Kanuti NWR Progress Report FY14
Aerial Surveys of Molting Geese on Kanuti National Wildlife Refuge, July 2014

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: 30 June – 2 July 2014
Participants: Mike Spindler**,** Bradley Storm
Author: Christopher M. Harwood
Report Date: September 3, 2014

Summary:

During 30 June – 2 July 2014, Refuge Manager/Pilot Mike Spindler and Maintenance Worker Bradley Storm 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, 2010, and 2012, they employed a reduced effort by surveying only 25 of the original 101 aerial line transects to target historical molting goose "hot spots" on or near Kanuti National Wildlife Refuge. These surveys covered three core areas within the Refuge, as well as nearby Lake Todatonten and the terminus of the Kanuti River (both off-refuge). For the first time in the survey's history, no white-fronts were observed. Totals of 48 (22 adults and 26 young) and 129 (44 adults and 85 young) Canada Geese were observed during separate on-transect and off-transect surveys, respectively.

Background:

Except for 2004 and 2005 when smoke precluded surveying, Kanuti NWR (KANWR) has attempted to participate 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 have 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 efforts is scheduled to be conducted at five-year intervals or soon thereafter, as resources allow.

Study Area and Methods:

"On-transect" Observations
After a period of refinement in methods beginning in 2001, protocols for the survey that once covered 101 transects were finalized by 2003. This survey was repeated consistently from 2003–2008 (Saperstein 2005, Harwood 2006, 2007, 2008). The final survey area included these transects covering goose habitat within KANWR, as well as the non-transect areas of Lake Todatonten and the terminus of the Kanuti River (i.e. the confluence of Kanuti and Koyukuk

Rivers, upriver to Refuge boundary; Fig. 1). During these surveys most white-fronts were observed along transects intersecting three core areas within the Refuge: (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 and Fish Creek. The latter two areas began to be used in later surveys while the Mud Lakes/Kanuti River area 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, 2012) and Saperstein (2005).

"Off-transect" Observations
Off-transect observations began in 2006 and are those made: a) opportunistically within the historical transect study area using methods that are not easily repeatable between years ("incidental"), and b) outside the historical transect study area ("supplemental"). While direct interannual comparisons of these data are eschewed (e.g., given their difficulty in repeating), they allow Refuge personnel to better monitor changes in habitat occupancy throughout the historical and non-surveyed portions of the Refuge. They further contribute to a minimum count of birds using the greater area at that time.

Analysis of historical goose distribution and abundance indicated regular detections along several river segments. These segments, although intersected by official transects, tend to be sinuous and/or south-north trending, and not well suited to coverage by east-west transects. Therefore, we further 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 "off-transect" surveying by circling: the Kanuti and South Fork Koyukuk Rivers, and Kanuti Chalatna Creek. Caution is observed in ensuring that detections within resurveyed areas are not duplicative of those encountered on-transect. 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 were also included in the off-transect survey. Although the main stem Koyukuk River is outside the historical survey area (i.e., described by the full complement of transects), Canada Geese have been regularly observed there (Fig. 2).

Results:

General Conditions
Refuge personnel completed all on- and off-transect surveys during 30 June and 2 July 2014.

On 30 June, transects in the South Fork Koyukuk/Fish Creek area were surveyed from 14:15–19:15. Only swans were observed during the survey period.
Survey conditions were reported as follows:

Sky = broken clouds
Visibility = > 10 miles with widely scattered showers

Wind = variable
Comments: contrasting lighting conditions; river level very high

On 1 July, the Katalahosa Lake and Kanuti Cabin/Mud Lakes core area transects were surveyed from 10:00–11:30 and 11:45–13:30, respectively). In the afternoon (14:10–18:16), the crew conducted off-transect surveys of: 1) the Kanuti River from just north of the Mud Lakes (i.e., so-called "Arnica Hill") to the confluence with the Koyukuk River, 2) the Lake Todatonten area, and 3) riparian areas of the main stem Koyukuk River from the Kanuti River confluence to Bettles. Survey conditions were as follows:

Sky = overcast
Visibility = > 10 miles
Wind = west at 5–8 mph
Comments = excellent lighting/conditions but river level very high

On 2 July, off-transect surveying of Kanuti Chalatna Creek and the South Fork Koyukuk River was completed between 10:00–11:15.
Limited survey conditions were recorded:

Sky = moderate rain showers

Total approximate survey flight time (13.6 hr, $1,700) for the project included: 5.0 hr for 30 June, 7.35 hr for 1 July, and 1.25 hr for 2 July (flight hours are "survey" hours, no ferry-time included). Projected fuel costs for the survey (13.6 hr x 8 gal/hr x $8.00/gal [Bettles pricing]) were $870. Spindler's food purchases totaled $60. The cost of the project, not including salaries, was $2,630. We had budgeted $3,000.

"On-transect" Goose Observations
No white-fronts and 48 Canada Geese (22 adults and 26 young) were observed during formally flown transect surveys. Canada Geese were observed along just 3 of 25 transects (Table 1; Fig. 1). No geese were detected at Mud Lakes or Lake Todatonten. A multi-year comparison of "on-transect" geese detections is provided in Tables 3 and 4, the latter standardized to include only those observations recorded along the 25 "reduced effort" transects.

"Off-transect" Goose Observations
An additional 120 Canada Geese (40 adults and 80 young) were observed on sloughs, oxbows, and backwaters along the Koyukuk River (outside of the transect study area, but largely within the Refuge; Table 2; Fig. 2). Opportunistic counts made while flying tight circles over the Kanuti River yielded an additional 9 Canada Geese (4 adults and 9 young). No additional geese were observed along the Kanuti Chalatna Creek or the South Fork Koyukuk River.

All Goose Observations
A total of 177 Canada Geese (66 adults, 111 [63%] young) were observed over the three days of both on- and off-transect flying (Table 5). A multi-year comparison of total non-duplicative observations derived from all search methods is included.

Other Wildlife Observations
The crew observed 87 adult and 31 young swans along transects, plus another 25 adults and 3 young during off-transect surveying (Tables 3 and 5). Only 2 other species of birds were

recorded: Sandhill Crane (family of 3) and Osprey (1). There were no moose observations. One brown bear was recorded; no black bears were observed.

Discussion and summary

During this year's effort we observed the fewest white-fronts (zero) and Canada Geese in the history of the survey. With so few geese observed study area-wide, an elaboration on where they did occur, as in previous years' reports, seems largely superfluous. However, possible explanations for the paucity of geese observed do seem entirely warranted.

Only one year following one of the coldest and latest springs in years, the Interior endured an historically rainy summer in 2014 (e.g., record rainfall for June – August in Fairbanks). While spring 2014 conditions were conducive to even early nesting (e.g., snow-free near Kanuti Lake by 28 April) and some goose family groups were observed on the Kanuti River in the first half of June, extremely high water, including flooding in some areas, appeared to inundate much of the graminoid growth (both riparian and within attached drawdown lakes) upon which these geese forage. High water levels persisted through the molt survey proper, suggesting a near month-long state of flooding which likely reduced, or at least redirected, goose feeding opportunities. Further, high water levels could have driven geese into riparian forests in the larger river basins, and even into shoreline shrubs of lacustrine and palustrine habitats, making them perhaps less visible during the survey.

To what extent last year's late spring may have contributed to this summer's low numbers is unknown. We were not able to survey in 2013 so we do not know if production was lower than typical. Lower 2013 production could have possibly reduced the number of returning birds, be they second-year subadults returning with their parents, or second-year subadults that elect to molt in the Kanuti study area.

Of course, interpretation of annual survey numbers is confounded by our lack of understanding about the composition of the population at this time. We know that some birds are local breeders that would be directly affected by conditions observed within the refuge. However, we do not know how many adult birds each year are migrants, and thus are subject to conditions that may differ markedly from those observed locally.

It has been six years since our last full-effort survey. While off-transect surveys during these years does complement coverage of the recently important core areas, we know that distribution can change, as has been observed with geese abandoning the once-important Lake Todatonten. Given possibly low numbers observed in 2012, no survey in 2013, and this year's historically low numbers, it may be prudent to implement the full 101-transect survey in 2015 to investigate possible redistribution of molting geese on Kanuti.

Literature Cited:

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Table 1. On-transect[1] goose observations during aerial goose surveys, Kanuti NWR, Alaska, 30 June – 2 July, 2014. [CAGO = Canada Goose.]

		Number[2]	
Transect	Species	Adults	Young
27[3]	CAGO	7	10
52[4]	CAGO	13	13
91[5]	CAGO	2	3
Total[5]	**CAGO**	**22**	**26**

[1] Geese observed on formal transects, at Lake Todatonten, or at terminus of Kanuti River.
[2] Geese in different groups on transect were combined.
[3] Transect in Mud Lakes/Kanuti River area.
[4] Transect in Katalahosa Lake area
[5] Transect in South Fork Koyukuk River/Fish Creek area.

Table 2. Off-transect[1] goose observations during aerial molting survey, Kanuti NWR, Alaska, 30 June – 2 July, 2014. [CAGO = Canada Goose.]

		Number	
River Segment	**Species**	**Adults**	**Young**
Koyukuk River [2]	CAGO	8	13
Koyukuk River [2]	CAGO	4	8
Koyukuk River [2]	CAGO	2	6
Koyukuk River [2]	CAGO	10	18
Koyukuk River [2]	CAGO	6	10
Koyukuk River [2]	CAGO	2	2
Koyukuk River [2]	CAGO	4	11
Koyukuk River [2]	CAGO	4	12
Subtotal [2]	**CAGO**	**40**	**80**
Kanuti River [3]	CAGO	2	0
Kanuti River [3]	CAGO	2	5
Subtotal [3]	**CAGO**	**4**	**5**
Grand Off-transect Subtotal [1]	**CAGO**	**44**	**85**

[1] Observations made outside formal transect area or during incidental efforts within this area
[2] Geese were outside formal transect area
[3] Geese observed along rivers surveyed by circling, rather than transect method

Table 3. On-transect goose and swan observations[1] by year during aerial molting goose surveys, Kanuti NWR, Alaska, 2001–2014[2]. [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[3]	37[3]
2007	280	100	124	190	189[3]	70[3]
2008	308	0	116	163	211[3]	57[3]
2009[4]	425	123	134	179	73[3]	31[3]
2010[4]	272	89	141	149	76[3]	30[3]
2012[4]	146	110	25	50	78[3]	37[3]
2014[4]	0	0	22	26	87[3]	31[3]

[1] Includes birds observed on formal transects, at Lake Todatonten, or at terminus of Kanuti River. Does not include observations made outside these areas or during resurveying efforts of river segments within transect area.
[2] No effort in some years due to smoky conditions, staffing conflict, or budget shortfall
[3] represents minimum counts
[4] represents reduced effort

Table 4. On-transect goose observations by year, standardized to include only those recorded within the "reduced effort" areas during aerial molting goose surveys, Kanuti NWR, Alaska, 2006–2014[1]. [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
2014	0	0	22	26

[1] No effort in some years due to smoky conditions, staffing conflict, or budget shortfall

Table 5. Combined totals of on- and off-transect goose and swan observations[1] by year during aerial molting goose surveys, Kanuti NWR, Alaska, 2006–2014[2]. [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
2006	338	88	159	196	219	37
2007	302	138	231	364	189	70
2008	320	28	185	314	211	57
2009[3]	449	166	290	365	77	31
2010[3]	294	151	259	329	78	30
2012[3]	195	197	169	334	92	44
2014[3]	0	0	66	111	112	34

[1] Includes all non-duplicative observations, irrespective of search method

[2] No effort in some years due to smoky conditions, staffing conflict, or budget shortfall. Does not include 2001–2003 because "off-transect" surveying was not performed in those years

[3] represents reduced effort, particularly influential of swan numbers

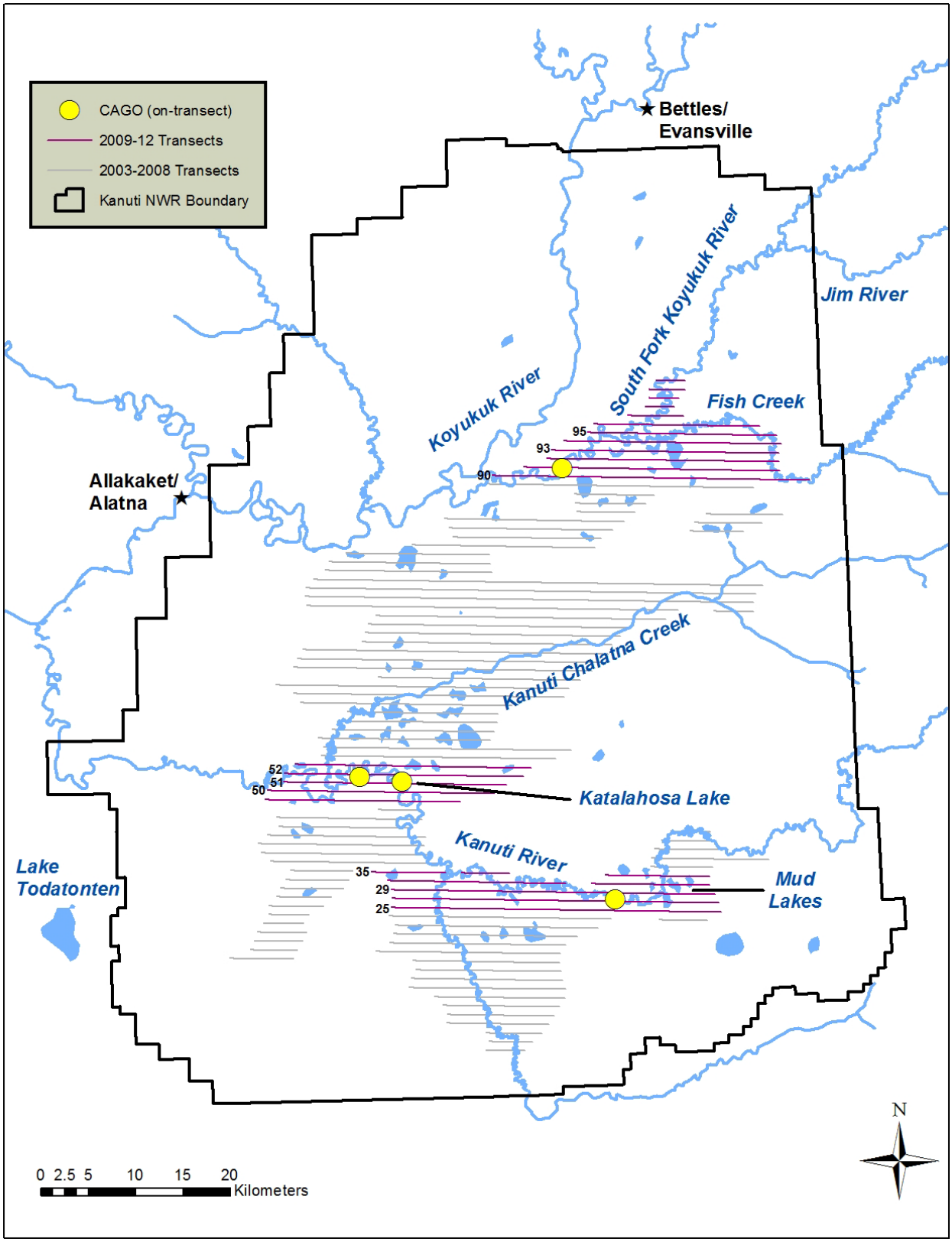

Figure 1. Locations of reduced effort aerial transect lines and "on-transect" goose observations, Kanuti NWR, 30 June – 2 July, 2014. [CAGO = Canada Geese; black numbers indicate transect number]

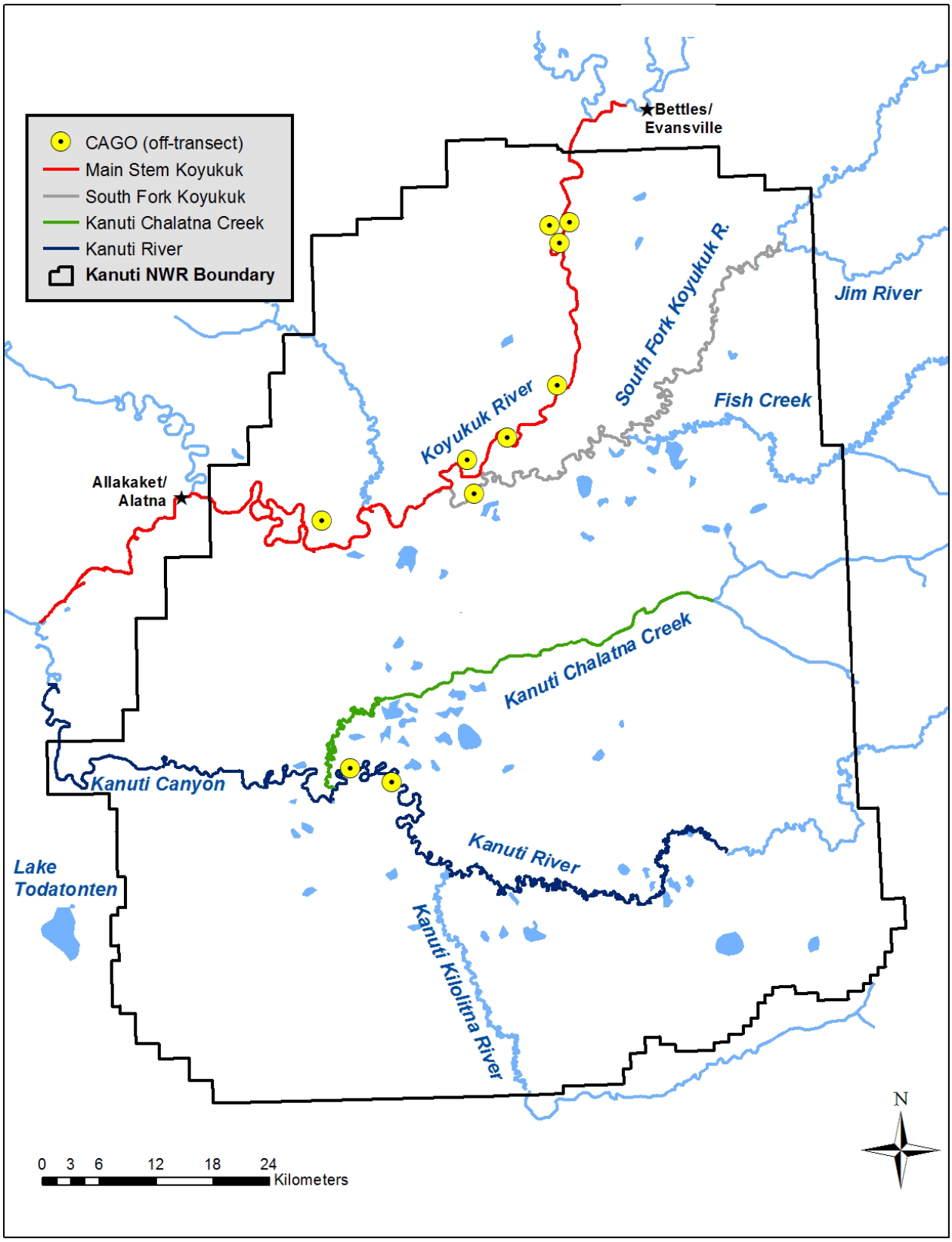

Figure 2. Locations of supplemental river surveys and "off-transect" goose observations, Kanuti NWR, 30 June – 2 July, 2014. [CAGO = Canada Geese]

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.

Production

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.