

**Wildlife Restoration OPERATING GRANT  
FINAL 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:** AKW-23 FY18

**PROJECT NUMBER:** 36.0

**PROJECT TITLE:** Evaluation of intensive management programs in Alaska during harvest regulatory years 2003-2016

**PERIOD OF PERFORMANCE:** July 1, 2017–June 30, 2018

**REPORT DUE DATE:** September 1, 2018

**PRINCIPAL INVESTIGATOR:** Thomas F. Paragi, Wildlife Biologist IV

**COOPERATORS:** Adam J. Craig, Biometrician III; Rob A. DeLong, Analyst Programmer V; John W. Merickel, Biometrician II; Jen K. Roach, GIS Analyst III

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**I. PROGRESS ON PROJECT OBJECTIVES DURING PERIOD OF PERFORMANCE**

**OBJECTIVE (1):** Describe time series of biological, environmental (e.g., weather, fire, habitat), and harvest parameters of prey and predators for each Intensive Management (IM) program using available data from when the first abundance estimates were reported in consistent presentation formats that incorporate estimates of variance when statistically-based sampling occurred.

**ACCOMPLISHMENTS:** Paragi and Merickel screened data sets of the GeoSpatial Population Estimator (GSPE) for replication of original abundance and composition estimates in IM areas and adjacent areas that might serve as non-treatment comparisons. Paragi assembled historic composition and abundance data (Gasaway et al. 1986) for moose from Survey and Inventory reports and had area biologists fill in details (e.g., sample size by age-sex class) to allow variance estimates and extend time series prior to active IM.

Based on research showing positive numeric response of moose to recent fires 11-30 years old where predation is not limiting abundance (Maier et al. 2005), Paragi created fire history perimeters for successive 30-year periods (1950-79, 1951-80, etc.; Alaska Fire Service) for characterizing potential habitat enhancement trends in some study areas. He had a technician download online monthly snow depth for 89 Alaska sites from the Western Climate Research

Center (University of Nevada, Reno) for characterizing winter severity on ungulates in IM and non-IM areas.

OBJECTIVE (2): Where results from Objective 1 are sufficient, estimate trend in parameters (e.g., abundance, recruitment indexed from calves per cow) for those years available before and after implementation of IM for each IM program to discern whether trends changed in the intended or forecasted direction following implementation.

ACCOMPLISHMENTS: Paragi and Merickel, discussed assumptions and potential analysis methods with Craig and other research staff. We considered simultaneously treating wolf control, bear control, and area burned as Analysis of Variance factors for trends in moose abundance and harvest in a statewide IM analysis. However, unlike for wolves (National Research Council 1997, Adams et al. 2008), we don't have literature estimates for the proportional reduction in pre-control bear abundance required for a moose population increase ("effectiveness"). Also, the post-fire response in vegetation cover and forage is highly variable because of burn scale and patchiness, fire behavior and severity, time since burn, etc., thus confounding correlation of burn effects with changes in moose abundance.

We will proceed with a case study approach (Ballard and Van Ballenberghe 1997, National Research Council 1997) to evaluate trends in ungulate abundance, calf:cow ratio, ungulate harvest, and predator removal for each IM program. We will use one-tailed hypothesis tests for our expectation of trends in each of the four parameters above based on whether lethal wolf control was implemented during three periods: from first ungulate abundance estimate with precision to IM law passage in 1994 (no wolf control; expectation: stable or decrease); from 1995 to beginning of lethal control (no wolf control; expectation: stable or decrease); and from the first implementation of lethal wolf control to RY2016 (expectation: increase). Length of the periods varies by IM program depending on year of the first abundance estimate with precision and the first year when lethal wolf control occurred. For periods with  $\geq 5$  years of data we will incorporate inter-annual and intra-survey variation in abundance for estimating trend using normal linear mixed models, whereas for periods with  $< 5$  years of data we will estimate means and differences in means. Time series plots will include all 3 periods and incorporate other study area factors for environmental context.

OBJECTIVE (3): Describe reported harvest of caribou and moose and reported take of black bears, brown bears, and wolves statewide by game management unit (GMU) as a context for interpreting caribou and moose harvest and trends statewide and the relative contribution from IM programs.

ACCOMPLISHMENTS: Roach and Paragi, assisted by a technician, continued developing and proofing a geodatabase in ArcGIS to document temporal and spatial changes in IM areas

authorized for predator control and in areas of liberalized harvest of predators that were often spatially associated with IM areas. Together these regulatory boundaries define areas of predator removal opportunity by the public and where predators may be removed by agency employees or contractors. Coding validation for method of bear take was completed for the analysis period by regional statistics technicians, but the data extraction from WinfoNet is awaiting completion of the geodatabase.

OBJECTIVE (4) Estimate caribou and moose hunting effort and kill per unit effort from GMUs along the road and ferry system to discern spatial shifts before and during IM programs and the effects of regulatory changes on harvest.

ACCOMPLISHMENTS: No work completed during this period as we are awaiting completion of the geodatabase for spatial boundaries.

## **II. SUMMARY OF WORK COMPLETED ON PROJECT TO DATE.**

Most of the work to date has been assembling, proofing/correcting, and organizing/formatting data for efficient analysis and archive. This process has taken longer than expected because most data are not in a centralized database or of a standard format and must be assembled by IM program or associated non-treatment area.

Paragi participated in discussions with headquarters and supervisory staff on cost coding of operations and salary for moose (by GMU subunit) and caribou (by herd) beginning in FY2019 to better distinguish IM project activities from other S&I activities.

## **III. SIGNIFICANT DEVELOPMENT REPORTS AND/OR AMENDMENTS.**

None.

## **IV. PUBLICATIONS**

None.

## **V. RECOMMENDATIONS FOR THIS PROJECT**

The project will continue 1 more year, primarily with analysis and writing in FY 2019.

**Prepared by:** Thomas F. Paragi

**Date:** 16 August 2018