

**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-C-2-2019

PROJECT NUMBER : 26.0

PROJECT TITLE: Biometric support for research and management programs

PERIOD OF PERFORMANCE: July 1, 2018 – June 30, 2019

REPORT DUE DATE: Sept. 1, 2019

PRINCIPAL INVESTIGATOR: Chris Krenz

COOPERATORS:

Jason Waite (Region I); Earl Becker (Region II); John Merickel, Alyssa Crawford, and Carly Hammond (Region III); Meg Inokuma (Region IV); Adam Craig (Region V); and Grey Pendleton (Statewide – waterfowl) are the biometric staff for this project.

I. PROGRESS ON PROJECT OBJECTIVES DURING PERIOD OF PERFORMANCE

OBJECTIVE 1: Provide biometric consulting, assistance, analysis, and evaluation to research and management staff. This includes biometricians reviewing and evaluating biometric aspects of proposed studies and Research Operational Plans.

ACCOMPLISHMENTS:

Region I – Jason Waite

1. Deer density assessed from fecal DNA samples: Assessed new modeling techniques (Area-Search) to greatly reduce time and effort required for pre-analysis data preparation and GIS processing, improve the speed and efficiency of data modeling, improve the precision of parameter estimates, and increase the potential for obtaining useful population estimates when data (recaptures) is sparse.
2. Mountain goat sightability model: Investigated spatially explicit extensions to the existing model in order to reduce the edge-effect (bias) associated with population estimates of small, spatially-adjacent geographic regions.
3. Mountain goat population estimates: Continued to apply the existing model to newly collected data.

4. Prince of Wales wolf project: Continued to provide biometric support, including density and population size estimates for the 2017 population estimate. Additional *post-hoc* simulations were also performed to further assess the potential effects of reduced sampling effort for future data collection efforts.
5. Provided biometric support for vegetation surveys. Consulted with biologist Karin McCoy on collecting data on deer browse utilization congruent with existing deer pellet transect surveys.
6. Provided biometric support for aerial deer surveys. Consulted with contractor Pat Valkenberg on his preliminary analysis of aerial alpine deer surveys.
7. Provided biometric support for brown bear movement models. Consulted with biologist Anthony Crupi and Dave Gregovich on analytical methods for elevational movements of brown bears.
8. Provided biometric support for upcoming brown bear projects. Consulted with biologist Anthony Crupi on a preliminary project to analyze morphometrics and growth of brown bears in Yakutat and Haines to provide improved estimates of age, population estimates or occupancy modeling of unmarked bears in the Haines area using camera trap data, and a Bayesian known-fates analysis.
9. Provided biometric support for Cleveland Peninsula mountain goat projects. Consulted with biologists Ross Dorendorf and Dan Eacker on potential projects to assess the distribution, population size, and viability of mountain goat populations on the Lower Cleveland Peninsula.
10. Deer Pellet Surveys. Assisted with traditional deer pellet transect surveys in Petersburg to assess efforts to concurrently collect deer browse availability and utilization data.

Region II – Earl Becker

1. A Kaplan-Meier survival model was used to estimate moose calf survival from 12 May 2017 to 20 April 2018 for GMU 15C. This analysis also compared the estimated calf survival to estimates from the 5 previous years. The analysis was done in r and the report written with rmd code. A Kaplan-Meier survival model was used to estimate adult cow moose survival from 15 May 2017 to 15 May 2018 for GMU 15C. This analysis also compared the estimated cow survival to estimates from the 5 previous years. The analysis was done in r and the report written with rmd code. A Kaplan-Meier survival model was used to estimate moose calf survival from 12 May 2017 to 30 April 2018 for GMU 15A. This analysis also compared the estimated calf survival to estimates from the 5 previous years. The analysis was done in r and the report written with rmd code. A Kaplan-Meier survival model was used to estimate adult cow moose survival from 15 May 2017 to 15 May 2018 for GMU 15A. This analysis also compared the estimated cow survival to estimates from the 5 previous years. The analysis was done in r and the report written with rmd code.
2. I analyzed GMU 6D black bear harvest for trends using robust statistics. Specific models dealt trends in age of harvested bears by regulatory year for all black bears, females, males. The percentage of females in the harvest was also modeled. The analysis of black bear harvest, especially the percentage of females in the

harvest, indicates that recent regulatory changes to reduce female harvest have been successful.

3. Develop an unbiased distance sampling model to estimate bear population size. The development of the model was restricted to writing r-code to perform the analysis for this reporting period. Major sections of my r-code were added to mimic the dht function of the mrds r-package (an r-package that is used for most advanced mark-recapture distance sampling analyses). The dht function has a specific data structure which required major revisions in my r-code to accommodate.
4. Biometricians for the National Park Service wrote a paper advocating for very simple distance sampling models (no mark-recapture data, no covariates to model detection) to estimate bear population size. I coauthored a paper (Becker and Christ 2019) that pointed out the flaws and large bias of this approach and advocated for our current advanced mark-recapture, distance sampling model (Becker and Christ 2017).
5. Using the completed non-stratified sampling r-code, the bear survey datasets for GMU 9D, 10, 9C, and 13E were re-analyzed and the results published in a Becker and Christ 2019 paper.

Region III – John Merickel, Alyssa Crawford, and Carly Hammond

1. Moose survey and inventory: Provided survey design, determined optimal sampling allocation, collected aerial survey data, analyzed data for population abundance estimates, and applied appropriate sightability corrections to abundance estimates for GMU subunits 12, 20E, and 21D with area biologists Jeff Wells, Jeff Gross, and Glenn Stout.
2. Statewide assessment of intensive management programs: Provided biometric support by creating data summaries and plots of moose data and preliminary analyses to assess effects of intensive management statewide with Tom Paragi, Rob DeLong, and Jen Roach.
3. Provided Biometric consultation for harvest data analysis: Consulted with research biologist Danny Caudill on implementation of statistical models for harvest data modeling.
4. Consulted on Fortymile wolf research project development: Consulted with research biologist Danny Caudill and Tok area biologist Jeff Gross on the implementation of a wolf research project to assess the effects of wolf control on the Fortymile wolf population.
5. Close-Kin Mark Recapture: Organized and begin to prepare samples to be sent to lab for DNA extraction and gene sequencing with research biologist Graham Frye (co-PI), and Galena area biologists Sara Longson and Glenn Stout.
6. Provided biometric consultation on trends of the Fortymile caribou herd: Consulted with research biologist Torsten Bentzen and Tok area biologist Jeff Gross on trends in survival, and demographic rates of the Fortymile caribou herd.
7. Hired new biometrician: Carly Hammond was hired as our new biometrician I in region III.

8. Provided biometric support for marten harvest research project: Assisted research biologist Kerry Nicholson in predictive modeling of marten harvest using trapper donated carcasses to predict catch rates in the following season.
9. Biometric consultation for automated caribou photo counting.

Region IV – Meg Inokuma

1. Provided biometric support on moose abundance and sex composition estimates: Assisted ADF&G area biologist Neil Barten (Region IV – Dillingham) in forecasting an effect in the abundance and sex with different numbers of harvest by creating an interactive spreadsheet model.
2. Provided biometric support on caribou abundance estimates: Assisted ADF&G area biologist Neil Barten (Region IV – Palmer), Togiak Refuge Biologist Andy Anderman, and ADF&G area biologist Heidi Hatcher in estimating abundance of Mulchatna Caribou Herd, Nushagak Peninsula Caribou Herd, and Nelchina Caribou Herd. Also ran simulation study to explain a few biologists how Rinvest method works.
3. Provided biometric support for moose calf survival study: Developed a hidden Markov model for Unit 17 moose calf survival study, working with an ADF&G research biologist Kassidy Colson (Region IV – Palmer).
4. Provided biometric support on browse analysis: Assisted ADF&G area biologist Frank Robbins and Heidi Hatcher (Region IV – Glennallen) in reviewing and analyzing browse data.
5. Provided biometric support on caribou abundance estimates: Assisted ADF&G research biologist Torsten Bentzenn (Region III – Fairbanks) in estimating abundance of Fortymile Caribou Herd.
6. Provided technical support in SCF archiving project: Assisted ADF&G research biologist Kalin Seaton (Region IV – Palmer at the time). developing a statewide SCF archiving project.
7. Provided biometric support in preparation for habitat enhancement effort: Assisted ADF&G biologist Mary Jo Hill (Statewide – Soldotna) in planning Alphabet Hills burn area study.
8. Provided biometric support for moose-vehicle research project: Assisted Utah State graduate student Luke McDonald who collaboratively works with ADF&G in analyzing moose-vehicle collisions in the Matanuska-Susitna Valley.
9. Reviewed Species Management Report and Plan: Reviewed and provided comments for operational reports and plans of moose, caribou, wolf, sheep, and furbearer in Region IV.

Region V – Adam Craig

1. Moose survey and inventory: Provided survey design, determined optimal sampling allocation, assisted with data analysis to estimate abundance and age/sex composition in Game Management Units 22B, 22C, 23, and 18.
2. Caribou survey and inventory: Provided survey design for composition estimates on Western Arctic and Teshekpuk caribou herds. Performed survival analyses on calf mortality data. Assisted with photocensus to estimate abundance of Western Arctic caribou herd. Provide timely estimates of harvest.

3. Muskox survey and inventory: Provided survey design for composition estimates of muskox populations in Game Management Units 22, 23, and 18.
4. Muskox research: Provided biometric consultation for design of longitudinal survival study on neonate muskox.
5. Provided biometric consultation for intensive management research: Assisted with design of moose research projects to assess potential limiting factors to abundance in Game Management Units 22 and 23.
6. Provided biometric consultation for browse removal surveys: Provided design for implementing browse removal surveys in Game Management Unit 18.

Statewide (waterfowl) – Grey Pendleton

1. Provided biometric support to emperor goose project: Reviewed and provided statistical comments and suggestions on the Research Operation Plan for this project. Assisted with implementation of the project via field work and extensive discussions regarding future options for the study as it continues.
2. Biometric support for estimating abundance of mallards in urban Anchorage, Alaska. Estimated monthly survival probabilities (winter months only) for winters 2014-15 through 2017-18. Also estimated movement probabilities among groups of ponds/streams within the Anchorage bowl.
3. Provided biometric support to dusky Canada geese project: Completed the 2018 estimates of the number of nests on Middleton Island, Alaska. Model development is continuing for including the number of nests missed during surveys in the total nest estimates.
4. Estimated the abundance of sea ducks in Kachemak Bay, Alaska: Participated in a second year of field sampling to further refine thoughts regarding sampling and the use hierarchical Bayesian methods to produce abundance.

OBJECTIVE 2: Biometric staff attend conferences and trainings as well as present findings.

ACCOMPLISHMENTS:

Region I – Jason Waite

1. Attended TWS meeting in Juneau, February 26-28, 2019.
2. Assisted with Capture-Mark-Recapture workshop at TWS with Dr. Mark Lindberg, February 26, 2019.
3. Attended a workshop on Bayesian SECR modeling in Juneau, August 13-17, 2018.

Region II – Earl Becker

1. Attended a Bayesian statistics course in Juneau.

Region III – John Merickel and Alyssa Crawford

1. Attended Remington model 870 shotgun training refresher course.

Region IV – Meg Inokuma

1. Attended spatial capture-recapture course in Juneau

2. Hosted a GSPE workshop for the region IV at the annual regional meeting
3. Attended the Wildlife Society Alaska Chapter meeting

Region V – Adam Craig

1. Attended annual meeting of the Western Arctic Caribou Herd Working Group.

Statewide (waterfowl) – Grey Pendleton.

4. Presented a poster, *Winter Survival and Movements of Mallards in Anchorage 2014-2018*, at the Alaska Chapter of the Wildlife Society annual meeting in Juneau in February. The poster was coauthored by Michael Petrula, Kyle Smith, and Tasha DiMarzio.

II. SUMMARY OF WORK COMPLETED ON PROJECT TO DATE.

Biometric consultation and analyses were provided for various research and management projects in regions I, II, III, IV, and V as well as the statewide waterfowl program. Consultation included survey and data collection recommendations, field data collection, and analysis of collected data. New biometric tools were worked on, built, and refined. Conferences and trainings were attended and various projects' findings were presented.

Actual expenditures for the project were lower than the grant request for this project. This was due to: 1) a position vacancy through part of the year, and 2) reduced travel as a result of travel restrictions. These cost savings are not anticipated to continue as the vacancy has been filled and restrictions on travel are being eased.

III. SIGNIFICANT DEVELOPMENT REPORTS AND/OR AMENDMENTS.

None.

IV. PUBLICATIONS

Becker E. and A. Christ. 2019. Rejection of Schmidt' et al's estimators of bear population size. *Ecol. Evol.* 9(10):6157-6164. <https://doi.org/10.1002/ece3.5134>

Roffler, G. H., J. N. Waite, K. L. Pilgrim, K. E. Zarn, and M. K. Schwartz. 2019 Estimating abundance of a cryptic social carnivore using spatially explicit capture-recapture. *Wildlife Society Bulletin* 43(1):31-41. DOI: 10.1002/wsb.953

V. RECOMMENDATIONS FOR THIS PROJECT

Provide biometric support through continuation of this project. This statewide project ends in FY20 and the biometricians rolled their duties into their respective FY20 regional coordination projects.

Prepared by: Jason Waite, Earl Becker, John Merickel, Meg Inokuma, Adam Craig, Grey Pendleton, and Chris Krenz.

Date: August 31, 2019