Noninvasive Genetics
A Powerful Tool For Wildlife Management

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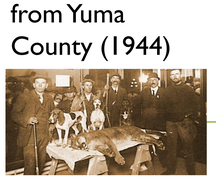
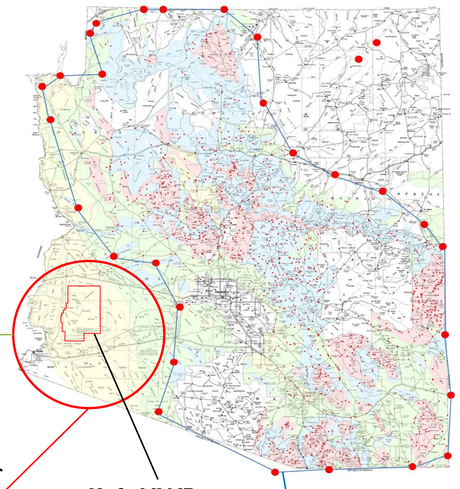
Recent records of mountain lions (*Puma concolor*) and concurrent declines in desert bighorn sheep (*Ovis canadensis mexicana*) on Kofa National Wildlife Refuge (Kofa NWR) in Arizona prompted investigations to estimate the number of mountain lions occurring there.

Hunter-killed mountain lion from Yuma County (1944)



The only record since 1903 on the Lower Colorado River



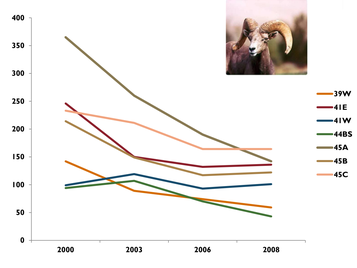
1944 – 2002

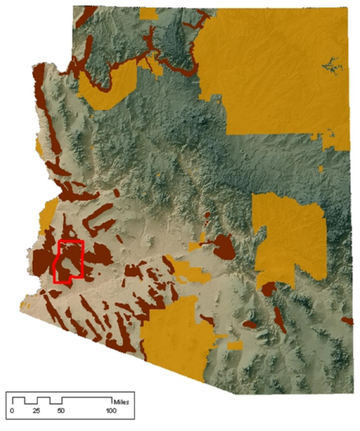
No records of mountain lions in southwestern Arizona

1981 – 2005

Records of hunter-harvested mountain lions in Arizona

Nearly 50% overall decline in desert bighorn sheep population size; based on aerial survey observation data in 7 game management units in SW Arizona





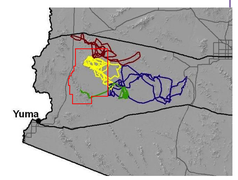
We performed noninvasive genetic analyses and identified species, individuals, and sex from scat samples collected from the Kofa and Castle Dome Mountains in Kofa NWR during 2006 – 2009.

1st mountain lion sighted nearly 60 years later during aerial survey for desert bighorn sheep on Kofa NWR, subsequently confirmed by tracks on the ground

Camera-traps revealed presence of at least 5 individuals

2003

2006 – 2009



4 individuals were captured and GPS-collared by 2009

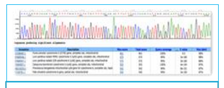
In light of the concern of predation by mountain lions on desert bighorn sheep, and future management of mountain lions in this area, two main questions needed answers:

How many mountain lions occurring on Kofa NWR?

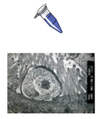
What are they eating?

From 105 scats collected, we identified a minimum of 11 individual mountain lions. These individuals consisted of six males, two females and three of unknown sex (Figure 1). Three of the 11 mountain lions were identified multiple times over the study period (Figure 2). We also identified 5 different prey species from bone fragments recovered from 51 of 54 mountain lion scats (Figure 3). We identified 5 different prey species of mountain lions.

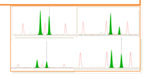
DNA extracted and analyzed from epithelial cells in carnivore scat samples



Mitochondrial DNA Sequencing – **Species ID**



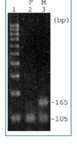
Nuclear DNA Genotyping – **Individual ID**



Number of individual mountain lions

2008 – 2010

X/Y Chromosome DNA Amplification – **Sex ID**



Diet of the mountain lions

DNA extracted from prey remains followed by DNA Sequencing – **Species ID**

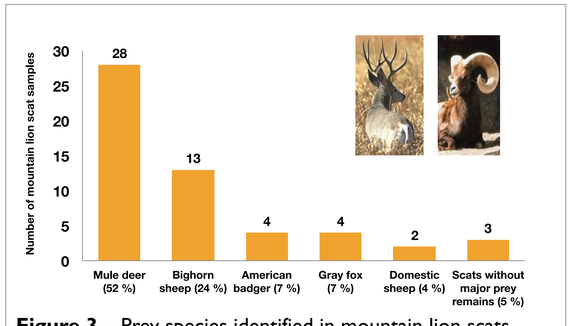


Figure 3 – Prey species identified in mountain lion scats

These estimates supplement previously recorded information on mountain lions in an area where they were historically considered only transient. We demonstrate that noninvasive genetic techniques, especially when used in conjunction with camera-trap and GPS-tracking methods, can provide additional and reliable information particularly for understanding the ecology and managing secretive species like the mountain lion.

105 scat samples collected (2007-09)
54 mountain lion, 12 bobcat, 3 coyote
11 individual mountain lions
6 males, **2 females** and 3 unknown sex

- **Species**
- **Individuals**
- **Sex**
- **Minimum Pop. Size**
- **Diet**

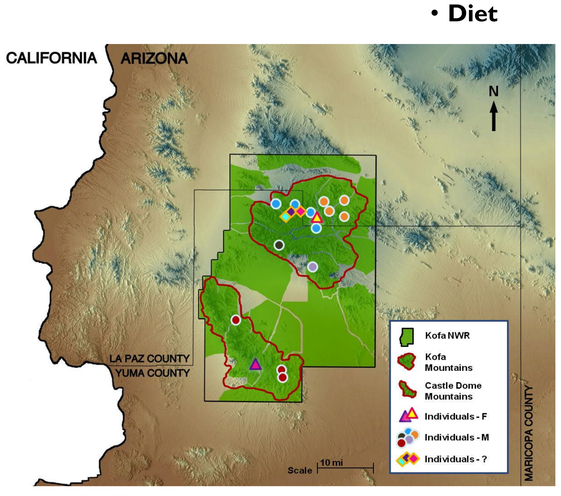


Figure 1 – DNA confirmed mountain lion scat locations. Dots of same color indicate collections from same individual.

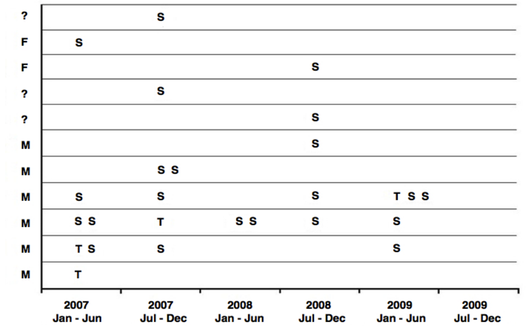


Figure 2 – Genetic captures of individual mountain lions listed by T = tissue samples from GPS-collared individuals, S = scat samples.