Alternative Technique for Surveying and Monitoring Mohave Ground Squirrels

2010 Results

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DMG Meeting

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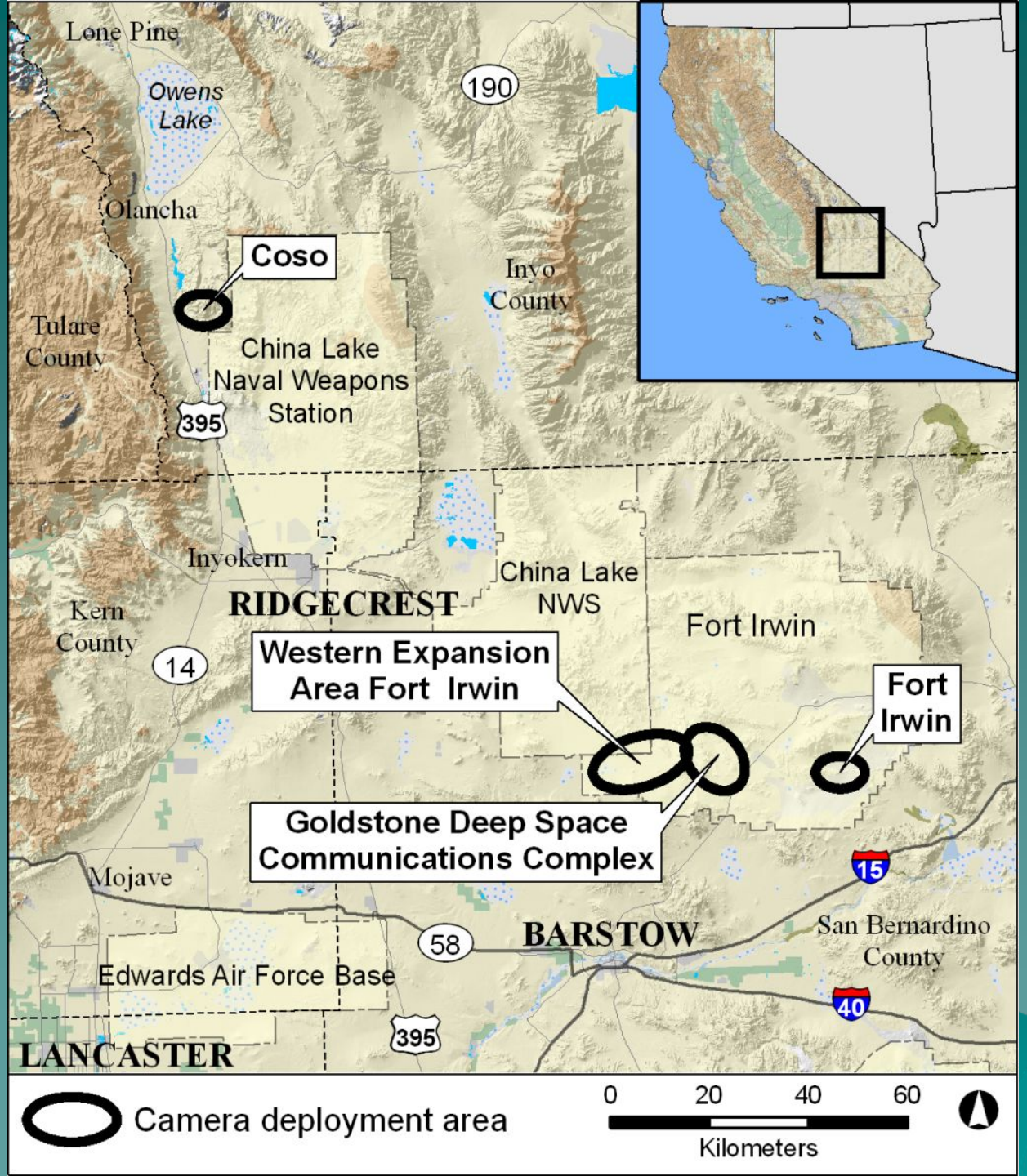
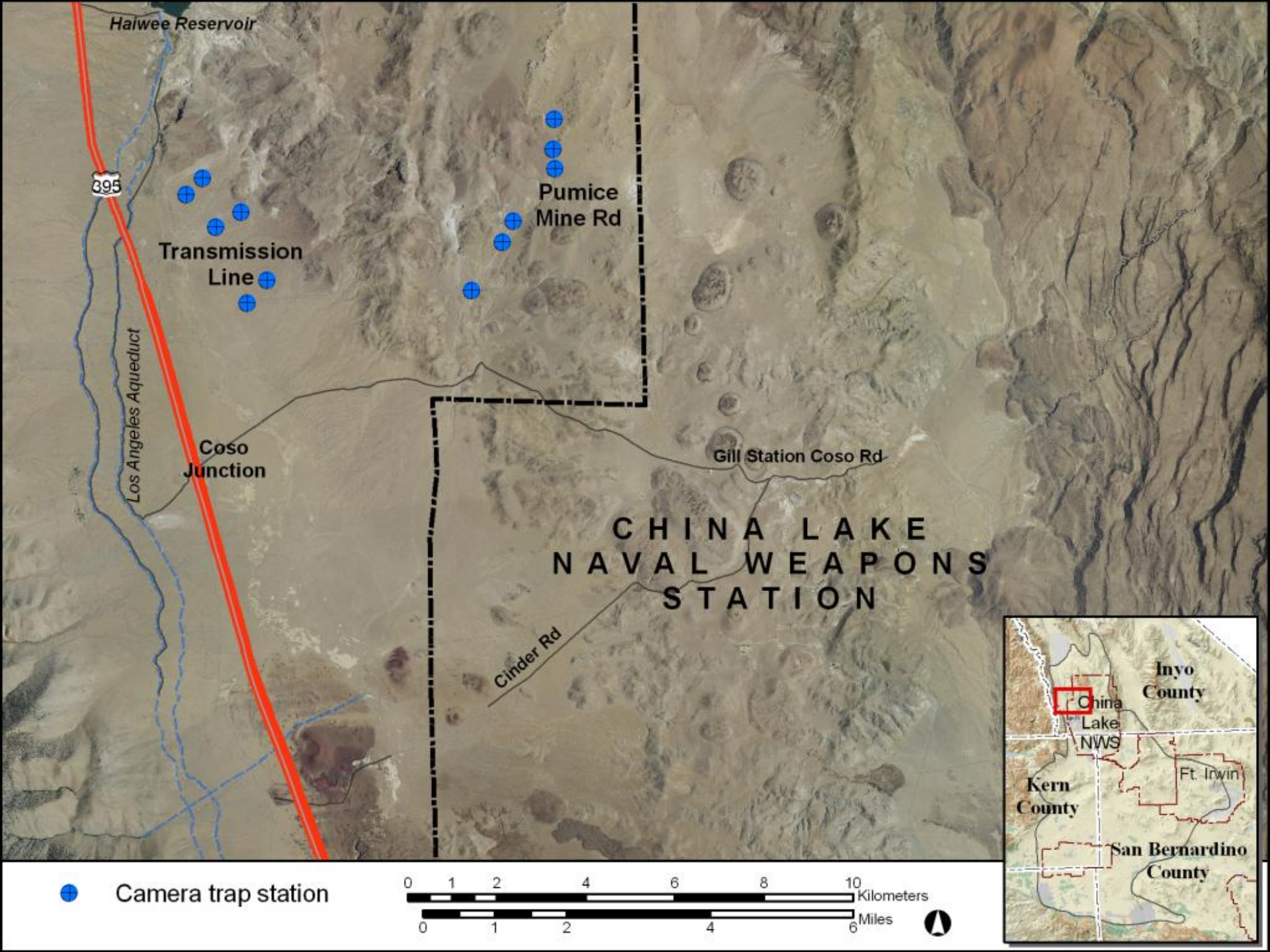
Study Objectives

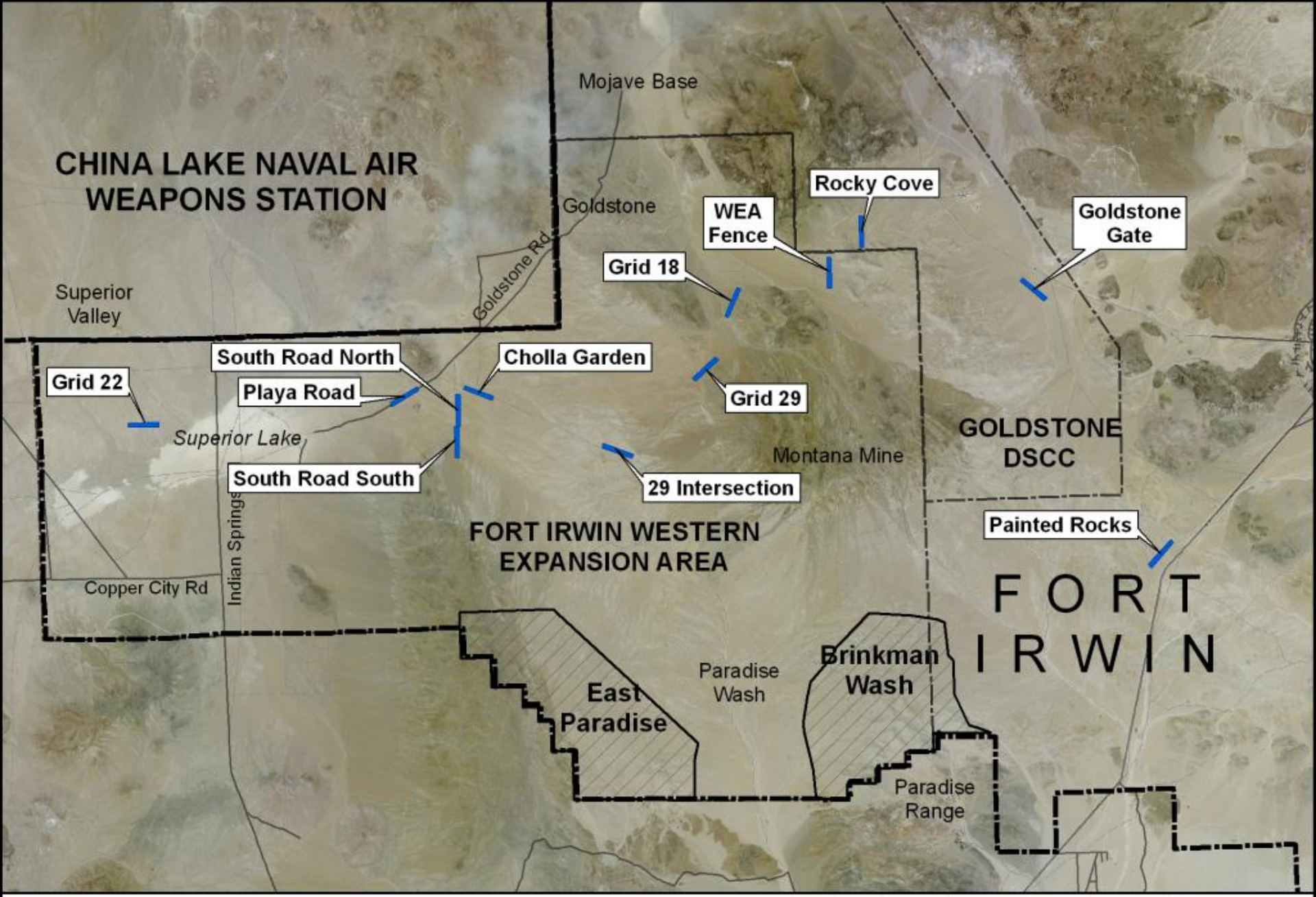
- Confirm that ground squirrels readily visit bait stations and are not bothered by camera traps
- Test that MGS can be detected using camera traps throughout the active season
- Compare the effectiveness of camera traps in detecting ground squirrel presence vs. live-trapping
- Determine if MGS and RTGS are readily distinguishable using camera traps?
- Determine if MGS marked with unique shave patterns were distinguishable using camera traps

Approach

- Record ground squirrel presence using live-traps and camera trap systems (100 live-traps versus14 cameras per grid) at conventional 840 x 105 m grids
- Survey for 5 consecutive days (2 days pre-baiting) with live-traps followed by camera trapping
- Monitor MGS presence from Feb-June using camera traps (Coso [2], WEA [8], Goldstone [4], Fort Irwin [2])
- Compare relative detection probability rates from live-trapping vs. camera traps (April [4] and May [4])


Lone Pine
Owens Lake
190
Olancha
Coso
Inyo County
Tulare County
China Lake Naval Weapons Station
395
Inyokern
China Lake NWS
RIDGECREST
Kern County
Fort Irwin
14
Western Expansion Area Fort Irwin
Fort Irwin
Goldstone Deep Space Communications Complex
15
Mojave
58
BARSTOW
San Bernardino County
Edwards Air Force Base
40
395
LANCASTER
Camera deployment area
0
20
40
60
Kilometers


Haiwee Reservoir
395
Transmission Line
Pumice Mine Rd
Los Angeles Aqueduct
Coso Junction
Gill Station Coso Rd
CHINA LAKE NAVAL WEAPONS STATION
Cinder Rd
Inyo County
China Lake NWS
Ft. Irwin
Kern County
San Bernardino County
Camera trap station
0 1 2 4 6 8 10 Kilometers
0 1 2 4 6 Miles


Mojave Base
CHINA LAKE NAVAL AIR WEAPONS STATION
Goldstone
Rocky Cove
WEA Fence
Goldstone Gate
Goldstone Rd
Grid 18
Superior Valley
South Road North
Cholla Garden
Grid 22
Playa Road
Grid 29
Superior Lake
GOLDSTONE DSCC
Montana Mine
South Road South
29 Intersection
FORT IRWIN WESTERN EXPANSION AREA
Painted Rocks
Indian Springs
Copper City Rd
FORT IRWIN
Brinkman Wash
Paradise Wash
East Paradise
Paradise Range
Camera trap stations (2010)
Camera trap stations
0 1 2 4 6 8 10 Kilometers
0 1 2 4 6 Miles


Goldstone Gate
Fort Irwin Rd
Goldstone Rd
Tiefort Bajada
GOLDSTONE DSCC
Langford Lake Rd
FORT IRWIN
Painted Rocks
Langford Lake MSR
Camera and audio-recording stations
Trapping grids (2010)
0 1 2 4 6 8 10 Kilometers
0 1 2 4 6 Miles

Summary Camera Trap Results

- Surveyed sixteen grids in 2010 using cameras
- Documented MGS, AGS, and RTGS presence at one or more locations
- Documented general visitation times
- Documented multiple visitations/day for all ground squirrel species
- Documented intra- and interspecific interactions
- Documented individual/group behavior
- Documented non-target species

MGS Presence Using Cameras

- Coso (Mar) – did not detect MGS at camera stations
- Ft Irwin WEA (Feb and Apr) – MGS camera detections at five of eight study sites
- Goldstone DSCC (May) – no MGS camera detections
- Ft Irwin proper (Jun) – RTGS detections in both study sites

Sample Camera Trap Data: Mohave Ground Squirrels

White-Tailed Antelope Ground Squirrels

Round-Tailed Ground Squirrels

Intra-/Interspecific Interactions

Sample Camera Trap Data: Examples of Non-Target Species Detections

Patterns of Ground Squirrel Camera Detections

Age and no. observed	MGS	AGS	RTGS	MGS/AGS
Single juvenile	x	x	x	x
Single adult	x	x	x	x
Single juvenile/adult	x	x	x	---
Multiple juveniles	x (up to 3)	x (up to 5)	---	---
Multiple adults	x (up to 2)	x (up to 5)	---	---
Single juvenile/ multiple adults	---	x (up to 3)	---	---
Single adult/ multiple juveniles	x (up to 3)	x (up to 5)	---	---
Multiple adults/juveniles	---	x (up to 3/4)	---	---

Cameras vs. Live Trapping
April 2010

Grid Name	Live-Trap Detections (no. MGS) marked	Camera Detections (min. no. MGS) marked/unmarked	Camera Detections (min. no. MGS) unmarked
Grid 29	2F	1F / 3F	4F
Playa Road	1F, 1M	1F, 1M / 1F	2F, 1M
S. Road North	4F, 4M	4F, 3M / 1F, 1M	4F, 3M
Cholla Garden	2F	1F / 2F, 1M	2F, 1M
Total	**9F, 5M**	**7F, 4M/ 7F, 2M**	**12F, 5M**

April Detection Rates

- Cameras with detections = 28/56
- Camera-days with detections = 76/280
- Total visitations = 440 (95, 14, 174, 157)
- Traps with captures = 20/400
- Trap-days with captures = 24/2000

Advantages of Camera Traps

- Detect MGS if they are present at similar or greater effectiveness as live-traps
- Does not require specialized qualifications/ permits to operate
- Non-invasive technique that is not limited by weather conditions
- Documents activity patterns of animals
- Records multiple visitations per day by animals
- Documents intra-/interspecific behavioral interactions

Advantages of Live Trapping

- 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

Possible Future Use of Camera Traps

- Determine the number of camera trap systems needed to fully sample conventional grid to directly compare with live-trapping surveys
- Utilize camera traps to locate future trapping sites to improve the cost effectiveness of live-trapping
- Investigate food preferences of MGS to possibly improve live-trapping success
- Investigate how MGS interact with live-traps to possibly improve trapping success
- Investigate if PIT tag reading devices can be effectively used in concert with camera traps/feeding stations

Camera Trap Research in 2011

- Fort Irwin, BLM, CDFG, and USACERL have provided resources to expand MGS surveys using camera traps on non-DoD lands
- First large scale field test of the camera trap survey technique
- Provide data to help validate the PACT model that the CEC PIER program is evaluating
- Help to field test the MGS habitat suitability model that the USGS is developing
- Vegetation sampling data will be directly applicable with ongoing CDFG vegetation mapping projects
- Research findings will be applicable across DoD and non-DoD lands
- Project results will improve our knowledge of MGS distribution

Questions?