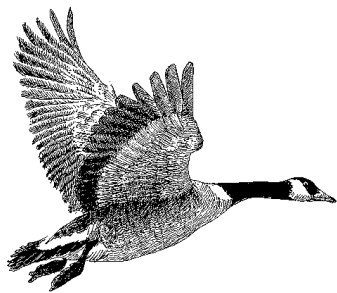


A BREEDING PAIR SURVEY OF CANADA GEESE IN NORTHERN QUÉBEC - 2017



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During the 1960's, aerial surveys identified the Ungava Peninsula in northern Québec as the primary nesting area for Atlantic flyway Canada geese (Kaczynski and Chamberlain 1968). Malecki and Trost (1990) used a more quantitative approach to estimate the number of breeding pairs throughout the boreal forest and Ungava Peninsula. Their findings confirmed that the highest densities were located along the coastal areas of Ungava Bay and Hudson Bay. In 1993, an annual survey was initiated in northern Québec using methods developed by Malecki and Trost (1990) (Bordage and Plante 1993). The objective of this survey is to monitor the status of the Atlantic population by estimating the number of breeding pairs. This report presents the results of the 2017 breeding ground survey.

Acknowledgments: This survey was cooperatively funded by the U. S. Fish and Wildlife Service (USFWS), Canadian Wildlife Service (CWS), and the Atlantic Flyway Council. Jean Rodrigue (CWS) served as an observer and Steve Earsom (USFWS) served as pilot and observer. William Harvey analyzed the data and wrote the report.

SURVEY METHODS

The survey followed the methodology of Malecki and Trost (1990). Aerial transects were flown in a Quest Kodiak on wheels at 30-45 m above ground level and a ground speed of 140 km/h. The survey is timed to cover the mid to late incubation period. Except for 2013 when no survey was flown, the survey has been conducted annually since 1993.

Observers recorded the number of geese observed as singles, pairs, or in groups (3 or more geese) within 200 m of each side of the plane. We occasionally observed multiple pairs of geese in close association (< 10-15 m apart). We classified these geese as grouped birds, since they were unlikely to be associated with a territory. Observers also recorded similar information for other waterfowl species. Coordinates for each location were generated using a global positioning system (GPS) and stored on a lap-top computer. Transect width was calibrated before the survey began.

The number of indicated pairs on a given transect was the sum of the singles and pairs observed by both observers. The total number of geese was the sum of grouped geese plus indicated pairs. The density of breeding pairs and total population density was estimated using a stratified quotient estimator; variance was calculated using the jack-knife procedure (Cochran 1977). Difference in population size between years was assessed with a z-test, using the sum of the sampling variances for the 2 years being compared. We considered differences to be significant

at the 0.10 level. The estimates presented in this report are not adjusted for visibility bias and thus represent an index to the population.

SURVEY STRATIFICATION

The survey area (north of 51° latitude and west of 67° longitude) was originally stratified based on Malecki and Trost's (1990) modification of northern Québec's ecoregions (Gilbert et al. 1985). In 2012, we modified survey strata to better capture differences in goose density by 1) adding a 20-mile buffer to the Hudson Bay coastal zone, 2) adding a 10-mile buffer to the Ungava Bay coastal zone, 3) shifting the portion of the Hudson Bay coastal zone south of Inukjuak and the portion of the Ungava Bay coastal zone northwest of Kangirsuk into the interior stratum, and 4) combining the interior tundra and taiga into a single stratum. This change created 3 strata: 1) Ungava Bay coast, 2) Hudson Bay coast, and 3) interior (Figure 1).

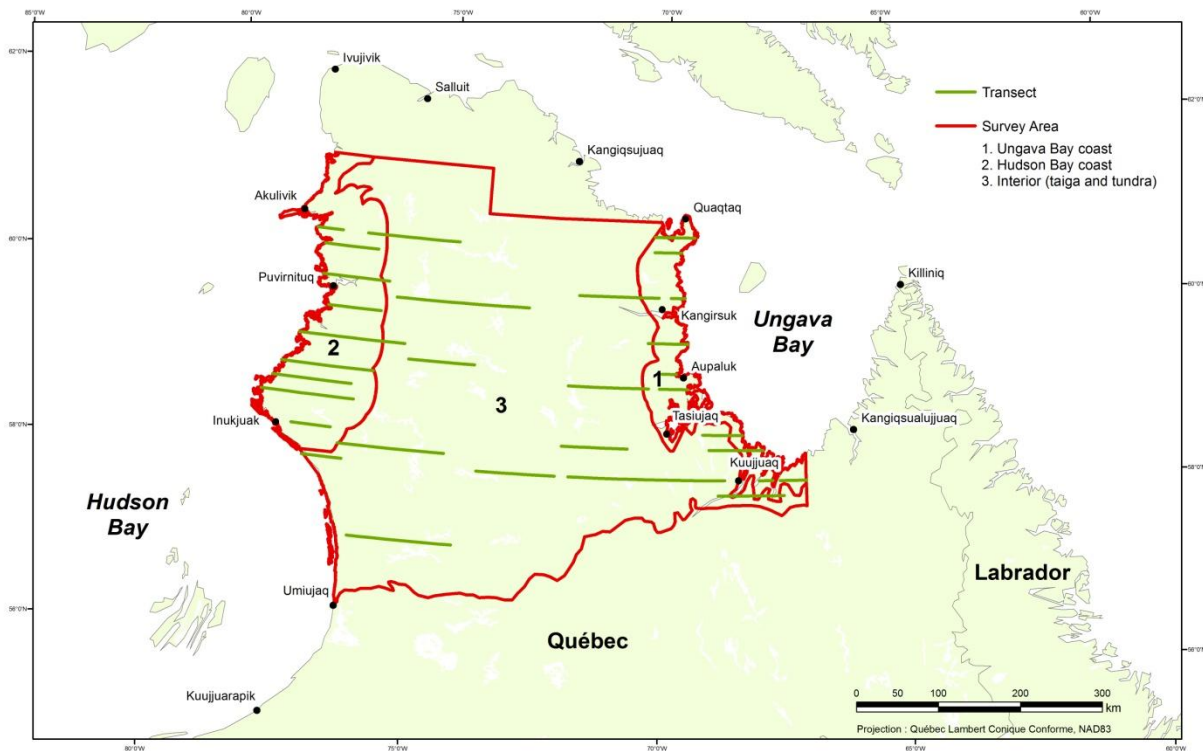


Figure 1. Location of survey strata and aerial transects in northern Québec.

RESULTS AND DISCUSSION

Habitat Conditions and Productivity Assessment

Transects were surveyed June 12-17. Habitat conditions during the survey appeared more advanced than average; most lakes and ponds were open and only patches of snow remained. The long-term average date of nest initiation is May 28 on the Hudson Bay coast and May 24 on the Ungava coast (Cotter et al. 2013). Snow cover maps from the last week of May, 2017 (Figure 2) suggest better nesting conditions than in 2016, when production was well below average. However, the late May snow maps do not suggest the very early spring thaw that often leads to high productivity. A model using May temperatures and June snowfall to forecast recruitment predicts slightly below average production for 2017 (J. Stiller, NY DEC).

The number of indicated pairs includes birds recorded as pairs and singles. Single birds are likely to be males associated with an incubating female while pairs include some nesting birds as well as subadult or failed breeders. Therefore, the proportion of indicated pairs observed as singles may provide a more reliable indicator of the proportion of indicated pairs that are actually nesting (see Humburg et al. 1998). The percentage of indicated pairs observed as singles on the Ungava Peninsula was 69% in 2017, the highest recorded for the history of the survey (mean = 52%, range = 34-69%).

Breeding Pair and Total Population Estimates

The estimated number of breeding pairs on the Ungava Peninsula in 2017 (161,147 pairs; SE = 17,246) was similar to the 2016 estimate of 191,526 pairs (SE = 24,898) ($P = 0.317$) (Figure 3). The current 3-year average for breeding pairs is 171,325 pairs. The total population estimate ((indicated pairs x 2) + non-breeders) in 2017 (705,926 individuals; SE = 73,125) was similar to the 2016 estimate of 663,495 individuals (SE = 80,114) ($P = 0.697$) (Figure 3). The total population estimate includes breeding pairs, non-breeders (i.e., those not of breeding age), failed breeders, and molt migrants from other areas and should therefore be interpreted cautiously. The sharp decline in the total population since 2010 (Figure 3) corresponds to an extended period of average or below-average production years (Figure 4), but may also be partly attributed to earlier survey dates and fewer molt migrants being counted.

Comparison of Survey Strata

From 1993-2000, the estimated density of breeding pairs was similar in the Hudson and Ungava Bay coastal zones (Figure 5). Since 2000, the pair density along Hudson Bay has increased dramatically while the density along Ungava Bay has remained largely stable (Figure 5). Pair density in the interior has remained low and relatively stable. At current densities, the distribution of total breeding pairs within the survey area is 60% on the Hudson Bay coast, 10% on the Ungava Bay coast, and 30% in the interior. Within the Ungava Bay coast transects, the relative distribution of indicated pairs has declined on southern transects (transects 17, 18, 19, 20, and 21), increased on northern transects (transects 11, 12, 13), and remained about the same on mid-latitude transects (transects 14, 15, and 16) (Figure 6).



Figure 2. Snow depth maps for northern Quebec from the last week of May in 2017 (A) and 2016 (B).

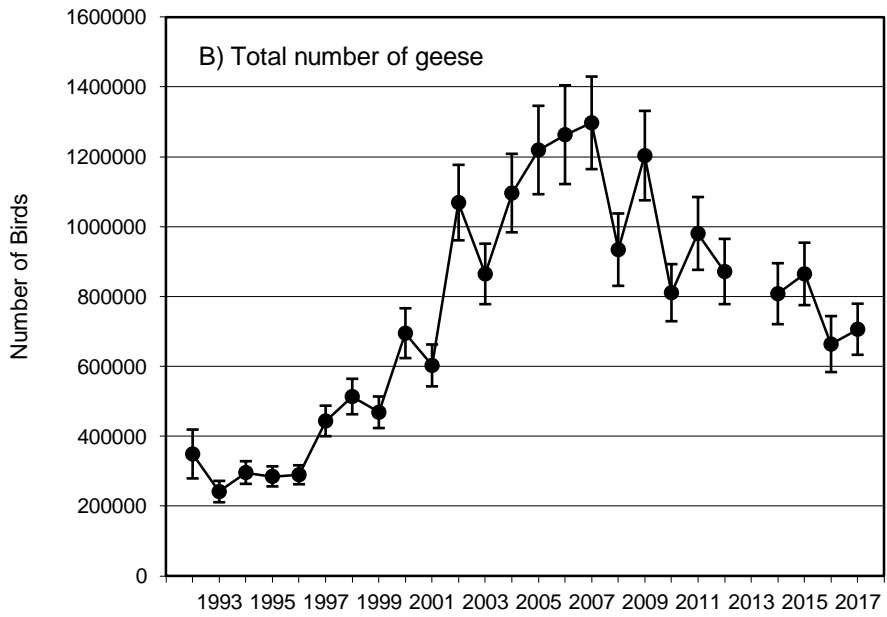
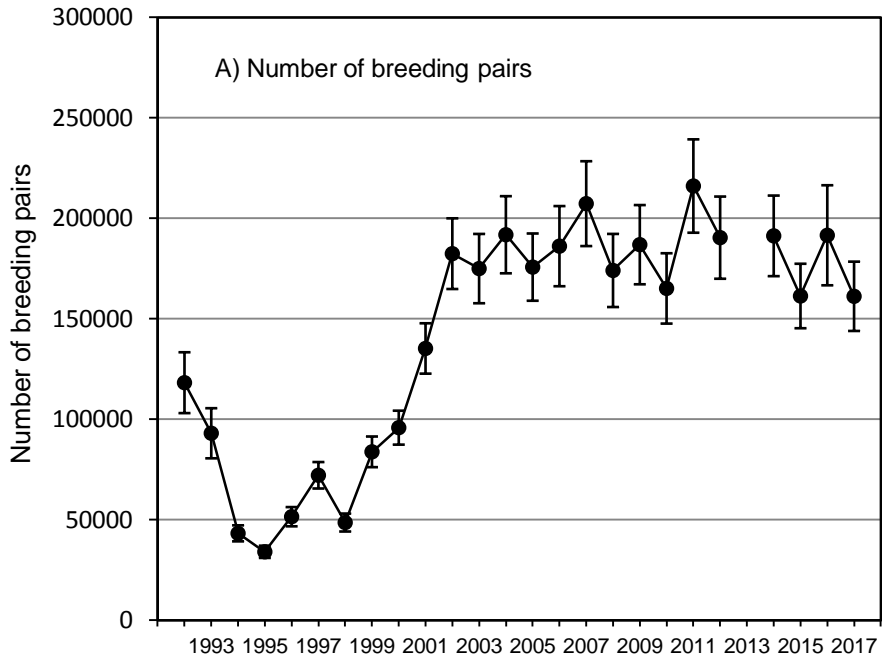


Figure 3. Estimated number (± 1 SE) of Canada goose breeding pairs (A) and total geese (B) on the Ungava Peninsula (No survey was flown in 2013).

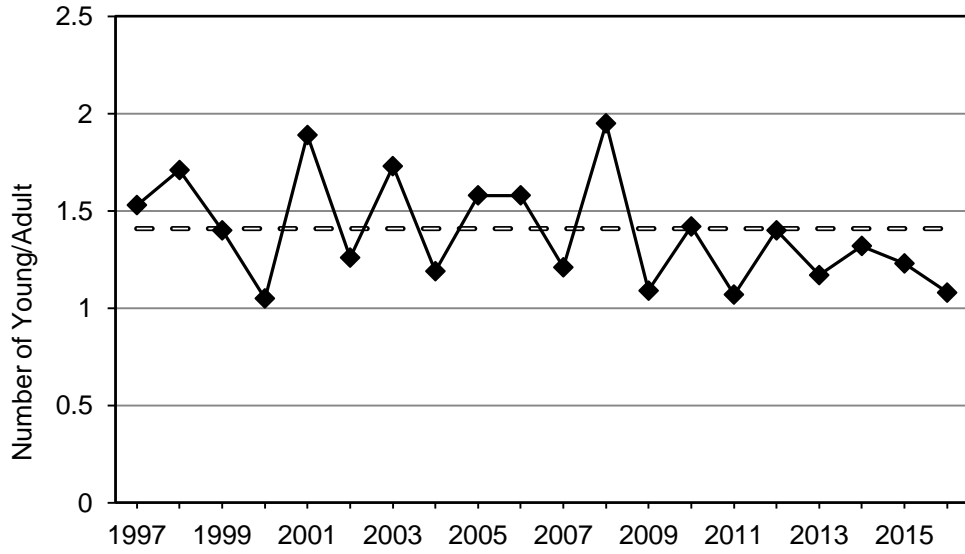


Figure 4. Number of young per adult captured in banding drives in northern Quebec (dashed line is long-term average).

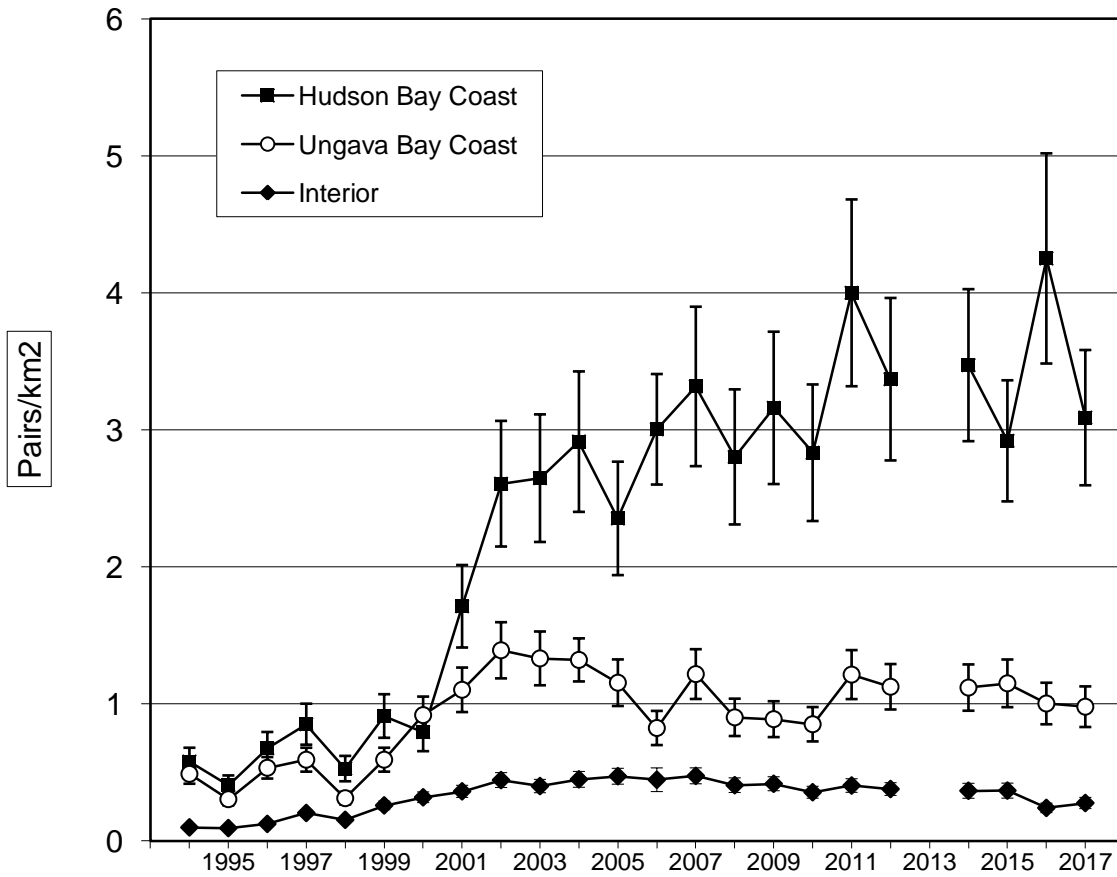


Figure 5. Average density (± 1 SE) of breeding Canada goose pairs for the Hudson Bay coast, Ungava Bay coast, and interior.

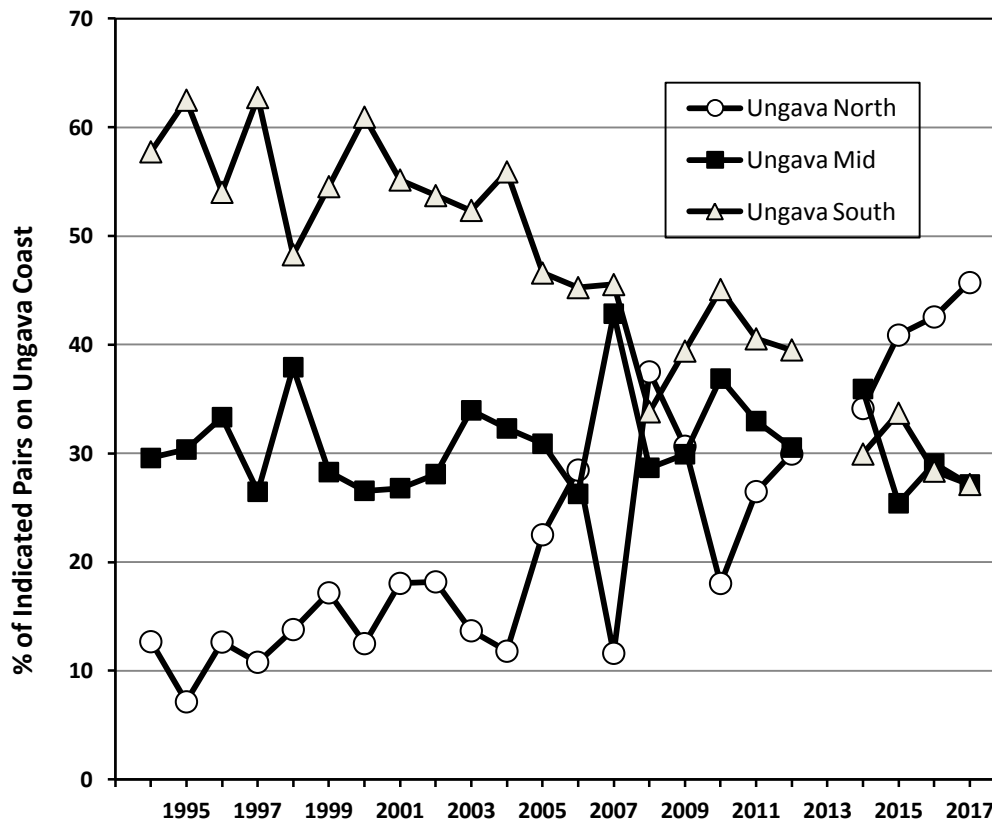


Figure 6. Percent of all indicated pairs on the Ungava Bay coast observed on northern, mid, and southern latitude transects (survey was not flown in 2013).

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