Welcome to the Conservation Lecture Series

www.dfg.ca.gov/habcon/lectures

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

• Amargosa Vole, Dr. Janet Foley & Dr. Robert Klinger
  June 9, 1:00-3:00, Sacramento

• White Abalone, Dr. Kristin Aquilino
  July 22, 1:00-3:00, Sacramento
DESERT TORTOISE
OUT STATE REPTILE

Presented by
Rebecca Jones
California Department
Of Fish & Wildlife
DT Protection

• 1939 state law prohibits purchase or sales
• 1961 laws prohibiting shooting or harming
• 1972-73 F&G code strengthened to prohibit collection of wild tortoises
• Desert Tortoise officially listed as threatened in August 1989 under the California Endangered Species Act CESA
Nomenclature

- *Gopherus agassizii* – Agaassiz’s Land Tortoise
- *Gopherus morafkai* – Morafka’s desert tortoise
Differences

**G. agassizii**
- Dome shaped
- North and west of the Colorado River
- Predominantly valleys and alluvial fans
- Number of clutches/yr 0-3

**G. morafkia**
- Flatter pear shaped
- South and east of the Colorado River
- Predominantly slopes and rocky hillsides
- Number of clutches/yr
Distribution
Biology

- Mating occurs in late summer to early fall

- Eggs usually hatch the following year in late summer but hatch the spring after
Adult tortoise

Sexual mature 15-20 yrs
Live to about 60 yrs in wild
Brumate in winter, but can be active any time of the year depending on temperature and rain
Females can store sperm
Lay 1-12 eggs may lay several clutches
• Color can range from blondish to almost black
• Bone is covered with scutes
• Home ranges - 2 to 40+ hectares
Hatchlings

- Size of silver dollar
- Soft shell
- Yoke sac
- Use rodent burrows
Diet

- Selective in choice of food depending on location and availability of plants
- Annual wildflower, hebaceous perrenials, native grasses and cacti.
- PEP (Potassium Excretion Potential) Plants *Lotus humistratus* and *Astragalus didymocarpus*
Threats

- Predators – Ravens, coyotes, golden eagles, badgers, desert kit fox, fire ants, ground squirrels, free-roaming dogs.
• Grazing

• OHVs
• Military Activities

• Alternative Energy
• Mining Past and Present

• Urban Development
• Exotic Plant Species-
  – *Bromus rubens*,
  – *Schimus barbatus*,
  – *Erodium cicutarium*
• Roads and railroads
• Wild fires

• Global warming
• Collection
• Shooting
• Burros
• Agricultural development
Health and Disease
Mycoplasma

- Bacterial Disease
- Found in captive populations in the 1970’s
- Found Desert Research Tortoise Natural Area (DTRNA)1988
- M. agassizii, and M. testudineum
- Known to case Upper Reparatory Tract Disease (URTD)
Symptoms - discharge from the nares, puffy eyelids, eyes recessed into the orbits, dullness to the skin and scutes, weight loss and and lethargic or erratic behavior

Translocate tortoise salvaged due to illness had a new *Mycoplasma* species on the penis
Cutaneous dyskeratosis

- Shell disease
- Unknown origin
- Initially identified on the Chuckwalla Bench
- Typified by shell lesions on the scutes
- Areas infected appear discolored, dry, rough and flakey, with peeling, pitting and chipping through multiple cornified layers
Cutaneous dyskeratosis

- Means of transmission are unknown
- Hypotheses include -
  - auto-immune disease
  - exposure to toxic chemicals
  - a deficiency disease
Herpesvirus

• Found captive population in 1982
• Seen in wild population 2003
• 2 new ones found
• URTD
• Plaques characteristic of Herpesvirus
EYE LESIONS, Blindness
DNA & ELISA were positive for *Mycoplasma testudineum*
Toxicants

• Arsenic
• Cadmium
• Lead
• Mercury
• Nickel
• Thorium
Typical Stressors for DTs

- Droughts: annual, seasonal
- Food quality & availability
  - biomass load of alien annuals
  - depletion of seed bank through grazing
- Toxicants, environmental contaminants
- Injuries from predators
Stressors have important roles

- Tortoise with 1 disease may show no clinical signs
- Tortoise with 1 disease & stressor more likely to show clinical signs, more likely to be ill & die
- Tortoise with 2 diseases more likely to die
No Simple Answers: Problem Areas

- Clinical signs not evident or overlapping
- Diseases may be latent; once acquired, always present
- Multiple tests may be necessary for pathogens or parasites
- Some tests not readily available
High Priorities for Research

- Effects of 2 pathogens operating together
- Herpesvirus: isolate and cultures of different types; transmission studies; location in tissues; recognize that tortoises may not mount an immune response
- *Mycoplasma*: *M. testudineum* transmission study, pathogenesis; study of new *Mycoplasma* from tortoise in Central Mojave Desert
Elevated toxicants

• Research is needed to:
  – establish baseline for adults at multiple sites, multiple seasons, dry and wet years
  – determine whether toxicants are transferred to eggs
High Priorities for Research: Nutrition

- Are wild tortoises receiving adequate nutrition for:
  - Growth
  - Egg production
  - Shell thickness & hardness
  - Resistance to disease
Population trends

- Study Plots
- Line Distance Sampling
Fremont Valley— ALL sizes

Tortoises / km$^2$

- 1981: 140
- 1987: 120
- 1991: 80
- 2001: 20
- 2007: 20
Fremont Peak — All sizes

Tortoises / km²

- 1980: High count
- 1985, 1989, 1993: Low counts
- 2007: Zero count

Graph shows a significant decline in tortoise population over time.
Lucerne Valley — All sizes

Tortoises / km²

Population declined 89% inside, 96% outside fence DTRNA
Trends in Abundance of Adult Tortoises
Change in abundance of adult Mojave Desert Tortoises in modeled habitat in each recovery unit

<table>
<thead>
<tr>
<th>Recovery Unit</th>
<th>2004</th>
<th>2012</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeastern Mojave</td>
<td>13,709</td>
<td>40,838</td>
<td>+27,129</td>
</tr>
<tr>
<td>Upper Virgin River</td>
<td>12,678</td>
<td>8,399</td>
<td>-4,280</td>
</tr>
<tr>
<td>Eastern Mojave</td>
<td>68,138</td>
<td>42,055</td>
<td>-26,083</td>
</tr>
<tr>
<td>Colorado Desert</td>
<td>111,749</td>
<td>85,306</td>
<td>-26,443</td>
</tr>
<tr>
<td>Western Mojave</td>
<td>152,967</td>
<td>76,644</td>
<td>-76,323</td>
</tr>
<tr>
<td>Total</td>
<td>359,242</td>
<td>253,242</td>
<td>-106,000</td>
</tr>
</tbody>
</table>

USFWS, in review
Relative Abundance of Smaller Tortoises (< 180 mm)
Management Histories & Strategies Affect Status of Agassiz’s Desert Tortoise Populations

Kristin H. Berry¹, Lisa Lyren¹, Julie Yee¹, & Tracy Bailey²

¹U.S. Geological Survey, CA, and ²Ridgecrest, CA
OBJECTIVES

- Compare tortoise densities & attributes
- Identify factors affecting recovery
- Provide recommendations for recovery & enhancing vehicle management
Three Management Areas/Strategies

DTRNA: DT Research Natural Area

Critical Habitat: Fremont-Kramer

Private lands: recently acquired, Desert Tortoise Preserve Committee, Inc.
DT Research Nat Area
- Protected >30 years
- Fenced, no grazing, no mining
Private lands (DTPC):
• No protection from grazing, vehicle use, dumping
Critical Habitat: Fremont-Kramer

- Sheep & intensive recreation vehicle use ‘til 1990
- Continuing recreational vehicle use
# Population Densities - Adults

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DENSITY/km²</th>
<th>Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTRNA</td>
<td>10.2</td>
<td>9.9–10.4</td>
</tr>
<tr>
<td>DTPC private lands, unfenced</td>
<td>3.7</td>
<td>3.6–3.8</td>
</tr>
<tr>
<td>Critical habitat</td>
<td>2.4</td>
<td>2.3–2.6</td>
</tr>
</tbody>
</table>

USFWS 2011: 3.5/km²
## Death Rates lowest in Natural Area

<table>
<thead>
<tr>
<th>Management area</th>
<th>Crude annual death rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desert Tortoise Research Natural Area</td>
<td>2.8</td>
</tr>
<tr>
<td>Critical habitat</td>
<td>20.4</td>
</tr>
<tr>
<td>Private lands</td>
<td>6.3</td>
</tr>
</tbody>
</table>
Causes of death for 47 on-plot tortoises

- Mammalian predators (coyote, kit fox)
- Domestic dog
- Raven predation
- Vehicles
- Shooting
- Unknown
The DTRNA:

~ 40 years of protection from sheep, vehicles & other disturbances works!
Continued monitoring of a translocated population of Agassiz’s Desert Tortoises (*Gopherus agassizii*): Questions that can aid conservation
Translocation

- Ft. Irwin, NTC
- Superior-Cronese Desert Wildlife Management Area (DWMA)
- Southern Expansion Area (545 km²)
- Translocation sites (2.58 km²)
Monitoring

- Post-translocation
  - Released spring 2008
  - Monitored monthly for survival
  - Monitored seasonally for health
Percent alive per plot
## Sources of Mortality

<table>
<thead>
<tr>
<th>Source</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predation - Canid</td>
<td>80</td>
<td>83.4</td>
</tr>
<tr>
<td>Predation - Raven</td>
<td>7</td>
<td>7.3</td>
</tr>
<tr>
<td>Temperature</td>
<td>3</td>
<td>3.1</td>
</tr>
<tr>
<td>Vehicles, crushing</td>
<td>3</td>
<td>3.1</td>
</tr>
<tr>
<td>Salvage – Disease</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>Snake bite</td>
<td>1</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>96</td>
<td></td>
</tr>
</tbody>
</table>
Important questions to address

• Survival
  • What is the long-term survival of translocated tortoises?
  • How is the long-term survival influenced by release-related decisions: (1) location, (2) habitat, and (3) seasonal and annual droughts?
  • What information can we apply to future translocations to increase the survival rates?

• Mortality
  • Are translocated tortoises more susceptible to certain sources of mortality (canid, raven, exposure, etc.)?
  • Do patterns of mortality change by site and over time?
Importance of Good Surveys

- Number of tortoises found can determine how much effort will be needed for translocation plan.

- Do your job correctly if you want to keep working.
Thank you

• Dr. Kristin Berry  USGS Biological Resource Division

• Linda Allison – USFWS Desert Tortoise Recovery Office