WHERE ARE THE MONSTERS?

Occupancy and detection probability of Gila Monsters in Southwestern Utah

SIENNA SOLIS-STOKES

INTRODUCTION

Iconic, long-lived venomous lizards of the American Southwest

Low tolerance to high temperatures

Suite of behavioral and physiological survival strategies to manage life in a highly seasonal environment

Shelter in rocky underground burrows for a majority of time

Short peak annual activity season

Diet typically consists of juvenile cottontails and rodents, ground-nesting bird eggs, and tortoise eggs

INTRODUCTION

Occupy Southern Utah at the northern boundary of their range, most north-eastern extent of the Mojave Desert

Patchy spatial distribution

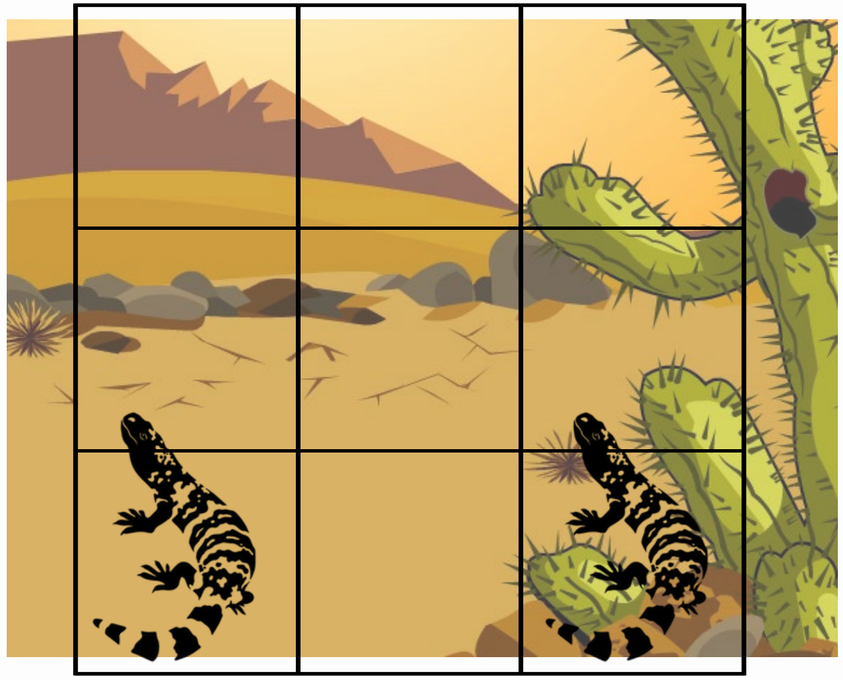
Shelter in rocky crevices and underground burrows

Utilize sandy dunes and washes for walkways and foraging

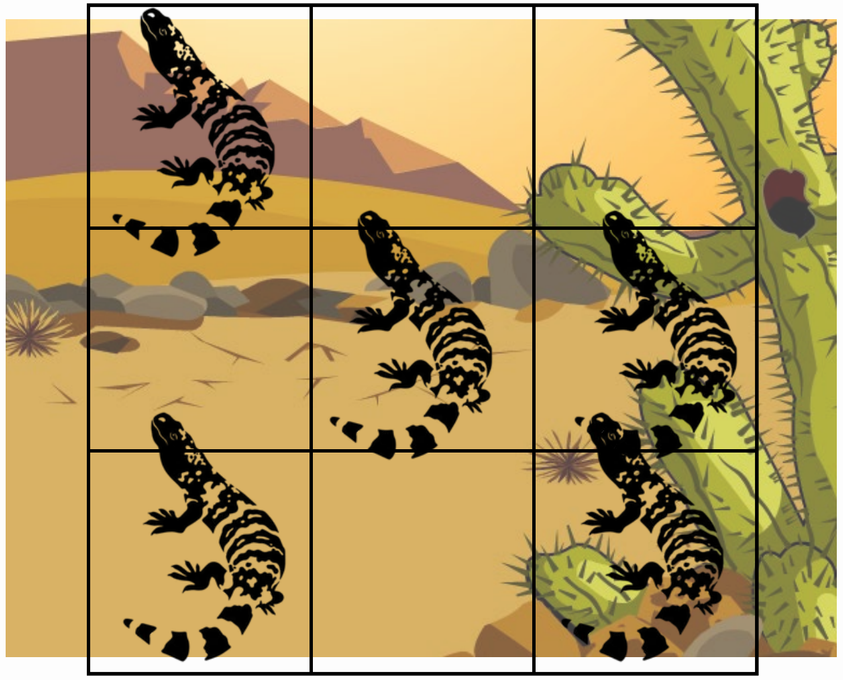
Rapid urban expansion in St. George, UT

INTRODUCTION

Occupancy: The proportion of sites, patches or habitat units occupied by a species



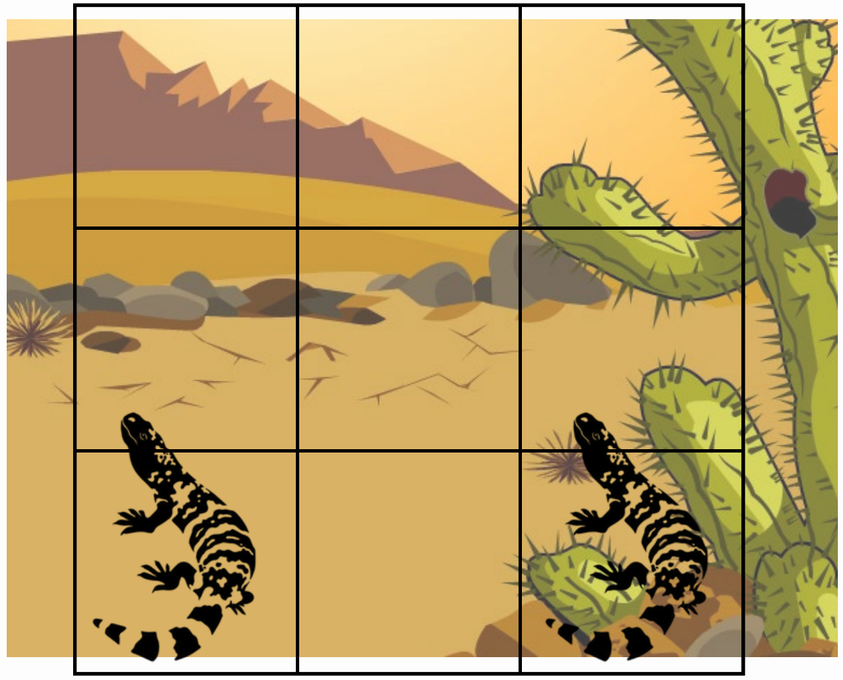
2/9 = 29% occupancy

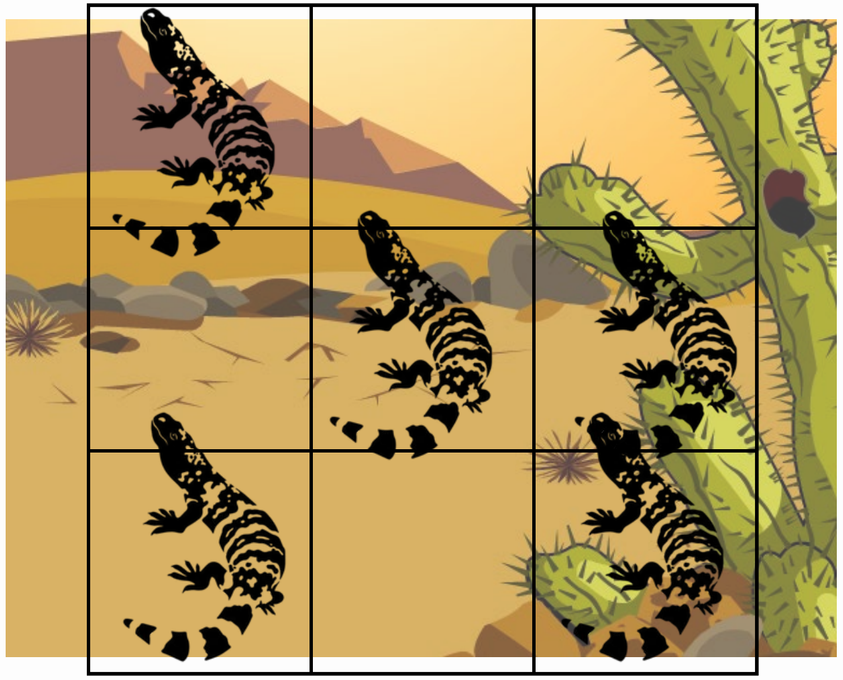


5/9 = 55% occupancy

INTRODUCTION

Occupancy: The proportion of sites, patches or habitat units occupied by a species





Assuming perfect detectability

INTRODUCTION

Detection probability accounts for imperfect detection during surveys

INTRODUCTION

Detection probability accounts for imperfect detection during surveys

HYPOTHESIS

Variation of environmental factors and landscape features jointly influence Gila monster occupancy and detectability.

PREDICTIONS

Because Gila monsters utilize sandy washes and dunes for walkways and foraging, we expect Gila monster detection will be greatest in areas with loose sand, in dunes and washes.

PREDICTIONS

Because Gila monsters utilize sandy washes and dunes for walkways and foraging, we expect Gila monster detection will be greatest in areas with loose sand, in dunes and washes.

Because Gila monsters have a low tolerance to high temperatures, we expect Gila monster detection will be greatest when ambient temperatures fall within their preferred range (23°C to 37°C).

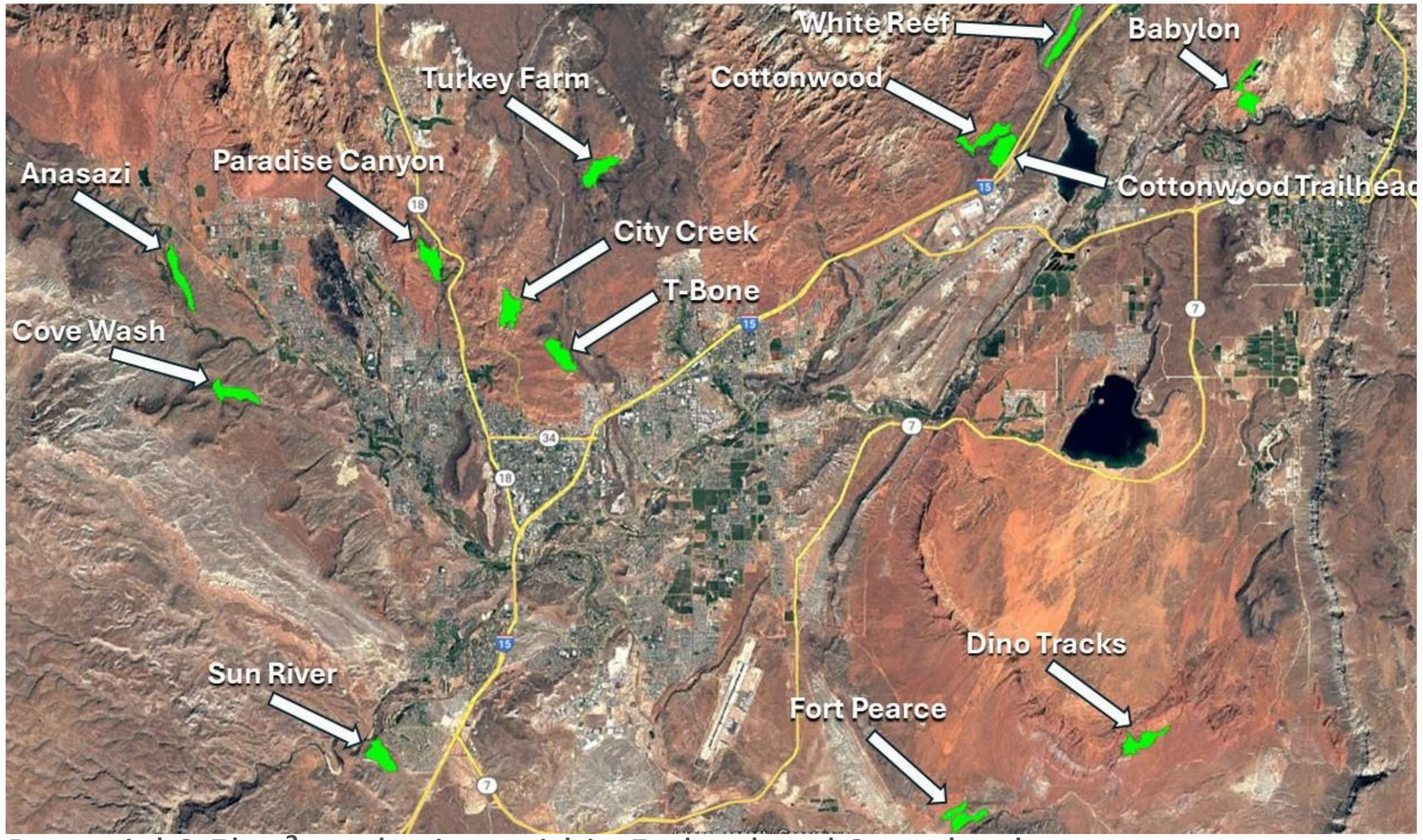
PREDICTIONS

Because Gila monsters utilize sandy washes and dunes for walkways and foraging, we expect Gila monster detection will be greatest in areas with loose sand, in dunes and washes.

Because Gila monsters have a low tolerance to high temperatures, we expect Gila monster detection will be greatest when ambient temperatures fall within their preferred range (23°C to 37°C).

We expect Gila monster occupancy will be associated with diverse desert vegetation, a high prey presence, and topographical heterogeneity.

METHODS



Potential 0.5km² study sites within Federal and State land.

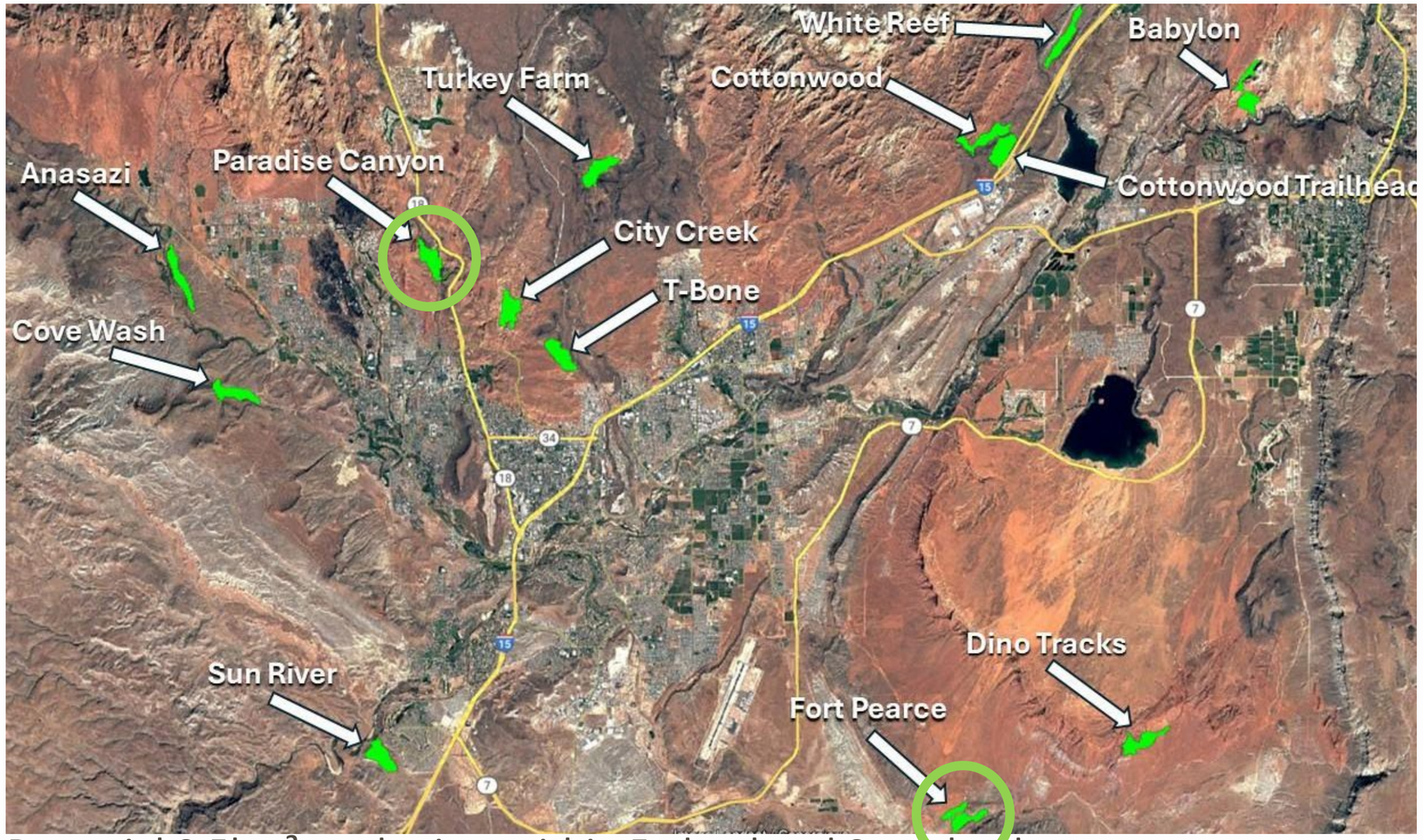
SITE SELECTION

Potential sites were categorized into **High, Medium,** and **Low Quality**

Criteria used to determine Habitat Quality:

- Topography
- Native plant diversity/abundance
- Habitat patch size
- Habitat disturbance
- Accessibility
- Historical Gila monster occurrences

METHODS



Potential 0.5km² study sites within Federal and State land.

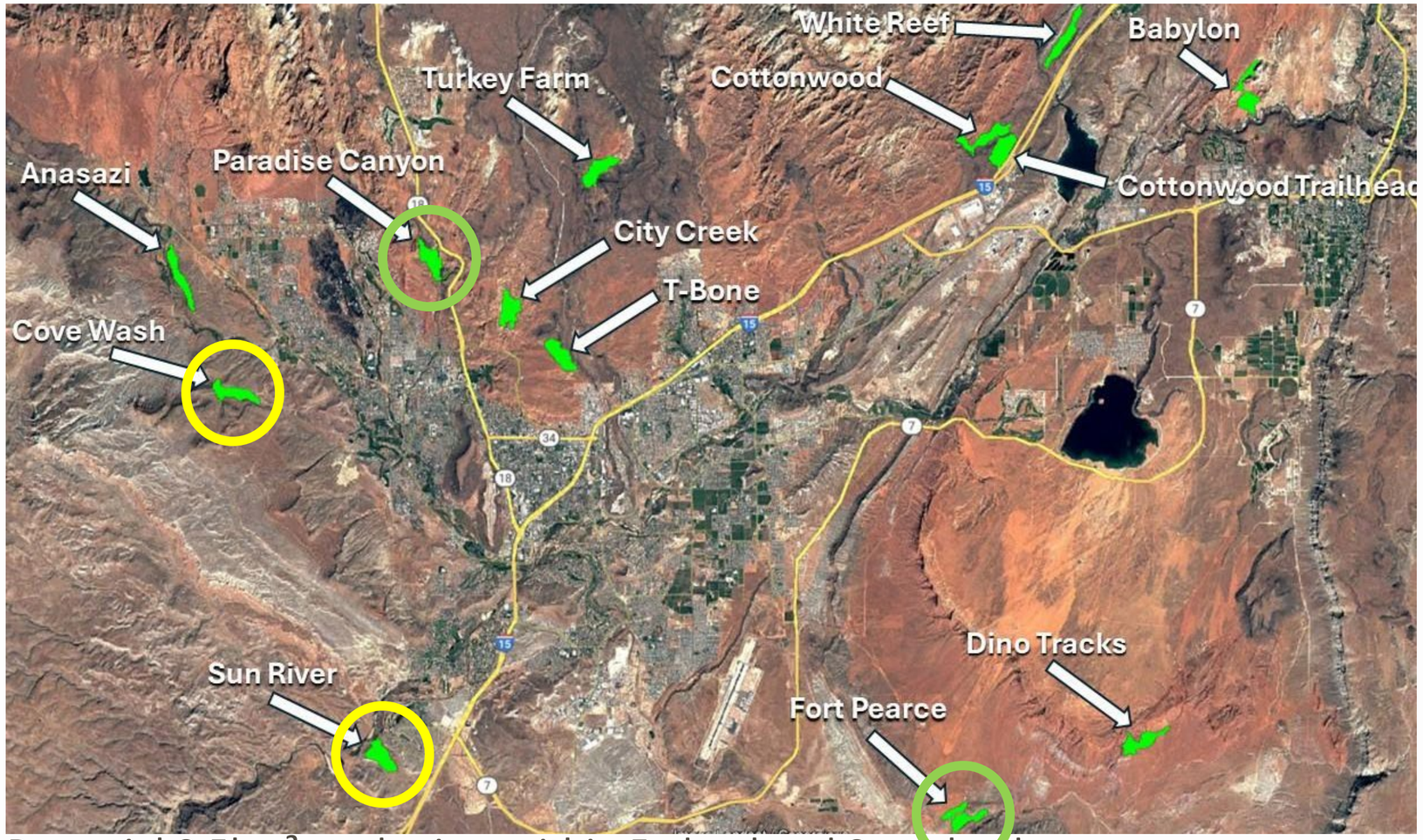
SITE SELECTION

Potential sites were categorized into **High, Medium,** and **Low Quality**

Criteria used to determine Habitat Quality:

- Topography
- Native plant diversity/abundance
- Habitat patch size
- Habitat disturbance
- Accessibility
- Historical Gila monster occurrences

METHODS



Potential 0.5km² study sites within Federal and State land.

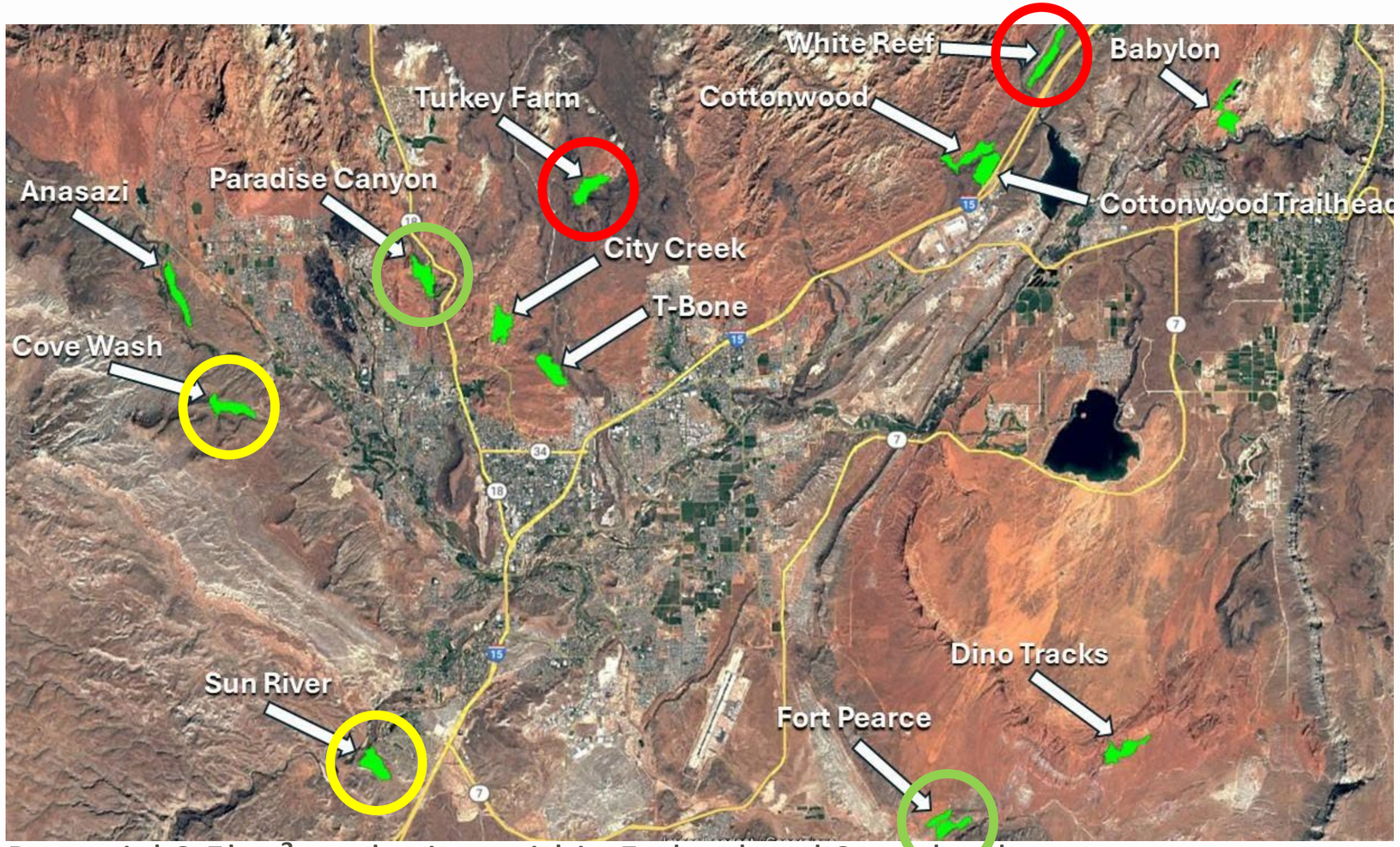
SITE SELECTION

Potential sites were categorized into **High, Medium,** and **Low Quality**

Criteria used to determine Habitat Quality:

- Topography
- Native plant diversity/abundance
- Habitat patch size
- Habitat disturbance
- Accessibility
- Historical Gila monster occurrences

METHODS



Potential 0.5km² study sites within Federal and State land.

SITE SELECTION

Potential sites were categorized into **High, Medium,** and **Low Quality**

Criteria used to determine Habitat Quality:

- Topography
- Native plant diversity/abundance
- Habitat patch size
- Habitat disturbance
- Accessibility
- Historical Gila monster occurrences

METHODS

Conduct line-transect distance surveys:

- Randomized, 1-km transects
- Segmented point collections every 0.25-km
- At different times/temperatures of the day
- Within the primary active season (April-July)

Data collection:

- Start and end survey times
- Transect ID
- Number of surveyors
- Ambient and substrate temperatures
- Gila monster sign or encounter
- Vegetative structure
- Geological structure
- Prey presence
- UTM GPS coordinates
- Photos

METHODS

GEOLOGICAL STRUCTURE CLASSES

Rocky Cliff

Sandstone

Rocky Debris Slope

Gravel - Small Rock

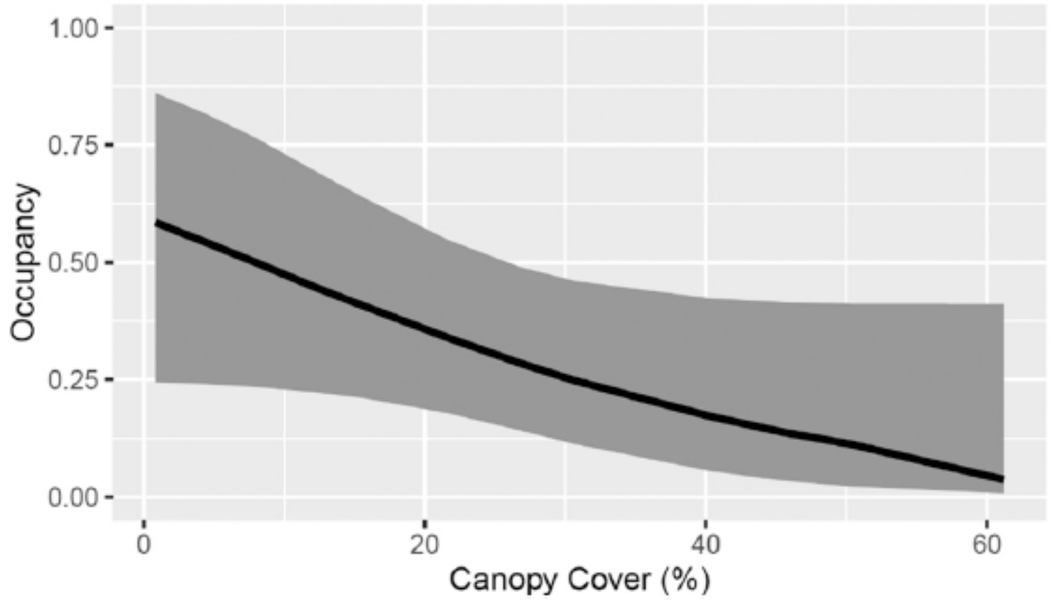
Stabilized Sand

Loose Sand

Fine Sand

ANALYSIS

SITE	T001	T002	T003	T004	T005	T006	T007	T008	T009	T010
FP	1	0	0	1	0	1	0	0	0	1
WR	0	0	0	0	0	0	0	0	0	0
PC	1	1	0	1	0	1	0	1	0	1
SR	0	0	0	0	1	0	1	0	0	0
CW	0	1	1	0	0	1	0	0	0	1
TF	0	0	0	0	0	0	0	1	1	0



Thacker et al. 2023

Observation Process
Transect and point-count surveys

Occupancy Pattern
Detection histories are reported as either:
1 (species detected) or **0** (species not detected)

Ecological Processes
Differences in log values of covariates to distinguish correlations and variation gradients

ANALYSIS

Identify environmental and landscape covariates which best predict Gila monster occupancy

Identify environmental and landscape covariates which optimize detection probability

Create occupancy models to which best predict Gila monster occupancy and inform population density estimates

Act as a guideline for future Gila monster surveys and management across the range