Common Raven Density and Tortoise Predation Analysis in Upper Virgin River (UVR) and the Red Cliffs Desert Reserve

Review: Why Monitor Ravens in the Reserve?

- Juvenile tortoises are very vulnerable to predation, making ravens a high-ranking threat to tortoises throughout the Mojave.

- Ravens thrive near human population centers due to "subsidies" (landfills, artificial reservoirs, powerlines all benefit ravens)

- Washington County is growing, raven population likely increasing

- Predation has been found during each monitoring year (2015-2021)

- Possibly a larger threat to local tortoise populations than what is currently known

Background

2015-2021

- Focus of raven monitoring was mostly raven nest and powerline surveys

- 53 total raven nests documented and 20 unique nesting territories (inside and adjacent to RCDR)

- 40 raven-attributed tortoise carcasses and 2 predation attempts. Almost 50% of all carcasses were found in Ivins/Toe Trail area.

- Recent feedback from USFWS and local partners: more data is needed (raven densities, rates of predation, etc.)

Background

- Raven point count surveys (10-minute interval)
  - Recommended protocol for obtaining raven densities (draft protocol for Nevada, K. Holcomb 2020)

- 'Techno Tortoise' decoy stations (lifelike 3D-printed decoys) recommended for assessing predation rates (protocol also from K. Holcomb 2020)

- Small pilot study was conducted with volunteers on non-federal lands in 2021 (raven point counts and bait station 'decoy' stations).

- A comprehensive study was approved for 2022, which included expanding onto BLM lands.

Springtime Point Count Surveys

- 108 surveys were conducted between April 8 and May 18, 2022.

- Minimum of 2 km buffer between each survey point.

- Spaced throughout tortoise habitat (areas below 4,000 ft) in the Reserve and elsewhere in Upper Virgin River (UVR) area. Approximately 176,600 total acres were surveyed.

- Participants included HCP staff, BLM Biologists/interns, and volunteers (including HCP and 'Friends of Snow Canyon' trail stewards).
  - All participants were trained on survey protocols, data collection/reporting, and raven identification.

Raven Point Count Survey Map
of Ravens Per Point
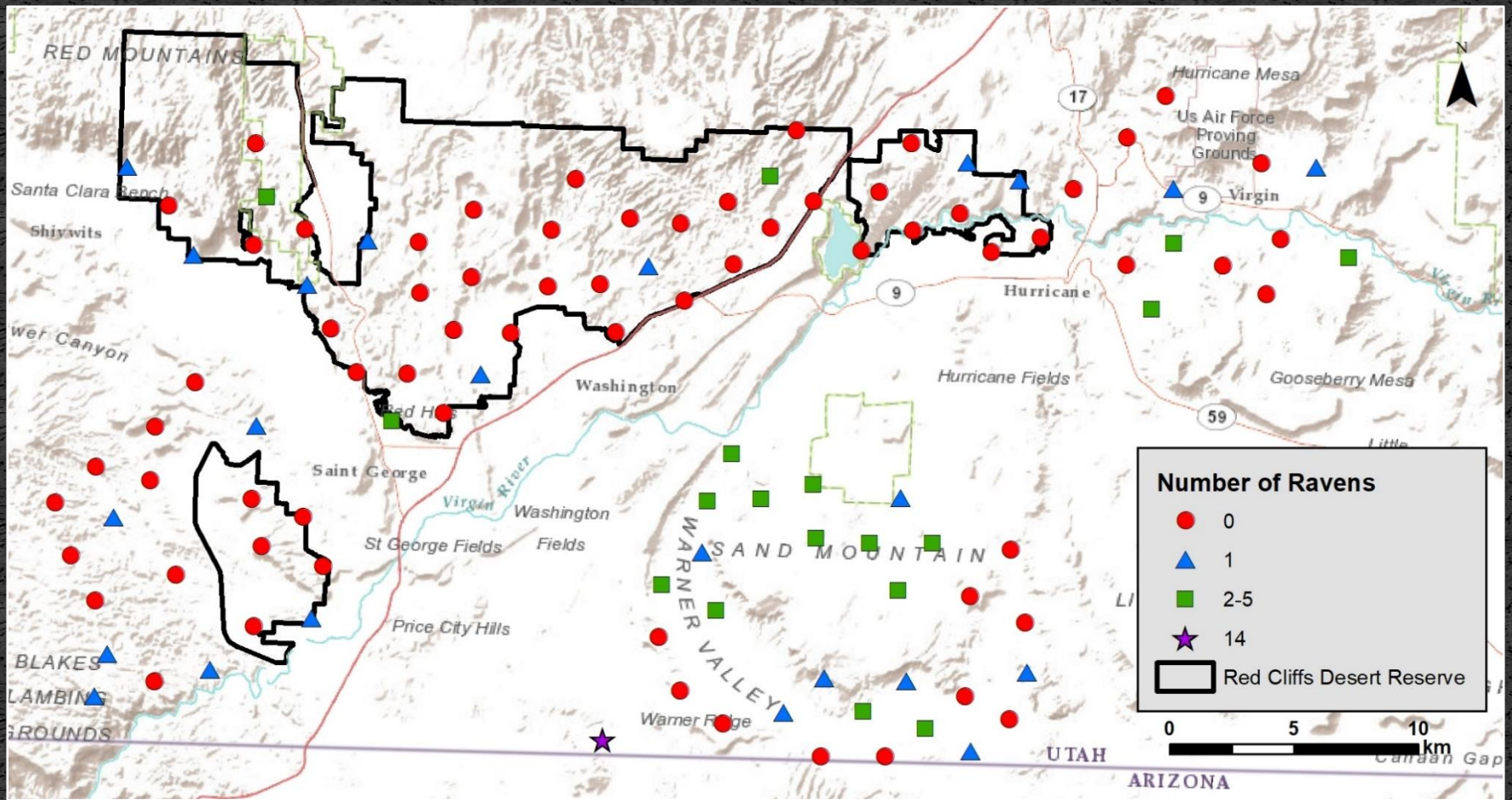
Raven Point Count Survey Results

- Ravens were observed at 42 of the 108 survey points (~39%)
  - Breakdown per survey point shown below:

| Ravens Documented	Frequency
0	66
1	23
2-5	18
14	1

Total Ravens: 89

Techno Tortoise Decoy Stations

Deployment period: April 13 – June 19, 2022

- 23 decoy stations deployed across same area as point count surveys; 21 decoy stations with Techno Tort, 2 as 'control' sites.
  - 75 mm, 3D-printed tortoise decoys (produced by Hardshell Labs, Joshua Tree, CA)
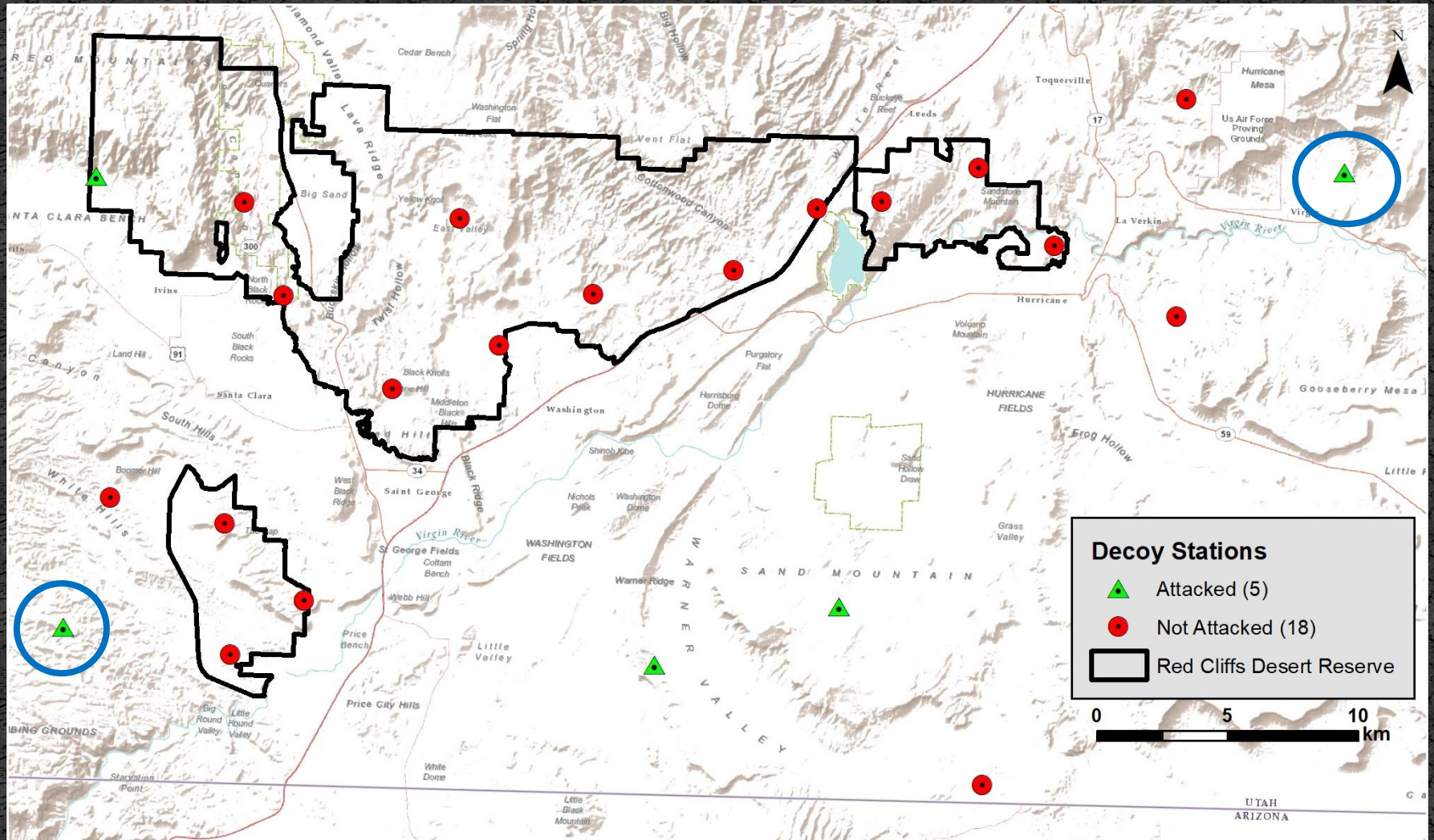- Full set-up: tortoise decoy, game camera, strap, and 2-ft step-in post

Techno Tortoise Decoy Stations

Tortoise Decoy Attacks

Decoy Stations

△ Attacked (5)

● Not Attacked (18)

▭ Red Cliffs Desert Reserve
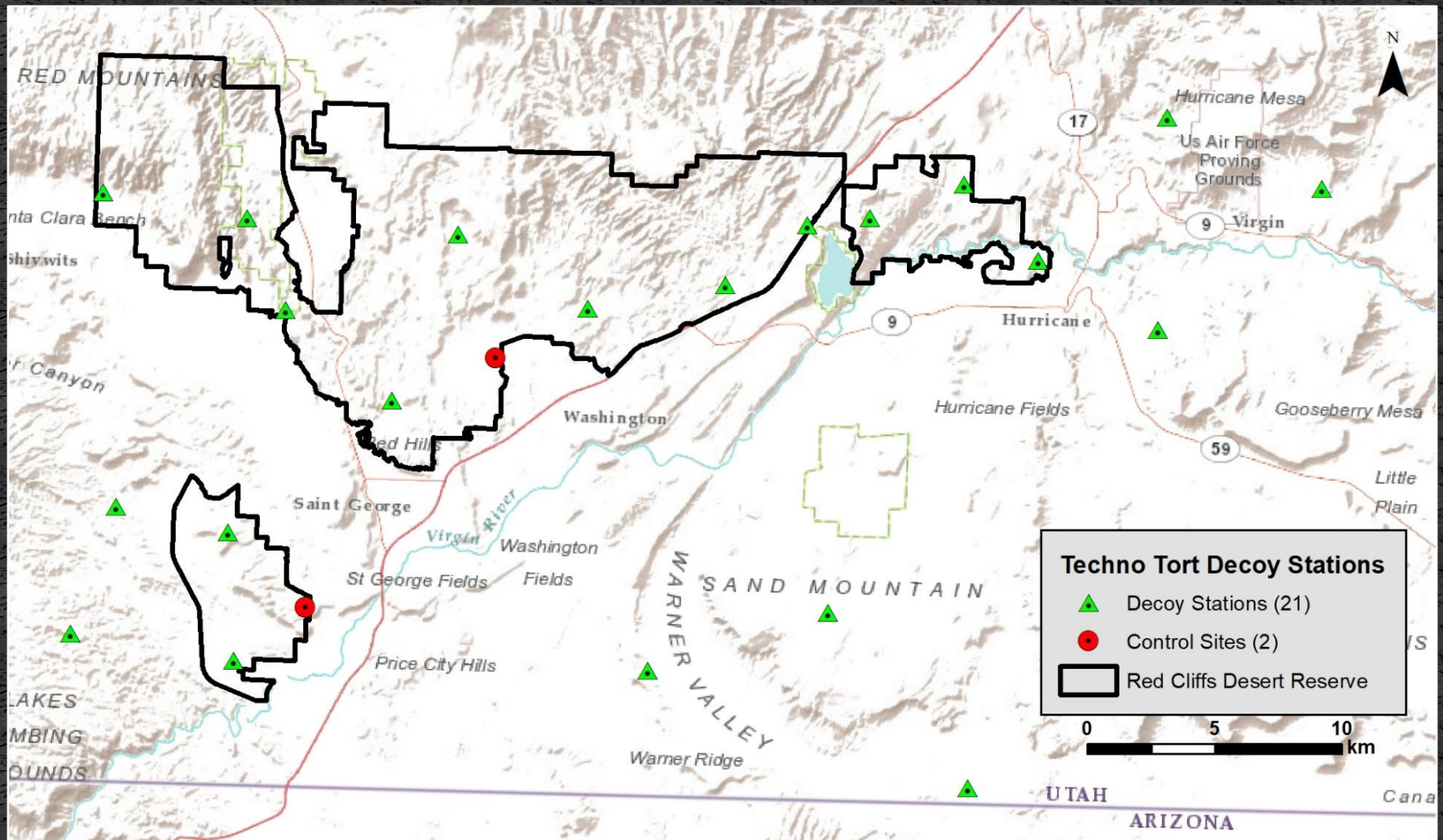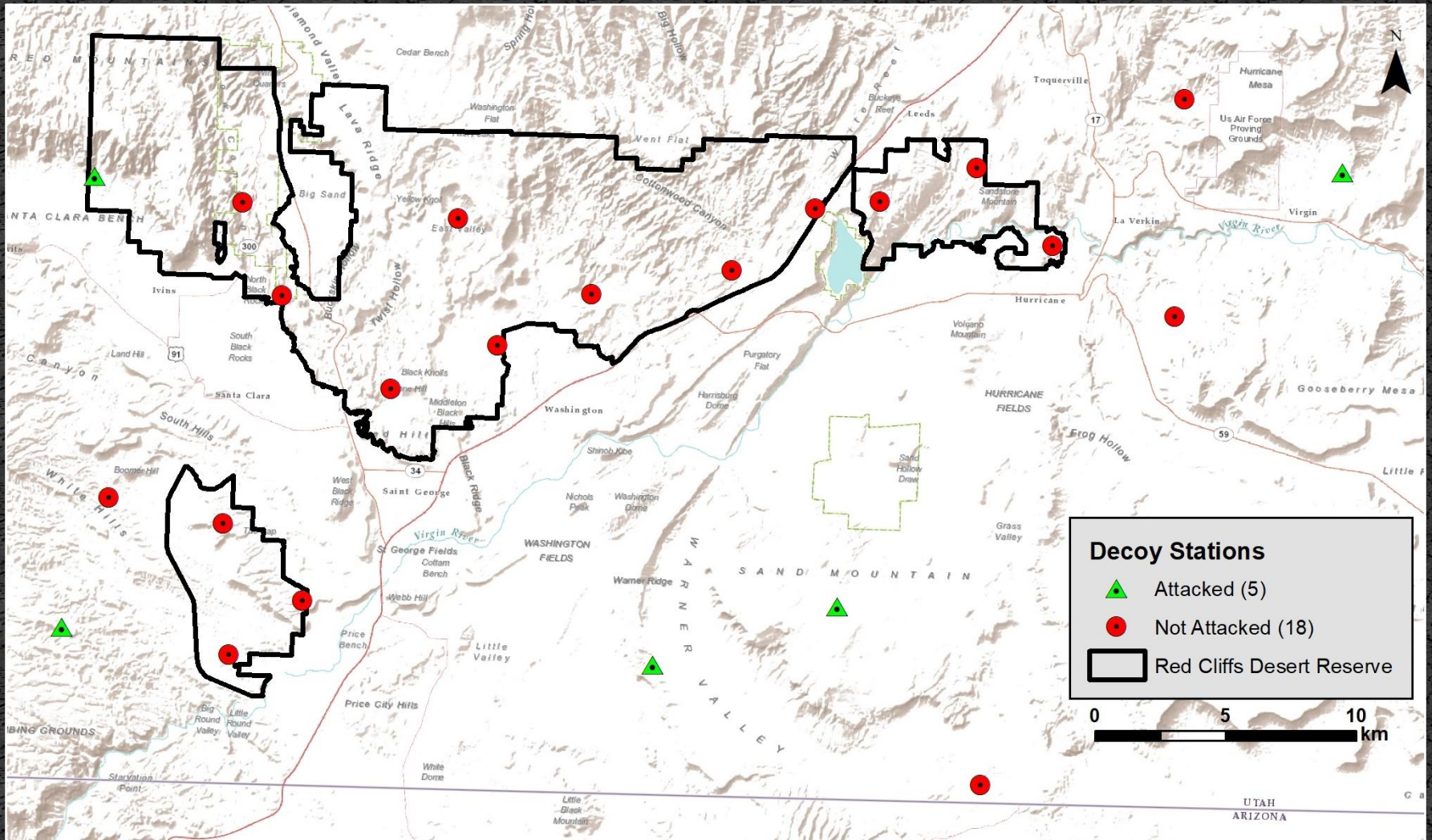
Tortoise Decoy Attacks

Tortoise Decoys Continued

- Total individual decoys attacked: 5
- Total attacks: 10

Decoy Location	# of Attacks	Total Days Available
Virgin	4	46
Zone 6 West	3	34
Kayenta	1	43
Warner Valley	1	44
Sand Mountain	1	58

Data Analysis

From K. Holcomb (2023) Draft Conflict Analysis

Raven Point Count Surveys

- Raven density: 2.7 ravens per km^{-2}
  - Suggested maximum target density: 0.89 ravens per km^{-2} from Holcomb et al. (2021)
- Raven observation rates were highest in the Warner Valley/Sand Mountain area, and generally higher outside the Reserve

Data Analysis

From K. Holcomb (2023) Draft Conflict Analysis

Techno Tortoise Decoy Stations

- 10 raven "attacks" in total
- Data from conflict analysis:
  - 18.4% annual chance of attack (0.184 hazard rate)
- Estimated annual sustainable conflict level: 7.8%

Stats presented are for 0 to 10-year-old Mojave desert tortoises

Conclusions

- Combination of survey data and decoy analysis indicates that tortoise-raven conflicts are unsustainably high in the Upper Virgin River (UVR) area
- Potential risk of localized to widespread functional extinction
- Recurring question: what are the thresholds that would trigger management actions?
  - Densities and estimated attack rates higher than what is considered "sustainable" for tortoises.
  - Additional risk extends to all juvenile tortoises within 2 km of a raven nest
- Problem appears to be more severe outside of the Reserve

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87 °F CAMERA 1 21 APR 2022 12:00PM

MOULTRIE ○ 84 °F CAMERA 1 30 APR 2022 10:58AM

MOULTRIE ○ 84 °F CAMERA 1 30 APR 2022 10:55AM

82 °F CAMERA 1 10 MAY 2022 05:16PM

Acknowledgments

- Kerry Holcomb (USFWS) for draft Conflict Analysis and continued project coordination
- John Kellam, Stephanie Taylor, Andy Ferrell, Melissa Buchmann, and other BLM staff and interns who assisted with training and field surveys
- Kristen Comella (Snow Canyon State Park) for project support and for providing assistance with 'Friends of Snow Canyon' volunteers
- Nicki Frei (SUU) and Chris Giles for assistance with pilot study in 2021
- Lura Snow for assistance with field surveys
- Bryan Loya for assistance with field surveys and data organization
- Geoff Smith (Utah Tech) and students for field survey assistance
- Lisa McAleer for GIS assistance
- HCP trail stewards and other volunteers