

**ARIZONA GAME AND FISH DEPARTMENT
HABITAT PARTNERSHIP PROGRAM
HABITAT ENHANCEMENT AND WILDLIFE MANAGEMENT PROPOSAL**

PROJECT INFORMATION

Project Title: Mountain Lion Management in SW AZ (minimum population size, food habits, connectivity patterns, prey species-BS, MD response)

Project No. 09-406

Region/GMU: Region 4

HPC: Yuma

Project Type: Management

Project Description: This project will partner with the University of Arizona and the U.S. Fish and Wildlife Service (USFWS) to continue and expand non-invasive genetic research that has been completed to date from May 2008 on felids at the Kofa National Wildlife Refuge (Kofa NWR) to a regional level – the area bordered by the Colorado River on the west, Interstate 10 on the north, the Tohono Nation on the East and Mexico on the south. The results from this project will provide the AZGFD and the USFWS with:

1. Estimates of minimum population size of mountain lions (*Puma concolor*) in the southwest region of Arizona and continual monitoring of mountain lion numbers on the southwest Arizona mountain complexes (During years 2009 - 2012)
2. Information on the source population(s) for mountain lions recently identified on the Kofa NWR mountain complexes and potential mountain lion movement/dispersal corridors connecting to the Kofa mountain complexes
3. Estimates of relatedness of individual mountain lions recently identified on the Kofa mountain complexes to the larger regional (defined below) mountain lion populations.
4. Mountain lion diet profiles and estimates of food habits such as seasonal prey selection (if any detected) by individual mountain lions identified in the southwest Arizona region mountain complexes.
5. Determine the affects of management actions involving the removal of mountain lions from the project area.

With the recent decline in desert bighorn sheep (*Ovis canadensis mexicana*) numbers on the Kofa NWR, predation by mountain lions has become a primary concern and is suspected as being the major cause of the decline. Kofa NWR has made significant progress in assessing its own mountain lion populations, but little is known about how they are related to mountain lions outside the refuge boundary. This information is necessary to investigate patterns of ingress/movement of mountain lions between the Kofa NWR and surrounding mountain complexes in the southwest Arizona region. The results from current studies involving camera trap detection, GPS-collar radio-tracking and scat DNA analysis, have demonstrated the need for expansion of this work to the surrounding areas. There is a critical need for continued information on the abundance of mountain lions and their food habits on the refuge and movements into the refuge to make decisions on mountain lion management within a regional context, since predator management actions have consequences that extend beyond the boundaries of the refuge.

Information obtained from the proposed study will be essential for the new Comprehensive Conservation Plan, scheduled for 2011. This study, in conjunction with other mountain lion population studies in northern, central and southeastern Arizona, will provide the AGFD and the USFWS with an estimate of current population numbers and genetic status of mountain lions throughout Arizona. The results from the ongoing study on Kofa have shown promise for being applied region- and even state-wide as a non-invasive genetic method to survey and manage a notoriously elusive species and to provide concrete data unobtainable by traditional survey methods. Mountain lion management has become a primary management issue in the southwestern region of Arizona, and the information on source populations, movements, and relatedness provided by this study will be critical to regional predator management decisions. This study also contributes to objectives in the 2007 Investigative Report and Recommendations for the Kofa Bighorn Sheep Herd, which are to identify causes and

extent of predation on bighorn sheep.

Wildlife Species to Benefit: Desert bighorn sheep, mule deer and mountain lion. Agencies will use information from this study to draft and implement management action plans focused towards the benefit of the highly vulnerable bighorn sheep and mule deer population on Kofa NWR as well as sheep and mule deer populations in surrounding areas. Control of mountain lion populations can be directed towards source populations identified rather than at sink populations. One of the sink populations is presumed to be the recently documented mountain lions on Kofa NWR and surrounding mountain complexes in southwest Arizona. The proposed study also aims to aid in the species-specific approaches outlined in the Game Subprogram (Wildlife Program) drafted by the AZGFD in 2007 -- #3 (Pg. 9 of 20), and #s 3, 4, 7 (Pg. 11 of 20).

Possible Funding Partners:

Implementation Schedule:

Beginning: Began May 2008

Completed: Reports due June 2010, 2011, 2012

NEPA Compliance: (if applicable)

Completed: Yes ___ No ___

Projected Completion Date:

PROJECT FUNDING

SBG Funds Requested: \$ 72,142 (70% BHS, 30% Deer- that is \$24,047 total year each year (\$14,428/yr for DBS and \$7,214/yr for Mule deer for each of 3 years)

Cost Share Funds: \$ 206,057

Total Project Costs: \$ 278,200

PARTICIPANT INFORMATION

Applicant: Melanie Culver

Telephone: 520-626-3775

Address:

UA Wildlife and Fisheries Program
 325 Biosciences East,
 Tucson, AZ 85721

AGFD Contact and Phone No.: Ron Thompson, 623-236-7354 (If applicant is not AGFD personnel)

Coordinated with:

Date:

Applicant's signature:

QuickTime™ and a decompressor are needed to see this picture.

Date: 08/19/2009

SEND COMPLETED APPLICATIONS TO:

**Game Branch
 AZ Game and Fish Dept.
 5000 W. Carefree Highway
 Phoenix, AZ 85086**

WAS PROJECT PRESENTED TO THE LOCAL HPC? YES NO

HAS PROJECT BEEN SUBMITTED IN PREVIOUS YEARS? IF SO WAS IT FUNDED?

No, Phase-I of this project, obtaining minimum population size estimate and diet profiles of mountain lions and bobcats on the Kofa NWR, was funded by the USFWS-SPP program through December 2009 (\$71,000). Phase II, examining the regional population of mountain lions, has not been previously submitted or funded.

NEED STATEMENT/PROBLEM ANALYSIS:

This study is considered a priority within Arizona as there has been a scarcity of data on mountain lion populations in the area of this study for the past decade or more. Obtaining a population size estimate and connectivity patterns for mountain lions in this region of Arizona will assist in the management of mountain lion populations existing among potentially vulnerable prey populations such as desert bighorn sheep and desert mule deer. Preliminary data on mountain lion diet and minimum population size have been obtained through scat DNA analyses, however, additional funding will be required to obtain data at a regional scale and perform a relatedness analysis of mountain lion genotypes. Such data would be used to identify patterns of mountain lion movement (ingress/egress) and map movement/dispersal corridors connecting the southwest Arizona region mountain complexes and surrounding mountain complexes.

PROJECT OBJECTIVES:

1. Estimate minimum population size of mountain lions in the area bordered by the Colorado River on the west, Interstate 10 on the north, the Tohono Nation on the East and Mexico on the south and continually monitor mountain lion numbers over a span of 3 years (2009 – 2012)
2. Generate relatedness (including parentage and kinship) estimates through a comparison of the genotypes of recently identified individual mountain lions on the Kofa mountain complexes mountain lions with those of proximal mountain lion populations obtained in Arizona, California and Mexico.
3. Identify the geographic locations of mountain lions most closely related to those recently identified on the Kofa mountain complexes, and map mountain lion movement/dispersal corridors connecting mountain complexes in southwest Arizona.
4. Generate mountain lion diet profiles and estimates of food habits such as seasonal prey selection (if any detected) by individual mountain lions identified in the southwest Arizona region mountain complexes.

PROJECT STRATEGIES:

During Phase-I of this project, reference biological (DNA) samples were collected from representative locations in Arizona and are currently in possession by the Conservation Genetics Laboratory in the School of Natural Resources at the University of Arizona, Tucson. These samples were collected in locations that include mountain lion habitat within an approximate 300 mile radius from the Kofa NWR. Scat samples from mountain lions have been collected extensively throughout Kofa NWR mountain complexes since Fall 2008. Scat collection has been opportunistic but will be supplemented by a randomized sampling design based on prey reproductive cycles that fall within the planned study period: 2009-2012. Mountain lion scat samples will also be collected from new areas from which we do not have reference DNA samples. These areas include mountain ranges in southern California and to the north and south of the refuge – Plomosas, Harcuvar and Harquahalas, Black Mountains, Cabeza Prieta NWR, Gila Bend Mountains and Pinacate Biosphere Reserve (Mexico). AZGFD wildlife managers and interns have contributed scats from these areas and will continue to do so in support of this project. To maximize our final yield of usable DNA from the scat samples and obtain a relatively large sample size, collection will be maintained continuously throughout all biological seasons (year-round). Outlined below are the field and laboratory methods:

Field Data Collection: All scats found suspected to be of mountain lion origin will be collected based on a standard field collection protocol for downstream DNA analyses (see attached). Sampled locations will be recorded using handheld GPS units along with time, date and habitat type details for mapping purposes after DNA analysis. Mapping details would include confirmed individual mountain lion locations, habitat use and

potential movement patterns. Scat samples collected will be dried and frozen as soon as possible to prevent any further DNA degradation and transported to the laboratory.

Laboratory Analysis: DNA will be extracted from epithelial cells on the surface of the scat samples, PCR amplification using mitochondrial DNA markers, will be sequenced to confirm species identification. Once identified, DNA from mountain lion scat samples will be PCR amplified using microsatellite DNA markers to generate individual genotypes. All genotypes obtained will be analyzed for relatedness and kinship using microsatellite data analysis software. A best estimate of gene flow across the compared populations and/or sub-populations will be obtained at the end of the analysis. Genotypes obtained exclusively from Kofa NWR mountain complexes will be put through rarefaction analysis programs to come up with a minimum population estimate during each of the three years. DNA will also be extracted from prey remains, such as bone fragments found inside the scat samples, for identification of prey species. Scat components identified will be compared to a database divided into the biological seasons to estimate any seasonal variation in prey selection by mountain lions.

Mapping of potential movement corridors connecting Kofa NWR to the most closely related mountain lion populations will be carried out using a Geographic Information System that will make use of habitat maps and user-defined points to predict connectivity and movement patterns for mountain lions in a heterogeneous landscape.

Software packages that will be used for the above described laboratory analysis include CERVUS®, RELATEDNESS®, KINSHIP®, BOTTLENECK®, GIMLET®, ArcGIS® and CircuitScape®.

PROJECT LOCATION: Mountain complexes in the Kofa NWR and surrounding mountain complexes in southwest Arizona and southern California, including the Plomosas, Harcuvar and Harquahalas, Black Mountains, Cabeza Prieta NWR, Gila Bend Mountains, and Pinacate Biosphere Reserve (Mexico).

LAND OWNERSHIP AT PROJECT SITE (Please state specifically if PRIVATE PROPERTY and provide landowner's name): Federal land – USFWS and BLM

IF PRIVATE PROPERTY, IS THERE A STEWARDSHIP AGREEMENT BETWEEN THE LANDOWNER AND THE DEPARTMENT?

NA

HABITAT DESCRIPTION:

Sonoran and Mojave Desert

ITEMIZED USE OF FUNDS:

Attached as excel file (SW-Arizona Mountain lion Genetic Analysis Project Budget)

LIST COOPERATORS AND DESCRIBE POTENTIAL PARTICIPATION:

Ron Thompson, Big Game Habitat and Large Carnivore Biologist, Arizona Game and Fish Department, 5000 W. Carefree Highway, Phoenix, AZ 85086; rothompson@azgfd.gov. Role: Provides technical expertise and biological support for the project and serves as liaison between USFWS and AZGFD for statewide mountain lion management.

Bob Henry, Game Specialist, Region IV, Arizona Game and Fish Department, 9140 E. 28th St., Yuma 85365; bhenry@azgfd.gov. Role: Provides regional expertise in predator/prey data and ultimately responsible for management implementation during and after the duration of the project. Assists with project support and reviews final reports. Serves as the regional liaison between USFWS and AZGFD for big game management.

Lindsay Smythe, Wildlife Biologist, Kofa National Wildlife Refuge, U.S. Fish and Wildlife Service, 9300 E 28th St., Yuma, AZ 85365; phone: 928-345-4916; fax: 928-783-8611; Lindsay_Smythe@fws.gov . Role: USFWS project officer and contact.

Dr. Melanie Culver, Assistant Unit Leader, Arizona Cooperative Fish and Wildlife Research Unit, University of Arizona, 213 Bio Sciences East, Tucson, AZ, 85721; phone: 520/626-3775; fax: 520/626-8801; culver@ag.arizona.edu. Role: Principal investigator, USGS contact.

Kofa National Wildlife Refuge, 356 W. 1st St., Yuma, AZ, 85364; phone 928/783-7861; fax: 928/783-8611. Role: Will provide biological support and technical assistance to the research assistant for the project.

Arizona Game and Fish Department, Region IV, 9140 E 28th St., Yuma, AZ 85365; phone 928/341-4041; fax 928/343-0730. Role: Has provided \$9000 of funding for DNA analysis of tissue samples from harvested mountain lions to examine relationships among mountain lions throughout the state of Arizona. Data from this study can be used to examine relationships and source populations of mountain lions in the southwestern region of Arizona, including Kofa NWR. Has also contributed scat samples obtained from areas surrounding the refuge.

PROJECT MONITORING PLAN:

NA

PROJECT MAINTENANCE:

AGFD along with the USFWS and University of Arizona will monitor mountain lion population estimates and progress of analysis towards mountain lion relatedness and movements. AZGFD will also meet with the USFWS, University of Arizona and partner funding societies on a monthly basis to ensure dissemination of information and adaptive management implementation.

PROJECT COMPLETION REPORT TO BE FILED BY:

The completed project report is due in June 2013, however bi-annual reports will be completed and provided to all partners including the HPC and will be filed by AZGFD Research Branch until the final report is completed.