

**FEDERAL AID
FINAL RESEARCH REPORT**

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 25526
Juneau, AK 99802-5526

PROJECT TITLE: Evaluation and testing of techniques for ungulate management

PRINCIPAL INVESTIGATORS: Tom Lohuis, John Crouse, Stacy Jenkins

COOPERATORS: Dr. Kathy Parker, University of Northern British Columbia, Prince George, BC, Canada; Dr. Perry Barboza University of Alaska Fairbanks, Fairbanks, AK; Kenai National Wildlife Refuge, U.S. Fish and Wildlife Service; Chugach National Forest, Cordova District; University of Wyoming Department of Animal Science

FEDERAL AID GRANT PROGRAM: Wildlife Restoration

GRANT AND SEGMENT NR: W-27-3, W27-3, W-33-1, W-33-2, W-33-3

PROJECT NR: 1.56

WORK LOCATION: Kenai Moose Research Center, Soldotna

STATE: Alaska

PERIOD: 1 July 2004–30 June 2005

I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

Wildlife managers depend on techniques and equipment to obtain the information base necessary to successfully manage moose (*Alces alces*) and caribou (*Rangifer tarandus*) populations. Techniques and methods continually evolve and are updated as technologies are improved and new ones are put into practice. The Moose Research Center (MRC) provides a venue to test new developments under controlled or semi-controlled conditions. The facility is the only place in the world where moose can be held in ambient weather conditions, forage on natural browse, and still be available for detailed, repeated observation and experimentation. This study provides a framework for operation of the facility and to conduct and report the results of tests.

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

“Evaluation and Testing of Techniques for Ungulate Management” has been continuously active since 1969 when the MRC became functional. During that time, over 70 peer-reviewed publications have resulted from research performed as part of this study. Over the course of project 1.56, techniques tested have included the use of new tranquilizing, immobilizing and/or reversing drugs, telemetry equipment and methods, animal handling and husbandry techniques, and evaluation of aerial surveys and other population assessment methods. However, during the

two most recent annual reporting periods, study 1.56 has been used primarily to support operation and maintenance of, and upgrades to the facility. Other expenses included utility costs, basic veterinary and animal husbandry supplies, repairs not readily attributable to a single research job, nonpermanent technician salaries, and immobilizing drugs, equipment, and food for captive moose and caribou herds. In addition, project 1.56 has been used to support research in collaboration with other agencies and biologists within ADF&G.

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

OBJECTIVE 1: MRC operations. Goal is to conduct research support activities and duties associated with maintaining and operating the MRC and caring for the captive animal population.

Maintenance and operations activities and facility upgrades at the MRC were conducted to enable research to continue and to repair deteriorated parts of the facility. Work concentrated on the laboratory and animal handling areas, metabolic stalls, and perimeter and interior fence. Renovations to the metabolic stalls were initiated and completed during this time period, culminating in the removal and replacement of 4 old, unusable stalls with new ones complete with in-floor heat to facilitate sample collection in winter weather conditions. Approximately 1500 feet of wire fence has been replaced and approximately 5000 more linear feet have been cleared of underbrush and are slated for replacement as time and funds permit. A 4000-square-foot steel roof has been installed on the barn.

The captive animal herds at the MRC consisted of 20–30 moose and 10–22 caribou during the time period covered by this report. In addition to routine animal husbandry and feeding operations necessary to maintain the health and safety of these animals, 10 orphaned moose (8 female, 2 male) calves were hand-raised at the facility during summer 2002 and 2003. These animals now form the core of the captive animal herd and will permit research operations for several years.

OBJECTIVE 2: Drug testing. Goals are to evaluate new immobilizing drugs and/or drug combinations used in the capture of moose and caribou.

This objective allows for the evaluation of immobilizing drugs used in the capture and handling of moose and caribou. Narcotic drugs currently in use are dangerous to research personnel and expensive. There is potential for safer, more cost-effective drugs or drug combinations; however, these must be evaluated in animals prior to use in a field setting. No drugs or drug combinations were tested during the period 2000–2005.

OBJECTIVE 3: Reproductive indices. Goals are to evaluate new techniques and equipment for monitoring reproductive status or reproductive events in moose and caribou.

Visual verification of reproductive events such as breeding and birth is not feasible in wild populations of moose and caribou. The ability to monitor these events via a remote system provides biologists with valuable information. However, these systems need to be validated by

direct observation prior to use in the field. The Heatwatch system was used to monitor estrus and breeding events in caribou during 2000–2002.

OBJECTIVE 4: Nutritional condition indices. Goals are to identify indices of body composition as well as energy and protein balance in moose and caribou.

Indices of body condition allow application of the indicator animal concept. That is, since the animal is a product of its environment, the body condition of that animal reflects the condition of its habitat, and serves an index of the position of the population relative to carrying capacity. Assessment of body condition and energy and protein balance also provides insight into the ability of individual animals in a population to survive and reproduce. Ultrasonography, palpation of tissue depth relative to underlying bony structures, and blood and urine levels of metabolites were tested relative to body composition measured by proximate analysis in both moose and caribou. Moose data has been analyzed, and manuscripts are in preparation and are referenced below. Caribou data continues to be collected and analyzed.

Circulating levels of the hormone leptin have been correlated with body fat levels in some mammals. During moose capture operations across the state, MRC personnel and collaborators collected blood samples for leptin assay from animals that were also assessed for subcutaneous rump fat measurement as a predictor of total body fat. Data analysis is ongoing in an attempt to link circulating leptin concentrations to total body fat levels.

OBJECTIVE 5: Miscellaneous projects

This objective was maintained as a nonspecific test bed for the evaluation of new and innovative techniques that were potentially useful for ungulate management. However, no work was performed under this objective during the 2000–2005 reporting period. This objective will be discontinued starting in FY2006.

OBJECTIVE 6: Moose digestion, reproduction, and physiology. This objective is maintained as a way to assess moose browse nutritional quality, browsing behavior, foraging ecology, and to further relate physiology and reproductive performance.

Glucocorticoid metabolite levels in feces have been documented to vary with body condition and disturbance to animals. Fecal glucocorticoid validation measures were made on one female and one male moose.

MRC personnel collaborated with Dr. Ansgar Aschfalk, Norwegian veterinary institute, to assess the response of moose to Salmonella infection. A publication is referenced below.

One hand-raised female moose was fistulated in summer 2003 to facilitate in vivo digestion studies. This animal is currently being shared with Bill Collins, in the ADF&G Palmer office.

MRC personnel collected 180 hours of observations of moose behavior and foraging activity on moose wearing radio collars designed to monitor activity in an attempt to validate the use of

these collars. Data is currently being analyzed and is intended for publication in a peer-reviewed journal.

MRC personnel collaborated with ADF&G Region I and U.S. Forest Service Yakutat Ranger District to design and carry out capture operations in fall 2002, spring and fall 2003, spring and fall 2004, and spring 2005 in Gustavus and Yakutat. Ultrasound was used to assess rump fat levels indicative of total body fat content and body condition measurements were made at time of capture. Blood and fecal samples were also collected for pregnancy testing and diet composition analysis, respectively. Annual progress reports detail numbers of moose captured and samples collected during each sampling season. The overall goals of this project are to relate diet composition to levels of body fat and body condition, and ultimately, to reproductive performance. Data is currently being analyzed and the study is ongoing.

We collaborated with investigators from ADF&G and the University of Wyoming Department of Animal Science to analyze 15 moose and 58 wolf samples to determine a fatty acid profile. We hypothesized that fatty acids of wolf adipose tissue would reflect that of their prey because wolves are non-ruminants and would not modify dietary fatty acids. Thus, adipose tissue of wolves preying on moose should contain fatty acids characteristic of moose. Indeed, wolf adipose tissue contained these fatty acids. This preliminary data set is being used to write a complete study proposal.

OBJECTIVE 7: Caribou digestion, reproduction, and physiology. This objective is maintained as a way to assess caribou browse nutritional quality, browsing behavior, foraging ecology, and to further relate physiology and reproductive performance.

During the winters of 2000–2001 and 2001–2002, measures of body condition, stable isotope signatures, and nitrogen metabolites were sequentially monitored in 6 female caribou. These caribou were maintained on diets of variable quality designed to duplicate nutritional conditions on winter ranges with varying lichen abundance. This work was recently published by Dr. Kathy Parker and is referenced below.

Stable isotope signatures in tissue have been shown to reflect nutritional condition, changes in seasonal metabolic function, or changes in diet that reflect changing browse quality or foraging ecology in some mammals. In order to develop a baseline set of data from caribou hooves, MRC personnel collaborated with investigators from the Kenai National Wildlife Refuge and the University of Wyoming to collect and analyze samples from hooves trimmed from caribou captured from the Killey River herd (n=20), Fox River herd (n=4), Kenai Lowland herd (n=14), and at the MRC (n=11). These samples are currently being analyzed at the University of Wyoming.

OBJECTIVE 8: Preparation of reports and publications

Work accomplished under this objective included 4 manuscripts listed below. During the most recent reporting period, we prepared study plans, proposals, and animal care and use protocols to support and secure approval for additional research. This research will be initiated under

“Evaluation and testing of techniques for ungulate management,” project 1.63, beginning 1 July 2005. This work includes the development of techniques to monitor parturition date and location in moose and caribou, to validate the efficacy of new immobilizing drugs, including a cocktail of ketamine and medetomidine, and to develop techniques to assess foraging effort and habitat quality, and to establish long-term ways to monitor the health and reproductive status of wild moose on the Kenai Peninsula.

IV. MANAGEMENT IMPLICATIONS

During the period covered by this report, research goals were suspended or truncated as a result of changes in staffing and budgetary constraints and the need to refurbish and replace much of the infrastructure at the MRC, and to rebuild the captive animal herd. The bulk of this work is completed and/or scheduled, and research began under project 1.60 during FY 2005. Additional projects are slated to begin this year.

V. SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN FOR LAST SEGMENT PERIOD ONLY

JOB 1: MRC maintenance and operations.

This objective was active during the most recent reporting period. The MRC currently houses 24 moose and 10 caribou, which were fed and cared for during this time. In addition to the daily animal husbandry requirements, we also completed the renovation of the metabolic stalls. Fence work completed during the reporting period utilized several ADF&G, U.S. Fish and Wildlife Service, and volunteer work crews to assist MRC staff, and resulted in approximately 5000 linear feet of fence cleared of brush and undergrowth that is now ready for replacement.

JOBS 2–7: These jobs were not active during the most recent reporting period.

JOB 8: Preparation of reports and publications.

Work accomplished during the most recent reporting period is detailed under Objective 8, above.

VI. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THE LAST SEGMENT PERIOD, IF NOT REPORTED PREVIOUSLY

None

VII. PUBLICATIONS

Parker, K. L. P. S. Barboza, T. R. Stephenson. 2005. Protein conservation in female caribou (*rangifer tarandus*): effects of decreasing diet quality during winter. *Journal of Mammalogy*. 86(3):610–622.

Stephenson, T. R. and J.A. Crouse. Dynamics of body fat in moose and its relationship to nutritional carrying capacity. In preparation.

The following papers were published and reported on in previous segment periods:

Aschfalk, A., K. J. Hundertmark, H. R. Bendiksen, J. M. Arnemo, and N. Densin. 2003. Serosurvey for antibodies against Salmonella species in free-ranging moose (*Alces alces*) from Norway. *Tierartzt. Wschr.* 116:417–420.

Hundertmark, K. J. and C. C. Schwartz. 2002. Evaluation of bioelectrical impedance analysis as an estimator of moose body composition. *Wildlife Society Bulletin.* 30:915–921.

VIII. RESEARCH EVALUATION AND RECOMMENDATIONS

IX. PROJECT COSTS FROM LAST SEGMENT PERIOD ONLY

Stewardship Investment items purchased: *list any equipment or other items purchased for which the cost of the individual item was \$5,000 or more (include cost)*

None

Total Costs

FEDERAL AID SHARE \$87,000 STATE SHARE \$29,000 = TOTAL \$116,000

X. APPENDIX

XI. PREPARED BY:

Tom Lohuis
Wildlife Biologist III

APPROVED BY:

Tom Paul
Federal Aid Coordinator
Division of Wildlife Conservation

SUBMITTED BY:

Earl Becker
Research Coordinator

Matt Robus, Director
Division of Wildlife Conservation

APPROVAL DATE: _____