Welcome to the Conservation Lecture Series

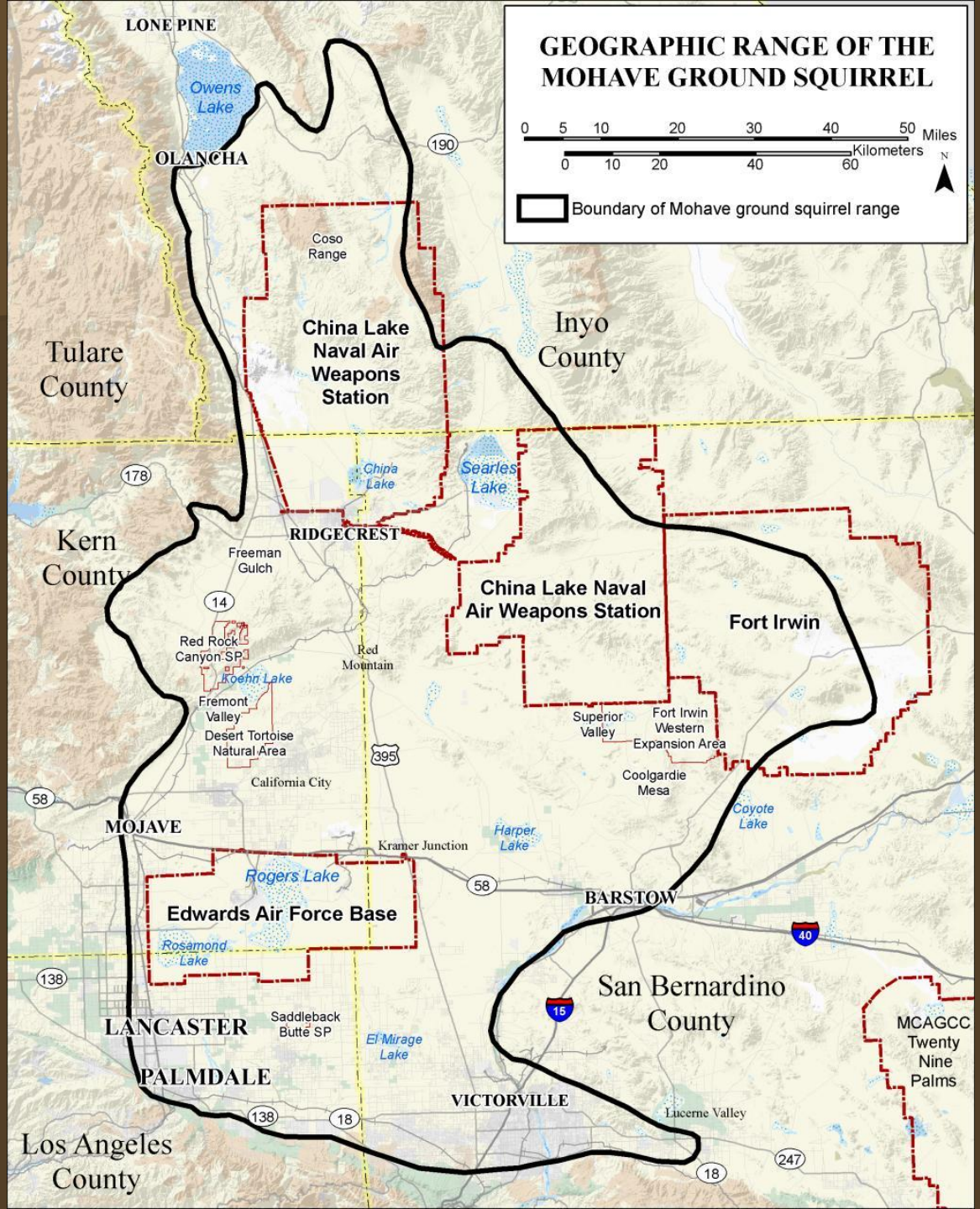
www.dfg.ca.gov/Conservation/Lectures

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


GEOGRAPHIC RANGE OF THE MOHAVE GROUND SQUIRREL
0 5 10 20 30 40 50 Miles
0 10 20 40 60 Kilometers
N
Boundary of Mohave ground squirrel range
LONE PINE
Owens Lake
OLANCHA
190
Coso Range
China Lake Naval Air Weapons Station
Inyo County
Tulare County
178
China Lake
Searles Lake
RIDGECREST
Kern County
Freeman Gulch
14
China Lake Naval Air Weapons Station
Fort Irwin
Red Rock Canyon SP
Red Mountain
Koehn Lake
Fremont Valley
Desert Tortoise Natural Area
Superior Valley
Fort Irwin Western Expansion Area
395
California City
Coolgardie Mesa
58
MOJAVE
Kramer Junction
Harper Lake
Coyote Lake
Rogers Lake
Edwards Air Force Base
58
BARSTOW
40
Rosamond Lake
138
San Bernardino County
15
LANCASTER
Saddleback Butte SP
El Mirage Lake
MCAGCC Twenty Nine Palms
PALMDALE
VICTORVILLE
Lucerne Valley
138
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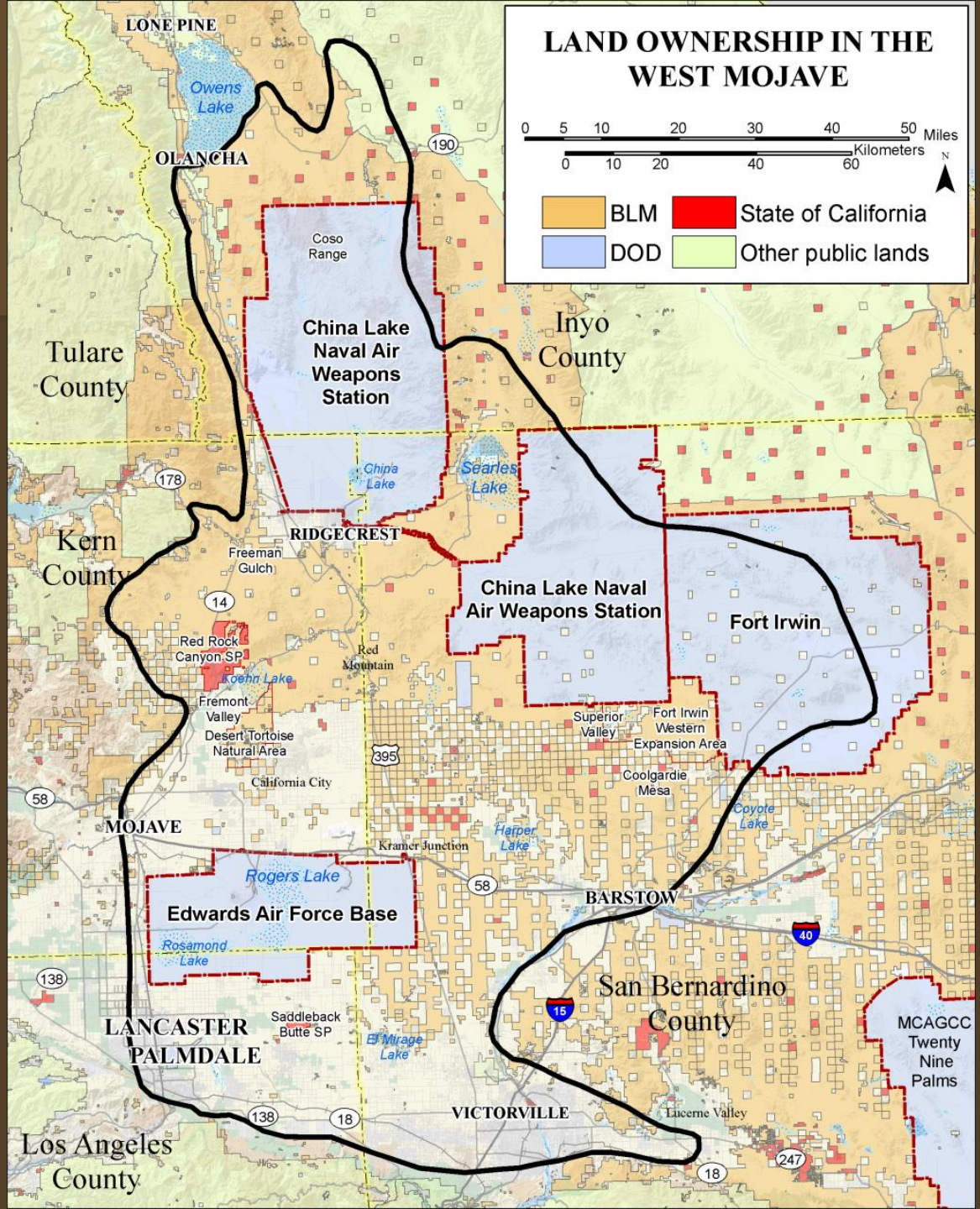
247
18
Los Angeles County


LAND OWNERSHIP IN THE WEST MOJAVE
0 5 10 20 30 40 50 Miles
0 10 20 40 60 Kilometers
N
BLM
State of California
DOD
Other public lands
LONE PINE
Owens Lake
OLANCHA
190
Coso Range
China Lake Naval Air Weapons Station
Inyo County
Tulare County
178
China Lake
Searles Lake
RIDGECREST
Freeman Gulch
Kern County
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PALMDALE
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El Mirage Lake
MCAGCC
Twenty Nine Palms
VICTORVILLE
Lucerne Valley
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18
247
18
Los Angeles County

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 vs. RTGS


Oregon
Idaho
Wyoming
Nevada
Utah
Colorado
United States
California
New Mexico
Arizona
Baja California
Mexico
Sonora
Chihuahua
Sinaloa
GEOGRAPHIC RANGE OF
MOHAVE GROUND SQUIRREL AND
ROUND-TAILED GROUND SQUIRREL
0 50 100 200 300 400 500 Miles
0 100 200 400 600 Kilometers
N
Mohave ground squirrel range
round-tailed ground squirrel range

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

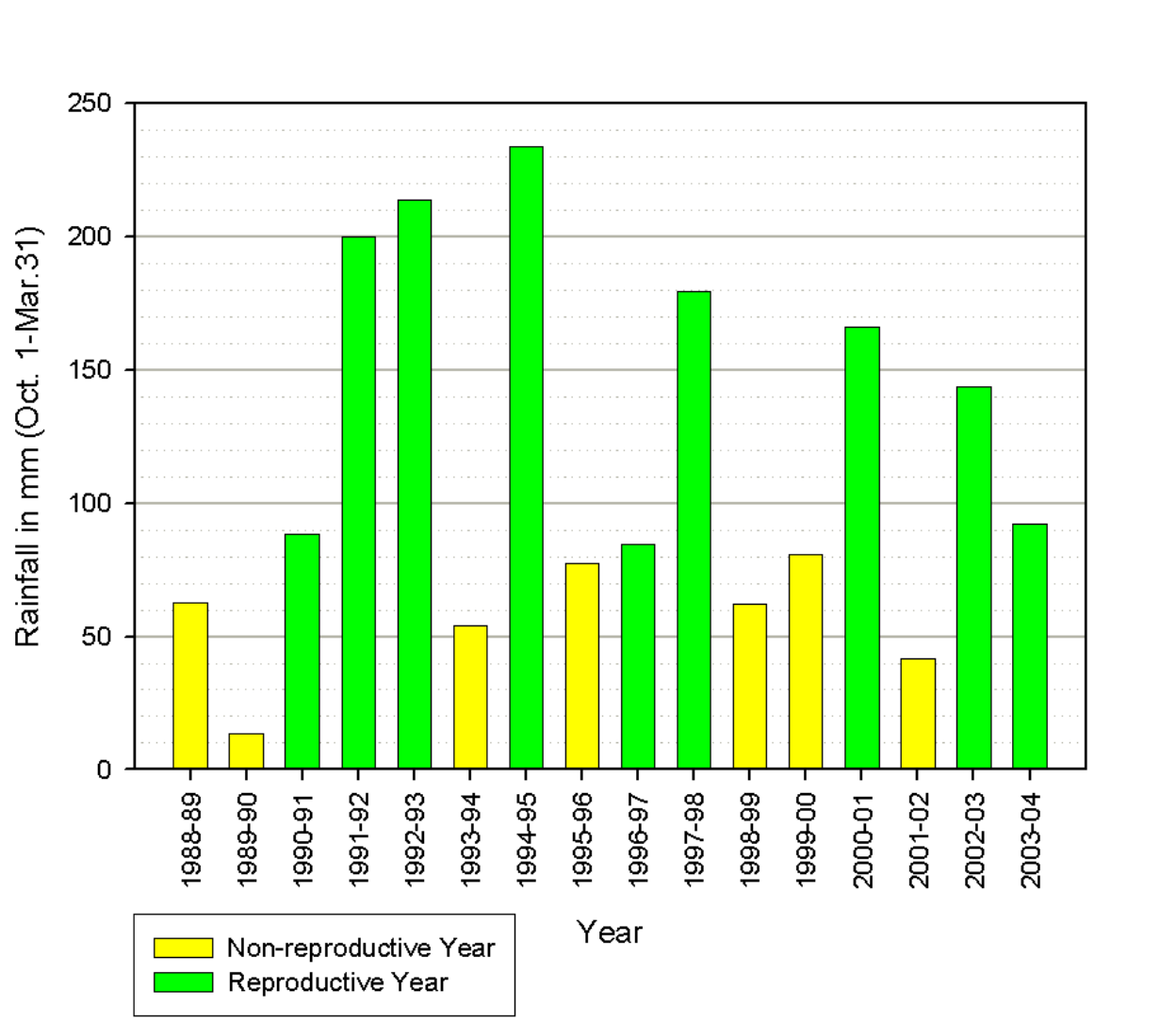
- MGS are widely distributed in major vegetation communities in western Mojave
- Found in creosote bush scrub, saltbush scrub, Mojave mixed woody scrub, and blackbrush scrub
- Seem to be most abundant in areas with higher diversity of shrubs and native forbs
- Mojave mixed woody scrub seems to satisfy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

Photos of habitat

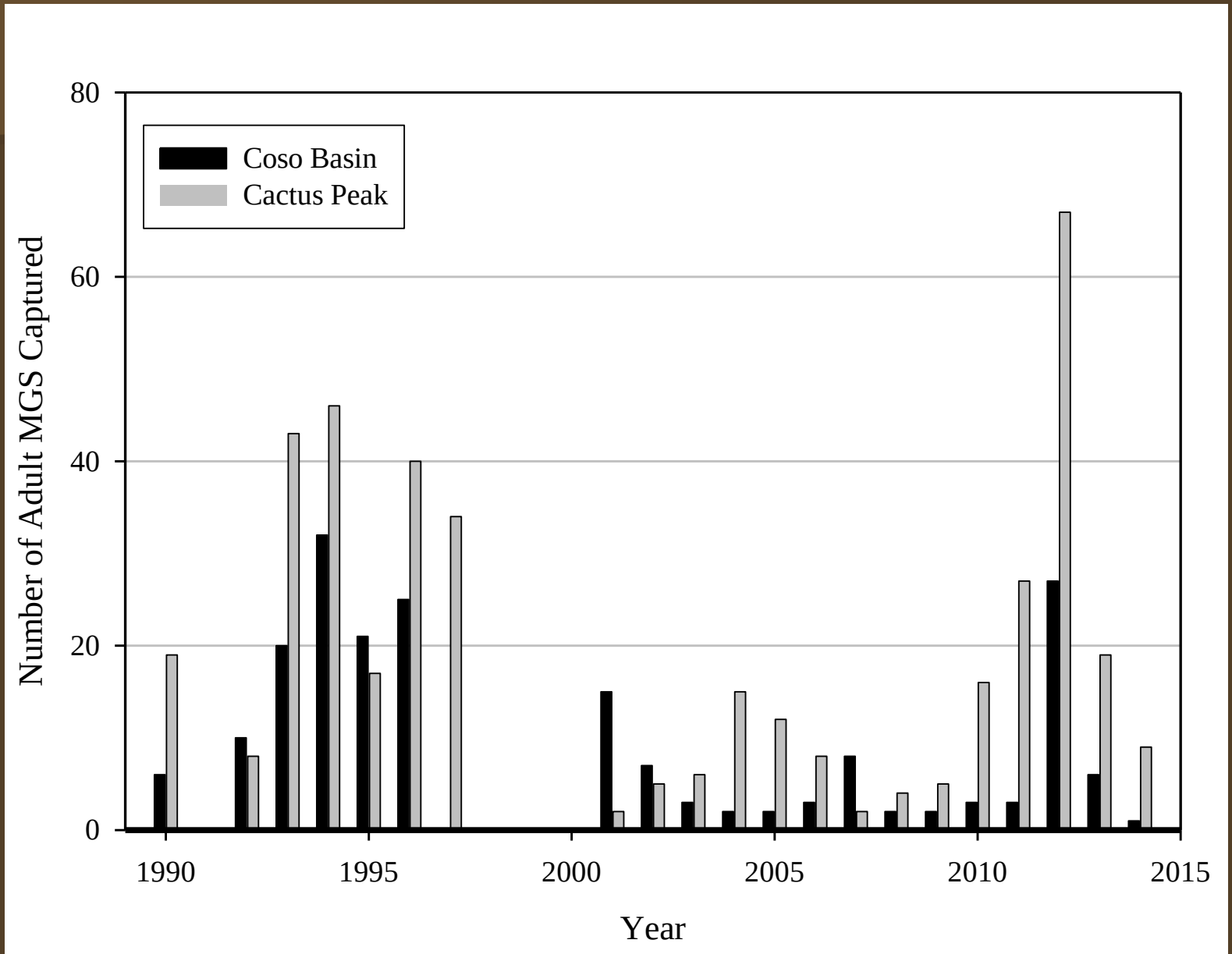
Annual Cycle

- 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



Adult Numbers at Coso



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

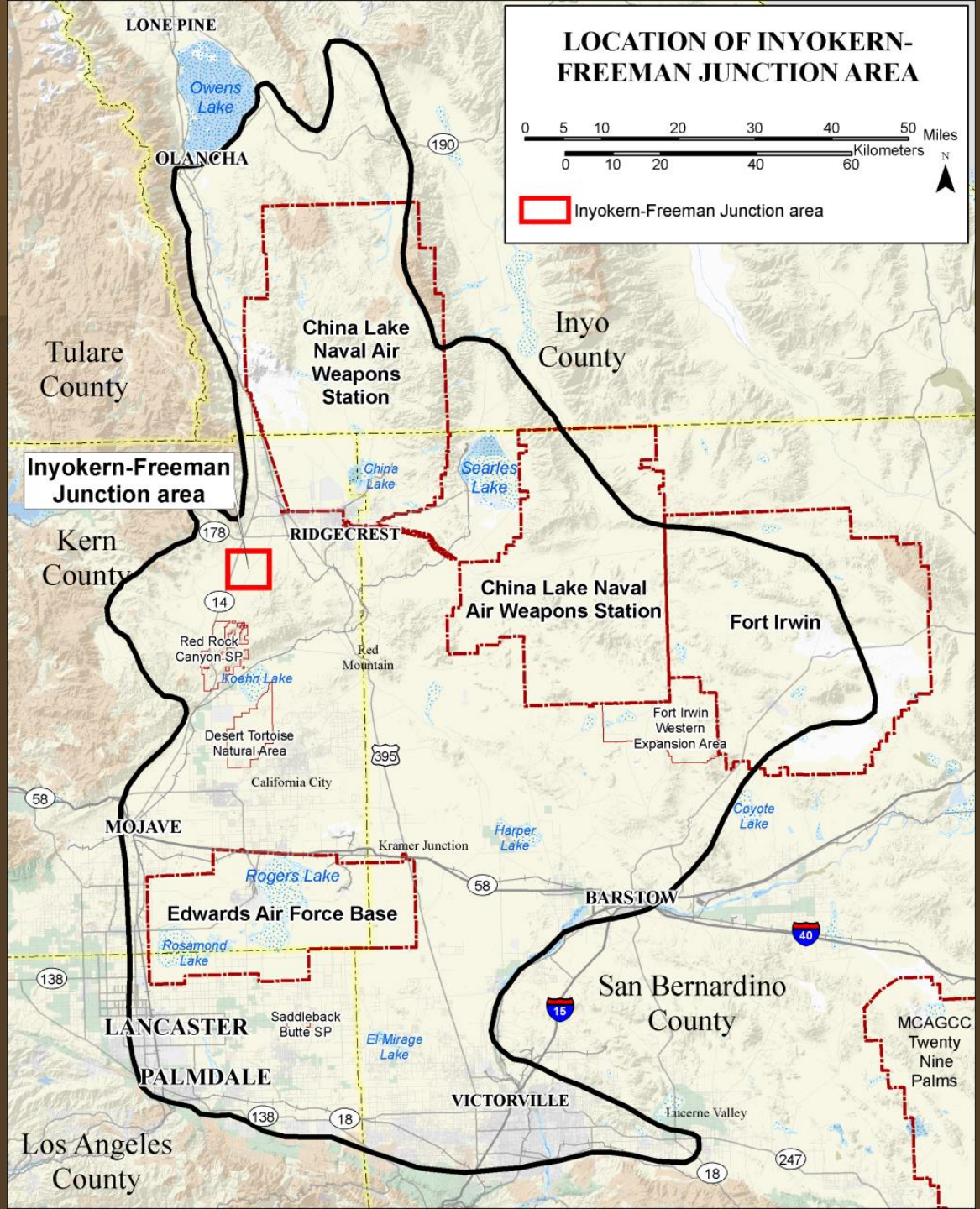
- Diet data is from Coso study 1988-1996, based on microhistological analysis of 754 fecal samples
- About 37% of diet was shrub leaf, chiefly winterfat, spiny hopsage, and saltbush
- Native forbs were important too
- 8 plant species made up most of diet, out of 77 distinct food items detected

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


LOCATION OF INYOKERN-FREEMAN JUNCTION AREA
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0 10 20 40 60 Kilometers
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Inyokern-Freeman Junction area
LONE PINE
Owens Lake
OLANCHA
190
Tulare County
China Lake Naval Air Weapons Station
Inyo County
Inyokern-Freeman Junction area
China Lake
Searles Lake
178
RIDGECREST
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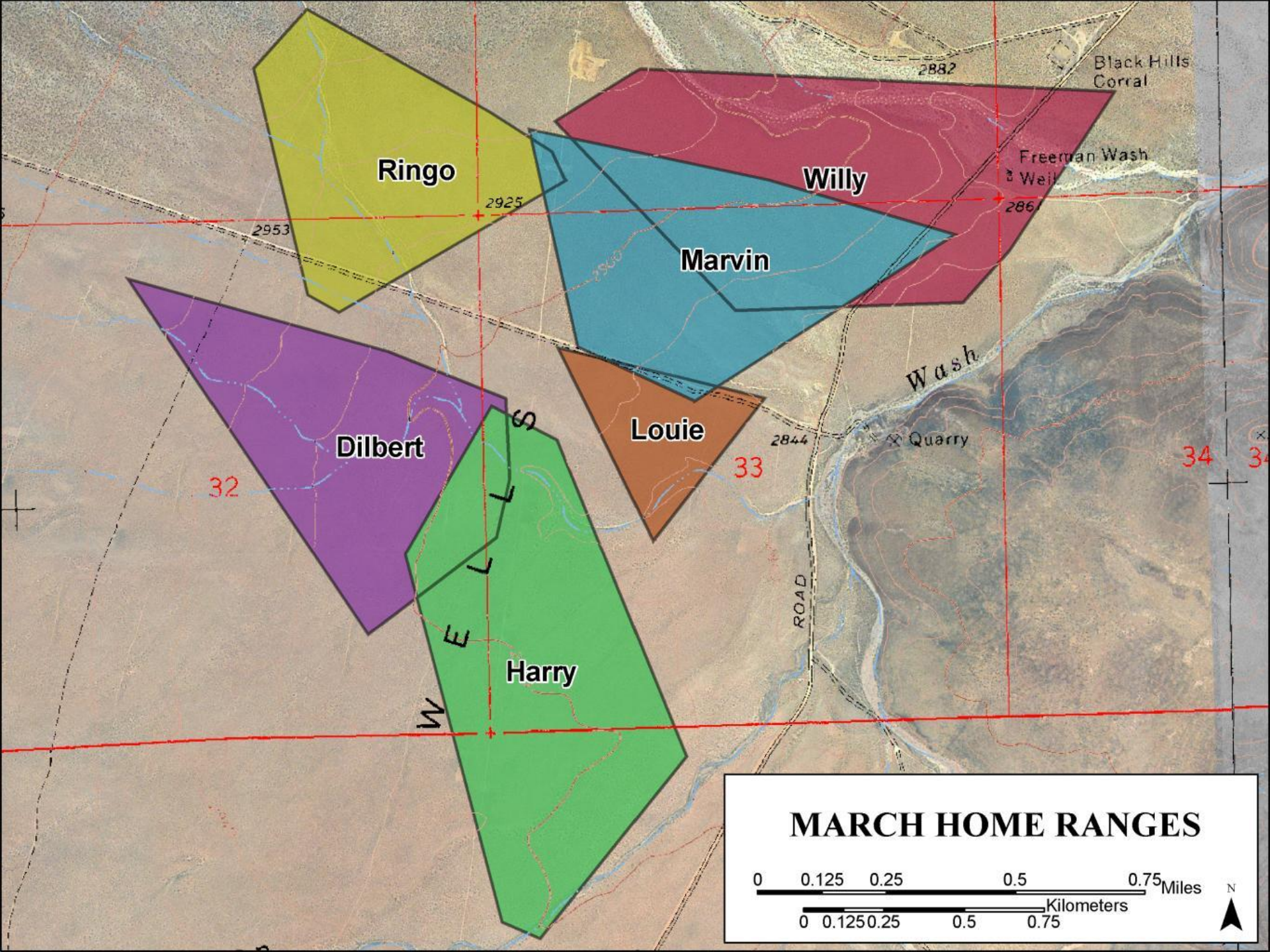
Ringo
Willy
Marvin
Louie
Dilbert
Harry
WELLS
Black Hills Corral
Freeman Wash
Well
Wash
Quarry
ROAD
2882
2925
2953
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32
33
34
MARCH HOME RANGES
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Kilometers
0 0.125 0.25 0.5 0.75
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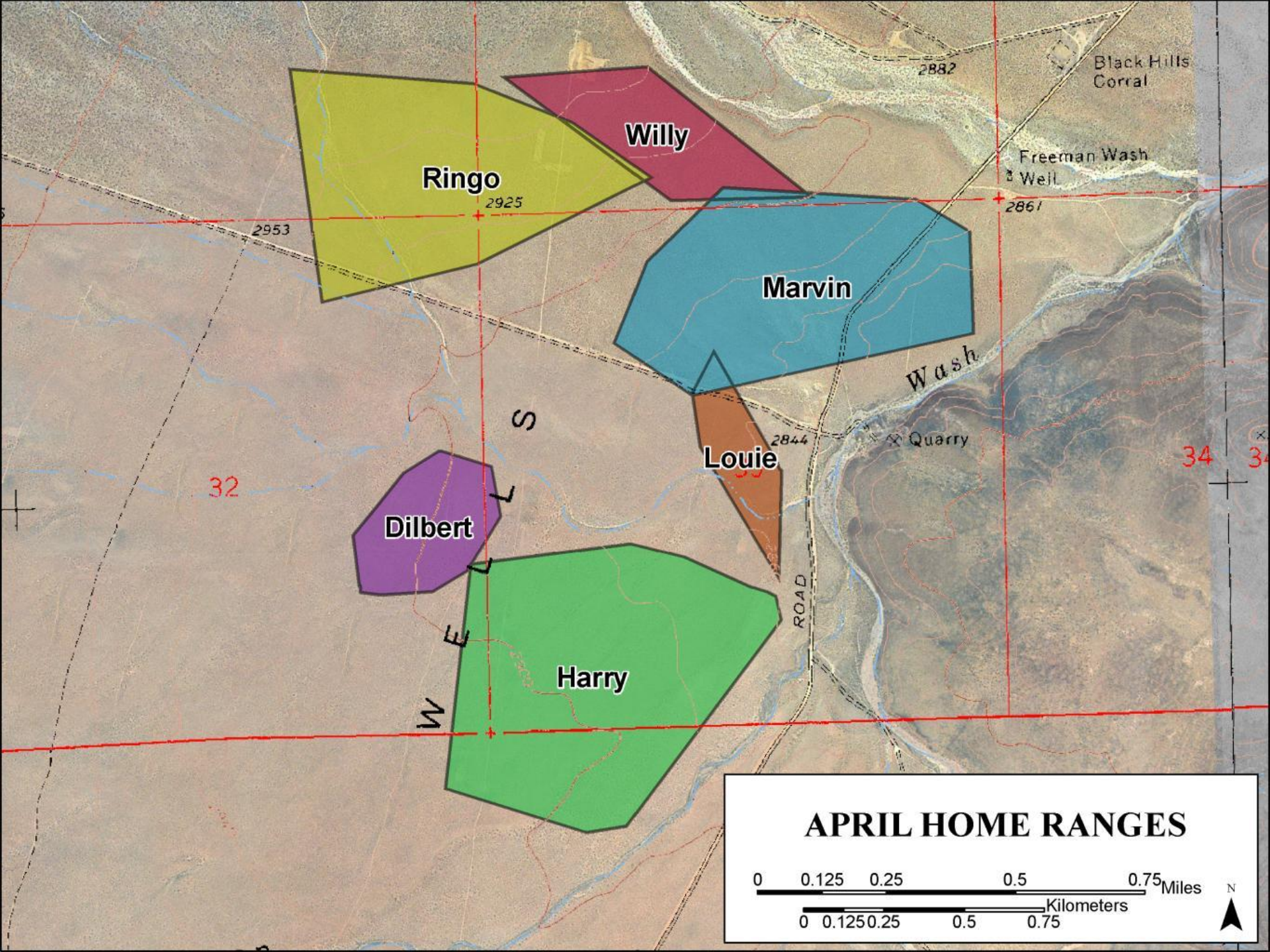
Ringo
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Marvin
Louie
Dilbert
Harry
Black Hills Corral
Freeman Wash
Well
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Wash
ROAD
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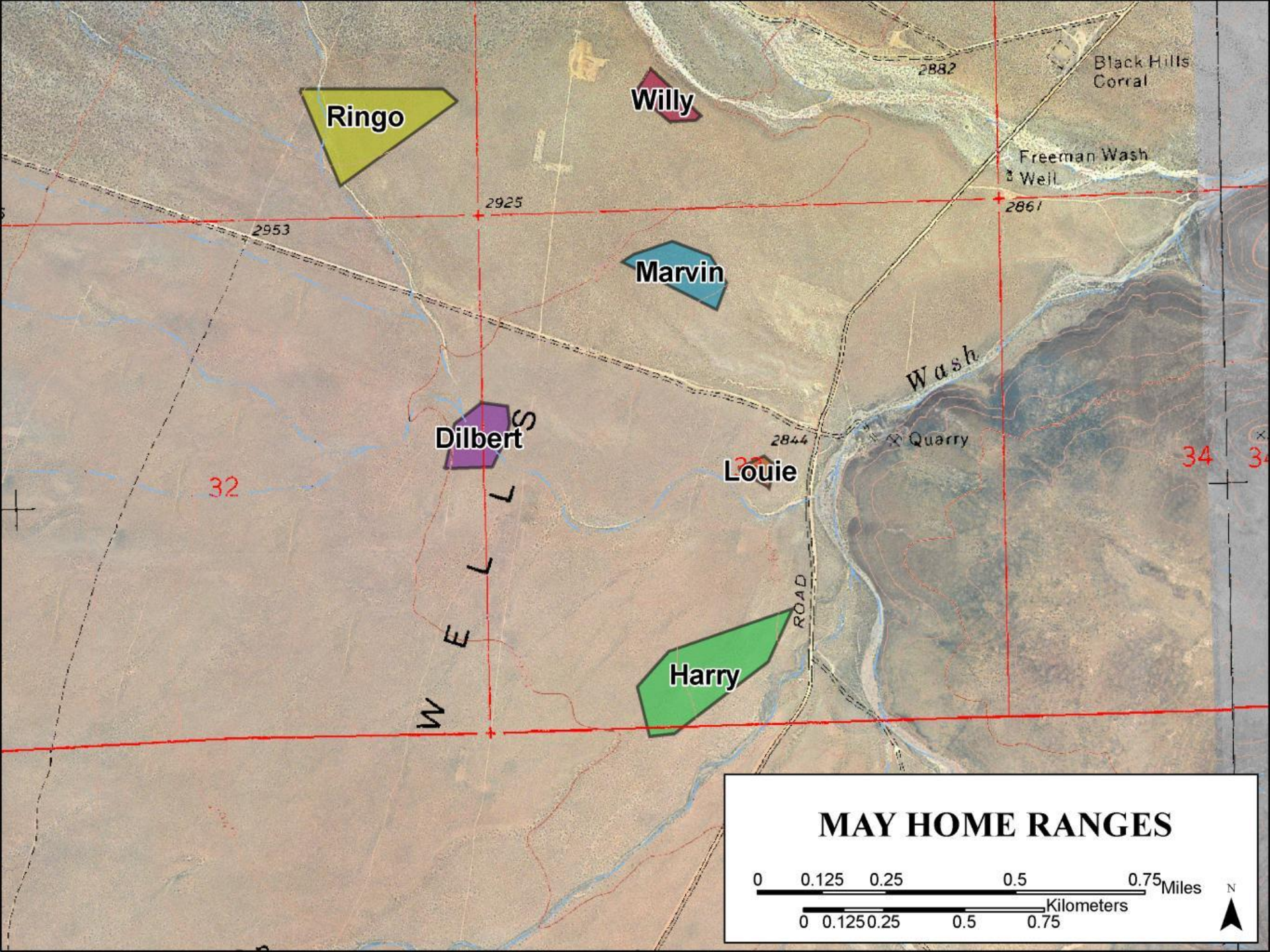
APRIL HOME RANGES
0 0.125 0.25 0.5 0.75 Miles
0 0.125 0.25 0.5 0.75 Kilometers
N


Ringo
Willy
Marvin
Dilbert
Louie
Harry
Black Hills Corral
Freeman Wash
Well
Wash
Quarry
WELLS
ROAD
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34
MAY HOME RANGES
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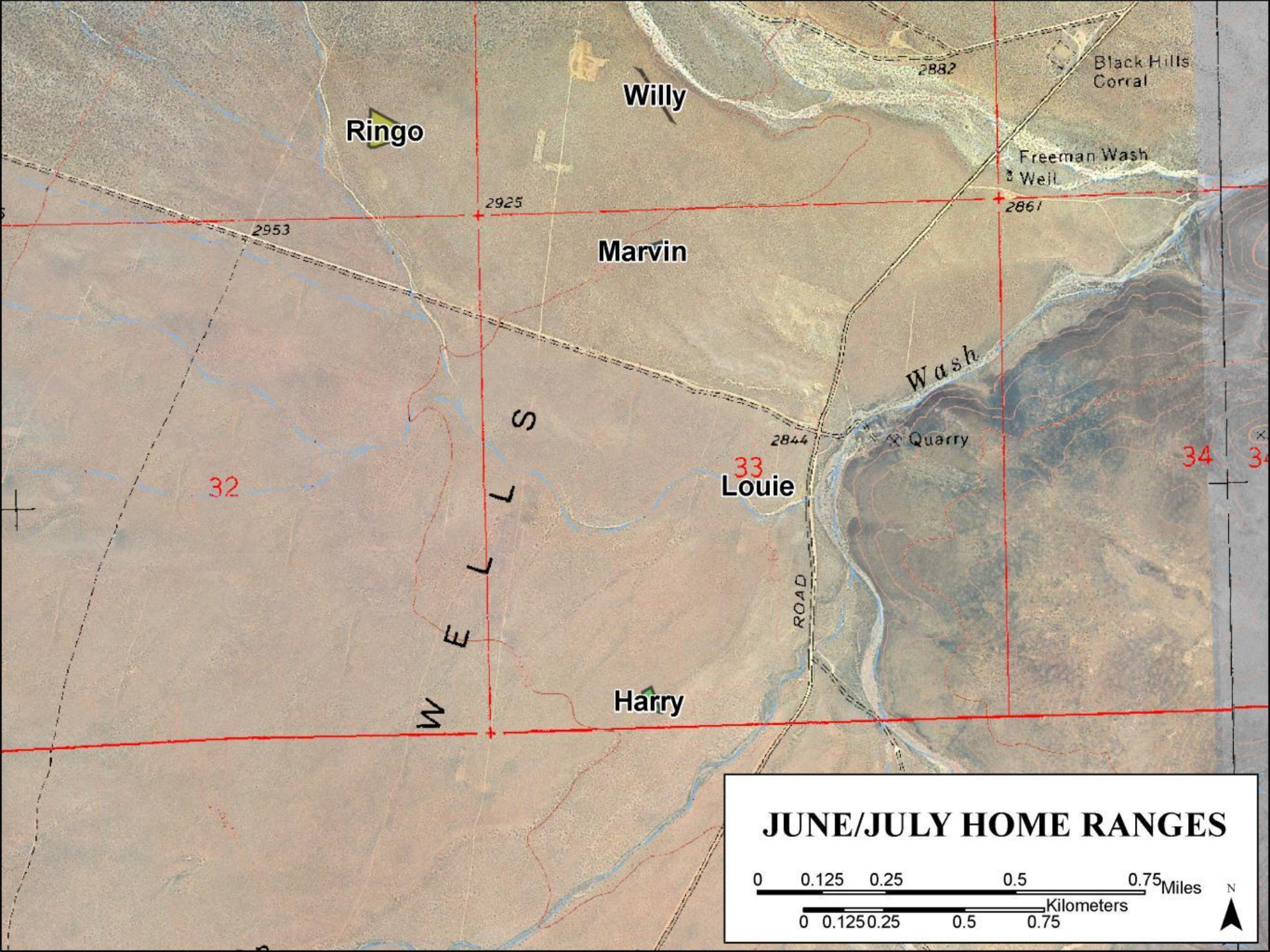
Kilometers
0 0.125 0.25 0.5 0.75
N


Ringo
Willy
Marvin
Louie
Harry
Black Hills Corral
Freeman Wash Well
Quarry
Wash
WELLS ROAD
2882
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2953
2861
2844
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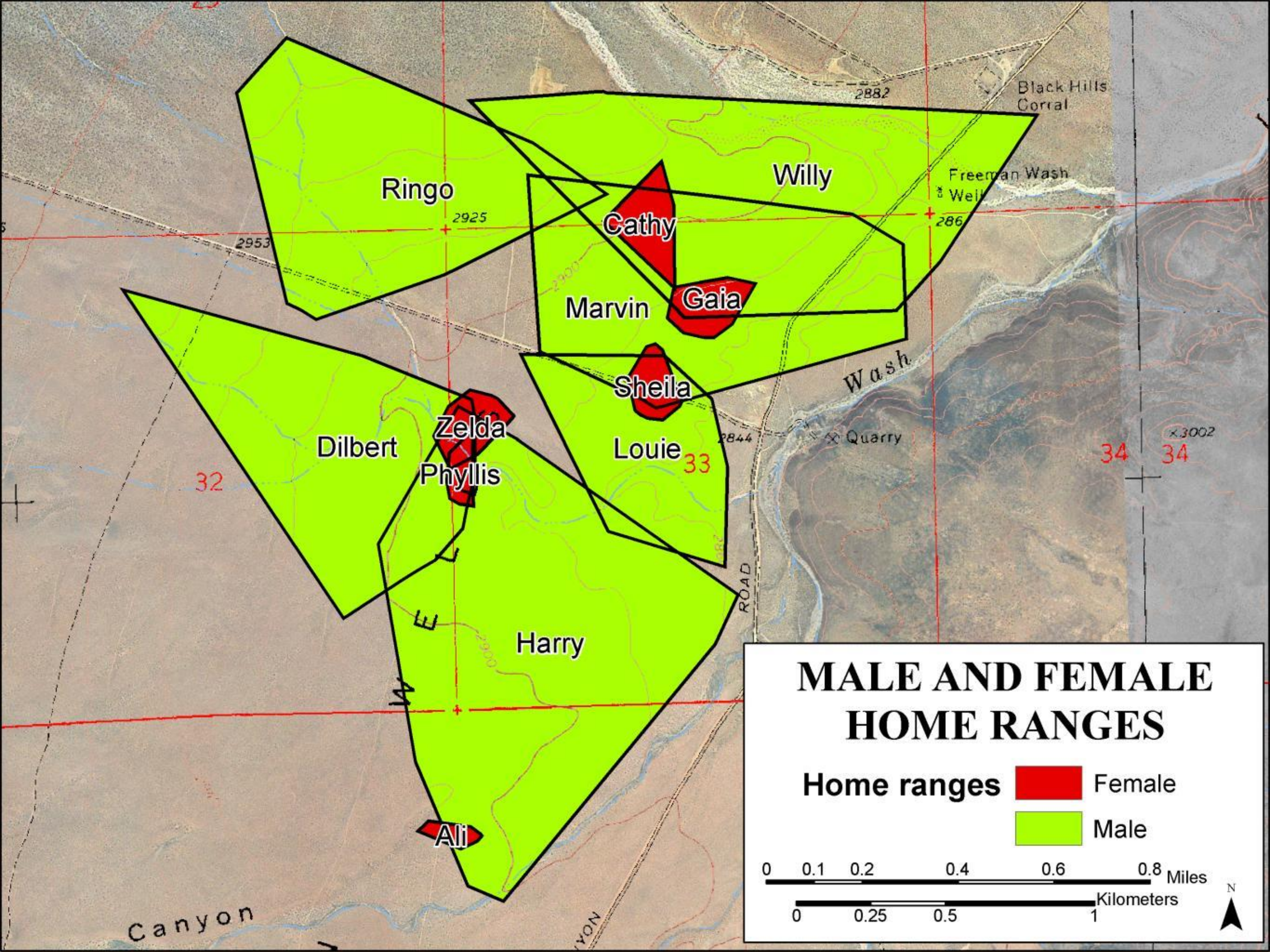
33
34
JUNE/JULY HOME RANGES
0 0.125 0.25 0.5 0.75 Miles
0 0.125 0.25 0.5 0.75 Kilometers
N


MALE AND FEMALE HOME RANGES
Home ranges
Female
Male
0 0.1 0.2 0.4 0.6 0.8 Miles
Kilometers
0 0.25 0.5 1
N
Ringo
Willy
Cathy
Gaia
Marvin
Sheila
Louie
Dilbert
Zelda
Phyllis
Harry
Ali
Black Hills Corral
Freeman Wash Well
Wash
Quarry
Canyon
ROAD
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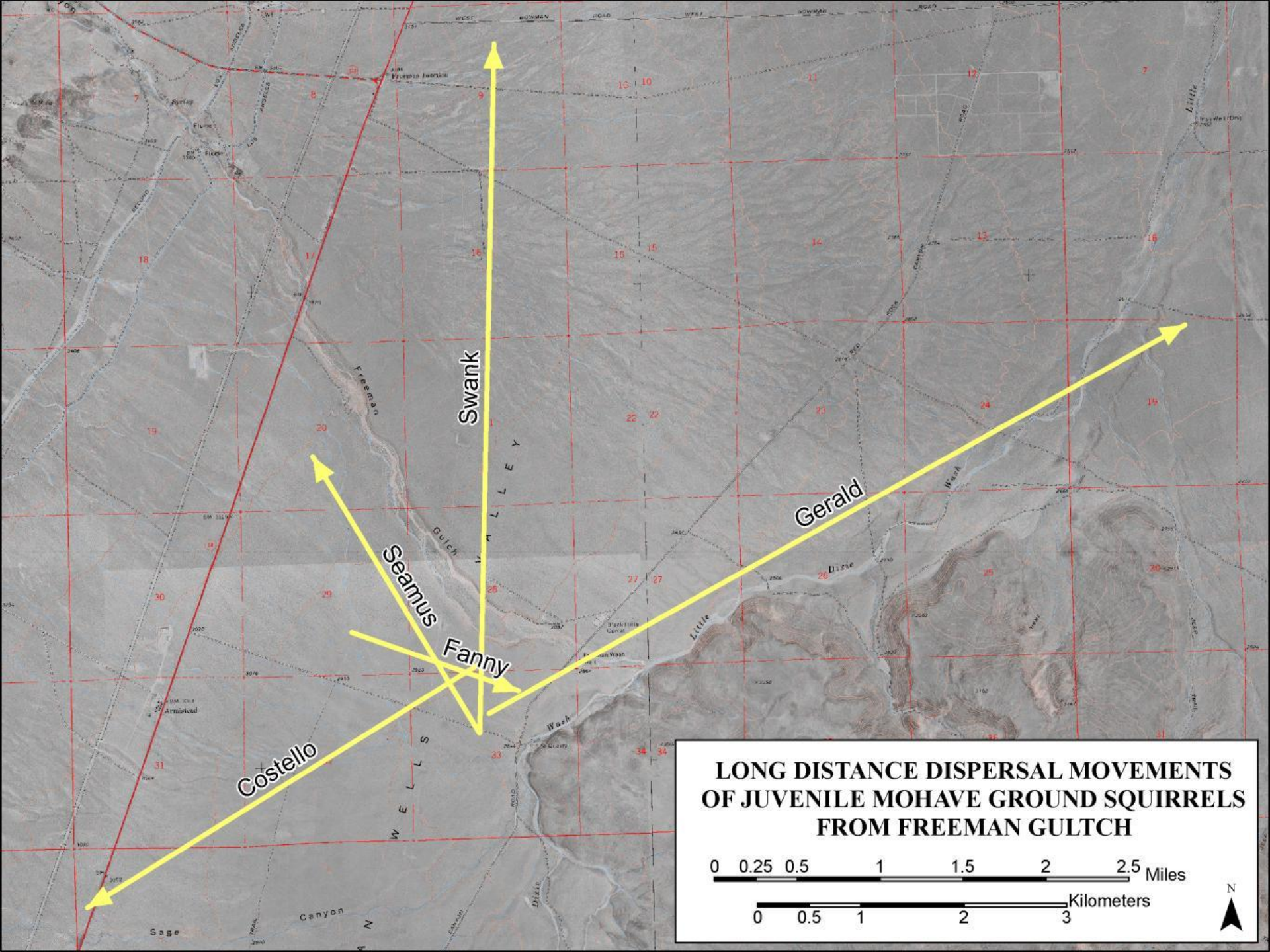
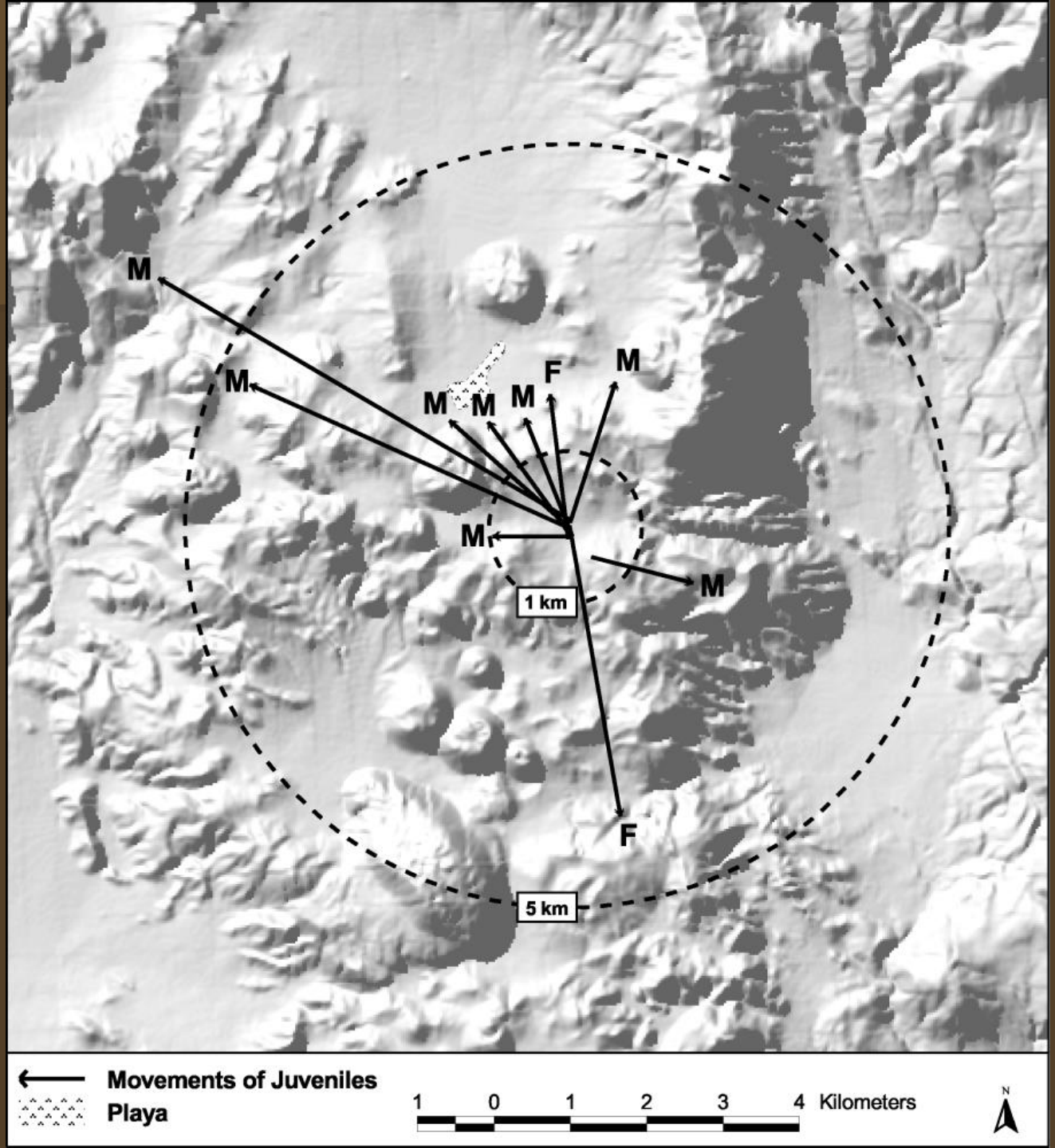

Swank
Seamus
Fanny
Gerald
Costello
LONG DISTANCE DISPERSAL MOVEMENTS
OF JUVENILE MOHAVE GROUND SQUIRRELS
FROM FREEMAN GULTCH
0 0.25 0.5 1 1.5 2 2.5 Miles
0 0.5 1 2 3 Kilometers
N


M
M
M
M
M
F
M
M
M
M
1 km
5 km
F
Movements of Juveniles
Playa
1 0 1 2 3 4 Kilometers
N

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

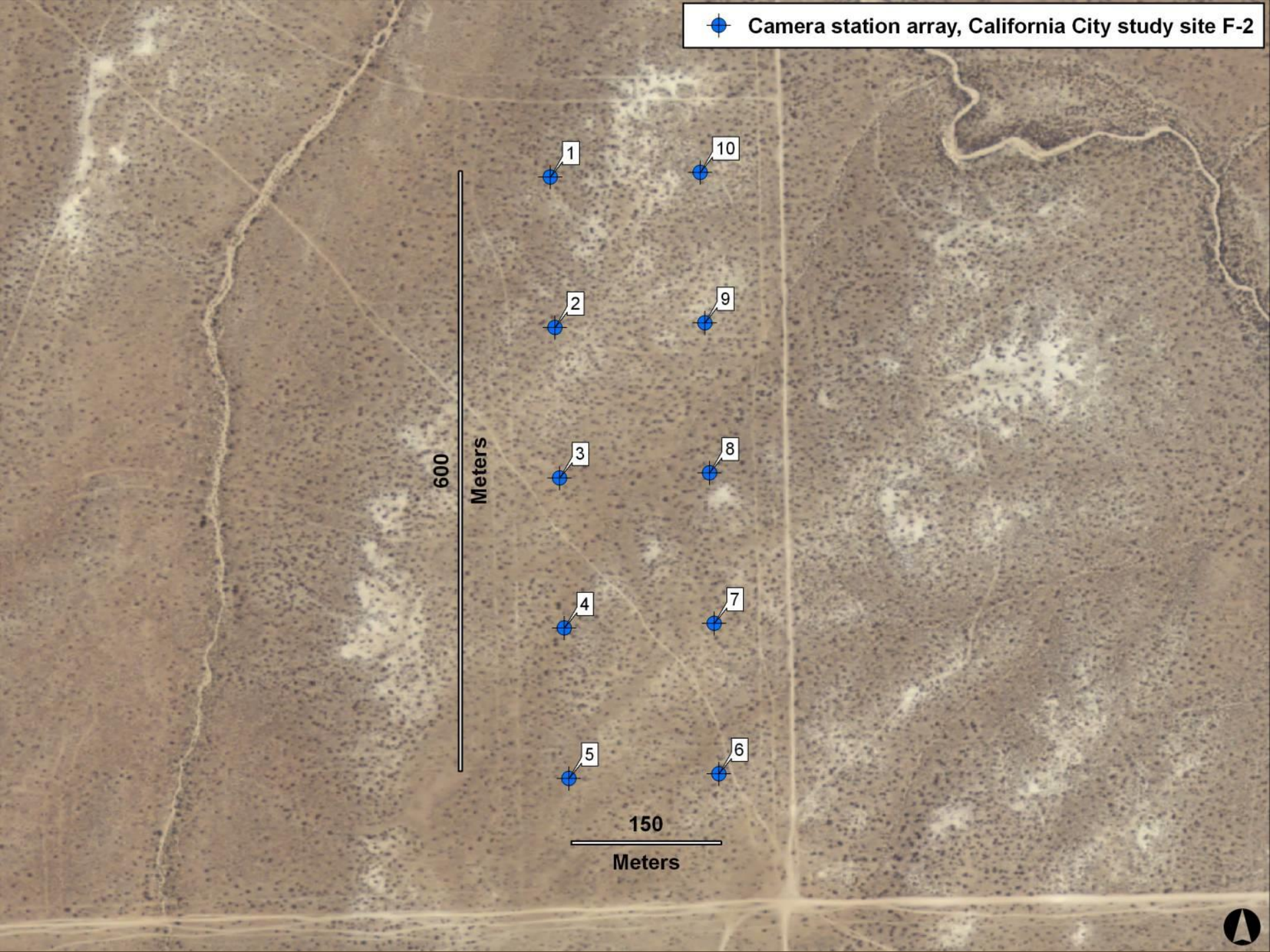
- Trap sites 3 times during active season
  - March 15-April 15 – adults all active
  - May 1-31 – juveniles trappable
  - June 15-July 15 – natal dispersal complete
- Use 100 traps per 80 acres or per 1 mile on linear projects
- Trap each site for 5 days during each session
- Negative results (no MGS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

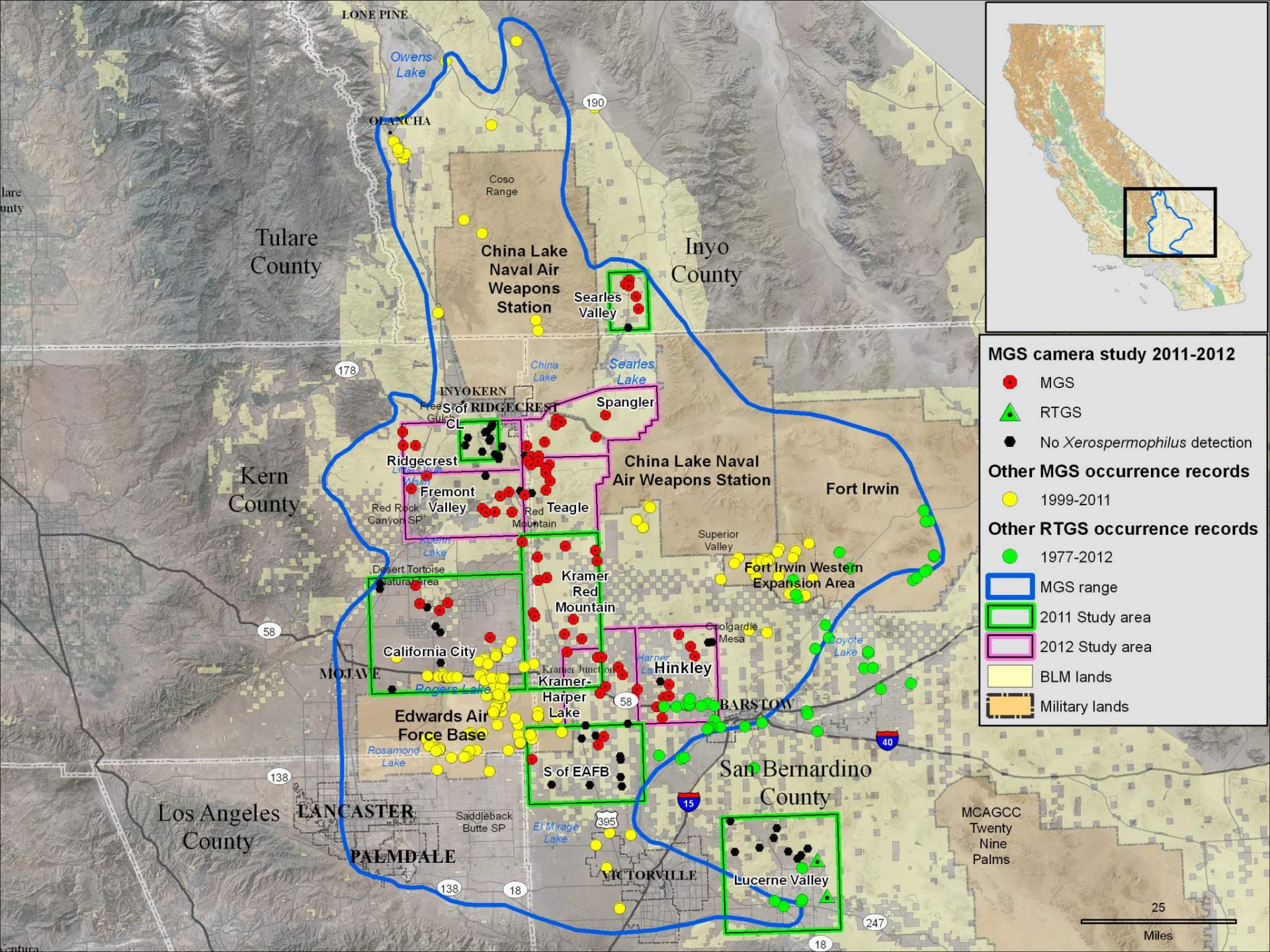

Camera station array, California City study site F-2
1
10
2
9
3
8
4
7
5
6
600
Meters
150
Meters

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


LONE PINE
Owens Lake
OLANCHA
Coso Range
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Searles Valley
Tulare County
Inyo County
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Fremont Valley
Red Rock Canyon SP
Red Mountain
Teagle
China Lake Naval Air Weapons Station
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Koehn Lake
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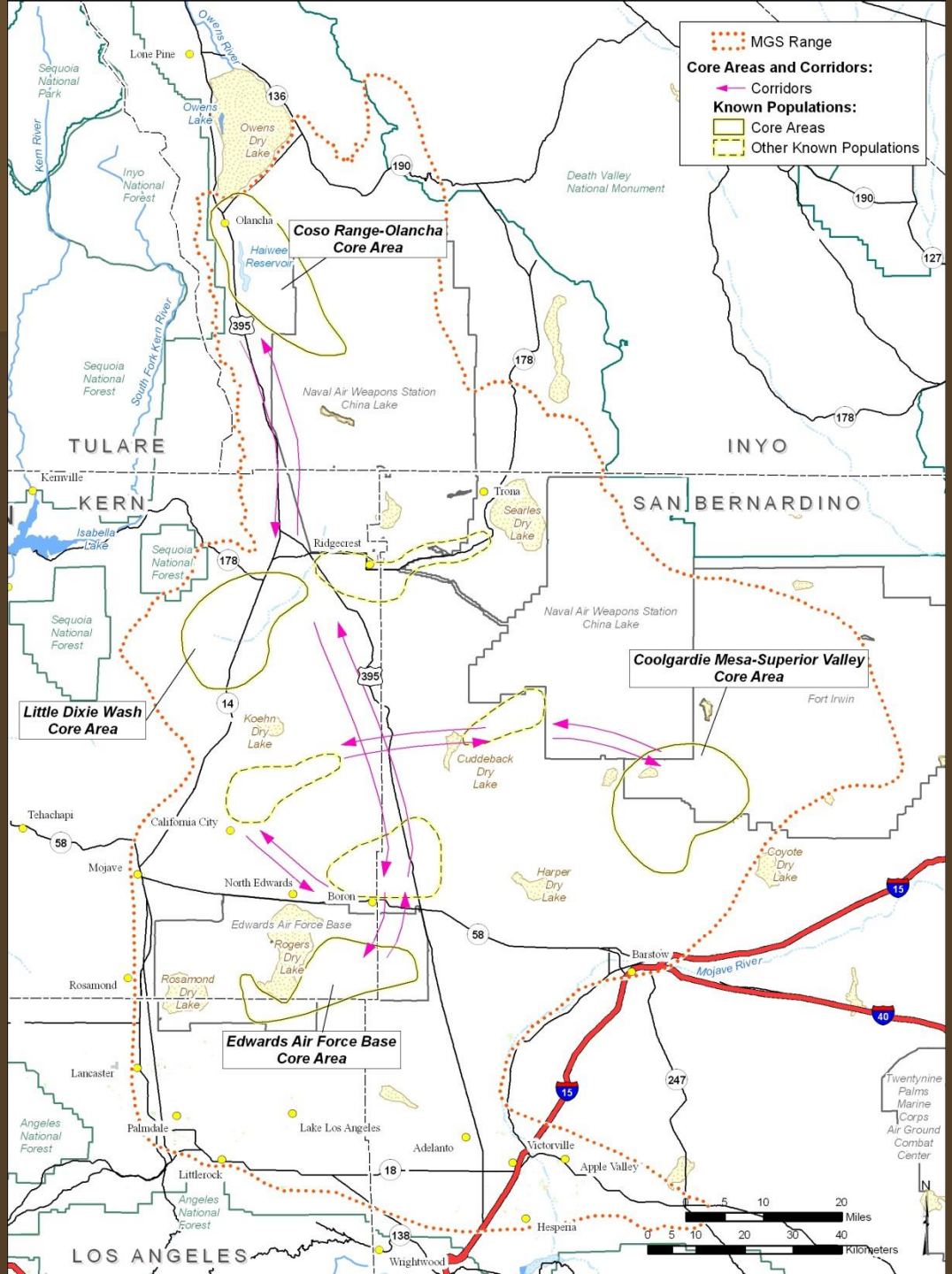
San Bernardino County
Los Angeles County
LANCASTER
Saddleback Butte SP
El Mirage Lake
PALMDALE
VICTORVILLE
Lucerne Valley
MCAGCC
Twenty
Nine
Palms
25
Miles
MGS camera study 2011-2012
MGS
RTGS
No Xerospermophilus detection
Other MGS occurrence records
1999-2011
Other RTGS occurrence records
1977-2012
MGS range
2011 Study area
2012 Study area
BLM lands
Military lands

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?

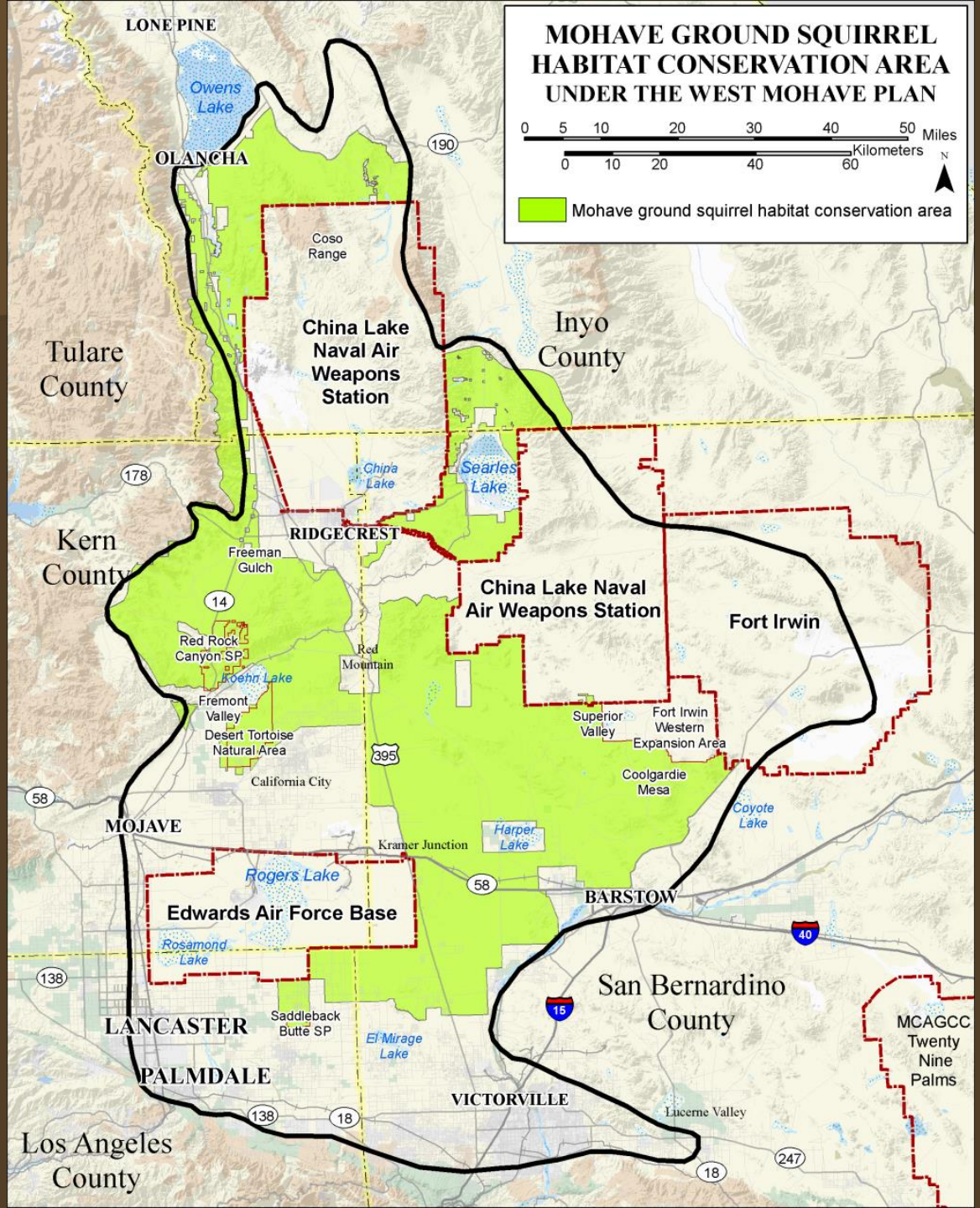

2012-04-25 10:36:58 AM M 5/5
95°F
PC800 HYPERFIRE PRO
RECONYX


2012-04-25 11:22:00 AM M 1/5
86°F
PC800 HYPERFIRE PRO
RECONYX


MGS Range
Core Areas and Corridors:
Corridors
Known Populations:
Core Areas
Other Known Populations
Coso Range-Olancha Core Area
Little Dixie Wash Core Area
Coolgardie Mesa-Superior Valley Core Area
Edwards Air Force Base Core Area
TULARE
INYO
KERN
SAN BERNARDINO
LOS ANGELES
Lone Pine
Owens River
Owens Lake
Owens Dry Lake
Sequoia National Park
Kern River
Inyo National Forest
Olancha
Haiwee Reservoir
South Fork Kern River
Sequoia National Forest
Naval Air Weapons Station China Lake
Death Valley National Monument
Kernville
Isabella Lake
Trona
Searles Dry Lake
Ridgecrest
Koehn Dry Lake
Cuddeback Dry Lake
Fort Irwin
Tehachapi
California City
Mojave
North Edwards
Boron
Harper Dry Lake
Coyote Dry Lake
Edwards Air Force Base
Rogers Dry Lake
Rosamond
Rosamond Dry Lake
Barstow
Mojave River
Lancaster
Palmdale
Lake Los Angeles
Adelanto
Victorville
Apple Valley
Littlerock
Angeles National Forest
Hesperia
Wrightwood
Twentynine Palms Marine Corps Air Ground Combat Center
N
0 5 10 20 Miles
0 5 10 20 30 40 Kilometers

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?


MOHAVE GROUND SQUIRREL
HABITAT CONSERVATION AREA
UNDER THE WEST MOHAVE PLAN
0 5 10 20 30 40 50 Miles
0 10 20 40 60 Kilometers
N
Mohave ground squirrel habitat conservation area
LONE PINE
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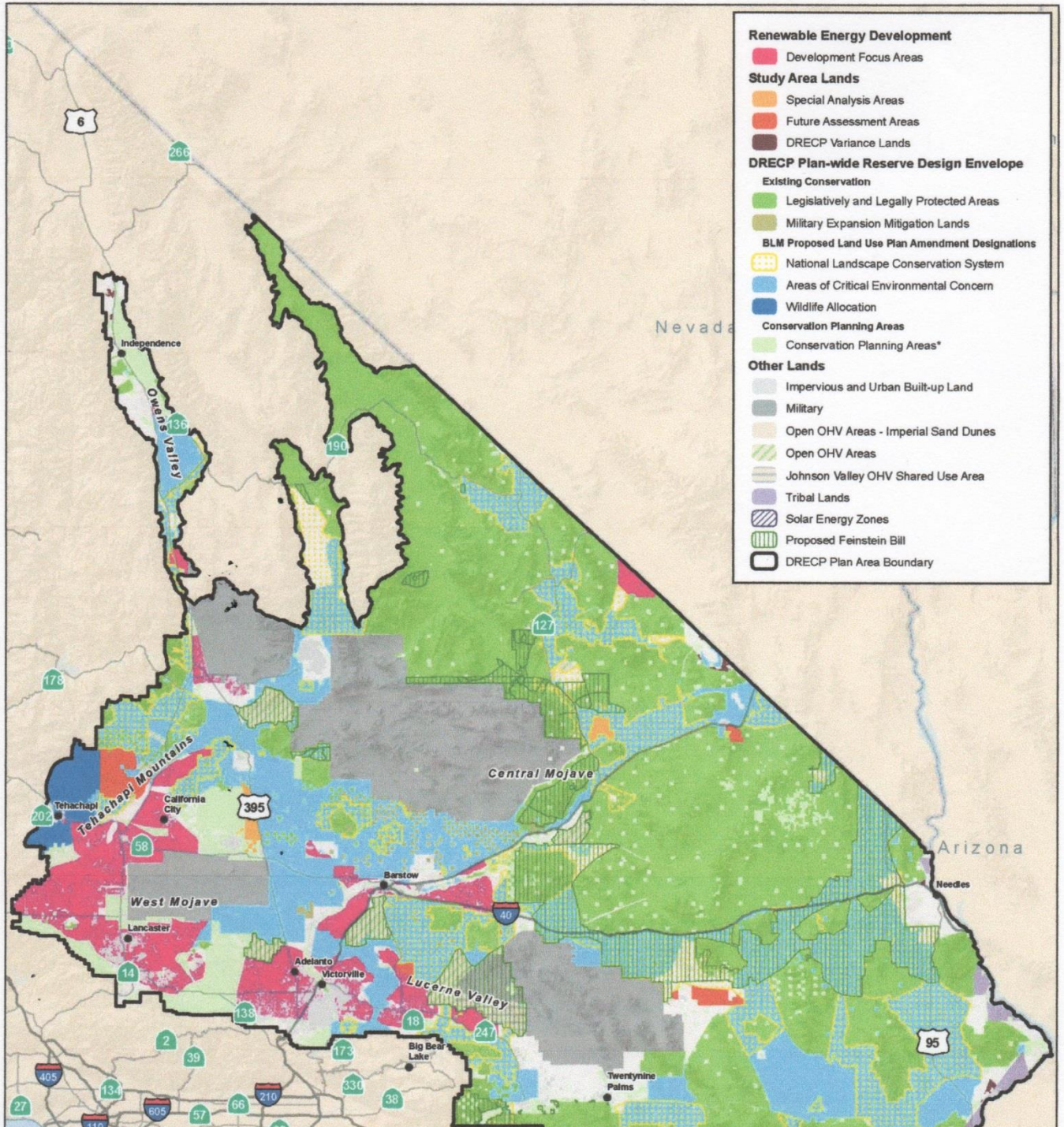
Renewable Energy Development

- 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


Renewable Energy Development
Development Focus Areas
Study Area Lands
Special Analysis Areas
Future Assessment Areas
DRECP Variance Lands
DRECP Plan-wide Reserve Design Envelope
Existing Conservation
Legislatively and Legally Protected Areas
Military Expansion Mitigation Lands
BLM Proposed Land Use Plan Amendment Designations
National Landscape Conservation System
Areas of Critical Environmental Concern
Wildlife Allocation
Conservation Planning Areas
Conservation Planning Areas*
Other Lands
Impervious and Urban Built-up Land
Military
Open OHV Areas - Imperial Sand Dunes
Open OHV Areas
Johnson Valley OHV Shared Use Area
Tribal Lands
Solar Energy Zones
Proposed Feinstein Bill
DRECP Plan Area Boundary
Nevada
Arizona
Independence
Owens Valley
Tehachapi Mountains
Tehachapi
California City
Central Mojave
West Mojave
Barstow
Needles
Lancaster
Adelanto
Victorville
Lucerne Valley
Big Bear Lake
Twentynine Palms
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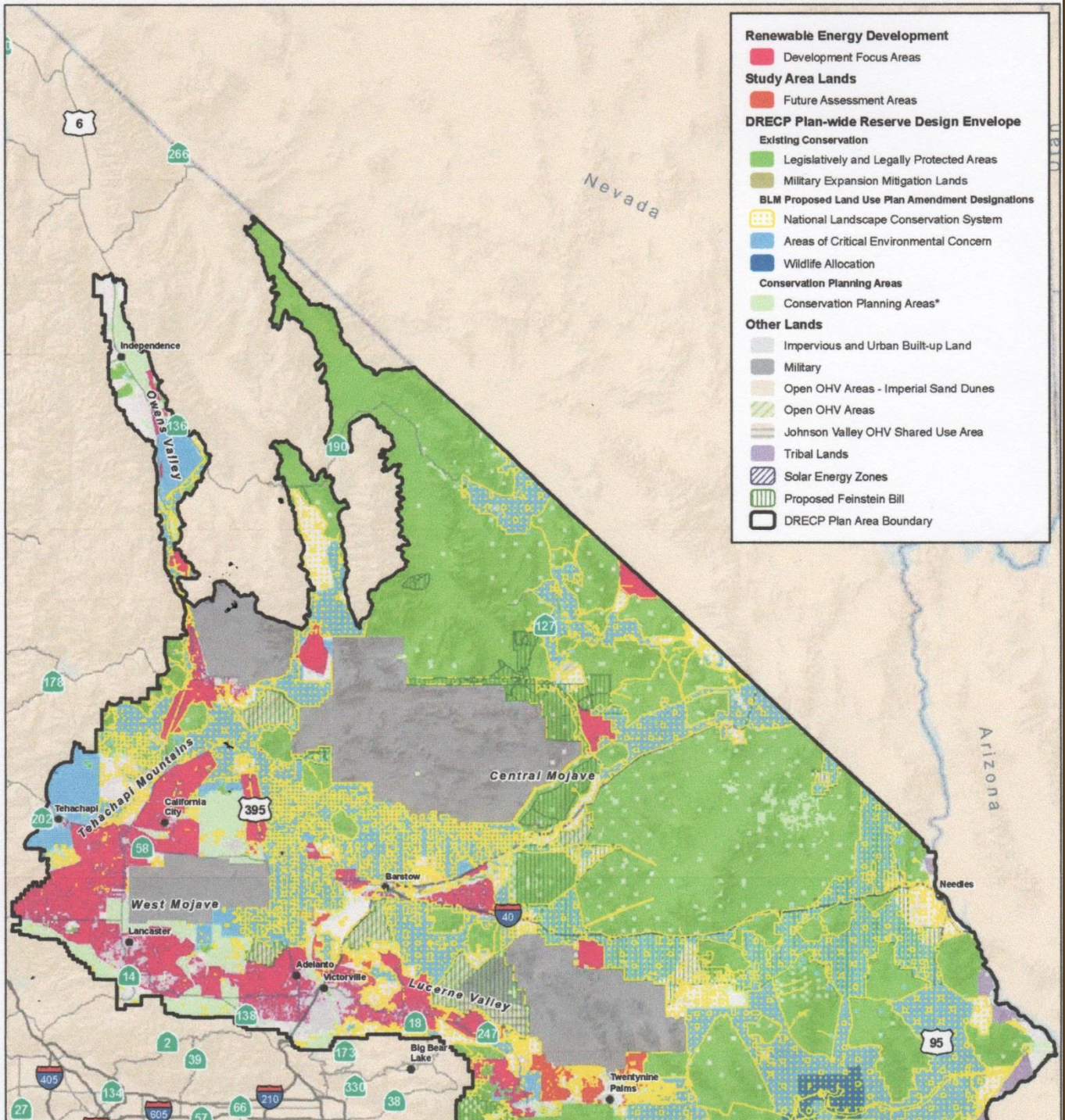
Renewable Energy Development
Development Focus Areas
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Conservation Measures

- 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

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