Biodiversity Hotspots in Clark County, NV

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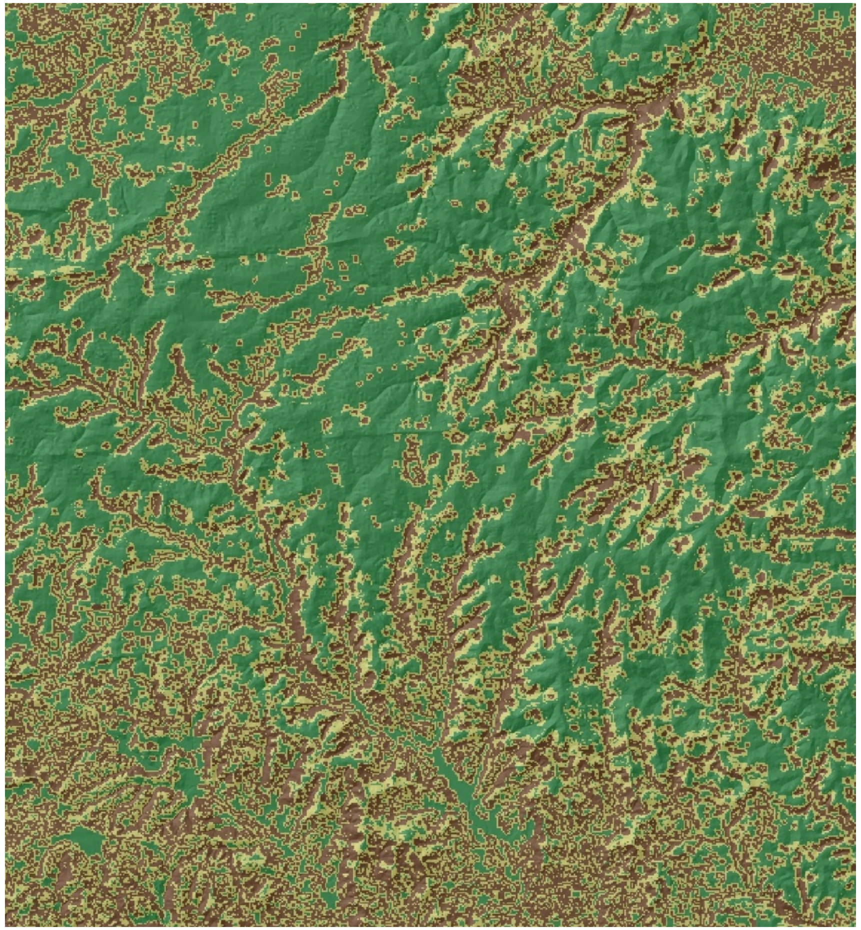
Biodiversity Hotspots – Why?

- The local and regional diversity of species
  - Sounds nice, right?
- Land management
  - More effective conservation of multiple species
  - Bigger bang-for-the-buck

Biodiversity Hotspots – Our opportunity

- Species Distribution Models (SDM)
- DCP has commissioned or has access to 55 SDMs
  - Maybe not representative

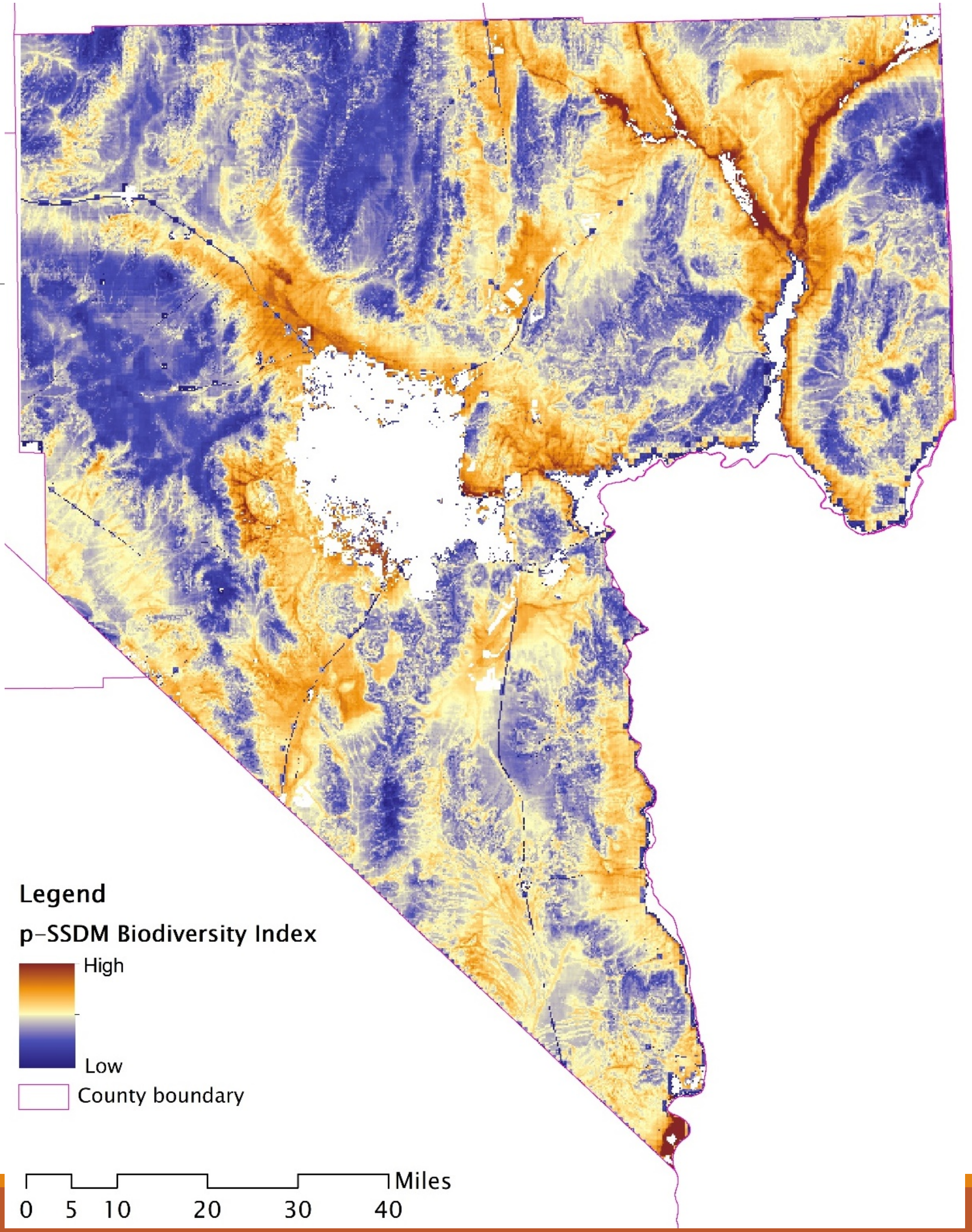


Biodiversity Hotspots – Methods

- Classified: suitable, suitable after processing, unsuitable
- GIS processing: resampling, reprojecting, rescaling
  - 250m x 250m grid
- Output: *relative* probability of each species' occurrence
- Analysis: stacked raw probability SDMs → p-SSDM
- Analysis: macroecological model

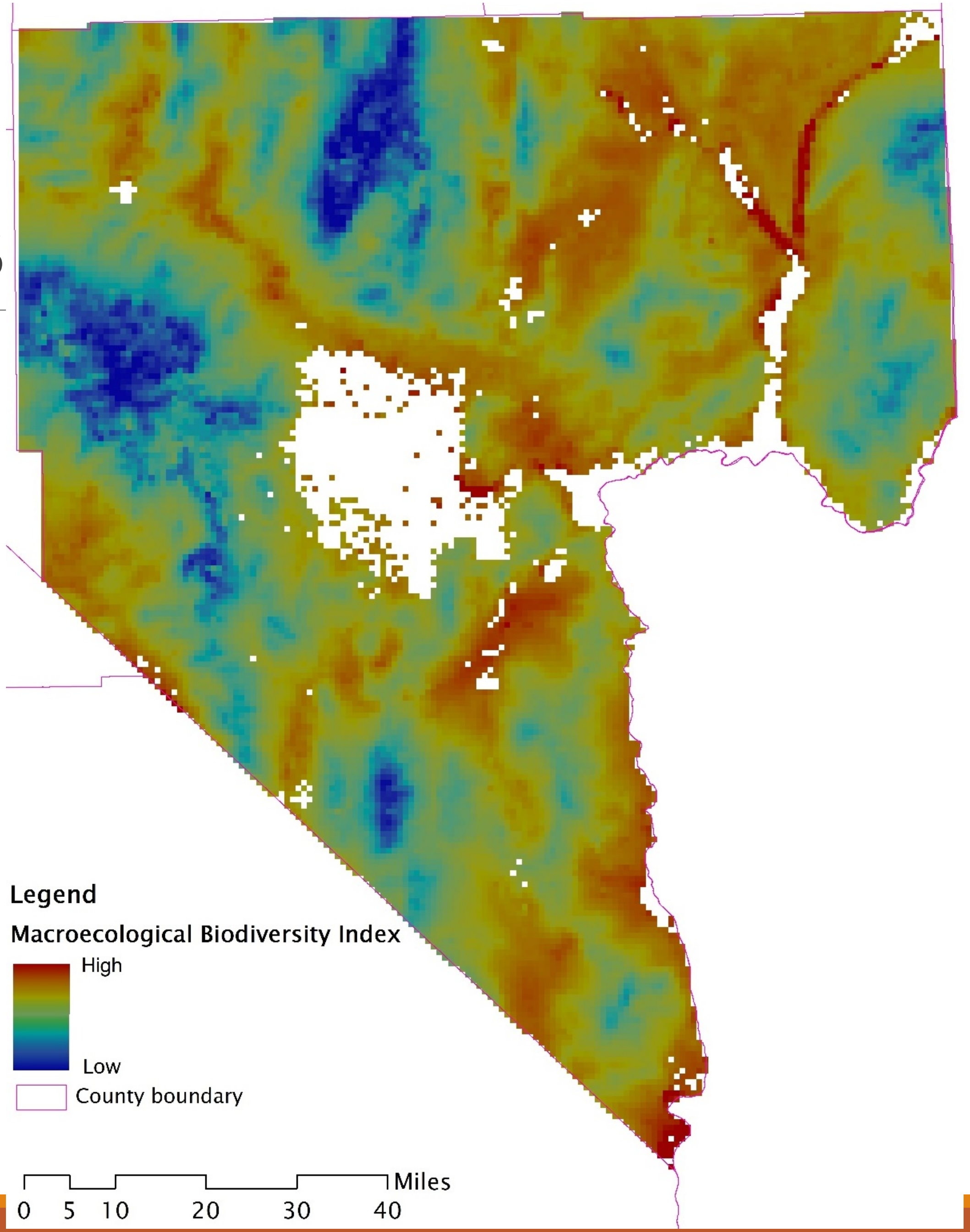
Biodiversity Hotspots – Results

- Classification: retained 40 SDMs after processing
- p-SSDM:

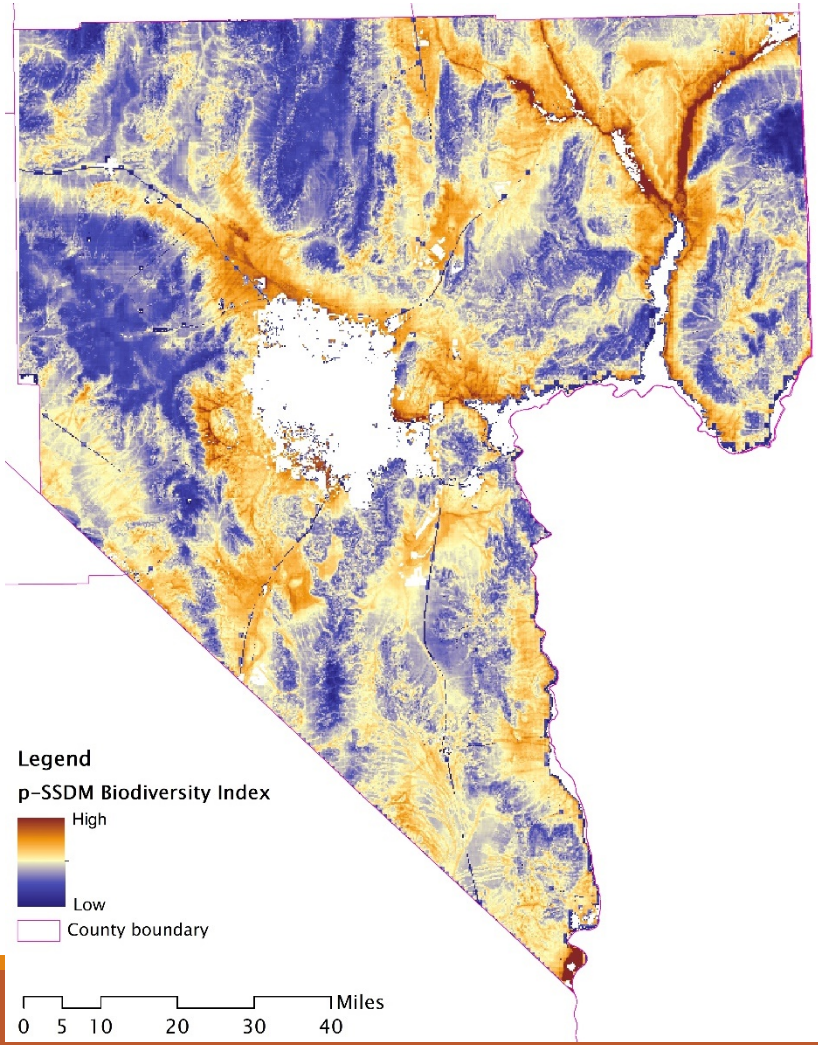


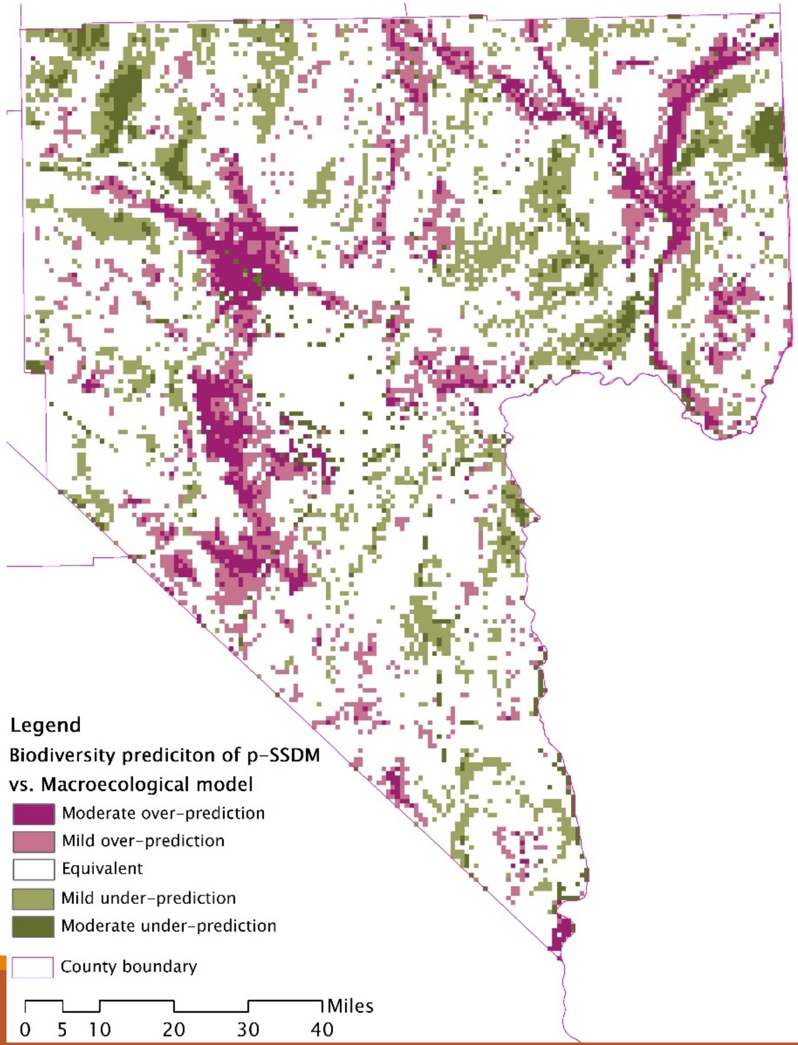
Biodiversity Hotspots – Results

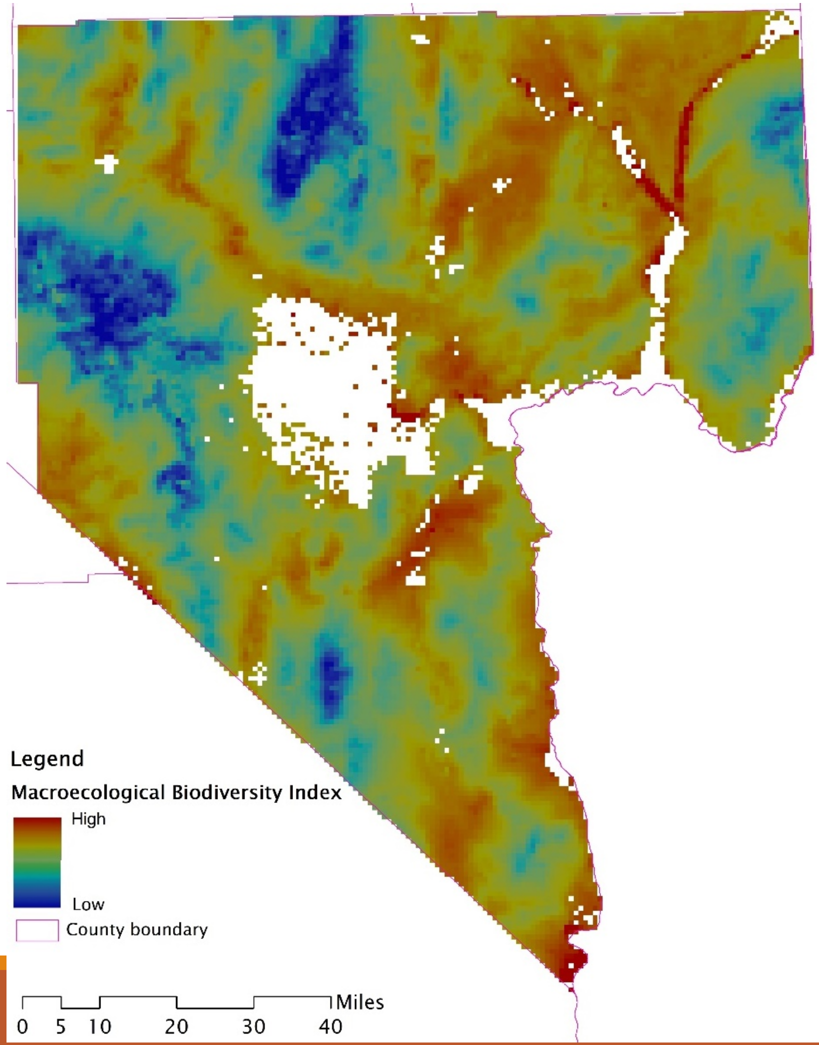
- Macroecological model:



Biodiversity Hotspots – Results

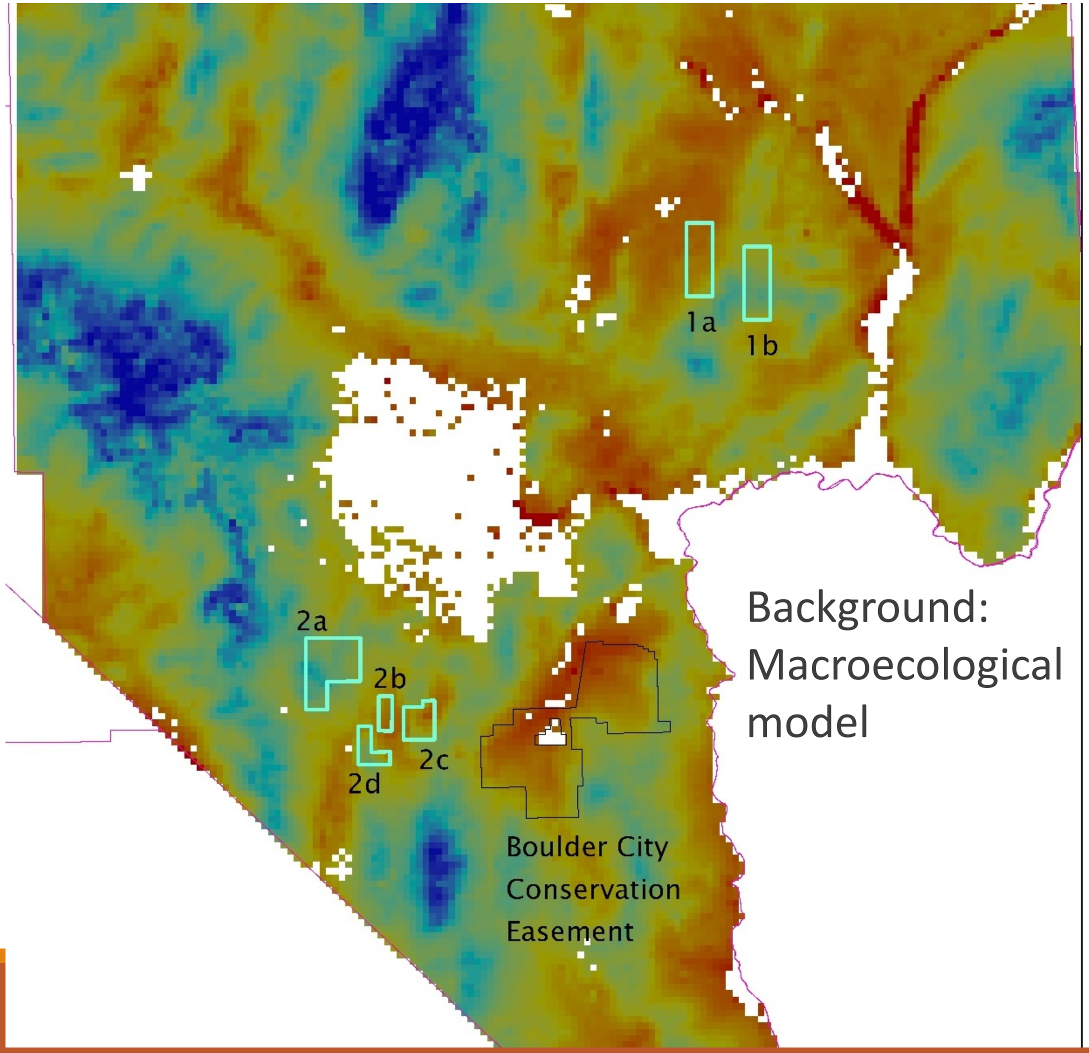




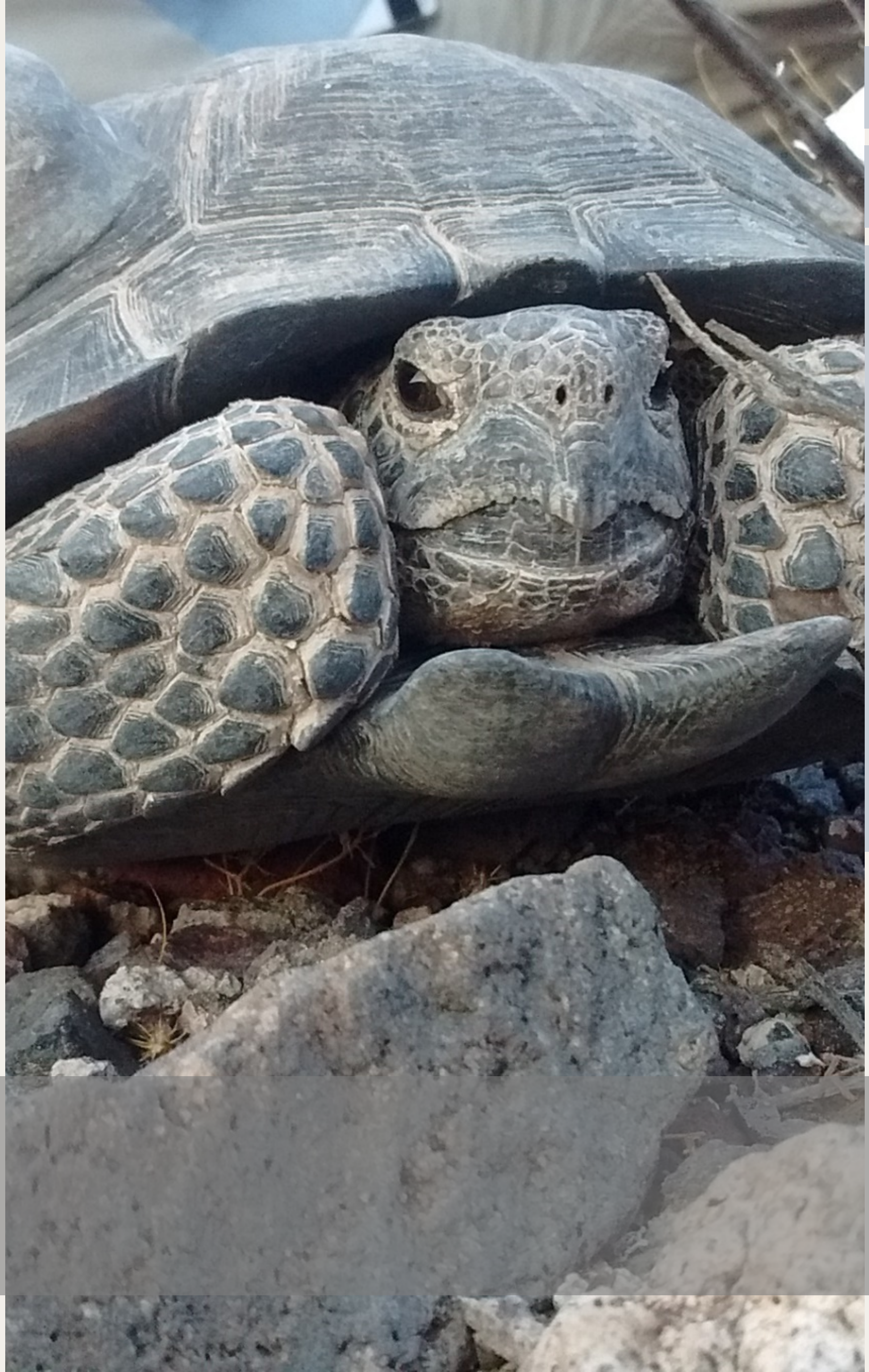


Biodiversity Hotspots – Case study

Reserve Unit	Average		Sum	
	p-SSDM	Macroecological	p-SSDM	Macroecological
1a	9.6	10.3	6897.0	455.3
1b	8.3	9.2	6120.5	404.3



End Biodiversity Hotspots



Desert Tortoise Survival:

Combining data sources and implications for understanding translocation success

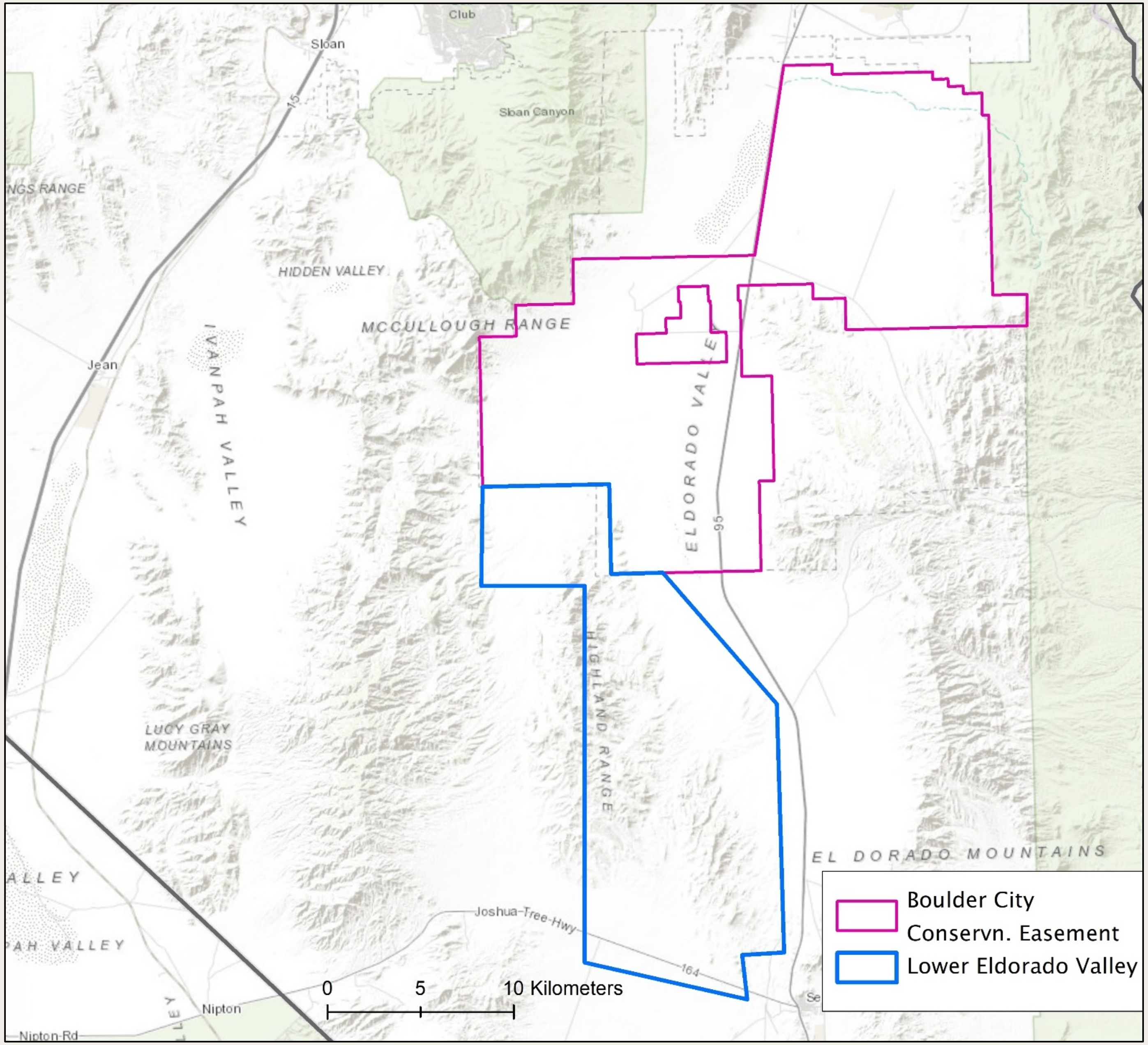
*Collab. data and manuscript with DCP, USFWS, USGS

Background

1. Can ancillary data improve precision of survival estimates compared to only radio-telemetry?
2. What are survival rates of resident vs. translocated tortoises, adults vs. juveniles?

The data

- The study area



Statistical Analysis

<u>Bayesian exponential survival model</u>

Time-to-event

Allows for right-censoring

Captures same information type (time to event, in weeks) for both datasets

Statistical Analysis

- Four groups of tortoises:
  - Resident adults
  - Resident juveniles
  - Translocated adults
  - Translocated juveniles

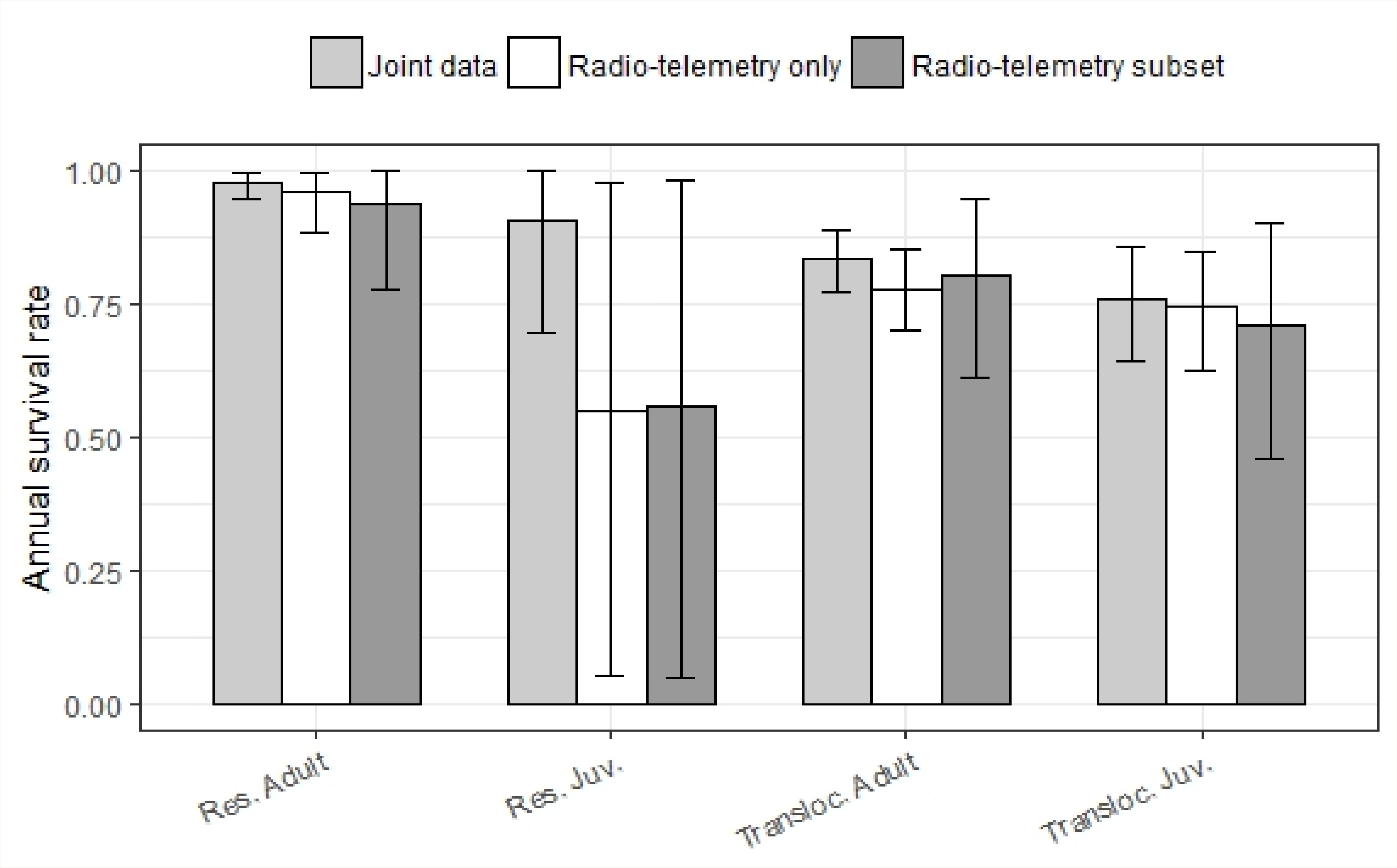
Results

Sample sizes

	Radio-telemetry	Mark-encounter	Total
Resident	23	44	67
Translocated	115	31	146
Total	138	75	**214**

Number mortalities = 44

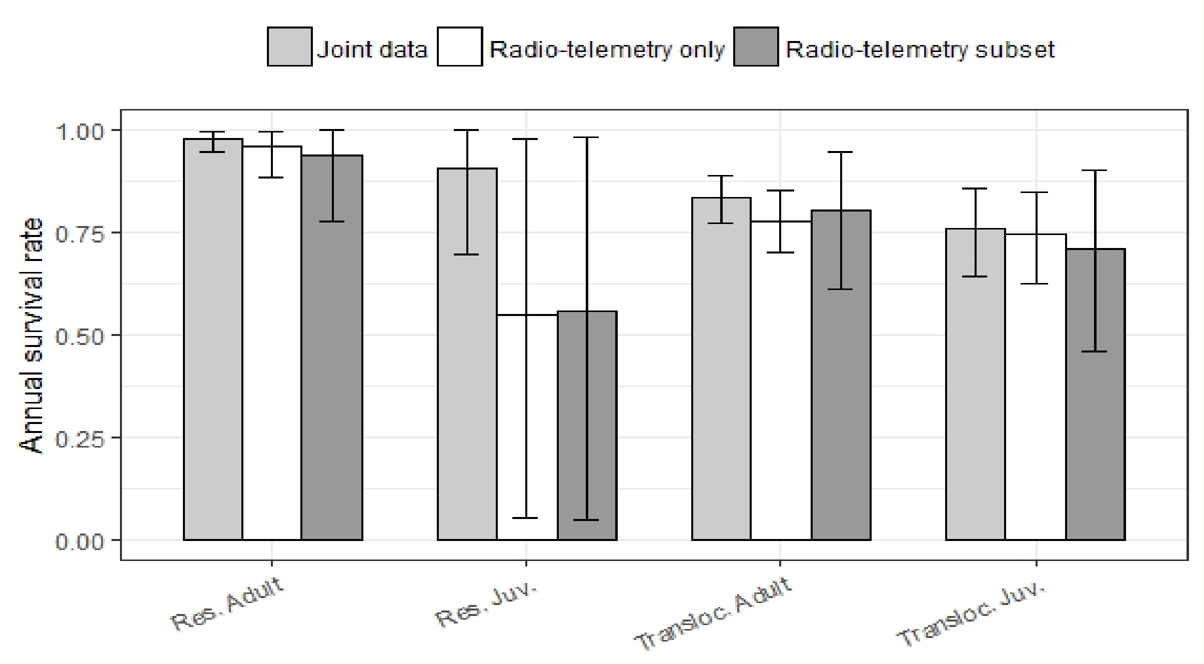
Results



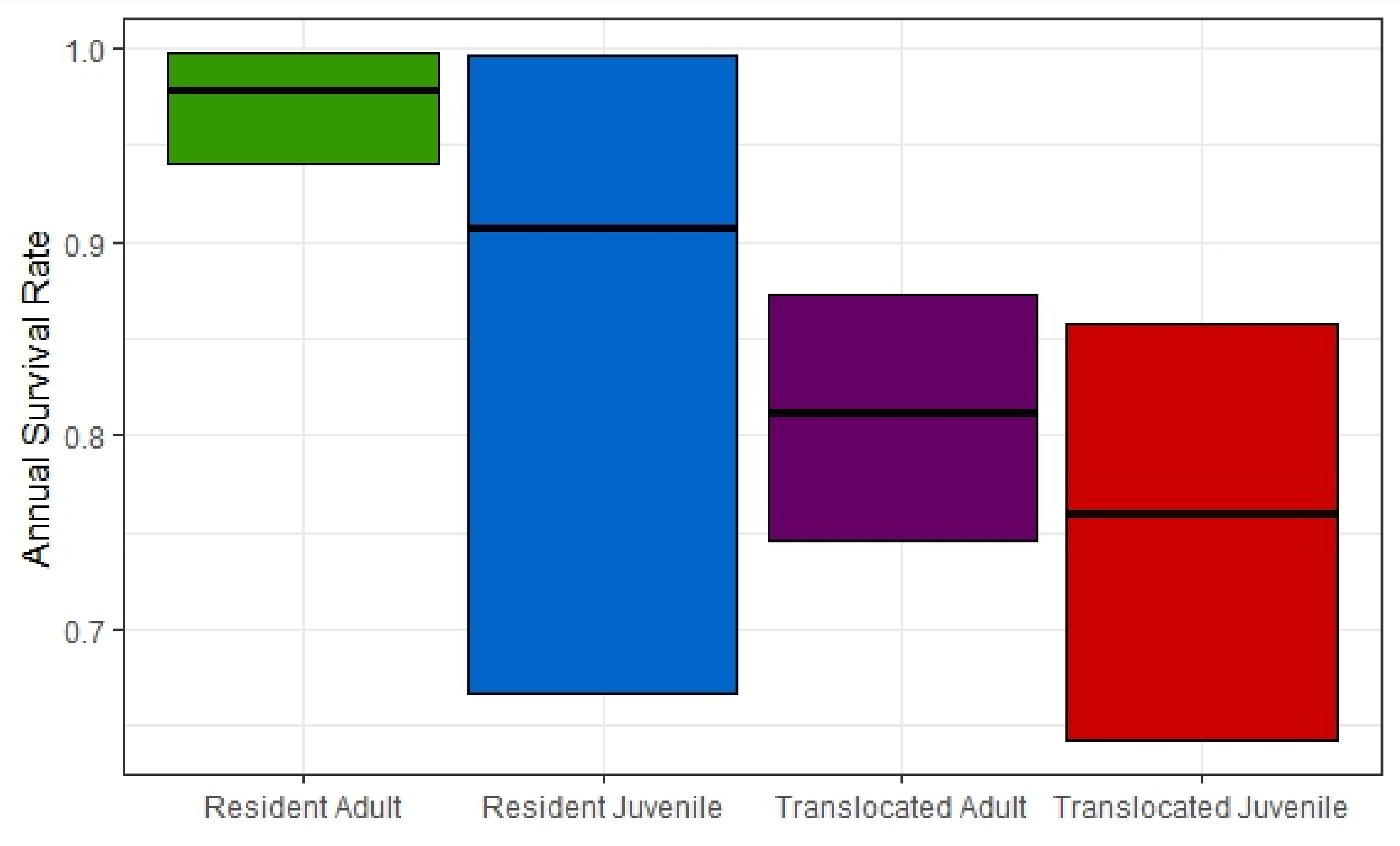
Joint data
Radio-telemetry only
Radio-telemetry subset
Annual survival rate
1.00
0.75
0.50
0.25
0.00
Res. Adult
Res. Juv.
Transloc. Adult
Transloc. Juv.

Results

Subgroup	Radio only vs. Joint	Radio subset vs. Joint
Resident adult	2.1	3.8
Resident juvenile	4.9	4.8
Transloc. adult	1.3	2.7
Transloc. Juvenile	1.0	2.0

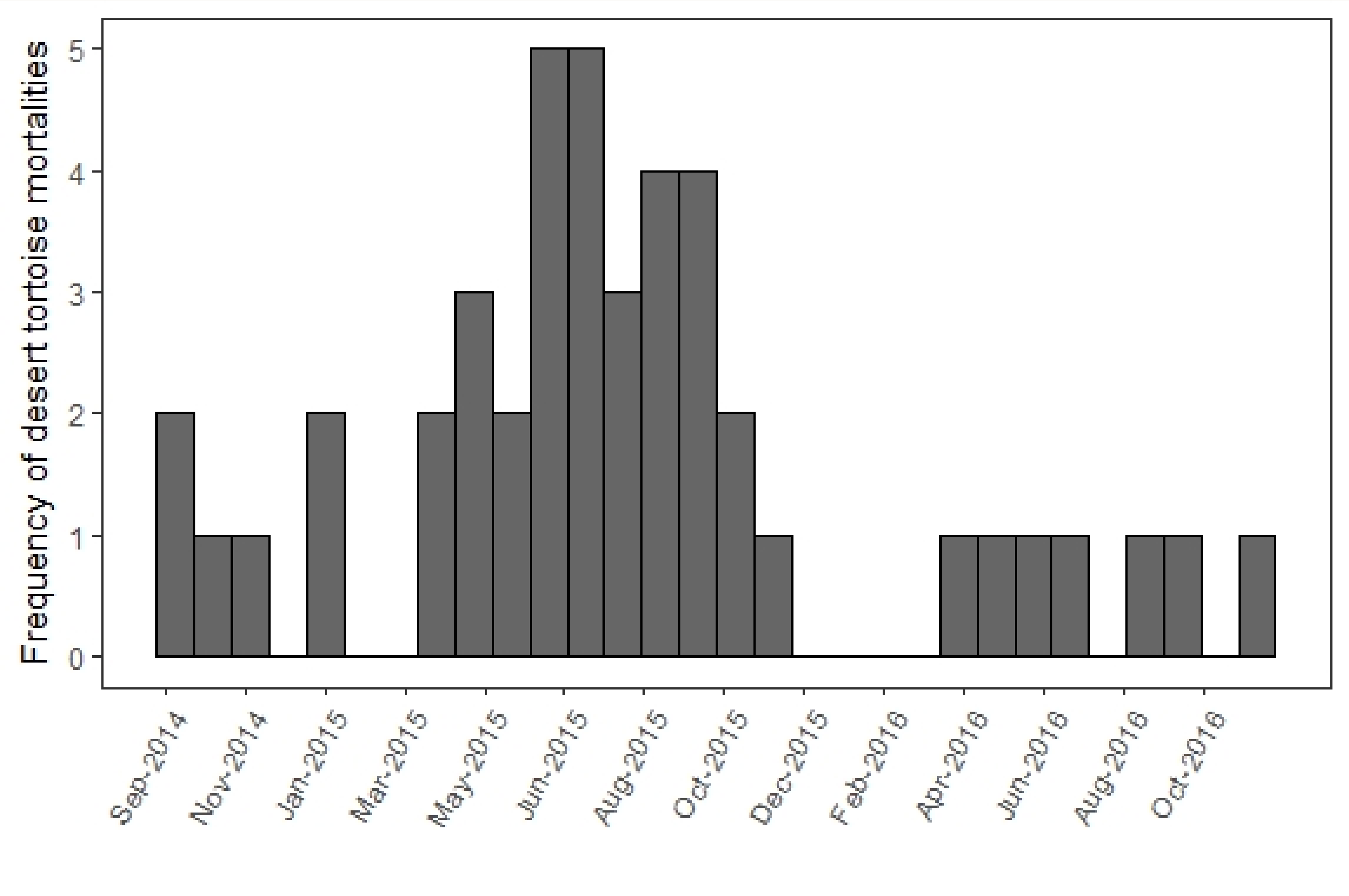


Results



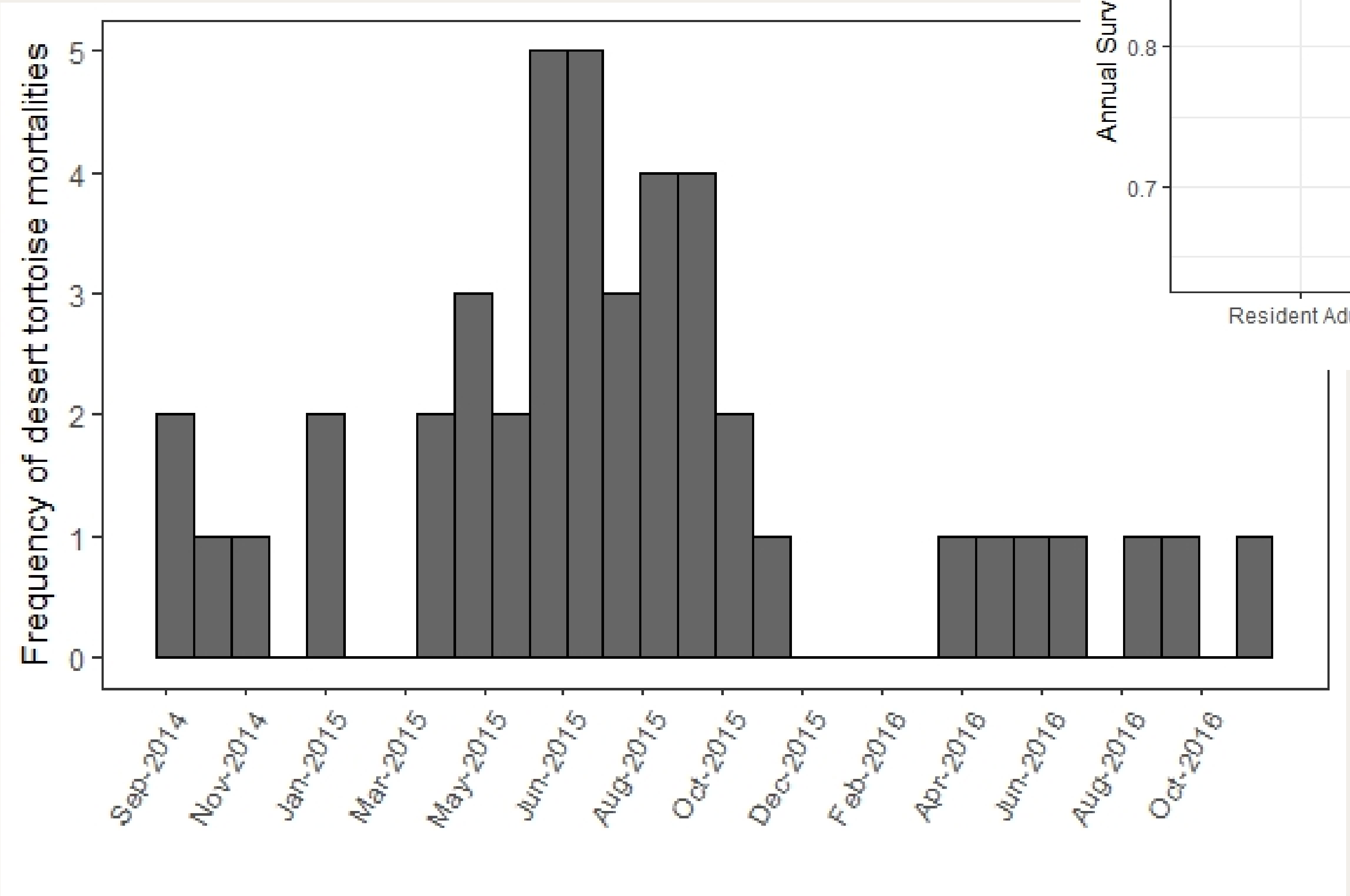
Annual survival:	0.978	0.907	0.812	0.759

Results



Frequency of desert tortoise mortalities
0
1
2
3
4
5
Sep-2014
Nov-2014
Jan-2015
Mar-2015
May-2015
Jun-2015
Aug-2015
Oct-2015
Dec-2015
Feb-2016
Apr-2016
Jun-2016
Aug-2016
Oct-2016

Results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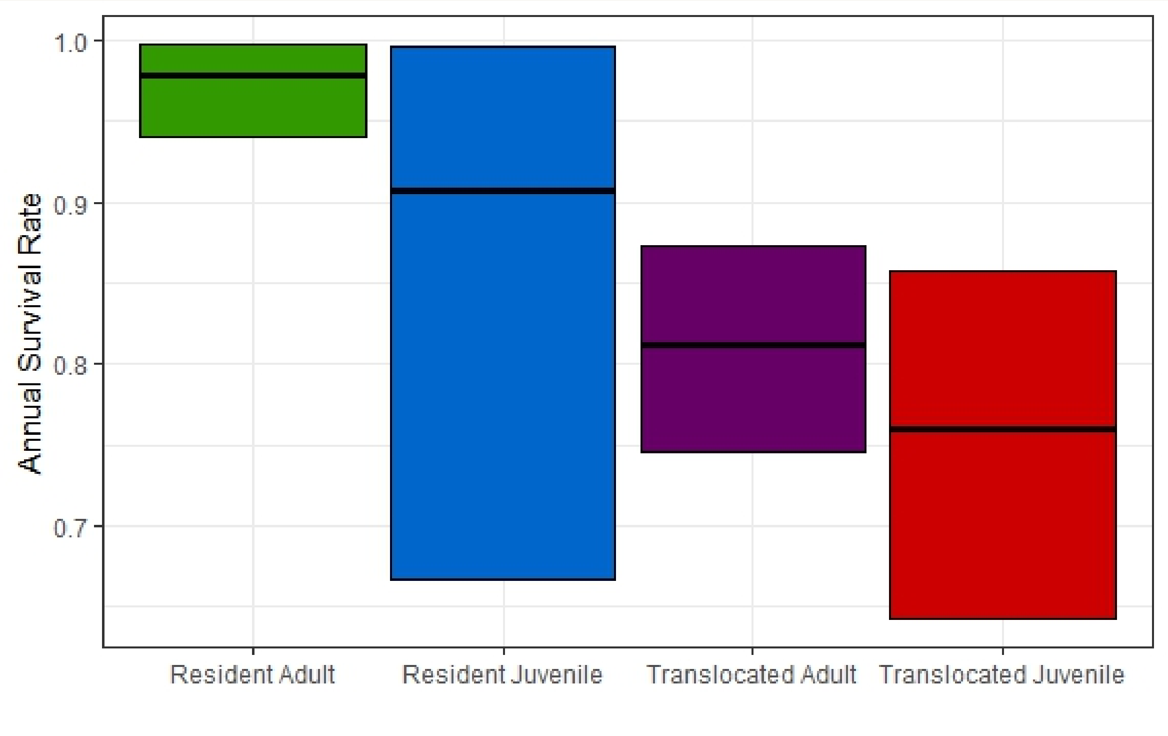
Oct-2016


Annual Survival Rate
1.0
0.9
0.8
0.7
Resident Adult
Resident Juvenile
Translocated Adult
Translocated Juvenile

Discussion

- Does mark-encounter data improve precision of survival estimates?
  - Nearly always, usually dramatically so
- Was survival equivalent among age classes and resident/translocated status?
  - No
  - But at population level that’s okay for these translocatees
  - Bertolero et al. (2018)

Discussion

- What’s next?
  - A few new mark-encounter data points
  - Separate by north vs. south Eldorado Valley
  - Revise and submit for publication

End of Desert Tortoise Survival

Desert Tortoise Occupancy in the BCCE

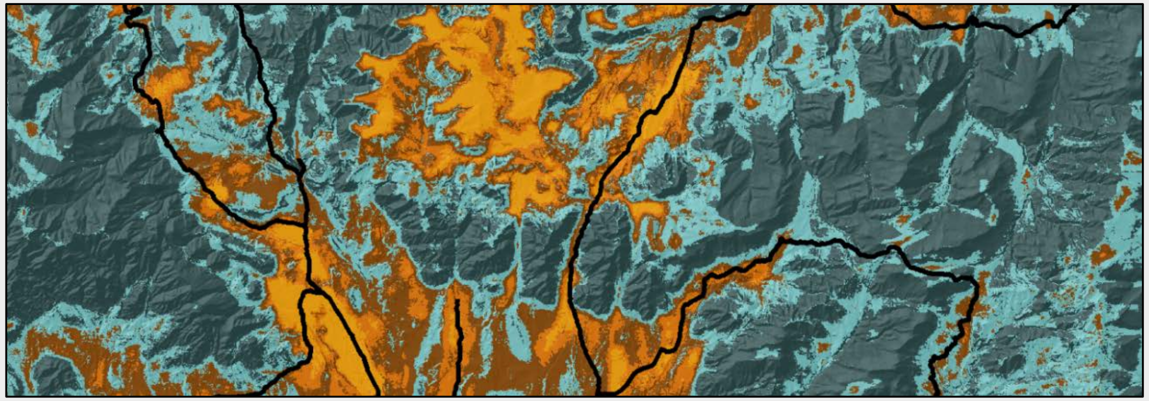
Background

- Occupancy sampling is surveying and recording the detection or non-detection of a species
- **Non-detection ≠ absent**
- Reflects most fundamental population variable – whether or not a species is present at a site

Background

Project goal:

Predictive raster layer of relative variation in probability of occurrence

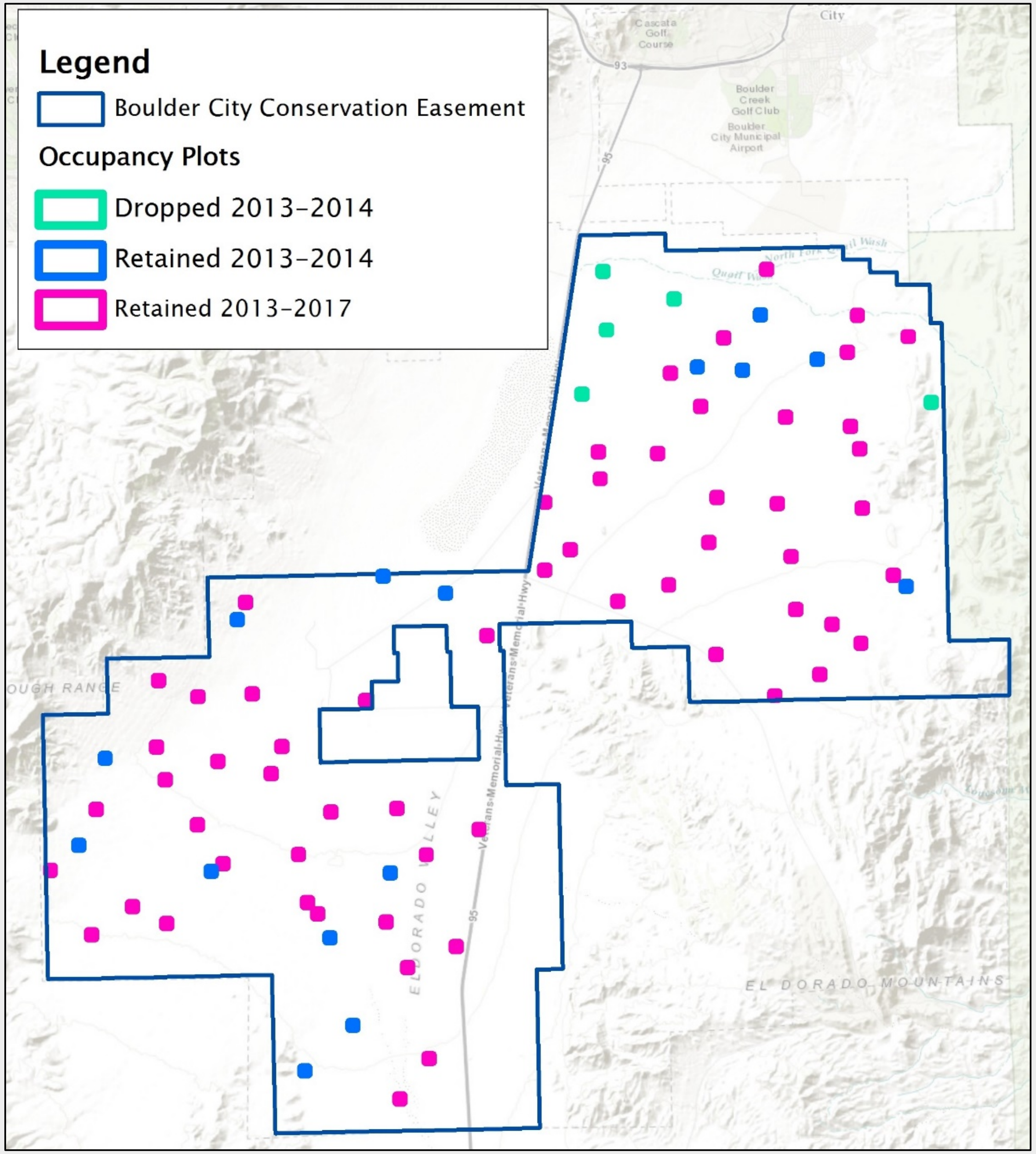


The challenge:

- Cryptic
- 90+% of time below ground - brumating / estivating
- Above-ground activity driven by past and current weather
  - previous winter's precipitation
  - current air temperature
- Whole primary season can appear "unoccupied", when really just lower probability of detection

Sampling details

- Total of 1,710 plot surveys



Sampling details

- Plot was walked, live tortoises and active burrows recorded separately.
- A plot was classified as “occupied” if either/both a live tortoise or active burrow were observed.

Predictor variables

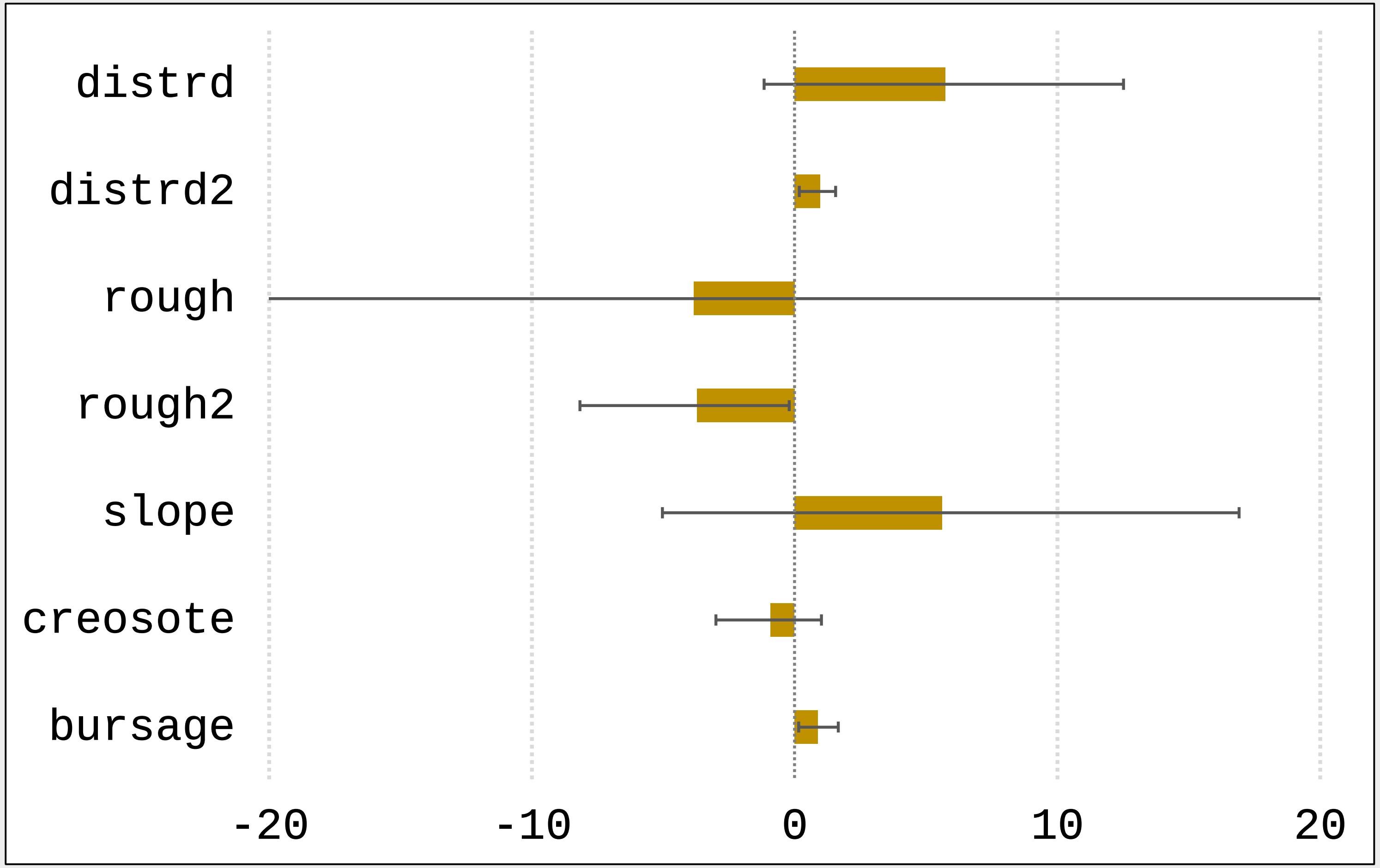
Type of predictor	Predictor variable
Topographic	Distance to road
	Roughness
	Slope
	Wetness
	Washes
Edaphic	Dominant soil
Vegetative	Creosote cover
	Bursage cover

Results

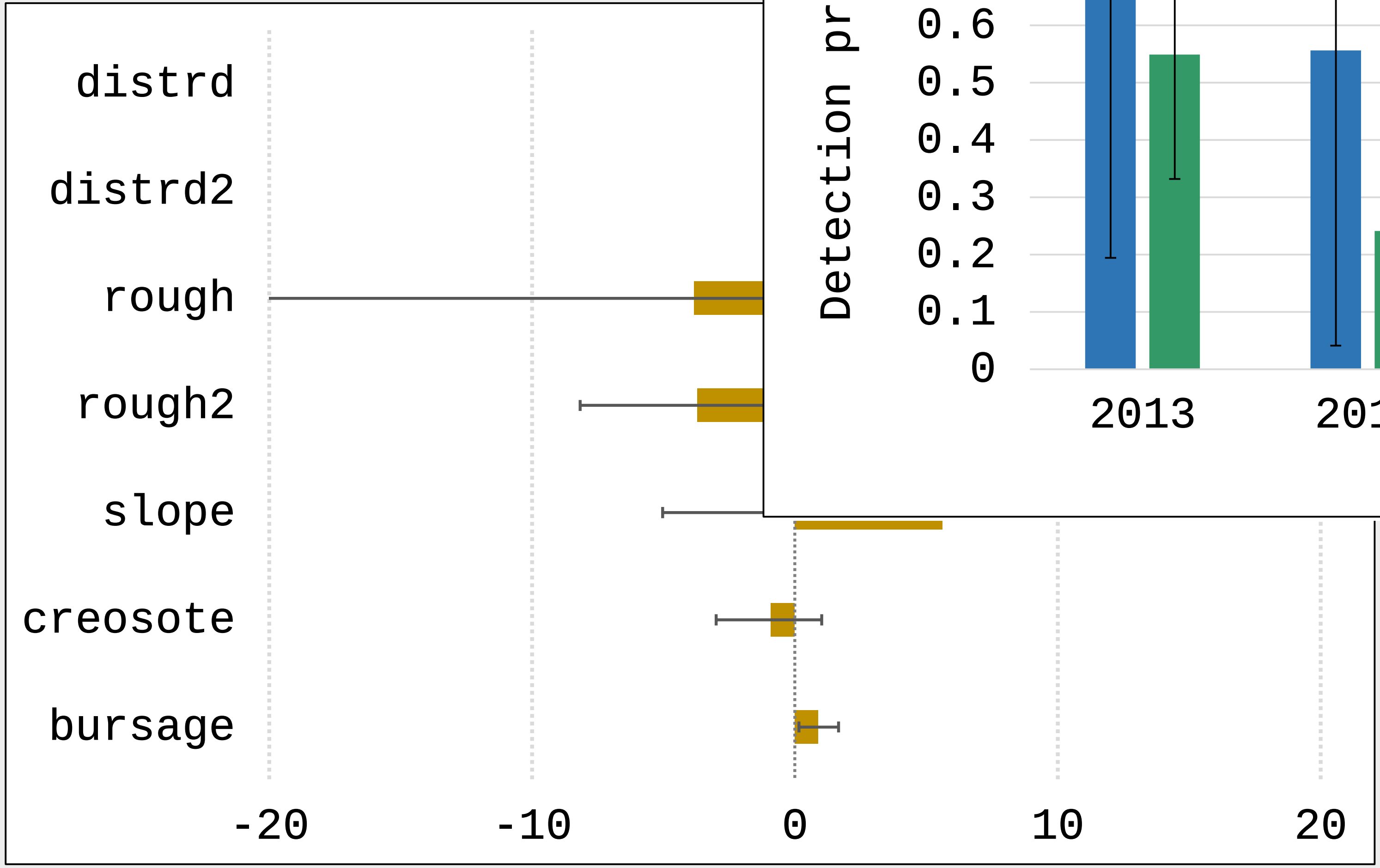
Raw data

Year	No. live tortoise	No. active burrow	Plot surveys
2013	10	12	225
2014	6	5	225
2015	22	8	420
2016	22	9	420
2017	36	29	420
Total	**96**	**63**	**1,710**

Results


distrd
distrd2
rough
rough2
slope
creosote
bursage
-20
-10
0
10
20

Results



distrd
distrd2
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slope
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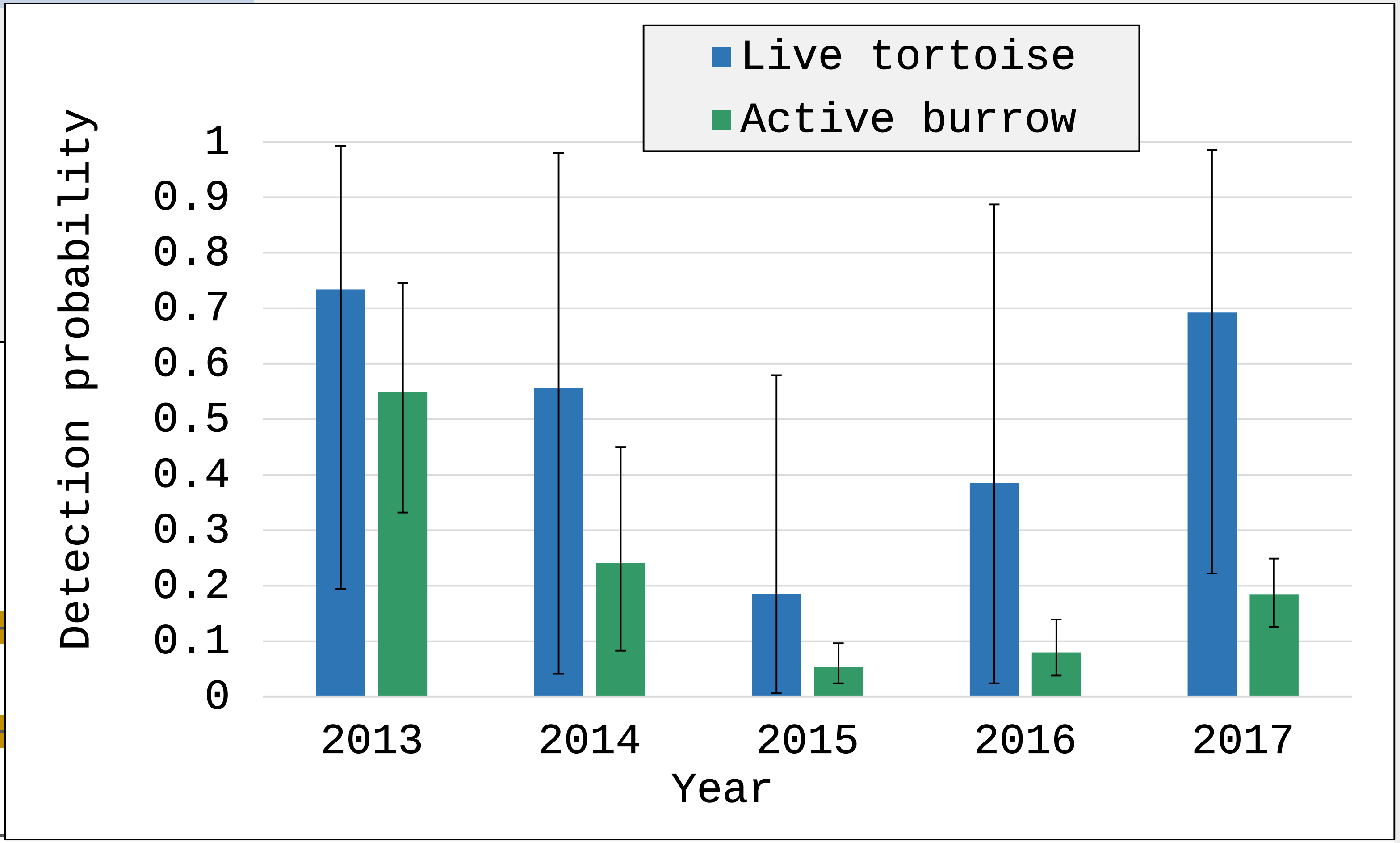
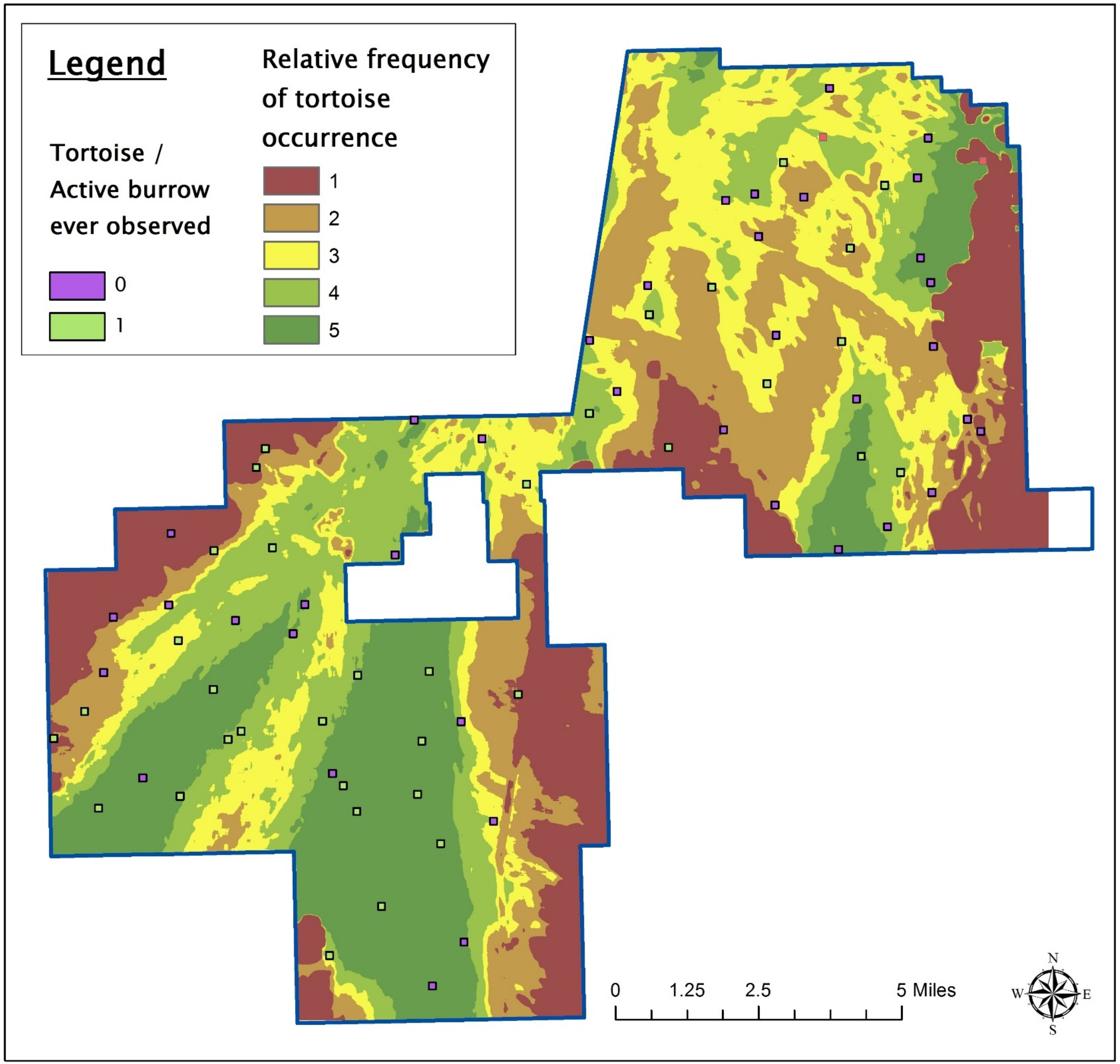
bursage
-20
-10
0
10
20



Live tortoise
Active burrow
Detection probability
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2013
2014
2015
2016
2017
Year

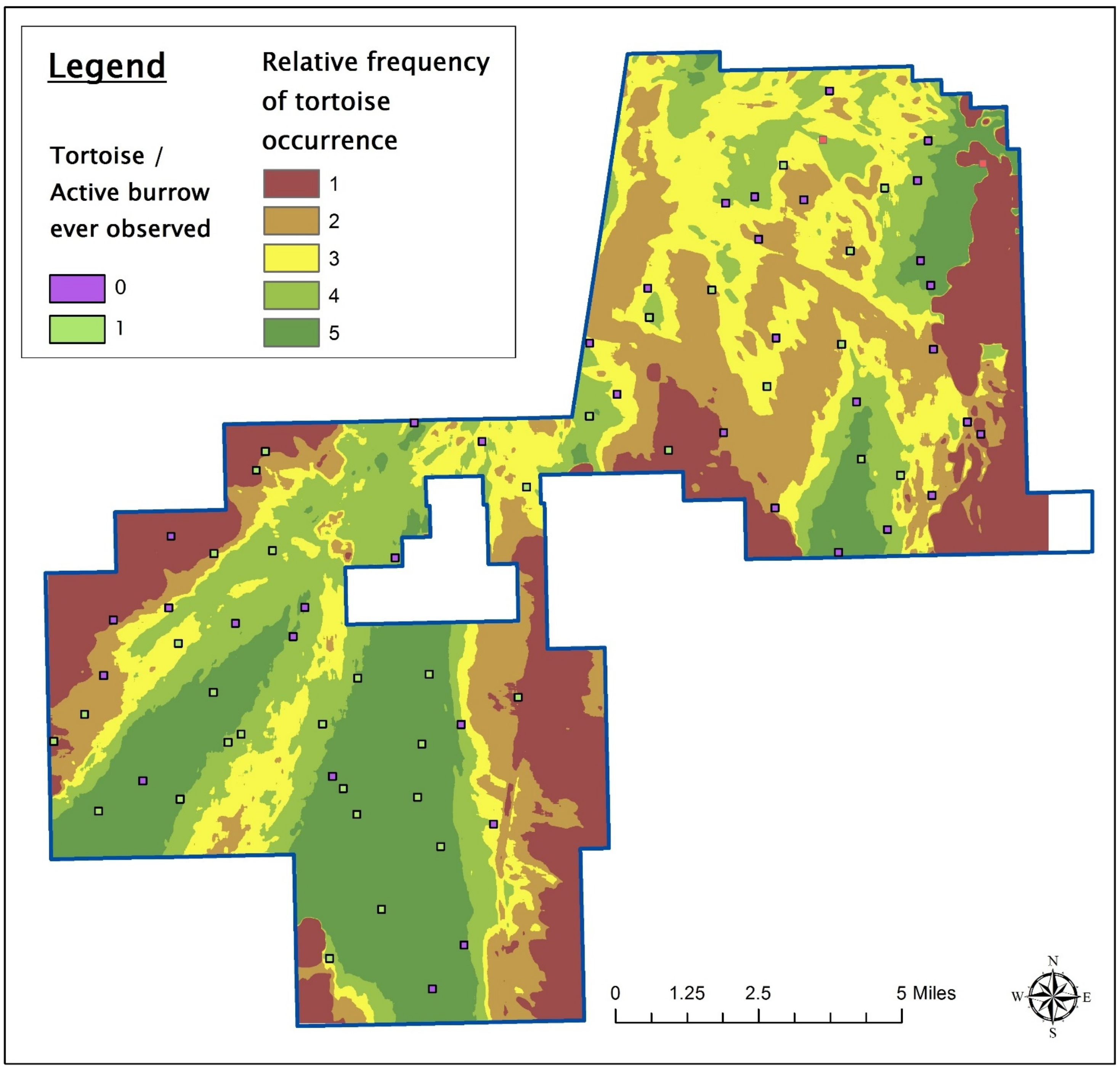
Results


Legend
Tortoise / Active burrow ever observed
0
1
Relative frequency of tortoise occurrence
1
2
3
4
5
0
1.25
2.5
5 Miles
N
E
S
W

Conclusions

- Generated predictive map
- Validated very well
- Ready-to-go restoration
- Room for vegetation detail
- Implications for monitoring

- Next step: submit for publication



End Desert Tortoise Occupancy