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-20.4.42 Wildlife Restoration FY2017

PROJECT TITLE: Southeast brown bear data analysis and report preparation

PROJECT DURATION: 1 July 2009–30 June 2018

REPORT DUE DATE: 1 September 2017

PRINCIPAL INVESTIGATOR: Anthony Crupi

COOPERATORS: Dr. Kim Titus

WORK LOCATION: Southeast Alaska

I. PROGRESS ON PROJECT OBJECTIVES DURING LAST SEGMENT

OBJECTIVE 1: Analyze and prepare for publication historic data on brown bear population and habitat ecology in Southeast Alaska.

During this reporting period we continued to make progress towards our objective, by compiling, synthesizing, and analyzing brown bear data from Southeast Alaska. Between 1981 and 2010, we conducted brown bear research at various study areas in Southeast Alaska. These studies generated a wealth of new information on brown bear population ecology and habitat use and these data were successfully integrated into resource management and policy decisions. As the field of wildlife ecology has developed, so have the tools available for analyses. Through this project and specifically this objective, we aim to further our understanding of coastal brown bear populations by applying current analytical methodologies to historic data and have begun drafting publications from this body of research.

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

Job/Activity 1-a: Gather and synthesize all historic data

Accomplishments

Several VHF and GPS location datasets were collected on Admiralty and Chichagof islands since 1981. We have digitized historic VHF telemetry data and integrated the remaining brown bear GPS location datasets. We generated a master geospatial database for use in ArcGIS with 7,570 aerial telemetry locations and 104,287 GPS collar locations for use in the analysis of Admiralty and Chichagof islands bear populations. During this period, we integrated additional

GPS data into the master geospatial database from Southeast mainland habitat study areas. This included 200,455 locations from Berners Bay, 124,763 fixes from the central mainland coast Bradfield Canal/Unuk River study area, and an additional 51,094 positions from Haines in northern Southeast. A portion of this data integration process has been to screen and filter inaccurate locations and exclude those impossible of being accurate locations. While the data are safely secured and backed up, we took additional measures to ensure data integrity by enlisting the assistance of a data programmer to develop a SQL Server database for archival and analyses purposes.

To understand the population dynamics of brown bear populations it is imperative to assess harvest patterns and the role these activities play on demography. Harvest records are routinely used by Division of Wildlife Conservation wildlife managers for a variety of reasons, including local and regional harvest patterns related to the regulatory process of the Alaska Board of Game. However, there has been no systematic nor consistent approach for evaluating the utility of the data for determining broader temporal and spatial patterns. Harvest analyses include estimates of harvest rate and sustainability, and determining how these patterns can assist policy decisions with information that informs the public and subsequent bear management decisions. To meet this end, we compiled 50,054 harvest records from 1980–2014 to analyze statewide patterns of brown bear harvest to compare to case studies in Southeast game management units.

Job/Activity 1-b: Apply constant analytical procedures to the data

Accomplishments:

For the past 4 years our program has been developing analytical tools to assist in our analyses of animal movement patterns, home range size, and habitat selection. These methods take a considerable amount of time to develop and refine, and we implemented several of these analytical procedures on this dataset. Our analysis of brown bear habitat ecology is dependent upon numerous habitat factors that serve as covariates in the habitat selection models. Last year we acquired a new IfSAR Digital Elevation Model for the study areas. We continued to explore the products available in this model and attributed the brown bear location data with these fine spatial resolution data. These data allowed us to evaluate a suite of new covariates including, slope, elevation, aspect, solar radiation, topographic position, snow loading, terrain ruggedness, and vegetation height in our analyses. We also investigated the utility of several landcover classifications and forest condition models and attributed these habitat covariates to the brown bear locations.

We are analyzing sex specific annual and seasonal home range use patterns using fixed kernel density estimation using least-squares cross validation and smooth cross validation bandwidth estimators which are biologically appropriate for the species. We will examine the effects of sex, age, and reproductive status on home range size using repeated-measures mixed effects models, treating each animal as

a random effect to account for individual variation in home range size. To measure seasonal habitat selection of brown bears, we will construct resource selection function (RSF) models to statistically compare the environmental terrain factors and landscape variables at locations used by study animals to random available locations using logistic regression. Models will be validated using k–fold cross validation. The relative probability of selection will be mapped and contrasted between sexes to evaluate biological hypotheses.

The sealing records used in the analysis of harvest pattern were examined for systematic errors and checked to verify the accuracy of records included in the database. We worked with area and regional staff to validate records associated with Intensive Management programs, such as brown bears taken over bait. Those records are now likely clean and correct. Several preliminary analyses indicate substantial variation in harvest patterns throughout the state, with a general trend towards increasing harvest.

Job/Activity 1-c.: Prepare manuscripts suitable for publication

Accomplishments:

We continued to prepare manuscripts during the report period and anticipate completion of several reports during the upcoming segment. We will continue our contract with Dr. Titus to achieve these objectives, as he was instrumental in the collection of many of these data.

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

We have not deviated from the objectives and activities outlined in this project. This project continues to be an important component of brown bear management in the region and is a high priority to the department.

IV. PUBLICATIONS

Pendleton, G., K. Titus, A. Crupi, J. Whitman, and L. Beier. *In Prep*. Brown bear population density on Northeast Chichagof Island, Alaska: potential methodological biases. Alaska Department of Fish and Game, Juneau, AK.

Crupi, A., K. Titus, R. Flynn and L. Beier. *In Prep*. Brown bear seasonal habitat selection of high density insular populations on Admiralty and Chichagof Islands. Alaska Department of Fish and Game, Juneau, AK.

Titus, K., G. Pendleton, and others. *In Pre*p. Patterns of harvest and management of Alaska's brown bears, 1980–2014.

V. RECOMMENDATIONS FOR THIS PROJECT

There was a considerable amount of data, spanning several decades from numerous principle investigators that needed to be synthesized for this project. This has been a monumental task to gather the historic data, interpret the data fields, and properly provide metadata so the datasets could be archived and used effectively in the future. The primary recommendation for this project is to continue data analysis and finalize publications. We will continue our contracting with retired employee, Dr. Kim Titus, to provide a historical perspective on the modern data analysis.

Prepared by: Anthony P. Crupi, Wildlife Biologist III

Date: September 1, 2017