FEDERAL AID ANNUAL RESEARCH PERFORMANCE REPORT

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
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Alaska Department of Fish and Game
Wildlife Restoration Grant

GRANT NUMBER: W-33-8

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

PROJECT DURATION: 1 July 2008–30 June 2012

REPORT PERIOD: 1 July 2009–30 June 2010

REPORT DUE TO HQ: 1 September 2010

PRINCIPAL INVESTIGATOR: Richard T. Shideler

WORK LOCATION: North Slope, Alaska

I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

Grizzly bears (*Ursus arctos*) were thought to have increased in the North Slope oil field region beginning in the late 1980s. Prior to the initiation of our study in 1993, little was known about grizzly bear interactions with oil field activity, or about the basic ecology of grizzly bears along the mid-Beaufort coast where they reach the northernmost mainland distribution in North America. This is also the region of the largest oil field in the United States. Knowledge of the interactions of grizzly bears with oil and gas exploration and production activities is important in order to reduce or minimize impacts of the development on this low-density and slow-growing bear population. Furthermore, potential impacts of development that affect the growth or survival of grizzly bears in the area can also affect harvest opportunities by sport hunters. Basic understanding of the population dynamics, habitat use, and potential impacts of oil and gas exploration and development are necessary to manage this bear population.

Two major effects of oil field exploration and development have been identified (Shideler and Hechtel 2000): 1) attraction to anthropogenic food sources due to improper food or garbage storage, and 2) disturbance of denning grizzly bears during winter off-road exploration, construction, and transportation activities. Food-conditioning has resulted in direct postweaning mortality due to grizzly bears killed in conflict situations. Although subadult mortality has been high, some cubs born to food-conditioned females have been weaned and may survive in the study area without getting into conflicts.

Disturbance of denning bears has occurred, although circumstances have not allowed a direct measure of population effects. Several methods to detect denning polar bears (*Ursus maritimus*), such as airborne and ground-vehicle based imaging with Forward-Looking Infrared (FLIR) (Amstrup et al. 2004) and surveying potential den locations with trained scent dogs (Perham and Williams 2003; Shideler 2007; Shideler and Perham 2008) have been used to detect denning grizzly bears during informal investigations (Shideler, ADF&G, unpublished data). However, these methods could be more

effectively applied if they were used in concert with a method to predict where grizzly bear den habitat is likely to occur. A similar approach has been employed with polar bears (Durner et al. 2001, 2003, 2006).

II. REVIEW OF PRIOR RESEARCH AND STUDIES IN PROGRESS ON THE PROBLEM OR NEED

As background for application of FLIR technology to detection of grizzly bear dens, I reviewed the literature about use of FLIR for detection of denning polar bears. I have also reviewed publications about use of stable isotopes in diet analysis, methodology to collect DNA from hair snags, and application of biostatistics to resource selection. Den habitat and selection modeling will be based on data from characteristics of ~250 dens of marked bears inspected prior to this project.

III. APPROACHES USED AND FINDINGS RELATED TO THE OBJECTIVES AND TO PROBLEM OR NEED

OBJECTIVE 1: Develop a feasible program to detect denning grizzly bears within areas that may be affected by industrial winter activity.

The approach to this objective has 2 principal components: 1) evaluate various detection technologies on both simulated and real dens under a variety of environmental conditions, and 2) develop a den habitat probability map (e.g., high, medium, low) of the study area based on a den selection model applied to land cover mapping at a suitable resolution to detect den habitat. In a management application, the most feasible detection method(s) would be applied to one or more of the habitat probability categories that overlap a specific proposed winter exploration or construction activity (e.g., ice road or work pad, seismic program).

OBJECTIVE 2: Investigate changes in the grizzly bear population in the oil field region resulting from changes in putrescible waste management.

The approach to this objective has 3 principal components: 1) monitor the locations of radiomarked bears to detect changes in home ranges or movements associated with removal of the food-conditioned bears; 2) continue long-term analysis of DNA samples to determine genetic relationships; 3) monitor demographic characteristics of bears in the study area, especially fate of offspring of food-conditioned bears.

OBJECTIVE 3: Prepare annual reports, technical reports, presentations at scientific and public forums, and publish results in peer-reviewed journals.

Data analysis, report and manuscript preparation, and presentations are ongoing.

IV. MANAGEMENT IMPLICATIONS

Application of feasible methods to detect grizzly bear dens when applied to potential denning habitat encompassed by winter construction, transportation, and exploration projects will allow industry to avoid active grizzly bear dens. This will not only enhance the safety of workers but also reduce disturbance of denning bears that can affect winter survival of adults and cub mortality resulting from premature den abandonment. Continued monitoring of the fate of offspring of food-conditioned bears and identification of potential newly food-conditioned bears will allow us to understand the

long-term effects on the demographics, habitat use, distribution, and movements of the oil field region bear population in response to changes in putrescible waste management. From these results we can develop mitigation strategies that can be applied not only to ongoing management of the current and expanded oil development on the North Slope but also to other similar situations elsewhere.

V. SUMMARY OF WORK COMPLETED ON JOBS FOR LAST SEGMENT PERIOD ONLY

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

Accomplishments: We reviewed literature and consulted with biometricians about the best model approach to use, and searched literature and elsewhere for real-time and historical weather data. This task is ongoing. Timely access to a biometrician is critical to this job, and may require contracting outside the department due to the workload and priorities of the region IIII DWC biometrician.

JOB/ACTIVITY 1b: Field verify and revise model from new den locations

Accomplishments: We reviewed literature, researched the suitability of remote sensing products (e.g., IFSAR and LIDAR), conducted den inspections, and flew a fall radiotracking flight to identify active den locations. IFSAR digital terrain models are available for the western third of the study area. LIDAR imagery is available for only a coastal swath through a portion of the existing oil fields and has yet to be converted to a format (e.g., digital terrain models) useful for mapping denning habitat. Land cover maps derived from LANDSAT imagery are available for the remainder of the study area but at a coarser scale than is desirable. For example, when we plotted the locations of 250 dens on the most recent land cover map available, we found that 62% of the dens were in habitat types that are unsuitable for denning (e.g., lakes, flooded meadows and other wetlands). Grizzly bears are apparently selecting well-drained microhabitats within the broader mapped habitat type.

We inspected 2 dens of marked bears in FY10 before an unseasonably early and persistent snowfall obscured evidence of the dens. During fall 2009 radiotracking flights we identified putative den locations of 33 marked bears. These dens will be inspected in FY11 after snowmelt. Because operational funding did not become available until late summer, we were unable to begin field verification at the optimal time of year—i.e., after persistent drifts have melted out but before initiation of snowfall.

JOB/ACTIVITY 1c: Evaluate den detection methods

Accomplishments: We selected 7 putative dens within 48 km of the permanent road-ice road system for detection tests with the airborne and hand-held FLIR imagers and scent dogs. Originally, we planned to use the same helicopter flight for the airborne and hand-held FLIR imagers and to survey each den aerially first, then land and use the hand-held FLIR imager. We were unable to obtain any FLIR images, as extreme weather grounded us the entire period of the survey. Winter 2009–2010 was unusually poor for flying, with frequent whiteouts and storms followed by extremely cold temperatures throughout the winter. In winter 2010–2011, we will use the Hagglunds over-snow vehicle to survey dens with the hand-held FLIR imager, but airborne operations will still

be subject to weather and daylight limitations. Although the FLIR surveys were unsuccessful, insights from these operations will contribute to the feasibility analysis of these methods. In addition, we have obtained several FLIR images of dens that were taken incidentally to other studies and we will evaluate these as well.

We surveyed 5 putative den sites with trained scent dogs. Dogs alerted at all 5 locations. We were unable to survey 2 other dens that we had initially selected. One den was partially open at the time of the survey so we abandoned that attempt due to concerns about personnel and dog safety and bear disturbance. The other den was located very near an ice road to a nearby village, and we were concerned about the security of the den if we created a snowmachine trail to the den. In midsummer 2010 we will inspect the 5 dens surveyed by the dogs, and measure the precision of the dog's alerts. Although use of scent dogs has its own set of constraints, the technique was more effective in a much broader set of weather conditions than the hand-held and airborne FLIR.

JOB/ACTIVITY 1d: Construct and instrument simulated den
Accomplishments: We constructed the artificial den prior to freeze-up, and in November installed the heater to mimic the heat emitted by a denning bear and the thermistors in the den's interior and at the adjacent ground surface. We removed the equipment in May. Based on the data downloaded from the thermistors, the heater worked acceptably. We intend to compare the den interior and ground surface temperatures with the hand-held and airborne FLIR images obtained during winter.

JOB/ACTIVITY 2a: Prepare grizzly bear DNA specimens for analysis
Accomplishments: We collected tissue samples from each of the 11 bears captured during FY10. These, along with specimens of bears captured in summer 2010, will be submitted to the genetics lab at the conclusion of our FY11 capture season. We will compare the individuals from these new captures with the 145 individuals previously analyzed on the project. Although one objective is to identify the fate of offspring of previously food-conditioned bears, we will also be able to confirm the spatial and genetic identity of maternal "clans" in our study area.

In addition to collecting samples from captured bears, we established 10 hair traps on poles around the periphery of the oilfield infrastructure in order to qualitatively assess our success in capturing bears that use the oil field. These hair samples will also be submitted to the genetics lab at the end of the FY11 summer field season.

JOB/ACTIVITY 2b: Capture bears and replace radio collars
Accomplishments: Because operating funds did not become available until August, the field season was truncated. However, we were able to replace collars on 4 adult females and 1 subadult female, capture 1 adult female with cubs and 4 subadult males that had not previously been captured, and recapture 2 adult males that had shed their collars 4–5 years ago.

JOB/ACTIVITY 2c: Analyze grizzly bear tissue for stable isotopes
Accomplishments: We collected hair and blood samples from all bears captured in FY10 and selected additional hair specimens from previously captured individuals. At the conclusion of the summer field season we will submit these samples, along with samples from the FY11 field season, to the University of Alaska Fairbanks Stable Isotope Laboratory for analysis of C and N isotopes.

JOB/ACTIVITY 4: Data analysis and reporting
Accomplishments: We entered capture data, den inspection data, genetic data, and weather data into Microsoft Access™ databases and Microsoft Excel™ tables.

VI. PUBLICATIONS

None.

Literature Cited:

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SHIDELER, R. T., AND C. J. PERHAM. 2008. Survey of maternal polar bear den habitat between Kaktovik and the KIC Well No. 1, February 2008. Unpublished report to Marsh Creek LLC, Anchorage, Alaska by Aklaq Services and U.S. Fish and Wildlife Service-Marine Mammals Management.

VII. RECOMMENDATIONS FOR THIS PROJECT

For much of the study area, a major limitation is lack of digital terrain and land cover mapping at a resolution sufficient to identify microhabitat used for denning. Technical requirements and cost prevent direct collection of this imagery by this project. However, we will recommend that collection of such imagery be pursued through collaborative efforts such as the North Slope Science Initiative.

The FY09 report recommended increased focus on bears using the northeastern portion of the study area due to proposed development of the Point Thomson natural gas development. Because of delays in receiving operating funds in FY10 we were unable to expand capture operations to include that area. We recommend including that area in such operations in FY11.

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