

# Predation Pressure on Desert Tortoises at the BCCE

by

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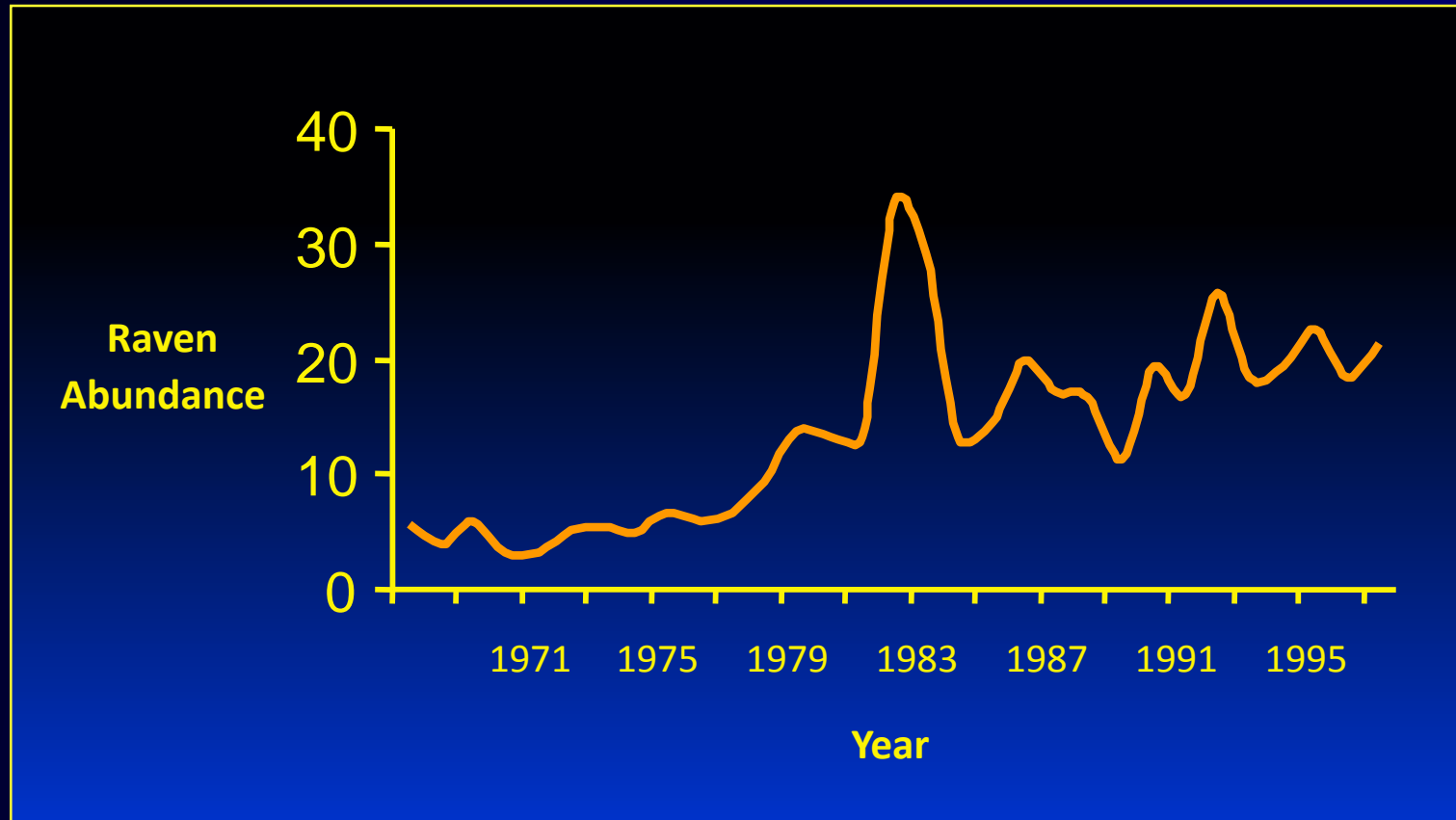
# Subsidized Predators are:

“Populations of predatory species that survive and prosper partially as a result of resources provided by human activities.”

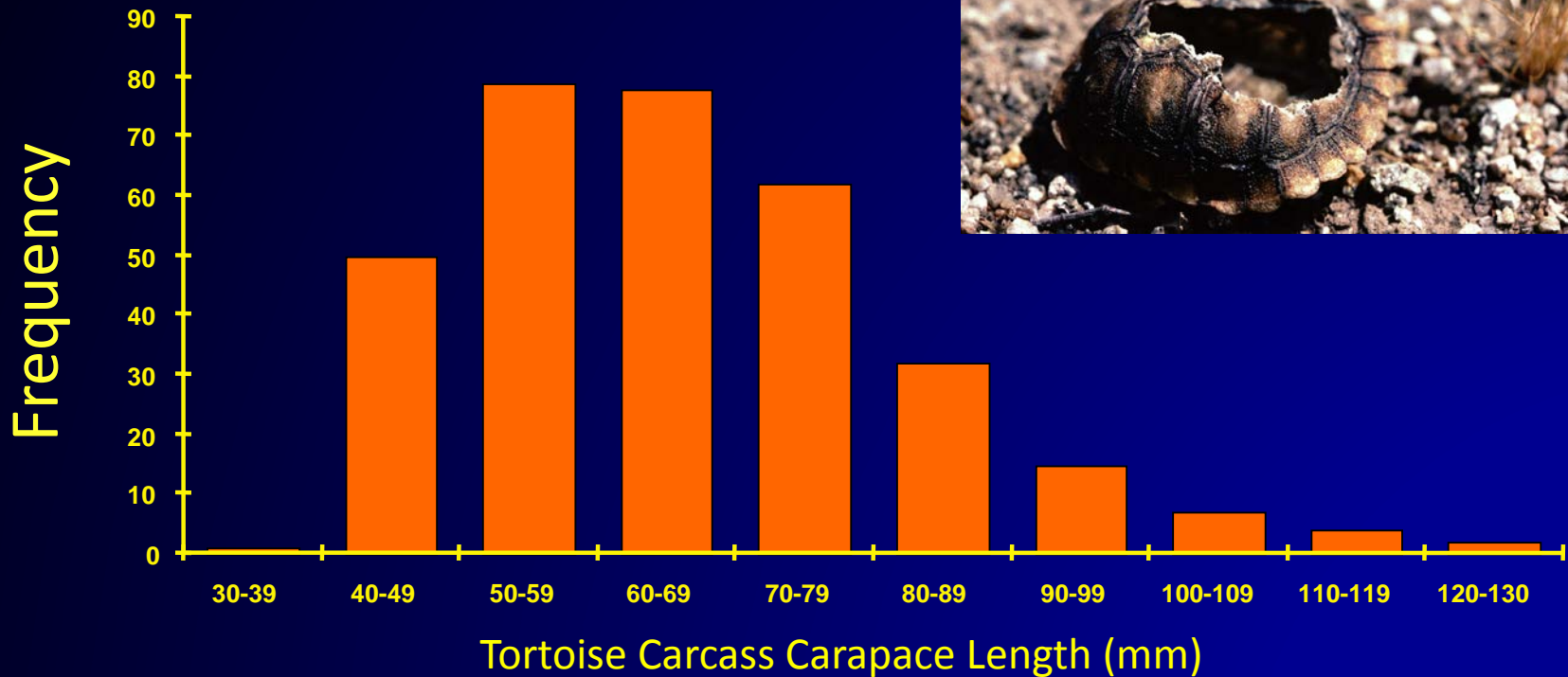
- Subsidies:
  - Food
  - Water
  - Nesting Substrate
  - Refugia



# Raven Populations Increased in the Mojave Desert



# Ravens Eat Juvenile Tortoises



# Purpose of Study

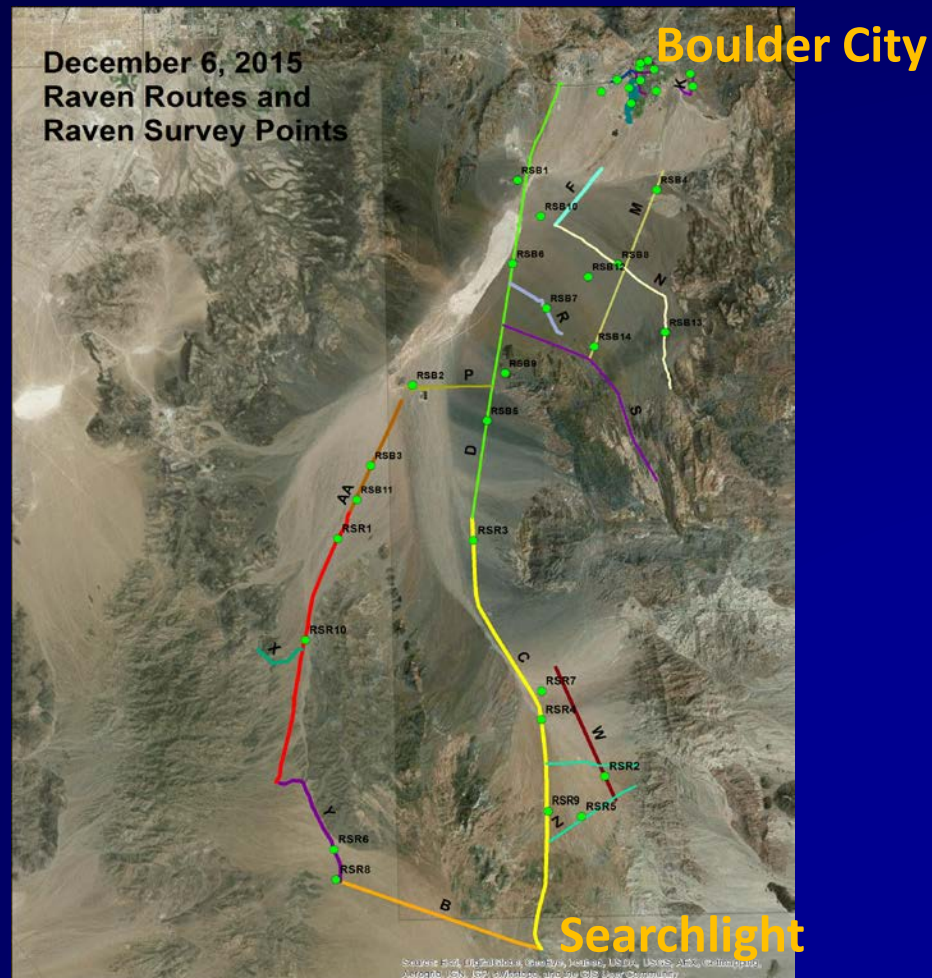
- Determine if there is a “Raven Problem” in the BCCE
  - Extend to other predators
  - Does predation occur?
  - Nature/extent of the current situation
- How and when to manage predators
  - Understand dynamics predator populations
  - Study spatio-temporal nature of predation risk
  - Determine if and what measures should be taken

# Objectives of Study

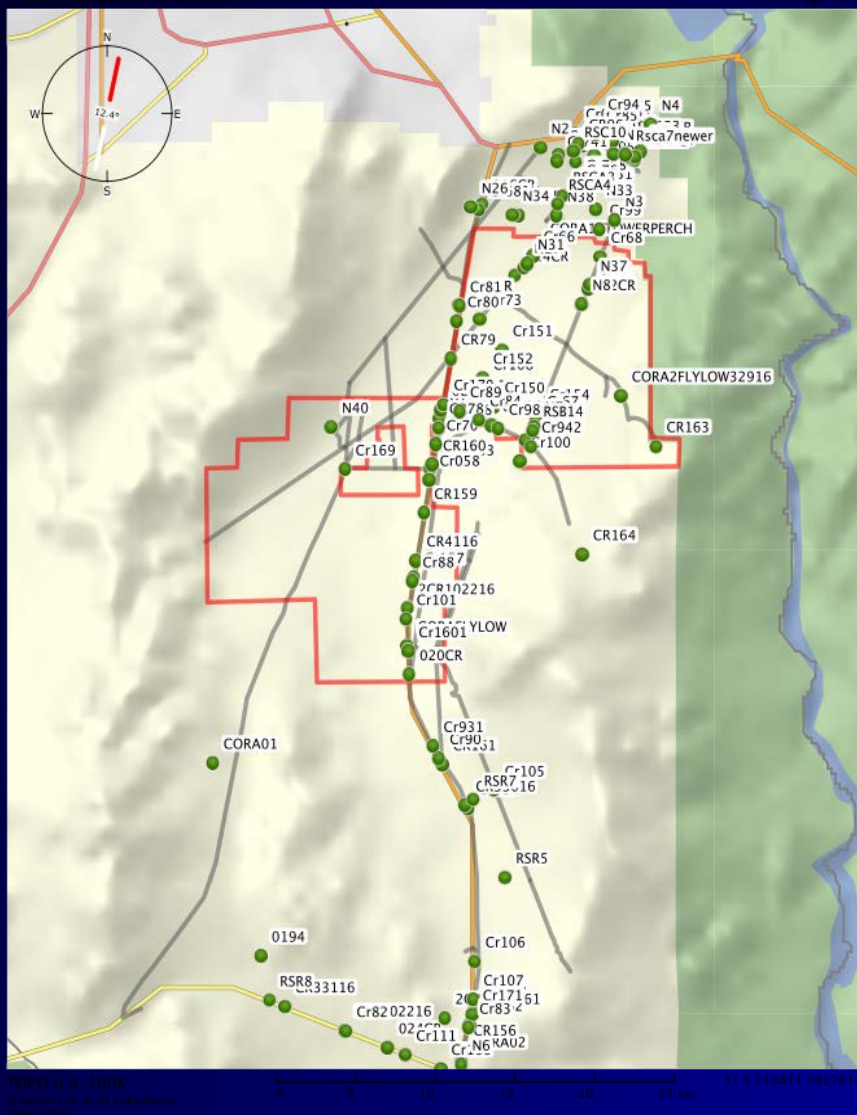
- Determine Temporal & Spatial Patterns of:
  - predator presence/abundance, including active raven & raptor nests
  - risk of predation
- Identify Food Items
  - tortoise remains
  - other foods
- Develop Predator Management Plan

# Determine Temporal & Spatial Patterns

- Predator presence and abundance
  - Raven surveys
    - road surveys
    - point counts



# All Raven Sightings



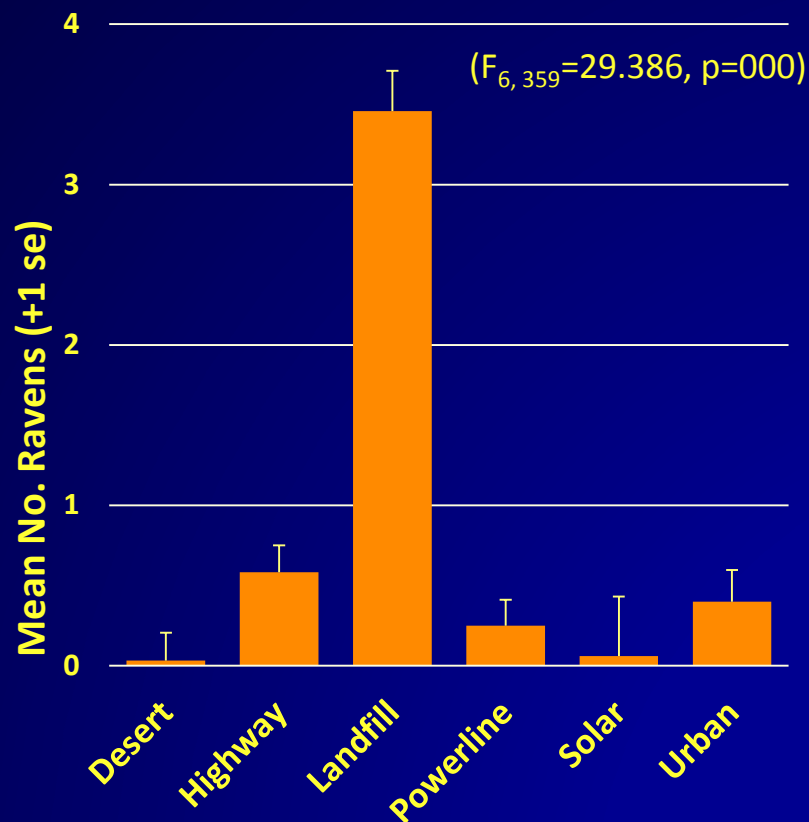


# Determine Temporal & Spatial Patterns

- Predator presence and abundance

- Raven surveys

- road surveys
- point counts

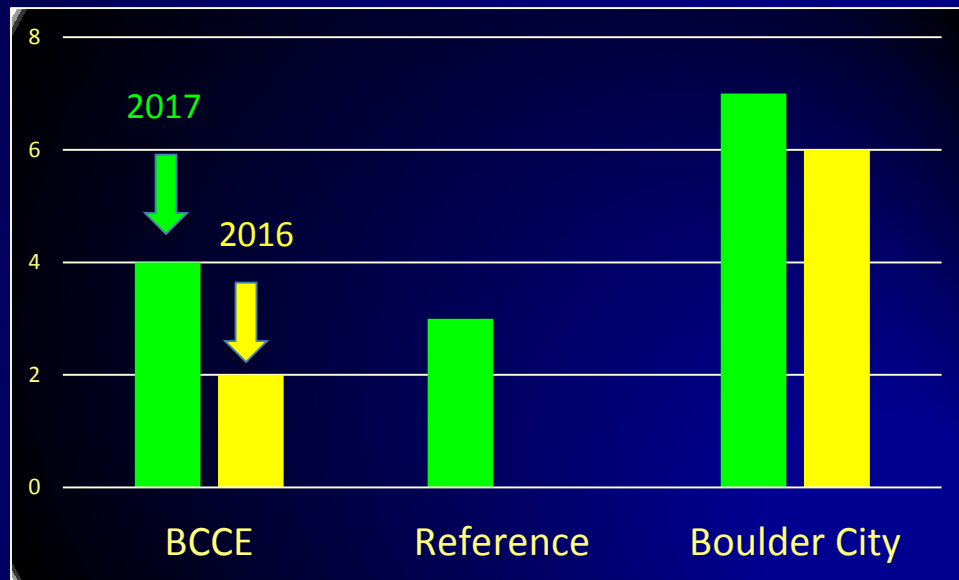


# Determine Temporal & Spatial Patterns

- Predator presence and abundance
  - Active raven and raptor nests

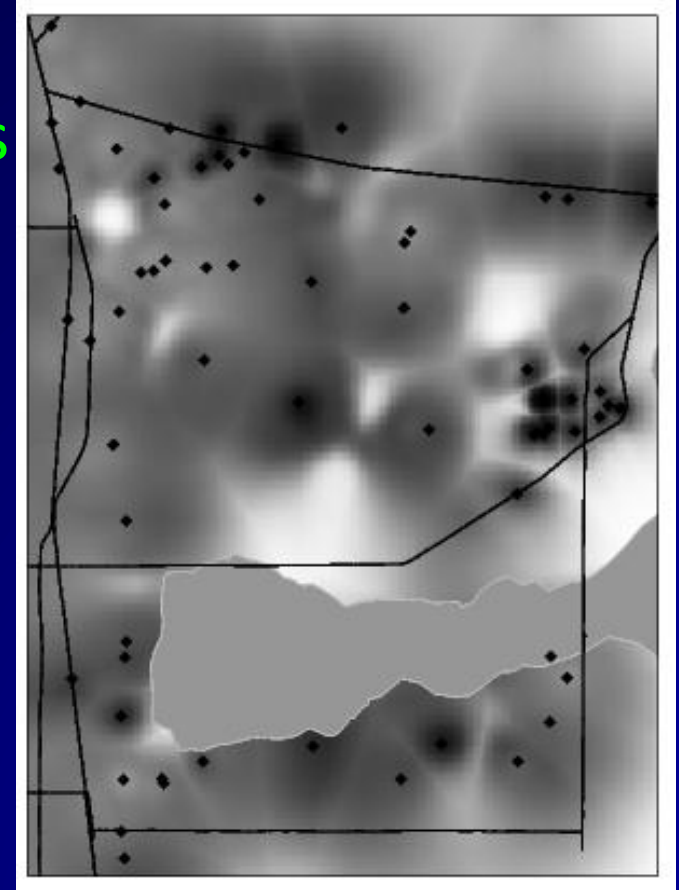


Number of Raven Nests



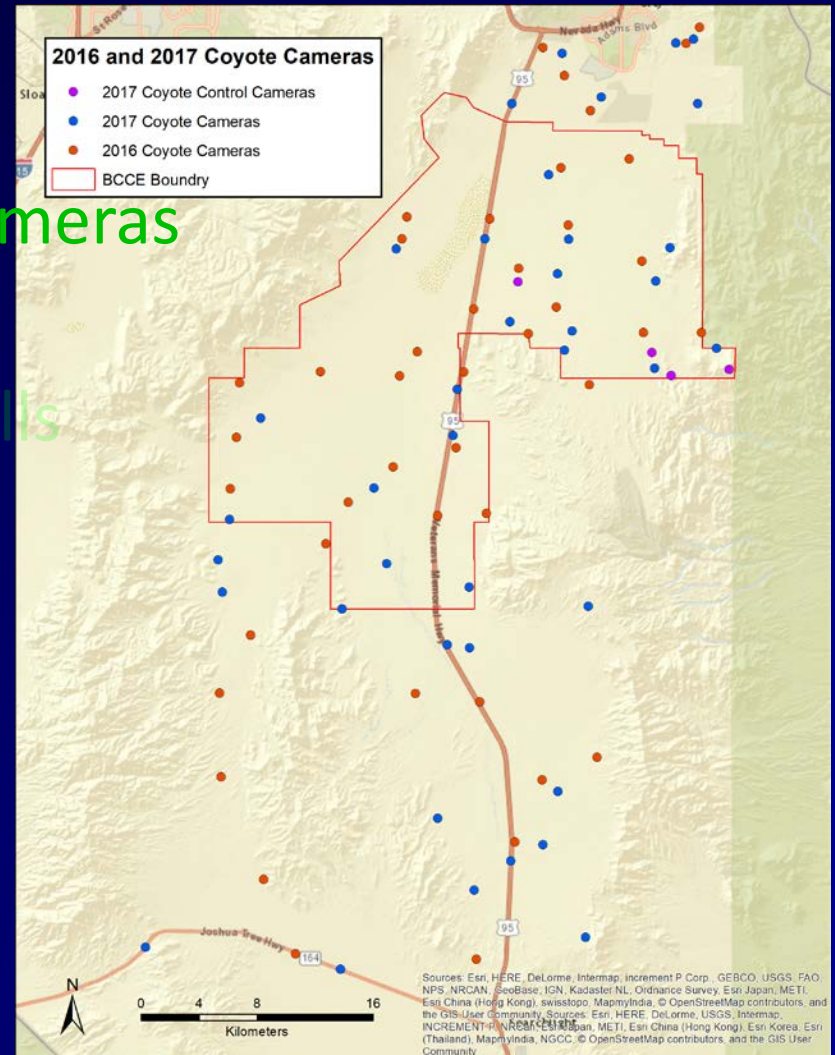
# Determine Temporal & Spatial Patterns

- Predation pressure
  - 40 Motion-triggered cameras at 80 random locations
  - 3D-printed tortoise shells



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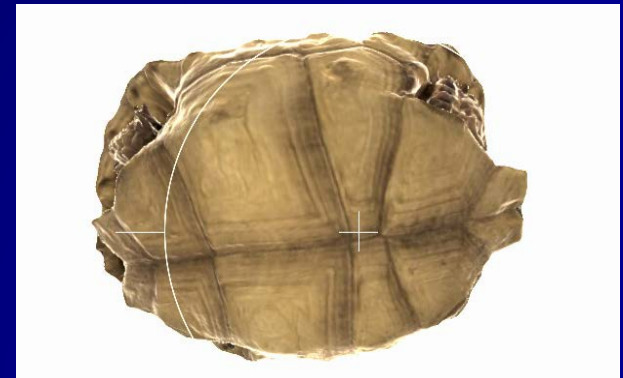
- Predation pressure

## Animals Photographed

	No. Cameras	Events
Coyotes	65	1456
Kit Foxes	62	1626
Ravens	18	152
Jackrabbits	66	1350

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# Determine Temporal & Spatial Patterns

- 3D-printed tortoise shells
  - Other species attack or investigate the shells



# Determine Temporal & Spatial Patterns

– 3D-printed tortoise shells

## Raven Encounters

	No. Cameras	Events
Encounters	8	88
Contacts	62	48

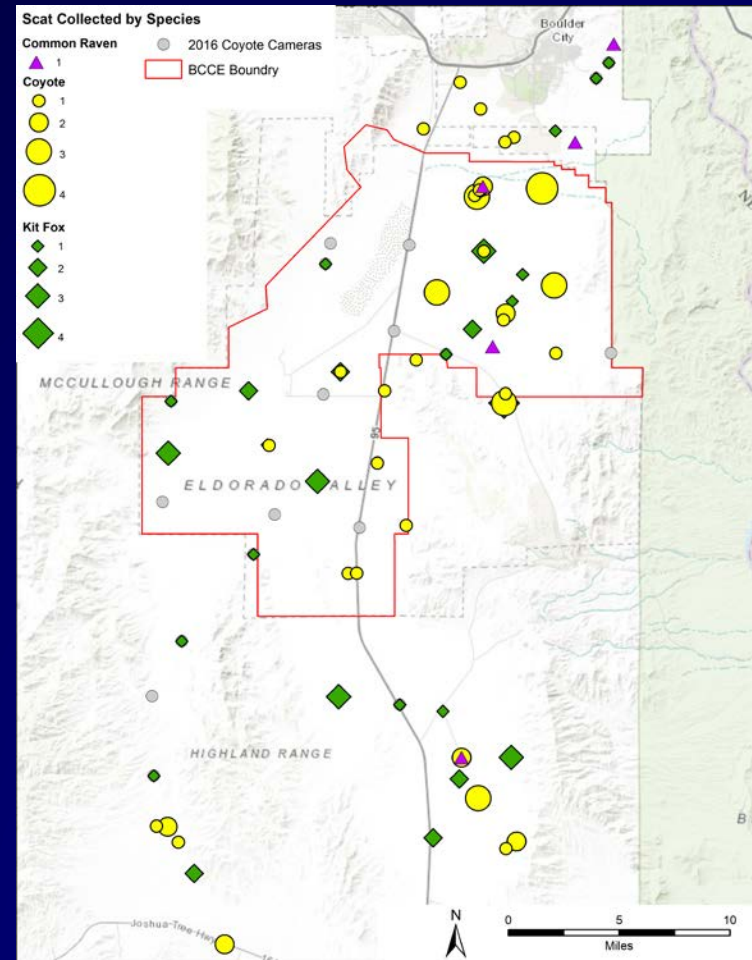
# Identify Food Items

- Tortoise remains
  - Visual inspection
  - Genetic analysis
- Other foods from scat



# Scat Collection Locations

	Locations	Scats
Coyote	37	124
Kit Fox	37	197
Ravens	5	19
All Spp.	67	363



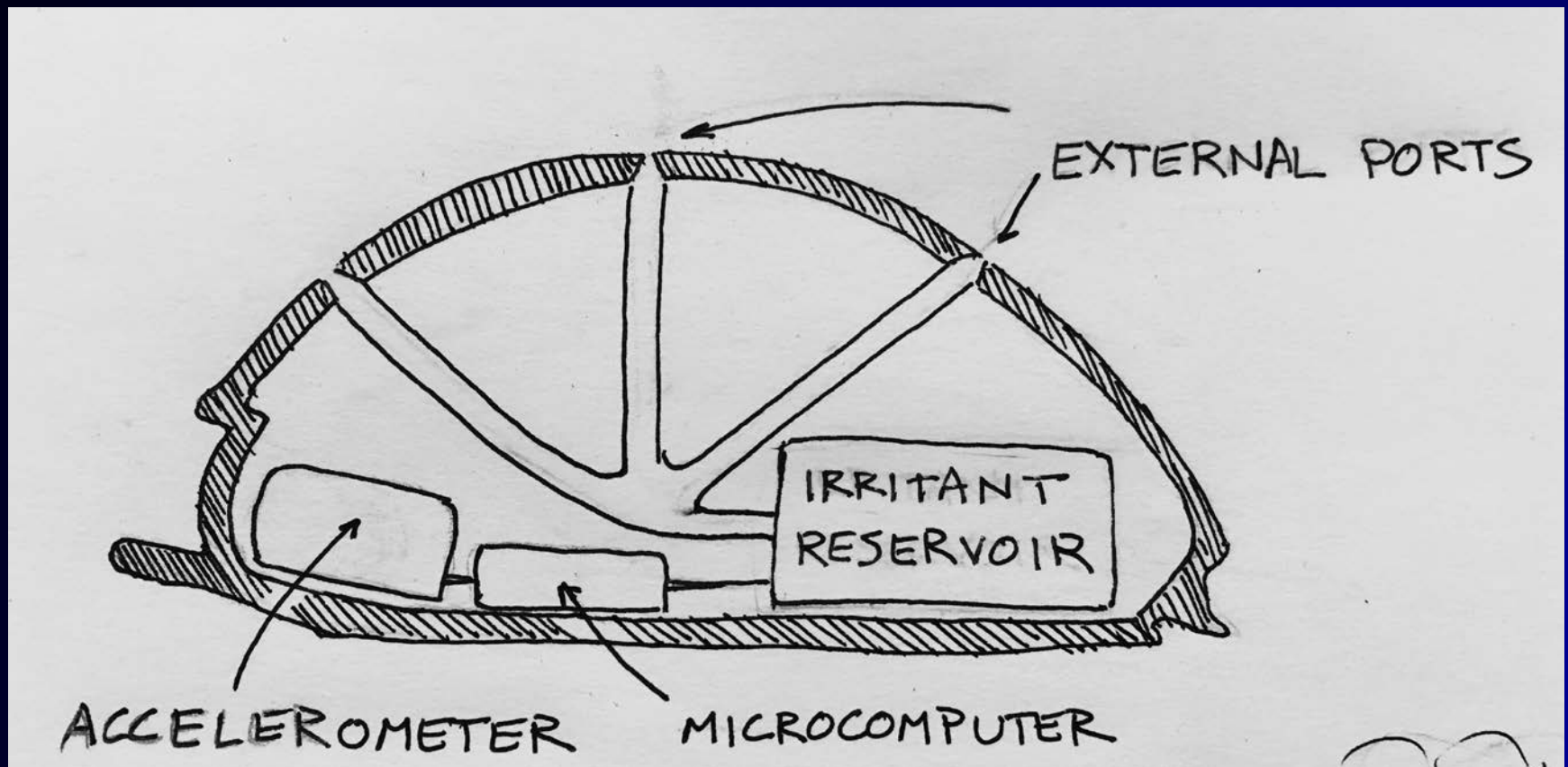
# Predator Management

## Multiphasic Approach

1. Alter Subsidizing Habitat
2. Aversive Conditioning
2. Lethal Removal
3. Research
4. Adaptive Management

# Weaponizing Techno-Torts™

## The Delivery Mechanism



# Weaponizing Techno-Torts™

## The Trigger

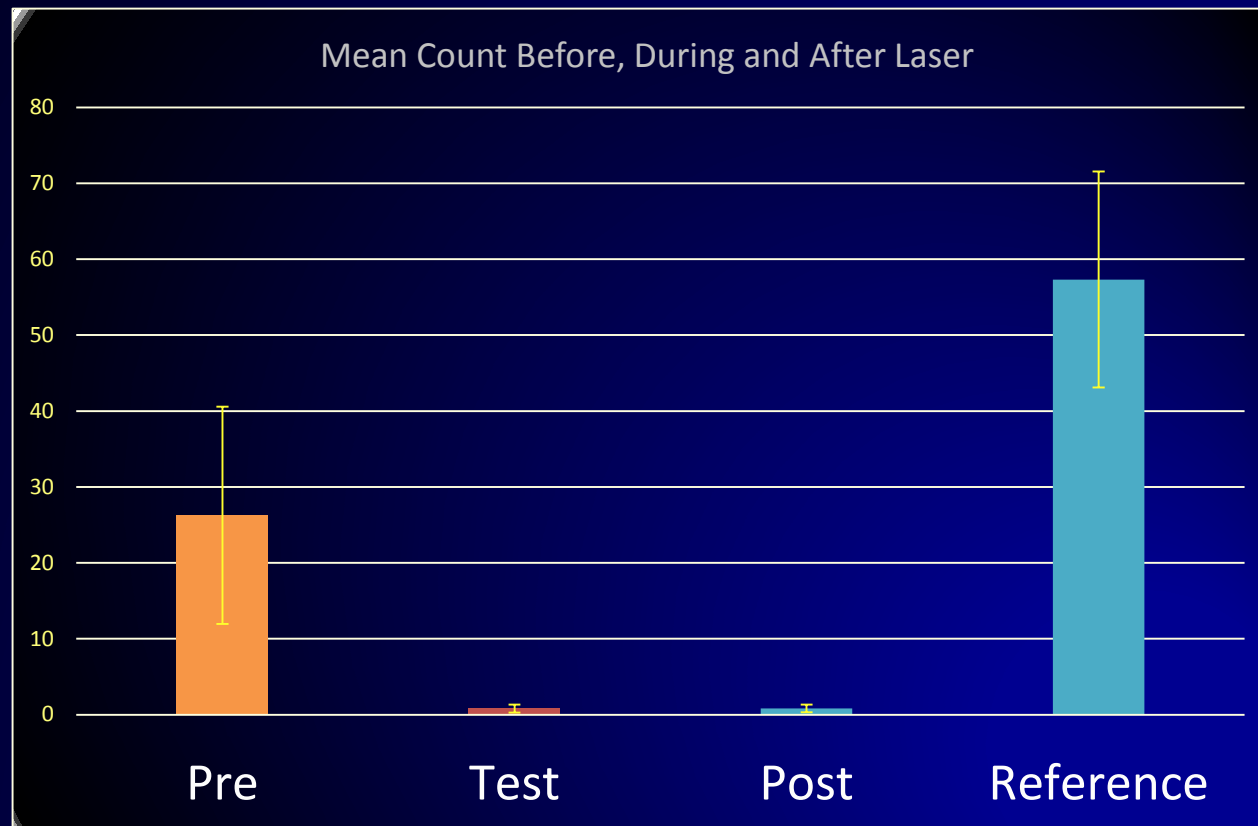




# Laser Warfare to Manage Ravens



# Laser Reduced Raven Numbers to NEAR ZERO at Pistachio Grove



# Oiling Eggs with Drones



**nest structure**

Thank You!





# Lethal Removal



# Landfill Management



# Nest Removal

