Mid-continent Greater White-fronted Goose Breeding Pair Survey in Northwest Alaska, 2006

Julian B. Fischer[1], Christine L. Moran[2], Paul D. Anderson[1], Robert A. Stehn[1], and Robert M. Platte[1]

[1]USFWS Migratory Bird Management, Waterfowl Management Branch, 1011 E. Tudor Road, Anchorage, AK 99503
[2]USFWS Selawik National Wildlife Refuge, 160 2nd Avenue, P.O. Box 270, Kotzebue, Alaska 99752

February, 2007

Keywords: *Anser albifrons frontalis*, greater white-fronted goose, Alaska, breeding pair, aerial survey, Selawik National Wildlife Refuge.

Introduction

The mid-continent population of greater white-fronted geese (*Anser albifrons frontalis*; hereafter white-fronts) breeds in tundra habitats from the central Canadian Arctic to the North Slope of Alaska, and south into boreal and taiga habitats of the interior and northwest portions of the state. Throughout their range, white-fronts are an important resource for consumptive and non-consumptive users. In Alaska, white-fronts are particularly important to subsistence hunters. Population and habitat management for white-fronts and waterfowl species in general, are integral components of enactment legislation for several National Wildlife Refuges, including Selawik NWR.

Management of mid-continent white-fronts is based largely on a fall staging survey that provides an index for the entire population (Nieman et al. 2006). The fall staging survey, however, does not necessarily reflect abundance or trend of the Alaska breeding component because white-fronts from all segments of the breeding range mix together in the survey area. The Management Plan for mid-continent white-fronts states that special management options for identifiable and manageable segments or subunits within the population could be considered should they be recognized with new information (Sullivan 1998). Winter distribution and migration patterns of white-fronts that breed in interior and northwest Alaska distinguishes this group of geese as a unique segment or subunit of the mid-continent population (Ely and Schmutz 1999, Webb 2006), but managers do not have a tool to identify when special management options would be warranted.

Development of reliable management tools on a regional scale in Alaska has been elusive. Aerial molting goose surveys are conducted in various locations in interior and northwest Alaska (Fischer 2007), but population trends from these surveys are equivocal and are likely dependent on parameters currently not monitored with precision. For example, the molt survey primarily monitors molt migrants; but molt migration in geese involves failed breeders and non-breeders (Salomonsen 1968, Hohman et al. 1992) with highest numbers expected at molt sites in years of poor breeding success (Reed et al. 2003) or following years of high juvenile recruitment. Thus, abundance estimates derived from molt surveys are biased by current and past year breeding conditions.

An alternative method of monitoring population trend is with breeding ground surveys. The value of such surveys has long been recognized by biologists and waterfowl managers when region- or population-specific indices of geese are needed (Kaminski 1979, Bishop and Williams 1990, Kraft and Funk 1990, Rusch et al. 1996, Abraham et al. 1999, Moser and Caswell 2003). Experimental breeding pair surveys for

the Eastern Prairie Population of Canada Geese (*Branta canadensis*) showed that such surveys are a useful alternative to staging or winter surveys and produce reasonable population estimates with relatively narrow confidence intervals (Malecki et al. 1981, Rusch et al. 1996).

In 2005 and 2006 we conducted intensive breeding pair surveys in late-May and early June to measure abundance and distribution of white-fronts in northwest Alaska (Fischer et al. 2005). The goal of this effort was to determine whether this type of survey could be a useful tool in identifying when special management options are needed for this group of birds.

Methods

The current white-fronted goose breeding pair survey was modified slightly from the 1996-1997 expanded breeding pair survey design (Platte 1999). The expanded breeding pair surveys were conducted in early to mid June to collect detailed distribution data within waterfowl production areas that are sampled annually during the Continental Waterfowl Breeding Population and Habitat Survey (hereafter, "Continental Survey"). Transect design in 2005 and 2006 was nearly identical to the 1997 expanded breeding pair survey of Selawik National Wildlife Refuge (NWR) and the Noatak Lowlands (Platte 1999; Fig. 1). One exception was that the Baldwin Peninsula stratum was excluded because no white-fronts were observed there in 1997. This design resulted in over 1,900 km of transects comprising a sample of 766 km^2 and 788 km^2, in 2005 and 2006, respectively; approximately 5% of the 14,848 km^2 study area.

The survey was timed to maximize the likelihood that peak numbers of birds were present on the breeding grounds, but prior to nest initiation. Two surveillance surveys were conducted on a subset of transects on May 12th and May 18th to assess presence and distribution of white-front pairs and flocks, and availability of nesting habitat. On these surveys observers reported flocked Canada geese and snow geese in the survey area with only a few white-fronts present. The surveillance surveys showed that nesting habitat was largely unavailable through mid-May with 90-95% and 50-80% snow coverage on May 12th and 18th, respectively. In general, snow cover was greater in the central and western portions of the survey area whereas spring phenology was more advanced in the east. River break-up in 2006 was approximately 10 days later than the previous year. Centers of large lakes were frozen through mid-May with open water margins. Based on these observations, the operational survey was flown May 27-June 3, 2006. Survey timing in prior years varied (1996: June 18-21; 1997: June 4-8; 2005: May 25-28).

The crew used the Selawik NWR Husky on wheels as a survey platform. Birds within 200 m of either side of the aircraft were recorded by Paul Anderson (Pilot/Biologist; left side observations), and Tina Moran (Wildlife Biologist; right side observations). They used USFWS - Migratory Bird Management customized aerial survey software to record all goose, scoter, swan, and loon observations. Numbers of geese were recorded and observations were categorized as singles, pairs, or flocks. Standard headers were recorded at the onset of each transect including: observer name, date, transect number, wind speed, wind direction, sky condition (clear, scattered, broken, overcast), and snow cover (<10%, 11-50%, 51%- 90%, >90%).

Analysis methods followed ratio estimation procedures (Cochran 1977) outlined for expanded breeding pair surveys in northwest Alaska (Platte 1999). We assumed

single birds were accompanied by a mate on a nest that was not visible to the observer. Thus, the number of indicated pairs was calculated by two times the number of singles plus the number of paired birds (Malecki et al. 1981). The number of total indicated birds was calculated as indicated paired birds plus birds in flocks.

Results and Discussion

Estimates of white-front density, number of indicated paired birds, and indicated total birds are presented in Table 1 and Figures 4-5. The 2006 survey yielded an estimate of 6,692 total white-fronts, of which 1,525 were indicated paired birds (Table 1). The 2006 total was within 1% of the estimate in 2005. Mean total geese in 2005-2006 was 43% lower than the mean of the 1996-1997 surveys. The portion of total geese that were in pairs has fluctuated among the four years of surveys (Fig. 3). Distribution of indicated pairs was similar to previous years with highest densities in the "Noatak" and "Selawik" strata (Table 1, Fig. 2). Distribution of total geese was somewhat different from other years with highest densities of geese in the "Marginal" stratum, followed by "Selawik". This result was influence by several large flocks in "Marginal" that greatly increased the density estimate for this relatively small stratum.

Maximizing the proportion of indicated paired birds to indicated totals would indicate a survey timed appropriately for indexing the breeding population. Surveys timed too early could lead to overestimation of local populations if more northerly breeders are still migrating through the area during the survey. However, band return data suggest that white-front migrants do not pass through the Selawik survey area on route to more northerly breeding sites on the North Slope (Bird Banding Laboratory, unpubl. data). Surveys timed too late may also overestimate local populations if failed or non-breeding molt migrants from other breeding sites enter the area during the survey (Malecki et al. 1981). On average, molting flocks caught during banding drives on in Selawik NWR (2000-2005) are comprised of 97% adults (Fischer 2007), suggesting that the area attracts molt migrants from other breeding sites. Thus, estimates from breeding surveys could be inflated if the survey is not completed prior to influx of molt migrants from other breeding sites which begins in mid to late June (Spindler and Hans 2005).

Lacking within-season replicate surveys, it is not possible to determine whether the paired:total ratio was optimal. Nevertheless, comparing observations among years, there is a negative relationship between survey date and the proportion of total geese that were indicated paired birds (Fig. 3). For example, in 1996 when the survey occurred late (midpoint June 20) the proportion of pairs was low (11%), whereas in 2005 the earliest timed survey (midpoint May 27), the proportion of indicated paired birds was relatively high (average 32%). In 1997 and 2006 the timing and proportion of pairs were intermediate to the other years (6 June -18% pairs; 31 May 31 - 23% pairs, respectively). Aerial survey observations on the North Slope showed that breeding birds as a proportion of total birds dropped from 60-50% (10-20 June) to 25-15% (21-30 June), and to below 15% in July (MBM unpubl. data). A similar pattern was observed at Selawik with the peak proportions (50-20%) of indicated paired birds occurring 25-30 May, declining to below 18% in early June and 10% after 15 June. While survey timing may affect the proportion of paired birds, other factors such as current breeding conditions, prior year gosling production, and phenology of snow melt likely affect the ratio as well. Thus, in

general, the survey should be conducted in late May, but several surveillance flights should be conducted prior to and following the survey to confirm appropriate timing.

Prior efforts to monitor white-fronts in interior and northwest Alaska have yielded variable measures of population abundance and trend. Concerns for the status of white-fronts in the interior and northwest portion of the state were raised in the 1990s following reported regional declines in abundance (Spindler et al. 1999). This decline occurred at a time when population indices on the North Slope of Alaska were stable (Larned et al. 2006, Mallek et al. 2006) and the continental population was increasing (Nieman et al. 2006). Subsequent investigations showed that survival of white-fronts from interior and northwest Alaska was significantly lower than survival of geese nesting in tundra habitats (Ely and Schmutz 1999); and that timing of migration, and fall and winter distribution could put them at risk of disproportionate sport harvest mortality in some locations in Canada, Texas and Mexico.

Abundance and trend of waterfowl breeding populations is currently monitored in interior and northwest Alaska during the Continental Survey, but the method is not designed specifically to monitor geese. Instead, the Continental Survey is timed to correspond with nest initiation and early incubation of ducks (Smith 1995), later than the optimal time for geese. Sightability of white-fronts decreases significantly in boreal habitats after nest initiation (M. Spindler, pers. comm.). The Continental Survey samples the Kotzebue Sound stratum (northwest Alaska) in early June (unpubl. FWS data; mean June 9, 1964-2006), approximately four weeks after white-fronts have arrived in the region (Shepard 1956, Kessell 1989, Spindler and Hans 2005, unpubl. FWS satellite data).

The white-front survey should be repeated in May, 2007 to determine whether the estimate of total geese remains consistent near 6,700 birds. Ideally, two surveillance surveys should be conducted prior to and following the operational survey to monitor changes in the pair:total ratio. Although white-fronts are currently monitored in northwest Alaska through the Continental Survey, sampling effort is just 16% of the white-front breeding pair survey, and thus is not sensitive to local changes in abundance and distribution. The two surveys have somewhat divergent estimates of pairs and total geese (Figs. 4-5). An additional year of data from the white-front breeding pair survey may help determine whether the population in northwest Alaska can be adequately monitored with the Continental Survey alone.

Literature Cited

Abraham, K. F., J. O. Leafloor, and D. H. Rusch. 1999. Molt migrant Canada geese in northern Ontario and western James Bay. Journal of Wildlife Management. 63:649-655.

Bishop, R. A. and B. K. Williams. 1990. Needs, capabilities and prospects for the future of goose management in North America. Transactions of the North American Wildlife and Natural Resources Conference. 55:374-377.

Cochran, W. G. 1977. Sampling Techniques. Third edition. John Wiley and Sons, Inc. New York, NY.

Ely, C. R., and J. A. Schmutz. 1999. Characteristics of mid-continent greater white-fronted geese from interior Alaska: distribution, migration ecology and survival. Unpubl. USGS report submitted to the Central Flyway Technical Committee.

Fischer, J. B. 2007. Mid-continent greater white-fronted geese in Alaska – 2006 project updates. Unpubl. U.S. Fish and Wildlife Service Report, Migratory Bird Management, Anchorage, AK.

Fischer, J. B., C. L. Moran, P. D. Anderson, R. M. Platte, and R. A. Stehn. 2005. Experimental mid-continent white-fronted goose breeding pair survey in northwest Alaska, May 25-28, 2005. Unpubl. U.S. Fish and Wildlife Service Report, Migratory Bird Management, Anchorage, AK.

Hohman, W. L., C. D. Ankney, and D. H. Gordon. 1992. Ecology and management of postbreeding waterfowl. Pp. 128-189, *in* B. D. J. Batt, A. D. Afton, M. G. Anderson, C. D. Ankney, D. H. Johnson, J. A. Kadlec, and G. L. Krapu, eds. Ecology and management of breeding waterfowl. Univ. Minnesota Press, Minneapolis, Minnesota.

Kaminski, R. M. 1979. Locating nesting waterfowl by helicopter. Wildlife Society Bulletin 7:194-197.

Kessell, B. 1989. Birds of the Seward Peninsula, Alaska: their biogeography, seasonality, and natural history. University of Alaska Press. Fairbanks, Alaska.

Kraft, M. J. and H. D. Funk. 1990. Goose management in the '90s: A Central Flyway perspective. Transactions of the North American Wildlife and Natural Resources Conference. 55:321-325.

Larned, W. W., R. Stehn, and R. Platte. 2006. Eider breeding population survey, Arctic Coastal Plain, Alaska, 2006. Unpubl. U.S. Fish and Wildlife Service Report, Migratory Bird Management, Soldotna, AK.

Malecki, R. A., F. D. Caswell, R. A. Bishop, K. M. Babcock, and M. M. Gillespie. 1981. A breeding-ground survey of EPP Canada Geese in northern Manitoba. Journal of Wildlife Management. 45:46-53.

Mallek, E. J., R. Platte, and R. Stehn. 2006. Aerial breeding pair survey of the Arctic Coastal Plain of Alaska-2005. Unpubl. U.S. Fish and Wildlife Service Report, Migratory Bird Management, Fairbanks, AK.

Moser, T. J., and D. Caswell. 2003. Long-term indices of Canada geese status and management. Pages 123-129 *in* T. J. Moser, R. D. Lien, K. C. VerCauteren, K. F. Abraham, D. E. Andersen, J. G. Bruggink, J. M. Coluccy, D. A. Graber, J. O. Leafloor, D. R. Luukkonen, and R. E. Trost, editors. Proceedings of the 2003 International Canada Goose Symposium, Madison, Wisconsin, USA.

Nieman, D., K. Warner, J. Smith, J. Solberg, F. Roetker, R. Walters, S. Durham, and K. Kraii. 2006. Fall inventory of mid-continent white-fronted geese. Unpubl. Canadian Wildlife Service Report.

Platte, R. M. 1999. Waterbird abundance and distribution on Selawik National Wildlife Refuge and Noatak Lowlands. Unpubl. U.S. Fish and Wildlife Service Report, Migratory Bird Management, Anchorage, AK.

Reed, E.T., J. Bety, J. Mainguy, G. Gauthier, and J.-F. Giroux. 2003. Molt migration in relation to breeding success in greater snow geese. Arctic 56:76-81.

Rusch, D. H., F. D. Caswell, M. M. Gillespie, and J. O. Leafloor. 1996. Research contributions to management of Canada geese in the Mississippi Flyway. Transactions of the North American Wildlife and Natural Resources Conference. 61:437-449.

Salomonsen, F. 1968. The moult migration. Wildfowl 19: 5-24.

Shepard, P., E. K. 1956. Section 1, 1956 Production and banding studies – Selawik. Unpubl. USFWS Report, Kotzebue.

Smith, G. W. 1995. A critical review of the aerial and ground surveys of breeding waterfowl in North America. Biological Science Report 5. National Biological Service. Washington D.C.

Spindler, M. A. and M. R. Hans. 2005. Nesting and local movements of female greater white-fronted geese in west-central Alaska. Unpubl. USFWS report, FY05-01, Koyukuk/Nowitna National Wildlife Refuge, USFWS, Galena, Alaska.

Spindler, M. A., J. M. Lowe, and J. Y. Fujikawa. 1999. Trends in abundance and productivity of white-fronted geese in the taiga of northwest and interior Alaska. Report to the Central Flyway Committee. U.S. Fish and Wildlife Service, Koyukuk/Nowitna National Wildlife Refuge, Galena, Alaska.

Sullivan, B. 1998. Management plan for midcontinent greater white-fronted geese. Central Flyway Waterfowl Technical Committee. Denver, CO.

Webb, D. D. 2006. Temporal and spatial distribution of interior Alaska white-fronted geese (Anser albifrons frontalis) during fall migration and winter staging. Master's Thesis, University of Alaska, Fairbanks.

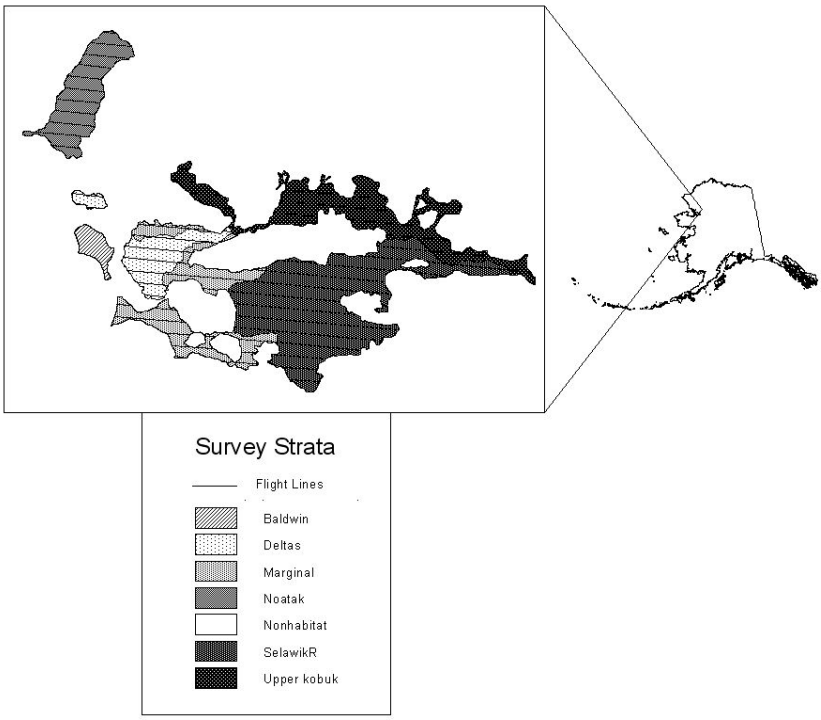

Figure 1. Location of the white-fronted goose breeding pair survey, northwest Alaska, 2006.

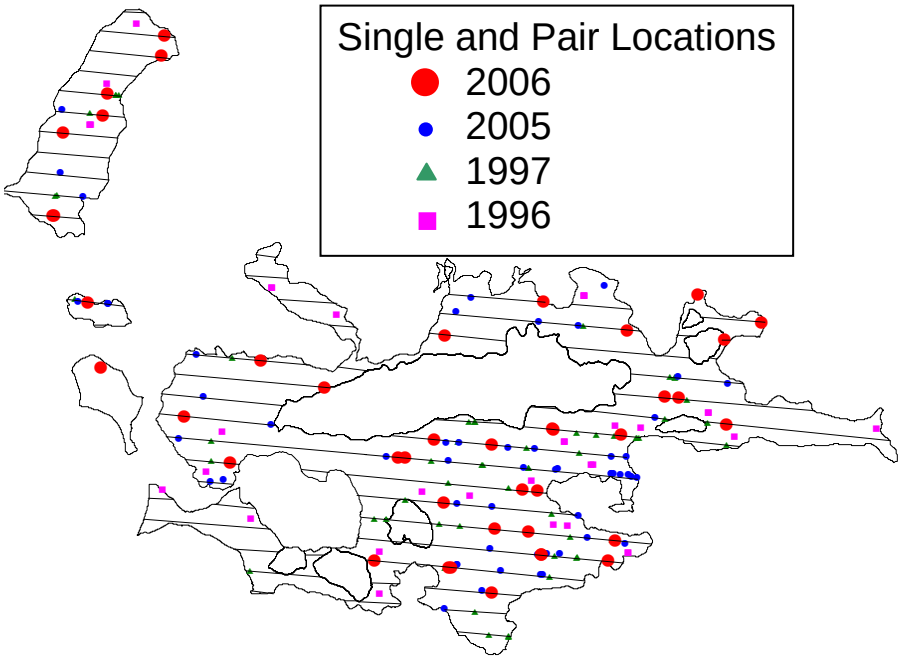

Figure 2. Locations of the 2006 survey transect lines, and indicated white-front pairs (singles and pairs), 1996-1997, and 2005-2006.

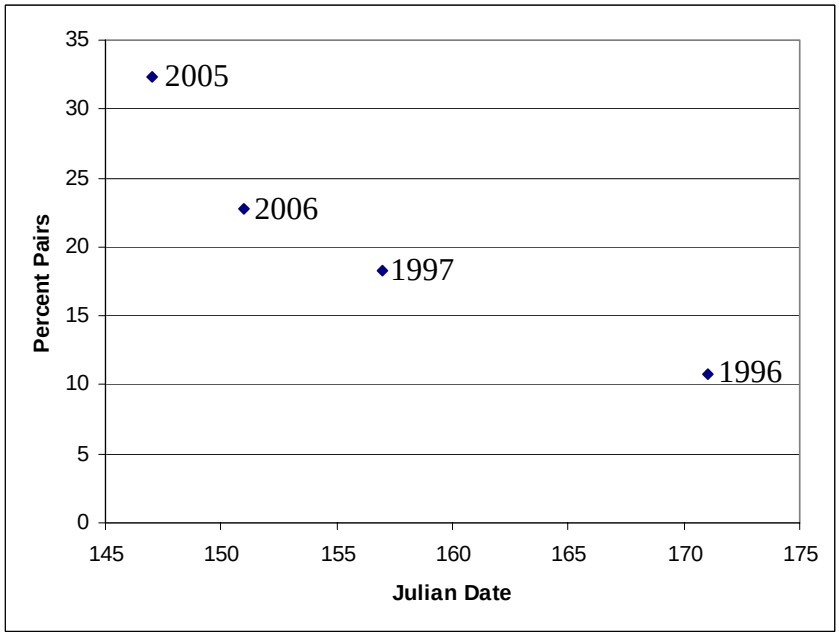

Figure 3. Relationship between survey midpoint date (Julian date) and percent of total white-fronts that were indicated paired birds, 1996-1997 and 2005-2006.

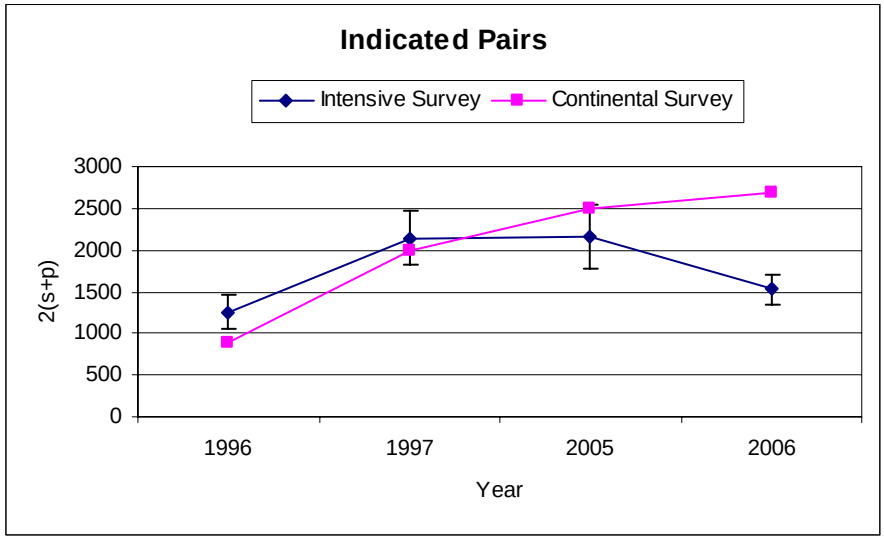

Figure 4. Comparison of indicated paired birds (±SE) estimated during the intensive surveys (1996-1997, and 2005-2006) and the Continental Survey.

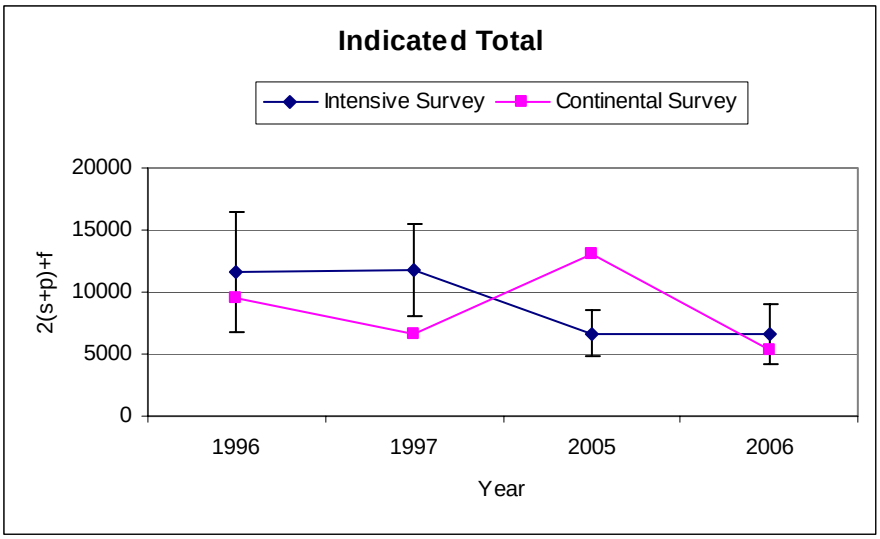

Figure 5. Comparison of total white-fronts (±SE) estimated during the intensive surveys (1996-1997, and 2005-2006) and the Continental Survey.

Table 1. Estimates of indicated paired birds and indicated total mid-continent greater white-fronted geese in northwest Alaska, May, 2005; May-June, 2006 (this study); and June 1996-1997 (Platte 1999). Indicated pairs was calculated by two times the number of singles plus the number of paired birds; total indicated birds was calculated by indicated pairs plus flocked birds.

			Indicated Paired Birds					Indicated Total Birds				
Stratum Name	Statum Size (km^2)	Year	Mean Density	SE	Population	SE	95%CI	Mean Density	SE	Population	SE	95%CI
Noatak	1896	1996	0.08	0.04	151	85	167	0.68	0.23	1280	442	866
		1997	0.15	0.09	292	167	327	1.11	0.32	2099	598	1172
		2005	0.08	0.03	150	59	116	0.39	0.14	729	261	512
		2006	0.16	0.04	298	80	157	0.33	0.15	633	277	543
Deltas	1413	1996	0.05	0.04	75	52	102	0.11	0.06	150	89	174
		1997	0.08	0.04	113	63	123	0.20	0.15	283	218	427
		2005	0.19	0.10	268	141	276	0.28	0.14	401	201	394
		2006	0.12	0.05	168	66	129	0.36	0.22	504	306	600
Marginal	2207	1996	0.05	0.03	117	67	131	0.49	0.28	1072	625	1225
		1997	0.03	0.02	71	44	86	0.03	0.02	71	44	86
		2005	0.03	0.02	75	51	100	0.32	0.20	695	442	866
		2006	0.03	0.02	72	47	92	0.71	0.33	1555	727	1425
Upper Kobuk	3255	1996	0.08	0.04	254	135	265	0.70	0.31	2264	1019	1997
		1997	0.05	0.04	174	122	239	0.58	0.23	1892	752	1474
		2005	0.10	0.04	317	118	231	0.27	0.11	882	355	696
		2006	0.06	0.02	200	73	143	0.39	0.17	1263	543	1064
Selawik	6076	1996	0.11	0.02	655	97	190	1.12	0.35	6785	2106	4128
		1997	0.25	0.04	1496	231	453	1.22	0.26	7411	1588	3112
		2005	0.22	0.06	1351	335	657	0.66	0.11	3977	694	1360
		2006	0.13	0.02	787	112	220	0.45	0.12	2737	727	1425
Total	14847	1996	0.08	0.01	1252	205	402	0.78	0.17	11551	2463	4827
		1997	0.14	0.02	2146	320	627	0.77	0.12	11756	1869	3663
		2005	0.15	0.03	2161	390	764	0.45	0.06	6684	954	1870
		2006	0.10	0.01	1525	177	347	0.44	0.08	6692	1234	2419