

Use of Wildlife Underpasses by Mojave Desert Tortoises (*Gopherus agassizii*) along U.S. Highways 93 and 95 in Clark County, Nevada

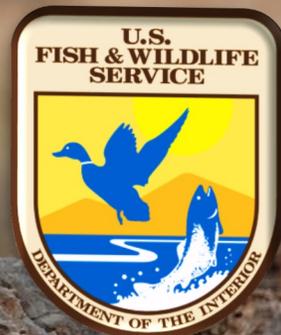
A presentation by: Scott Cambrin & Kerry L. Holcomb



MOJAVEMAX.COM



desert conservation
PROGRAM



Thank You!



Mark Slaughter (BLM)

Flo Deffner (USFWS-DTRO)

Evan Myers (BLM)

Aaron Rutledge (BLM)

Michael Burroughs (USFWS)

Kelly Holcomb (NDOT)

Julie Ervin-Holoubek (NDOT)

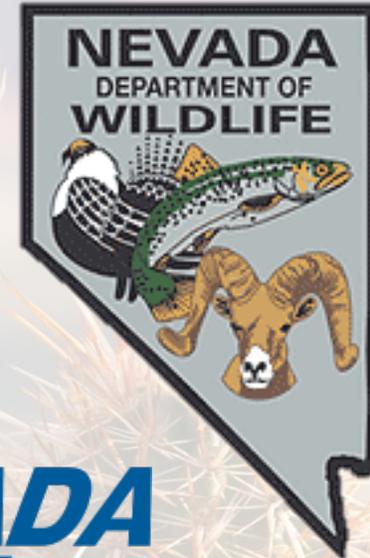
Katie Kleinck (NDOT)

Jason Jones (NDOW)

Ashley R. Holcomb (GBI)

Seth Harju (Heron Environmental)

And my others...





Roads Take a Heavy Toll on Chelonians

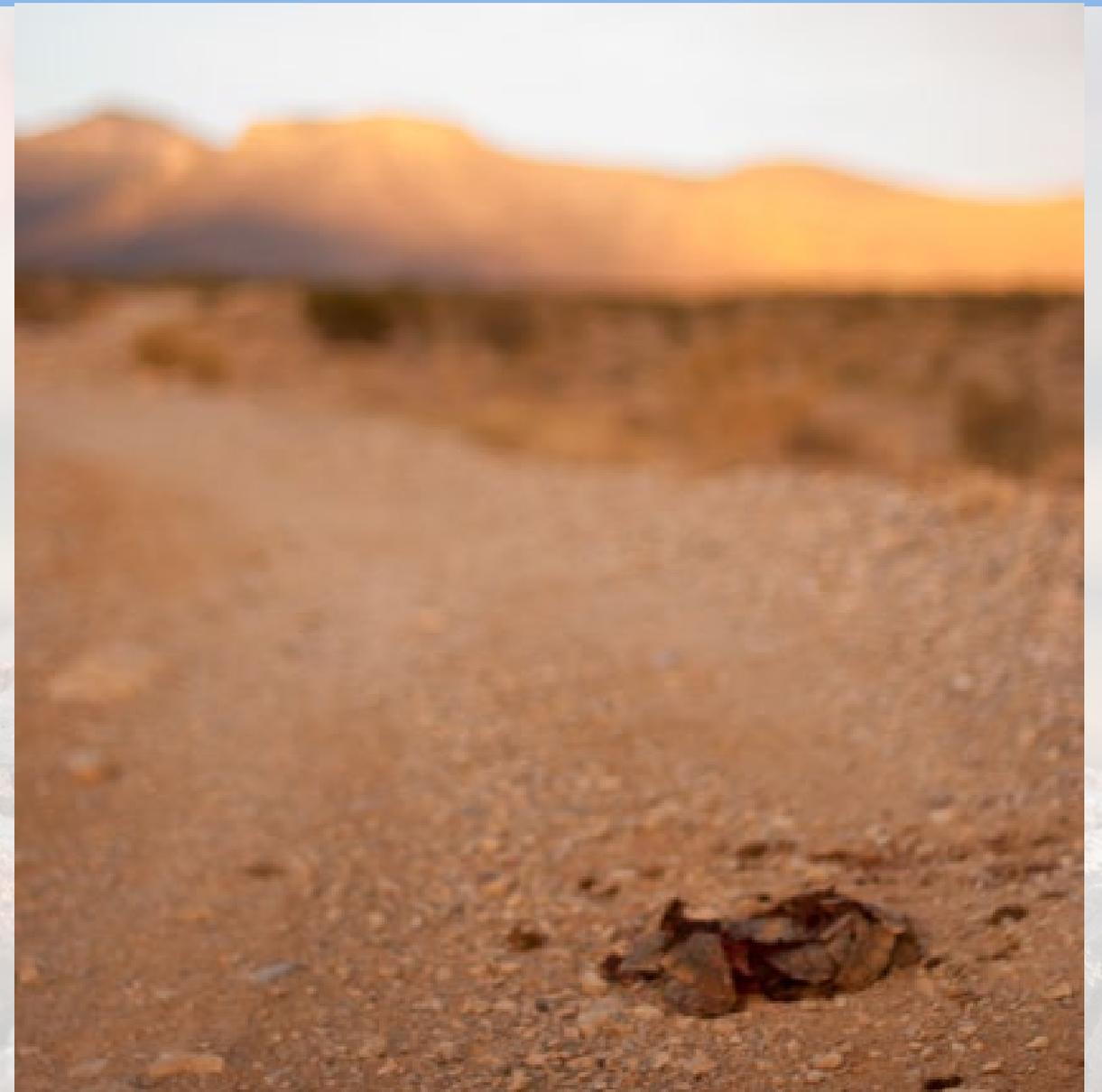
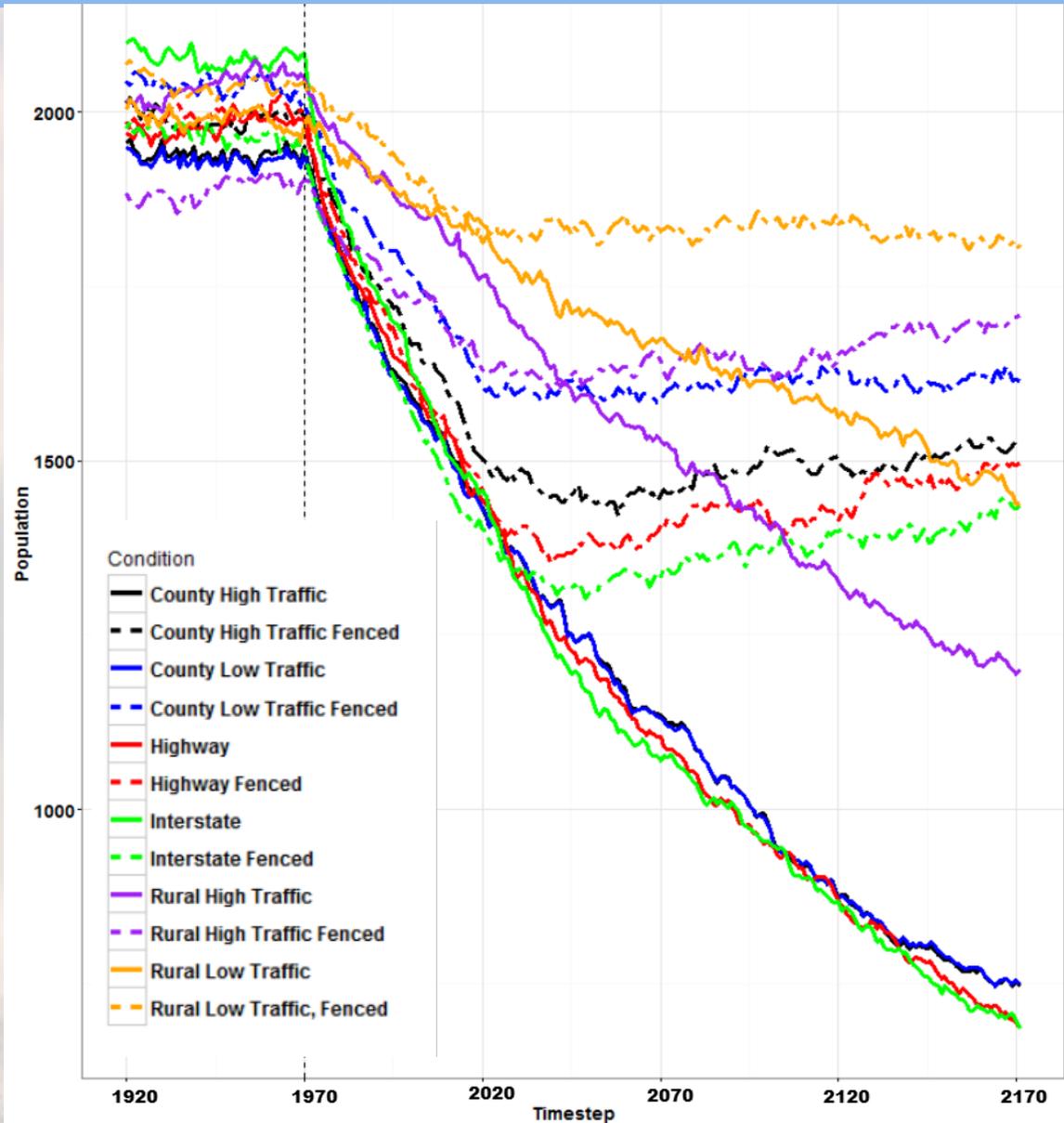


Roads are known to:

- Deplete populations,
- Bias sex ratios,
- Shift demographics,
- Limit population size,
- Alter behaviors,
- Degrade habitats,
- Cause fragmentation,
- Subsidize and attract predators, and
- Increases the likelihood of collection.



Road-Effect Zone



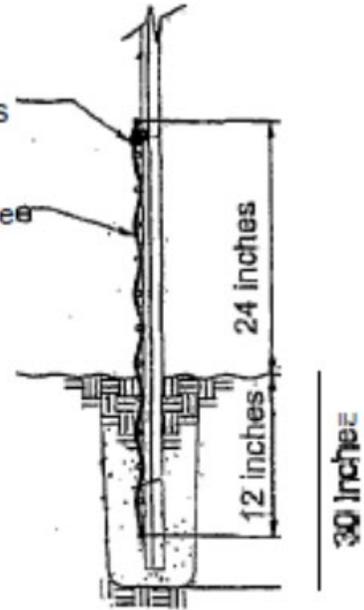
Mitigating the Effects of Roads



4-strand
wire fence

Hog rings
12-18" intervals
See Detail B

Galvanized fence
Material



Avoid <1x2" mesh



Fencing Needs



RECOVERY UNIT

ROADS WHERE TORTOISE FENCING IS NEEDED

kilometers

miles

Western Mojave

178

110

North-eastern Mojave

186

116

Colorado Desert

271

168

Upper Virgin River

17

11

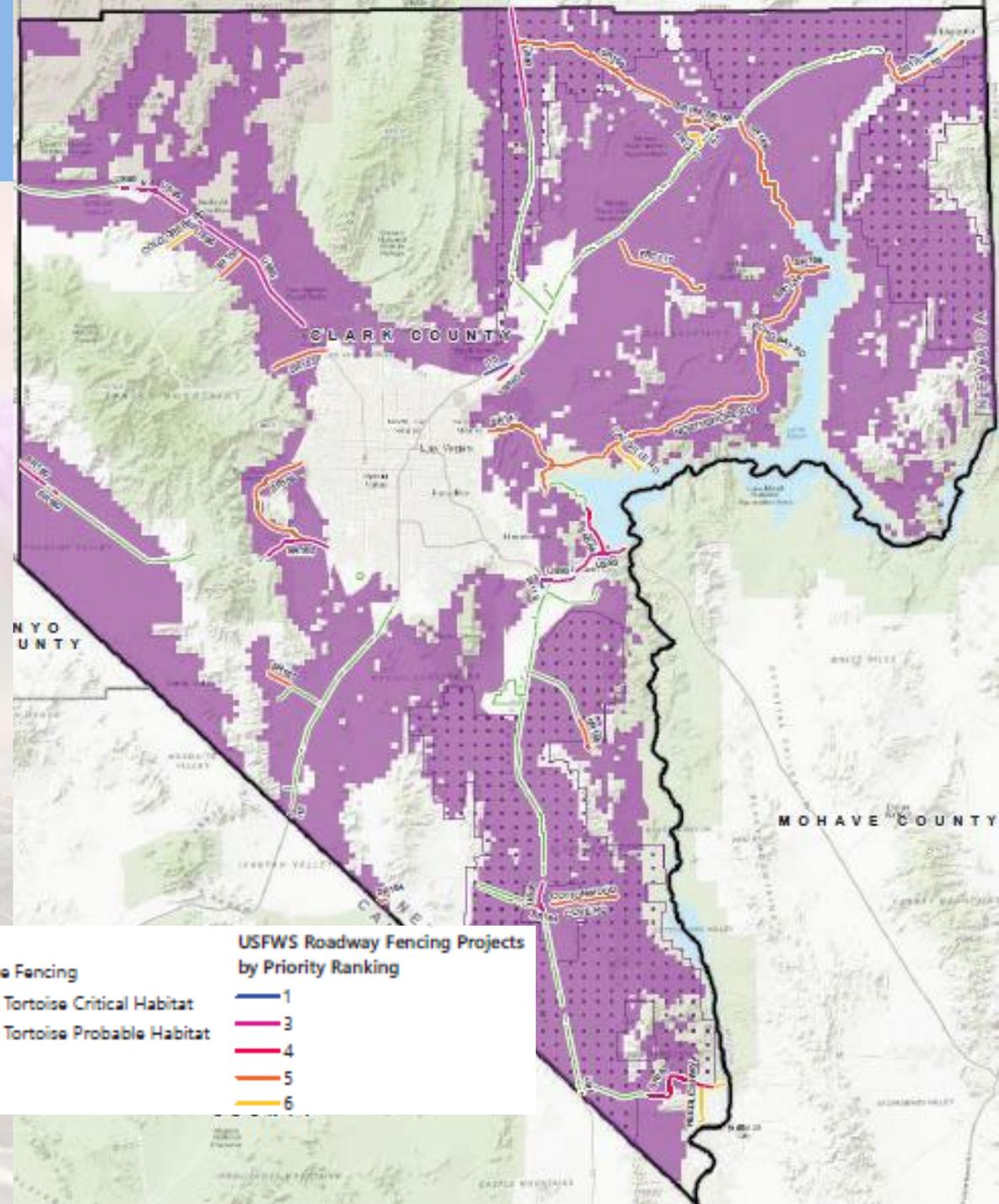
Total

652

405

Clark County Fencing Priorities

- 424.29 miles of tortoise fencing
- 254.77 miles of fencing still needed
 - 6.80 miles of priority 1 (I 15 & I 11)
 - 0 miles of priority 2
 - 54.57 miles of priority 3 (US 95/93: SR 160)
 - 17.05 miles of priority 4 (SR 163/564/604)
 - 157.73 miles of priority 5
 - 18.62 miles of priority 6



Goals and Objectives

Overall Goal: Determine if underpasses are a viable source to connect tortoise populations separated by roads

Phase I Questions

- Do tortoises shelter in, or pass-through underpasses currently installed along US93 & US95?
- Do behavioral responses to underpasses differ as a function of age class (Adults Vs. Juveniles)
- Perform a Before-After-Control-Impact analysis of lengthened underpass

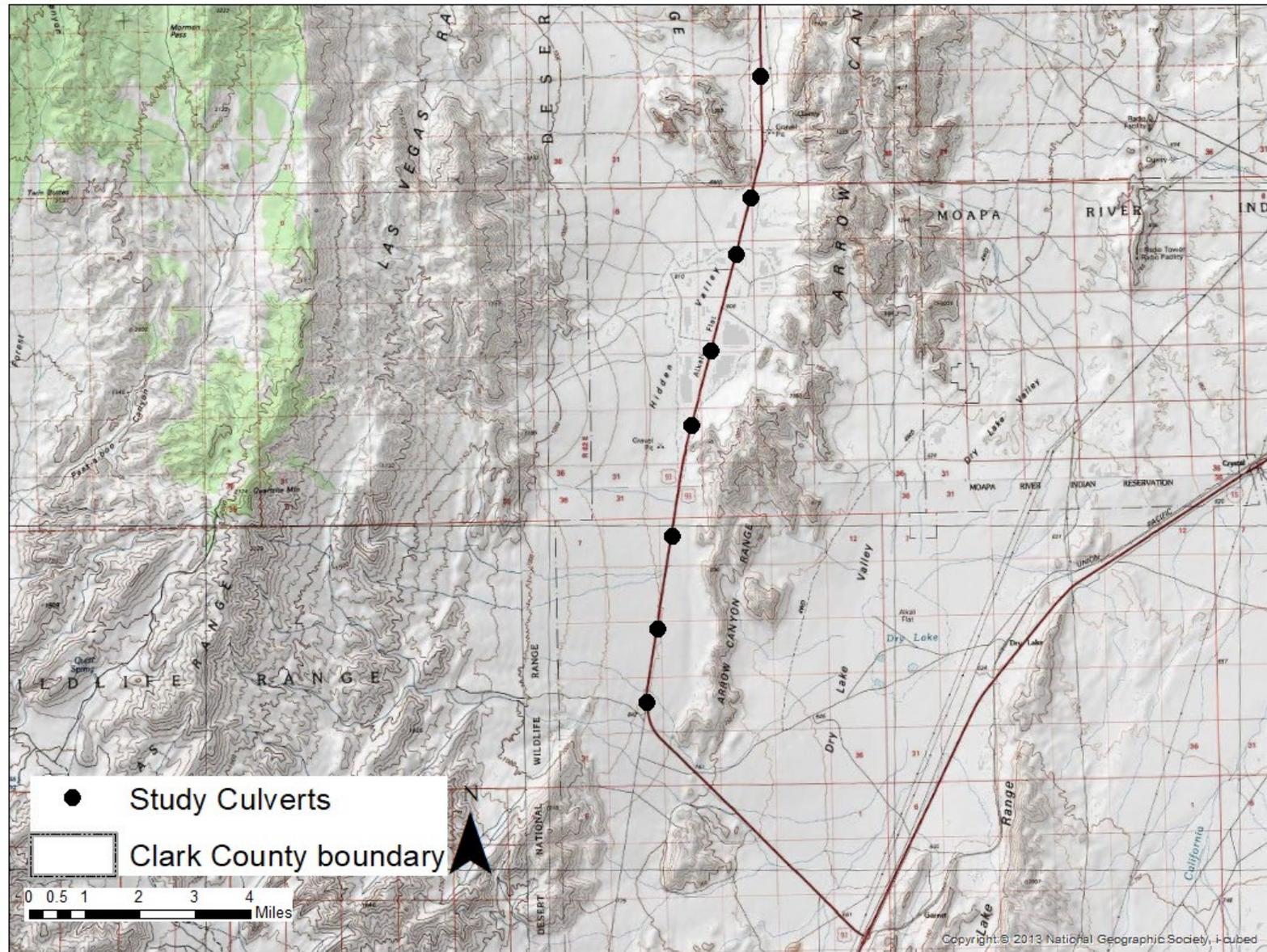
Broader Project Objectives

- Document the frequency of use of different underpass designs by tortoises, and
- Develop recommendations for future underpass designs.





Study Site

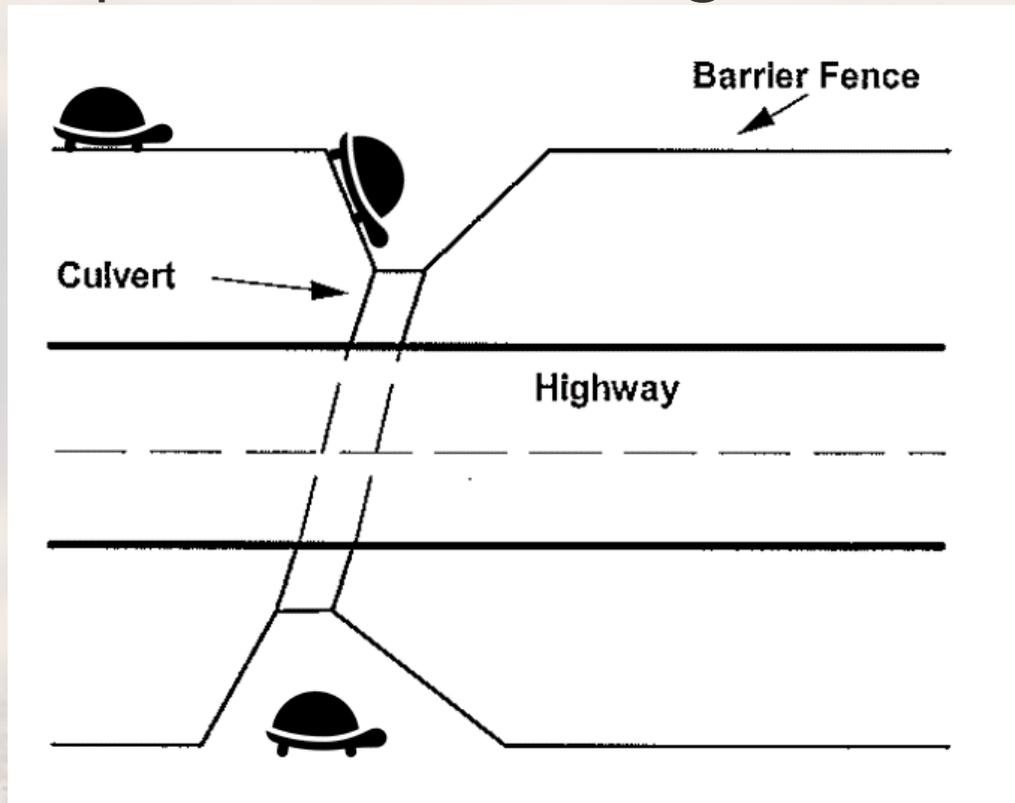




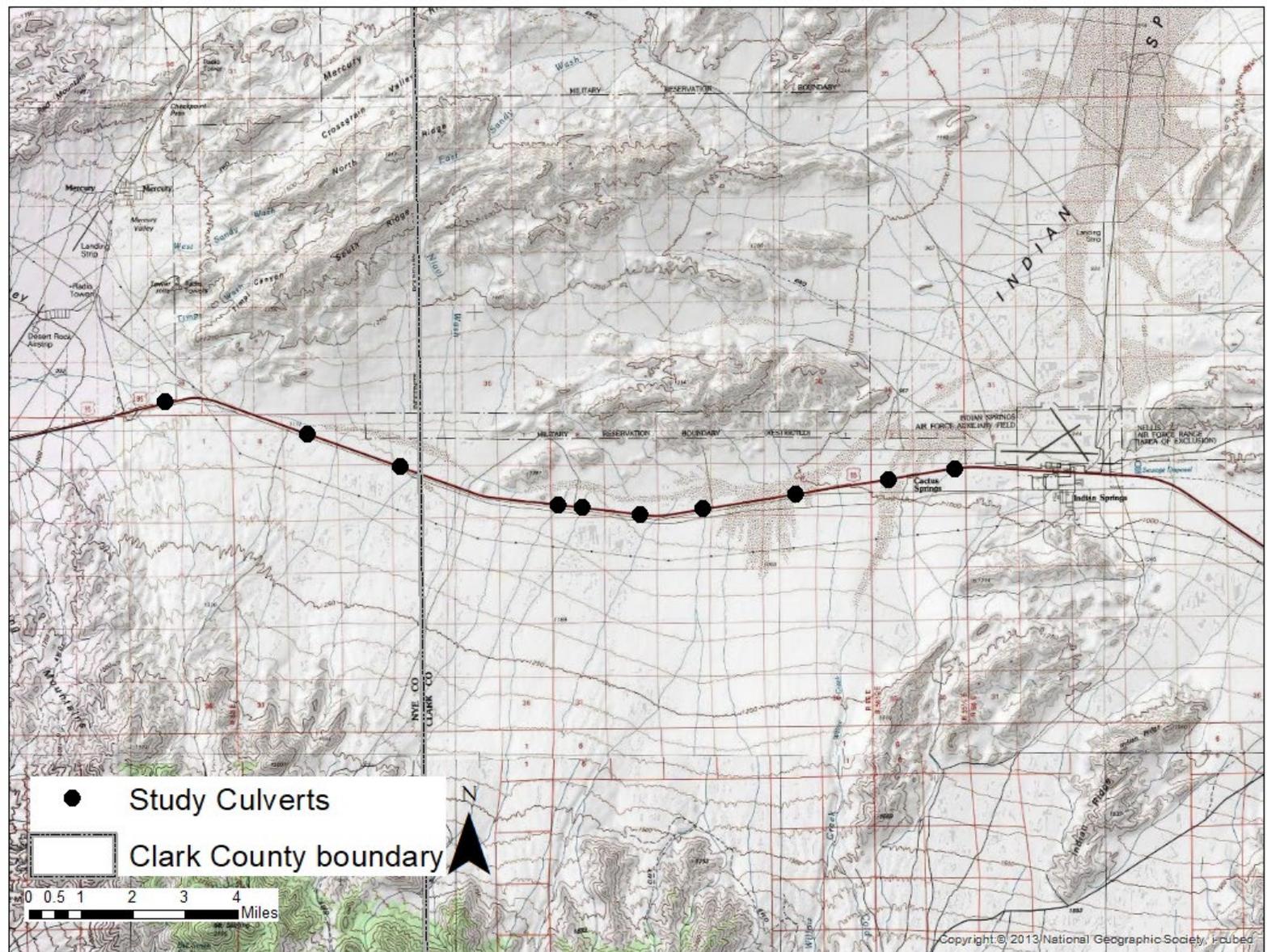
Study Site



- One 36-inch, one 30-inch and six 24-inch corrugated metal culverts (n=8 crossings, culvert 1 extended in 2018)
- Range of culvert lengths = 95 feet to 125 feet
- Openness index range = ~ 0.02 to ~ 0.03



95 Study Site



95 Study Site

- Five 36 inch and five 48 inch concrete box culverts (n = 10 crossings)
- Range of culvert lengths = 105 feet – 148 feet (8 of 10 are open in the median)
- Openness index range = 3.65 – 22.33



Equipment

- Bushnell Trophy HD (18 total)
 - Three photos per trigger
- 64 gigabyte SD card
 - Flash defused with scotch-tape
- Sampling Periods
 - Spring (March 1 to June 15)
 - Fall (September 1 to November 15)
- Photos from 2015-2018 analyzed by hand/
2018-2021 analyzed through machine learning



Individual Identification



Observation Classifications

- Juvenile < 180mm MCL
- Adult \geq 180mm MCL
- Proportion crossers = # of individuals entering the culvert /# of individuals that crossed





Results



10 sampling periods on US 95 (Spring 2017 Through Fall 2021)

	All	Adult	Jv	Adult in a Rectangular Culvert - 36" height	Adult in a Rectangular Culvert - a 48" Height
Total	34	14	19	10	4
Crossers	8	5	3	4	1
Proportion Crossers	0.24	0.36	0.16	0.40	0.25
Stay on "new" side	5	3	2	2	1
Proportion Stayers	0.15	0.21	0.11	0.20	0.25



Results



12 sampling periods on US93 (Spring 2015 through Fall 2021)

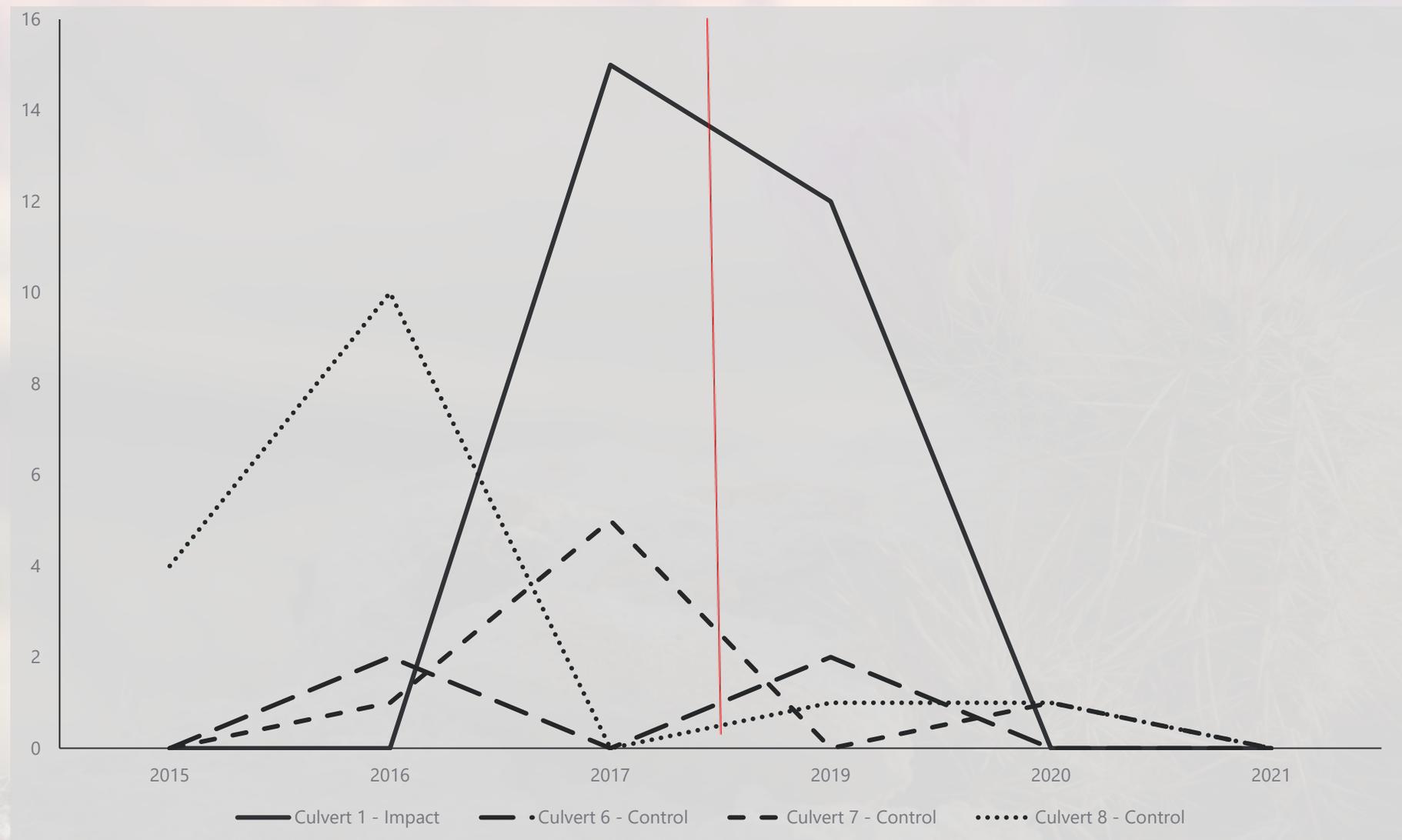
	All	Adult	Juvenile	Adult in a 24" Culvert	Adult in a >24" Culvert
Total Individuals	32	18	14	11	7
Individual Crossers	10	9	1	5	4
Proportion Crossers	0.31	0.50	0.07	0.45	0.57
Individual Side Change	7	6	1	4	0
Proportion Side Change	0.22	0.33	0.07	0.36	0.00



Results



Culvert Length BACI – Adult Observations

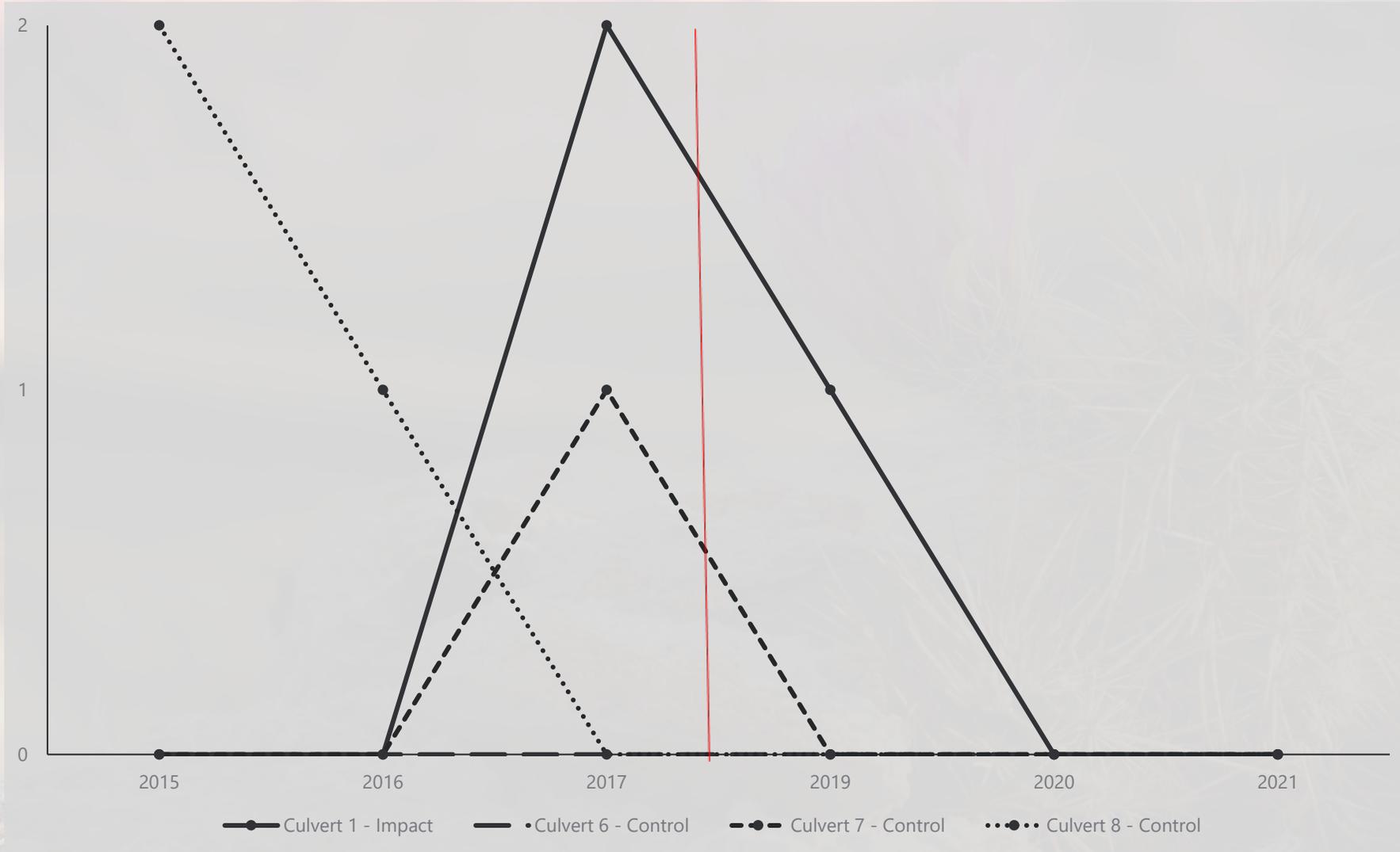




Results

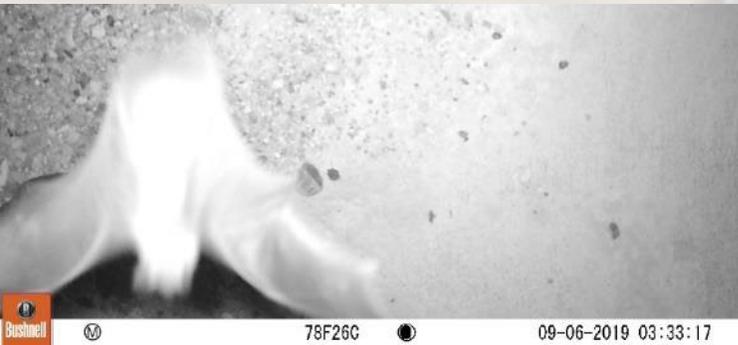


Culvert Length BACI – Adult Individual Crossings



Results

- By conserving “Surrogate species” like the desert tortoise, we are at the same time conserving many other species, all of which are critical to their respective ecosystem.
- At least 43 total vertebrate and invertebrate species observed
 - 13 Mammals
 - 12 reptiles
 - 11 Arthropods
 - 7 birds



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Discussion

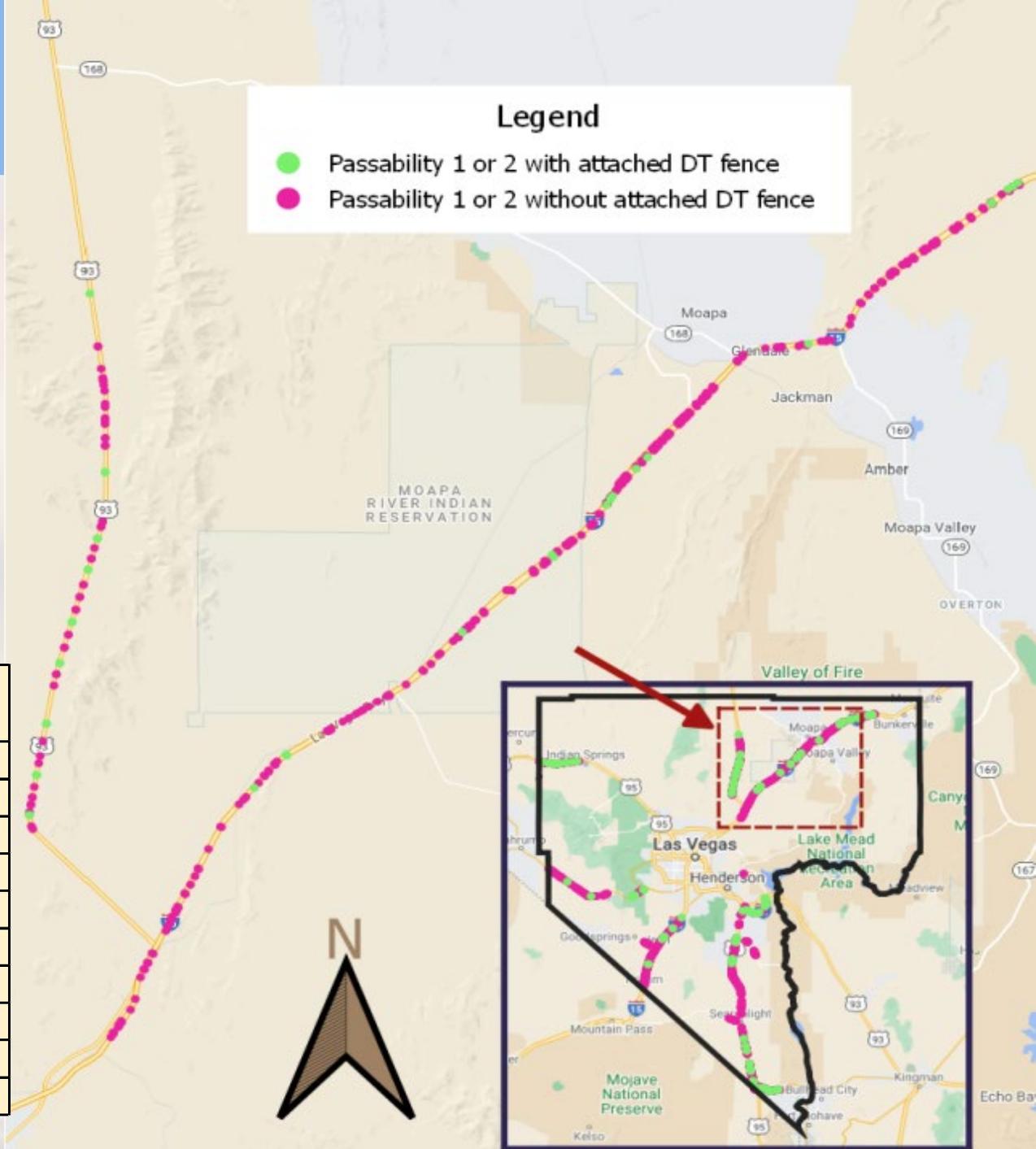
- Tortoises both shelter in and pass-through all types and sizes of crossing structures available to them on the landscape
- Both adults and juveniles will use the culverts although there may be some differences related to the frequency of crossing and the culvert material
- Individual adult crossings were not impacted by a 7 meter lengthening of culvert 1 (BACI ratio = 0.63), even though encounters per year did see a slight affect (BACI ratio = 1.004)



Culverts in Clark County

- 12% of passable culverts and 10% of all culverts are connected to the tortoise fencing in NV
- 56% of passable attached culverts has some rip rap on at least one side and 53% of all culverts
- 18% of passable attached culverts have a drop off on one side and 46% of all culverts.

	# of Culverts	Avg distance Between Culverts in Meters
Grade 1 / Easily Passable	225	N/A
Grade 2 / Passable With Some Effort	112	N/A
Grade 3 / Passable by some tortoises	112	N/A
Grade 4 / Not passable requires intervention	109	N/A
Grade 5 / Major Redesign or Heavy Equipment	165	N/A
all Culverts	723	472
Culverts grade 1-4	558	605
All Culverts Grade 1 or 2	337	992
all Culverts Attached to Fencing	74	3,857
All Culverts grade 1 or 2 Attached to Fencing	51	5,048



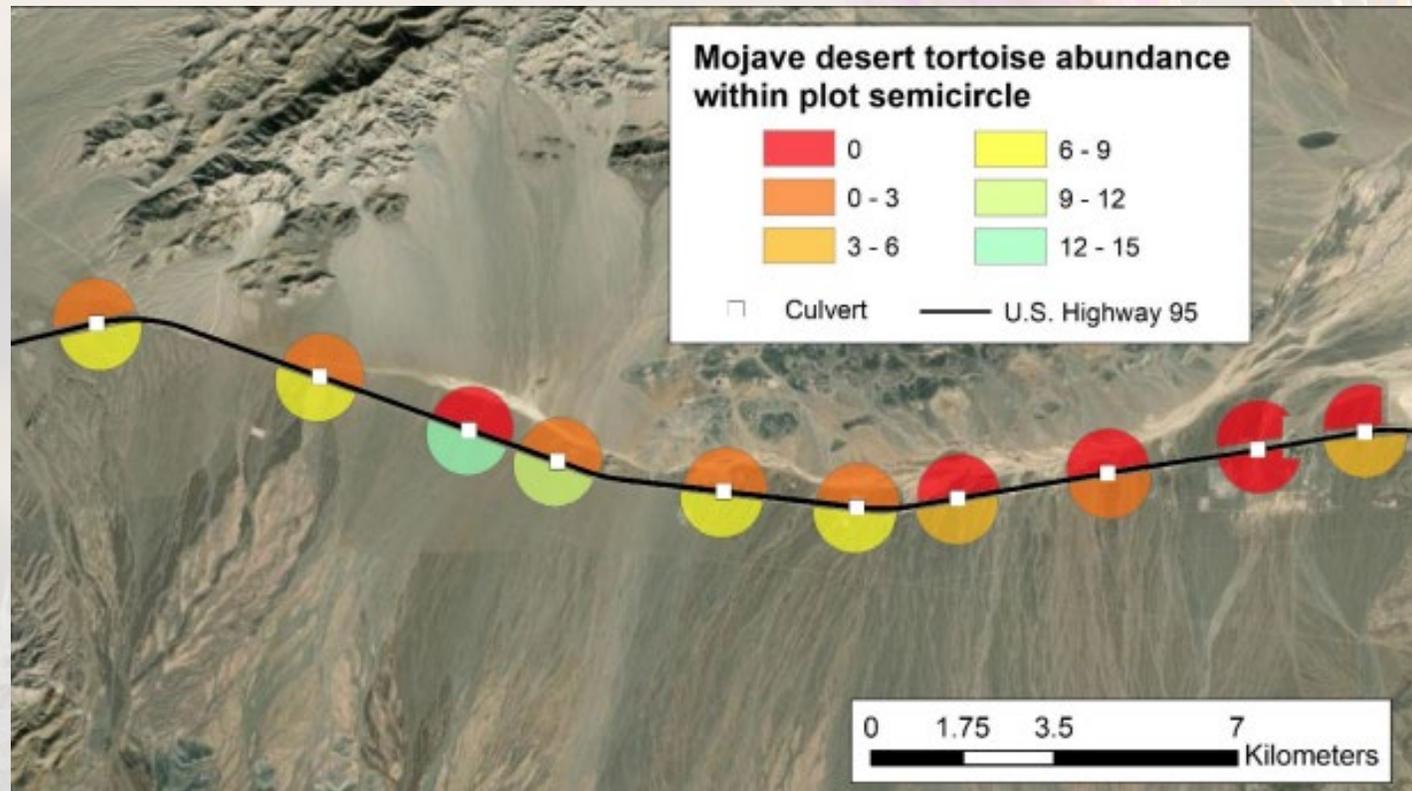
Next Steps

- Connect all graded 1 and 2 to the fence (286 culverts)
- Develop a low maintenance solution to limit maintenance of drop-off pools
- Perform maintenance on all 3 and 4 graded culverts and attach them to the fence
- Ensure that maintenance continues on all connected culverts
- Maintain and connect new fences when installed.



Future Work

- Explore how tortoise Density near the road may affect movement through culverts
- Explore how the Highway may affect tortoise movement
- Explore if translocated tortoises released near culverts will incorporate the culvert into their home range



Connectivity Management Plan



- Connectivity literature review
- Summarizes several projects completed to help better understand connectivity in Clark County
- Provides recommendations to maintain and increase connectivity throughout Clark County
- Should be available online before the end of 2022

Clark County Connectivity Management Plan

Final
May 2022



Prepared for:
Clark County Desert Conservation Program
500 S. Grand Central Parkway
Las Vegas, Nevada 89155

Prepared by:
RECON Environmental, Inc.
3111 Camino del Rio North, Suite 600
San Diego, California 92108



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Questions?

