Kanuti National Wildlife Refuge
2005 Wolf Survey Results
March 23-27

Author: Lisa Saperstein
Date: April 20, 2005

In response to a request by the Western Interior Regional Advisory Council at their March 2005 meeting, Kanuti National Wildlife Refuge (Refuge) conducted an aerial wolf survey of the Refuge and adjacent lands using the Stephenson survey method. Pilot Harley McMahan was contracted for the survey due to his expertise in tracking wolves. The survey area covered 3,949 mi^2, but roughly 1,101 mi^2 of this was windswept and considered unworkable; it was excluded from the analysis (Figure 1). The actual survey area was therefore reduced to 2,848 mi^2; tracking conditions in the remainder of the survey area were good to excellent. The survey took approximately 30 hours of flight time, not including travel time to and from Bettles.

A total of 56 wolves in 13 packs (range 1 – 9 wolves) were counted within and near the portion of the survey area that had good tracking conditions (Figure 1). This total included one carcass, recently killed by people. Three of the 13 packs (19 total wolves) were found outside of the survey area (Figure 1). Tracks of two more wolves were located, although the individuals were not seen, which increases the total to 58 wolves.

Pilot McMahan was instructed to follow tracks out of the designated survey area if they were initially encountered within it and the wolves could be located in a relatively short amount of time. Based on previous radio telemetry data, we know that some wolves found on the Refuge have territories that are largely outside of the Refuge boundary. Including wolves that only spend a fraction of their time within the survey area may overestimate the density. Cases of wolves found outside of designated survey areas are treated different ways in the literature. In some cases they are excluded based on known movement patterns, and in others they are only included if half of their fresh tracks are within the survey area. Rather than exclude these wolves from the density estimate, we only counted half of them in calculations to more accurately represent actual wolf occurrence in the survey area (Mark McNay, Alaska Department of Fish and Game, personal communication, April 2005). In other words, the 19 wolves that were found outside of the survey area were only counted as 10 wolves for the density estimate.

Therefore, the initial 2005 survey count of 58 wolves was adjusted to 48 wolves to account for packs located outside of the survey area. This is considered a *minimum* count and it represents a "snapshot in time" for when the survey was conducted. The 2005 adjusted total is similar to the 40 wolves incidentally observed during a late October – early November 2004 moose survey within the same area.

Wolf densities are usually reported as the number of wolves/1,000 mi^2. The 2005 survey resulted in a density estimate of just under 17.0 wolves/1,000 mi^2. Density during a similar aerial survey in mid-March 2001 was about 14 wolves/1,000 mi^2 (Figure 2). Telemetry data from radio-collared packs on and near the Refuge from 1998 - 2001 indicated a density of around 15 wolves/1,000 mi^2 for collared packs (Maxwell 2005); this density estimate did not include wolves that were not members of collared packs. General wolf territories based on the telemetry data are also shown in Figure 1.

The intensity of potential predation on moose can be assessed by looking at moose/wolf ratios. The fall 2004 moose survey on Kanuti Refuge resulted in an estimated 842 moose, or 310 moose/1,000 mi^2. This moose density is appropriate to use for areas just outside of the refuge boundary that were included in the wolf survey. The moose/wolf ratio is therefore about 18 moose/wolf during the winter of 2004 – 2005 (Table 1).

The Alaska Department of Fish and Game management goal for GMU 24 is a fall density of 13 – 23 wolves/1,000 mi^2 (Stout 2003). A rough rule of thumb is that ratios over 30 moose/wolf could result in stable to increasing moose populations *if* the habitat can support this number of moose and if other sources of mortality from factors such as hunting or severe weather were not excessively high (Gasaway et al. 1983). According to Mark McNay (ADFG, personal communication, April 2005), the density of wolves seen during the Kanuti survey is typical for areas of interior Alaska without predator control. The observed moose/wolf ratio is low, but consistent with other low density areas such as GMU 19D (McGrath area), 20C (south of Tanana River and west of Nenana River), and the Yukon Flats.

Determining wolf densities and moose/wolf ratios is not an exact science, and a number of general factors should be kept in mind when looking at these relationships.

- Wolf density will be highly dependent on the size and shape of the survey area. This was seen during the Kanuti survey in that a number of wolves were found just outside of the survey area.
- Wolf density is highly variable and is affected by factors such as prey, season, and harvest. Studies in North America show that 64% of the variation in wolf density could be explained by variation in prey availability (Fuller et al. 2003).
- Tracking conditions during wolf surveys and the ability of trackers will affect results. For this survey, we had good conditions in most of the survey area and an excellent tracker who was successful in finding lone wolves and pairs. Time of year also affects survey results; cohesiveness of packs changes throughout the year.
- Moose populations are variable and are affected by factors such as age structure of the population, predation and human harvest, environmental conditions such as snow depth, and habitat quality. Caribou are also prey for wolves in winter; caribou were scarce in the survey area this winter, but they were in the area in relatively high numbers (>1,000) last winter.
- Moose estimates from surveys are not exact counts; this will be discussed further below.

The estimated number of moose calculated from the fall 2004 survey has not been adjusted for moose that are not seen in survey units. It is unavoidable to miss some moose during surveys, no matter how experienced the survey pilot/observer team is. Recent research by the Alaska Department of Fish and Game using radio-collared moose suggests that 20-25% of the moose in a survey unit may be missed in forest-shrub habitat (Boertje 2005). Previous work on Kanuti Refuge suggested that 14% of the moose were missed. The Kanuti Refuge percentage did not use radio-collared moose to test how many were being missed. Those calculations were made by surveying units with normal intensity, immediately re-surveying parts of the units with higher intensity (more time spent in unit, more circling), and calculating how many additional moose were seen during the high-intensity surveys compared to the normal surveys.

Not correcting for missed moose is not an issue when comparing one moose survey to another if surveyors are missing about the same percentage of moose in each survey; the survey results will just be conservative. However, calculating moose/wolf ratios using uncorrected moose values will result in a number of moose per wolf that is lower than what really exists. Whether observers are missing 15%

or 25% of the moose in survey units can make a difference in the moose/wolf ratios. Of course, the wolf numbers are considered minimal counts, and how close this minimum is to the actual number of wolves in the area is highly dependent on tracking conditions and the ability of the tracker.

In summary, we estimated there are about 17 wolves/1,000 mi^2 in the survey area; this density is consistent with other areas of interior Alaska with natural predator levels. Moose density in the survey area is low, and the resulting moose/wolf ratio of 18 moose/wolf is also low but similar to other low-density moose areas in Alaska. Moose and wolf populations both can be highly variable and will change according to a number of factors. Estimating moose and wolf populations is not an exact science and factors that affect the estimates should be kept in mind. These efforts represent the best that we can do given current budgets.

Table 1. Summary of data used to calculate moose/wolf ratios.

Total moose estimated on Kanuti NWR 2004	842 (range = 602 – 1,083)
Estimated moose density	310 moose/1,000 mi^2
Estimated wolf density	17 wolves/1,000 mi^2
Estimated number of moose per wolf	18 moose/wolf

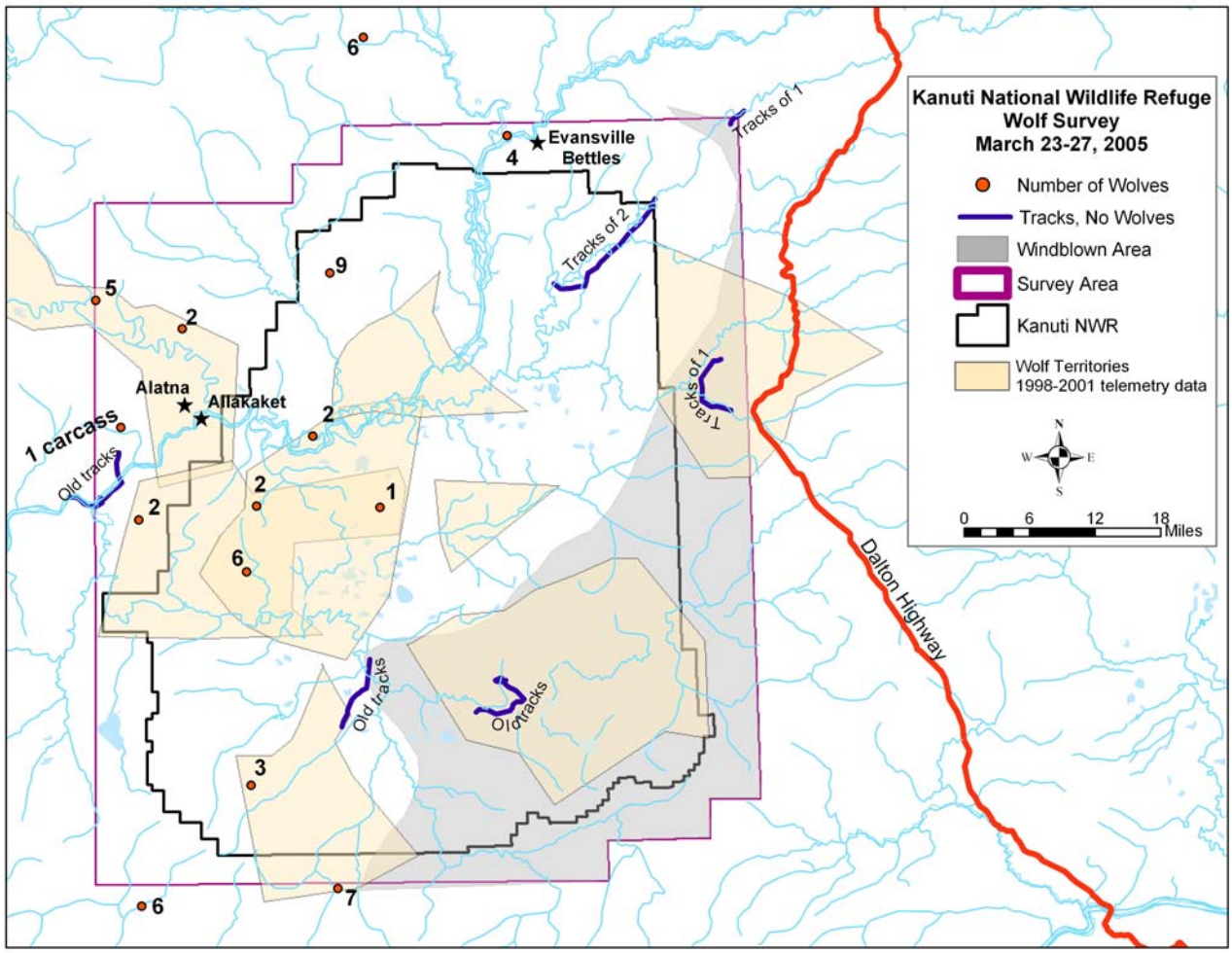

Figure 1. Wolf survey area and location of wolf observations Kanuti National Wildlife Refuge, 2005.

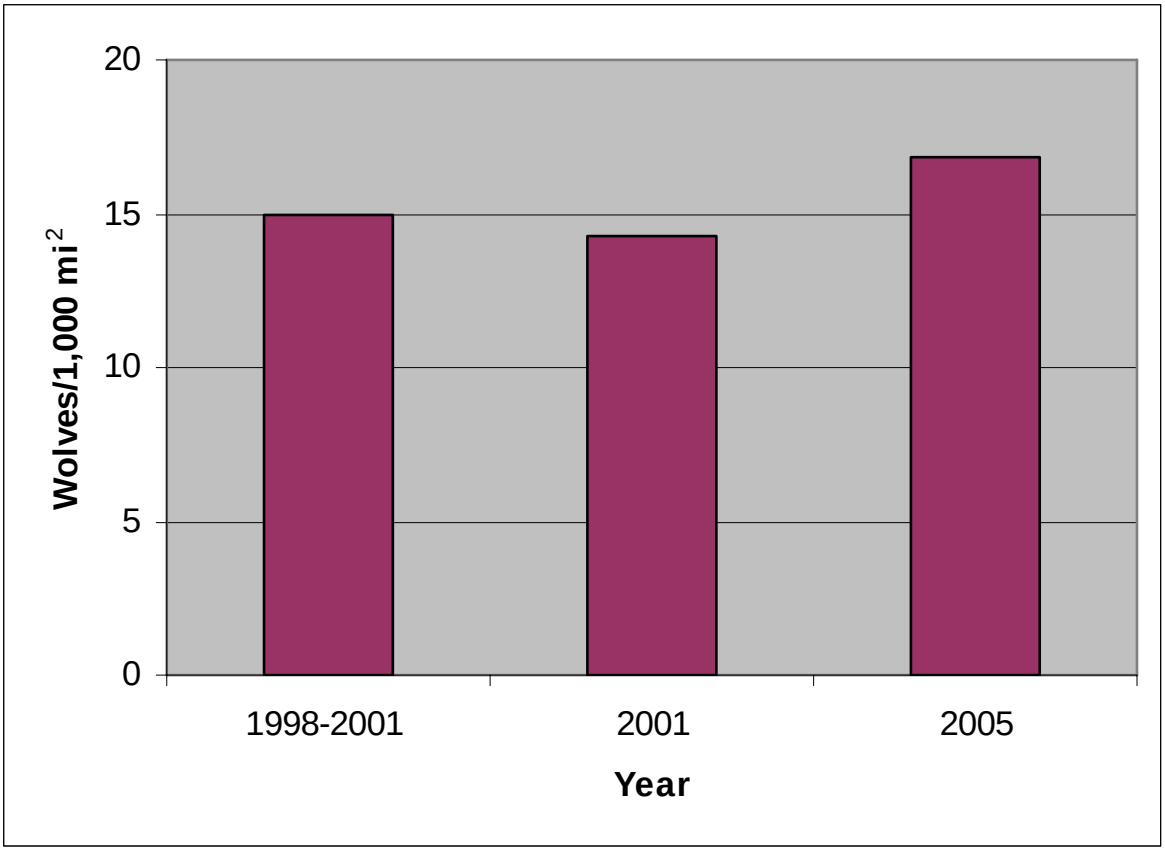

Figure 2. Estimates of wolf density in the Kanuti National Wildlife Refuge area, 1998 – 2005. The 1998 – 2001 density is a summary of radio telemetry data collected year-round during that period. The 2001 and 2005 density estimates are from late winter aerial surveys.

References Cited

Boertje, R. 2005. Using a sightability correction factor of 1.2 to 1.25 for Nov. GSPE estimates (forest-shrub mixtures). Alaska Department of Fish and Game memorandum. Fairbanks, AK 5 pp.

Fuller, T.K., L.D. Mech, and J.Fitts Cochrane 2003. Wolf population dynamics. Pages 161-191 in L.D. Mech and L. Boitani, eds., *Wolves: Behavior, ecology, and conservation*. University of Chicago Press. Chicago, IL. 448 pp.

Gasaway, W.C., R.O. Stephenson, J.L. Davis, P.E.K. Shepherd, and O.E. Burris. 1983. Interrelationships of wolves, prey, and man in interior Alaska. Wildlife Monographs 84. 50 pp.

Maxwell, M. 2005 (draft). Wolf distribution and abundance on Kanuti National Wildlife Refue, Alaska. Unpublished U.S. Fish and Wildlife Service report, Kanuti National Wildlife Refuge, Fairbanks, AK. 21 pp.

Stephenson, R.O. 1978. Characteristics of exploited wolf populations. Alaska Department of Fish and Game Final Report, Federal Aid in Wildlife Restoration. Projects W-17-3 through W-17-8, Job 14.3R. Juneau, AK. 21 pp.

Stout, G.W. 2003. Unit 24 wolf management report. Pages 223-231 in C. Healy, ed., *Wolf management report of survey and inventory activities 1 July 1999-30 June 2002*. Alaska Department of Fish and Game. Juneau, AK.