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

PROJECT NUMBER: P4.43

PROJECT TITLE: Spatial relationships, harvest vulnerability, harvest rates, and population density of brown bears on the northern mainland coast of Southeast Alaska

PERIOD OF PERFORMANCE: July 1, 2017 to June 30, 2018

REPORT DUE DATE: September 1, 2018

PRINCIPAL INVESTIGATOR: Anthony Crupi

COOPERATORS: National Park Service

I. PROGRESS ON PROJECT OBJECTIVES DURING PERIOD OF PERFORMANCE

OBJECTIVE 1: Describe seasonal spatial relationships of brown bears in a portion of GMU 5 including seasonal home ranges and habitat selection

ACCOMPLISHMENTS: We estimated the home range size for 69 brown bears with an adequate number of annual locations collected during the study period. Male brown bear home range size was 3 times larger than females with a mean size of 391.1 ± 312.2 km^2, and female home range size averaged 120.7 ± 109.4 km^2. We mapped the home ranges of each age-sex cohort to depict the array of home range sizes and spatial locations occupied by GPS collared bears. Adult males had the largest home range size and female bears with dependent offspring maintained the smallest home ranges. We also analyzed seasonal distribution of each cohort and found that adult male home ranges peaked in the spring during breeding season. Adult female bears occupied their largest seasonal home range during the late summer associated with travel between salmon spawning locations. In late summer we found 29% of all brown bear locations within 50m of salmon spawning reaches and 71% within 500m.

OBJECTIVE 2: Estimate harvest rate of brown bears

ACCOMPLISHMENTS: Between 2009 and 2016 we collected and analyzed 238 brown bear DNA tissue samples to estimate the harvest rate of brown bears in GMU 5A. We calculated an apparent harvest rate of 5.4%, 95% CI [3.3–8.3] from DNA samples and

brown bear harvest sealing records. Total mortality rate for GMU 5A was 7.6 % 95% CI [5.1–10.9].

OBJECTIVE 3: Estimate the density of brown bears on the Yakutat Forelands

ACCOMPLISHMENTS: We modeled the population density and abundance of brown bears in Yakutat using a spatially-explicit capture–recapture (SECR) framework using capture history data from 152 unique individual brown bears, identified from 338 samples collected at 565 hair sampling traps. We examined models that accounted for trap type, sex, time, behavior, and site-specific capture probability. The top model was improved by the inclusion of sex and telemetry data. Using SECR models, we estimated the density of the population as 98.8 ± 8.2 bears/1,000 km^2, 95% CI [84.1–116.2], and a density coefficient of variation of 0.08. Within the 2,447 km^2 study area we estimated an expected abundance of 260.1 ± 21.5 brown bears. We predicted the population size for all of GMU 5A totaling 353.8 ± 29.2 bears, 95% CI [300.9–415.8]. We estimated the sex composition of the entire population in GMU 5A as 225 female bears, 95% CI [165–296] and 129 male bears, 95% CI [99–205].

OBJECTIVE 4: Characterize bear den selection

ACCOMPLISHMENTS: We evaluated brown bear den site selection within the Yakutat study areas. We conducted aerial surveys during den emergence and combined these with GPS collar data to determine locations of dens. We used remotely sensed data to develop a resource selection function (RSF) to identify denning habitats with the greatest relative probability of brown bear use. We evaluated dens based on three elevation classes, low (0-99m), medium (100–500m), and high (>500m). We developed an RSF for each elevation zone and found that the top model in the low zone showed positive selection for forest height, slope, and topographic position, and negative selection for snow load, likely due to forest canopy snow interception. At medium elevations bears selected forest and shrub habitat, with positive selection for topographic position, elevation, and slope. The recruitment of adequate forest structure at low and medium elevations should be a consideration for brown bear dens in future forest management in Southeast Alaska. Bears denning at elevations greater than 500m, typically excavated dens into soil, and selection occurred towards elevations lower in this class, and preferred dens with higher values of solar radiation. Cross validation showed that models had good predictive ability.

II. SUMMARY OF WORK COMPLETED ON PROJECT TO DATE.

During this study we captured and GPS radiocollared 92 brown bears (49 males, 43 females) in GMU 5A, including the capture of 22 brown bears (15 males, 7 females) at the Yakutat landfill. We also captured and deployed GPS radiocollars on 18 brown bears (10 males, 8 females) in GMU 5B. To estimate habitat space use we retrieved 102 GPS radio collars from 87 individual bears. The spatial data collected from collared animals allowed us to meet jobs associated with Objectives 1, 3, and 4. With DNA collected from bears on this project we were able to determine mortality and harvest rates for Objective 2, and estimate density and abundance for Objective 3. During this project we investigated brown bear den site selection in Objective 4 and determined important

habitats used by bears denning at a wide range of elevations. We will be working diligently over the next year to finalize project results for publication.

III. SIGNIFICANT DEVELOPMENT REPORTS AND/OR AMENDMENTS.
None.

IV. PUBLICATIONS During the reporting period we drafted a manuscript, “Elevation Influences Brown Bear Den Site Habitat Selection”. During the next segment we will prepare this report for publication.

V. RECOMMENDATIONS FOR THIS PROJECT

We have concluded the field work phase of this project and in the coming segment we will prepare final project reports following objectives and job activities outlined in the project statement. We will use the GPS location data collected to model seasonal habitat selection based on the habitat classification that we developed

Prepared by: Anthony Crupi

Date: 9/1/2018