Exhibit 4-a-1

Tortoise Predation and Raven Monitoring in the Red Cliffs Desert Reserve

Cameron Rognan & Mark Draper

September 2015

Raven Predation of the Desert Tortoise

Raven predation in the Mojave Desert

- 250 tortoise carcasses found under one nest from a 4 year period in California.

Raven predation in Utah

- 34 tortoise carcasses near nest site found in 1997.
- 2009 JBR Environmental Consultants Survey 4 raven-killed juveniles found.

Upper Virgin RIT

1. Identify raven nests along power lines and remove all raven nests encountered within desert tortoise habitat.
2. Assess the use of raptor perches by ravens; Are these perches subsidizing raven populations that are predating tortoises?

Desert Tortoise Recovery Office – Top 3 recovery actions prioritized, March 2015:

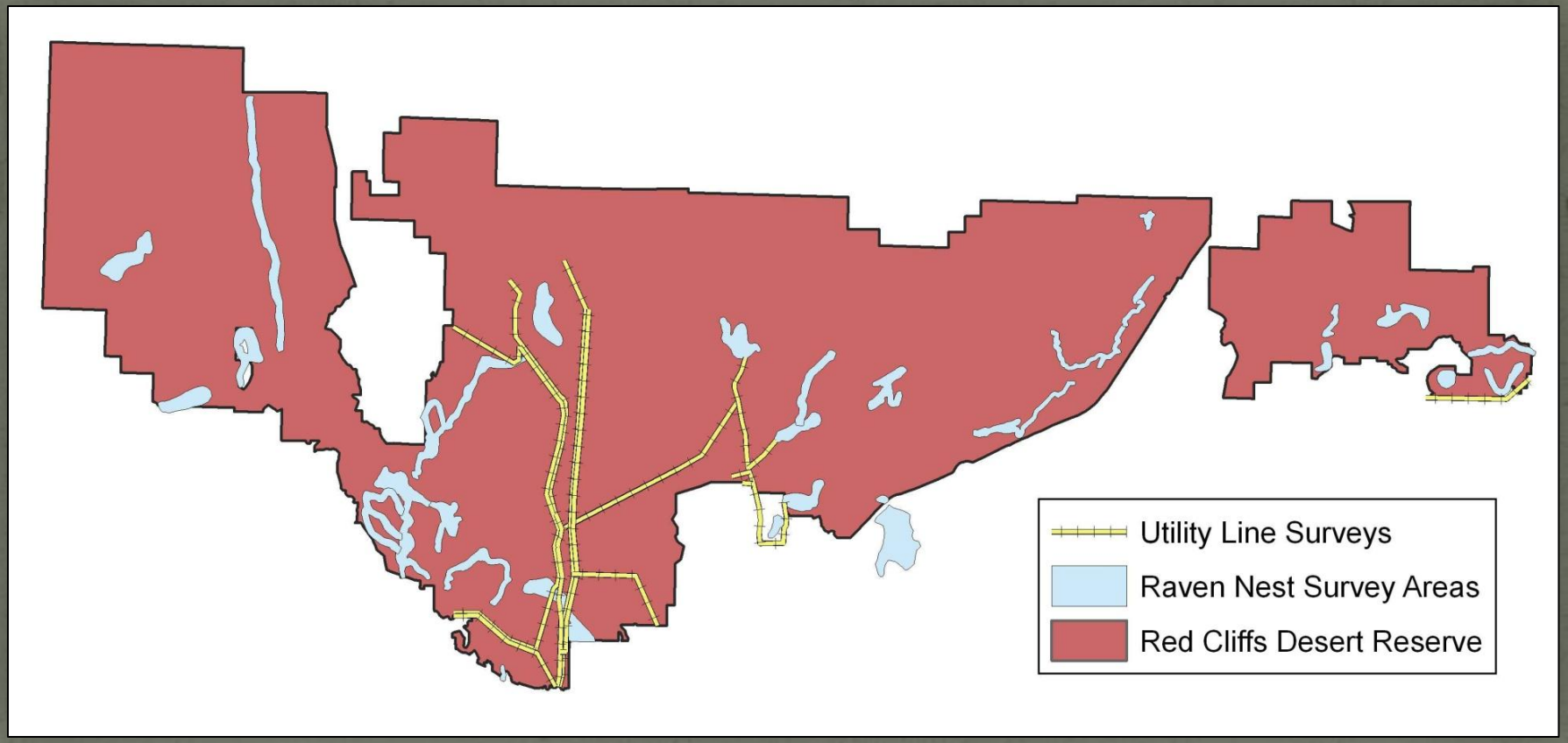
1. Restore habitat
2. Reduce predator subsidies
3. Targeted predator control

Survey Methods

- Visited all previous known nesting areas & searched for new sites.
- Monitored nest activity.
- Inspected all nest and roost areas for pellets, tortoise remains etc.

- Walked under all major utility lines.
- Carefully inspected below each pole for raven pellets and tortoise remains.

Areas Surveyed



Survey Results

Survey Method	Survey Hours	Area Covered	Pellets	Tortoise Carcasses
Nest Survey	65	3900 Acres	69	6
Utility Line	25	60 Km	26	5

Tortoise Remains Found

Tortoise Remains	Nest Survey / Utility Line Survey	Time since death	Predated	Possible Predator / Scavenger
Hatchling	Nest Survey	< week	Yes	Raven
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Hatchling	Nest Survey	< 6 months	Yes	Raven / Rodent
Juvenile	Nest Survey	< 6 months	Yes	Raven / Rodent
Hatchling	Nest Survey	< 1 month	Unknown	Raven
Sub-adult	Nest Survey	< 6 months	Yes	Coyote
Juvenile	Utility Line Survey	1 year	Unknown	Raven / Raptor
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Adult	Utility Line Survey	1 year	Unknown	Unknown
Adult	Utility Line Survey	2 years	No	None
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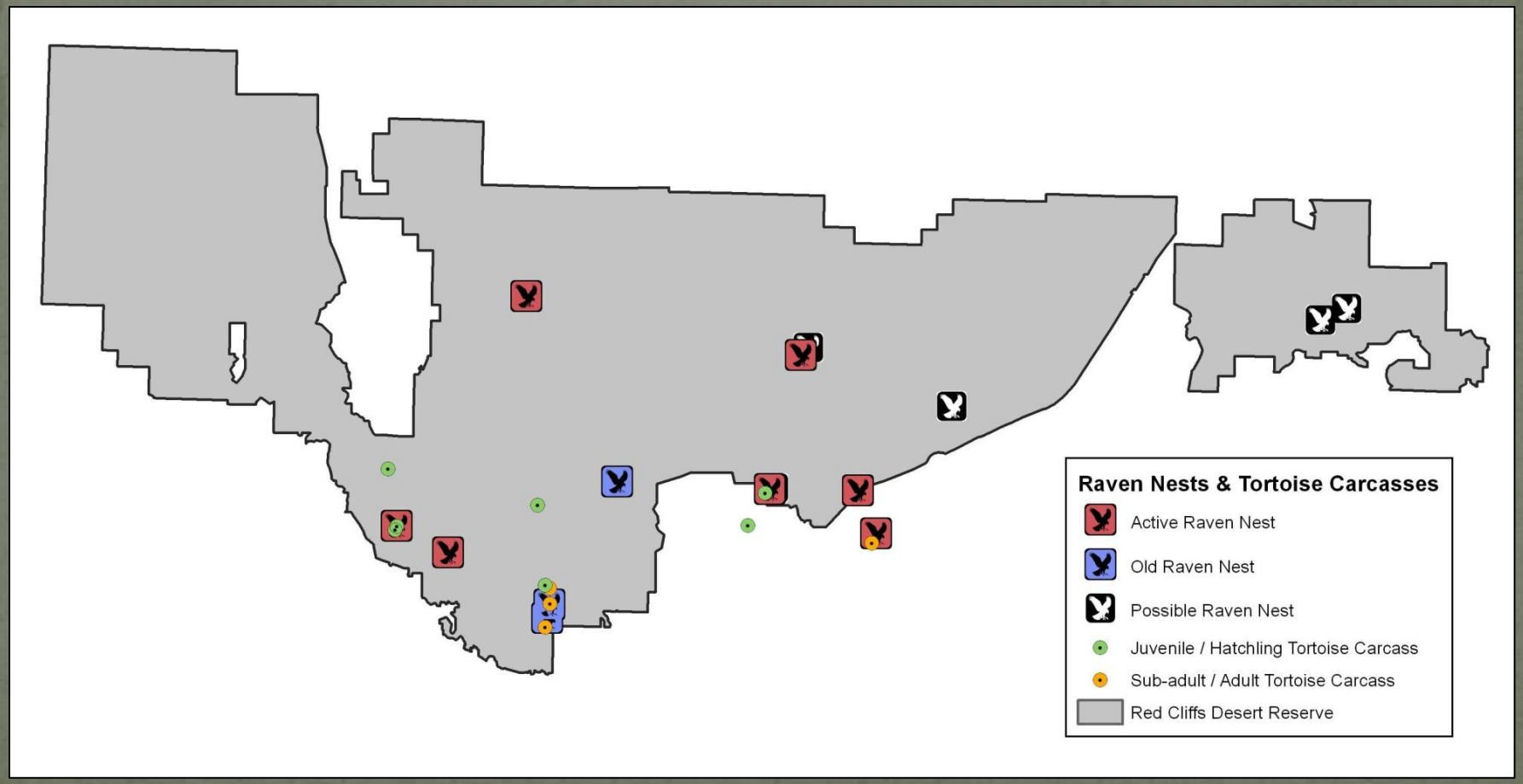
Raven Nests and Tortoise Carcasses



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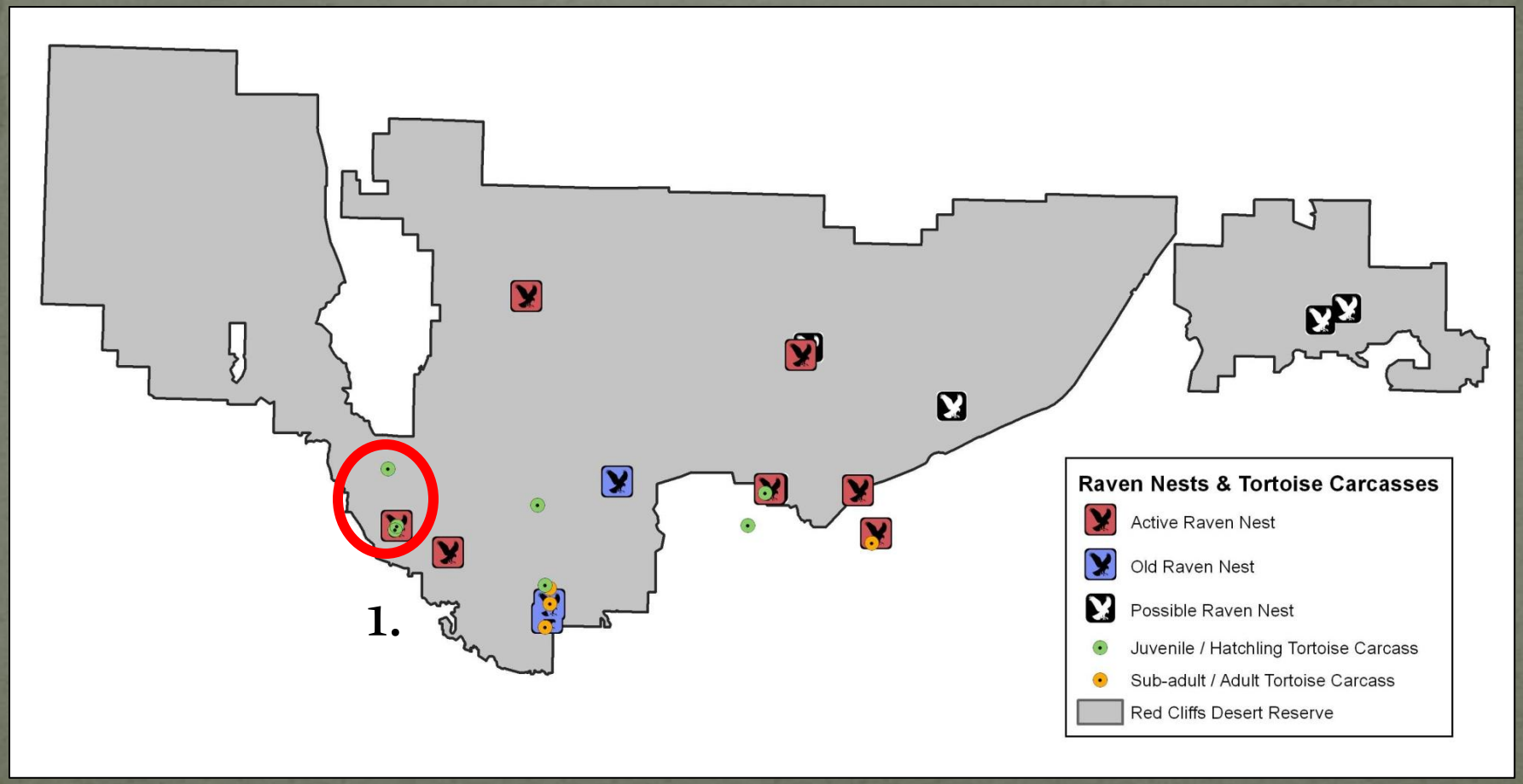

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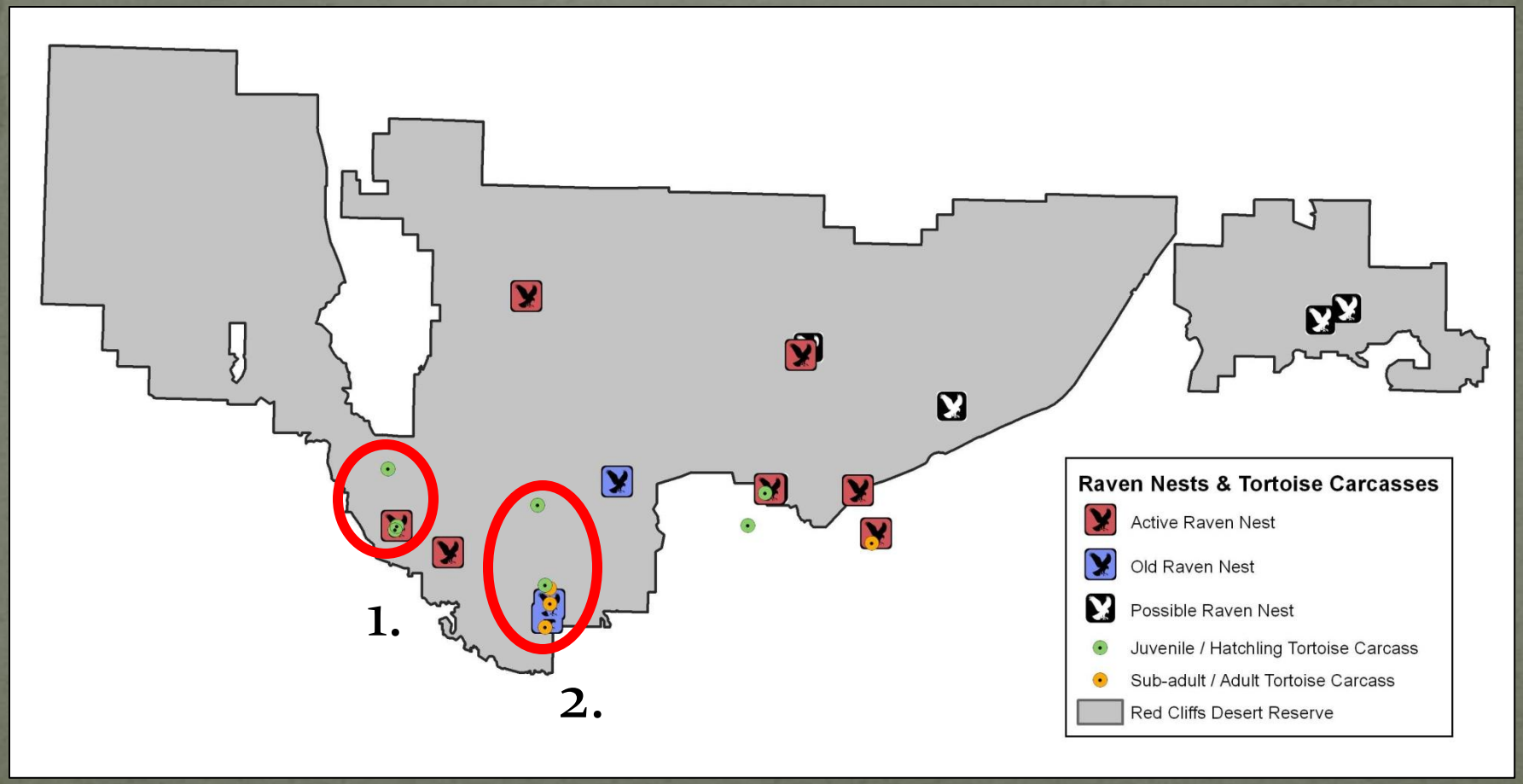

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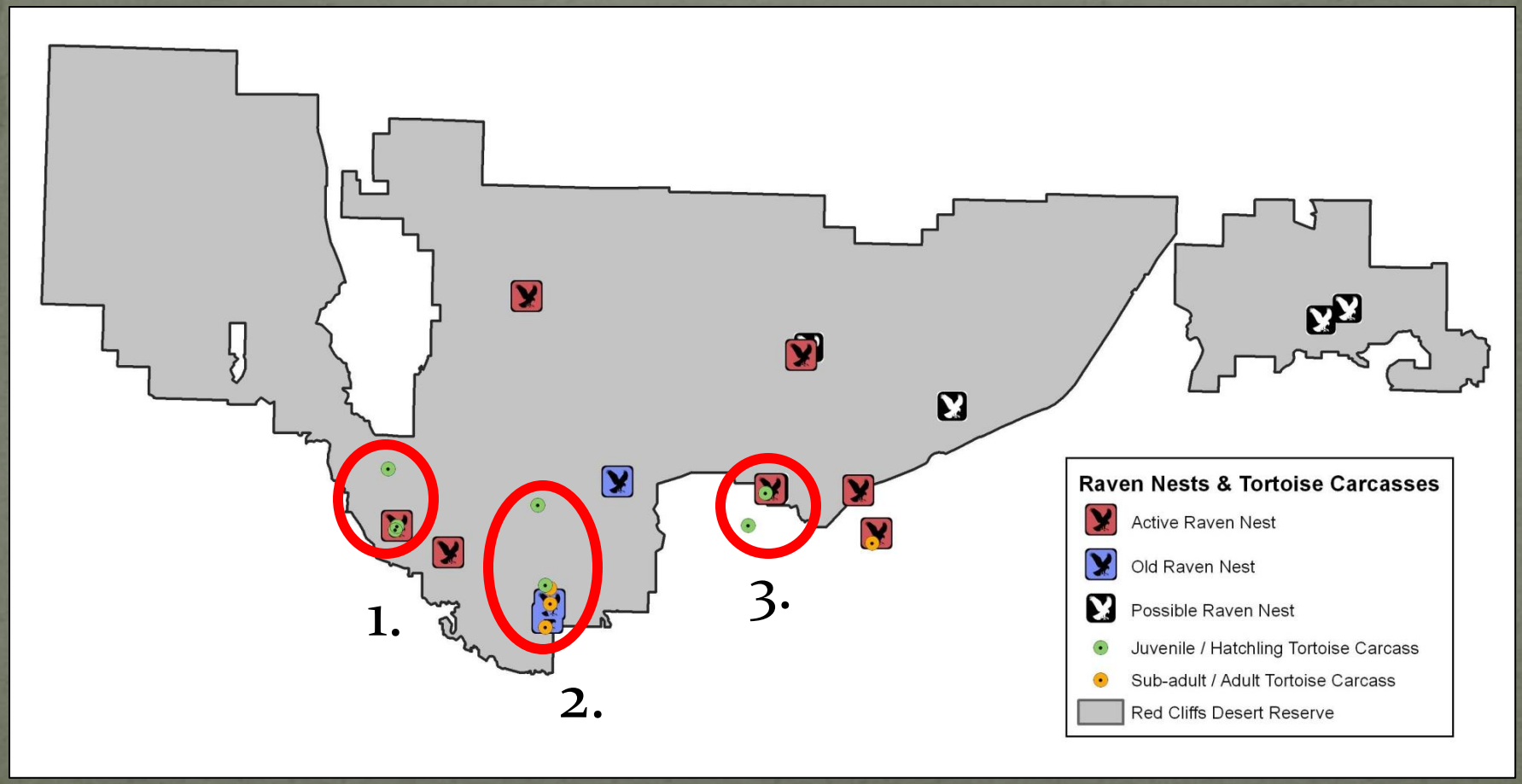

Raven Predated Carcasses

Carcasses Found in Packrat Nests

Other Nest / Roost Items

Nesting Success of Ravens?

- 7 active nests observed
- 18-24 young fledged

Gila Monster Predation on Tortoise

Some Ravens Avoiding Tortoises?

- Tortoises found at 4 different raven nest sites
- Learned behavior
- Other food resources available

Conclusions & Recommendations

- Ravens are killing hatchling tortoises in the Reserve.
- Predation appears to be local, and less than other areas of the Mojave.
- Recommend continued monitoring.
- Control measures taken as needed.

Thank You!