FEDERAL AID ANNUAL RESEARCH PERFORMANCE REPORT

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

Alaska Department of Fish and Game
Wildlife Restoration Grant

Grant Number: W-33-3 **Segment Number:** 1

Project Number: 1.68

Project Title: Factors affecting moose forage quality and subsequent reproductive success.

Project Duration: 1 July 2009 to 30 June 2014

Report Due Date: 1 September 2011.

Partner:

PRINCIPAL INVESTIGATOR: William B. Collins

COOPERATORS:

WORK LOCATION: Matanuska Research Farm, Togiak Valley, Colville River, Nelchina Basin, Game Management Unit 15

I. PROGRESS ON PROJECT OBJECTIVES DURING LAST SEGMENT

OBJECTIVE 1: Nitrogen as a potentially limiting nutrient to moose. We have made steady progress in measuring digestible protein across a variety of moose ranges in Alaska. We have developed refined assays for evaluating the protein quality of browses for moose, and we have quantified the effects of tannins on protein digestion by moose.

OBJECTIVE 2: Effects of climate and utilization on browse quality. We have established a set of controlled experiments which will enable us to begin assessing the effects of soil temperature, soil fertility, soil moisture, and solar radiation on the productivity and quality of two important willow forages—an upland species, *Salix pulchra*, and a riparian species, *Salix alaxensis*.

OBJECTIVE 3: Hormonal link between diet quality and reproductive performance. We have established baseline concentrations of leptin, ghrelin, and corticosterone in moose throughout the annual cycle of this seasonally synchronous breeder. We have completed 3 feeding trials enabling us to begin examining the effects of nutrition on production of ghrelin, leptin, and corticosterone, which in turn, affect the production of progesterone and reproductive performance.

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

JOB/ACTIVITY 1: Moose forage nitrogen and protein binding

We completed most chemical analyses of forages for the Nushagak-Togiak-Goodnews gradient, but we were unable to complete our second sampling of forages in the Colville drainage due to lack of access in summer 2011.

JOB/ACTIVITY 2: Diets by fecal alkane analysis

Diet analysis has not been started but not completed at this time.

JOB/ACTIVITY 3: Climate/utilization effects—potted willows

Treatments have been maintained during the 2011 growing season, and problems restricting root growth to soil in pots has been corrected.

JOB/ACTIVITY 4: Hormonal link

We completed high energy-low protein, and low energy-high protein trials, completed hormonal assays, and have begun data analysis.

JOB/ACTIVITY 5: Forage availability by remote sensing

Low level aerial photography of moose habitat near Cooper Landing was completed and measurements of forage availability at corresponding points on ground have been completed. Two manuscripts based on remote sensing of Nelchina and Placer Valley habitats have been completed and submitted.

JOB/ACTIVITY 5: Tractable calves for nutrition/habitat research

Rearing of tractable calves as replacement stock for research was completed.

V. PUBLICATIONS

Carnahan, A., D. Spalinger, and W. Collins. In review. Determining the diets of moose (Alces alces) in Alaska from fecal recovery of plant cuticular alkanes.

Carnahan, A., D. Spalinger, and W. Collins. In review. Alkane and long-chain alcohol recovery in moose: implications for diet composition analysis in browsing herbivores.

Clauss, M., I. Lechner, P. Barboza, W. Collins, T. Tervoort, K. Sudekum, D. Codron, and J. Hummel. 2010. The effect of size and density on the mean retention time of particles in the reticulorumen of cattle (*Bos primigenius* f. *taurus*), muskoxen (*Ovibos moschatus*) and moose (*Alces alces*). British J. of Nutrition 105:634-644.

Lechner, I., P. Barboza, W. Collins, J. Fritz, D. Gunther, B. Hattendorf, J. Hummel, K. Sudekum, M. Clauss. 2010. Differential passage of fluids and different-sized particles in fistulated oxen (*Bos primigenius* f. *taurus*), muskoxen (*Ovibos moschatus*), reindeer (*Rangifer tarandus*) and moose (*Alces alces*): rumen particle size discrimination is independent from contents stratification. Comparative Biochemistry and physiology, Part A 155:211-222.

Lechner, I., P. Barboza, W. Collins, D. Gunther, B. Hattendorf, J. Hummel, M. Clauss. 2009. No bypass in adult ruminants: passage of fluid ingested vs. fluid inserted into the rumen in fistulated muskoxen (*Ovibos moschatus*), reindeer (*Rangifer tarandus*) and moose (*Alces alces*). Comparative Biochemistry and Physiology, Part A 154:151-156.

Seefeldt, S., W. Collins, J. Kuhl, and M. Clauss. 2010. White sweetclover (*Melilotus albus*) and narrowleaf hawksbeard (*Crepis tectorum*) seed germination after passing through moose. Invasive Plant Science and Management 3:26-31.

Spalinger, D., W. Collins, T. Hanley, N. Cassara, and A. Carnahan. 2010. The impact of tannins on protein, dry matter, and energy digestion in moose (Alces alces). Can. J. Zool. 88:977-987.

Walton, K., D. Spalinger, N. Harris, and W. Collins. In review. High spatial resolution vegetation mapping for assessment of wildlife habitat using multispectral aerial photography.

Walton, K., D. Spalinger, N. Harris, and W. Collins. In review. Landscape scale quantification of wildlife habitat using landsat imagery and hierarchical classification techniques.

VI. RECOMMENDATIONS FOR THIS PROJECT

Continue as planned

Prepared by: William B. Collins

Date: 30 August 2011