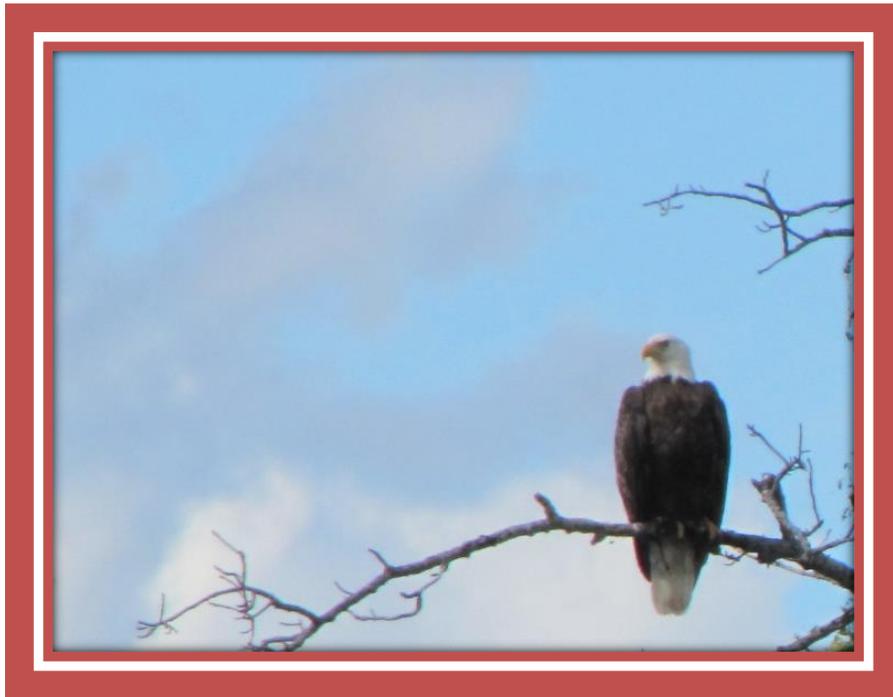


## Aerial Raptor Stick Nest Survey -- Fall 2012



Tim Craig and Lester Dillard  
*Kanuti National Wildlife Refuge*  
Fairbanks, Alaska

## **Introduction**

A number of raptors that build stick nests in trees use Kanuti National Wildlife Refuge each year. These birds include Bald Eagles (*Haliaeetus leucocephalus*), Northern Goshawks (*Accipiter gentilis*), Sharp-shinned Hawks (*Accipiter striatus*), Harlan's Hawks (*Buteo jamaicensis harlani*), and Osprey (*Pandion haliaetus*). The Common Raven (*Corvus corax*), another tree nester, nests on the Refuge as well and is often considered an "ecological raptor" because they compete with true raptors for nest sites and food (Craighead and Craighead 1956).

Intensive surveys for stick-nesting raptors have not occurred on the Refuge in recent years, although several nests have been found by Refuge employees, incidental to other work. Despite low numbers of documented nests by Bald Eagles (2) and Osprey (1) on the Refuge, adult birds are seen along its rivers each year in locations where there are no known nests. The number of these sightings suggests there are more nests of both species than are currently known. For example, during a 6 day float trip along the South Fork Koyukuk and Jim Rivers in 2012, downstream of Prospect camp, two biologists spotted a total of 13 adult Bald Eagles and one Osprey. No Osprey nests are known along these rivers, and only two Eagle nests (one on Bureau of Land Management managed lands) have been located on these watercourses. It could be argued that these birds were repeated sighting of the adults from the two known nests. However, these sightings were nearly evenly distributed along the streams and were widely dispersed (37 km apart); the home range of Bald Eagles is usually comparatively small, around 1-2km<sup>2</sup> (Buehler 2000).

No accipiter nests have been found on the Refuge, but recent surveys along some rivers on Refuge's have shown that territorial Northern Goshawks do occur there. Goshawks usually nest in forest stands with old growth characteristics like large stems and closed canopies (Squires and Reynolds 1997). In the only study of Goshawks conducted in the Interior, stands of large paper birch trees (*Betula papyrifera*) were the preferred nesting sites (McGowan 1975). The aforementioned goshawk surveys on Kanuti NWR have revealed that these large accipiters do nest in apparently low numbers along rivers on the Refuge. The Kanuti NWR has a very active fire regime, in fact over 70% of the Refuge has burned since 1950. Because rivers "armor" vegetation communities against wildfire, the timber stands along many of the rivers on the Refuge are comprised of large, old trees. In contrast, most of the closed deciduous tree communities that occur away from rivers on the Refuge are much younger (<60 years old). However, some of the oldest of these stands may now be comprised of large enough trees to have become suitable as Northern Goshawk nesting habitat.

We initiated a raptor stick nest survey in fall 2012 for several reasons. First, the number of summertime Bald Eagle sightings made along watercourses seems out of proportion to the known number of nests on the Refuge. Second, many upland, closed deciduous timber stands on the Refuge are old enough that they may have become suitable goshawk nesting areas in recent years. Finally, as an intensive aerial survey has not been attempted in several years, we wanted to investigate the accuracy of anecdotal evidence pointing to low densities of stick-nesting raptors.

The objectives of this study were to:

- Search for stick nests along the Refuge’s 5 major rivers: the South Fork and main Koyukuk Rivers, and the Jim, Kanuti, and Kanuti Kilolitna Rivers.
- Search for stick nests along Henshaw Creek – a major salmon spawning stream.
- Search for Northern Goshawk nests in randomly selected closed deciduous stands that were either unburned, or 35-43 years old.

### **Methods**

This survey was based out of Bettles, Alaska and we used an American Champion Scout wheel-plane to conduct the survey. The work occurred over portions of three days (1, 3 and 5 October) and we spent a total of 13h and 33m searching for stick nests and ferrying to search locations (Table 1). Conditions were excellent during the survey; clear and calm on 1 October and overcast and calm on the other survey days. During this effort, we searched for stick nests along the major rivers on Kanuti NWR, Henshaw Creek, and 10 randomly selected polygons encircling closed deciduous timber stands that were 35 – 43 years old and located in the southern part of the Refuge.

Regardless of location, during the survey we flew at approximately 500’ (152m) agl, at about 75 mph (121 km/h), and pilot and observer searched for nest sites out opposite sides of the plane. When we spotted a likely looking nest site, or nearby high quality nesting stands, we often circled to closely scrutinize that area (Fig. 1).



**Figure 1. Typical raptor nesting habitat along a river on Kanuti National Wildlife Refuge, Alaska.**

All observations were recorded using an Apple touchscreen IPAD loaded with a GPS mapping application and a GIS map of the Refuge which portrayed topography, fire history, closed timber stands and water courses (Fig. 2). To make entries, the backseat observer touched the screen to

enter a waypoint and bring up a dialog box where pertinent information was then entered. In some cases, the observer also took a picture of the subject waypoint which the mapping application appended to the waypoint. As a precautionary redundancy, we also entered selected waypoints into the plane's GPS.

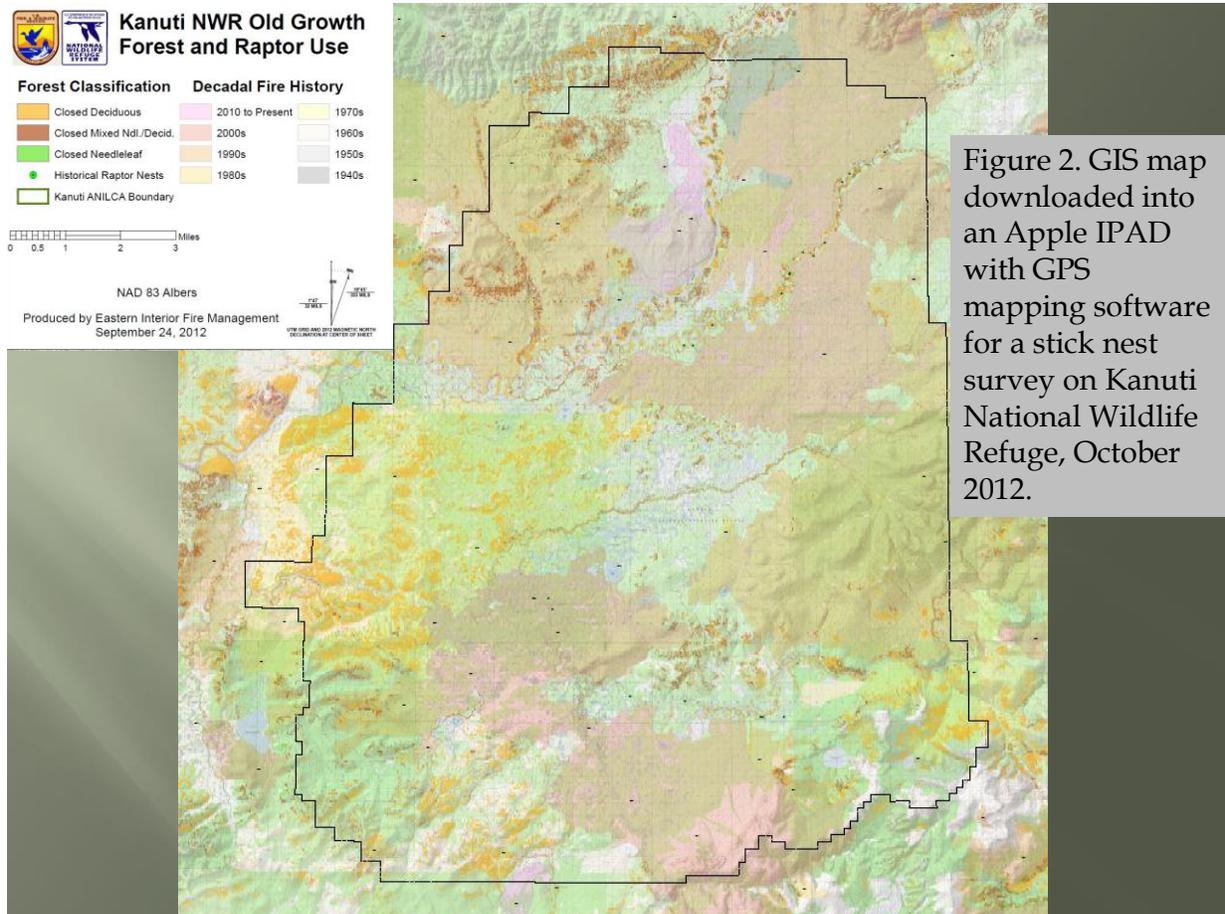


Figure 2. GIS map downloaded into an Apple IPAD with GPS mapping software for a stick nest survey on Kanuti National Wildlife Refuge, October 2012.

When we spotted a stick nest, we attempted to determine what species of raptor made the nest based on stick and nest size, and nest placement. Some nests were indiscernible and we simply recorded these as stick nests. Even though our primary objective was to search for raptor stick nests we also recorded the swans, raptors, wolves, bears and moose we spotted.

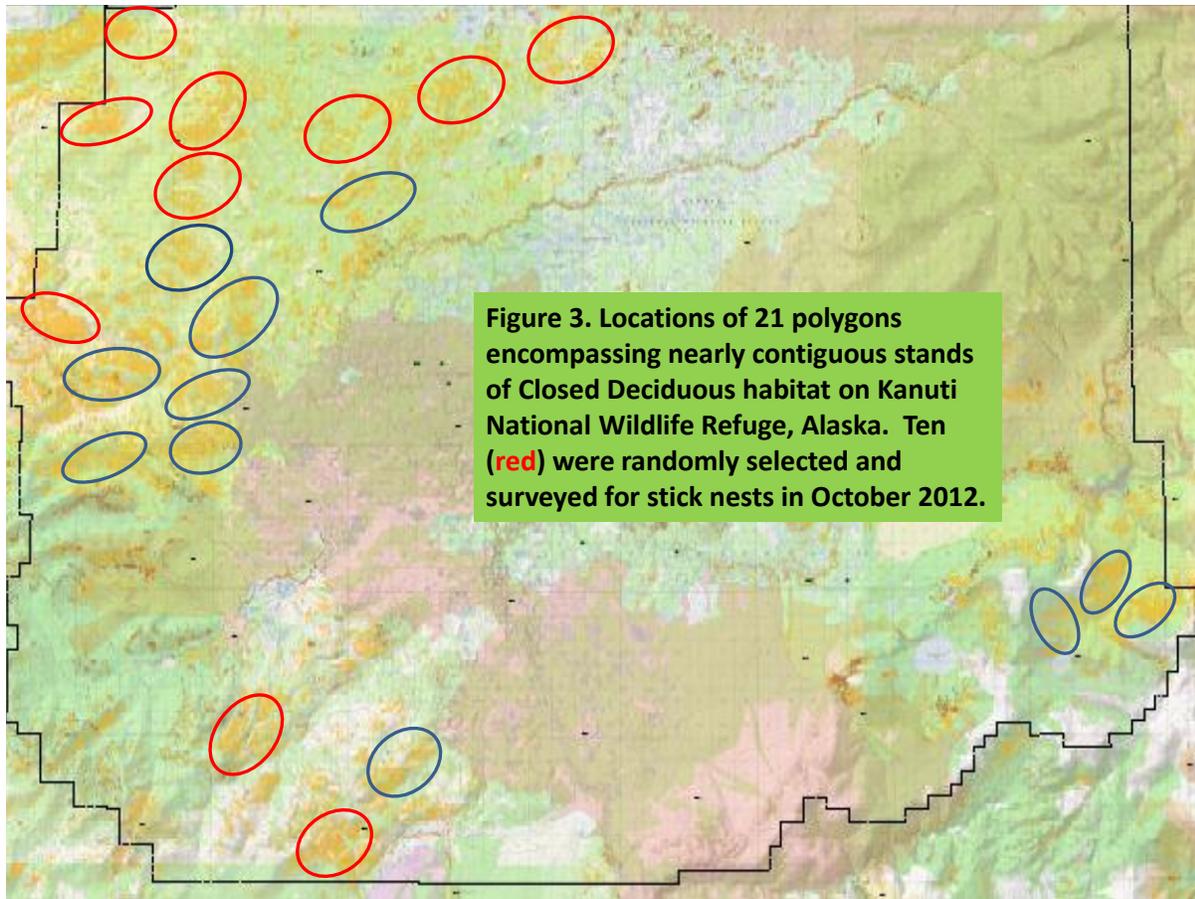
*River survey techniques.* We used the plane's GPS to navigate to either the start of each surveyed watercourse or its intersection with the Refuge Boundary. We then followed the streams until they either left the Refuge or joined another river. The rivers we surveyed included the South Fork and main Koyukuk, Jim, Kanuti and Kanuti Kilolitna Rivers. We also searched for nests along Henshaw Creek because it is a major salmon spawning stream. Usually, we made two passes on each river, flying first one side and then the other, looking for nests wherever suitable habitat occurred. Because of the plane's speed, turning radius and funding limitations, we were not able to survey all suitable habitat along rivers with multiple sloughs, adjacent lakes, and frequent meanders that resulted in wide and irregular riparian areas. Conversely, along some sections of the smaller rivers the riparian habitat was so narrow that we were able to survey all

areas in a single pass. In spite of these differences, we spent nearly the same amount of time surveying the three larger rivers on the Refuge (Table 1).

Table 1. Locations surveyed and time spent in each location during a raptor stick nest search of selected rivers and lakes and closed deciduous timber stands on Kanuti National Wildlife Refuge, Alaska, October 2012.

Location	Time		Type of survey	Approximate length (km) of river surveyed (min./km)
	Hours	Min.		
<b>South Fork Koyukuk and Jim Rivers</b>	2	25	Linear, River	70 (2.1)
<b>Kanuti River</b>	2	50	Linear, River	170 (1.0)
<b>Koyukuk River</b>	2	28	Linear, River	100 (1.5)
<b>Kanuti Kilolitna River</b>	0	40	Linear, River	30 (1.3)
<b>Henshaw Creek</b>	0	35		25 (1.4)
<b>Selected lakes</b>	0	35	Ad hoc	NA
<b>Closed Deciduous stands</b>	4	0	Polygon	NA
<b>Total</b>	13	33		395

*Closed Deciduous Polygon survey techniques.* We identified 21 separate closed deciduous timber stands that were more or less contiguous and were at least 35 years old in the southern part of the Refuge (Fig. 3). These stands ranged in size from about 14 – 35km<sup>2</sup> each. Because of funding limitations, we were not able to search all of these stands and randomly picked 10 patches and surveyed those instead. At each timber patch we first flew the stand boundary using the IPAD GPS mapping application for guidance. Then, we “filled in” each irregularly shaped survey area by flying either line transects (flat plots) or contours (hilly areas) to survey the entire patch. Even though funding limitations precluded covering these timber stands thoroughly we tried to maintain a constant search effort in each.



Selected Lakes survey techniques. We surveyed all suitable habitat near the shores of the following lakes: several unnamed lakes along Nolitna Creek, Big and Little Kaldolyeit, Konedsin Minnkohwin, Mingkoket, Minnkokut, Fish Creek, and Clawanmenka Lakes.

### **Results and discussion.**

Stick nests. We found 17 locations where stick nests occurred during our survey. Judging by their morphology, five of these nests were probably made by Bald Eagles, four by Northern Goshawks, and two by Ospreys (Table 2). Harlan's Hawks probably built most of the remaining nests, although it should be noted that we did not attempt to discriminate between Common Raven and Harlan's Hawk nests. In addition, one nest was so dilapidated that we were not able to speculate as to the species that built it.

Table 2. Observations made during a stick nest search of selected rivers and lakes and closed deciduous timber stands on Kanuti National Wildlife Refuge, Alaska, October 2012.

observation	Date/time	Lat	Long	Northing	Easting
<b>Bald Eagle, ad</b>	10/1/12, 1:36:28	66.61315	-151.646	1852482	104660
<b>Bald Eagle, ad</b>	10/1/12, 2:00:24	66.58122	-151.828	1848660	96705
<b>Bald Eagle, ad</b>	10/1/12, 2:49:44	66.77164	-151.308	1870646	118977

<b>Bald Eagle, ad</b>	10/1/12, 2:53:38	66.77888	-151.246	1871562	121672
<b>Bald Eagle, ad</b>	10/3/12, 12:12:41	66.29025	-152.152	1815890	83192
<b>Black bear</b>	10/3/12, 6:07:10	66.45676	-152.477	1834028	68139
<b>Great horned owl</b>	10/3/12, 4:00:56	66.43448	-152.564	1831464	64304
<b>Moose: Cow</b>	10/3/12, 10:36:49	66.18434	-151.623	1804876	107385
<b>Moose: Cow</b>	10/3/12, 9:57:55	66.29216	-151.12	1817756	129598
<b>Moose: Cow, 2</b>	10/3/12, 10:53:09	66.17274	-151.626	1803581	107290
<b>Moose: Cow, 2</b>	10/3/12, 11:44:36	66.02243	-151.909	1786437	95054
<b>Moose: Cow, cow/ calf</b>	10/3/12, 11:22:05	66.19676	-152.054	1805623	87871
<b>Moose: Cow/ calf</b>	10/3/12, 12:04:19	66.23053	-152.113	1809301	85132
<b>Moose: Cow/calf</b>	10/3/12, 1:08:42	66.30533	-152.619	1817056	62137
<b>Moose: Cows, 2</b>	10/3/12, 10:54:55	66.18221	-151.632	1804624	106989
<b>Moose: Large bull</b>	10/01/12, 4:57:00	66.72003	-152.37	1863397	72206
<b>Moose: Large bull</b>	10/3/12, 10:10:49	66.22181	-151.09	1809998	131270
<b>Moose: Large bull</b>	10/3/12, 10:29:50	66.23739	-151.469	1811029	114107
<b>Moose: Large bull</b>	10/3/12, 6:20:22	66.68293	-152.005	1859709	88481
<b>Moose: Large bull</b>	10/5/12, 11:50:29	66.12926	-152.405	1797694	72214
<b>Moose: Large bull, 2 cow</b>	10/3/12, 10:23:24	66.21263	-151.329	1808524	120524
<b>Moose: Large bull, 2 cows (1 W/Collar)</b>	10/1/12, 7:02:51	66.89253	-151.678	1883445	102163
<b>Moose: Large bull, 3 cow,1 small bull</b>	10/3/12, 11:39:23	66.05625	-151.963	1790123	92482
<b>Moose: Large bull, cow</b>	10/3/12, 10:46:03	66.17055	-151.566	1803437	110028
<b>Moose: Large bull, cow</b>	10/3/12, 11:01:07	66.1737	-151.75	1803493	101692
<b>Moose: Large bull, cow</b>	10/3/12, 11:36:11	66.06735	-151.959	1791361	92605
<b>Moose: Large bull, cow</b>	10/3/12, 9:52:23	66.30363	-151.053	1819163	132548

<b>Moose: Large bull, cow/calf</b>	10/3/12, 1:22:42	66.29926	-152.952	1816106	47134
<b>Moose: Medium bull</b>	10/3/12, 12:46:41	66.29758	-152.425	1816389	70874
<b>Moose: Medium bull, cow</b>	10/3/12, 10:40:26	66.17652	-151.564	1804104	110107
<b>Moose: Small bull</b>	10/3/12, 12:34:47	66.2893	-152.284	1815625	77253
<b>Moose: Small bull, cow/calf</b>	10/3/12, 9:55:44	66.29571	-151.111	1818167	129962
<b>Northern Goshawk, ad</b>	10/1/12, 2:09:58	66.5674	-151.866	1847070	95028
<b>Northern Goshawk, ad</b>	10/3/12, 1:04:42	66.30218	-152.609	1816716	62601
<b>Osprey, ad</b>	10/3/12, 12:55:13	66.30334	-152.522	1816928	66495
<b>Sharp-tail Grouse</b>	10/5/12, 11:25:45	66.06725	-152.503	1790693	67943
<b>Stick nest</b>	10/5/12, 9:20:50	66.25639	-151.009	1814003	134769
<b>Stick nest, Bald Eagle</b>	10/1/12, 1:07:31	66.65025	-151.504	1856832	110831
<b>Stick nest, Bald Eagle</b>	10/1/12, 1:45:03	66.61336	-151.656	1852489	104200
<b>Stick nest, Bald Eagle (2 nests)</b>	10/3/12, 12:21:45	66.29798	-152.196	1816695	81190
<b>Stick nest, Bald Eagle (very old)</b>	10/1/12, 1:15:53	66.64089	-151.494	1855809	111312
<b>Stick nest, Harlan's Hawk</b>	10/1/12, 1:22:21	66.63186	-151.51	1854780	110634
<b>Stick nest, Harlan's Hawk</b>	10/3/12, 9:52:23	66.30363	-151.053	1819163	132548
<b>Stick nest, Harlan's Hawk</b>	10/1/12, 12:47:07	66.70021	-151.379	1862592	116143
<b>Stick nest, Harlan's Hawk</b>	10/1/12, 4:31:39	66.58629	-152.027	1848947	87809
<b>Stick nest, Harlan's Hawk</b>	10/3/12, 12:55:13	66.30334	-152.522	1816928	66495
<b>Stick nest, Harlan's Hawk</b>	10/1/12, 1:53:41	66.58671	-151.74	1849399	100573
<b>Stick nest, Harlan's Hawk?</b>	10/1/12, 6:00:14	66.52998	-152.223	1842444	79255
<b>Stick nest, Northern Goshawk?</b>	10/1/12, 4:22:33	66.57978	-151.952	1848324	91156
<b>Stick nest, Northern Goshawk?</b>	10/3/12, 10:38:58	66.17427	-151.612	1803775	107936
<b>Stick Nest, Northern Goshawk? (2 nests)</b>	10/3/12, 1:08:08	66.30675	-152.637	1817197	61288

<b>Stick nest, Osprey, (Known nest)</b>	10/3/12, 12:16:51	66.28654	-152.153	1815476	83141
<b>Stick nest, Osprey?</b>	10/3/12, 11:55:32	66.14261	-152.057	1799598	87932
<b>Swan, 11 ad</b>	10/1/12, 1:48:21	66.59902	-151.686	1850851	102952
<b>Swan, 16 ad, 4 Yg</b>	10/1/12, 2:12:57	66.56748	-151.836	1847123	96389
<b>Swan, 2 ad</b>	10/5/12, 12:04:14	66.35053	-152.002	1822785	89703
<b>Swan, 3 ad, 2 yg</b>	10/3/12, 11:16:40	66.18143	-151.944	1804067	92883
<b>Swan, 6 ad</b>	10/1/12, 5:35:47	66.55905	-152.477	1845393	67841
<b>Swans, 2 ad, 1 yg</b>	10/3/12, 11:02:10	66.18002	-151.717	1804246	103148
<b>Swans, 2 ad, 2 yg</b>	10/3/12, 11:19:52	66.19815	-151.965	1805898	91880
<b>Swans, 2 ad, 2 yg</b>	10/5/12, 12:09:33	66.49277	-152.136	1838418	83266
<b>Swans, 2 ad, 3 yg</b>	10/3/12, 1:10:26	66.3085	-152.643	1817386	61043
<b>Swans, 31 ad, 2 yg</b>	10/3/12, 10:42:38	66.16518	-151.541	1802881	111188
<b>Swans, 4 ad, 2 yg</b>	10/1/12, 1:04:04	66.65782	-151.473	1857724	112163
<b>Wolf, 1 (on kill)</b>	10/1/12, 1:00:49	66.66911	-151.427	1859057	114172
<b>Wolf, 3</b>	10/1/12, 2:47:29	66.76291	-151.32	1869656	118491
<b>Wolf, white</b>	10/3/12, 1:21:42	66.29862	-152.924	1816056	48432

The stick nests that we attributed to Northern Goshawks were all located in large deciduous trees in unburned habitat near rivers. We did not spot any nests in the closed deciduous timber stands not along rivers. This may have resulted because:

- The timber stands were densely packed with trees and detection of nests was difficult. The combination of the high speed of the plane and the huge number of potential nesting trees, meant that we simply could not check every potential nest site. Because forest nesting raptors occur at low densities, even at lower latitudes (Reynolds and Wight 1978), it is probable that we missed seeing some stick nests.
- While some trees in these timber stands were quite tall, most were still smaller diameter than true old growth trees in the Interior. It may be that 35 – 43 year old deciduous trees simply do not develop enough mass, particularly in their lateral branches, to be used by larger raptors like goshawks.
- Currently, there may not be many nesting forest raptors on Kanuti NWR due to its high latitude.

*Bird observations.* Even though winter was imminent and some small, shallow ponds had already frozen, we spotted five adult Bald Eagles and an Osprey during our survey (Table 3). Most of these Bald Eagles (4) were along the South Fork Koyukuk and in fact we saw more raptors there than in any other location. It should be noted that we did spend slightly more time surveying this river (2.1 min./km vs. the mean of all rivers of 1.5±0.3 min./km), mainly because of its extensive riparian area. We saw nearly the same number of swans along the South Fork Koyukuk and the Kanuti Rivers and their nearby lakes, and fewer elsewhere, probably because of the greater number of sloughs, lakes and ponds associated with these rivers.

*Other observations.* Breeding season for moose was in full swing and we saw moose at more locations than any other large mammal. We made the majority of these observations along the Kanuti and Kanuti Kilolitna Rivers, and spotted far fewer along the other rivers. In fact, we saw no moose along the South Fork Koyukuk, and ≤ 3 on each of the other rivers, perhaps reflecting the “boat-ability” and associated hunting pressure along these rivers.

Table 3. Observations made by location during a raptor stick nest survey on Kanuti National Wildlife Refuge, Alaska, October 2012.

	South Fork Koyukuk/ Jim Rivers	Kanuti River	Koyukuk River	Kanuti Kilolitna River	Henshaw Creek	Selected Lakes	Closed Deciduous Stands	Total
<b>Bald Eagle</b>	4			1				4
<b>Black bear</b>						1		1
<b>Great horned owl</b>		1						1
<b>Moose</b>		Total=26 (8 large, 1 med, 1 small bull; 14 cow; 2 calf)	Total=3 (1 Large bull, 2 cows)	Total=18 (2 Large, 1 med, 2 small bulls; 10 cows; 3 calf)	Total=1 (1 Large bull)	Total=1 (1 Large bull)		Total=49 (13 large, 2 med, 3 small bulls; 26 cows; 5 calf)
<b>Northern Goshawk</b>	1	1						2
<b>Osprey</b>				1				1
<b>Sharp-tailed Grouse</b>							1	1
<b>Stick nests</b>	6	3	3	5				17
<b>Swans</b>	31ad, 6yg	38ad, 7 yg	6ad	2ad, 3yg		2ad, 2 yg		77ad, 16 yg
<b>Wolf</b>	4	1						5

Climate change in the Arctic and sub-Arctic has resulted in an increase in temperature, and associated lengthened growing season (Chapin et al. 1995). This trend is expected to continue. It

will be interesting to see if the number of Bald Eagles and Osprey that nest on Kanuti NWR changes in response to the new environmental conditions in the years to come.

### **Recommendations**

- We suggest that a spring survey following the same protocol be conducted prior to leaf-out and snow melt, but after Bald Eagles and other raptors have arrived on territory to ascertain the extant nesting density on the Refuge. Nest detection probability may be higher during these conditions and we can investigate species specific nest occupancy.
- We suggest that effort in the South Fork, and main Koyukuk Rivers be increased in future surveys, perhaps expending twice the field-time in these wide riparian areas as during the 2012 survey.

### **Literature Cited**

Buehler, David A. 2000. Bald Eagle (*Haliaeetus leucocephalus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/506>

Chapin, F. S., III, G. R. Shaver, A. E. Giblin, K. J. Nadel-hoffer, and J. A. Laundre. 1995. Responses of arctic tundra to experimental and observed changes in climate. *Ecology* 76: 694-711.

Craighead, J.J. and F.C. Craighead. 1956. Hawks, owls and wildlife. Stackpole, Harrisburg, Pennsylvania. 443pp.

Jenkins, J. M. and R.E. Jackman . 1993. Mate and nest site fidelity in a resident population of bald eagles. *The Condor* 95:1053-105.

McGowan, J. D. 1975. Distribution, density and productivity of Goshawks in interior Alaska. Proj. Rep. W-17-4, W17-5, W-17-6, Job 10.6A. Fed. Aid Wildl. Restor. Alaska Dep. of Fish and Game. 30 pp. and appendices.

Reynolds, R.T. and H.M. Wight. 1978. Distribution, density, and productivity of accipiter hawks breeding in Oregon. *Wilson Bull.* 90:182-196.

Squires, John R. and Richard T. Reynolds. 1997. Northern Goshawk (*Accipiter gentilis*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/298doi:10.2173/bna.298>