

**Alaska Department of Fish and Game  
Wildlife Restoration Grant**

**Grant Number:** W-33

**Segment Number:** 11

**Project Number:** 3.52

**Project Title:** Climatic and nutritional regulators of caribou productivity in western Alaska

**Project Duration:** 1 July 2011 to 30 June 2015

**Report Due Date:** 1 Sep 2013

**Partner:**

**PRINCIPAL INVESTIGATOR:** William B. Collins

**COOPERATORS:** Don Spalinger, University of Alaska Anchorage; Nathan Wolf, University of Alaska Anchorage; Andy Aderman, Togiak National Wildlife Refuge; Norm Harris, University of Alaska Fairbanks, Agriculture and Forestry Experiment Station.

**WORK LOCATION:** Western Alaska, Game Management Units 9, 10, 17, and 19.

---

**I. PROGRESS ON PROJECT OBJECTIVES DURING LAST SEGMENT**

**OBJECTIVE 1 :** Nutritional factors affecting caribou productivity. We made significant progress determining forage availability by season and relative to caribou distribution. We analyzed forage quality relative to distribution of caribou on Unimak Island, focusing on nitrogen and energy availability.

**OBJECTIVE 2 :** Climatic factors affecting caribou productivity. In our initial effort to identify key mechanisms by which the quality of caribou forage is controlled and to aid in our understanding of the movement and resource selection, we established six study sites within the ranges of the Nushagak and Mulchatna Caribou Herds where we imposed treatments of various snow covers using snow fences. At each snow fence site, and at additional paired sites without snow fences, we installed i-button data loggers to monitor soil temperatures and ion exchange strips to monitor nitrogen mineralization within the soil. In addition, at each of the six sites, we completed a vegetation survey and measured soil water content. In early April 2013 we measured the extent and depth of snow cover and the CO<sub>2</sub> flux through the snow pack. We continued sampling dominant caribou forages for nutritional analysis.

OBJECTIVE 4 : We began analyzing the effects of soil fertility, soil moisture, solar radiation, temperature, timing of greenup, and length of growing season as regulators of nitrogen and energy availability to caribou.

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

### JOB/ACTIVITY \_1\_:

We have developed forage maps for Unimak Island.

### JOB/ACTIVITY \_2\_:

We collected additional winter caribou fecal samples, as well as reference plants, from Unimak, Muchatna, and Nushagak ranges. We completed our determination of caribou diets in spring, summer and fall for the Unimak Island caribou. The winter diet analysis is in progress. Given the relative absence of forage lichens on Unimak Island and in the diets of caribou there, as well as in the southern Alaska Peninsula, we have extended our collection of feces and reference plants to include a range of sites across the Alaska Peninsula and the Aleutian Islands--Unimak, Akutan, Adak, Kagalaska, and Umak—to examine the significance of lichens in the diets and overall nutrition of caribou. We will examine Adak, Kagalaska and Umak only as logistical opportunities present themselves.

### JOB/ACTIVITY \_3\_:

We are evaluating various available methods and data bases for determining historic and current greenup across the study area.

### JOB/ACTIVITY \_4\_:

On the Nushagak and Mulchatna caribou ranges we are continuing to monitor effects of snow cover on soil temperature, mineralization of nitrogen, and forage quality. We recorded soil temperature by installing i-buttons, and obtained measures of soil nitrogen and phosphorus using resin strips installed within and outside of areas over which snow drifts formed behind snow fencing. The snow fences ensured a range of snow covers and soil temperatures for evaluation of the effects of depth, duration, and degree of freezing on mineralization of nutrients, and subsequent effects on forage quality.

We completed nitrogen analysis of 128 *Salix pulchra* (representing upland species) and 128 *Salix alaxensis* (representing riparian species) plants that we cloned, isolated in pots, and subjected to 4 treatments: 2 levels of fertility, 2 soil temperatures, 2 levels of soil moisture, and 2 levels of direct solar radiation. The most significant factors affecting forage nitrogen were soil fertility, followed by solar radiation, followed by soil moisture..

JOB/ACTIVITY \_5\_:

We have not yet begun mapping and interpretation of ice crust effects on forage availability.

**IV. SIGNIFICANT DEVIATIONS AND/OR ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THIS SEGMENT PERIOD**

**V. PUBLICATIONS**

**VI. RECOMMENDATIONS FOR THIS PROJECT**

Extend our collection of feces and reference plants to include a range of sites across the Alaska Peninsula and the Aleutian Islands--Unimak, Akutan, Adak, Kagalaska, and Umak—to examine the significance of lichens in the diets and overall nutrition of caribou.

**Prepared by:** William B. Collins

**Date:** 8/28/12