

Strategic Minimization of Road Effect



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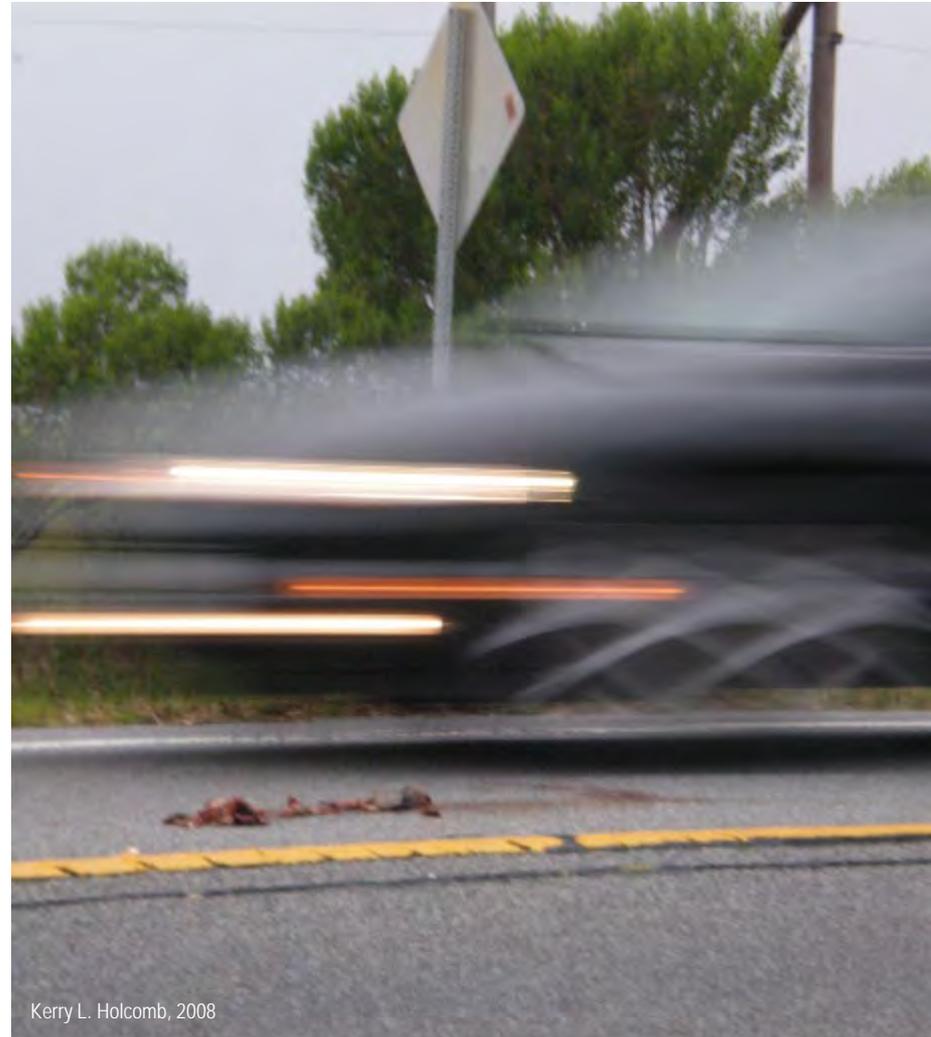


Roads Take an Unsustainable Toll on Chelonians



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



- Road infrastructure covers ~1% of the U.S., yet evidence of road induced ecological changes covers ~19% of the U.S.
- Chelonians are particularly vulnerable to road effects
 - High rates of adult survivorship are imperative as a result of
 - Low rates of recruitment and
 - Delayed reproductive maturity

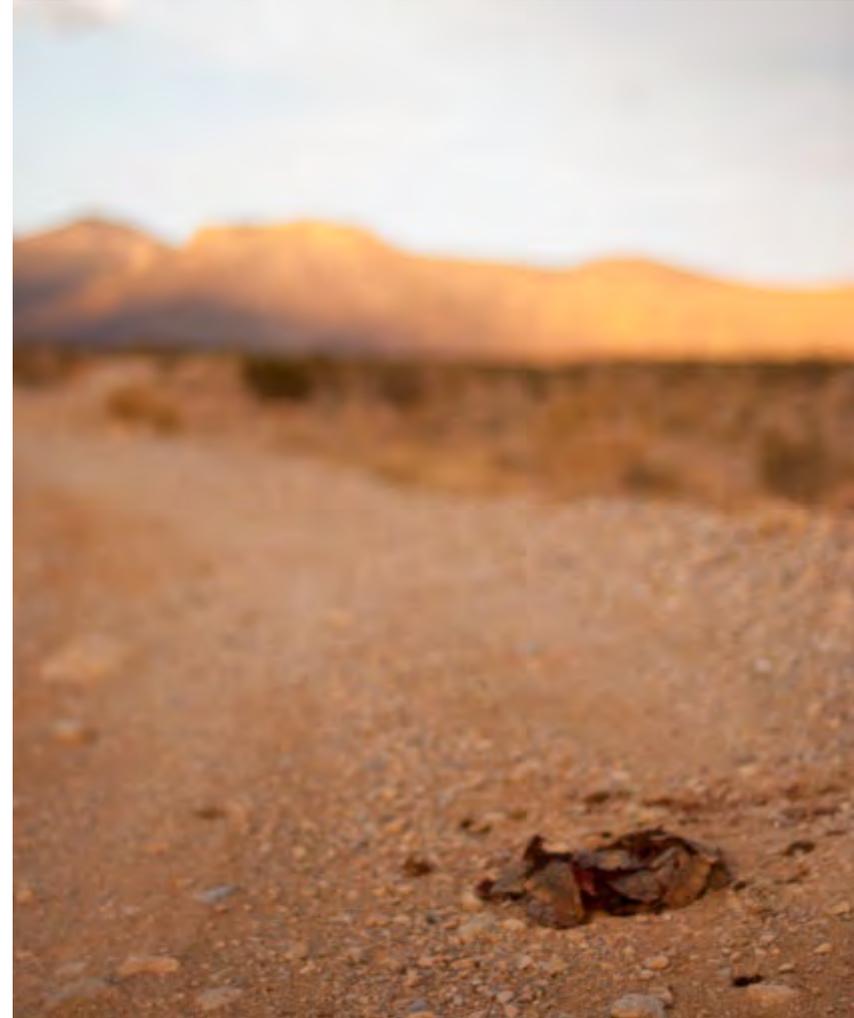




Roads Implicated in Decline of the Desert Tortoise



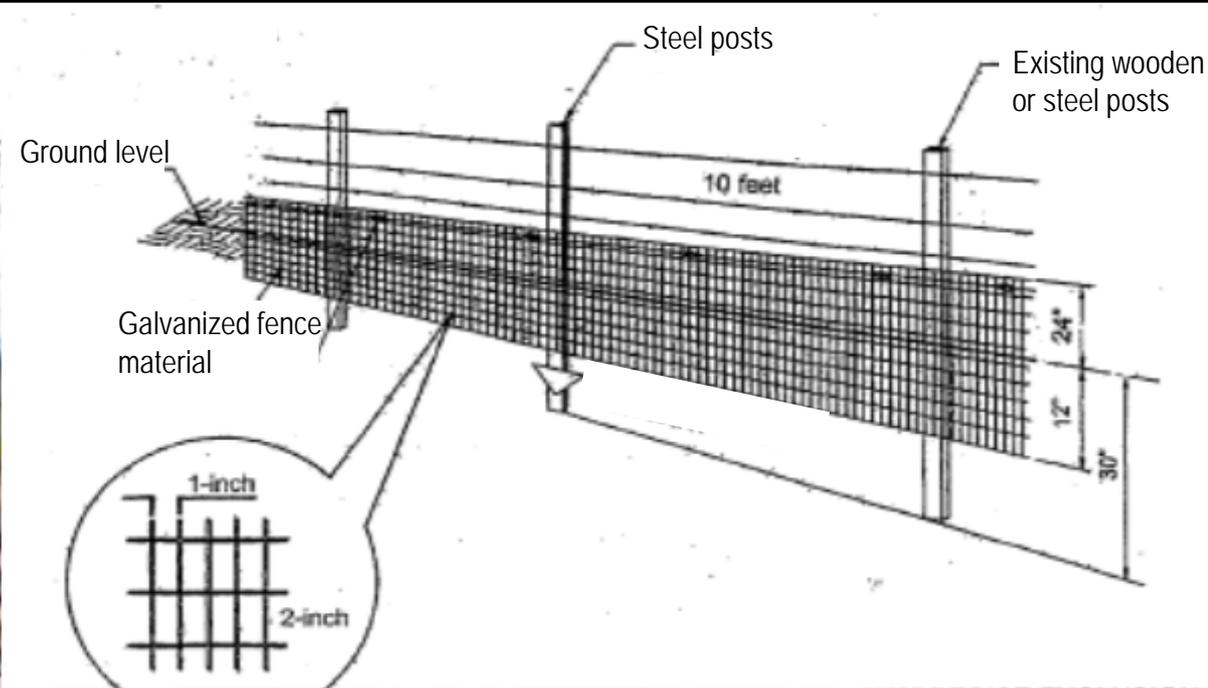
- Listing factors A through C
- 2011 Desert Tortoise Recovery Plan



Reducing Road-effects



Reducing Road-effects



Minimizing the Effects of Roads

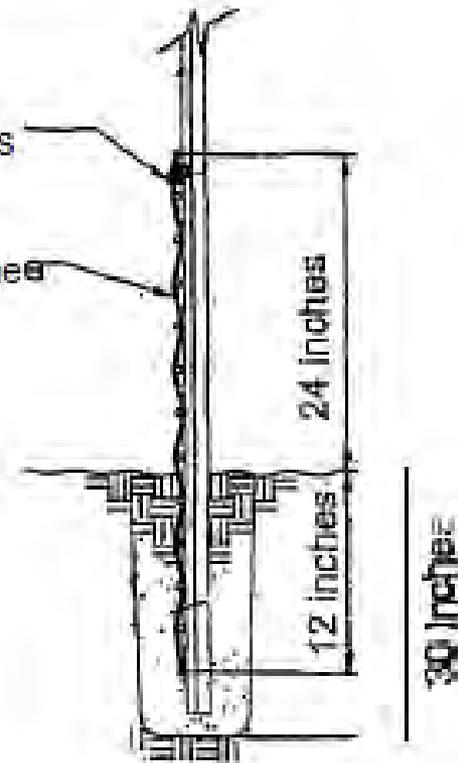


- Fence or otherwise establish effective barriers to tortoises along heavily-traveled road
- Utilize existing culverts to alleviate habitat fragmentation

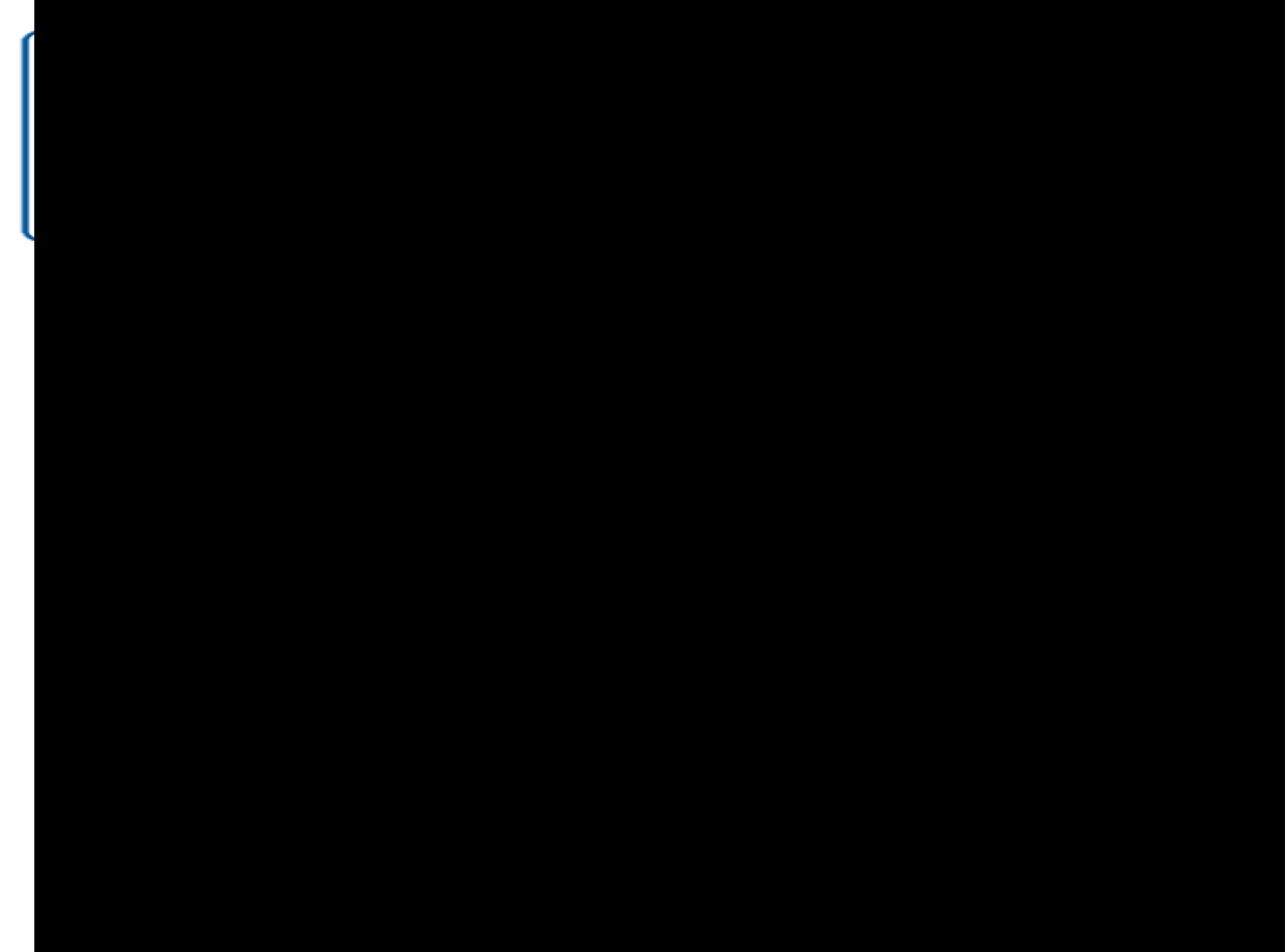
4-strand
wire fence

Hog rings
12-18" intervals
See Detail B

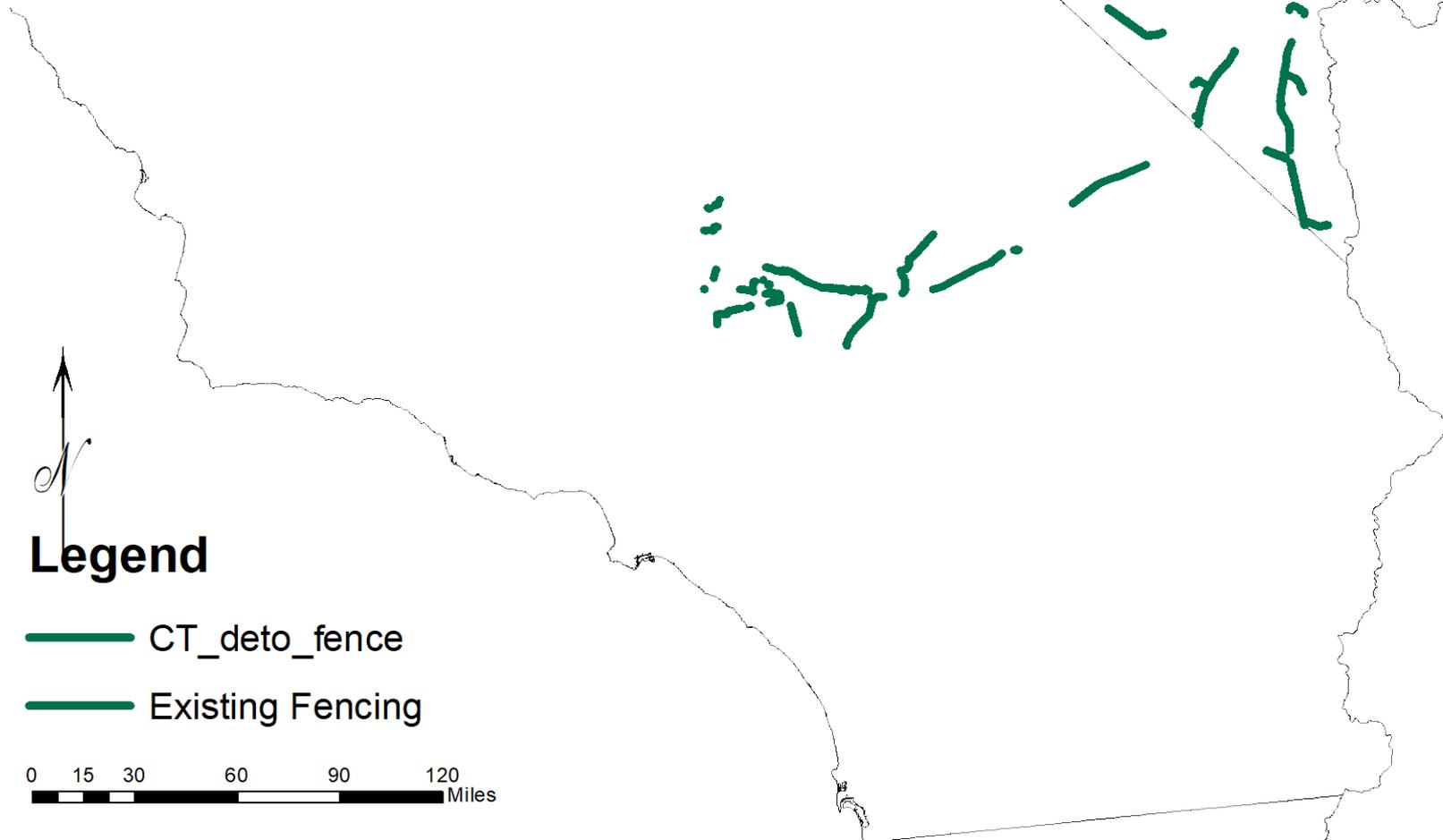
Galvanized fence
Material



SECTION A



Existing Exclusionary Fencing

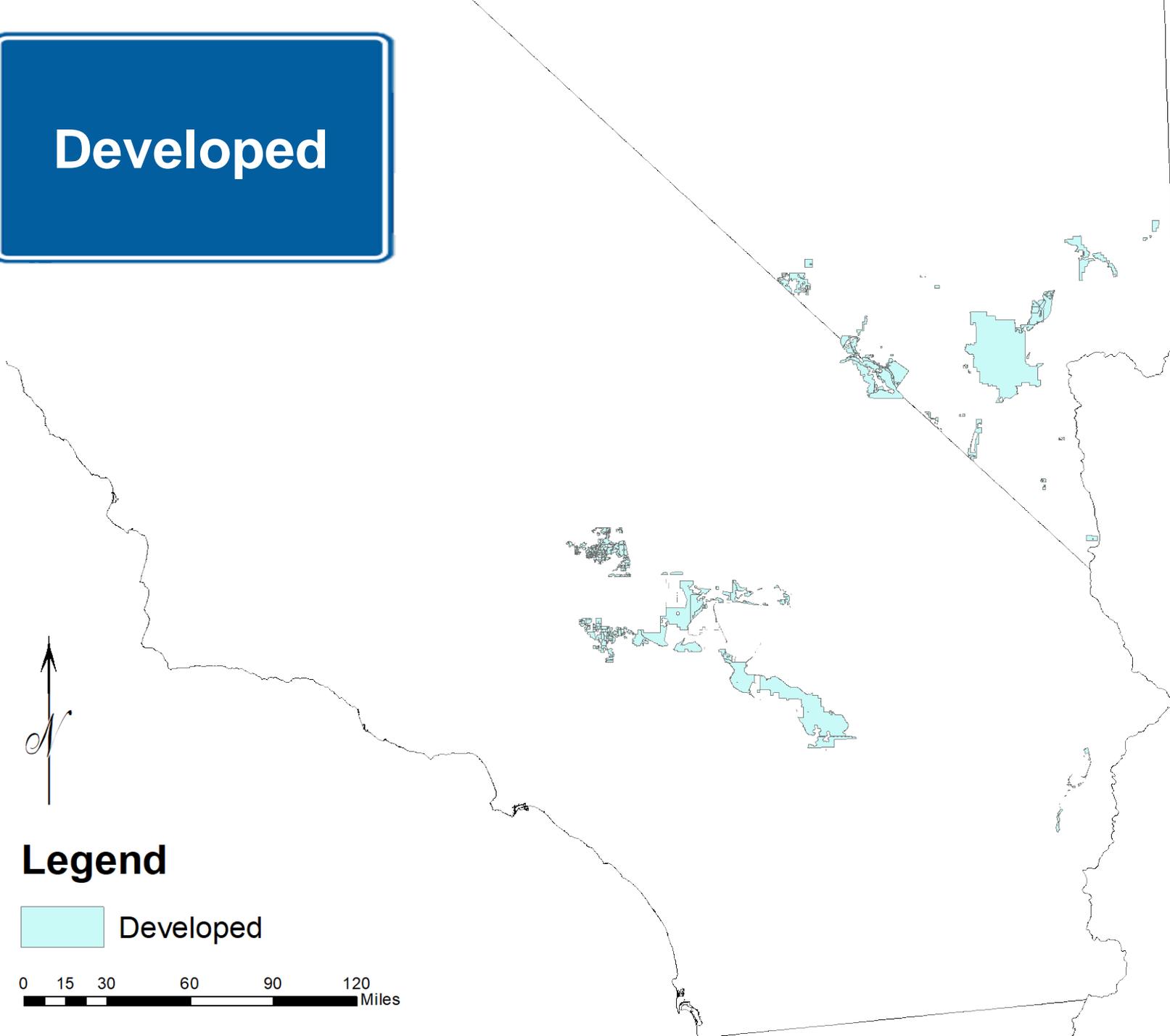


Legend

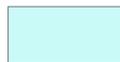
- CT_deto_fence
- Existing Fencing

0 15 30 60 90 120 Miles

Developed



Legend

 Developed

0 15 30 60 90 120 Miles

Recovery Importance Index (RII)



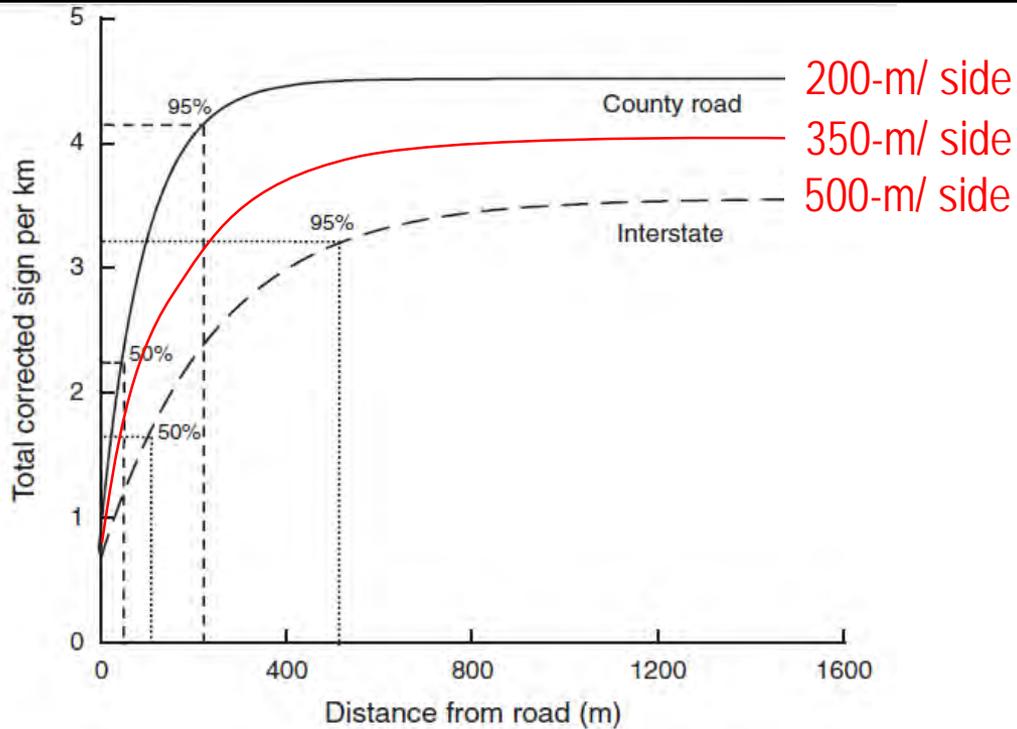
The Recovery Importance Index (RII or “r”) seeks to synthesize the following input data to predict where fencing would optimally effect Mojave desert tortoise recovery:

- “h”, Estimate of road-effect zone hectares (Peaden et al. 2015, Nafus et al. 2013, Boarman and Sazaki 2006) as a function of Caltrans draft Functional Classification (Caltrans Data)
- “p”, Average desert tortoise Habitat Potential (Nussear et al. 2009)
- “o”, percentile of 2001 to 2017 Mojave desert tortoise range-wide monitoring observation from a transect buffered by a 3-km radius (USFWS Data, Berry 1986)

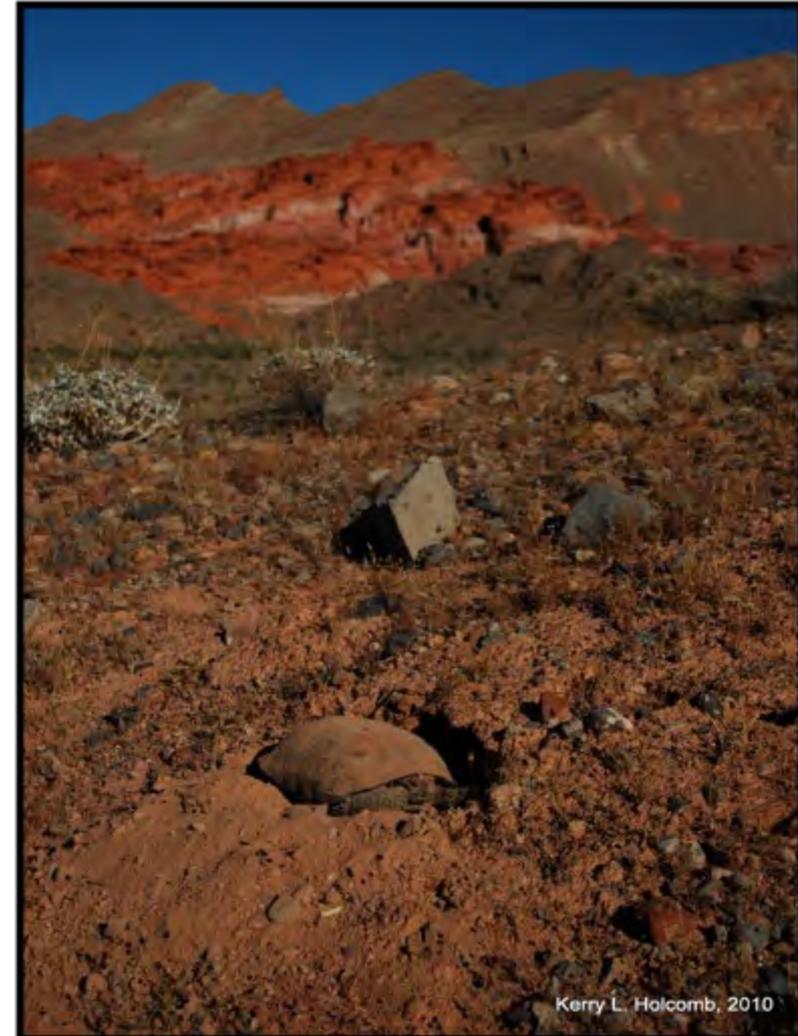
$$r = h * p$$
$$r = h * (p + o)$$

Where “r” attempts to index the relative conservation importance of 1 kilometer road segments

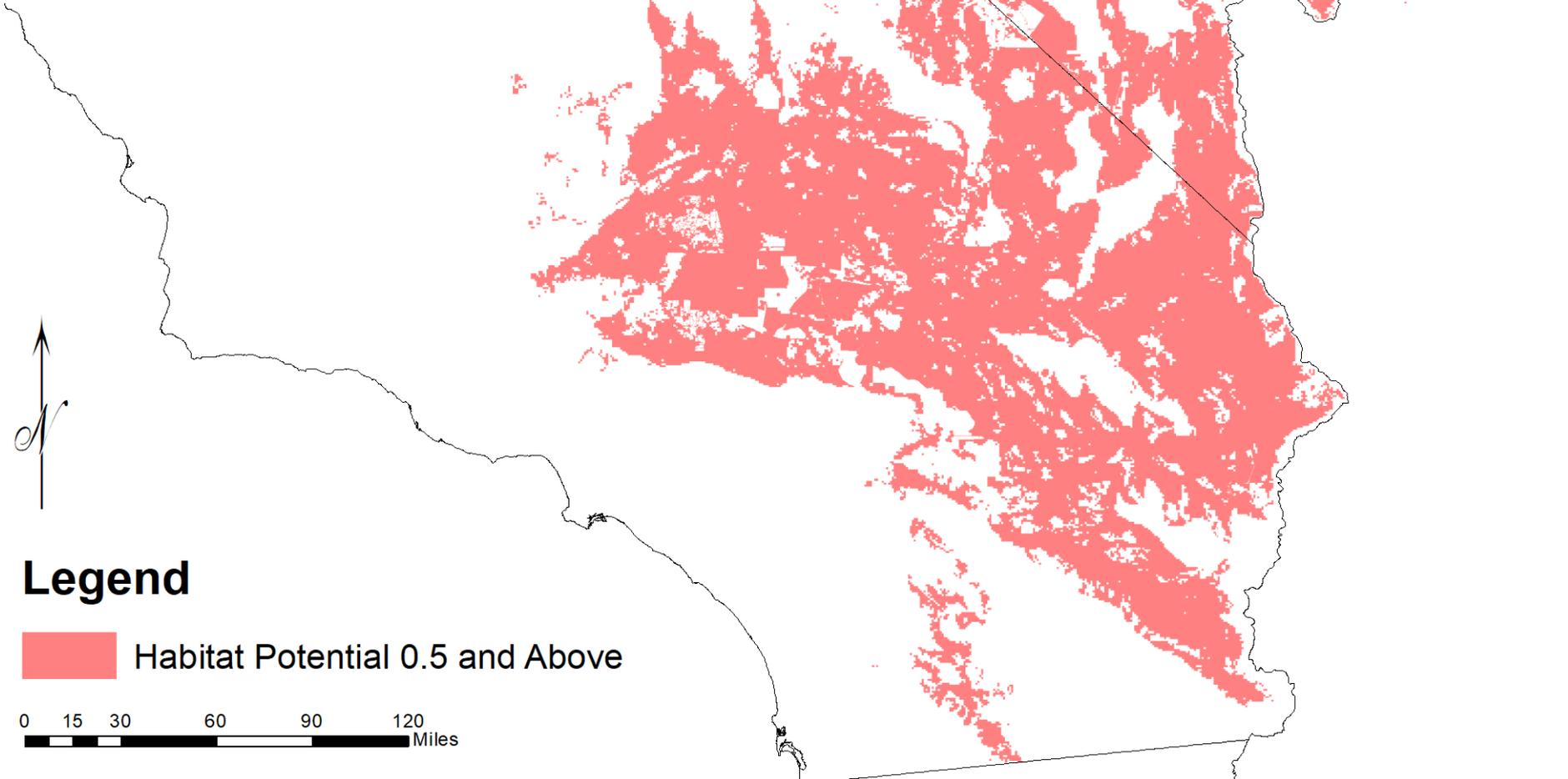
Input Data



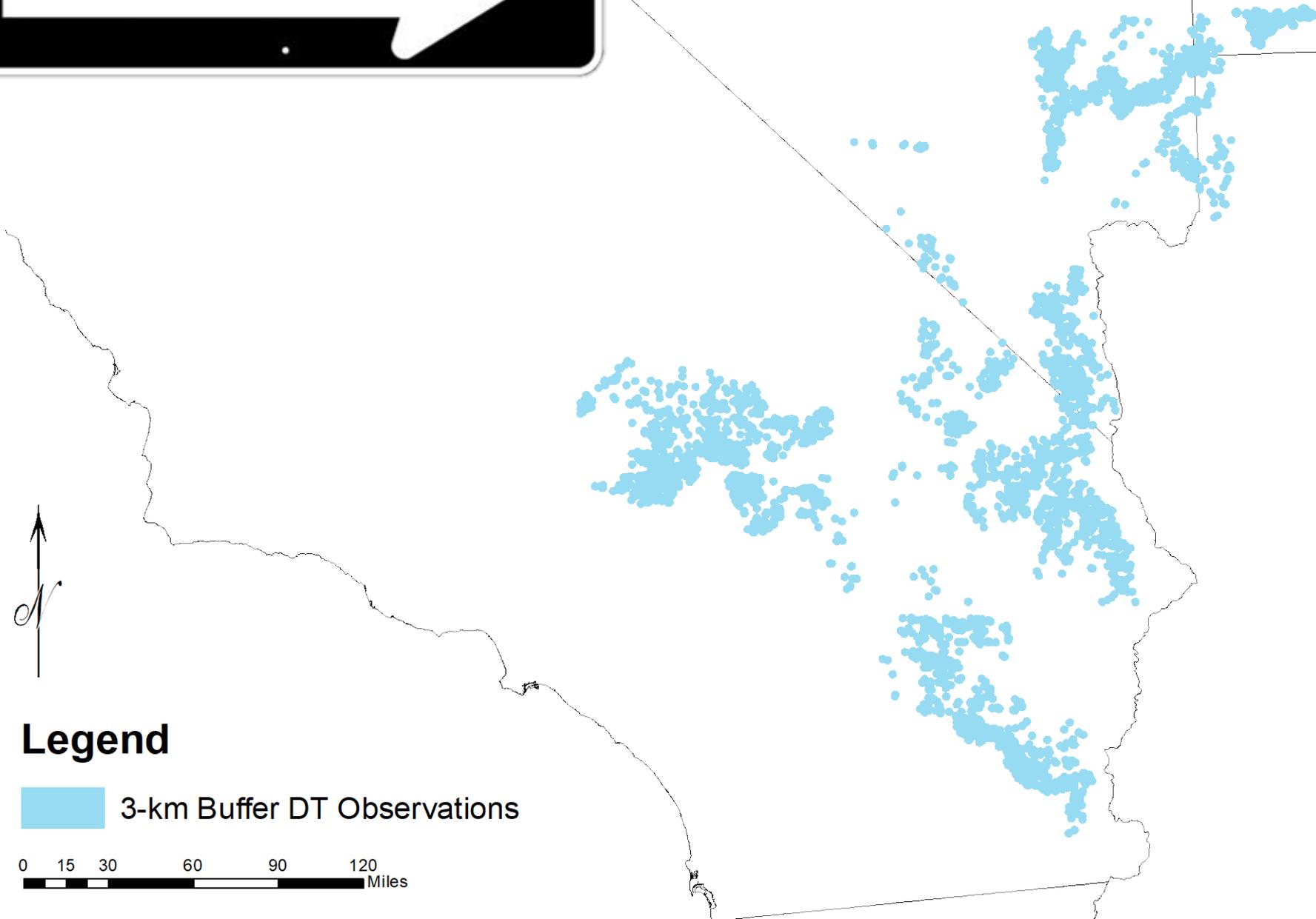
Road type	Estimated distance (m)			
	50%	75%	90%	95%
County road	46.0	112.6	200.7	267.4
Interstate	119.1	289.4	514.5	684.8



Input Data

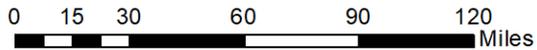


Input Data



Legend

 3-km Buffer DT Observations



Feasibility Index (RII)



The Feasibility Index (FI or “f”) seeks to categorize the technical and logistical difficulty of installing desert tortoise exclusionary fence:

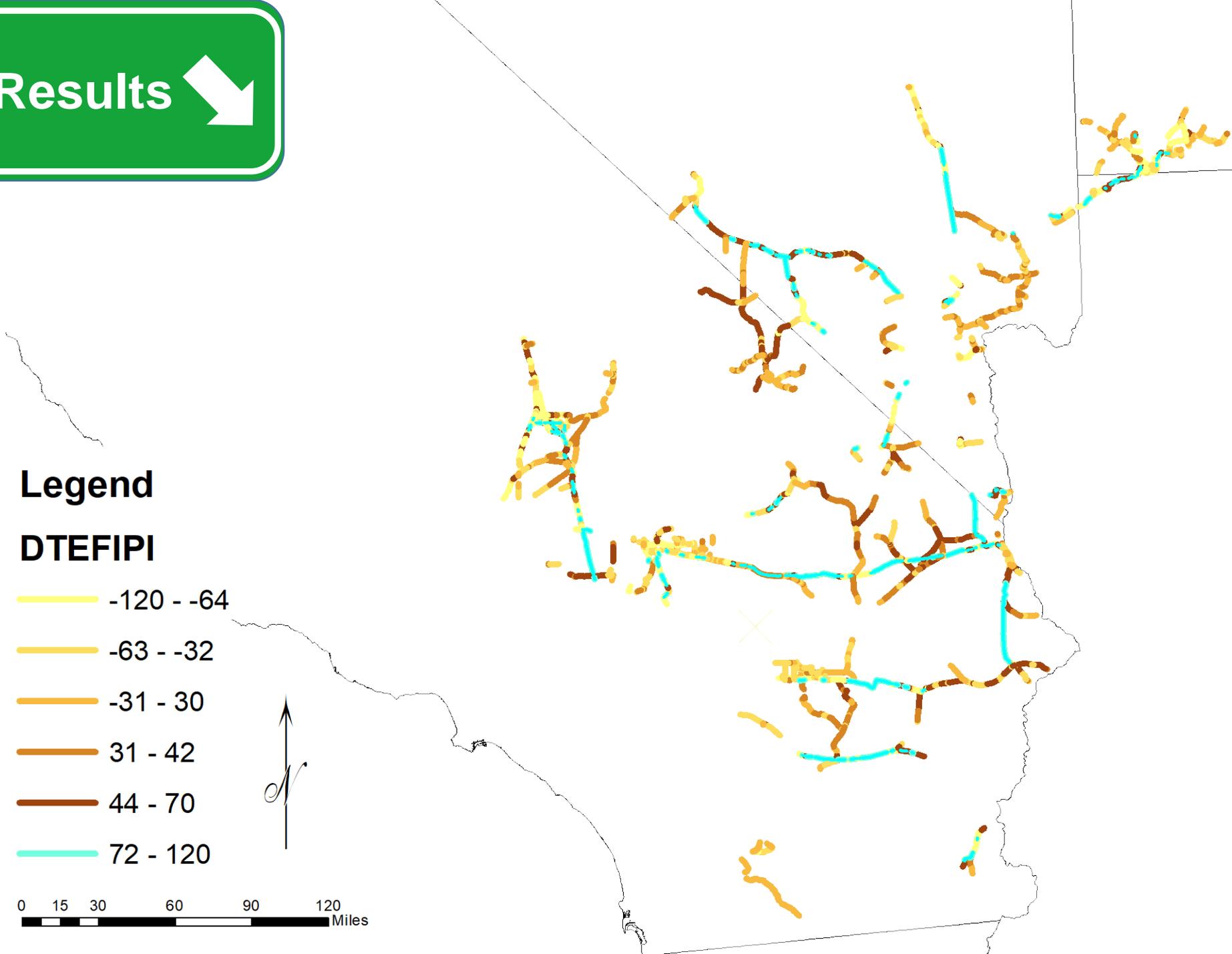
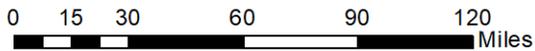
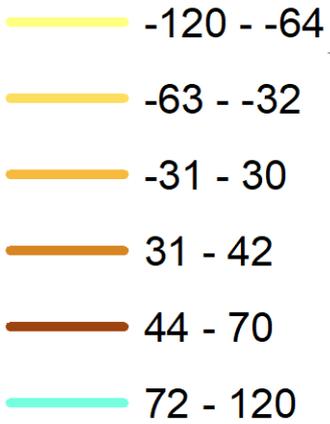
- An FI score of 1 is applied to all 1-km road segments that are not at grade and that are located on state or federally managed property.
- An FI score of -1 is applied to all 1-km road segments that are at grade and that are located on private property

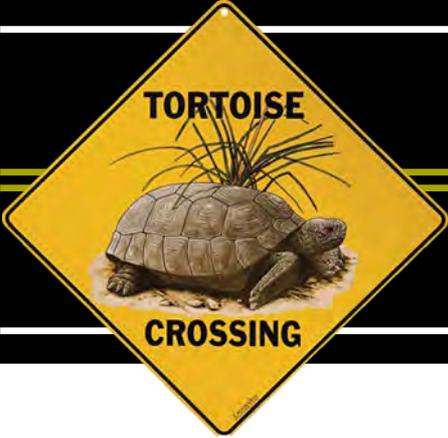
Results



Legend

DTEFIPI





- 6 in 10 individual adult tortoises that approached 24 to 36 inch corrugated metal culverts used these structures to cross the road





**Work
Ahead**



- Complete Mojave desert tortoise exclusionary fence census geodatabase – HELP PLEASE
- Further refine FI to include hydrology and local roads that would perforate the fence
- Gather input from experts on Recovery Implementation Teams
- Test DTEFIPI rankings
- Start implementation

Thanks



- **Cathy Wilson** (USFWS - SNFWO)
- **Flo Gardipee** (USFWS – DTRO)
- **Brian Croft** (USFWS – PSFWO)
- **Roy Averill-Murray** (USFWS – DTRO)
- **Ann McLuckie** (Utah Division of Wildlife Resources)



Questions

