

**Wildlife Restoration OPERATING GRANT
FINAL 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-B-R3-2020

PROJECT NUMBER: P4.40

PROJECT TITLE: Grizzly bear use of the North Slope Oilfield Region

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

PERFORMANCE YEAR: July 1, 2020 - June 30, 2021; year 2 of a 2-year grant

REPORT DUE DATE:

PRINCIPAL INVESTIGATOR: Richard T. Shideler, Wildlife Research Biologist, ADF&G

COOPERATORS: Kerry Nicholson, ADF&G

I. PROGRESS ON PROJECT OBJECTIVES DURING PERIOD OF PERFORMANCE

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: Locate active dens in the fall and collect their habitat attributes in the summer.

In fall 2019 we acquired putative den locations for 13 GPS-collared bears based on their changes in activity and interpretation of their GPS locations. We provided these locations on a need-to-know basis to oilfield personnel so they could plan their winter activities. Previously we had noticed that in some cases there were discrepancies between putative den location in the fall and their actual location when we inspected dens the following summer. We assumed this was due to programming of the GPS collars. In order to save battery life during hibernation the GPS collars were programmed to reduce location acquisition to 1/day late in the den entrance period. Once bears entered dens, the GPS signal generally cannot be received by the Iridium satellite. Therefore, it is possible that between the bears' last daily above-ground location and cessation of subsequent signal the bears dug a den at new locations that were not detected until spring emergence when the satellite once again received a signal. We inspected 12 of these dens in August-September 2020 after snow drifts melted and a helicopter was available.

In fall 2020 we identified 17 putative den locations. These will be inspected in fall 2021 (FY22).

JOB/ACTIVITY 1B: Continue to collect den habitat attributes from inspected dens to fine-tune a predictive den habitat model.

In addition to the 2019-2020 dens, we inspected an additional 18 dens from previous years that had not been inspected. Following protocols developed previously we collected habitat attributes such as slope, aspect, geomorphic type, vegetation, and use of the den site by other animals such as Arctic ground squirrels and foxes.

In addition to collecting data on newly inspected dens, we collected data on 48 random points associated with current and previously inspected den in order to develop a use/availability model. Data have been archived in a Microsoft Access® database for further analysis.

JOB/ACTIVITY 1C: Compare the den attributes from inspected grizzly bear dens with similar attributes on the most recent version of ArcticDEM.

Although ArcticDEM has been upgraded, problems with the slope and altitude data were discovered during a recent project to use the DEM for polar bear denning. We have postponed further analysis until FY22 when we will have a contractor correcting the ArcticDEM for our use.

JOB/ACTIVITY 1D: Investigate the role of snow in den site selection. Compare the distribution of snow drifts modeled by the Snow-Dens 3D model with true locations of each den. The drift model may be useful in enhancing the den habitat map.

Due to ongoing problems with ArcticDEM this job will be postponed until FY22 when a contractor will run SnowDens 3-D snow accretion model to identify snow conditions at dens that could influence site selection.

OBJECTIVE 2: Investigate movements and home ranges of grizzly bears in the region, and their responses to oil and gas activities and to natural or human-caused removals of food-conditioned bears.

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

In FY 21 we captured 13 bears between the Sagavanirktok River and Teshekpuk Lake. We replaced collars on 5 bears whose collars were scheduled to drop off summer 2021. We re-captured 3 bears that had shed their collars in FY21. We captured 5 bears new to the study in the oilfield region.

During these captures we took body measurements, tissue, blood, and hair samples. The blood and hair samples were collected for subsequent stable isotope analysis although we did not anticipate analyzing them in FY21. Samples were archived for future analysis. Isotope analysis can be used to (1) identify food-conditioned bears in the collared population, (2) add to our understanding of North Slope coastal bear diets. The blood

samples are also available for disease screening by the Department's Wildlife Veterinarian.

We collected the tissue samples for DNA "fingerprinting" from captured bears and also biopsy darted an additional 2 bears that were too young to capture. We expect to submit those samples in FY22.

JOB/ACTIVITY 2B: Analyze movements (e.g., locations, rates, and sinuosity of travel) when bears enter the oilfields and compare with those same characteristics of bears that do not enter the oilfields.

We downloaded and archived data from the GPS collars. The Department developed a web-based map on which are plotted GPS locations. We can use that map for management purposes to notify oilfield Security of bears in their area.

JOB/ACTIVITY 2C: Compare movements and feeding areas of bears that eat solely natural foods with bears that are food-conditioned.

We downloaded and archived data from the GPS collars. These data will be analyzed statistically in FY22.

JOB/ACTIVITY 2D: Compare movements of collared animals with "hotspots" identified in ground observations from oilfield security reports.

Occasionally we responded to oilfield security officers' requests to identify an individual bear that was near human activity. We identified the collared bear that was nearest to the location at the time provided by the officer. In some instances, we were also able to proactively notify security that a food-conditioned bear that might come into conflict was in their area.

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

Genetic samples from FY20 and FY21 captures, and miscellaneous hair collection (e.g., from unmarked bears harvested in the oilfield region) will be submitted for analysis in FY22.

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. SUMMARY OF WORK COMPLETED ON PROJECT TO DATE

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: Locate active dens in the fall and collect their habitat attributes in the summer.

As of the end of FY21 we have identified 418 dens of marked bears and collected habitat attribute information on more than 300 of them. We will collect to collect attribute information on new dens.

JOB/ACTIVITY 1B: Continue to collect den habitat attributes from inspected dens to fine-tune a predictive den habitat model.

We have collected a suite of den habitat data and den measurements on 333 dens of marked bears since 1992. Two hundred and nineteen of these dens have been inspected after May 2000 when Selective Availability was turned off and GPS coordinate positional error was reduced generally to a few meters. Data have been archived in a Microsoft Access® database for further analysis.

Analysis of these data is ongoing.

JOB/ACTIVITY 1C: Compare den attributes from inspected grizzly bear dens with similar attributes on the most recent version of ArcticDEM.

In FY20 an upgraded version of ArcticDEM became available. We intended to compare slope and aspect data collected at the site with this version to determine if it is useable for modeling. However, due to complications with the DEM's accuracy, no progress was made on this job. This job will be postponed until FY22.

JOB/ACTIVITY 1D: Investigate the role of snow in den site selection. Compare the distribution of snow drifts modeled by the Snow-Dens 3D model with true locations of each den. The drift model may be useful in enhancing the den habitat map. Previous unpublished analysis of 55 dens in pingos and 210 dens in other geomorphic types indicated that the mean aspects of both pingo and non-pingo dens were similar (214°T for pingos and 215°T for non-pingo dens). The preponderance of dens facing the direction opposite the winter prevailing winds suggested that snow drifting may be influencing den site selection. Liston et al. (2015) had successfully tested the snow drift model SnowDens-3D to predict locations for polar bear dens. In FY19 we contracted with Dr. Glen Liston to test SnowDens-3D on ArcticDEM. Results indicated that ArcticDEM was imprecise and in fact had numerous errors in the coverage that eliminated its utility for future mapping. In FY20 an upgrade to ArcticDEM became available and we intended to contract with Dr. Liston again to run his model with the recent version of ArcticDEM. Due to the absence of the Principle Investigator on medical leave for 5 months, no progress was made on a contract to model snow distribution using the most recent version of ArcticDEM and compare drift depth and location with known den locations. This job will be postponed until FY22.

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.

As of the end of FY20, we have captured 178 bears since the project’s inception in 1990. Capture locations have ranged from near the Arctic National Wildlife Refuge border in the east to near Teshekpuk Lake in the west but centered on the industrial area between the Sagavanirktok and Colville rivers. Until FY17 most of these bears were radio-collared with VHF transmitters. Since FY17 most bears have been fitted with Iridium-based GPS transmitters. As of the end of FY21 we have 13 bears fitted with either VHF or GPS transmitters.

Since the 1990s, collection of hair samples from captured bears and from other miscellaneous sources (e.g., oil well marker pipes, power pole snares, landfill fence) and blood from captured animals has also provided material for analysis of stable isotopes of C and N. Since 2013 we have also collected opportunistically hair and blood samples from bears killed by hunters in GMU 26A and 26B. Results of analysis of food habits using C and N through FY 2009 were published previously (Bentzen et al. 2014). We were able to identify bears that were food-conditioned based on their isotopic signatures. Since FY09 we have archived hair and blood samples pending additional funding. We have continued to collect hair and blood samples at each capture session since 2009, and in FY16 we had those from 2009 to 2016 analyzed at the University of Alaska Stable Isotope Facility. Since FY17 we have collected and archived samples with the expectation that we will analyze them in FY21. During the last several years we have noticed an apparent increase in bears feeding on coastal waterfowl, especially black brant (*Branta bernicula nigricans*), snow geese (*Anser caerulescens*) and white-fronted geese (*Anser albifrons*). The first 2 species feed heavily on coastal vegetation that is influenced by marine waters. In addition, a few individual bears have been observed feeding on chum salmon (*Oncorhynchus keta*) from the very small run in the Itkillik River. With that in mind in FY21 we anticipate analyzing not only isotopes of C and N, but also S to detect the importance of feeding on marine-based resources in the grizzly bear food web. Interruptions to the availability of the lab due to Covid-19 has delayed this task until FY22.

JOB/ACTIVITY 2B: Analyze movements (e.g., locations, rates, and sinuosity of travel) when bears enter the oilfields and compare with those same characteristics of bears that do not enter the oilfields.

We downloaded and archived data from the GPS collars; however, no further progress was made on this job except providing short-term movements and location data to oilfield personnel for management purposes. We plan on more extensive analysis in FY22.

JOB/ACTIVITY 2C: Compare movements and feeding areas of bears that eat solely natural foods with bears that are food-conditioned.

We downloaded and archived data from the GPS collars; however, no further progress was made on this job. We plan on more extensive analysis in FY22.

JOB/ACTIVITY 2D: Compare movements of collared animals with “hotspots” identified in ground observations from oilfield security reports.

Pedersen (2019) compiled and analyzed oilfield security grizzly bear ground reports from 1992-2014 and identified “hotspots” where observations of bears from the oilfield road system and facilities were clumped. Since fitting GPS transmitters on oilfield bears in 2017, we have been able to detect bear locations in relation to facilities within the half hour interval rate at which the collars acquire locations. Because the download interval may be several days after the GPS coordinates are collected, we usually don’t have real-time comparisons between the bear’s location and its observation by security officers. However, we can retrospectively determine if the bear observed by security was a collared bear, and if so we can identify the individual.

In FY20 we downloaded and archived data from the GPS collars and archived reports of ground observations by security officers. We plan on more extensive analysis in FY22.

However, we continued to respond to oilfield security officers’ occasional requests to identify a specific bear that they observed near human activity. We identified the GPS-collared bear that was nearest to the location at the time recorded by the officer. In some cases the bear was not collared. In some instances, we were also able to proactively notify security that a food-conditioned bear that might come into conflict was near their location

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

We have given oral and poster presentations at numerous conferences of the International Association of Bear Research and Management, and at international and domestic bear-human interaction workshops. We also gave oral and poster presentations at several oil and gas industry conferences and workshops. See Section IV for recent publications and presentations.

JOB/ACTIVITY 3A: Data analysis and reporting.

We have focused data compilation and analysis in 6 areas: (1) Development of a den habitat use model from data collected during den inspections; (2) identification of den locations on a DEM of suitable scale; (3) denning ecology and characteristics of dens (e.g., dimensions, site characteristics, entrance/exit timing); (4) physical and demographic characteristics of the local bear population based on capture data and genetic analyses, focusing on differences between food-conditioned segment and natural food segment of the population; (5) home range and movements based on VHF collaring and, more recently, locations collected by GPS collars and how to merge the 2 datasets; and (6)

evaluation of methods to detect dens during the hibernation season. Although analyses are ongoing, preliminary results have been presented in Federal Aid reports, oral and poster presentations, and meetings and workshops.

We are collaborating with N.J. Pedersen on preparation of a formal manuscript from his thesis chapter about analysis of grizzly bear “hotspots” from security reports.

III. SIGNIFICANT DEVELOPMENT REPORTS AND/OR AMENDMENTS

None

IV. PUBLICATIONS

Bentzen, T. W., R. T. Shideler, and T. M. O’Hara. 2014. Use of stable isotope analysis to identify food-conditioned grizzly bears on Alaska's North Slope. *Ursus* 25(1):14–23.

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

Pedersen, N.J. 2019. Human-bear interactions in the North Slope oilfields of Alaska: characteristics of grizzly bear sightings and use of infrared for bear den detection. M.Sc. Thesis, University of Alaska-Fairbanks.

Pedersen, N.J., Todd J. Brinkman, R.T. Shideler, and C.J. Perham. 2020. Effects of environmental conditions on use of forward-looking infrared for bear den detection in the Alaskan arctic. *Conservation Science and Practice*. 2.e215.

Perham, C.J. and R.T. Shideler. 2020. Application of a new technology and modern use of an old one to locate bear dens on the North Slope. Address to Alaska Chapter of the Wildlife Society, February 10-14, 2020.

V. RECOMMENDATIONS FOR THIS PROJECT

The following recommendations apply to future research and monitoring:

1. Maintain a sample of ca. 30 GPS-collared bears within the oil field region to monitor demographic characteristics, oil field use, and den locations.
2. Conduct periodic radio-tracking surveys of GPS-collared females to investigate cub production and mortality, and to confirm collar loss or bear mortality if the GPS portion of the collar fails.
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.

- c. Include snow drift modelling as a component of den selection using the same procedure reported by Liston et al. (2015) for polar bear denning.
4. Once an accurate den habitat map becomes available, identify areas that may be affected by industry winter activities and recommend a feasible detection method to identify active dens.
5. Continue to collect and analyze genetic data from newly captured bears, from hair collected incidentally around the oil field, and from tissue collected from hunter harvest or department bear control projects. These data can provide background for a demographic analysis of the both the food-conditioned and natural food segments of the population. Genetic identification of the fate of weaned cubs that appear in the genetic samples can be useful in investigating overall cub survival, fate of adults that are not in the capture sample can assist in evaluating adult mortality, and identification of non-collared bears using the oilfield area can augment the capture sample.
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. This may provide an indication that additional bears are becoming food-conditioned. 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.

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