Welcome to the Conservation Lecture Series

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Questions? Contact margaret.mantor@wildlife.ca.gov
Lecture Schedule

- Spartina and California Clapper Rail, Dr. Donald Strong
  November 17, 1:00-3:00, Sacramento

- Foothill Yellow-Legged Frog and Stream Ecology, Dr. Sarah Kupferberg
  December 3, 1:00-3:00, Sacramento

- Rare Plants in Pine Hill, Dr. Debra Ayres
  January 22, 1:00-3:00, Sacramento

- Bighorn Sheep, Dr. Jeff Villepique
  February 4, 1:00-3:00, Ontario

- Tricolored blackbird, Dr. Robert Meese
  February 4, 1:00-3:00, Sacramento

- Invasive Watersnakes, Dr. Brian Todd
  March 12, 1:00-3:00, Sacramento

- White-nose Syndrome in Bats, Dr. David Wyatt
  April 14, 12:00-1:30, Sacramento
MOHAVE GROUND SQUIRREL
Xerospermophilus mohavensis
Land Ownership in MGS Country

- BLM land makes up 32% of MGS range
- Private land (31%) concentrated in the south near Lancaster and Victorville
- Military land makes up about 34% of the range
  - Since MGS is not federally listed, military bases are not strictly required to take conservation measures
History

- MGS first collected 1886 near Rabbit Springs in Lucerne Valley
- Very little attention until 1971 – then listed as Rare under California Endangered Species Act
- With re-authorization of CESA in 1986 it was changed to Threatened status
- Delisted by California Fish & Game Commission in 1993 – decision overturned by CA Supreme Court/no CEQA analysis
More History

- BLM’s West Mojave Plan set up an MGS Conservation Area in 2006
- Petition for federal listing submitted in 2005 by Defenders of Wildlife
- USFWS delivered their 12-month finding in Oct 2011
- They concluded that the MGS is not endangered or threatened in a significant portion of its range – a great relief to all!
Taxonomy

- First described as *Spermophilus mohavensis*, but the genus was split up in 2009
- Now the MGS is in the genus *Xerospermophilus* with the round-tailed ground squirrel (*X. tereticaudus*) and two other species
- MGS and the RTGS are sibling species, closely related and capable of hybridizing
- Their ranges meet near the Mojave River and on Fort Irwin
MGS Studies

- 1960 – Hudson & Bartholomew documented physiological / behavioral adaptations
- 1977 – Recht used radiotelemetry to study daily activity, diet, use of space
- 1980 – Aardahl carried out range-wide surveys
- 1988-1997 – Coso Grazing Exclosure Study
- Starting in 2001 – Endangered Species Recovery Program at CSU Stanislaus
Substrate Preferences

- MGS prefer fine-textured soils suitable for burrowing – these are usually found on alluvial surfaces
- MGS typically occur on alluvial fans, bajadas, and in basins and valleys
- They tend to avoid establishing home ranges on steep, rocky slopes
- Dispersing juveniles are known to move through rough terrain
Vegetation Communities

- MGS are widely distributed in major vegetation communities in western Mojave.
- Found in creosote bush scrub, saltbush scrub, Mojave mixed woody scrub, and blackbrush scrub.
- Seem to be most abundant in areas with higher diversity of shrubs and native forbs.
- Mojave mixed woody scrub seems to satisfy MGS requirements quite well.
Photos of habitat
Annual Cycle

- Active only in spring and early summer
- Males emerge about Feb 1
- Females about 2 weeks later
- Young born end of March (4 week gestation)
- Young weaned in early May (5 week lactation)
- Adult males enter dormancy first, then adult females, then juveniles
Winter Rainfall And Reproduction At Coso Sites

![Bar chart showing rainfall and reproduction at Coso Sites]


- **Rainfall in mm (Oct. 1-Mar. 31)**: 0, 25, 50, 100, 150, 200, 250

- **Legend**:
  - Non-reproductive Year
  - Reproductive Year
Adult Numbers at Coso

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Adult MGS Captured</th>
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<tbody>
<tr>
<td>1990</td>
<td>0</td>
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<tr>
<td>1995</td>
<td>20</td>
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<tr>
<td>2000</td>
<td>40</td>
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<tr>
<td>2005</td>
<td>60</td>
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<tr>
<td>2010</td>
<td>80</td>
</tr>
<tr>
<td>2015</td>
<td>100</td>
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Coso Basin
Cactus Peak
What MGS Eat

- Mohave ground squirrels feed almost entirely on plant material
- They utilize a number of species of herbaceous and perennial plants
- They feed on foliage, flowers, and seeds
- Diet shifts during the active season, as different resources become available
MGS Diet Study

- Diet data is from Coso study 1988-1996, based on microhistological analysis of 754 fecal samples
- About 37% of diet was shrub leaf, chiefly winterfat, spiny hopsage, and saltbush
- Native forbs were important too
- 8 plant species made up most of diet, out of 77 distinct food items detected
Winterfat
Spiny hopsage
Home Range and Dispersal

- HR for adult females is ~1-2 ha
- HR for adult males can be up to 100 ha in the breeding season (Feb-Mar)
- Juvenile dispersal occurs in late May-early June and is male-biased
- Although more young males move long distances, some females disperse up to 4-6 km
Surveying for MGS

- Visual and auditory surveys – not too effective
- Live-trapping – CDFW protocol trapping to determine presence/absence on development sites
- Trail cameras – first used in 2009, effective if bait used to attract squirrels
- Live-trapping vs. camera trapping – it depends on your objectives!!
CDFW Protocol Trapping

- Trap sites 3 times during active season
  March 15-April 15 – adults all active
  May 1-31 – juveniles trappable
  June 15-July 15 – natal dispersal complete
- Use 100 traps per 80 acres or per 1 mile on linear projects
- Trap each site for 5 days during each session
- Negative results (no MGS detected) are good for 1 year
Trapping as a Detection Method

- Protocol trapping is usually done in development areas where MGS are scarce.
- From 2003-2012, only 21 sites had MGS out of 543 trapped (3.8% positive).
- Low capture success has promoted the idea that MGS are hard to catch.
- Trapping for research surveys has been more successful – 102 sites positive / 259 total (39.4%).
- It helps to trap where MGS are present.
Camera Trapping

- Dave Delaney of US Army Corps of Engineers was prime mover introducing camera trapping to MGS studies in 2009
- After preliminary studies on Fort Irwin, we carried out an extensive MGS survey in 2011-2012
- Camera trapping detected MGS at 73 sites out of 123
Camera Advantages

- Detect MGS with roughly the same or greater effectiveness as traps
- Operators do not require special qualifications or experience
- Can be used in hot or cold weather with no danger to animals
- Document activity patterns during the day and behavioral interactions
Trapping Advantages

- Collect definitive demographic data: sex, age, reproductive condition
- By marking animals, gain an indication of abundance
- Trapping is essential to obtain tissue samples for genetic work or to radio-tag individuals
- It all depends on your objectives
Round-tailed Ground Squirrels

- They seem to be encroaching from the east – Lucerne Valley, Ft. Irwin, Hinkley
- At two sites west of Hinkley both species have been found together
- Genetic evidence of hybridization / hybrids may be capable of reproduction
- Is this a threat to genetic integrity of MGS?
What are Important Threats?

- Loss of habitat from urbanization, agriculture, energy facilities, other infrastructure?
- Habitat degradation from livestock grazing, OHV recreation, military training and testing?
- Natural drought events, anthropogenic climate change?
Renewable Energy Development

- State and federal mandates require massive development of solar, wind, and geothermal.
- Desert Renewable Energy Conservation Plan will attempt to expedite siting of RE while conserving desert biological resources.
- Draft plan is now out for comment with deadline of Jan. 9, 2015.
- There are a series of alternatives showing different arrangements of DFAs and reserve designs.
Conservation Measures

- Acquiring and managing conservation land in critical areas is the most effective approach.
- Restoration of degraded habitat is a very long-term undertaking and questionably effective.
- Translocation is very questionable and has never been demonstrated to be effective.
- Captive breeding is sometimes suggested, but MGS breed just fine in nature if given a chance.
References


THANKS TO ALL THE MGS SUPPORTERS

- California Department of Fish and Wildlife
- Bureau of Land Management
- US Army Corps of Engineers / CERL
- National Training Center / Fort Irwin
- Edwards Air Force Base
- China Lake Naval Air Weapons Station
- California Energy Commission
- California Department of Parks and Recreation
- Endangered Species Recovery Program / CSU Stanislaus
- Many, many desert biologists