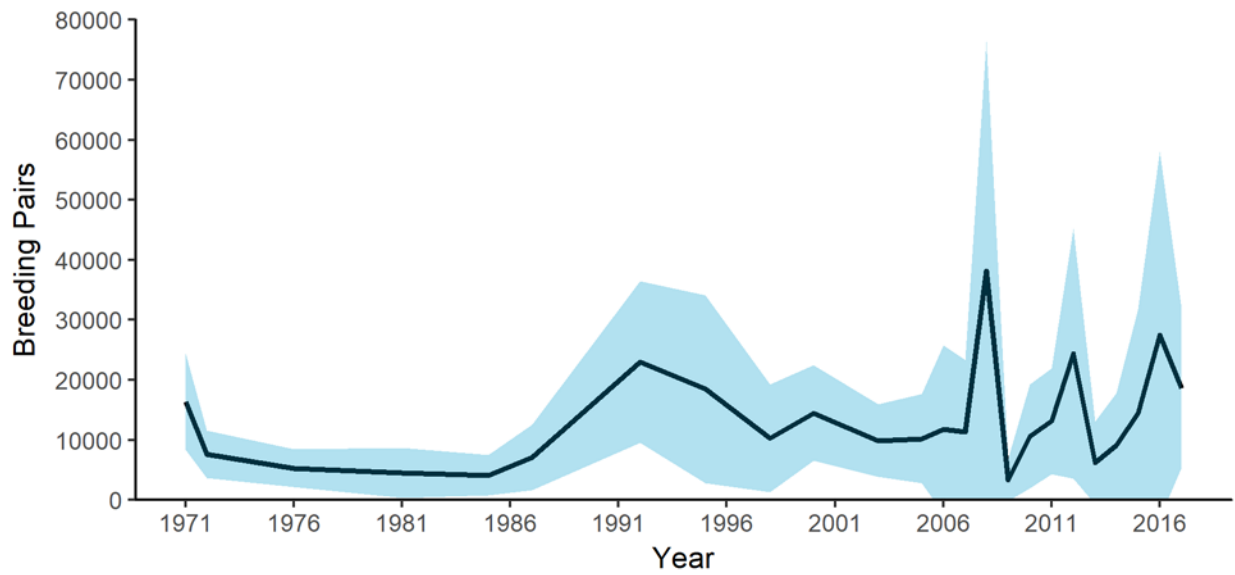


Figure 4.4-6 Indicated Breeding Pair of Green-Winged Teal in Southern Ontario, 1971–2017, black line represents the breeding pair estimate while the shaded area represents the 95% Confidence Interval.

ST. LAWRENCE LOWLANDS BREEDING WATERFOWL SURVEY, QUEBEC

The Green-winged Teal shows a generally stable long-term trend in the St. Lawrence Lowlands (Table 4.4-3 and Figure 4.4-7). The breeding population in 2017 was estimated at 3 400 pairs, similar to the 5-year average of 3 300.

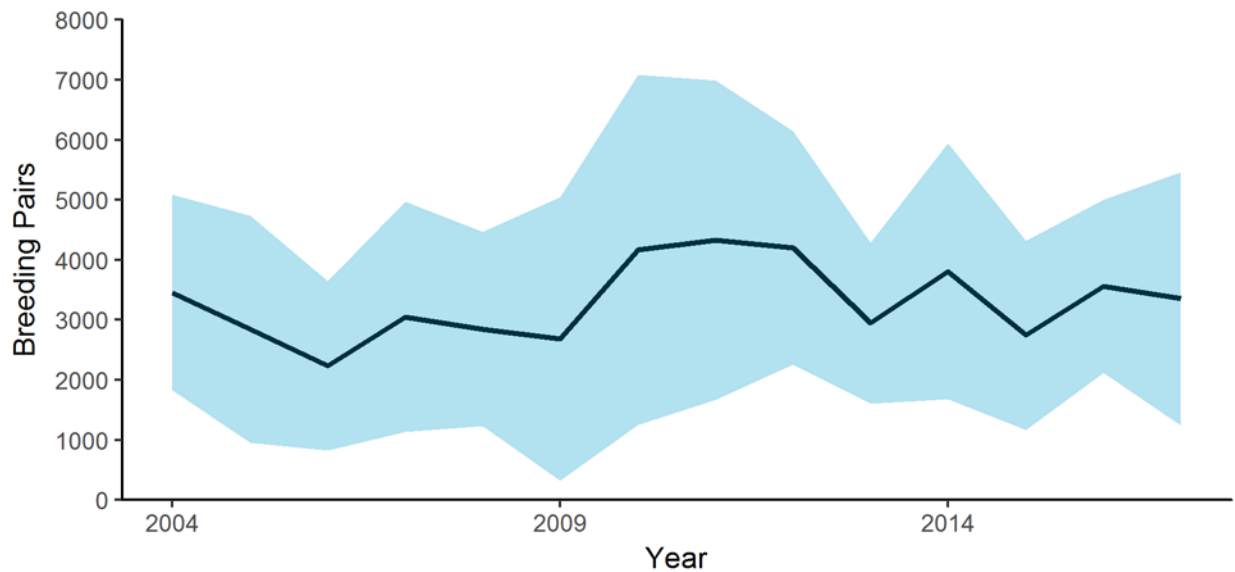


Figure 4.4-7 Indicated Breeding Pairs Estimates and Trends for the Green-winged Teal in the St. Lawrence Lowlands, Quebec, 2004–2017, black line represents the breeding pair estimate while the shaded area represents the 95% Confidence Interval.

4.4.2 Harvest

In Canada, the Green-winged Teal harvest has been declining steadily since the survey began in the late 1960s (Figure 4.4-8). The U.S. harvest has shown much variation between 2010 and 2017.

4.4.3 Management and Conservation Concerns

Green-winged Teal are numerous and their population has increased over recent decades. An important segment of the Green-winged teal population breeds in the boreal forest, unlike other dabbling ducks, which buffer this species from habitat losses farther south caused by agricultural and urban development.

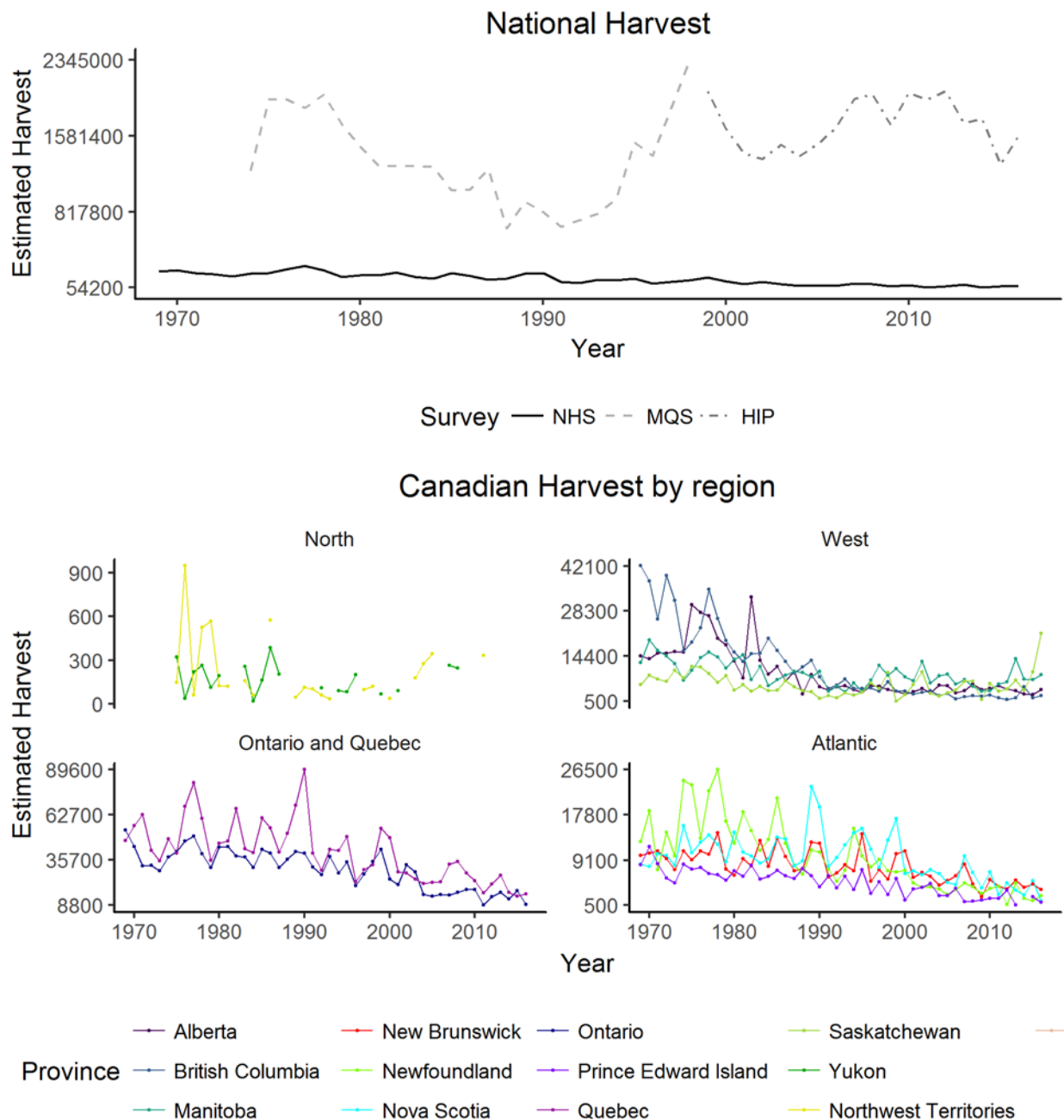


Figure 4.4-8 Estimated harvest for the Green-Winged Teal in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

4.5 Blue-Winged Teal (*Spatula discors*)

The Blue-winged Teal breeds throughout much of Canada, but its core breeding range is located in the Prairie Pothole Region. This species is one of the first duck species to migrate south in the fall and one of the last to migrate north in the spring.

4.5.1 Abundance and Trends

The Blue-winged Teal population is monitored on the species' core breeding range through the WBPHS in western Canada, as well as the Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C. The species is also monitored outside of the WBPHS survey area by the Southern Ontario Waterfowl Plot Survey.

LARGE-SCALE WATERFOWL SURVEY

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

The population estimate for 2017 for the Blue-winged Teal is 18% higher than the 2016 estimate. The population in the traditional survey area, as well as in the U.S. and Canadian Prairies, is well above its NAWMP goal (NAWMP 2012; Figure 4.5-1). Blue-winged Teal numbers show significant increasing short-term (2011–2017) trends in the Western Boreal area, and significant decreasing trends for the U.S. Prairies (Table 4.5-1). Long-term (1961–2017) trends for this species are significant and positive in the Canadian and U.S. Prairies as well as for the traditional survey area.

Table 4.5-1. Blue-Winged Teal Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	6666 (6000 - 7332)	7889 (7113 - 8665)	1.50*	1.95*	-0.75
Alaska	0 (0 - 0)	0 (0 - 0)	NA	NA	NA
Western Boreal Canada	558 (393 - 723)	626 (413 - 838)	-0.08	3.06	12.77*
Canadian Prairies	3333 (2842 - 3824)	4764 (4126 - 5403)	1.80*	4.17*	3.85
U.S. Prairies (North Central)	2775 (2356 - 3194)	2499 (2113 - 2885)	1.59*	-1.25	-8.45*

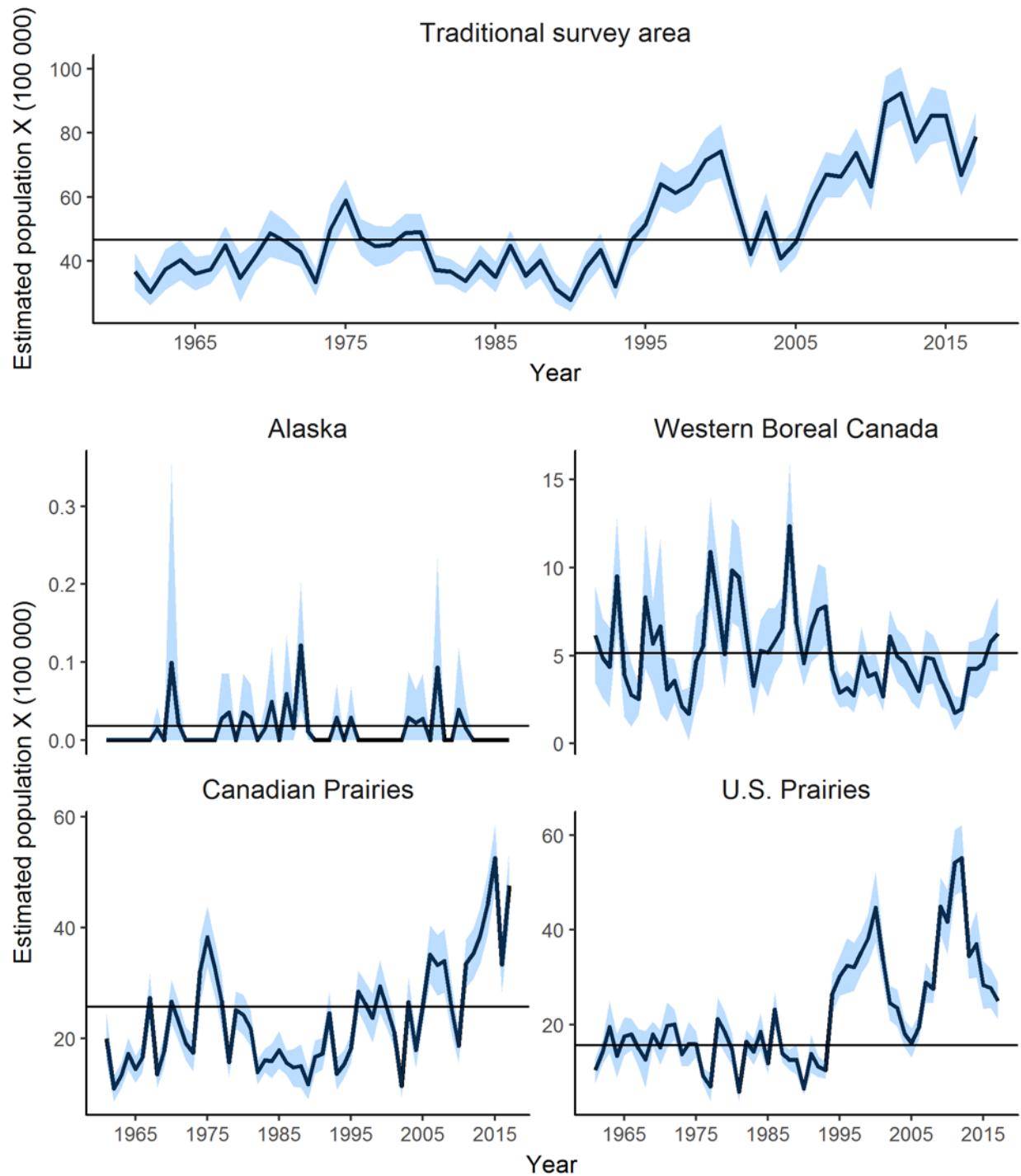


Figure 4.5-1 Blue-Winged Teal Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Interval (Horizontal lines represent the NAWMP goal in each region of the survey)

SMALL-SCALE WATERFOWL SURVEYS

Table 4.5-2. Blue-Winged Teal Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)

Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	1961–2017	2008–2017	2013–2017
Central Interior Plateau of BC	9.06 (5.66-12.46)	8.17 (4.38-11.96)	4.00	-6.98*	4.29
Southern Ontario	3.44 (0.00-8.99)	2.00 (0.00-4.82)	-11.43*	-8.91	-3.55

COOPERATIVE YUKON ROADSIDE WATERFOWL BREEDING POPULATION SURVEY

In southern Yukon, the Blue-winged Teal population increased in 2016 compared to 2015. The population index has varied considerably since 1991, but appears to be decreasing slightly (non-significant trend; Figure 4.5-2).

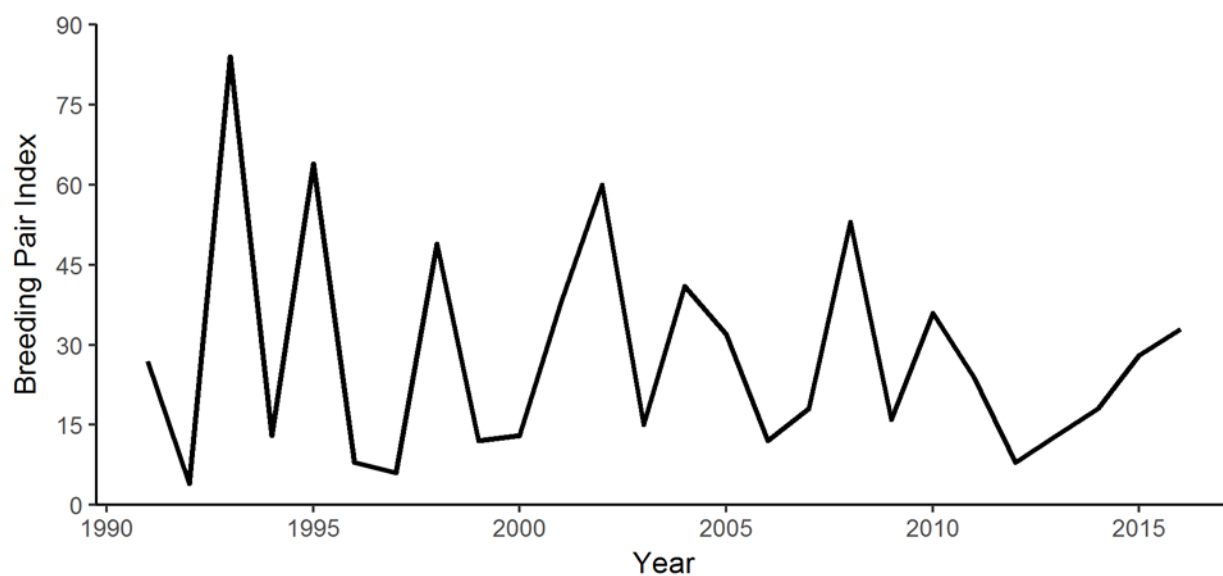


Figure 4.5-2 Breeding Pair Index for the Blue-Winged Teal in Southern Yukon, 1991–2016

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

The Blue-winged Teal is a common species in central British Columbia. Population numbers have shown important inter-annual variation between 2006 and 2009, while showing an overall stable population trend since the survey began in 2006 (Figure 4.5-3).

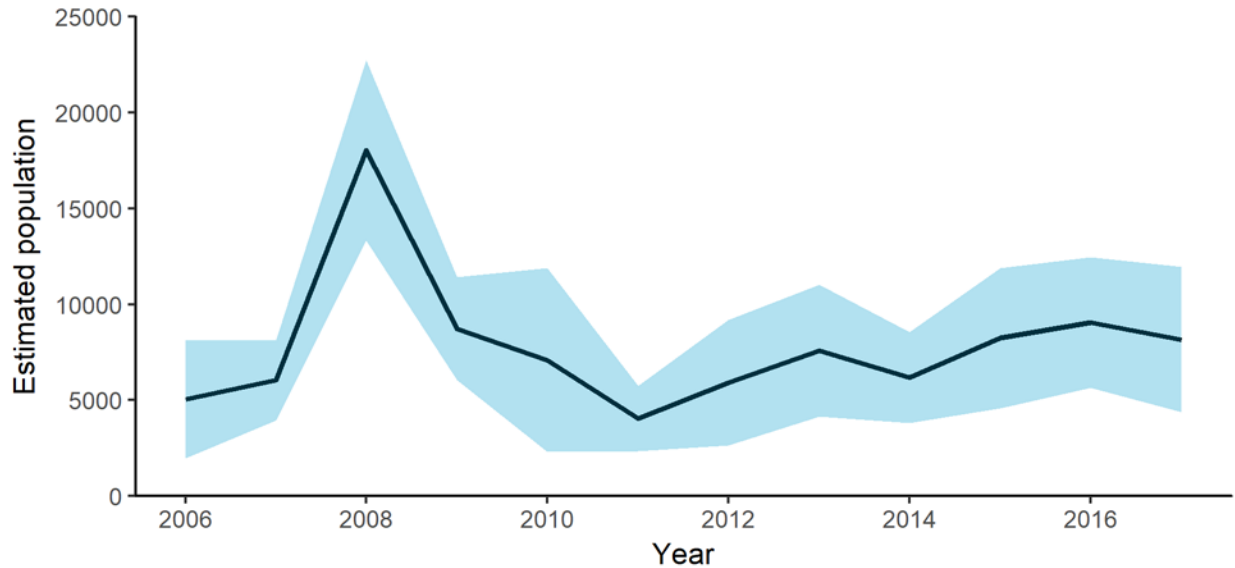


Figure 4.5-3 Population Estimates of Blue-winged Teals in British Columbia Central Plateau, 2006-2017, black line represents the population estimate while the shaded area represents the 95% Confidence Interval.

SOUTHERN ONTARIO WATERFOWL PLOT SURVEY

The breeding population of Blue-winged Teal in Southern Ontario has exhibited a significant long-term declining trend since the early 1970s (Figure 4.5-4). The specific causes of the decline are uncertain but could include habitat loss (Ross 2010) or breeding phenology in relation to survey timing (S. Meyer, CWS – Ontario Region, pers. comm.).

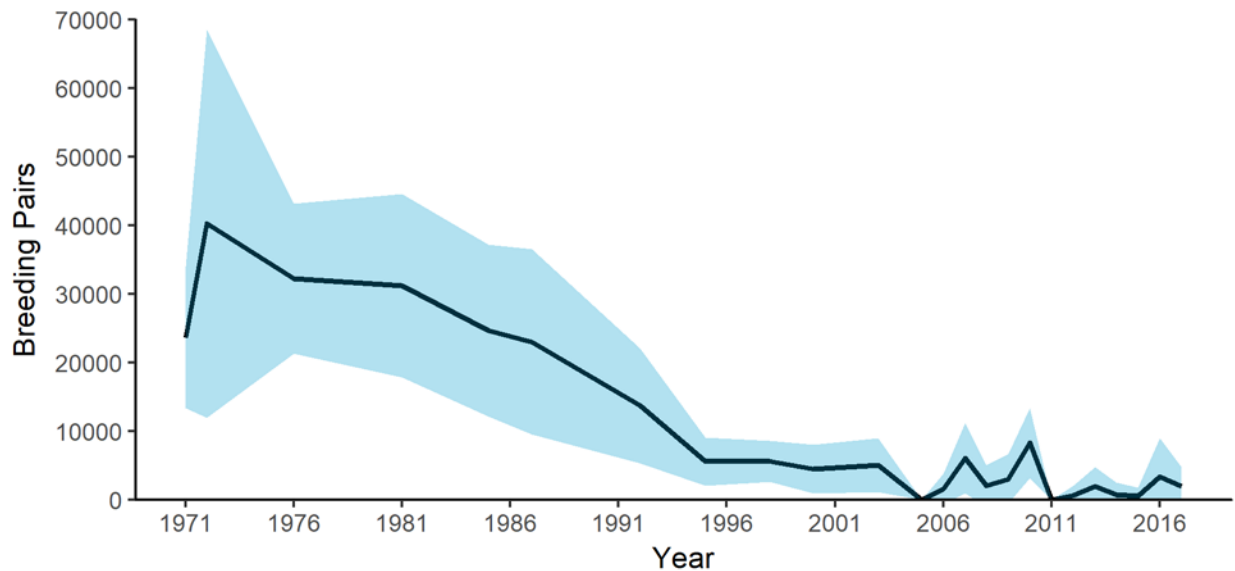


Figure 4.5-4 Indicated Breeding Pair of Blue-winged Teal in Southern Ontario, 1971–2017, black line represents the breeding pair estimate while the shaded area represents the 95% Confidence Intervals.

4.5.2 Harvest

The Blue-winged Teal does not account for a significant portion of the waterfowl harvest in Canada. It is one of the earliest migrants in spring and most adult males have left Canada before the opening of the hunting season in the fall. Consequently, the majority of the Blue-winged Teal harvest in Canada is of hatch-year birds. Most Blue-winged Teal overwinter in areas south of the U.S., which also limits the harvest in the U.S. Figure 4.5-5 shows harvest estimates for the Blue-winged Teal in Canada and the U.S. In Quebec, because of the long-term decline observed in the species' population (Brousseau and Lepage 2013a), the CWS restricts the harvest of Blue-winged Teal.

4.5.3 Management and Conservation Concerns

The population status of the Blue-winged Teal is greatly influenced by wetland conditions on the prairie breeding grounds. In eastern Canada, the intensification of agriculture and the increased destruction of favourable habitat in the recent decades are thought to be the main factors responsible for the decline of the Blue-winged Teal in Quebec and Ontario (Ross 2010; Brousseau and Lepage 2013a).

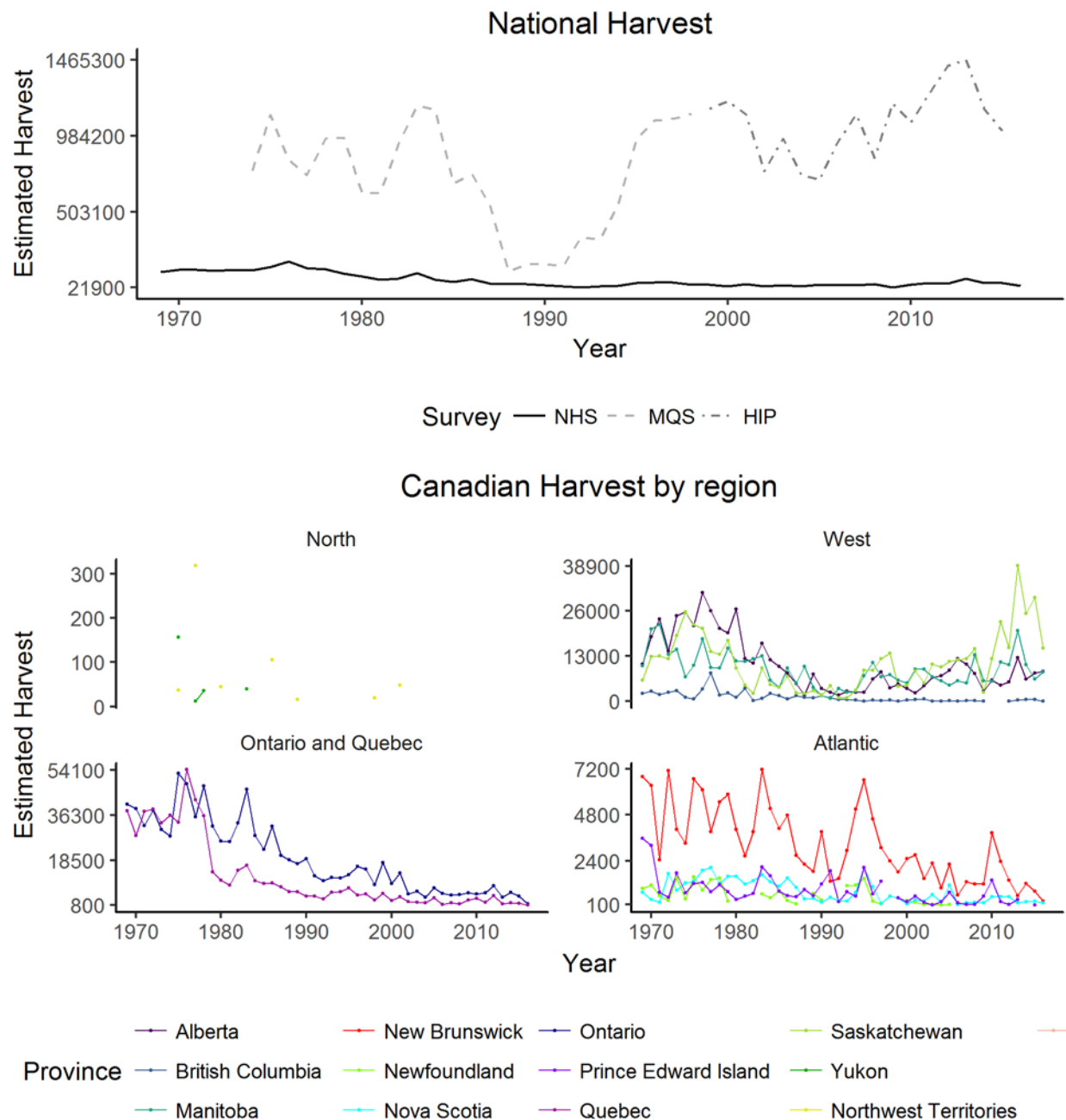


Figure 4.5-5 Estimated harvest for the Blue-Winged Teal in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

4.6 American Wigeon (*Mareca americana*)

The American Wigeon breeding range is centered in western Canada. It breeds in Alaska, northern Yukon and the Northwest Territories, as well as farther south in the Canadian Prairies.

4.6.1 Abundance and Trends

The American Wigeon is monitored on its core breeding range through the Waterfowl Breeding Population and Habitat Survey (WBPHS) in western Canada, as well as the Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C.

LARGE-SCALE WATERFOWL SURVEY

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

Breeding densities for the American Wigeon tend to be high in the prairie and parkland habitats of the southern Prairie Provinces in wet years, when pond density is high. In dry years, birds tend to travel farther north to breed.

Population estimates and trends are shown in Table 4.6-1 and Figure 4.6-1. The 2017 population estimate in the WBPHS remains slightly below the NAWMP population objective of 3.0 million birds (NAWMP 2012). In the Canadian Prairies, the American Wigeon population has been well below the NAWMP population goal of 1.2 million birds for decades (Figure 4.6-1). In the Western Boreal Region, the population has been above the NAWMP goal (1.3 million birds) since 2013, this after a decade-long period during which it remained below the population objective.

Table 4.6-1. American Wigeon Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	3411 (3026 - 3796)	2777 (2471 - 3083)	0.28*	2.03*	4.01*
Alaska	644 (491 - 797)	595 (483 - 708)	3.63*	-3.76*	1.54
Western Boreal Canada	1959 (1642 - 2277)	1543 (1281 - 1806)	0.08	6.14*	7.58*
Canadian Prairies	457 (365 - 549)	490 (407 - 572)	-0.80*	0.35	-2.19
U.S. Prairies (North Central)	351 (226 - 476)	149 (78 - 220)	1.58*	2.46	2.84

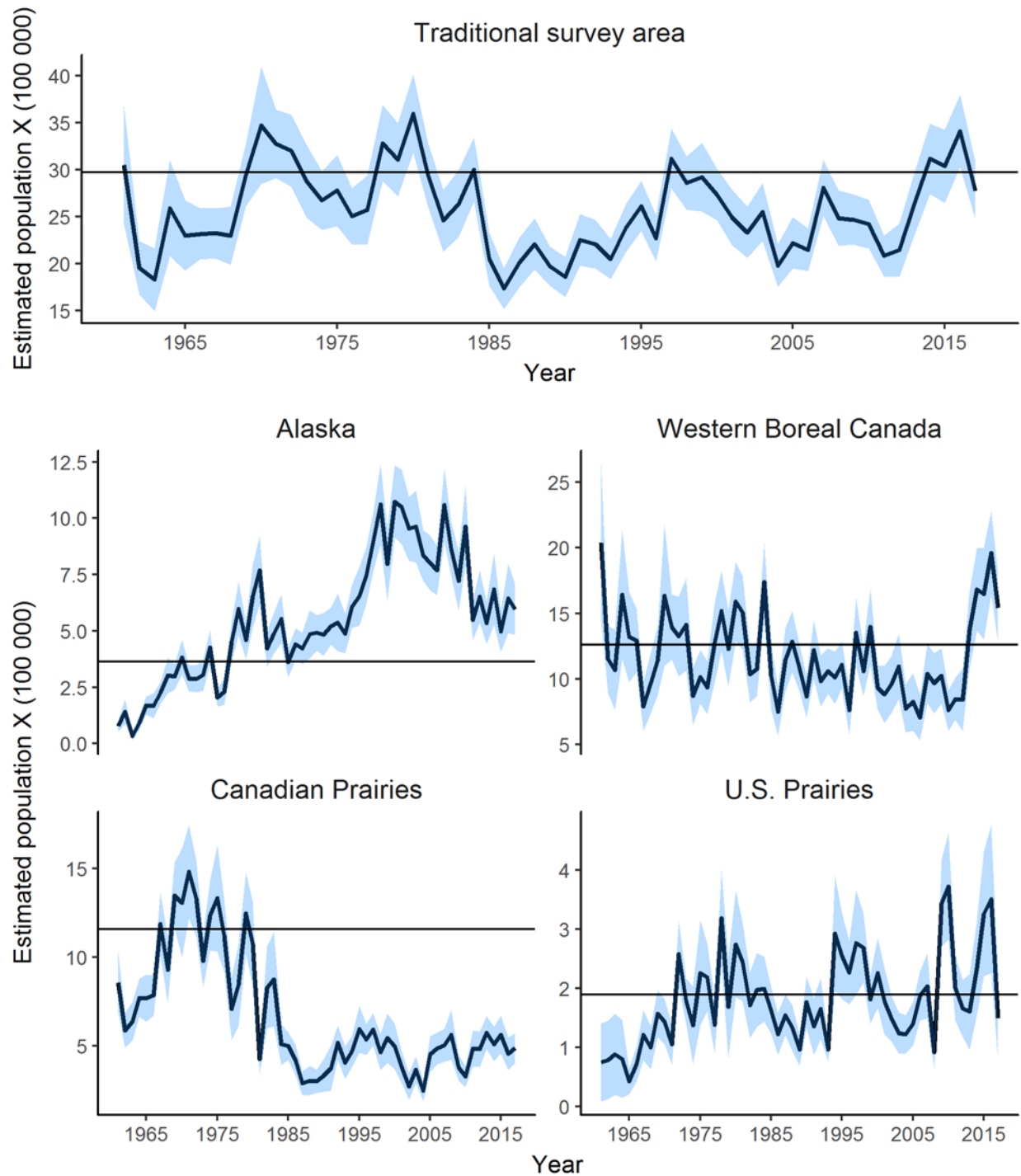


Figure 4.6-1 American Wigeon Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Interval (Horizontal lines represent the NAWMP goal in each region of the survey)

SMALL-SCALE WATERFOWL SURVEYS

Table 4.6-2. American Wigeon Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)

Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	2006–2017	2008–2017	2013–2017
Central Interior Plateau of BC	13.52 (9.77-17.27)	20.99 (10.86-31.13)	-1.63	-0.42	5.79

COOPERATIVE YUKON ROADSIDE WATERFOWL BREEDING POPULATION SURVEY

In southern Yukon, the American Wigeon population index increased in 2016 relative to previous years. Despite year-to-year variations, the population has been declining since the end of the 1990s (significant trend; Figure 4.6-2).

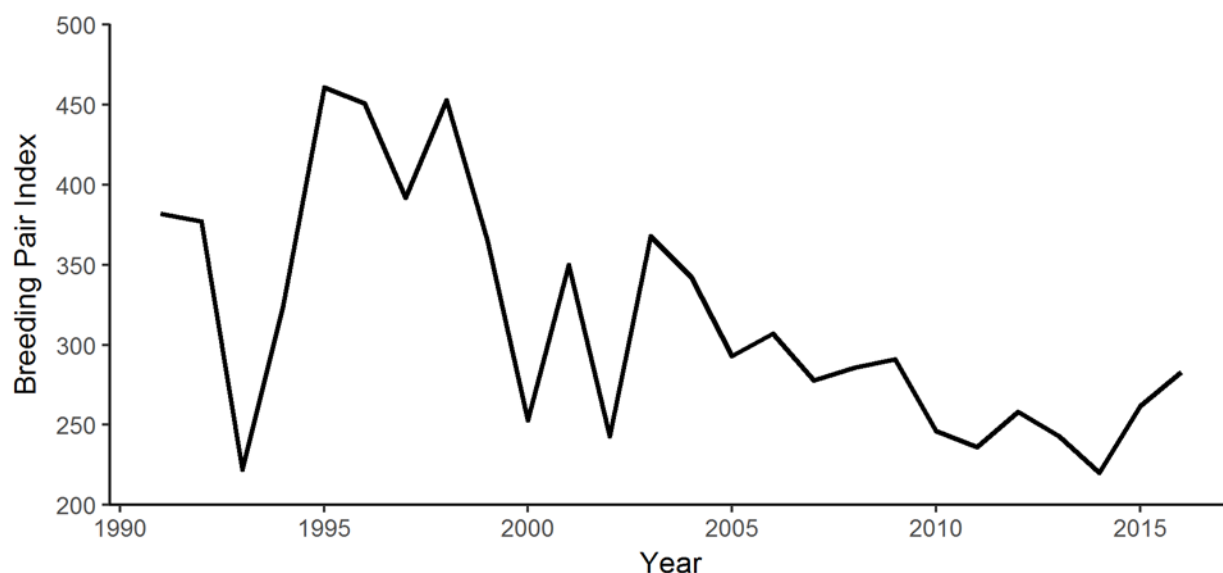


Figure 4.6-2 Breeding Pair Index for the American Wigeon in Southern Yukon, 1991–2016

NORTHWEST TERRITORIES BOREAL WATERFOWL AND WATERBIRDS SURVEY

The numbers of American Wigeon pairs in the Northwest Territories Boreal survey area were at their highest since the inception of the survey in 1985 and almost double the long-term average. Their numbers vary significantly from year-to-year (Figure 4.6-3).

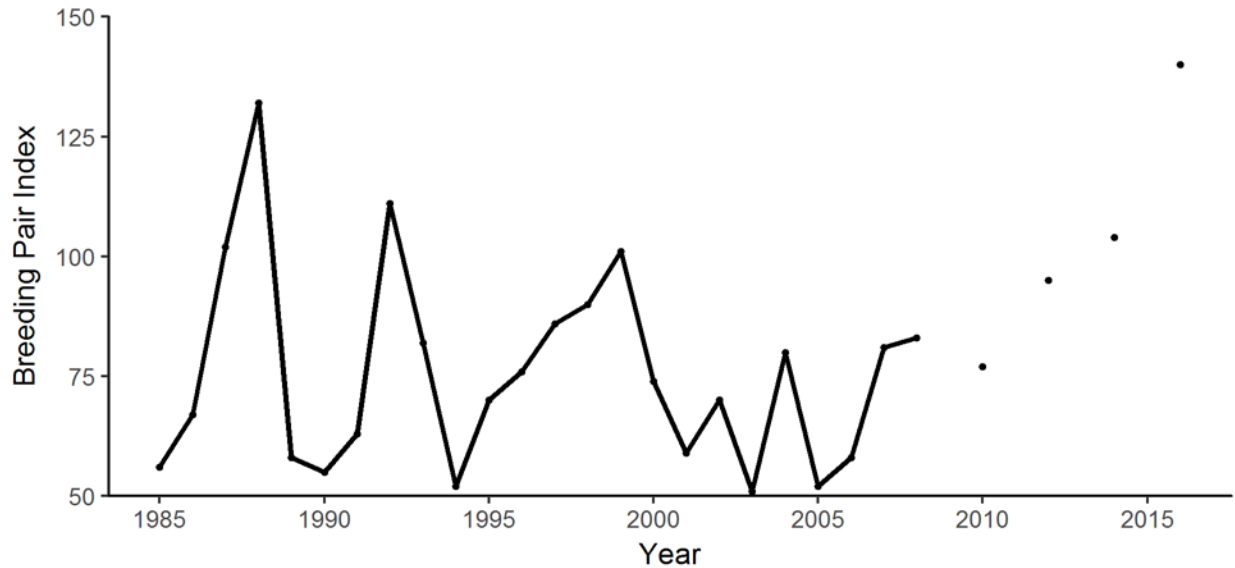


Figure 4.6-3 Total Number of Breeding Pairs for the American Wigeon observed in the Northwest Territories Boreal Waterfowl and Waterbirds Survey, 1985-2016. Since 2008, surveys have been done every second year.

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

The American Wigeon is one of the most abundant species in central British Columbia. The species has exhibited a relatively stable trend since 2006 (Figure 4.6-4).

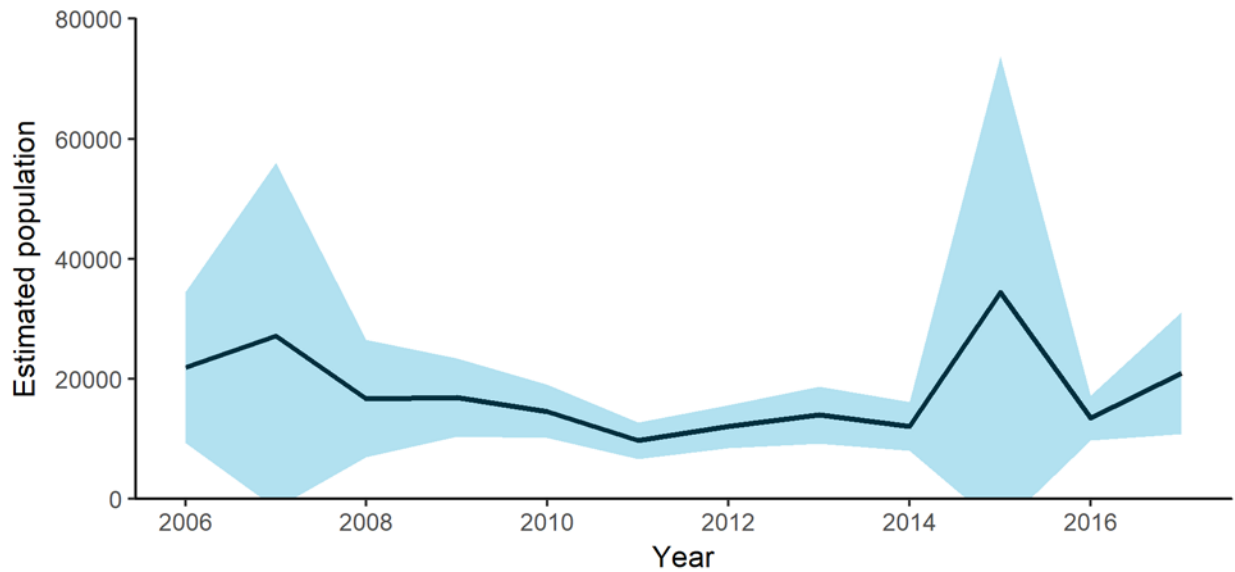


Figure 4.6-4 Population Estimates of American Wigeon in British Columbia Central Plateau, 2006–2017, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

4.6.2 Harvest

Over the past two decades, 30 000 to 40 000 American Wigeon on average have been harvested by hunters every year in Canada. Most of the continental American Wigeon harvest takes place in the U.S., with an average annual harvest of 725 000 birds in the last decade. In Canada, after sharp decreases in the annual harvest of this species in the 1970s and 1980s, the harvest appears to have since stabilized. The 2016 harvest of American Wigeon in Canada (49 443 birds) was the highest since 1997 (Figure 4.6-5).

4.6.3 Management and Conservation Concerns

Wetland abundance in the Prairies is a determining factor in the success of breeding populations of American Wigeon in western and central portions of the continent (Mini *et al.* 2014). The continental population declined in the 1980s due to prolonged drought in the Prairies. In the 1990s, however, habitat conditions in western North America improved and the species' breeding range exhibited a continued eastward expansion. These two factors have allowed the continental population of the American Wigeon to partially recover in recent years. In the Canadian Prairies, the expansion of agriculture has significantly reduced the habitat for many waterfowl species while in the U.S., the loss and degradation of habitat on staging and wintering areas represent a serious problem for the American Wigeon (Mini *et al.* 2014).

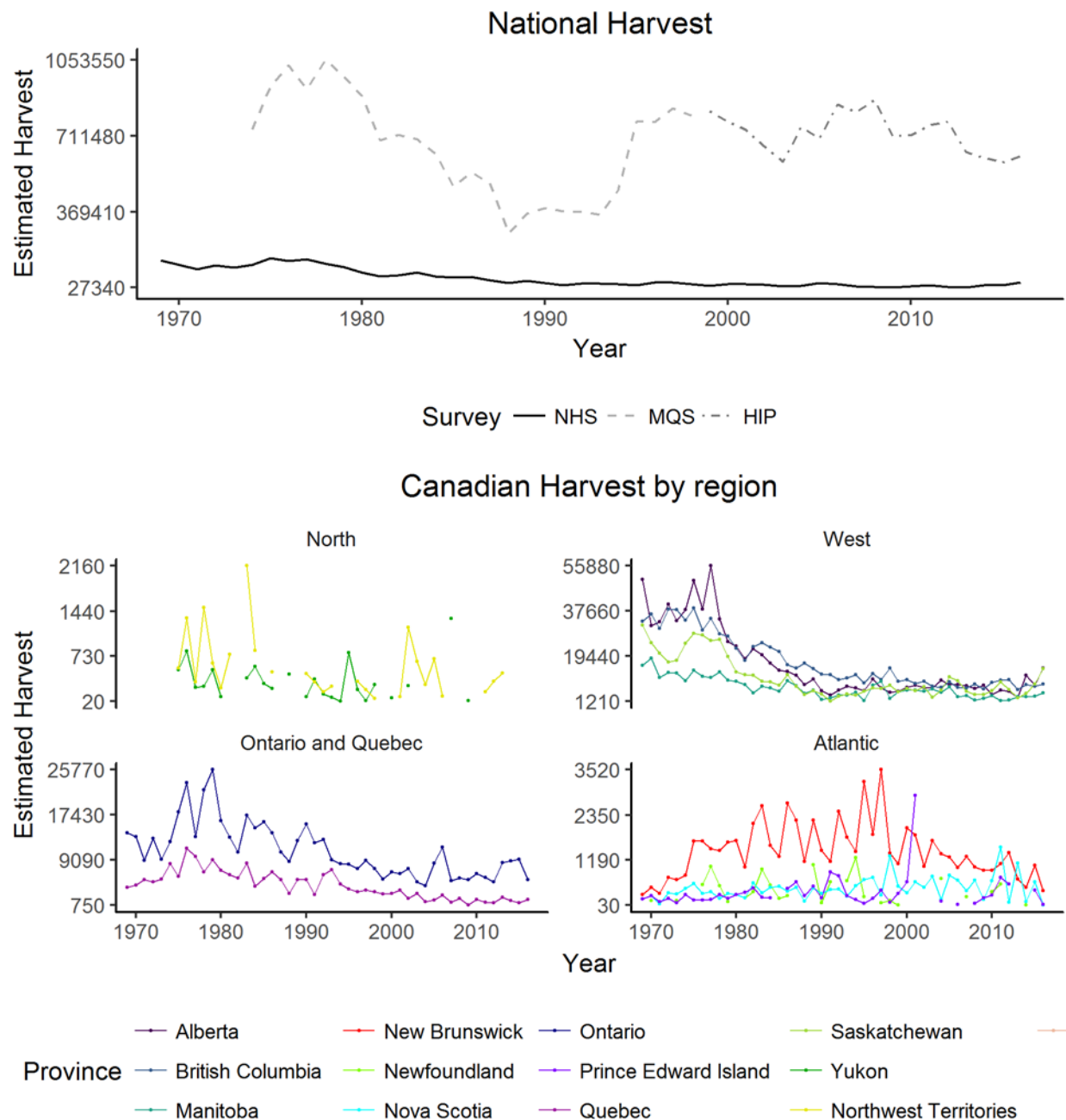


Figure 4.6-5 Estimated harvest for the American Wigeon in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

4.7 Gadwall (*Mareca strepera*)

The Gadwall is a common duck species found in Canada, with its core breeding area located in the Prairies. The species has shown a dramatic population increase throughout most of its range (Leschack *et al.* 1997). The Gadwall population has doubled since the 1990s, following a period of prolonged drought in the 1980s.

4.7.1 Abundance and Trends

The Gadwall is monitored in its core breeding area mainly through the Waterfowl Breeding Population and Habitat Survey (WBPHS) in western Canada, as well as the Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C. The species was also previously monitored outside of the WBPHS survey area by the Cooperative Yukon Roadside Waterfowl Breeding Population Survey until 2016.

LARGE-SCALE WATERFOWL SURVEY

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

Within the traditional survey area, the Gadwall population has doubled in size since the 1990s (Figure 4.7-1) and shows significant increasing long-term, 10-year, and 5-year trends (Table 4.7-1). In the Canadian and U.S. Prairies, long-term and 10-year trends suggest a significant increase in population numbers, Gadwall populations are above the NAWMP goals in most parts of the survey area (NAWMP 2012; Figure 4.7-1), and the population size in the traditional survey area is more than twice the objective of 1.5 million birds

Table 4.7-1. Gadwall Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])

WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	3701 (3315 - 4088)	4177 (3768 - 4587)	3.12*	4.23*	4.13*
Alaska	9 (-6 - 24)	1 (-1 - 4)	1.59	1.71	9.18
Western Boreal Canada	119 (85 - 152)	63 (37 - 90)	0.49	-3.55*	5.03
Canadian Prairies	2261 (1981 - 2540)	2494 (2195 - 2793)	2.94*	5.37*	7.52*
U.S. Prairies (North Central)	1313 (1048 - 1577)	1619 (1340 - 1897)	3.89*	3.20*	-0.32

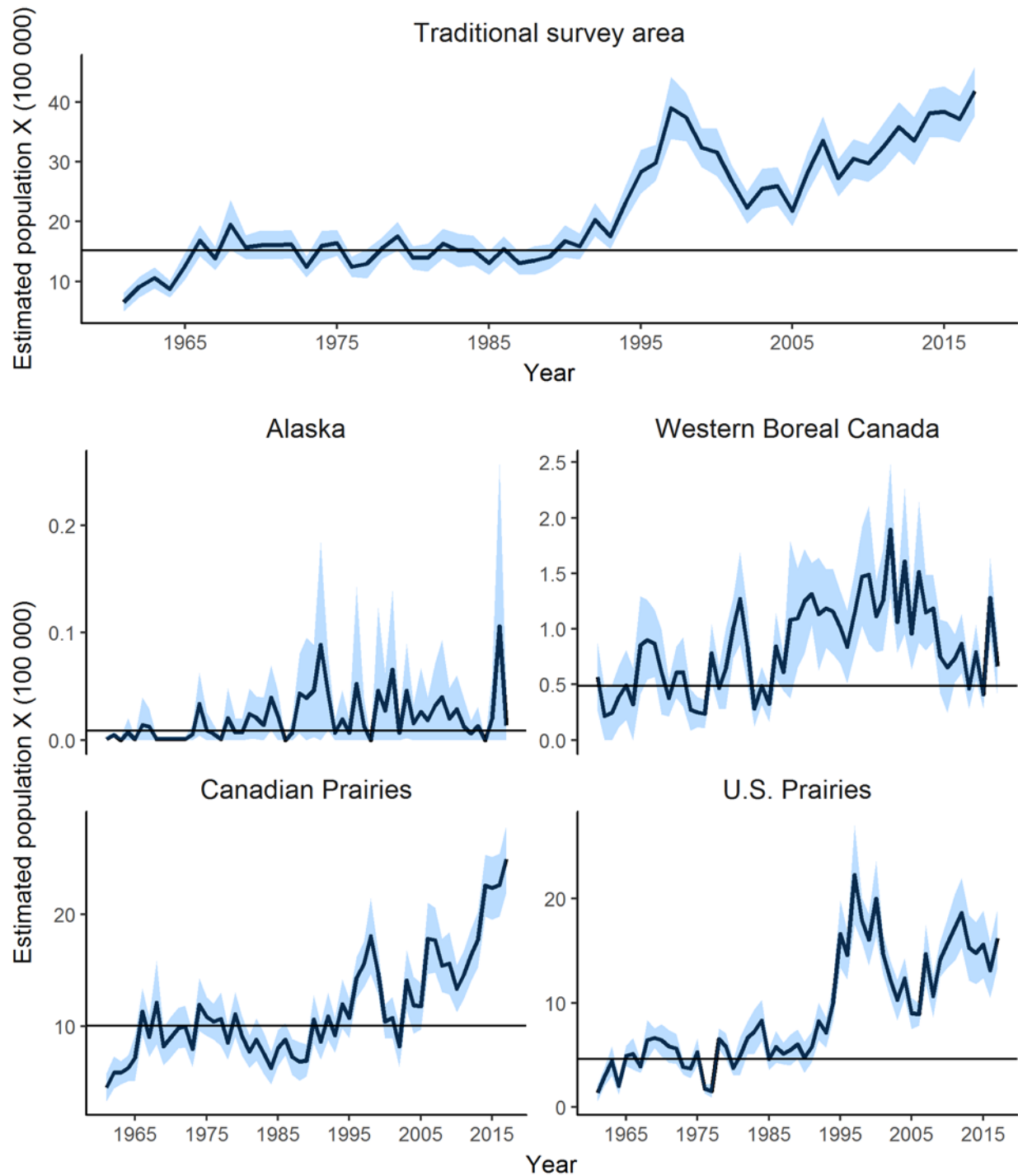


Figure 4.7-1 Gadwall Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Interval (Horizontal lines represent the NAWMP goal in each region of the survey)

SMALL-SCALE WATERFOWL SURVEYS

Table 4.7-2. Gadwall Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)					
Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	2006–2017	2008–2017	2013–2017
Central Interior Plateau of BC	6.65 (1.36-11.95)	3.34 (1.44-5.23)	-3.04	-2.59	-8.46

COOPERATIVE YUKON ROADSIDE WATERFOWL BREEDING POPULATION SURVEY

Since 2001, the population in southern Yukon has remained above the very low numbers observed in the 1990s, but has shown substantial yearly variations (Figure 4.7-2).

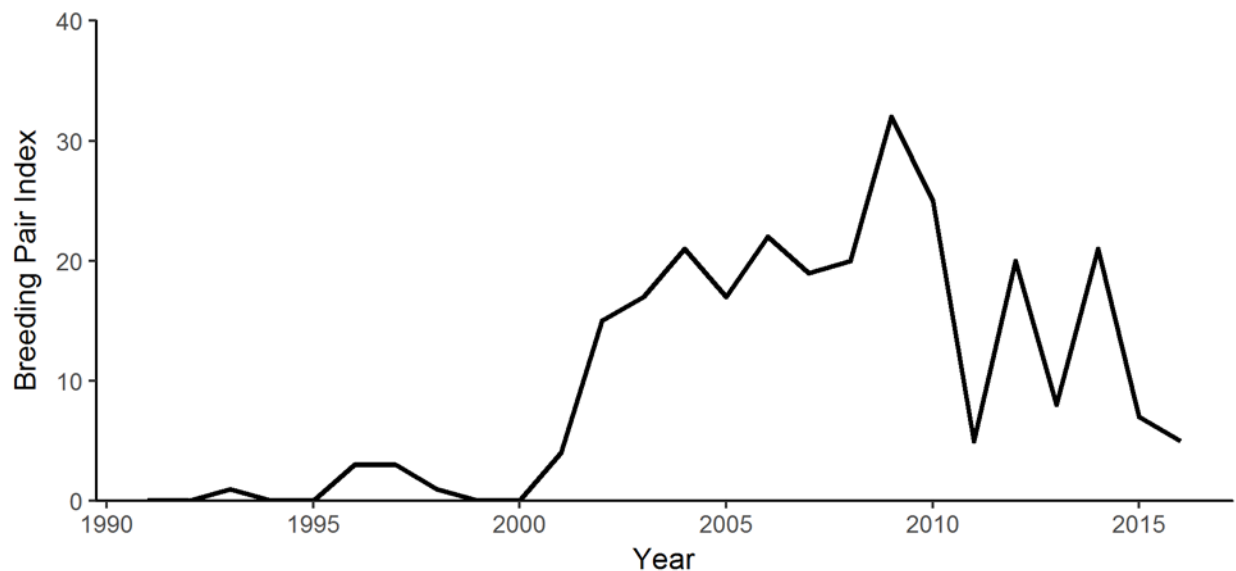


Figure 4.7-2 Breeding Pair Index for the Gadwall in Southern Yukon, 1991–2016

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C

The Gadwall is a relatively common species in central British Columbia. Overall, the species has exhibited a decreasing trend over the last 5 years (-8.5%; Figure 4.7-3).

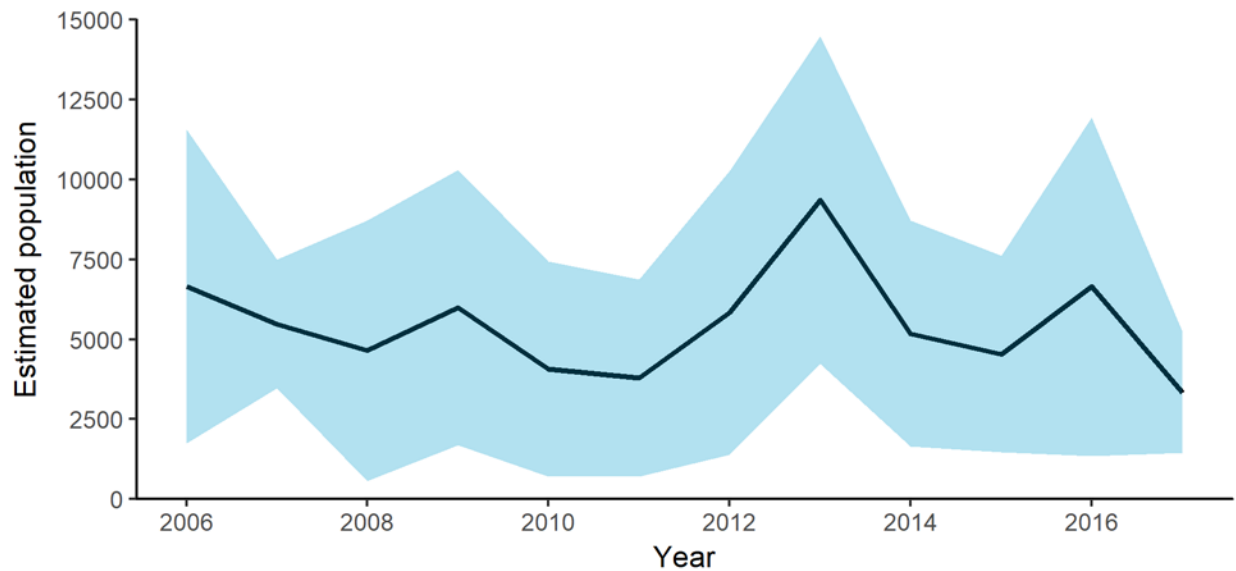


Figure 4.7-3. Population Estimates Gadwalls in Spring in British Columbia Central Plateau, 2006-2017, black line represents the population estimate while the shaded area represents the 95% Confidence Interval.

4.7.2 Harvest

In Canada, most of the Gadwall harvest takes place in the Prairie Provinces. At the continental scale, it is one of the most harvested species of dabbling ducks. However, most of the harvest takes place in the U.S. (Figure 4.7-4). Indeed, during the past 10 years, an average of 45 000 Gadwalls have been harvested in Canada, compared to an average of approximately 1.6 million birds per year in the U.S.

4.7.3 Management and Conservation Concerns

Gadwall numbers have increased considerably since the 1990s, with a doubling of the population in the last decade or so. No other dabbling duck species has shown a comparable population increase to that of the Gadwall, especially in the Prairie Pothole Region (Leschack *et al.* 1997). The increases in breeding numbers are linked to better wetland conditions in the Prairie Pothole Region and to enhancement of habitat management actions (Baldassarre 2014).

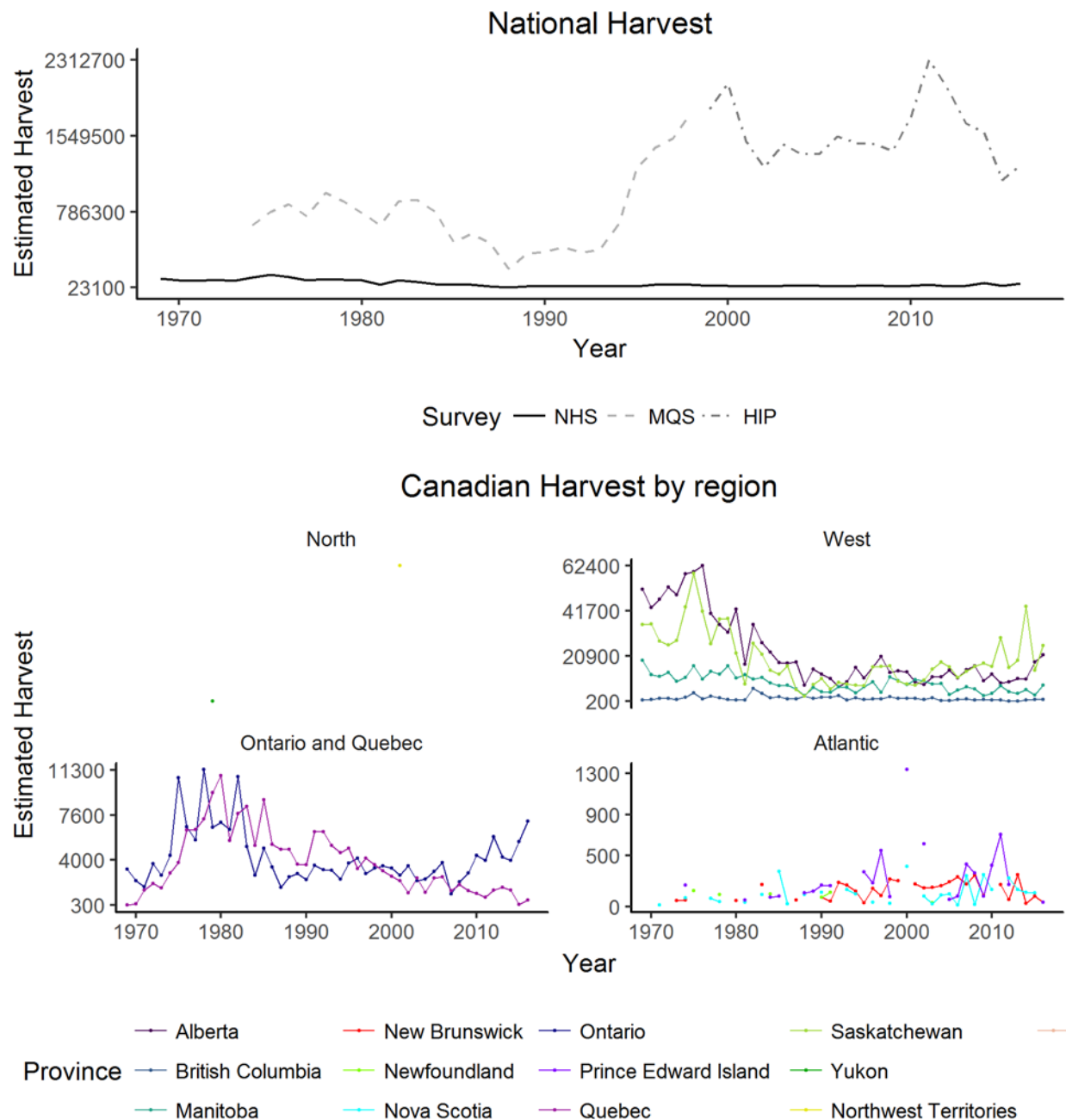


Figure 4.7-4 Estimated harvest for the Gadwall in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

4.8 Northern Shoveler (*Spatula clypeata*)

In Canada, the core breeding range of the Northern Shoveler is in the Prairie Pothole and Parkland regions of Saskatchewan, Alberta and Manitoba (Dubowy 1996). The continental population is currently increasing.

4.8.1 Abundance and Trends

The Northern Shoveler is monitored in its core breeding range through the Waterfowl Breeding Population and Habitat Survey (WBPHS), as well as the Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C.

LARGE-SCALE WATERFOWL SURVEY

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

The survey area population of the Northern Shoveler is increasing and well above the NAWMP goal of 2.0 million ducks (NAWMP 2012; Figure 4.8-1).

Northern Shoveler show significant positive long-term trends in all regions. The 10-year trends suggest a significantly increasing population in the Canadian Prairies and Western Boreal region. Short-term (5-year) trends show significant decreases in the U.S. Prairies and the traditional survey area, but significant increases in Alaska and the Western Boreal Region (Table 4.8-1).

Table 4.8-1. Northern Shoveler Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])

WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	3954 (3584 - 4324)	4353 (3957 - 4749)	2.16*	2.04*	-2.79*
Alaska	539 (399 - 680)	430 (324 - 537)	5.41*	0.01	12.75*
Western Boreal Canada	811 (626 - 996)	606 (476 - 737)	0.86*	7.21*	16.62*
Canadian Prairies	1787 (1536 - 2038)	2498 (2185 - 2812)	2.61*	2.57*	-3.03
U.S. Prairies (North Central)	817 (675 - 958)	818 (644 - 992)	1.68*	-0.95	-13.7*

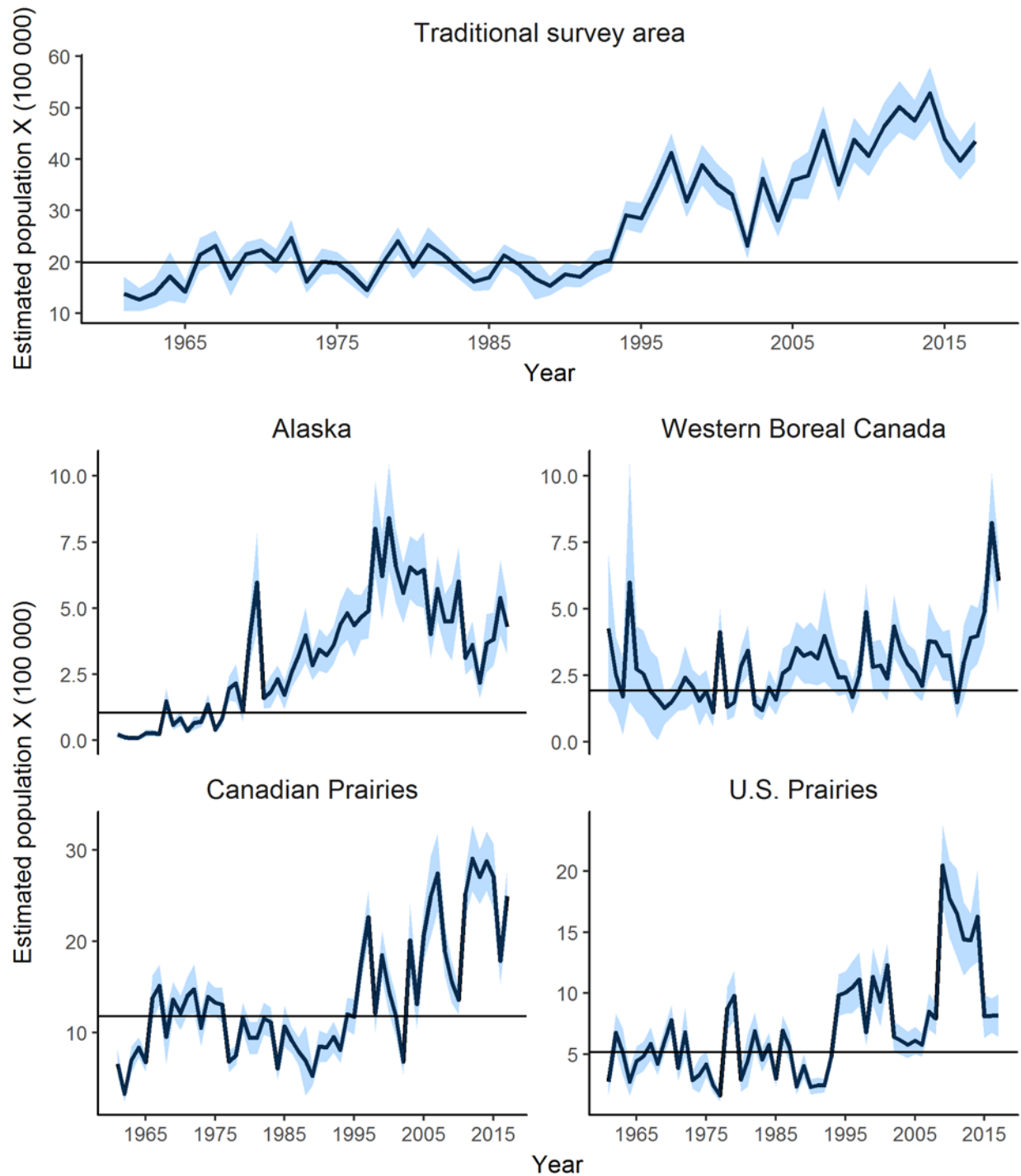


Figure 4.8-1 Northern Shoveler Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Interval (Horizontal lines represent the NAWMP goal in each region of the survey)

SMALL-SCALE WATERFOWL SURVEYS

Table 4.8-2. Northern Shoveler Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)

Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	2006–2017	2008–2017	2013–2017
Central Interior Plateau of BC	15.84 (8.91-22.77)	12.18 (5.73-18.63)	4.73	3.18	1.43

COOPERATIVE YUKON ROADSIDE WATERFOWL BREEDING POPULATION SURVEY

In southern Yukon, the 2016 Northern Shoveler population index was comparable to the 2015 estimate. Population numbers have shown inter-annual variation and appear to be decreasing in Yukon since 1991 (Figure 4.8-2).

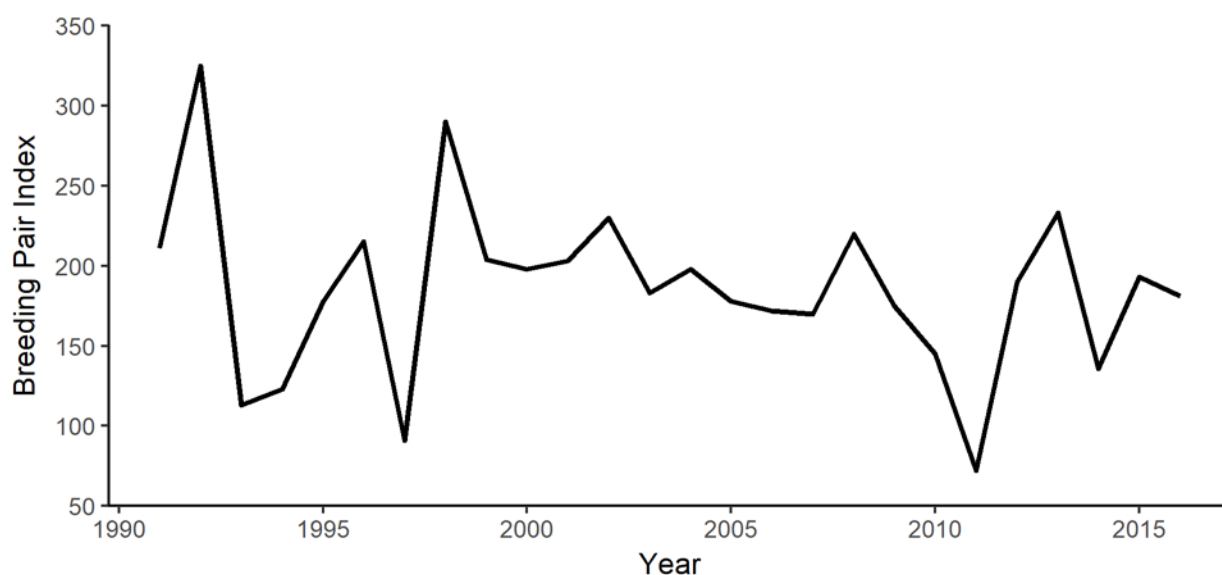


Figure 4.8-2 Breeding Pair Index for the Northern Shoveler in Southern Yukon, 1991–2016

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

The Northern Shoveler is one of the most common species in central British Columbia. Overall, the species' population in this region seems to have increased in number since 2006, with a long-term increasing trend of 5% annually (2006-2017; Figure 4.8-3).

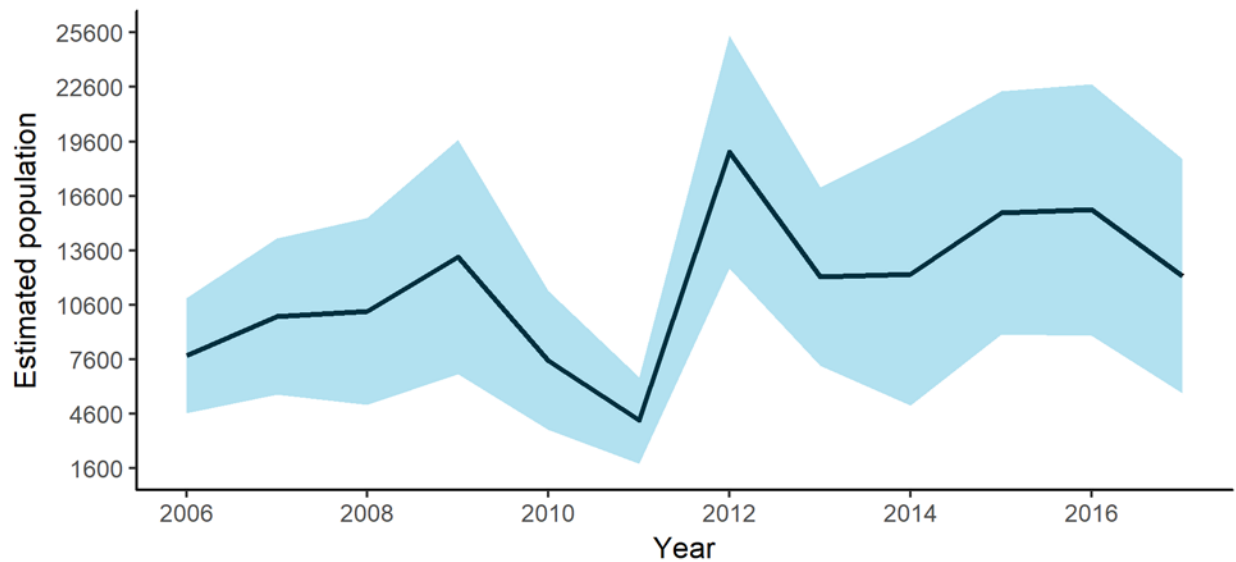


Figure 4.8-3. Population Estimates of Northern Shoveler in Spring in British Columbia Central Plateau, 2006-2017, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

4.8.2 Harvest

The Canadian Northern Shoveler harvest takes place primarily in Saskatchewan, but the bulk of the harvest takes place in the U.S. (Figure 4.8-4). Despite a steady population increase, the Canadian harvest of the Northern Shoveler has been relatively stable.

4.8.3 Management and Conservation Concerns

The Northern Shoveler population appears to be in good health. The primary concerns, as for other duck species, are habitat loss and degradation.

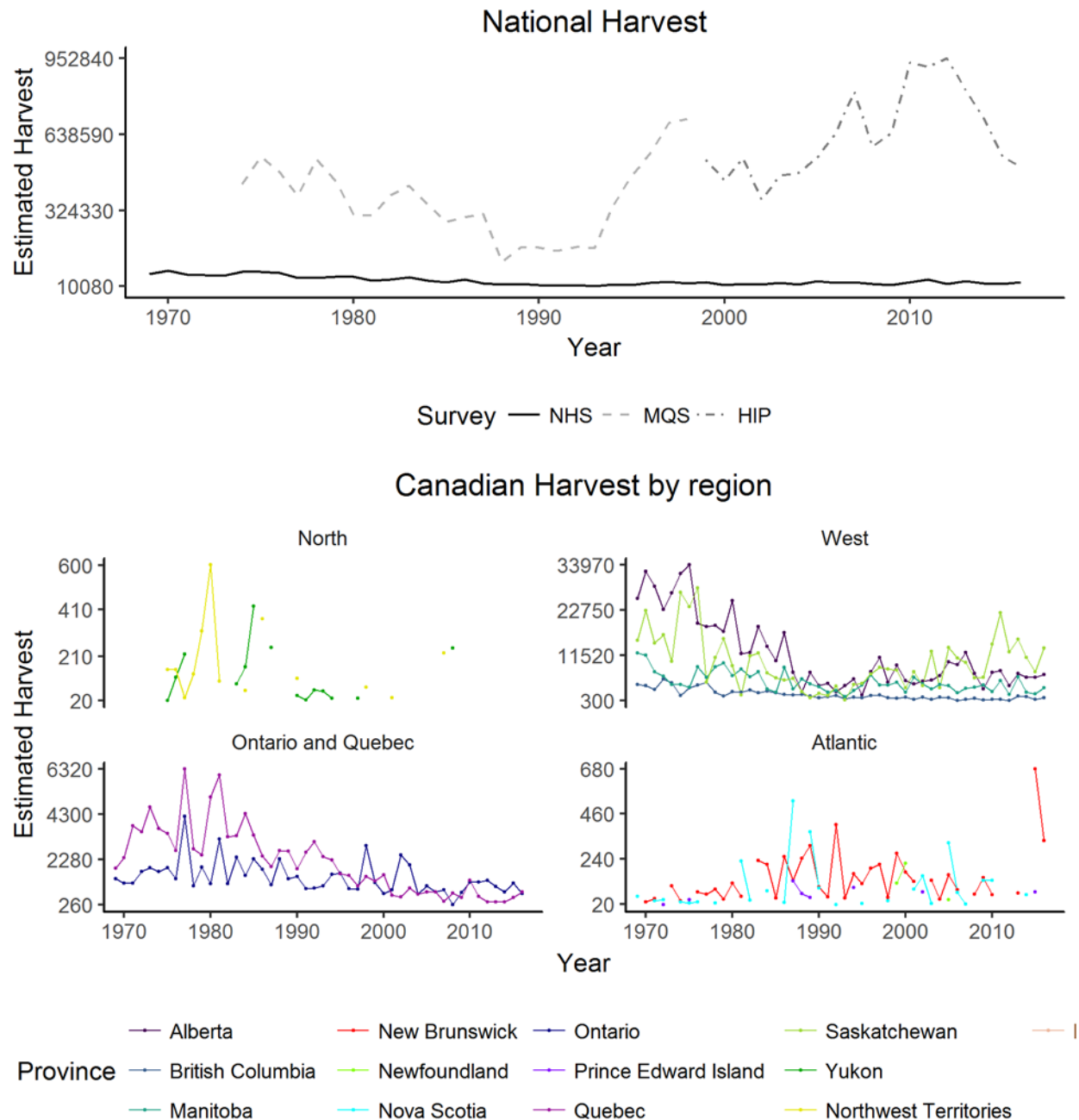


Figure 4.8-4 Estimated harvest for the Northern Shoveler in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

4.9 Wood Duck (*Aix sponsa*)

The Wood Duck is a distinctive cavity-nesting species that is commonly found in riparian habitats, swamps and marshes (Hepp and Bellrose 2013). In Canada, it breeds primarily in the eastern provinces, with most of its breeding population found in Ontario, Quebec and New Brunswick. There is also a small breeding population in the west in scattered locations from southern British Columbia to the extreme southwest portion of Alberta. Once threatened with extinction, the Wood Duck populations are now stable or increasing throughout its breeding range (Baldassarre 2014).

4.9.1 Abundance and Trends

Estimating the breeding population of Wood Duck is difficult because of the species' elusive behaviour and its use of densely vegetated habitats (Zimmerman *et al.* 2015). This results in a low detectability of birds from traditional fixed-wing surveys. Helicopter surveys and ground-based surveys provide better estimates, but broad range data are less available. Targeted waterfowl surveys are conducted in southern Ontario, Quebec, and the Maritimes, and provide information on local breeding populations. Although population trends are also available from the BBS, the location of BBS routes along roadsides results in a low frequency of observations that limits data extrapolation.

According to the NAWMP, the population estimate in eastern and western North America was approximately 4.4 million and 200 000 birds, respectively, between 2002 and 2011 (combining information from multiple surveys; NAWMP 2012). Both populations are stable or increasing in North America.

SMALL-SCALE WATERFOWL SURVEYS

Table 4.9-1. Wood Duck Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)					
Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	Long-term	2008–2017	2013–2017
Southern Ontario	86.58 (54.92-118)	140.65 (83.20-197.92)	10.15*	6.75*	19.2*
St. Lawrence Lowlands	3.00 (1.85-4.15)	4.57 (2.64-6.51)	9.99*	9.47*	11.83*

SOUTHERN ONTARIO WATERFOWL PLOT SURVEY

The Wood Duck is the second most abundant duck species in southern Ontario after the Mallard, and its population shows a significant increasing 5-year, 10-year, and long-term trend in this region (Table 4.9-1). In Ontario, the breeding population has increased since the early 1970s and now represents the largest proportion of the breeding population in eastern Canada (Figure 4.9-1). In southern Ontario, the Wood Duck breeding population is higher in 2017 compared to 2016, and is above the 10-year average of approximately 82 000 breeding pairs.

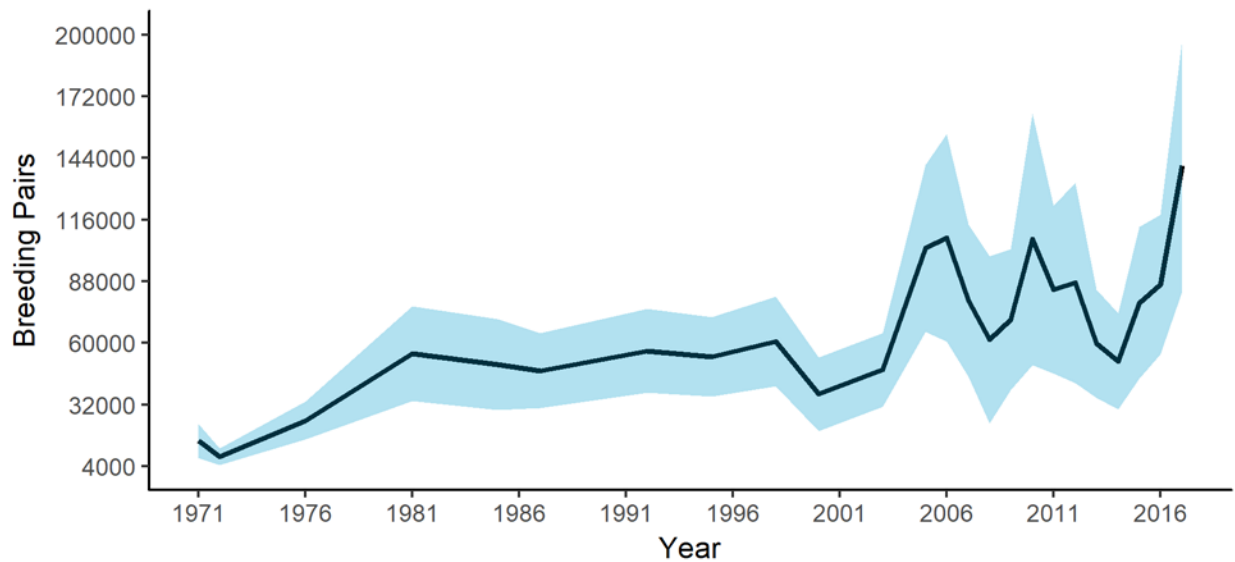


Figure 4.9-1 Indicated Breeding Pair of Wood Ducks in Southern Ontario, 1971–2017, black line represents the breeding pair estimate while the shaded area represents the 95% Confidence Interval.

ST. LAWRENCE LOWLANDS BREEDING WATERFOWL SURVEY, QUEBEC

In the St. Lawrence Lowlands, the Wood Duck is a common species, and its population shows a significant increasing 5-year, 10-year, and long-term trend (Table 4.9-1 and Figure 4.9-2). The number of breeding pairs increased from approximately 3 000 in 2016 to 4 600 in 2017, and remains above the 5-year average of 3 600 pairs. This steady increase (10% per year, 2004-2017) has led the Wood Duck to replace the Black Duck as the second most abundant species, behind the Mallard, for this region, for the second year since the beginning of this survey.

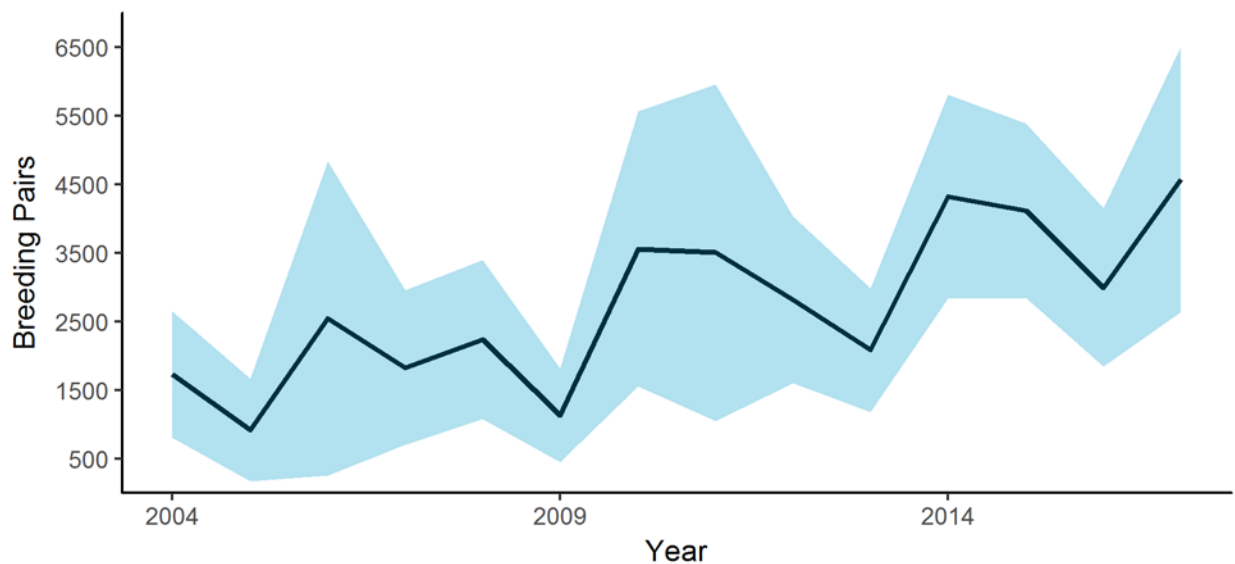


Figure 4.9-2 Indicated Breeding Pairs Estimates and Trends for the Wood Duck in the St. Lawrence Lowlands, Quebec, 2004–2017, black line represents breeding pair estimate while the shaded area represents the 95% Confidence Interval.

4.9.2 Harvest

Wood Ducks are sought after by hunters and an average of 73 000 birds of this species have been harvested annually in Canada over the past 10 years (Figure 4.9-3). In the U.S., more than one million Wood Ducks are harvested every year, accounting for more than 10% of the annual waterfowl harvest in the U.S.

4.9.3 Management and Conservation Concern

During the late 1800s to the early 1900s, extinction of the Wood Duck appeared imminent. The destruction of hardwood forests and overharvesting from hunting were the two major factors that contributed to the species' decline (Baldassarre 2014). A complete ban on the Wood Duck hunt was in place between 1918 and 1941. The Wood Duck population recovered, and thus the hunt was reopened in 1941. The population is currently increasing or stable throughout much of the species' range, based on recent various breeding bird atlases in eastern Canada and northeastern United States (Baldassarre 2014; Zimmerman *et al.* 2015).

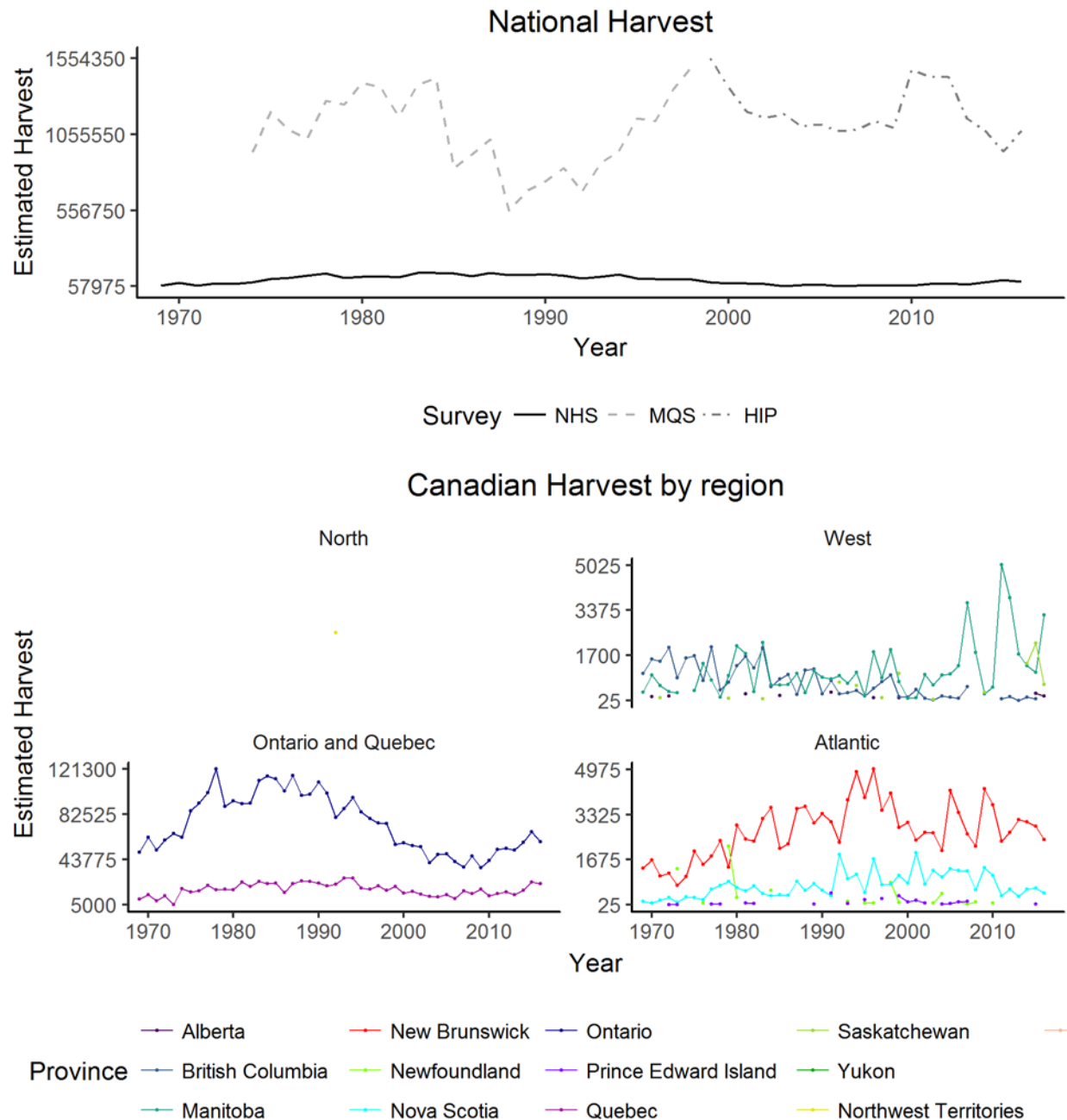


Figure 4.9-3 Estimated harvest for the Wood Duck in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

5. Population Status of Inland Diving Ducks

5.1 Greater Scaup (*Aythya marila*) and Lesser Scaup (*Aythya affinis*)

Lesser and Greater Scaup are closely related and nearly identical in their overall appearance, which can make it difficult to distinguish them from each other. The status of the North American breeding population of Scaup (Greater and Lesser Scaup, combined) has become a conservation concern, due to apparent declines from the historically high levels observed in the late 1970s (Austin *et al.* 2000).

The Greater Scaup is the larger of the two species and has a circumpolar breeding distribution. In North America, the Greater Scaup is widely distributed across Arctic and Subarctic regions from Alaska to Labrador, where it nests mainly in coastal tundra habitats (Kessel *et al.* 2002). The species has a discontinuous breeding distribution, with the vast majority of birds nesting in western Alaska. Large numbers of birds also nest within the Bristol Bay—Yukon-Kuskokwim Delta and Seward Peninsula—Kotzebue Sound Regions. Limited breeding has been reported along western Hudson Bay, south from Rankin Inlet, Nunavut, to the northern Ontario coastline and as far east as Cape Henrietta Maria. The species also nests in low densities in northern Quebec along northeastern James Bay and eastern Hudson Bay, and east to western Labrador, with scattered breeding in Newfoundland, as well as further south on the lower North Shore and the Magdalen Islands in Quebec.

The Lesser Scaup is the smaller of the two Scaup species and is the most abundant and widespread diving duck in North America. The core breeding area for the Lesser Scaup is the Western Boreal and Prairie and Parkland Regions from central Alaska through Manitoba, but the species also nests at lower densities in the east throughout the northern and boreal forests of Ontario (including Hudson Bay lowlands), Quebec, and Labrador (Anteau *et al.* 2014).

5.1.1 Abundance and Trends

The Greater and Lesser Scaup are monitored within their core breeding ranges mainly through the Waterfowl Breeding Population and Habitat Survey (WBPBS), as well as the Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C. For the purposes of population monitoring, Greater Scaup and Lesser Scaup numbers are combined and reported as “Scaup”, because of the difficulty in distinguishing between species during aerial surveys from fixed-winged aircraft. Because the Lesser Scaup is more abundant than the Greater Scaup, the former makes up a larger proportion of the continental Scaup population (Anteau *et al.* 2014).

LARGE-SCALE WATERFOWL SURVEY

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

The continental population of Scaup experienced a decline between the mid-1980s and the mid-2000s. In the most recent 10 years, the population has generally showed an increasing trend, with the exception of Alaska. However, Scaup numbers remain below the NAWMP goal of 6.3 million birds (NAMWP 2012; Table 5.1-1). The number of Scaup in the Canadian Western Boreal Region accounts for nearly two-thirds of the continental total. As with the continental population, the Western Boreal breeding population shows significant declining long-term, but increasing 10-year trends. The population remains well below the NAWMP population goal of 4.3 million birds for this region (Figure 5.1-1). The Canadian Prairies breeding population also remains below the NAWMP goal of 1.05 million birds despite showing significant 5- and 10-year increasing trends (Table 5.1-1).

Table 5.1-1. Scaup (Lesser and Greater) Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])

WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	4992 (4408 – 5575)	4731 (3923 – 4819)	-0.28*	1.98*	0.32
Alaska	587 (453 – 722)	721 (521 -920)	-0.63*	-4.54*	0.29
Western Boreal Canada	3221 (2695 – 3747)	2613 (2257 -2969)	-0.35*	3.24*	0.88
Canadian Prairies	814 (48 -980)	793 (624 – 961)	-0.19	4.52	0.48
U.S. Prairies (North Central)	391 (261 – 521)	224 (139 – 308)	2.41	4.23	-5.01

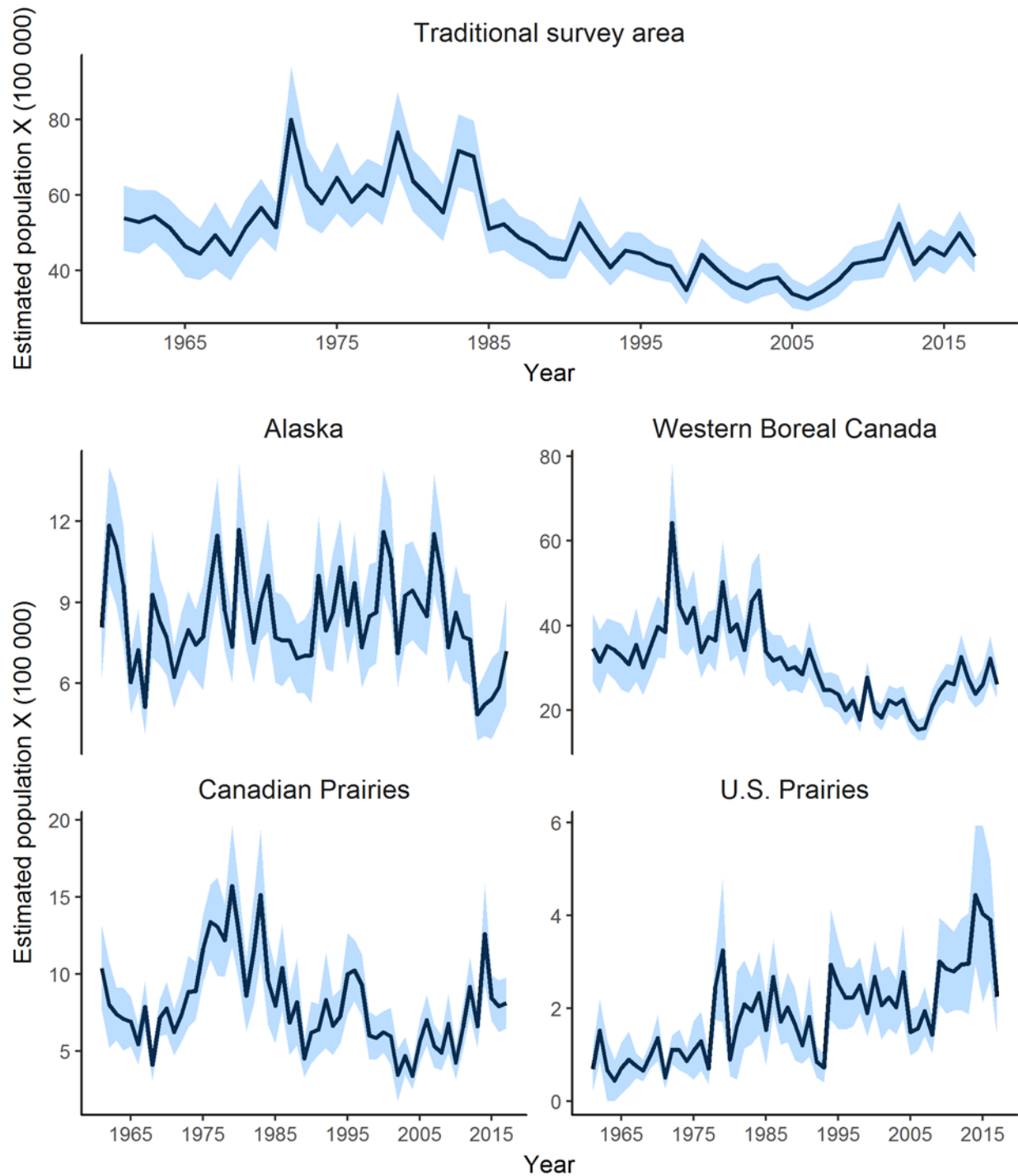


Figure 5.1-1 Scaup (Lesser and Greater) Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

SMALL-SCALE WATERFOWL SURVEYS

Table 5.1-2. Scaup (Lesser and Greater) Breeding Population Estimates with 95% Confidence Intervals and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)					
Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	2006–2017	2008–2017	2013–2017
Central Interior Plateau of BC	36.42 (20.88-51.95)	49.59 (25.94-73.24)	-1.1	-1.44	0.89

COOPERATIVE YUKON ROADSIDE WATERFOWL BREEDING POPULATION SURVEY

In the southern Yukon, the Scaup breeding population index has been showing a declining significant trend since the beginning of the survey in 1991 (Figure 5.1-2).

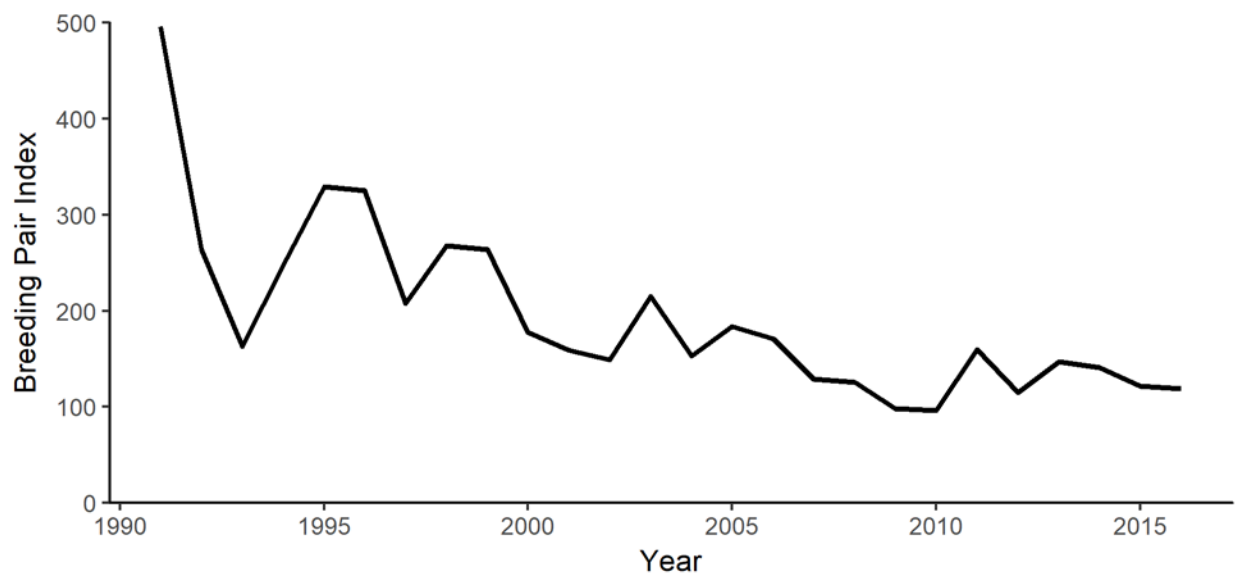


Figure 5.1-2 Breeding Pair Index for the Scaup (Lesser and Greater) in Southern Yukon, 1991–2016.

NORTHWEST TERRITORIES BOREAL WATERFOWL AND WATERBIRDS SURVEY

Lesser Scaups are one of the most abundant diving duck species in the Northwest Territories Boreal survey area. Numbers of pairs were below the long-term average in 2016 and the trend shows a steady decline since the inception of the survey in 1985.

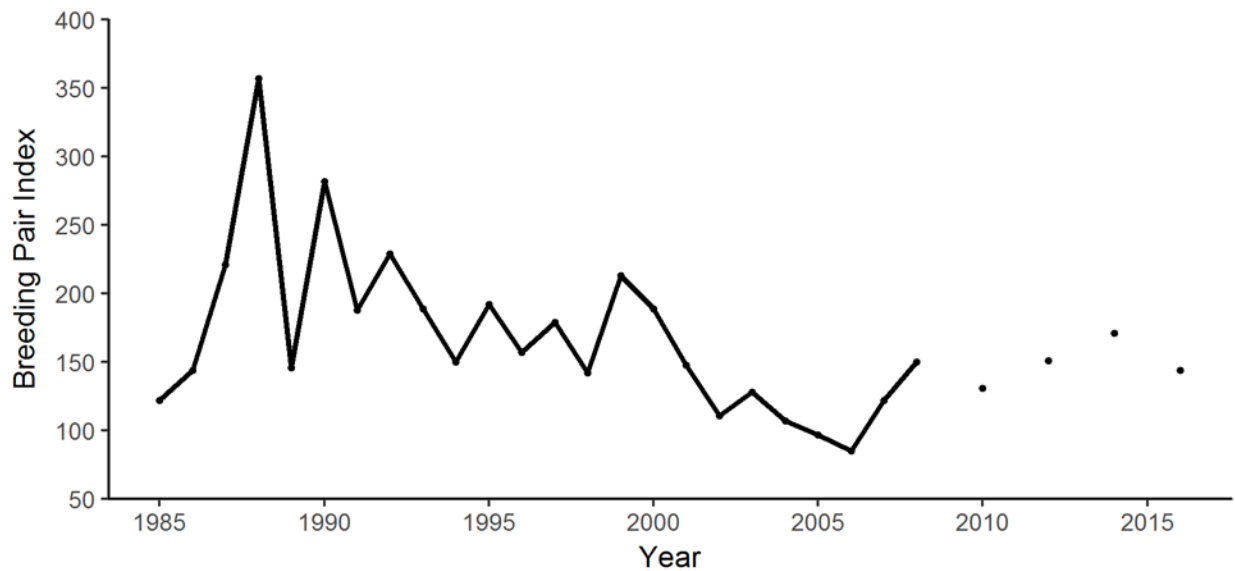


Figure 5.1-3 Total Number of Breeding Pairs for the Lesser Scaup observed in the Northwest Territories Boreal Waterfowl and Waterbirds Survey, 1985-2016. Since 2008, surveys have been done every second year.

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

Scaup in the central Plateau B.C. have shown a relatively stable trend since 2006 (Figure 5.1-4).

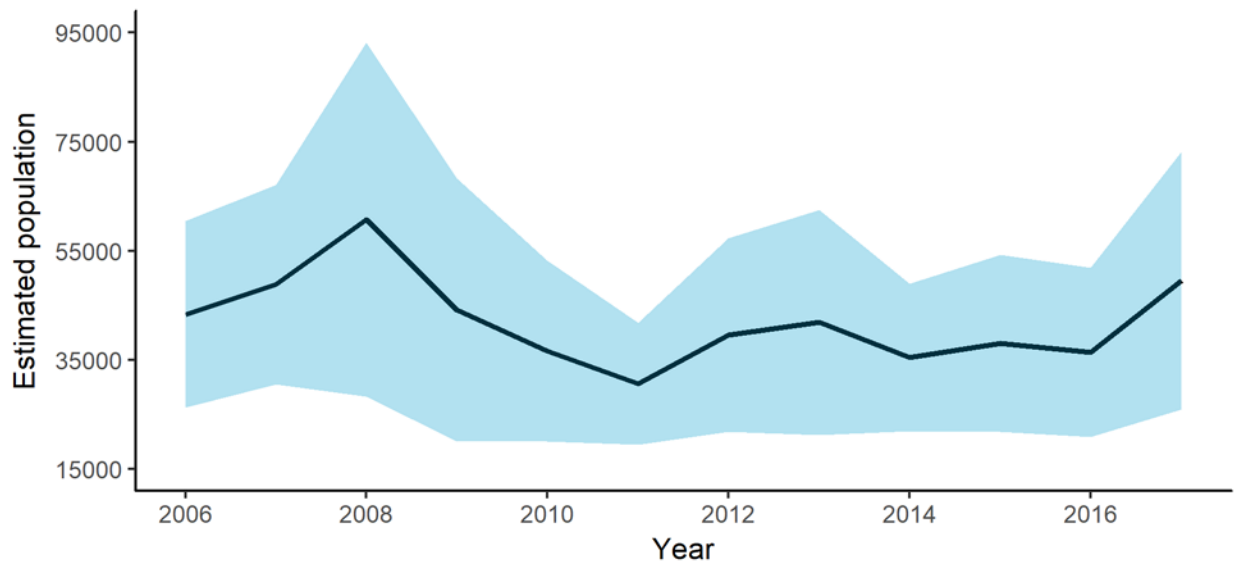


Figure 5.1-4 Population Estimates of Scaup (Lesser and Greater) in British Columbia Central Plateau, 2006-2017, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

5.1.2 Harvest

The harvest of Lesser Scaup and Greater Scaup in Canada has declined considerably over the long-term (Figure 5.1-5 and 5.1-6). In the U.S., the harvest of Scaup has varied considerably (Figure 5.1-5 and 5.1-6) since the beginning of the survey in 1974. In 2016, 72 478 Greater Scaup were harvested in Canada

and the U.S. combined, while the harvest for Lesser Scaup at the continental level was of 185 601 birds. In the past decade, the Canadian harvest of both the Lesser and Greater Scaup has accounted for about 10% of the total continental harvest.

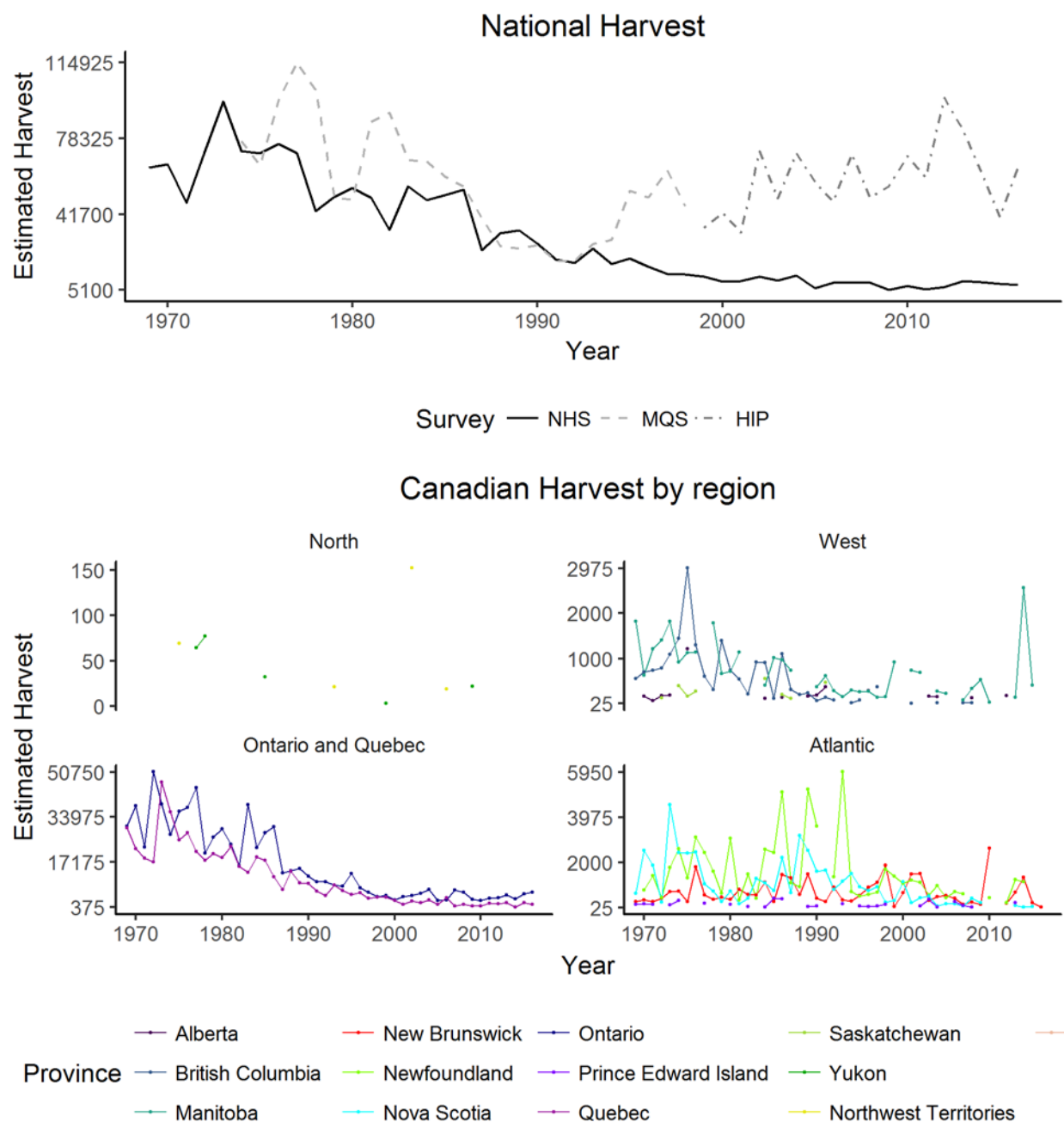


Figure 5.1-5 Estimated harvest for the Greater Scaup in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

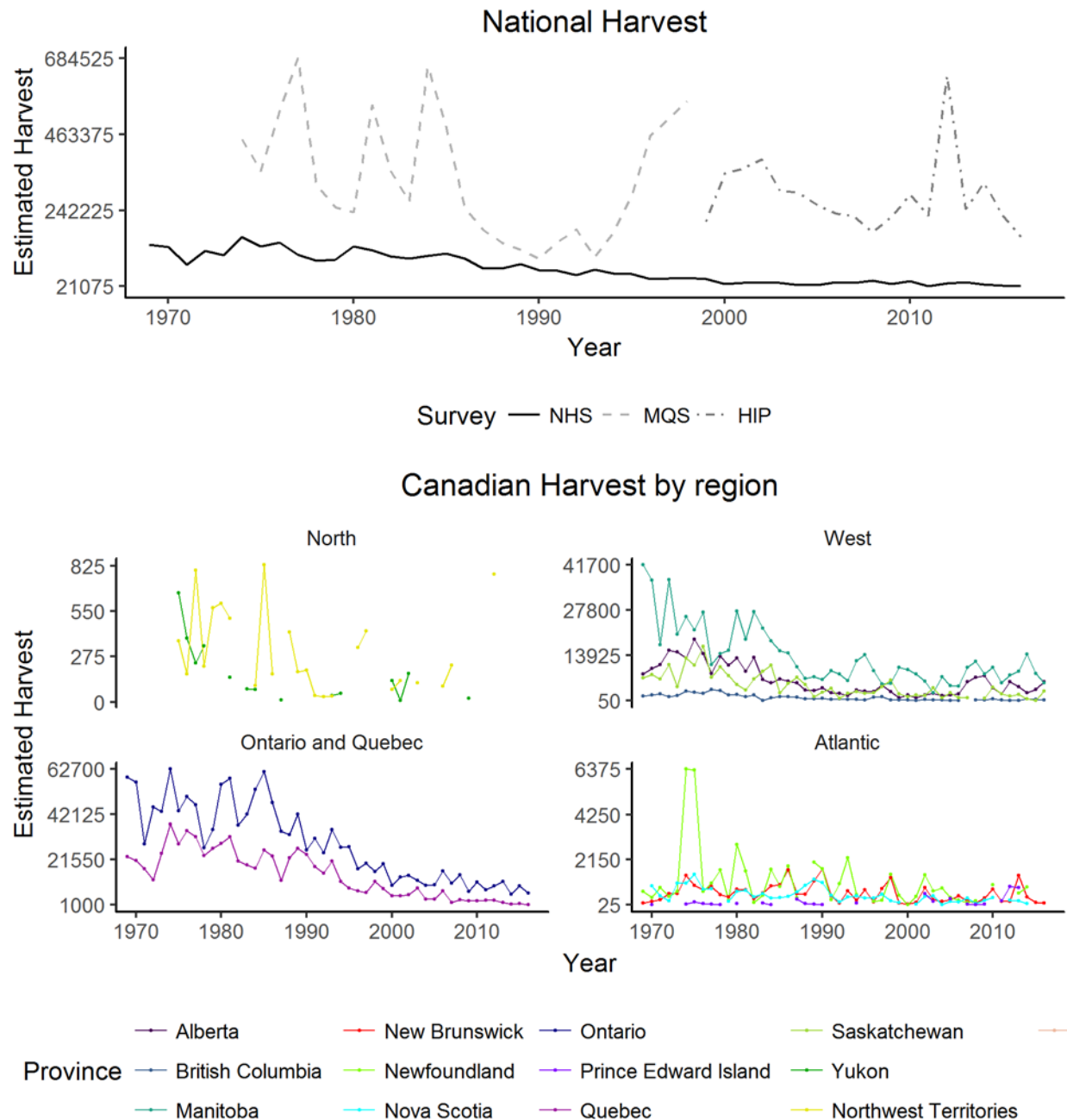


Figure 5.1-6 Estimated harvest for the Lesser Scaup in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

5.1.3 Management and Conservation Concerns

The difficulty in differentiating between Greater Scaup and Lesser Scaup during fixed-wing surveys is a challenge for managers who require more detailed information on the status of populations in order to develop hunting regulations and conservation policies. Currently, numbers for both species observed during aerial—and most ground-based—surveys preclude the identification of differing population trajectories and species-specific population estimates. Because Lesser Scaup are a dominant component of the combined population, changes in the population status of the less abundant Greater Scaup, in particular, may be undetectable. Both species of Scaup are also late migrants which can make the traditional aerial waterfowl surveys less reliable for these species (Finger *et al.* 2016).

Scaup populations in the Canadian Prairies declined similarly to other duck populations during the drought years in the 1980s, but were slow to recover when habitat conditions improved subsequently (Austin *et al.* 2000; Anteau *et al.* 2014). Scaup breeding in the boreal forest also declined during the 1980s, and numbers for this species still have not returned to levels observed in the 1970s. Reasons for this failure to return to 1970s numbers are unknown, but research is ongoing (Ross *et al.* 2015; Arnold *et al.* 2016; Koons *et al.* 2017).

5.2 Ring-Necked Duck (*Aythya collaris*)

The Ring-necked Duck is a common diving duck that breeds throughout the boreal forest (Roy *et al.* 2012). In Canada, its range extends from southern Yukon to Newfoundland, with some breeding recorded in Labrador. The Ring-necked Duck commonly nests in dense emergent vegetation in shallow wetlands (e.g., marshes, bogs and fens).

5.2.1 Abundance and Trends

The Ring-necked Duck is monitored on its core breeding range through the WBPHS in western and eastern Canada, as well as the Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C. The species is also monitored by other small-scale regional breeding waterfowl surveys across the country, including the Southern Ontario Waterfowl Plot Survey.

LARGE-SCALE WATERFOWL SURVEYS

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

In the survey area as a whole, the Ring-necked Duck population shows significant increasing long-term (1961–2017) and short-term (2008–2017 and 2013–2017) trends (Table 5.2-1). Long-term trends (1961–2017) are all positive and significant in the Canadian regions. Similarly, the medium-term (2008–2017) trends for the traditional survey area, as well as all other regions in the survey are positive, and significant for all regions except Alaska. In the U.S. Prairies, the short-term trend suggests a significant decrease in the population size for the Ring-necked Duck (Table 5.2-1 and Figure 5.2-1).

Table 5.2-1. Ring-Necked Duck Breeding Population Estimates with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	1773 (1490 - 2055)	1917 (1626 - 2208)	3.5*	6.71*	9.58*
Alaska	56 (18 - 94)	42 (20 - 65)	1.88	1.06	10.24
Western Boreal Canada	1396 (1133 - 1658)	1566 (1288 - 1845)	3.82*	5.93*	10.76*
Canadian Prairies	247 (160 - 334)	280 (201 - 359)	3.92*	14.03*	11.48*
U.S. Prairies (North Central)	74 (31 - 117)	28 (13 - 43)	1.52	8.33*	-16.47*

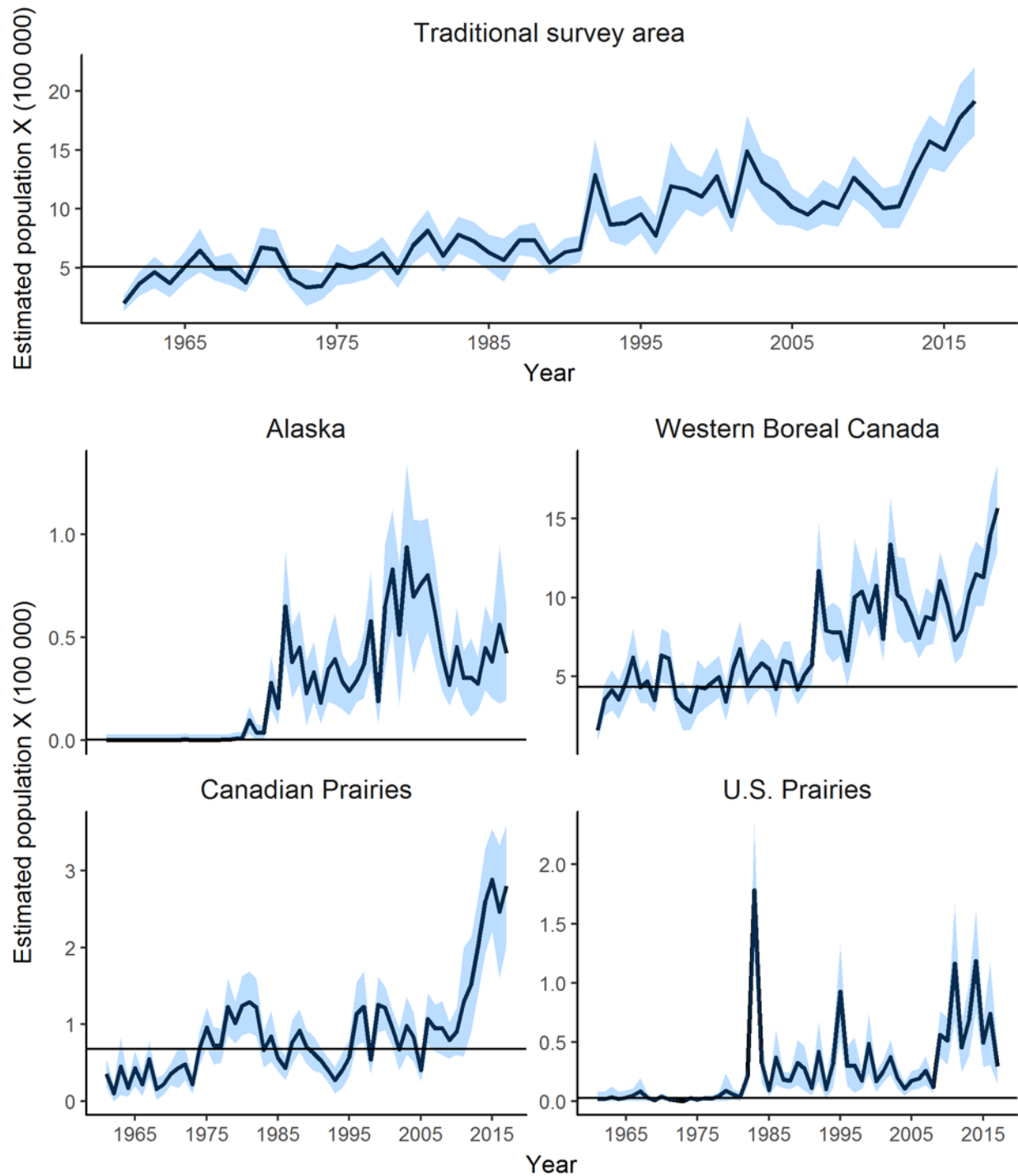


Figure 5.2-1 Ring-Necked Duck Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals (Horizontal lines represent the NAWMP goal in each region of the survey)

EASTERN WATERFOWL BREEDING GROUND SURVEY

In eastern Canada, Ring-necked Ducks show a relatively stable trend in most regions of the survey area (Figure 5.2-2 and Table 5.2-2).

Table 5.2-2. Ring-Necked Duck Breeding Population Estimates with 95% Credible Intervals (CI) and Trend Estimates Based on the Eastern Waterfowl Breeding Ground Survey (The estimates are based on the combined results of helicopter and fixed-wing aircraft surveys. Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
EWS—Eastern Waterfowl Breeding Ground Survey	Breeding Population Estimates in Core Area (in thousands)		Trends in Numbers of Breeding Birds in Core Area		
	2016	2017	1990–2017	2008–2017	2013–2017
Eastern Survey Area	572 (441 - 770)	463 (353 - 627)	0.12	-0.68	-0.73
Atlantic Highlands	76 (54 - 117)	72 (51 - 112)	0.64	0-.22	0.10
Eastern Boreal Shield	110 (80 - 164)	94 (68 - 142)	0.14	0.18	0.18
Central Boreal Shield	125 (85 - 214)	76 (52 - 122)	0.19	-0.45	-0.56
Western Boreal Shield	252 (179 - 396)	215 (150 - 343)	0.01	-2.19	-2.35

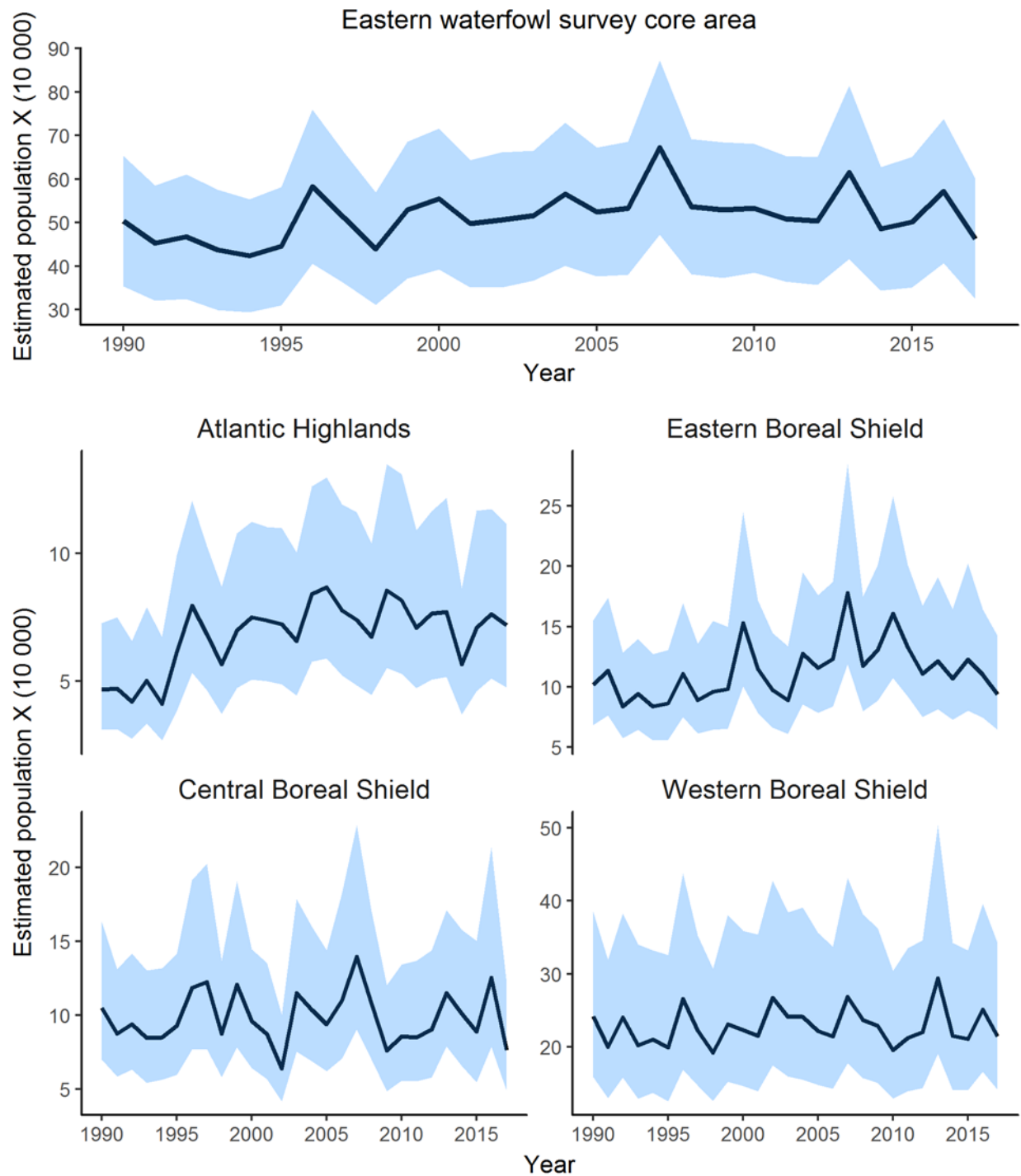


Figure 5.2-2 Ring-Necked Duck Breeding Population Estimates Based on the Eastern Waterfowl Breeding Ground Survey, black line represents the population estimate while the shaded area represents the 95% Credible Intervals (The figures represent the combined results of helicopter and fixed-wing aircraft surveys.)

SMALL-SCALE WATERFOWL SURVEYS

Table 5.2-3. Ring-Necked Duck Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)

Survey/Area	Population Estimates (in thousands)		Trends in population		
	2016	2017	Long-term	2008–2017	2013–2017
Central Interior Plateau of BC	53.69 (40.89-66.49)	76.97 (58.63-95.30)	-0.88	1.05	9.79*
Southern Ontario	12.19 (2.97-21.41)	25.33 (5.16-45.50)	4.84*	1.62	-1.97

COOPERATIVE YUKON ROADSIDE WATERFOWL BREEDING POPULATION SURVEY

The Ring-necked Duck breeding pair index has shown considerable year-to-year variation in southern Yukon, but a stable long-term trend has been observed since 1991 (Figure 5.2-3).

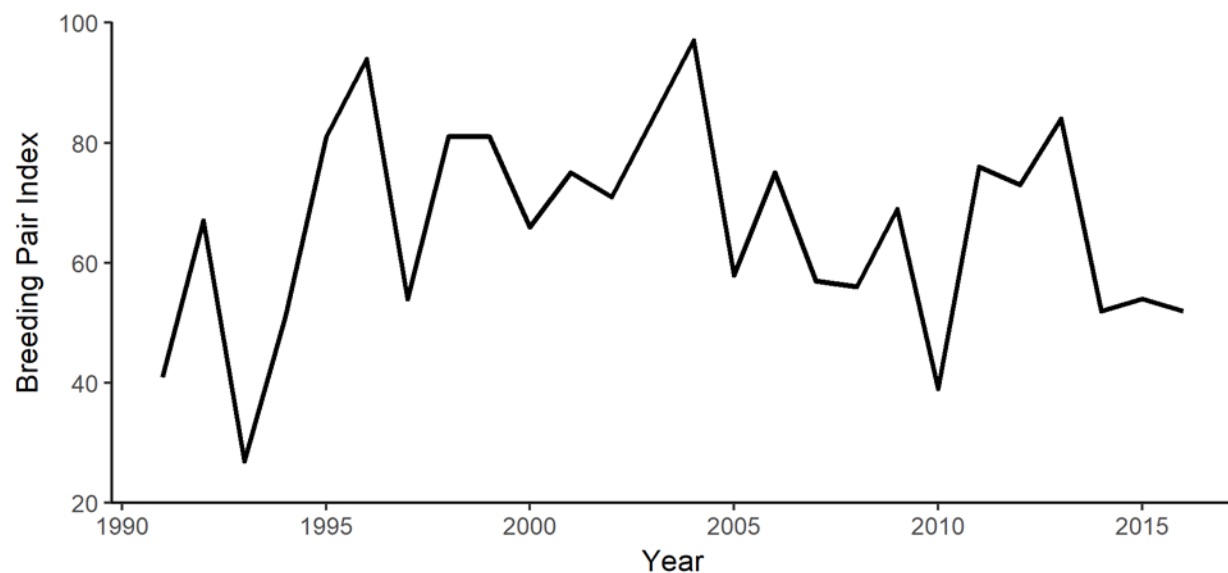


Figure 5.2-3 Breeding Pair Index for the Ring-Necked Duck in Southern Yukon, 1991–2016.

NORTHWEST TERRITORIES BOREAL WATERFOWL AND WATERBIRDS SURVEY

Ring-Necked Duck pair numbers were the second highest recorded since 1985 at the Northwest Territories Boreal survey area (Figure 5.2-4). Long-term trend in breeding pairs has been increasing.

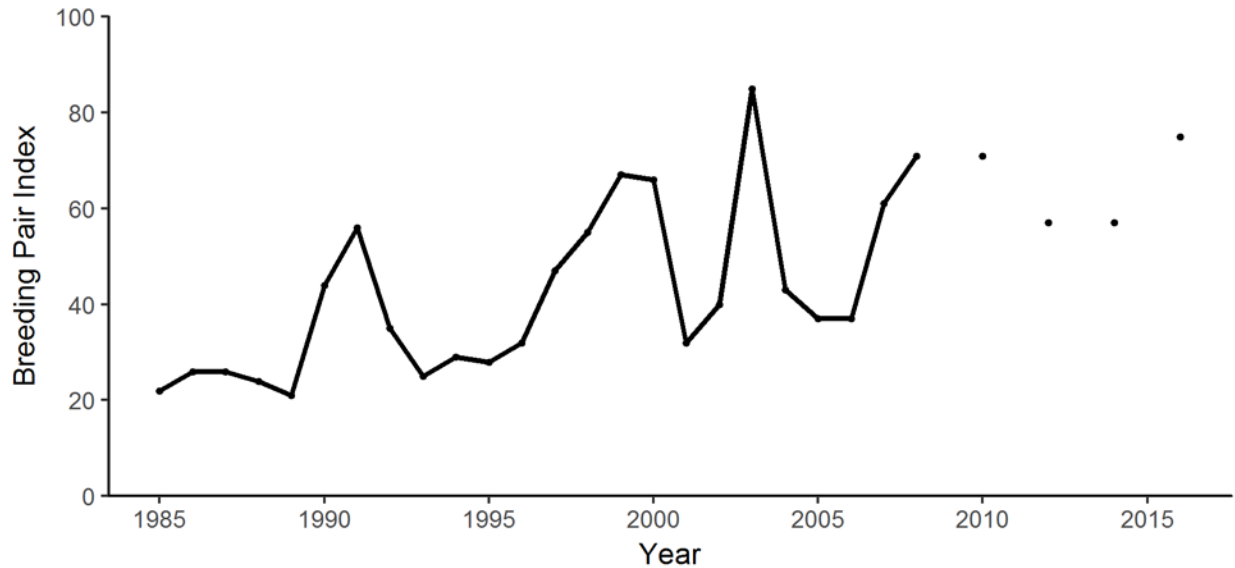


Figure 5.2-4 Total Number of Breeding Pairs for the Ring-Necked Duck observed in the Northwest Territories Boreal Waterfowl and Waterbirds Survey, 1985-2016. Since 2008, surveys have been done every second year.

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

The Ring-necked Duck is a common species in central British Columbia. Despite a decreasing population trend over the long-term (2006-2017), there is a significant increase in the population over the last 5-years (9.8%; Figure 5.2-5).

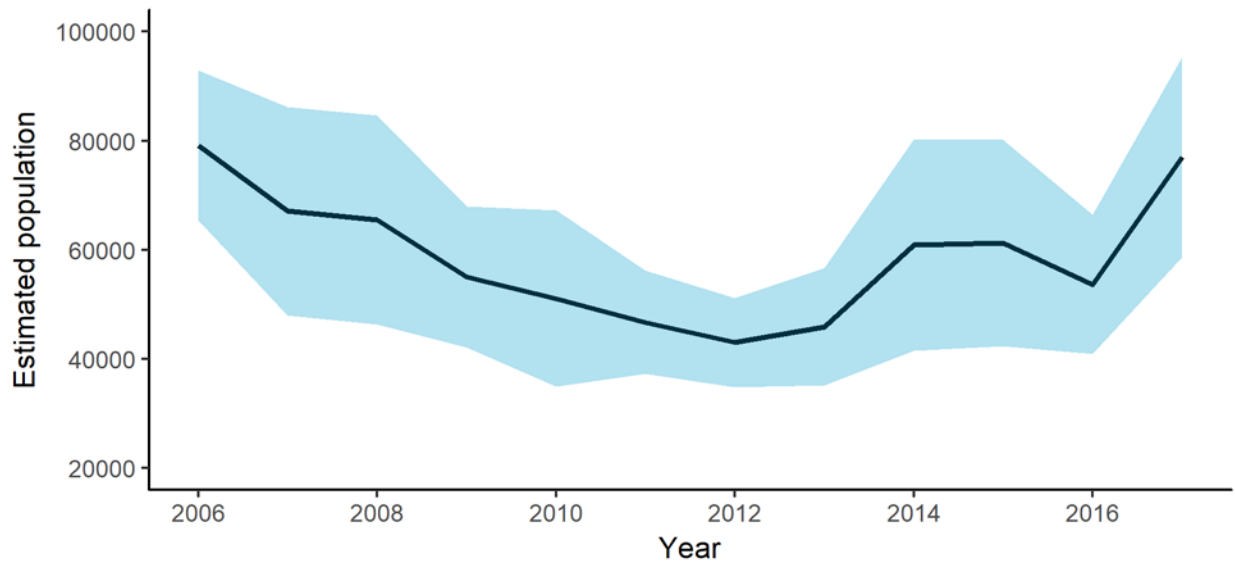


Figure 5.2-5 Population Estimates of Ring-Necked Duck in British Columbia Central Plateau, 2006-2017, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

SOUTHERN ONTARIO WATERFOWL PLOT SURVEY

Breeding population estimates for Ring-necked Duck in Southern Ontario show increasing 10-year and long-term trends, with 1.6% and 4.8% annual increases, respectively (Figure 5.2-6).

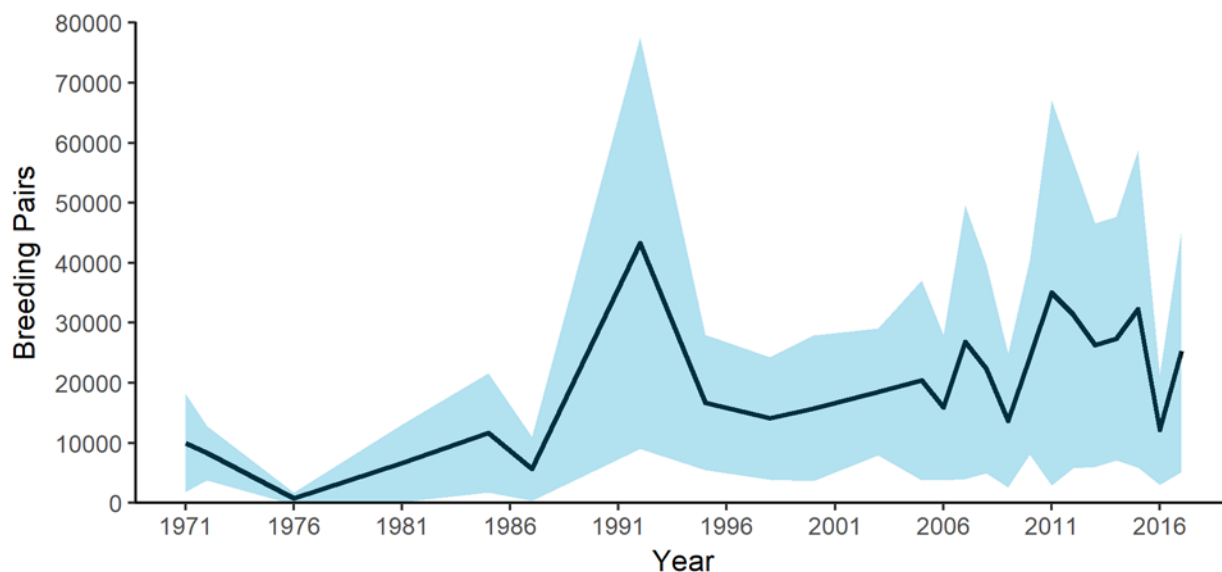


Figure 5.2-6 Indicated Breeding Pair of Ring-Necked Ducks in Southern Ontario, 1971–2017, black line represents the breeding pair estimate while the shaded area represents the 95% Confidence Intervals.

5.2.2 Harvest

Ring-necked Ducks are a sought-after species by hunters, with an average of 37 000 birds taken annually in Canada in the past 10 years (Figure 5.2-7), which represents approximately 5.5% of the combined U.S. and Canada harvest (e.g., 467 894 birds in 2016). Historically, the Ring-necked Duck has been, and remains, one of the top-five hunted ducks in Canada.

5.2.3 Management and Conservation Concerns

The Ring-necked duck use permanent wetlands in remote northern areas; thus, opportunities for management of breeding and post breeding habitats are limited. Acidification may be contributing to reduced reproductive success in some northern wetlands, but the population have been increasing continentally since the 1970.

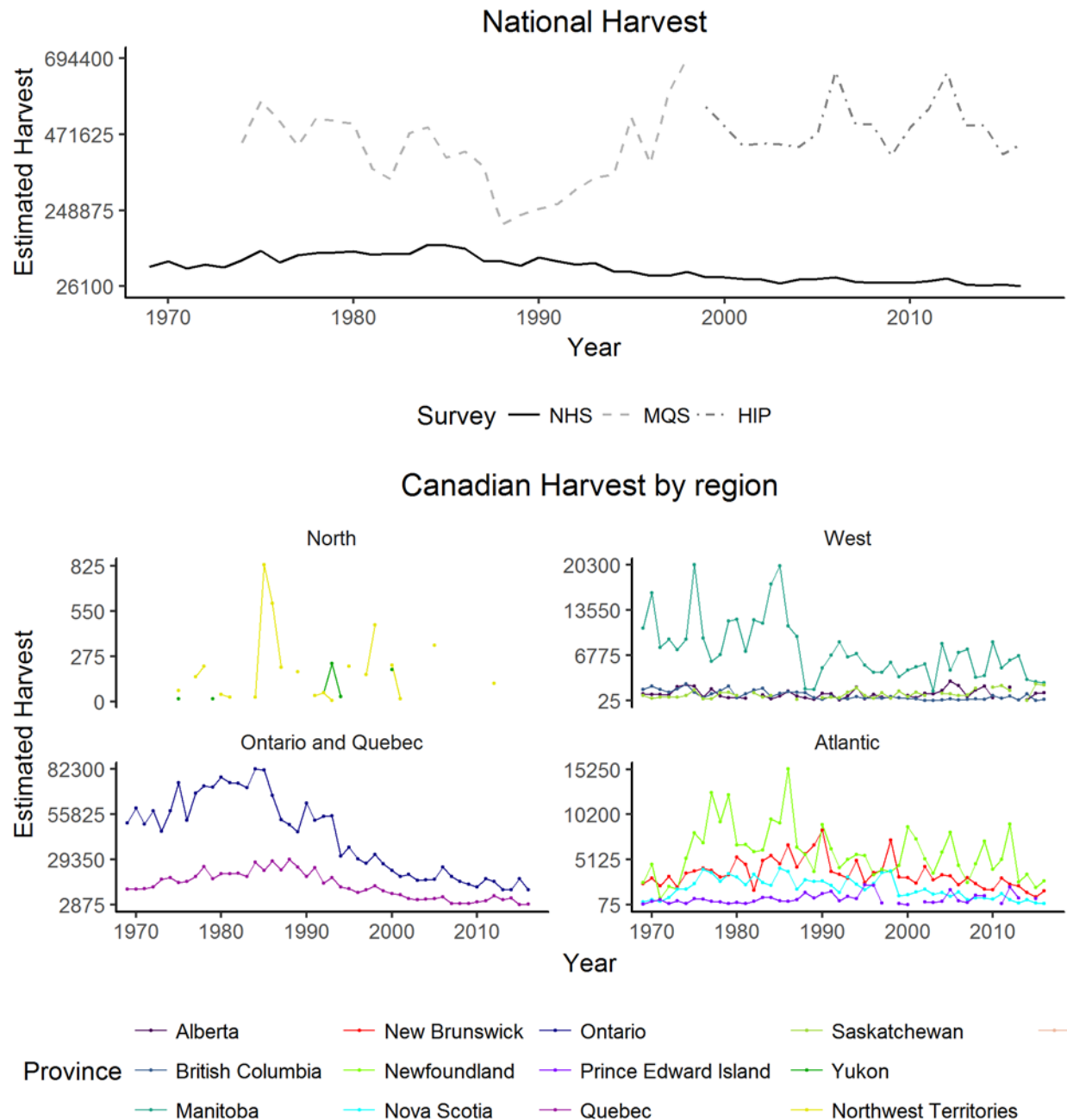


Figure 5.2-7 Estimated harvest for the Ring-Necked Duck in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

5.3 Redhead (*Aythya americana*)

The Redhead breeds exclusively in North America and primarily in the Prairie Pothole Region of Canada and the U.S. Nests are constructed in dense emergent vegetation of deep marshes. The Redhead is the most likely to demonstrate facultative brood parasitism (Woodin and Michot 2002).

5.3.1 Abundance and Trends

The Redhead is monitored mainly in its core breeding range through the Waterfowl Breeding Population and Habitat Survey (WBPHS) in western Canada.

LARGE-SCALE WATERFOWL SURVEY

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

Redhead numbers have shown a significant increasing trend over the 10-year and longer term in the traditional survey area, as well as in the Canadian Prairies (Table 5.3-1). However, the short-term trend for the U.S. Prairies suggests that the Redhead population in this region is undergoing a significant decline. Data suggest that the Alaska population of the Redhead has been drastically reduced, with no birds of this species observed since 2012 in the region. The continental population in the survey area as a whole is well above the NAMWP goal of 638 850 birds (NAWMP 2012), as well as the population in the Canadian Prairies (Figure 5.3-1).

Table 5.3-1. Redhead Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	1285 (1059 - 1512)	1110 (930 - 1290)	2.10*	2.43*	-1.58
Alaska	0 (0 - 0)	0 (0 - 0)	NA	NA	NA
Western Boreal Canada	95 (53 - 138)	53 (34 - 71)	-1.27*	-2.96	7.77
Canadian Prairies	1001 (786 - 1215)	881 (708 - 1053)	3.09*	4.55*	5.55*
U.S. Prairies (North Central)	189 (132 - 247)	177 (130 - 223)	1.66*	-2.90	-19.9*

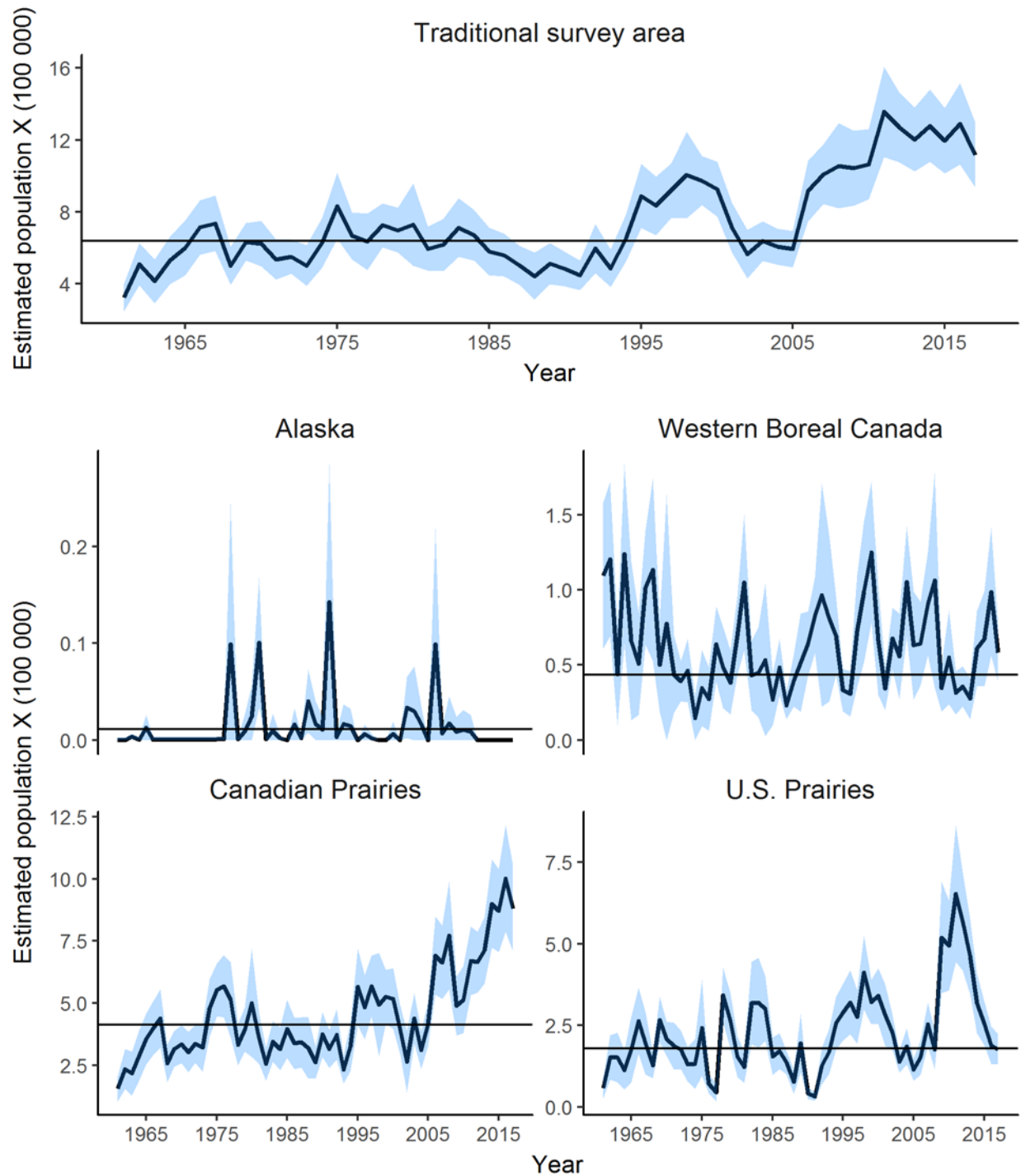


Figure 5.3-1 Redhead Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals (Horizontal lines represent the NAWMP goal in each region of the survey)

SMALL-SCALE WATERFOWL SURVEY

Table 5.3-2. Redhead Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)					
Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	2006–2017	2008–2017	2013–2017
Central Interior Plateau of BC	1.94 (0.43-3.46)	1.18 (0.03-2.33)	9.61	5.89	10.97

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

Population estimates for Redhead in the Central Interior Plateau of British Columbia show an increasing over the last 5 years (Table 5.3-2, Figure 5.3-2).

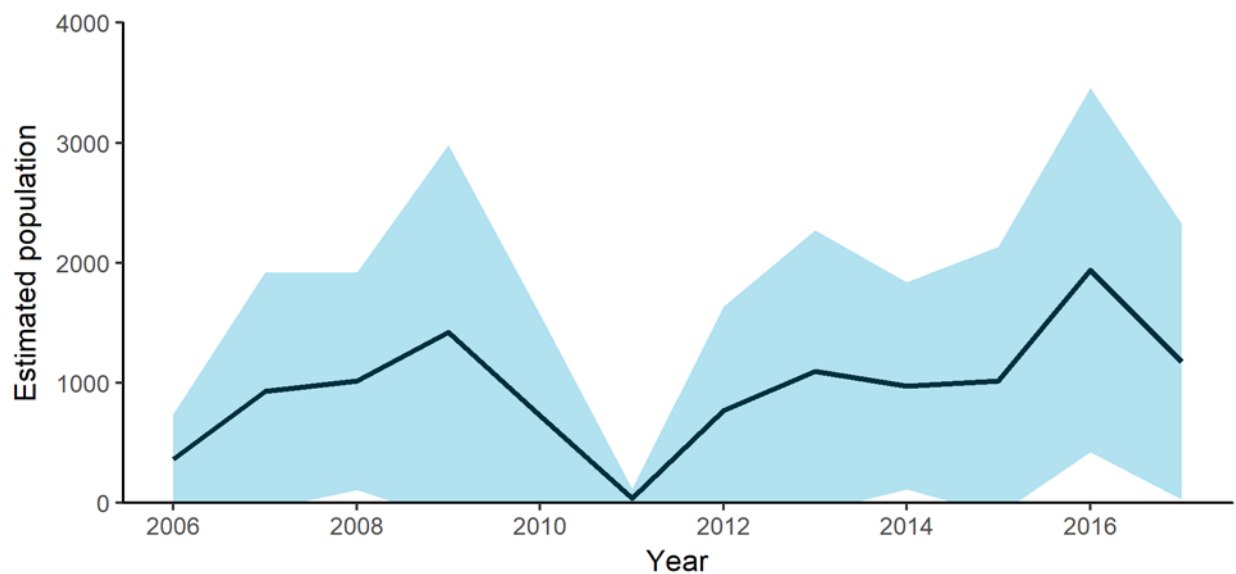


Figure 5.3-2 Population Estimates of Redheads in British Columbia Central Plateau, 2006–2017, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

5.3.2 Harvest

In 2005, the number of Redheads harvested in Canada (approximately 36 000 birds) reached a level that had not been observed since 1986, but the average harvest in Canada over the past 10 years has been of approximately 21 000 birds. The U.S. harvest of this species is about 10 times larger than the Canadian harvest, with approximately 230 000 birds harvested every year in the last decade (Figure 5.3-3).

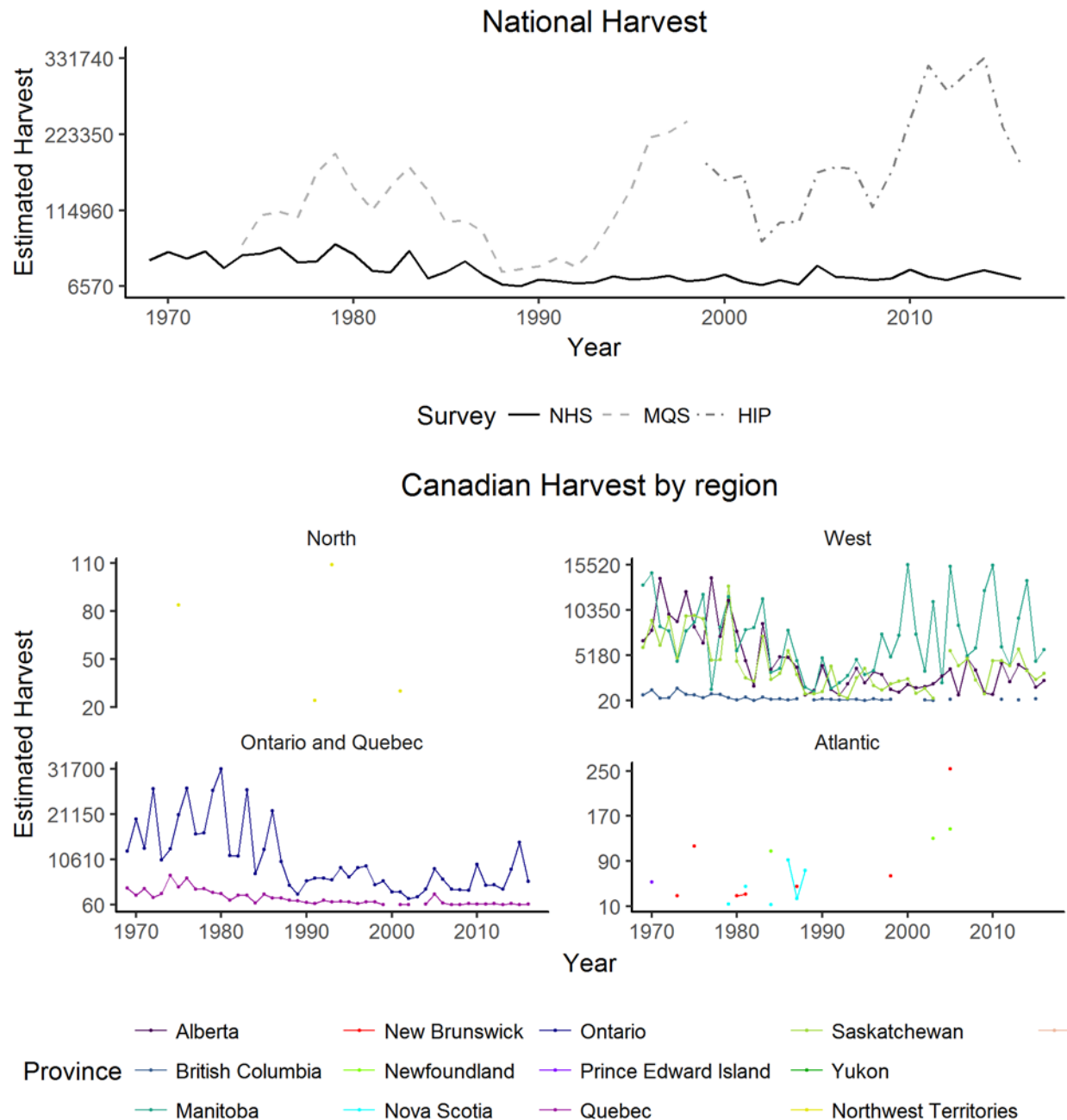


Figure 5.3-3 Estimated harvest for the Redhead in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

5.3.3 Management and Conservation Concerns

The abundance of wetlands in the Prairies play a key role in the number of Redhead breeding pairs, but predation pressure, which increases during periods of drought and when water levels drop, is important as well (Woodin and Michot 2002). Redhead hens are also more prone to parasitize Canvasback nests during drought which affect the community dynamic of both species (Péron and Koons 2012).

5.4 Canvasback (*Aythya valisineria*)

The Canvasback is the largest diving duck species in North America. It is also one of the least abundant waterfowl species in Canada. The Canvasback is a primary host for parasitic egg-laying by the Redhead and brood parasitism is an important factor affecting its nesting success (Mowbray 2002).

5.4.1 Abundance and Trends

The core breeding area of the Canvasback is in the Prairie and Parklands Region of the Prairie Provinces, but the species is also found in the U.S. Prairies, Alaska, British Columbia, Yukon and areas of the western edge of the Northwest Territories. The Canvasback is monitored in its core breeding area mainly through the Waterfowl Breeding Population and Habitat Survey in western Canada (WBPHS; Figure 5.4-1).

LARGE-SCALE WATERFOWL SURVEY

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

In most of the survey regions, Canvasback numbers have been closely monitored and have, for the past two decades, remained most years above the NAMWP population objective, this following a period of decline in the early 1980s. The continental population of Canvasbacks shows significant increasing long-term (1961–2017) trends in the Canadian and U.S. Prairies as well as Alaska (Table 5.4-1). Overall, Canvasbacks are above or at the NAWMP goals in all regions of the survey area (Figure 5.4-1).

Table 5.4-1. Canvasback Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])

WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	730 (595 - 864)	732 (611 - 853)	0.71	2.67*	-1.67
Alaska	75 (20 - 130)	84 (18 - 151)	1.84*	2.08	20.23*
Western Boreal Canada	176 (91 - 261)	149 (93 - 206)	-0.74	0.89	6.33
Canadian Prairies	396 (313 - 479)	436 (355 - 516)	1.19*	3.33*	-2.53
U.S. Prairies (North Central)	82 (51 - 113)	63 (40 - 86)	2.86*	2.89	-15.54*

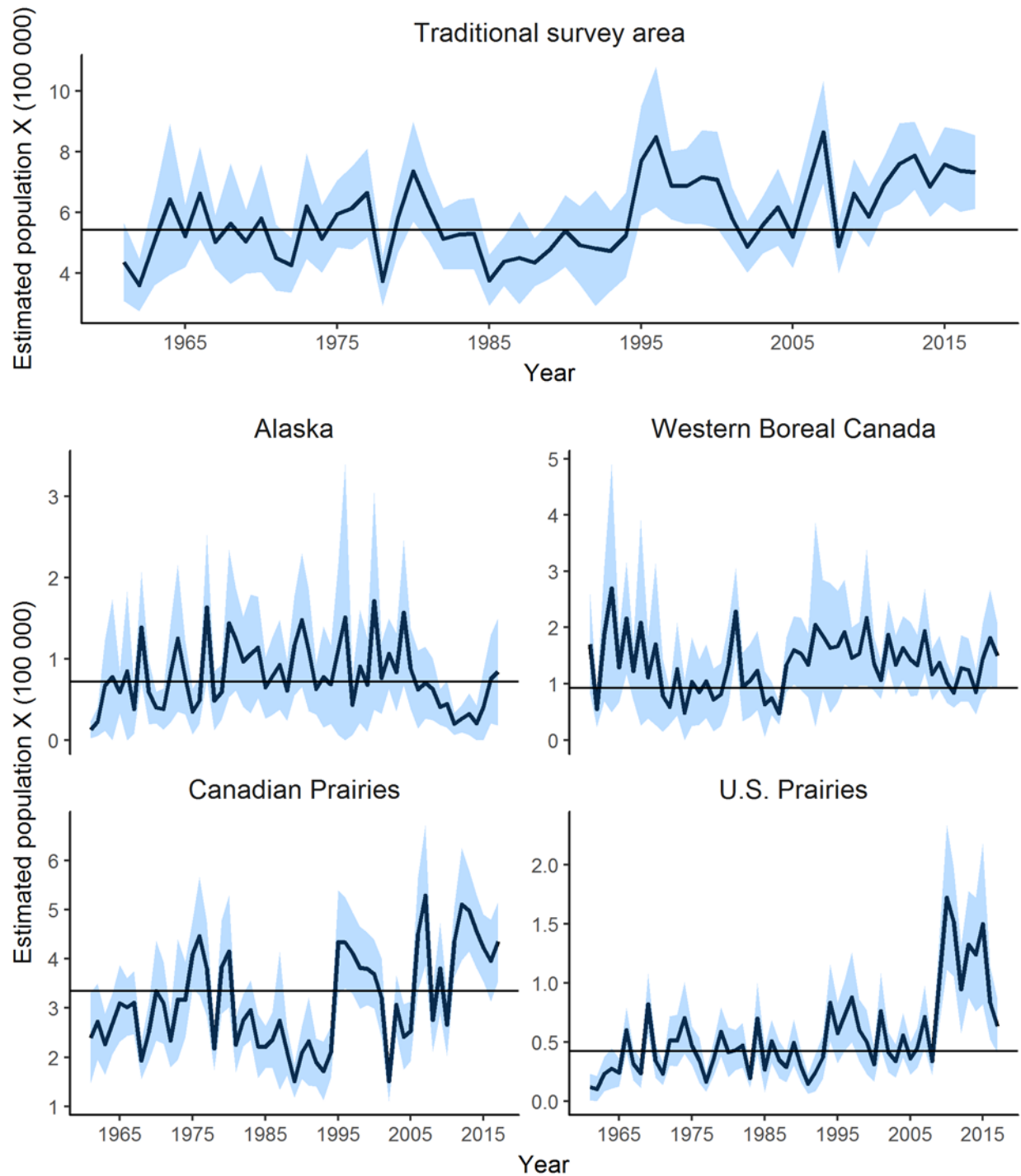


Figure 5.4-1 Canvasback Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals (Horizontal lines represent the NAWMP goal in each region of the survey)

SMALL-SCALE WATERFOWL SURVEYS

Table 5.4-2. Canvasback Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)

Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	2006–2017	2008–2017	2013–2017
Central Interior Plateau of BC	0.16 (-0.16-0.49)	0.24 (-0.09-0.58)	-13.52*	-14.38*	-16.67

COOPERATIVE YUKON ROADSIDE WATERFOWL BREEDING POPULATION SURVEY

Despite the population varying considerably year to year, the species appears to exhibit a relatively stable trend since the survey began in 1991 (Figure 5.4-2).

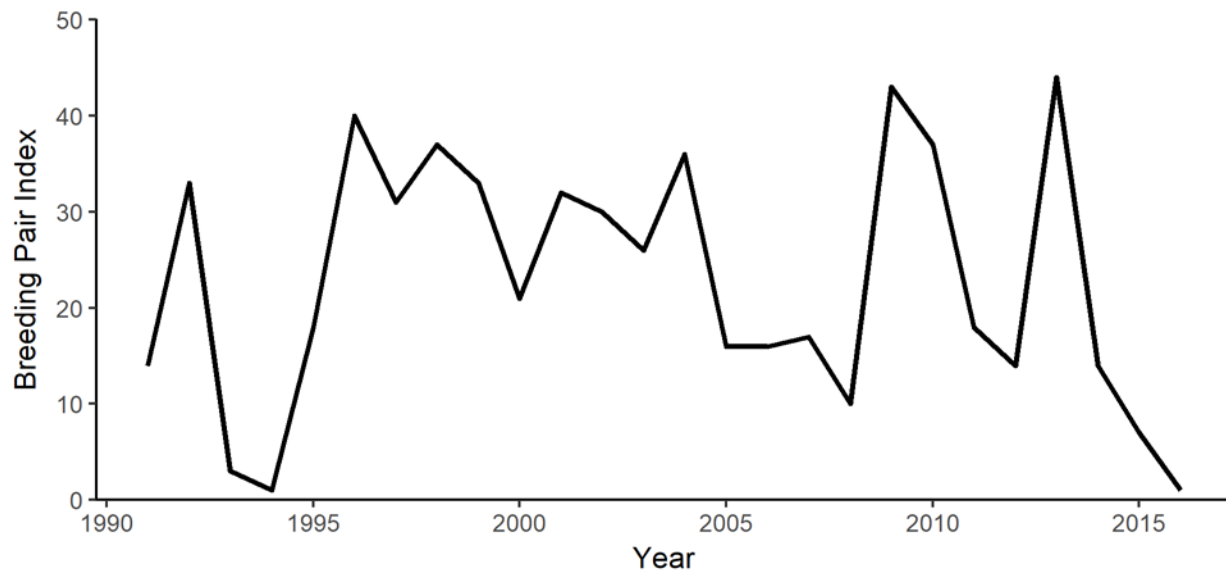


Figure 5.4-2 Breeding Pair Index for the Canvasback in Southern Yukon, 1991–2016

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

Despite an increase in the population to 240 in 2017 from 160 in 2016, Canvasback are experiencing a significant decline in population in this area (-13.5%; Table 5.4-2, Figure 5.4-3).

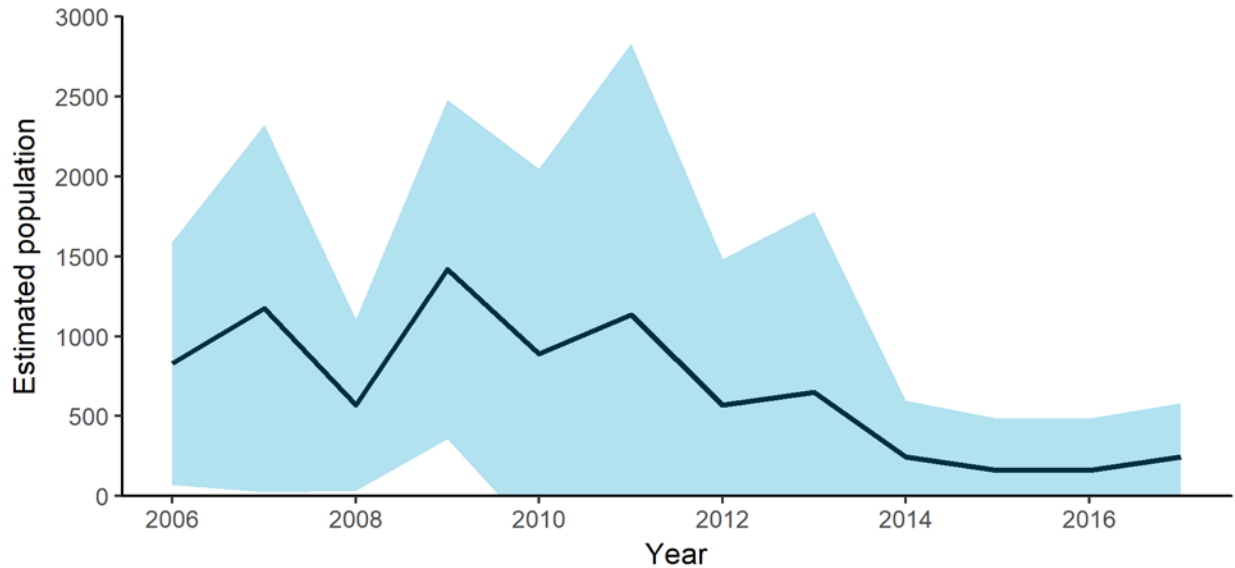


Figure 5.4-3 Population Estimates of Canvasbacks in British Columbia Central Plateau, 2006–2017, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

5.4.2 Harvest

In Canada, Canvasbacks are mostly harvested in the Prairie Provinces. Harvest has declined in part because of the reduced number of hunters but also because there are currently harvest restrictions on Canvasback in British Columbia and Manitoba. The majority of the continental harvest takes place in the U.S. (Figure 5.4-4).

5.4.3 Management and Conservation Concerns

Canvasback breeding populations have increased since the 1990s and have remained above or near the NAWMP goal (NAWMP 2012) since then. These increased population levels have coincided with the return of favourable breeding conditions in the Prairies. Much of the variation in this species' abundance is due to changes in the abundance of wetland on the Prairies breeding ground due the wet-dry cycle of the region.

Coastal development and reduced water quality in wintering areas are factors that are thought to reduce the size of the continental population. In addition, Canvasback nests are often parasitized by Redheads, who use them to lay their eggs. Parasitized nests are often deserted, thereby affecting Canvasback nesting success and productivity (Mowbray 2002; Péron and Koons 2012).

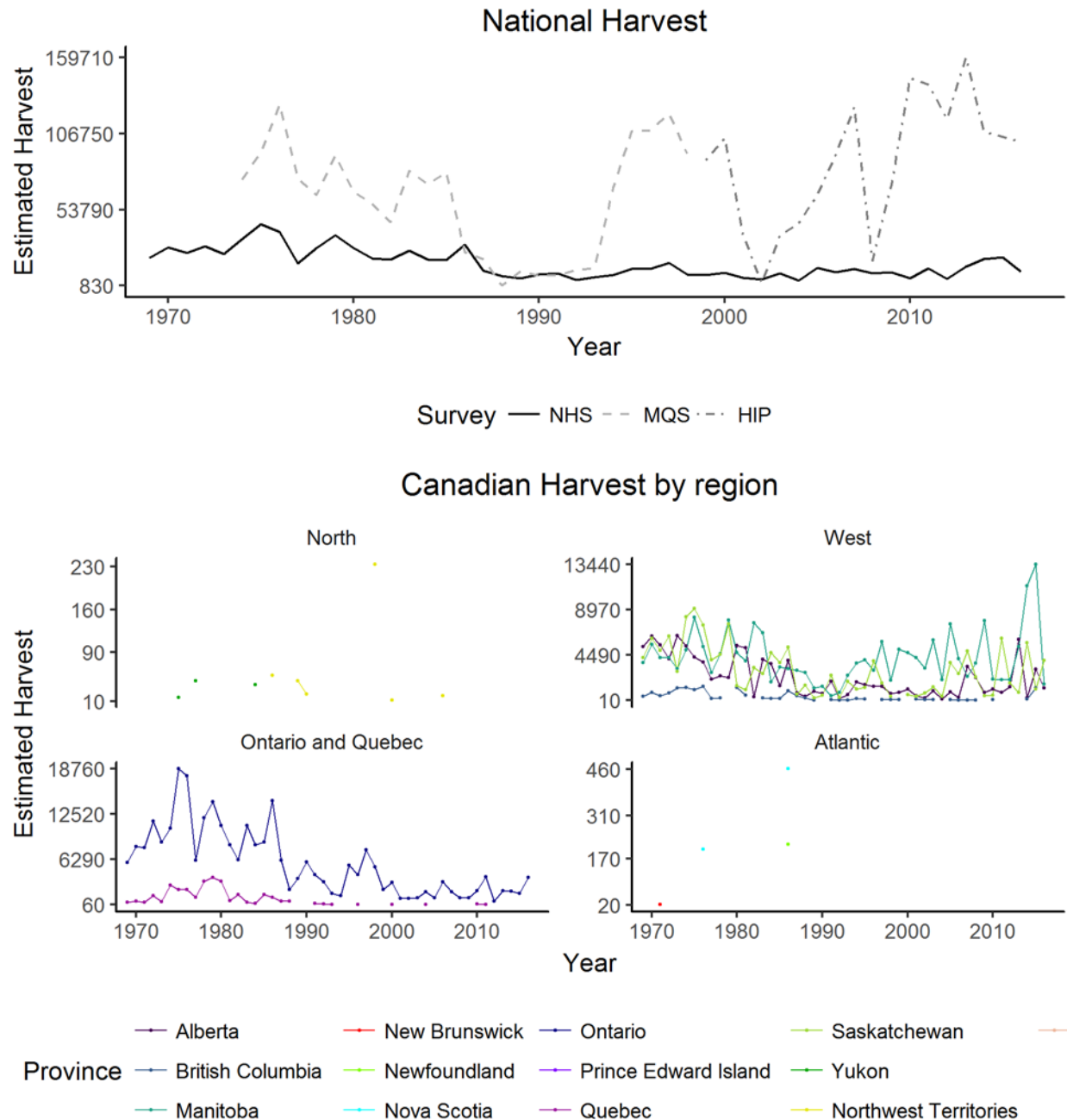


Figure 5.4-4 Estimated harvest for the Canvasback in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

5.5 Ruddy Duck (*Oxyura jamaicensis*)

The Ruddy Duck is not an abundant species in Canada and is mainly found in the Prairie Pothole Region. The Ruddy Duck winters in saline coastal habitats and large inland water bodies in the U.S. and Mexico (Brua 2002). Ruddy Duck numbers are stable or increasing throughout most of the species' breeding range and are one of the least harvested ducks in Canada.

5.5.1 Abundance and Trends

The core breeding area of the Ruddy Duck is in the Prairie and Parklands, but the breeding range extends in Alberta and British Columbia. In Canada the Ruddy Duck is monitored in its core breeding area mainly through the Waterfowl Breeding Population and Habitat Survey in western Canada (WBPHS; Figure 5.5-1), as well as the Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C (Figure 5.5-2).

LARGE-SCALE WATERFOWL SURVEY

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

The Ruddy Duck continental population and the U.S. and Canadian Prairie populations have been showing a significant increasing long-term trend (Table 5.5-1).

Table 5.5-1. Ruddy Duck Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	1069 (794 - 1345)	981 (679 - 1283)	2.12*	6.78*	9.3*
Alaska	0 (0 - 0)	0 (0 - 0)	NA	NA	NA
Western Boreal Canada	186 (49 - 322)	56 (9 - 104)	-0.48	6.08	10.92
Canadian Prairies	618 (401 - 835)	701 (419 - 983)	2.44*	11.4*	9.55*
U.S. Prairies (North Central)	266 (165 - 366)	224 (125 - 322)	3.84*	-1.64	5.44

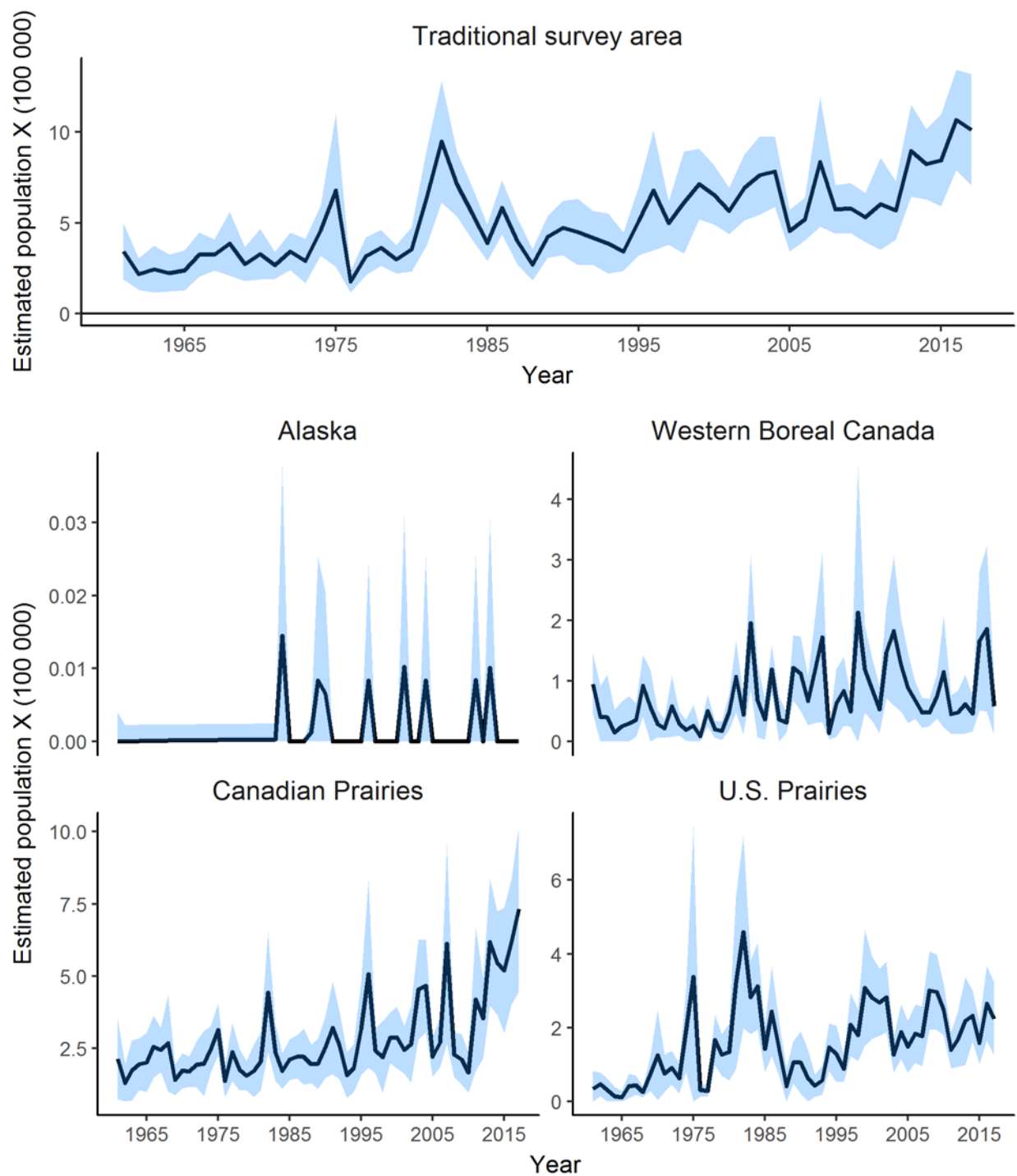


Figure 5.5-1 Ruddy Duck Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

SMALL-SCALE WATERFOWL SURVEY

Table 5.5-2. Ruddy Duck Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)

Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	2006–2017	2008–2017	2013–2017
Central Interior Plateau of BC	3.36 (0.65-6.07)	3.29 (0.57-6.00)	-4.37	-2.15	-1.84

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

The Ruddy Duck has shown variability in population from year to year, but overall is experiencing a decreasing population trend over the long-term (2006–2017; Table 5.5-2, Figure 5.5-2).

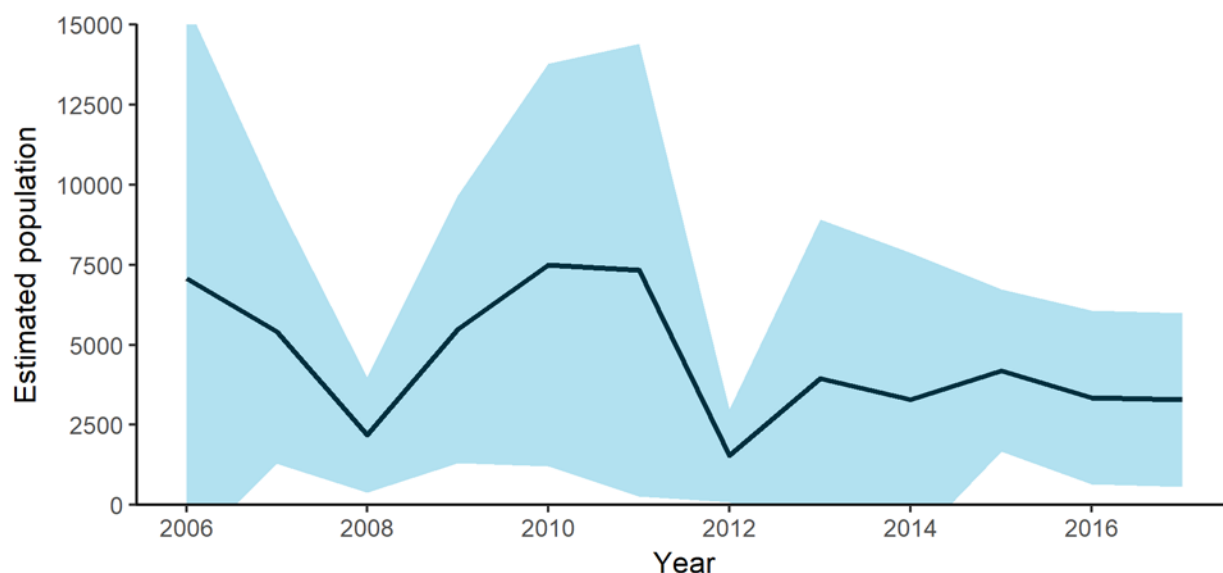


Figure 5.5-2 Population Estimates of Ruddy Duck in British Columbia Central Plateau, 2006–2017, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

5.5.2 Harvest

The Ruddy Duck is one of the least harvested species in North America. In Canada, the average yearly harvest in the last 20 years has been approximately 2 000 birds, with most of the harvest taking place in Ontario (Figure 5.5-3). The 2016 harvest estimate is the largest it has been since 1997, at 3 827 birds.

5.5.3 Management and Conservation Concerns

Ruddy Ducks are prone to accumulate contaminants such as polychlorinated biphenyls, selenium and heavy metals including lead because of their diet (Brua 2002). Degradation of wintering habitat in the Salton Sea in California and Chesapeake Bay in Virginia and Maryland could also be a threat to this species (Brua 2002).

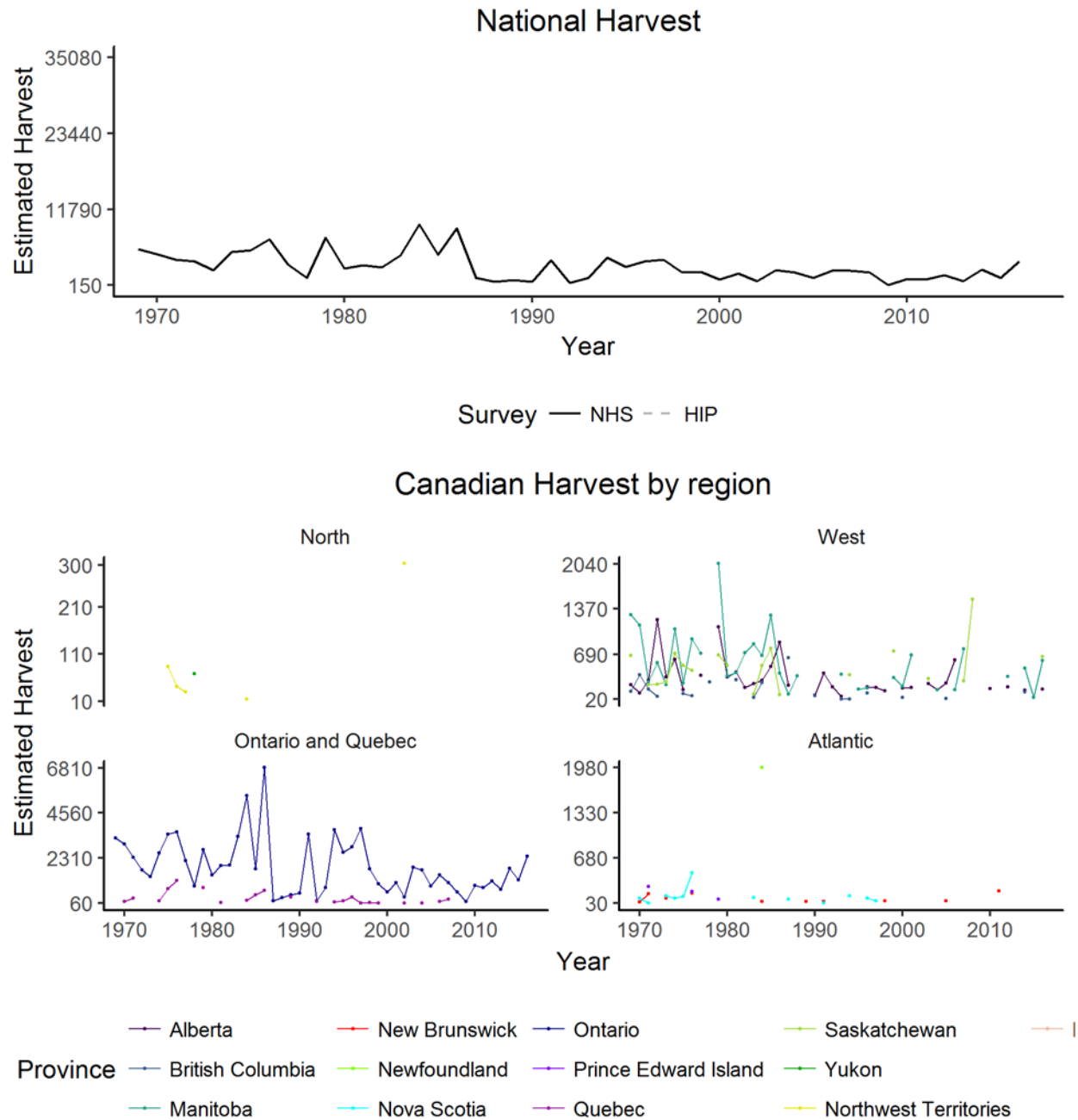


Figure 5.5-3 Estimated harvest for the Ruddy Duck in Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>).

6. Population Status of Sea Ducks

There are 15 sea ducks species in the continent (Bowman *et al.* 2015). Most sea ducks breed at low densities in remote parts of the continent over broad geographic areas, and moulting and wintering birds often gather on large lakes and in coastal waters. Thus, surveying sea ducks is expensive. Most species of sea ducks are poorly monitored by traditional waterfowl surveys, and information on population size and trend for most species is unreliable (Bowman *et al.* 2015). The WBPHS, which is used as a basis for setting population goals for many North American waterfowl, is completed during the spring, but is not well designed to survey sea duck populations. Issues arise from the fact that the core breeding range of about half of the sea duck species is not covered by the WBPHS, and also because the survey is not optimally timed to capture peak counts of breeding sea ducks, which generally nest later than dabbling ducks. Additionally, some groups of sea ducks have not been differentiated into species in the past during the WBPHS (e.g., scoters, goldeneyes, mergansers). Furthermore, sea ducks have not been banded in large numbers. Much of our knowledge is therefore based on a very few, localized studies. Based on limited data, 10 of the 15 species were declining in the 1980s and 1990s (Boyd *et al.* 2015; Koneff *et al.* 2017). More recent analysis indicates that most species are currently stable, albeit at a lower level than the populations have been observed in the past. The causes of past and present declines remain largely unknown (Bowman *et al.* 2015).

Sea ducks are characterized by high adult survival, delayed maturation, and low reproductive rates which make their populations sensitive to factors that influence adult survival such as harvest (Koneff *et al.* 2017). Even though harvest rates are low for sea ducks, it is believed that reductions in harvest levels may be needed to help stabilize those populations. Determining what the annual harvest should be is a priority to achieve sustainability (Rothe *et al.* 2015). In Canada, harvest levels are poorly documented. In part because the Harvest Questionnaire Survey, a national survey, does not adequately sample sea duck hunters that are living predominantly in the coastal regions.

The Sea Duck Joint Venture (SDJV) was formed in 1999 under the auspices of the NAWMP to address concerns about the status of sea ducks (Sea Duck Joint Venture Management Board 2014). The SDJV is a conservation partnership that provides funding and coordination to support research and monitoring of North American sea ducks. Partners include federal (U.S. and Canada), state and provincial wildlife agencies, private conservation groups, and academics. Its purpose is to improve knowledge about sea duck life histories and limiting factors to improve management and address concerns about population declines. A SDJV Strategic Plan was developed for 2014–2018. This plan identifies information needs for sea ducks and describes general strategies to address those needs.

6.1 Eiders

Common and King Eiders inhabit Arctic and Subarctic coastal marine habitats and have a circumpolar distribution. Their breeding range in Canada is extensive and covers most coastlines, from the Beaufort Sea east into the Coronation and Queen Maud gulfs, and north into the High Arctic islands, as well as areas throughout the eastern Canadian Arctic, including Ungava, Hudson and James bays, and from the coast of Labrador, farther south to the St. Lawrence Estuary in Quebec, and south into Nova Scotia. Eiders that breed in Canada and that winter as far north as open water persists form large aggregations in coastal areas. In the Pacific, they winter as far north as the polynyas (areas of open water surrounded by sea ice) adjacent to the Chukotka Peninsula in Russia, while in the northwest Atlantic they winter in Hudson Bay, southwest Greenland, and from the Labrador coast south to New York. There are four subspecies of Common Eiders and two populations of King Eiders, and the two populations of King Eiders are thought to be demographically distinctive, as they experience different climatic conditions and locally specific threats.

Eiders have long been exploited for food and eiderdown, and more recently they have become the focus of outfitted hunts along the eastern seaboard of the U.S. Market hunting almost extirpated them from eastern North America by the end of the 19th century. The Migratory Birds Convention (1916) designated

special protection to eiders and largely eliminated commercial hunting in North America. More recently, commercial exploitation of eiders in Greenland has led to concern for the sustainability of eiders wintering there (Hansen 2002; Gilliland *et al.* 2009). Unlike other species of migratory birds in North America, Common Eiders in some areas of eastern Canada support large commercial and subsistence harvests of eiderdown, a harvest that provides a cash crop in areas with low employment, or that is used locally for insulation in Inuit parkas, supporting local economies.

Industrial activity in Canada's north is likely to increase in the next few decades. There is renewed interest in offshore oil and gas development in the Beaufort Sea, as well as in some areas in the eastern Arctic. Marine shipping is likely to increase in the Arctic as well, especially in the Hudson Strait. Both the Beaufort Sea and the Hudson Strait have important marine resting and feeding areas used by thousands of eiders during certain times of the year. Increased human activity in these areas could negatively affect eiders through disturbance and pollution from accidental spills or chronic discharge.

The remoteness of much of the breeding and wintering range of eiders, the existence of several distinctive populations, and the fact that eiders do not use recognized North American flyways all have been factors that have led to inconsistent or absent management and monitoring programs across Canada. Canada has a core responsibility for the management of eiders, but better collaboration is needed with Canadian northern wildlife management boards, as well as with Russia, Greenland, France (Saint-Pierre and Miquelon), and the U.S.

6.2 Common Eider (*Somateria mollissima*)

Common Eiders inhabit Arctic and Subarctic coastal marine habitats and have a circumpolar distribution that includes Russia, Alaska, Canada and Greenland. The species spends its entire life cycle in marine environments; it nests in large colonies mostly on marine islands and forms large aggregations in inshore coastal regions during the nonbreeding season. There are four subspecies of Common Eiders.

6.2.1 Abundance and Trends

PACIFIC COMMON EIDER

More than half of the Pacific Common Eiders (*Somateria mollissima nigra*) that breed in Canada nest in the central Canadian Arctic (Dolphin and Union Strait, Coronation Gulf, and Queen Maud Gulf). Their staging and moulting areas are not well known. Pacific Common Eiders may overwinter in the Arctic Ocean, but most are believed to winter in Alaska, in the Bering Sea, as well as further south in the Aleutian Region.

Pacific Common Eiders are monitored intermittently by aerial surveys conducted in the core of the Canadian breeding range in the Central Arctic region. Beginning in 1995, aerial and ground surveys were conducted over three years to document the size and location of nesting colonies, to provide a breeding population estimate for the region, and to establish a baseline for monitoring Pacific Common Eider populations in the future. At that time, the breeding population for the central Arctic was estimated at about 37 000 eiders, and the primary nesting areas were identified as the southeastern Dolphin and Union straits, outer Bathurst Inlet, Melville Sound, Elu Inlet, and central Queen Maud Gulf (L. Dickson, pers. comm.). Aerial surveys in the Bathurst Inlet area were conducted in late June 1995, and again between 2006–2008, to establish a baseline for monitoring Pacific Common Eider breeding population trends (Raven and Dickson 2008). At a subset of 24 colonies in the same area, nest success and annual survival of adult females were monitored over a 7-year period starting in 2001 (Hoover and Dickson 2007). Aerial surveys were conducted in the Queen Maud Gulf area in late June 2014 and in Bathurst Inlet starting in 2015. The surveys were conducted to establish long-term monitoring of population trends by providing more extensive coverage of the breeding range of Pacific Common Eiders. The Canadian aerial surveys indicate that the population declined by 50% between 1995 and 2007–2008 at key breeding sites in Bathurst Inlet, NU. Surveys conducted in 2015 and 2016 showed that the population had stabilized but there were no signs of recovery towards 1995 numbers. The declines observed in Queen Maud Gulf are more severe, with 78% fewer eiders detected there in 2016 than in 1995. In addition, a

count is obtained about every 10 years during the spring migration at Point Barrow, Alaska (Suydam *et al.* 2000; Quakenbush *et al.* 2009). The counts at Point Barrow are considered less reliable but tend to support the results of the Central Arctic Survey, with an observed decline of 53% over a 20-year period, from approximately 156 000 birds in 1976 to 73 000 birds in 1996. Counts in 2003 and 2004, however, suggested that this subspecies numbers had increased to over 100 000 eiders.

Satellite telemetry of eiders from a nesting colony near Bathurst Inlet, Nunavut, indicated that most of these eiders winter off the southeast coast of Chukotka Peninsula, Russia, and off the coast of St. Lawrence Island, Alaska (Dickson 2012). About one third of the males also moult off the Russian coast in the summer.

NORTHERN COMMON EIDER

The northern subspecies of the Common Eider (*S. m. borealis*) breeds on small islands throughout the coastal areas of the eastern Canadian Arctic and Greenland, and winters along the coasts of Newfoundland and Labrador, Quebec's Gulf of St. Lawrence, and southwest Greenland.

There is no recent trend estimates for most of this subspecies' breeding area: its very large distribution in the Canadian Arctic makes it difficult to monitor. Historical data exist for a few areas only: these are Ungava Bay, coastal Labrador, East Bay Southampton Island and Hell Gate (High Arctic), and Digges Sound.

A winter monitoring program was implemented in 2003 to monitor the component of this subspecies' population that overwinters in Canada. The entire wintering range of Northern Common Eiders in eastern Canada (and Saint-Pierre and Miquelon, France) has been surveyed every third winter since the survey was implemented. Estimates of adult male Eiders from 2003–2009 suggest that the Canadian overwintering component has been stable over this period, but the 2012 estimate was significantly greater than previous estimates (Figure 6.2-1). The most recent survey was conducted in February 2015 and the adult male population estimate is close to the estimates obtained during the 2003–2009 period. The population trend since 2003 is stable.

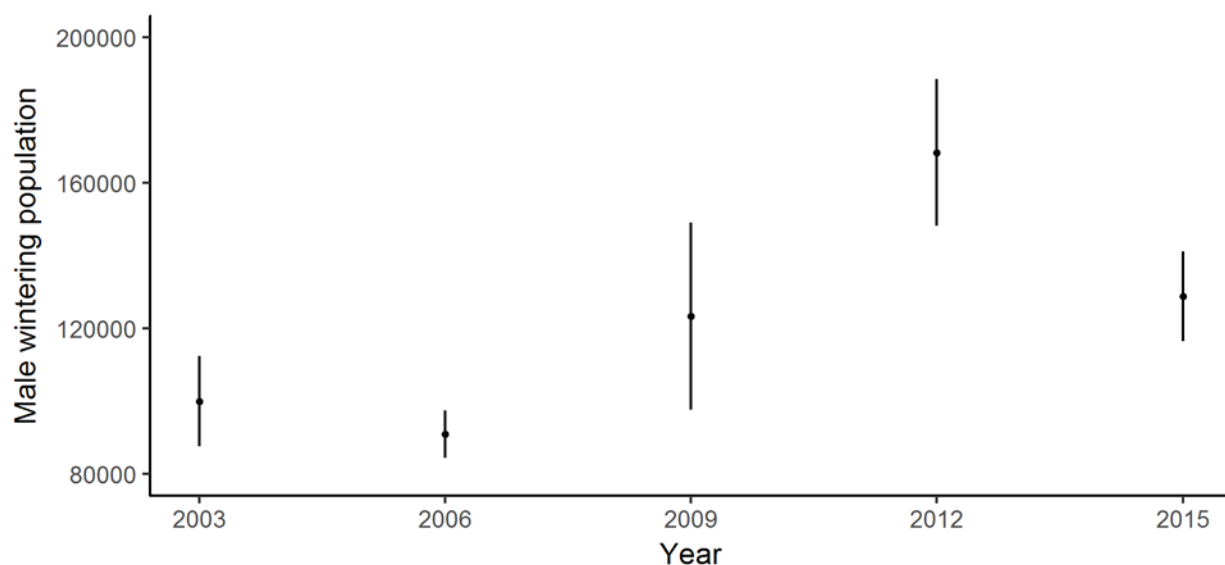


Figure 6.2-1. Estimated population size of the Adult Males Wintering Population for the Northern Common Eider 2003-2015. Black dot represent the population size while the black line represent the 95% Confidence Intervals.

HUDSON BAY COMMON EIDER

The Hudson Bay subspecies of the Common Eider (*S. m. sedentaria*) breeds within Hudson Bay and winters in open water leads near the Belcher Islands and off the western coast of Quebec. The Hudson Bay Common Eider is one of the only waterfowl species in the world that spends the entire year in Arctic waters.

Breeding data for this subspecies exist only for the Belcher Islands and the area of La Perouse Bay, Manitoba. The Belcher Islands, first surveyed in the 1980s, were surveyed again in 1997. The results showed that the breeding population had declined by 70% since the late 1980s, apparently due to winter weather events (e.g., freezing of polynyas: areas of open water surrounded by sea ice) that led to high levels of mortality in 1992 (Robertson and Gilchrist 1998). The CWS initiated research into the winter ecology of Hudson Bay Common Eiders in 1998. The three winters that followed were mild, with vast expanses of open sea available to foraging flocks. There have been no known significant winter mortality events since this work began.

AMERICAN COMMON EIDER

The American Common Eider (*S. m. dresseri*) population estimate was approximately 240 000 birds in 2010, based on a few regional surveys and experts' opinions in the population distribution range (C. Lepage, CWS–Quebec Region, pers. comm.). Reliable data for breeding areas exist only for segments of the population that breed in colonies in the St. Lawrence Estuary and the North Shore of the Gulf of St. Lawrence, Quebec. Recent numbers in Quebec's surveyed areas total about 44 000 breeding pairs (C. Lepage, CWS–Quebec region, unpubl. data). The actual population in the estuary has been stable, based on the trends of the five largest colonies (Pannetier Lebeuf and Giroux 2014). Numbers in colonies are thought to have mostly recuperated from a cholera episode in 2002, which killed about 20% of breeding females in this area (Diéval *et al.* 2011). The segment of the population breeding along the Gulf of St. Lawrence is increasing at about 7% per year and is now more than three times higher than what numbers used to be between 1925 and 1988 (Rail and Cotter 2015).

The number of eiders breeding in northern Newfoundland and southern Labrador appears to be

increasing (Bowman *et al.* 2015). There is little information on the status of the population segments breeding in the southern portion of this subspecies' range. Eiders breeding in New Brunswick have been experiencing a long-term decline of about 3% per year (Bowman *et al.* 2015) which has continued through 2017 (K. Conner unpublished data). Anecdotal information for Nova Scotia suggests declines in the number and size of breeding colonies in these areas as well.

Aerial surveys conducted in the Estuary and Gulf of St. Lawrence in August 2010 reported 152 000 moulting eiders (CWS–Quebec region, unpubl. data), which represent a large proportion of this subspecies' population at that time of the year.

6.2.2 Harvest

The National Harvest Survey provides information regarding the harvest of eiders, but does not distinguish between the various subspecies of Common Eiders. The harvest of this species in Canada has been gradually declining since the 1970s, from an average of approximately 27 000 birds taken annually, to approximately 17 000 birds over the past decade (Figure 6.2-2). The 2016 Canadian harvest estimate, at 12 346 birds, was one of the lowest for this species since the beginning of the survey with harvests in Nova Scotia and New Brunswick being near zero. In the U.S., eider harvest occurs only in Alaska and states of the Atlantic Flyway. The 2016 harvest of eiders (all subspecies together) was estimated at 6 600 birds (Roberts and Padding 2017). Local or subspecies-specific research and monitoring programs provide more detailed information on harvest for the Common Eider (see below).

PACIFIC COMMON EIDER

Harvest information for the Pacific Common Eider is limited, but suggests that a substantial harvest of eiders in eastern Russia is taking place. A rough estimate of the subsistence harvest in 2001 in Chukotka, Russia, was of 115 000 eiders (from four different species) [E. E. Syroechkovski Jr., Russian Institute of Ecology and Evolution, pers. comm.]. However, it is not known what percentage of this take is of Pacific Common Eiders originating from Canadian breeding grounds. The subsistence harvest of Pacific Common Eiders in Canada and Alaska is estimated at 2 500 birds per year (Fabijan *et al.* 1997).

NORTHERN COMMON EIDER

This subspecies is unique in that it is intensively harvested commercially in west Greenland. In Canada, it is subject to both subsistence and recreational harvest. Recent demographic modelling suggested that harvest levels in the 1990s and early 2000s were unsustainable (Gilliland *et al.* 2009). Most of the harvest occurred in Greenland and on the island of Newfoundland, but a population model indicated that the harvest level in Greenland was excessive, leading to a harvest allocation issue with Canada. More restrictive harvest regulations were put in place in Newfoundland in 1997, and in Greenland between 2002 and 2004 (Merkel 2010), resulting in a decrease in the overall harvest. Pressures to liberalize harvest in Greenland and Newfoundland continue.

Harvest information is estimated through the National Harvest Survey in Canada, but the estimates are thought to be imprecise for most sea duck species. The survey suggests that eider harvest has generally declined over the last 30 years. However, the harvest in Newfoundland and Labrador has been increasing since 2005, and unusually high levels close to 20 000 birds were recorded in 2007 and 2008. Such high levels had not been observed since the mid-1980s and may be unsustainable (Gilliland *et al.* 2009). The 2010–2013 average harvest estimate for the *borealis* subspecies was of about 9 000 birds. Most of the hunting takes place in Newfoundland, Labrador and Quebec. This subspecies is not harvested in the U.S., as it overwinters in Canada and Greenland.

HUDSON BAY COMMON EIDER

Hudson Bay Common Eiders are harvested (recreational harvest) throughout their range during the breeding season and more particularly in the Belcher Islands during winter, when they are concentrated in open waters. The annual harvest of eiders by Belcher Island residents was estimated at 6 000 birds in

1986 (Reed 1986). Egg and down collection takes place throughout the range during the breeding season, but its extent is unknown.

AMERICAN COMMON EIDER

The American Common Eider were among the most commonly harvested waterfowl in several coastal regions of eastern Canada and the U.S. The most recent harvest estimate was of approximately 18 000 birds (2011–2014 average), which is below the estimated sustainable harvest for this subspecies. Historically, the majority of the American Common Eider harvest has taken place in Canada. However, while the Canadian harvest has declined, the subspecies has become the focus of outfitted hunts along the eastern seaboard of the U.S. In 2013, approximately 65% of the total harvest took place in the U.S. The harvest in Nova Scotia has declined from about 10 000 to 15 000 birds per year in the early 1990s to less than 1 000 birds per year since 2011.

American Common Eiders are harvested not only as part of the recreational harvest, but also for Aboriginal subsistence use. As such, the species is locally important for some Aboriginal communities in Quebec and Atlantic Canada. Few estimates of subsistence harvest are available. Eiderdown harvest also represents an important economic activity in the St. Lawrence Estuary.

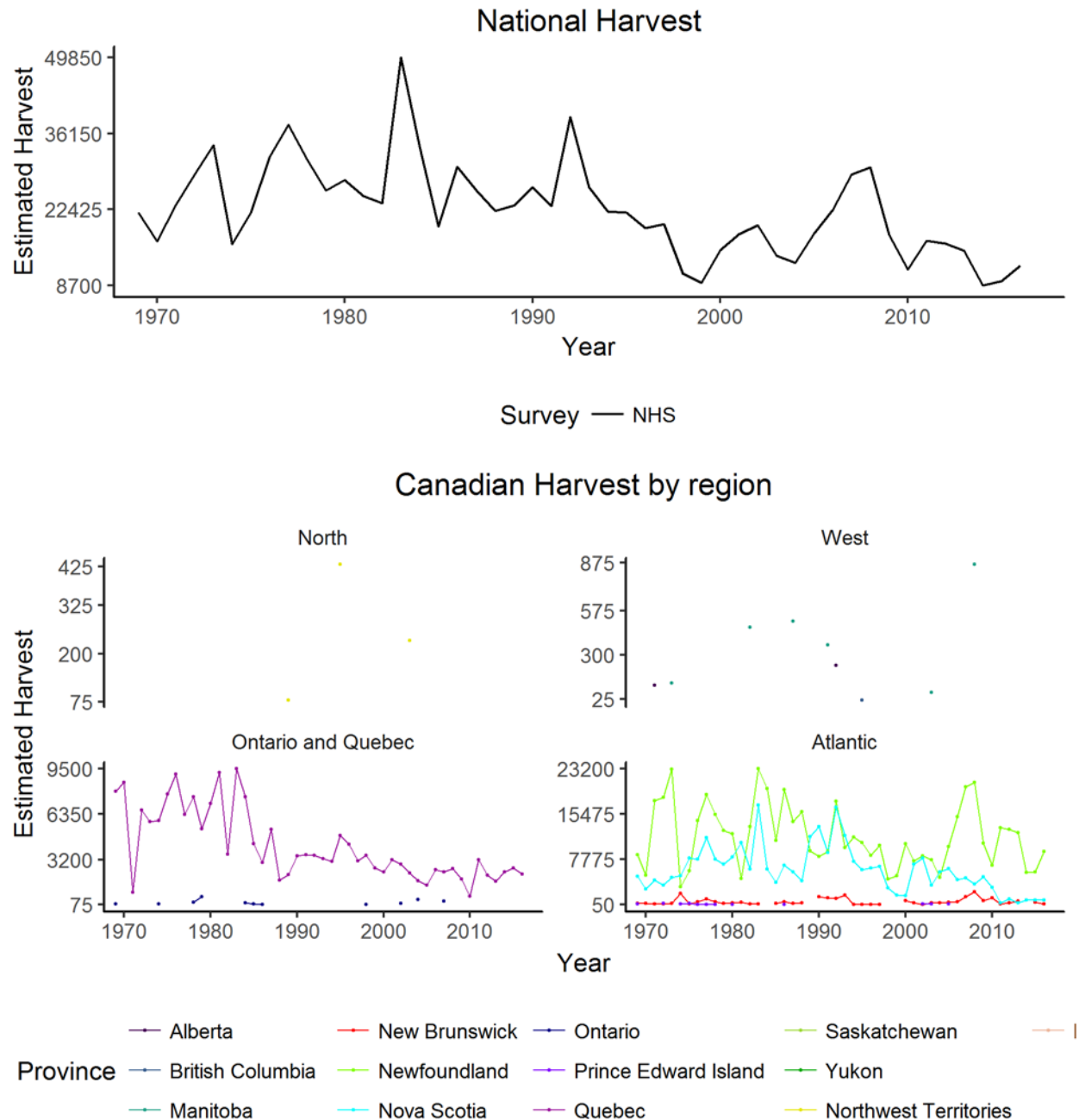


Figure 6.2-2 Estimated harvest for the Common Eider in Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

6.2.3 Management and Conservation Concerns

PACIFIC COMMON EIDER

Pacific Common Eiders are particularly vulnerable to shipping disturbance and oil spills because they congregate in large, dense, flocks during winter, moulting, and migration. Discovery of offshore oil and gas reserves in two key spring staging areas, combined with increasing resource development in Canadian Arctic breeding areas, will likely result in increased human activity and may have potential adverse effects on this subspecies' population.

NORTHERN COMMON EIDER

Emerging threats for Northern Eiders include disease, disturbance of breeding colonies by polar bears, increased shipping through the Hudson Strait, mortality from oil spills, and high harvest in Newfoundland. Cholera was detected on the East Bay Colony in 2005 (Descamps *et al.* 2012) and was subsequently detected at many colonies along the south coast of Hudson's Strait and Ungava Bay (Iverson *et al.* 2016). Similarly, Inuit from Nunavut and Nunavik have recently reported catastrophic losses at many breeding colonies as a result of polar bear activity. Although polar bear activity has been observed intermittently, it has never been observed at the current high levels (Iverson *et al.* 2014).

HUDSON BAY COMMON EIDER

The Hudson Bay Common Eider 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 portions of the population are concentrated in open-water leads that sometimes freeze over (Robertson and Gilchrist 1998). The frequency and magnitude of these die-offs and their impact on the Hudson Bay Common Eider population are unknown. This subspecies is harvested by Aboriginal subsistence hunters (adults, egg and down collection) throughout the year. Little information on harvest levels is available.

AMERICAN COMMON EIDER

Diseases likely play an important role in the dynamics of this subspecies. Intermittent outbreaks of avian cholera have been reported throughout the subspecies' range; in 2002, an estimated 6 000 adult females died at breeding colonies in the St. Lawrence Estuary (Joint Working Group on the Management of the Common Eider 2004). The impacts of these emerging and re-emerging diseases on American Common Eiders are poorly understood. However, research programs at the Université du Québec à Montréal are focusing on the impact of avian cholera on population dynamics of eiders breeding in the St. Lawrence Estuary. Furthermore, the U.S. Geological Survey's National Wildlife Health Center has been collaborating with the Southeastern Cooperative Wildlife Disease Study and the USFWS to characterize other diseases that could affect eiders, such as the orthomyxovirus.

In addition to diseases, changes in predator and prey communities have also been implicated as potential stresses on American Eiders breeding in the southern portion of their breeding range. The population recovery of river otters, mink, Great Black-backed Gulls and Bald Eagles has been identified as a potential source of mortality and disturbance at American Eider breeding colonies in Nova Scotia, New Brunswick and Maine (S. Gilliland, CWS–Atlantic Region, pers. comm.). Another recent threat to nesting success that has been identified for Northern Common Eiders is the increase in polar bear incursion on colonies as the polar sea ice diminishes (Iverson *et al.* 2014); this could affect the dresseri subspecies at its northern boundary in Labrador. There is evidence that there has been significant long-term declines of blue mussels, their preferred prey, throughout their wintering area in the New England States (Sorte *et al.* 2017), and documented decline of mussels at a major wintering site in New Brunswick (S. Gilliland, CWS–Atlantic Region, unpubl. data), suggesting degradation of winter habitats may in part be responsible for recent declines of eiders in the southern portion of this subspecies' range. In response to concerns for this subspecies, a restriction on the harvest of Common Eider has been put in place in 2016 in the U.S. and the Maritime Provinces.

6.3 King Eider (*Somateria spectabilis*)

The King Eider has a circumpolar distribution. Among sea ducks, this species is one of the most northerly nesting species. The continental population is apparently declining (Powell and Suydam 2012).

6.3.1 Abundance and Trends

For the purposes of management, two King Eider populations are identified based on the species' wintering areas: the Western Arctic population and the Eastern Arctic population. No annual surveys covering the King Eider are carried out in North America. The continental population is estimated at 600 000 individuals (NAWMP 2012).

WESTERN POPULATION

The population estimates and trends for the Western Arctic King Eider are currently based on a count obtained approximately every 10 years during spring migration at Point Barrow, Alaska (Suydam *et al.* 2000; Quakenbush *et al.* 2009). These counts indicate a 56% decline in numbers over a 20-year period, from 800 000 birds in 1976 to approximately 350 000 birds in 1996. However, counts conducted in 2003 and 2004 suggest that the population may have stabilized, or possibly increased, since the mid-1990s (304 000 and 592 000 birds in 2003 and 2004, respectively). Aerial transect surveys on western Victoria Island suggest that the King Eider population breeding in this area declined by 54% between the early 1990s and 2004–2005 (Raven and Dickson 2006). The greatest decline occurred around Holman, the only community in the survey area.

EASTERN POPULATION

A review of available data on wintering grounds in Greenland has shown a substantial decrease in the number of wintering and moulting King Eiders. These findings suggest that the Eastern Arctic Population is declining. It is not known whether this apparent decline represents a shift in distribution due to human disturbance (Powell and Suydam 2012). In the Rasmussen Lowlands of Nunavut, however, a significant decline in the numbers of King Eiders was observed between 1974–1975 and 1994–1995 (Gratto-Trevor *et al.* 1998). These findings echoed the concerns expressed by hunters in the area that King Eider populations were declining (Johnston *et al.* 2000). In February 2010, the CWS conducted exploratory surveys in parts of the Hudson Strait and in Frobisher Bay. These surveys confirmed the occurrence of large numbers of wintering King and Common Eiders at the northern tip of Labrador and the southern tip of Baffin Island (S. Gilliland and C. Lepage, CWS, unpubl. data), with small numbers of birds occurring on the eastern side of Ungava Bay and Frobisher Bay. The east coast of Baffin Island has not been explored, but anecdotal observations by helicopter pilots suggest that groups of eiders may winter there as well (J. Innis, pers. comm.).

6.3.2 Harvest

The King Eider is hunted for subsistence in Canada, Greenland, Alaska, and Russia. Concerns have been raised that local harvests of the species in communities such as Holman (Canada) are having an impact on the population, although harvest data for the three countries is not providing the accuracy needed to model the impacts on adult survival. Fabijan *et al.* (1997) estimated that the harvest in Alaska and Canada represented 2–5% of the population from the mid-1970s to the mid-1990s. The eider harvest in Canada occurs mainly in June, with most (99%) of the harvest activities occurring at Holman (96% of the birds harvested are King Eiders). In Canada, sport harvesting of King Eiders has always been very small (Cotter and Lepage 2013).

In the eastern Arctic, limited data on eider harvesting are available. However, the harvest of eiders (King and Common Eiders combined) in southwest Greenland is estimated at over 100 000 birds per year. The largest eider harvest in Canada takes place in Newfoundland, where about 10% of the harvest may consist of King Eiders (Gilliland and Robertson 2009) [Figure 6.3-1].

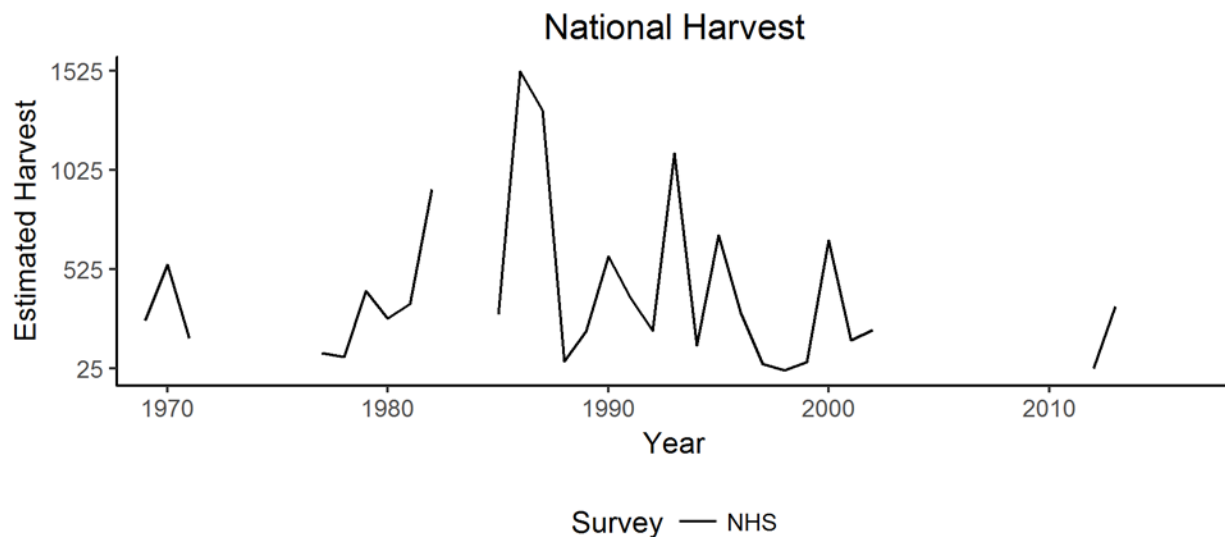


Figure 6.3-1 Estimated harvest for the King Eider in Canada between 1968 and 2016. Harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>). Missing data indicate year for which the sample size from the National Harvest Survey was insufficient to estimate the National harvest.

6.3.3 Management and Conservation Concerns

Subsistence harvesting by Aboriginal people and losses associated with starvation are two major sources of mortality for King Eiders (Cotter and Lepage 2013). Losses from mass starvations occur particularly during the spring migration. In 1964, 100 000 King Eiders of the Western Population perished due to the lack of open water between the ice, which resulted in lack of access to food sources (Barry 1968).

The breeding success of the King Eider varies greatly from year to year. A delay in the spring ice melt or bad weather conditions during migration or during the breeding season can greatly affect this species' productivity (Powell and Suydam 2012). The impact on King Eider populations of changes in the extent of the sea ice and the composition and availability of prey resulting from climate change in the Arctic remains unknown (Powell and Suydam 2012).

Industrial activity in Canada's north is likely to increase over the coming decades. There is renewed interest in offshore oil and gas development in the Beaufort Sea and in some areas in the eastern Arctic. Marine shipping is also likely to increase in the Arctic, especially in the Hudson Strait. Both the Beaufort Sea and the Hudson Strait harbour important marine resting and feeding areas that are used by thousands of eiders at certain times of the year. Increased human activity in these areas could negatively affect eiders through disturbance and pollution from accidental spills or chronic discharges, especially because this species spends most of its life in marine habitats.

The remoteness of most of the species' breeding and wintering areas, the existence of several distinct populations, and the fact that eiders do not use recognized North American flyways are all factors explaining the lack of consistent management and monitoring programs in Canada. Canada has a core responsibility for managing eiders, but better collaboration is needed between Canadian northern wildlife management boards, Russia, Greenland, France (Saint-Pierre and Miquelon) and the U.S. if the species' population is to be managed sustainably.

6.4 Harlequin Duck (*Histrionicus histrionicus*)

Until the 1990s, little was known about the ecology of Harlequin Ducks in North America. However, research efforts have improved our understanding of this species in some areas. For management purposes, there are two distinct populations of Harlequin Ducks in North America—the Western Population along the Pacific Coast, and the Eastern Population along the Atlantic Coast. The Eastern Population breeds in Quebec, Newfoundland and Labrador, New Brunswick, and Nunavut. The Western Population breeds in Alaska, Yukon, British Columbia, Alberta, Montana, Wyoming, Idaho, and Washington.

The Eastern Population experienced a decline in the 1980s, probably because of overharvesting. It has been listed as being of Special Concern under the Canadian *Species at Risk Act*. However, the species has shown increases in its numbers since the 1990s. The Western Population has low numbers but appears stable.

6.4.1 Abundance and Trends

EASTERN POPULATION

This population contains two distinct subpopulations based on the use of two distinct wintering locations. Harlequin Ducks that breed in northern Quebec and Labrador and winter in Greenland are considered a distinct population from those that breed in southern Labrador, Newfoundland, New Brunswick and the Gaspé Peninsula of Quebec and winter mostly in eastern North America (Maritimes and Maine) (Robert *et al.* 2008; Thomas *et al.* 2009). Genetic studies support the existence of two subpopulations with minimal gene flow taking place between them (Scribner *et al.* 2000). The extent of overlap between the breeding and wintering areas of these subpopulations is unknown.

The Eastern Population declined to historic low numbers in the 1980s and early 1990s, probably because of overharvesting (Goudie 1991). Since then the population appears to show a slight upward trend (Bowman *et al.* 2015). Counts of Harlequin Ducks have been made at irregular intervals at key wintering sites in Atlantic Canada between 2001 and 2013. Results suggest a rapid increase of the species of about 9% per year during the last 12 years, but these counts are not random and were not standardized within or among sites (Bowman *et al.* 2015). The Eastern Population was estimated to be roughly 6 800 individuals in the mid-2000s (Robert 2013b). The province of Quebec is the most important breeding area in eastern North America for the species, as approximately ~80% of pairs breed in northern Quebec (Robert 2013b).

The size of the Harlequin subpopulation overwintering in Greenland is uncertain, but an estimate of 6 200 moulting harlequins was made along the western coast of Greenland during surveys in 1999 (Boertmann and Mosbech 2002).

The subpopulation of Harlequin Ducks wintering in the Maritimes and Maine is estimated at about 3 000 birds, with slightly more than half of these (~1600 birds) wintering in Maine at a single location (Robertson and Goudie 1999; Mittelhauser 2008). Winter surveys conducted in 2010 identified approximately 300 birds in the Bay of Fundy, 600 on the southern and eastern coasts of Nova Scotia and 450 in Newfoundland (Bowman *et al.* 2015). While the 2014 Eastern population Barrow's Goldeneye Winter Survey in Quebec has reported about 235 Harlequin Ducks wintering between Port-Daniel and Newport along the south coast of the Gaspé Peninsula, this estimates was up to 210 individuals in 2017 (CWS–Quebec Region, unpublished data).

Environment Canada (2007) published a summary of the status of the Eastern Population of the Harlequin Duck entitled *Management Plan for the Harlequin Duck (Histrionicus histrionicus), Eastern Population, in Atlantic Canada and Quebec*. This document is available at: <http://publications.gc.ca/site/eng/309449/publication.html>

WESTERN POPULATION

There are no comprehensive estimates of Harlequin Duck numbers or trends for western North America. The Western Population is much larger than the Eastern Population; rough estimates range from 150 000 to 250 000 birds (Robertson and Goudie 1999). The bulk of the Western Population apparently winters in the Aleutian Islands in the Northern Pacific Ocean (Bowman *et al.* 2015).

6.4.2 Harvest

The Western Population of Harlequin Ducks is hunted, but under restrictive regulations. However, estimates of harvest are poor because sea duck hunters are under-sampled in harvest surveys. Harlequin Ducks harvest by sport hunters is probably in the low 100's along the West Coast, and subsistence harvest in Alaska may account for 2 500 birds. Better information on harvest is needed (Robertson and Goudie 1999). The hunting of Harlequin Ducks in eastern North America has been prohibited since 1990.

6.4.3 Management and Conservation Concerns

In the late 1980s, the Eastern Population of the Harlequin Duck was estimated at less than 1000 individuals (Goudie 1991). Overhunting, disturbance from recreation (boats) and development (aquaculture and fisheries, hydroelectric developments), and habitat loss are believed to have played a role in the decline of the population (Robertson and Goudie 1999). The Eastern Population was assessed as endangered in 1990 by the Committee on the Status of Endangered Wildlife in Canada. Consequently, in 1990 the hunting of this species was banned throughout the Atlantic Flyway. Later, new information indicating that the number of harlequins breeding in eastern Canada was significantly larger than suspected led to the population being reassessed as a species with a population of Special Concern in 2001 (Environment Canada 2007). The Eastern Population has been increasing and this increase, may be attributable to the fact that the hunting of the species has been prohibited everywhere in eastern North America since 1990 (COSEWIC 2013). In addition, campaigns to make the public aware of the species' precarious status in eastern Canada have probably also contributed to the increase in population numbers. Although hunting of Harlequin Ducks has been prohibited in eastern Canada since 1990, these remain extremely vulnerable to hunters because of their tameness, their tendency to feed close to shore, and the resemblance of the female and immature individuals to ducks of other species that may be hunted legally.

Hunting closures have not been implemented in western Canada, where hunting of the species is thought to be rare. However, data from the B.C. Coastal Waterbird Survey suggest that the Western Population might be declining at a rate of 2–3% per year (CWS and Bird Studies Canada, unpubl. data). A review of the status of the Western Population and of the current monitoring programs is underway. In the early 2000s, the daily bag limit for western Harlequin Ducks in British Columbia was reduced from eight to two birds in recognition of the continental importance of British Columbia for breeding and wintering birds.

6.5 Scoters

The three species of scoters that breed in Canada are the Black Scoter (*Melanitta americana*), the Surf Scoter (*M. perspicillata*) and the White-winged Scoter (*M. fusca*). Little information about scoters is available compared to some other groups of sea ducks, but among the three species, the White-winged Scoter is the best known. Research efforts in recent years have led to a better understanding of the breeding, moulting and wintering ecology of this group. Brown and Fredrickson (1997), Bordage and Savard (2011), and Anderson et al. (2015) provide useful reviews of the information available on scoters. Several projects supported by the SDJV have also addressed research on important information gaps about scoters (www.seaduckjv.org/). There are currently no surveys that provide reliable population or trend estimates for scoters, but some are under development through the SDJV. There are no NAWMP population objectives available for these three species.

6.5.1 Abundance and Trends

LARGE-SCALE WATERFOWL SURVEYS

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA

Because the three species of scoters are difficult to distinguish from each other, they are counted together during fixed-wing aircraft surveys such as the WBPHS. Based on the known extent of breeding distributions, scoters detected in the Canadian Prairies should be White-winged Scoters only, while scoters in Western Boreal Canada are likely to include both White-winged and Surf Scoters.

Although the scoters (3 species combined) are found at very low densities in the Canadian Prairies, results of the WBPHS suggest that scoter numbers have declined over the long term (Table 6.5-1 and Figure 6.5-1). The same is true in Western Boreal Canada and in the survey area as a whole. However, these data should be interpreted with caution, as the surveys are not well designed for estimating numbers for this bird group (Anderson *et al.* 2015). Alisauskas et al. (2004) showed that the observed declines are not consistent across the region, as scoters increased over the previous decade in northern Manitoba and Saskatchewan but continued to decline in northern Alberta and the Northwest Territories.

Table 6.7-1. Scoter (three species combined) Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])

WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	1355 (981 - 1729)	969 (722 – 1217)	-0.75*	0.69	-1.35
Alaska	275 (176 – 373)	209 (153 – 265)	-0.84*	-2.50	-0.79
Western Boreal Canada	1076 (715- 1437)	759 (518 -999)	-0.70*	1.74	-1.49
Canadian Prairies	4 (1 -8)	1 (0 – 4)	-3.45*	2.12	5.46
U.S. Prairies (North Central)	0 (0 – 0)	0 (0 – 0)	NA	NA	NA

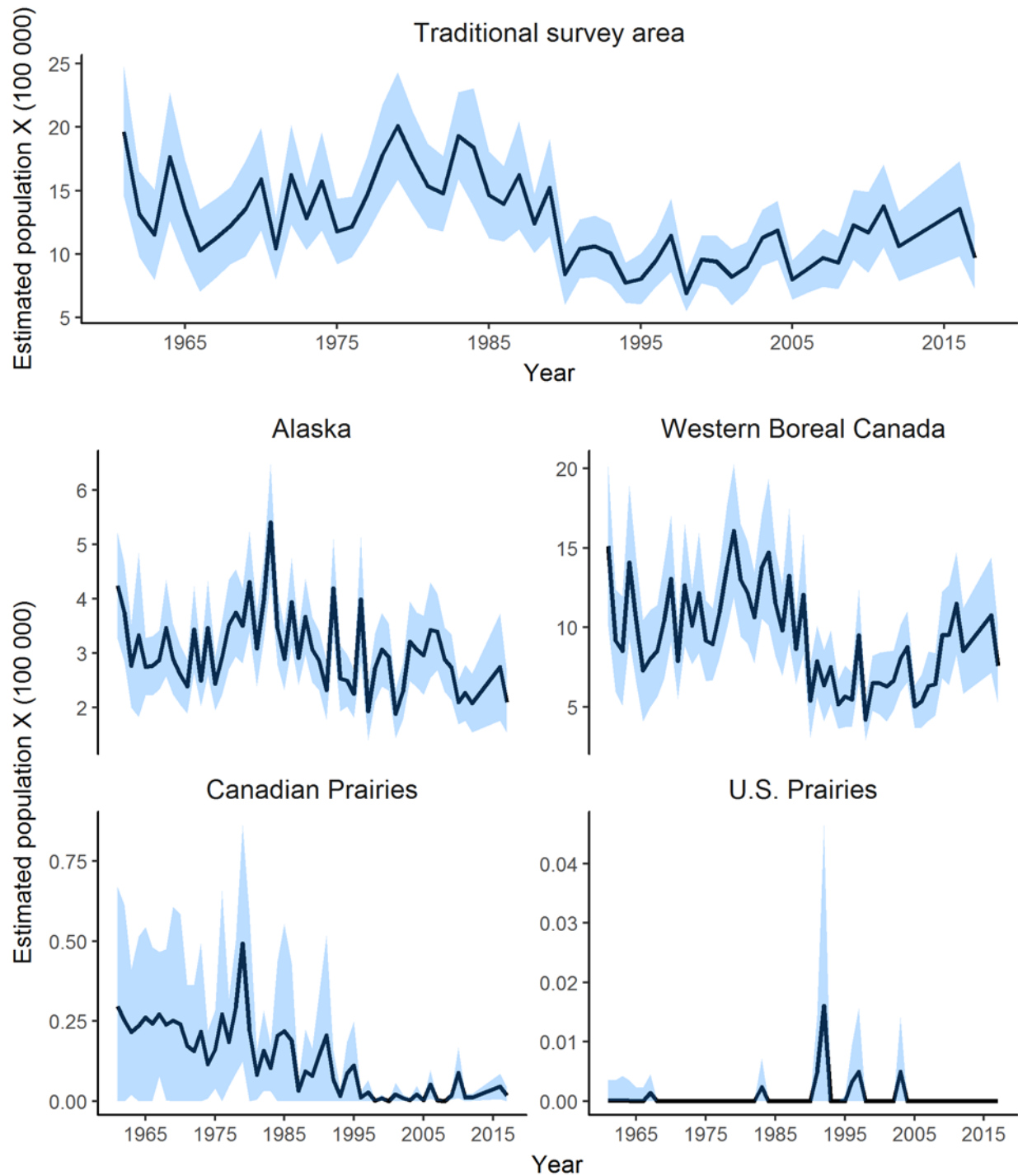


Figure 6.5-1 Scoter (three species combined) Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

6.6 Black Scoter (*Melanitta americana*)

There are two Black Scoter populations in Canada: the Atlantic population and the Pacific Population. Until recently, the eastern breeding ground was thought to encompass the Ontario Hudson Bay Lowlands, northern and central Quebec, and western Labrador. However, recent telemetry studies show that pairs also breed from the Hudson Bay coast of Manitoba west-northwest almost as far as the Great Slave Lake in the Northwest Territories (SDJV 2015a). The Pacific Population breeds primarily in Alaska, but possibly also in northern Yukon and the northwestern Northwest Territories (Bordage and Savard 2011).

6.6.1 Abundance and Trends

The continental Black Scoter population totals approximately 500 000 birds (300 000 birds in the Atlantic Population and 200 000 birds in the Pacific Population; 2002–2011 average, NAWMP 2012).

The Black Scoter population is monitored partially through the WBPHS (Figure 3.1-1, Monitoring Section), which combines the three scoter species that breed in Canada. The three species are not differentiated during these surveys, as it is difficult to distinguish among them from fixed-wing aircraft. This survey predominantly covers the White-winged and Surf Scoter breeding areas.

ATLANTIC POPULATION

• SPRING STAGING

The Chaleur Bay area (Quebec and New Brunswick) and the St. Lawrence Estuary and Gulf are major spring staging areas for scoters. Aerial surveys indicated a spring staging population of about 90 000 Black Scoters (i.e., 52 000 in the Chaleur Bay and 36 300 in the St. Lawrence Estuary, Quebec) in 2005 (McAloney *et al.* 2005). In 1998, over 220 000 scoters (the three species combined) were staging in the St. Lawrence Estuary and Gulf (Rail and Savard 2003).

As part of the Atlantic and Great Lakes Sea Duck Migration Study, a number of Black Scoters were marked with satellite transmitters in the Chaleur Bay in 2009 and 2010 (seaduckjv.org/atlantic_migration_study.html). This study provided information on seasonal connectivity, timing and direction of movements, and site fidelity to wintering, breeding and moult sites (SDJV 2015a).

• MOULTING

During late July and early August 2013, a new reconnaissance survey, based on the extent of satellite telemetry data and employing visual estimates, documented about 45 000 Black, Surf and White-winged Scoters moulting in eastern James Bay in an area around Charlton Island and along the Quebec coastline. Approximately 40 000 Surf, White-winged and Black Scoters were also observed in an area around the Belcher Islands and along the eastern Hudson Bay coastline up to and including Guillaume-Delisle Lake in Quebec. Also, about 110 000 scoters (predominately Black Scoter) were observed in western Hudson Bay scattered along the coastline as far north as Churchill, Manitoba, with the majority (90 000) found between the Ontario/Manitoba border and Nelson River inlet (Badzinski *et al.* 2013).

6.6.2 Harvest

In Canada, the harvest includes only a few thousand birds in eastern Canada (Figure 6.6-1). Most of the harvest takes place in the U.S. In 2016, approximately 20 000 Black Scoters were harvested in the U.S., which represented approximately 90% of the total estimated harvest for this species.

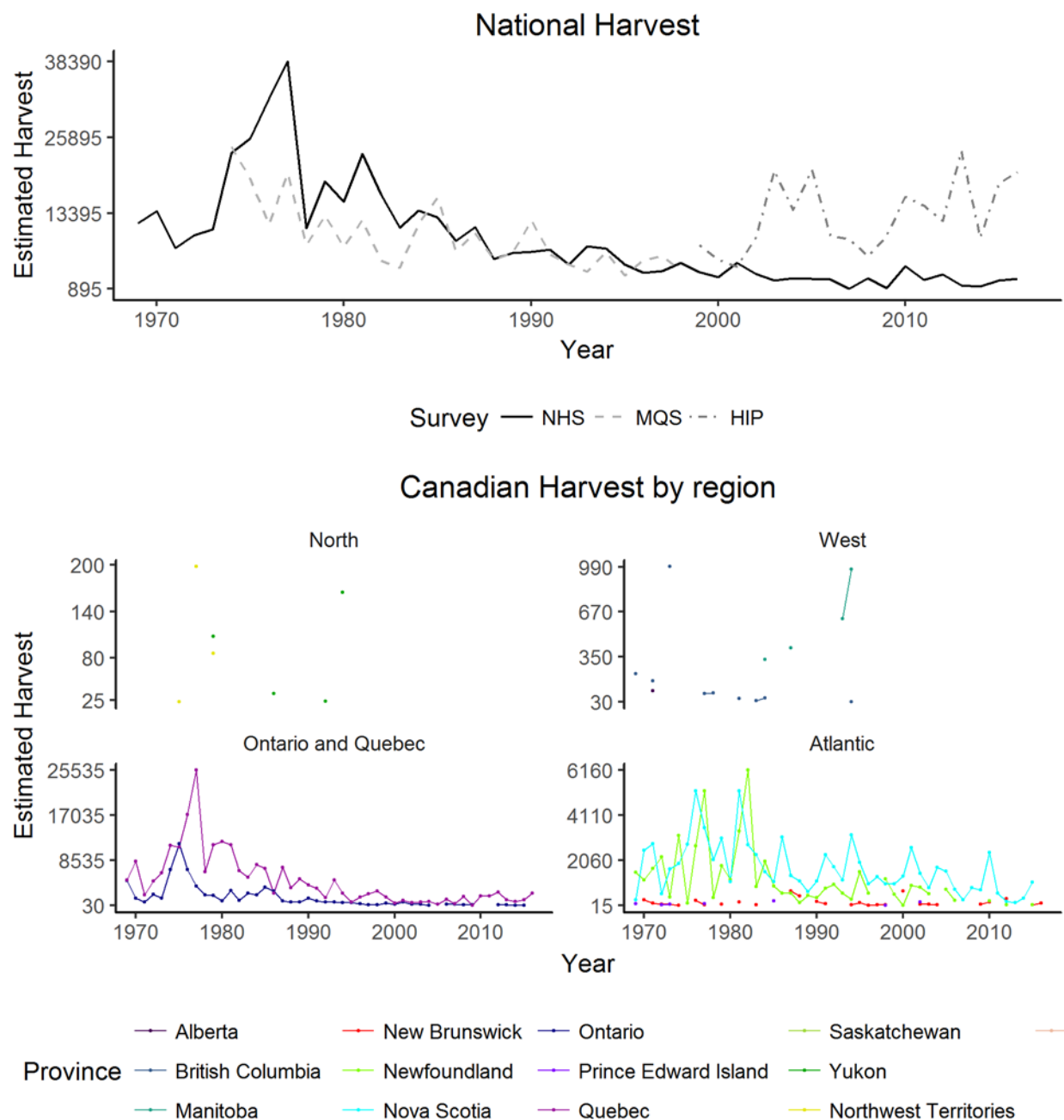


Figure 6.6-1 Estimated harvest for the Black Scoter in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

6.6.3 Management and Conservation Concerns

A number of aspects of the breeding ecology of Black Scoters remain poorly known (Bordage and Savard 2011). Reproductive success can vary significantly between years, making adult survival crucial to population dynamics. Thus, this species' population may be sensitive to mortality from hunting.

The fact that this species congregates during moulting and in winter makes it highly vulnerable to oil spills and other toxic substances. The Black Scoter could also face threats from the expected development of offshore wind energy and aquaculture. The development of new hydroelectric projects and the construction of transmission lines in northern Quebec could modify the landscape and affect the breeding of the species (Lepage and Savard 2013a).

6.7 Surf Scoter (*Melanitta perspicillata*)

Two populations of Surf Scoters are recognized in North America: one population winters in the Pacific, whereas the other winters in the Atlantic. The Eastern Population breeds in the eastern Northwest Territories (south Keewatin), in the Hudson Bay lowlands (in Manitoba and Ontario), and throughout central Quebec and Labrador (SDJV 2015b). The Western Population breeds primarily in Alaska, but also in northern Yukon and the northwestern Northwest Territories, and to a lesser degree in northern B.C., Alberta and Saskatchewan.

6.7.1 Abundance and Trends

LARGE-SCALE WATERFOWL SURVEYS

Scoters are monitored through the Waterfowl Breeding Population and Habitat Survey (WBPHS, Figure 3.1-1, Monitoring section) in the western part of their range, but the three species are not differentiated during this survey, as it is difficult to distinguish among them from fixed-wing aircraft. In eastern Canada, the WBPHS only partially covers the southern edge of the Surf Scoter's range. An additional issue is that the survey is not optimally timed to monitor Surf Scoters, which generally breed later than other duck species, leading to annual population estimates that fluctuate widely depending on timing of migration and on how many birds remain in survey areas at the time of the survey (Lepage and Savard 2013b). Therefore, targeted monitoring and research activities are conducted periodically.

The population abundance is roughly estimated at 700 000 birds for all North America (NAWMP 2012), with about 225 000 wintering along the Pacific Coast and from 150 000 to 400 000 wintering on the Atlantic Coast (SDJV 2015b).

EASTERN WATERFOWL BREEDING GROUND SURVEY

In eastern Canada, Surf Scoters are counted during the helicopter plot survey component of the Eastern Waterfowl Breeding Ground Survey, but the survey does not provide a reliable population index for this species because it only partially covers the southern edge of the Surf Scoter's range. The Surf Scoter's core breeding area is farther north and not covered by the survey. In 2017, the population estimate of 132 000 birds was lesser than the 164 000 birds counted in 2016, but still well above the 10-year average of 113 000 birds. Population estimates from the traditional survey area fluctuate widely on an annual basis, but over the long term, Surf Scoters continue to do well in eastern Canada, displaying a long term increasing trend (1990-2017) of 3% (Table 6.7-1, Figure 6.7-1).

Table 6.7-1. Surf Scoter Breeding Population Estimates with 95% Confidence Intervals (CI) Based on the Eastern Waterfowl Breeding Ground Survey (The figure represents results from the helicopter plot survey only; Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
EWS—Eastern Waterfowl Breeding Ground Survey	Breeding Population Estimates in Core Area (in thousands)		Trends in Numbers of Breeding Birds in Core Area		
	2016	2017	1990–2017	2008–2017	2013–2017
Eastern Survey Area	164 (72 - 255)	132 (10 - 254)	2.99	2.76	4.51

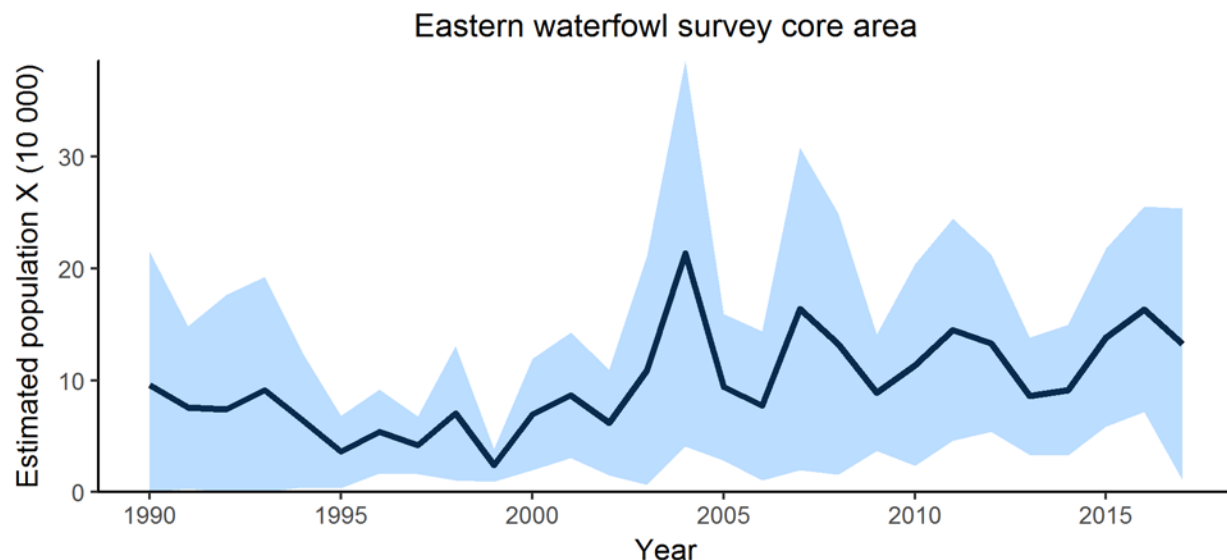


Figure 6.7-1 Surf Scoter Breeding Population Estimates Based on the Eastern Waterfowl Breeding Ground Survey in the Eastern Survey Area, black line represents the population estimate and the shaded area represents the 95% Confidence Intervals (Results from the helicopter plot survey data only)

SMALL-SCALE WATERFOWL SURVEYS

Table 6.7-2. Scoter (all three species) Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)					
Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	2006–2017	2008–2017	2013–2017
Central Interior Plateau of BC	9.81 (2.19-17.44)	11.83 (4.67-18.98)	14.20*	13.96*	13.19

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

Scoters have shown a significantly increasing population trend over the long term in this area (14.2%; Table 6.7-2, Figure 6.7-2).

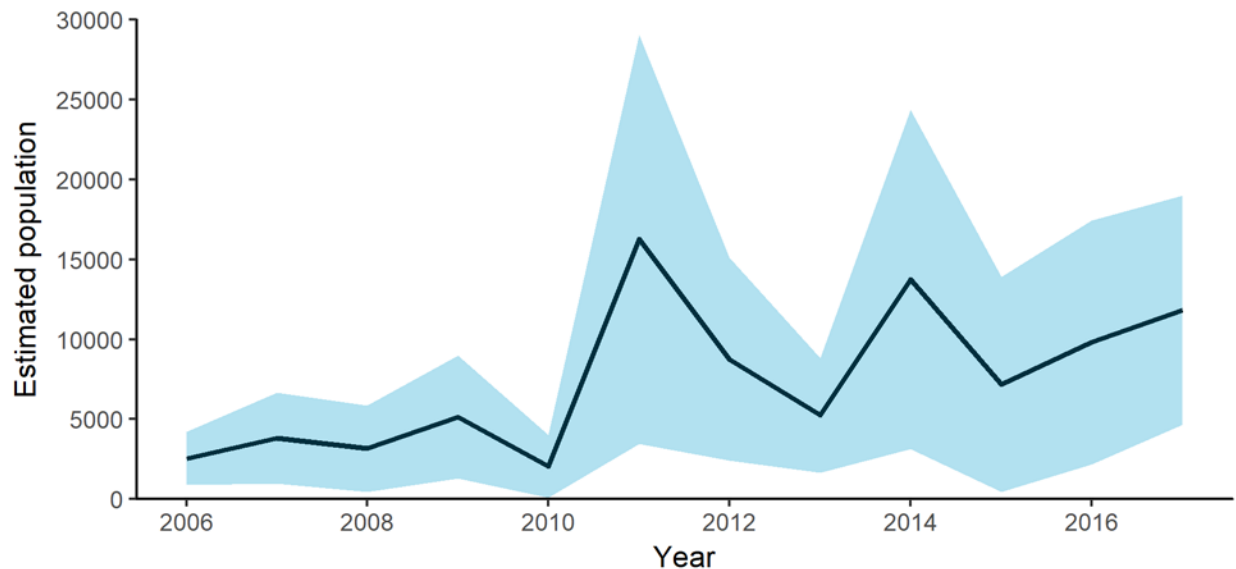


Figure 6.7-2 Population Estimates of Scoters (all three species) in British Columbia Central Plateau, 2006–2017, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

OTHER MONITORING

• SPRING STAGING

The Chaleur Bay area (Quebec and New Brunswick) and the St. Lawrence Estuary and Gulf are major spring staging areas for scoters (SDJV 2015d). In 1998, over 220 000 scoters (all three species combined) were estimated to be staging in the St. Lawrence Estuary and Gulf (Rail and Savard 2003). Surf Scoters were estimated to account for 70% of all scoters in that region.

• MOULTING

Between 50 000 and 62 000 moulting scoters (mostly male Surf Scoters) were sighted along the Labrador coast in 1998 and 1999 (S. Gilliland, CWS–Atlantic Region, pers. comm.). An aerial survey conducted in the Estuary and Gulf of St. Lawrence in August 2010 reported more than 90 000 moulting scoters, 95% of which were Surf Scoters (Bolduc et al. unpublished data). More than 30 000 Surf Scoters are estimated to moult along the northern portion of the James Bay coast and along the eastern Hudson Bay coast, including in the Belcher Islands (Badzinski *et al.* 2013).

• FALL STAGING

Surveys in September and October 2006 indicated that the St. Lawrence Estuary was an important staging area for Surf Scoters in the fall, as many as 80 000 birds were counted there (J.-P. Savard, S&T–ECCC, pers. comm.).

In the St. Lawrence Estuary, efforts were made in October 2012 and 2013 by the CWS and American partners to mark Surf scoters with satellite transmitters, as part of the larger Atlantic and Great Lakes Sea Duck Migration Study (SDJV 2015a). These marked birds provided valuable information on seasonal connectivity, timing and direction of movements, site fidelity to wintering, and breeding and moult sites (SDJV 2015a).

6.7.2 Harvest

The estimated Canadian harvest has been less than 5 000 Surf Scoters annually over the past decade (Figure 6.7-3).

6.7.3 Management and Conservation Concerns

Large concentrations of Surf Scoters (intermixed with White-winged Scoters) are found in coastal British Columbia, in habitats that also support shellfish aquaculture—an industry that has the potential to expand dramatically. Initial assessment in British Columbia indicates that shore-based shellfish aquaculture has little impact on scoters (Žydelis *et al.* 2006), and off-bottom aquaculture may provide profitable feeding opportunities (Žydelis *et al.* 2009). However, it is not clear if aquaculture expansion might negatively affect scoters. The fact that this species feeds on farmed mussels and clams is also problematic for the industry (Anderson *et al.* 2015).

The Surf Scoter is particularly vulnerable to toxic spills (e.g., spills in the St. Lawrence Estuary and Gulf) because individuals tend to concentrate in large groups in marine habitat. The moulting period, during which the species is less mobile, is especially critical. The Surf Scoter has a low reproductive rate and generally low reproductive success, which means that populations are highly sensitive to adult mortality (Anderson *et al.* 2015). Hydroelectric development is also a potential threat to the species in its breeding habitat (Lepage and Savard 2013b).

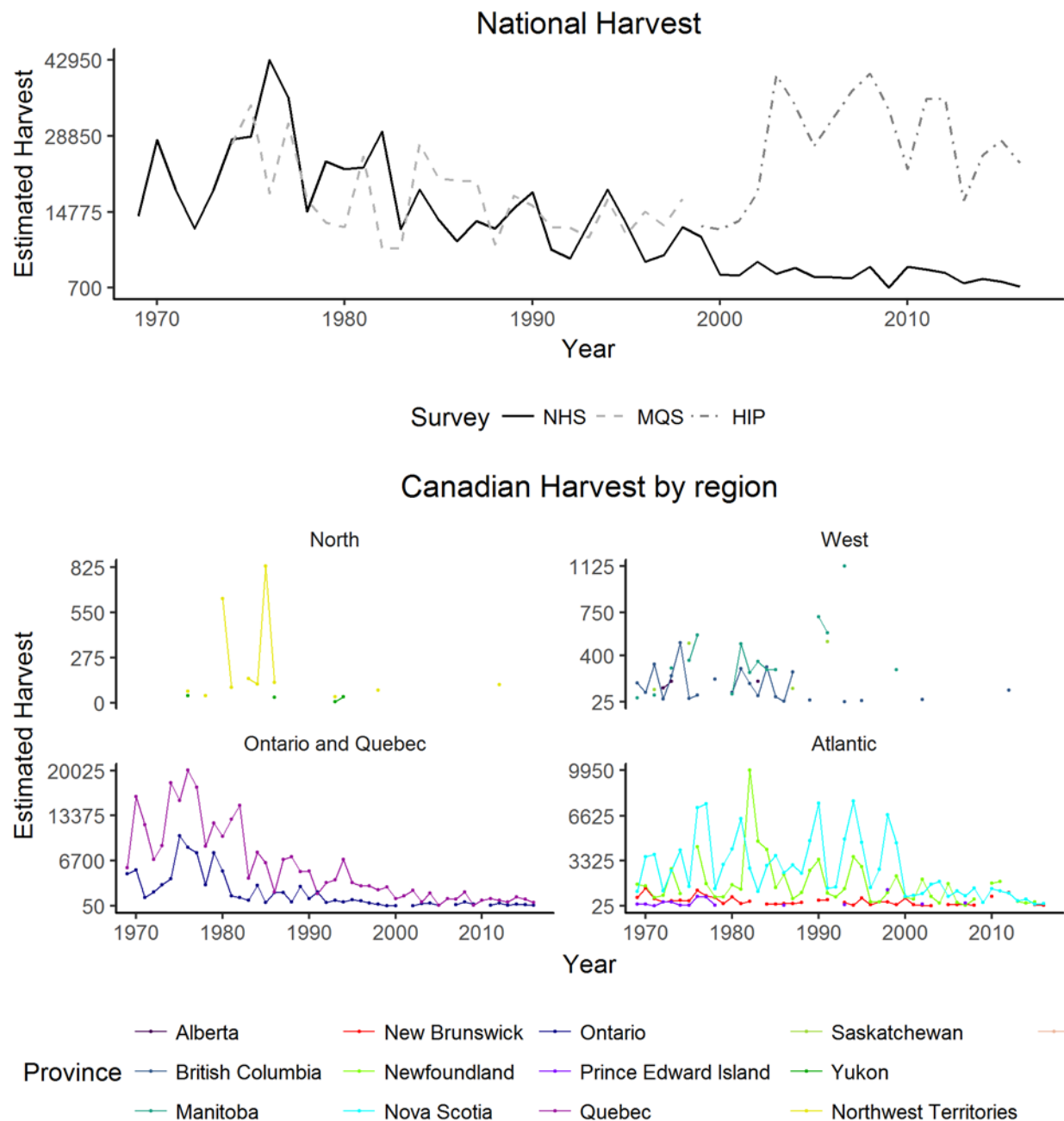


Figure 6.7-3 Estimated harvest for the Surf Scoter in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

6.8 White-Winged Scoter (*Melanitta fusca*)

Of the three scoter species that breed in Canada, the White-winged Scoter is the best known (Brown and Fredrickson 1997). It breeds primarily in Alaska and central and northwestern Canada, in the boreal forest from Yukon to Manitoba, and at lower densities in the Canadian Prairies. The species winters on the Atlantic and Pacific coasts.

6.8.1 Abundance and Trends

WESTERN CANADA

The Waterfowl Breeding Population and Habitat Survey (WBPHS) covers a large part of the breeding area of White-winged Scoters in western Canada. However, since the three scoter species are counted together during this survey, it is not possible to obtain an accurate estimate of the White-winged Scoter population. Based on the known extent of breeding distributions, scoter populations in the Canadian Prairies include only White-winged Scoters, while populations in Western Boreal Canada include White-winged and Surf Scoters. All three species are present in Alaska. However, these data should be interpreted with caution, as the surveys are not well designed for estimating scoter numbers (Anderson *et al.* 2015).

Although the species is found at very low densities in the Canadian Prairies, scoter numbers have declined over the long term based on the results of the WBPHS (Table 6.5-1 and Figure 6.5-1).

EASTERN CANADA

White-winged Scoters marked on moulting grounds in the St. Lawrence Estuary have shown quite dispersed breeding locations in the subsequent years: Northwest Territories (Great Bear and Great Slave lakes), northern Saskatchewan and Manitoba, northwestern Ontario and northern Quebec (SDJV 2015a).

The Northumberland Strait, Chaleur Bay, the St. Lawrence Estuary and Gulf, the Great Lakes and James Bay are all important spring staging areas for White-winged Scoters wintering on the Atlantic Coast (SDJV 2015a).

An estimated 5 000 individuals moult in the St. Lawrence Estuary and Gulf (Lepage and Savard 2013c), while thousands of birds have been observed in northeast James Bay and southeast Hudson Bay, particularly the Cape Jones area, Long Island Sound, Lake Guillaume-Delisle and the Belcher Islands (Badzinski *et al.* 2013).

6.8.2 Harvest

In Canada, the annual harvest for this species is estimated at slightly less than a thousand individuals (Figure 6.8-1).

6.8.3 Management and Conservation Concerns

The White-winged Scoter may accumulate a number of contaminants in its flesh, making it potentially vulnerable to poisoning (Brown and Fredrickson 1997). Spills of hydrocarbons and other toxic substances on White-winged Scoter moulting or wintering grounds may harm the species since the species is often present in high densities along oil transportation routes (Vermeer and Vermeer 1975; Ohlendorf and Fleming 1988).

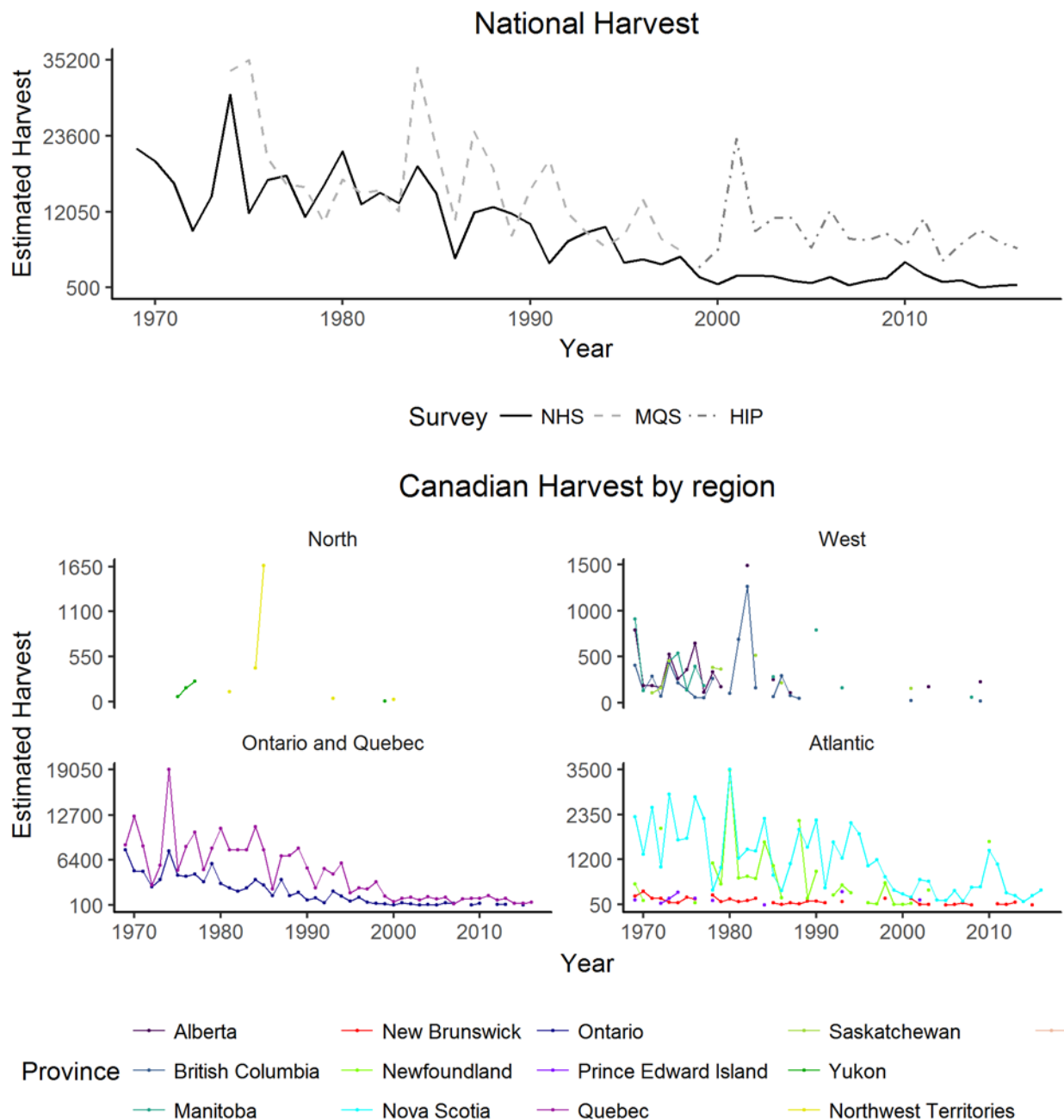


Figure 6.8-1 Estimated harvest for the White-Winged Scoter in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

6.9 Barrow's Goldeneye (*Bucephala islandica*)

Two geographically isolated populations of Barrow's Goldeneye are found in North America: a small Eastern Population and a much larger Western Population. The Eastern Population was listed as "Special Concern" in Schedule 1 of the *Species at Risk Act* in 2003 (Environment Canada 2013).

6.9.1 Abundance and Trends

EASTERN POPULATION

The size of the Eastern Population of Barrow's Goldeneye is estimated to be at about 8 500 individuals (Environment Canada 2013). Since 2005, a triennial winter survey has been conducted in Quebec and New Brunswick. The 2014 Eastern Population Barrow's Goldeneye Winter Survey was estimated at $6\,576 \pm 283$ birds (photo-corrected for species misidentification and counts) in the St. Lawrence Estuary and the western portion of the Gulf (Quebec and the Dalhousie area in New Brunswick), which indicates a stable trend (Figure 6.9-1). However, the latest survey held in 2017 showed a ~30% increase, with a record high abundance of about 8 455 individuals. More than 80% of this population winters along the St. Lawrence Estuary and Gulf (Robert and Savard 2006; Robert 2013a). Approximately 500 individuals winter in the Maritimes provinces, and 100 individuals winter in Maine (Robert and Savard 2006; Environment Canada 2013).

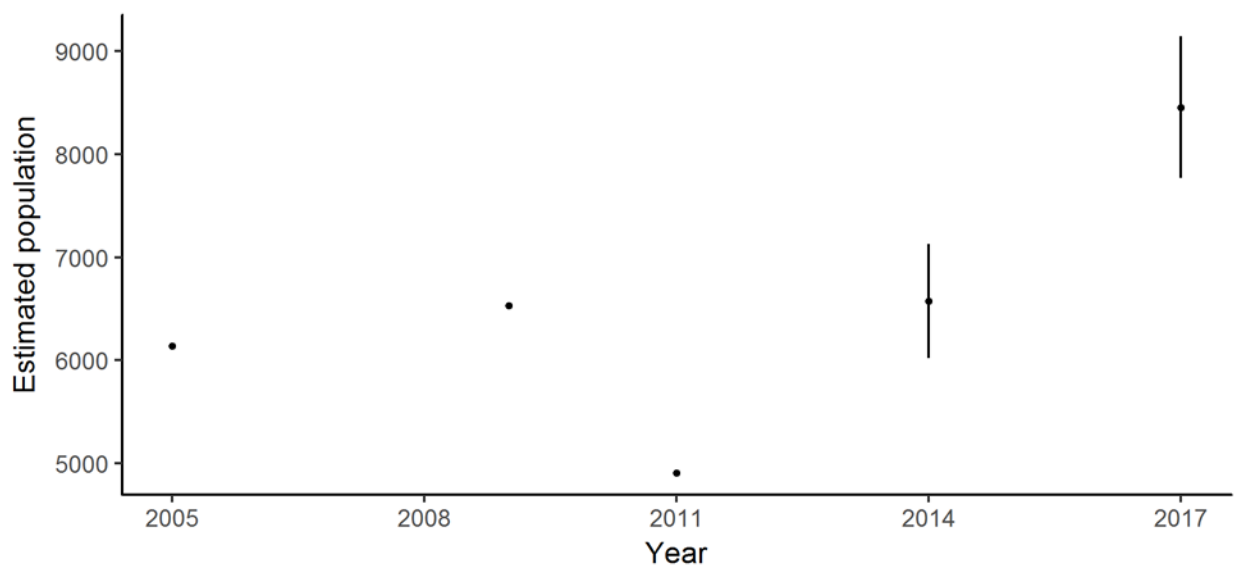


Figure 6.9-1: Eastern Population Barrow's Goldeneye Winter Survey. From 2014 onward the numbers are corrected from photos.

RESEARCH HIGHLIGHTS IN EASTERN CANADA

The main breeding area of the Eastern Population of Barrow's Goldeneye consists mainly of the small fishless lakes of the high plateaus north of the St. Lawrence River from Charlevoix east to Blanc-Sablon, Québec (Robert *et al.* 2000; Robert, Drolet and Savard 2008a; Robert 2013a). Relatively high numbers of pairs and lone males counted in aerial and ground surveys indicate that this area is probably the core breeding area for the Eastern Population of Barrow's Goldeneye (Robert *et al.* 2000).

In eastern North America, the principal moulting sites for adult male Barrow's Goldeneyes are located in the coastal waters of northeastern James, Hudson, Ungava and Frobisher bays, and in a few coastal inlets of northern Labrador (Benoit *et al.* 2001; Robert, Benoit and Savard 2002). Some individuals use small inland lakes for moulting. Two moulting areas—Tasiujaq and Tuttutuuq River, Ungava Bay—were identified while tracking males with satellite telemetry in July 2000. At least 200 goldeneyes (mostly Barrow's) were at the first location, while at least 3 000 goldeneyes (mostly Common) were in the latter area (M. Robert, CWS–Quebec Region, pers. comm.). Barrow's Goldeneyes spend up to four months in moulting locations, which highlights the importance of these areas in the species' annual cycle (Robert, Benoit and Savard 2002). We know very little about females' moulting sites, but the information we have reveals that they use the Ungava Bay vicinity (both inland lakes and inlets of the bay), inland lakes close to northeastern James Bay, and both sides of the St. Lawrence Estuary (Savard and Robert 2013).

WESTERN POPULATION

Some data are available for this population from the breeding waterfowl surveys of the southern Yukon (Figure 6.9-2), where there has been no discernible trend in the population over the past 10, 15 or even 21 years. The Waterfowl Breeding Population Survey of the British Columbia Central Interior Plateau has tracked the Western Population of Barrow's Goldeneye since 2006. CWS analyses estimated the presence of 22 777 individuals in the Central Interior Plateau Region in 2017, comparable to the 2016 estimate (Table 6.9-1, Figure 6.9-3).

The size of the Western Population of Barrow's Goldeneye is estimated at 250 000 individuals (NAWMP 2012).

Table 6.9-1. Barrow's Goldeneye Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)					
Survey/Area	Population Estimates (in thousands)		Trends in population		
	2016	2017	2006–2017	2008–2017	2013–2017
Central Interior Plateau of BC	29.39 (11.34-47.43)	22.78 (16.87-28.68)	-0.96	-0.90	-0.55

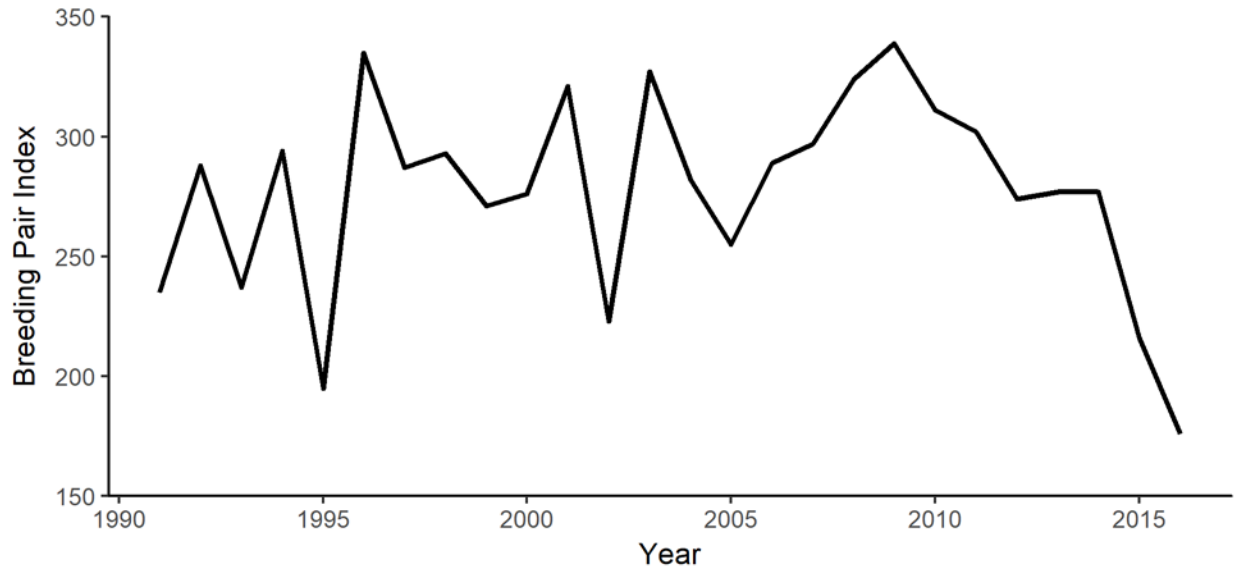


Figure 6.9-2 Breeding Pair Index for the Barrow's Goldeneye in Southern Yukon, 1991–2016

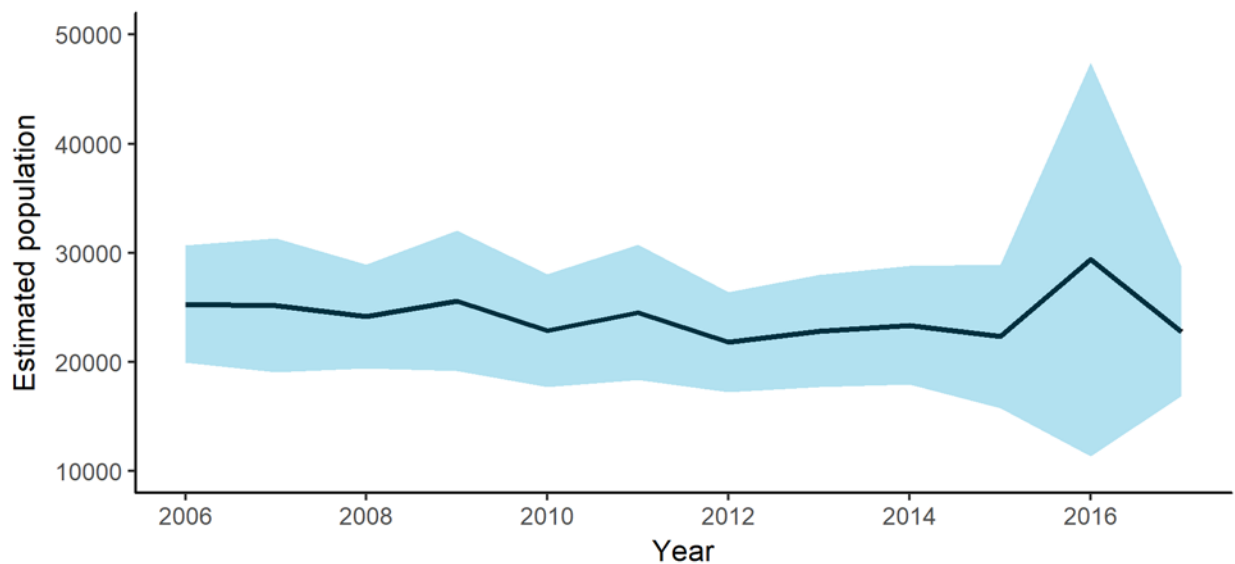


Figure 6.9-3 Population Estimates of Barrow's Goldeneyes in British Columbia Central Plateau, 2006-2017, black line represent mean while the shaded area represent the 95% Confidence Intervals.(A likely small portion of Common Goldeneyes is included in the Barrow's Goldeneye estimates)

RESEARCH HIGHLIGHTS IN WESTERN CANADA

Between 2006 and the present, satellite transmitters were implanted in over 300 Pacific Barrow's Goldeneyes to investigate migration routes, seasonal habitat affiliations, and degree of site fidelity within and across years. Migration data from cohorts of birds captured during breeding, moulting and wintering periods were used to describe population structure and to delineate appropriate units for management. Adult males marked on breeding ponds in the Cariboo Plateau of British Columbia moulted over a large but annually consistent area from central Alberta to northern Northwest Territories. Notably, about 30% of these males moulted on a small lake in Alberta (Cardinal Lake) each year, and this discovery led to

surveys that identified 5 000–6 000 moulting males on the lake. Cariboo Plateau adult males and females marked during remigial moult on Cardinal Lake consistently wintered along the Pacific Coast, from southern Washington State to just north of Vancouver Island, which constitutes the southern portion of the species' primary wintering range. Hatch-year birds did not travel to the coast in association with their mothers or siblings, but they ultimately overwintered in the same general region as their parents. Birds marked at five coastal wintering sites (from Vancouver, B.C. to south-central Alaska) had different migration and distribution patterns and appear to constitute largely discrete population segments throughout the annual cycle. Finally, adult birds showed high levels of site fidelity to breeding, moulting and wintering sites. This finding has important management and conservation implications, especially if discrete segments are harvested at excessive levels (S. Boyd, ECCC - S&T, pers. comm.).

6.9.2 Harvest

The Canadian harvest is not well known, mainly because the National Harvest Survey does not provide reliable harvest estimates for species hunted at very low numbers.

In the past, there were concerns about the harvest of birds from the Eastern Population of this species. However, restrictive regulations were implemented throughout eastern Canada after the population was designated as a species of Special Concern under the federal *Species at Risk Act*. Hunters were restricted to maximum daily bag (since 2007) and possession limits (since 2012) of one bird. The current daily bag limit of one bird per day allows for the accidental harvest of this species. Annual harvest of Barrow's Goldeneye in the five eastern provinces (Atlantic Canada and Quebec) is typically less than 1 000 individuals per year (Gendron and Smith 2017).

WESTERN POPULATION

Hunting pressure on the Western Population is generally low. The Pacific Flyway sport harvest is estimated at less than 5 000 birds, which are mostly taken in Alaska, British Columbia, and Washington State. Estimates of subsistence harvest are also low, with fewer than 3 000 birds harvested in Alaska.

6.9.3 Management and Conservation Concerns

In 2000, the Eastern Population of Barrow's Goldeneye was designated as one of Special Concern by the Committee on the Status of Endangered Wildlife in Canada and subsequently listed as a species of Special Concern under the *Species at Risk Act*. Hunting has been restricted in eastern Canada as this activity represents a potential threat to the long-term survival of this species. Because Barrow's Goldeneye is an arboreal species, forestry operations on its breeding grounds are possible threats (Robert, Drolet and Savard 2008b). The Mountain Pine Beetle infestation that started in the early 1990's and forest fires have resulted in the extensive loss of mature forests in Central British Columbia. There is also the threat of oil spills on its wintering grounds (Robert 2013a).

6.10 Common Goldeneye (*Bucephala clangula*)

In North America, the Common Goldeneye breeds across the boreal forest from Newfoundland to Alaska, as well as throughout montane forests. It is also known to breed in the Aspen Parkland Region, and the Acadian and Great Lakes forests, usually in areas where trees are large enough to provide suitable nesting cavities. The species winters in freshwater environments, as far north as open water remains ice-free during winter, and along both the Pacific and Atlantic coasts (Eadie *et al.* 1995).

6.10.1 Abundance and Trends

In Canada, goldeneyes are monitored through the WBPHS and EWS. However, fixed-wing surveys do not distinguish Common Goldeneyes from Barrow's Goldeneyes, and can only track the combined population of the two species. Most birds observed during both surveys are Common Goldeneye however (Baldassarre 2014). In eastern Canada, both species are speciated during the helicopter plot survey component of the WBPHS. The North American population of Common Goldeneyes has been estimated approximately at 1.2 million birds (NAWMP 2012).

LARGE-SCALE WATERFOWL SURVEYS

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

The estimated abundance of goldeneyes in 2017 in the traditional survey area was below the 2016 estimate. Goldeneyes show significant increasing long-term (1961–2017) trends in the Canadian and U.S. Prairies and in the traditional survey area, but a significant decreasing long-term trends in the Western Boreal Forest (Table 6.10-1 and Figure 6.10-1).

Table 6.10-1. Goldeneye (both species) Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])

WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	642 (419 - 866)	569 (435 - 703)	-0.38	-1.73	-4.65
Alaska	17 (7 - 28)	35 (18 - 52)	-0.18	-2.97	-1.80
Western Boreal Canada	492 (285 - 700)	364 (255 - 472)	-0.81*	-2.96	-7.56*
Canadian Prairies	133 (52 - 214)	170 (93 - 247)	2.23*	3.1*	5.93*
U.S. Prairies (North Central)	0 (0 - 0)	0 (0 - 0)	NA	NA	NA

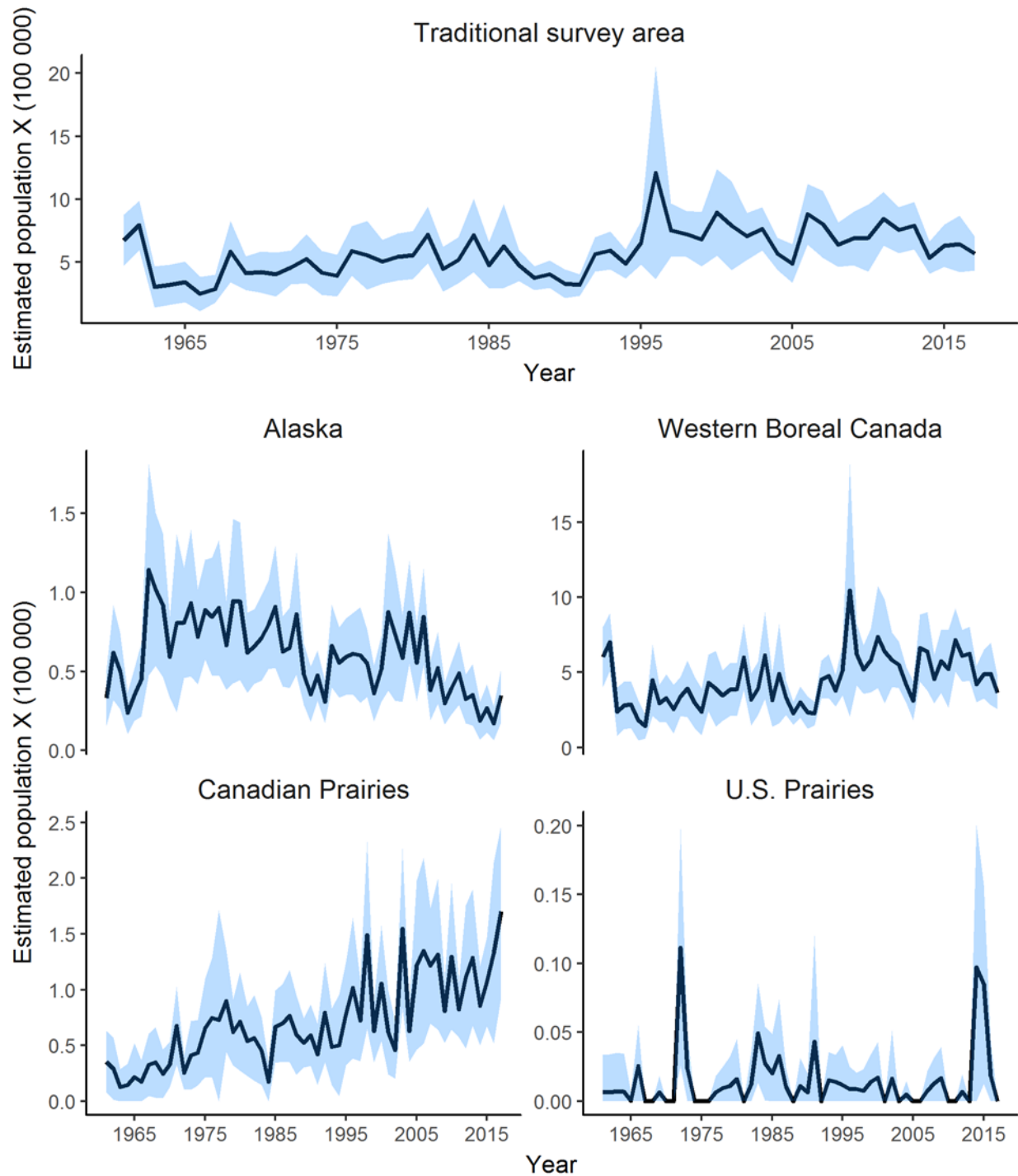


Figure 6.10-1 Common and Barrow's Goldeneye Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

EASTERN WATERFOWL BREEDING GROUND SURVEY

Results from the Eastern Waterfowl Breeding Ground Survey (helicopter plot survey only) indicate that the Common Goldeneye population trend is relatively stable in most survey strata (Table 6.10-2 and Figure 6.10-2).

Table 6.10-2. Common Goldeneye Breeding Population Estimates with 95% Confidence Intervals (CI) and Trend Estimates Based on the Eastern Waterfowl Breeding Ground Survey (The estimates are based on helicopter plot surveys only. Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
EWS—Eastern Waterfowl Breeding Ground Survey	Breeding Population Estimates (in thousands)		Trends in Numbers of Breeding Birds		
	2016	2017	1990–2017	2008–2017	2013–2017
Eastern Survey Area	271 (167 - 375)	293 (217 - 368)	0.45	0.01	0.04
Atlantic Highlands	9 (3 - 15)	11 (0 - 24)	-0.19	4.57	-0.44
Eastern Boreal Shield	129 (33 - 225)	104 (52 - 156)	-0.68	-0.63	0.33
Central Boreal Shield	51 (31 - 70)	61 (46 - 76)	1.38*	-0.52	-0.68
Western Boreal Shield	82 (47 - 117)	117 (66 - 168)	1.37*	0.56	0.5

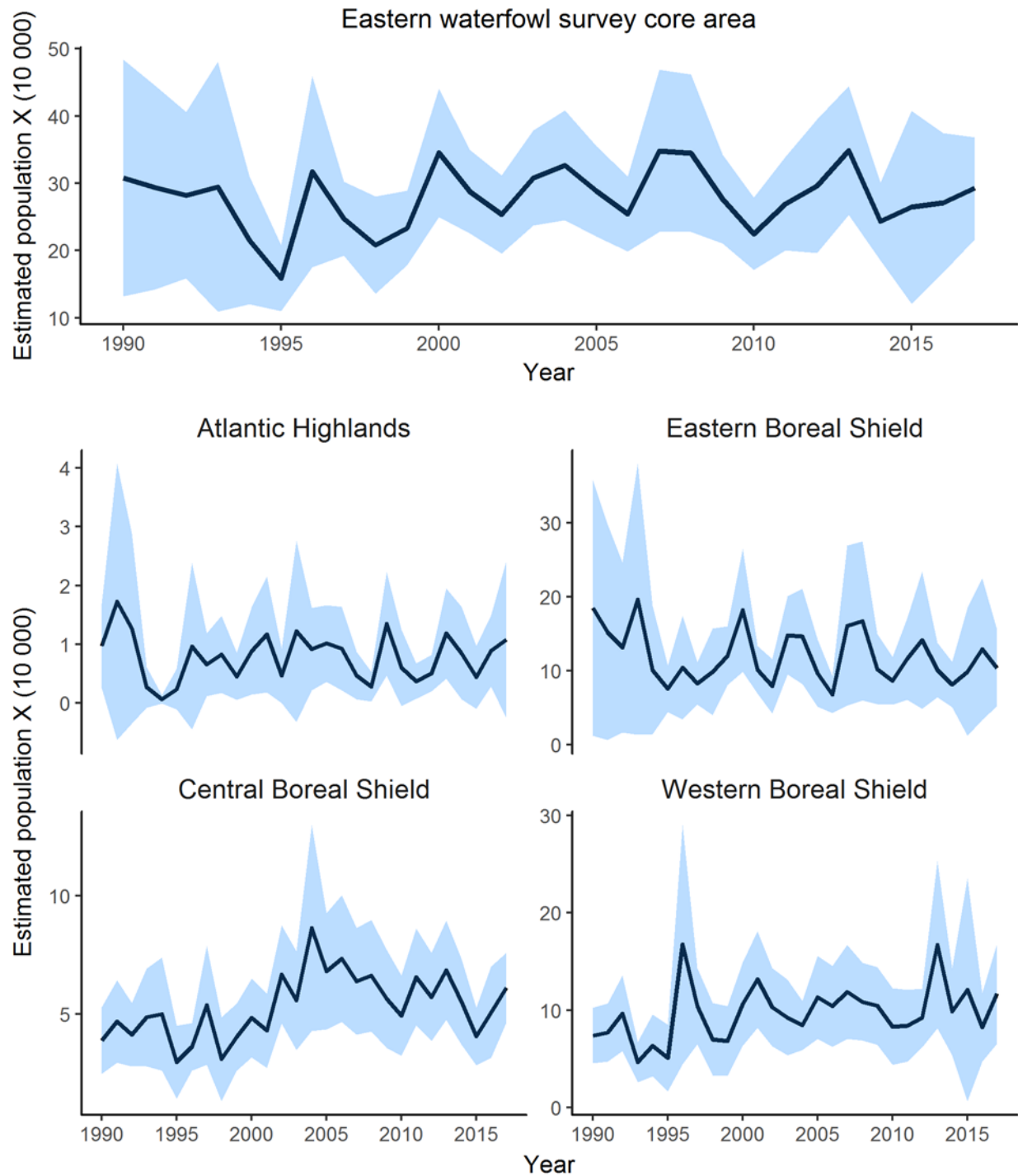


Figure 6.10-2 Common Goldeneye Breeding Population Estimates Based on the Eastern Waterfowl Breeding Ground Survey, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals (The figures represent the results of helicopter plot surveys only).

6.10.2 Harvest

Common Goldeneyes are hunted across Canada, with the largest number traditionally taken in eastern Canada, with the most harvested in Ontario (Figure 6.10-3). The total number of Common Goldeneyes taken in Canada has been decreasing since the 1980s.

6.10.3 Management and Conservation Concerns

Common Goldeneyes are obligate cavity nesters, and often dominate interactions with competitor species for food and nest sites (Eadie *et al.* 1995). In regions that were or are being logged, forestry practices may have reduced the availability of suitable cavities, although the species will readily make use of nest boxes (Pöysä and Pöysä 2002; Corrigan *et al.* 2011).

The species prefers fishless lakes, and in some areas the Common Goldeneye may have benefited from acidification (i.e., acid rain) through the decline of fish competitors and subsequent increases in invertebrate prey populations (Blancher *et al.* 1992; Mallory *et al.* 1994)

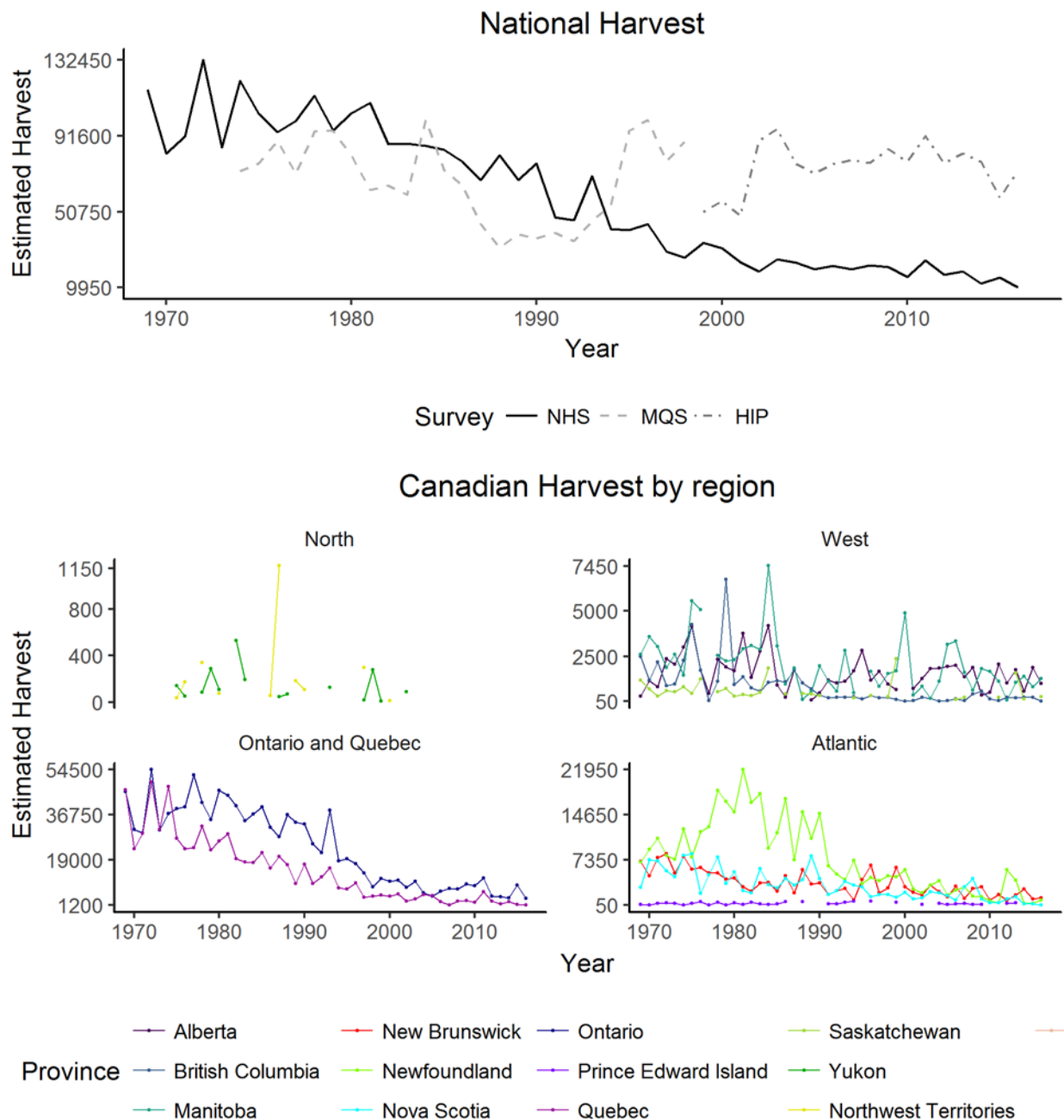


Figure 6.10-3 Estimated harvest for the Common Goldeneye in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

6.11 Long-Tailed Duck (*Clangula hyemalis*)

The Long-tailed Duck has a circumpolar distribution. In North America, pairs breed at low densities in Arctic and Subarctic wetlands in a vast, remote area ranging from the west coast of Alaska across most of northern Canada, as far north as Ellesmere Island and as far south as the Hudson Bay Lowlands, to the east coast of Labrador (SDJV 2015c). During most of the year, Long-tailed Ducks primarily inhabit coastal marine waters, often far offshore (Robertson and Savard 2002). This species winters along the Pacific Coast from Alaska, sometimes far out in open water in the Bering Sea, to southern California in the west and mostly along the Atlantic Coast between Labrador and North Carolina, but also in open water in Hudson Bay and in the Great Lakes, in eastern North America (SDJV 2015c).

6.11.1 Abundance and Trends

There have been no comprehensive surveys of Long-tailed Duck abundance because this species breeds at low densities over a vast range. Like other sea ducks inhabiting offshore areas during the winter, as opposed to most other species of waterfowl, Long-tailed Ducks are poorly monitored by mid-winter waterfowl surveys (inland or nearshore areas). The continental population size is estimated at 1 million birds (NAWMP 2012).

The WBPHS shows that breeding populations of Long-tailed Ducks have declined approximately 3% annually since the survey began in 1957 to 2012. However, the Long-tailed Duck population appears to have been increasing for the 2008–2012 period (Bowman *et al.* 2015). Nevertheless, that survey covers only a small portion of Alaska and northwestern Canada, which represents a very small portion of their overall breeding range. For this particular survey, no data are available after 2012 for the Long-tailed duck.

6.11.2 Research Highlights

There are many aspects of the basic biology of Long-tailed Ducks that are largely unknown, such as the location of major breeding, moulting, staging and wintering areas; the location of spring and fall migration travel corridors; habitat use and movement patterns in seasonally important use areas, and; connectivity, annual affiliation and fidelity of birds to major use areas. SDJV partners have undertaken a multi-year, large-scale satellite telemetry study in eastern North America to address many of these information gaps for the Long-tailed Duck. Some of the preliminary findings include: 1) females marked at Atlantic Coast or Lake Ontario wintering locales do not appear to segregate by winter area affiliation after settling at their Arctic breeding areas; 2) a possible major moulting area for males may exist in the Arctic Ocean near the Adelaide Peninsula and King William Island, Nunavut; 3) Hudson Bay, most notably around the Belcher Islands, appears to be a key staging area for many of the marked birds, particularly during fall migration; and 4) birds of both sexes exhibited site fidelity for Great Lakes or Atlantic Coast wintering areas where they were captured and marked (SDJV 2015a).

6.11.3 Harvest

The Long-tailed Duck is not a widely hunted species in Canada or the U.S. However, they are an important species in the subsistence harvest in some northern communities. The extent of the harvest by Aboriginal people is unknown.

The harvest of Long-tailed Ducks in Canada has declined over time, probably in relation to the decline of hunter numbers. In Canada, most of the harvest occurs in the eastern provinces (Figure 6.11-1).

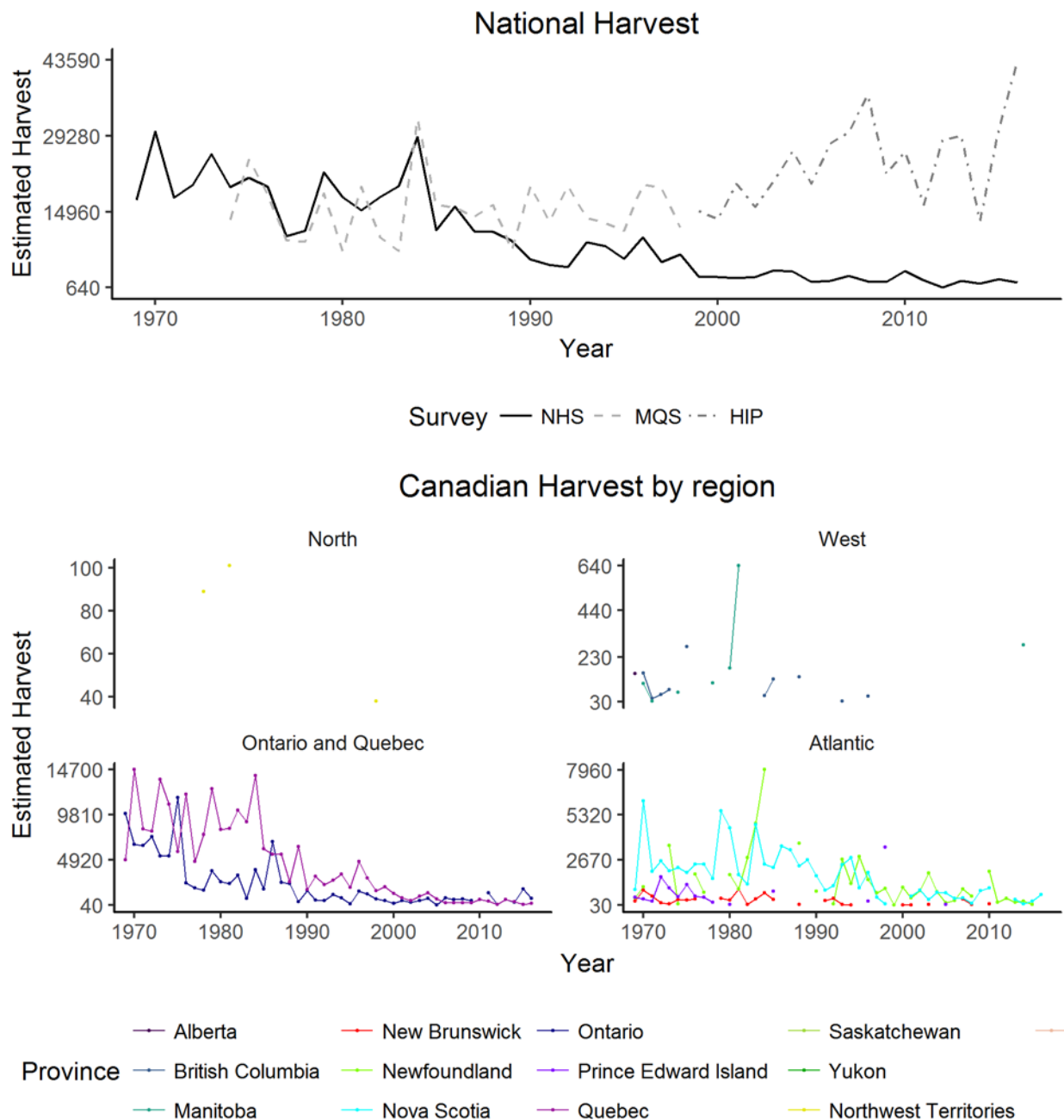


Figure 6.11-1 Estimated harvest for the Long-Tailed Duck in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

6.11.4 Management and Conservation Concerns

The Long-tailed Duck is a relatively abundant sea duck and, despite a significant long-term decline in its breeding population, there are no concerns over the population size. According to the SDJV Technical Team, one of the main management and conservation concerns pertaining to the Long-tailed Duck is the lack of an adequate annual survey on the breeding or wintering grounds (SDJV 2015c).

6.12 Bufflehead (*Bucephala albeola*)

The Bufflehead is the smallest of the North American sea ducks. The species occurs from coast to coast, but is more abundant in western regions of Canada. The continental population is increasing (Gauthier 2014).

6.12.1 Abundance and Trends

The Bufflehead is found only in North America and breeds primarily in Alaska, British Columbia, Alberta and Saskatchewan. Breeding also occurs at lower densities further to the east in Manitoba, Ontario and Quebec. Buffleheads winter along both the Atlantic and Pacific coasts, as well as throughout the continental U.S. The continental population of Buffleheads is estimated at more than 1.67 million individuals (NAWMP 2012).

The Bufflehead is monitored in its core breeding range through the Waterfowl Breeding Population and Habitat Survey (WBPHS; Figure 3.1-1, Monitoring section) in western Canada and through the Eastern waterfowl survey in the east. The species is also monitored in British Columbia by the Central Interior Plateau Waterfowl Breeding Pair Survey and the Yukon by the Roadside Waterfowl Breeding Population Survey.

LARGE-SCALE WATERFOWL SURVEYS

WATERFOWL BREEDING POPULATION AND HABITAT SURVEY IN WESTERN CANADA AND THE NORTHWESTERN UNITED STATES

Population estimates of Buffleheads in 2017 were similar to or slightly lower than those of 2016 in all regions of the survey area except the U.S. prairies, where the 2017 estimate double compared to 2016. Population numbers for this species are showing increasing long-term (1961–2017) trends in all areas of the survey, all of which were significant except in the U.S. Prairies (Table 6.12-1 and Figure 6.12-1). The short-term (2013–2017) trend suggests an increase in Bufflehead numbers in the Canadian Prairies, but a decrease in the U.S. Prairies (Table 6.12-1).

Table 6.12-1. Bufflehead Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	1353 (1154 - 1553)	1329 (1145 - 1513)	2.17*	2.39*	2.01
Alaska	44 (27 - 61)	43 (26 - 60)	0.72*	-0.90	0.21
Western Boreal Canada	894 (725 – 1063)	875 (720 - 1030)	1.94*	1.34	1.20
Canadian Prairies	410 (306 - 514)	400 (302 - 497)	3.43*	5.89*	4.53
U.S. Prairies (North Central)	5 (1 - 10)	11 (2 - 19)	1.21	5.90*	-4.44

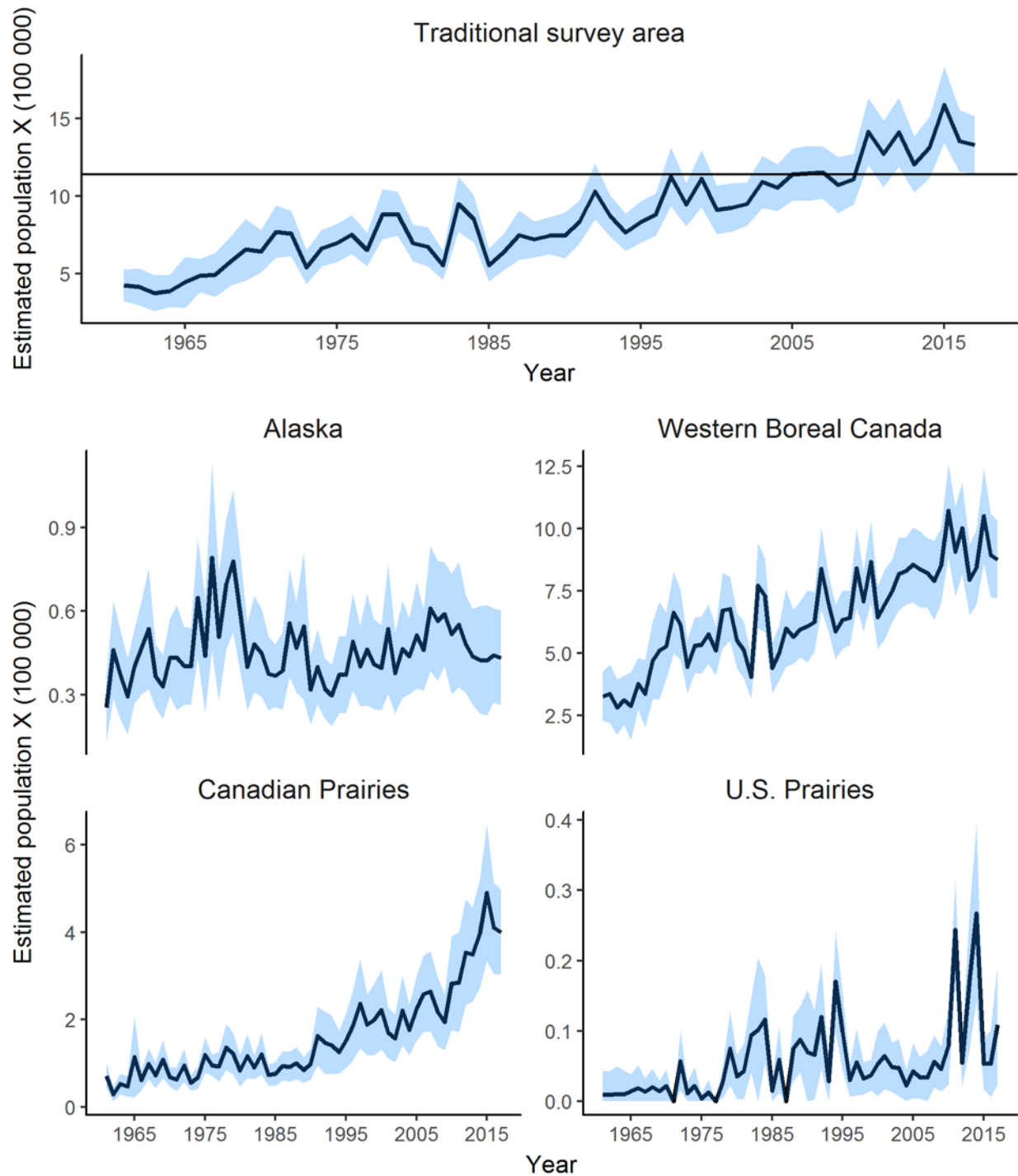


Figure 6.12-1 Bufflehead Breeding Population Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals (Horizontal lines represent the NAWMP goal for the traditional survey area)

EASTERN WATERFOWL BREEDING GROUND SURVEY

Since the beginning of the survey in 1990, there has been considerable annual variance in Bufflehead numbers (Figure 6.12-2). Several factors could explain this variability including, the survey timing which might be too early for this species, as most Buffleheads, like other sea ducks, are still migrating when the survey is carried out; the species' boreal breeding range is only partially covered by the survey; and Buffleheads breed in low density within the survey area (Brousseau and Lepage 2013b). Overall, however, the species has exhibited a relatively stable population trend since the survey began (Table 6.12-2).

Table 6.12-2. Bufflehead Breeding Population Estimates with 95% Confidence Intervals (CI) Based on the Eastern Waterfowl Breeding Ground Survey (The figure represents results from the helicopter plot survey only; Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])					
EWS—Eastern Waterfowl Breeding Ground Survey	Breeding Population Estimates in Core Area (in thousands)		Trends in Numbers of Breeding Birds in Core Area		
	2016	2017	1990–2017	2008–2017	2013–2017
Eastern Survey Area	44 (17 - 71)	38 (14 - 62)	0.11	1.74	4.81

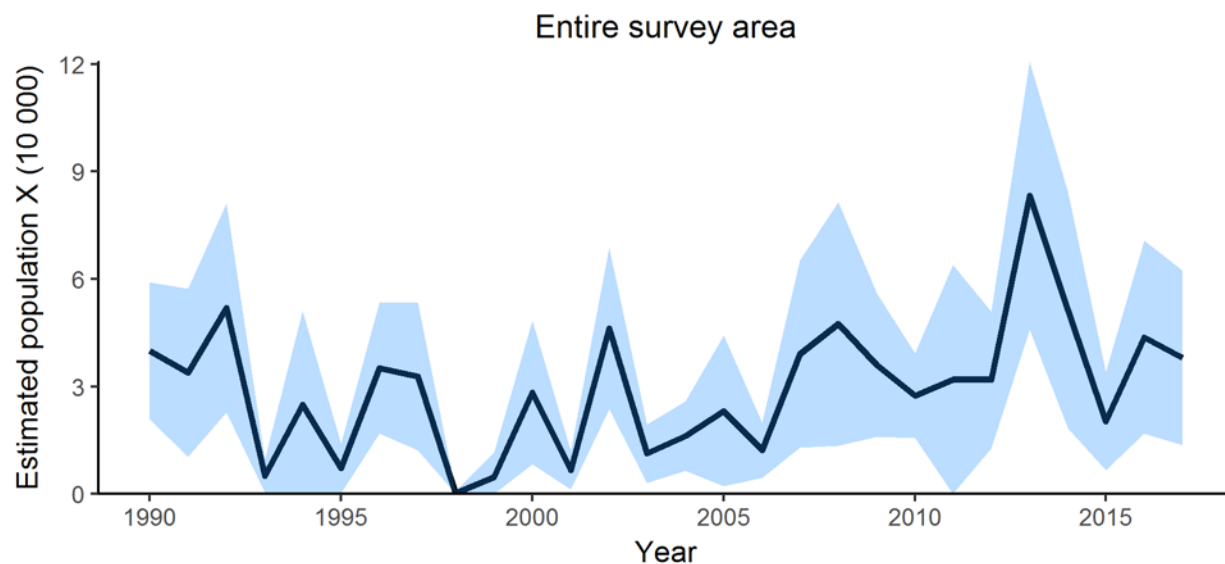


Figure 6.12-2 Bufflehead Breeding Population Estimates Based on the Eastern Waterfowl Breeding Ground Survey, black line represents the population estimate and the shaded area represents the 95% Confidence Intervals (The figure represents results from the helicopter plot survey only).

SMALL-SCALE WATERFOWL SURVEYS

Table 6.12-3. Bufflehead Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)

Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	2006–2017	2008–2017	2013–2017
Central Interior Plateau of BC	46.64 (35.17-50.11)	43.47 (33.54-53.39)	-0.51	0.81	3.46

COOPERATIVE YUKON ROADSIDE WATERFOWL BREEDING POPULATION SURVEY

The Yukon Roadside Waterfowl Breeding Population Survey suggests a stable long-term trend for Bufflehead (Figure 6.12-3).

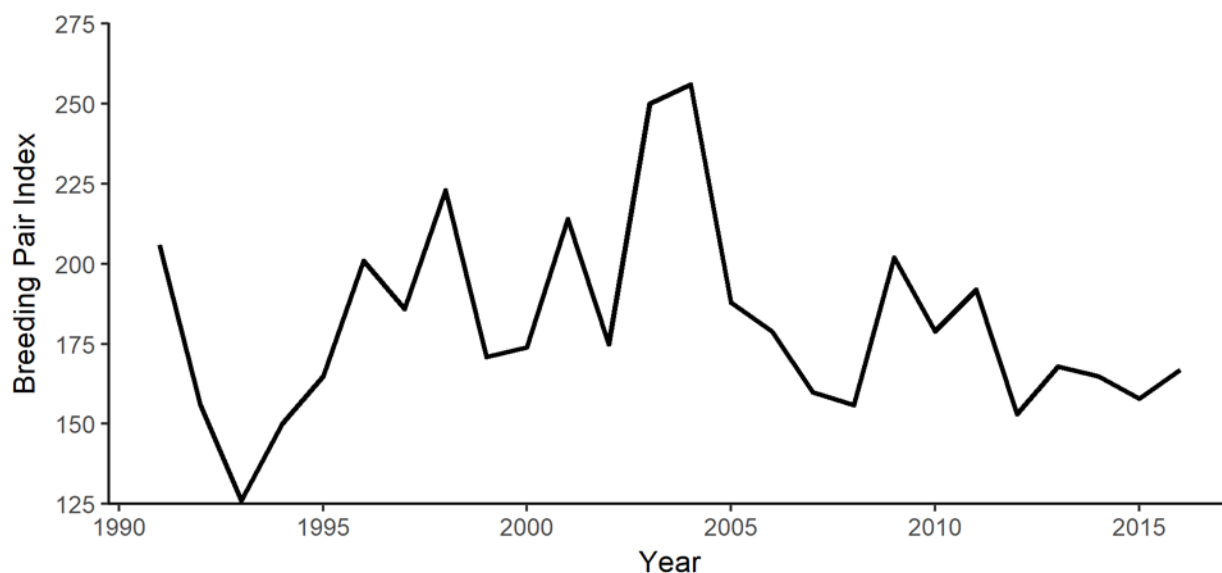


Figure 6.12-3 Breeding Pair Index for the Bufflehead in Southern Yukon, 1991–2016

NORTHWEST TERRITORIES BOREAL WATERFOWL AND WATERBIRDS SURVEY

The Bufflehead is one of the least abundant sea duck species in this area and has shown much variation in population over the course of the survey (Figure 6.12-4). The 2016 estimate of 26 ducks was slightly below the 2014 estimate of 33.

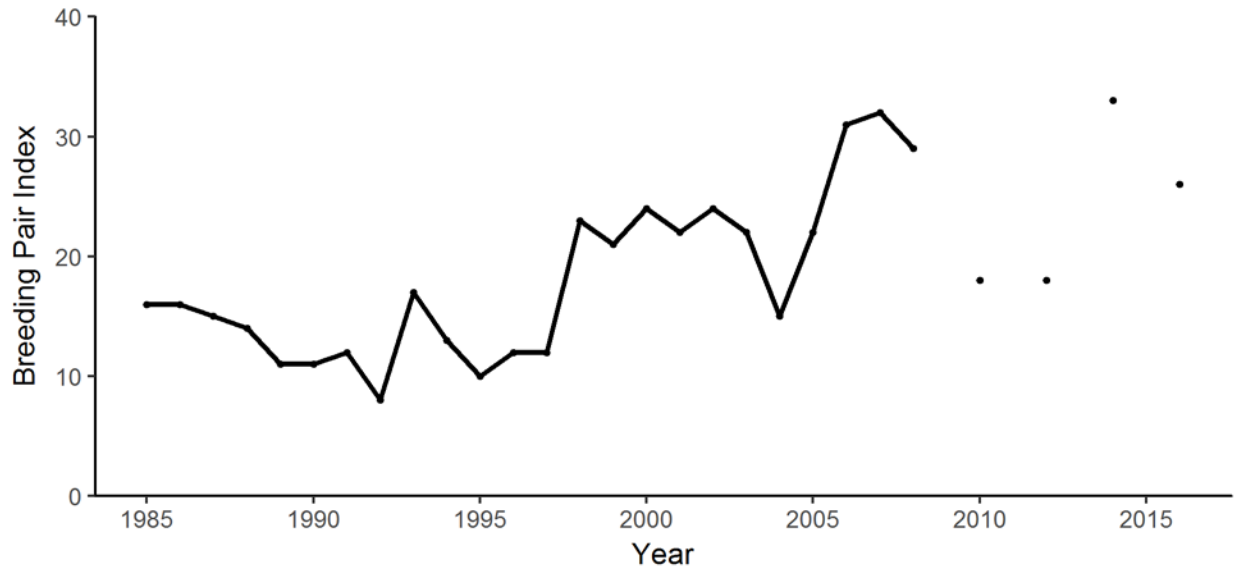


Figure 6.12-4 Total Number of Breeding Pairs for the Bufflehead observed in the Northwest Territories Boreal Waterfowl and Waterbirds Survey, 1985-2016. Since 2008, surveys have been done every second year.

WATERFOWL BREEDING PAIR SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

Breeding Pair Surveys in the central Interior Plateau Region of British Columbia for the Bufflehead species show a stable long-term trend (Figure 6.12-5).

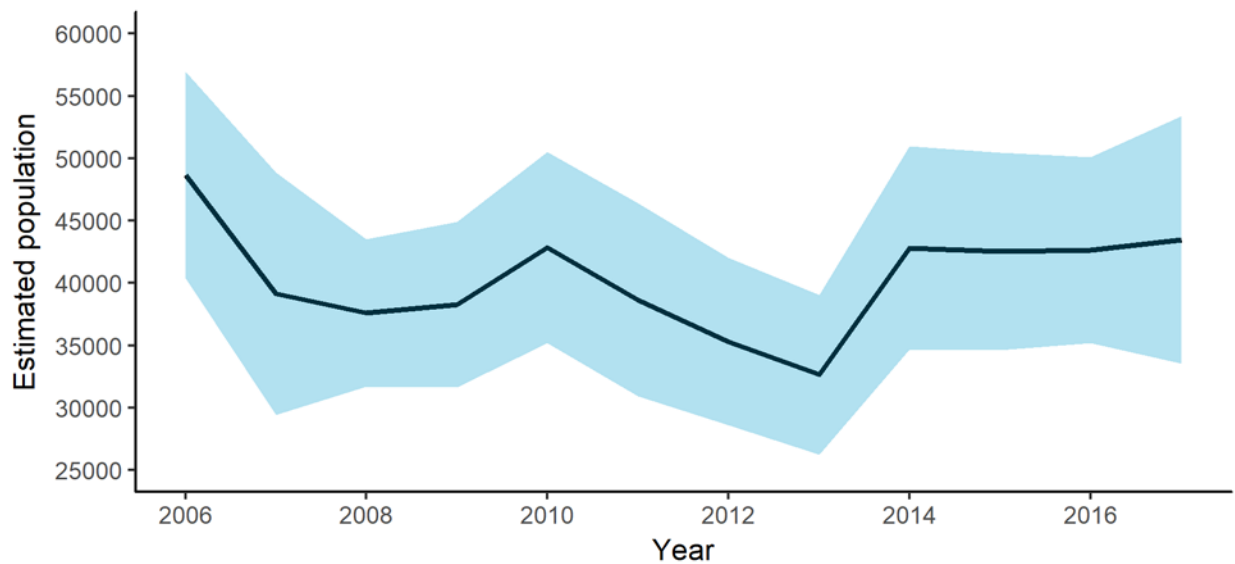


Figure 6.12-5 Population Estimates of Buffleheads in British Columbia Central Plateau, 2006-2017, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

6.12.2 Harvest

In Canada, the number of Buffleheads harvested has declined, in correspondence with a general decline in the number of waterfowl hunters. In the U.S., where the majority of Buffleheads are taken, the number

of birds harvested has been variable, but has generally been increasing since 2000 (Figure 6.12-6).

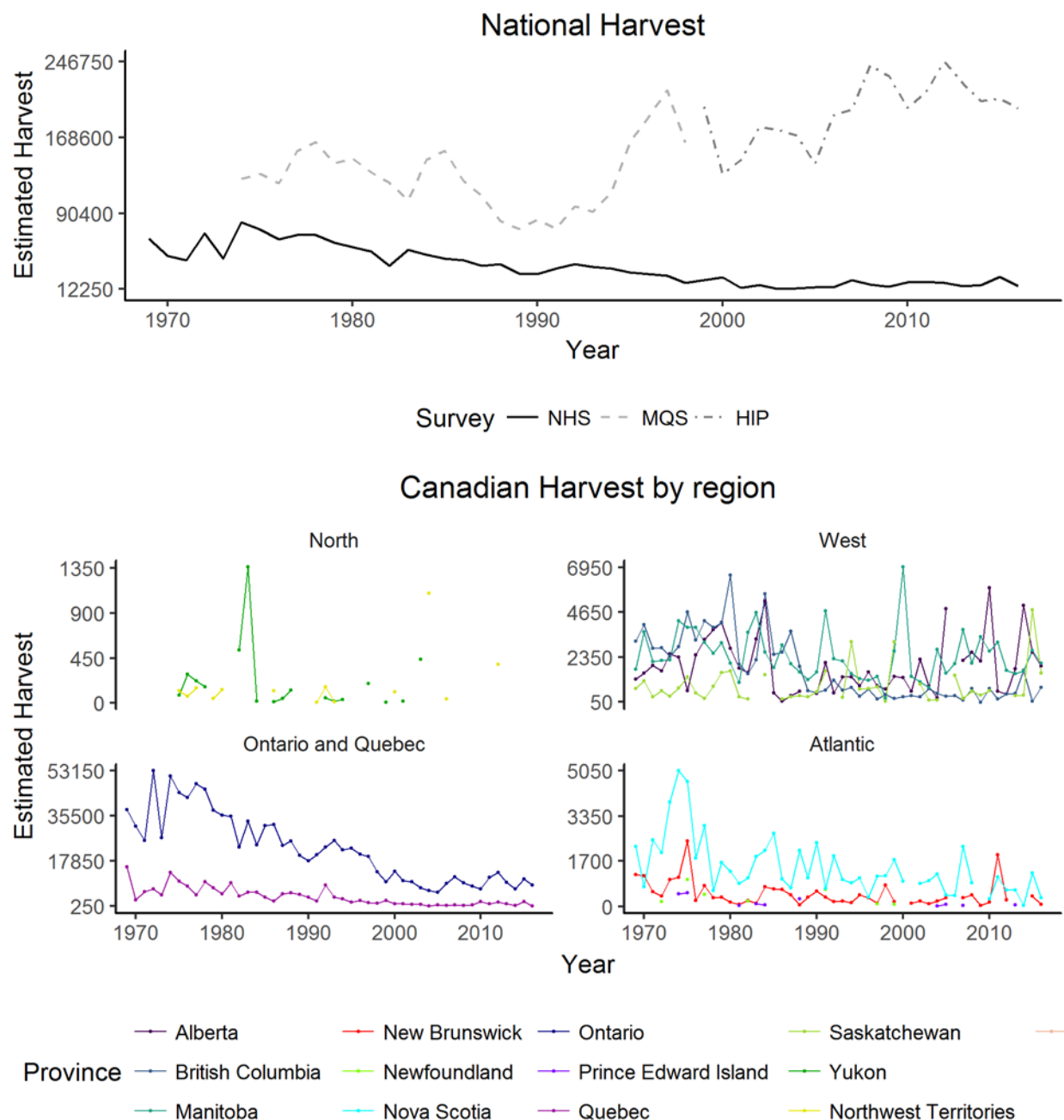


Figure 6.12-6 Estimated harvest for the Bufflehead in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=defandlang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

6.12.3 Management and Conservation Concerns

The Bufflehead breeding distribution is influenced by the distribution and availability of nesting cavities. Loss of cavity-bearing trees due to agricultural expansion and forestry in the boreal forest, particularly in the Aspen Parkland, is a potential concern (Gauthier 2014).

6.13 Common Merganser (*Mergus merganser*)

The Common Merganser is the largest of the three North American merganser species. It breeds across Canada wherever trees are large enough to support suitable nesting cavities. Common Mergansers winter along both the Pacific and Atlantic coasts, and across the continental U.S., as far north as open water remains available (Pearce *et al.* 2015). The Common Merganser is the most abundant merganser species.

6.13.1 Abundance and Trends

The population size and trends for mergansers are not reliably known, as many aerial surveys do not distinguish among the three species, whose breeding ranges overlap extensively. In addition, the boreal forest, which is an important part of the merganser breeding range, is not covered very well by many surveys. However, the three species can be reliably identified during helicopter-based plot surveys conducted as part of the Eastern Waterfowl Breeding Ground Survey. The Common Mergansers is also monitored by the Southern Ontario Waterfowl Plot Survey. The continental Common Merganser population size is estimated at 1.2 million birds (NAWMP 2012).

LARGE-SCALE WATERFOWL SURVEY

EASTERN WATERFOWL BREEDING GROUND SURVEY

The Common Mergansers show a long term significant increase in eastern Canada (Figures 6.13-1). The increase is mainly due however to a strong population increase that occurred during the last five years.

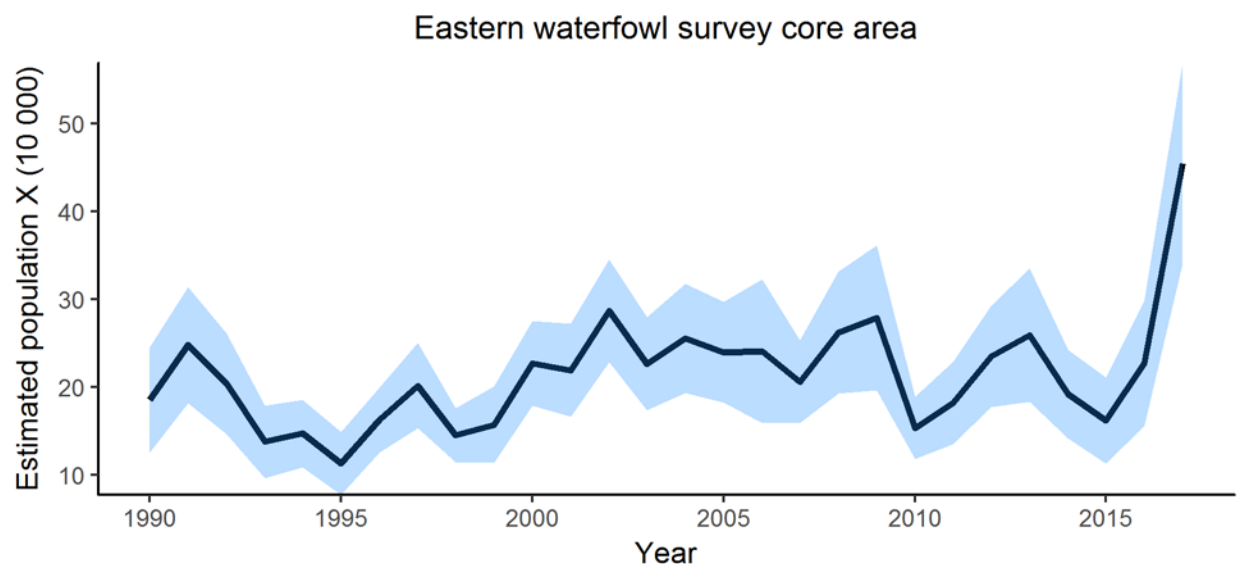


Figure 6.13-1 Common Merganser Breeding Population Estimates Based on the Eastern Waterfowl Breeding Ground Survey, black line represents the population estimate and the shaded area represents the 95% Confidence Intervals (The figure represents results from the helicopter plot survey only).

SMALL-SCALE WATERFOWL SURVEYS

Table 6.13-3. Common Merganser Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)

Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	1971-2017	2008-2017	2013-2017
Southern Ontario	5.61 (1.07-10.15)	19.37 (0.45-38.28)	7.90*	3.91	2.33

SOUTHERN ONTARIO WATERFOWL PLOT SURVEY

In southern Ontario, numbers of breeding Common Mergansers have increased significantly since the early 1970s and more rapidly in the last decade (Figure 6.13-2).

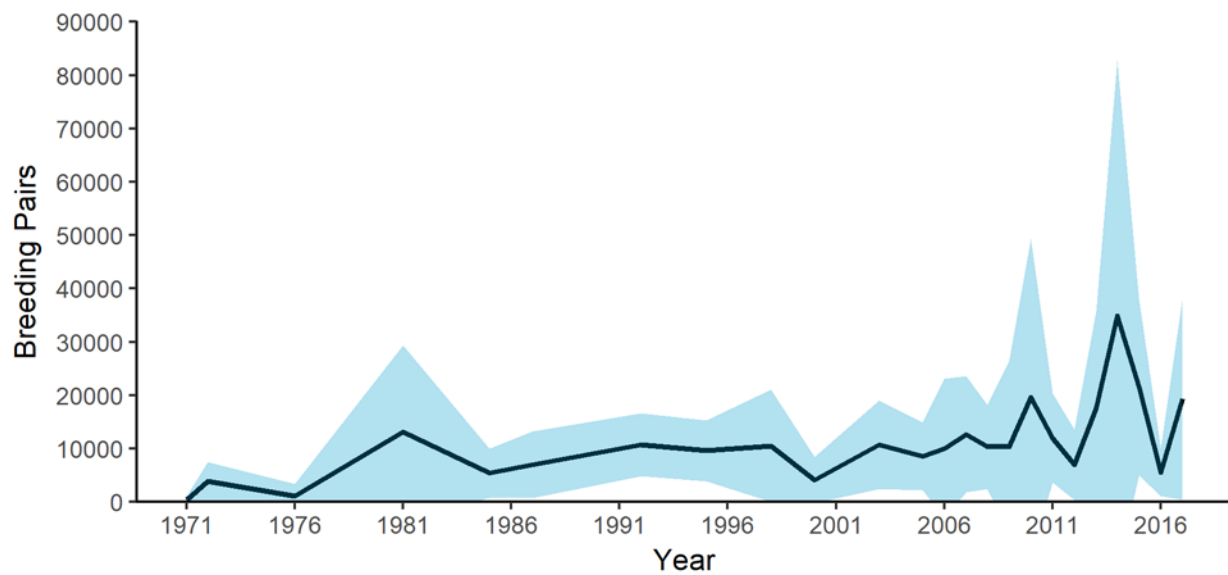


Figure 6.13-2 Indicated Breeding Pair of Common Mergansers in Southern Ontario, 1971–2017, black line represents the breeding pair estimate while the shaded area represents the 95% Confidence Intervals.

6.13.2 Harvest

Overall, hunters do not heavily harvest mergansers. In Canada, mergansers are hunted predominantly in the Atlantic Provinces, Quebec and Ontario, as well as to a lesser extent in British Columbia (Figures 6.13-3).

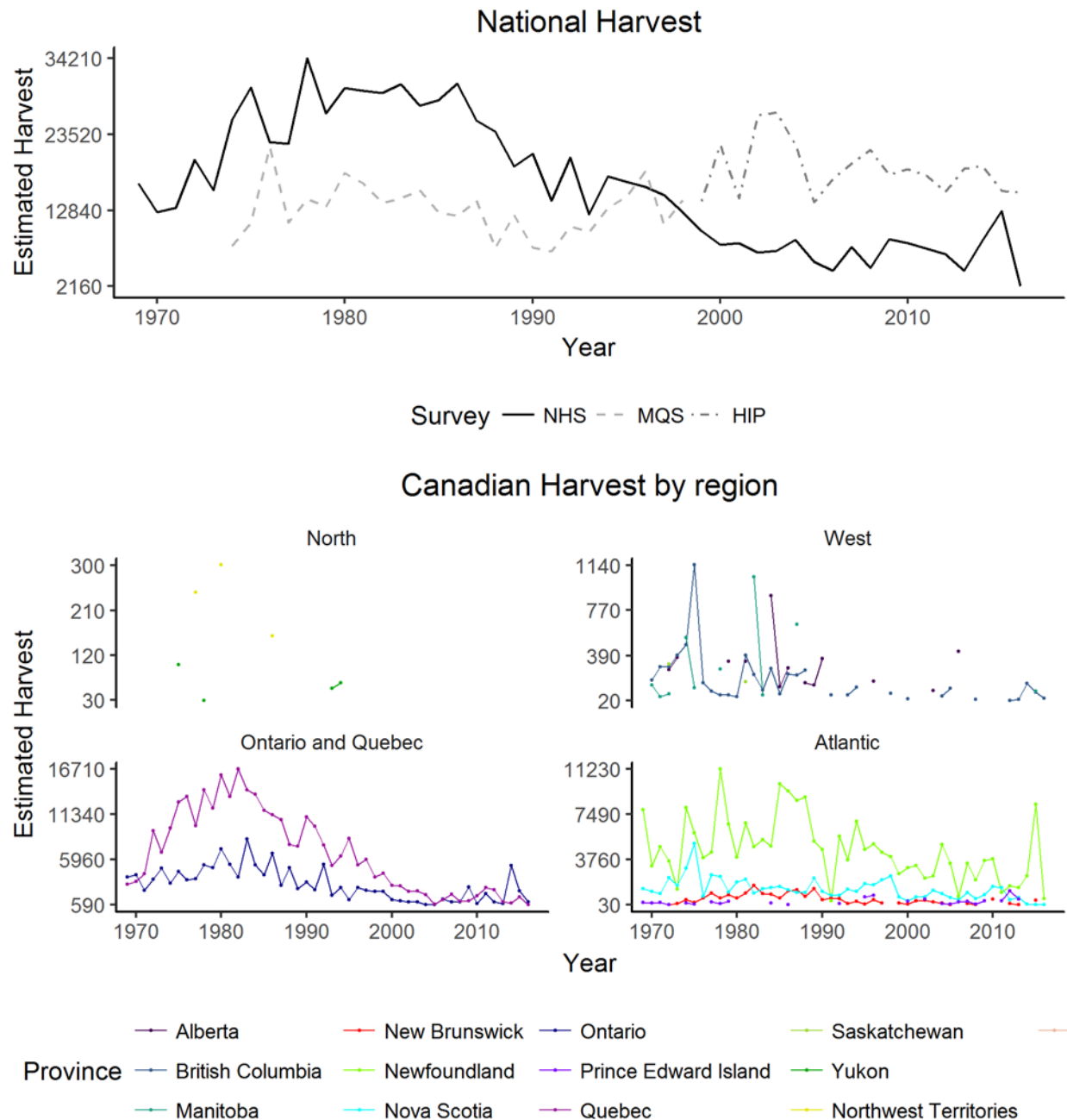


Figure 6.13-3. Estimated harvest for the Common Merganser in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

6.13.3 Management and Conservation Concerns

The most important factor limiting the population size and breeding distribution of the Common Merganser is probably the availability of fish, but suitable nesting cavities can also play a role locally. In areas that were or are being logged, forestry practices may have reduced the availability of cavities suitable for nesting. Lake acidification and associated declines in fish populations can also reduce habitat quality (Pearce *et al.* 2015). Due to their trophic level, Common Mergansers are vulnerable to contaminants (e.g., mercury, lead), and may be useful bioindicator species for fish-bearing streams and lakes (Pearce *et al.* 2015).

6.14 Red-Breasted Merganser (*Mergus serrator*)

The Red-breasted Merganser has a wide range in North America, and is known to breed at high latitudes (up to 75°N), but is more likely to spend winters on the coast. Its population status and numbers are difficult to estimate because aerial surveys of breeding birds do not differentiate between the three species of mergansers and the species are combined in counts (Craik *et al.* 2015).

6.14.1 Abundance and Trends

The population size and trends for mergansers are not reliably known, as many aerial surveys do not distinguish among the three species, whose breeding ranges overlap extensively. In addition, the boreal forest, which is an important part of the merganser breeding range, is not covered very well by many surveys. However, the three species can be reliably identified during helicopter-based plot surveys conducted as part of the Eastern Waterfowl Breeding Ground Survey. Recent Red-breasted Merganser numbers show increasing short- and long-term trends (SDJV 2007), this following a decline in the continental population from 700 000 individuals in 2004 (NAMWP 2004) to 400 000 birds in 2012 (NAWMP 2012).

LARGE-SCALE WATERFOWL SURVEY

EASTERN WATERFOWL BREEDING GROUND SURVEY

The Red-breasted mergansers show stable trends in eastern Canada (Figure 6.14-1). While the Common and the Hooded Mergansers are well captured by the helicopter plot survey component of the Eastern Waterfowl Breeding Ground Survey (timing and range), this is not the case with the Red-breasted Merganser, as can be seen with the high variability illustrated in Figure 6.14-1. The Red-breasted Merganser nests later than the other mergansers species (and as a consequence, there may still be migrating birds in the breeding counts) and the EWS only covers part of its breeding range (Lepage 2013b).

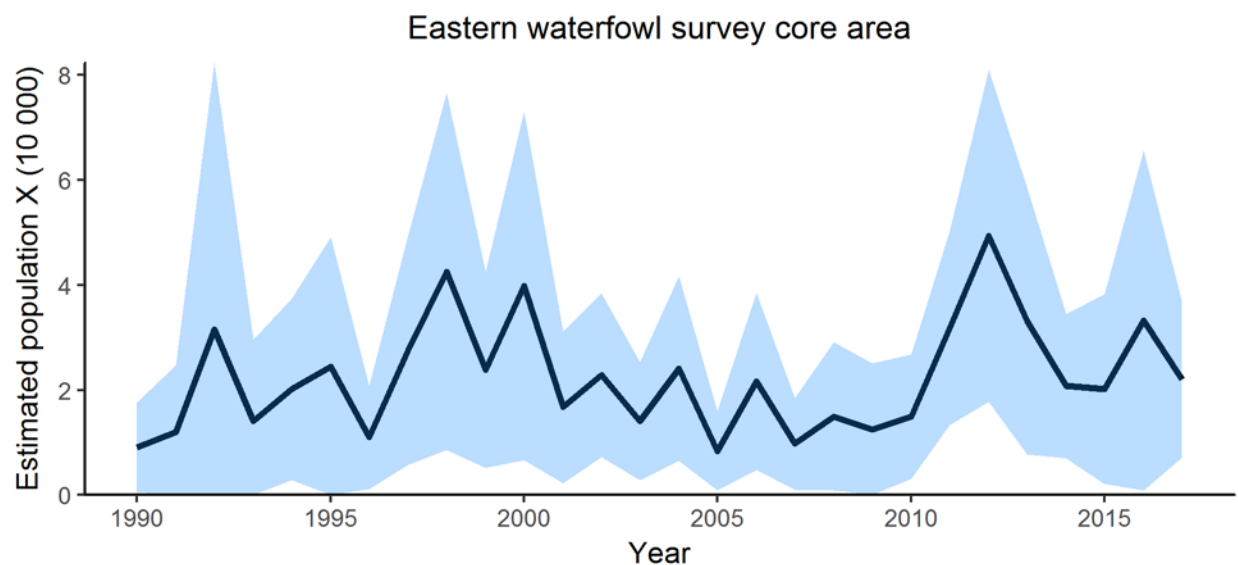


Figure 6.14-1 Red-Breasted Merganser Breeding Population Estimates Based on the Eastern Waterfowl Breeding Ground Survey, black line represents the population estimate and the shaded area represents the 95% Confidence Intervals (The figure represents results from the helicopter plot survey only).

6.14.2 Harvest

Overall, hunters do not heavily harvest mergansers. In Canada, mergansers are hunted predominantly in the Atlantic Provinces, Quebec and Ontario, as well as to a lesser extent in British Columbia (Figure 6.14-2).

6.14.3 Management and Conservation Concerns

The ecology of the Red-breasted Merganser is not well known throughout its North American range and has received little attention (Lepage 2013b). The lack of a reliable survey for this species could hamper conservation efforts in the future.

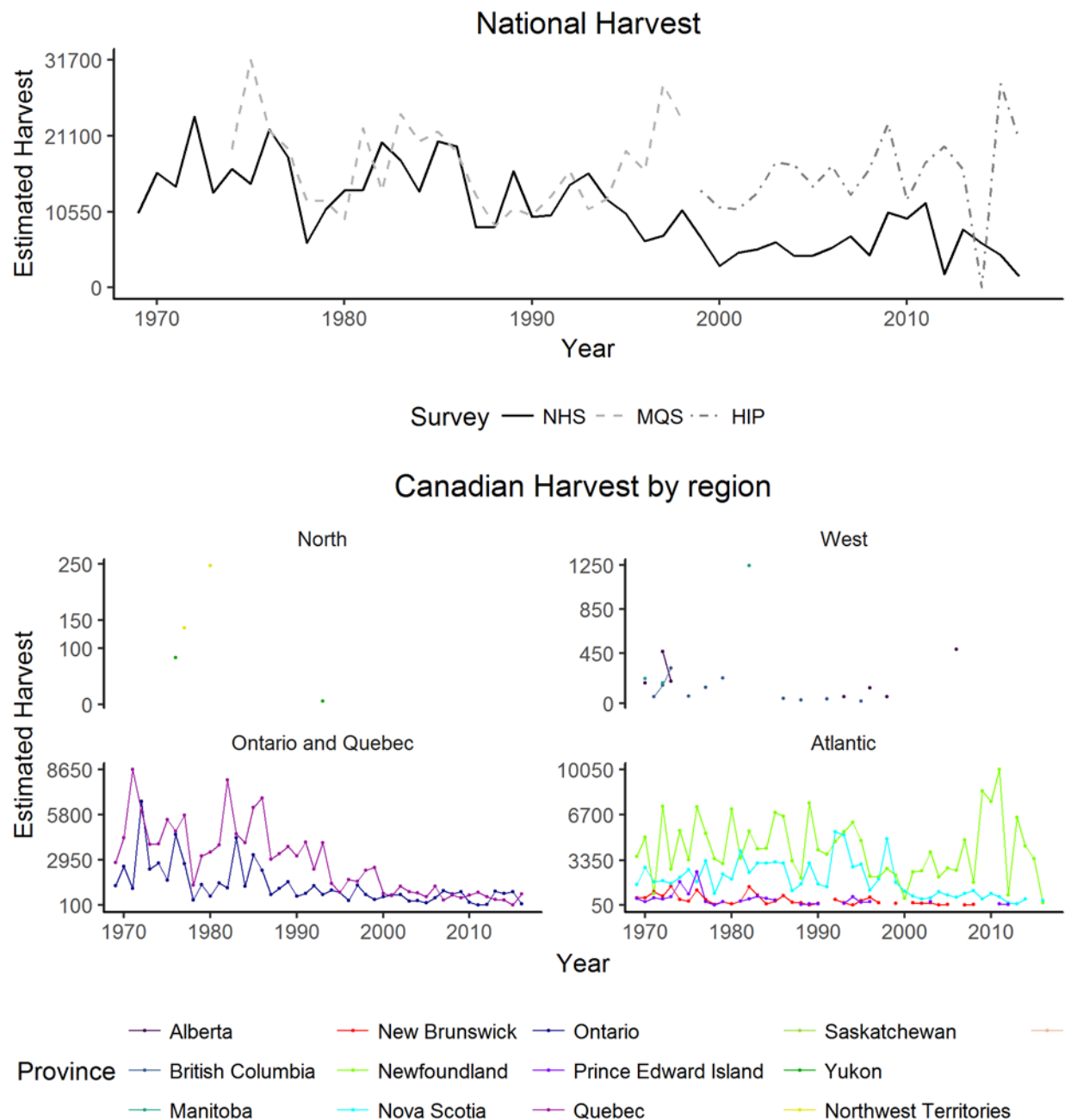


Figure 6.14-2 Estimated harvest for the Red-Breasted Merganser in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

6.15 Hooded Merganser (*Lophodytes cucullatus*)

The Hooded Merganser is the smallest of the three merganser species and is the only one that occurs solely in North America (Dugger *et al.* 2009). It is mostly found in the southern regions of Canada. The Hooded Merganser breeds mostly in eastern Canada, where it shows the highest densities in the Great Lakes region in southern Ontario, and in Quebec. The species also occurs in southeast Saskatchewan, southern Manitoba, and the Maritimes. Its population status and numbers are difficult to estimate accurately due to the species' secretive nature, the remoteness of some of its breeding range, and its tree cavity-nesting habits (Dugger *et al.* 2009).

6.15.1 Abundance and Trends

The population size and trends for mergansers are not reliably known, as many aerial surveys do not distinguish among the three species, whose breeding ranges overlap extensively. In addition, the boreal forest, which is an important part of the merganser breeding range, is not covered very well by many surveys. However, the three species can be reliably identified during helicopter-based plot surveys conducted as part of the Eastern Waterfowl Breeding Ground Survey. The Hooded Merganser is also monitored by the Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C and the Southern Ontario Waterfowl Plot Survey.

LARGE-SCALE WATERFOWL SURVEY

EASTERN WATERFOWL BREEDING GROUND SURVEY

The Hooded Merganser population is increasing at 3% rate over the long-term in the EWS survey area (Figure 6.15-1).

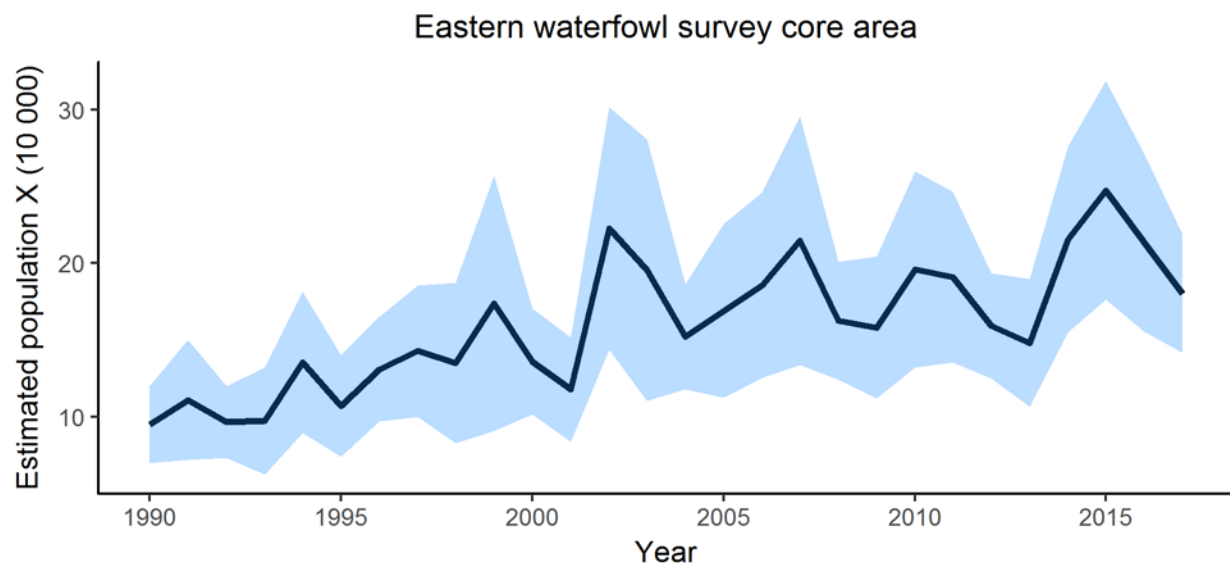


Figure 6.15-1 Hooded Merganser Breeding Population Estimates Based on the Eastern Waterfowl Breeding Ground Survey, black line represents the population estimate and the shaded area represents the 95% Confidence Intervals (The figure represents results from the helicopter plot survey only).

SMALL-SCALE WATERFOWL SURVEYS

Table 6.15-1. Merganser (Hooded and Common) Breeding Population Estimates with 95% Confidence Intervals (CI) and Trends for Smaller-Scale Waterfowl Surveys (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)

Survey/Area	Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in population		
	2016	2017	2006–2017	2008–2017	2013–2017
Central Interior Plateau of BC	13.38 (8.76-18.00)	11.26 (8.65-13.88)	-0.33	0.80	3.54
Southern Ontario	26.07 (11.03-41.11)	35.95 (12.70-59.19)	9.09*	10.05*	18.57

WATERFOWL BREEDING POPULATION SURVEY OF THE CENTRAL INTERIOR PLATEAU OF B.C.

The survey of Mergansers in B.C. consists of mainly of Hooded Mergansers (~80%), and a smaller portion of Common Mergansers (~20%). The Merganser population in this region has shown a relatively stable trend over the long-term of this survey (2006–2017), with a slight increase in the population over the last 5-years.

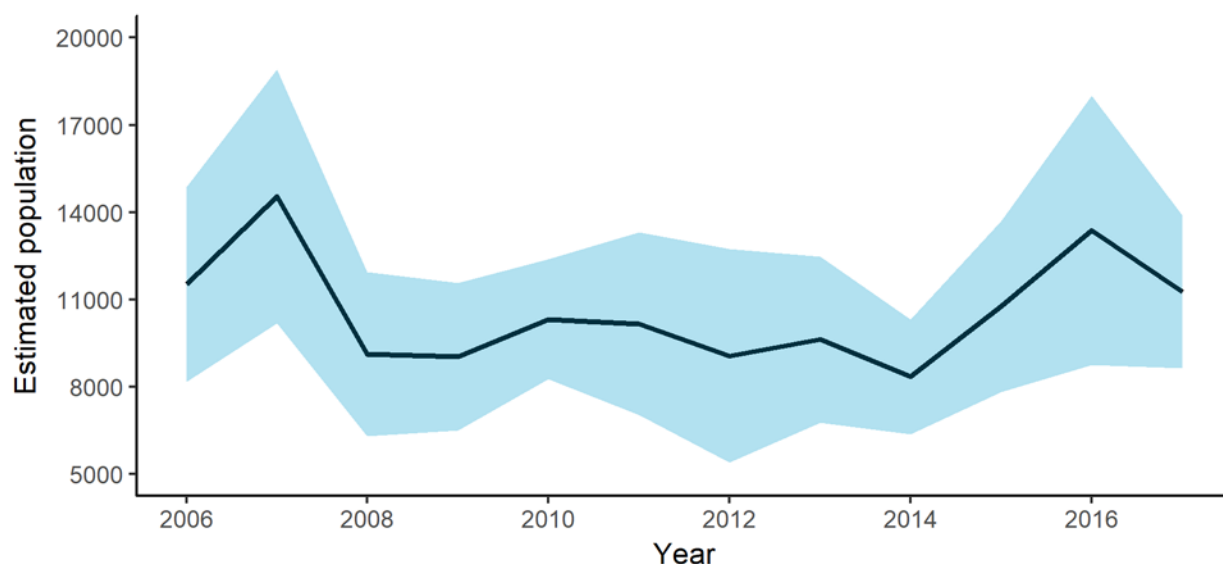


Figure 6.15-2 Population Estimates of Mergansers (Hooded and Common) in British Columbia Central Plateau, 2006–2017, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

SOUTHERN ONTARIO WATERFOWL PLOT SURVEY

In southern Ontario, numbers of breeding Hooded Mergansers show high variability and a slight overall increase over the long-term (Figure 6.15-3).

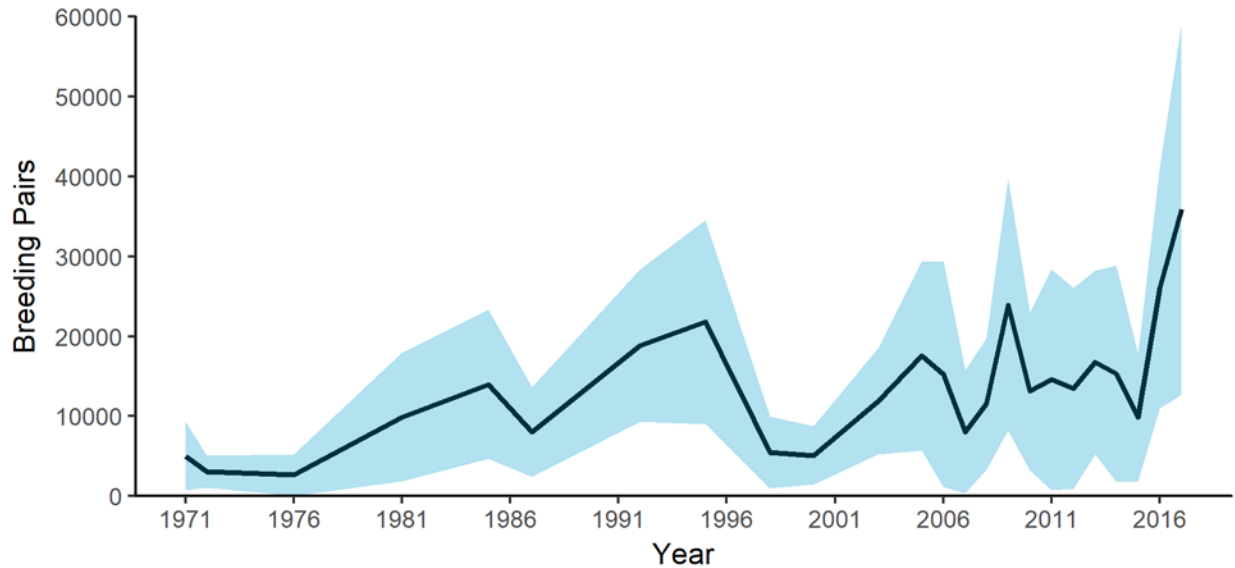


Figure 6.15-3 Indicated Breeding Pair of Hooded Mergansers in Southern Ontario, 1971–2017, black line represents the breeding pair estimate while the shaded area represents the 95% Confidence Intervals.

6.15.2 Harvest

Overall, hunters do not heavily harvest mergansers. In Canada, mergansers are hunted predominantly in the Atlantic Provinces, Quebec and Ontario, as well as to a lesser extent in British Columbia (Figures 6.15-4).

6.15.3 Management and Conservation Concerns

This species is not a highly sought-after or commonly harvested game bird in Canada, but, like many other sea ducks, impacts from hunting are unknown (Dugger *et al.* 2009). Deforestation and acid rain may be potential threats for this species in some parts of its range. Other conservation concerns for the Hooded Merganser include the availability of suitable nesting cavities and the degradation and loss of wetlands (Lepage 2013a).

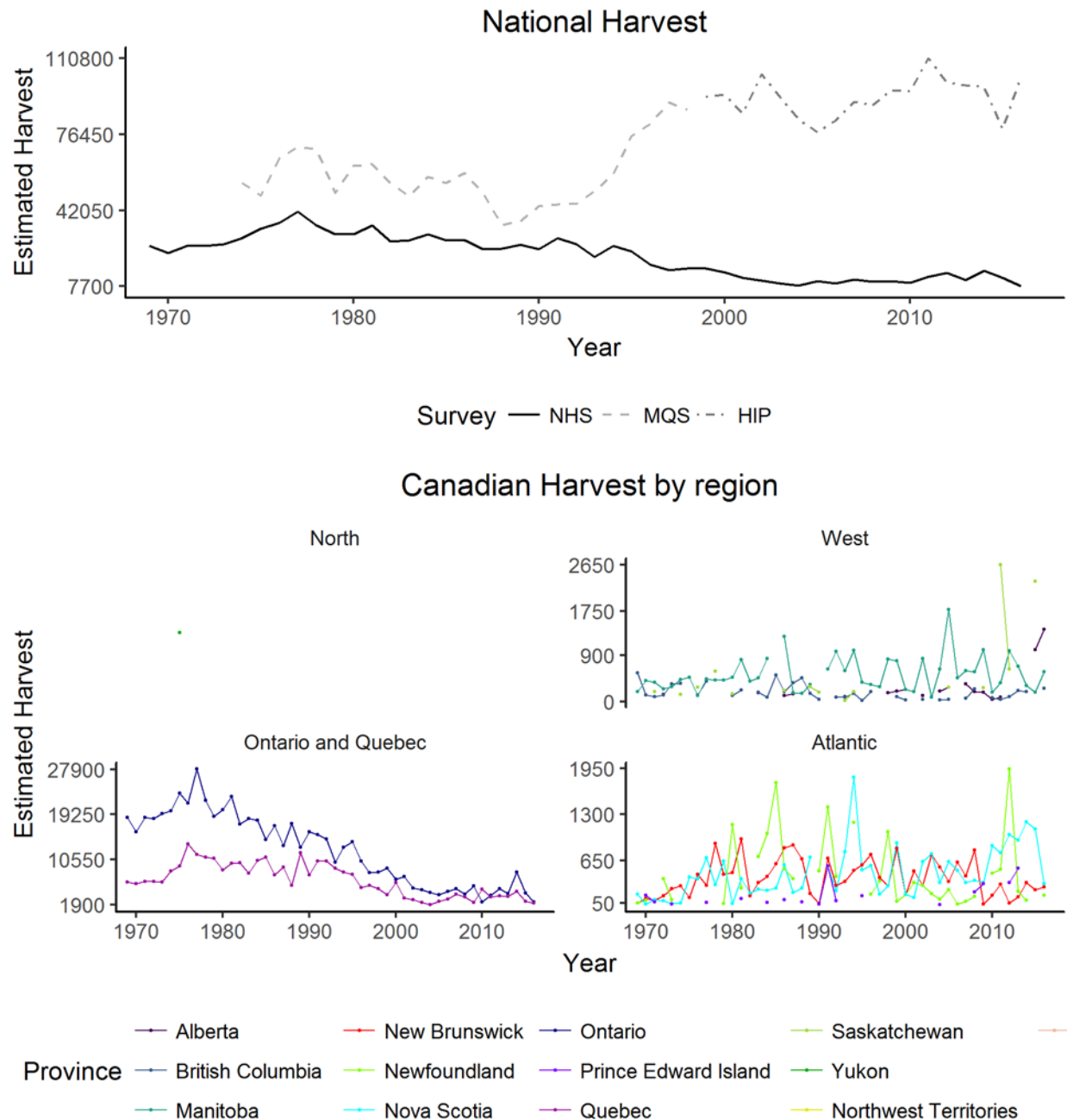


Figure 6.15-4 Estimated harvest for the Hooded Merganser in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>. For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

7. Population Status of Geese

There are six species of geese that nest in Canada: the Snow Goose, the Canada Goose, the Cackling Goose, the White-fronted Goose, Ross's Goose and the Brant. The species are often subdivided by subspecies or population for regional management purposes. Geese are present almost everywhere in North America, though very few birds spend their entire annual cycle in Canada. Most migrate north–south and are shared between Canada, the U.S. and Mexico. A few migrate east–west and are shared with other countries (Russia, Greenland, northern Europe). Most populations of geese are either stable or increasing in abundance. Some have benefitted from human-induced changes to the landscape and have become so abundant that they require special population management measures to reduce their impacts.

Foraging by large numbers of Snow Geese has resulted in significant alteration of plant communities in some Arctic and Subarctic staging and nesting areas. In some areas, this has led to reductions in the availability of their preferred forage plant species, as well as to secondary effects on soil chemical characteristics. The amount of habitat affected by foraging geese has increased as the populations have grown, and there are concerns that continued expansion of the area affected by geese eventually could lead to loss of ecosystem function or lead to significant impacts for other species. Concern over potential impacts of geese on their habitats prompted managers to undertake measures to increase hunter harvest of Mid-continent Lesser Snow Geese and Greater Snow Geese: these species were designated as overabundant in 1999. This was done through liberalization of hunting regulations, and amendments to the *Migratory Birds Regulations* in Canada and the U.S. to allow harvests to occur outside of the normal hunting season. Ross's Geese were declared overabundant in the U.S. in 1999, and in Canada beginning in 2014. The CWS also recently designated the Lesser Snow Geese nesting in the western Arctic as overabundant, and thus they are now subject to special conservation measures to increase harvest in western Canada.

Temperate-breeding Canada Geese also have been increasing in abundance, but no population has yet been designated as overabundant in Canada. Most conflicts with humans occur in urban areas in southern Canada (e.g., golf courses, urban parks, private lands), and permits are often issued to reduce conflicts where Canada Geese cause damage or threaten human safety.

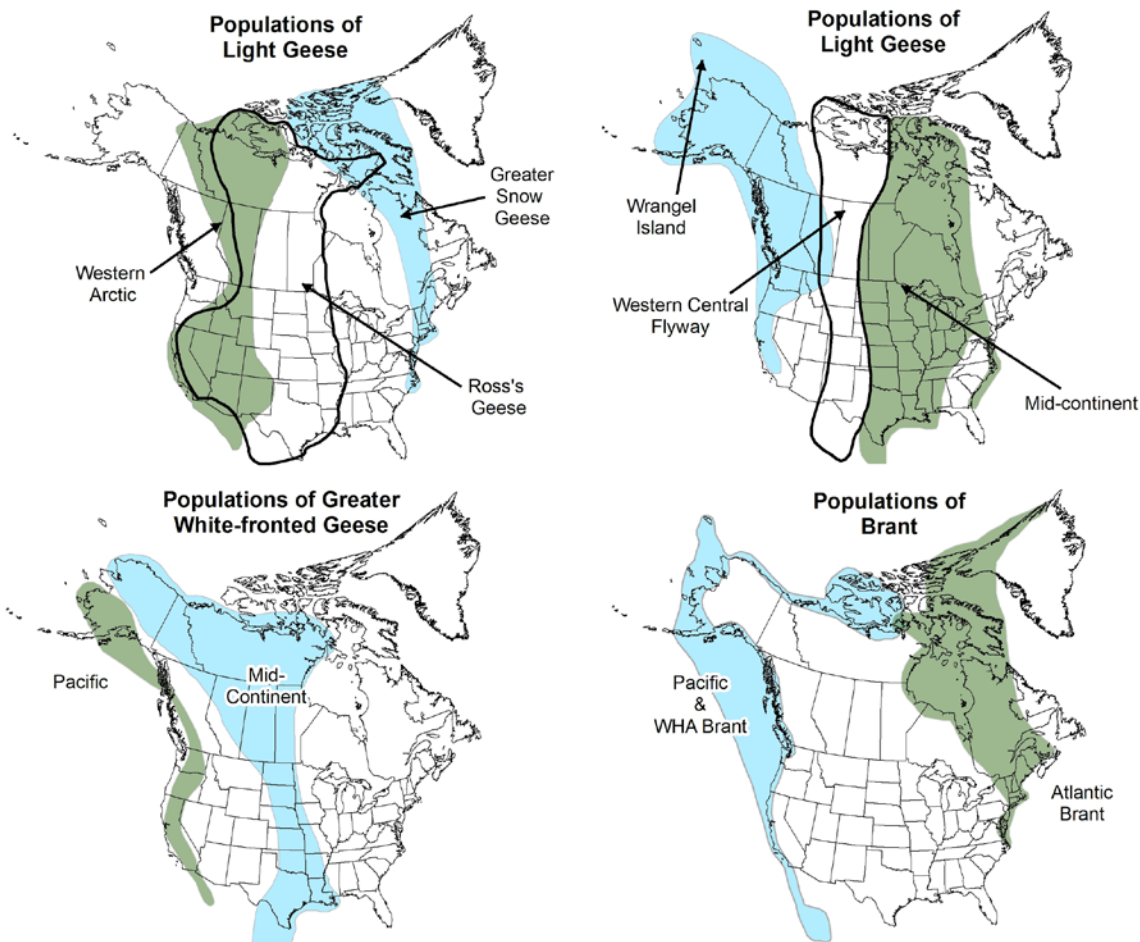


Figure 7-1. Approximate Ranges of Brant, as well as Snow, Ross's, and White-Fronted Geese in North America (Source: USFWS 2017).

7.1 Snow Goose

Two subspecies of Snow Goose are recognized for management purposes: the Lesser Snow Goose (*Anser caerulescens caerulescens*) and the Greater Snow Goose (*A. c. atlantica*).

7.2 Greater Snow Goose (*Anser caerulescens atlantica*)

The Greater Snow Goose population has undergone an important increase, from a few thousand individuals in the 1900s to between 700 000 and 1 million birds in the last decade. This species was designated as "overabundant" in 1998.

Greater Snow Geese breed in the Canadian Eastern High Arctic from the Foxe Basin to Alert on northern Ellesmere Island, with the largest nesting colony located on Bylot Island, Nunavut. Some breeding colonies can also be found on the western coast of Greenland (Figure 7-1). The birds winter along the mid-Atlantic coast from New Jersey to North Carolina. In the past, during migration the entire population would stage in the marshes and agricultural lands of southern Quebec, but a small portion of the population also migrates through eastern Ontario and northern New Brunswick.

7.2.1 Abundance and Trends

The Greater Snow Goose population has been monitored in its spring staging areas in southern Quebec since 1965. During the spring migration, the population concentrates in a smaller area than during the breeding or wintering periods when the birds are more dispersed. The spring survey has expanded greatly since the 1960s and now covers a large territory extending from Lac Champlain (south) to Lac St. Jean (north) and from eastern Ontario (west) to Chaleur Bay (east). Five aircraft are used simultaneously to ensure complete coverage during a one-day survey each spring.

The Greater Snow Goose population experienced a rapid growth in the late 1960s, followed by a period of relative stability from 1974 to 1982. Subsequently, population growth resumed, reaching an average annual rate of increase of 9.9% between 1982 and 1999 (Figure 7.2-1; Reed and Calvert 2007) growth was halted following the implementation in Canada of special conservation measures in the fall of 1998 and spring conservation harvests in 1999 (Reed and Calvert 2007). Since 1998, the Greater Snow Goose population has fluctuated between 700 000 and 1 million birds in response to the implementation and effectiveness of the special conservation measures in Canada and the U.S. The population has appeared to be decreasing in the last three years and to have stabilized below one million birds, and is currently experiencing a significant decreasing population trend of 4.5% over the last 5 years (2013-2017). The 2017 spring estimate of 747 000 geese was below last year's estimate of 915 000 (Figure 7.2-1; Lefebvre *et al.* 2017).

Greater Snow Geese are now being observed in greater numbers on agricultural lands in eastern Ontario at the western edge of the spring staging range. A similar situation has been observed on the tidal marsh habitats in and around Restigouche County in New Brunswick, where the presence of migrating Greater Snow Geese is now well established, although numbers appear to have remained stable there.

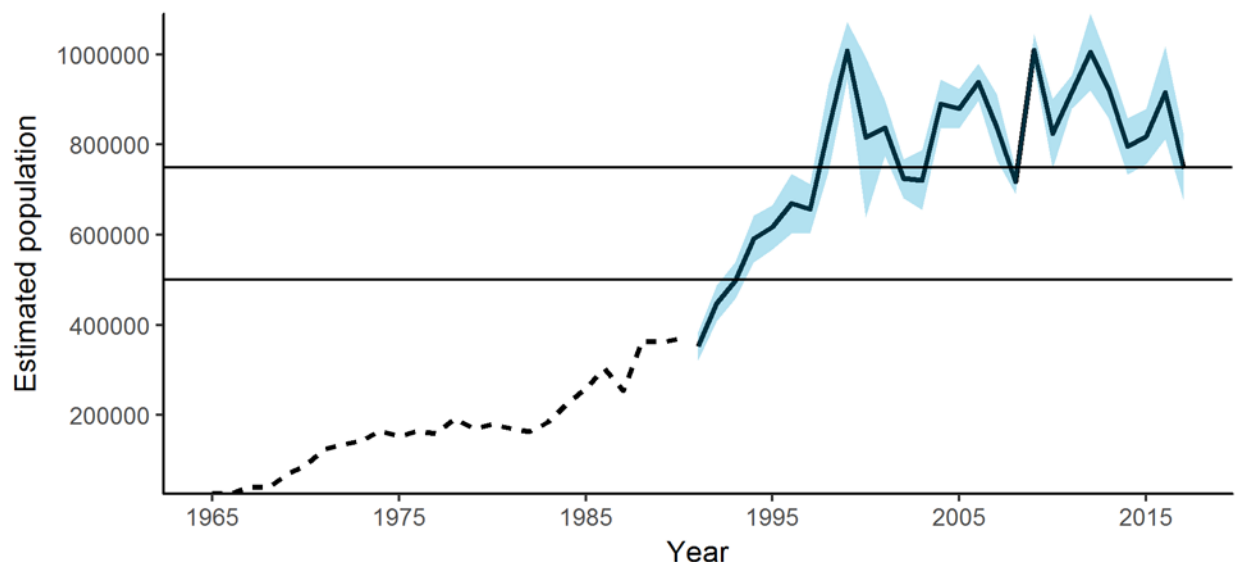


Figure 7.2-1 Greater Snow Goose Population Estimates during the Spring Staging Period in Southern Quebec. Shaded area represents the 95% Confidence intervals (The black horizontal lines represent the target range for the population. Estimates from 1998 to 2000 were corrected for flocks not observed during the survey, using data from a telemetry study. Estimates from 2002 and onward are based on a revised methodology)

Numbers of adult Greater Snow Geese have also been estimated using the Lincoln method, which uses data from band recoveries and harvest estimates to estimate population size. In 2015 and 2016, Lincoln estimates averaged approximately 600,000 adult birds, well below the 5-year average of about 1.26 million adult geese; this is consistent with recent declines in spring counts.

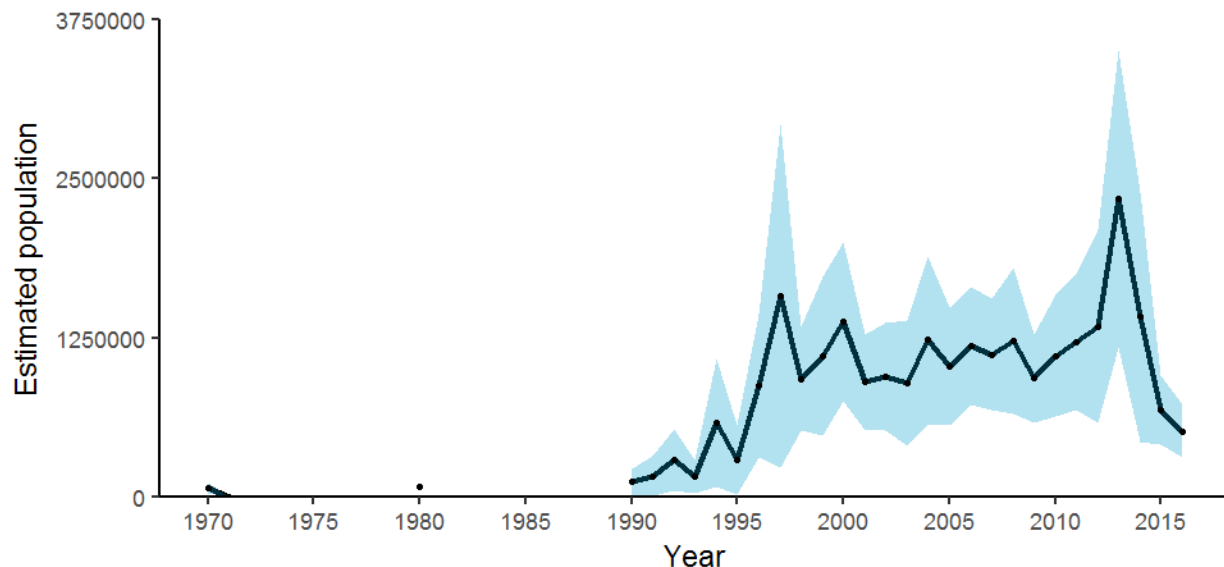


Figure 7.2-2 Lincoln Estimates of Population Size for Adult Greater Snow Geese, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals. (Source: R. Alisauskas, ECCC - S&T, unpubl. data)

7.2.2 Harvest

In order to reduce the population size and the population growth rate, measures were put in place in hunting season 1998–1999 to increase the Greater Snow Goose harvest in Canada and in the U.S. Harvest regulations were liberalized (bag and possession limits, season length) in both countries, and special conservation measures in Canada allowed the use of different hunting methods during the regular hunting seasons such electronic calls and bait. Special conservation seasons were also established in Canada (Quebec), during which hunters are permitted to harvest Greater Snow Geese in the spring, when hunting is normally prohibited.

The average number of Greater Snow Geese harvested annually in the fall in Canada increased slightly after the implementation of special conservation measures in 1998 (Figure 7.2-4). In Canada, in 2016, the fall goose harvest was estimated at 51 717 birds, well below the 5-year average of 63 555 (2012-2016). In the U.S., liberalized bag and possession limits were implemented in 1999, and a slight increase in the harvest was observed in the following years. In 2016-17, the fall harvest was estimated at approximately 25 560 birds, which was higher to the previous year's estimate, but less than the 2013 and 2012 estimates (Raftovich *et al.* 2017).

In the early years of the special conservation measures (1999–2002) in Quebec, the average number of Greater Snow Geese harvested in the spring was of about 55 000 birds per year (Figure 7.2-3). However, the spring harvest has since declined to an average of about 27 000 birds annually from 2003 to 2013, largely due to a decrease in the number of participating hunters. An estimated 29 546 birds were harvested during spring 2017 in Quebec (Figure 7.2-3). A spring conservation harvest was also implemented for the first time in southeastern Ontario in the spring of 2012. In 2017, an estimated 1 095 geese were harvested, a number lower than the 2015 estimate of 2 089 birds (Smith and Gendron 2017).

In the spring of 2009, a Conservation Order for Greater Snow Geese was put in place for the first time in several U.S. states in the Atlantic Flyway. An average of 50 227 geese (shot and retrieved) were harvested annually during the spring between 2010 and 2014. However, in the spring of 2016, the estimated (shot and retrieved) harvest of Greater Snow Geese was 44 358 birds (Figure 7.2-3). This is a 55.6% decrease from the 2015 estimate of 86 641. This decrease from the 2015 estimate could in part be

due to a 15% decrease in the number of hunters that participated in the hunt, as well as a 22% decrease in the number of days hunted (Atlantic Flyway Council 2017).

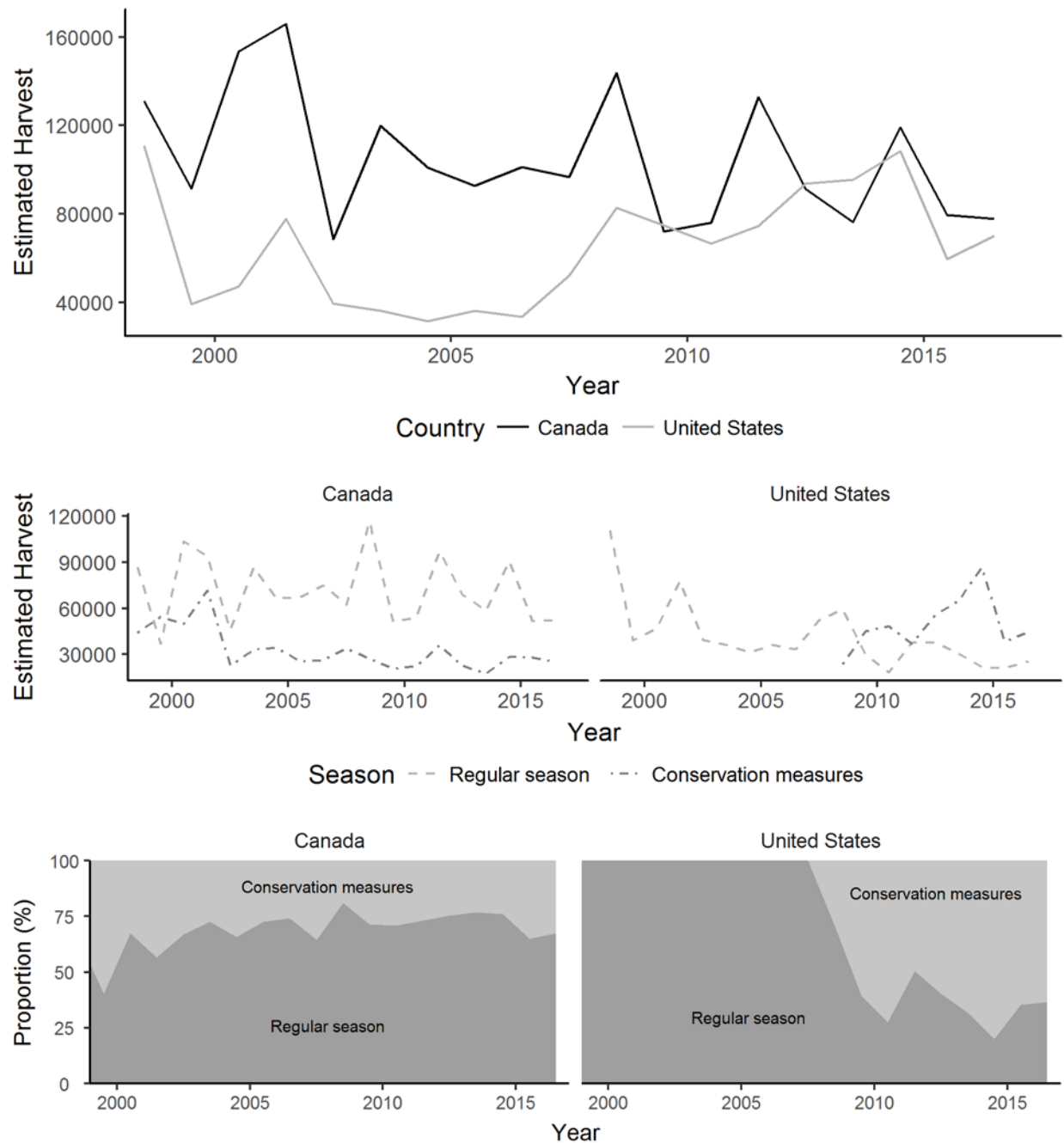


Figure 7.2-3 Harvest of Greater Snow Geese in Spring (Conservation Measures) and Fall (Regular Season) in Canada and the U.S. (Source: Smith and Gendron 2017; Atlantic Flyway Council 2017)

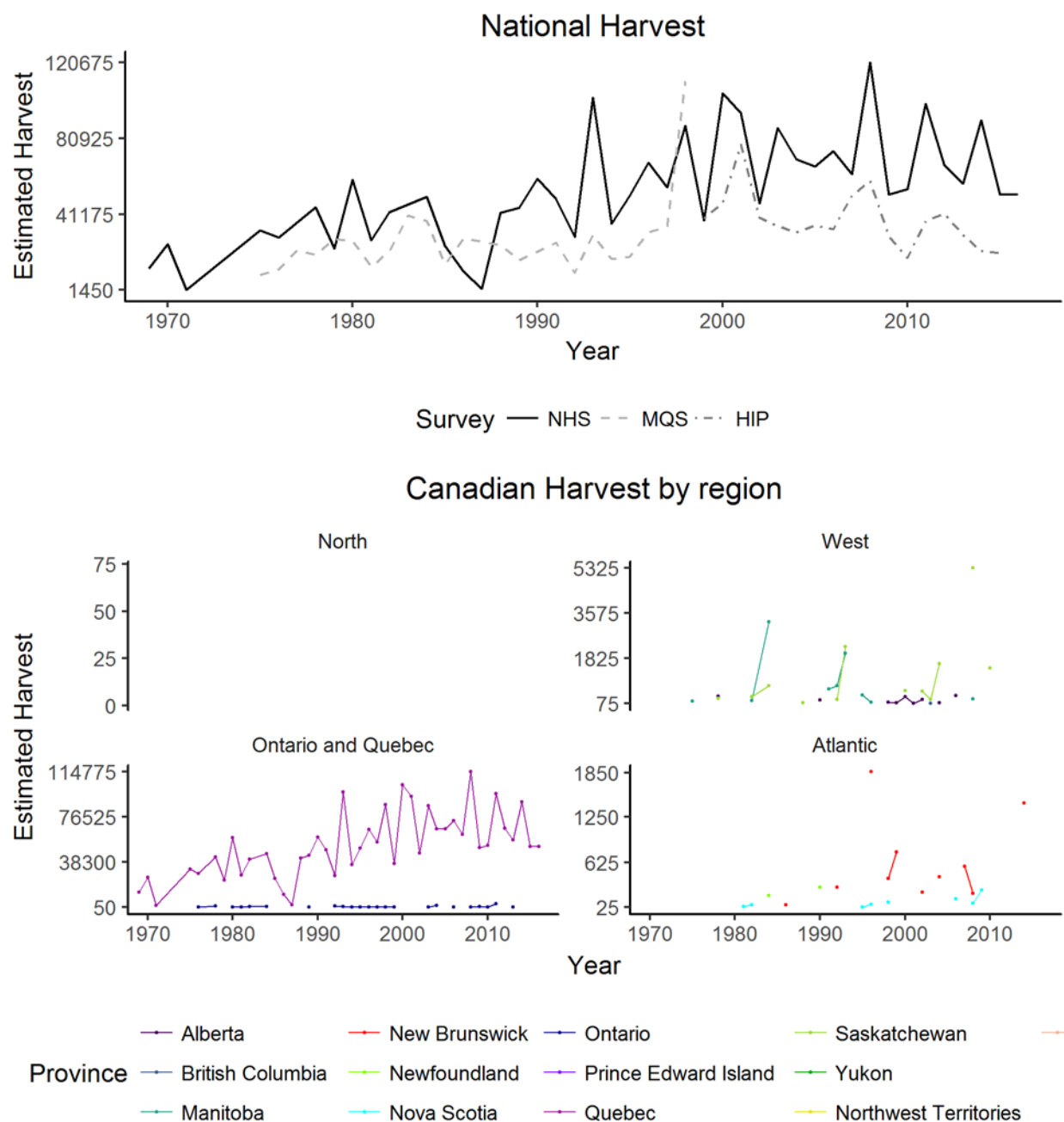


Figure 7.2-4. Estimated harvest for the Greater Snow Goose in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). For the U.S. data, results prior to 1999 are not directly comparable to those after 1999. (An unknown but likely small portion of the Atlantic Flyway harvest is composed of Lesser Snow Geese).

7.2.3 Management and Conservation Concerns

In 1965, the Greater Snow Goose population was estimated at 25 000 geese. The population grew and reached 100 000 birds by the 1970s. Starting in mid-1980s, the population entered a period of rapid growth and reached 1 million birds in 1999.

Before the mid-1970s, the Greater Snow Goose relied mainly on marshland vegetation for sustenance. Since then, changes in agricultural practices have led to extensive foraging in farm fields. In particular, the development of large-scale monoculture farming operations, such as for corn or cereal, have provided an unlimited supplement to the snow goose's traditional diet, and led to improved survival of the geese during the winter and during migratory stopovers. This shift has increased over time to the point where the birds now obtain the majority of their food from these sources. Modern agricultural practices featuring monocultures and ever-larger fields have contributed to the growing use of agricultural foods by the birds. This "agricultural subsidy" has increased the survival and reproductive output of Greater Snow Geese and is largely responsible for their population growth.

In an effort to stop population growth and reduce the Greater Snow Goose population special conservation measures were put in place in Quebec in the fall of 1998. The special measures were aimed at increasing the harvest of geese by hunters through the use of additional hunting methods such as the liberalization of daily bag and possession limits, and offering a spring conservation harvest. The first spring conservation harvest was established in 1999 in Quebec, and was expanded to eastern Ontario in 2012. Subject to specific controls, the use of special methods and equipment, such as electronic calls and bait, was allowed in fall and spring. At the same time, the number of days permitted for hunting during the fall hunting season was maximized. Very liberal daily bag and possession limits for Snow Geese continue to be recommended.

Following the implementation of special conservation measures, the growth of the Greater Snow Goose population appears to have stabilized (Reed and Calvert 2007; Lefebvre *et al.* 2017). Spring survey data suggest that the population has fluctuated between about 700 000 and 1 million birds since 1998 (Figure 7.2-1).

7.2.4 Research Highlight

A detailed study of the reproductive ecology of Greater Snow Geese at the Bylot Island breeding colony in Nunavut has been conducted annually since 1989. Bylot Island is located off the northern end of Baffin Island in the eastern High Arctic and harbours, on its southwest plain, the largest breeding colony of Greater Snow Geese. More information is available about this research project at:

www.cen.ulaval.ca/bylot

7.3 Lesser Snow Goose (*Anser caerulescens caerulescens*)

Lesser Snow Goose populations have increased dramatically since the 1970s. The Mid-continent Lesser Snow Goose population was designated as “overabundant” in 1999 and has since been subject to special measures to control the species’ abundance. In 2014, the Western Arctic Population was also designated as “overabundant” in Canada.

The size of the Mid-continent Lesser Snow Goose population estimated using banding and harvest data averaged approximately 2.3 million adults during the 1970s and approximately 12.5 million from 2012–2016; population growth has slowed since 2000 and may have stabilized in recent years (Figure 7.3-2).

Lesser Snow Geese are colonial birds, nesting in coastal and inland areas of the Arctic in colonies that range from a few hundred to several hundred thousand birds. For management purposes, colonies are grouped into three regions: eastern, central and western Arctic regions (Figure 7-1). The eastern and central Arctic colonies collectively form the Mid-continent Population of Lesser Snow Geese, which migrates through the prairie provinces and mainly winters in the Central and Mississippi Flyways. Those nesting on Banks Island, on the mainland near the Mackenzie River delta, and on the north slope of Alaska comprise the Western Arctic Population, which migrates through Alberta and western Saskatchewan, and mainly winters in the Pacific Flyway. Another population of Lesser Snow Geese nests on Wrangel Island, off the northeast coast of Siberia, and winters mainly along the Pacific Coast at the mouth of the Fraser-Skagit Rivers in B.C. and Washington, in California, and in smaller numbers in Oregon. All three populations overlap somewhat on migration and wintering areas.

7.3.1 Abundance and Trends

Lesser Snow Geese nest in remote locations in several colonies in the Arctic, and for that reason, it is difficult and expensive to survey populations. Photographic surveys were used from the 1960s through 2014 to monitor major Lesser Snow Goose nesting colonies (Mid-continent and Western Arctic Populations). These surveys were not done every year and covered only known colonies that had been identified based on other surveys. The number of Mid-continent Lesser Snow Geese and Ross’s Geese (combined) are also indexed by surveys on wintering areas in January. Each year, Lesser Snow Geese are also banded on their breeding grounds in the Arctic. Recently, band recovery data and harvest estimates have been used to estimate population size and trend (Alisauskas *et al.* 2009; Alisauskas *et al.* 2011; Alisauskas *et al.* 2012). The colony of Lesser Snow Geese on Wrangel Island is monitored through ground surveys conducted by Russian biologists (Kerbes *et al.* 1999).

All Lesser Snow Goose populations are above their NAWMP population objectives, which are: Mid-continent population, 1 500 000 birds; Western Arctic population, 200 000 birds; and Wrangel Island population, 120 000 birds (NAWMP 2012).

MID-CONTINENT (EASTERN AND CENTRAL ARCTIC COLONIES) AND WESTERN ARCTIC POPULATIONS

Breeding ground surveys have indicated substantial growth in the size of Lesser Snow Goose colonies, as well as the establishment of new colonies in recent years (Kerbes *et al.* 2006; Kerbes *et al.* 2014). Photographic surveys conducted at all known major nesting areas in the eastern, central and western Arctic have also shown substantial population growth (Tables 7.3-1 and 7.3-2).

Table 7.3-1. Estimate Number of Nesting Lesser Snow Geese in the Canadian Arctic, 1965–2014, Based on Photo Surveys (* Combined results from 2005–2006; Data available only until 2014; Source: K. M. Meeres, CWS–Prairie Region, unpubl. data)

Year	Central Arctic	West Hudson Bay	South Hudson Bay	Southampton Island	Baffin Island
1965–67	10 300				
1973		390 200	64 800	155 800	446 600
1976	56 400				
1977		353 200			
1978		331 800			
1979			118 900	233 000	454 800
1980		317 400			
1982	105 700				
1985		436 400			
1988	317 100				
1990		201 900			
1997		211 600	408 700	721 200	1 733 500
1998	740 600				
2003		261 100			
2004				652 500	
2005					1 618 600
2006	1 463 800		478 200*		
2008		246 300		939 700	
2011					2 459 100
2014				1 038 000	

Table 7.3-2. Estimated Numbers of Lesser Snow Geese in the Western Arctic Colonies, 1976–2013, Based on Photo Surveys Unless Noted Otherwise (^a Ground survey, ^b Helicopter survey, ^c Digital imagery survey; Data available only until 2013; Source: K. M. Meeres, Saskatoon, CWS - Prairies Region, unpublished data)				
Year	Egg River	Anderson River	Kendall Island	Total
1976	165 000	3800	800	169 600
1981	198 100	8400	1000	207 500
1987	196 500	7200	1400	205 100
1995	479 400	3600	3000	486 000
1996	436 000 ^a	2788 ^b	210 ^b	438 998
1997	264 000 ^a	806 ^b	2506 ^b	267 312
1998	452 000 ^a	596 ^b	736 ^b	453 332
1999		246 ^b	1608 ^b	
2000		1142 ^b	472 ^b	
2001		1327 ^b	1199 ^b	
2002	570 500	1900	6900	579 300
2003		502 ^b	58 ^b	
2004		26 ^b	1914 ^b	
2005		1472 ^a	2236 ^b	
2006		2334 ^a	2242 ^b	
2007	295 100	4100	4600	303 800
2008		1504 ^b	1724 ^b	
2009 ^c	427 000	200	300	427 500
2013	419 814	111	203	420 128

The Mid-continent Population of the Lesser Snow Goose has also been monitored in January in wintering areas since 1970 (Figure 7.3-1). Winter counts are used to provide an index of the population level, but do not represent a complete count of all birds, and are not based on a statistical sampling framework. Therefore, the relation between counts and the actual population size is unknown (Alisauskas *et al.* 2012). Winter counts include Ross's Geese, a small proportion of the Lesser Snow Goose that originates from western Arctic colonies, and juvenile birds of both species. Mid-winter counts underestimate actual population levels (Mowbray *et al.* 2000; Alisauskas *et al.* 2012). Mid-winter counts increased from 0.78 million geese in 1970 to about 3.5 million geese in 2016 (Figure 7.3-1; Fronczak 2017).

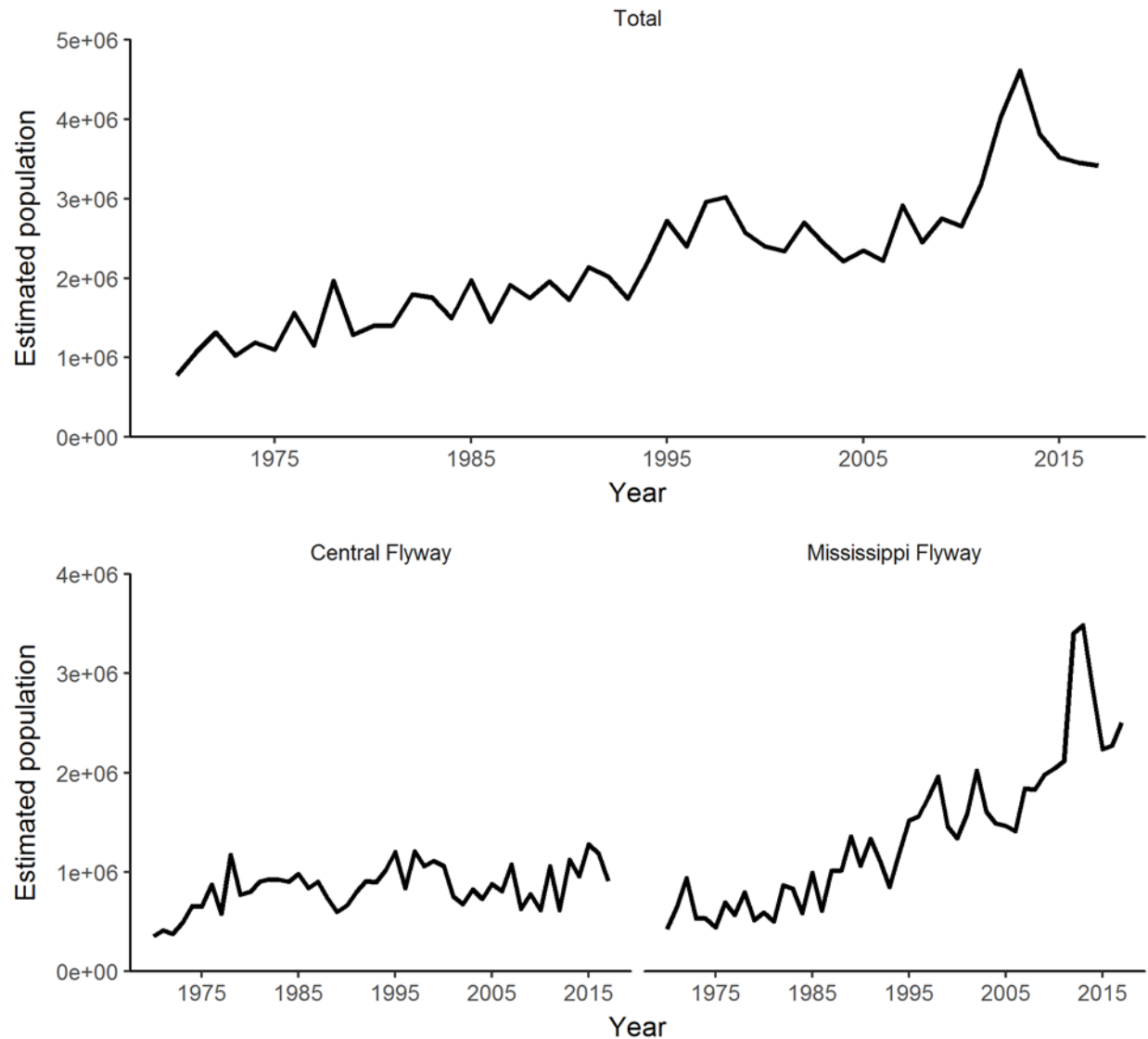


Figure 7.3-1 Mid-continent Lesser Snow Goose Populations in Mid-winter (Counts include some Ross's Geese, Source: Fronczak 2017)

Recently, the size of the Mid-continent Lesser Snow Goose population has been estimated using band recovery data and harvest estimates from the mid-continent region of North America (Lincoln 1930; Alisauskas *et al.* 2009; Alisauskas *et al.* 2011; Alisauskas *et al.* 2012). Estimates obtained from harvest and banding data suggest numbers that are considerably higher than previously thought and much higher than those reported from photographic surveys or mid-winter counts. Lincoln estimates of population size for mid-continent Lesser Snow Geese averaged 2.3 million adults in the 1970s, 3.5 million adults in the 1980s, 8 million adults in the 1990s, 13 million adults from 2007–2016. The 2016 estimate was approximately 12 million adults (Figure 7.3-2). Despite a significant increasing long-term trend, the 5-year and 10-year trends both suggest a declining population.

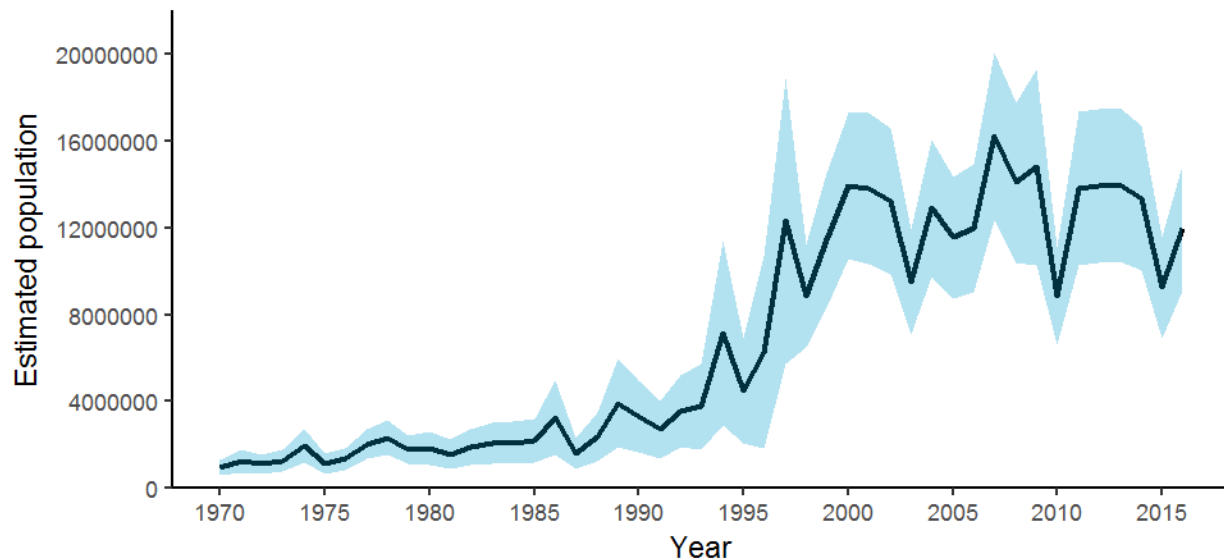


Figure 7.3-2 Lincoln Estimates of Population Size for Midcontinent Adult Lesser Snow Geese, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.
(Source: R. Alisauskas, ECC - S&T, unpubl. data)

Similarly, harvest estimates and band recoveries of adult Lesser Snow Geese from the Western Arctic and Wrangel Island populations were used to estimate the combined size of these adult populations using the techniques described by Alisauskas et al. (2009, 2011 and 2012). These estimates assumed that harvest estimates for adult Lesser Snow Geese in the Pacific Flyway states were overestimated by approximately 40%, and therefore harvest estimates were adjusted downward as suggested by Padding and Royle (2012). The preliminary estimates indicate that the combined population of adult Lesser Snow Geese averaged approximately 300 000 birds in the 1970s, and has risen to an average of approximately 1.2 million adults between 2012 and 2016 (Figure 7.3-3). Like the Mid-continent population of Lesser Snow Geese, the combined Western arctic and Wrangel Island populations saw a slight decline during the last 5 year (-8.75%).

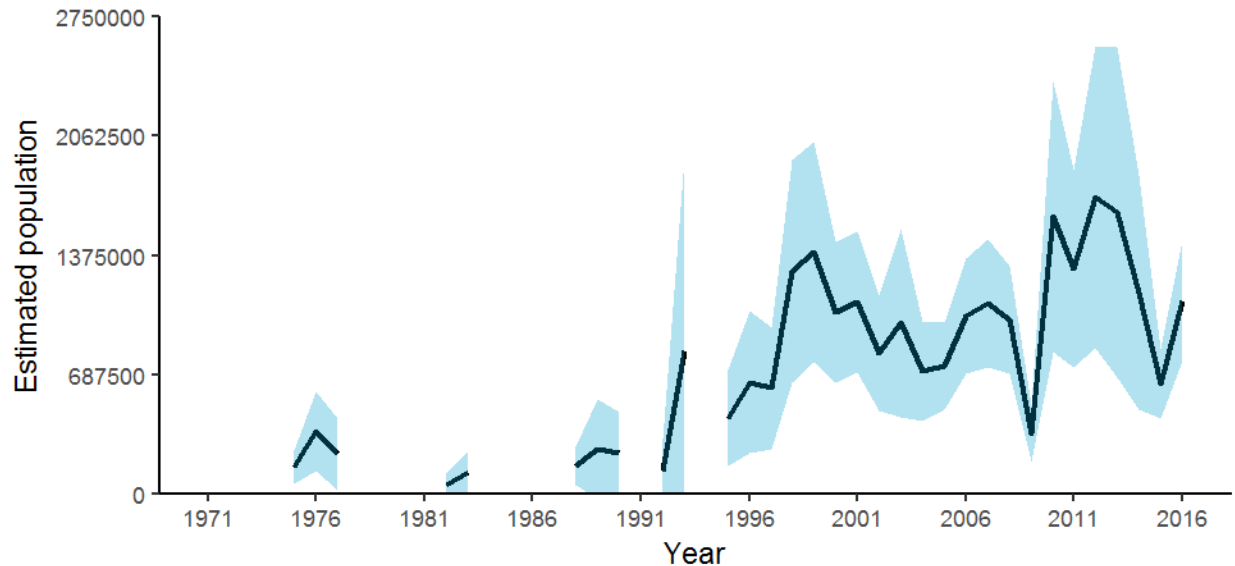


Figure 7.3-3 Lincoln Estimate of Population Size for Adult Lesser Snow Geese Wintering in the Pacific Flyway, black represents the mean and the shaded blue area represents the 95% Confidence Interval (includes both the Western Arctic Population and the Wrangel Island Population in Russia; Source: R. Alisauskas, ECC - S&T, unpubl. data)

WRANGEL ISLAND POPULATION

Lesser Snow Geese nesting on Wrangel Island, Russia, are of great interest to Canada, because this population migrates through western Canada in the fall and spring, and because more than half of the population winters in the Fraser Delta (British Columbia) and in the nearby Skagit Delta (Washington). The present colony of Lesser Snow Geese on Wrangel Island is all that remains of several colonies that existed in Siberia a century ago. Russian biologists monitoring the colony documented a decline in the early 1970s, but the Lesser Snow Goose population has undergone a dramatic increase since 1990 reaching the highest numbers since surveys were initiated in 1969, with approximately 352 000 birds in 2017 (Figure 7.3-4; Pacific Flyway unpubl. data 2017).

The number of birds wintering in the Fraser–Skagit area has roughly doubled since the early 1990s, increasing to approximately 100 000 birds in 2007–2008, one of the highest abundances ever recorded. Increased harvest rates combined with poor breeding years caused the population to decline to about 57 000 birds in 2008–2009. The 2016–2017 mid-winter population was estimated at 99 000 birds, with 25% of the birds being young (A. Breault, CWS–Pacific, pers. comm.).

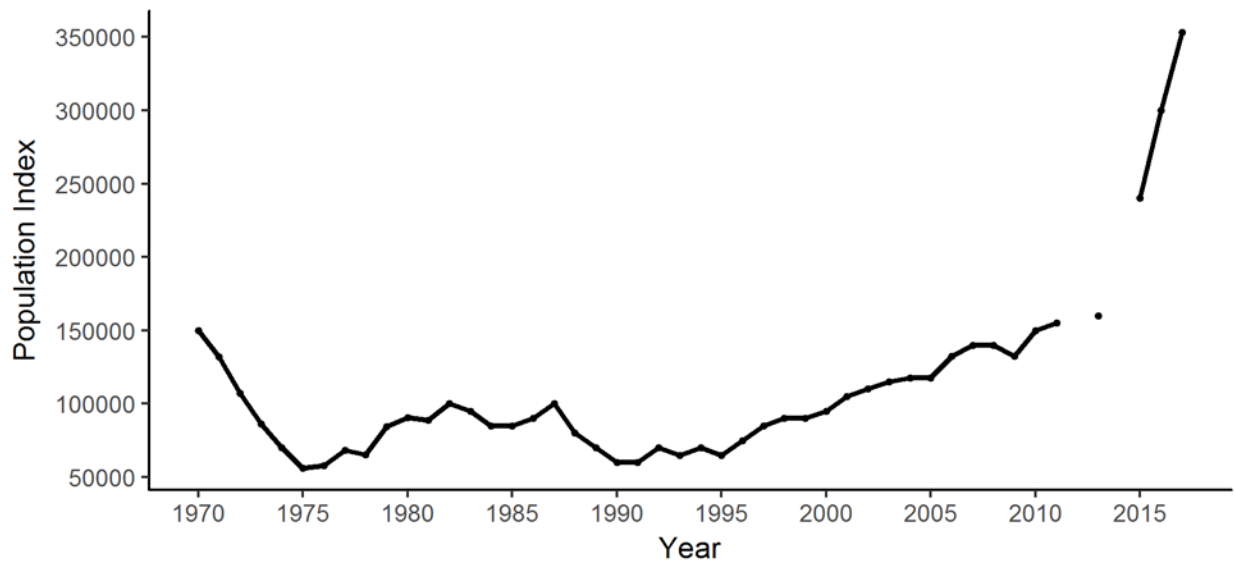


Figure 7.3-4 Population Index of Lesser Snow Geese on Wrangel Island, Russia, 1970–2017 (Data were not gathered in 2012 and 2014; Source: Olson 2017)

7.3.2 Harvest

Overall, the harvest of Lesser Snow Geese during regular seasons, combined with spring conservation harvest, increased in years following the implementation of special conservation measures in 1999 (Figure 7.3-5). In recent years, the harvest has declined somewhat or at least stabilized, perhaps due to waning interest by hunters, and satiation effects as harvest levels have reached their maximum, or because the birds have responded behaviorally to the increased harvest pressure from hunters (Alisauskas *et al.* 2011; Johnson *et al.* 2012). In the U.S., the harvest of Mid-continent Lesser Snow Geese when the spring Conservation Order is in effect adds significantly to the harvest during the fall and winter hunting seasons, but spring harvest estimates include both Ross's Geese and Lesser Snow Geese (Alisauskas *et al.* 2011; Johnson *et al.* 2012).

In Canada, most harvest of Mid-continent Lesser Snow Geese takes place in Saskatchewan. In the U.S., Lesser Snow Geese are mainly harvested in three flyways. Geese harvested in the Mississippi and Central flyways belong to the Mid-continent Population, while geese harvested in the Pacific Flyway come from the Western Arctic and Wrangel Island Populations (Figure 7.3-5).

Since 1990, the CWS Pacific Region has conducted a special annual harvest survey of Lesser Snow Geese from the Wrangel Island Population. Harvest estimates varied from a low of 748 birds in 1990 to a high of 3 680 birds in 2016–2017 (Figure 7.3-6), 40% more than the 2 626 birds harvested in the 2015–2016 season.

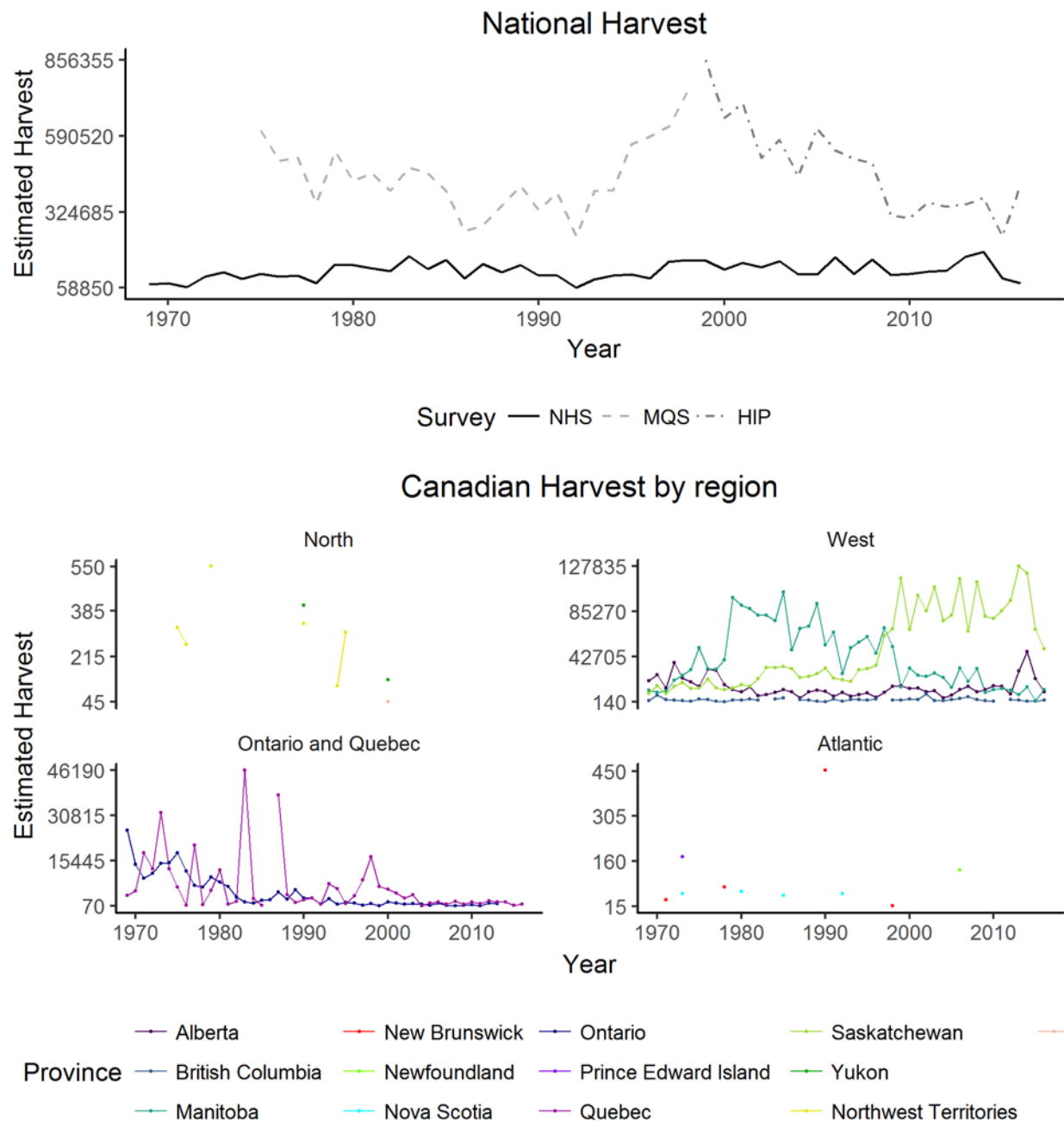


Figure 7.3-5 Estimated harvest for the Lesser Snow Goose in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). For the U.S. data, results prior to 1999 are not directly comparable to those after 1999 (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)

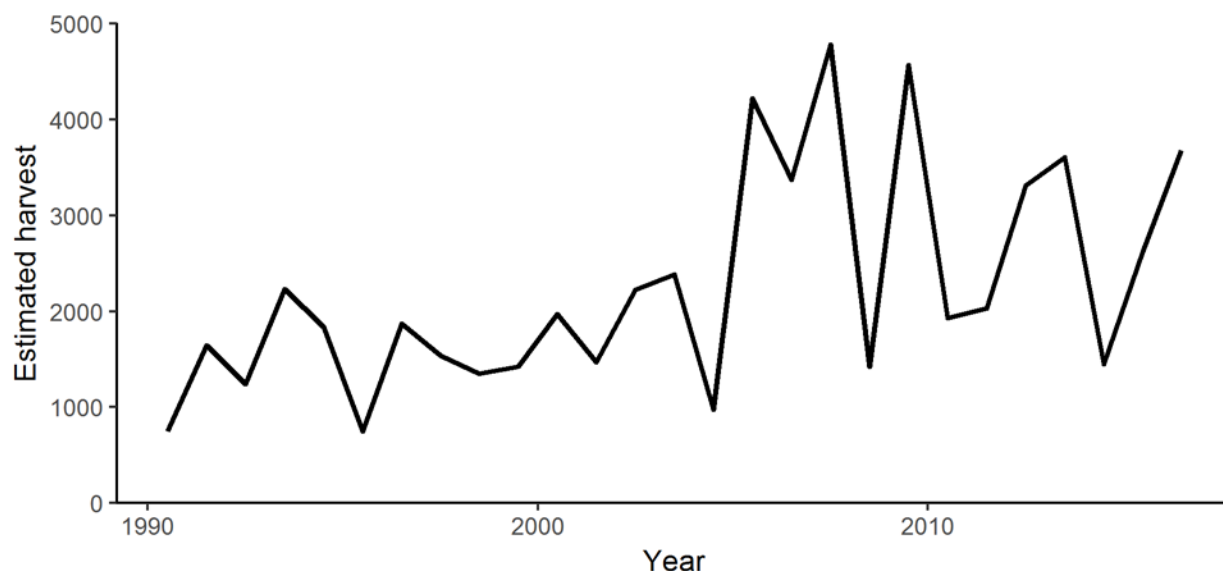


Figure 7.3-6 Lesser Snow Goose Harvest for the Wrangel Island Population (On the Fraser Delta only, source: A. Breault, CWS-Pacific Region, unpubl. data)

7.3.3 Management and Conservation Concerns

The Mid-continent Population of Lesser Snow Geese increased rapidly over the past few decades and remains at high levels. The increase is tied to large-scale changes in land use, mainly involving the conversion of much of the North American landscape into agricultural crop land. Spillage from mechanized harvesting leaves, literally, millions of bushels of waste grain lying on the ground, and geese are one group of birds that have greatly benefited from this superabundant food source. This is particularly true in the mid-continent region of North America, where populations of Canada Geese, Cackling Geese, White-fronted Geese, Ross's Geese and Lesser Snow Geese all show similar demographic trends, and populations today are much larger than they were in the 1970s. Adult survival rates have increased over the past several decades, most likely as a result of superabundant food leading to higher overwinter survival. In turn, population sizes have increased, and harvest rates by hunters have decreased, due mainly to declining hunter numbers. In fact, it is very likely that the Mid-continent Population of Lesser Snow Geese (and some others to the east and west of there) can no longer be controlled through hunting. (Leafloor *et al.* 2012). Snow Goose populations have become so large that they are affecting the plant communities at staging areas and Arctic breeding grounds on which they and other species rely. These geese alter Arctic habitats during the spring and summer, cause crop depredation during the fall and winter, and create potential dangers to other species and their habitats. This conservation concern was first identified in the mid-1990s (Ankney 1996; Batt 1998) and it continues to be a concern for waterfowl managers today, although Mid-continent Lesser Snow Geese appear to have stabilized now.

The Mid-continent Lesser Snow Goose Population was designated as “overabundant” in 1999, and since then the U.S. and Canada have liberalized hunting regulations applying to this population in an attempt to stop or reverse the rapid population growth. In 1999, special conservation measures were implemented that allowed harvest outside the traditional hunting period, as well as the use of special hunting equipment for both the fall hunting seasons and the spring conservation harvest. The first spring conservation season was established in Manitoba in 1999 and extended to Saskatchewan and Nunavut in subsequent years.

The Western Arctic Population of the Lesser Snow Goose is showing a pattern of population growth that is similar to that which has been observed in other populations of Snow Geese and Ross's Geese. The population was designated as "overabundant" in 2014 and special conservation measures were implemented (a liberalization of the harvest and a spring conservation season established in 2015) in Alberta and Northwest Territories. Such a designation will help to control the population before it reaches a level that cannot be controlled through increased harvest by hunters.

Even the smallest population of Lesser Snow Geese, the population nesting on Wrangel Island, can cause management concerns. When the Fraser–Skagit winter population increased above 60 000 birds in the early 2000s, geese of the northern wintering segment caused crop depredation complaints, aircraft safety concerns at the Vancouver International Airport, nuisance issues in urban areas, and bulrush habitat degradation in area marshes. In recent years, winter cover crop programs and coordinated deterrence efforts by the airport and municipalities have reduced conflicts. In addition, increased grubbing rates in tidal marshes have resulted in a severe reduction in bulrush biomass; data from a long-term monitoring program suggests that large parts of the tidal marsh could move to a state of "functional extinction" if the number of geese remains high (S. Boyd, ECCC - S&T, pers. comm.). A harvest strategy has been implemented to maintain the Fraser–Skagit winter population within 50 000–70 000 total geese so that the marsh habitat remains at a sustainable level, and that socio-economic concerns are minimized. The primary goal of the harvest strategy is to make hunting regulations, and hence harvest rates, responsive to goose abundance. For a variety of reasons, the large majority of this harvest occurs on the Skagit Delta in Washington State.

7.4 Ross's Goose (*Anser rossii*)

Ross's Geese were considered a rare species in the early part of the last century, but its numbers have increased greatly over the last 50 or more years (Alisauskas *et al.* 2012). Ross's Geese were designated as overabundant in Canada in 2014, and are subject to special conservation measures to control their numbers in western Canada.

7.4.1 Abundance and Trends

Most Ross's Geese nest in the Queen Maud Gulf Region of the central Canadian Arctic; recent counts at the Karrak Lake colony estimated the population at approximately 630 000 geese in 2016, similar to the 2014, and 2015 estimates (Figure 7.4-1). Population growth over the longer term seems to have slowed and stabilized at about 650 000 nesting Ross's Geese (R. Alisauskas and D. Kellett, EC–Science and Technology Branch, unpubl. data). Despite Ross's Geese and Lesser Snow Geese exhibiting significant long-term (1993-2016) increasing trends, both species now have significant decreasing trends over the last 5 years (2012-2016).

Increasing numbers of Ross's Geese are being found along the western coast of Hudson Bay, on Baffin, Southampton and Banks islands, at La Perouse Bay, Manitoba, and at Cape Henrietta Maria, Ontario (Kerbes 1994; Alisauskas *et al.* 2012). The species traditionally wintered mostly in California, New Mexico, Texas and Mexico, but has expanded its range eastward in North America in the past two decades; most US band recoveries from Ross's geese now occur in the midcontinent region of the United States, and not the Pacific Flyway (Alisauskas *et al.* 2006).

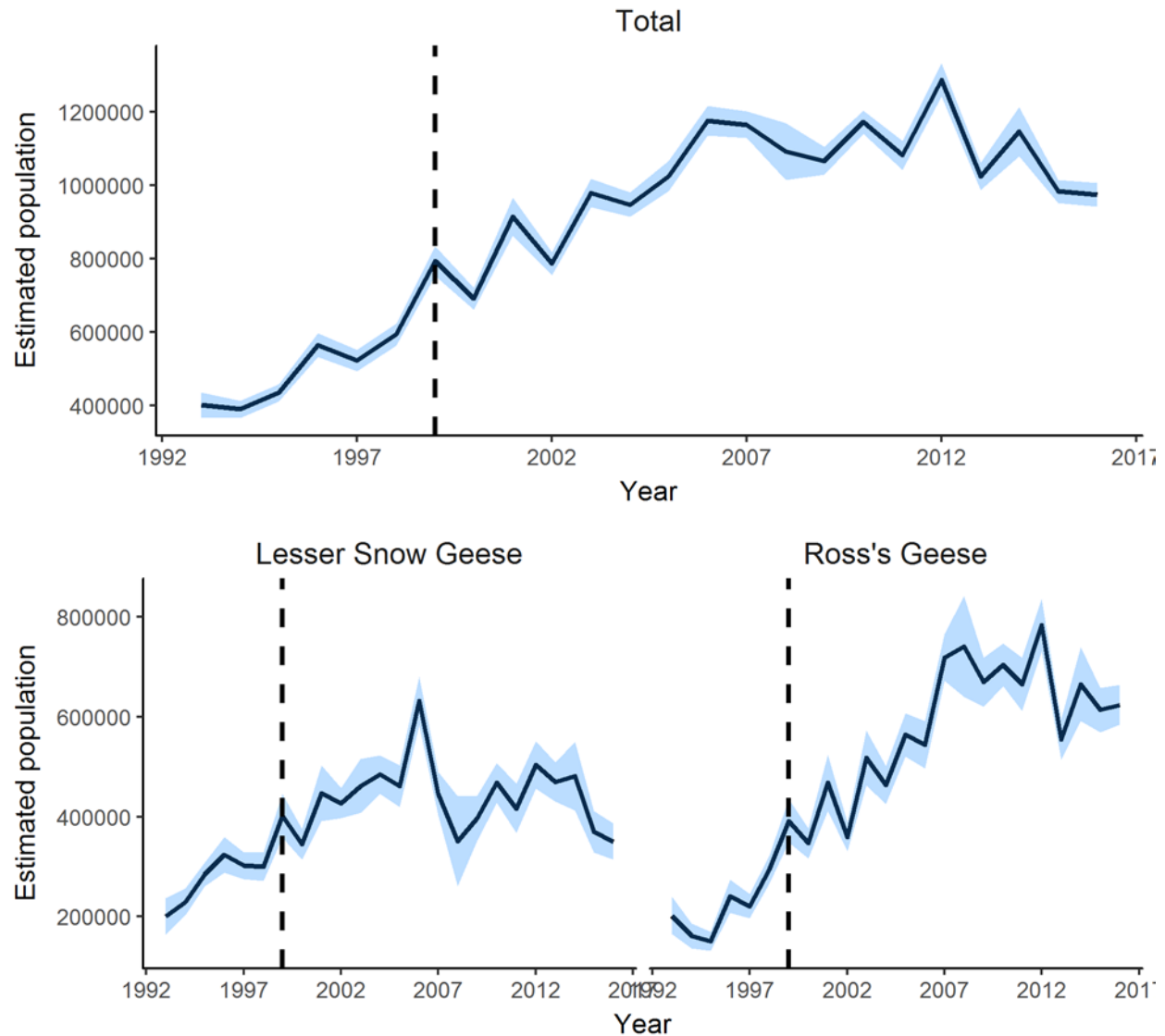


Figure 7.4-1 Estimates for Numbers of Ross's and Lesser Snow Geese that Attempted to Nest at Karrak Lake, 1993–2016, black line represents the population estimate, shaded area represents the 95% Confidence Interval, and the vertical dotted line indicates the introduction of special conservation measures (Source: R. Alisauskas, ECC - S&T, unpubl. data)

The estimated population of Ross's Geese in the early 1900s was thought to be between 5 000 and 6 000 birds (Kerbes 1994). In the 1960s, the population was estimated at about 100 000 birds (Kerbes 1994). By 1988, photo survey estimates of the number of nesting birds suggested the population had increased to more than 188 000 birds in the Queen Maud Gulf Migratory Bird Sanctuary (Kerbes 1994; Jónsson *et al.* 2013) and to about 495 000 birds in 1998 (Kerbes *et al.* 2014). By the mid-2000s, Ross's Geese had expanded their range eastward on both nesting and wintering areas (Alisauskas *et al.* 2006; Alisauskas *et al.* 2012), and the number of nesting Ross's Geese estimated by photo survey in the central Arctic of Canada was approximately 1.3 million birds in 2006 (Kerbes *et al.* 2014).

Helicopter surveys on Baffin Island, in conjunction with the banding in August, suggested that there were

at least 20 000 Ross's Geese present thereby 2009 (Alisauskas *et al.* 2012). Recent observations during annual banding operations suggest that the numbers of Ross's geese are much higher than that (J. Leafloor, CWS – Prairies Region, pers. comm.), but no new estimates are available. A new colony of nesting Ross's Geese also became established near the McConnell River, Nunavut, in the early 1990s, and its size was estimated at more than 70 000 birds in 2003. The colony continued to increase and was estimated at about 90 000 nesting birds in 2005 (Caswell 2009). Information gathered while banding Lesser Snow Geese near Cape Henrietta Maria, Ontario, indicated that the Ross's Goose population there may be as large as 2 250 pairs (Abraham 2002).

Total numbers of Ross's Geese are difficult to estimate using traditional survey techniques due to the sheer size and remoteness of their nesting range, the high densities of nesting birds, and their complete overlap with snow geese during the nesting season (Alisauskas *et al.* 2012). Recently, Alisauskas *et al.* (2009; 2012) suggested that Lincoln's (1930) approach could be used to estimate population size of Ross's Geese. This method can be used to estimate population size of adult and juvenile birds in August (i.e., at the time of banding) from banding data and harvest estimates. Ross's Geese have been banded annually since 1989 in numbers sufficient to estimate their rapid increasing population size. The most recent Lincoln estimate of adult population size suggests that there were about 1.7 million adults in the population in 2016, similar to the average population estimate of 1.864 million adults from 2012-2016 (Figure 7.4-2).

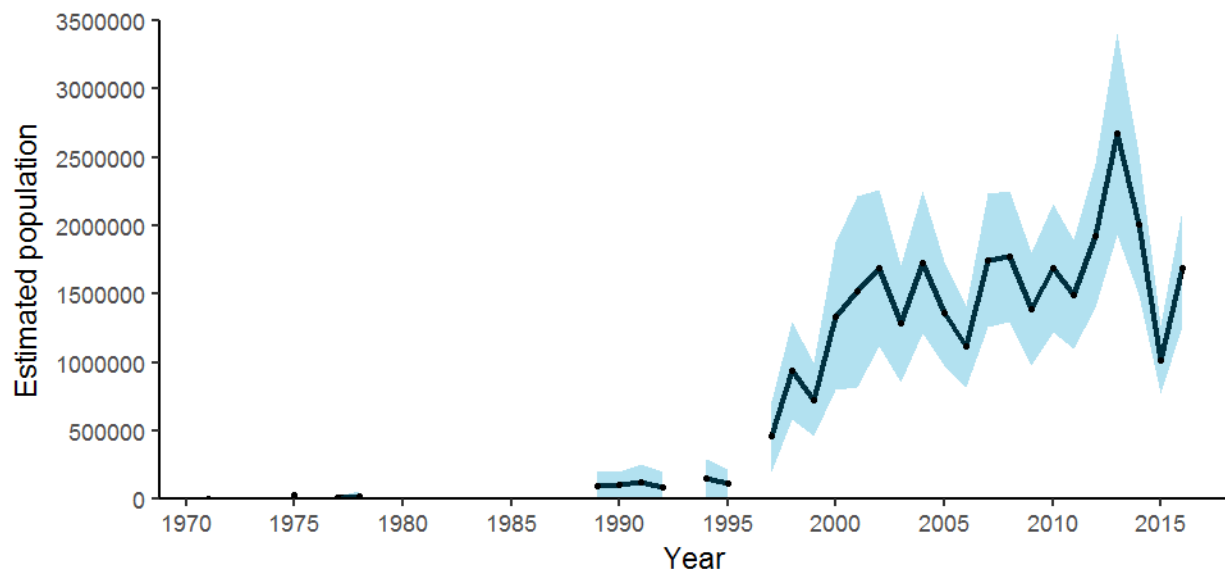


Figure 7.4-2 Lincoln Population Estimates of Adult Ross's Geese in July, 1975–2016, black line represents the population estimates while the shaded area represents the 95% Confidence Intervals. (Source: R. Alisauskas, ECC - S&T, unpubl. data).

In 2017, nesting conditions over much of the breeding range were excellent for Ross's Geese. In the central Arctic, peak hatch dates of nesting Ross's Geese were very early, and large numbers of juvenile Ross's Geese were already capable of flight by August 8 in 2017. (K. Drake, Bird Studies Canada, pers. comm.). Likewise, production of Ross's Geese appeared to be very good on Southampton and Baffin islands, where large numbers of goslings were seen and captured in July and August during annual banding operations (J. Leafloor, CWS–Prairie Region, pers. comm.).

7.4.2 Harvest

The estimated harvest of Ross's Geese in the U.S. and Canada increased slowly from the 1960s to the 1980s and then more rapidly through the 1990s. In Canada, the majority of Ross's Geese are harvested

in the Prairies, more specifically in Saskatchewan (Figure 7.4-3). Despite the increase in the harvest over time, harvest rates (the proportion of birds shot by hunters each year) have declined, and in recent years only about 2% of adult Ross's Geese are harvested annually by hunters.

7.4.3 Management and Conservation Concerns

Increasing numbers of Ross's Geese contribute to alteration of their breeding and staging areas through foraging and nest-building activities (Alisauskas *et al.* 2006; Abraham *et al.* 2012). In Canada, the Ross's Goose was designated as "overabundant" in June 2014. Harvest has been liberalized and special conservation seasons were established in spring of 2015. In the U.S., special conservation measures have been in place for Ross's Geese since 1999.

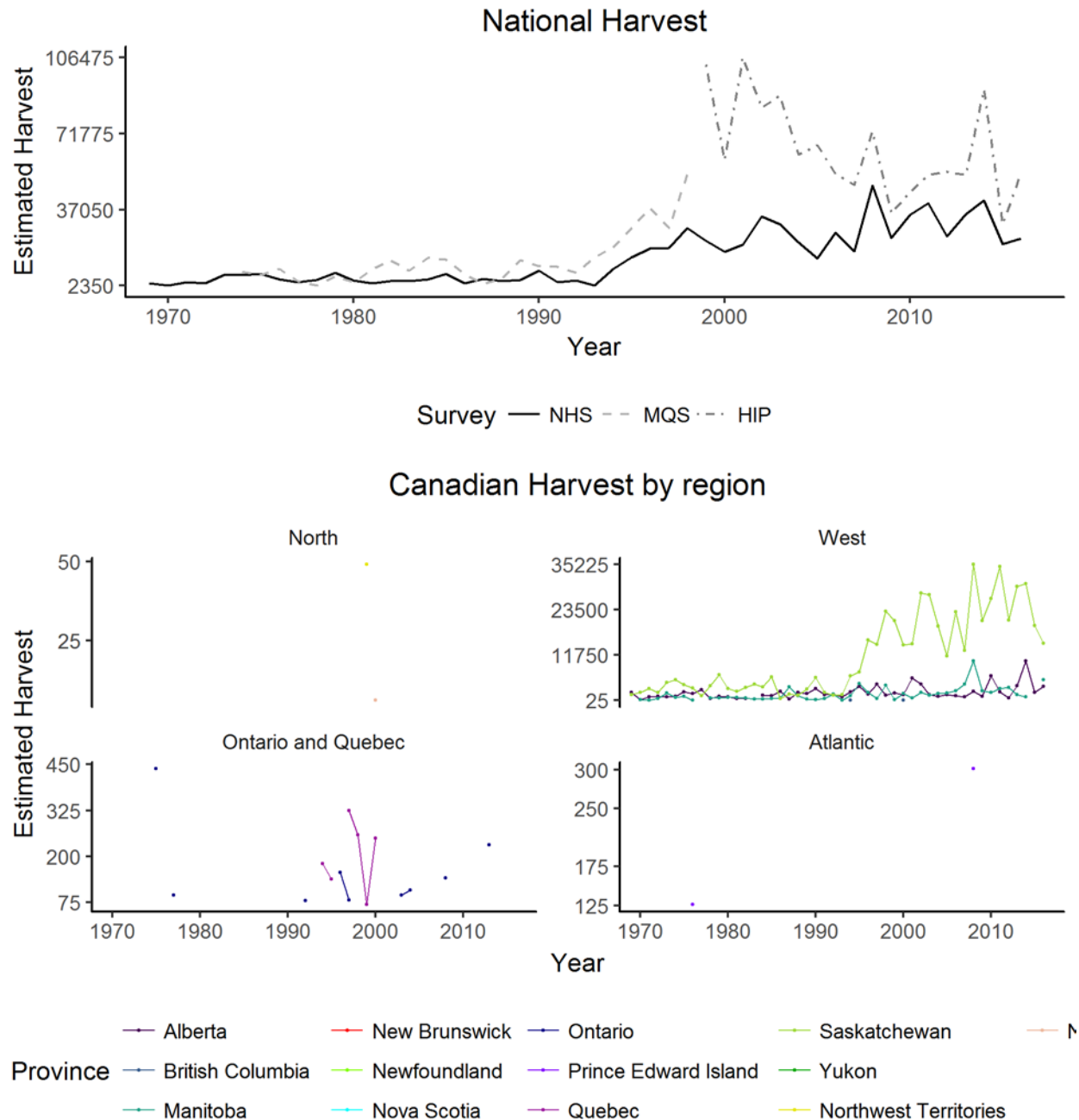


Figure 7.4-3 Estimated harvest for the Ross's Goose in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

7.5 Greater White-Fronted Goose (*Anser albifrons*)

The Greater White-fronted Goose has one of the largest ranges of any species of goose in the world. In North America, the species nests across a broad region of the Arctic from Alaska to the west coast of Hudson Bay. There are three populations of Greater White-fronted Geese in North America: the Mid-continent Population, the Tule Population, and the Pacific White-fronted Geese Population. The Tule and Pacific populations breed in southern Alaska and winter primarily in California. The Mid-continent Population includes all White-fronted Geese that breed in Canada as well as those in interior and northern Alaska, and that winter in the Central and Mississippi Flyways of the U.S. (Figure 7-1). Most Mid-continent White-fronted Geese migrate through Alberta and Saskatchewan in the fall.

7.5.1 Abundance and Trends

The Mid-continent Population of White-fronted Geese is currently monitored by a fall staging survey in the Canadian Prairies, which is the basis for the NAWMP population objective. Initially, this population was surveyed during spring staging, but the survey was deemed problematic and, in 1992, was replaced by a fall survey in southern Saskatchewan and Alberta, which provides an annual index of the population size.

Fall surveys in the Canadian Prairies have fluctuated between years with an increasing trend from 1992–2016. The fall 2016 population index was of approximately 1 million geese, comparable to last year's estimate. The 3-year average population index was 994 271 geese (Figure 7.5-1). The population is currently above its NAWMP population objective of 600 000 birds based on fall counts (NAWMP 2012).

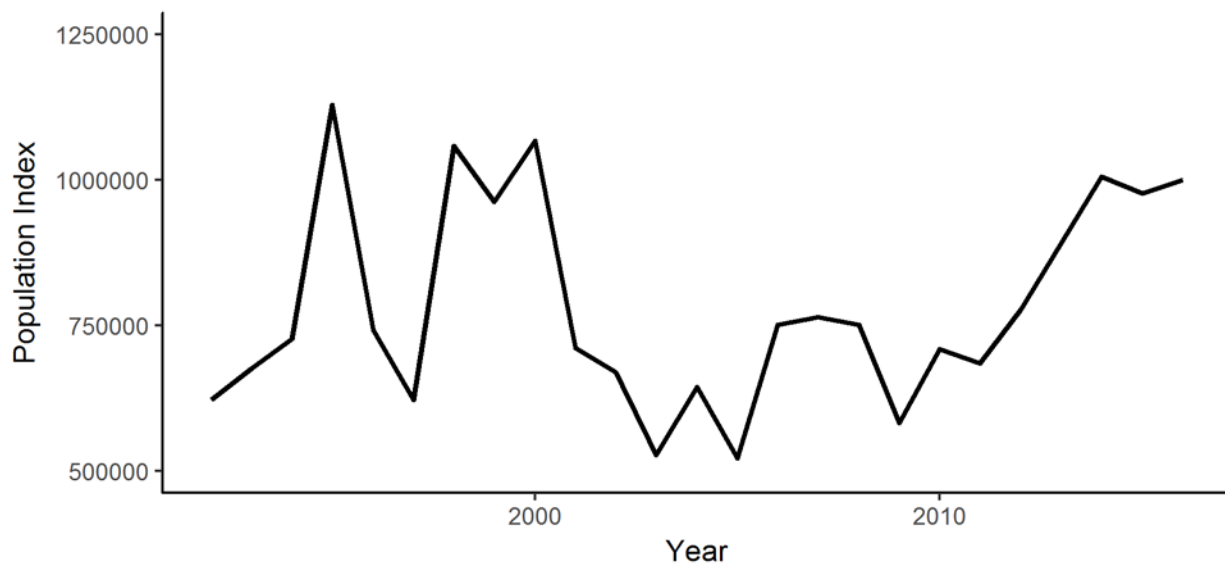


Figure 7.5-1 Fall survey results for the Mid-continent Population of the Greater White-fronted Goose in Saskatchewan and Alberta (There was no survey conducted in 2013; Source: Blake Bartzen, CWS-Prairie Region, unpubl. data)

Other monitoring programs for Mid-continent White-fronted Geese have shown increasing trends over the past four decades. Mid-winter numbers increased approximately seven-fold between 1969 and 2016 (Figure 7.5-2). Indices from regional breeding ground surveys in northern and central Alaska more than doubled from 1986–2012 (Stehn *et al.* 2013).

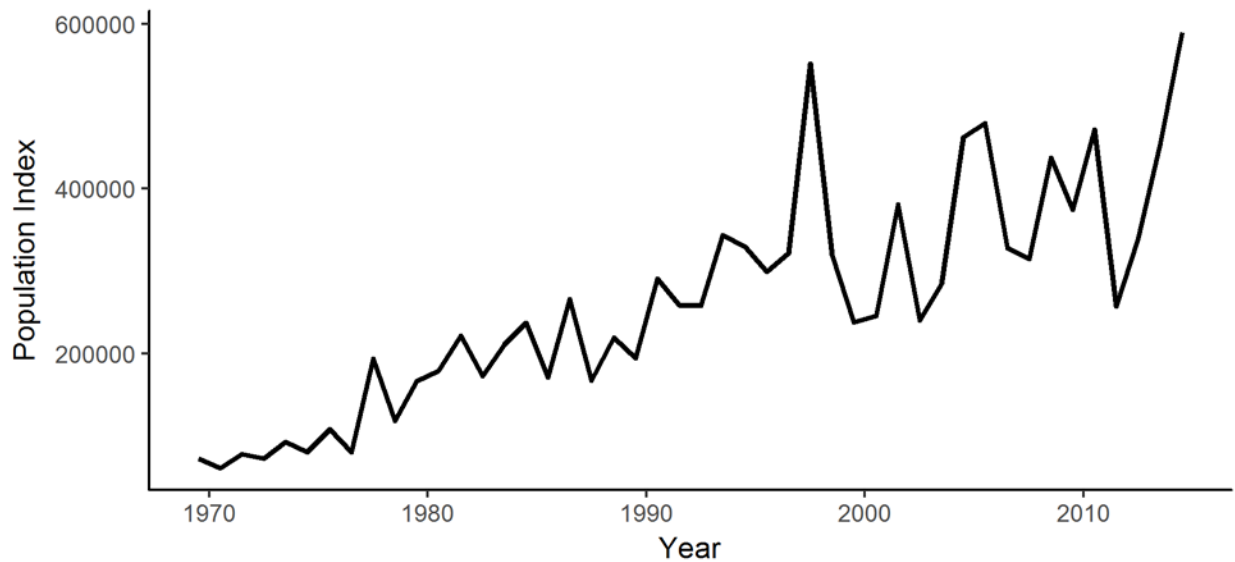


Figure 7.5-2 Mid-winter Counts of Mid-continent White-fronted Geese in the Central and Mississippi Flyways (Source: Fronczak 2017)

Each year, Mid-continent White-fronted Geese are banded on their breeding grounds in northern Canada and Alaska. In Canada, banding began in 1990 in the Queen Maud Gulf Migratory Bird Sanctuary. Recoveries of banded birds provide information on distribution of harvest, annual survival and harvest rates. Band recovery data and harvest estimates have recently been used to estimate population size and trend (Lincoln 1930; Alisauskas *et al.* 2009).

Estimates of population size derived using the Lincoln method show an approximately five-fold increase from 1975 to 2016; the most recent 2016 estimate suggests a population size of about 2.5 million adults, which is similar to the average estimated population size of 2.3 million adults from 2012-2016 (Figure 7.5-3).

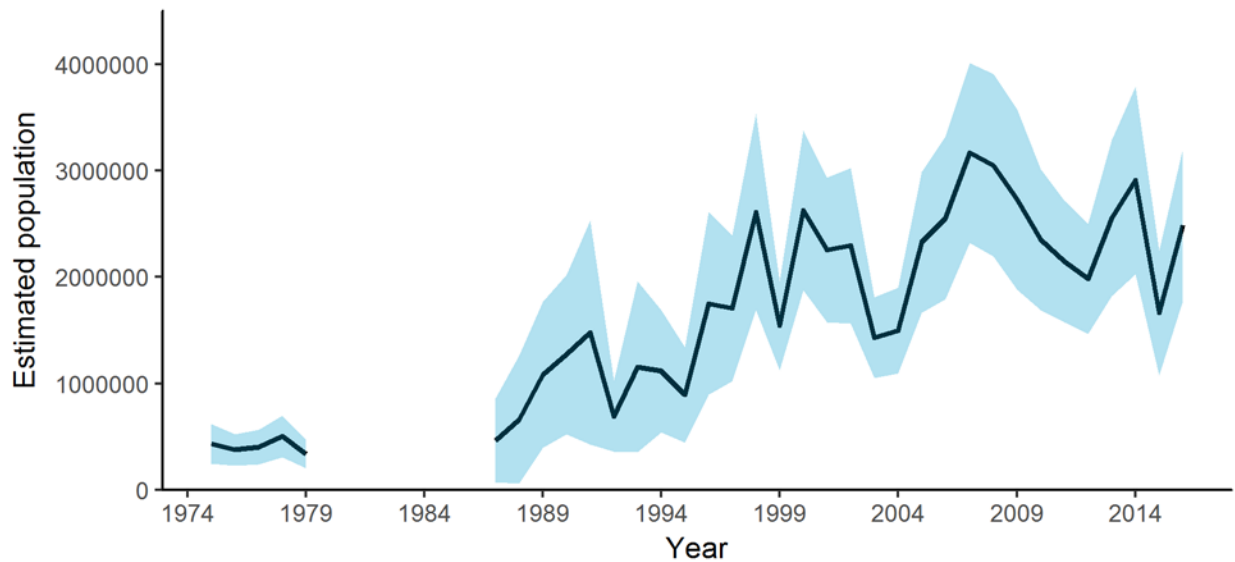


Figure 7.5-3 Lincoln Population Estimates of Adult Mid-continent White-fronted Geese in July, 1975–2016, black line represents the population estimate, and the shaded area represents the 95% Confidence Interval (Source: R. Alisauskas, ECCC - S&T, unpubl. data)

7.5.2 Harvest

Figure 7.5-4 shows the harvest of White-fronted Geese over time. Harvests in Canada averaged about 70 000 birds per year from 2006–2016. Almost all of the Canadian harvest takes place in the provinces of Alberta and Saskatchewan, and although estimated harvests have been more erratic in the past few years, there has been an increase in the harvest in Canada (Figure 7.5-4). In the U.S., the harvest of Mid-continent White-fronted Geese averaged approximately 105 000 birds per year in the 1970s but increased to approximately 314 288 birds in 2016. The total continental harvest of Mid-continent White-fronted Geese has also increased over time.

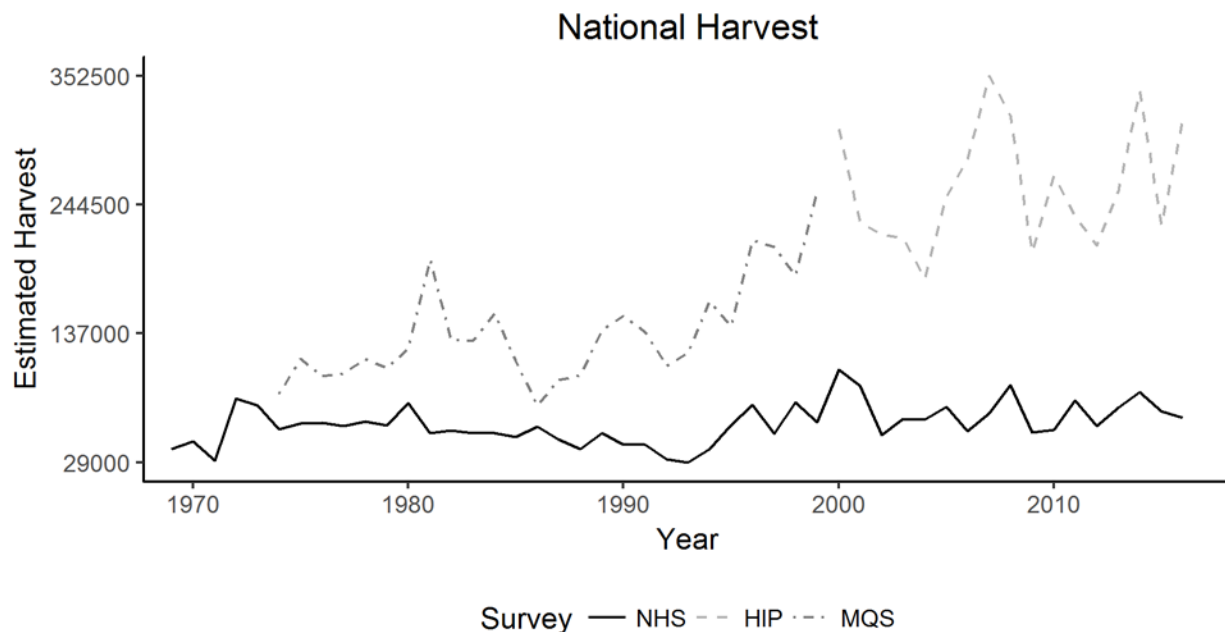


Figure 7.5-4 Estimated harvest for the White-Fronted Goose in U.S. and Canada between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

7.5.3 Management and Conservation Concerns

There are no serious management concerns for the White-fronted Goose. Most monitoring programs for White-fronted Geese suggest that the population has increased significantly in size over the past several decades. Winter counts and breeding productivity surveys and studies must be continued to monitor the population.

7.6 Cackling Goose (*Branta hutchinsii*)

In 2004, the American Ornithologists' Union split the species previously referred to as the Canada Goose (*Branta canadensis*) into two different species (Banks *et al.* 2004): the Canada Goose and the Cackling Goose. The two species are similar in appearance, but Cackling Geese are generally much smaller, nest mainly in Arctic tundra and coastal habitats, and can be distinguished from Canada Geese based on their mitochondrial DNA. The Cackling Goose has been divided into 4 subspecies (*minima*, *hutchinsii*, *leucopareia*, and *taverneri*), but only *hutchinsii* is known to nest in Canada.

Traditionally, Cackling Geese were managed as two separate populations in the Mississippi and Central Flyways: the Tall Grass Prairie and Short Grass Prairie Populations. Due to extensive overlap in wintering areas, the two populations were merged into the Mid-Continent Population of Cackling Geese in 2013. The Mid-continent Population of Cackling Geese includes all Cackling Geese that nest north of the tree line in Canada; they mostly migrate through the Prairie provinces and winter in the southern states of the Central and Mississippi Flyway.

7.6.1 Abundance and Trends

Total numbers of Cackling Geese are difficult to estimate with traditional survey techniques, due to the extensive size and remoteness of their breeding range, and intermixing with Canada Geese on their wintering grounds. Mid-winter counts of Cackling Geese in the Central and Mississippi Flyways in the U.S. averaged about 325 000 birds in the 1970s and increased to an average of about 656 000 birds from 2008-2017, inclusive (Figure 7.6-1). There is a significant increasing long-term (1985-2017) trend for this species in these areas.

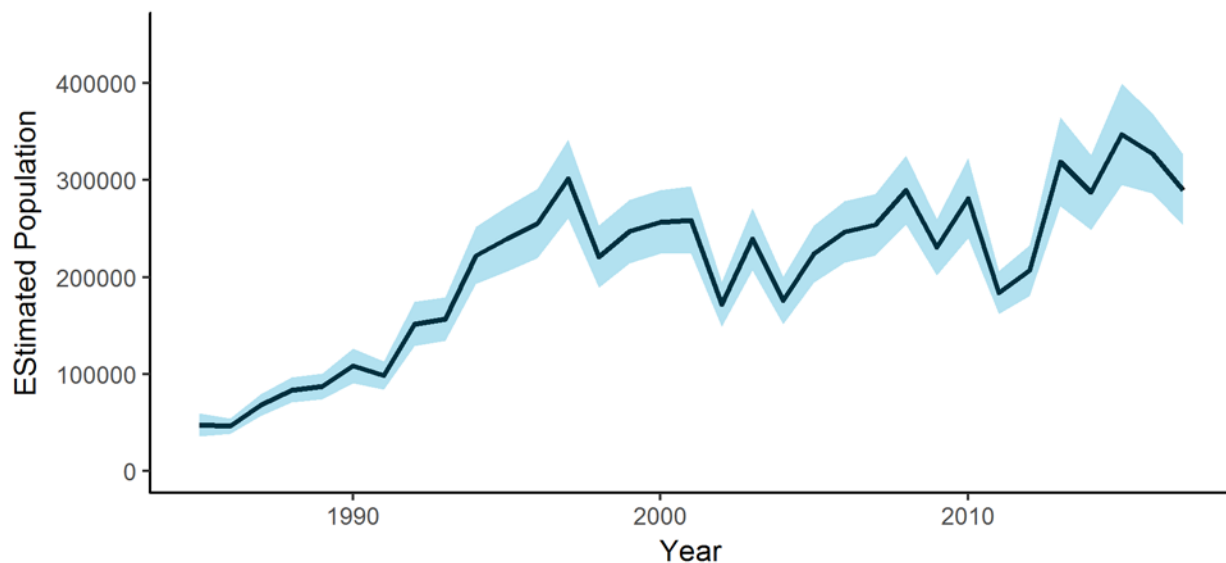


Figure 7.6-1 Mid-winter Counts of Cackling Geese in the Central and Mississippi Flyways, 1985-2017
(Source: J. Dooley, USFWS, unpubl. data)

Recently, Alisauskas *et al.* (2009) suggested that Lincoln's (1930) approach could be used to estimate the population size of several species of Arctic-nesting geese for which band recovery data and age-specific harvest estimates were available. From trends in population size for all years where sufficient data were available, it appears that Mid-continent Cackling Geese numbers have increased markedly since the 1970s based on Lincoln estimates (Figure 7.6-2). The population estimates averaged approximately 414 000 adult birds from 1975–1979, and approximately 3.2 million adults from 2012–2016

(J. Leafloor, CWS–Prairie Region, unpubl. data). Though Lincoln estimates have increased over the long term, recent estimates have been highly variable, and there is a decreasing short-term (2011-2016) trend in these estimates.

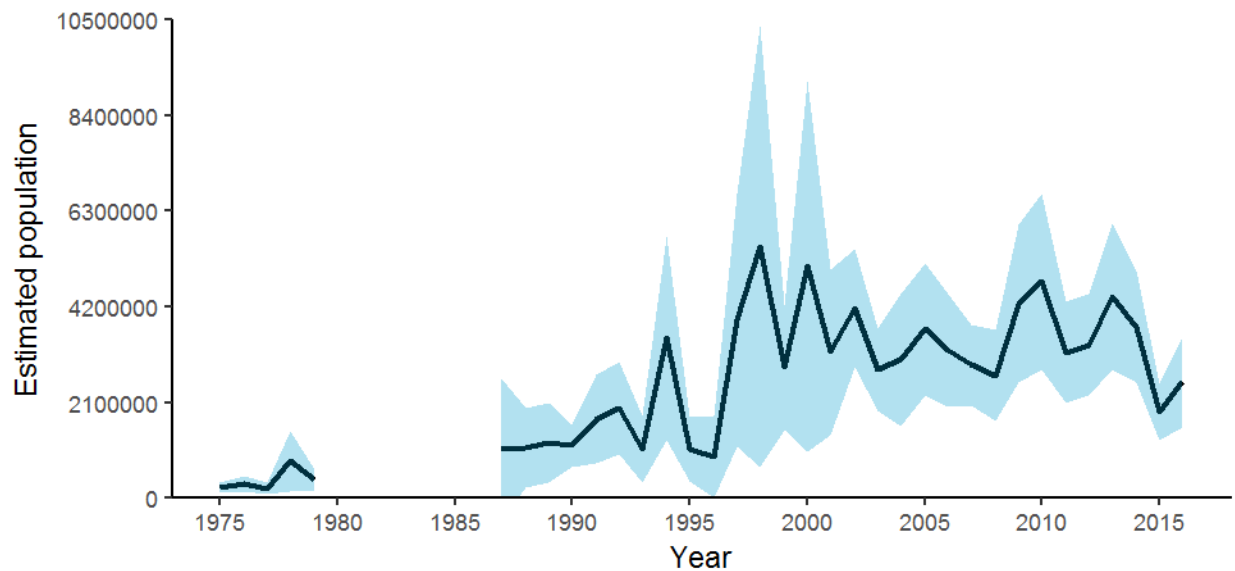


Figure 7.6-2 Lincoln Population Estimates of Mid-continent Cackling Geese, 1975–2016, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals (J. Leafloor, CWS-Prairie Region, unpubl. data).

7.6.2 Harvest

Estimated harvests of Cackling Geese in the Canadian Prairies have shown considerable inter-annual variation since 1971, but have increased over the long term (Figure 7.6-3).

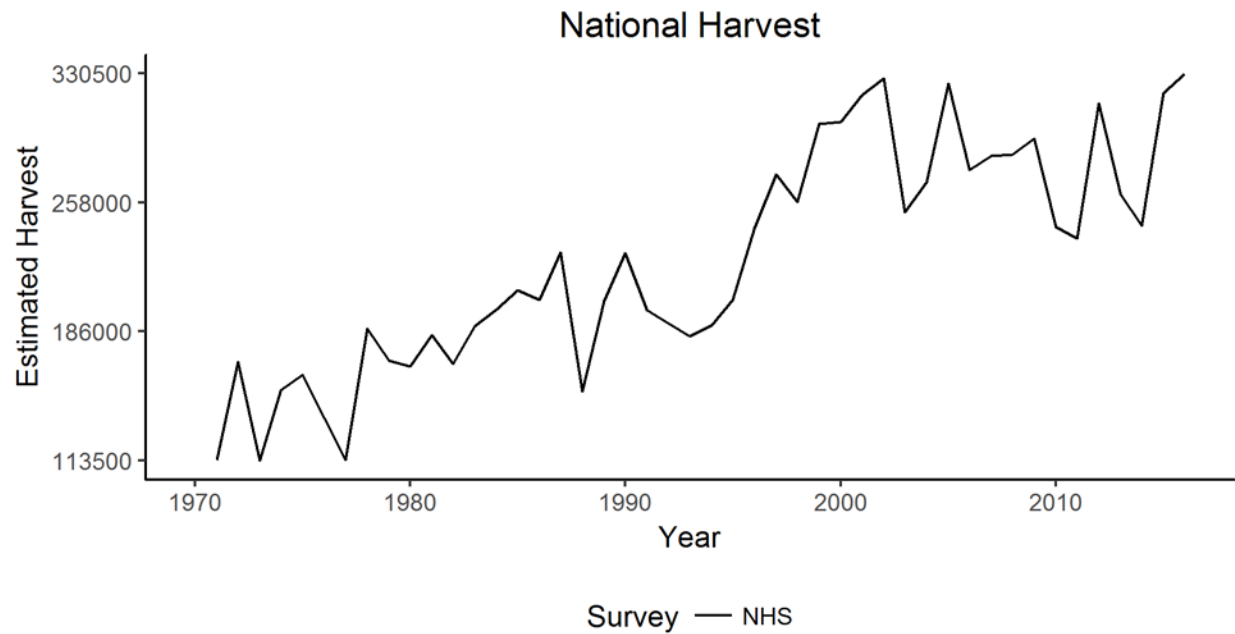


Figure 7.6-3 Estimated harvest for Cackling Goose in Canada between 1971 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>).

7.6.3 Management and Conservation Concerns

There is no conservation concern for the Cackling Goose in Canada but the Cackling Goose is contributing to crop depredation issues in the US.

7.7 Canada Goose (*Branta canadensis*)

Canada Geese that have part of their breeding range in Canada are grouped into different management populations based on their breeding and wintering ranges (Dickson 2000) Canada Geese can be divided into Subarctic-breeding and temperate-breeding populations.

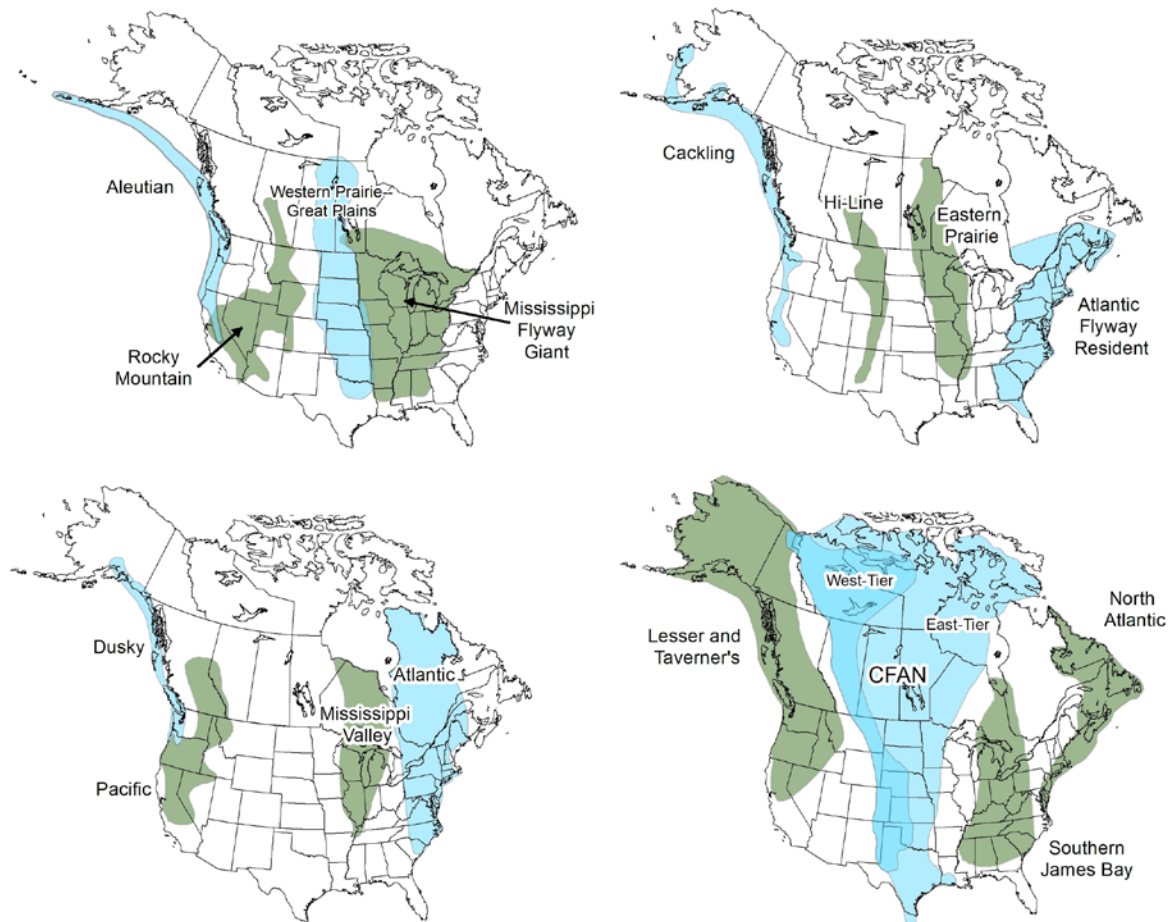


Figure 7.7-1 Approximate ranges of Canada Goose Populations in North America (source: USFWS 2017).

7.7.1 Subarctic Breeding Populations

NORTH ATLANTIC POPULATION CANADA GOOSE

The North Atlantic Population (NAP) of Canada Geese breeds in Labrador, insular Newfoundland and eastern Quebec (north shore), including Anticosti Island. There appears to be a contribution to the NAP by birds that breed in western Greenland, which are increasing and expanding (Fox *et al.* 1996; Scribner *et al.* 2003; Fox and Glauder 2010; Fox *et al.* 2013). The majority of the NAP overwinters in southern Atlantic Canada and New England. A small portion of the NAP winters from New Jersey south to North Carolina (Figure 7.7-1).

ABUNDANCE AND TRENDS

Canada Geese from several Subarctic breeding populations (North Atlantic, Atlantic and Southern James Bay Populations) intermix with temperate-breeding Canada Geese on wintering grounds in the Atlantic

Flyway. The best method to evaluate the NAP population status is to count birds during the breeding period, when they tend to occupy relatively discrete ranges with little overlap among neighbouring populations.

The NAP breeding population is surveyed by the two survey platforms (helicopter plot survey and fixed-wing survey) of the Eastern Waterfowl Breeding Ground Survey, (Figure 3.1-2, Monitoring section). ; the population index is at approximately 46 900 breeding pairs in 2017, which represents about 36% of the total NAP Canada Goose Population, estimated at 130 000 geese (Figure 7.7-2). This population of Canada Geese has stayed relatively stable since surveying began in 1990.

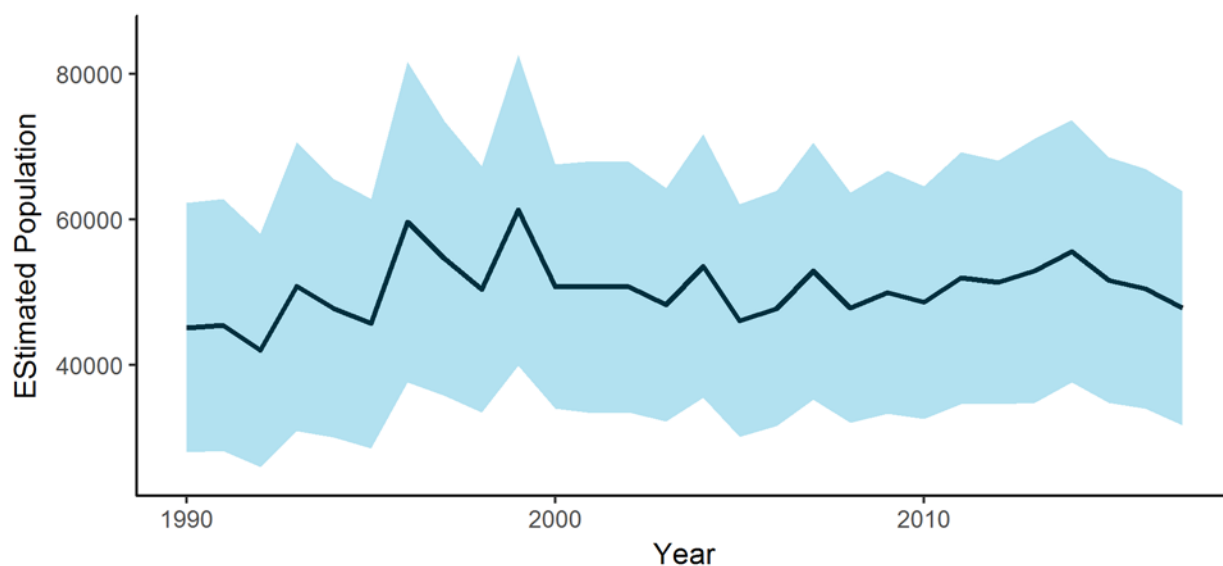


Figure 7.7-2, Population estimate from the Eastern Waterfowl Breeding Ground Survey (EWS). Black line represents the population estimate and the shaded area represents the 95% Confidence Intervals (Estimates are based on helicopter and fixed-wing aircraft surveys)

One of the critical needs for managing the NAP of Canada Geese is a reliable estimate of the number of NAP geese taken by hunters. Limited banding of NAP geese had been conducted for several years in the spring where geese stage on Prince Edward Island. However, this banding effort did not produce a number of bandings sufficient to estimate survival and harvest rates. Efforts to band geese breeding in southern Labrador were initiated in the summer of 2007 and continued in 2009 and 2011. In 2012, in an attempt to band geese breeding on the Island of Newfoundland as well as in Labrador, this banding effort was broadened. Banding operations were suspended in 2013 due to these efforts not banding the minimum number of birds to estimate survival and harvest rates.

Of particular note is the fact that banding operations during the summer of 2007 identified the presence of Canada Geese banded as juveniles in several U.S. states. As has been documented for other Canada Goose populations, the presence of moulting temperate-breeding migrant geese is a concern in terms of both the accuracy of breeding survey estimates and the potential effects on North Atlantic Canada Goose Population due to competition for resources.

The utility of banding NAP Canada Geese on the breeding grounds is still under review by program partners to determine if delivery of this program has the ability to meet management needs.

ATLANTIC POPULATION CANADA GOOSE

Atlantic Population (AP) Canada Geese nest throughout northern Quebec, especially along the shores of Ungava Bay and eastern Hudson Bay (where 80% of the breeding birds are found), and in the interior of the Ungava Peninsula. AP Canada Geese winter from New England to South Carolina, with the largest concentration occurring on the Delmarva Peninsula (Figure 7.7-1).

ABUNDANCE AND TRENDS

A breeding ground survey has been conducted every year since 1993 to estimate the number of breeding pairs on the Ungava Peninsula in northern Quebec. This survey covers the two regions that were shown previously to include the highest densities of nesting geese: the region of flat coastal tundra of Ungava Bay and Hudson Bay and the region of taiga and inland tundra (Malecki and Trost 1990; Rodrigue 2013b; Harvey and Rodrigue 2015). Estimates produced by this survey are not adjusted for visibility bias, and thus represent an index to the population. The estimated number of Canada Goose breeding pairs is shown in Figure 7.7-3. The breeding pair estimates have risen nearly five-fold since 1995, year of a record low level of about 30 000 pairs. The most recent 10-year average is 185 000 breeding pairs (Harvey *et al.* 2017), which puts the population below the management objective of 225 000 breeding pairs of AP geese in the Ungava Region of northern Quebec.

Since 1997, a pre-season banding program has been in place for AP Canada Geese breeding in the Ungava Peninsula, along the northern Hudson Bay coast, and along the south and west coasts of Ungava Bay.

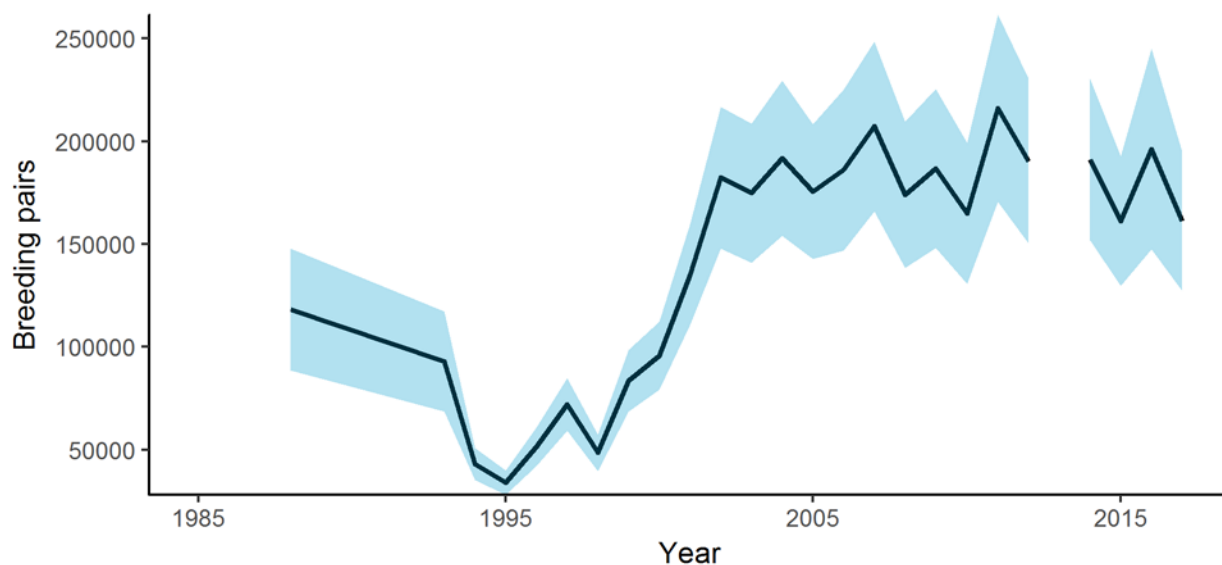


Figure 7.7-3 Estimated Numbers of Atlantic Population Canada Goose Breeding Pairs on the Ungava Peninsula, black line represents the breeding pair estimate and the shaded area represents the 95% Confidence Intervals (No survey was conducted in 2013; Source: Harvey and Rodrigue 2017)

In the southern boreal forest of Quebec, AP Canada Geese are counted as part of the Eastern Waterfowl Breeding Ground Survey. The region covered by the survey is at the southern limit of the nesting range of AP Canada Geese. In 2017, the population in the southern boreal forest was estimated at 24 100 breeding pairs, below the 10-year average of 26 600 breeding pairs (Figure 7.7-4). The population shows a 10-year declining trend of 3% (C. Lepage, CWS–Quebec Region, unpubl. data).

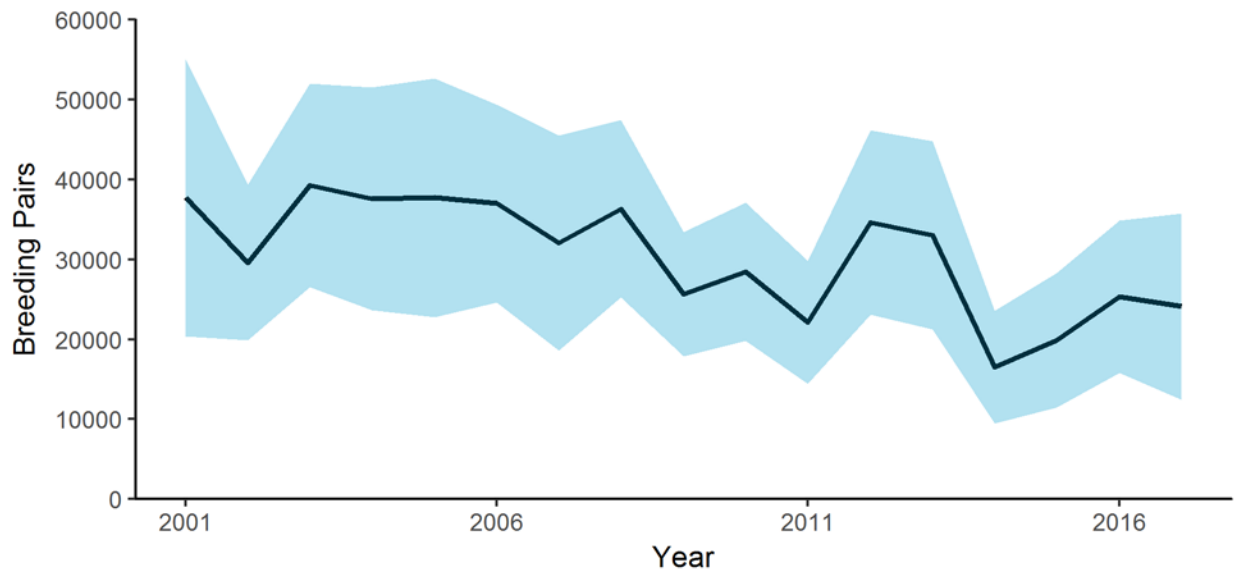


Figure 7.7-4 Estimated Numbers of Atlantic Population Canada Goose Breeding Pairs in the Southern Boreal Forest in Quebec Based on the Eastern Waterfowl Breeding Ground Survey (EWS), black line represents the breeding pair estimate and the shaded area represents the 95% Confidence Intervals (Estimates are based on helicopter survey only; Source: C. Lepage, CWS–Quebec Region, unpubl. data)

This once-heavily hunted population peaked at nearly 1 million birds during the 1970s, before experiencing a sharp decline during the late 1980s and early 1990s that prompted the establishment of breeding ground surveys in 1988 in northern Quebec. In 1993, the number of breeding pairs of Canada Geese in the Ungava Peninsula was estimated at 91 300, a 23% decrease from the 1988 count. The population continued to decline until 1995, when it reached a historic low of 29 300 breeding pairs: this sharp drop prompted authorities to completely close the sport hunting season for the AP until 1999. In the following years, the population has recovered rapidly and, since 2002, has appeared to be stable in its core breeding range (Figure 7.7-3) and decreasing in its southern breeding range (Figure 7.7-4). All hunting restrictions on the species were lifted in Canada in 2002 (Rodrigue 2013b). However, the harvest continues to be managed carefully even though the population is now restored.

SOUTHERN HUDSON BAY POPULATION CANADA GOOSE

The Southern Hudson Bay Population (SHBP) is composed of Canada Geese that nest in coastal habitats along western and southern James Bay (including Akimiski Island, Nunavut) and southern Hudson Bay and in the adjacent interior lowland muskeg of Ontario and Manitoba. The winter range of this population generally includes a broad area in the U.S. west of the Mississippi River associated states of Minnesota Missouri, Arkansas and Louisiana extending as far east as Michigan southern Ontario, Ohio, western Kentucky, western Tennessee and southern Illinois (Figure 7.7-1). The SHBP consists of the combined former Southern James Bay Population (SJB), Mississippi Valley Population (MVP) and Eastern Prairie Population (EPP) of Canada Geese. This population was designated starting in 2016 to streamline and improve management and monitoring of Canada Geese within the Mississippi Flyway (Luukkonen and Leafloor 2017).

Monitoring of the SHBP includes a spring population survey and a summer banding program each of which are conducted throughout the coastal part of their breeding and brood rearing areas. These programs provide information about population status, productivity and harvest, all of which are required for management of this population. In 2016, a single redesigned spring breeding population survey was initiated within the breeding range of the SHBP, replacing the 3 former population-specific surveys (Brook and Badzinski 2016). This survey was created to improve cost and time efficiencies, survey coverage

(particularly of higher density coastal breeding areas), detection of breeding density changes at finer spatial scales, quality of survey data and analytical methodologies (Luukkonen and Leafloor 2017). However, the population estimates from the current, ongoing SHBP survey are not directly comparable to those of the discontinued SJPB, MVP and EPP surveys. The SHBP survey provides information on annual changes in breeding pair densities and distributions throughout the breeding range of Canada Geese. The primary purpose of the redesigned SHBP survey is detection of temporal and spatial changes in the distribution of the breeding pairs in two survey areas, the Ontario and Manitoba mainland and Akimiski Island (Brook and Badzinski 2017).

ABUNDANCE AND TRENDS

The estimated 2017 breeding pair index (number of indicated pairs x 2) was 71,557 (95% CI = 5,874) for the mainland and 9,503 (95% CI = 3,514) for Akimiski Island (Brook and Badzinski 2017). The estimated 2016 breeding pair index was 65,082 (95% CI = 3,691) for the mainland and 4,586 (95% CI = 502) for Akimiski Island (Brook and Badzinski 2016). Both the Ontario and Manitoba mainland and Akimiski Island breeding pair indices were higher in 2017 than in the first year (2016) of the redesigned survey. As the survey continues and several more years of data are collected, a more robust change detection analysis will be used to monitor changes in the population and its distribution.

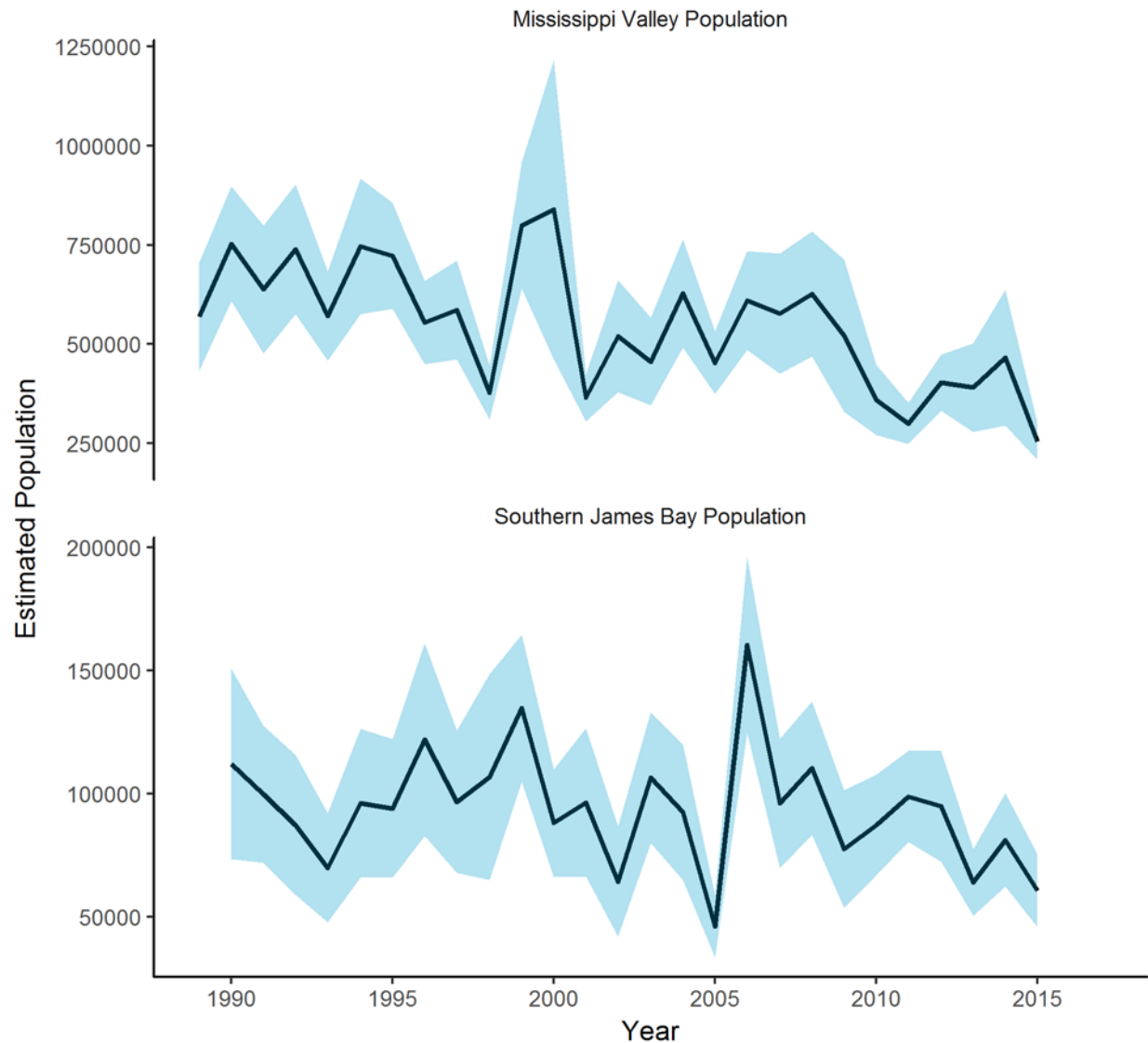


Figure 7.7-5 Mississippi Valley (top figure) and Southern James Bay (bottom figure) Canada Geese spring population estimates. The black line represents the estimated population and the shaded area represents the 95% Confidence Interval (Both of these surveys have been discontinued in 2016)

South of the Hudson Bay Lowlands in northwestern Ontario, Canada Geese are counted during the Waterfowl Breeding Population and Habitat Survey in boreal habitats of stratum 50. In the 1970s, there were an average of about 25 000 Canada Geese in this area, however the population has been steadily increasing since and the 2017 estimate reached approximately 154 200 birds (Figure 7.7-7); reasons for the recent increase are unclear.

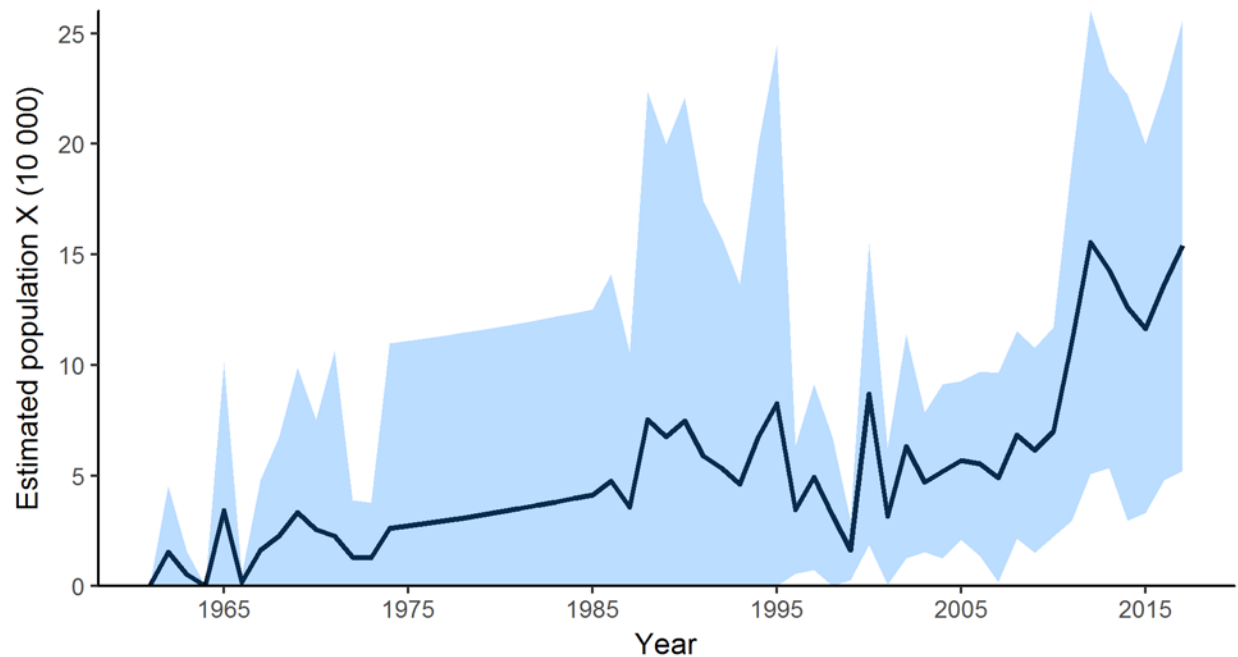


Figure 7.7-6 Numbers of Canada Geese in the Waterfowl Breeding Population and Habitat Survey (WBPHS) Stratum 50, 1955–2017, black line represents the population estimate and the shaded area represents the 95% Confidence Interval.

Boreal habitats in Alberta, Saskatchewan, Manitoba and the Northwest Territories are surveyed during the Waterfowl Breeding Population and Habitat Survey in strata 12–18, 20–25, and 75–77 (Figure 3.1-1, Monitoring section). In the 1970s, the number of Canada Geese in all of these strata combined averaged about 156 000 birds per year. The 2017 estimate of 642 900 birds is 31% lower than the 2016 estimate of 932 300, but is still slightly above the 10-year average of approximately 610 000 (Figure 7.7-7).

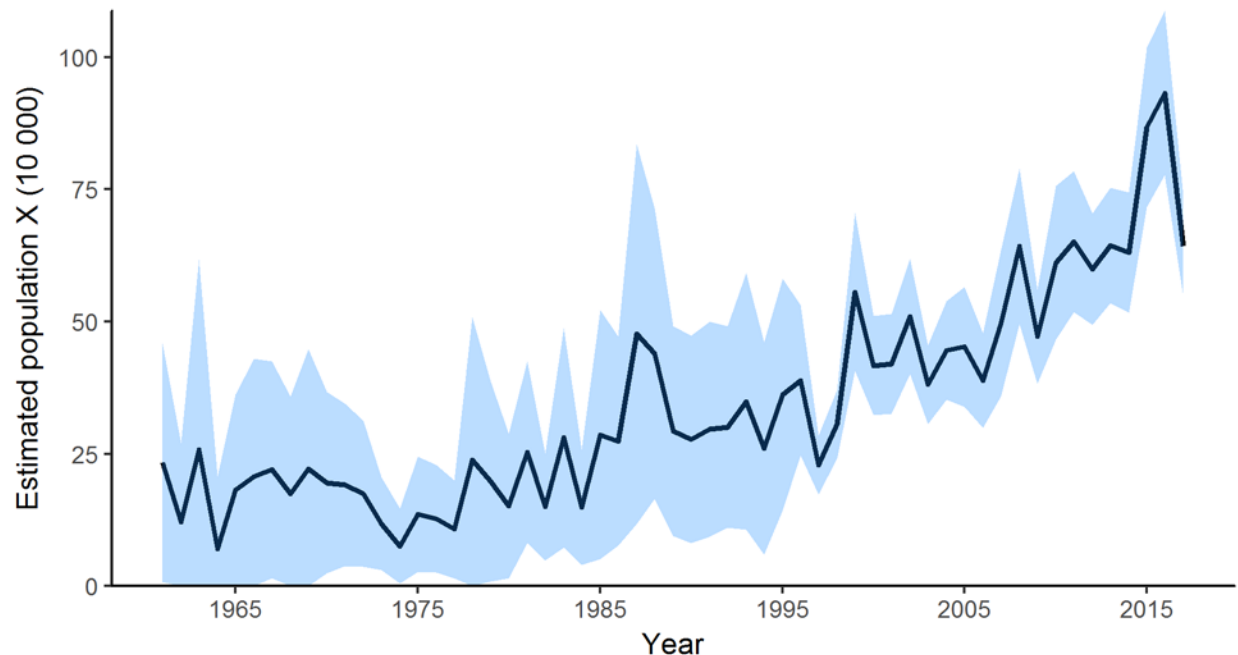


Figure 7.7-7 Numbers of Canada Geese in Boreal Strata 12–18, 20–25, and 75–77 of Western Canada during the Waterfowl Breeding Population and Habitat Survey (WBPHS), 1955–2017, black line represents the population estimate and the shaded area represents the 95% Confidence Interval.

PACIFIC POPULATION CANADA GOOSE

The Pacific Population of Canada Geese nest and winter west of the Rocky Mountains from northern Alberta and B.C. south through the Pacific Northwest to California (Figure 7.7-1).

Breeding Pacific Canada Geese are surveyed in the course of the Waterfowl Breeding Population and Habitat Survey. The Pacific Population index in 2017 was 298 000 geese, similar to the prior year's count of 313 000 (USFWS 2017).

7.7.2 Temperate-breeding Populations

Temperate-breeding Canada Geese breed in central and southern Ontario, southern Quebec, and the Maritimes. They also breed in western Canada in the southern areas of Prairie provinces and British Columbia. In the Maritimes, some population growth and expansion of the breeding range is the result of deliberate re-establishment of local Canada Goose flocks beginning in the late 1960s. Although temperate-breeding geese are sometimes referred to as “residents” because they do not migrate to far northern regions for the breeding season, some do migrate long distances. In May and early June, sub-adults and failed breeders will migrate to Subarctic and Arctic regions of Canada for the summer to moult their feathers. Temperate-breeding Canada Geese will also migrate south during severe winter weather in search of open water and food. In addition to the growing numbers in Canada, temperate-breeding Canada Geese in the U.S. have also increased rapidly, and large numbers of sub adults and failed breeders migrate to Canada for the moulting period (Abraham *et al.* 1999; Luukkonen *et al.* 2008). The status of temperate-breeding Canada Goose populations in all regions in Canada are at or well above management population objectives (Table 7.7-1).

Temperate-breeding populations of Canada Geese have grown rapidly to the point that they are causing conflicts with humans (e.g., fouling parks, golf courses and private lands), crop damage and danger (e.g., collisions at airports, territorial aggression towards passers-by, and concerns about disease transmission)

in local areas. Regulatory amendments liberalizing the harvest of temperate-breeding Canada Geese in southern Canada were adopted in recent years to reduce population size and conflicts with humans.

Table 7.7-1. Population Objective for Temperate-breeding Canada Geese in Southern Canada		
Geographic Populations	Abundance	Population Objectives
Maritime Provinces	6 200 ¹ pairs	3 000–6 000 pairs
Southern Quebec	14 100 pairs	2 000–3 000 pairs
Southern Ontario	81 800 ² pairs	40 000–80 000 pairs
Southern Prairie Provinces	1 100 000 birds	400 000–800 000 geese
Southern British Columbia	40 600 birds	10 000–15 000 geese
¹ Abundance for Maritime Canada is estimated from 2008–2010 data. ² Abundance estimate is based on four-year average (2014-2017) of indicated breeding pairs from the Southern Ontario Waterfowl Plot Survey		

MARITIME PROVINCES

The temperate-breeding population in the Maritimes is growing, probably due to the deliberate re-establishment of local Canada Goose flocks in the late 1960s and again in the 1990s. There are no temperate-breeding Canada Geese in Newfoundland and Labrador (geese breeding in Newfoundland and Labrador belong to the subarctic population referred to as the North Atlantic Population).

Contemporary estimates of breeding effort in Maritime Canada (as derived from the Eastern Waterfowl and Agricultural Landscape survey plots) suggest an average of roughly 6 200 indicated breeding pairs broadly distributed across the region in spring, with the highest densities found in agricultural areas. Banding operations initiated in Maritime Canada in 2007 continued through 2014 in an attempt to assess the contribution of this population to overall goose harvest in the region. Approximately 4 000 Canada Geese have been banded in the Maritimes in the past 8 years.

SOUTHERN QUEBEC

In 2017, the number of breeding pairs in southern Quebec (combination of southern part of the Eastern Waterfowl Breeding Ground Survey area and the St. Lawrence Lowlands Breeding Waterfowl Survey) was estimated at 14 100 (C. Lepage, CWS–Quebec Region, unpubl. data). The species has expanded rapidly into southwestern Quebec since the early 2000s (Rodrigue 2013a), with a significant increasing trend of 7.5% annually since 2004 (Figure 7.7-8).

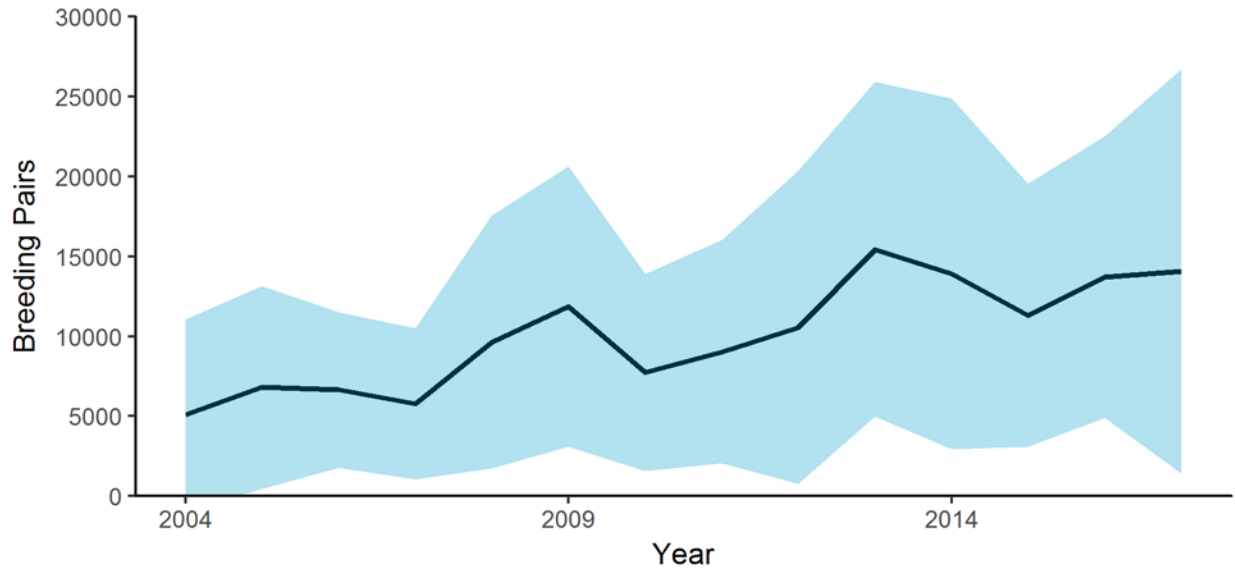


Figure 7.7-8 Estimated Breeding Pairs of Temperate-Breeding Canada Geese in Southern Quebec, 2004–2017, black line represents the breeding pair estimate and the shaded area represents the 95% Confidence interval (Source: C. Lepage, CWS–Quebec Region, unpubl. data).

SOUTHERN ONTARIO

As recently as 1970, Canada Geese did not commonly nest throughout southern Ontario. But anthropogenic changes on the southern Ontario landscape (e.g., shifts in agricultural practices, increase in waterfront lawns, golf courses, stormwater ponds), combined with favourable environmental conditions, resulted in the creation of ideal habitat conditions for the Canada Goose, allowing the population to grow rapidly. Results from the Southern Ontario Waterfowl Plot Survey show that the population south of the French and Mattawa rivers has grown from a few thousand pairs in the 1970s to a recent 10-year average of just over 83 000 breeding pairs (Figure 7.7-9). Increasing at a rate of 8.4% annually from 1971 to 2017, the population growth rate now appears to have stabilized, with an average annual increase of 0.7% since 2008. The 2017 breeding pair estimate was 92 211 breeding pairs (Figure 7.7-9).

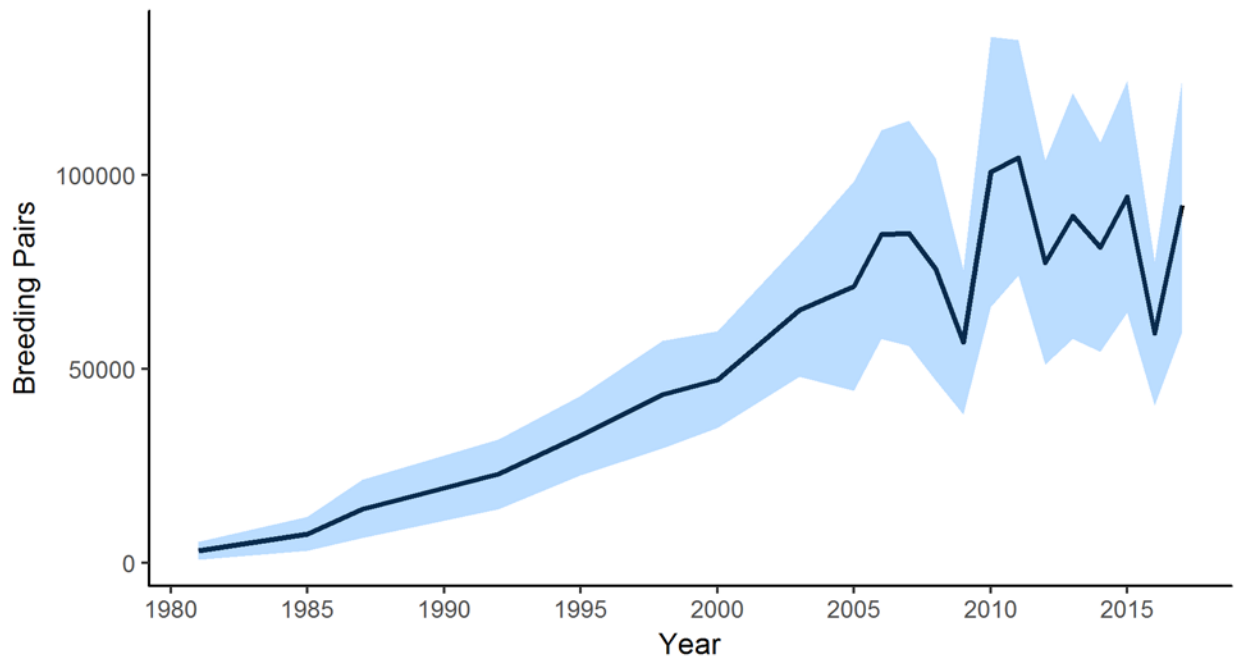


Figure 7.7-9 Estimated Breeding Pairs of Temperate-Breeding Canada Geese in Southern Ontario, 1981–2017, black line represents the breeding pair estimate and shaded area represents the 95% Confidence Interval (Source: S. Meyer, CWS–Ontario Region, unpubl. data)

SOUTHERN PRAIRIE PROVINCES (PRAIRIE–PARKLAND CANADA GEESE)

Most Canada Geese that nest in prairie and parkland habitats of the Prairie Provinces are monitored annually through the Waterfowl Breeding and Habitat Population Survey. Historically, Canada Geese in this region were divided into several units for harvest management purposes: Western Prairie/Great Plains Population, Hi-Line Population, and the Rocky Mountain Population. As temperate-breeding populations of Canada Geese in the U.S. and Canada have grown and expanded, the need for such subdivisions has declined, and instead we report on trends observed in Prairie Canada.

Canada Geese in Prairie strata of western Canada averaged approximately 87 000 birds annually from 1970–1979 but grew to about 1.1 million birds by 2017 (Figure 7.7-10).

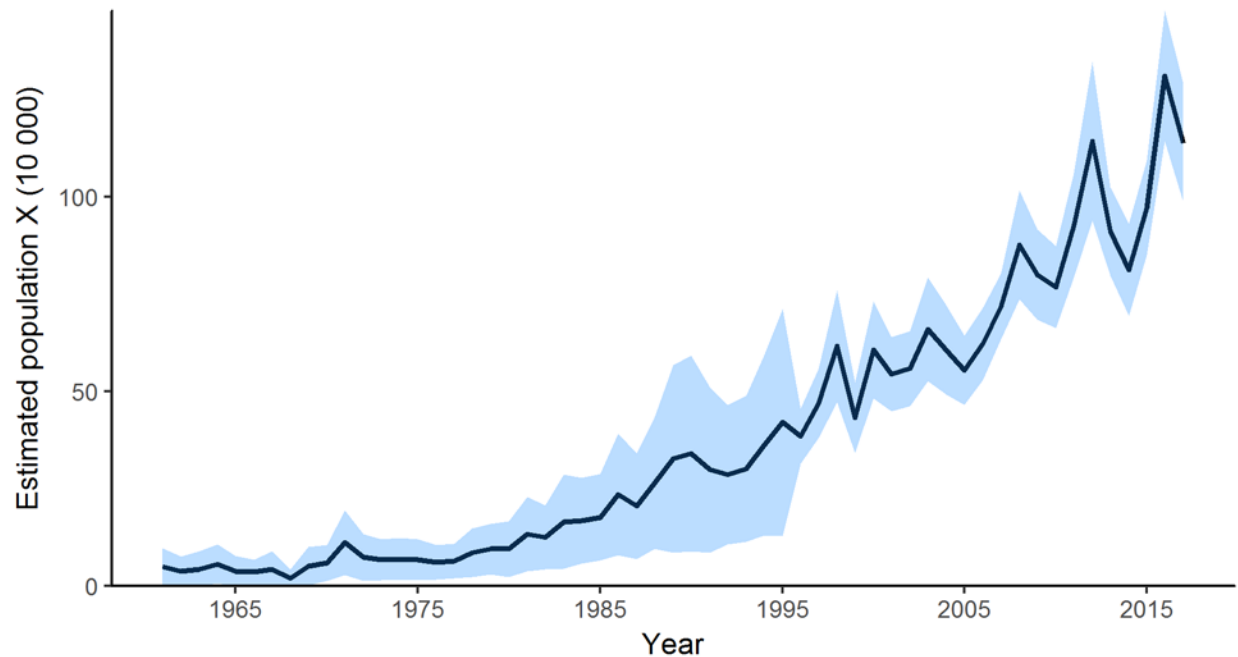


Figure 7.7-10 Numbers of Canada Geese Estimated Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada, Strata 26–40, 1955–2017, black line represents the population estimate and the shaded area represents the 95% Confidence Intervals.

SOUTHERN BRITISH COLUMBIA

Historically, Canada Goose populations in southern B.C. occurred at very low densities and in scattered distribution, but through transplant programs and natural dispersal, these have expanded their distribution and abundance significantly over the last three decades.

The temperate-breeding Canada Geese in central and southern B.C. are monitored by the Waterfowl Breeding Population Survey of the Central Interior Plateau of B.C. since 2006. The 2017 breeding population was estimated at 40 600 individuals, 17% more than in 2016 (A. Breault, CWS–Pacific Region, pers. comm.).

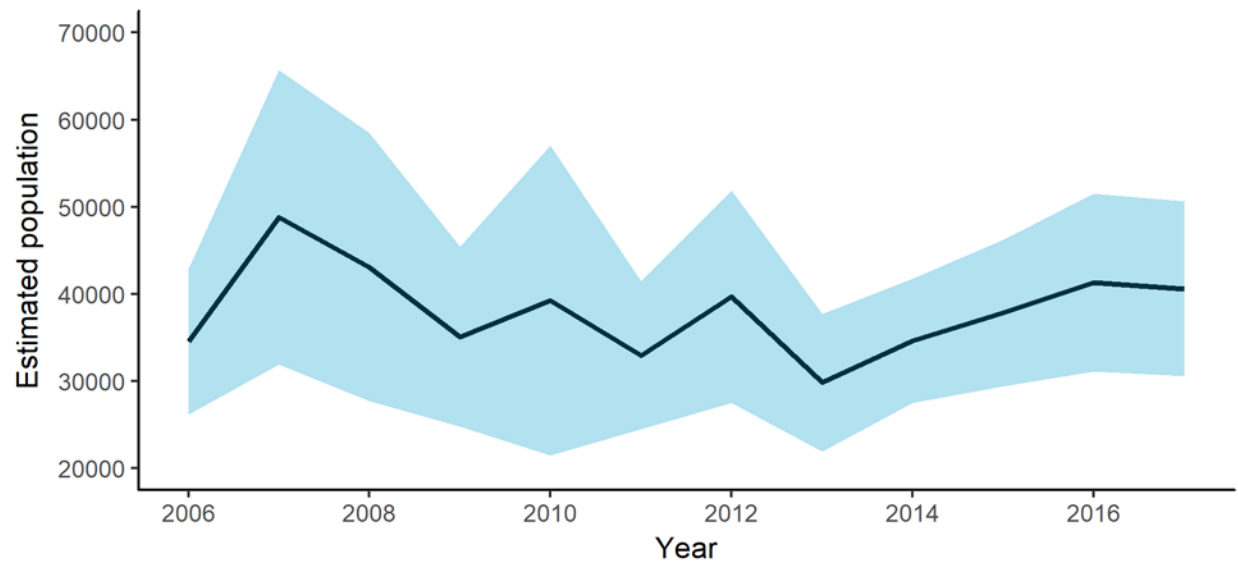


Figure 7.7-11 Population Estimates of Canada Geese in British Columbia Central Plateau, 2006-2017, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals.

7.7.3 Harvest

Figure 7.7-12 presents overall harvest estimates of Canada Geese for Canada and the U.S. These numbers include a portion of Cackling Geese. Harvest of Canada Geese has been on the rise, with the continental harvest surpassing 3 million annually since 2001.

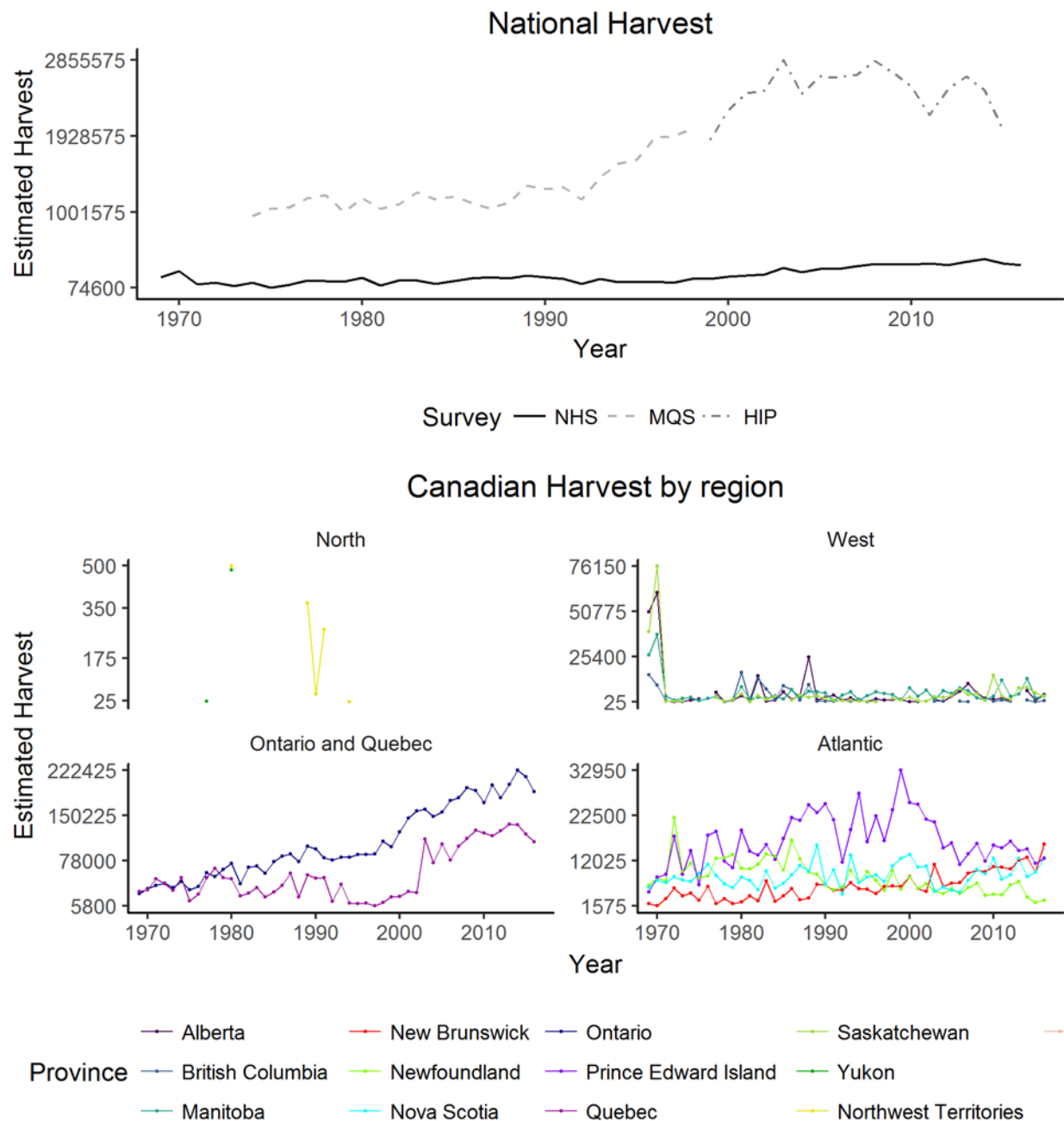


Figure 7.7-12 Estimated harvest for the Canada Goose in U.S. and Canada (top figure), and by province (bottom figures) between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Mail Questionnaire Survey (1974-1998) and the Migratory Bird Harvest Information Program (1999-2016). For the U.S. data, results prior to 1999 are not directly comparable to those after 1999. (Numbers include Cackling Geese which may represent a significant portion in some regions)

7.7.4 Management and Conservation Concerns

SUB-ARCTIC BREEDING POPULATIONS

Populations of subarctic-nesting geese are relatively stable, with the exception of the Southern James Bay and the Mississippi Valley populations of Canada Geese. Numbers of Canada Geese nesting on Akimiski Island in James Bay have declined from approximately 75 000 birds in 1985 to approximately 12 000 birds in 2013 (Leafloor *et al.* 1996; Brook and Hughes 2014). The specific causes of the decline are uncertain, but could be related to poor growth conditions for goslings (Hill *et al.* 2003) resulting from habitat degradation by staging Lesser Snow Geese in brood-rearing areas (Jefferies *et al.* 2006). Similarly, numbers of the Mississippi Valley Population of Canada Geese have declined since the beginning of the survey in 1989 and the specific causes of the decline are uncertain. Canada Goose populations will continue to be monitored closely. Although the decline in the Mississippi Valley Population is concerning, the current management plan states that management action should not be considered until it is clear that the breeding population stays consistently below the threshold level for three consecutive years and that other population dynamic metrics, such as productivity, survival, and harvest rate, concur with the decline (S. Badzinski, CWS–Ontario Region, pers. comm.).

TEMPERATE-BREEDING POPULATIONS

Human-geese conflicts are the most significant management concern for Canada Geese, and these usually occur in urban areas. Problem populations of resident and urban Canada Geese are primarily controlled by municipal initiatives and through federal hunting regulations. Key management practices include egg addling, prevention of nesting, landscape management, and relocation of moulting flocks to areas where they can be subjected to hunting mortality. More information about the management and population control of Canada and Cackling Geese in southern Canada could be found on Environment and Climate Change Canada's website: www.ec.gc.ca/mbc-com/

7.8 Brant (*Branta bernicla*)

Based on differences in breeding and wintering ranges, four distinct populations of Brant are recognized in North America; these are the Atlantic, Eastern High Arctic, Black and Western High Arctic populations.

7.8.1 Abundance and Trends

ATLANTIC BRANT (*B. b. hrota*)

This population of the subspecies *B. b. hrota* nests on islands in the Canadian Eastern Low Arctic. The Atlantic Brant Population is surveyed annually in its wintering area in the U.S. (Atlantic Coast from Massachusetts to North Carolina). Winter counts have been conducted along the Atlantic Coast in the U.S. since 1961, and have averaged approximately 135 000 birds from 2013-2017 (USFWS 2017; Figure 7.8-1).

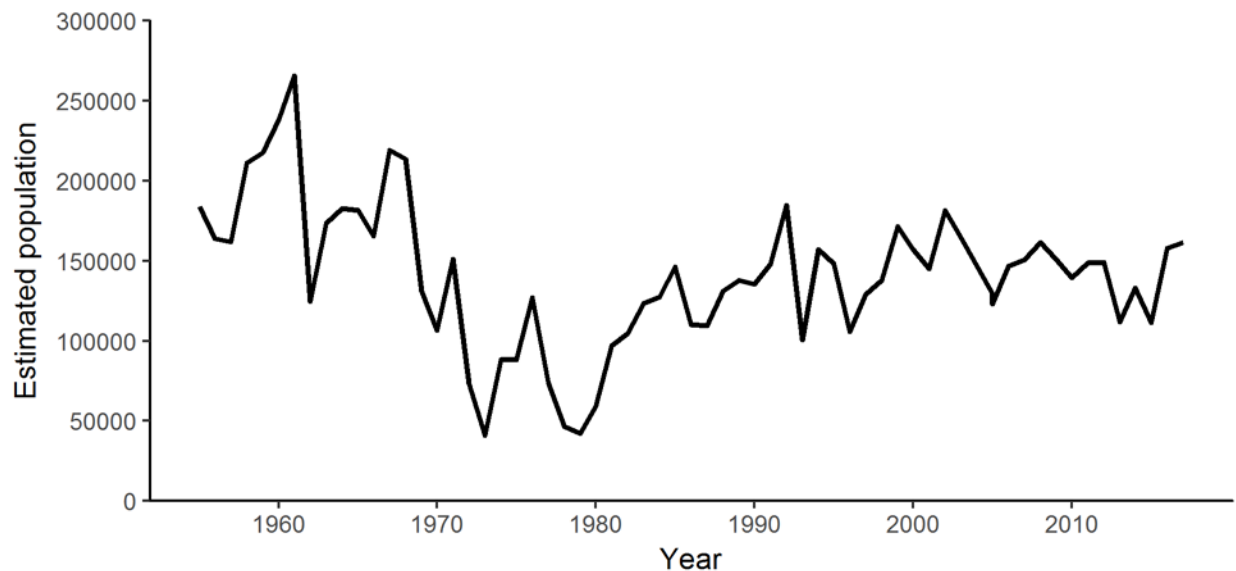


Figure 7.8-1 Mid-winter Counts of Atlantic Brant in the Atlantic Flyway in the United States (Source: Roberts and Padding 2017)

Recently, Alisauskas et al. (2009) used harvest and band recovery data to estimate the population size of several species of Arctic-nesting geese, a technique that has been used recently to estimate the size of the Atlantic Brant population (J. Leafloor, CWS–Prairie Region, unpubl. data). Lincoln estimates have been quite variable in recent years, and averaged approximately 199 000 birds from 2012–2016 (Figure 7.8-2).

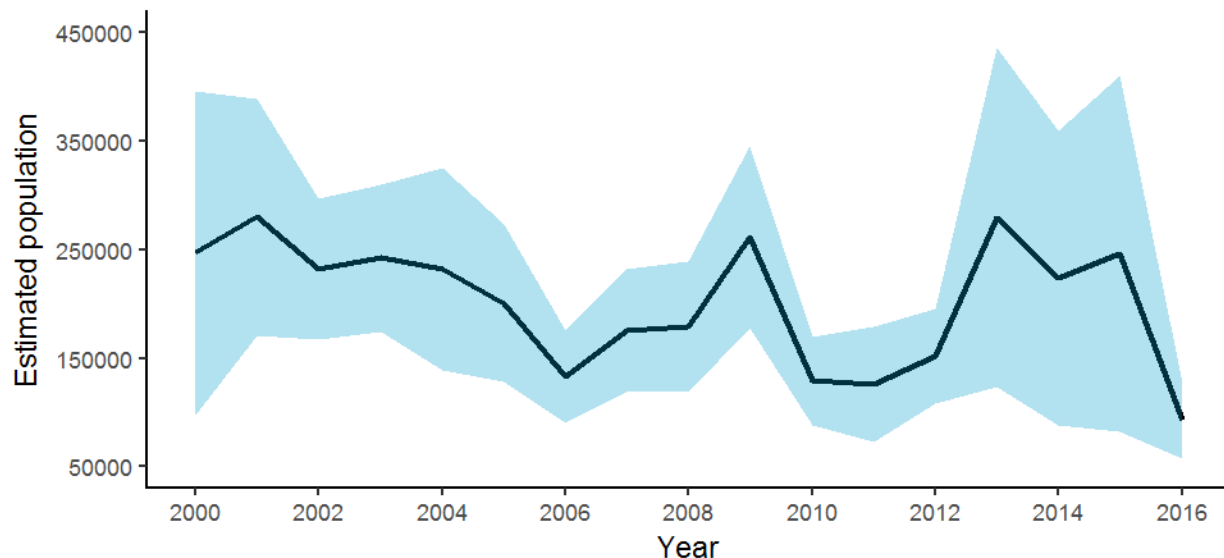


Figure 7.8-2 Lincoln Estimates of Population Size for the Atlantic Brant, 2000–2016, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals (source; J. Leafloor, CWS-Prairie Region, unpubl. data)

EASTERN HIGH ARCTIC BRANT (*B. b. hrota*)

This group of the subspecies *B. b. hrota* breeds on islands of Canada's Eastern High Arctic, migrating via Greenland and Iceland to winter in Ireland (Reed *et al.* 1998). No surveys are currently being conducted on the Canadian breeding grounds, and little information is available about the birds' distribution within the breeding range. The number of Eastern High Arctic Brant is estimated through counts on the wintering grounds in Ireland, where the population grew from fewer than 10 000 birds in the late 1960s to more than 33 000 birds in 2004–2005 (Lewis *et al.* 2013). Results of the 2014 International Census estimated a population of 31 985 geese, a decrease from the 2013 count of 34 985 birds.

The percentage of young is also assessed during the fall census. As is the case for most Arctic birds, productivity fluctuates markedly between years: only 1–2% of the population is composed of young birds in poor years, while this percentage increases to values as high as 20–30% in good years. In 2014, the number of young accounted for 4.1% of the fall population, an important increase compared to 2013 which represented the lowest percentage ever recorded (Wildfowl and Wetlands Trust 2015). Following the peak count in 2011 (48 002 birds), two consecutive years with very low breeding success (< 2%) have led to a halt in the growth of the population (Wildfowl and Wetlands Trust 2015).

BLACK BRANT AND WESTERN HIGH ARCTIC BRANT

Black and Western High Arctic Brant numbers are assessed annually during mid-winter aerial and ground surveys in January. During surveys, it is difficult to separate the two types of Brant that winter on the west coast of North America.

BLACK BRANT

Black Brant nest in the central and western low Canadian Arctic, in Alaska, and in western Russia. The population winters along the Pacific Coast, mainly in Mexico (Reed *et al.* 1998). The last mid-winter index for the Black Brant in the Pacific flyway was 155 720 birds in 2017, higher than the 2016 estimate of 140 025 birds (Olson 2017). Black Brant counts could include an unknown proportion of Western High Arctic Brant.

There are no regular surveys of breeding grounds in Canada, and in fact, the Canadian distribution and abundance of breeding Black Brant are not well known.

Part of the Black Brant Population stages along the coast of British Columbia during the spring migration. It is estimated that between 3 000 and 7 000 Brant stopover in the Queen Charlotte Islands on their way to northern breeding grounds. Roughly 25 000–30 000 Black Brant stage in the spring in the Strait of Georgia, B.C., with the two most important sites being the Fraser River Delta and the Parksville–Qualicum area on Vancouver Island.

Historically, between 1 000 and 10 000 Black Brant spent the winter in British Columbia. Recent estimates of the wintering population in B.C. indicate that approximately 2 500 individuals are found in three major wintering locations: the Fraser River Delta (more than 2 000 birds), the Queen Charlotte Islands (more than 200 birds) and Vancouver Island (a few dozen birds a decade ago to 150 Brant overwintering in the Parksville–Qualicum area in 2013–2014; S. Boyd, ECCC - S&T, pers. comm.). In the areas of Boundary Bay and Robert's Banks of the Fraser River Delta, the wintering Brant population has been generally increasing since 1992. The British Columbia peak winter population was estimated at 3 550 Brant during the 2016–2017 winter, a slight increase from the 3 302 birds observed in the 2015–2016 winter (A. Breault, CWS–Pacific, pers. comm.).

WESTERN HIGH ARCTIC BRANT

The Western High Arctic Brant includes individuals that are intermediate in appearance between *B. b. nigricans* and *B. b. hrota*, and is thought by some biologists to be a distinct subspecies. Recent evidence from genetic studies suggests that western high arctic nesting areas are occupied by both subspecies, and that there is evidence of hybridization in areas where the two groups overlap. Nesting occurs on islands of the western High Arctic and wintering occurs mainly in a small area in Puget Sound, Washington (Reed *et al.* 1998). Mid-winter counts suggest relatively large historical fluctuations in the population size of the Western High Arctic Brant (Figure 7.8-3). Although Western High Arctic Brant intermix with Black Brant during the fall migration and in winter, historically, mid-winter counts from the core wintering area in Washington State have been used as an index of the population size because most of the population is thought to winter there. Based on the counts at Port Susan in Washington State, there were 15 878 Brant estimated in 2017, higher than the 2016 estimate of 11 800 Brant (Olson 2017). This estimate also includes an unknown number of Black Brant.

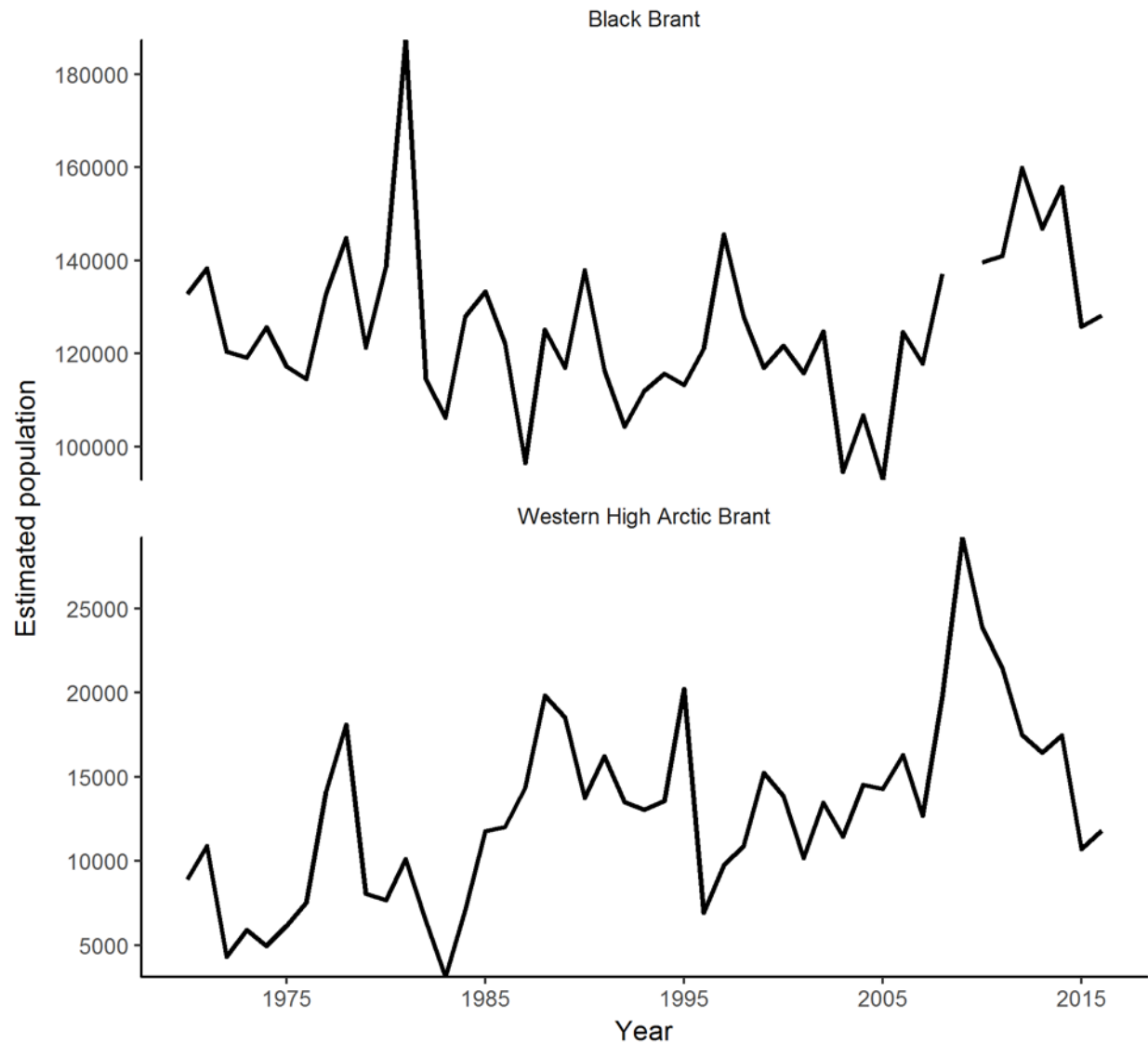


Figure 7.8-3 Mid-winter Inventory of Black and Western High Arctic Brant (Note: Beginning in 1986, Black Brant numbers include counts along the Alaska coast. No survey was conducted in 2009; Source: Olson 2017)

7.8.2 Harvest

ATLANTIC BRANT

Harvest of the Atlantic Brant has the potential to be near the maximum supportable, as the population is relatively small, and the Atlantic Brant is a highly valued game species, particularly in the U.S. Relatively few Atlantic Brant are harvested in Canada (Figure 7.8-4), and the number taken by subsistence hunters is not presently known. It is likely that the latter harvest represents no more than a few thousand birds annually.

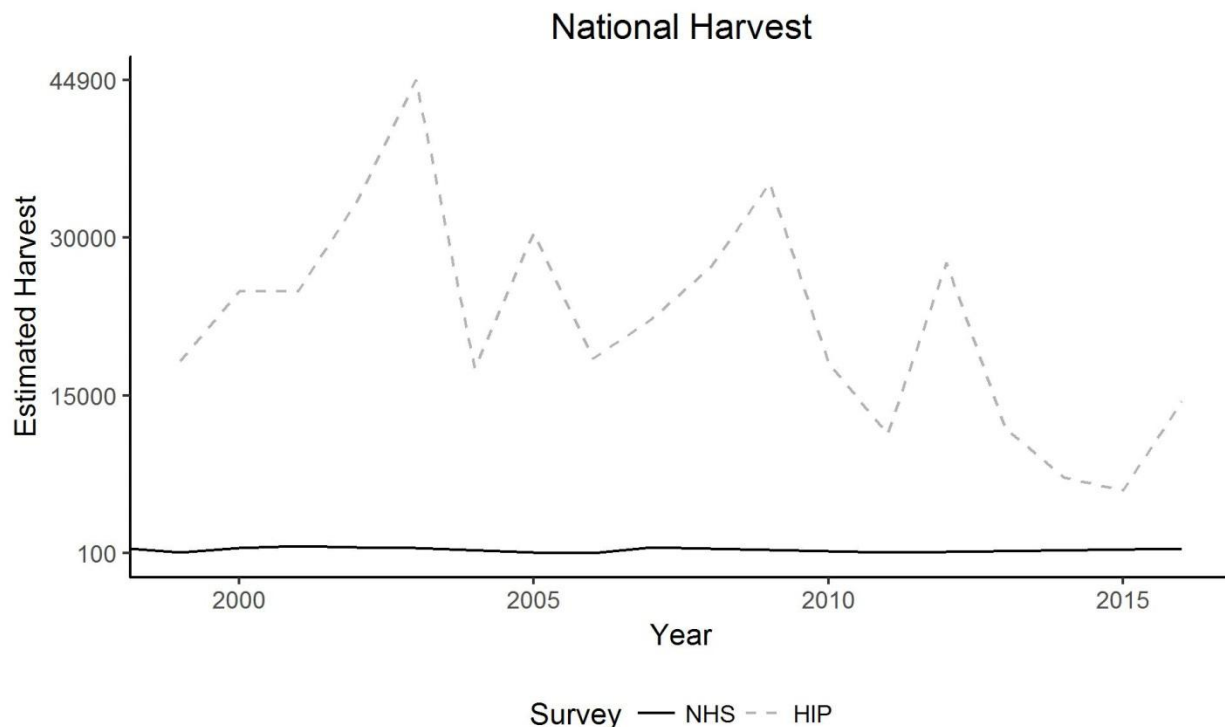


Figure 7.8-4 Estimated harvest for Atlantic Brant in U.S. and Canada between 1999 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Migratory Bird Harvest Information Program (1999-2016). U.S. data can be found at <https://flyways.us/regulations-and-harvest/harvest-trends>.

BLACK AND WESTERN HIGH ARCTIC BRANT

In British Columbia, hunting of Brant is not allowed except for a reduced and late hunting season from March 1 to 10 in the Fraser River delta. This hunt was established in 1977 to shift the harvest pressure on the much larger Pacific Flyway Population of Black Brant that winter south of British Columbia, thereby reducing harvest on the local population and helping to increase local numbers of wintering birds. Between 1990 and 2017, the local harvest has ranged from 68 to 250 birds.

EASTERN HIGH ARCTIC BRANT

For Eastern High Arctic Brant, there is a small subsistence harvest in Canada (<100 birds annually) and subsistence hunting also occurs in Greenland. No hunting of Eastern High Arctic Brant is permitted on its wintering grounds.

7.8.3 Management and Conservation Concerns

Brant are more vulnerable to sporadic heavy losses from starvation and periodic nesting failures than most other geese because of their strong dependence on specific plants for foraging and the harsh environments where some populations live. Among North America's goose species, the Brant is the only species for which no population of Brant has begun using agricultural landscapes to any great extent: for the most part, the species' is restricted to natural marine marshes. This means that the birds may not have been able to capitalize on the landscape features that are driving the exponential population growth of other species. Their comparative vulnerability requires careful regulation of hunting and monitoring of the status of populations (Reed *et al.* 1998). The protection of staging areas and wintering grounds, as

well as the limiting of disturbance and other impacts to Brant populations, are probably the most important actions that can be taken to protect Brant.

Western High Arctic Brant are of particular management concern given their relatively small number, restricted winter distribution and potentially unique subspecies status. They are also vulnerable to petroleum spills, especially given that the majority of geese overwinter in Padilla and Samish bays, adjacent to tankers and an oil refinery at Anacortes. They are also vulnerable because of starvation and periodic nesting failures, and because of their dependence on specific forage plants in harsh Arctic environments. Finally, these geese fly long distances in the spring and fall between breeding and wintering areas and are therefore subject to poor weather conditions during migration and an unknown hunting pressure at staging areas (S. Boyd, ECCC - S&T, pers. comm).

8. Population Status of Swans

8.1 Tundra Swan (*Cygnus columbianus*)

The Tundra Swan is the most abundant and widespread of the two swan species native to the continent (Figure 8.1-1). As the Tundra Swan's common name implies, the species breeds on lakes, ponds and wetlands associated primarily with coastal river deltas within tundra habitat, this throughout Arctic and Subarctic regions of Canada and Alaska (Limpert and Earnst 1994). Recent data have extended the known breeding range of this species as far north as the island of Igloolik, northwest Foxe Basin, Nunavut (Lecomte and Giroux 2015). The Tundra Swan is managed as two populations—the Eastern and Western Populations—primarily based on affiliations of the species with each of its traditional major wintering areas, which occur along the Atlantic and Pacific coasts. The Mid-Winter Waterfowl Survey is used as the primary means of tracking annual abundances and trends of each Tundra Swan population.

Birds of the Eastern Population typically breed in areas extending from the Seward Peninsula of Alaska to the northeast shore of Hudson Bay and Baffin Island. They migrate through the interior of the continent, with most birds wintering in coastal areas from Maryland to North Carolina and relatively smaller numbers within the lower Great Lakes region, including in southern Ontario (Ad Hoc Eastern Population Tundra Swan Committee 2007). Birds of the Western Population typically breed along the coastal lowlands of western Alaska and migrate through western Canada and along the Pacific Coast, with most birds wintering in California, Utah and the Pacific Northwest, including in southern British Columbia (Pacific Flyway Council 2001).

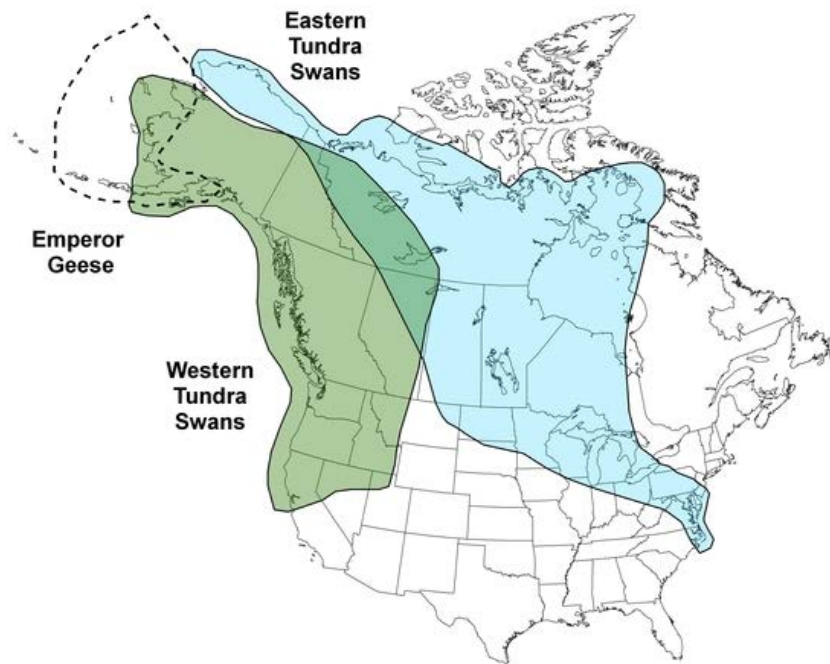


Figure 8.1-1 Geographic Range of the Eastern and Western Tundra Swan Populations (Source: USFWS 2017)

8.1.1 Abundance and Trends

EASTERN POPULATION

During the 2016 Mid-Winter Waterfowl Survey, 113 600 swans were observed in Ontario and the Atlantic and Mississippi flyway states, similar to the 2015 estimate of 117 100 swans (Dubovsky 2016). Annual counts have varied from year to year, but the population trend has been stable over the last 10 years (Figure 8.1-2). The Eastern Population is above its population objective of 80 000 birds (NAWMP 2012).

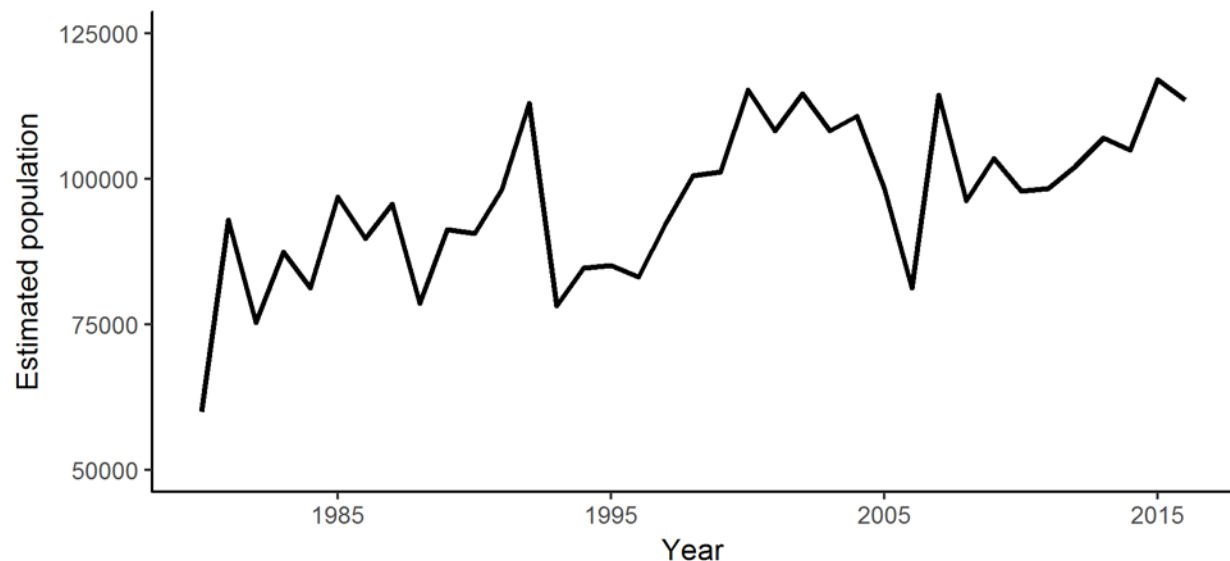


Figure 8.1-2 Number of Tundra Swans Counted during the United States' Mid-Winter Survey (In 2010 and 2011, several important wintering areas in California were not covered during the mid-winter survey; Source: Dubovsky 2016)

WESTERN POPULATION

Since the 1970s, when surveys for this species began, annual counts of the Western Population have fluctuated significantly. During the 2017 mid-winter survey, 70 800 Western Population Tundra Swans were counted on the wintering grounds (U.S. and northwest Pacific), 4% lower than the 2015 estimate of 68 200 birds. The mid-winter survey estimates suggest a stable trend since the beginning of the survey (USFWS 2017). The Western Population of the Tundra Swan is above its population objective of 60 000 birds (NAWMP 2012).

8.1.2 Harvest

The hunting of Tundra Swans is currently prohibited in Canada. However, Tundra Swans in the Eastern and Western populations have been managed by closely regulated annual harvests in the U.S. since 1983 and 1962, respectively. Hunting is currently allowed during the fall migration in some U.S. states of the Pacific and Central Flyways, as well as on wintering grounds in some U.S. states of the Atlantic Flyway.

8.1.3 Management and Conservation Concerns

Tundra Swan populations have been relatively stable in the past decade and have remained near or above their population objectives. However, management plans for both populations establish goals for collecting more information, such as improving the Mid-Winter Waterfowl Survey to obtain better counts, developing breeding ground surveys to estimate breeding populations and trends, identifying and

protecting of breeding, staging and wintering habitats, and gathering more information on the Aboriginal harvest to better estimate the total harvest.

8.2 Trumpeter Swan (*Cygnus buccinator*)

The Trumpeter Swan is largest waterfowl species found only in North America. Once a widespread and abundant species in North America—found from Alaska to California, and British Columbia to Newfoundland—increasing hunting pressure and habitat loss in the early 1900s drastically reduced the Trumpeter Swan population to only a few individuals (Mitchell and Eichholz 2010). However, through significant conservation efforts to protect nesting habitat and with reintroduction and translocation programs, Trumpeter Swan populations across North America have increased in size and continue to do so.

There are three Trumpeter Swan populations in North America: the Pacific Coast Population, the Rocky Mountain Population, and the Interior Population (Figure 8.2-1). All three populations are increasing in size (Groves 2017). The Pacific Coast Population breeds mainly in Alaska, but also in Yukon and in northwestern British Columbia. The Rocky Mountain Population breeds mainly in Alberta, western Saskatchewan, southern Yukon and the Northwest Territories. The Interior Population breeds primarily in Ontario, but small numbers have become established in eastern Saskatchewan and in adjacent Manitoba.

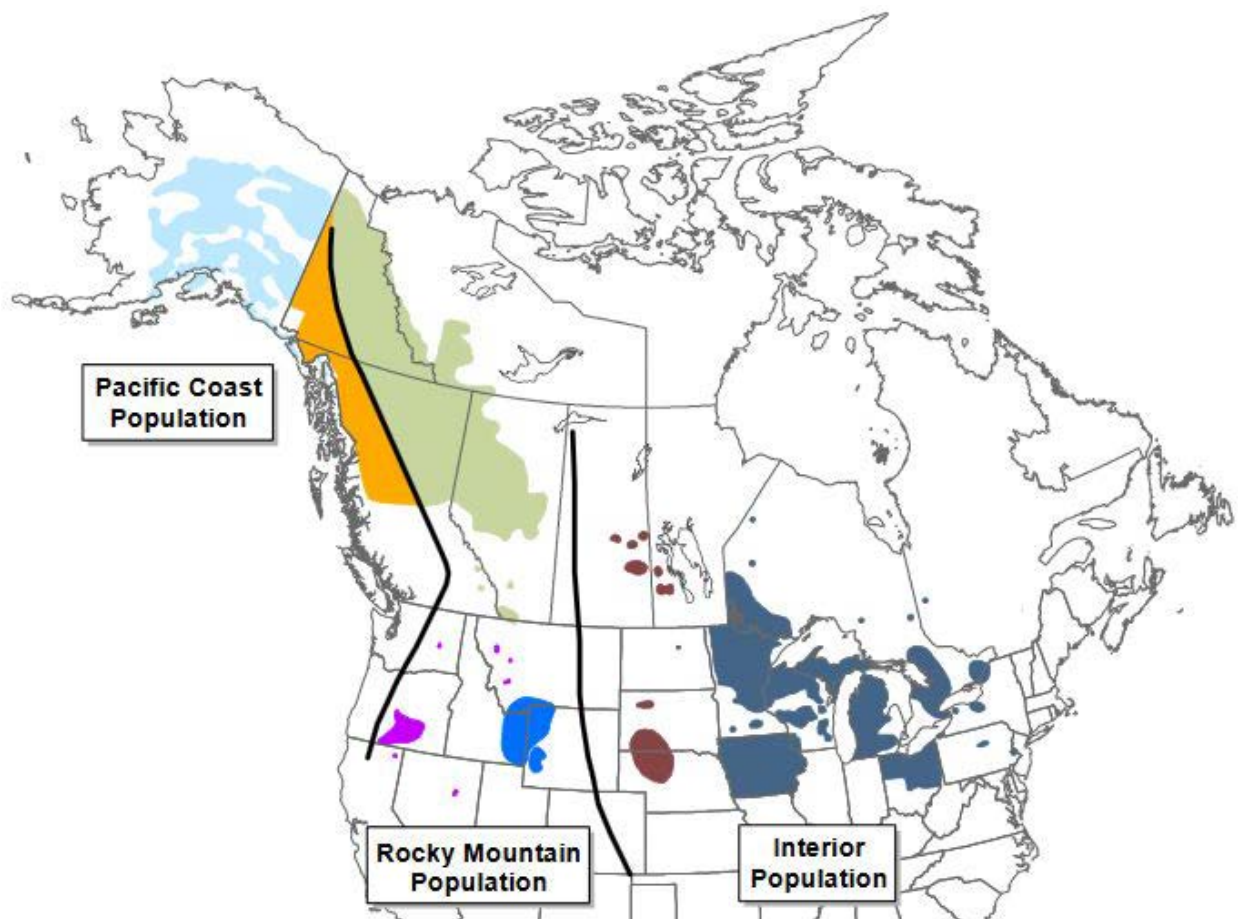


Figure 8.2-1 Breeding Distribution of Trumpeter Swan Populations in North America, Showing Individual Topographical Maps (shaded areas) Sampled in Western Canada as Part of the 2050 North American Trumpeter Swan Survey (Source: Groves 2017)

8.2.1 Abundance and Trends

The three populations have reached or exceeded their population objective (Pacific Population: 25 000 swans; Rocky Mountain Population: 5% average annual growth in numbers of wintering birds, Interior Population: 2 000 birds; NAWMP 2012). Consequently, most swan-release programs, which were aimed at restoring the species' population after it reached very low numbers in the 1930s, have now been discontinued (Groves 2017).

The abundance and distribution of Trumpeter Swan populations are assessed at five-year intervals with the North American Trumpeter Swan Survey. This survey consists of several surveys conducted simultaneously by federal, provincial and state agencies in the U.S. and Canada throughout the species' North American breeding range (Table 8.2-1). The first survey, which was conducted in 1968, estimated the continental population at 3 722 Trumpeter Swans. The most recent survey was completed in the fall of 2015. The last complete survey estimated the continental population at 63 016 birds, an increase of 36% compared to the previous survey in 2010 (Groves 2017).

Table 8.2-1. Trumpeter Swan Population Abundance Estimates and Trends in North America Based on the Five-year North American Trumpeter Swan Survey (source: Groves 2017)			
Population	2005	2010	2015
<i>Pacific Coast Population</i>			
Alaska	17 245	19 638 (923) ^a	22 015 (1 113) ^a
Yukon and North Western British Columbia	867 (41) ^a	1 141 (294) ^a	2 225 (436) ^a
Total	18 112	20 779 (969)^a	24 240 (1 195)^a
<i>Rocky Mountain Population</i>			
Canada	3 270	5 773 (295) ^a	10 957 (227) ^a
Tri-State Area	355	380	548
Other U.S. Flocks	49	163	216
Total	3 674	6 316	11 721
<i>Interior Population</i>			
High Plains	362	384	464
Mississippi and Atlantic Flyways	2 858	6 770	26 591
Total	3 220	7 154	27 055^b
North American Total	25 006	34 249	63 016^b

^a Population estimate was obtained from a statistical sample. Standard error of the estimate is in parentheses

^b Several cooperators in the Mississippi Flyway used different survey methods in 2015 than in previous years

PACIFIC COAST AND ROCKY MOUNTAIN POPULATIONS

During early surveys, the range of the Pacific Coast Population in Canada and part of the Rocky Mountain Population range in Canada (Yukon, north-central/northwestern British Columbia) were

surveyed using a statistical sampling procedure, and a total count was attempted in the remainder of the range. Because of the increasing abundance and expanding breeding range of this population, in 2010, for the first time, the entire Canadian breeding range of the Pacific Coast Population and Rocky Mountain Population (Yukon, British Columbia, Alberta and the Northwest Territories; excluding some very sparsely occupied regions of northern Yukon and north-central British Columbia) was surveyed using a sampling procedure (Figure 8.2-1).

The 2015 estimate for the Canadian portion of the Rocky Mountain Population was 16 143, an 80% increase compared to the 8 950 estimate for 2010 (Table 8.2-1). The 2015 estimate for the Canadian portion of the Pacific Coast Population was 2 979, a 106% increase compared to the 1 443 estimate for 2010. All Canadian areas of the Rocky Mountain Population exhibited growth since the 2010 survey.

Changes to the survey methodology in 2010, range extension and the random selection of areas that were not covered by the 2010 survey, are thought to explain part of the increase in the size of both the Rocky Mountain and Pacific Coast populations of Trumpeter Swans in Canada. Previous surveys in these areas likely underestimated their true abundance.

During the winter period, more than 40% of the Pacific Coast Trumpeter Swan Population is present on the coastline, and in wetlands and agricultural fields of Vancouver Island and the Fraser River Valley in British Columbia. This used to be the largest wintering Trumpeter Swan concentration in North America, but the centre of abundance has since moved to the northern portion of Puget Sound in Washington State. Aerial surveys were conducted every three years in southwestern B.C. between 1970 and 2006, but they have since been discontinued. During the most recent survey, which was conducted in January and February of 2006, 7 570 swans were counted, which represented an 11.7% increase from the 6 775 swans observed in 2000–2001.

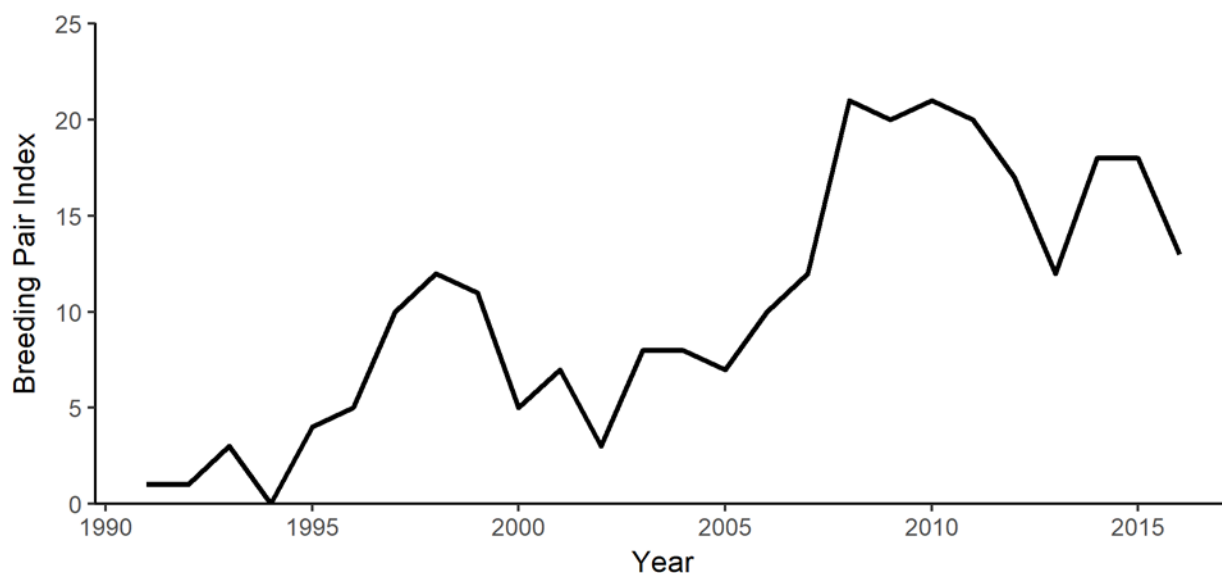


Figure 8.2-2 Breeding Pair Index for the Trumpeter Swan in Southern Yukon, 1991–2016

INTERIOR POPULATION

The only formal survey conducted in Canada of the Interior Population of Trumpeter Swans was in 2015, in Riding Mountain National Park, Manitoba, where 97 swans were recorded, a dramatic increase from the 49 counted in 2010 (Groves 2017).

8.2.2 Harvest

In the past, hunting has led to declines and local extirpations in Trumpeter Swan populations. Hunting is has been prohibited in both Canada and the U.S since 1918.

8.2.3 Management and Conservation Concerns

The main management concerns for the Pacific Population of Trumpeter Swans are lead poisoning, habitat alteration and crop depredation (Pacific Flyway Council 2006). Swan populations in northwest Washington State and on the Sumas Prairie, British Columbia, have lost approximately 2 500 individuals to lead poisoning and power line strikes since 1999 (L.K. Wilson, CWS–Pacific Region, pers. comm.). International efforts were initiated in 2001 to locate the sources of lead. Telemetry studies identified Judson Lake, on the Canada–U.S. border, as a key site responsible for the lead shot poisoning. Swans were deterred from using Judson Lake through hazing activities (2006–2009): an exclusion zone covering about half the lake was set up to prevent swans from accessing the section of the lake with the highest lead shot density (2009–present). Compared to the 5-year average prior to experimental management, lead-related swan mortalities have been reduced by 64% in the greater study area (Whatcom, Skagit and Snohomish counties of Washington State and the Sumas Prairie of British Columbia) and 72% in the primary study area (Whatcom County and the Sumas Prairie) [L.K. Wilson, CWS–Pacific Region, pers. comm. 2014]. Yellow (*Nuphar polysepala*) and fragrant pond lily (*Nymphaea odorata*) are the predominant floating plants on Judson Lake. Their extensive woody root systems may be preventing lead pellets from sinking deeper in the sediment, making the pellets accessible to swans. The temporary removal of pond lilies from a portion of the lake is anticipated to reduce the amount of lead pellets available to swans by allowing them to sink deeper into the sediment. From November 2014 to March 2015, 201 swan mortalities were documented in the study area, but the winter population continued to grow at an estimated rate of 5% (S. Boyd, ECCC - S&T, pers. comm.).

In Ontario, a swan re-introduction program, initiated in 1982, had achieved its goal of at least 500 free-living swans by 2005 (H. Lumsden, Ontario Ministry of Natural Resources, unpubl. data). The captive-breeding and release program ended in 2006. Surveys conducted in 2015 as part of the continental five-year survey showed a total minimum population of 2 000 swans in Ontario (S. Badzinski, unpubl. data). The southern and eastern Ontario flocks have continued to grow, and in 2015, 924 swans were counted during winter aerial and ground-based surveys. Breeding Trumpeter Swans also occur in northwestern Ontario, where in late summer of 2015, data from aerial surveys, combined with anecdotal observations, yielded a total count of 1 076 birds in the areas west and north of Thunder Bay, an increase compared to the 274 birds counted in 2010.

9. Population Status of other Hunted Species

9.1 Murres

There are only two species of Murres, the Common Murre (*Uria aalge*) and the Thick-billed Murre (*Uria lomvia*), and both are found in North America. These seabirds occur in the colder waters of the North Pacific and North Atlantic oceans and adjacent parts of the Arctic Ocean. They often breed in dense colonies on coastal cliffs and islands, where they build their nest directly on cliff ledges. Common Murres breed primarily in Boreal and Low Arctic waters, whereas most Thick-billed Murres breed farther north in Low and High Arctic waters. Both species move south in the winter to stay free of frozen waters.

The Common Murre breeding range in Canada is mostly limited to the Gulf of St. Lawrence, Quebec, and along the east coast of Newfoundland and south coast of Labrador (almost 90% of Common Murres breed in Newfoundland). Small numbers nest on islands off the coast of Nova Scotia and in the Bay of Fundy. They also breed on islands off the coast of British Columbia.

Some Thick-billed Murres breed in small numbers among Common Murres on the Pacific and Atlantic coasts, but most Murres harvested in Canada breed in the Arctic regions of Canada, and Greenland north of the 60th parallel. They concentrate in a few very large colonies (i.e., more than 0.5 million breeding individuals) such as the colony on Digges Island, in northern Hudson Bay. The breeding distributions of the two species overlap extensively in the Pacific region, but less so in the Atlantic (Ainley *et al.* 2002).

9.1.1 Abundance and Trends

In Canada, both species are more abundant on the Atlantic Coast than the Pacific Coast. Small numbers of Common Murres breed in B.C., and a small number of Thick-billed Murres breed in the western Arctic. With the exception of a few colonies of Common Murres, long-term monitoring programs indicate that the population numbers for Murres breeding at colonies in the Northwest Atlantic and the eastern Arctic are stable or increasing (Chardine *et al.* 2003; Robertson, Wilhelm and Taylor 2004; Regular *et al.* 2010). Colony size estimates using new methodologies (i.e., digital photography and geographic information systems) show that the size of some large colonies was previously underestimated (A. Gaston, unpubl. data; S. Wilhelm, unpubl. data).

9.1.2 Harvest

Thick-billed Murres, as well as a very small number of Common Murres, are hunted as they migrate, and Aboriginal peoples in Canada also harvest an estimated few thousand birds near the breeding colonies each year.

Thick-billed Murres have traditionally been hunted in the winter in coastal areas of Newfoundland and Labrador. Murres are not considered migratory game birds, but when the province joined Canada in 1949, the importance of Murre hunting to residents of Newfoundland and Labrador was recognized, and a variety of legislative and regulatory amendments have since been made to allow for the legal harvest of both species in Newfoundland and Labrador (Chardine *et al.* 2008).

Throughout the 1970s to the mid-1990s, the outcomes of large unregulated harvests warranted improved hunter education, regulatory changes, as well as increased enforcement (Elliot 1991). These efforts, along with harvest restrictions implemented in the mid-1990s, appear to have been successful in reducing the annual harvest from approximately 750 000 birds to approximately 250 000 birds by the early 2000s (Chardine *et al.* 1999). Reduced winter sea ice cover appears to have led to the redistribution of Murres wintering off eastern Newfoundland, resulting in a reduction of the harvest pressure (Gaston 2002; Gaston and Robertson 2010). Reductions in winter ice cover associated with climate change may change

the susceptibility of birds to hunting. The estimated number of Murres harvested in Newfoundland and Labrador in 2016 was approximately 123 000 birds (Figure 9.1-1). This is the highest the harvest has been since data was collected annually starting in 2010. However, concerns have been expressed regarding the accuracy of the existing harvest estimates. Work is being conducted to refine these estimates and to improve the assessment of harvest levels.

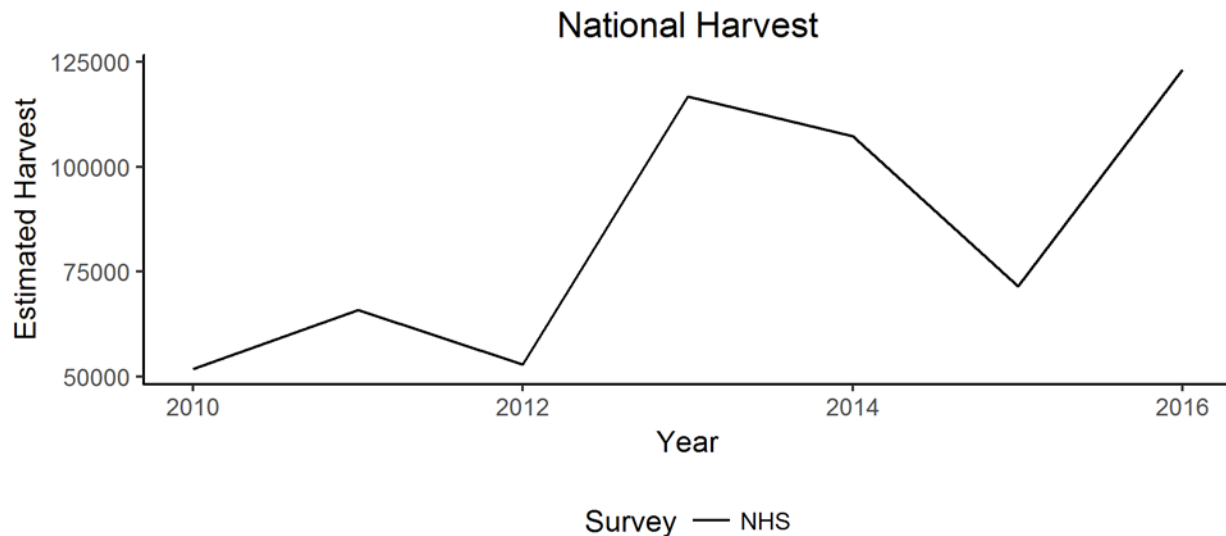


Figure 9.1-1 Estimated harvest for the Murre in Canada between 2010 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>) [No data available for earlier years; harvest of Murres takes place only in Newfoundland and Labrador.]

9.1.3 Management and Conservation Concerns

Population numbers of both species were significantly reduced over the last century because of human disturbance, hunting, oil pollution and commercial fisheries. In recent years, Murre populations have increased due in part to reductions in chronic oil pollution, gill net fisheries and harvest. Murres have been hunted by residents of Newfoundland and Labrador and by Aboriginal peoples for generations. Newfoundland residents were granted hunting rights soon after they entered Confederation in 1949 and the hunt by residents of Newfoundland and Labrador is managed through the *Migratory Birds Regulations*. However, until 1994, there was no limit to the number of Murres that could be legally killed, and daily takes could exceed 500 birds per hunting crew (2 to 3 hunters). Between 600 000 and 900 000 birds were shot annually during the 1970s and 1980s. Harvests levels have been well below the allowable take since the introduction of bag and possession limits, and reductions in season length in 1994.

9.2 American Woodcock (*Scolopax minor*)

The American Woodcock (hereafter “Woodcock”) is a popular migratory game bird in Canada, and much more so in the U.S. The species has experienced a long-term decline at least since the mid-20th century, with the main cause of this decline likely the loss of early successional forested habitat. Results from the Singing-ground Survey suggest a moderate decrease in population size relative to the early 1970s (Seamans and Rau 2016).

In Canada, the Woodcock breeds from southeastern Manitoba across south and south-central Ontario, southern Quebec, the Maritimes and southern Newfoundland. The species also breeds throughout the eastern U.S. Woodcock winter in southern parts of the breeding range in the southeastern U.S.

9.2.1 Abundance and Trends

Reliable annual population estimates and harvest estimates are essential for comprehensive Woodcock management. However, such information is difficult to obtain. Woodcock are difficult to find and count because of their cryptic colouration, small size and preference for areas that are densely vegetated (Seamans and Rau 2016). Thus, the status of Woodcock in North America is monitored through the Singing-ground Survey, which consists of a spring count of male courtship displays at dusk. Counts of singing males provide indices of Woodcock populations and can be used to monitor annual population changes (Seamans and Rau 2016). The survey covers the central and northern portions of the Woodcock breeding range and includes areas mostly in the eastern U.S., but areas in Canada north of the Great Lakes and the St. Lawrence valley are included in the survey as well (Seamans and Rau 2016). Previous analyses of band recoveries indicated that there were two relatively discrete populations (Krohn, Martin and Burnham 1974) which conforms to the boundary between the Atlantic and Mississippi Flyways. New research, however, suggests that mixing may be occurring on the wintering grounds especially with eastern North American woodcock (Moore and Krementz 2017). Currently, however, Woodcock are managed based on two regions: the Eastern Region and the Central Region, as recommended by Owen et al. (1977). In Canada, Woodcock breeding in Manitoba and Ontario belong to the Central Population, while those breeding in Quebec and the Maritimes are part of the Eastern Population.

The Singing-ground Survey data for 2017 did not indicate a significant declining 10-year trend (2008–2017) for Woodcock in the Eastern Management Region after showing a decline for the previous year. The trend for the Central Management Region was not significant (Seamans and Rau 2017). Both management regions continue to show a significant, long-term (1968–2017) declining trend; 1% per year for the Eastern Management Region and 0.6% per year for the Central Management Region (Figure 9.2-1; Seamans and Rau 2016). In Canada, the number of Woodcock estimated from the surveys over the long-term period (1968–2017) showed significant declines for Ontario and the Maritime provinces (Table 9.2-1).

Table 9.2-1. Trends in the number of American woodcock heard during the Singing-ground Survey in Canadian provinces (Trends are expressed as an annual percentage change. * indicate trend significant at the 95% level)

Province	Population index (singing male per route)		Trends in population	
	2016	2017	1968-2017	2007-2017
Manitoba	5.15	6.38	0.48	2.56
Ontario	5.13	5.21	-0.85*	-2.12
Québec	4.61	4.57	-0.59	-0.48
New Brunswick	6.00	4.67	-1.35*	-2.83*
Prince Edward Island	2.71	3.13	-1.08	-1.05
Nova Scotia	2.88	2.73	-0.90	-0.39

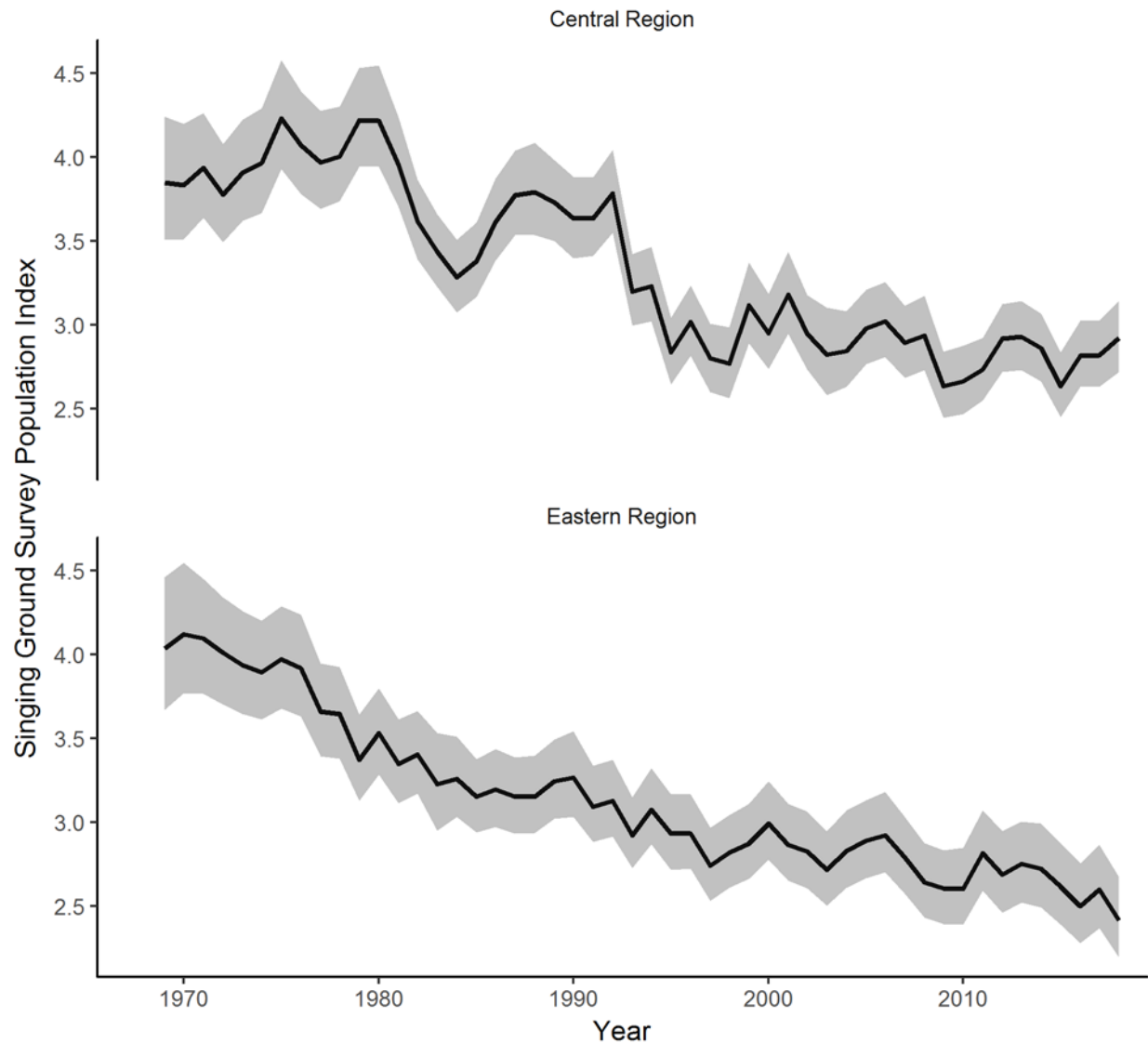


Figure 9.2-1 American Woodcock Breeding Population Indices, black line represents the population estimate and grey shaded areas represents the 95% Confidence Interval (Source: Seamans and Rau 2017)

An indirect measurement of recruitment or annual productivity of Woodcock is derived from age ratios (number of immature birds per adult female) of wings collected from the U.S. national harvest (Wing-collection Survey). Data for 2016 indicate an index in the Eastern Management Region (U.S. portion of survey only) of 1.42, which represents a 2.9%/year decrease from 2015 and a 12.3%/year decrease from the long-term (1963–2016) regional index. In the Central Management Region (U.S. only), the recruitment index was 1.32, representing a 10.9%/year increase from 2015 and a 14.3%/year decrease from the long-term regional index of 1.54. The 2014 recruitment index in Canada (i.e., Ontario, Quebec, Nova Scotia and New Brunswick) was 2.02, which has slightly increased compared to the 5-year average (2010–2014) of 1.72 (Gendron and Smith 2017).

9.2.2 Harvest

The harvest of American Woodcock in Canada and the U.S. had been declining over the past decades, but has recently stabilized. The decline, however, has been much more pronounced in the U.S. (Figure 9.2-2). In 2016, there were 25 175 Woodcock harvested in Canada, which is approximately 7.4% above the 10-year (2006–2016) average of 23 525 birds per year. Nevertheless, the number of Woodcock hunters in Canada has been undergoing a long-term decline, from about 20 000 hunters in the late 1970s to about 2 000–4 000 annually in the past ten years. In the U.S., the 2016-17 harvest was estimated at 202 400 Woodcock, which is consistent with the harvest in the previous year, and 27% below the 10-year average of approximately 278 000 Woodcock (Seamans and Rau 2016).

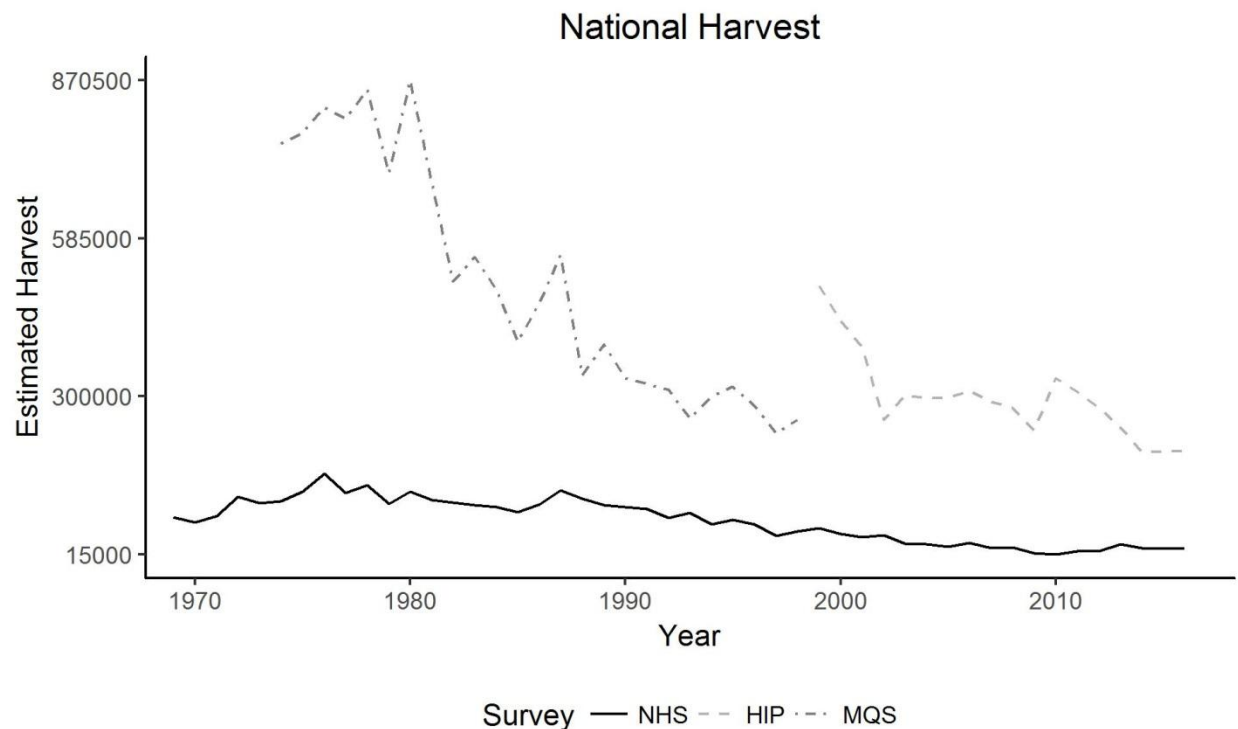


Figure 9.2-2 Estimated harvest for the American Woodcock in U.S. and Canada between 1968 and 2016. Harvest data was obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>). For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

9.2.3 Management and Conservation Concerns

Woodcock populations have been experiencing a long-term decline since the 1960s. Causes of this decline are thought to result in large part from the degradation and loss of early successional habitat on both breeding and wintering grounds (Kelley *et al.* 2008), through fire suppression, urban development, and increased forest succession following land abandonment. Woodcock prefer young or recently disturbed forest; abandoned farmland mixed with forest is ideal. The species also makes use of open habitat types (e.g., fields, pasture, regenerating clear-cuts) during its life cycle, especially at night. The maturation of forests, the suppression of fire, agricultural intensification, and urbanization may all have contributed to the decreases observed in American Woodcock populations.

9.3 American Coot (*Fulica americana*)

The American Coot is a common bird of North America, and in Canada it breeds from British Columbia to Ontario, with the highest densities found in the Prairie provinces. The species is often mistaken for a duck and is often found in rafts of mixed waterfowl, but it belongs to a distinct order (Gruiformes). The species winters in the southeastern U.S., Mexico and Central America, as far south as Panama. American Coots were more abundant in Canada prior to a population decline in the early 20th century, which is thought to have been linked to wetland loss and overhunting (Brisbin and Mowbray 2002). The population is now increasing or has stabilized.

9.3.1 Abundance and Trends

Information on the population status of the American Coot at a continental level comes from the BBS. In Canada, the species' abundance is showing a large increase, but the BBS is poorly designed for monitoring population trends of marsh birds (Environment Canada 2014). American Coots are also surveyed during the Waterfowl Breeding Population and Habitat Survey (WBPHS). Results of this survey show that population estimates have fluctuated greatly since the 1970s (Figure 9.3-1), with a tendency towards a long term increasing trend. In the Canadian Prairies, the 2017 estimate (2.1 million birds) was 24% above the 10-year average of 1.7 million birds. Although the WBPHS covers the core of the American Coot breeding range, many individuals breed outside of the area covered by this survey (Case and Sanders 2010).

Table 9.3-1. American Coot Breeding Population with 95% Confidence Intervals (CI) and Trend Estimates Based on the Waterfowl Breeding Population and Habitat Survey (WBPHS) in Western Canada and the Northwestern United States (Trends are expressed as an annual percentage change. Significant trends are indicated with a star [*])

WBPHS— Western Canada and Northwestern U.S.	Breeding Population Estimates (in Thousands, [Upper CI, Lower CI])		Trends in Numbers of Breeding Birds		
	2016	2017	1961– 2017	2008– 2017	2013– 2017
Traditional Survey Area	2819 (2175 - 3463)	2145 (1722 - 2567)	2.47*	-2.4	-6.25
Canadian Prairies	2064 (1478 - 2651)	1640 (1263 - 2016)	3.62*	-1.3	-3.11
U.S. Prairies (North Central)	606 (355 - 858)	463 (273 - 653)	2.87*	-3.91	-16.34*

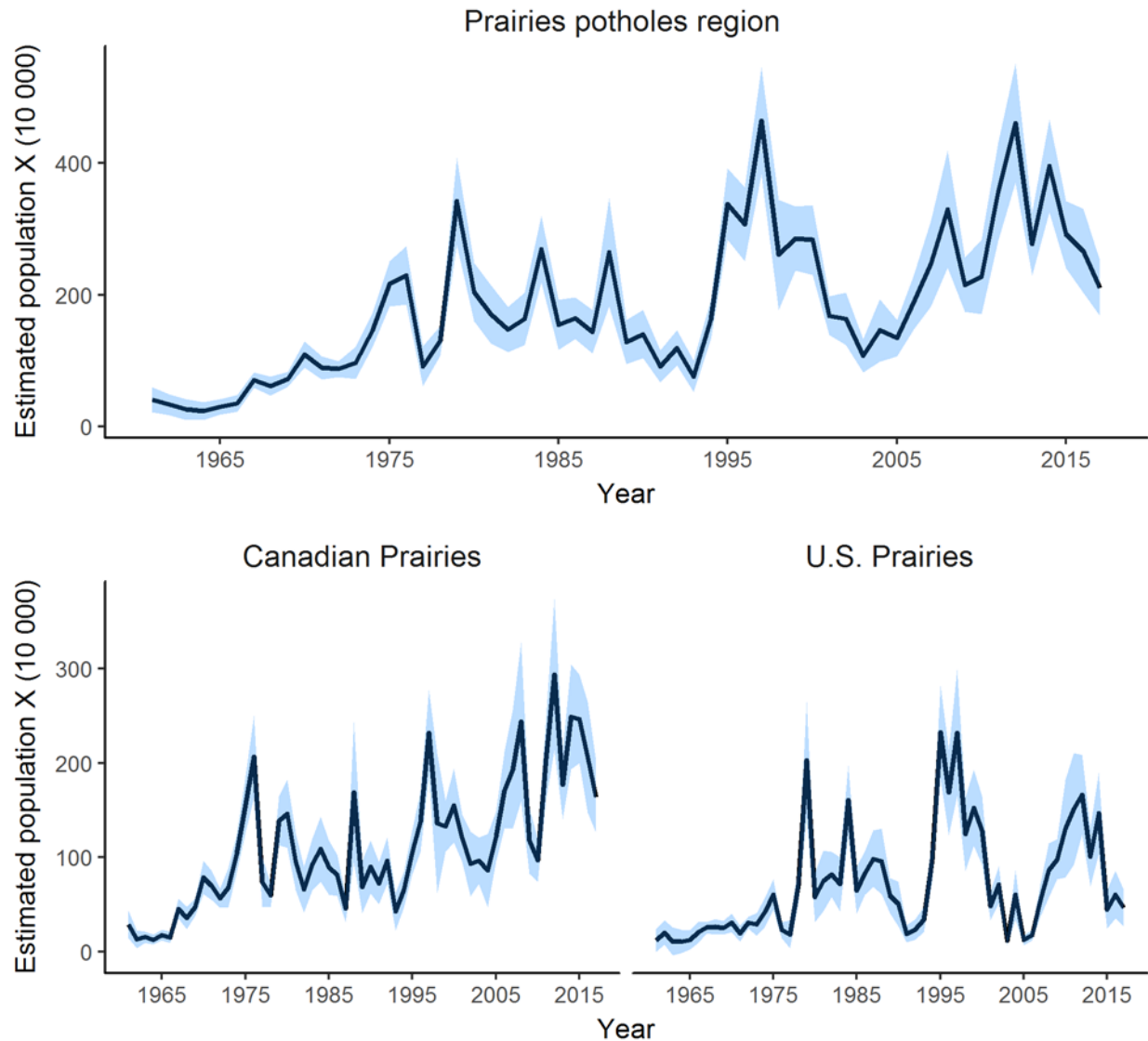


Figure 9.3-1 American Coot Breeding Population Estimates Based on the Waterfowl Breeding Population Habitat Survey (WBPHS) in the Canadian and U.S. Prairies, black line represents the population estimate and the shaded area represents the 95% Confidence Interval.

9.3.2 Harvest

The harvest of American Coots in Canada has fallen considerably over time, from an average of 40 000 birds per year in the mid-1970s to fewer than 3 000 birds per year for the 5-year period between 2012 and 2016 (Figure 9.3-2). In the U.S., harvest has varied considerably through the years, with an average of approximately 290 000 birds taken annually in the last decade.

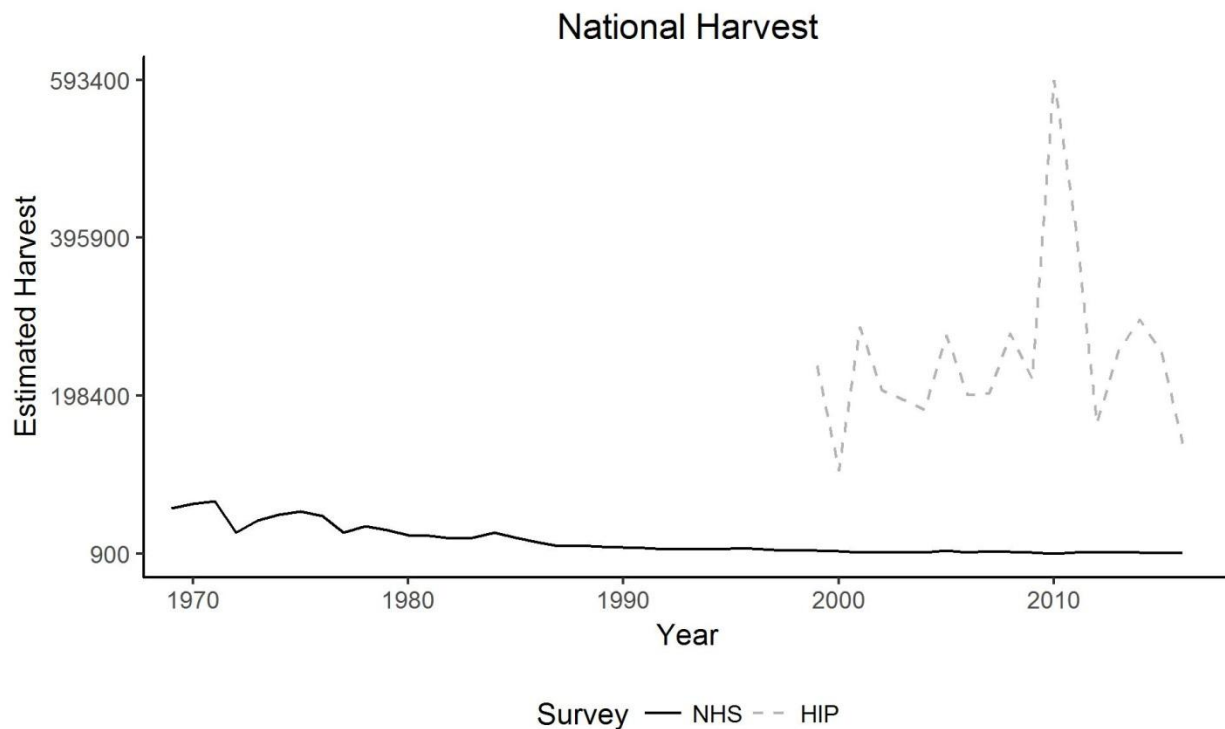


Figure 9.3-2 Estimated harvest for the American Coot in U.S. and Canada between 1968 and 2016. Harvest data was obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>), while the U.S. data were obtained from the Migratory Bird Harvest Information Program (1999-2016).

9.3.3 Management and Conservation Concerns

While the loss of wetland habitat has contributed to the historical decline of the American Coot population, this species has likely been less affected by habitat change than other marsh birds (Brisbin and Mowbray 2002). The preference of the American Coot for seasonal or temporary wetlands, along with its ability to successfully colonize new sites when water levels change, has minimized the impacts of habitat alteration, although drought conditions have been known to contribute to sudden temporary declines (Brisbin and Mowbray 2002).

9.4 Common Gallinule (*Gallinula galeata*)

The Common Gallinule is a secretive marsh bird that is found primarily in southern Ontario and southwestern Quebec. In Canada, the species breeds primarily in well interspersed freshwater marshes, but also uses human-made impoundments and sewage lagoons.

9.4.1 Abundance and Trends

No population estimate for the Common Gallinule is currently available for Canada. Data from the Ontario Breeding Bird Atlas and the Great Lakes Marsh Monitoring Program show a significantly declining population trend over the past two decades (1995–2016). Longer term data are not available (Figure 9.4-1). For more information on the Great Lakes Marsh Monitoring Program, see: www.bsc-eoc.org/volunteer/glmp/

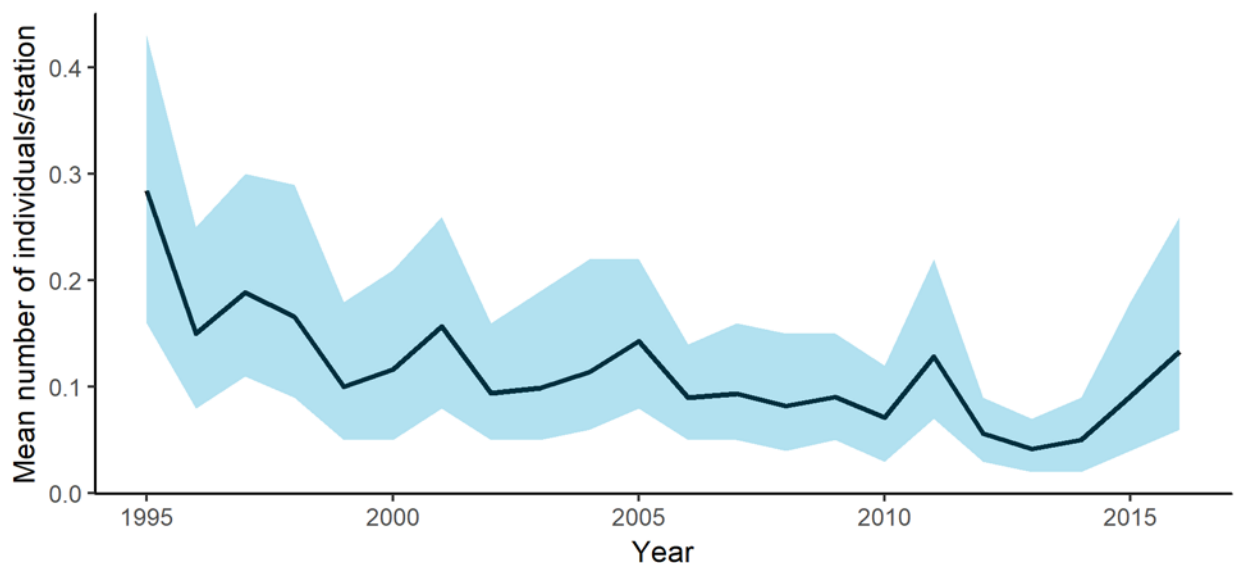


Figure 9.4-1 Population Numbers for Common Gallinule in Ontario, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals (Source: Great Lakes Marsh Monitoring Program, 1995–2016)

9.4.2 Harvest

The estimated gallinule harvest in the U.S. averaged 17 960 birds per year from 2005 to 2014. In 2016, the total estimated harvest of Common Gallinule and Purple Gallinule (*Porphyrio martinicus*) combined, was 10 000 birds, a notable decrease from the 21 300 birds harvested in 2013 but an increase from the 8 900 birds harvested in 2015 (Raftovich *et al.* 2017). The harvest of Common Gallinules in Canada is very small. Too few birds are reported as part of the National Harvest Survey to generate reliable harvest estimates.

9.4.3 Management and Conservation Concerns

In recent years, efforts have been made to improve the collection of harvest information and the monitoring of secretive marsh bird populations across North America, especially in Canada, where no data are available (Case and Sanders 2010; Seamans *et al.* 2013). Given the significant population decline of the Common Gallinule in Ontario over the last 20 years, the species is listed as a priority species in Ontario with the associated objective of reversing its decline (Zeran *et al.* 2009). Consequently,

in 2012, CWS, Ontario Region, in partnership with the Ontario Ministry of Natural Resources and Forestry, initiated a pilot banding project of gallinules in Ontario. Since then, over 346 Common Gallinules have been banded in Ontario during pre-hunting season duck banding activities. To date, four gallinules have been recaptured during banding operations, one has been reported by a hunter in Ontario and one was found dead in Texas. In 2014, feathers were collected to examine the use of stable isotopes or elemental concentrations to link up harvest (through hunter-returned wings) to natal origin: investigations are ongoing.

9.5 Mourning Dove (*Zenaida macroura*)

The Mourning Dove is one of the most familiar and heavily harvested migratory game birds (primarily in the U.S.), as well as one of the most abundant and widespread avian species in North America. The species commonly breeds in urban and rural areas across southern Canada, but the greatest breeding densities are found around the Lower Great Lakes and in the St. Lawrence Plain Region of Ontario and Quebec in the east, and in the Prairie Pothole Region of Manitoba, Saskatchewan and Alberta in the west (Otis *et al.* 2008).

9.5.1 Abundance and Trends

The Mourning Dove is monitored in Canada through the Breeding Bird Survey (BBS). Results from the survey indicate that the population has increased markedly since 1970, but has levelled off during the most recent decade (Environment Canada 2014). The estimated population in Canada is 500 000 to 5 million adults. The long-term trend (1970–2014) for the Canadian portion of this species' population is indicative of an increase in population since the 1970s, but the 10-year trend indicate that the population is stable (Environment Canada 2014). In Southern Ontario and Southern Quebec, where the species is hunted, the Mourning Dove is showing a long term population increase (Figure 9.5-1). This increase has stabilized over the last 10 years however and the population seems to be stable, except in BCR12 in Ontario where the population has tended to decreased over the last 5 years.

In the U.S., Mourning Dove populations were in the past monitored through the Mourning Dove Call-count Survey (CCS). The CCS was conducted from 1966 to 2013 but subsequently discontinued. Since 2014, Mourning Doves are monitored only through the BBS (Seamans 2017b). The species is managed based on three regions, as the breeding, migratory and wintering distribution of dove populations are largely independent (Seamans 2017b). These areas are referred to as the Eastern, Central and Western Management Units. In 2016, the population size of Mourning Doves in the U.S. was estimated at approximately 279 million birds (Seamans 2017). Results from the BBS indicate that the abundance of doves increased in the Eastern Management Units during the long term (1966–2016) and remained unchanged over the 10-year term (Seamans 2017b). There was evidence of a decline in the Central and Western Management Units over the long term but not during the most recent 10-year term periods. The 2017 BBS data were not available at the time this report was produced.

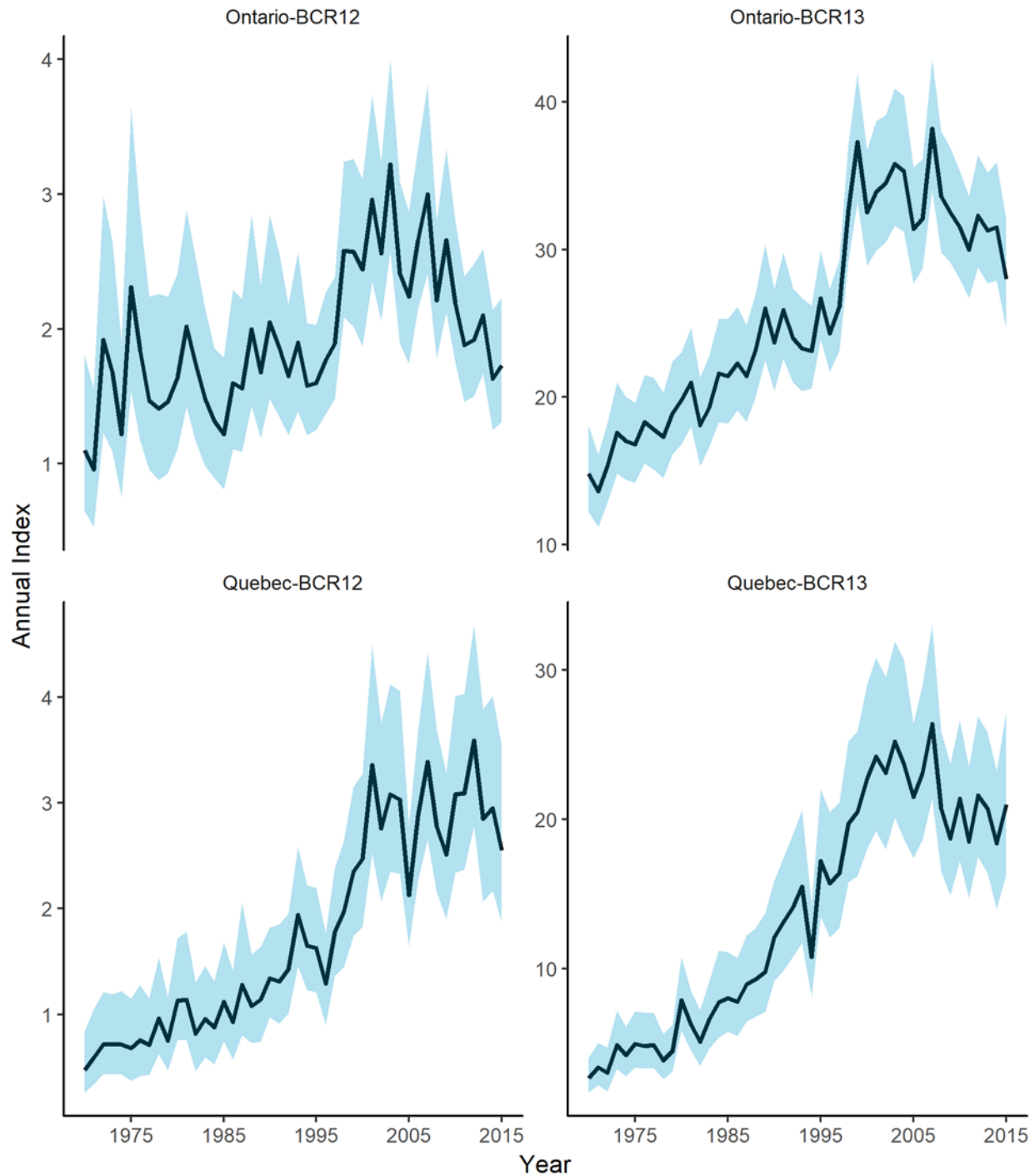


Figure 9.5-1 Annual Indices of Abundance from the Breeding Bird Survey for Mourning Dove in Bird Conservation Region 12 and Bird Conservation Region 13 in Quebec and Ontario. Black line represents the population estimate and shaded areas represent the 95% Credible Intervals (Source: A. Smith, CWS - National Capital Region, unpubl. data).

9.5.2 Harvest

Dove hunting is permitted in 40 of the 50 states, where 15–20 million birds are harvested annually (representing 5–10% of the continental dove population, Otis *et al.* 2008). In 2016, approximately 13.5 million birds were harvested in the U.S. by approximately 837 800 hunters, an estimate similar to that for the 2015 hunting season (Seamans 2017).

In Canada, there has been an annual hunting season for the hunting season since 1960 in British Columbia: in 2013 a dove hunting season was introduced in Ontario, as well as in Quebec in 2016. The harvest in British Columbia has declined considerably over the years, ranging from 5 391 doves killed in 1977 to 17 birds during the 2016 season. During the 2016 hunting season in Ontario, 13 508 birds were harvested, the smallest harvest since dove hunting season was introduced to the province (Gendron and Smith 2017). In Quebec, 952 doves were harvested during 2016, the first year that a hunting season was in place.

9.5.3 Management and Conservation Concerns

As a habitat generalist, the Mourning Dove has well adapted to the presence of humans and to human-induced changes in both urban and rural landscapes. Currently, there are no major threats to the species (Otis *et al.* 2008).

9.6 Wilson's snipe (*Gallinago delicata*)

Wilson's snipe is one of the most abundant and widespread shorebird species in North America (Mueller 1999). Its numbers have been relatively stable in Canada since the late 1960s or 1970s. The species is hunted in both Canada and the U.S.

9.6.1 Abundance and Trends

The Wilson's snipe is difficult to monitor because of its inconspicuous nature. It is monitored in Canada through the Breeding Bird Survey (BBS), but this survey was not designed to monitor population trends for this species and it covers only a portion of its large range. As a result, population trends based on data from this survey should be interpreted with caution.

Long-term trend data from the BBS suggest that snipe numbers have been increasing since the 1970s. Increasing trends have also been observed in Manitoba and British Columbia, but population numbers appear to be declining in New Brunswick, the Northwest Territories, Nova Scotia and Prince Edward Island in this same period (Smith A.C. et al. unpublished). The Canadian population—birds breeding and migrating—is estimated at 1 million individuals (Environment Canada 2014).

9.6.2 Harvest

The species is hunted by a relatively small number of hunters compared to other species of waterfowl, and these hunters harvest a relatively small number of birds (Case and McCool 2009). The harvest of Wilson's snipe has declined in Canada and the U.S. since the 1970s, but it appears to have stabilized at a low level over the past few decades (Figure 9.6-1).

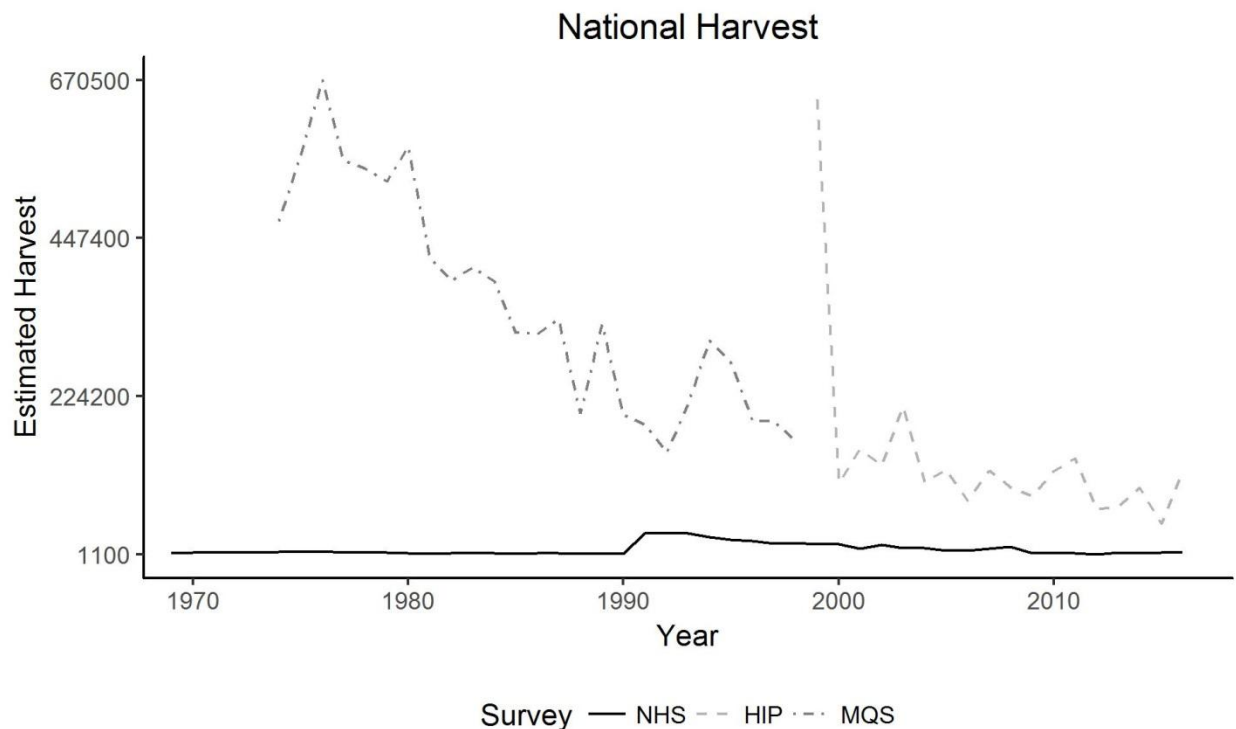


Figure 9.6-1 Estimated harvest for the Wilson's snipe in U.S. and Canada between 1968 and 2016. Harvest data was obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>). For the U.S. data, results prior to 1999 are not directly comparable to those after 1999.

9.6.3 Management and Conservation Concerns

Given that the Wilson's snipe depends on wetlands throughout its life cycle, the draining and conversion of wetlands is detrimental to this species. Other threats include collisions with communication towers, buildings and cars (Mueller 1999).

An assessment was conducted in 2009 to identify priority information needs for rails and snipes (Case and McCool 2009). One of the resulting recommendations was to undertake national monitoring programs aiming at identifying populations' sizes and trends in abundance, and evaluate the potential importance of habitats and harvest levels at the range-wide scale, including in Canada, the U.S. and Mexico (Case and McCool 2009). In Canada and the U.S., the Great Lakes Marsh Monitoring Program implements these recommendations by monitoring the population numbers and habitat of rail and snipe species, including the Wilson's snipe (Tozer 2013).

9.7 Sandhill Crane (*Grus canadensis*)

Three Sandhill Crane populations breed in Canada, namely the Central Valley Population, the Mid-continent Population and the Eastern Population. The Central Valley Population breeds mainly in California, but its range extends to the lower Fraser Valley and northern Vancouver Island in British Columbia. The Mid-continent Population, the larger populations, breeds across Canada from eastern British Columbia to western Ontario, south from the Prairies and north to Yukon and the Northwest Territories. The population is stable and above its population objective. The Eastern Population of Sandhill Crane breeds in eastern Ontario, around the Great Lakes up to James Bay, and from western to central Quebec. This population shows a long-term increasing trend of 4.4% annually and is above its management population objective of a 3-year fall average of 30 000 cranes (Dubovsky 2017).

9.7.1 Abundance and Trends

MID-CONTINENT POPULATION

The Mid-continent Population is the largest of all North American crane populations and consists of a mixture of various subspecies of the Sandhill Crane: approximately two-thirds Lesser Cranes (*Grus canadensis canadensis*), one-fourth Canadian Sandhill Cranes (*G. c. rowani*) and the remainder, Greater Sandhill Cranes (*G. c. tabida*). Sandhill Cranes of this population breed from southern Ontario northwestward through the Arctic and Alaska and into eastern Siberia. Individuals of this population winter in western Oklahoma, New Mexico, southeastern Arizona, Texas and Mexico.

The Mid-continent Population of Sandhill Cranes is monitored through a spring aerial transect survey in its key staging areas in Nebraska, U.S., as more than 90% of the Mid-continent Population is found in that area at the time of the annual survey (Dubovsky 2017). Population indices corrected for visibility bias have been available since 1982. The Sandhill Crane population has been relatively stable since the early 1980s, but the trend has been increasing slightly over the past few years. The photo corrected population index in the spring of 2017 was 596 416 birds (Dubovsky 2017; Figure 9.7-1). The photo-corrected three-year average for 2015–2017 was 494 242 birds, which is above the established population objective range of 349 000–472 000 cranes.

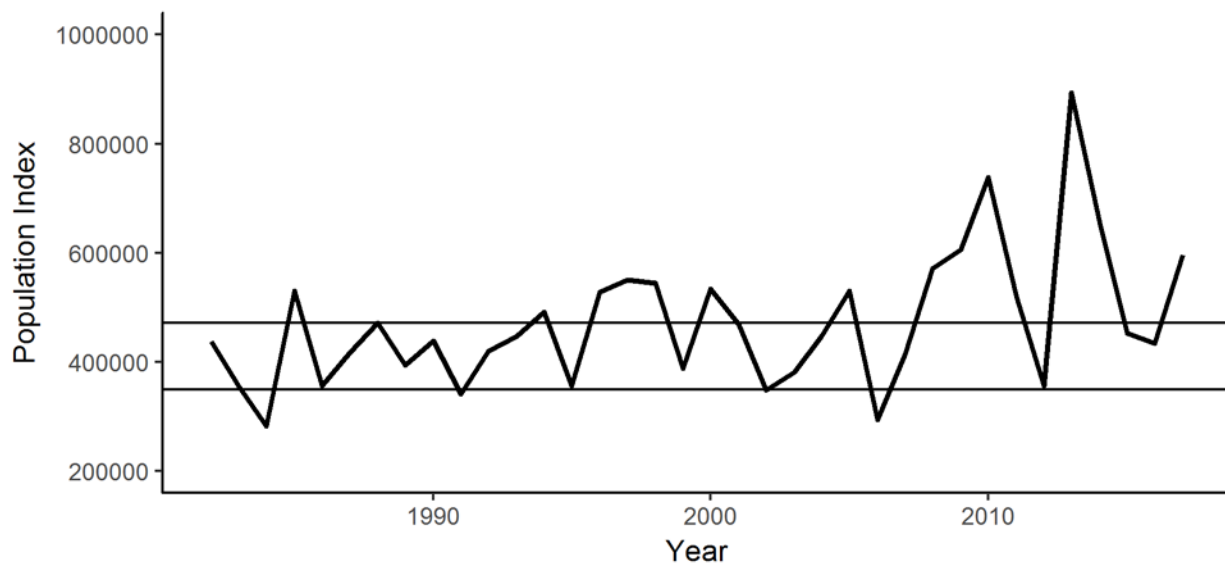


Figure 9.7-1 Spring Population Indices for Mid-continent Sandhill Cranes in Their Spring Staging Areas (e.g. Central Platte River Valley, Nebraska and Adjacent Areas). Horizontal lines represent the upper and lower limits of the population objective (Source: Dubovsky 2017).

EASTERN POPULATION

The Eastern Population of Sandhill Cranes has rebounded from near-extirpation in the late 1800s to a level that exceeded 30 000 cranes in 1996 (Dubovsky 2017). Strict regulation of the harvest, combined with the protection and restoration of habitat, has allowed the population to expand both in size and in geographic range (Meine and Archibald 1996; Case and McCool 2009).

The Eastern Population of Sandhill Cranes breeds in Ontario, Quebec and several Great Lakes states. Since 1979, the USFWS conducts a survey of this population while the birds are in their major migratory staging areas in the Mississippi and Atlantic Flyways. The survey is conducted each year in late October and provides a fall index of the population abundance. The survey has documented a long-term (1979–2009) increasing trend of 3.9% per year in the population abundance (Amundson and Johnson 2010). The 2016 count was of 95 403 cranes, similar to the 2015 estimate of 95 869 (Dubovsky 2017).

In Ontario, surveys of staging Sandhill Crane have been conducted for close to 40 years on Manitoulin Island and on the north shore of Lake Huron. These surveys were, until 2013, coordinated by the Manitoulin Island Nature Club and took place during the peak fall migration period. Numbers reached an all-time high in October 2009 (8 895 birds), likely due in part to increased survey effort, and have since then fluctuated as a function of the availability and interest of volunteers. In 2014, the crane survey conducted by the Manitoulin Island Nature Club was discontinued. CWS, Ontario Region, initiated in 2013 a study to develop an operational survey of the Eastern Population Sandhill Crane in Ontario. During the fall of 2013, 2014, 2015 and 2016, the minimum population counts were of 7 207, 7 493, 10 971 and 11,405 cranes, respectively. This included the area from Sault Ste. Marie to Mattawa (excluding Manitoulin Island in 2014 and 2015) and north to Cochrane. Productivity (ratio of juveniles relative to adults in the fall population) was estimated at 0.11 in 2014, 0.13 in 2015 and 0.16 in 2016. Note, however, that counts between years are not comparable due to differences in survey coverage and effort.

In Quebec, the 2017 population estimate from the helicopter plot survey component of the WBPHS was 5 800 indicated breeding pairs, an increase compared to the 10-year average of 4 200 birds (Figure 9.7-2). The survey covers only the southern portion of what is thought to be the core breeding area of Sandhill Cranes in Quebec. The 2001–2017 trend shows an increase of 11.4% annually (C. Lepage, CWS–Quebec Region, unpubl. data). A comparison of the 2010–2014 and the 1984–1989 distribution data gathered through southern Quebec Breeding Bird Atlas projects shows the dramatic expansion of the species in the province (www.atlas-oiseaux.qc.ca/donneesqc).

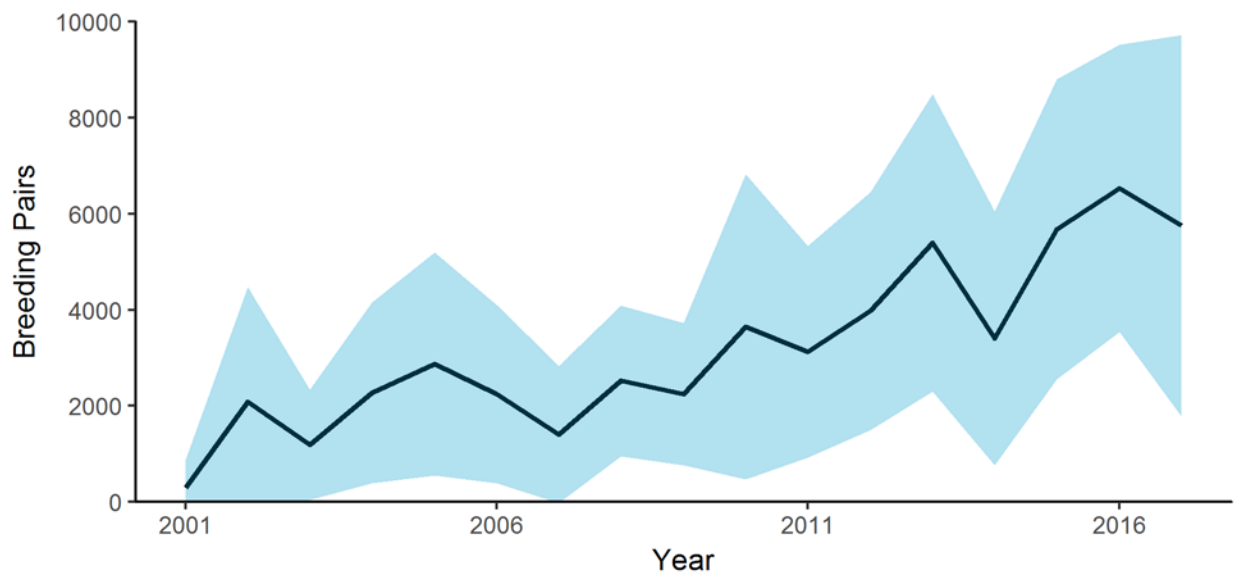


Figure 9.7-2 Estimated Breeding Pair Numbers of Sandhill Cranes Based on the Eastern Waterfowl Breeding Ground Survey, black line represents the breeding pair estimate and the shaded area represents the 95% Confidence Interval (Estimates are based on helicopter plot survey only; Source: C. Lepage, CWS-Quebec Region, unpubl. data)

9.7.2 Harvest

MID-CONTINENT POPULATION

The Canadian hunting season for the Mid-continent Sandhill Crane Population is currently open only in Manitoba, Saskatchewan and Yukon. The harvest has been quite variable, but it has been trending upward in Canada since the 1970s (Figure 9.7-3). The harvest in both Manitoba and Saskatchewan, however, showed sharp declines in the late 2000s. The Canadian harvest of this population of Sandhill Cranes is largely driven by non-Canadian hunters. Typically, over 50% of the harvest is by non-Canadian residents, and in recent years that proportion has been 70–80% (G. Raven, CWS-Prairie Region, pers. comm.). The overall Canadian harvest of Mid-continent Population Sandhill Cranes was 11 502 birds in 2016 (Figure 9.7-3).

In the U.S., the harvest of Sandhill Cranes from the Mid-continent Population had remained relatively stable over time, until 2016. That year, 25 272 birds were harvested, a 96% increase compared to the harvest in 2015 (12 862 birds) and the largest harvest since the survey began in 1975 (Figure 9.7-3). This increase may have to do with the 65% increase in the number of Central Flyway hunters that participated this season compared to last (Dubovsky 2017).

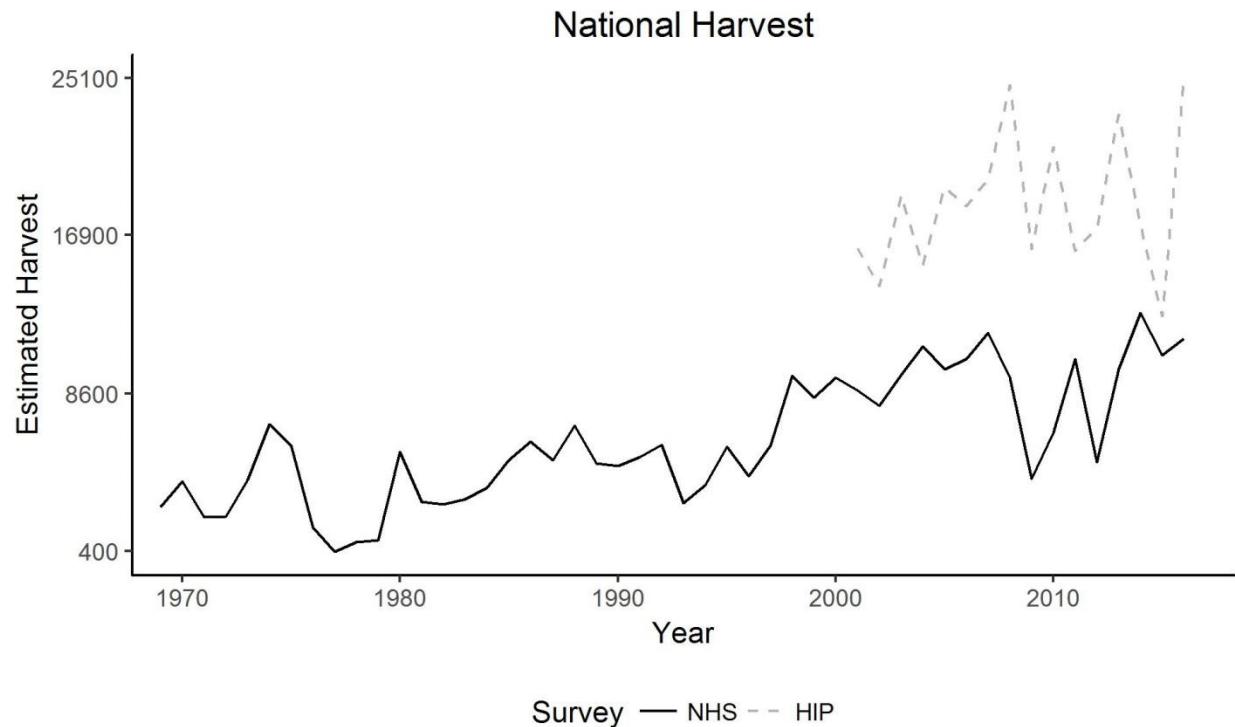


Figure 9.7-3 Estimated harvest for the Sandhill Crane in U.S. and Canada between 1968 and 2016. Canadian harvest data were obtained from the National Harvest Survey (<http://ec.gc.ca/reom-mbs/enp-nhs/index.cfm?do=def&lang=e>).

EASTERN POPULATION

Eastern Population Sandhill Cranes are presently not harvested in Canada. However, they are hunted in two states in the U.S.: Kentucky and Tennessee. In 2016, the state of Kentucky held its sixth Eastern Population Sandhill Cranes hunting season, while the state of Tennessee held its fourth hunting season, with a total of 757 cranes harvested in the two states combined (Dubovsky 2017).

9.7.3 Management and Conservation Concerns

Sandhill Crane populations endured significant declines throughout North America during the first half of the 20th century, primarily due to habitat loss, increased human encroachment, and overhunting (Gerber *et al.* 2014). The conservation of Sandhill Crane critical habitat (e.g. roosting habitat) is likely the most important factor to consider for the long-term conservation of the population. In fact, the single most important factor regulating Sandhill Crane populations is thought to be habitat availability (Gerber *et al.* 2014).

9.8 Band-Tailed Pigeon (*Patagioenas fasciata*)

In Canada, the Band-tailed Pigeon only occurs in forested habitats of coastal southern British Columbia. The species has a very low reproductive rate (clutch size of one egg), but some birds nest twice in a season. The species' population has suffered a large decrease since the 1970s, in part due to overharvesting. To address this decline, the harvest has been severely limited in Canada for the past 20 years. The Band-tailed Pigeon was listed as Special Concern in 2011 under the *Species at Risk Act*.

9.8.1 Abundance and Trends

Two surveys provide an annual index of the size and trend of the Band-tailed Pigeon population in Canada: the Breeding Bird Survey (which covers only 50% of the species' breeding range in Canada) and the Mineral Site Survey, which was developed in 2001 and implemented in 2004 by the Pacific Flyway Study Committee to provide an annual index of the abundance of Pacific Coast Band-tailed Pigeons. Results from these surveys indicate a decline in the population over the last decade (COSEWIC 2008). The Management Plan in the Species at Risk Act estimate the Canadian population around 43 000 to 170 000 birds representing 5% of the global population (Environment and Climate Change Canada, 2017).

BREEDING BIRD SURVEY

The BBS has provided an annual index of the abundance of the Band-tailed Pigeon since 1968. Results from this survey indicate a 4% annual population decline over the long term (1968–2016), and a decline of 3.2% over the last five years (2012–2016) for Pacific Coast band-tailed pigeons in British Columbia (Seamans 2017a). The estimated long term trend for both the Pacific Coast and Interior populations is a decline by 2% and 4.5% respectively. Extrapolation from this survey suggests a population of approximately 160 000 Band-tailed Pigeons in Canada (Partners in Flight Science Committee 2013).

MINERAL SITE SURVEY

The Mineral Site Survey was developed as an alternative method to assess population trends of Pacific Coast Band-tailed Pigeons in 2004 (Seamans 2017a). Pigeons gather at mineral sites (50–200 individuals) to ingest sodium (COSEWIC 2008). The Mineral Site Survey consists of visual counts of Band-tailed Pigeons at 52 mineral sites located in California, Washington State, Oregon and British Columbia. Results from the Mineral Site Survey were inconclusive for trend in the median annual count of Pacific Coast Band-tailed Pigeons seen at mineral sites since the survey became operational in 2004 (Seamans 2017a). Results for British Columbia however point to a 6.7% decline in population size over the long-term (2004–2016), and similar rates of decline for the 10-year and 5-year trend periods (Tables 9.8-1).

Table 9.8-1. Estimated Trend (Lower and Upper 95% Credible Intervals) in Band-tailed Pigeon Abundance from the Mineral Site Survey in British Columbia (Trends are expressed as the percent change per year; Source: Seamans 2017)			
Period	Trend	LCI	UCI
2004–2017	–6.7	–11.2	–1.9
2013–2017	–6.6	–12.9	0.6

9.8.2 Harvest

The Canadian hunting season for the Band-tailed Pigeon was closed between 1994 and 2000 in response to the low number of birds suspected to occur in British Columbia and declines in Washington State. Population increases in Washington State and research results that indicated that the provincial

population was much larger than initially thought were primarily responsible for the limited re-opening that was implemented in British Columbia in 2001.

The Canadian harvest has been declining since the early 1970s, when between 5 000 and 8 000 birds were harvested annually. At least 67 Band-tailed Pigeons were harvested in Canada in 2016. The estimated total harvest for 2016 in the U.S. was 6 700 pigeons, considerably fewer than the 13 500 birds harvested in 2014 (Seamans 2017a).

9.8.3 Management and Conservation Concerns

The causes of the historical continental-scale decline of the Band-tailed Pigeon population are uncertain, but past excessive harvest in the U.S. is thought to be a major cause. Habitat loss is likely also a contributing factor, at least in Pacific Coast population declines. Band-tailed Pigeons are also subject to trichomoniasis, a parasitic disease caused by the protozoan parasite *Trichomonas gallinae*. This parasite has caused major mortality events in this species, in addition to some less-easily detected chronic losses (Seamans 2017a).

The Band-tailed Pigeon was identified in 2008 by the Committee on the Status of Endangered Wildlife as a species of Special Concern in Canada because of concerns over long-term population declines, as well as habitat loss (COSEWIC 2008). Information on the legal status of this species under the *Species at Risk Act*, as well as assessment and recovery documents, are available online at www.registrelep-sararegistry.gc.ca/species/. The species is listed as a conservation priority in one or more Bird Conservation Strategies in Canada (www.ec.gc.ca/mbc-com/).

The single greatest challenge in the monitoring and management of Band-tailed Pigeon populations is the lack of reliable information on population size. Existing surveys provide only trends in abundance, and no reliable information is available on the total population size.

9.9 Rails

Two species of rails are hunted in Canada: the Virginia Rail (*Rallus limicola*) and the Sora (*Porzana carolina*). Rails are secretive marsh birds that breed and stage in many wetlands in Canada. Most often, they remain hidden in dense emergent vegetation, which makes surveying and hunting them challenging.

9.9.1 Abundance and Trends

Although rails are counted during the BBS, their secretive behaviour and infrequent calling habits result in low detectability during surveying. Population trends based on BBS results should therefore be interpreted with caution. In Ontario, rails are also monitored by the Great Lakes Marsh Monitoring Program (Bird Studies Canada) which includes protocols to increase the detectability of these secretive marsh birds and therefore, is more reflective of population trends in this area.

VIRGINIA RAIL

In Canada, Virginia Rails breed in the southern part of most provinces. Long-term population trends (1970-2015) are available for Canada, Ontario, British Columbia, Saskatchewan and Manitoba. Long-term population trends for all provinces listed, as well as Canada as a whole, suggest an increase in the size of the Virginia Rail population (Environment and Climate Change Canada 2017). For the period 2005–2015, there is a slight increase in the population trend for this species (Smith A.C. et al. unpublished).

Conversely, survey results from the Great Lakes Marsh Monitoring Program show the abundance of this species in the Great Lakes area is declining since the mid-1990s (Figure 9.9-1).

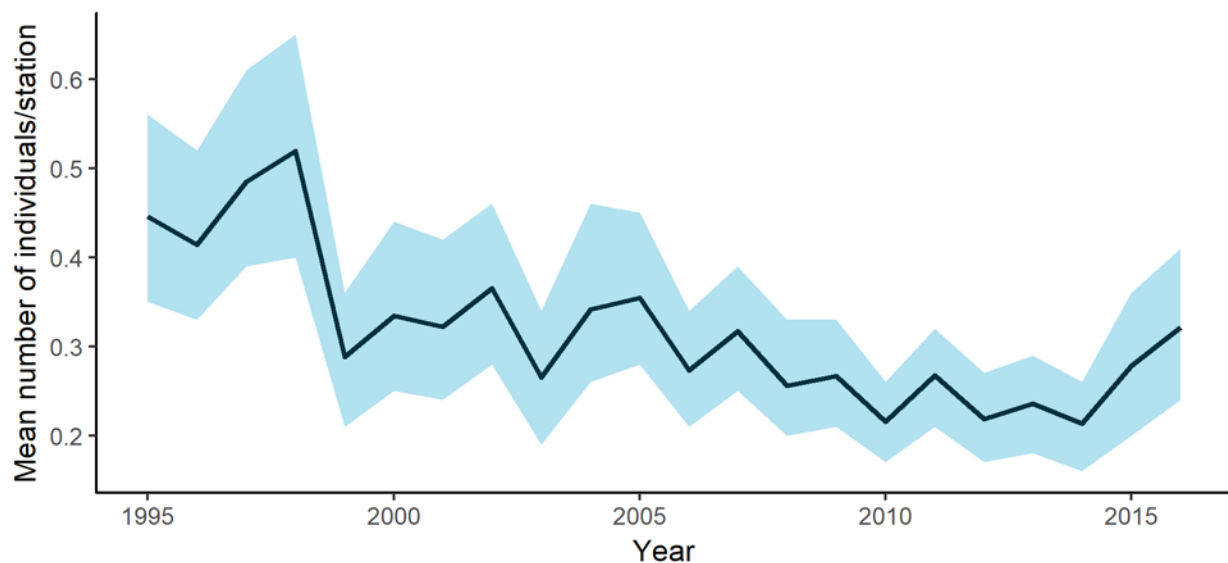


Figure 9.9-1 Population Numbers for Virginia Rail in Ontario, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals (Source: Great Lakes Marsh Monitoring Program, 1995–2016)

SORA

Sora breed in wetlands across Canada, and population trends are available for Canada and all provinces. Since 1970, the population size has been showing large inter-annual fluctuations, but with little change in the overall population size (Environment Canada 2014). Long-term trends (1970–2014) for this species suggest a relatively stable population in Canada overall, as well as in all provinces and territories except

Saskatchewan, where the trend suggest an increase (Environment Canada 2014). Results for short-term trends (10-year period from 2004 to 2014) are similar (Environment Canada 2014).

The Sora is also monitored in Ontario during surveys conducted as part of the Great Lakes Marsh Monitoring Program. The abundance of the species in the Great Lakes area show annual fluctuations, but it appears to be stable since the mid-1990s (Figure 9.9-2).

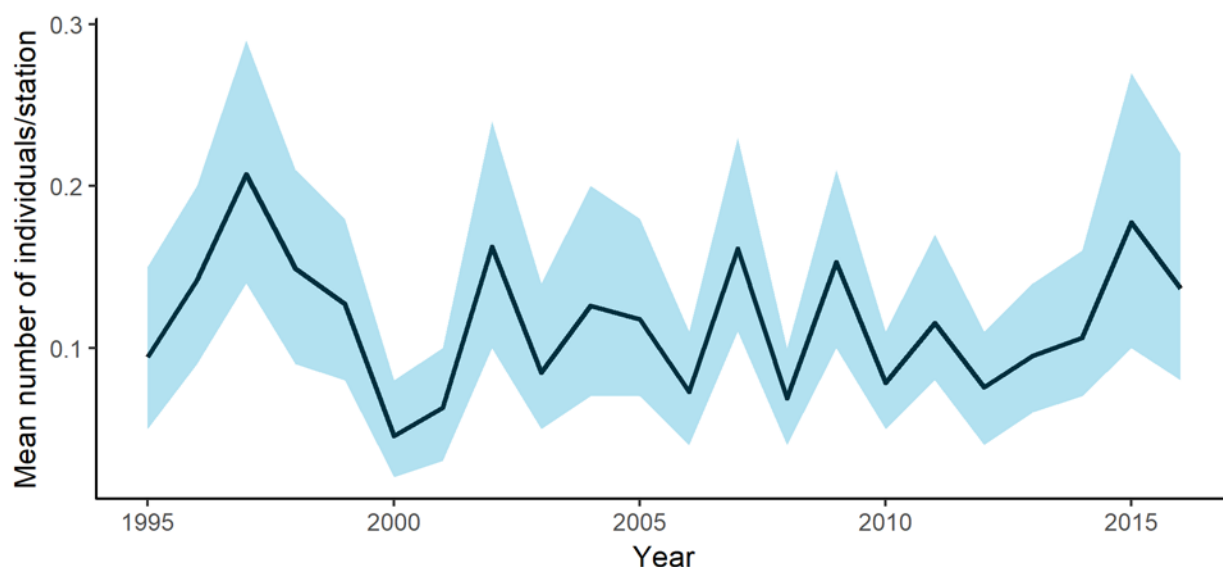


Figure 9.9-2 Population Numbers for Sora in Ontario, black line represents the population estimate while the shaded area represents the 95% Confidence Intervals (Source: Great Lakes Marsh Monitoring Program, 1995–2016)

9.9.2 Harvest

Currently, the hunting of King Rails and Yellow Rails is prohibited in Canada. Despite the Virginia Rail's status as a game bird in North America, the species is rarely hunted (Conway 1995). Ontario and Yukon are the only province and territory with a hunting season for Virginia Rails and Sora. Other provinces have had hunting seasons in the past, but they have since been closed. The collection of harvest data for rails began in 1989 as part of the National Harvest Survey. Since that time, the harvest has been decreasing. 164 rails were harvested in Canada (Ontario) in 2015 and no rail harvest has been reported in 2012, 2013, 2014, or 2016 (Gendron and Smith 2017).

9.9.3 Management and Conservation Concerns

Wetlands are critical in maintaining the breeding population of rails in Canada. Thus, continued wetland degradation and loss may represent the greatest threat to the long-term sustainability of the King Rail (Environment Canada 2014)

The monitoring of rail populations is difficult because of the birds' secretive behaviour, their cryptic colouration and their infrequent vocalizations, as well as difficult access to the dense marshes that they tend to use (Case and McCool 2009). A strategy was developed in 2009 to identify priority information needs for rails and snipe (Case and McCool 2009). In recent years, a focus on improving harvest data gathering and monitoring the abundance of secretive marsh bird species in North America, such as rails, resulted in 2011 in the implementation of the Standardized North American Marsh Bird Monitoring Protocol (Conway 2011).

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