FEDERAL AID ANNUAL RESEARCH 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-10 Wildlife Restoration FY2016

PROJECT NUMBER: 4.40

PROJECT TITLE: Grizzly bear use of the North Slope oil fields and surrounding region

PROJECT DURATION: 1 July 2008–30 June 2017

REPORT DUE DATE: 1 September 2016

PARTNER: Funding for a radio-telemetry flight to locate dens in FY16 was by grants from ConocoPhillips-Alaska, Inc., Caelus Energy Alaska, LLC, and Repsol E&P, USA.

PRINCIPAL INVESTIGATOR: Richard T. Shideler, ADF&G

WORK LOCATION: Game Management Units 26A and 26B, oil field region

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I. SUMMARY OF WORK COMPLETED THIS SEGMENT ON JOBS IDENTIFIED IN ANNUAL WORK PLAN

OBJECTIVE 1: Continue the den detection research with the goal of developing a management program using a combination of tested detection methods applied to the highest probability denning habitat. This will allow industry to optimize detection of denning grizzly bears and avoid them during winter exploration, transportation, and maintenance activities.

JOB/ACTIVITY 1A: Develop a grizzly bear den habitat selection model.

Problems with the scale of available Digital Elevation Models (DEM) continued to thwart our objective to develop a habitat selection model and map. In FY16 we had anticipated being able to compare results from high-resolution digital aerial photogrammetry ("Structure from Motion" technique) obtained for us by Dr. Matthew Nolan of the University of Alaska Fairbanks with a LiDAR-based DEM offered by Repsol E & P, USA ("Repsol"). Unfortunately, legal issues surrounding potential public of the proprietary LiDAR imagery have stalled acquisition of the Repsol DEM; however, negotiations are ongoing. In the meantime, we will continue analysis of the SfM data for its efficacy in refining a den habitat map.

JOB/ACTIVITY 1B: Collect data on habitat characteristics of dens of radio-marked bears, and field verify areas of high, medium, and low probability denning habitat based on the predictive model generated in job 1a.

Due to reduced funding and poor weather we had to limit our den location effort to one early December radio-telemetry flight within the western portion of the oil fields. We found 14 putative dens of radio-marked bears by interpolation of their radio signals. One of those putative dens was less than 0.5 miles from an ice road that was already under construction, but would be used for only a few more weeks. We recommended that the company reduce vehicle activity along the temporary road whenever possible and close it to vehicle access after it was no longer needed. Another putative den was located in the overburden pile of a large gravel mine that had been decommissioned for gravel removal but still active as a water source. The nearby area was proposed as a winter test facility by a European car manufacturer. The presence of this bear required that they move their proposed test area outside the 0.5 mile buffer required by state permit stipulations.

Due to decreased funding in FY15 we inspected only dens that were within walking distance of the road system or that could be inspected in conjunction with other aspects of the project that required helicopter support (e.g., capture for collar replacement). We inspected 2 dens that were within walking distance from the road system. Two other putative dens, including the one near the ice road and an additional den in the Colville delta, turned out to be bears that were dead prior to the fall survey. Their radio-signals were on the same mortality signal pattern that is used to indicate a den. Had we been under full funding and surveying several times over the fall period we likely would have detected the dead bears prior to the denning flight.

No progress was made on field verification of the den habitat selection model pending completion of the predictive model and availability of funding (see job 1a).

JOB/ACTIVITY 1C: Evaluate the efficacy of den detection methods (e.g., handheld and airborne forward-looking infrared "FLIR" imagers, trained scent dogs).

Operational funding for this job had been through a National Fish and Wildlife Foundation (NFWF) grant, which ended fall 2013. Since then we have collected additional data on den detection methods on an opportunistic basis. No such opportunities occurred during FY16.

One of our FY14 annual report recommendations was to investigate the efficacy of using a FLIR unit mounted on an unmanned aerial vehicle (UAV or "drone) to detect bear dens. This would potentially provide a more responsive and cost-effective method. The University of Alaska Fairbanks initiated a graduate research project to investigate this. Graduate student Nils Pedersen will be testing the UAV on artificial dens and, if available, radiocollared denning bears. ADF&G committed to assist the project. Part of this assistance is to maintain a sample of radiocollared bears near the road system that would be available to field test the UAV. Although in FY16 we removed collars from bears on the periphery of the study area, we retained collars on 18 bears that would be available for the UAV project.

JOB/ACTIVITY 1D: Construct and instrument an artificial den to test the accuracy of FLIR under varying snow conditions.

Operational funding for this job had been through a grant from NFWF that ended prior to FY16. We reported results in the NFWF final report appended to the FY14 annual federal aid report. This job has been turned over to UAF graduate student Nils Pedersen as part of the project mentioned in job 1c. In addition to testing the FLIR mounted on the UAV, Mr. Pedersen will continue testing the handheld FLIR on artificial dens using methods we developed in our proof-of-concept study reported in the NFWF report.

OBJECTIVE 2: Investigate the response of "natural food" bears to the removal of food-conditioned bears from the oil field, especially to determine if these bears attempt to obtain human food.

JOB/ACTIVITY 2A: Capture bears and replace radio collars.

At the end of FY16 we had a sample size of 27 bears with functional radio collars. By the end of FY16, bear mortality, collar loss and likely emigration from the study area had reduced the effective radio-collared sample to 21. Due to uncertainty in future funding, we removed collars from 4 more bears that were on the periphery of the study area. However, consistent with our objective of maximizing bears around the oilfield road system, we captured a young female in the landfill area. Our total sample size as of the end of FY16 was 18 radio-collared bears.

We received reliable reports or directly observed an additional minimum 2-3 bears in the immediate landfill area but could not extend our capture period to search for them. We strongly suspect these are newly food-conditioned bears, but cannot confirm unless we capture them. Of particular interest would be if they are offspring of existing food-conditioned bears, or developed the food-conditioning on their own.

JOB/ACTIVITY 2B: Analyze grizzly bear DNA specimens for individual relationships.

One goal of this project has been to identify individual relationships among bears in the study area generally and especially those using the oil fields. This provides a sense of the number of bears using the area, insight into cub survival to weaning by identifying maternity-paternity of captured or harvested individuals, the social structure of bears in the area, and the potential familial relationships of food-conditioned bears. Earlier in this project we collected specimens for genetic "fingerprinting" from 3 sources: 1) tissue samples collected at the time of capture from bears newly captured for the study; 2) hair collected on barbed wire hair traps on power poles and other features (e.g. survey posts, oil well markers) within the oil fields; and 3) tissue obtained by using a biopsy dart. We reported results from collections from previous years in FY14 and FY15 federal aid annual reports.

The systematic collection and analysis of hair at established barbed wire hair "traps" on power poles was funded by NFWF and ended in FY13. Therefore, beginning in FY14 we discontinued routine periodic collection of hair from power pole hair traps because the long interval between sample collections (e.g., 2–3 weeks) allowed UV to degrade the DNA in hair follicles. In addition, some of the samples were contaminated by creosote on

the power poles. We have continued to collect hair on an opportunistic basis, with the goal of submitting samples for individual identity analysis when funding becomes available.

We have archived hair samples from power pole hair traps that we collected since 2013, as well as tissue samples collected from harvested bears in Game Management Unit 26B as part of a grizzly bear management project, and from the hair collected from other sources within the study area. In June 2016 we observed several unmarked bears in the area around the North Slope Borough landfill in the Prudhoe Bay area. The landfill had been upgraded in 2015-2016; however, bears were already gaining access to the landfill due to poorly designed gates. We collected hair from these gates, in one case observing the individual bear that deposited it. These samples will hopefully enable us to determine if the bears currently using anthropogenic foods are offspring of previously food-conditioned bears or "new" bears that have learned to exploit an easy food source.

JOB/ACTIVITY 2C: Establish barbed-wire hair traps on specific power poles and other permanent structures where bears have been observed rubbing. Hair collected at these sites will be included in the DNA analysis in job 2b.

Due to reduced budget in FY16, we made only 3 ground trips to the study area. Previous experience had indicated that hair collected after >2 week interval was too denatured to provide suitable DNA. Therefore, we did not collect any hair. We removed barbed wire from 3 power poles that had not been visited by bears during the previous 3 years. As of the end of FY 16 we have only 10 poles "active." We intend to leave these poles active until future of the project is known.

JOB/ACTIVITY 2D: Collect and analyze specimens for stable isotope analysis to identify food-conditioned bears within the oil field sample.

Since the 1990s, we have collected hair and blood samples from the bears we captured and since 2013 from bears killed by hunters. Results for analysis of food habits using C and N through FY 2006 were published. In FY14 samples from bears we captured since 2007, as well as the samples from hunters, were analyzed by the University of Alaska Fairbanks-Stable Isotope Facility for concentrations of stable isotopes of C and N. We have archived samples and data, pending updates from the RY 2016 grizzly bear harvest. We collected hair and blood samples from the 8 recaptures and 1 new capture in FY16. If funding becomes available we will have these samples analyzed at the UAF lab.

In late FY16 we began collaboration with the DWC Marine Mammals program to investigate stress and reproductive hormones from grizzly bear hair using the 322 samples we have collected since 1992. Consumables necessary for the analysis were purchased by the Marine Mammals program in FY16, and we anticipate completion of the analysis in FY17.

OBJECTIVE 3: Write annual progress reports, a research interim technical report in FY16, and a final technical report. Give presentations at scientific forums. Publish results in peer-reviewed journals.

JOB/ACTIVITY 3A: Data analysis and reporting.

Data analysis and manuscript preparation are ongoing. Manuscripts are being prepared on denning ecology, effects of food-conditioning, and grizzly bear den detection.

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

None.

III. PUBLICATIONS

The following manuscript was published:

G. E. Liston, C. J. Perham, R. T. Shideler, and A. N. Cheuvront. 2015. Modeling snow habitat for polar bear dens with SnowDens-3D. Ecological Modeling.

The following manuscript is in review:

T. Lan, J. Cheng, A. Ratan, W. Miller, K. Rode, T. Atwood, S. Farley, R. T. Shideler, S. L. Talbot, T. Mailund, and C. Lindqvist. *In prep*. Genome-wide evidence for a hybrid origin of modern polar bears. Nature-Genetics.

A poster was prepared for the 24th conference of the International Association for Bear Management and Research in Anchorage in June 2016: “Den use by grizzly bears on the Arctic Coastal Plain, Alaska.”

IV. RECOMMENDATIONS FOR THIS PROJECT

The following recommendations apply to future research and monitoring:

1. Maintain a sample of ca. 30 radio-marked bears within the oil field region and monitor demographic characteristics, oil field use, and den locations. Dependent upon funding, equip ≥6 bears that frequent the oil fields with GPS collars and test the feasibility of a “virtual fence” that will alert project staff that the bears have entered the oil fields. Investigate the possibility of tying this alert to oil field security to provide a real-time notification that a marked bear is in their area.

2. Conduct radiotracking surveys of dens within the oil-field region and provide locations to industry to meet their permitting requirements to avoid occupied dens, and to test precision of the habitat map using future dens.

3. Continue to develop the den habitat suitability map.
    a. Ground-truth the precision of the map by a) retrospectively comparing locations of previously occupied dens that have not been inspected (i.e., not included in the development of the den habitat model), and b) randomly selected points that may or not be suitable habitat predicted by the model.
    b. Compare new den locations with predicted habitat values from the map.

4. Once an accurate den habitat map becomes available, identify areas that may be affected by industry winter activities and apply a feasible detection method to identify active dens.

5. Continue to collect and analyze genetic data from newly captured bears, from hair collected at snares around the oil field, and from tissue collected from hunter harvest or department bear control projects or from biopsy darts.

6. On an opportunistic basis, continue to evaluate the feasibility of using dogs to detect denning bears, especially focusing on the weather and snow conditions (e.g., snow depth, snow density, presence of ice layers) when dogs fail to locate the den or require an unacceptably long time (e.g., >0.5 hr) to detect the den.

7. Continue to collect and analyze bear samples for stable isotope analysis. For selected individuals that may be feeding in areas with a marine influence, test for S in addition to C and N. On an opportunistic basis, collect food items for isotope analysis in order to augment the existing data for the North Slope food web.

8. Expand the geographical scope to areas such as northeastern NPR-A where we have had to reduce effort, including removing collars, due to funding declines. This is where industry is actively expanding.

9. Continue support of the UAF graduate project, including testing the UAV on marked bears in their dens.

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