ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
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Alaska Department of Fish and Game
State Wildlife Grant

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Project Title: Import of predation and habitat quality to moose in Game Management Unit 13

Project Duration: July 1, 2006 – June 30, 2010

Report Period: July 1, 2009 – June 30, 2010

Report Due to HQ: 1 September, 2010

Principle Investigator: Bruce W. Dale

Project Location: Game Management Unit 13A, Southcentral Alaska. The exact boundaries will be determined by movements of radio-collared moose, research needs, and other related research projects but will likely include the drainages of the Oshetna River, Tyone River, Nelchina River, and Goose Creek and may include the drainages of Tolsona Creek and Moose Creek

I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

Low calf recruitment has limited both population growth and harvests. This research was required to determine if predation remained an important factor limiting recruitment relative to productivity.

II. REVIEW OF PRIOR RESEARCH AND STUDIES IN PROGRESS ON THE PROBLEM OR NEED

Predation by brown bears can be an important factor limiting survival of moose and caribou calves. Bears have been shown to take up to 84% of moose calves born during their first summer (Bertram and Vivion 2002) and 16-25% of caribou calves (Adams et al. 1995, Boertje and Gardner 2000). In Game Management Unit (GMU) 13 in south-central Alaska, experimental re-location of brown bears during moose calving indicated that reducing bear numbers by 60% resulted in significant increases in calf:cow ratios in autumn (Ballard and Miller 1990). The Alaska Board of Game liberalized bear bag limits from 1980-1986 to reduce brown bear numbers for the purpose of increasing moose calf recruitment and ultimately harvest by of moose by hunters (Miller and Ballard 1992). Sows with cubs remained protected and same-day-airborne hunting and bear baiting remained prohibited. Harvest increased and bear numbers declined but moose calf survival did not increase in a study area in northern GMU 13 (Miller and Ballard 1992).

In response to decreases in the moose population, the board again liberalized bag limits and extended seasons in 1994 to reduce bear numbers and predation on moose. Bear harvest again increased and remains at high levels. We conducted a pilot calf mortality in 2003, and a calf mortality study in 2006 in another well-studied portion of GMU 13 (GMU 13A West) 2006 to

determine if liberal hunting regulations reduced bear predation on moose calves. The area has excellent conditions for bear hunting including good access, sightability, spring snow conditions for travel and tracking, and a large and motivated hunting public. It was thought that dramatic reductions in bear numbers were possible, but that if that did not occur, it was unlikely that bear reductions could occur in more remote and more heavily vegetated regions in south-central Alaska. Thus the GMU 13A West study area became a test case for increasing moose calf survival through liberalized bear hunting.

Testa (2004a, 2004b) investigated this same study area from 1994-2000 and concluded that increases in recruitment would provide more increase in harvest than increases in productivity despite apparent nutritional constraints on productivity. This conclusion is partially dependent on the assumption that bear caused neonatal mortality is largely additive in GMU 13 A West, as it was in the northern study area bear translocation (Ballard and Miller 1990). Reduced but compensatory bear predation could mask a reduction in mortality due to bears and was suggested as a possible reason contributing to the lack of a response of moose calves to the earlier increase in bear harvest (Miller and Ballard 1992). We compare current estimates of adult condition to those obtained by Testa and Adams (1998) and conducted a health assessment of moose calves to evaluate their viability.

The GMU 13 A West study area has had significant research on brown bears including a mark-recapture estimate of brown bear density in 1998 (Testa et al. 2000). IN addition, an aerial line-transect survey was conducted across much of Unit 13 in XXXX (Becker XXXX). Estimating bear population size where bears occur at low densities and where sightability is poor is very difficult. Precision is poor, costs are high, and most methods are complicated by lack of closure and capture heterogeneity (). While estimating the current bear population size remains problematic, we began radio-collaring bears in 2006 to evaluate minimum population size, demographics, and movements in part to evaluate their status as predators of moose calves. Hunter-induced changes in bear demographics and function responses on the part of remaining bears were also suggested as possible reasons for the lack of response in moose calf survival (Miller and Ballard 1992).

Increases in moose calf survival due to bear reduced bear numbers may also be limited by subsequent increases in wolf predation on calves (Ballard et al. 1986, Miller and Ballard 1992). Wolf reduction began in GMU 13 in 2000 through liberalized means and methods and wolves were further reduced in portions GMU 13 (including our 13A West study area). This should reduce the potential for wolf predation to mask reductions in bear-caused calf mortality. In addition, this would allow evaluation of the efficacy of solely reducing wolf numbers to increase moose harvest should bears remain important predators of moose calves. Reducing bear numbers to increase ungulate harvests remains controversial and in some systems may produce conservation concerns.

III. APPROACHES USED AND FINDINGS RELATED TO THE OBJECTIVES AND TO PROBLEM OR NEED

We monitored calf production and survival, habitat use, population health and evaluated causes of calf mortality and conducted a health assessment.

We found that bear predation on calves remained and important cause of recruitment. We found that productivity and growth were less than optimum but still more than adequate to provide for elevated harvests. Where trends couldbe established, indices of nutritional status of moose in unit 13 appeared to be steady (adult max rump fat, calf weights) to increasing (twinning rate). The health assessment indicated adequate health of calves. Low copper values were observed in some individuals but the ramifications of this condition are unknown.

IV. MANAGEMENT IMPLICATIONS

Managers can reach population and harvest objectives under the current management regime. Indeed, they are making good progress. Harvest rates above approximately 5% will require a reduction in bear caused mortality of calves. Increases in forage quality may help enhance or sustain harvests.

V. SUMMARY OF WORK COMPLETED ON JOBS

Objective 1: Continue to monitor the dynamics of GMU 13A moose population

> **Job/Activity 1a:** In concert with Survey and Inventory activities, we monitored calf production, recruitment and population trend. Monitoring indicated progress towards harvest and population objectives.

Objective 2: Utilize multiple predator-multiple prey models to assess the role of predation on population dynamics

> **Job/Activity 1a:**
> We evaluated 2 models for density dependent predation rates on moose calves and compared the performance of these models to empirical data for 11 study areas in Alaska and the Yukon. Both the models and the empirical data suggest that predator swamping or “dilution” may be an important process in determining moose harvest rates at varying moose densities.
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> We modified a multiple-predator model developed by Dale et al. (1994) to evaluate trends in neonatal calf survival when wolf predation is reduced but bear numbers remain constant. We also used this model to estimate the range of potential parameters for a Type II functional response of bears to changes in abundance of moose calves.

Objective 3: Assess habitat selection of moose

> **Job/Activity 1a:** We collected the necessary data to evaluate habitat selection of moose in GMU 13A west. This data has been evaluated to reveal the basics of habitat selection in GMU 13A west. The data will provide a baseline for understanding future changes in nutritional performance or habitat quality and availability due to development or other causes.
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> This data has been used for sampling purposes to evaluate annual variation in protein availability by W. Collins and D. Spalinger (Project 1.59) and may be used to evaluate

variation in copper and selenium availability to moose in Unit 13. This dataset is also being used to compare bear distribution relative to moose distribution during summer.

Objective 4: Assessment of nutritional condition of cow moose

Job/Activity 1a:
We collected several years' data on the assessments of nutritional condition of cow moose including calf weights, max rump fat, and other measures of body condition. These data have been compared to earlier assessments in Unit 13 and nutritional condition of moose in Unit 16B. These comparisons have been used to evaluate Intensive Management population objectives for Unit 13 moose. Current population and harvest objectives appear to be sustainable in GMU13A west. Future monitoring of trends in nutritional condition of moose will be used as an additional trigger to institute cow harvests as the population responds to Intensive Management actions.

Objective 5: Assessment of nutritional condition factors affecting survival of calf moose

Job/Activity 1a:
Data collection and analysis is complete for this objective. Results suggest that fat reserves are slightly lower in Unit 13 calves than in comparison areas and liver copper levels may be marginal although the consequences of the observed levels are not known. Further investigation into the copper deficiency is being considered. However, in general, the nutritional condition of neonatal moose calves appears adequate and subsequent growth and development appear to be normal for the overall nutritional state of this moose population.

I. PUBLICATIONS

The results of this project were presented at the 2010 North American Moose Workshop and Conference in International Falls, MN. The results were solicited for publication in the proceedings of that conference. A draft of the manuscript is near completion and will be submitted in a few weeks.

Prepared by: Bruce Dale, RIV

Date: September 1, 2010