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

**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

**REPORT PERIOD:** 1 July 2009–30 June 2010

**REPORT DUE TO HQ:** 1 September 2010

**PRINCIPAL INVESTIGATOR:** Craig L. Gardner

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

## I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

Area managers of ADF&G's Division of Wildlife Conservation identified the following research needs for the intensive management area in Unit 20E: 1) better understanding of the effects of habitat quality and predation on moose population trends; in particular the importance of grizzly bear (*Ursus arctos*) predation on moose (*Alces alces*) calves in hunter accessible areas; 2) delineate grizzly bear temporal and spatial use of those areas; and 3) evaluate grizzly bear habitat use in space and time relative to landscape disturbances caused by the 2004 wildfires. This information is necessary to interpret results of an ongoing intensive management program and pertinent for designing future intensive management actions to meet moose and caribou population and harvest objectives in Unit 20E and other areas of Interior Alaska.

Understanding habitat and human use factors that influence grizzly bear and possibly black bear (*Ursus americanus*) distribution and abundance are fundamental in developing adaptive management programs in Interior Alaska. Grizzly bears have the ability to occupy a variety of habitats resulting in almost a continuous spatial occupation of ranges (Apps et al. 2004) but distribution can change due to changes in habitat. The spatial structure of a grizzly bear population has direct bearing on its role as a predator. During summer 2004, wildfires disturbed 31% of the area within the Upper Yukon-Tanana Bear Control area (UYTBC) and grizzly bear numbers and distribution during 20 May–19 July 2006 appeared to be reduced within the burn area (Gardner et al., ADF&G, unpublished data). In order to design future grizzly bear and moose management programs in that area and possibly in other areas in the Interior prone to wildfire, we need to comprehend bear and moose population and distribution reactions and trends relative to wildfire.

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

During 20 May–19 July 2006, we applied DNA-based mark–recapture hair-trap sampling in a portion of the UYTBC with the primary objectives: 1) determine the abundance and spatial distribution of grizzly bears, and 2) identify relationships between grizzly bear distribution and various environmental and human-developed parameters. We estimated the grizzly bear superpopulation in the control area to be 76.2 (63.9–107.6; cv = 13%). We found that grizzly bear distribution was not uniform across the area. The area disturbed by the 2004 wildfires no longer supported grizzly bears and the density outside of the burn (20.8/1000 $km^2$; cv = 10%) appeared to be higher then what was found during the mid–1980s (13.7/1000 $km^2$) by Boertje et al. (1987). We evaluated the relationship between grizzly distribution and landscape variables and found that grizzly bear use of the control area was best explained by burn disturbance and not by terrain roughness, elevation, or other landscape features more associated with grizzly bear persistence in other areas (Apps et al. 2004).

In contrast to the 2006 grizzly bear data, moose use of the area impacted by the 2004 wildfire during May and June has continued; verified during twinning surveys (Jeff Gross, ADF&G, personal communication). Positive effects of wildfire or prescribed burning on moose have been hypothesized by Schwartz and Franzmann (1989) and Boertje et al. (1992) but the mechanisms of how fire disturbance may work are not known. By studying grizzly bear distribution and predation on moose relative to 2004 wildfire disturbance, we could answer current questions concerning the viability and importance of fire as a method of controlling predation thereby benefitting future management decisions.

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

OBJECTIVE: Determine grizzly bear population size and distribution relative to the 2004 wildfires in Unit 20E.

During FY10, I focused on determining grizzly bear seasonal movements and distribution. These data will be used to evaluate grizzly bear use of wildfire impacted habitats and to design sampling protocol for a future DNA-based mark–recapture population estimate in the study area.

To monitor seasonal movements and distribution, I deployed 3 GPS radio collars, 2 on adult females and 1 on an adult male during July 2008, 4 GPS collars on adult females during May 2009, and 4 GPS collars on adult females during June 2010. I also deployed 2 VHF radio collars on adult males, 1 during May 2009 and 1 during June 2010 to aid in finding adult females during the breeding season.

The GPS collars record the bear's location once every 1 1/2 hours between 15 May and 15 October. I can upload the data while flying over the radiocollared bear in a fixed-winged aircraft. I conducted data retrieval flights once every 2–3 weeks. The data

are also stored on board the collars. The collars shut off during 16 October–14 May to save battery life. The GPS radio-transmitter's projected operational life is 2 1/2 years. Two of the GPS collars (1 on male) have failed prematurely and have been retrieved. One of the VHS collars fell off during June 2009 and was retrieved. At the end of FY10, I had 8 operating GPS collars all on adult females and 1 operating VHS collar on an adult male.

I have not evaluated grizzly bear use of habitats affected by the 2004 wildfires. I did determine grizzly bear movement patterns for 5 female bears by 2-week periods during 20 May and 20 July 2009. This period corresponds to the sampling period used during the DNA-based mark–recapture grizzly bear population estimate study conducted in 2006. Female grizzly bears accompanied by cubs ($n$ = 2) had home ranges 10.7 $km^2$–39.6 $km^2$ during the 2-week periods. This finding is important because the sample unit size used during the 2006 study was 49 $km^2$ meaning that it is possible that females with cubs may not have been available for sampling.

## IV. MANAGEMENT IMPLICATIONS

Following 2 years of study, I have used study results to improve the models used to estimate grizzly bear numbers and to design DNA-based mark–recapture population estimate studies. Grizzly bear habitat use and distribution will be analyzed as sample sizes become adequate.

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

Federal funds were used to pay my salary while working on these tasks.

JOB/ACTIVITY 1a: Literature review
**Accomplishments:** On a monthly basis, I conducted a literature search for information on grizzly bear habitat use, food habits, seasonal movement patterns, and DNA-based mark–recapture population estimate techniques and statistical analysis. I have acquired numerous publications that are being used to help focus my research questions and to develop methodologies.

JOB/ACTIVITY 1b: Study design
**Accomplishments:** I consulted with 2 biometricians in project design and sampling protocol. Study design for the DNA-based mark–recapture population estimate component of the study is still ongoing as advances are made in modeling and as I learn more about movement patterns using GPS radio collars.

JOB/ACTIVITY 1c: Deploy GPS radio collars on male and female adult grizzly bears and purchase of additional collars
**Accomplishments:** I deployed 3 GPS radio collars, 2 on adult females and 1 on an adult male during July 2008, 4 on adult females during May 2009, and 4 on adult females during June 2010. Based on results from this study and others, I will no longer deploy

GPS radio collars on males because in most cases the radios are shed and destroyed by the male within a month of deployment.

JOB/ACTIVITY 1d: Acquiring bait for future DNA-based mark–recapture study
**Accomplishments:** I collected fish and cow blood to use as bait, however, I used it to conduct another study because the DNA-based mark–recapture study is not planned to occur until at least FY12.

JOB/ACTIVITY 1f: Logistical support (Radiotrack collared bears; aerial truth fire maps)
**Accomplishments:** I radiotracked collared bears once every 2 weeks. I did not complete the aerial surveys to truth the existing fire maps.

JOB/ACTIVITY 1g: Data analysis
**Accomplishments:** Most of my effort was directed toward working with department programmers in developing a database storage system for a large and increasing data set that includes programs for data retrieval, maintenance, and analyses. Furthermore, I analyzed movement data to assist in designing the future DNA-based mark–recapture population estimate study and to assist analyses and models for the 2006 estimate.

## VI. PUBLICATIONS

None.

Literature Cited:

APPS, C. D., B. N. MCLELLAN, J. G. WOODS, AND M. F. PROCTOR. 2004. Estimating grizzly bear distribution and abundance relative to habitat and human influence. Journal of Wildlife Management 68:138–152.

BOERTJE, R. D., W. C. GASAWAY, D. V. GRANGAARD, D. G. KELLEYHOUSE, AND R. O. STEPHENSON. 1987. Factors limiting moose population growth in Subunit 20E. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Job 1.37R. Project W-22-5. Juneau, Alaska, USA.

BOERTJE, R. D., D. G. KELLEYHOUSE, AND R. D. HAYES. 1992. Methods for reducing natural predation on moose in Alaska and Yukon: an evaluation. Pages 505–512 *in* Ecology and conservation of wolves in a changing world. L. N. Carbyn, S. H. Fritts, and D. R. Seip, editors. Published Canadian Circumpolar Institute, University of Alberta, Edmonton, Alberta, Canada.

SCHWARTZ, C. C., AND A. W. FRANZMANN. 1989. Bears, wolves, moose, and forest succession, some management considerations of the Kenai Peninsula, Alaska. Alces 25:1–11.

## VII. RECOMMENDATIONS FOR THIS PROJECT

Maintain at least 8–10 GPS radio collars on female grizzly bears. Ensure that adequate funding is obtained to complete the DNA-based mark–recapture study in FY12.

4.39 Grizzly and black bear distribution and abundance relative to the 2004 wildfires in eastern Interior Alaska: Possible intensive management consequences
FY10 Progress Annual Report

**Prepared by:** Craig L. Gardner

**Date:** 12 August 2010