ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
Juneau, AK 99811-5526

PROJECT TITLE: Comparative nutritional status among 6 high-density moose subpopulations in Interior Alaska

PRINCIPAL INVESTIGATOR: Kalin A. Kellie

COOPERATORS: None

FEDERAL AID GRANT PROGRAM: Wildlife Restoration

GRANT AND SEGMENT NO. W-33-7

PROJECT NO. 1.67

WORK LOCATION: Units 20A, 20B, and 20D

STATE: Alaska

PERIOD: 1 July 2008 – 30 June 2009

I. PROGRESS ON PROJECT OBJECTIVES SINCE PROJECT INCEPTION

This is the first year of the project.

II. SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN THIS PERIOD

JOB/ACTIVITY 1A: Literature review.

I read peer-reviewed literature on the following topics: moose nutrition, moose and wildfire, moose mortality, moose reproduction and animal movement. All pertinent information was incorporated into my digital notes archive by topic.

JOB/ACTIVITY 2A: Moose capture.

In Unit 20A we immobilized 71 calves (non-burned flats: n = 28; Survey Line fire: n = 23; Fish Creek burn: n = 20), and radiocollared 52 of them. In central Unit 20B we immobilized 26 calves. We averaged 9 calf immobilizations and 3.65 hours helicopter time per day. Per calf, we averaged 0.4 hours helicopter time, 0.6 fixed-wing hours, 1.6 darts, and 0.3 double reversals. Four fixed-wing pilots, 5 darters, and an additional 6 handlers assisted with capture operations.

Calf capture in Minto Flats and Delta Junction study areas was delayed for 1 year pending funding from the U.S. Army. These data are now scheduled for collection in March 2010.

JOB/ACTIVITY 2B: Comparison of nutritional condition among populations.

Average calf weights from all 4 areas were <385 lb, indicating moose should be harvested at sufficient rates to prevent growth of the moose populations (Appendix:Boertje et al. 2007). Among the 4 study areas, mean body weight was lowest in the Unit 20A non-burned flats and highest in central Unit 20B (Appendix:Fig. 1). The Fish Creek fire weights had the most variation. The non-burned flats weights were lighter* than both Survey Line fire and central Unit 20B ($\alpha = 0.10$, $P = 0.043$ and $P = 0.0003$, respectively), but not different from weights from the Fish Creek burn. Mean weight in the non-burned study area in 2009 was 2 lb lighter than the lowest annual mean weight from female calves weighed in that area from 1997 to 2001 (referenced as “Tanana Flats” in Appendix: Boertje et al. 2007; 332 lb in 1998). Spring 2009 weights were among the lightest recorded. See capture memo (Appendix) for details.

Based on calf weights obtained during March 2009, nutritional condition in the 2001 burns may be improving. However, any real increase in calf weight is moderate at best (i.e., around 25 lb) and detection power is questionable at this sample size. More samples are needed to achieve the statistical power necessary to confirm any nutritional improvement inside the 2001 burns. In the non-burned study area, nutrition appears to be stable. Female calf weights were similar to those measured from 1997 to 2001 outside the burn. Full statistical comparison of population nutrition using calf weights will be performed after additional sampling in March 2010.

JOB/ACTIVITY 3A: Unit 20A browse surveys.

Browse surveys were postponed until April 2010 to correspond with March 2010 calf captures, which were delayed because of U.S. Army funding delays.

JOB/ACTIVITY 3B: Minto Flats and Unit 20D browse surveys.

Browse surveys were postponed until April 2010 to correspond with March 2010 calf captures, which were delayed because of U.S. Army funding delays.

JOB/ACTIVITY 4A: Radiotracking.

Forty-eight collared calves in Unit 20A were radiotracked twice monthly from late March through the end of fiscal year 2009 (i.e., 30 June 2009).

III. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THIS SEGMENT PERIOD

We used an R-44 helicopter to investigate cause of death for 10 calf mortalities that occurred between 10 March and 31 July 2009. This information was included in on-going investigations of age-specific survival at high density (see Federal Aid Project 1.65).

IV. PUBLICATIONS

None to date.

V. RECOMMENDATIONS FOR THIS PROJECT

During summer 2009, 2 large wildfires began burning in Unit 20A within the current study areas. During winter 2009–2010, we will need to reevaluate hypotheses and study design to include these new fires.

* Uses $\alpha = 0.10$ and $P < 0.05$ as a decision rule.

VI. APPENDIX

Department memo on March 2009 moose capture attached.

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APPROVAL DATE: ____________________

APPENDIX

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

DIVISION OF WILDLIFE CONSERVATION

Sarah Palin, GOVERNOR

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MEMORANDUM

TO: Don Young
Rod Boertje
Tom Seaton
Kimberlee Beckmen
Scott Brainerd

ISSUE DATE: July 02, 2009
REVISED: August 12, 2009

FROM: Kalin Kellie

SUBJECT: 20A/B March 2009 Moose Calf Capture

Overview

In March 2009, ADF&G management and research staff immobilized and weighed 97 moose calves in 4 different study areas near Fairbanks, Alaska (Fig. 1). The results of this field season may be useful to managers and cooperators during the interim before the final research report in Sept 2013. I use this memo to communicate current research in a timely format, documenting field logistics and providing a summary for various cooperators and colleagues.

Moose calf weights have been identified as a sensitive index to population nutrition and low nutrition is likely when calf weights are below 385 lbs (Boertje et al. 2007). Mean calf weights in 3 GMU 20A study areas (i.e., Fish Creek Burn, Survey Line Fire and Nonburn Flats) are part of a 3-yr project investigating improvements in moose nutrition following two large wildfires in 2001. Mean calf weight measured in Central 20B provides context for nutritional condition among areas with both high moose density and high levels of harvest. I also compare our results with both spring 2009 weights and long-term data collected in study areas across Western and Interior Alaska. My thanks to Tony Gorn and Letty Hughes (Nome ADF&G), Eric Wald (USFWS Bethel), Glen Stout (ADF&G Galena) and Mark Keech (Fairbanks ADF&G) for sharing their data.

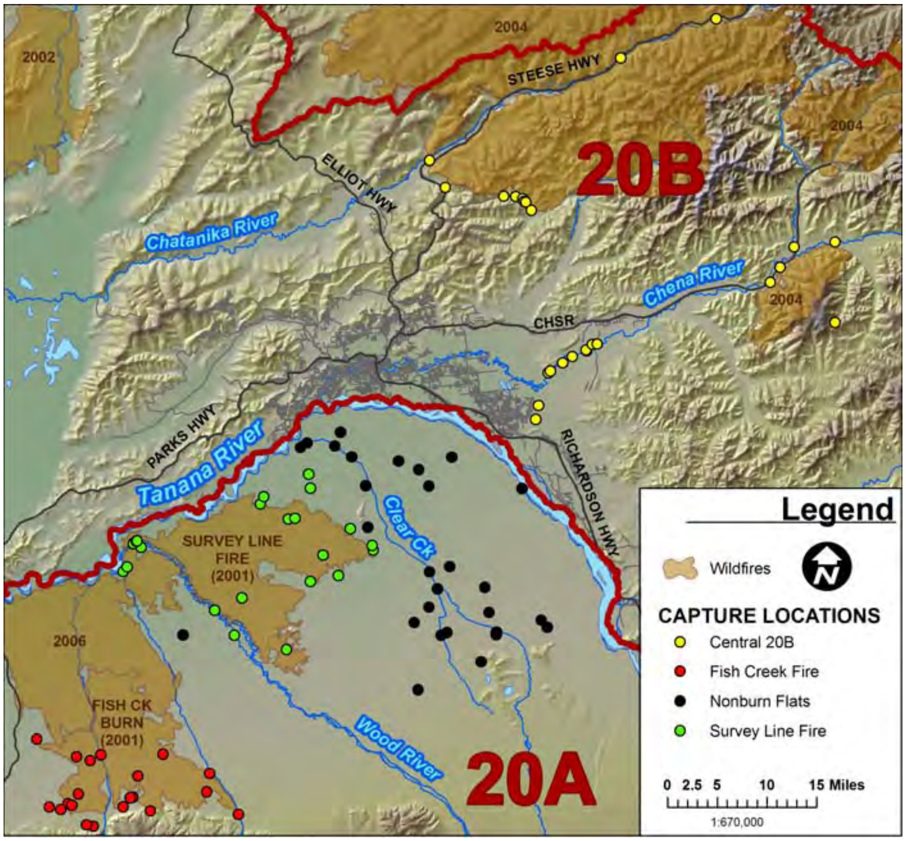

Figure 1. Capture locations for 97 moose calves captured in GMU 20A and 20B from March 1-20, 2009. Locations are color-coded by study area.

Logistics

Marking Moose

Radiocollars were Telonics Mod 600NH transmitters operating at 57bpm with a S6A mortality sensor at 114 bpm with a 5.5 hr delay. The transmitter canister was encased in Cast-1 type epoxy to improve durability and combined with an adjustable collar that uses a housed bungee to expand from 29 to 37 inches. The non-collared calves in 20A and all calves in 20B were ear tagged in one ear. All animals were marked with 30-day expiry warnings against human ingestion of meat.

Capture Methods

We used a mix of 1.2mg Carfentanil and 160mg Xylazine in a 1cc dart. Animals were reversed with a mixture of 200mg Tolazoline and 120mg Naltrexone injected IM. We took body measurements, blood and a weight. All weights were measured by suspending the calf in a net from a tripod and reading the weight from a 500-pound dial scale. Chase times were recorded and lactate levels in the blood were measured for 17 calves as part of a pilot project with Dr. Kimberlee Beckmen comparing capture stress among methods. Trace mineral samples were collected for 30 calves. None were treated with antibiotics.

Results

In GMU 20A we immobilized 71 calves (Nonburn Flats: n = 28; Survey Line Fire: n = 23; Fish Creek Burn: n = 20), and radiocollared 52 of them. In Central GMU 20B we immobilized 26 calves. We averaged 9 calf immobilizations and 3.65 hrs helicopter time per day. Per calf, we averaged 0.4 hrs helicopter time, 0.6 fixed-wing hrs, 1.6 darts, 0.3 double reversals. We spent 25.5K on an R-44 helicopter charter (39.3 hrs) and 3.4K on AV gas (150 hrs) for department fixed-wing aircraft. Four fixed-wing pilots, 5 darters and an additional 6 handlers assisted with capture operations.

Calf Weights

Average weights from all 4 areas were < 385 lbs, indicating moose should be harvested at sufficient rates to prevent growth of the moose populations (Boertje et al. 2007). Among the four study areas, mean body weight was lowest in 20A non-burned flats and highest in Central 20B (Fig 2). The Fish Creek Fire weights had the most variation. Nonburn Flats weights were lighter[*] than both Survey Line fire and Central 20B (α=0.10, P=0.043 and P=0.0003, respectively), but not different from weights from the Fish Creek Burn. Mean weight in the Nonburn study area in 2009 was 2 pounds lighter than the lowest annual mean weight from female calves weighed in that area from 1997-2001 (referenced as "Tanana Flats" in Boertje et al. 2007; 332 lbs in 1998; Fig. 3). Spring 2009 weights were among the lightest recorded (Fig. 3 and 4).

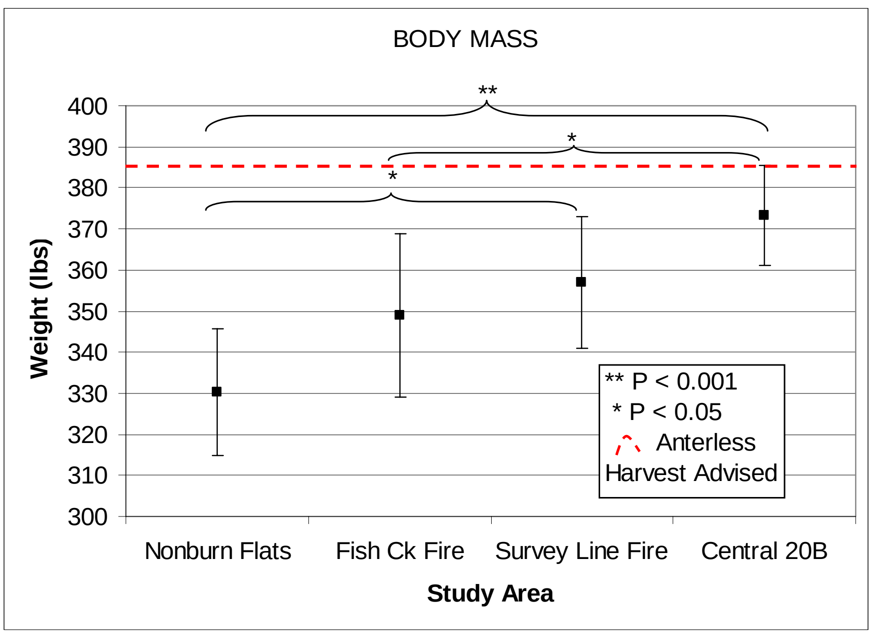

Figure 2. Calf weights measured in March 2009 for the 4 study areas. Nonburn Flats, Fish Ck Fire and Survey Line Fire are all in GMU 20A. Significance is reported using two-tailed t-tests for unequal variances at an alpha level of 0.1.

[*] Uses α = 0.10 and P < 0.05 as a decision rule.

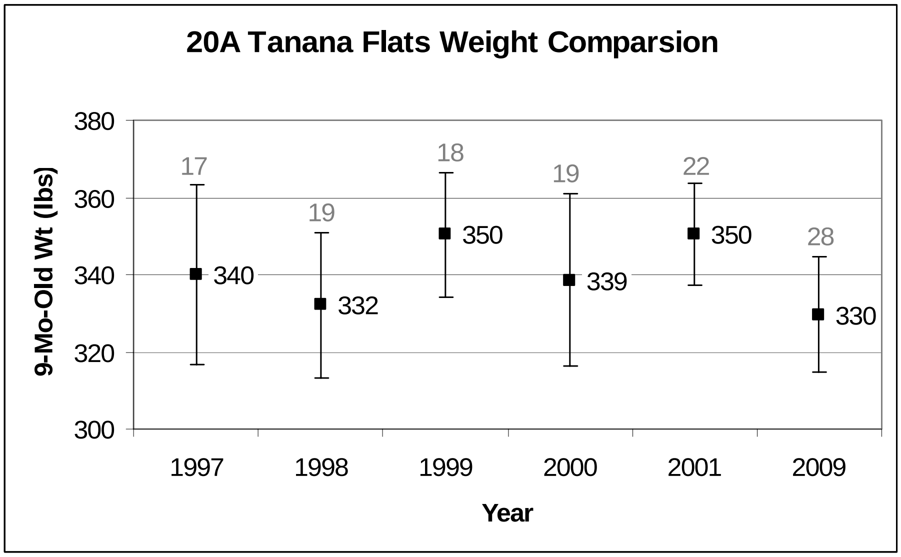

Figure 3. Past and present female calf weights in the Nonburn Flats study area. The 2009 average weight is not significantly different from weights collected 8-12 years earlier, suggesting that nutrition of calves still alive in the spring has not changed substantially in these areas. Alpha = 0.10.

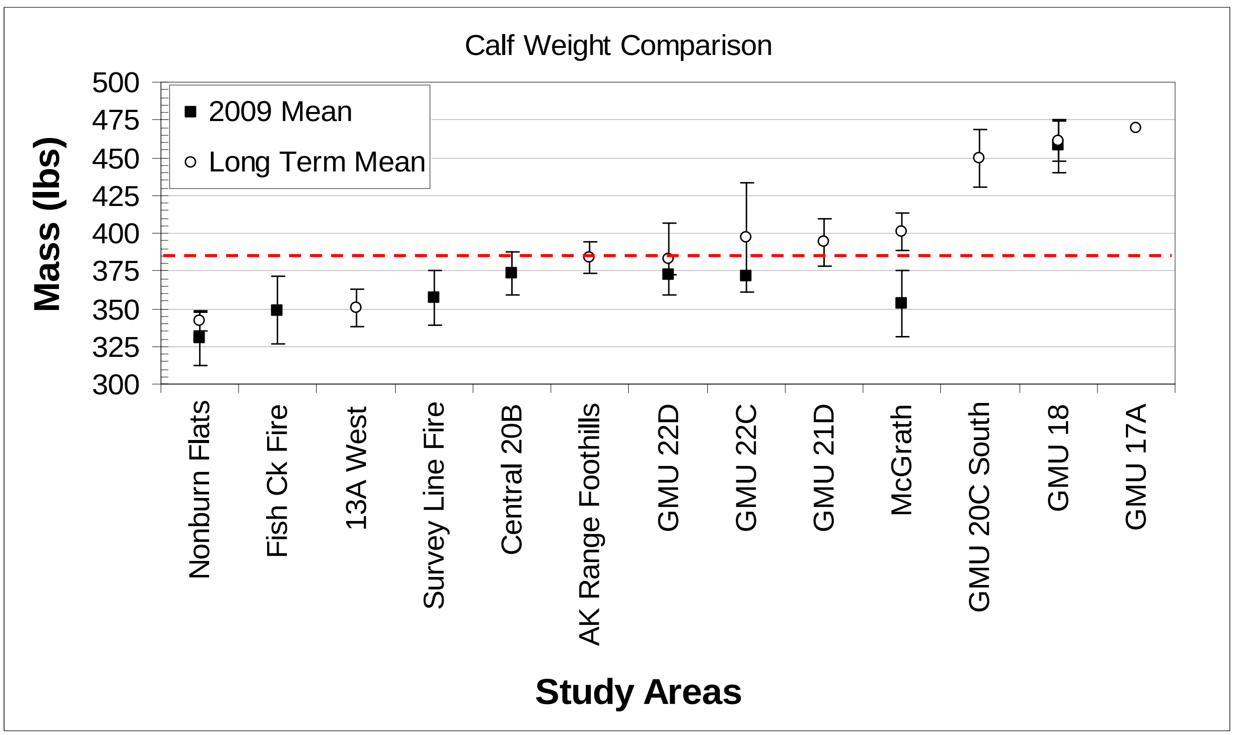

Figure 4. Comparison of mean calf weights across study areas for spring 2009, and long-term means. Dashed line indicates the calf weight at which antlerless harvest is recommended to slow population growth and stabilize nutrition. Alpha = 0.10.

Body Measurements
Total length, metatarsus length and body weight all have a similar ranking among study areas (Table 1). Neck measurements were relatively similar among study areas. Our expandable collars were not snug but secure and had to be expanded slightly to slip over the head and ears.

Table 1. Mean body measurements of immobilized moose calves from the 4 study areas. Standard error is in parentheses. Linear dimensions are in centimeters and weights are in pounds.

Study Area	Total Length	Metatarsus	Neck	Weight
Nonburn Flats	220 (3.1)	49 (2.1)	56 (0.7)	330 (9.0)
Fish Ck Fire	223 (4.7)	47 (3.4)	58 (0.9)	349 (11.4)
Survey Line Fire	226 (2.3)	50 (2.2)	57 (0.8)	357 (9.3)
Central 20B	226 (2.0)	53 (0.9)	58 (0.7)	373 (7.1)

Lactate Sampling
Lactate values were variable across chase times and there was no clear relationship between capture stress and lactate readings. However, it is likely that the majority of the lactate readings are invalid. We later learned the lactate instrument we were using requires temperatures between 50 and 140° F, and we worked below this range throughout the capture.

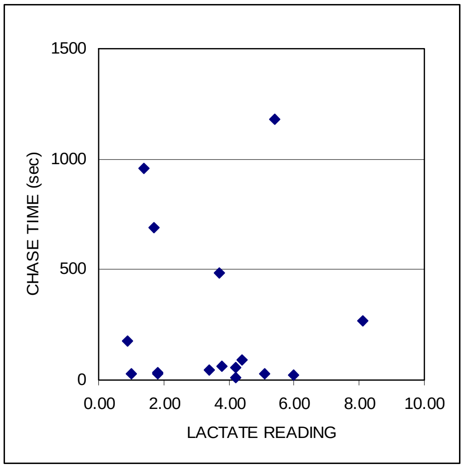

Figure 5. Lactate readings and chase times for 17 capture events of short-yearling female moose between 02 and 05 March, 2009.

Mortality
Two of the 54 radiocollared calves (4%) died as a direct result of immobilization. The first animal regurgitated and then inhaled a large amount of rumen and promptly died of asphyxiation. This is a rare side-effect of Naltrexone and there is no known way to mitigate for this in future capture efforts. The second animal died of capture myopathy after a prolonged chase during darting. Although we guard against prolonged chases, occasionally this occurs and capture myopathy can result. In this case, the animal was darted once, began running and was darted twice more before becoming immobilized. To date, an additional 7 radiocollared moose have died. Four deaths were related to malnutrition, two were killed by wolves and one was killed by a grizzly bear.

Discussion

Calf Weights and Nutritional Condition

Calf weights are currently considered our most sensitive index to population nutrition (Boertje et al. 2007). Based on calf weights obtained during March 2009, nutritional condition in the 2001 burns may be improving. However, any real increase in calf weight is moderate at best (i.e., around 25 pounds) and detection power is questionable at this sample size. More samples are needed to achieve the statistical power necessary to confirm any nutritional improvement inside the 2001 burns. In the nonburn study area, nutrition appears to be stable. Female calf weights were similar to those measured from 1997-2001 outside the burn.

Although total snow accumulation was 6” higher than normal by March 2009 in the Fairbanks area (http://climate.gi.alaska.edu/AKCityClimo/AK_Climate_Sum.html), snow depths were relatively shallow. This was the result of a significant reduction in snow pack during record high temperatures in mid January 2009 (Fig. 6). However, in areas of central and western Alaska, snow was much deeper than average (e.g., 24” above average in Nome) and this may have contributed to lighter mean calf weights in GMU 22D and McGrath (Fig. 4). In areas where snow was relatively shallow (i.e., < 30”), 2009 weights were not significantly lighter (e.g., Nonburn Flats and GMU 18).

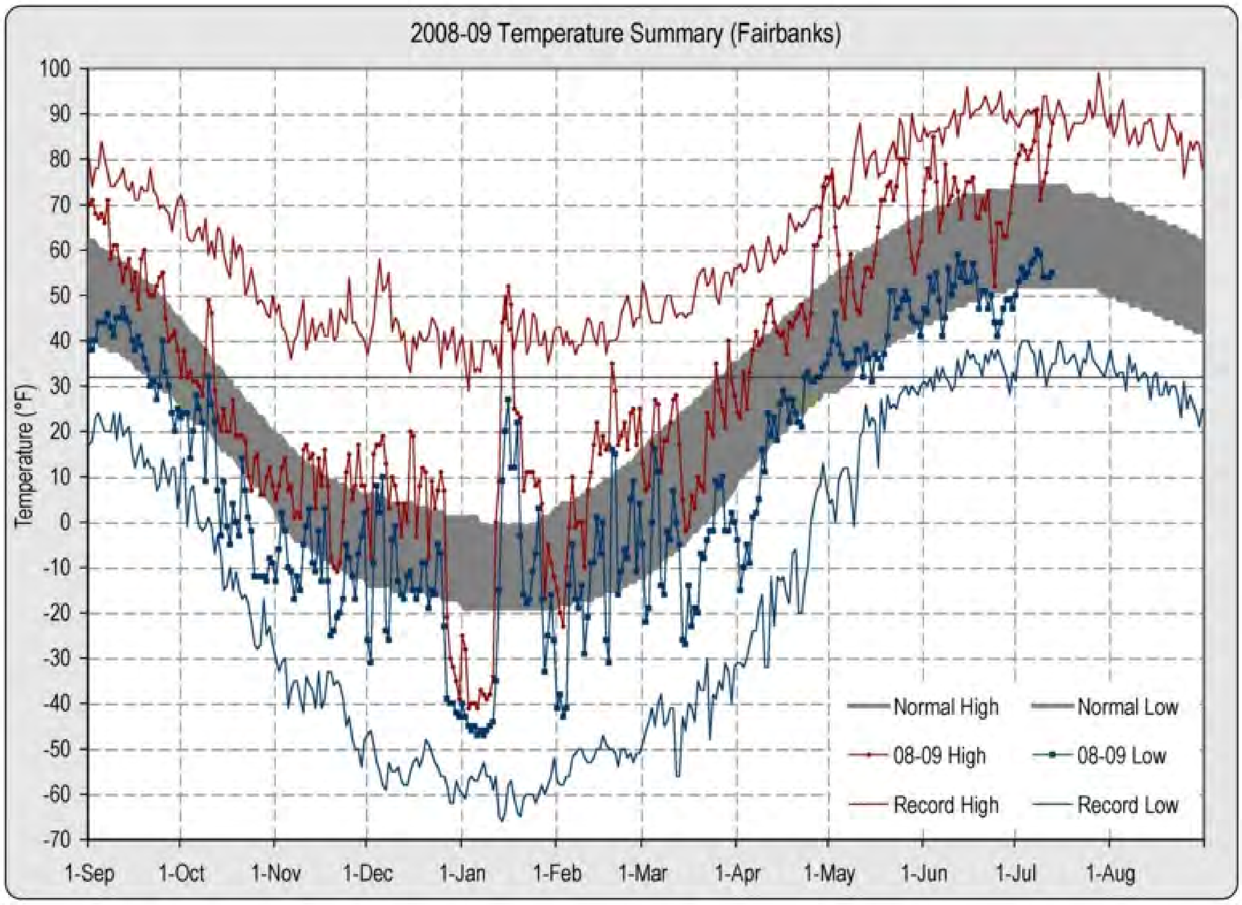

Figure 6. Daily temperature summary for Fairbanks International Airport during winter 2008-2009. Note the severe cold period followed by rapid warming in January 2009. Source: http://climate.gi.alaska.edu/Climate/Fairbanks/index.html

Moose Movements to Date

Summaries of data by study area are subject to change as the study progresses. Moose calves were assigned to a study area based on their location at time of capture. During the next 12 months, these assignments will be re-evaluated based on movements relative to the study areas. Radiocollared moose in 20A have been located twice monthly since capture. All animals have remained residents of 20A. In early May, there was a Northward shift and most individuals were found in wet fen areas (Fig 7.). Moose collared in the Nonburn Flats and Survey Line Fire study areas have remained close to or within their study areas. Movements of calves collared in the Fish Creek Burn were more uniform in direction and during the calving season many calves (now yearlings) used the 2006 burn adjacent to the North. Most of these calves were seen either with their dam or in close proximity, thus these locations also appear to reflect the movements of parturient adult cows.

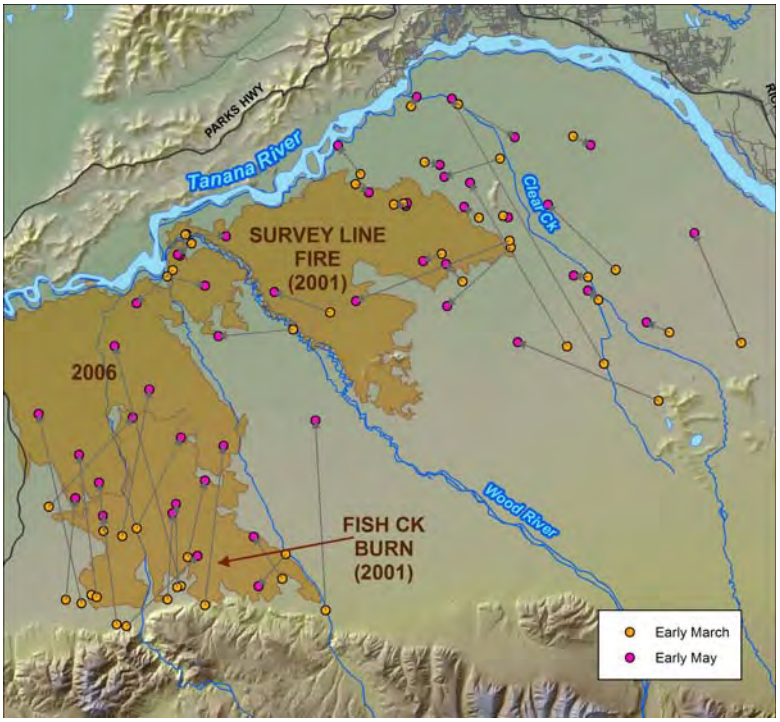

Figure 7. Movements of short-yearling female moose between late winter range (orange circles: early March 2009) and calving areas (pink circles: early May 2009).

Literature Cited

BOERTJE, R.D., K.A. KELLIE, C.T. SEATON, M.A. KEECH, D.D. YOUNG, B.W. DALE, L.G. ADAMS, AND A.R. ADERMAN. 2007. Ranking Alaska moose nutrition: signals to begin liberal antlerless harvests. Journal of Wildlife Management 71:1494–1506.