Kanuti NWR Progress Report FY12
Aerial Surveys of Molting Geese on Kanuti National Wildlife Refuge, July 2012

Purpose: Aerial survey of molting Greater White-fronted and Canada geese
Location: Kanuti National Wildlife Refuge (NWR), Koyukuk and Kanuti rivers, and Lake Todatonten
Dates: July 6–8, 2012
Participants: Mike Spindler**,** Les Dillard
Author: Christopher M. Harwood
Report Date: August 16, 2012

Summary:

During 6–8 July 2012, Refuge Manager/Pilot Mike Spindler and Wildlife Biologist/Pilot Les Dillard conducted aerial surveys of molting Greater White-fronted Geese (*Anser albifrons*, hereafter "white-fronts"), and Canada Geese (*Branta canadensis*) on Kanuti NWR. As in 2009 and 2010, they employed a reduced effort by surveying only 25 of the original 101 aerial line transects to target historical goose "hot spots" on or near Kanuti National Wildlife Refuge. These surveys covered three core areas, nearby Lake Todatonten, and the terminus of the Kanuti River. Totals of 256 white-fronts (146 adults and 110 young) and 75 Canada Geese (25 adults and 50 young) were observed during official surveys. Additional geese were observed incidentally in non-transect surveys of the main stem and South Fork of the Koyukuk River, the Kanuti River, and Kanuti Chalatna Creek.

Background:

Except for 2004 and 2005 when smoke precluded surveying, Kanuti NWR (KANWR) has participated in the coordinated aerial molting white-front survey in interior Alaska since 2001. Fischer (2006*a*) and Saperstein (2005) provide the history and rationale of the collective and Kanuti NWR-specific efforts concerning monitoring Alaska's mid-continent white-front population. A total of 101 east-west transects were flown during these early surveys. However, several of the transect lines were often devoid of geese. Therefore, after consulting with Migratory Bird Management (Fischer 2009), KANWR focused their survey effort in 2009 on the 25 transects where geese were most likely to occur. Thereafter, these 25 transects constituted the regular annual molting goose survey on the Refuge. In addition, a complete survey that includes the original 101 transects and recapitulates the 2006–2008 surveys will be conducted at five-year intervals.

Study Area and Methods:

"Official" Observations
After a period of refinement in methods beginning in 2001, protocols for the "official" survey that once covered 101 transects were finalized by 2003. This survey was repeated consistently from 2006–2008 (Saperstein 2005, Harwood 2006, 2007, 2008). These transects covered goose habitat within KANWR, as well as Lake Todatonten and the terminus of the Kanuti River (i.e. the confluence of Kanuti and Koyukuk Rivers, upriver to Kanuti Canyon; Fig. 1). During these surveys most white-fronts were observed in three core areas: (1) the Mud Lakes and Kanuti River down to its confluence with the Kanuti Kilolitna River; (2) near Katalahosa Lake, and; (3) near South Fork Koyukuk River/Fish Creeks. The latter two areas began to be used in later surveys while the Mud Lakes/Kanuti always hosted geese. Therefore, we selected 25 transects

that covered these core areas (12, 5, and 8 transects of varying lengths each in the South Fork, Katalahosa, and Mud Lakes/Kanuti areas, respectively) to improve survey efficiency and began surveying them exclusively beginning in 2009. The reduced effort affords the Refuge greater flexibility to deal with annual plane/pilot/observer availability, budget shortfalls, variation in weather, etc.

Surveys were conducted in a Bellonca Scout on floats and methods follow those described in Harwood (2006, 2007, 2009, 2010) and Saperstein (2005).

"Unofficial" Observations

Unofficial observations are those made: a) within the historical study opportunistically using methods that are not repeatable between years ("incidental"), and b) outside the historical study area ("supplemental"). Unofficial observations are recorded separately from official ones in this report. While interannual comparisons of these data are not possible, they allow Refuge personnel to monitor changes in habitat occupancy throughout the historical and non-surveyed portions of the Refuge.

Analysis of historical goose distribution and abundance indicated regular detections along several river segments. These segments, although intersected by transects, tend to be sinuous and/or south-north trending, and not well suited to coverage by east-west transects. Therefore, we covered these areas by close, regular circling, rather than intercepting them intermittently as we flew straight transects. Three areas within the historical study area were selected for this type of "unofficial" surveying by circling: the Kanuti and South Fork Koyukuk Rivers, and Kanuti Chalatna Creek. In addition, the greater main stem Koyukuk River corridor (e.g., including its immediate oxbows and other potential goose habitat) between Old Bettles and the Kanuti River mouth was also included in this "unofficial" survey. Although it is not in the "historical" survey area, Canada Geese have been regularly observed there (Fig. 2).

Results:

General Conditions

Refuge personnel completed surveys of all official and unofficial areas during 6–8 July 2012. On 6 July, transects in the South Fork Koyukuk/Fish Creek area, as well as supplemental areas immediately up- and downriver of the transects, were surveyed from 14:36–18:50. Survey conditions for 6 July were as follows:

Sky = scattered at 5,000 ft, broken at 20,000 ft
Visibility = $\geq$ 30 miles
Wind = SW at 5 mph; frequent light turbulence; winds increased (NE at 10–12 mph) after 11:30
Temperature = 68°F

On 7 July, the Katalahosa Lake and Kanuti Cabin/Mud Lakes transect areas were surveyed in the morning (08:10–09:16 and 09:44–11:50, respectively). In the afternoon (11:53–17:00) Lake Todatonten and some of the unofficial riparian areas were surveyed (Kanuti River from north of the Mud Lakes to mouth plus the main stem Koyukuk River back to Bettles). Survey conditions were as follows:

Sky = partly cloudy ("perfect survey conditions"); 4000 ft and broken in afternoon; light rain from 13:57–14:20
Visibility = $\geq$ 30 miles
Wind = NE at 5 mph in morning; SE at 15 mph at Lake Todatonten
Temperature = 57°F in morning; 68°F in afternoon

On 8 July, Kanuti Chalatna Creek and Kanuti River (i.e., unofficial riparian areas) were completed (08:30–09:58). Survey conditions were as follows:

Sky = overcast at 5,000 ft, light rain showers
Visibility = not recorded
Wind = light out of NNE at 5 mph
Temperature = 59°F

The following general water levels were also recorded for the major survey areas: main stem Koyukuk River = high, South Fork Koyukuk River = intermediate, Kanuti River = extremely low, Kanuti Chalatna Creek = low, Lake Todatonten = low.

Total survey flight time (13.9 hr, $1,738) for the project included: 4.0 hr for 6 July, 7.8 hr for 7 July, and 2.1 hr for 8 July (flight hours are "survey" hours, no ferry-time included). Projected fuel costs for the survey (13.9 hr x 8 gal/hr x $8.00/gal [Bettles pricing]) were $890. Food purchases totaled $105. The cost of the project, not including salaries, was $2,733. We had budgeted $3,000.

"Official" Goose Observations

Totals of 256 white-fronts (146 adults and 110 young) and 75 Canada Geese (25 adults and 50 young) were observed during official surveys. Geese were observed on 7 of 25 transects (white-fronts on 7, and Canada Geese on 4; Table 1; Fig. 1). Eighty-two percent (120 individuals) of adult white-fronts were detected on only 2 transects (transect numbers 27 and 29), with 70 (only 48%) individuals in the "Mud Lakes" area. No young white-fronts were detected at Mud Lakes. No geese were observed at Lake Todatonten, again, nor were geese observed at the confluence of the Kanuti and Koyukuk rivers. A multi-year comparison of "official" geese detections is provided in Tables 3 and 4, and Figure 3, the latter two standardized to include only those observations recorded in the "reduced effort survey" areas.

"Unofficial" Goose Observations

An additional 312 Canada Geese (96 adults and 216 young) were observed on sloughs, oxbows, and backwaters along the Koyukuk River (outside of the study area, but largely within the Refuge; Table 2; Fig. 2). However, only 15 white-fronts (8 adults) were observed in this area. Opportunistic counts made while flying tight circles over the Kanuti River (upriver and downriver of Katalahosa Lake transects) and South Fork Koyukuk River (upriver and downriver of the northernmost official transects) yielded an additional 48 white-fronts (20 adults and 28 young) but no Canada Geese. Fourteen (4 adult) white-fronts were observed along Kanuti Chalatna Creek. An additional 62 (34 adult) Canada Geese in the Katalahosa Lake area were found during unofficial surveying but were missed during the official transect survey. None of these observations were used in comparisons with previous years' surveys.

All Goose Observations

Totals of 392 white-fronts (195 adults, 197 [50%] young) and 503 Canada Geese (169 adults, 334 [66%] young) were observed over the three days during both official and unofficial observations.

Other Wildlife Observations

The crew observed 78 adult (including 26 pairs) and ≥37 young swans along transects, plus another 14 adults (including 5 pairs) and 7 young during incidental efforts. Only 2 other species of birds were recorded: Pacific Loon (flock of 3) and Bald Eagle (1). There were 8 moose observations (12 total individuals) of the following composition: single bull (1), single cow (3), cow with calf (2), cow with twins (1), single unknown (1).

Discussion and summary

Even though we reduced our survey effort in 2009 (25 vs. 101 transects) we recorded the highest number of adult white-fronts since the survey's inception. However, in 2012, we again observed a marked decline (46%) in adult white-fronts from the previous year. While observations from the "reduced effort" areas have indeed fluctuated over the last 6 surveys (Table 4 and Figure 3), this is the fewest to date. There could be several explanations for the observed decline, including a difference in survey timing from 2010, fewer molt migrants using the surveyed areas, and/or more residents failed and non-breeders departed the area. It is also possible that birds were just outside the surveyed areas and were not detected; this was noted with Canada Geese at the Katalahosa Lake area where no geese were observed there during the official transect survey, yet 34 adults and 28 young were observed the next day during an unofficial resurvey.

As always, the interpretation of data collected on this survey is confounded by our inability to clearly distinguish between such "resident" (i.e., resident throughout the breeding season) and "migratory" (non-local failed breeders, etc.) birds. The observed occurrence of family groups help us identify successful local breeders to an extent, but the status (e.g., Kanuti breeder, Kanuti non-breeder, molt-migrant, etc.) of flocked birds cannot be ascertained by the survey methods currently employed. Consequently, the annual contribution of these cohorts to the white-front population on the Refuge is unknown. Given this recent decline in observations of adult white-fronts and the taxon's sensitive history in the Interior, continued vigilance on the refuge is warranted. Given that the last complete survey was done in 2008, it may be opportune that the every-five-year complete survey is scheduled for 2013.

As was observed in past surveys, the Mud Lakes proper were found to be the most important local molting area for adult white-fronts in 2012. The northern (South Fork/Fish Creek) and middle (Katalahosa) transect areas tend to be more variable year to year (Fig. 3), and they always support fewer birds No geese were observed at Lake Todatonten for the *fifth* year in a row, nor were any observed at the mouth of the Kanuti River. We observed that Lake Todatonten was again very shallow during our survey. Unless this drying trend reverses, Lake Todatonten may cease to be used by waterfowl in the future, including molting geese.

Despite the low number of adult white-fronts observed during the official survey, the number of goslings observed was one of the highest numerically, and the highest proportionately (45% of all observations), over the survey's history. Similarly, although total (official and incidental) observations of adult Canada Geese were also markedly down from 2010 (259) and 2009 (290), the number of young observed in total was on par with the previous 2 surveys (329 and 365, respectively). These results suggest favorable breeding conditions for both species. Similar conditions throughout the range may suggest that there may have been fewer failed breeders available to use the refuge during the molting period.

Literature Cited:

Fischer, J. B. 2006*a*. Mid-continent greater white-fronted geese in Alaska – 2005 project updates. Unpublished USFWS Report, Migratory Bird Management, Anchorage.

Fischer, J. B. 2006*b*. Meeting Notes: Alaska Biologists Coordination Meeting, Interior/NW Alaska Mid-continent White-fronted Geese, March 16, 2006. Unpublished USFWS Report, Migratory Bird Management, Anchorage.

Fischer, J. B. 2009. Thoughts on Kanuti NWR white-fronted goose survey efforts: Julian Fischer 4/2/2009. Email attachment to Christopher Harwood (carbon copied to Lisa Saperstein and Mike Spindler), Migratory Bird Management, Anchorage.

Harwood, C. M. 2006. Aerial Surveys of Molting Geese on Kanuti National Wildlife Refuge, July 2006. Progress Report FY07-01. Unpublished USFWS report, Kanuti National Wildlife Refuge, Fairbanks, Alaska.

Harwood, C. M. 2007. Aerial Surveys of Geese on Kanuti NWR, May and July 2007. Progress Report FY07-05. Unpublished USFWS report, Kanuti National Wildlife Refuge, Fairbanks, Alaska.

Harwood, C. M. 2008. Aerial Surveys of Geese on Kanuti NWR, May and July 2008. Progress Report FY08-04. Unpublished USFWS report, Kanuti National Wildlife Refuge, Fairbanks, Alaska.

Harwood, C. M. 2009. Aerial Surveys of Geese on Kanuti NWR, July 2009. Progress Report FY09-04. Unpublished USFWS report, Kanuti National Wildlife Refuge, Fairbanks, Alaska.

Harwood, C. M. 2010. Aerial Surveys of Geese on Kanuti NWR, June 2010. Progress Report. Unpublished USFWS report, Kanuti National Wildlife Refuge, Fairbanks, Alaska.

Saperstein, L. 2005. Aerial Surveys of Molting Geese on the Kanuti National Wildlife Refuge, Alaska, 2001–2003. Progress Report FY04-001. Unpublished USFWS Report, Kanuti National Wildlife Refuge, Fairbanks, Alaska.

Table 1. Official[1] goose observations by transect during aerial goose surveys, Kanuti NWR, Alaska, July 6–8, 2012. [**GWFG** = Greater White-fronted Goose, CAGO = Canada Goose.]

		Number[2]	
Transect	Species	Adults	Young
27[3]	**GWFG**	**70**	**0**
29[3]	**GWFG** CAGO	**50** 5	**30** 5
32[3]	**GWFG** CAGO	**8** 8	**20** 20
93[4]	**GWFG** CAGO	**4** 9	**8** 20
94[4]	**GWFG**	**2**	**10**
95[4]	**GWFG**	**8**	**16**
96[4]	**GWFG** CAGO	**4** 3	**26** 5
Total[5]	**GWFG** CAGO	**146** 25	**110** 50

[1] Geese observed on transects, at Lake Todatonten, or at terminus of Kanuti River.
[2] Geese in different groups on transect were combined.
[3] Transects in Mud Lakes/Kanuti River area.
[4] Transects in South Fork Koyukuk River/Fish Creek area.
[5] No geese were found on transects in Katalahosa Lake area.

Table 2. Unofficial[1] goose observations during aerial molting survey, Kanuti NWR, Alaska, July 6–8, 2012. [**GWFG** = Greater White-fronted Goose, CAGO = Canada Goose.]

		Number	
River Segment	**Species**	**Adults**	**Young**
Koyukuk River [2]	CAGO	24	70
Koyukuk River [2]	CAGO	12	16
Koyukuk River [2]	**GWFG**	**8**	**7**
Koyukuk River [2]	CAGO	12	22
Koyukuk River [2]	CAGO	24	60
Koyukuk River [2]	CAGO	6	14
Koyukuk River [2]	CAGO	14	26
Koyukuk River [2]	CAGO	4	8
South Fork Koyukuk [2]	CAGO	4	24
South Fork Koyukuk [2]	**GWFG**	**4**	**16**
South Fork Koyukuk [2]	CAGO	6	6
Subtotal [2]	**GWFG** CAGO	**12** 106	**23** 246
Kanuti River [3]	**GWFG**	**6**	**0**
Kanuti River [3]	CAGO	30	8
Kanuti River [3]	CAGO	4	20
Kanuti River [3]	**GWFG**	**10**	**18**
South Fork Koyukuk [3]	**GWFG**	**7**	**16**
South Fork Koyukuk [3]	**GWFG** CAGO	**10** 4	**20** 10
Kanuti Chalatna Creek [3]	**GWFG**	**4**	**10**
Subtotal [3]	**GWFG** CAGO	**37** 38	**64** 38
Grand Unofficial Subtotal [1]	**GWFG** CAGO	**49** 144	**87** 284
Combined Official/Unofficial Total [4]	**GWFG** CAGO	**195** 169	**197** 334

[1] Observations made outside "official" study area or during incidental efforts within official survey area
[2] Geese were outside official study area
[3] Geese observed along rivers surveyed by circling, rather than transect method
[4] Includes both official and unofficial observations

Table 3. Goose and swan observations[1] by year during aerial molting goose surveys, Kanuti NWR, Alaska, 2001–2003, 2006–2010, 2012. [GWFG = Greater White-fronted Goose, CAGO = Canada Goose; ad = adults, yg = young]

Year	GWFG ad	GWFG yg	CAGO ad	CAGO yg	Swan ad	Swan yg
2001	332	142	67	54	91	6
2002	117	50	101	128	103	14
2003	313	65	52	78	108	13
2006	332	71	108	95	219[2]	37[2]
2007	280	100	124	190	189[2]	70[2]
2008	308	0	116	163	211[2]	57[2]
2009[3]	425	123	134	179	73[2]	31[2]
2010[3]	272	89	141	149	78[2]	32[2]
2012[3]	146	110	25	50	78[2]	37[2]

[1] Does not include observations made outside "official" study area or during incidental efforts
[2] represents minimum counts
[3] represents reduced effort

Table 4. Goose observations by year standardized to include only those recorded within the "reduced effort" areas during aerial molting goose surveys, Kanuti NWR, Alaska, 2006–2010, 2012. [GWFG = Greater White-fronted Goose, CAGO = Canada Goose; ad = adults, yg = young]

Year	GWFG ad	GWFG yg	CAGO ad	CAGO yg
2006	322	64	104	86
2007	270	80	118	175
2008	308	0	99	149
2009	425	123	134	179
2010	272	89	141	149
2012	146	110	25	50

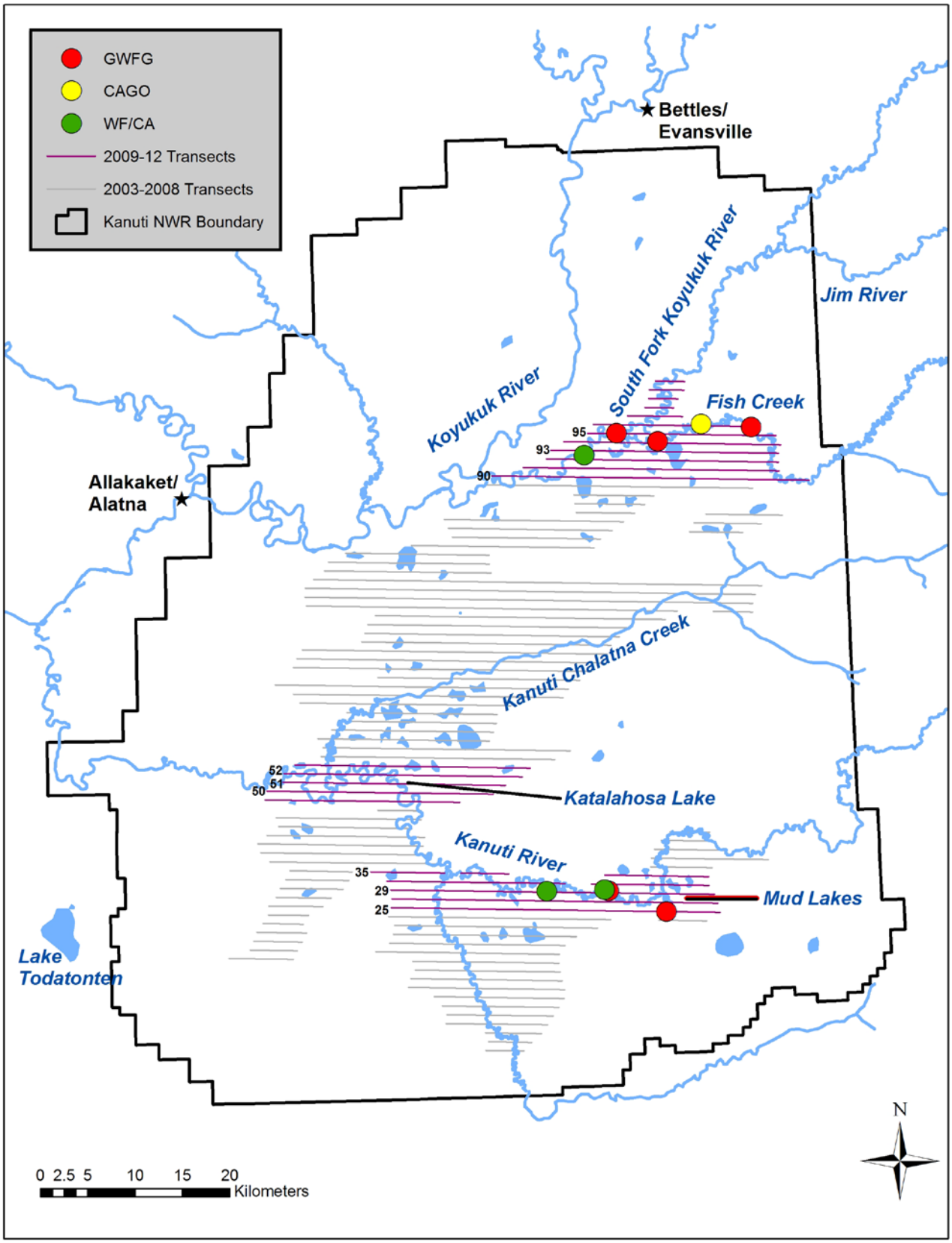

Figure 1. Locations of reduced effort aerial transect lines and "official" goose observations, 6–8 July, 2012, Kanuti NWR. [GWFG = Greater White-fronted Geese, CAGO = Canada Geese; WF/CA = both geese species co-located; black numbers indicate transect number]

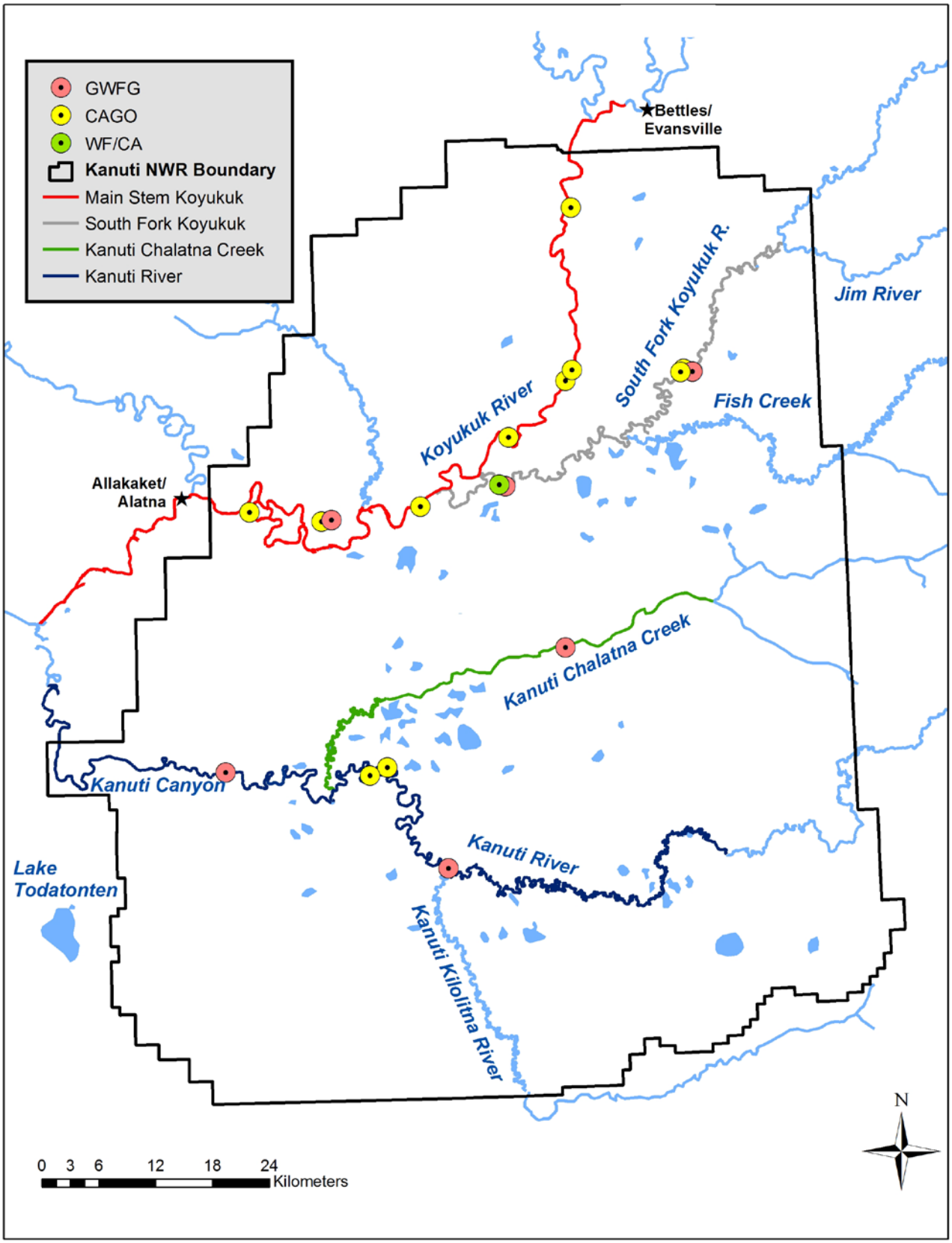

Figure 2. Locations of supplemental river surveys and "unofficial" goose observations, 6–8 July, 2012, Kanuti NWR. [GWFG = Greater White-fronted Geese, CAGO = Canada Geese; WF/CA = both geese species co-located]

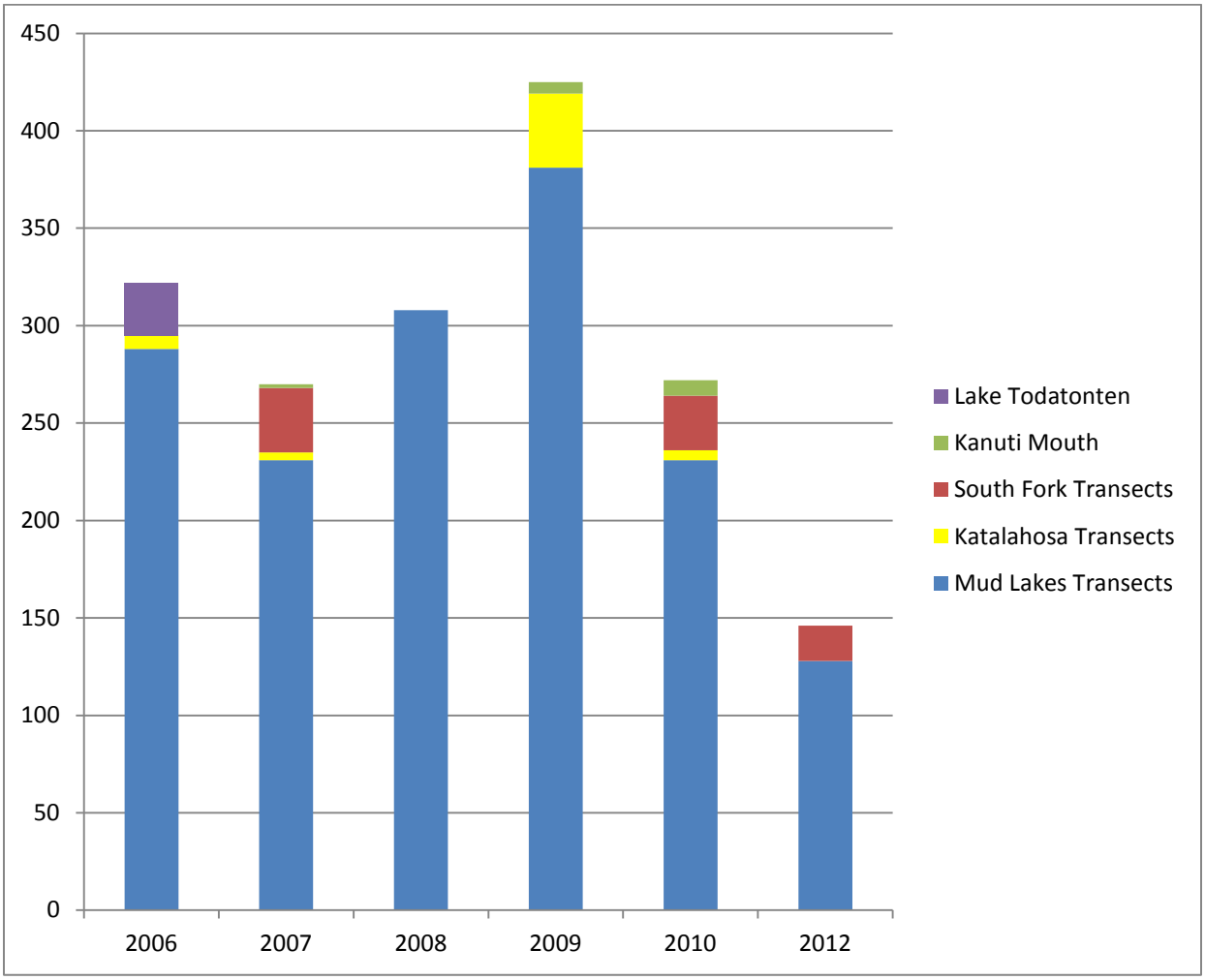

Figure 3. Within- and between-year comparison of official adult Greater White-fronted Goose observations since 2006 recorded at the 3 core transect areas (Mud Lakes, Katalahosa, South Fork), Kanuti Mouth, and Lake Todatonten, constituting the "reduced effort" survey area begun in 2009.

Attachment: Memo from Julian Fischer (*filename = Kanuti surveys.doc*) in 2 April 2009 to Christopher Harwood (carbon copied to Lisa Saperstein and Mike Spindler)

Thoughts on Kanuti NWR white-fronted goose survey efforts. Julian Fischer 4/2/2009

Differing Missions and Scales

I believe MBM and Refuges monitor bird population on different scales, and this influences what we promote as priority activities for each of our respective programs. For MBM, we focus on broad-scale, population level surveys that can be used for management indices and ultimately harvest regulations. Wherever possible, surveys are multi-species. Species-specific surveys are typically conducted only when significant population level conservation concerns are apparent. Refuges, on the other hand, have local constituents and defined boundaries in which to focus their efforts. For that reason, a conservation concern for a single species may be a very important issue within the boundaries of a given refuge even if the net impact to the continental population may be insignificant.

These two different scales on interest came together in the late 1990s as a result of Mike Spindler's insights and concern for what appeared to be a localized decline of white-fronted geese. Due to his energy and leadership, studies were initiated that identified differences in migration timing, routes, and winter distribution. This provided the needed information to institute changes in site-specific hunting regulations, and a more conservative approach to harvest management in the updated Flyway Management Plan. It is always difficult to determine a cause and effect response, but it is heartening to note that the indices that were used to identify a regional decline have since returned to levels observed in the early 1990s.

Breeding Population Surveys

Continentally there has been a movement among goose managers to move away from winter surveys and towards breeding pair surveys to provide data for management. A few years ago, I was hopeful that the Alaska boreal midcontinent population could be monitored through a multi-refuge coordinated breeding pair survey. Perhaps this was naïve. Mike had already described the difficulty in detecting white-fronts in the boreal forest, especially when nesting is initiated. Nonetheless, we (MBM, Selawik, Koyukuk, and Kanuti) all tried it. I believe we were successful in Selawik, but less so at Koyukuk and Kanuti.

The reason it worked well at Selawik, I believe, is threefold: the habitat is taiga rather than boreal forest which allows for far better visibility; the Selawik population is at the terminus of the subpopulation migration route; and the refuge headquarters is located next to the breeding site allowing for relatively inexpensive scouting flights to determine appropriate timing. It is possible that breeding pair surveys could be improved for Koyukuk and Kanuti, but precise and accurate estimates would likely require a significant increased cost in time and funding and a yet undiscovered method to account for detection probability and overflight of birds towards more northerly breeding areas. Managers should consider several facts before pursuing such efforts further: 1) on a continental scale, the midcontinent white-front population is rebounding following more restrictive harvest measures as detailed in the Flyway Management Plan, and in changes to the AMBCC harvest regulations in staging areas (closure of harvest under subsistence regulations in Delta Junction); 2) regionally, molting survey data suggests numbers have returned to early 1990 levels in Koyukuk-Nowitna NWR; 3) annual survival estimates in the interior component of the midcontinent population has increased over the last few years; 4) annual surveys conducted by MBM (continental BPS- N754) provide estimates of white-fronts in all interior refuges (albeit with low precision); and 5) periodic "Expanded Breeding Pair Surveys" conducted by MBM provide estimates of population size and distribution with greater precision than the annual survey. For

these reasons, it is difficult for MBM to promote a species-specific breeding pair survey for white-fronts within the interior refuges as a high priority task.

As for the molting survey at Kanuti, significant changes in design and implementation are warranted, but the survey should continue as one element of the refuge monitoring effort. Past surveys have demonstrated that the population of molting white fronts is small (a few hundred birds), and traditionally many of those birds were at Todatonten, outside refuge boundaries. While the area doesn't appear to be important on a population level, it may be important locally, both to subsistence hunters, and as a component of the refuge ecology (*Spring/summer subsistence harvest of white-fronts in the Kanuti area has been reported to be around 75 birds annually. (This suggests that there is a local reliance on these birds and depending on when the harvest occurs, could be a limiting factor for the species in the refuge. Unfortunately, the AMBCC survey does not distinguish between spring and summer harvest. If the harvest is taking place in spring, then most geese harvested are likely passing through to breeding sites further north. If the harvest is occurring in summer, then they are likely local breeders/molters, and the impact the reported harvest on a small population will certainly keep the population very low*). Thus it seems prudent for the refuge to remain aware of any significant shifts in the numbers of molters on the refuge. That said, it is clear that significant efficiencies can be achieved in the design of the survey. Given the numbers of birds and the well established distribution, I believe the survey could be completed in a single day effort. I presume that the refuge possesses all the point locations, or at least transect numbers associated with molt surveys since 2000. If the survey area was pared down to include 80% of historical observations, then total flight time would be significantly reduced. There would be a slight loss of comparability to previous year's survey results but it would be a reasonable sacrifice. I would then advocate an effort to fly the full complement of transects that contained 100% of historical observations once every five years. I suspect that by mapping out 100% of molting goose locations you would find room for significant efficiencies as well. Results of the expanded molting goose survey on a 5-year interval will provide information about the proportion of geese that occur outside of the core surveyed area, and will reveal changes in distribution.

<u>Distribution</u>

Despite the difficulties associated with population surveys, important localized information on habitat use can be obtained from aerial surveys. Such information, I believe, may be important for land managers (i.e. Refuge Managers) as they grapple with various issues that may impact their refuges. Distribution of white-fronts at all phases of their life cycle is important to understand, regardless of their ultimate breeding site. Without intact and productive staging habitats, white-fronts will be hard pressed to breed and raise young successfully. ANILCA specifies that Kanuti is to conserve greater white-fronted goose populations and habitats, and as far as I know this is not limited to local breeders; rather it would include all white-fronts that use the refuge even for a stopover period. A number of years of May survey data from various sources (refuge, MBM) should provide a relatively clear picture of where your hot spots are. From reading your reports it seems that the most notable locations are the Mud Lakes region, the confluence of the South Fork Koyukuk and Fish Creek, and the confluence of the Chalatna Creek and Kanuti River. I suspect the same locations are important during the molting period, but you should examine those data to confirm that assumption. Replication of full molting surveys on a 5-year schedule, as described earlier, will help reveal significant changes in distribution.

The situation at Todatonten Lake that you describe is a compelling problem. I am not sure if BLM is aware of the former significance of the area and the apparent change in distribution of geese away from the lake. Perhaps further investigations can be made under the umbrella of climate change studies.

<u>Production</u>

The status of migratory birds can be monitored in various ways. In an ideal world we would have estimates of breeding population size, annual productivity, annual survival, and harvest estimates for each and every species that occurs on the refuge. Although breeding population size is very difficult to monitor annually for this species in the boreal forest, productivity is a measure that can be monitored. The molting survey is one method of estimating production, but as noted in the report, weather conditions can affect detection of broods from an aerial platform, and detection of non or failed-breeders is likely far higher than for successful breeders – a situation that can lead to biased estimates of production. An alternative method is to monitor production through a float survey along the Kanuti River. The method was written up in a Kanuti NWR report by Merry Maxwell in 2001, and appears to be a relatively efficient way to calculate production. According to the report the effort required 2 people for 2 full days. While the total numbers of adult birds are likely to be fewer than seen by air, a more accurate assessment of production is likely result. It sounds like these float data go back to the mid 1990s, and were stopped in 2000. There may be logistical reasons that the survey was dropped, but if not, the refuge should consider this as a method to calculate production. This effort would complement the 13 year data set of comparable efforts on the Koyukuk/Nowitna refuge. MBM is currently attempting to devise a method to estimate interior region production through age ratio work at the fall staging area in Delta Junction. I recently encouraged a graduate student to take this project on, and he'll be starting UAA next year. It would be useful to have refuge specific production estimates to compare with interior region estimates.

Summary

The refuge should not proceed with additional spring breeding pair surveys of white-fronted geese, but should visit key stopover locations when standard flights spring phenology flights are conducted; molt surveys should continue annually but with a significantly reduced area coupled with a survey at the current design once every 5 years; and renewal of float surveys should be considered as a method to monitor productivity. Please feel free to give a call if you want to talk about any of this further.