

What Effect Does the Implementation of Roadside Barriers and Culverts Have on Gopher Tortoise Mortality Rates?

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Background/Motivation

- Gopher tortoises are considered a keystone species because many other species use their burrows (Catano & Stout, 2015; White & Tuberville, 2017).
- Gopher tortoises are threatened in Alabama, Mississippi, Louisiana, and Florida (Florida Fish and Wildlife Conservation Commission, n.d.).
- Roads and railroads are a significant source of mortality for gopher tortoises (Florida Fish and Wildlife Conservation Commission, n.d.; Rautsaw, Martin, Vincent, et al., 2018); however, grassy areas by roads are used as permanent habitat for gopher tortoises (Rautsaw, Martin, Lanctot, et al., 2018).



Figure 1. The gopher tortoise is an endangered keystone species in the southeastern U.S. Photo from Orlando Law Group.

Literature Cited: Catano, C. P., & Stout, I. J. (2015). Functional relationships reveal keystone effects of the gopher tortoise on vertebrate diversity on a longleaf pine savanna. *Biodiversity and Conservation*, 24(8), 1957-1974. <https://doi.org/10.1007/s10531-015-0920-x>; Dodd, C. K., Barichivich, W. J., Smith, L. L. (2004). Effectiveness of a barrier wall and culverts in reducing wildlife mortality on a heavily traveled highway in Florida. *Biological Conservation*, 118(5), 619-631. <https://doi.org/10.1016/j.biocon.2003.10.011>; Florida Fish and Wildlife Conservation Commission. (n.d.). *Gopher Tortoise Program*. <https://myfwc.com/wildlifehabitats/wildlife/gopher-tortoise/#:~:text=Gopher%20tortoises%20share%20their%20burrows,are%20protected%20under%20state%20law>; Pike, D. A., Dinsmore, A., Crabill, T., Smith, R. B., & Seigel, R. A. (2005). Short-term effects of handling and permanently marking gopher tortoises (*Gopherus polyphemus*) on recapture rates and behavior. *Applied Herpetology*, 2(2), 139-147.; Rautsaw, R. M., Martin, S. A., Lanctot, K., Vincent, B. A., Bolt, M. R., Seigel, R. A., & Parkinson, C. L. (2018). On the road again: Assessing the use of roadsides as wildlife corridors for gopher tortoises (*Gopherus polyphemus*). *Journal of Herpetology*, 52(2), 136-144. <https://doi.org/10.1670/17-013>; Rautsaw, R. M., Martin, S. A., Vincent, B. A., Lanctot, K., Bolt, M. R., Seigel, R. A., & Parkinson, C. L. (2018). Stopped dead in their tracks: The impact of railways on gopher tortoise (*Gopherus polyphemus*) movement and behavior. *COPEIA*, 106(1), 135-143. <https://doi.org/10.1643/CE-17-635>; White, K. N., & Tuberville, T. D. (2017). BIRDS AND BURROWS: AVIFAUNA USE AND VISITATION OF BURROWS OF GOPHER TORTOISES AT TWO MILITARY SITES IN THE FLORIDA PANHANDLE. *Wilson Journal of Ornithology*, 129(4), 792-803.

Hypothesis

We hypothesize that there is a relationship between the presence of roadway barriers and the mortality rate of Gopher Tortoises.

Predictions

We predict that gopher tortoise mortality rates, as measured by annual capture-mark-recapture estimates, will be lower in areas where barriers and culverts have been added to roads, and higher in areas without roadside barriers and culverts.

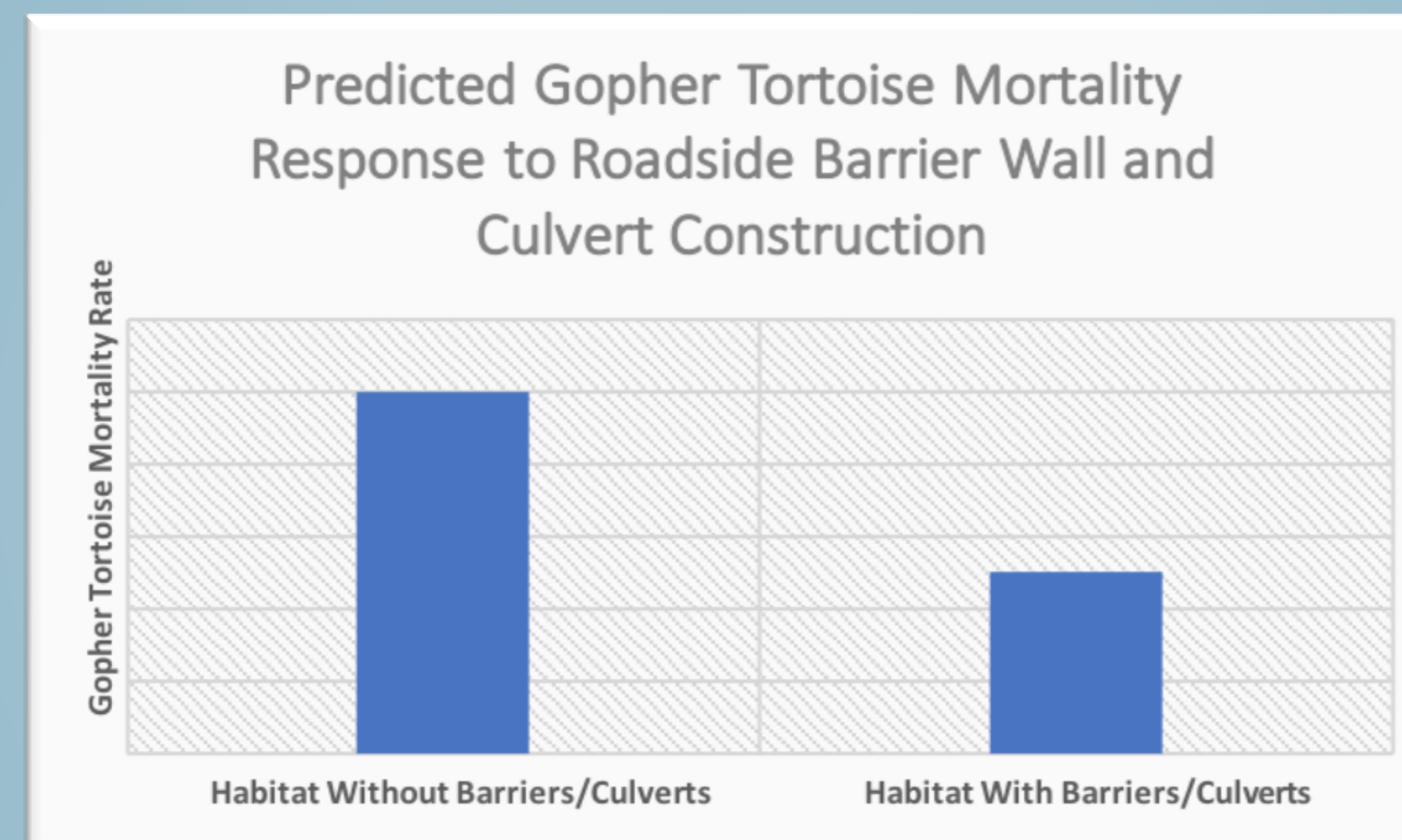


Figure 2. Our predictions about how the construction of roadside barriers and culverts will influence gopher tortoise mortality rates. Mortality rates will be measured using annual capture-mark-recapture estimates.

Intended Analysis

- Independent variable: Whether or not barrier walls and culverts are constructed next to each road (categorical)
- Dependent variable: Tortoise populations after barrier wall construction or lack of barrier wall construction (continuous)
- Significance of population changes will be determined using a T-test.
- Our inference is limited to tortoises that live directly next to roads, since those are the only tortoises we will be capturing.

Study Design

- We will use remote sensing and satellite data to randomly select ten roads in the Conecuh National Forest, Alabama
- Researchers will drive slowly down these roads marking all the gopher tortoises they see
- Tortoises will be marked with non-toxic paint on the shells using a paint-covered sponge (Pike et al, 2005). Tortoises will be recaptured after one month.
- Barrier walls and culverts will be constructed on five of the roads. Studies have shown that barrier walls and culverts decrease road mortality for numerous species (Dodd et al, 2004), but the impact of barrier walls and culverts on gopher tortoises is not clear.
- After barrier walls and culverts are constructed, tortoise populations will be re-measured at all ten locations once every year for five years.



Figure 3. A culvert constructed under a road with a minimal barrier wall. Barrier walls for this study would be taller and more solid. Photo from Roseke Engineering.

Expected Benefits

- If barrier walls and culverts reduce gopher tortoise mortality rates, constructing barrier walls and culverts will have a positive impact on gopher tortoise populations.
- Since gopher tortoises are a keystone species, decreased gopher tortoise mortality rates will increase survival of many other species.
- If barrier walls have no impact on gopher tortoise populations, resources can be allocated elsewhere.