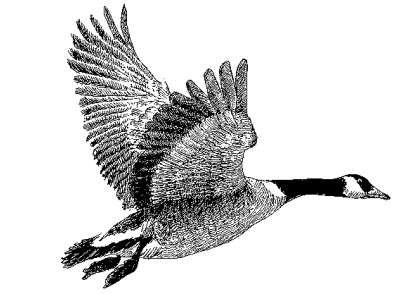
A BREEDING PAIR SURVEY OF CANADA GEESE IN NORTHERN QUÉBEC - 2022



William Harvey, Maryland Department of Natural Resources

Christine Lepage, Canadian Wildlife Service, Québec Region

Josée Lefebvre, Canadian Wildlife Service, Québec Region

Robert Spangler, U.S. Fish & Wildlife Service

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 2022 breeding ground survey.

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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. The survey has been completed each year since 1993, except for except for 2013, 2020 and 2021.

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 $P \leq 0.10$. 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 51º latitude and west of 67º 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).

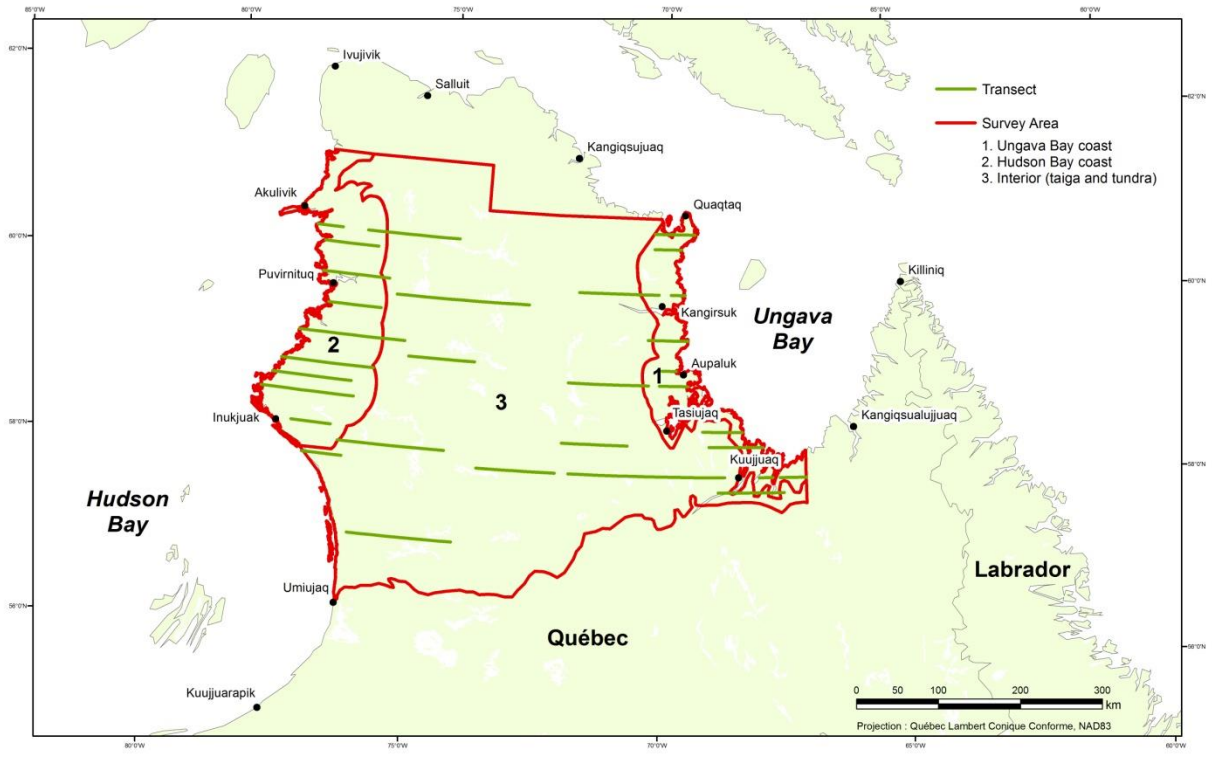

Figure 1. Location of survey strata and aerial transects in northern Quebec.

HABITAT CONDITIONS AND PRODUCTIVITY ASSESSMENT

Transects were surveyed June 16-25. Habitat conditions during the survey appeared more advanced than average with little snow or ice remaining (Figure 2). 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 2022 (Figure 3) suggest similar nesting conditions to 2021 when production was predicted to be near average. A model using May temperatures and June snowfall to forecast recruitment predicts average production for 2022 (J. Dooley, USFWS, Figure 4).

Figure 2. Habitat conditions north of Kuujjuaq on the Ungava coast on June 18, 2022 (top) and south of Puvirnituq on the Hudson Bay coast, June 20, 2022 (bottom).

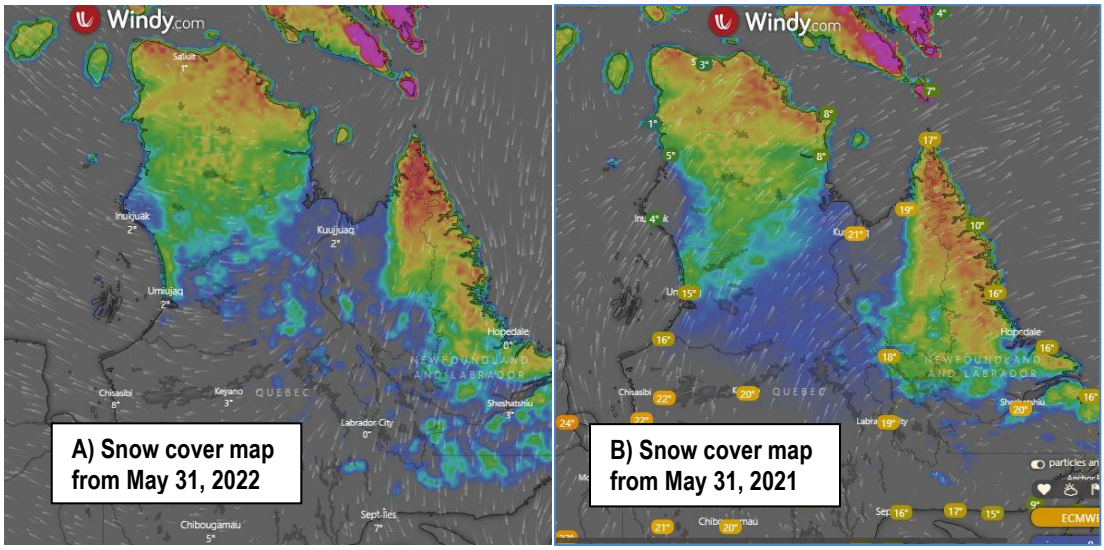

Figure 3. Snow depth maps for northern Quebec from the last week of May in 2022 (A) and 2021 (B).

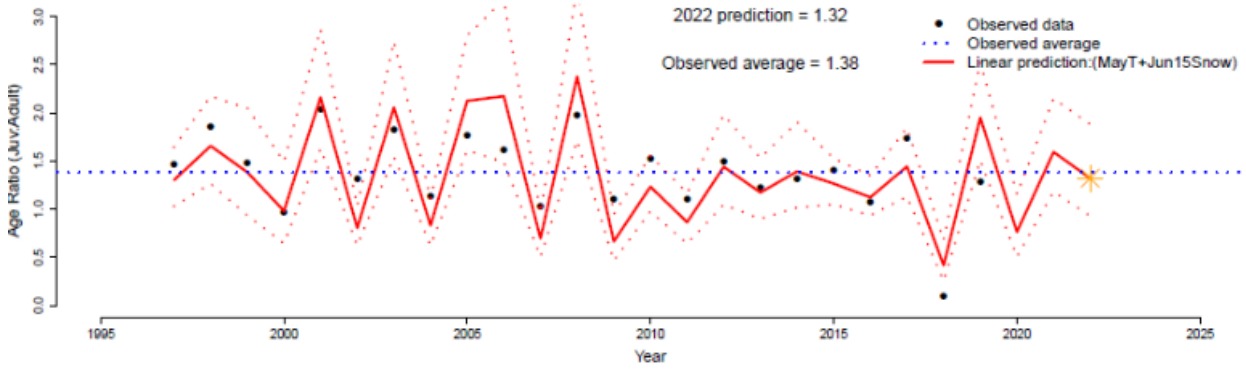

Figure 4. Number of young per adult captured in banding drives in northern Quebec during 1997-2019 (dashed line is long-term average) and predicted age ratio for 2022.

BREEDING PAIR AND TOTAL POPULATION ESTIMATES

The estimated number of breeding pairs on the Ungava Peninsula in 2022 (163,714 pairs; SE = 16,711) was greater than the 2019 estimate of 119,530 pairs (SE = 11,962) (P = 0.029) (Figure 5, Appendix 1). The total population estimate (indicated pairs x 2 + non-breeders) in 2022 (1,316,348 individuals; SE = 142,103) was greater than the 2019 estimate of 622,063 individuals (SE = 64,062) (P < 0.001) (Figure 5, Appendix 1). 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.

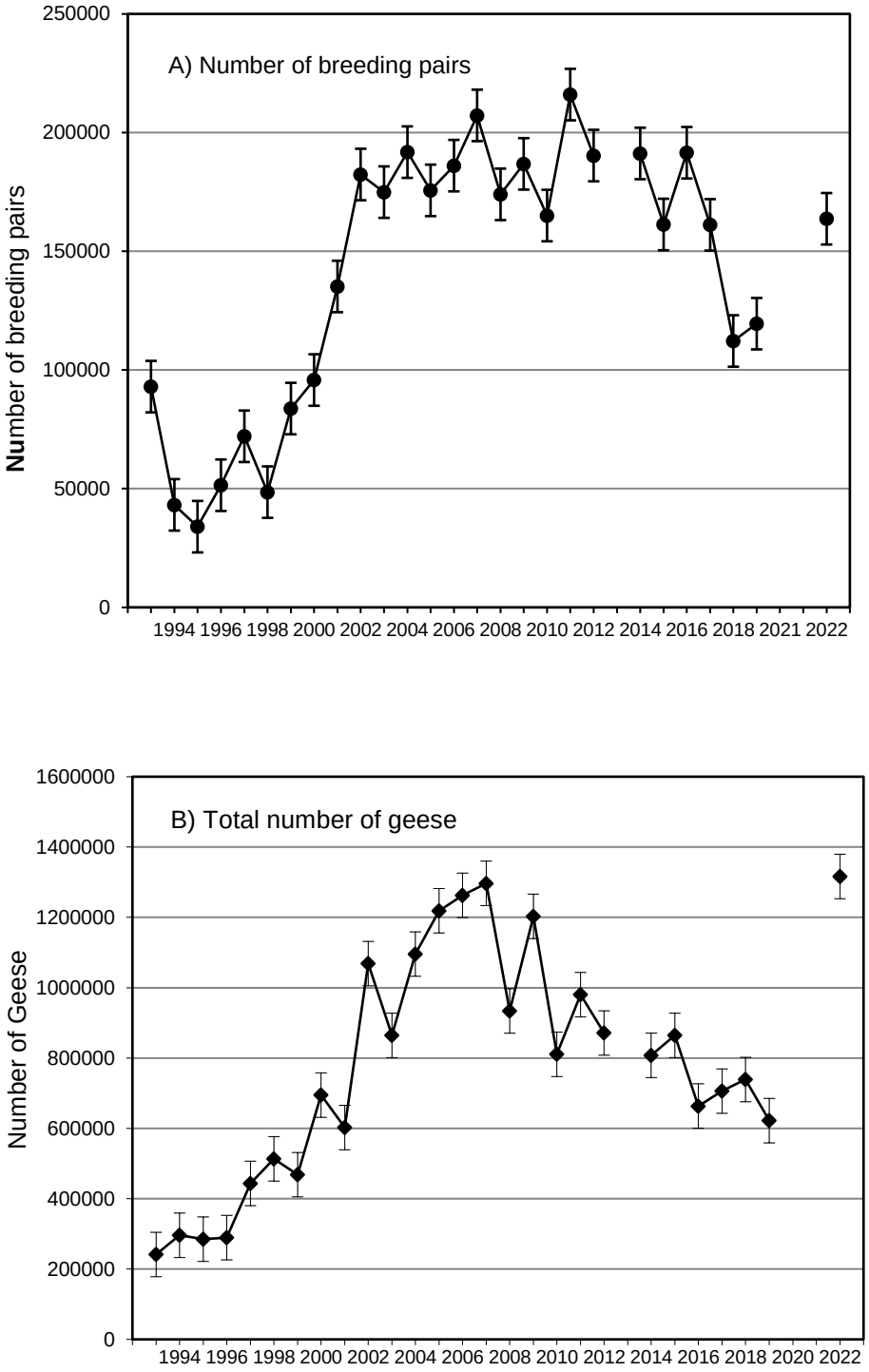

Figure 5. Estimated number (± 1 SE) of Canada goose breeding pairs (A) and total Canada geese (B) on the Ungava Peninsula (No surveys were flown in 2013, 2020 or 2021).

COMPARISON OF SURVEY STRATA

From 1993-2000, the density of breeding pairs was similar in the Hudson and Ungava Bay coastal zones (Figure 6). Since 2000, the pair density along Hudson Bay has increased while the density along Ungava Bay has remained largely stable. Pair density in the interior has remained low and relatively stable. The density in 2022 increased compared to 2019 in all regions (Figure 6). At current densities, the distribution of total breeding pairs within the survey area is 49% on the Hudson Bay coast, 8% on the Ungava Bay coast, and 43% in the interior.

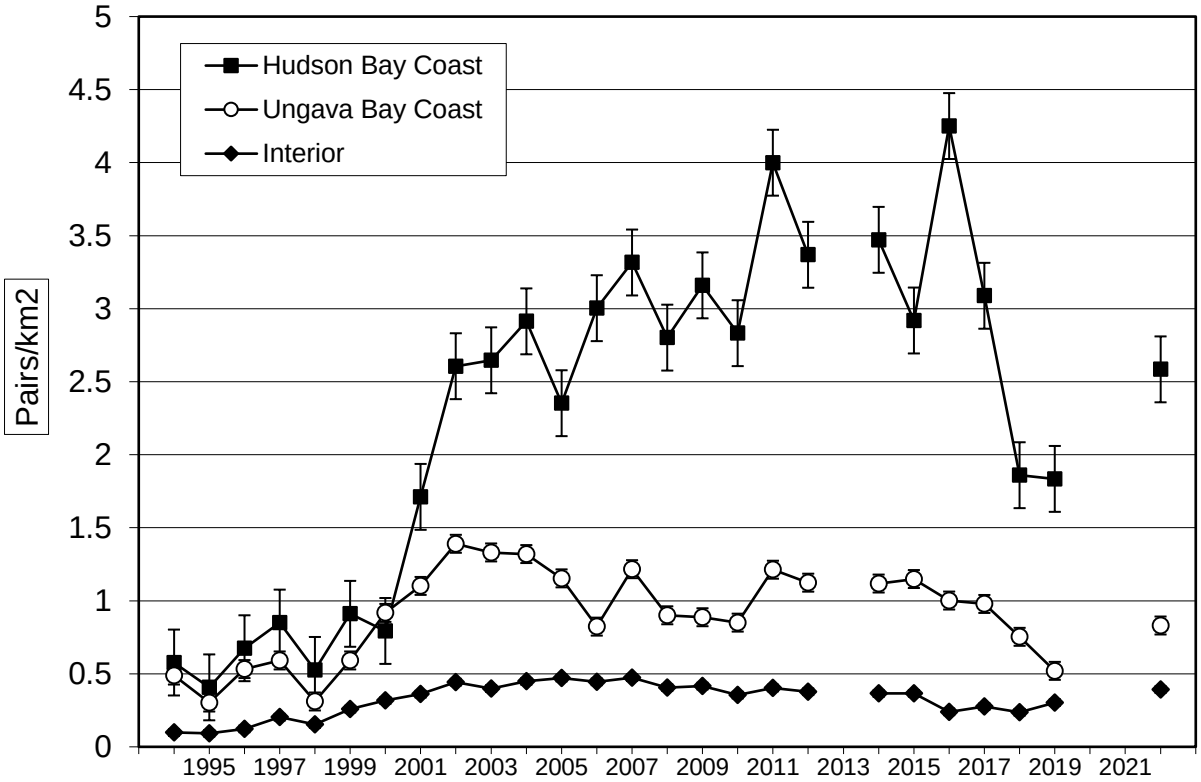

Figure 6. Average density (± 1 SE) of breeding Canada goose pairs for the Hudson Bay coast, Ungava Bay coast, and interior.

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Appendix 1. Number of breeding pairs and total Canada geese estimated for northern Quebec.

Year	Breeding Pairs	SE Breeding Pairs	Total Geese	SE Total Geese
1993	92992	12466	241407	30599
1994	43184	3991	295868	32435
1995	33995	3045	284868	28713
1996	51466	4789	289494	27112
1997	72079	6584	443549	43642
1998	48559	4471	513398	50697
1999	83750	7629	468318	45138
2000	95777	8447	694687	71341
2001	135196	12533	602417	59919
2002	182371	17587	1068510	107975
2003	174942	17246	864307	86550
2004	191789	19192	1095667	112292
2005	175679	16737	1218919	126490
2006	186109	19951	1262801	141311
2007	207262	21115	1296708	132434
2008	174007	18195	933742	103544
2009	186844	19713	1202943	128024
2010	165075	17503	810604	81724
2011	216032	23230	980181	104201
2012	190340	20448	871198	93379
2013	No Survey			
2014	191234	20050	807730	87222
2015	161302	16041	864357	89343
2016	191526	24898	663495	80114
2017	161147	17246	705926	73125
2018	112235	11338	738819	76690
2019	119530	11962	622063	64062
2020	No Survey			
2021	No Survey			
2022	163714	16711	1316348	142103