Alaska Department of Fish and Game Wildlife Restoration Grant

GRANT NUMBER: AKW-B-R1-2020 Amendment #1 SFY21

PROJECT NUMBER: P4.43

PROJECT TITLE: Brown bear population density and habitat selection on the northern mainland coast of Southeast Alaska

PERIOD OF PERFORMANCE: July 1, 2020 - June 30, 2021

REPORT DUE DATE: Submit to FAC August 28, 2021

PRINCIPAL INVESTIGATOR: Anthony P. Crupi

Cooperators: N/A

Authorities: 2 CFR 200.328 2 CFR 200.301 50 CFR 80.90

I. PROGRESS ON PROJECT OBJECTIVES DURING PERIOD OF PERFORMANCE

OBJECTIVE 1: Investigate spatial relationships of brown bears in GMU 1D including seasonal home range estimates and habitat selection.

Activity 1A: Deploy GPS collars. Activity 1B: Monitor and retrieve GPS collars. Activity 1C: Analyze GPS location data to assess spatial movement patterns, habitat use, and home range size.

ACCOMPLISHMENTS: During the fall of 2020 and spring of 2021, we continued our efforts to investigate spatial relationships in GMU 1D. Between 4 August 2020 - 10 June 2021 we captured and deployed GPS collars on 28 brown bears (18F:10M) in the Haines study area. We captured a representative sample of animals including: 12 adult females, 6 adult males, 6 sub-adult females, and 4 sub-adult males. Five of the 12 adult females had 9 dependent offspring (4 yearlings and 5 cubs of the year). We captured 6 bears that had been previously marked, and all bears were captured according to IACUC protocol 0070-2020-46. We collected standard morphological measurements of captured bears, as well as teeth for determining age, tissue for DNA genotyping, blood for stable isotope analyses, and hair to investigate the genetic architecture of coat color variation. We foot snared 3 bears and

immobilized 25 bears with helicopter support. The average elevation at which female bears were captured was 102 m and male bears was 42 m. No mortalities, severe injuries, or adverse reactions resulted from chemical immobilization.

We recovered 16 GPS collars during the reporting period, downloaded the data, and incorporated the locations into a geospatial database. The collars were recovered following successful release from the bear, torn from the bear during interspecific conflicts, lost at the den site, replaced during recapture, or returned after being harvested or killed in defense of life and property.

We computed annual home range estimates from an adequate number of locations (n>1000) for brown bears wearing GPS collars during September 2018 – October 2020. We used a kernel density estimator with an HREF bandwidth (85%) and clipped the polygons to the available shoreline to represent individual animal movements within the usable study area. Annual home ranges were grouped by sex (male/female) and age class (adult > 5 years/juvenile independent 2–4 years), and differences were evaluated using a Mann-Whitney-Wilcox test. We found a small sex difference (133.1 km² for males vs. 90.0 km² for females) with males (n=9) occupying larger median home ranges than females (n=17). There was a larger difference between home ranges depending on age class, as juvenile bears (228.4 km²) had much larger ranges than adults (88.7 km²), though only 3 juveniles had enough data to adequately represent their class as some individuals were removed as outliers since their movements were exceedingly large. As we recover additional GPS collars we will be able to shed more light on the differences between sex and age classes, though these estimates appear to be within the range found in the adjacent Yakutat forelands study area.

OBJECTIVE 2: Estimate harvest rate of brown bears.

Activity 2A: Estimate harvest rate of brown bears.

Activity 2B: Estimate harvest rate based on an analysis of the DNA results.

ACCOMPLISHMENTS: We received the DNA analysis results from Wildlife Genetics International (WGI) for 31 hunter harvested samples and 28 tissue samples from research captured bears. These samples will be combined with past and future samples to estimate the harvest rate of brown bears in GMU 1D.

OBJECTIVE 3: Estimate population density and abundance.

Activity 3A: Prioritize sampling locations based on GPS location data.

Activity 3B: Deploy sampling detectors to collect bear hair.

Activity 3C: Estimate density and abundance using DNA-based SECR models.

ACCOMPLISHMENTS: This objective will begin in FY 22. During this reporting period, we used GPS collar data collected during the first three years of the study to generate a robust sampling design. We performed several simulations to validate that the number

and distribution of hair sampling detectors would yield an estimated density that was similar to the realized estimate.

OBJECTIVE 4: Monitor brown bear survival.

Activity 4A: Aerial surveys to monitor animal status and reproduction.

Activity 4B: Calculate survival estimates for male and female cohorts.

ACCOMPLISHMENTS: We conducted routine ground based and aerial telemetry surveys to monitor the status of each collared bear. Eighteen (9F:9M) of 68 marked animals (26%) were deceased by the end of the reporting period. Mortality of the overall population was high in FY21, as 49 brown bears were reported and sealed in GMU 1D. The mortality of marked animals, a relatively small portion of the overall population, was consistent with overall mortality, as 11 of the 47 animals (23%) monitored during any portion of 2020 were killed by hunter harvest, defense of life and property, agency staff, illegal take, or another bear. Preliminary known fate models used to estimate annual survival probability showed that both male and female survival in 2020 was 79%, and the overall survival estimated between 2018–2020 was higher for females (84%) than males (75%).

OBJECTIVE 5: Examine brown bear den site selection.

Activity 5A: Locate brown bear dens from GPS radiocollar locations and spring aerial surveys.

Activity 5B: Describe the attributes of den sites and then compare the attributes with those from random available locations.

ACCOMPLISHMENTS: We conducted an aerial survey on 26 April 2021 in a fixed-wing plane, searching alpine habitat for brown bear dens. We observed a substantially deeper snowpack in 2021 compared to the five previous survey years. High elevation snow stations in northern SEAK indicated depths similar to the snow filled winter of 2011–12. Eleven brown bear dens were identified, including three located using tracking telemetry. We attempted to track 32 GPS collared bears and successfully detected 25 bears. We found that most collared bears were still in or near their dens, late relative to previous den emergence data collected in the region.

We used den survey data to predict den site selection patterns and recently published an article describing this den habitat model. All dens observed were in terrain considered by our resource selection function model as prime denning habitat. The aerial survey den locations and GPS collar den sites will be used to further validate the model.

The mean elevation of den sites observed near Haines in 2021 was 601.9 ± 103.7 m. All dens were found between 300–900 m elevation. The lowest den was found near the eastern edge of Takhin Ridge (314 m) and the highest was located near Big Boulder Creek in the Four Winds Mountain Range (868 m). The majority of dens were classified in moderately steep terrain in snow-covered shrub habitat. From 160 dens collected between 2008–2021, we found the mean elevation of brown bear den sites was 742.4 ± 162.6 m and slope was $35^{\circ}\pm 10^{\circ}$.

II. SUMMARY OF WORK COMPLETED ON PROJECT TO DATE

At the completion of the third year of this six-year study, we have captured and GPS radio-collared 68 brown bears (49F:19M) in GMU 1D. To date we have retrieved 40 GPS collars to identify spatial relationships. The animal spatial movements and survival data collected from marked animals allowed us to accomplish several jobs associated with project objectives. As well, the spatial habitat use data assisted in planning the design of the brown bear density estimate that is scheduled for FY 22.

III. SIGNIFICANT DEVELOPMENT REPORTS AND/OR AMENDMENTS

None

IV. PUBLICATIONS

Crupi, A.P, D.P. Gregovich, and K.S. White. 2020. *Steep and Deep: terrain and climate factors explain brown bear (Ursus arctos) alpine den site selection to guide heli-skiing management.* PLoS ONE 15(9):e0238711.

https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0238711

Cove et al. 2021. *SNAPSHOT USA 2019: a coordinated national camera trap survey of the United States.* Ecology. <u>https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/ecy.3353</u>

On-line Data: <u>https://emammal.si.edu/snapshot-usa-2019-home-page</u>: subproject: AK_Forest_Chilkat_Preserve.

Levi et al. 2021. *Community ecology and conservation of bear-salmon ecosystems*. Frontiers in Ecology. <u>https://www.frontiersin.org/articles/10.3389/fevo.2020.513304/abstract.</u>

We also developed programs for outreach and education to discuss the brown bear research program. We made several efforts to inform the public about the project including presentations to the Upper Lynn Canal Fish and Game Advisory Committee and the Haines Avalanche Center on brown bear denning with recommendations related to skiing in bear denning habitat. <u>https://www.youtube.com/watch?v=ADjW1SeEQbI</u>

News stories related to the brown bear population in the study area were reported in the Chilkat Valley News and on KHNS and KTOO radio stations.

https://khns.org/bear-break-ins-continue-but-now-theyve-learned-to-open-car-doors

https://www.ktoo.org/2020/11/13/a-bear-catastrophe-in-haines-fish-and-game-raises-concernsover-record-brown-bear-kills/

https://khns.org/fish-and-game-raises-concerns-over-record-high-number-of-brown-bear-kills-in-haines

https://khns.org/task-force-discusses-solutions-to-bear-related-issues

https://www.ktoo.org/2021/03/03/bear-researcher-shares-tips-for-identifying-and-avoidingwinter-bear-dens/

https://www.ktoo.org/2020/11/12/shouldnt-all-of-juneaus-bears-be-hibernating-by-now/ https://khns.org/haines-mourns-the-death-of-well-known-chilkoot-bear

https://www.adfg.alaska.gov/static/applications/webintra/wcnews/2021/releases/02-24-2021.pdf

V. RECOMMENDATIONS FOR THIS PROJECT

We recommend continuing this project for the duration of the study and expect the funding allocated to the project in FY22 will be adequate to meet program objectives.

Prepared by: Anthony P. Crupi, Wildlife Biologist III

Date: 8/23/2021