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-B-R1-2020

PROJECT NUMBER: 2.01

PROJECT TITLE: Integrated Spatial Capture-Recapture Approach to Estimate Abundance of Sitka Black-tailed Deer.

PERIOD OF PERFORMANCE: July 1, 2019 – June 30, 2021

PERFORMANCE YEAR: July 1, 2019 – June 30, 2020; year 1 of a 2-year grant

REPORT DUE DATE: Submit to FAC August 28, 2020

PRINCIPAL INVESTIGATOR: Daniel R. Eacker, Wildlife Biologist III

COOPERATORS: University of Idaho

Authorities: 2 CFR 200.328
2 CFR 200.301
50 CFR 80.90

I. PROGRESS ON PROJECT OBJECTIVES DURING PERFORMANCE YEAR

OBJECTIVE 1: Develop and simulate integrated spatial capture-recapture model to inform study design.

ACCOMPLISHMENTS: This objective was completed during year 1 as it was needed to implement the study. These simulations guided the pilot study design that combines data from game camera photos and fecal DNA (fDNA) sampling to estimate deer abundance and density on Mitkof Island in Unit 3 with a 10–20% coefficient of variation (CV). During the reporting year, we further refined the portion of the integrated spatial capture-recapture (SCR) model that describes the data for unmarked individuals from game camera photos. These improvements increased precision of age-class-specific abundance estimates and allowed the model to probabilistically assign an age-class for deer that could not be identified reliably as a buck, doe, or fawn from photos. These revisions also reduced the run time for the model to converge.

We also developed a set of custom functions in Program R during the reporting period to streamline the implementation of our integrated SCR approach for the initial estimates we provide below for winter 2018–2019 (year 1). This computer code will allow us to efficiently produce the final results for a manuscript, where we plan to compare estimates from the integrated SCR model with those produced only from the marked portion of the model (i.e. fDNA data) and only from the unmarked portion of the model (i.e., game camera photo data).

We have continued to work on a manuscript during the reporting year but have not submitted it to a peer-reviewed journal as planned due to substantial time needed to address other objectives. This manuscript is a top priority for fall 2020 and we expect to submit it to a peer-reviewed journal before winter 2020–2021.

OBJECTIVE 2: Sample deer populations using game cameras and fDNA and record site covariates.

ACCOMPLISHMENTS: During September 2019, we replaced 34 older game cameras that were borrowed from the Petersburg Area Biologist with new game cameras and serviced the other existing Hyperfire 2 game cameras. We were unable to get to 12 game cameras at the Spirit Creek site due to losing a GPS unit that had a securing cable break. We returned May 2020 and recovered all camera cards, replaced batteries and desiccant sheets, and applied silicone lubricant to the camera seals. Despite not getting to these cameras at the Spirit Creek site, only 2 of 16 cameras failed prematurely due to battery failure; 1 other camera at the site failed due to water damage and has since been repaired at no cost from Reconyx and reinstalled at the site this summer 2020. Overall, we recovered full data from 61/64 game cameras that yielded a total of 100,217 photos and recorded snow depths at a subset of the sites.

We sampled deer pellets for fDNA as planned during winter of the reporting period. We were able to complete 3–4 sampling occasions at the same 3 fDNA sites as in FY19. We searched at least 51 km of transect for deer pellets using minimal personnel. We collected a total of 497 fDNA samples from 248 deer pellet groups following our well-established sampling protocol. We continued to use snow tracking of deer to locate fresh pellets. We attempted to track sampling effort more closely by saving GPS track logs and will incorporate this into future sampling to properly account for variation in sampling effort. Finally, we collected habitat type and snow measurements while surveying transects for deer pellets.

OBJECTIVE 3: Process game camera photos and fDNA.

ACCOMPLISHMENTS: We used our stand-alone, web-based software developed in the shiny package in Program R to greatly increase the efficiency of processing game camera photos into species-specific counts. We had 2 separate expert reviewers identify deer in photos to sex and age class (i.e., juvenile, adult female, adult male) whenever possible, and heavily scrutinized photos of deer to provide accurate counts.

After inventorying and quality-checking the fDNA samples, we packaged and shipped them to the Laboratory for Ecological, Evolutionary and Conservation Genetics at the University of Idaho, Moscow, Idaho for processing. We experienced some delays at the laboratory due to a lack of genetic diversity of Mitkof Island deer relative to other populations; this required the lab to develop additional microsatellite markers and rerun the extracted samples to accurately separate individuals at a cost of $2,200. Importantly, we immediately shipped out our samples collected during the reporting year to the lab, which allowed the lab to extract the DNA from all samples before they were forced to shut down for a 2-month period due to the Covid-19 situation. This resulted in significant underspending in our annual contract with the University of Idaho of $33,000 (includes 10% indirect costs); in total, we were only charged $8,741 for the genetic processing in the reporting year, which is $24,259 less than we budgeted for. We expect a 2-month delay in getting the genetic results back this year due to a backlog of work at the lab from the Covid-19 situation and expect the results before December 2020.

We have extracted relevant spatial covariates (e.g., forest size-density classes, elevation, snow) that will be considered in modeling deer abundance and encounter rates on Mitkof Island.

OBJECTIVE 4: Radio-collar and monitor deer to estimate survival, cause-specific mortality (when available), relative probability of use, and to inform movement parameters in the SCR model.

ACCOMPLISHMENTS: Along with attending capture training in Palmer, AK, in December 2019, ordering and organizing capture gear, and training at the shooting range, we submitted an Assurance of Animal Care Form for our capture protocol to a group of peer reviewers; this form was approved and our capture was just completed. Our capture was originally planned for May 2020 of the reporting year, but the review committee recommended that we avoid the parturition period and move the capture to August 2020 (year 2). Although the work did not occur during the reporting period, we are pleased to report that 18 of 20 collars were deployed on yearling and adult female deer with no capture-related mortalities. These collars are planned to drop off September 2022 after collecting 2 full years of data on each individual deer. We also plan to deploy the remaining 2 collars just before the fDNA sampling session for winter 2020–2021.

OBJECTIVE 5: Develop winter resource selection function to predict relative probability of use in the study area.

ACCOMPLISHMENTS: This objective is now planned for FY2023 after GPS data have been recovered from collars in September 2022.

OBJECTIVE 6: Data synthesis and preparation of reports and publications.

ACCOMPLISHMENTS: This objective is not planned until FY2023 now, but we will produce annual reports of the results after they are received from the genetics lab by September 30th of each year. Also, we will produce a publication based on the model simulations and the first year of pilot data and submit the manuscript to a peer-reviewed journal.

II. SUMMARY OF WORK COMPLETED ON PROJECT TO DATE.

We completed all field sampling and data collation objectives for the reporting period. We have not processed the game camera photos from winter 2019–2020 due to more pressing tasks (i.e., finalizing initial abundance estimates and preparing for deer capture and collaring). We achieved a final genotyping success rates of 90% for our winter 2018–2019 samples, which represents one of highest genotyping success rates of any non-invasive genetic sampling of pellets or scat. We estimated an average deer density in winter 2018–2019 of 9.56 deer/km^2 (95% Bayesian Credibility Interval (BCI) = 7.75 – 12.07) across the 7 sites, which translated into an extrapolated abundance estimate on deer winter range (490 km^2) of 4,686 deer (95% BCI = 3,796–5,912); this represented an 11.8% CV on the estimate. We estimated there were 1,581 does (95% BCI = 1,186–2,083), 1,591 bucks (95% BCI = 1,210–2,100), and 1,523 fawns (95% BCI = 1,153–1,993) on deer winter range in 2018–2019; these age-class-specific abundance estimates had CVs of 14.6%, 14.3% and 14.3% respectively. Interestingly, both the marked and unmarked datasets suggested a nearly equal ratio of bucks and does in the population (buck-to-doe ratio = 1.02, 95% BCI = 0.75–1.37). This result was intuitive since Mitkof Island was restricted to only 1 buck per hunter over a 2-week season since 1976. However, the length of the hunting season was increased to a 5-week period in the last Board of Game cycle and this period included some of the deer rut. Minimum harvest estimates suggested that harvest more than doubled after this change in season length compared to the previous year from 30 bucks to 109 bucks. Thus, it will be important to evaluate if our integrated spatial mark-recapture approach to estimating deer abundance can detect this substantial change in harvest.

III. SIGNIFICANT DEVELOPMENT REPORTS AND/OR AMENDMENTS.

Our costs for genetic sampling have been under budget due to high genotyping success rates that negated the need to run samples twice to achieve a consensus genotype. For example, we budgeted $33,000 for processing 500 samples, but were only charged

$8,970.76 due to the high rates of genotyping success. We hope to find other ways to reduce these costs over time and expand the method to other areas in the future.

IV. PUBLICATIONS

Popular press article and radio interview:

https://www.kfsk.org/2019/12/19/new-deer-count-method-shows-promising-results-for-southeast-alaska/

Popular press article and radio interview:

https://www.kfsk.org/2020/07/20/deer-estimate-shows-healthy-population-on-mitkof-island/

V. RECOMMENDATIONS FOR THIS PROJECT

We will incorporate rigorous tracking of sampling effort due to snow tracking for deer pellets in future efforts as we did not fully account for this in our first year of sampling; thus, we will record and save all GPS track logs from transect searching. Also, we will measure pellet length to hopefully separate juvenile from adult pellets in the fDNA samples.

We recommend extending this 2-year pilot study for 2 more years since we will have a powerful approach by having GPS collar data with 2-hr fixes, fDNA sampling of marked individuals, and game camera photos of unmarked deer. The fine-scale GPS collar data will allow us to increase precision of estimates and develop an explanatory variable of relative probability of use (RPU) for deer to predict density over the study area. We expect that abundance estimates will decrease by including RPU as a predictor since it will account for the young clear-cuts and muskegs that deer appear to avoid in winter. The revised habitat model for deer may also inform forestry activities and could be combined with previous GPS studies (i.e., Chichagof and Prince of Wales Islands) in a regional meta-analysis. Thus, with this extended project timeline the final report for this project would be available in FY23.

Prepared by: Daniel R. Eacker, Wildlife Biologist III

Date: September 21, 2023