Midcontinent Greater White-fronted Goose Banding in Alaska, 2010

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September 5, 2010

Due to the scarcity of harvest distribution data and relative survival rates for greater white-fronted geese (GWFG, *Anser albifrons frontalis*) in Alaska, a banding program was initiated in the early 1960s and has been the basis for research partnerships with the University of Alaska, the U.S. Geological Survey, the University of Chihuahua, several National Wildlife Refuges and the Division of Migratory Bird Management (MBM), Anchorage. An active banding program for GWFG in Canada has also provided valuable survival estimates to compare with geese at Alaska sites. Annual banding activities are recommended in the Midcontinent Greater White-fronted Goose Management Plan to assess population size and survival, and monitor harvest rate and geographic and temporal distribution of the harvest. Band recovery, collar resight data, radio telemetry and satellite tracking results have helped discover and verify flyway corridors and wintering areas used by midcontinent GWFG that breed in Alaska. Results of ongoing banding efforts have shown that the interior and northwest Alaska segment of the midcontinent population differ from geese in Canadian breeding sites, demonstrated by earlier initiation of autumn and spring migration, use of unique wintering areas in Mexico and lower annual survival.

Declines in abundance of midcontinent GWFG in interior Alaska during the 1990s heightened the concern for this species in Alaska. In 2003, the Alaska MBM banding program expanded to the Arctic Coastal Plain (ACP, Figure 1) to examine whether lower survival rates of mid-continent white-fronts were unique to the interior boreal forests of central and northwest Alaska or if the phenomenon was state-wide and extended to the tundra areas of the ACP. Banding efforts in interior and northern Alaska have occurred nearly continuously since 1960 (Appendix 3, 4) and for the past two decades, these efforts revealed survival rates up to 15% lower for boreal birds than for tundra birds and is possibly related to differences in habitat or other conditions (e.g., temperature, moisture, predators; Fischer 2010). Recovery data from 2008 showed an increase in interior Alaska survival rates, and was the first time that the ACP and interior rates were not significantly different (Fischer 2009). Banding on the ACP has also helped to determine the degree of interchange between boreal and tundra nesting GWFG in Alaska, which occurs, to a very small degree.

A minimum annual sample of 1,000 banded white-fronts in interior/northwest Alaska is needed for 10 years to ensure a 90% chance of detecting a 5% difference in survival rate (Schmutz 2001). Since 1998 the goal of Migratory Bird Management (MBM) Anchorage has been to band a minimum of 1000 GWFG annually in the interior among the Innoko, Koyukuk-Nowitna, and Selawik National Wildlife Refuges (NWR, Fig.1), and an equal number on the ACP. Banding sites at Selawik and Koyukuk-Nowitna NWR have not been visited since 2005 because of the paucity of large molting flocks there and concern about disturbance to these small populations (these areas were also avoided in 2002, Appendix 2). Geese in Kanuti NWR, in interior Alaska, were banded in 1973-96, but few large flocks of GWFG have been observed there in subsequent years and were only banded in 2003 when satellite transmitters were installed. In 2002, the lower Noatak River Delta in northwestern Alaska was added to the banding locations as was the Seward Peninsula in 2004. However, small numbers of trappable geese in these and other historical banding areas make these locations difficult to band. Historically, neck collars were used to mark a portion of the banded population (not deployed since 2002 except for VHF radio-collars in 2002-03 and 2008). Satellite transmitters were implanted into GWFG in 2001-2003 (42 in interior Alaska and 9 on the ACP) to further examine migration and staging.

As in previous years, the objective in 2010 was to band a minimum 1000 GWFG in both interior Alaska (Innoko NWR) and the central ACP. Band sites on the ACP alternates among eastern (east of the Colville River), central (between the Ikpikpuk and Colville rivers), and western (west of the Ikpikpuk River).

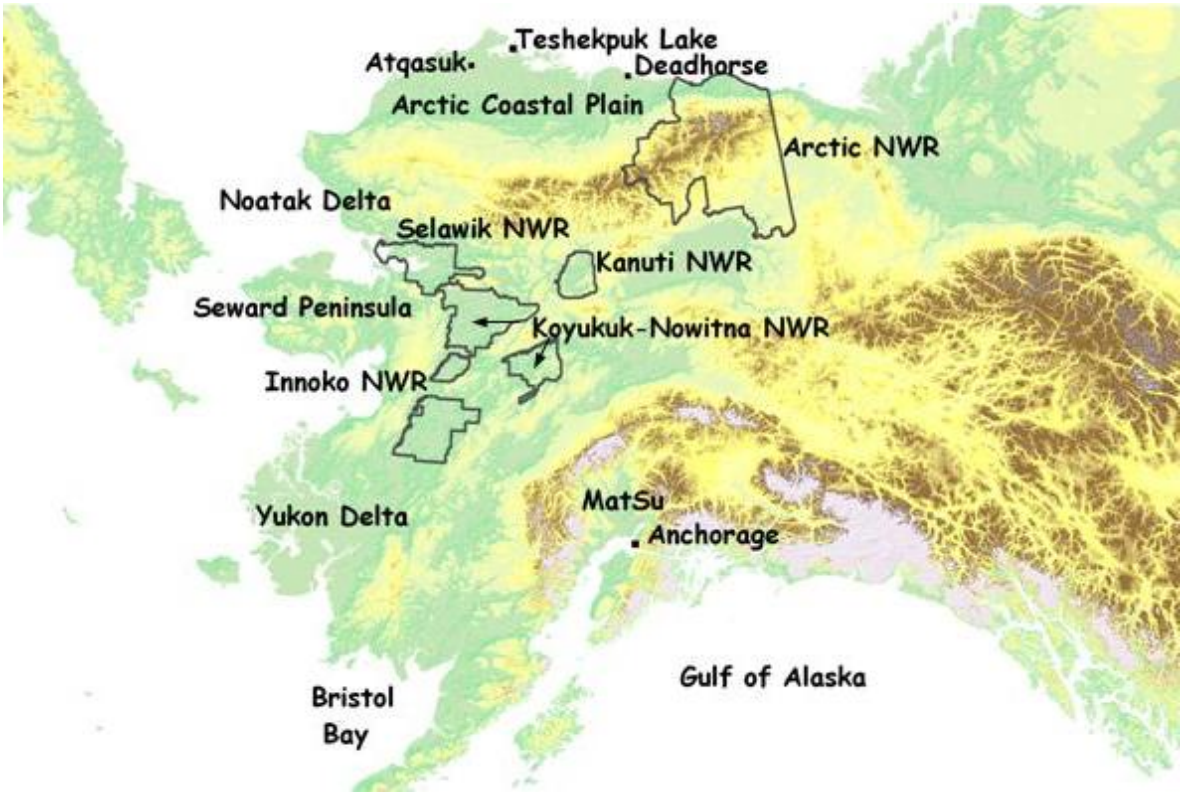

Figure 1. Location of GWFG banding areas in the state of Alaska.

Around 2003, a particularly virulent strain of avian influenza, AI, identified as Asian HPAI H5N1, emerged and spread throughout Southeast Asia. As of March, 2006 the Asian HPAI was identified in wild and domesticated birds in 41 nations in Asia, Africa, and Europe. At the same time, several hundred human cases were documented, resulting in over 100 deaths. The role of migratory birds in spreading Asian HPAI is unclear, but migratory birds are considered a possible vector for entry of the virus into the Americas. A viral link exists between genetic lineages of Asian low pathenogenic AI (LPAI) and LPAI found in Alaskan waterfowl (Koehler et al. 2008). Since GWFG are not known to mix with any Asian migrants, they were considered to have a relatively low potential among Alaskan birds to act as carriers. However, while the prevalence rate went down in 2007 and 2008 relative to the previous year, GWFG cloacal samples obtained in 2006 yielded a low pathogenic avian influenza prevalence rate of 3.7%, second only to northern pintail (USFWS/USGS 2007).

Based on these results, the interagency subcommittee of the HPAI Surveillance Working Group identified the greater white-fronted goose as a “species of interest” for avian influenza monitoring in 2008. The concern is particularly high for the mid-continent population of white-fronted geese given its proclivity to concentrate in dense aggregations during molt and fall staging, and to distribute broadly in winter throughout south-central United States and Mexico (Ely and Schmutz 1999, King and Hodges 1979: from Fischer and Schmutz 2008). In addition, mid-continent greater white-fronted geese share wetland molting habitat with northern pintails, a priority species for HPAI surveillance, providing opportunity for interspecific infection.

In addition to examining GWFG for evidence of virus shed to the throat and cloaca, in 2008-2010, MBM investigators took blood to examine the prevalence of AI antibodies in GWFG in Alaska to

appraise historical exposure and the proportion of birds with the potential to be asymptomatic carriers of HPAI (see below). In 2010, a target of 200 paired cloacal and mouth/throat (oral-pharyngeal) swab samples were to be opportunistically collected in each of two regions, interior and ACP. A total 200 blood samples were to be collected from both areas.

Schedule and Personnel

Julian Fischer and Bill Larned, Principal Investigators, U.S. Fish and Wildlife Service, Migratory Bird Management, 1011 E. Tudor Rd. Anchorage, Alaska, formulated schedules and logistics.

2010 Itinerary

Tuesday, 7/6
No banding. All aircraft, personnel to Innoko camp. Prep and crew logistics, safety meeting.
Wednesday, 7/7
Banding at Innoko. Banded at two lake sites. Blood work. Overnight at Innoko cabin.
Thursday, 7/8
Banding at Innoko. Banded at two river sites. Blood work. Overnight at Innoko cabin.
Friday, 7/9
Travel day; all crews to Deadhorse. Overnight Deadhorse.
Saturday, 7/10
Weather day (fog). No banding.
Sunday, 7/11
Banded one site on N. Slope west of Deadhorse. Fog in AM. Blood work. Overnight Deadhorse.
Monday, 7/12
Weather day (wind). No banding.
Tuesday, 7/13
Banded two sites on N. Slope west of Deadhorse. Blood work. Overnight Deadhorse.
Wednesday, 7/14
Crews to Anchorage. Some FWS flown to Kotzebue for swan banding.

Personnel and Duties

Julian Fischer (FWS Anchorage) GWFG projects coordinator, bander
Paul Anderson (FWS Anchorage) Pilot, bander
Karen Bollinger (FWS Fairbanks) Molting surveys, pilot, bander
Ken Richardson (FWS McGrath) Pilot
Heather Wilson (FWS Anchorage) Bander
Dennis Marks (FWS Anchorage) Banding schedules, bander
Kevin Whitworth, Dara Whitworth, Paul Burcar (FWS McGrath) Banders
Fred Myer, Deb Ceglowski (FWS McGrath, 524-3251) Volunteers
Chase Freeman (FWS Anchorage) Bander
Lyndi Denlinger (FWS Anchorage) Bander
Nate Olson (FWS Koyukuk NWR) Pilot, bander

Methods

Trapping. Locating GWFG flocks is accomplished through prior aerial surveys and/or reconnaissance. MBM protocol for trapping geese consists of locating a flock of molting geese on a lake deep and wide enough for Cessna-206 maneuvering, with room to land and taxi behind the flock, with suitable shoreline for the net setup (dry, flat and shaded), and where the wind will assist in the drive (e.g., having the most difficult portion of the drive into the wind but not too long a swim against the wind).

During setup, one plane remains in the air to keep the geese flocked up on the water, and to herd disparate flocks together. It takes 20 to 40 min to set the trap, depending on terrain and size/experience of the crew. Two lead nets are deployed either parallel, perpendicular or at an angle, depending on terrain. Most frequently, the long lead is set down the beach in the direction the geese are approaching, and a short lead, the “far” lead, running from the pot perpendicular to the shore out into the water. The bottom edge of the pot net and the leads are staked down so geese cannot escape underneath. When setup is complete, ground crew boards aircraft or hides in the vegetation near both ends of the leads, ready to reveal themselves, but only if instructed to do so by pilots (via hand held radio) as it is critical that persons on the shore not be seen. Aircraft depart and land behind the flock and begin moving the geese toward the trap. Preferably, one plane remains airborne to direct the operation and keep geese from going onshore prematurely. Input from the ground crew is rarely but sometimes necessary if the geese come to shore outside the leads.

After the pot net door is closed off, any available persons should move around the outside of the net to keep geese from bunching up on one side which can cause injury and overheating. An evaluation is necessary to decide whether or not some of the geese need to be released immediately. In good conditions (cool, dry with shade and sufficient banders), 400 geese is the maximum number that can safely be kept in the net during processing. Excess geese are released immediately upon capture.

Banding. Avoid placing banding station too close to the catch pen, as human movements and noise may increase stress to the geese. Make sure band ends come together squarely and smoothly; spread bands evenly when removing from string. Bands apparently wear more evenly if applied round and can rotate freely. Read band number with care, especially with recaptures since there is no way to check these data later; data recorder should read back to verify. Carefully identify sex via cloacal exam, be sure to look for brood patch, note condition (e.g., injuries, exhaustion). Record the species, age, sex, exact location, date, time and other notes (collar number, radio freq, avian influenza sample info, etc.). Release bird toward the shore. Data are entered directly into BBL banding software or imported from spreadsheet, processed, checked and e-mailed to USGS Bird Banding Laboratory. Banding permits must be renewed every 3 years.

Avian Influenza. Collect paired cloacal and pharyngeal swab sample according to protocols. Lift swab off bottom of sample vial prior to breaking off shaft--any pressure on the bottom of the vial may crack the vial, later. If only one series of vials is being used, you can record the last three digits, otherwise record the entire number. See AI protocol for other collecting and preservation details/concerns.

Results

The Innoko River area usually floods in the spring. However, as opposed to 2008 and 2009 where very heavy flooding occurred in the Innoko River survey area, minimal flooding was reported (S.Kovach, USFWS, pers. comm., 2010) and more normal water levels were observed in 2010. FWS survey personnel noted that "the interior of Alaska is very dry this spring due to little winter snowfall and below average spring rainfall" (Mallek, www.flyways.us, USFWS 2010). On the ACP, lake water levels appeared normal.

With a seasoned, well organized crew, 2010 experienced another very successful marking and sampling effort. With no major equipment problems, 4 full days of banding, 3 travel days and 2 weather days, 2147 GWFG were banded and 133 recaptured from 7 sites in two regions: interior Alaska, represented by an established banding area in the Iditarod River drainage upstream from the confluence of the Innoko River, Innoko NWR and the central ACP in the vicinity of Teshekpuk lake (Fig.1). The goal to band a minimum of 1000 GWFG in each region of the interior and ACP was nearly met for the interior and met for the ACP, with 918 and 1096 new bands, respectively (Tables 1 and 2; appendix 1 for location details). Additionally, 379 paired oral-pharyngeal/cloacal avian influenza and 195 blood samples were collected.

TABLE 1. Detail of GWFG handled in 2010 banding effort in interior and Arctic Coastal Plain, Alaska, by location, date, capture, age and sex. Table includes 133 recaptured GWFG.

		Innoko NWR				Arctic Coastal Plain			
		7-Jul			8-Jul	11-Jul	13-Jul		Totals
		A	B	C	D	E	F	G	
ASY	F	64	91	107	29	83	154	174	702
	M	82	140	175	50	98	222	235	1002
	U	1	1						2
ASY Total		**147**	**232**	**282**	**79**	**181**	**376**	**409**	**1706**
SY	F	37	30	49	10	13	32	43	214
	M	25	25	52	19	18	49	35	223
SY Total		**62**	**55**	**101**	**29**	**31**	**81**	**78**	**437**
Unk Age/Sex							2	2	4
Totals		**209**	**287**	**383**	**108**	**212**	**459**	**489**	**2147**
by Area					**987**			**1160**	

Aging GWFG is inexact, however, in 2010 we estimate that after second-year GWFG made up 79% of captured geese for both areas (Innoko and ACP; 81%, 82%, 85%, 83%, 83%, 77%, 77%, 82% and 83% for 2001-2009, respectively); the ASY ratio was slightly higher on the ACP in 2010 (84% vs. 75%, for Innoko). Fifty-seven percent of the recorded GWFG (new and recap) were male in 2010 (55%, 57%, 59%, 55%, 57%, 56%, 55%, 59% and 58% for 2001-2009).

TABLE 2. Summary of geese handled in 2010 banding effort for all banding sites in interior and Arctic Coastal Plain, Alaska combined, by age and sex.

		After Second-Year				Second-Year				Totals
		F	M	U	Totals	F	M	Totals	Unk Age	
Innoko	**New Bands**	280	392		672	125	121	246		918
	Recaps	11	55	2	68	1		1		69
ACP	**New Bands**	383	523		906	88	102	190		1096
	Recaps	28	32		60				4	64
Totals		**702**	**1002**	**2**	**1706**	**214**	**223**	**437**	**4**	**2147**

Recaptures

An encounter is any reporting of a previously marked bird, by recapturing, sighting, or killing and are used to assess population size and survival, monitor harvest rate and geographic and temporal distribution of the harvest. Of the 2,147 birds handled in 2010, 133 were previously banded, recaptured birds (Tables 2 and 3) and was, as usual, about 5-7% (6 % in 2010) of the total GWFG handled. This year, recaptured birds were caught in nearly equal numbers from the two banding areas, Innoko and the ACP (Table 3), in contrast to previous years where many fewer banded geese were caught on the ACP (0, 1 and 21, for 2007-2009). Given that many more GWFG are present for the molt on the ACP as compared to Innoko, the high number of recaptures on the ACP might be due to recurrent use the same lakes for banding, and molt sight fidelity among GWFG.

TABLE 3. Numbers of recaptured GWFG for each banding site of geese handled in 2010 banding effort for interior and Arctic Coastal Plain Alaska.

	Innoko NWR					Arctic Coastal Plain				Combined
	A	B	C	D	Totals	E	F	G	Totals	Totals
F	2	3	6	1	**12**	0	25	3	**28**	**40**
M	8	20	23	4	**55**	0	31	1	**32**	**87**
U	1	1			**2**	0	2	2	**4**	**6**
Totals	**11**	**24**	**29**	**5**	**69**	**0**	**58**	**6**	**64**	**133**

Since 1924, over 8,000 recoveries of GWFG banded in Alaska have been reported (Figure 2). While band returns from 2010 have not yet been examined, in previous years geese demonstrated a high degree of molting site fidelity and only a very limited degree of mobility between interior and North Slope populations. With few exceptions, GWFG recaptured in Innoko and the ACP were originally banded in those locations.

Birds from both molting areas, Innoko and the ACP have been hunted and shot in more than 20 U.S. states and Canadian provinces (Figure 3,4). Alberta, Saskatchewan and Texas have accounted for more than 60% of all GWFG shot and reported.

Injury, mortality

From telemetry performed in 2008, we now know that some of the geese that appear healthy upon release die soon after banding (Fischer 2009). In 2010, one GWFG died within view of the trapping location as an immediate result of the banding operation. From past experience, having more than 400 geese in the pen, particularly at the Innoko NWR, can lead to many more injuries. By keeping the

numbers in the pen below 400 at Innoko and 500 on the ACP, most birds looked healthy upon release. A very few appeared exhausted but swam away on release. Apparent injuries to approximately 10 GWFG at Innoko consisted of skin scraped from the back by other geese in the net pen, far fewer than in past years when larger numbers were retained in the net pen and geese were not as carefully monitored. Several tule white-fronted goose (*A.a. gambelli*), a larger and darker subspecies found in small numbers with molting GWFG in western Alaska required size 8 bands (inside diam.11/16") instead of the 7B band (inside diam.17/32") generally used for GWFG. Serious injury to the leg can result from chafing from too small a band. Eighteen suspected tule geese were fitted with size 8 bands in 2010.

Avian Influenza Sampling

As part of the national HPAI H5N1 virus investigation, cloacal and oral-pharyngeal swabs were collected from 379 geese (Table 4); sampling was per National Wildlife Health Lab protocols. Samples were shipped to the Alaska Science Center to be evaluated by the National Wildlife Health Lab in Madison, WI. Many more ASY geese were sampled; 318 after second-year vs. 57 second-year birds. In 2010, as in 2009 and 2008, MBM investigators sought to examine seroprevalence of AI antibodies to assess historical exposure to LPAI (see below); 195 samples were collected (Table 4).

TABLE 4. Number of geese sampled for avian influenza and blood, for each banding site for the 2010 banding effort in interior and Arctic Coastal Plain Alaska.

	Innoko NWR				North Slope			
	7-Jul		8-Jul		11-Jul	13-Jul		
	A	B	C	D	E	F	G	Totals
AI Samples								
ASY	19	36	62	33	113	39	16	318
SY	5	8	10	13	16	2	3	57
U						2	2	4
Totals	24	44	72	46	129	43	21	379
Blood Samples								
A	19	28	38		38	38	14	175
S	4	1	1		5	2	3	16
U						2	2	4
Totals	23	29	39		43	42	19	195

Distribution, Survival and Disease (from Fischer 2010)

Distribution

Leg-band and neck collar data – Leg-band and neck collar resight data indicate that white-fronted geese from interior and northwest Alaska have different migration and winter distributions than geese from other portions of the breeding range (Ely and Schmutz 1999, Anderson and Haukos 2003). For example interior/northwest Alaska birds are more likely to winter in Mexico and use spring staging grounds in northwestern Texas and Nebraska than geese from other breeding areas. Further, geese from interior and northwest Alaska initiate fall and spring migration earlier than other segments of the midcontinent population.

Satellite transmitters – From 2001 to 2003 satellite transmitters were deployed in 51 midcontinent white-fronts in Alaska to study migration pathways and timing of movements. Principal findings of this research were that during fall staging, white-fronts from interior and northwest Alaska had very little spatial and temporal overlap with white-fronts from North Slope Alaska. Results of this research are presented in Webb (2006).

Leg-Banding Program

Leg banding is an effective tool to examine survival rates, migration routes, and harvest distribution in migratory birds. A minimum annual sample of 1,000 banded white-fronts in interior/northwest Alaska is needed for 10 years to ensure a 90% chance of detecting a 5% difference in survival rate (Schmutz 2001). A total of 45,232 midcontinent white-fronts have been banded in major molting areas in interior, northwest, and North Slope Alaska since 1969. In 2009, staff from Migratory Bird Management, Innoko NWR, Koyukuk/Nowitna NWR, and the USGS-ASC banded 2,026 white-fronts at three sites on the Innoko NWR (1,079 bands) and three sites on the central-eastern North Slope (947 bands; Marks 2009 report).

Banding effort on the North Slope has been variable in recent decades. A total of 5,145 white-fronted geese were banded on the North Slope in 1975-1979 (King and Hodges 1979, Lobpries 1980) and an additional 1,085 geese were banded in 1990-1994 (USFWS unpubl. data). Banding on the North Slope resumed in 2003 with the goal of 1,000 geese per year in order to provide sufficient data to compare survival rates of geese in tundra habitats with boreal habitats, and to detect and quantify interchange between tundra nesting and boreal nesting geese in Alaska.

Preliminary analysis of live recapture data from 1971-2009 suggests that white-fronts are faithful to molting sites. Of geese recaptured during banding drives, 98% were in the same area where initially banded (Table 12). Moreover, less than 1% of recaptures occurred on the opposite side of the Brooks Range from where they were initially banded. These proportions are biased, however, because banding and recapture efforts have been unequal among years with 92% of banding occurring at Innoko and the North Slope since 2003. Thus, it is more likely that banded birds will be recaptured at Innoko or the North Slope simply because they are sampled more frequently and with greater effort. However, analysis of recapture data limited to the North Slope and Innoko NWR, 2004-2009, show that proportion of the recaptures in the same area where originally banded was very similar to the longer-term data set (Table 13). For example, 99% of recaptured geese were in the same area as initially banded.

Annual Survival

Joel Schmutz (USGS-ASC) generated survival estimates of adult white-fronts banded in interior and North Slope Alaska from 2000-2009 using band recoveries. Sexes and adult age classes were pooled as band recovery analyses require large sample sizes. For interior Alaska, analyses was restricted to white-fronts captured at Innoko NWR, as that area has contributed most of the banded birds, and therefore annual variation can be examined without it being confounded with spatial variation across interior Alaska. For interior Alaska and North Slope data sets, the best model was one where survival varied from year to year and that variation was modeled as a random effect, wherein the presented standard error represents real, ecological variation around the annual mean that is not confounding with sampling variation. These models have more parameters than a time constant model or a trend model and less parameters than a fully year-specific model.

Survival estimates in 2009 are based on birds banded 2000-2008. While estimates are lower for white-fronts molting in interior Alaska than those on the North Slope, the differences are not statistically significant (Fig. 15). For interior Alaska, the mean and SE of annual survival

was 0.741 +/- 0.056 (95% CI = 0.631-0.851). For North Slope, the estimate was 0.818 +/- 0.070 (95% CI = 0.681-0.955). The results presented here differ from estimates in previous summary reports in that the interior Alaska estimate is limited to Innoko NWR only.

Estimates of indexed reporting rates (product of the probability a band will be recovered and probability a recovered band will be reported), from the North Slope have historically been higher than interior estimates. There is now some equivocal evidence that similar to survival estimates, reporting rates for tundra and boreal nesting white-fronts are converging. When reporting rates differ between populations, the population with a lower reporting rate is the one where a greater proportion of its incurred mortality is due to either non-harvest mortality or unreported harvest mortality. It is unclear why the survival rates are converging, but the similar pattern in reporting rates suggests that the proportional causes for mortality of North Slope and interior white-fronts are becoming more similar for the two sets of birds. One possible explanation is that subsistence harvest in interior Alaska (probably largely unreported) has declined and is now of a similar magnitude as for North Slope white-fronts. Other alternative explanations are that band reporting has increased among subsistence hunters in interior Alaska, and that these two populations have a progressively more similar wintering environment, in terms of non-hunting mortality risks (e.g., maybe the risks to avian cholera are now more uniform across their wintering range).

The factors contributing to lower estimates of annual survival and indexed reporting rates in boreal nesting white-fronts are currently unknown. Low survival rates may be related to the distinctive migration patterns and winter distribution unique to this component of the population. Unique migration timing and year-round distribution may lead to disproportionate mortality from factors such as harvest (see Harvest and Distribution sections), exposure to avian disease in the Rainwater Basin of Nebraska (see Disease section), poor habitat conditions in Mexico, and/or natural predation on molting grounds. Alternatively, survival estimates from interior boreal Alaska could be biased low if there is a higher incidence of capture-related mortality from banding activities relative to tundra habitats. The latter explanation is a critical first step in understanding the nature and extent of differential survival throughout the population. The USFWS and USGS are investigating this question and will report results in 2010.

Disease

Three white-fronted goose disease investigations have been conducted in Alaska since 2001. The first was a study on Avian Cholera, the second on Highly Pathogenic Asian Avian Influenza H5N1, and a third on seroprevalence of Low Pathogenic Avian Influenza. A summary of objectives and results are described below.

Avian Cholera - Band return data show that Alaska breeding midcontinent white-fronts migrate through Nebraska's Rainwater Basin (Ely and Schmutz 1999) where outbreaks of avian cholera are relatively common (Samuel et al. 2005). A three-year study was initiated in 2001 to:

1) quantify recent exposure to *Pasteurella multocida*, the bacterium responsible for causing avian cholera in white-fronts from interior/northwest Alaska; and
2) detect occurrence of avian cholera carriers in the population based on pharyngeal swab cultures.

Serum and oral swab samples were collected from captured geese in several sites in interior and northwest Alaska in July, 2001-2003 to assess whether white-fronts are exposed to avian cholera, determine the likelihood that these geese act as carriers of the disease agent, and to compare results to other goose populations. The results of this work were published in the Journal

of Wildlife Diseases (Samuel et al. 2005). The key finding was that white-fronts in interior and northwest Alaska may be exposed to avian cholera during the winter or spring, but are unlikely to play a significant role as carriers of the bacterium causing avian cholera. Analysis of serum samples showed that approximately 4% of the sampled geese had antibody levels to *P. multocida* indicative of recent exposure to the bacteria. While antibodies in serum samples indicated exposure to *P. multocida*, the bacteria itself was not present in swab samples indicating that the geese are not likely carriers. It is noteworthy that sampling occurred in years when there were no major outbreaks in the spring staging areas; thus, the impact of a major outbreak to the Alaska breeding population is unknown.

High Pathogenic Asian Avian Influenza H5N1 – In recent years a virulent strain of avian influenza, Asian H5N1, spread from Southeast Asia into central Asia, Europe and Africa, and has been identified in wild birds. Migratory birds are considered a possible vector for entry of the virus into the Americas and individual birds crossing between Alaska and Asia or populations mixing in staging areas are thought to pose some risk of introduction of the virus to North America. As a result, the Interagency Avian Influenza Working Group developed criteria to rank the Migratory Bird species that occur in Alaska according to the risk they pose of carrying the Asian HPAI H5N1 virus (USFWS/USGS 2009). From this list, 29 species were selected for targeted sampling for the surveillance program. Although white-fronts were not selected as a target species, they were selected as a "Species of Interest" for surveillance sampling due to the high rate of low pathogenic avian influenza (LPAI) virus measured in 2006.

The surveillance sampling procedure requires cloacal and oral-pharyngeal swab samples collected from live-captured and hunter harvested birds. In four years of sampling, no highly pathogenic avian influenza (HPAI) was detected in any sampled white-fronts. Sampling of live birds will continue in 2010 at Innoko NWR and the North Slope with a sample target of 200 geese in each location.

Low Pathogenic Avian Influenza Seroprevalence – Pre-existing, low-pathogenic AI-specific antibodies can infer clinical protection from mortality associated with HPAI H5N1 (Kalthoff et al. 2008) and thus can create potential for apparently healthy birds to be asymptomatic carriers of HPAI. Therefore, in 2008-2009, Heather Wilson (USFWSMBM) examined seroprevalence of AI antibodies in midcontinent white-fronts in Alaska as a means of assessing historical exposure (Wilson et al. *in prep*). Preliminary analyses indicate differences in AI seroprevalence rates between sexes, ages (adults vs. juveniles), and between geographic locations within Alaska (interior vs. Arctic Coastal Plain Alaska). In 2009, 96 serum samples were collected from white-fronted geese at Innoko NWR and 99 from the Arctic Coastal Plain (ACP). Serologic results indicated that historical exposure was greater on the ACP than at Innoko in 2009. This suggested a reversal of the pattern observed in 2008, where historical exposure was lower on the ACP than at Innoko. Overall, 38% of the greater white fronted geese sampled in 2009 were positive for non-subtype specific, low pathogenic AI antibodies, a proportion similar to that in 2008 (35%; Wilson et al. 2010). The 2008-2009 results from this study imply that a consistent proportion (~36%) of greater white-fronted geese molting in Alaska have the potential to be asymptomatic carriers of HPAI. Subtyping of 2008-2009 LPAI antibodies is currently underway.

Reporting Bands

The Bird Banding Lab, Patuxent Wildlife Research Center in Laural, MD is encouraging all banders to publicize the new web site reporting capability at: http://www.reportband.gov. Finders receive instant feedback if the banding data is in our files and they receive a confirmation e-mail acknowledgement. This also gives the finder the choice of receiving their certificate by e-mail rather than standard postal service.

Acknowledgements

In addition to personnel mentioned earlier, thanks to Julian Fischer for summaries and comments, and Bob Platte and Bob Stehn (all USFWS Anchorage) for technical assistance.

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APPENDIX 1. Banding locations for all interior and Arctic Coastal Plain, Alaska GWFG sites for USFWS 2010 banding effort.

Date/Location		Description	Deg Min Sec		Dec Degrees	
Innoko NWR						
7-Jul	A	approx. 50 mi NW Shageluk, Alaska	63 09' 14.1"	158 33' 20.0"	63.15400	158.55556
7-Jul	B	approx. 50 mi NW Shageluk, Alaska	63 06' 58.4"	158 15' 29.4"	63.11622	158.25817
8-Jul	C	approx. 35 mi NW Shageluk, Alaska	63 02' 23.6"	158 45' 20.6"	63.03989	158.75572
8-Jul	D	approx. 35 mi NW Shageluk, Alaska	63 04' 00.8"	158 45' 11.8"	63.06689	158.75328
Arctic Coastal Plain						
11-Jul	E	approx. 105 mi W Deadhorse, Alaska	70 45' 14.0"	152 45' 44.8"	70.75389	152.76244
13-Jul	F	approx. 100 mi W Deadhorse, Alaska	70 25' 53.5"	152 53' 24.4"	70.43153	152.89011
13-Jul	G	approx. 110 mi W Deadhorse, Alaska	70 30' 01.0"	153 16' 46.4"	70.50028	153.27956

APPENDIX 2. Summary of Migratory Bird Management GWFG Banding Projects 1997–2010.

1997 - FWS aluminum leg bands and neck collars installed.
1998 - FWS aluminum leg bands and neck collars installed.
1999 - FWS aluminum leg bands only.
2000 - FWS aluminum leg bands and neck collars installed.
2001 - FWS aluminum leg bands, satellite implants (Innoko 6, Koyukuk 3, Selawik 3), avian cholera: throat swabs (*Pasteurella multocida* carrier) and blood samples(for antibodies, prior exposure).
2002 - FWS aluminum leg bands and neck collars installed, satellite implants (Innoko 10, Koyukuk 3, Selawik 4, Noatak 5), VHF radio collars, blood samples and throat swabs (see above).
2003 - FWS aluminum leg bands, satellite implants (Kanuti 4, Noatak 4, ACP 9), VHF radio collars (Ely, USGS only), blood and throat swabs, subcutaneous VHF radio implants (17 at Noatak).
2004 - FWS aluminum leg bands only. Restart banding effort on arctic coastal plain, last done in 1994 by FWS.
2005 - FWS aluminum leg bands only.
2006 - FWS aluminum leg bands and avian influenza sampling (cloacal swabs).
2007 - FWS aluminum leg bands and avian influenza sampling (cloacal and oral-pharyngeal swabs).
2008 - FWS aluminum leg bands, AI sampling (cloacal and oral-pharyngeal swabs plus blood); 200 capture survival birds measured, bled, radioed.
2009 - FWS aluminum leg bands, AI sampling (cloacal and oral-pharyngeal swabs plus blood); 449 birds swabbed, 199 bled.
2010 - FWS aluminum leg bands, AI sampling (cloacal and oral-pharyngeal swabs plus blood); 371 birds swabbed, 195 bled.

APPENDIX 3 . Summary of all GWFG banding in Alaska by region, 1960-2010. For total numbers of GWFG banded. Data from Bird Banding Lab database, Patuxent Wildlife Research Center.

	Bristol Bay	Innoko	Kanuti	Koyukuk	Matsu	Noatak	ACP	Nowitna	Selawik	Seward Pen	Tankus	Yukon Delta	Yukon Flats	Total
1960													1	1
1961											20			20
1962												210		210
1964											3			3
1966												5		5
1967												1714		1714
1968												2341		2341
1969		500				71				266		520		1357
1970							1170					1		1171
1971							1527							1527
1972												5		5
1973			302	761										1063
1975				575			761					1		1337
1976				1122			1107					3		2232
1977				282			981							1263
1978				1000			1146							2146
1979				1102			1147							2249
1980					291							130		421
1981					39							379		418
1982					136		31							167
1983					12									12
1984												1		1
1985		9										41		50
1986		545										12		557
1987		604	171					32				16		823
1988	62	944	56	2					125			104		1293
1989	503	22		224				4	91			64		908
1990	434	1158	340	443			20		217			10		2622
1991	169	138	302				257		25			4		895
1992		577		27			255		75			21		955
1993		686	291	171			173		64			18		1403
1994		567	141	451			407		196			1		1763
1995			73	145	207							31		456
1996			119	110	89							2		320
1997				289	97							16		402
1998		515		78			2		264			108		967
1999		168							52			211		431
2000		1082		92										1174
2001		918		132					257					1307
2002		628		98		176			17					919
2003		1311	13			56	790					8		2178
2004		976				182	1274		182	178		13		2805
2005		1150				198	921			206				2475
2006		1140					1069			241				2450
2007		1043					1169							2212
2008		1113					1154							2267
2009		1178					968							2146
2010		987					1160							2147
Total	1168	16972	1808	7104	871	683	16329	36	1565	891	23	5990	1	55588

APPENDIX 4. Summary of GWFG banding in Alaska, by year, region and permittee, 1960-2010. Key to abbreviations, below. Not included are 1 GWFG from Yukon Flats and 23 from Tanana-Kuskokwim (Appendix 3) banded by JUN and ADFG. From the Bird Banding Lab database, Patuxent Wildlife Research Center, Laural, MD.

	Bristol Bay	Innoko	Kanuti	Koyukuk	Matsu	Noatak	ACP	Nowitna	Selawik	Seward Pen	Yukon Delta
1960											
1961											
1962											JUN
1964											
1966											JUN
1967											JUN/LEN
1968											JUN
1969		JUN				JUN				JUN	JUN/YD
1970							JUN				YD
1971							JUN				
1972											YD
1973			JUN	JUN							
1975				JUN			JUN				ADFG
1976				JUN			JUN				YD
1977				JUN			JUN				
1978				JUN			JUN				
1979				JUN			JUN				
1980					ADFG						YD/ADFG
1981					ADFG						YD/ADFG
1982					ADFG		JUN				
1983					ADFG						
1984											FAI
1985		INN									FAI/USGS
1986		INN									USGS
1987		INN	KAN					NOWI			USGS
1988	USGS/T/B	INN/SEL	KAN	SEL					SEL		USGS
1989	USGS/T/B	INN		KOY				NOWI	SEL		USGS
1990	T	INN/USGS	KAN	KOY			FAI		SEL		USGS
1991	USGS	INN	KAN				ANC/USGS		SEL		USGS
1992		INN		KOY			ANC/FAI		SEL		USGS
1993		ANC	KAN	ANC			ANC/TROY		ANC		USGS
1994		ANC	KAN	ANC			ANC		SEL		USGS
1995			KAN	KOY	USGS						USGS
1996			KAN	KOY	USGS						USGS
1997				FAI	USGS						USGS
1998		FAI		FAI			HEL		FAI		USGS
1999		ANC							ANC		USGS/YD
2000		ANC		ANC							
2001		ANC		ANC					ANC		
2002		ANC/USGS		ANC		ANC			ANC		
2003		ANC/USGS	ANC			ANC	ANC				USGS
2004		ANC				ANC	ANC		ANC	ANC	USGS
2005		ANC				ANC	ANC			ANC	
2006		ANC					ANC			ANC	
2007		ANC					ANC			ANC	
2008		ANC					ANC			ANC	
2009		ANC					ANC				
2010		ANC					ANC				

APPENDIX 4 (continued). Key to abbreviations for table of summary of GWFG banding in Alaska, by region and permittee. From Patuxent Wildlife Research Center, Laural, MD.

Permit Holder	
ANC	MBM Anchorage
FAI	MBM Fairbanks
USGS	USGS Alaska Science Center
INN	Innoko NWR
JUN	MBM Juneau
ADFG	Alaska Fish and Game
YD	Yukon Delta NWR
SEL	Selawik NWR
B	Alaska Pen/Becherof NWR
KAN	Kanuti NWR
KOY	Koyukuk NWR
NOWI	Nowitna NWR
T	Togiak NWR
TROY	Troy Ecological Research
LEN	Cal Lensink
HEL	James Helmericks

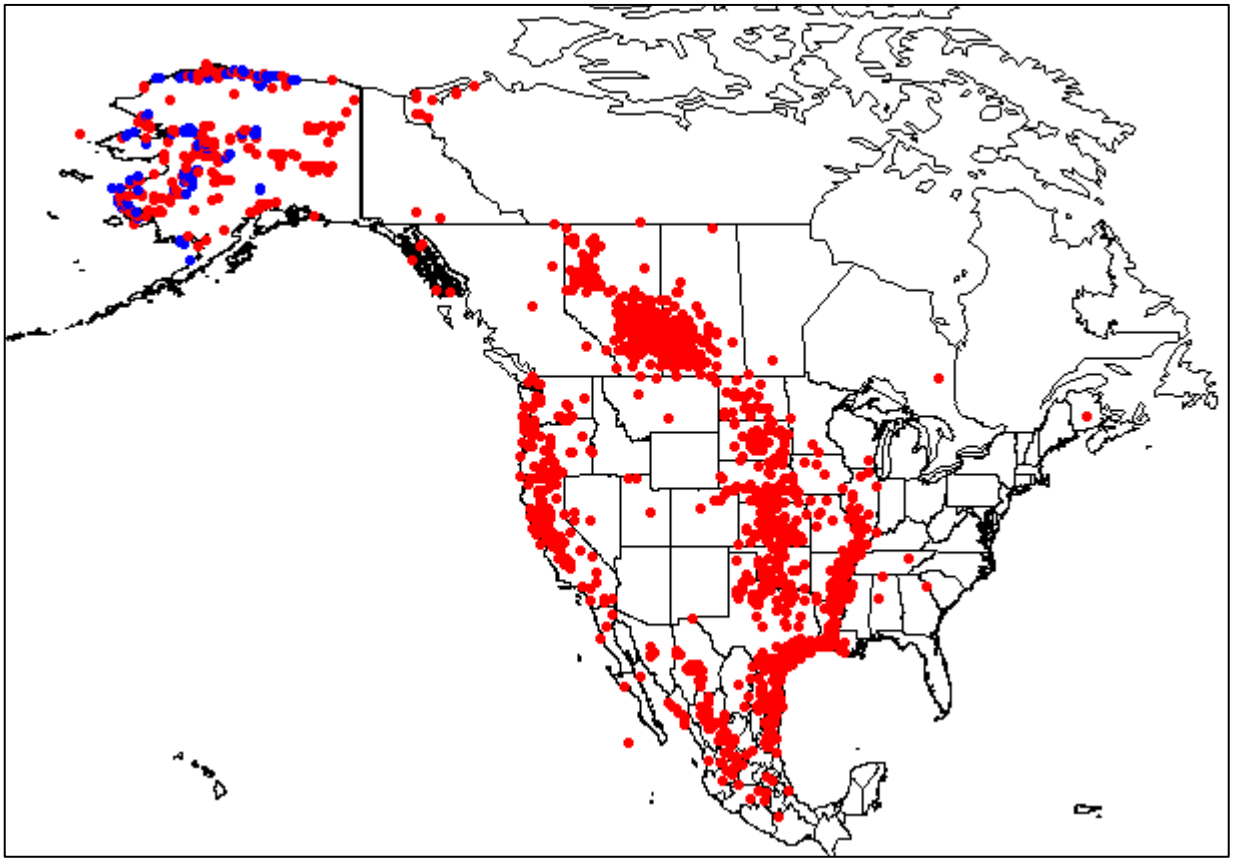
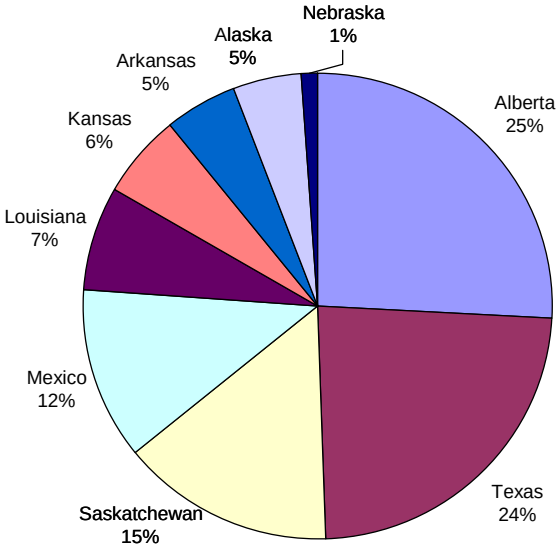
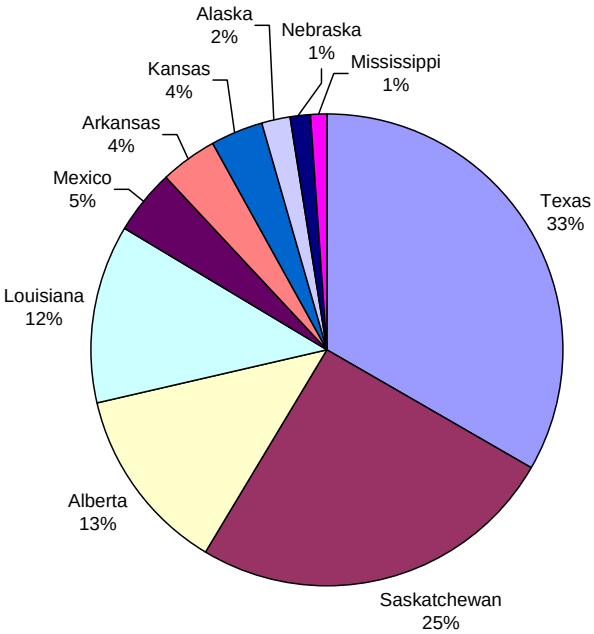


Figure 2. Encounters of all GWFG banded in Alaska, 1924 to 2010. Banding locations in blue; individual recovery locations, red (n=8554 recoveries). Data from Game Bird Encounters database, USGS Bird Banding Laboratory, Pautuxant, MD.



Illinois	0.89
Oklahoma	0.75
North Dakota	0.68
Mississippi	0.48
South Dakota	0.48
Colorado	0.34
Missouri	0.20
Tennessee	0.20
Alabama	0.14
British Columbia	0.14
Minnesota	0.14
Montana	0.14
Utah	0.14
Kentucky	0.07
New Brunswick	0.07
Ontario	0.07
South Carolina	0.07

Figure 3. Recovery locations of shot mid-continent GWFG banded in Innoko NWR, Alaska. Chart shows proportion of GWFG with >1 percent from each location; table lists those with <1 percent contribution each to total recovered (n=1465 of birds recovered by hunting between years 1948-2010).



Illinois	0.77
South Dakota	0.68
Oklahoma	0.53
Missouri	0.43
North Dakota	0.43
Northwest Territories	0.43
Iowa	0.24
Tennessee	0.10
California	0.05
Indiana	0.05
Montana	0.05

Figure 4. Recovery locations of shot mid-continent GWFG banded on Arctic Coastal Plain, Alaska. Chart shows proportion of GWFG with >1 percent from each location; table lists those with <1 percent contribution each to total recovered (n=2074 birds recovered by hunting between years 1970-2010). Data from Game Birds Encounters database, USGS Bird Banding Laboratory, Pautuxant, MD.