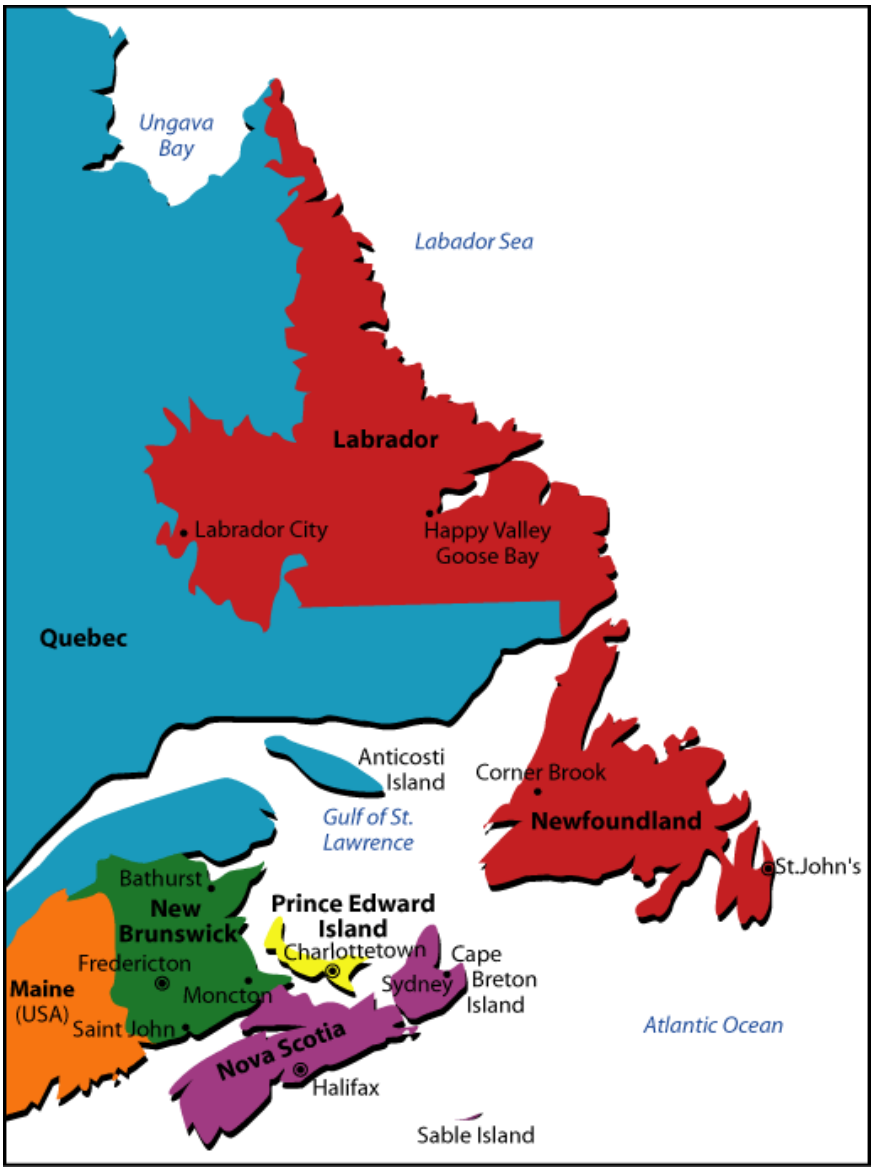
MANAGEMENT PLAN
FOR THE
NORTH ATLANTIC POPULATION
OF CANADA GEESE



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EXECUTIVE SUMMARY

The North Atlantic Population (NAP) of Canada geese is defined as all Canada geese breeding in Labrador, Newfoundland, western Greenland, and portions of eastern Quebec. In 1996, both the United States Fish and Wildlife Service and the Canadian Wildlife Service formally recognized the NAP as a separate population in the Atlantic Flyway from the Atlantic Population (AP). Prior to the formal recognition by both regulatory agencies, the Canadian Wildlife Service had managed the NAP as a separate unit.

Historically, the NAP wintered along the coast from Nova Scotia south to North Carolina. However the component of the population wintering from Maryland to North Carolina has largely disappeared. The main wintering region of the NAP is currently from New England north to Nova Scotia. Reliable long-term data on the status of NAP geese are lacking. Fall and winter counts may have some utility, but are confounded by apparent northward shifts in the wintering ranges of waterfowl in general. Breeding ground surveys are conducted through fixed-wing and rotary platforms. Integration of these survey data is ongoing.

The primary management goal for the NAP is to maintain the NAP at or above levels observed during 2001-2005. This population level allows for the maximum benefit to society in agreement with International treaties, and will provide for a sustainable sport harvest of ~40,000 NAP geese/year in the Atlantic provinces of Canada and maximum opportunity for harvest of Atlantic Flyway Resident Population (AFRP) Canada geese in the U.S.

Breeding ground survey effort needs to be continued by both regulatory agencies. Survey integration is a priority for this population. Transition from a spring banding effort on Prince Edward Island towards a summer banding program in Labrador is another high priority for the NAP. The current lack of representative banding and a small sample size hinder management of this population. Another management objective for this population is to maintain the current wintering distribution of the NAP. Research efforts should be directed towards elucidation of current migration timing and terminus points for the NAP.

The harvest strategy contained within Appendix I outlines clear, targeted harvest rates and season packages for harvest within the range of NAP. Season packages are for the U.S. NAP harvest areas. Explicit season packages and criteria set in advance and followed for several years at a time should result in more stable and predictable hunting regulations, and increase our knowledge of how regulations affect harvest.

This management plan should be reviewed and modified as needed at 5-year intervals.

PREFACE

The four Flyway Councils are administrative bodies established in 1952 to represent the state/provincial wildlife agencies and work cooperatively with the U.S. Fish and Wildlife Service (USFWS), Canadian Wildlife Service (CWS), and Mexico (SEMARNAT) for the purpose of protecting and conserving migratory gamebirds in North America. The Councils have prepared numerous management plans to date for most populations of swans, geese, doves, pigeons, and sandhill cranes in North America. These plans typically focus on populations, which are the primary unit of management, but may be specific to a species or subspecies. Management plans serve to:

- Identify common goals.
- Establish priority of management actions and responsibility for them.
- Coordinate collection and analysis of biological data.
- Emphasize research needed to improve management.

Flyway species management plans are products of the Councils, developed and adopted to help state and federal agencies cooperatively manage migratory gamebirds under common goals. Management strategies are recommendations and do not commit agencies to specific actions or schedules. Fiscal, legislative, and priority constraints influence the level and timing of implementation.

The 1989 Atlantic Flyway Canada Goose management plan (Canada Goose Subcommittee Atlantic Flyway Council Technical Section, 1989) did not separate the North Atlantic Population NAP) from the Atlantic Population (AP). This became a concern of managers when Quebec-breeding migrants reached critically low levels but birds originating in Newfoundland-Labrador appeared to be maintaining a stable population. In addition, the Canadian Wildlife Service continued to manage the NAP as a population distinct from the AP. However, surveys of the NAP were infrequent and not standardized. There were no recruitment studies and survival rate estimates based on neck collar observation data appeared low.

In 1994 the Canada Goose Committee was charged with compiling and evaluating data relevant to the separation of this group of geese from the remainder of the Atlantic Population. A compilation and evaluation of available data were made in May 1996 and updated in December 1997 by the North Atlantic Population Canada Goose Working Group of the Atlantic Flyway Technical Section. This previous document, section III of the Atlantic Flyway Canada Goose Management Plan, was prepared from that work and until now served as an interim guiding document for the management of NAP geese. This current management plan replaces the interim section III plan.

This management plan defines a goal, objectives, strategies, and tasks for management of the NAP in states and provinces of the Atlantic Flyway. The continued partnership and involvement of the U.S. Fish and Wildlife Service (USFWS), the Canadian Wildlife Service (CWS), and state and provincial wildlife management agencies is critical to the successful implementation of this plan.

INTRODUCTION

The North Atlantic Population (NAP) of Canada geese is herein defined as all Canada geese breeding in Labrador, Newfoundland, western Greenland, and portions of eastern Quebec. This delineation is similar to what was presented by Bellrose (1976).

Subspecies Composition

The original description of the Canada Goose (*Anser canadensis*) by Linnaeus was of geese from the area of Quebec City, and it is unknown whether these were breeding birds or transients (Todd 1938). Taverner (1931) described *Branta canadensis canadensis* as breeding across the continent rather than trying to sort out subspecies and populations with the information at hand. Todd (1938) described *Branta canadensis interior* based on his extensive travels in eastern North America and the difference between the geese on the east coast of Hudson Bay and those in Newfoundland-Labrador (*B. c. canadensis*). The two subspecies were thought to intergrade in the region of Ungava Bay south. Low (1935) reported banding evidence supporting a distinct group of geese migrating along the North Atlantic coast. Hanson and Smith (1950) described a North Atlantic population which breeds in Newfoundland-Labrador and eastern Quebec and winters from Nova Scotia to Massachusetts and possibly as far south as New Jersey and North Carolina. Palmer (1976) describes *B. c. canadensis* as limited to a North Atlantic population, but *B. c. interior* makes up four sub-populations (Eastern Prairie Population, Mississippi Valley Population, Southern James Bay Population, Mid-Atlantic Population) as described by Hanson and Smith (1950). There has never been a definitive and convincing demarcation between the breeding grounds of *interior* and *canadensis.* Recent genetic investigations of geese breeding in western Greenland indicated that they were more closely related to eastern Ungava Bay AP geese than NAP geese (Scribner et al. 2003), although their migratory and wintering patterns mirror NAP birds more than AP (Kristiansen et al. 1999). This apparent conundrum between the genetic affiliation and migratory and wintering pattern of geese breeding in western Greenland warrants further investigation.

DISTRIBUTION

Breeding Distribution

The primary breeding grounds of NAP geese lie in Labrador, Newfoundland, and portions of southeastern Quebec (generally east of 70° 30'longitude), Anacosti Island, and western Greenland (Fig. 1). Canada geese that historically nested in the southern Maritime Provinces (Prince Edward Island, Nova Scotia, New Brunswick) were extirpated by about 1900 (Erskine 1997). Other sources of NAP geese are from western Greenland. Recent work in Greenland has indicated an increase in the numbers of breeding Canada Geese and band and collar recovery suggests affiliation with eastern North America (Fox et. al 1996, Kristiansen et al. 1999, Malecki et al. 2000, T. Fox pers comm. 2005).

Migration

Bellrose (1976) described the migration of this (sub-) population "...down the Labrador coast to the Maritimes, where it picks up birds from Newfoundland. It continues along the coast of New England , across Long Island down the New Jersey shore, and along coastal Maryland to Pea Island National Wildlife Refuge, North Carolina..." Analyses of recent neck-collar data and an update of band recoveries (Bateman and Daury 1994) suggest that this description is still valid, although the proportion of geese moving to the southern part of the winter range has diminished. Recoveries of NAP geese in the states of Delaware, Maryland, Virginia, and North Carolina declined from 30% of recoveries for 1920-86 to only 6% for 1987-95 (Hestbeck and Bateman 2000). Since 2000, only 10 recoveries of banded NAP geese have occurred south of New Jersey. All of these recoveries were indirect recoveries. Two occurred in Delaware, 5 in Maryland, 2 in Virginia, and 1 in North Carolina. Paucity of band recoveries in southern Virginia and North Carolina may be a function of recent season closures and very restrictive hunting seasons.

Neck-collar sightings indicate that while some NAP geese are present in New England in early October, the bulk of the migration does not occur until November and December (Hestbeck and Bateman 2000). Collar observation data indicated that total numbers of NAP geese in the U.S. peak in November and remain constant until spring migration begins in March (Fig. 2). Radio-marked geese from Labrador followed a similar pattern. There were only two observations of Maritime-collared geese in Maryland prior to 15 October, but none in New Jersey. Neck collar observations of geese from Greenland indicate arrival to New England in mid-October with geese remaining on wintering areas in the U.S. to at least the first week of March.

In recent years, Prince Edward Island (PEI) has been an important migration stop in both spring and fall**.** In November upwards of 30,000 to 40,000 geese stage on PEI, with numbers of Canada geese observed on PEI increasing in recent years (Fig. 3). Earlier conjecture that geese staging on PEI in the fall were birds migrating east from the Ungava region (Atlantic Population) has not been supported by leg band, neck collar, or radio marked recovery data.

Seven of 9 geese radio-collared in Labrador in 1999 moved from Labrador to the southern Maritime Provinces during October and November. Two birds moved to the southern New England/Long Island region by mid October. The surviving Labrador geese moved from the Maritime region to southern New England/Long Island between early December and the third week of January. The only Newfoundland radioed goose that survived the Canadian hunting season moved to southern New England in January (Malecki et al. 2000). Newfoundland geese may be more prone to over-winter in Canada than geese from Labrador, and those that do migrate south may do so later than Labrador birds.

Geese radio-marked in 2000 in Newfoundland and eastern Labrador exhibited similar movements to those marked in 1999. Geese were also marked in western Labrador in 2000. While a few of these birds showed coastal movements, most migrated along inland pathways. They also appeared to migrate earlier through the Maritimes (Malecki et al. 2001).

Geese radio-collared in Greenland migrated earlier than Labrador or Newfoundland geese, moving into the U.S. NAP area in October. Although only 4 of 6 radio marked geese survived to leave

Greenland, they all showed an affinity to western Long Island before moving to the Chesapeake Bay area in late January.

Geese captured in coastal North Carolina and equipped with satellite transmitters indicated similar movement patterns. One bird marked at Lake Mattamuskeet NWR summered in southern Labrador, arrived on PEI between 20 September and 28 September and stayed in the PEI – Nova Scotia area until early December. It arrived in coastal MA sometime between mid-December and early January where contact was lost. A second bird was marked at Pea Island NWR and also summered in southern Labrador. On southern migration, it appeared to either totally bypass the Maritimes or stayed only briefly. This bird was in Labrador on October 6 and had arrived in central CT no later than October 15.

Winter distribution

The NAP historically wintered from Nova Scotia south to North Carolina (Fig. 4). Once the NAP birds move south of Nova Scotia they begin to overlap with migrant AP geese and Atlantic Flyway Resident Population (AFRP) birds. The more coastal orientation of the North Atlantic Population compared to the AP is less evident from neck-collar observations than from the band recoveries. Neck-collars from Maritime-affiliated geese were seen inland in southern New England and New Jersey (Erskine 1997). This is presumably the result of harvest patterns or, possibly, a result of change in distribution over time (band recoveries include many data from an early time-period). However, geese neck-collared in the Maritimes during spring or fall were primarily associated with the Maritime Provinces during early fall and southern New England and Long Island during winter (Hestbeck and Bateman 2000). Fair numbers of these geese (16 percent of observations) were observed in winter in New Jersey, but only low numbers (6 percent of observations) south of New Jersey. Fewer birds were neck-collared in Labrador, but observations in winter were primarily (80%) in New England and secondarily in the Lower Hudson River Valley and New Jersey (20%). Radio-marked birds show similar distribution, but 2 of 4 Greenland birds moved into the Chesapeake area in late January (Malecki et al. 2000). Resident geese banded in New England also exhibit the same movement patterns if prolonged cold weather conditions result in widespread freezing of inland and some coastal waters. The only wintering areas where the North Atlantic birds can be reliably differentiated are in Nova Scotia. Approximately 15,000 birds winter in that province (R. Milton, pers. comm.).

Pea Island National Wildlife Refuge, North Carolina has been considered a traditional wintering area for a segment of the NAP. Records of the number of wintering geese in that refuge show a decrease from an average 4,370 geese during 1966-1970 to 503 geese during 1990-1995. Resident geese now also use the refuge (L. Fritsch, pers. comm.). Resident geese, however, tend to browse along impoundment areas while birds believed to be migrants use the eel grass beds of Pamlico Sound, west of the impoundments and areas to the south (R. Noffsinger, pers. comm.). It is unclear how many NAP birds presently winter in the Carolinas. Recent DNA sampling of harvested geese in the Back Bay region of Virginia and North Carolina may shed some light on the contribution of NAP stocks towards migrant goose numbers at the southern terminus. Analyses from 73 Canada geese harvested in North Carolina and 16 from Virginia in 2006 indicated that 20% of the birds from North Carolina and 16% of the birds from Virginia were NAP geese. In 2007 an additional 108 geese from North Carolina and 30 from Virginia were sampled. The NAP comprised 14% of

the North Carolina sample and 22% of the Virginia sample. It is difficult to extrapolate these ratios to the rest of coastal North Carolina or coastal Virginia, but they do indicate that a segment of the NAP continues to winter in the southern portion of the Atlantic Flyway.

Presence of molt migrant Resident Geese

There is growing evidence that significant numbers of AFRP geese from the U.S. may migrate north to molt in NAP breeding areas. Prior to recent banding operations in Labrador, only 41 of 42,368 AFRP geese banded in the New England states of MA, NH, and CT had been recovered in the Canadian NAP harvest area. These data suggested that geese observed during past May/June breeding surveys in Labrador and Newfoundland were NAP residents, with few molt migrants from the northeastern U.S. Stable isotope analyses (Caccamise et al. 2000) also indicated little mixing of AFRP geese in the Maritimes.

Spring banding programs on PEI from 1996-2006 have captured a total of 4,496 Canada geese, including 96 recaptures. Of these recaptures, only 1 bird was initially banded in the U.S. (NY) during the molt. Two other birds were initially caught during winter banding operations in the U.S. (DE, NJ), while the remaining birds were from prior spring bandings on PEI.

Band recoveries, however, may not accurately reflect the presence and magnitude of molt migrants in NAP breeding areas if such birds return to the U.S. before Canadian hunting seasons commence or harvest pressure is light. During summer goose banding operations along coastal Labrador in 2007, 5 Massachusetts, 2 New Hampshire, 2 Maine, 1 Connecticut, and 1 Tennessee summer banded geese were recaptured, along with one spring banded PEI goose. Many large- bodied adult geese in the later stages of molt were observed but not captured, lending further credence to the potential presence of AFRP molt migrants. This was the first attempt to capture and band NAP geese on their primary breeding grounds in many years, so the number of AFRP recoveries was surprising.

Growing resident goose populations in New Brunswick and Nova Scotia may also contribute to molting concentrations in Newfoundland and Labrador. If operational banding programs in Newfoundland and Labrador are developed, banding of AFRP geese in the Maritimes may yield more recaptures in the coming years. Presence of large numbers of AFRP molt migrants on the NAP breeding grounds may have profound implications for breeding population estimates.

POPULATION STATUS

Reliable long-term data on the status of NAP geese are lacking. Fall and winter counts may have some utility, but are confounded by apparent northward shifts in the wintering ranges of waterfowl in general and the co-mingling of other goose populations. Consequently, recently established breeding population surveys are needed to provide better measures to assess population status of NAP geese.

Fall migration counts of geese on PEI increased dramatically over the past 40 years. There is no evidence that the number of geese wintering in the Maritimes has declined since the 1950s, and it

may even have increased in recent years (R. Milton, pers. comm.). There is some evidence that more geese winter farther north in Nova Scotia, probably due to milder winters since 1970 (Erskine 1997). The number of wintering birds in Nova Scotia is highly variable, but can approach 20,000 birds in some years (CWS unpubl. Coastal Survey Database).

Breeding Population Surveys

The NAP is currently surveyed through 2 different platforms, a USFWS fixed-wing survey, and the CWS Eastern Waterfowl helicopter plot survey (Fig 5). Prior to 1990, periodic fixed-wing surveys were conducted in Labrador and portions of Newfoundland. The first aerial breeding population survey of NAP geese was flown in Labrador in 1980. Fifteen fixed-wing transects were surveyed then and again in 1993-1994 and 1998-1999. Between 1980 and the early 1990s, there was no difference in the number of breeding pairs of geese recorded on the surveys, but the total number of geese was lower in 1993 than in 1980 or 1994 (Bateman 1994). Breeding pair estimates for the survey area (a portion of Labrador covering 247,000 $km^{2)}$ increased from approximately 13-14,000 pairs (unadjusted for visibility) in 1993-1994, compared to 20-26,000 pairs in 1998-1999. The annual standard error (SE) for these surveys averaged approximately 15%. Total goose estimates (unadjusted for visibility) for these same years were 27-48,000, and 61-86,000, respectively, showing a much higher annual variation than the pair estimates.

The total number of geese breeding in Labrador (a much larger area than was covered by the surveys above) was initially estimated to be on the order of 25,000 pairs (Goudie and Whitman 1987; Bateman 1993; 1994). Breeding densities in Labrador range from 0 in mountainous habitat to 20-70 pairs per 100 km^2 in some of the most productive eco-regions (Bateman 2000).

The earliest breeding population estimate for insular Newfoundland was about 4,000 pairs, but this was believed to represent a minimal figure because high densities (1.5 pairs per km^2) recorded on patterned fen sites, notably the Swift Current Barrens, were not sampled representatively.

Since 1996, aerial transect surveys have been flown by USFWS, and results have suggested larger populations than estimated previously. These fixed wing surveys covered portions of the breeding range of NAP geese in both Labrador and Newfoundland. For the entire survey period to date (1996-2007), the overall pair estimate has averaged approximately 66,000 pairs ± 4,700, with Labrador accounting for 36,000 ± 3,700, and Newfoundland accounting for 29,900 ± 1,400. Trend estimates for the 12-year period (Fig. 6) suggest a non-significant ($P = 0.12$) decline, but this was largely due to unusually large estimates in 1996 and 1999 that are questionable. Estimates from Labrador for those years were nearly twice as high as any other years, indicating a potential bias in the estimator. If those years are excluded, there is no significant trend for either survey area or the NAP as a whole. The average for the baseline period of this plan (2001-2005; see Management Goal section) was approximately 60,000 total indicated pairs and 156,000 total birds.

Canada geese have also been counted on the Eastern Waterfowl (formerly known as the BDJV) helicopter plot surveys. Initiated in 1990, the survey was substantially redesigned for the 1996 field season. The redesign involved reducing the plot size from 10 km x 10 km to 5 km x 5 km, substantially increasing the number of plots surveyed and introducing the rotating sampling scheme. The smaller plot size has been used since 1996. Many of the 5 km x 5 km plots were

selected as a portion of previously run 10 km x 10 km plots.

The Eastern Waterfowl survey was expanded in 2001, including 10 new plots that expanded the survey coverage to a larger portion of Labrador. Survey results for the area covering Newfoundland, Labrador and southeastern Quebec east of 70 30' (the principal breeding range of NAP geese), indicate an average of approximately 45,000 total indicated pairs and 90,000 total indicated birds during the baseline period, following a long-term increase in both estimates during the previous decade (Fig. 7). Unfortunately, there are still relatively few BDJV plots in Labrador, especially compared to southeastern Quebec.

An analysis of the years of overlap between the USFWS and the BDJV surveys (1996-2005), indicate poor correlation between the 2 surveys (P = 0.53). These differences largely involve breeding pair estimates, whereas the total indicated bird estimates seem to mirror each other more closely. The disparity between the two survey results has made interpretation of population status difficult. Given the recent evidence of molt migrant AFRP geese in the NAP breeding range, the utility of monitoring total indicated birds as a population metric is uncertain. Modeling work to date has identified some possible causes, such as visibility correction factors, that may help reconcile the survey differences. Integration and development of a composite population estimate based upon the data from both surveys is a high priority to improve our ability to manage this population.

Recent work in Greenland has indicated an increase in the numbers of breeding Canada Geese and suggested affiliations with eastern North America (Fox et al. 1996). An aerial breeding pair survey was flown in west Greenland in June 1999. Mean densities of breeding pairs of Canada geese ranged from 0.25 pairs/km^2 in high density habitats to 0.03 pairs/km^2 in the low. The total estimate of breeding Canada geese was approximately 2,500 pairs ± 894 (Malecki et al. 2000). A repeat survey of these transects flown in 2005 indicated a 6-fold increase in the total population estimate (T. Fox, pers comm.), but the pair density was unchanged. The increase was due to the observation of numerous groups of flocked birds, presumed to be non-breeding birds of Greenland origin. Observations of various sized and colored Canada geese in western Greenland, however, raise the question of the presence of North American molt migrants (T. Fox pers comm.).

Survival and Recruitment

Survival estimates calculated from birds neck-collared on PEI averaged 82% for 1988-1990, but only 66% during 1991-1998. Annual estimates for more recent years were highly variable, ranging from 50-54% in 1991 and 1998, to 77-82% in 1992 and 1997 (W. Kendall, pers. comm.). These estimates are lower than expected for a stable Canada goose population based on data from other sub-arctic nesting populations, but are similar to those estimated for some resident geese (J. Hestbeck, pers. comm.). Recruitment in NAP Canada geese may be higher than for other sub-arctic nesting populations, allowing the population to sustain lower survival rates. Survival rates did increase after closure of the Canada goose season in the U.S. portion of the Atlantic Flyway in 1995 and decreased when the season re-opened in 1998. Survival for small samples of radio-marked adult females in 1999-2000, after the U.S. NAP area was re-opened, was approximately 67-68%. Recent levels of adult NAP leg-banding on Prince Edward Island and the timing of those bandings (spring) do not allow for reliable survival rate analyses from band returns.

At the present time there are no field surveys or environmental predictors available to assess reproductive success of NAP geese prior to the hunting season. Age composition of the harvest is calculated from tail fans collected by the CWS Species Composition Survey each year. Age ratios (juveniles per adult) of geese harvested in Newfoundland, Nova Scotia, and Prince Edward Island are believed to provide an index to reproductive success of the Newfoundland-Labrador breeding birds, and are not likely to have been greatly influenced by the presence of released birds. However, if large numbers of AFRP molt migrants are present during the molt and available for harvest in September, declining age ratios may be a function of these molt migrants. Since 1990, age ratios have ranged from 0.50 to 1.20, with an overall declining trend ($P = 0.01$). Reasons for the decline, and the exact relation of the index to age composition of the population, are unknown. Age ratios were below 1:1 during 1990-1992, and again between 1996-1999, with the lowest ratio recorded in 28 years occurring in 1999 (Fig 8). Unfavorable weather conditions, i.e., prolonged snow or ice cover during the nesting season could affect reproductive success of NAP geese.

HARVEST

Harvest areas

Band recovery and neck collar data were used to delineate NAP harvest areas in the US (Fig. 9). In 2002, these areas were further partitioned into high and low harvest areas (Appendix I). In Canada, NAP harvest areas include all of Labrador, Newfoundland, the Maritime Provinces, and Districts B, E, and G in Quebec (Fig 9). In the U.S., NAP harvest occurs in portions of every state from Maine to North Carolina. Outside of the delineated NAP harvest zones identified in Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, and New York, however, this harvest is ancillary to Atlantic Population Canada goose harvest. These NAP harvest areas have proven to be well delineated, particularly the low harvest zones. Band recovery data indicate that these zones account for well under the 30% of all NAP recoveries that they initially were intended to contain. However, the relative low number of NAP geese banded and recovered annually, limits our ability to refine harvest areas in the U.S.

Harvest trends

Canada goose harvests in the Atlantic Provinces are comprised of geese from NAP breeding areas in Newfoundland and Labrador and the growing AFRP populations in PEI, New Brunswick, and Nova Scotia. Increasing Canada goose populations in Greenland may also be contributing to the harvest composition in the Canadian Maritimes. Limited aboriginal harvest occurs in the Maritimes and southern Quebec. Harvest south of Maine is made up of varying proportions of NAP in combination with other populations; AP, AFRP, and to a lesser extent, Southern James Bay Population (SJBP). Initial attempts to differentiate populations of Canada geese in the Atlantic Flyway morphometrically were inconclusive. The recent introduction of 2,000+ resident geese from southern Ontario into New Brunswick, and the subsequent dispersal of these birds and their progeny, was a confounding factor in these analyses.

Recent attempts to differentiate Canada goose populations in the AF have centered upon stable isotope analyses (Caccamise et al. 2000), analyses of mtDNA (Scribner et al. 2003a), and use of

weighted band recoveries (Sheaffer 2004). Both stable isotope and mtDNA analyses show great promise in differentiating various populations of geese. Cost may be prohibitive, however, for regulation setting and harvest management objectives. Use of weighted band returns does, however, provide harvest derivation information precise enough to inform harvest management decisions.

The harvest in the Atlantic Provinces generally increased from approximately 26,900 in 1975 to 54,603 in 1989 (Table 1). Since 1990, harvest has ranged from approximately 27,000 to 57,000, with a mean of 43,600 ± 2,100. No significant trend in harvest was apparent over this time period ($P = 0.64$). However, harvest in 1992 (when reproduction was very poor) was unusually low at 27,900. Highest harvests occurred in 1999. Estimated goose harvest has been declining in recent years. For the period 2001-2005, mean annual harvest was 39,800.

Hunter numbers in the Atlantic Provinces have been steadily declining since 1975 ($P < 0.001$). Therefore, harvest per successful goose hunter might be considered a better index of the population given the stable season lengths and bag limits. That index does not suggest a reduction in availability of geese to hunters, again with the exception of 1992, as there has been an increasing trend in harvest per successful hunter since 1990 ($P = 0.004$) (Fig. 10). There has been a slight but not significant ($P = 0.27$) decline in harvest per hunter since 2000. Waterfowl hunter numbers are declining ($P < 0.01$) over the long-term in the Canadian NAP harvest zone, although hunter numbers since 2000 have been stable ($P = 0.62$).

The Canada goose hunting season, which was closed in the U.S. portion of the Atlantic Flyway in 1995, was re-opened for a limited season in five New England states and on Long Island in 1998. Harvests of geese in New England, which were stable at about 20,000 until the mid 1980's increased to nearly 42,000 geese during the last half of that decade (Serie and Cruz 1997). Harvests declined after bag limit restrictions were instituted in 1992 and the regular goose season closed in 1995. Harvest increased after a 40-day season with a 2-bird bag limit was authorized beginning in 1998. Recent (2002-2005) moderate package seasons in the US NAP harvest area (60-day, 2-bird bag) have resulted in total goose harvests ranging from 28,000 to 39,000 (Table 2). Hunter numbers in this time frame are roughly half of that in the mid 1980s.

Harvest derivation analyses based upon weighted band returns (Sheaffer 2005) indicate that harvest of adult NAP geese in U.S. NAP harvest areas from 2000-2004 averaged 7,700 ± 2,100 (Figure 11). Limited harvest of NAP geese occurs in areas outside of established NAP harvest zones. The estimated overall U.S. harvest of adult NAP geese from 2000-2004 was 8,100 ± 2,300. Overall AF adult goose harvest over this period averaged 26,974 ± 4,884. Estimation of juvenile harvest through this methodology is not deemed valid (Sheaffer 2005), so recent estimates of total NAP goose harvest in the U.S. are not readily available at this time. Based upon the above analyses by Sheaffer (2005), standard USFWS harvest estimates (Table 2) can be roughly broken down by population (AP, NAP, SJBP). Periodic harvest derivation analyses should be conducted to determine trends over time in harvest composition of geese throughout the Atlantic Flyway.

MANAGEMENT GOAL

The goal of wildlife management agencies in the Atlantic Flyway, with respect to NAP geese, is:

To maintain the NAP at or above levels observed during 2001-2005. This population level allows for the maximum benefit to society in agreement with International treaties, and will provide for a sustainable sport harvest of ~40,000 NAP geese/year in the Atlantic provinces of Canada and maximum opportunity for harvest of Atlantic Flyway Resident Population (AFRP) Canada geese in the U.S.

NAP geese are the geese most commonly available to hunters in the Atlantic Provinces of Canada, and in that portion of Quebec lying south of Labrador. Annual harvest of Canada geese in the Atlantic Provinces averaged 45,200 during 1995-1999. Approximately half of this harvest was in Prince Edward Island (average 22,400 birds), while harvests in Newfoundland and Labrador averaged 7,400 (17%), Nova Scotia averaged 9,600 (21%) and New Brunswick averaged 5,800 (13%).

For the period 2001-2005, mean annual harvest was 39,800. During this period harvest distribution amongst the Provinces within the Canadian NAP harvest zone has remained relatively the same. Maintaining the population at or above current levels is necessary to sustain this level of recreational use.

In the U.S. portion of the Atlantic Flyway, control of Resident Canada goose populations is a primary concern, especially in the more urbanized northeastern states. Since 1997, the spring population in the northeastern U.S. has averaged close to 1 million birds (Serie and Raftovich 2005). Resident geese are frequently the source of complaints (Conover and Chasko 1985, Hindman and Ferrigno 1990). High harvests associated with resident populations (Serie and Cruz 1997) indicate that resident populations can provide extensive recreational hunting opportunity. However, many sportsmen prefer to hunt during traditional fall-winter seasons and do not participate as much during early or late resident goose seasons (Heusmann 1999). Maximizing harvest of AFRP geese will help alleviate conflicts throughout this region.

We chose 2001-2005 as the baseline period because population survey methods and harvest regulations were relatively constant during that period, and population levels seemed acceptable.

MANAGEMENT OBJECTIVES AND APPROACH

A. Population Size

Objective: Maintain the NAP at or above levels observed during 2001-2005.

Approach:

1. Conduct annual aerial surveys of NAP geese breeding in Labrador, Newfoundland and eastern Quebec.

Responsibility: USFWS, CWS

2. Develop an operational procedure for integrating all aerial survey data to obtain a single population estimate or index.

   Responsibility: USFWS, CWS

3. Determine feasibility of monitoring environmental factors to predict annual productivity of NAP geese.

   Responsibility: USFWS, CWS

4. Establish annual hunting regulations in Canada and the U.S. to help achieve the population size objective (see Objective C. Harvest Management).

   Responsibility: AFC, USFWS, CWS

Discussion: Current NAP levels seem to provide for desired levels of recreational use and other benefits to stakeholders in both the U.S. and Canada. The NAP is believed to be stable since the mid 1990s, relatively liberal hunting seasons have been sustained, and damage complaints associated with this population have been minimal. However, a higher population might allow for more harvest of AFRP geese in the U.S.

Monitoring of the breeding population is essential because NAP geese mix with other goose populations (AP, AFRP) on wintering and staging areas, especially in the northeastern U.S. A single population objective (breeding pairs or total geese) can not be specified at this time, due to difficulties integrating results of fixed-wing (USFWS) and helicopter plot surveys (CWS) that cover different portions of the NAP range, with some overlap. USFWS and CWS are working to reach agreement on a composite breeding population estimate (or index), and that work needs to continue. As soon as that is resolved, a more specific population objective should be set. Stakeholders and managers can then decide whether increasing or decreasing the current population is desirable. In the interim, managers in the Atlantic Flyway will have to consider results of each population survey independently, and make judgments about reliability and utility of those data for management decisions.

Annual productivity is an important demographic influencing growth of any Canada goose population. Age ratios of NAP geese show considerable annual variation, suggesting that environmental factors may be important. Having some ability to predict reproductive success would be valuable for making decisions that affect population status of NAP geese. However, the cost of doing annual field studies solely to assess productivity is prohibitive, so emphasis should be on analysis of available weather data or other information.

The principal tool we have to influence NAP population size is harvest management. Under Objective C, a formal harvest strategy will be developed that specifies hunting regulations and criteria for changing regulations based on status of the breeding population.

B. Population Distribution

Objective: Document and maintain the current breeding and winter distribution of NAP geese.

Approach:

1. Clarify the current breeding area delineation for NAP geese.

   Responsibility: USFWS, CWS

2. Document and delineate important migration and wintering areas for NAP geese.

   Responsibility: AFC, USFWS, CWS

3. Document abundance and seasonal movements of NAP geese affiliated with southern wintering areas.

   Responsibility: AFC, USFWS

4. Make reasonable efforts to maintain the historical wintering distribution of NAP Canada geese southward to Pea Island, North Carolina (see Objective C: Harvest Management).

   Responsibility: AFC, USFWS

5. Document extent and location of crop depredation.

   Responsibility: AFC

Discussion: Management of the NAP as a distinct population of geese is a relatively recent development, so questions remain about their range delineation, seasonal distribution, and movements. Additional studies are needed to address these questions, and to determine if the winter distribution can be influenced through management.

With respect to the breeding range, there is uncertainty about where the breeding area boundary between NAP and AP geese should be drawn. There is undoubtedly some overlap, but determining where the populations are most distinct will ensure that appropriate areas are included in population surveys and other monitoring programs on the breeding grounds. Likewise, the contribution of geese from Greenland to the NAP has not been well established, and has not been reflected in monitoring programs to date. In the Maritime Provinces, the growing number of AFRP geese may confound population and harvest data from those areas if not adequately monitored in the future.

Migrant geese play an important role in the traditional hunting of geese throughout the Atlantic Flyway and, in many areas, the presence of migrant geese provides non-consumptive benefits to other facets of society. Thus, maintenance of traditional wintering populations of migrant geese

is important for a number of reasons, and the decline in numbers of migratory geese wintering in southern Atlantic Flyway states is a significant concern. North Carolina is believed to be the historic southern terminus for NAP geese, and recent DNA analyses of hunter harvested birds indicate that NAP geese still comprise about 20% of the harvest in the Back Bay area of North Carolina and Virginia, although the number of geese involved may be small. Another small segment of the NAP may still winter along the Outer Banks of North Carolina.

In recent years, the number of geese wintering in the Maritime Provinces has grown, consistent with shifts in winter ranges of other migratory goose populations. Whether this is due to a shift in winter distribution, a range-wide increase in NAP abundance, or a growing number of AFRP geese in that region is unclear. However, having more geese wintering in the northern Atlantic Flyway can exacerbate problems associated with overabundant AFRP geese, such as agricultural depredation. In some portions of the NAP wintering grounds, crop depredation is a serious concern, particularly in the early spring as migrant geese start heading north. In other areas foraging geese are impacting winter cover crops. Management to alleviate such concerns depends in large part on whether NAP or AFRP geese are responsible.

Changes in the seasonal distribution of migratory geese have been a challenge for waterfowl managers for decades. There is much debate about the feasibility of trying to maintain the historic distribution of the NAP, in light of changing climate and land use patterns that have allowed geese to winter in more northern locations. Nonetheless, we remain supportive of efforts to investigate the potential for management, and to avoid actions that may accelerate the loss of traditional wintering flocks in southern areas of the flyway. Where practical, hunting regulations may be tailored to promote survival and movement of NAP geese affiliated with southern wintering areas.

Possible research related to this objective would include studies designed to estimate the numbers of NAP geese staging or wintering at key locations in the Atlantic Flyway. Historical data were reviewed to delineate high and low harvest areas for use in harvest management (see Objective C: Harvest Management). Additional information might be gained from local population surveys, tissue analyses (e.g., DNA, stable isotopes), band recovery data and satellite telemetry or neck-collar studies. Geese are currently being neck-banded in Greenland, so results of those studies may contribute to this management objective.

C. Harvest Management

Objective: Establish annual hunting regulations to help achieve the population size and distribution objectives for NAP geese, and allow maximum opportunity for harvest of AFRP geese.

Approach:

1. Establish target harvest rates to be achieved in Canada and the U.S. based on NAP status.

   Responsibility: AFC, USFWS, CWS

2. Implement hunting regulations to achieve desired harvest rates, provide sustainable and equitable opportunity for all stakeholders, and maximize harvest of AFRP geese.

   Responsibility: AFC, USFWS, CWS

3. Periodically assess harvest rates and distribution of NAP goose harvest, based on band recovery data.

   Responsibility: AFC, USFWS, CWS

4. Incorporate current information on seasonal distribution of NAP geese to direct harvest away from birds affiliated with southern wintering locations, where practical.

   Responsibility: AFC. USFWS

5. Assess feasibility of developing a population model for NAP geese.

   Responsibility: AFC, USFWS, CWS

Discussion: Goose hunting regulations serve dual purposes of affecting population size and recreational opportunity. To accomplish this objective, we will develop a formal harvest strategy (Appendix I) that prescribes specific regulatory packages (i.e., season lengths, bag limits, framework dates) to achieve desired harvest rates for the NAP, and criteria for when and where each package should be used. Regulatory packages for Canada may differ from those in the U.S. Having packages and criteria set in advance and followed for several years at a time should result in more stable and predictable hunting regulations, and increase our knowledge of how regulations affect harvest.

An essential component of the harvest strategy is continued use of "tiered" harvest regulations in the U.S. to maximize harvest of AFRP geese, while affording protection of NAP geese in high harvest areas. "High" and "low" harvest areas for NAP geese were first established in 2002. Low harvest areas (defined as areas where <30% of all NAP band returns in a state came from) have been allowed longer seasons and higher bag limits than high harvest areas. Harvest of NAP geese in current low harvest zones has been relatively small, as expected from the historic data used to delineate those zones. However, periodic refinement of high and low harvest areas, including delineation of new AFRP harvest zones, should be a part of the NAP harvest strategy. Establishment of AFRP harvest zones in existing NAP zones, where existing AFRP zone criteria are met (< 10% of a states total migrant recoveries), would further increase potential harvest of AFRP geese, with negligible impact on the NAP. Establishment of regional (interstate) AFRP and low harvest zones should be considered if acceptable to all affected states.

Past analyses have indicated that the NAP can sustain harvest rates approaching 25% when reproductive success is good. Consequently, the harvest strategy developed under the previous interim NAP plan prescribed four target harvest rates, ranging from “very restrictive” (4%) to “liberal” (24%) to achieve population management needs. Current regulations in Canada are consistent with the liberal harvest rate, whereas current regulations in the U.S. are more

consistent with a moderate harvest rate. Although the NAP is believed to be stable, uncertainty about its status has delayed implementation of more liberal regulations in the U.S.

Recent analyses of NAP band recovery data (1998-2001) indicate that direct recovery rates and estimated harvest rates in the U.S. NAP area have been low. From 1998-2000, a period characterized by 40-day seasons with a 2-bird daily bag, the mean direct recovery rate in the U. S. NAP zone was 1.8%. This translates to a mean harvest rate of 3.3%, assuming a reporting rate of 0.54 (S. Sheaffer, unpubl. data). From 2002-2007, a period in the U.S. high harvest areas characterized by 60-day seasons with a 2-bird daily bag, mean direct recovery rates in the U. S. were 2.9%. Given the same reporting rate estimate of 0.54, this translates into a 5.5% harvest rate. The recently completed reporting rate study (USFWS unpubl. data) indicate reporting rates of ~68% for interior Canada geese. Thus the estimate of a 5.5% harvest rate is likely high.

Recent season structures have not resulted in high harvest of NAP geese within the U.S. NAP harvest zones. Further, the geographic distribution of NAP recoveries in New England and New York has been very consistent, with most coming from areas east of the Connecticut River and on the eastern half of Long Island. In those areas where the potential to harvest migrant NAP geese is low, states should be allowed to have more liberal seasons in order to exert greater harvest pressure on resident goose populations.

To ensure that desired harvest rates are not being exceeded, an improved preseason banding program and periodic analysis of band recovery data are needed. Band recovery analysis has also served as the basis for delineating harvest zones for the NAP and other goose populations throughout the flyway. Continued monitoring of harvest derivation and distribution is necessary to ensure that harvest zones are accurately delineated and updated when appropriate.

Unfortunately, capturing an adequate sample of NAP geese is difficult. Rocket netting of geese on PEI during spring migration has resulted in banding of several hundred geese per year, but this is not sufficient to provide satisfactory estimates of harvest rate or survival. We suggest a pre-season banding goal of approximately 1,000 NAP geese (adults and juveniles) per year to allow for more reliable monitoring of annual harvest rates. Feasibility (and cost) of establishing a breeding ground banding program is a high priority, but spring banding to achieve the desired sample size should continue in the interim.

If it is determined that a significant number of NAP geese still occur in southern wintering areas, then measures to promote continuation of this flock should be considered. Previous studies have indicated that the bulk of NAP geese tend to migrate later in the fall than AP geese, so modest delays in opening date may have limited utility for this population. However, geese moving to southern terminus locations in North Carolina and Virginia may migrate earlier than those birds wintering in the northern wintering areas. Allowing harvest in the U.S. NAP areas during early fall (rather than later) may afford greater protection to NAP geese. However, given the relatively low harvest rates (<6%) on NAP geese in the U.S. it is uncertain whether more extended closures would allow significantly more geese to pass through to southern wintering areas.

Finally, we acknowledge that population models could be useful tools for harvest management of NAP geese. It would be desirable to have models that relate population growth rate to

population size, productivity, and expected harvest rates, based on an objective analysis of available data. Unfortunately, we do not currently have reliable estimates or indices of population size and productivity upon which to base harvest models, and obtaining better data through field studies is too costly. Alternatives such as Potential Biological Removal models (as have been developed for wood ducks) may offer some potential, and should be explored as opportunities arise.

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APPENDIX I

Harvest Strategy for NAP Canada Geese, 2008-2012

This appendix describes the process by which the Atlantic Flyway Canada Goose Committee will recommend annual goose hunting regulations for NAP harvest areas. It is based largely on principles established for management of NAP geese since 1996 when the NAP was formally recognized as a distinct population in the Atlantic Flyway.

NAP Harvest Region: NAP harvest regulations shall apply to the following areas of the Atlantic Flyway (Fig. 1):

In the U.S.: 1) the entire states of Maine, New Hampshire, and Rhode Island: 2) the Connecticut River Zone of Vermont; 3) the Coastal and Central Zones of Massachusetts; 4) the NAP Zone of Connecticut; and 5) the Long Island Zone of New York State.

In Canada: 1) all of the Atlantic Provinces (Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and New Brunswick); and 2) hunting districts B, E, and G in Quebec.

NAP Harvest Zones: Within the U.S. portion of the NAP harvest region, states may delineate up to three Canada goose harvest zones (High Harvest, Low Harvest, and AFRP zones) to maximize harvest of AFRP geese while affording adequate protection of NAP geese. High Harvest zones must include the locations of at least 70% of all known direct and indirect recoveries of leg-banded NAP geese. Low Harvest zones may include no more than 30% of all recoveries in the state, and may be further subdivided to create an AFRP Zone, where no more than 10% of all NAP recoveries in the state have occurred.

In Canada, NAP harvest zones include all of the Atlantic Provinces (Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and New Brunswick), and hunting districts B, E, and G in Quebec.

Regulatory Alternatives: Past analyses have indicated that the NAP can sustain harvest rates approaching 25% when reproductive success is good. Therefore, regulatory alternatives were designed to achieve overall harvest rates of 4% (very restrictive), 8% (restrictive), 16% (moderate), or 24% (liberal). Specific hunting regulations expected to achieve these harvest rates are prescribed below, followed by criteria for when each harvest level should be considered.

Closed season:	No regular season for migrant geese in Canadian or U.S. NAP harvest areas, except in designated AFRP areas. Restrictions outside of the NAP Harvest region (e.g., coastal New Jersey, eastern Maryland, Delaware, and coastal areas of Virginia and North Carolina) may be considered.
Very Restrictive:	Regulations in Canada should include a limited season with a 2-bird daily

bag limit. In U.S. High Harvest areas, a 15-day season, between October 1 and November 30, with a 1-bird daily bag, is recommended. In U.S. Low Harvest areas, a 30-day season, between October 1 and February 15, with a 2-bird daily bag is recommended.

Restrictive: Regulations in Canada may provide for a full season with no greater than a 3-bird daily limit. In U.S. High Harvest areas, a 30-day season, between October 1 and December 31, with a 2-bird daily bag, is recommended. In U.S. Low Harvest areas, a 50-day season, between October 1 and February 15, with a 3-bird daily bag is recommended.

Moderate: Regulations in Canada may provide for a full season with a 5-bird daily limit. In U.S. High Harvest areas, a 60-day season, between October 1 and January 31, with a 2-bird daily bag, is recommended. In U.S. Low Harvest areas, a 70-day season, between October 1 and February 15, with a 3-bird daily bag is recommended.

Liberal: Regulations in Canada may provide for a full season with a 5-bird daily limit. In U.S. High and Low Harvest areas, a 70-day season, between October 1 and February 15, with a 3-bird daily bag, is recommended.

Note: Special seasons for AFRP geese (September and late winter) may continue in all areas, and are not counted as part of regular seasons prescribed above. Also, in designated AFRP areas within the NAP harvest region, an 80-day season, between October 1 and March 10, with a 5-goose daily limit is recommended.

Criteria for Selecting Regulatory Alternatives: Establishing criteria for selecting the most appropriate regulatory package for NAP geese is difficult in the absence of a single, reliable, annual estimate of population size and productivity. Therefore, we recommend that regulations be based on consideration of all available population data, to assess current status of the NAP relative to indices from 2001-2005. We will compare annual as well as 3-year running averages of breeding pair estimates and total population size, and consider current year weather conditions on the breeding grounds, in order to assess NAP status and recommend a regulatory package.

In general, the following assessments will result in recommending the corresponding regulatory alternative:

1. A **Closed** season should be considered when the breeding population falls below 25% of the observed 2001-2005 level.

2. A **Very Restrictive** season should be considered when the breeding population falls below 50% of the observed 2001-2005 level.

3. A **Restrictive** season should be considered when the breeding population falls below 75% of the observed 2001-2005 level.

4. A **Moderate** season should be considered when the breeding population is within the observed 2001-2005 level.

5. A **Liberal** season should be considered when the breeding population is at or above the observed 2001-2005 level.

Discussion: Most migratory bird hunters favor longer seasons over high bag limits, and we assumed this to be true for goose hunters as well. This was reflected in the regulatory alternatives above, which were designed to maximize the number of days with 2-3 bird limits.

No explicit allocation of NAP harvests between Canada and the U.S. is proposed. NAP geese spend much of the fall and winter seasons in Canada, so more harvest would be expected to occur in Canada than in the U.S. However, having equitable opportunities for goose hunting in both jurisdictions is desirable, especially in areas of the U.S. where harvest can help alleviate conflicts associated with AFRP geese. Consequently, maximum season lengths in both jurisdictions are comparable when both regular and special seasons are considered.

Further, NAP geese comprise the majority of geese harvested in most of Atlantic Canada, so fairly uniform regulations across that region seem appropriate at this time. In contrast, the proportions of NAP and AFRP geese available to hunters in the northeastern U.S. vary widely, often on a very localized scale. In some cases, this allows managers to refine hunting regulations to provide more goose hunting opportunity in areas where AFRP geese comprise most of the harvest. While this may complicate regulations among and within states, the benefits of increasing recreational opportunity and harvest of AFRP geese are important.

Framework dates were considered an important part of the regulatory alternatives. NAP geese tend to migrate later than AP geese, and collar observation data suggest that in early October more than 70% of NAP geese are still in Canada. That figure drops to 60% by late October and 44% in November. The number of NAP geese found in the U.S. NAP area remains nearly stable from November through the late winter. Allowing the majority of the hunting season in U.S. high harvest areas in the early fall months will allow some resident geese to be harvested at a time when duck seasons are open and most waterfowl hunters are afield.

Evaluation:
Regulations should remain constant for at least 3 years following any change, to allow for more systematic evaluation. Direct recovery rates for NAP geese should be determined annually, including a summary of where (state or province) and when (e.g., regular or special seasons, by month, etc.) recoveries occurred. Harvest rate estimates should be reviewed periodically (e.g., every 3 years after a regulation change) and compared to target harvest rates for the regulations that were in effect. Possible changes to regulatory packages may be warranted if harvest rates exceed or fall below targeted levels, and changes in regulations may be necessary sooner than every 3 years if population status changes abruptly.

APPENDIX II

Figures

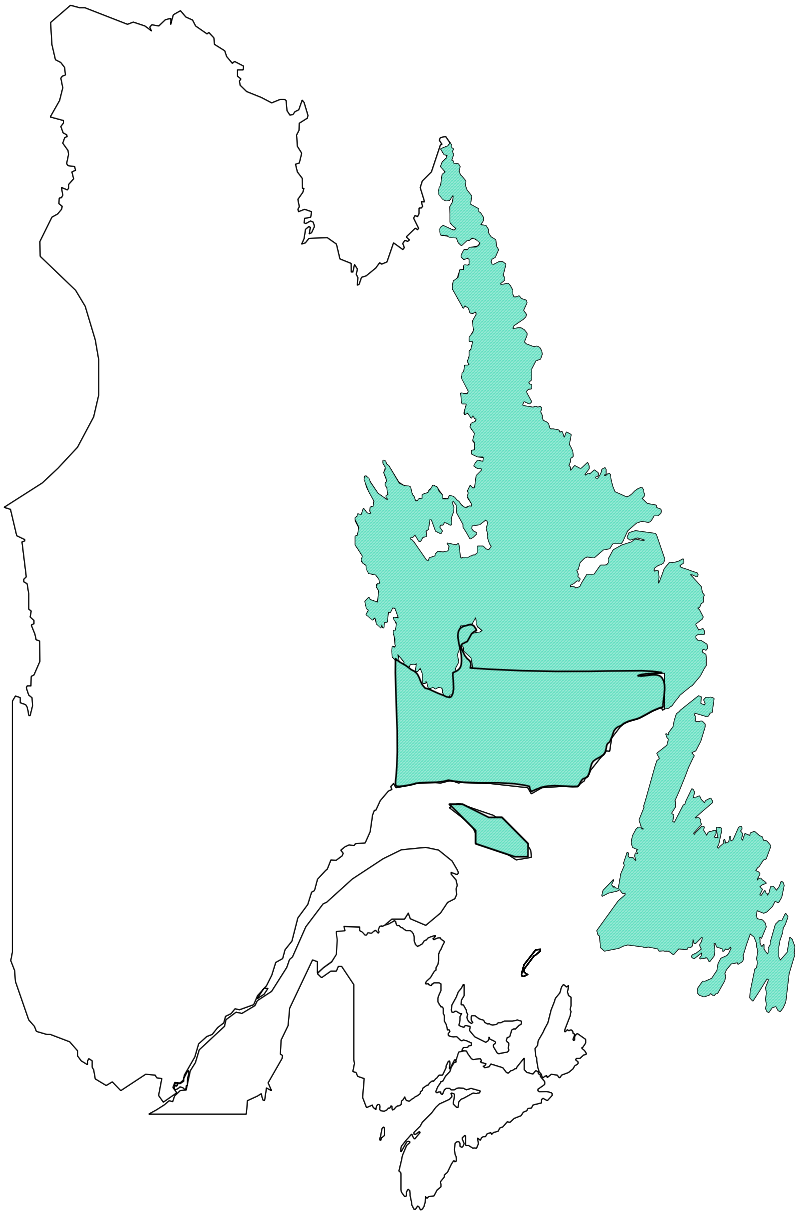

Figure 1. Breeding range of North Atlantic Population Canada geese.

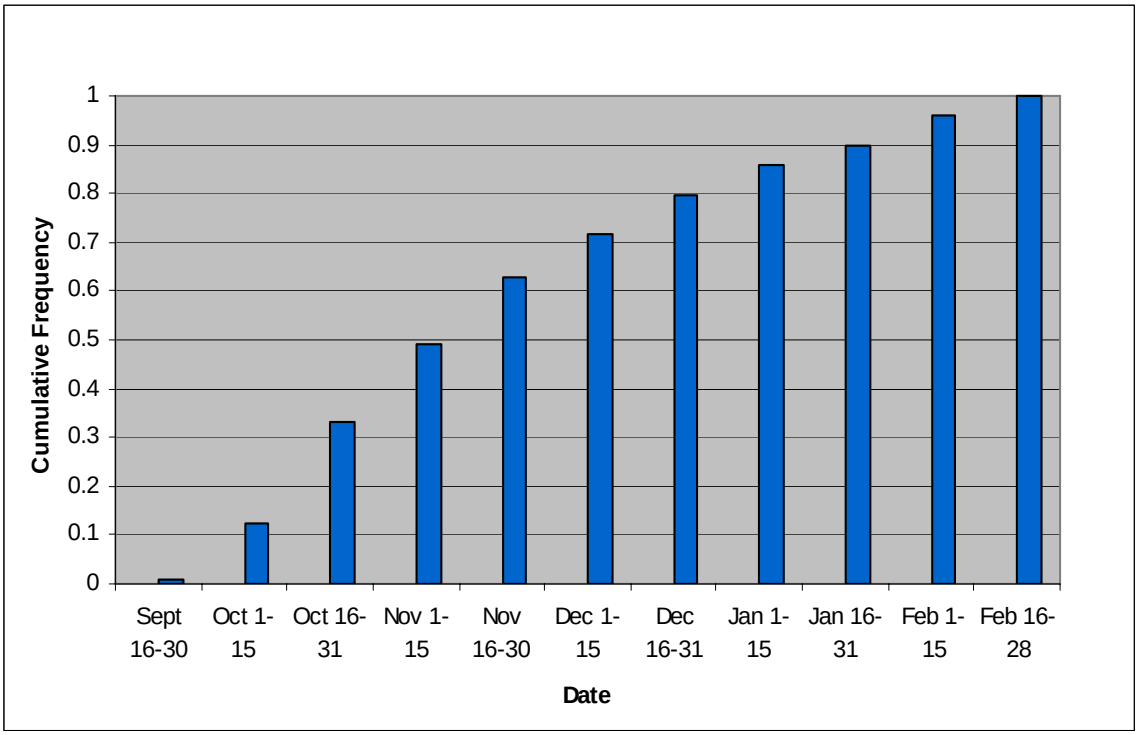

Figure 2. Temporal neck collar observations of North Atlantic Population Canada geese in southern New England.

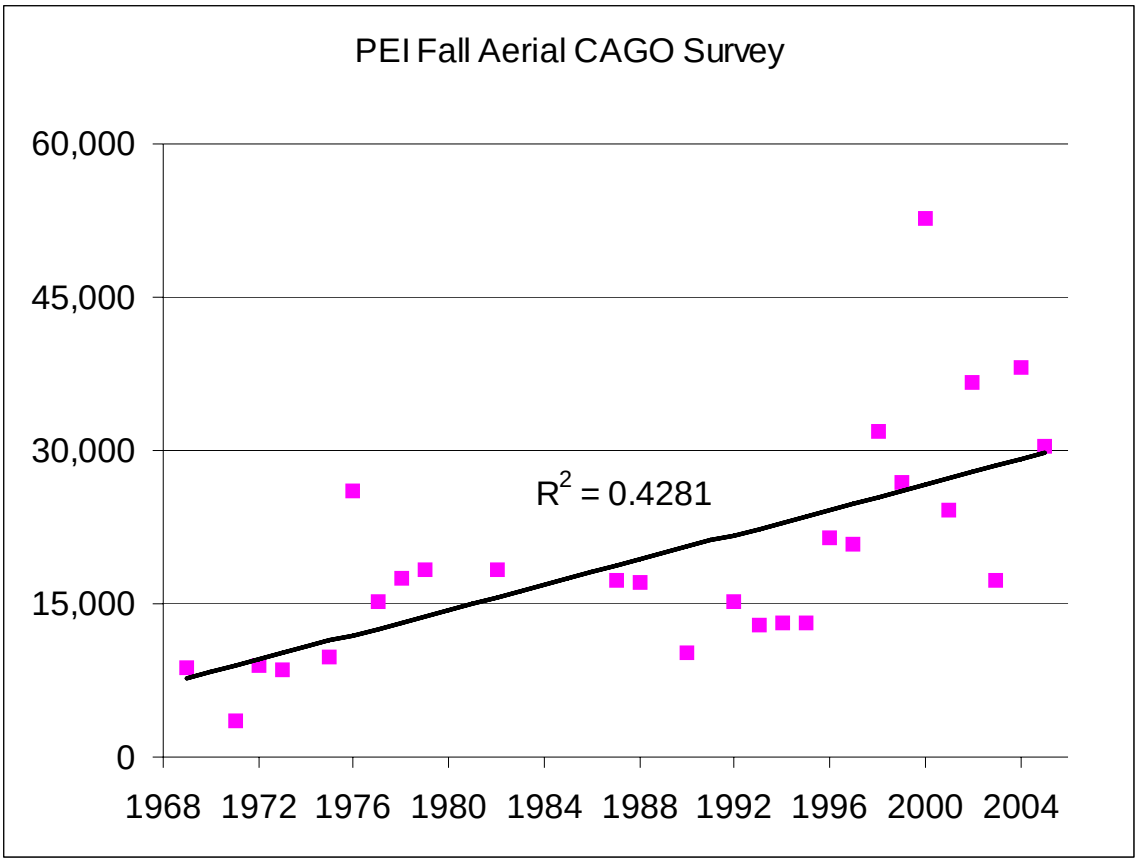

Figure 3. November counts of North Atlantic Population Canada geese on Prince Edward Island.

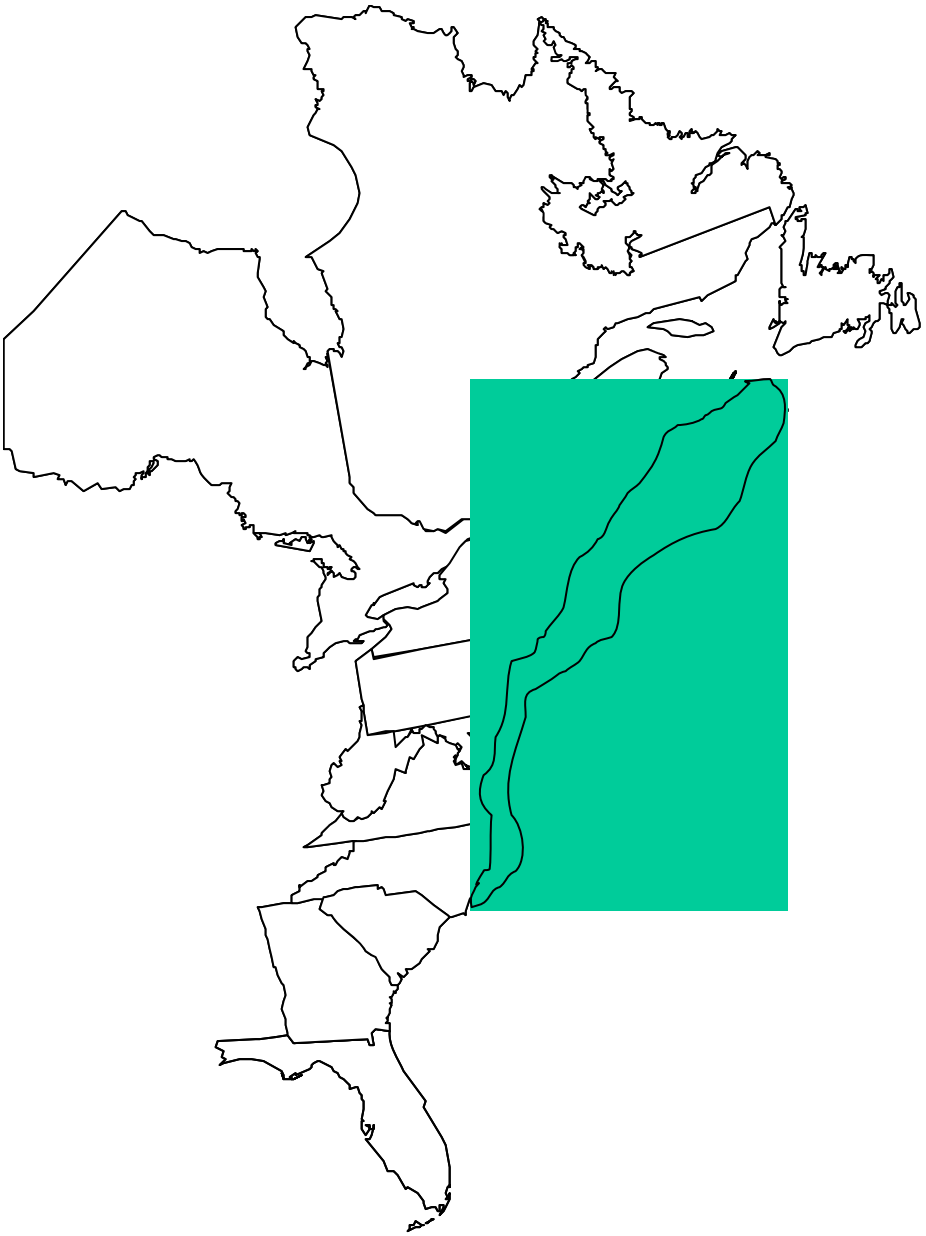

Figure 4. Wintering range of North Atlantic Population Canada geese.

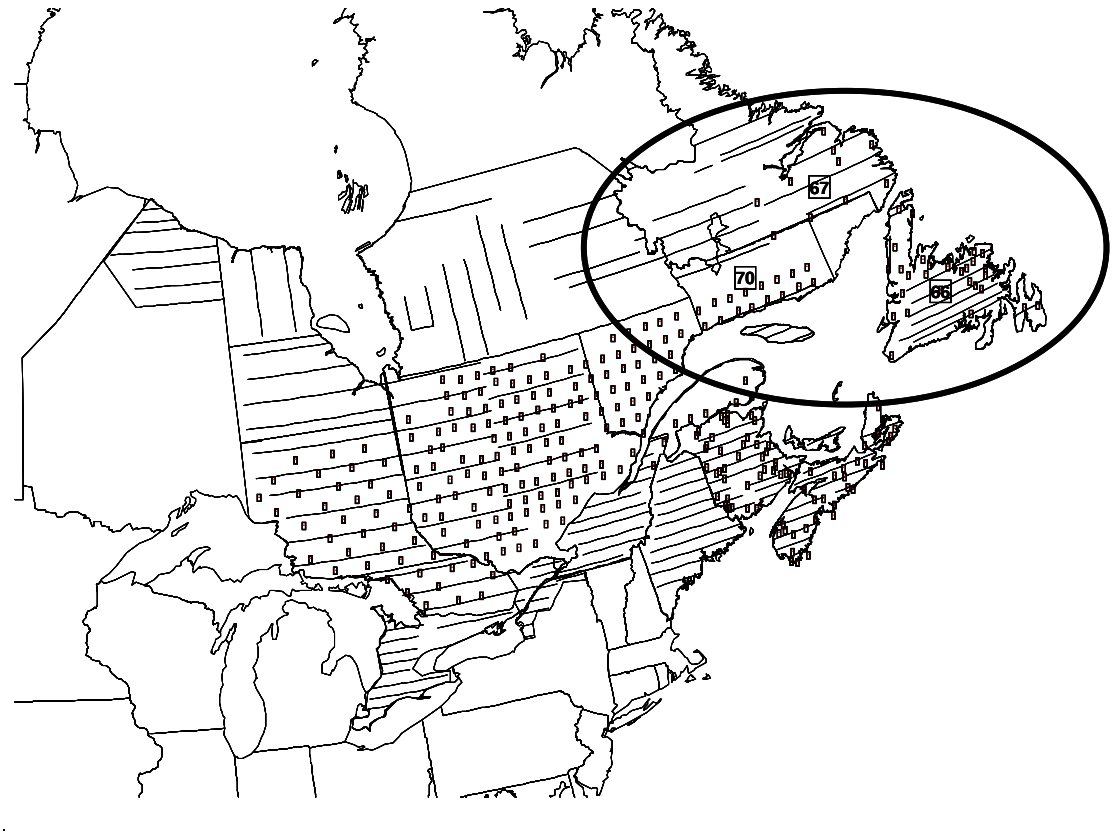

Figure 5. Fixed-wing transects and helicopter plot locations for North Atlantic Population breeding surveys.

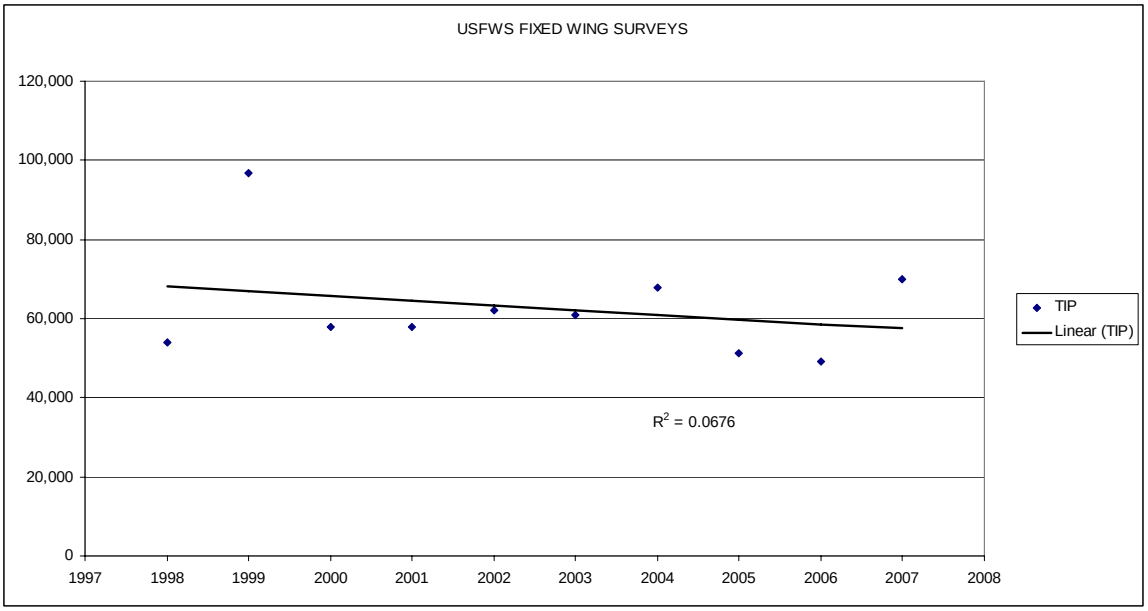

Figure 6. Fixed-wing breeding survey results (Total Indicated Pairs) for North Atlantic Population Canada geese, 1996-2007.

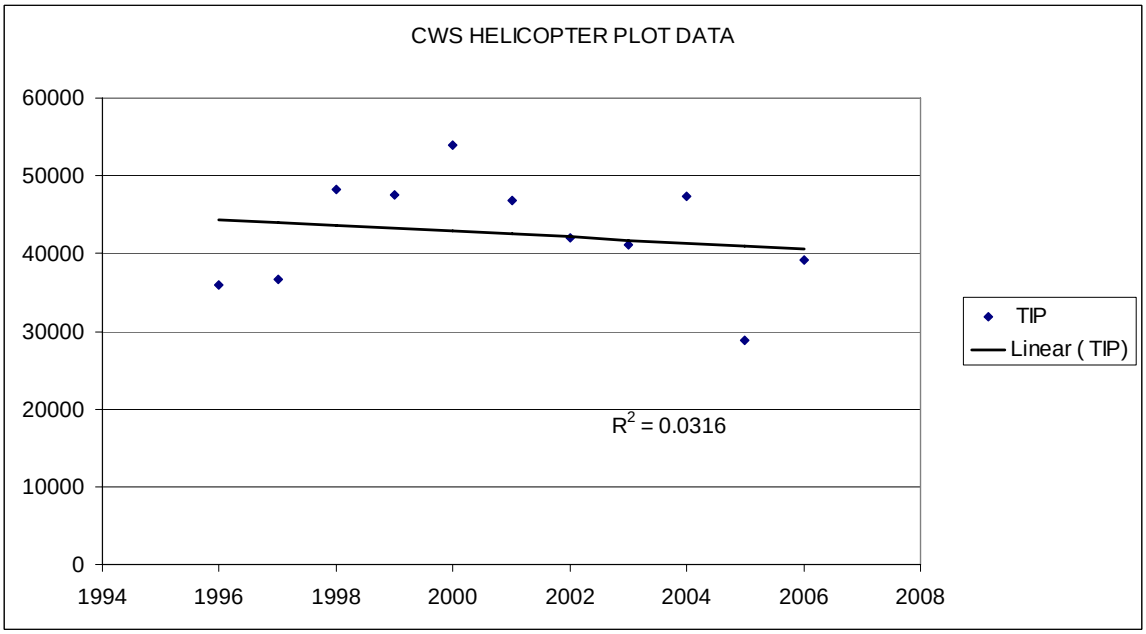

Figure 7. Helicopter plot breeding survey results (Total Indicated Pairs) for North Atlantic Population Canada geese, 1996-2007.

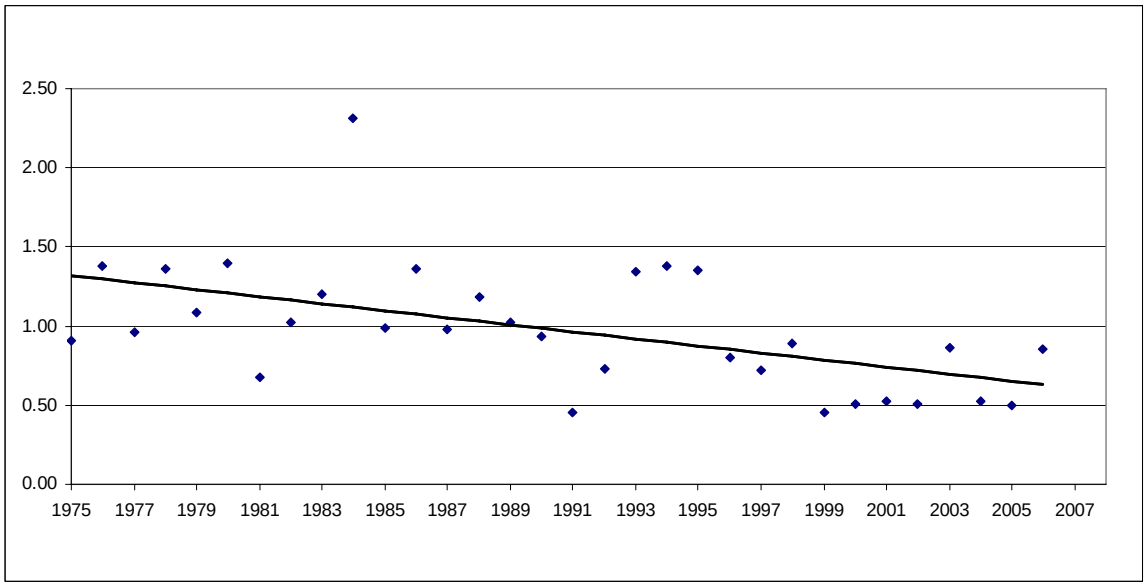

Figure 8. Age ratios of harvested North Atlantic Population Canada geese in Canada, 1975-2007.

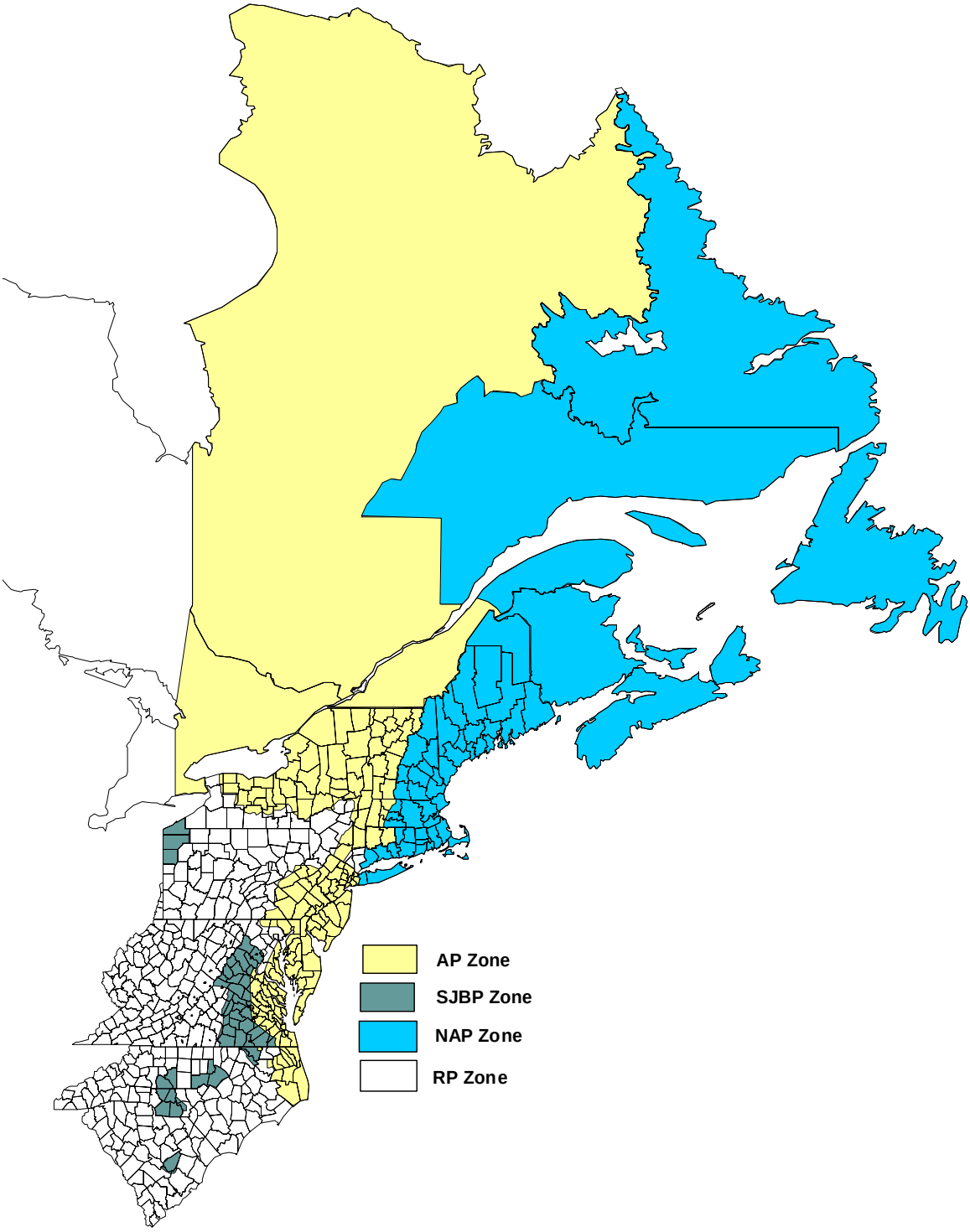

Figure 9. North Atlantic Population Canada geese harvest areas in the U.S and Canada.

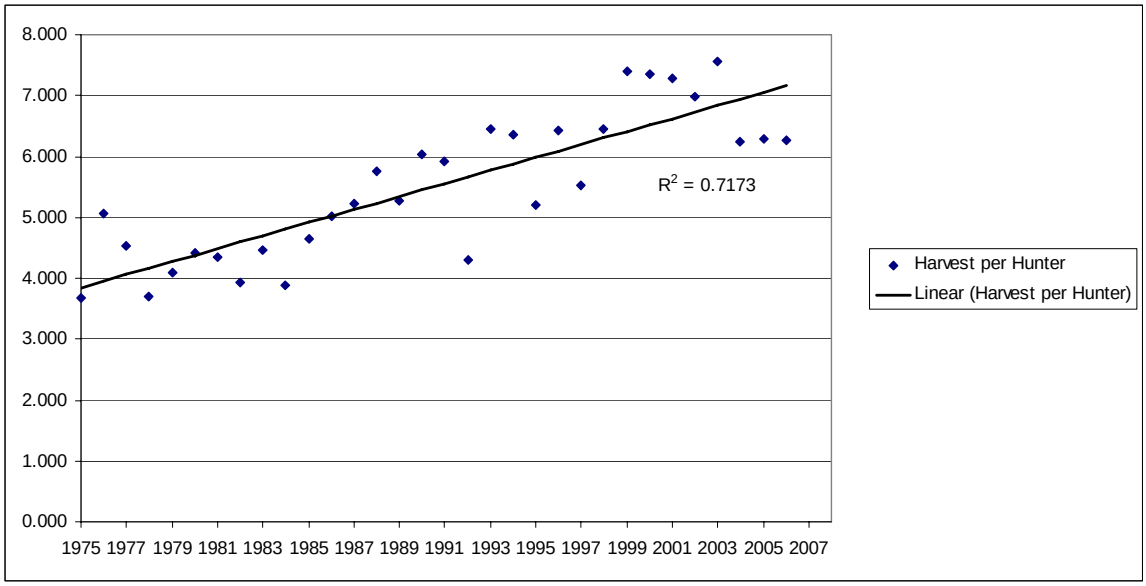

Figure 10. Harvest per successful goose hunter in Canadian NAP harvest area.

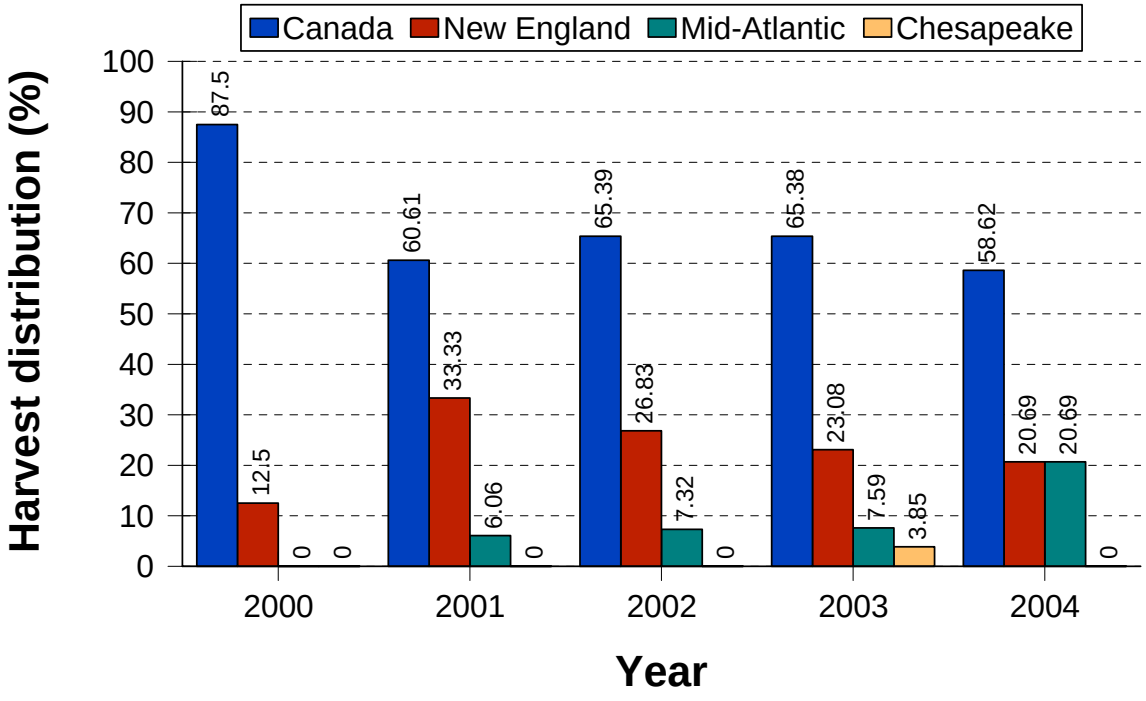

Figure 11. Estimated harvest derivation of Canada geese in the U.S. NAP harvest areas, 2000-2004.

Tables

Table 1. Estimated regular season harvests of Canada geese in Atlantic Provinces of Canada, 1998-2006.

Season	NFL	PEI	NS	NB	Total[1]	NAP[2]
1998	9,746	23,781	10,802	6,225	50,554	50,554
1999	5,464	32,944	12,633	6,079	57,120	57,120
2000	8,223	25,932	13,507	8,418	56,080	56,080
2001	5,553	25,136	10,554	5,615	46,858	46,858
2002	6,744	22,126	10,831	4,962	44,663	44,663
2003	5,004	20,983	4,915	11,245	42,147	42,147
2004	4,481	15,028	5,996	6,100	31,605	31,605
2005	5,516	16,109	5,240	6,866	33,731	33,731
2006	4,364	11,245	4,769	6,940	27,318	27,318
2001-05 Mean	5,460	19,876	7,507	6,958	39,801	39,801

[1] Estimates of goose harvest in southern Quebec are unavailable at this time.
[2] Estimated NAP harvest, assuming NAP = 100% of Total CAGO harvest in the Atlantic Provinces.

Table 2. Estimated regular season harvests of Canada geese in U.S. NAP zones, 1998-2006.

Season	ME	NH	MA-Cen	MA-Coa	RI	CT-NAP	NY-LI	Total	NAP[1]
1998	3,709	2,954	5,015	4,042	2,064	2,885	2,900	23,569	4,714
1999	7,897	4,147	4,493	2,330	2,376	5,935	1,504	28,682	5,736
2000	4,805	4,536	3,631	3,279	1,468	4,729	1,924	24,372	4,874
2001	5,468	3,169	3,121	2,299	1,874	7,187	5,461	28,579	5,716
2002	9,135	4,791	5,855	1,244	2,358	8,254	7,812	39,449	7,890
2003	6,322	3,819	3,348	1,142	3,439	7,061	5,766	30,897	6,179
2004	4,546	2,658	4,122	1,975	3,538	4,803	6,494	28,136	5,627
2005	5,394	3,556	2,465	1,904	2,772	9,275	8,268	33,634	6,727
2006	7,474	4,386	2,583	2,583	4,680	6,438	8,938	37,082	7,416
2001-05 Mean	6,173	3,599	3,782	1,713	2,796	7,316	6,760	32,139	6,428

[1] Estimated NAP harvest, assuming NAP = ~20% of Total CAGO harvest in New England (from Tables 24-25 in Sheaffer 2005).