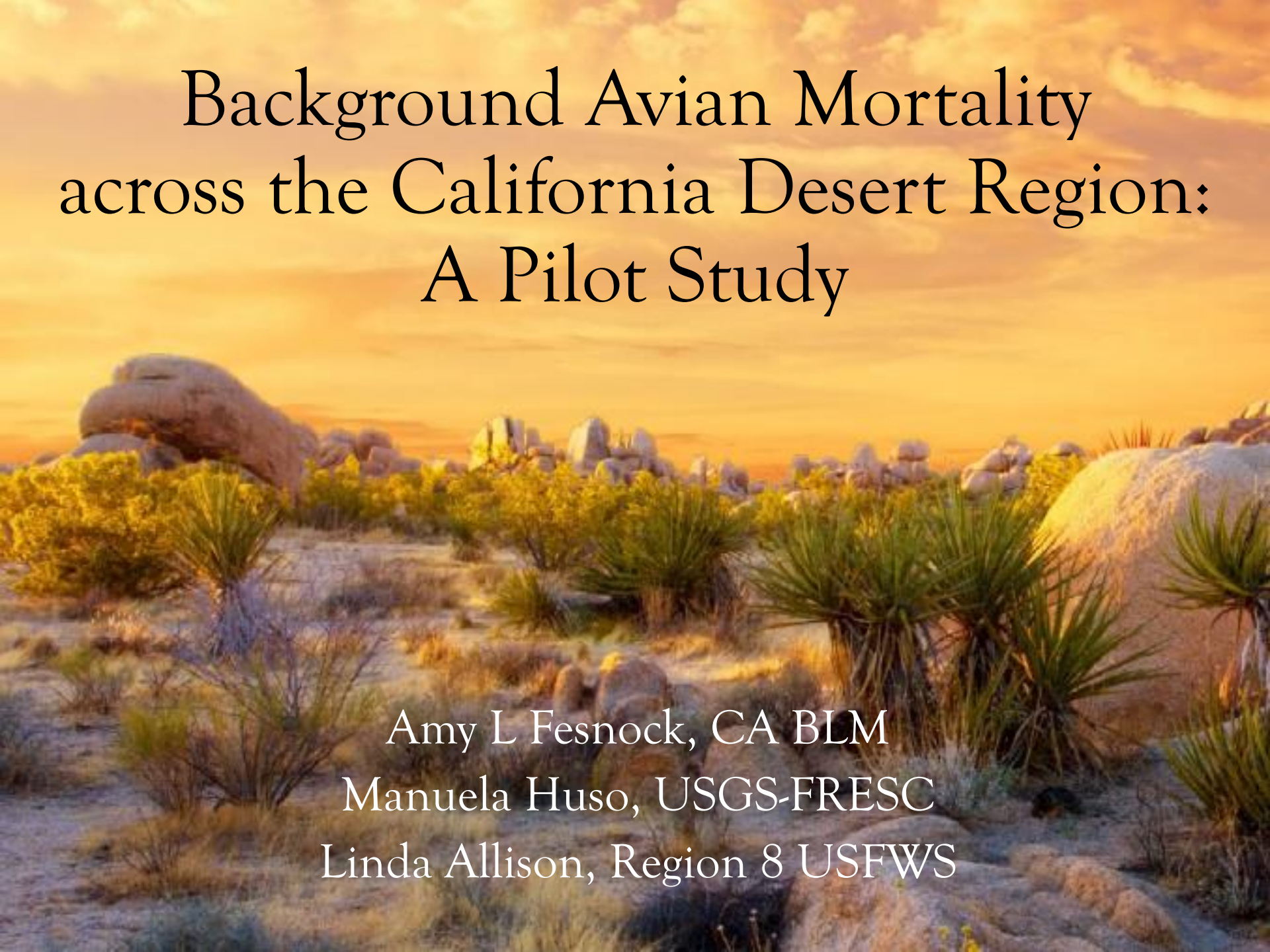
Background Avian Mortality across the California Desert Region: A Pilot Study



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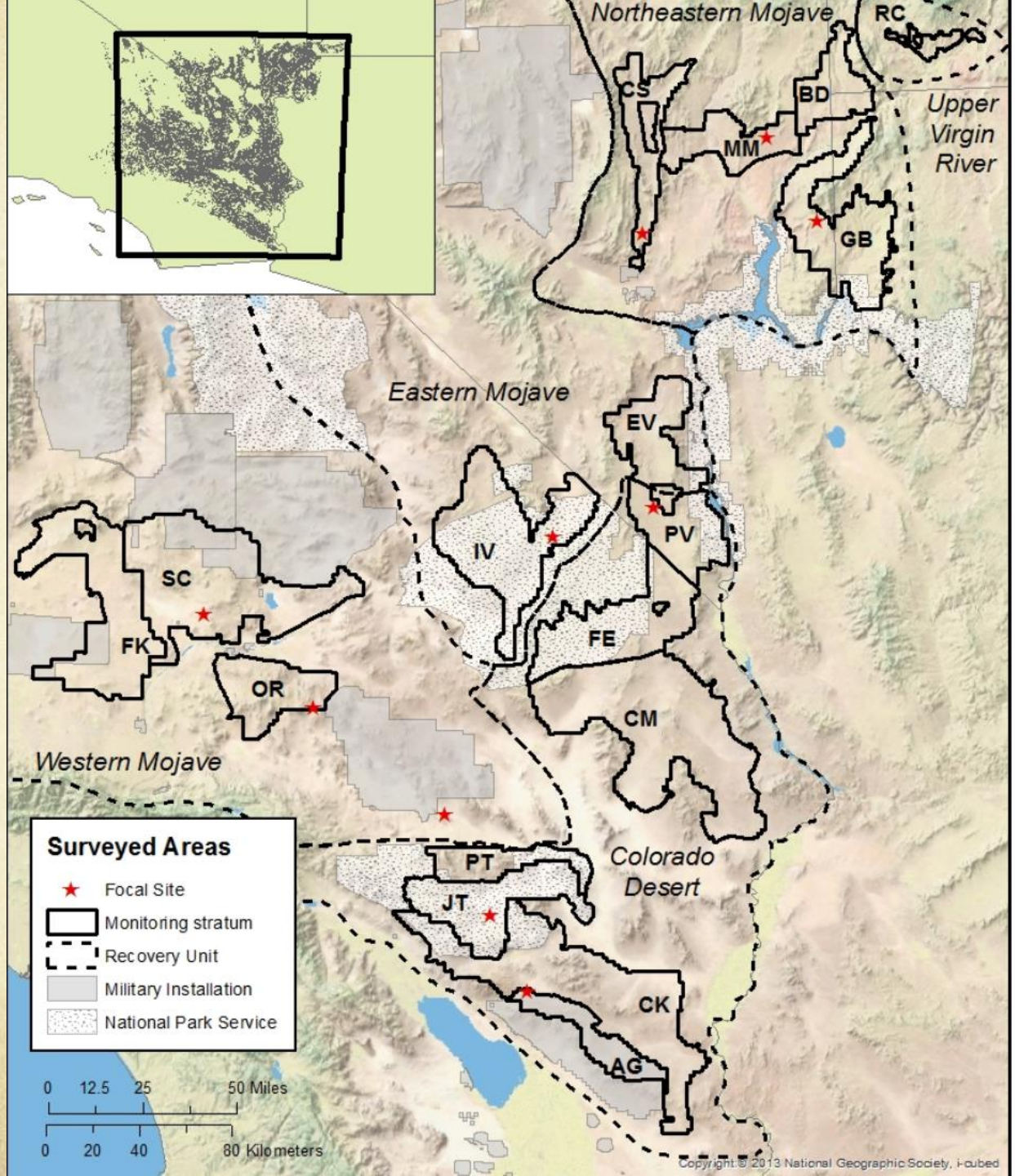
Purpose and Need for the Pilot Study

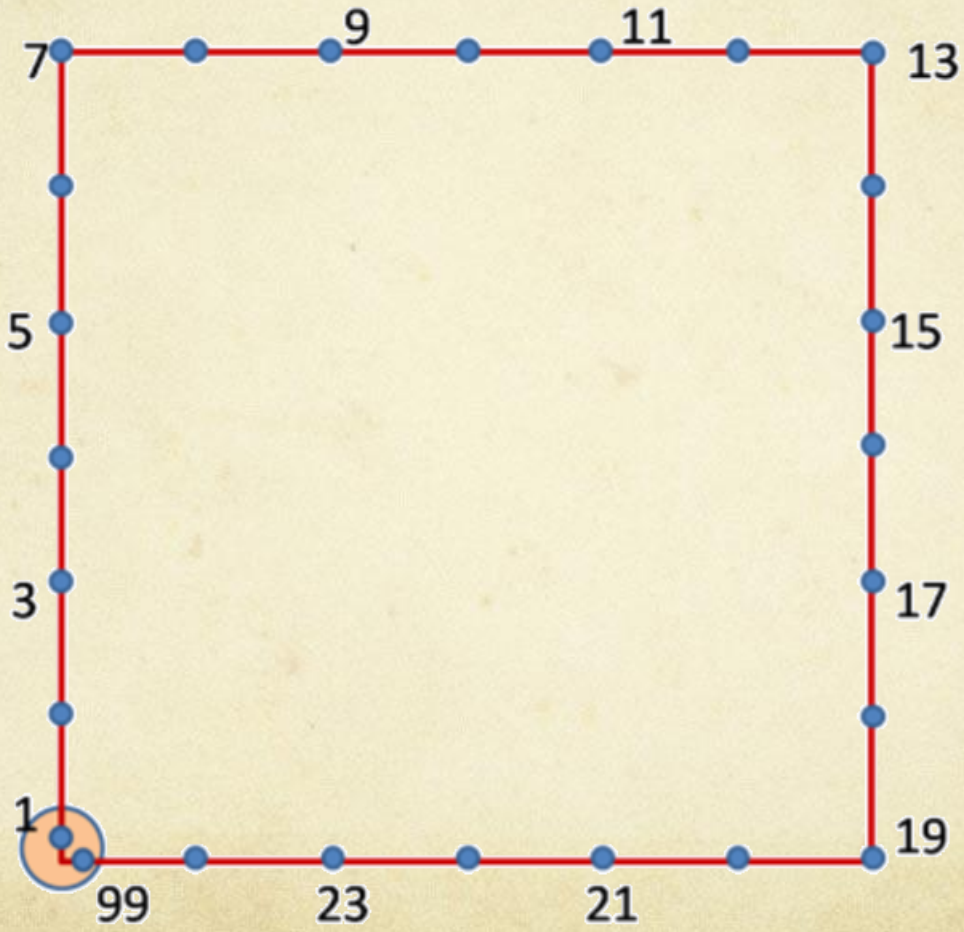
- 2010-Major push for renewable energy (especially solar)
- Monitoring from first projects documented avian fatalities
- Mortalities rates at RE facilities are corrected for
  - Observer Detection Probabilities
  - Scavenger Rates/Carcass Persistence
- Questions were raised as to what is the "normal" detectable mortality rate across the California desert region
- How would the "background mortality rate" provide context to inform our understanding of avian mortalities at facilities

Study Design

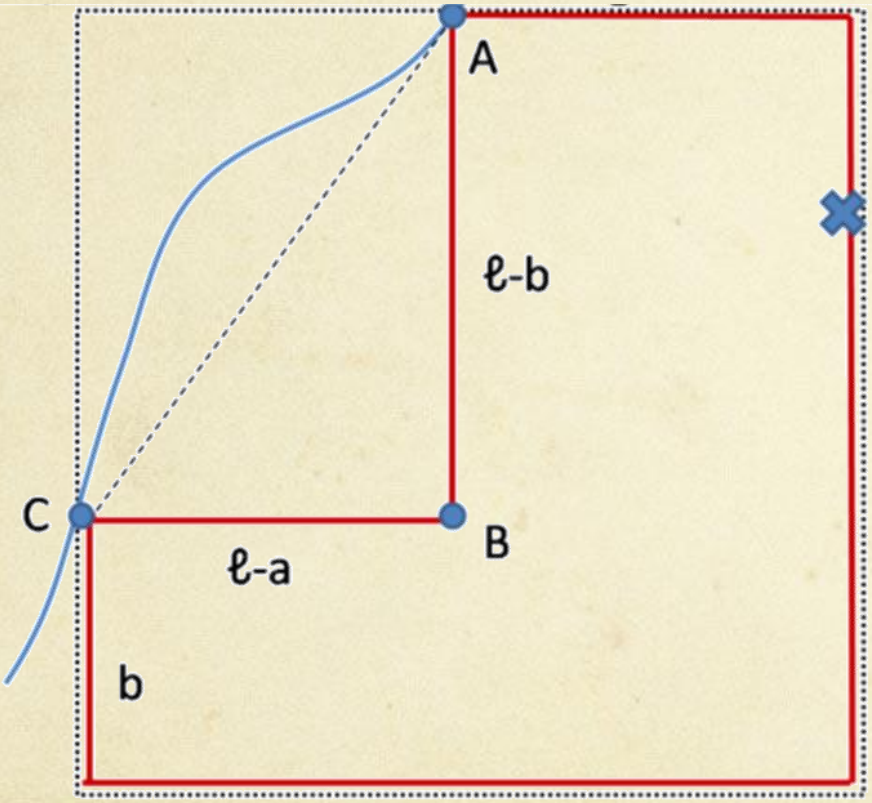
- Paired with Tortoise LDS
  - Range-wide
  - Natural Areas
- Observer Trials incorporated in LDS training
- Scavenger Trails Conducted

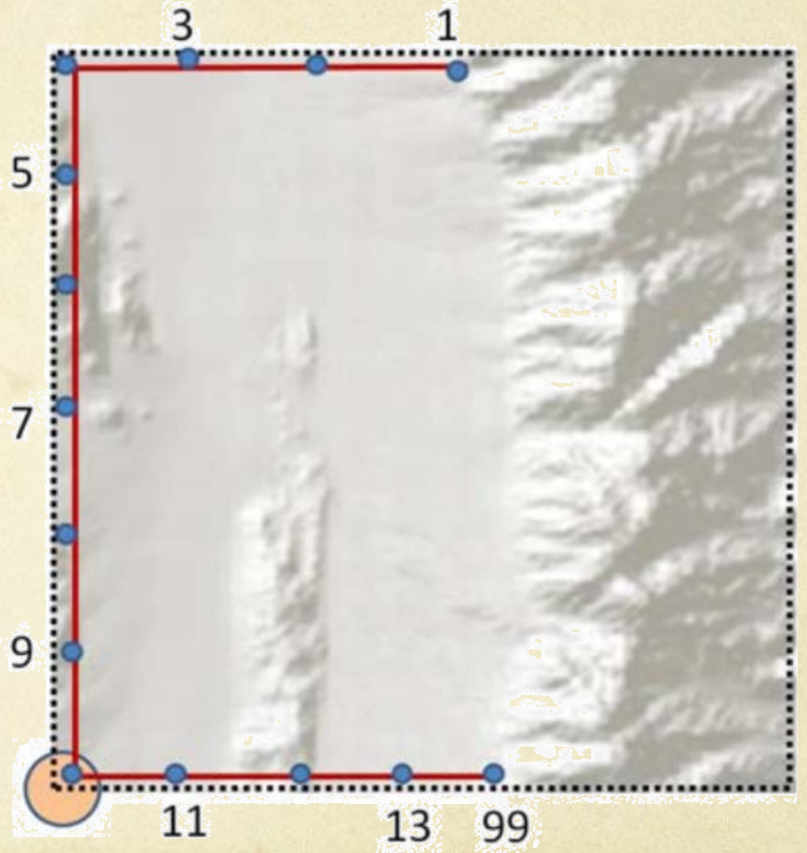


The Normal 12-km LDS transect



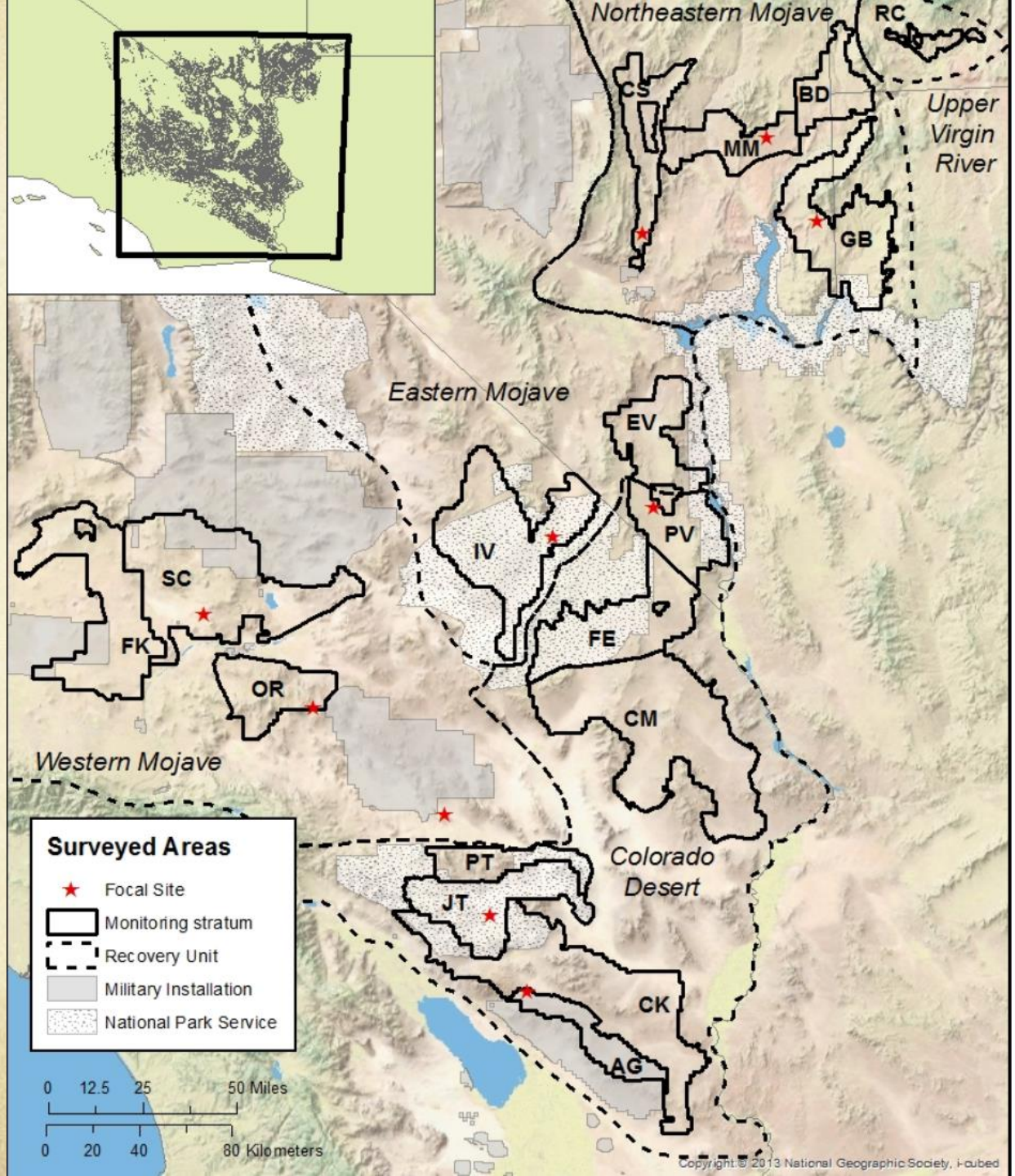
Established Means to Alter Transect





Range Wide

- Freemont-Kramer
- Superior-Cronese
- Ord-Rodman
- Pinto Mountains
- Joshua Tree NP
- Chuckwalla
- Chocolate Mtns
- Ivanpah
- Piute Fenner
- Chemehuevi



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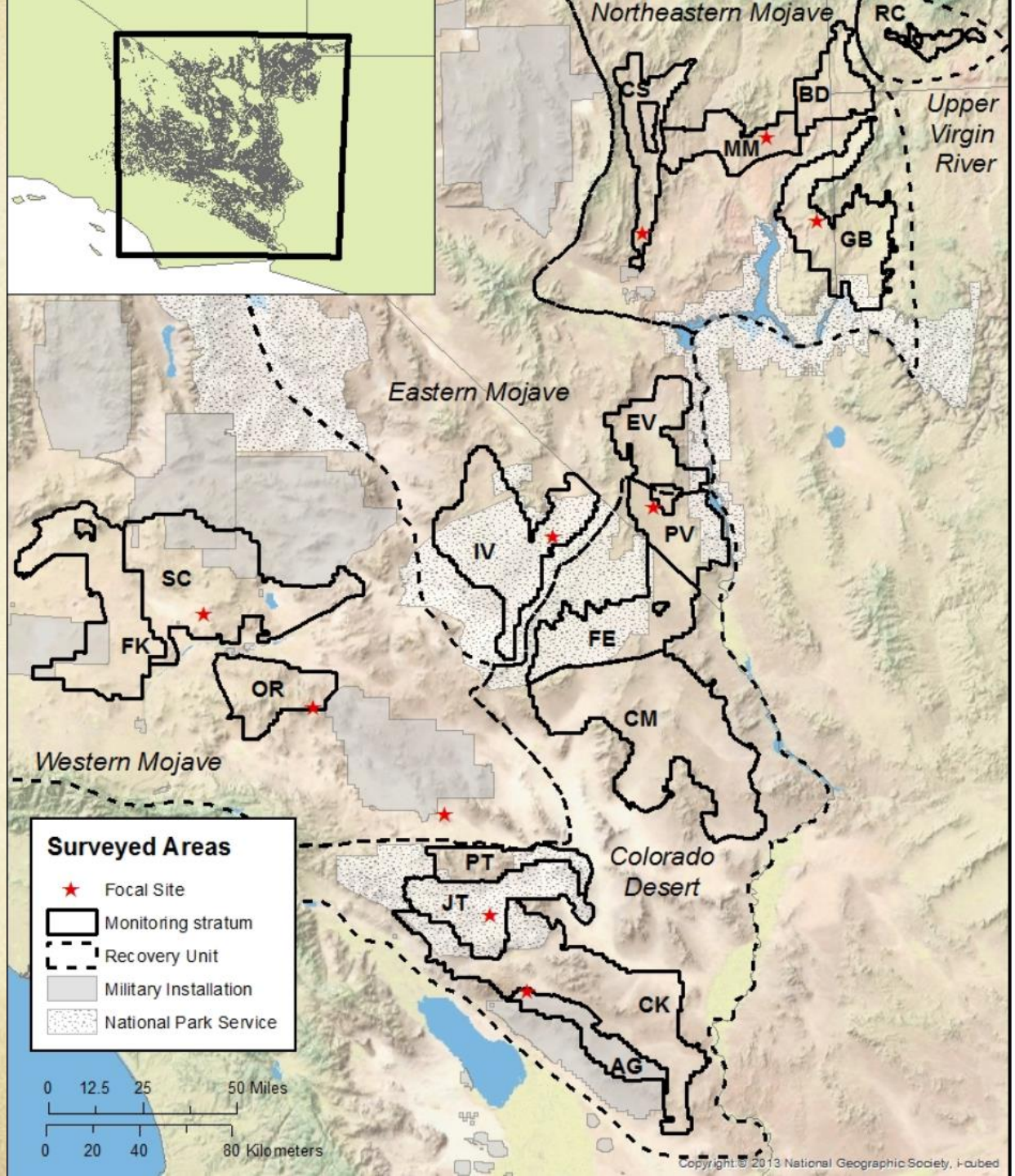
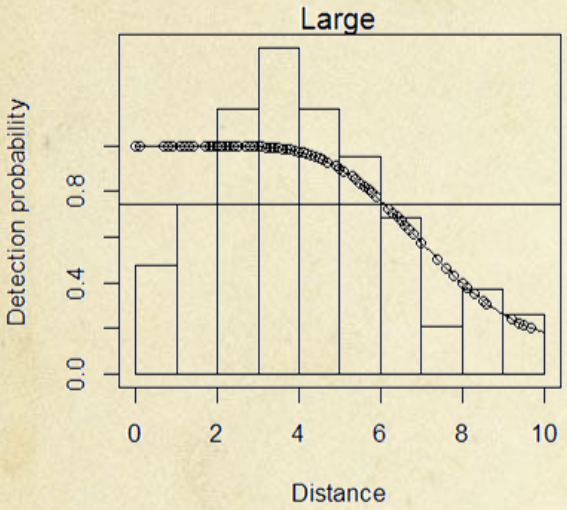
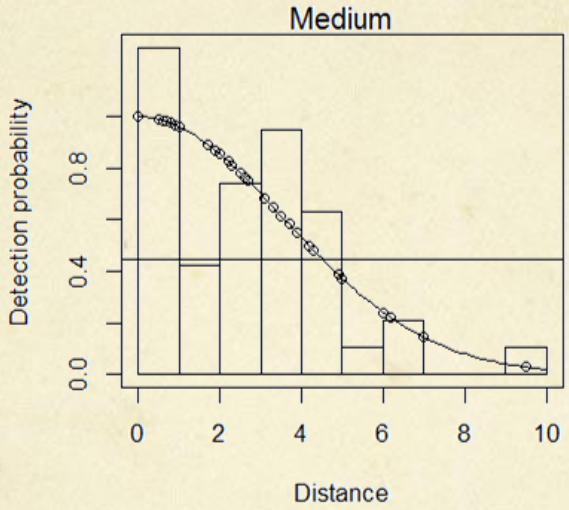


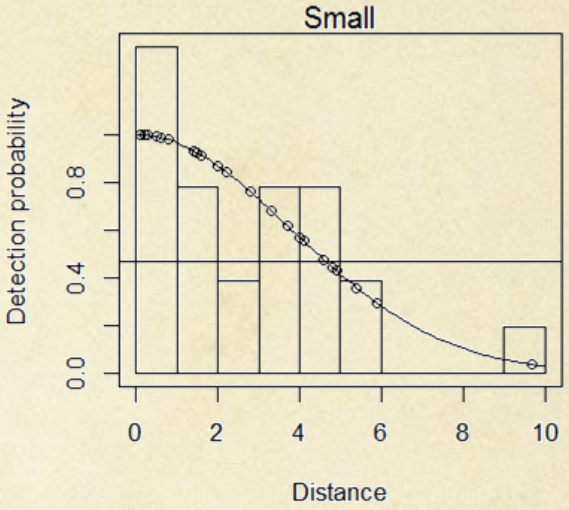
Observer Detection Probability

- Desert Tortoise LDS technicians were trained to search for dead birds at the same time as they looked for tortoises.
- On the training transects, 62 large, 28 medium and 34 small bird carcasses were placed at varying distances from the training transects (spaced 25 m apart).
- When a bird carcass was detected, searchers recorded
  - perpendicular distance from the transect to the bird
  - distance from the observer to the bird at the time of discovery.
- During the detection trials, 97% detections were within <10 m, so we used 10 m as the effective sampling width.

Observer Detection Probability







Carcass Persistence Trials

- Conducted in three areas
  - Chuckwalla ACEC
  - Joshua Tree National Park
  - Fremont-Kramer ACEC
- At each site, 10 large, 20 medium and 30 small bird carcasses were placed in random locations and checked daily for continued persistence.
- Persistence times were modeled using the R package survival.
- Effective search interval (Huso 2011) was calculated
  - the time at which 99% of carcasses would have been removed, or no longer detectable to an observer.

Searcher Efficiency/Carcass Persistence

- Average searcher efficiency (and 95% confidence limits) within 10m of the transect
- Average proportion of carcasses persisting through the effective interval (and 95% confidence limits).

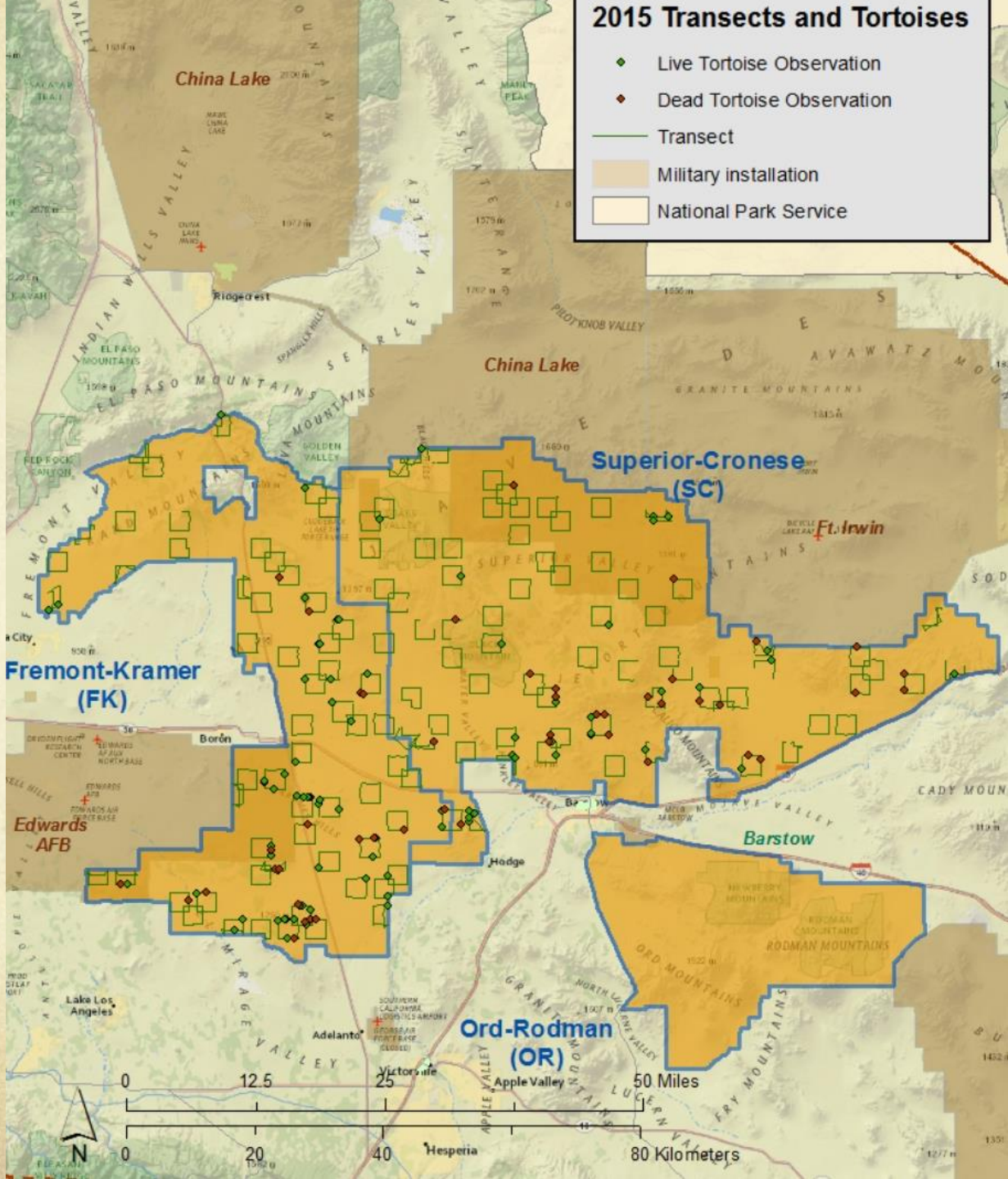
Size	SE	95%LCL	95%UCL	Prop Persist	95%LCL	95%UCL	Effective Interval (d)
L	0.77	0.43	0.96	0.22	0.10	0.44	318
M	0.44	0.35	0.55	0.22	0.15	0.30	77
S	0.47	0.34	0.59	0.21	0.17	0.26	30

Overall Probability of Detection

Size	Pr (detection)	95%LCL	95%UCL
L	0.160	0.064	0.358
M	0.095	0.062	0.135
S	0.100	0.070	0.138

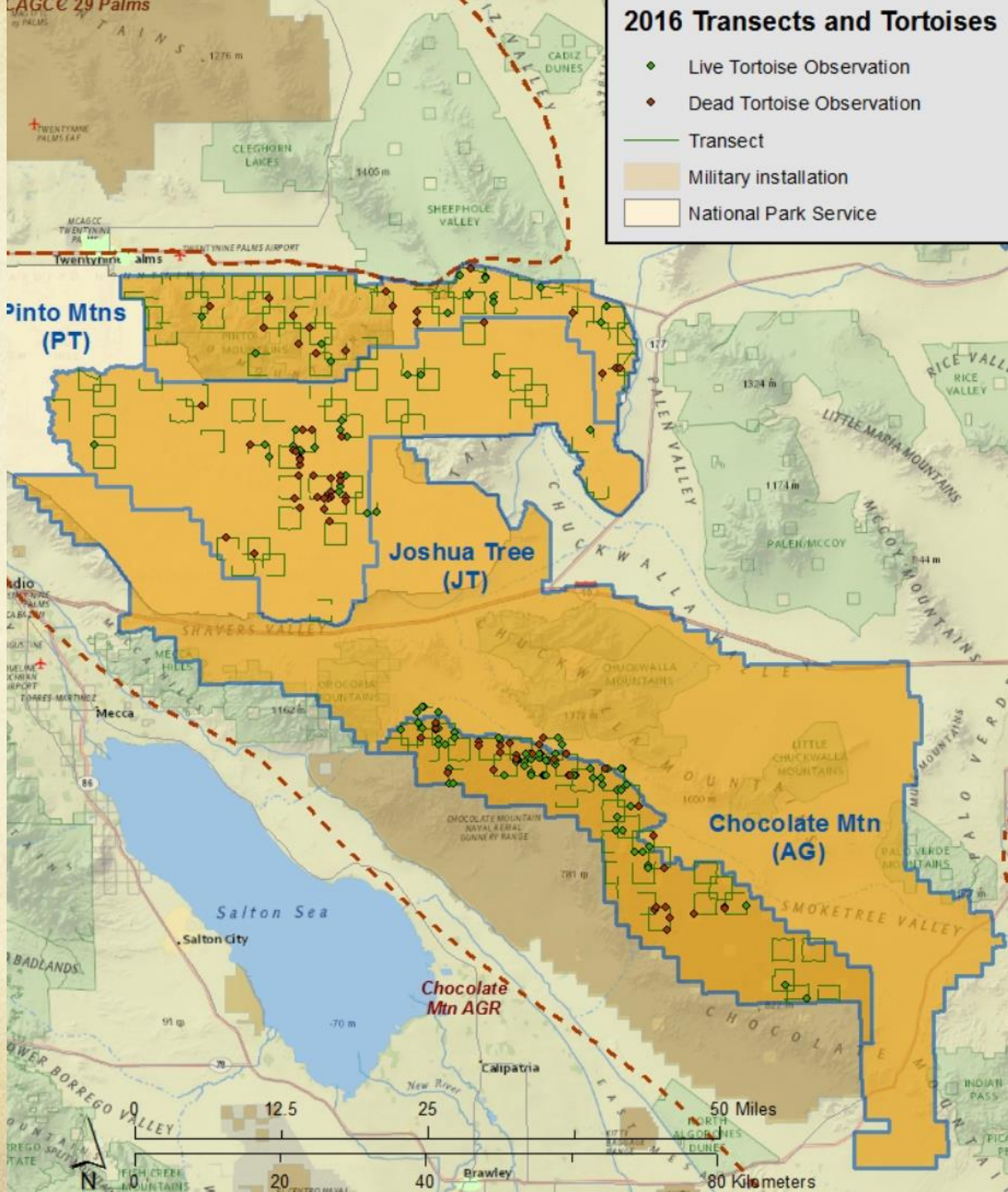
Transect Distribution

- Freemont-Kramer
  - 57 transects
  - 677.7 km
- Superior-Cronese
  - 70 transects
  - 780.5 km
- Ord-Rodman
  - 60 transects
  - 677.7 km



Transect Distribution

- Pinto Mtns
  - 50 transects
  - 451.7 km
- Joshua Tree
  - 60 transects
  - 614.5 km
- Chuckwalla
  - 120 transects
  - 1270.0 km
- Chocolate Mtn
  - 36 transects
  - 375.7 km



Results

- 453 transects covering 4,847.8 km surveyed March to May
- With the 10-m transect width, area of ground surveyed
  - 96.74 km^2 or 37.35 $mile^2$ of area searched

- Avian Mortalities Observed – 6
  - 1 Red-tailed Hawk adult (L), predated, base of nest
  - 1 Red-tailed Hawk juvenile (M),
  - 1 rock wren (S), shrike impaled on cactus
  - 3 feather spots.

Estimates of Median Fatality

		Searched Area				Searched Period/mi2		
Size	X	M* (median)	95%LCL	95%UCL	eff.int	Period M*/mi2	95%LCL	95%UCL
L	4	31	9	142	318	0.83	0.24	3.80
M	1	13	1	43	77	0.35	0.03	1.15
S	1	12	1	40	30	0.32	0.03	1.07
L	1	9	1	44	318	0.24	0.03	1.18
M	4	45	15	109	77	1.20	0.40	2.92
S	1	12	1	40	30	0.32	0.03	1.07
L	1	9	1	44	318	0.24	0.03	1.18
M	1	13	1	43	77	0.35	0.03	1.15
S	4	42	14	99	30	1.12	0.37	2.65

Estimates of Median Fatality

	Full Yr/mi2			Full Yr/acre		
Size	Year M/mi2	95%LCL	95%UCL	Year M/acre	95%LCL	95%UCL
L*	0.95	0.28	4.36	0.0015	0.0004	0.0068
M	1.65	0.13	5.46	0.0026	0.0002	0.0085
S	3.91	0.33	13.03	0.0061	0.0005	0.0204
L	0.28	0.03	1.35	0.0004	0.0000	0.0021
M*	5.71	1.90	13.83	0.0089	0.0030	0.0216
S	3.91	0.33	13.03	0.0061	0.0005	0.0204
L	0.28	0.03	1.35	0.0004	0.0000	0.0021
M	1.65	0.13	5.46	0.0026	0.0002	0.0085
S*	13.68	4.56	32.25	0.0214	0.0071	0.0504

In Summary

- Median background mortality (large, medium, small birds)
  - 0.95, 5.71 and 13.68 per square mile per year
- Upper 95% confidence limits
  - 4.36, 13.83 and 32.25 per square mile, respectively
- In practice, the most reasonable category in which to place them might be the one with the shortest effective interval, i.e., small birds… which results in
  - 0.28, 1.65 and 13.68 per square mile per year, for large, medium and small birds, respectively.
- Translated per acre
  - 0.0004, 0.0026, 0.0214, for large, medium, and small birds
  - Total – 0.024 birds per acre

Comparing Data from Solar Facilities

Annual Avian Mortality per acre, all bird sizes combined

- Solar Facility A –1.7 birds/acre
- Solar Facility B –0.4 birds/acre
- Solar Facility C –0.6 birds/acre
- Background Mortality Across the Region –0.024 birds/acre

In Conclusion

- Only 3 bird carcasses were found in >35 square miles.
- 3 feather spots were found
  - Potentially remnants of a dead bird that was removed by scavengers or simply a preening station for a live bird.
- Conservative approach to Median background mortality was on the order of 0.95, 5.71 and 13.68 per square mile per year, for large, medium and small birds, respectively.
- Background Mortality Rate Across the Region – 0.024 birds/acre
- When compared to mortality rates from solar projects, background mortality does not appear to be a significant factor and could easily be accounted in the sampling design error rates.

Acknowledgements

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