Greater White-fronted Goose Banding in Alaska in 2007 by Migratory Bird Management, USFWS

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Due to the scarcity of harvest distribution data and relative survival rates of Alaska midcontinent greater white-fronted geese (*Anser albifrons frontalis*), a banding program was initiated in 1975. Results of this effort showed 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. An active banding program for greater white-fronted geese (GWFG) in Canada has provided valuable survival estimates to compare with geese at Alaska sites. Banding efforts in interior and northwest Alaska (Fig.1) are ongoing in order to determine if survival remains significantly lower than other breeding areas of midcontinent white-fronted geese, and if trends in annual survival differ between these sites. In addition, the Alaska banding program expanded to the Arctic Coastal Plain to determine whether lower survival rates of mid-continent white-fronts was unique to interior and northwest Alaska, or if the phenomenon was state-wide.

Declines in abundance of geese in interior Alaska heightened concern for the importance of this species in the interior refuges and has been the basis for research partnerships with the University of Alaska, the University of Chihuahua, the Division of Migratory Bird Management, several National Wildlife Refuges, USGS, and local high schools. Band recovery, collar resight data, and satellite tracking results, have helped discover and verify flyway corridors and wintering areas used by midcontinent GWFG that breed in Alaska. The FWS also cooperates with researchers in Mexico to document habitat use and hunting pressure near winter locations.

Banding efforts have recently been expanded to the Arctic Coastal Plain, ACP, where data is currently insufficient to assess survival rates for tundra breeding GWFG in Alaska. Banding on the ACP will also help determine the degree of interchange between boreal nesting and tundra nesting GWFG in Alaska. Since 1998 the goal has been to band 1000 or more GWFG annually among the Innoko, Koyukuk, and Selawik National Wildlife Refuges (NWR, Fig.1). Geese in Kanuti NWR, in interior Alaska, were banded in 1973-96, but few GWFG have been observed there in recent years and were only banded in 2003 when satellite transmitters were installed. In 2002, the Lower Noatak River Delta, northwestern Alaska, was added to the banding locations as was the Seward Peninsula in 2004. However,small numbers of trapable geese in the Noatak Delta, Seward Peninsula, Koyukuk NWR and Selawik NWR resulted in a temporary end to goose capture operations in those areas in 2006, 2007, 2002 and 2005, respectively (Appendix 2). Starting in 2003, GWFG were banded on the ACP and several were added to the group of satellite transmitter birds. For many years, neck collars were also used to mark a portion of the banded population (collars not deployed since 2002, except on VHF radio-collared geese, Appendix 2).

Similar to previous years, we targeted high-density molting areas; in 2007 these were Innoko NWR and the ACP near Teshekpuk Lake. Other historical banding areas for this effort have included the Noatak River delta, Selawik NWR, Koyukuk-Nowitna NWR and the Seward Peninsula, and were not worked in 2007 because of the paucity of large molting flocks. In order to provide ample data for annual survival estimates for each region, the objective in 2007 was again to band a minimum 1000 GWFG at both the interior/northwest region and on the ACP. Within the Innoko NWR, lesser Canada geese (*Branta canadensis parvipes*) sometimes flock with the GWFG and are captured and banded together with GWFG.

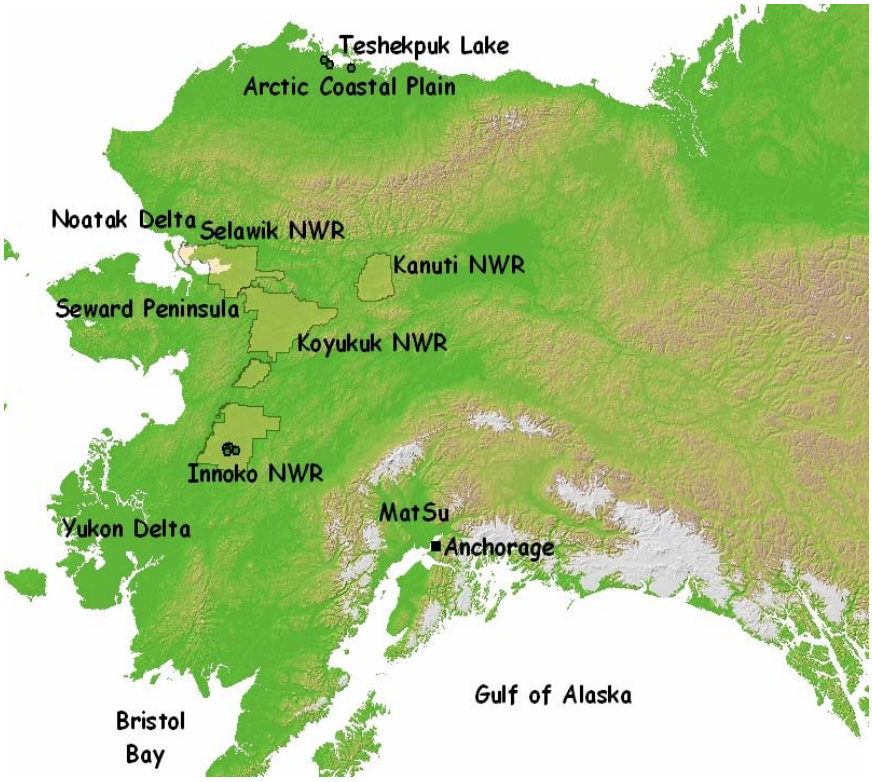


Figure 1. State of Alaska with historical GWFG banding areas and 2007 banding locations on Innoko NWR and Arctic Coastal Plain. From GWFG banding effort in Alaska 2007.

Around 2003, a particularly virulent strain of avian influenza, 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, 186 human cases have been documented in 8 countries, resulting in 108 deaths. The role that migratory birds have in spreading Asian HPAI is unknown, but migratory birds are considered a possible vector for entry of the virus into the Americas; birds crossing between Alaska and Asia or populations mixing in staging areas are thought to pose some risk for the introduction of the virus to Alaska and North America. Since GWFG are not known to mix with any eastern migrants, they are now considered to have a relatively low potential among Alaskan birds to act as carriers; cloacal and mouth/throat (oral-pharyngeal) swabs were opportunistically collected as birds were handled for banding.

Schedule and Personnel

Bill Larned and Julian Fischer, Principal Investigators, U.S. Fish and Wildlife Service, Migratory Bird Management, 1011 E. Tudor Rd. Anchorage, Alaska, william_larned@fws.gov; julian_fischer@fws.gov, formulated the schedule and planned logistics.

2007 Itinerary:

Thursday, 7/5

No banding. All aircraft, personnel to Innoko camp. Prep and crew meeting to go over logistics, safety and make plans.

Friday, 7/6

Banding at Innoko. Banded on lake site. Overnight at Innoko cabin.

Saturday, 7/7

Banding at Innoko. Banded two Iditarod River sites. Overnight at Innoko cabin.

Sunday, 7/8
Banding at Innoko. Banded two Iditarod River sites. Overnight at Innoko cabin.
Monday, 7/9
No banding. Travel day. Crews to Deadhorse. Overnight Deadhorse.
Tuesday, 7/10
No banding due to weather (fog). Overnight Deadhorse.
Wednesday, 7/11
No banding due to weather (fog). Overnight Deadhorse.
Thursday, 7/12
Banded two sites on N. Slope near Teshukpuk Lake. Overnight Deadhorse.
Friday, 7/13
Banded two sites on N. Slope near Teshukpuk Lake. Last day of banding. Overnight Deadhorse.
Saturday, 7/14
Travel Day. Crews not brant banding fly to Anchorage and Soldotna.

PERSONNEL AND DUTIES:
Julian Fischer (Anchorage 786-3644) GWFG projects coordinator, bander
Bill Larned (Soldotna, 260-0124) Field operations supervisor, pilot, bander
Paul Anderson (Anchorage 786-3653) Pilot, bander
Karen Bollinger (Fairbanks, 456-0342) Molting surveys, pilot, bander
Brad Scotton (Galena, 656-1231) Pilot, bander
Rob Macdonald (Juneau) Pilot, bander
Paige Gingrich (UAF) N.Slope AI logistics, bander.
Robin Corcoran (McGrath, 524-3251), Bander, Innoko Canada Goose banding schedules
Heather Wilson (Anchorage, 786-3831) Bander
Dennis Marks (Anchorage, 786-3987) Banding schedules, band reporting, bander
John Terenzi (Anchorage 786-3509) Bander, Tule research
Eric Smith Bander, Tule research assistant
Paul Ladegard (McGrath, 524-3251) Pilot, logistics
Mike Bye (McGrath, 524-3251) Logistics
Kayty Harrison and Conor Reynolds (McGrath, 524-3251) logistics, banding assistants

AIRCRAFT/PILOTS:
Innoko:
N234JB Cessna 206 amphib (Bollinger pilot)
N9798Z C-206 amphib (Anderson pilot)
N735HB C-185 (Ladegard pilot)
PA-18 cub (Scotton, pilot)
Deadhorse:
N61599 Cessna 206 amphib - Larned
N9798Z Cessna 206 amphib - Anderson
N234JB Cessna 206 amphib - MacDonald, Bollinger

Methods
Trapping. The method used by FWS for trapping and banding geese consists of 1) locating a flock of molting geese on a suitable lake (deep and wide enough for C-206 maneuvering), 2) setting up the trap 3) herding the flock and 4) handling birds.

Locating geese is accomplished through routine aerial surveys, prior experience and reconnaissance. When geese are discovered, details of the drive are worked out between pilots, including selecting a lake that has: room to land and taxi behind the flock, a suitable place for the pot net; dry, preferably with shade and vegetation to help separate geese (wet feathers seem to lead to more severe injuries when birds climb on each other). An ideal site is one where the trap can be set up out of sight of the geese and where the wind will assist in the drive (e.g., having the most difficult portion of the drive into the wind; not too long a swim against the wind).

Aircraft land and the pot net (larger one is generally used, leaving some extra for closing it off after the geese enter) and leads are set. Generally, one plane stays in the air to keep the geese flocked up–or even to combine two flocks, and to keep them away from the shore. It takes 20 min to an hour to set the trap, depending on terrain and size/experience

of the work crew. There are two leads: a long one that runs between 50-100m down the beach in the direction from which the geese are approaching, and a short lead, the "far" lead, running from the pot perpendicular to the shore out into the water as far as possible. The bottom edge of the pot and the leads are staked down so geese cannot escape underneath (if one goose gets out, many probably will). When the net is complete, ground crew hides in the vegetation near both ends of the leads, ready to reveal themselves, if instructed to do so by pilots (via hand held radio).

Aircraft depart, land behind the geese and begin moving the geese toward the trap. Preferably, one plane remains airborne to direct the operation (reporting flock movement relative to the trap and aircraft and anticipating potential escape routes). Input from the ground crew is rarely but sometimes needed. As the geese get close, it is critical that people on the shore not be seen as this can foil a drive. Rarely, ground crew may be necessary if the geese come to shore outside the leads. It is common for a few geese to miss the lead and run past ground crew and it is important to wait for instructions before standing up or showing yourself in any way.

After the pot door is closed off with the geese inside, people stand around 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), 300-400 geese is probably the maximum number that can safely be kept in the net pot and excess geese are released (looking for collared and banded birds).

Banding. Currently, banding permits must be renewed every 3 years through the USGS Bird Banding Laboratory (BBL). In setting up banding station, avoid placing banding station too close to the goose catch pen. In warm weather, begin banding ASAP. Make sure band ends come together squarely and smoothly; spread bands evenly when removing from string. Read band number with care, especially with recaps since there is no way to check these data later. The recorder should read back your data-listen and verify! Carefully identify sex via cloacal exam; be sure to look for brood patch; note condition (e.g., injuries, exhaustion). Release bird toward the shore. Species, age, sex, exact (GPS) location, date and other notes (e.g., collar number, radio frequency, brood patch, cloacal swab) are noted on a waterproof field band schedule. These data are entered into an Excel spreadsheet and imported into BBL banding software (in 2007, Bandit!) and e-mailed to the BBL Patuxent Wildlife Research Center in Laurel, MD.

Avian Influenza. Rotate swab in cloaca to collect body cells (not feces), place in vial, lift swab off bottom to break 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

Due to a 50-75% lesser than normal snowpack (B. Platte pers. com.), water was extremely low in lakes on the Innoko NWR in 2007. This made the use of aircraft to drive geese on most lakes there impossible. Therefore, all but one drive was conducted on the Iditarod River; methods were modified slightly to accommodate GWFG capture on the river. On the ACP, frozen tundra again presented a problem setting net posts; a drill with large masonry bit and a mallet worked well in sinking the posts.

With a seasoned, well organized crew, we had another very successful marking effort in 2007; In 6 days of banding (plus 4 travel days and one weather day; 11 days in all), we handled 2488 geese, installed 2323 new bands and recorded 124 recaptured GWFG from 9 sites in two regions: Innoko NWR within the Iditarod River drainage just upstream from the confluence of the Innoko River, and the ACP, within 15 miles of Teshekpuk Lake (Fig.1, Appendices 5a, b). The goal to band a minimum of 1000 GWFG in each region of the interior and ACP was met, with 1167 and 1169 GWFG banded on Innoko NWR and near Teshekpuk Lake (Table 1). In 2003, 2004, 2005 and 2006 , we banded a total of 2441, 3061, 2475 and 2323 geese, respectively, throughout the state.

Summary of MBM, USFWS effort in 2007:

New bands applied (GWFG, SCGO*)	2221 (2212, 9)
Recaptures	124

*SCGO - small Canada goose

Few lesser Canada geese, CAGO, were caught and processed in 2007; GWFG comprised >99% of the total (Table 1, GWFG were 97% and 77.5% of the totals in 2006 and 2005). While Innoko and the ACP have traditionally contributed the bulk of geese banded for this effort (89%, 83% and 81% in 2006, 2005 and 2004), in 2007 only these two regions were worked. Totals are compiled below (Table 1); see Appendix 1 for banding location details. In Innoko, many molting geese were on rivers and small oxbows. Both Innoko and ACP areas had many large lakes with numerous large flocks of molting geese.

TABLE 1. Detail of geese handled in 2007 banding effort in interior and Arctic Coastal Plain, Alaska, by location, date, species, age and sex, including 124 recaptured geese. No bands on recaptured geese were replaced with new bands. From GWFG banding effort in Alaska 2007.

			Innoko					Arctic Coastal Plain				
			6-Jun	7-Jun		8-Jun		12-Jun		13-Jun		
			1	2	3	4	5	1	2	3	4	Total
GWFG	**ASY**	**F**	92	33	39	160	27	118	82	121	90	762
		M	115	72	40	256	59	171	75	169	106	1063
		U				6						6
	SY	**F**	19	5	9	74	32	46	31	44	17	277
		M	17	12	12	66	22	41	11	33	14	228
	GWFG Total		**243**	**122**	**100**	**562**	**140**	**376**	**199**	**367**	**227**	**2336**
	Total GWFG by Area						1167				1169	
CAGO	**AHY**	**F**		1								1
		M		7	1							8
	CAGO Total			**8**	**1**							**9**
Total Geese Processed			**243**	**130**	**101**	**562**	**140**	**376**	**199**	**367**	**227**	**2345**

Aging GWFG is inexact, however, after second-year GWFG made up 77% of all GWFG banded in 2007, equal to the 77% in 2006, both years having a higher proportion of second-year geese than were identified in previous years (83% ASY in 2005, 83% in 2004, 85% in 2003, 82% in 2002 and 81% in 2001). Fifty-five percent of the recorded (new and recap) GWFG were male in 2007 (56%, 57%, 55%, 59%, 57% and 55% in 2006, 2005, 2004, 2003, 2002 and 2001).

TABLE 2. Summary of geese handled in 2007 banding effort in interior and Artic Coastal Plain Alaska, by age and sex. From GWFG banding effort in Alaska 2007.

		ASY/AHY*				SY			Total
		F	M	U	Total	F	M	Total	
New Bands	**GWFG**	711	993	3	1707	277	228	505	2212
	CAGO	1	8		9				9
	Total, new	**712**	**1001**	**3**	**1716**	**277**	**228**	**505**	**2221**
Recaps	**GWFG**	51	70	3	124				124
Total geese handled		**763**	**1071**	**6**	**1840**	**277**	**228**	**505**	**2345**

*all, and only, SCGO were identified as AHY

Recaptures

Of the more than 2,300 birds handled in 2007, 124 were previously banded (Tables 2, 3, and 4; 165, 231, 212, and 120 in 2006, 2005, 2004, and 2003) and is about 5% of the total GWFG handled in 2007 compared to 7%, 11%, 9%, 7% and 5% in 2006, 2005, 2004 and 2003. All previously banded birds were captured in Innoko; none were caught on the ACP in 2007, certainly due to the massive area, large numbers of molting GWFG, and shorter banding history in the area.

TABLE 3. Numbers of recaptured geese for each banding site of geese handled in 2007 banding effort for interior and Arctic Coastal Plain Alaska. No banded CAGO were captured.

	Innoko					Arctic Coastal Plain				
	1	2	3	4	5	1	2	3	4	Total
GWFG	55	17	2	39	11	0	0	0	0	124

As generally seen, geese demonstrated a high degree of molting site fidelity; all but one of the Innoko recaps were originally banded in Innoko, and were banded back to 1999 (Table 4). The one recap not from Innoko was originally banded on the Noatak Flats. In past years GWFG recaptured in Innoko but not banded there were first banded on the Noatak Flats and Koyukuk River; GWFG banded on the ACP were recaptured on the Seward Peninsula. No bands on recaptured geese were replaced with new bands. In a comparison of sex identification in recaptured GWFG, 19% of the sexes recorded in 2007 were different than the original sex designation.

TABLE 4. Recaptured GWFG from Innoko NWR in 2007 by location and year of banding. All were banded in Innoko, except one (*), banded in 2003 on the Noatak Flats, Alaska. No previously banded birds were captured on the Arctic Coastal Plain in 2007. From 2007 Alaska GWFG banding effort.

Year Banded	Total
1999	1
2000	5
2001	13
2002	8
2003	11*
2004	26
2005	34
2006	26
Total	124

Reporting Bands (hunters, etc.)

From BBL: We encourage all banders to publicize the new web site reporting capability (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. In addition this capability will save the BBL both paper and time expenses.

Annual Survival (*from Fischer 2007*)

Leg-banding provides data necessary to calculate annual survival of midcontinent greater white-fronted geese in interior and northwest Alaska. 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). After 7 years of banding 1,000 white-fronts

annually in interior/northwest Alaska, we have approximately an 80% chance of detecting a 10% change in survival. Joel Schmutz (USGS-ASC) used band recoveries from 2000-2005 to generate survival estimates for white-fronts from interior/northwest Alaska (Fig. 20). He found that during this period, mean survival rate was 0.62 (± 0.05 95%CI). This estimate was significantly lower than mean survival of white-fronts from Queen Maud Gulf, Canada during the 2000-2004 period (0.77; ± 0.05 95%CI). Indexed reporting rate (product of the probability a band will be recovered and probability a recovered band will be reported) also differed significantly between interior Alaska and Queen Maud Gulf (0.10 ± 0.01 95%CI, 0.18 ± 0.02 95%CI, respectively). Crews have banded approximately 1,000 white-fronts each year on the ACP since 2003. The current survival estimate for white-fronts on the ACP is 0.79 (± 0.18 95%CI). Indexed reporting rate is 0.18 ± 0.13 95%CI. Precision of these estimates will increase substantially over the next few years with continued banding effort, but at present the ACP estimates are very similar to those of Queen Maud Gulf. This finding suggests that low survival is not Alaska-wide, but is specific to one component of the population that occurs in boreal habitats of interior and northwest portions of the state.

The factors contributing to low 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 sport harvest, exposure to avian disease in the Rainwater Basin of Nebraska, poor habitat conditions in Mexico, subsistence harvest in Alaska, 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 will seek funding to investigate this question in 2008.

Injuries

As far as is known, only one bird died as an immediate result of the trapping and banding exercise and all birds looked relatively healthy upon release. A few appeared exhausted but swam away on release. Injuries consisted of skin scraped from the back by other geese when in the net pen. Some skin was removed from the backs of between 20-50 birds, more than in 2006 but fewer than many past years when geese were not as carefully monitored in the net pen. While these injuries were limited to the back and did not affect flight feathers, some appeared serious and survivorship of these birds is not known. From past experience, more than 300 geese in the pen can lead to many more injuries, though it is common to underestimate goose numbers in the pen. In one Innoko drive we kept over 500 geese in the pen. A few northern pintail ducks were also slightly injured before they were rescued from the net pot.

A GWFG banded by in Alaska was captured in California in 2007 with a severe injury to the leg, apparently caused by band chafing. Those banders advised the use of a size 8 band (inside diam.11/16") for Tule GWFG instead of the 7B band (inside diam.17/32") we currently use for all GWFG. Craig Ely, USGS, noted from his records that this goose was average-sized and thought the injury might have been caused by a previous injury that made the leg swell. In any case, size 8 bands will be available in the future to use when the 7A band seems too small.

Avian Influenza Sampling

As part of the national HPAI H5N1 virus investigation, we performed cloacal swabs, in all three areas, on 1322 geese (Table 5). Cloacal sampling was per National Wildlife Health Lab protocols. Samples from Innoko NWR were shipped to the Alaska Science Center to be evaluated by the National Wildlife Health Lab in Madison, WI; samples from the ACP were shipped to the University of Alaska, Fairbanks, for analysis. In the BBL database, a remark for each cloacal swab was reported.

TABLE 5. Number of geese sampled for AI for each banding site in the 2007 banding effort for interior and Arctic Coastal Plain Alaska. For GWFG banding effort in Alaska 2007.

	Innoko [Total GWFG 394]					**Arctic Coastal Plain** [Total 997]				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**Total**
CAGO		2								**2**
GWFG	233	118	43			374	167	365	91	**1391**

Conclusion

With no major mechanicals, 5 full days of banding, 2 weather days and 3 travel days, 2221 geese were newly banded and 124 recaptured GWFG were recorded with a minimum of injuries to birds, and none to banders; the goal to band a minimum of 1000 GWFG in both the interior and on the ACP was met in 2007. With an experienced crew in the air and on the ground, it was again an extremely successful, efficient and enjoyable banding operation.

More Information

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

Fischer, Julian B. 2007. Midcontinent greater white-fronted geese in Alaska – 2006 project updates. U.S. Fish and Wildlife Service, Migratory Bird Management, Waterfowl Management, Anchorage, Alaska

Schmutz, J. A. , and C.R. Ely. 1999. Survival of greater white-fronted geese: Effects of year, season, sex and body condition. Journal of Wildlife Management 63:1239-1249.

Schmutz, J. C., to Managers and biologists concerned about white-fronted geese in interior Alaska. Memorandum regarding Sample sizes needed for monitoring survival with a banding program, 3 January 2001, USGS, Alaska Biological Science Center.

Spindler, M. A., J. M. Lowe, and J. Y. Fujikawa. 1999. Trends in abundance and productivity of white-fronted geese in thte taiga of northwest and interior Alaska. Unpubl. report for the Central Flyway Technical Committee.

Spindler, Mike and Deborah Webb. 2003. Abundance, migration, and survival of white-fronted geese that nest in northwest and interior Alaska. Koyukuk/Nowitna National Wildlife Refuge report, U.S. Fish and Wildlife Service, Galena, Alaska.

APPENDIX 1. Banding locations for all interior and Arctic Coastal Plain, Alaska GWFG sites for 2007 banding effort.

	Site Description			Lat	Long	Lat-Long in Decdeg	
Innoko							
6-Jul	Innoko 1	50 mi NW Shageluk, AK	Lake	63° 6' 15"	158° 19' 11"	63.1041	158.3198
7-Jul	Innoko 2	45 mi NW Shageluk, AK	River	63° 9' 47"	158° 37' 23"	63.1630	158.6230
7-Jul	Innoko 3	40 mi NW Shageluk, AK	River	63° 7' 32"	158° 45' 21"	63.1256	158.7559
8-Jul	Innoko 4	40 mi NW Shageluk, AK	River	63° 7' 32"	158° 45' 20"	63.1257	158.7555
8-Jul	Innoko 5	40 mi NW Shageluk, AK	River	63° 3' 19"	158° 42' 10"	63.0553	158.7028
Artic Coastal Plain							
12-Jul	ACP 1	45 mi WNW Nuiqsut, AK	Lake	70° 26' 10"	152° 54' 23"	70.4362	152.9063
12-Jul	ACP 2	45 mi WNW Nuiqsut, AK	Lake	70° 26' 9"	152° 54' 55"	70.4360	152.9153
13-Jul	ACP 3	80 mi WNW Nuiqsut, AK	Lake	70° 30' 48"	154° 13' 55"	70.5134	154.2320
13-Jul	ACP 4	85 mi WNW Nuiqsut, AK	Lake	70° 36' 1"	154° 30' 33"	70.6001	154.5092

APPENDIX 2. Summary of Migratory Bird Management GWFG Banding Projects 1997–2007.

1997 - Bands and collars.
1998 - Bands and collars.
1999 - Bands only.
2000 - Bands and collars.
2001 - Bands, satellite implants (Innoko 6, Koyukuk 3, Selawik 3), avian cholera: throat swabs (*Pasteurella multocida* carrier) and blood samples(for antibodies, prior exposure).
2002 - Bands and collars, satellite implants (Innoko 10, Koyukuk 3, Selawik 4, Noatak 5), VHF radio collars, blood samples and throat swabs (see above).
2003 - 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 - Bands only.
2005 - Bands only.
2006 - Bands and avian influenza sampling (cloacal swabs).
2007 - Bands and avian influenza sampling (cloacal and oral-pharyngeal swabs).

APPENDIX 3 . Summary of all GWFG banding in Alaska, by region, 1960-2006. Data from Bird Banding Lab database, Patuxent Wildlife Research Center, Laural, MD.

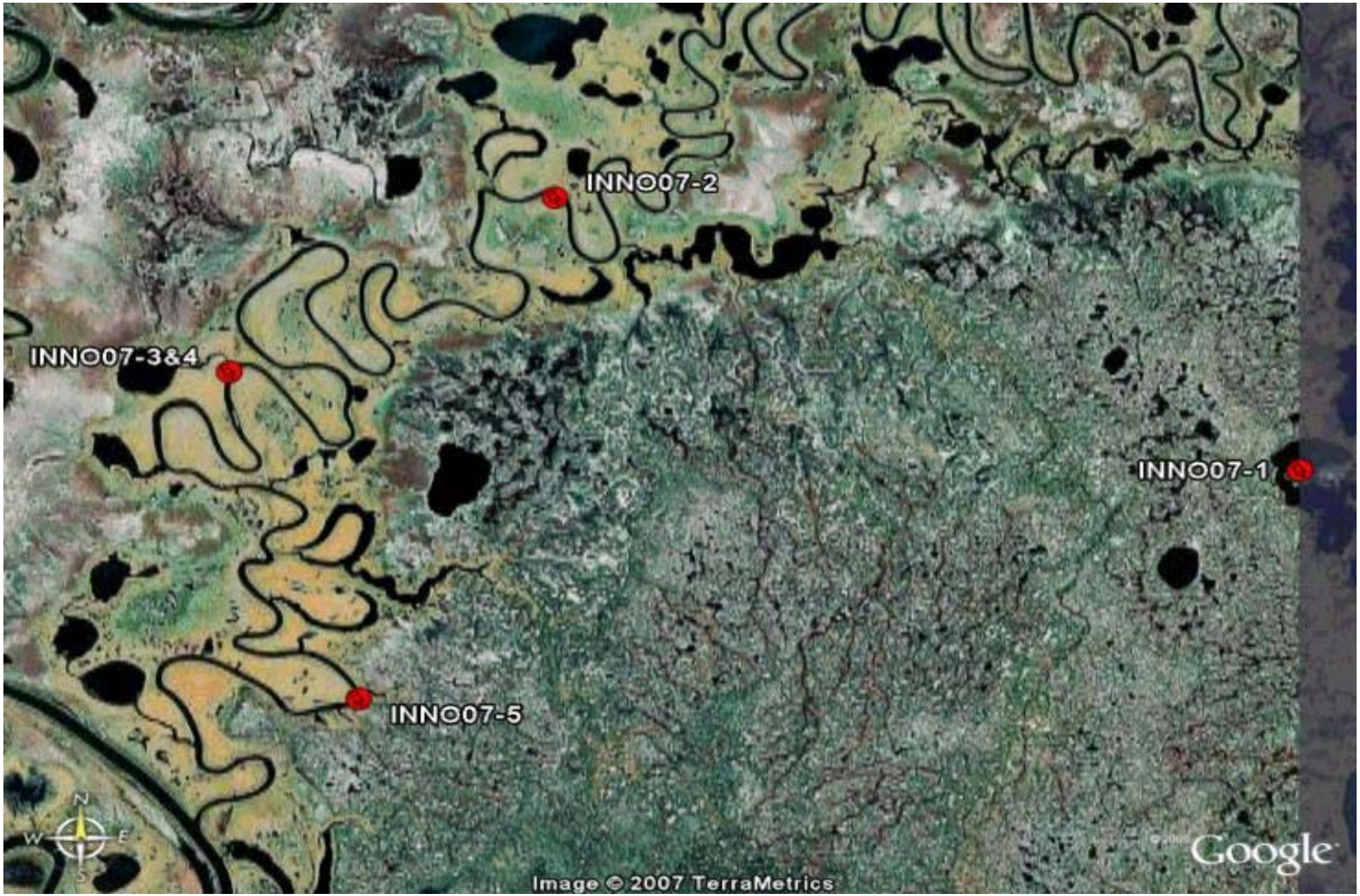
	Bristol Bay	Innoko	Kanuti	Koyukuk	Matsu	Noatak	ACP	Nowitna	Selawik	Seward Pen	Tankus	Yukon Delta	Yukon Flats	Total
1960													1	1
1961											20			20
1962												210		210
1964											3			3
1966												5		5
1967												1714		1714
1968												2341		2341
1969		500				71				266		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
Total	1168	13638	1808	7104	871	683	13038	36	1565	891	23	5990	1	46816

APPENDIX 4. Summary of GWFG banding in Alaska, by year, region and permittee, 1960-2006. 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.

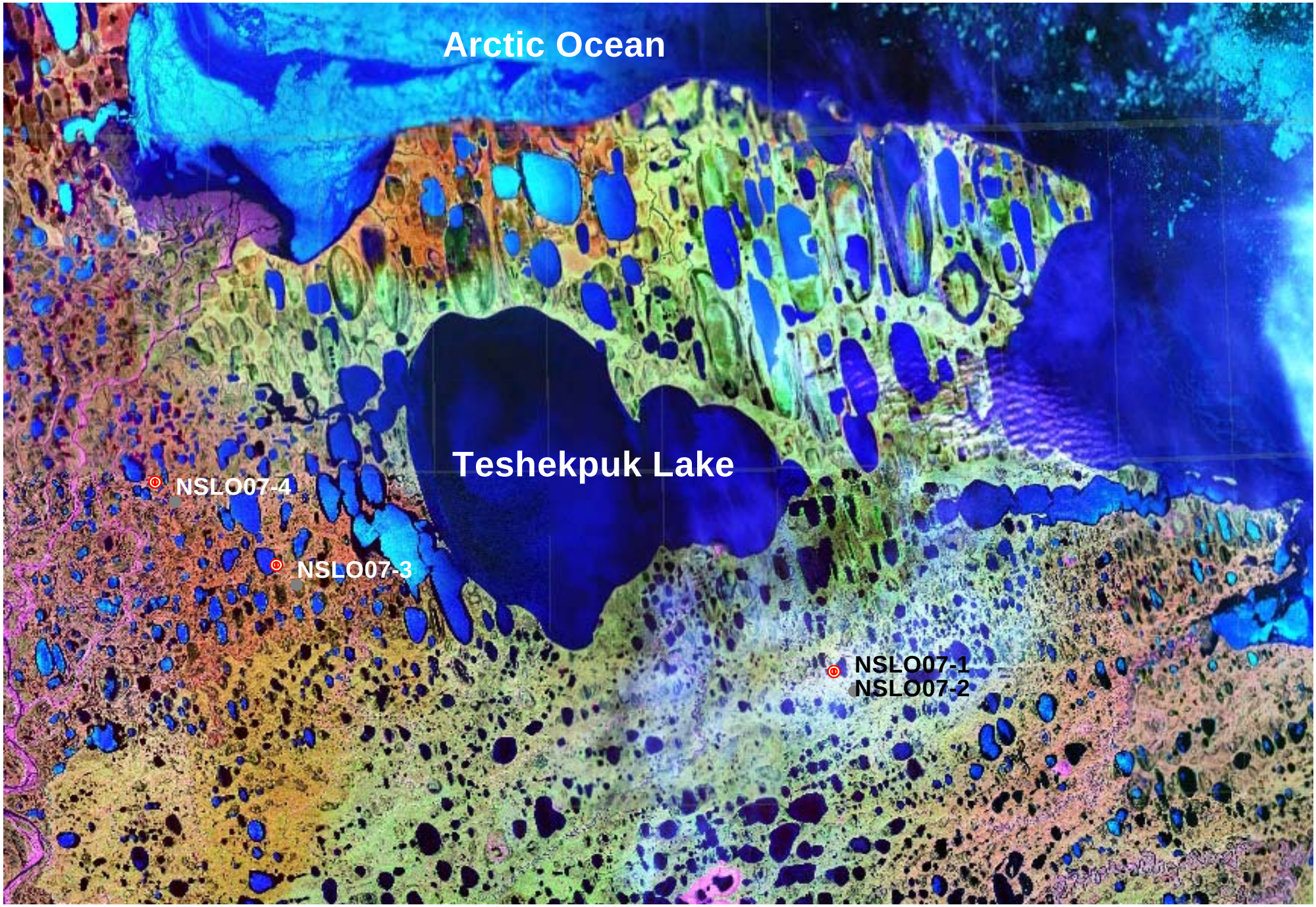
	Bristol Bay	Innoko	Kanuti	Koyukuk	Matsu	Noatak	ACP	Nowitna	Selawik	Seward Pen	Yukon Delta
1960											
1961											
1962											JUN
1964											
1966											JUN
1967											JUN/ LEN
1968											JUN
1969		JUN				JUN				JUN	JUN/ YD
1970							JUN				YD
1971							JUN				
1972											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
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/ INN					ANC			ANC	

APPENDIX 4 (continued). Key to abbreviations for table of summary of all GWFG banding in Alaska, by region and permittee, 1960-2006. 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



APPENDIX 5a. Innoko NWR banding area showing 2007 GWFG banding locations in the Innoko NWR, the Iditarod River, and the Innoko R., lower left. Image from Google Earth 2007; data points from 2007 GWFG banding effort for Alaska.



APPENDIX 5b. Alaska's Arctic Coastal Plain banding area showing 2007 GWFG banding locations near Teshekpuk Lake. Image from NASA World Wind 1.4; data points from 2007 GWFG banding effort for Alaska.