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: W-33 **Segment Number:** 10

PROJECT NUMBER: 4.39

PROJECT TITLE: Grizzly and black bear distribution and abundance relative to the 2004 wildfires in eastern Interior Alaska: Possible intensive management consequences

PROJECT DURATION: 1 July 2008–30 June 2014

REPORTING PERIOD: 1 July 2011 – 30 June 2012

REPORT DUE DATE: 1 September 2014

PRINCIPAL INVESTIGATOR: Craig L. Gardner, ADF&G; ADF&G coauthors: Kalin A. Kellie Seaton, Brian D. Taras, and Nathan J. Pamperin

WORK LOCATION: Game Management Unit 20E, Fortymile River drainage

I. PROGRESS ON PROJECT OBJECTIVES DURING LAST SEGMENT

OBJECTIVE 1: Determine the following trends relative to the 2004 wildfires in Unit 20E: 1) grizzly bear population size and distribution and possibly, predation on moose calves, 2) moose population size, composition, and trend, and if possible, 3) black bear population size and distribution and possibly, predation on moose calves. Develop an intensive management strategy that incorporates findings from this research.

During July 2008–June 2011, we have confined the study to evaluating grizzly bear population size and distribution relative to the 2004 wildfires. To meet this objective, we deployed 13 GPS radio collars on 10 female (2 recollars) and 1 male and 2 VHF collars on 2 males grizzly bears and monitored movements and distribution and continue to model the mark-recapture data collected in 2006. We discontinued collaring males after FY09 because 0 of 3 collars deployed on adult males lasted >1 month before radio structural failure. The GPS radiotransmitter projected operational life is 2 1/2 years but only 3 of 13 have gone to term. Because the quality of the radios was not adequate to meet project objectives, we temporarily terminated that job and did not collar during FY12. During FY12, we evaluated the effects of dependent bears in family groups on population and variance estimates and how these effects can be minimized by sampling methods by expanding the genetic analysis of the 2006 data by extending the genotypes to 23–markers (including the gender marker). We used the software PARENTE (Cercueil et al. 2002) to conduct a parentage analysis which uses allele frequencies, predicted error rates, mutation rates, and gender to assign a probability that for any pair of individuals they are parent and offspring. Further during FY12, we developed a study plan to conduct a DNA-based mark/recapture population estimate of grizzly bears during FY14 in the 2006 study area. Study

design changes included increased survey intensity by reducing the size of the sample units from 49 km^2 to 36 km^2, increasing the number of sample periods from 4 to 5 and to move the traps between all sessions instead of once between the second and third periods. We predict these changes will increase the capture rate and improve the precision of the population estimate. The proposed study was not approved due to fiscal restraints.

II. SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN THIS PERIOD

JOB/ACTIVITY 1A: Literature review.
I conducted monthly literature reviews.
Federal funds were used to pay Craig Gardner's salary while working on this activity. On a monthly basis, I conducted a literature search for information on bear DNA-based mark-recapture population estimate techniques and analyses and on grizzly and black bear seasonal movements and habitat use. I have acquired numerous publications that will be incorporated into the manuscript we are currently preparing reporting the results from the 2006 DNA-based mark-recapture grizzly bear population estimate study.

JOB/ACTIVITY 1B: Revisit study design.
I revised the 2006 DNA-based mark-recapture population estimate study design to incorporate recent improvements in sampling methods and analyses.
Federal funds were used to pay for Craig Gardner's salary while working on this activity. After review of the literature, results of model simulations, and movement data collected during the past 3 years, we adjusted our original 2006 study design by increasing survey intensity to increase capture probability, reduce capture heterogeneity and to improve modeling precision. Our changes included reducing sample unit size to 36 km^2 from 49 km^2, increase the number of sample periods from 4 to 5, reduce the length of the sampling period from 14 days to 10, and to move traps between each session.

JOB/ACTIVITY 1C: Deploy GPS radio collars on female adult grizzly bears and purchase of additional collars.
Purchase and deploy GPS radiocollars on adult female grizzly bears.
No federal funds were expended on this activity. We did not proceed because the GPS collars used did not perform adequately to answer our research questions.

JOB/ACTIVITY 1F: Radiotrack collared bears and upload location data.
Federal funds were used to pay for tracking flights. We flew 5 tracking flights to upload movement data and to verify family status. Four radio collars were active during July–August 2011 and 3 during May–June 2012 all on adult females. For each individual bear, I uploaded GPS data as well as obtained a visual observation to monitor association, i.e., with cubs, yearlings, or 2-year-olds or with an adult male. Three of the 4 bears during May 2011 had cubs; 2 of these females lost their offspring prior to August 2011. One of the radio collars was functioning following den emergence during May 2012 and all 3 of her cubs survived.

JOB/ACTIVITY 1G: Data analysis and reporting.
We completed preliminary data analysis and presented our methods at the 2012 International Statistical Ecology Conference in Krokkleiva, Norway.

Below is the abstract of our presentation at the conference:
As part of a program to reduce predation on moose (*Alces alces)* calves, we conducted a DNA capture-recapture study to estimate grizzly bear (*Ursus arctos*) density in a remote and forested 10,552 km^2 area of Interior Alaska. We divided a 5,194 km^2 study area into 106 7×7 km units, within which we maintained 1 lure-baited hair trap during each of the 4–14 day sampling periods. We moved all traps mid-study. The system lacked geographic closure and the potential for bias was exacerbated by large home ranges. Using a combination of the Huggins-Pledger and Pradel models did not provide a reliable "core density." Thus we used spatially explicit capture-recapture (SECR) methods, which directly estimate density, employing both Bayesian (WinBUGS) and maximum likelihood (R-package "secr") estimators. We modeled home range center density as the intensity of an in homogeneous poisson process. From this, we demonstrated that grizzly bear distribution was three times greater in unburned areas relative to those recently burned. The top (AICc) SECR models accounted for heterogeneity in both detection probability and home range size. Accommodating heterogeneity increased the density estimate by one-third and doubled its SE. We recommend design modifications and explore, through simulation, bias induced by dependent observations (Taras and Gardner 2012, abstract).

IV. PUBLICATIONS
Preliminary results presented at the July 2012 International Statistical Ecology Conference in Norway.

V. RECOMMENDATIONS FOR THIS PROJECT
Continue to request funding to repeat the mark-recapture grizzly bear population estimate in the 2006 study area.

PREPARED BY: Craig L. Gardner

DATE: 8 August 2012