Research Report

Texas A&M
Natural Resources Institute

Report 0-6972-1

Project 0-6972

Assessing Traffic Threats for Amphibian and Reptile Species of Greatest Conservation Need on Texas Roadways: Final Report

Research Report

D.K. Walkup, K.L. Skow, T.J. Hibbitts, W.A. Ryberg, and R.R. Lopez

May 31, 2019;
published October 2022

https://library.ctr.utexas.edu/hostedpdfs/tamu/0-6972-1.pdf

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA/TX-21/0-6972-1		

4. Title and Subtitle Assessing Traffic Threats for Amphibian and Reptile Species of Greatest Conservation Need on Texas Roadways: Final Report	**5. Report Date** Submitted: May 2019 Published: October 2022 **6. Performing Organization Code**
7. Author(s) Danielle K. Walkup, PhD. https://orcid.org/0000-0001-6836-4212; Kevin L. Skow; Toby J. Hibbitts, PhD. https://orcid.org/0000-0001-7126-6891; Wade A. Ryberg, PhD. https://orcid.org/0000-0003-2548-8113; Roel R. Lopez, PhD.	**8. Performing Organization Report No.** 0-6972-1
9. Performing Organization Name and Address Texas A&M University Natural Resources Institute 578 John Kimbrough Blvd. 2260 TAMU College Station, TX 77840-2260	**10. Work Unit No.** **11. Contract or Grant No.** 0-6972
12. Sponsoring Agency Name and Address Texas Department of Transportation Research and Technology Implementation Division 125 E. 11th Street Austin, TX 78701	**13. Type of Report and Period Covered** Technical Report May 2018–May 2019 **14. Sponsoring Agency Code**

15. Supplementary Notes

Project performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration.

16. Abstract

Many environmental impacts involve state and federally listed threatened and endangered (TE) species. Wildlife-vehicle collision (WVC) data can improve environmental impact assessments for TE species. Accurate WVC data has been collected for amphibian and reptile species on Texas roadways since 2012, in the form of observations in the "Herps of Texas" project on the citizen science platform iNaturalist. These data were used to create a database of species of greatest conservation need (SGCN) recorded and verified in the state that was joined with Texas road traffic data from the Texas Department of Transportation (TxDOT) and used to evaluate SGCN species presence and mortality on and near roads. As of 3 April 2018, there were 11,527 Research Grade quality records of 62 SGCN species downloaded from the iNaturalist "Herps of Texas" project. Maps distinguishing live and dead SGCN Reptiles and Amphibians observations >100 m away from and 100 m within either side of 2,333 control sections across Texas are found in Appendix A of this report. There were 1,474 records of 44 SGCN near control sections with associated traffic data. We found shorter distances to roads, higher traffic volumes, latitude and longitude were important predictors of mortality in all SGCN observations together. With respect to environmental impacts involving state and federally listed TE species, we found that some amphibian and reptile species groups were more likely to complicate transportation project planning than others and for different reasons.

17. Key Words	18. Distribution Statement
amphibian, reptile, species of greatest conservation need, threatened and endangered, traffic mortality, wildlife-vehicle collision, environmental impact	No restrictions. This document is available to the public through the National Technical Information Service, Alexandria, Virginia 22312, https://www.ntis.gov/.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	626	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

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Performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration

May 2019; Published October 2022

Disclaimer

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Acknowledgments

The authors would like to thank the individuals that were instrumental in the success of this project. Thanks to Texas Department of Transportation employees John Moravec, John Young Jr, Mark Fisher, and Chris Glancy for their generous advice and support throughout this project. Additionally, collaborations among many administrators, researchers, students, and staff at the Texas A&M Natural Resources Institute helped make this project a success. Finally, thanks to the volunteers of the iNaturalist community for their contributions to biodiversity research through citizen science.

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Project Summary

Transportation planning is complicated by natural resource and environmental issues. Project planning and delivery are more efficient when environmental impacts are known early. Many environmental impacts involve state and federally listed threatened and endangered (TE) species. GIS-based habitat models can overestimate TE species' occurrence in environmental impact assessments. Overestimated TE species' occurrence can lead to ineffective prioritization and allocation of resources. Wildlife-vehicle collision (WVC) data can improve environmental impact assessments for TE species. Accurate WVC data has been collected for amphibian and reptile species on Texas roadways since 2012, in the form of observations in the "Herps of Texas" project on the citizen science platform iNaturalist. These data were used to create a database of species of greatest conservation need (SGCN) recorded and verified in the state that was joined with Texas road traffic data from the Texas Department of Transportation (TxDOT) and used to evaluate SGCN species presence and mortality on and near roads.

As of 3 April 2018, there were 11,527 Research Grade quality records of 62 SGCN species downloaded from the iNaturalist "Herps of Texas" project. Of those records, 7,178 observations of 59 SGCN species were located within the 200 m buffer of Texas road control sections (1,737 dead, 5,392 alive, and 49 unknown). Maps distinguishing live and dead SGCN Reptiles and Amphibians observations >100 m away from and 100 m within either side of 2,333 control sections across Texas are found in Appendix A of this report. The majority of these control sections (2,244) had 10 or fewer observations of SGCN species. There were 1,474 records of 44 SGCN near control sections with associated traffic data. Of those records, 976 observations of 36 SGCN were located within the 200 m buffer of Texas road control sections. These records were used to characterize the importance of traffic volume in predicting mortality of all SGCN on or near roads, and also the mortality of western diamondback rattlesnakes (*Crotalus atrox*), red-eared sliders (*Trachemys scripta*), and Texas horned lizards (*Phrynosoma cornutum*).

We found shorter distances to roads, higher traffic volumes, latitude and longitude were important predictors of mortality in all SGCN observations together, and in observations of western diamondback rattlesnakes and Texas horned lizards. Traffic volume was a less important predictor of mortality for red-eared sliders. South and west Texas appeared to be hotspots of mortality for SGCN overall and for western diamondback rattlesnakes and Texas horned lizards, while south and east Texas were hotspots for red-eared sliders.

With respect to environmental impacts involving state and federally listed threatened and endangered (TE) species, we found that some amphibian and reptile species groups were more likely to complicate transportation project planning than others and for different reasons. Below we summarize a "watch-list" for each of these species groups.

Salamander occurrences were lower than any other species group in our database. Additionally, the fact that most Texas salamanders are aquatic makes road mortalities in this group rare. However, almost all of the central Texas spring and aquifer salamanders are SGCN species and many of these are federally endangered. While threats from vehicular collisions are not a worry, these species can occur in creeks and springs that are in road right-of-ways and should be protected from disturbances and pollutants.

Frog and toad occurrences were greater than salamanders in our database, but still far lower than the reptile species groups. Most frog and toad species cross roads near wetlands in which they breed, which occurs seasonally during narrow windows of optimal weather conditions. Road mortality events in this group can have large population consequences, because most individuals on roads during these conditions are breeding adults. Two species to watch in this group are the federally endangered Houston Toad (*Anaxyrus houstonensis*) and the Crawfish Frog (*Lithobates areolatus*), which has been shown to be declining rapidly throughout its range.

Lizard occurrences were lower than any other reptile group in our database. Many species of lizards prefer open habitats and are commonly seen on roads. This is especially true for the state threatened Texas Horned Lizard (*Phrynosoma cornutum*), which regularly basks and forages on roads. Their use of crypsis as a defense and their slow running speed make them susceptible to road mortality. Another lizard species susceptible to road mortality is the Spot-tailed Earless Lizard (*Holbrookia lacerata*), which is currently awaiting a federal listing determination in 2020.

Snake occurrences were almost as high as turtles in our database. Like lizards, nearly all species of snakes are susceptible to road mortality, because they regularly bask on roads. Unlike lizards, however, a snake's long body and sometimes slow crawling speed make them even more susceptible to road mortality. The federally threatened Louisiana Pinesnake (*Pituophis ruthveni*) has been seen less than 10 times in East Texas in the last 20 years. Unfortunately one of those sightings was a road mortality. Another snake species susceptible to road mortality, especially in north central Texas prairies, is the Western Massasauga (*Sistrurus tergeminus*), which is also currently awaiting a federal listing determination in 2020.

Turtle occurrences in our database were greater than any other species group. Many of those occurrences were from aquatic turtle species, which is counterintuitive because most of those species rarely leave their aquatic habitat. Unfortunately, those turtle species are most often encountered out of water when females are searching for nesting sites. When those nesting sites are selected near roads, then those turtles are more susceptible to road mortality. Three turtle species to watch are the Rio Grande Cooter (*Pseudemys gorzugi*), Western Chicken Turtle (*Deirochelys reticularia miaria*), and Alligator Snapping Turtle (*Macrochelys temminckii*), which are each awaiting a federal listing determination in 2023, 2022, and 2020, respectively. The state threatened Texas Tortoise (*Gopherus berlandieri*) is also susceptible to road mortality in South Texas. This endemic terrestrial species ranges over a wide area with most individuals encountering several roads in their lifetime.

1 Introduction

1.1 Purpose and Need

Developing transportation infrastructure is a long process involving planning, funding, and implementation cycles that can take more than a decade for certain projects (Lederman and Wachs 2014). Environmental studies and mitigation are frequently planned and implemented near the end of this process and on a project-by-project basis. Each project may require a different environmental focus, as each state's resource agencies and Department of Transportation (DOT) may emphasize different natural resource issues. For very large states like Texas with extremely different natural ecosystems, the environmental focus or natural resource issue for projects may vary within and among different regions and districts further complicating planning efforts.

In an attempt to simplify planning, recent federal legislation, rules, and initiatives (e.g., Eco-Logical, Green Infrastructure) encourage and sometimes require state DOTs to increase levels of coordination with local, state, and federal agencies in linking natural resource issues with transportation planning (Lederman and Wachs 2014). At the same time, DOTs face increasing demands for time and cost-reductions associated with project environmental reviews and permitting. Difficulties achieving greater environmental planning efficiency have been linked to: 1) duplicated efforts gathering and accessing environmental data by DOT, local planning agencies, and environmental resource agencies, 2) environmental impact considerations arising late in project planning or delivery leading to unexpected costs and schedule delays, 3) selection of project alternatives that require costly and time consuming environmental studies and mitigation efforts to correct for negative impacts on wildlife and ecosystems that could have been avoided if considered earlier in the planning process, and 4) frequent revisions of environmental documents and delays in study and permit approvals (Lederman and Wachs 2014).

As part of the National Environmental Policy Act (NEPA) process, transportation planners must be responsive to both state and federal Departments of Fish and Wildlife when making determinations about potential impacts on threatened and endangered species. Since much of this determination hinges on habitat impacts associated with particular species, a better understanding of TE species' habitat requirements and distribution should assist transportation planners in avoiding obvious environmental impacts early in the planning process (Blandford et al. 2013). A common approach used to characterize TE species' habitat requirements and distribution involves species distribution modeling with GIS data. These models have been used to identify potential "hotspots" of transportation, mainly road, impacts on TE species and their habitats (Patrick et al. 2009).

As with all models, reliability of output depends on quality and accuracy of data used in development (Blandford et al. 2013). Sources of error in model development can be traced to: 1) gaps in understanding of ecology of rare TE species, 2) lack of data on TE species within range of transportation project, 3) resolution of available remote sensing data (or other GIS data) is too coarse to reflect habitat variables being selected by TE species (or data not available), and 4) dynamic habitat requirements of TE species (e.g., ephemeral wetlands) may not be captured in model if remote sensing data (or other GIS data) are collected at the wrong times. These represent just a few of the more common sources of error. Importantly, many models suffer from more than one of these sources of error, and just one source of error can lead to situations where predicted occurrence is actually non-occurrence (Patrick et al. 2009). Finally, even near-perfect models suffer from the implicit assumption that TE species' populations would be located wherever modeled suitable habitat is predicted to occur. This assumption has led to an overestimation of TE species' occurrence in many regions (Patrick et al. 2009).

Potential overestimation of TE species' occurrence misinforms transportation planners and generates opportunity costs for DOTs, because limited financial resources and overburdened personnel are prioritized and deployed ineffectively. This problem can be exacerbated in multi- jurisdictional projects where a number of different agencies, each with different capacities for deploying mitigation and other mandates given to them, are responsible for managing roads (Patrick et al. 2009). In addition, overestimation of TE species' occurrence can create situations where mitigation may never produce a viable population, because the starting point of no roads may have already been a nonviable population (Roedenbeck et al. 2007). In such cases, transportation and related agencies can be mistakenly blamed for ineffective mitigation. Too frequently, too little research has been done to differentiate between potential transportation impacts and other factors determining occurrence and persistence of TE species. Ultimately, if transportation impacts are not the limiting factor, or even a major contributor, to TE species imperilment, then mitigation of such impacts is wasteful and ineffective. Overestimation of TE species' occurrence can contribute to this waste and ineffectiveness.

For obvious safety reasons, WVCs are a growing concern among DOTs and the driving public (Bissonnette et al. 2008). In addition, conservation organizations and agencies are concerned about TE species' mortality (Fahrig and Rytwinski 2009). As such, predicting and prioritizing places for mitigation of impacts to wildlife and drivers is an important step in reducing WVCs regardless of target species. One approach is to use previous collisions to find “hotspots” or seasonal collisions to find “hot moments” of conflict. These predictions can improve accuracy and effectiveness of transportation environmental impact assessments and mitigation for TE species over species distribution modeling approaches, because they are based on evidence that the species was actually present and struck (i.e., imperiled) by a vehicle. To inform these types of predictions and corresponding mitigation at large scales, it becomes necessary to collect accurate WVC data (Shilling et al. 2013).

1.2 Objectives

In Texas, citizen scientists participating in the “Herps of Texas” project on iNaturalist have voluntarily posted observations of amphibians and reptiles, or herpetofauna, since 2012. Currently over 60,000 observations have been recorded state-wide, including TE species (e.g., species of greatest conservation need, SGCN). Most of these observations occur on Texas roadways, which potentially makes them an important source of WVC information. All research grade observations include a photo of the animal to confirm species identification, and this photo can also be used to determine mortality of the individual.

These data can be used to identify which species, where species, and when species are found on roads (e.g., “hot species”, “hotspots”, “hot moments”), and also whether they survived the road encounter. Such information can be used to better understand the causes of WVCs and therefore create more accurate and effective environmental impact assessments and mitigation strategies for TE amphibians and reptiles in Texas at relevant spatial scales (e.g., project area, district-level, regional-scale, state-wide).

Our goal was to provide TxDOT with these data and information by accomplishing the following objectives:

1) Use 60,000 observation dataset to create a road crossing database for all SGCN, which can produce "heat" maps pinpointing TxDOT control sections (i.e., road segments) where the greatest frequency of crossings occur for all SGCN and by species throughout Texas.

2) Use the same dataset to produce "heat" maps pinpointing TxDOT control sections where the greatest frequency of dead-on-road (DOR) SGCN observations occur.

3) Test whether traffic volume, based on Annual Average Daily Traffic (AADT) data, in areas with frequent road crossings can explain the frequency of DOR observations of SGCN in the database.

2 Methods

2.1 Database

iNaturalist is an application, online community, and database that stores and preserves records of observations of species contributed by scientists and citizen scientists. Participants in iNaturalist upload photographs of specimens along with their geographic coordinates and proposed species' identification. iNaturalist species' identifications must be confirmed by at least one other member of the online community to be catalogued as research grade. Research grade data can be downloaded for free at the iNaturalist website; however, many of the localities are obscured from the public. Taxonomic curators have permission to view and use these obscured records, and one of our principal investigators, Dr. Toby J. Hibbitts, is a taxonomic curator of amphibians and reptiles of Texas for iNaturalist. With this permission, we downloaded the research grade dataset from iNaturalist, which included the complete records of all amphibians and reptiles that were observed in Texas and uploaded to the project called "Herps of Texas". This project is continually growing and included 60,000+ observations on 31 January 2018. All of these observations were included in our primary database. From the iNaturalist "Herps of Texas" project, we downloaded records that had photographs or calls, contained no captive individuals, and were of research grade (indicating that the original identification was verified by at least one other person and in most cases a taxonomic curator).

With the downloaded database, we then went through and removed all observations where the location accuracy was greater than 1 km, leaving us with a database of 53,601 observations of all herpetofauna. The pictures associated with each observation were evaluated to determine if the animal was dead or alive, and the background of the observation was classified as natural, paved road, unpaved road, anthropogenic (e.g. fences), or other (e.g. in hand, in vehicle). Any research grade observations that included a call instead of a picture were included and assumed to be alive at the time of the observation, and the background classified as N/A.

In order to create the herpetofauna road crossing database, we used ArcGIS to combine TxDOT road data with the "Herps of Texas" project data from iNaturalist. First, we identified and labeled those species classified as SGCN by TPWD and also those currently under review for federal listing in this new herpetofauna road crossing database. Then we used a near analysis in ArcGIS to link the localities of all amphibian and reptiles

SGCN observations to the nearest control section from the TxDOT database (accessed 20 December 2018). The near analysis also allowed us to search and recall observations from the road crossing database that were at different distances from control sections.

We also created a herpetofauna traffic database, by using ArcGIS to combine the TxDOT Average Annual Daily Traffic (AADT) with the control section database. There was no unique identifier for the roads to associate them with the AADT data in the publicly available database, thus we used a near analysis to link the AADT data with the nearest control section. We populated our traffic database with the most recent traffic volume information available (i.e., F2016 traffic column; accessed January 2019 at https://gis-txdot.opendata.arcgis.com/datasets/4480ddc1608a4ca1a6ca4da25f9fbf1b_0). We averaged the traffic estimates for any control section with more than 1 traffic count. We then merged the AADT data with the herpetofauna database using the control sections as the unique identifier and kept only observations near control sections that had associated AADT data. The final herpetofauna traffic database had 6,699 observations of all herpetofauna.

2.2 Mapping

Once the initial herpetofauna road crossing database was created, we were able to map the frequency of all amphibian and reptile observations near the TxDOT control sections. We selected observations located within 200 m of a control section (i.e. 100 m on either side of the road). Because roads are georeferenced by midline in this database, we selected a large buffer size to ensure that species' observations from the largest roads and right of ways were included in subsequent analyses. We conducted a frequency analysis in ArcGIS to determine the frequency of amphibian and reptile SGCN observations at each control section. This frequency analysis was conducted for all amphibian and reptile SGCN observations combined and then for each SGCN species individually. Finally, we joined the frequencies of observations back to the appropriate control sections and projected the values as heat maps throughout Texas. To generate heat maps of DOR SGCN observations, we repeated this process for all observations of dead SGCN throughout Texas.

For each SGCN species, we created between two and 18 maps: one Texas-wide point map that includes all records of the species near and off roads; one Texas-wide point map that includes all records of dead and alive observations of the species within the 200 m road buffer; one to four point maps that include all records of the species near and off roads in each of the four TxDOT geographic regions (i.e. North, South, East, and West) the species was found in; one to four point maps that include dead and alive observations of the species within the 200 m road buffer in each of the four TxDOT geographic regions the species was found in; zero to four heat maps that include the observations per control section (for observations within the 200 m road buffer) for each of the four TxDOT geographic regions in which the species was found; and zero to four heat maps that include the dead observations per control section (within the 200 m road buffer) for each of the four TxDOT geographic regions in which the species was found (Appendix A).

2.3 Traffic Analyses

To test whether traffic volume, based on AADT data, could help explain the frequency of DOR observations of SGCN in the database, we performed binomial logistic regressions in R v 3.5.2 (R Core Team, 2018). For the analyses, the dependent variable was the binomial Dead or Alive, determined from the research grade SGCN observations. Predictor variables included latitude, longitude, month, route type (e.g. county road, state highway), taxonomic group (i.e. anuran, lizard, salamander, snake, and turtle), distance to road (m), and AADT data described above. In general, the pseudo-R^2 value for each analysis was low (< 20%) indicating that the predictor variables were unable to explain much of the variation in the dependent variable when constrained by the linear relationships imposed by the logistic regressions. For this reason, we sought analytical approaches with fewer statistical assumptions, namely classification tree analyses.

We performed recursive partitioning analyses with classification trees using package rpart (Therneau and Atkinson, 2018) and random forest classification, which combines many classification trees for more accurate classifications, using package randomForest (Liaw and Atkinson, 2002). Classification trees use recursive partitioning to predict what outcome (e.g. dead/alive) an observation will have based on the associated predictor variable. Ideally, classification trees end in homogenous (i.e. all dead or all alive) terminal nodes. Classification trees presented below were pruned using a complexity parameter and the terminal nodes were limited to include 5% or more observations to minimize overfitting. However, because classification trees can be dependent on the observations included in the data set, we also used random forest analyses, where hundreds of trees are combined to create the classification. We used the same dependent and predictor variables for the classification trees and the random forests as for the binomial logistic regressions above. We also repeated the analyses for those individual SGCN with enough data (> 100 observations; Table 1): western diamondback rattlesnakes (*Crotalus atrox*), red-eared sliders (*Trachemys scripta*), and Texas horned lizards (*Phrynosoma cornutum*). For the random forest analyses, we divided each data set into an 80% training and 20% testing set by randomly assigning each observation to one or the other set. Out of bag errors for the training and testing sets are reported below.

3 Results and Conclusions

3.1 Database

As of 3 April 2018, there were 11,527 Research Grade quality records of 62 SGCN species downloaded from the iNaturalist “Herps of Texas” project (Fig. 1; Table 1). Of those records, 7,178 observations of 59 SGCN species were located within the 200 m buffer of Texas road control sections (Fig. 1; Fig. 3; Table 1). There were 1,474 records of 44 SGCN near control sections with associated traffic data. Of those records, 976 observations of 36 SGCN were located within the 200 m buffer of Texas road control sections.

Of the 7,178 SGCN observations in the 200 m road buffer, 1,737 were dead and 5,392 were alive, and 49 were unknown (e.g., the pictures were removed from iNaturalist) (Fig. 2; Fig. 4).

Maps for each species are provided in Appendix A. Notable information for the major taxonomic groups is provided below.

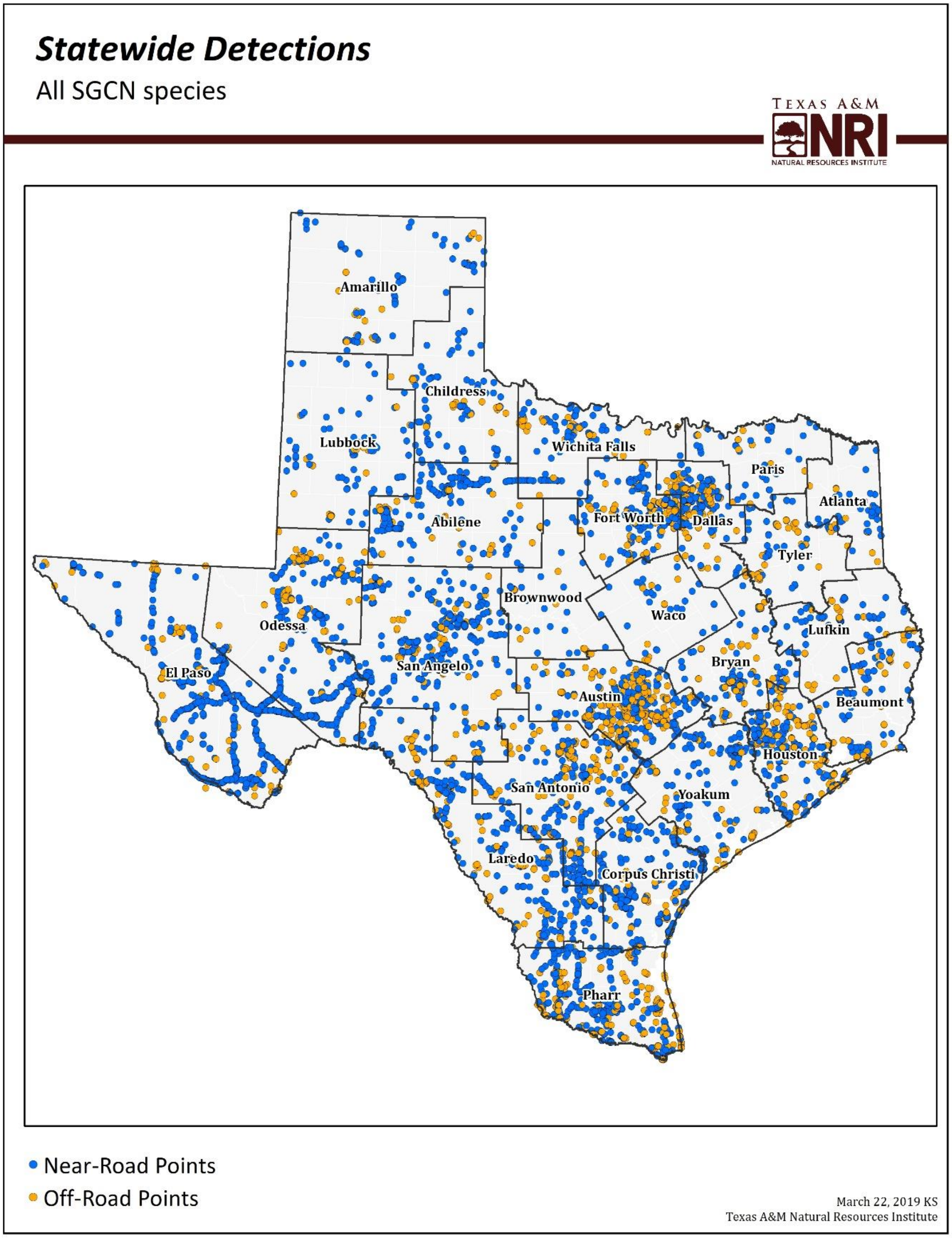

Fig. 1. All statewide observations of Amphibian and Reptile Species of Greatest Conservation Need in the "Herps of Texas" project on iNaturalist. Near-road points are points <100 m from the road midline.

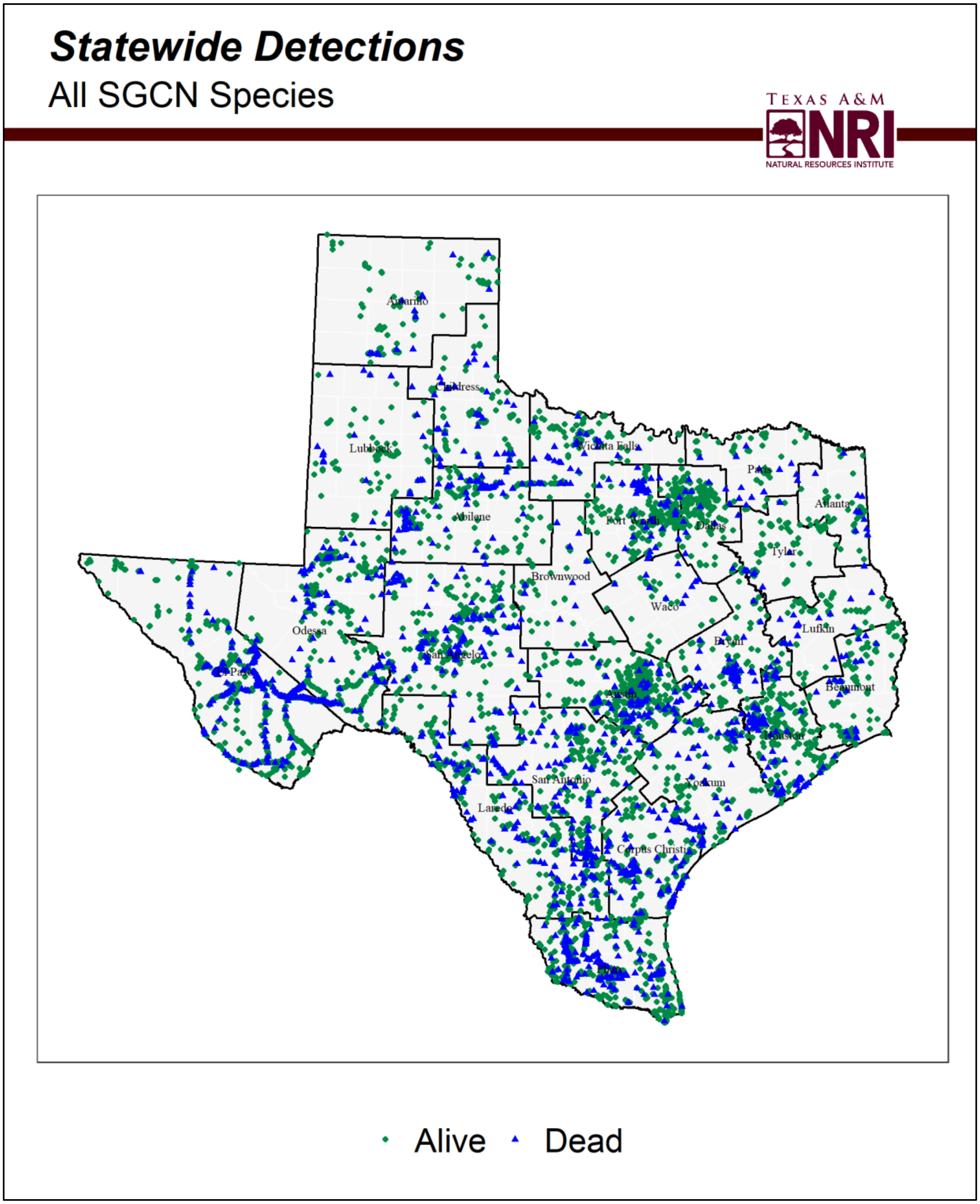

Fig. 2. All statewide observations of dead and alive Amphibian and Reptile Species of Greatest Conservation Need in the "Herps of Texas" project on iNaturalist.

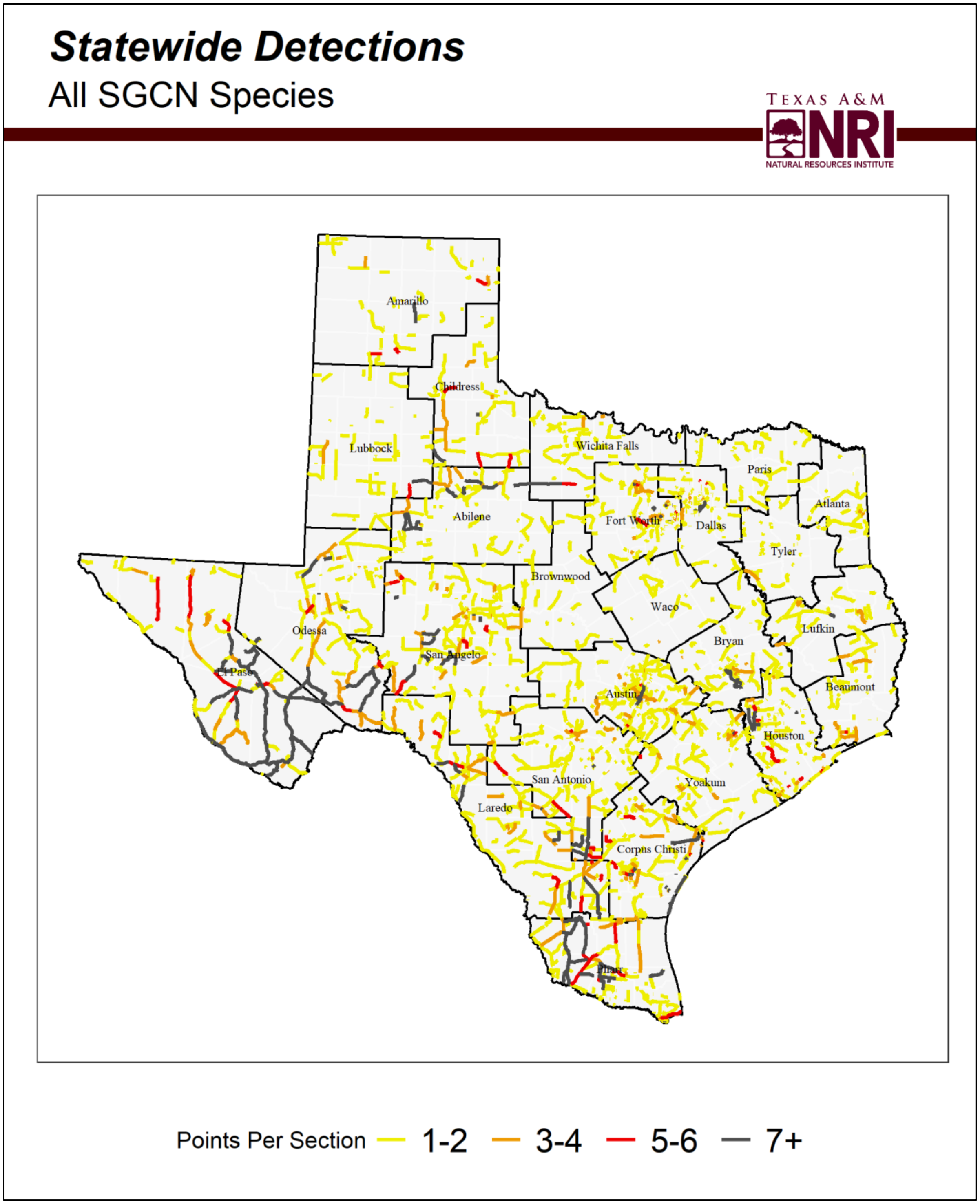

Fig. 3. Statewide observations of all Amphibian and Reptile Species of Greatest Conservation need in the "Herps of Texas" project on iNaturalist per control section.

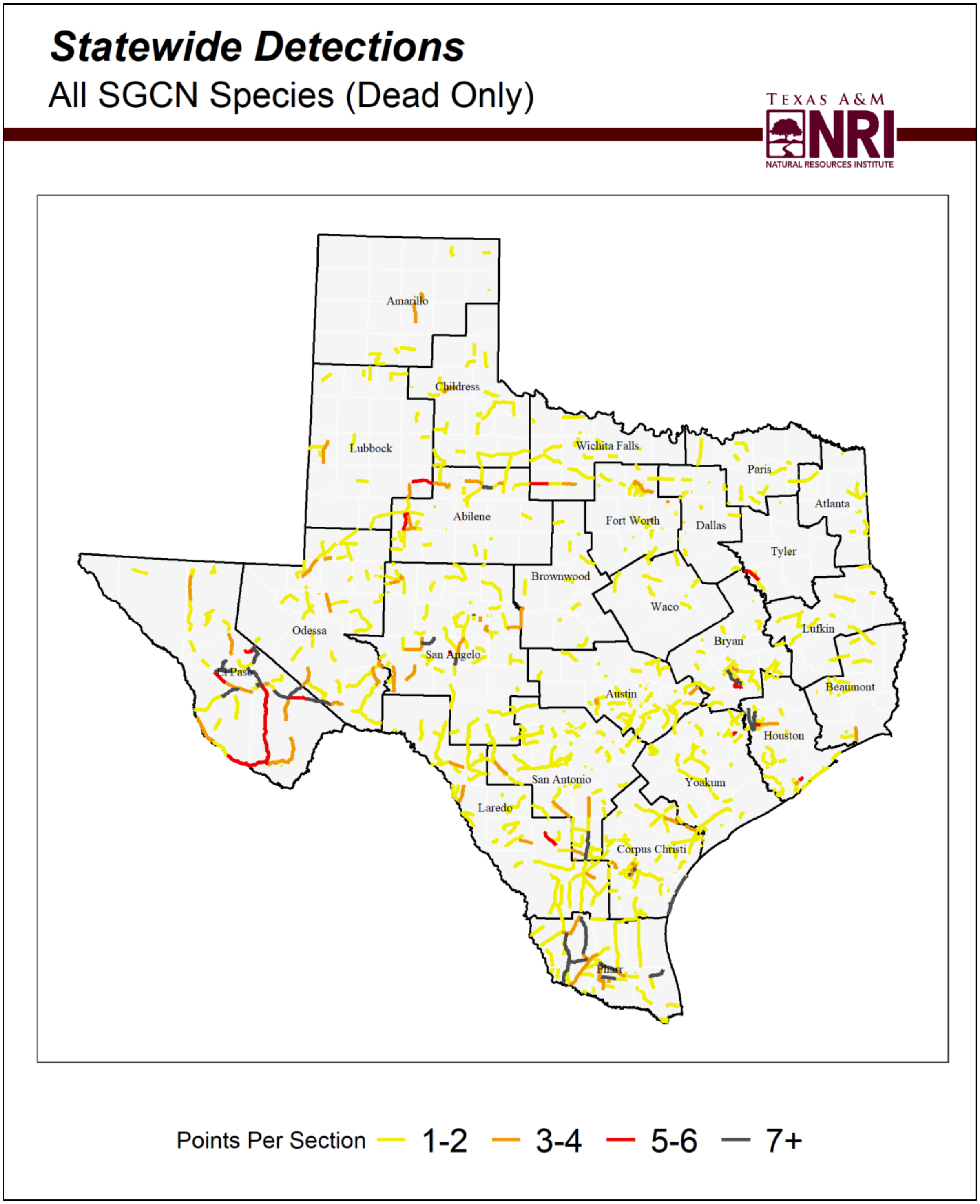

Fig. 4. Statewide observations of all dead Amphibian and Reptile Species of Greatest Conservation need in the "Herps of Texas" project on iNaturalist per control section.

Table 1. Summary of observations of Amphibian and Reptiles Species of Greatest Conservation Need included in the “Herps of Texas” project on iNaturalist. “All” includes all observations of each species, both on and off roads. “Road” includes all the observations found within 100 m of a control section. “Traffic” includes all the SGCN observations with associated traffic data. “Maps” lists the pages in the appendix with the maps for the corresponding species.

CLASS	GROUP	COMMON NAME	SCIENTIFIC NAME	ALL	ROAD	TRAFFIC	MAPS
Amphibians	Frogs/Toads	Houston Toad	*Anaxyrus* (*Bufo*) *houstonensis*	7	5	-	A2 – A7
Amphibians	Frogs/Toads	Woodhouse’s Toad	*Anaxyrus* (*Bufo*) *woodhousii*	144	97	23	A8 – A25
Amphibians	Frogs/Toads	Sheep Frog	*Hypopachus variolosus*	73	61	21	A26 – A31
Amphibians	Frogs/Toads	White-lipped Frog	*Leptodactylus fragilis*	11	9	10	A32 – A36
Amphibians	Frogs/Toads	Crawfish Frog	*Lithobates* (*Rana*) *areolatus*	94	84	18	A37 – A50
Amphibians	Frogs/Toads	Cajun Chorus Frog	*Pseudacris fouquettei*	95	68	20	A51 – A61
Amphibians	Frogs/Toads	Strecker’s Chorus Frog	*Pseudacris streckeri*	151	85	6	A62 – A74
Amphibians	Frogs/Toads	Mexican Burrowing Toad	*Rhinophrynus dorsalis*	20	15	8	A75 – A80
Amphibians	Frogs/Toads	Mexican Smilisca	*Smilisca baudinii*	21	9	2	A81 – A85
Amphibians	Salamanders	Southern Dusky Salamander*	*Desmognathus auriculatus**	9	2	1	A86 – A90
Amphibians	Salamanders	Salado Springs Salamander	*Eurycea chisholmensis*	4	-	-	A91 – A93
Amphibians	Salamanders	Cascade Caverns Salamander	*Eurycea latitans*	9	1	-	A94 – A98
Amphibians	Salamanders	San Marcos Salamander	*Eurycea nana*	5	1	-	A99 – A103
Amphibians	Salamanders	Georgetown Salamander	*Eurycea naufragia*	11	8	-	A104 – A108
Amphibians	Salamanders	Texas Salamander	*Eurycea neotenes*	17	10	2	A109 – A113
Amphibians	Salamanders	Fern Bank Salamander	*Eurycea pterophila*	14	-	-	A114 – A115
Amphibians	Salamanders	Texas Blind Salamander	*Eurycea rathbuni*	7	2	5	A116 – A120
Amphibians	Salamanders	Blanco Blind Salamander	*Eurycea robusta*	NA	NA	NA	NA
Amphibians	Salamanders	Barton Springs Salamander	*Eurycea sosorum*	7	4	1	A121 – A125
Amphibians	Salamanders	Jollyville Plateau Salamander	*Eurycea tonkawae*	11	2	-	A126 – A130
Amphibians	Salamanders	Comal Blind Salamander	*Eurycea tridentifera*	4	-	-	A131 – A132

CLASS	GROUP	COMMON NAME	SCIENTIFIC NAME	ALL	ROAD	TRAFFIC	MAPS
Amphibians	Salamanders	Austin Blind Salamander	*Eurycea waterlooensis*	2	2	-	A133 – A137
Amphibians	Salamanders	Black-spotted Newt	*Notophthalmus meridionalis*	17	9	-	A138 – A142
Amphibians	Salamanders	Rio Grande Siren (large form)†	*Siren* sp.†	6	2	-	A143 – A147
Reptiles	Lizards	Dixon's Whiptail‡	*Aspidoscelis dixoni*‡	NA	NA	NA	NA
Reptiles	Lizards	Reticulated Gecko	*Coleonyx reticulatus*	33	32	6	A148 – A152
Reptiles	Lizards	Reticulate Collared Lizard	*Crotaphytus reticulatus*	25	9	3	A153 – A158
Reptiles	Lizards	Spot-tailed Earless Lizard	*Holbrookia lacerata*	219	161	19	A159 – A172
Reptiles	Lizards	Keeled Earless Lizard	*Holbrookia propinqua*	86	31	2	A173 – A177
Reptiles	Lizards	Western Slender Glass Lizard	*Ophisaurus attenuatus*	1,065	1,038	9	A178 – A191
Reptiles	Lizards	Texas Horned Lizard	*Phrynosoma cornutum*	704	426	153	A192 – A209
Reptiles	Lizards	Greater Short-horned Lizard	*Phrynosoma hernandesi*	41	2	-	A210 – A214
Reptiles	Lizards	Dunes Sagebrush Lizard	*Sceloporus arenicolus*	19	3	7	A215 – A219
Reptiles	Snakes	Scarlet Snake	*Cemophora coccinea*	14	4	1	A220 – A228
Reptiles	Snakes	Black-striped Snake	*Coniophanes imperialis*	18	5	2	A229 – A234
Reptiles	Snakes	Western Diamondback Rattlesnake	*Crotalus atrox*	2,367	1,902	491	A235 – A252
Reptiles	Snakes	Timber Rattlesnake	*Crotalus horridus*	159	108	34	A253 – A266
Reptiles	Snakes	Prairie Rattlesnake	*Crotalus viridis*	173	143	31	A267 – A272
Reptiles	Snakes	Texas Indigo Snake	*Drymarchon melanurus*	155	89	20	A273 – A282
Reptiles	Snakes	Speckled Racer	*Drymobius margaritiferus*	19	8	1	A283 – A288
Reptiles	Snakes	Plains Hognose Snake	*Heterodon nasicus*	84	55	11	A289 – A297
Reptiles	Snakes	Northern Cat-eyed Snake	*Leptodeira septentrionalis*	11	8	3	A298 – A303
Reptiles	Snakes	Brazos Watersnake	*Nerodia harteri*	58	7	3	A304 – A308
Reptiles	Snakes	Concho Watersnake	*Nerodia paucimaculata*	10	7	-	A309 – A313
Reptiles	Snakes	Smooth Green Snake	*Opheodrys vernalis*	NA	NA	NA	NA

CLASS	GROUP	COMMON NAME	SCIENTIFIC NAME	ALL	ROAD	TRAFFIC	MAPS
Reptiles	Snakes	Louisiana Pine Snake	*Pituophis ruthveni*	2	2	-	A314 – A318
Reptiles	Snakes	Massasauga**	*Sistrurus tergeminus***	112	95	19	A319 – A332
Reptiles	Snakes	Mexican Blackheaded Snake	*Tantilla atriceps*	1	1	-	A333 – A337
Reptiles	Snakes	Big Bend Blackheaded Snake	*Tantilla cucullata*	27	22	2	A338 – A347
Reptiles	Snakes	Texas Garter Snake	*Thamnophis sirtalis*	21	7	-	A348 – A359
Reptiles	Snakes	Texas Lyre Snake	*Trimorphodon vilkinsonii*	29	21	2	A360 – A365
Reptiles	Turtles	Smooth Softshell Turtle	*Apalone mutica*	8	2	-	A366 – A373
Reptiles	Turtles	Spiny Softshell Turtle	*Apalone spinifera*	562	266	50	A374 – A391
Reptiles	Turtles	Common Snapping Turtle	*Chelydra serpentina*	486	231	45	A392 – A409
Reptiles	Turtles	Texas Tortoise	*Gopherus berlandieri*	363	113	40	A410 – A415
Reptiles	Turtles	Cagle's Map Turtle	*Graptemys caglei*	32	19	2	A416 – A420
Reptiles	Turtles	Texas Map Turtle	*Graptemys versa*	121	56	6	A421 – A432
Reptiles	Turtles	Big Bend Mudturtle	*Kinosternon hirtipes*	3	2	-	A433 – A437
Reptiles	Turtles	Alligator Snapping Turtle	*Macrochelys temminckii*	27	11	2	A438 – A447
Reptiles	Turtles	Texas Diamondback Terrapin	*Malaclemys terrapin*	18	11	1	A448 – A456
Reptiles	Turtles	Rio Grande Cooter	*Pseudemys gorzugi*	49	18	1	A457 – A463
Reptiles	Turtles	Common Box Turtle	*Terrapene carolina*	382	185	29	A464 – A477
Reptiles	Turtles	Ornate Box Turtle	*Terrapene ornata*	307	191	61	A478 – A495
Reptiles	Turtles	Big Bend Slider	*Trachemys gaigeae*	27	8	2	A496 – A500
Reptiles	Turtles	Red-eared Slider	*Trachemys scripta*	2,951	1,403	299	A501 – A518

*Most authorities now consider the dusky salamanders in Texas to be *Desmognathus conanti*.
†A large form of *Siren* has been found in the Rio Grande and is recognized in the TPWD TCAP database, but it has not been officially named yet.
**The Massasauga is listed as *Sistrurus catenatus* in the TPWD TCAP database, but the current nomenclature used on iNaturalist is *S. tergiminus*.
‡This species is now considered a pattern variant of *Aspidoscelis tesselatus*, and is no longer recognized by most authorities.

3.1.1 Amphibians – Frogs and Toads

Of the 44 species of frogs and toads found in Texas, 9 are considered SGCN, and all nine of these species had records in the database. The number of records of each species was highly variable, ranging from 7 to 144. Some of the species recognized as SGCN are wide ranging in Texas but with noticeable declines in parts of their distributions, while others have localized distributions and only short seasonal activity periods.

The Houston Toad (*Anaxyrus houstonensis*) has very few records in our database. Existing records maintained by USFWS give a much better representation of what roads may be affected by Houston Toads.

The Woodhouse's Toad (*Anaxyrus woodhousii*), Crawfish Frog (*Lithobates areolatus*), Cajun Chorus Frog (*Pseudacris fouquettei*), and Strecker's Chorus Frog (*Pseudacris streckeri*) are all species that are included on the SGCN list due to declines observed in parts of their distributions in Texas. The state can monitor their current distributions and population status to determine if future listing by the state is warranted.

The Sheep Frog (*Hypopachus variolosus*), Mexican Burrowing Toad (*Rhinophrynus dorsalis*), Mexican Smilisca (*Smilisca baudini*), and Mexican White-lipped Frog (*Leptodactylus fragilis*) are primarily restricted to the Rio Grande Valley. Their restricted distribution in Texas makes them more susceptible to habitat alterations. Also breeding sites often include roadside ditches that may increase road mortality during the breeding season.

3.1.2 Amphibians – Salamanders

Of the 27 species of salamanders found in Texas, 15 are considered SGCN, and 14 of these species had records in the database. The number of individuals of each species found near roads was low, ranging between 2 and 17. Only the Ambystomatid salamanders are known to make migrations to breeding sites; therefore, they are the only group frequently encountered on roads in Texas. The fact that most Texas salamanders are aquatic makes road mortalities of this group rare.

Almost all of the central Texas spring and aquifer salamanders (*Eurycea chisholmensis, E. latitans, E. nana, E. naufragia, E. neotenes, E. pterophila, E. rathbuni E. robusta, E. sosorum, E. tonkawae, E. tridentifera,* and *E. waterlooensis*) are SGCN species and many of these are federally endangered. These salamanders are all aquatic so mortality from vehicular collisions is not a worry. They can occur in creeks and springs that are in road right-of-ways; these sites that do occur near roads should be protected from disturbance as much as possible.

The Rio Grande Siren (*Siren* sp.) and Sirens in general are a group that have been going through taxonomic revision for years. A large form has been identified in the lower Rio Grande valley, but it has not been officially named. This form is found south of the sand sheet in South Texas. Sirens are strictly aquatic and only suffer road mortality in flood conditions. Impacts to Sirens are similar to those described for Texas spring salamanders.

3.1.3 Reptiles – Lizards

Of the 45 native species of lizards found in Texas, 9 are considered SGCN, and all but one of these species had records in the database. The number of records of each species was highly variable, ranging from 19 to 1,065. Most of the extreme variation in this group is accounted for by one species (see below).

Many of the SGCN lizard species have restricted Texas distributions (*Coleonyx reticulatus, Crotaphytus reticulatus, Phrynosoma hernandesi, and Sceloporus arenicolus*). Those with broader distributions have mostly suffered population declines (e.g. *Holbrookia lacerata, Phrynosoma cornutum*) in parts of their range and road mortality in the areas that these species are still present may be substantial.

Our most frequently observed lizard in Texas was the Western Slender Glass Lizard (*Ophisaurus attenuatus*). They can be abundant especially in coastal prairies and barrier islands. Over 95% of the records of this species are from the roads on Padre Island. This lizard is considered an SGCN species because inland populations occur in much lower densities and are patchily distributed. They also seem to be declining due to conversion of prairies into agriculture and the invasion of woody plants into prairie habitat.

3.1.4 Reptiles – Snakes

Of the 79 species of snakes in Texas, 18 are considered SGCN, and all but one of these species had records in the database. The number of records of each species was highly variable, ranging from 1 to 2,367. Species with few records are usually those that are very rare and restricted to small areas in the state, while the high numbers for other species are due to common, widespread species being considered SGCN as a result of harvesting.

Harvested species include the Western Diamondback and Prairie Rattlesnakes (*Crotalus atrox* and *C. viridis*). These species are collected for rattlesnake roundups and are considered SGCN so the state can monitor trends of take through time. Both of these species are common and frequently encountered on roads.

Ten of the SGCN species have small distributions within Texas, and most of these are uncommon within their restricted ranges. These include our two endemic snake species the Brazos River Water Snake (*Nerodia harteri*) and the Concho River Water Snake (*N. paucimaculata*), although they rarely cross roads.

The other SGCN snake species are more wide ranging but deal with other pressures to their populations such as habitat loss (*Thamnophis sirtalis* and *Sistrurus tergeminus*), human persecution (*Crotalus horridus*), and collection pressure (*Drymarchon melanurus*).

The Western Hognose Snake (*Heterodon nasicus*) is uncommon over most of its distribution in Texas but has seemingly disappeared from the eastern half of the state due to unknown circumstances. Taxonomic changes within this group have recently moved the Mexican Hognose Snake into its own full species (*Heterodon kennerlyi*). We did not include a map for this species because it was not originally listed in the TCAP, and because Mexican Hognose Snake populations seem to be stable throughout Texas.

3.1.5 Reptiles – Turtles

Of the 25 species of turtles in Texas (not including sea turtles), 14 are considered SGCN, and all of these species had records in the database. The number of records of each species was highly variable, ranging from 3 to 2,951. The most common species in the state, Red-eared Slider (*Trachemys scripta*), is included on the SGCN list so that TPWD can gather information about harvest numbers of other turtle species. The least common species, Big Bend Mudturtle (*Kinosternon hirtipes*), is known only from one small creek drainage in far west Texas.

Several common species, specifically the Red-eared Slider mentioned above, Spiny Softshell (*Apalone spinifera*), and Common Snapping Turtle (*Chelydra serpentina*), are included in the SGCN list to help TPWD monitor the level of harvest of other turtle species and to help fund research on the status of their populations. These common species may soon be removed from the SGCN list due to a recent ban on the collection of all turtles in Texas for commercial purposes.

Both species of Box Turtles (*Terrapene ornata* and *T. carolina*) are included in the SGCN lists largely due to perceived population declines. Some of the potential reasons for these declines include increased predation on hatchlings from mesocarnivores and increased mortality on roads due to larger human population sizes and larger road networks within their habitat.

Many of these turtle species are restricted to aquatic habitats such as lakes or rivers, and they rarely leave that environment. Unfortunately, when they do leave the water, it is usually for reproduction (females laying eggs). These female turtles making nesting movements can become an important source of mortality for some populations, because turtle life history is such that removing reproductive females from populations usually results in steep population declines over time.

3.2 Mapping

Species absent from the database may still be present on and near roads. Absences can be the result of multiple factors, including lack of surveys, lack of detection, and lack of available individuals. Because this database represents undirected searching by many individuals, there are some areas that are searched frequently (e.g., highways in west Texas) and some areas that are underrepresented (e.g., panhandle counties). Additionally, there could be bias in detecting individuals on or near the roadways. Typically larger species in these groups are more easily detected than smaller species. Finally, absences could result from a lack of available individuals – when surveys do not align with the times the species are actually moving. Also, there were very few observations on Interstate Highways, which is likely due to safety issues with stopping on these roads.

Reptiles and Amphibians were observed within 100 m of 2,333 control sections across Texas. The majority of control sections (2,244) had 10 or fewer observations of SGCN species; 57 control sections had between 11 and 25 observations; 25 control sections had between 26 and 50 observations; 4 control sections had between 51 and 75 observations; 0 control sections had between 76 and 100 observations; and 3 control sections had more than 100 observations of SGCN individuals.

The highest number of observations was found on control section 10537 (FD 702206; 615 observations). This control section is located in Padre Island National Seashore in Kleberg County and had 607 observations of the Western Slender Glass Lizard from March to May 2017 from a targeted effort by one individual searcher. After that, control section 15551 (FD 704951) is the control section with the highest number of observations of SGCN herpetofauna (178 observations) which had 161 observations of the Western Slender Glass Lizard during 2017 for Park Road 22, still in Padre Island National Seashore. See the information on this species in section 3.1.3 for more information. The next two highest observations per control section occurred in west Texas. Control section 86608 (US 385) had 74 observations of 4 SGCN (western diamondback rattlesnakes, prairie rattlesnakes, Texas horned lizards, and ornate box turtles), and 95709 (FM 170) had 73 observations of 4 species (western diamondback rattlesnakes, Texas lyre snakes, reticulated geckos, and a Big Bend slider).

Within 100 m of a road, snakes and turtles are the most common groups found on the Interstate Highways (IH; 11 and 20, respectively), US Highways (UA and US; 466 and 152 observations, respectively), and State Highways (SH; 480 and 208 observations, respectively) (Table 2). Frogs and toads were commonly found on County Roads (CR; 243 observations) and Farm to Market roads (FM; 98 observations) (Table 2). Although there were few records of salamanders in general, they were mostly found on City Streets (CS; 14 observations), CR (12 observations), and SH (11 observations). Lizards were most commonly found on FD (863 observations), CR (346 observations) and Park Roads (PR; 157 observations). Snakes were commonly found on both smaller road ways (e.g. CR (574 observations), FM (527 observations)) as well as larger highways (e.g. SH - 480 observations; US - 464 observations). Although turtles were the second most observed group on larger SH and US, they were most commonly found on CS (874 observations), CR (487 observations), and FM (259 observations) roads.

Table 2. Number of SGCN Amphibian and Reptile observations within 100 m of the road on the different road types. BS – Business State Highways; BU – Business US Highways; CR – County Road; CS – City Street; FC – Undefined; FD – Undefined; FM – Farm to Market Road; IH – Interstate Highway; PR – Park Road; RE – Recreational Road; RM – Ranch to Market Road; SH – State Highway; SL – State Highway Loop; SS – State Highway Spur; UA – US Highway Alternate roadway; US – US Highway. Bolded columns are those road types included in the SGCN traffic analyses.

Group	BS	BU	**CR**	CS	**FC**	FD	**FM**	IH	**PR**	**RE**	**RM**	**SH**	**SL**	**SS**	**UA**	**US**
Frogs and Toads	-	3	**243**	32	**4**	9	**98**	1	**4**	**-**	**2**	**25**	**-**	**-**	**-**	**17**
Lizards	-	-	**346**	42	**5**	863	**104**	2	**157**	**-**	**59**	**68**	**-**	**-**	**-**	**56**
Salamanders	-	-	**12**	14	**4**	-	**-**	2	**-**	**-**	**-**	**11**	**-**	**-**	**-**	**-**
Snakes	-	4	**574**	74	**14**	88	**527**	11	**16**	**-**	**227**	**480**	**3**	**-**	**2**	**464**
Turtles	4	-	**487**	874	**290**	98	**259**	20	**64**	**1**	**28**	**208**	**23**	**3**	**2**	**150**

3.3 Traffic Analyses

3.3.1 Species of Greatest Conservation Need - SGCN

To characterize the relationship between traffic volume and the frequency of dead-on-road (DOR) SGCN observations, we first divided the data set into a training and test set for random forest analysis by randomly assigning 80% of the observations to the training set and the remaining 20% to the test set. We ran the random forest analysis with 500 trees and had an out-of-bag error rate estimate of 17.96% on the training set, but only 11.44% on the test set. This indicated that the random forest was able to correctly predict the dead/alive outcome accurately for almost 90% of the test data set. Satisfied with this level of accuracy, we moved forward with further interpretations of the analyses.

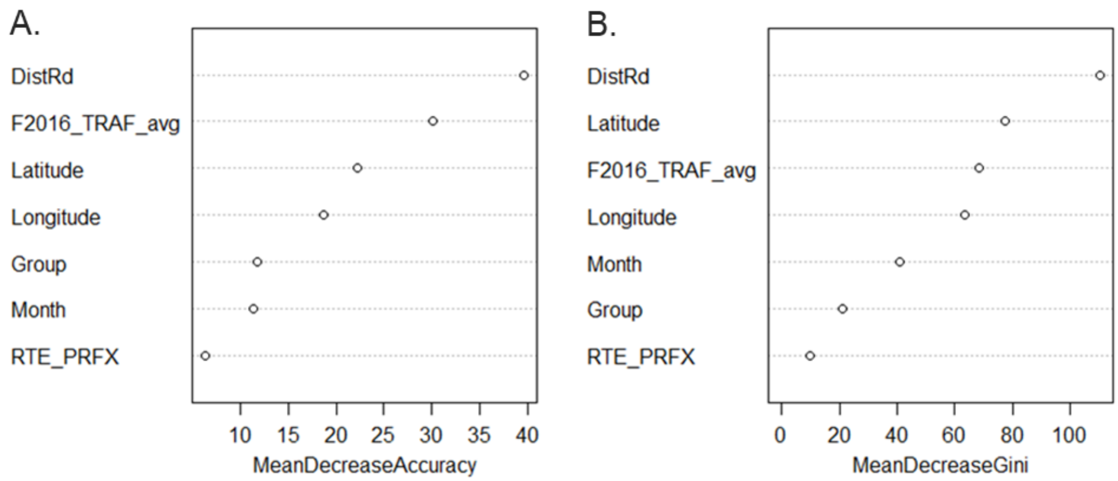

Fig. 5. (A) Variables with larger Mean Decrease in Accuracy are considered more important because removing them reduces accuracy of the model. Similarly, in (B) variables with larger Mean Decrease in Gini are considered more important because removing those increases model misclassifications. Abbreviations are: DistRd – distance to road (m); F2016_TRAF_avg – average AADT from 2016; and RTE_PRFX –road type (e.g., state highway, city road).

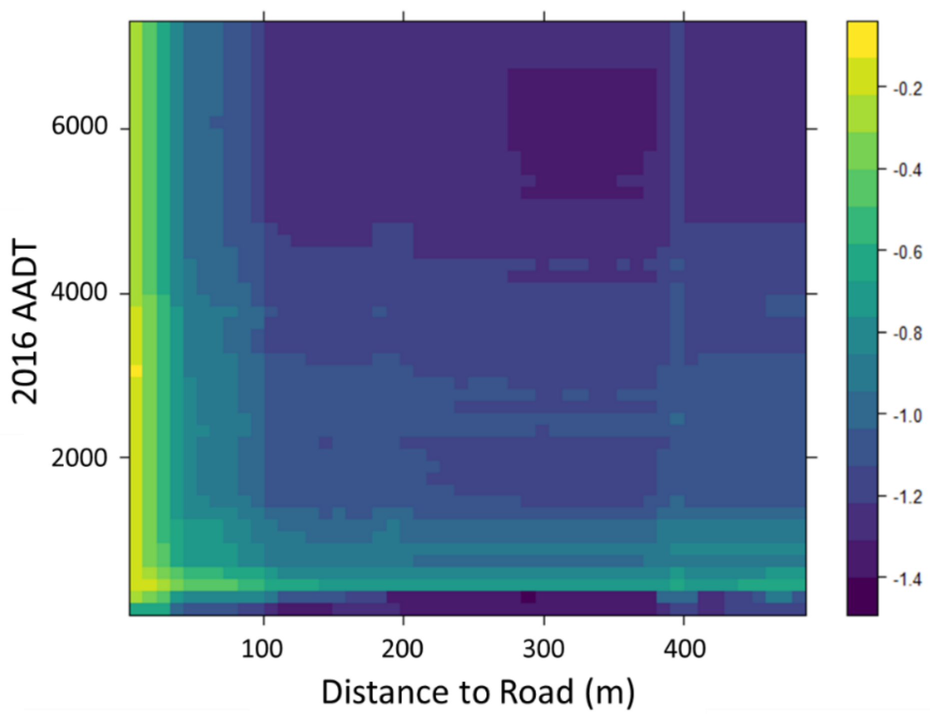

Fig. 6. Partial dependence plot with outliers removed for dead observations based on distance to road and 2016 AADT. Yellow colors identify values for distance to road and 2016 AADT that are important predictors of dead SGCN observations.

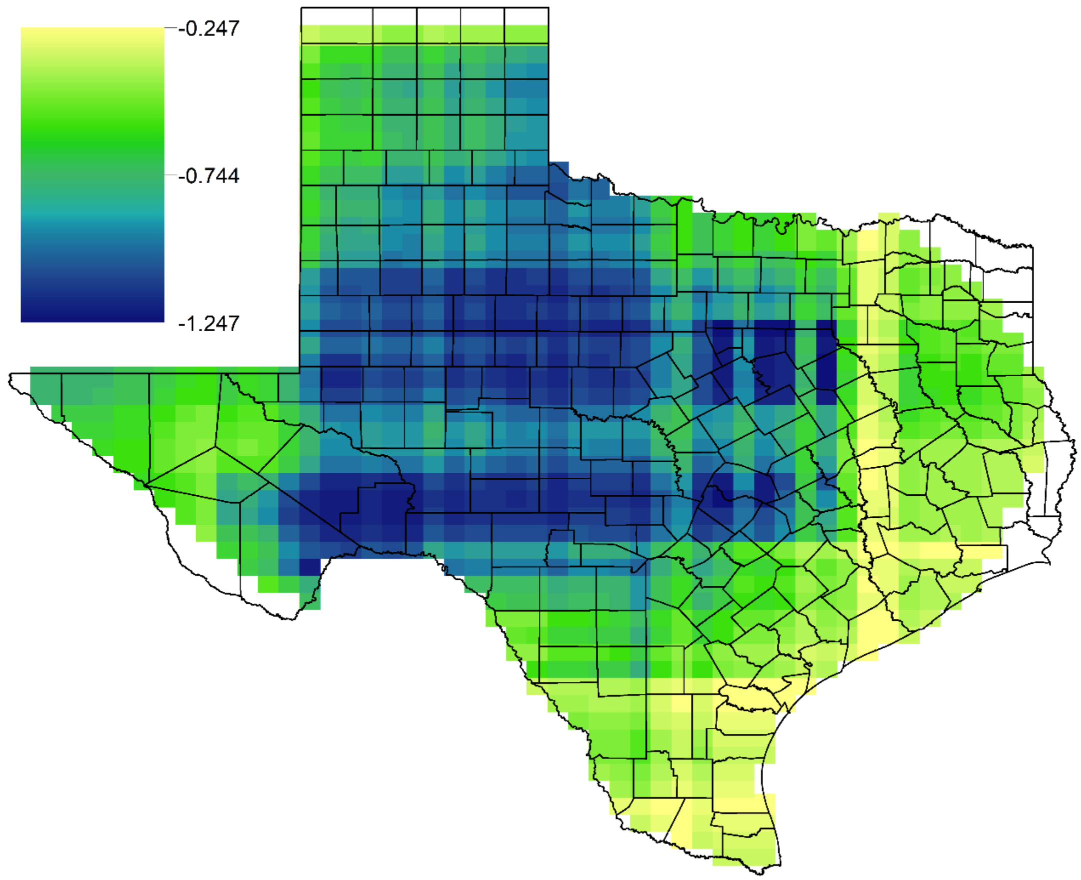

Fig. 7. Partial dependence plot for dead SGCN observations based on latitude and longitude in Texas. Projection area constrained by distribution of observations.

We found distance to road, average AADT, latitude and longitude were important predictors of whether SGCN observations were dead individuals or alive based on Mean Decrease in Accuracy (Fig. 5a) and Mean Decrease in Gini (Fig. 5b). Variables with larger Mean Decrease in Accuracy were considered important because removing them from the analysis reduced the accuracy of the model. Similarly, variables with larger Mean Decrease in Gini were considered important because removing them increased the impurity index, which describes misclassifications or heterogeneity at the terminal nodes. These results showed that SGCN observations closer to roads and in areas with higher traffic were predicted to be dead (Fig. 6), which was expected. Interestingly, however, there appeared to be hotspots and coldspots where these relationships were stronger or weaker, respectively, throughout the state (i.e., latitude and longitude were important predictors). These hotspots of dead SGCN observations were found in south and east Texas, coastal prairies, and to a lesser extent in the western part of the state (Fig 7). The panhandle and central Texas were mostly coldspots for dead SGCN observations.

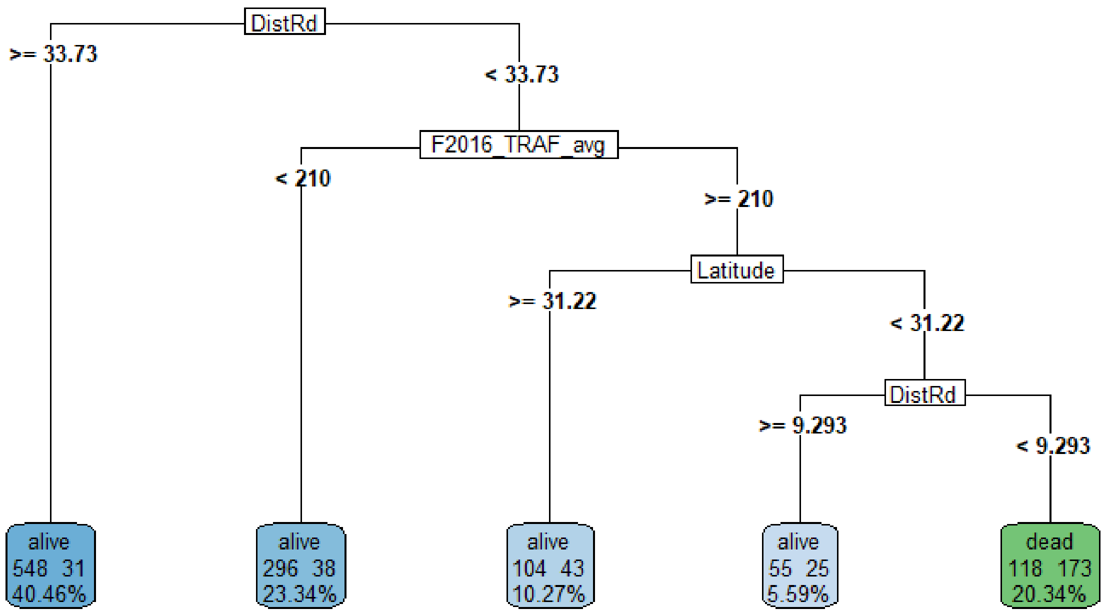

Fig. 8. Pruned classification tree using the full SGCN herpetofauna traffic database; terminal nodes contain minimum of 5% of the data.

The classification tree above uses all the SGCN herpetofauna traffic database to classify observations into dead or alive categories (Fig. 8). We included it here to illustrate some of the conclusions from Figs. 5-7, but also to caution that results from classification tree analyses, in particular the values at each split along the tree, can be variable depending on the data available. As an example, we see in the tree above that the distance to road and AADT predict the first splits of the data. A distance to road of approximately 33.73 m is suggested in tree above, but that number can change to be higher or lower with a slightly different data set, even if distance to road is still predicted to be important in the analysis. Similarly, the tree indicates that even relatively low amounts of traffic, in this example, 210 AADT, can impact whether individuals are found dead or alive on roads. Again, this splitting value could be higher or lower with a slightly different data set. Variable classification tree results can emerge as part of the random forest analysis, where, in this study, 500 different subsets of the data set were used for training or testing. Or, if the database of SGCN observations grows over time or more AADT data becomes available, we might also expect the results of the classification tree analysis to change.

3.3.2 Western Diamondback Rattlesnake

We repeated the classification tree and random forest analyses described above to investigate the importance of traffic in predicting mortality in the western diamondback rattlesnake, which had 483 complete observations in the database (8 of 491 observations reported in Table 1 had incomplete data and were not included in analyses).

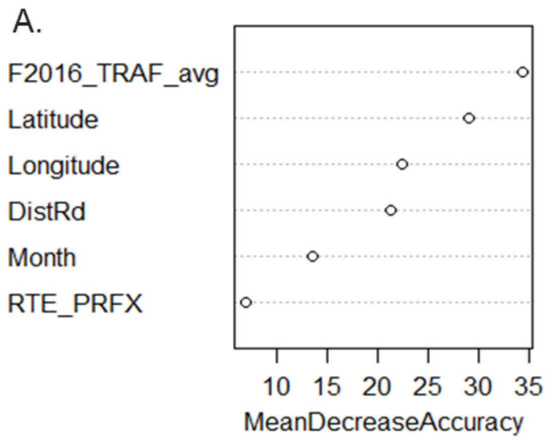

Fig. 9. (A) Variables with larger Mean Decrease in Accuracy are considered more important because removing them reduces accuracy of the model. Similarly, in (B) variables with larger Mean Decrease in Gini are considered more important because removing those increases model misclassifications. Abbreviations are: DistRd – distance to road (m); F2016_TRAF_avg – average AADT from 2016; and RTE_PRFX –road type (e.g., state highway, city road).

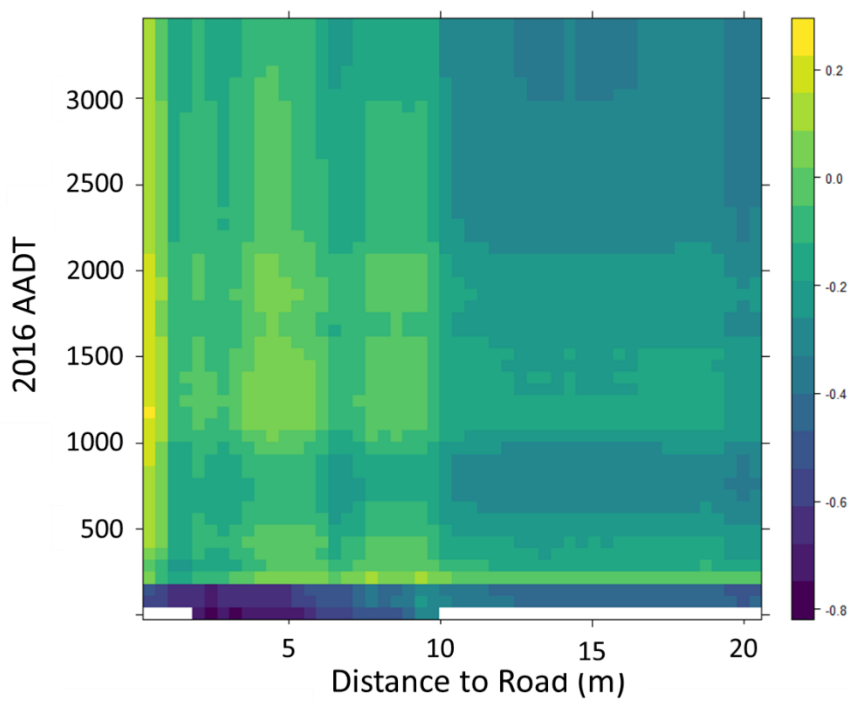

Fig. 10. Partial dependence plot with outliers removed for dead observations of western diamondback rattlesnakes (*Crotalus atrox*) based on distance to road and 2016 AADT. Yellow colors identify values for distance to road and 2016 AADT that are important predictors of dead SGCN observations.

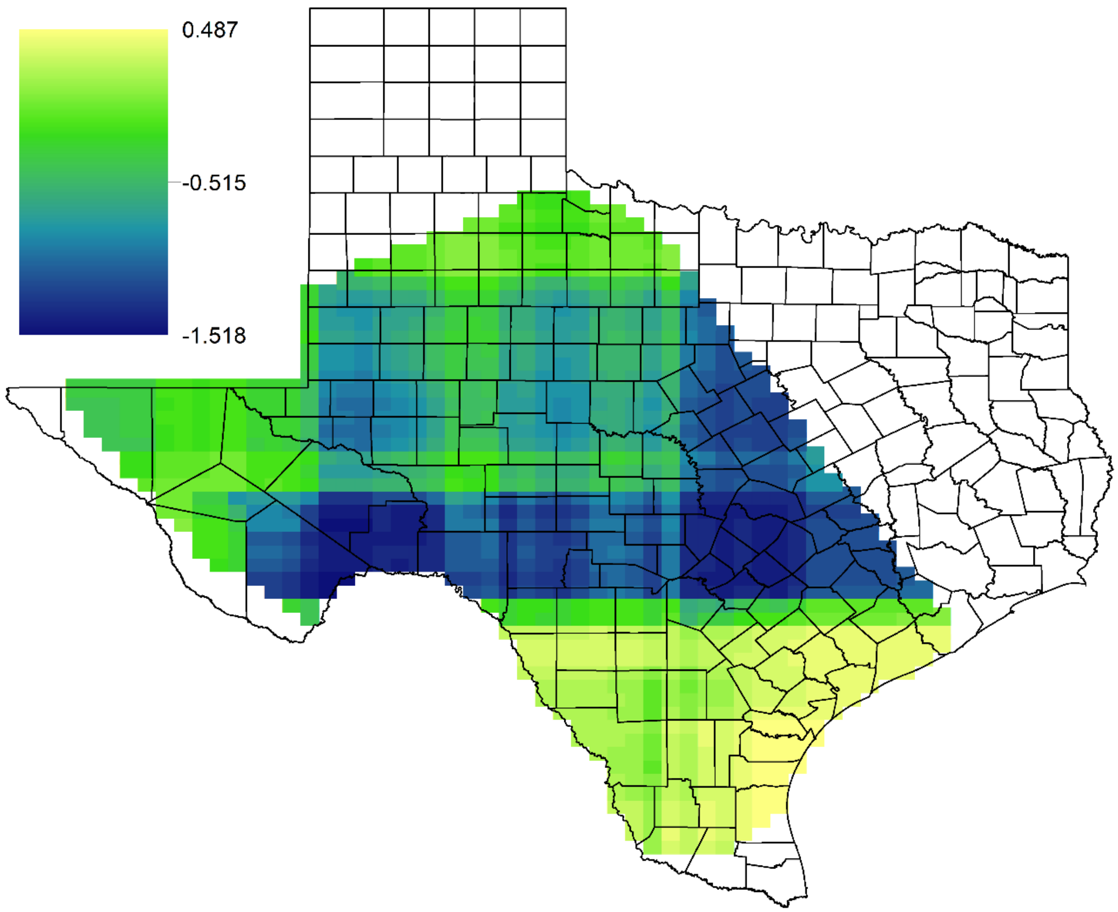

Fig.11. Partial dependence plot for dead observations of western diamondback rattlesnakes (*Crotalus atrox*) based on latitude and longitude in Texas. Projection area constrained by distribution of observations.

For the western diamondback rattlesnake, we used the same randomized subsampling protocol for random forest analysis described above. We observed an estimated out-of-bag error rate of 19.32% on the training set and 20.0% on the test set based on 1,000 trees. This indicates that the random forest was able to correctly predict the dead/alive outcome accurately for 80% of the test data set. Moving forward with interpretations of the results, we again found that AADT, distance to road, and latitude and longitude were important predictors of mortality for western diamondbacks (Fig. 9).We also observed that month may play a larger role in returning homogenous terminal nodes (Fig. 9b) than it did for the full SGCN herpetofauna traffic analyses above. With respect to traffic, we found that values for AADT greater than approximately 200 contributed to higher probabilities of being dead on roads. Additionally, there appeared to be hotspots of dead observations based on location in the state (latitude and longitude). These hotspots of mortality occurred in south, north-central, and west Texas (Fig 11).

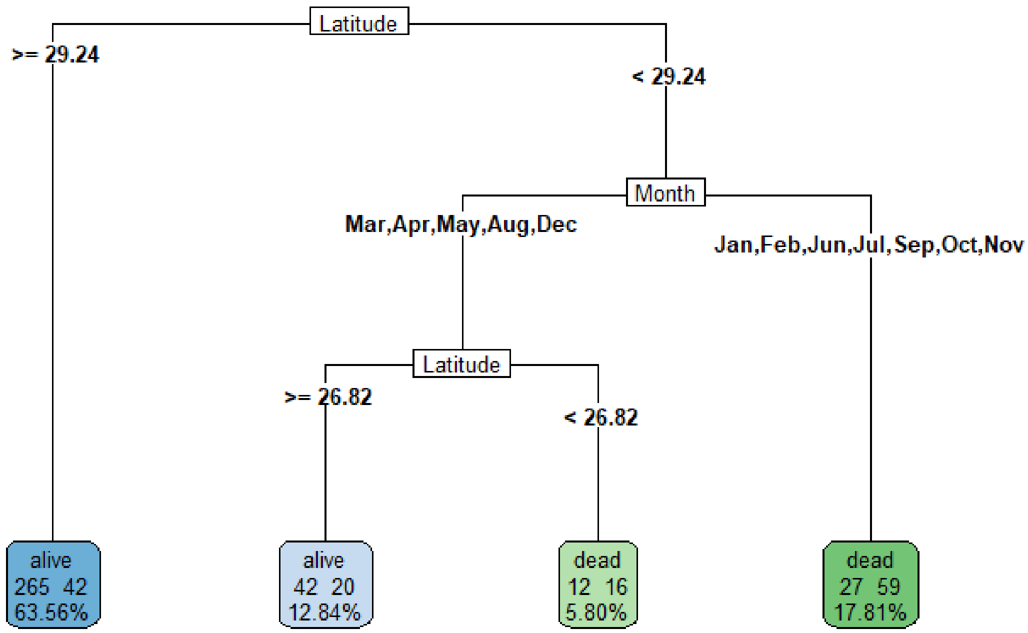

Fig. 12. Pruned classification tree using all western diamondback rattlesnake (*Crotalus atrox*) observations; terminal nodes contain minimum of 5% of the data.

We included the classification tree above to help illustrate some of the conclusions above from Figs. 9-11. This tree shows that latitude and month were important predictors used to classify western diamondback rattlesnake observations into dead or alive categories.

3.3.3 Red-eared sliders

We repeated the classification tree and random forest analyses described above to investigate the importance of traffic in predicting mortality for red-eared sliders (*Trachemys scripta*), which had 277 complete observations in the database (22 of 299 observations reported above in Table 1 had incomplete data and were not included in the analysis).

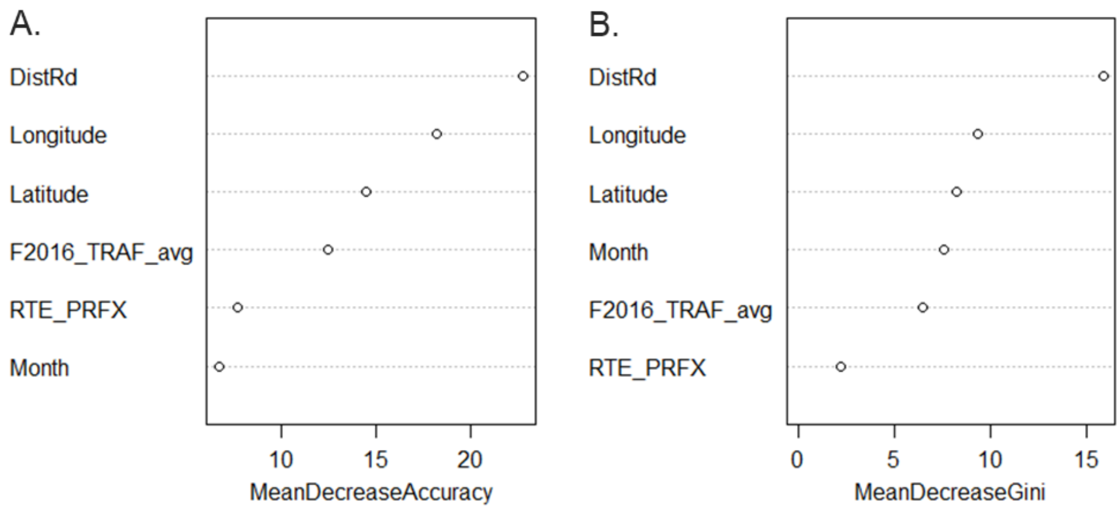

Fig. 13. (A) Variables with larger Mean Decrease in Accuracy are considered more important because removing them reduces accuracy of the model. Similarly, in (B) variables with larger Mean Decrease in Gini are considered more important because removing those increases model misclassifications. Abbreviations are: DistRd – distance to road (m); F2016_TRAF_avg – average AADT from 2016; and RTE_PRFX –road type (e.g., state highway, city road).

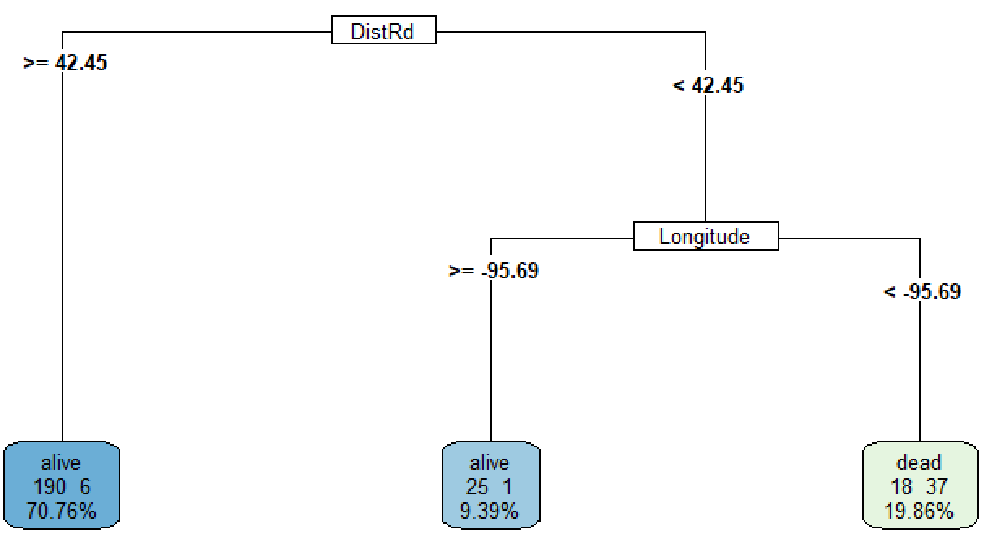

Fig. 14. Pruned classification tree using all red-eared slider (*Trachemys scripta*) traffic observations; terminal nodes contain minimum of 5% of the data.

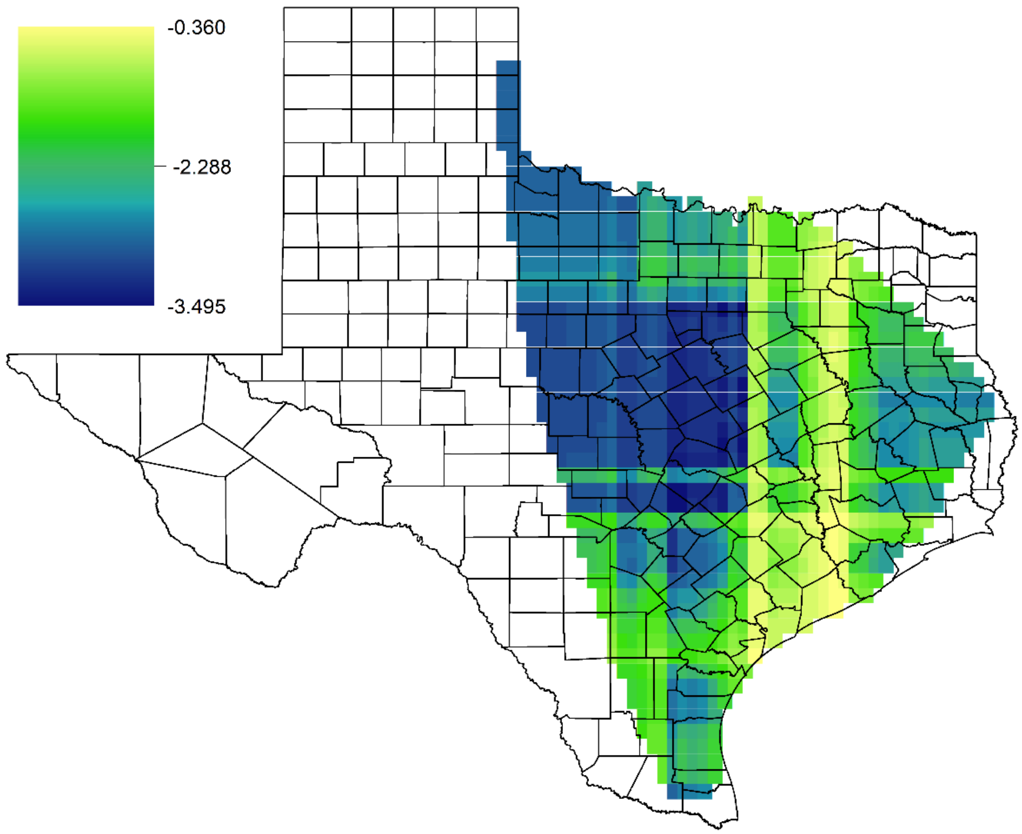

Fig.15. Partial dependence plot for dead observations of red-eared sliders (*Trachemys scripta*) based on latitude and longitude in Texas. Projection area constrained by distribution of observations.

For the red-eared slider random forest analysis, we again created training and test data sets by randomly assigning 80% of observations to a training set with the remaining being assigned to a test set. We ran the random forest analysis with 1000 trees and had an out-of-bag estimate of error rate of 8.33% on the training set, but 13.11% on the test set. This indicated that the random forest analysis was able to correctly predict the dead/alive outcome accurately for 87% of the test data set. Further interpretations of results for red-eared sliders indicated that distance to road was the most important predictor of mortality. Latitude and longitude were also somewhat important predictor variables in the random forest analyses (Fig. 13). We found that red-eared slider observations less than approximately 42.45 m from roads were more likely to be classified as dead, especially in eastern, and to a lesser extent, southern Texas (Figs. 14-15).

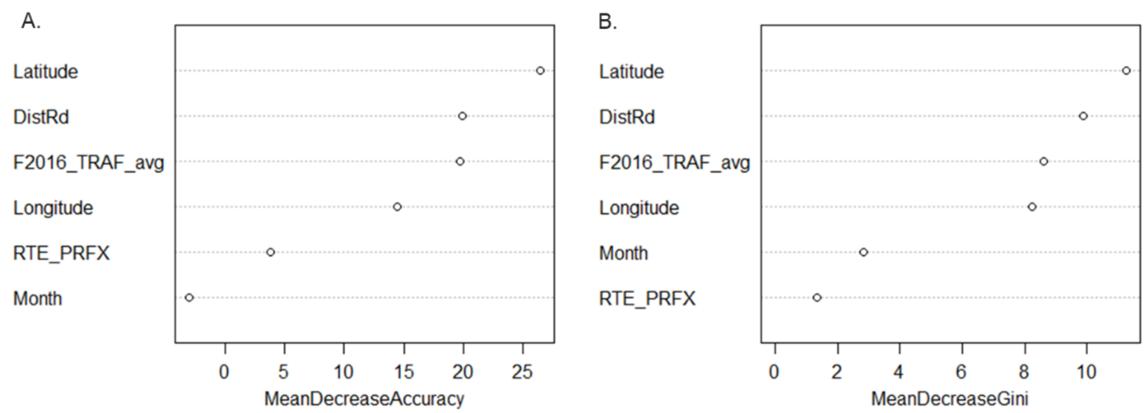

Fig. 16. (A) Variables with larger Mean Decrease in Accuracy are considered more important because removing them reduces accuracy of the model. Similarly, in (B) variables with larger Mean Decrease in Gini are considered more important because removing those increases model misclassifications. Abbreviations are: DistRd – distance to road (m); F2016_TRAF_avg – average AADT from 2016; and RTE_PRFX –road type (e.g., state highway, city road).

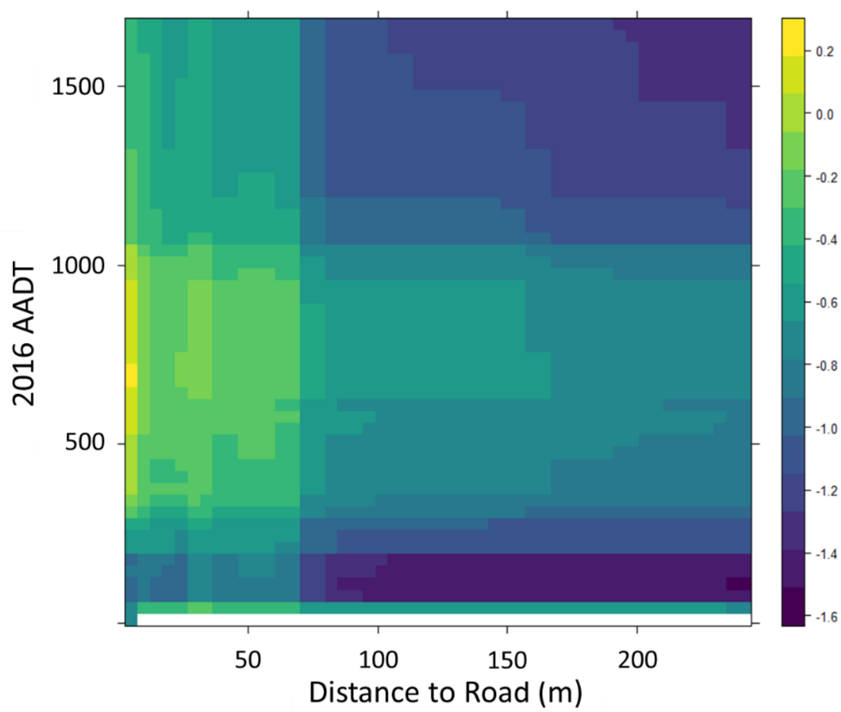

Fig. 17. Partial dependence plot with outliers removed for dead observations of Texas horned lizards (*Phrynosoma cornutum*) based on distance to road and 2016 AADT. Yellow colors identify values for distance to road and 2016 AADT that are important predictors of dead SGCN observations.

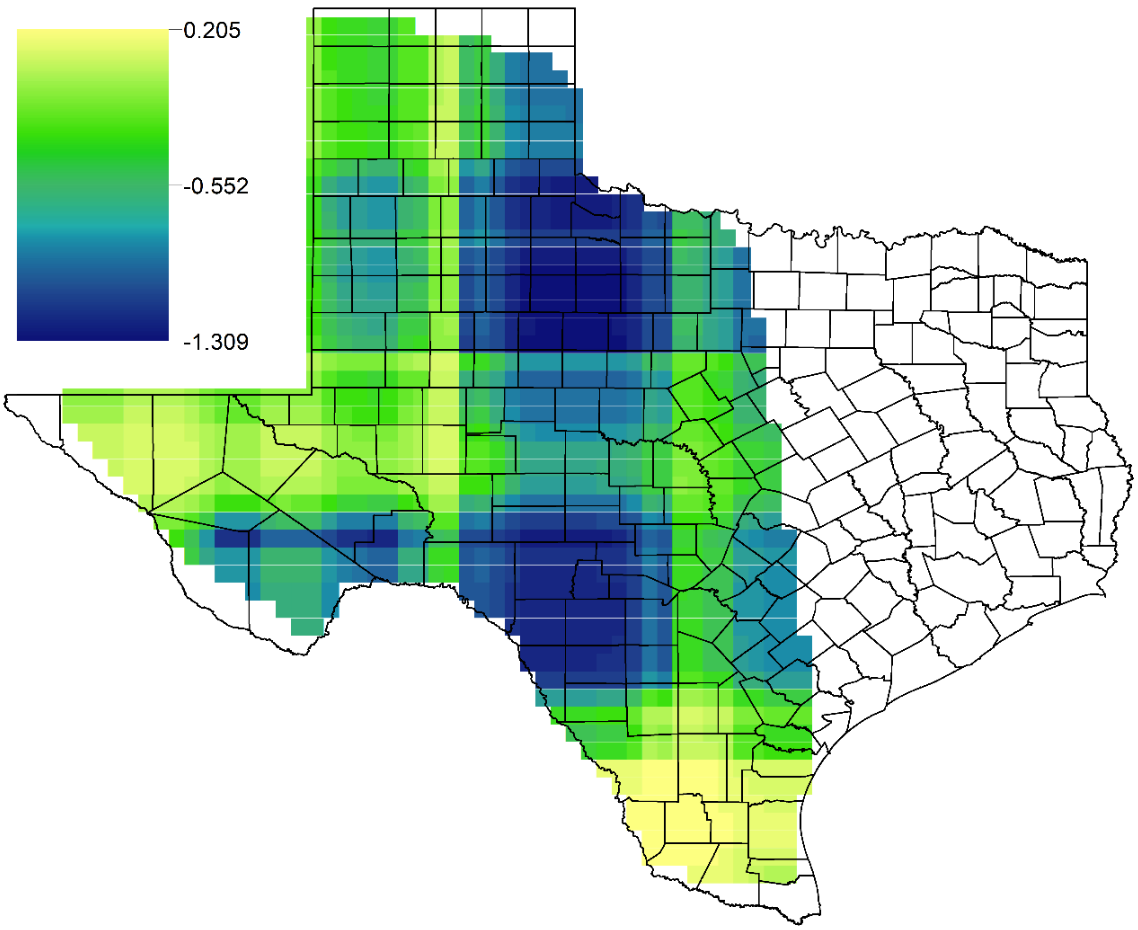

Fig.18. Partial dependence plot for dead observations of Texas horned lizards (*Phrynosoma cornutum*) based on latitude and longitude in Texas. Projection area constrained by distribution of observations.

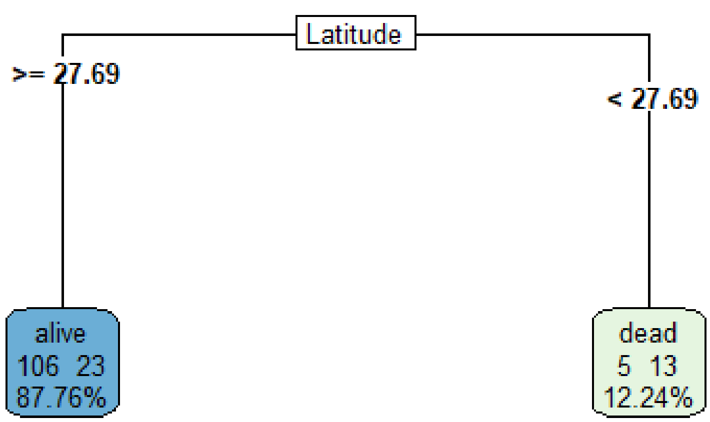

Fig. 19. Pruned classification tree using all Texas horned lizard (*Phrynosoma cornutum*) traffic observations; terminal node contains minimum of 5% of data.

3.3.4 Texas Horned Lizard

We repeated the classification tree and random forest analyses described above to investigate the importance of traffic in predicting mortality for the Texas horned lizard (*Phrynosoma cornutum*), which had 147 complete observations available (6 of 153 from Table 1 had incomplete data and were not included in the analysis).

For the Texas horned lizard random forest analysis using 1,000 trees, we observed an out-of-bag error rate of 15.97% on the training set and 21.43% on the test set. This indicates that the random forest was only able to correctly predict the dead/alive outcome accurately for 79% of the test data set. In this analysis, latitude was the most important predictor of mortality for Texas horned lizards, but distance to road, AADT, and longitude were also important (Fig. 16). We also found that Texas horned lizard observations less than approximately 75 m from roads were more likely to be classified as dead, especially in south and west Texas, and to a lesser extent in central Texas and the western panhandle (Figs. 17-19).

3.4 Data Set Biases

There are a number of biases in the observational citizen science database we used that can impact analyses (Dickinson et al., 2010), and indeed restricted the use of more common analyses like the binomial logistic regression in this study. One commonly encountered problem is data quality or accuracy. In the case of the “Herps of Texas” iNaturalist project, this is generally not a problem because experienced herpetologists volunteer as project coordinators that verify observations. All observations in the database for this study are research grade observations, which means the species identification has at least 2/3rds agreement among coordinators and the observation includes a date, latitude and longitude, and pictures or calls.

Beyond issues with accuracy, there can be observer biases related to volunteer behaviors and experience that influence what is found, what observations they can safely collect, and what they choose to stop for. There are almost certainly biases in species size in our data set, because larger individuals are easier to find than smaller ones. Smaller individuals dead on roads are also generally scavenged quicker than larger individuals, which are generally available to be found for longer periods of time. Because this is an opportunistic data set, data collected also depends on what organisms observers are more likely to stop for. In our experience, rarer or novel herpetofauna are more likely to be stopped for than more common herpetofauna. Additionally, observers have personal preferences in systematic groups and may be more likely to stop for a snake on the road versus an amphibian on the road. Observers may also be more likely to stop for something alive on the road (e.g. to move turtles to safety) than dead on the roads.

Finally, there are safety issues with observations collected on roads. We had many fewer observations on interstate highways than other types of roads, most likely for safety reasons.

Observers also have biases about where they go to make observations. Most observations are made near a person's residence (where they travel everyday) and most people live in cities, therefore biasing observations to be made near cities. Amateur herpetologists also like to travel to areas with high species diversity or areas with unique and interesting species. Many herpetologists travel to the Big Bend region of Texas and to the lower Rio Grande Valley to look for pretty, rare, or unique reptile and amphibian species, those areas also have an especially high diversity of reptiles which attracts people.

There were also biases present in the traffic data set, which was designed to capture human activity and did not necessarily align with herpetofauna captures. For example, our final database had 53,601 observations, 11,527 of them were of SGCN herpetofauna. Once those SGCN observations were merged with control sections that had traffic estimates, we had only 1,474 observations for analysis across the state of Texas.

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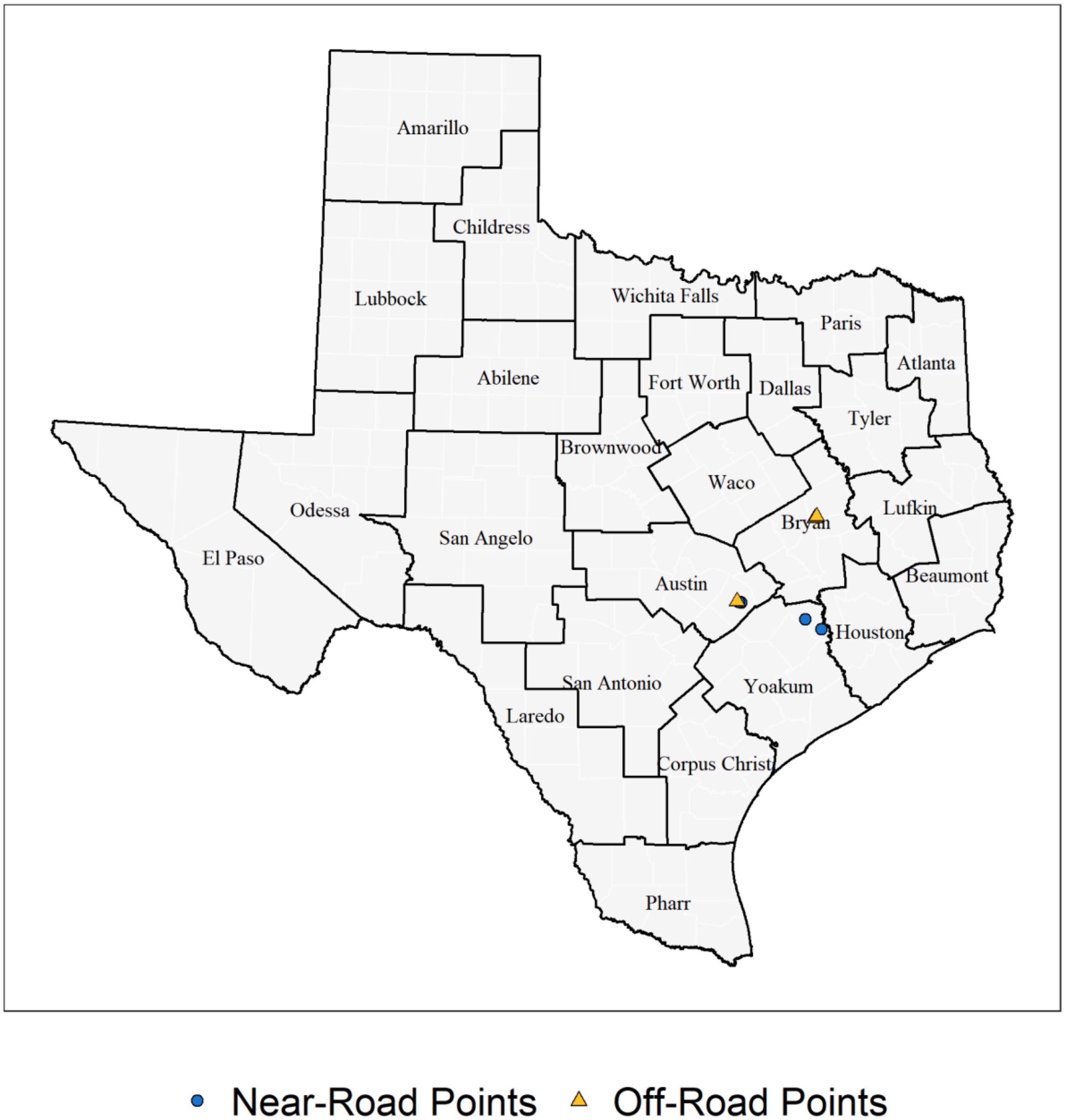
Appendix A.

Maps are arranged by taxonomic group (i.e. Frogs and Toads, Salamanders, Lizards, Snakes, Turtles) and then in alphabetical order by scientific name for all Species of Greatest Conservation Need (SGCN) included in the iNaturalist "Herps of Texas" project. For each species, there are two state-wide maps, between 1 and 8 regional dot maps, and between 0 and 8 regional control section heat maps.

- State-wide maps:
  - Near and off road maps: Blue dots represent points located within 200 m of a TxDOT road section; yellow dots represent points outside the 200 m road buffer.
  - Dead and alive road maps: Red dots represent dead observations located within 200 m of a TxDOT road section; blue dots represent alive observations located within the 200 m road buffer.
- Regional point maps:
  - Near and off road maps: Blue dots represent points located within 200 m of a TxDOT control section; yellow dots represent points outside the 200 m road buffer.
  - Dead and alive road maps: Red dots represent dead observations located within 200 m of a TxDOT road section; blue dots represent alive observations located within the 200 m road buffer.
- Regional heat maps:
  - Near road maps: Number of observations within 100 m of a TxDOT road section for each control section, grouped into 1, 2, 3, 4, and 5+ observations.
  - Near road, Dead only maps: Number of dead observations within 100 m of a TxDOT road section for each control section, grouped into 1, 2, 3, 4, and 5+ observations.

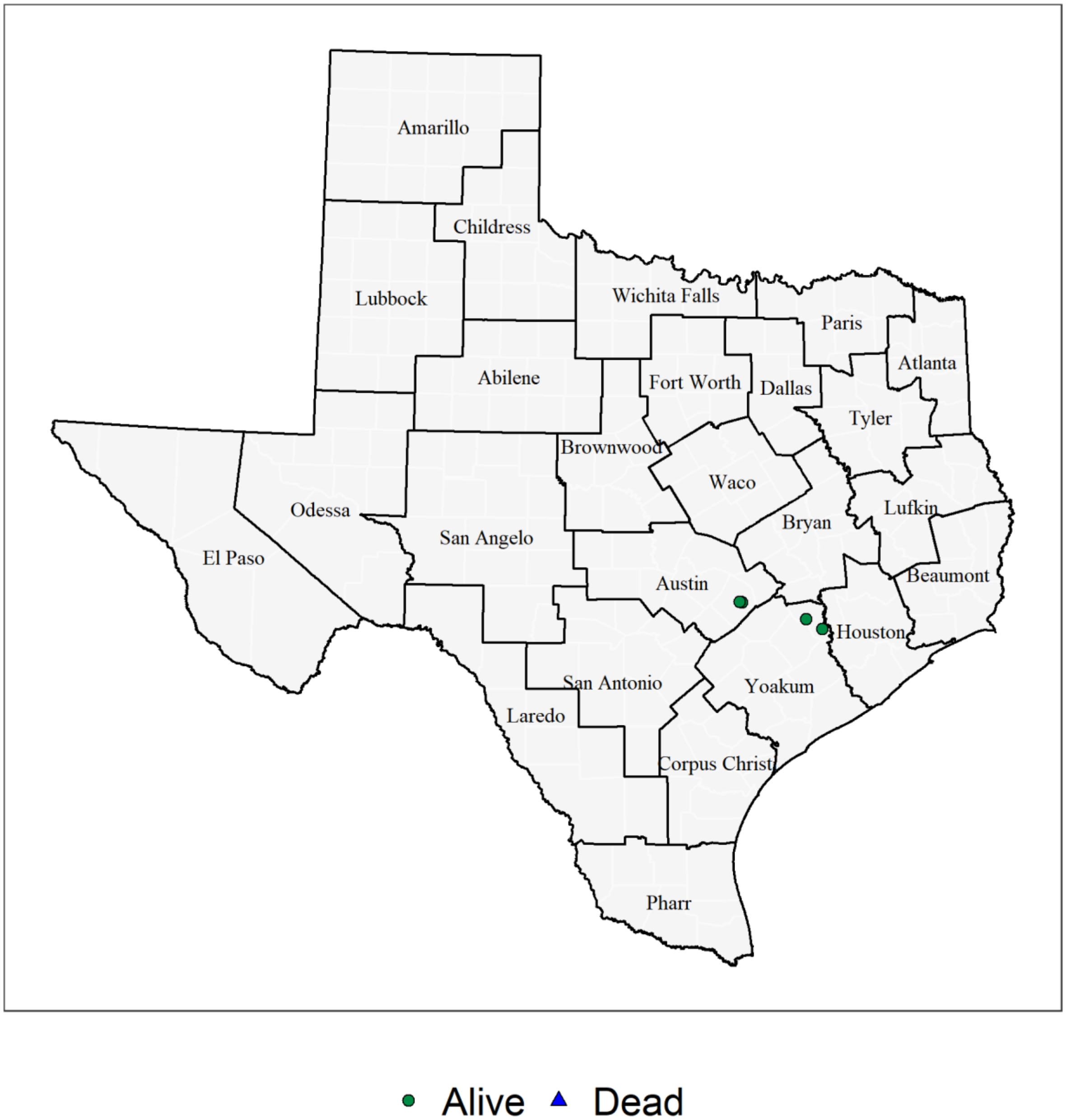
A1. Amphibians – Frogs and Toads

Anaxyrus houstonensis
Houston Toad



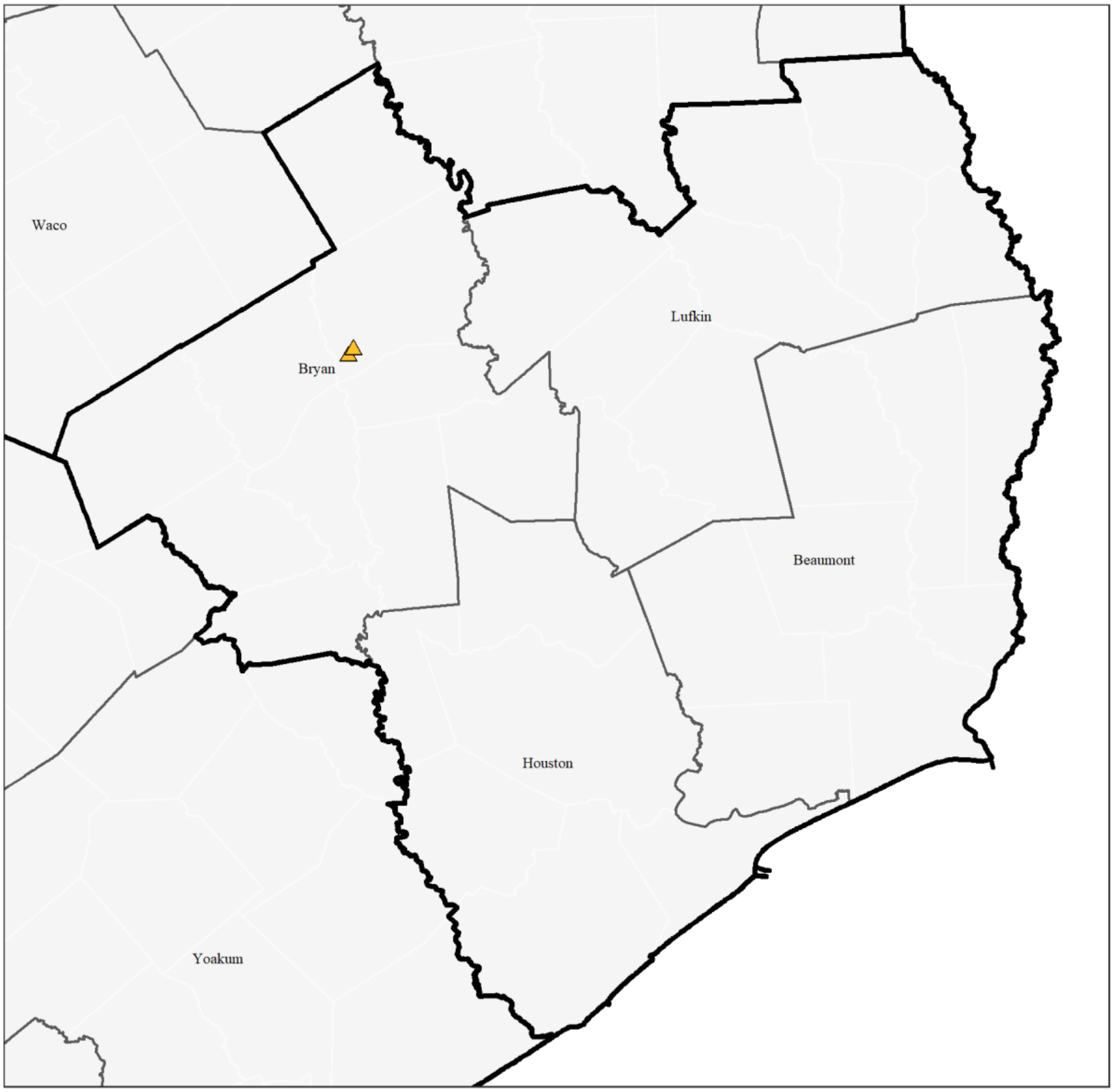
Anaxyrus houstonensis

Houston Toad



Anaxyrus houstonensis

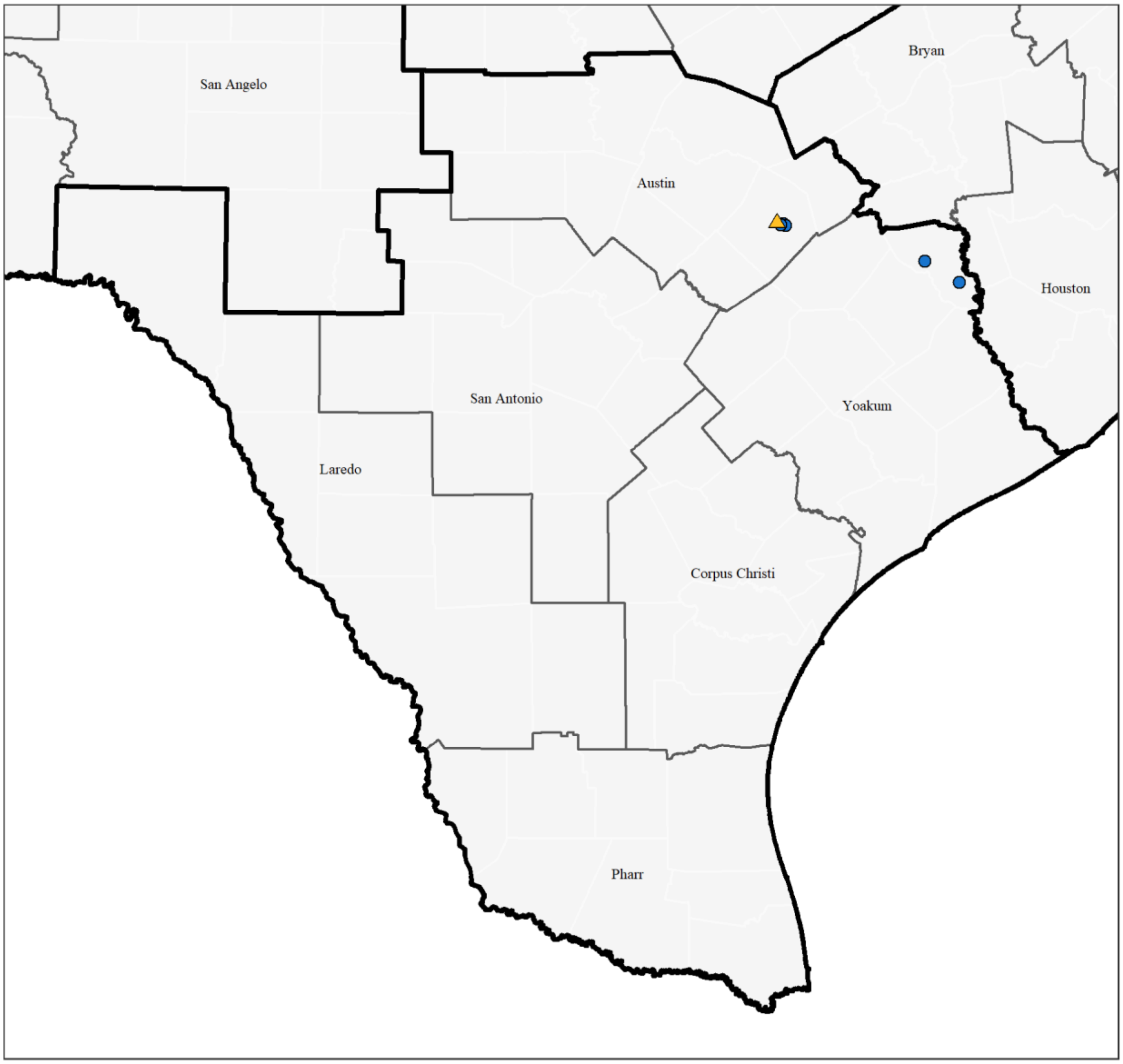
Houston Toad



Near-Road Points Off-Road Points

Anaxyrus houstonensis

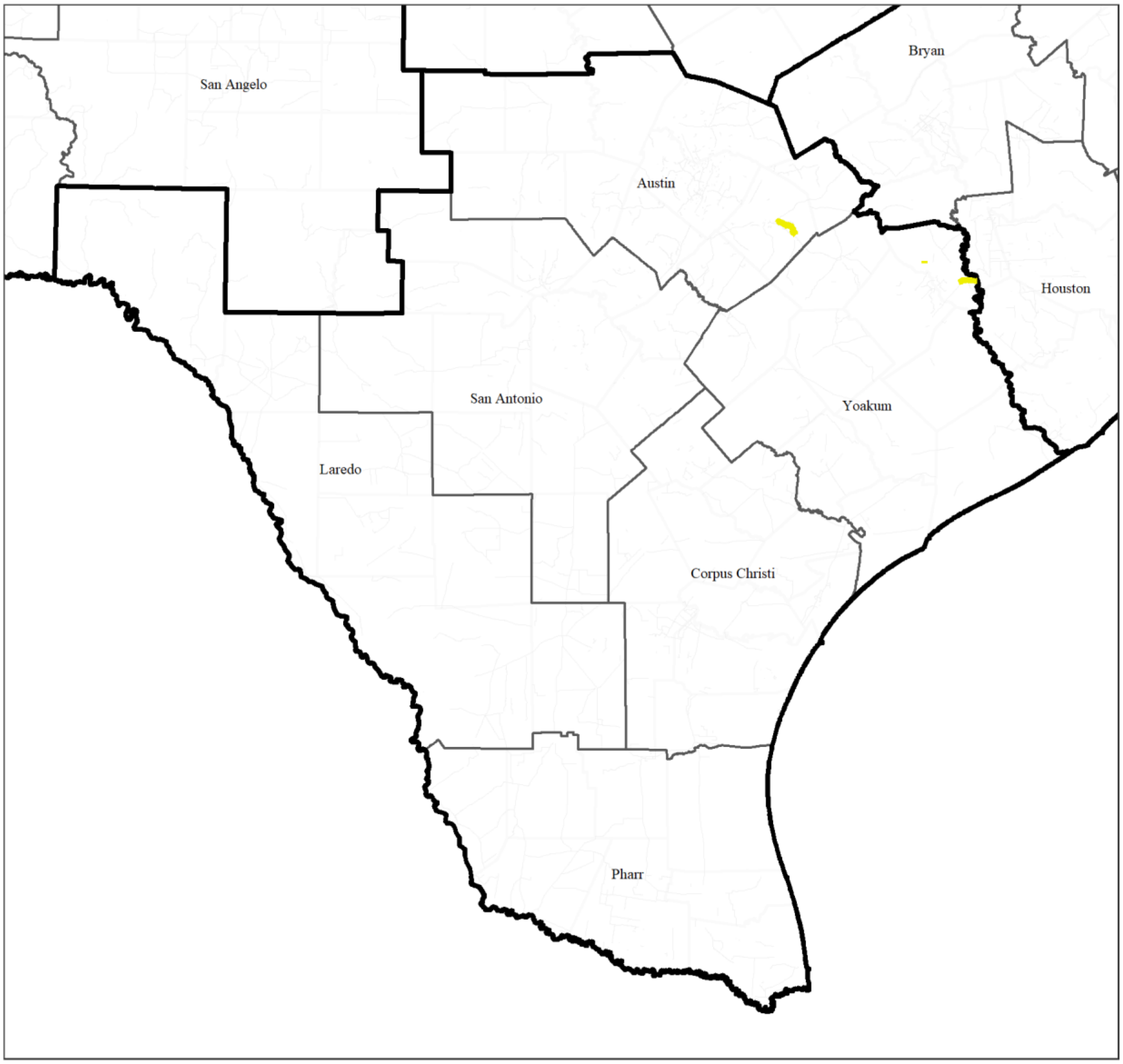
Houston Toad



• Near-Road Points △ Off-Road Points

Anaxyrus houstonensis

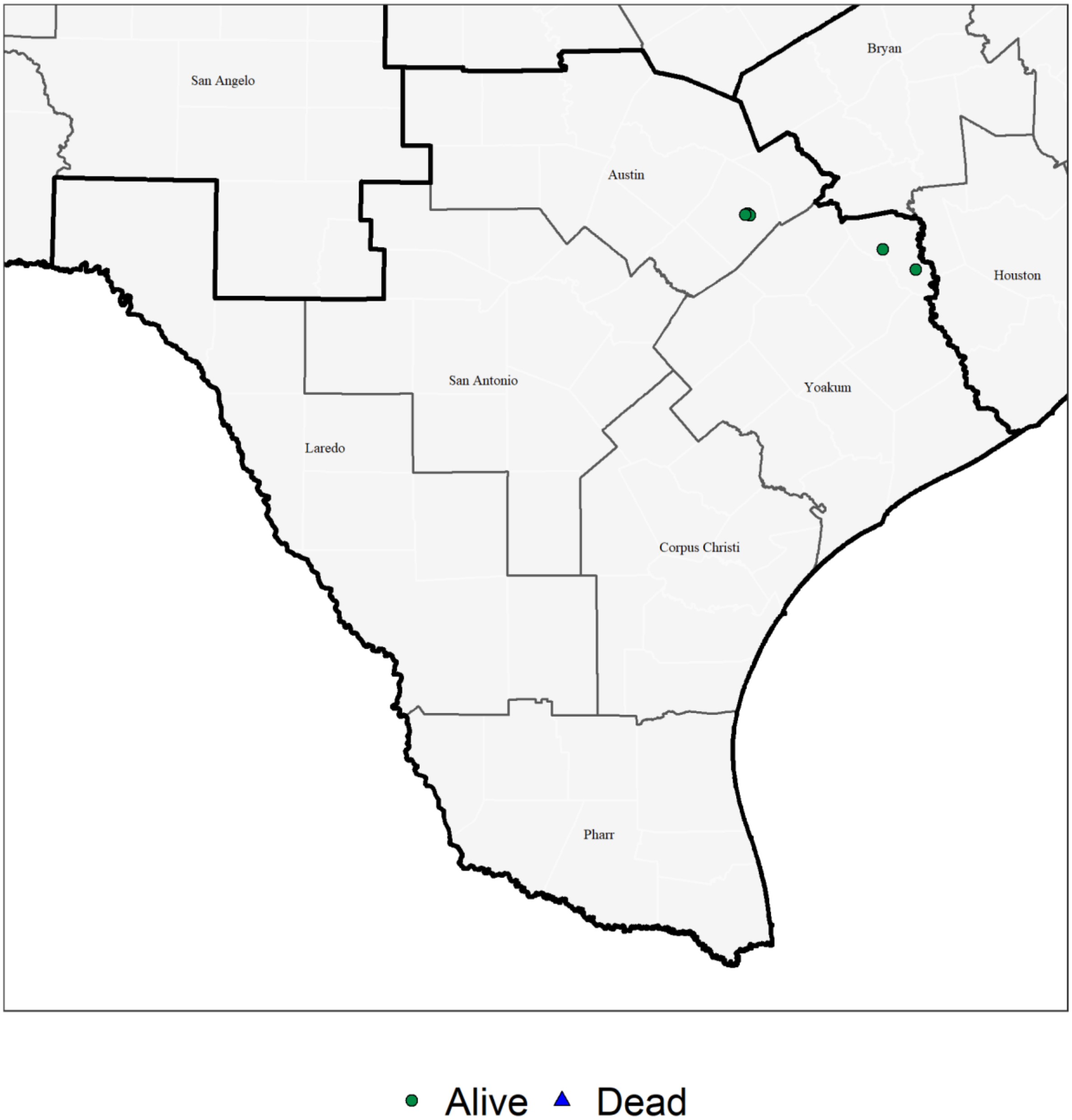
Houston Toad



Points Per Section 1-2 3-4 5-6 7+

Anaxyrus houstonensis

Houston Toad



Anaxyrus woodhousii

Woodhouse's Toad

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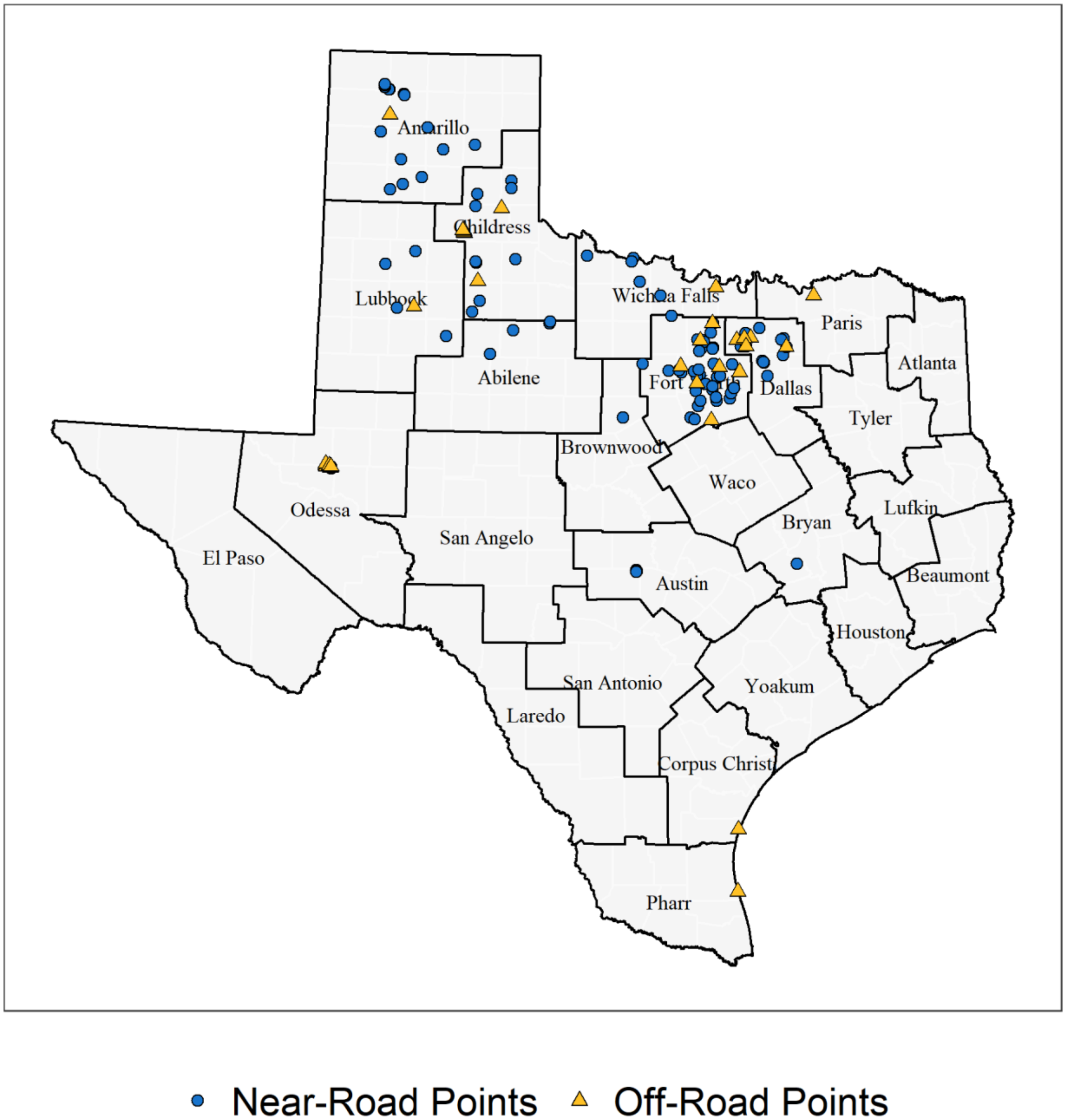
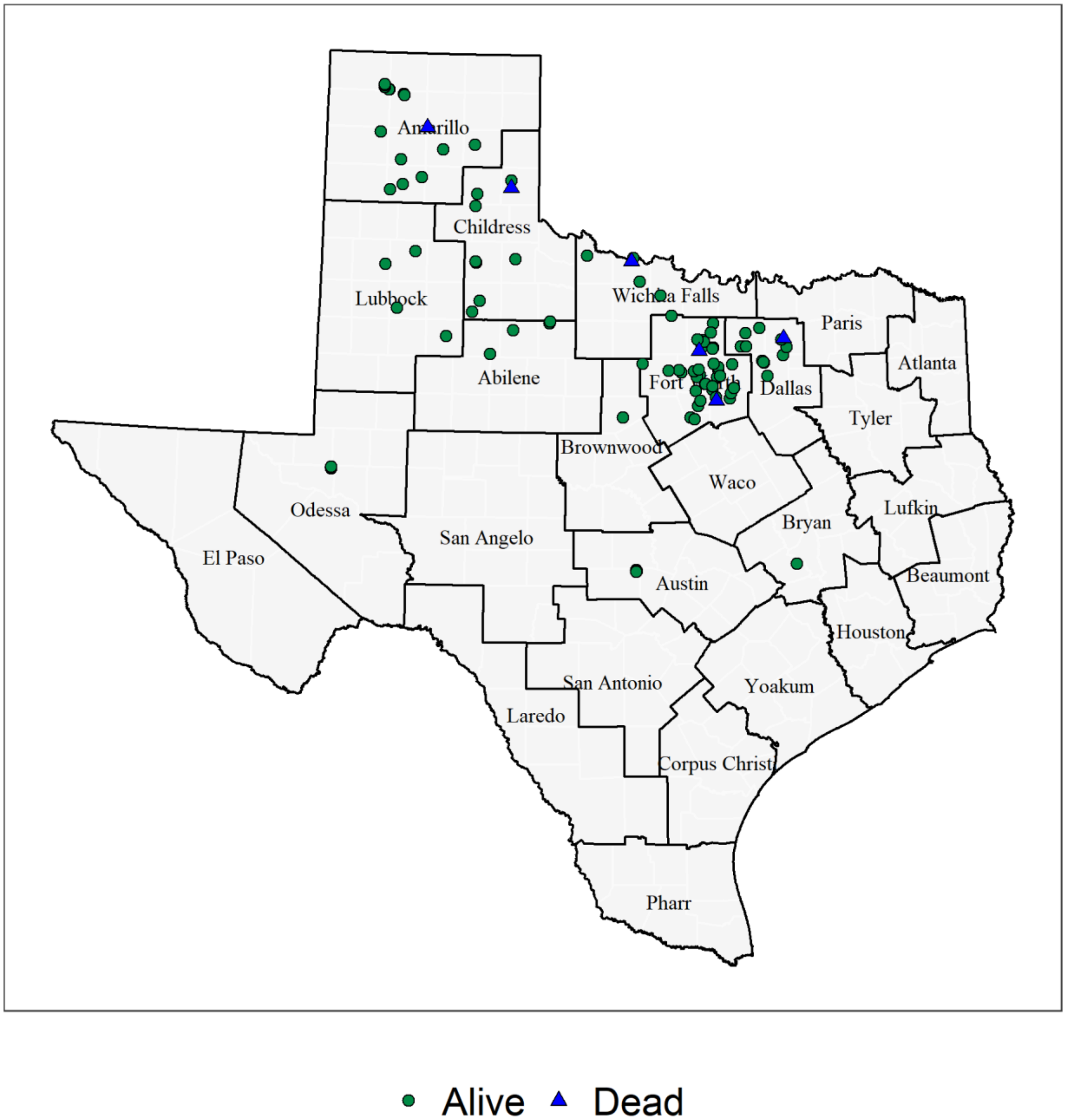


Anaxyrus woodhousii

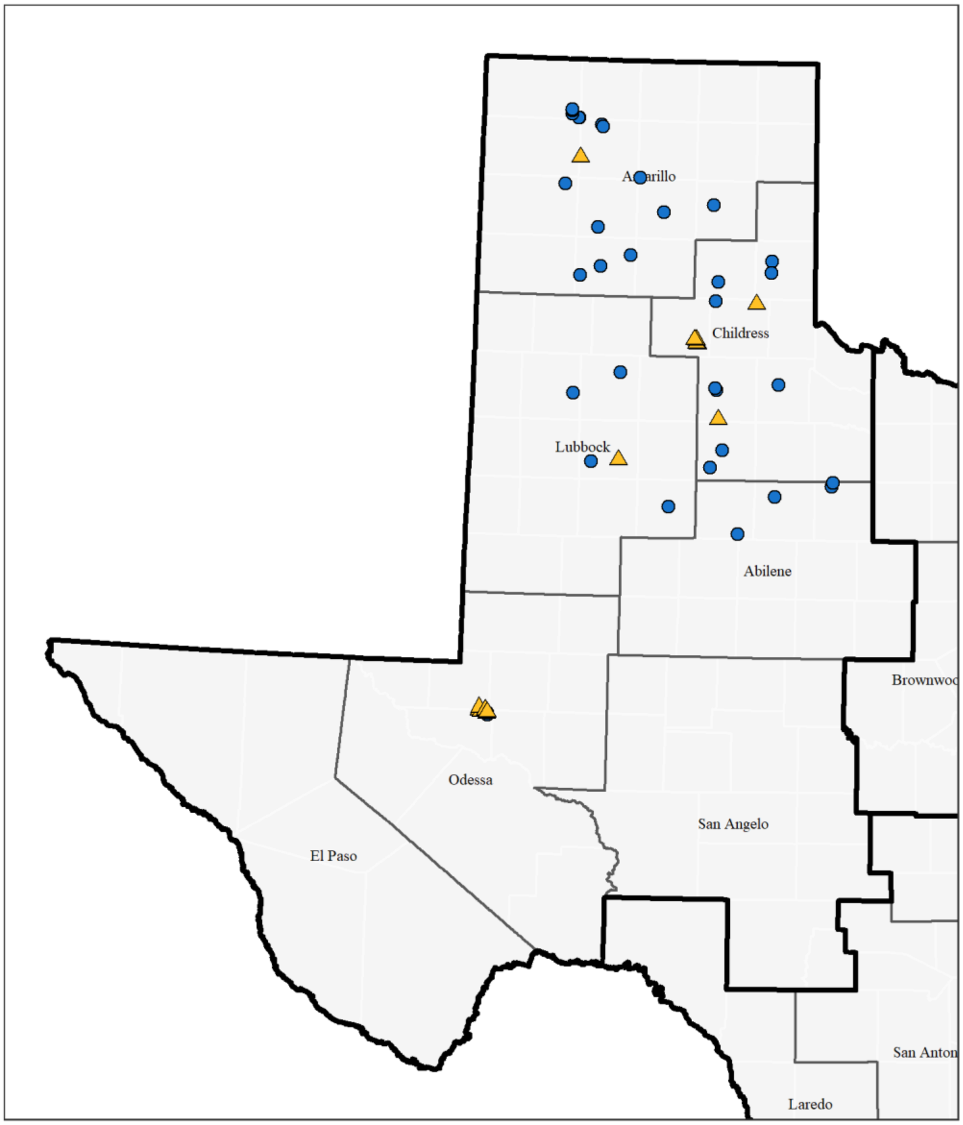
Woodhouse's Toad



Anaxyrus woodhousii

Woodhouse's Toad

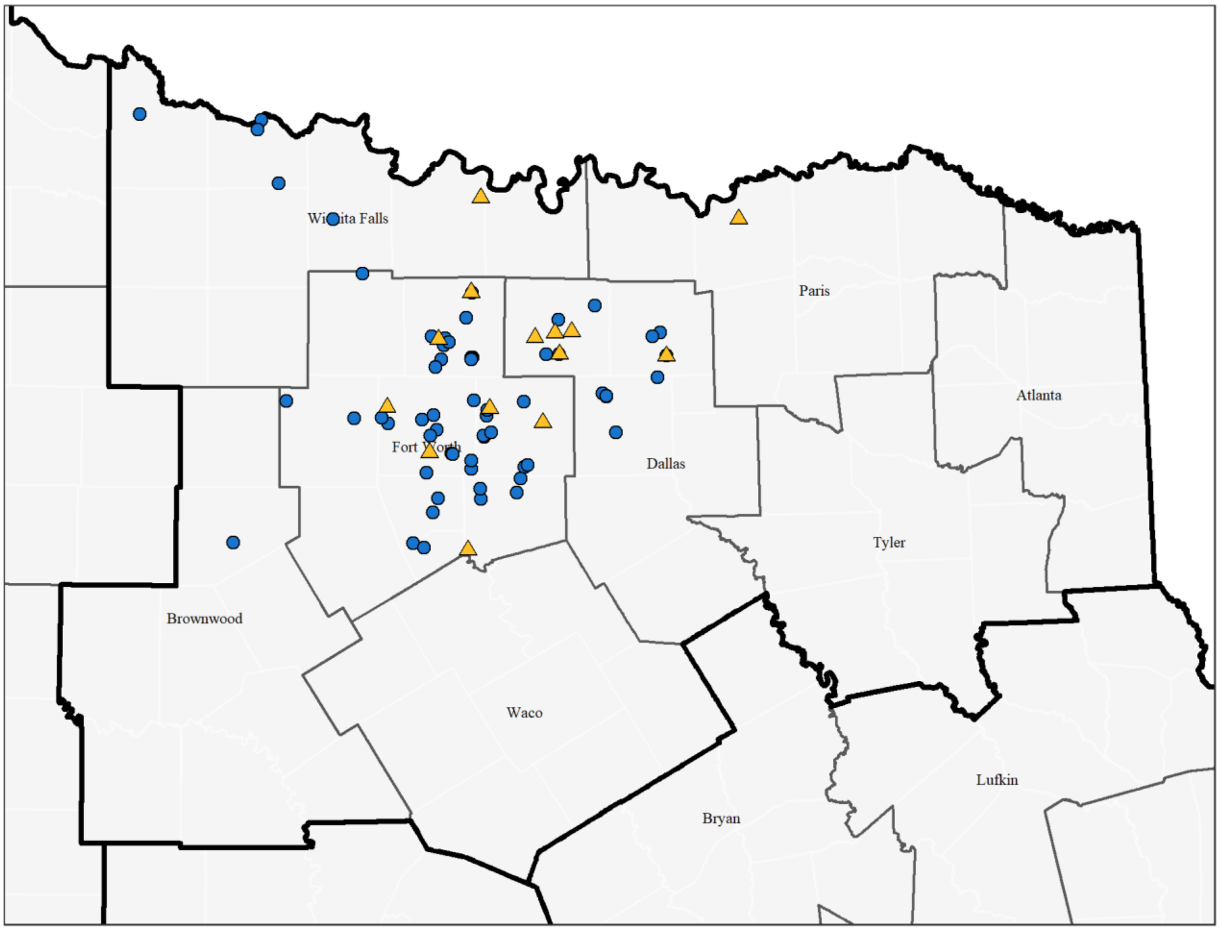
Texas A&M NRI Natural Resources Institute



● Near-Road Points △ Off-Road Points

Anaxyrus woodhousii

Woodhouse's Toad



• Near-Road Points △ Off-Road Points

Anaxyrus woodhousii

Woodhouse's Toad

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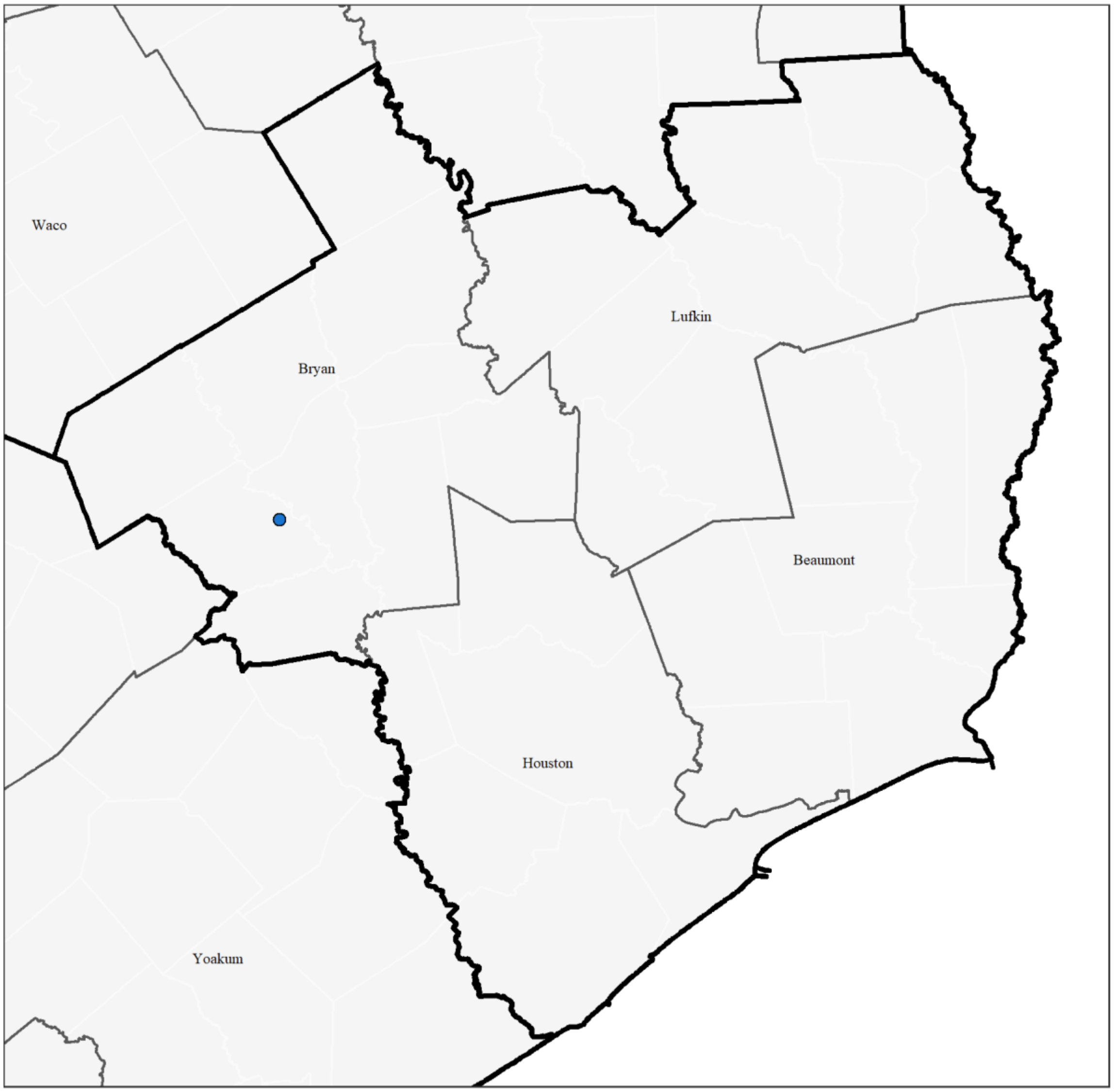

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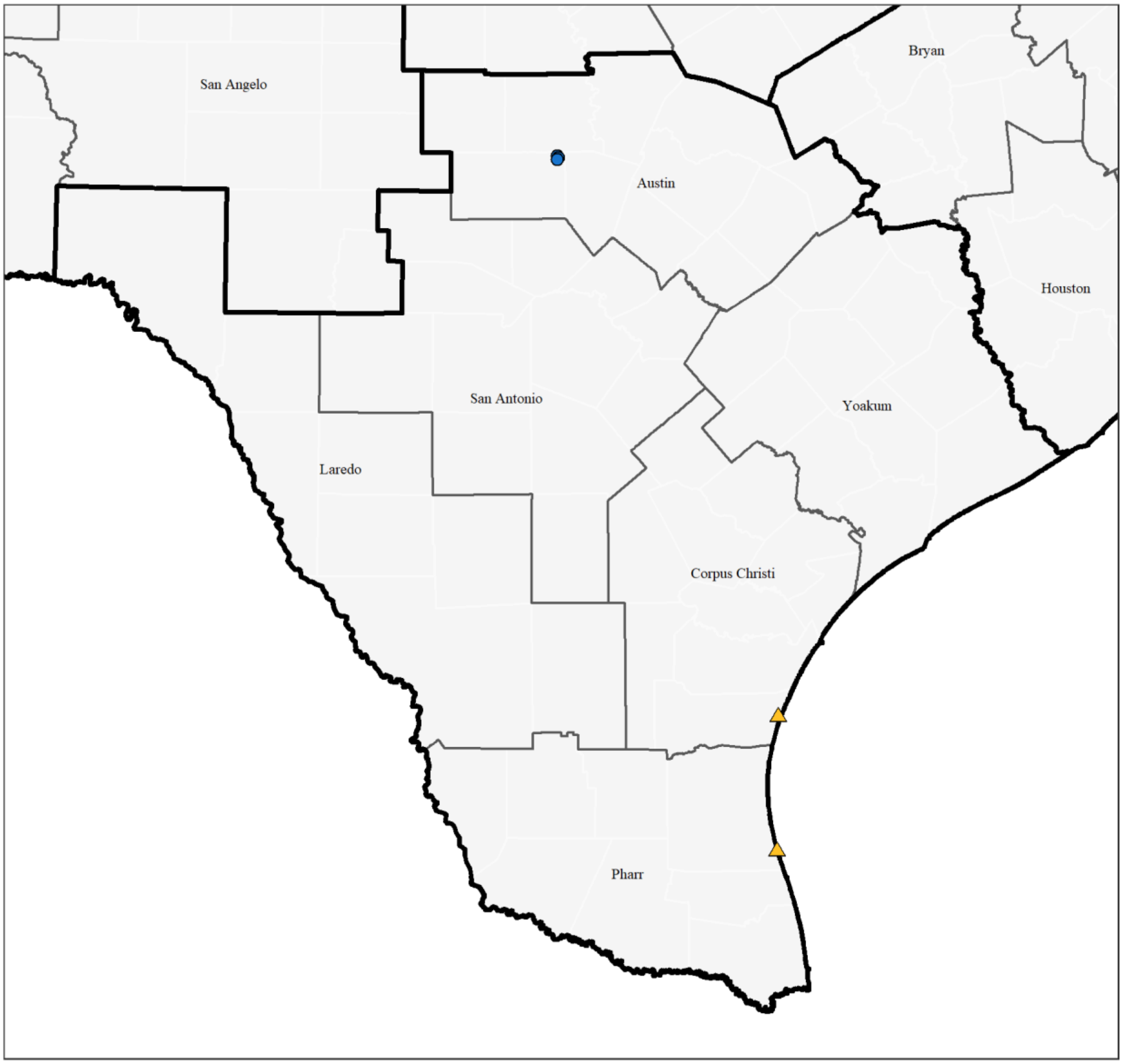
Anaxyrus woodhousii

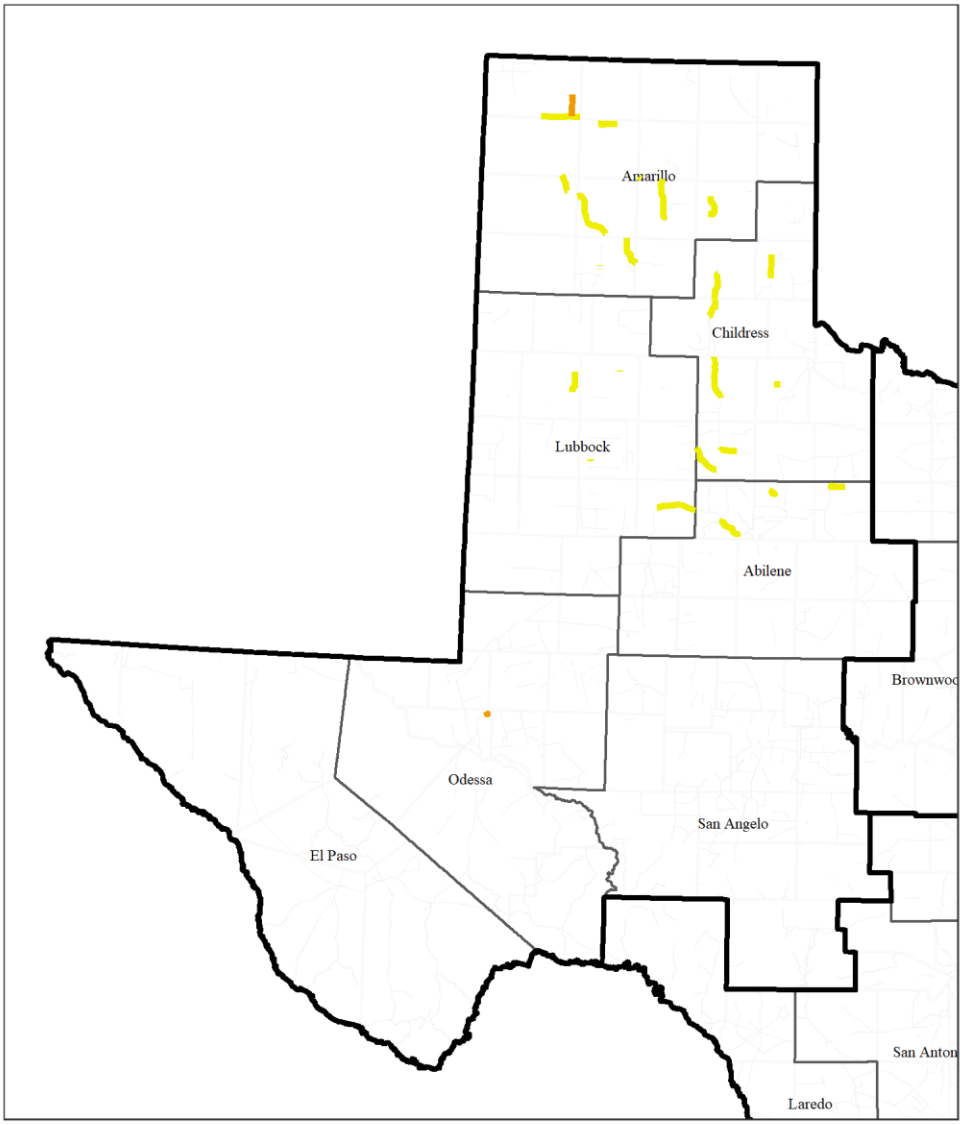
Woodhouse's Toad



● Near-Road Points ▲ Off-Road Points

Anaxyrus woodhousii

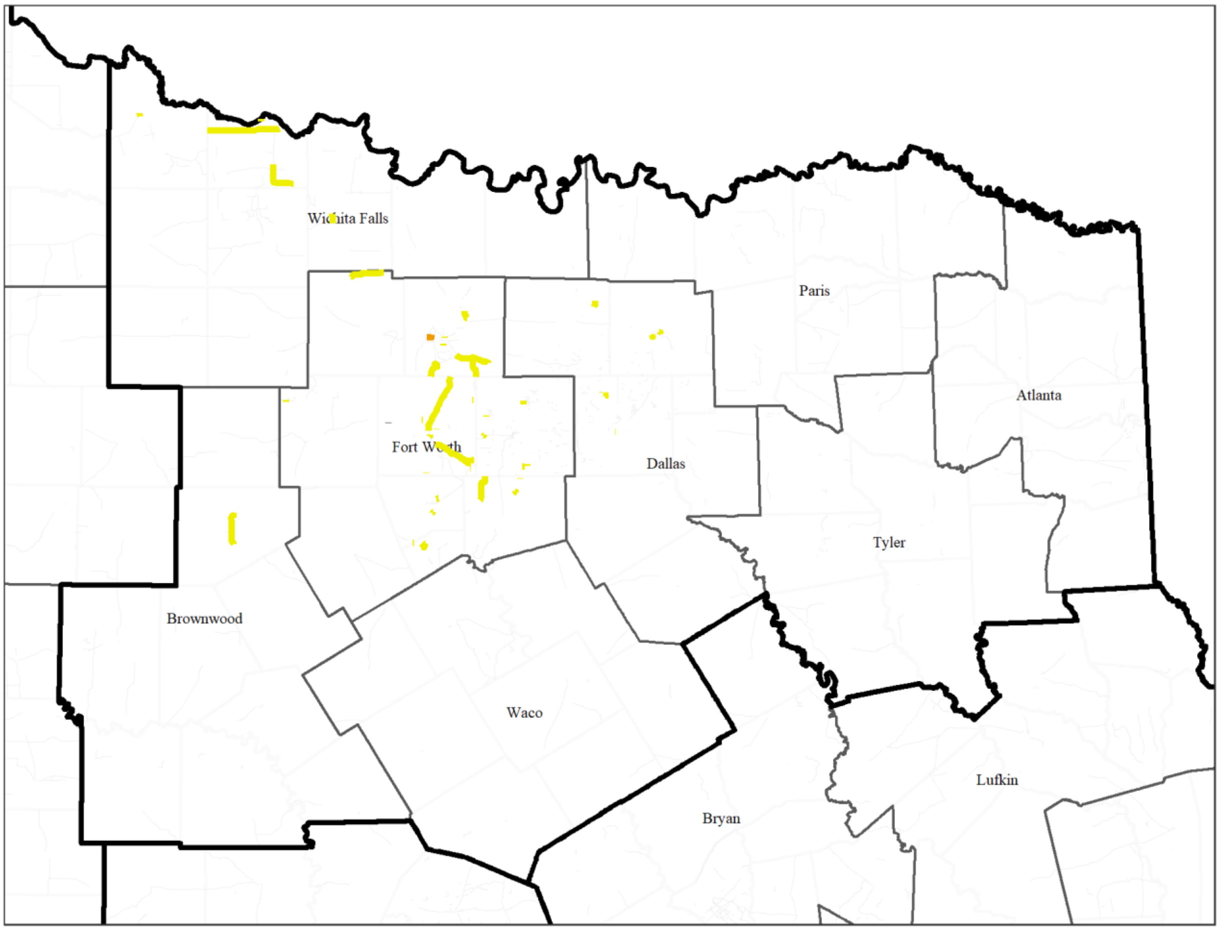
Woodhouse's Toad



Points Per Section 1-2 3-4 5-6 7+

Anaxyrus woodhousii

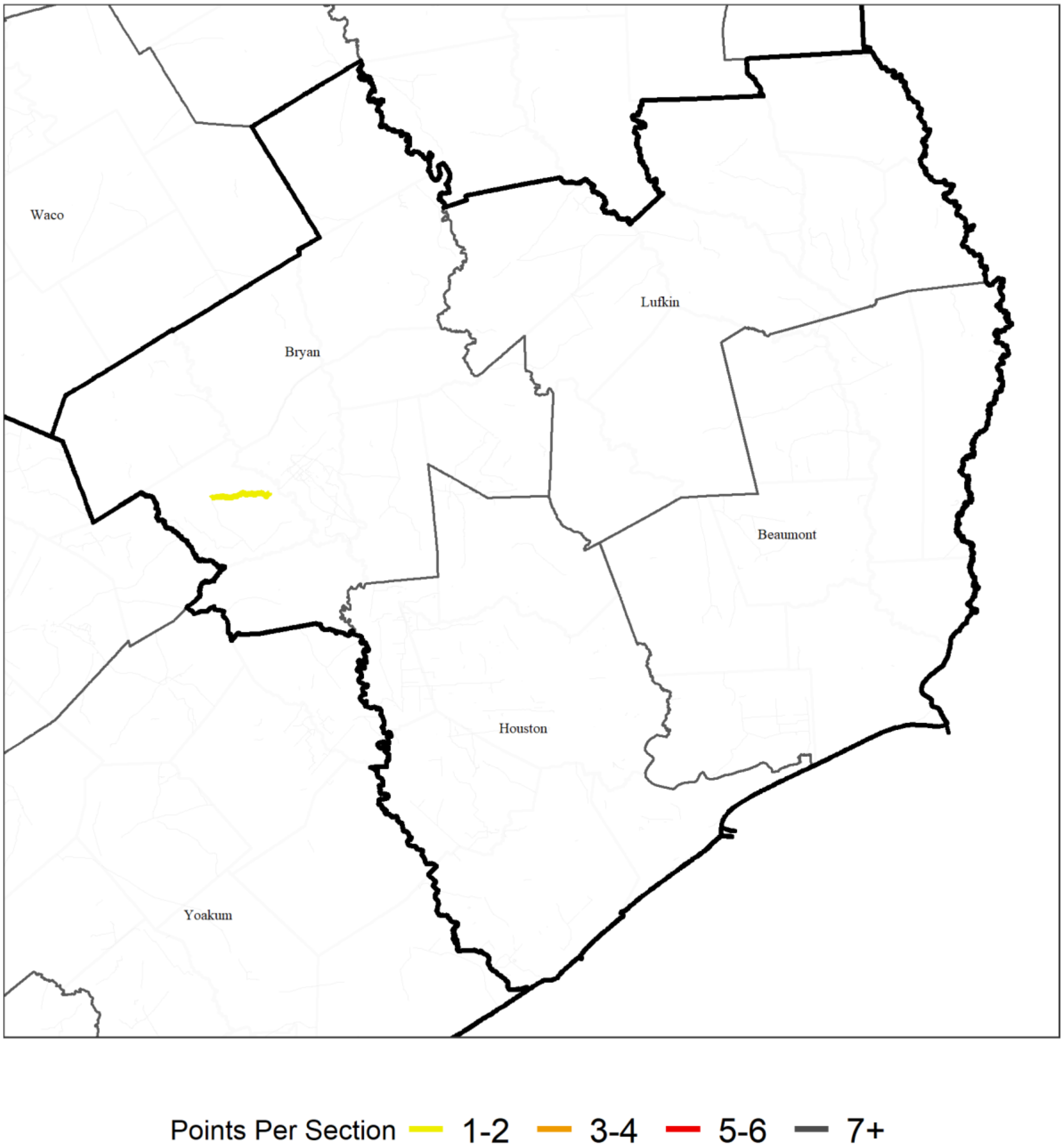
Woodhouse's Toad



Points Per Section 1-2 3-4 5-6 7+

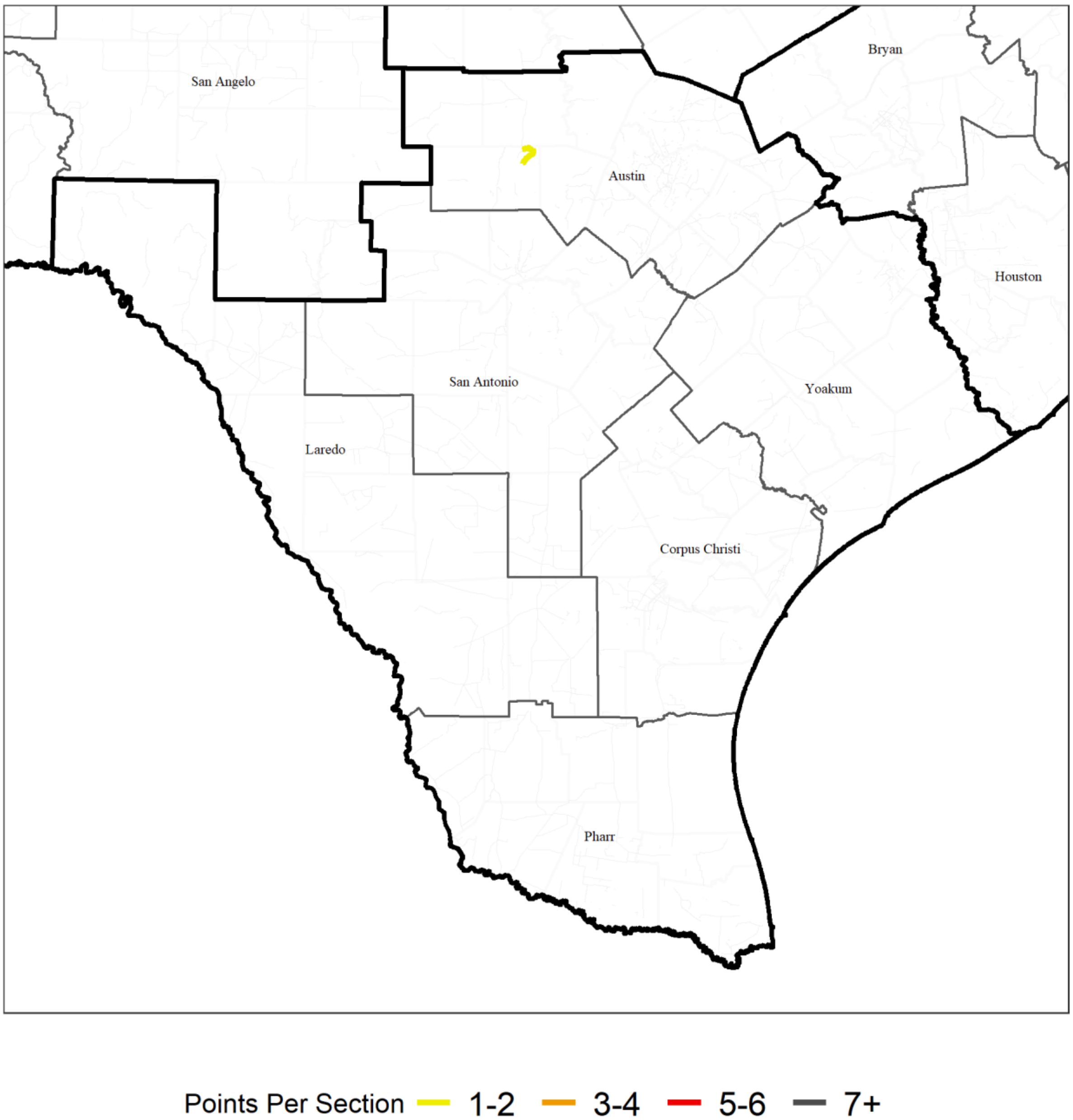
Anaxyrus woodhousii

Woodhouse's Toad

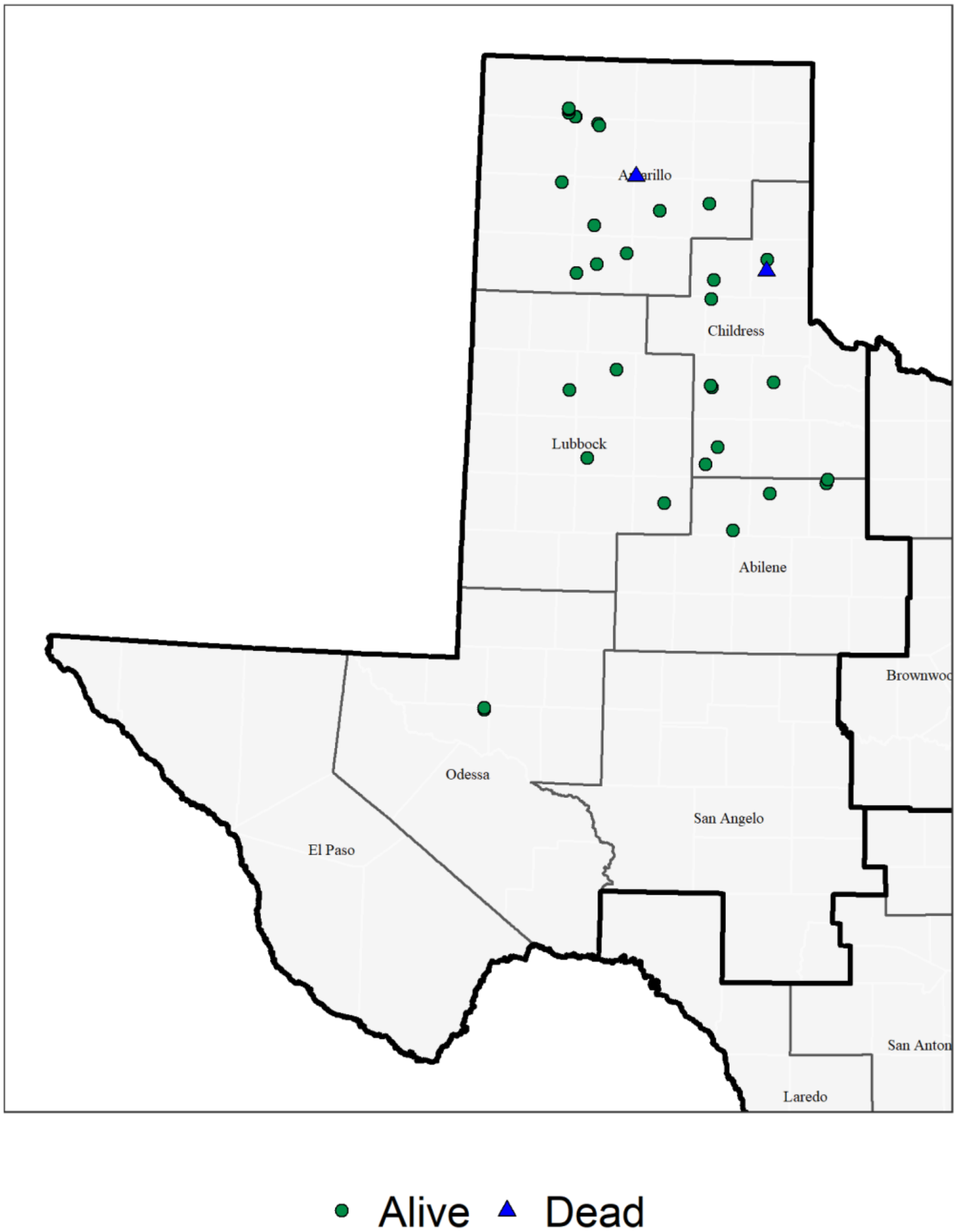


Anaxyrus woodhousii

Woodhouse's Toad

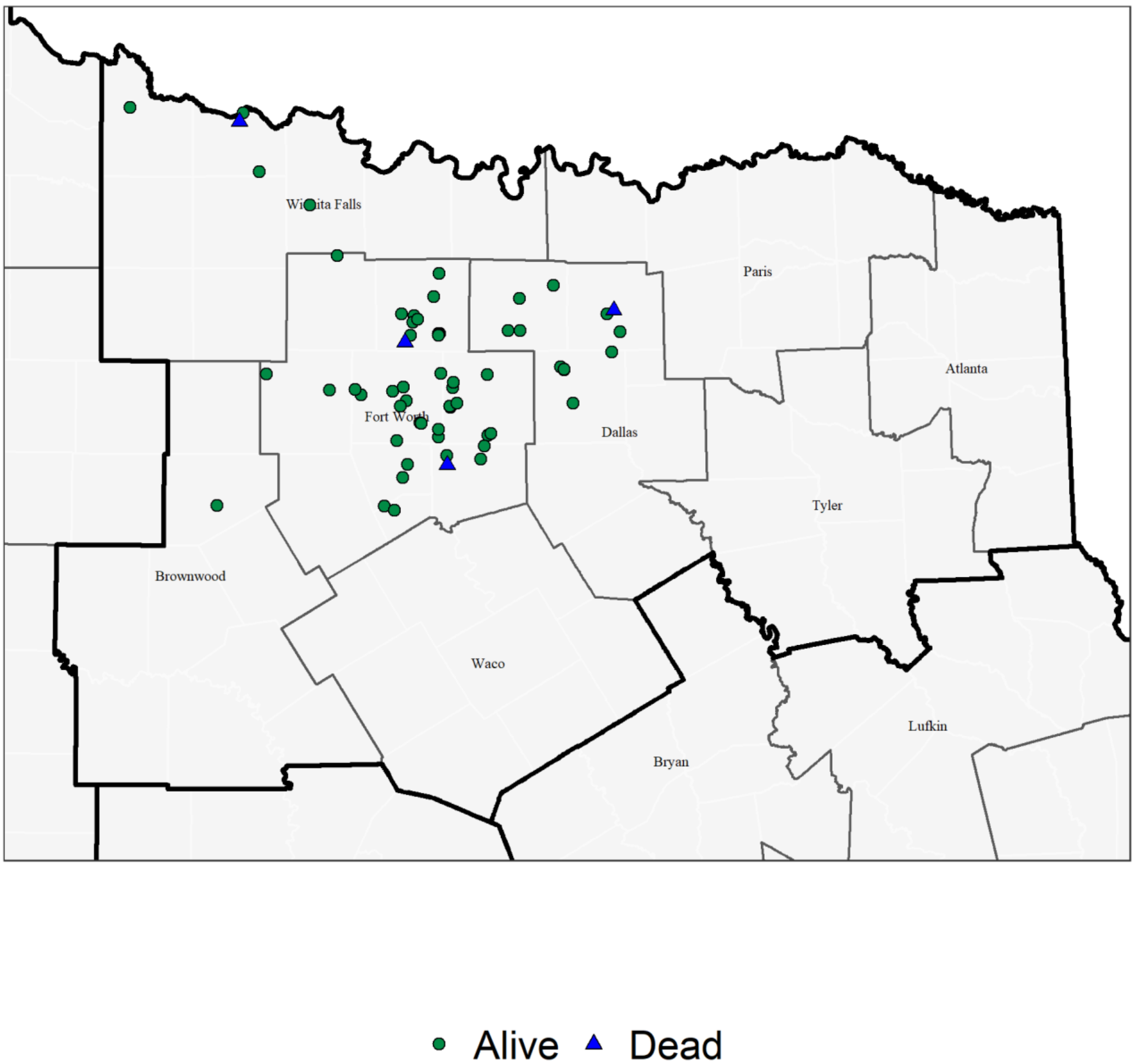


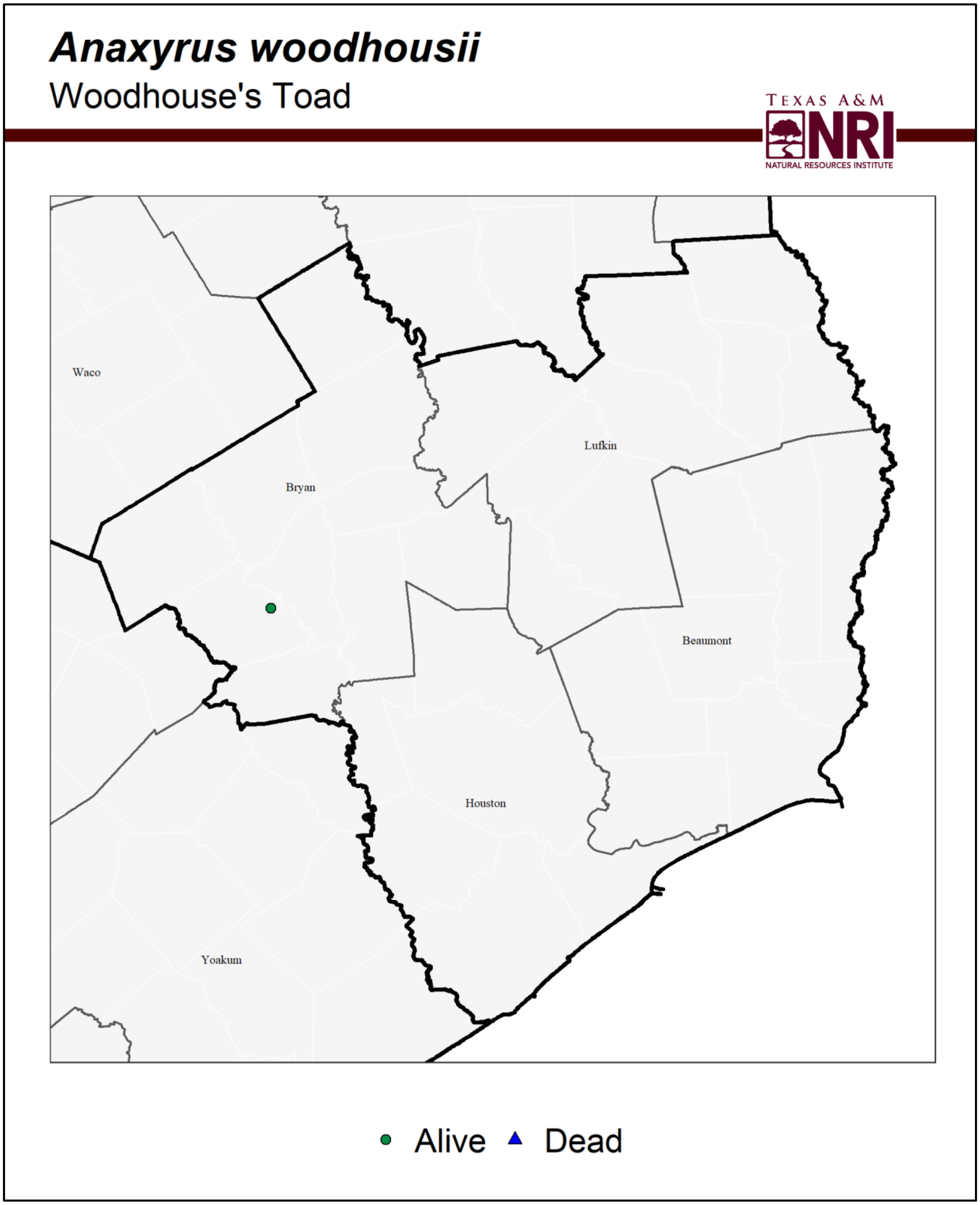
Anaxyrus woodhousii
Woodhouse's Toad



Anaxyrus woodhousii

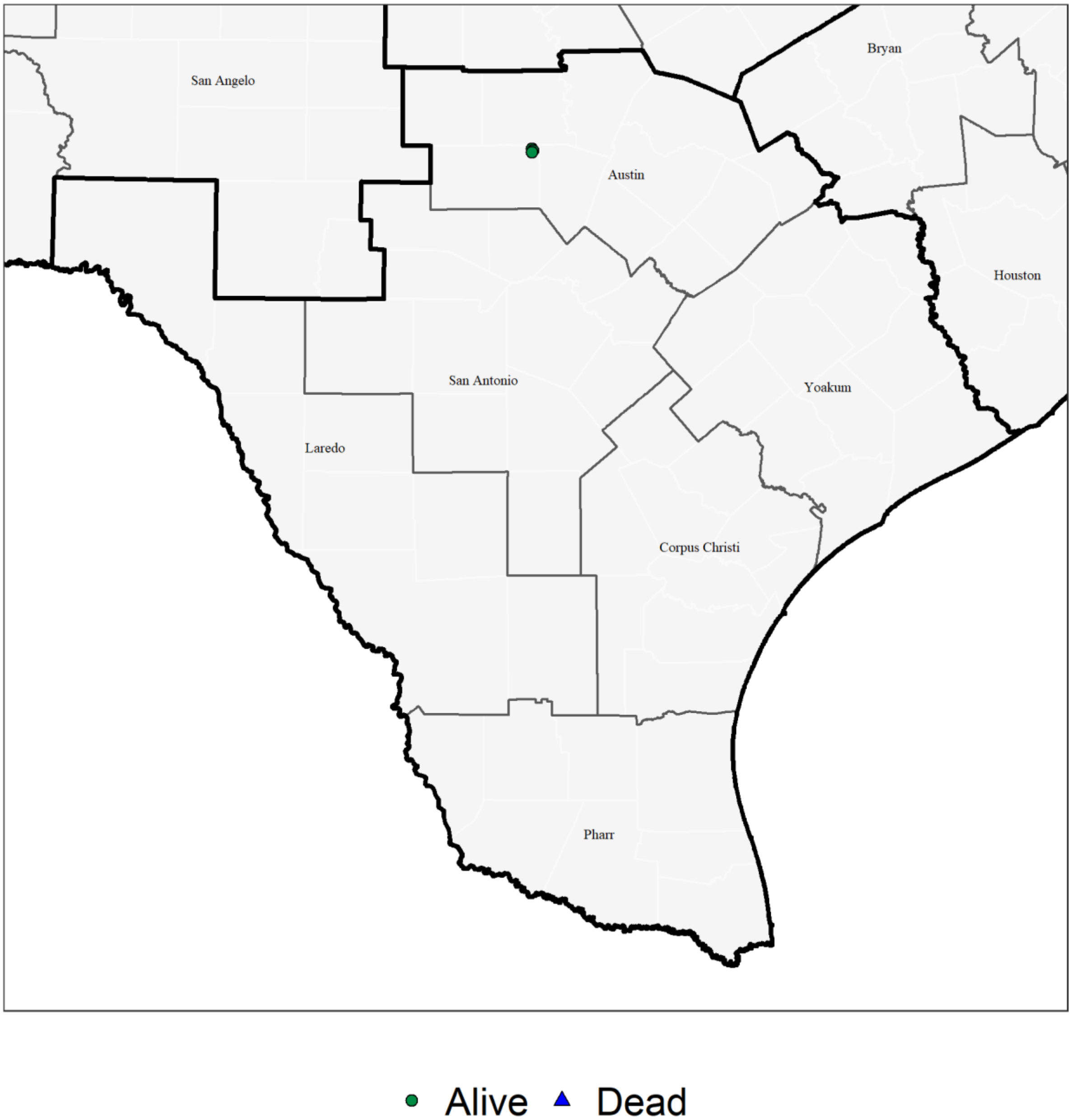
Woodhouse's Toad




Anaxyrus woodhousii
Woodhouse's Toad
TEXAS A&M
NRI
NATURAL RESOURCES INSTITUTE
Waco
Bryan
Lufkin
Beaumont
Houston
Yoakum
Alive
Dead

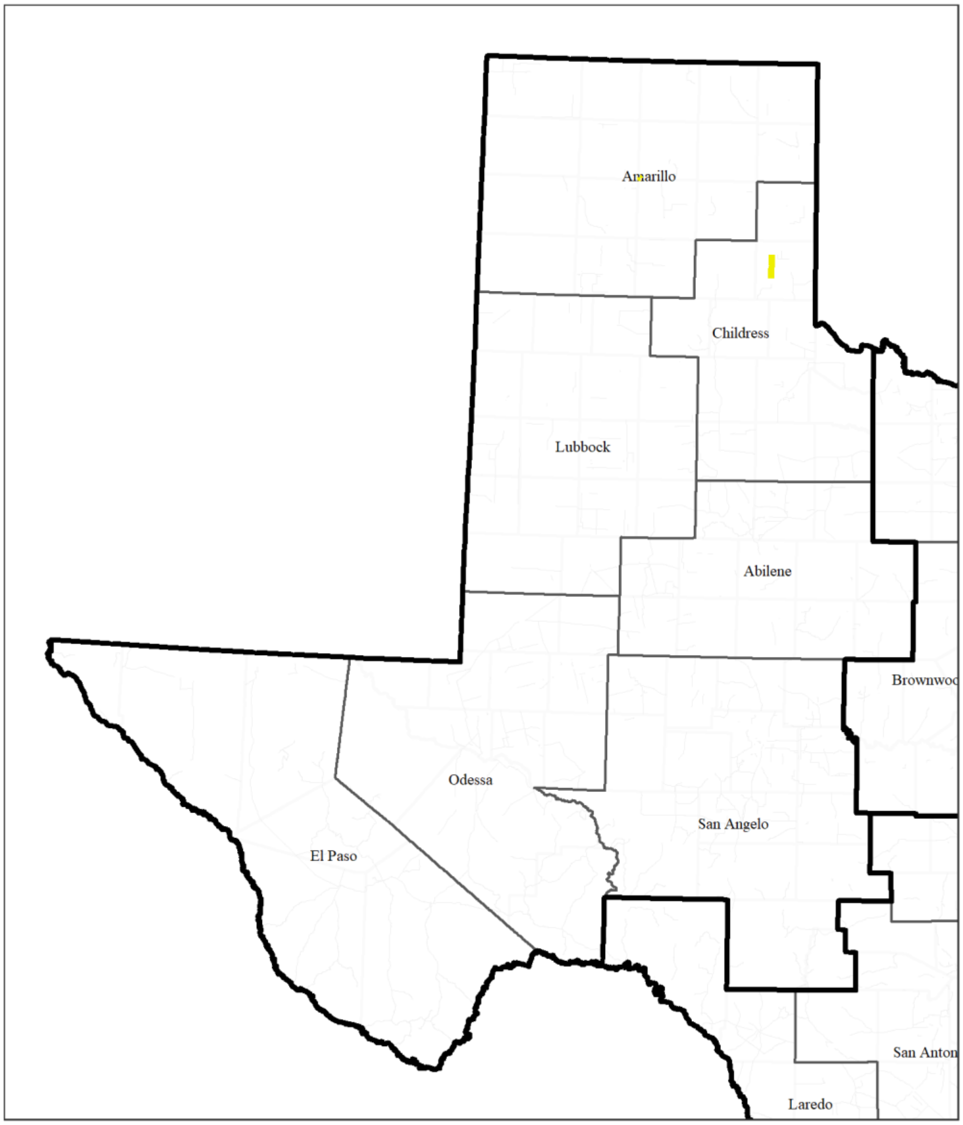
Anaxyrus woodhousii

Woodhouse's Toad



Anaxyrus woodhousii

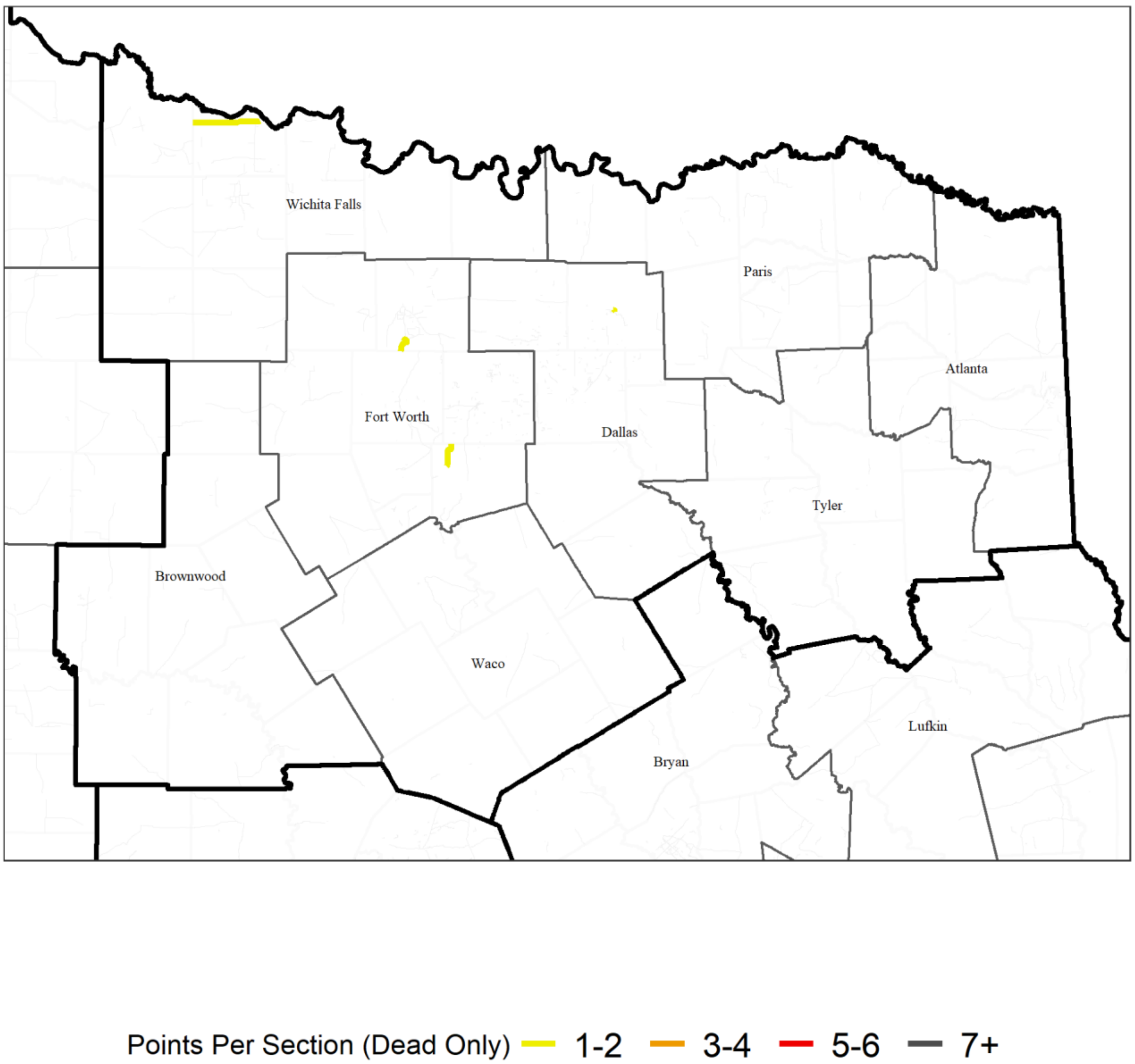
Woodhouse's Toad



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Anaxyrus woodhousii

Woodhouse's Toad



Hypopachus variolosus
Sheep Frog

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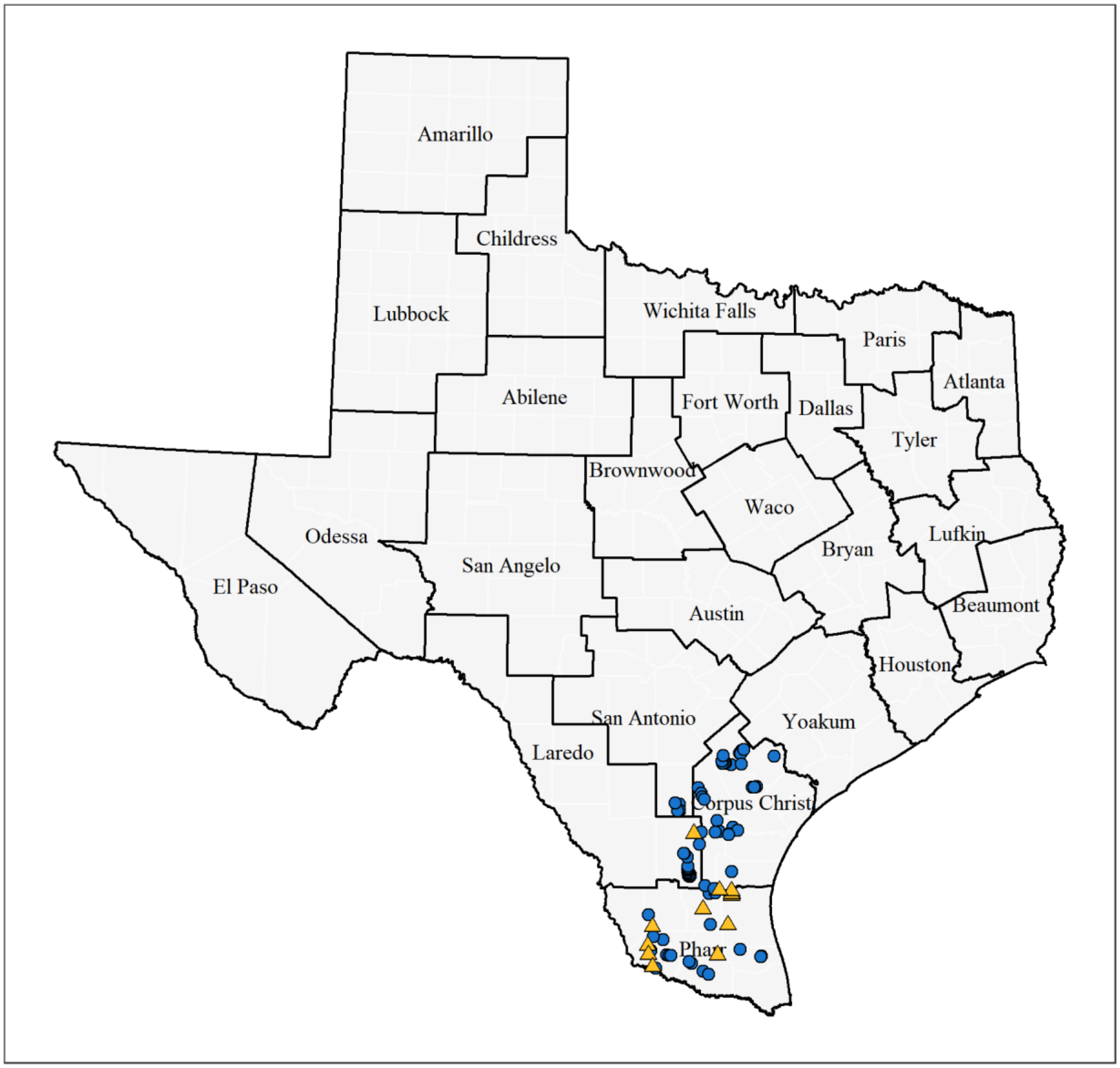
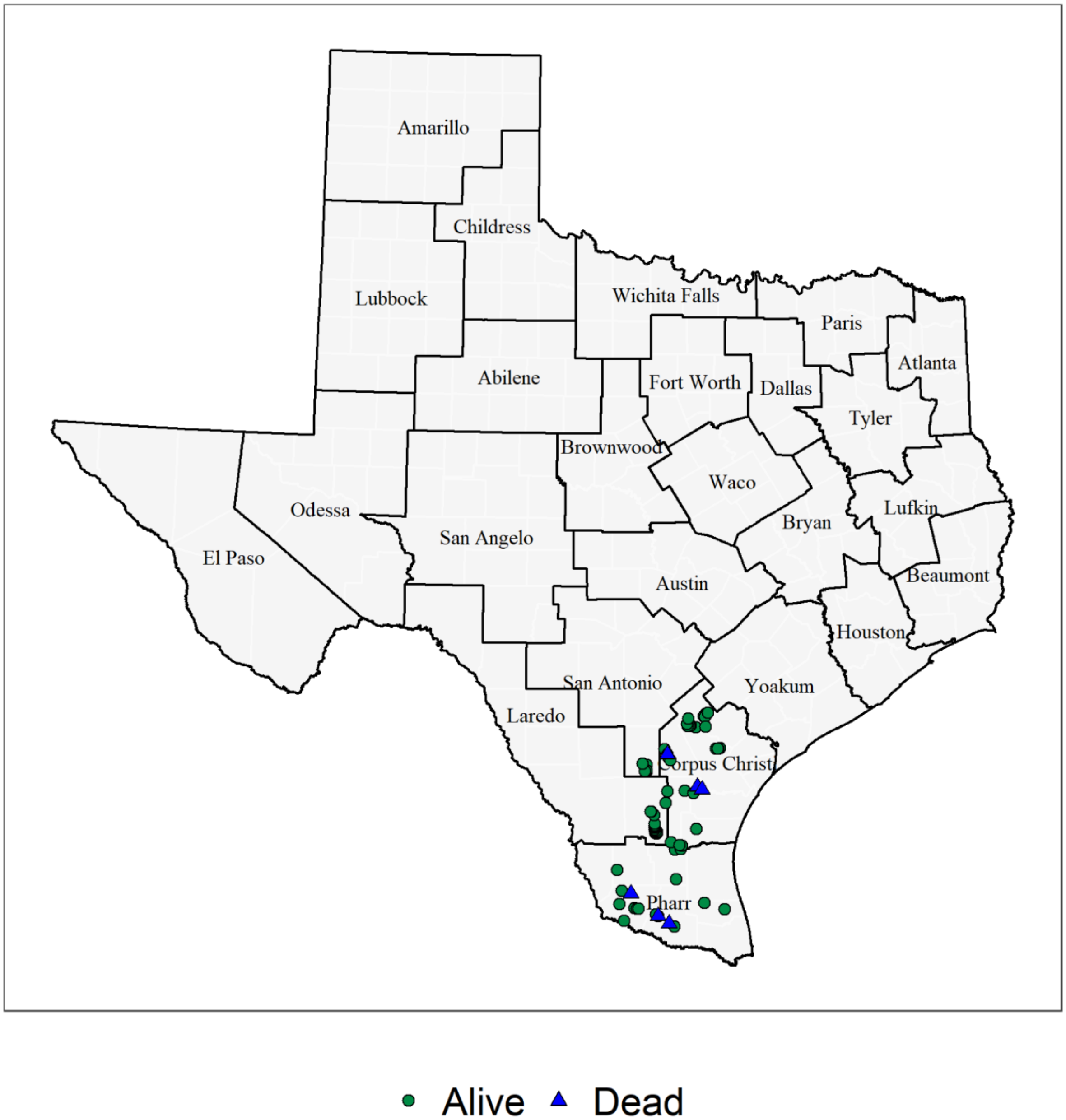


● Near-Road Points ▲ Off-Road Points

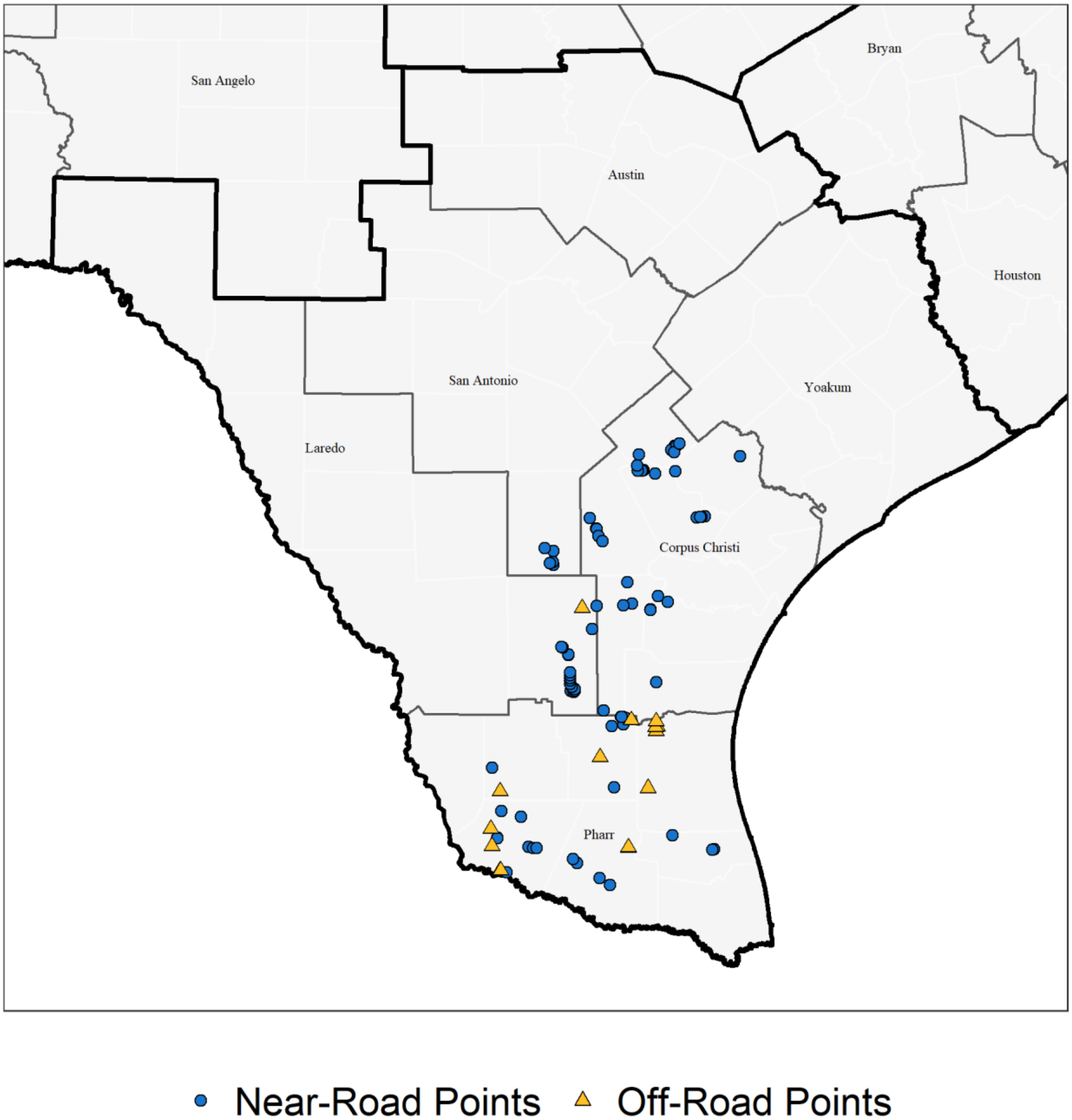
Hypopachus variolosus

Sheep Frog



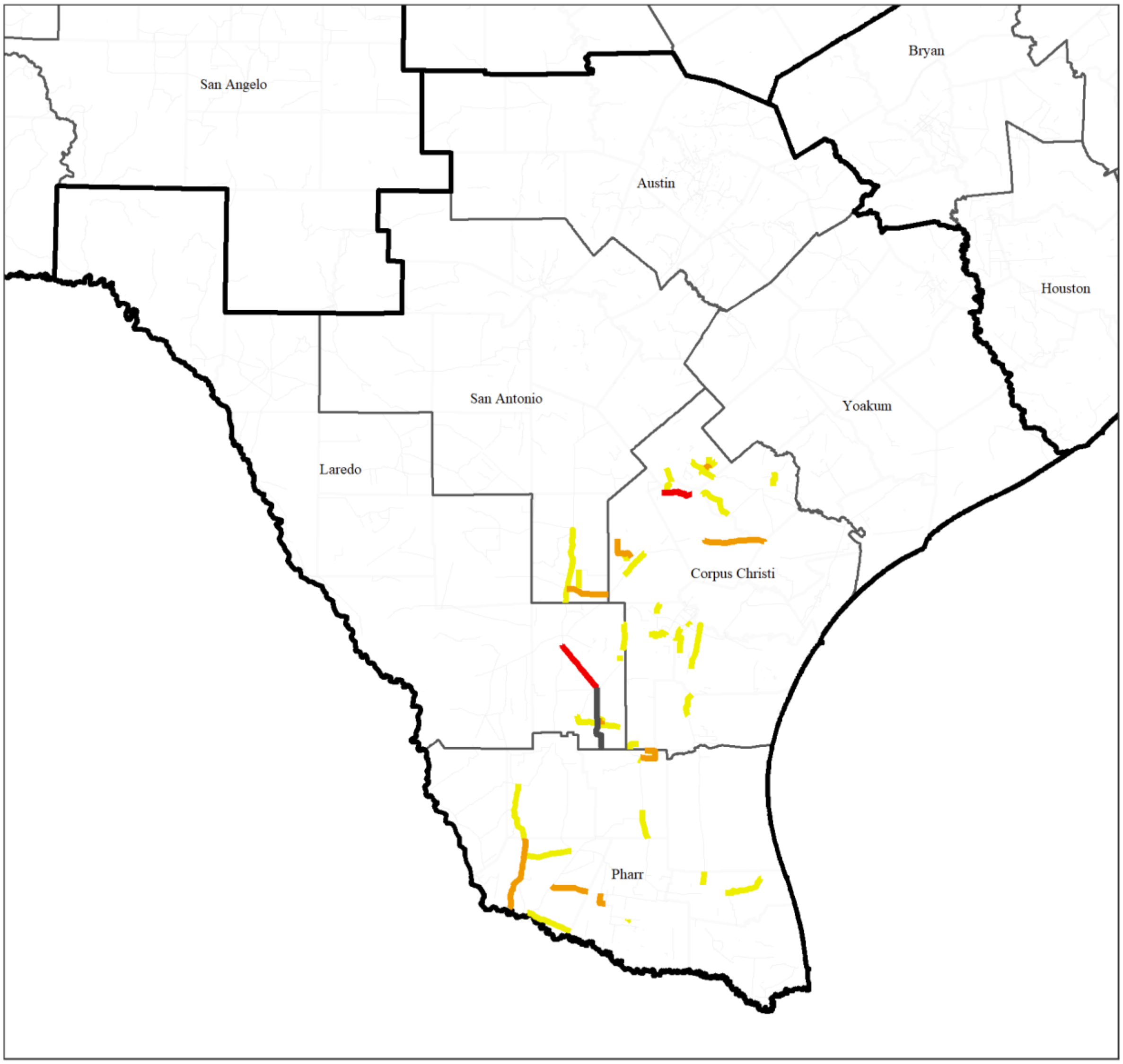
Hypopachus variolosus

Sheep Frog



Hypopachus variolosus

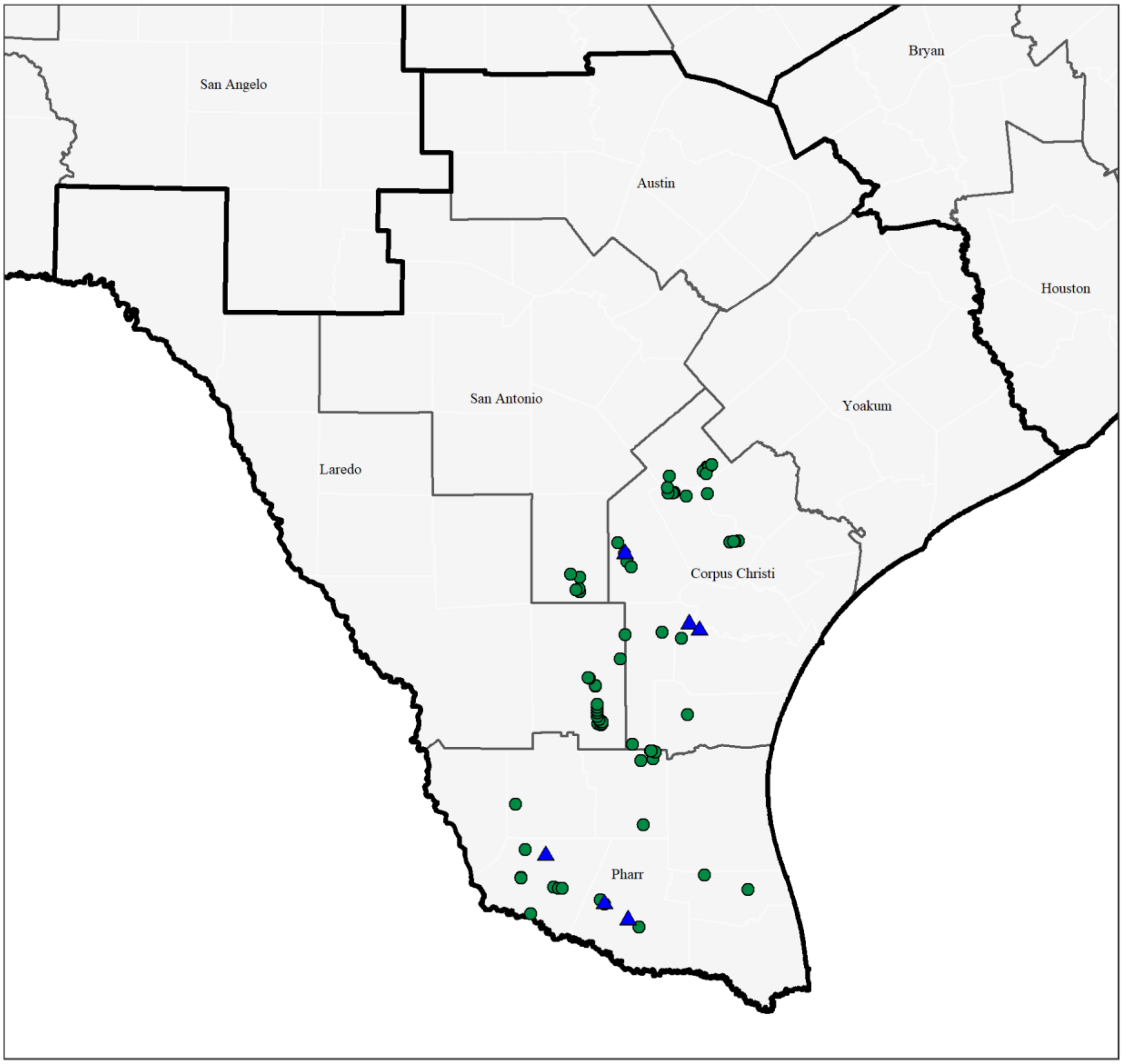
Sheep Frog



Points Per Section 1-2 3-4 5-6 7+

Hypopachus variolosus

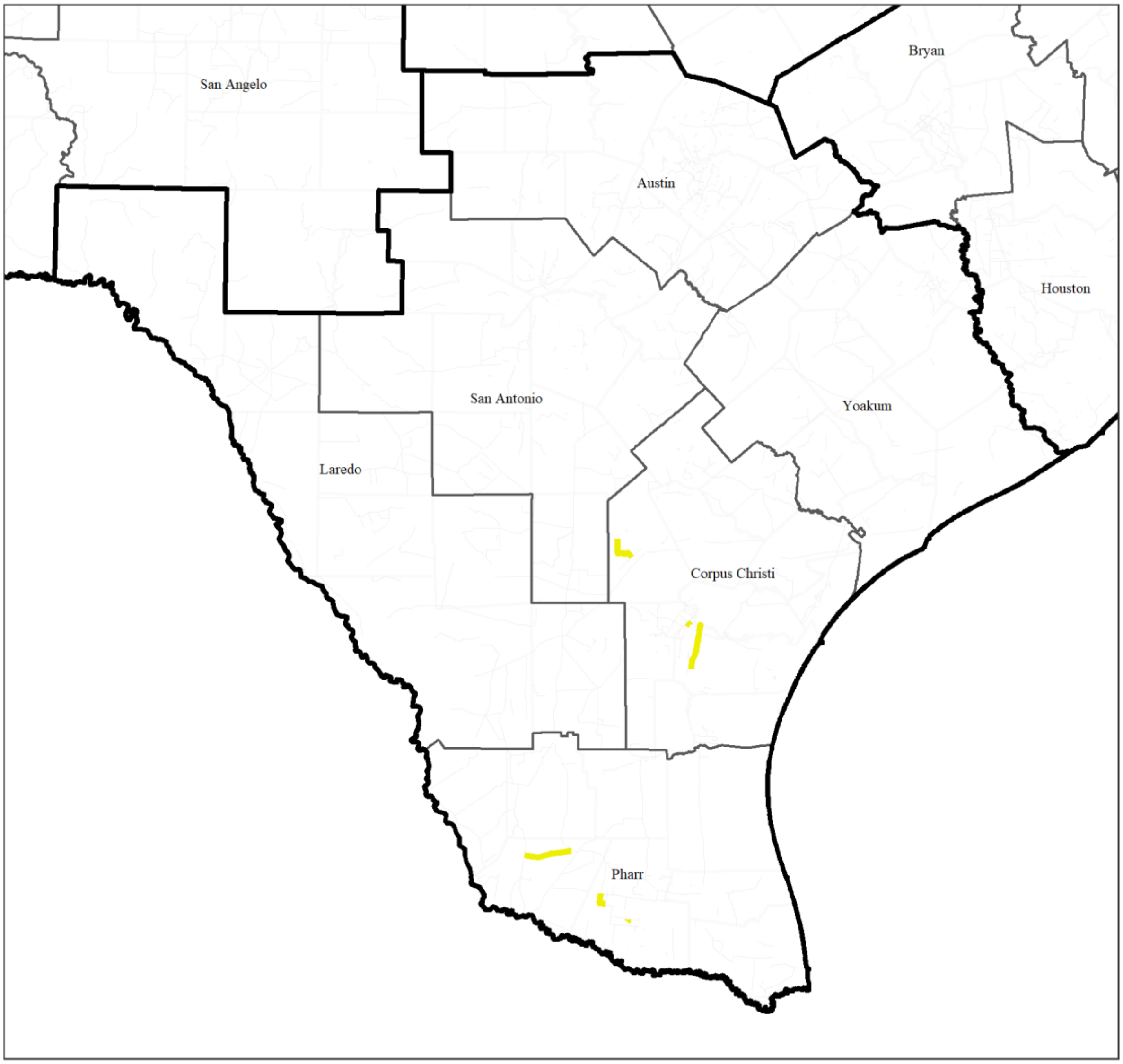
Sheep Frog



Alive Dead

Hypopachus variolosus
Sheep Frog

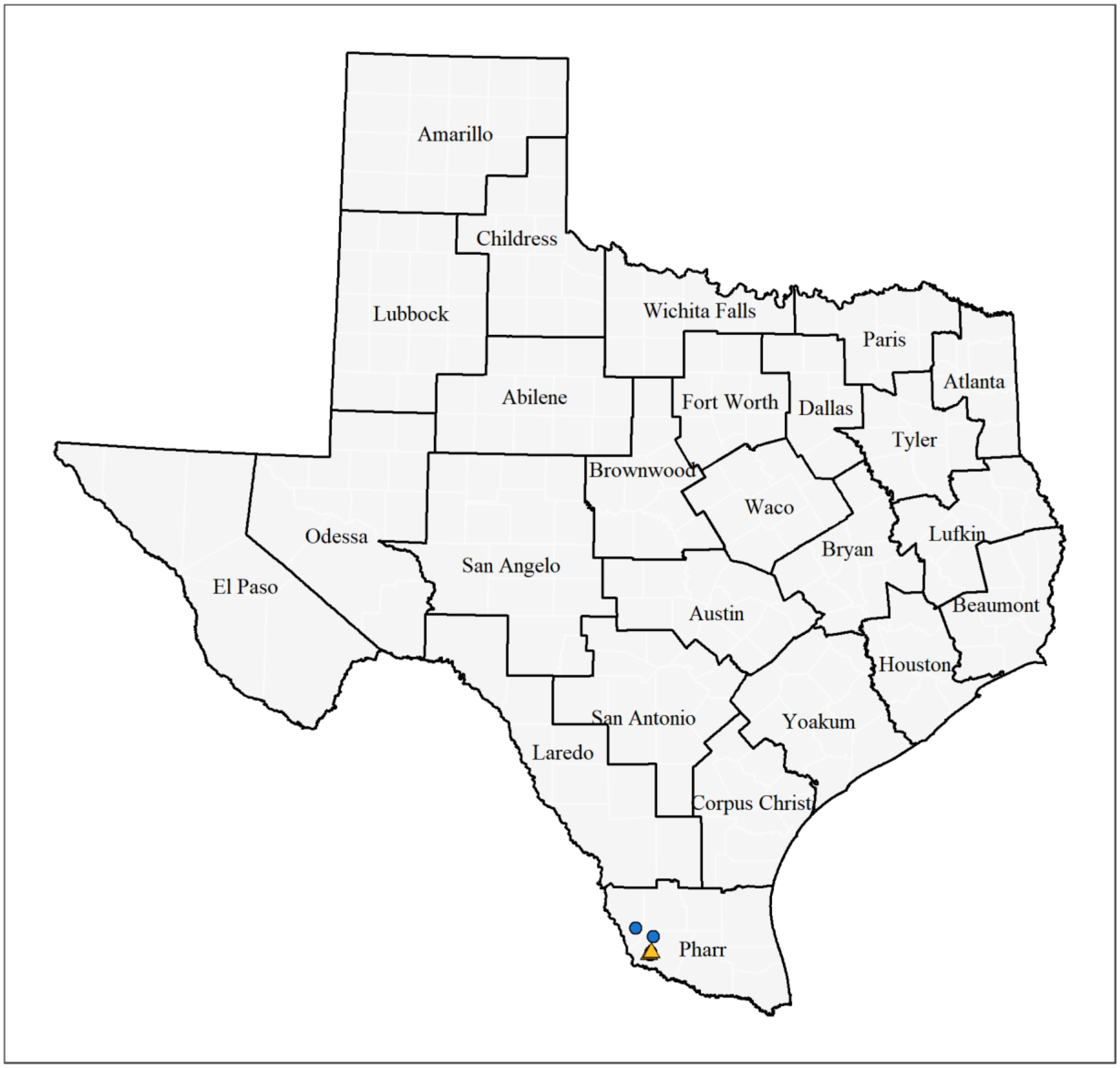
Texas A&M NRI Natural Resources Institute



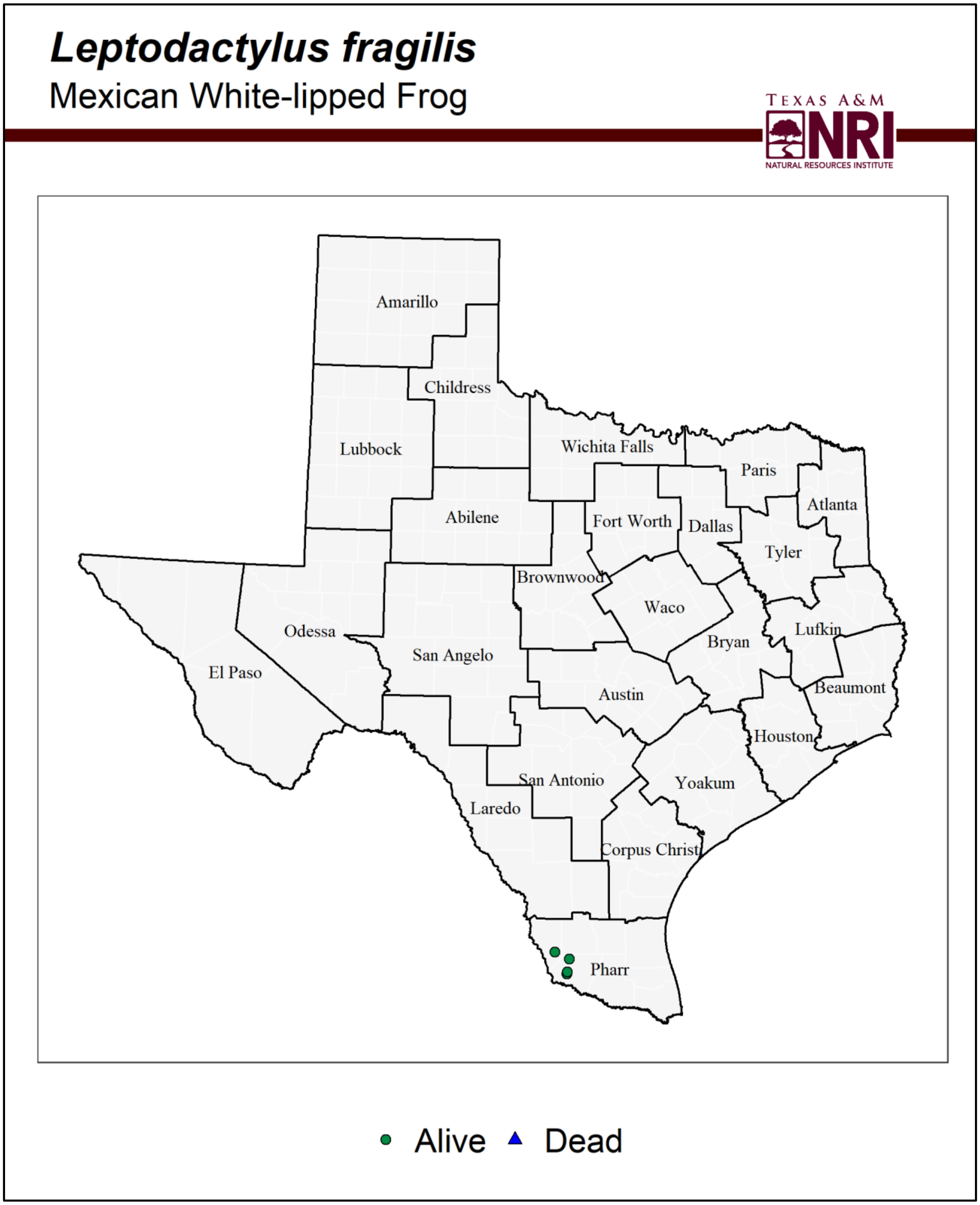
Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Leptodactylus fragilis

Mexican White-lipped Frog



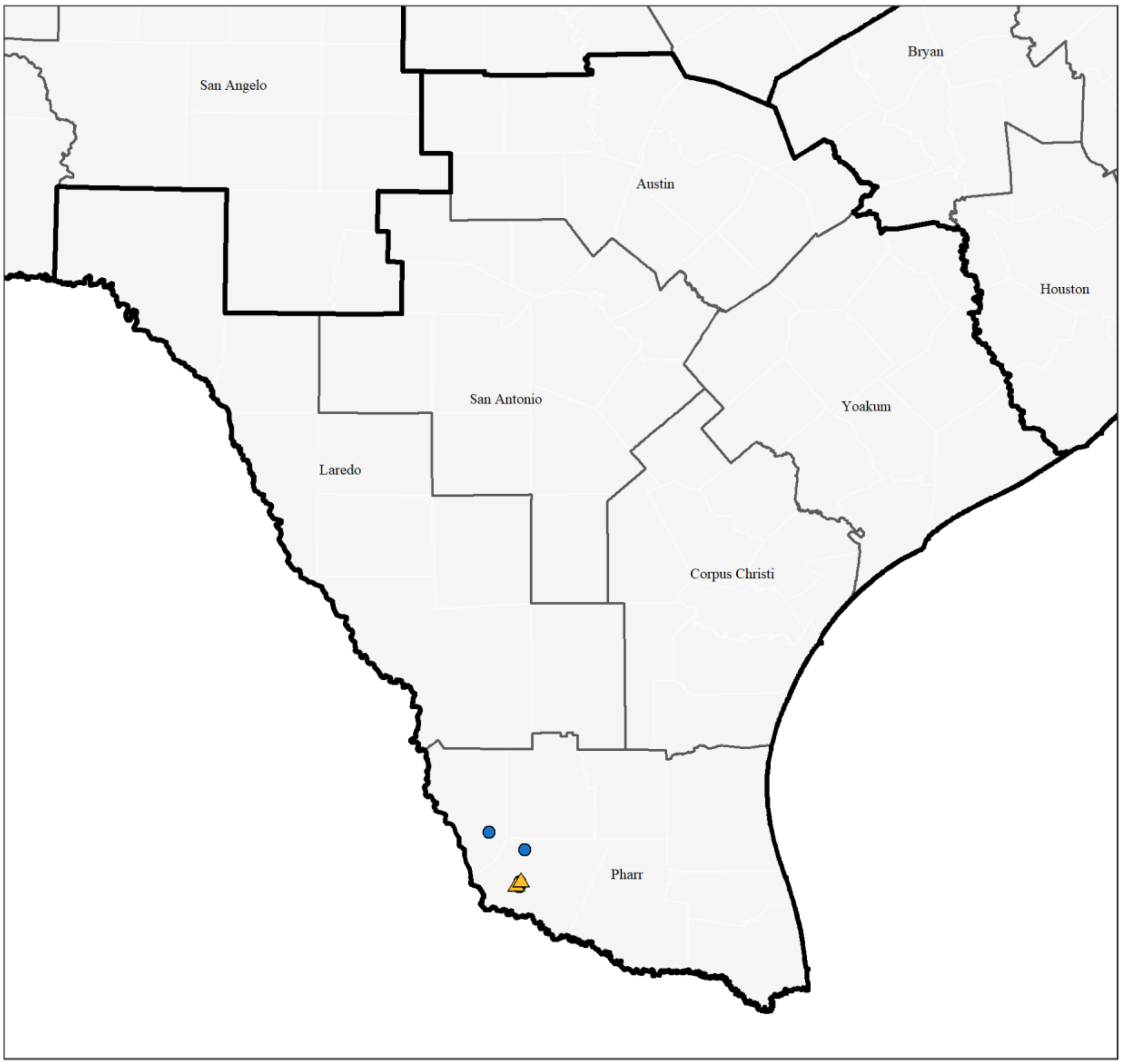
Near-Road Points Off-Road Points



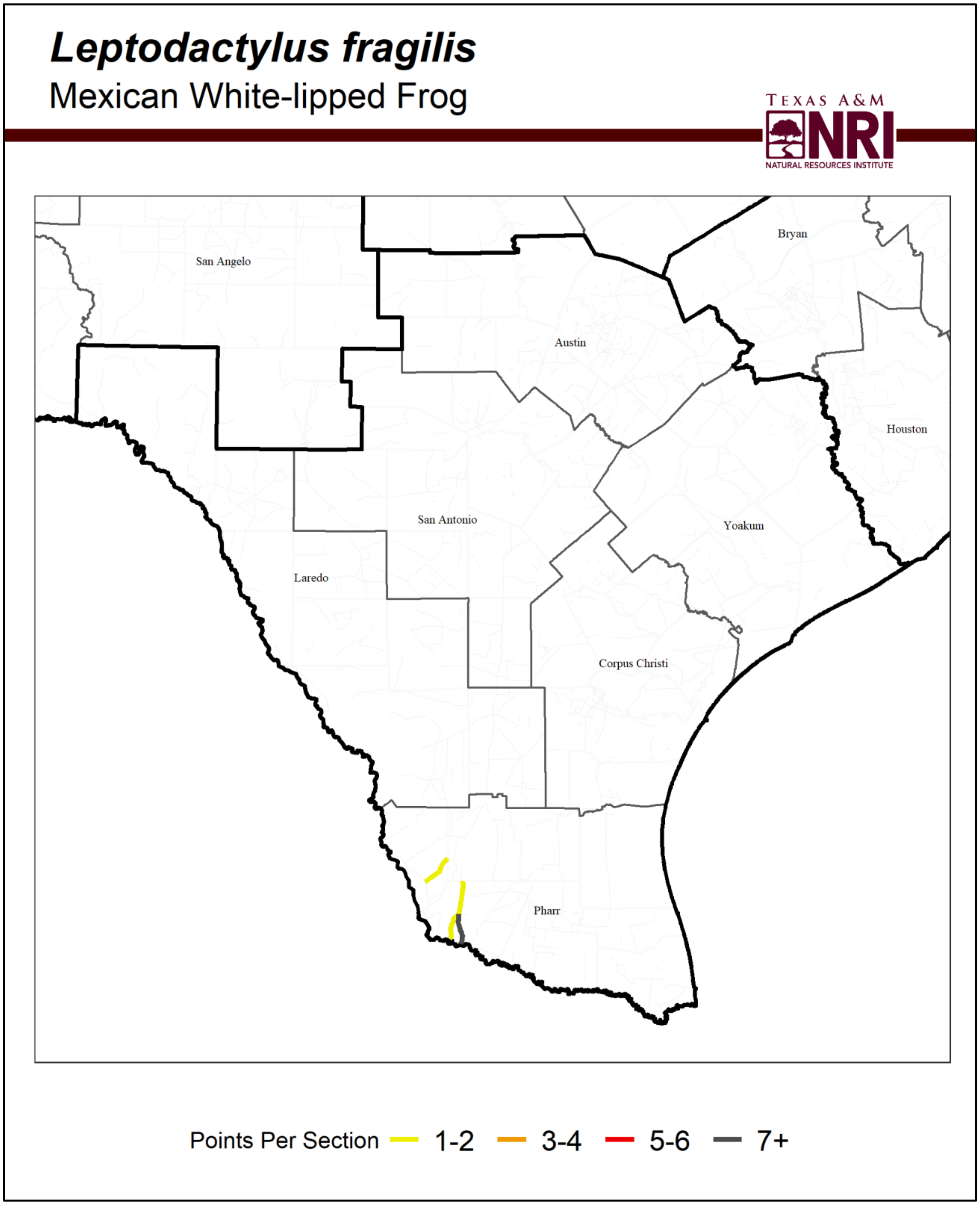
Leptodactylus fragilis
Mexican White-lipped Frog
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE
Amarillo
Childress
Lubbock
Wichita Falls
Paris
Atlanta
Abilene
Fort Worth
Dallas
Tyler
Brownwood
Waco
Odessa
Lufkin
Bryan
El Paso
San Angelo
Austin
Beaumont
Houston
San Antonio
Yoakum
Laredo
Corpus Christi
Pharr
Alive
Dead

Leptodactylus fragilis

Mexican White-lipped Frog

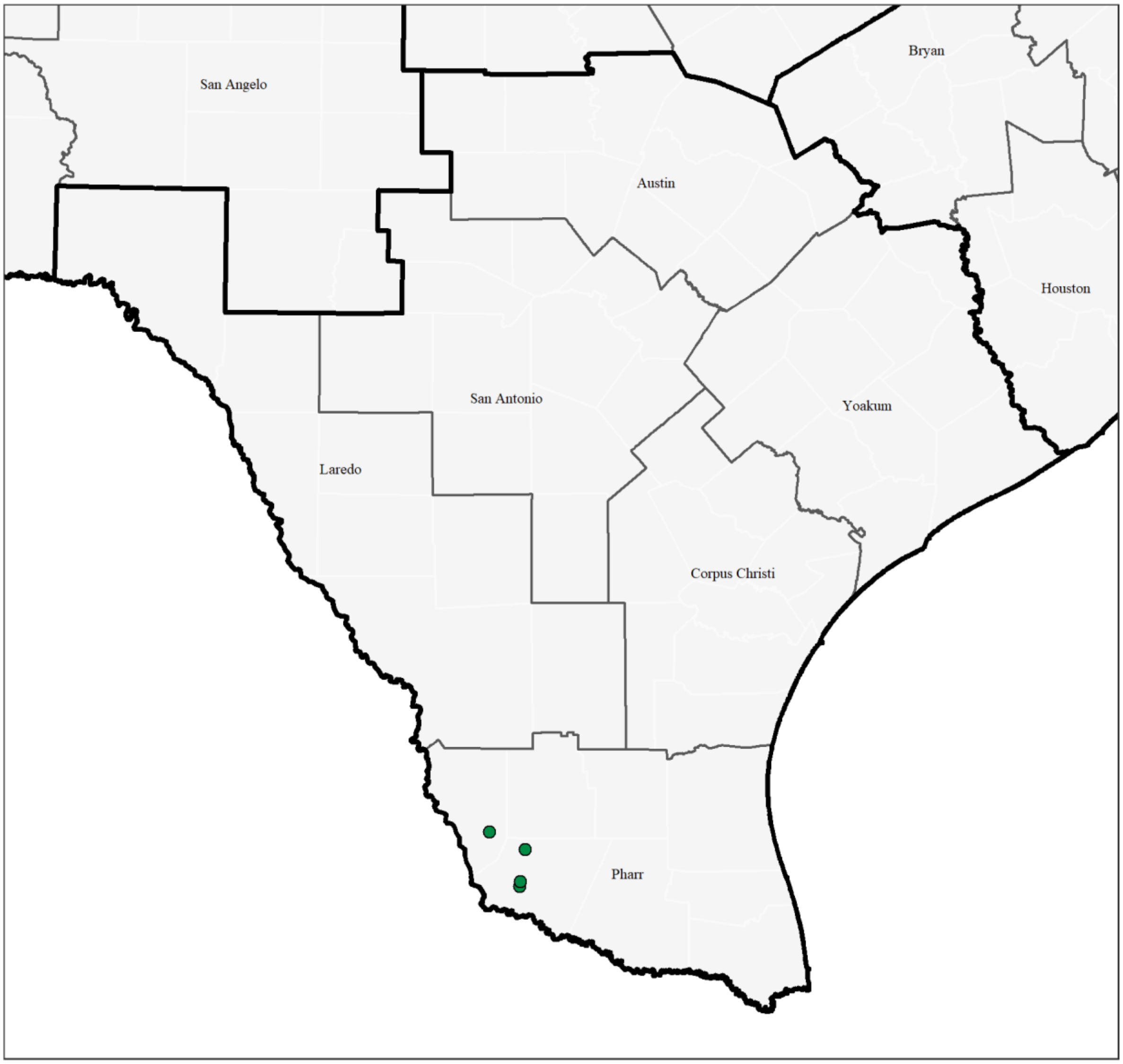


• Near-Road Points △ Off-Road Points


Leptodactylus fragilis
Mexican White-lipped Frog
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE
San Angelo
Bryan
Austin
Houston
San Antonio
Yoakum
Laredo
Corpus Christi
Pharr
Points Per Section 1-2 3-4 5-6 7+

Leptodactylus fragilis

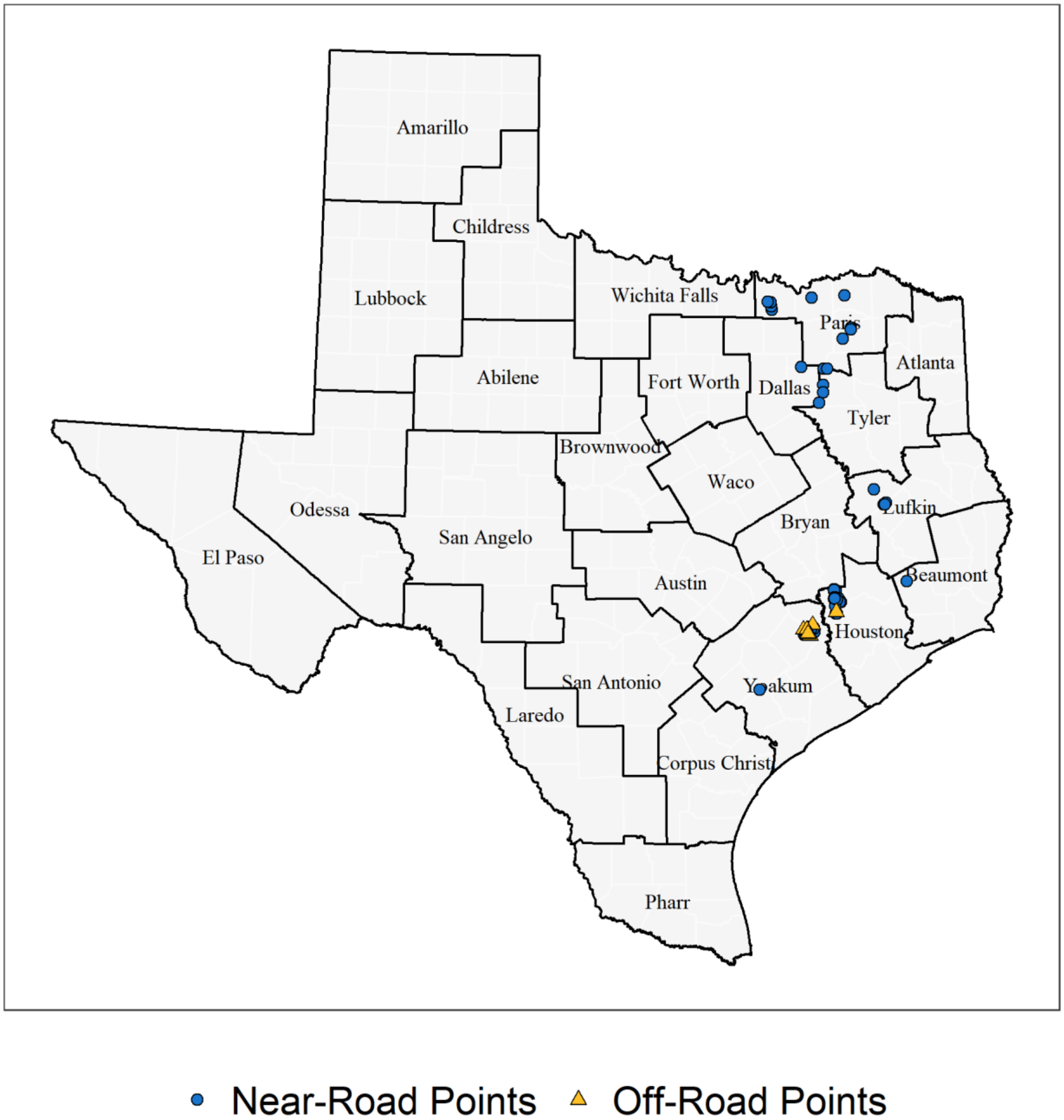
Mexican White-lipped Frog



• Alive ▲ Dead

Lithobates areolatus

Crawfish Frog



Lithobates areolatus

Crawfish Frog

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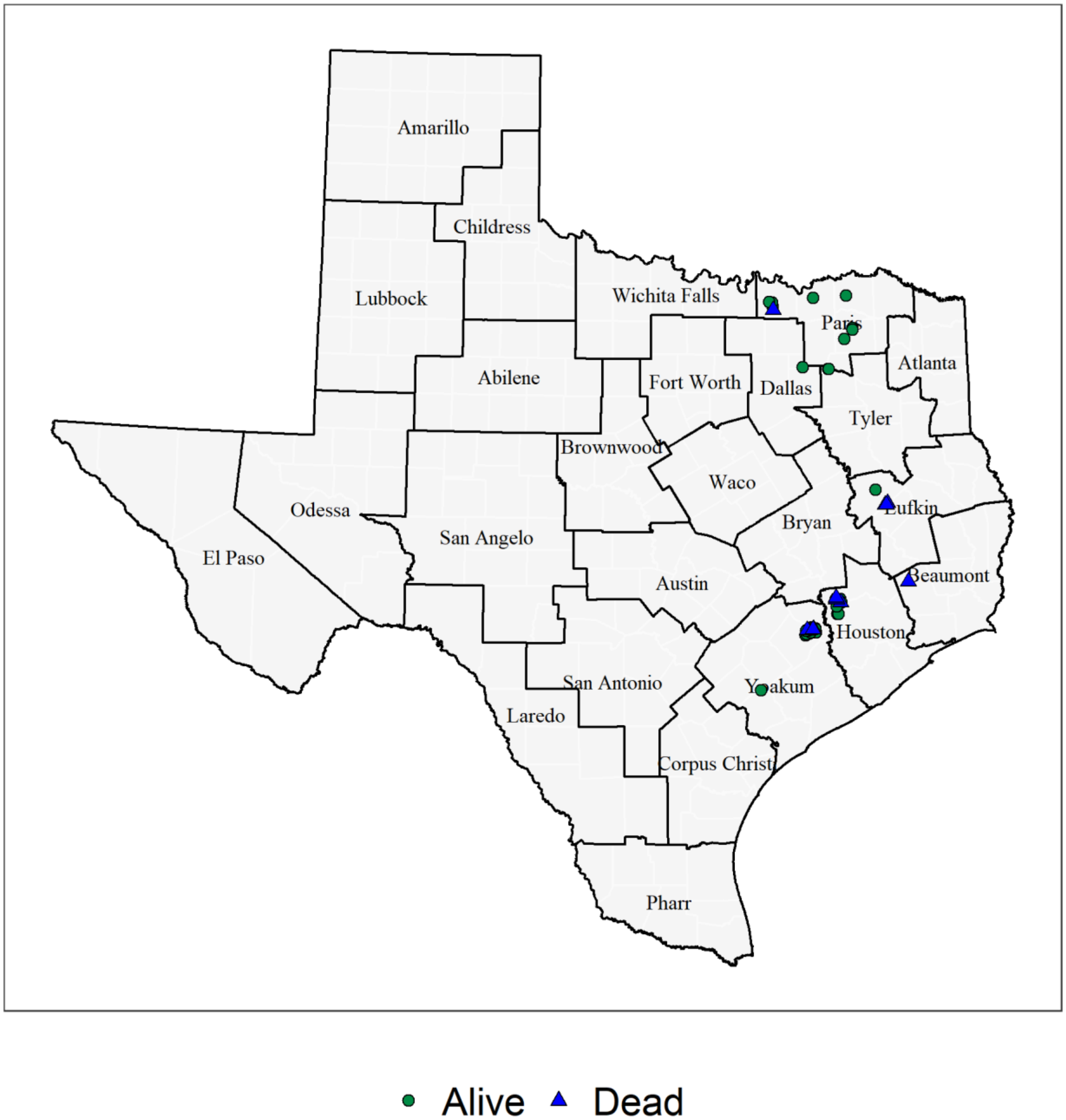
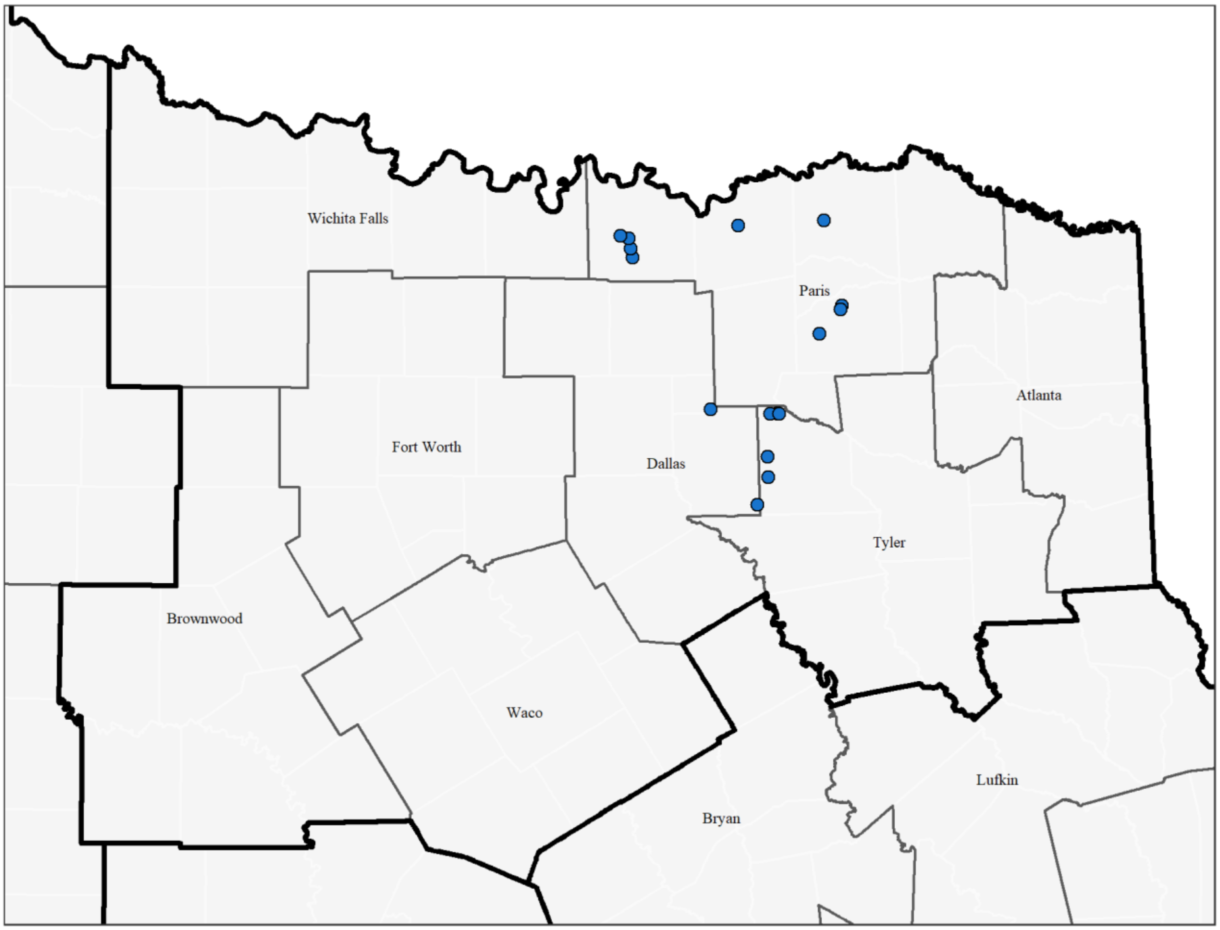


Lithobates areolatus

Crawfish Frog

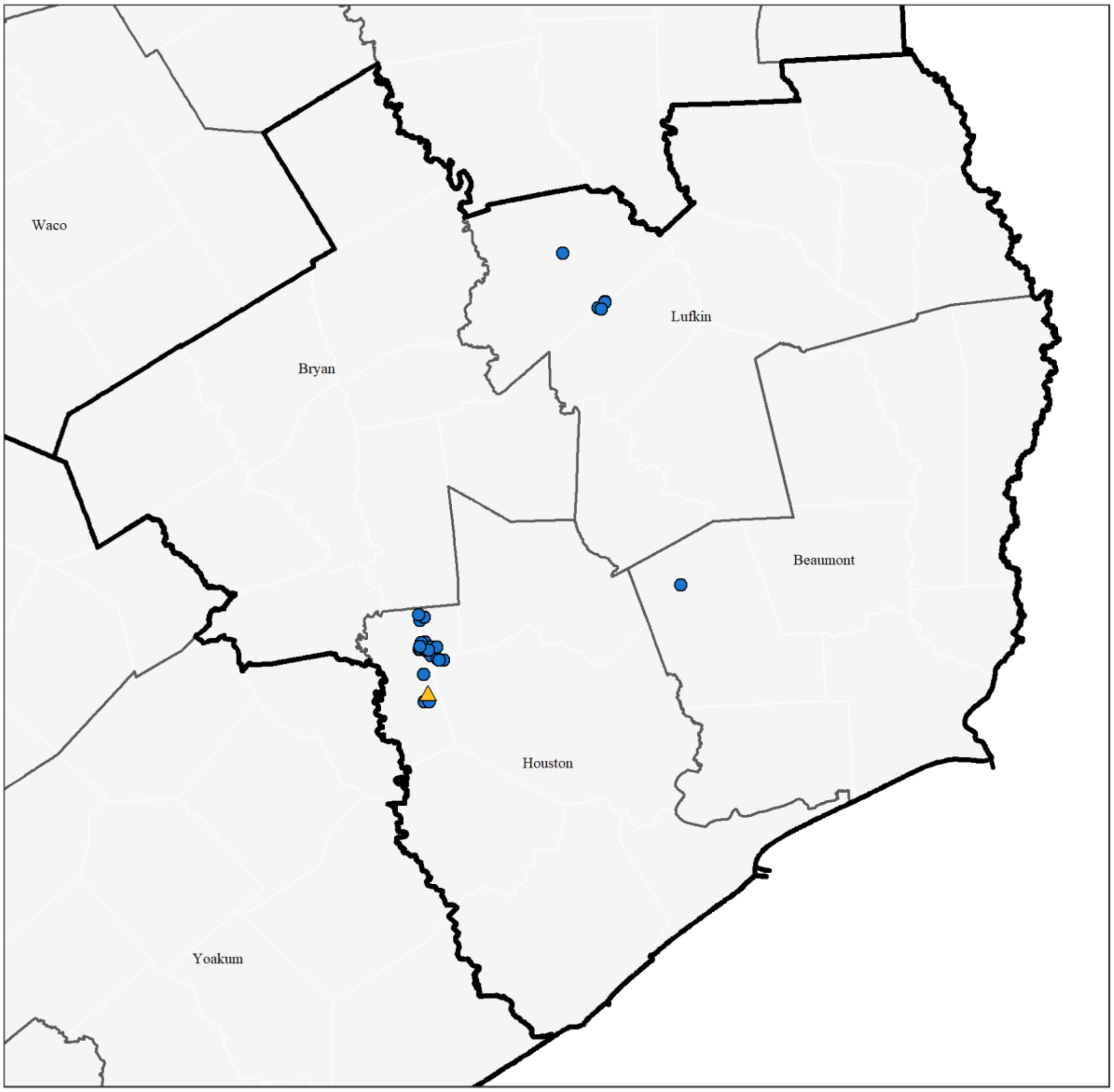
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Near-Road Points   Off-Road Points

Lithobates areolatus

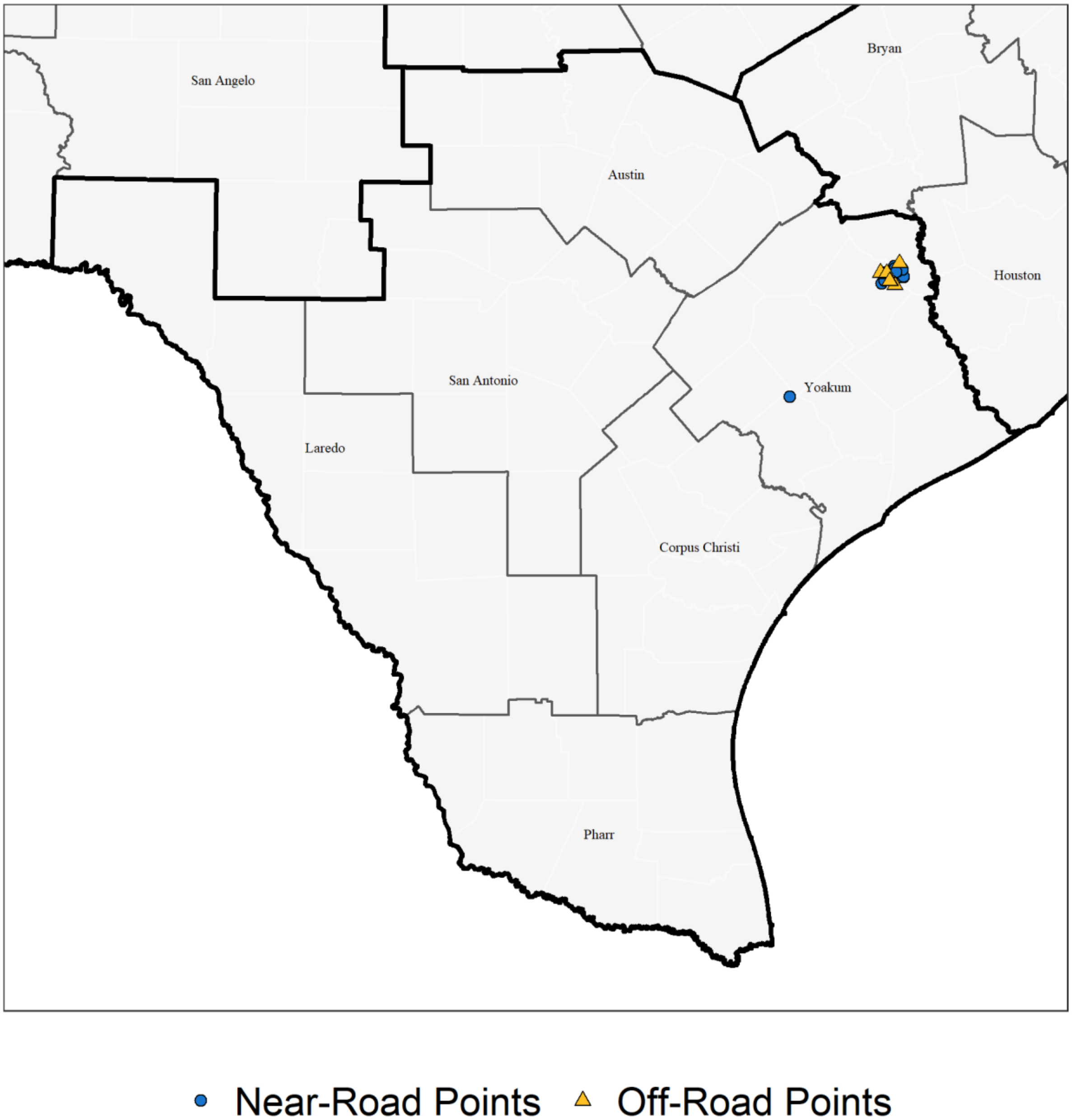
Crawfish Frog



• Near-Road Points △ Off-Road Points

Lithobates areolatus

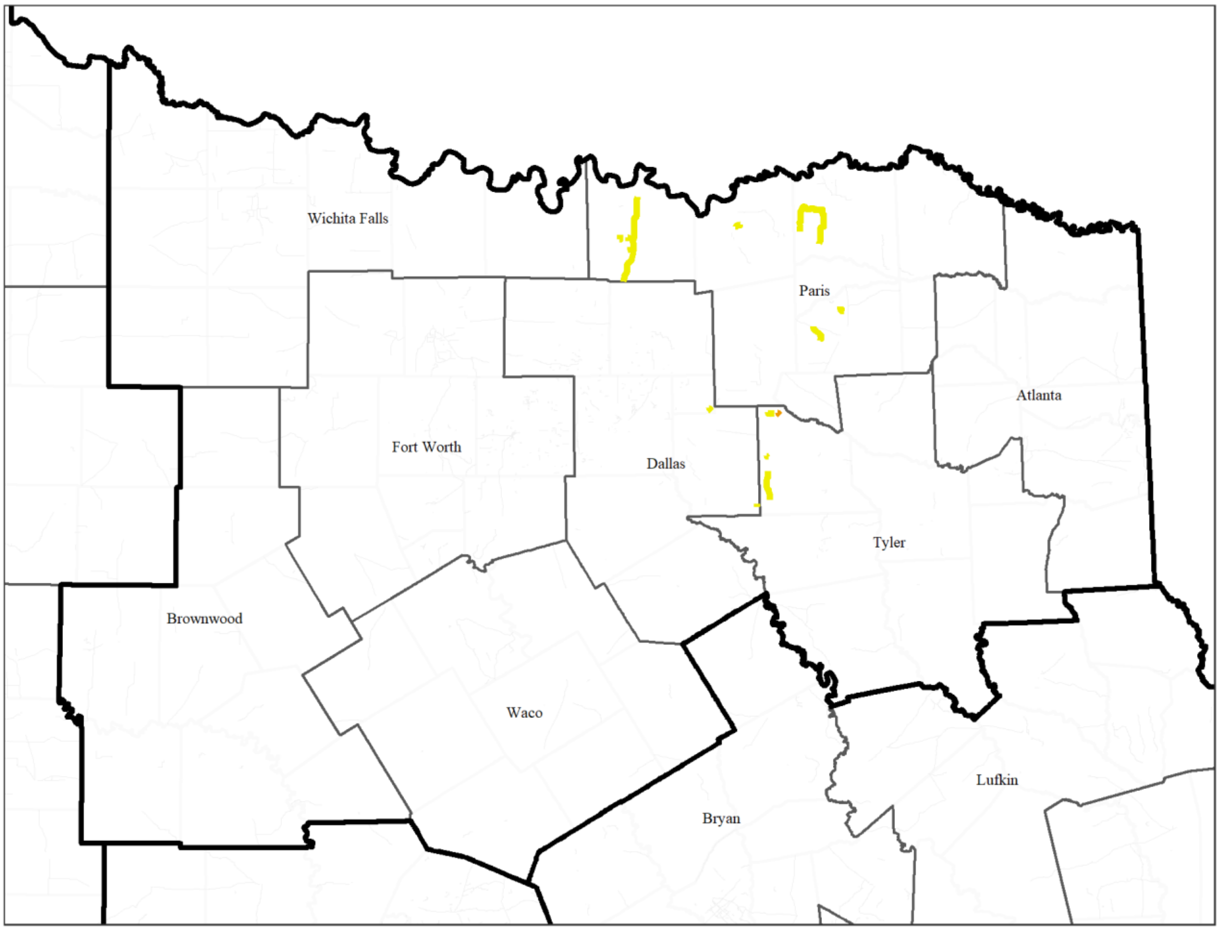
Crawfish Frog



Lithobates areolatus

Crawfish Frog

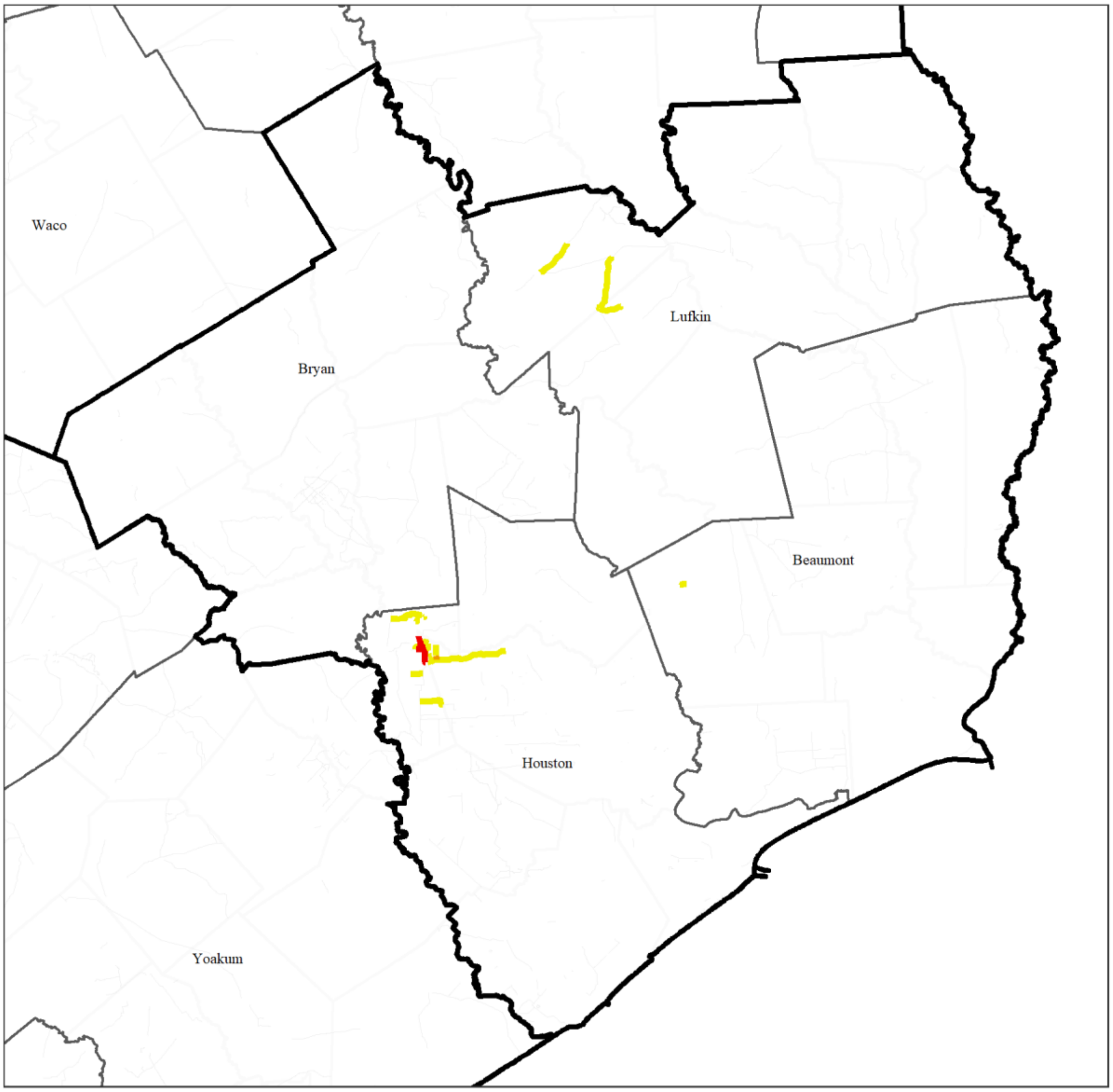
Texas A&M NRI Natural Resources Institute



Points Per Section 1-2 3-4 5-6 7+

Lithobates areolatus

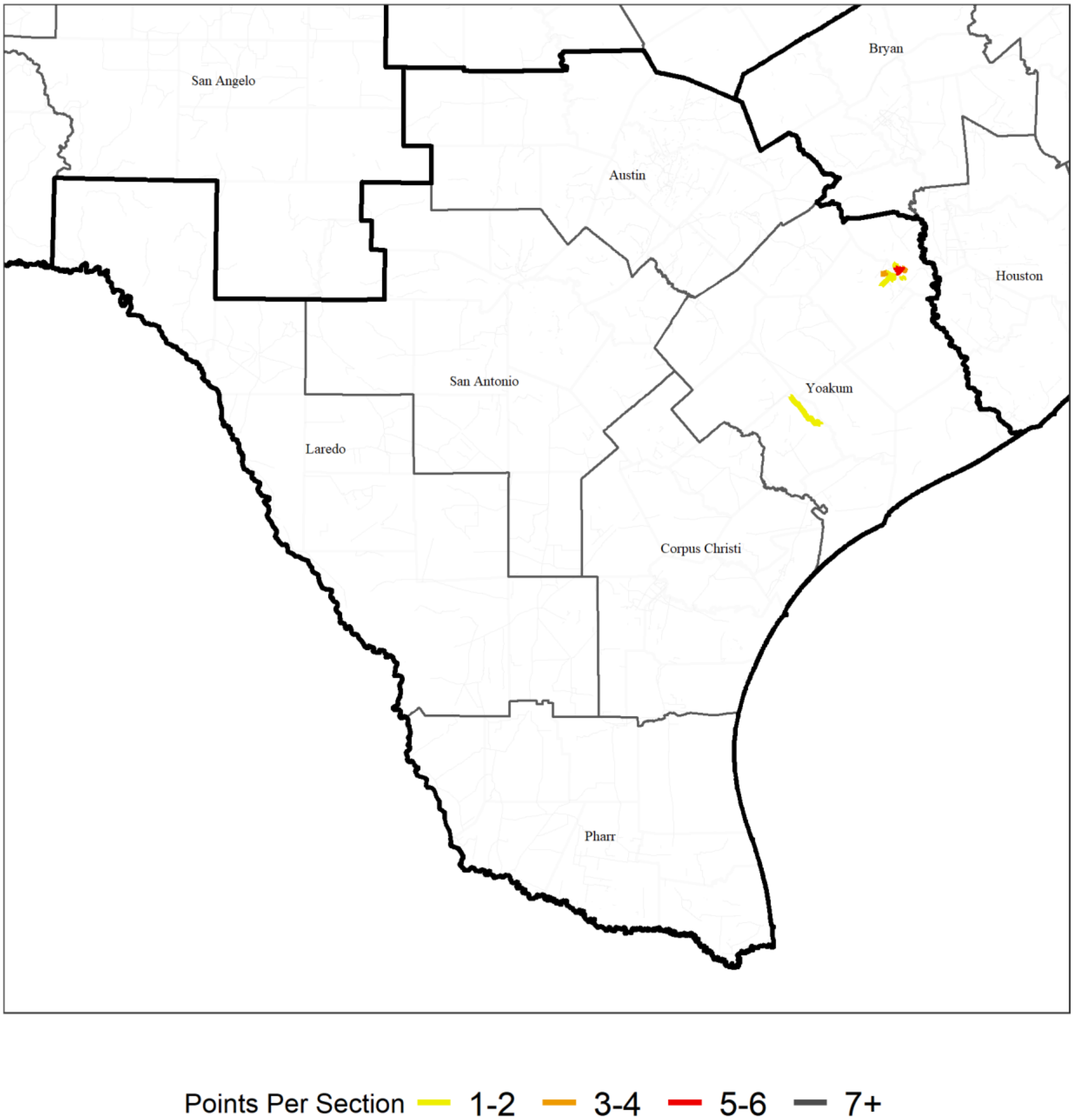
Crawfish Frog



Points Per Section 1-2 3-4 5-6 7+

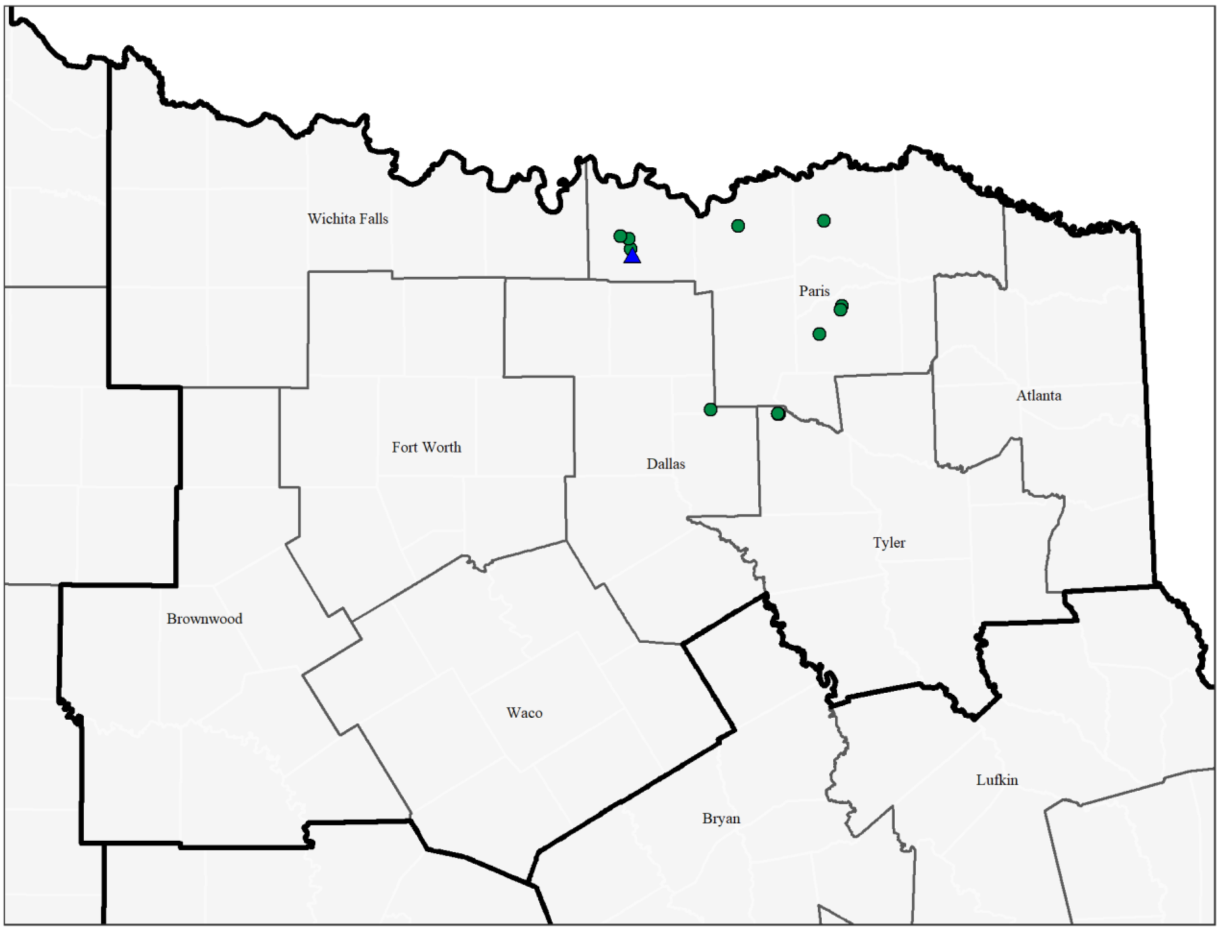
Lithobates areolatus

Crawfish Frog



Lithobates areolatus

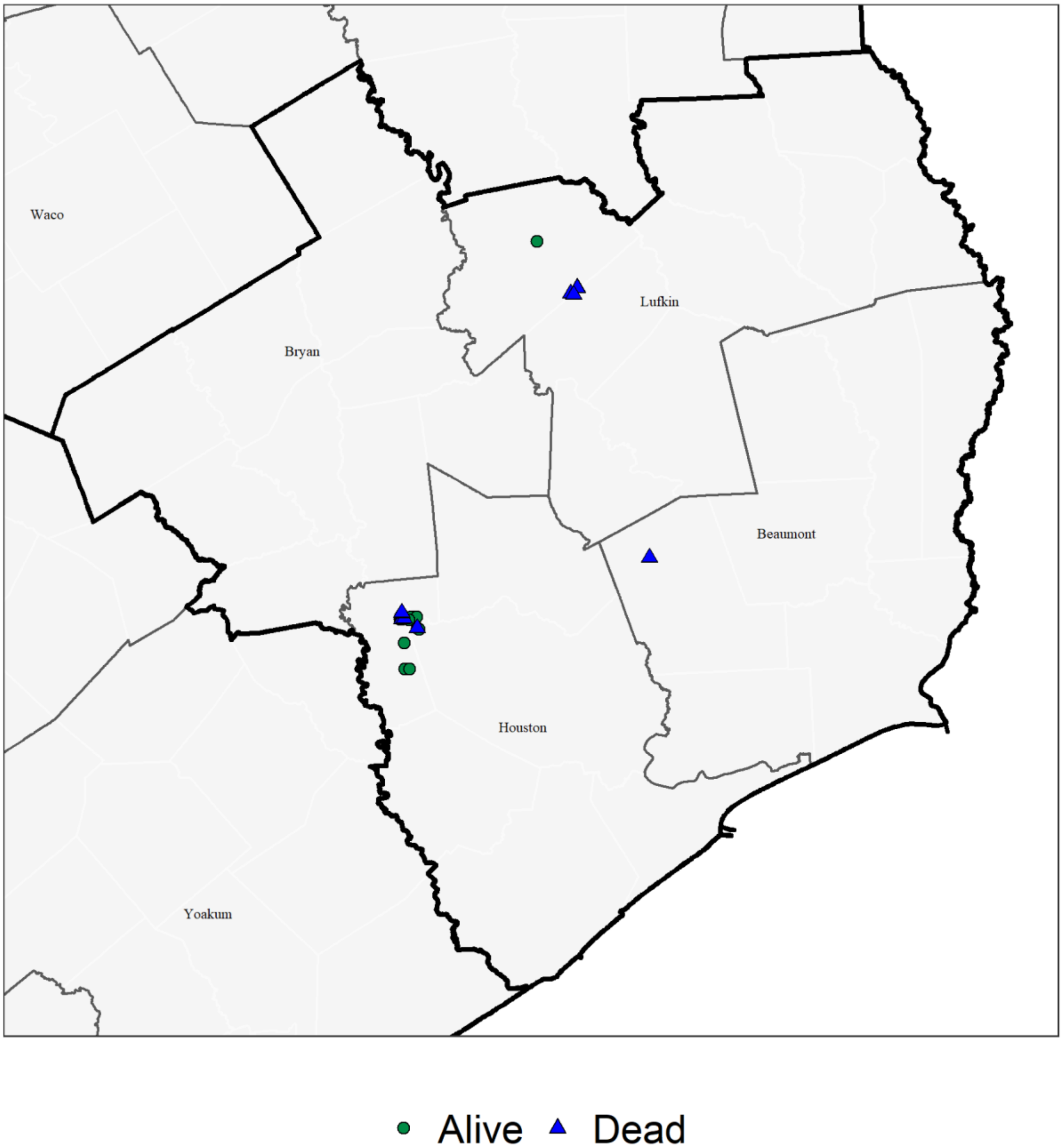
Crawfish Frog



Alive Dead

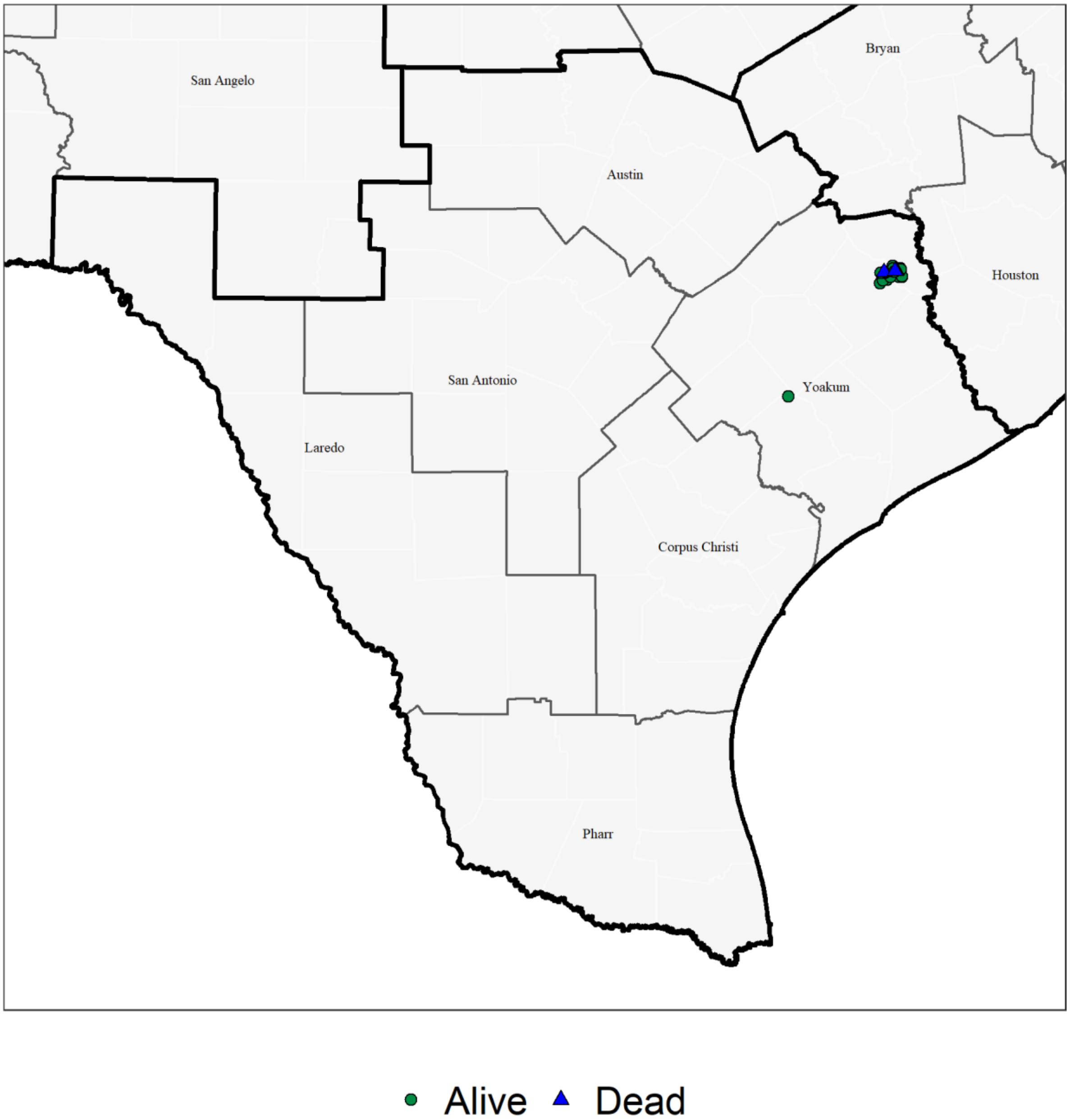
Lithobates areolatus

Crawfish Frog



Lithobates areolatus

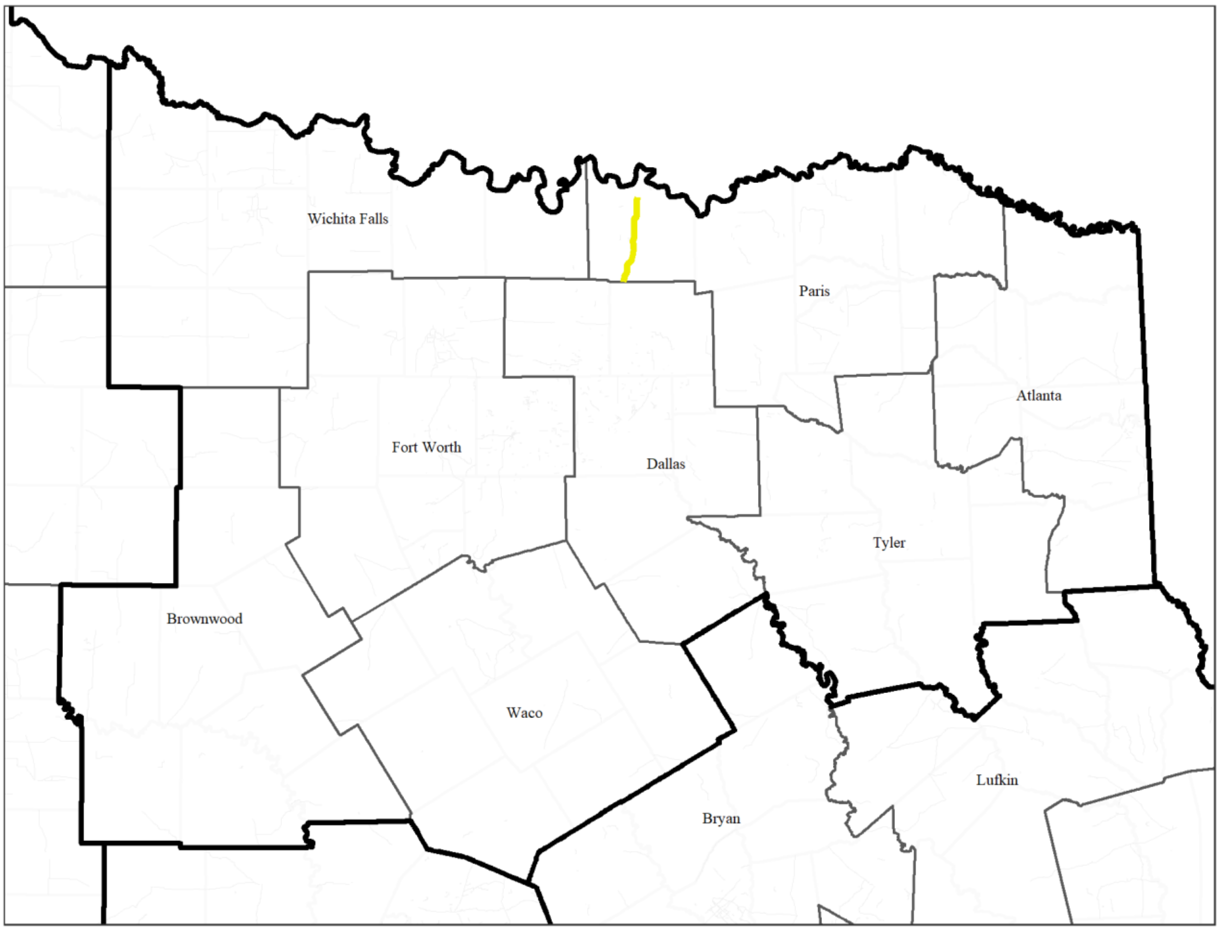
Crawfish Frog



Lithobates areolatus

Crawfish Frog

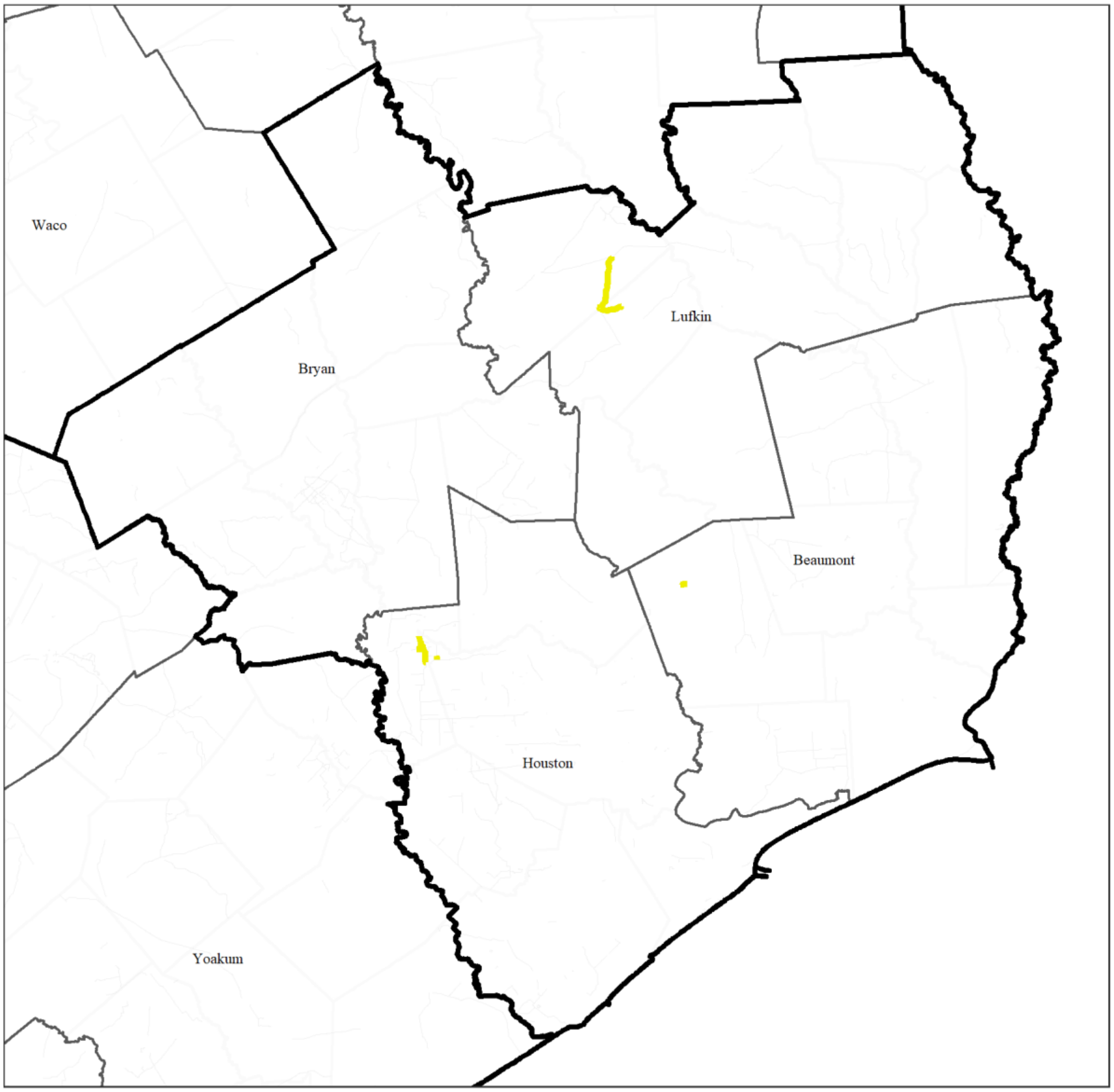
Texas A&M NRI Natural Resources Institute



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Lithobates areolatus

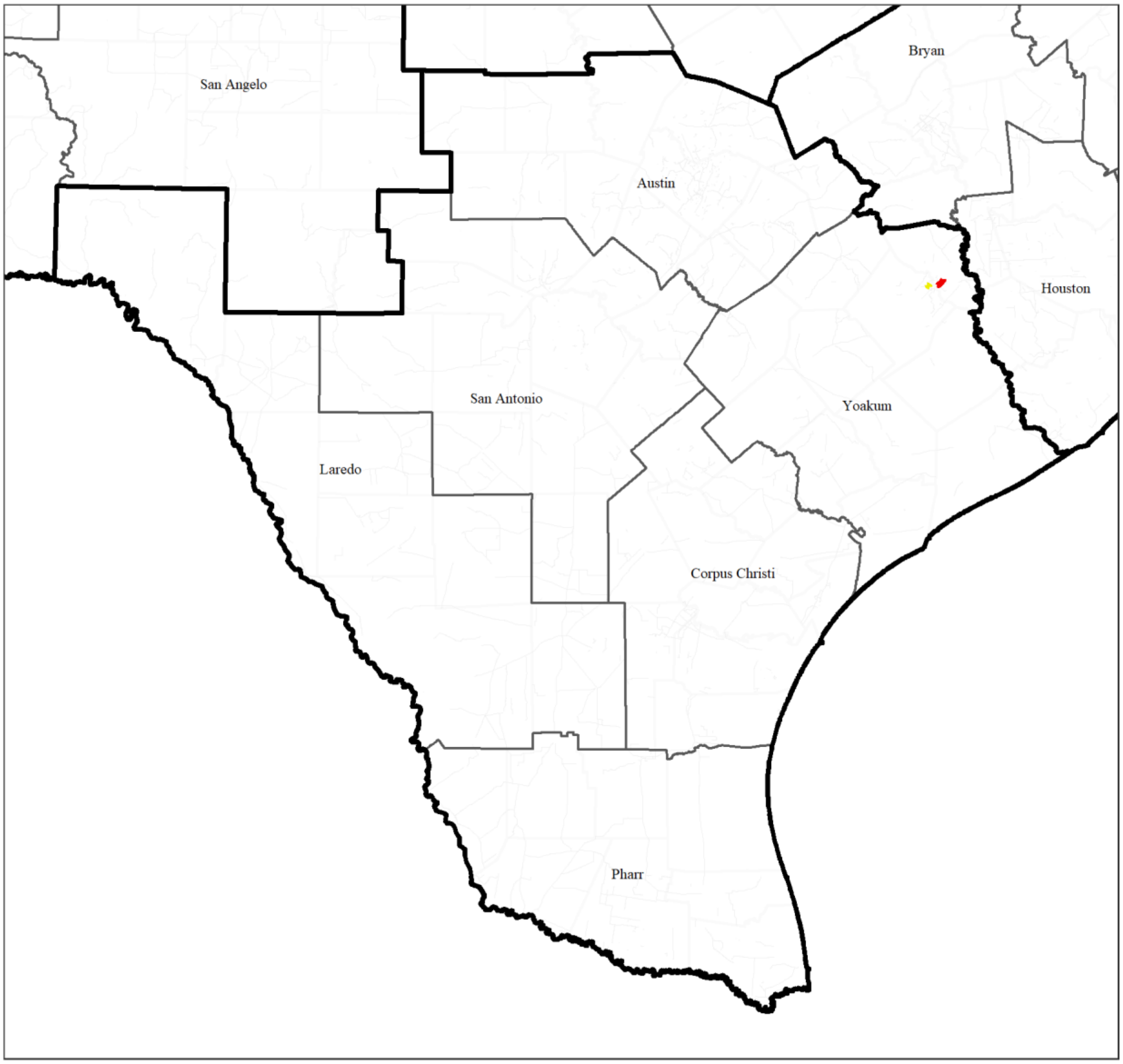
Crawfish Frog



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Lithobates areolatus

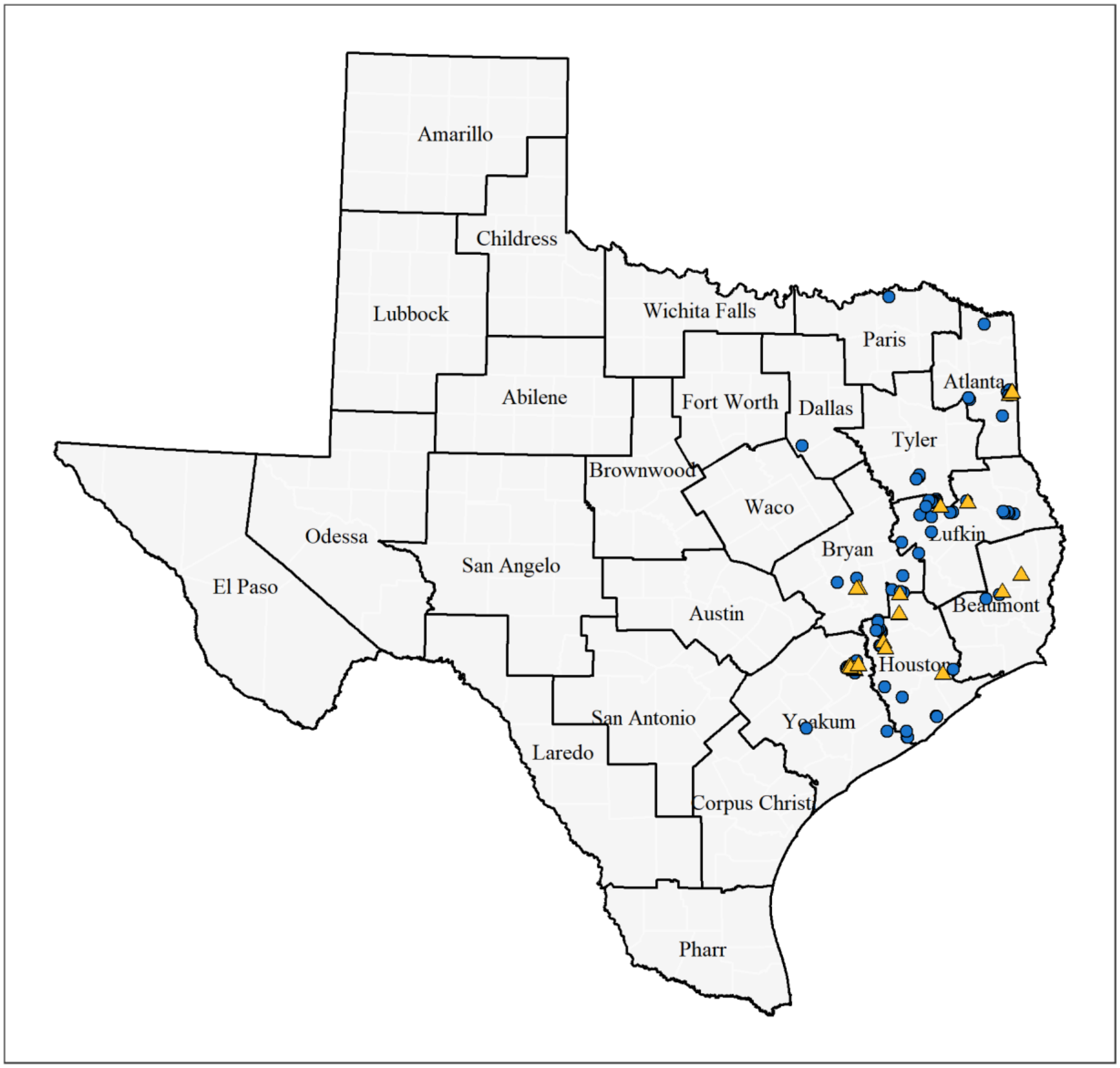
Crawfish Frog



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Pseudacris fouquettei

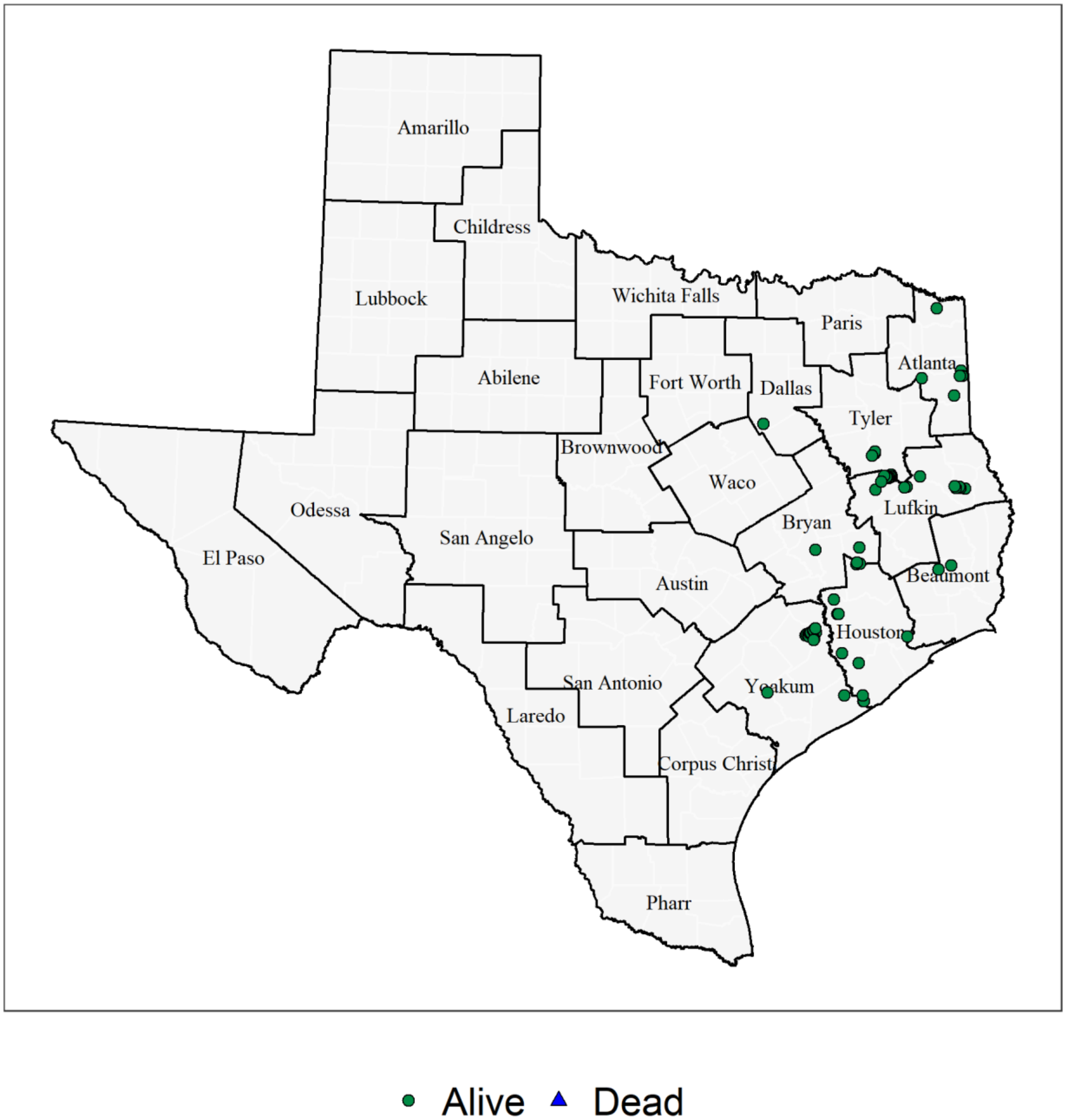
Cajun Chorus Frog



• Near-Road Points ▲ Off-Road Points

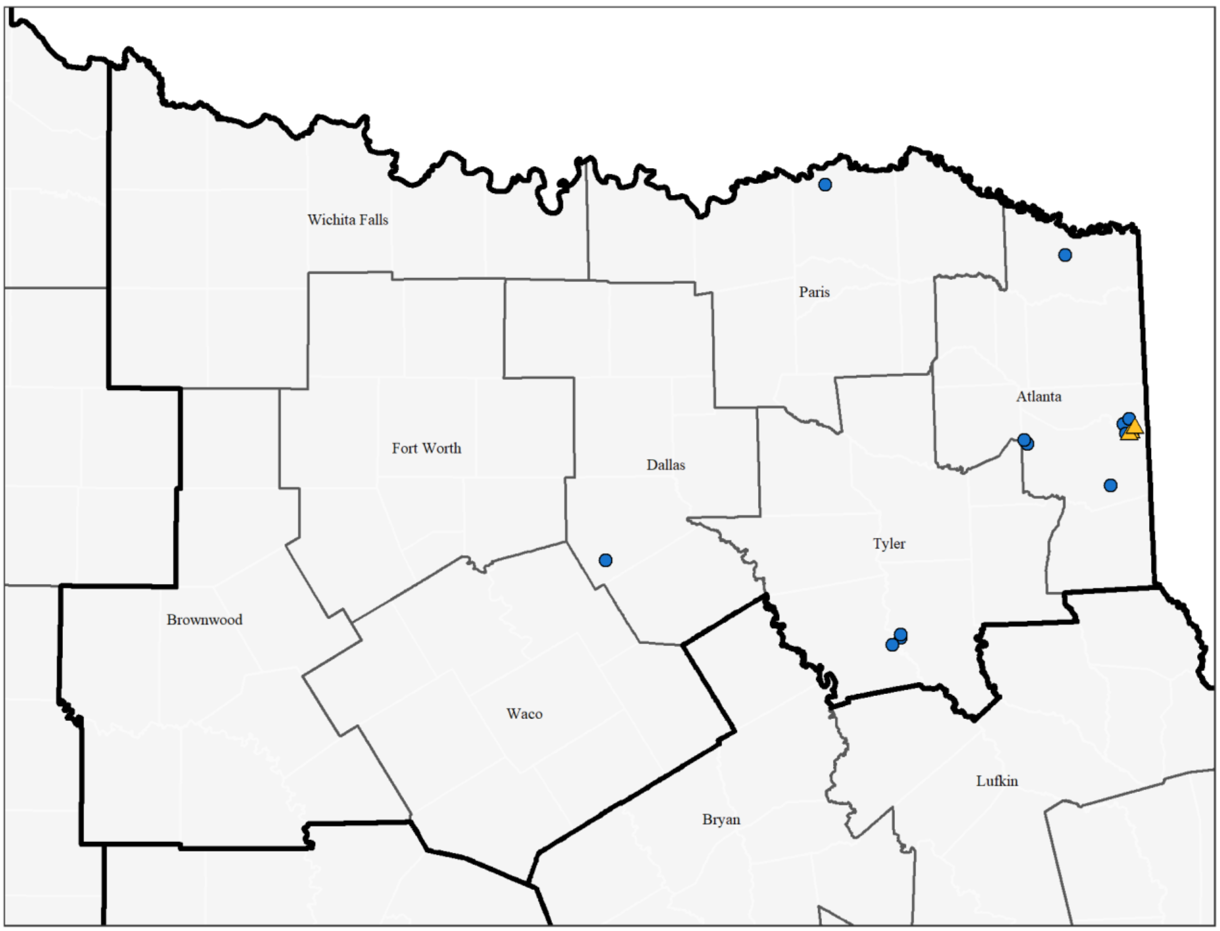
Pseudacris fouquettei

Cajun Chorus Frog

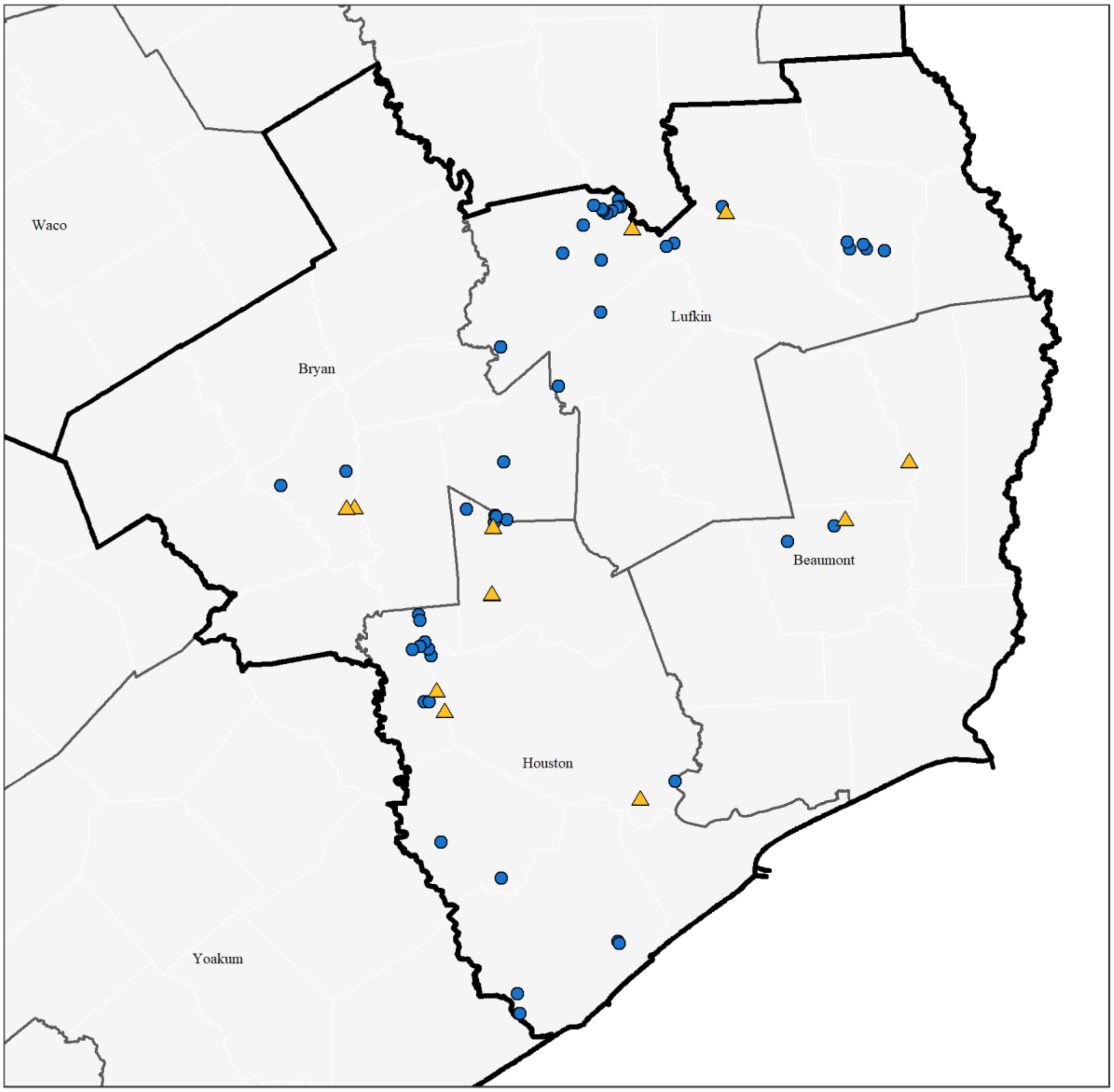


Pseudacris fouquettei

Cajun Chorus Frog



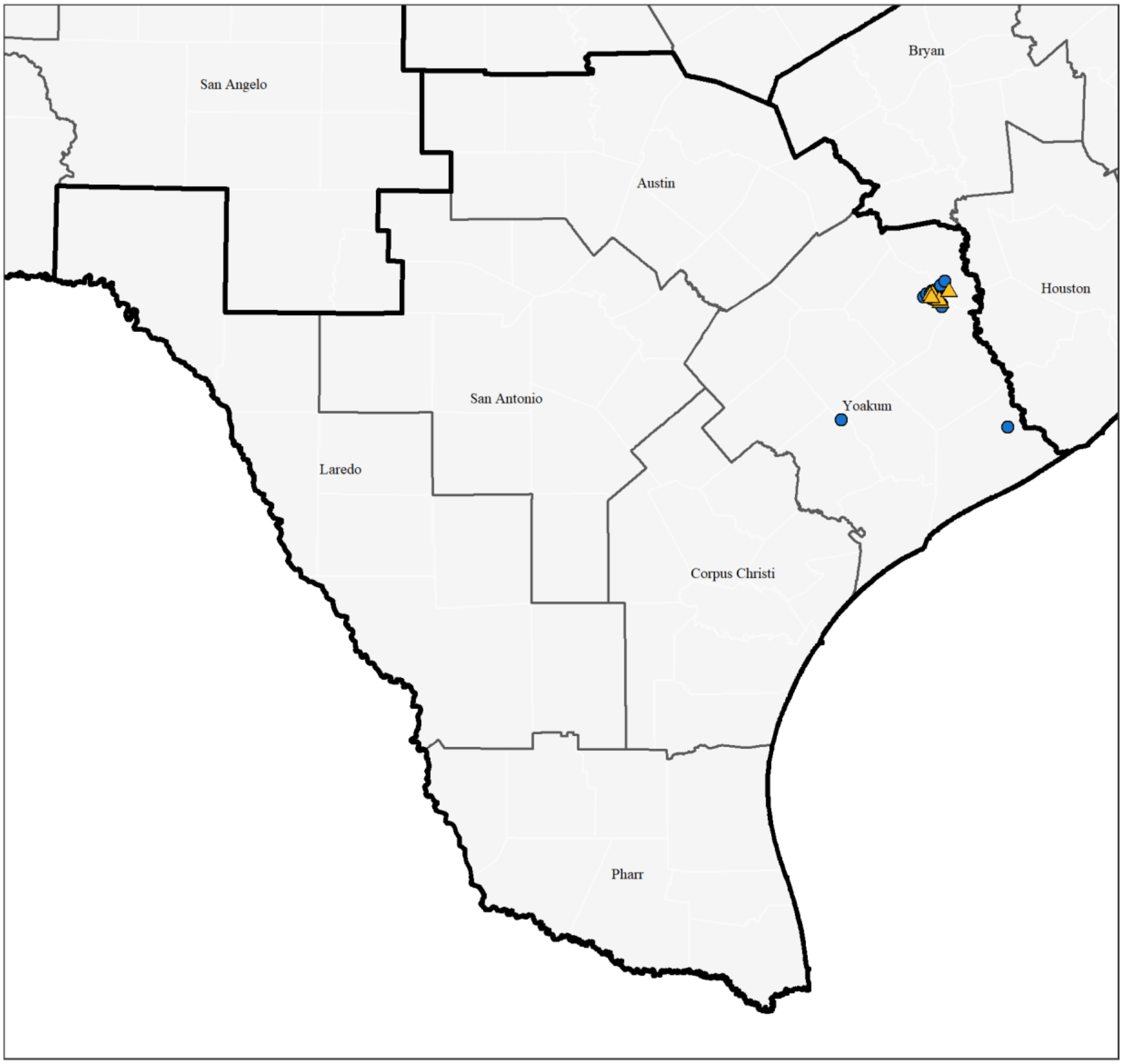
Pseudacris fouquettei
Cajun Chorus Frog



Near-Road Points   Off-Road Points

Pseudacris fouquettei

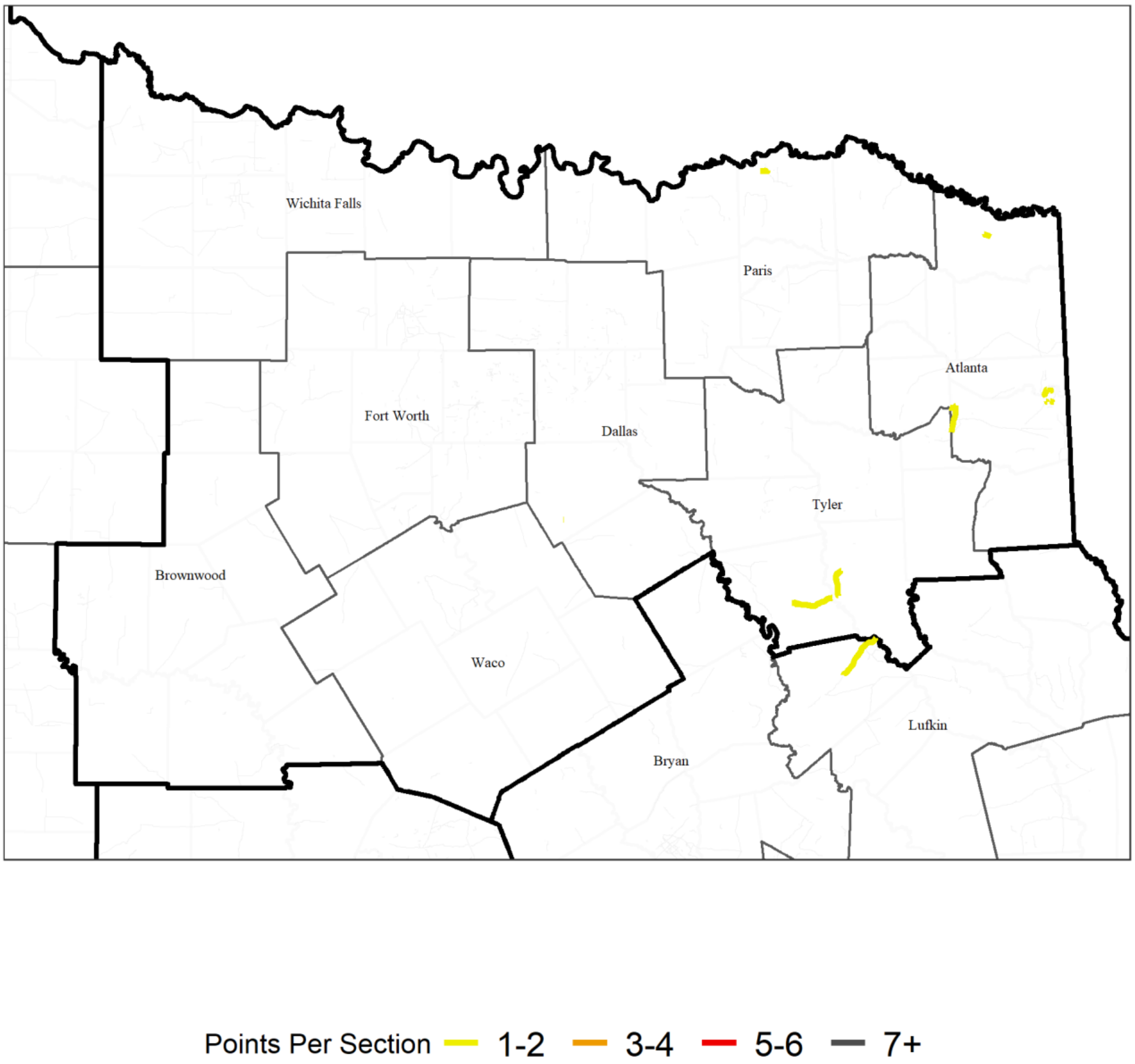
Cajun Chorus Frog



• Near-Road Points △ Off-Road Points

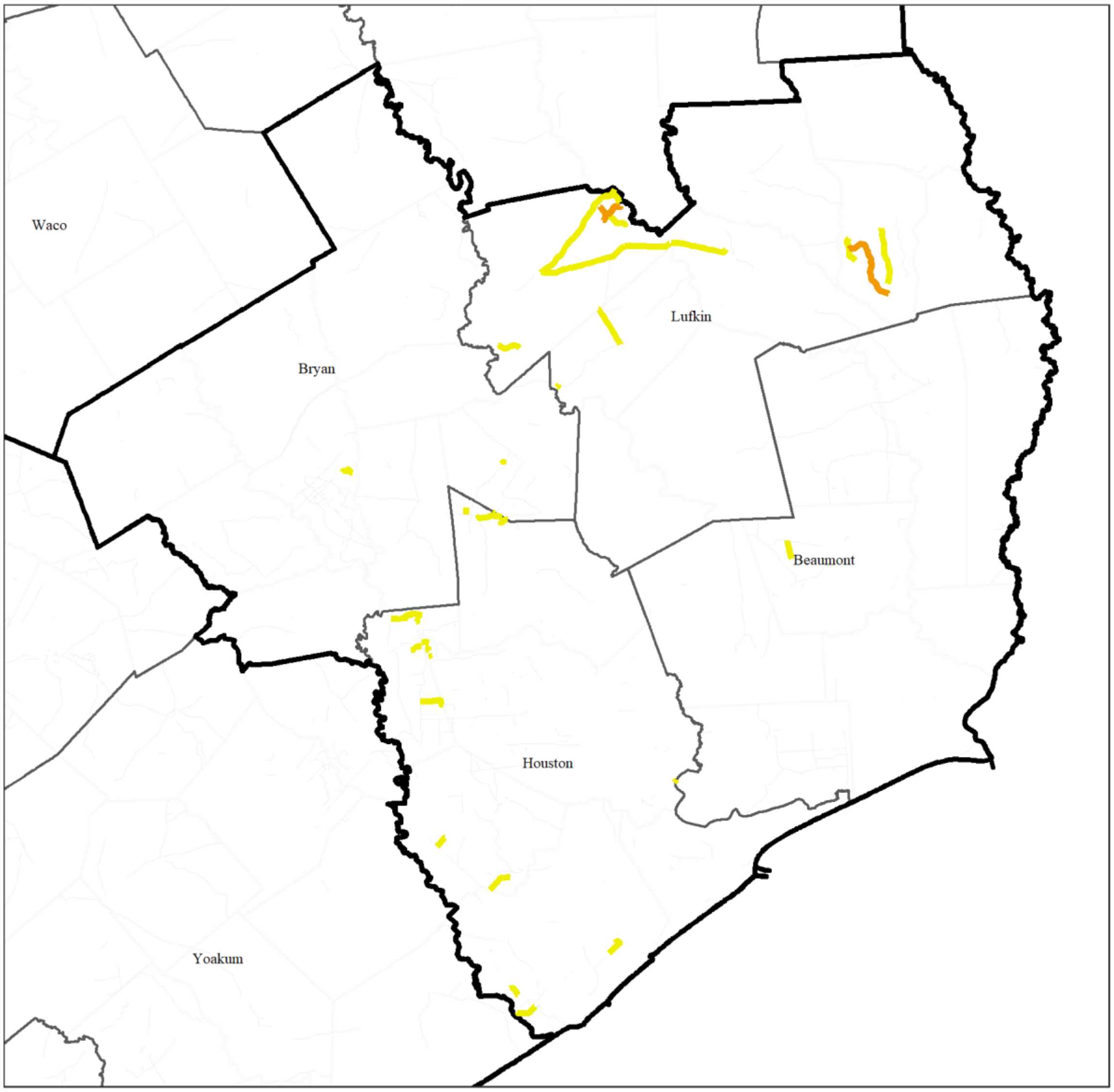
Pseudacris fouquettei

Cajun Chorus Frog



Pseudacris fouquettei

Cajun Chorus Frog

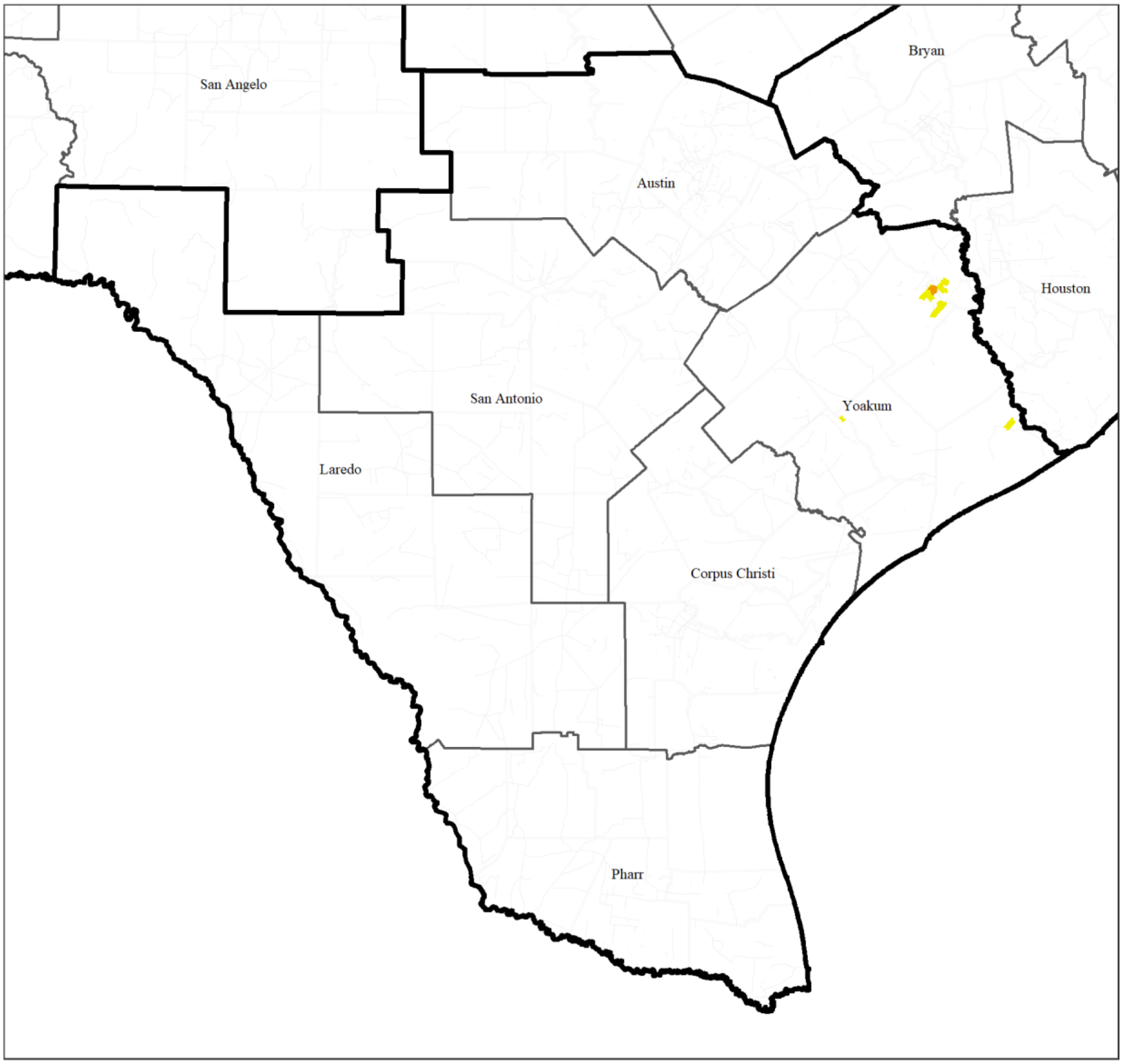


Points Per Section 1-2 3-4 5-6 7+

Pseudacris fouquettei

Cajun Chorus Frog

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE

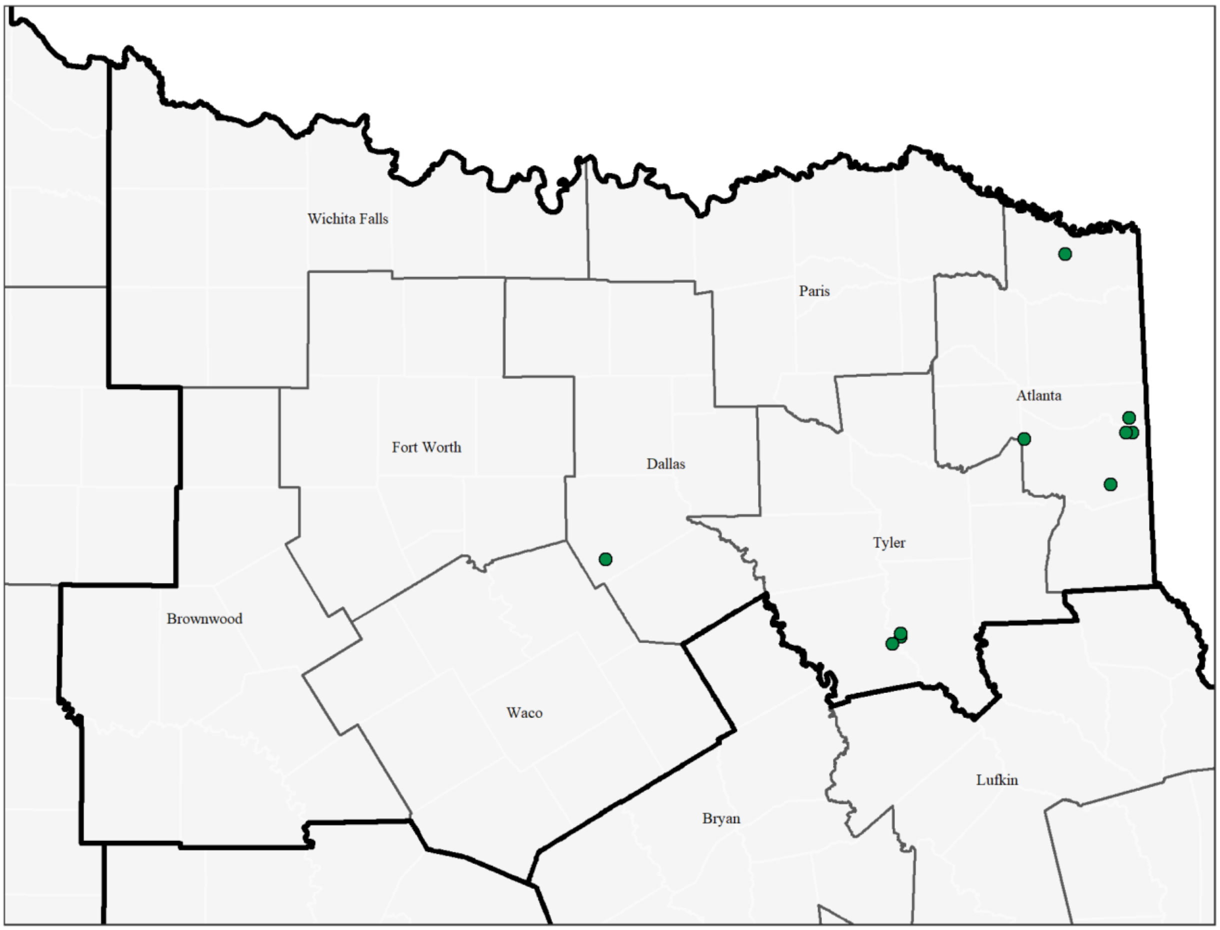


Points Per Section 1-2 3-4 5-6 7+

Pseudacris fouquettei

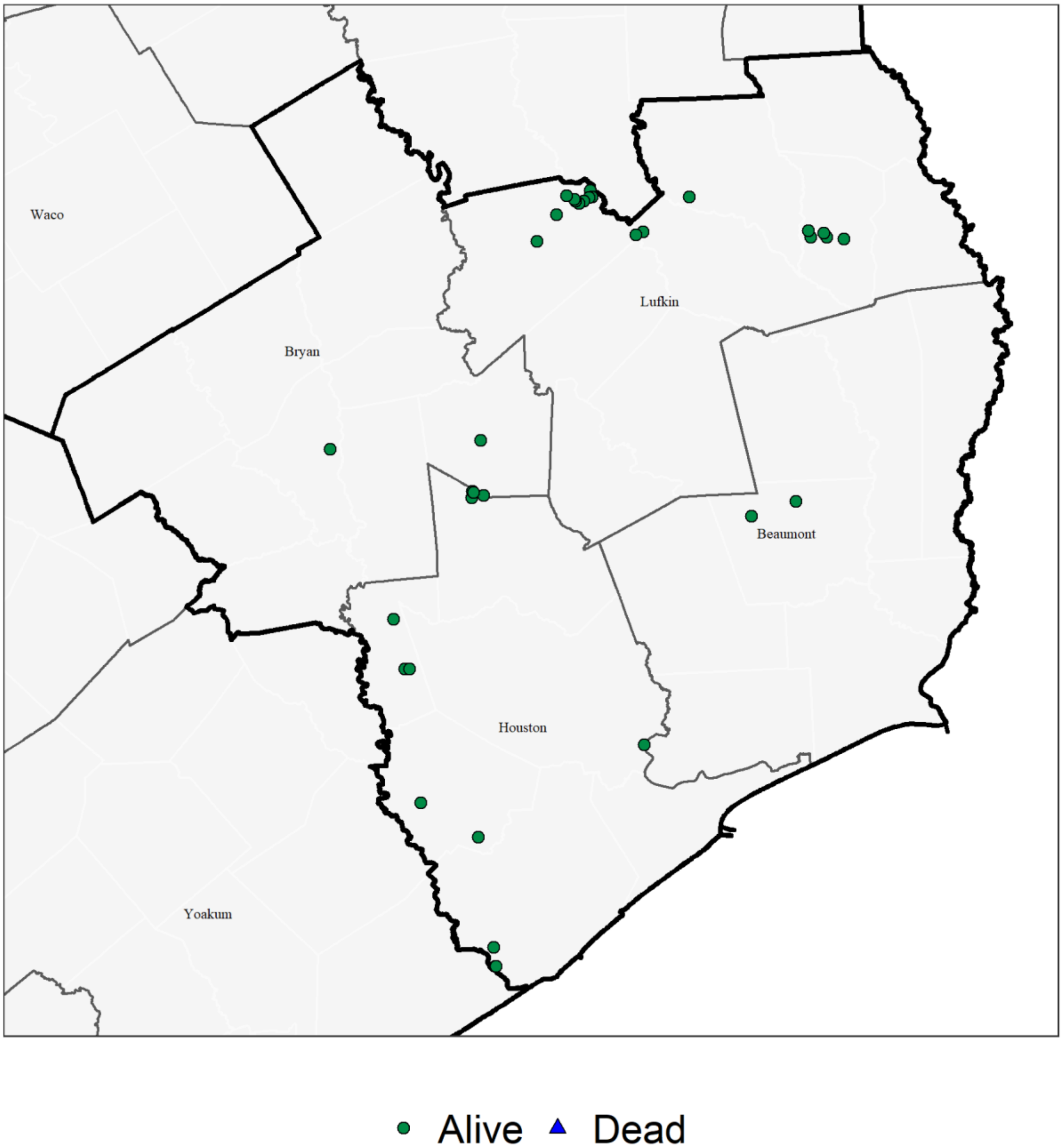
Cajun Chorus Frog

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



● Alive ▲ Dead

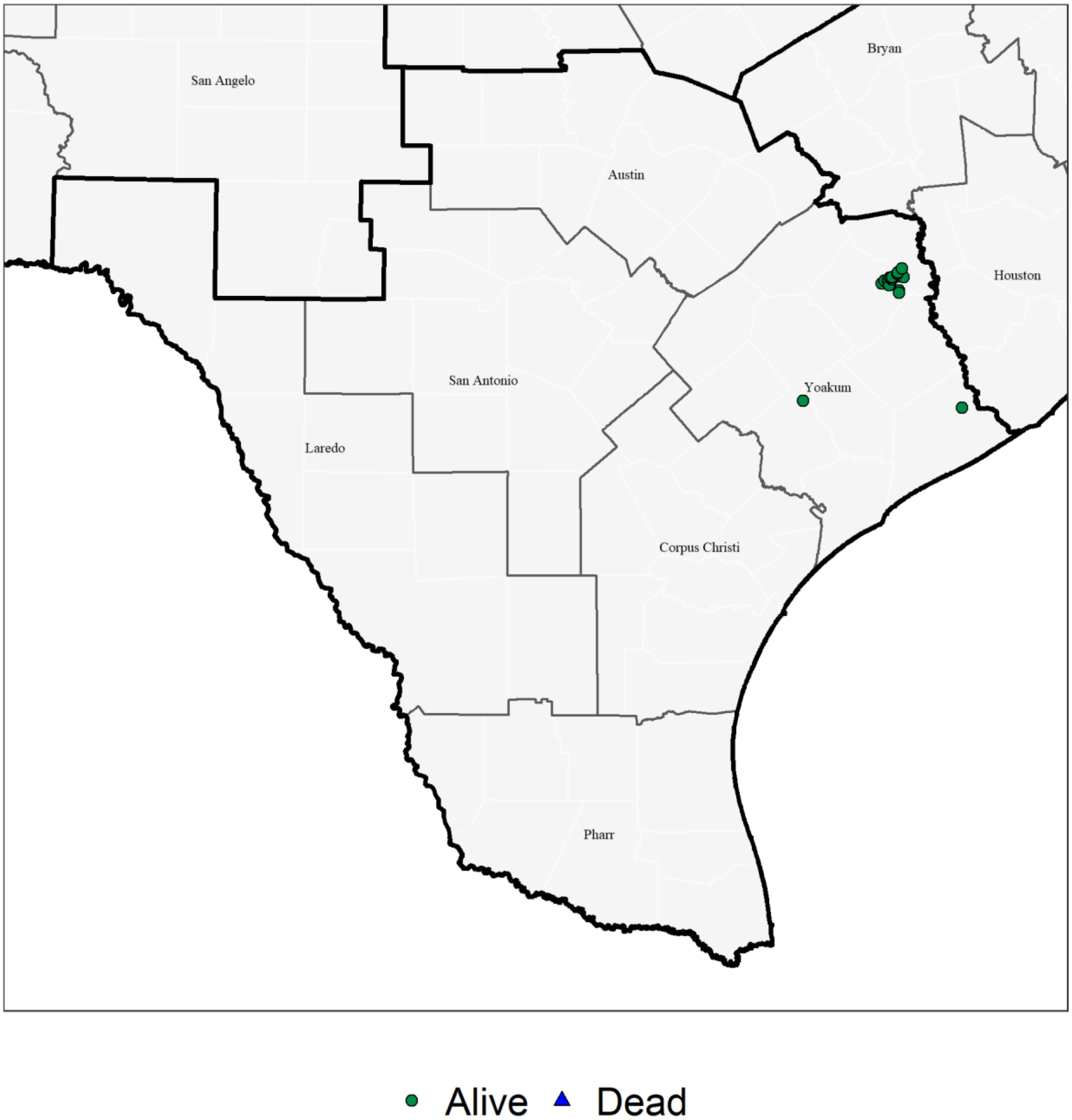
Pseudacris fouquettei
Cajun Chorus Frog



Pseudacris fouquettei

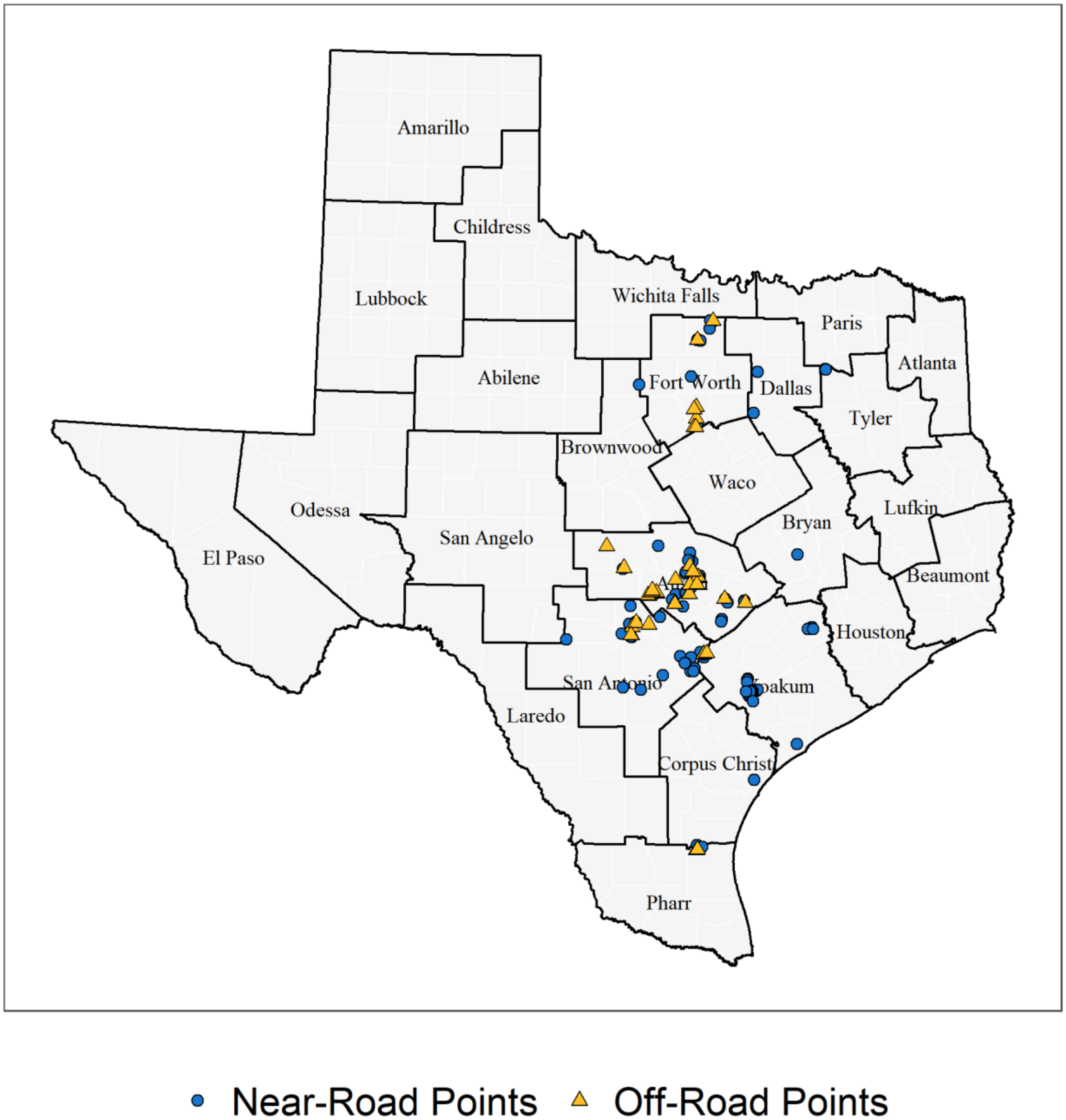
Cajun Chorus Frog

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



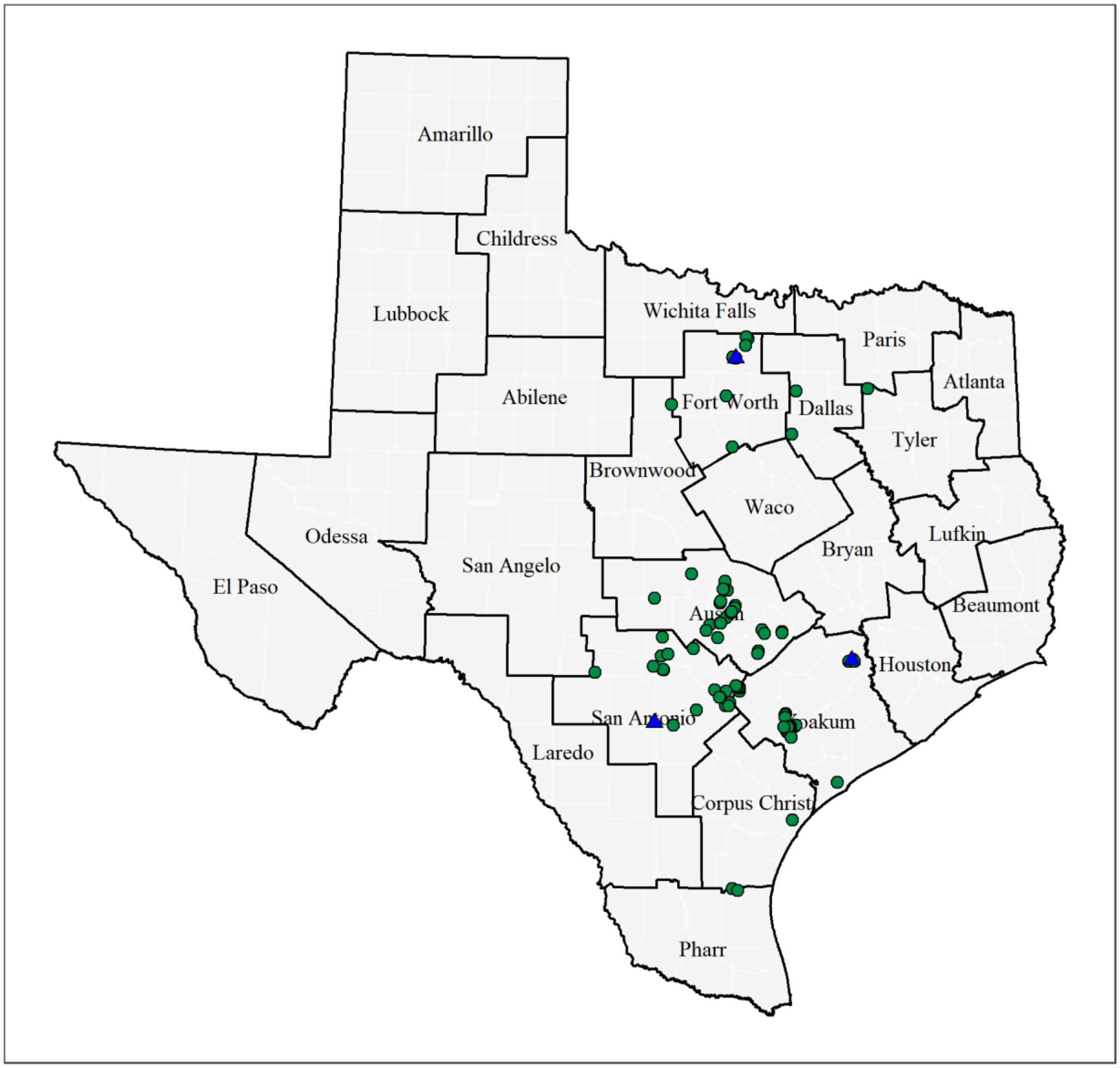
Pseudacris streckeri

Strecker's Chorus Frog



Pseudacris streckeri

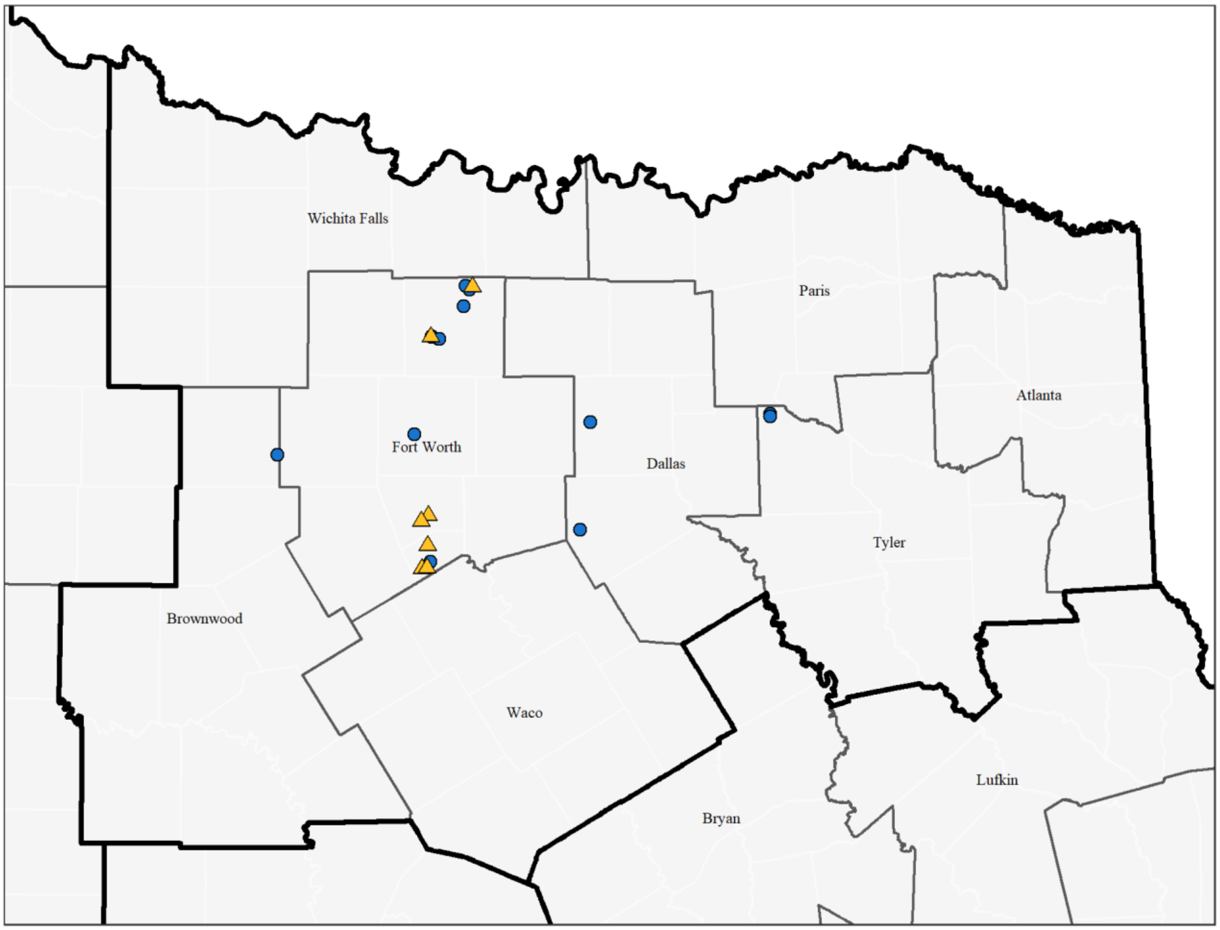
Strecker's Chorus Frog



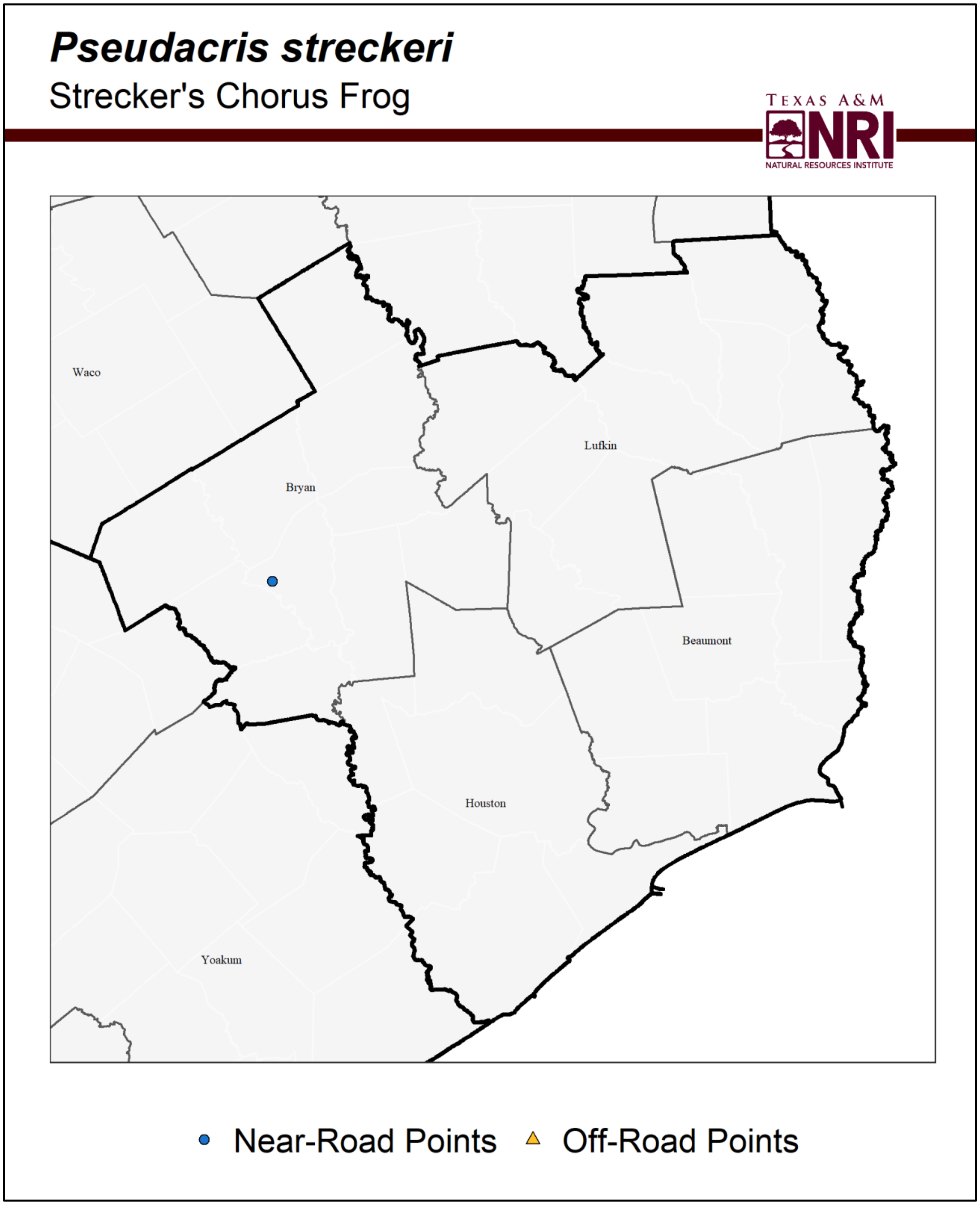
● Alive ▲ Dead

Pseudacris streckeri

Strecker's Chorus Frog

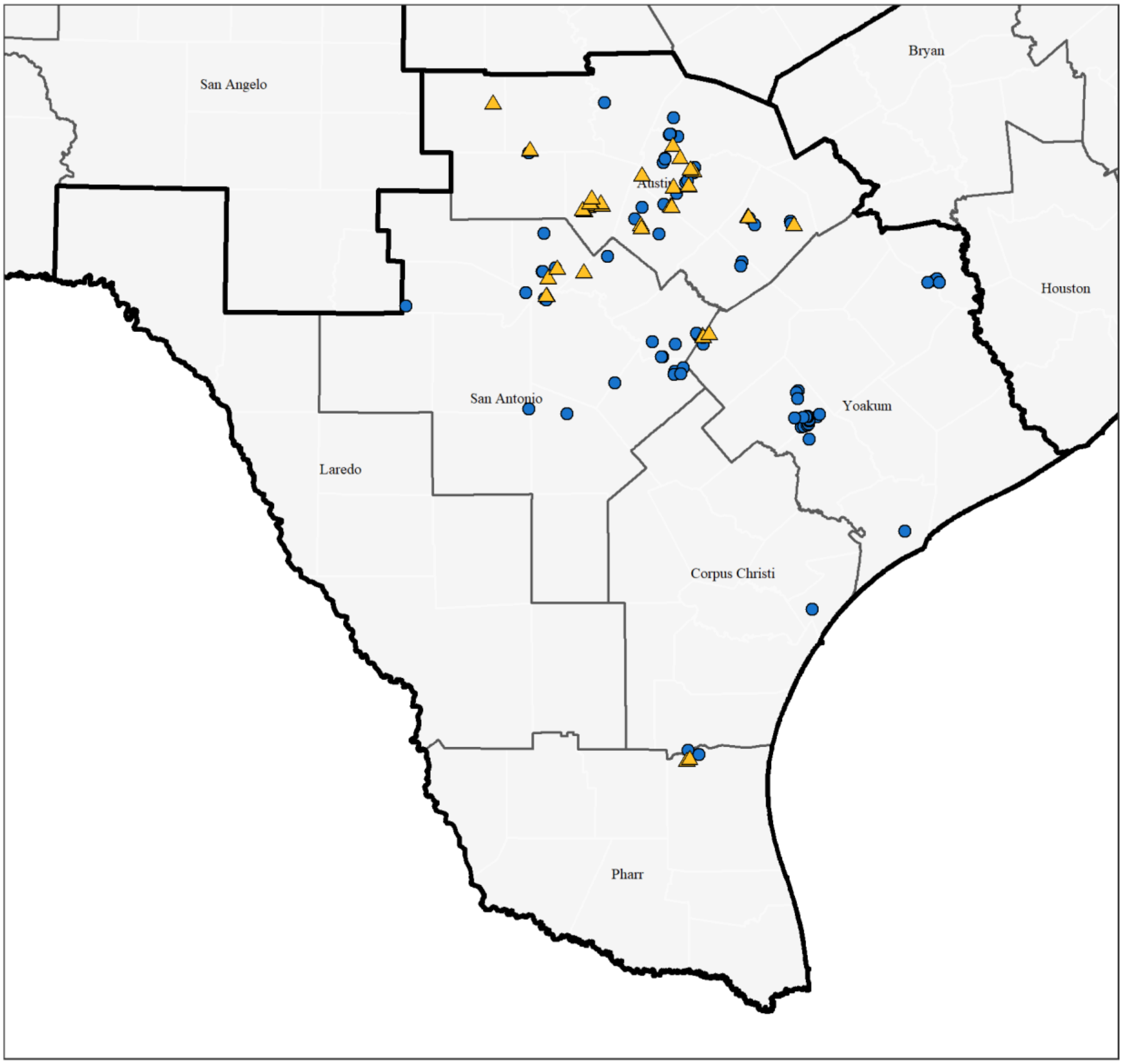


Near-Road Points Off-Road Points


Pseudacris streckeri
Strecker's Chorus Frog
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE
Waco
Bryan
Lufkin
Beaumont
Houston
Yoakum
Near-Road Points
Off-Road Points

Pseudacris streckeri

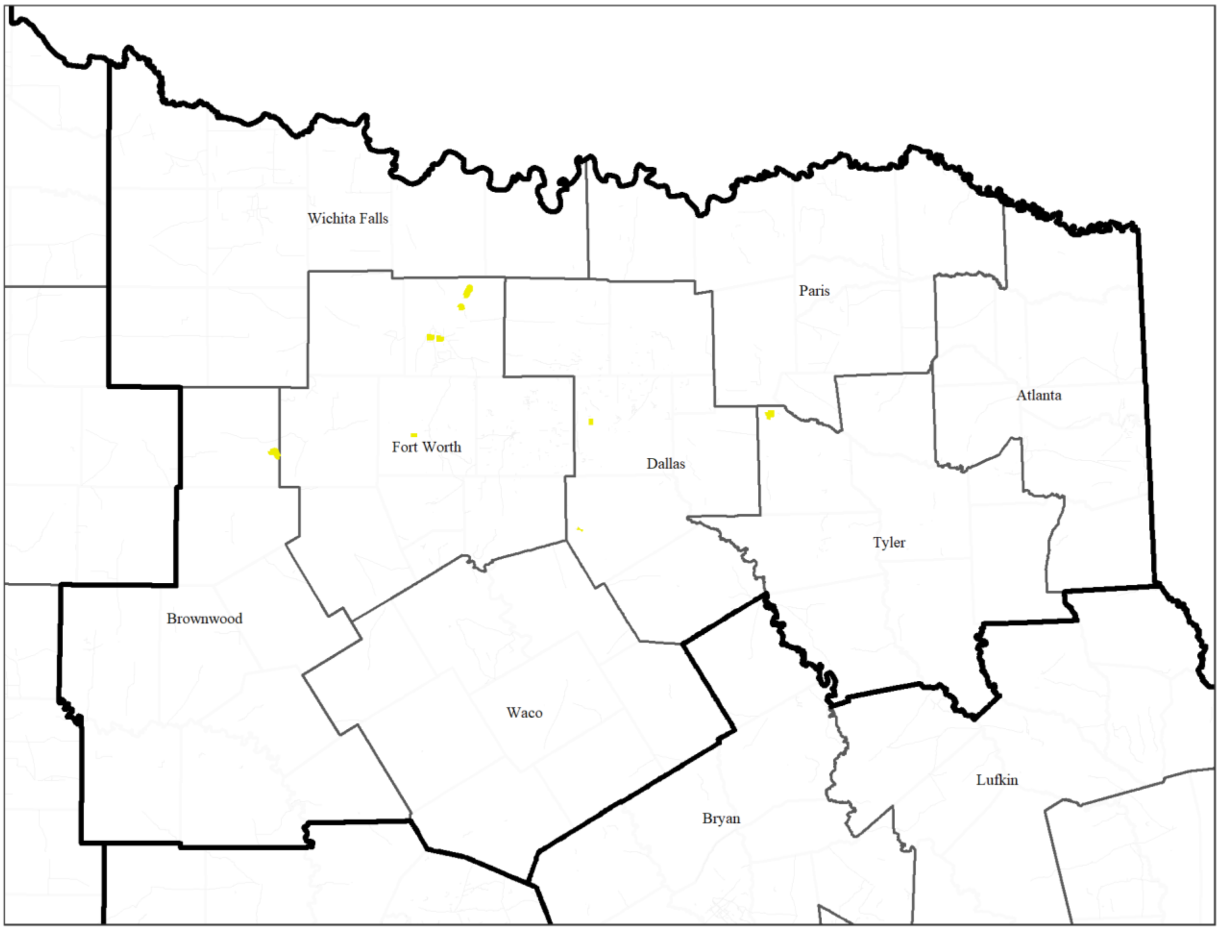
Strecker's Chorus Frog



Near-Road Points   Off-Road Points

Pseudacris streckeri

Strecker's Chorus Frog



Points Per Section 1-2 3-4 5-6 7+

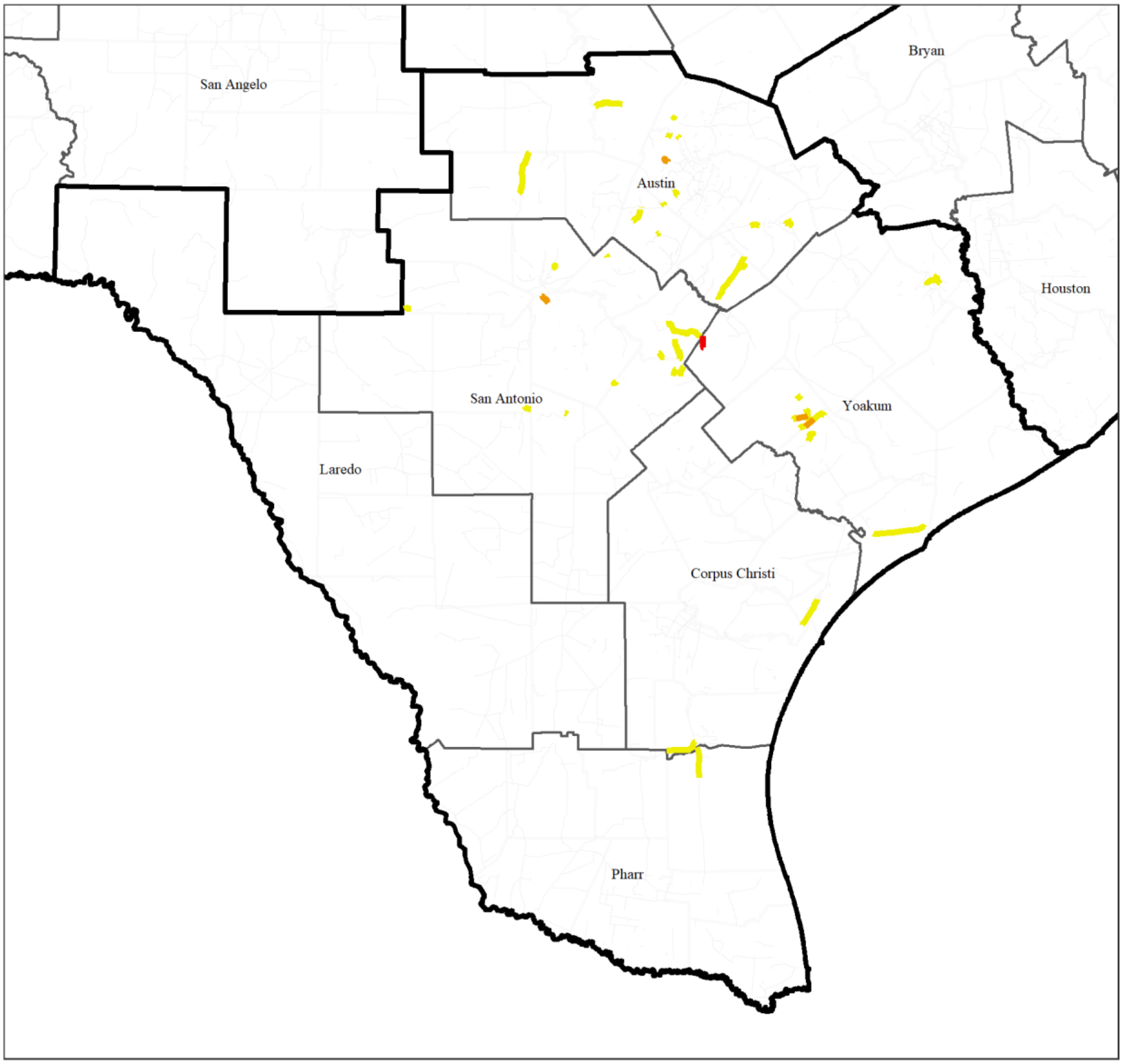
Pseudacris streckeri

Strecker's Chorus Frog

Points Per Section 1-2 3-4 5-6 7+

Pseudacris streckeri

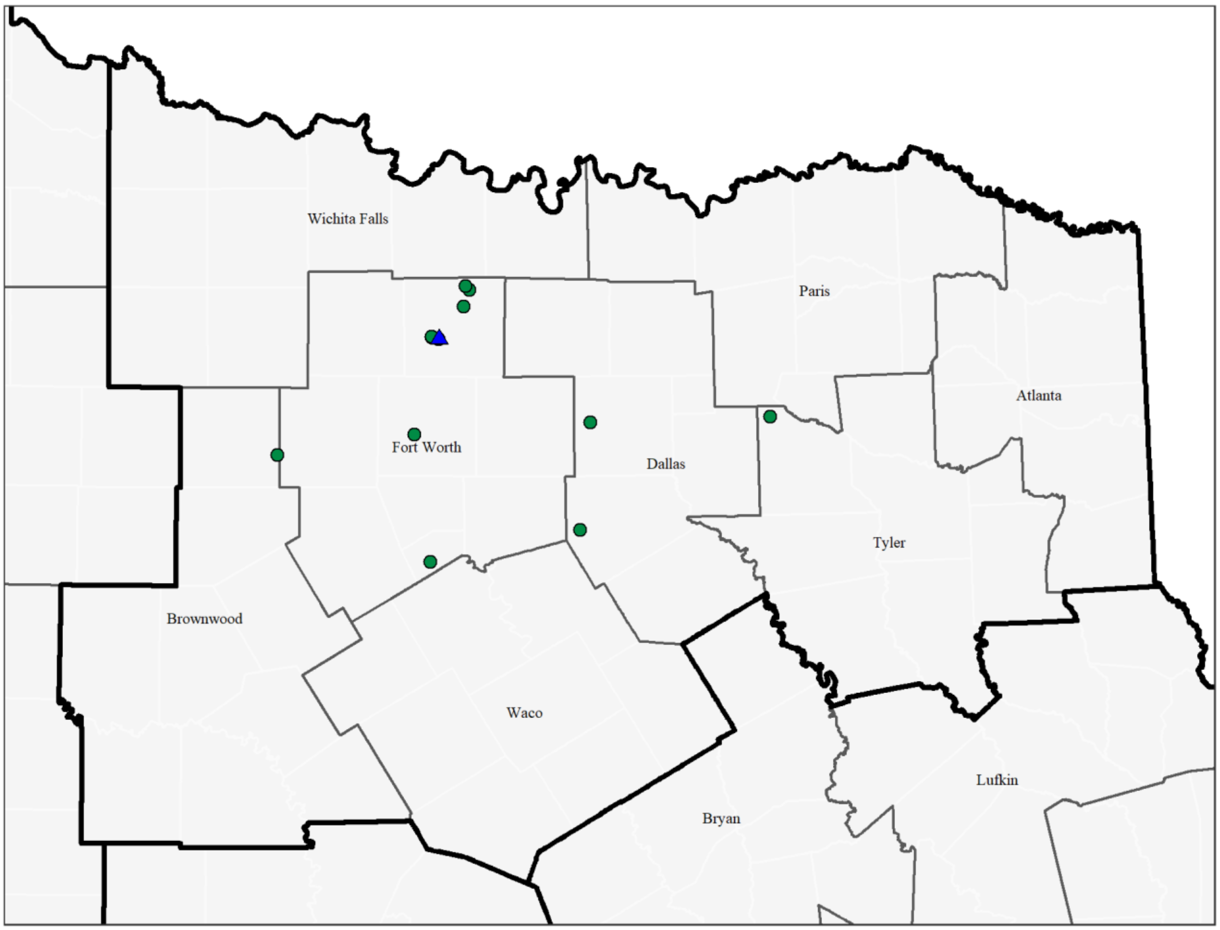
Strecker's Chorus Frog



Points Per Section 1-2 3-4 5-6 7+

Pseudacris streckeri

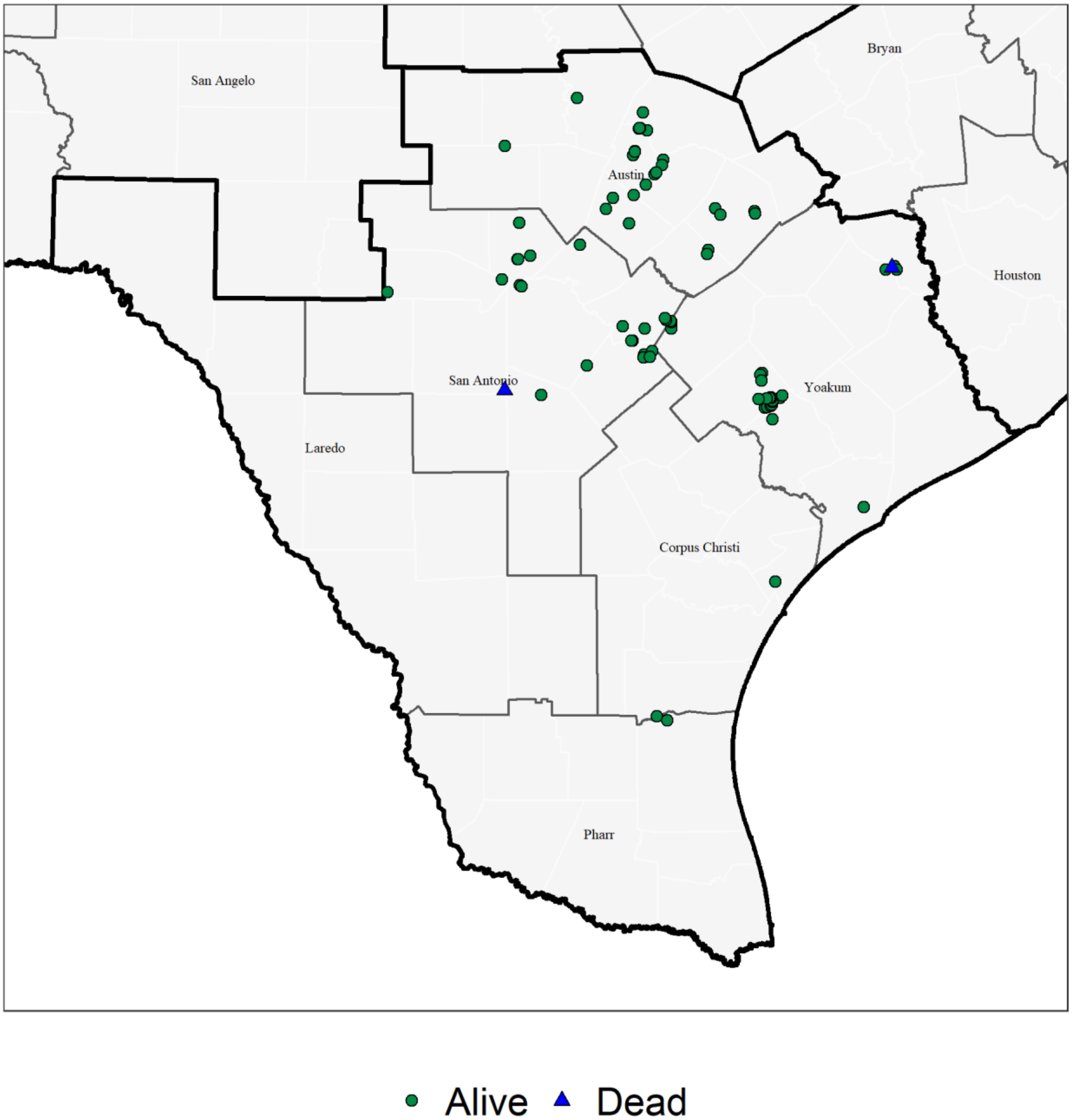
Strecker's Chorus Frog



● Alive ▲ Dead

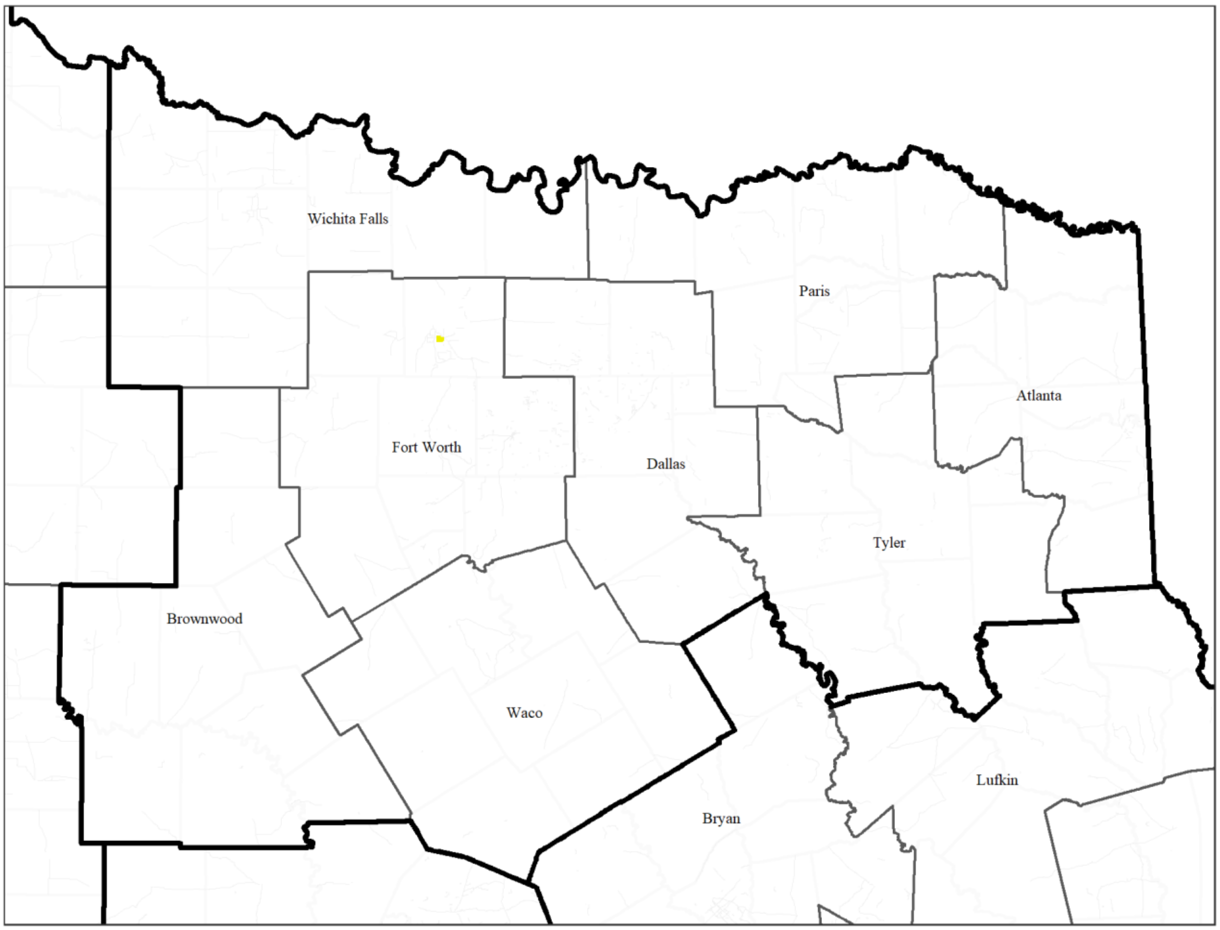
Pseudacris streckeri

Strecker's Chorus Frog



Pseudacris streckeri

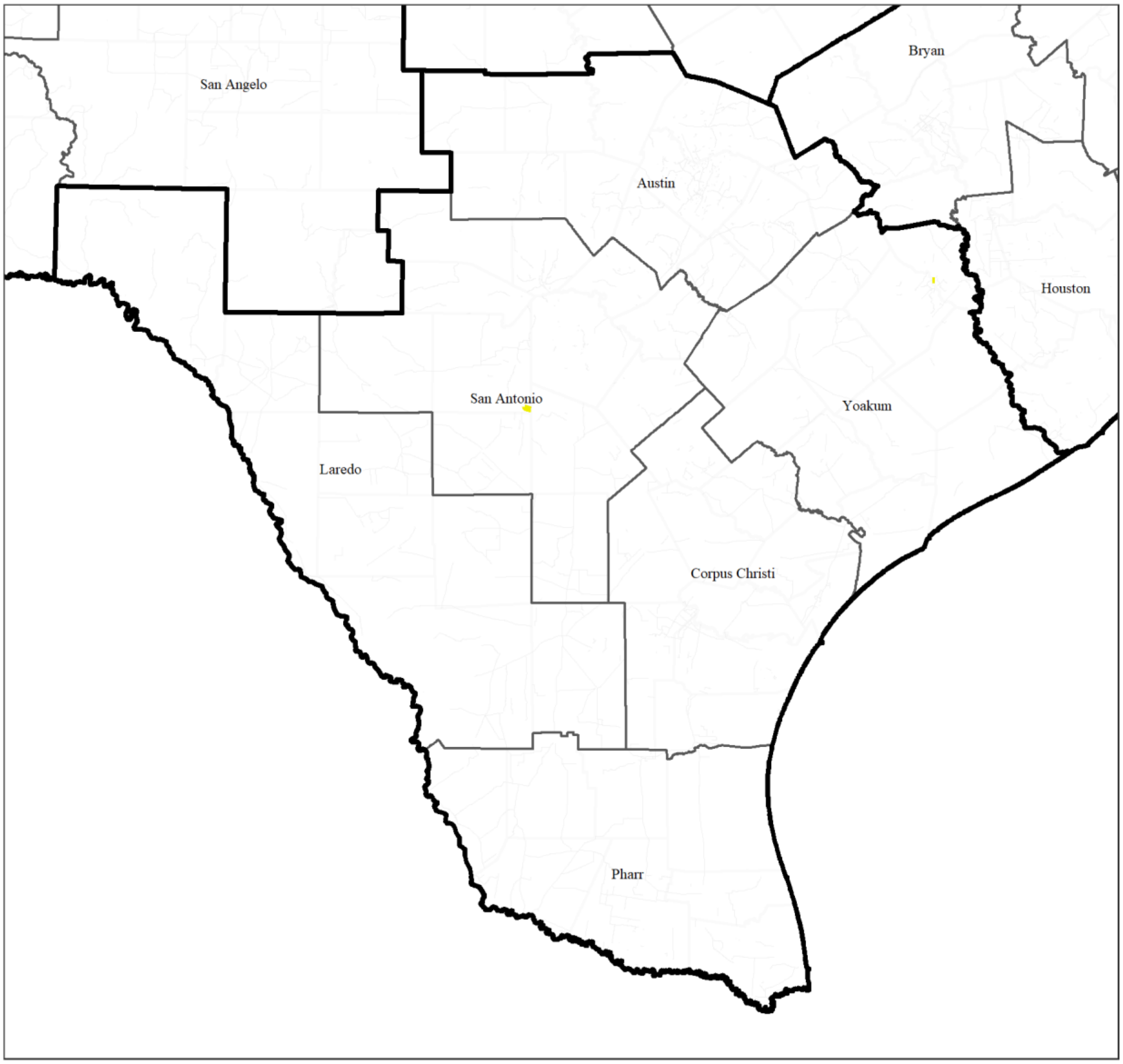
Strecker's Chorus Frog



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Pseudacris streckeri

Strecker's Chorus Frog



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Rhinophrynus dorsalis

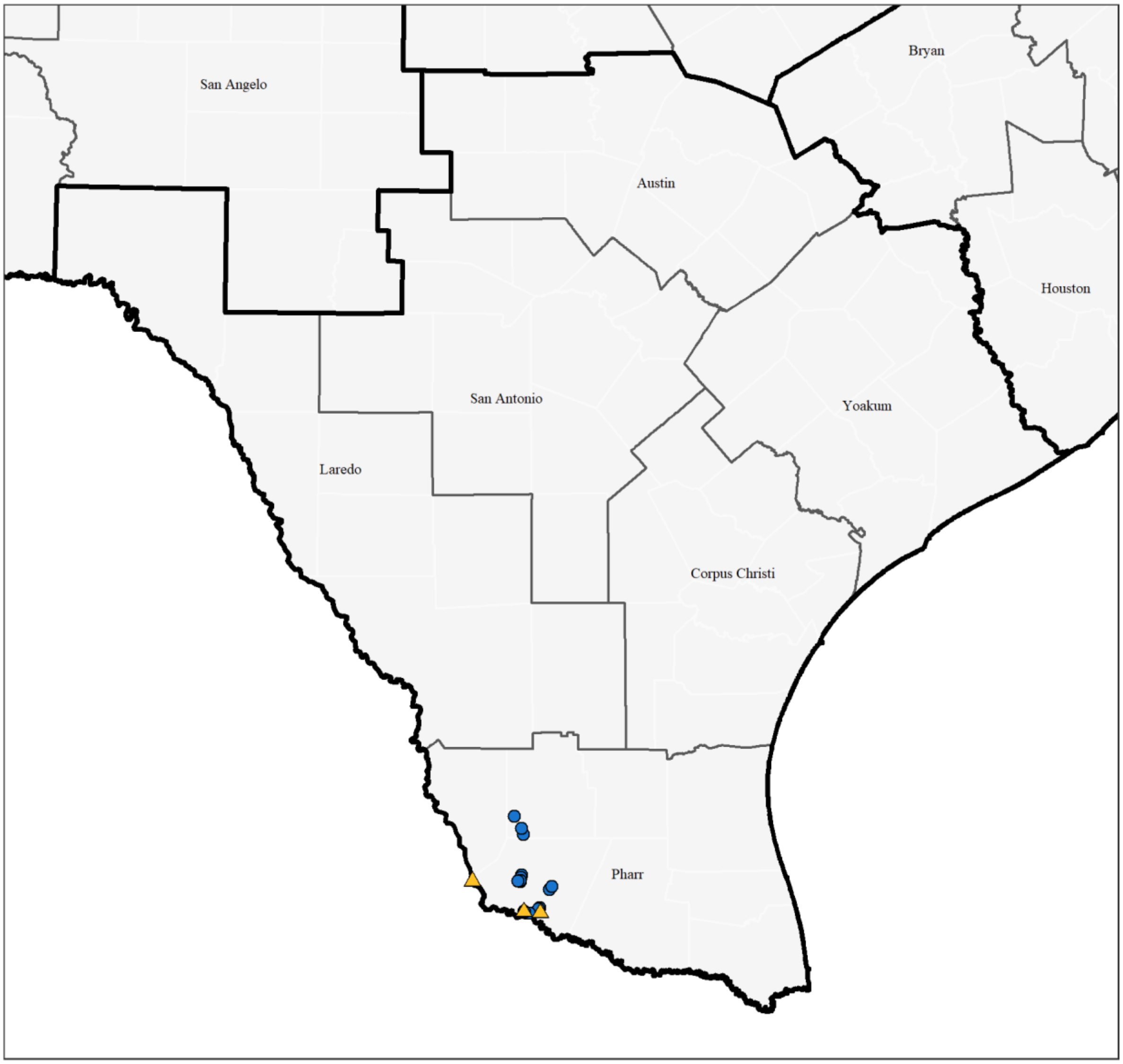
Mexican Burrowing Toad

Rhinophrynus dorsalis

Mexican Burrowing Toad

Rhinophrynus dorsalis

Mexican Burrowing Toad



● Near-Road Points ▲ Off-Road Points

Rhinophrynus dorsalis

Mexican Burrowing Toad

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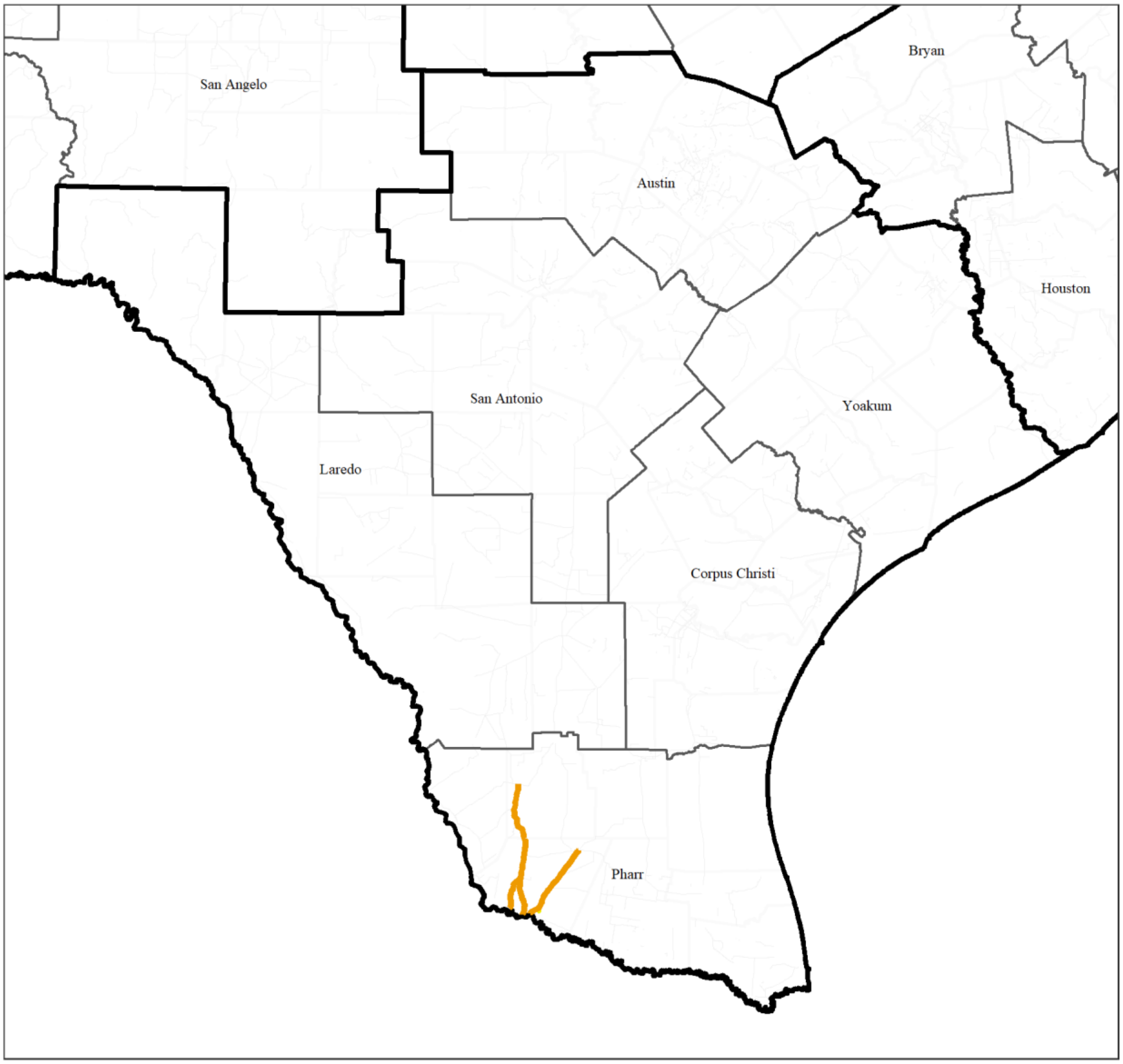
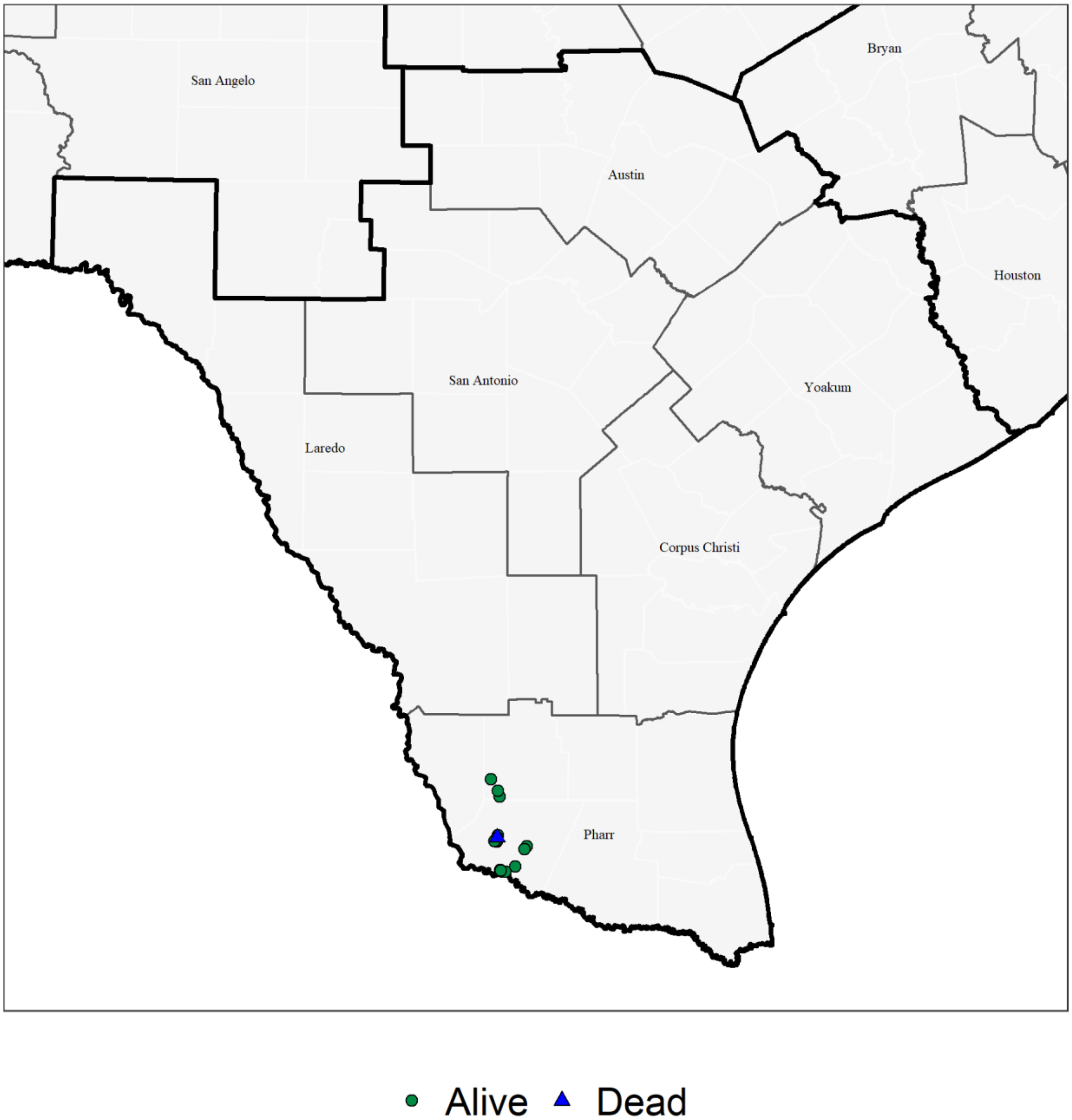


Points Per Section 1-2 3-4 5-6 7+

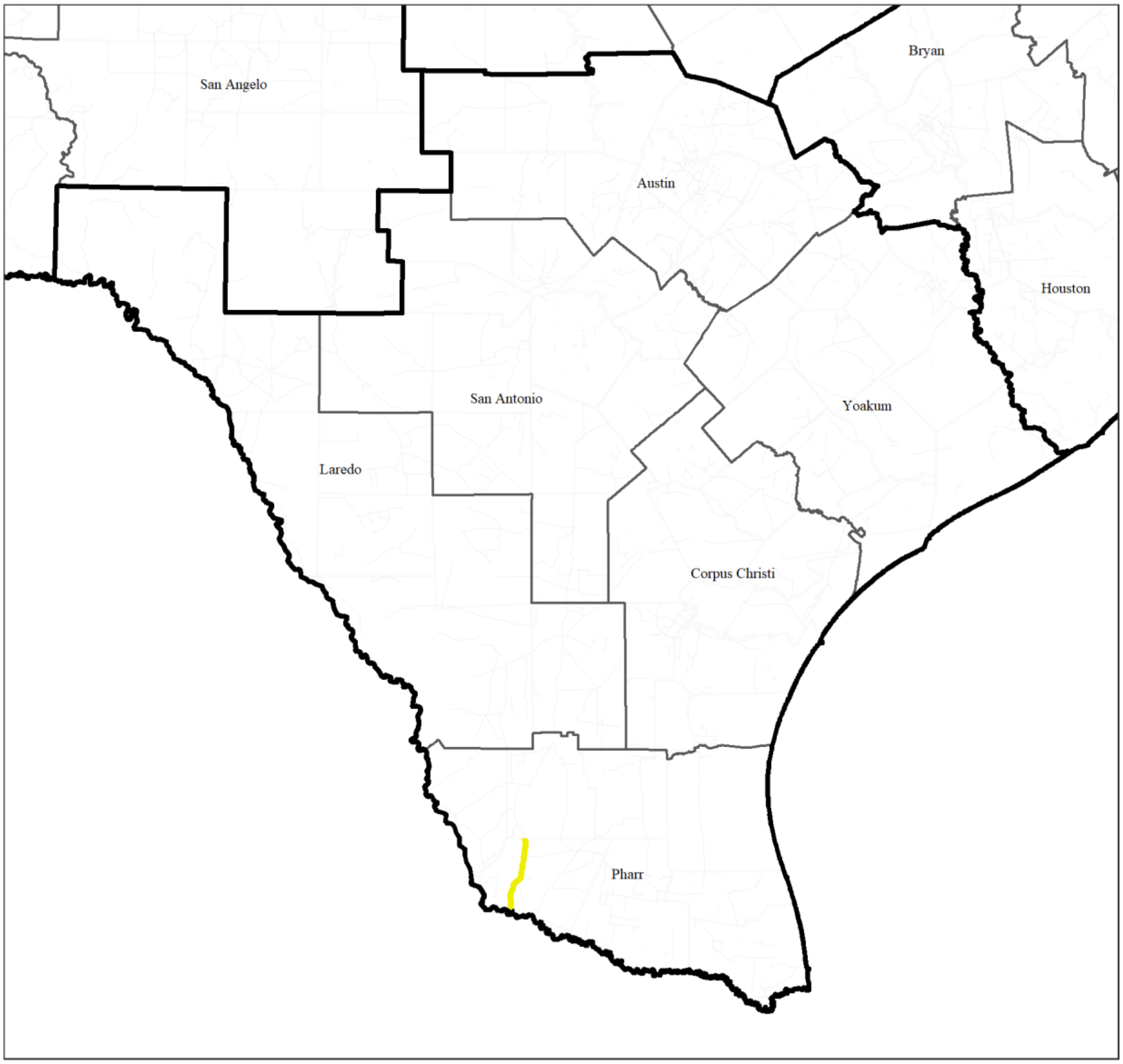
Rhinophrynus dorsalis

Mexican Burrowing Toad



Rhinophrynus dorsalis

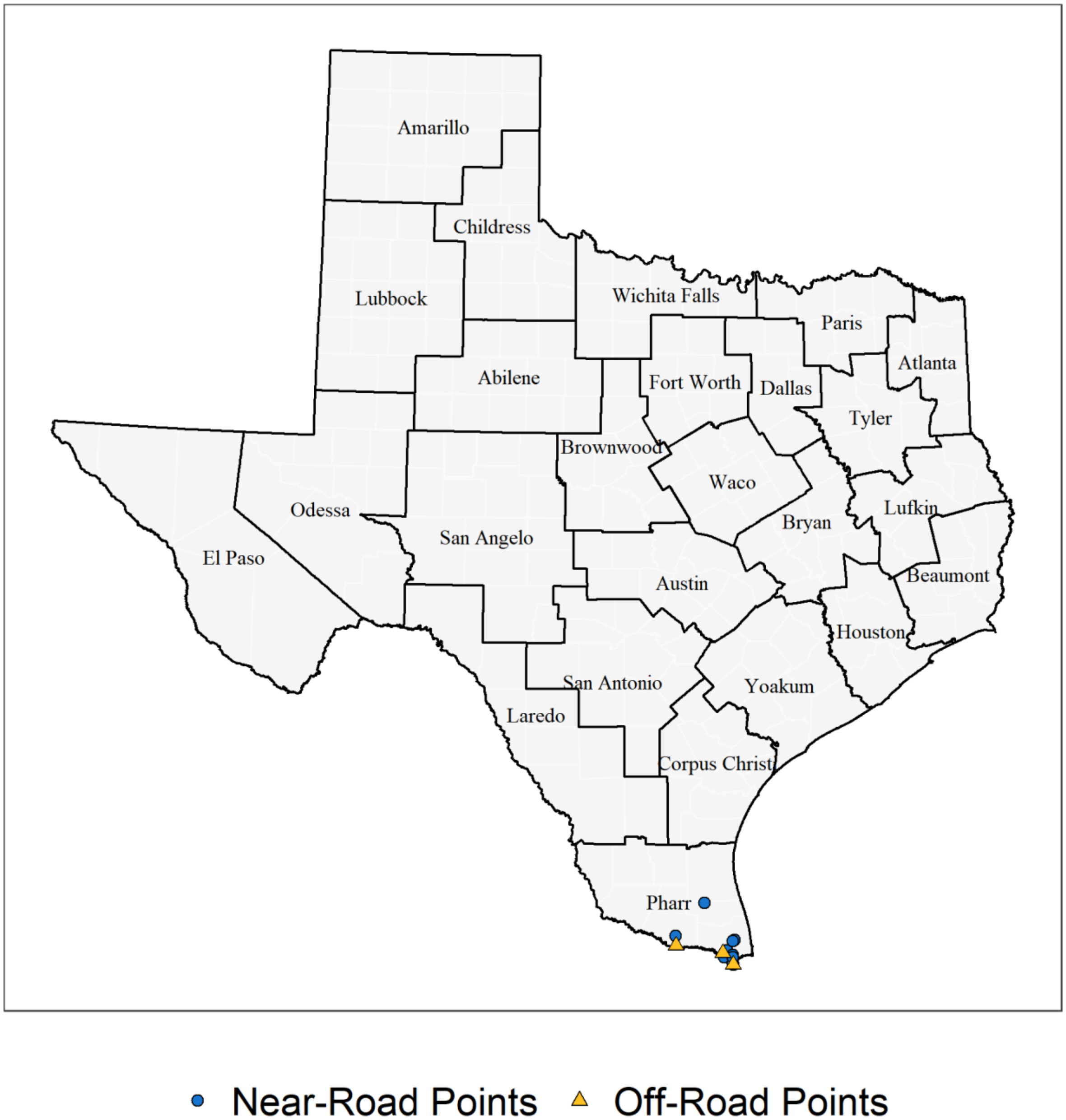
Mexican Burrowing Toad

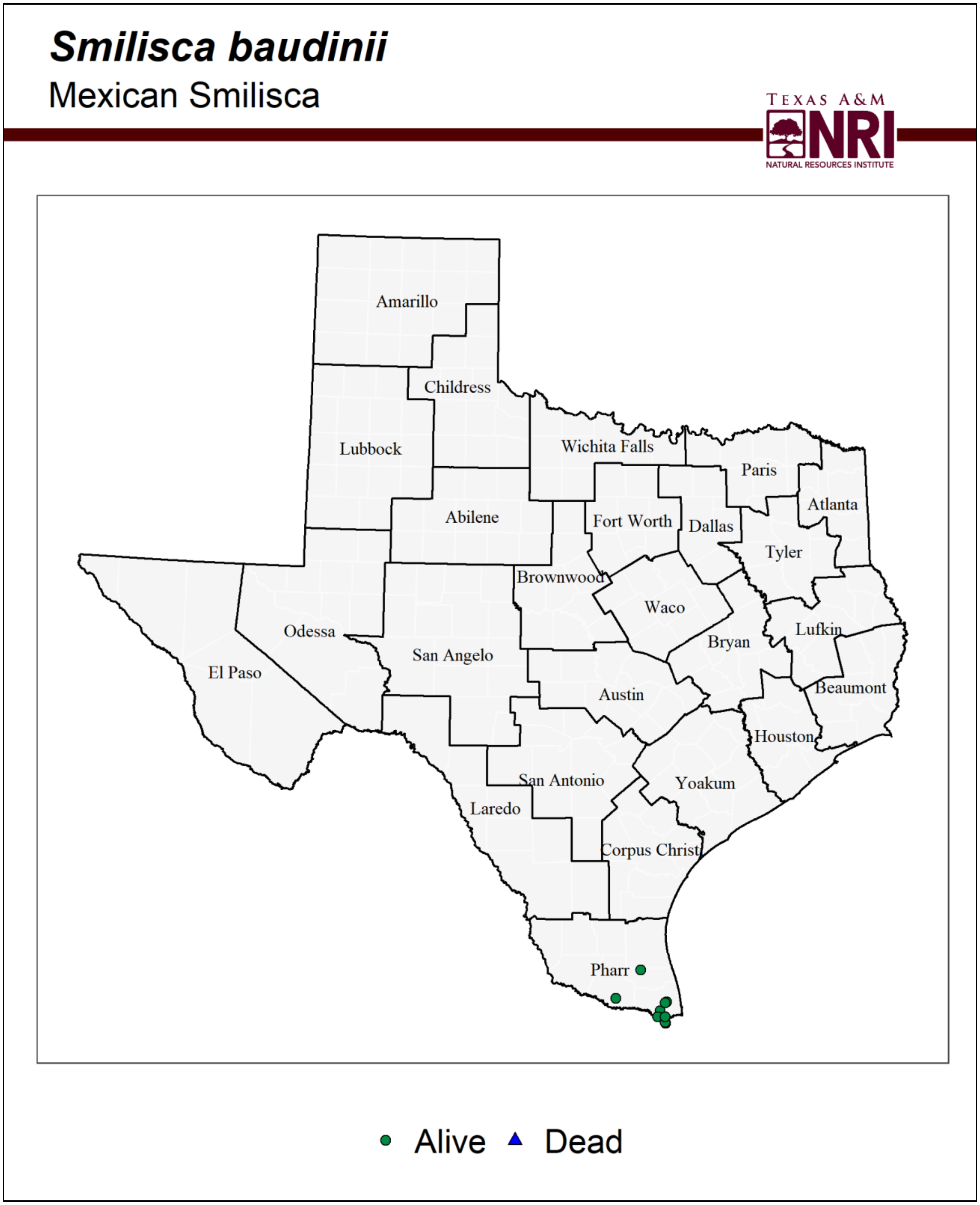


Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Smilisca baudinii

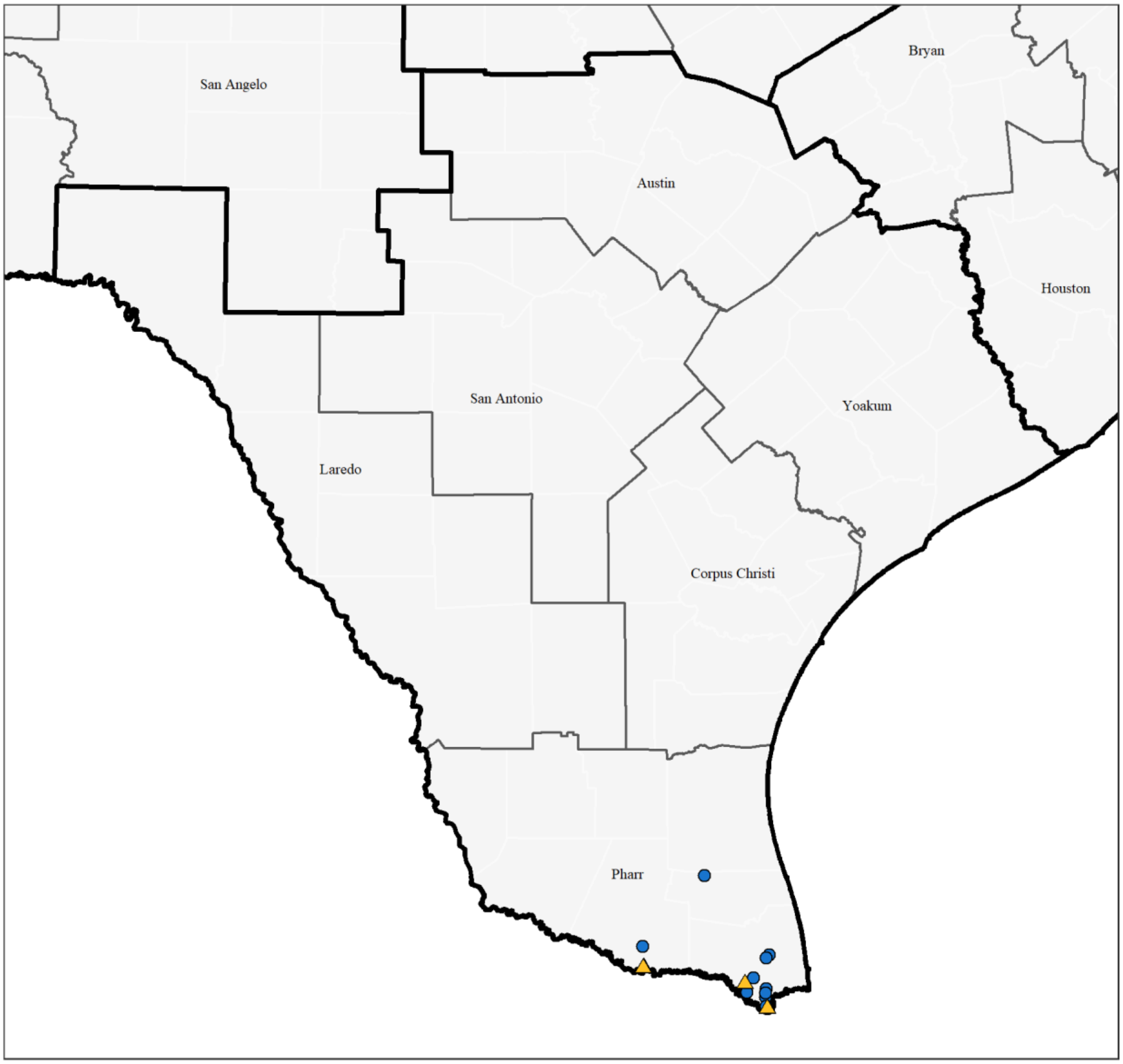
Mexican Smilisca




Smilisca baudinii
Mexican Smilisca
Amarillo
Childress
Lubbock
Wichita Falls
Paris
Atlanta
Abilene
Fort Worth
Dallas
Tyler
Brownwood
Waco
Odessa
Lufkin
Bryan
El Paso
San Angelo
Austin
Beaumont
Houston
San Antonio
Yoakum
Laredo
Corpus Christi
Pharr
Alive
Dead

Smilisca baudinii

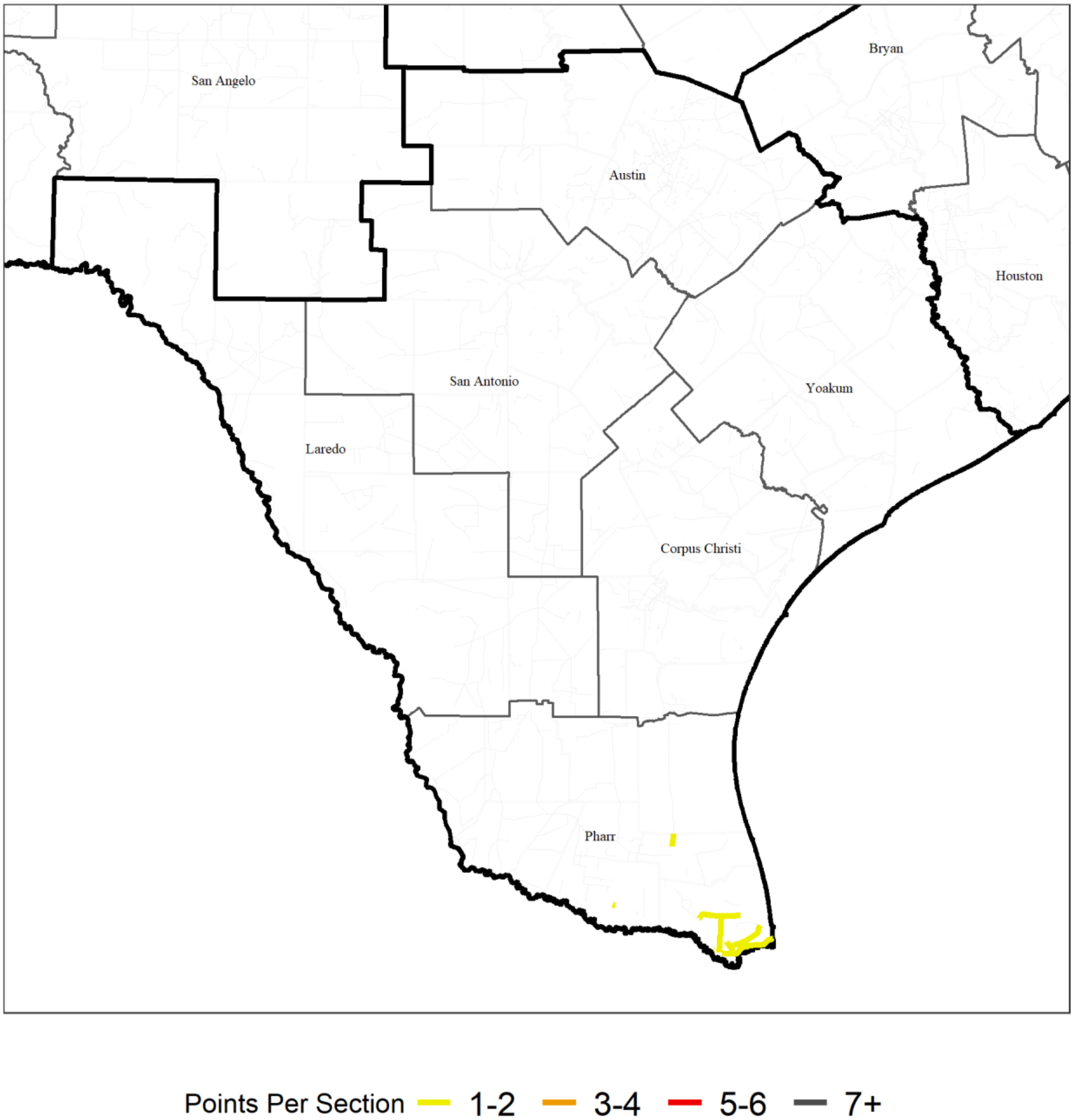
Mexican Smilisca



Near-Road Points   Off-Road Points

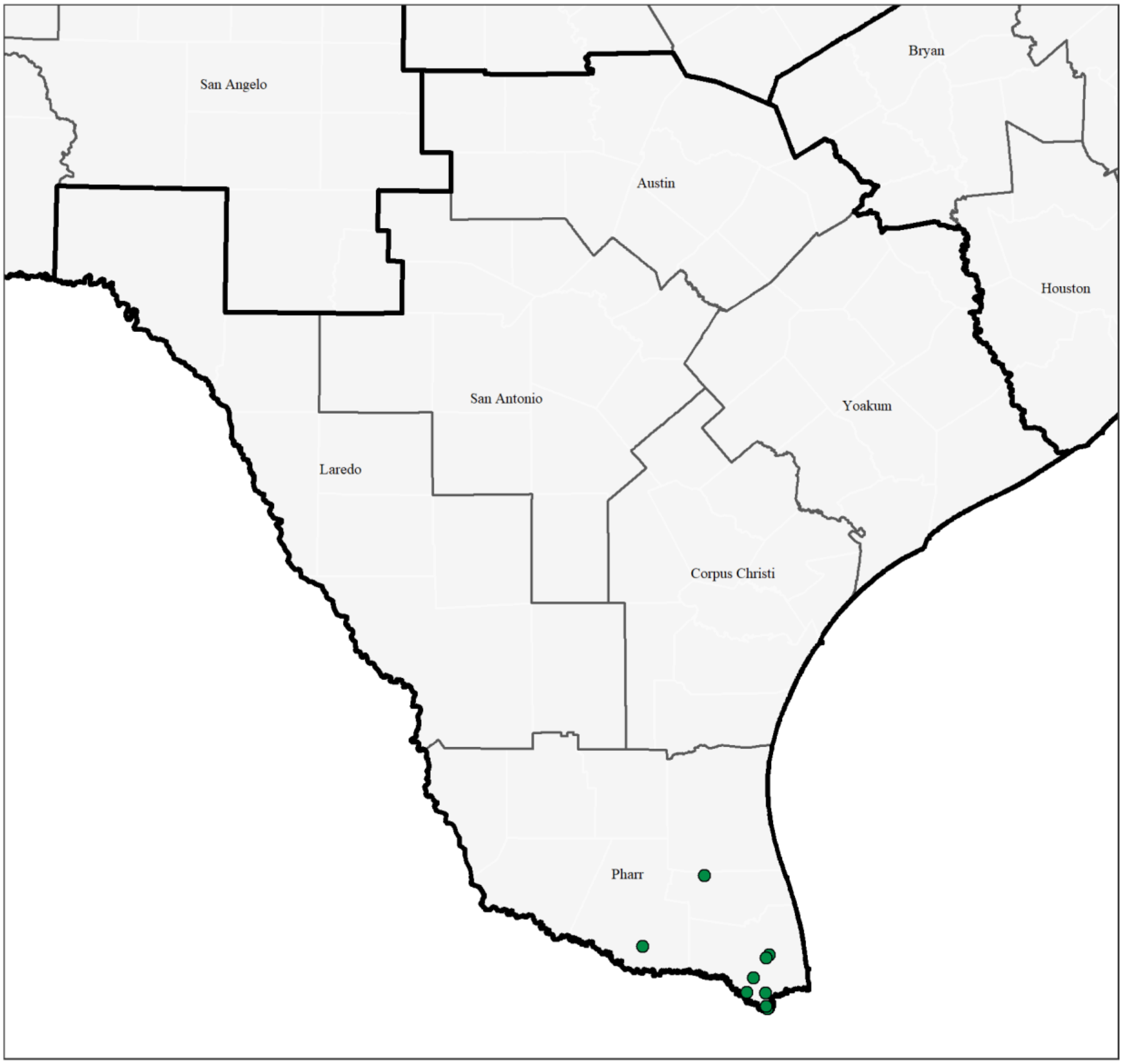
Smilisca baudinii

Mexican Smilisca



Smilisca baudinii

Mexican Smilisca

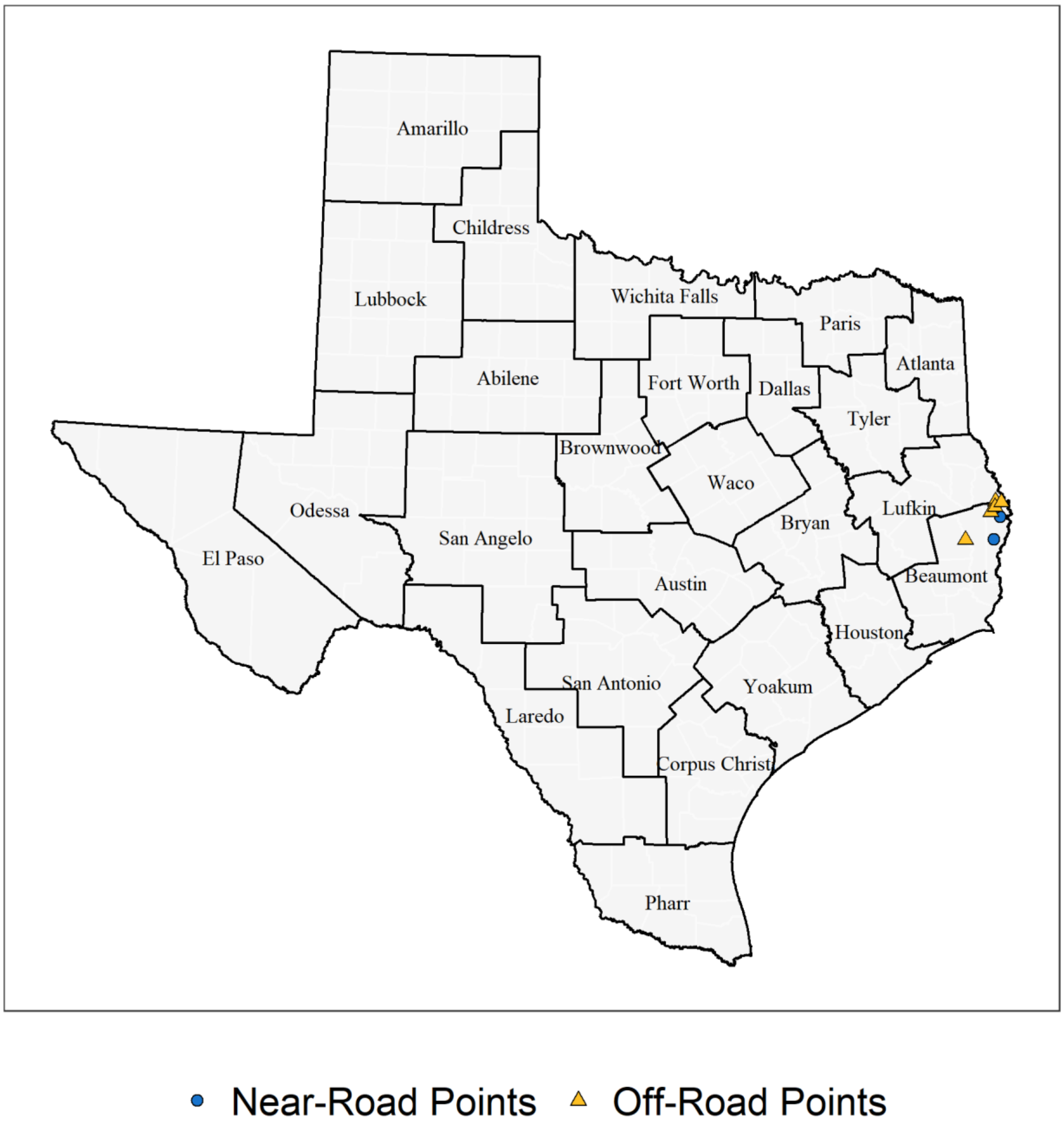


Alive Dead

A2. Amphibians – Salamanders

Desmognathus auriculatus

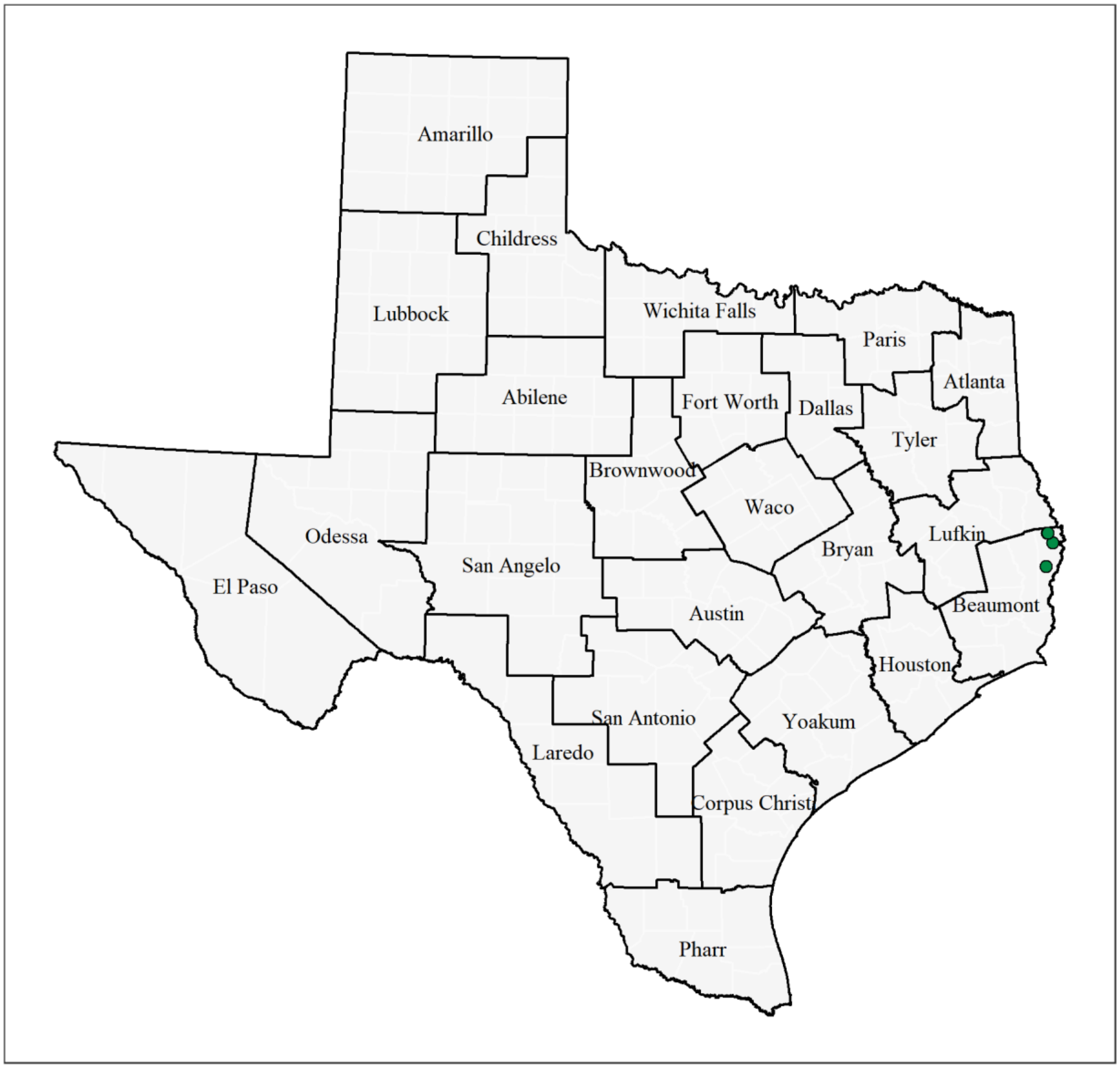
Southern Dusky Salamander



Desmognathus auriculatus

Southern Dusky Salamander

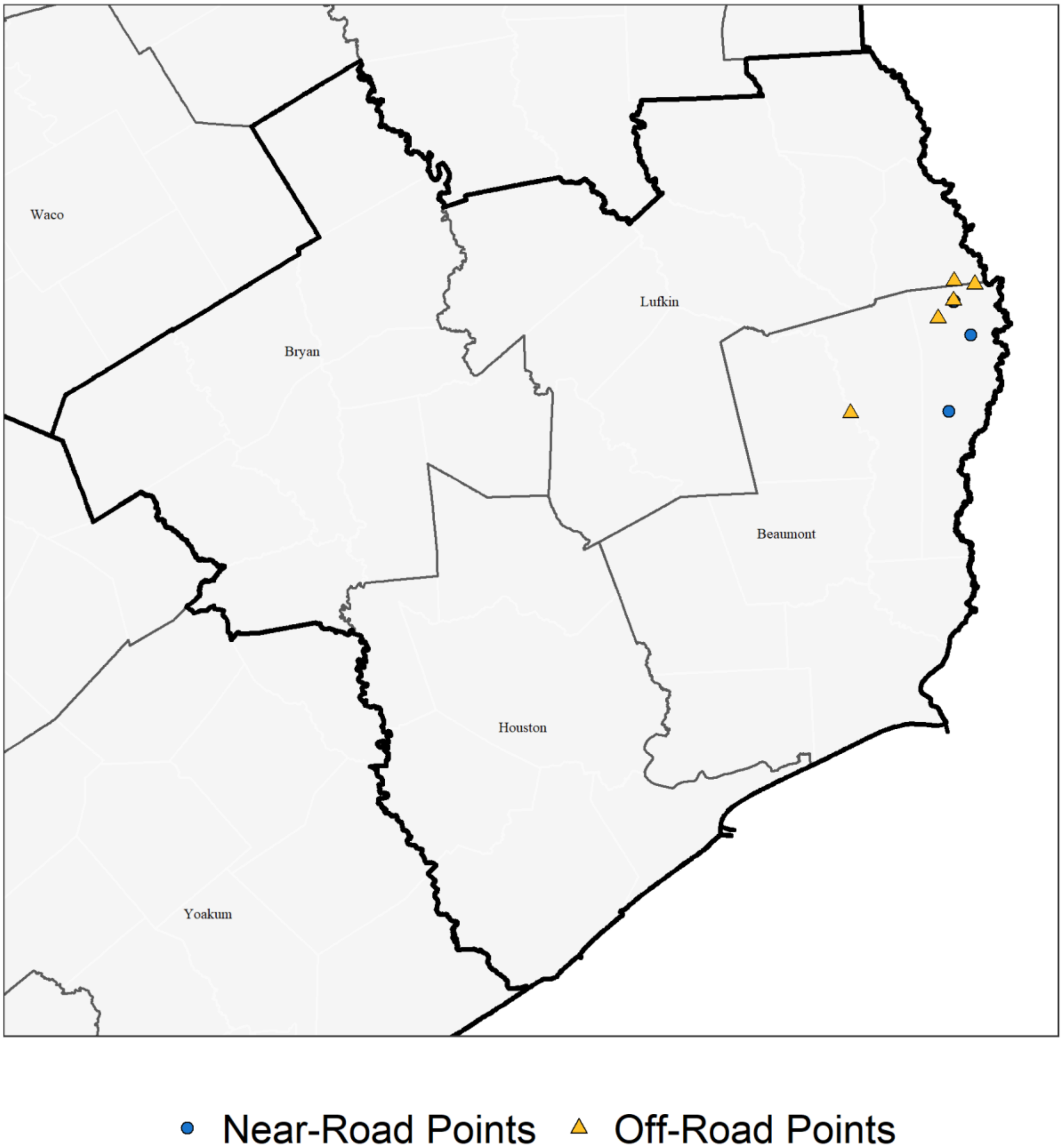
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



● Alive ▲ Dead

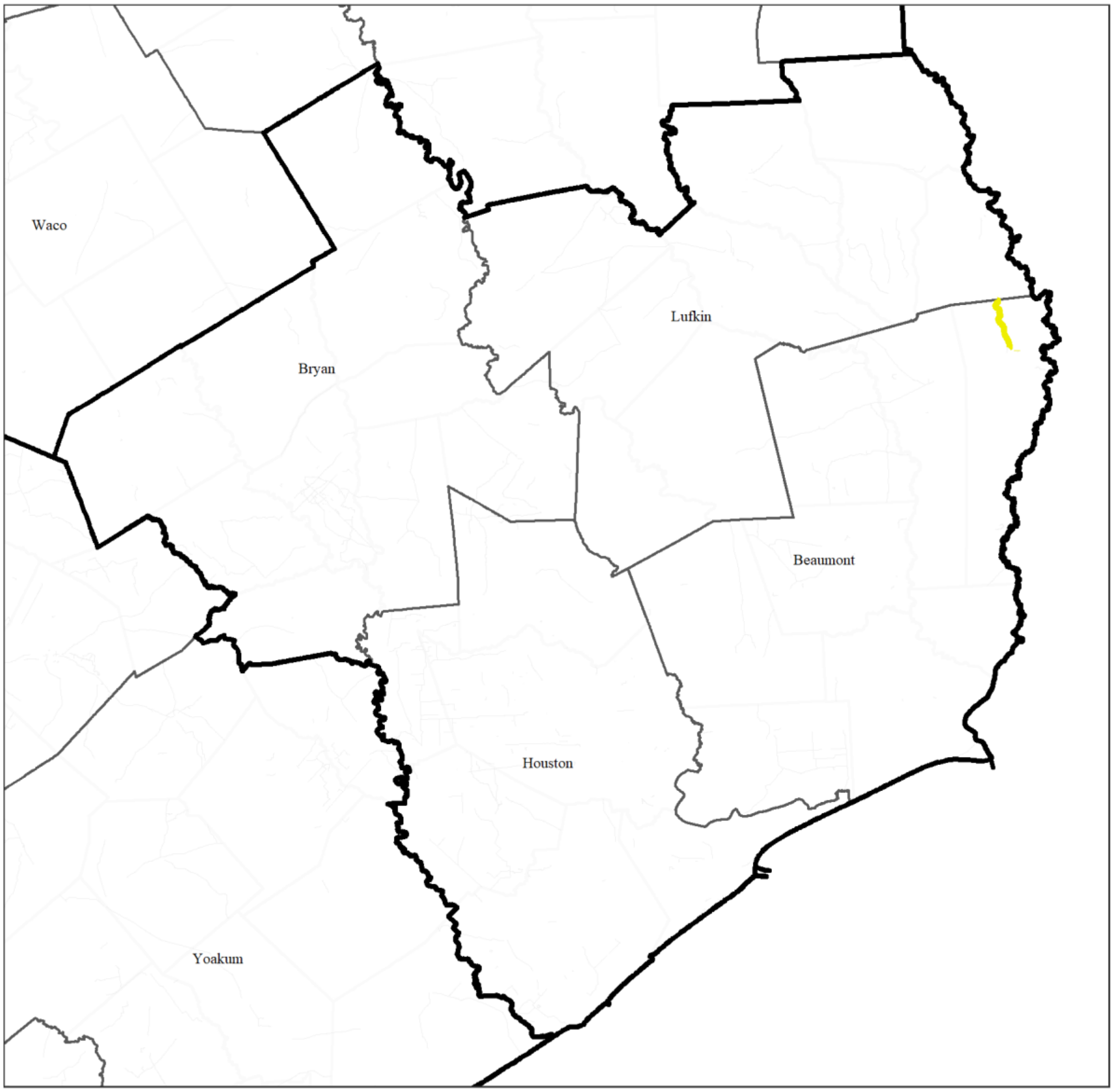
Desmognathus auriculatus

Southern Dusky Salamander



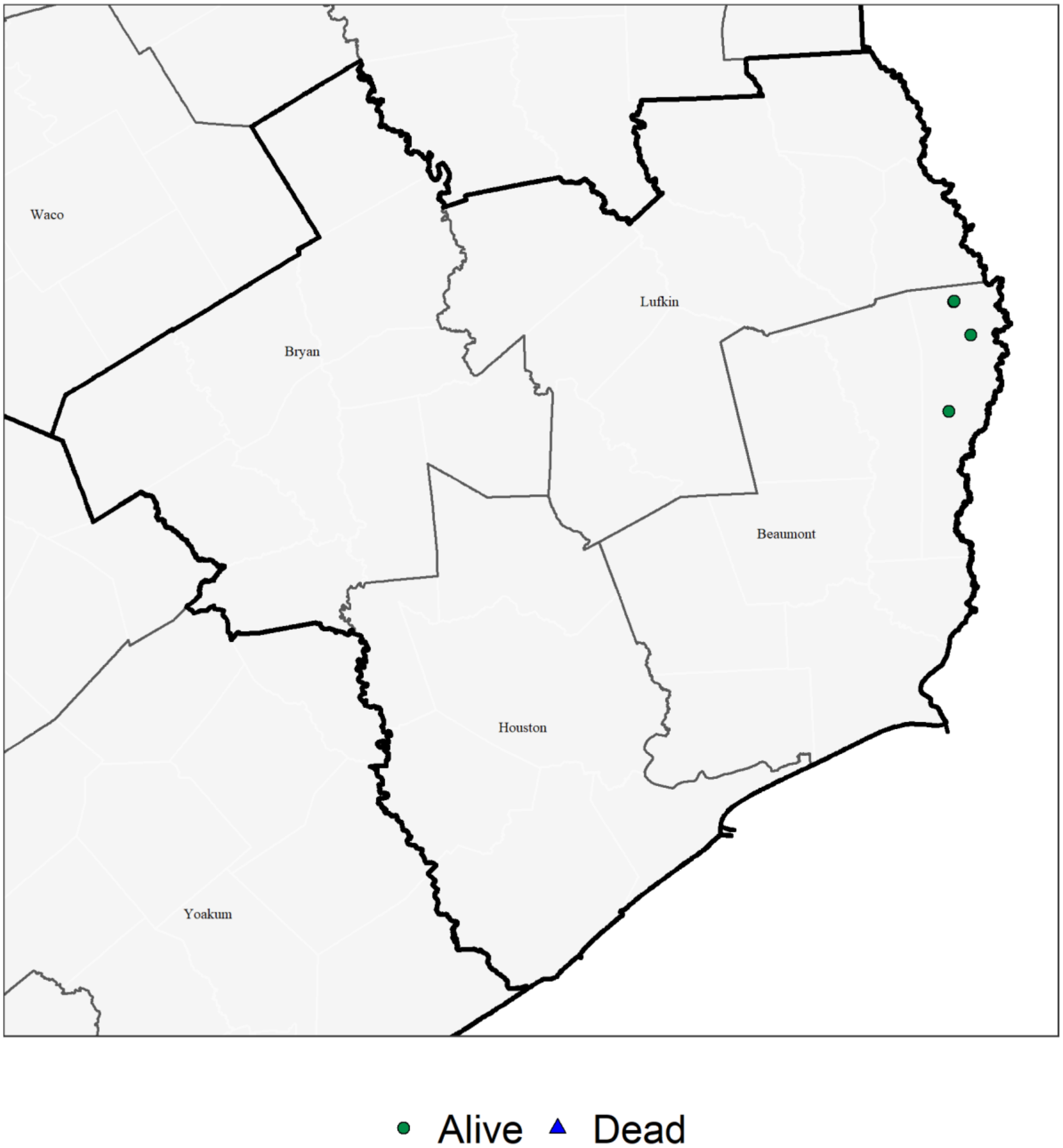
Desmognathus auriculatus

Southern Dusky Salamander



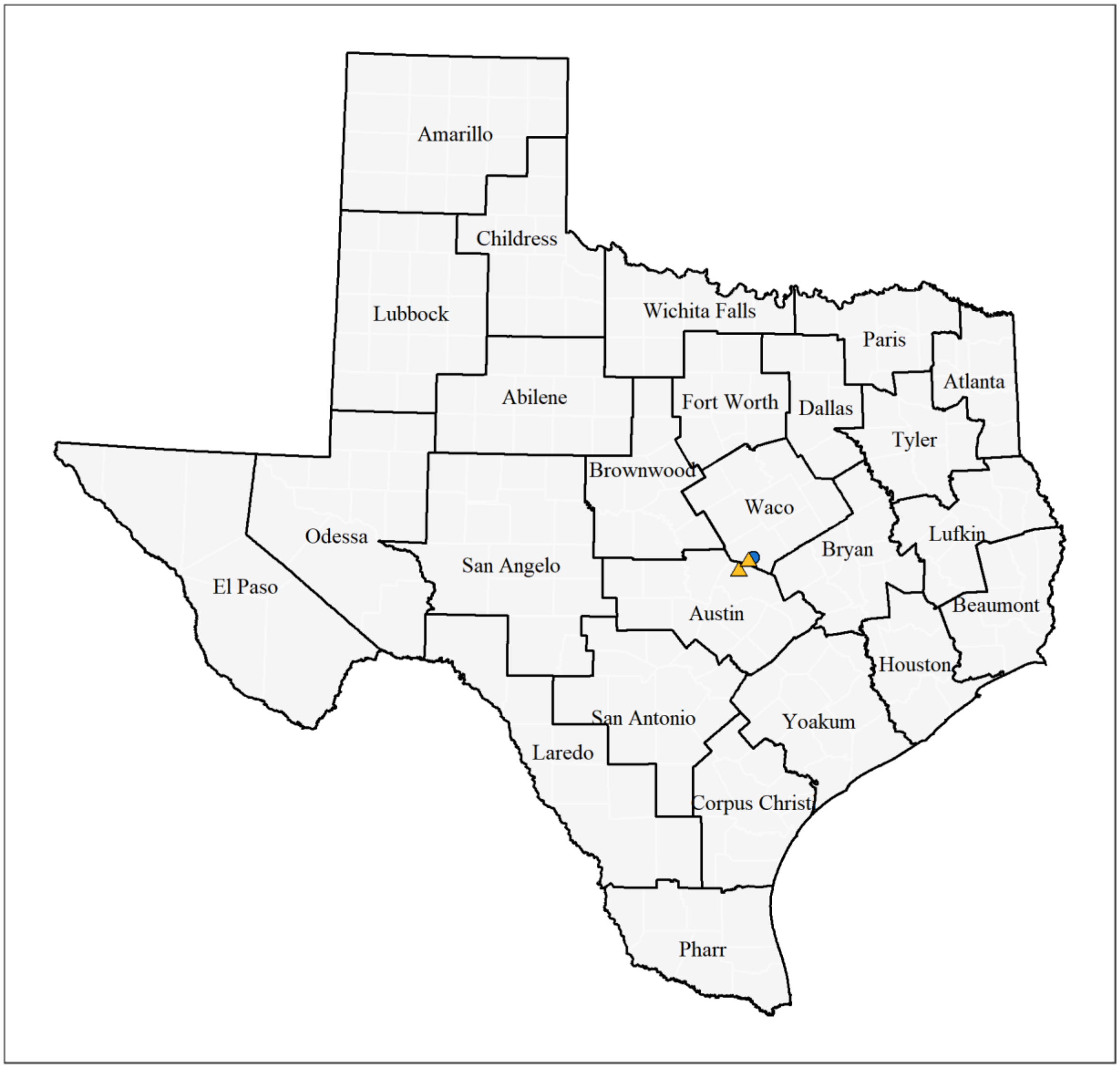
Points Per Section 1-2 3-4 5-6 7+

Desmognathus auriculatus
Southern Dusky Salamander



Eurycea chisholmensis

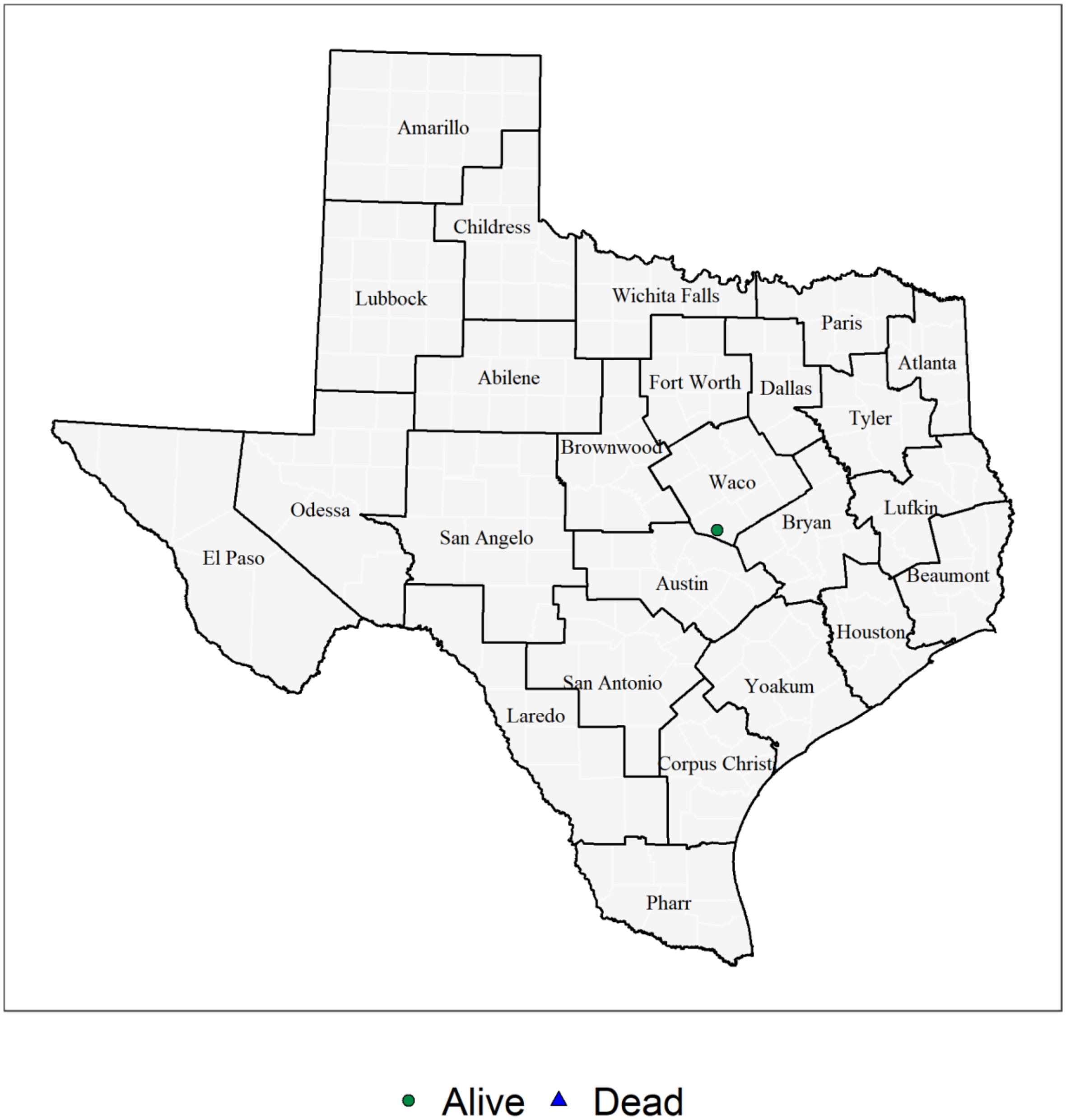
Salado Salamander



Near-Road Points   Off-Road Points

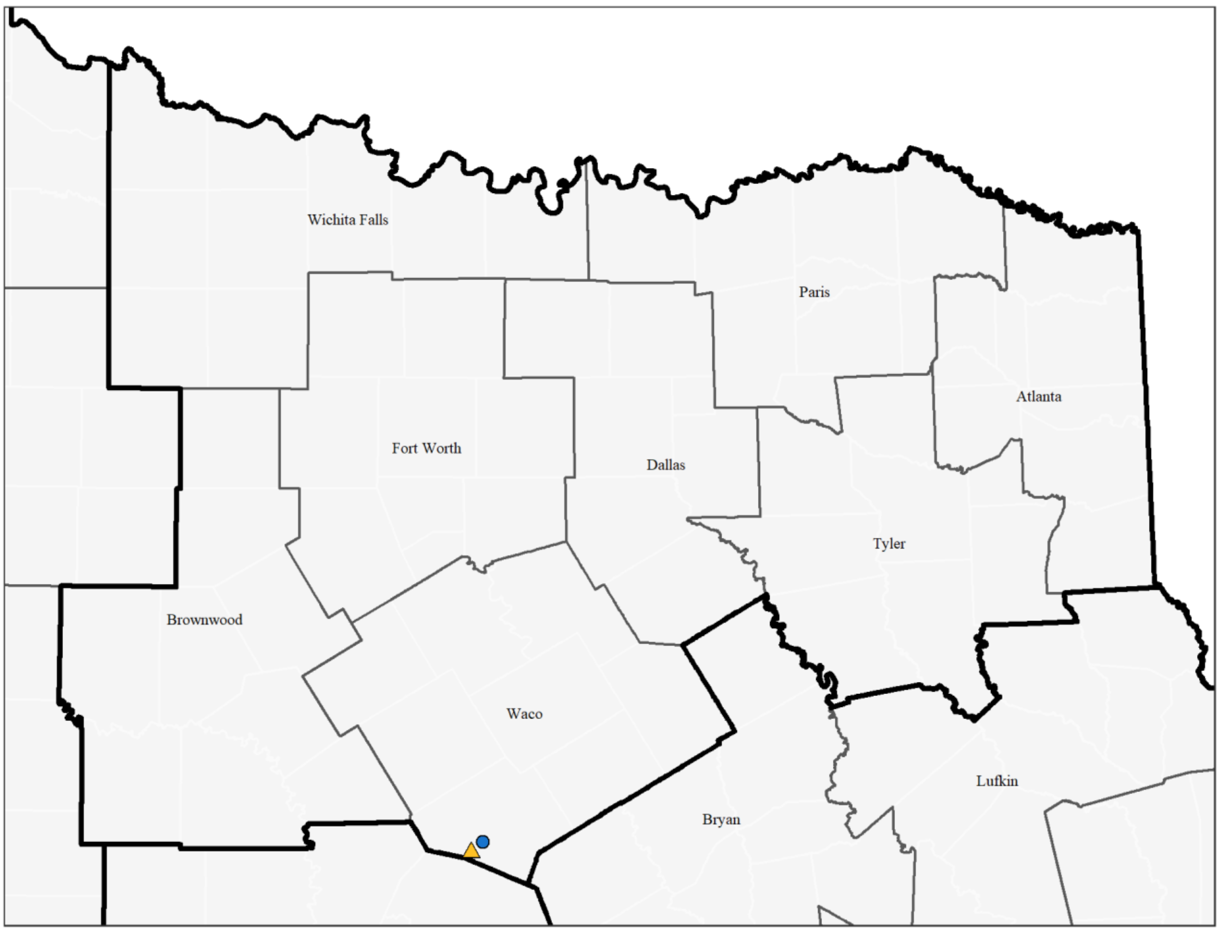
Eurycea chisholmensis

Salado Salamander



Eurycea chisholmensis

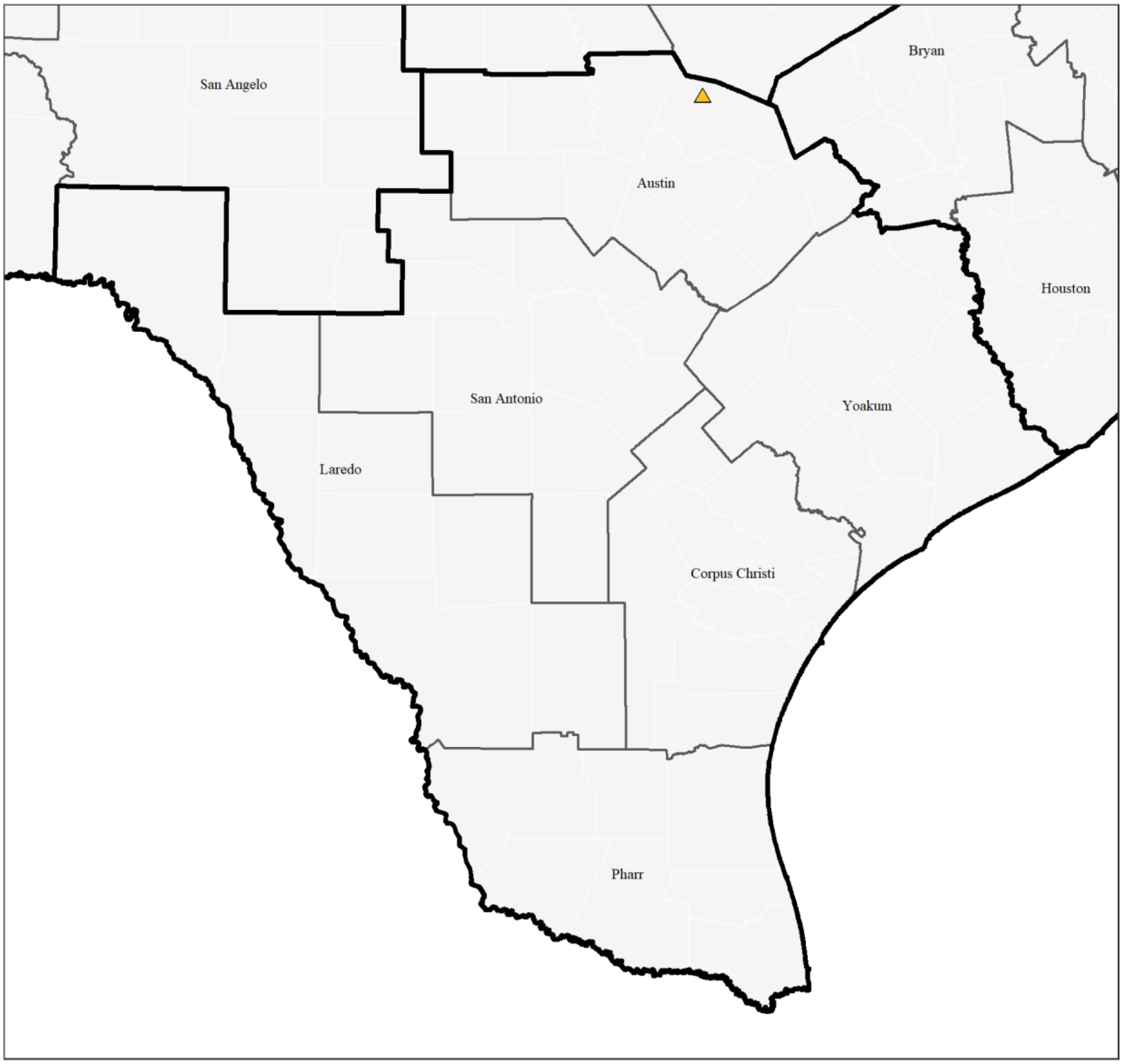
Salado Salamander



● Near-Road Points ▲ Off-Road Points

Eurycea chisholmensis

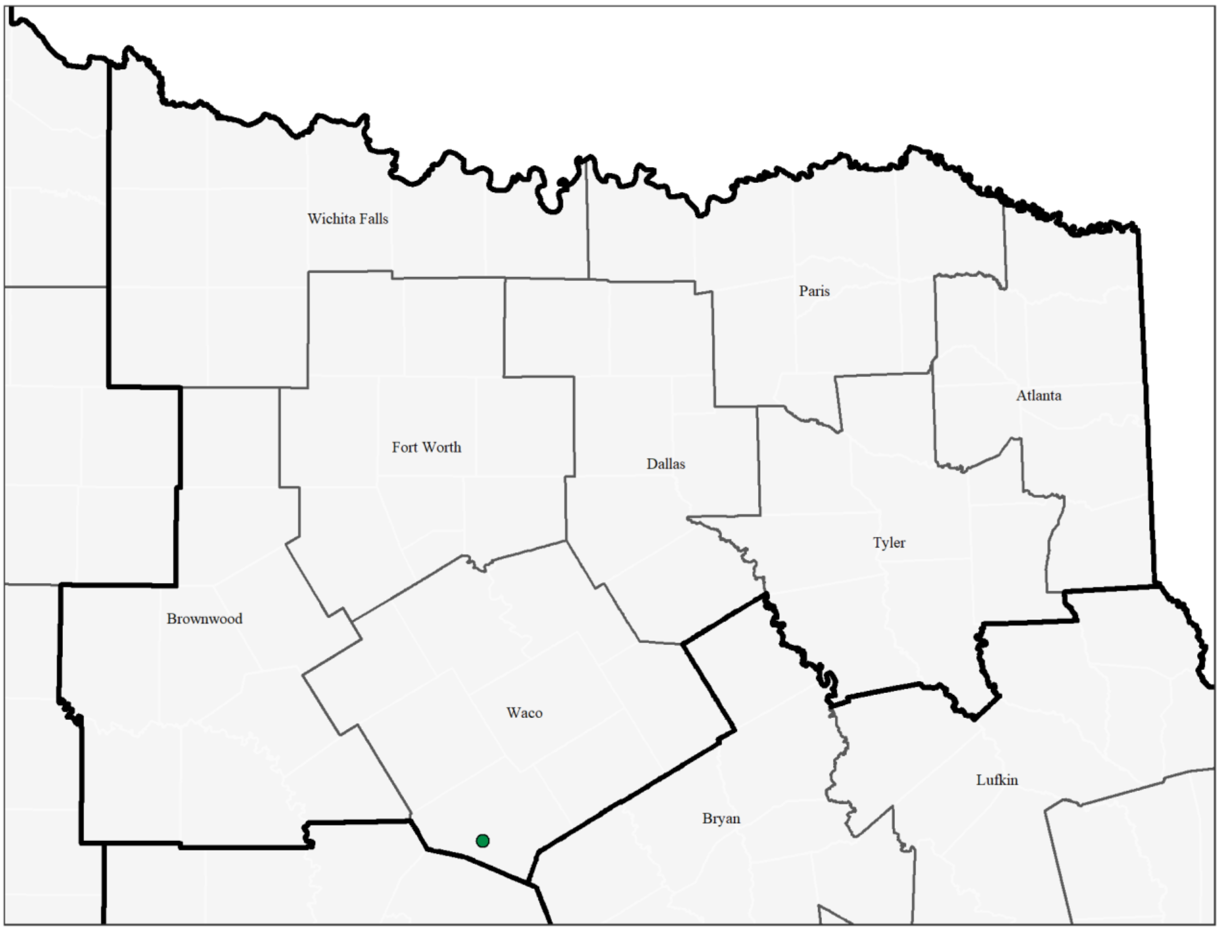
Salado Salamander



• Near-Road Points △ Off-Road Points

Eurycea chisholmensis

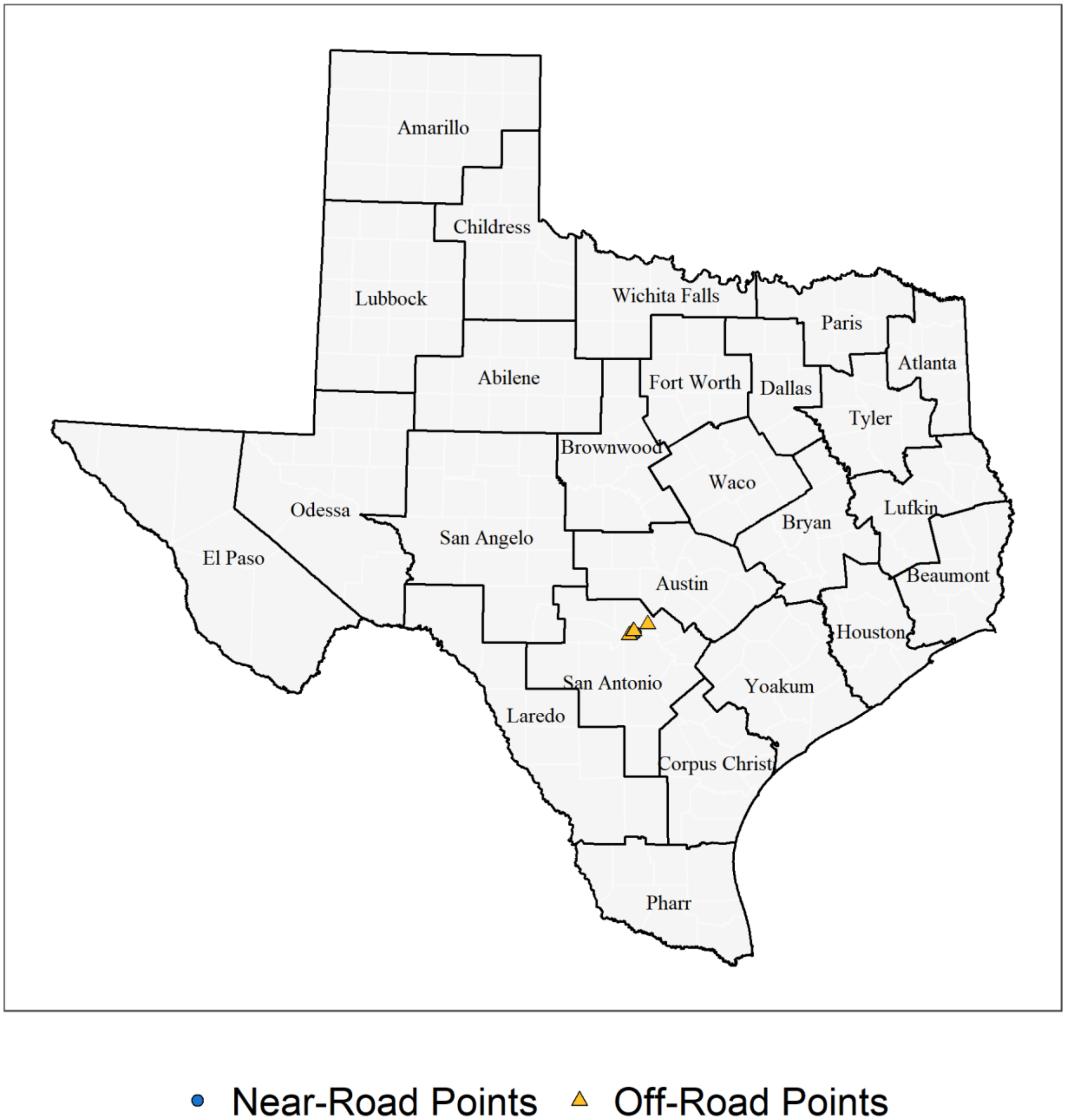
Salado Salamander



• Alive ▲ Dead

Eurycea latitans

Cascade Caverns Salamander

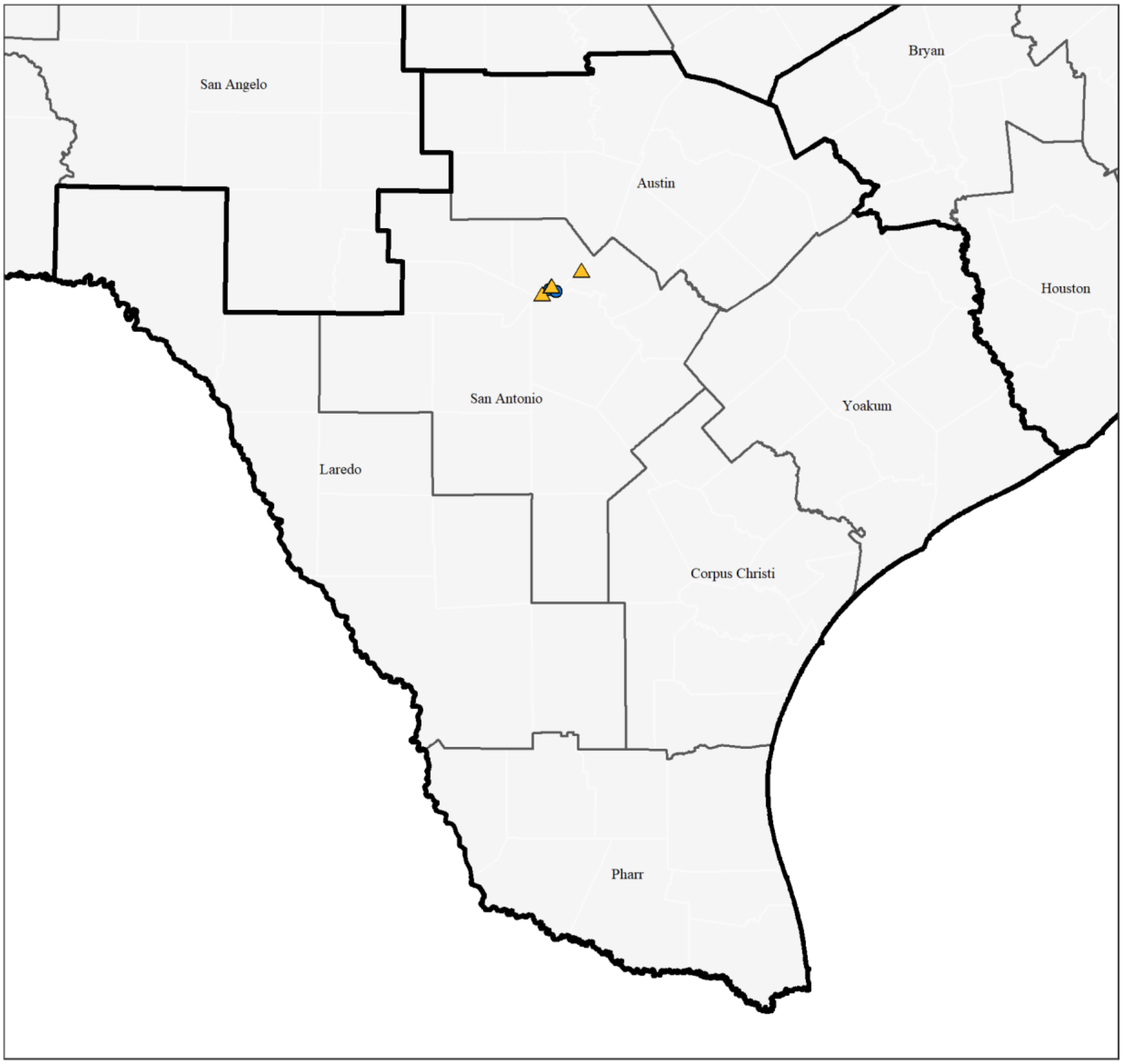


Eurycea latitans

Cascade Caverns Salamander

Eurycea latitans

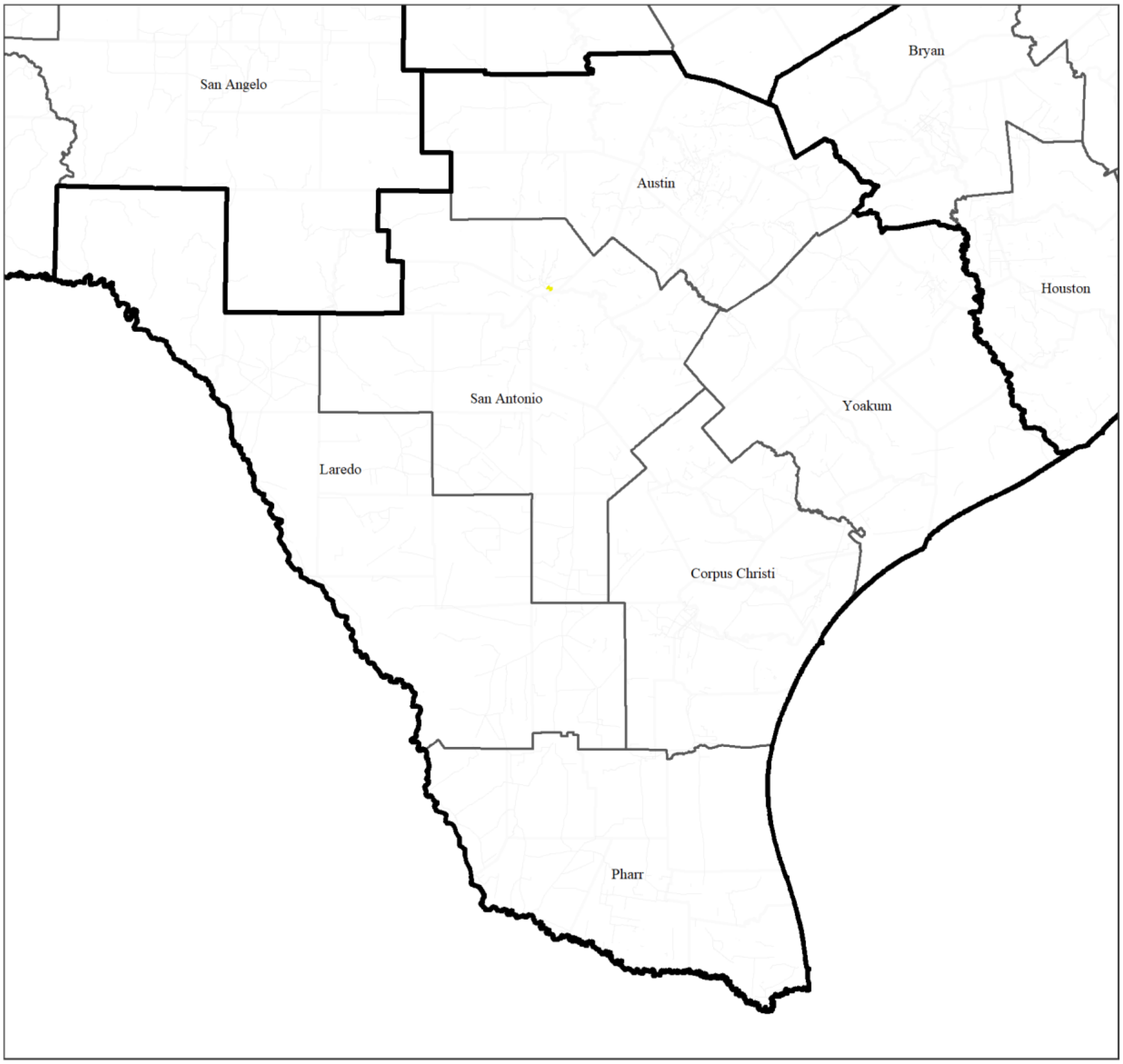
Cascade Caverns Salamander



• Near-Road Points ▲ Off-Road Points

Eurycea latitans

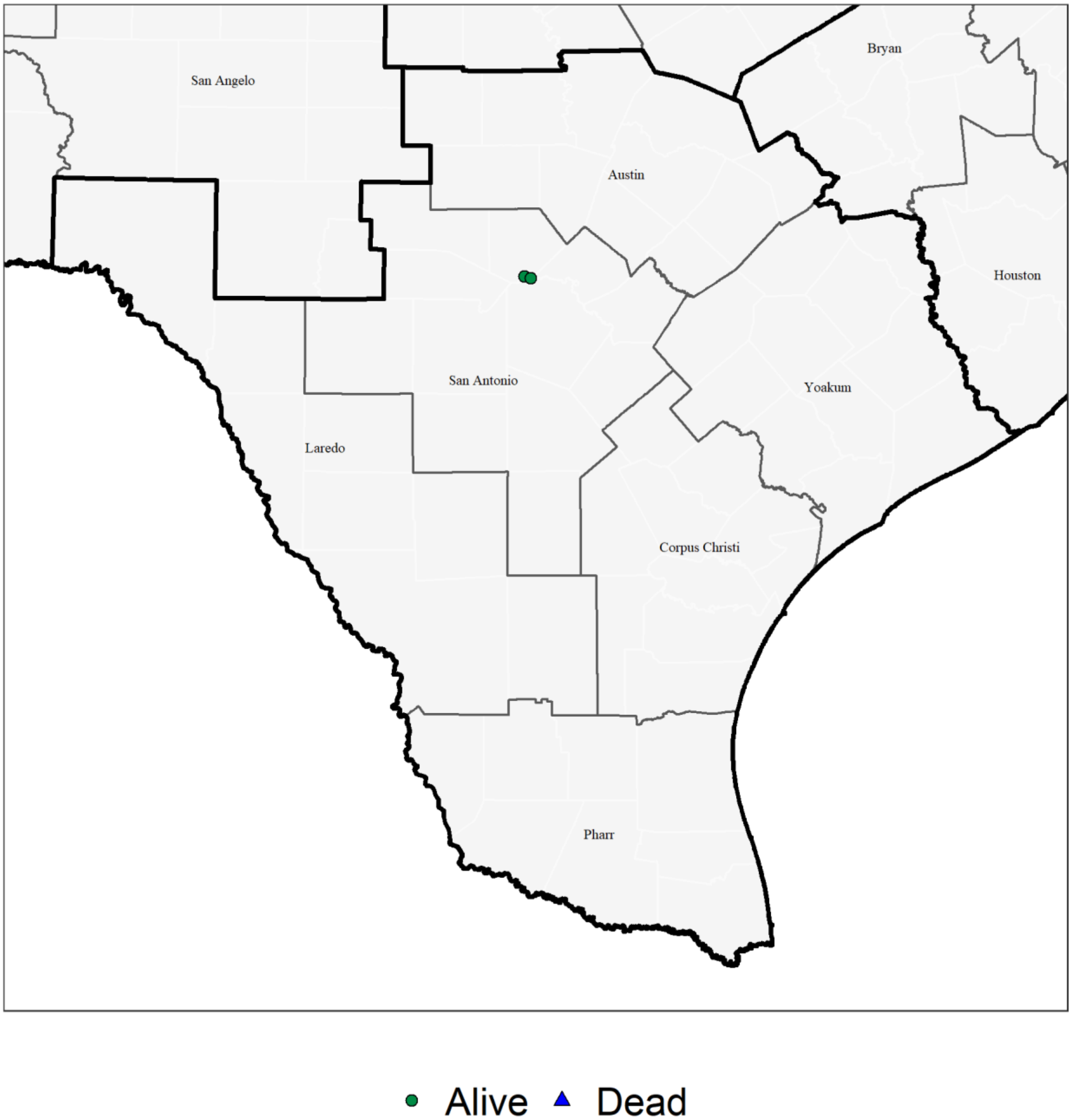
Cascade Caverns Salamander



Points Per Section 1-2 3-4 5-6 7+

Eurycea latitans

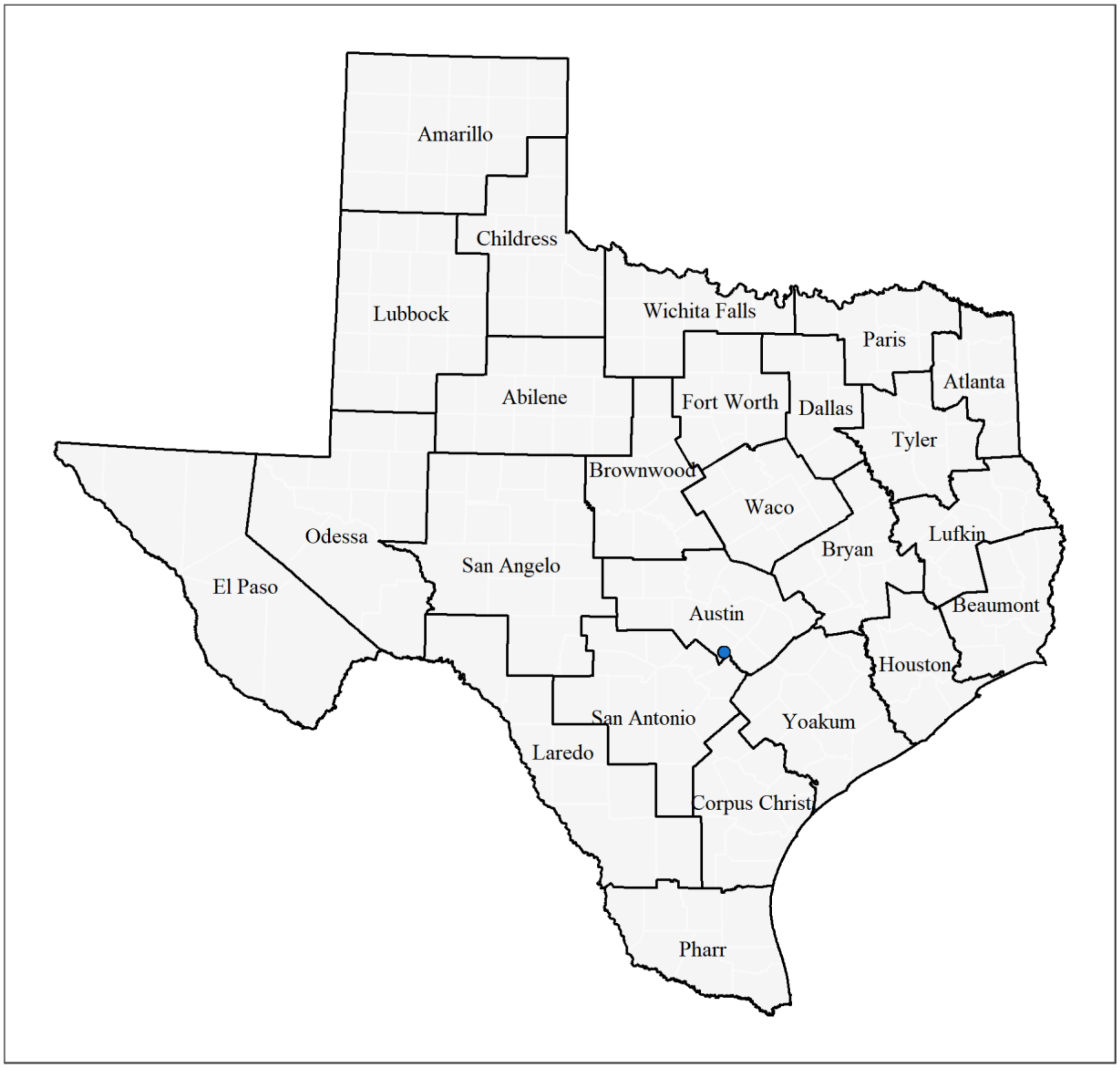
Cascade Caverns Salamander



Eurycea nana

San Marcos Salamander

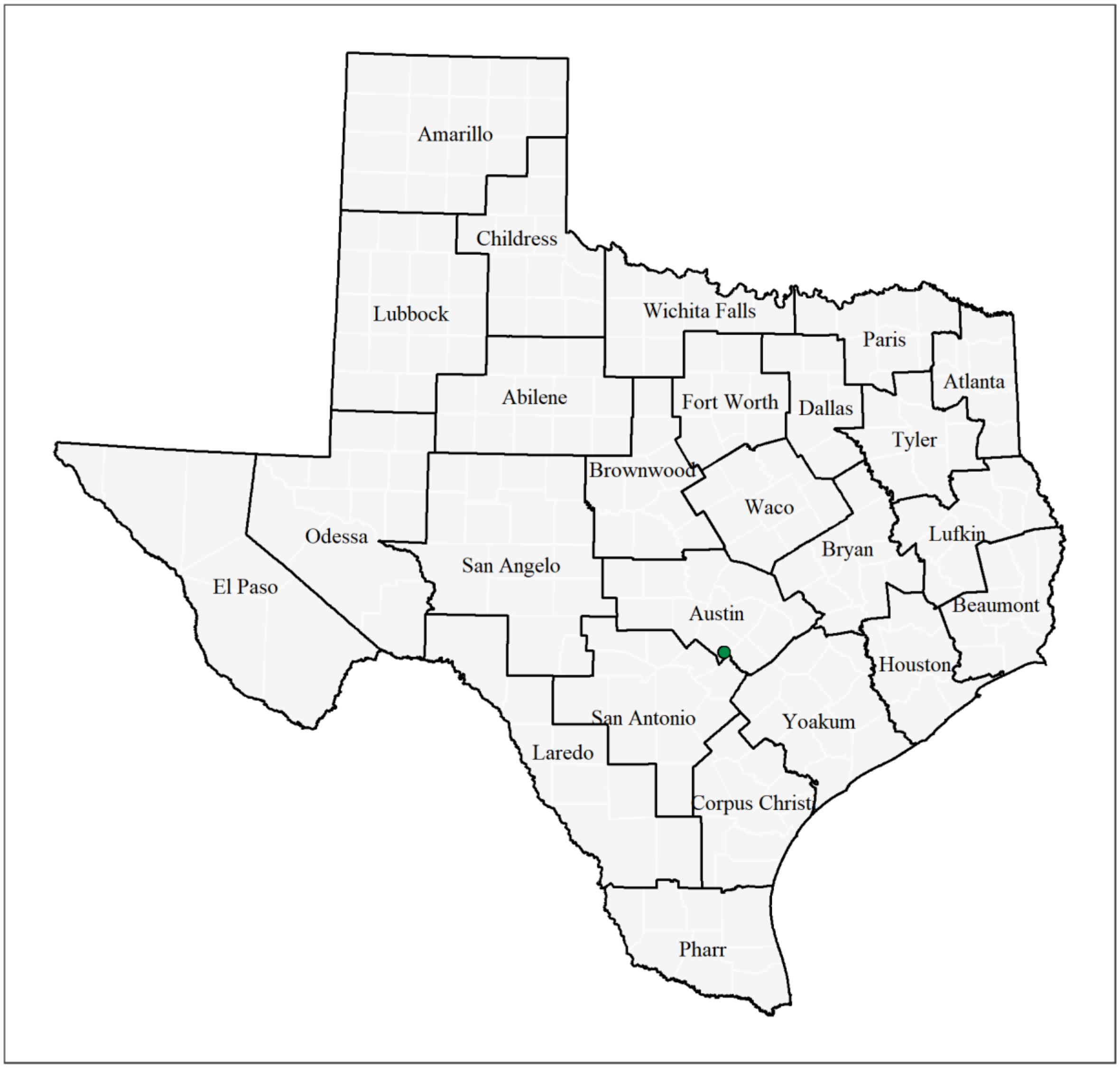
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



• Near-Road Points △ Off-Road Points

Eurycea nana

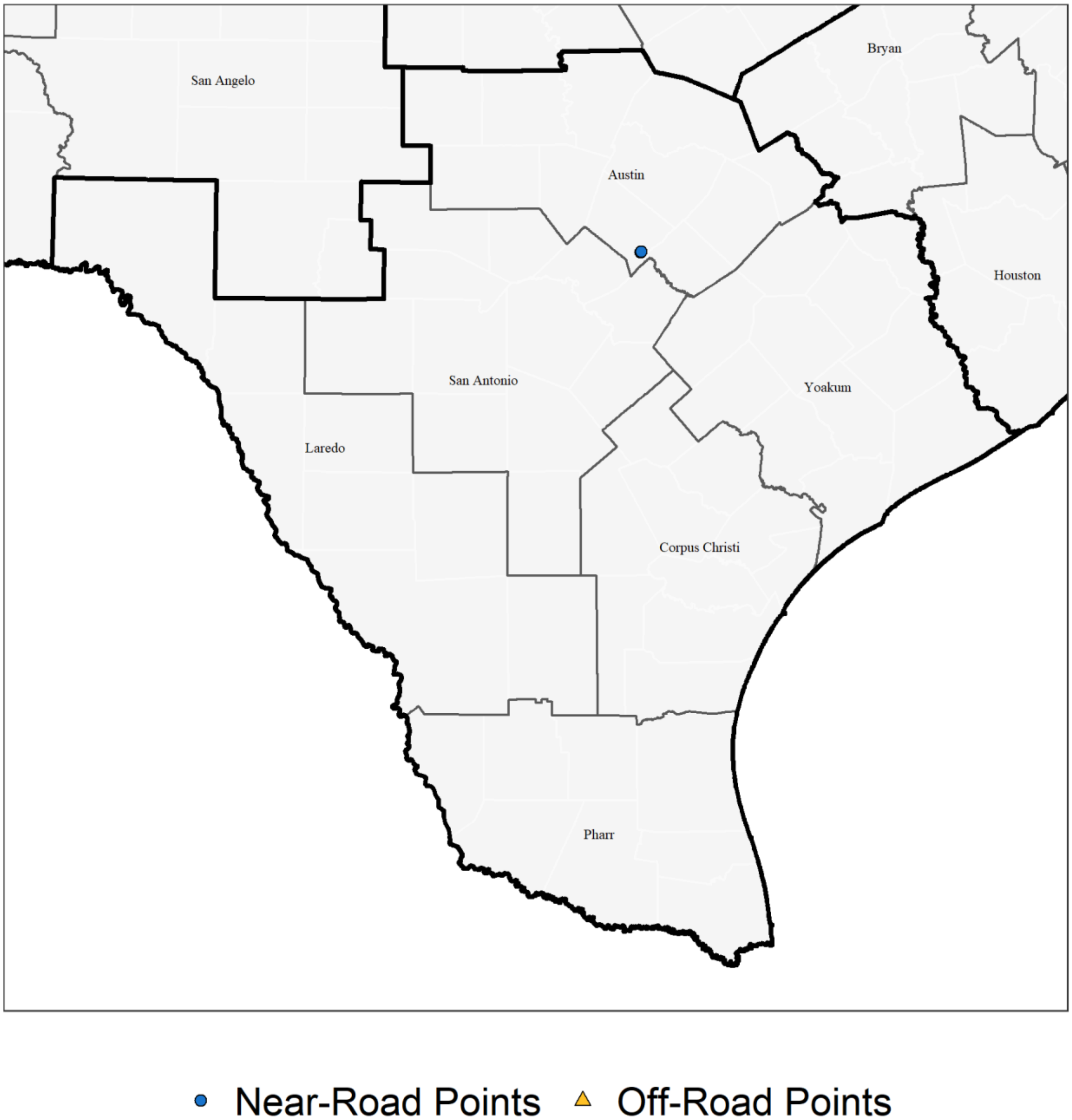
San Marcos Salamander



Alive Dead

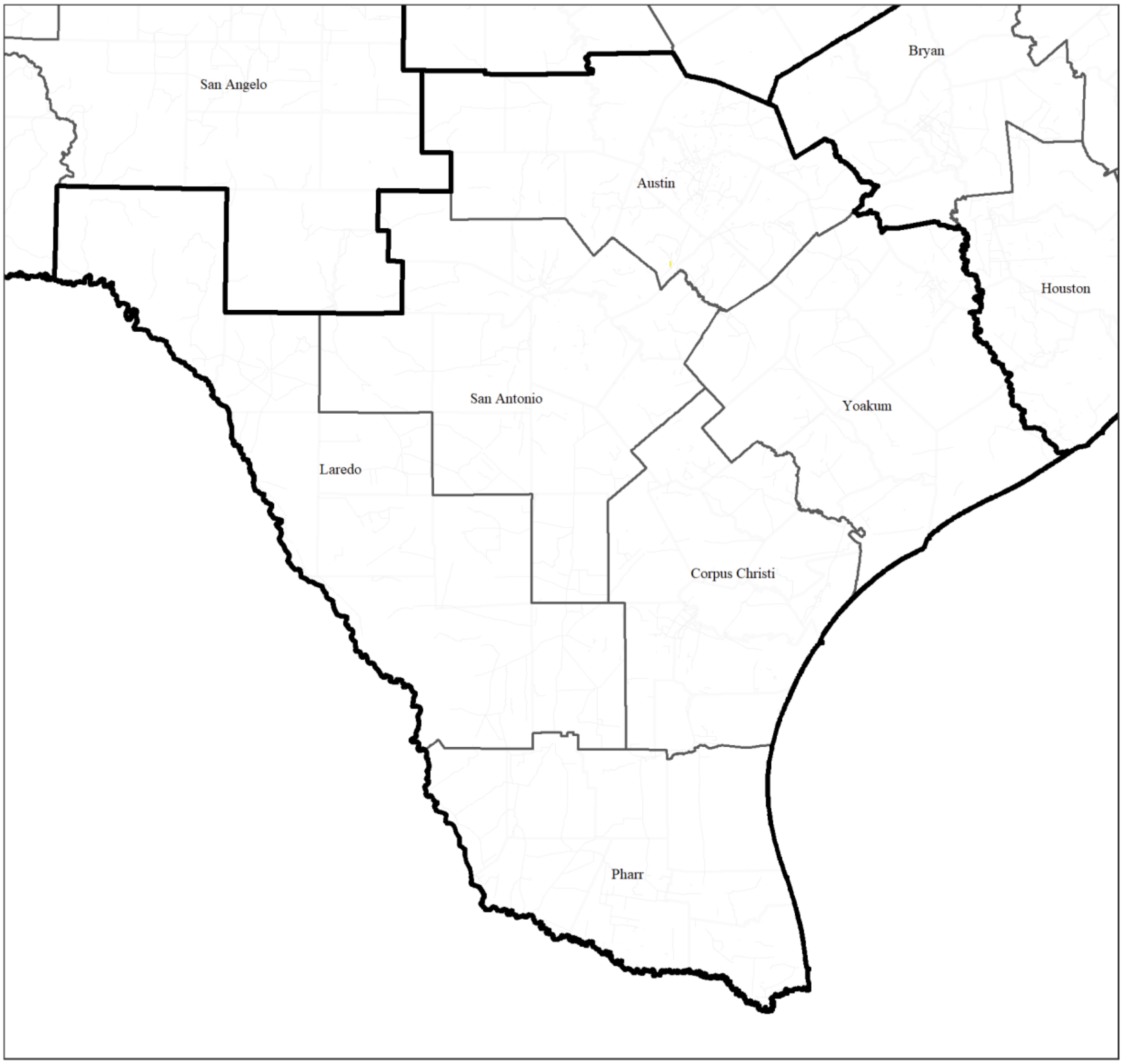
Eurycea nana

San Marcos Salamander



Eurycea nana

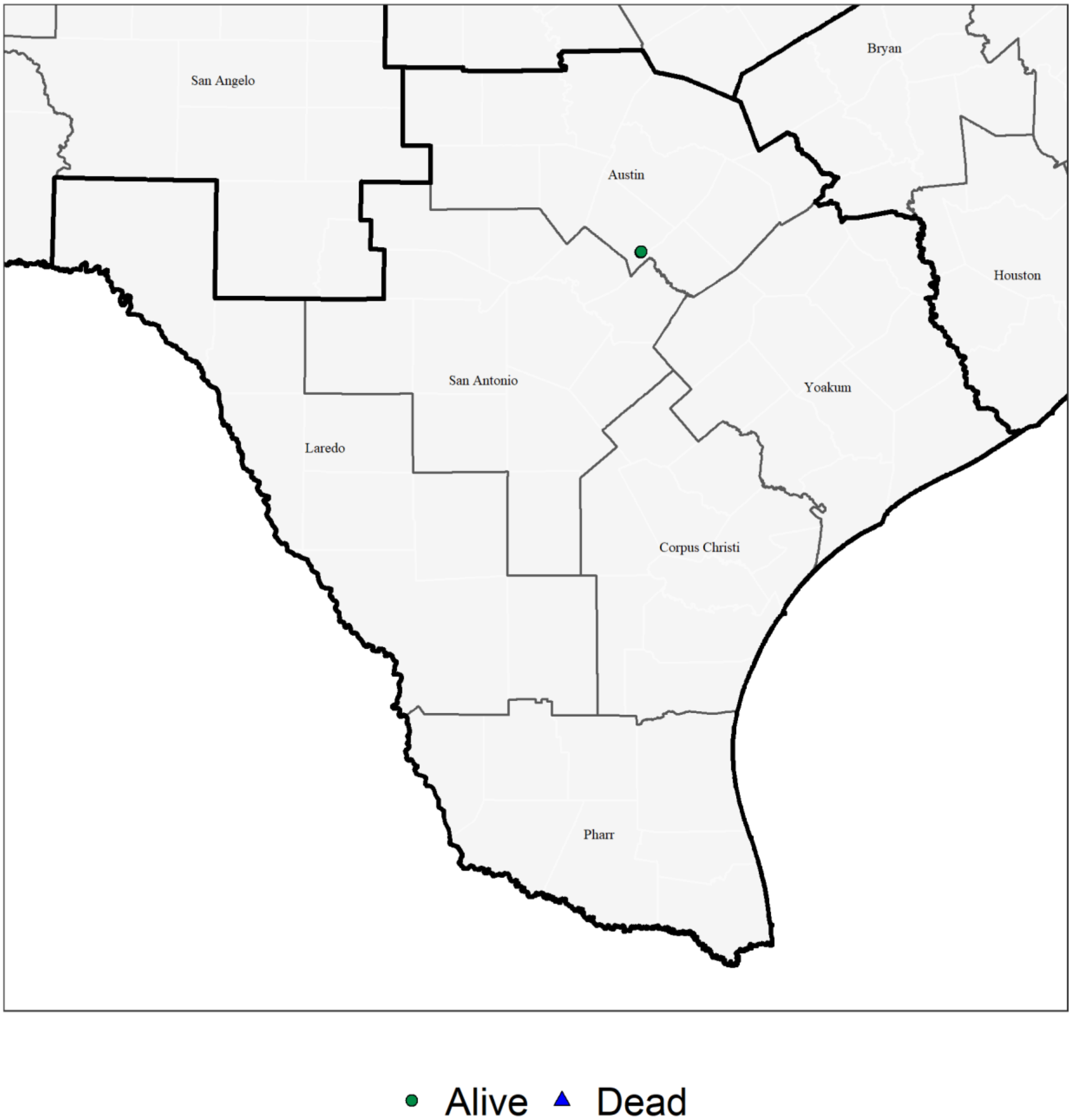
San Marcos Salamander



Points Per Section 1-2 3-4 5-6 7+

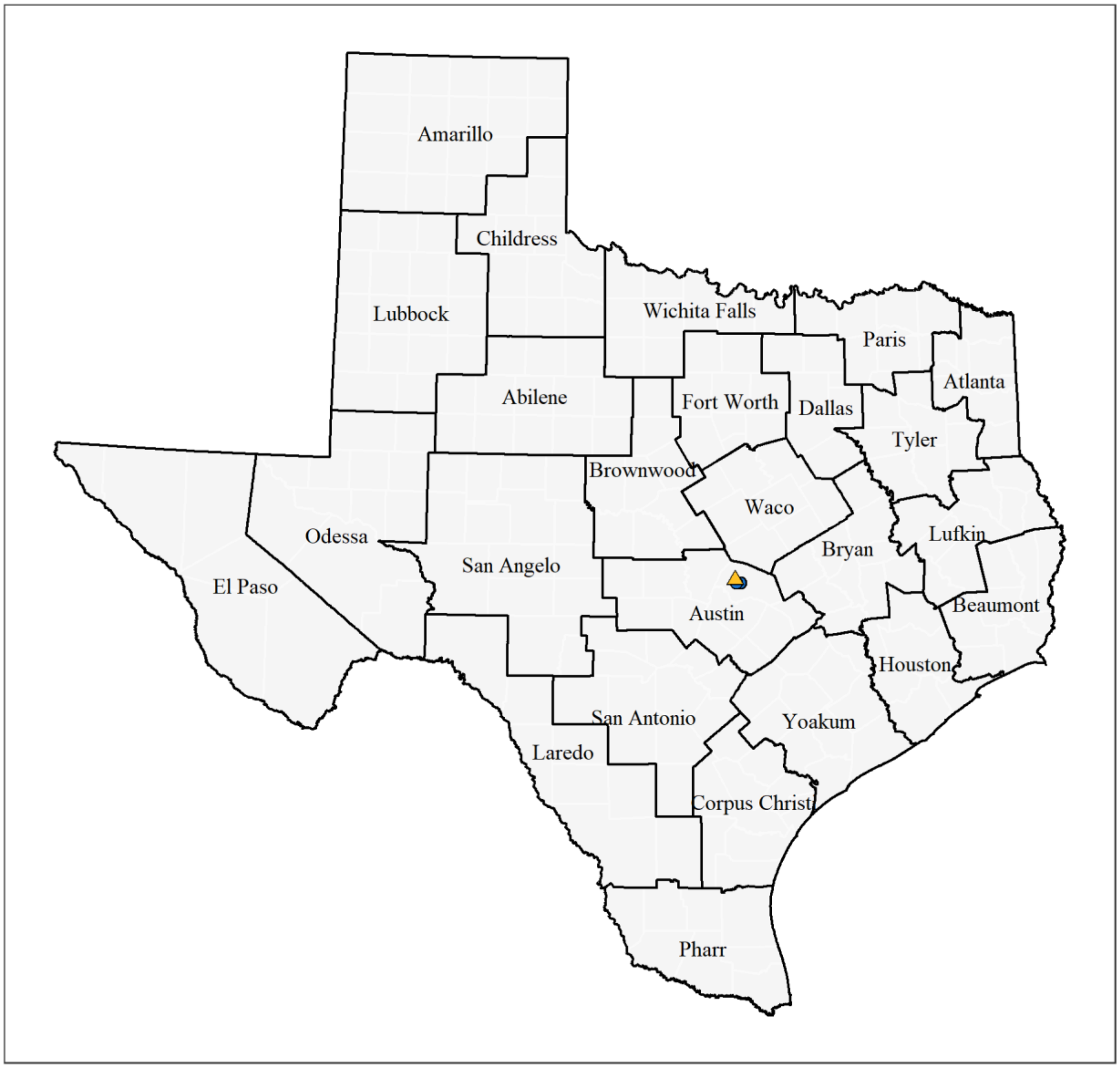
Eurycea nana

San Marcos Salamander

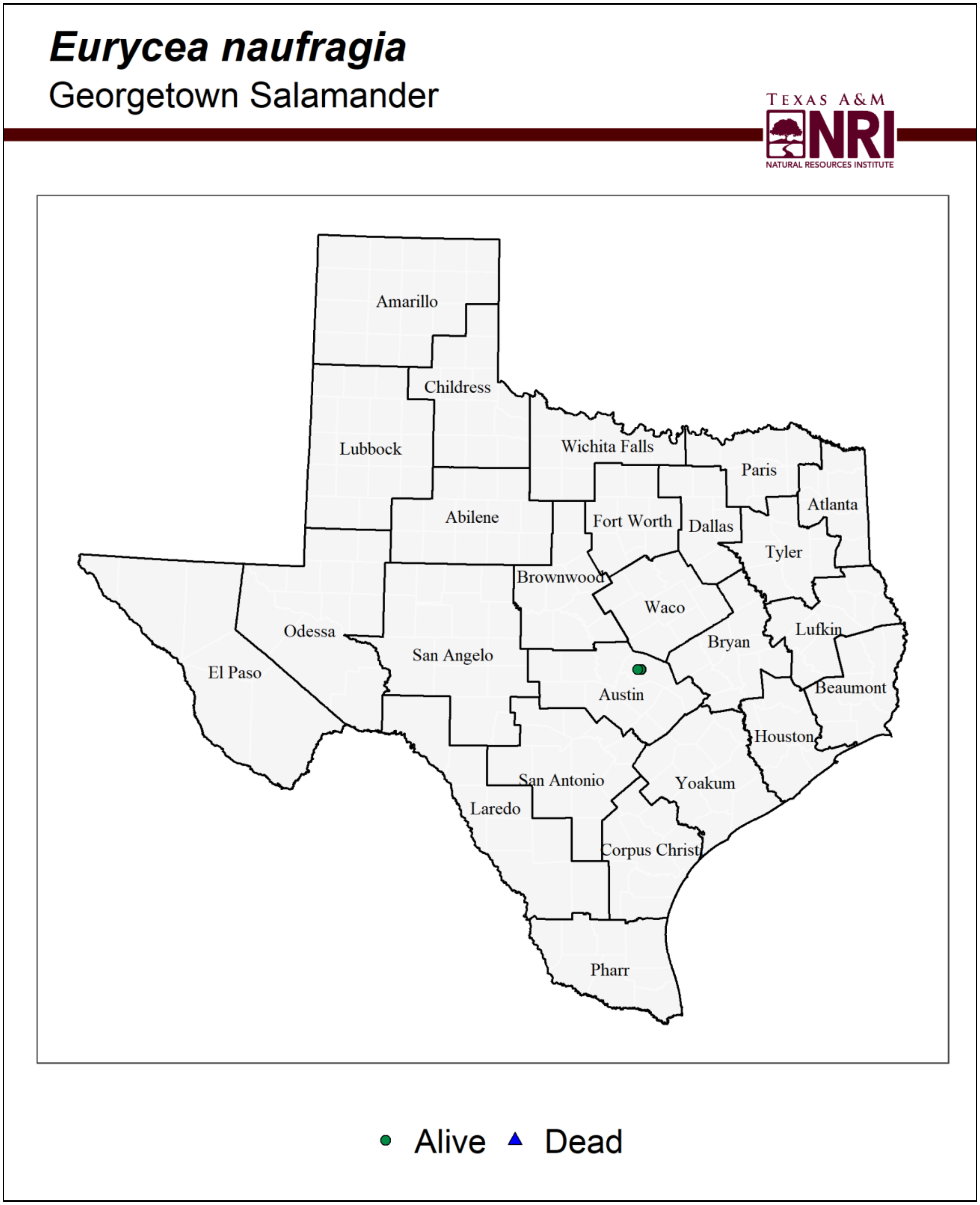


Eurycea naufragia

Georgetown Salamander



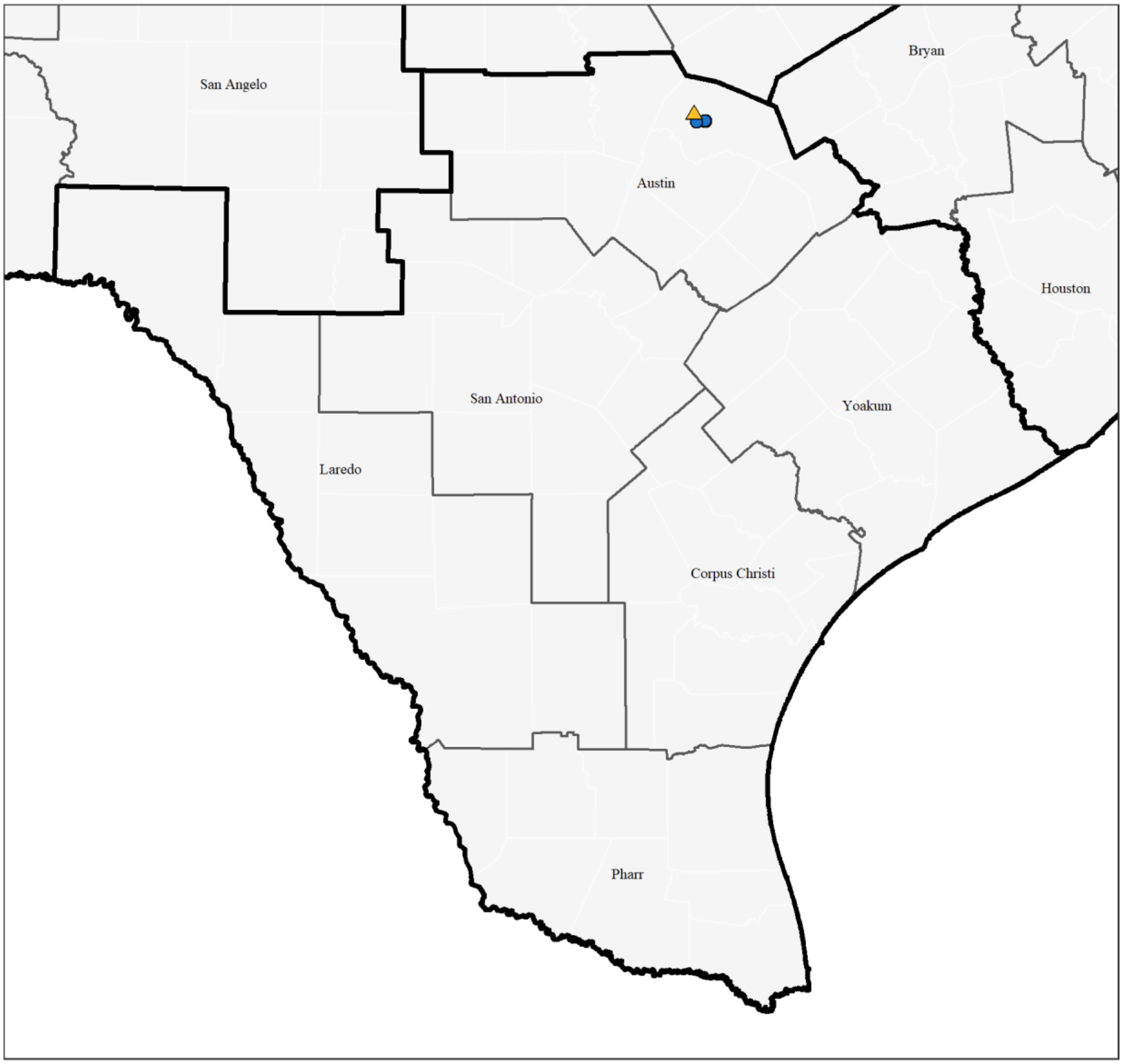
• Near-Road Points △ Off-Road Points



Eurycea naufragia
Georgetown Salamander
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE
Amarillo
Childress
Lubbock
Wichita Falls
Paris
Atlanta
Abilene
Fort Worth
Dallas
Tyler
Brownwood
Waco
El Paso
Odessa
San Angelo
Bryan
Lufkin
Austin
Beaumont
Houston
San Antonio
Yoakum
Laredo
Corpus Christi
Pharr
Alive
Dead

Eurycea naufragia

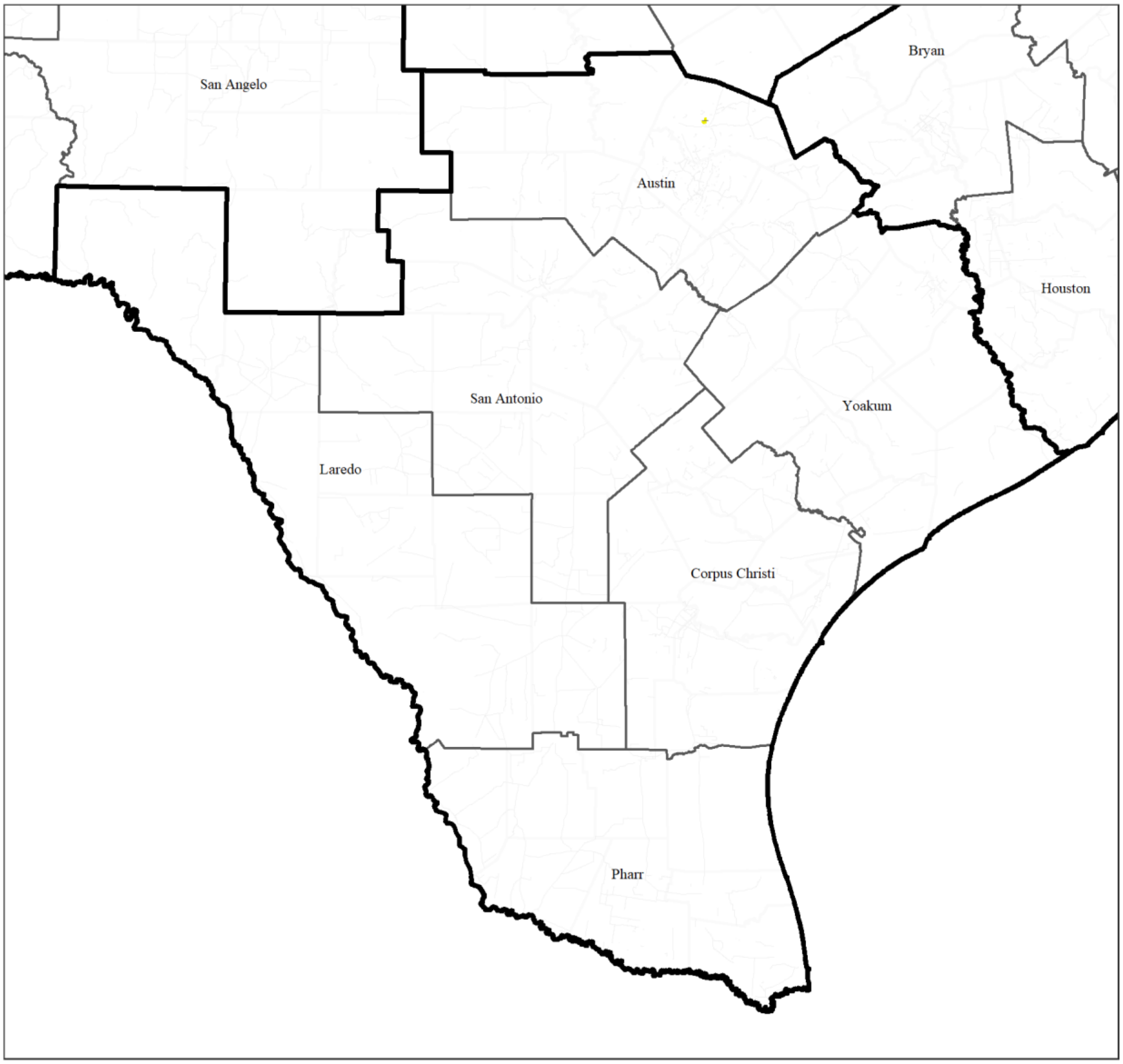
Georgetown Salamander



• Near-Road Points ▲ Off-Road Points

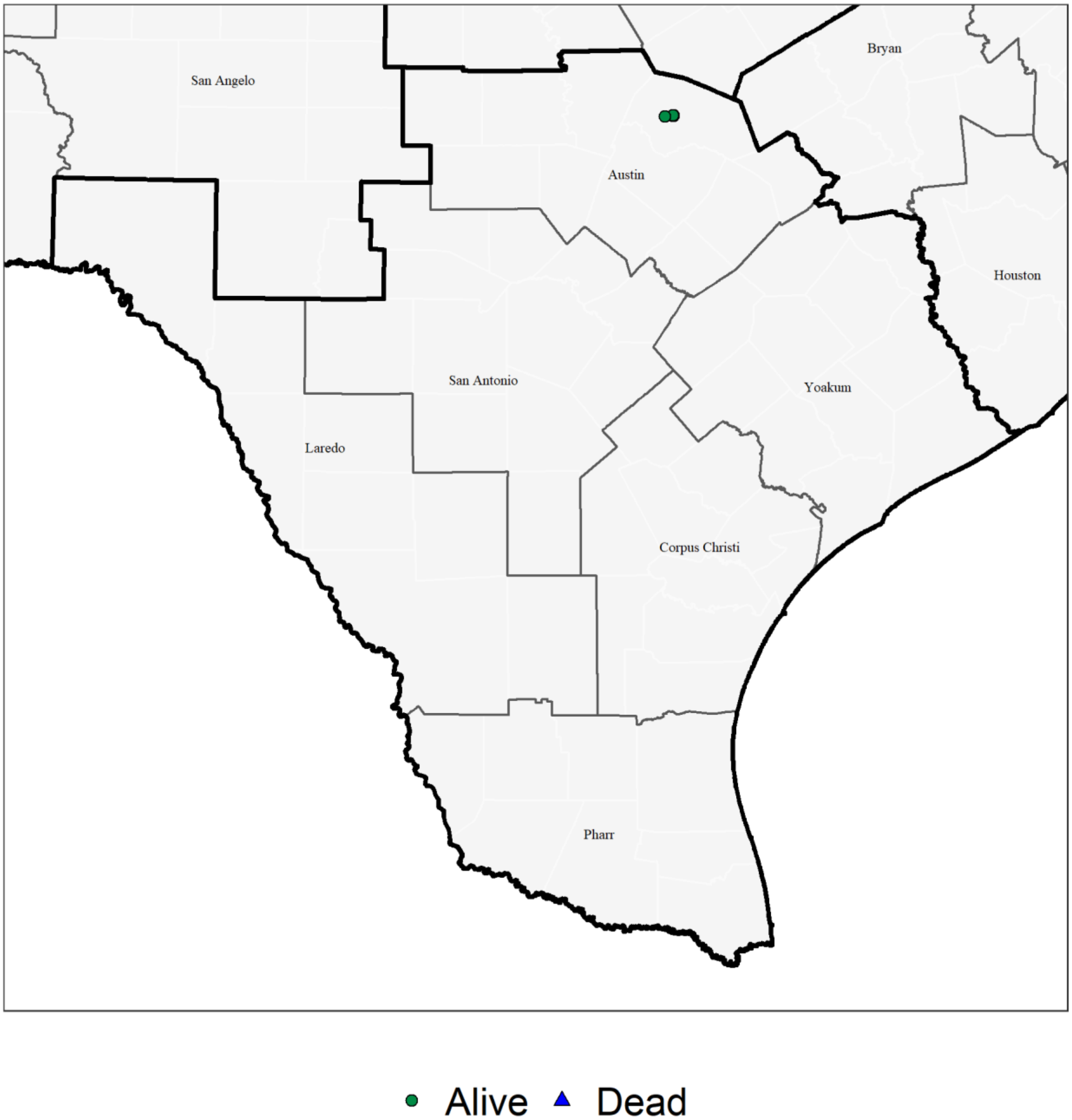
Eurycea naufragia

Georgetown Salamander



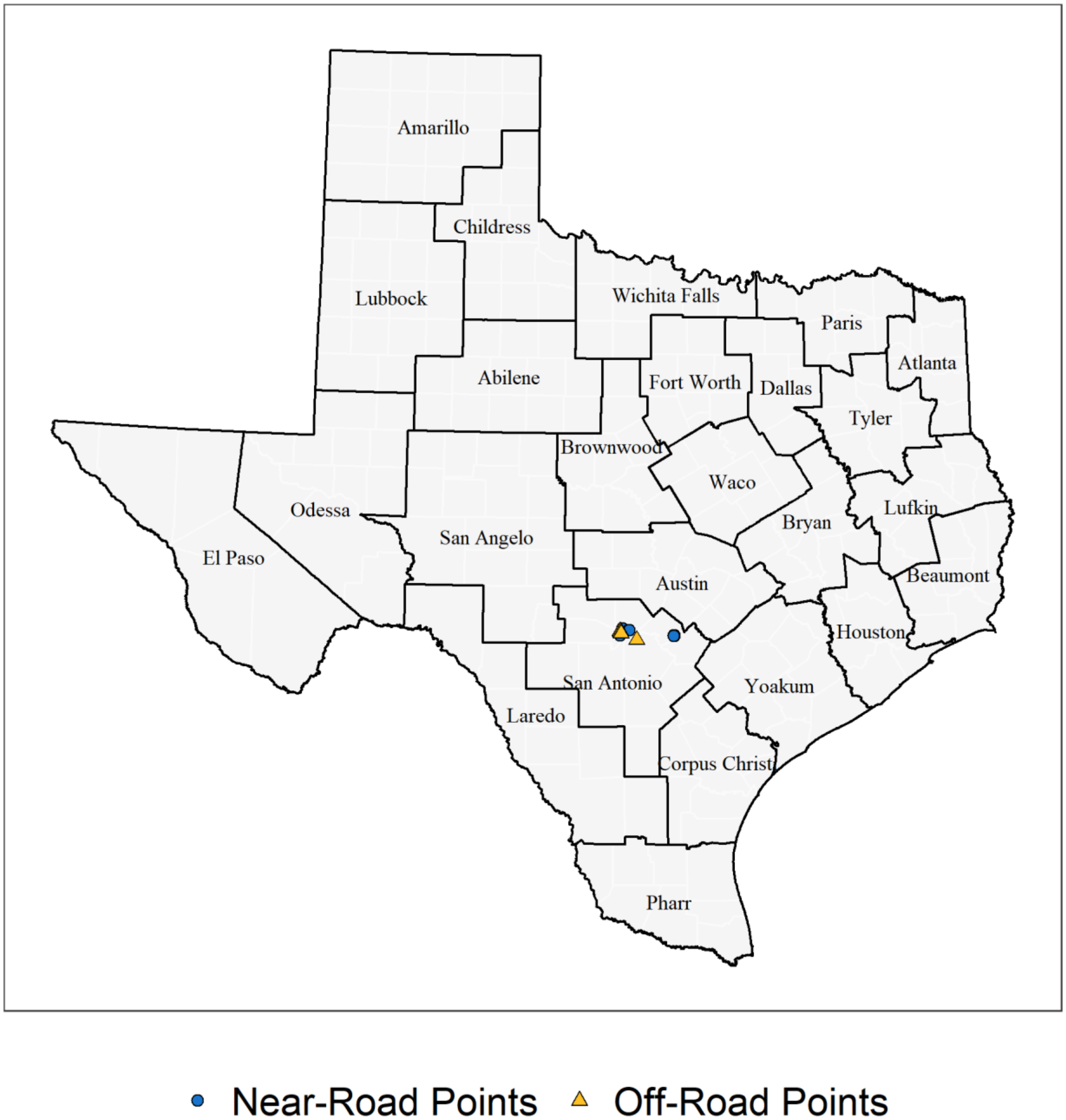
Points Per Section 1-2 3-4 5-6 7+

Eurycea naufragia
Georgetown Salamander



Eurycea neotenes

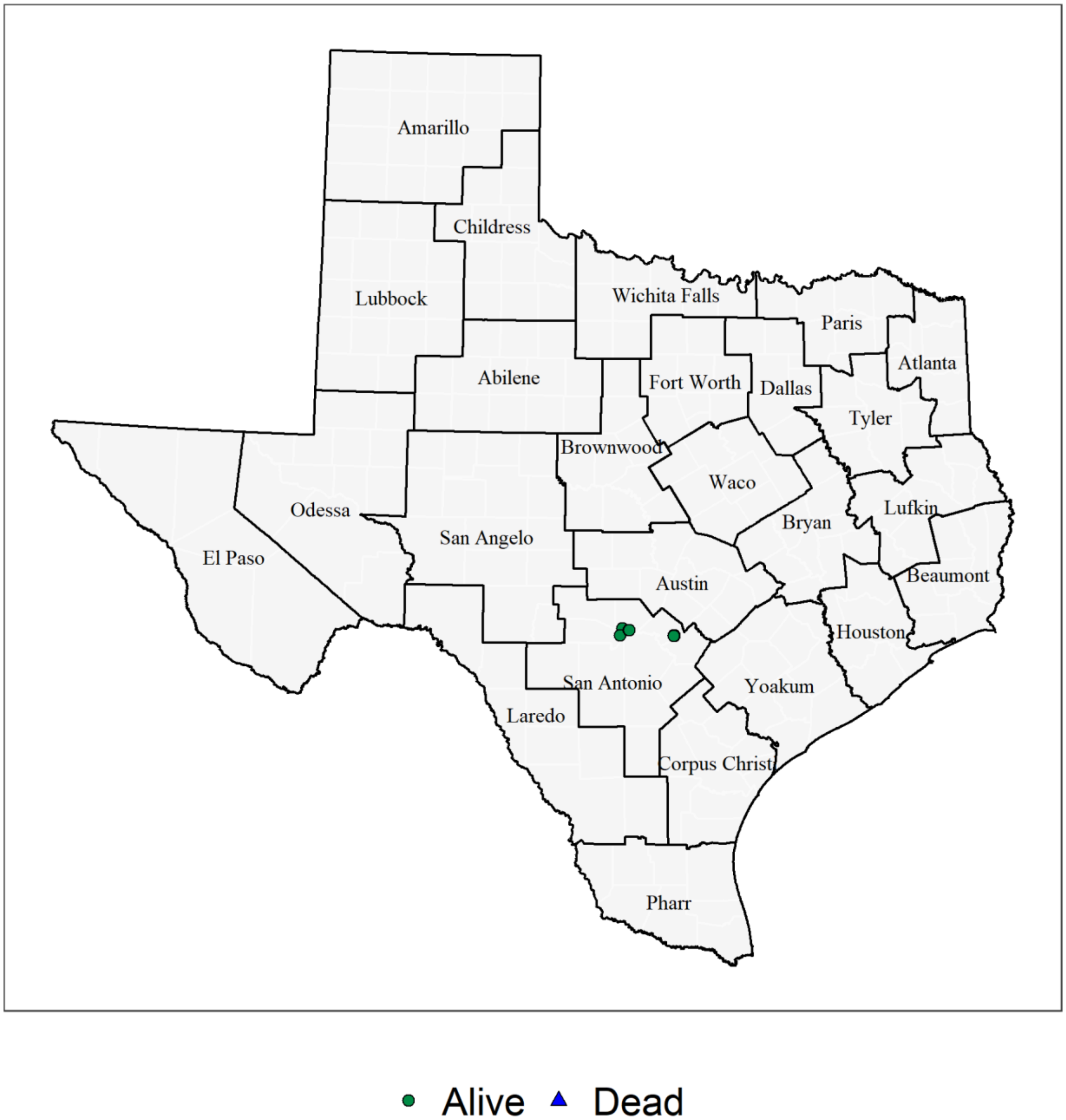
Texas Salamander



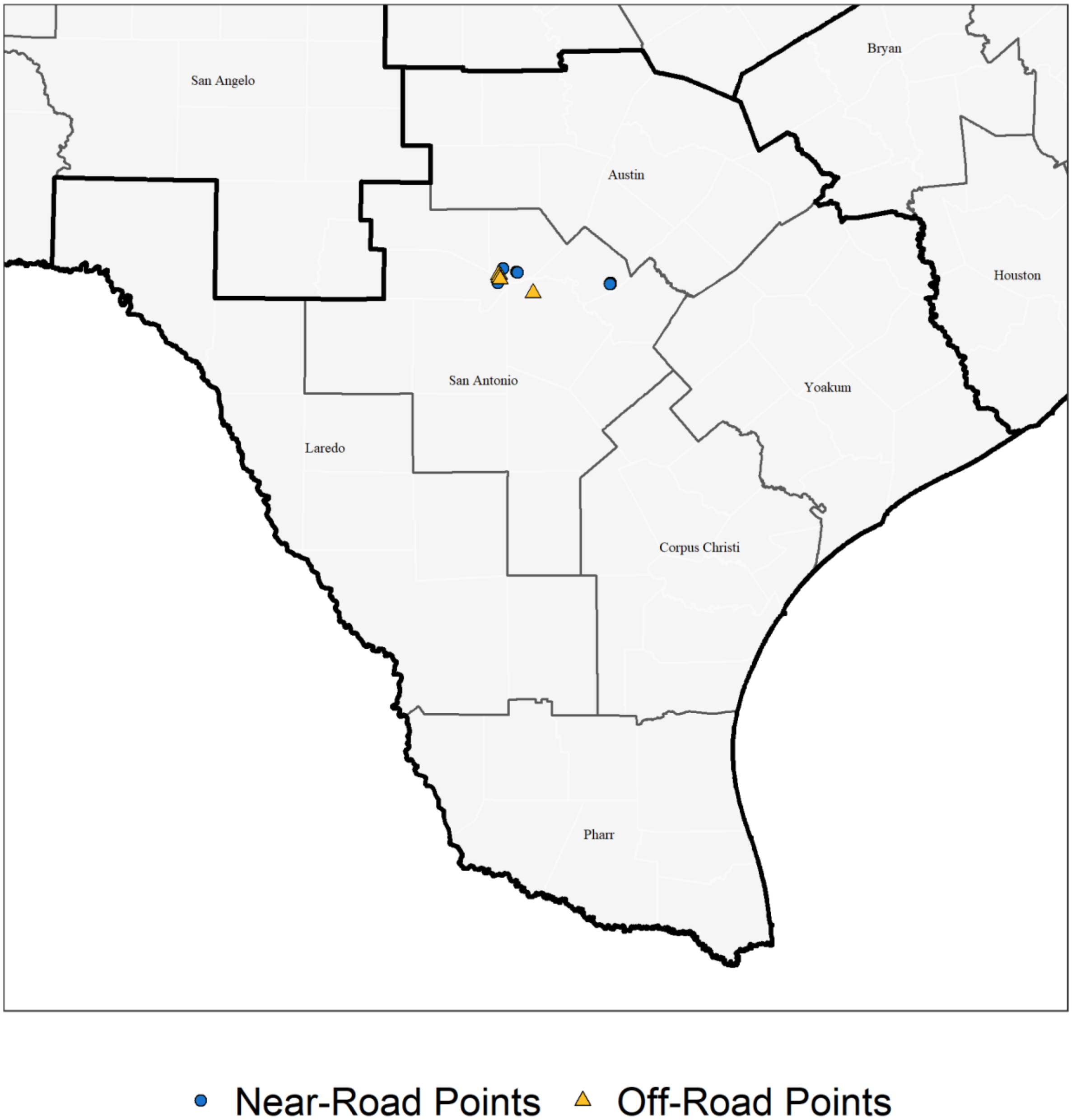
Eurycea neotenes

Texas Salamander

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



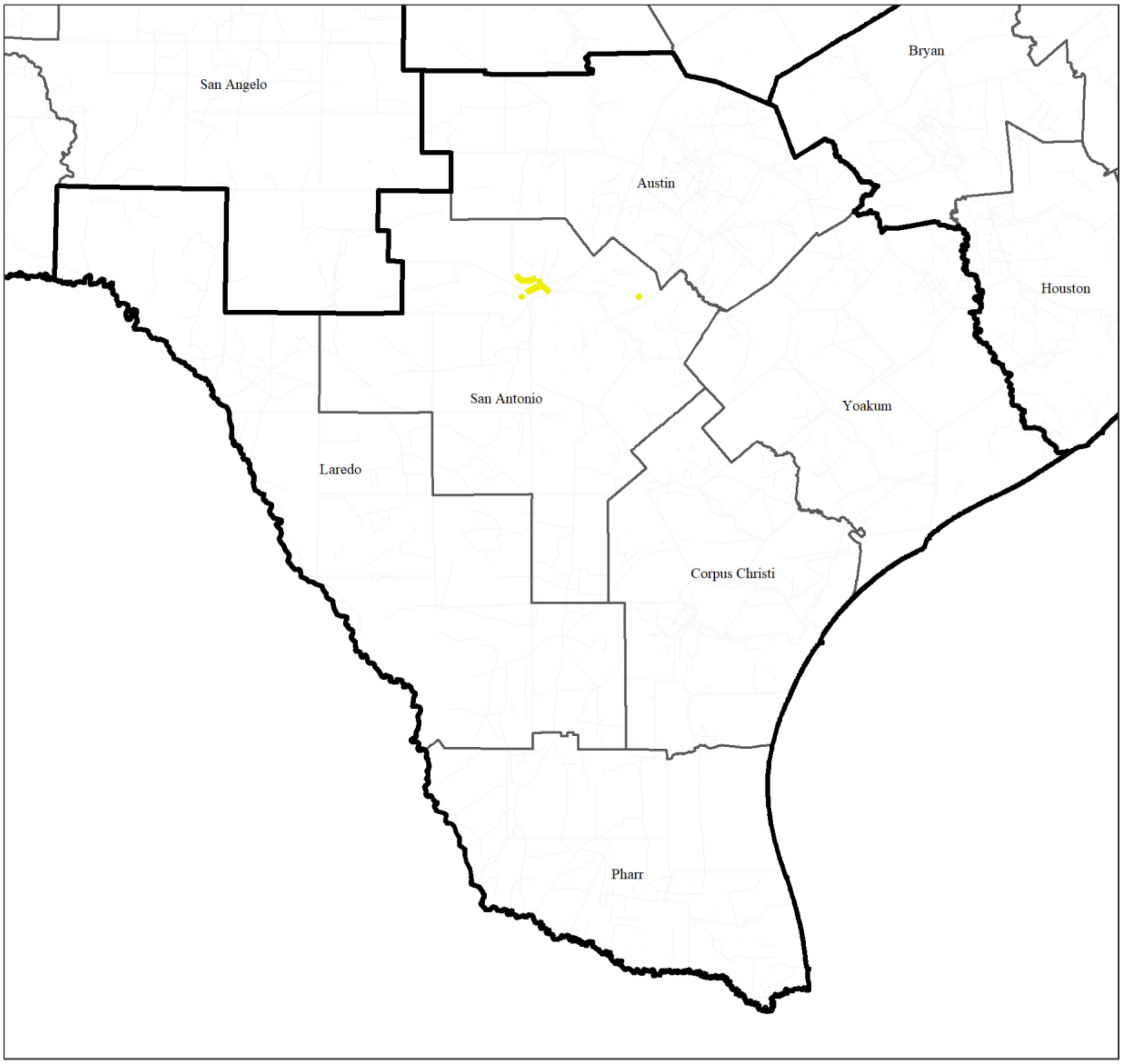
Eurycea neotenes
Texas Salamander



Eurycea neotenes

Texas Salamander

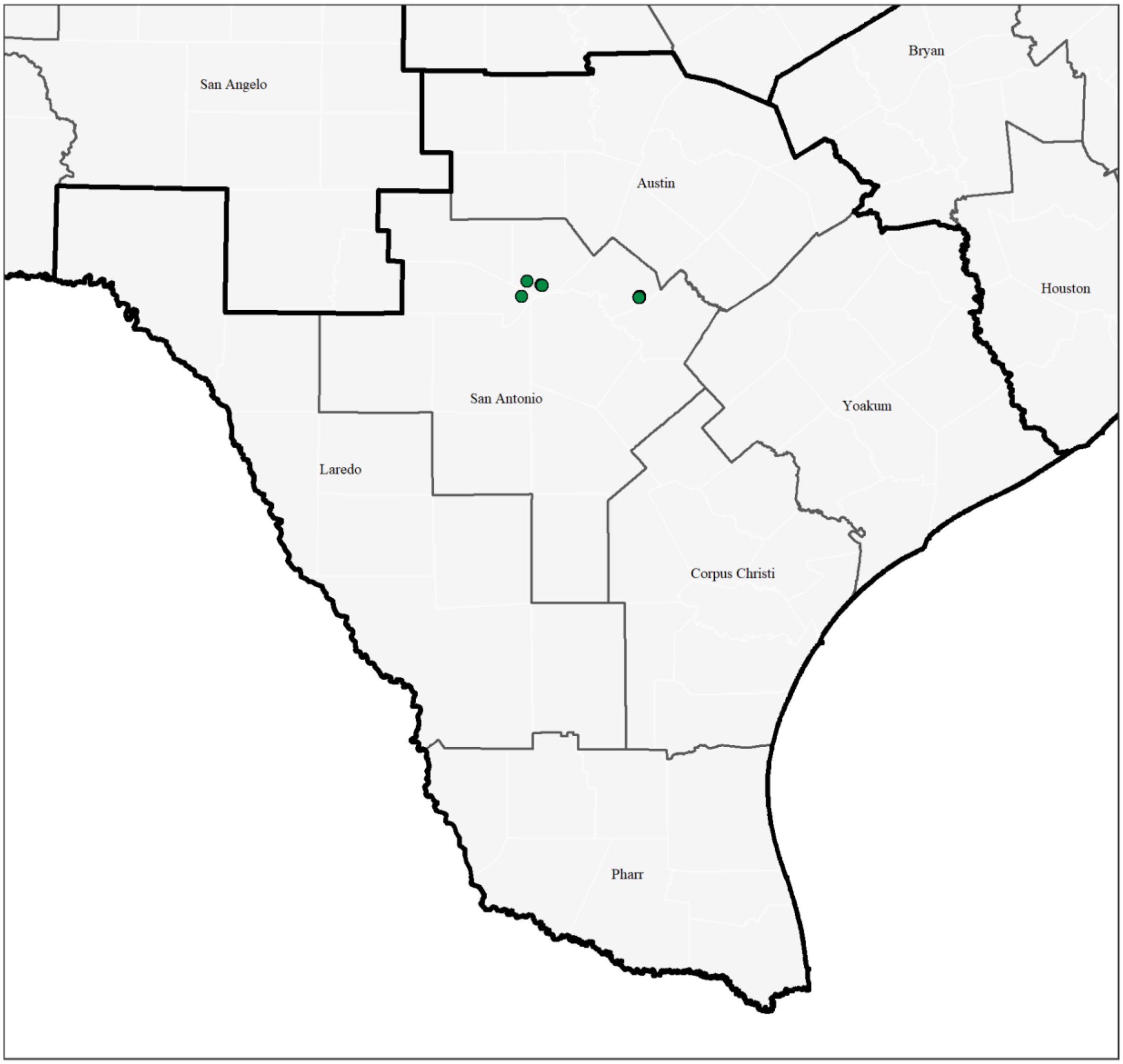
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section 1-2 3-4 5-6 7+

Eurycea neotenes

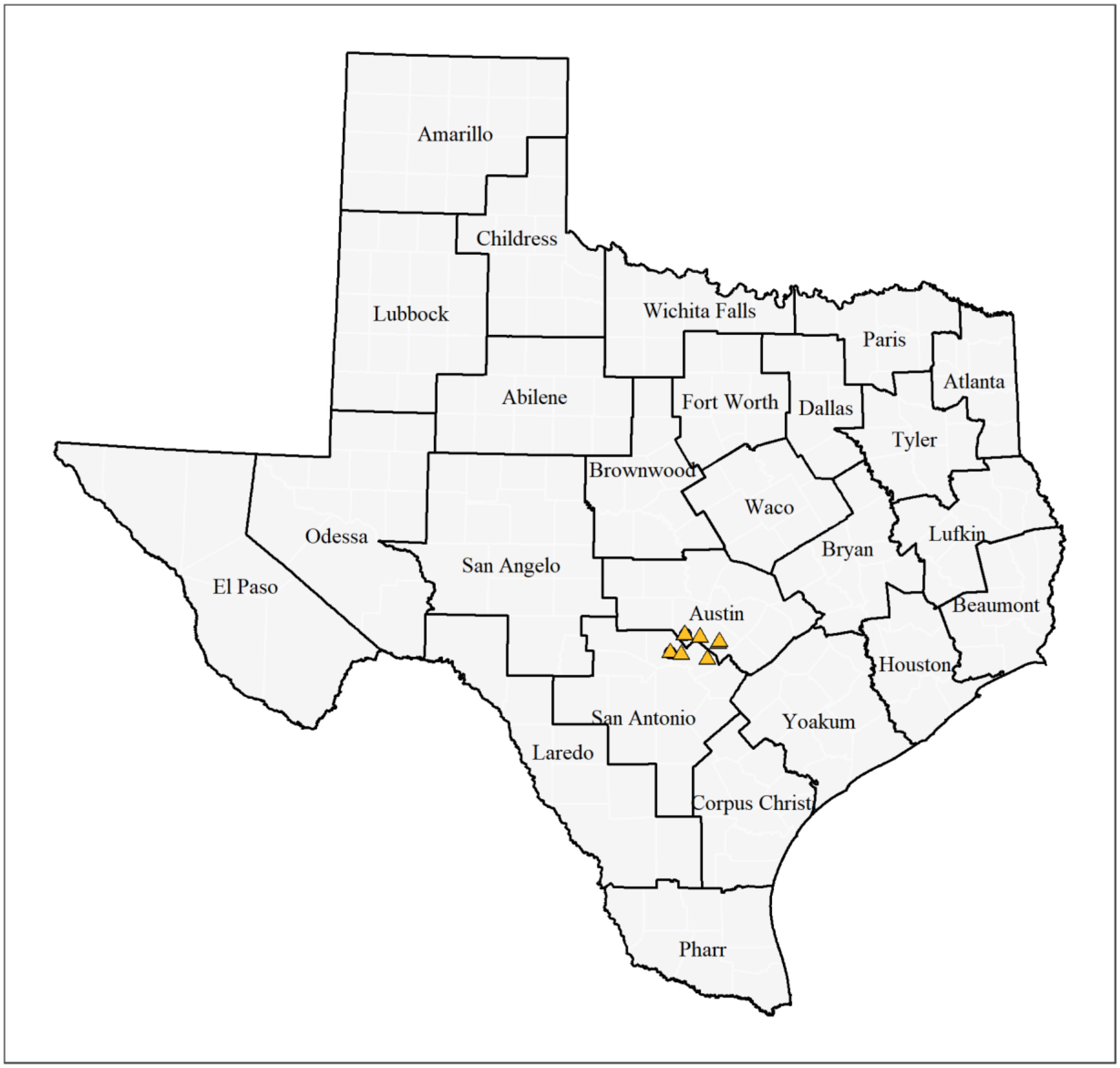
Texas Salamander



● Alive ▲ Dead

Eurycea pterophila

Fern Bank Salamander

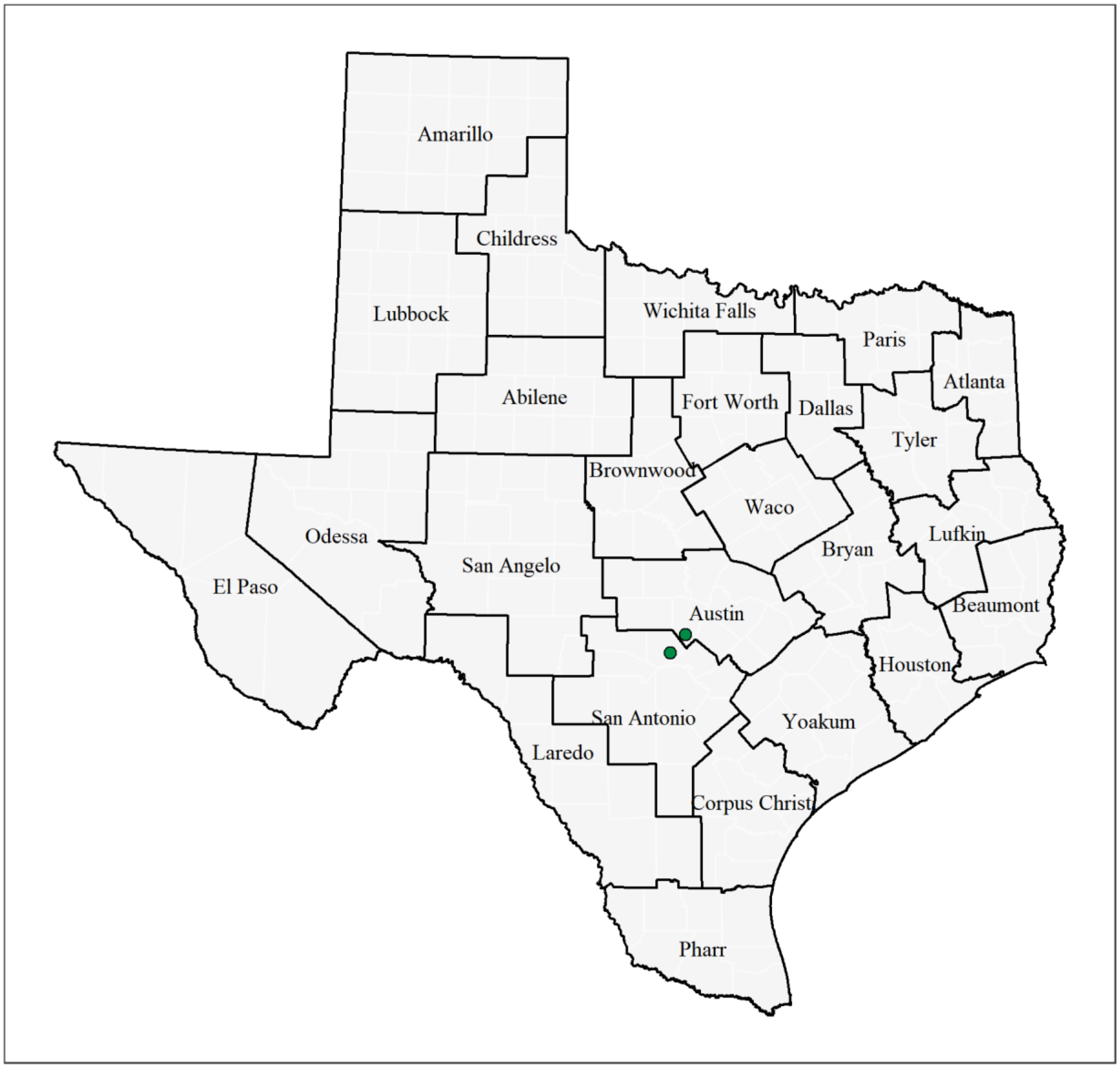


● Near-Road Points ▲ Off-Road Points

Eurycea pterophila

Fern Bank Salamander

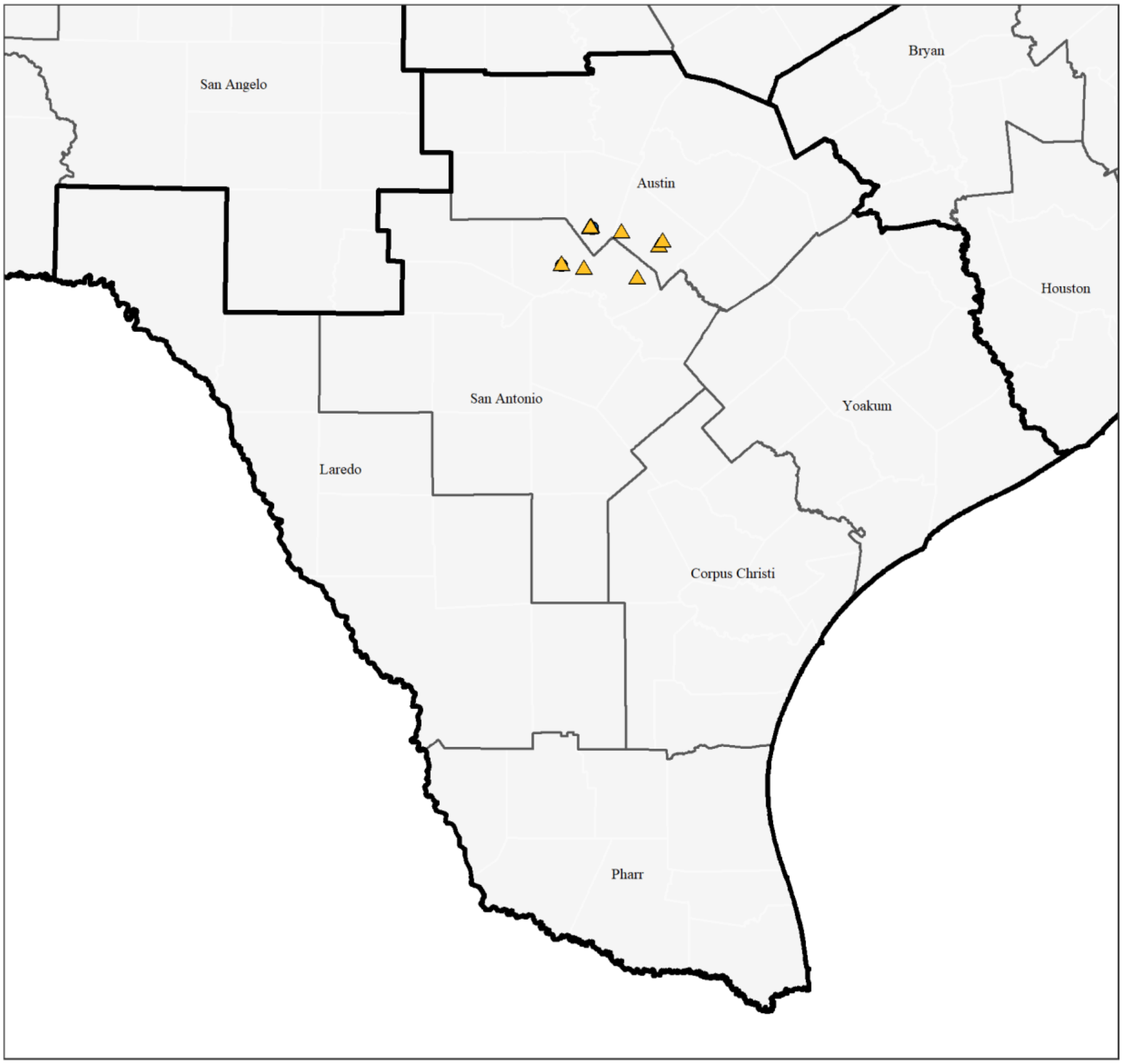
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



● Alive ▲ Dead

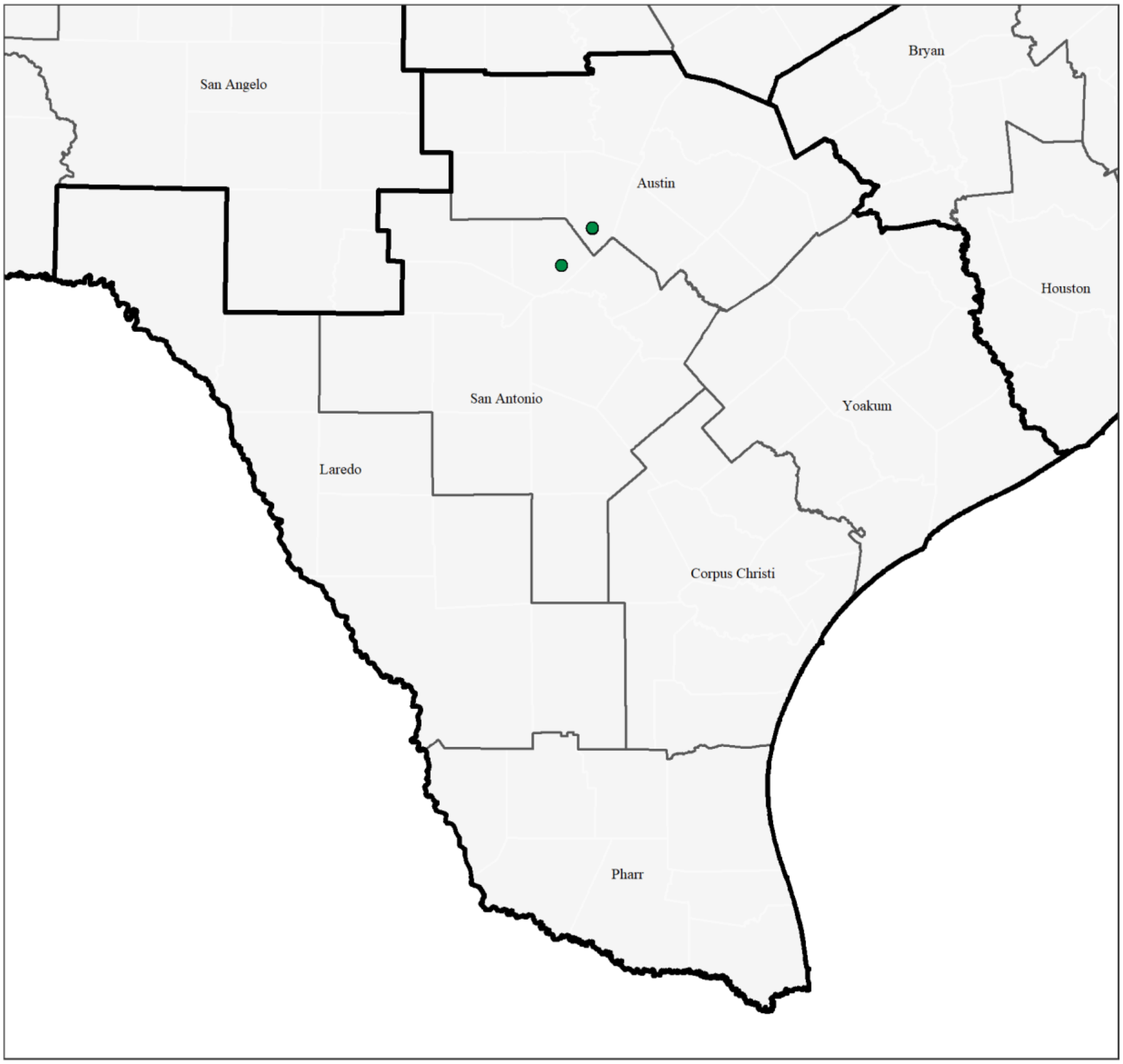
Eurycea pterophila

Fern Bank Salamander



Near-Road Points   Off-Road Points

Eurycea pterophila
Fern Bank Salamander

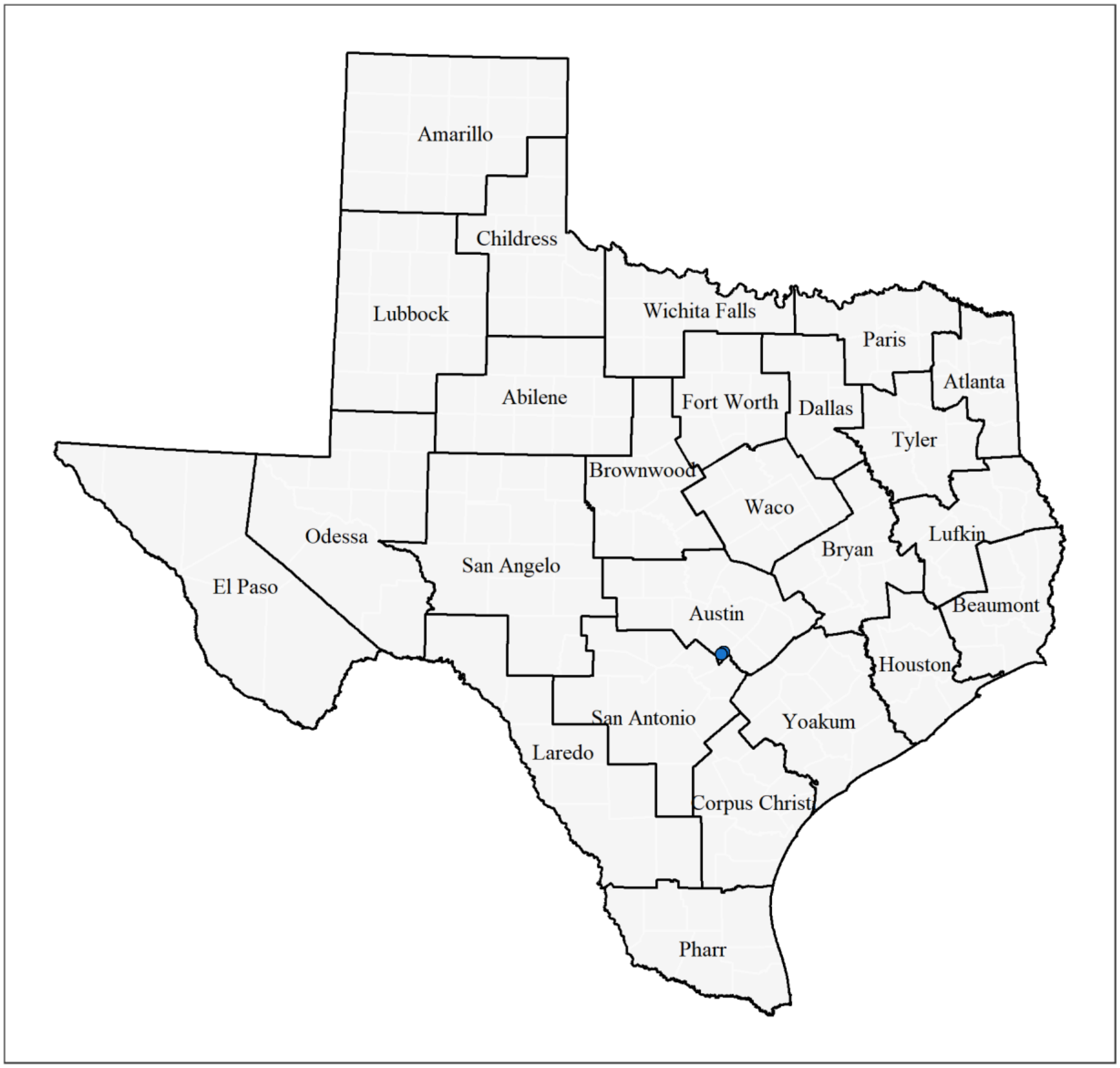


● Alive ▲ Dead

Eurycea rathbuni

Texas Blind Salamander

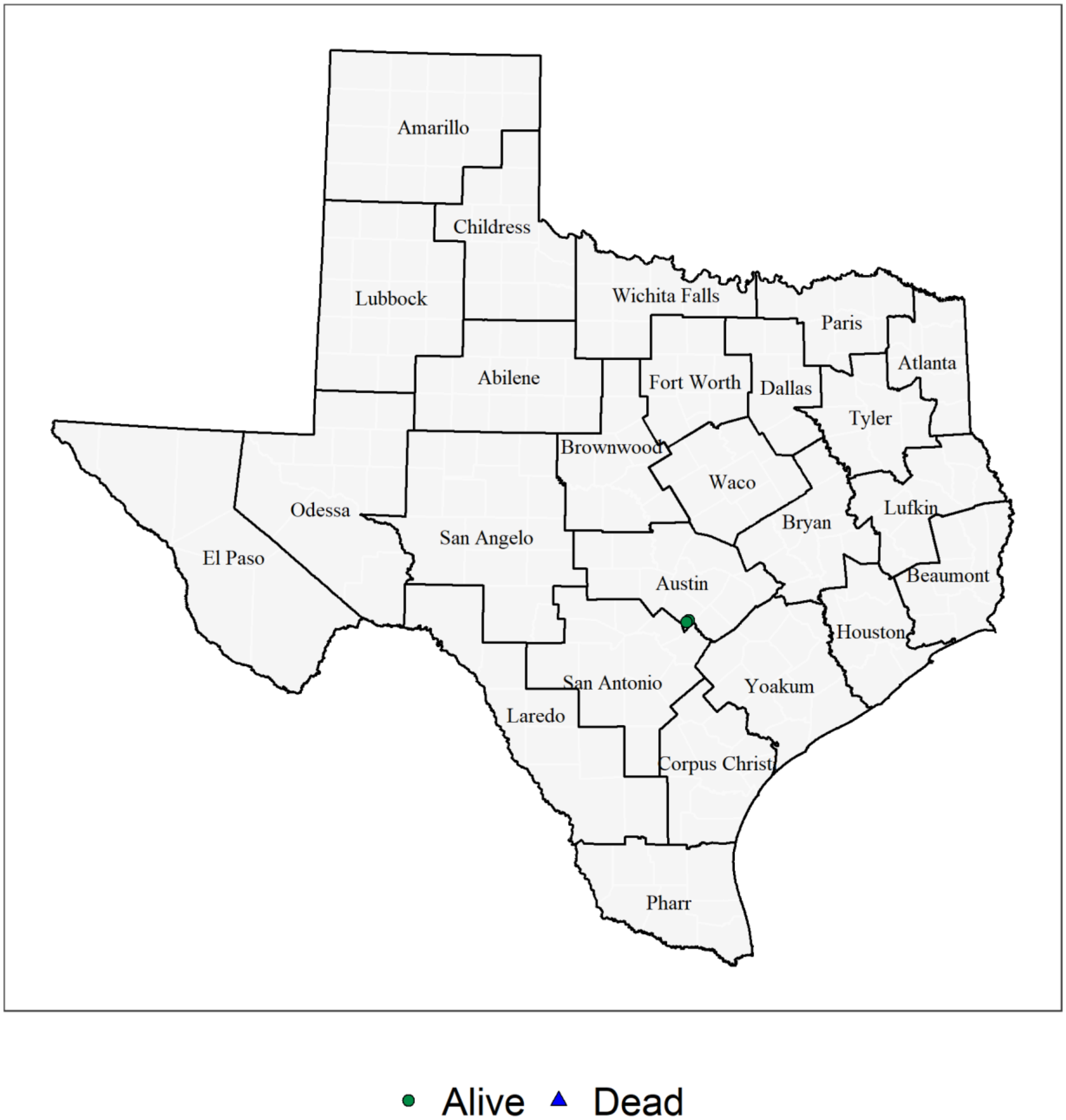
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



• Near-Road Points ▲ Off-Road Points

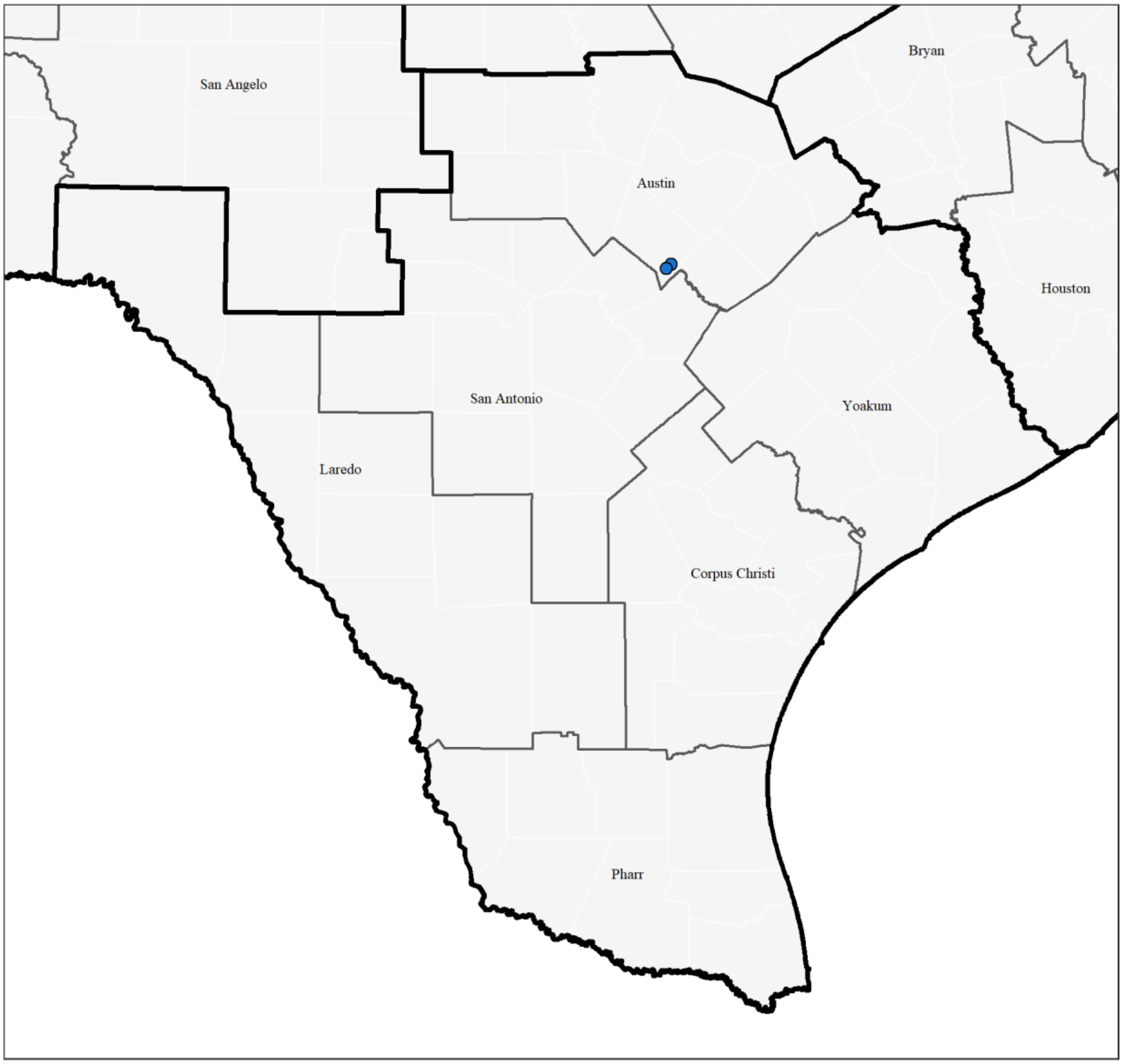
Eurycea rathbuni

Texas Blind Salamander



Eurycea rathbuni

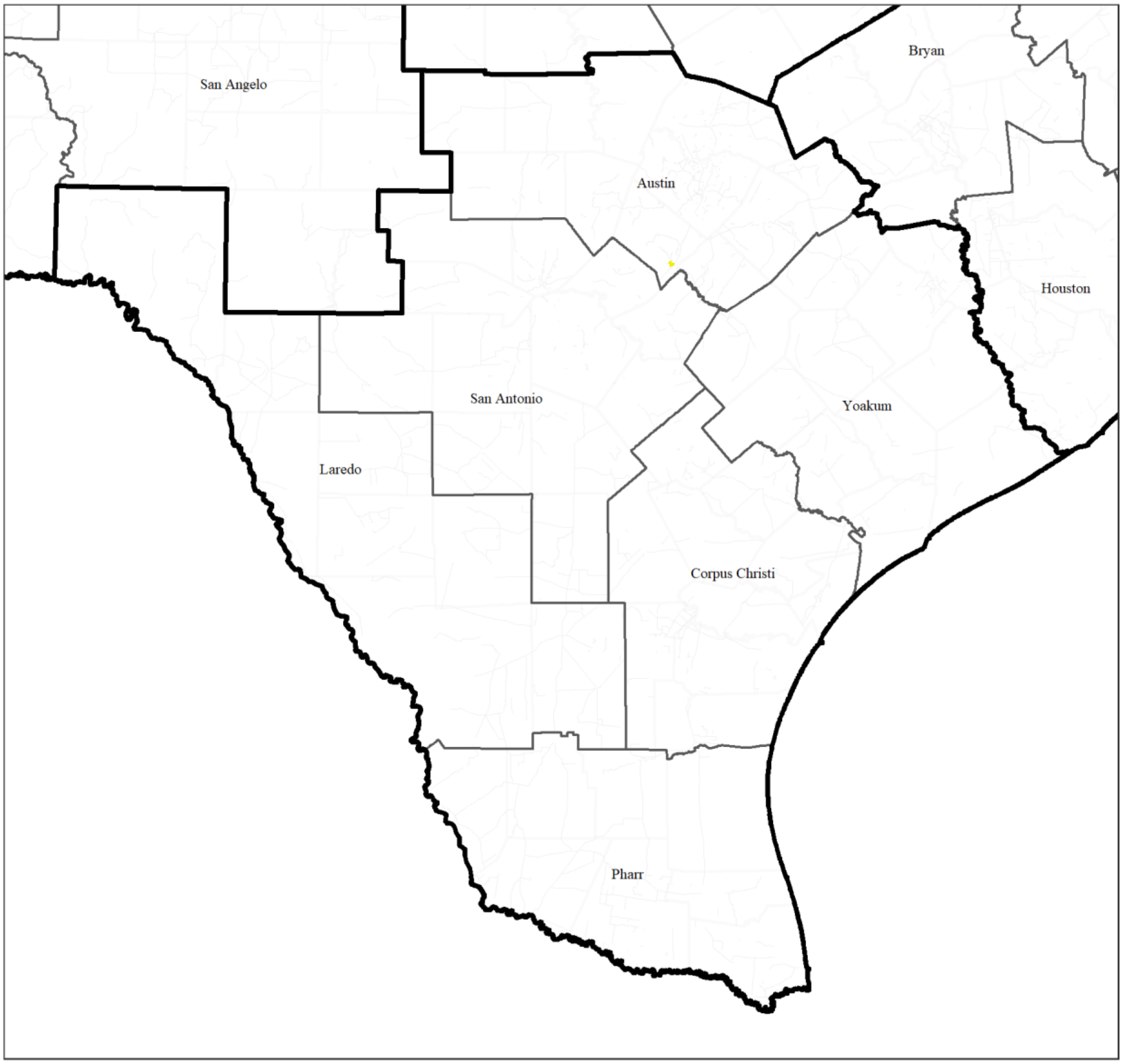
Texas Blind Salamander



• Near-Road Points ▲ Off-Road Points

Eurycea rathbuni

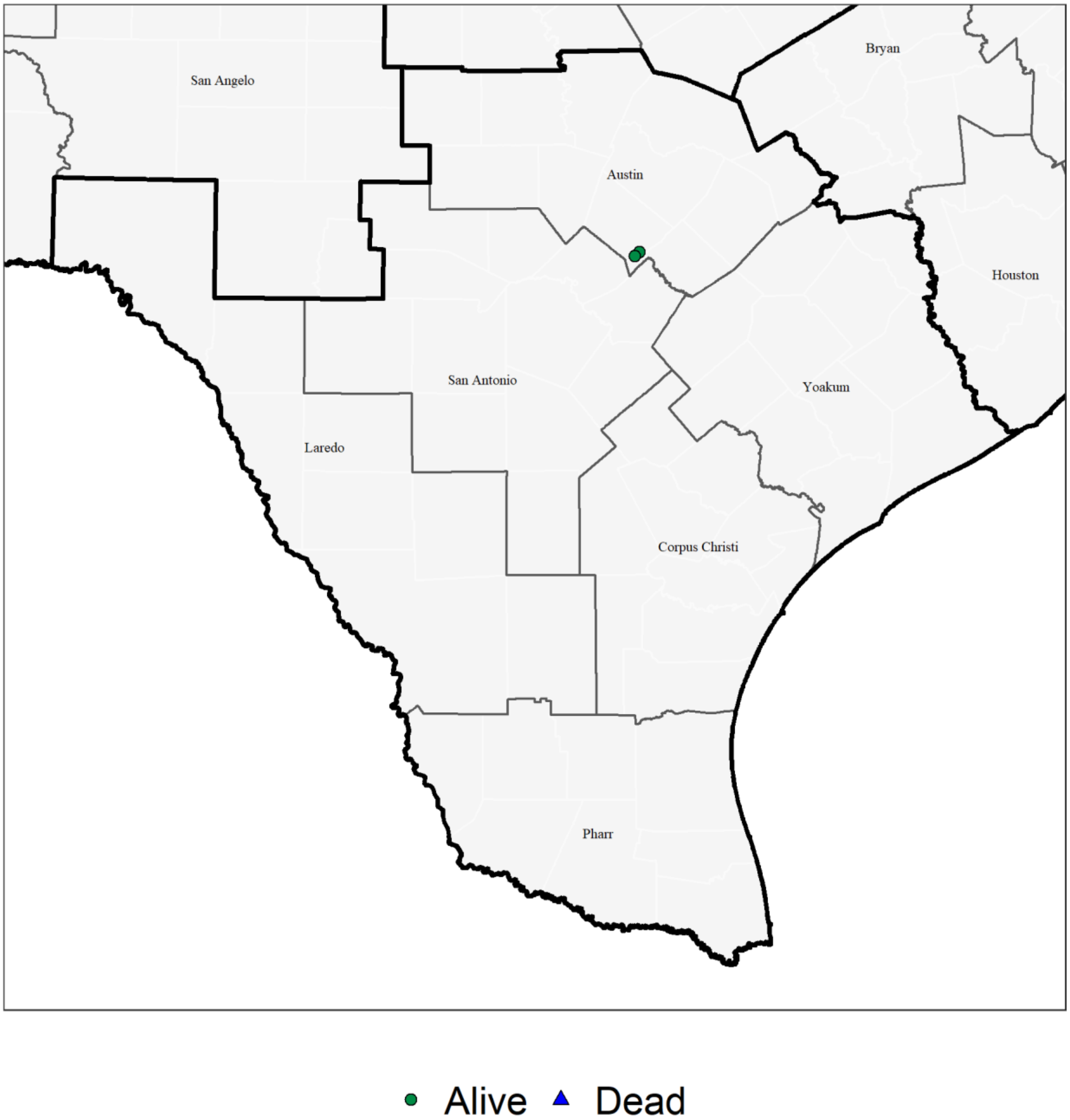
Texas Blind Salamander



Points Per Section 1-2 3-4 5-6 7+

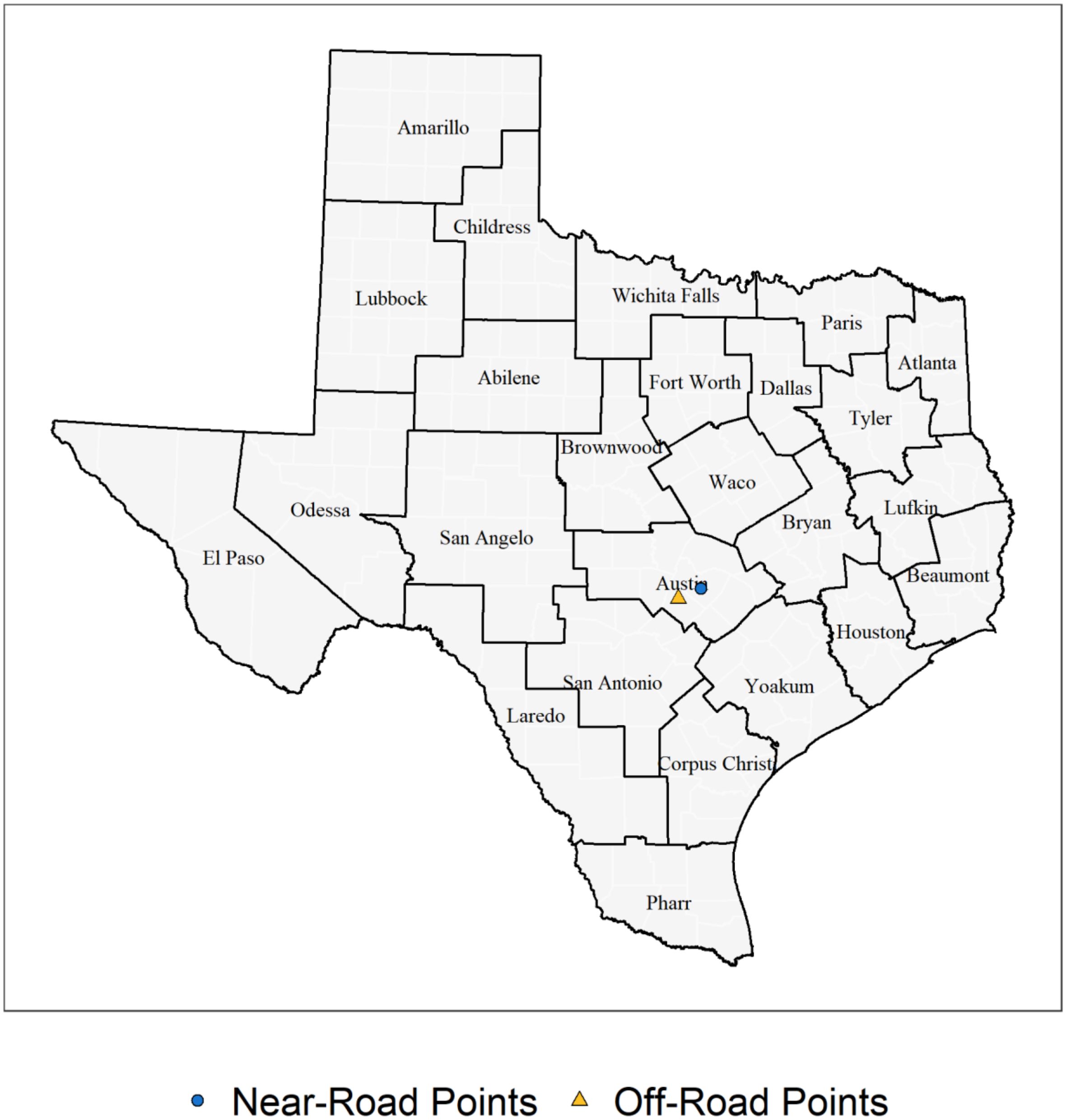
Eurycea rathbuni

Texas Blind Salamander



Eurycea sosorum

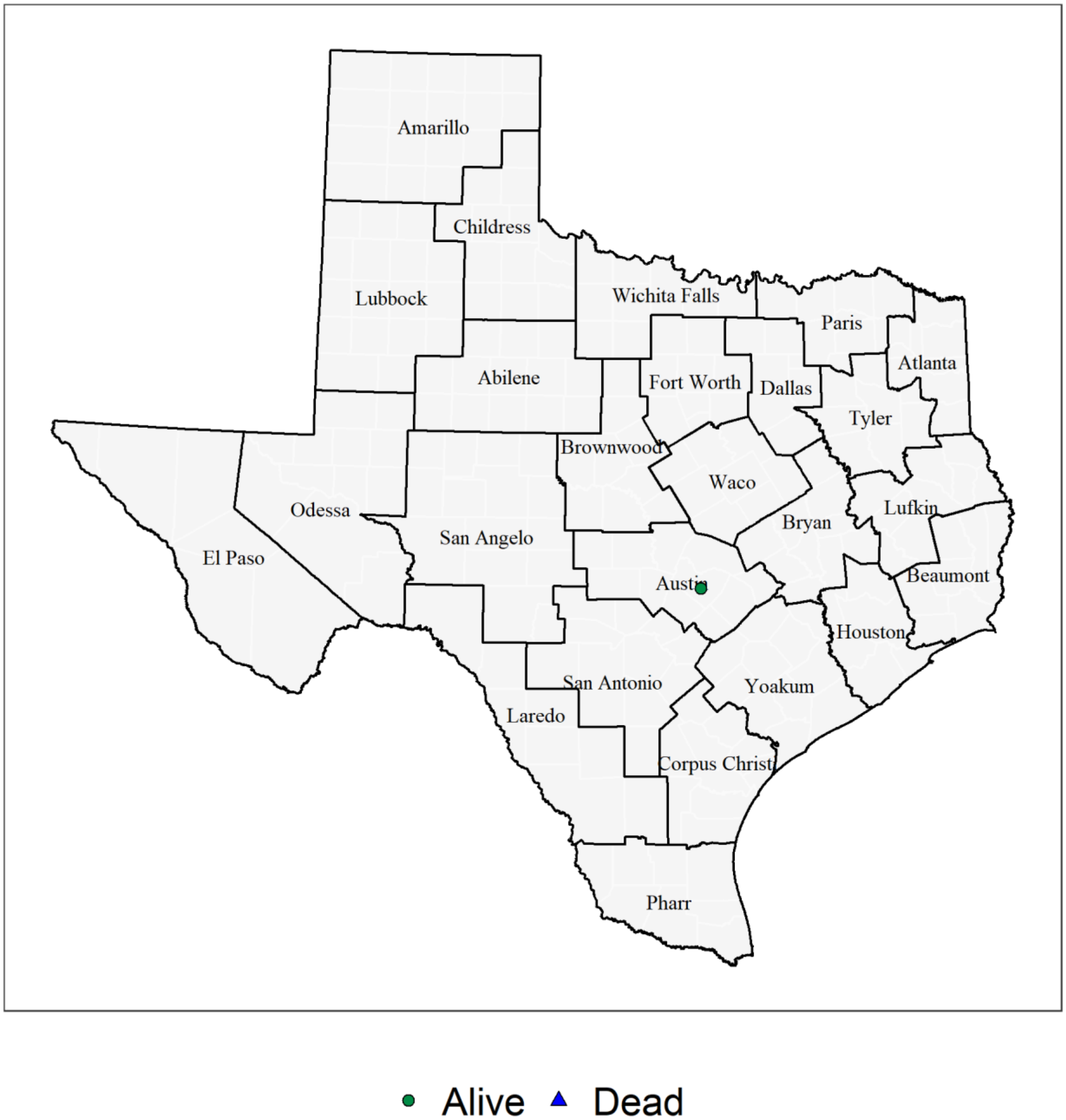
Barton Springs Salamander



Eurycea sosorum

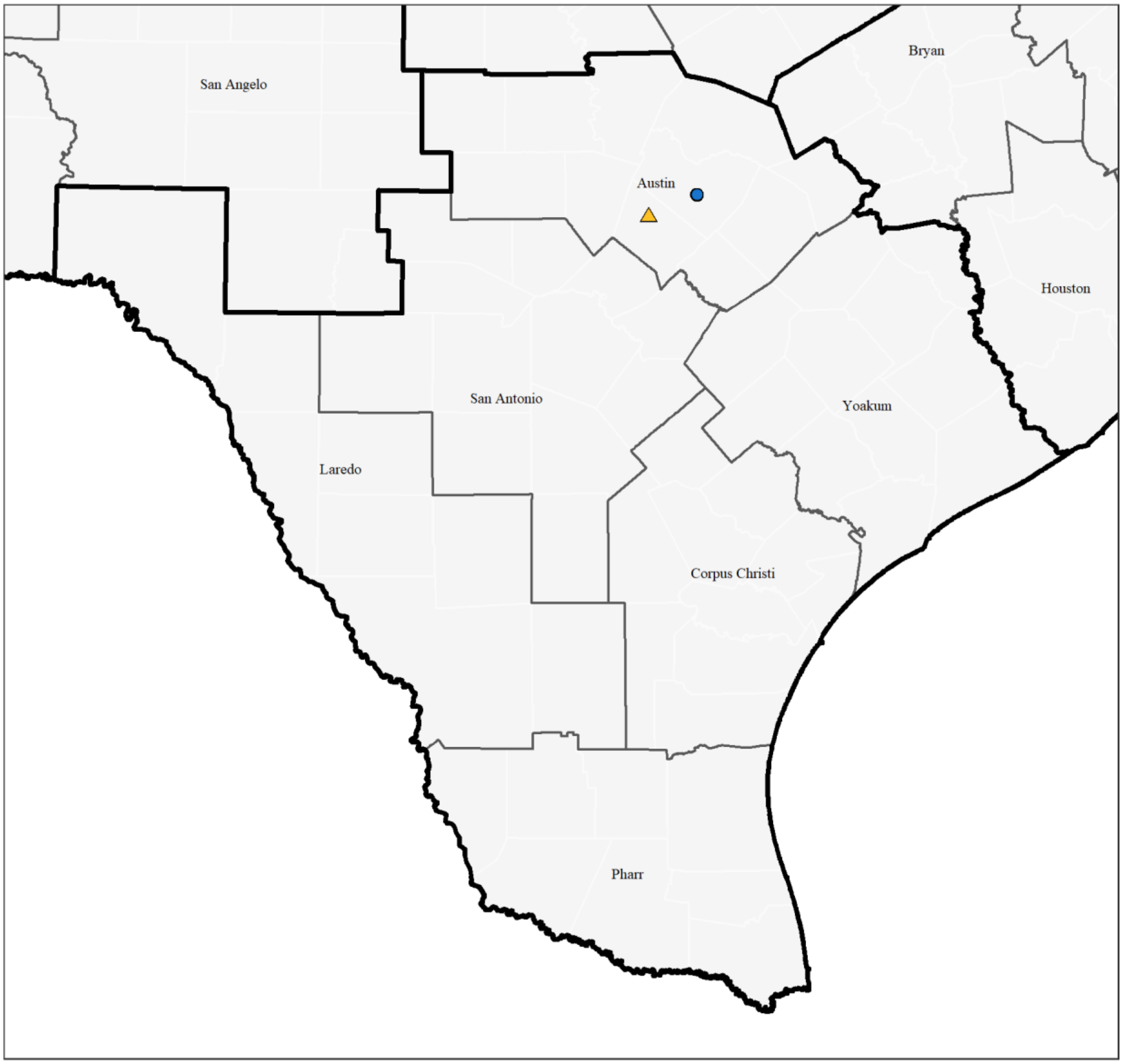
Barton Springs Salamander

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Eurycea sosorum

Barton Springs Salamander

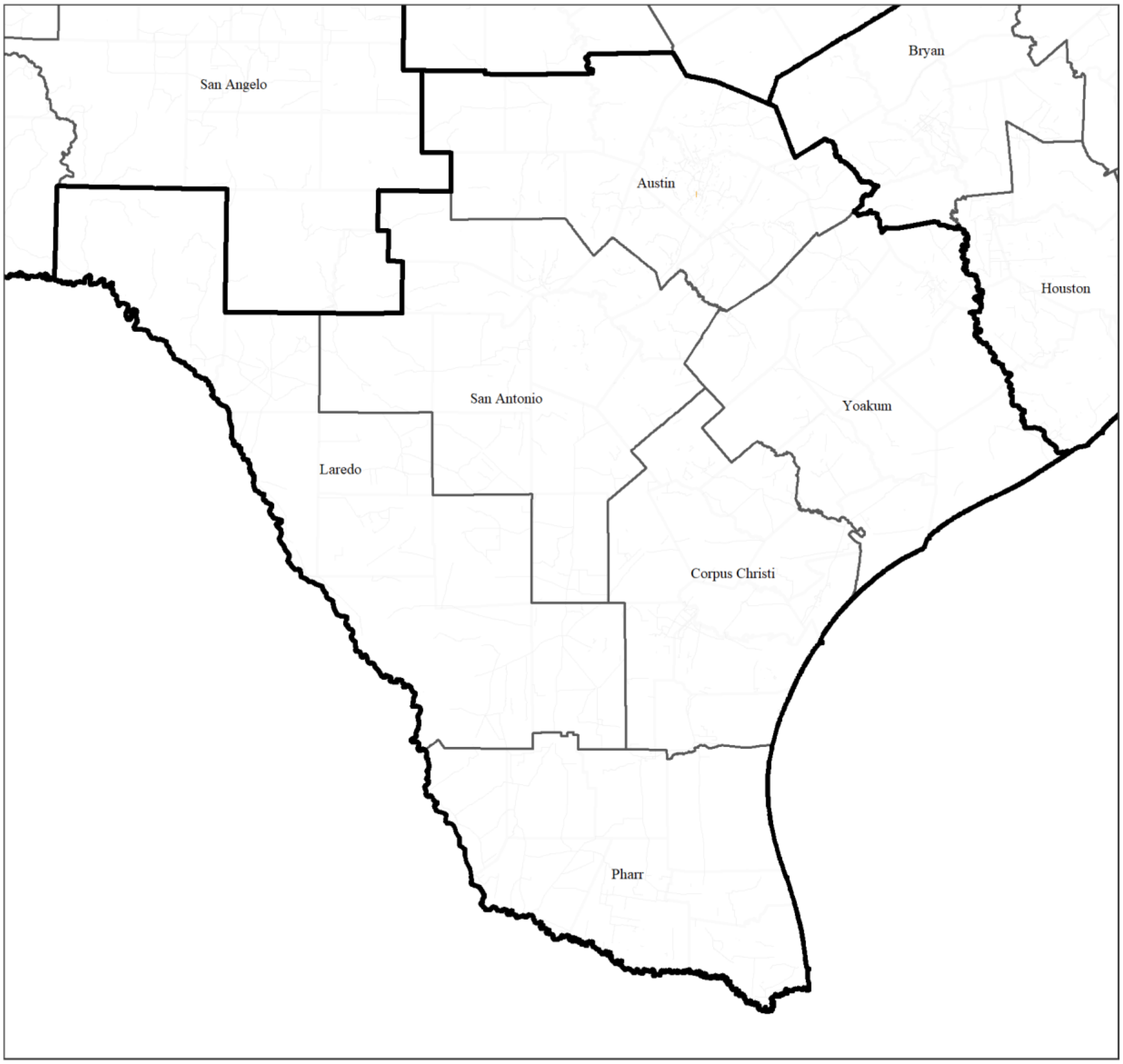


● Near-Road Points ▲ Off-Road Points

Eurycea sosorum

Barton Springs Salamander

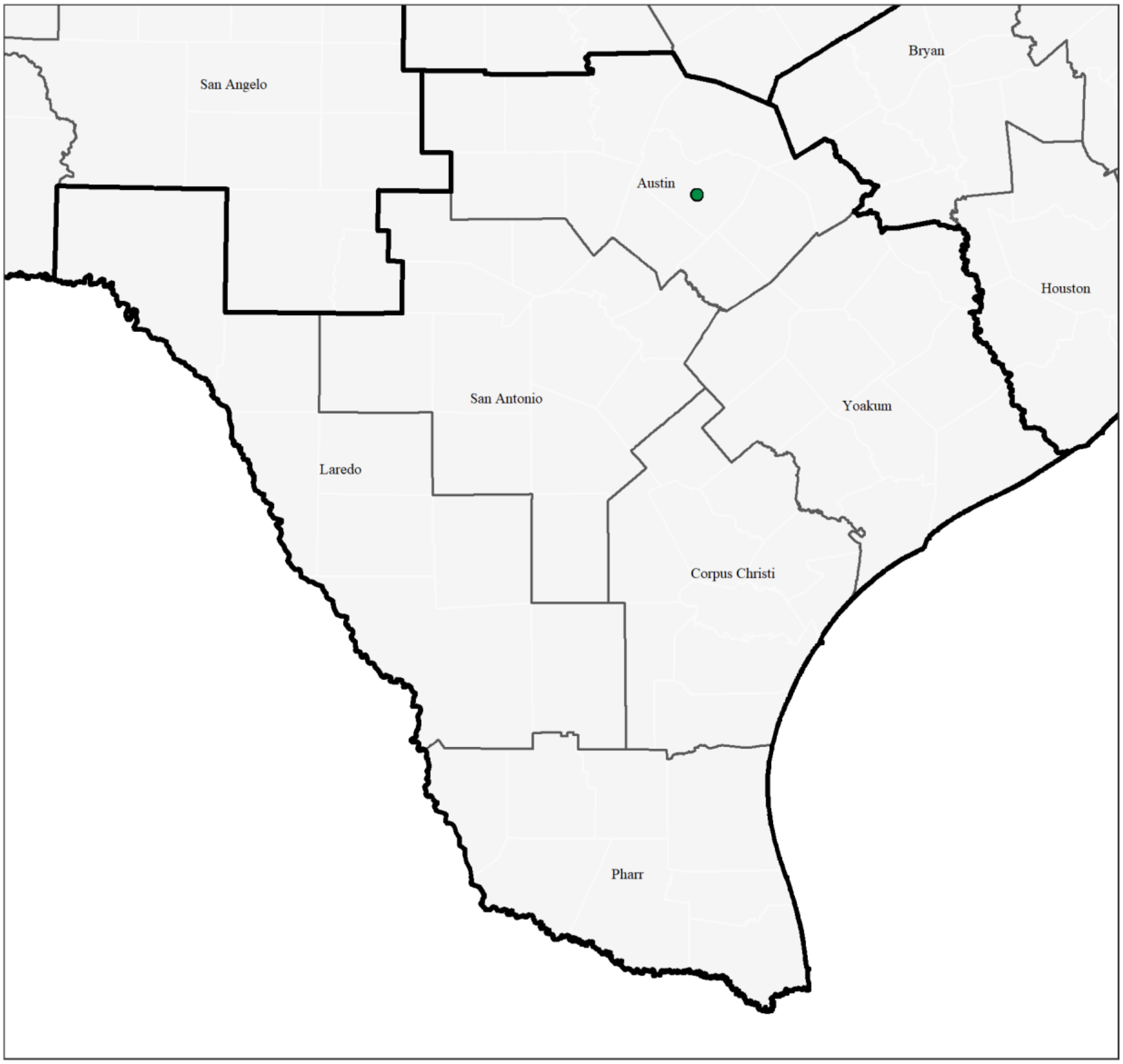
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section 1-2 3-4 5-6 7+

Eurycea sosorum

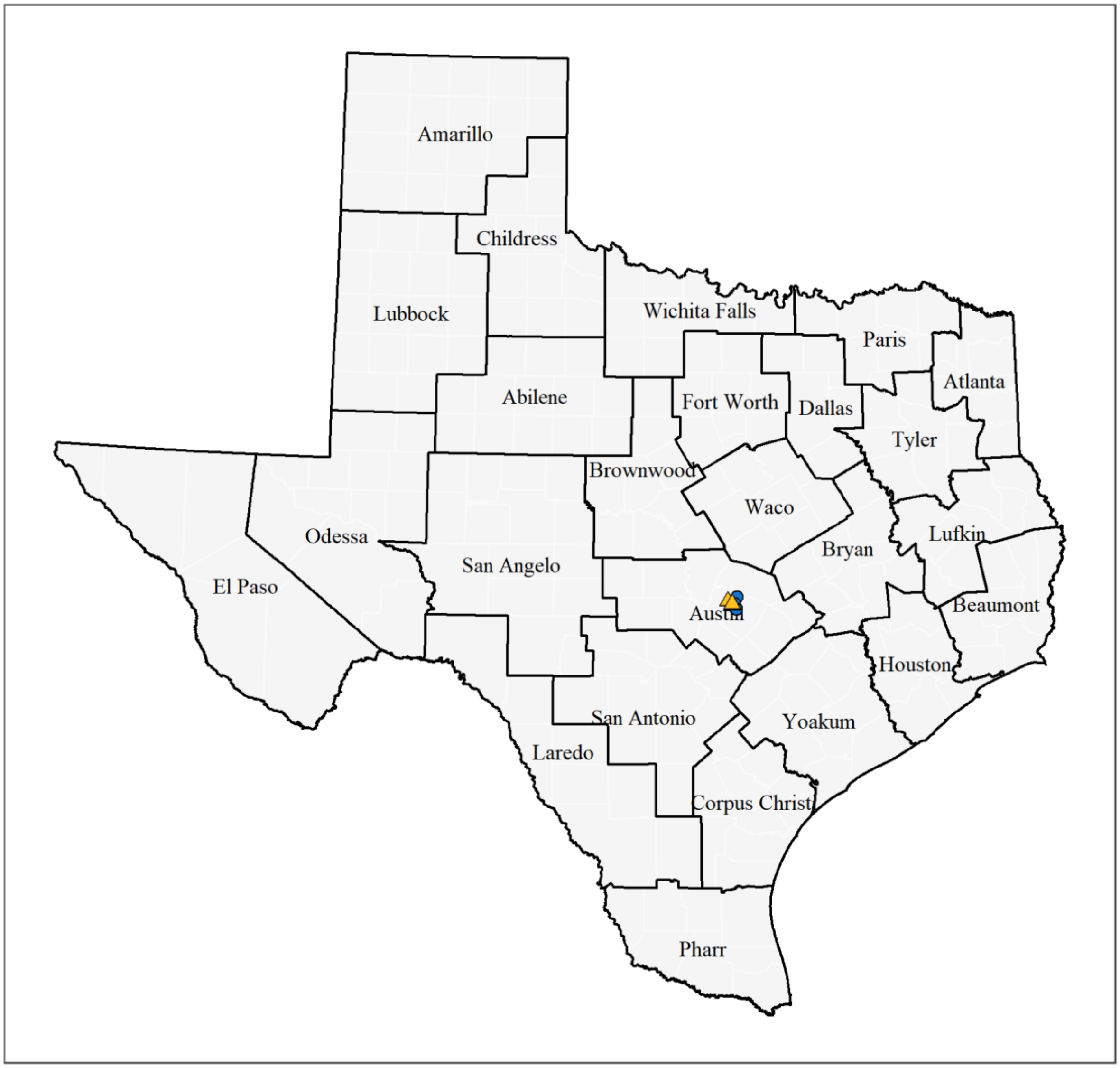
Barton Springs Salamander



● Alive ▲ Dead

Eurycea tonkawae

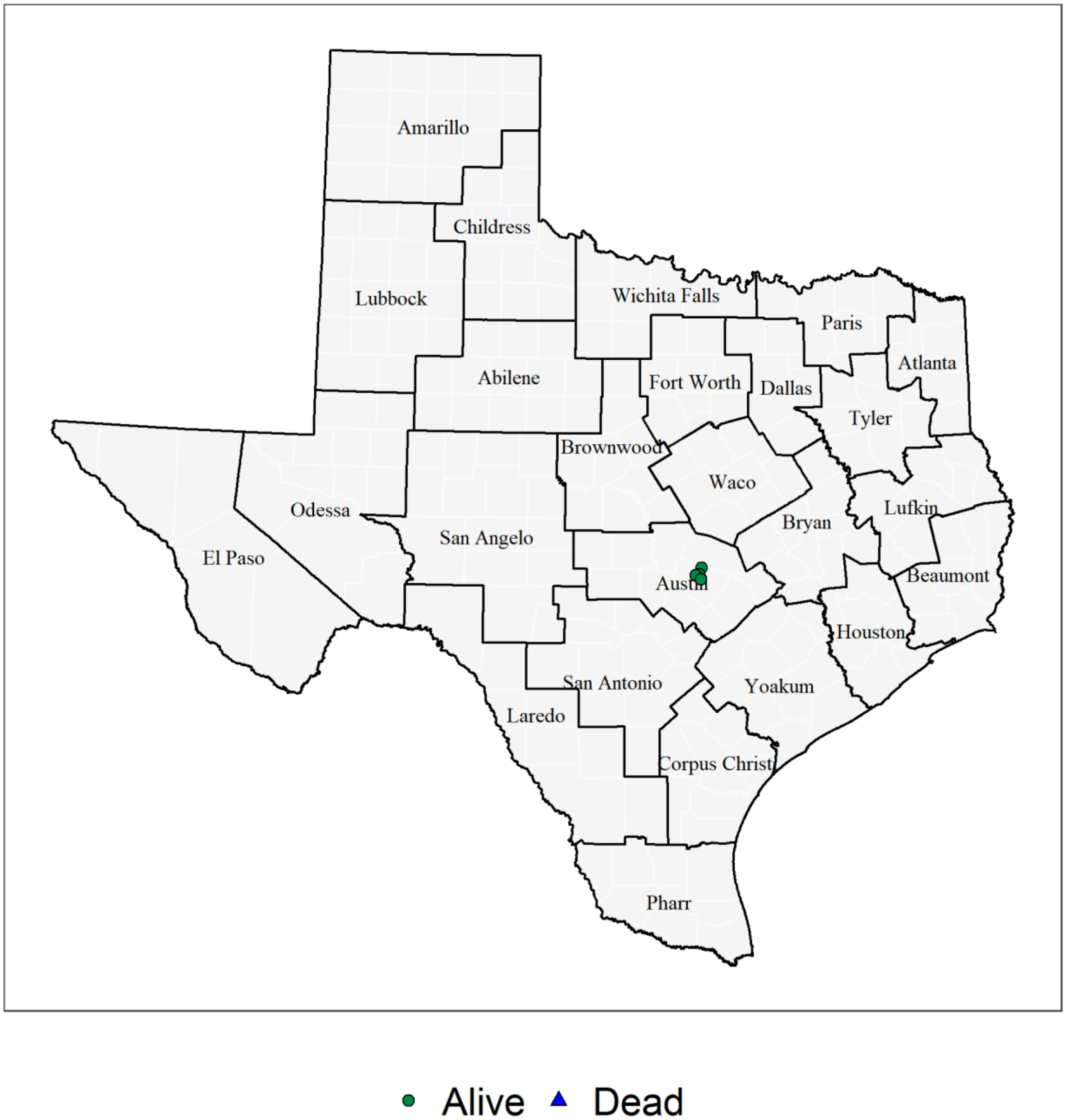
Jollyville Plateau Salamander



● Near-Road Points ▲ Off-Road Points

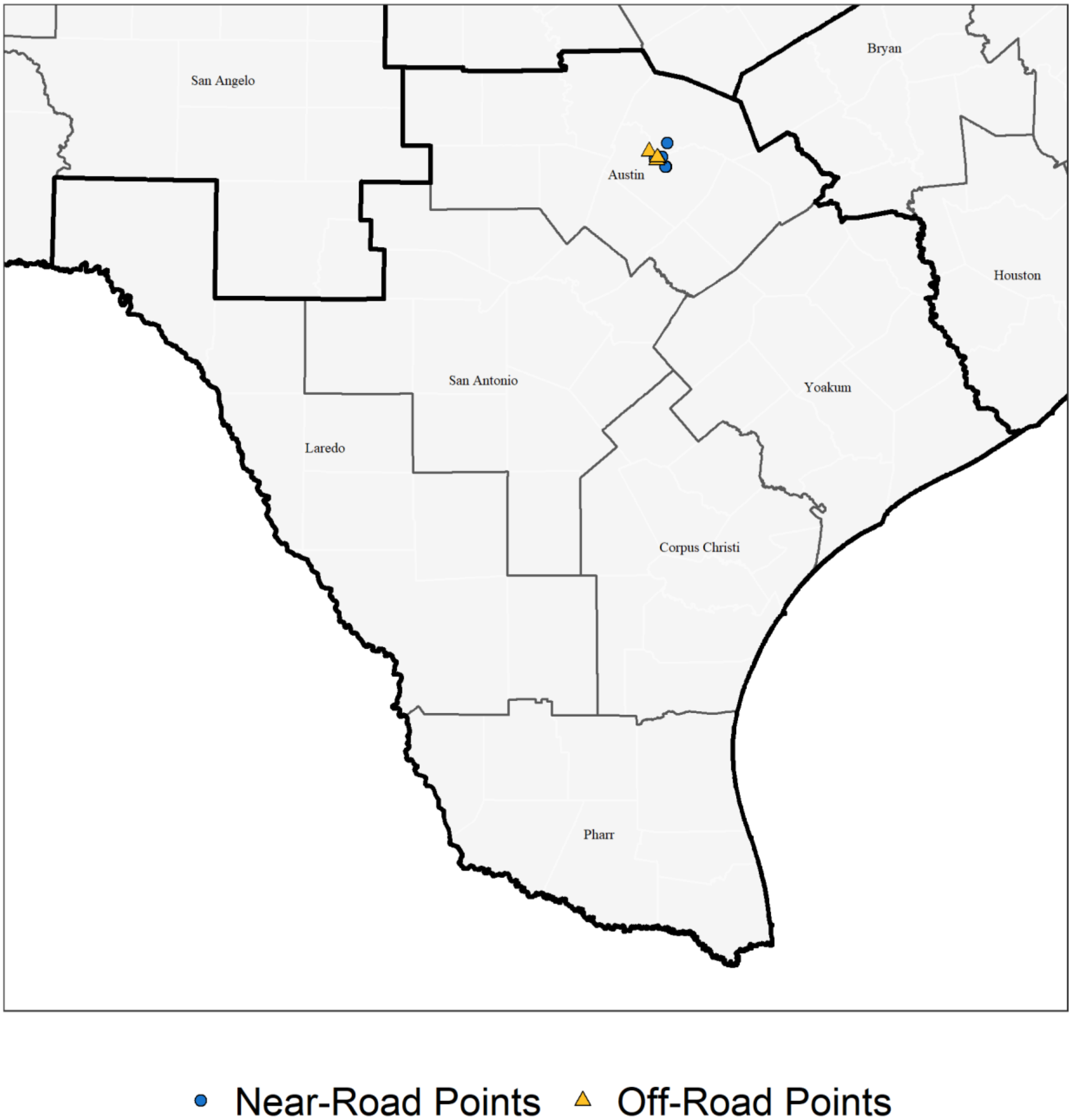
Eurycea tonkawae

Jollyville Plateau Salamander



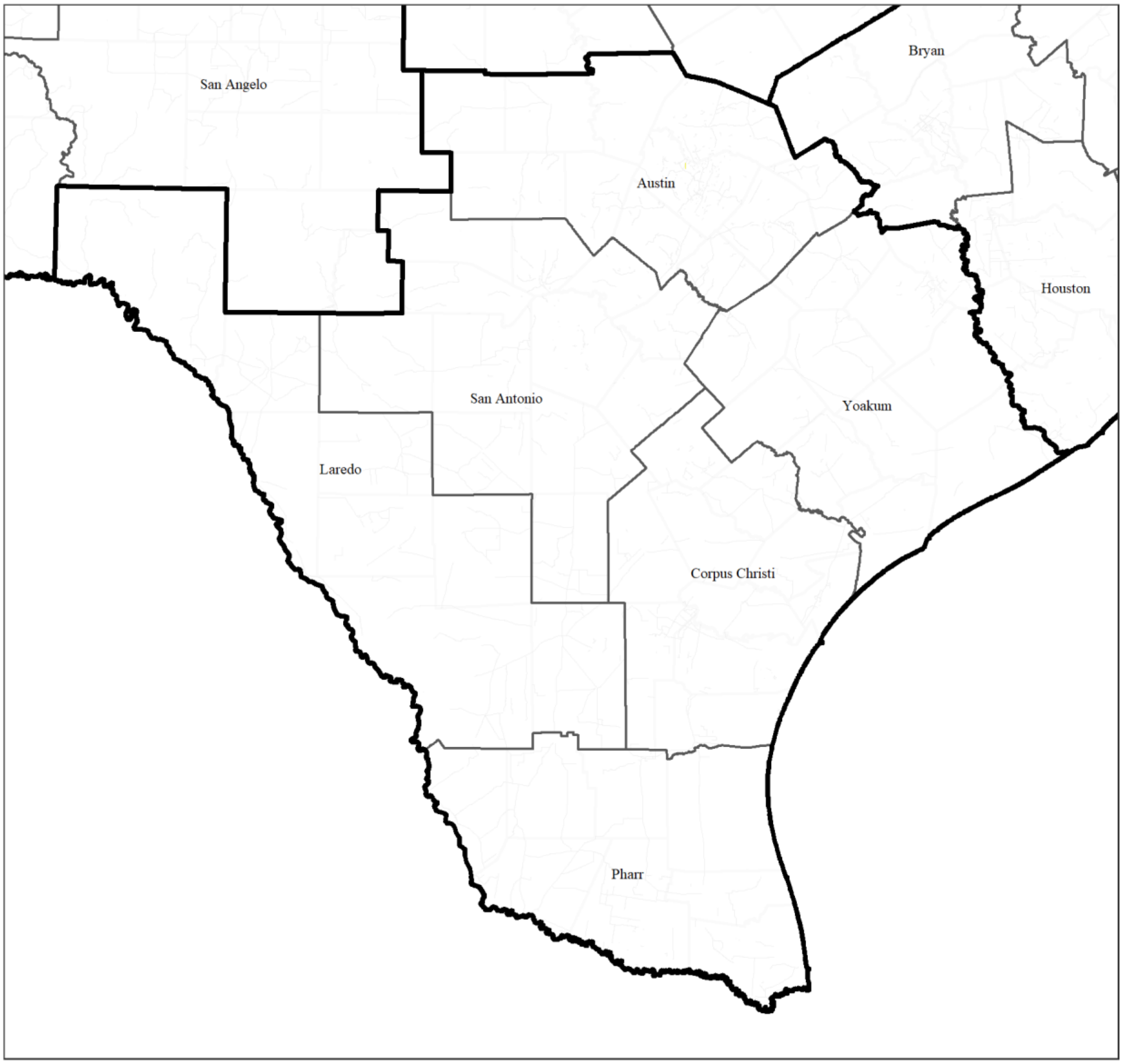
Eurycea tonkawae

Jollyville Plateau Salamander



Eurycea tonkawae

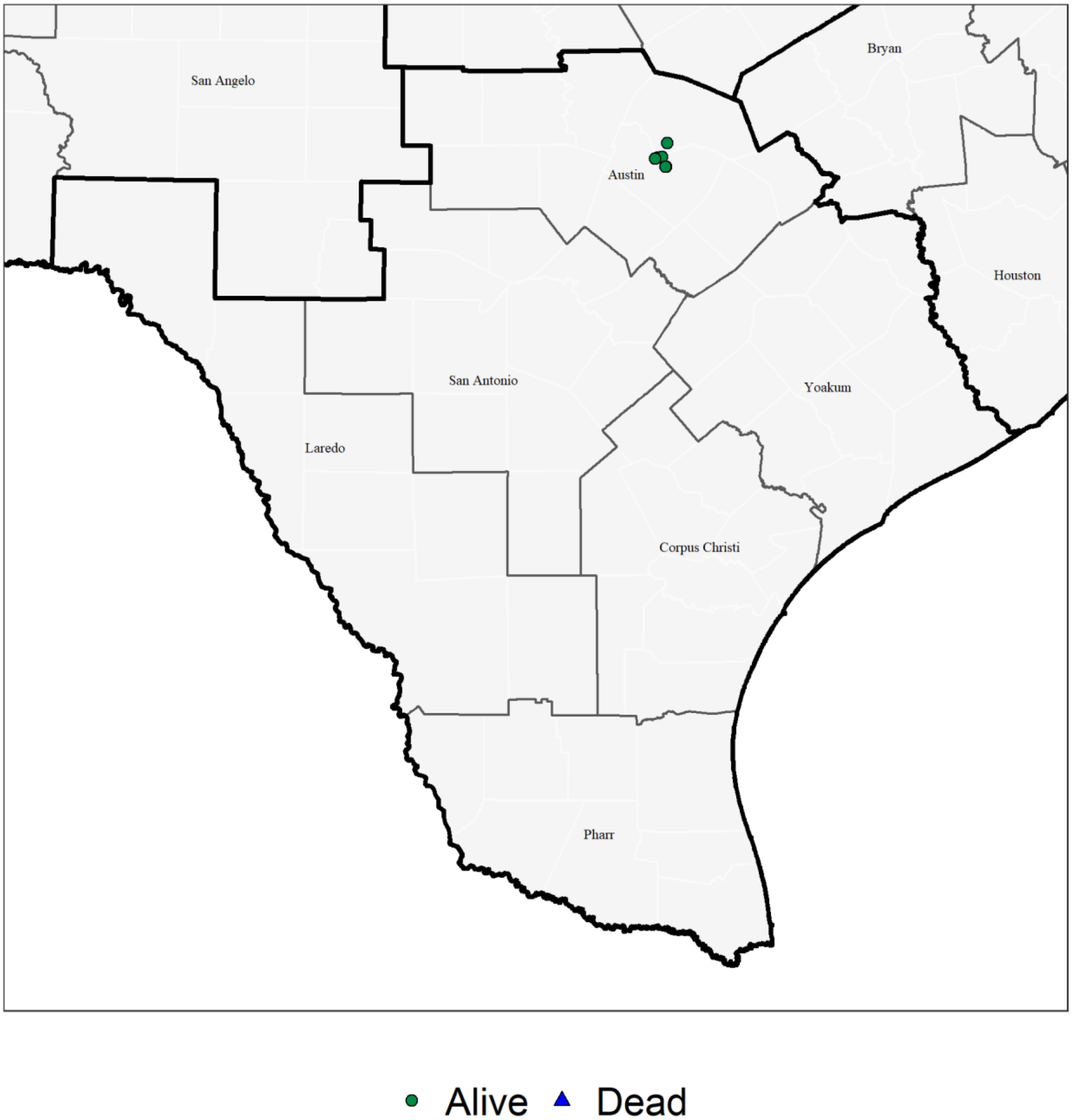
Jollyville Plateau Salamander



Points Per Section 1-2 3-4 5-6 7+

Eurycea tonkawae

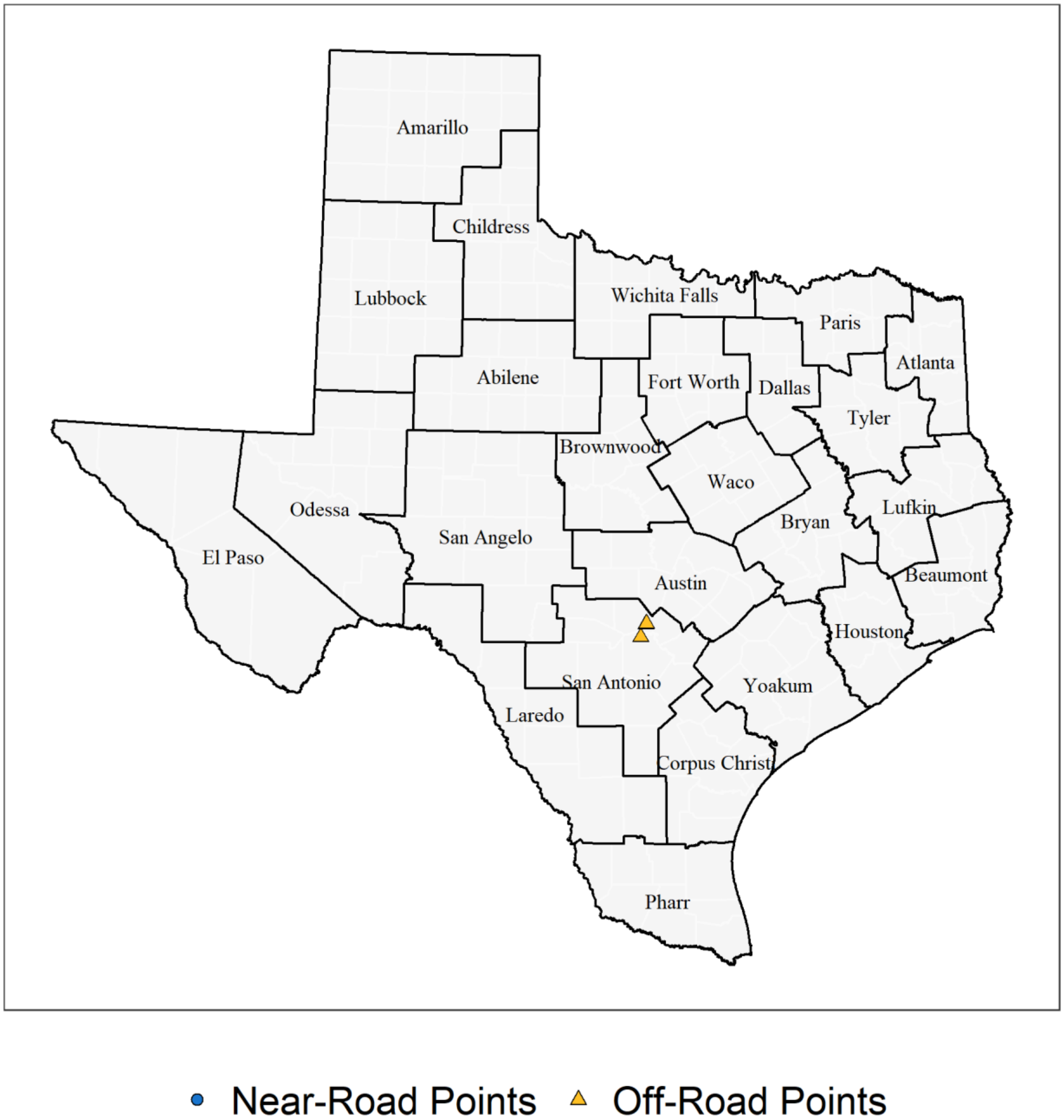
Jollyville Plateau Salamander



Eurycea tridentifera

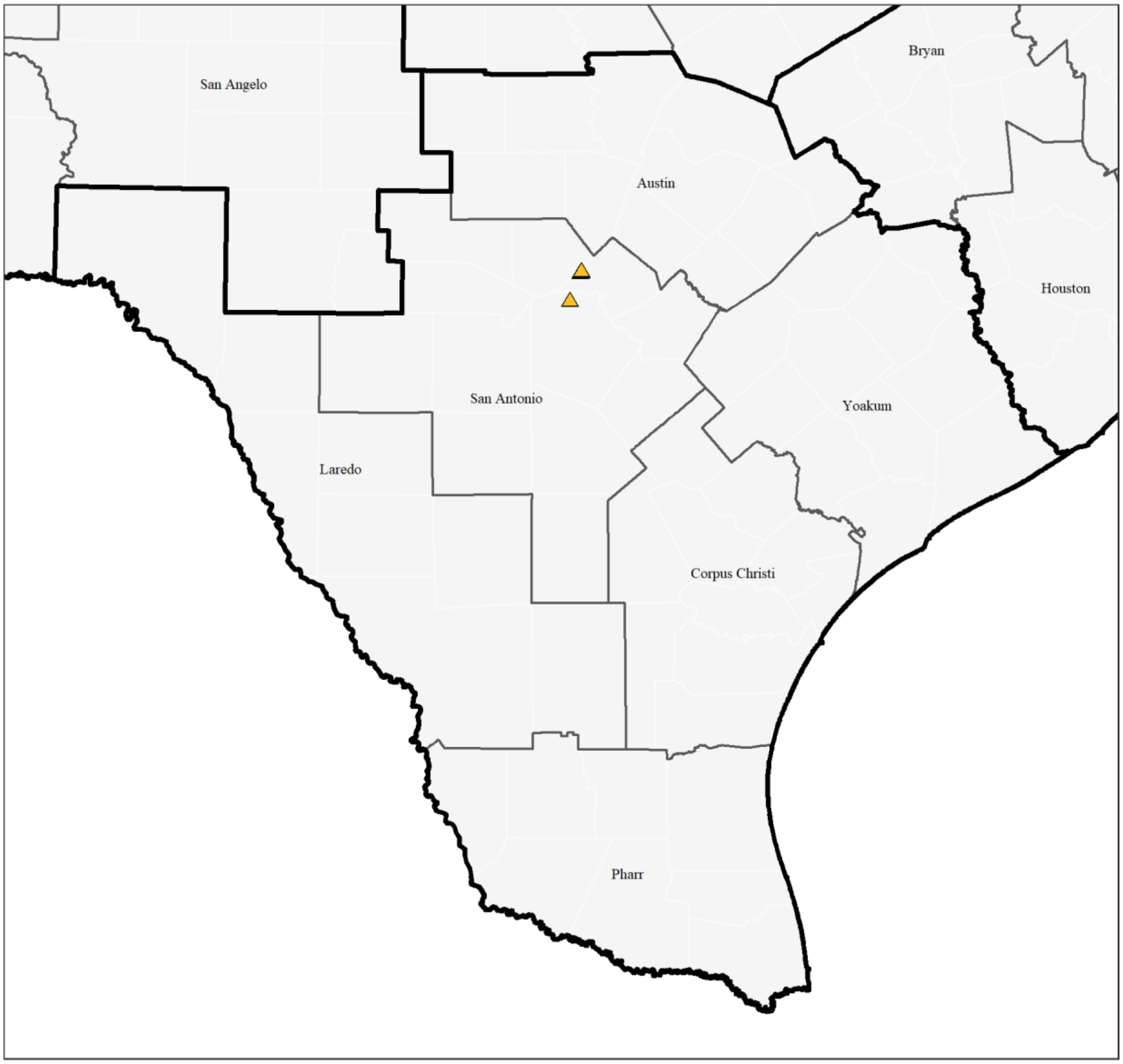
Comal Blind Salamander

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Eurycea tridentifera

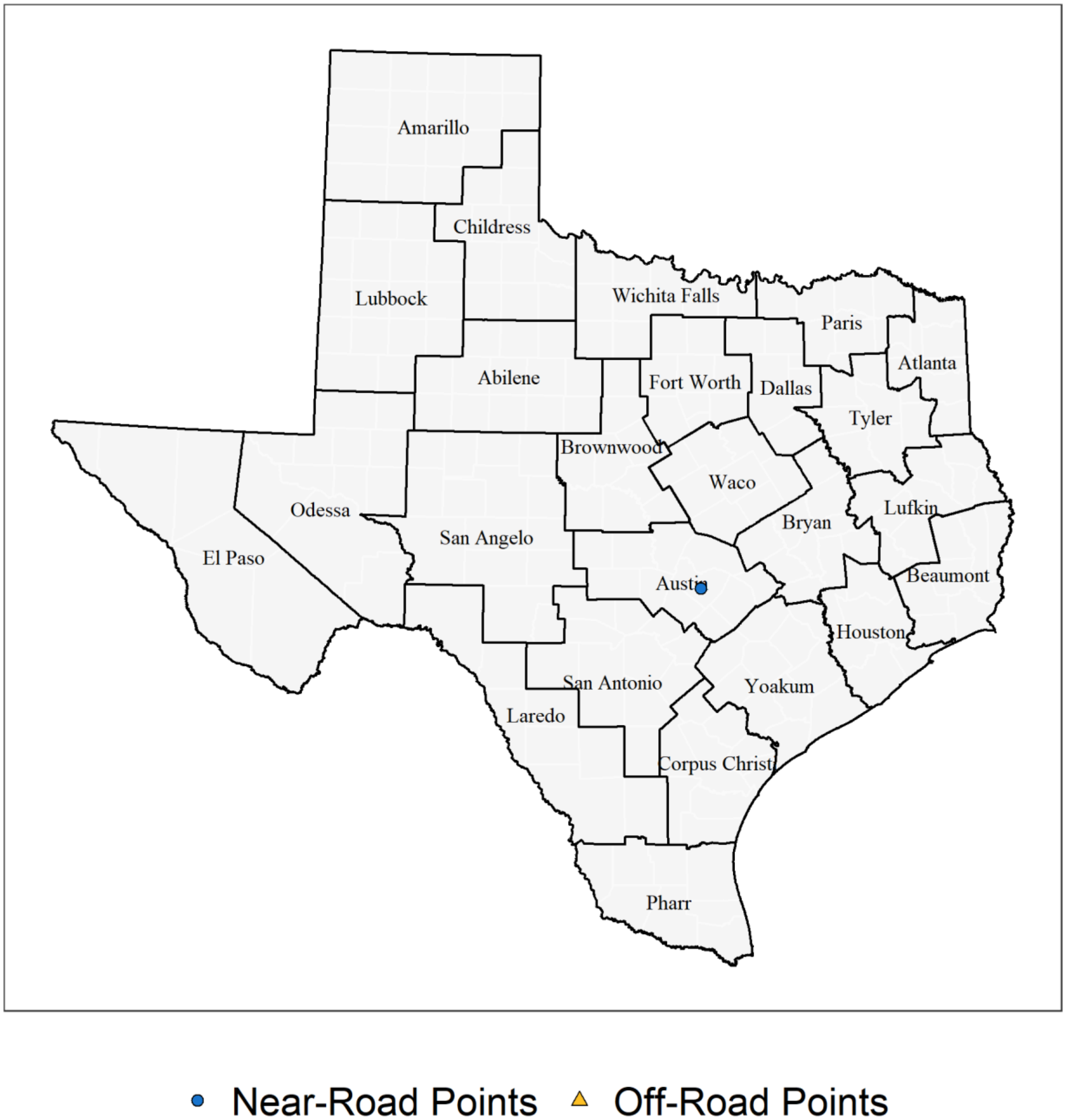
Comal Blind Salamander



Near-Road Points Off-Road Points

Eurycea waterlooensis

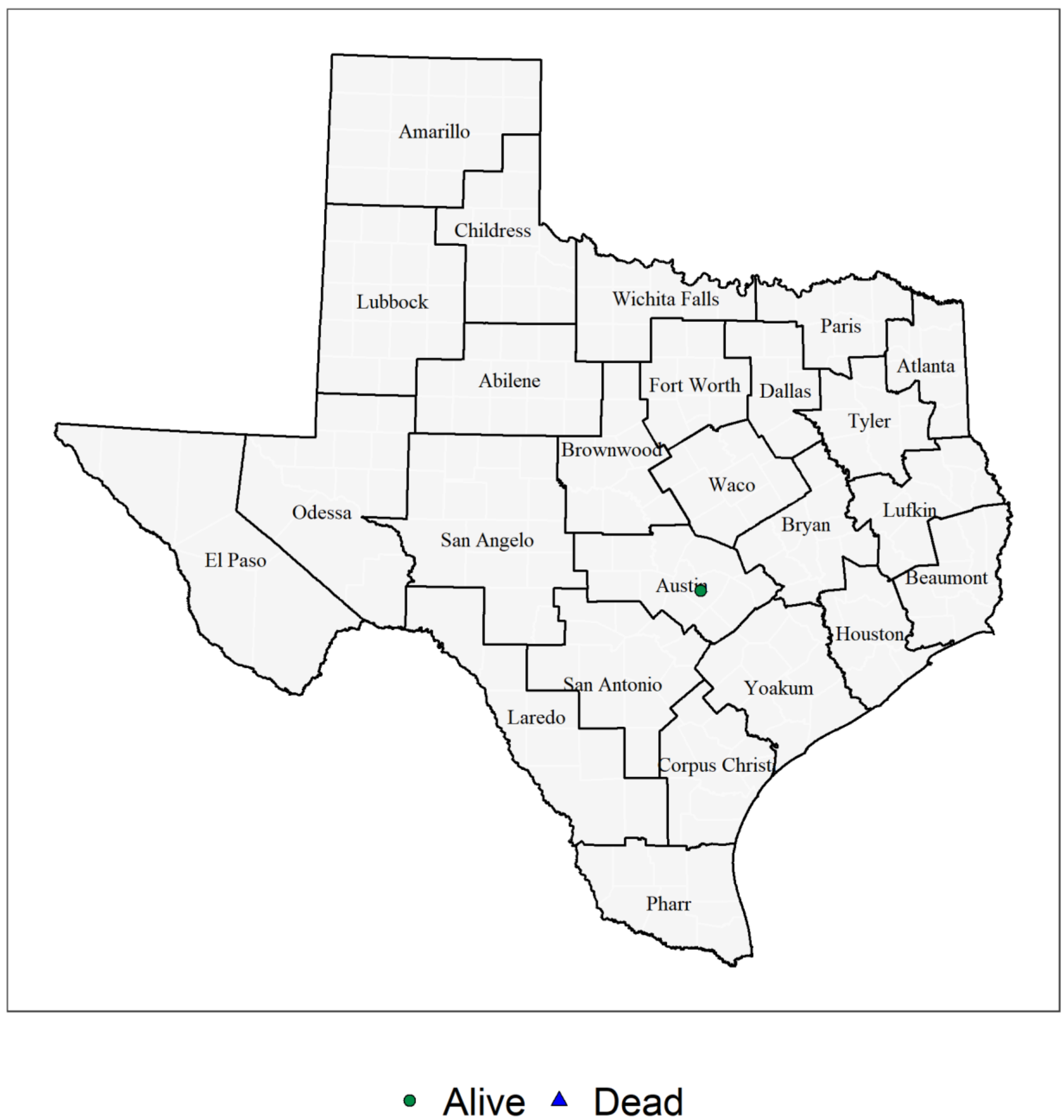
Austin Blind Salamander



Eurycea waterlooensis

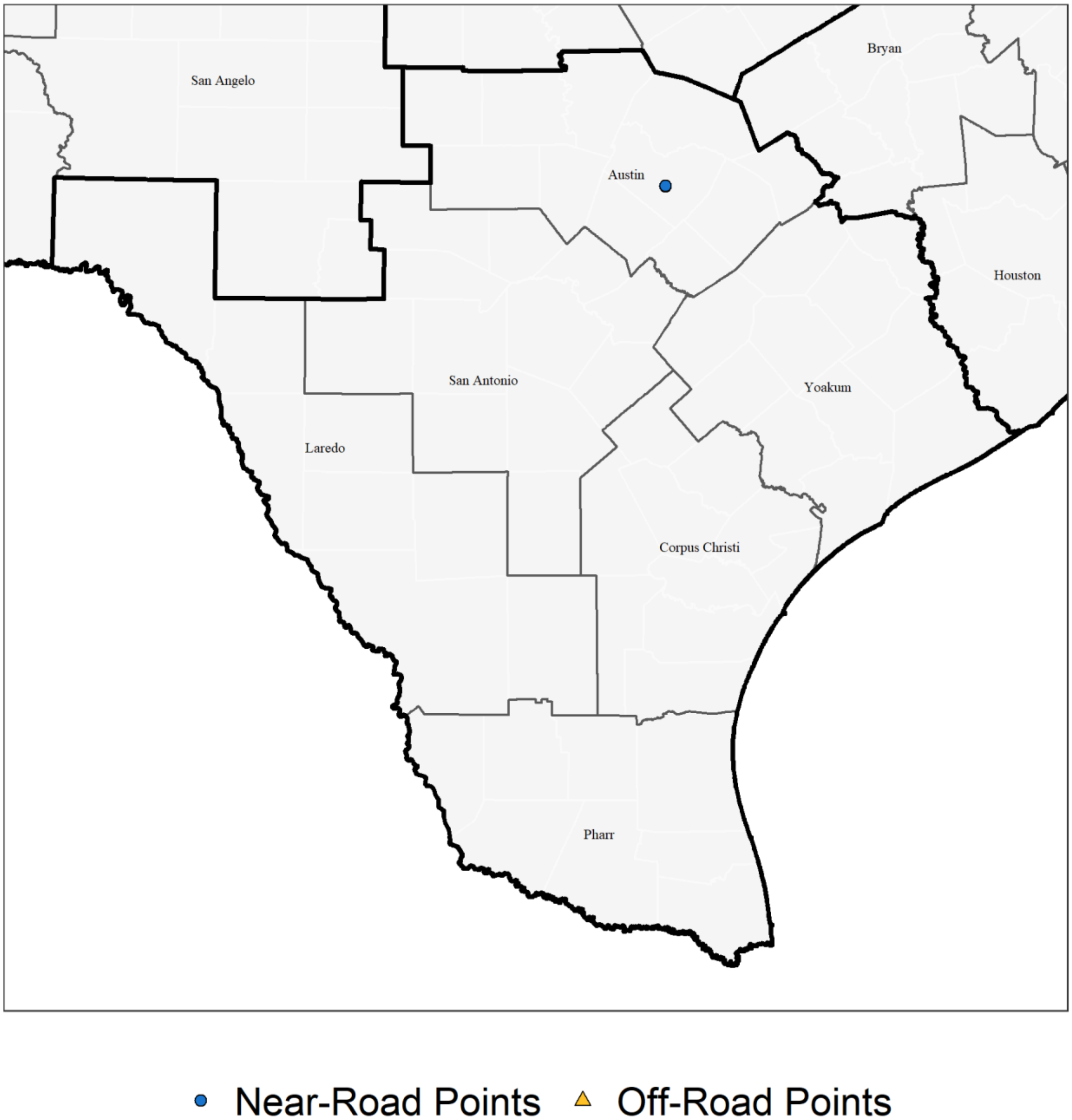
Austin Blind Salamander

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



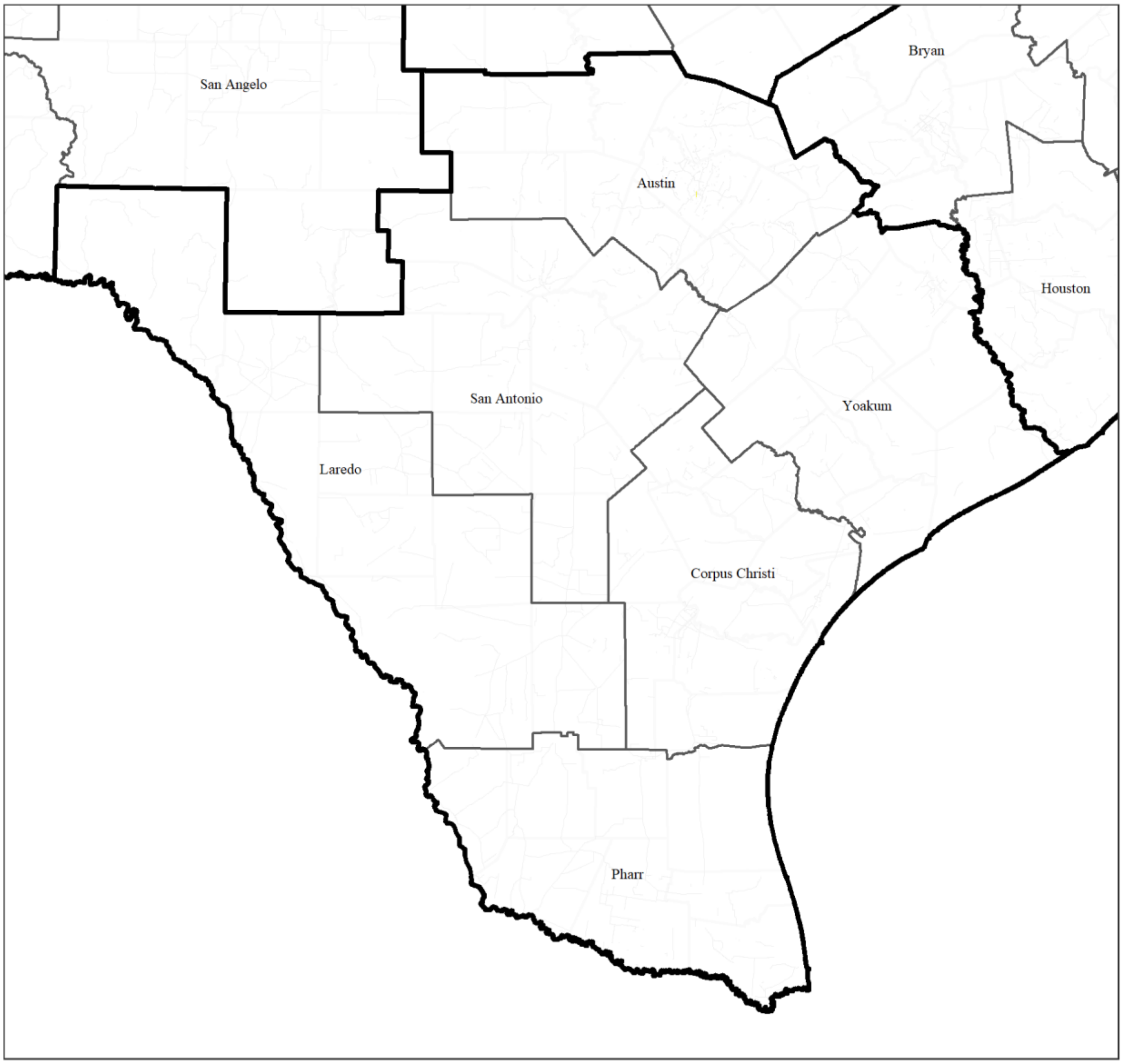
Eurycea waterlooensis

Austin Blind Salamander



Eurycea waterlooensis

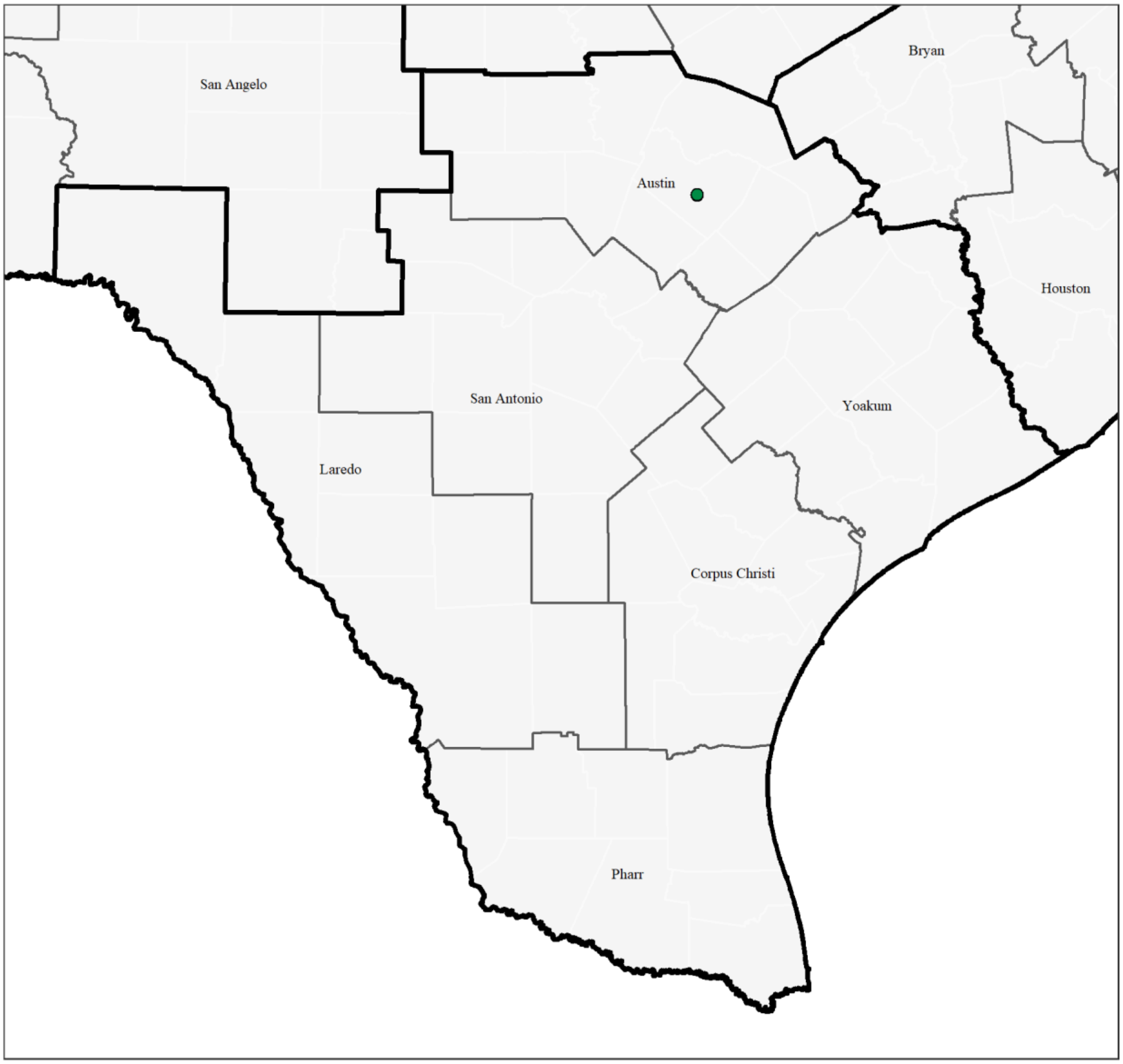
Austin Blind Salamander



Points Per Section 1-2 3-4 5-6 7+

Eurycea waterlooensis

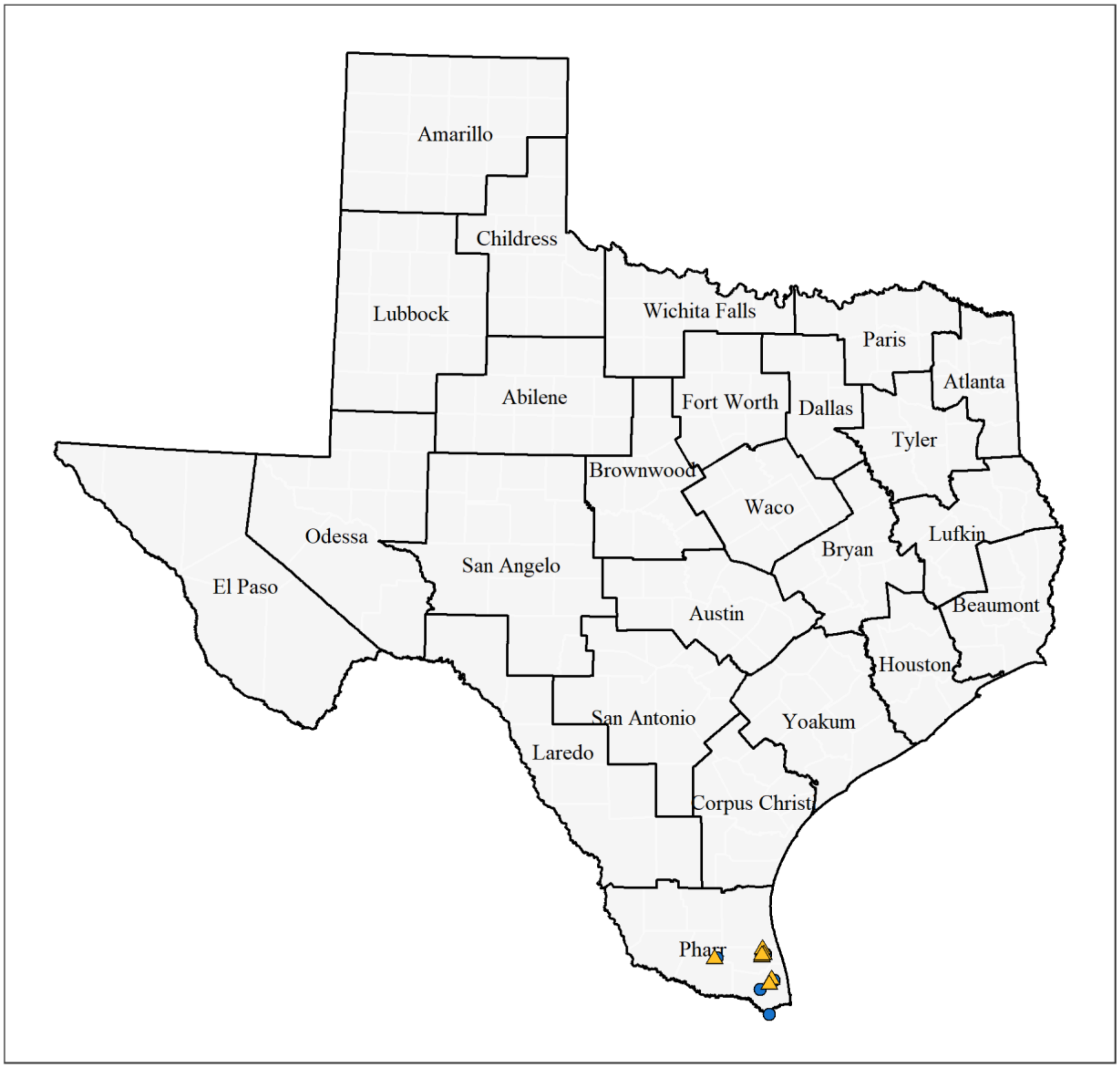
Austin Blind Salamander



Alive Dead

Notophthalmus meridionalis

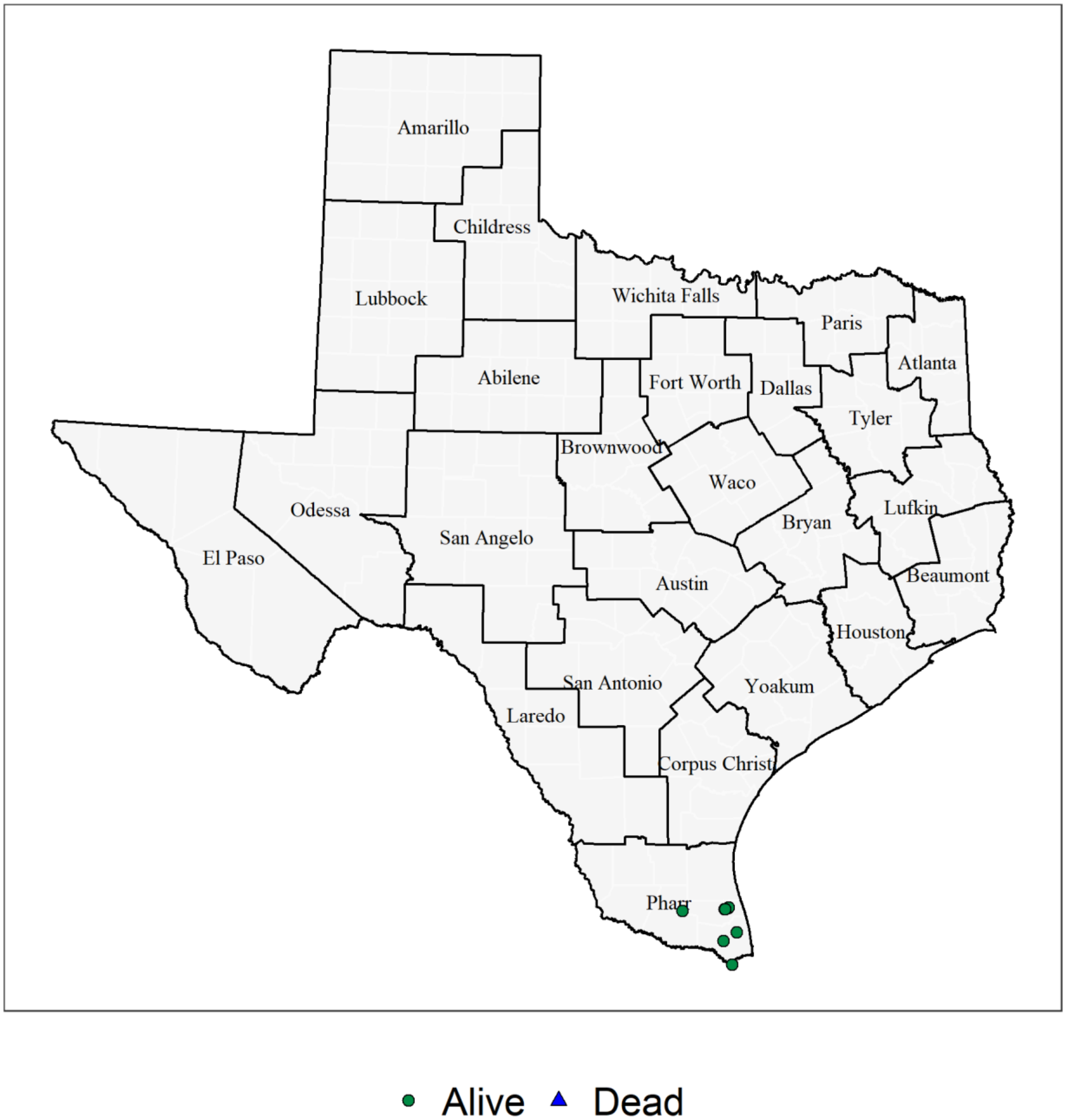
Black-spotted Newt



• Near-Road Points △ Off-Road Points

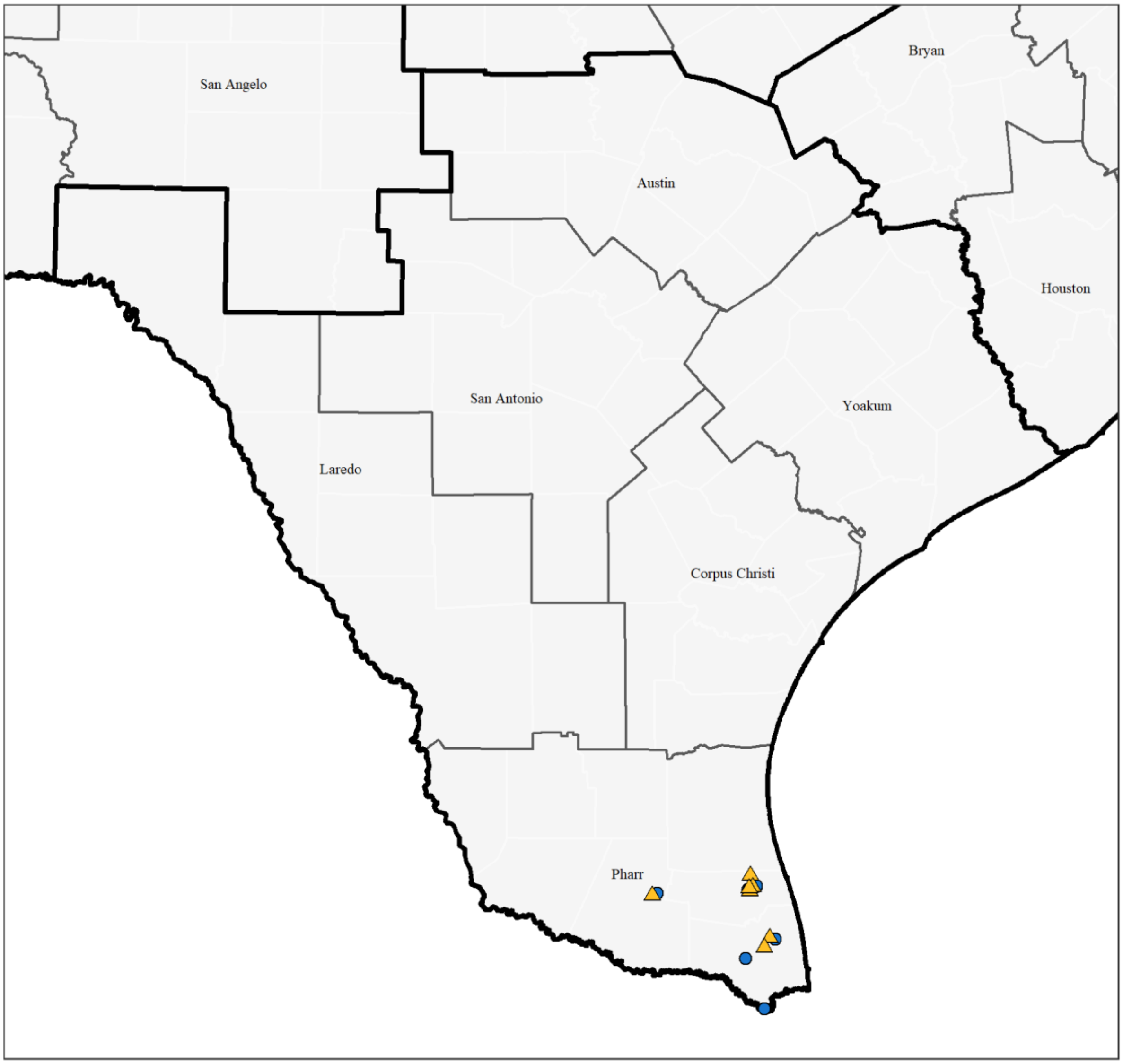
Notophthalmus meridionalis

Black-spotted Newt



Notophthalmus meridionalis

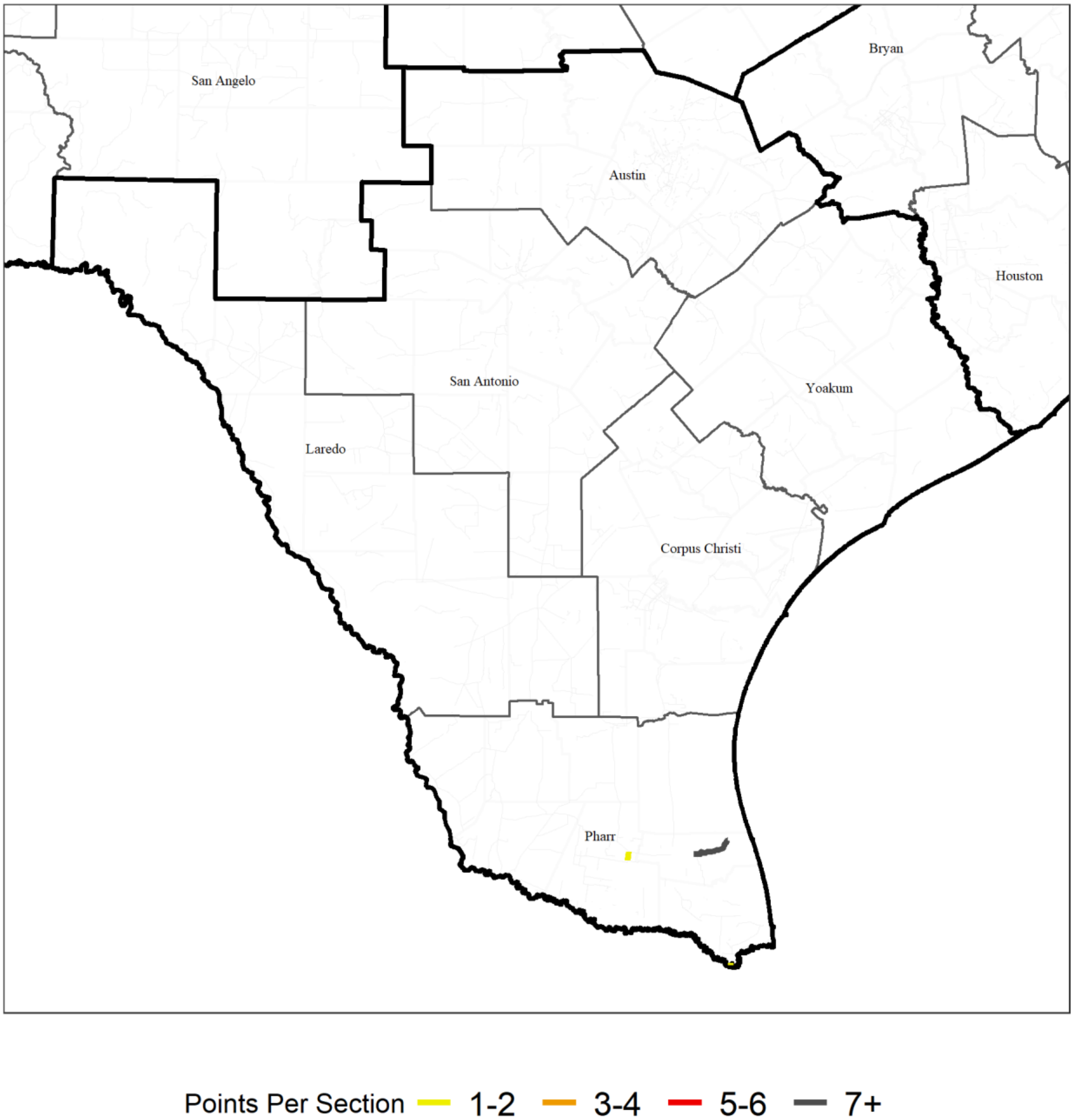
Black-spotted Newt



• Near-Road Points ▲ Off-Road Points

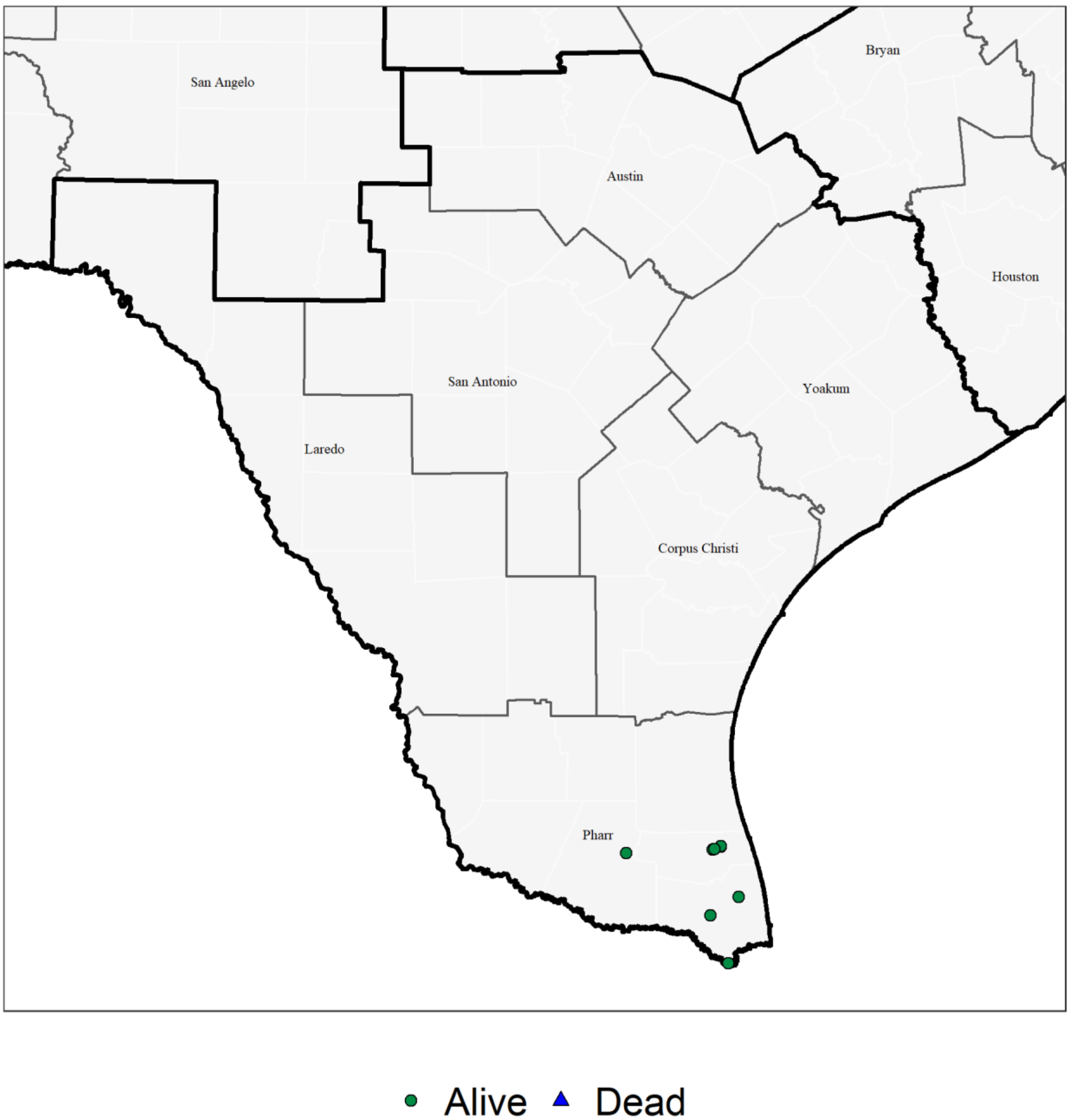
Notophthalmus meridionalis

Black-spotted Newt



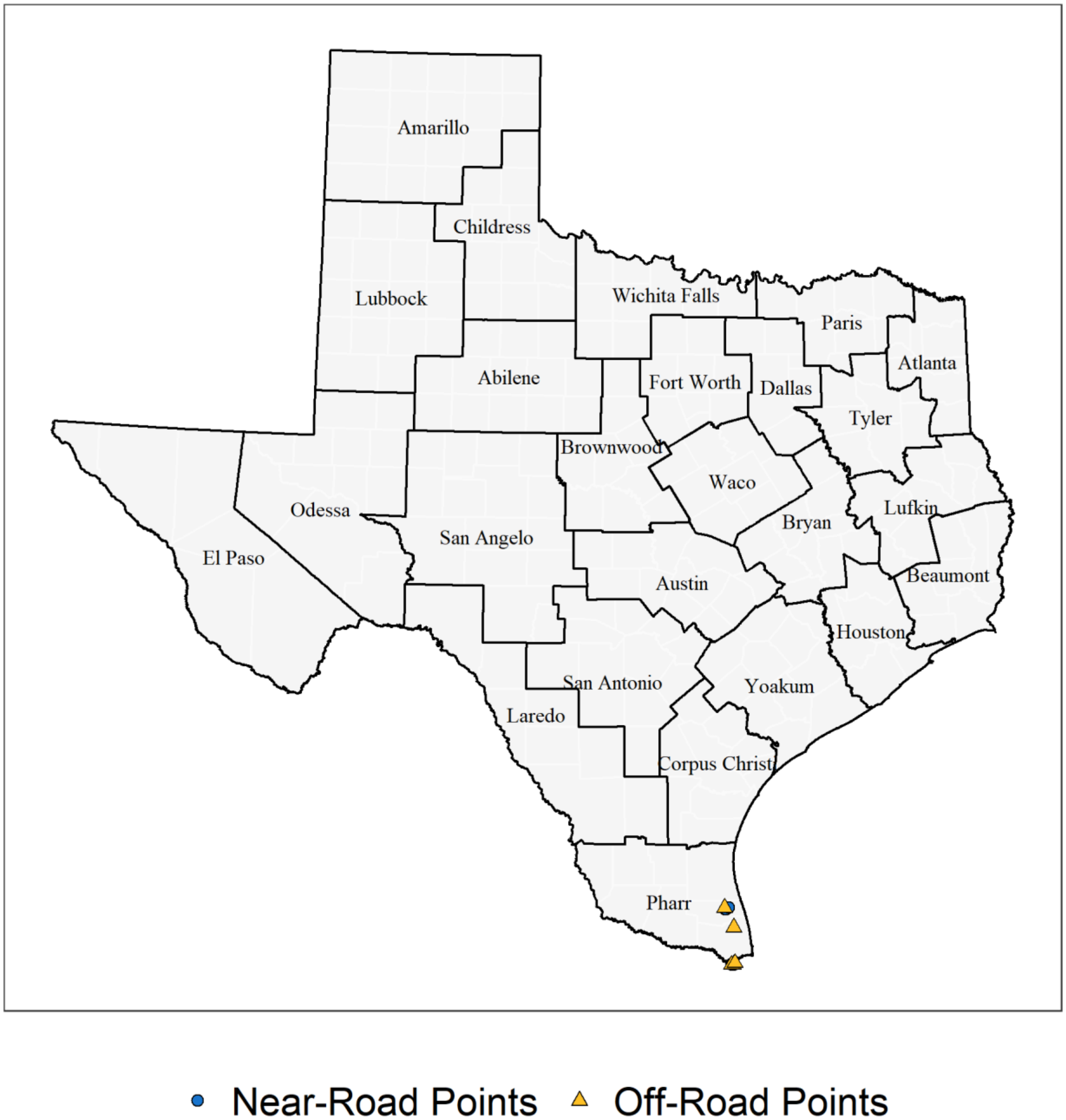
Notophthalmus meridionalis

Black-spotted Newt



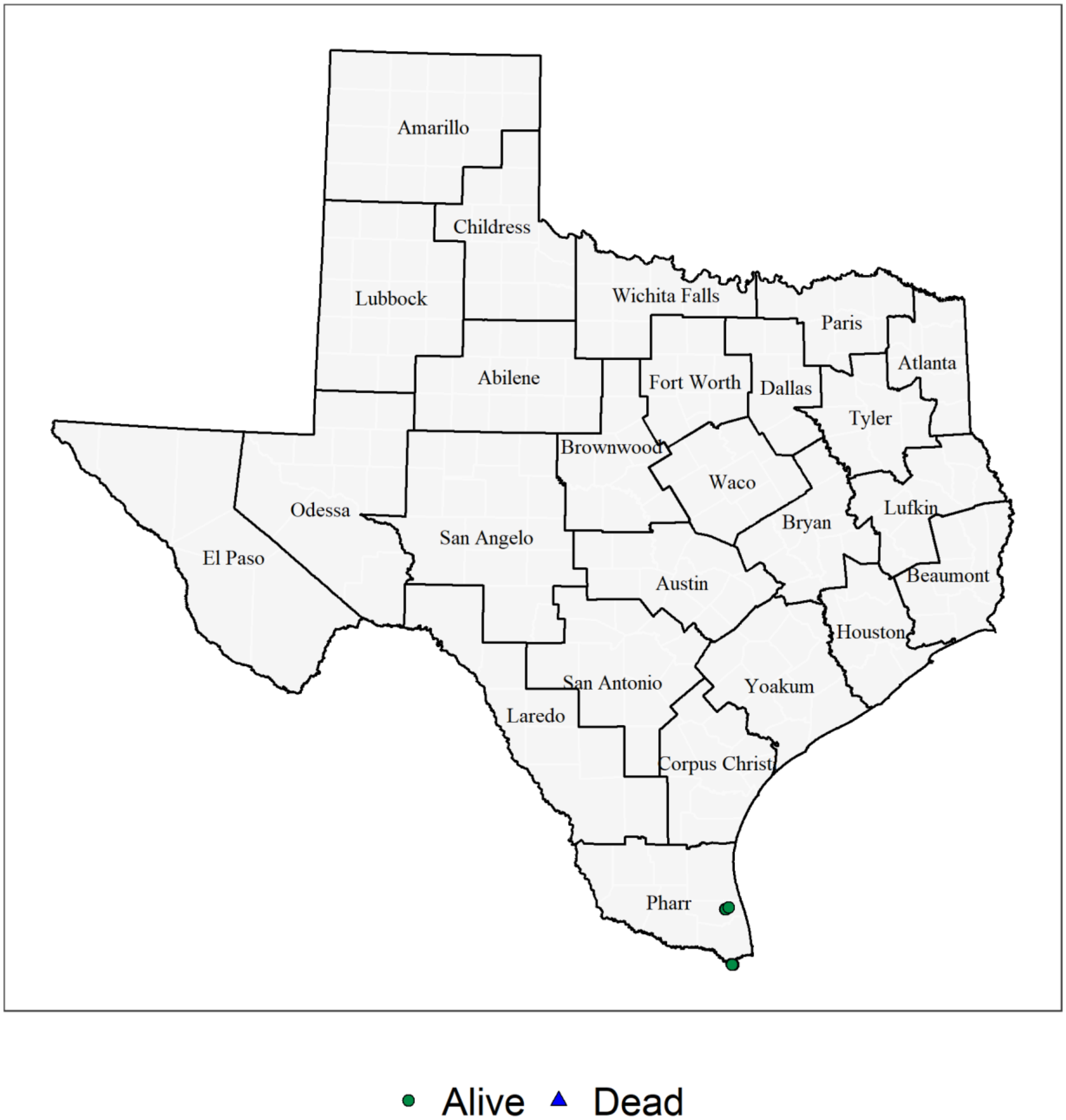
Siren intermedia

Lesser Siren



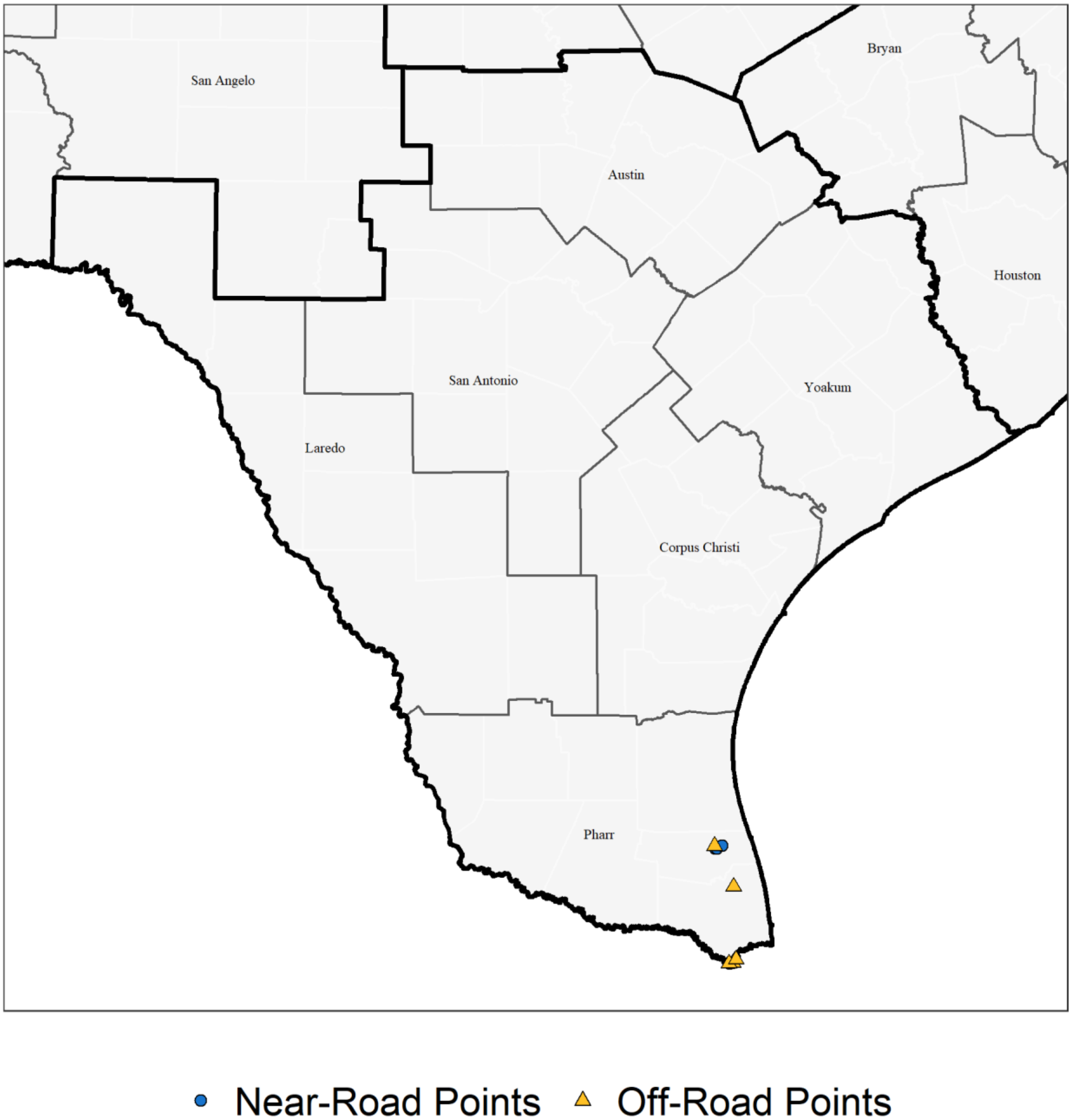
Siren intermedia

Lesser Siren



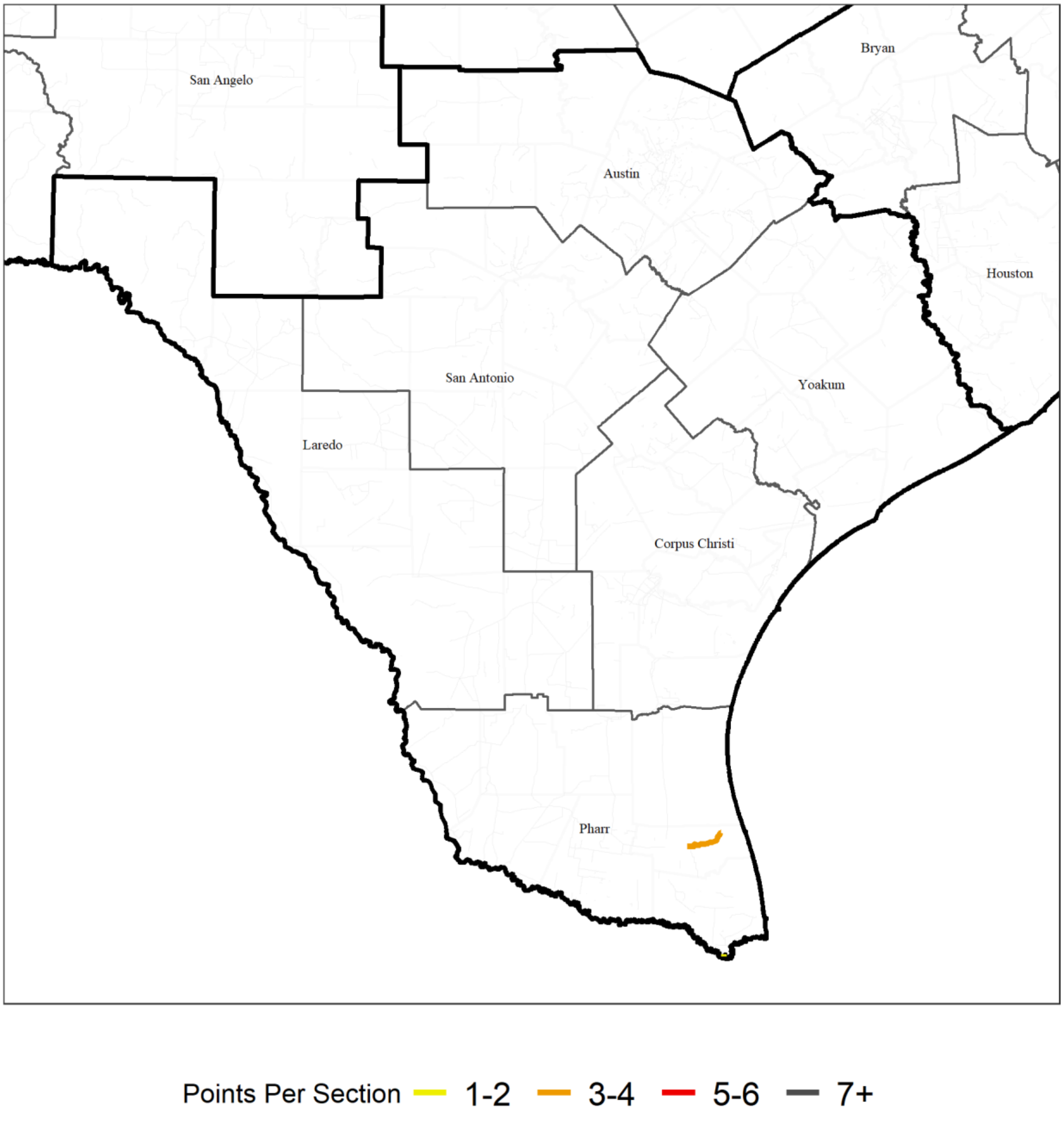
Siren intermedia

Lesser Siren



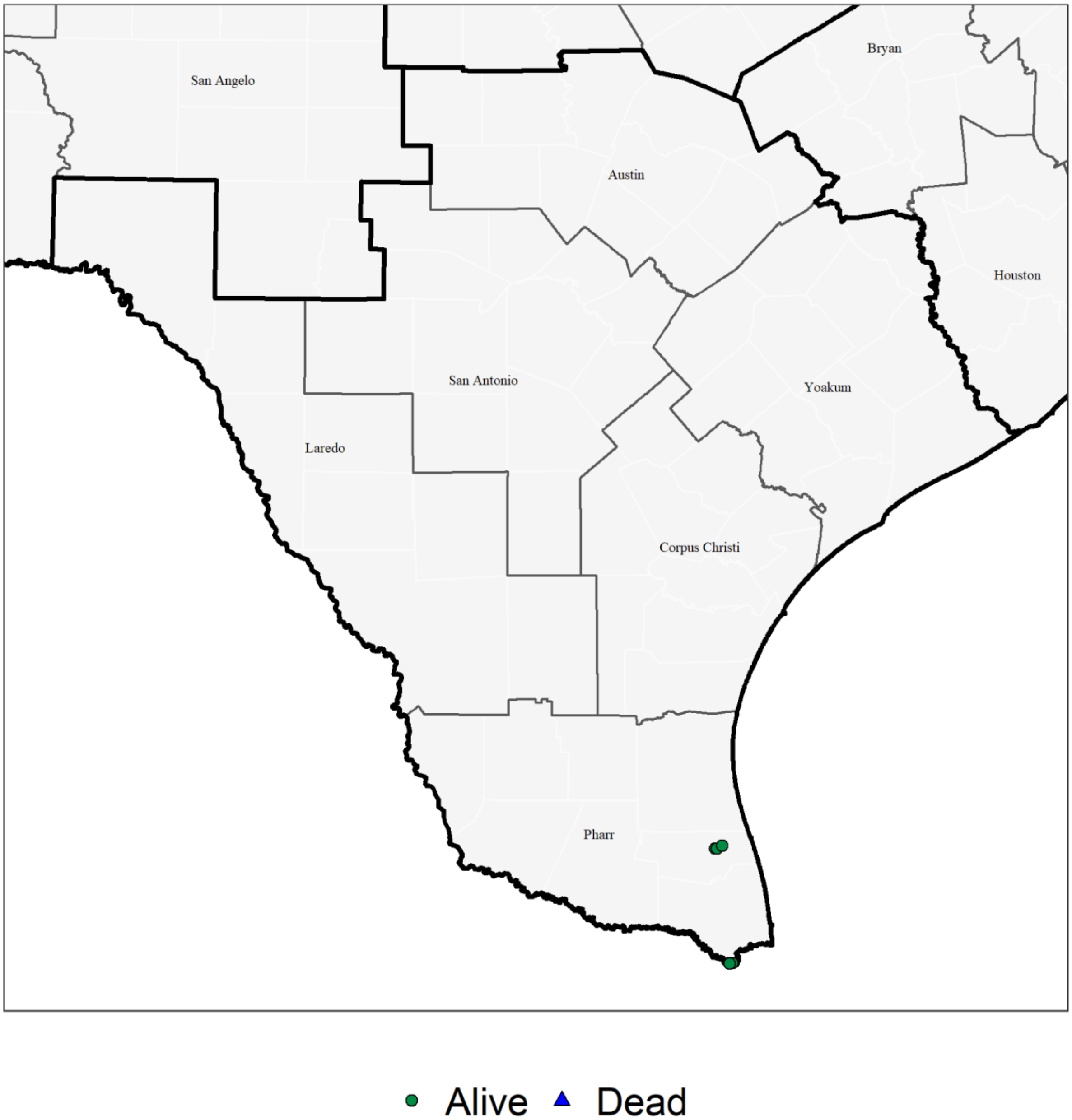
Siren intermedia

Lesser Siren

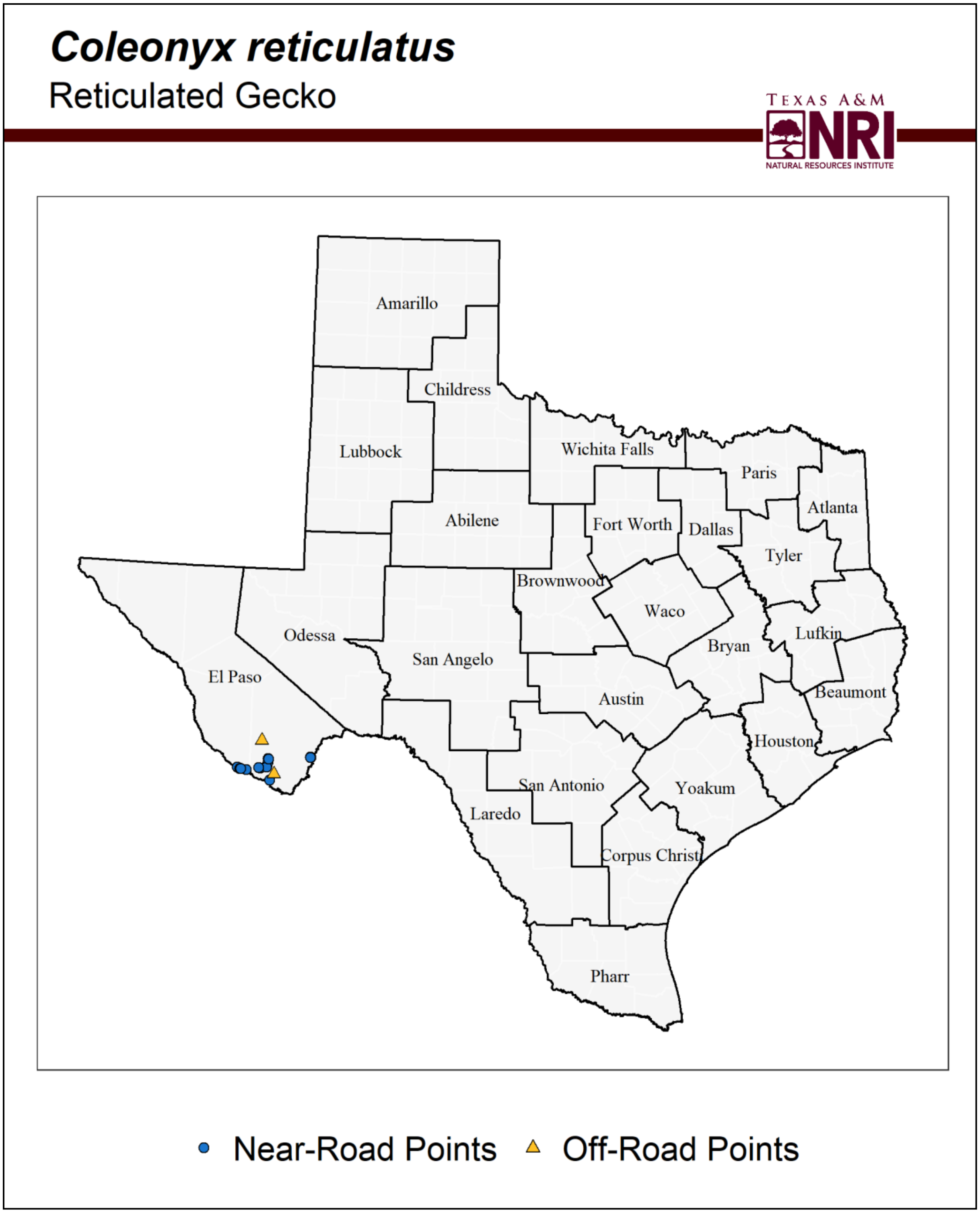


Siren intermedia

Lesser Siren



A3. Reptiles – Lizards



Coleonyx reticulatus
Reticulated Gecko

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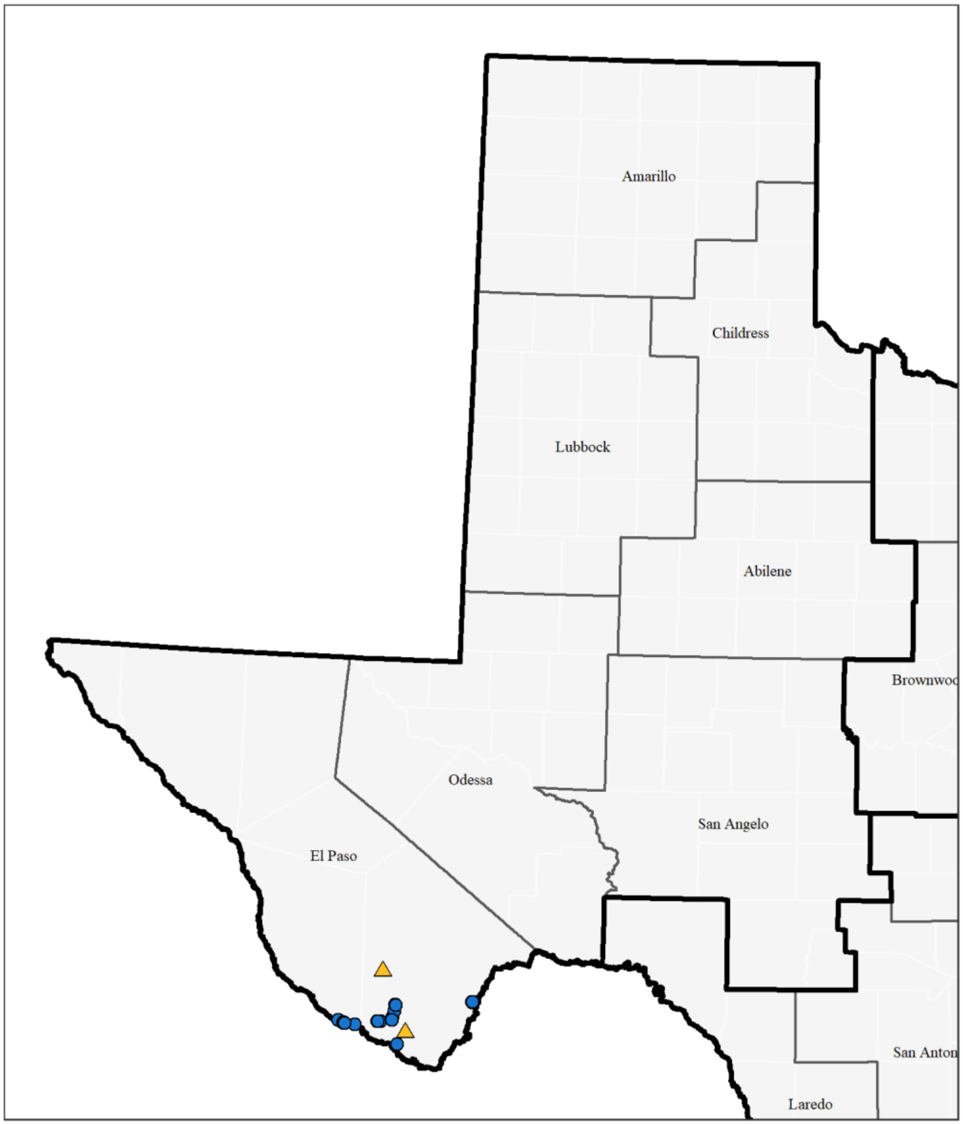
Coleonyx reticulatus

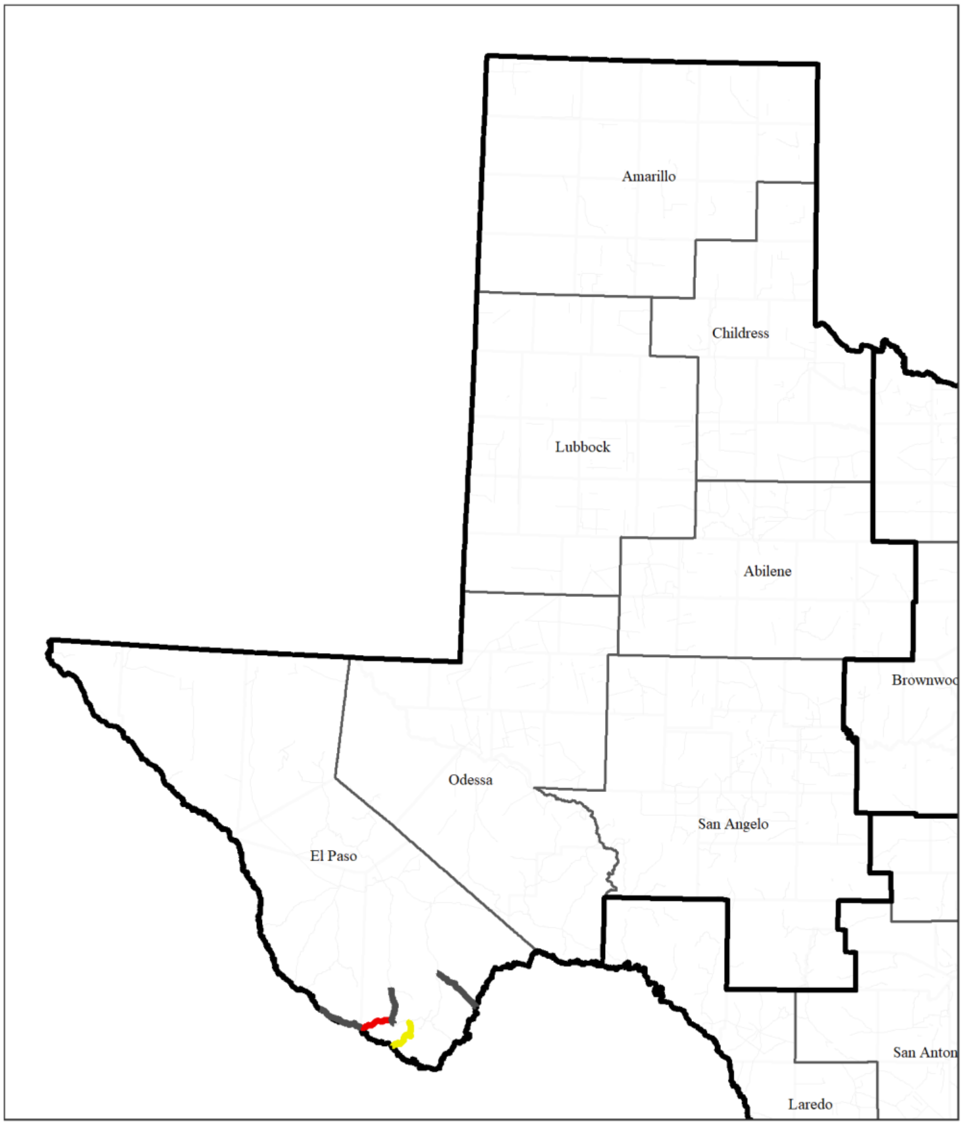
Reticulated Gecko



• Near-Road Points △ Off-Road Points

Coleonyx reticulatus

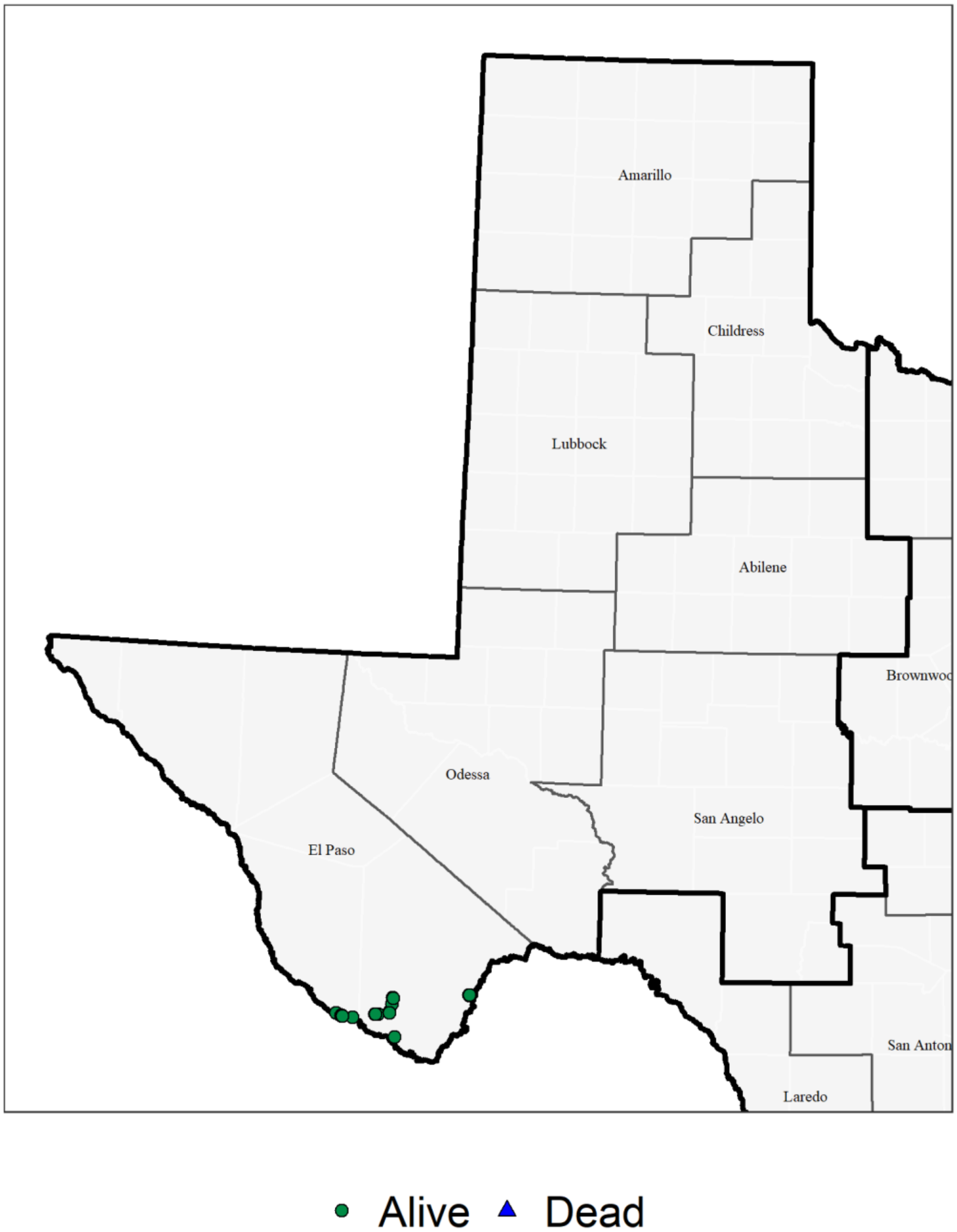
Reticulated Gecko



Points Per Section 1-2 3-4 5-6 7+

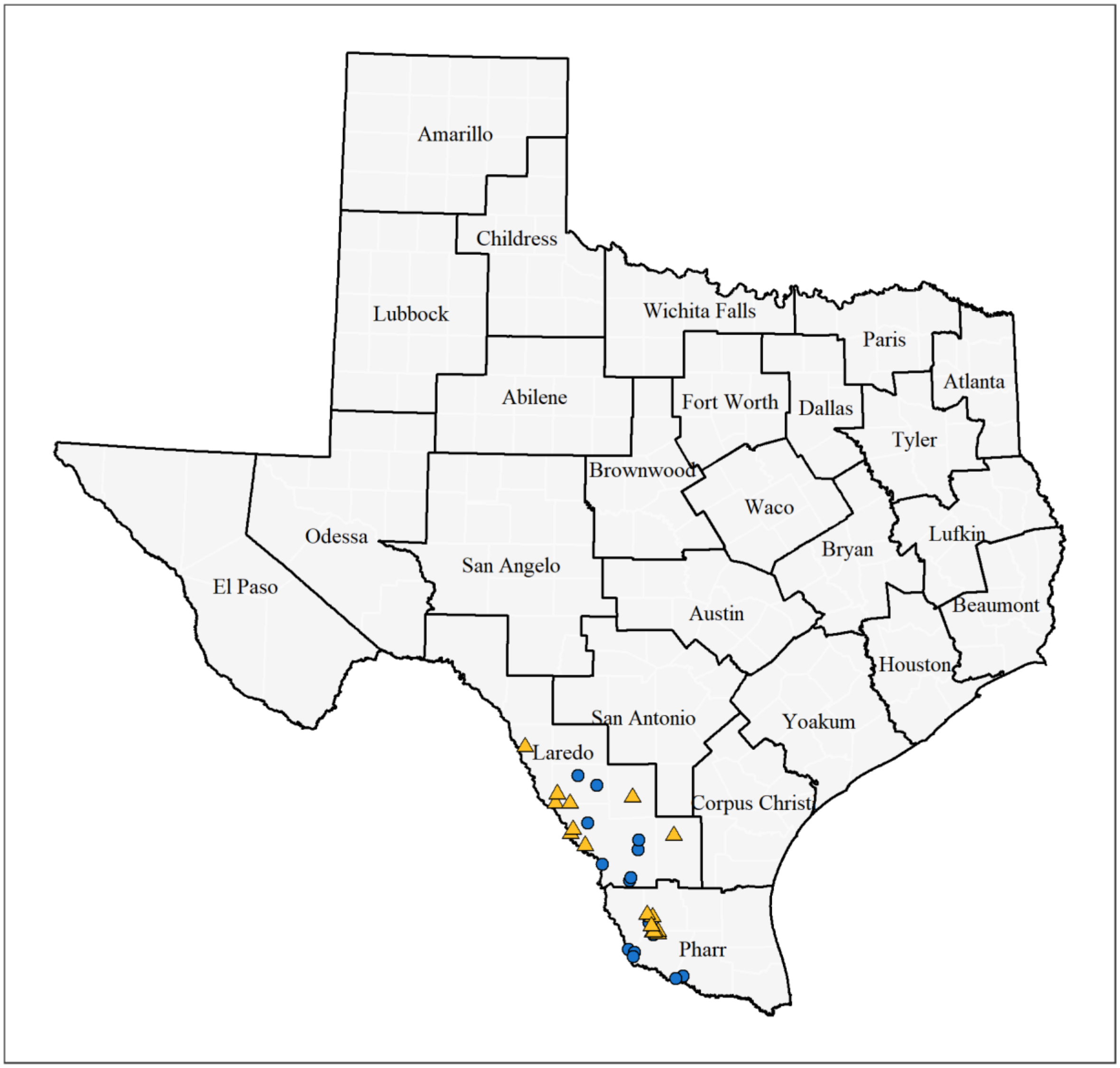
Coleonyx reticulatus

Reticulated Gecko



Crotaphytus reticulatus

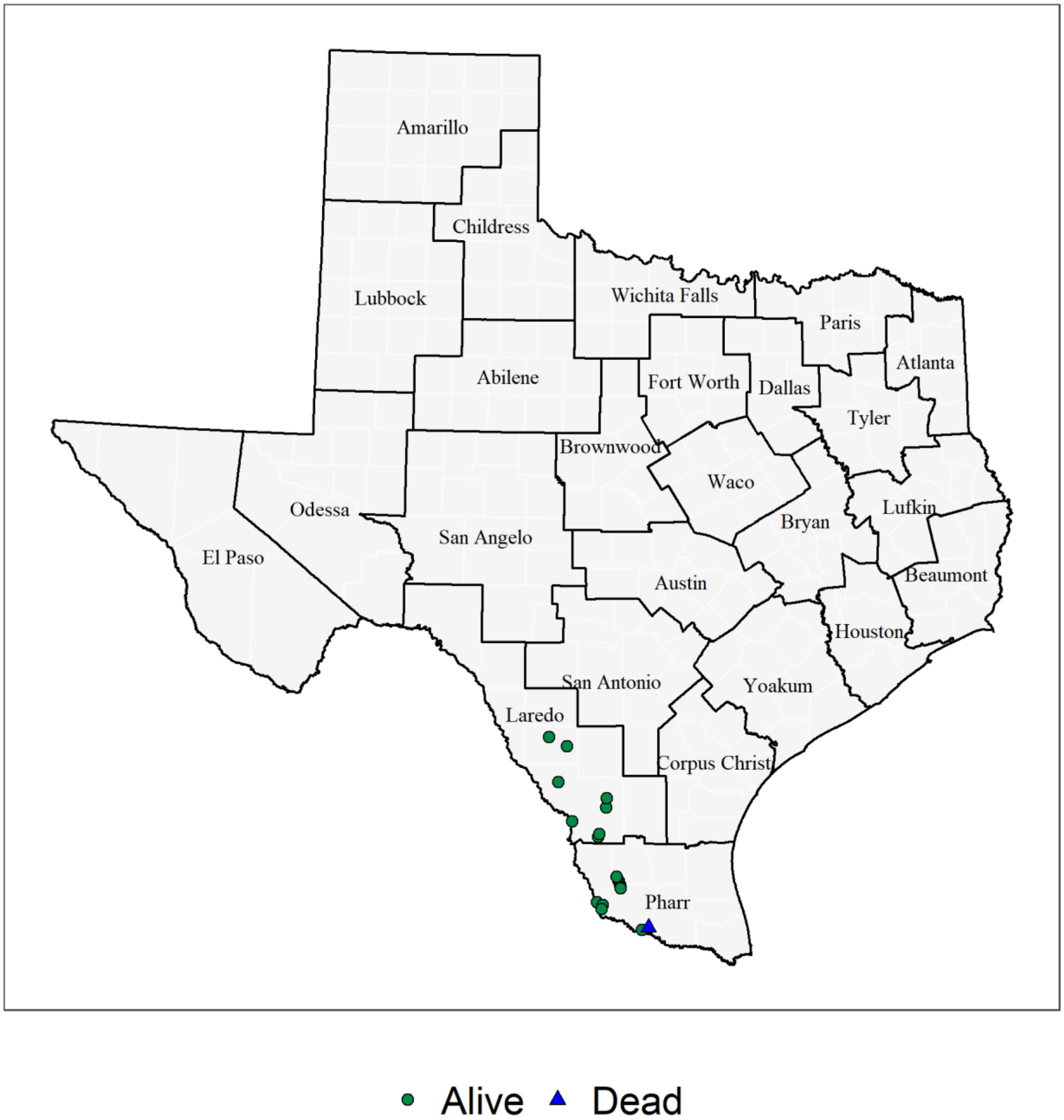
Reticulate Collared Lizard



Near-Road Points   Off-Road Points

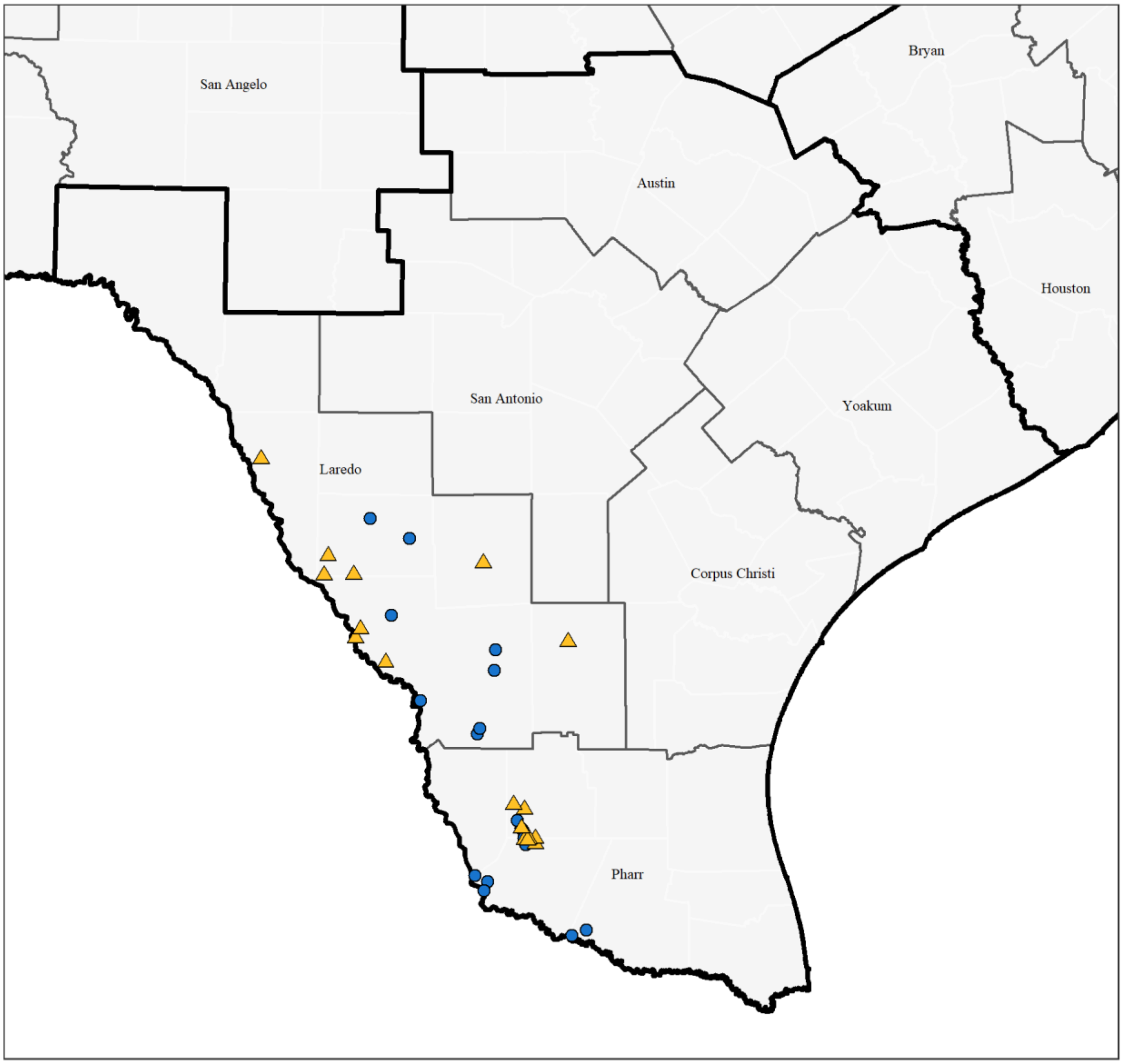
Crotaphytus reticulatus

Reticulate Collared Lizard



Crotaphytus reticulatus

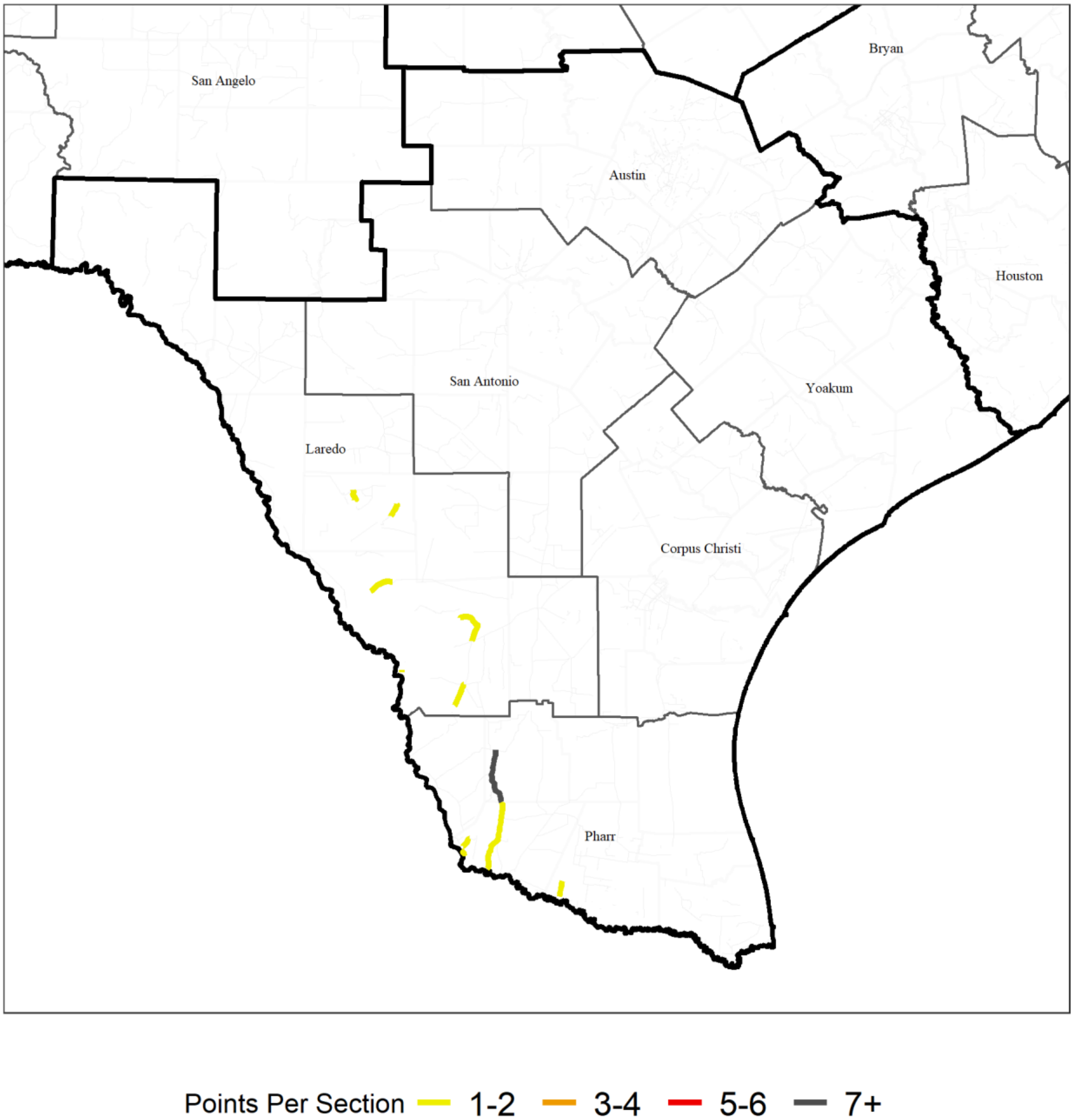
Reticulate Collared Lizard



• Near-Road Points △ Off-Road Points

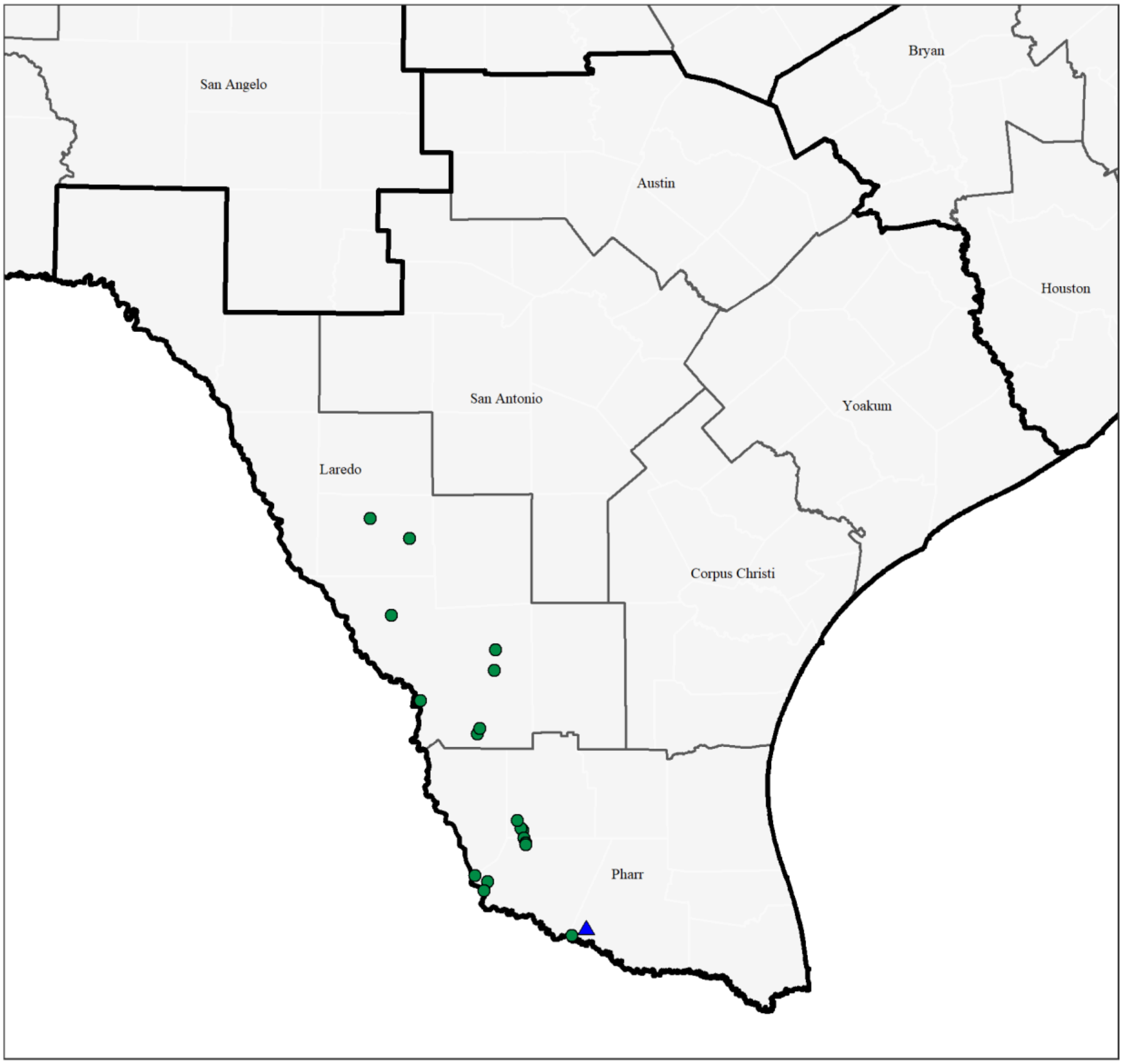
Crotaphytus reticulatus

Reticulate Collared Lizard



Crotaphytus reticulatus

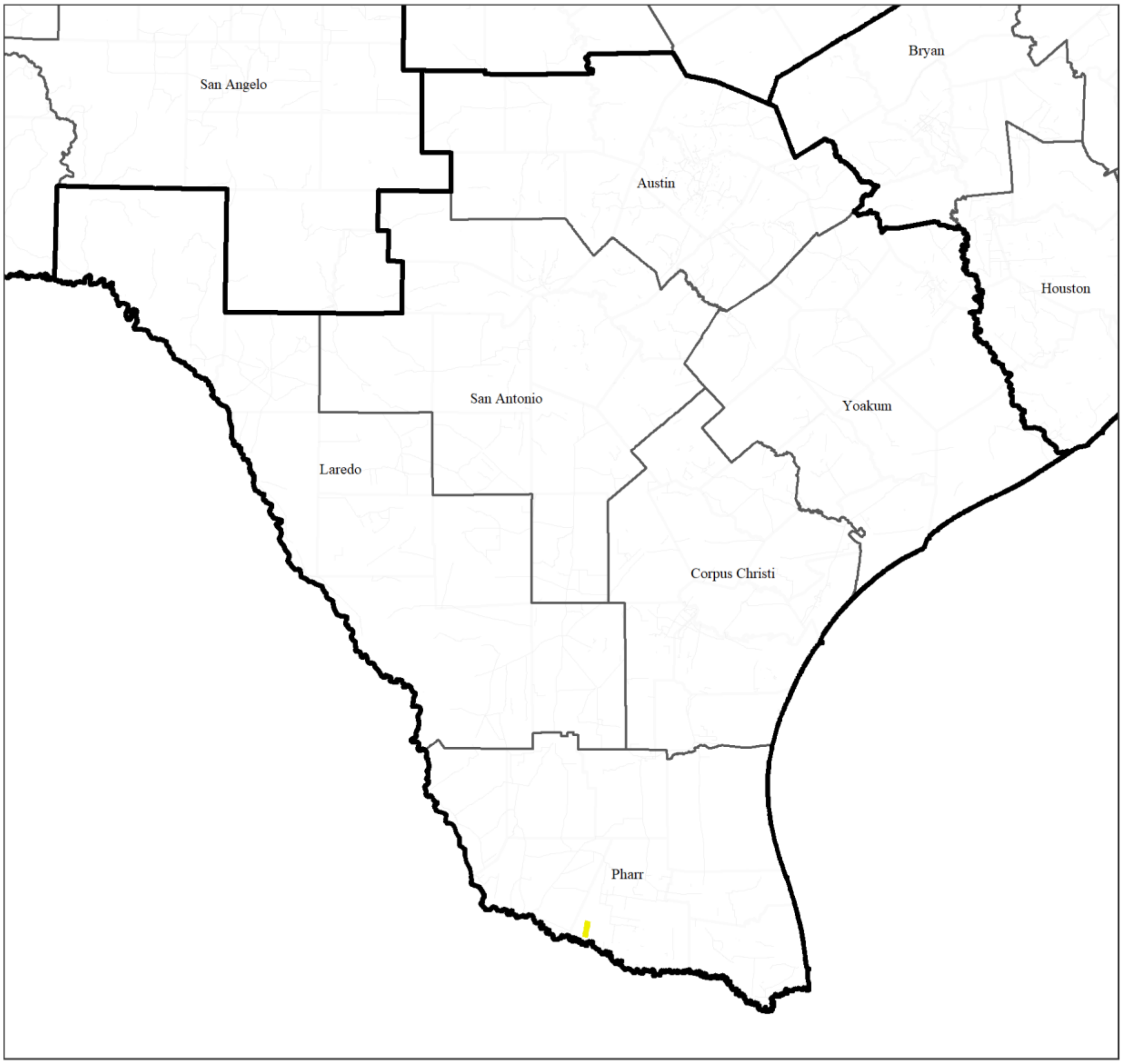
Reticulate Collared Lizard



● Alive ▲ Dead

Crotaphytus reticulatus

Reticulate Collared Lizard

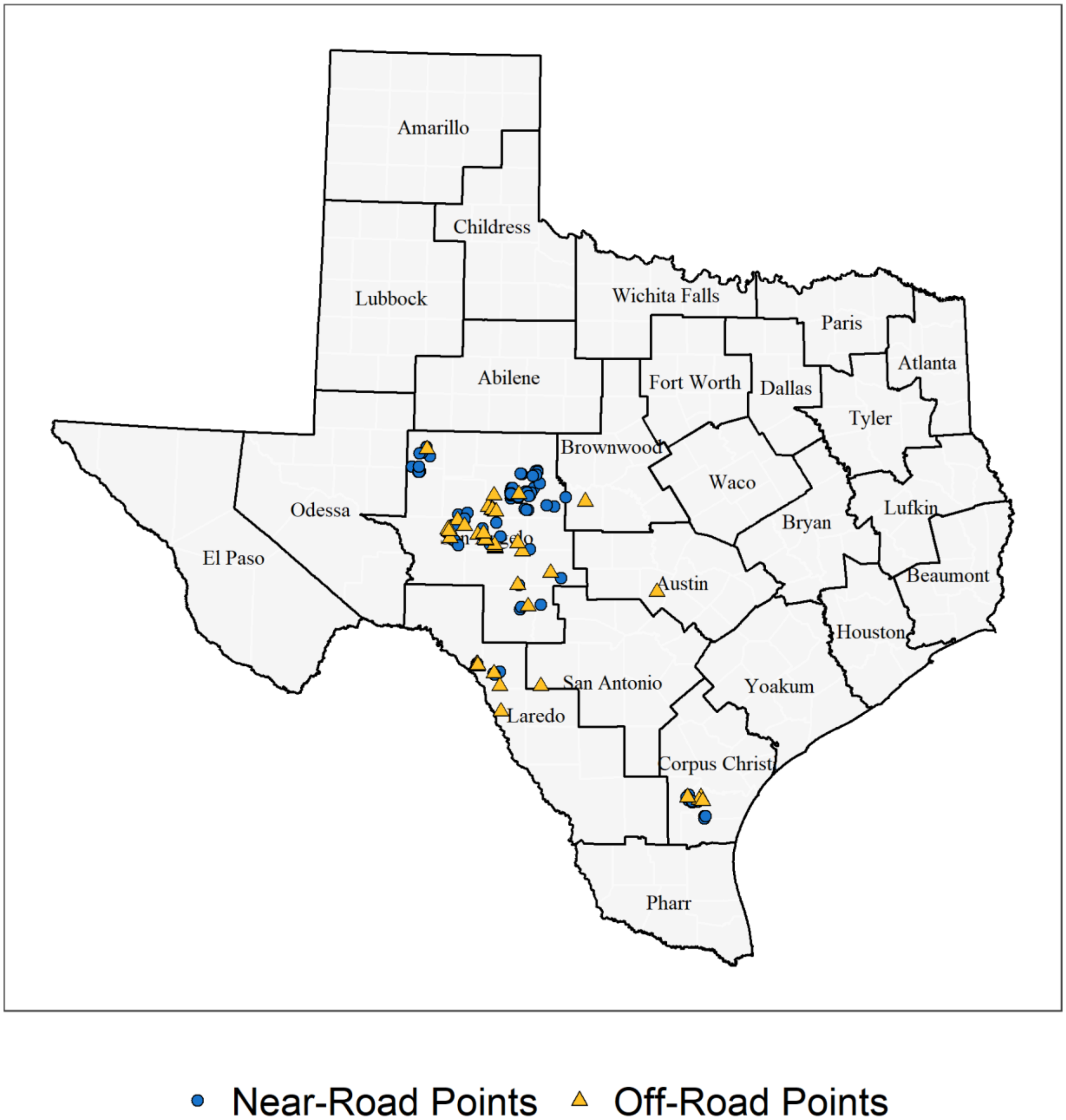


Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Holbrookia lacerata

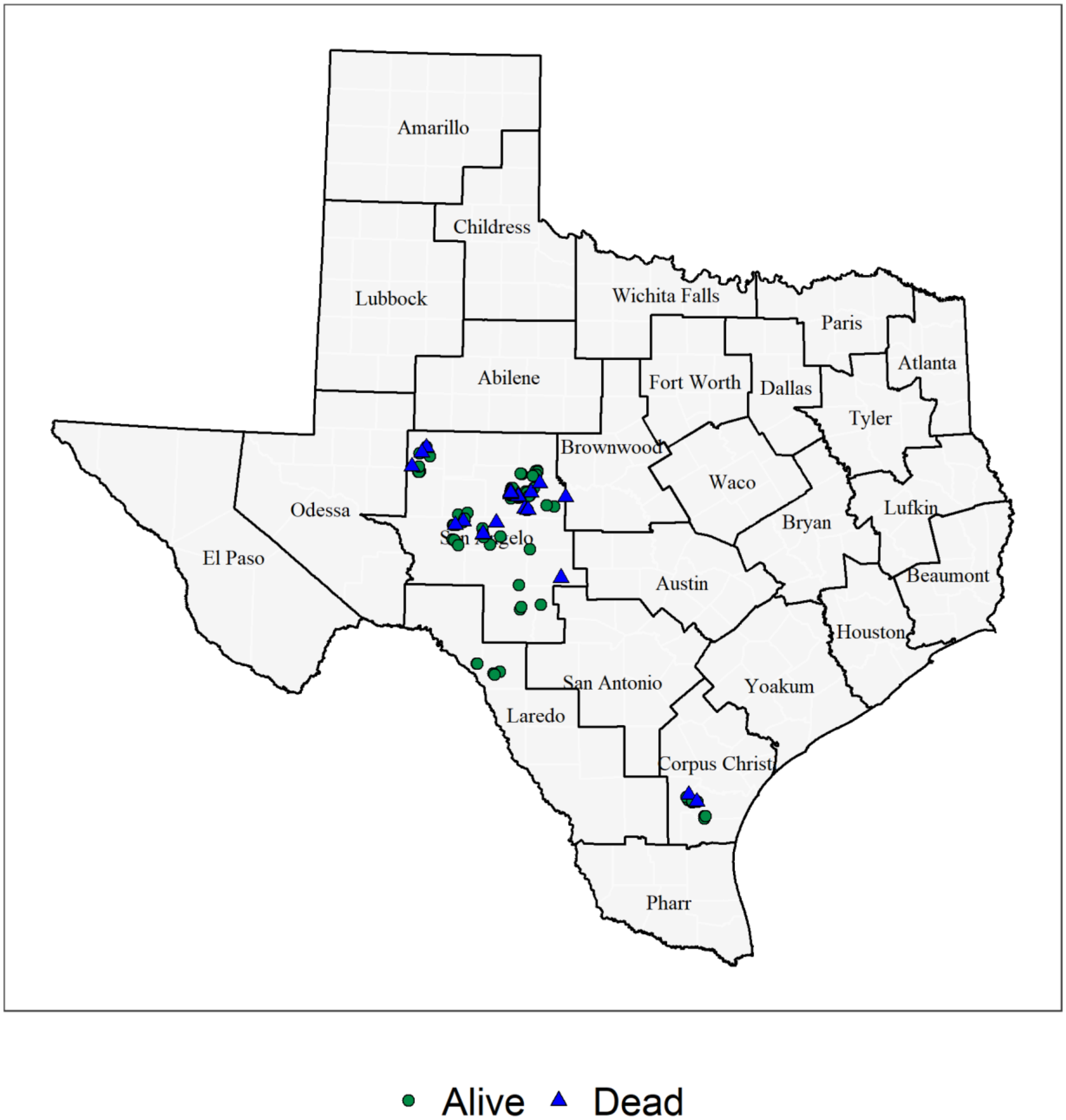
Spot-tailed Earless Lizard

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



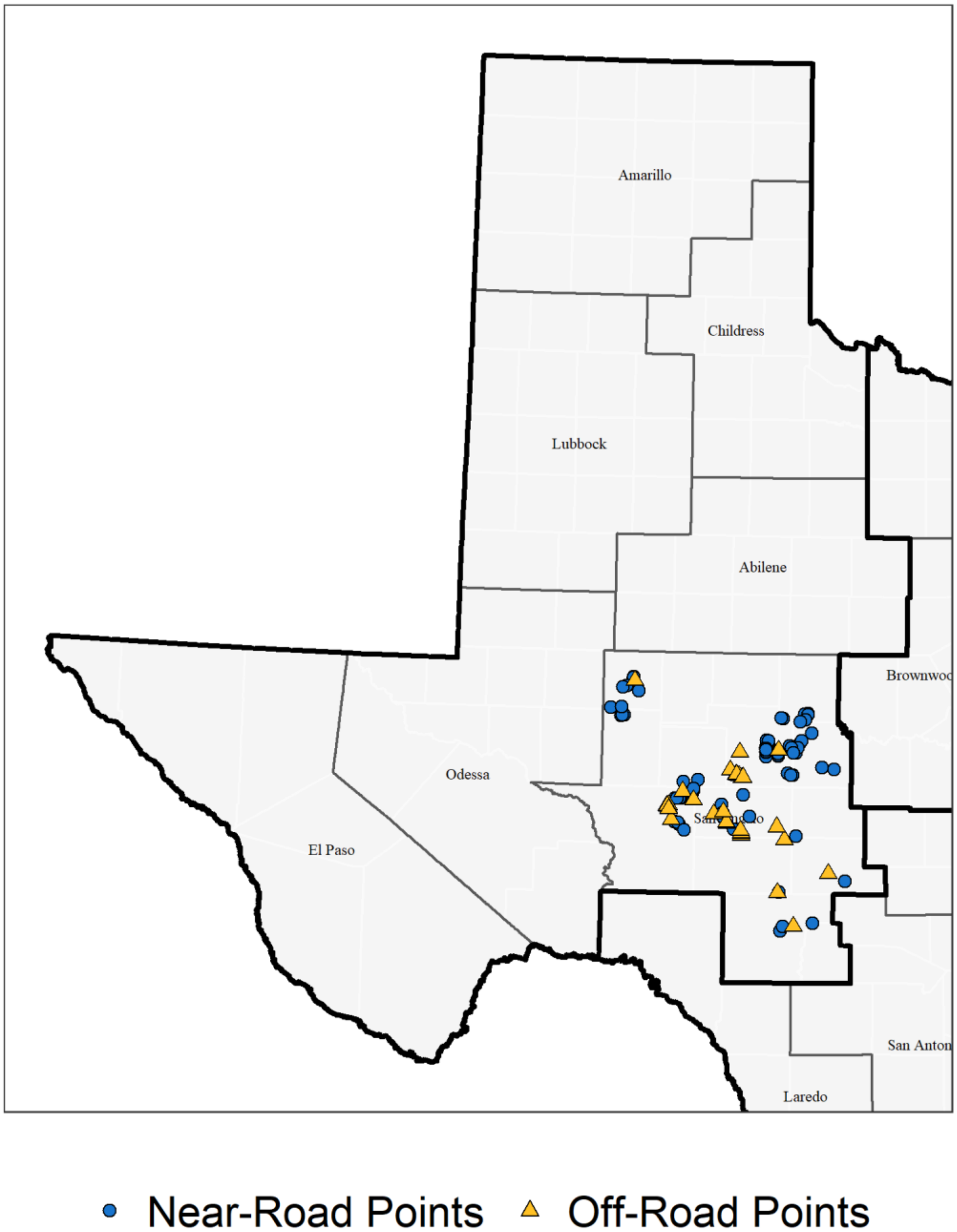
Holbrookia lacerata

Spot-tailed Earless Lizard



Holbrookia lacerata

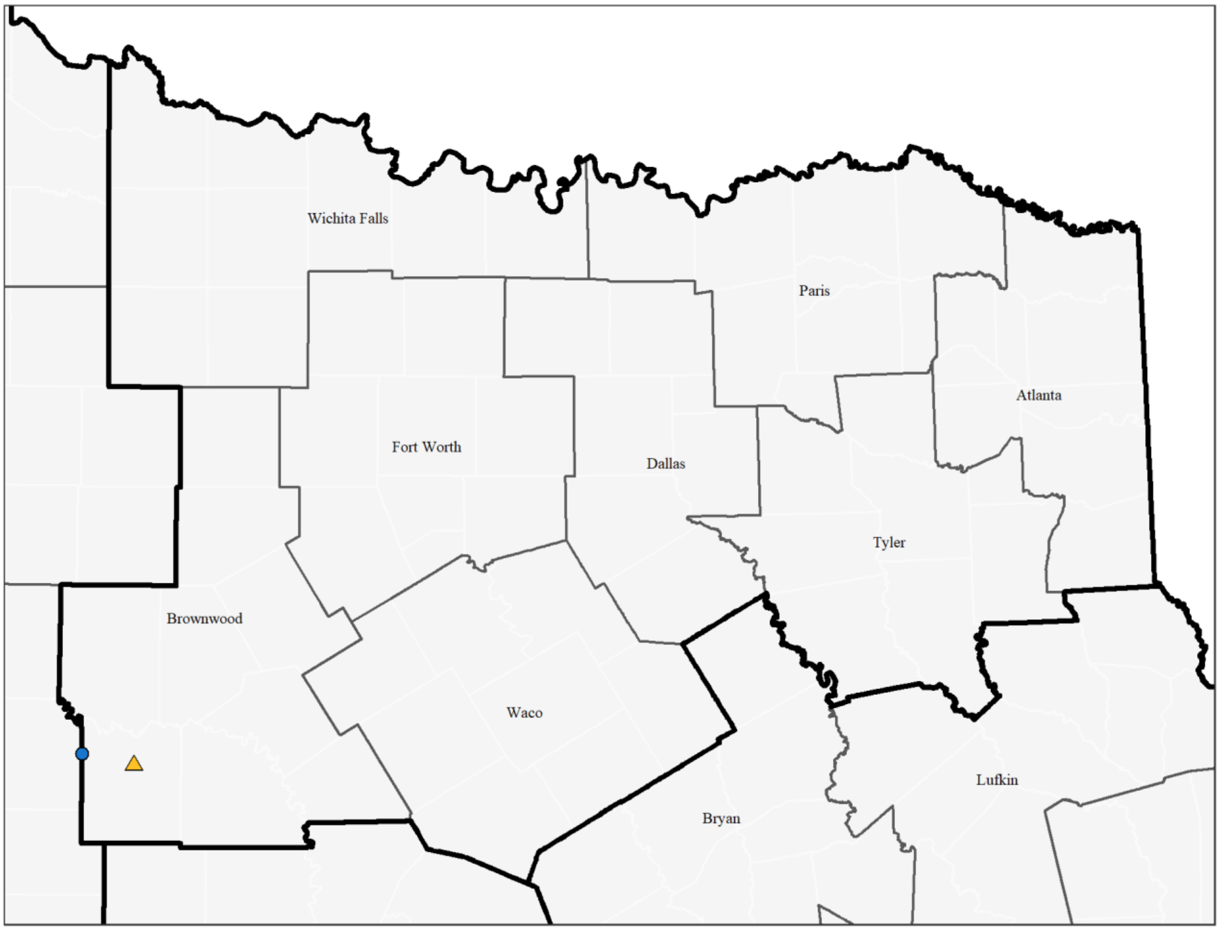
Spot-tailed Earless Lizard



Holbrookia lacerata

Spot-tailed Earless Lizard

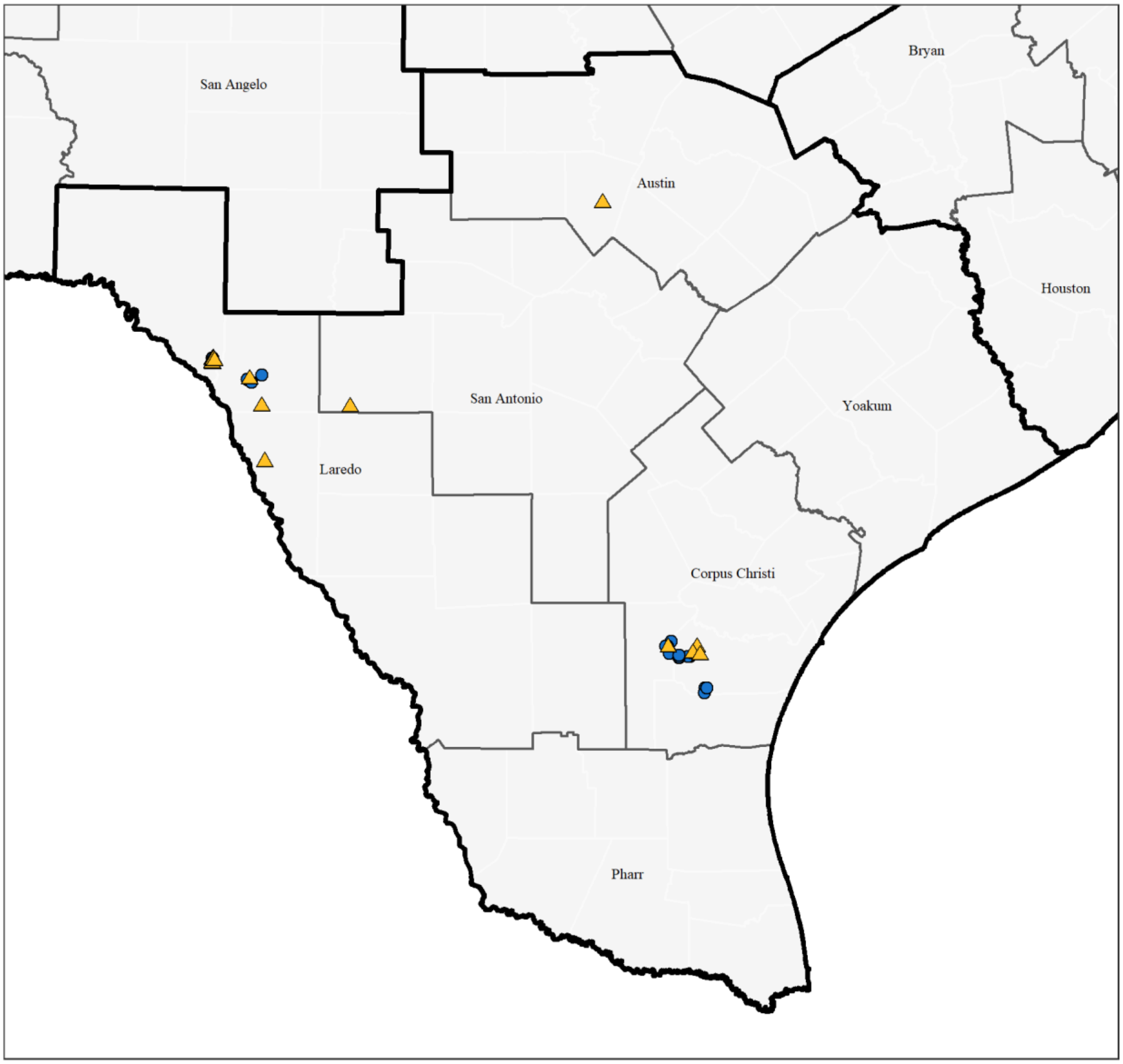
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Near-Road Points   Off-Road Points

Holbrookia lacerata

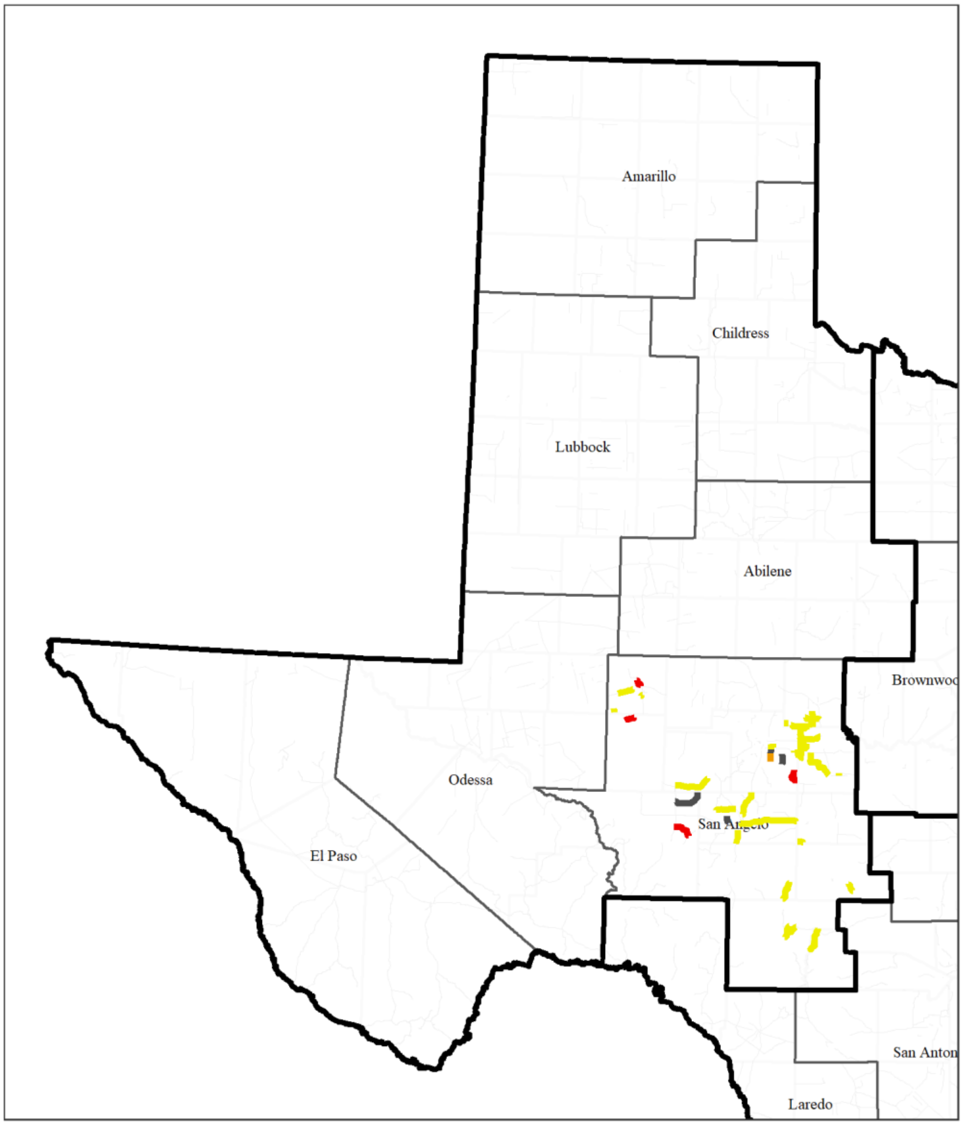
Spot-tailed Earless Lizard



● Near-Road Points △ Off-Road Points

Holbrookia lacerata

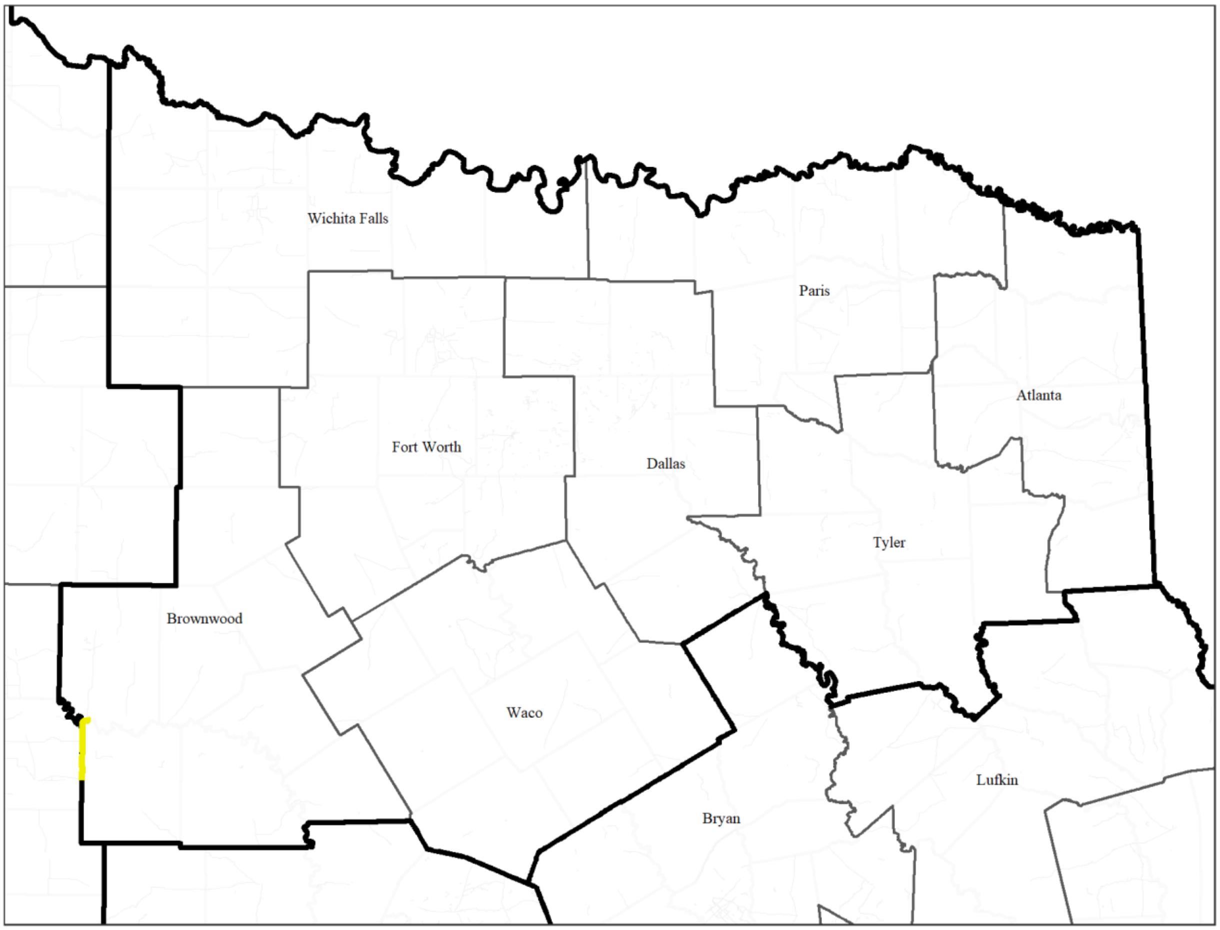
Spot-tailed Earless Lizard



Points Per Section 1-2 3-4 5-6 7+

Holbrookia lacerata

Spot-tailed Earless Lizard

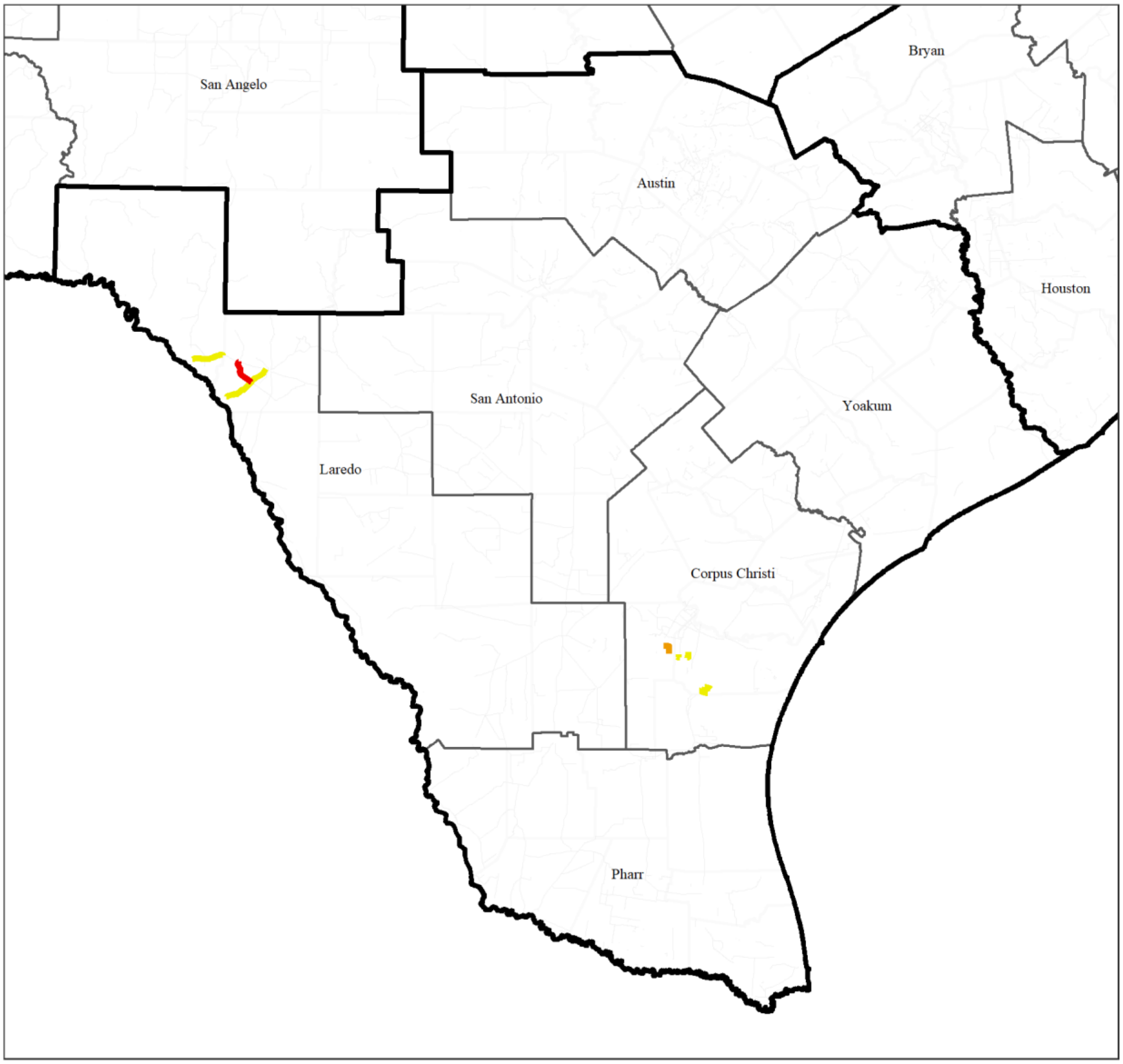


Points Per Section 1-2 3-4 5-6 7+

Holbrookia lacerata

Spot-tailed Earless Lizard

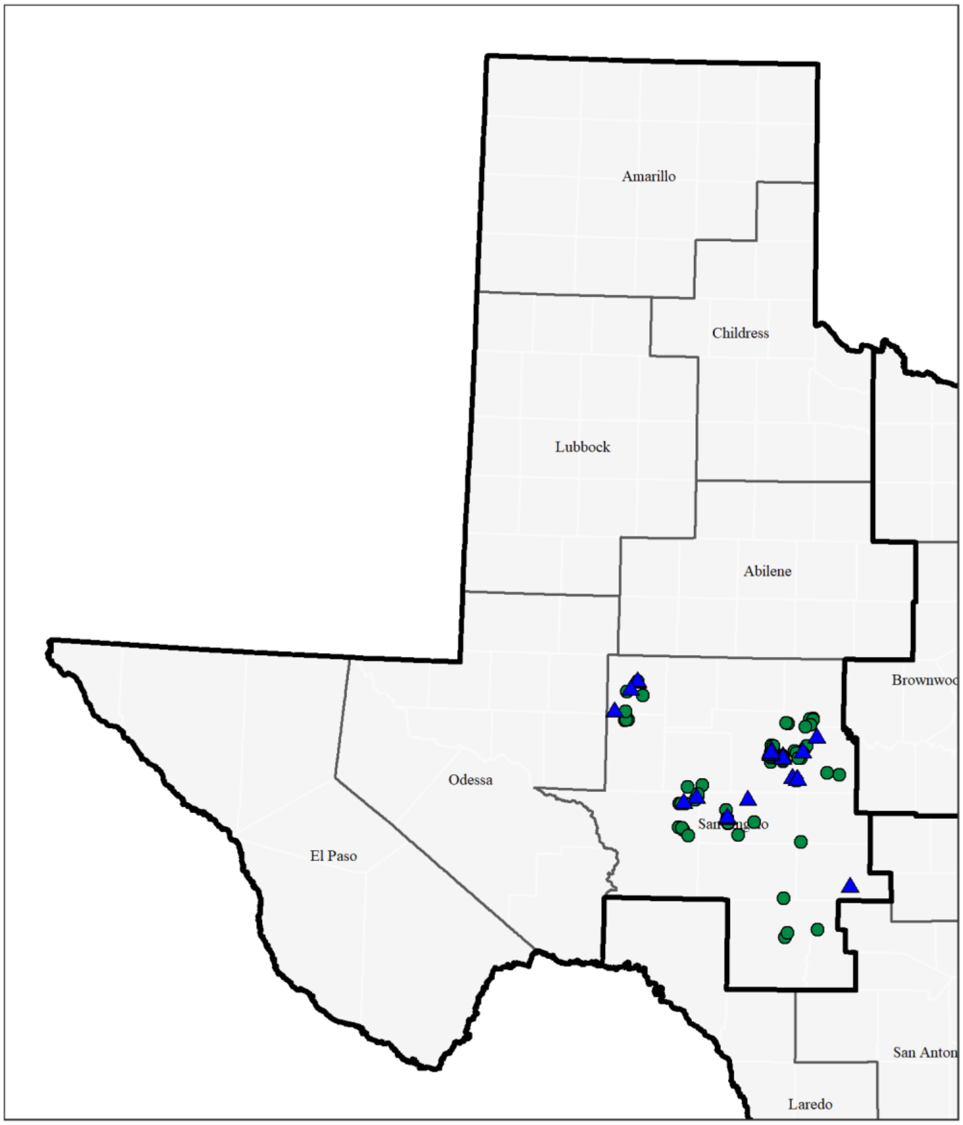
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section 1-2 3-4 5-6 7+

Holbrookia lacerata

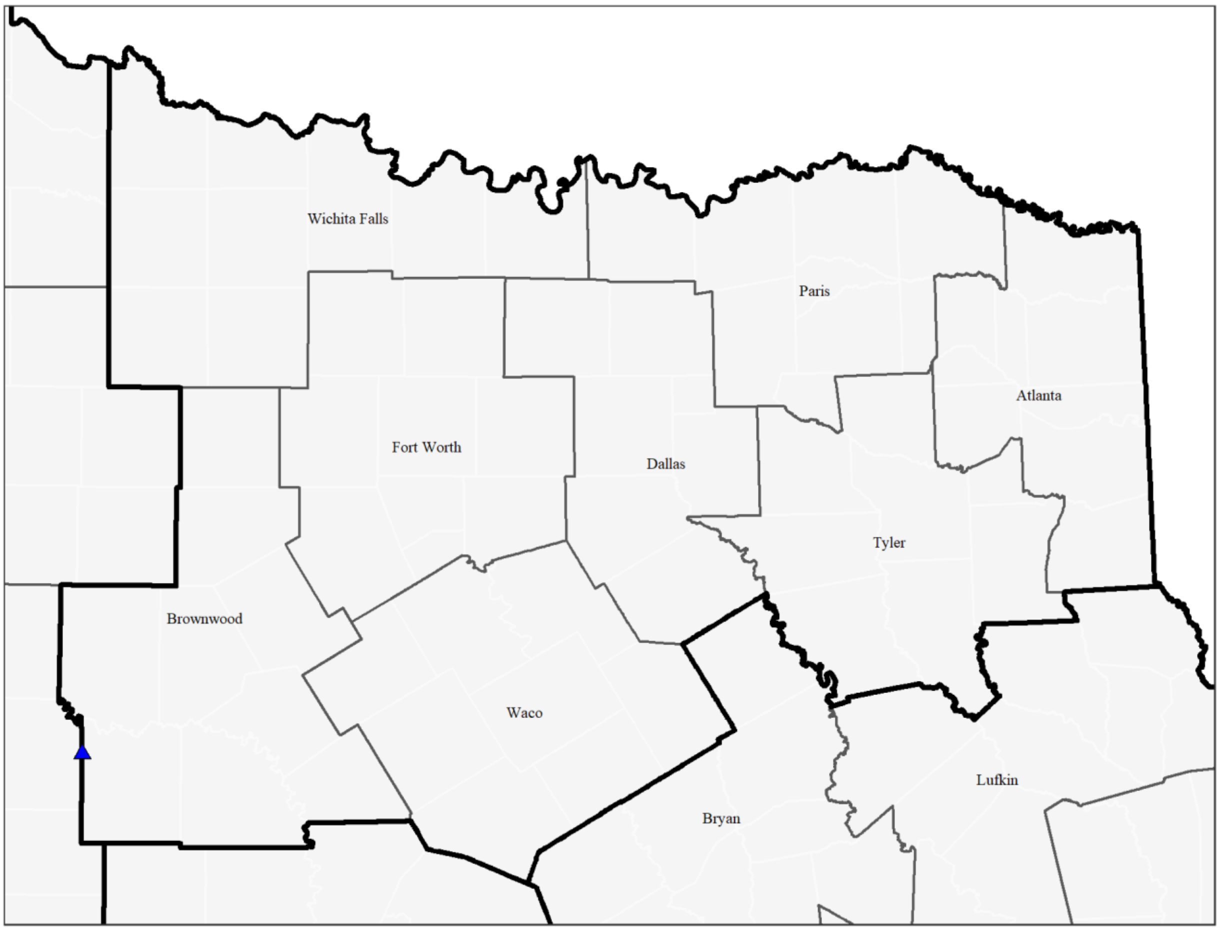
Spot-tailed Earless Lizard



● Alive ▲ Dead

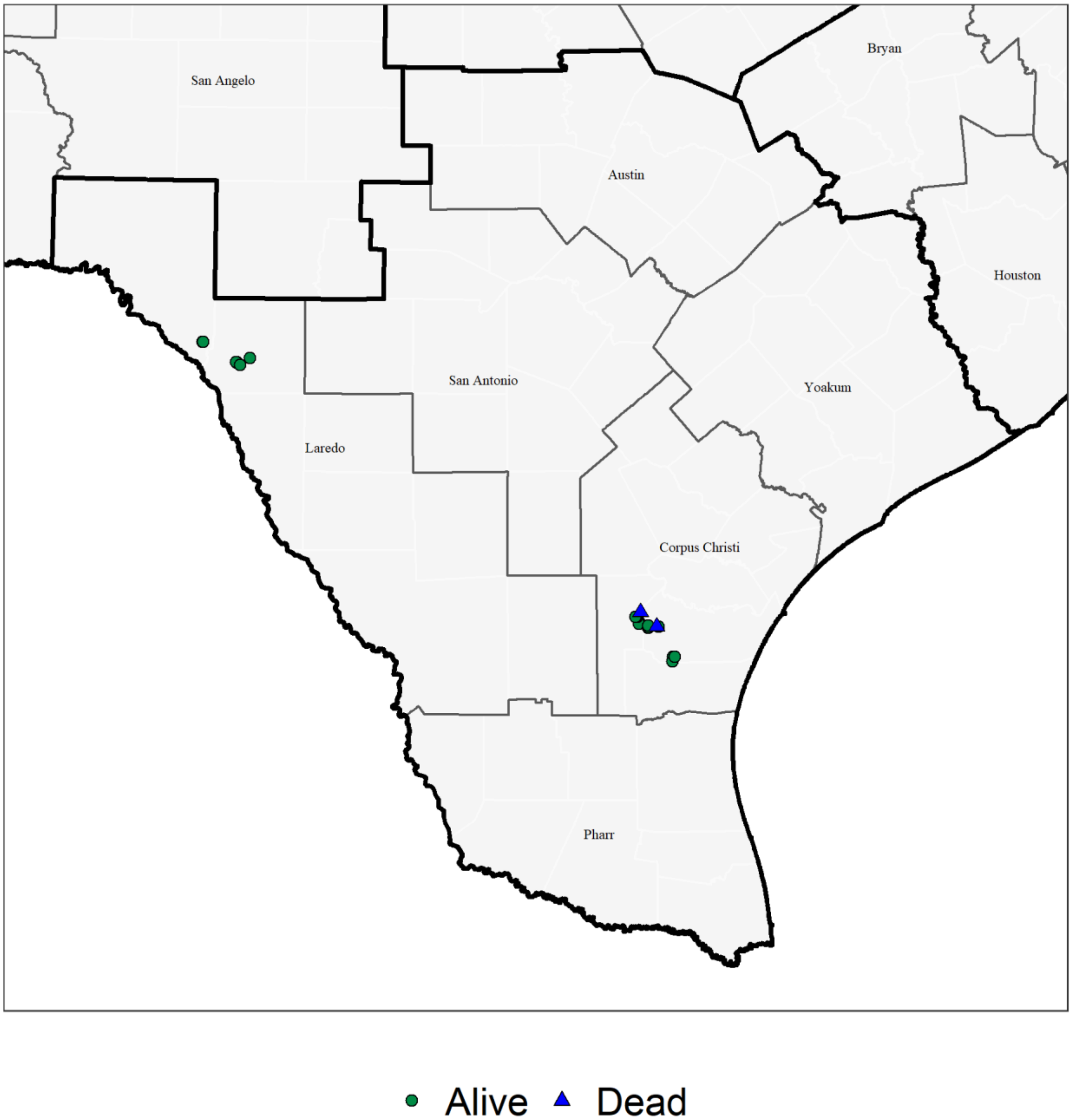
Holbrookia lacerata

Spot-tailed Earless Lizard



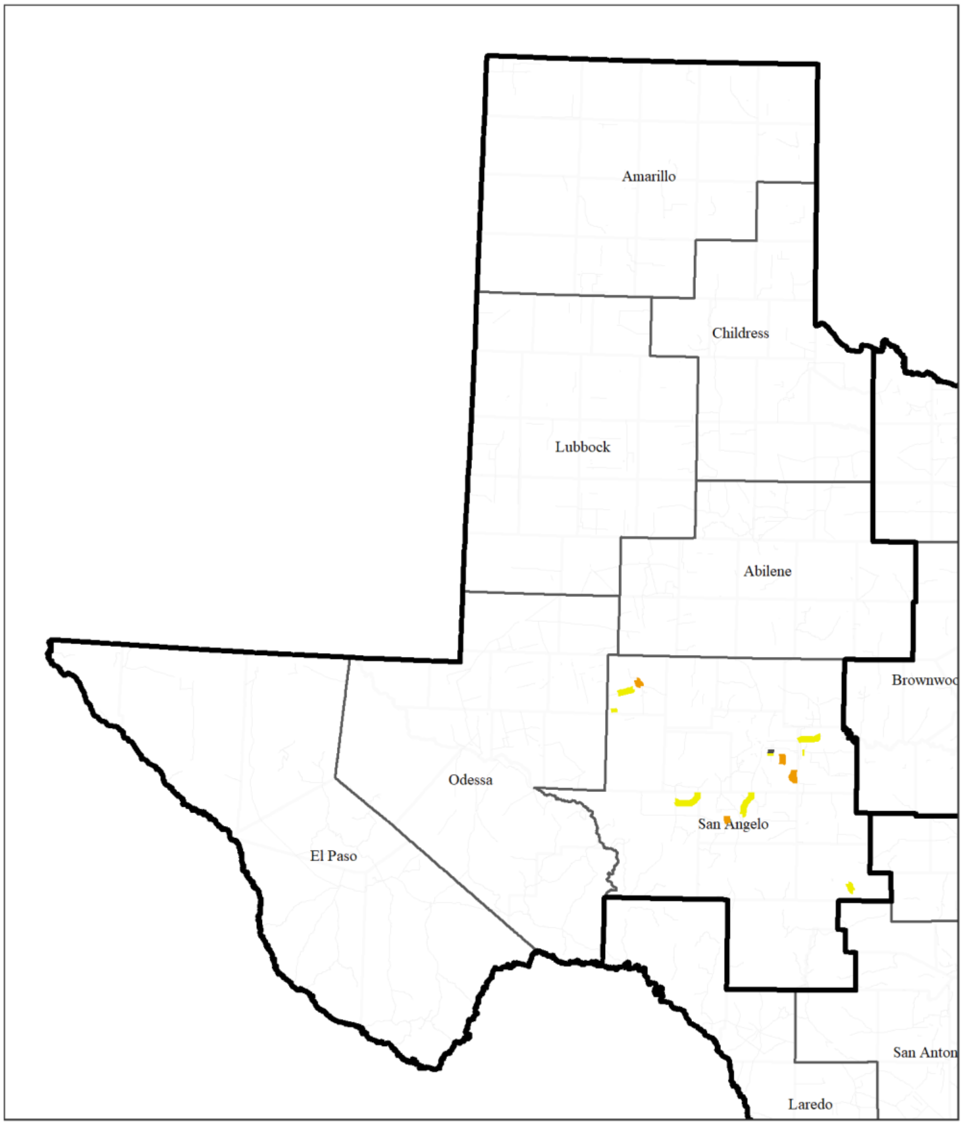
● Alive ▲ Dead

Holbrookia lacerata
Spot-tailed Earless Lizard



Holbrookia lacerata

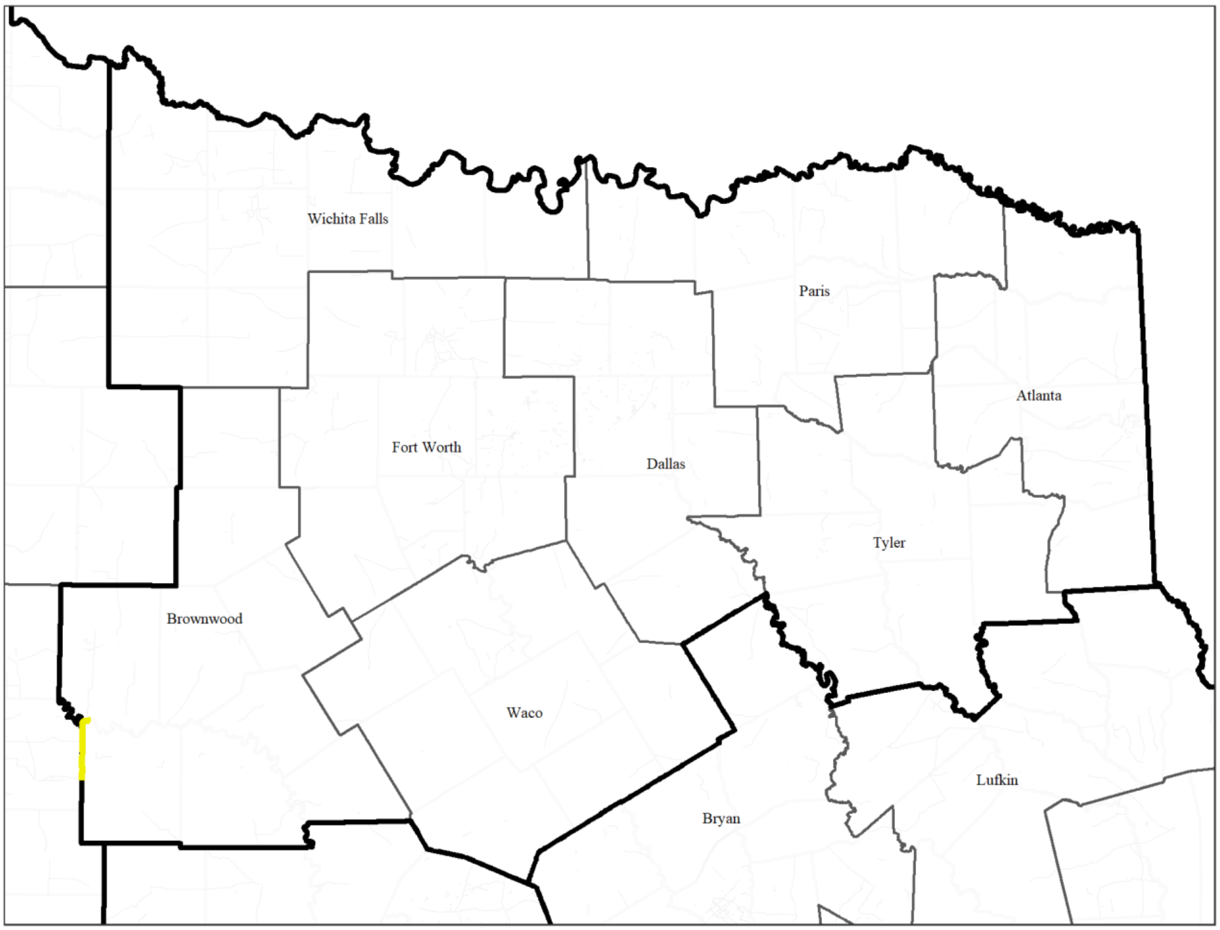
Spot-tailed Earless Lizard



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Holbrookia lacerata

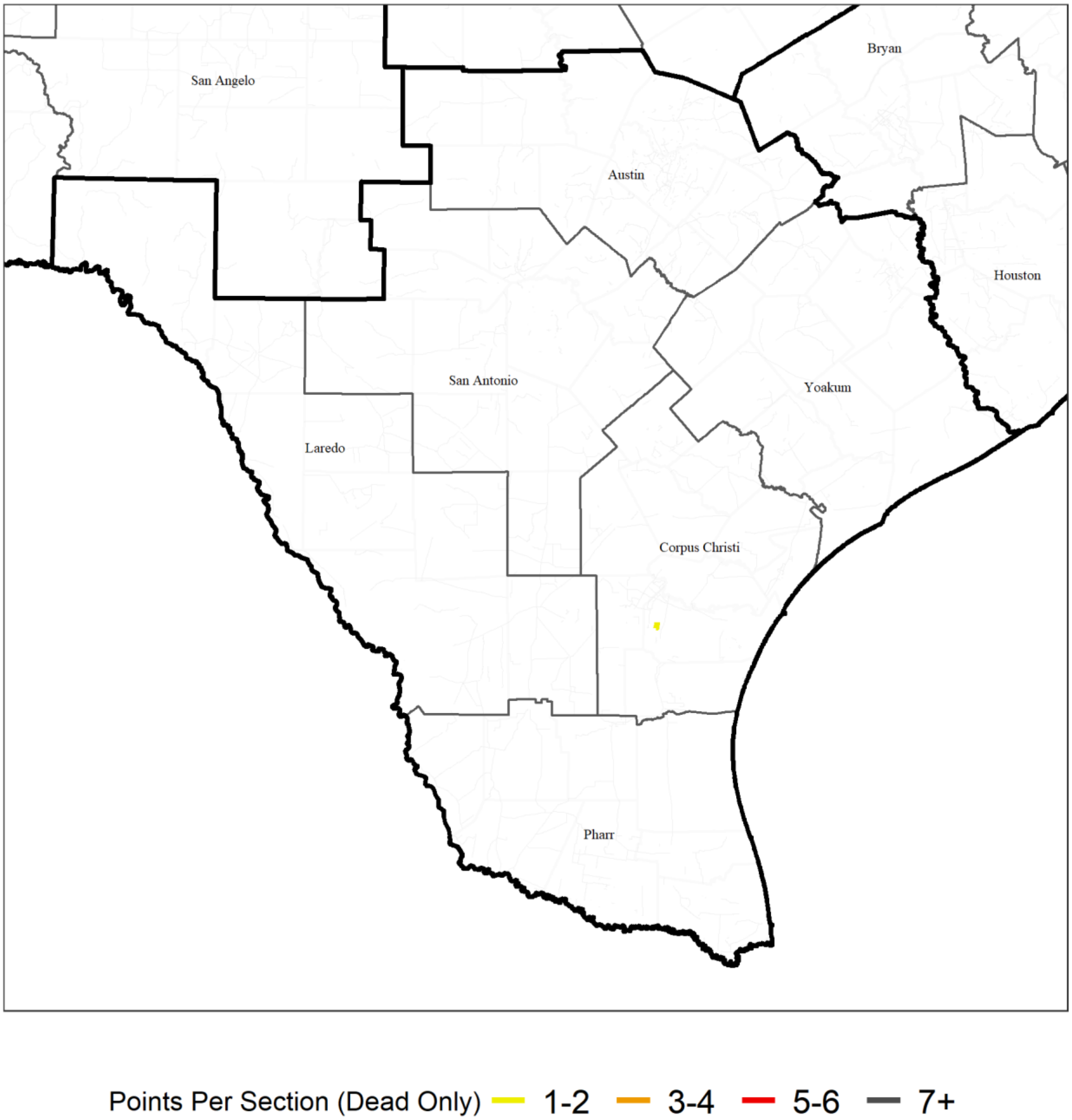
Spot-tailed Earless Lizard



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

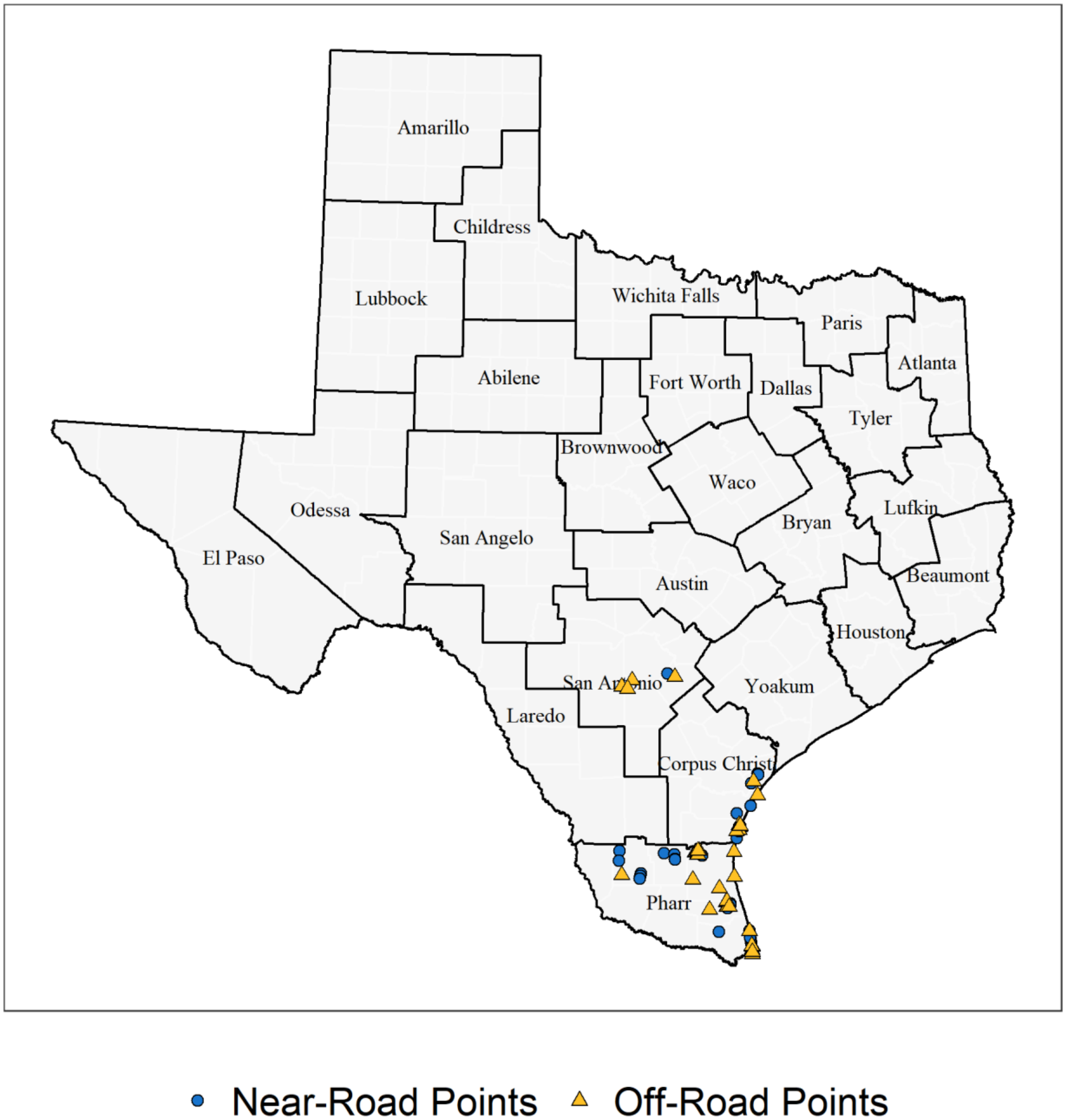
Holbrookia lacerata

Spot-tailed Earless Lizard



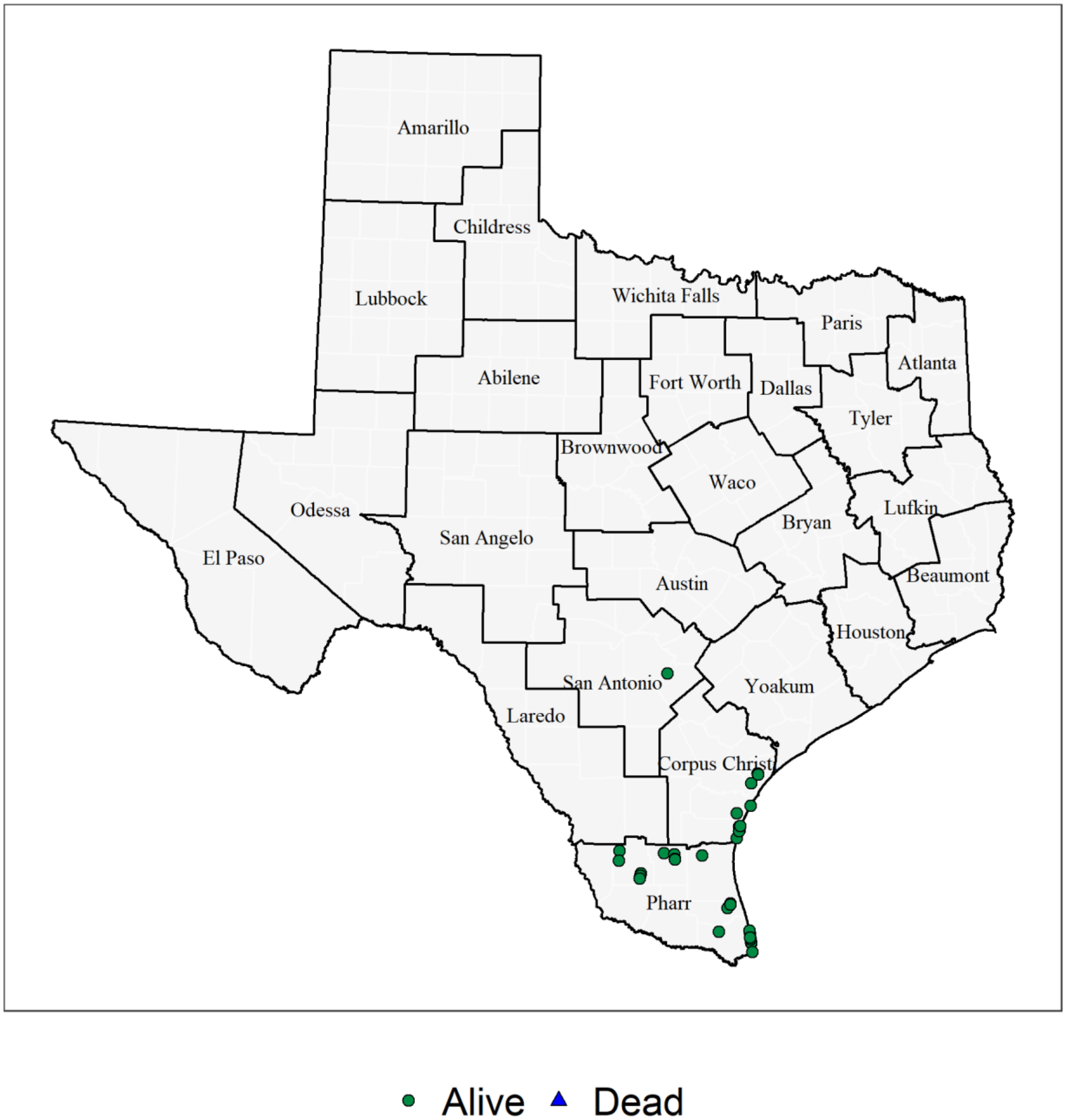
Holbrookia propinqua

Keeled Earless Lizard



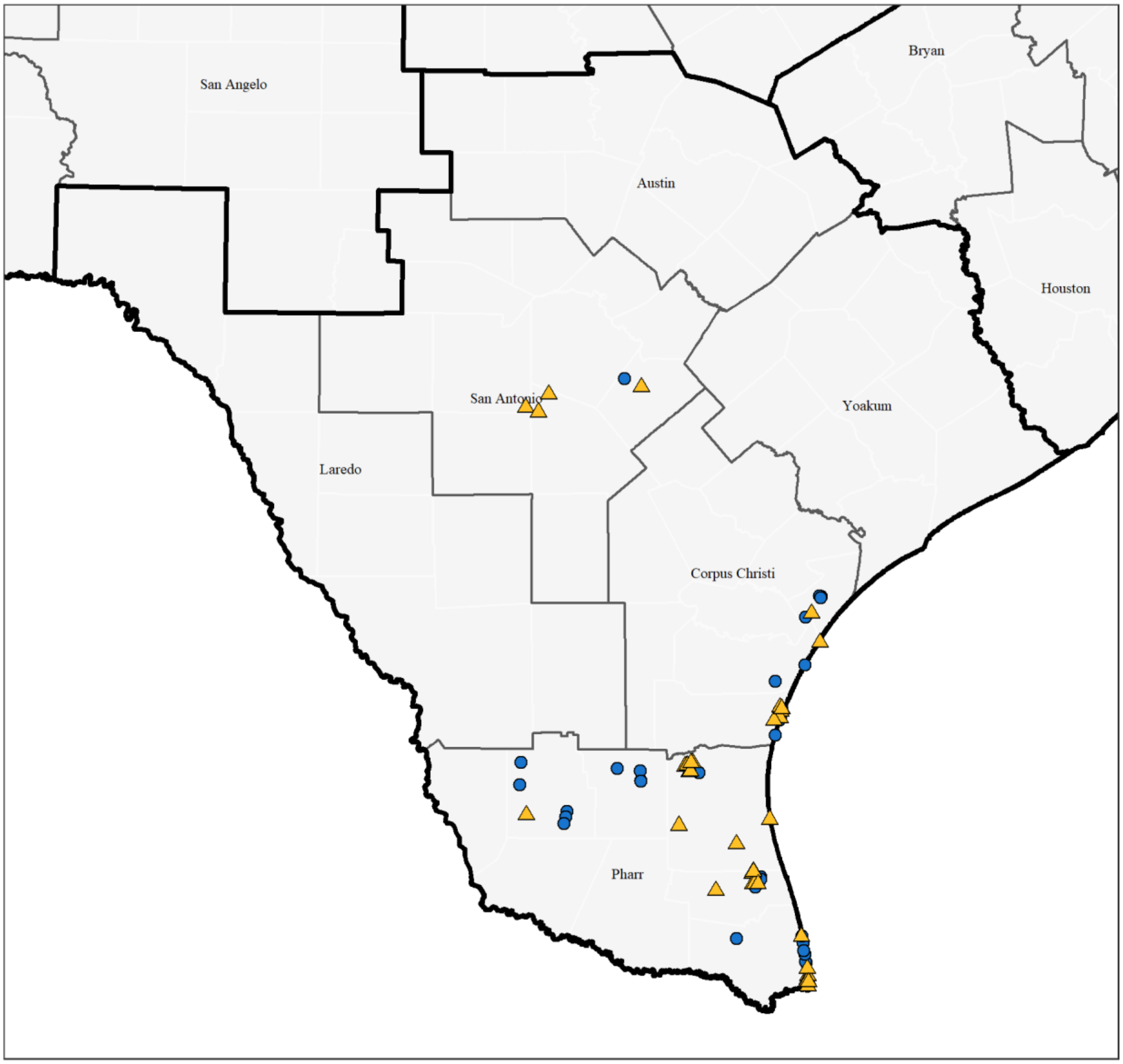
Holbrookia propinqua

Keeled Earless Lizard



Holbrookia propinqua

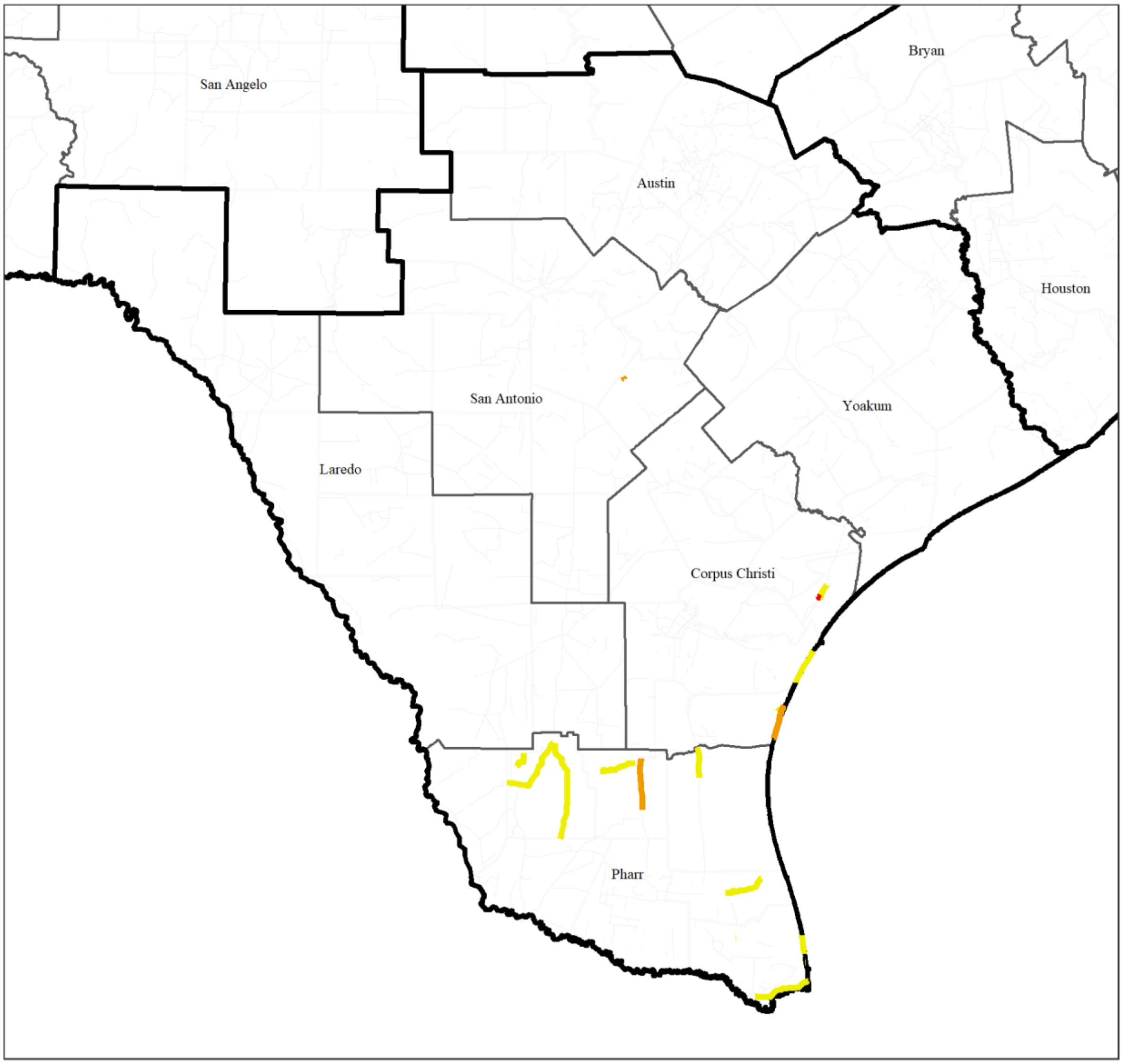
Keeled Earless Lizard



• Near-Road Points △ Off-Road Points

Holbrookia propinqua

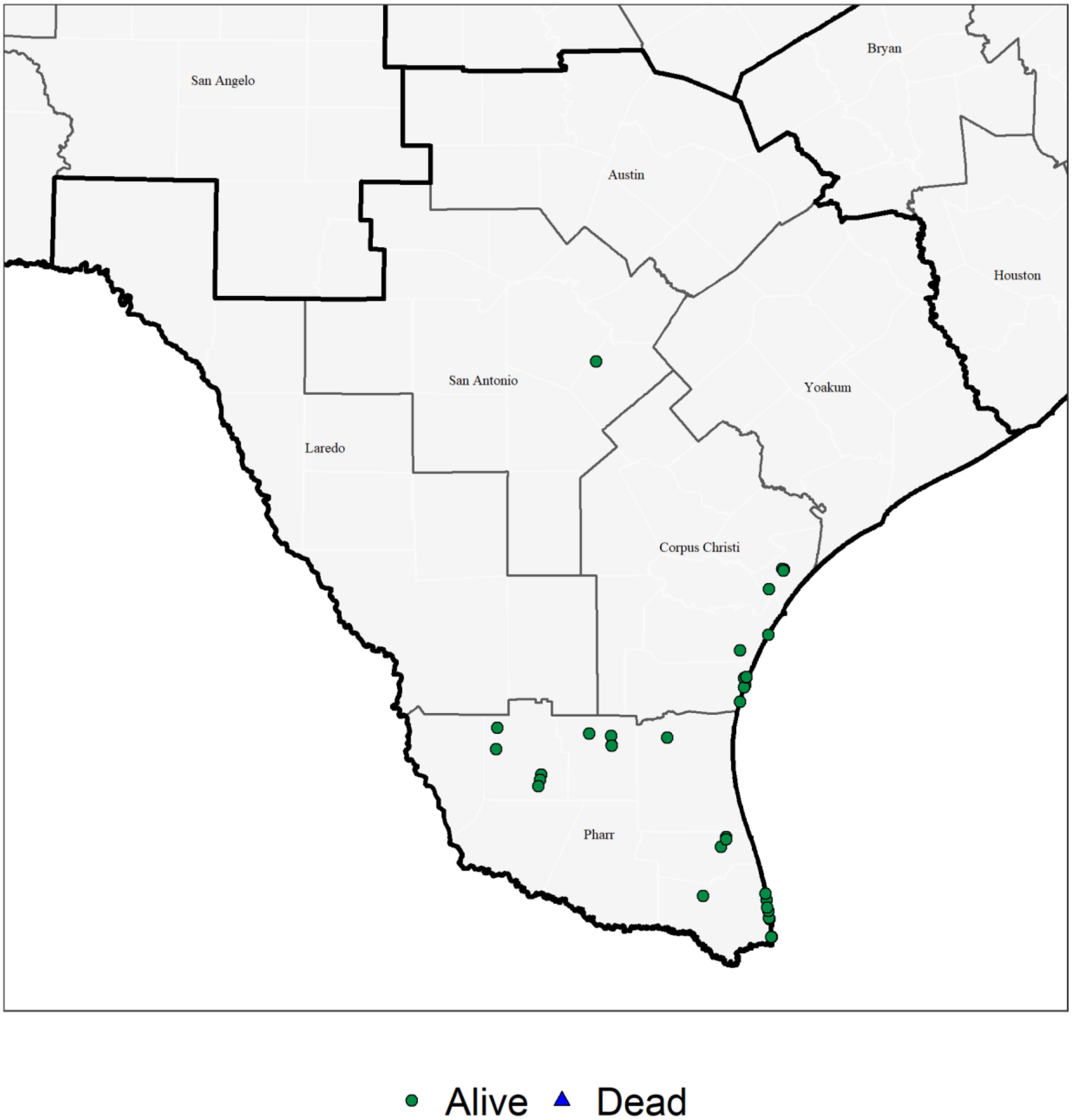
Keeled Earless Lizard



Points Per Section 1-2 3-4 5-6 7+

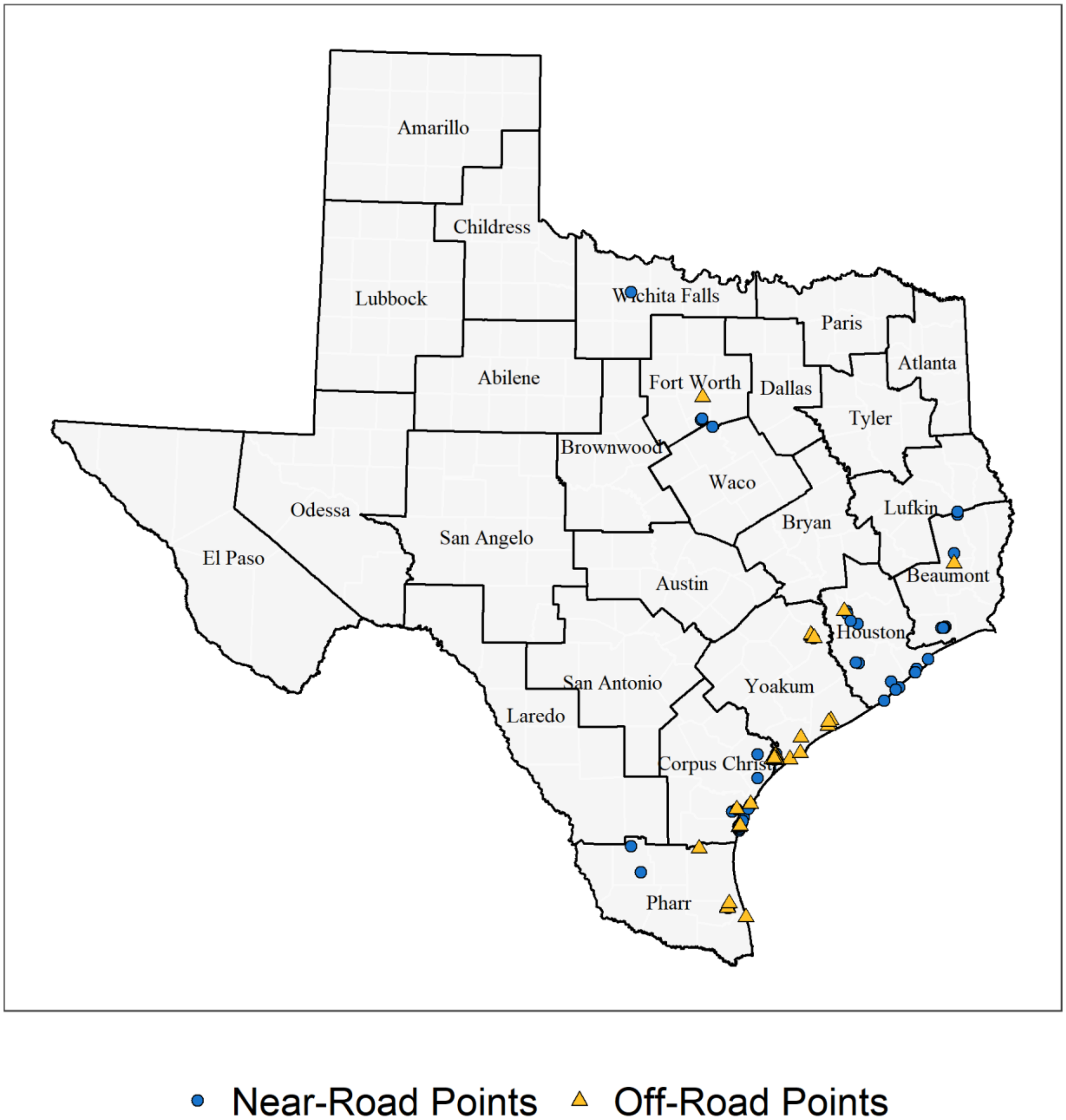
Holbrookia propinqua

Keeled Earless Lizard



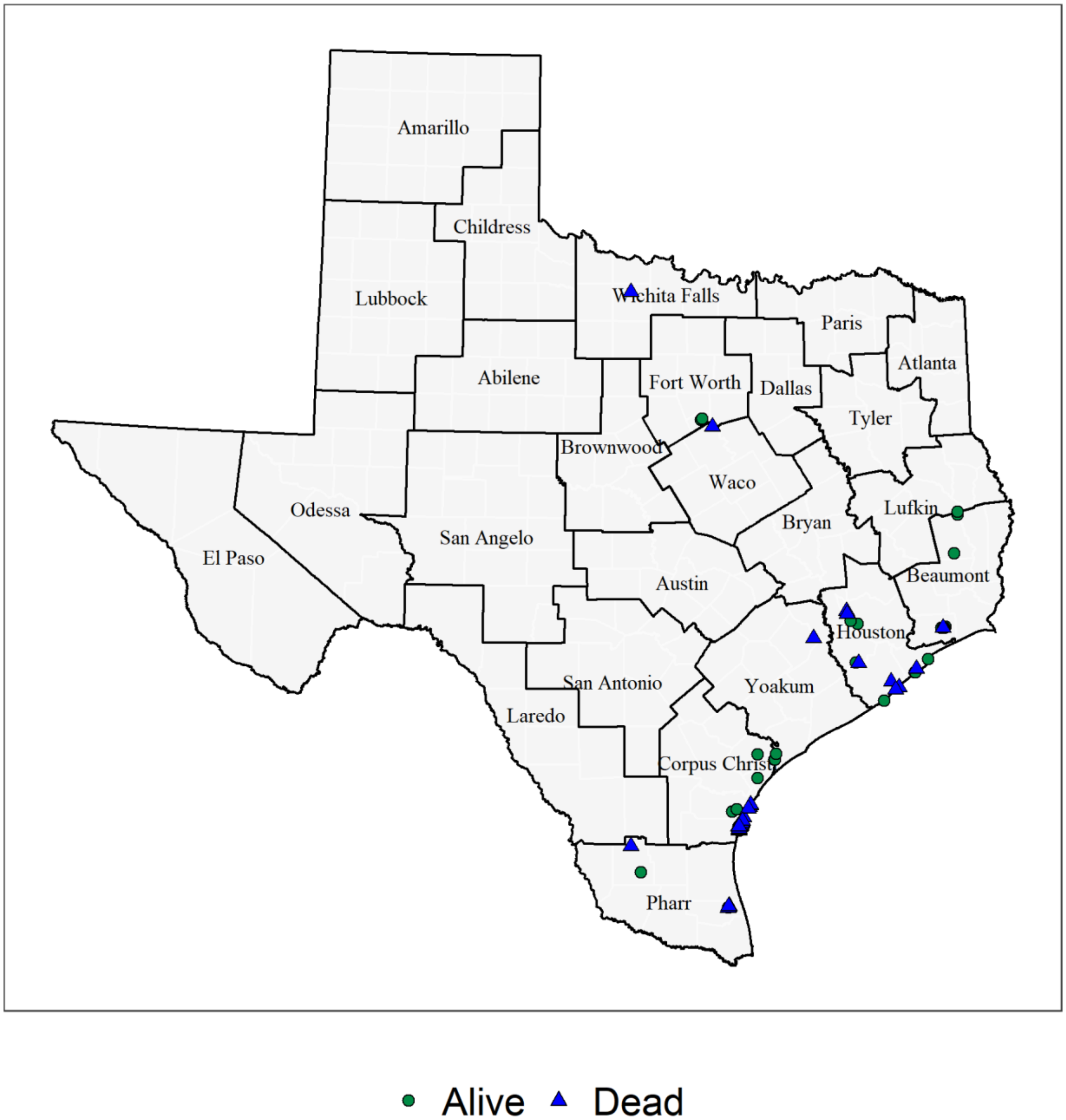
Ophisaurus attenuatus

Slender Glass Lizard



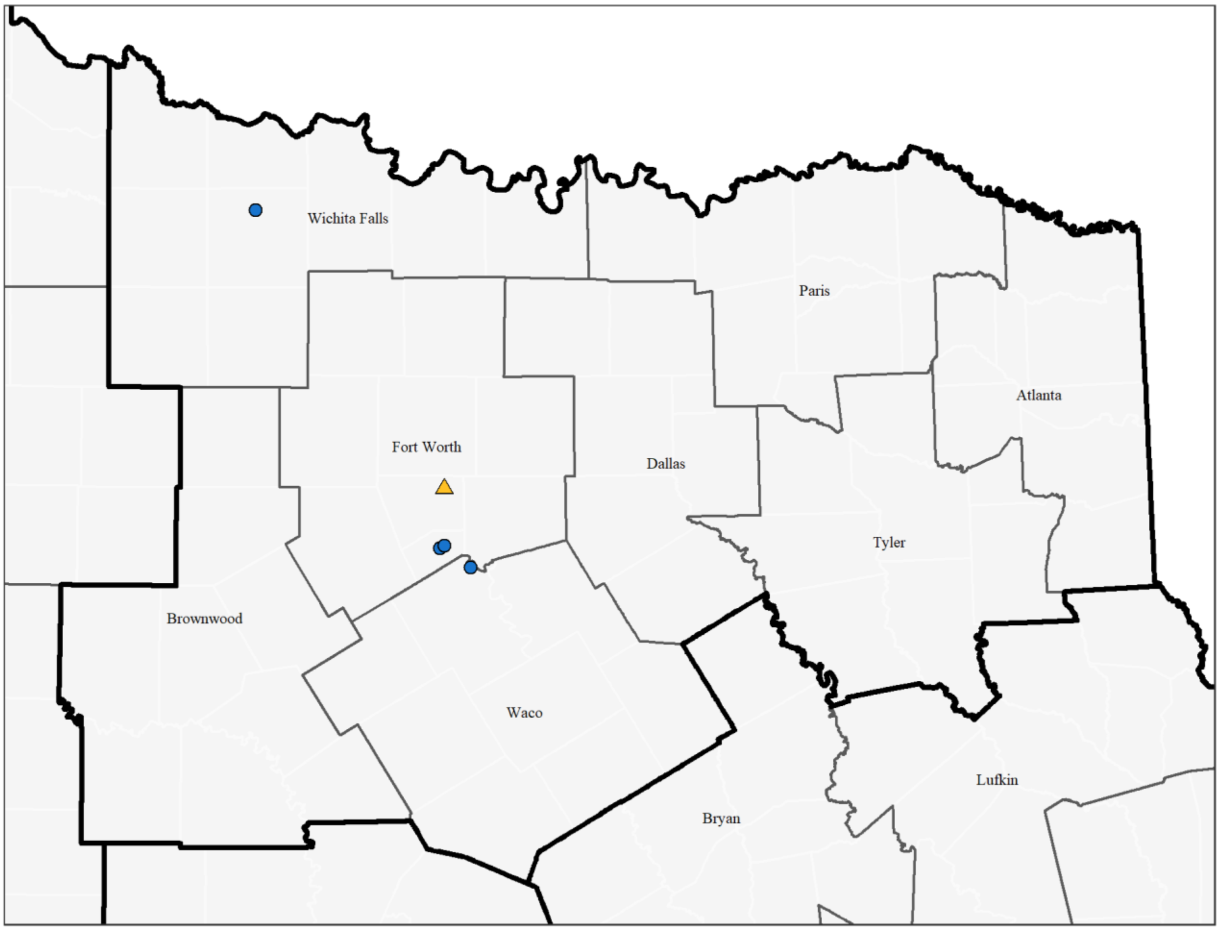
Ophisaurus attenuatus

Slender Glass Lizard



Ophisaurus attenuatus

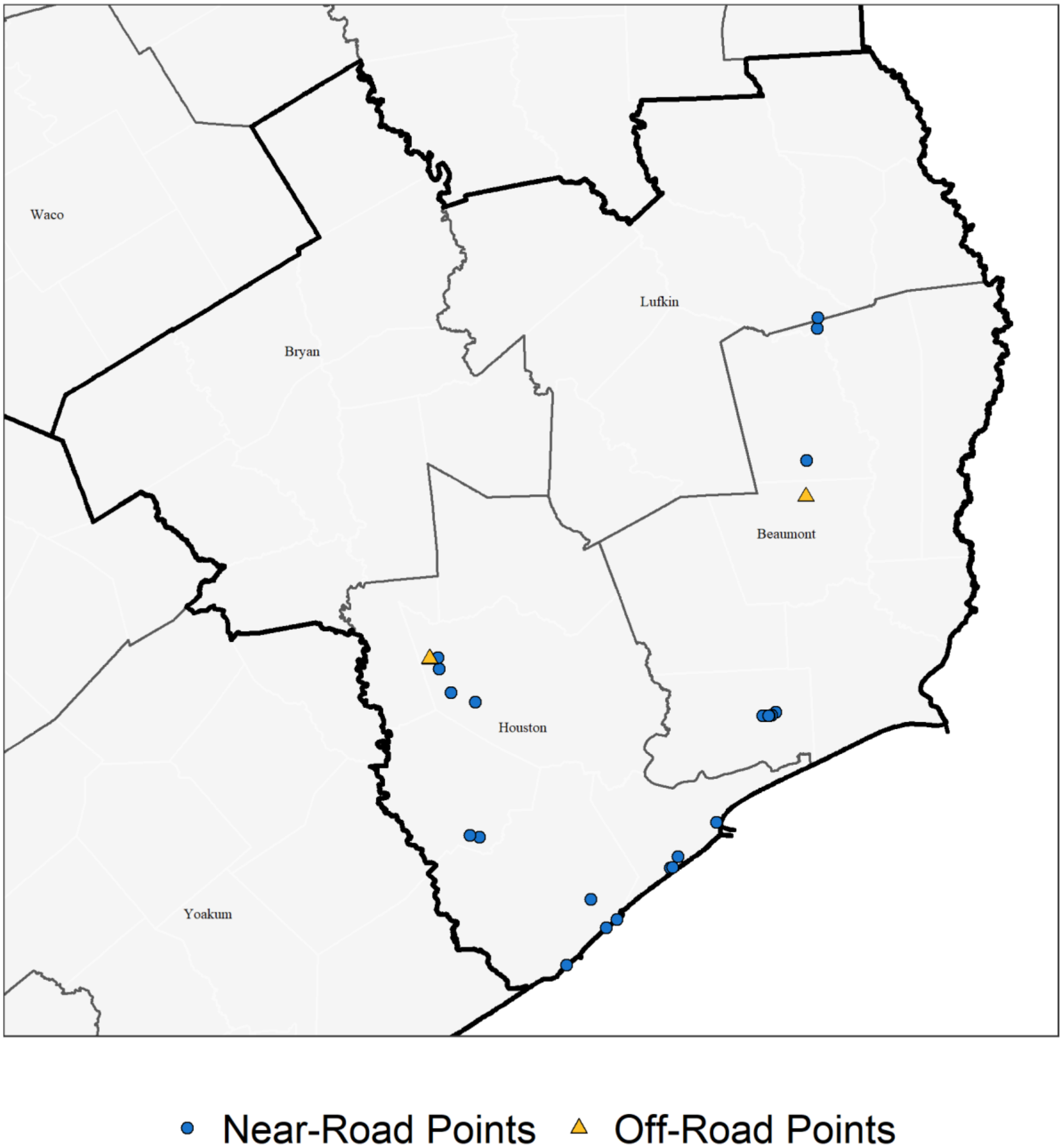
Slender Glass Lizard



• Near-Road Points △ Off-Road Points

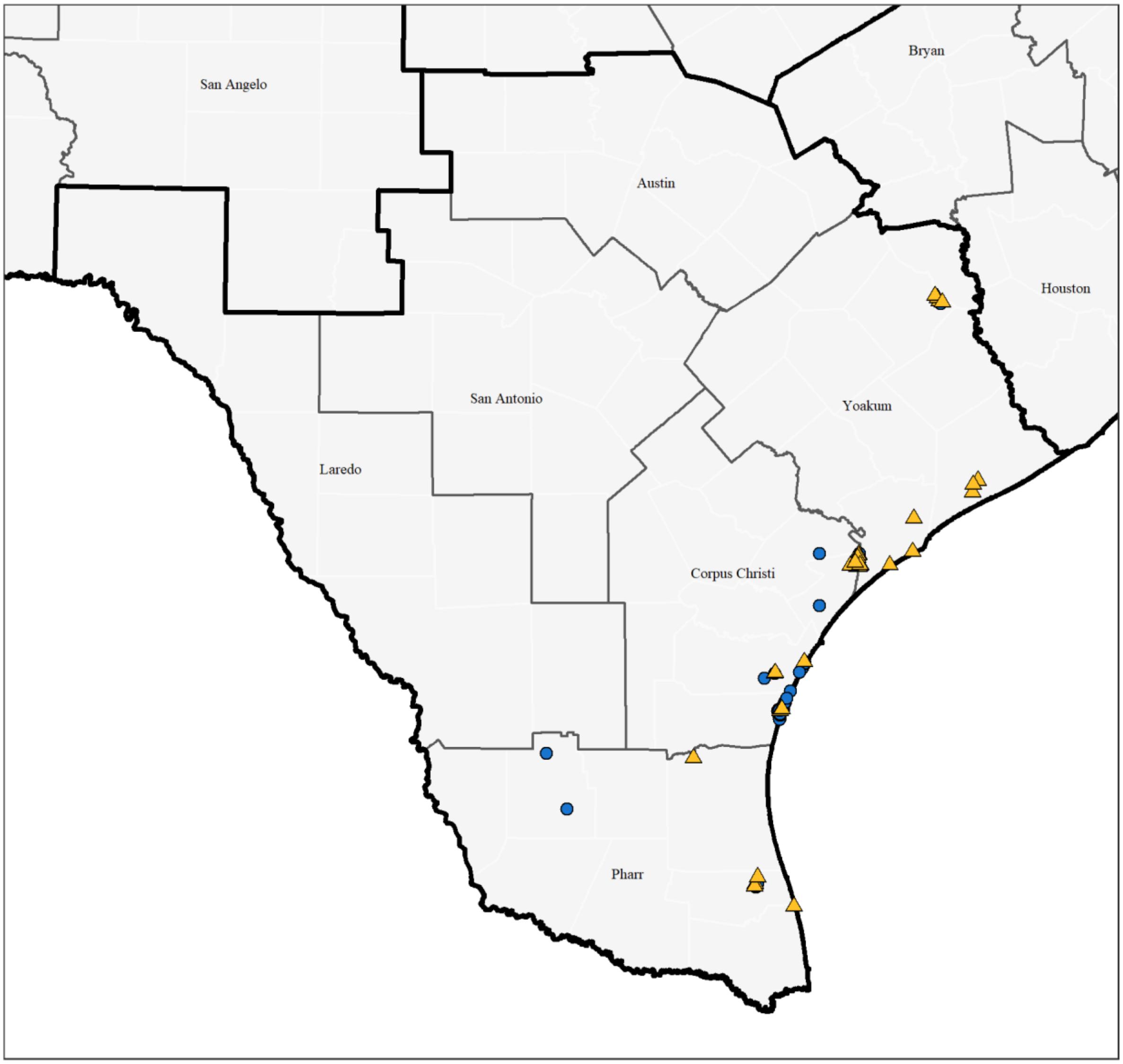
Ophisaurus attenuatus

Slender Glass Lizard



Ophisaurus attenuatus

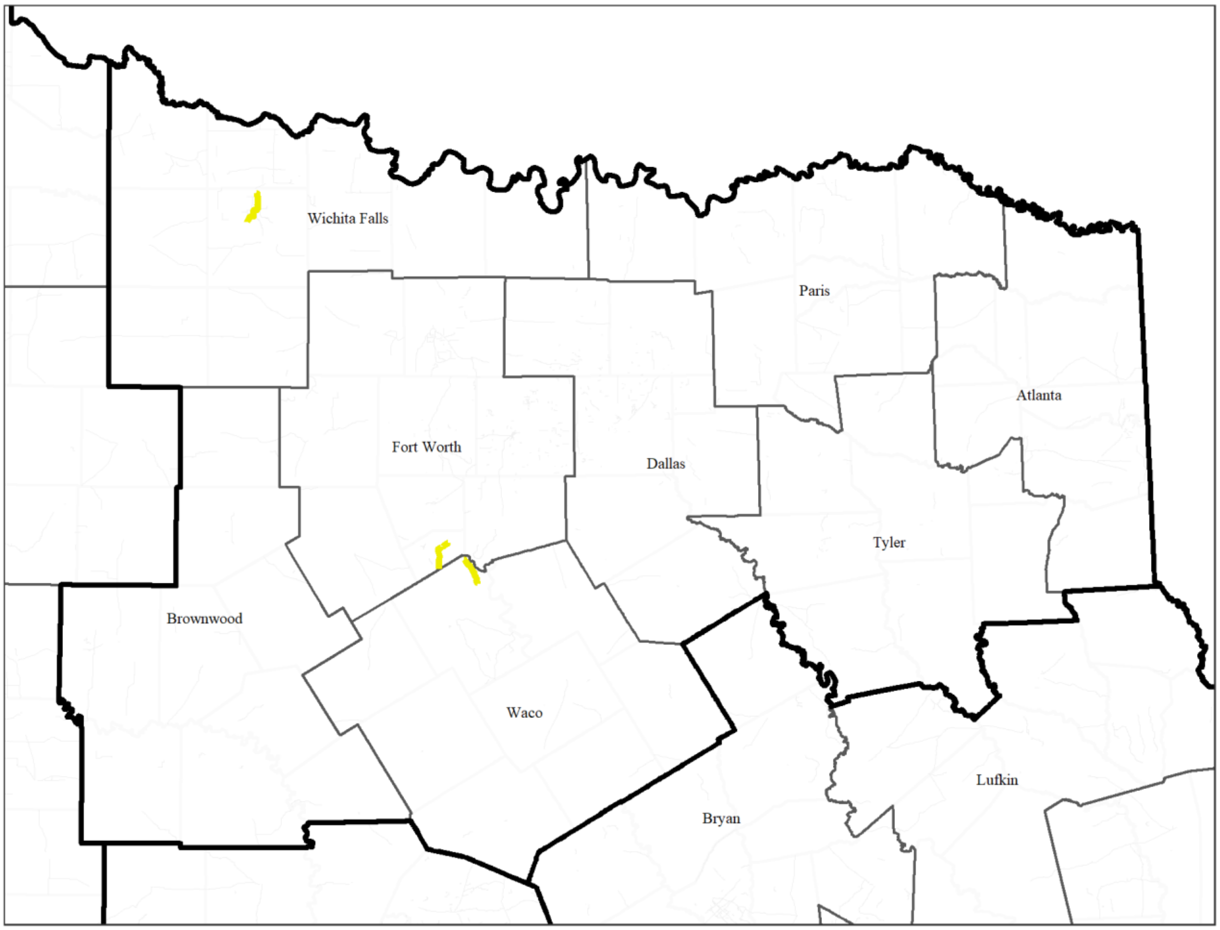
Slender Glass Lizard



• Near-Road Points △ Off-Road Points

Ophisaurus attenuatus

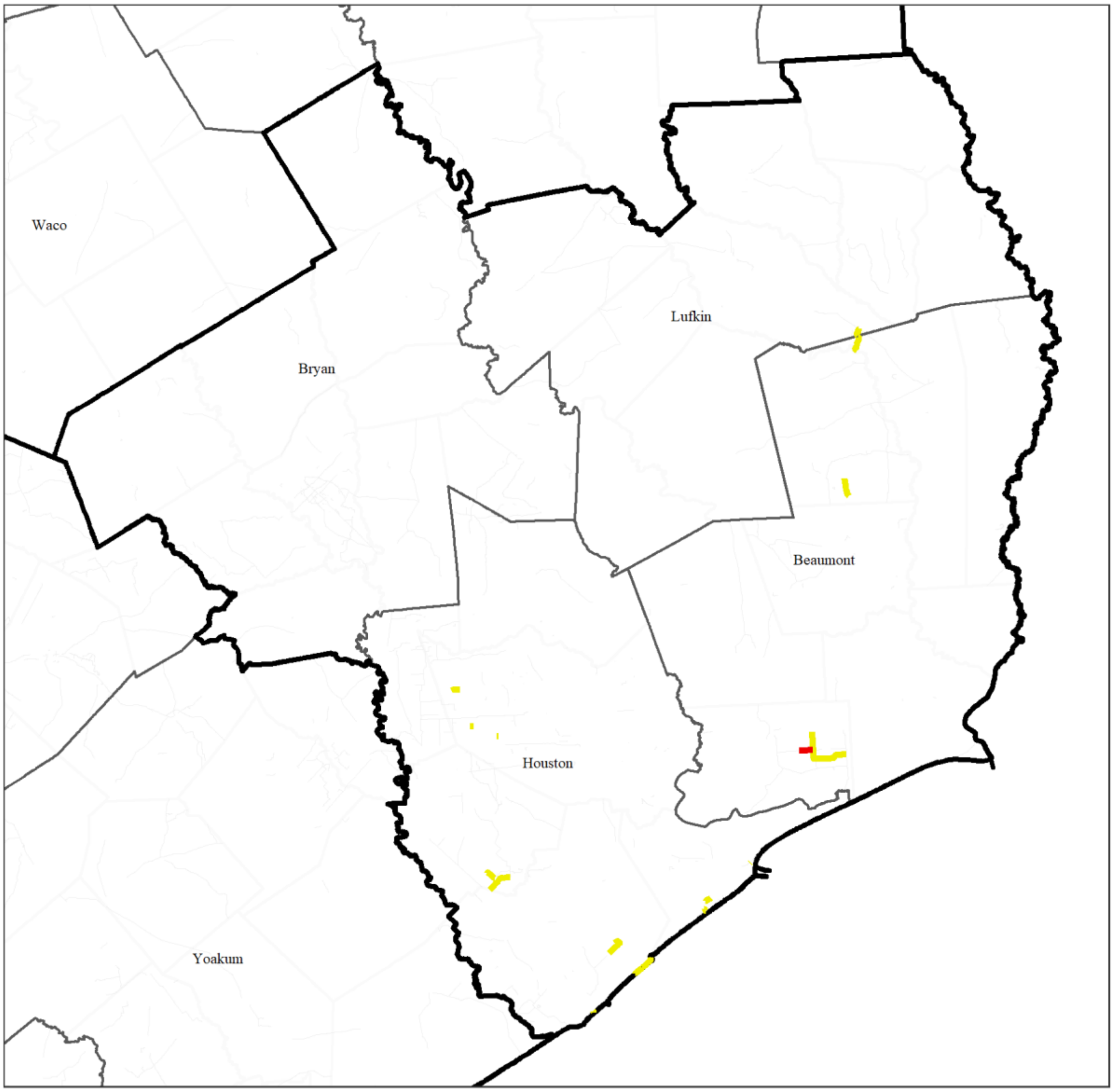
Slender Glass Lizard



Points Per Section 1-2 3-4 5-6 7+

Ophisaurus attenuatus

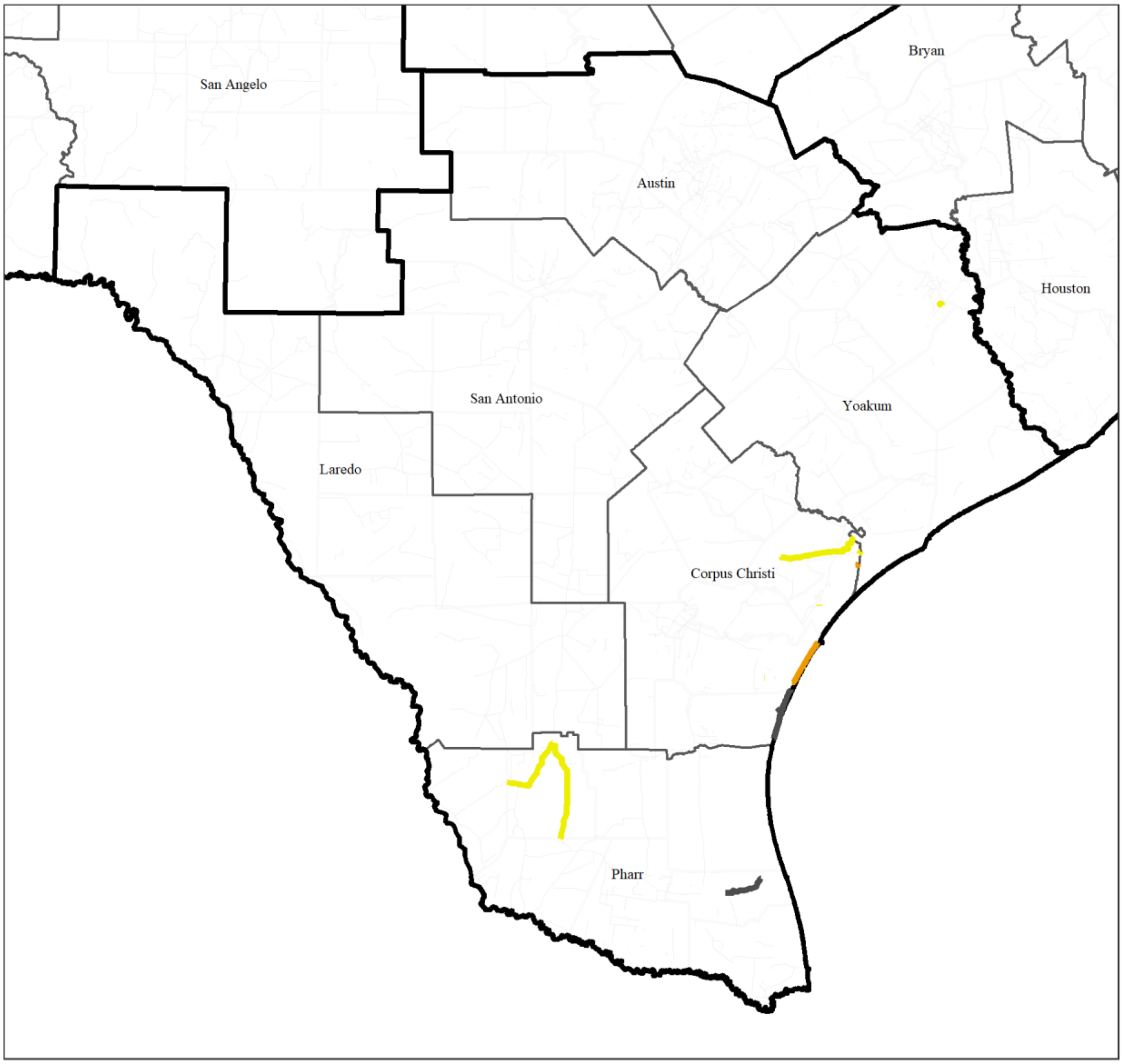
Slender Glass Lizard



Points Per Section 1-2 3-4 5-6 7+

Ophisaurus attenuatus

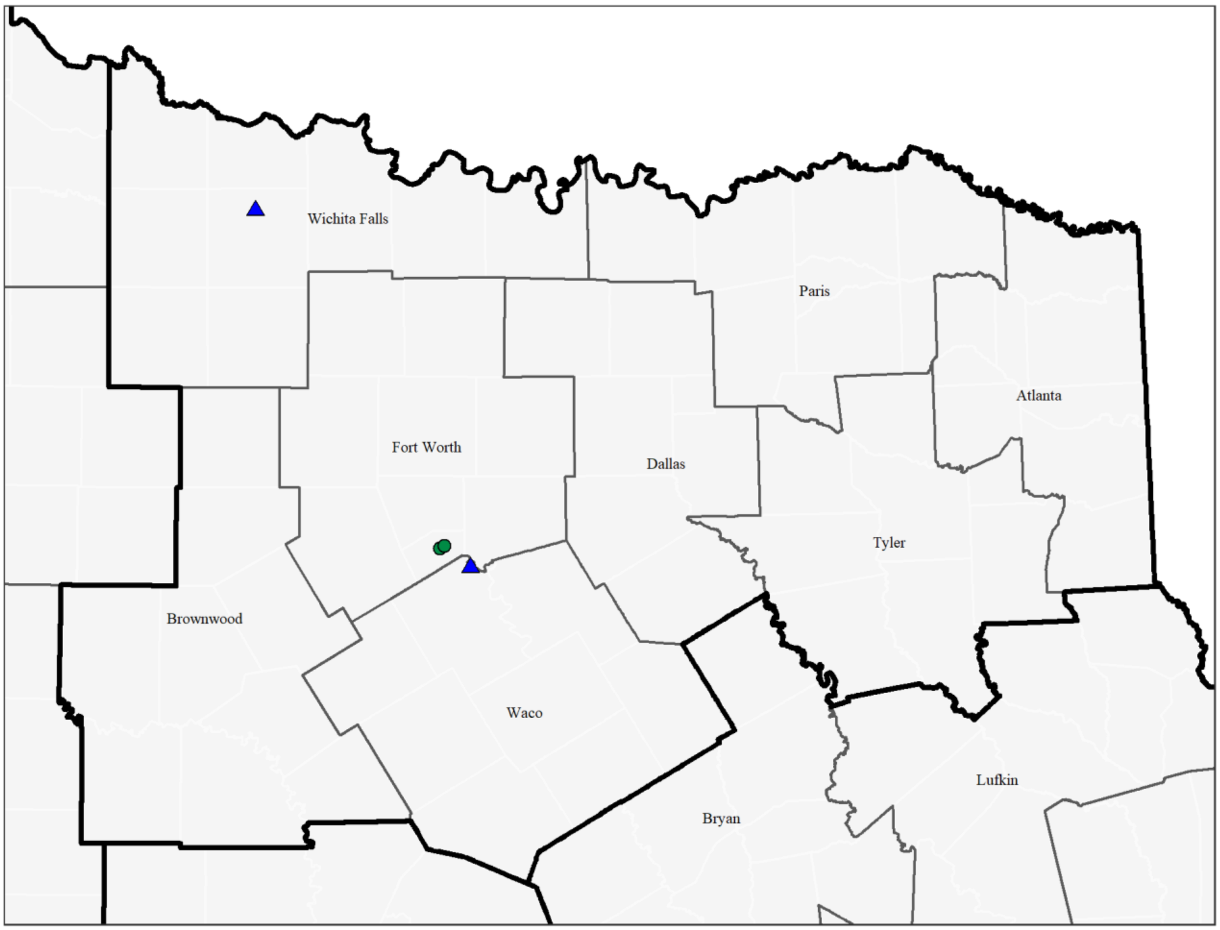
Slender Glass Lizard



Points Per Section 1-2 3-4 5-6 7+

Ophisaurus attenuatus

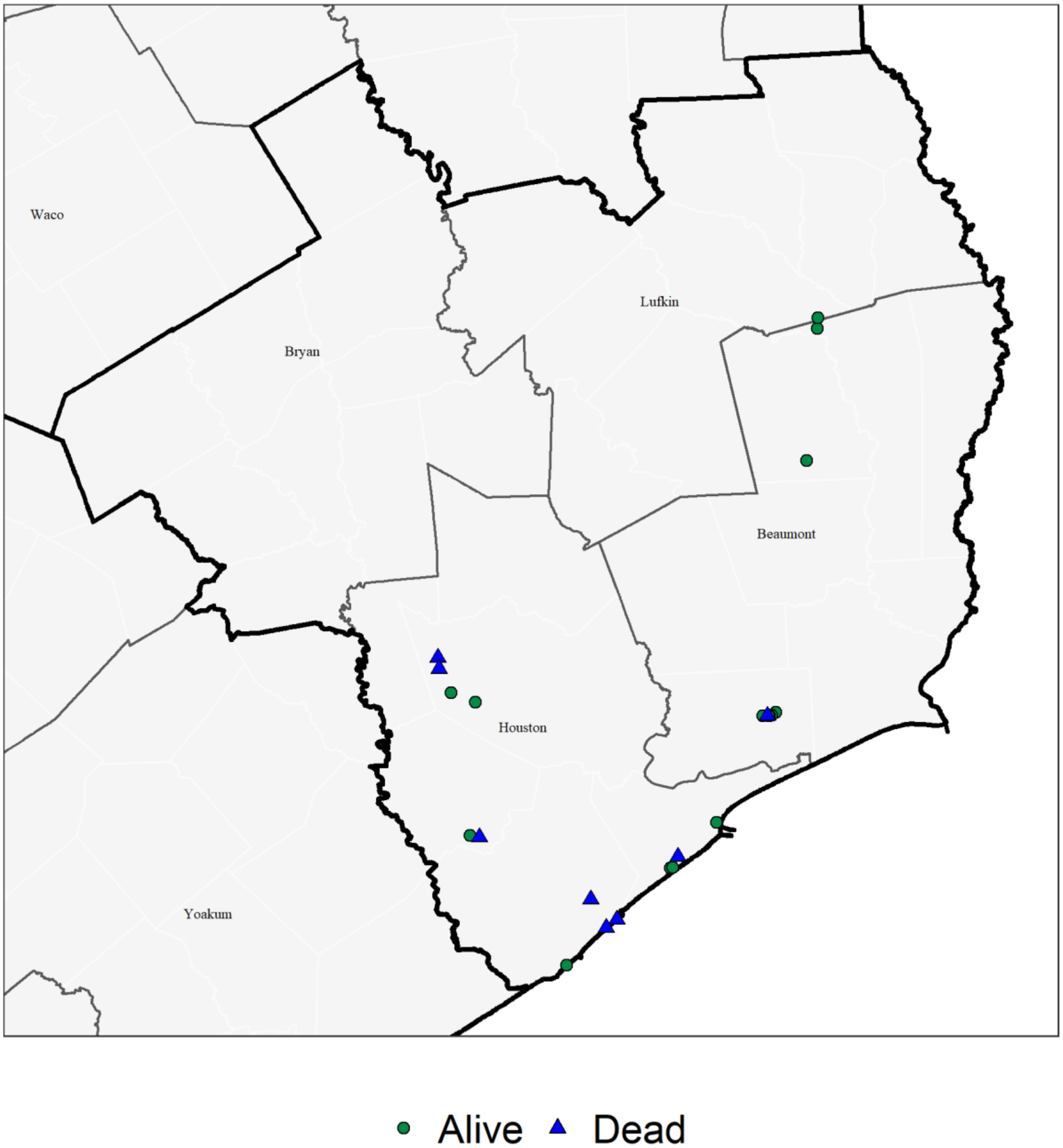
Slender Glass Lizard



Alive Dead

Ophisaurus attenuatus

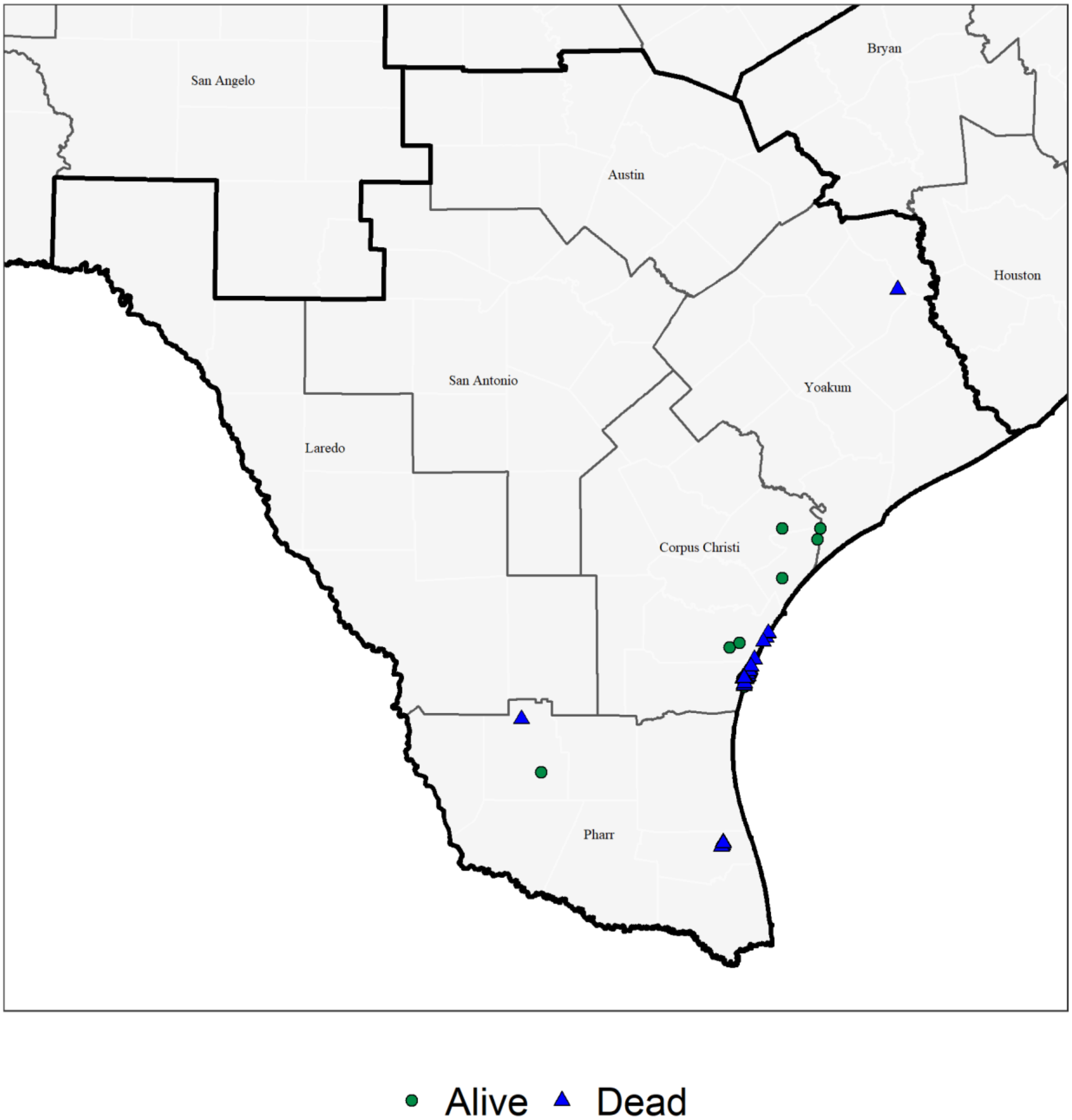
Slender Glass Lizard



Ophisaurus attenuatus

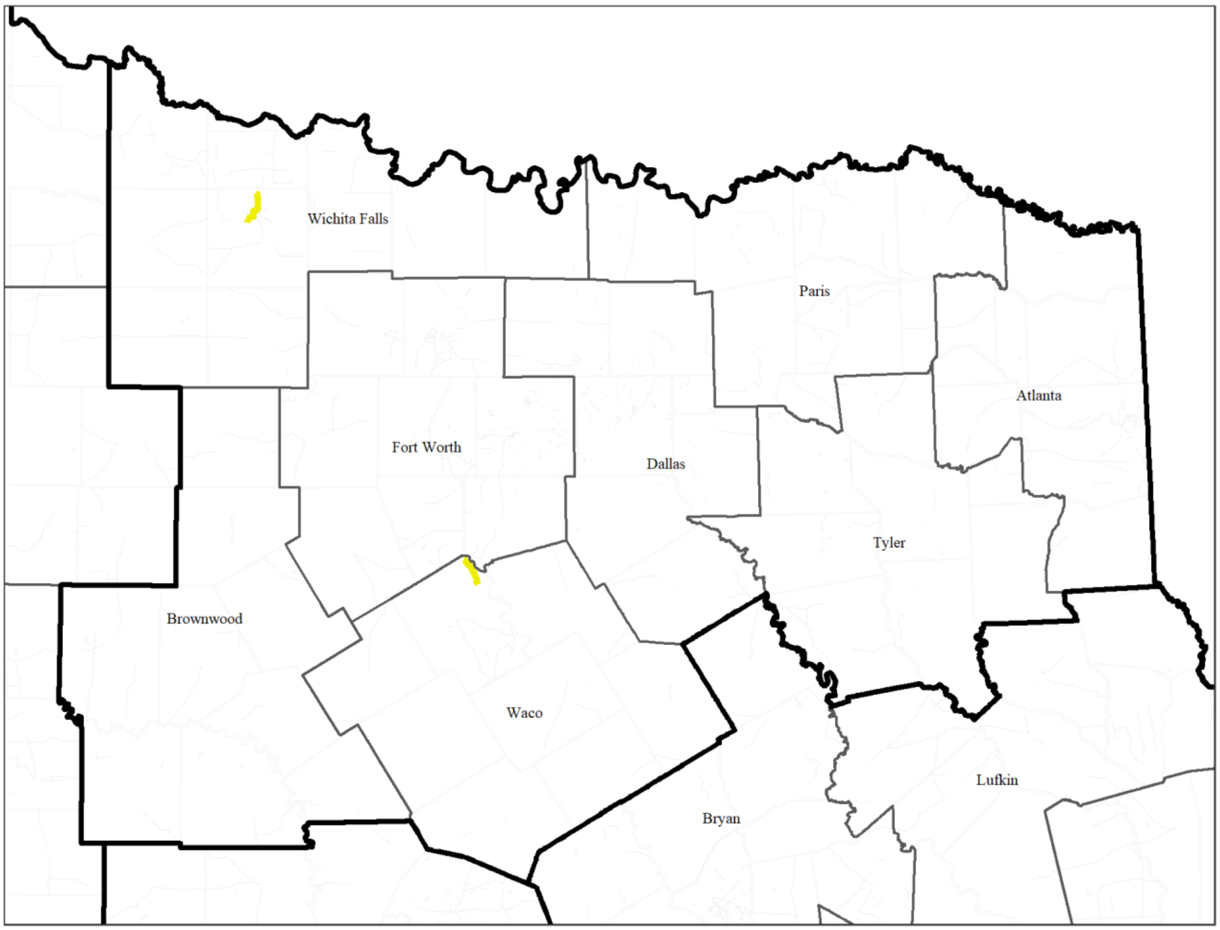
Slender Glass Lizard

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Ophisaurus attenuatus

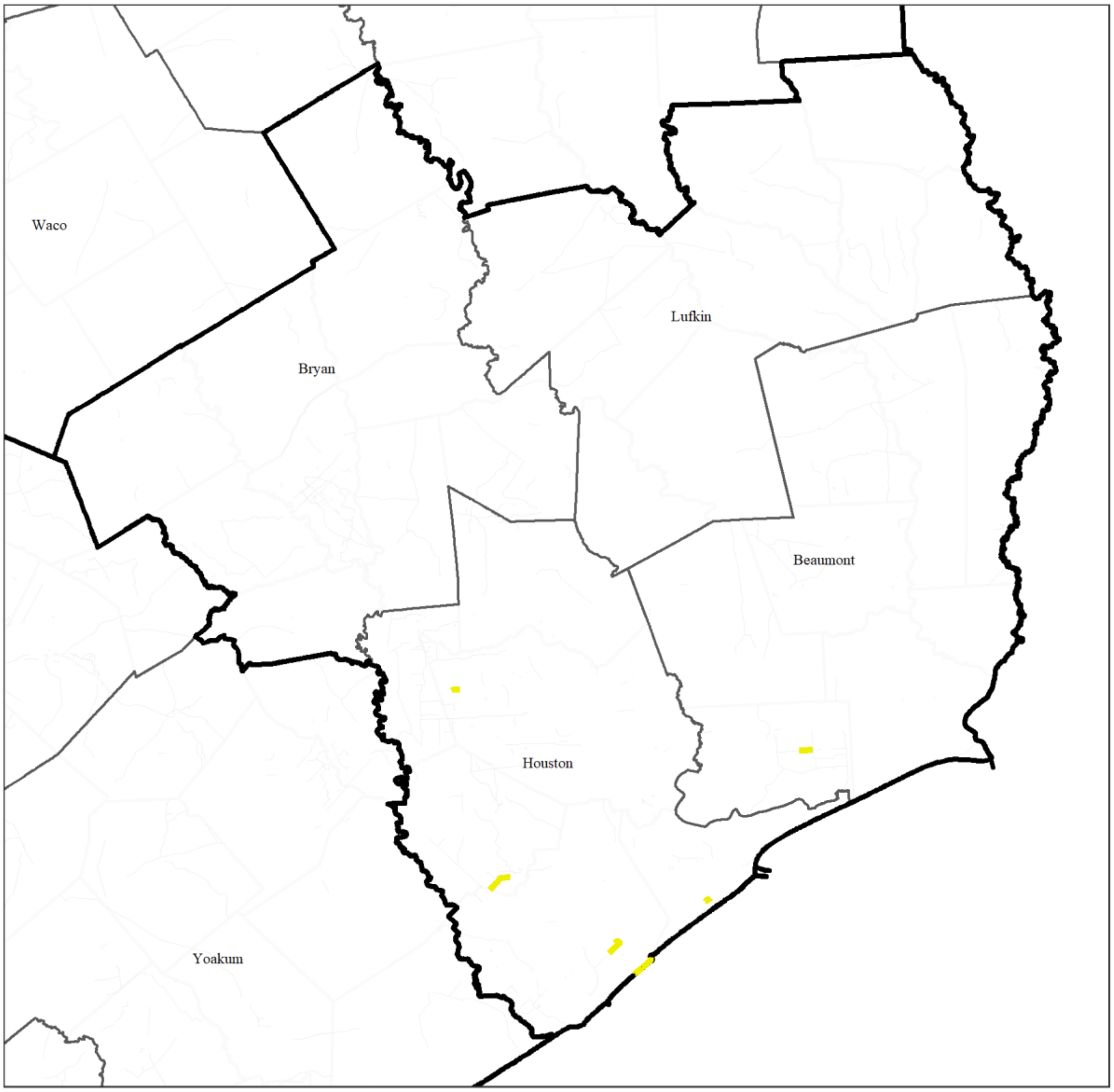
Slender Glass Lizard



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Ophisaurus attenuatus

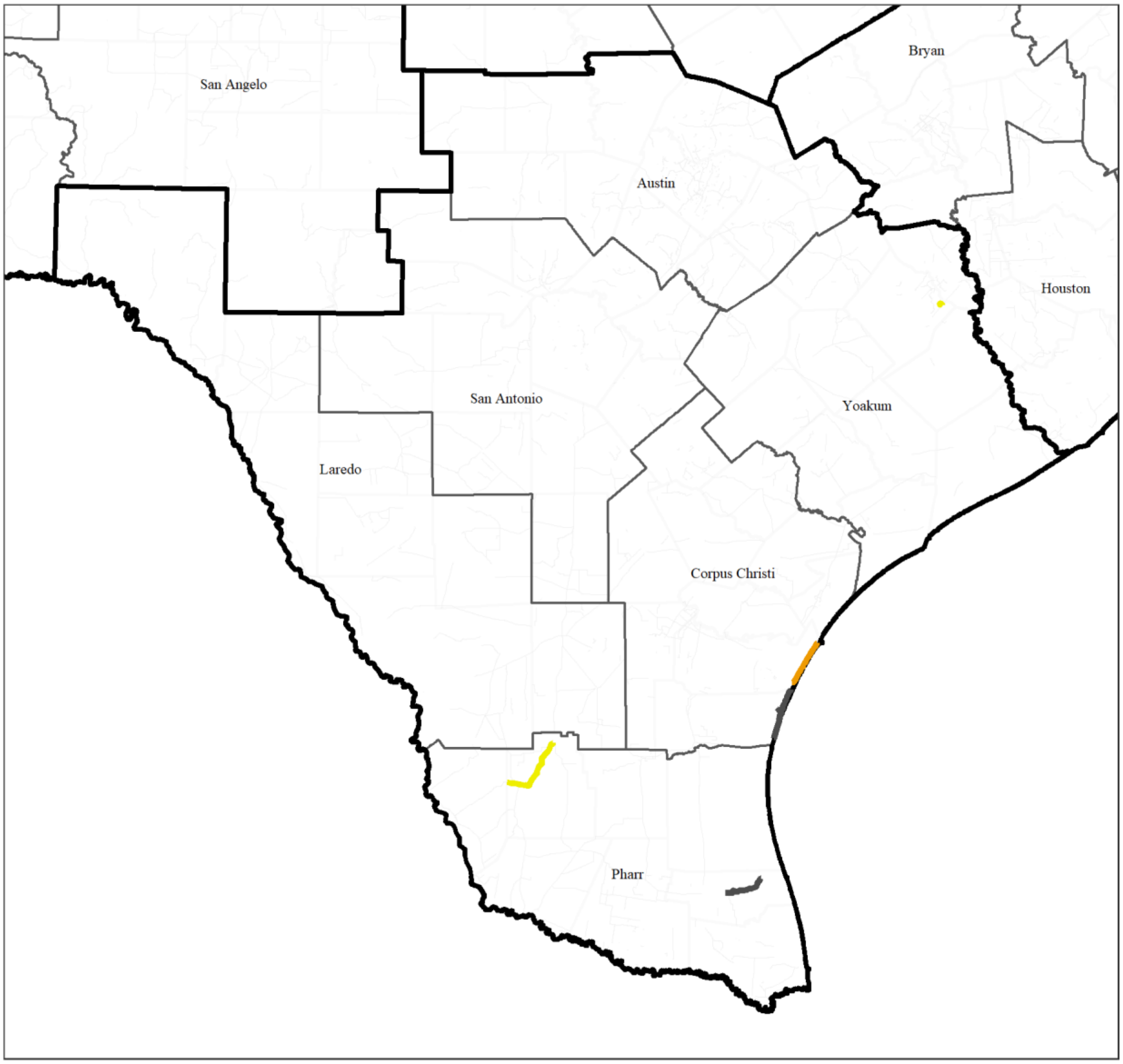
Slender Glass Lizard



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Ophisaurus attenuatus
Slender Glass Lizard

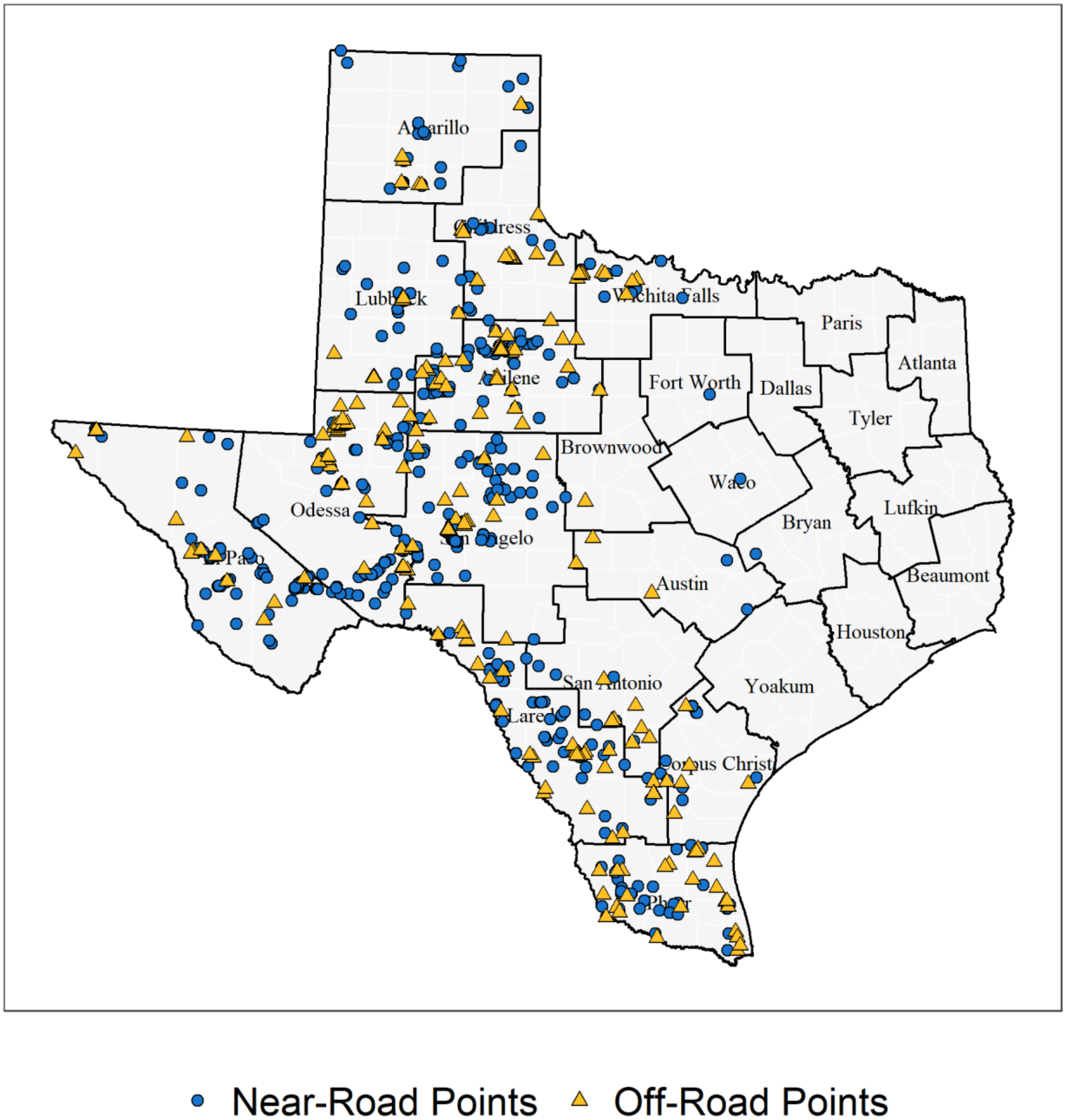
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

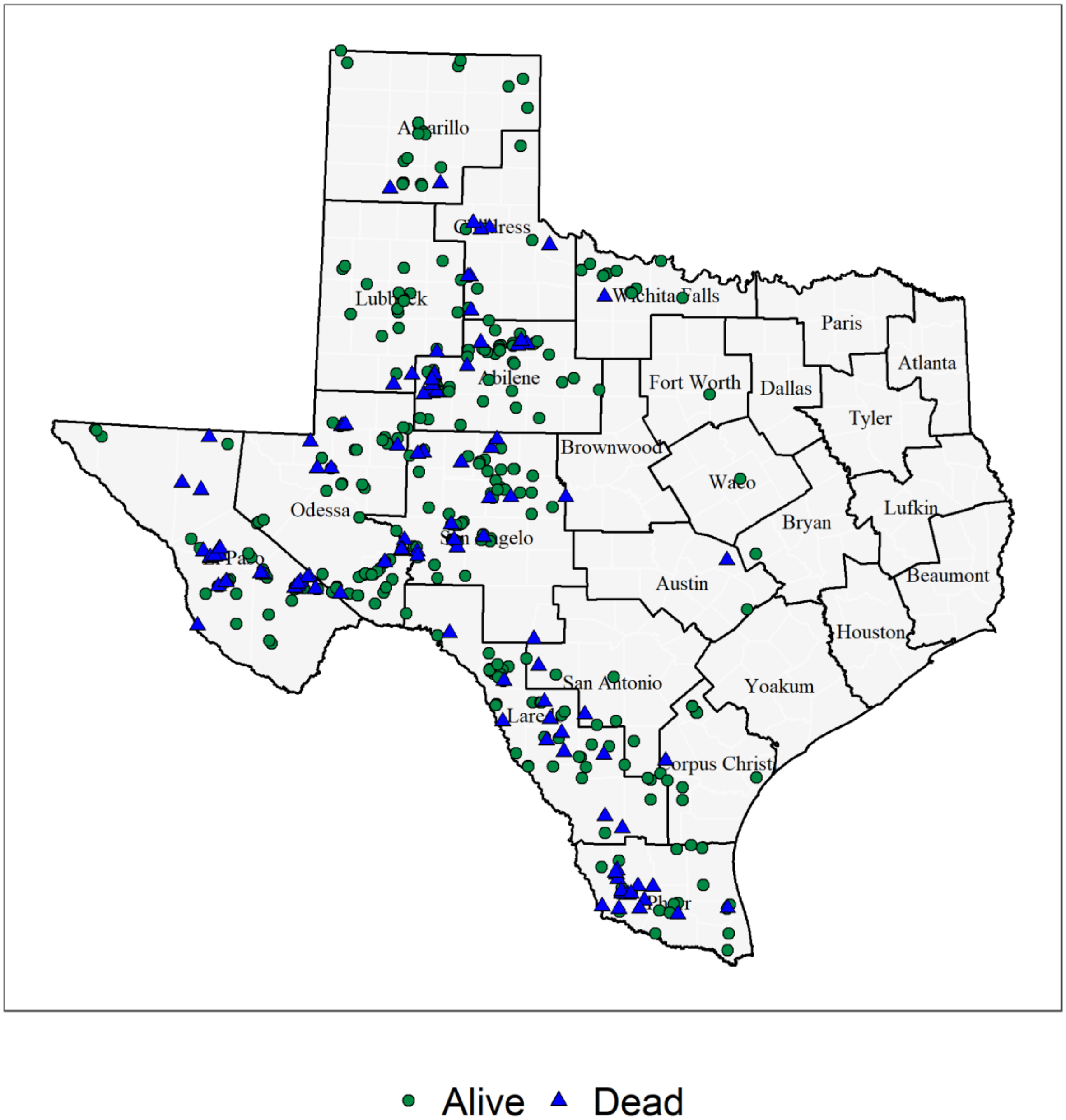
Phrynosoma cornutum

Texas Horned Lizard



Phrynosoma cornutum

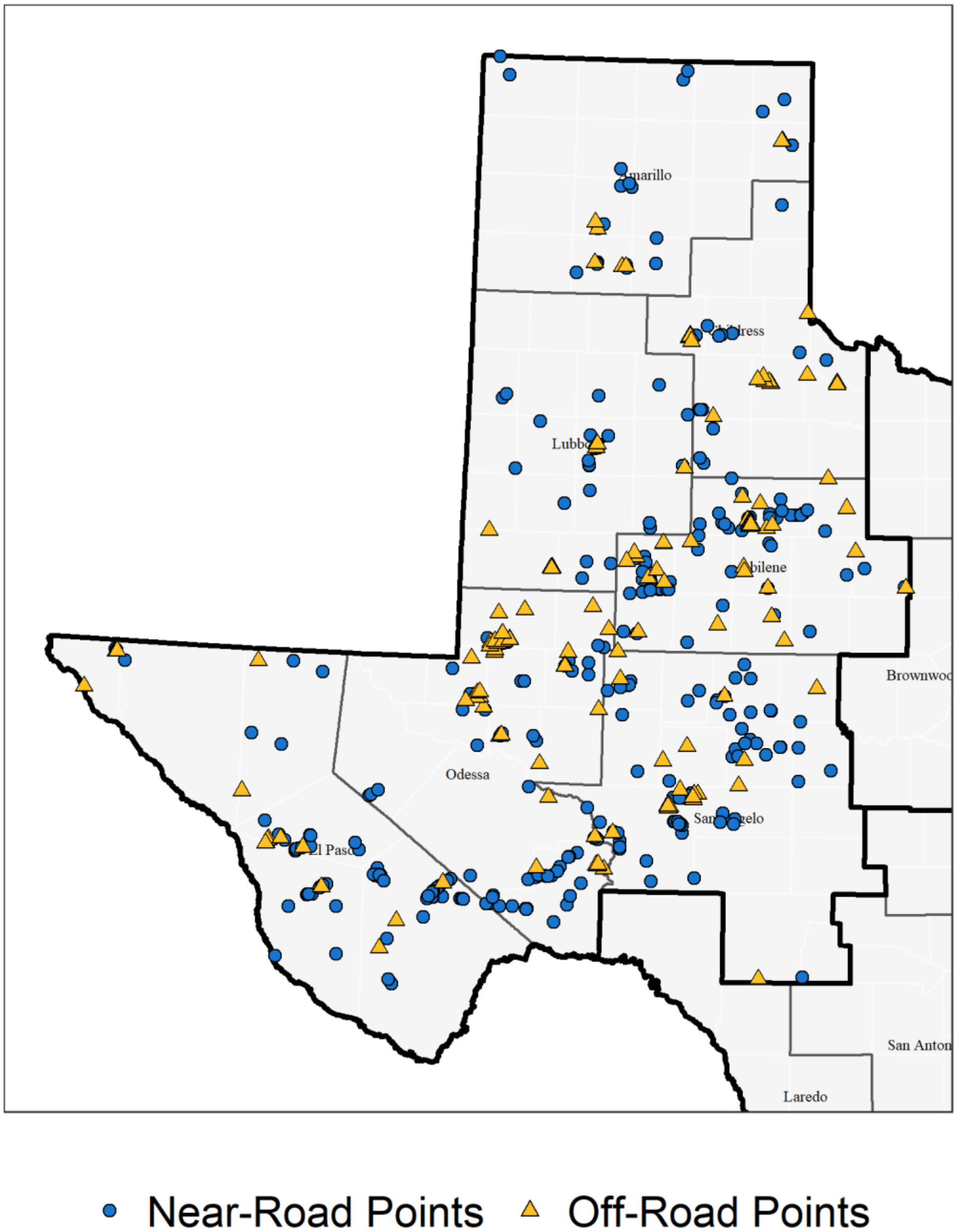
Texas Horned Lizard



Phrynosoma cornutum

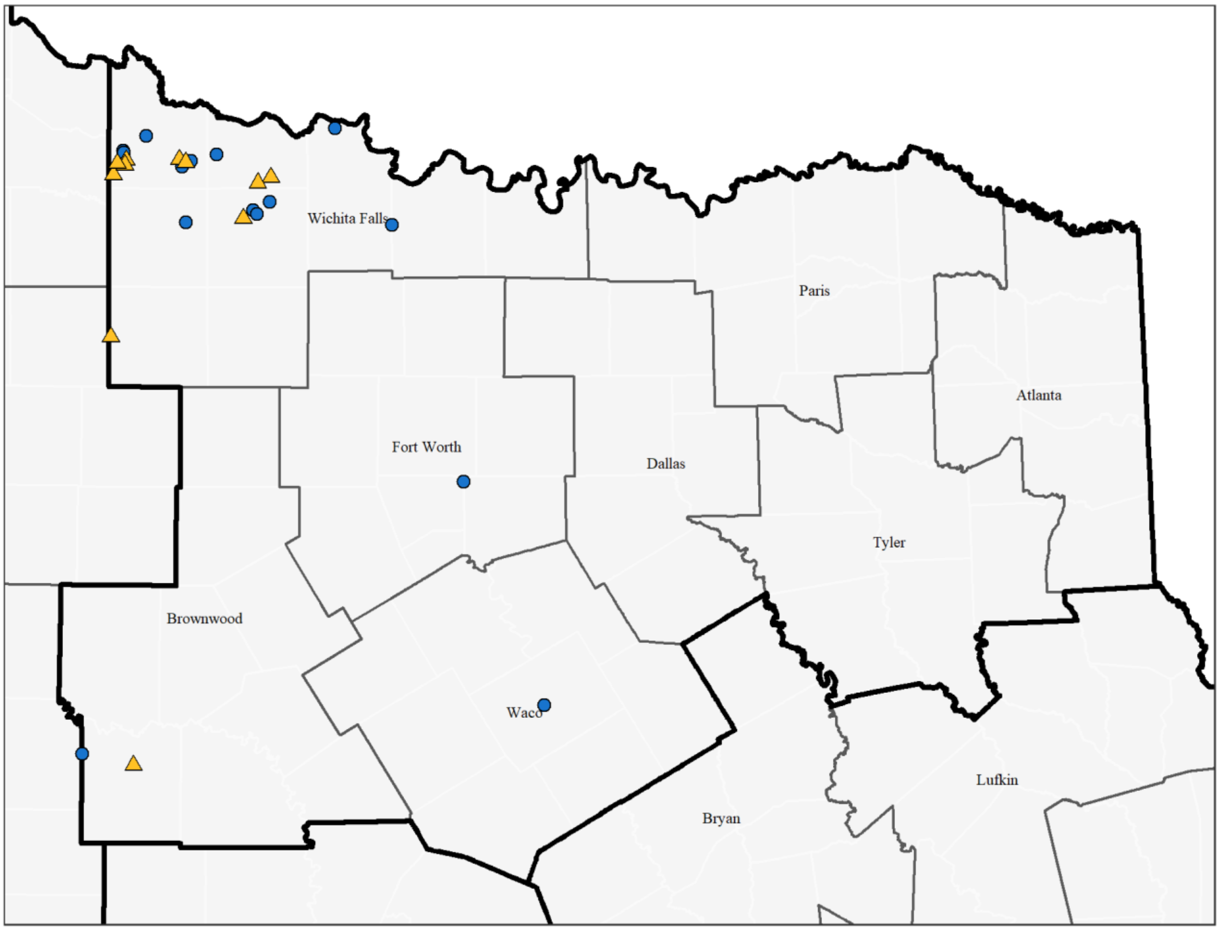
Texas Horned Lizard

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Phrynosoma cornutum

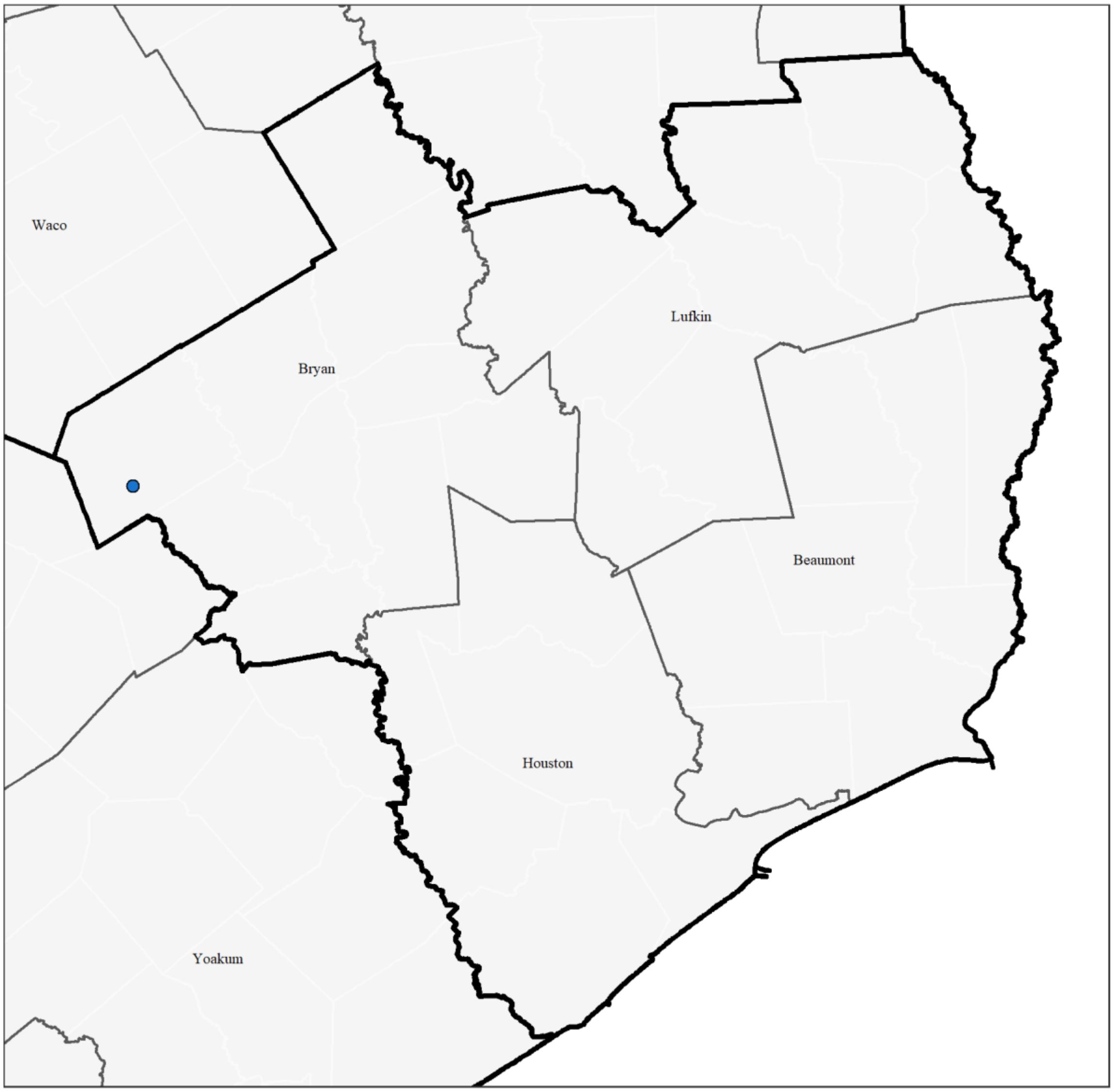
Texas Horned Lizard



• Near-Road Points △ Off-Road Points

Phrynosoma cornutum

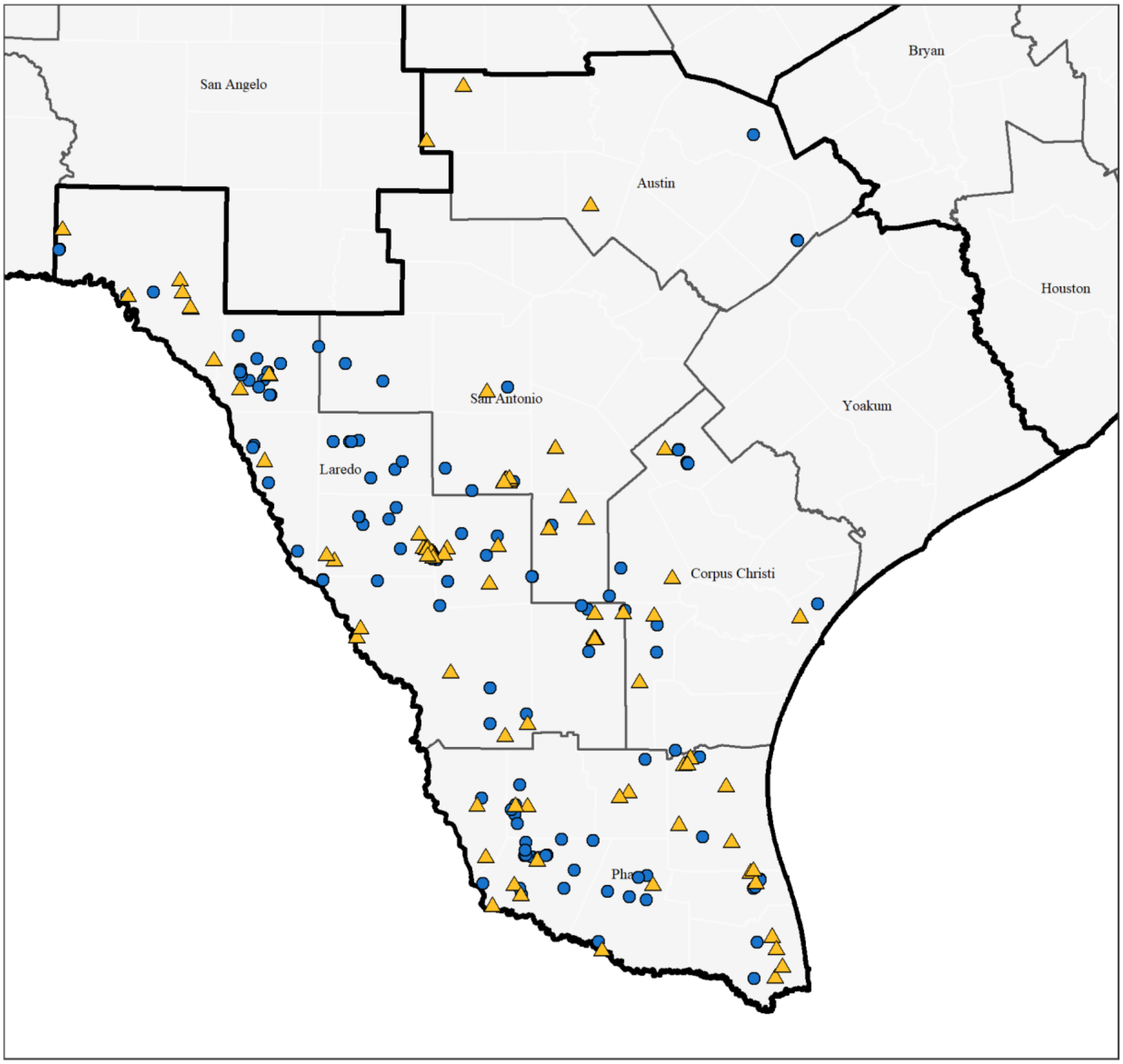
Texas Horned Lizard



Near-Road Points   Off-Road Points

Phrynosoma cornutum

Texas Horned Lizard

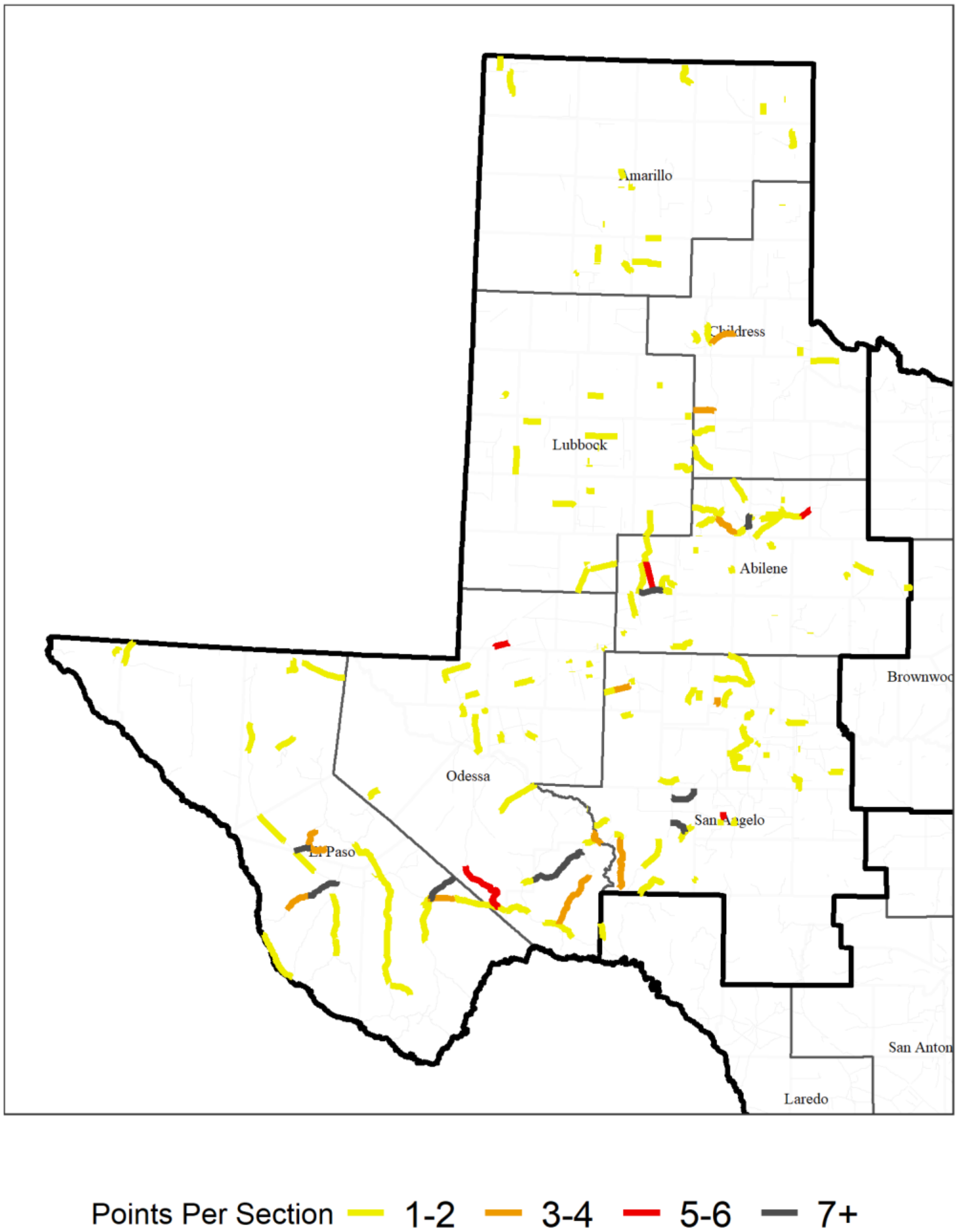


Near-Road Points Off-Road Points

Phrynosoma cornutum

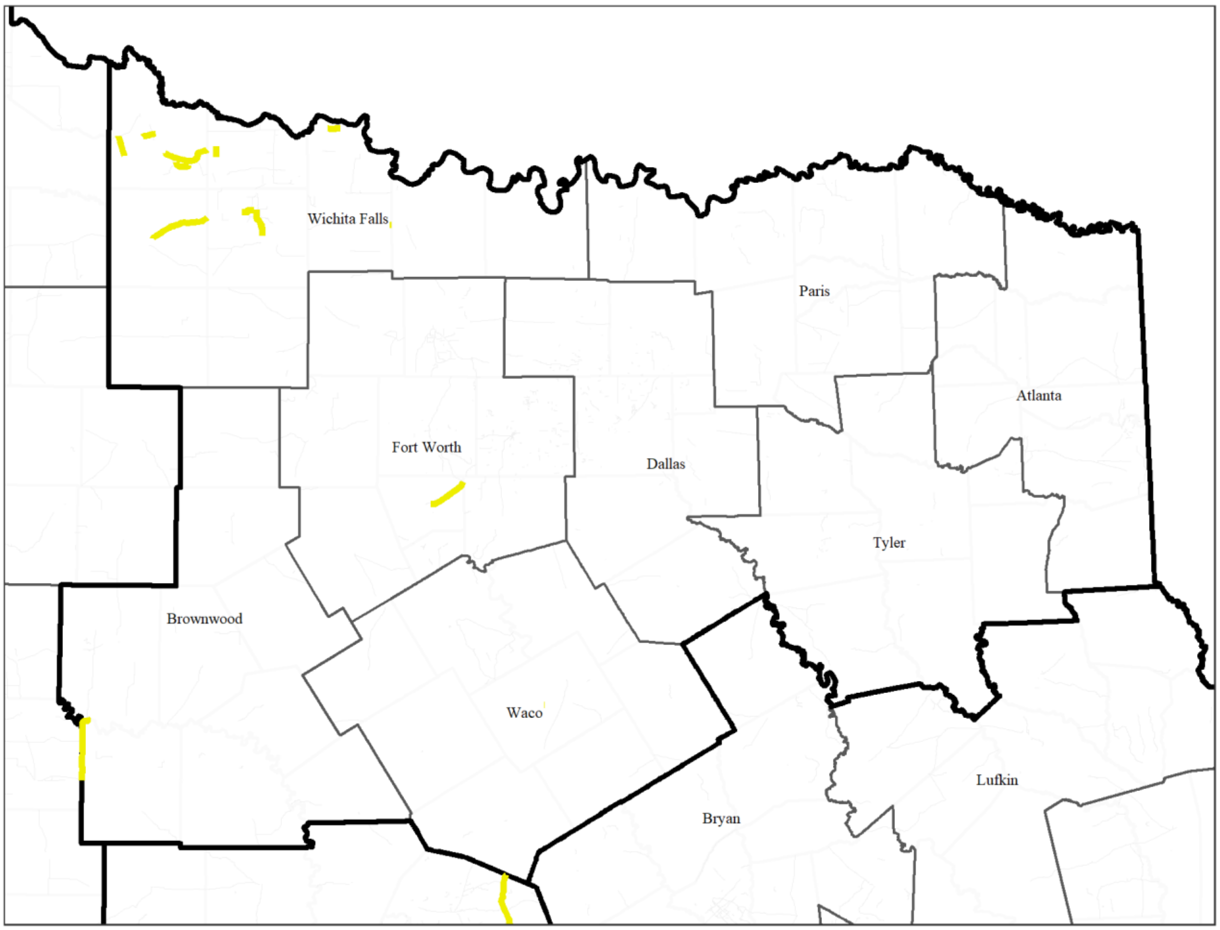
Texas Horned Lizard

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Phrynosoma cornutum

Texas Horned Lizard



Points Per Section 1-2 3-4 5-6 7+

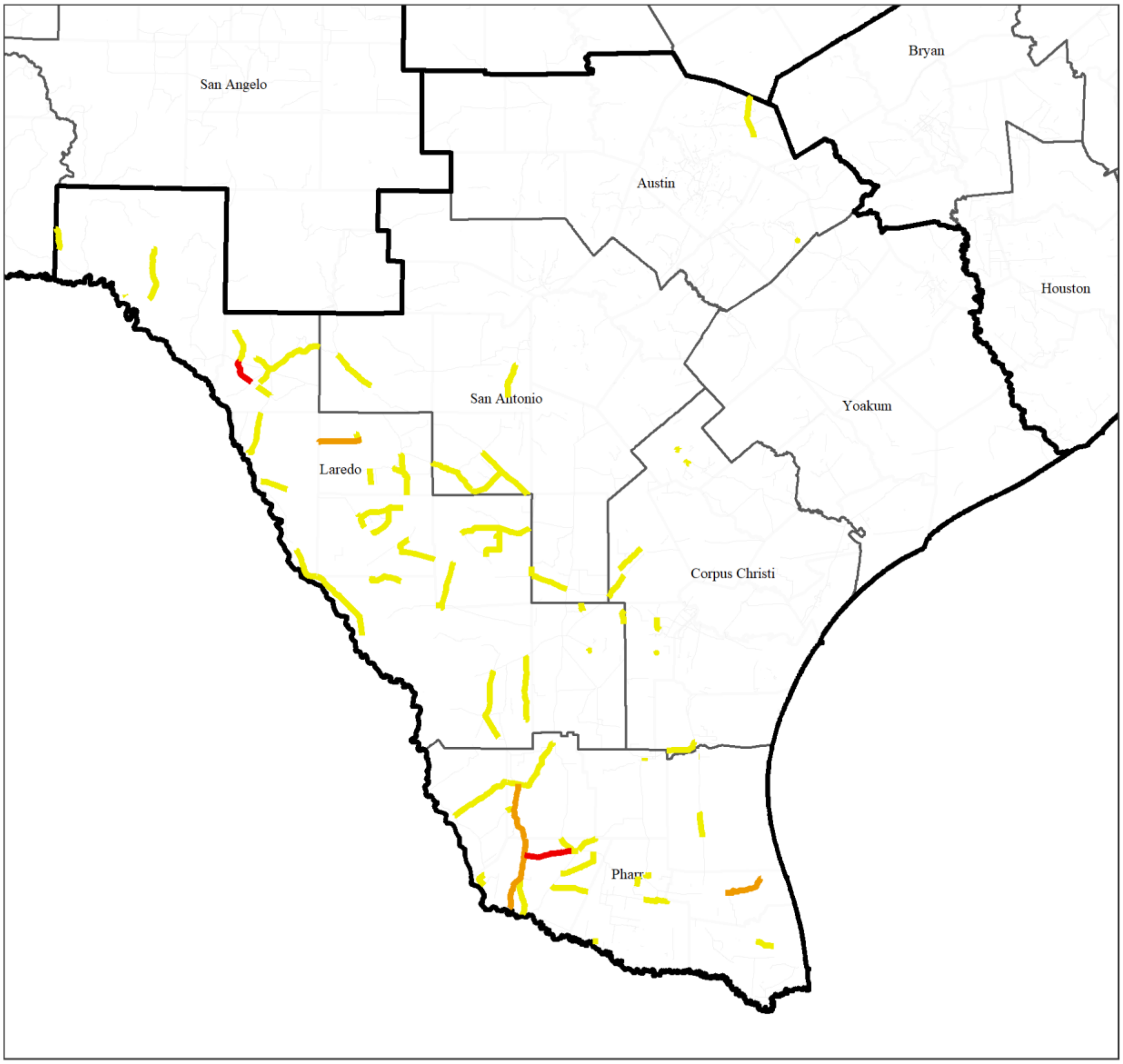
Phrynosoma cornutum

Texas Horned Lizard

Points Per Section 1-2 3-4 5-6 7+

Phrynosoma cornutum

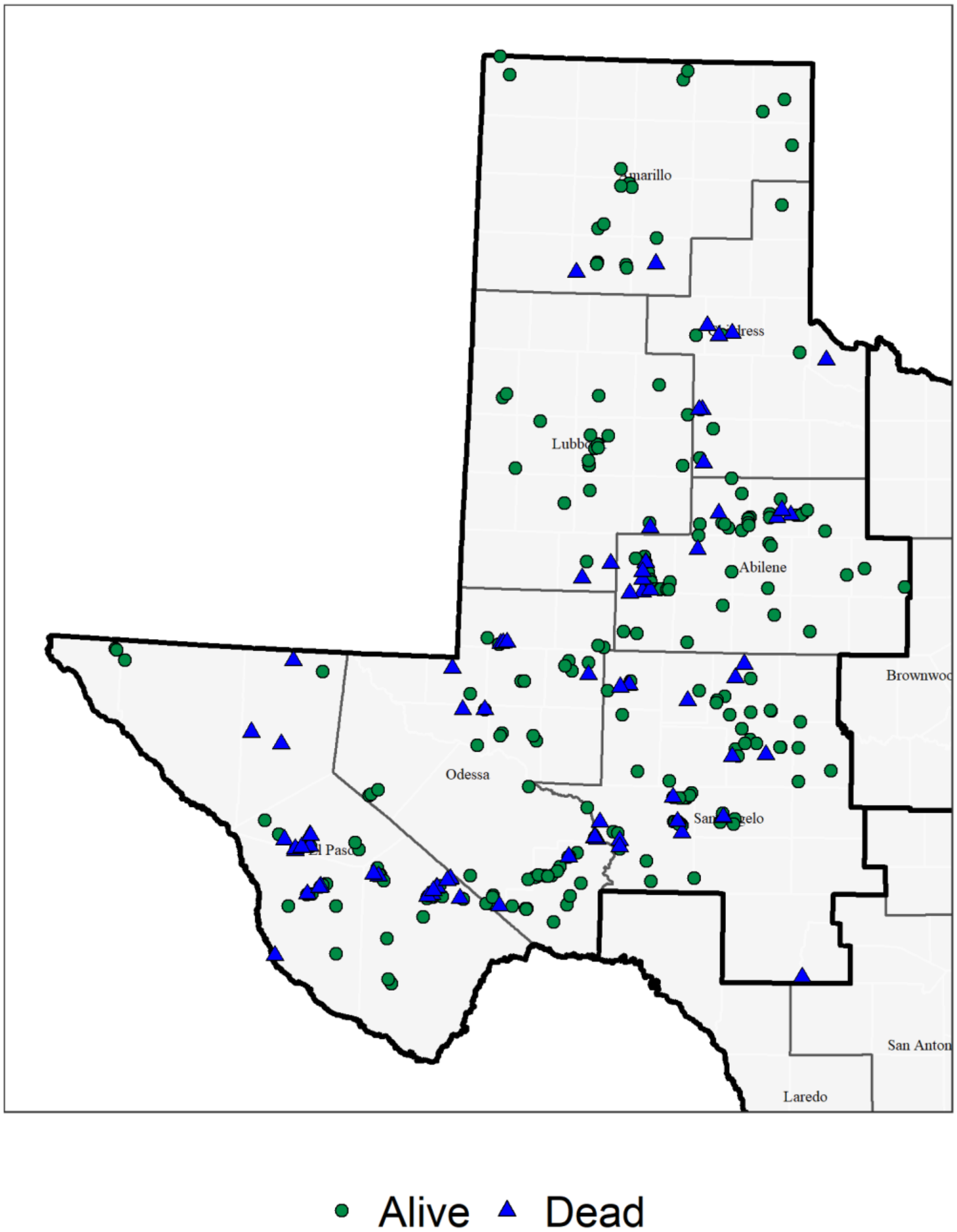
Texas Horned Lizard



Points Per Section 1-2 3-4 5-6 7+

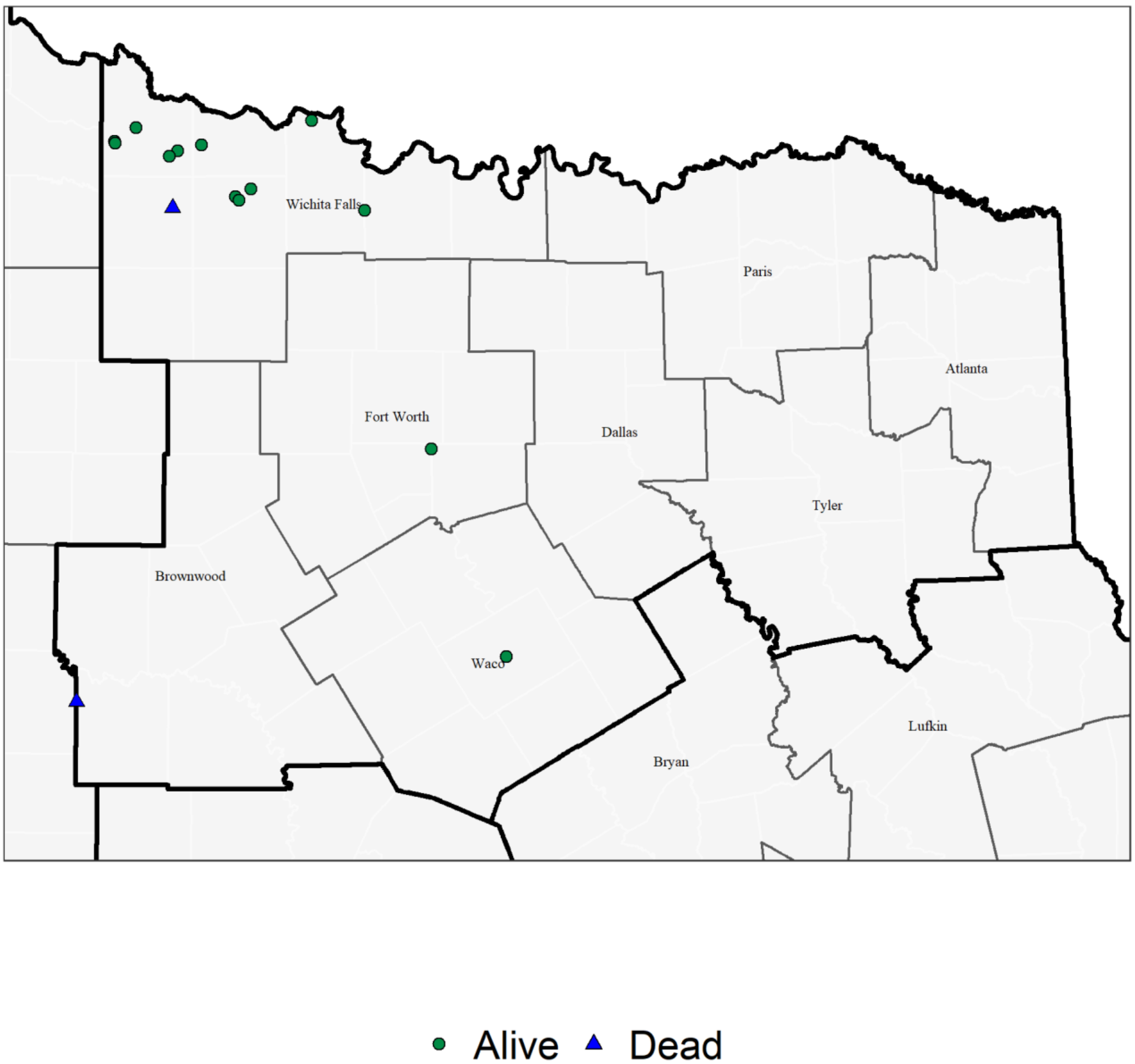
Phrynosoma cornutum

Texas Horned Lizard



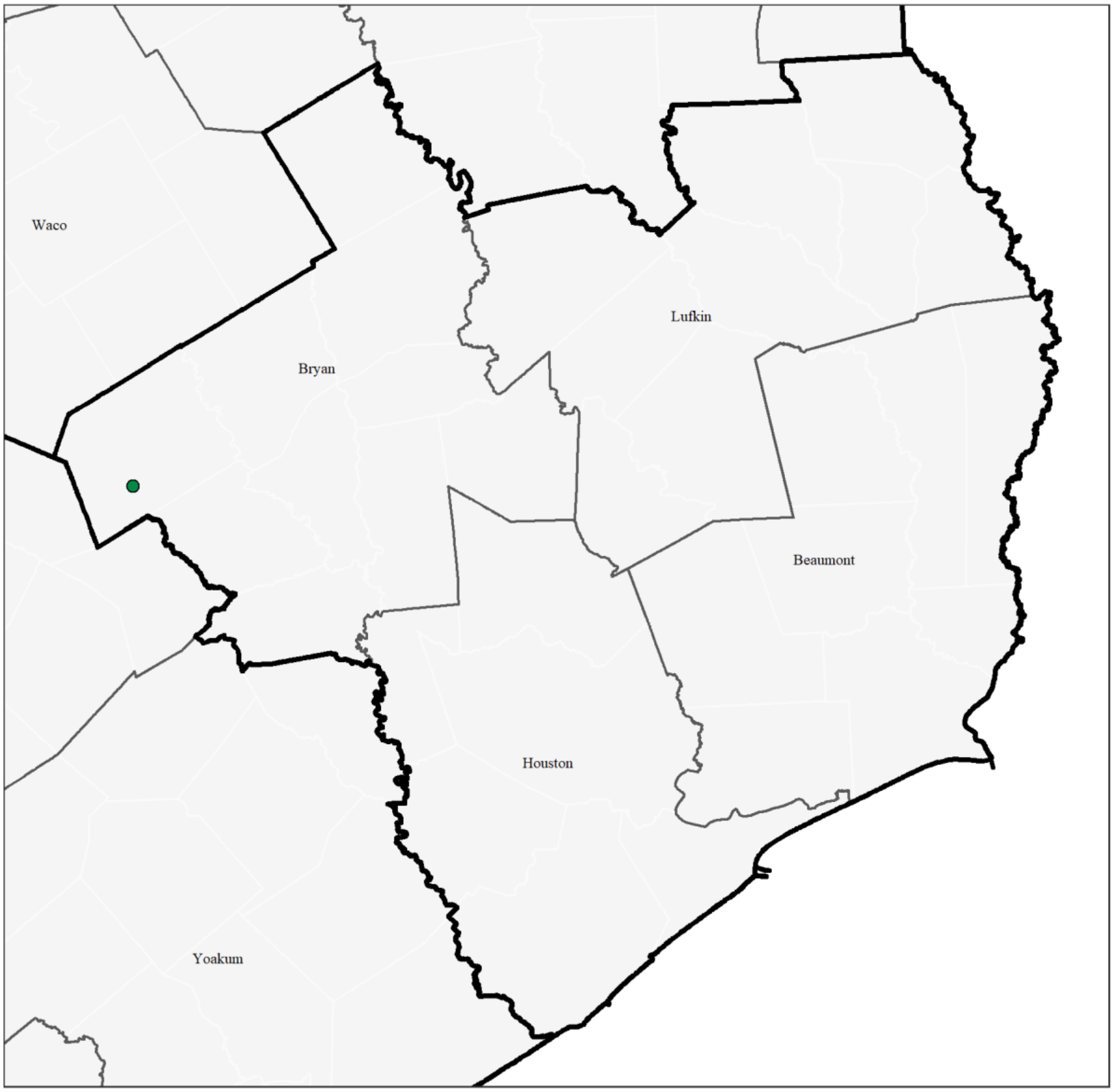
Phrynosoma cornutum

Texas Horned Lizard



Phrynosoma cornutum

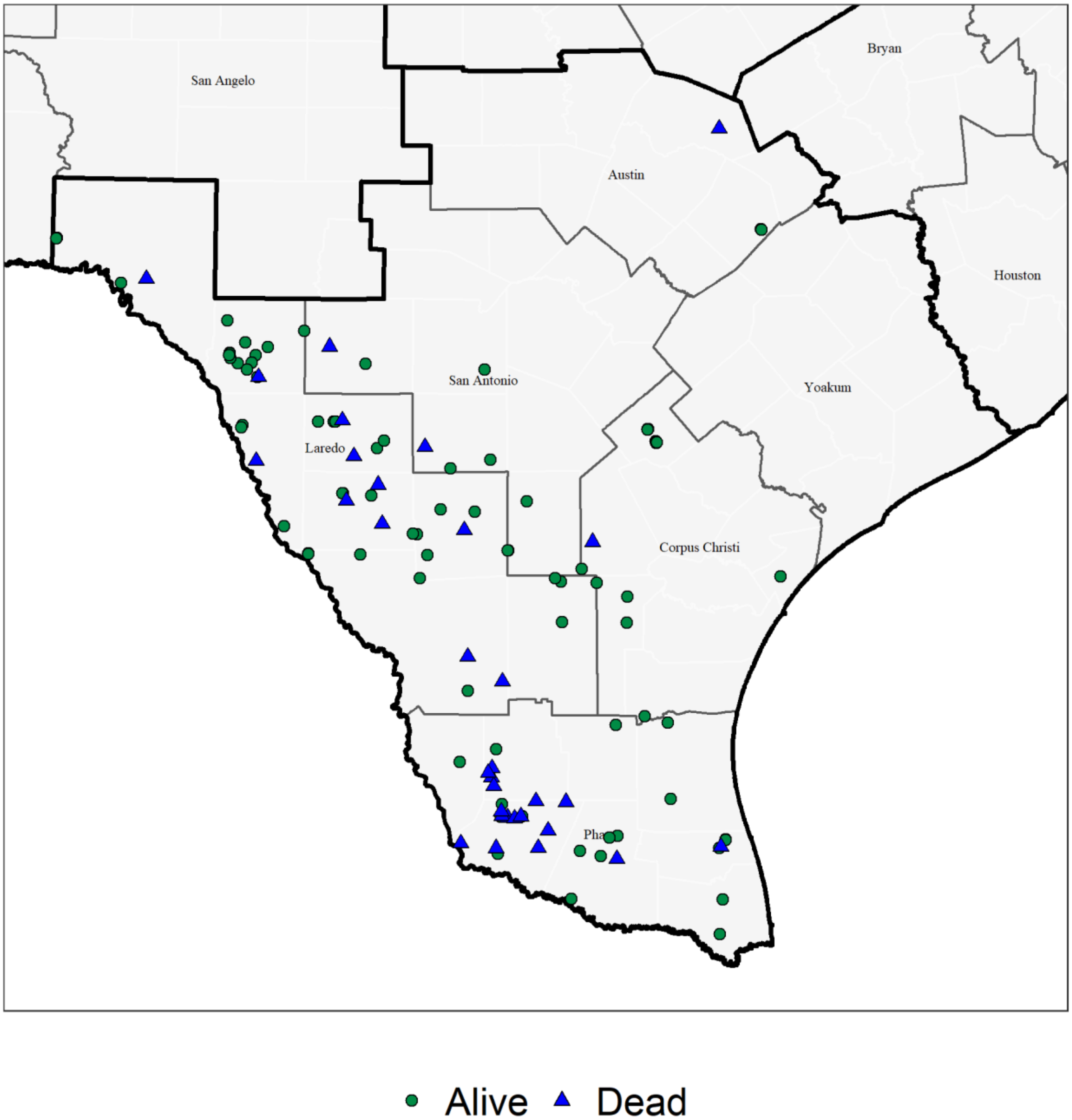
Texas Horned Lizard



● Alive ▲ Dead

Phrynosoma cornutum

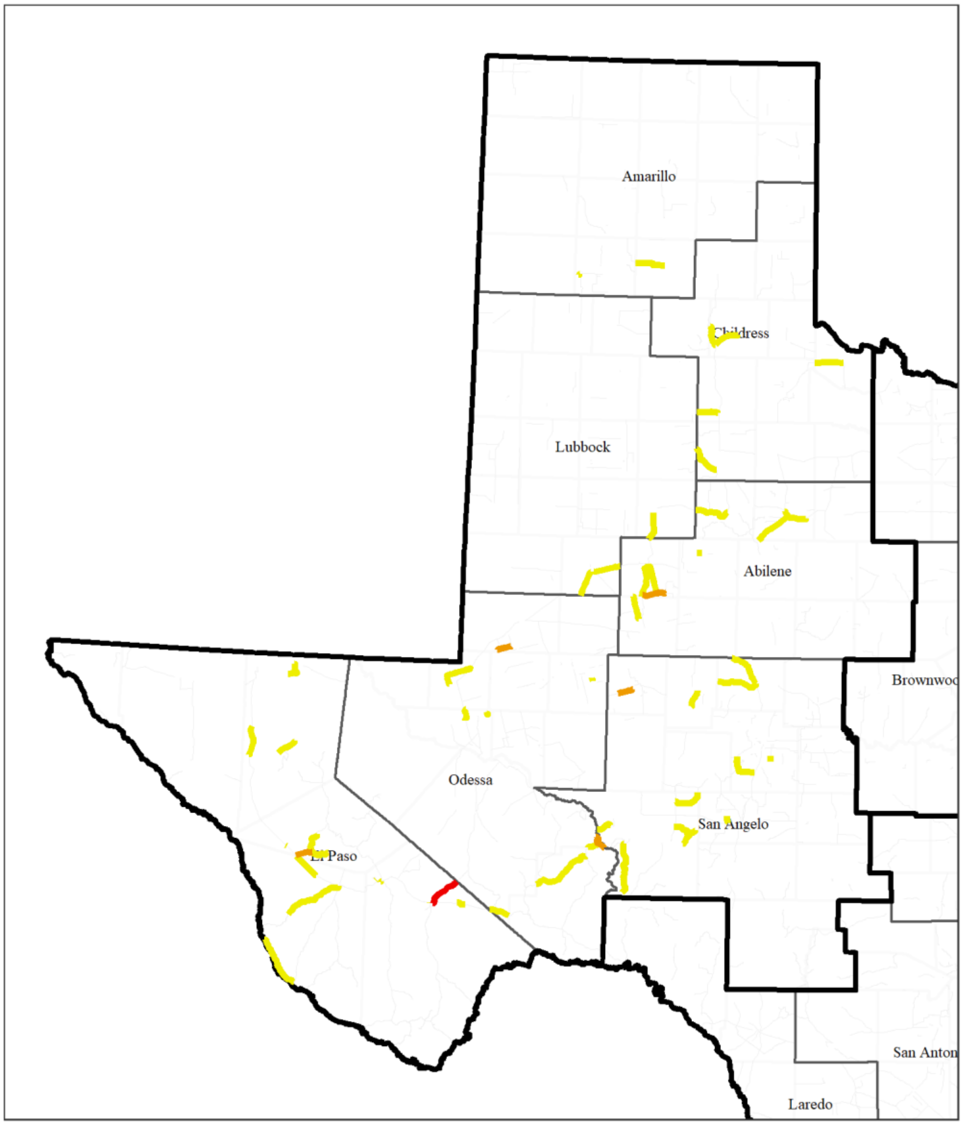
Texas Horned Lizard



Phrynosoma cornutum

Texas Horned Lizard

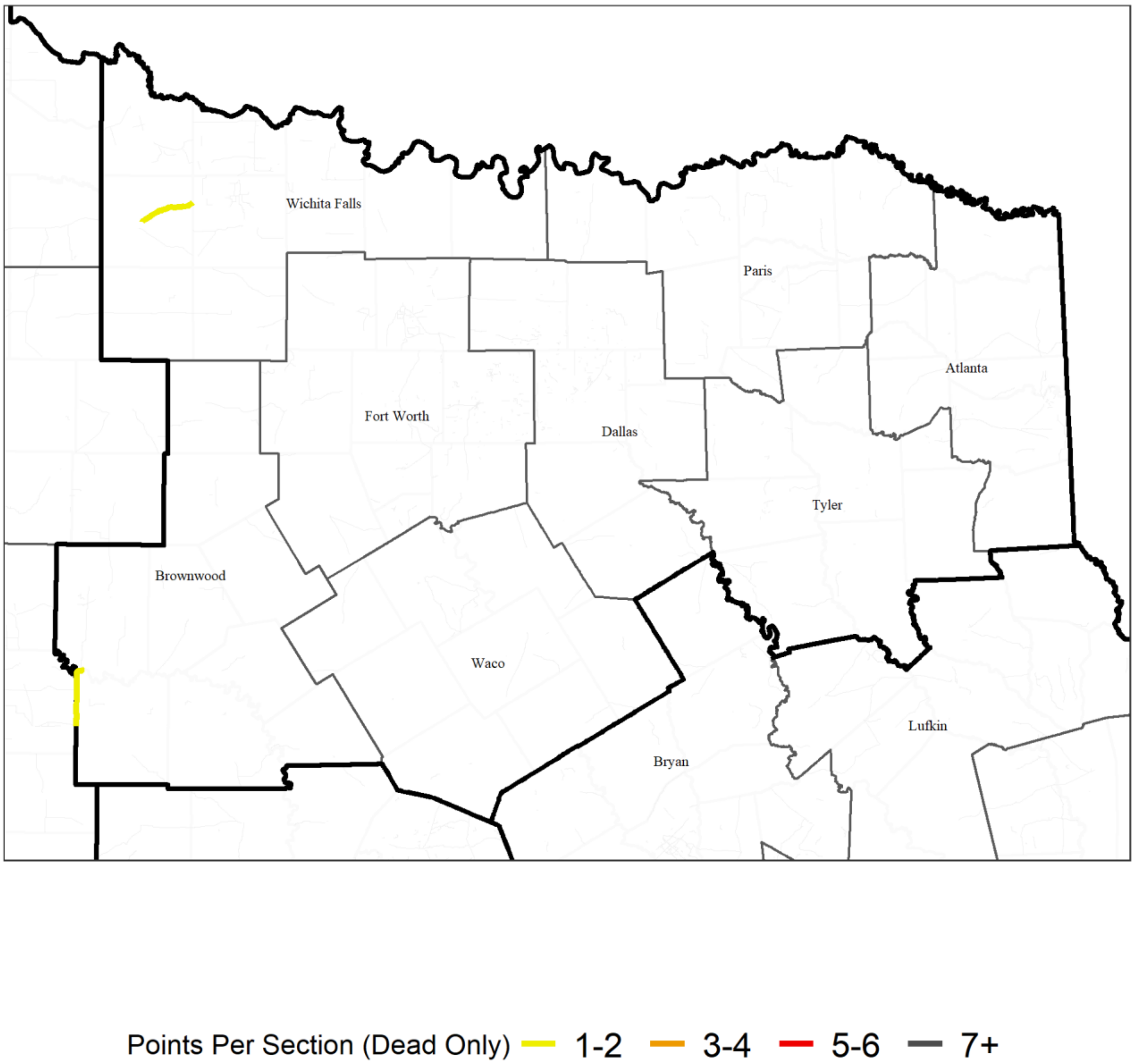
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

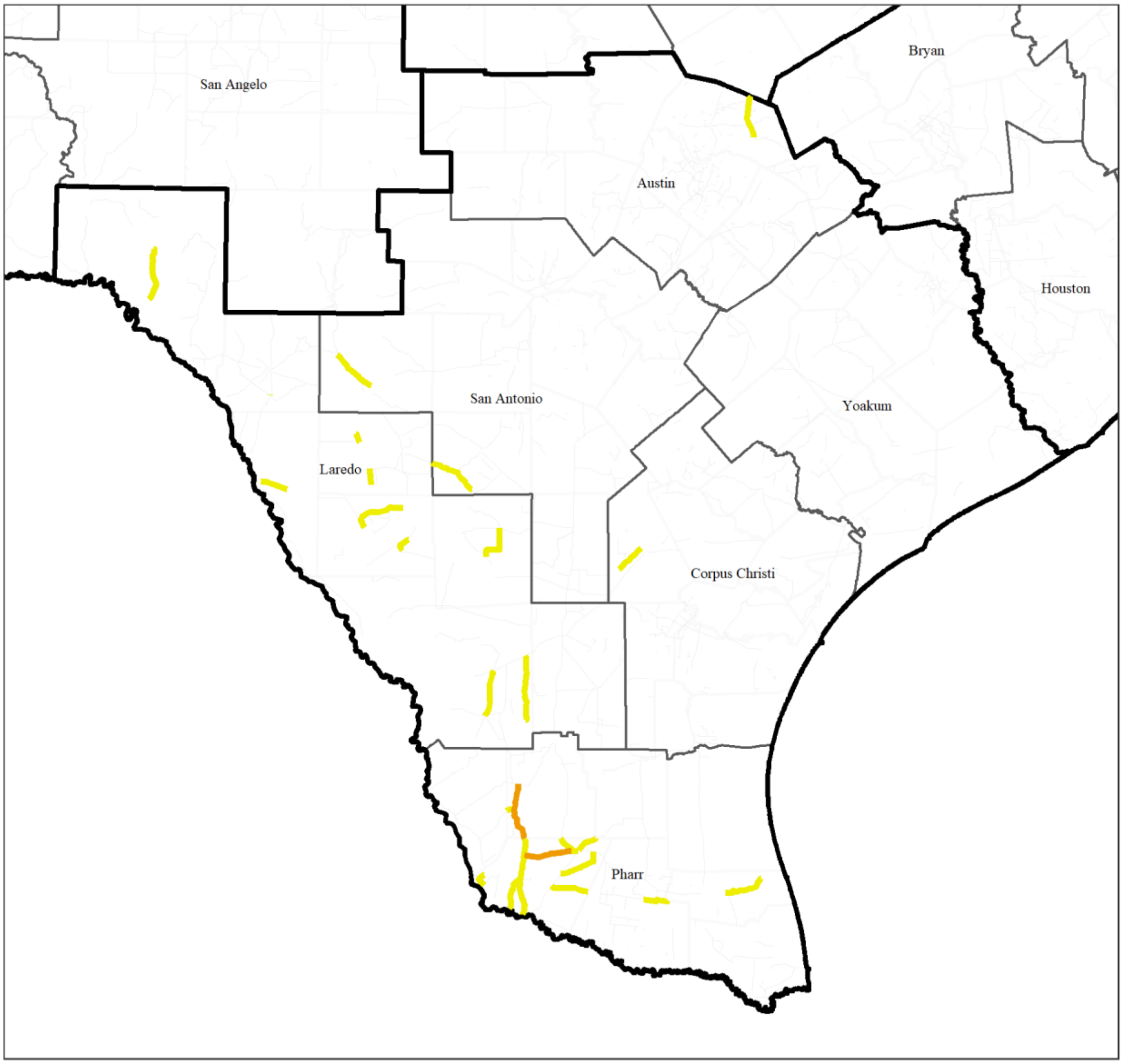
Phrynosoma cornutum

Texas Horned Lizard



Phrynosoma cornutum

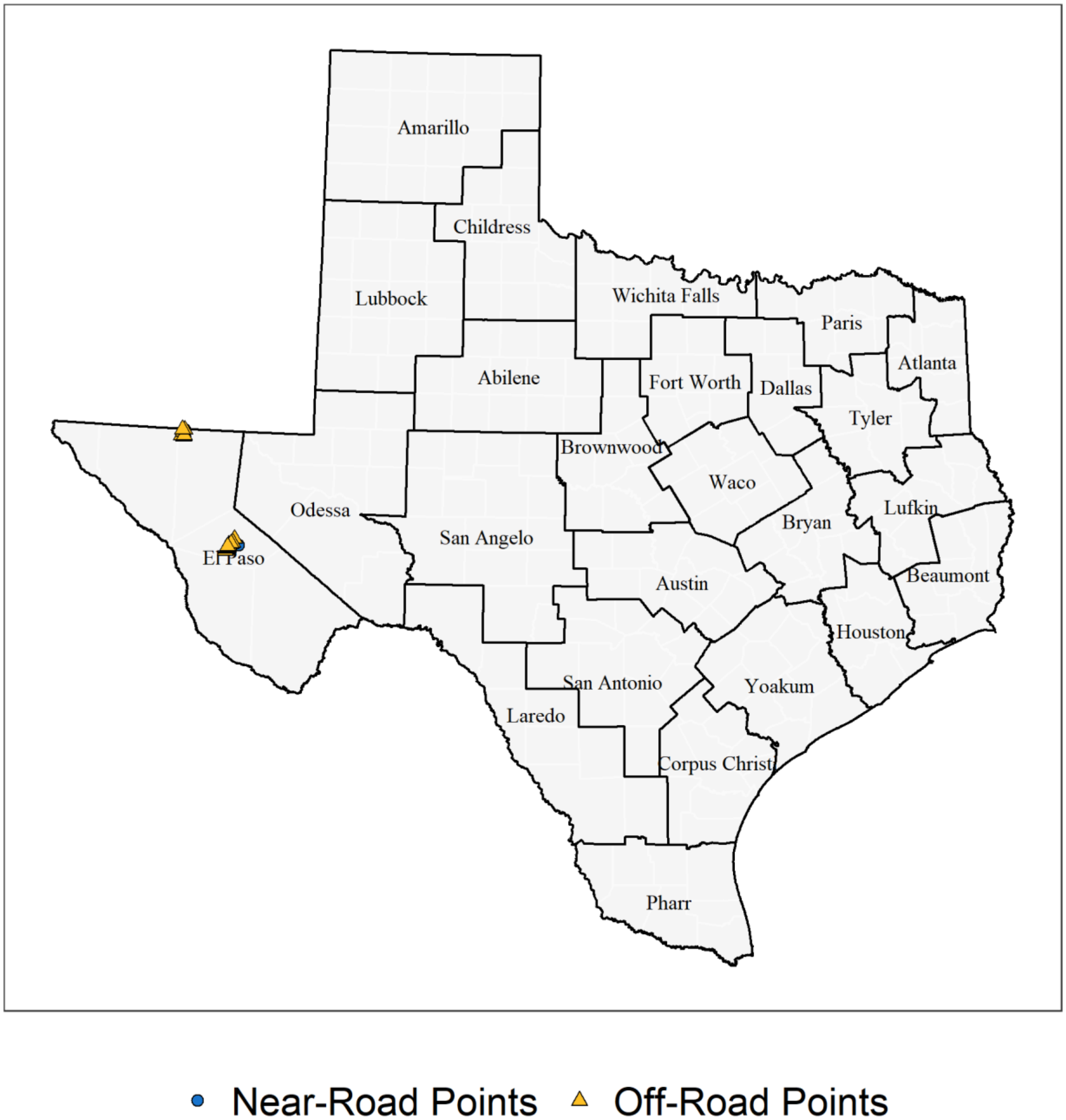
Texas Horned Lizard



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

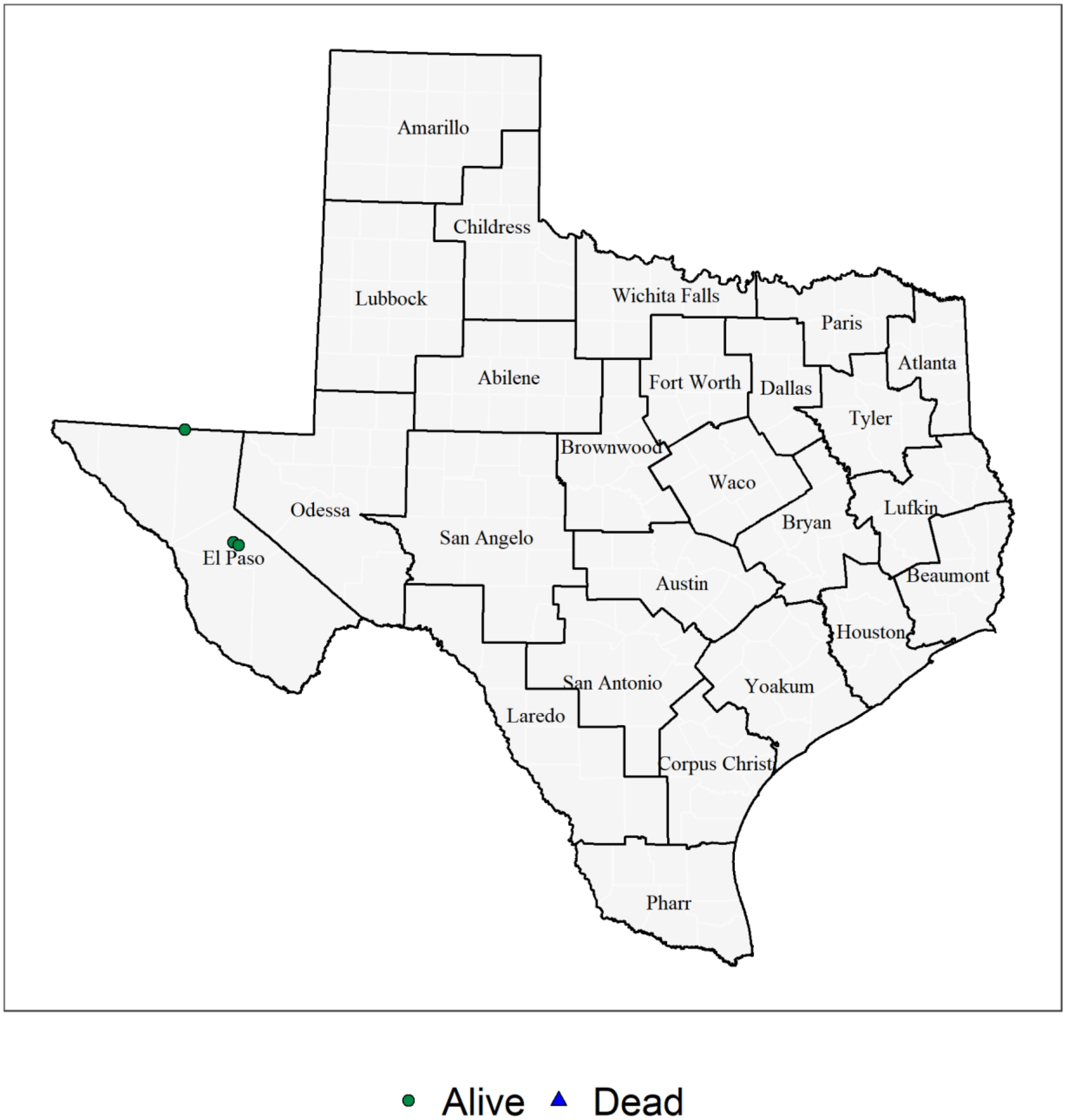
Phrynosoma hernandesi

Greater Short-horned Lizard



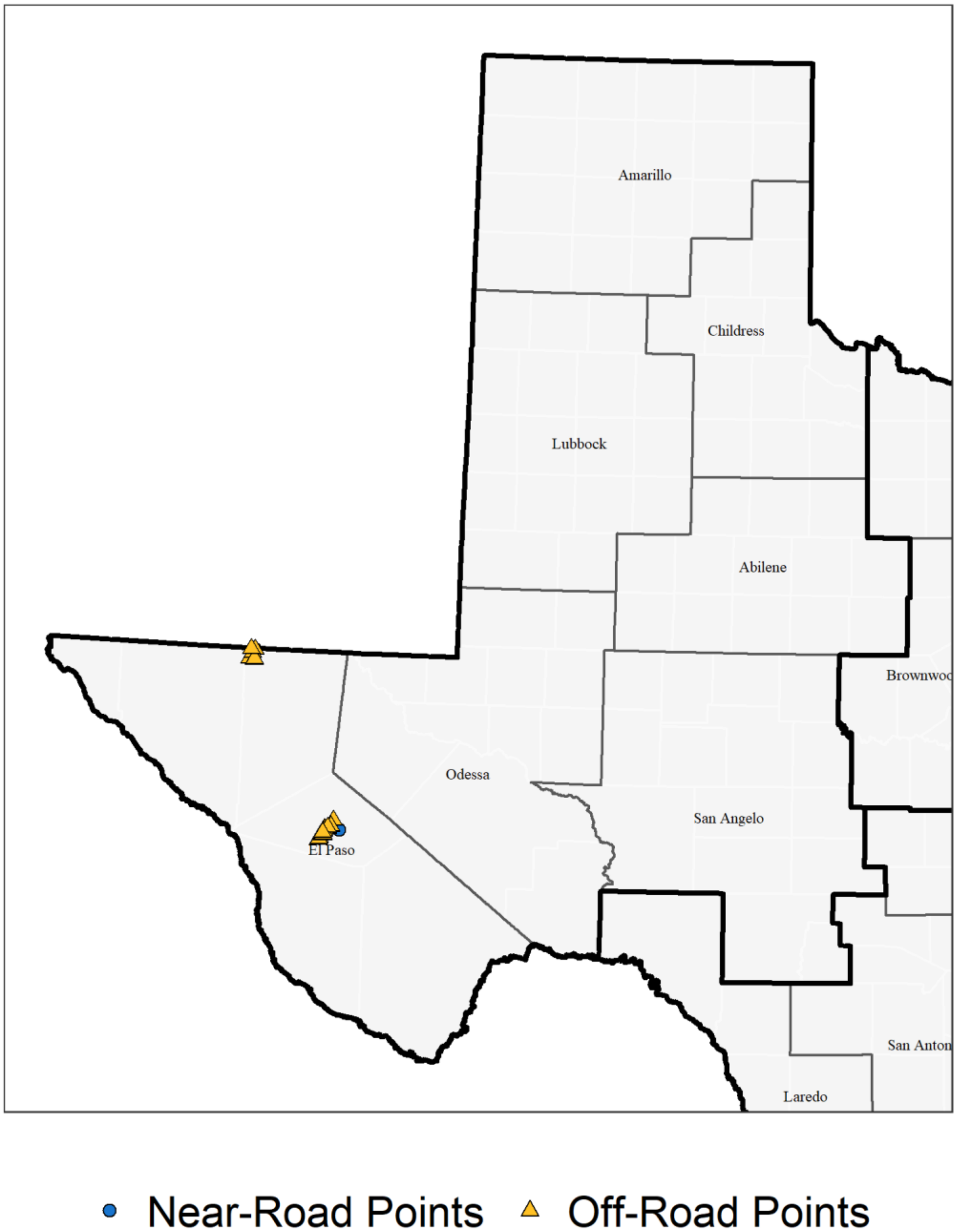
Phrynosoma hernandesi

Greater Short-horned Lizard



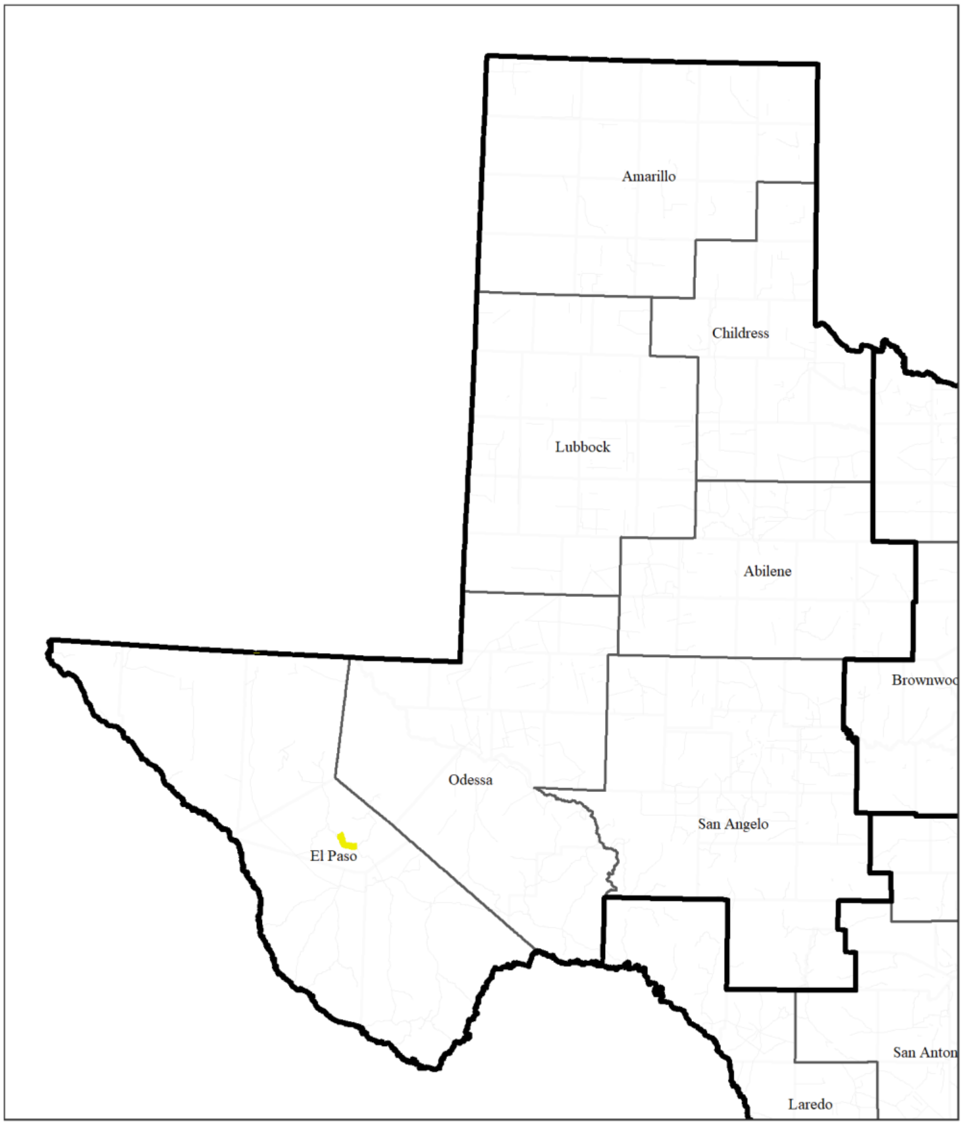
Phrynosoma hernandesi

Greater Short-horned Lizard



Phrynosoma hernandesi

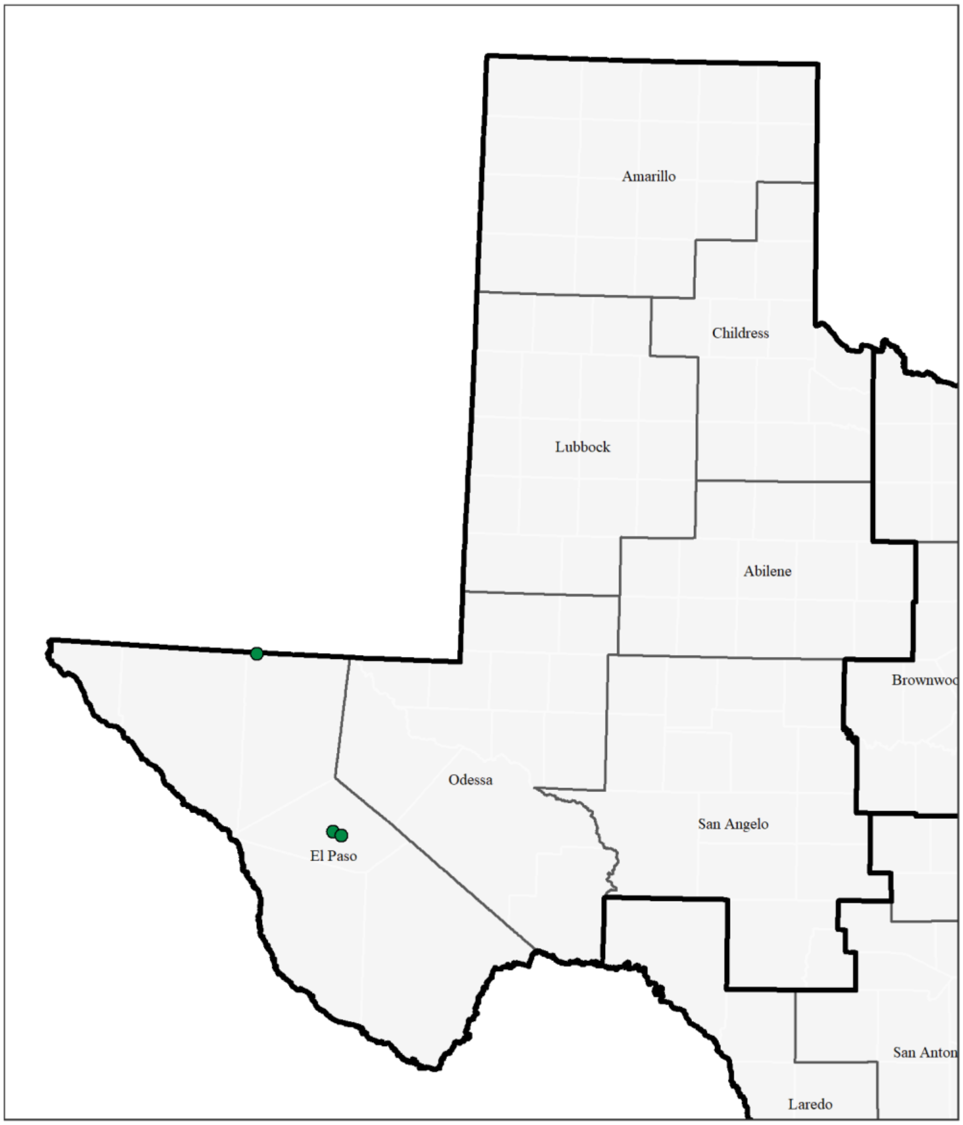
Greater Short-horned Lizard



Points Per Section 1-2 3-4 5-6 7+

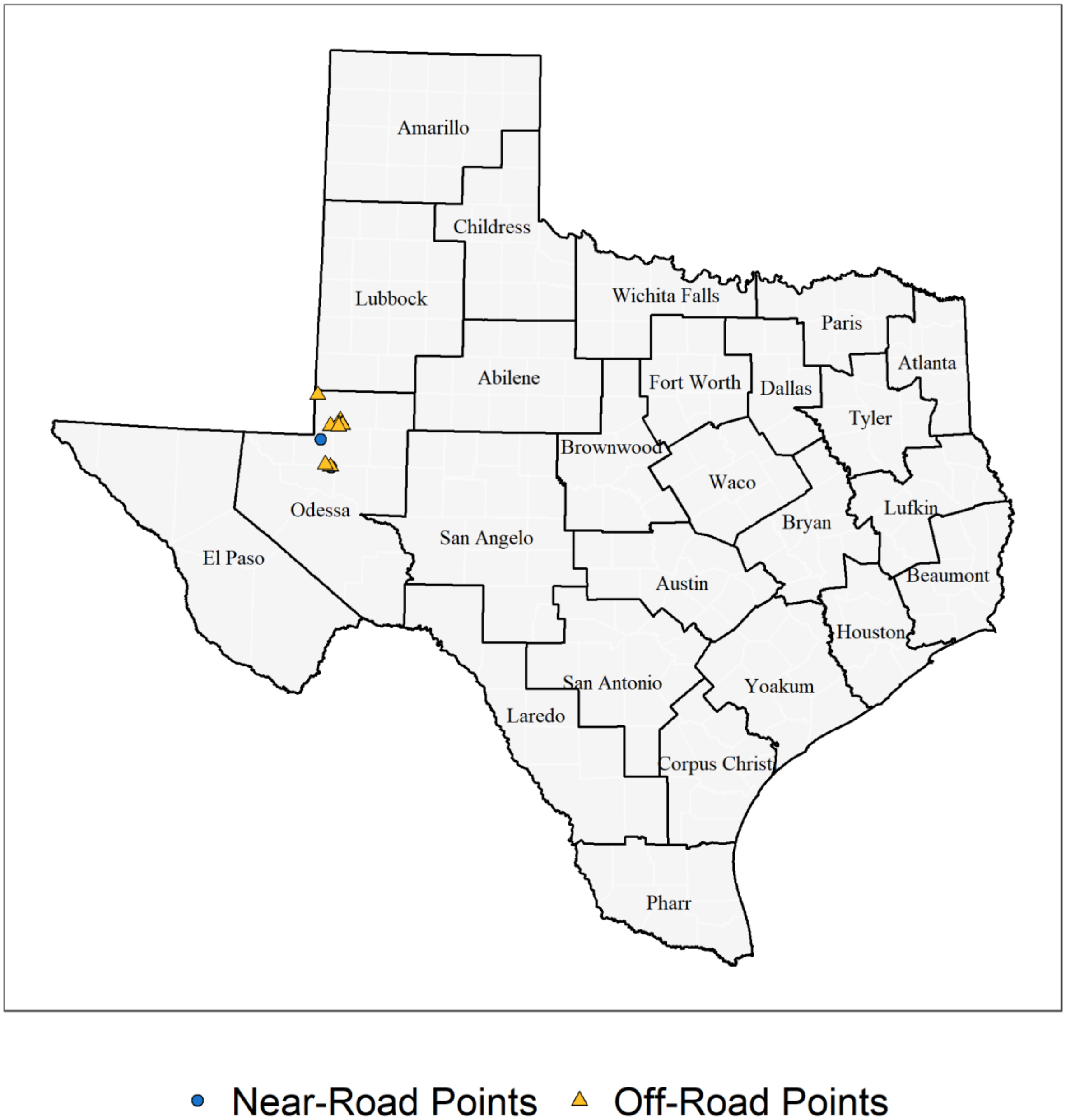
Phrynosoma hernandesi

Greater Short-horned Lizard



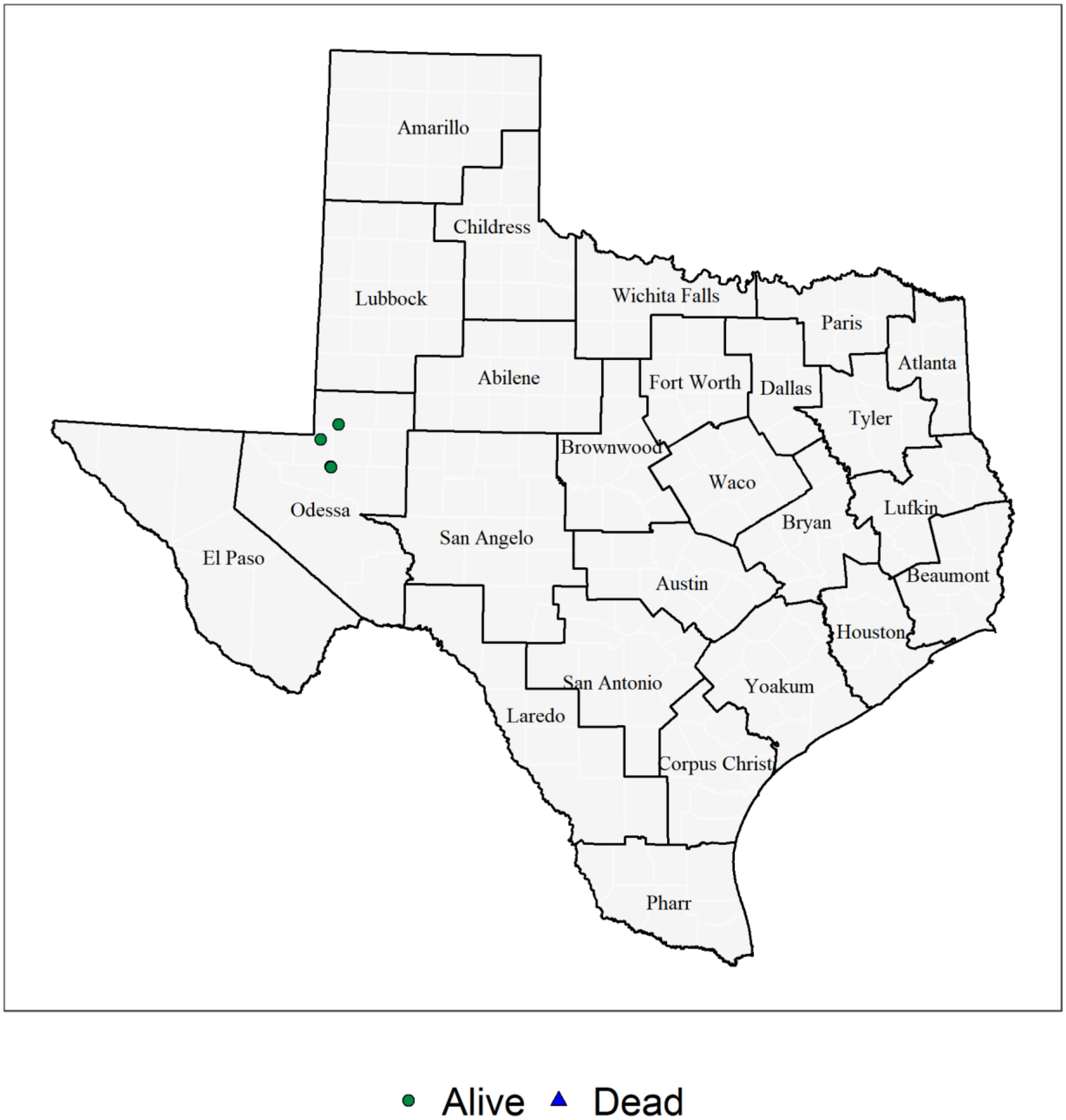
• Alive ▲ Dead

Sceloporus arenicolus
Dunes Sagebrush Lizard



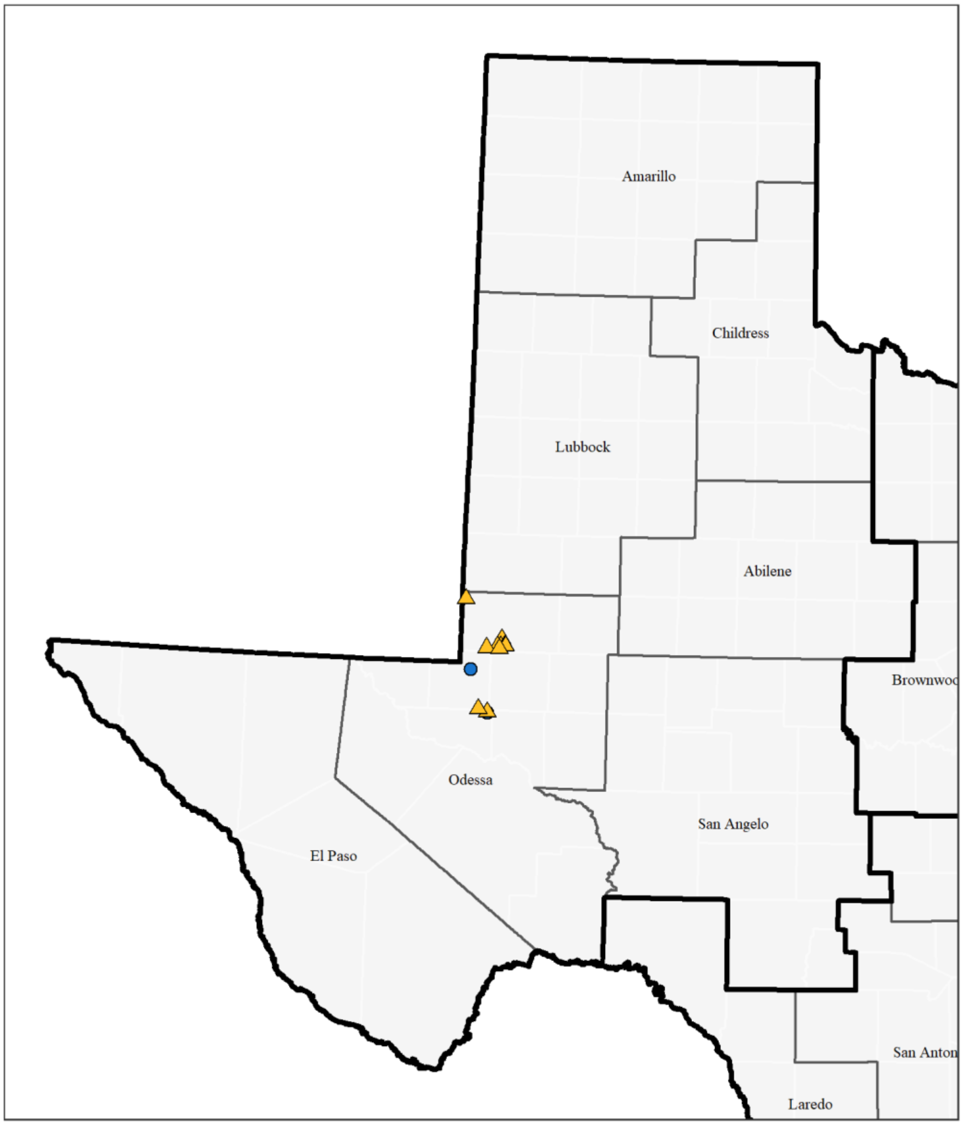
Sceloporus arenicolus

Dunes Sagebrush Lizard



Sceloporus arenicolus

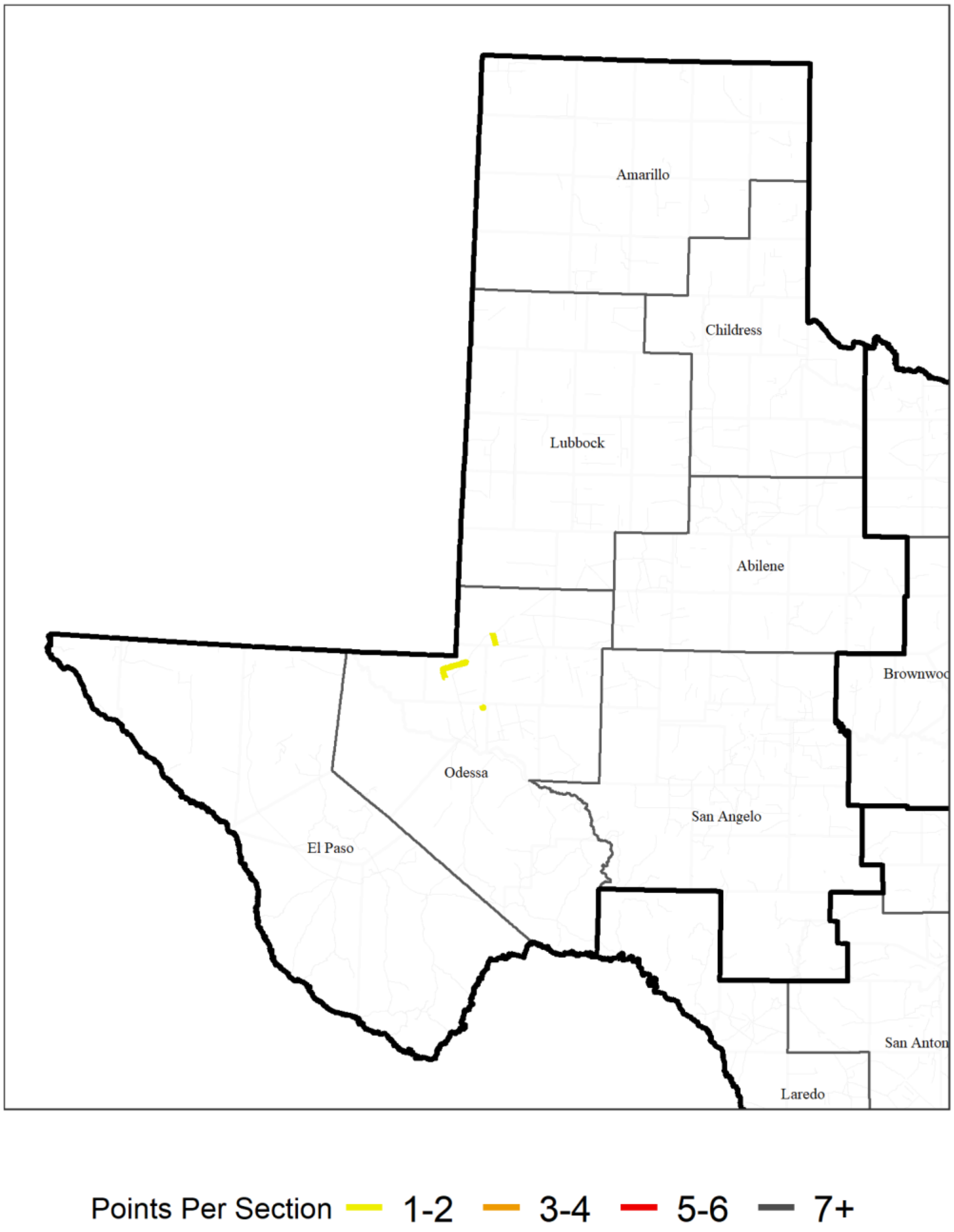
Dunes Sagebrush Lizard



Near-Road Points   Off-Road Points

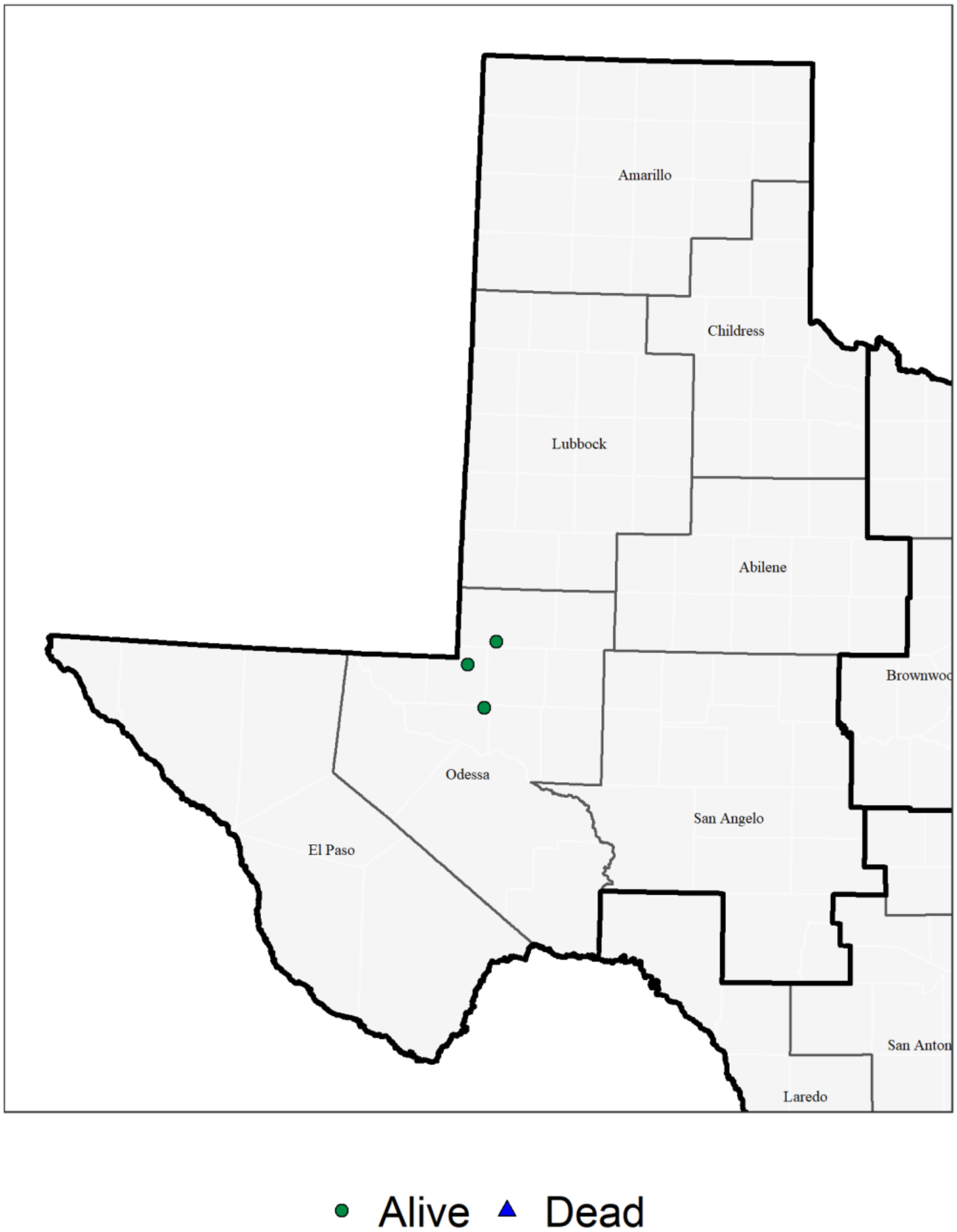
Sceloporus arenicolus

Dunes Sagebrush Lizard

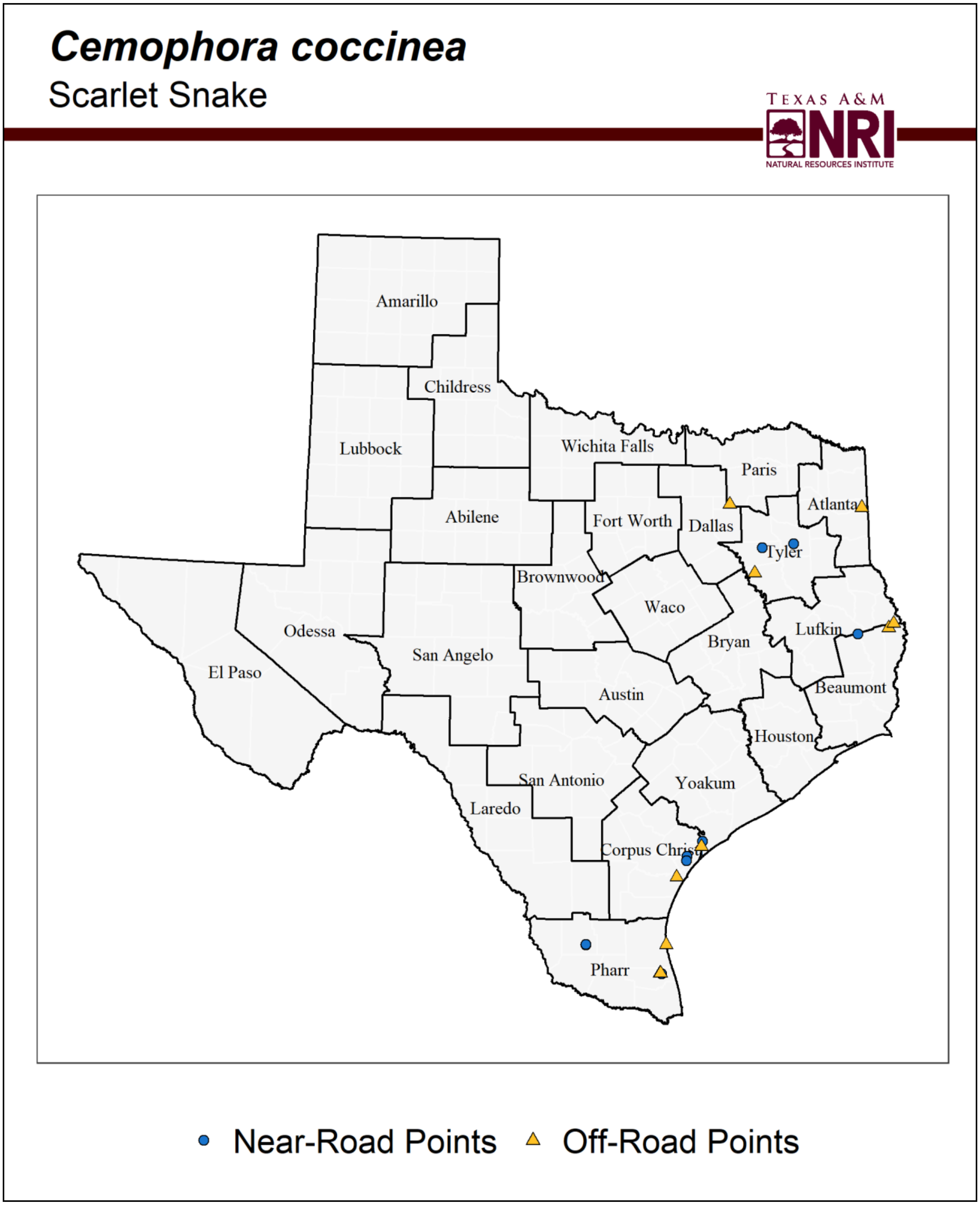


Sceloporus arenicolus

Dunes Sagebrush Lizard

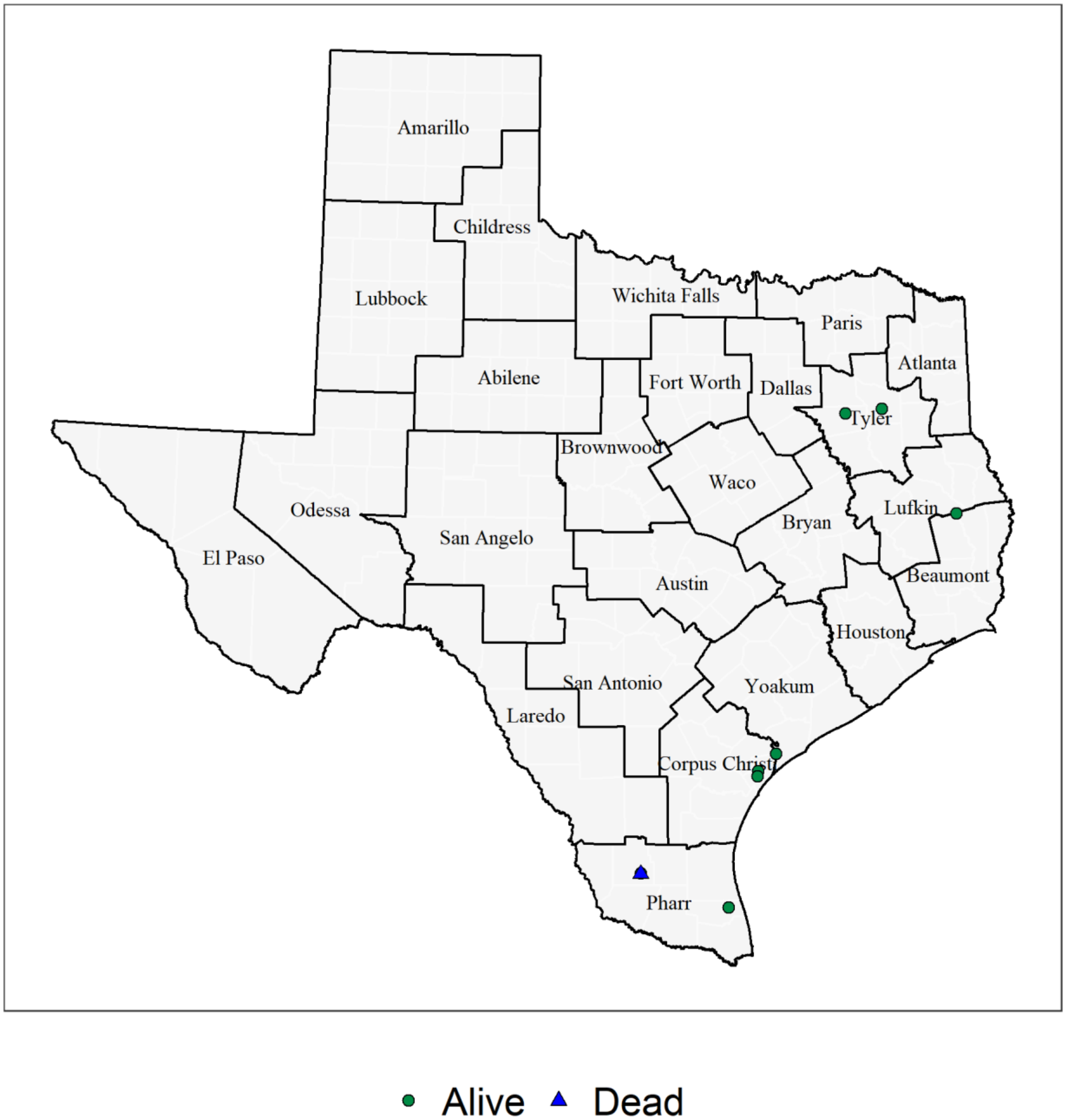


A4. Reptiles – Snakes



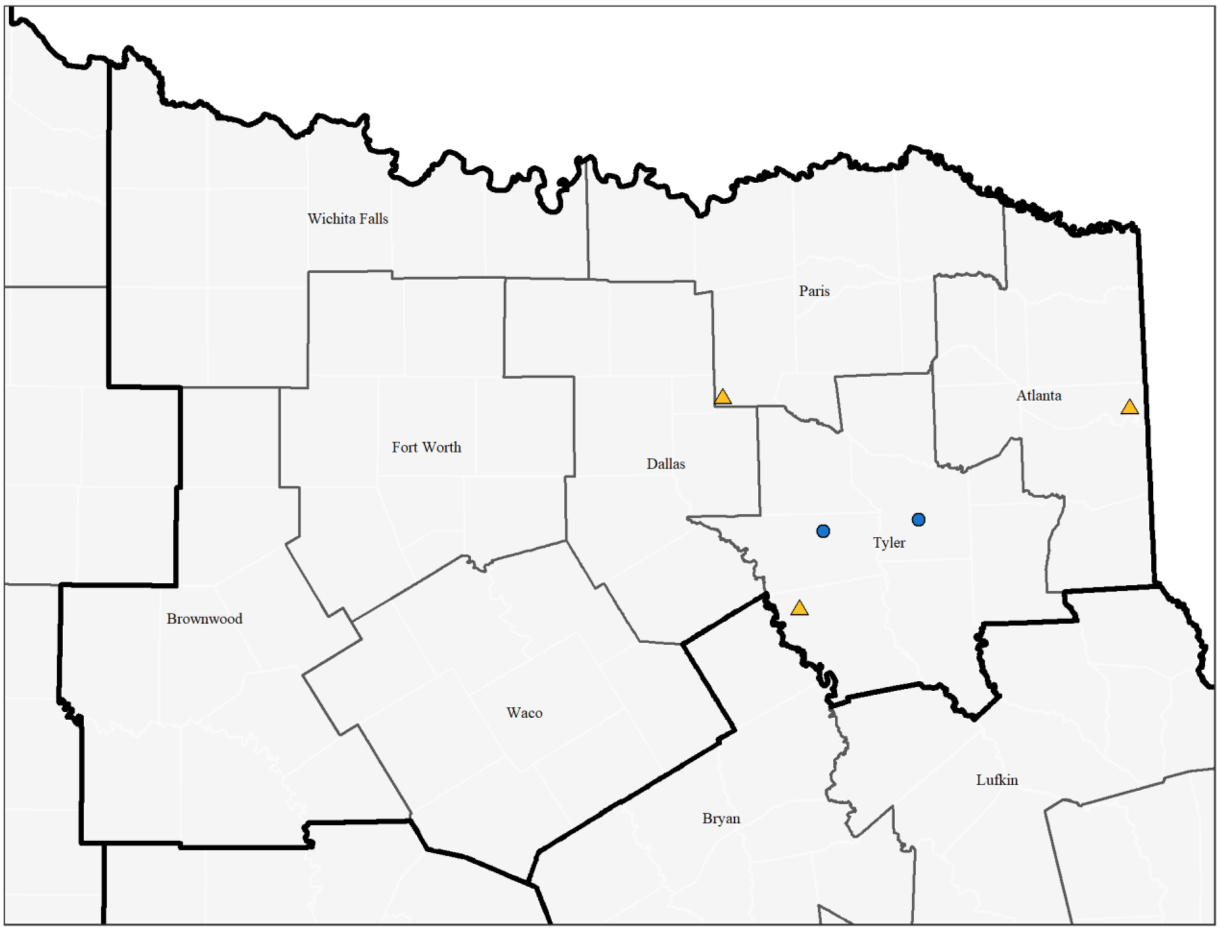
Cemophora coccinea

Scarlet Snake



Cemophora coccinea

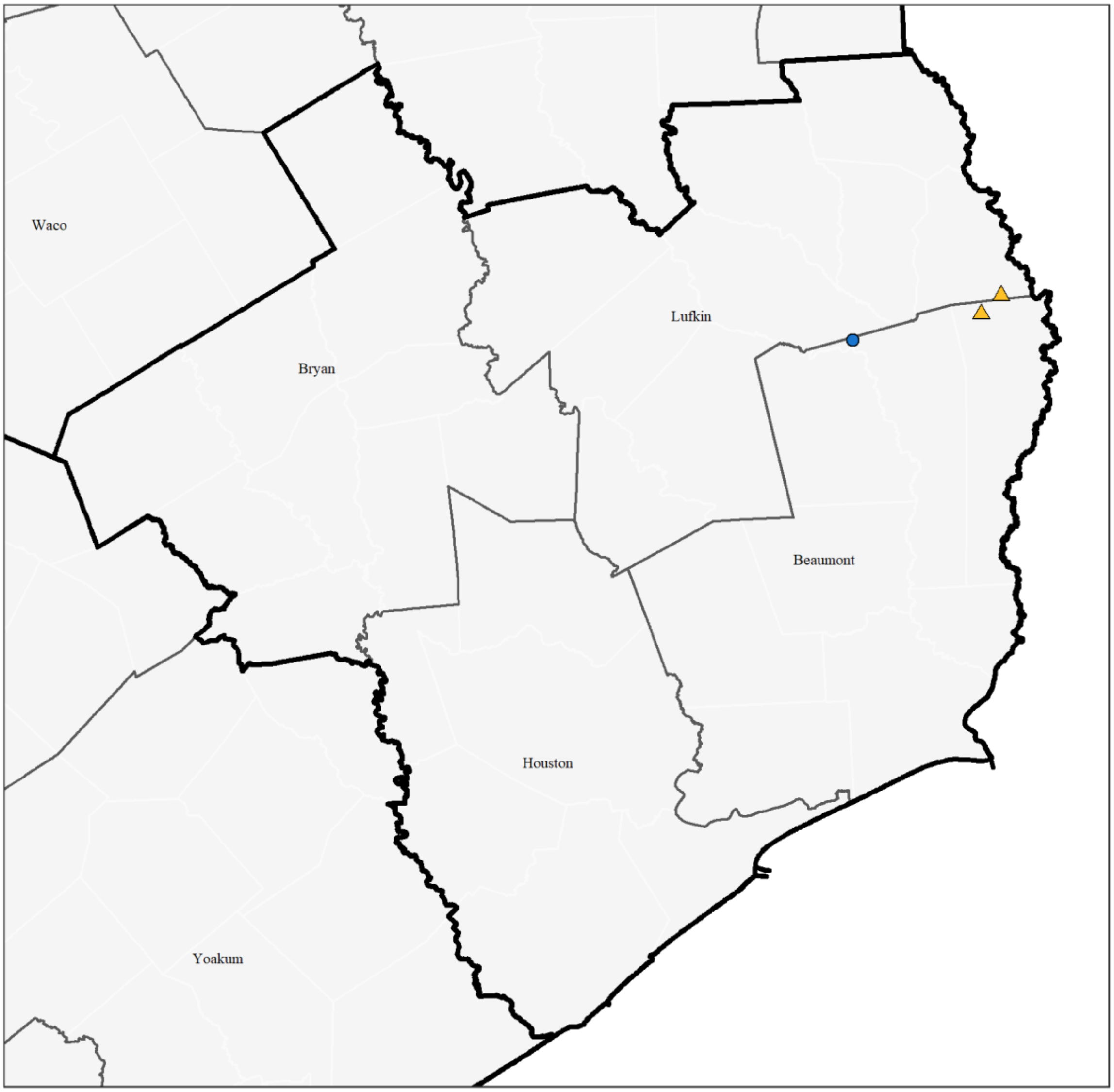
Scarlet Snake



• Near-Road Points △ Off-Road Points

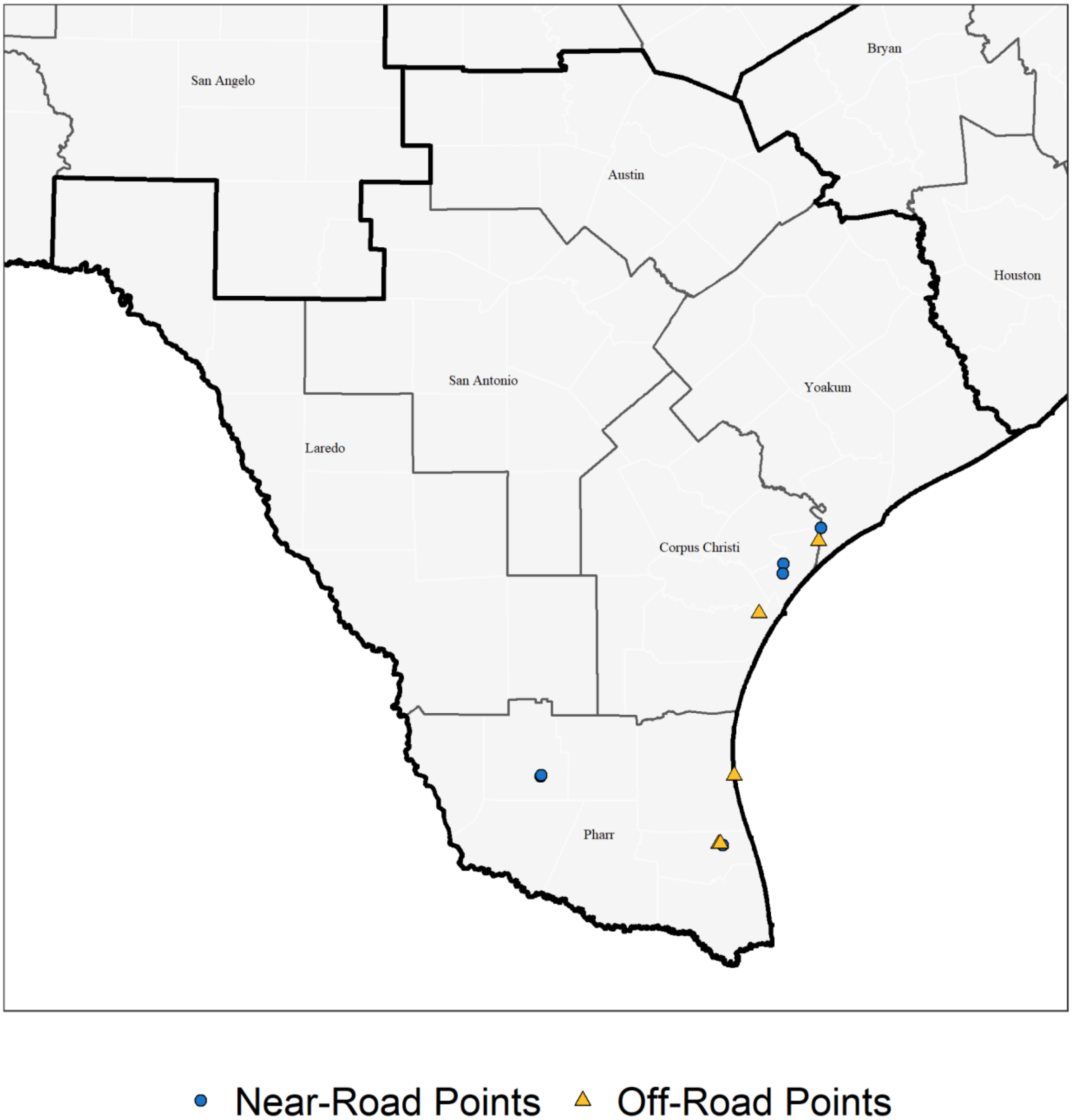
Cemophora coccinea

Scarlet Snake



Near-Road Points Off-Road Points

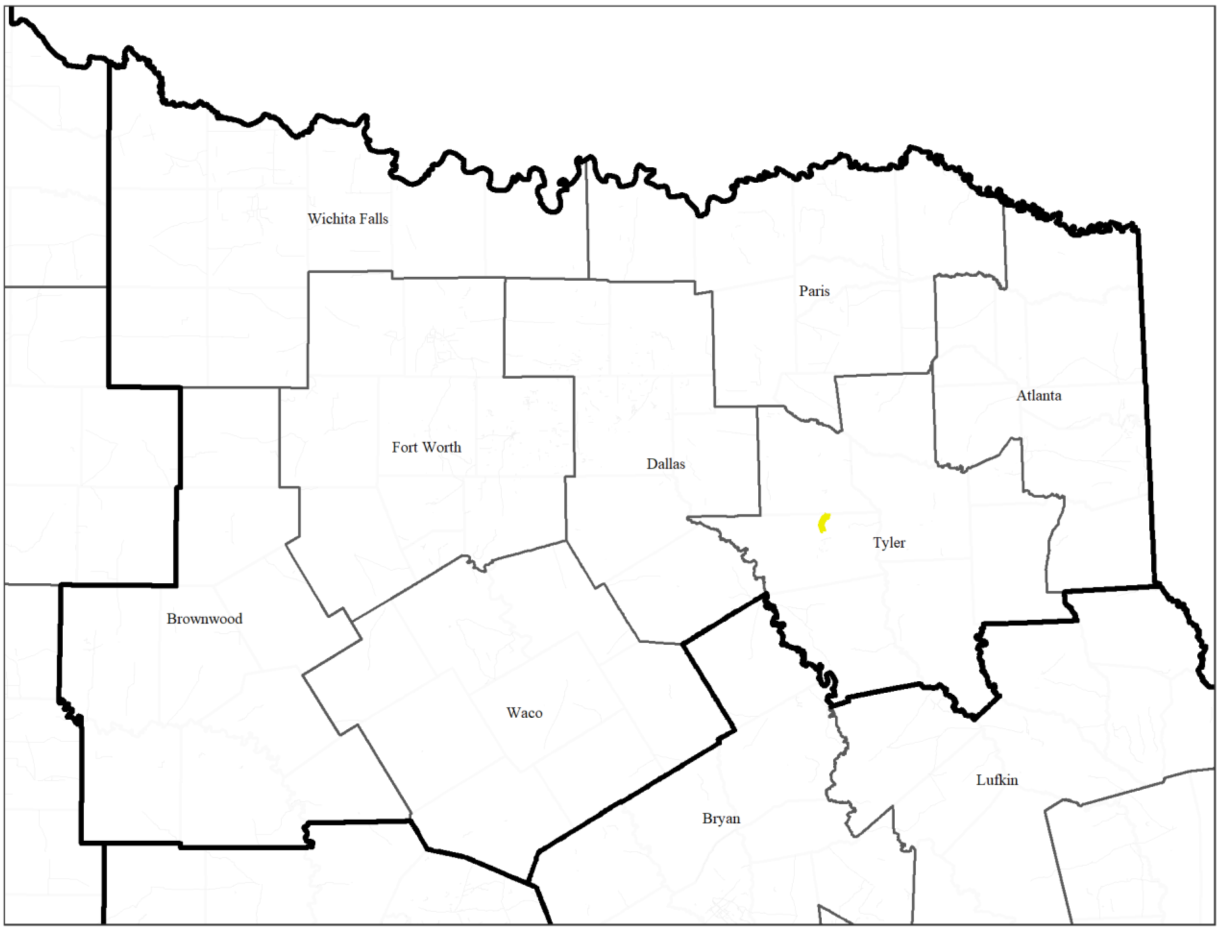
Cemophora coccinea
Scarlet Snake



Cemophora coccinea

Scarlet Snake

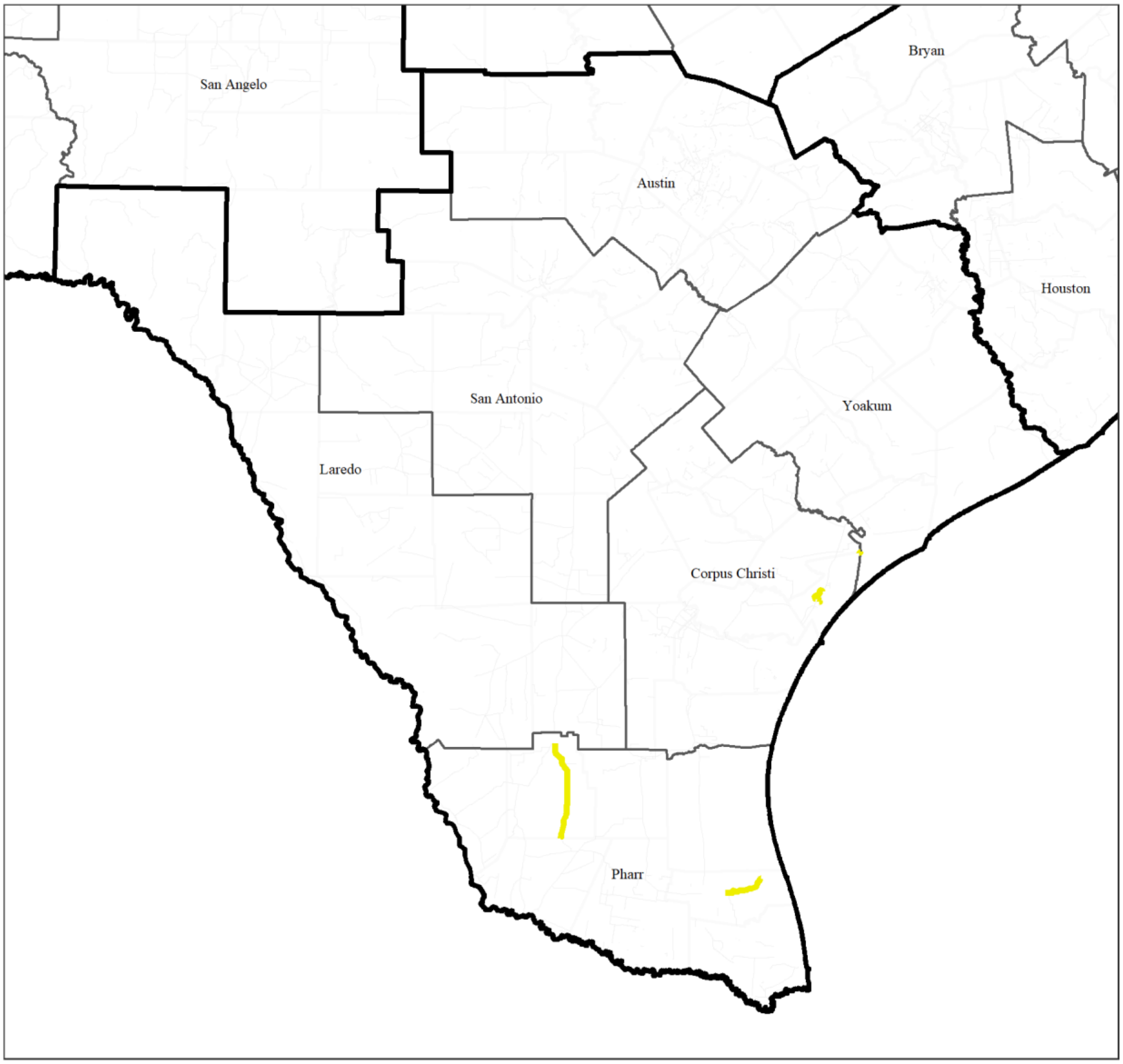
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section 1-2 3-4 5-6 7+

Cemophora coccinea

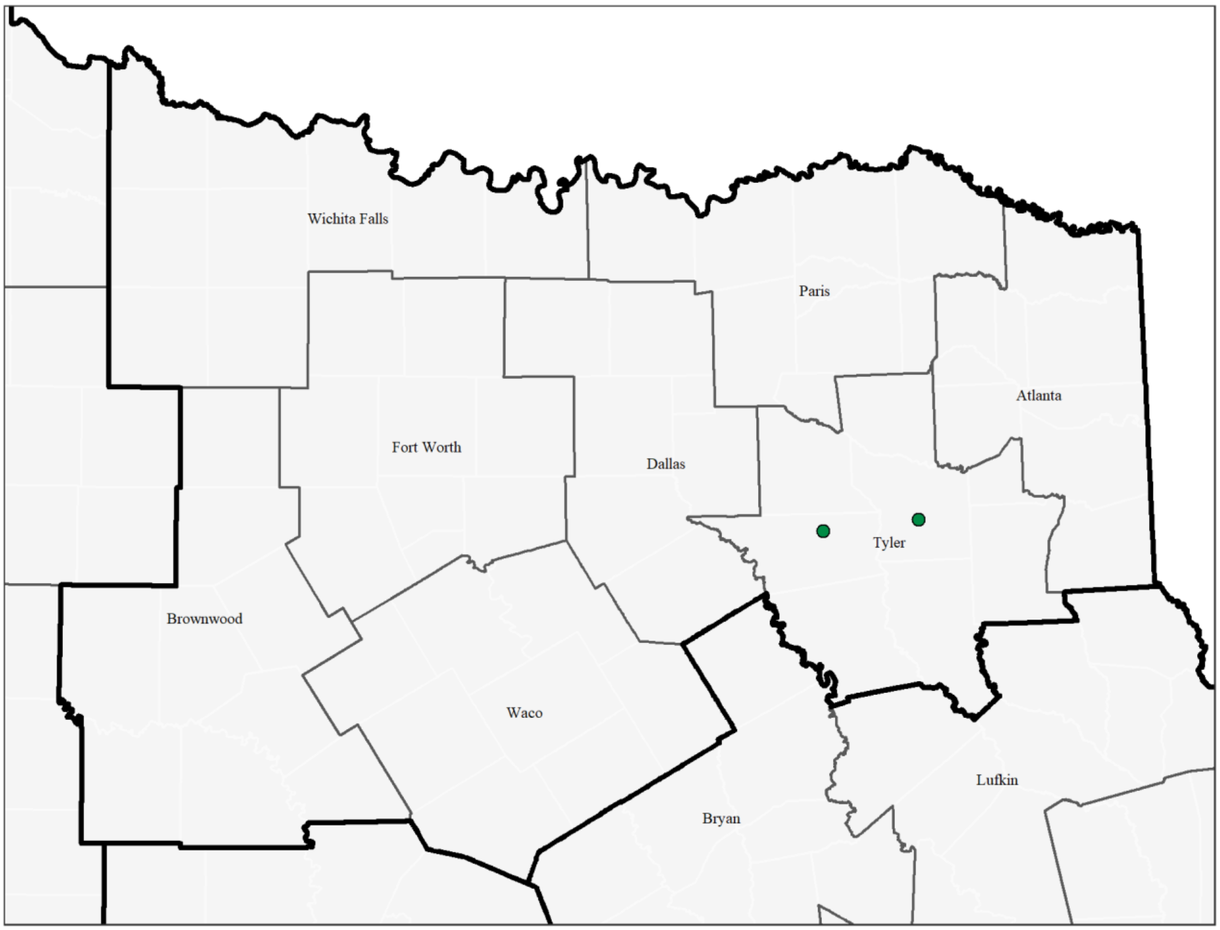
Scarlet Snake



Points Per Section 1-2 3-4 5-6 7+

Cemophora coccinea

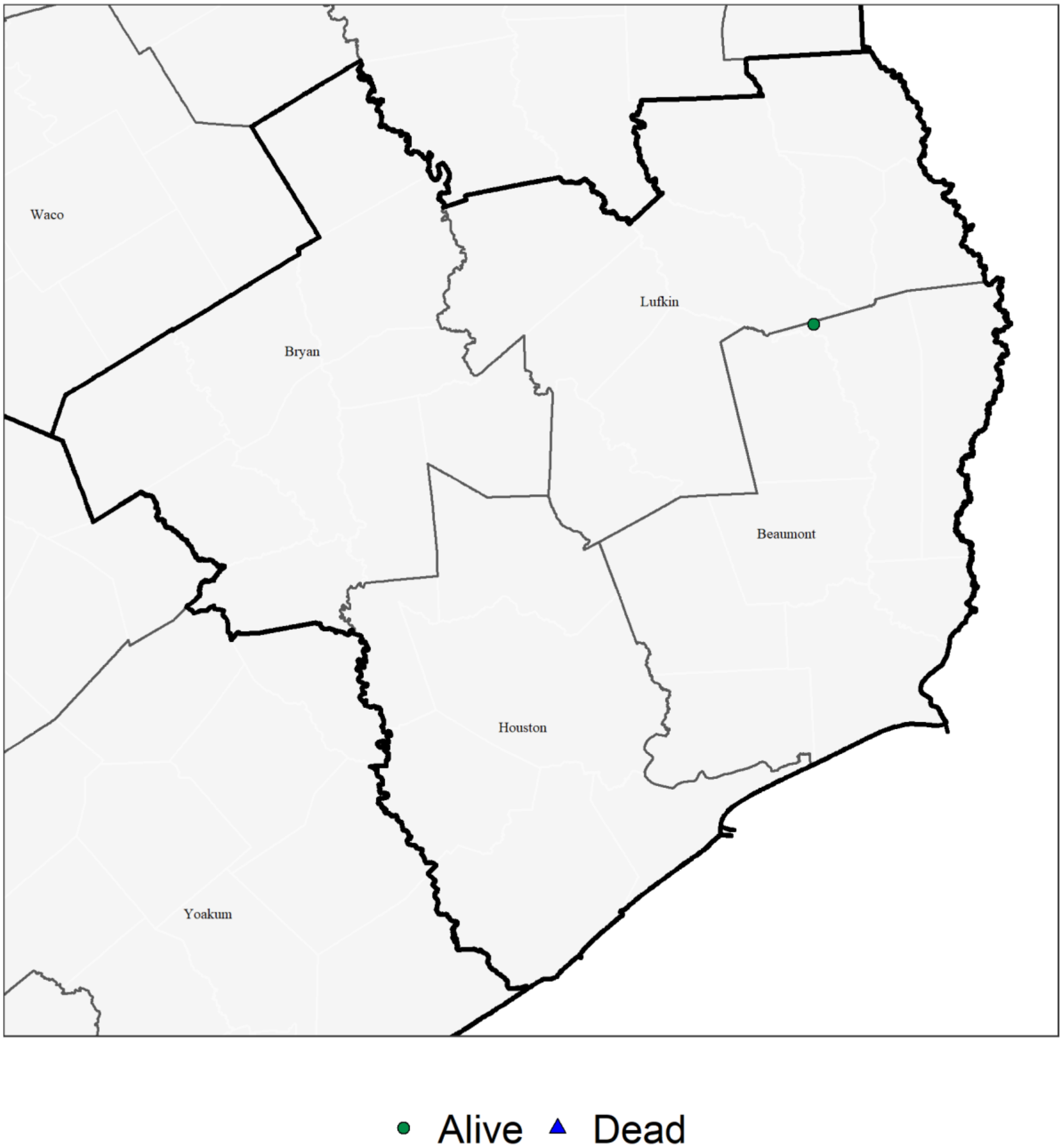
Scarlet Snake



● Alive ▲ Dead

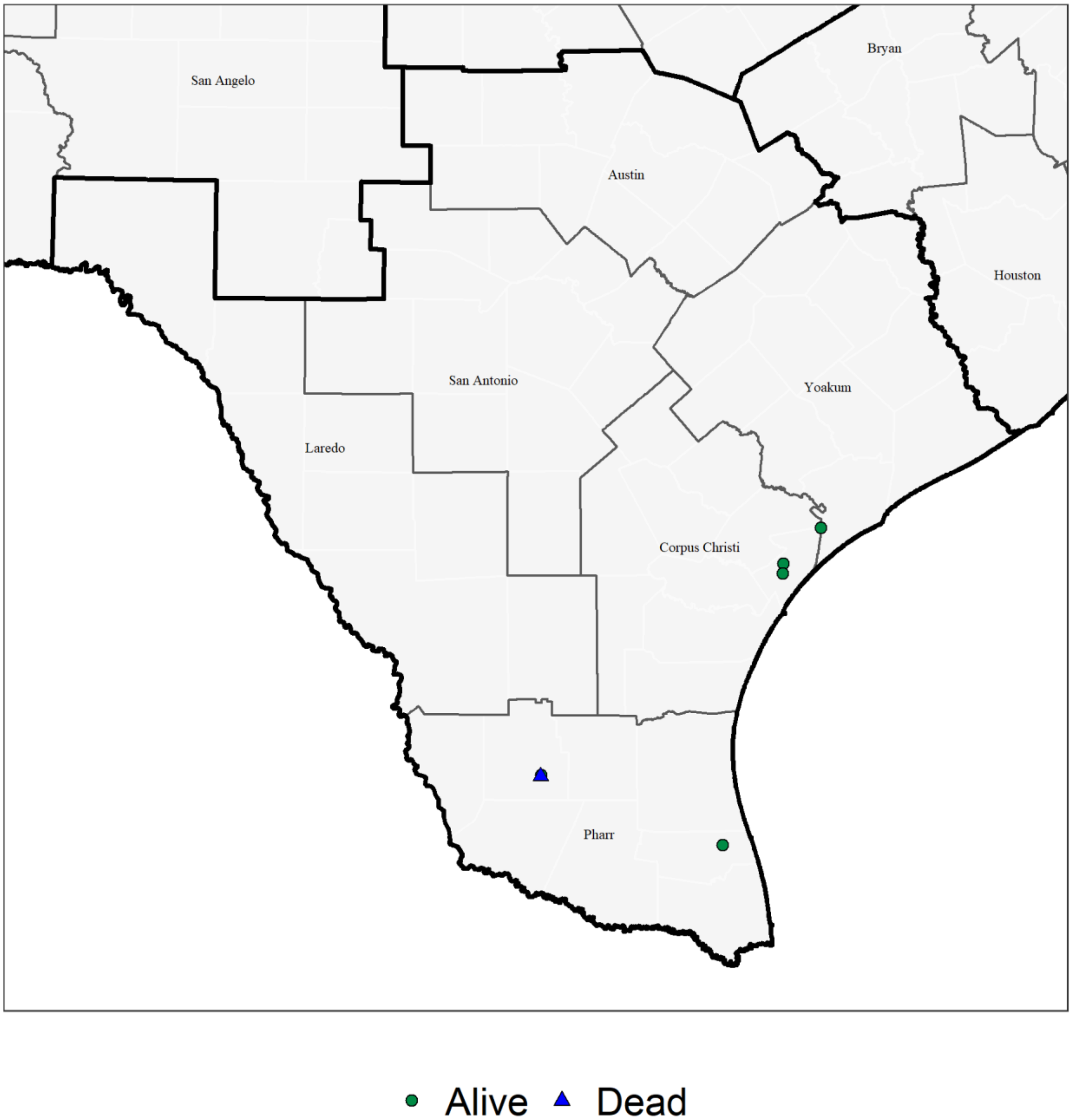
Cemophora coccinea

Scarlet Snake



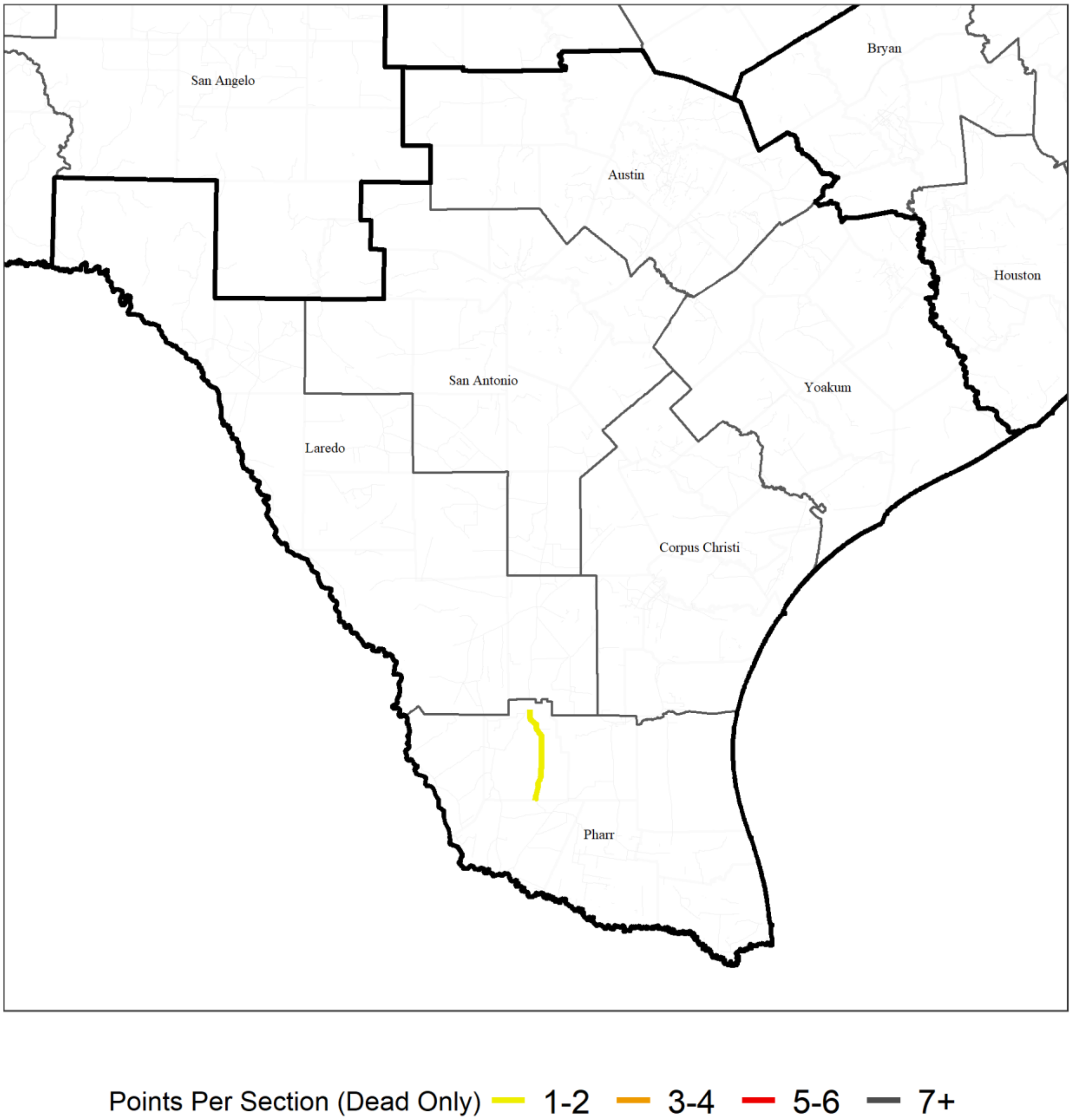
Cemophora coccinea

Scarlet Snake



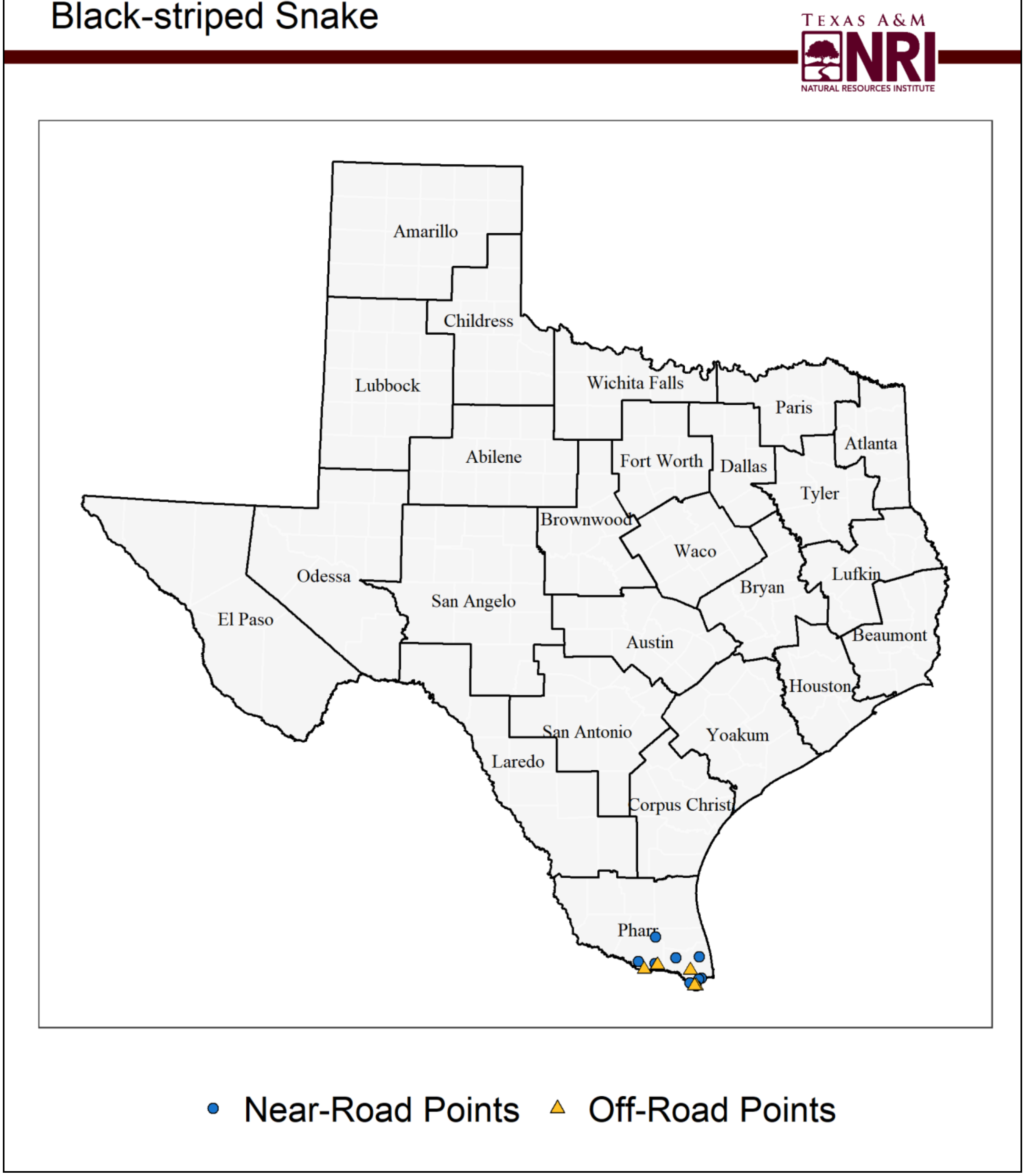
Cemophora coccinea

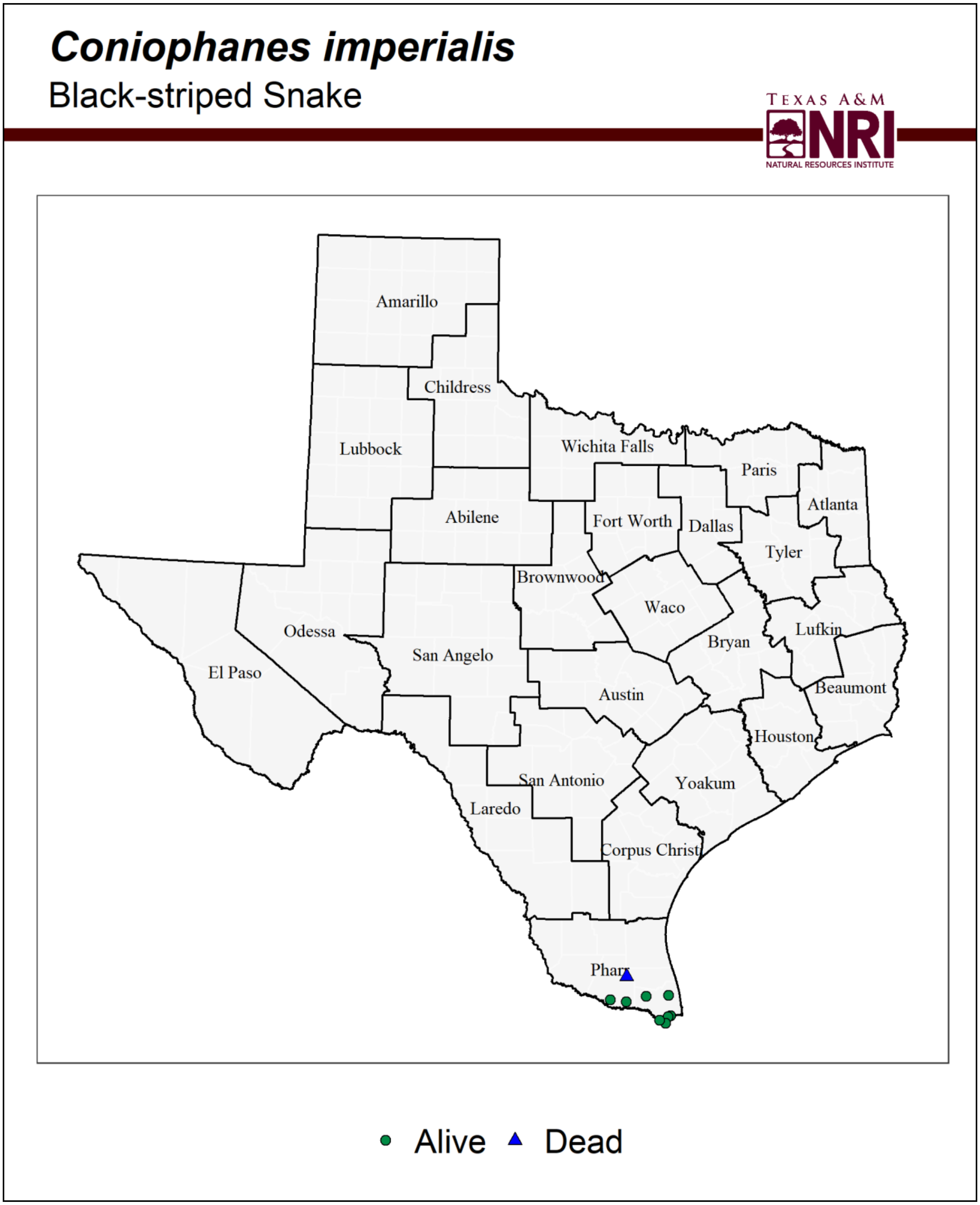
Scarlet Snake



Coniophanes imperialis

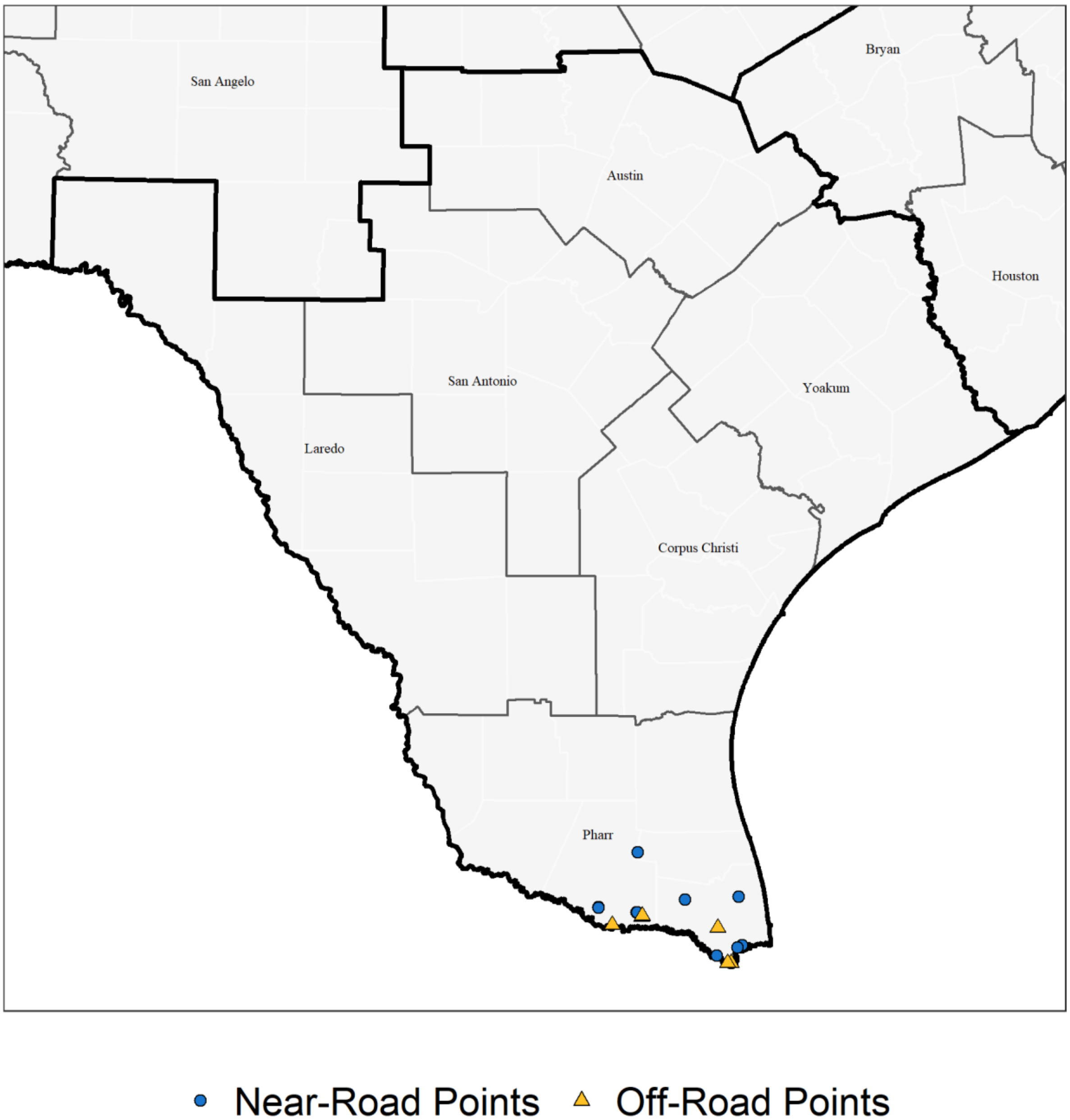
Black-striped Snake




Coniophanes imperialis
Black-striped Snake
TEXAS A&M
NRI
NATURAL RESOURCES INSTITUTE
Amarillo
Childress
Lubbock
Wichita Falls
Paris
Atlanta
Abilene
Fort Worth
Dallas
Tyler
Brownwood
Waco
Odessa
Bryan
Lufkin
San Angelo
El Paso
Austin
Beaumont
Houston
San Antonio
Yoakum
Laredo
Corpus Christ
Phar
Alive
Dead

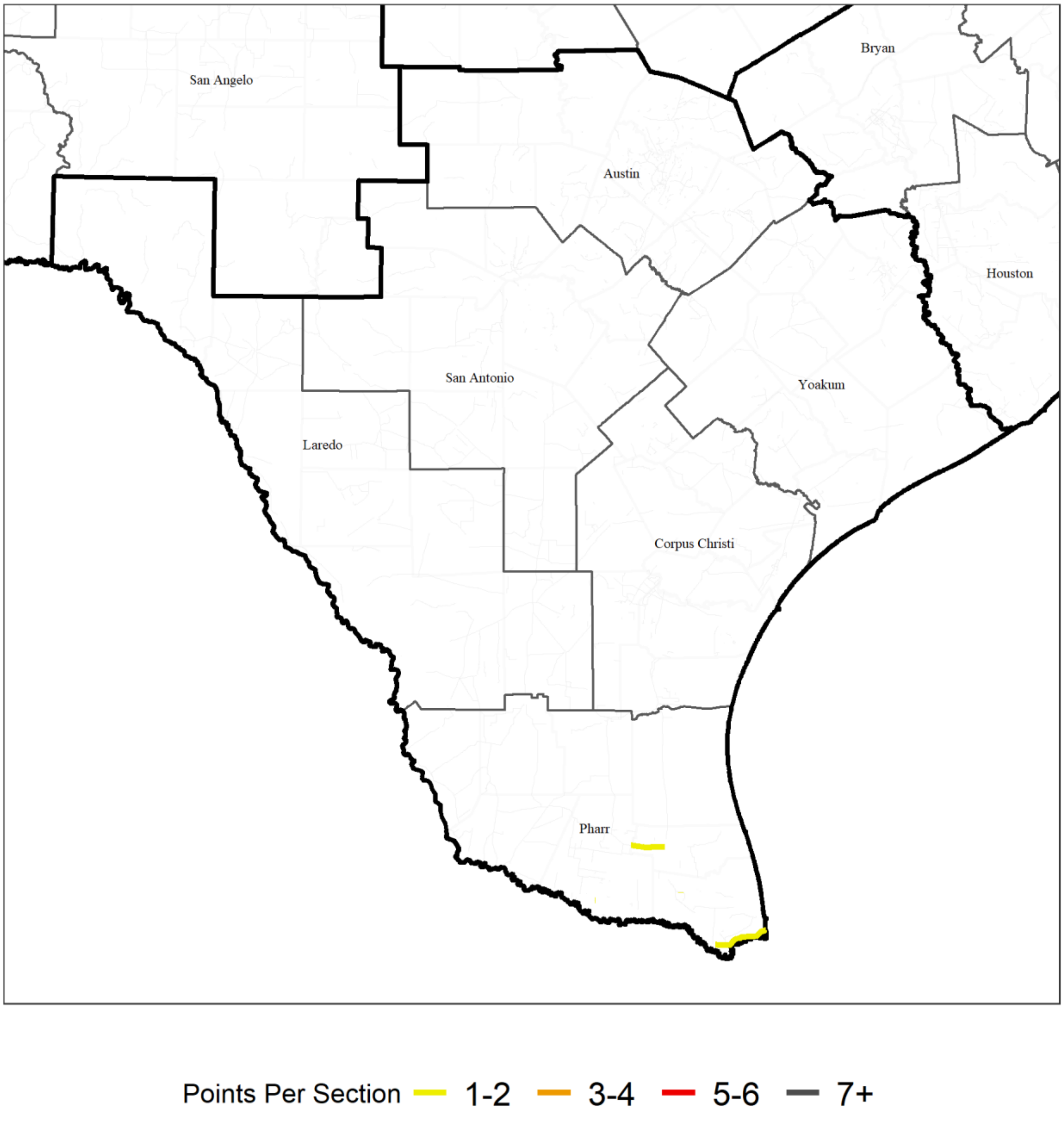
Coniophanes imperialis

Black-striped Snake



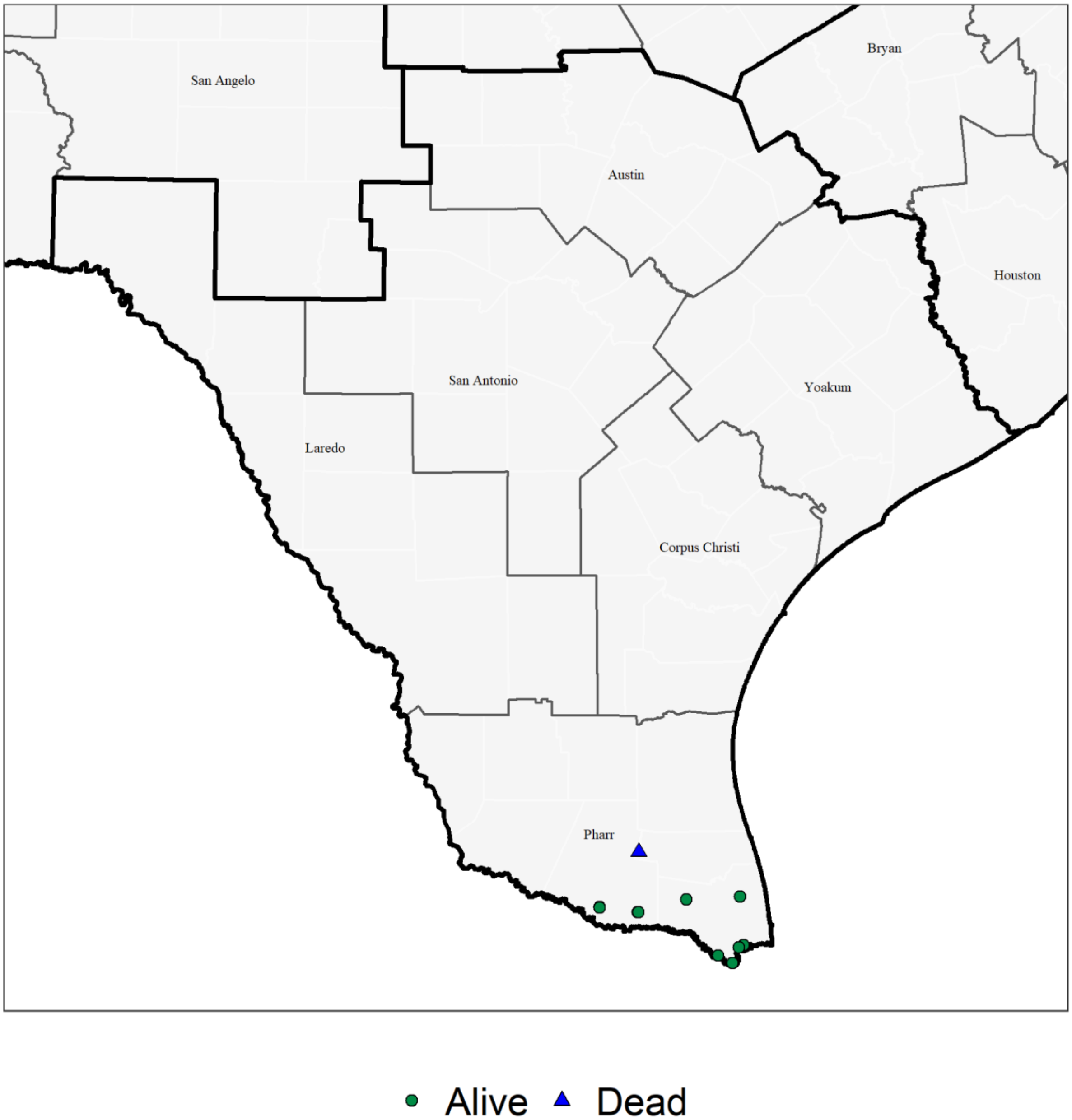
Coniophanes imperialis

Black-striped Snake



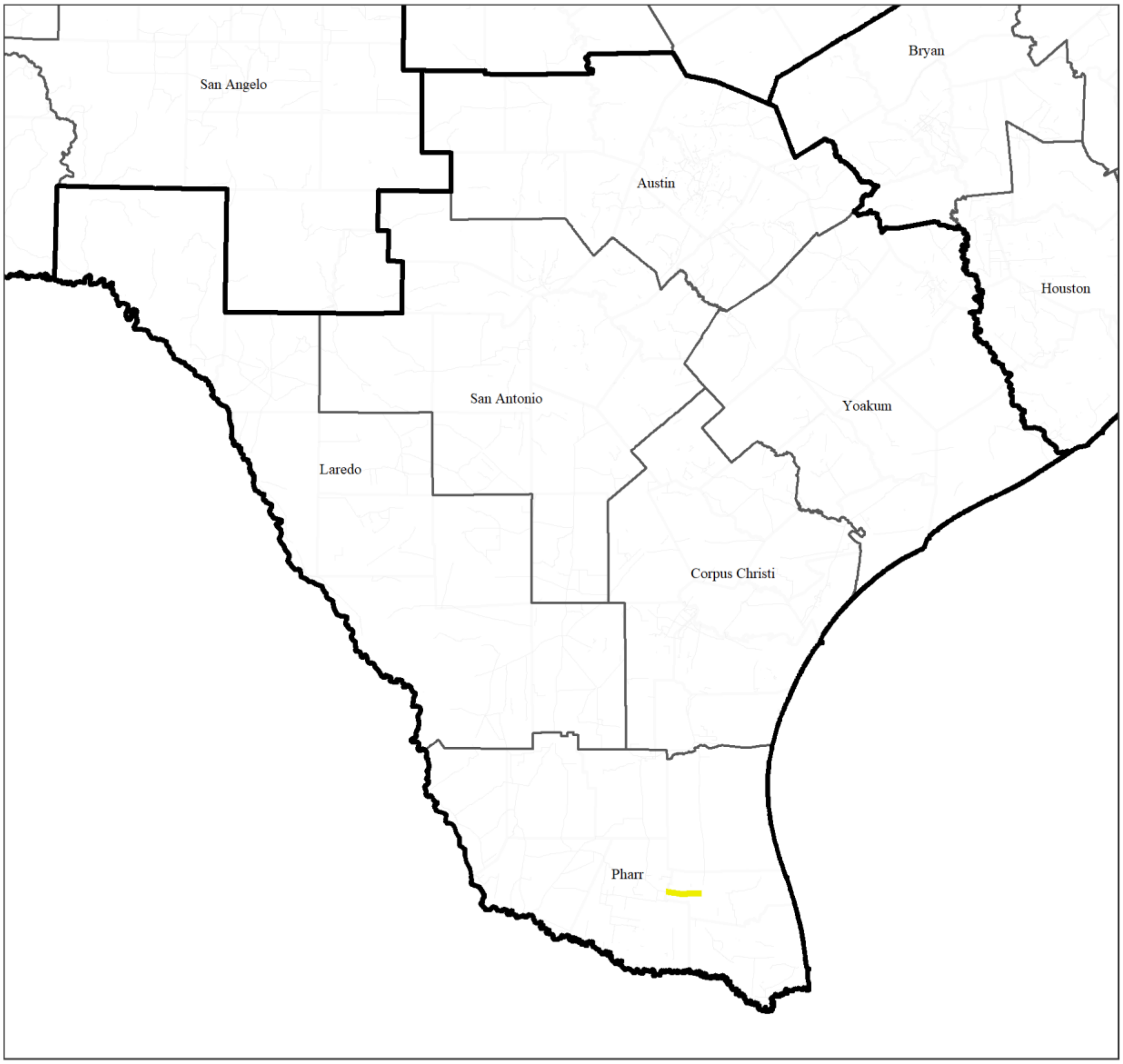
Coniophanes imperialis

Black-striped Snake



Coniophanes imperialis

Black-striped Snake

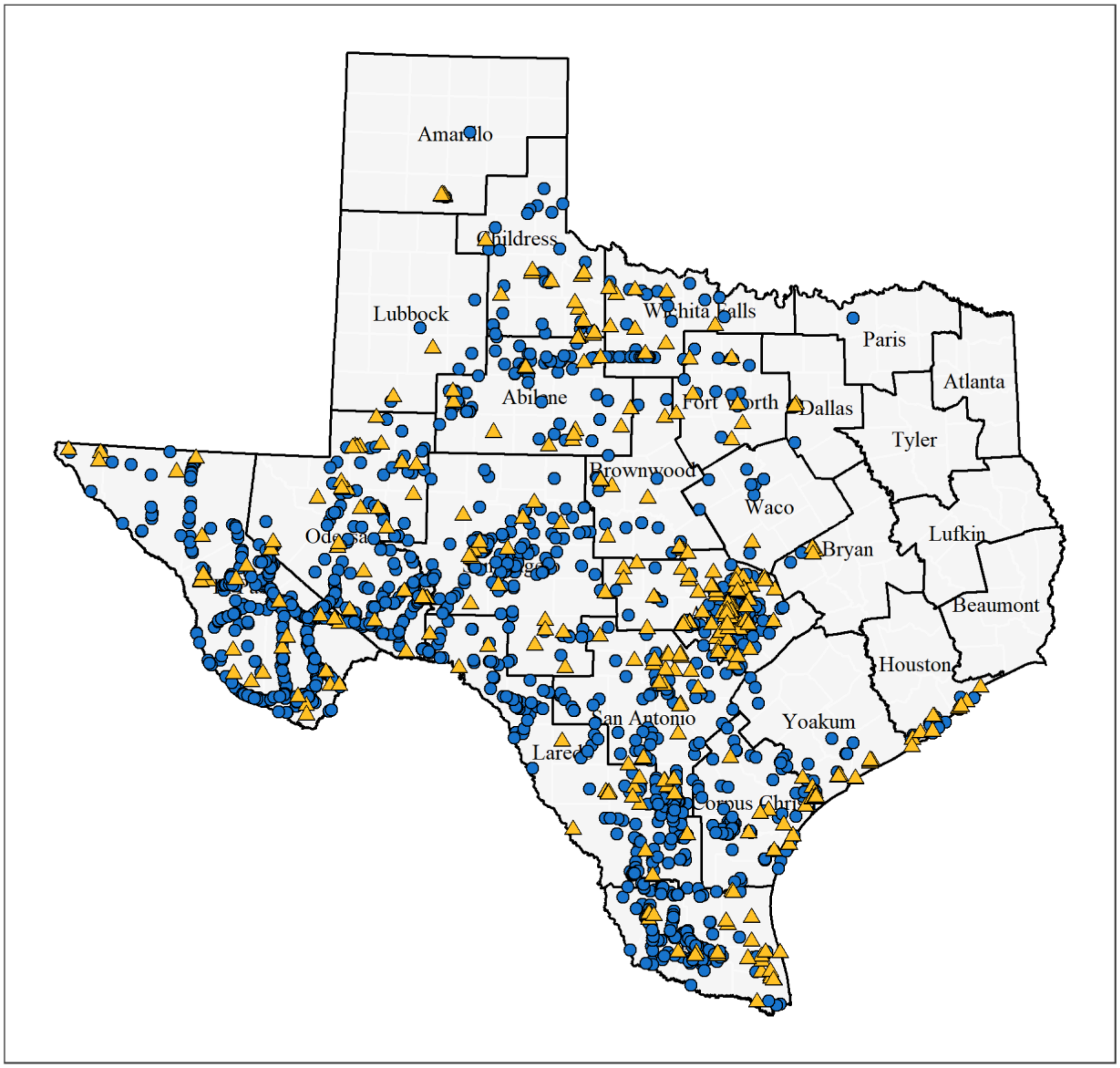


Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Crotalus atrox

Western Diamondback Rattlesnake

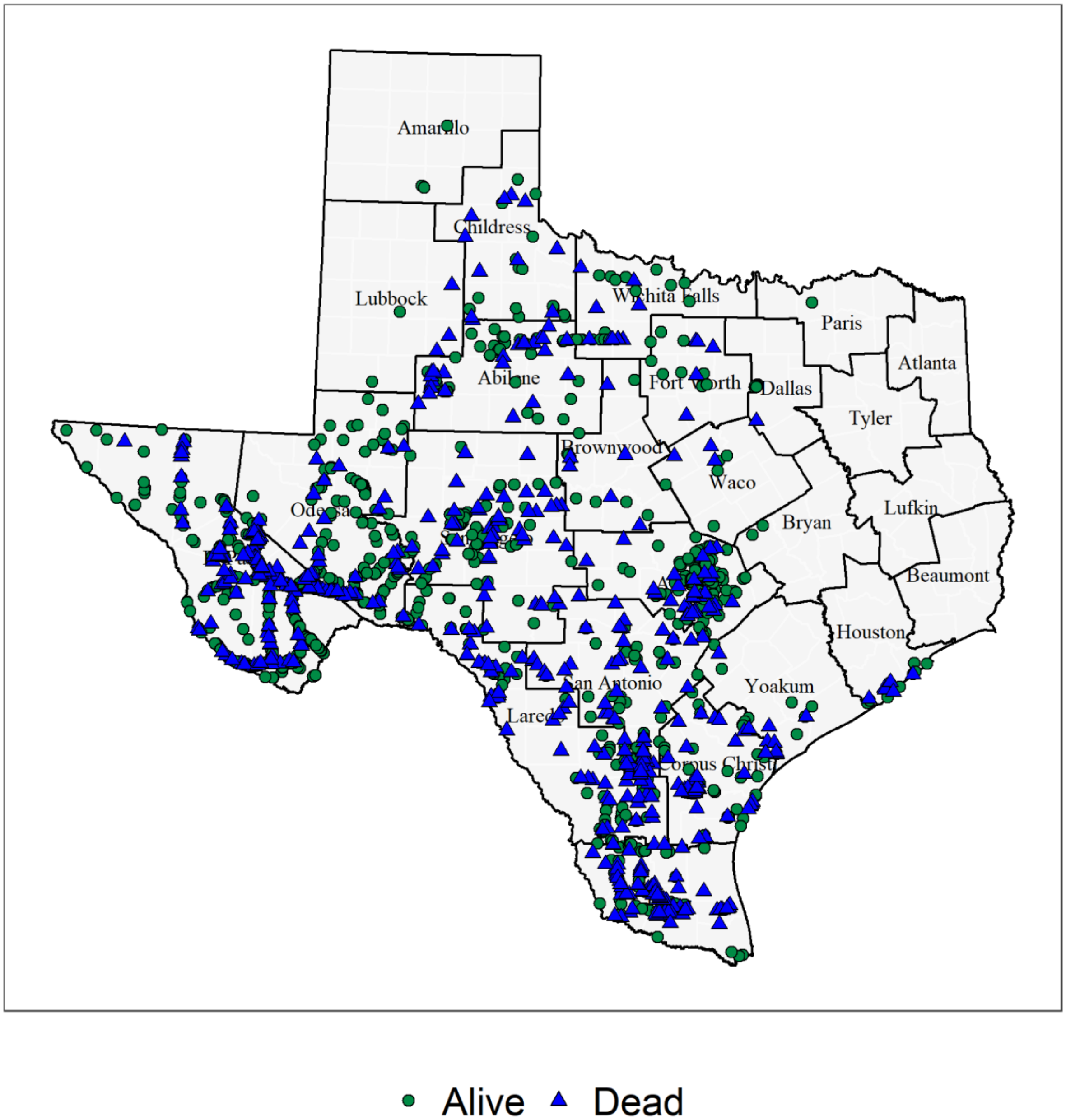
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



• Near-Road Points △ Off-Road Points

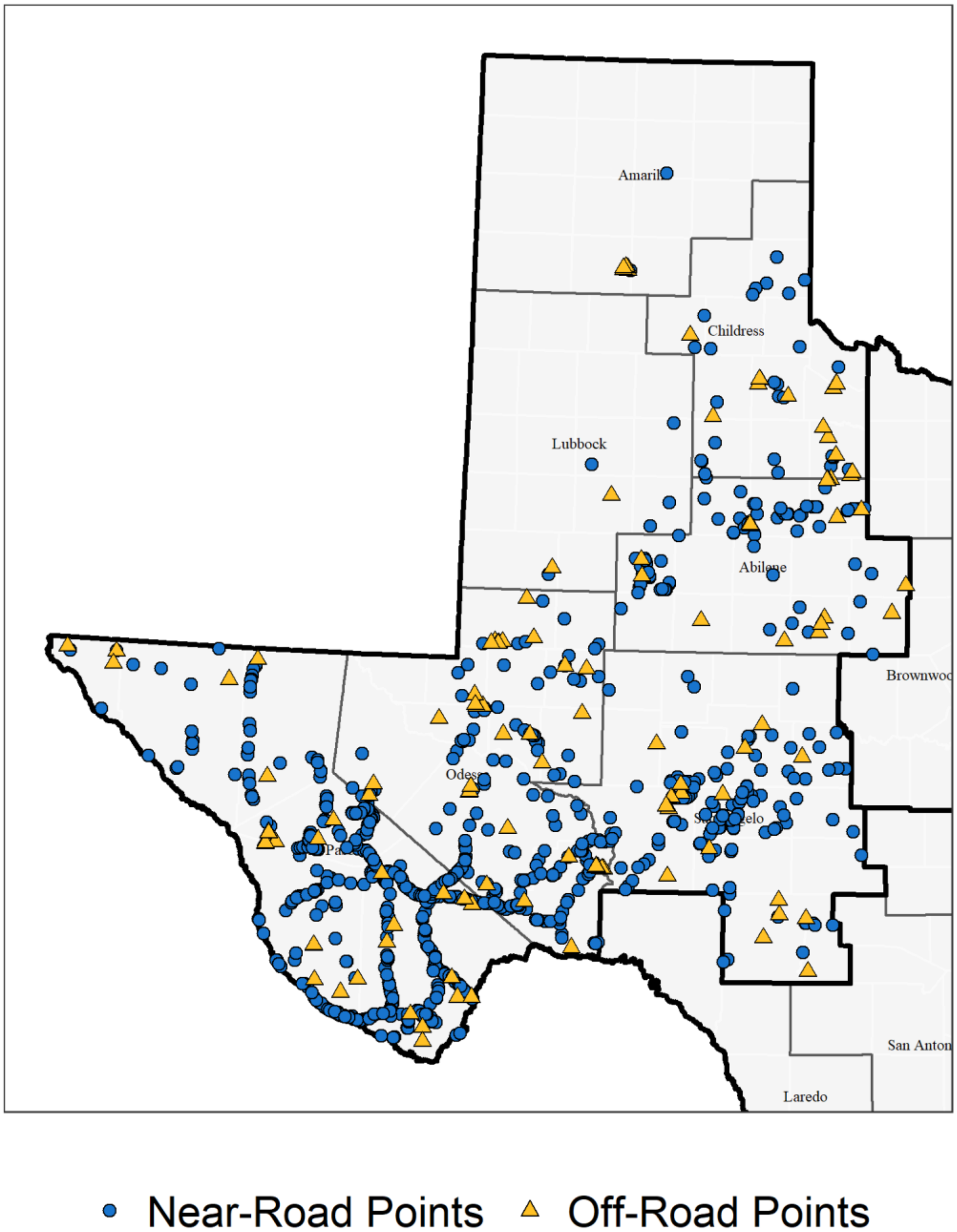
Crotalus atrox

Western Diamondback Rattlesnake



Crotalus atrox

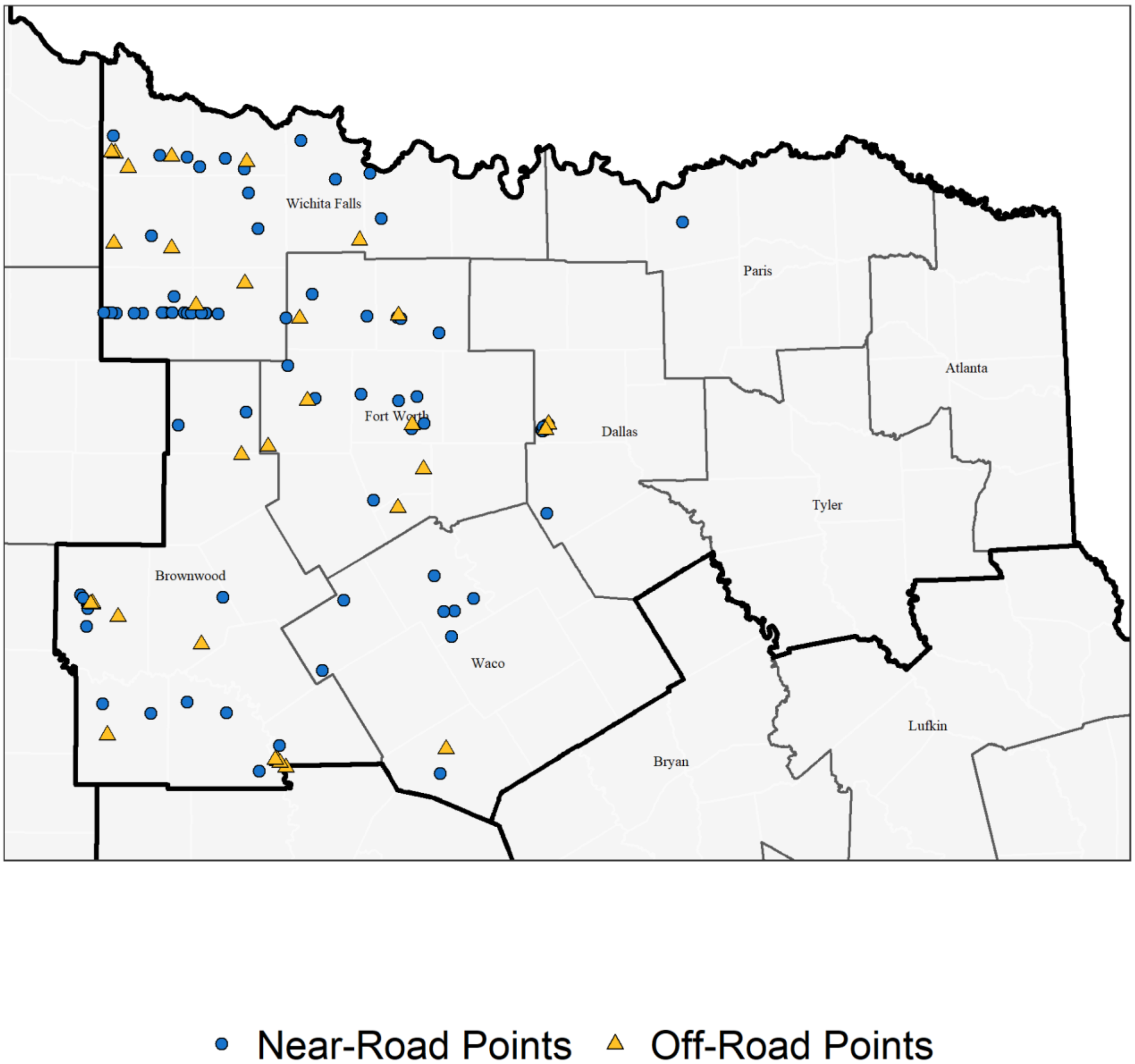
Western Diamondback Rattlesnake



Crotalus atrox

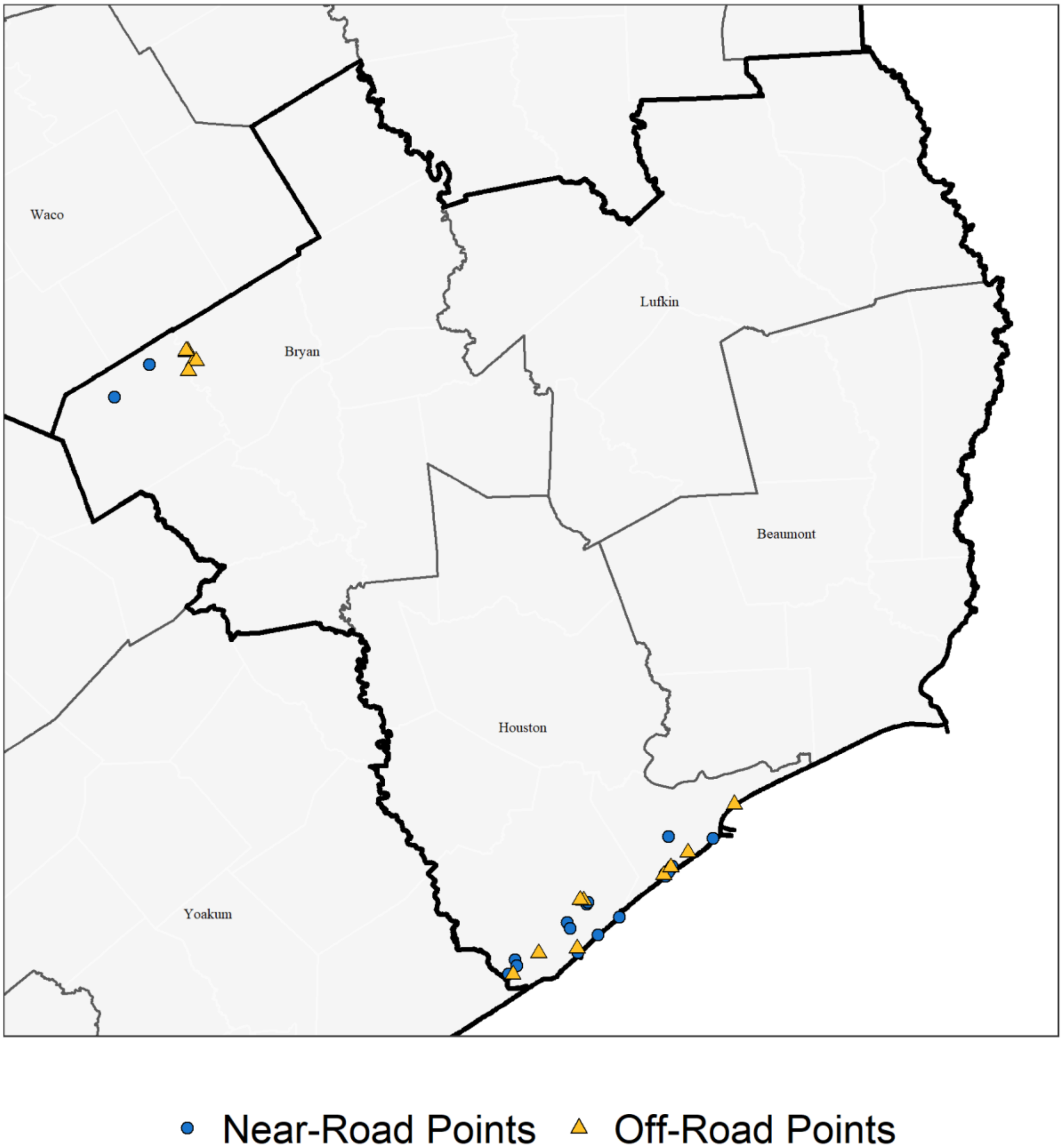
Western Diamondback Rattlesnake

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



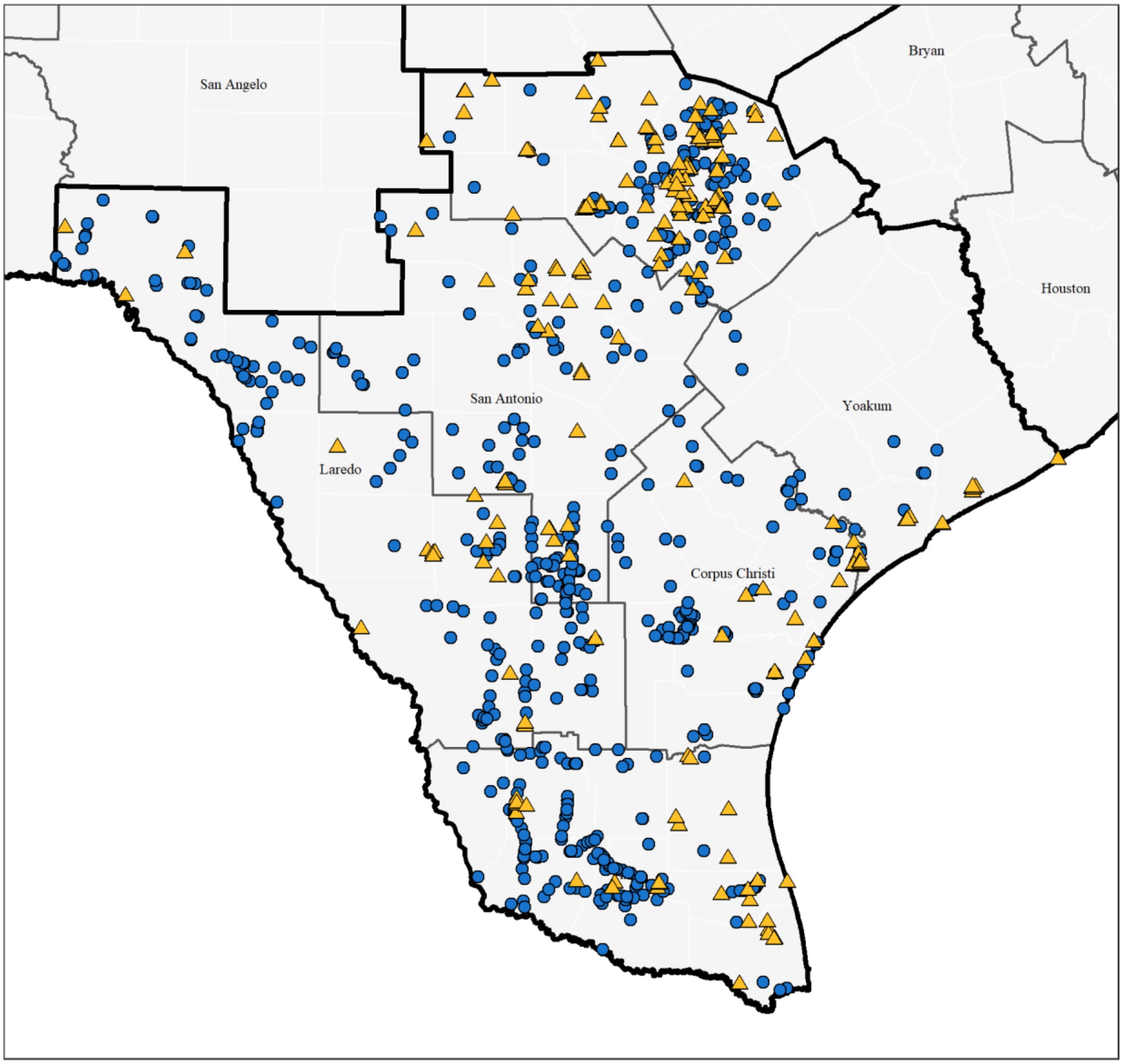
Crotalus atrox

Western Diamondback Rattlesnake



Crotalus atrox

Western Diamondback Rattlesnake

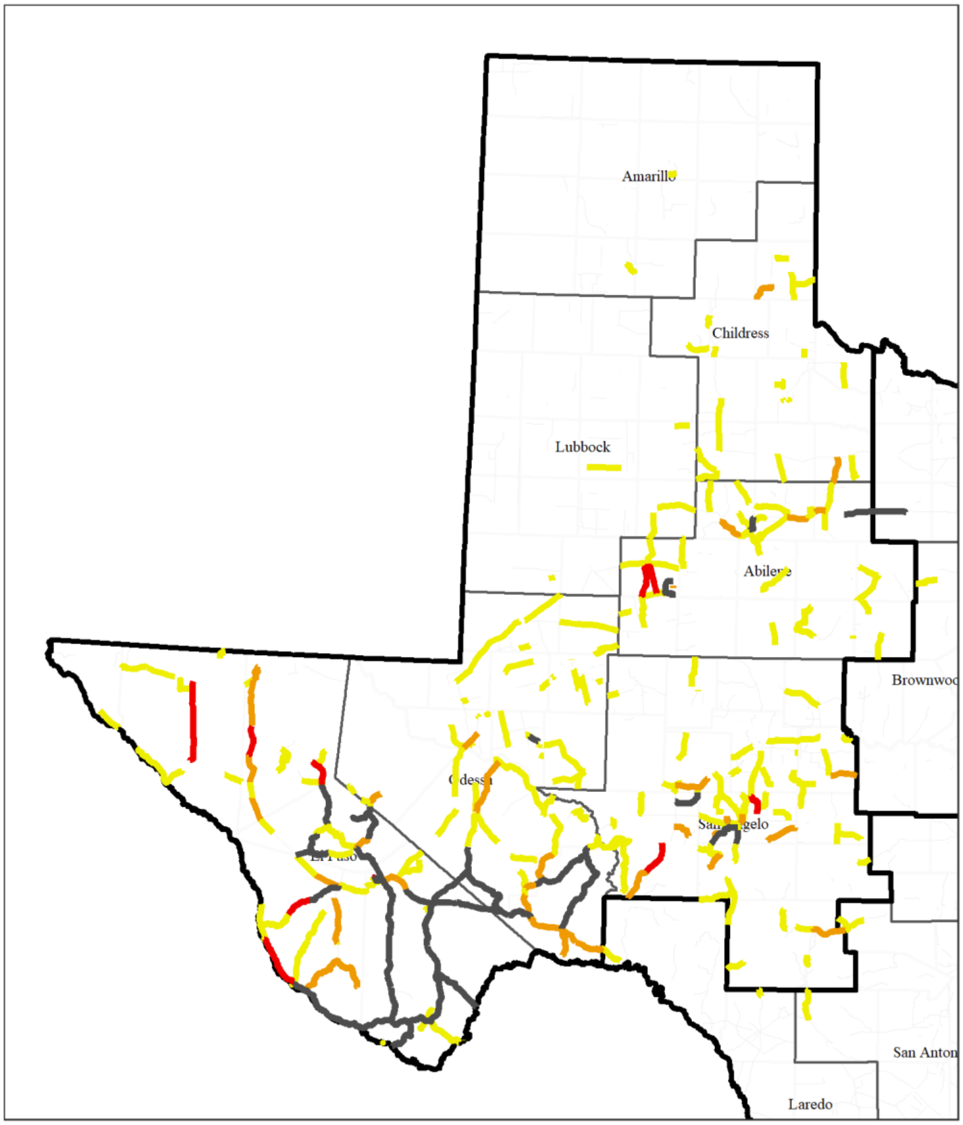


• Near-Road Points △ Off-Road Points

Crotalus atrox

Western Diamondback Rattlesnake

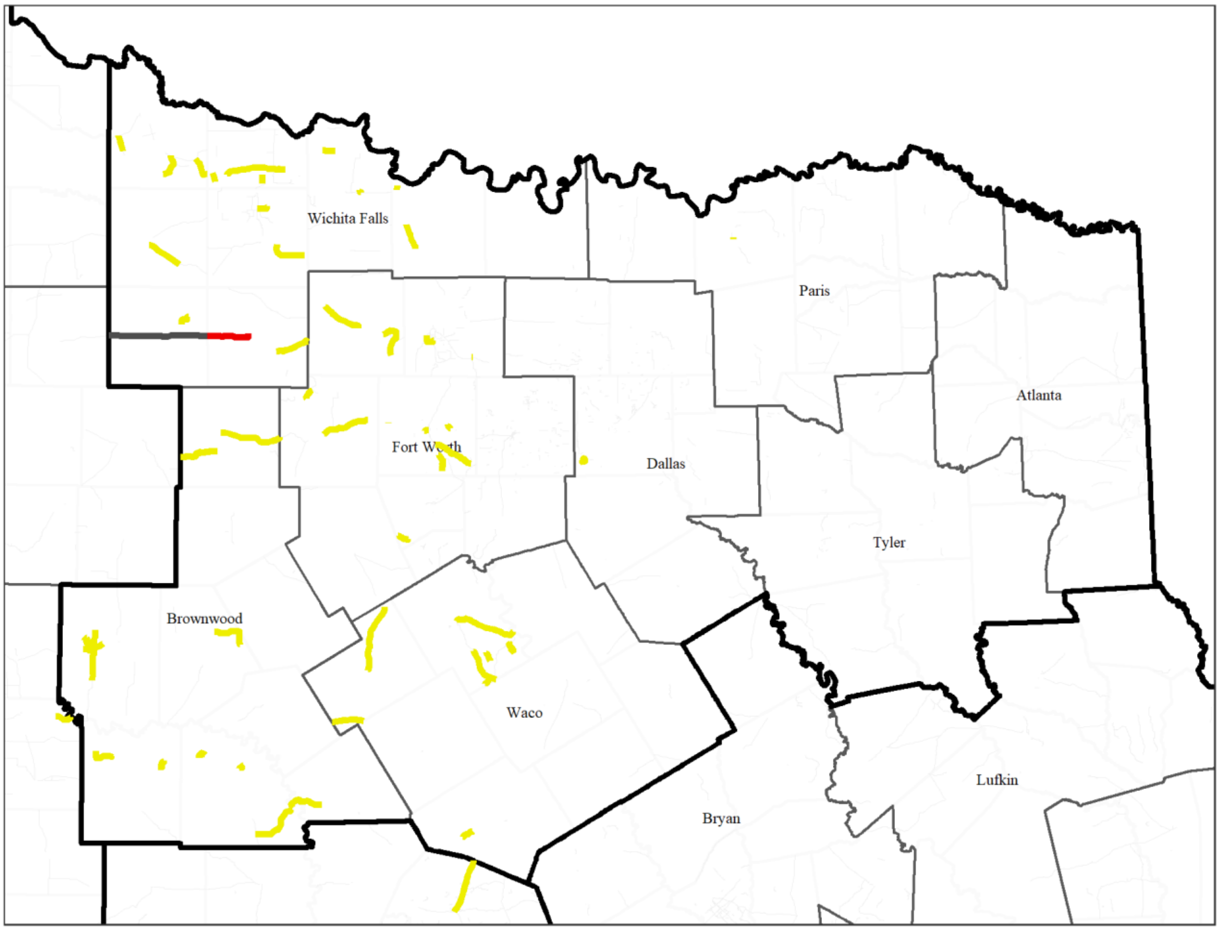
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section 1-2 3-4 5-6 7+

Crotalus atrox

Western Diamondback Rattlesnake

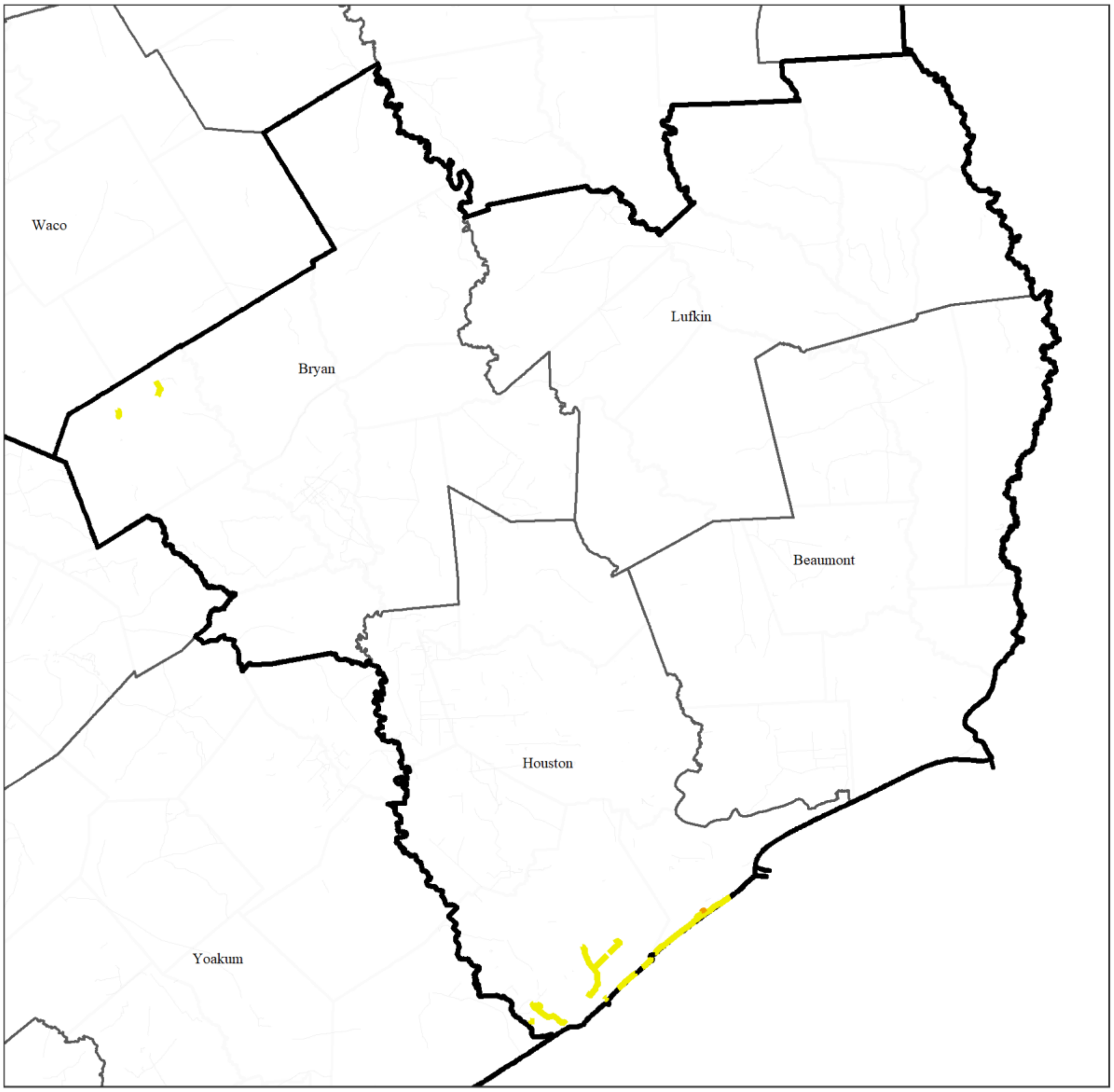


Points Per Section 1-2 3-4 5-6 7+

Crotalus atrox

Western Diamondback Rattlesnake

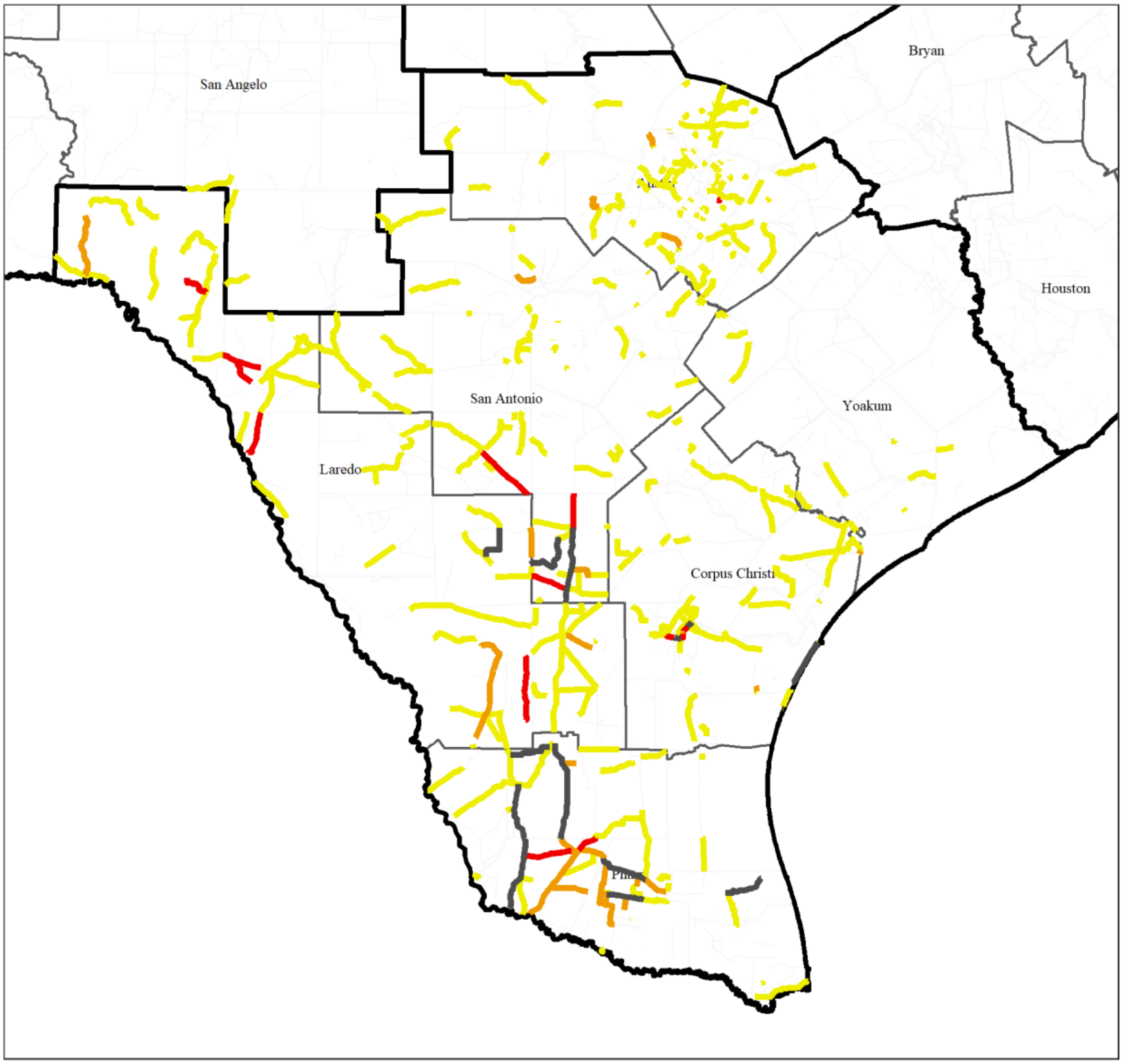
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section — 1-2 — 3-4 — 5-6 — 7+

Crotalus atrox

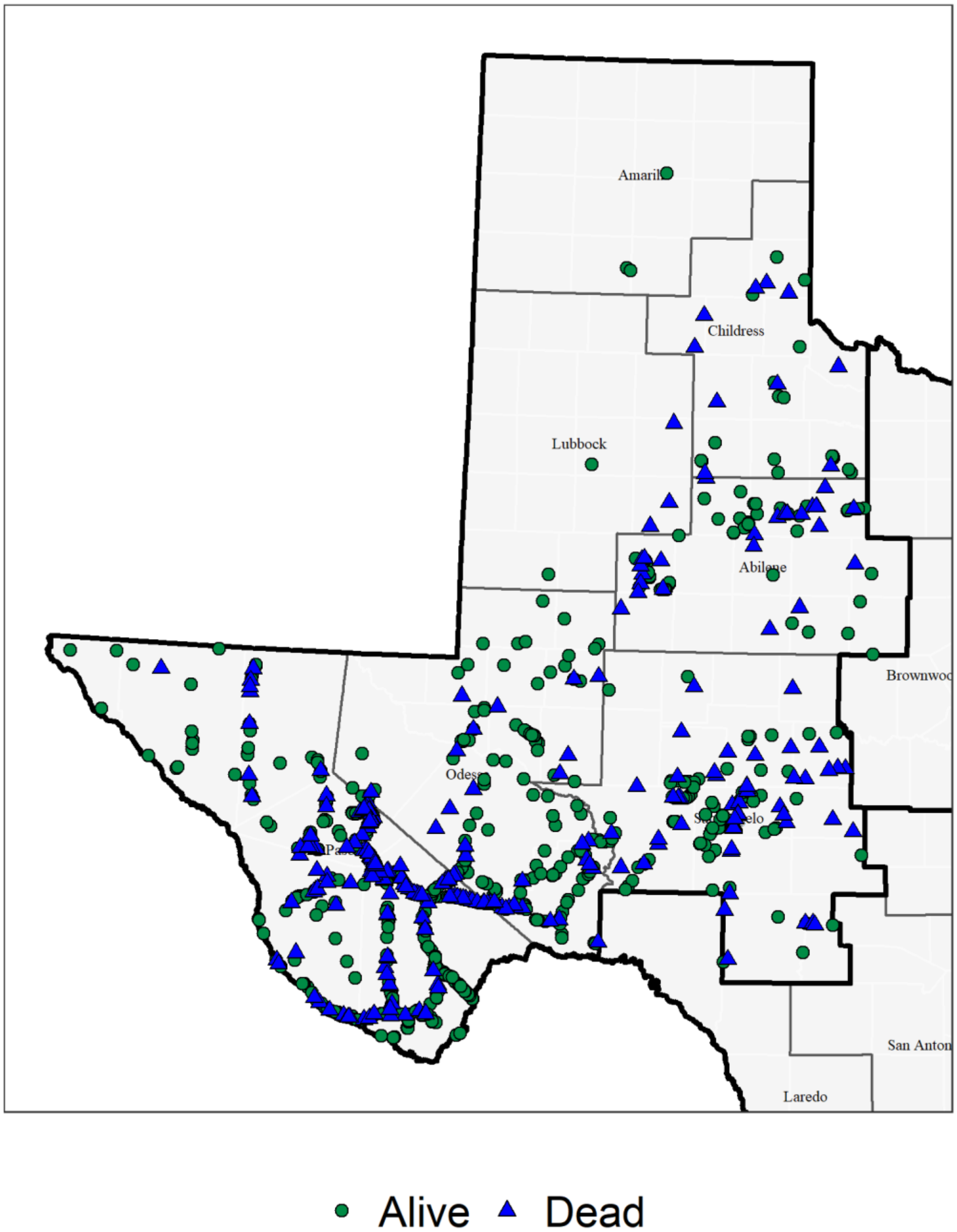
Western Diamondback Rattlesnake



Points Per Section — 1-2 — 3-4 — 5-6 — 7+

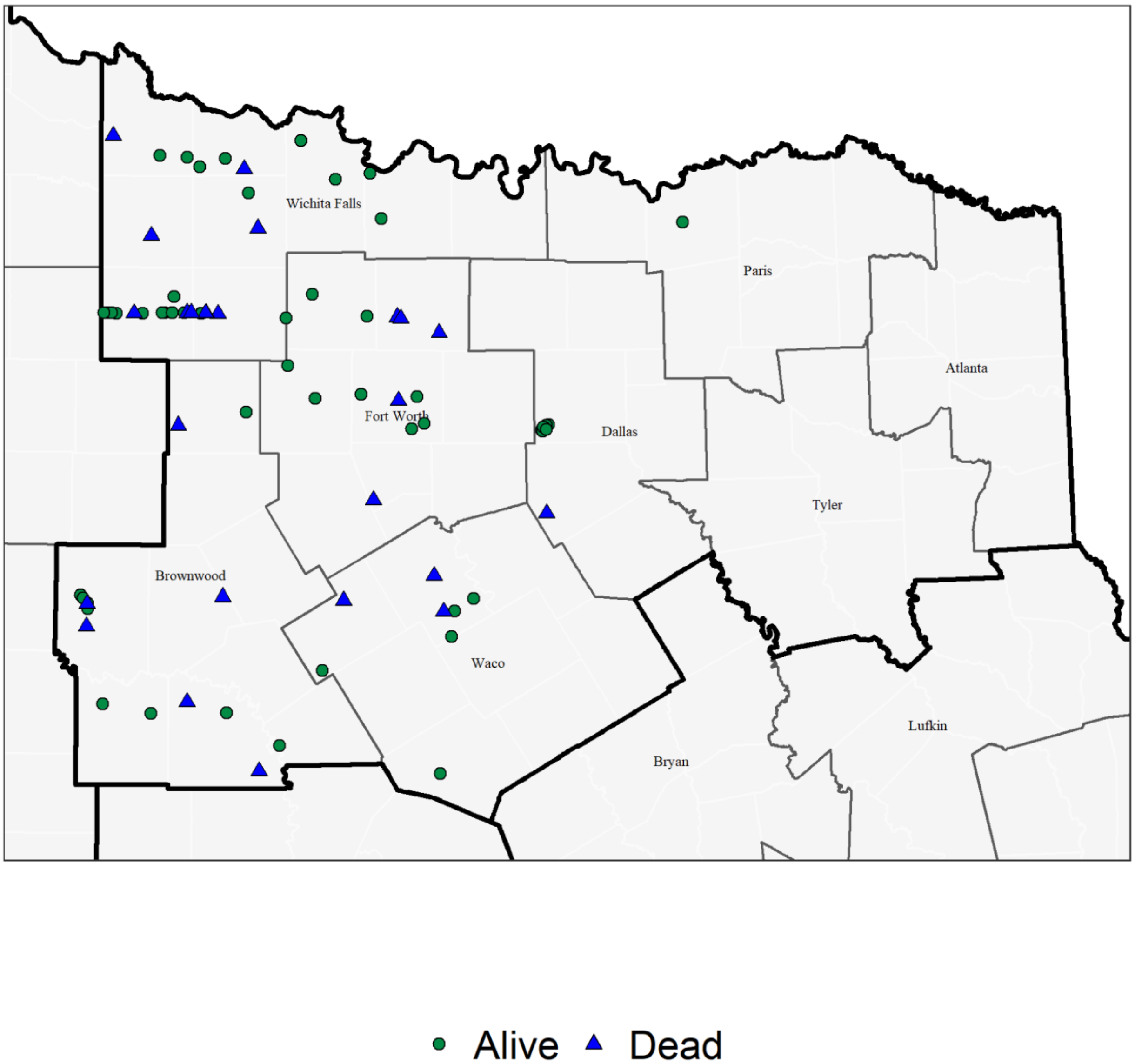
Crotalus atrox

Western Diamondback Rattlesnake



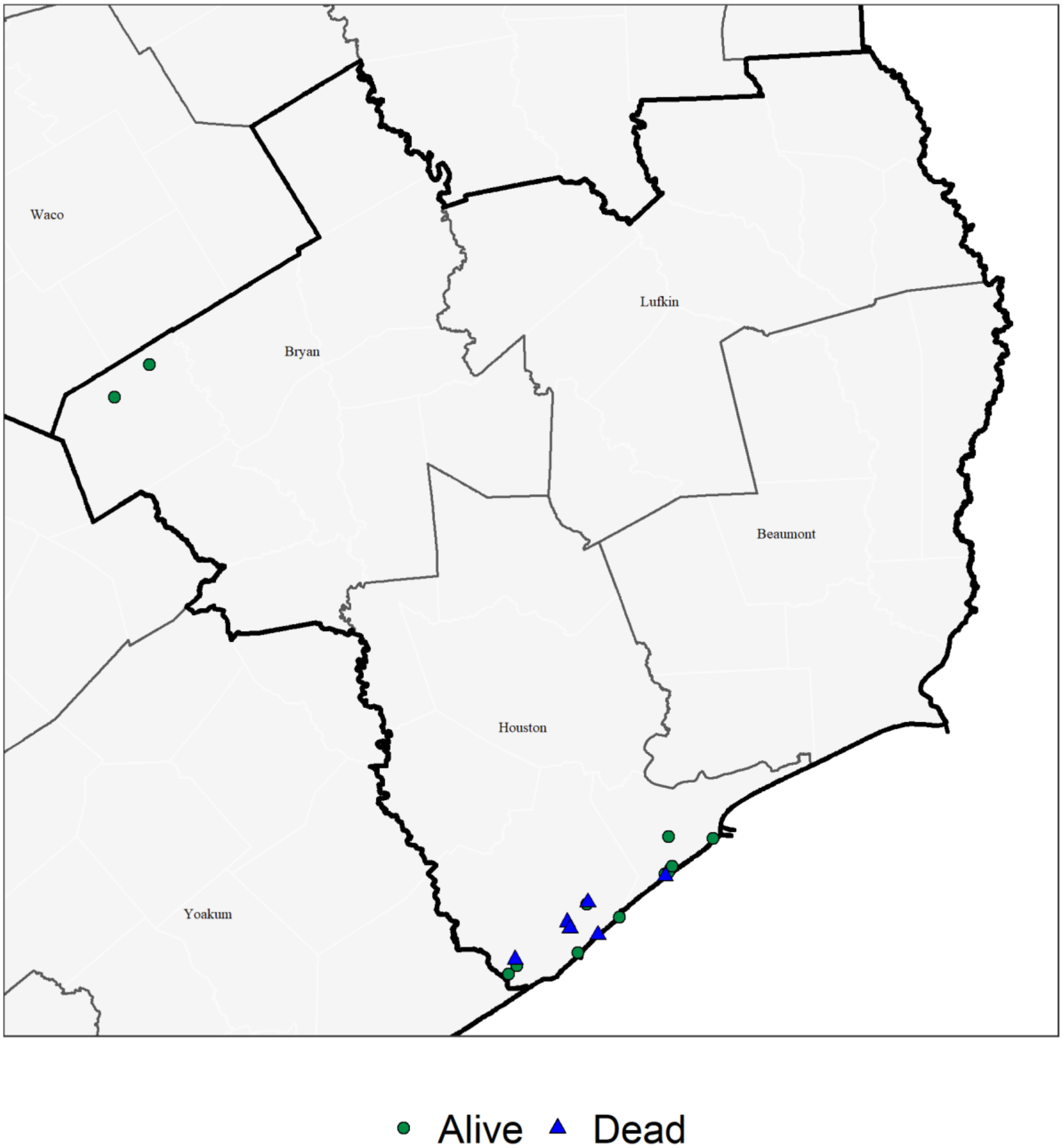
Crotalus atrox

Western Diamondback Rattlesnake



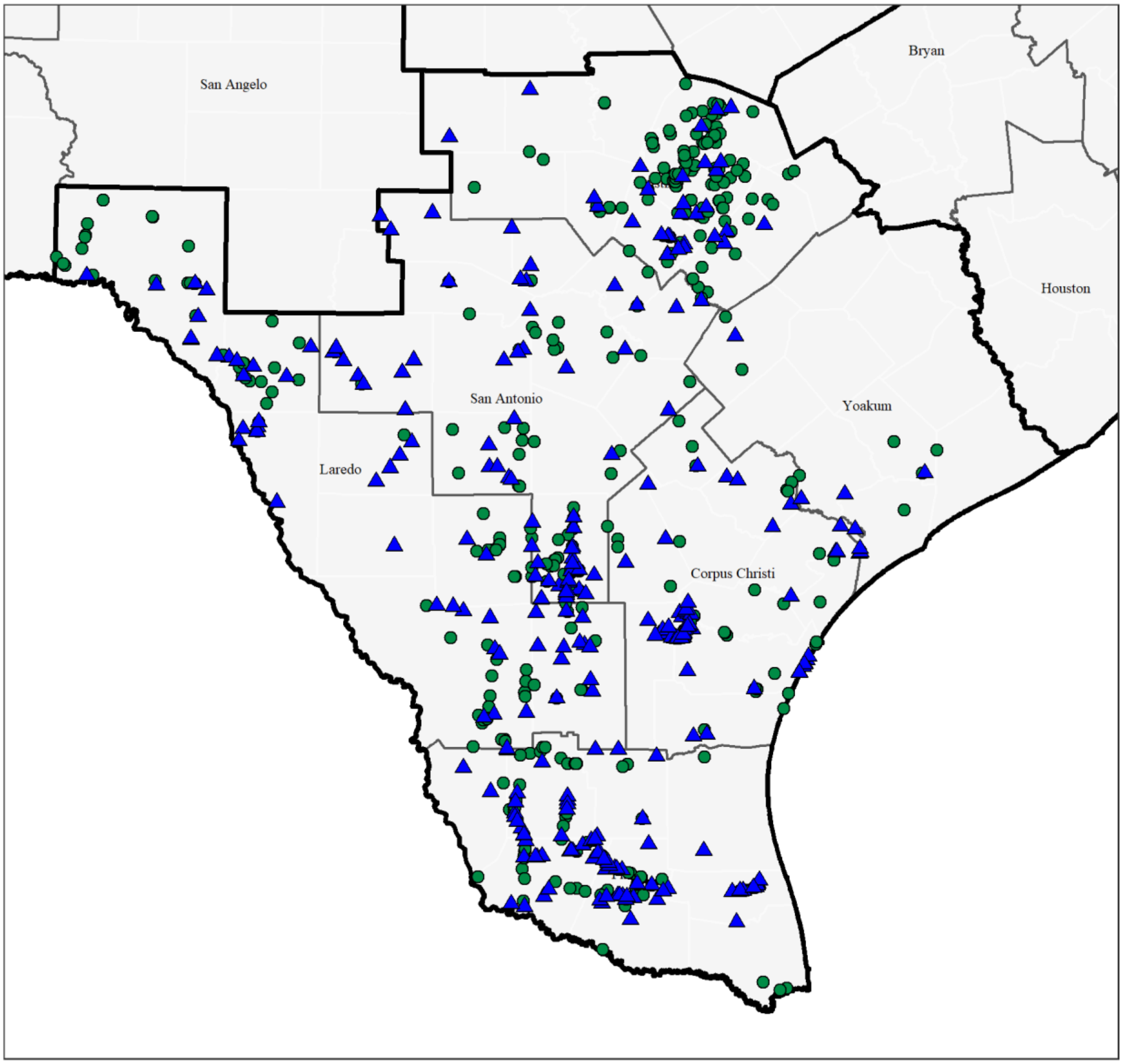
Crotalus atrox

Western Diamondback Rattlesnake



Crotalus atrox

Western Diamondback Rattlesnake

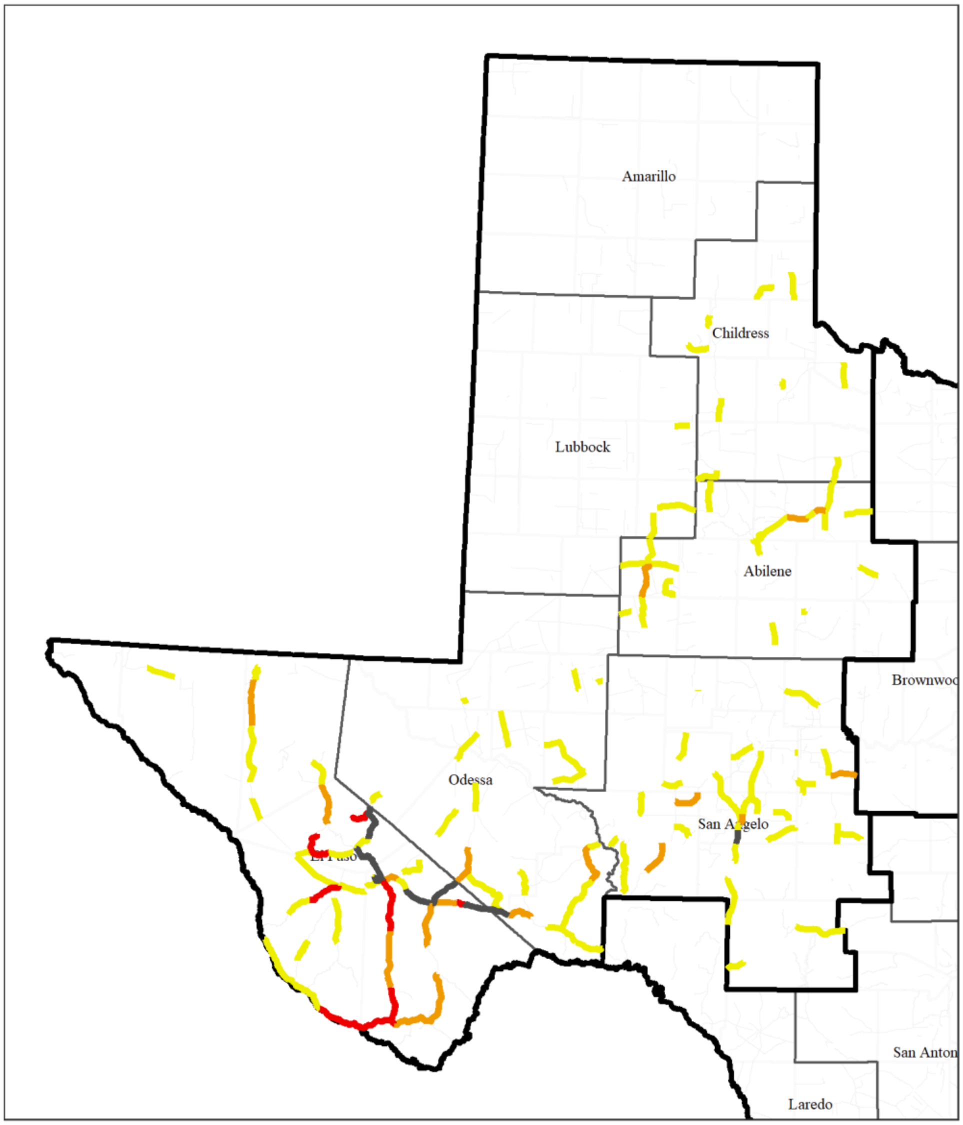


• Alive ▲ Dead

Crotalus atrox

Western Diamondback Rattlesnake

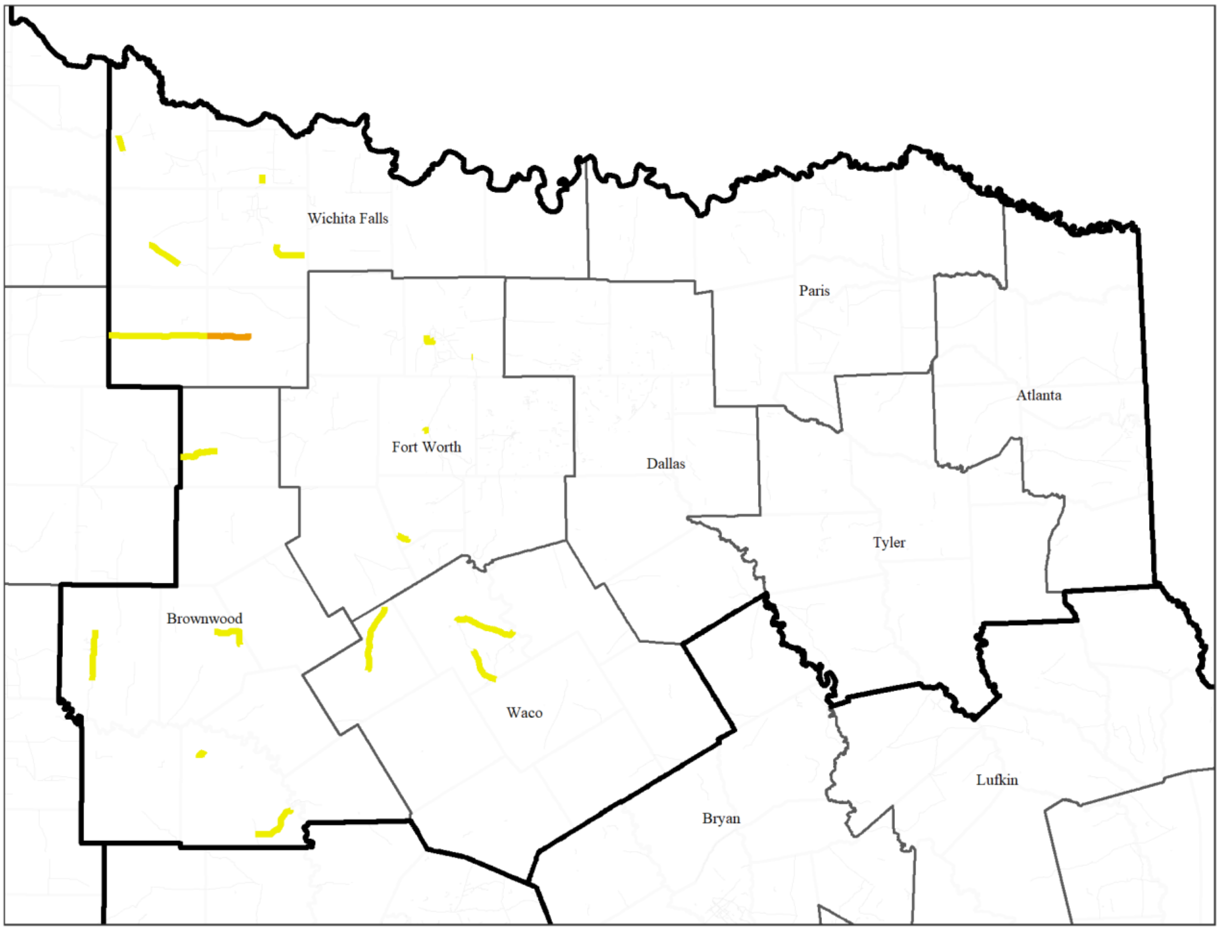
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



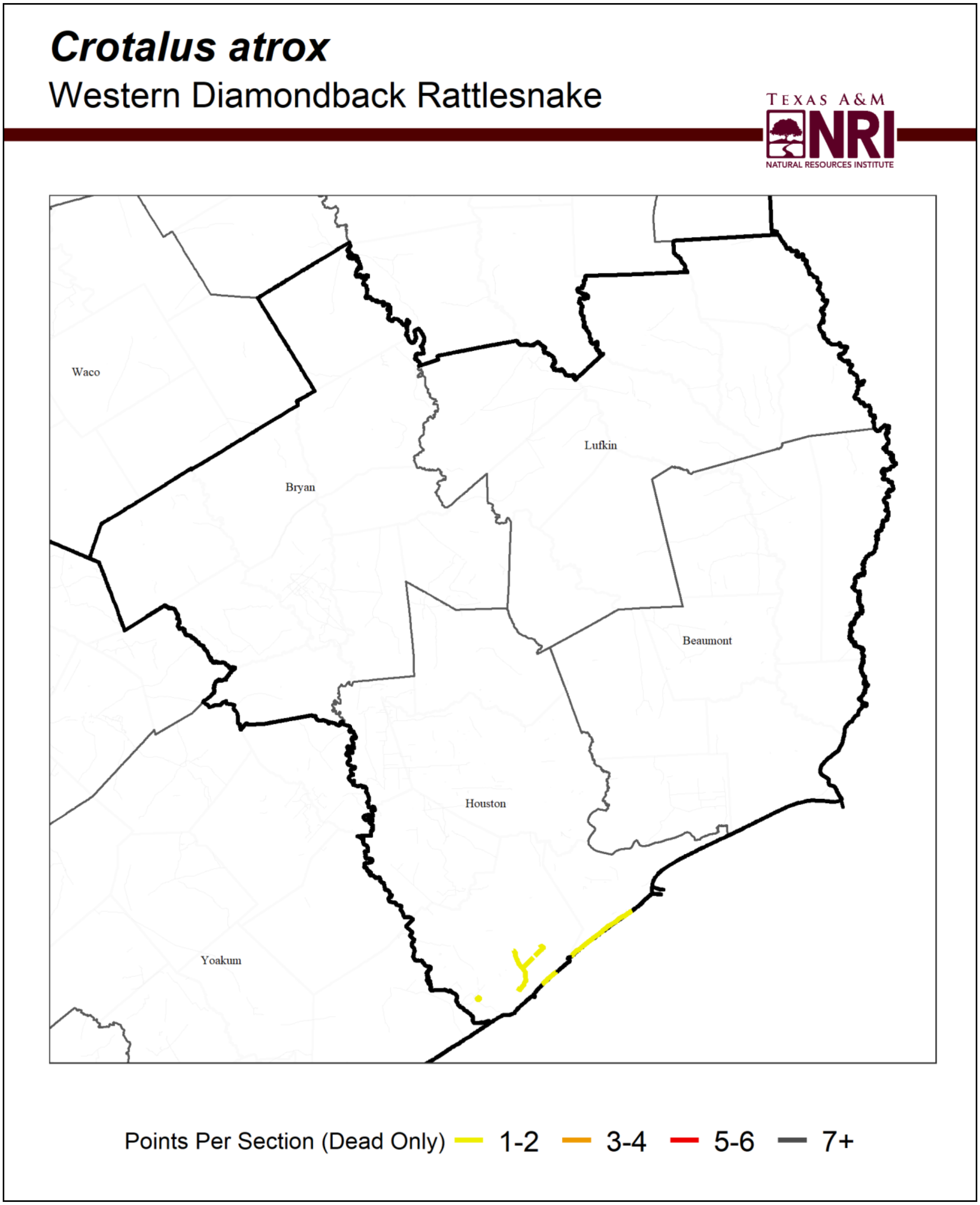
Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Crotalus atrox

Western Diamondback Rattlesnake



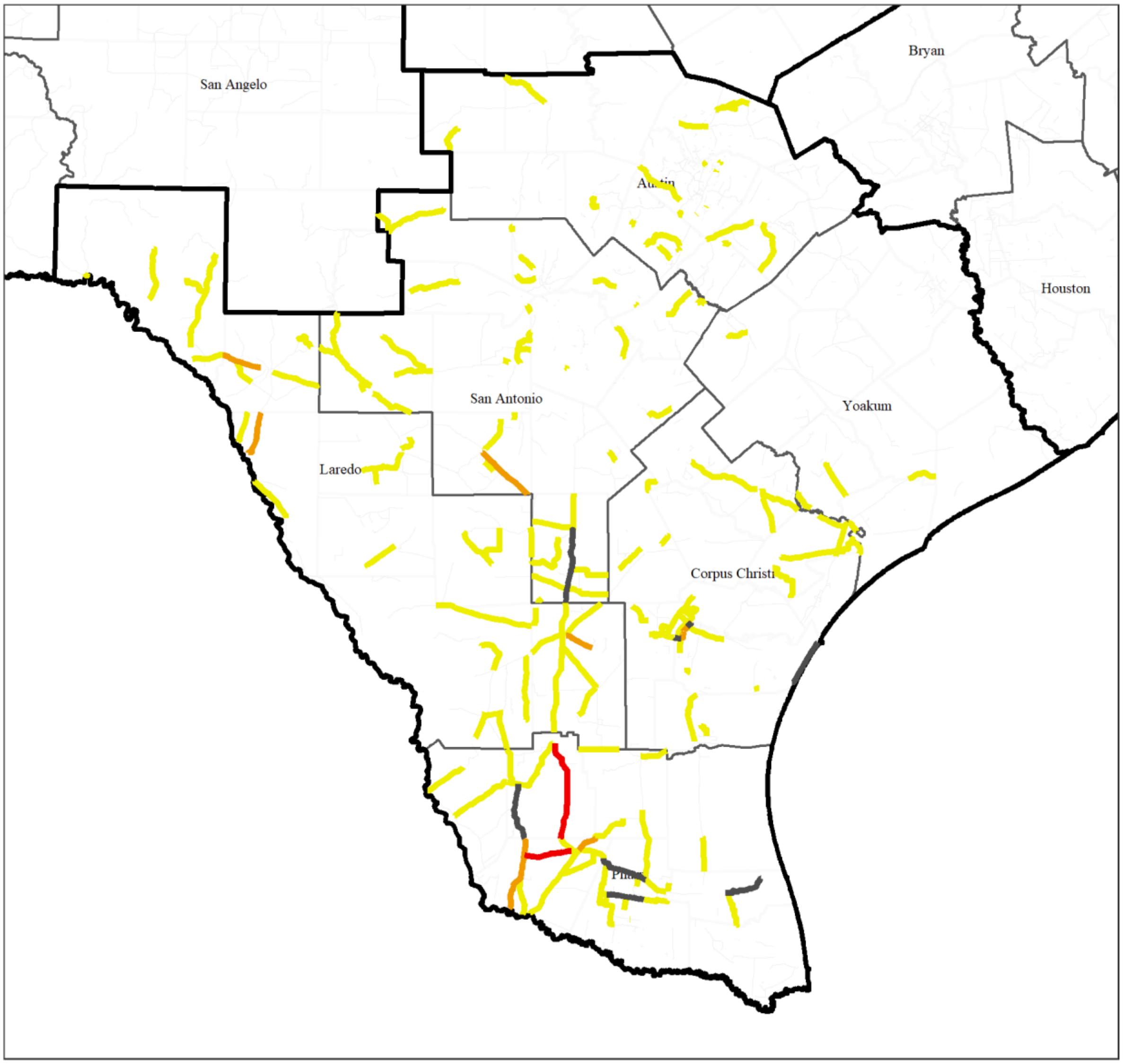
Points Per Section (Dead Only) 1-2 3-4 5-6 7+



Crotalus atrox
Western Diamondback Rattlesnake
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE
Waco
Bryan
Lufkin
Beaumont
Houston
Yoakum
Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Crotalus atrox

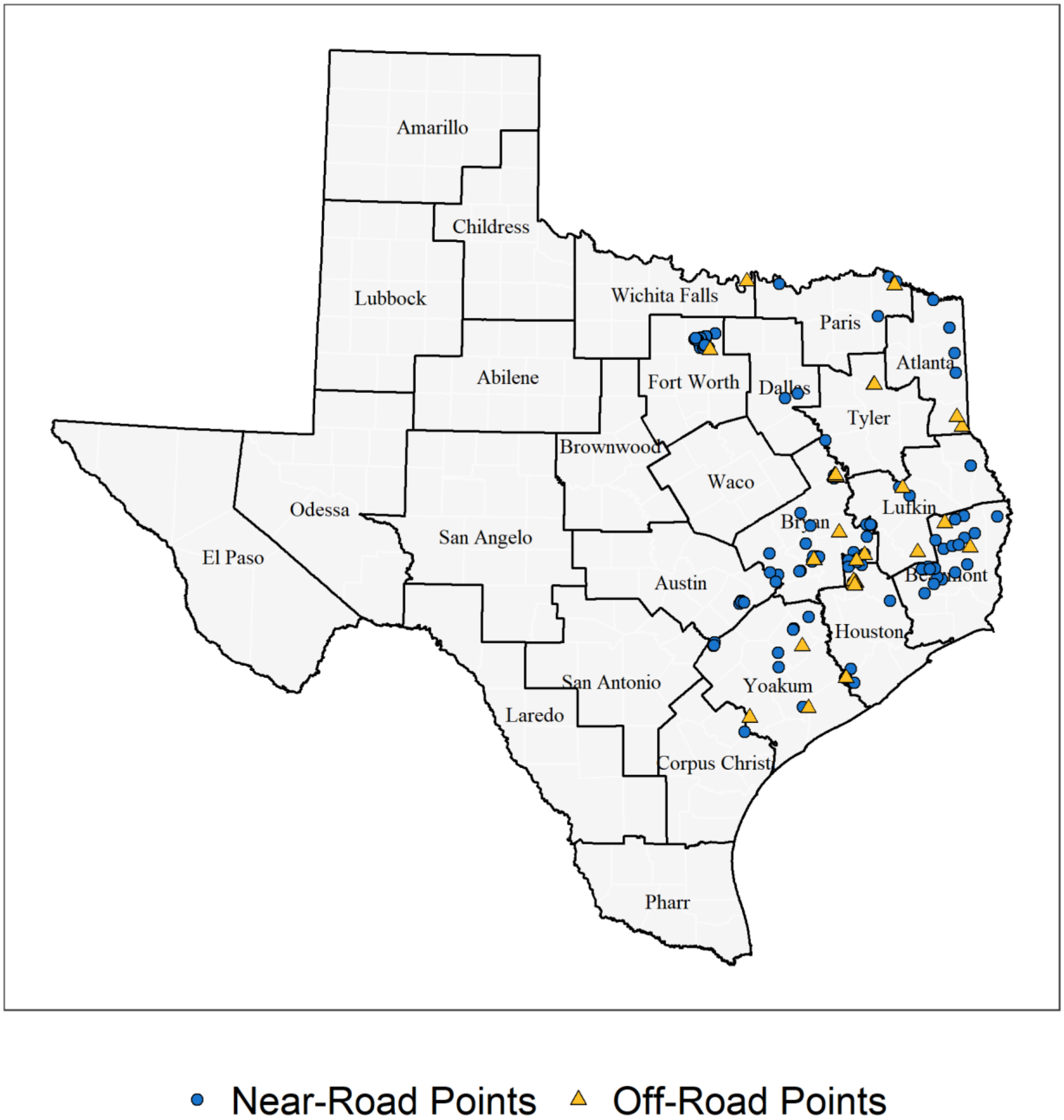
Western Diamondback Rattlesnake



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

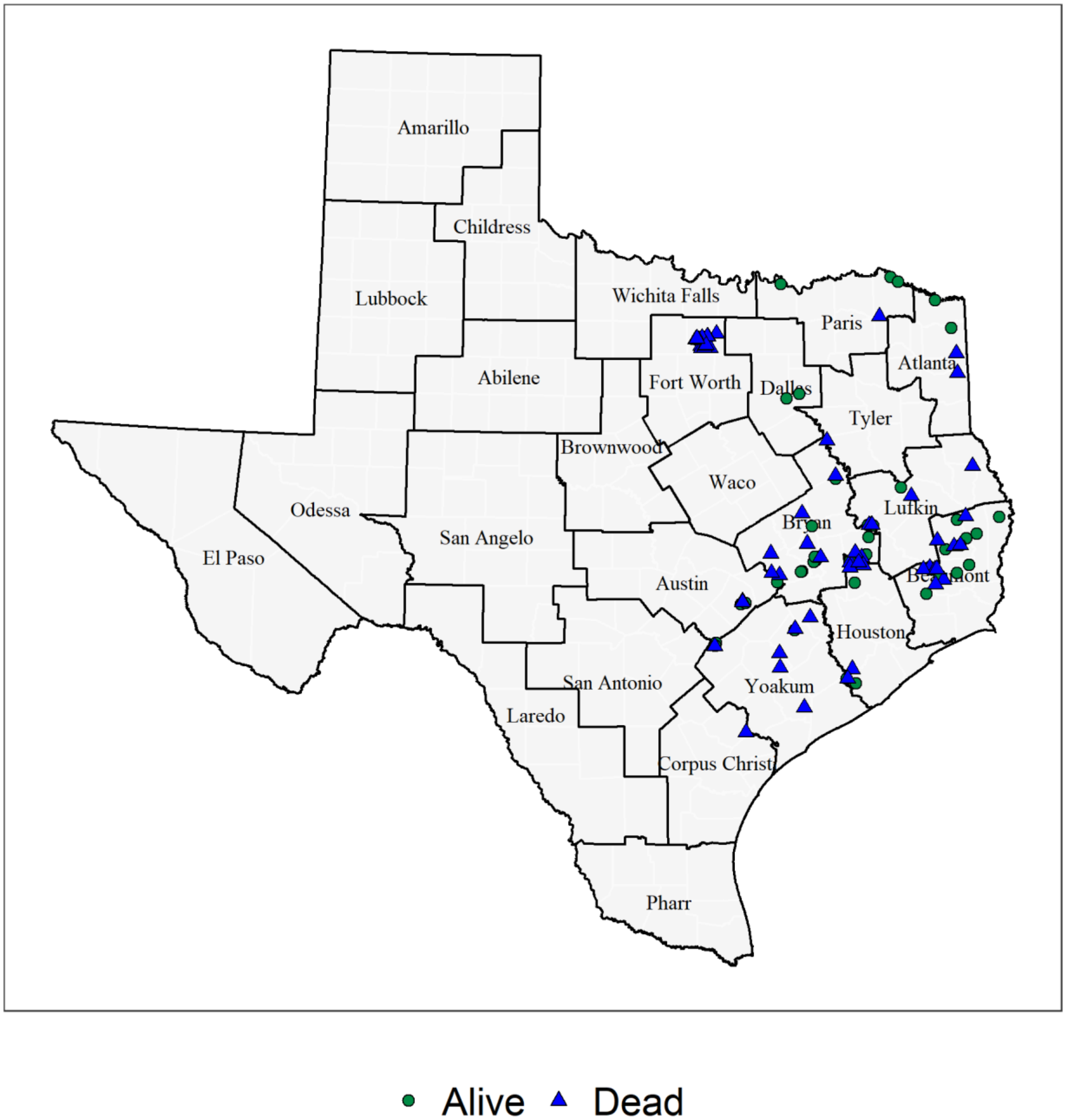
Crotalus horridus

Timber Rattlesnake



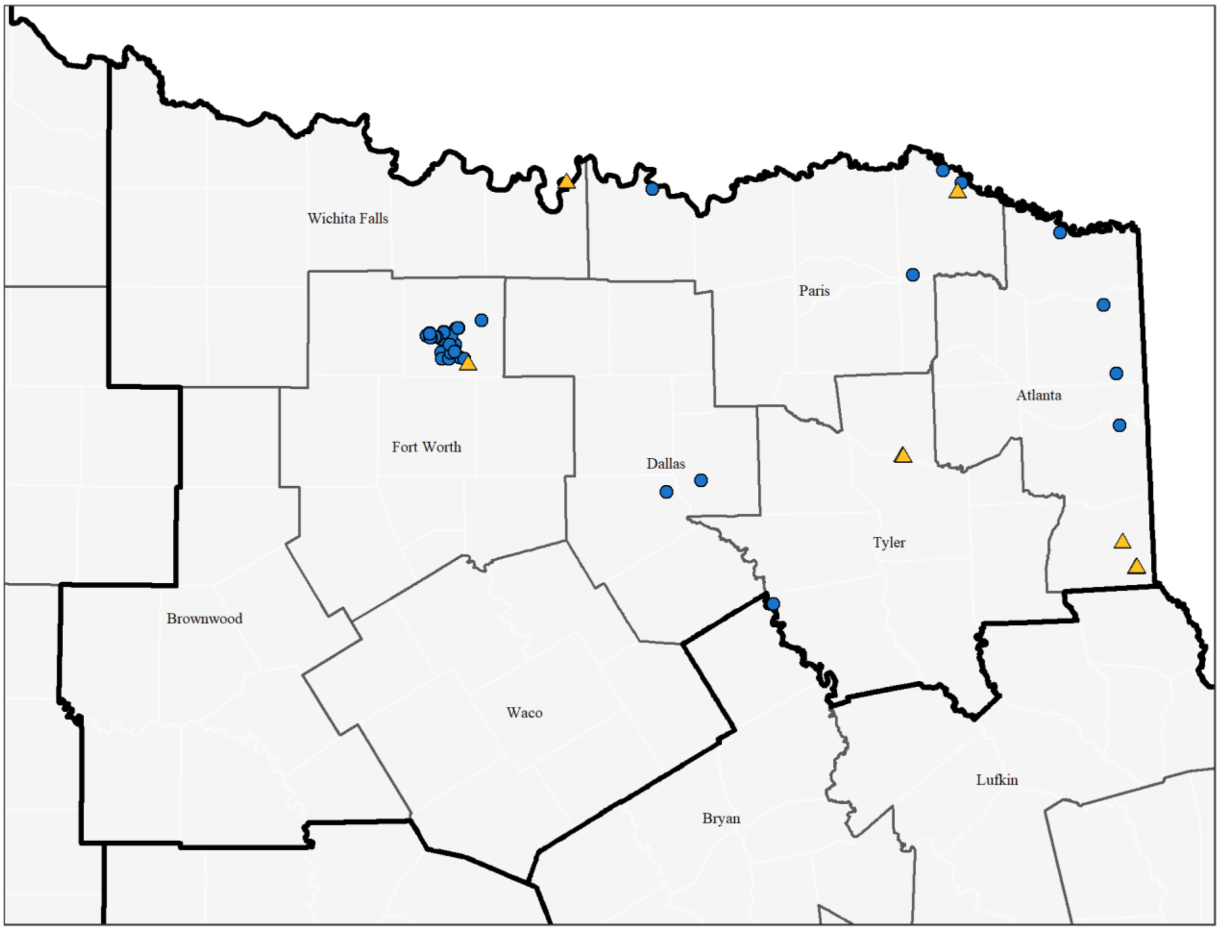
Crotalus horridus

Timber Rattlesnake



Crotalus horridus

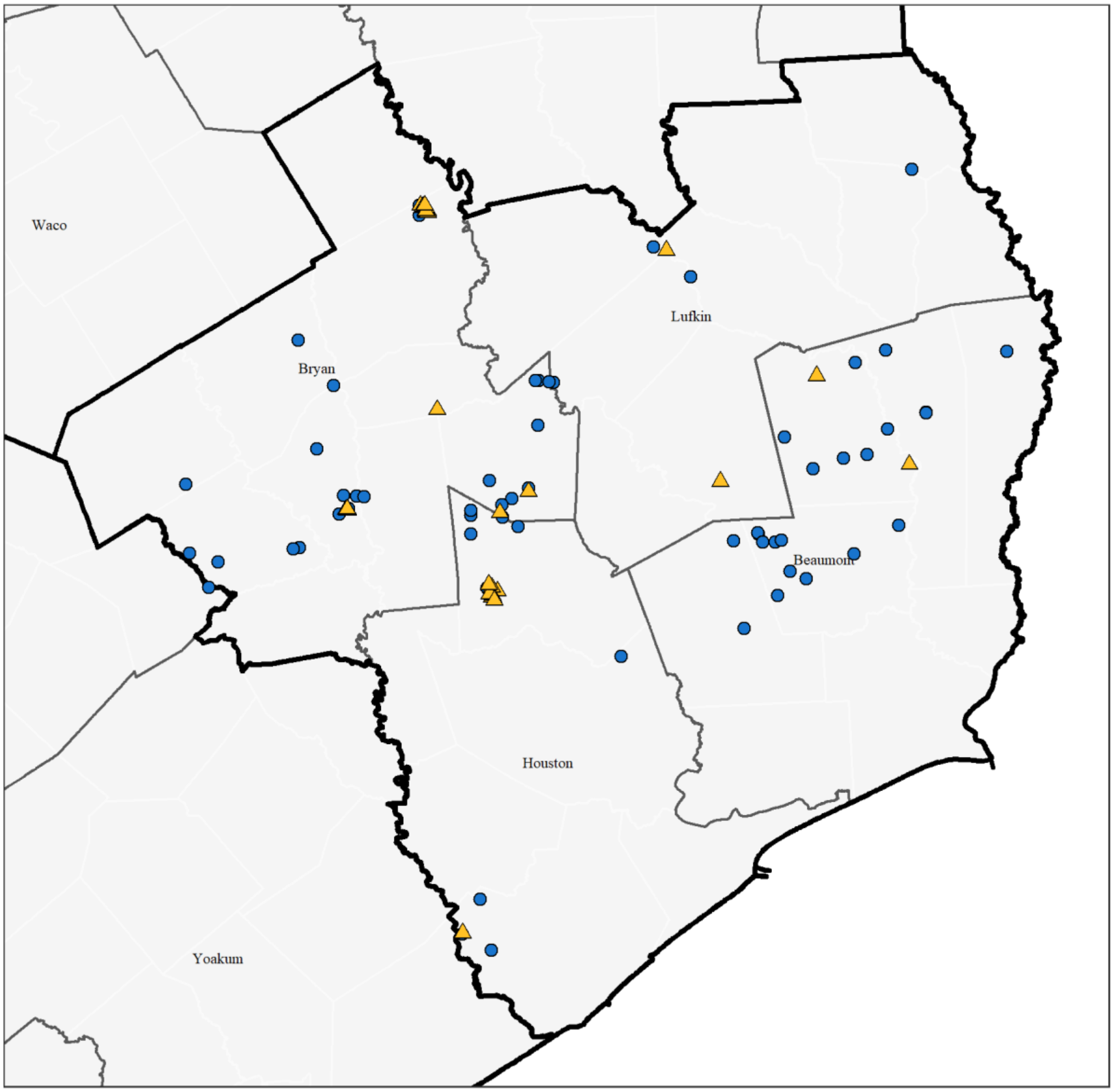
Timber Rattlesnake



Near-Road Points Off-Road Points

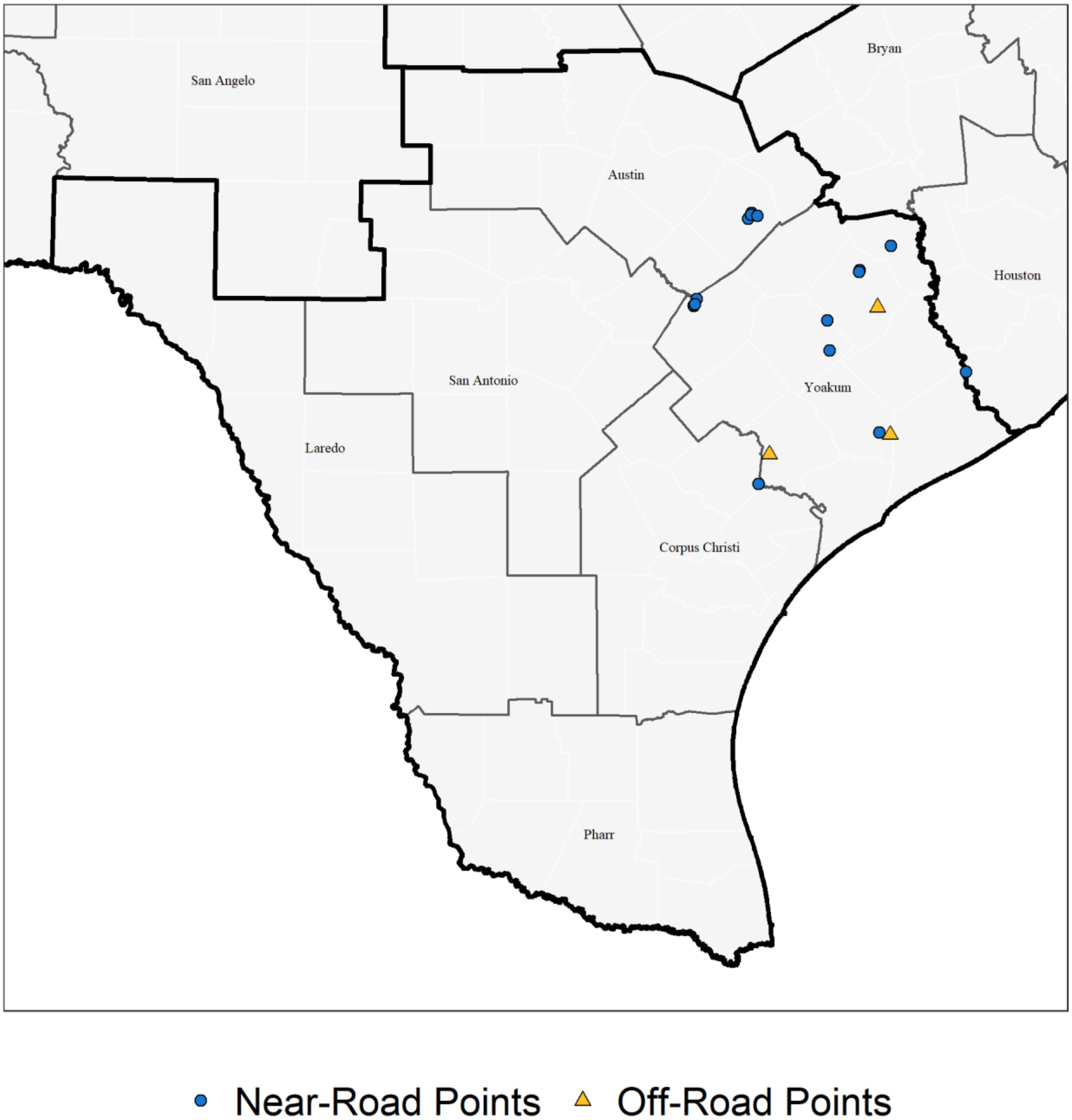
Crotalus horridus

Timber Rattlesnake



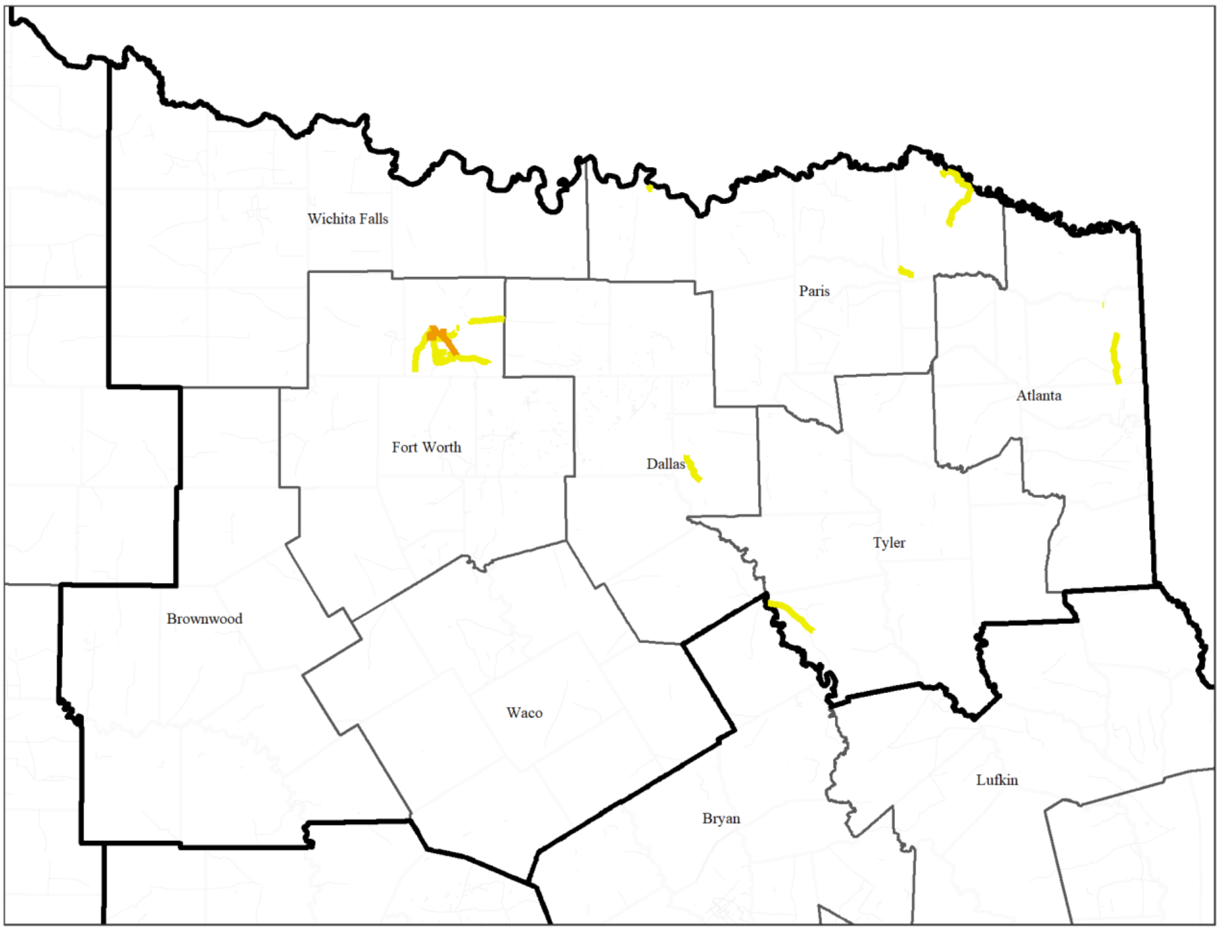
• Near-Road Points △ Off-Road Points

Crotalus horridus
Timber Rattlesnake



Crotalus horridus

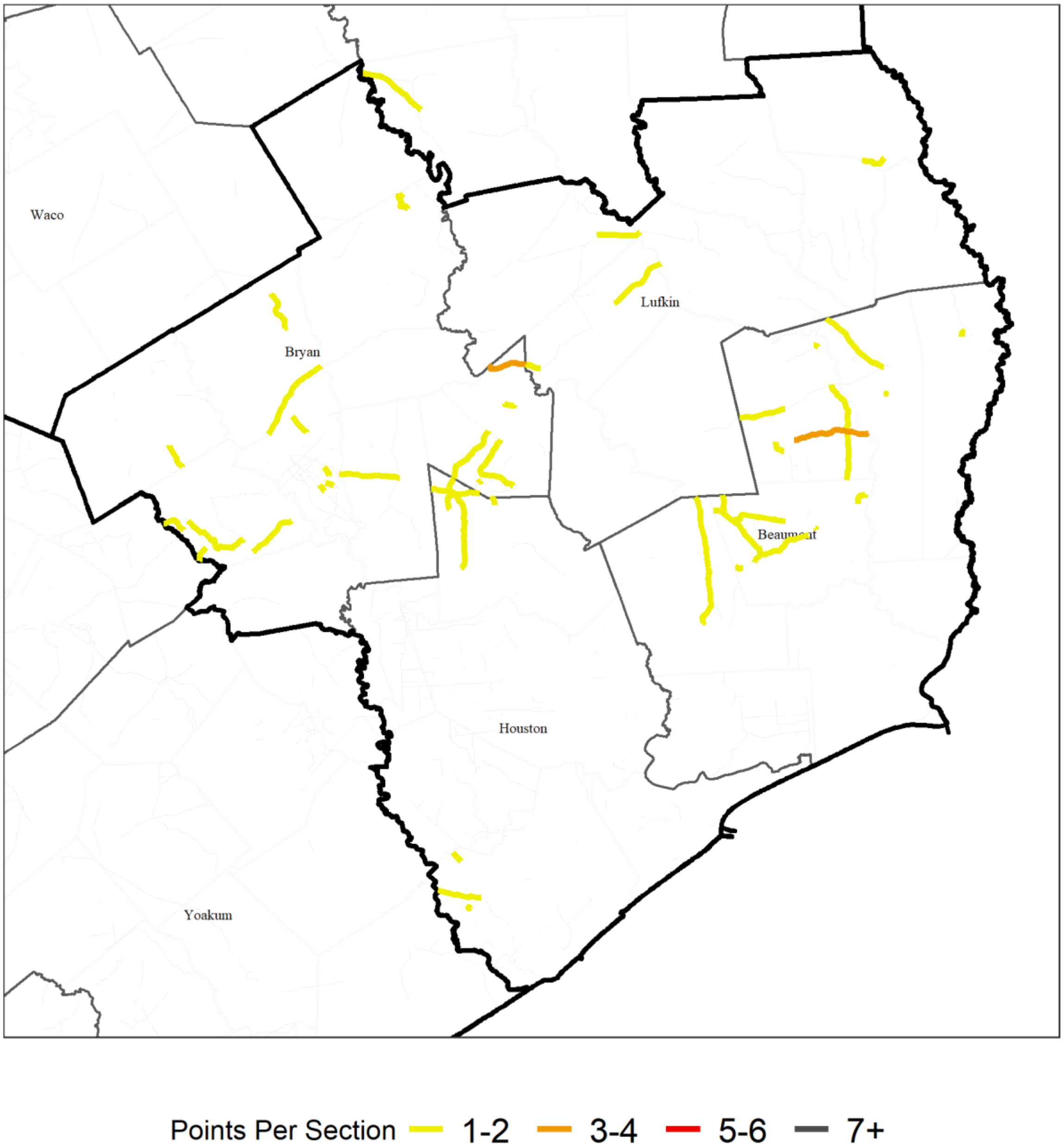
Timber Rattlesnake



Points Per Section 1-2 3-4 5-6 7+

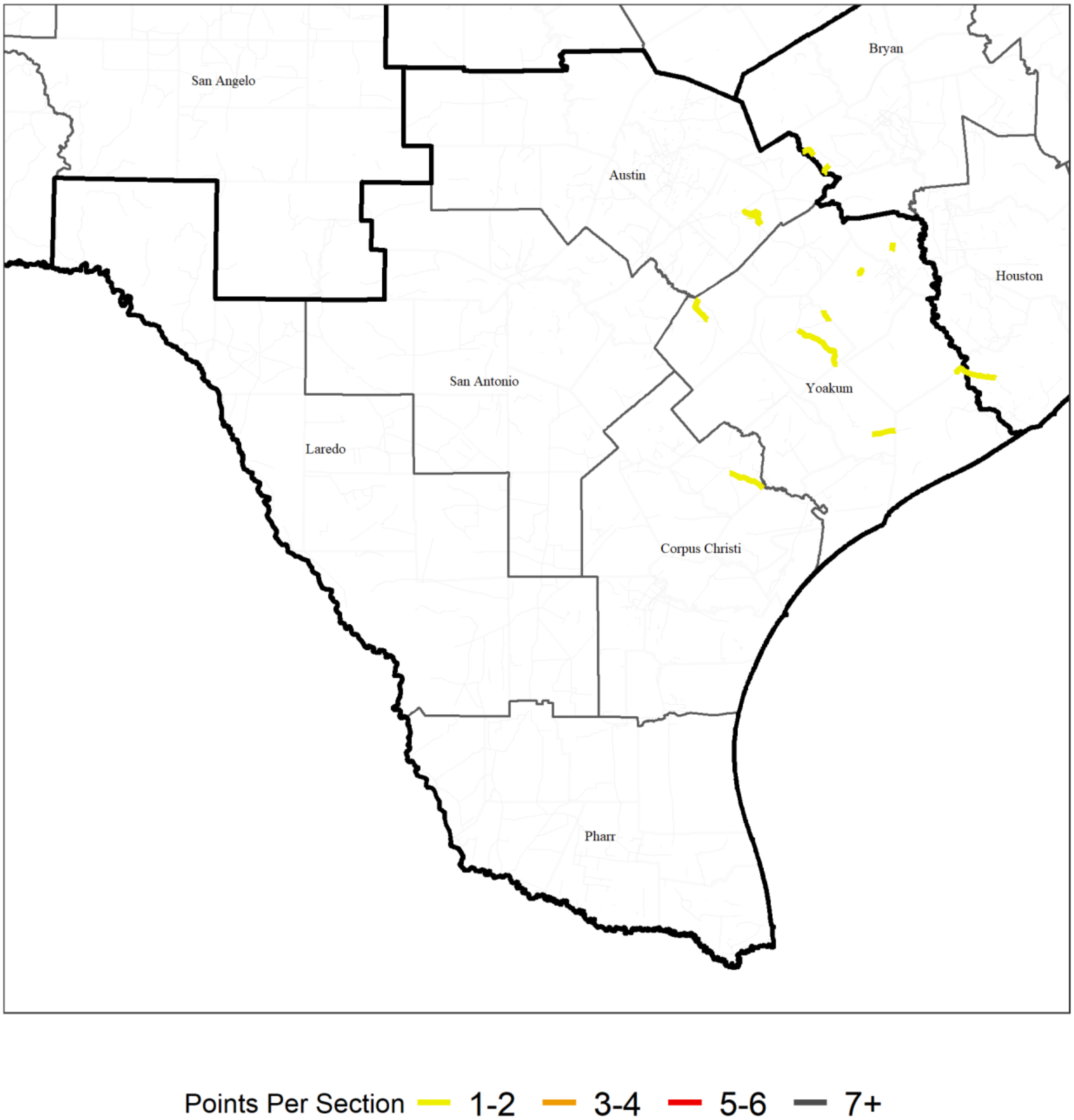
Crotalus horridus

Timber Rattlesnake



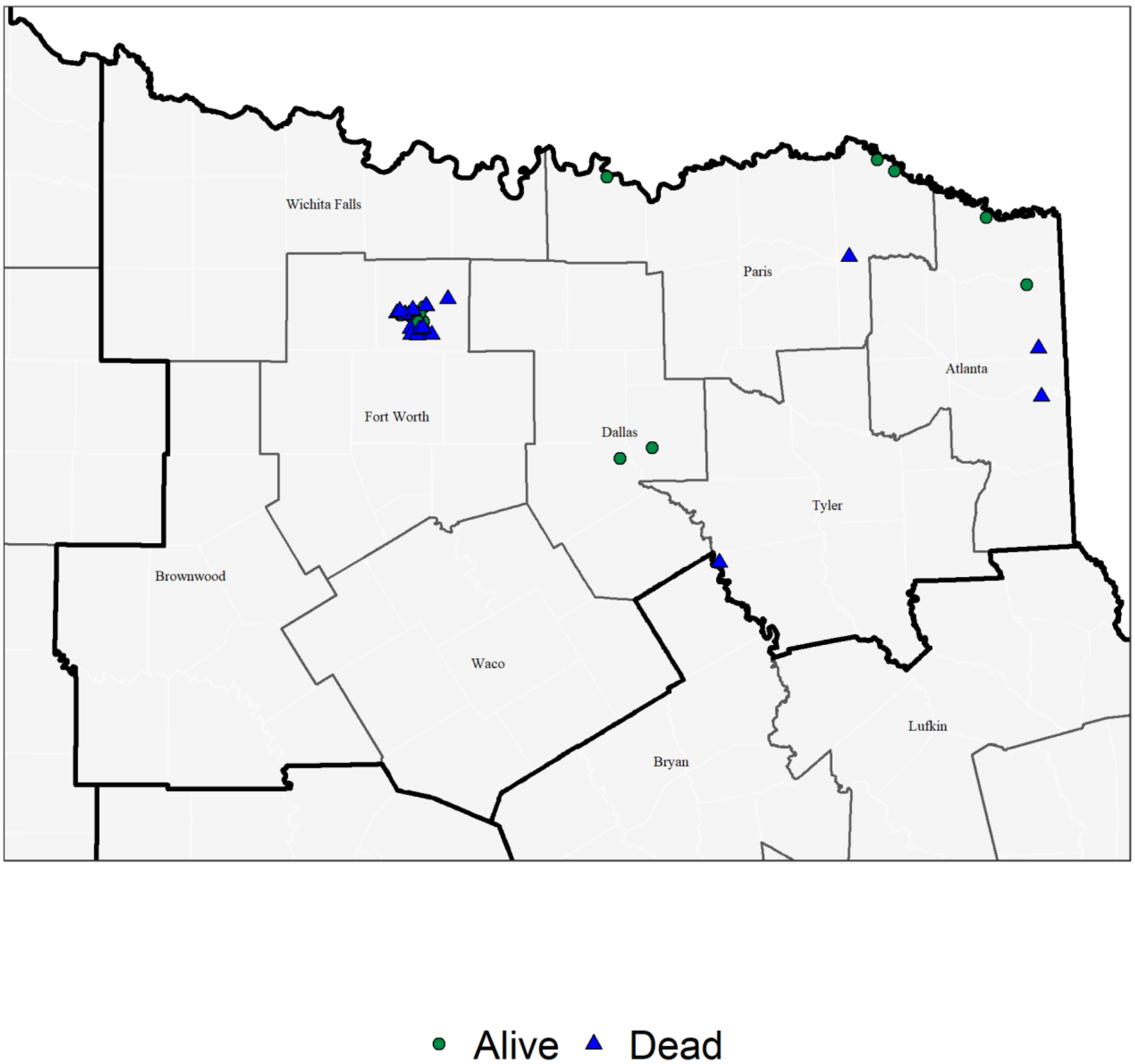
Crotalus horridus

Timber Rattlesnake



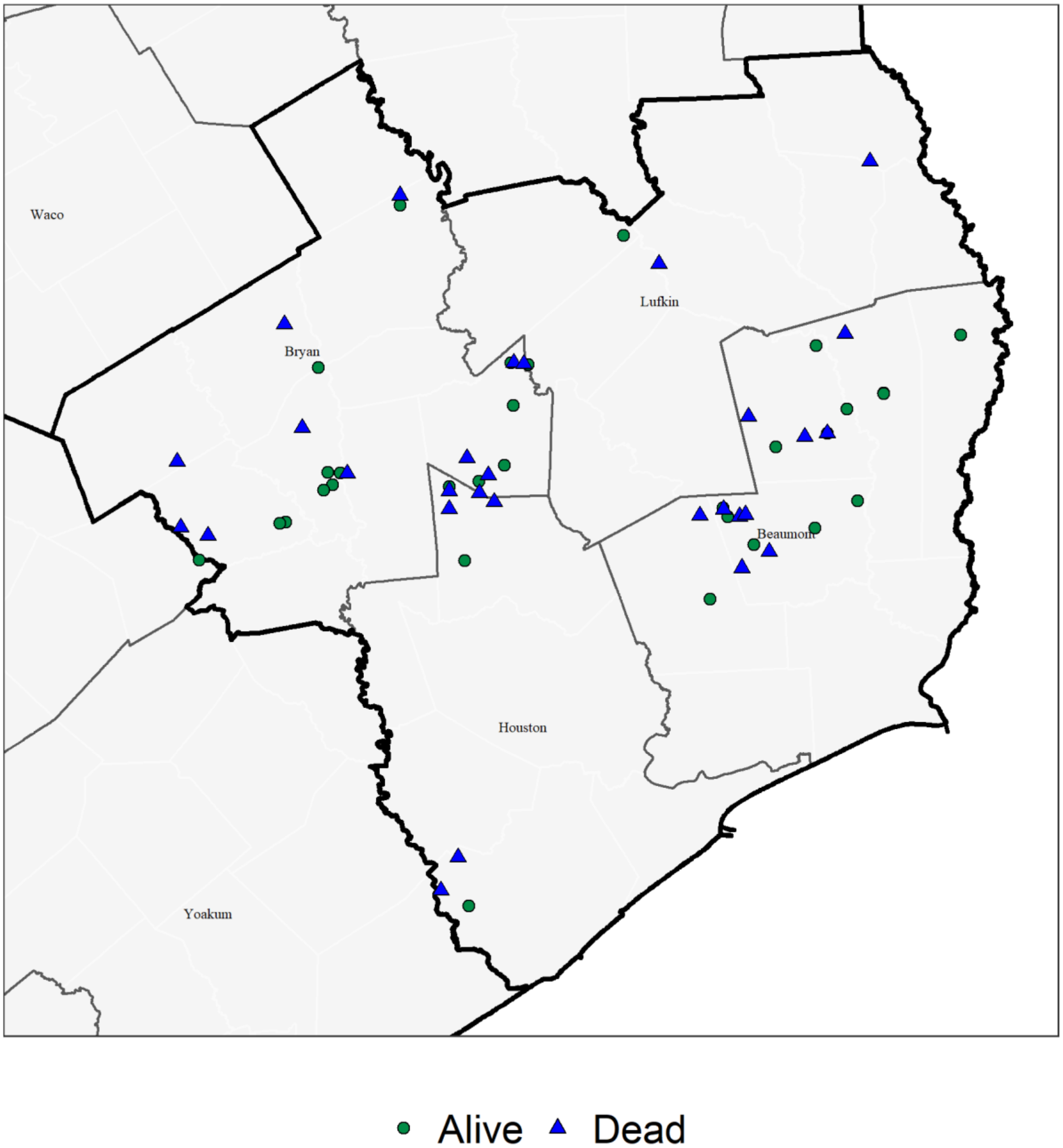
Crotalus horridus

Timber Rattlesnake



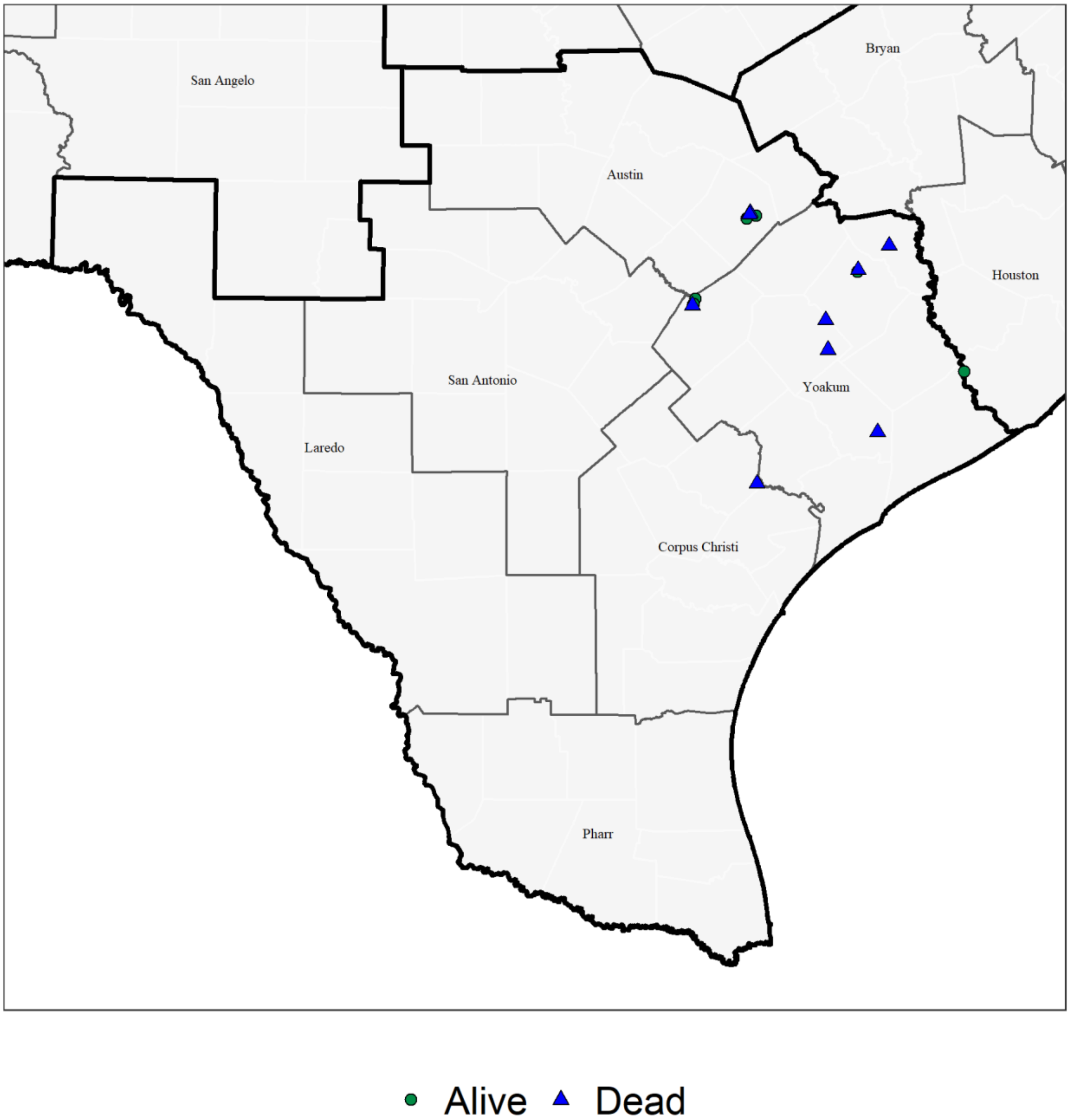
Crotalus horridus

Timber Rattlesnake



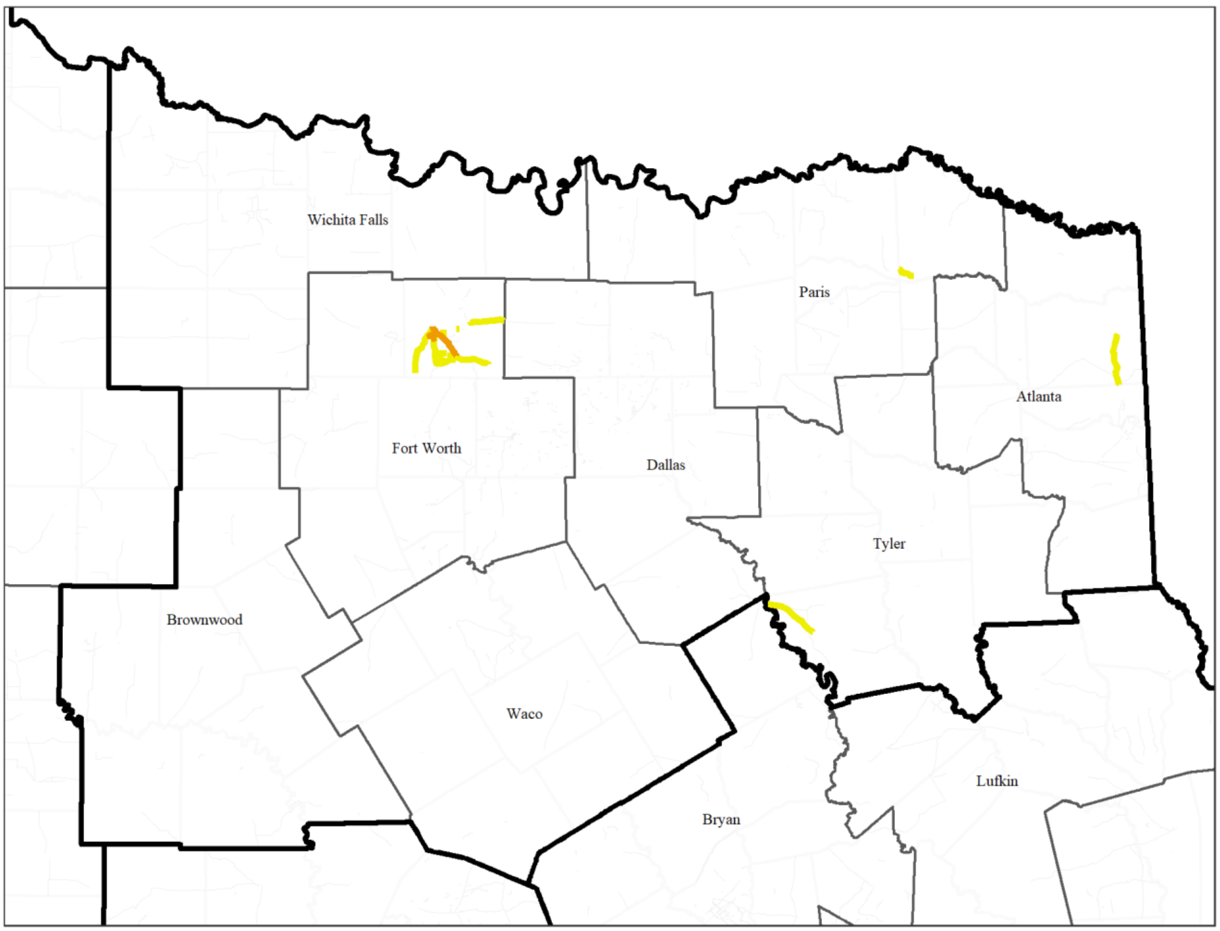
Crotalus horridus

Timber Rattlesnake



Crotalus horridus

Timber Rattlesnake



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Crotalus horridus

Timber Rattlesnake

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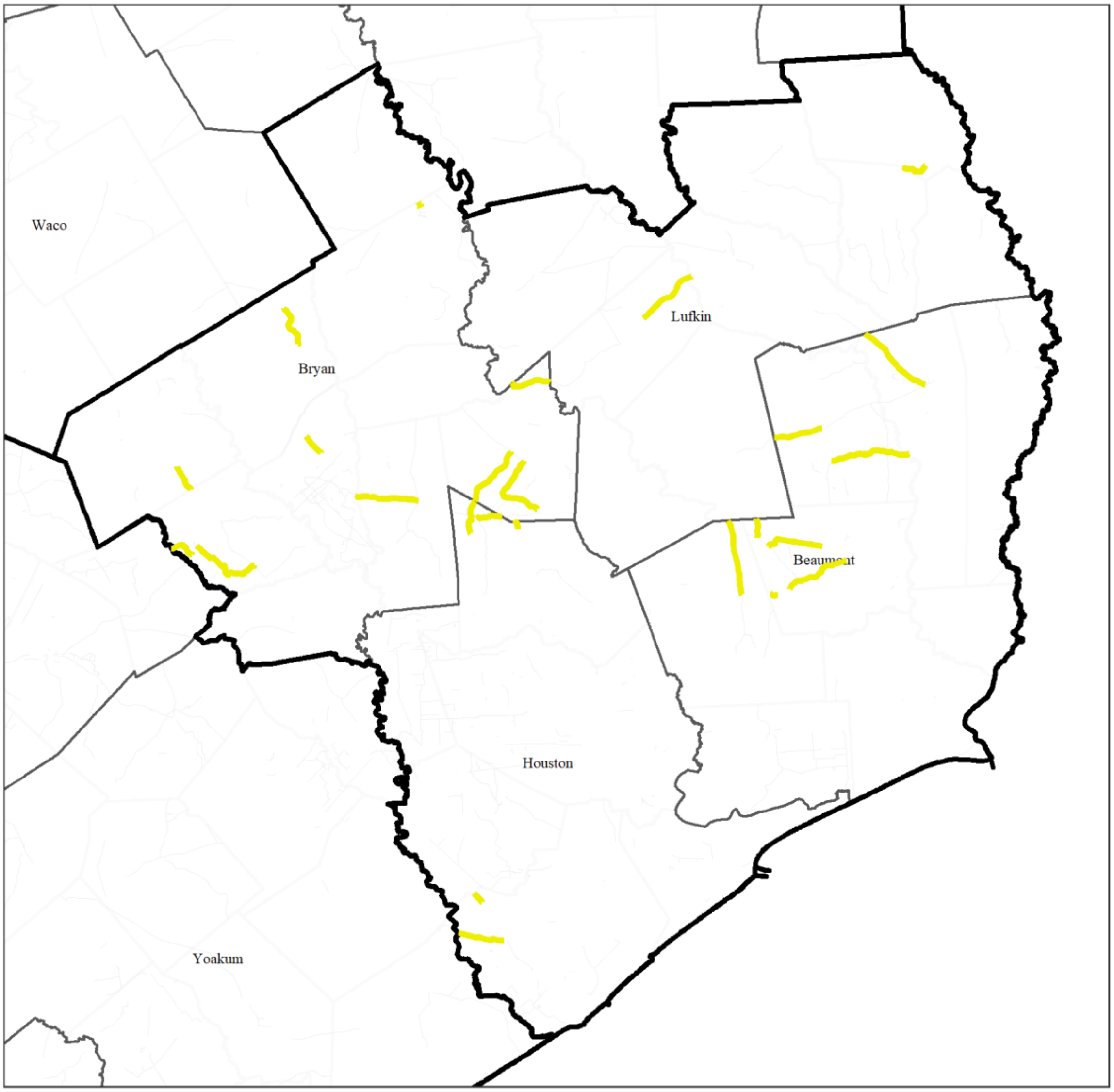
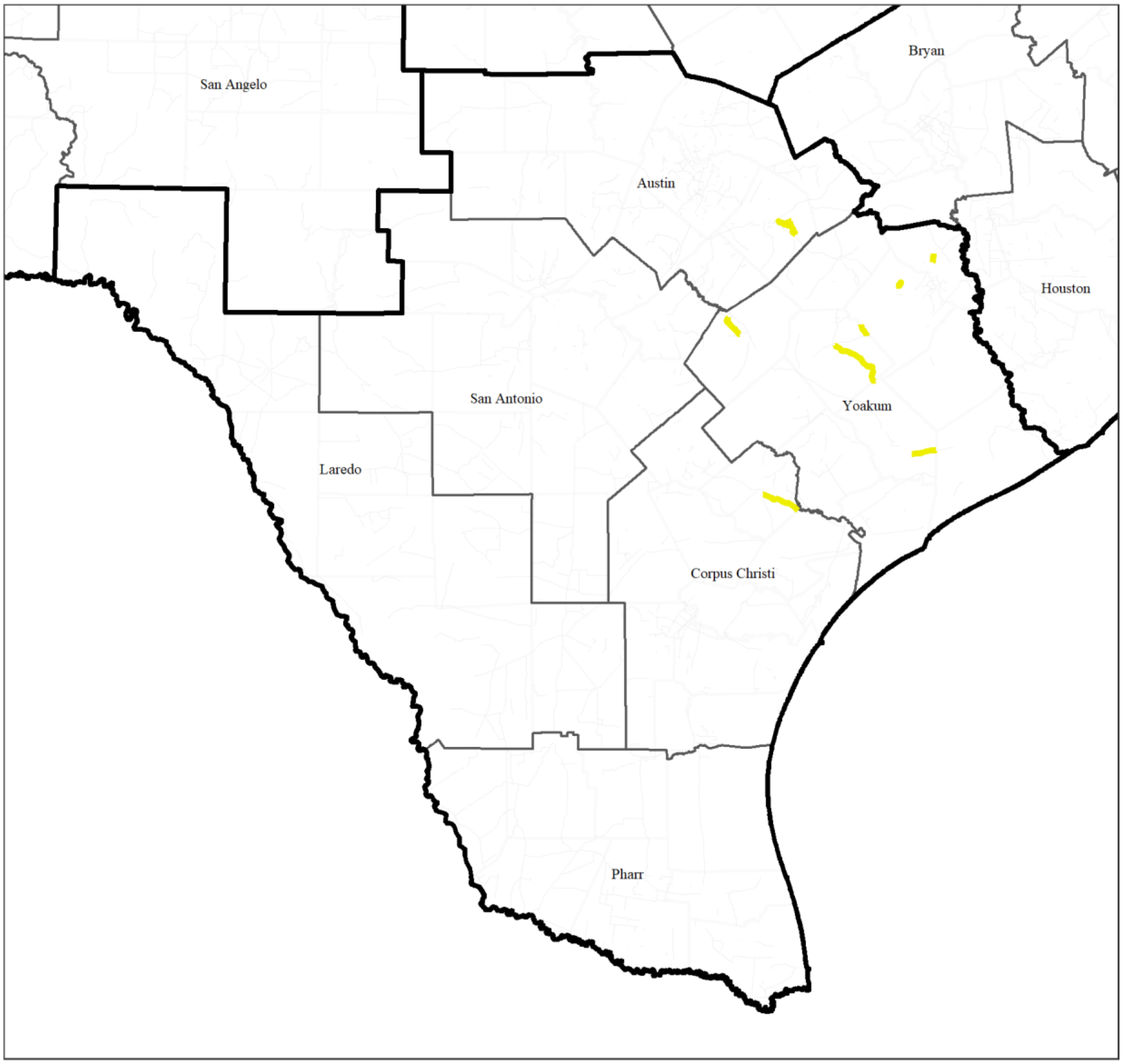


Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Crotalus horridus

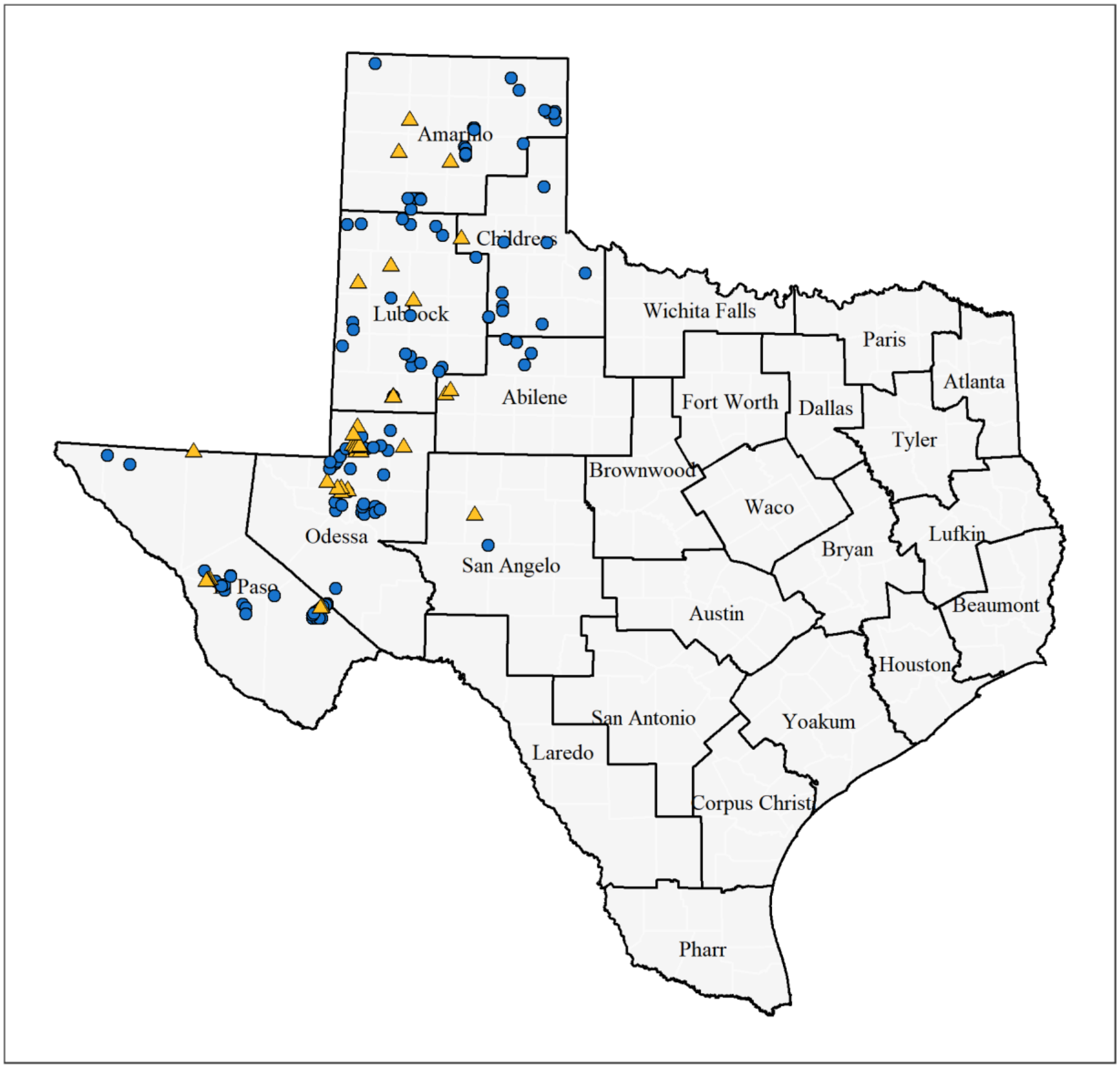
Timber Rattlesnake



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

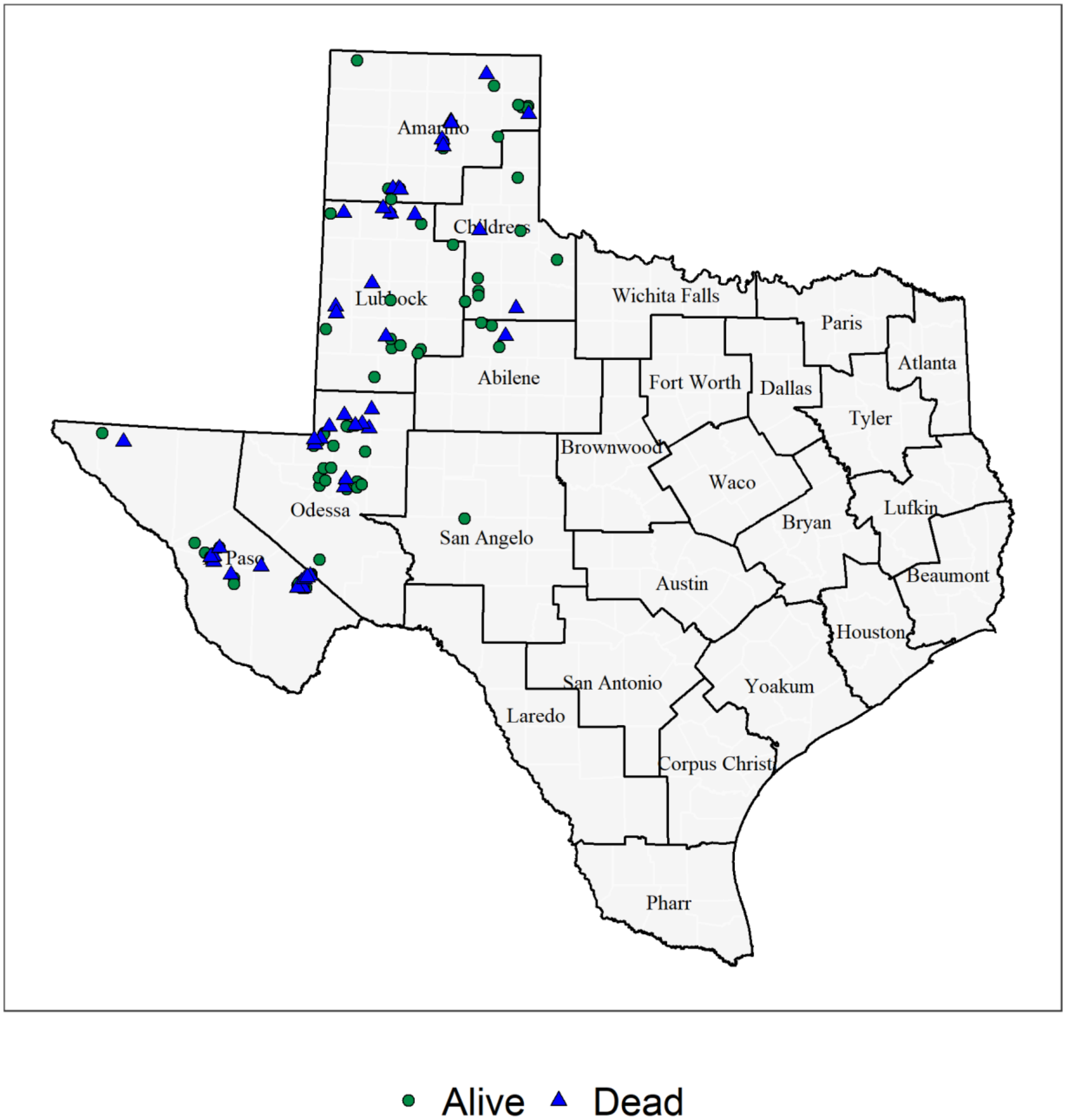
Crotalus viridis

Prairie Rattlesnake



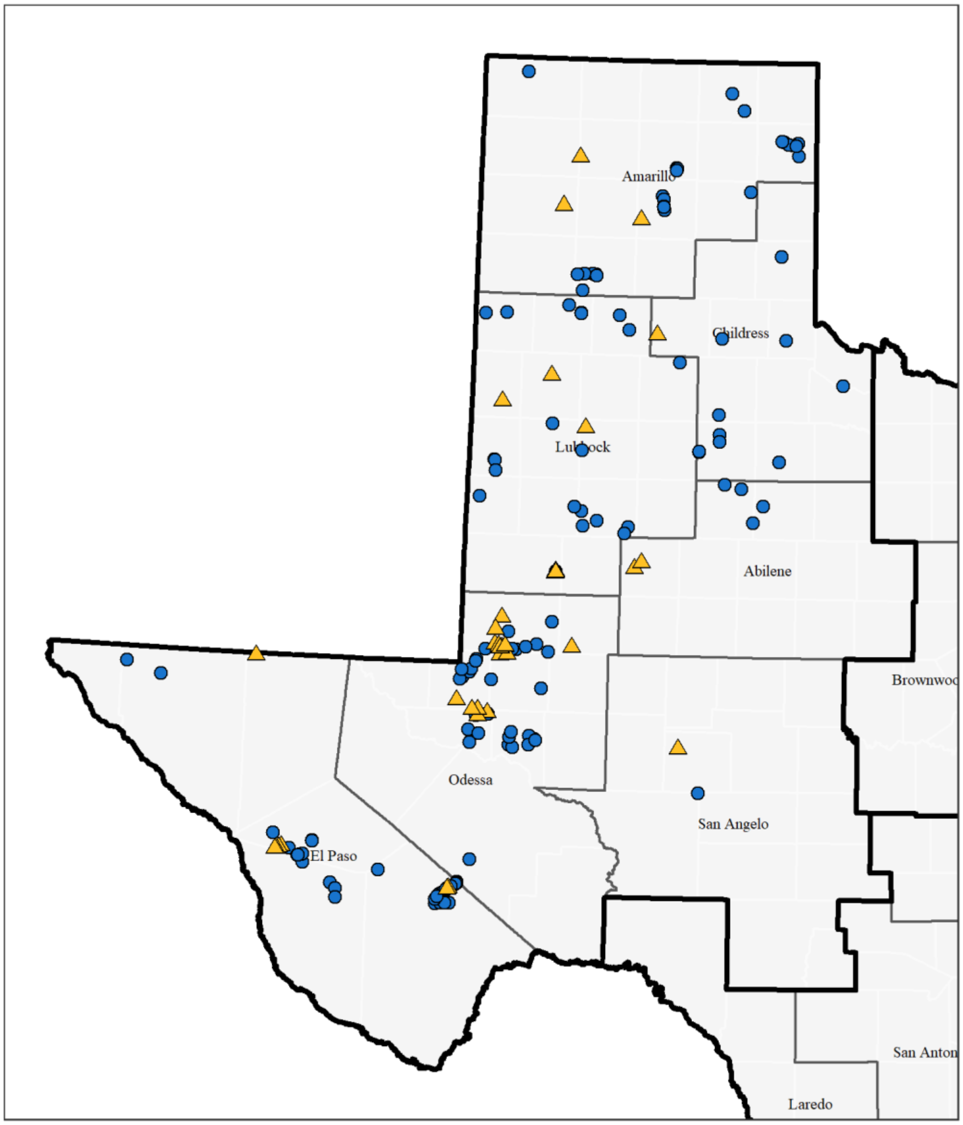
• Near-Road Points △ Off-Road Points

Crotalus viridis
Prairie Rattlesnake



Crotalus viridis

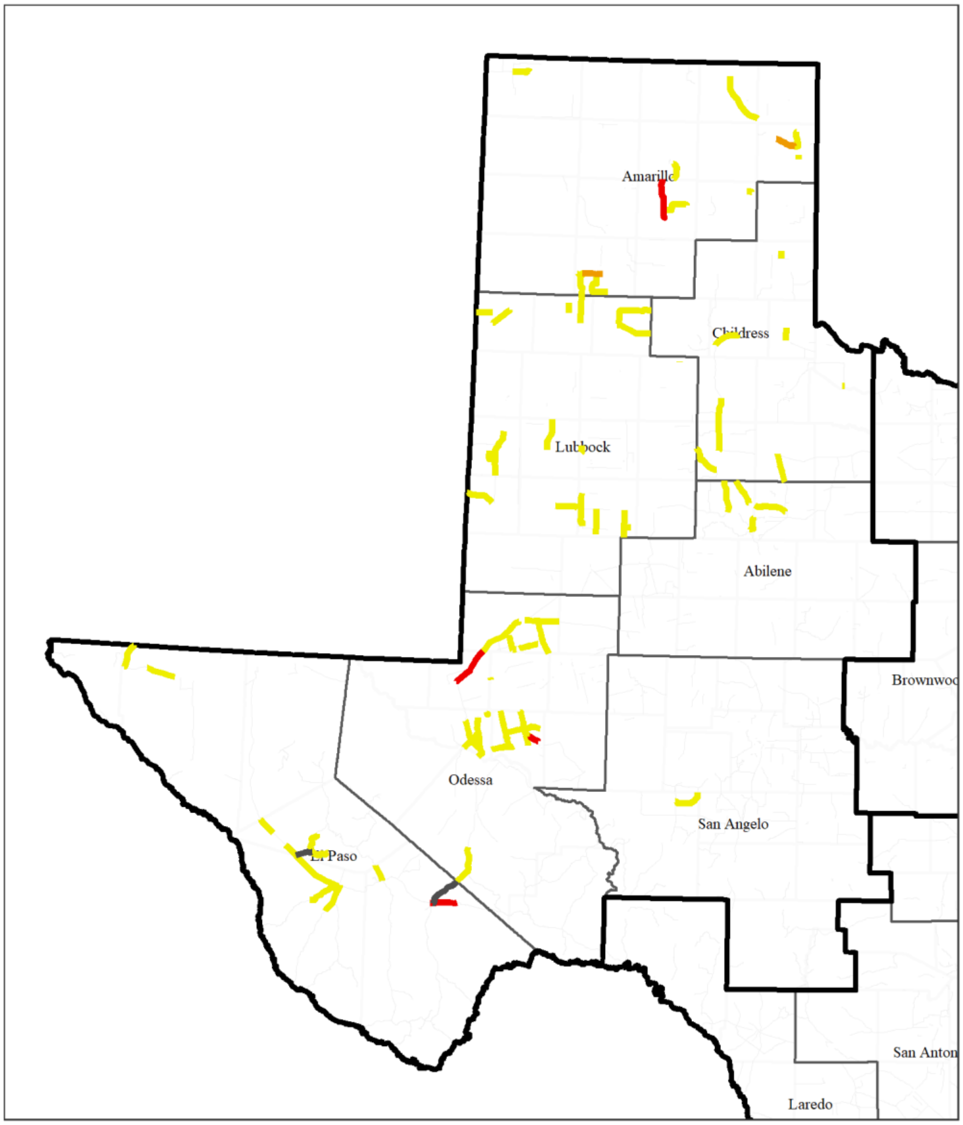
Prairie Rattlesnake



• Near-Road Points △ Off-Road Points

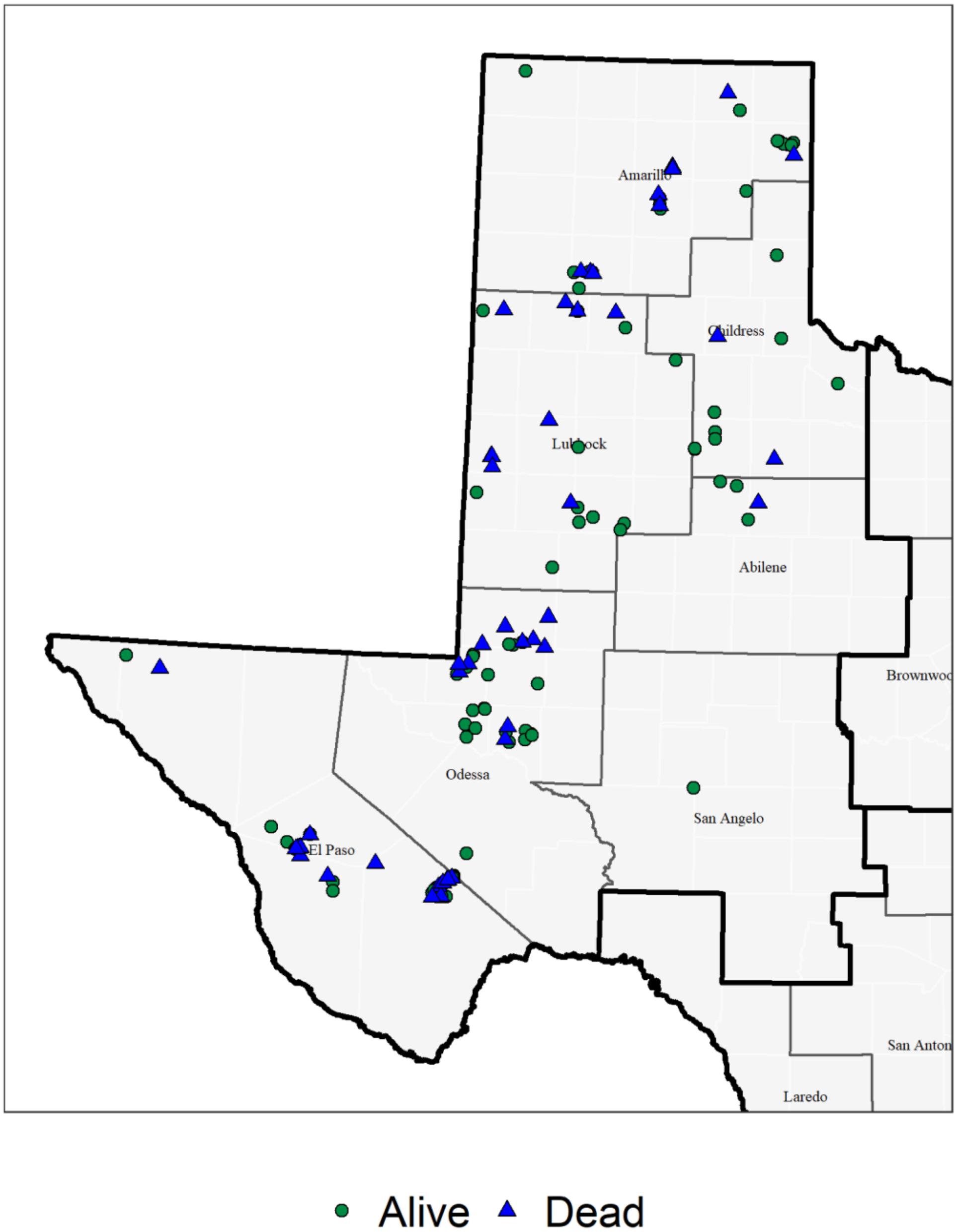
Crotalus viridis

Prairie Rattlesnake



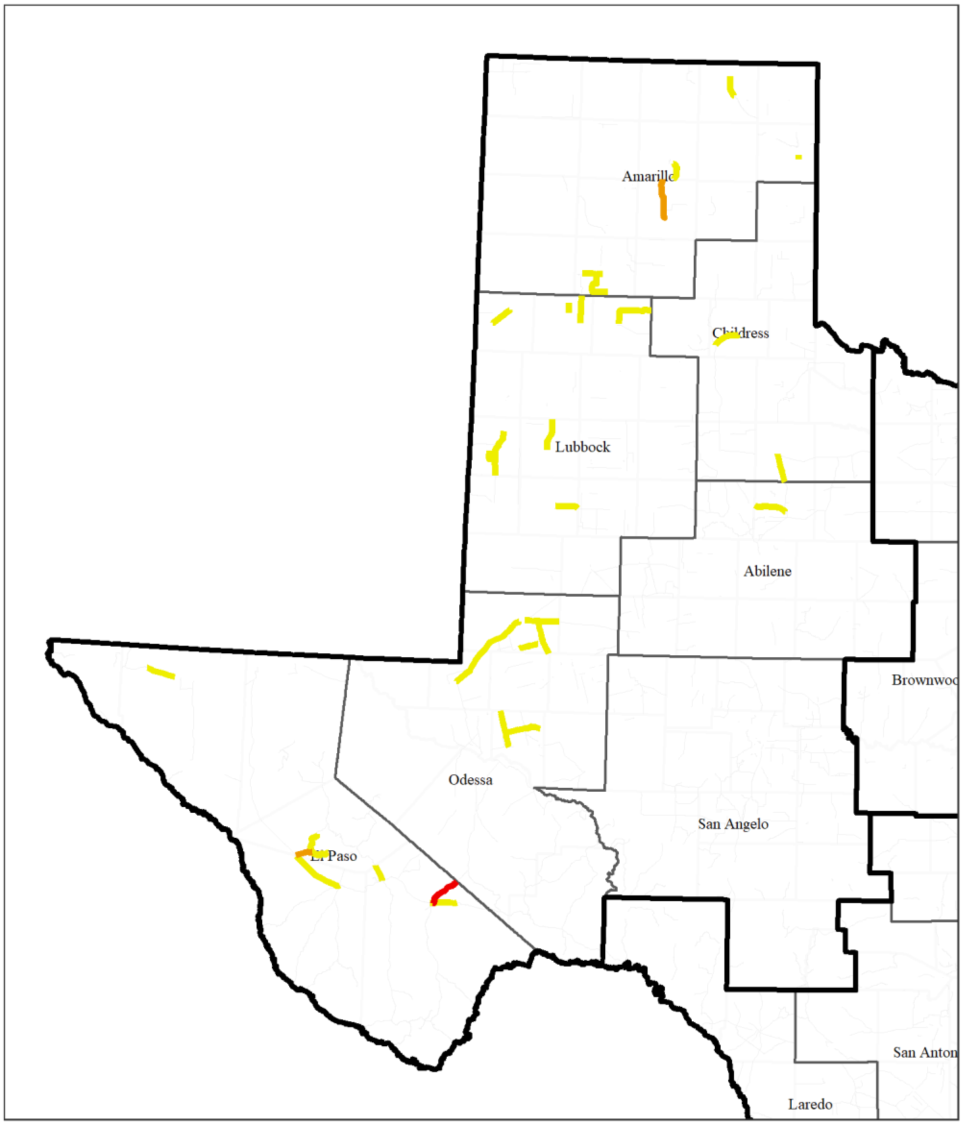
Crotalus viridis

Prairie Rattlesnake



Crotalus viridis

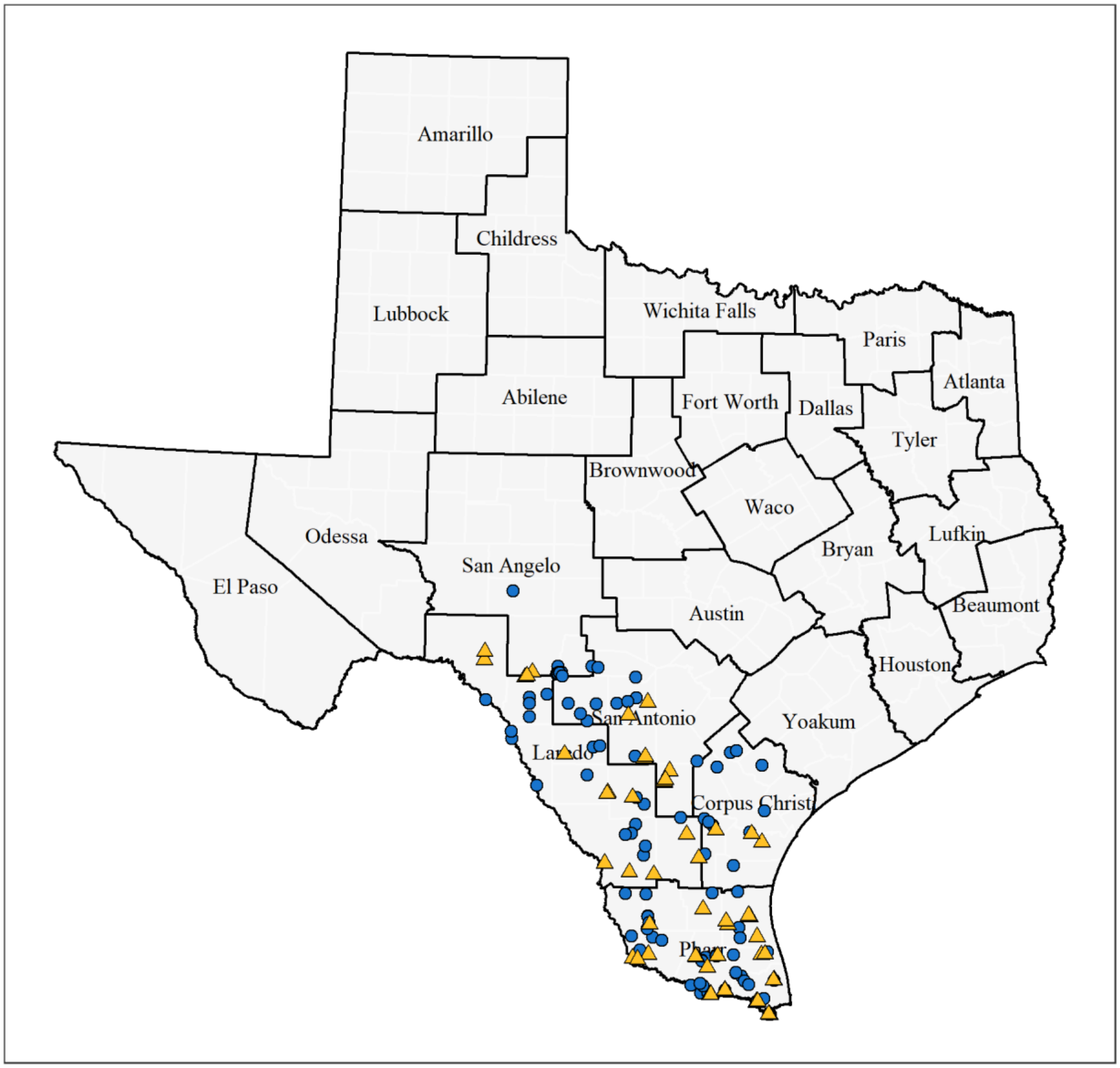
Prairie Rattlesnake



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Drymarchon melanurus

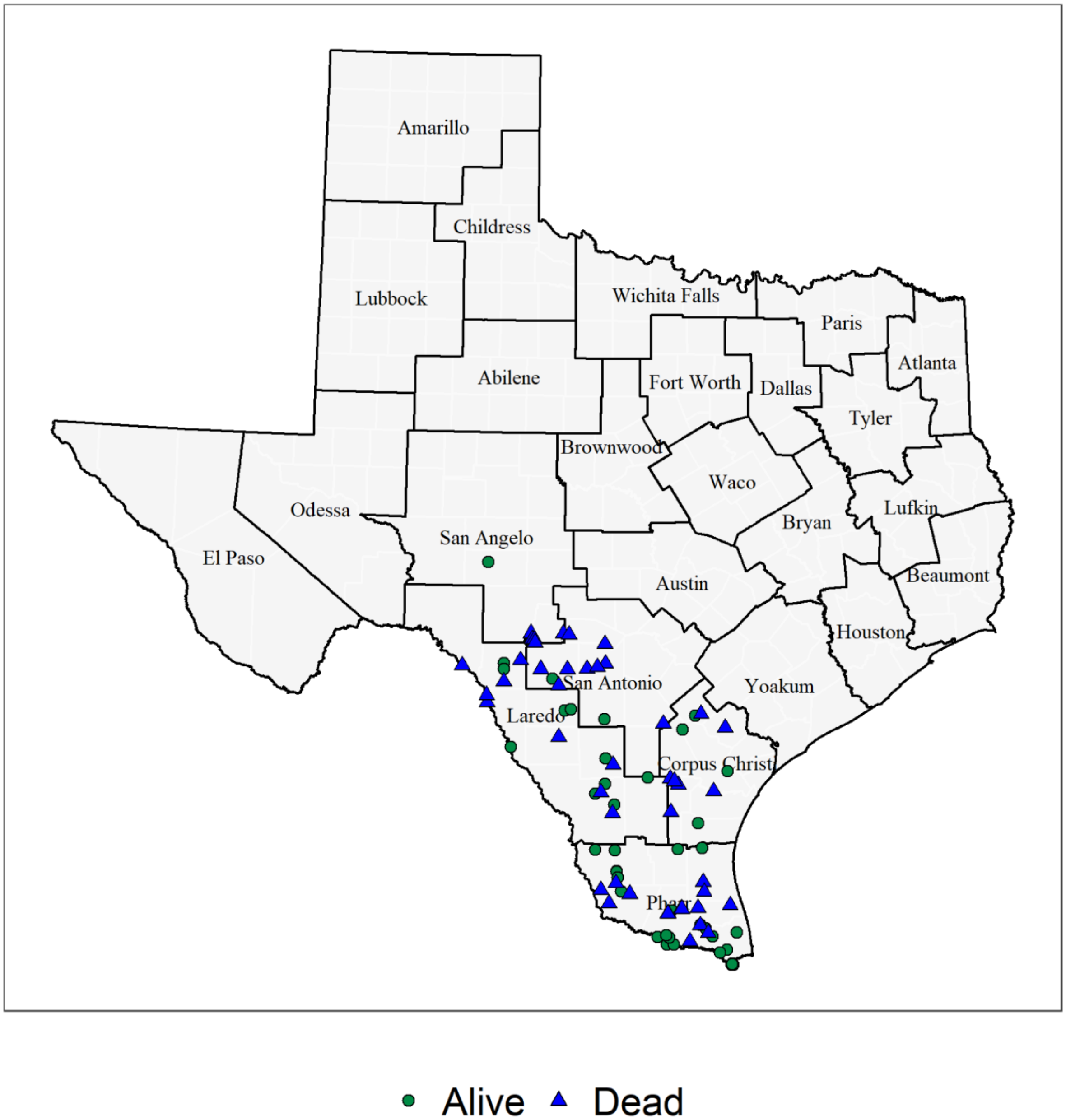
Texas Indigo Snake



Near-Road Points Off-Road Points

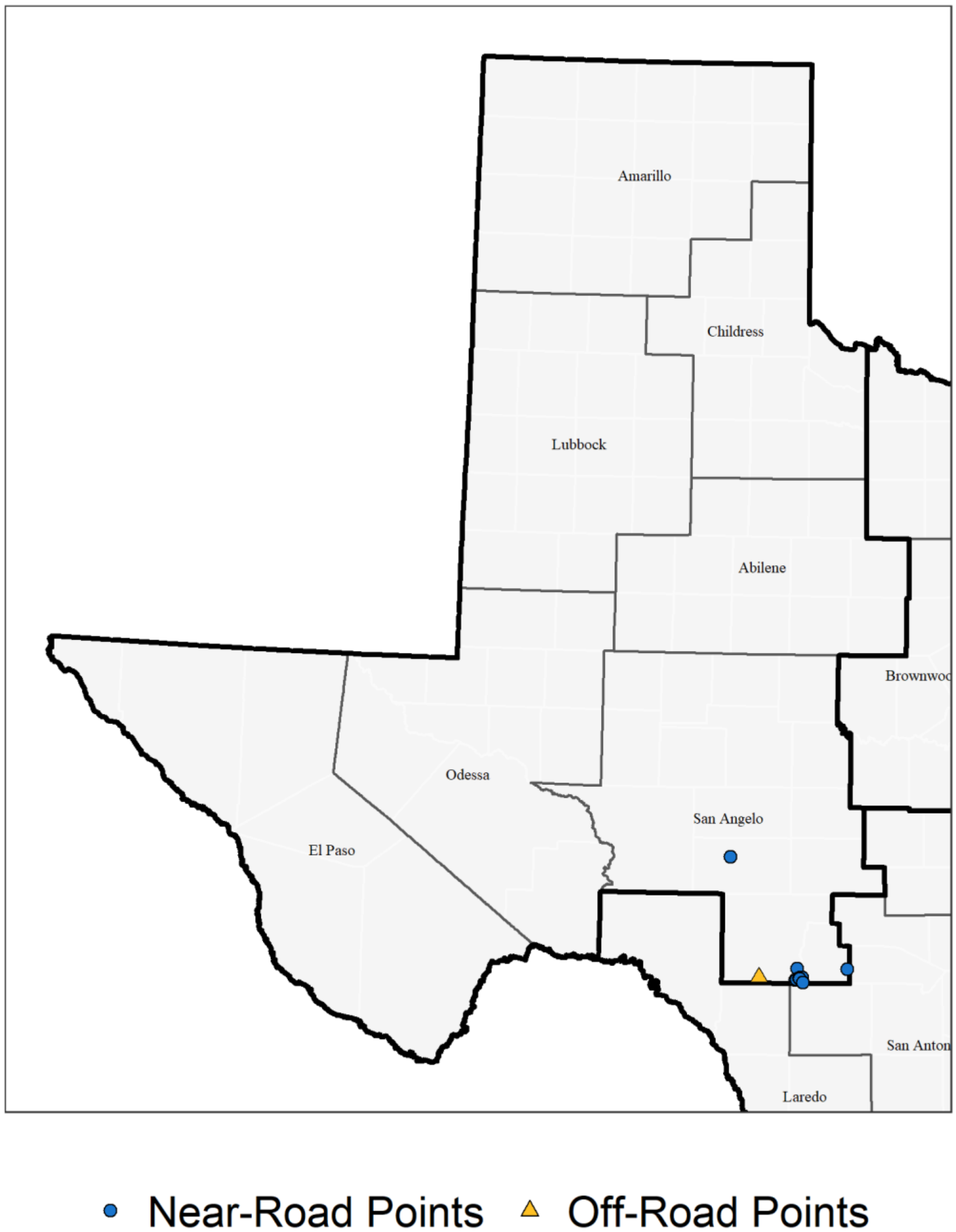
Drymarchon melanurus

Texas Indigo Snake



Drymarchon melanurus

Texas Indigo Snake



Drymarchon melanurus

Texas Indigo Snake

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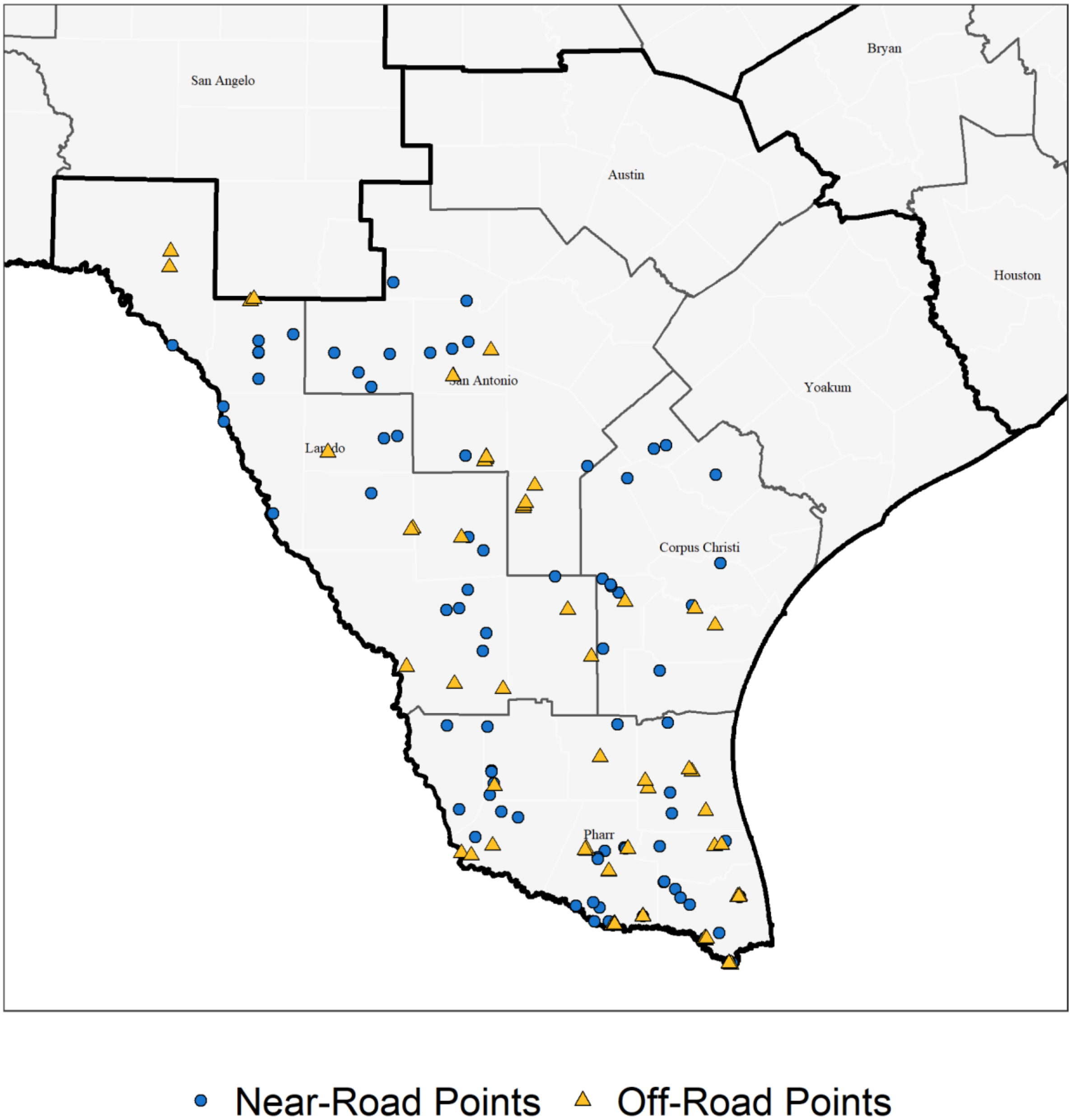
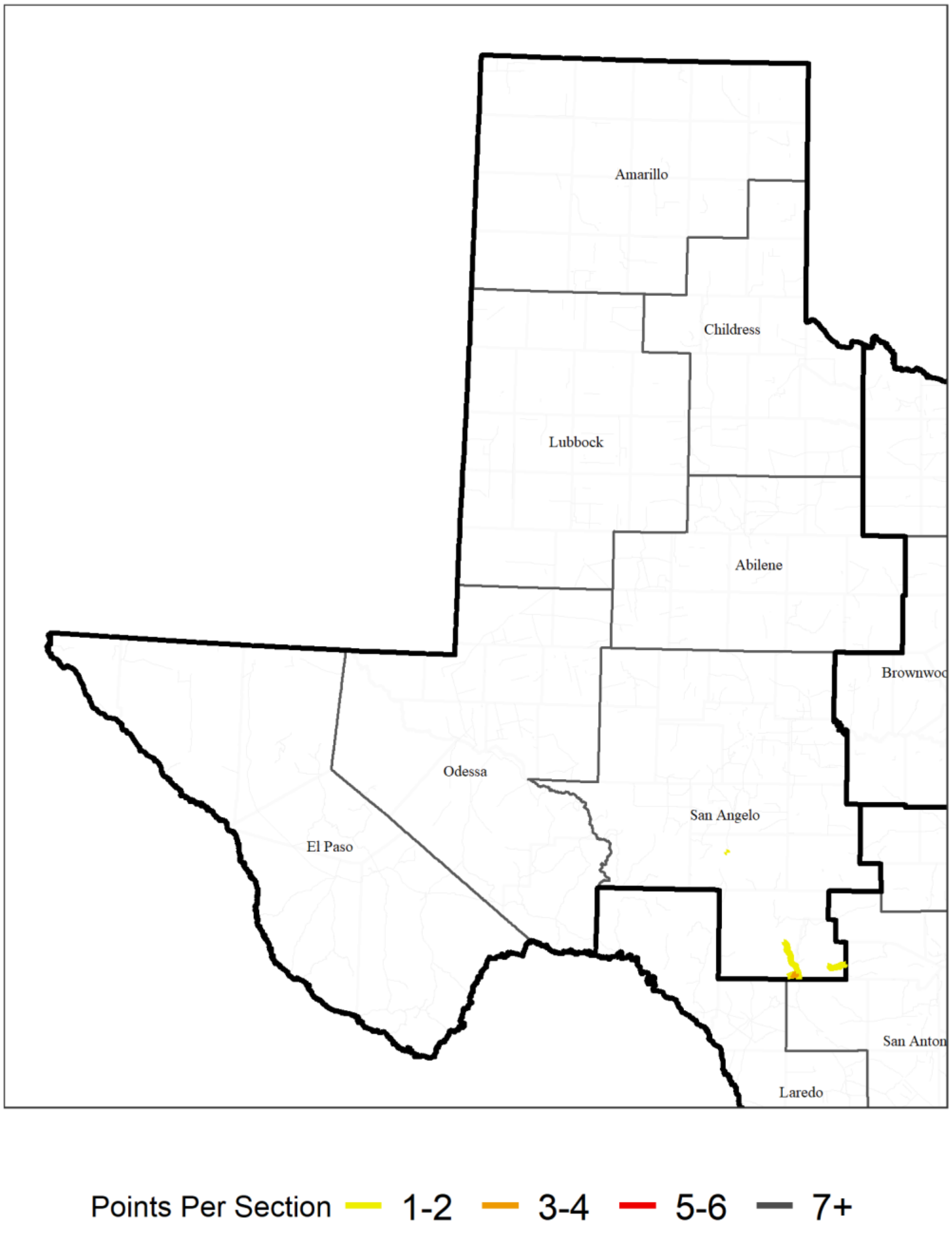


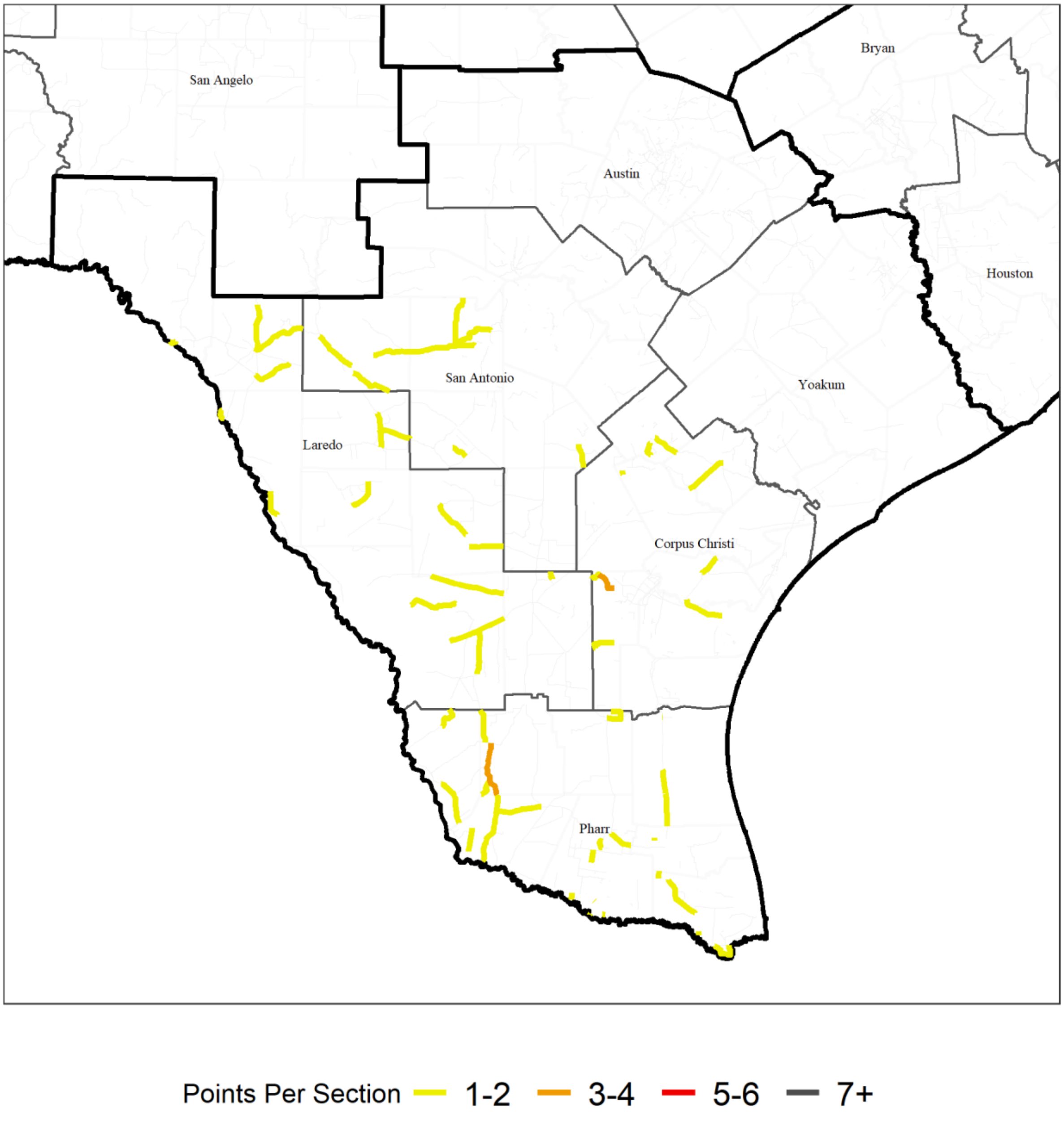
Drymarchon melanurus

Texas Indigo Snake



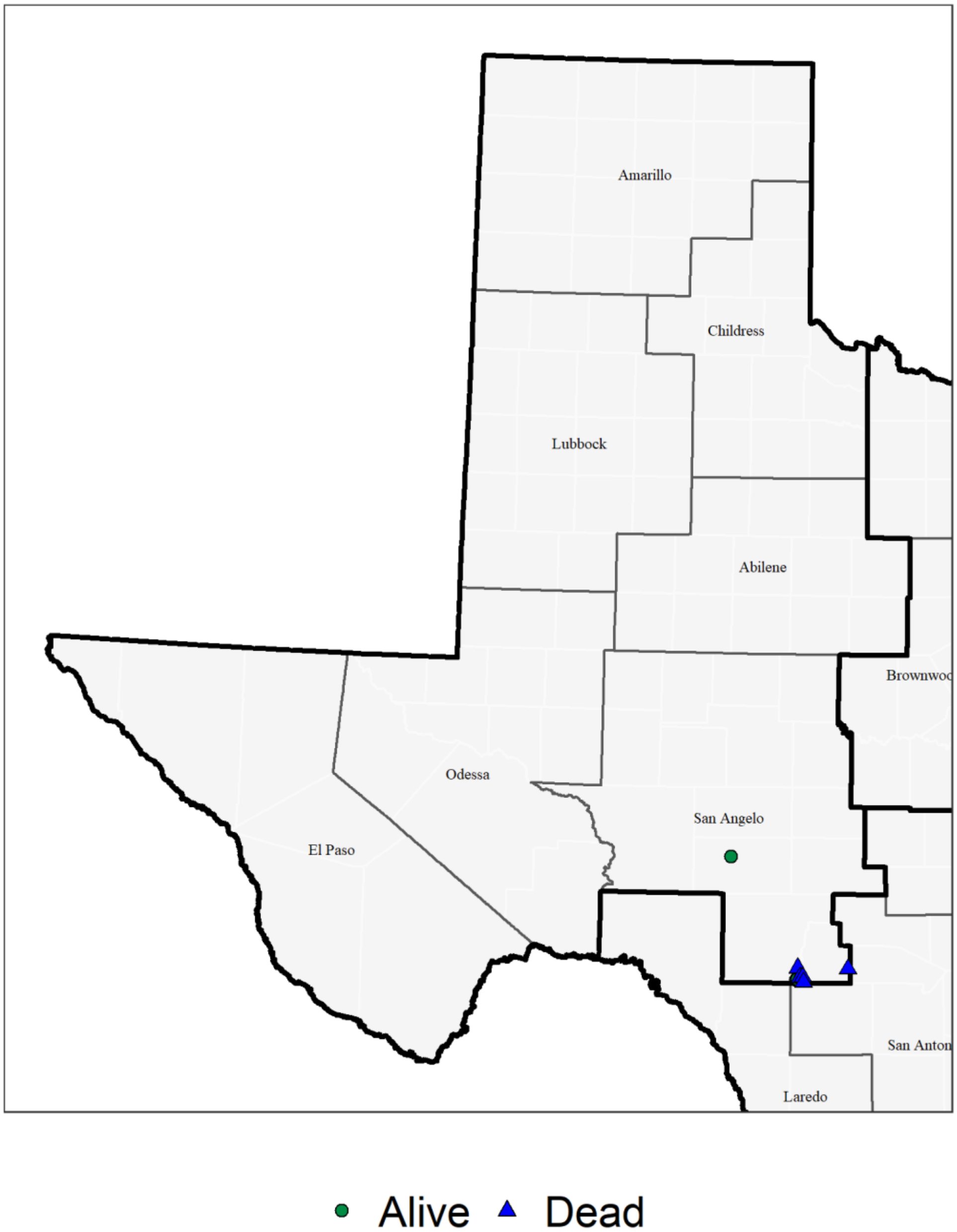
Drymarchon melanurus

Texas Indigo Snake



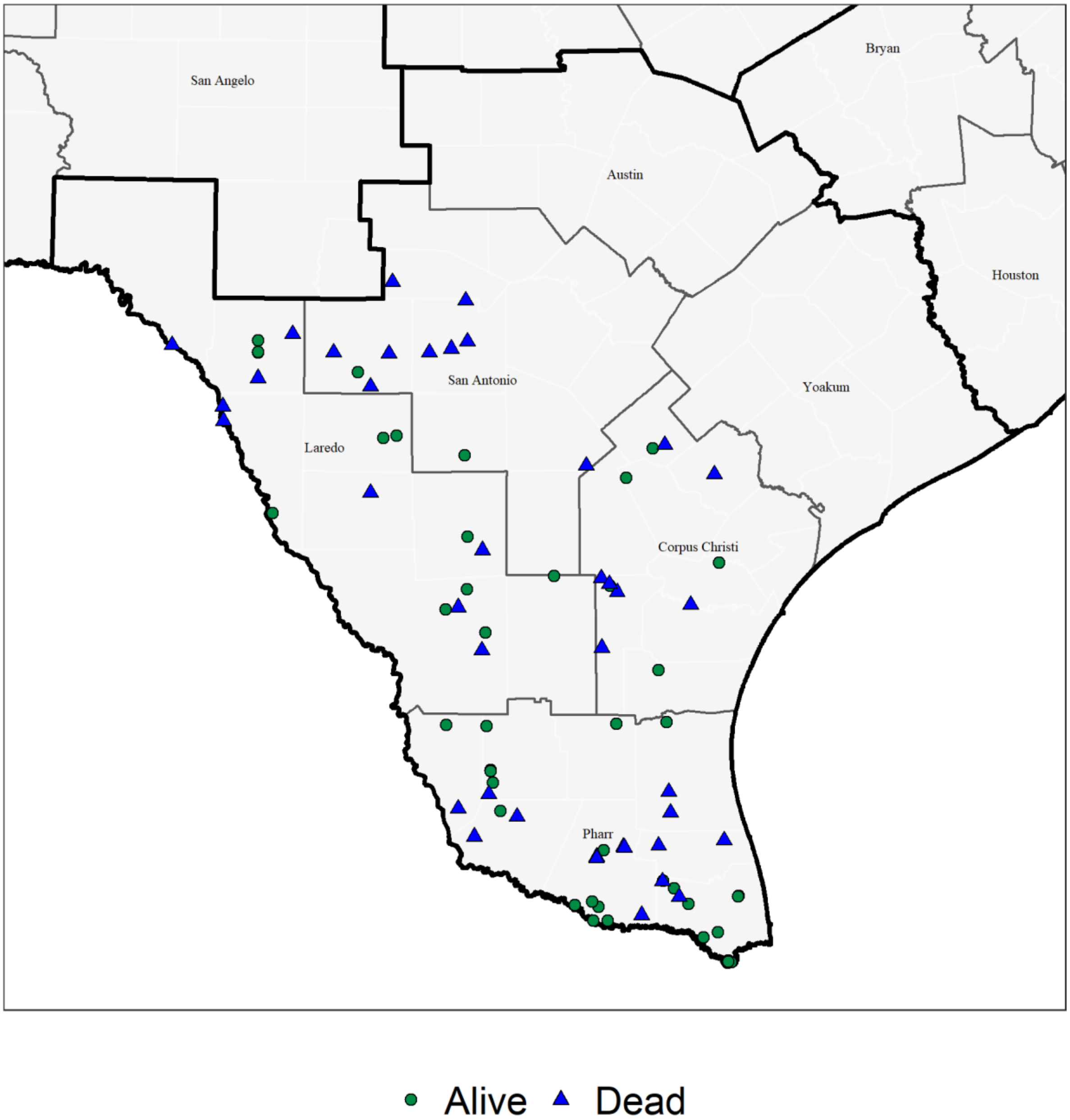
Drymarchon melanurus

Texas Indigo Snake



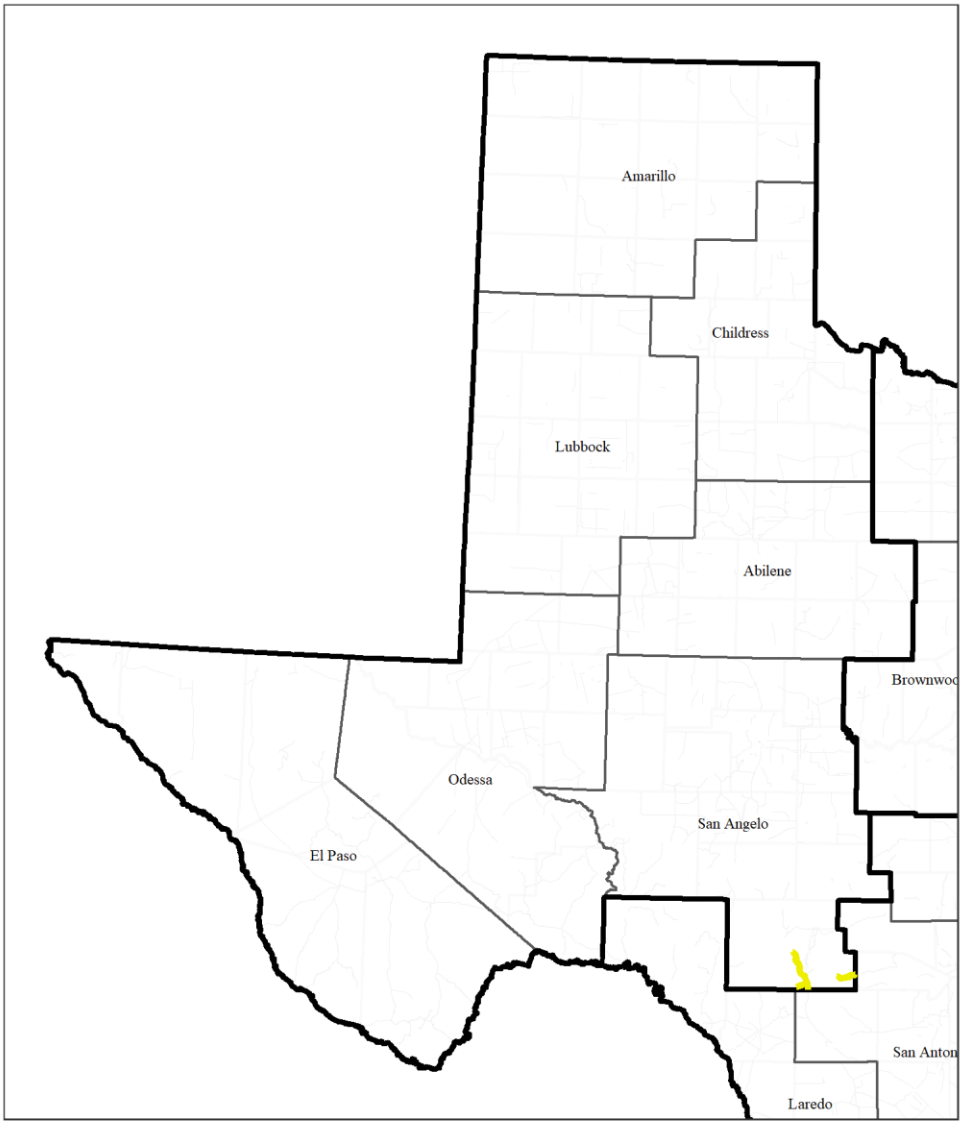
Drymarchon melanurus

Texas Indigo Snake



Drymarchon melanurus

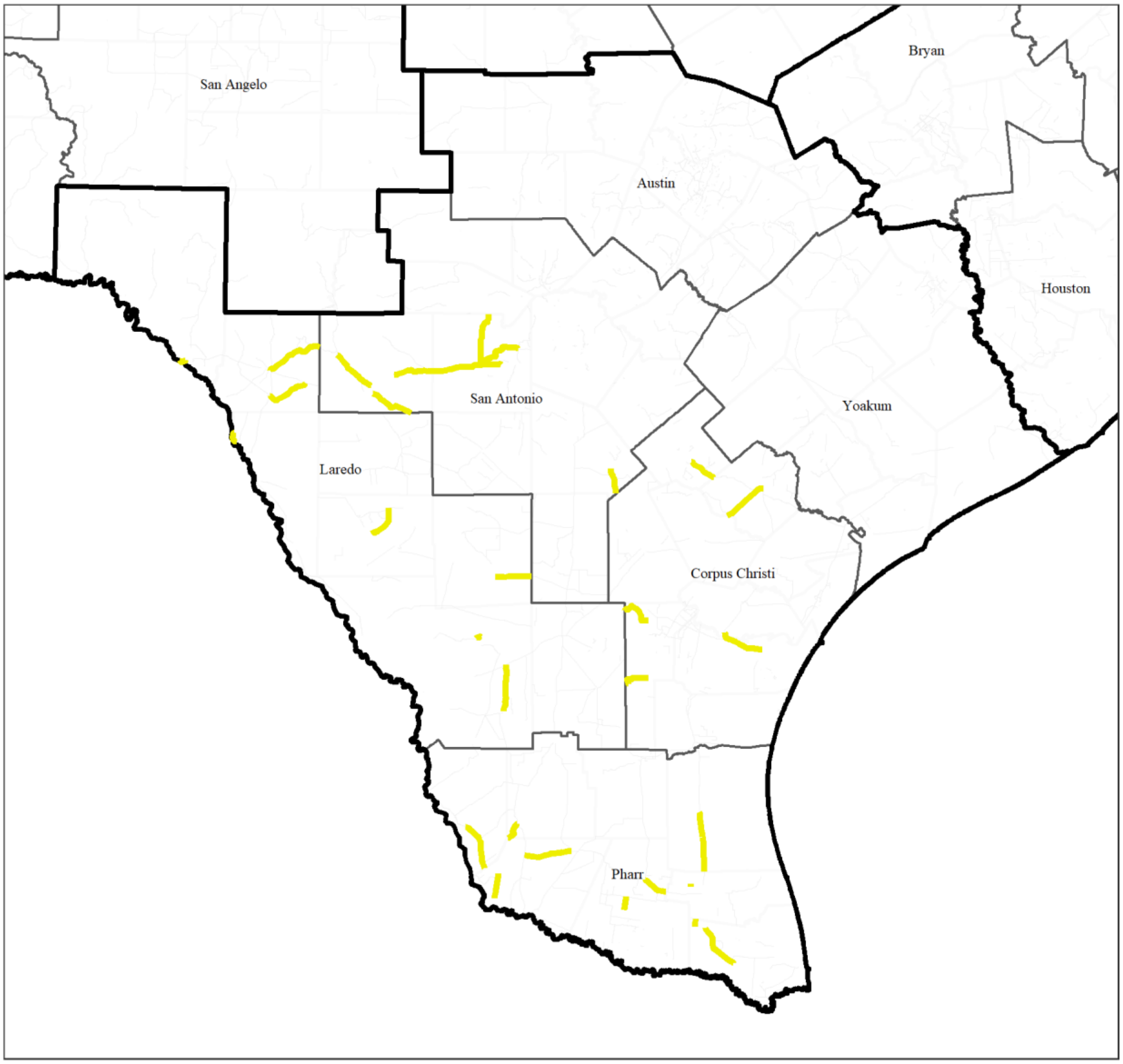
Texas Indigo Snake



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Drymarchon melanurus

Texas Indigo Snake

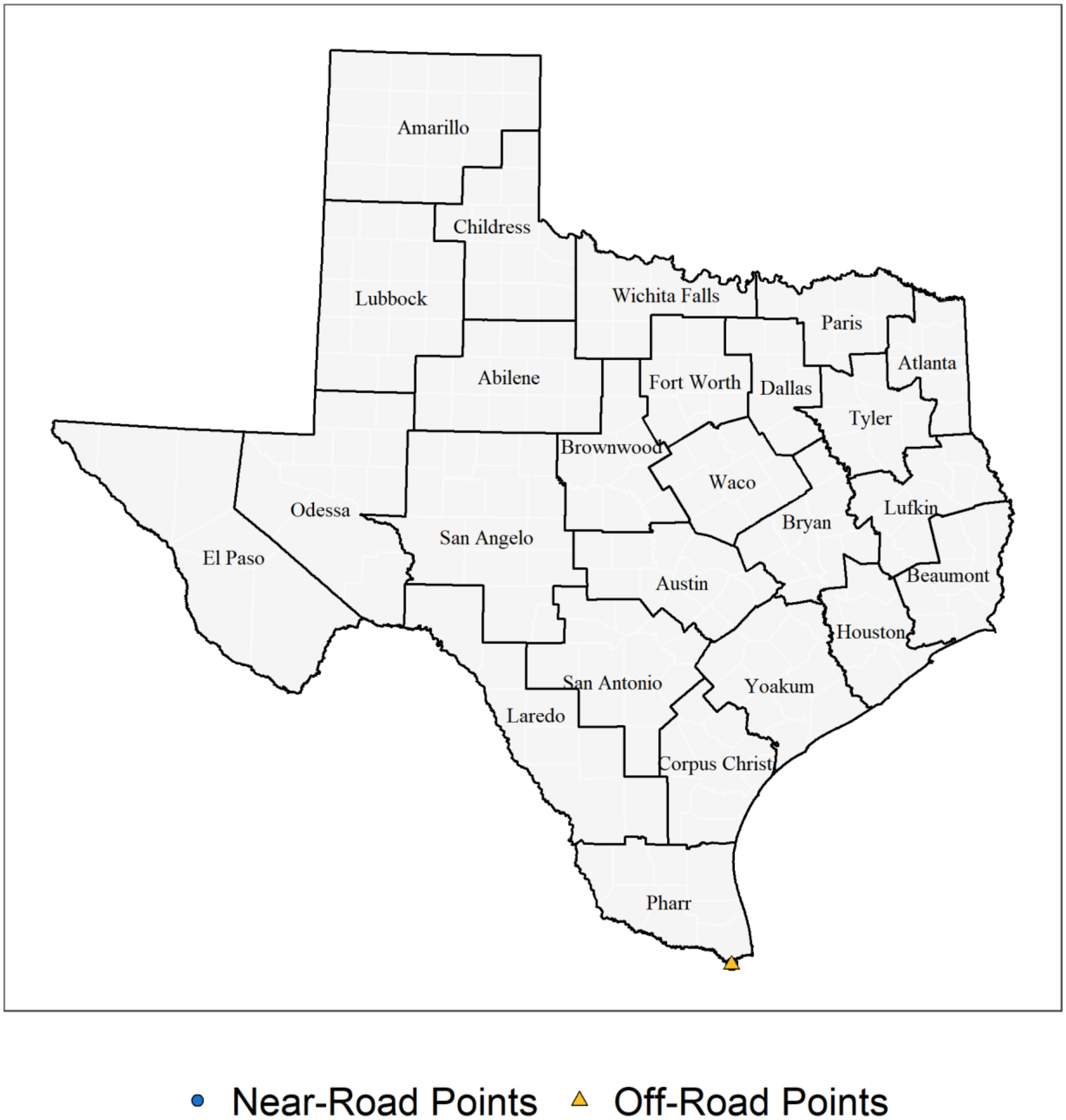


Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Drymobius margaritiferus

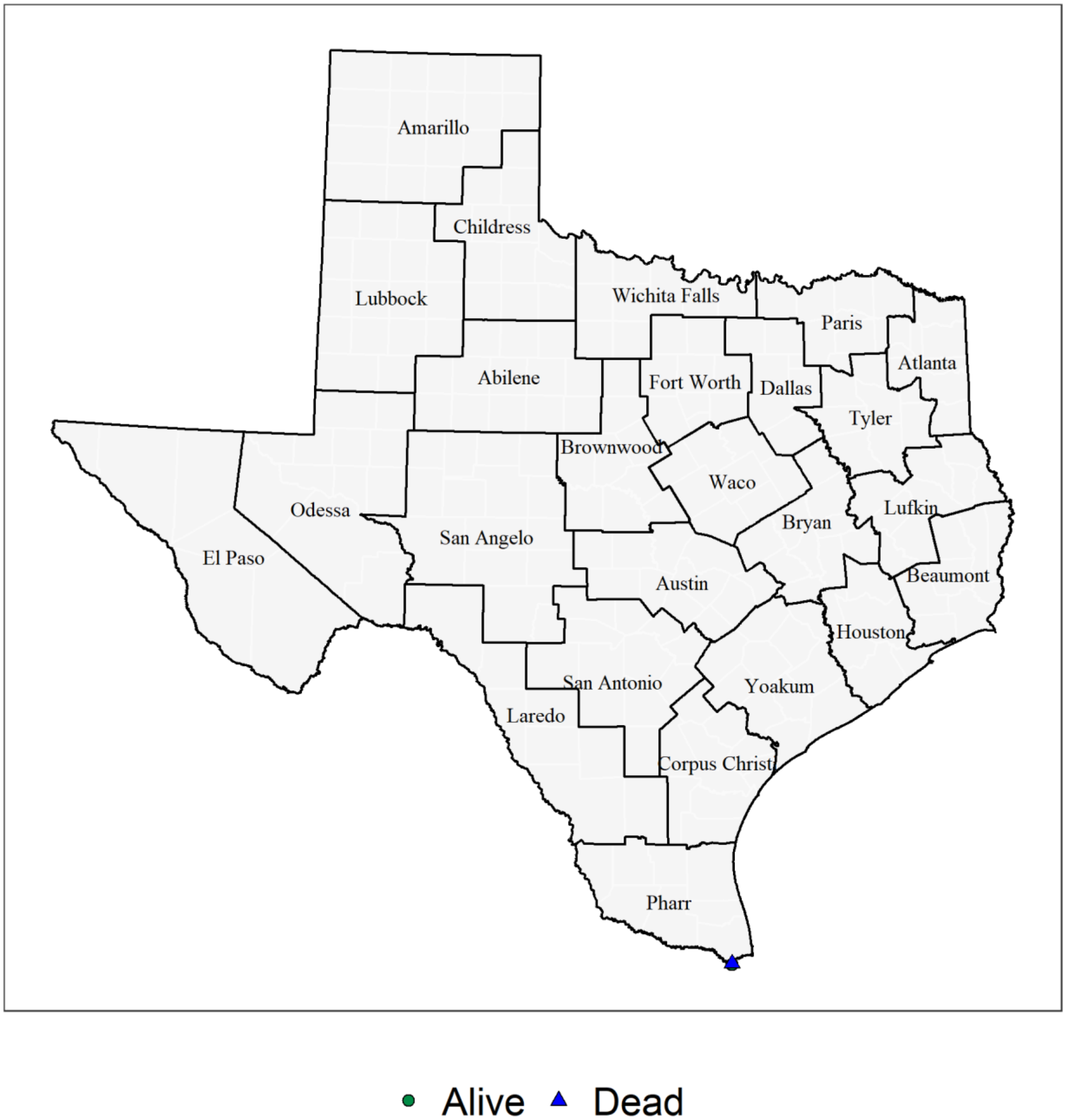
Speckled Racer

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



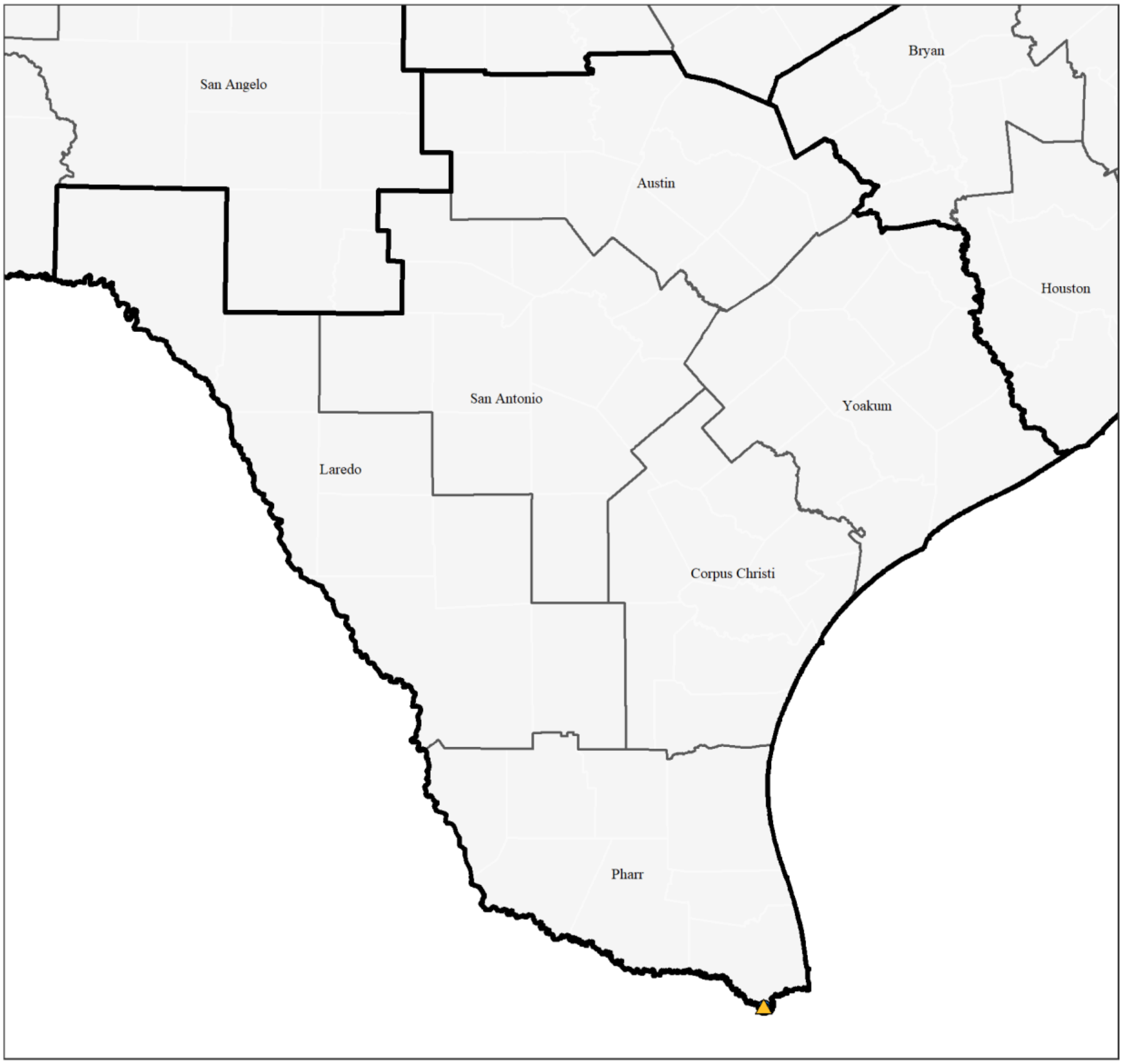
Drymobius margaritiferus

Speckled Racer



Drymobius margaritiferus

Speckled Racer

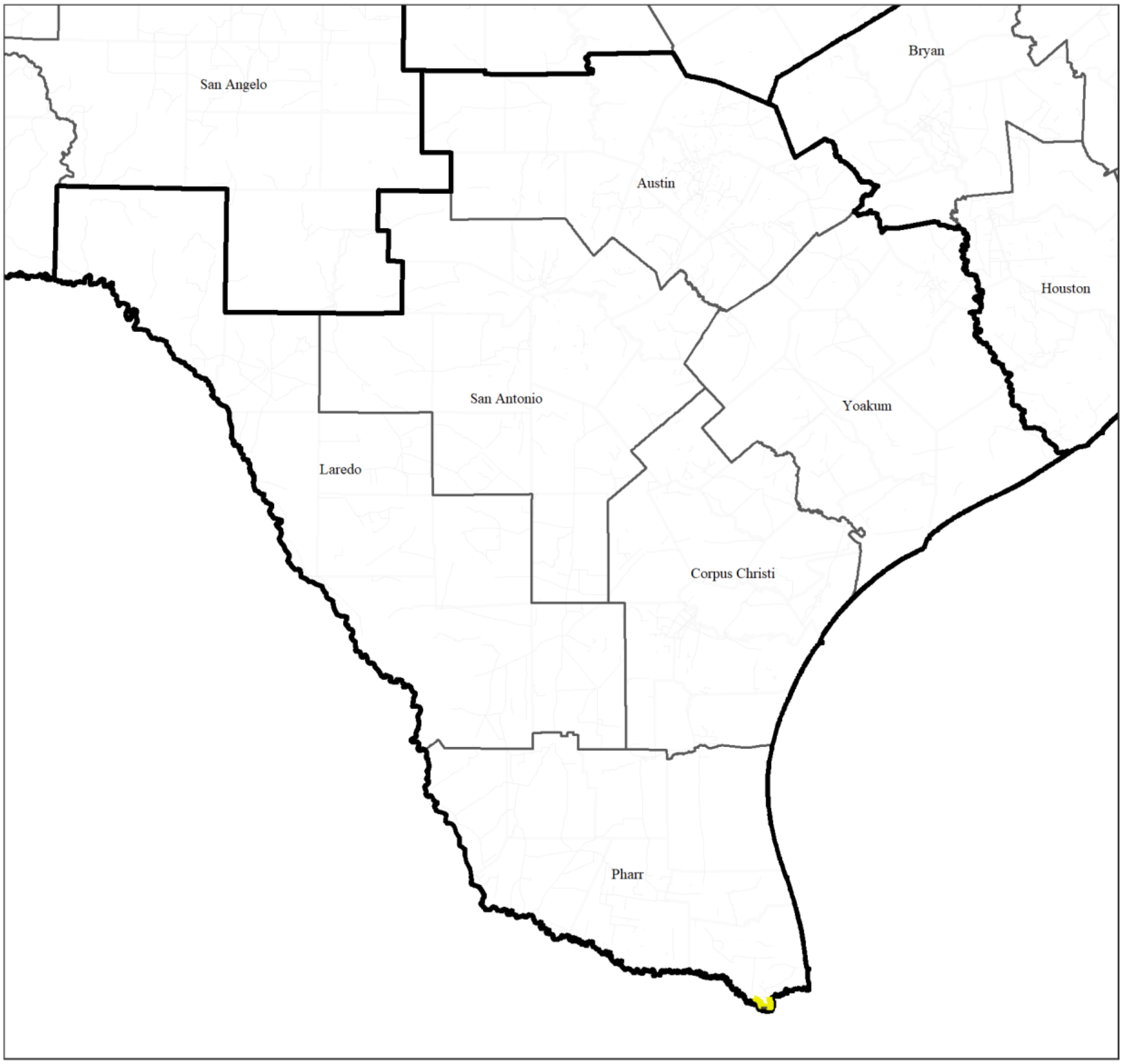


Near-Road Points   Off-Road Points

Drymobius margaritiferus

Speckled Racer

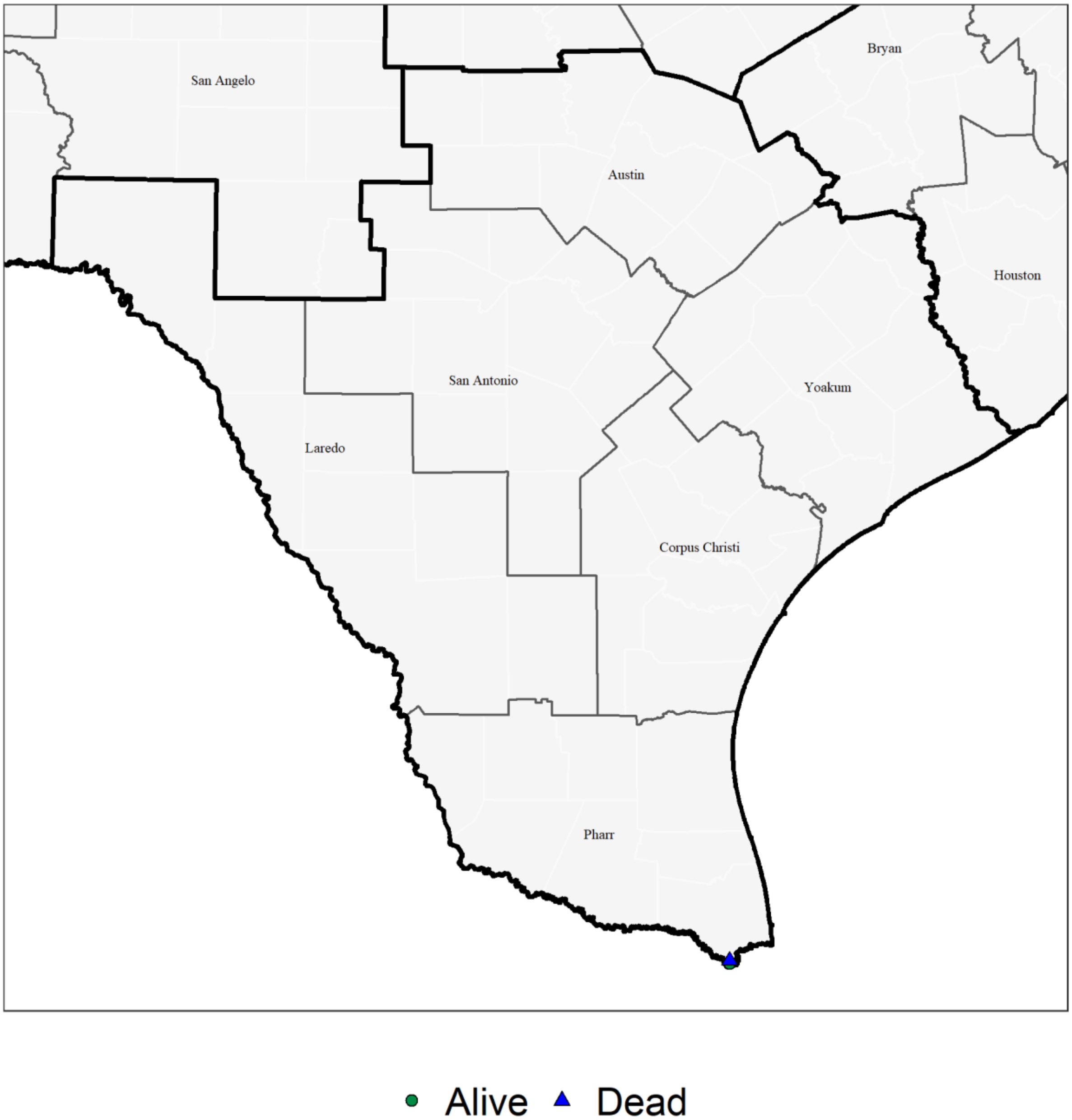
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section 1-2 3-4 5-6 7+

Drymobius margaritiferus

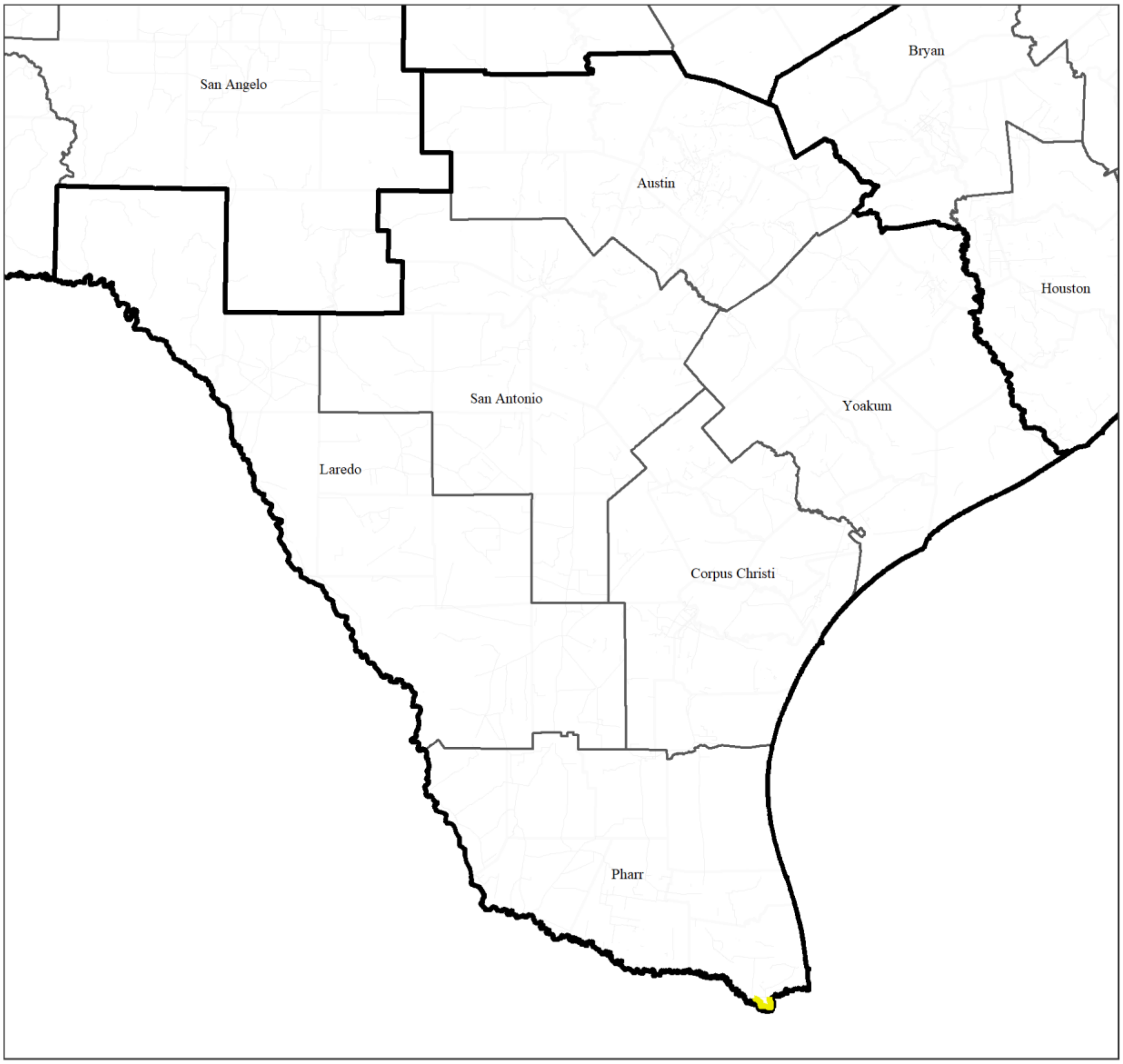
Speckled Racer



Drymobius margaritiferus

Speckled Racer

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE

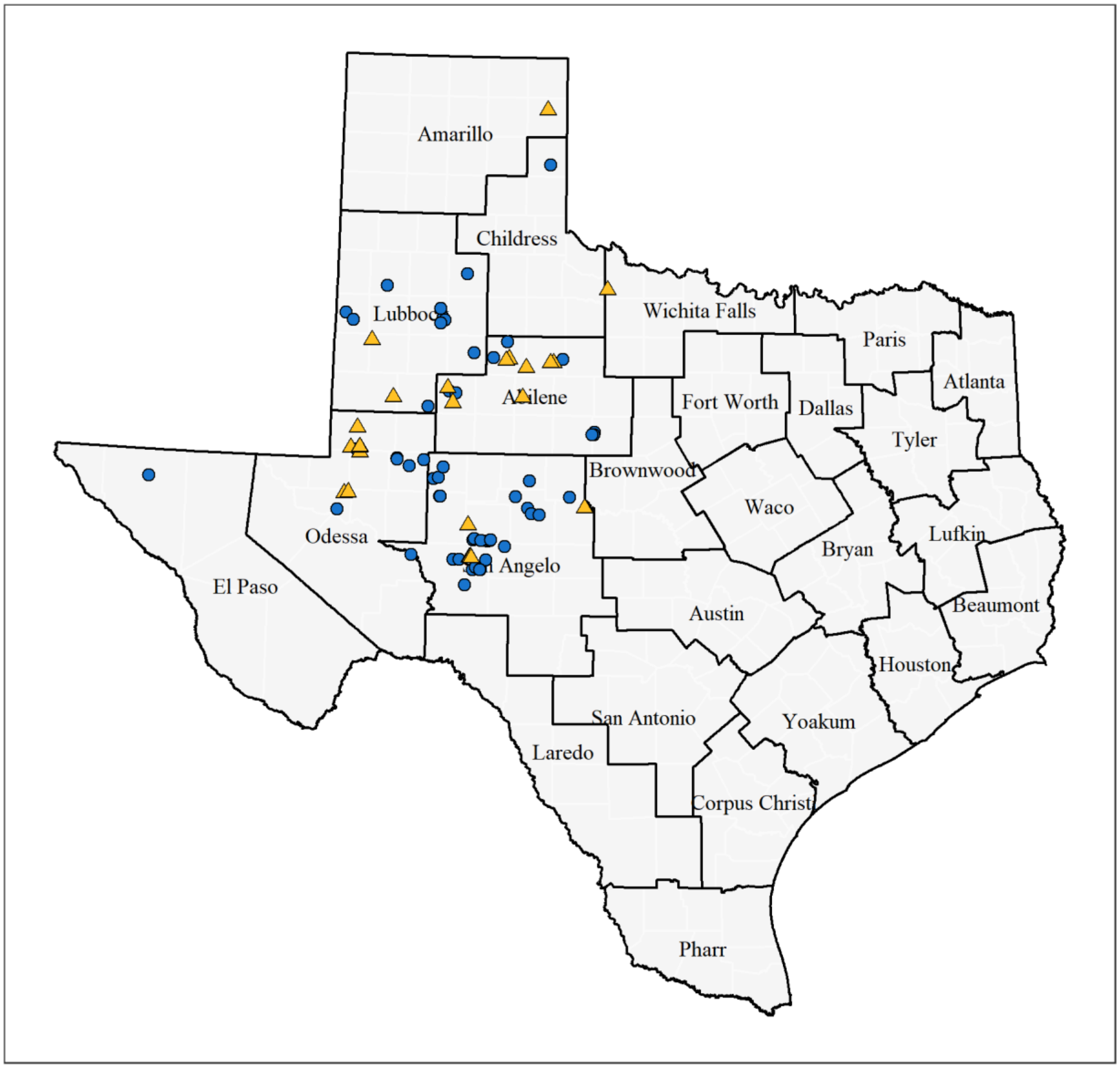


Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Heterodon nasicus

Plains Hognose Snake

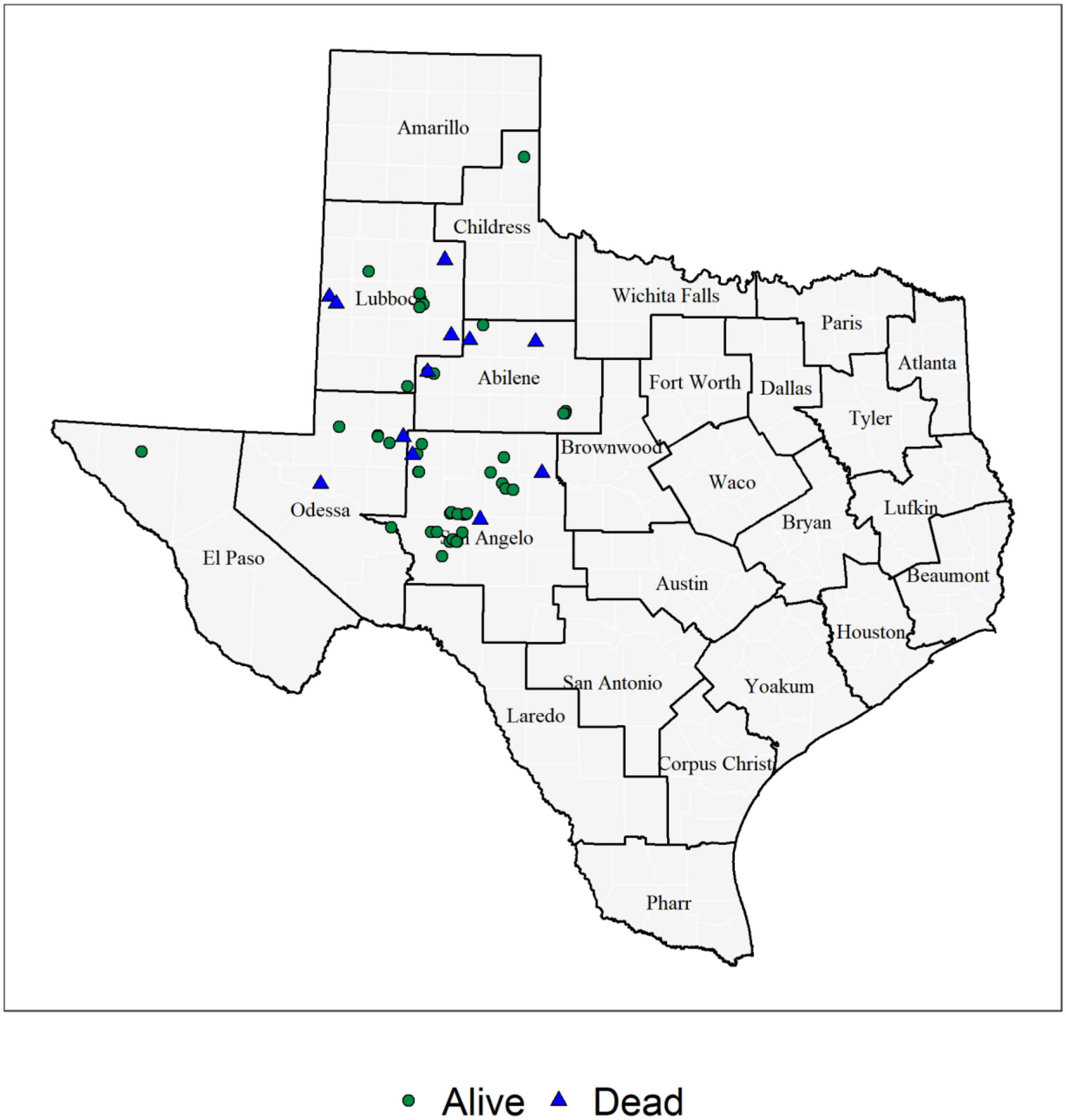
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



• Near-Road Points △ Off-Road Points

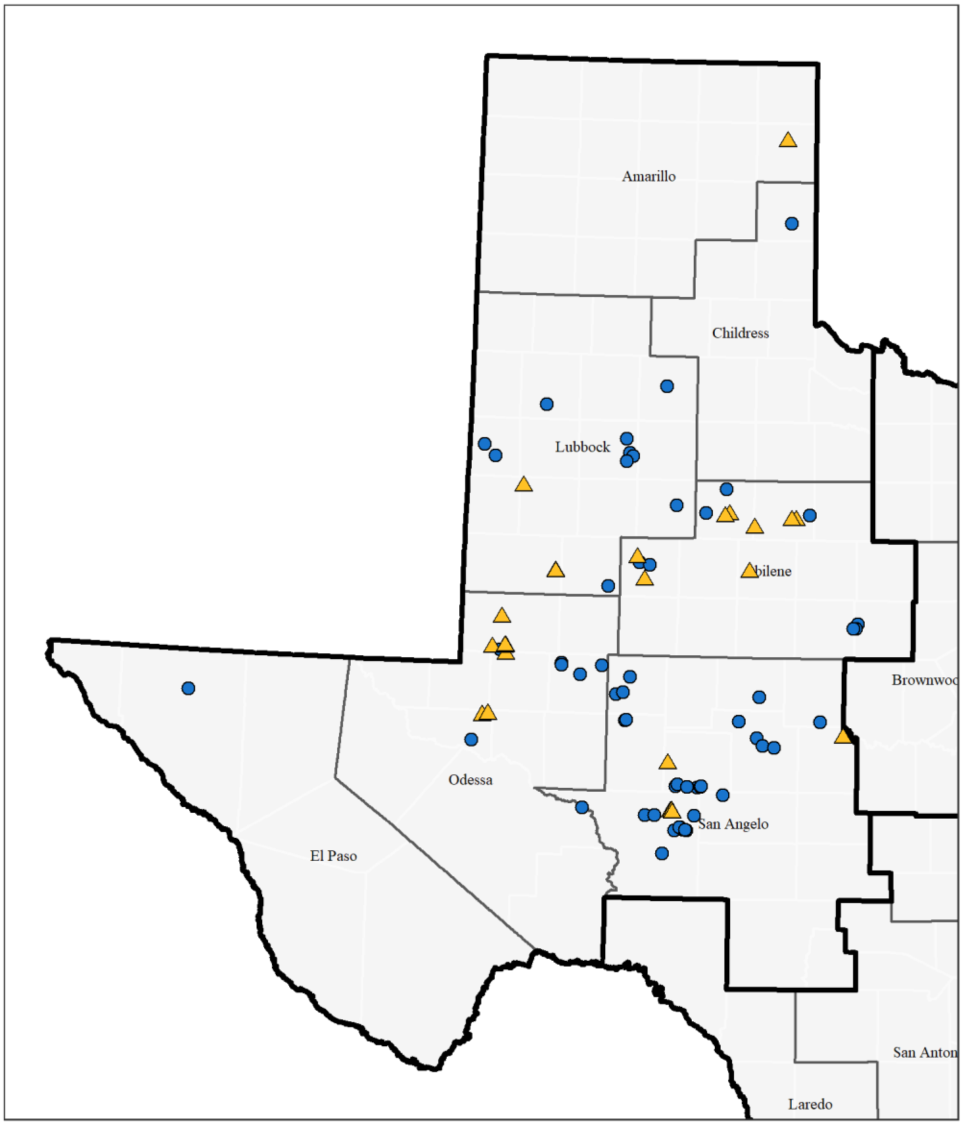
Heterodon nasicus

Plains Hognose Snake



Heterodon nasicus

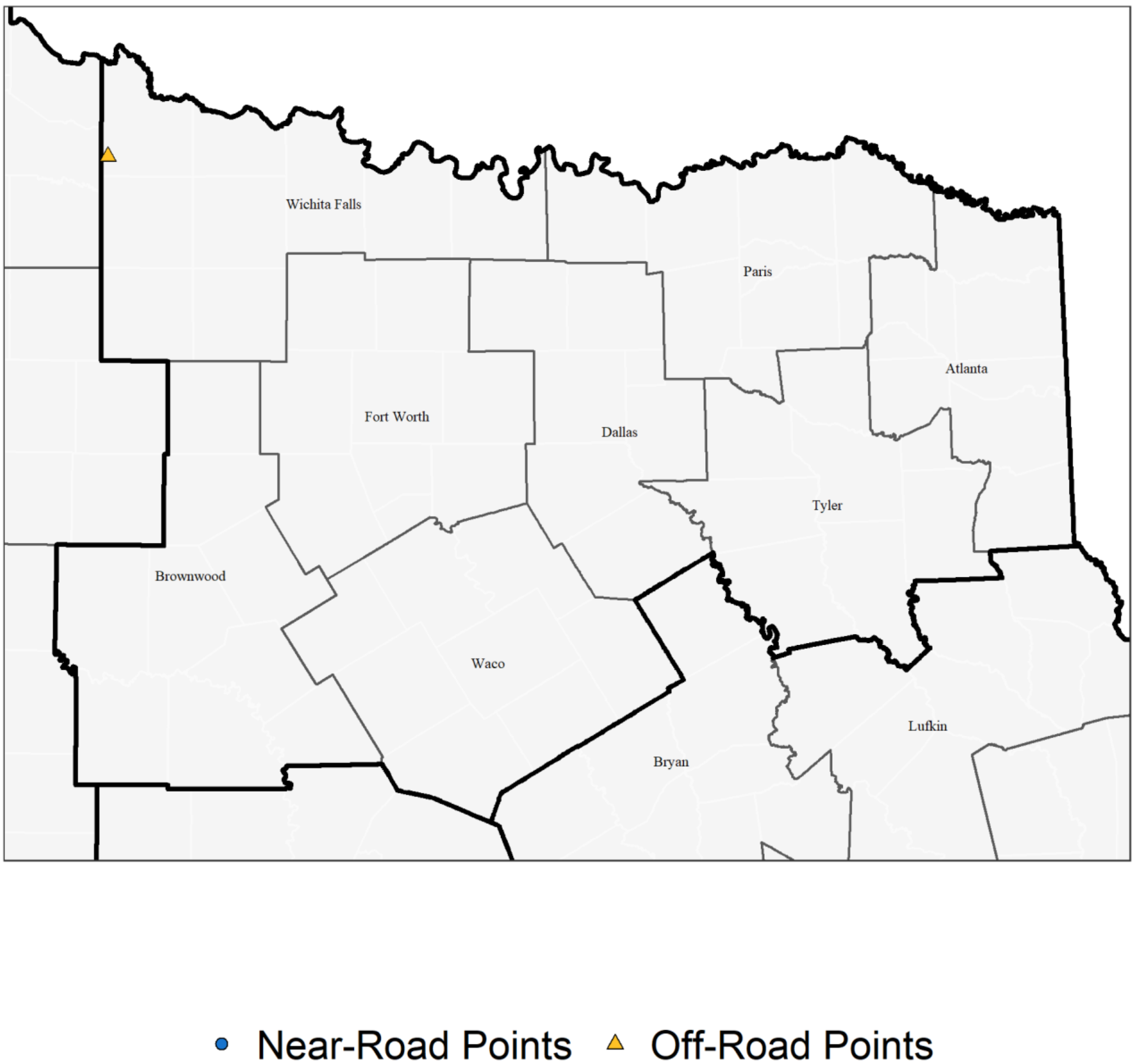
Plains Hognose Snake



• Near-Road Points △ Off-Road Points

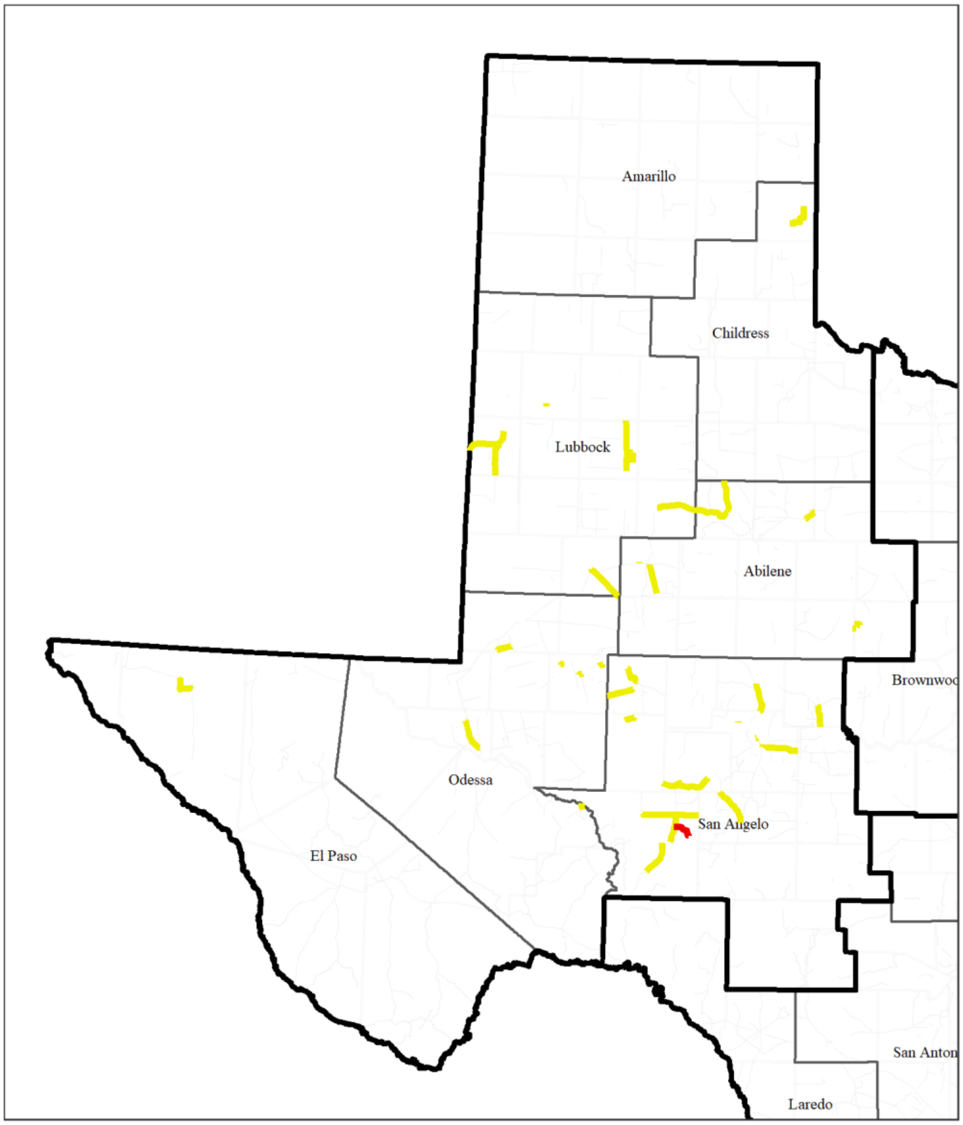
Heterodon nasicus

Plains Hognose Snake



Heterodon nasicus

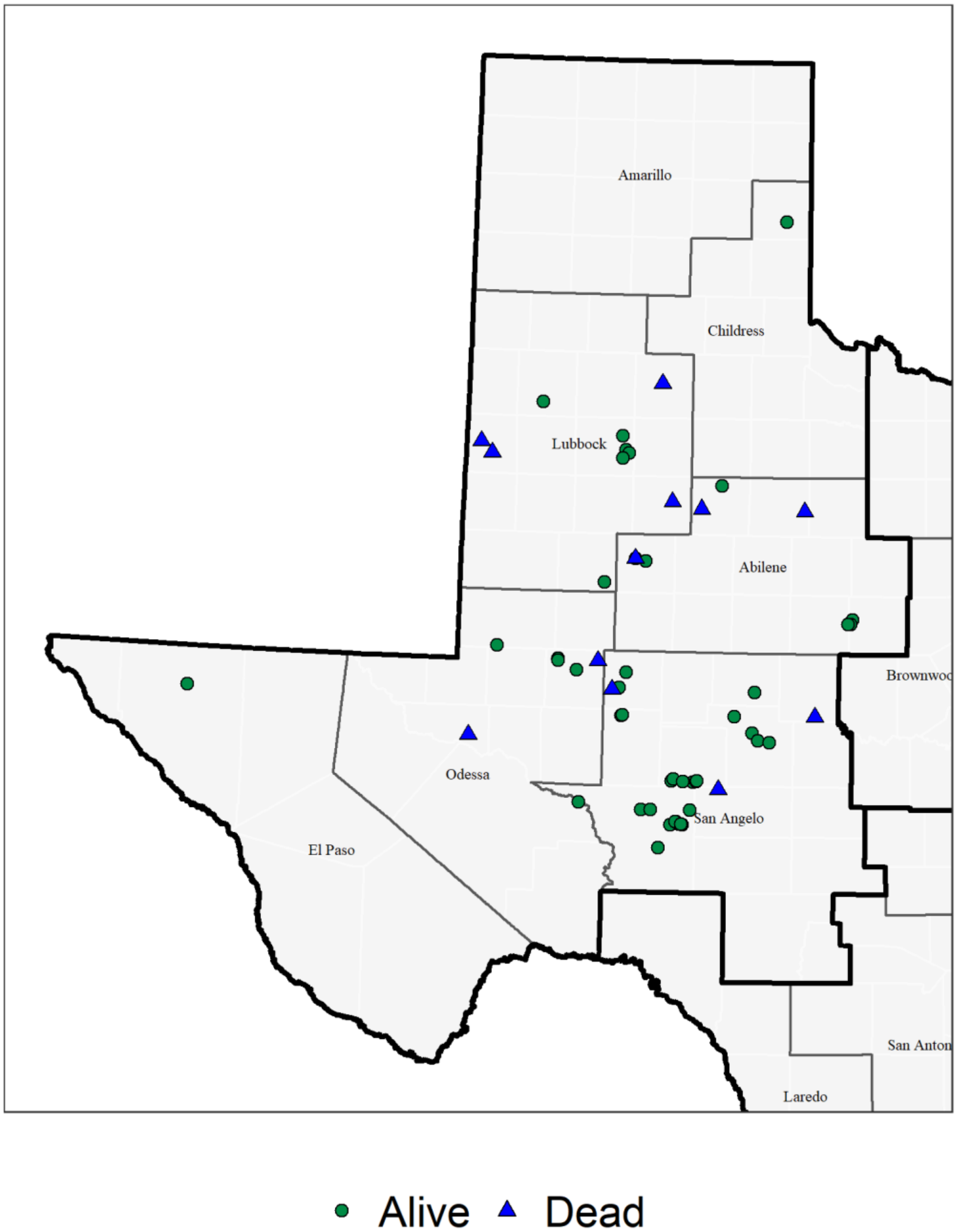
Plains Hognose Snake



Points Per Section 1-2 3-4 5-6 7+

Heterodon nasicus

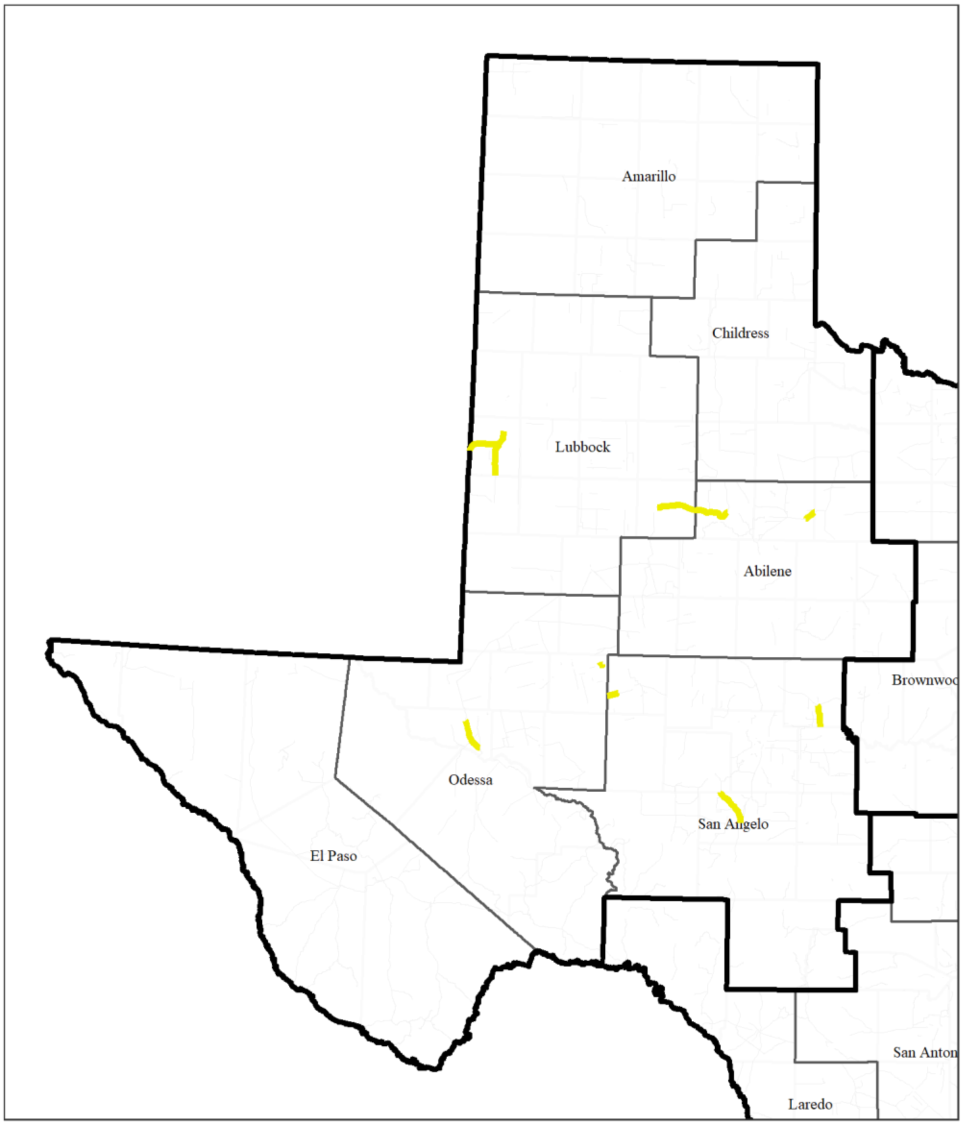
Plains Hognose Snake



Heterodon nasicus

Plains Hognose Snake

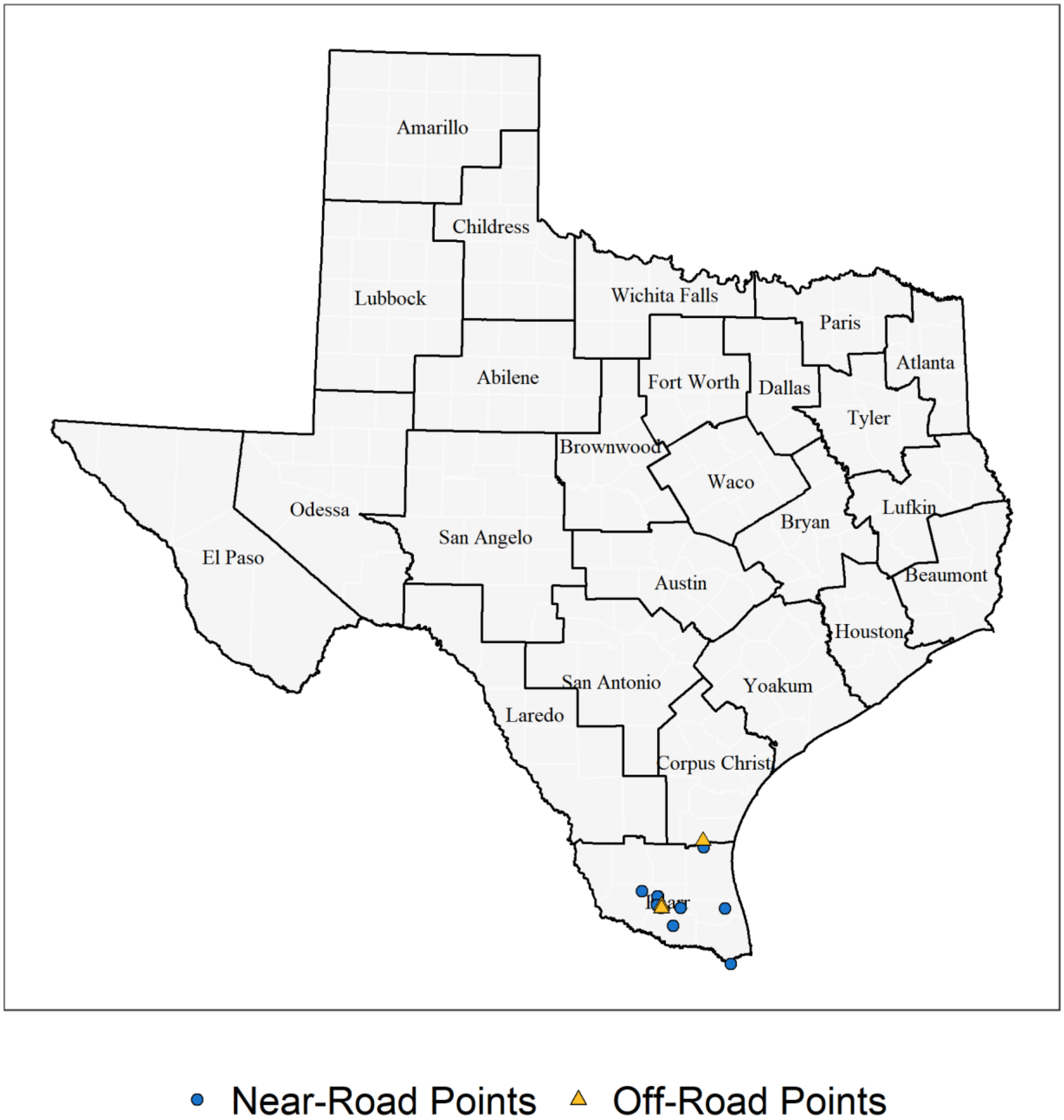
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

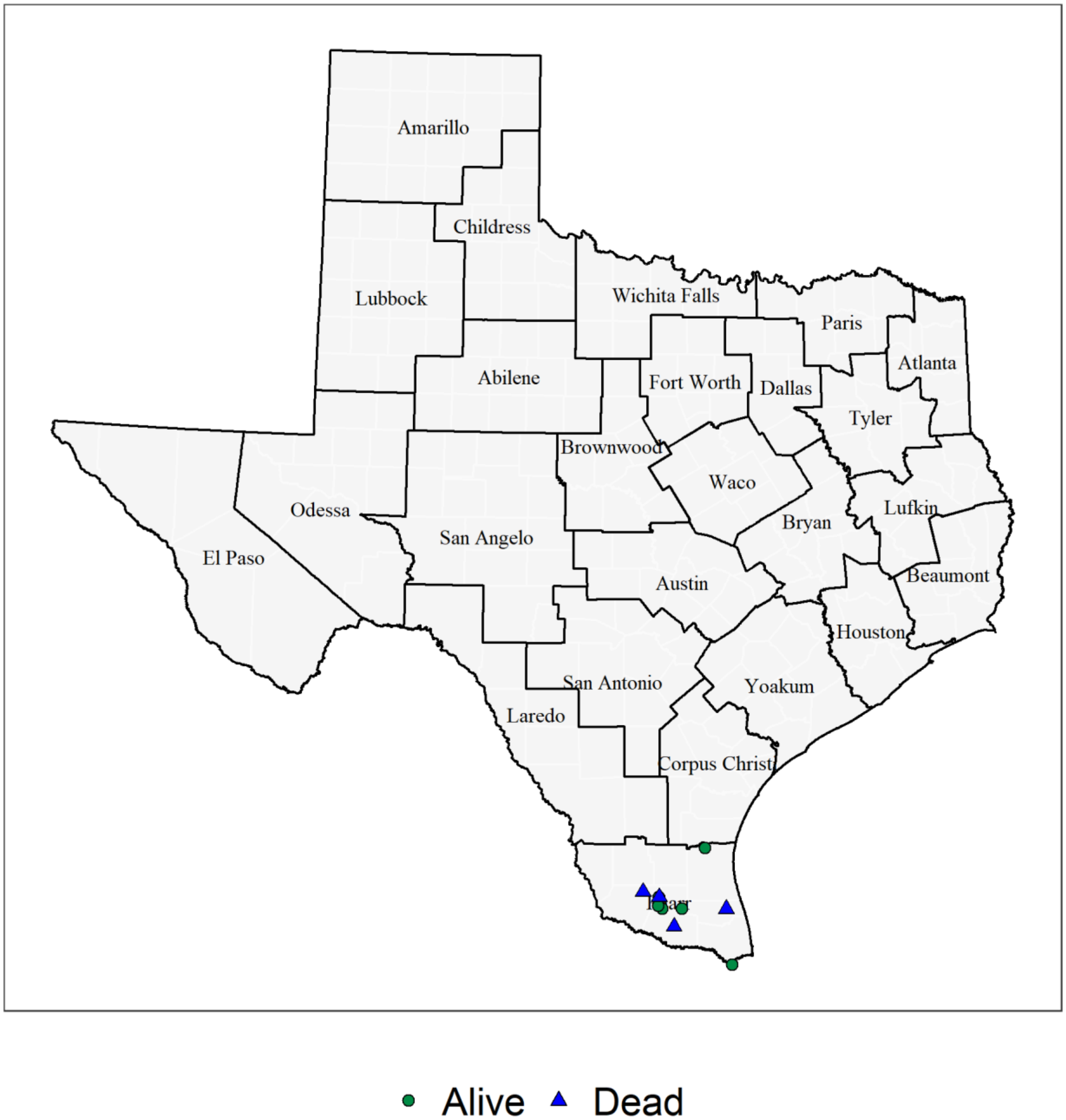
Leptodeira septentrionalis

Northern Cat-eyed Snake



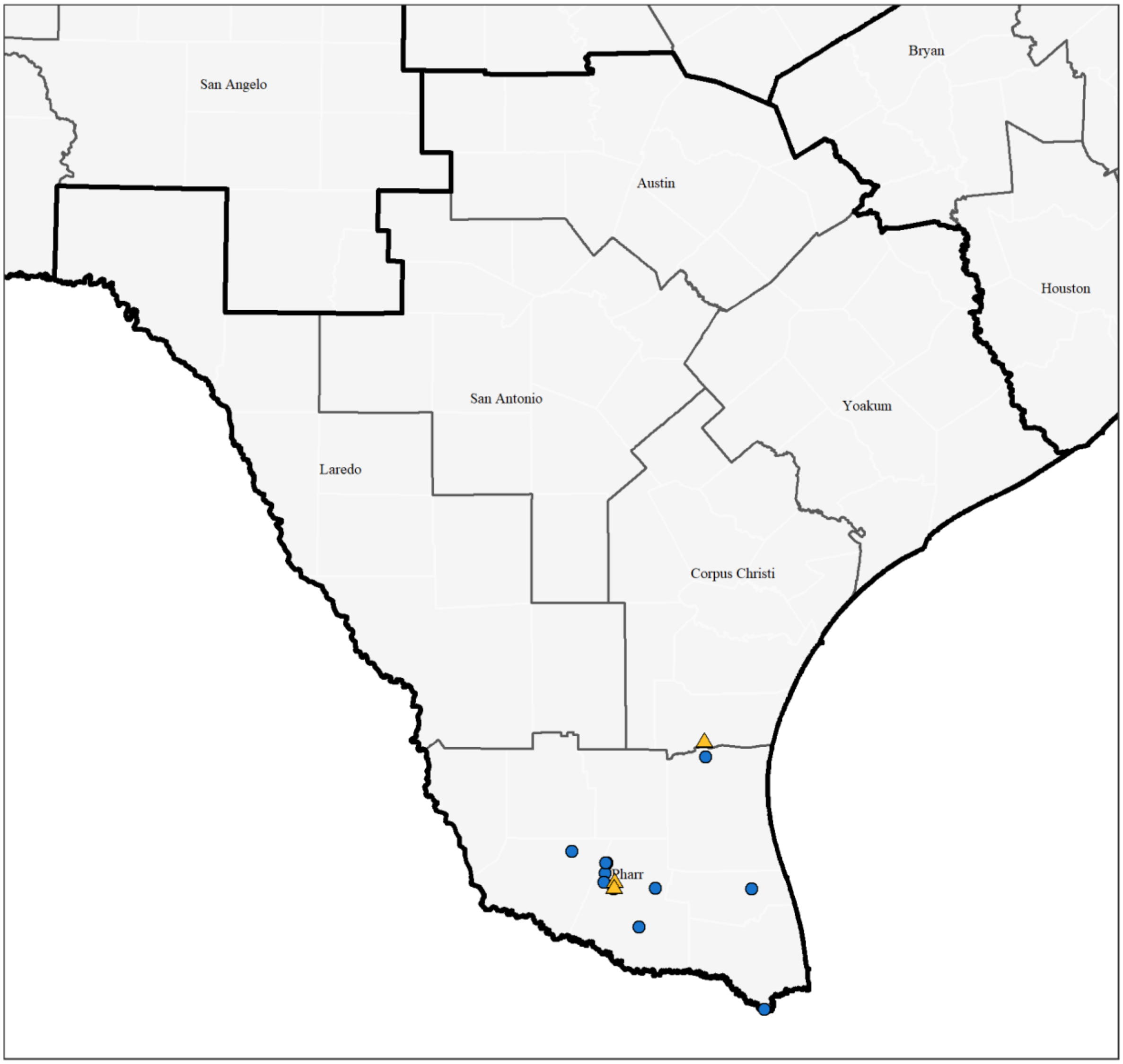
Leptodeira septentrionalis

Northern Cat-eyed Snake



Leptodeira septentrionalis
Northern Cat-eyed Snake

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE

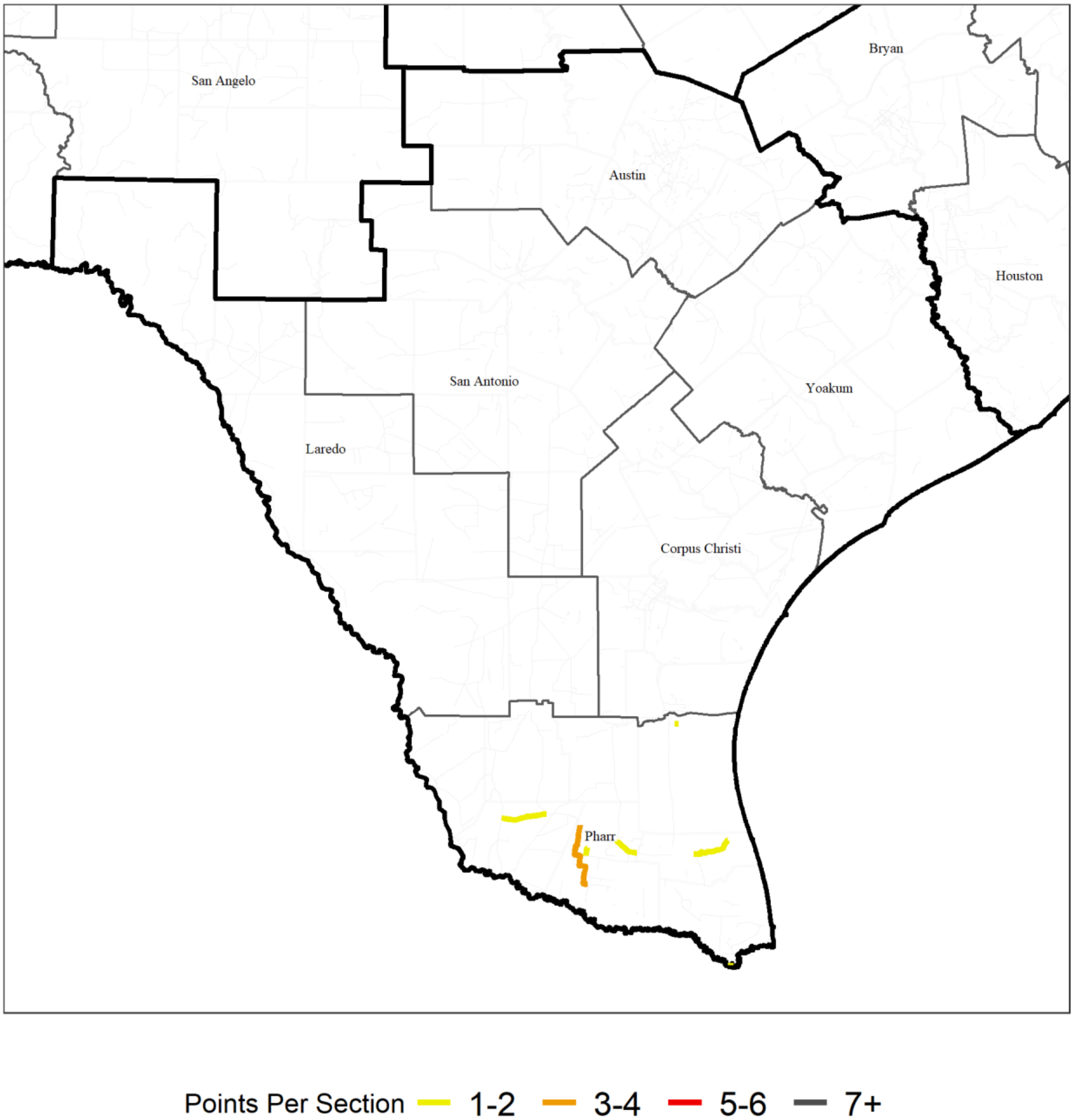


Near-Road Points Off-Road Points

Leptodeira septentrionalis

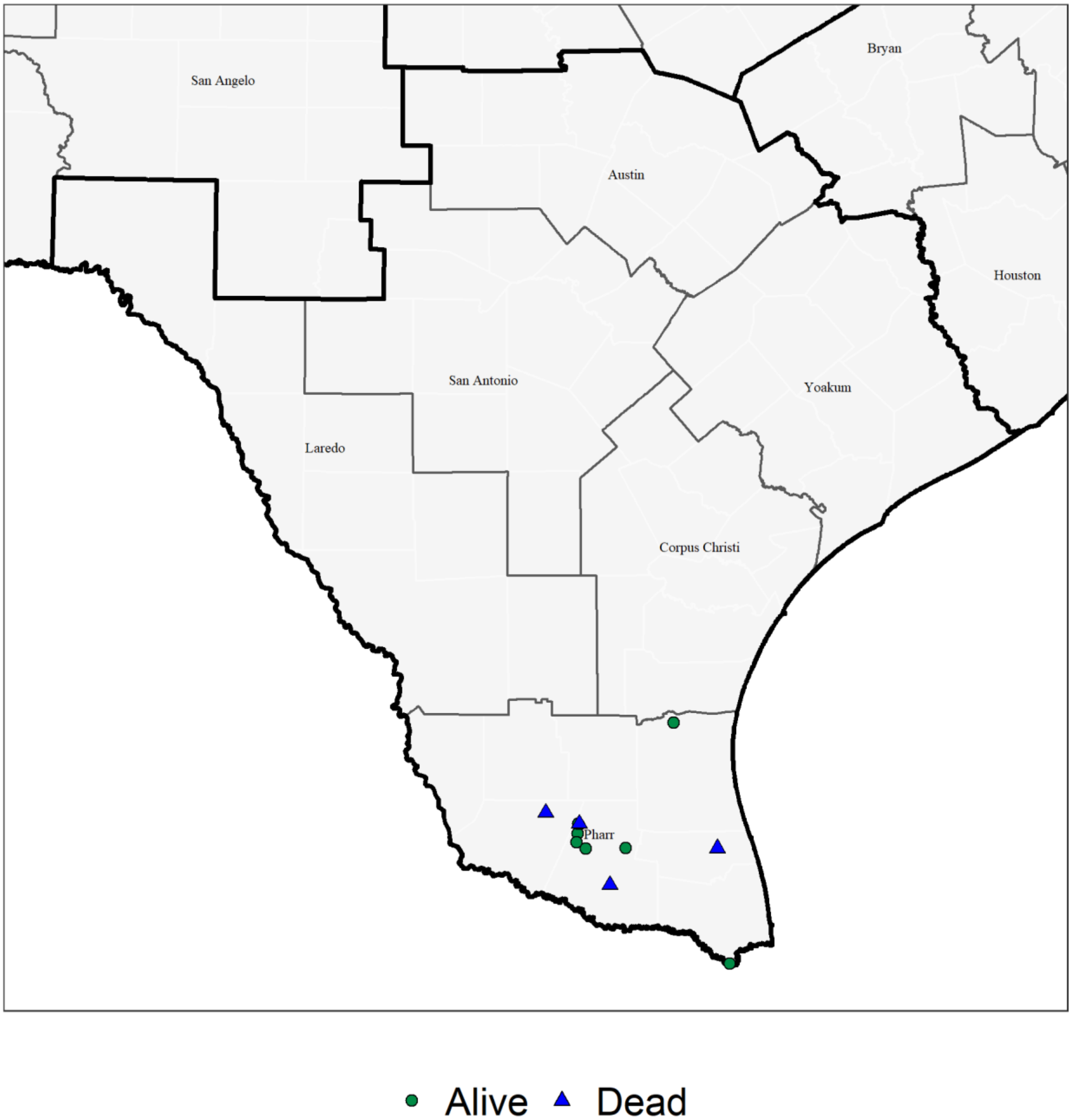
Northern Cat-eyed Snake

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE

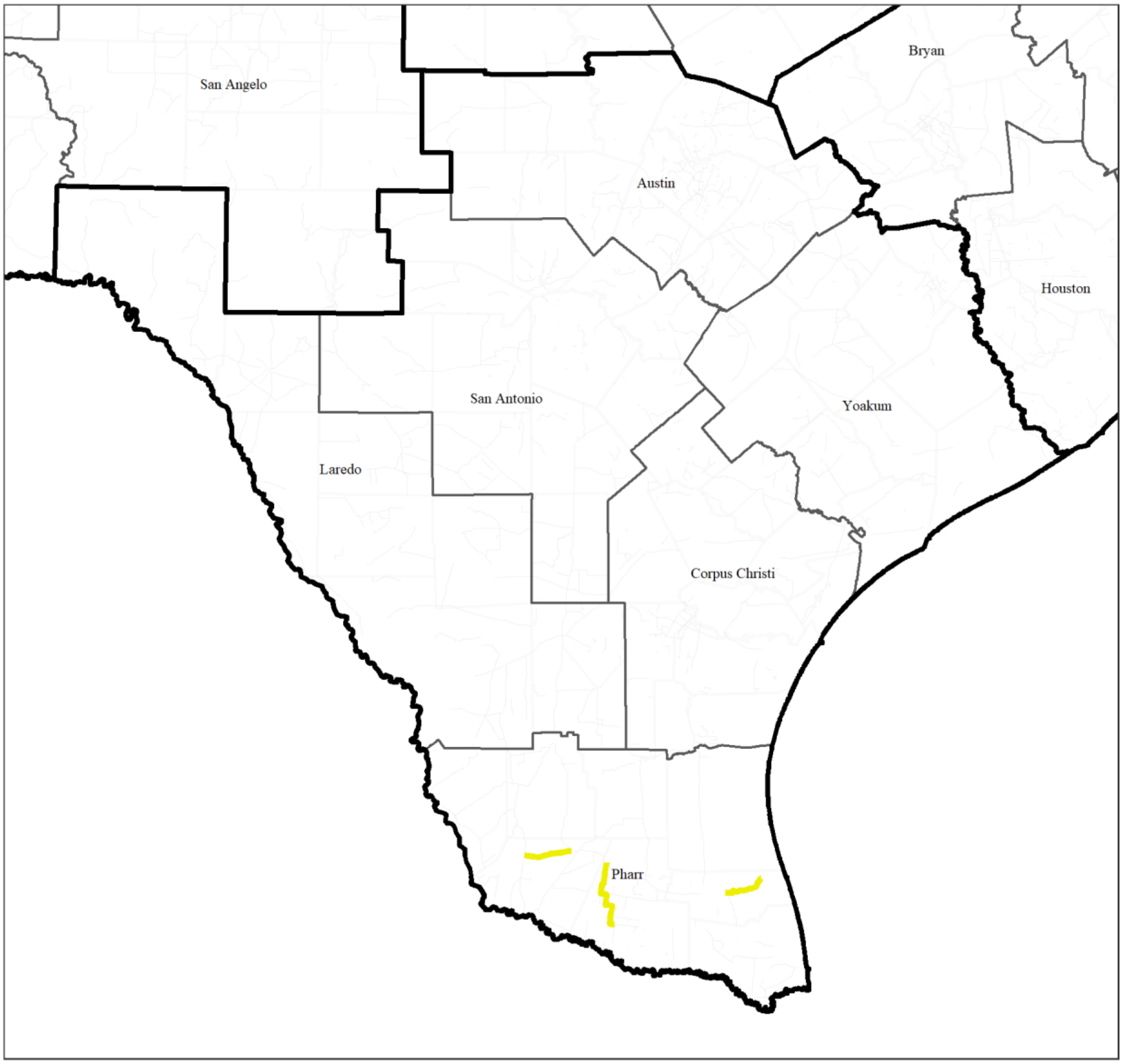


Leptodeira septentrionalis

Northern Cat-eyed Snake



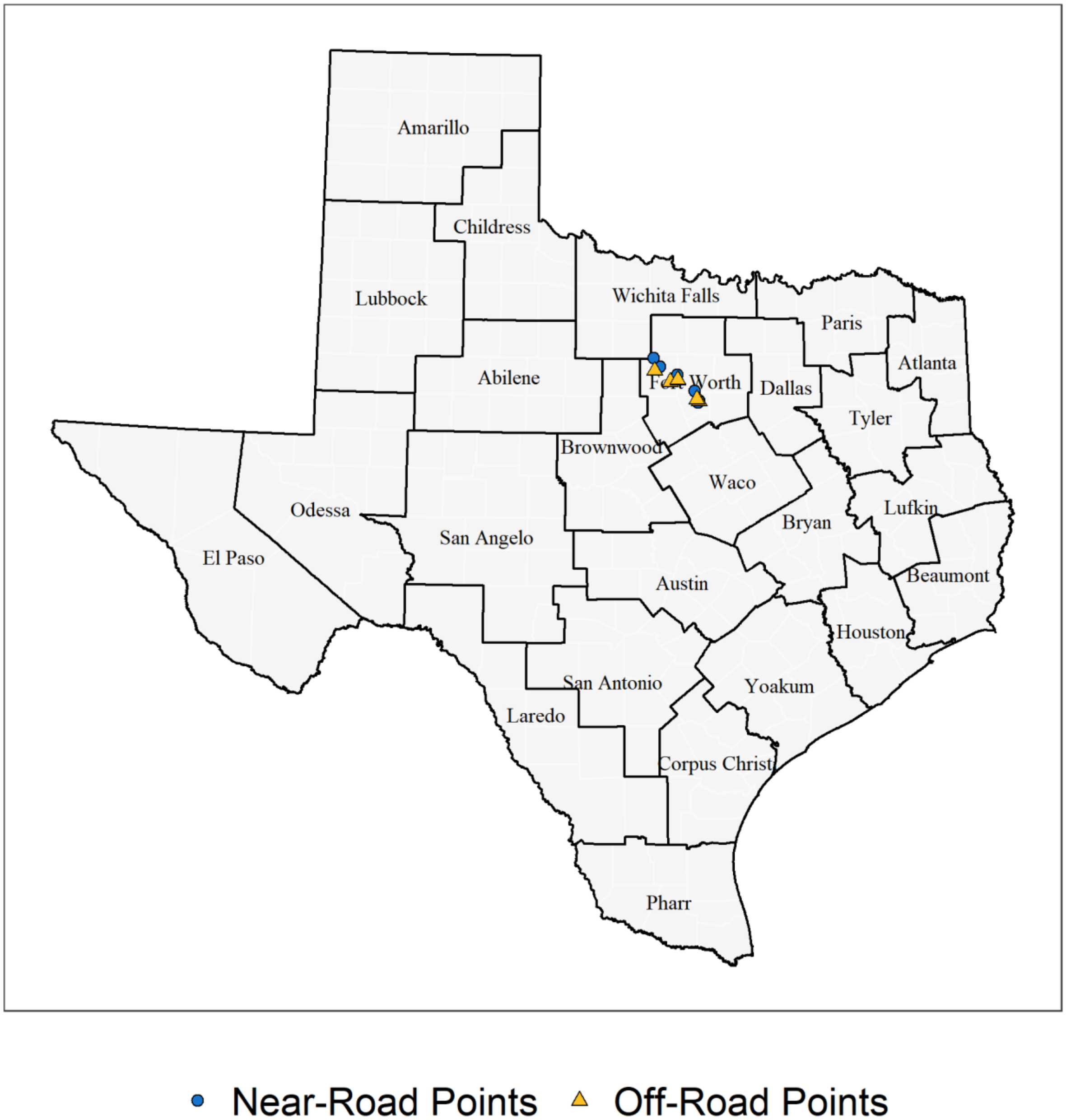
Leptodeira septentrionalis
Northern Cat-eyed Snake



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

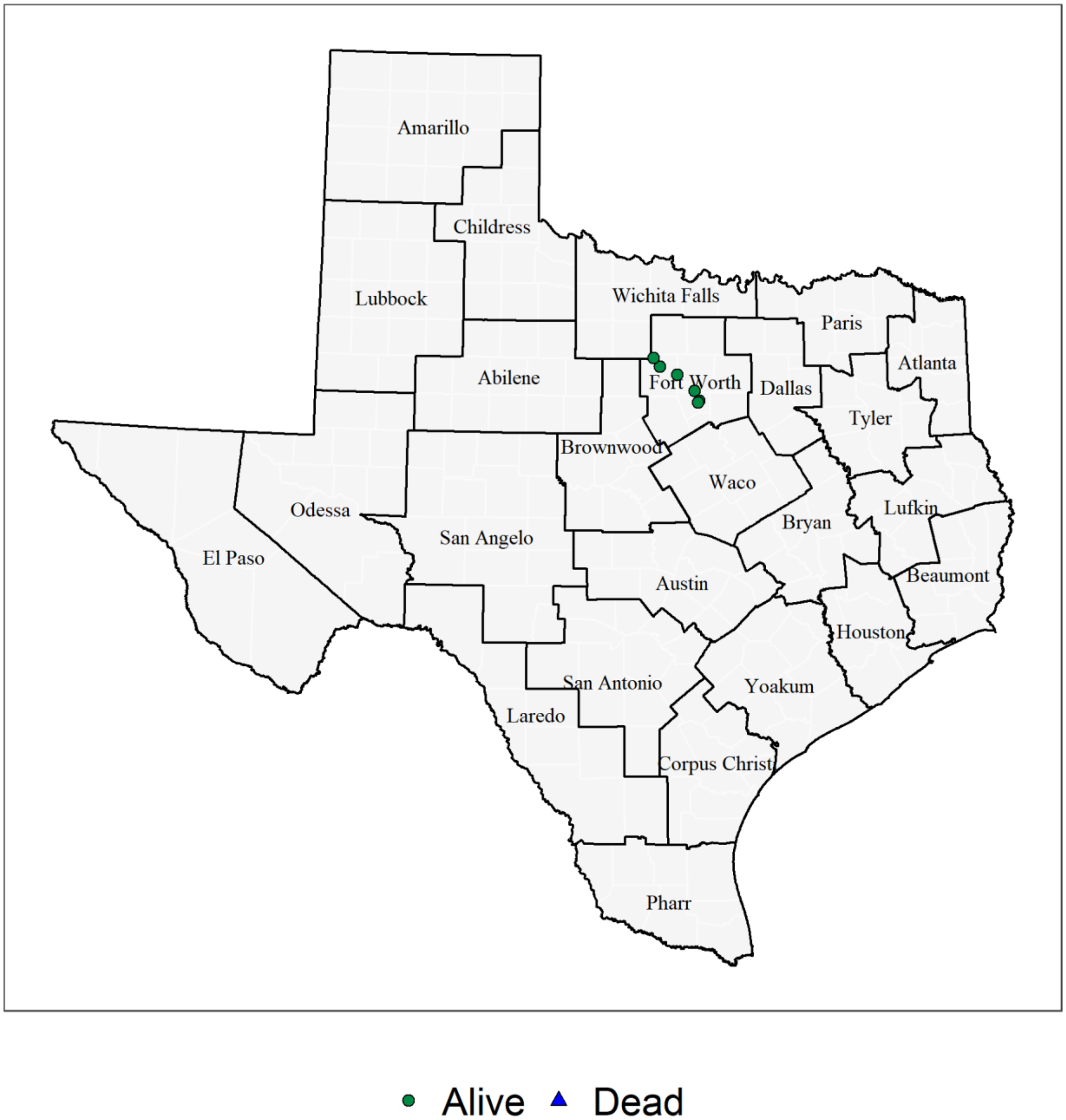
Nerodia harteri

Brazos River Watersnake



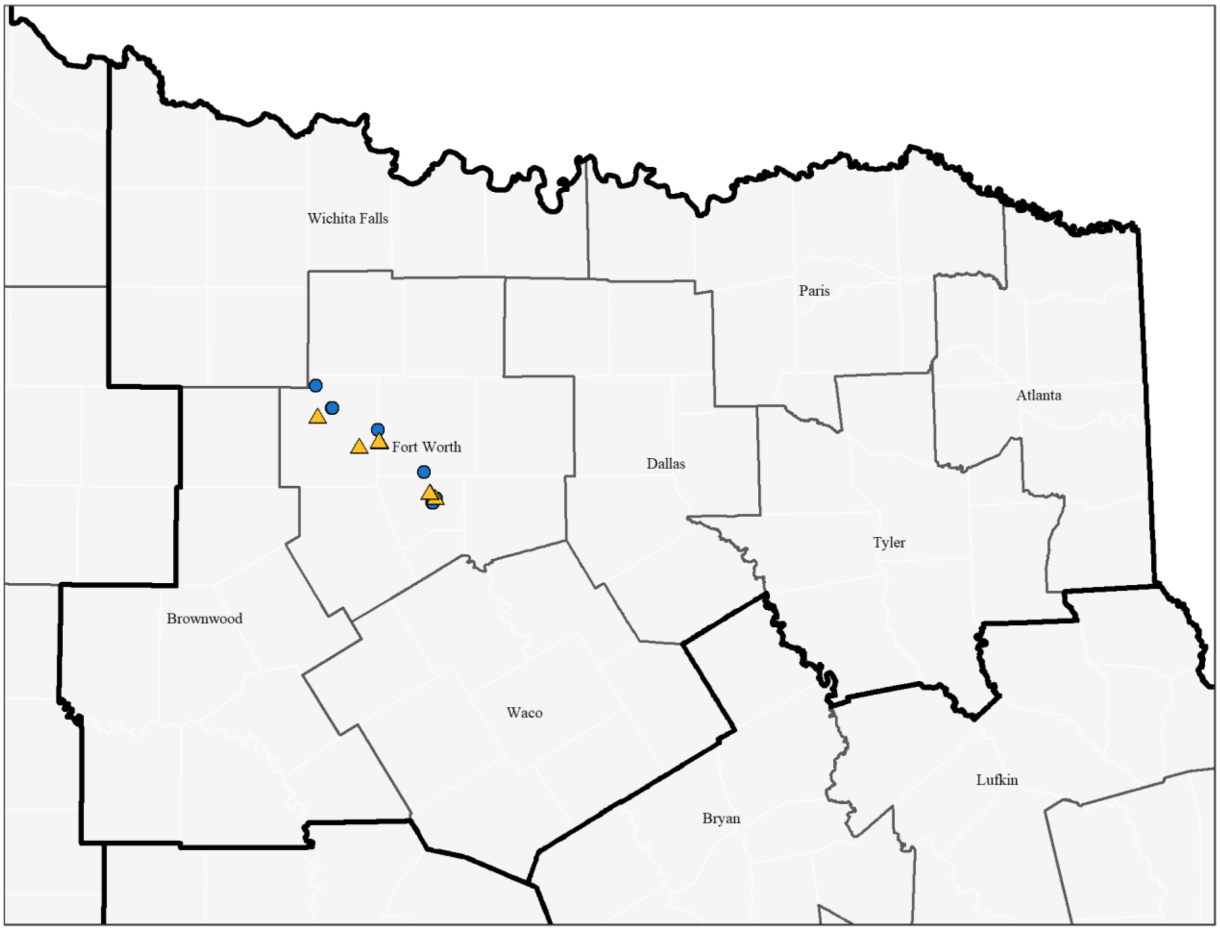
Nerodia harteri

Brazos River Watersnake



Nerodia harteri

Brazos River Watersnake

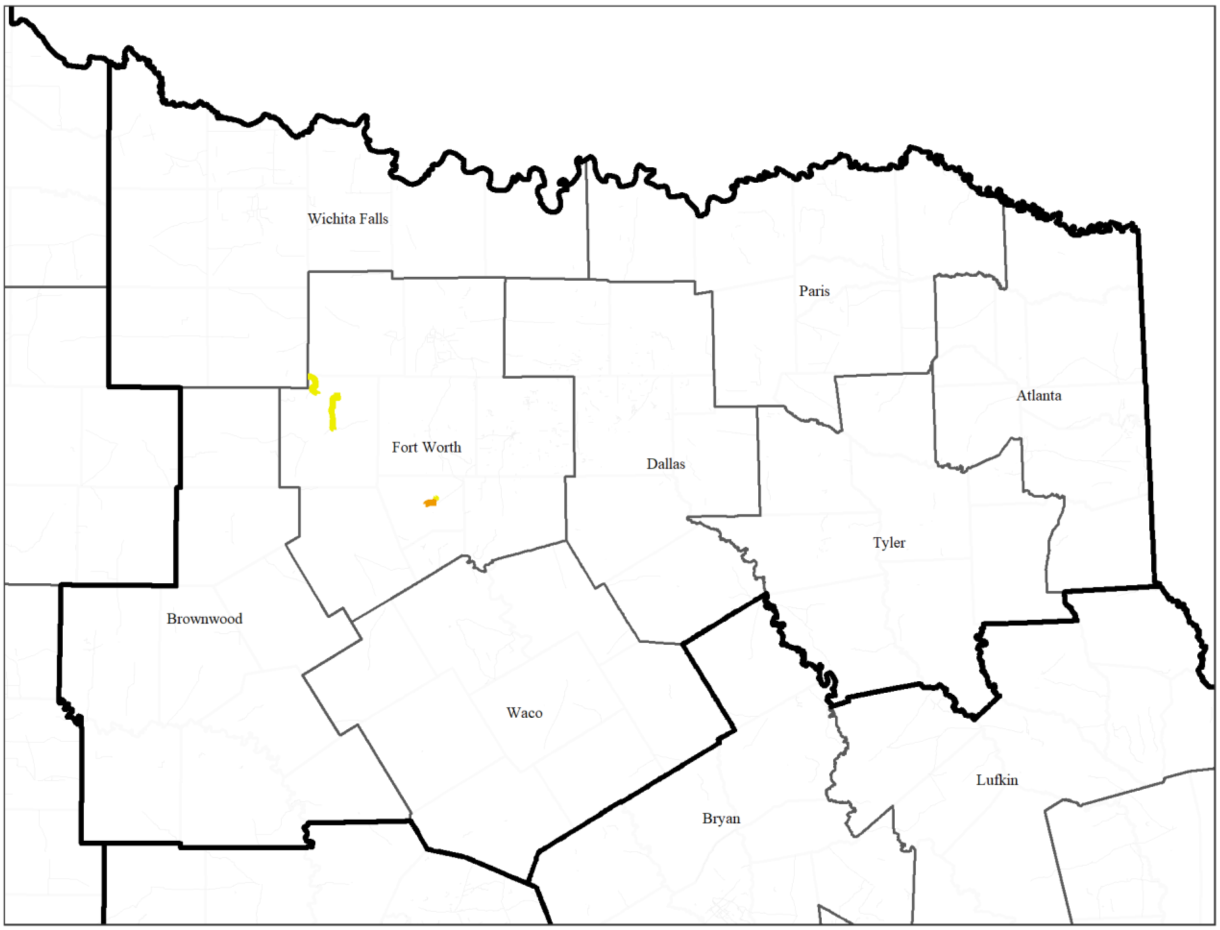


• Near-Road Points △ Off-Road Points

Nerodia harteri

Brazos River Watersnake

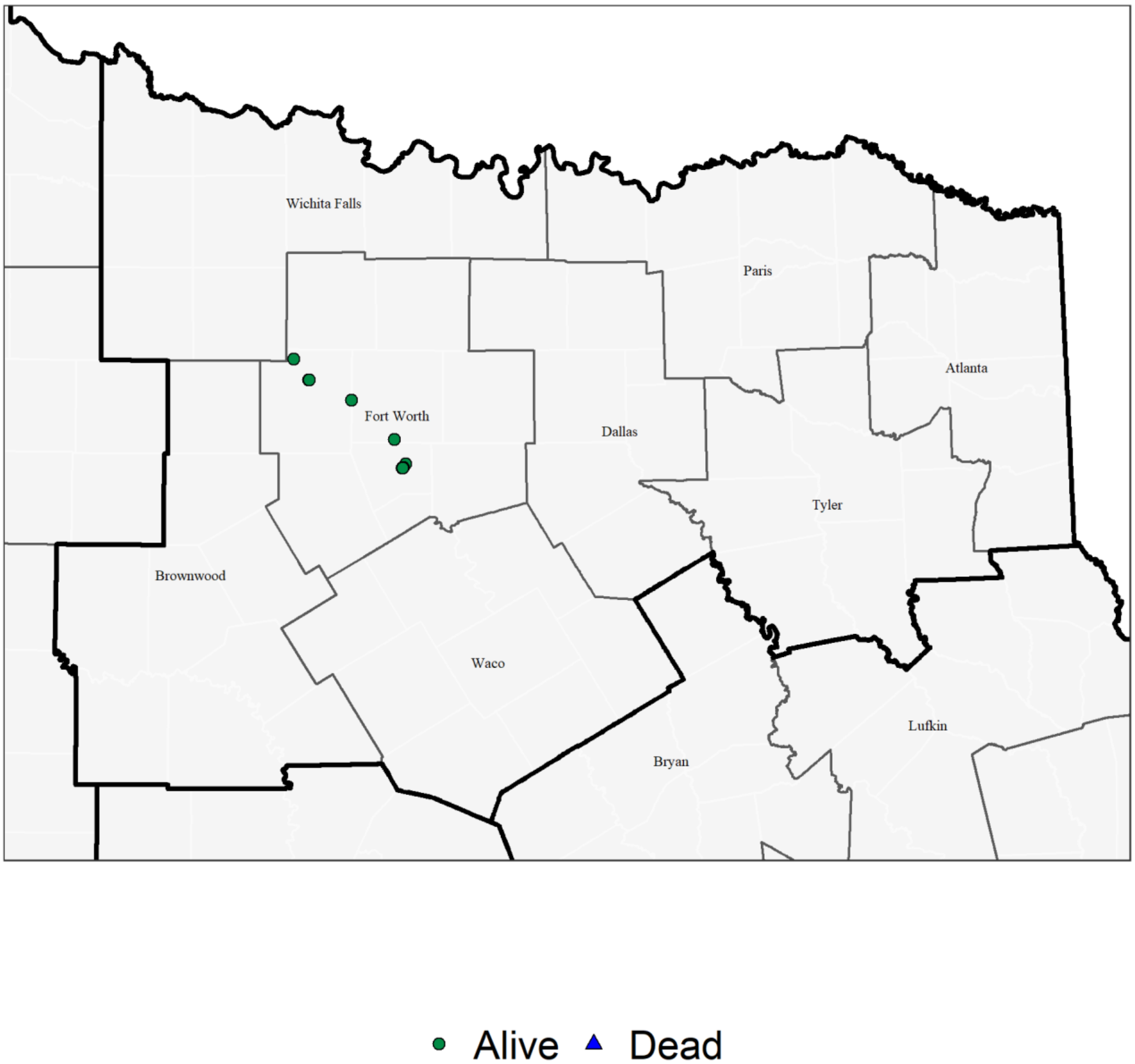
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section 1-2 3-4 5-6 7+

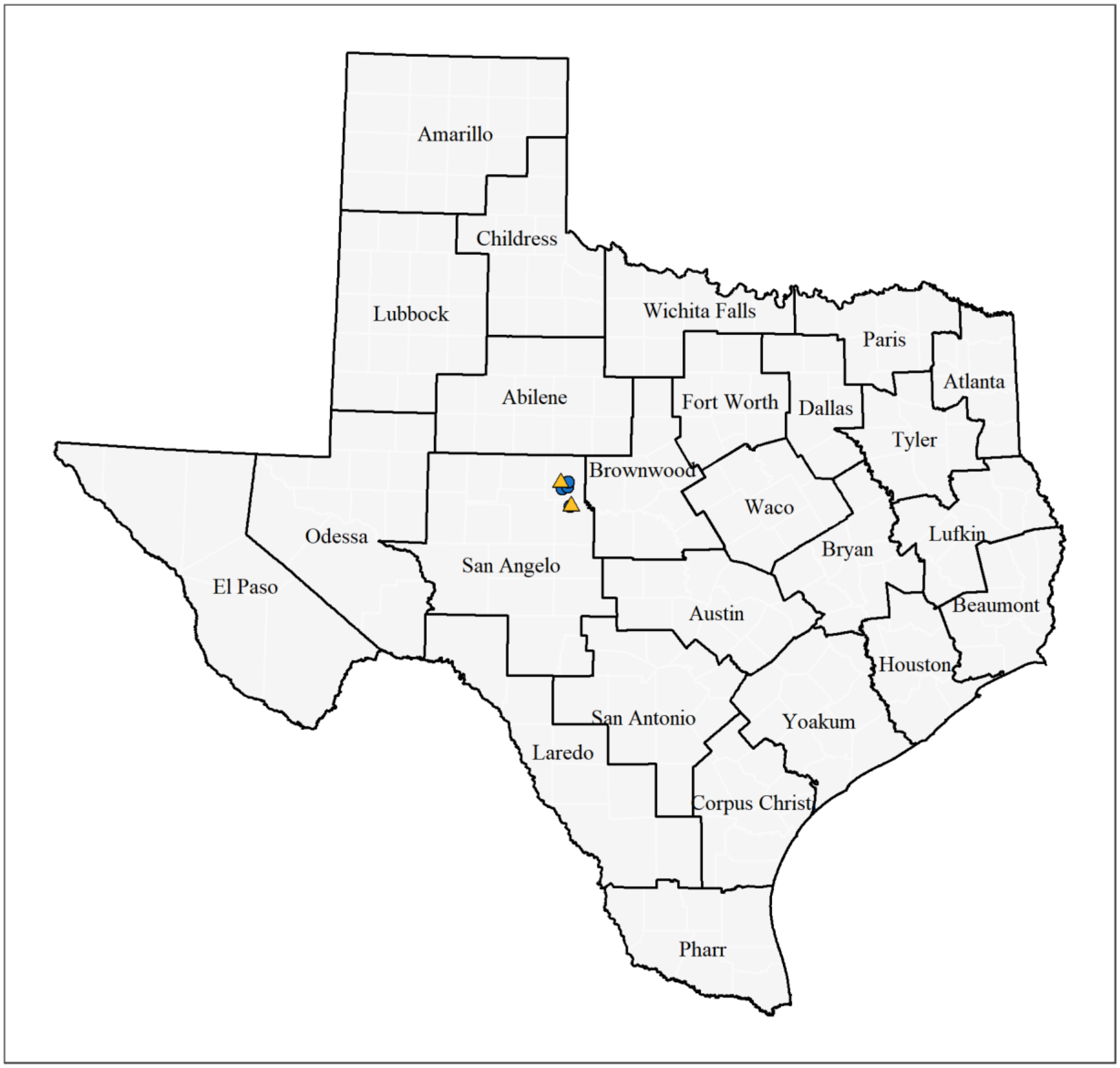
Nerodia harteri

Brazos River Watersnake



Nerodia paucimaculata

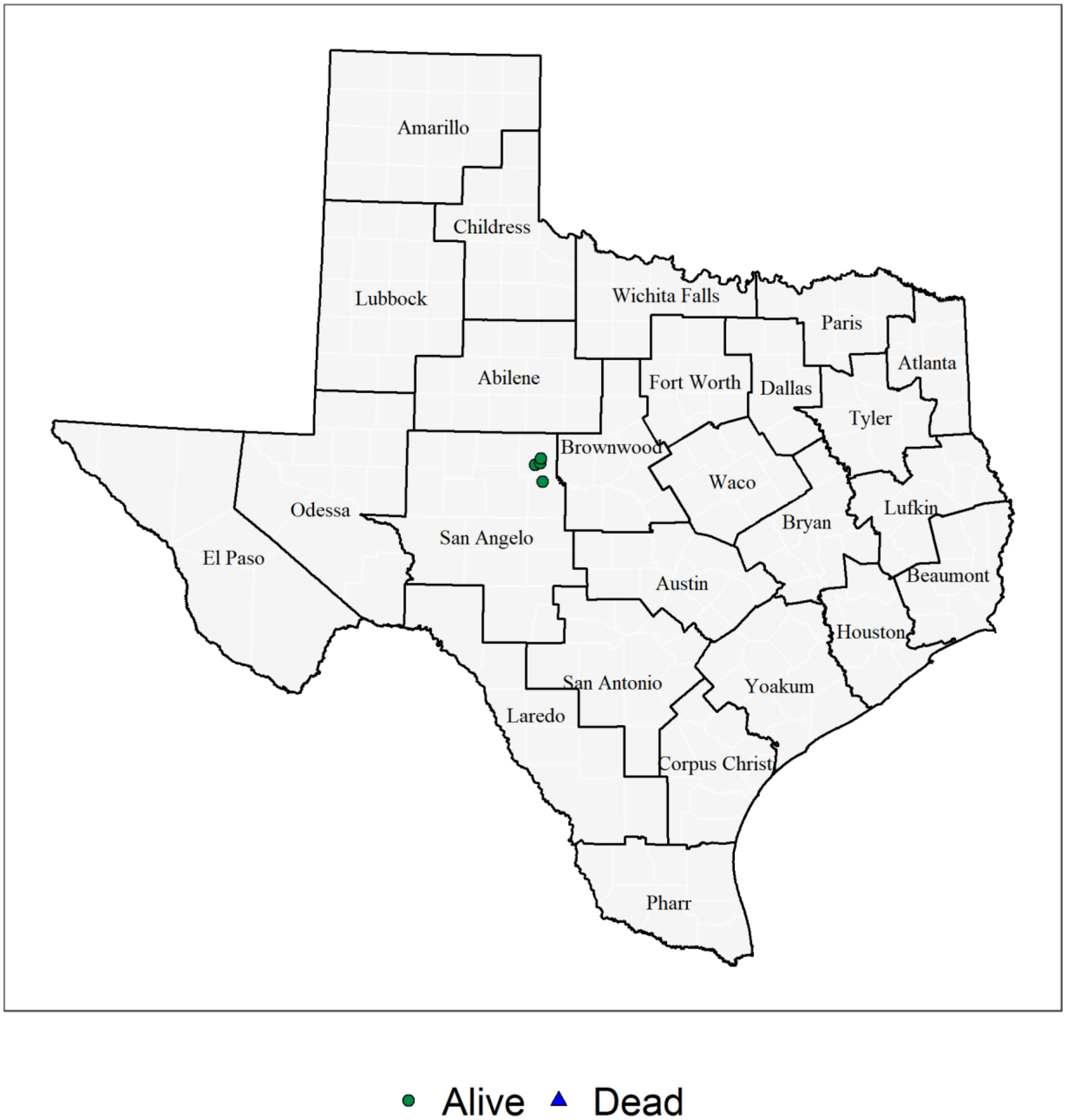
Concho Watersnake



● Near-Road Points ▲ Off-Road Points

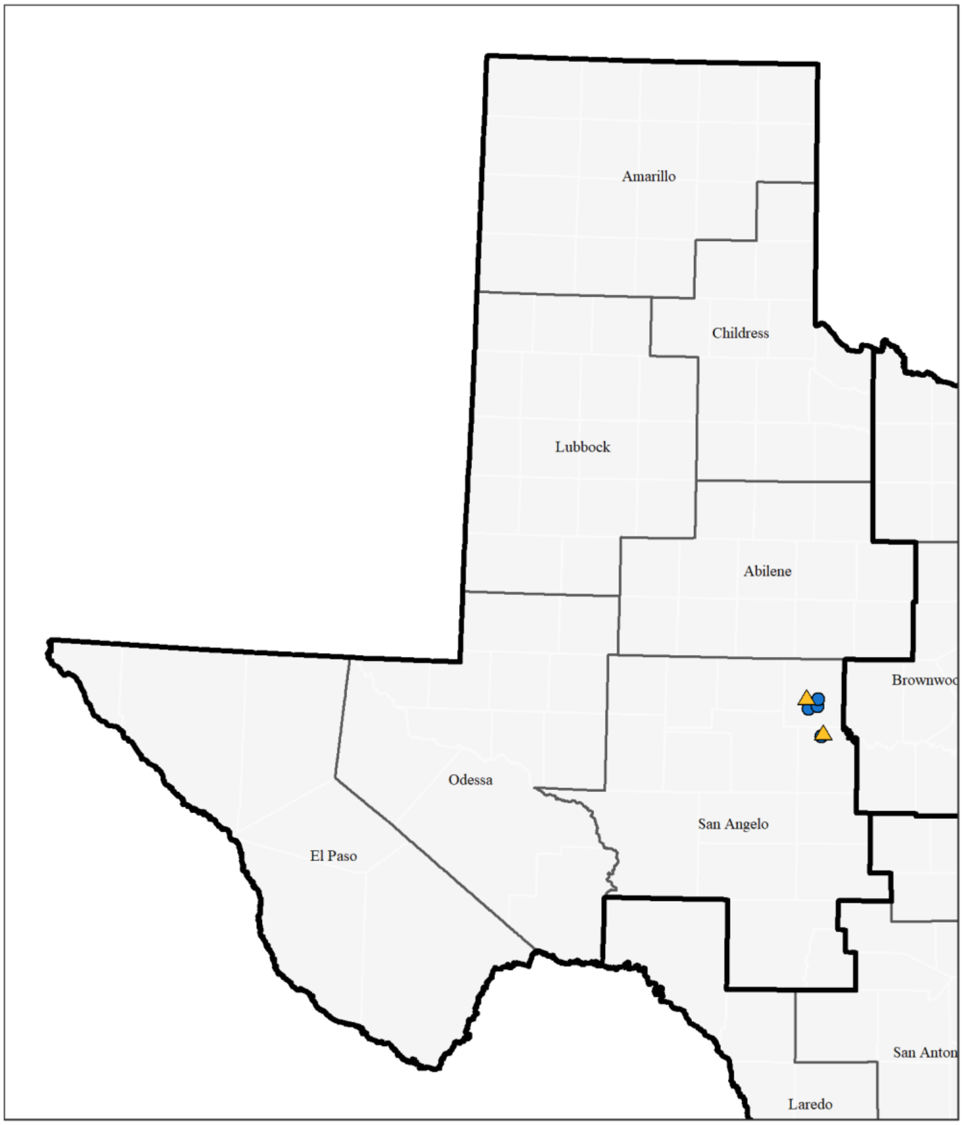
Nerodia paucimaculata

Concho Watersnake



Nerodia paucimaculata

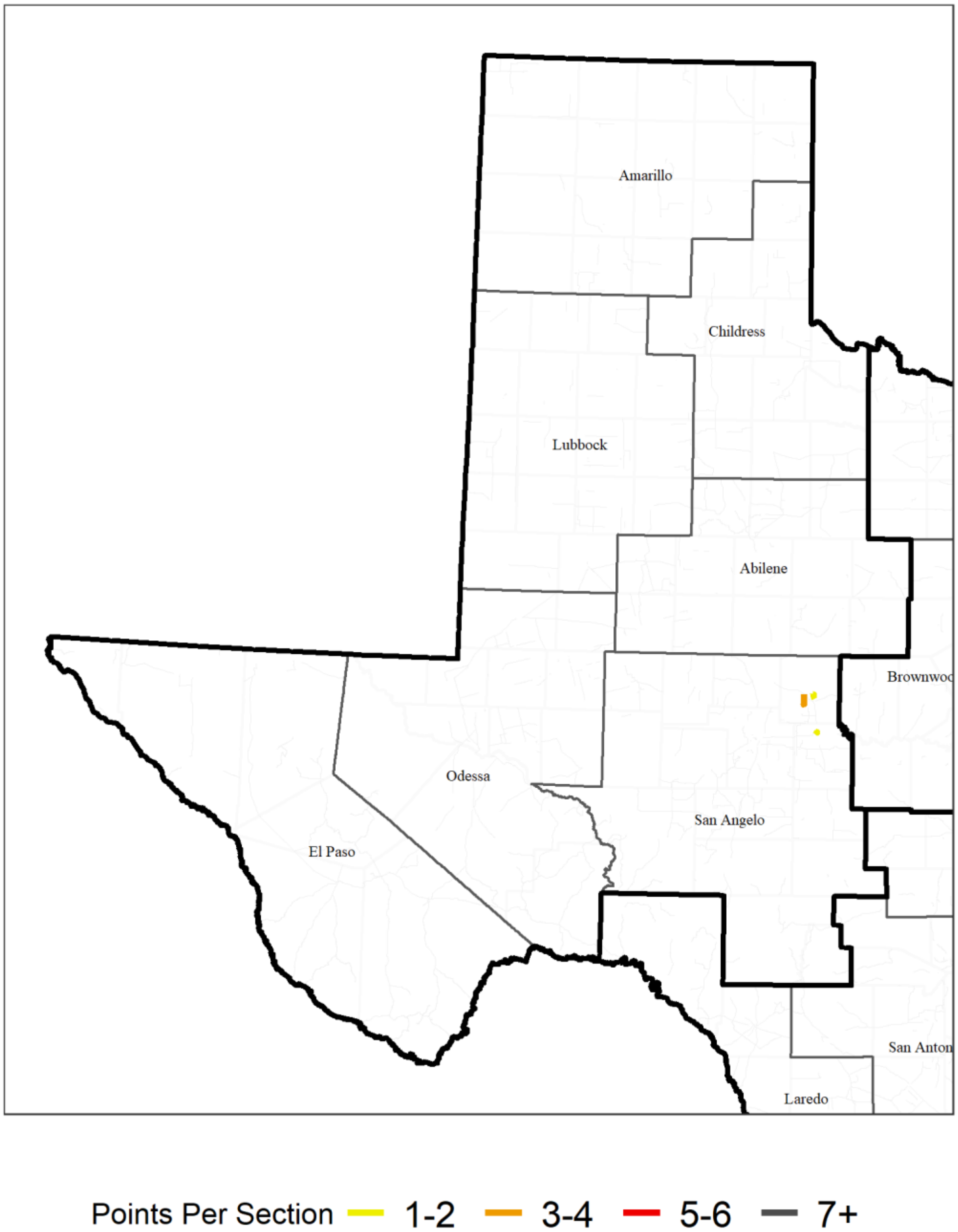
Concho Watersnake



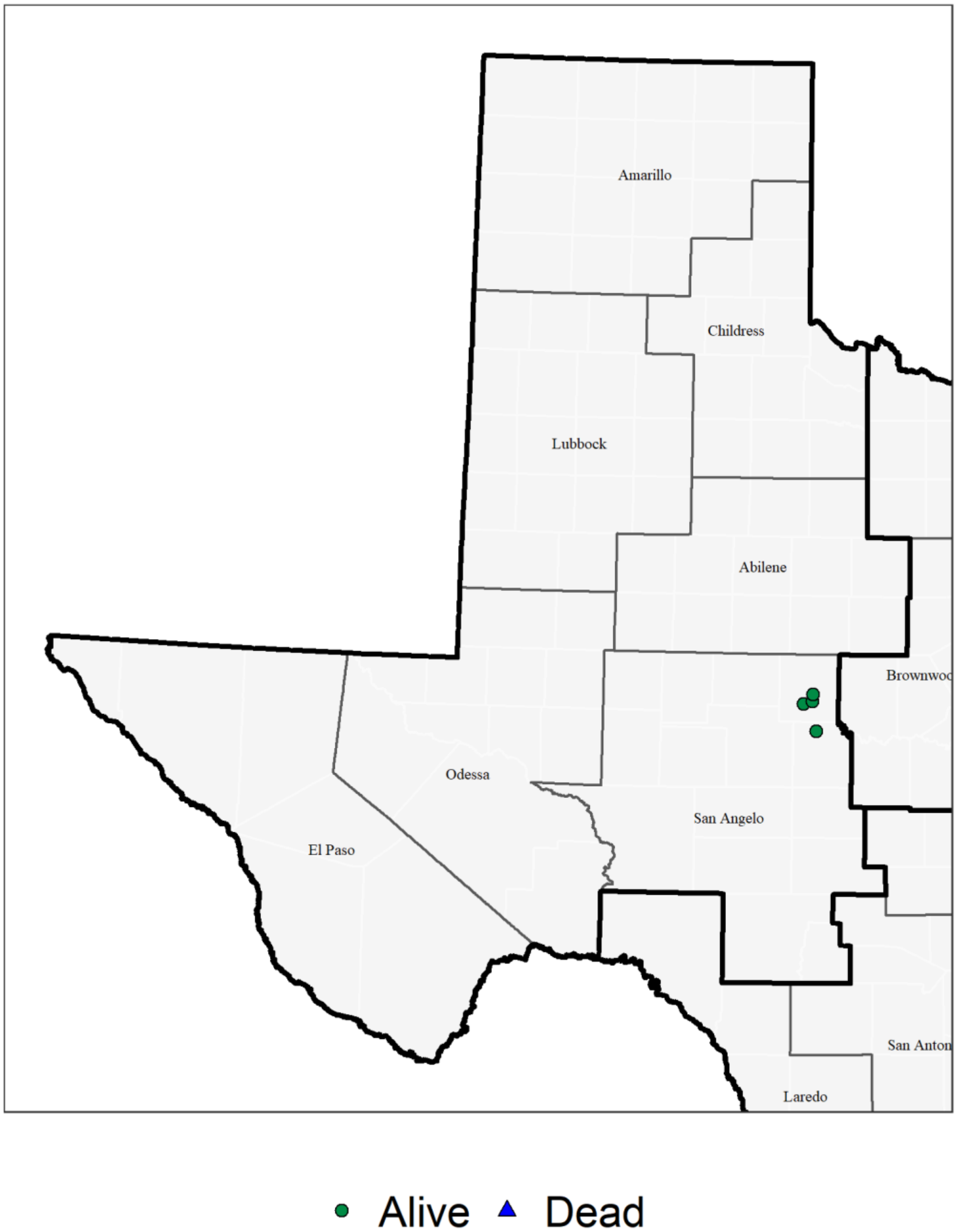
Near-Road Points Off-Road Points

Nerodia paucimaculata

Concho Watersnake

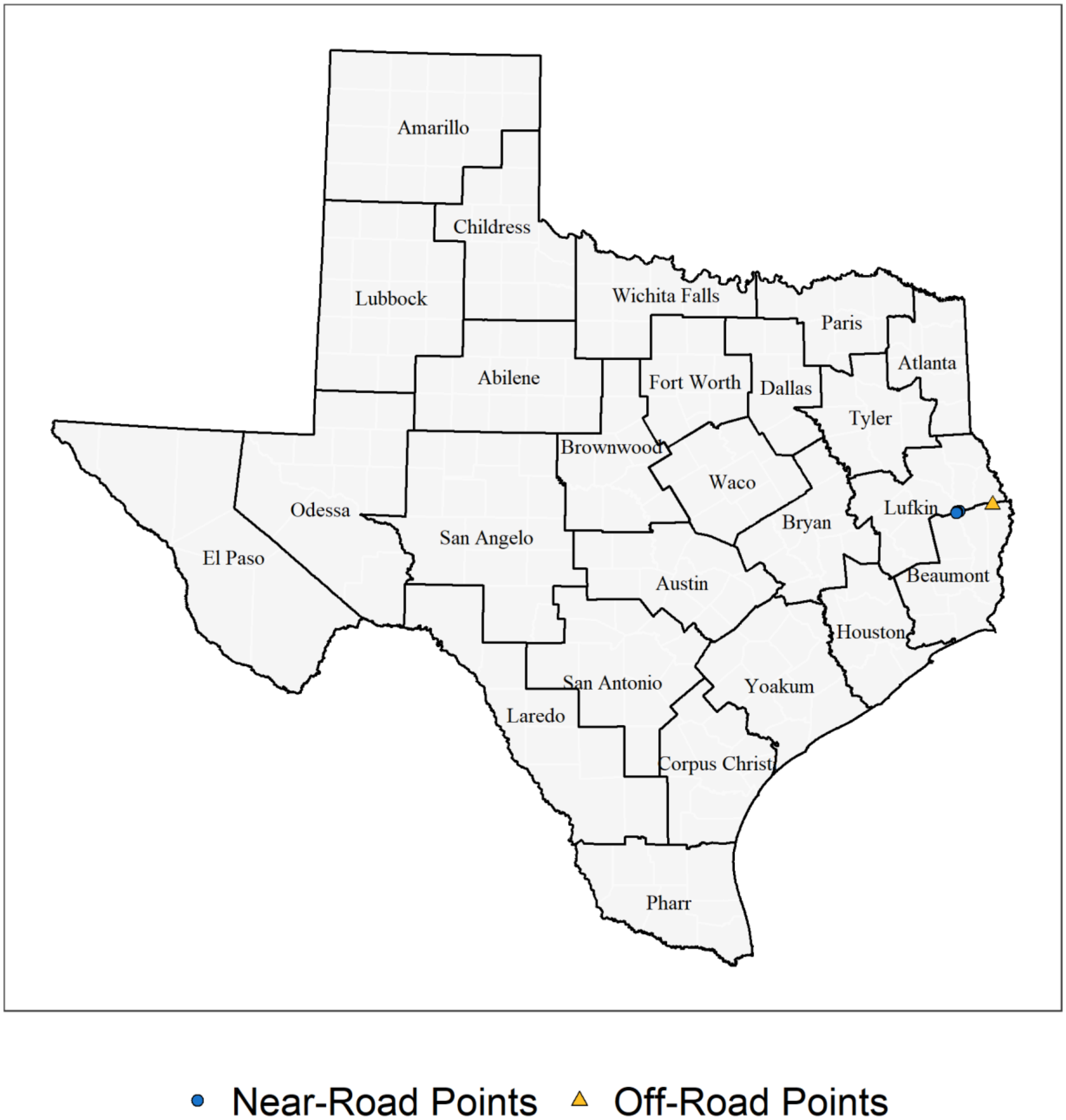


Nerodia paucimaculata
Concho Watersnake



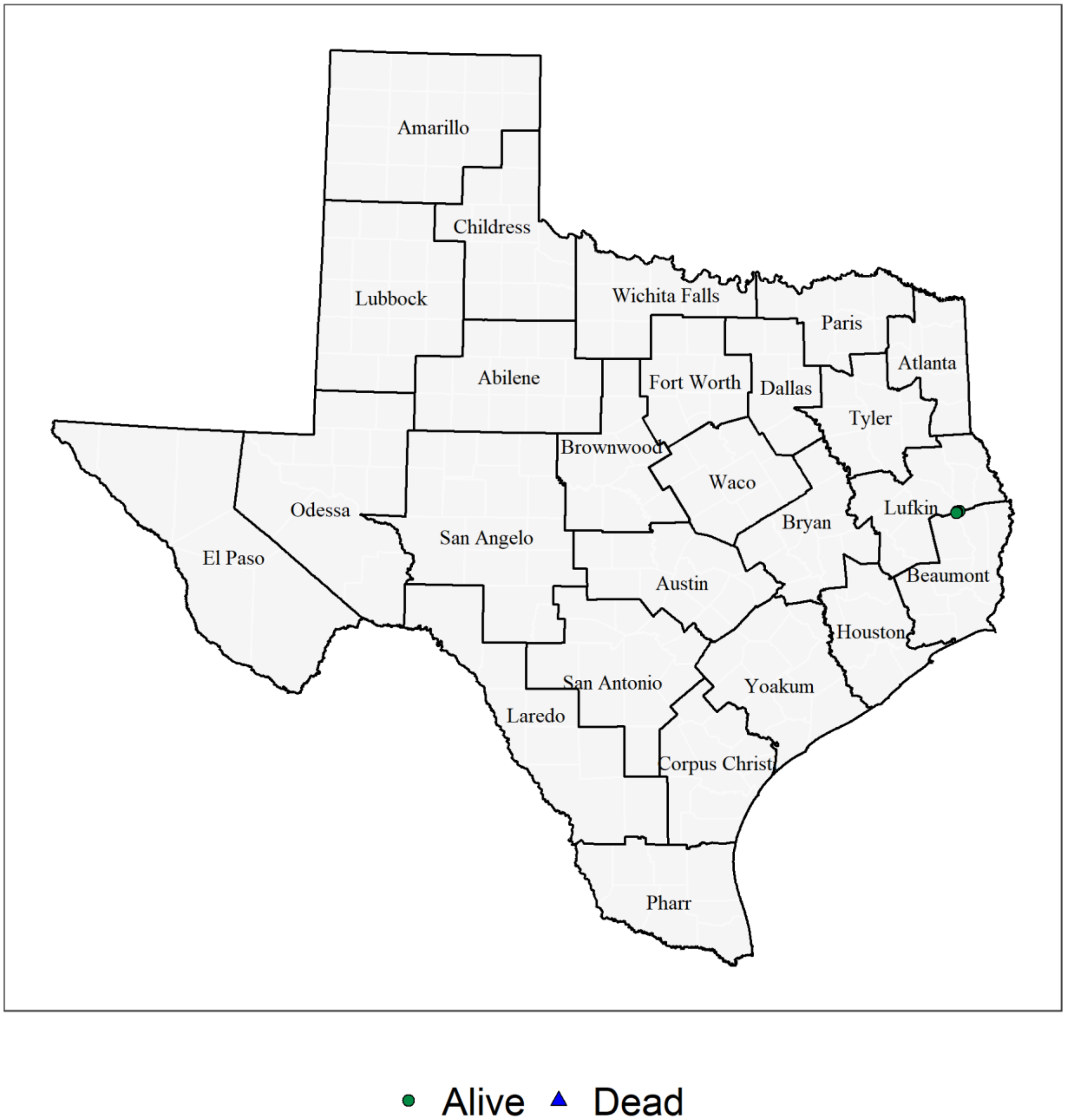
Pituophis ruthveni

Louisiana Pinesnake



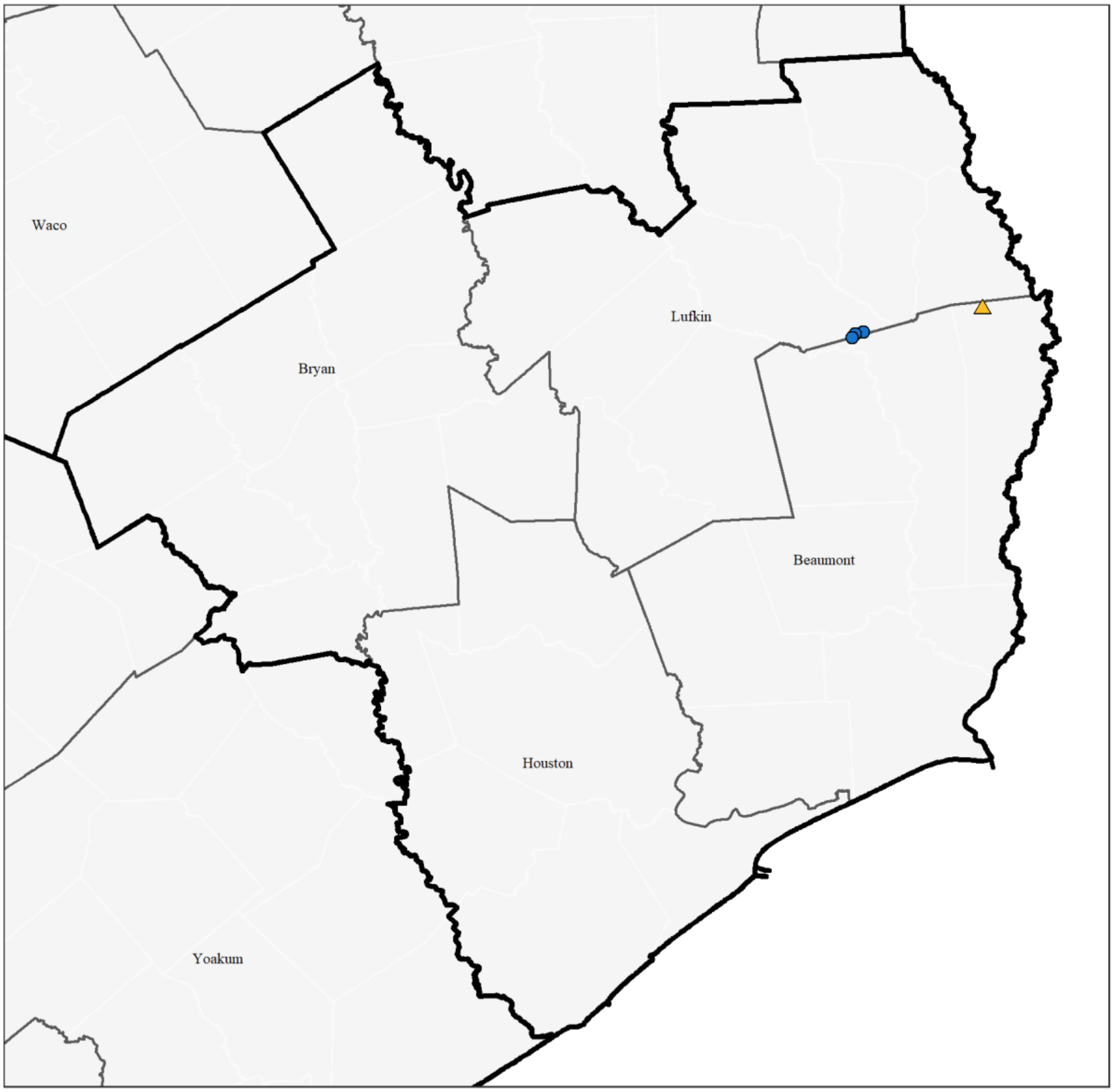
Pituophis ruthveni

Louisiana Pinesnake

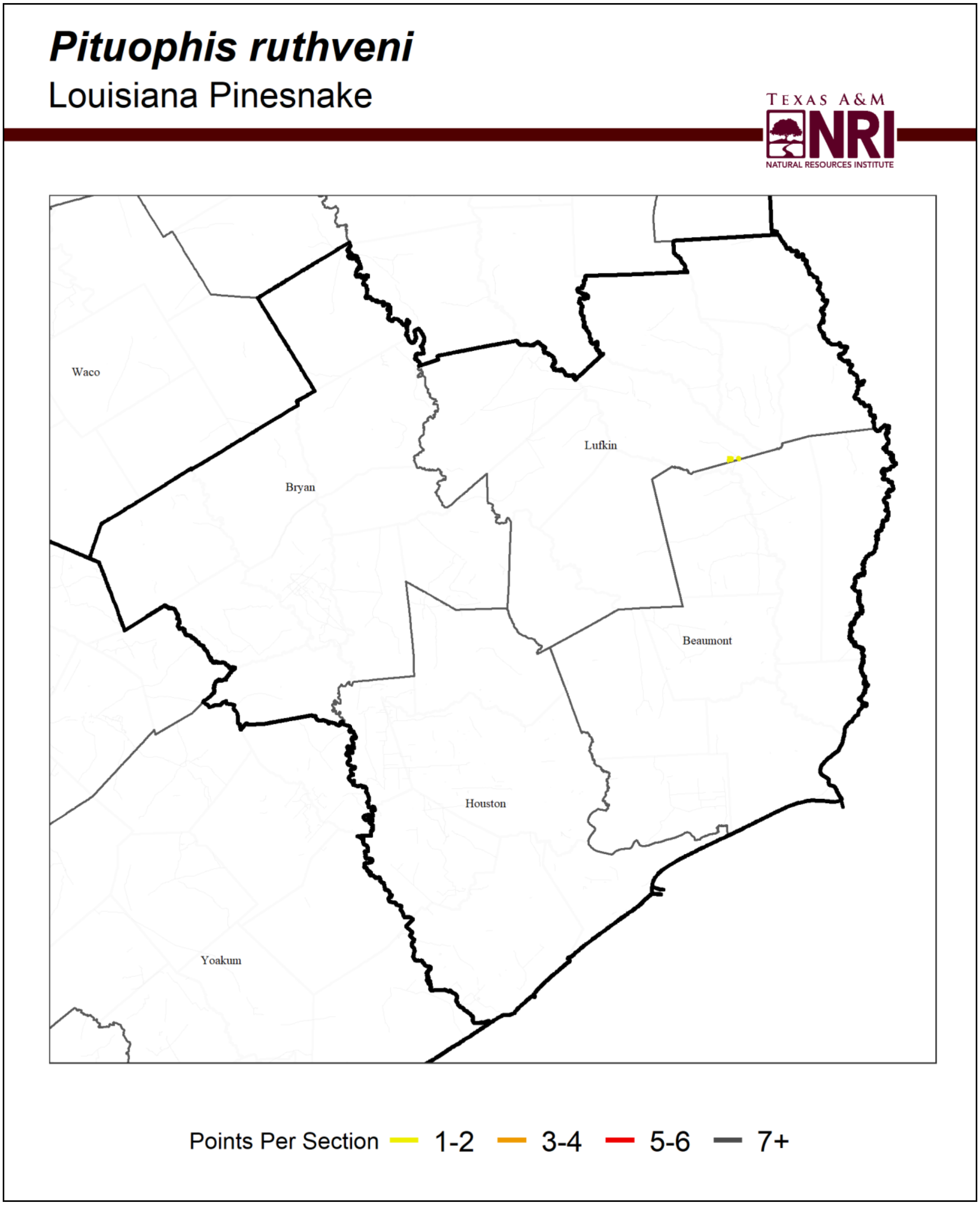


Pituophis ruthveni

Louisiana Pinesnake

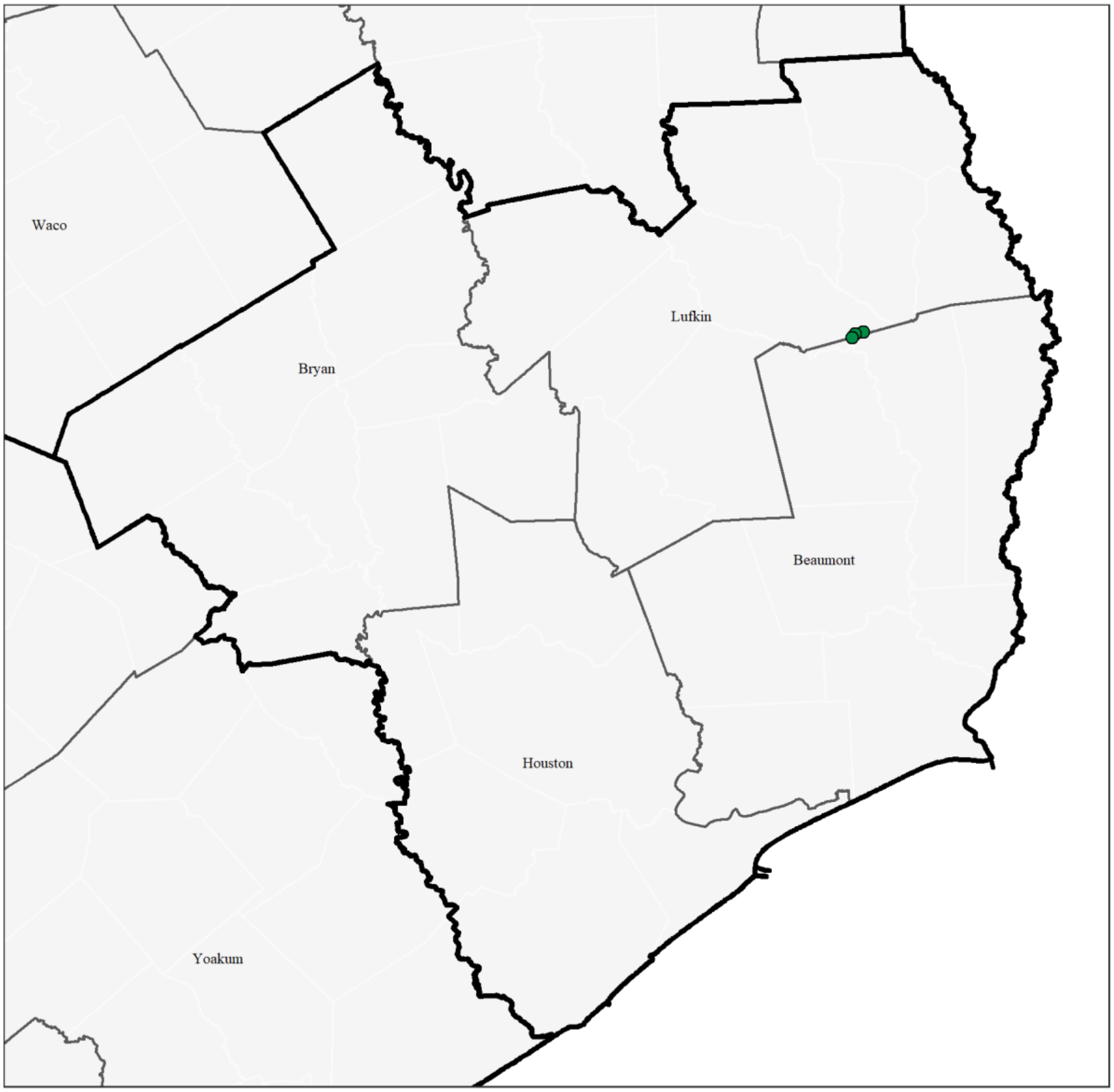


Near-Road Points Off-Road Points


Pituophis ruthveni
Louisiana Pinesnake
TEXAS A&M
NRI
NATURAL RESOURCES INSTITUTE
Waco
Lufkin
Bryan
Beaumont
Houston
Yoakum
Points Per Section 1-2 3-4 5-6 7+

Pituophis ruthveni

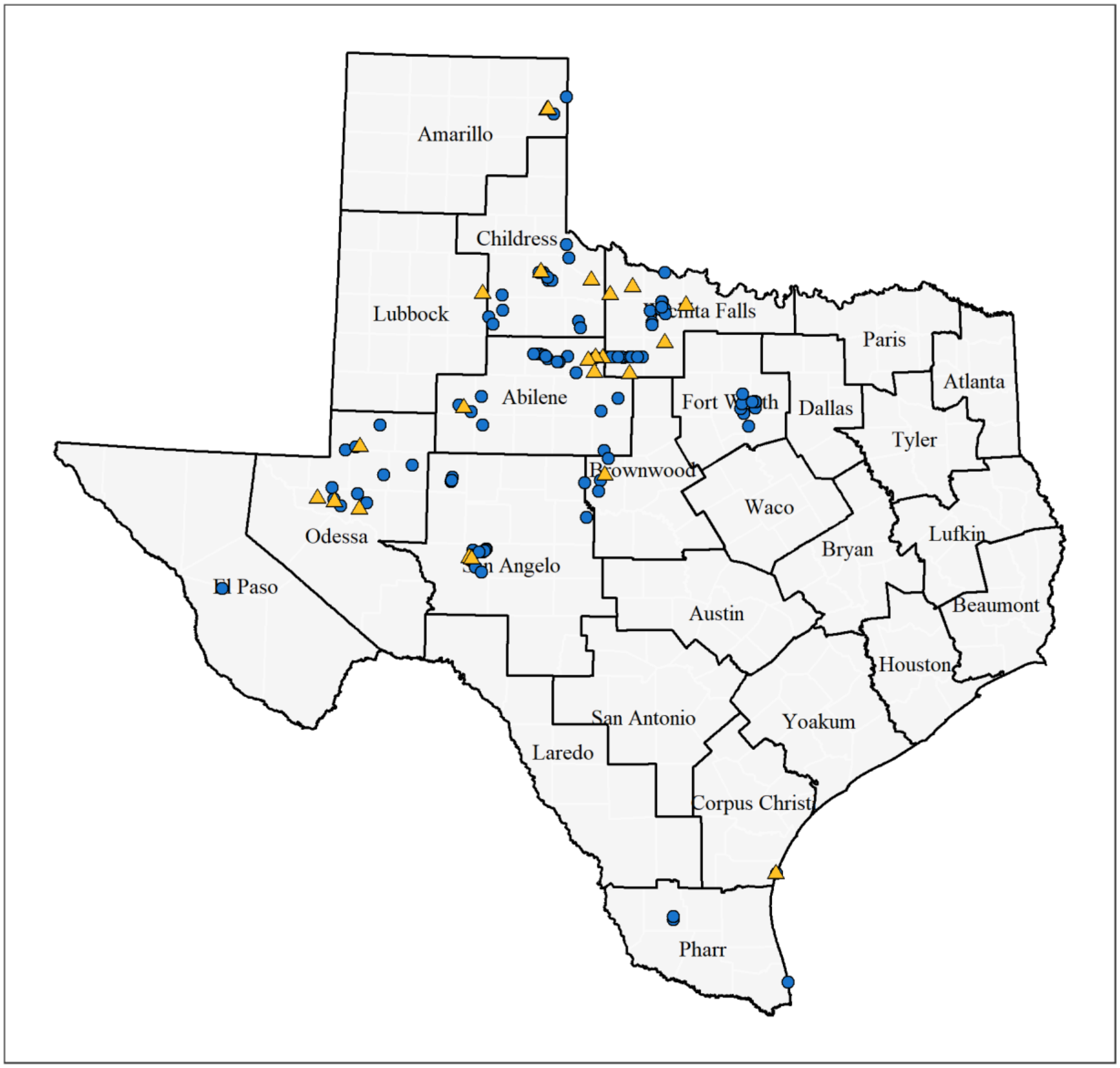
Louisiana Pinesnake



● Alive ▲ Dead

Sistrurus tergeminus

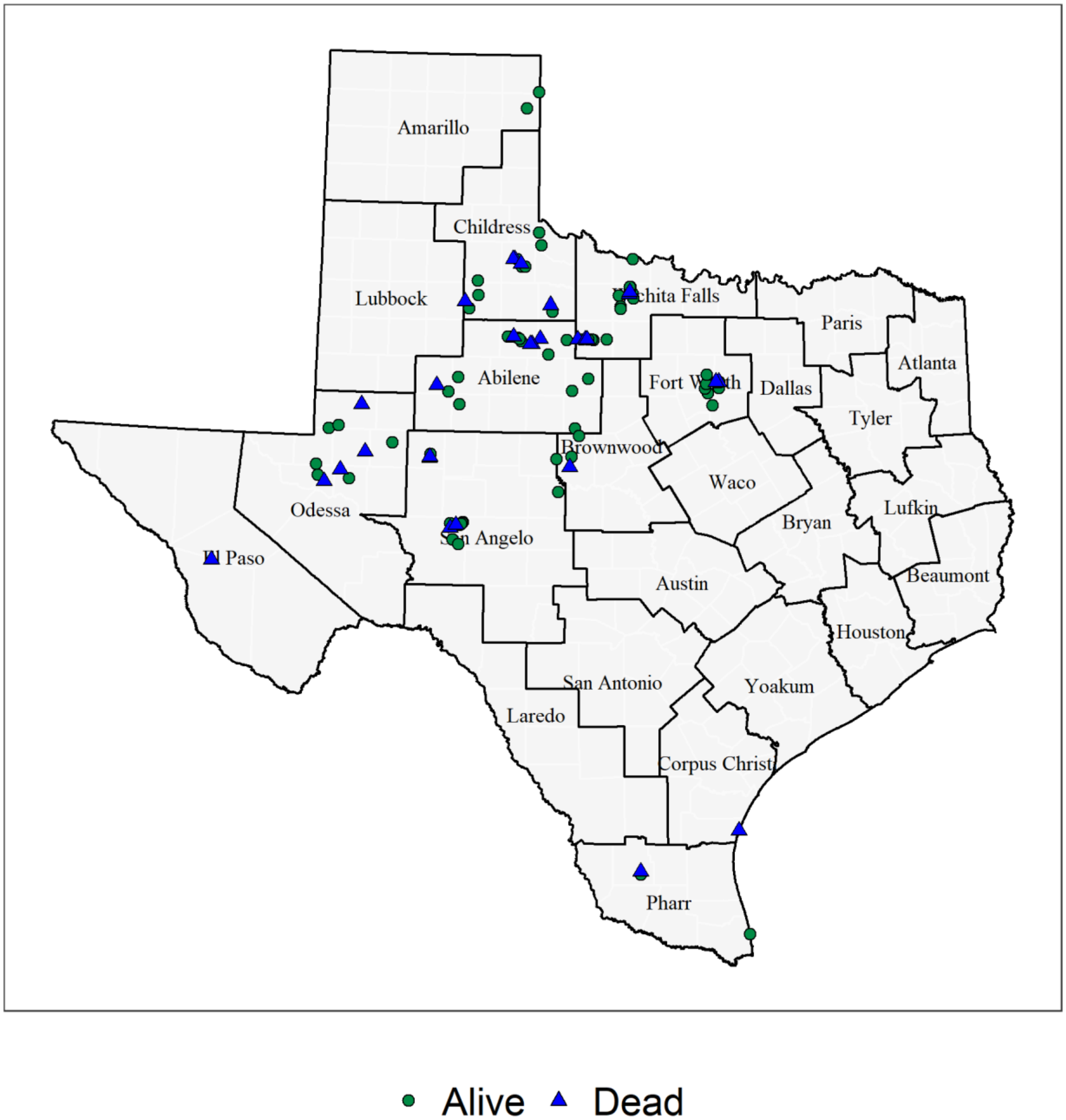
Western Massasauga



Near-Road Points Off-Road Points

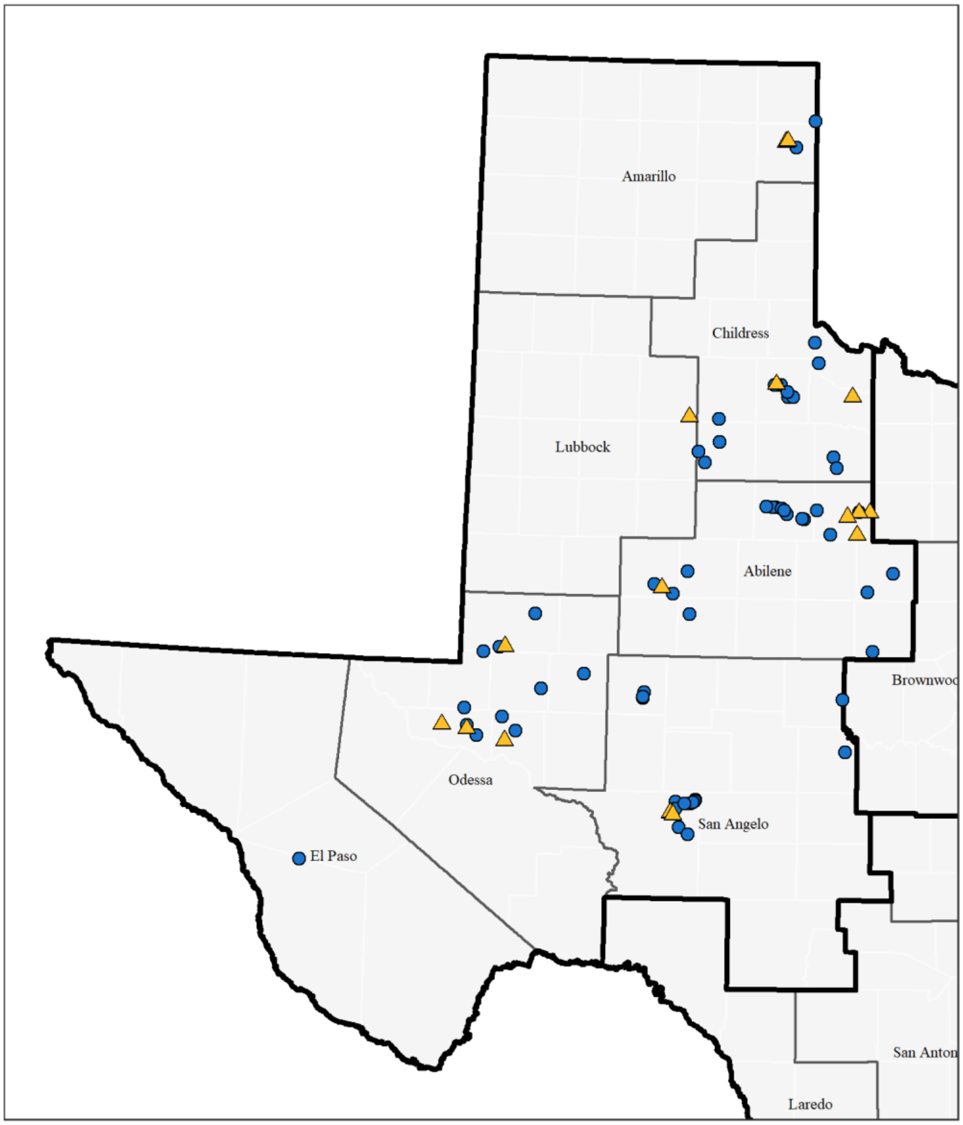
Sistrurus tergeminus

Western Massasauga



Sistrurus tergeminus

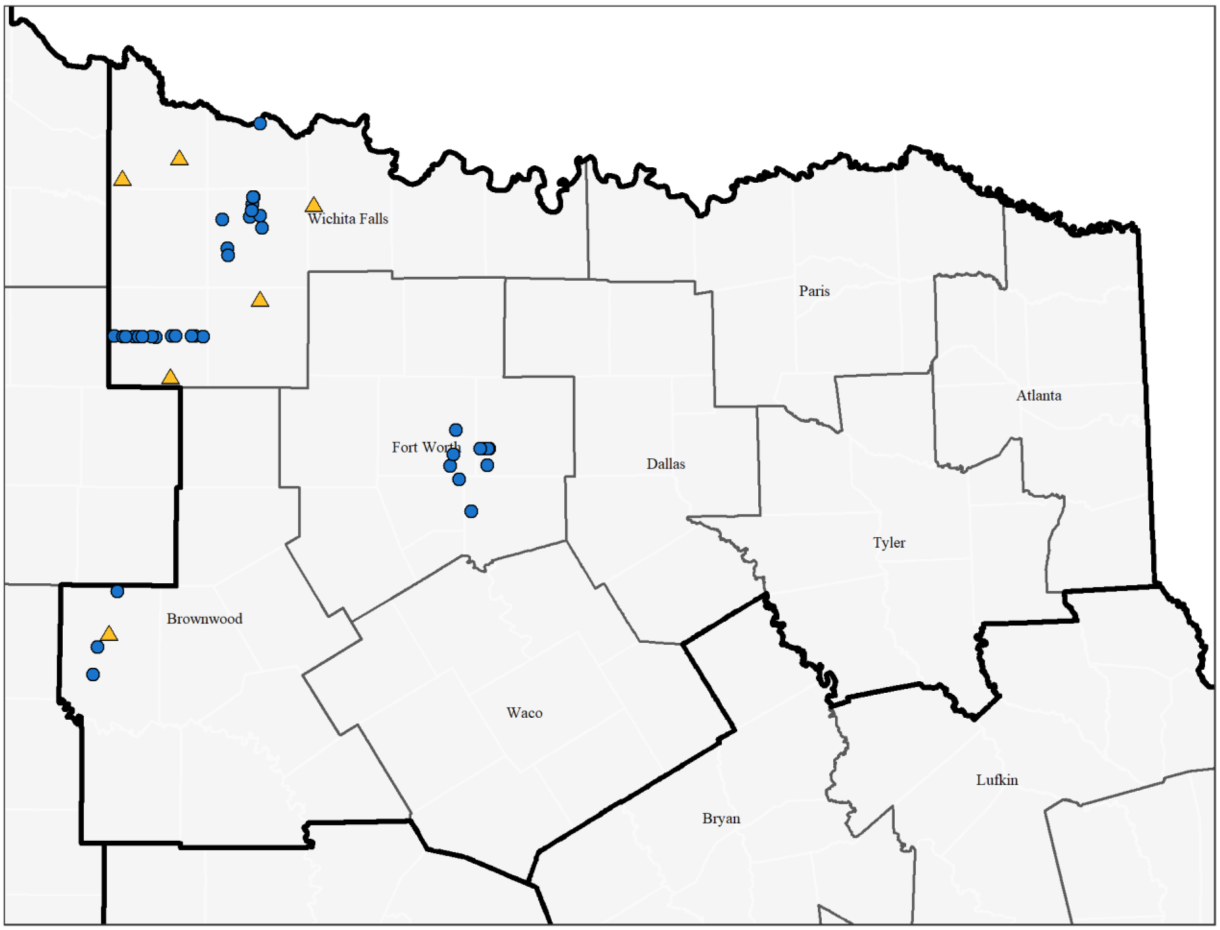
Western Massasauga



• Near-Road Points △ Off-Road Points

Sistrurus tergeminus

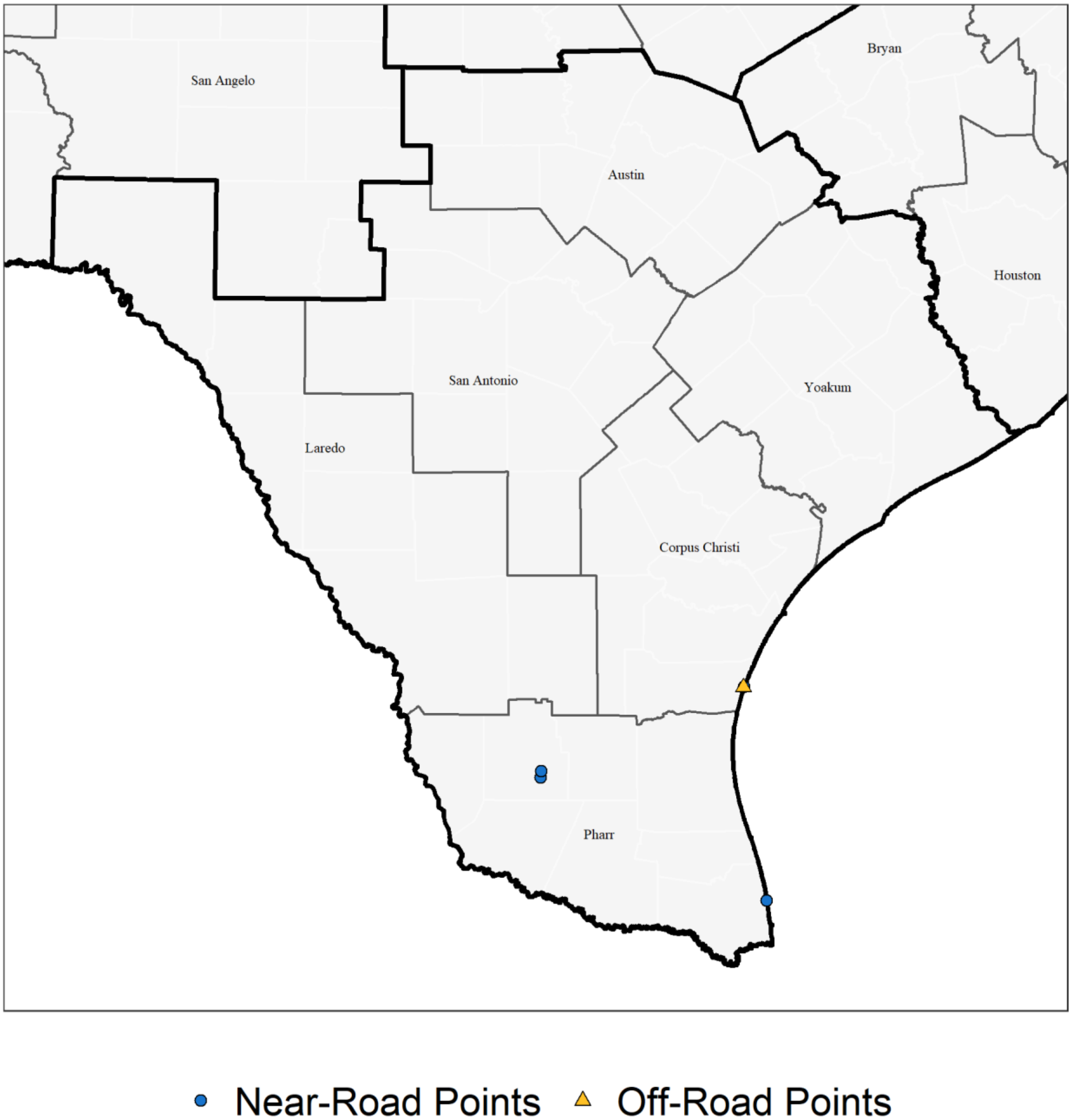
Western Massasauga



Near-Road Points   Off-Road Points

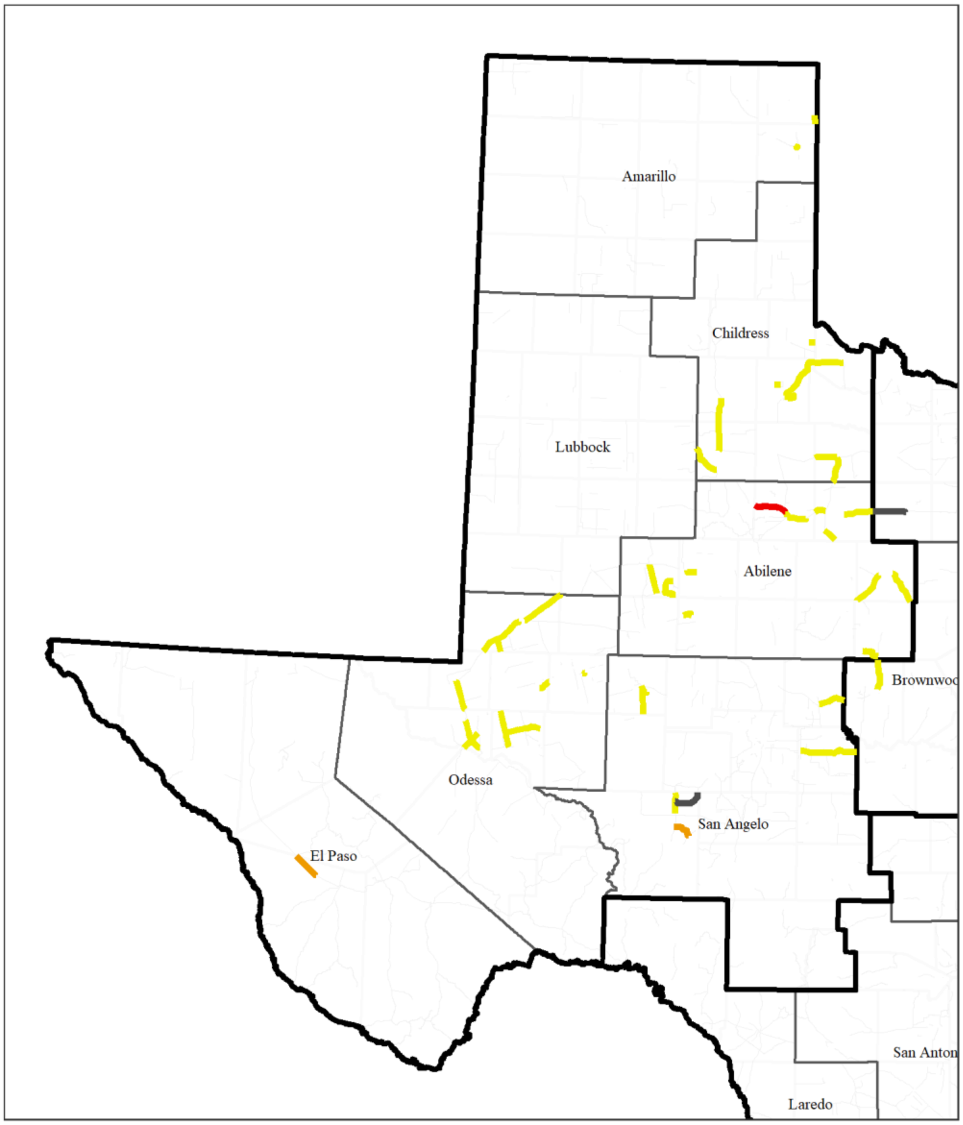
Sistrurus tergeminus

Western Massasauga



Sistrurus tergeminus

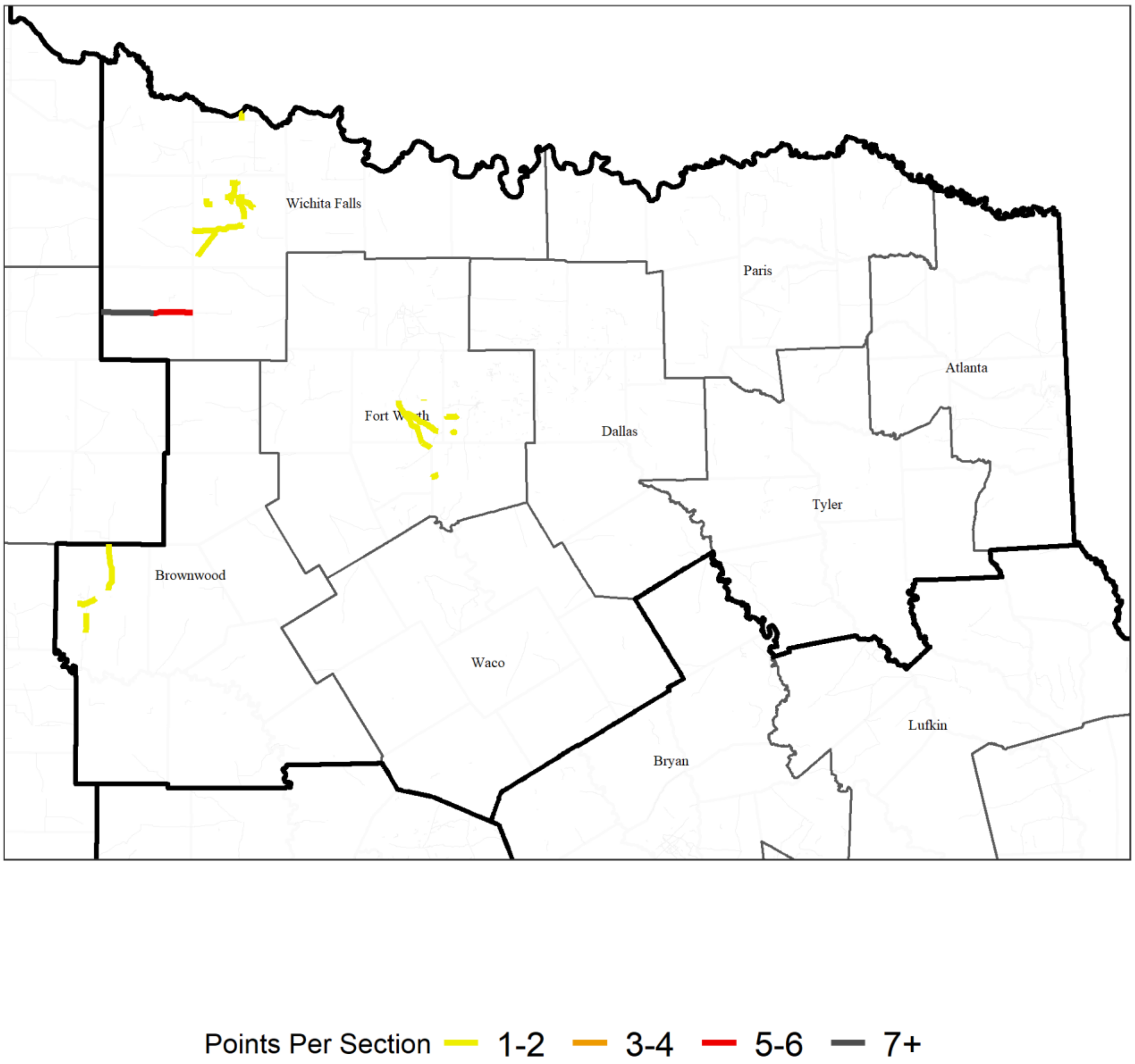
Western Massasauga

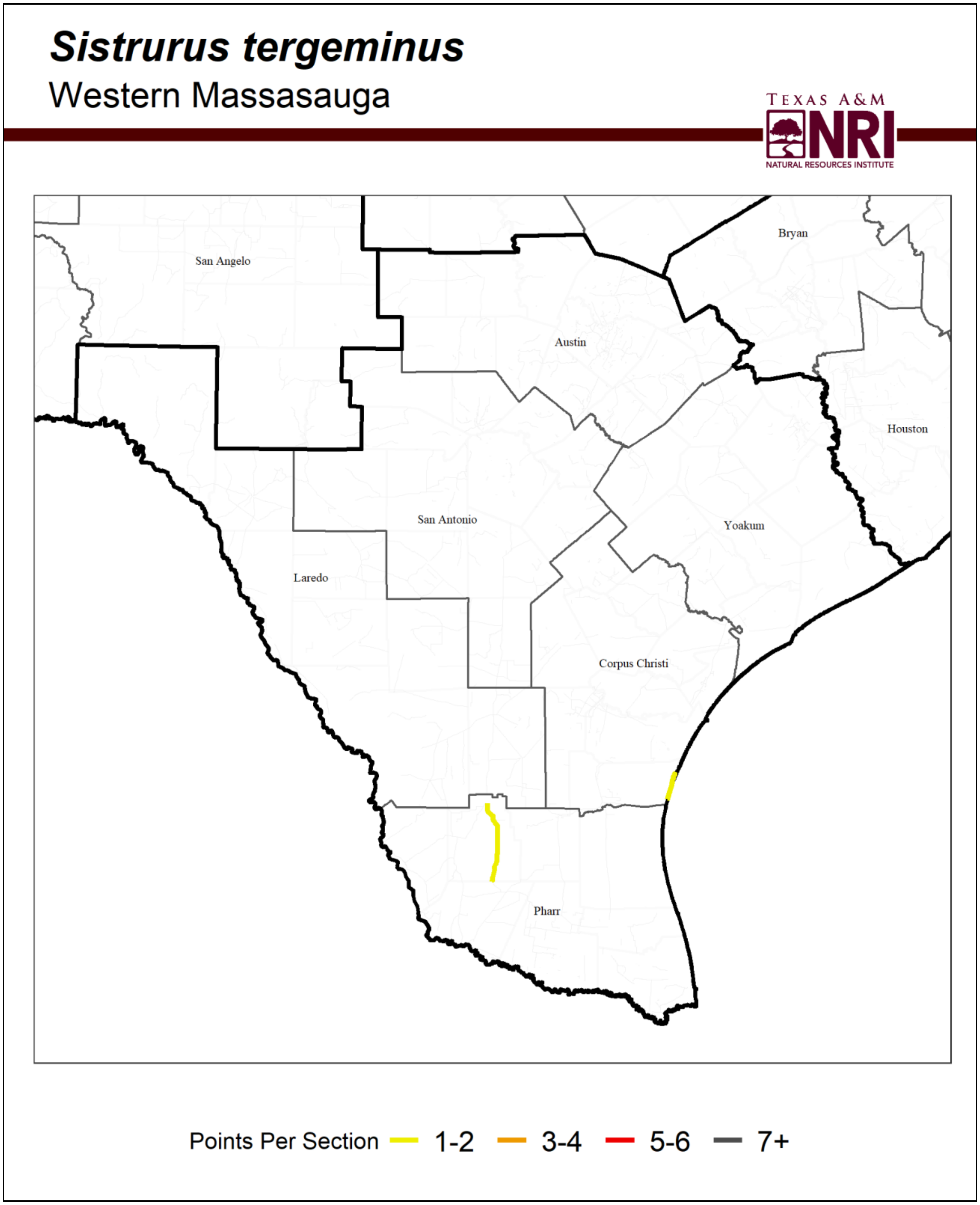


Points Per Section 1-2 3-4 5-6 7+

Sistrurus tergeminus

Western Massasauga

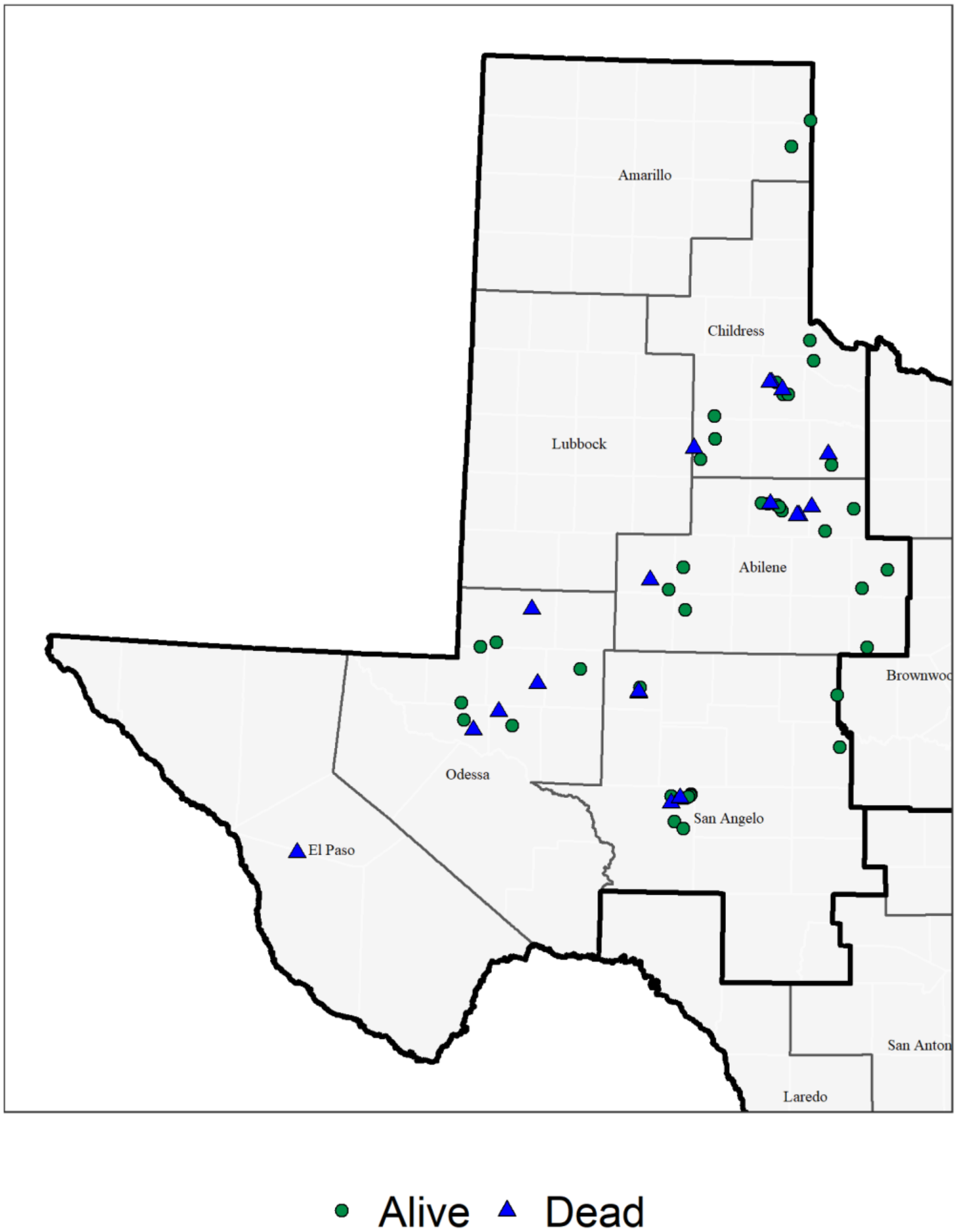



Sistrurus tergeminus
Western Massasauga
TEXAS A&M NRI
NATURAL RESOURCES INSTITUTE
San Angelo
Bryan
Austin
Houston
San Antonio
Yoakum
Laredo
Corpus Christi
Pharr
Points Per Section 1-2 3-4 5-6 7+

Sistrurus tergeminus

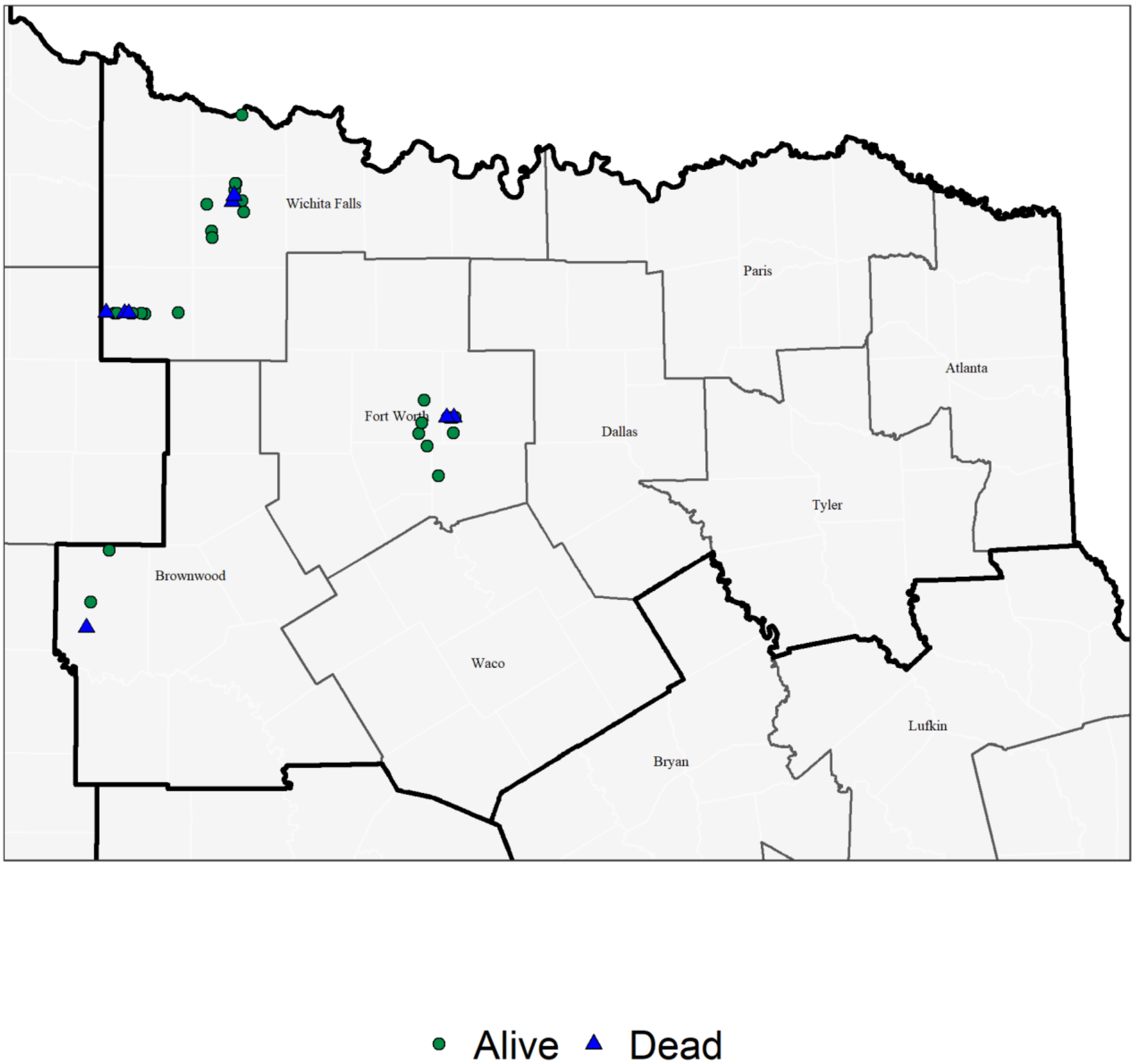
Western Massasauga

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Sistrurus tergeminus

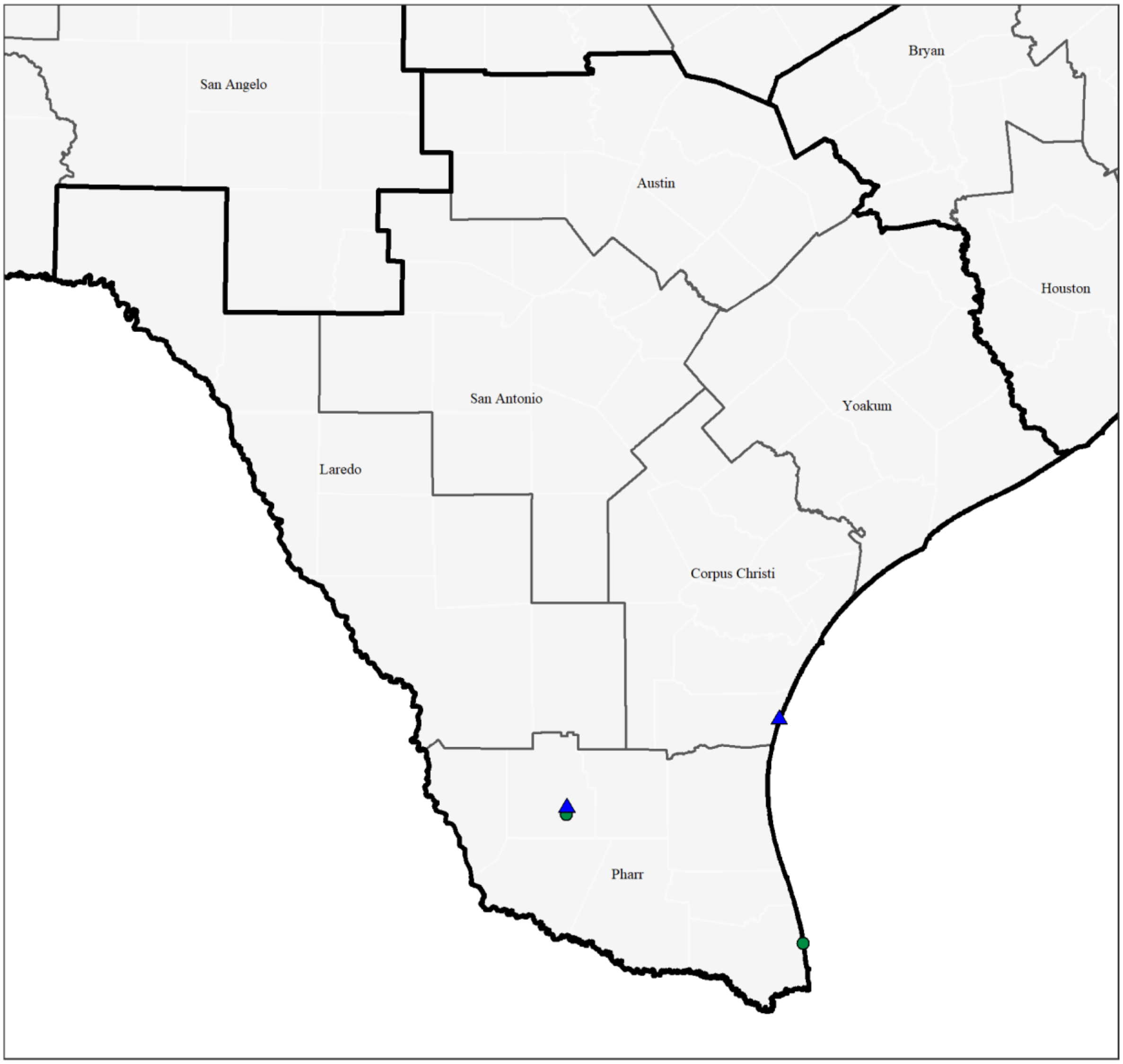
Western Massasauga



Sistrurus tergeminus

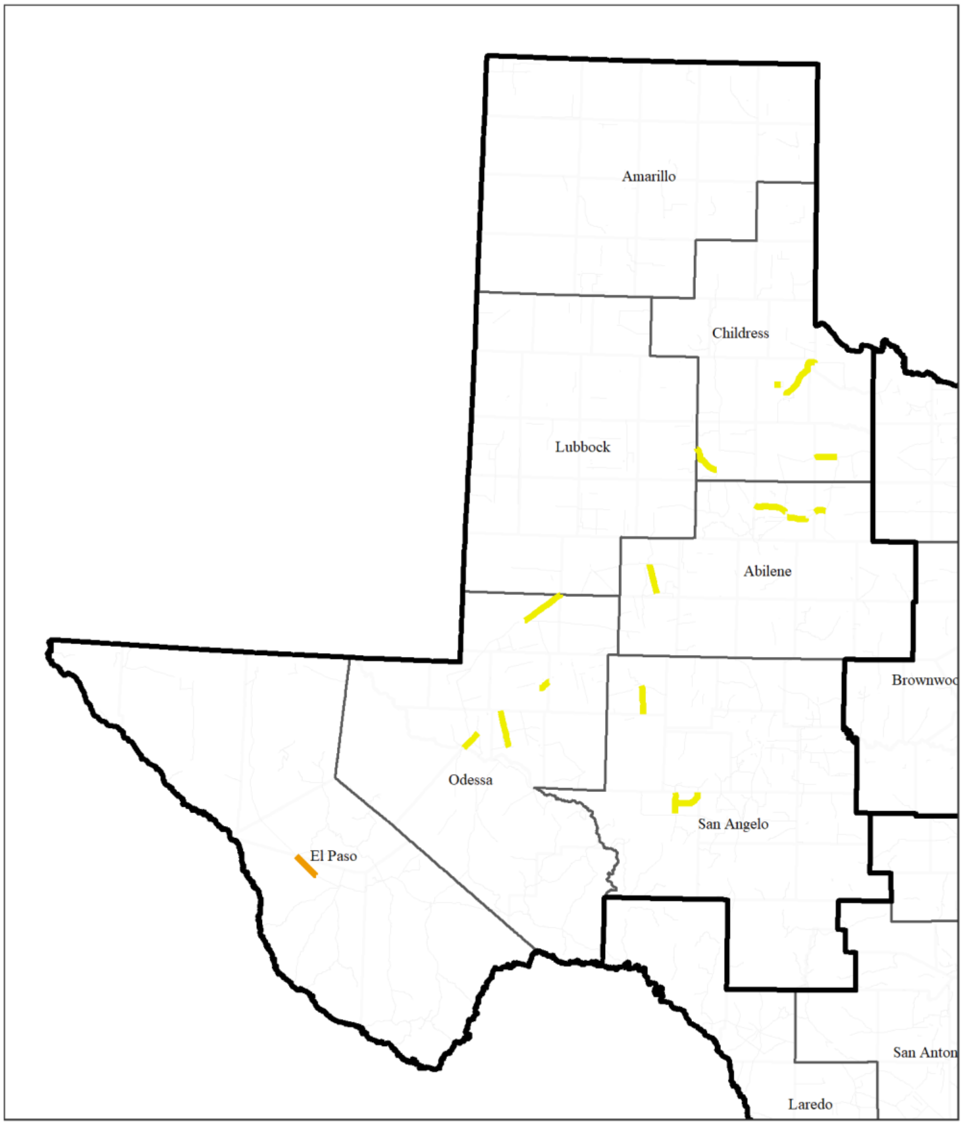
Western Massasauga

Texas A&M NRI Natural Resources Institute



Alive Dead

Sistrurus tergeminus
Western Massasauga

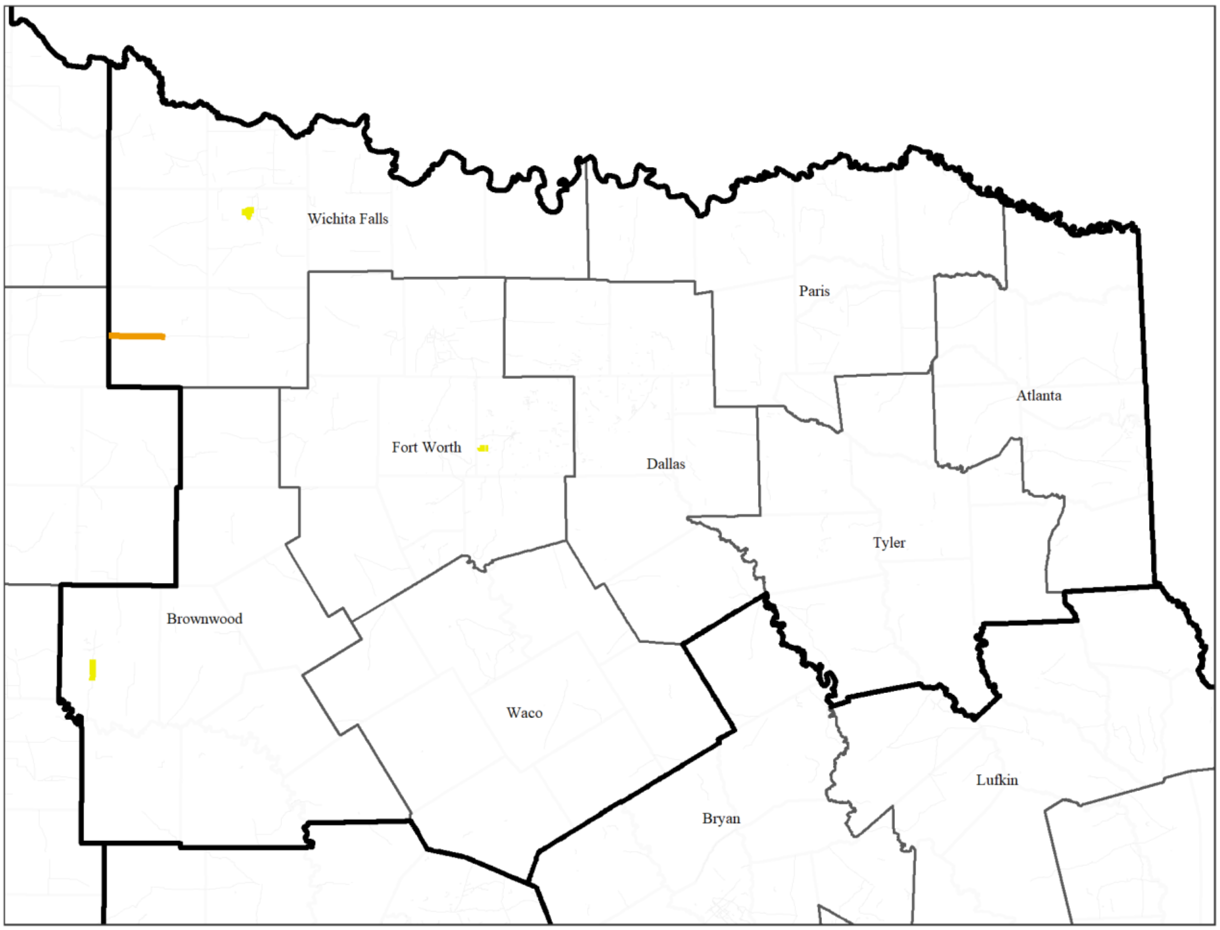


Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Sistrurus tergeminus

Western Massasauga

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE

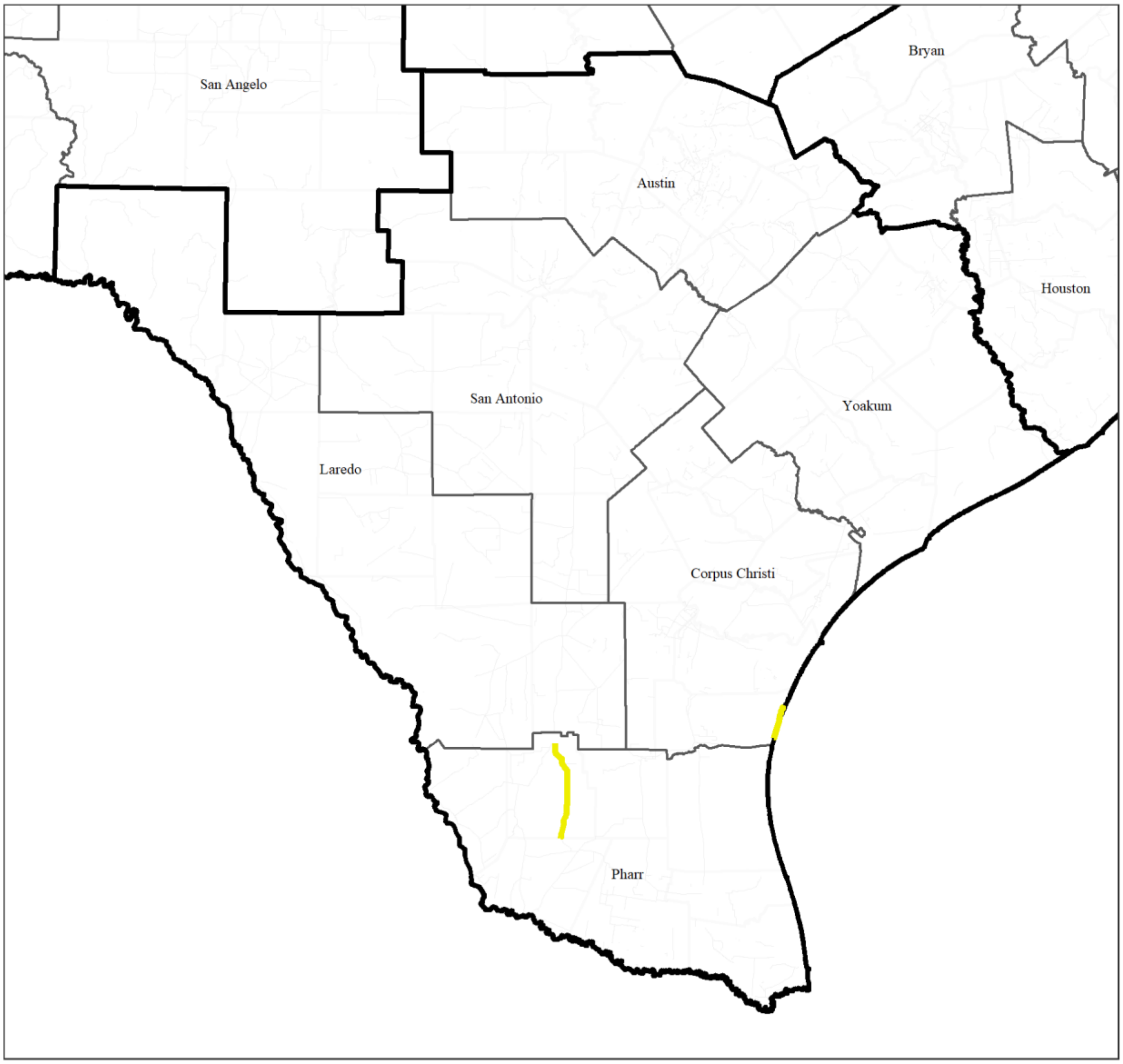


Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Sistrurus tergeminus

Western Massasauga

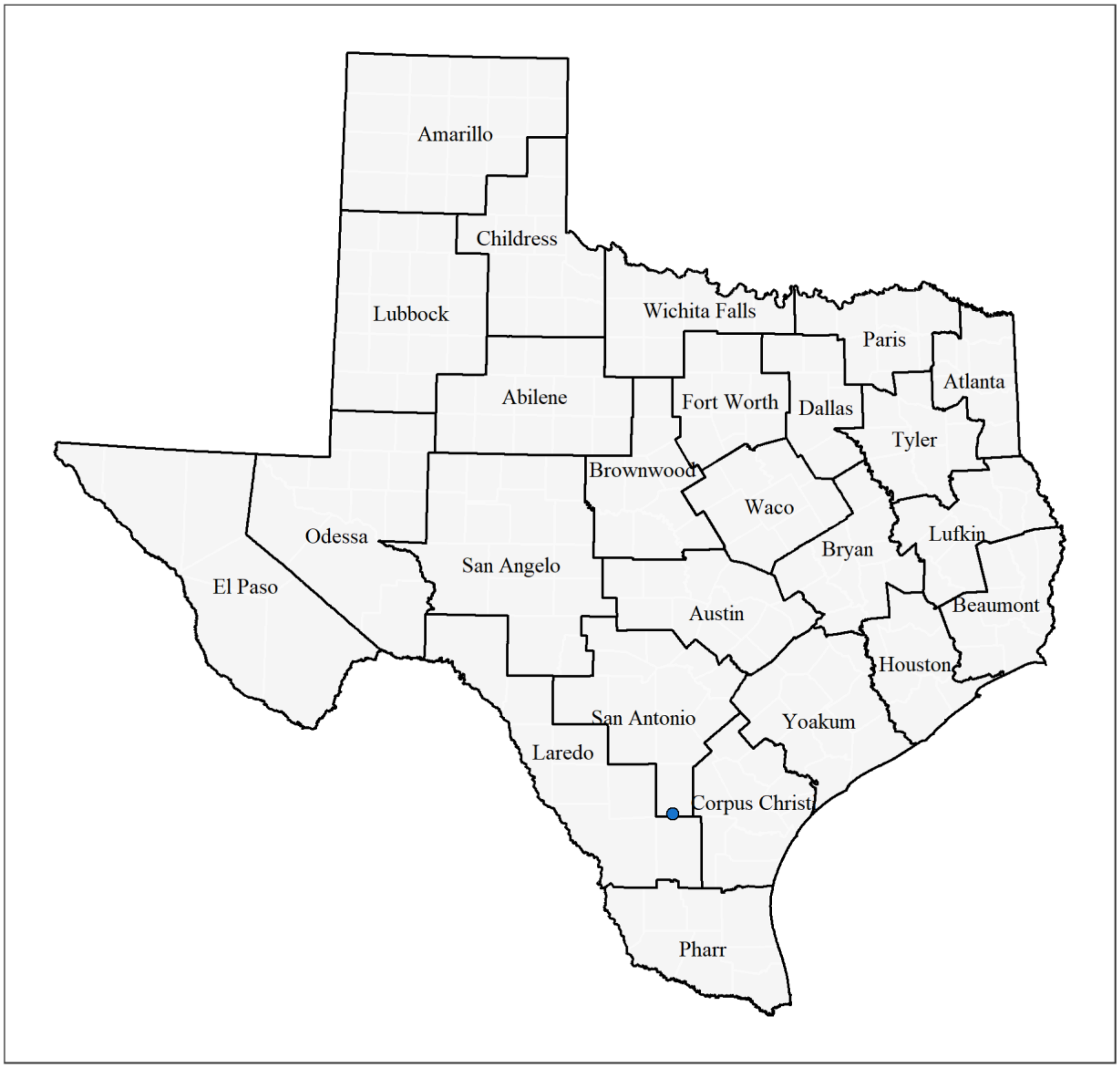
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Tantilla atriceps

Mexican Black-headed Snake

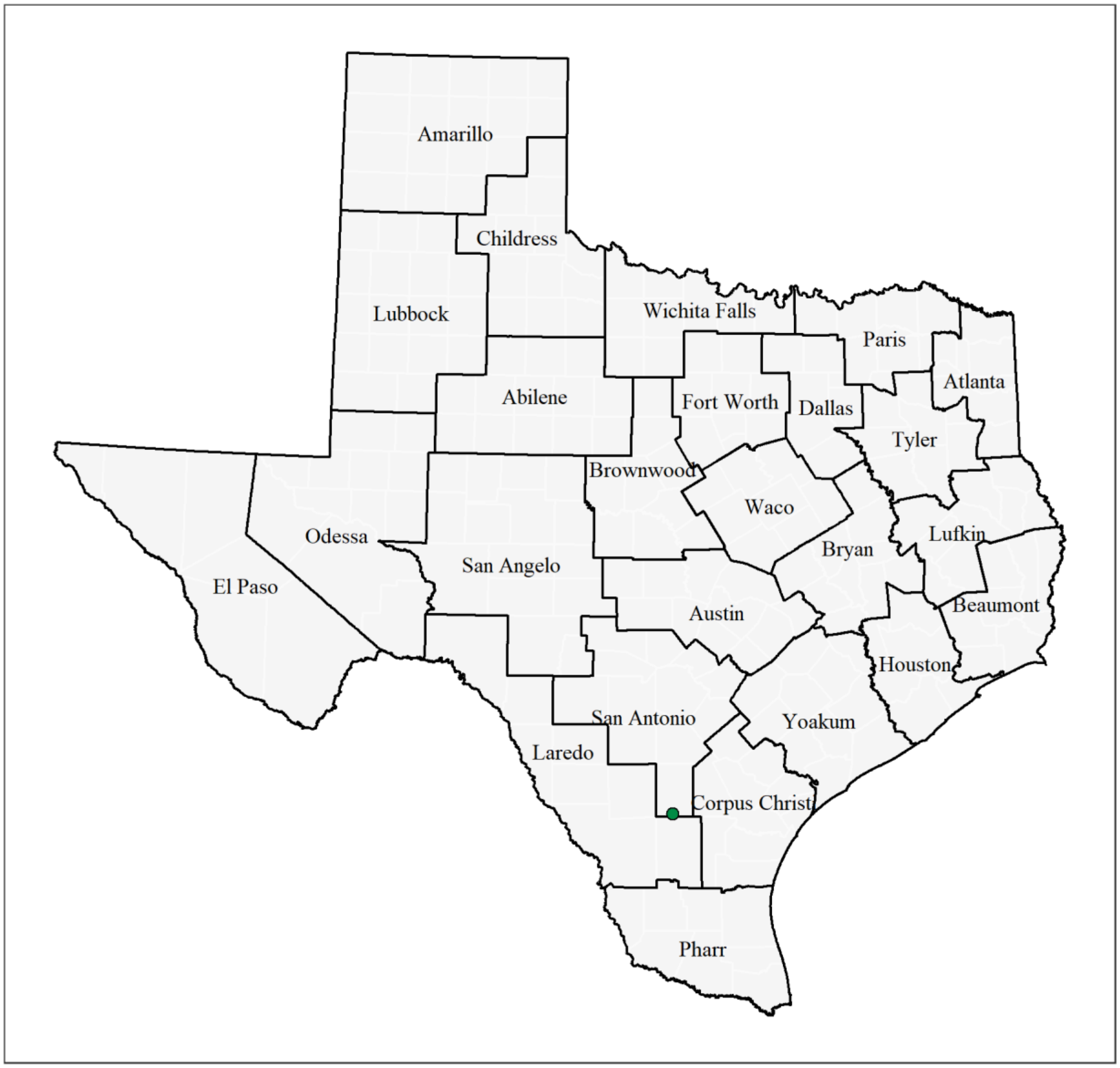


• Near-Road Points △ Off-Road Points

Tantilla atriceps

Mexican Black-headed Snake

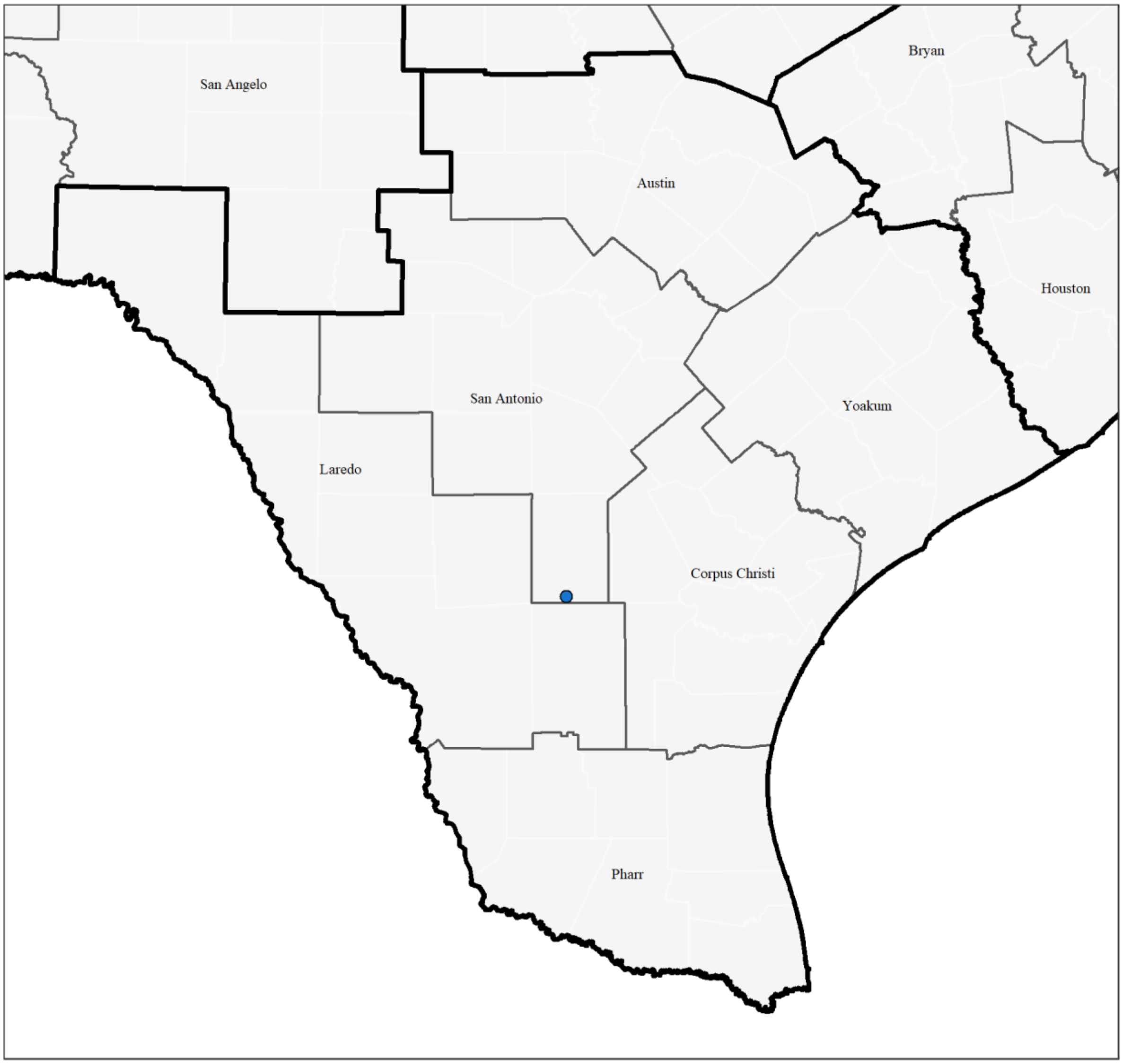
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



• Alive ▲ Dead

Tantilla atriceps

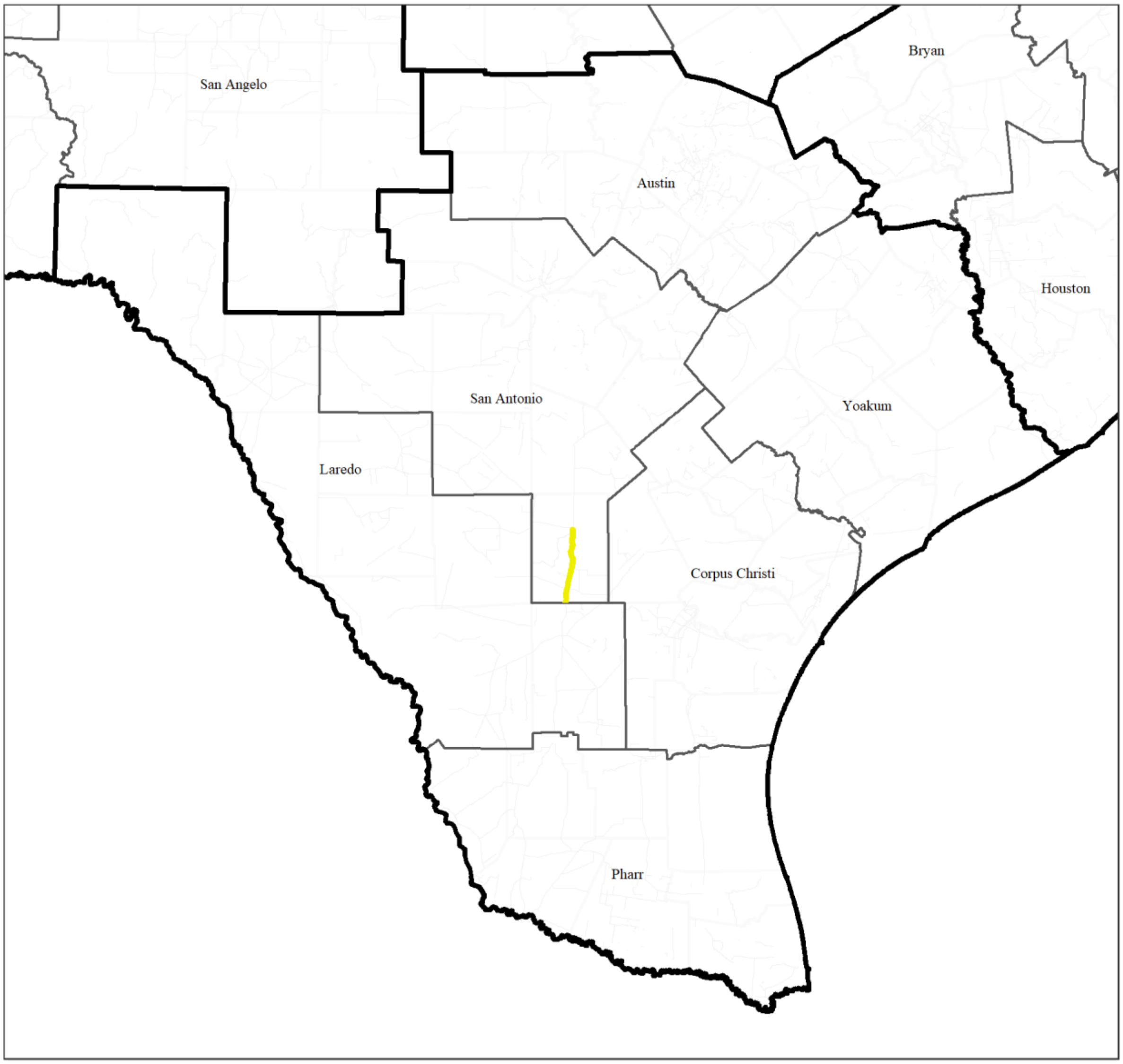
Mexican Black-headed Snake



Near-Road Points   Off-Road Points

Tantilla atriceps

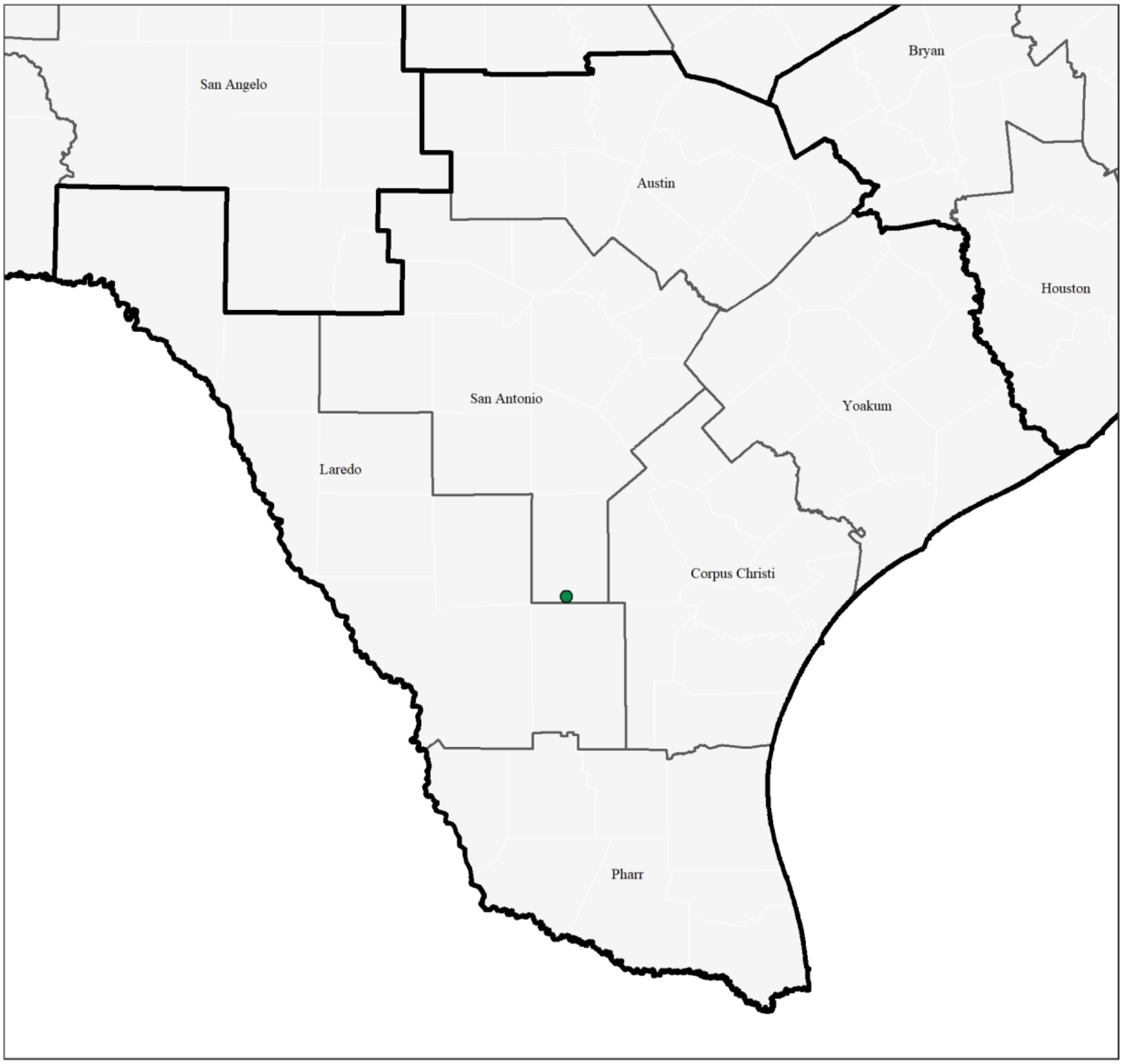
Mexican Black-headed Snake



Points Per Section 1-2 3-4 5-6 7+

Tantilla atriceps

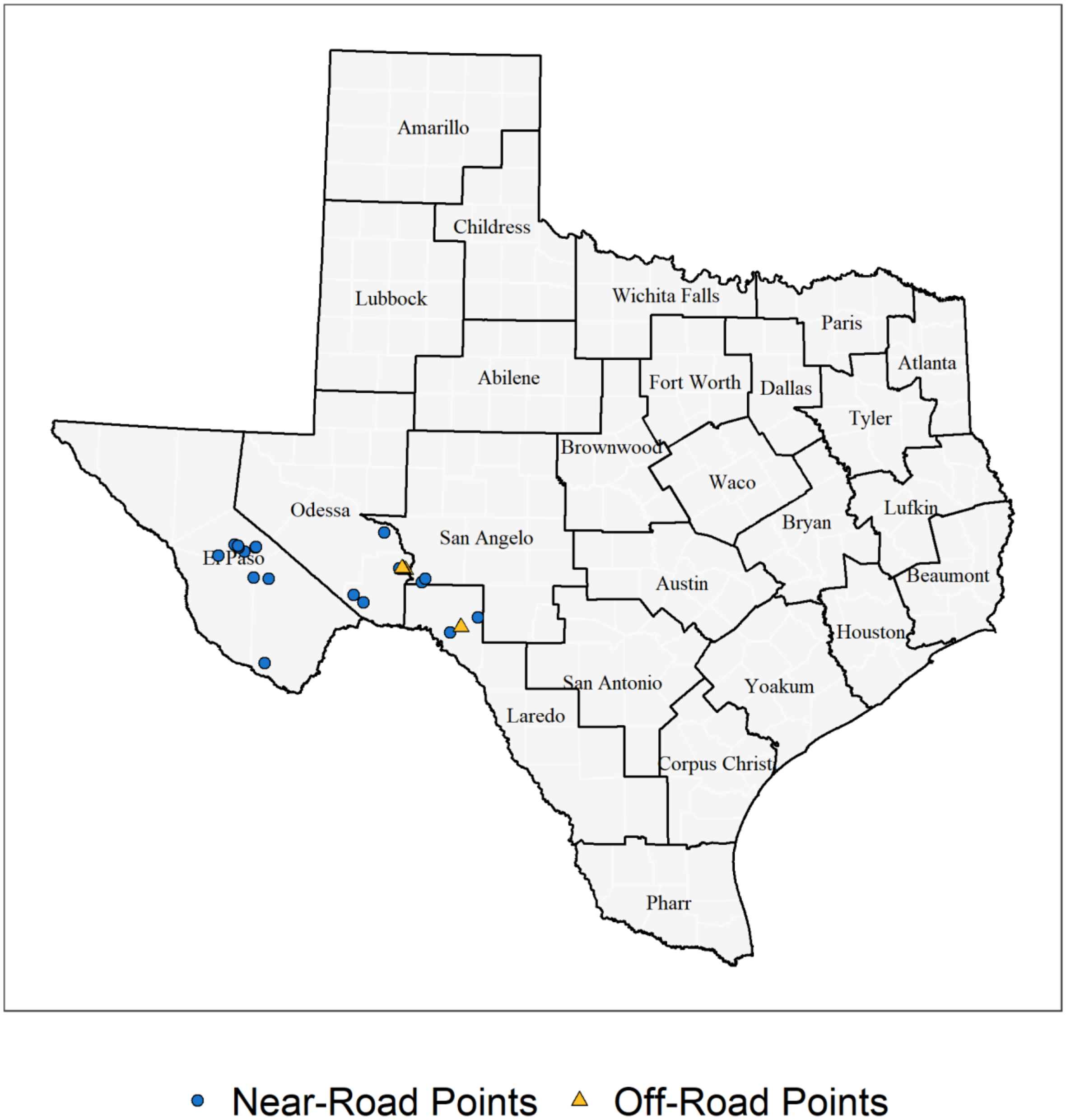
Mexican Black-headed Snake



● Alive ▲ Dead

Tantilla cucullata

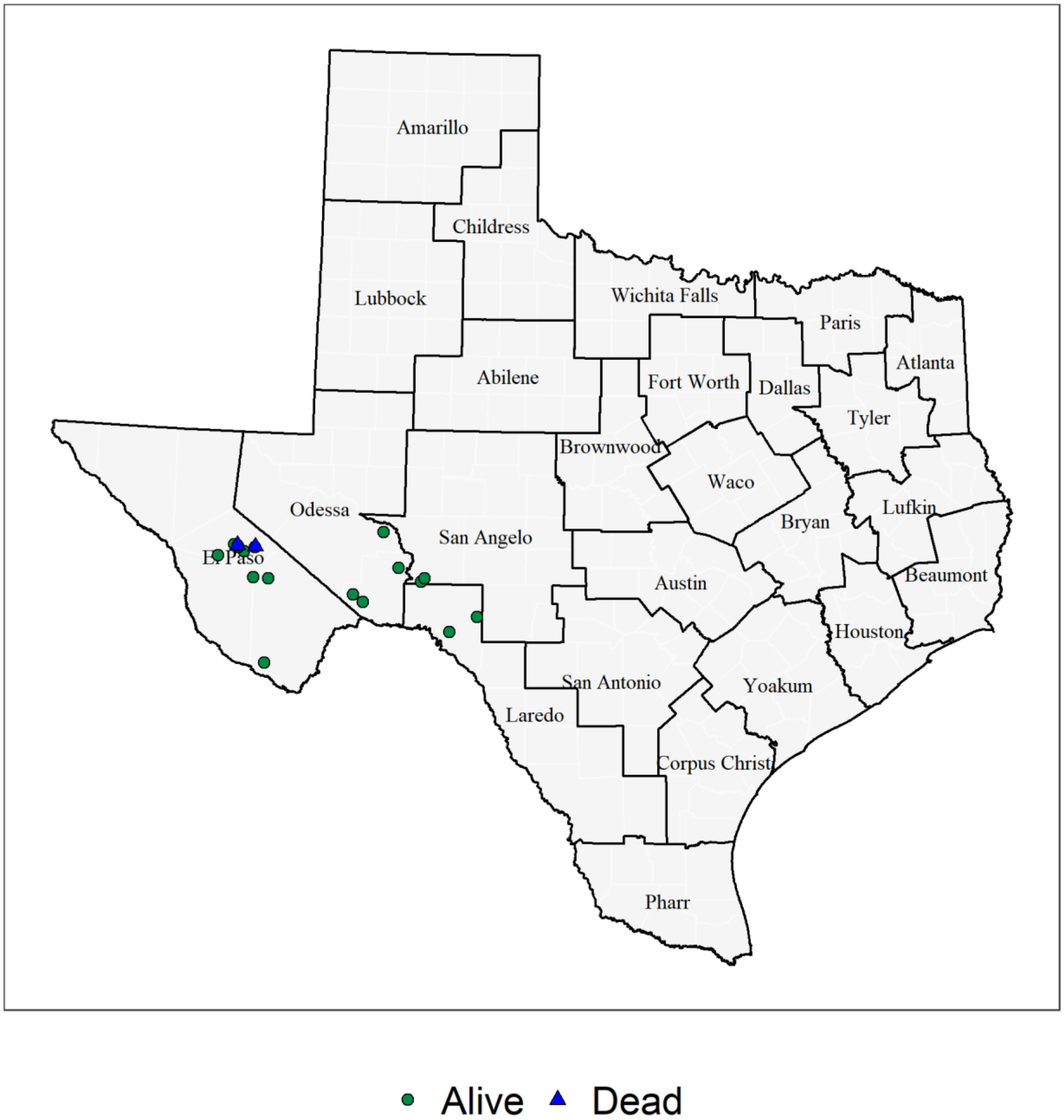
Big Bend Blackhead Snake



Tantilla cucullata

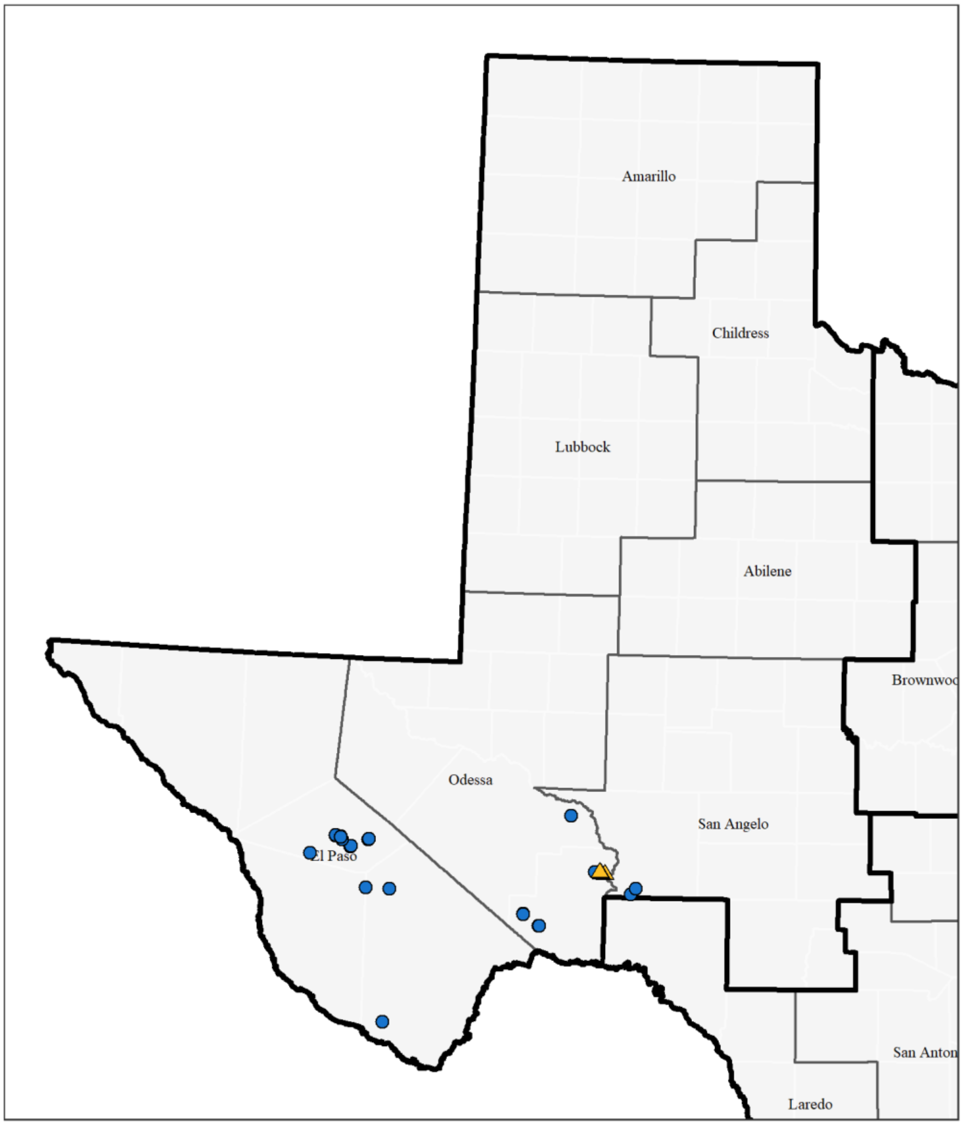
Big Bend Blackhead Snake

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Tantilla cucullata

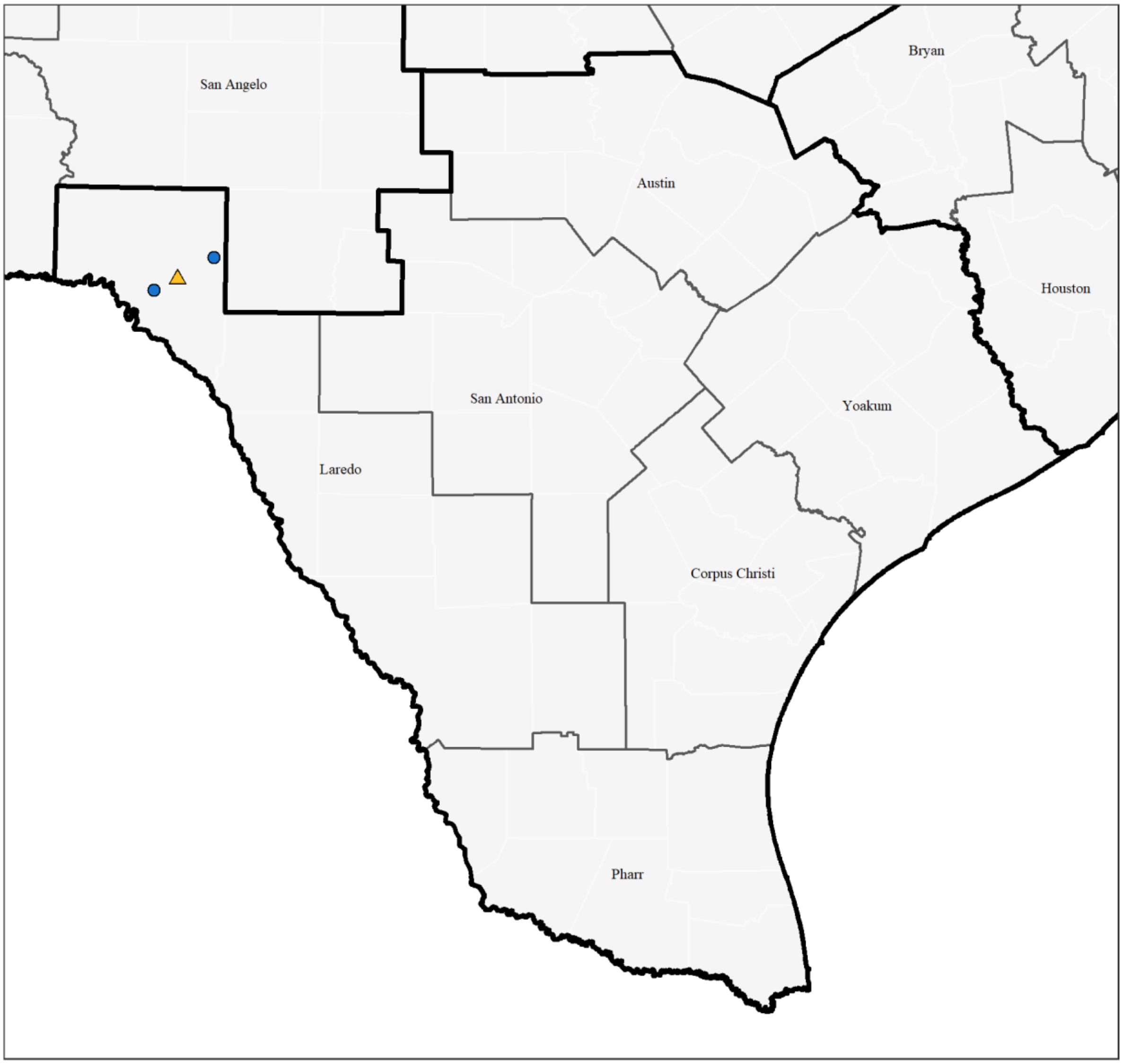
Big Bend Blackhead Snake



● Near-Road Points ▲ Off-Road Points

Tantilla cucullata

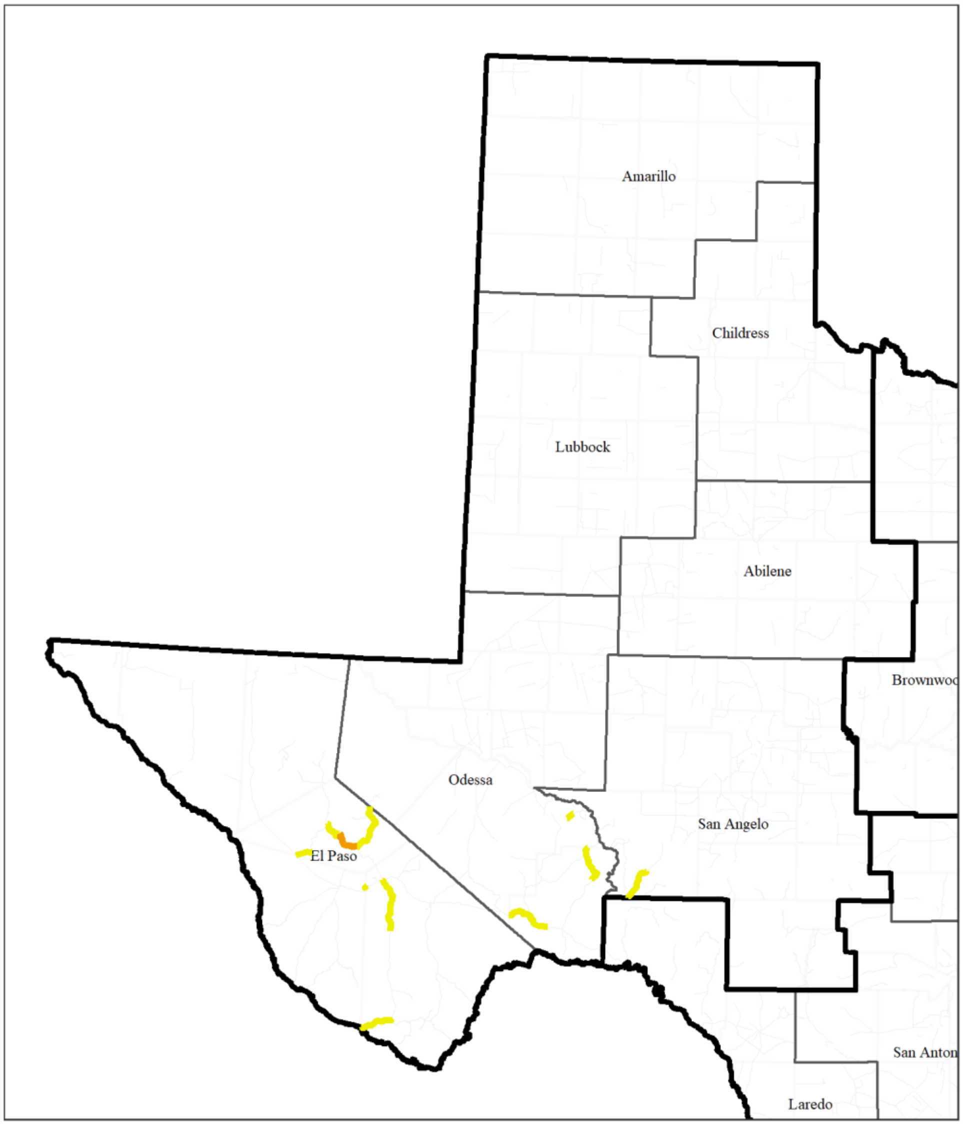
Big Bend Blackhead Snake



• Near-Road Points △ Off-Road Points

Tantilla cucullata

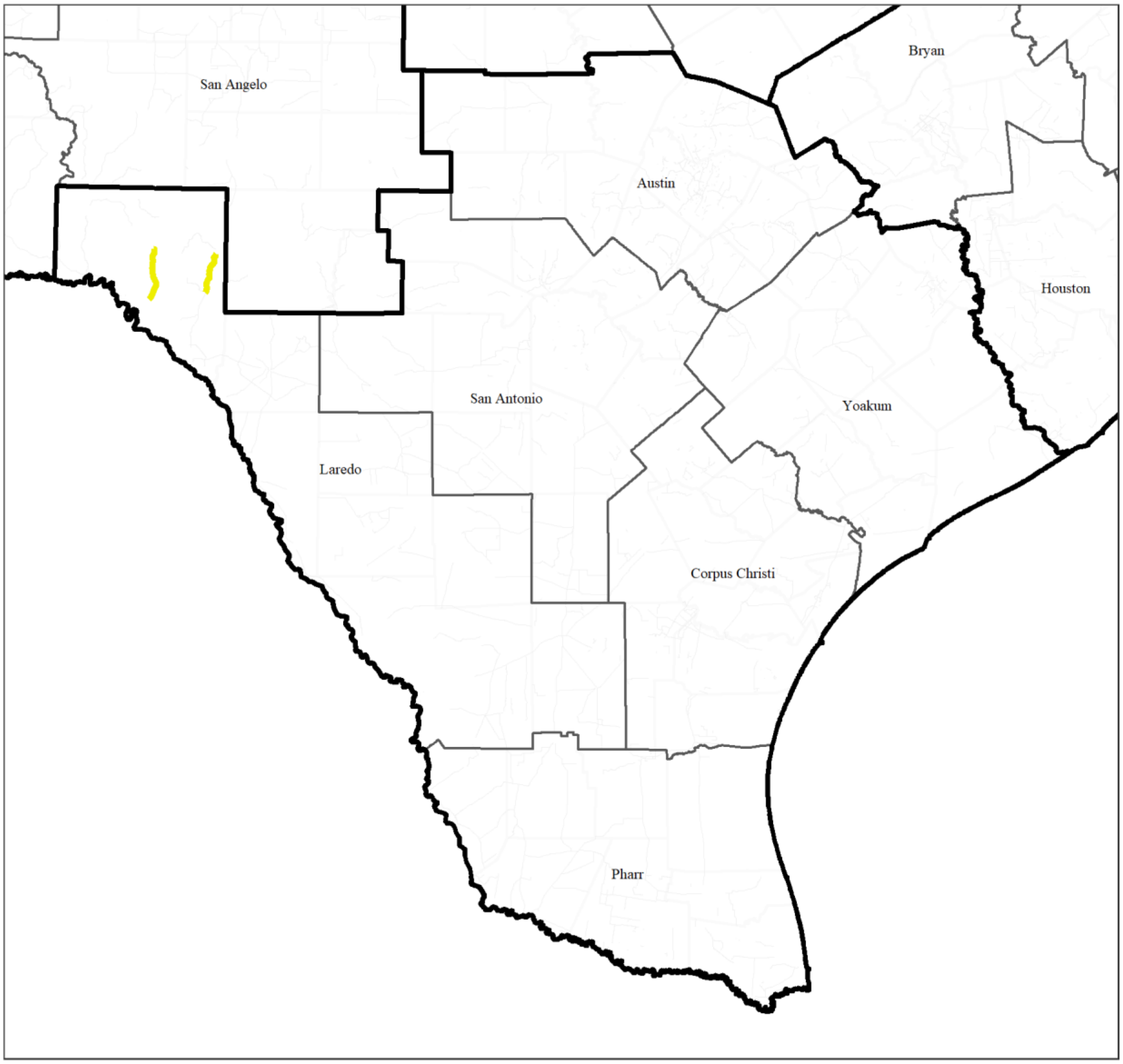
Big Bend Blackhead Snake



Points Per Section 1-2 3-4 5-6 7+

Tantilla cucullata

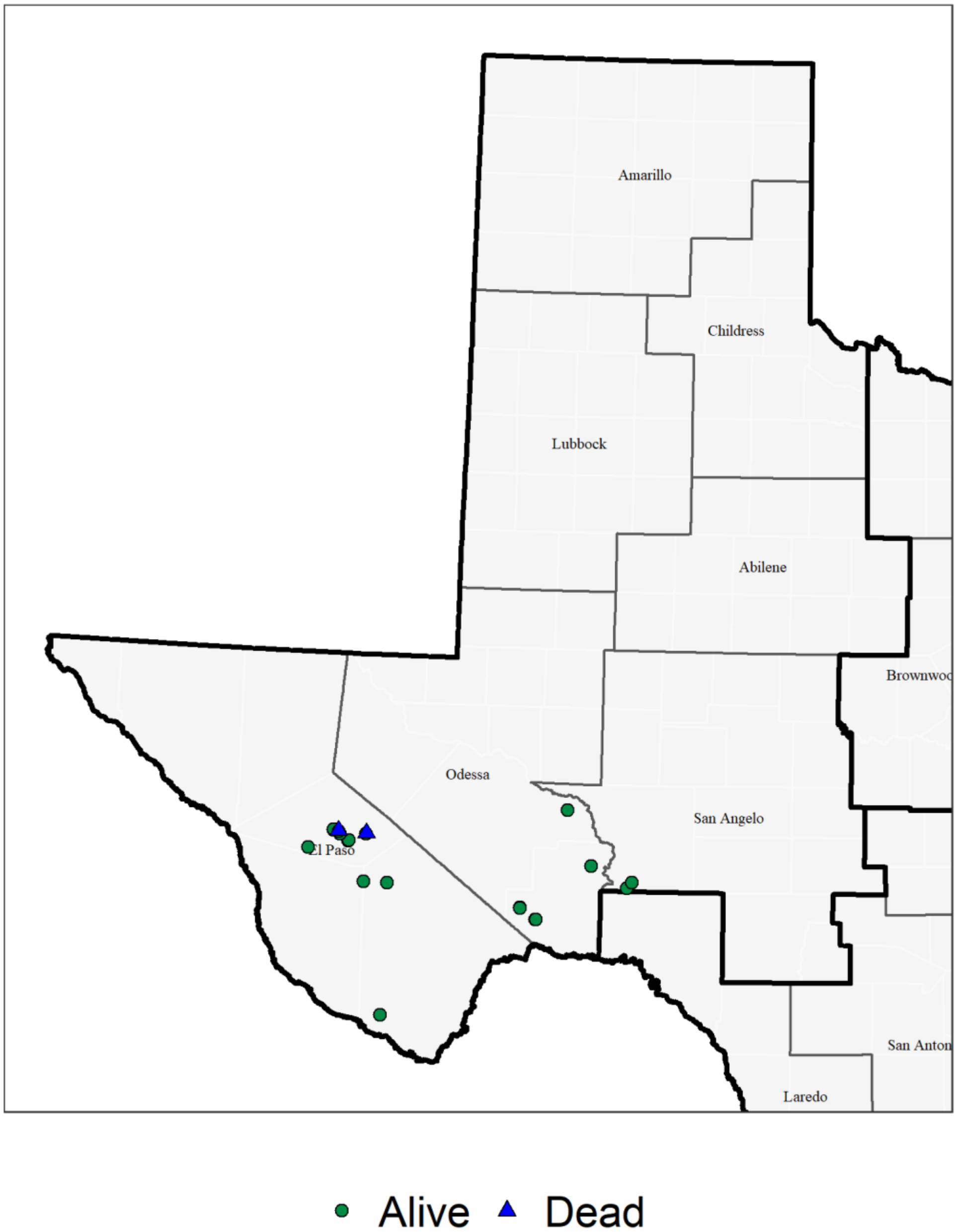
Big Bend Blackhead Snake



Points Per Section 1-2 3-4 5-6 7+

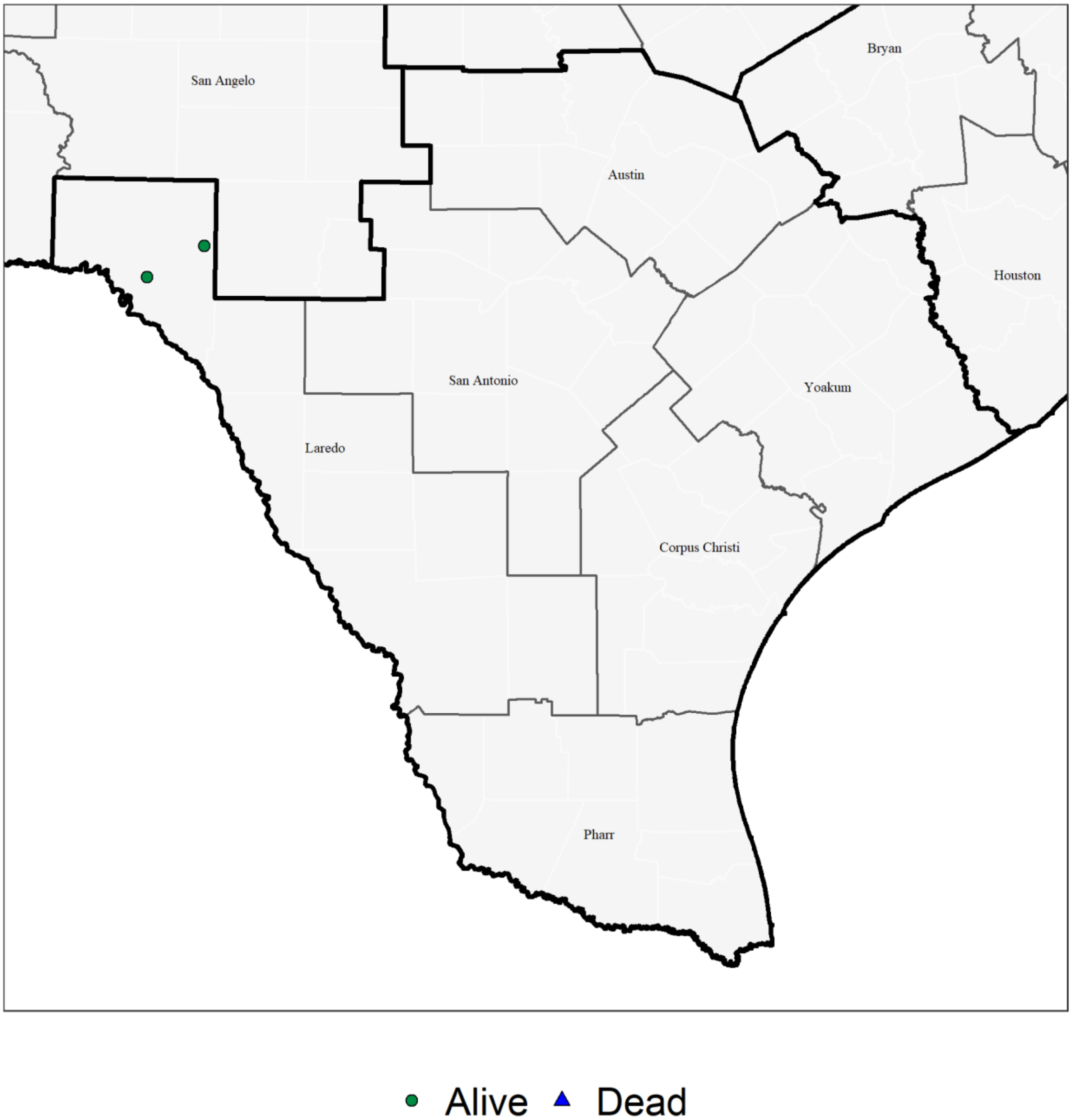
Tantilla cucullata

Big Bend Blackhead Snake



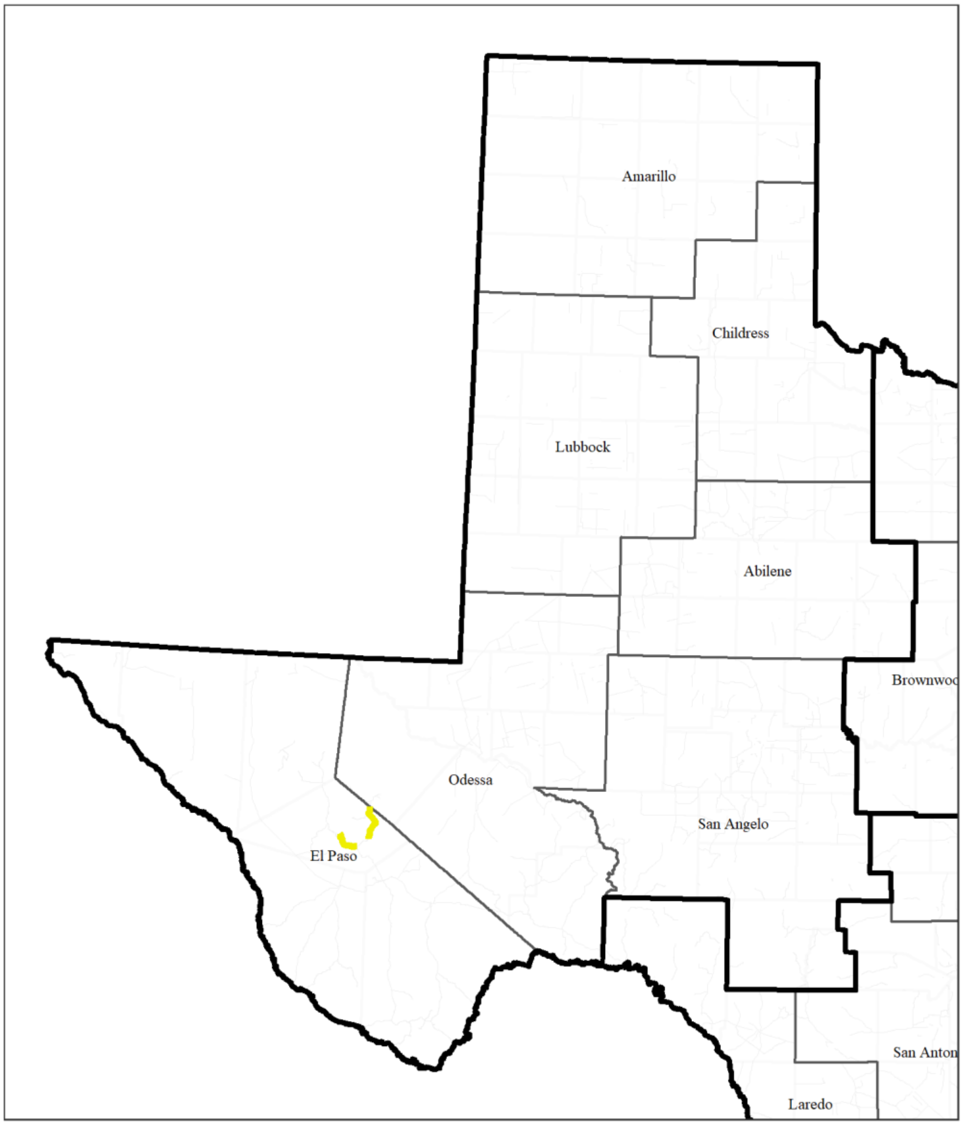
Tantilla cucullata

Big Bend Blackhead Snake



Tantilla cucullata

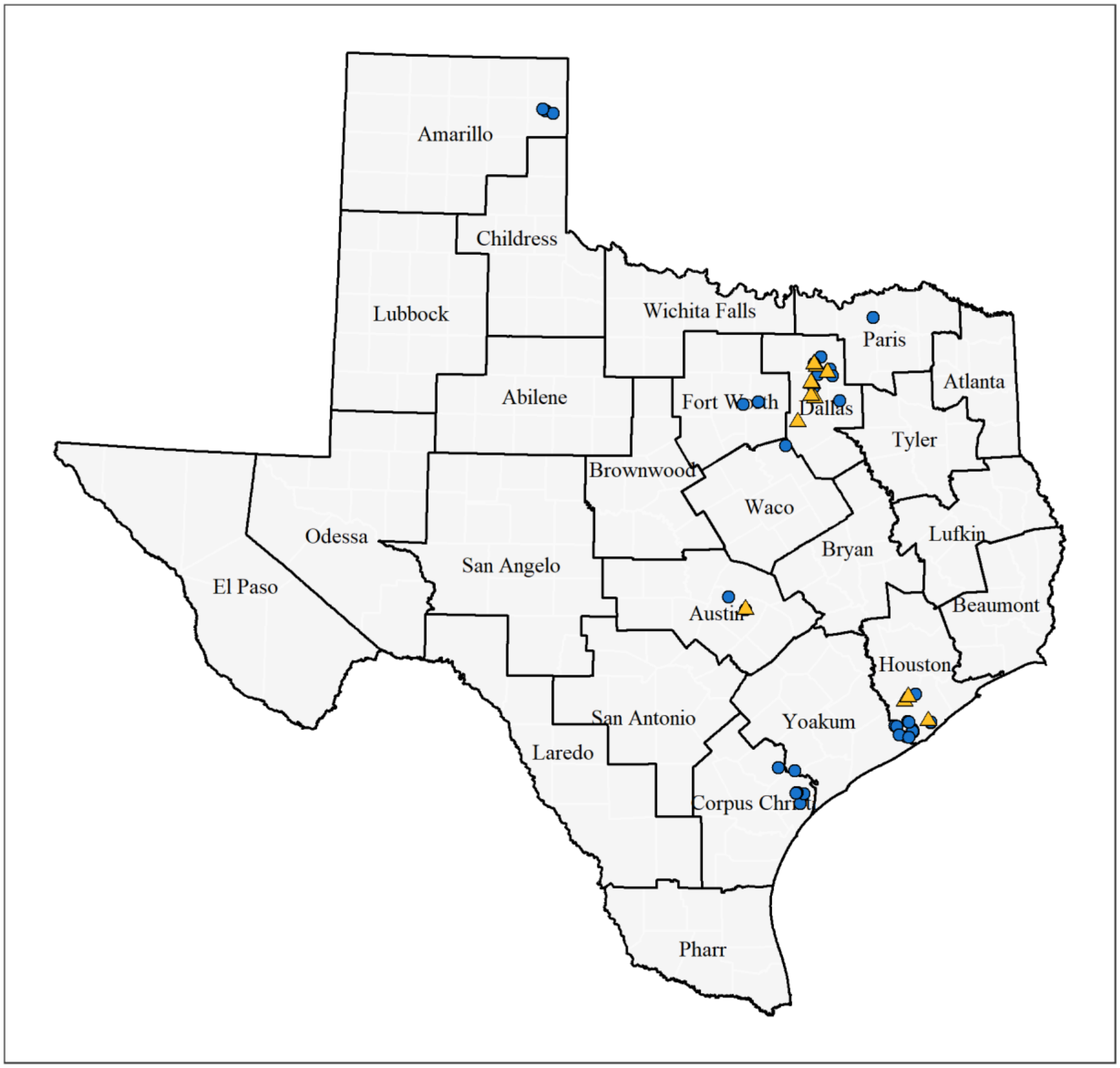
Big Bend Blackhead Snake



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Thamnophis sirtalis

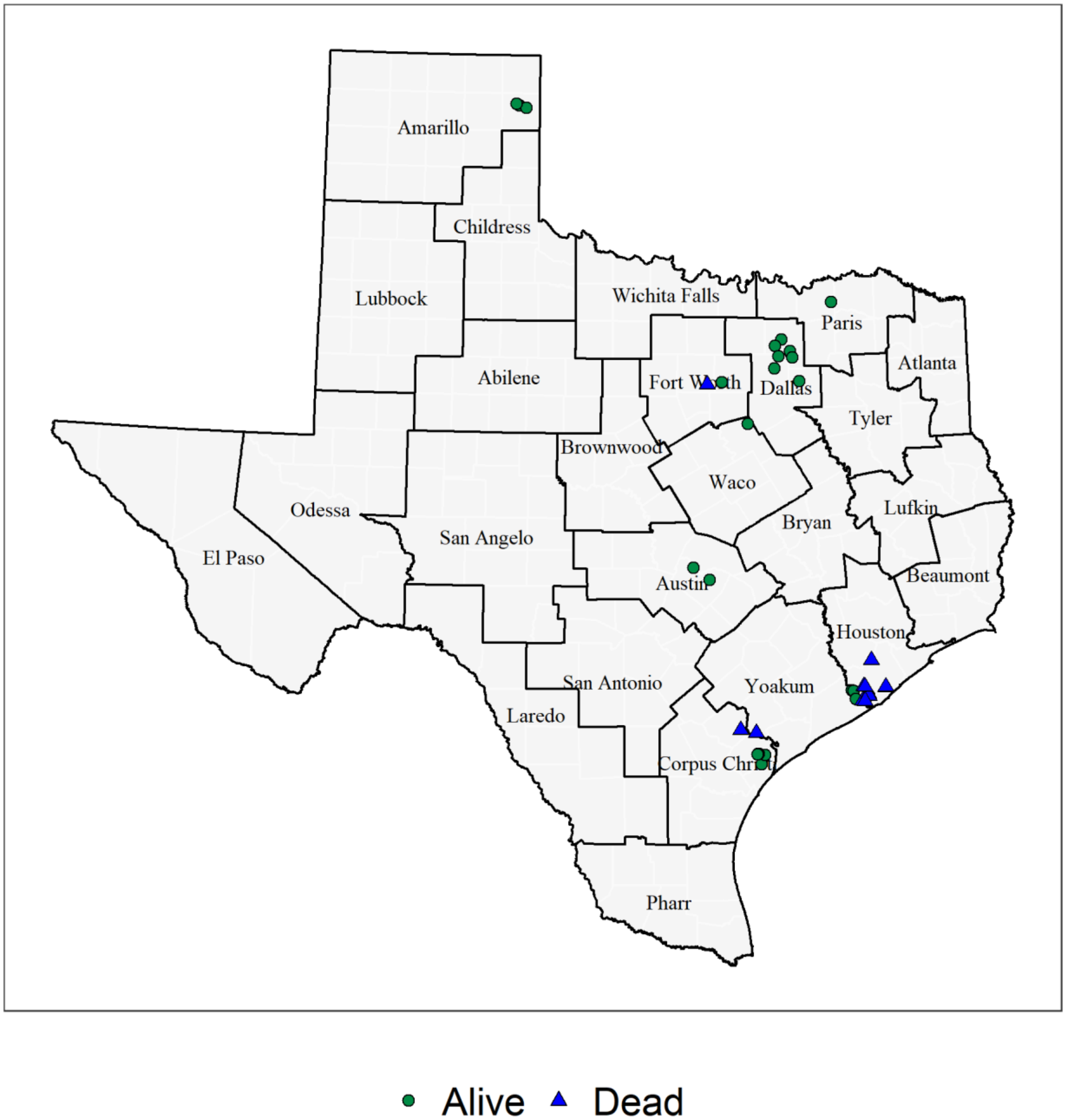
Common Garter Snake



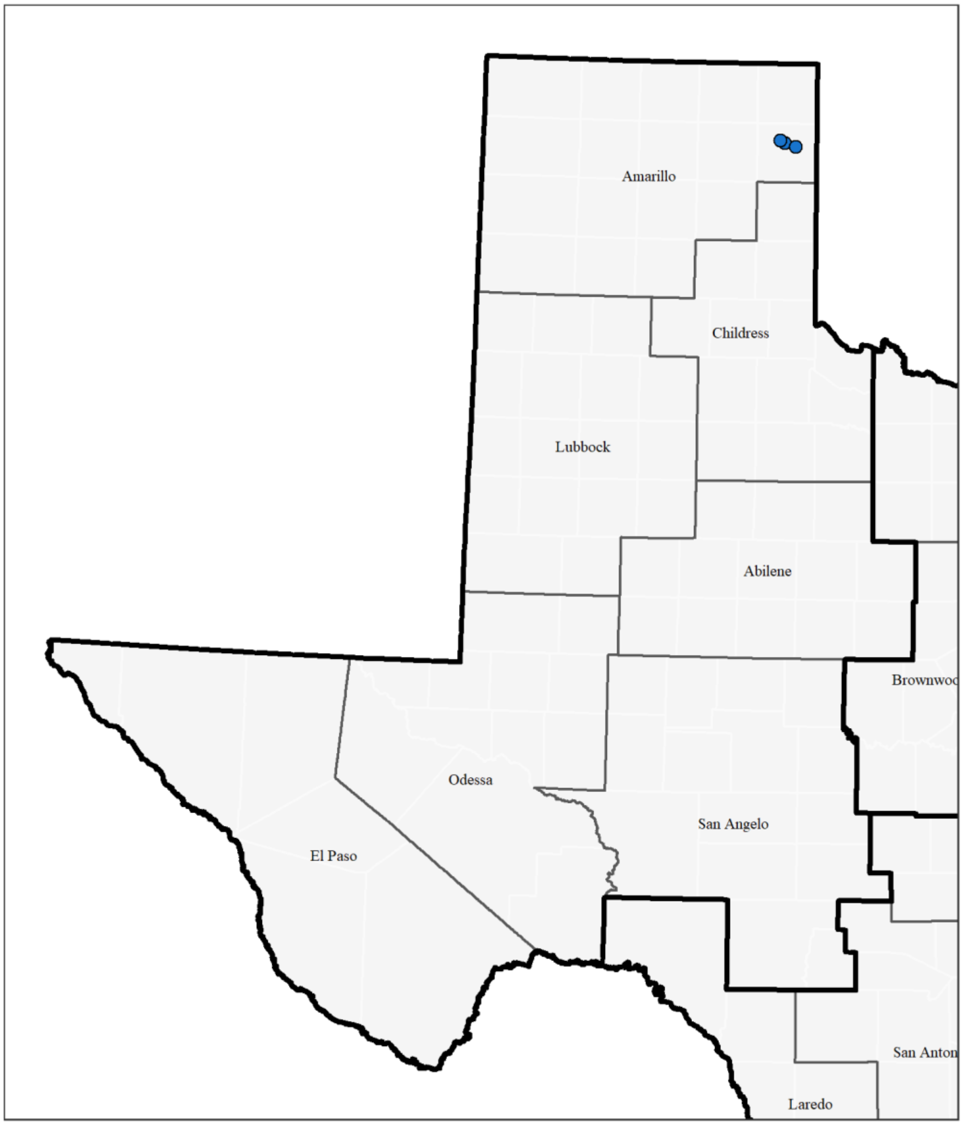
• Near-Road Points △ Off-Road Points

Thamnophis sirtalis

Common Garter Snake



Thamnophis sirtalis
Common Garter Snake

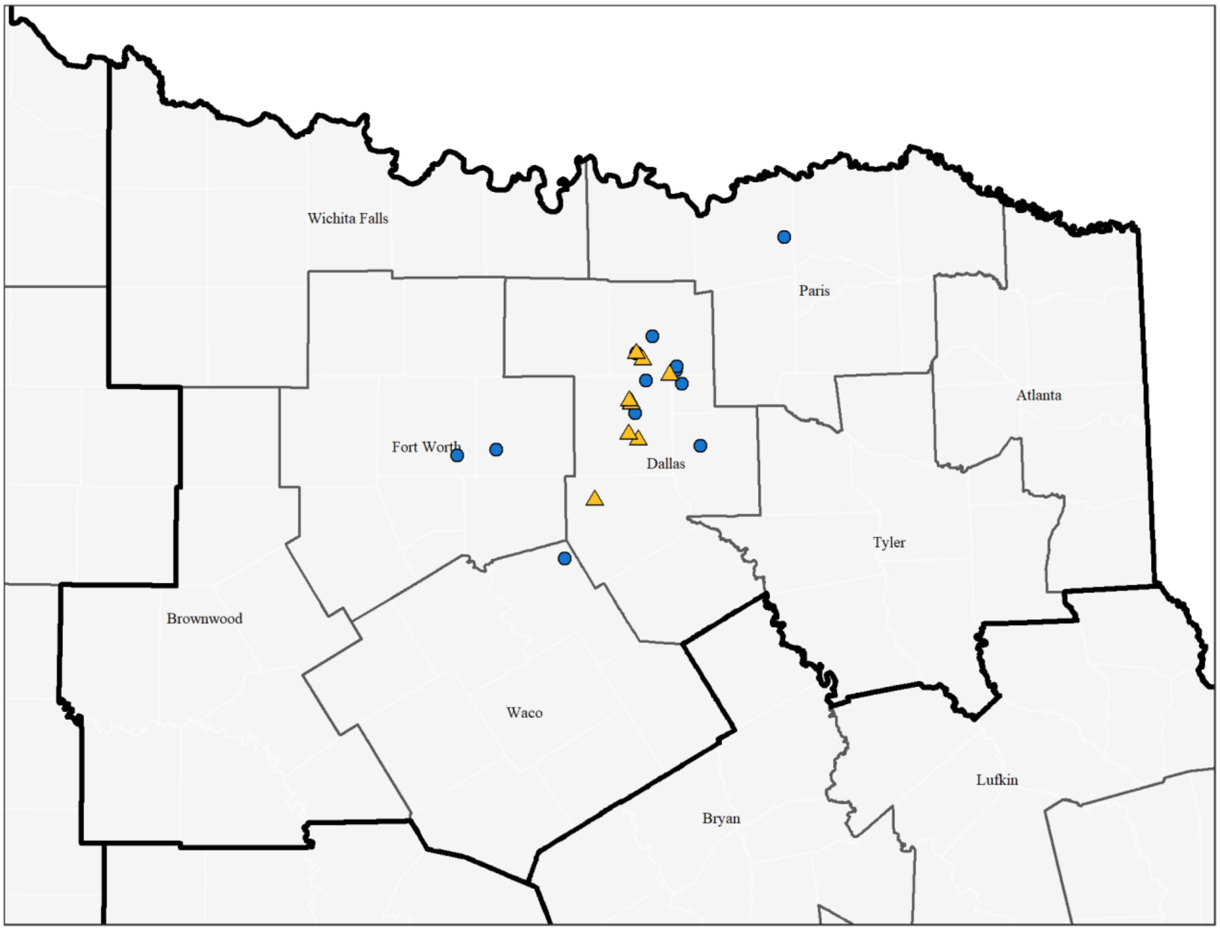


• Near-Road Points △ Off-Road Points

Thamnophis sirtalis

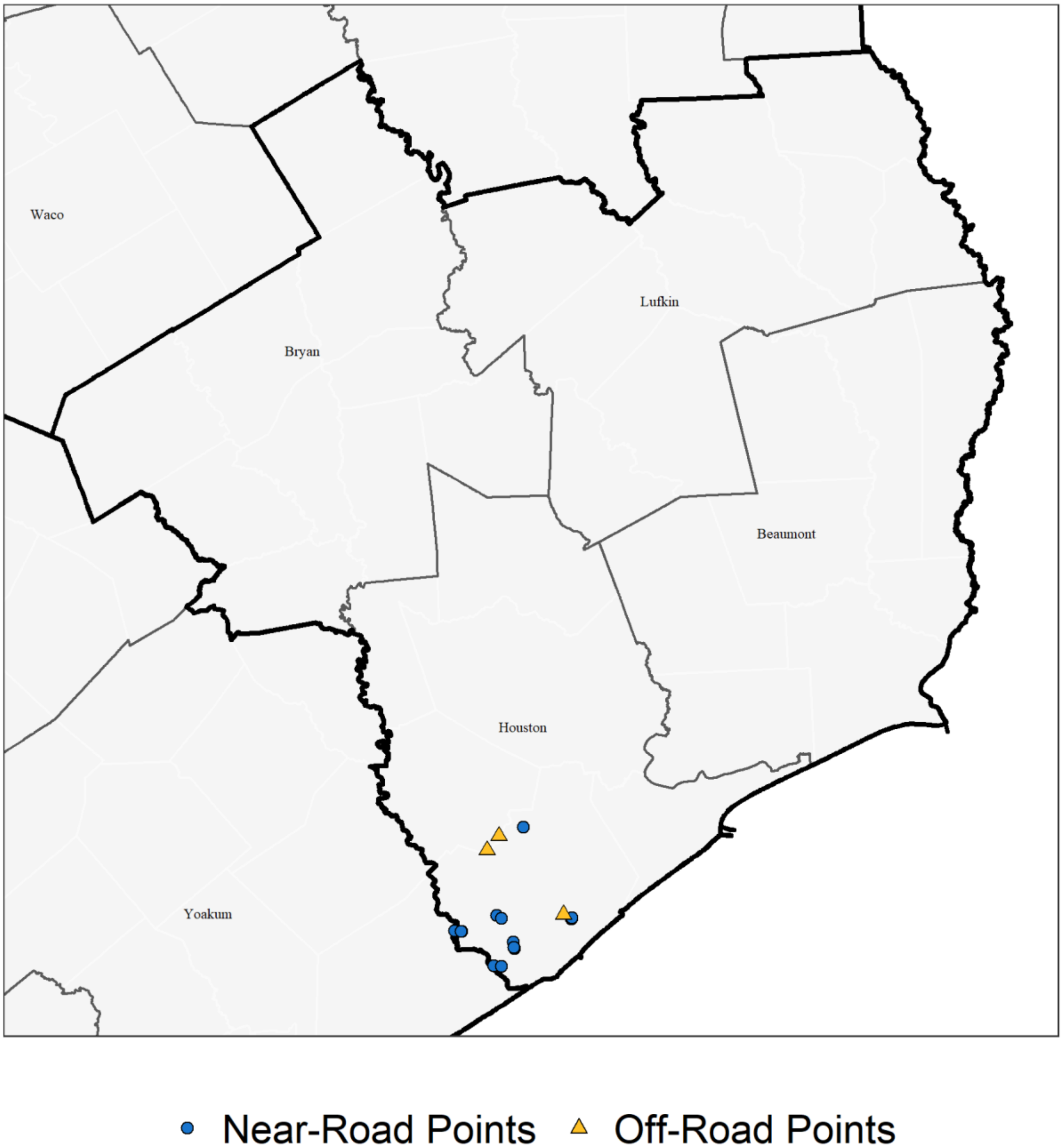
Common Garter Snake

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



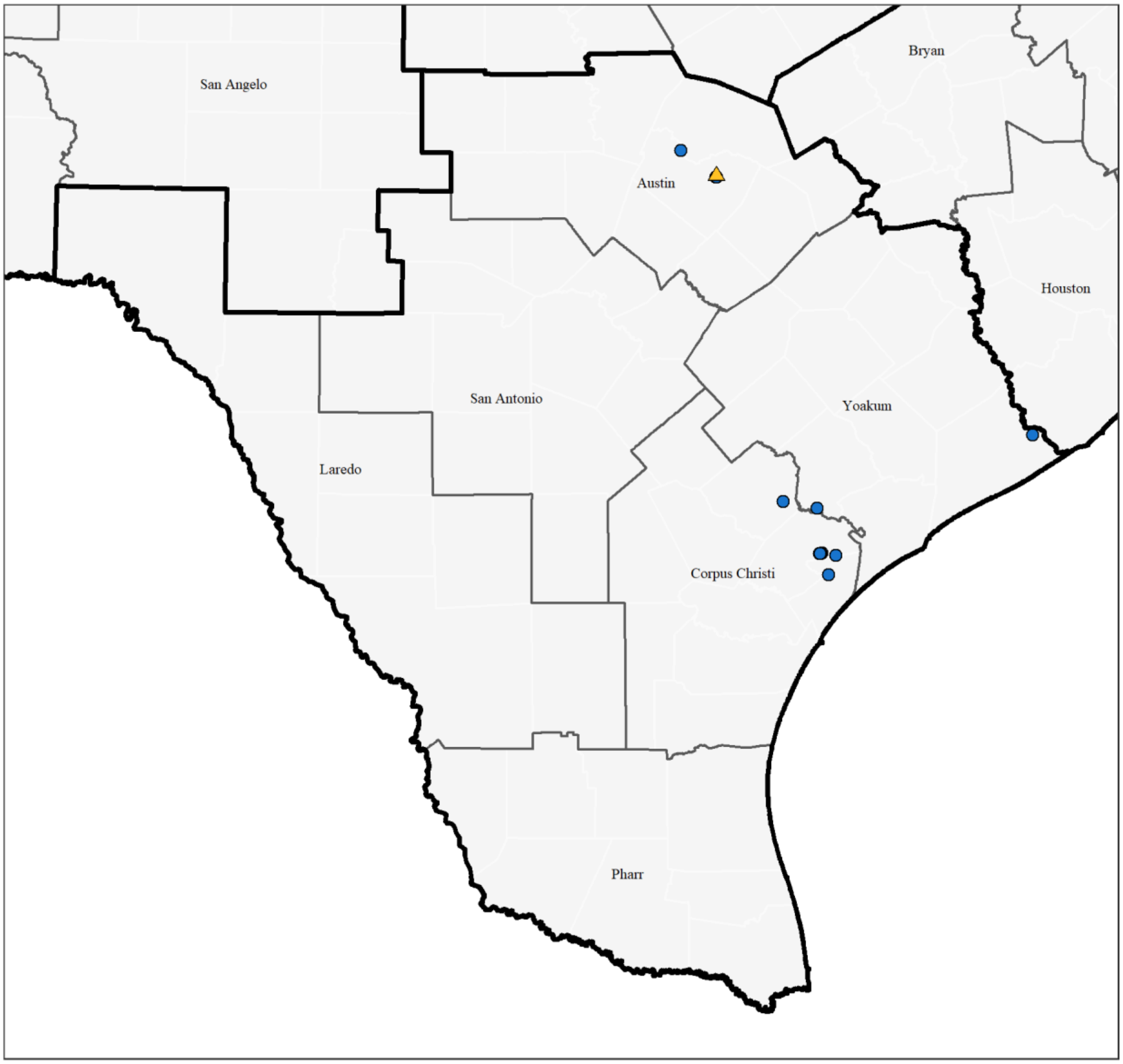
Near-Road Points Off-Road Points

Thamnophis sirtalis
Common Garter Snake



Thamnophis sirtalis

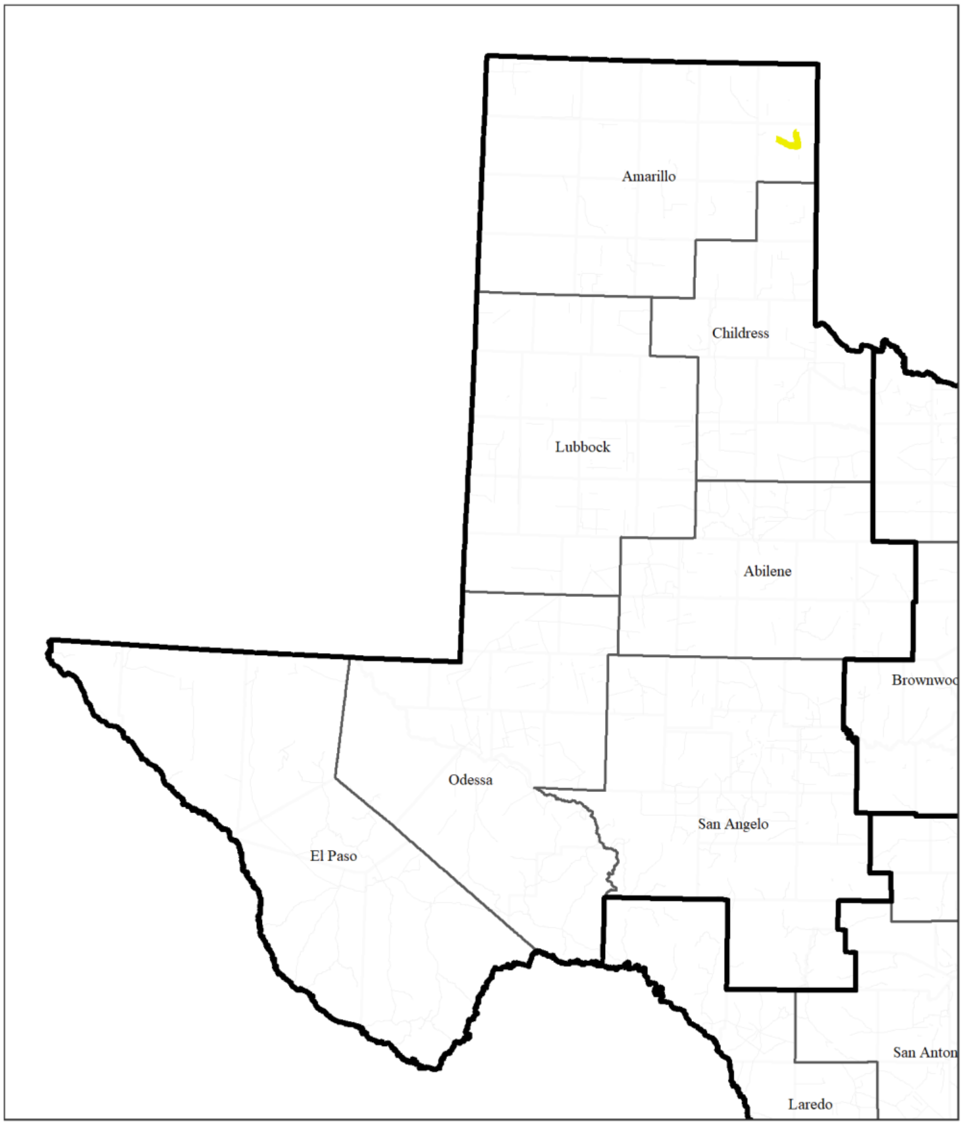
Common Garter Snake



• Near-Road Points △ Off-Road Points

Thamnophis sirtalis

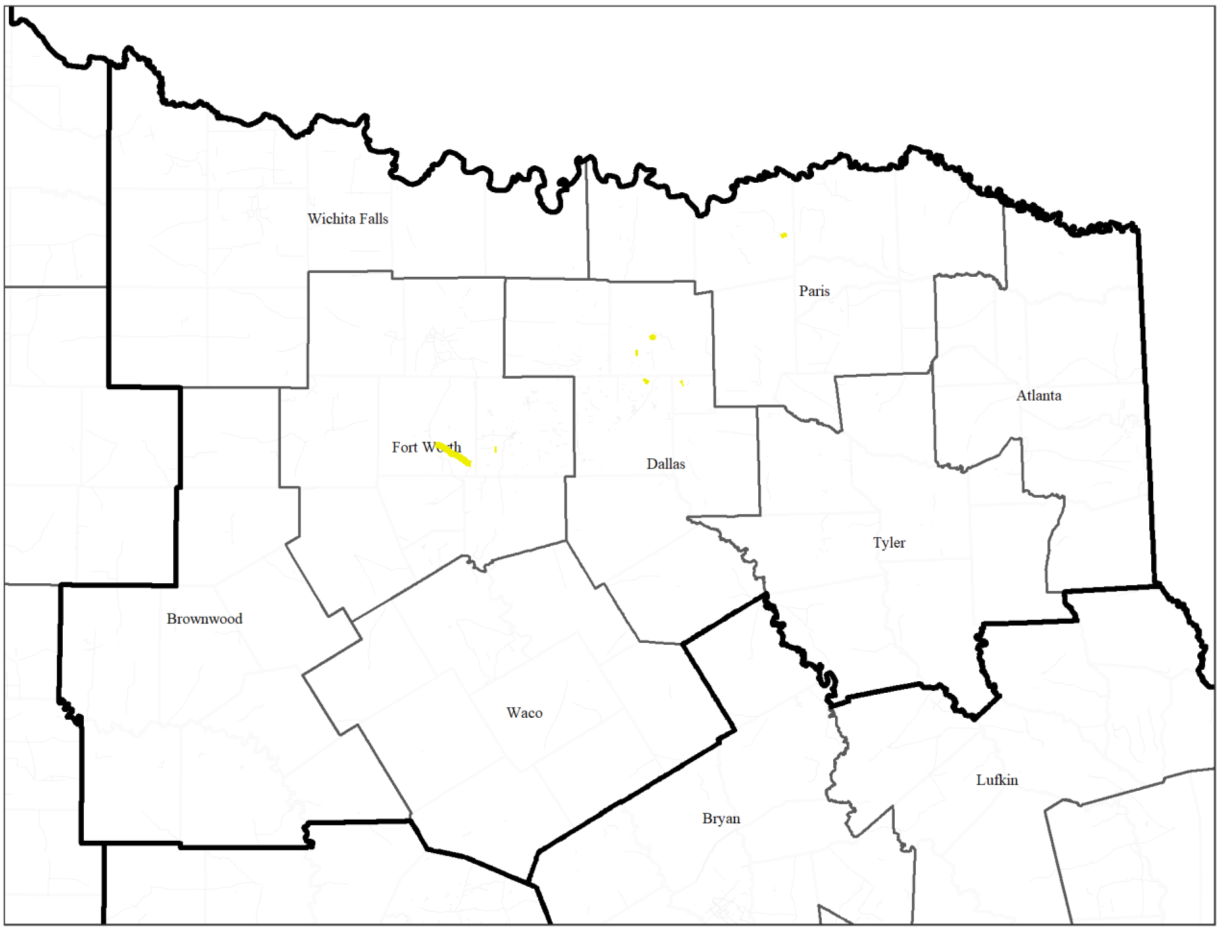
Common Garter Snake



Points Per Section 1-2 3-4 5-6 7+

Thamnophis sirtalis

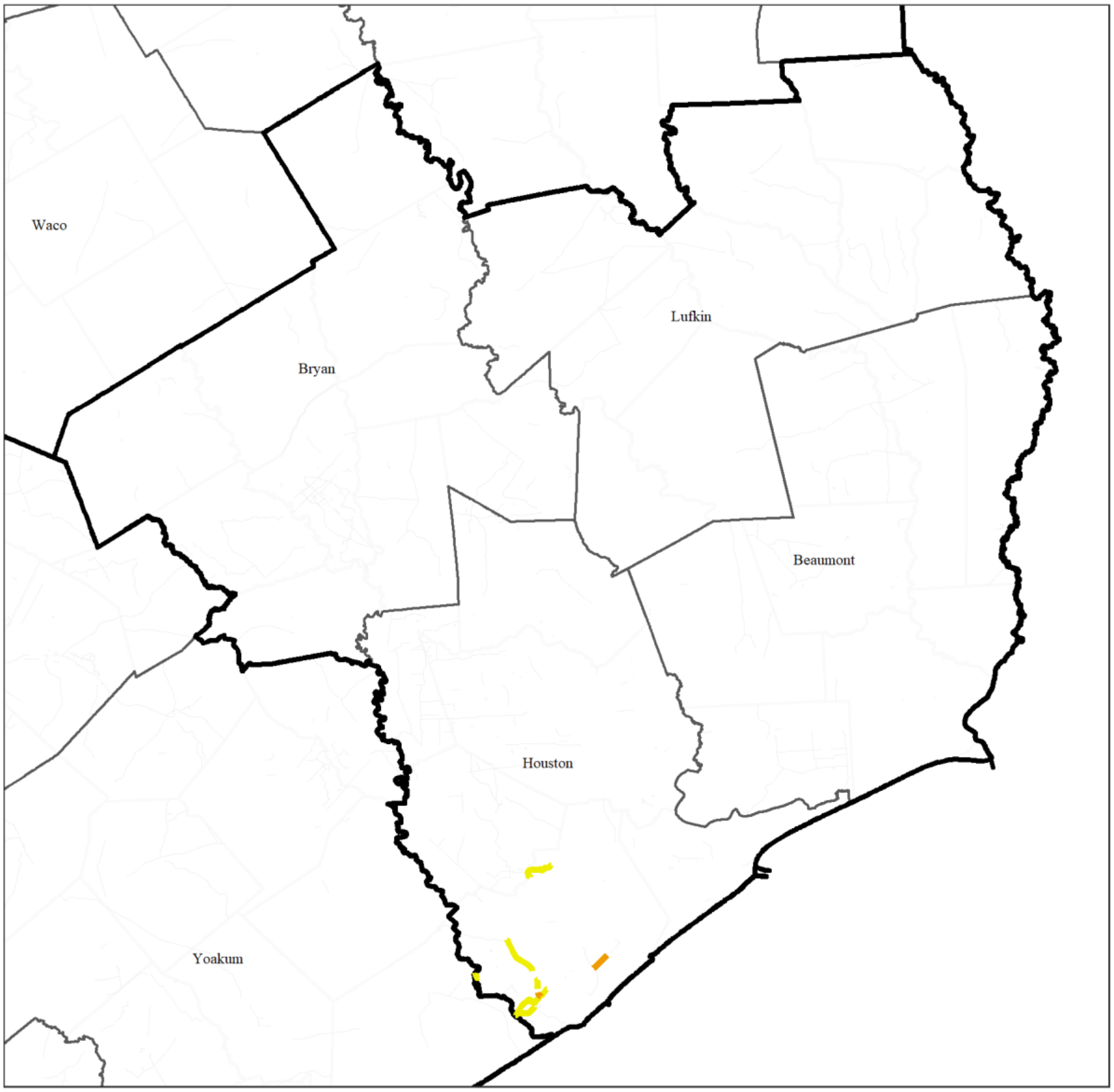
Common Garter Snake



Points Per Section 1-2 3-4 5-6 7+

Thamnophis sirtalis

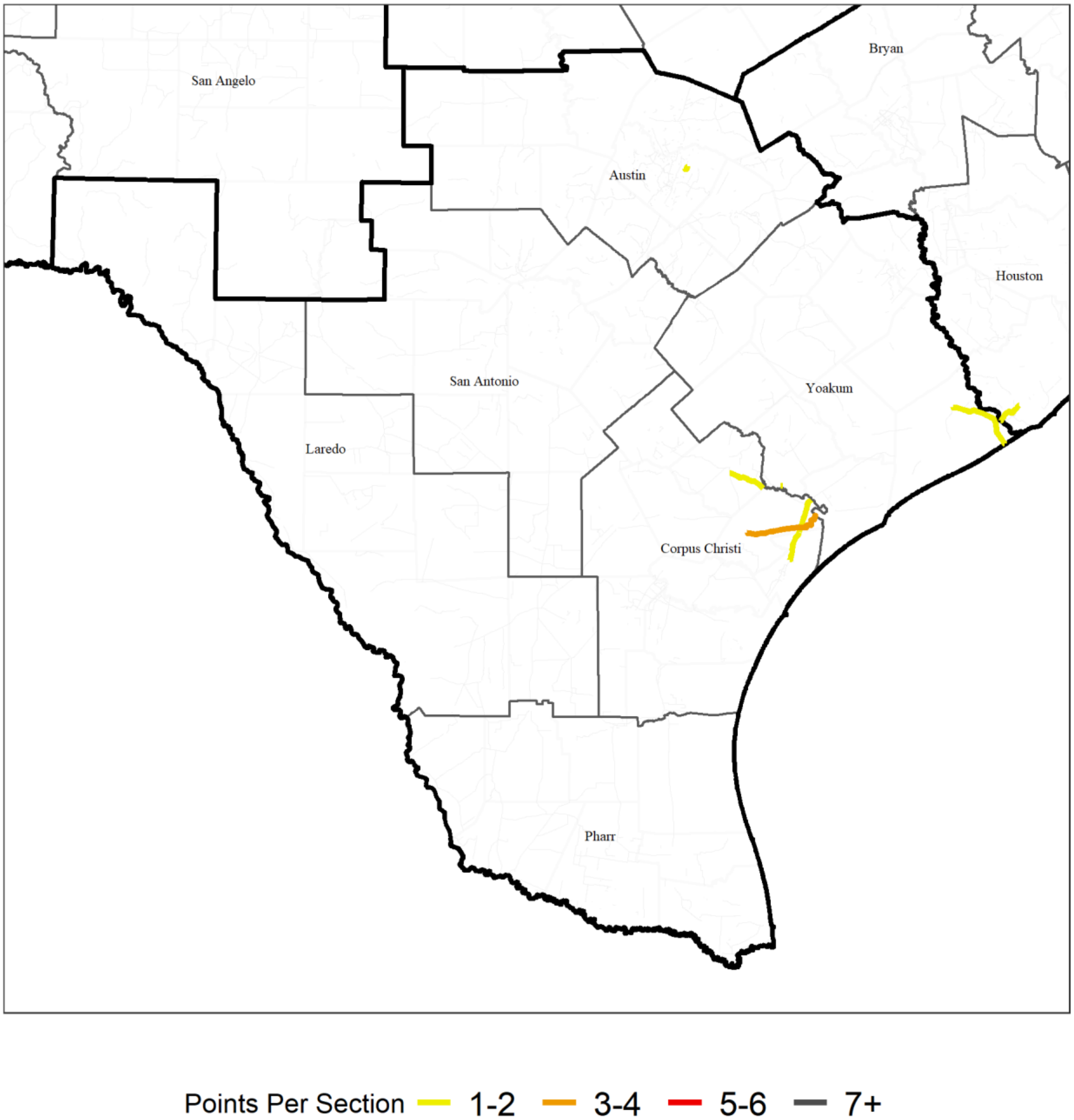
Common Garter Snake



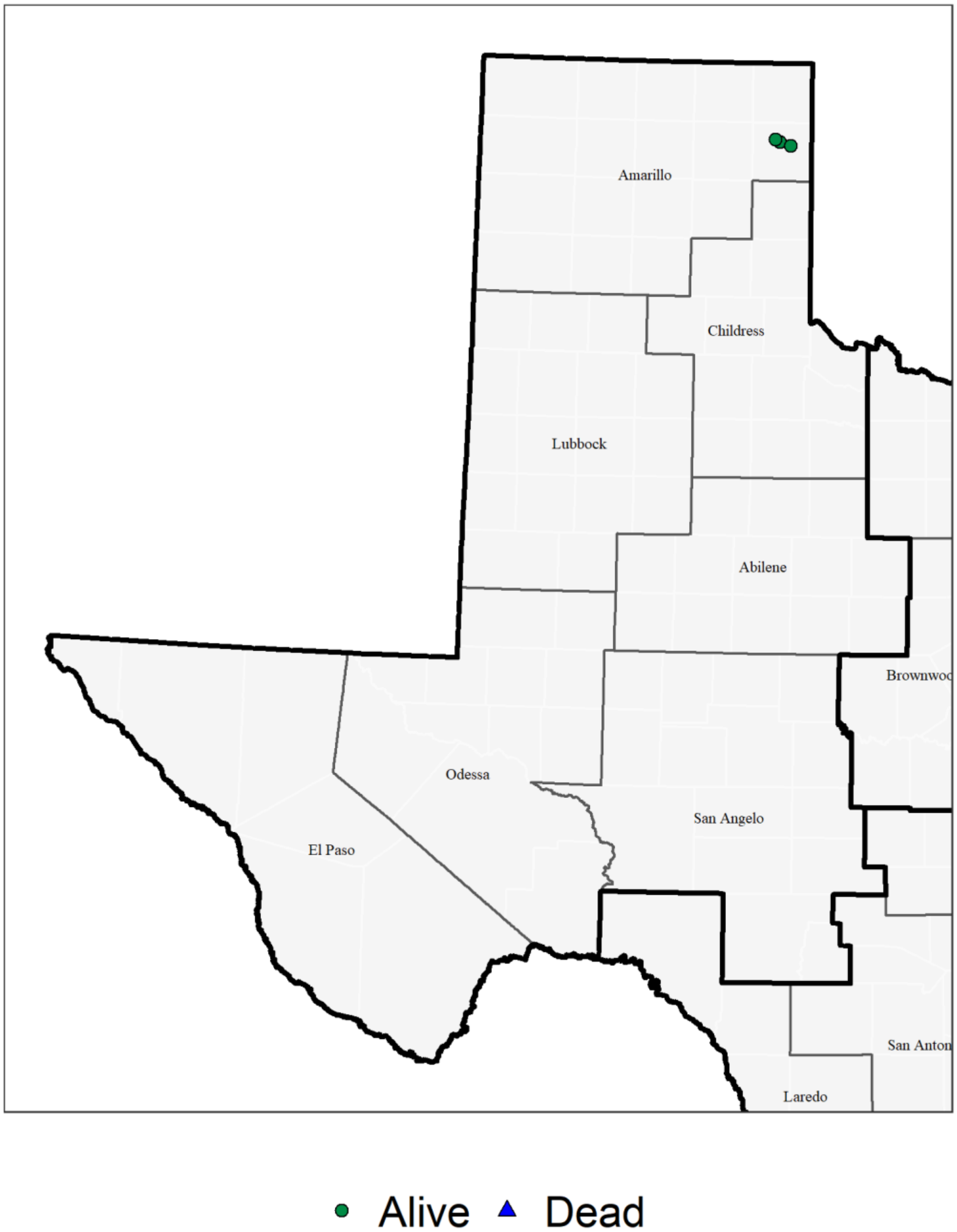
Points Per Section 1-2 3-4 5-6 7+

Thamnophis sirtalis

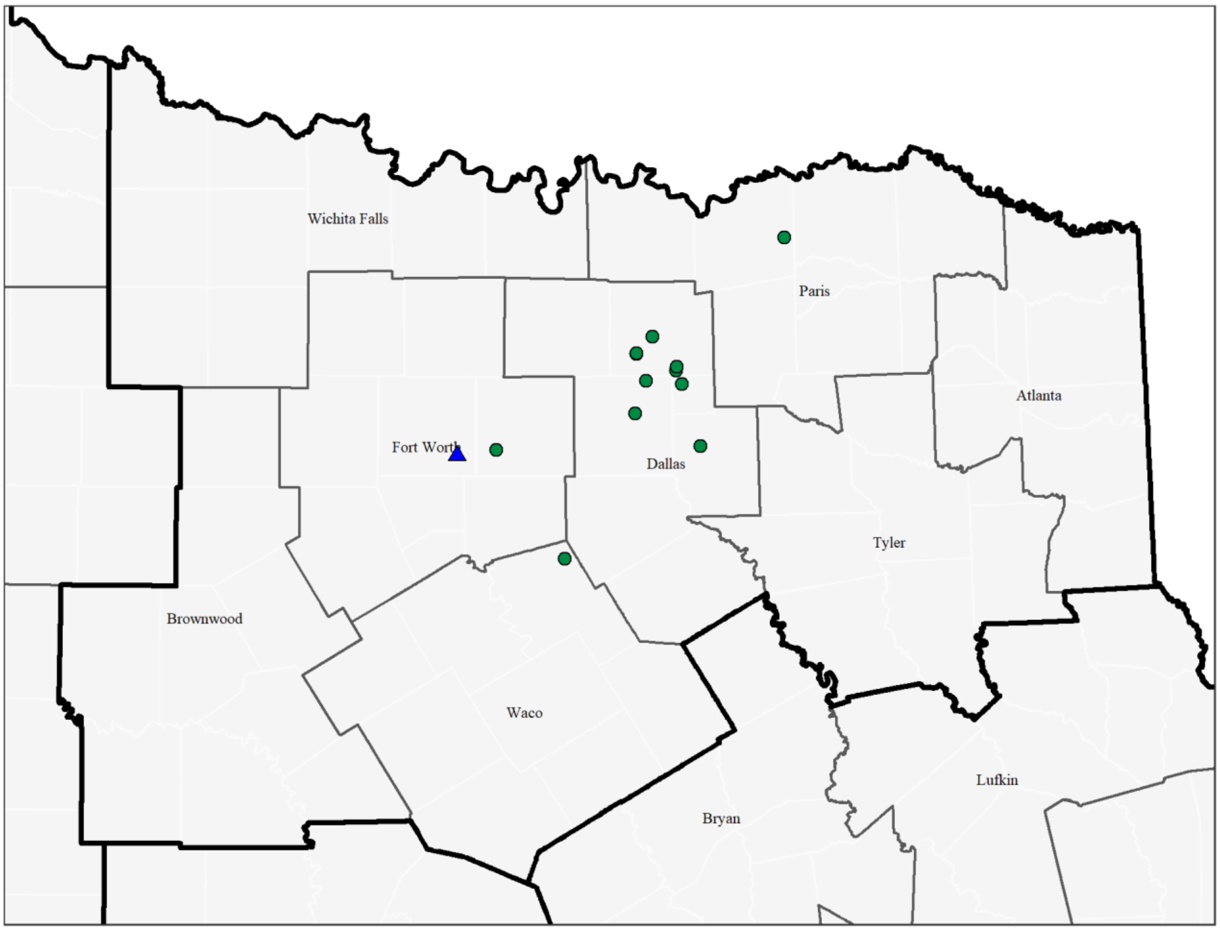
Common Garter Snake



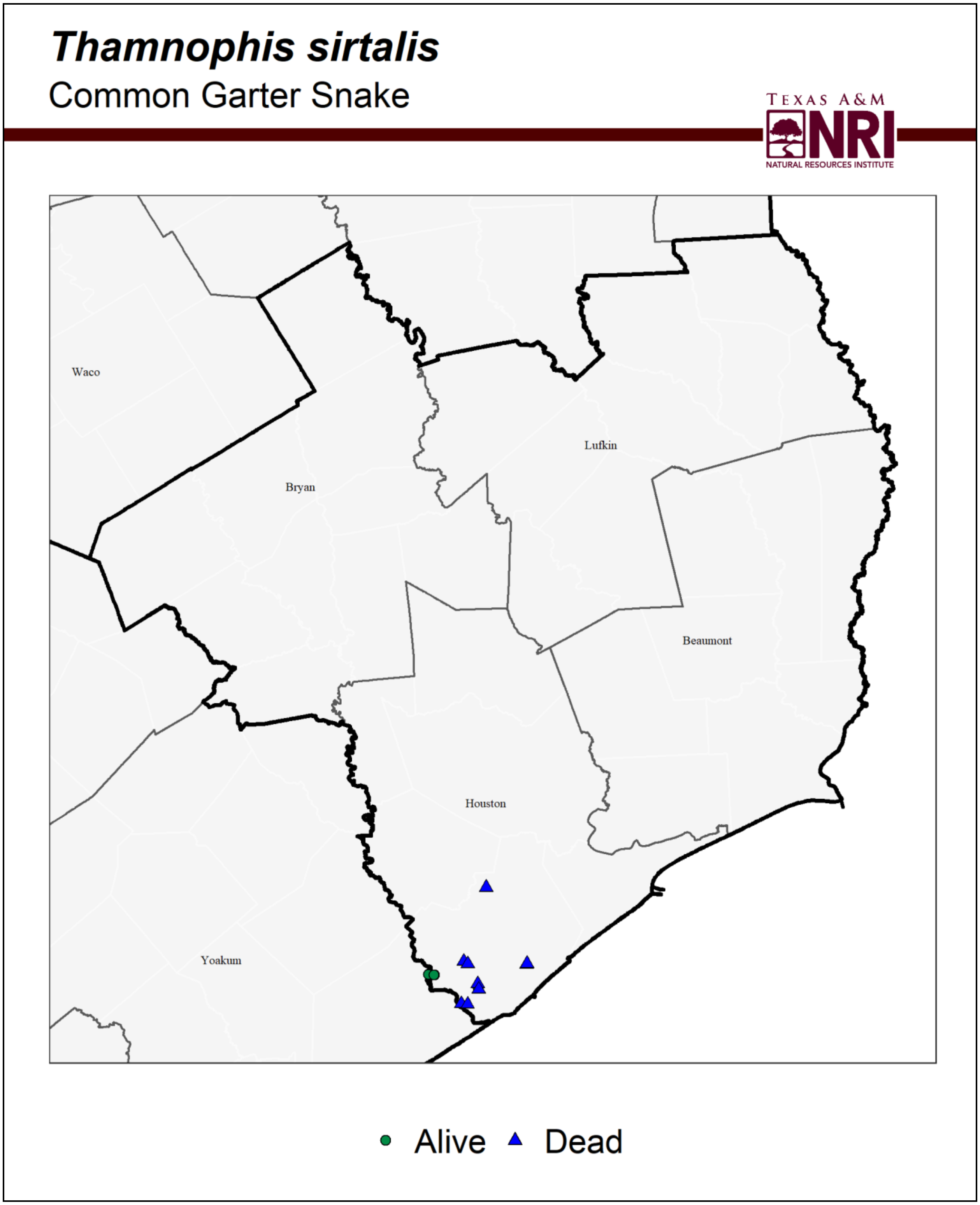
Thamnophis sirtalis
Common Garter Snake



Thamnophis sirtalis
Common Garter Snake

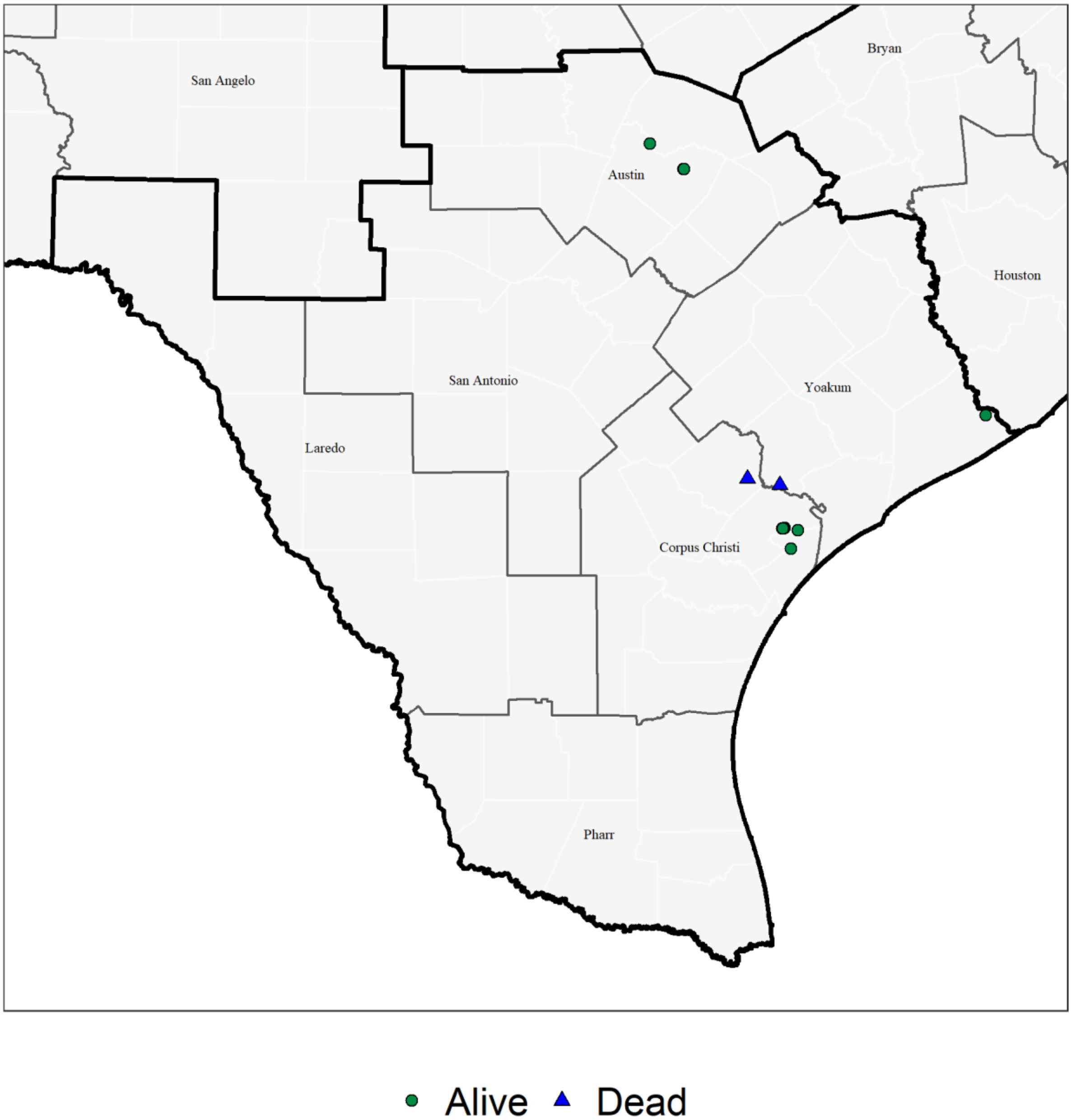


• Alive ▲ Dead

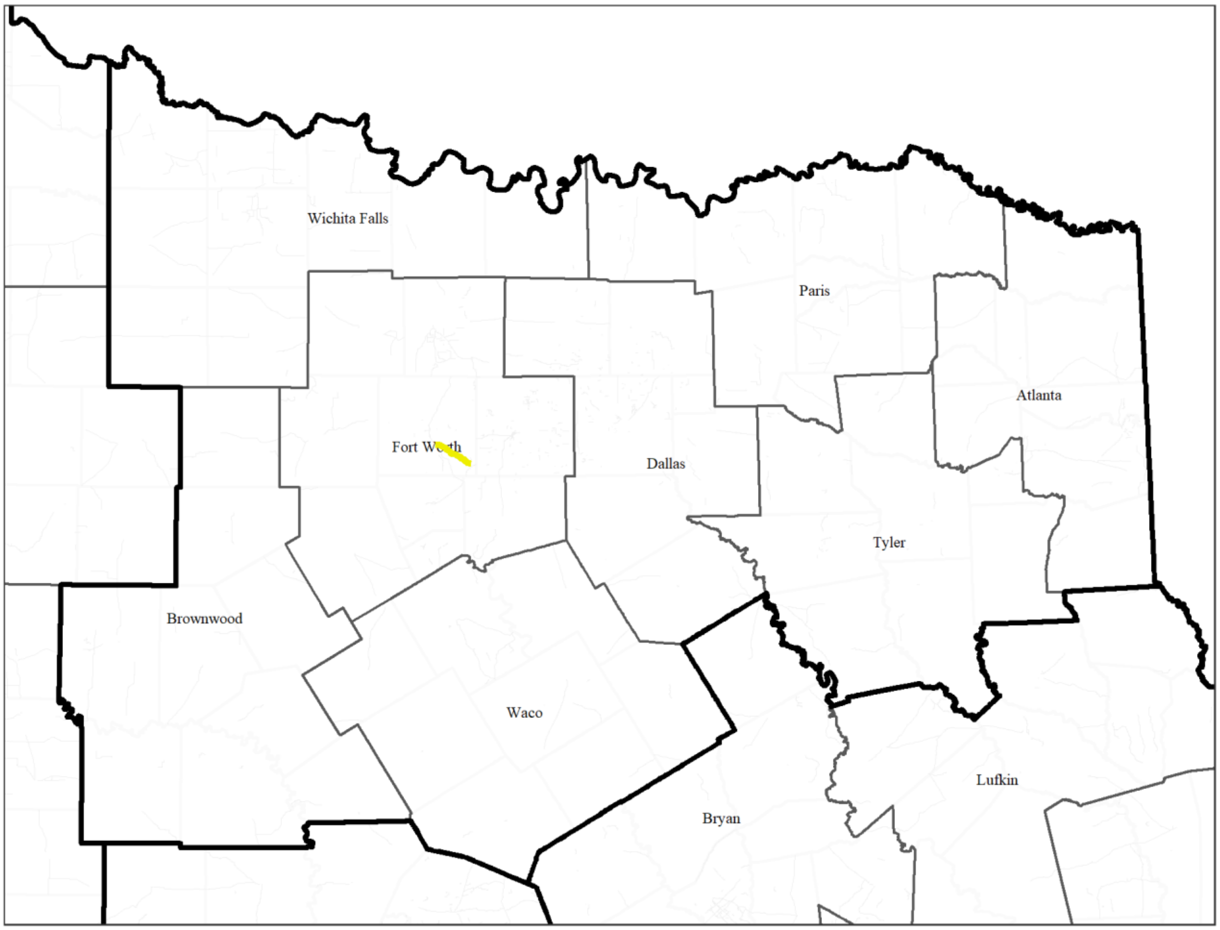

Thamnophis sirtalis
Common Garter Snake
TEXAS A&M
NRI
NATURAL RESOURCES INSTITUTE
Waco
Bryan
Lufkin
Beaumont
Houston
Yoakum
Alive
Dead

Thamnophis sirtalis

Common Garter Snake



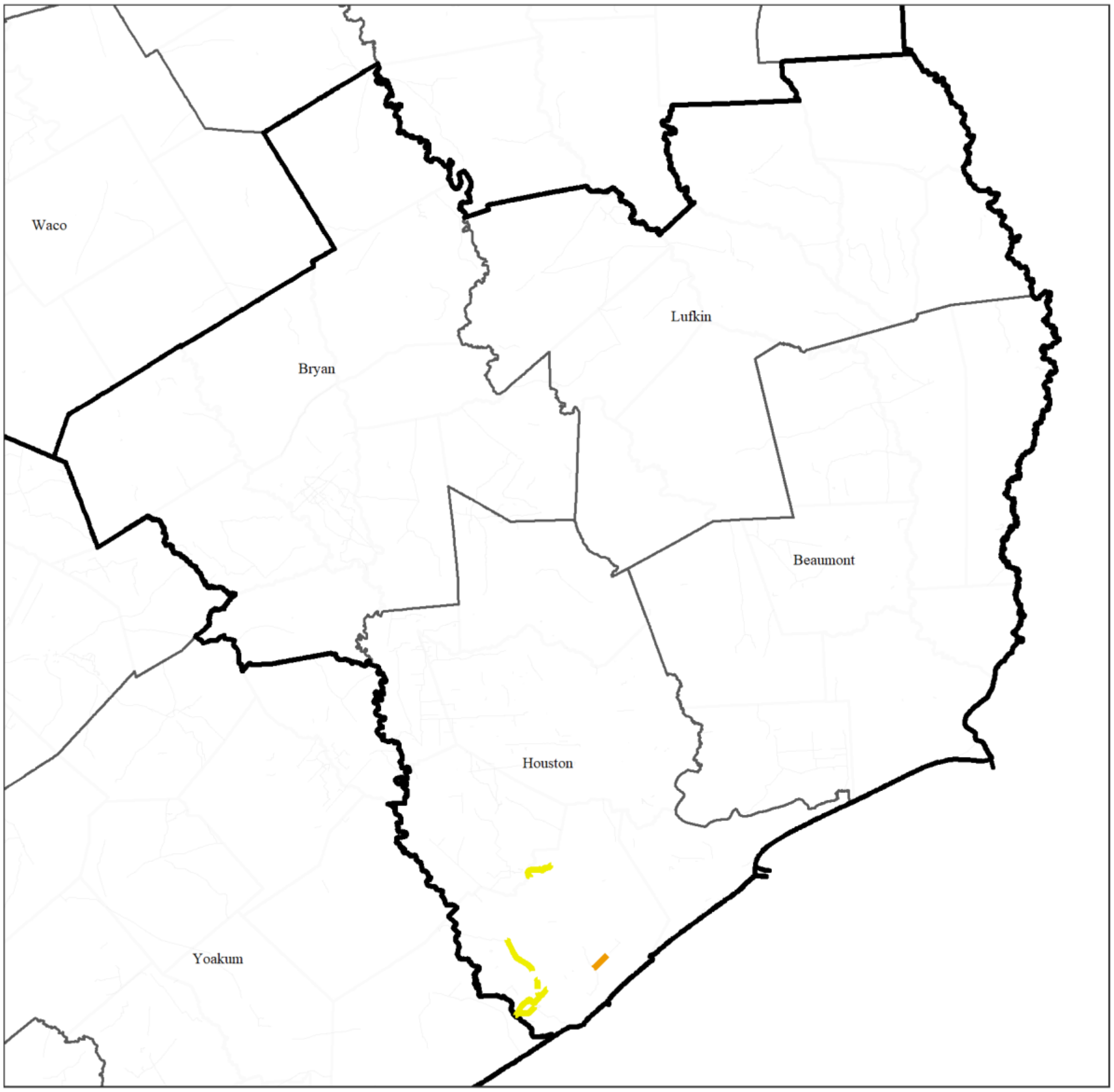
Thamnophis sirtalis
Common Garter Snake



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Thamnophis sirtalis

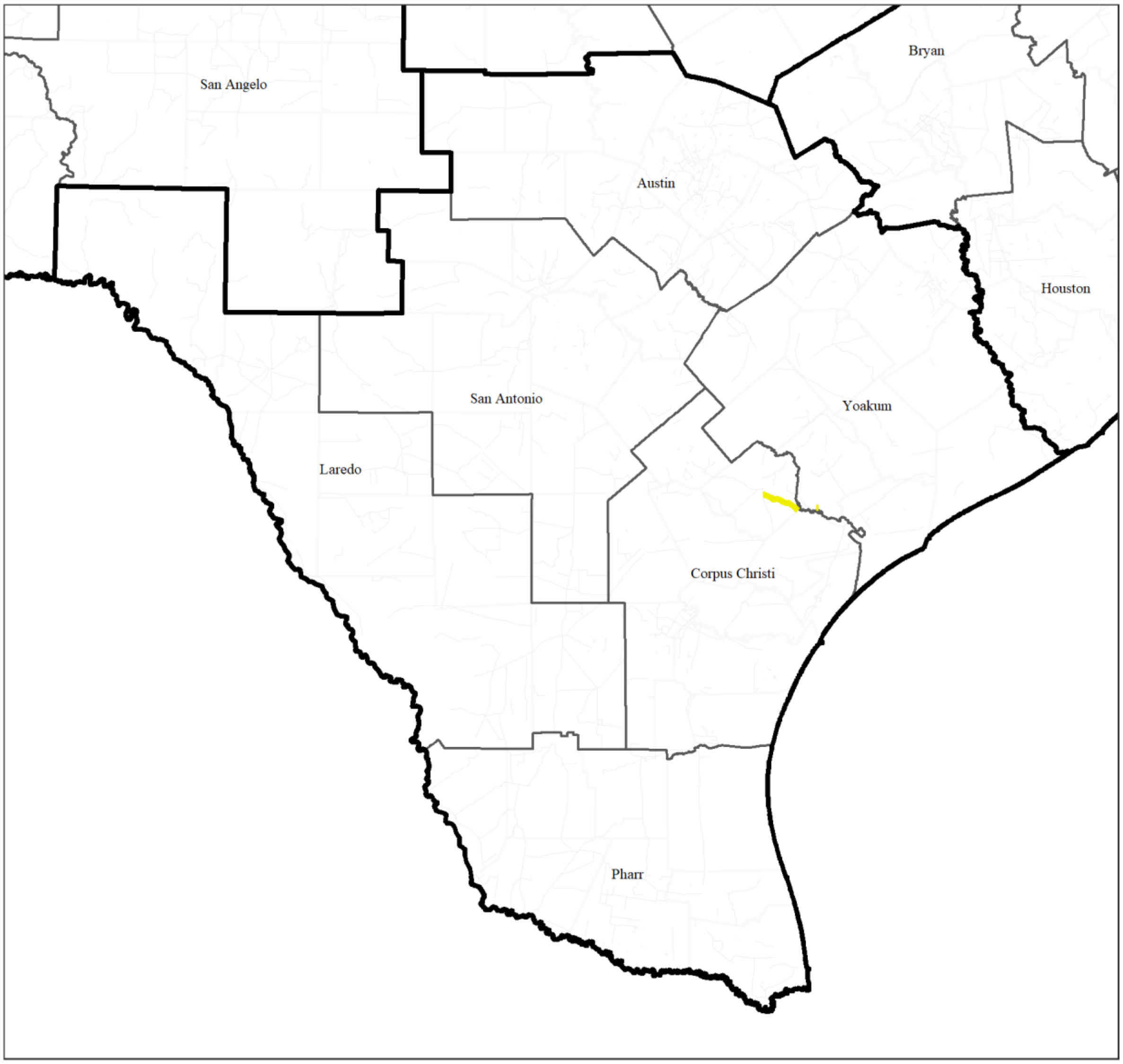
Common Garter Snake



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Thamnophis sirtalis

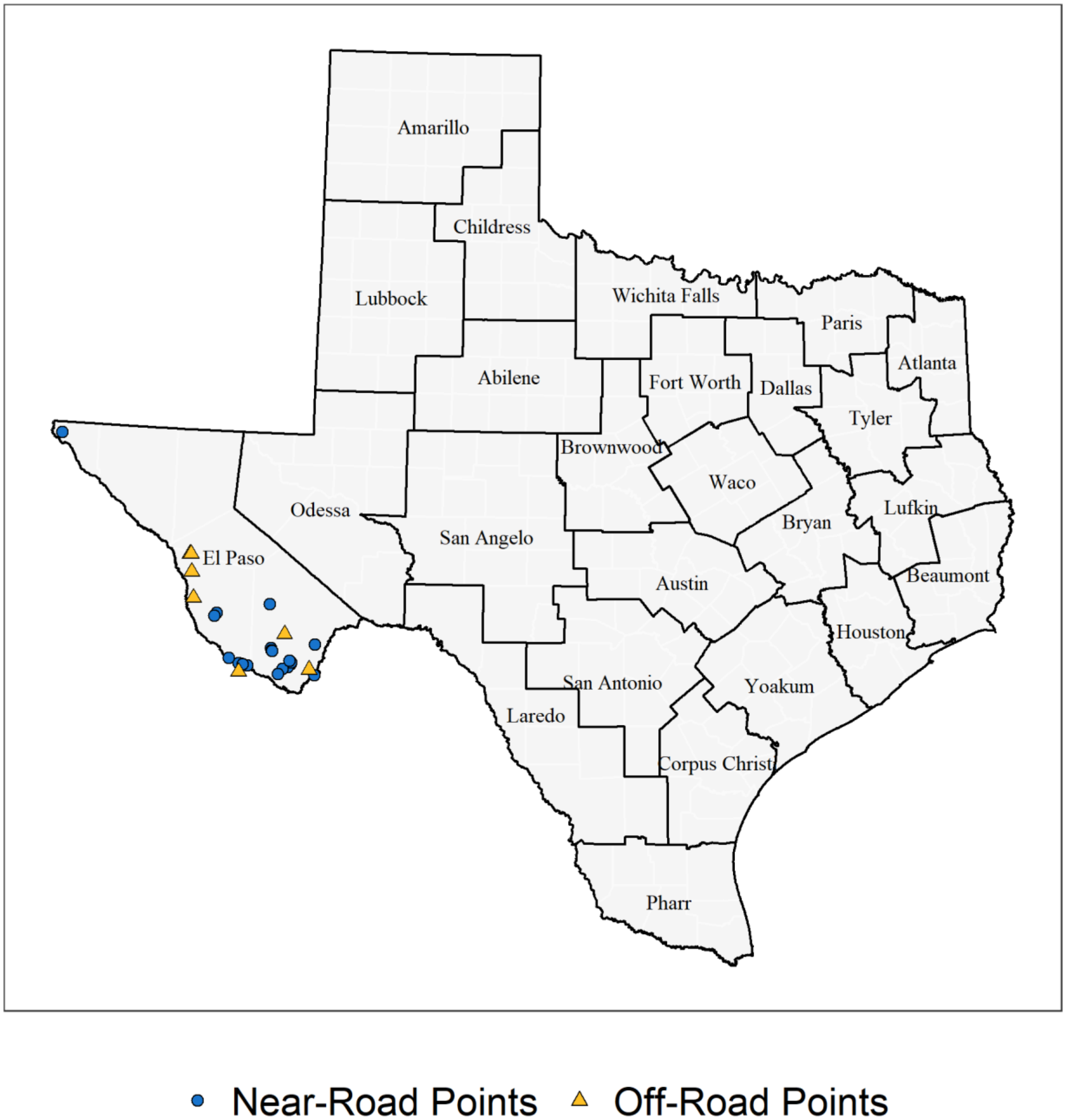
Common Garter Snake



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Trimorphodon vilkinsonii

Texas Lyre Snake

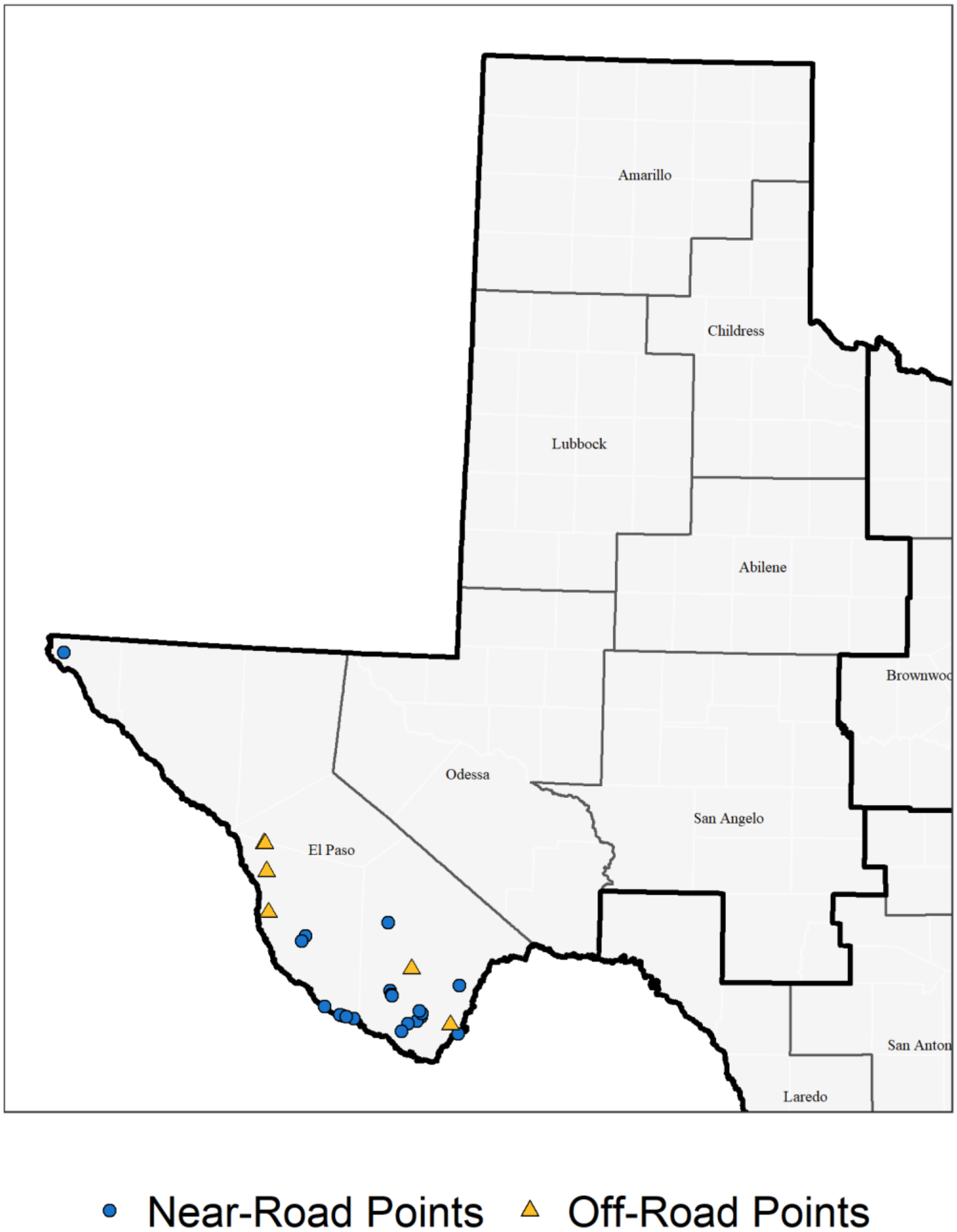


Trimorphodon vilkinsonii

Texas Lyre Snake

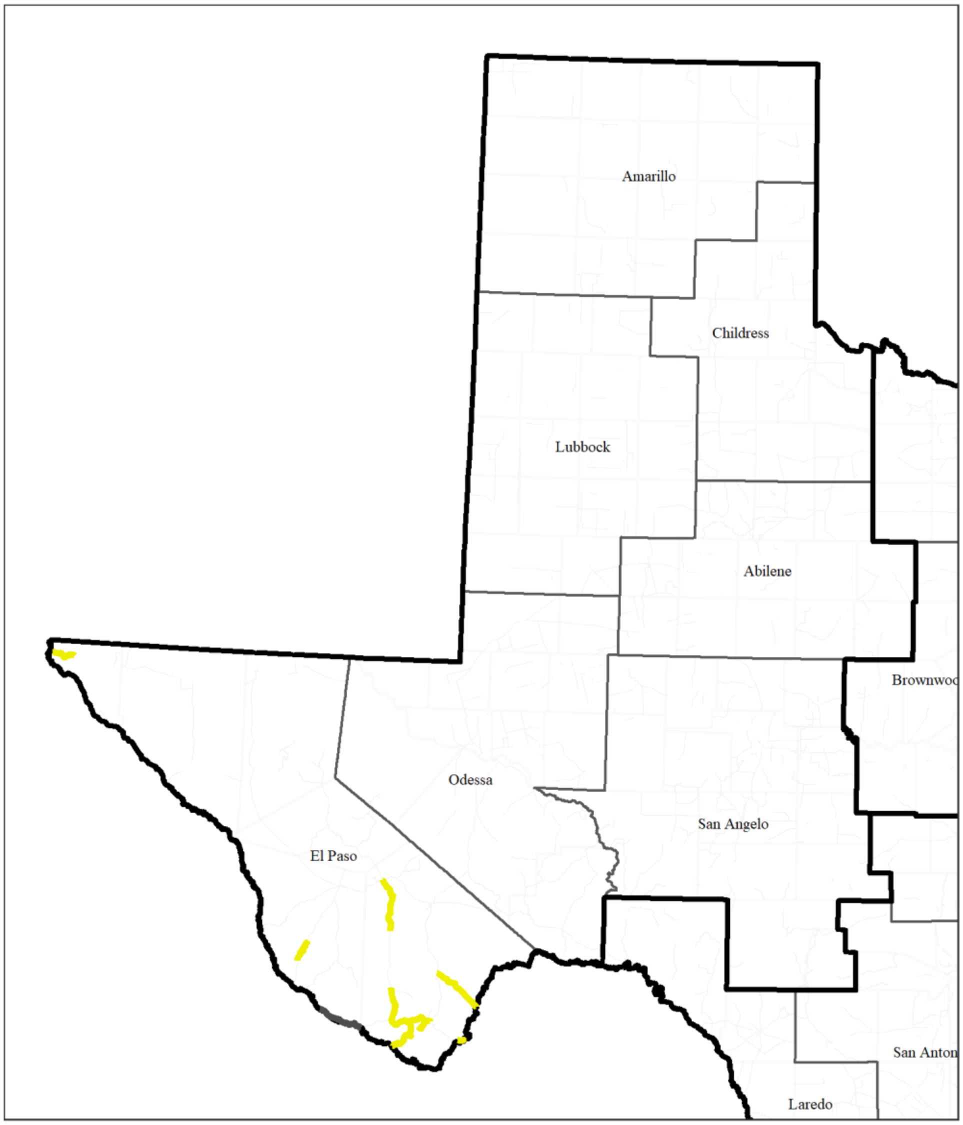
Trimorphodon vilkinsonii

Texas Lyre Snake



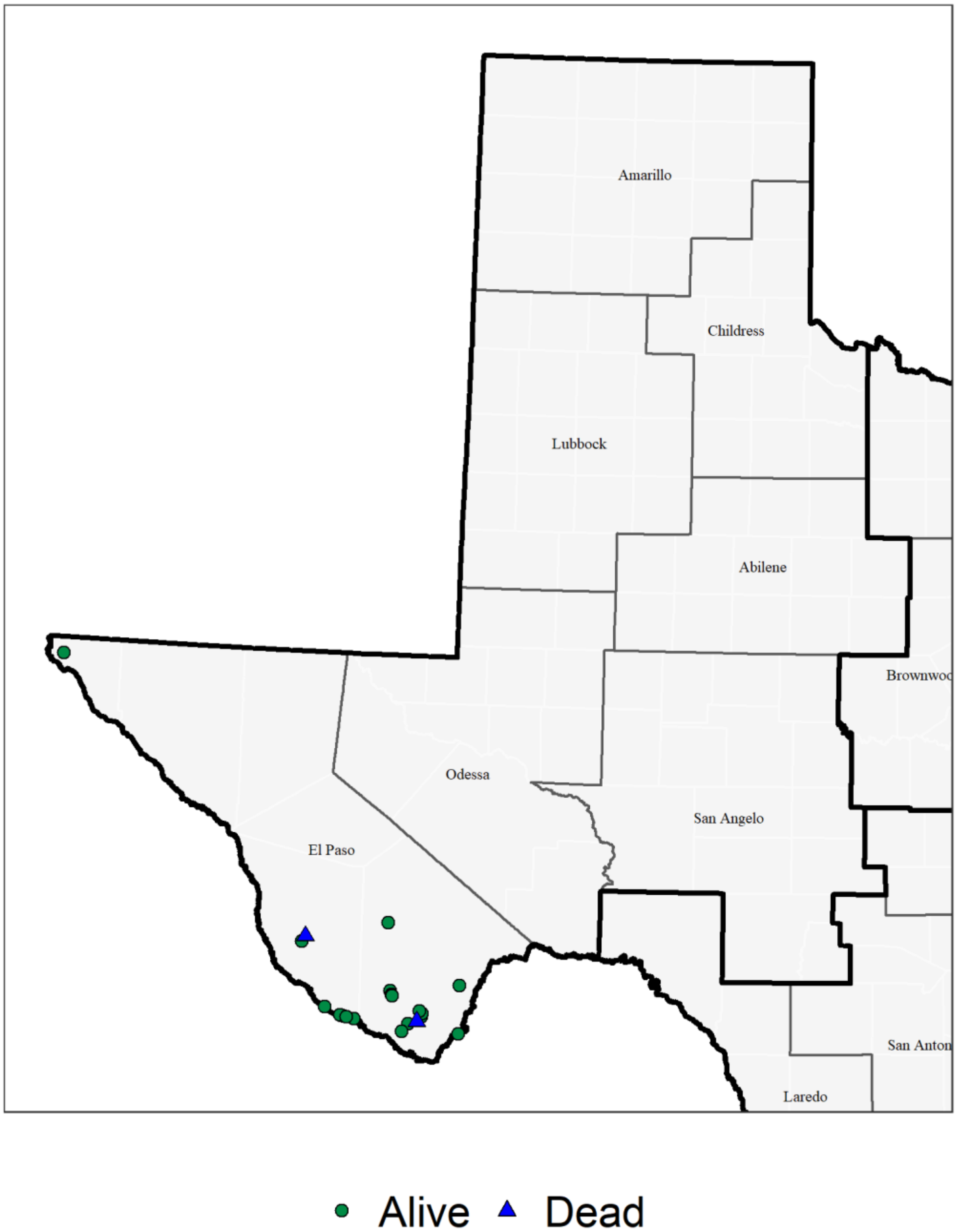
Trimorphodon vilkinsonii

Texas Lyre Snake



Points Per Section 1-2 3-4 5-6 7+

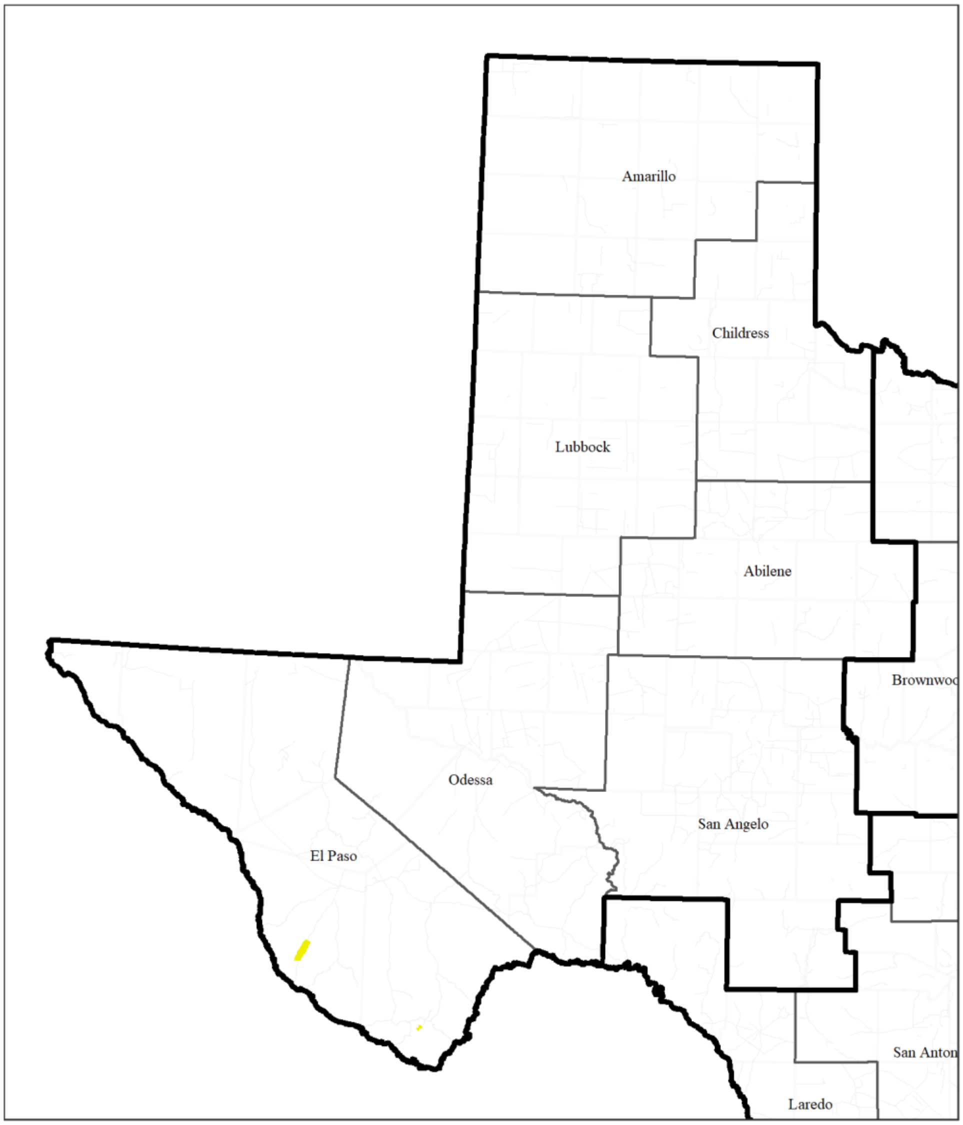
Trimorphodon vilkinsonii
Texas Lyre Snake



Trimorphodon vilkinsonii

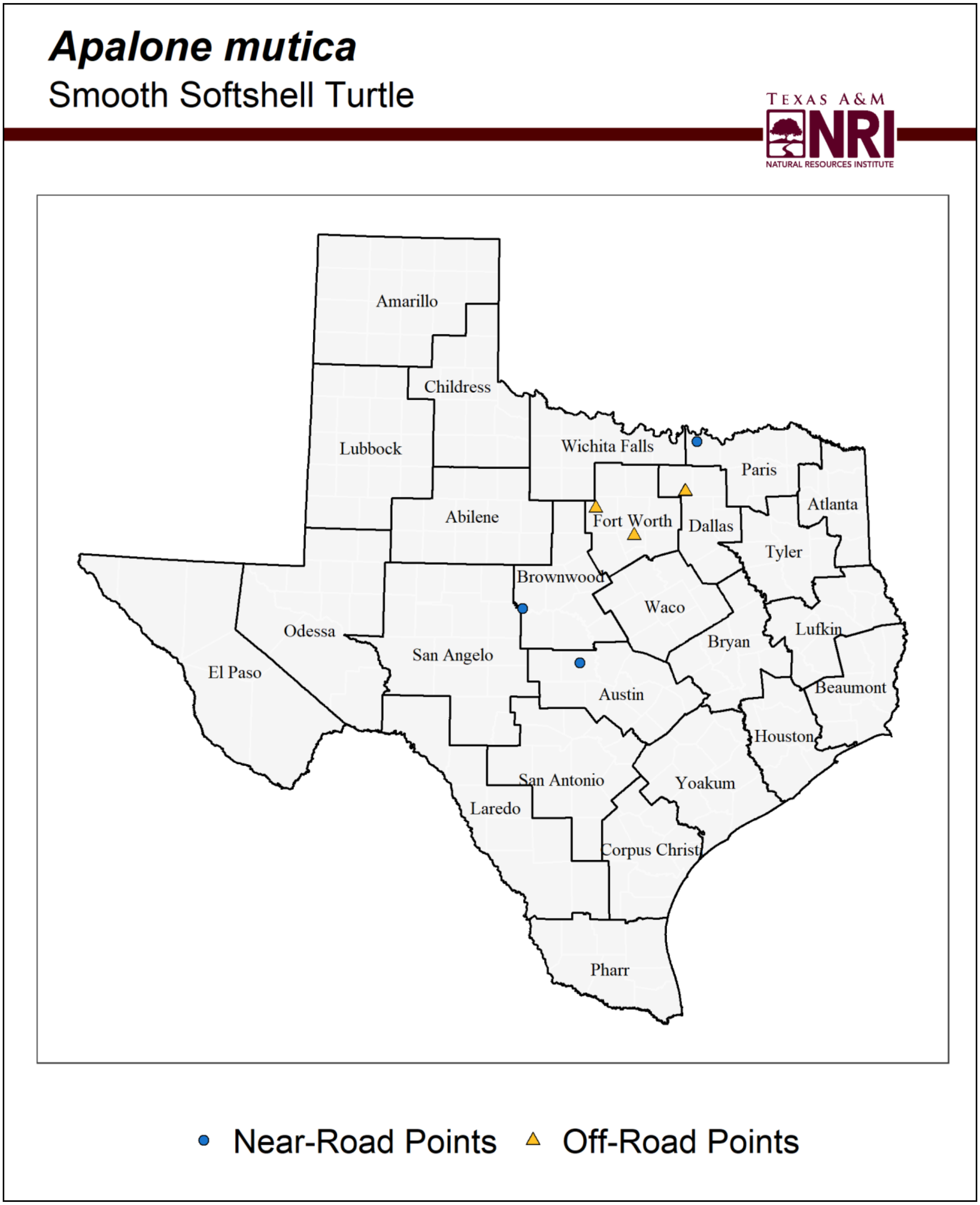
Texas Lyre Snake

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

A5. Reptiles – Turtles

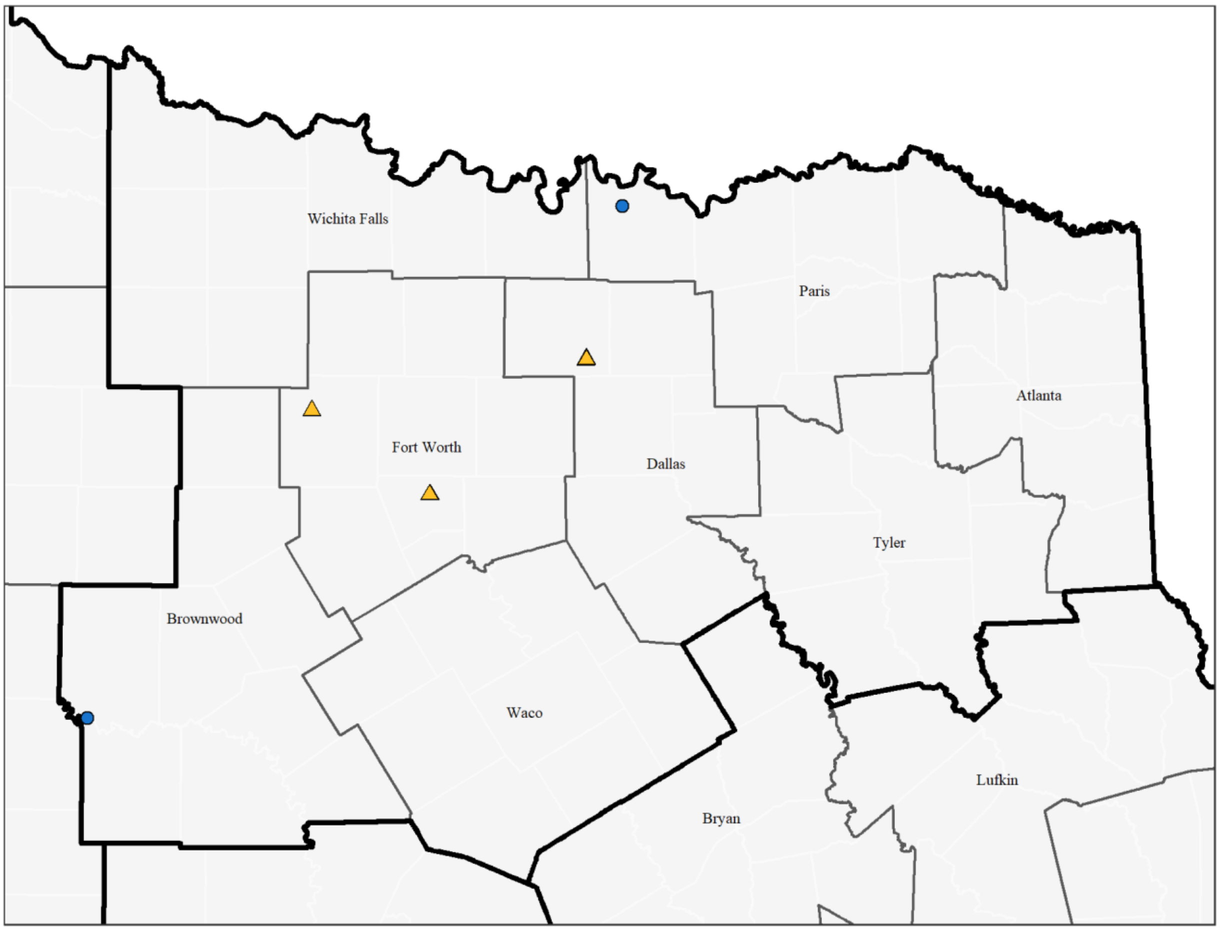


Apalone mutica

Smooth Softshell Turtle

Apalone mutica

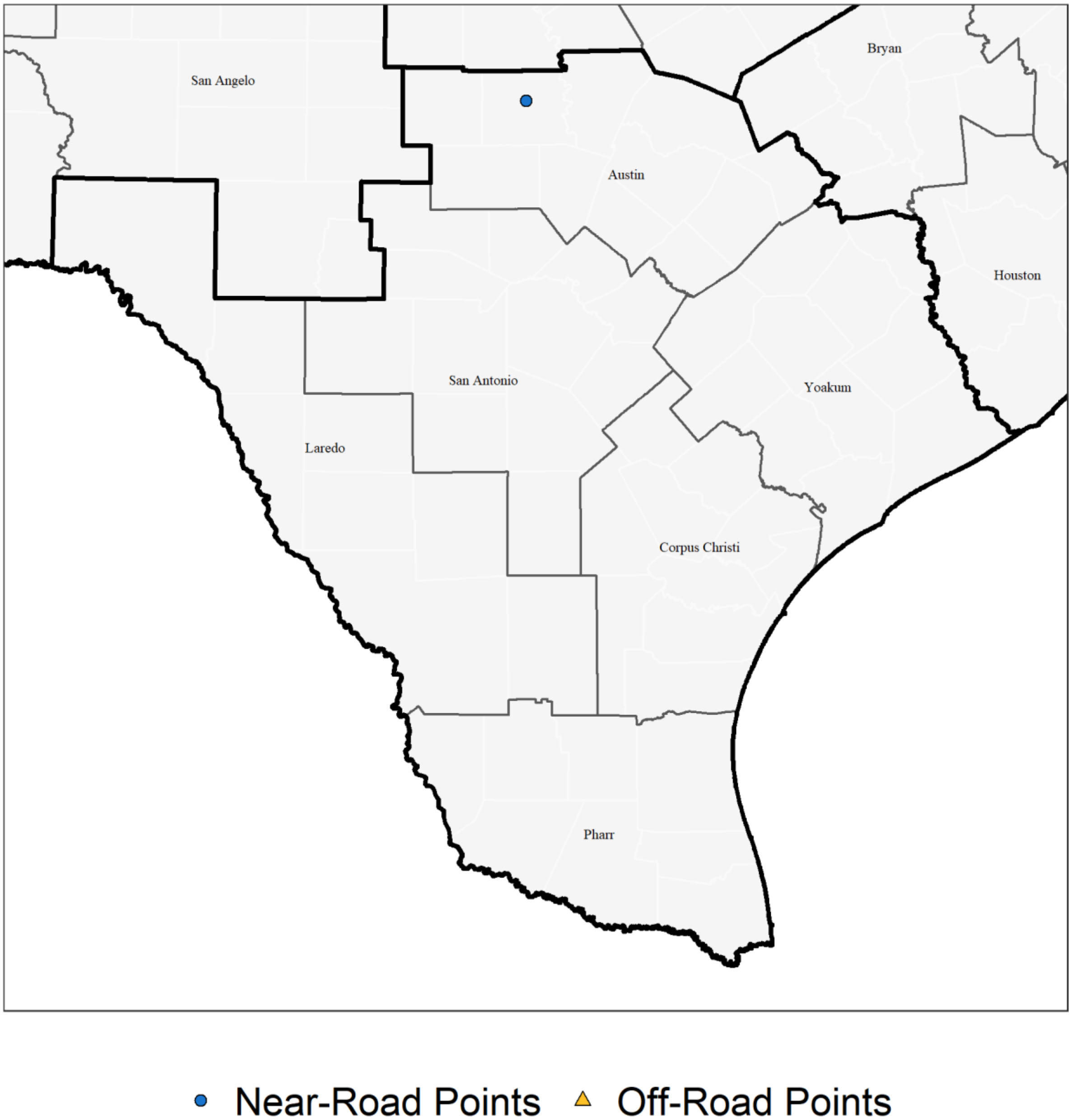
Smooth Softshell Turtle



• Near-Road Points △ Off-Road Points

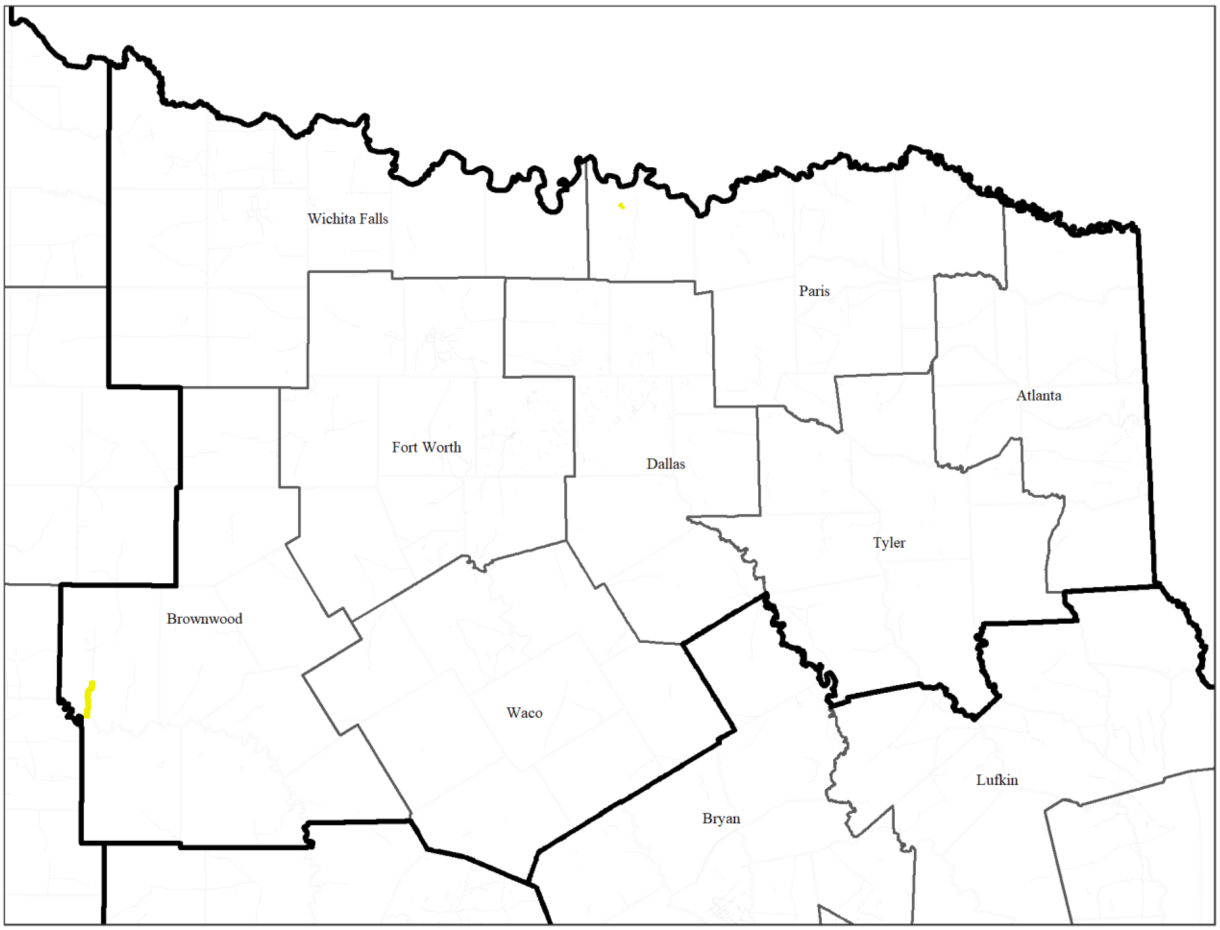
Apalone mutica

Smooth Softshell Turtle



Apalone mutica

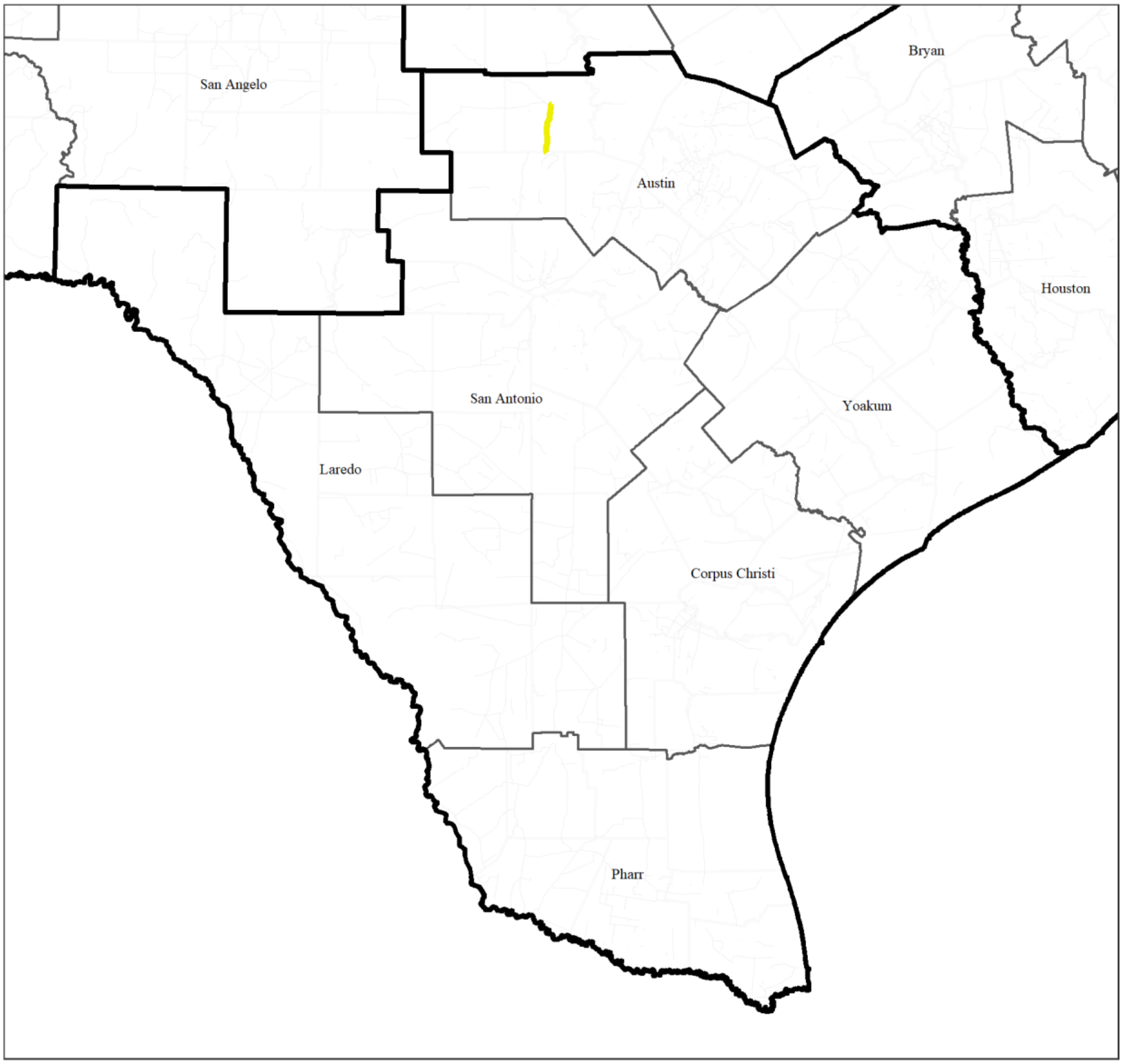
Smooth Softshell Turtle



Points Per Section 1-2 3-4 5-6 7+

Apalone mutica

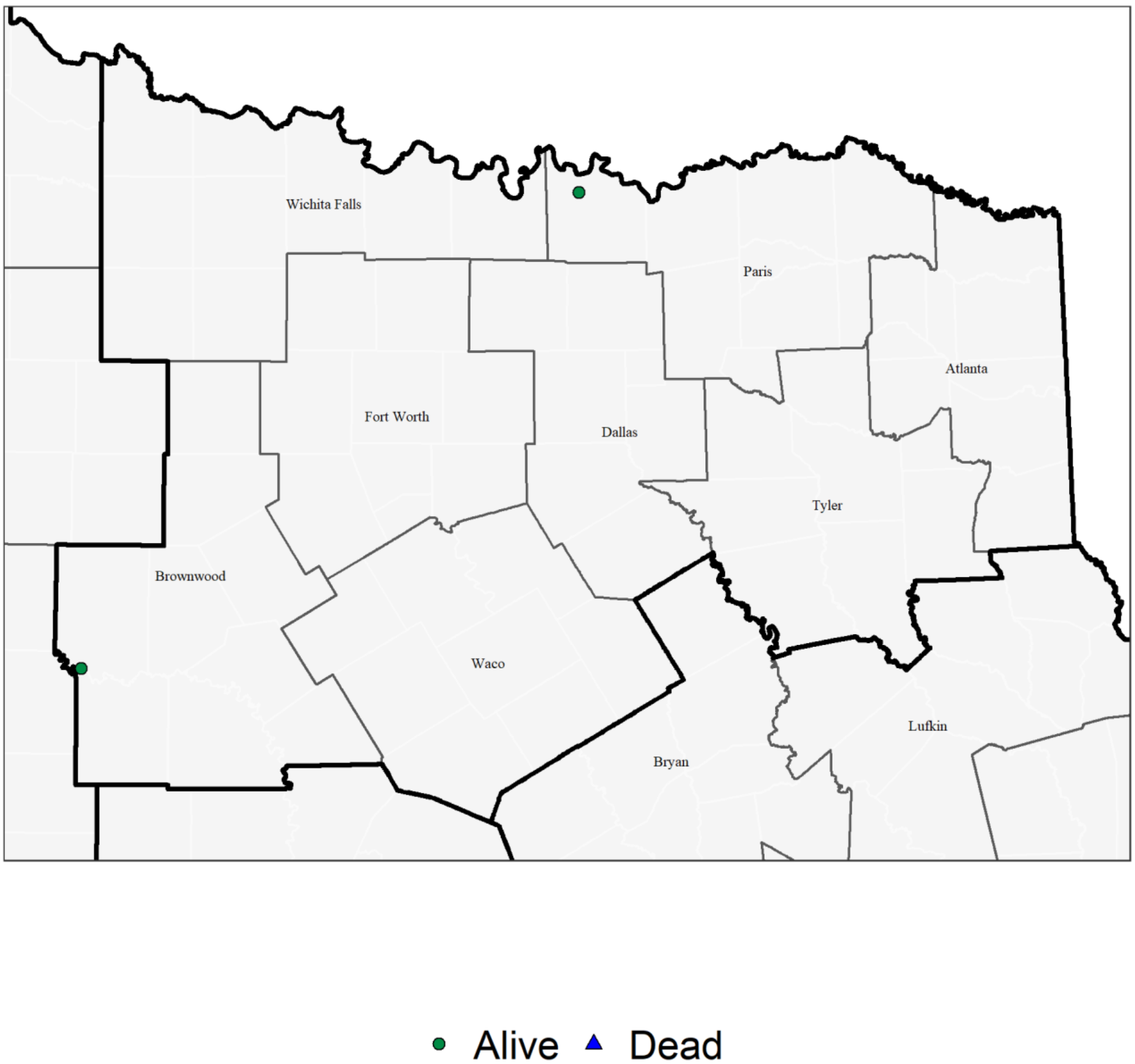
Smooth Softshell Turtle



Points Per Section 1-2 3-4 5-6 7+

Apalone mutica

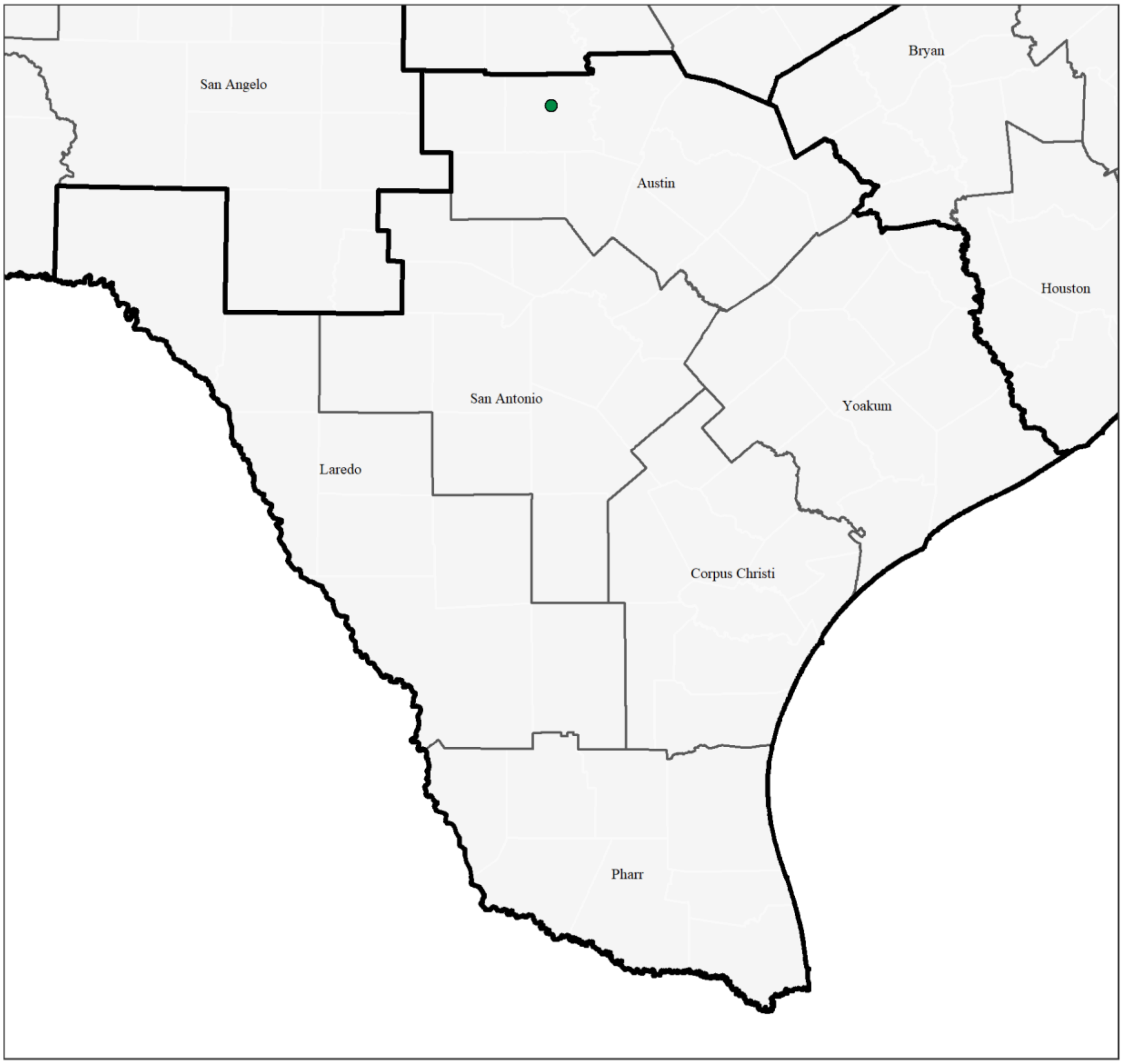
Smooth Softshell Turtle



Apalone mutica

Smooth Softshell Turtle

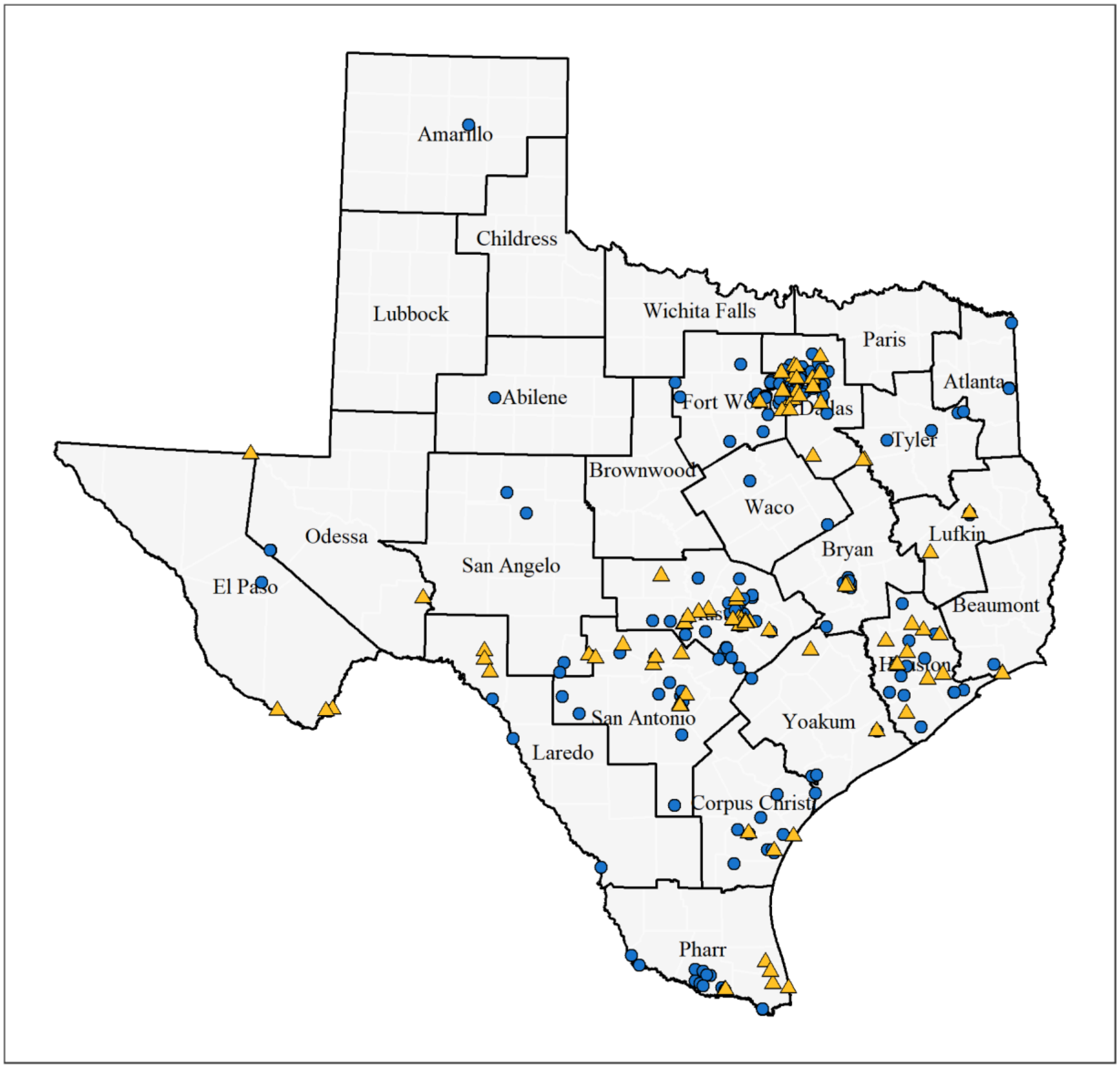
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



● Alive ▲ Dead

Apalone spinifera

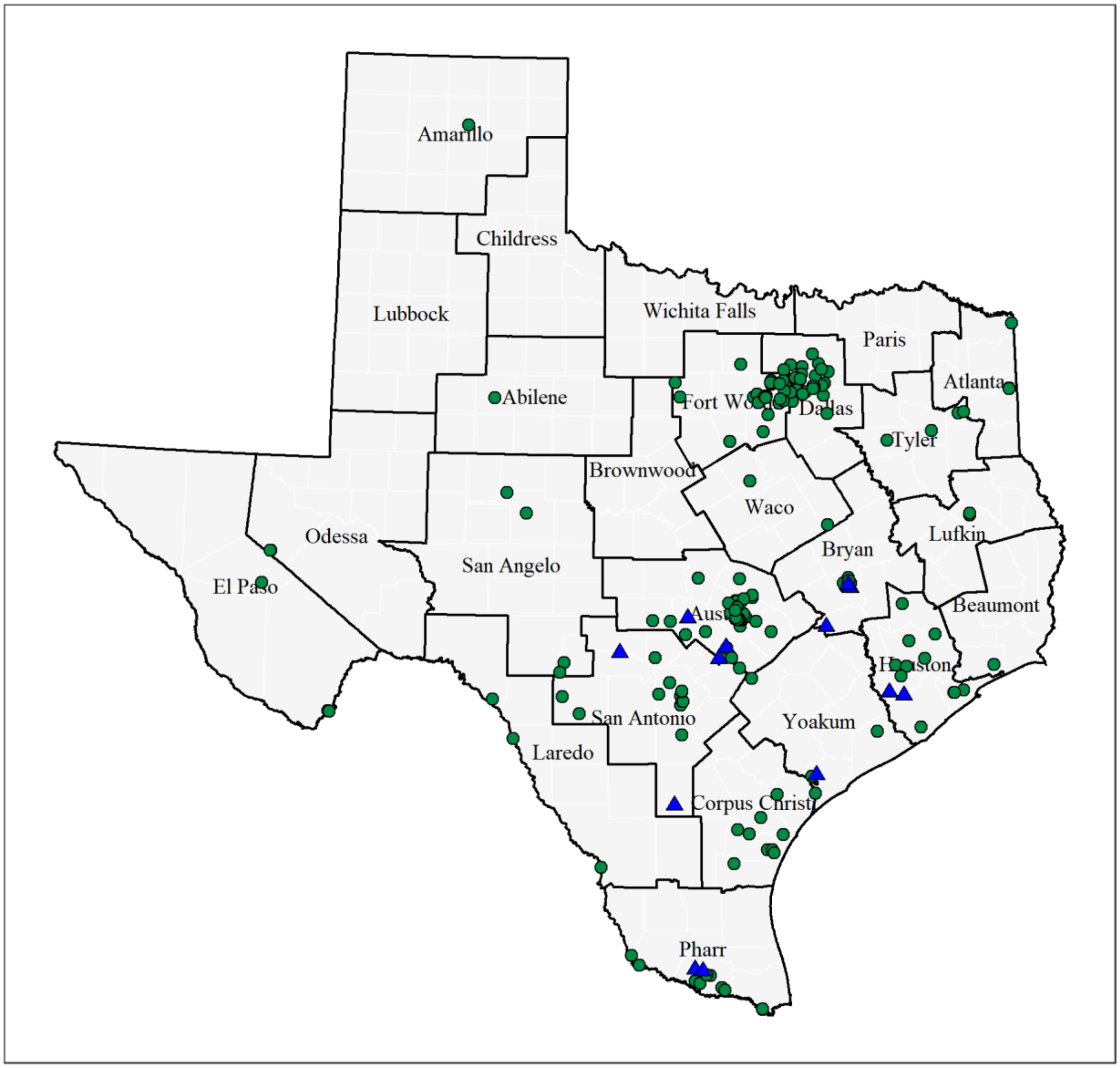
Spiny Softshell



• Near-Road Points △ Off-Road Points

Apalone spinifera

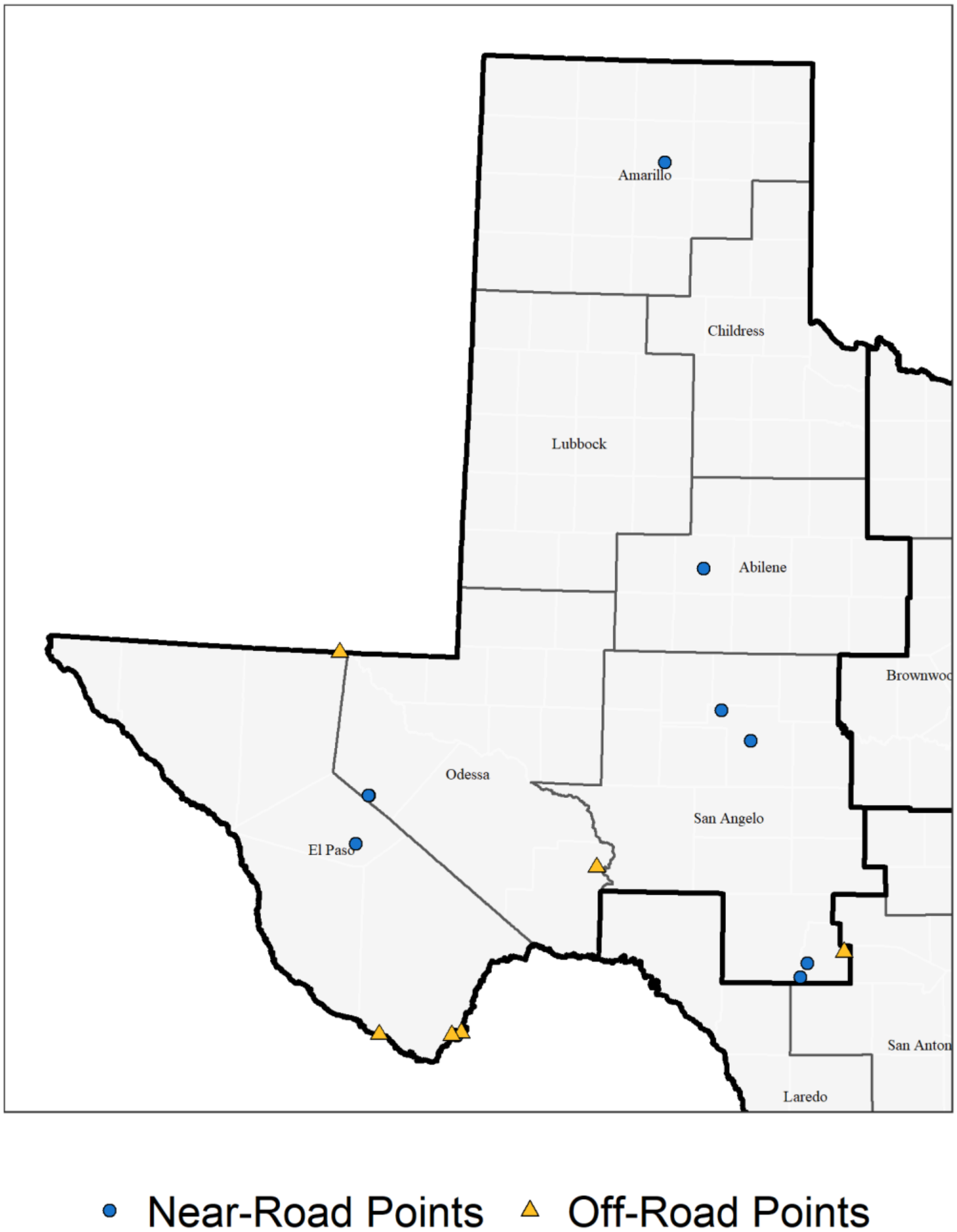
Spiny Softshell



Alive Dead

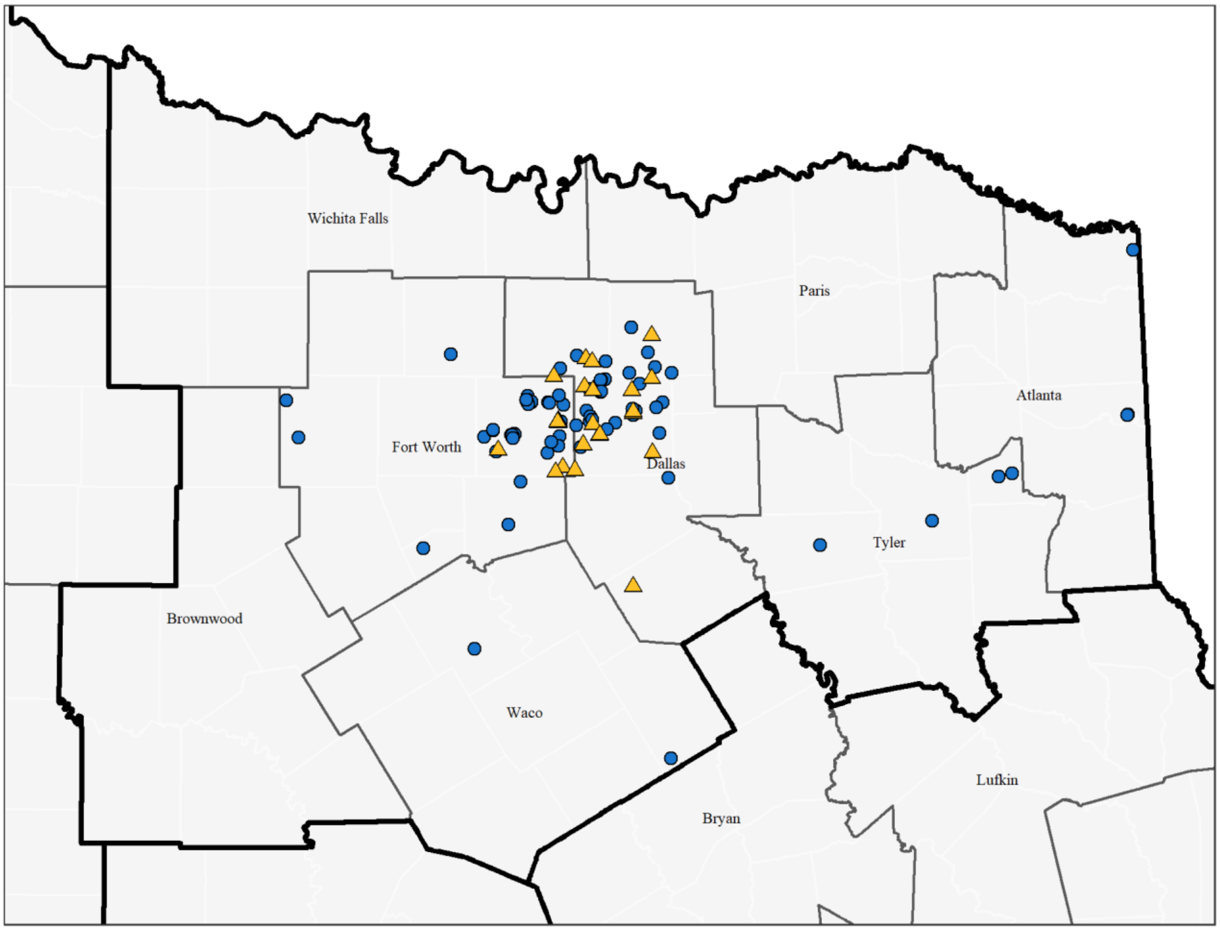
Apalone spinifera

Spiny Softshell



Apalone spinifera

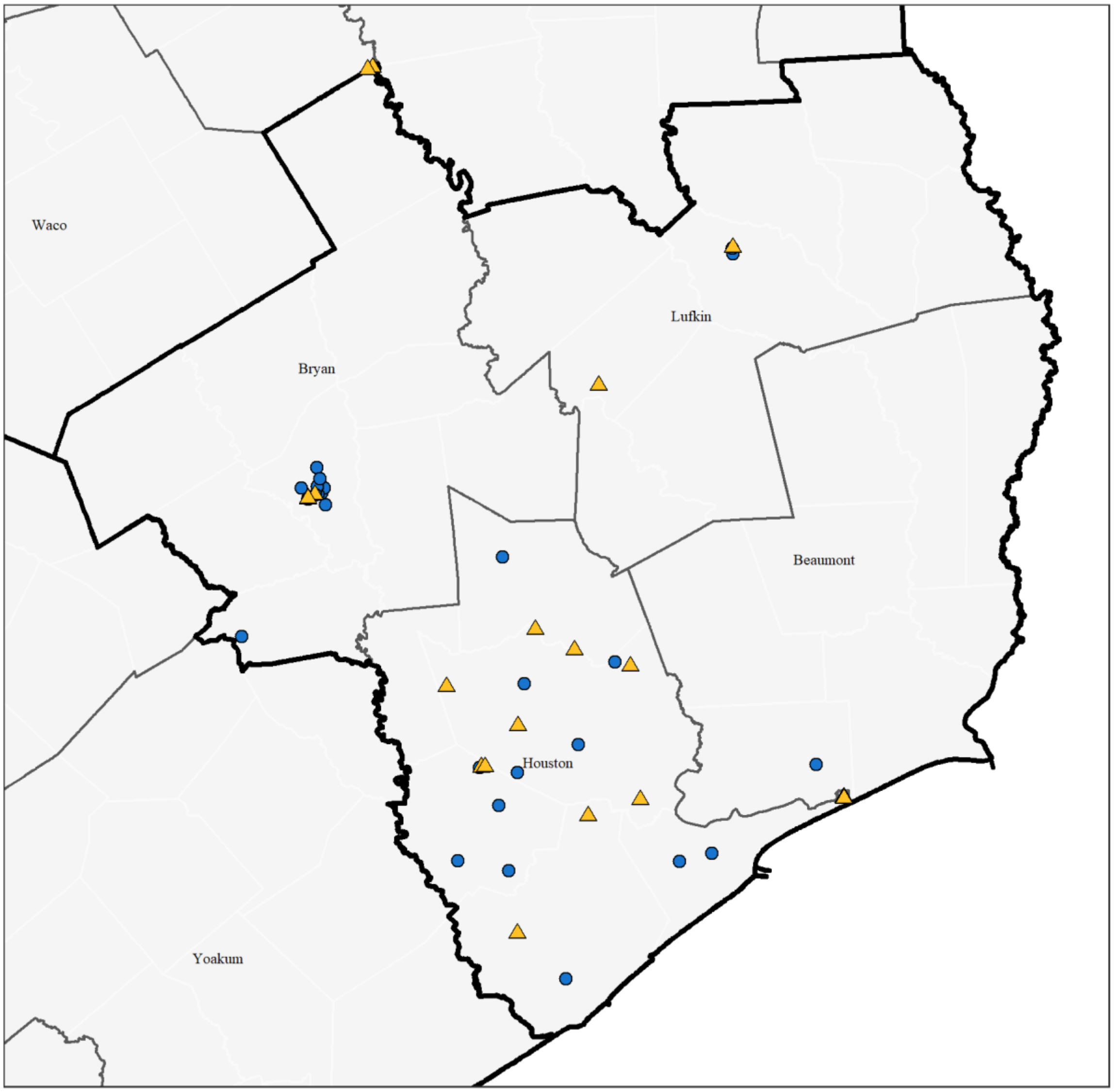
Spiny Softshell



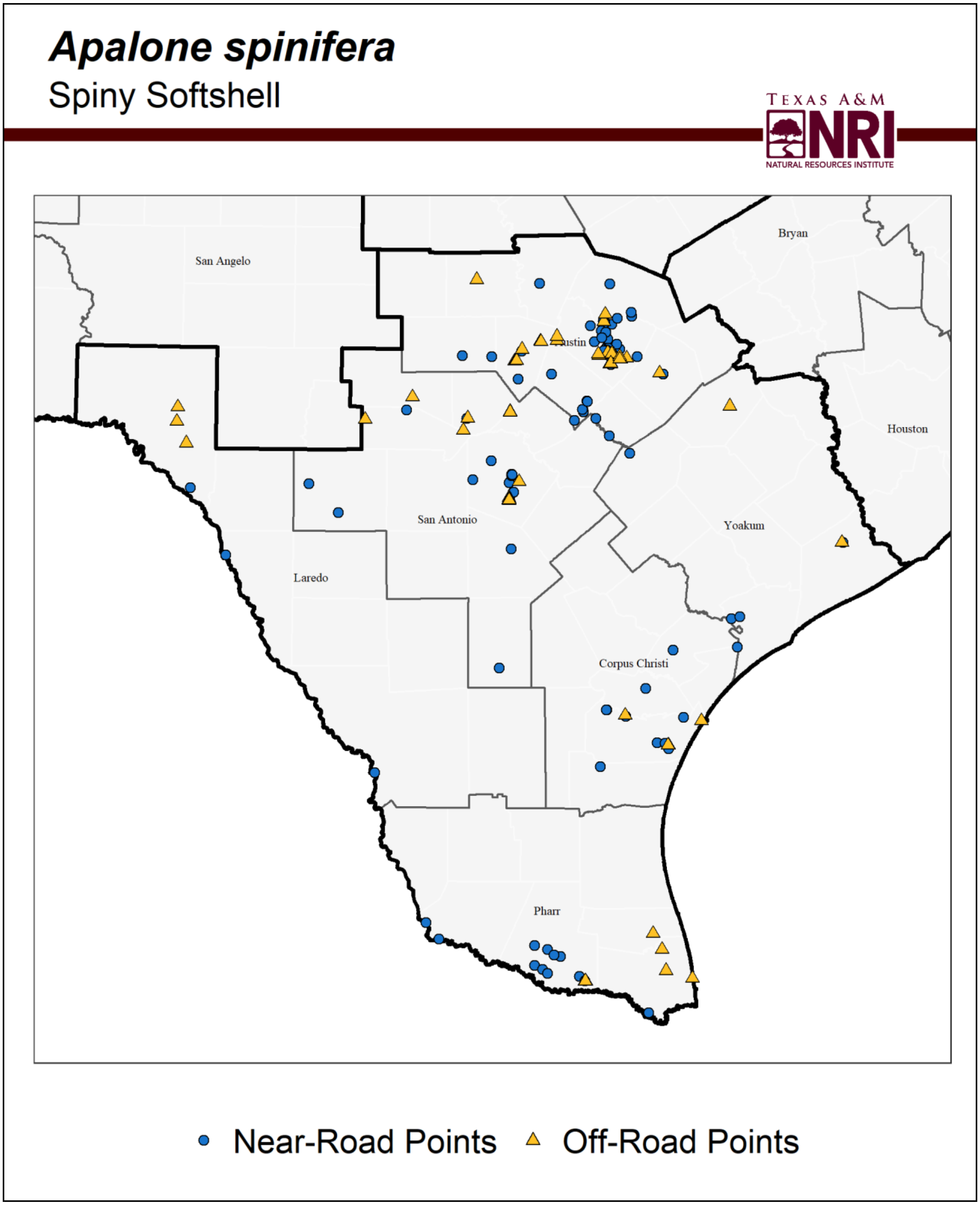
• Near-Road Points △ Off-Road Points

Apalone spinifera

Spiny Softshell

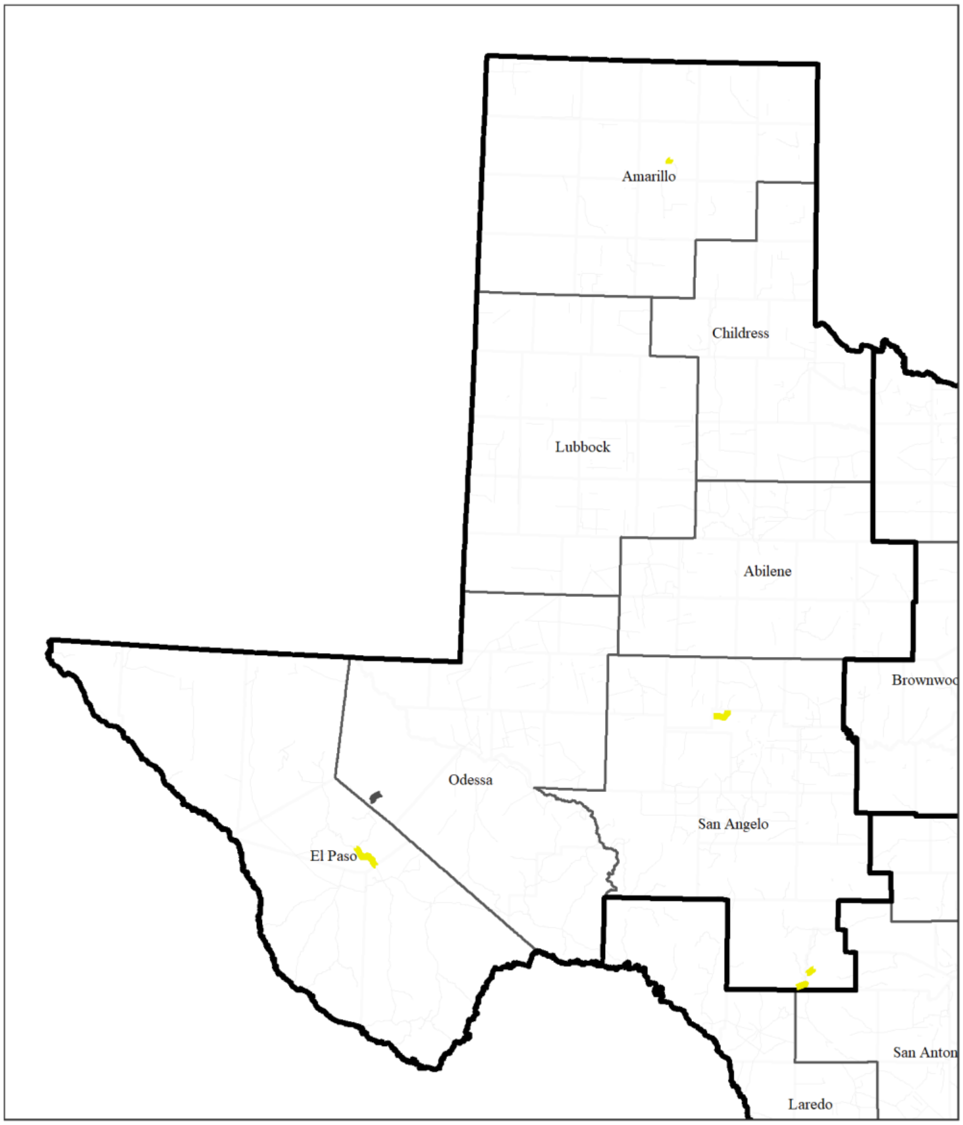


• Near-Road Points △ Off-Road Points


Apalone spinifera
Spiny Softshell
TEXAS A&M
NRI
NATURAL RESOURCES INSTITUTE
San Angelo
Bryan
Austin
Houston
San Antonio
Yoakum
Laredo
Corpus Christi
Pharr
Near-Road Points
Off-Road Points

Apalone spinifera

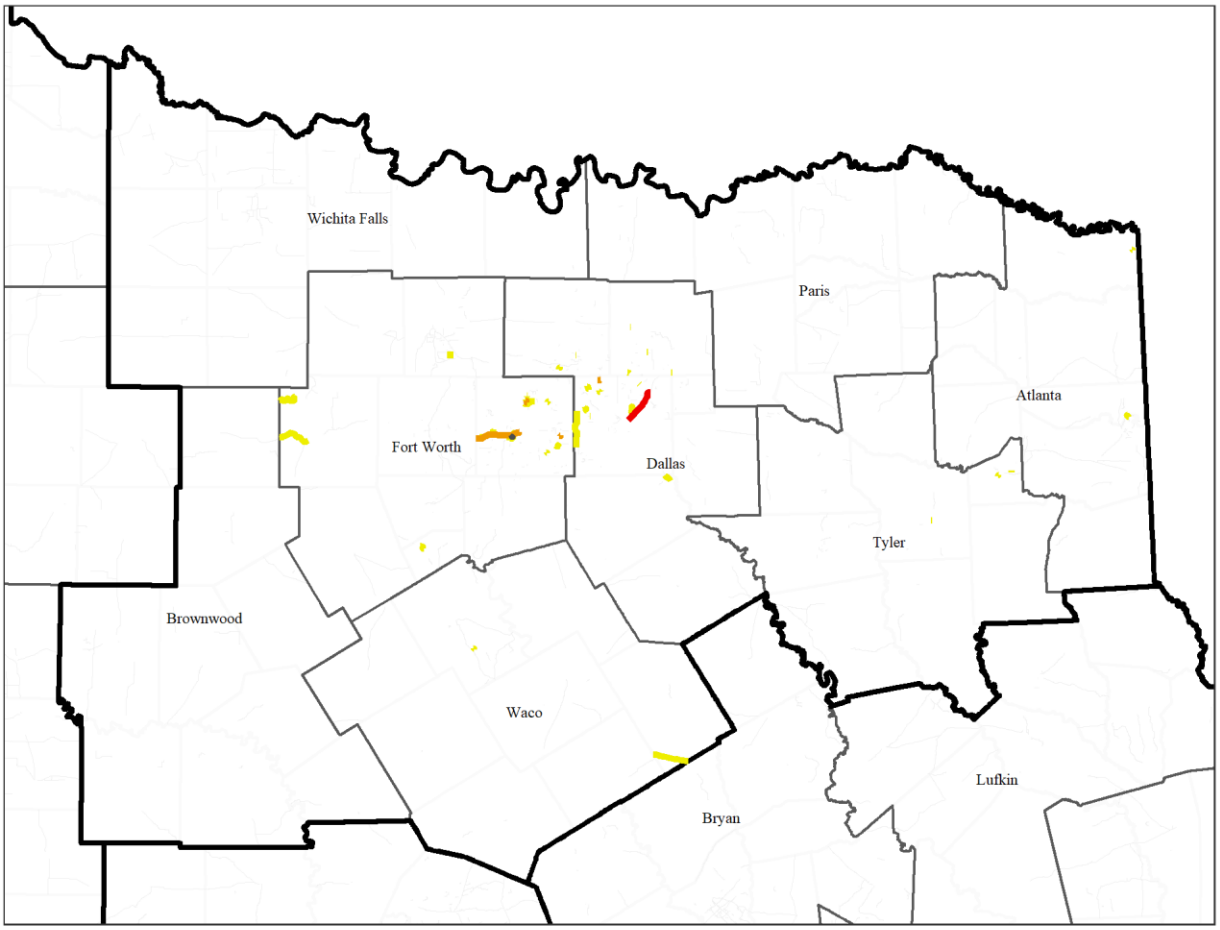
Spiny Softshell



Points Per Section 1-2 3-4 5-6 7+

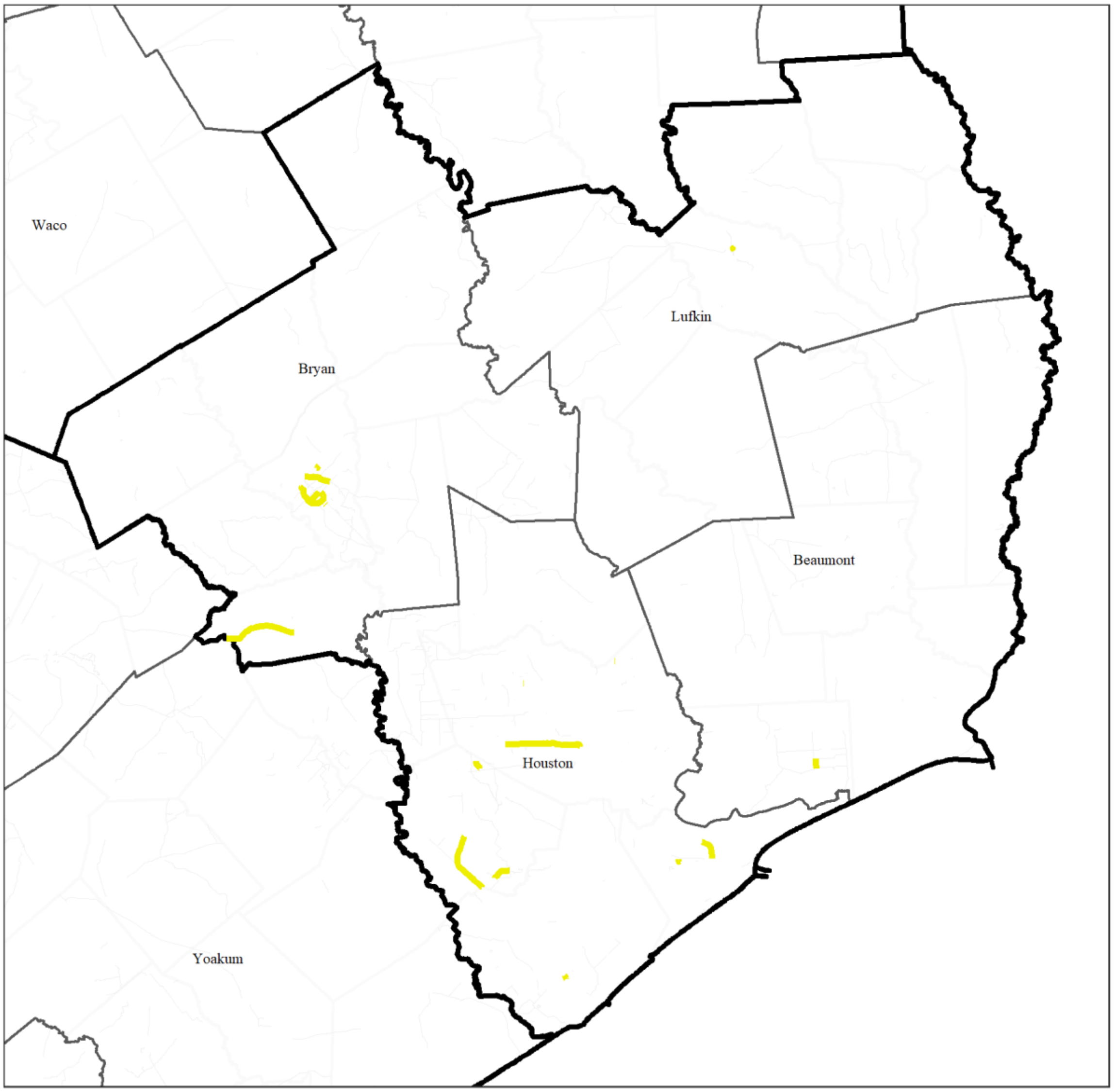
Apalone spinifera

Spiny Softshell



Points Per Section 1-2 3-4 5-6 7+

Apalone spinifera
Spiny Softshell

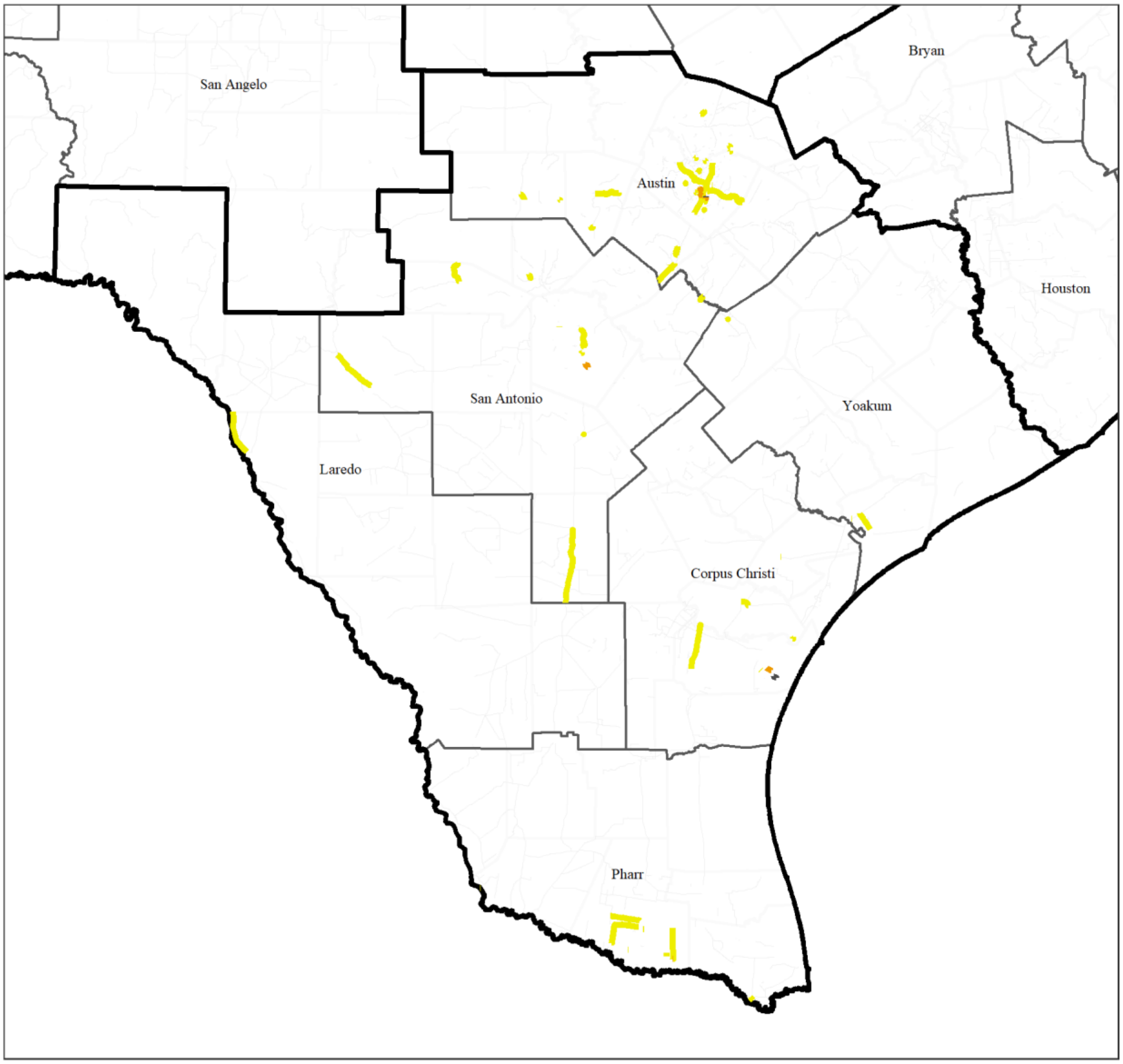


Points Per Section 1-2 3-4 5-6 7+

Apalone spinifera

Spiny Softshell

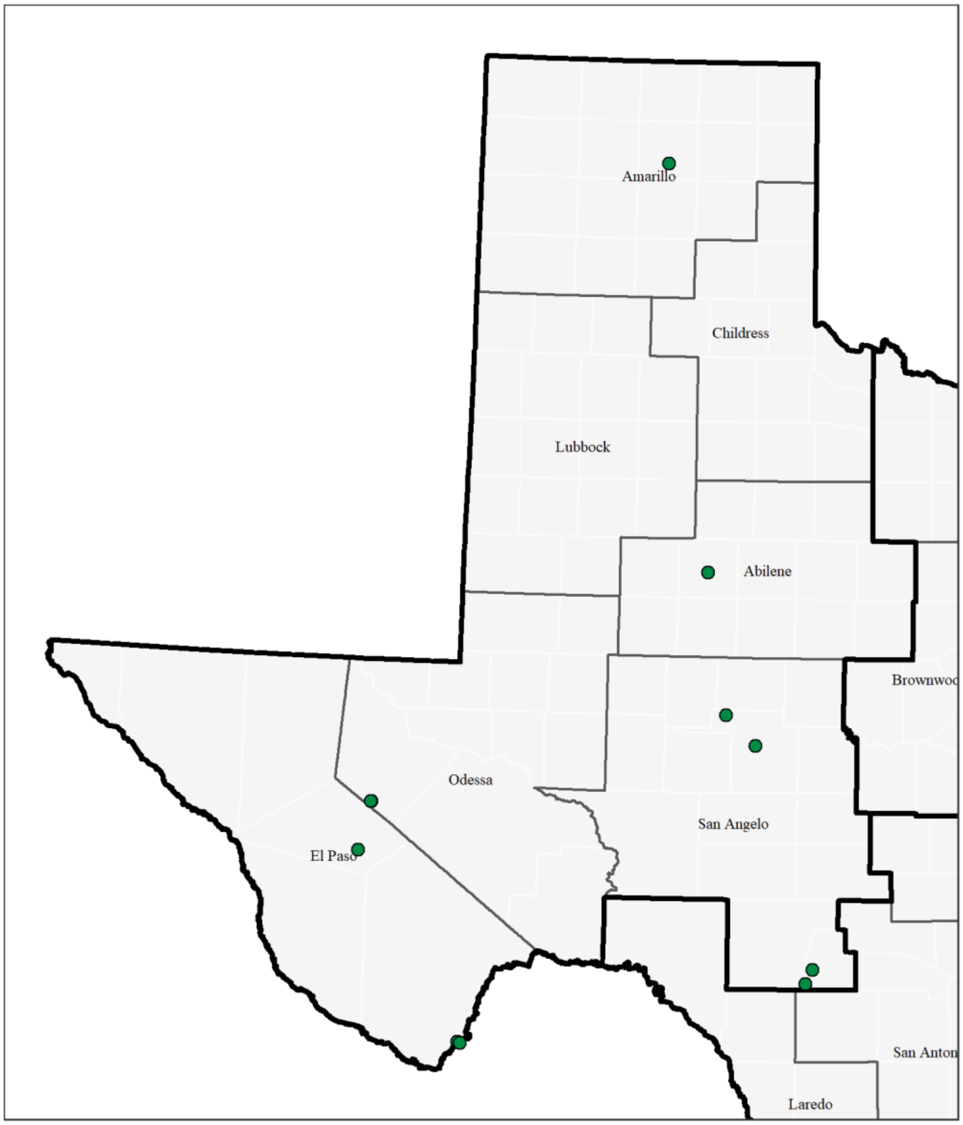
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section 1-2 3-4 5-6 7+

Apalone spinifera

Spiny Softshell

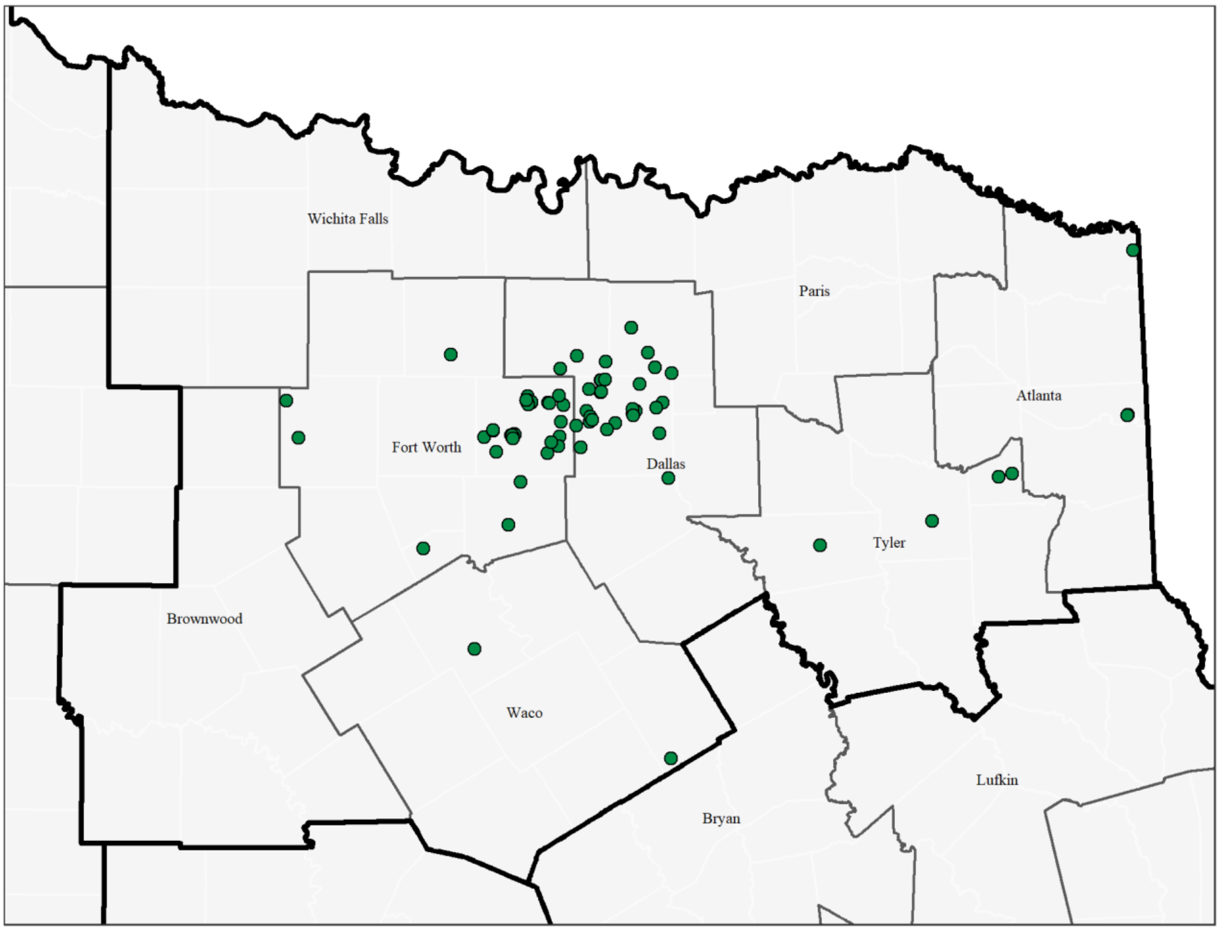


● Alive ▲ Dead

Apalone spinifera

Spiny Softshell

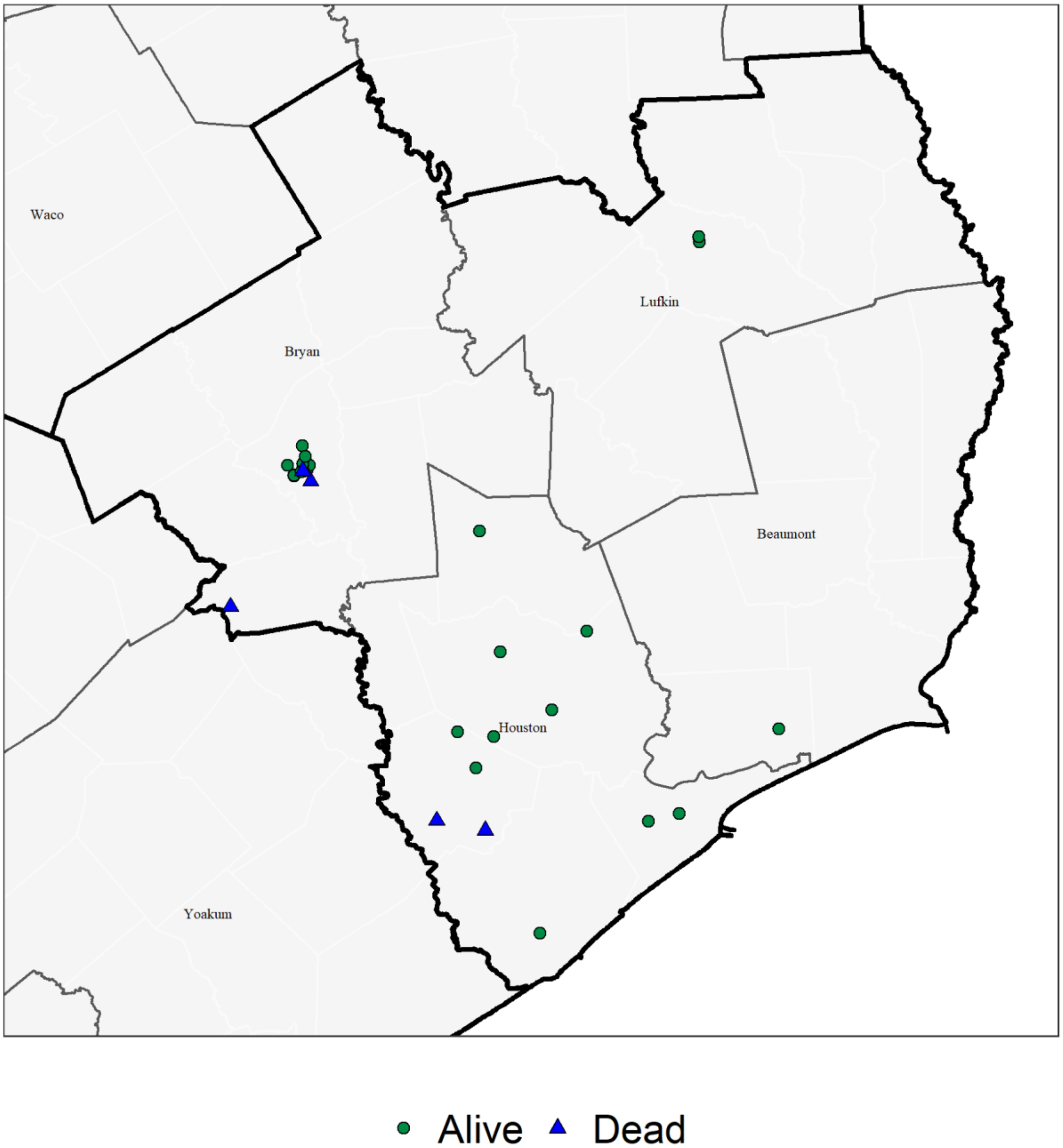
Texas A&M NRI Natural Resources Institute



● Alive ▲ Dead

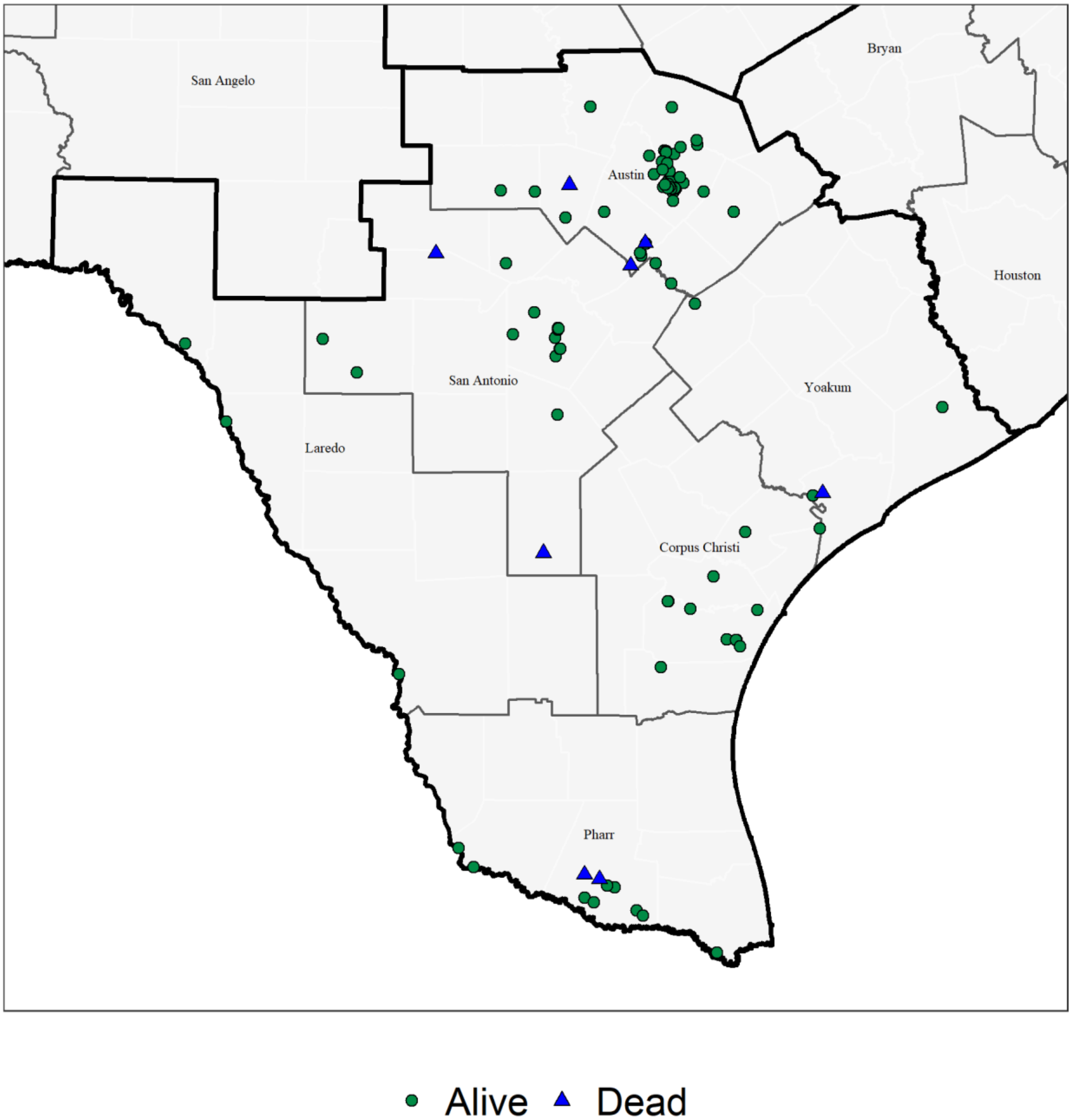
Apalone spinifera

Spiny Softshell



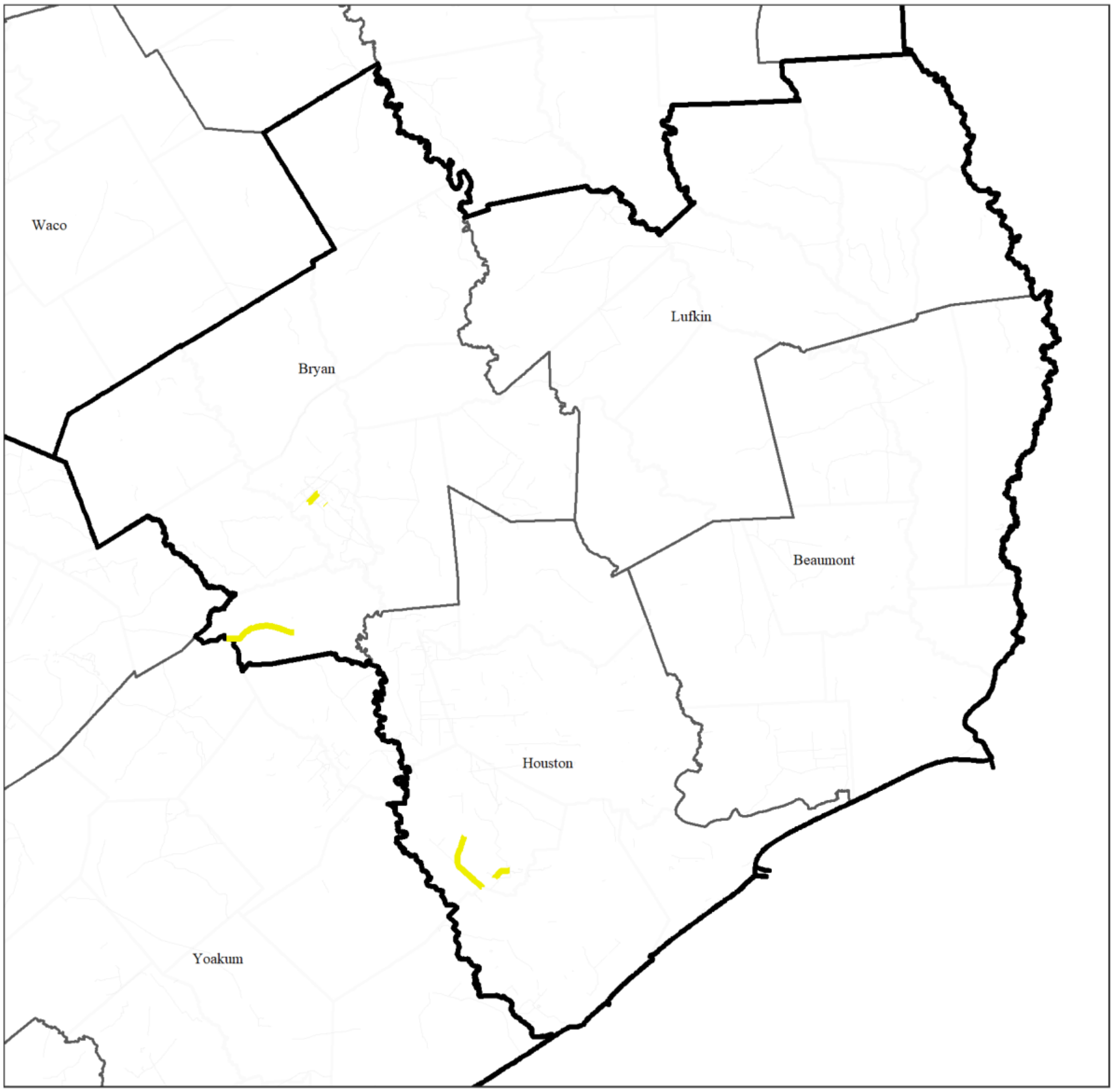
Apalone spinifera

Spiny Softshell



Apalone spinifera

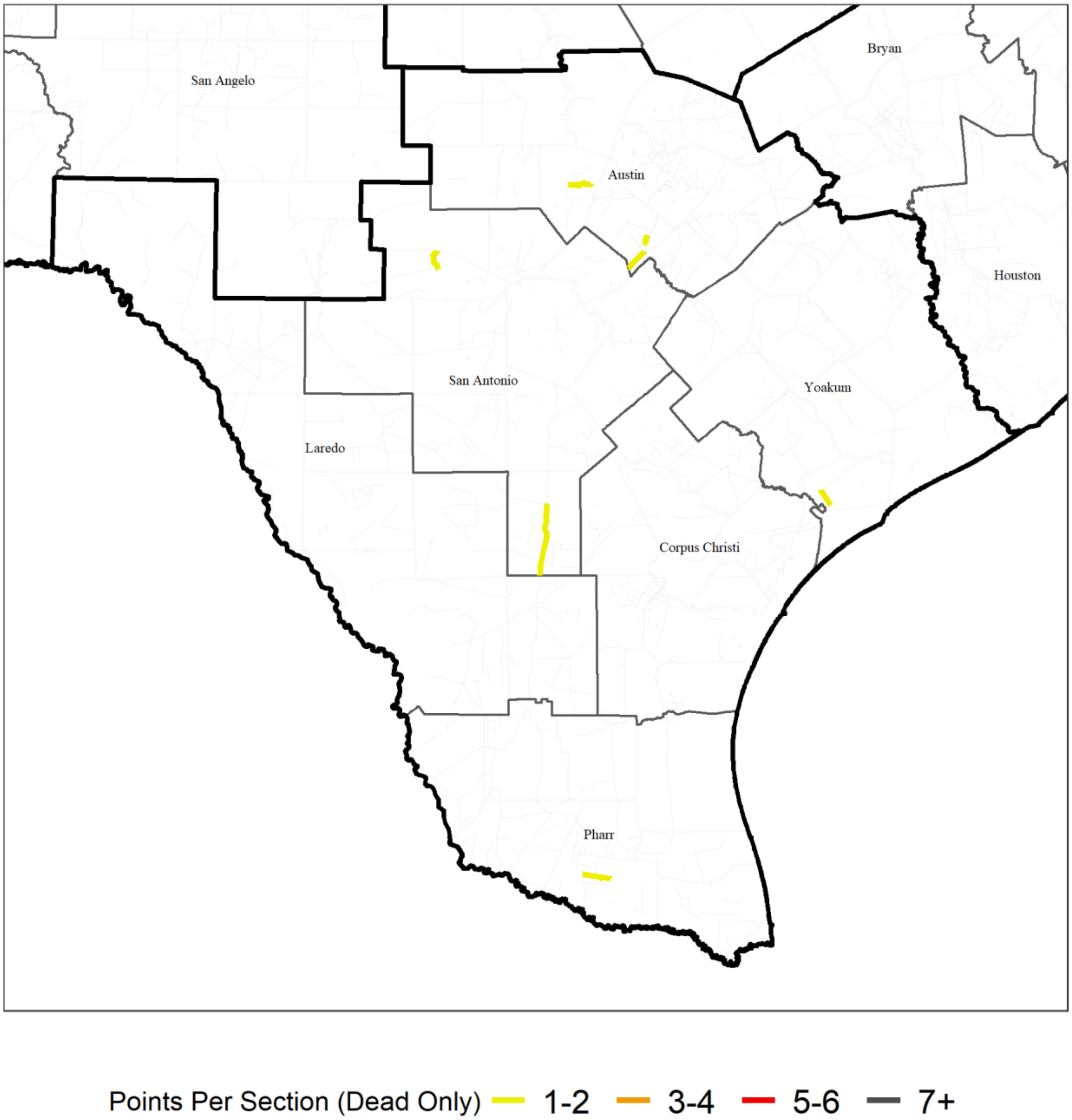
Spiny Softshell



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

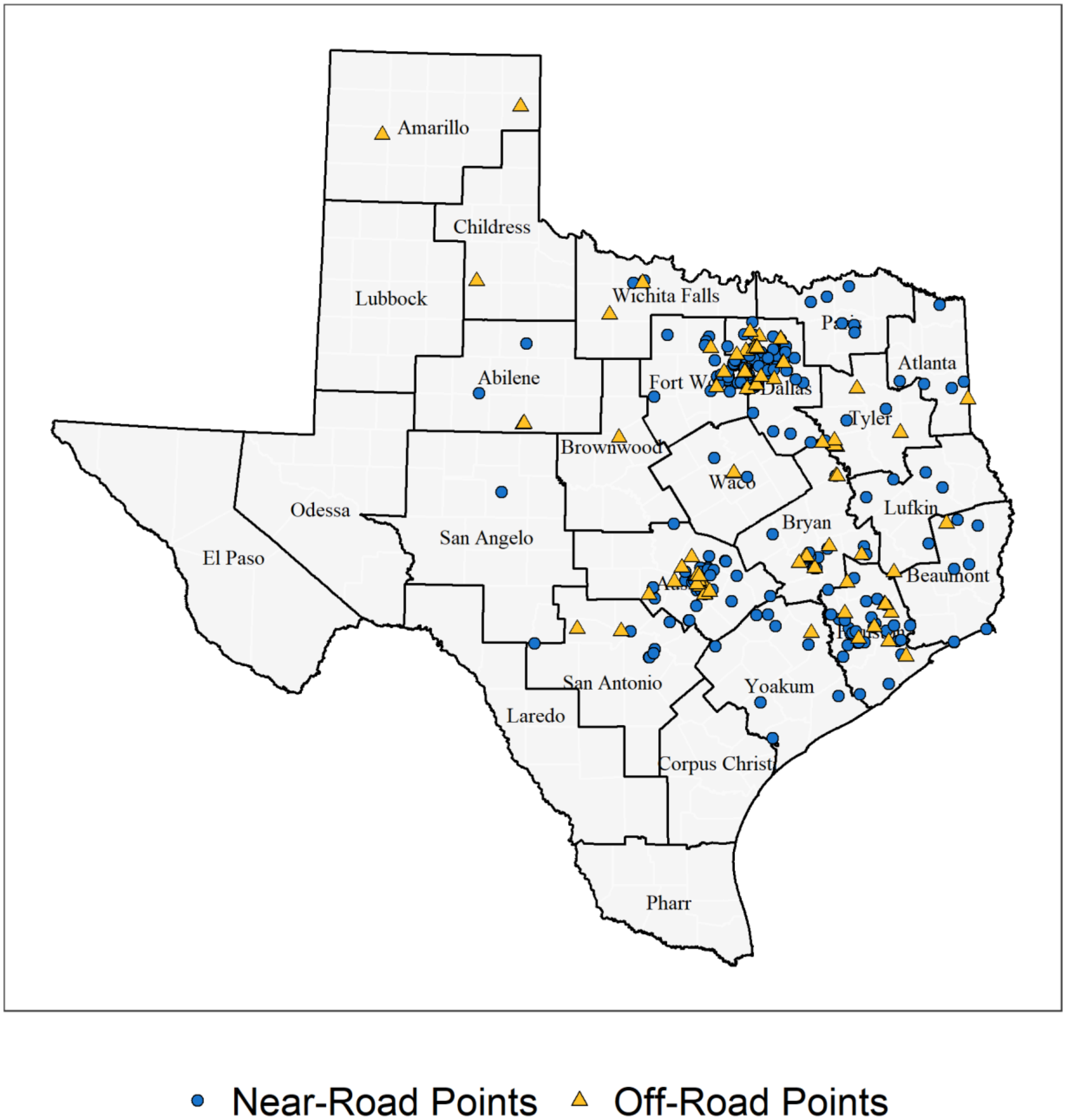
Apalone spinifera

Spiny Softshell



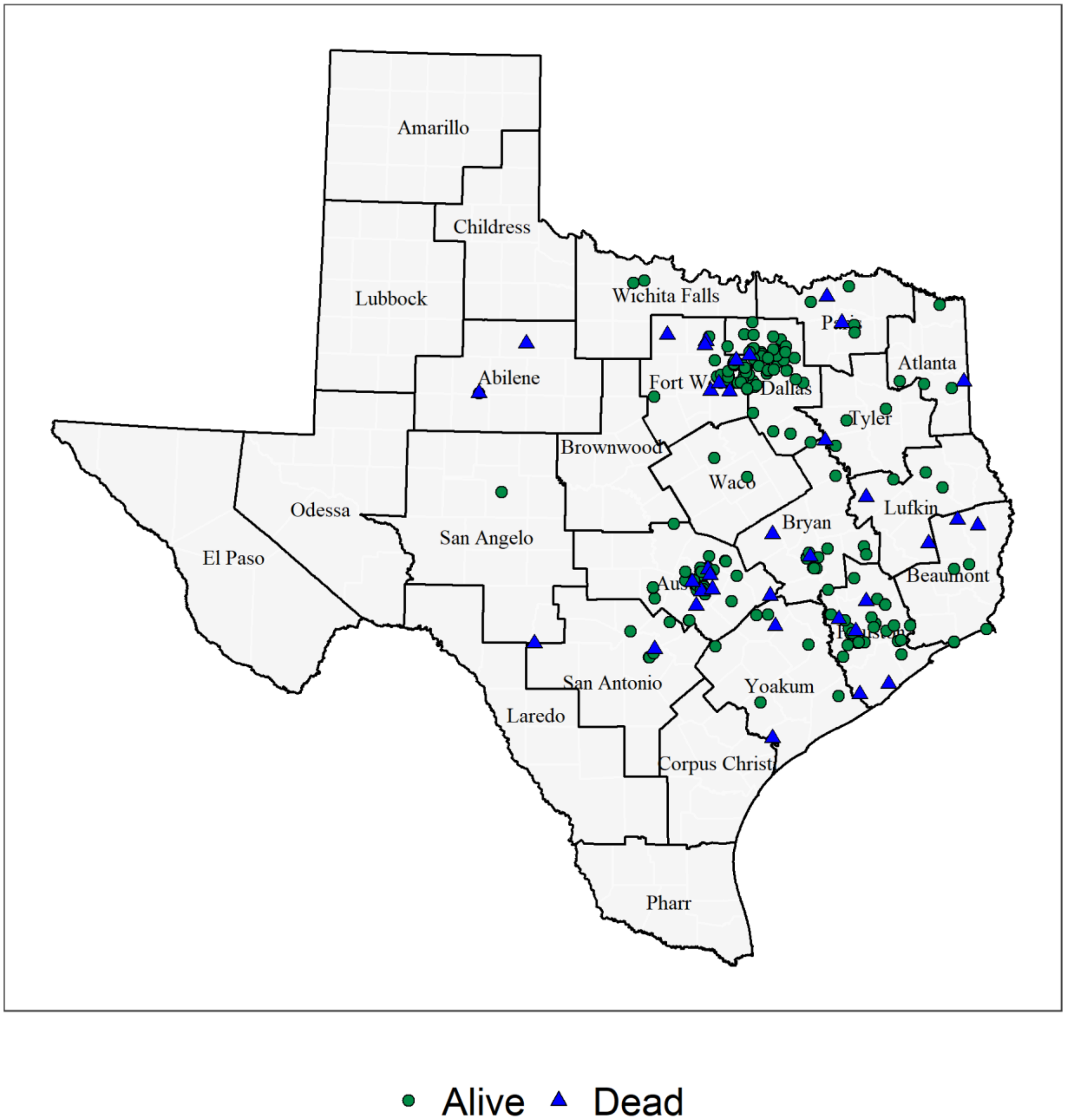
-

Chelydra serpentina
Common Snapping Turtle



Chelydra serpentina

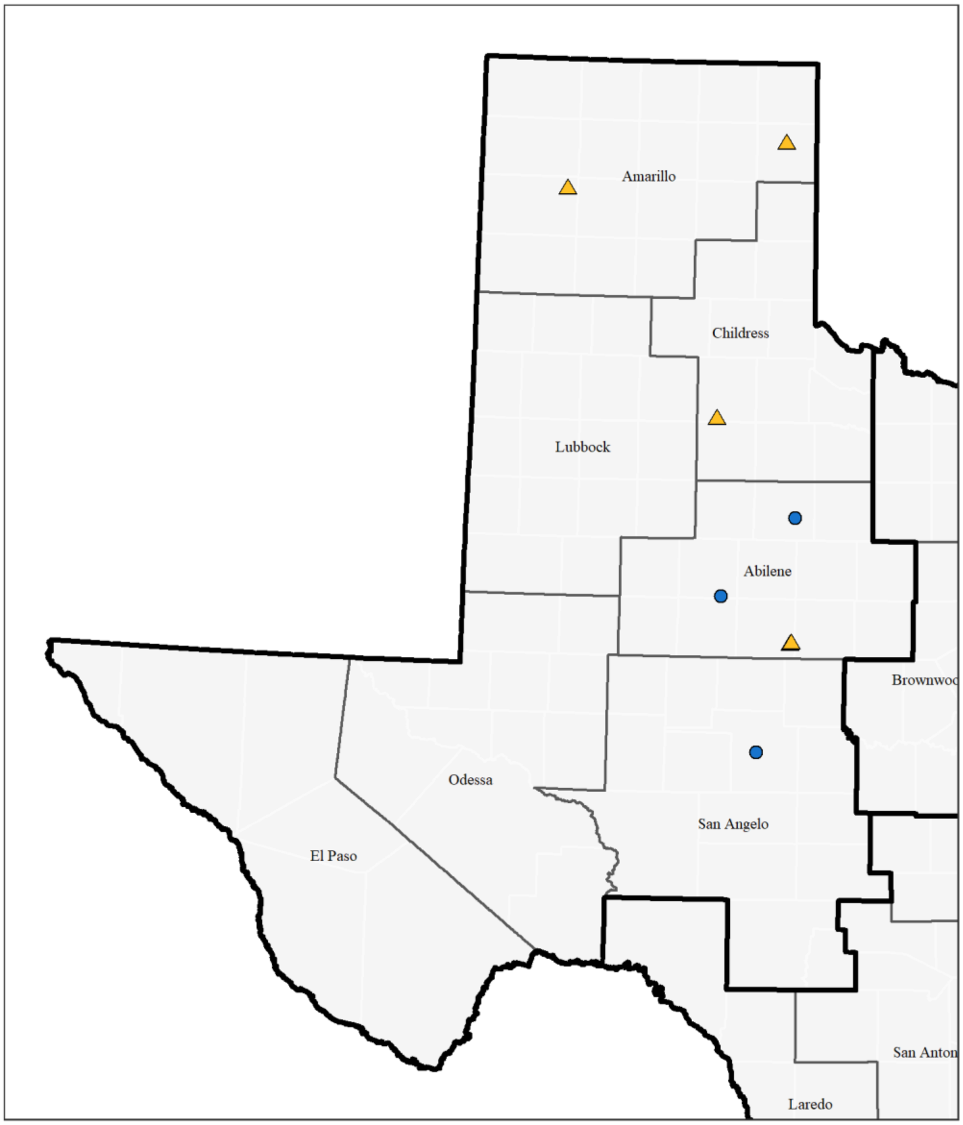
Common Snapping Turtle



Chelydra serpentina

Common Snapping Turtle

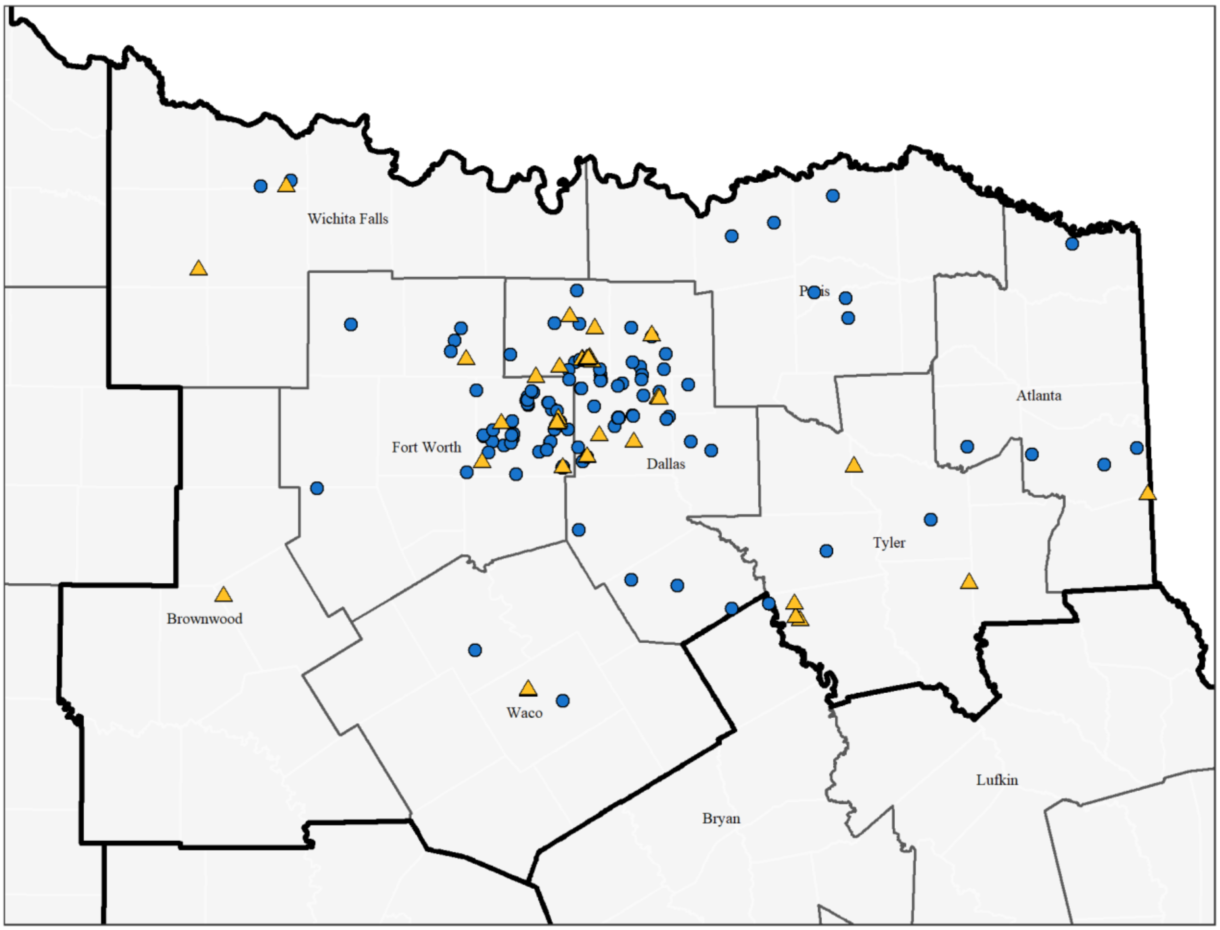
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



• Near-Road Points △ Off-Road Points

Chelydra serpentina

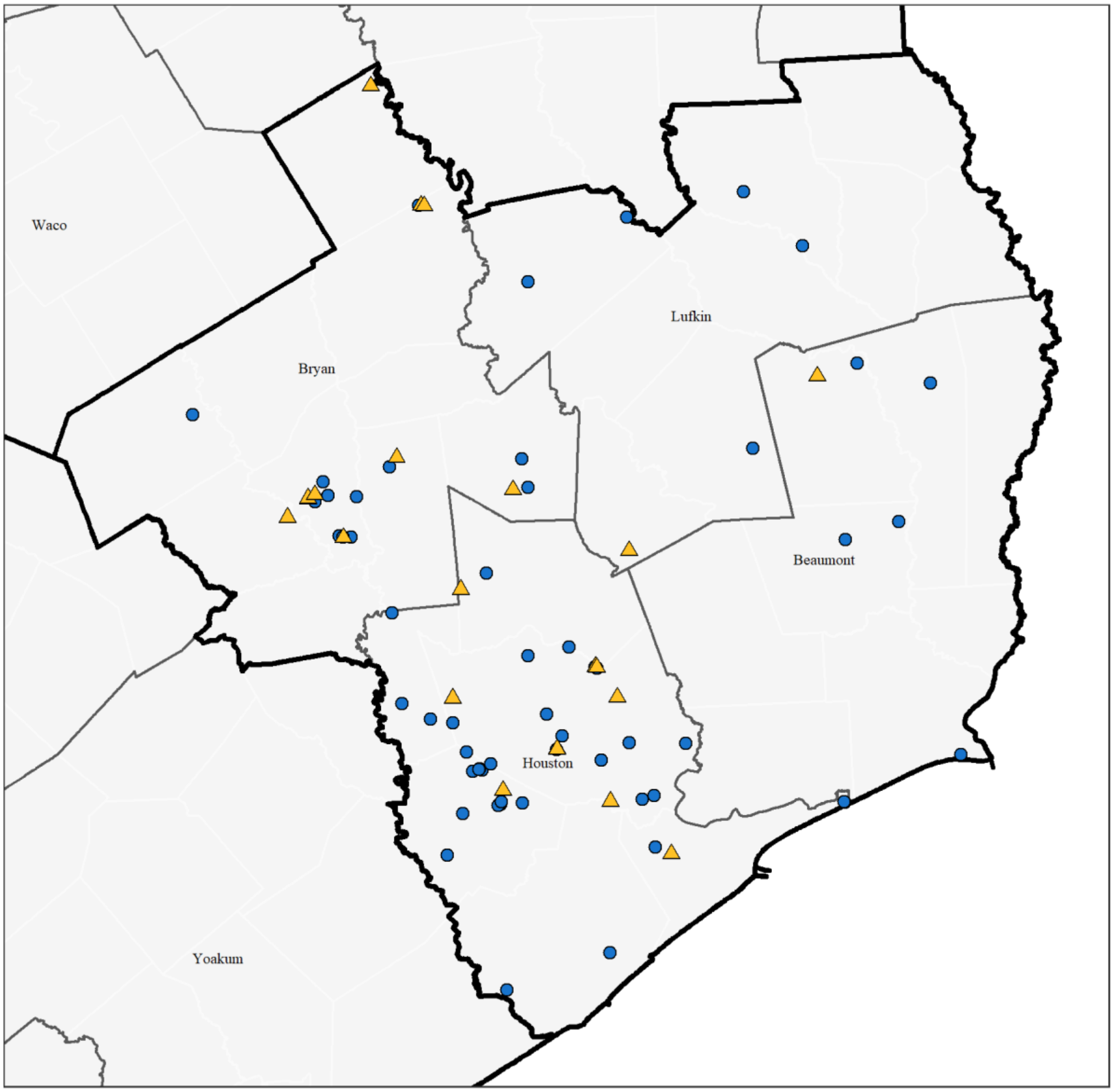
Common Snapping Turtle



Near-Road Points   Off-Road Points

Chelydra serpentina

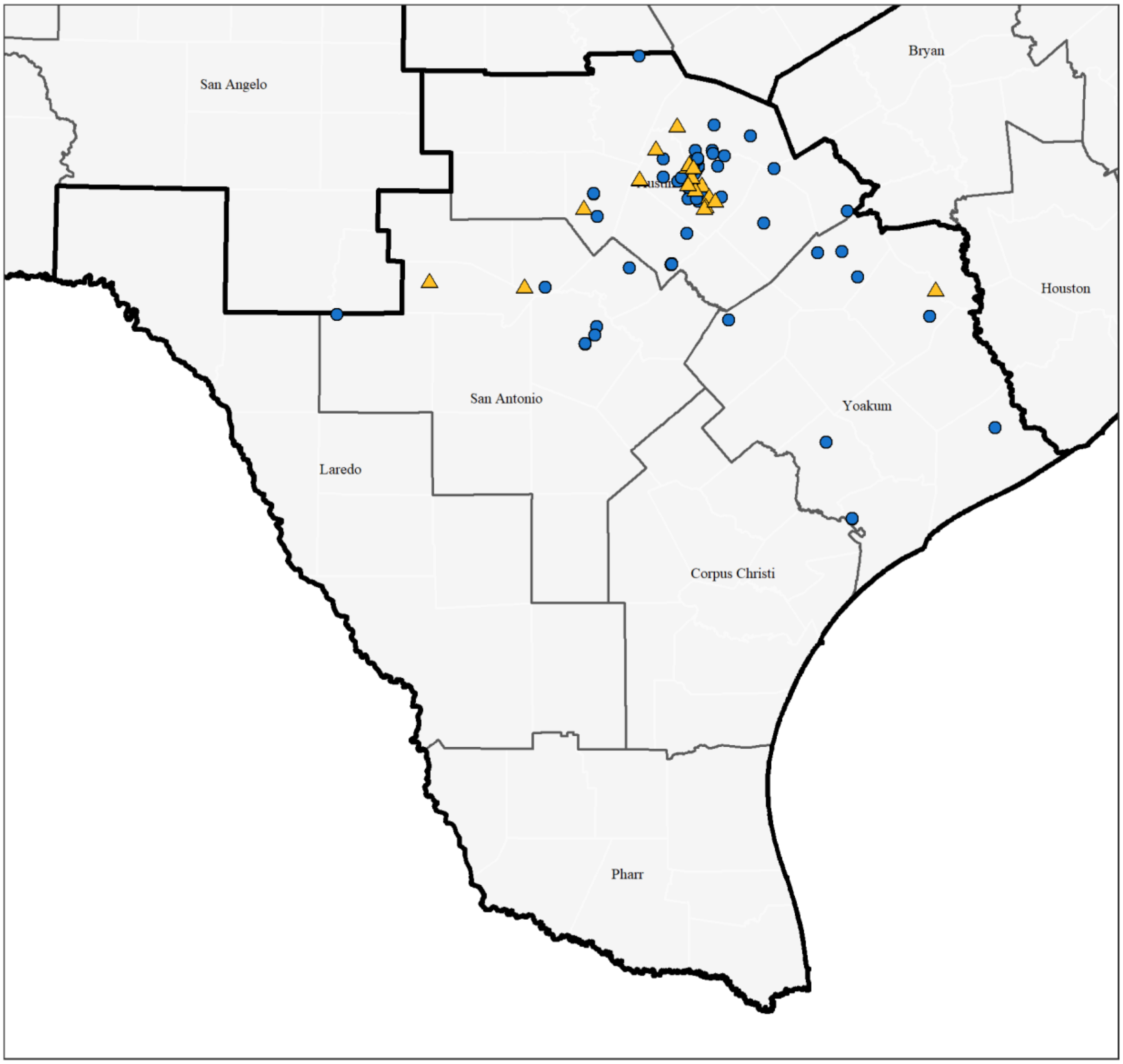
Common Snapping Turtle



● Near-Road Points ▲ Off-Road Points

Chelydra serpentina

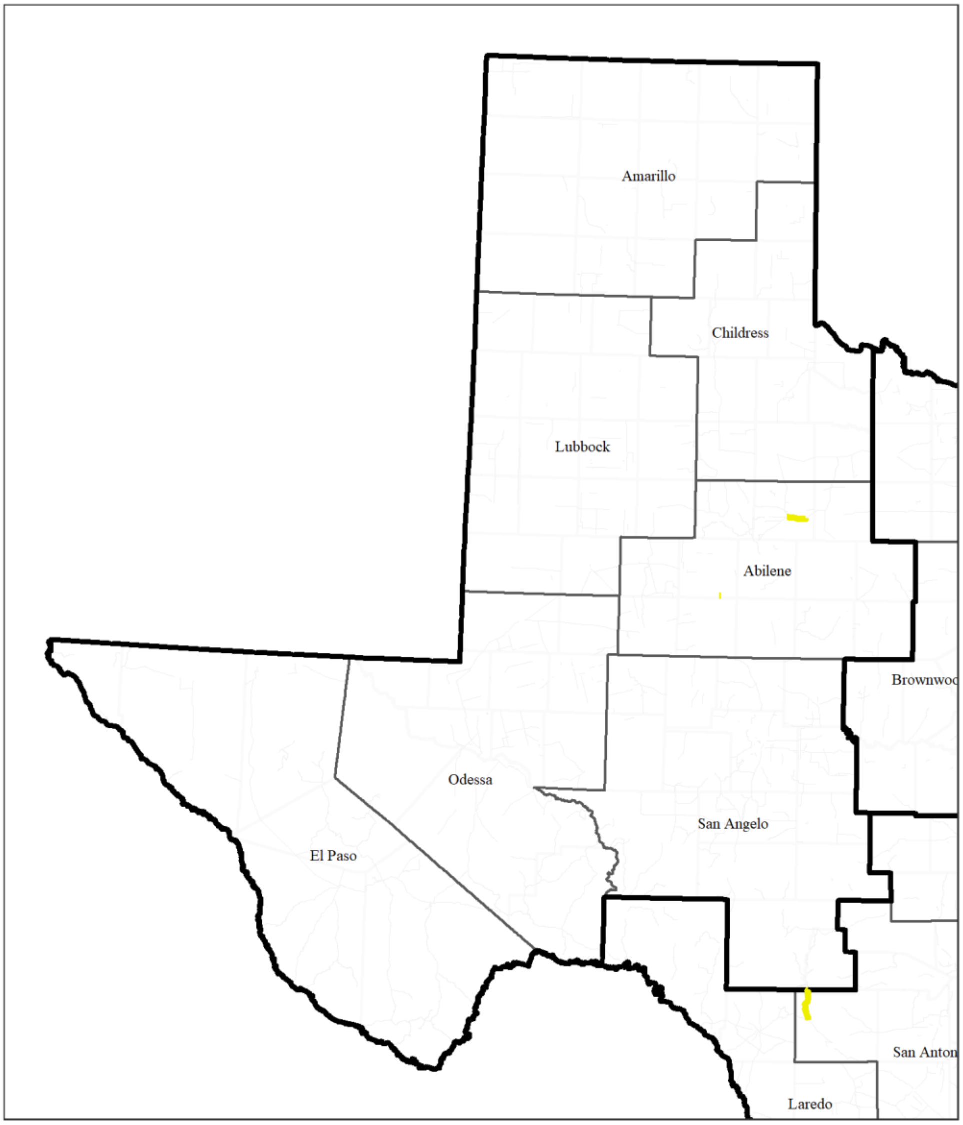
Common Snapping Turtle



• Near-Road Points △ Off-Road Points

Chelydra serpentina

Common Snapping Turtle

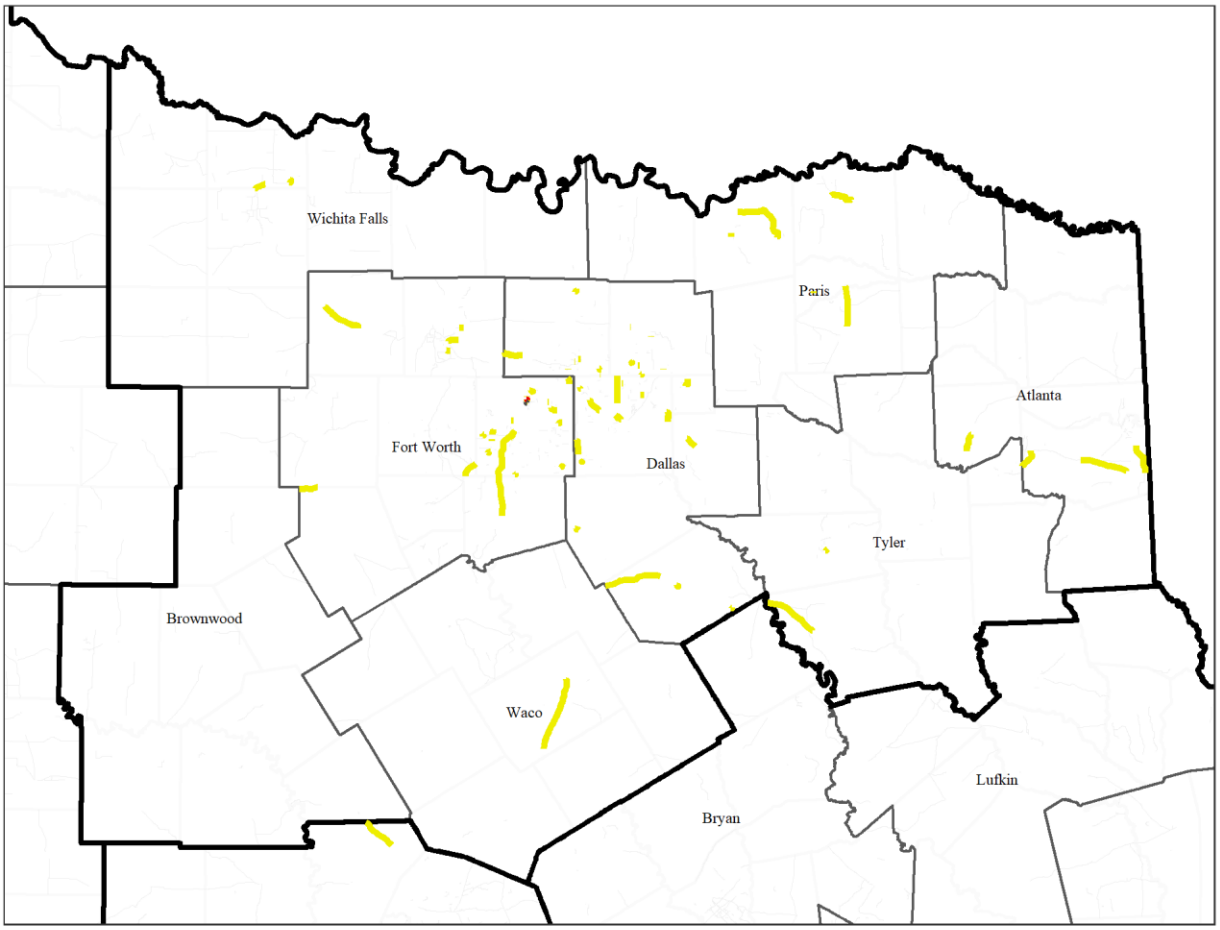


Points Per Section 1-2 3-4 5-6 7+

Chelydra serpentina

Common Snapping Turtle

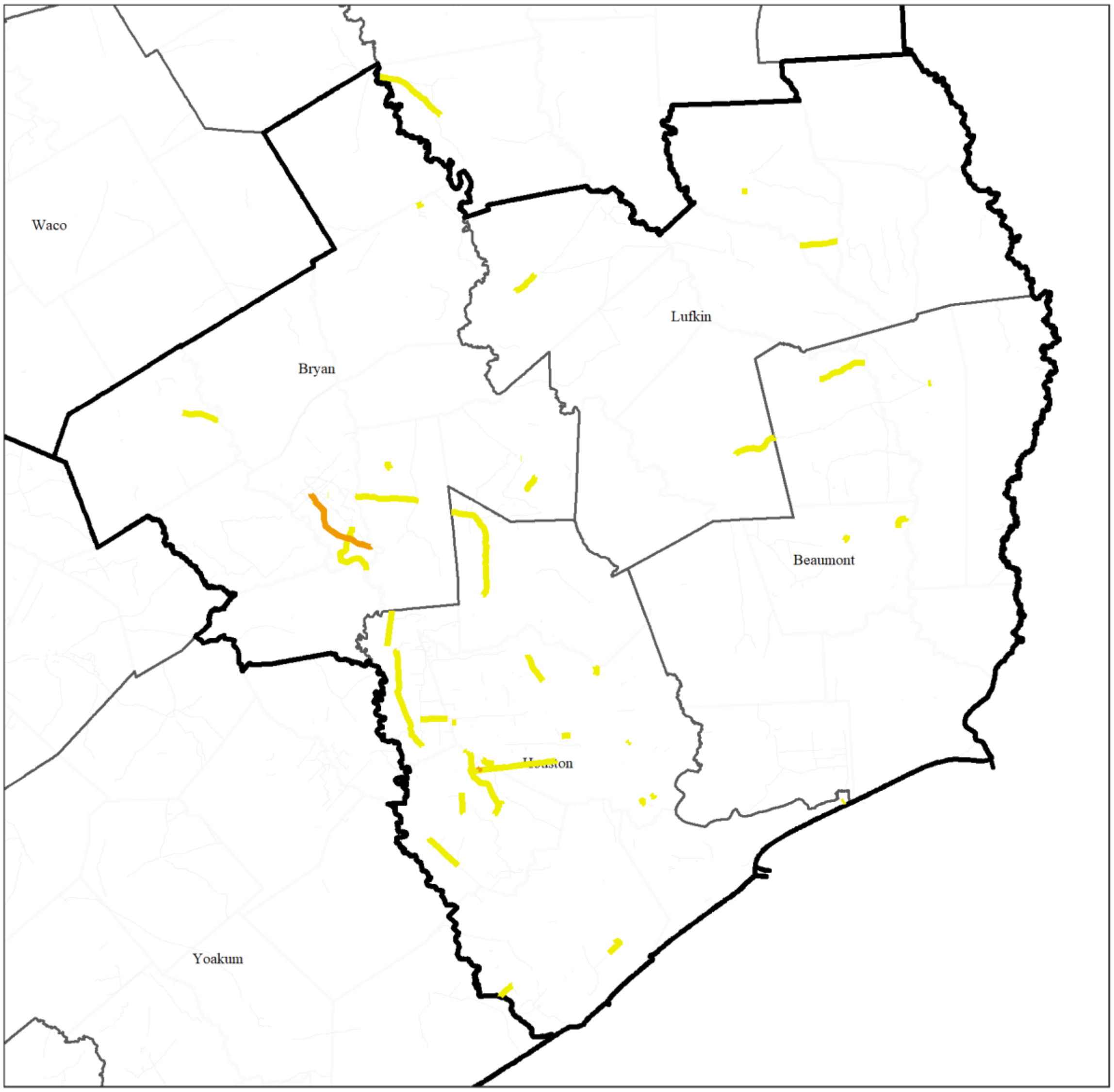
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section 1-2 3-4 5-6 7+

Chelydra serpentina

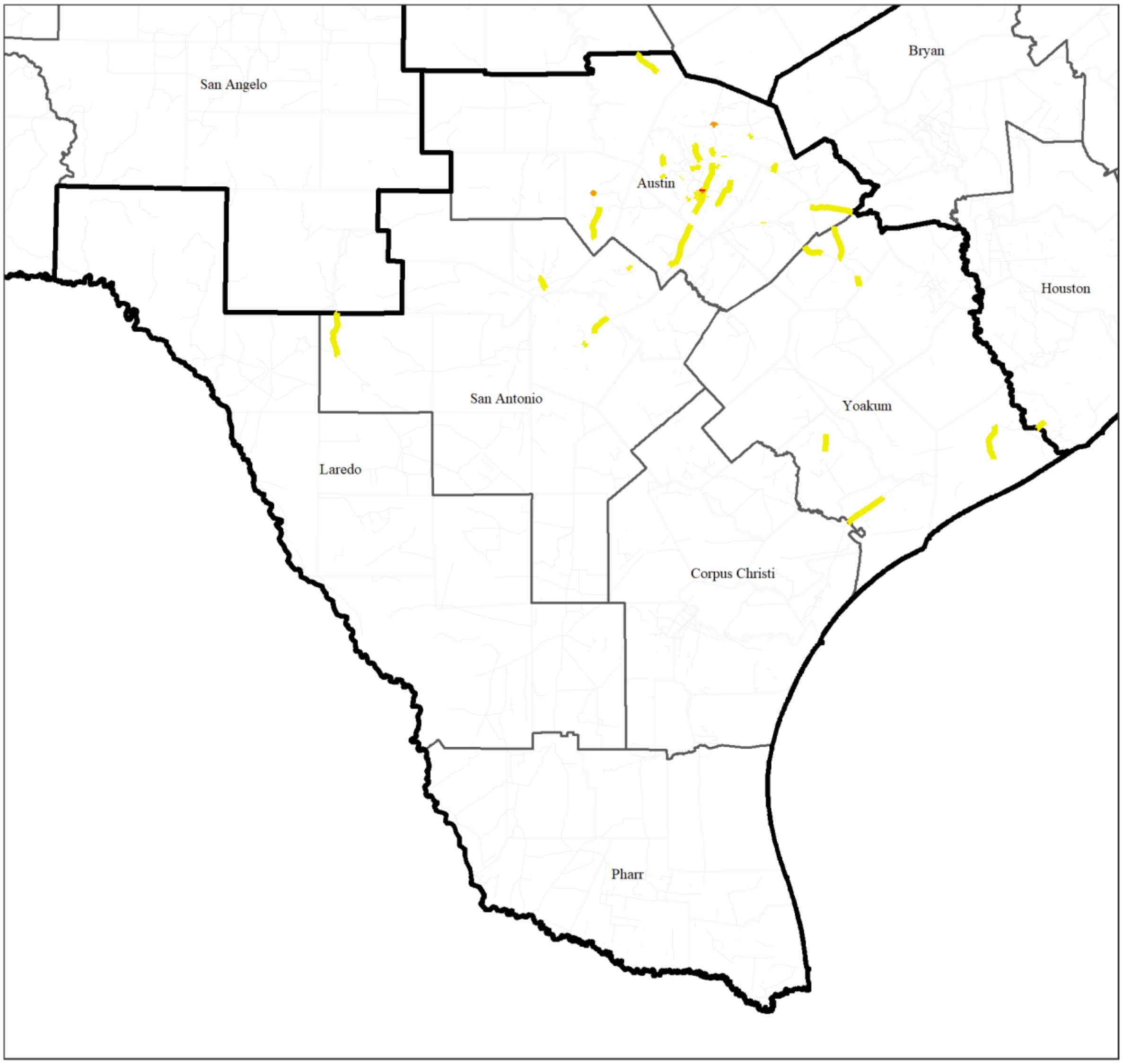
Common Snapping Turtle



Points Per Section 1-2 3-4 5-6 7+

Chelydra serpentina

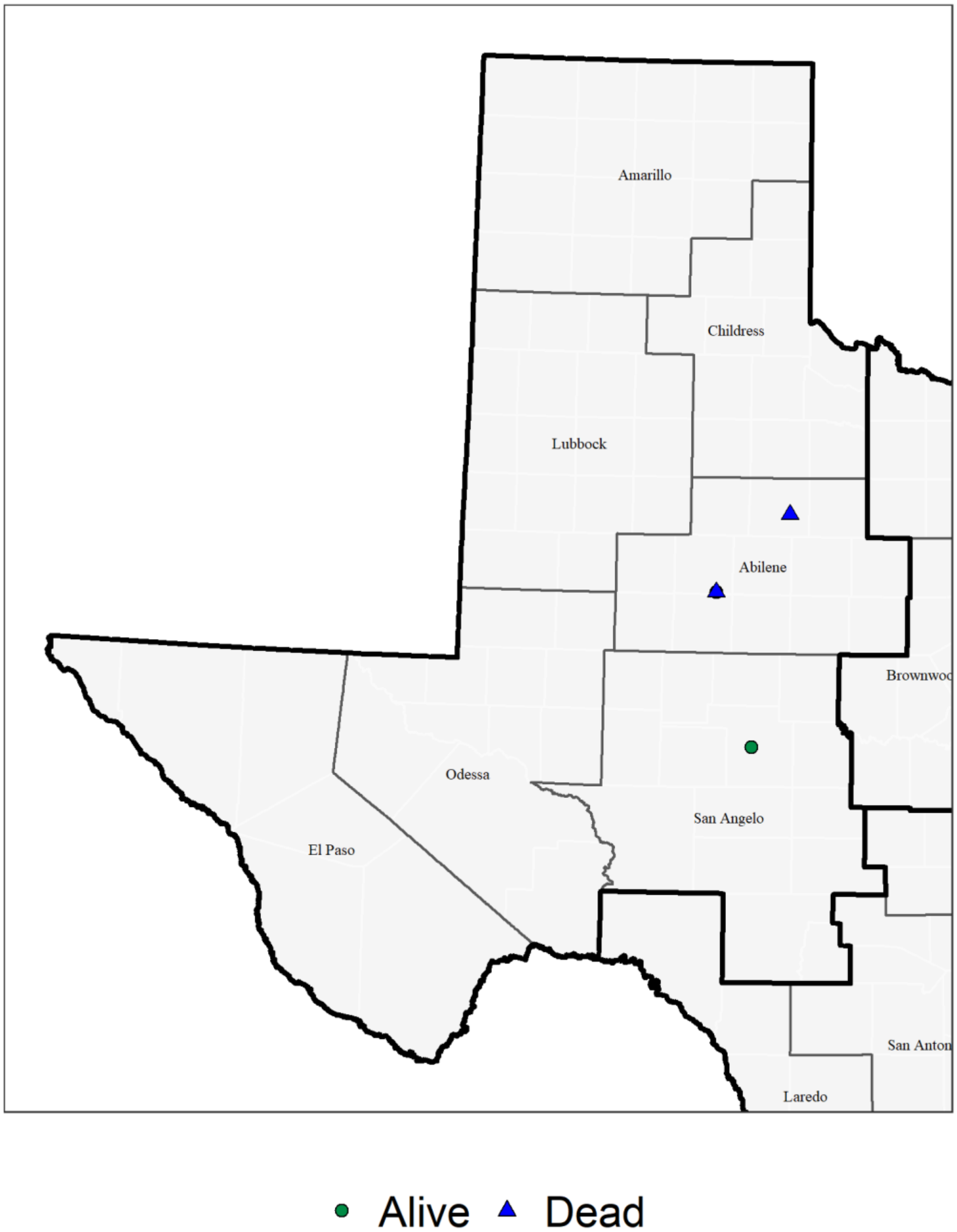
Common Snapping Turtle



Points Per Section 1-2 3-4 5-6 7+

Chelydra serpentina

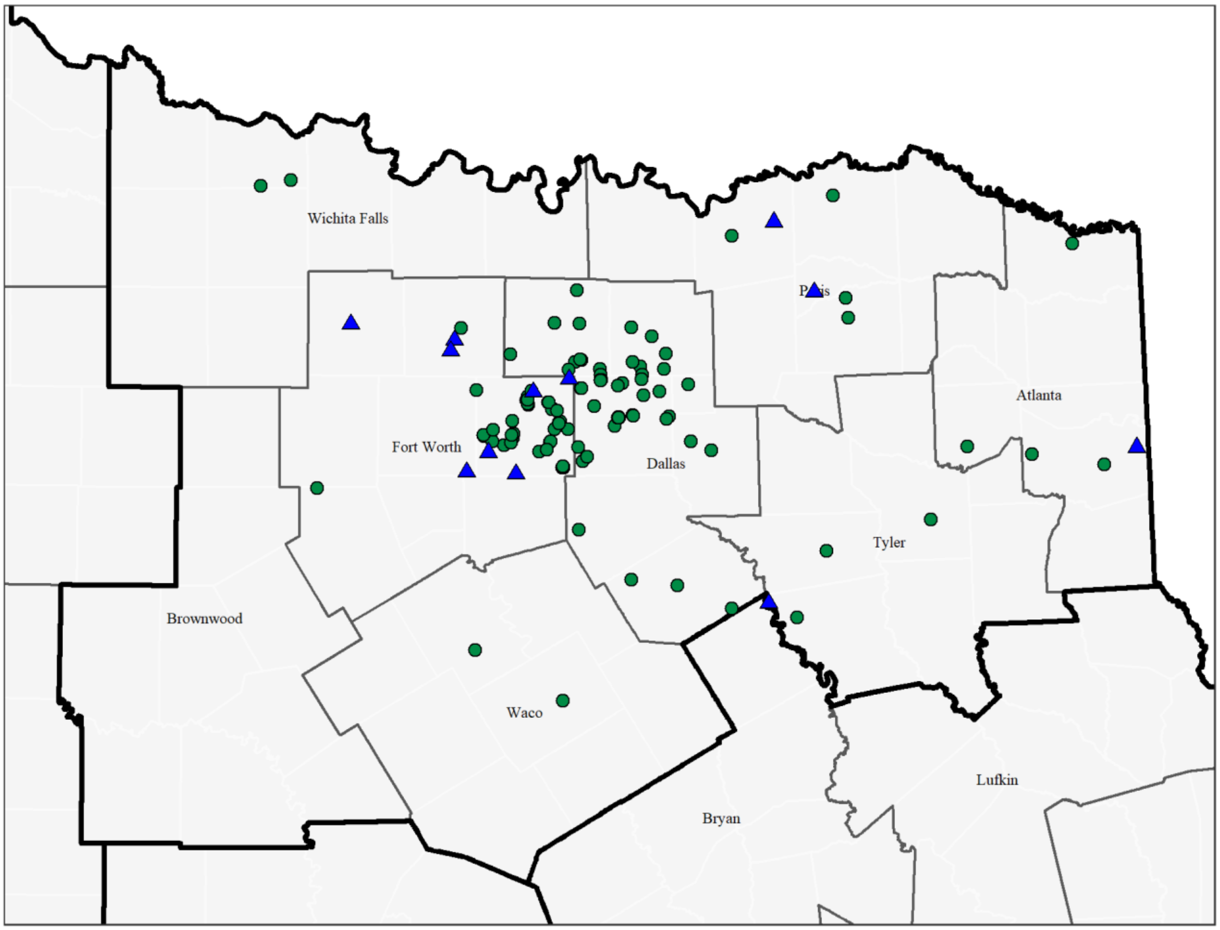
Common Snapping Turtle



Chelydra serpentina

Common Snapping Turtle

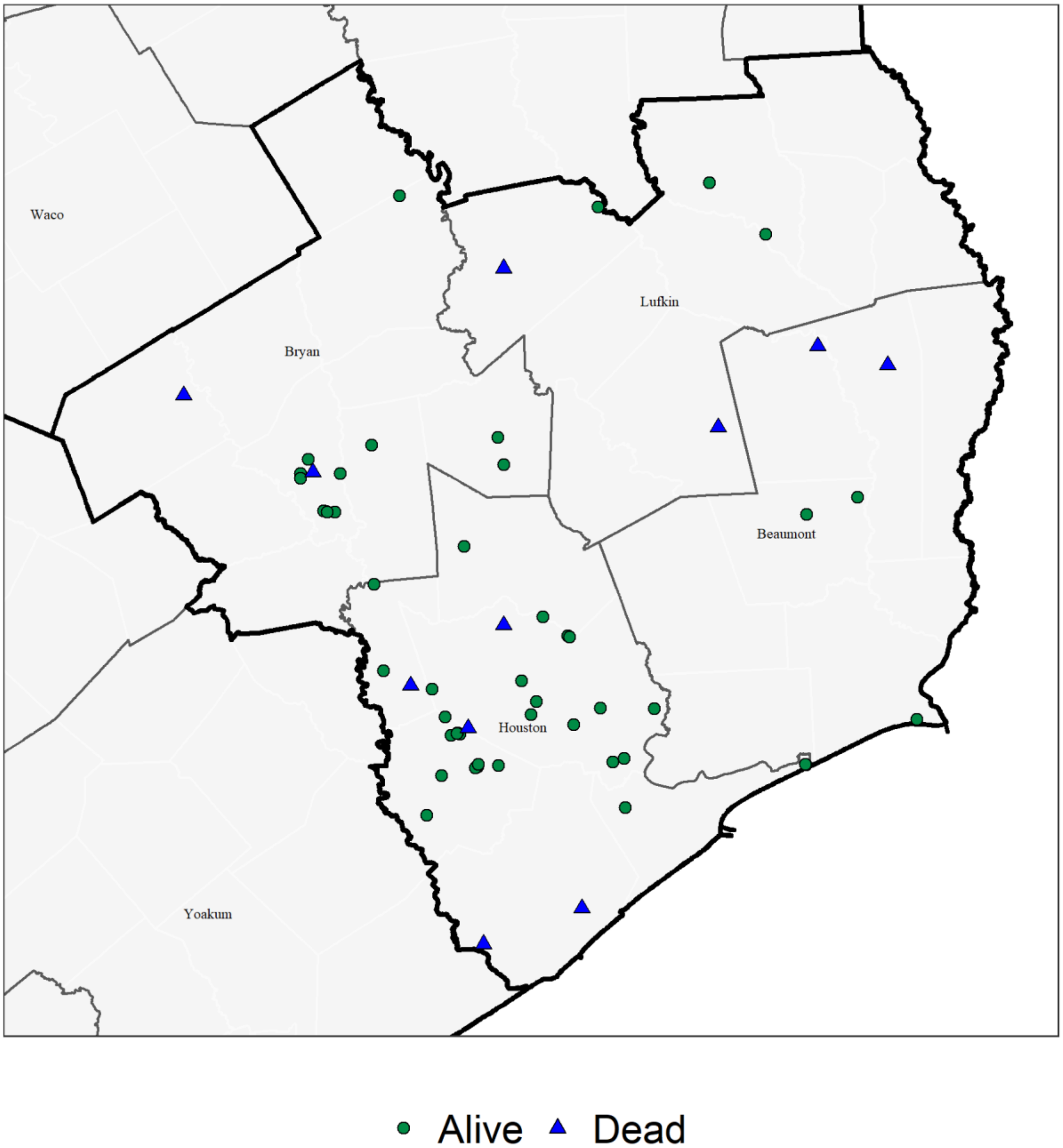
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Alive Dead

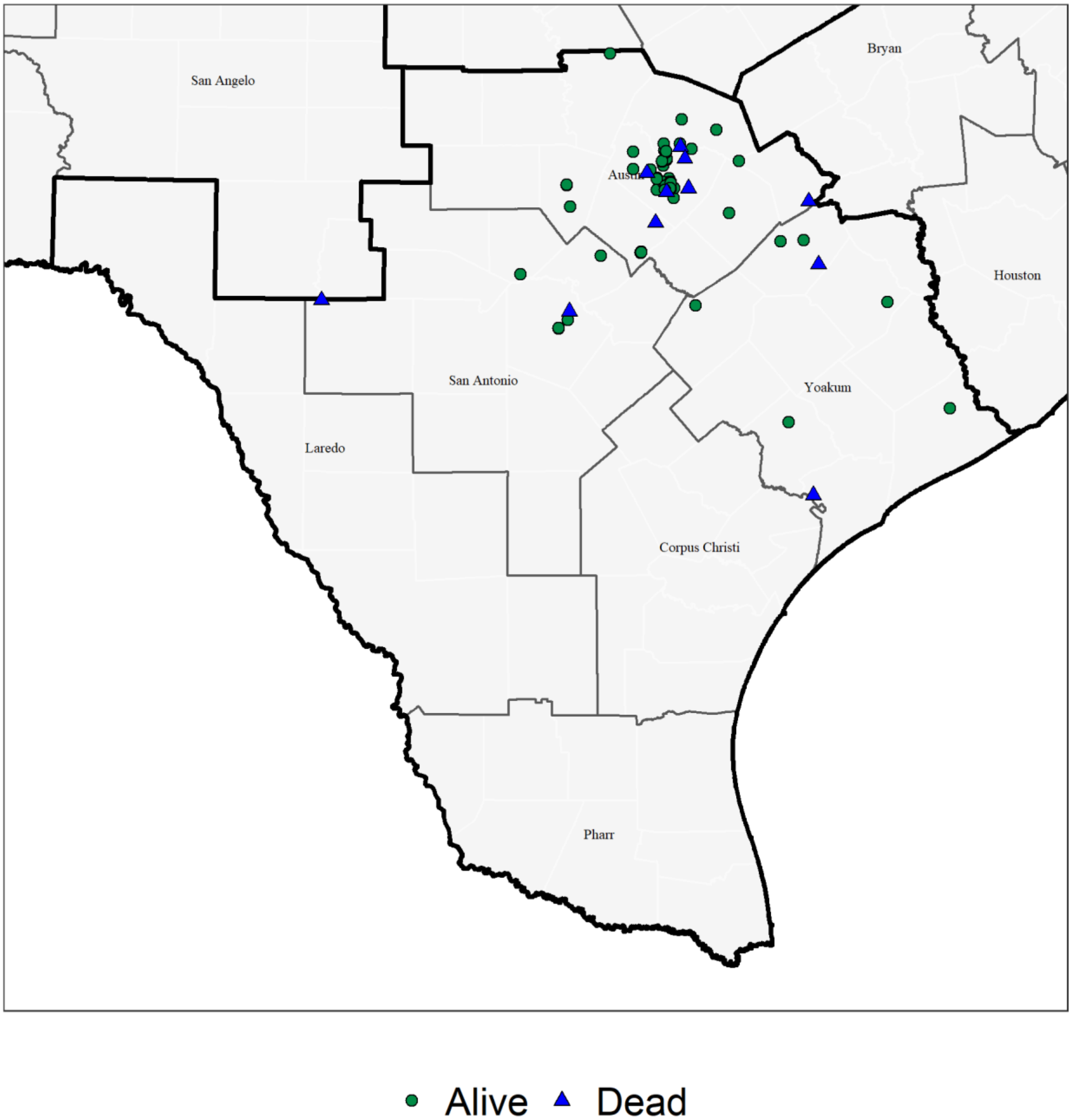
Chelydra serpentina

Common Snapping Turtle



Chelydra serpentina

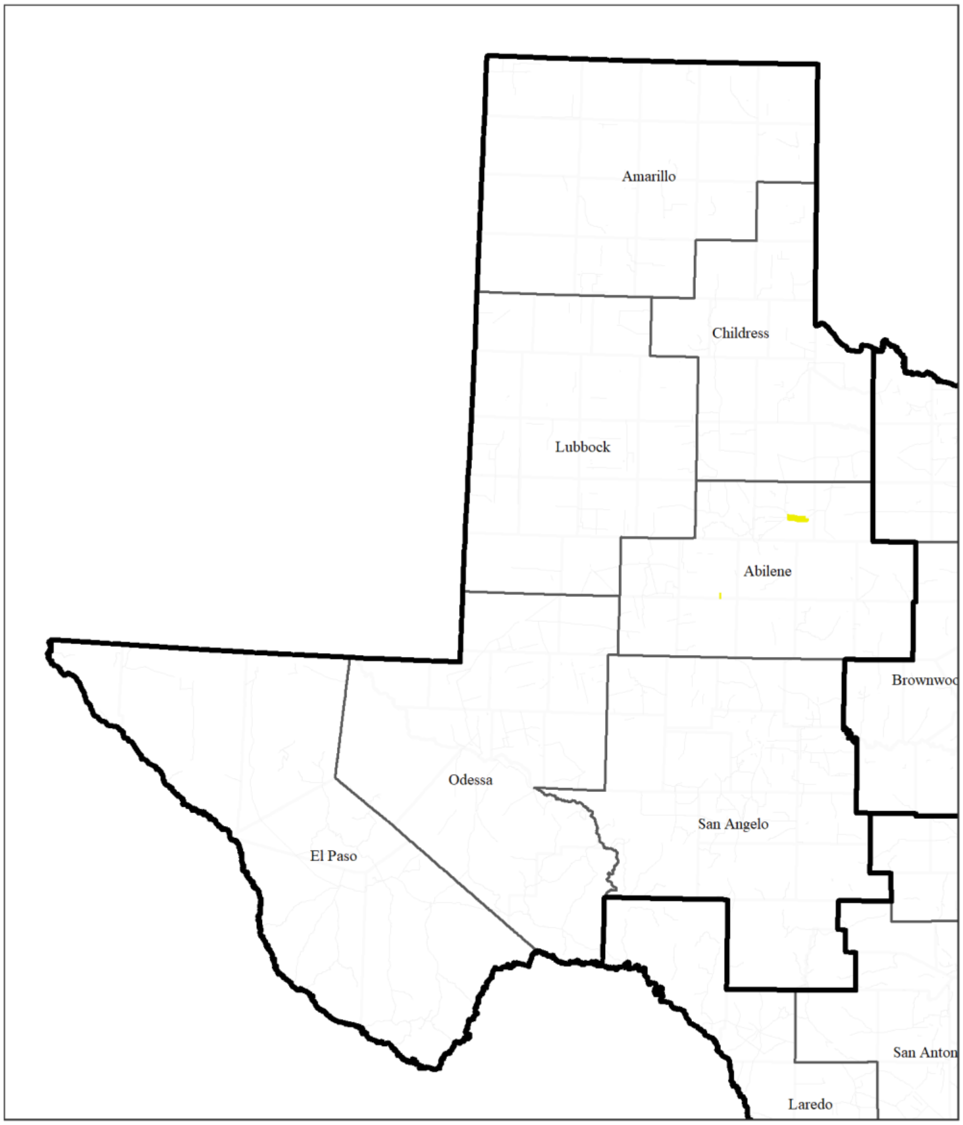
Common Snapping Turtle



Chelydra serpentina

Common Snapping Turtle

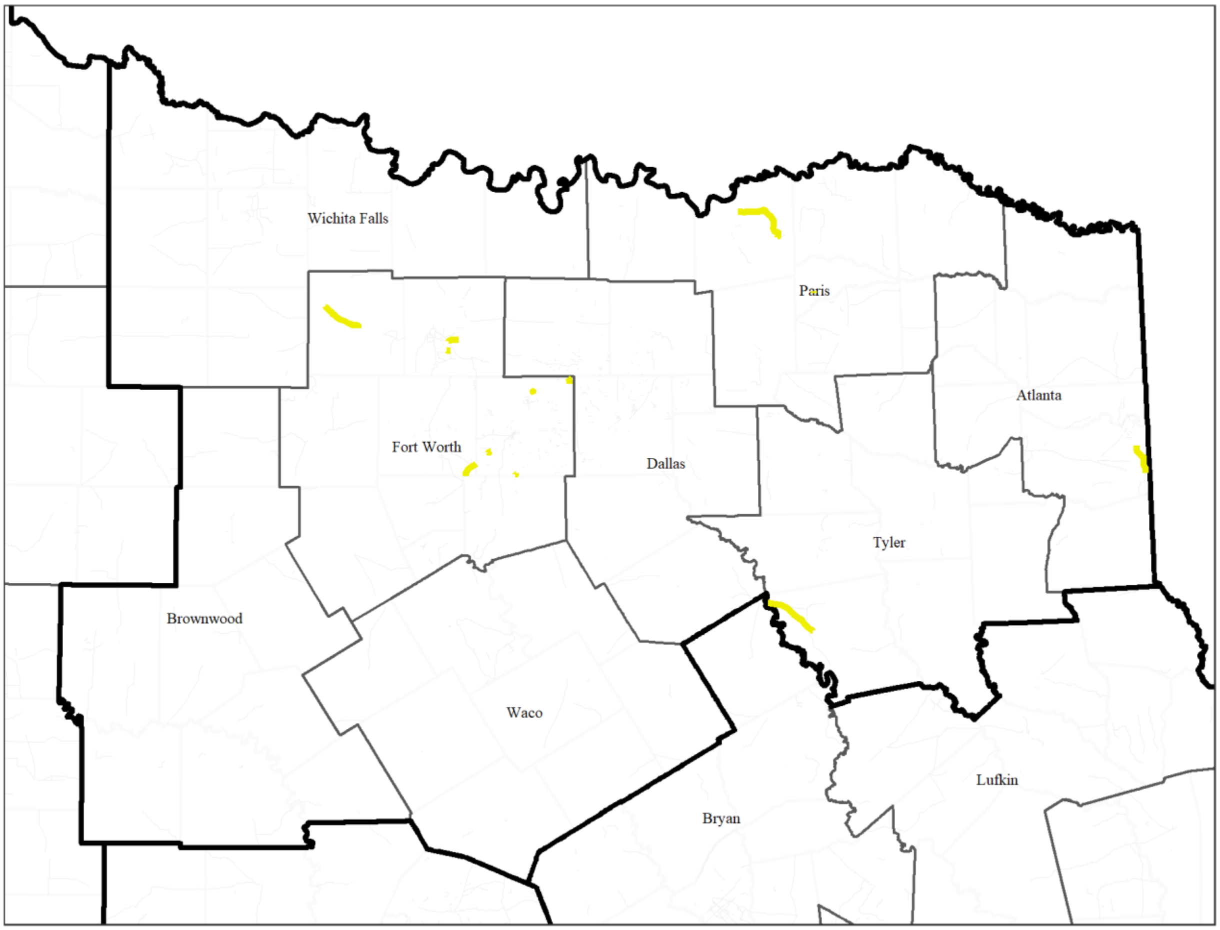
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Chelydra serpentina

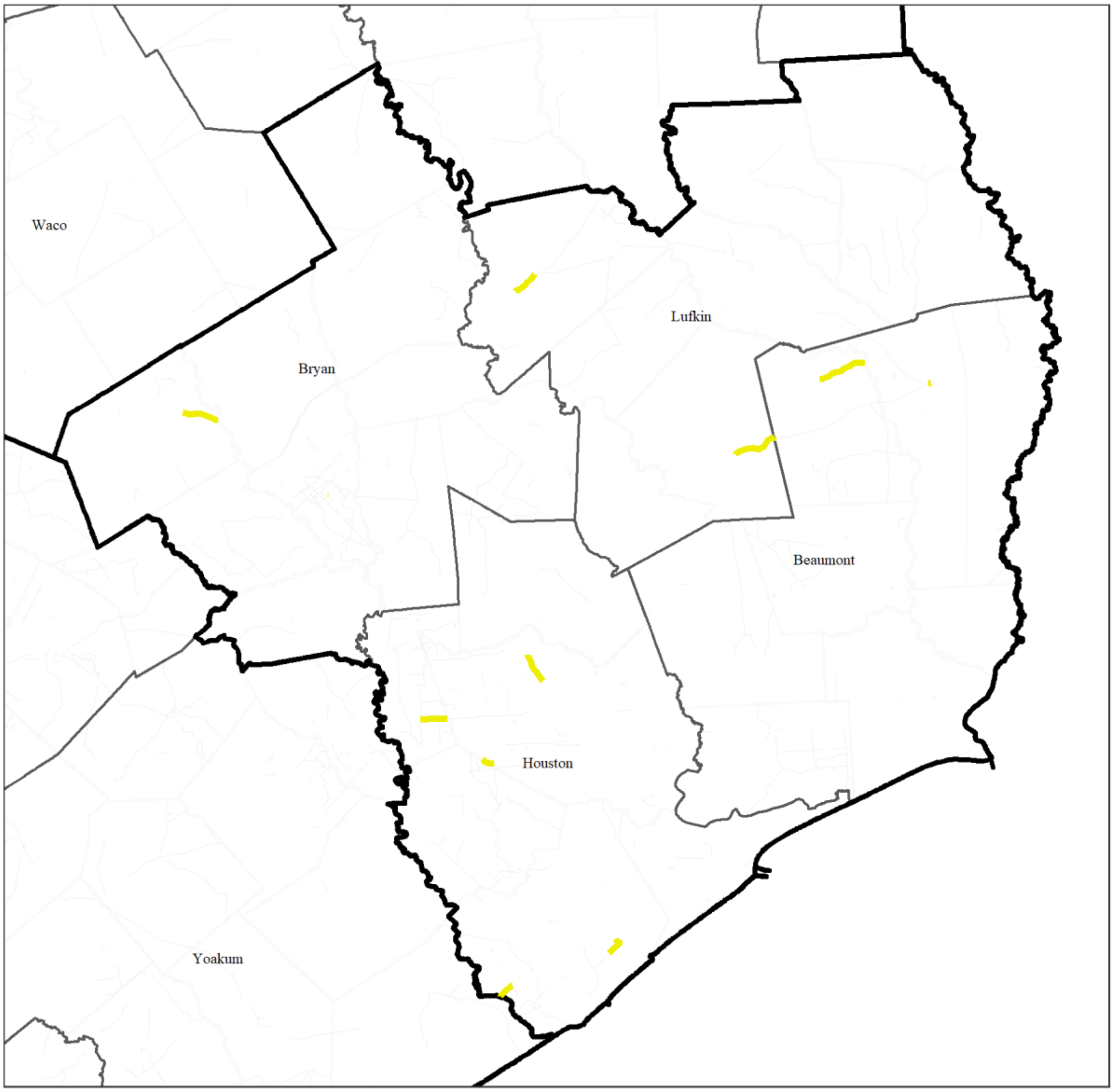
Common Snapping Turtle



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Chelydra serpentina

Common Snapping Turtle

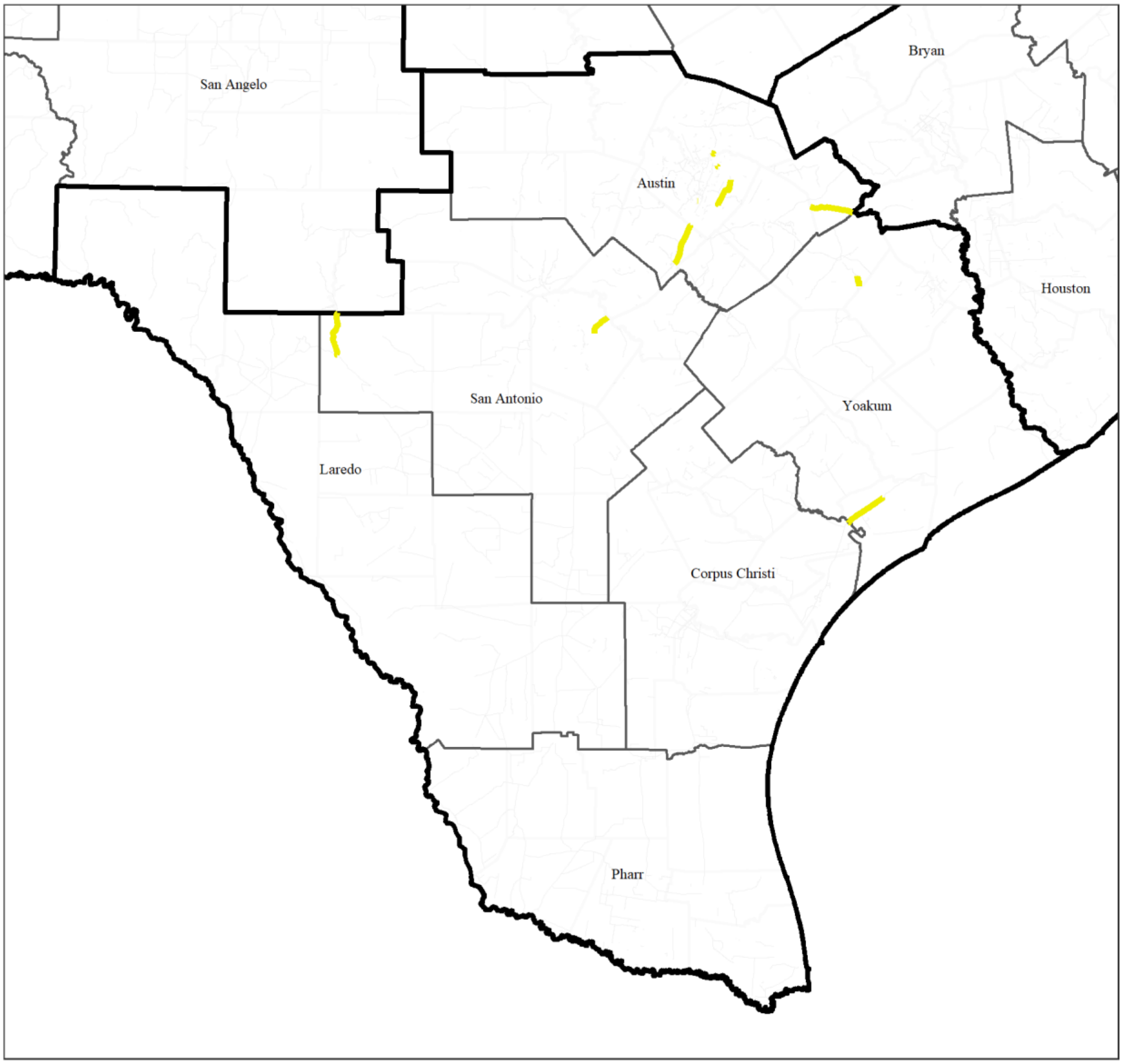


Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Chelydra serpentina

Common Snapping Turtle

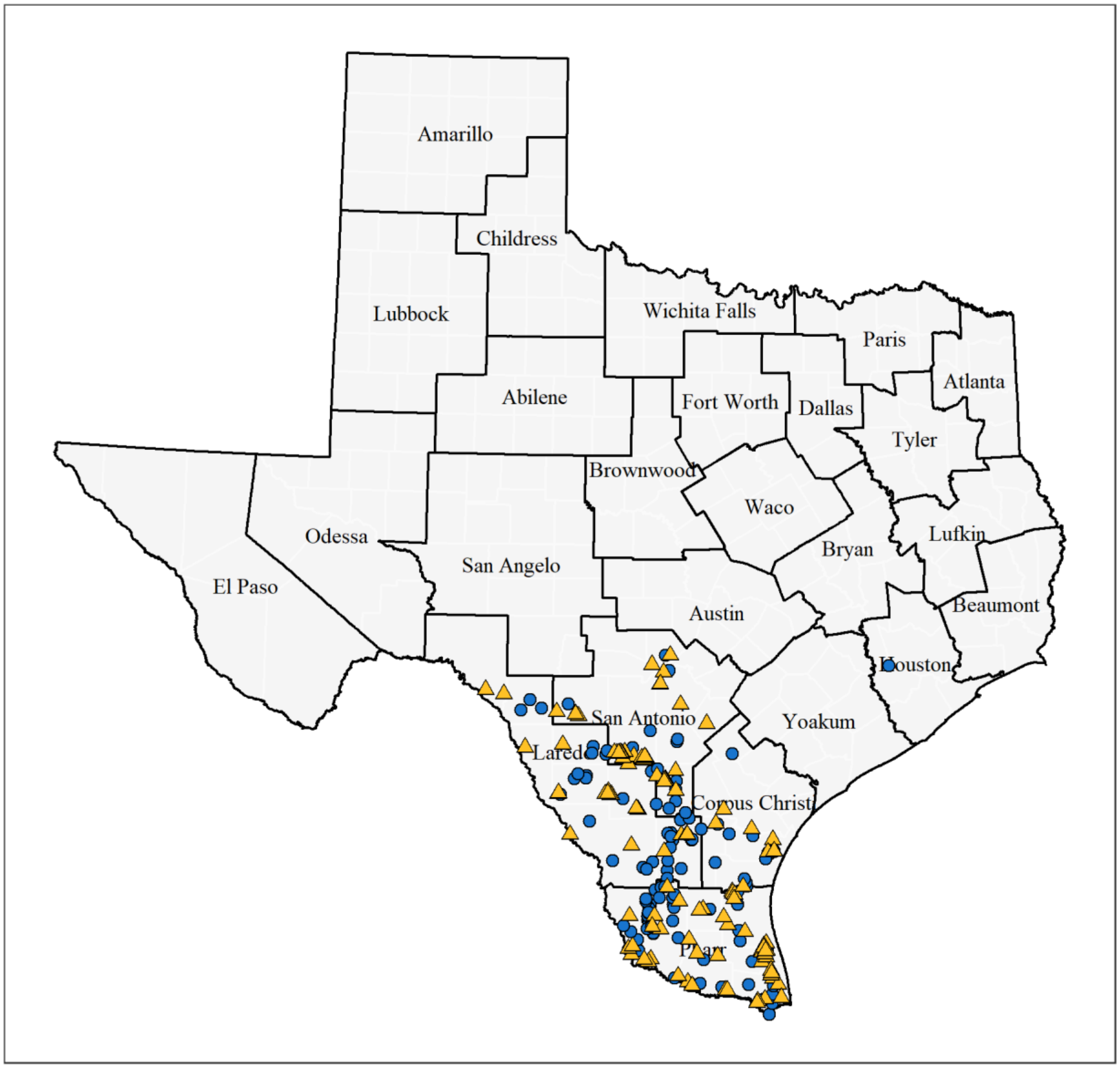
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section (Dead Only) — 1-2 — 3-4 — 5-6 — 7+

Gopherus berlandieri

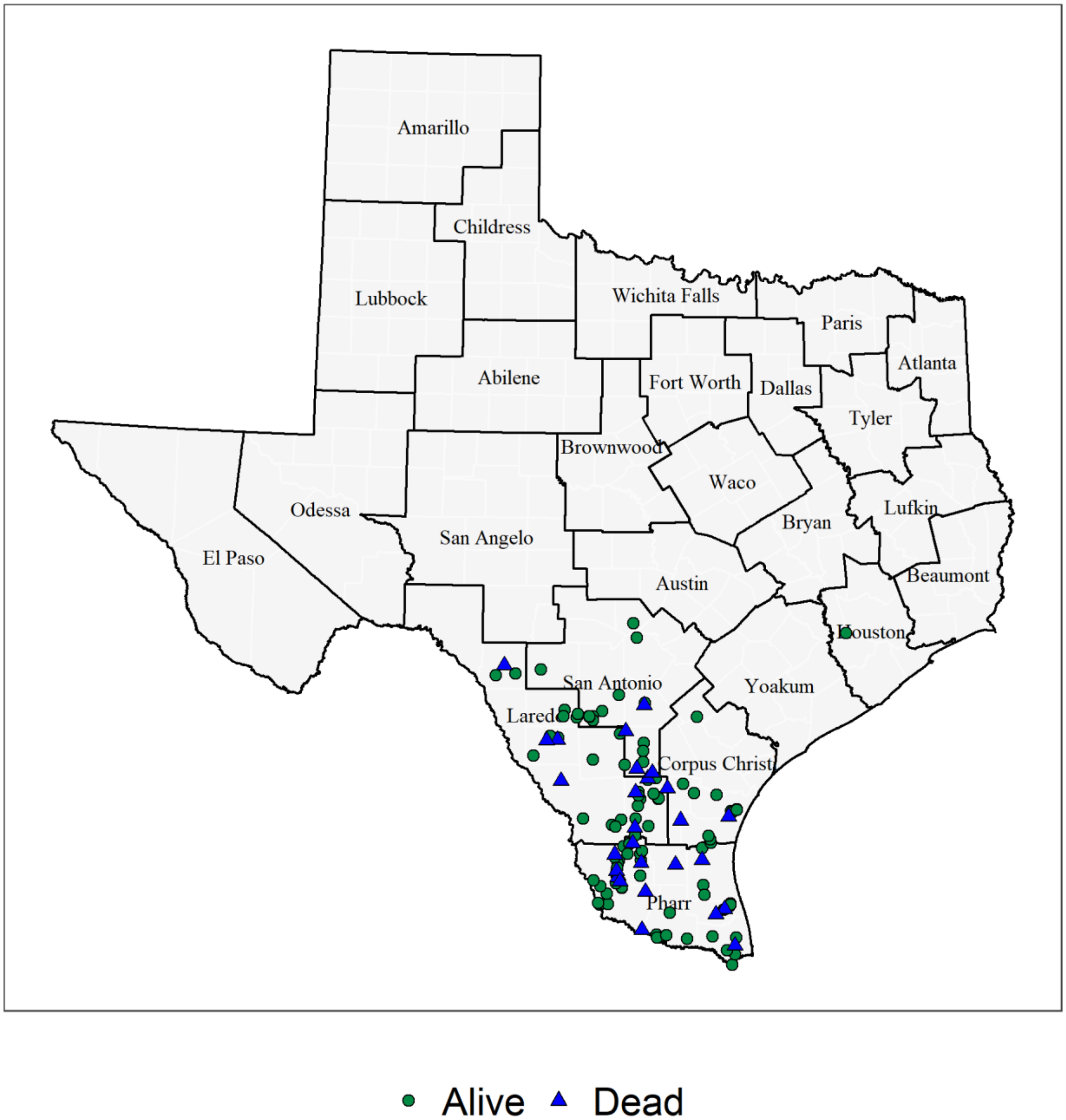
Texas Tortoise



• Near-Road Points △ Off-Road Points

Gopherus berlandieri

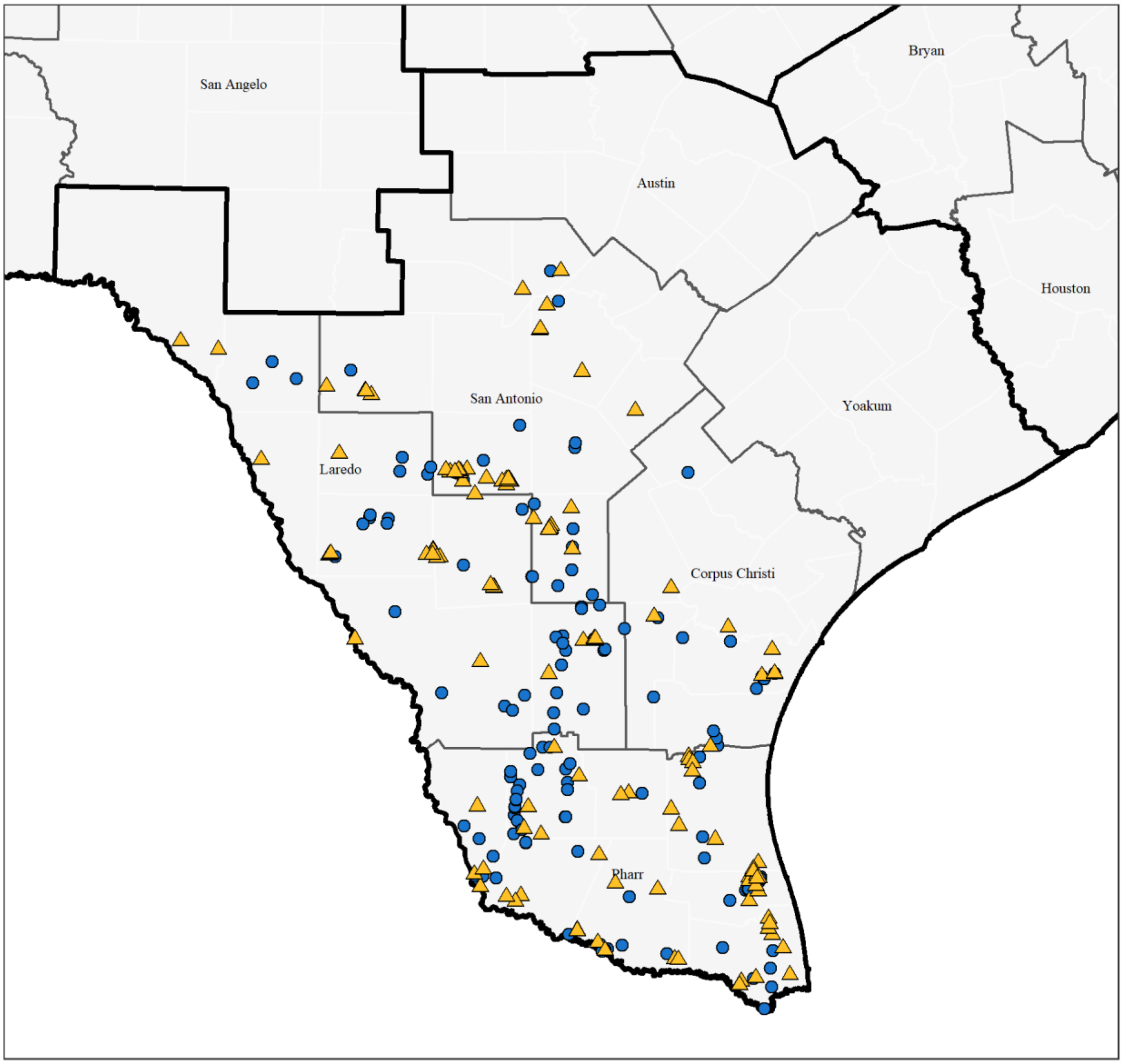
Texas Tortoise



Gopherus berlandieri

Texas Tortoise

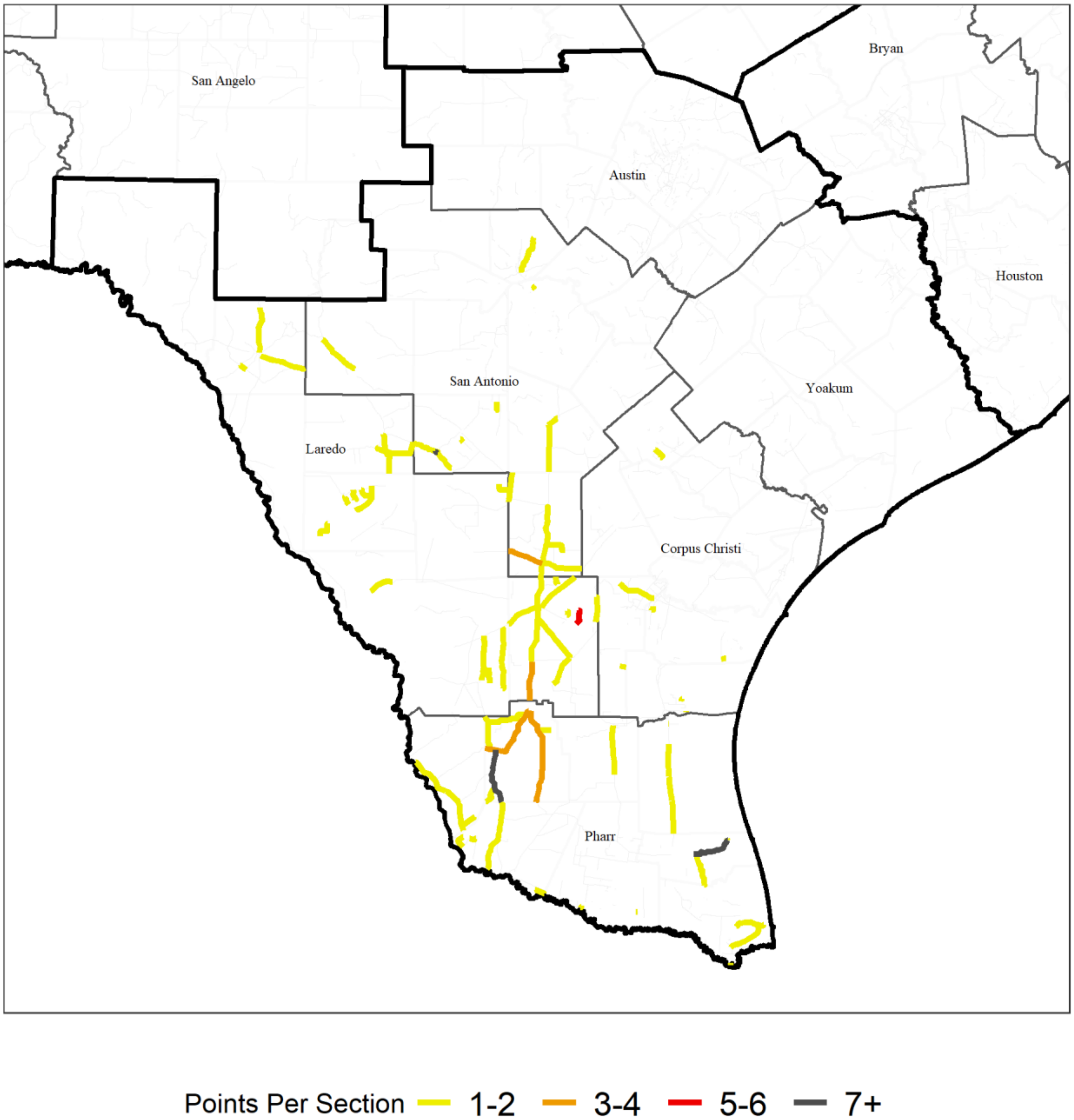
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



• Near-Road Points △ Off-Road Points

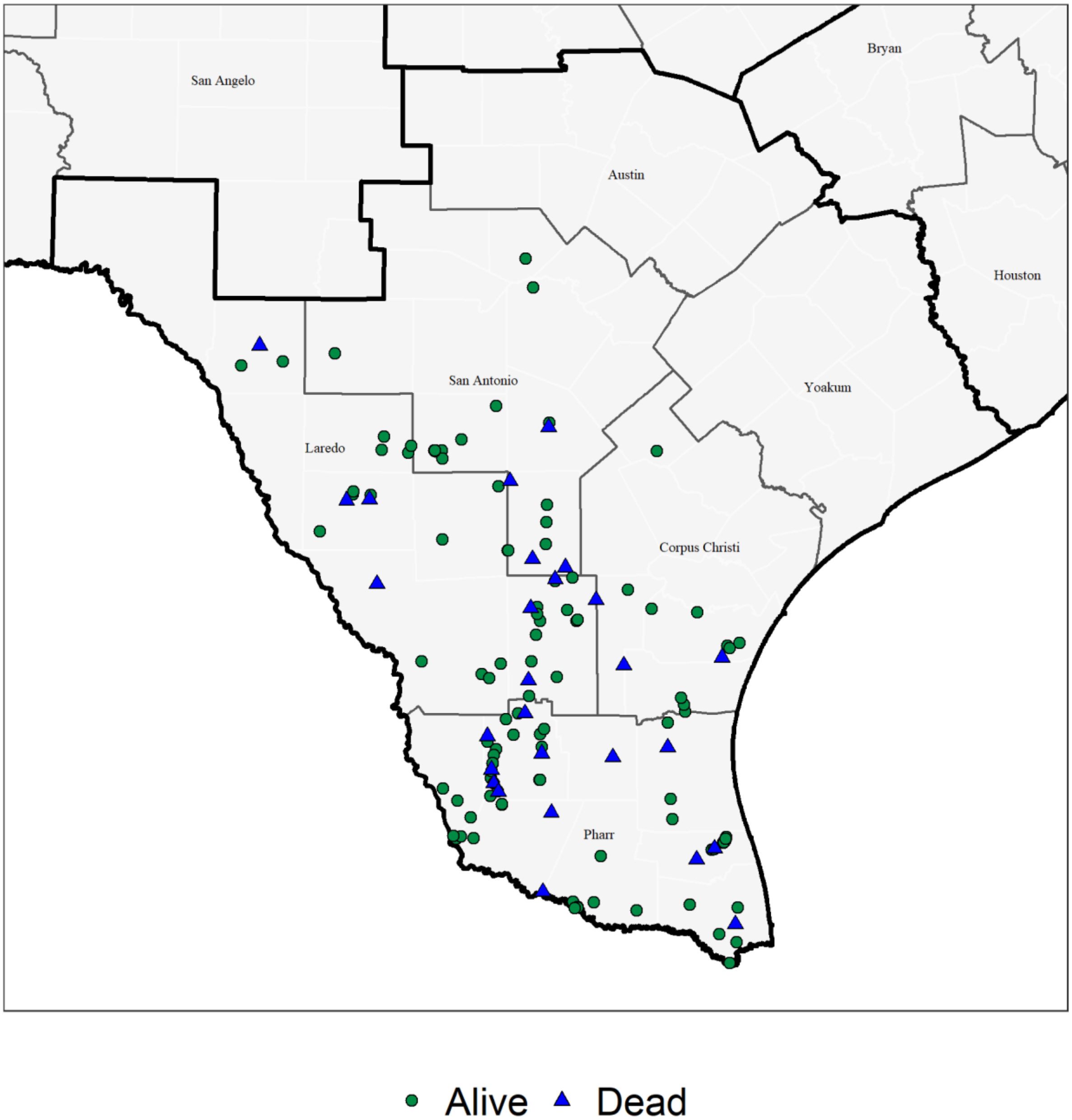
Gopherus berlandieri

Texas Tortoise



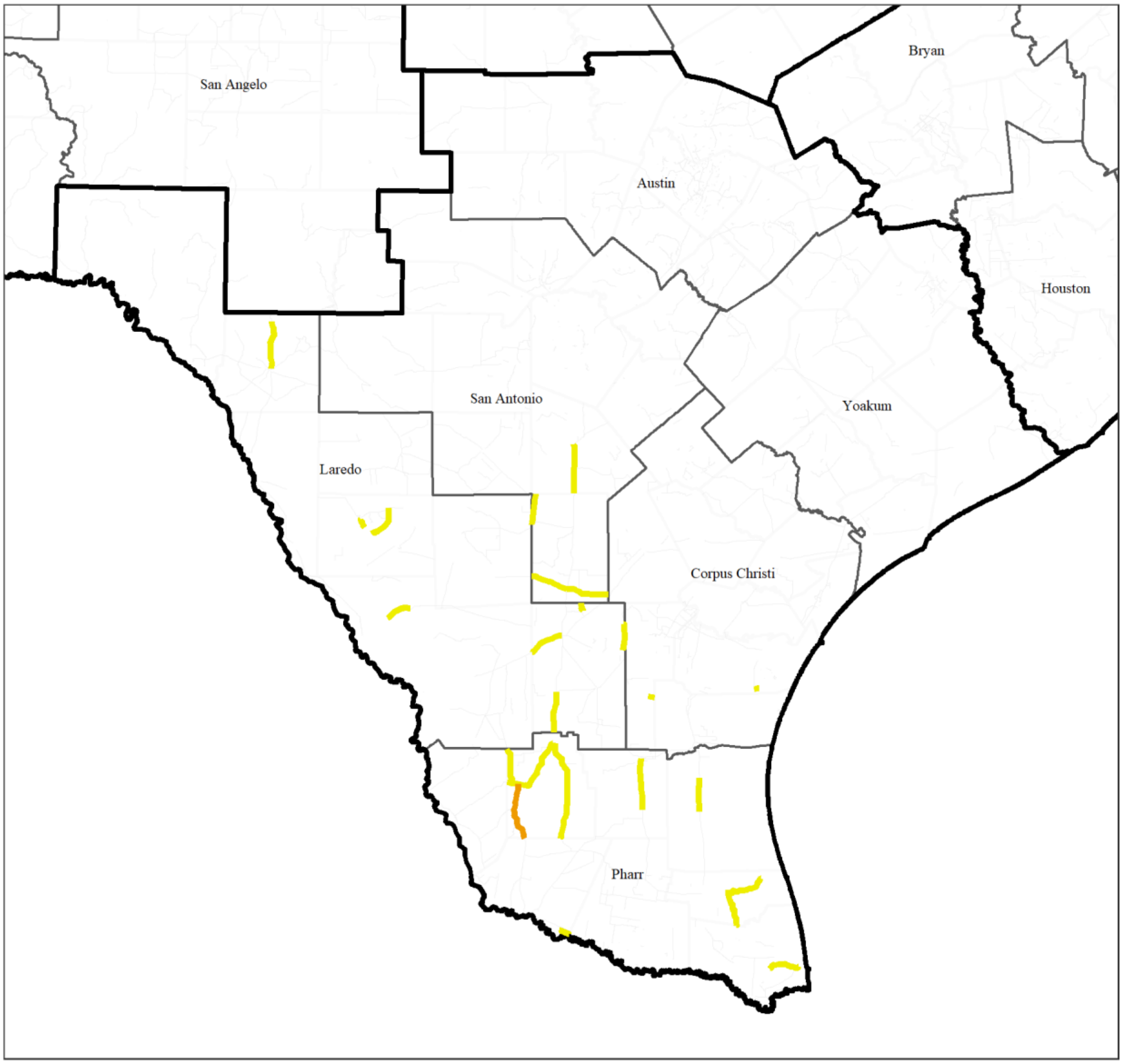
Gopherus berlandieri

Texas Tortoise



Gopherus berlandieri

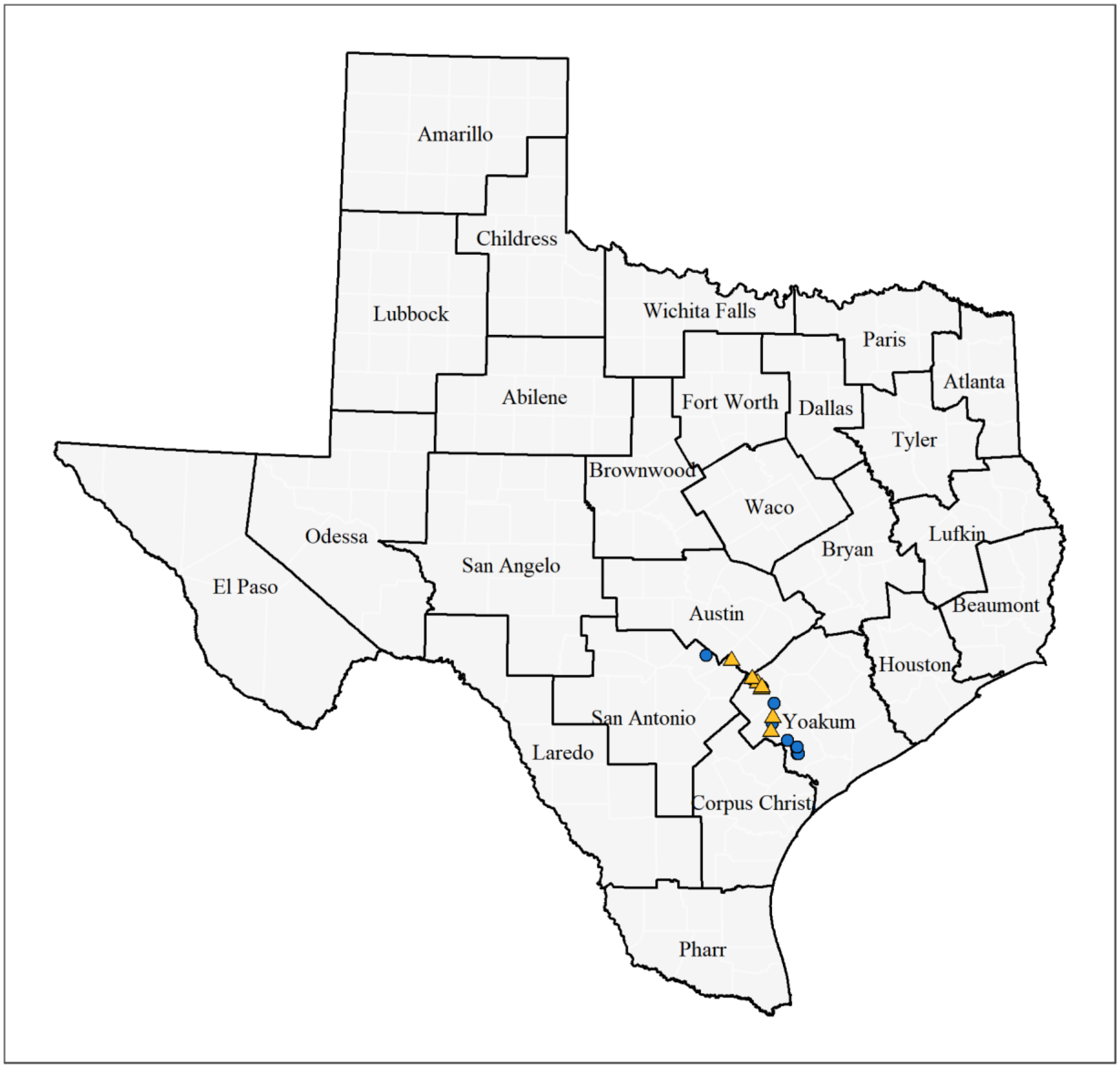
Texas Tortoise



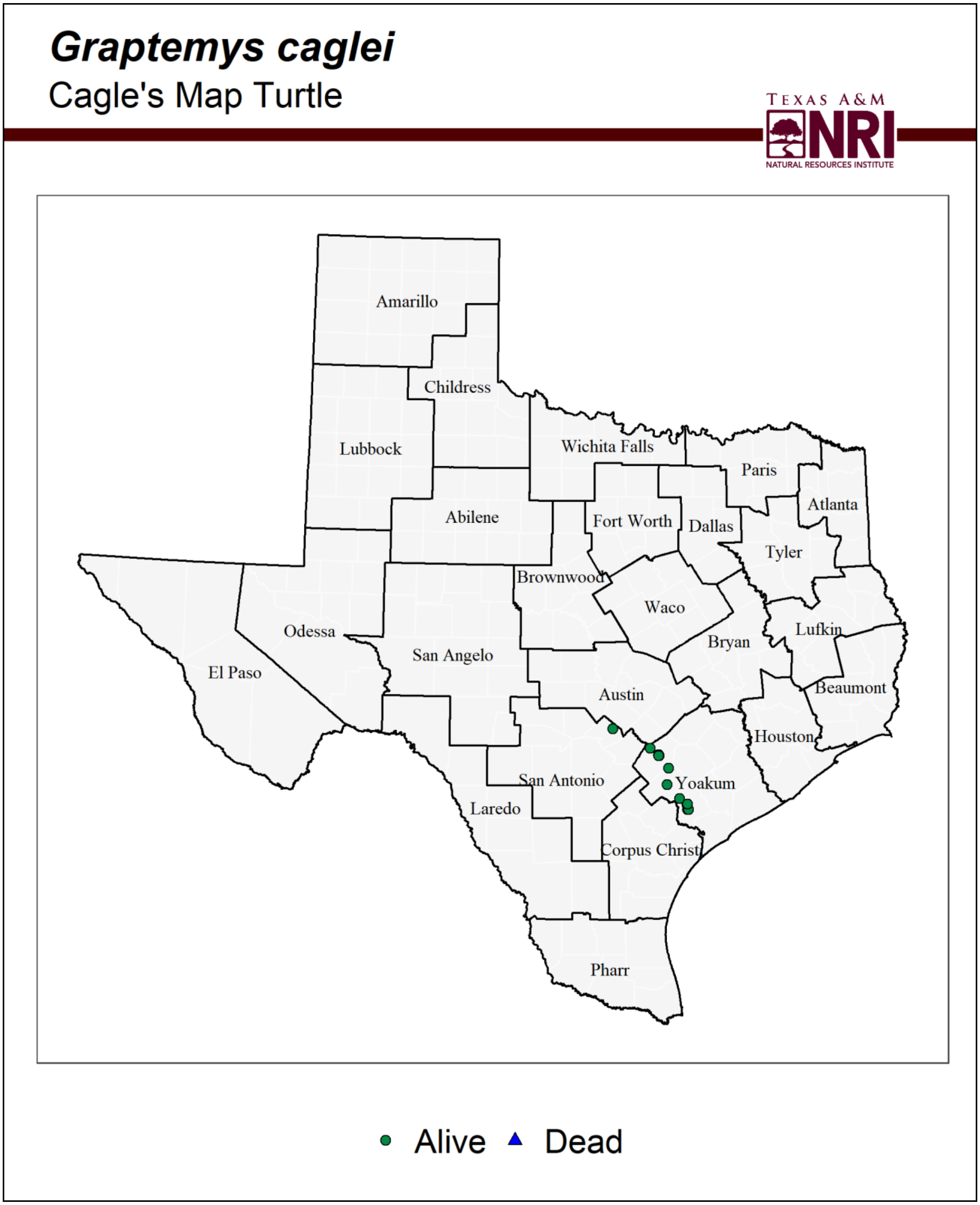
Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Graptemys caglei

Cagle's Map Turtle

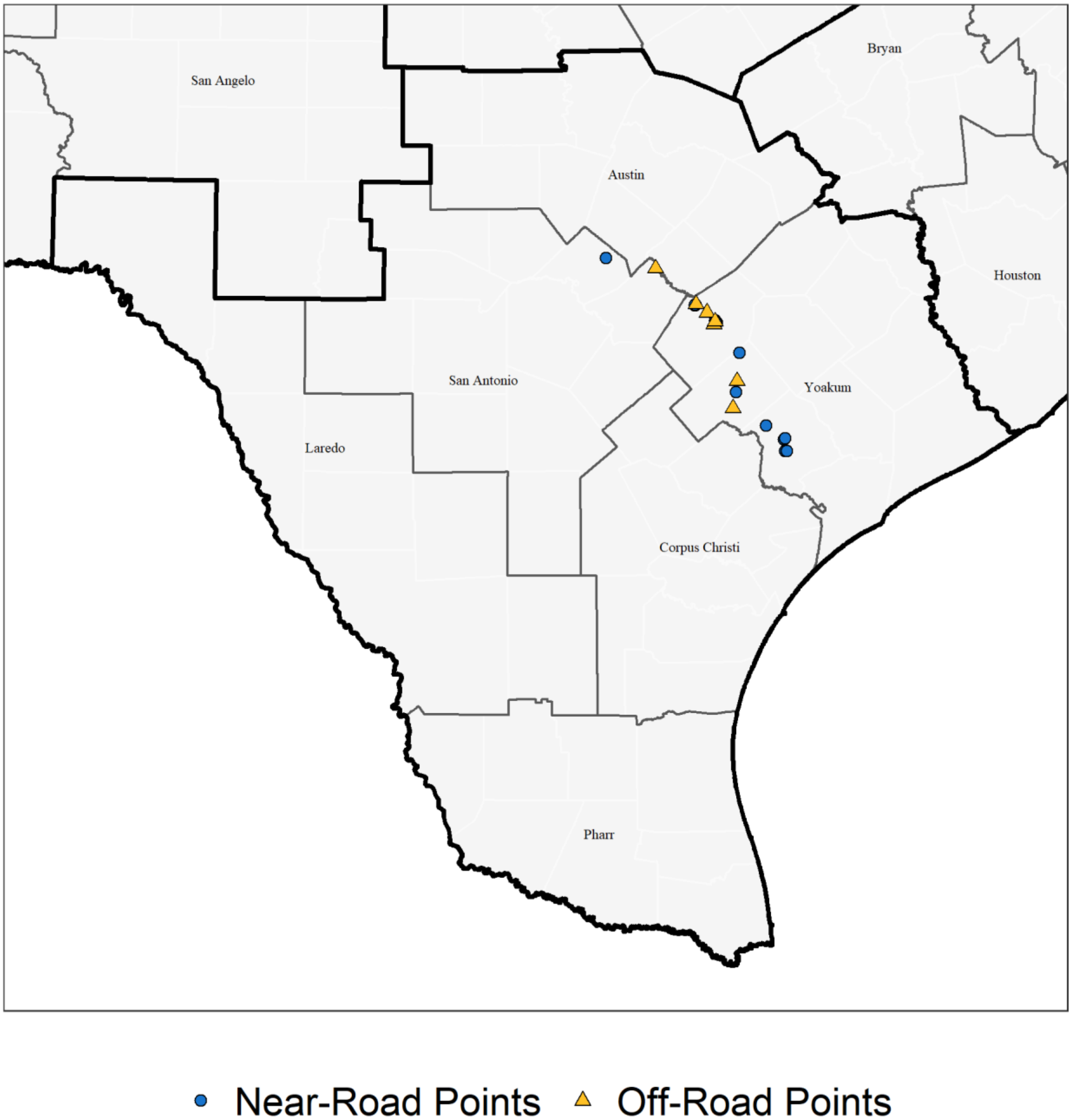


• Near-Road Points △ Off-Road Points


Graptemys caglei
Cagle's Map Turtle
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE
Amarillo
Childress
Lubbock
Wichita Falls
Paris
Atlanta
Abilene
Fort Worth
Dallas
Tyler
Brownwood
Waco
Odessa
Lufkin
Bryan
El Paso
San Angelo
Austin
Beaumont
Houston
San Antonio
Yoakum
Laredo
Corpus Christi
Pharr
Alive
Dead

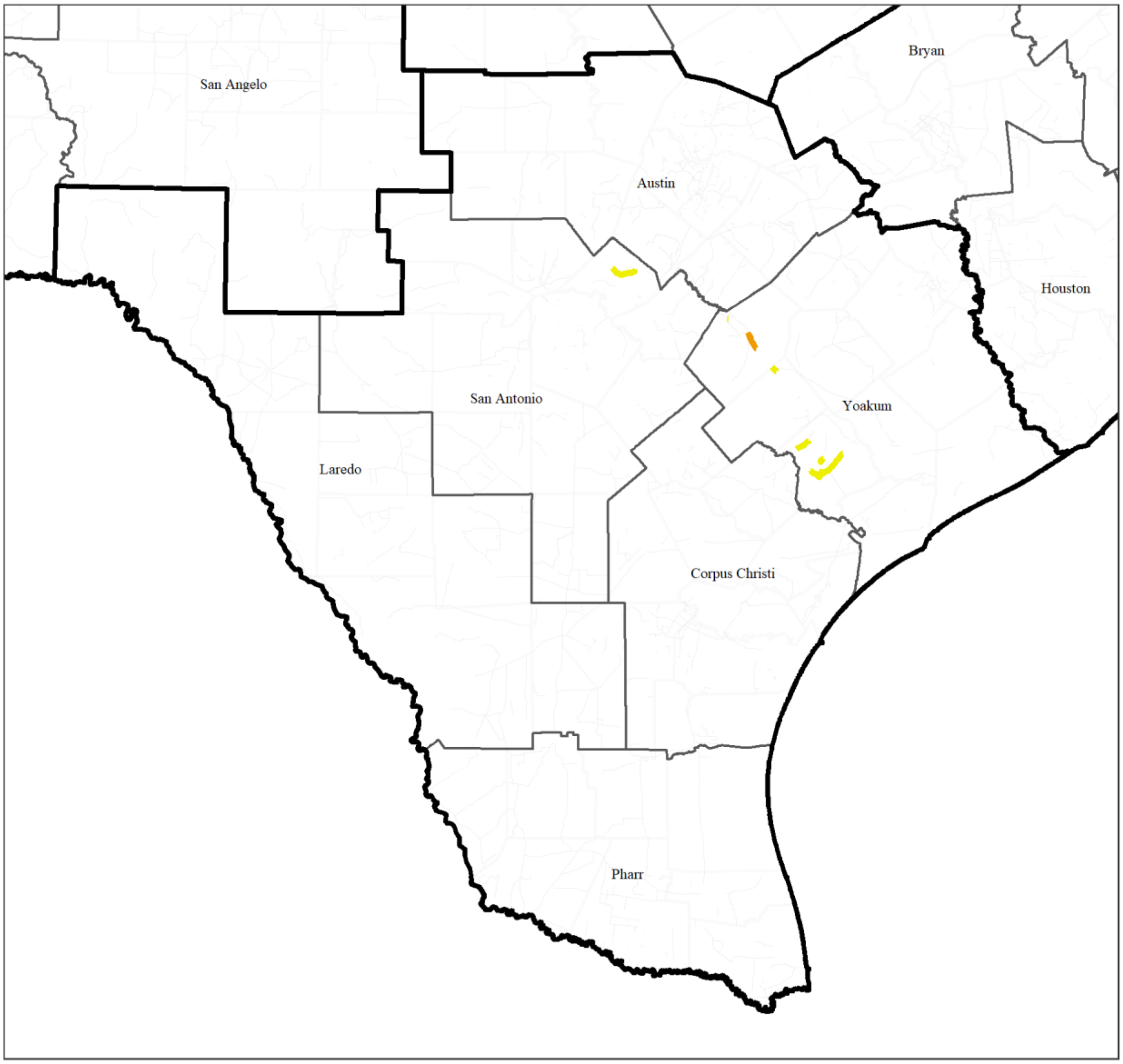
Graptemys caglei

Cagle's Map Turtle



Graptemys caglei

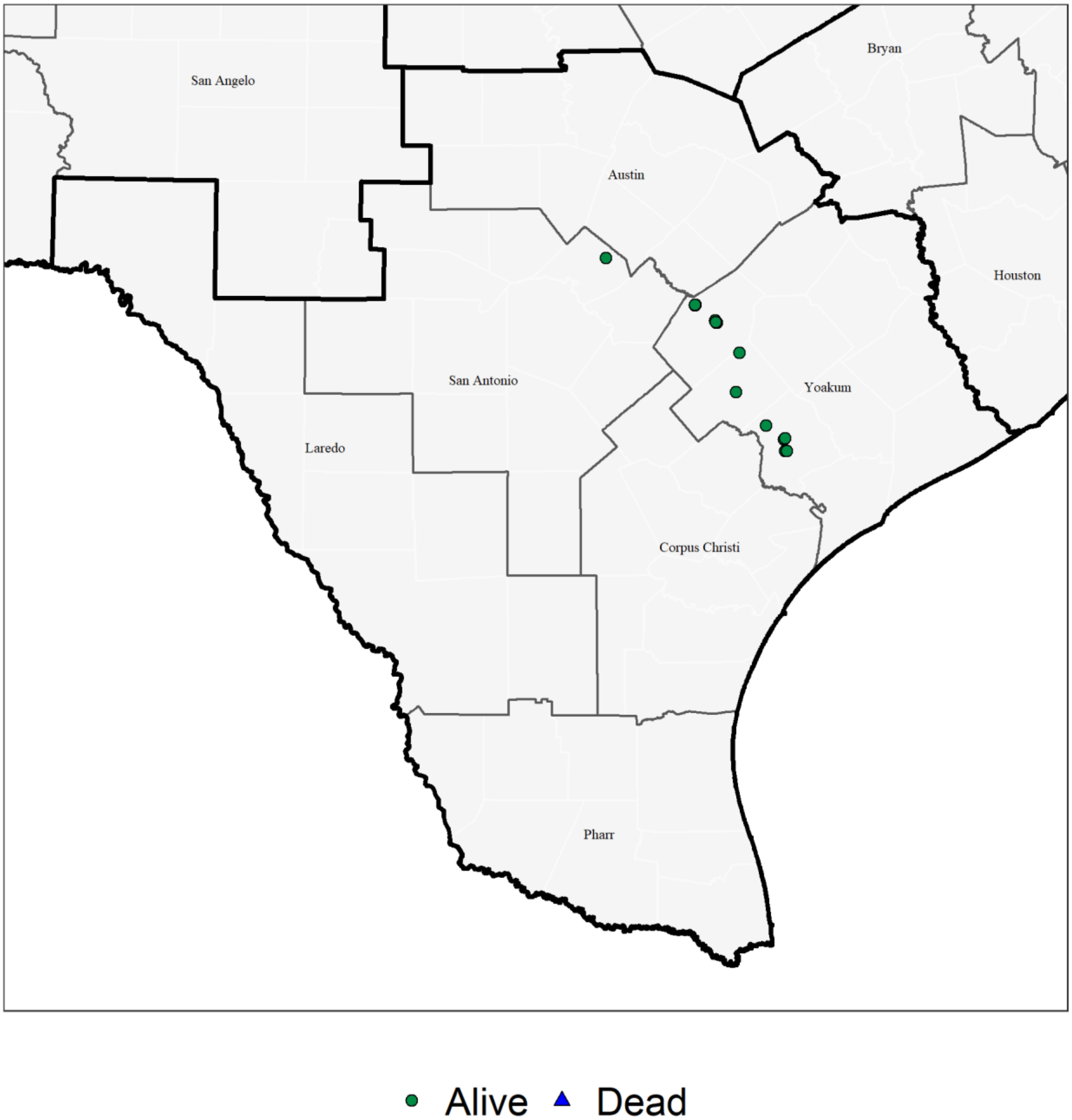
Cagle's Map Turtle



Points Per Section 1-2 3-4 5-6 7+

Graptemys caglei

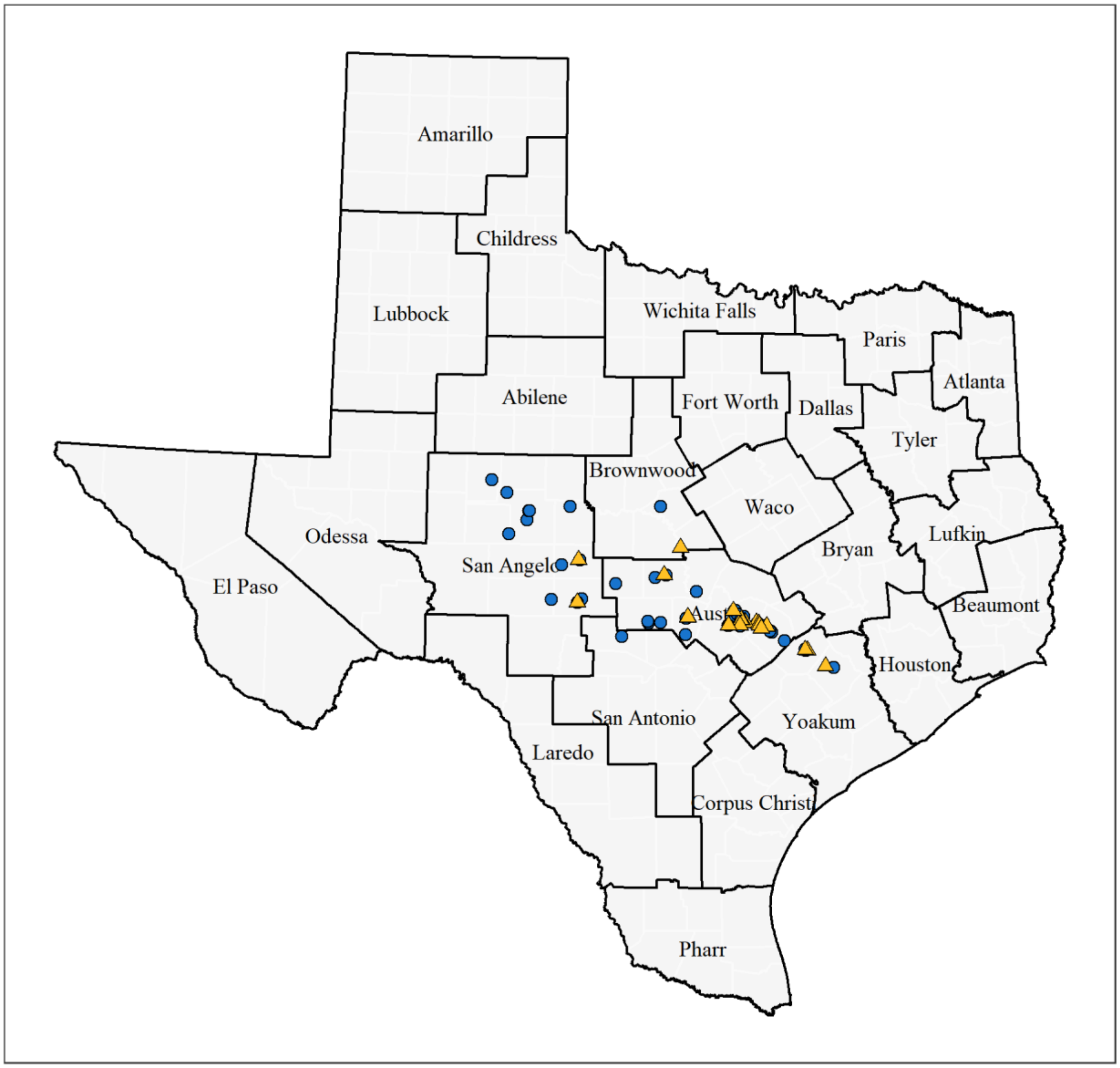
Cagle's Map Turtle



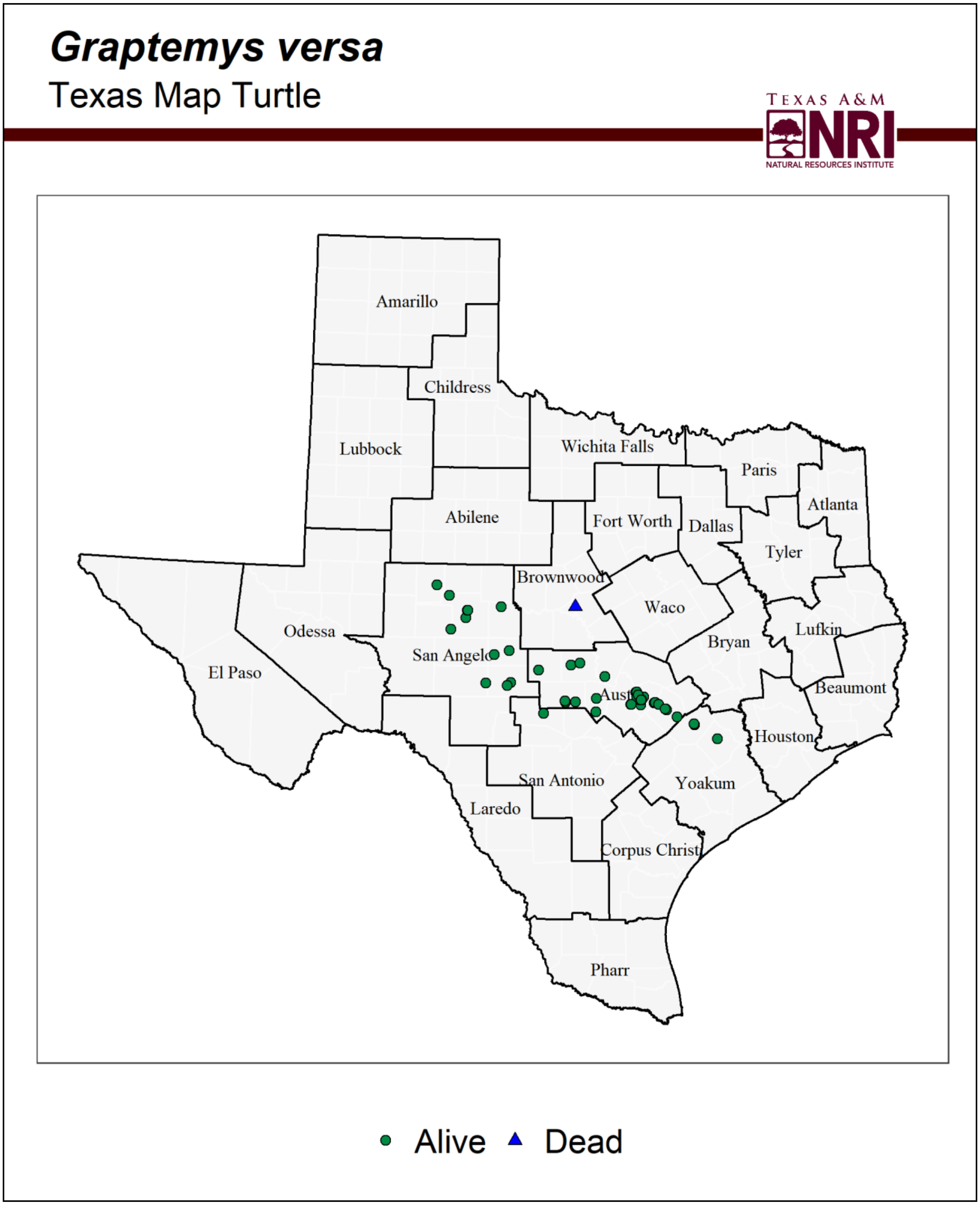
Graptemys versa

Texas Map Turtle

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



• Near-Road Points △ Off-Road Points


Graptemys versa
Texas Map Turtle
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE
Amarillo
Childress
Lubbock
Wichita Falls
Paris
Atlanta
Abilene
Fort Worth
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Brownwood
Waco
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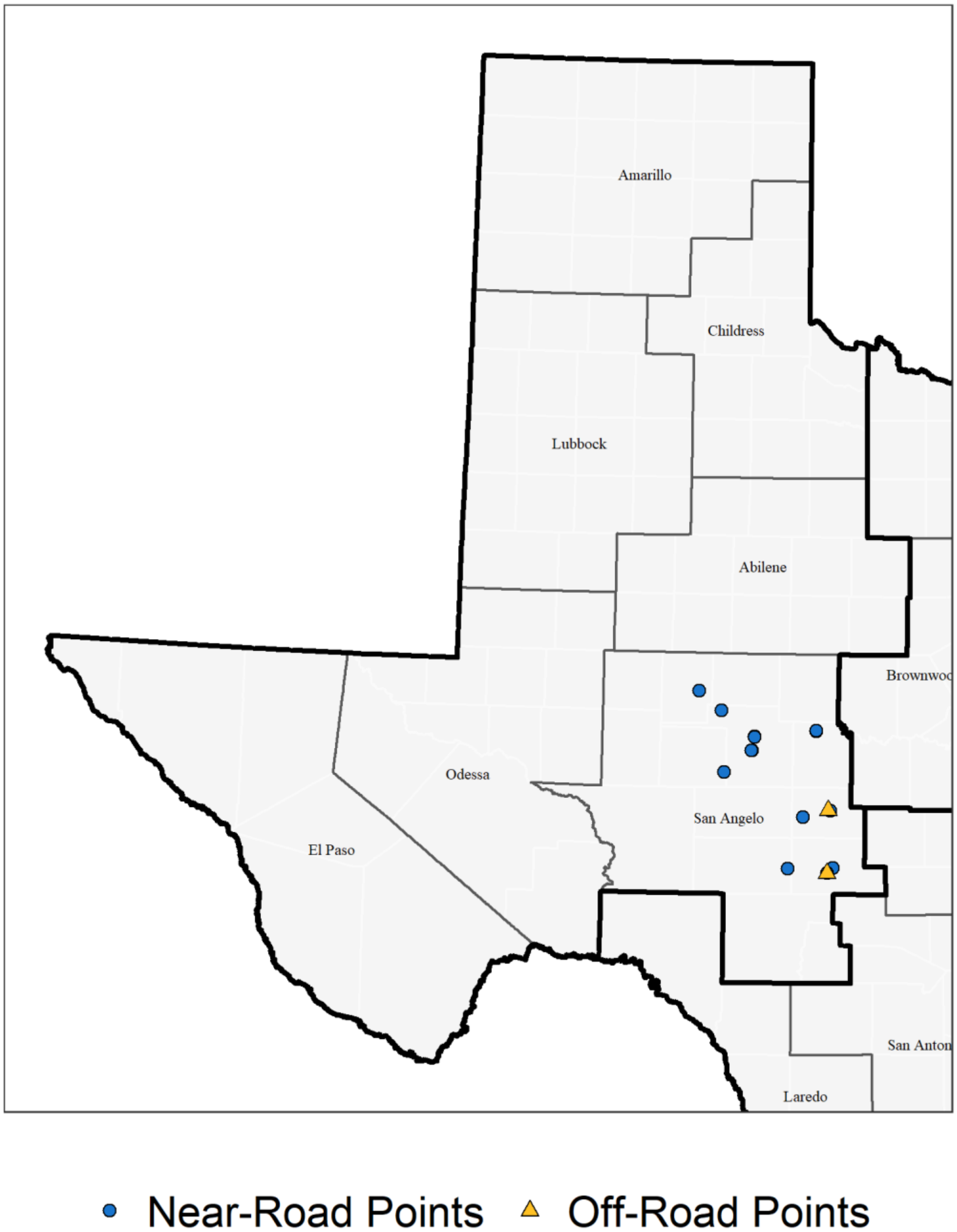
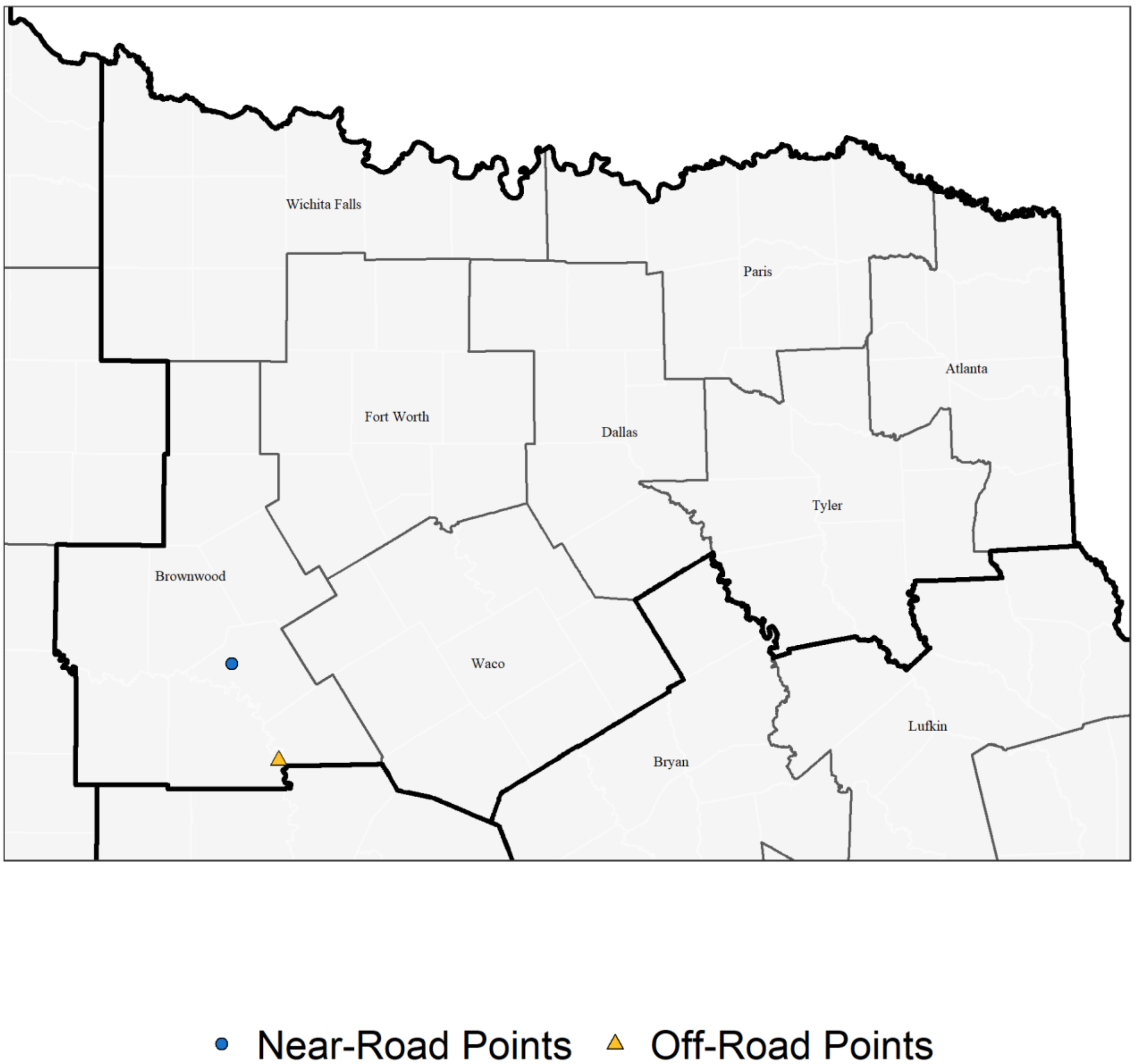
Bryan
Lufkin
San Angelo
El Paso
Austin
Beaumont
Houston
San Antonio
Yoakum
Laredo
Corpus Christi
Pharr
Alive
Dead

Graptemys versa

Texas Map Turtle

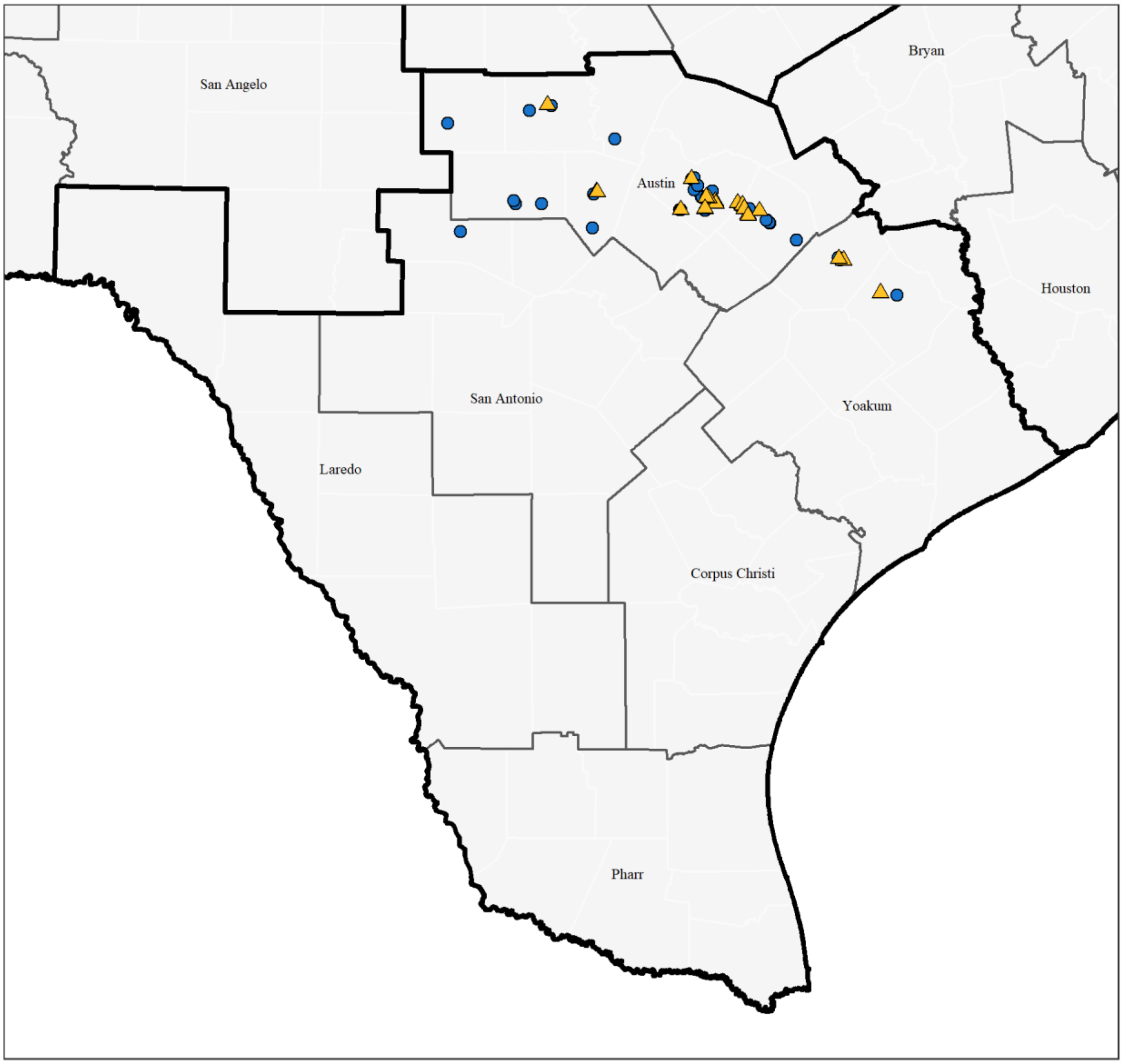


Graptemys versa
Texas Map Turtle



Graptemys versa

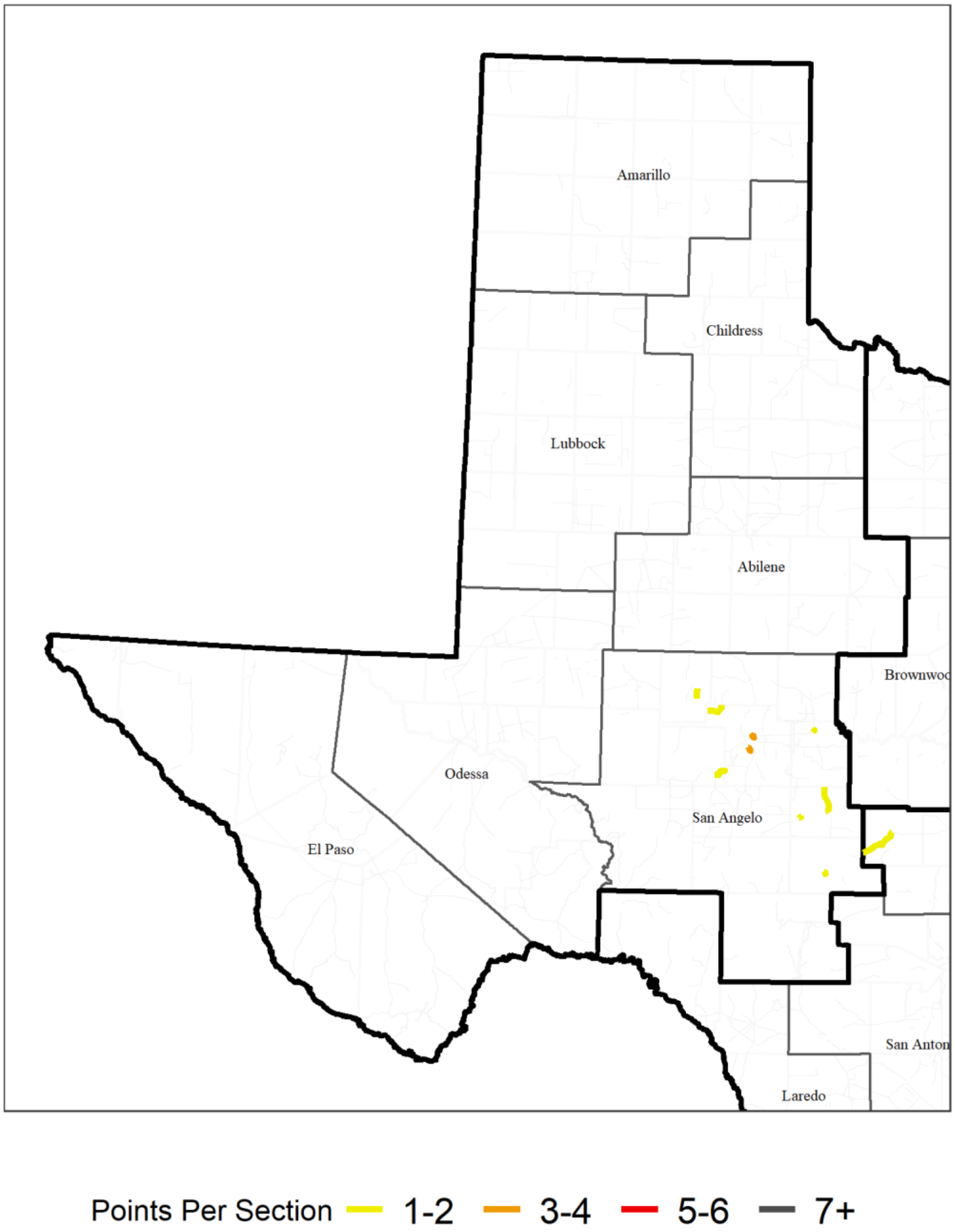
Texas Map Turtle



• Near-Road Points △ Off-Road Points

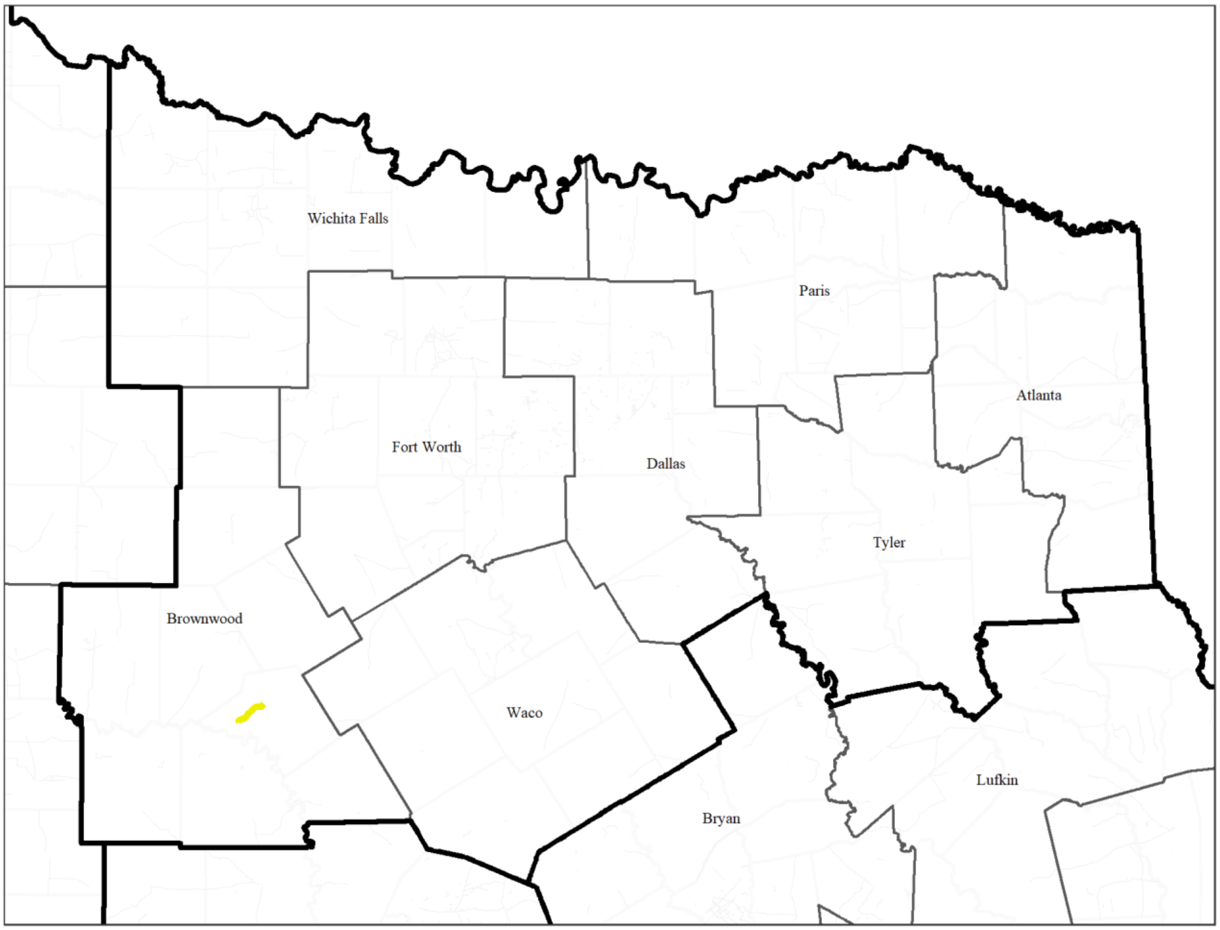
Graptemys versa

Texas Map Turtle



Graptemys versa

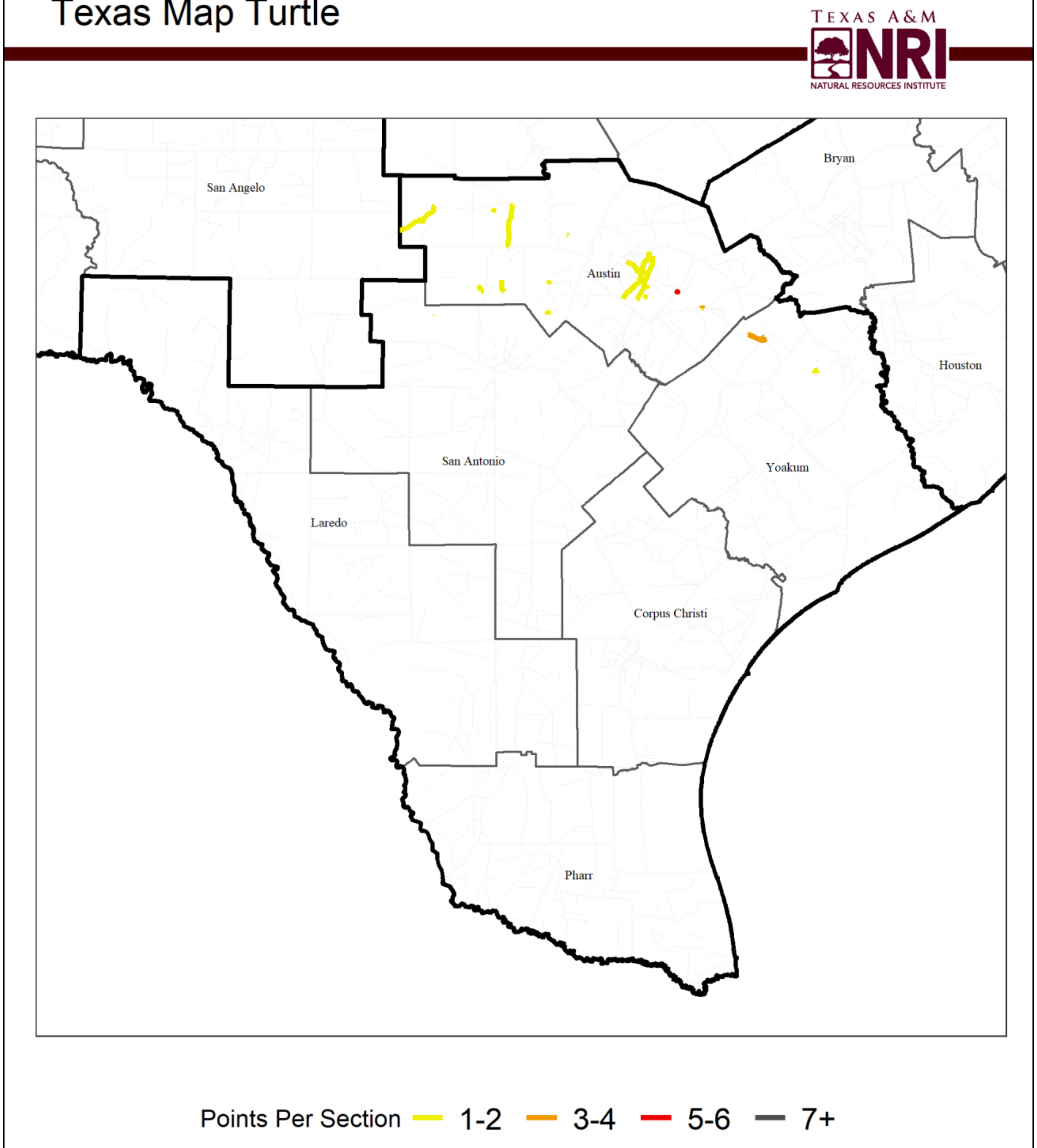
Texas Map Turtle



Points Per Section 1-2 3-4 5-6 7+

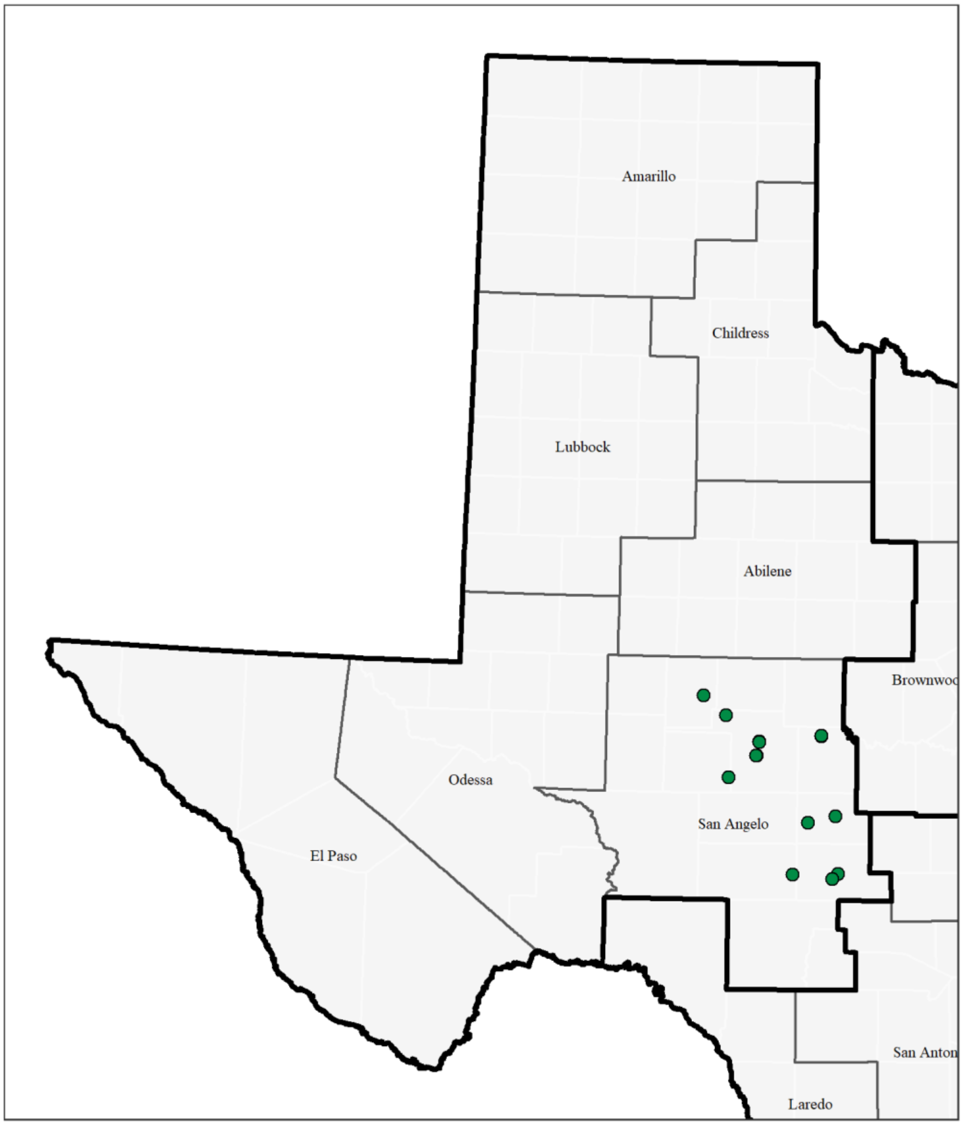
Graptemys versa

Texas Map Turtle



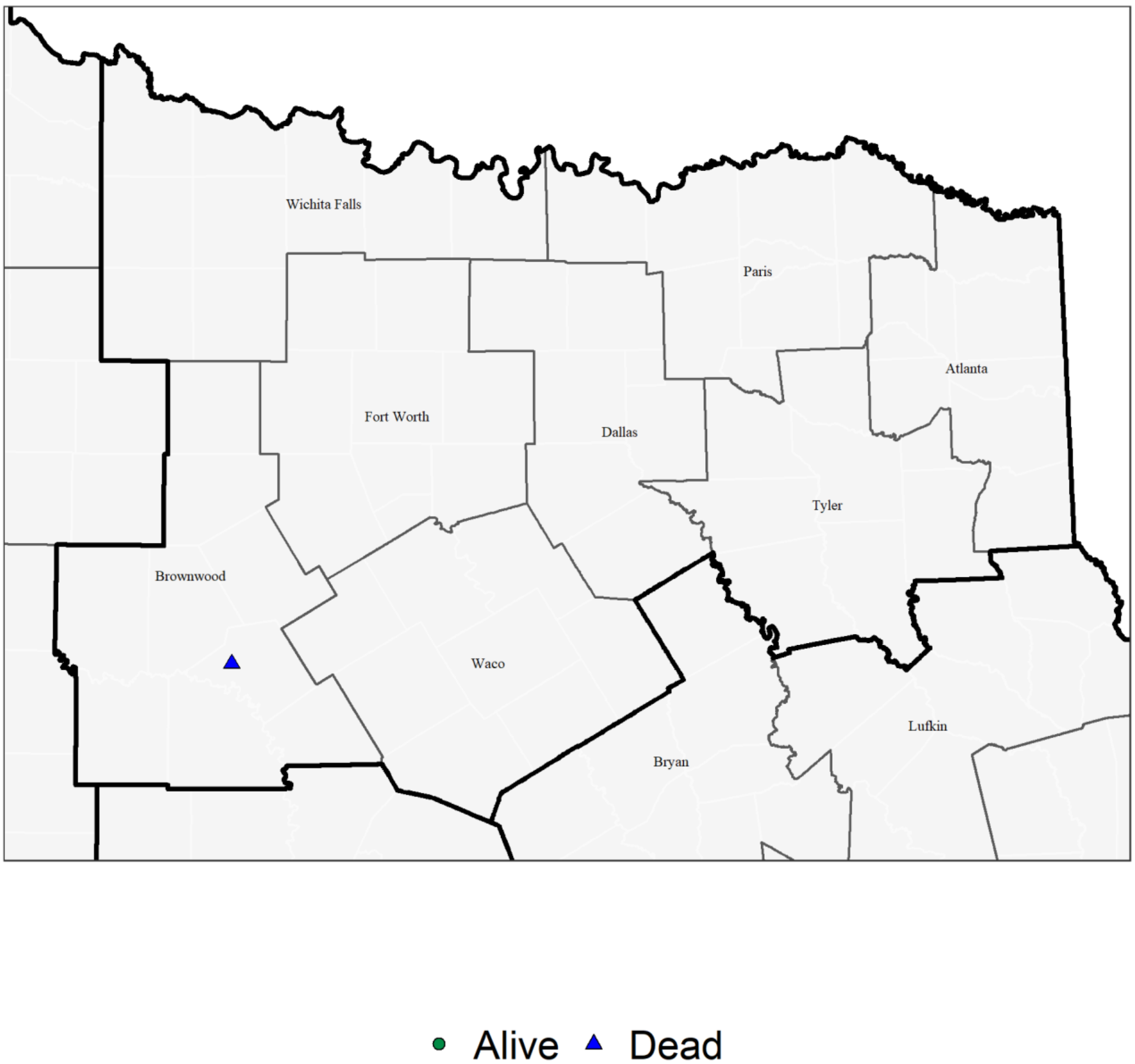
Graptemys versa

Texas Map Turtle



Alive Dead

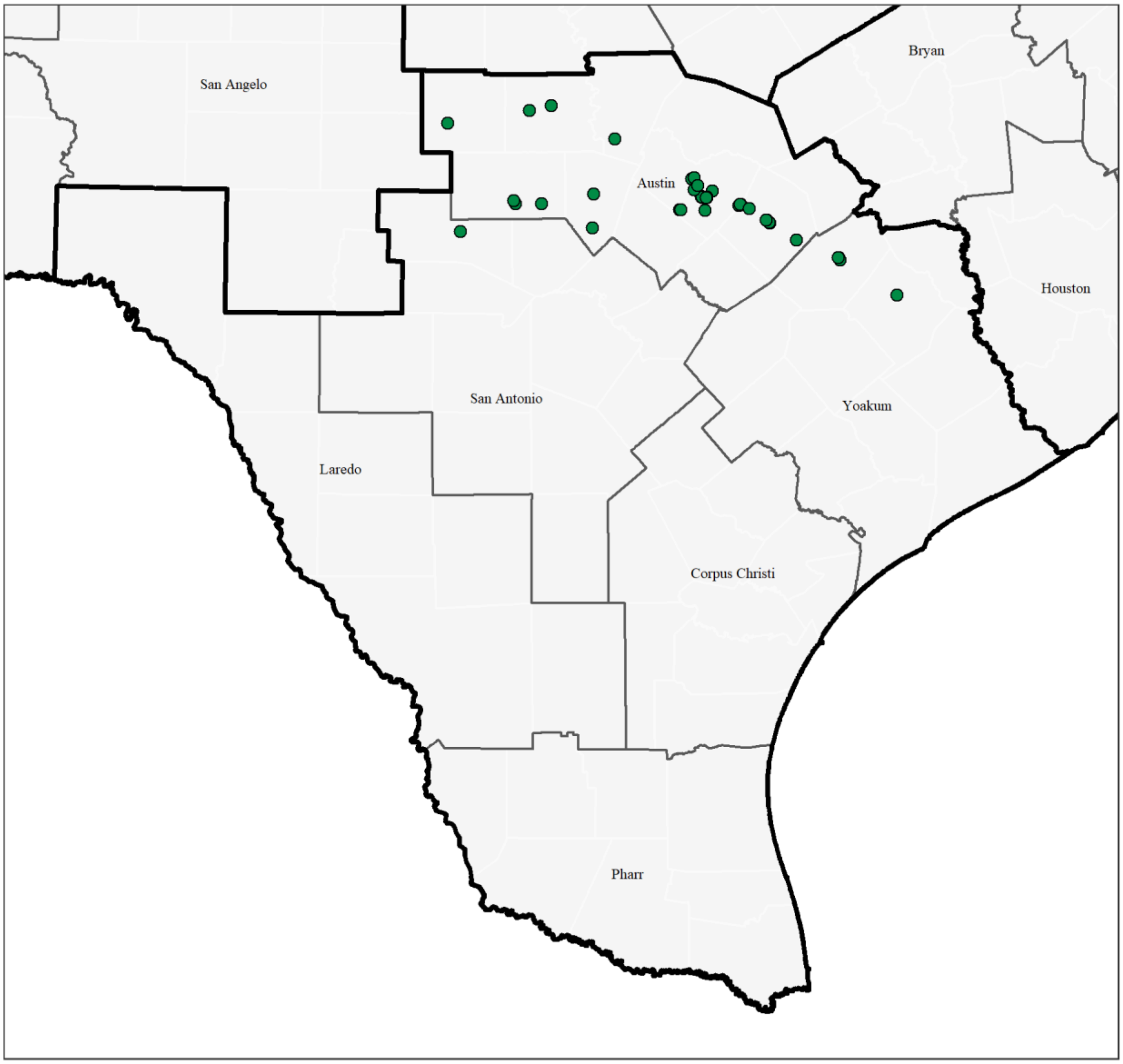
Graptemys versa
Texas Map Turtle



Graptemys versa

Texas Map Turtle

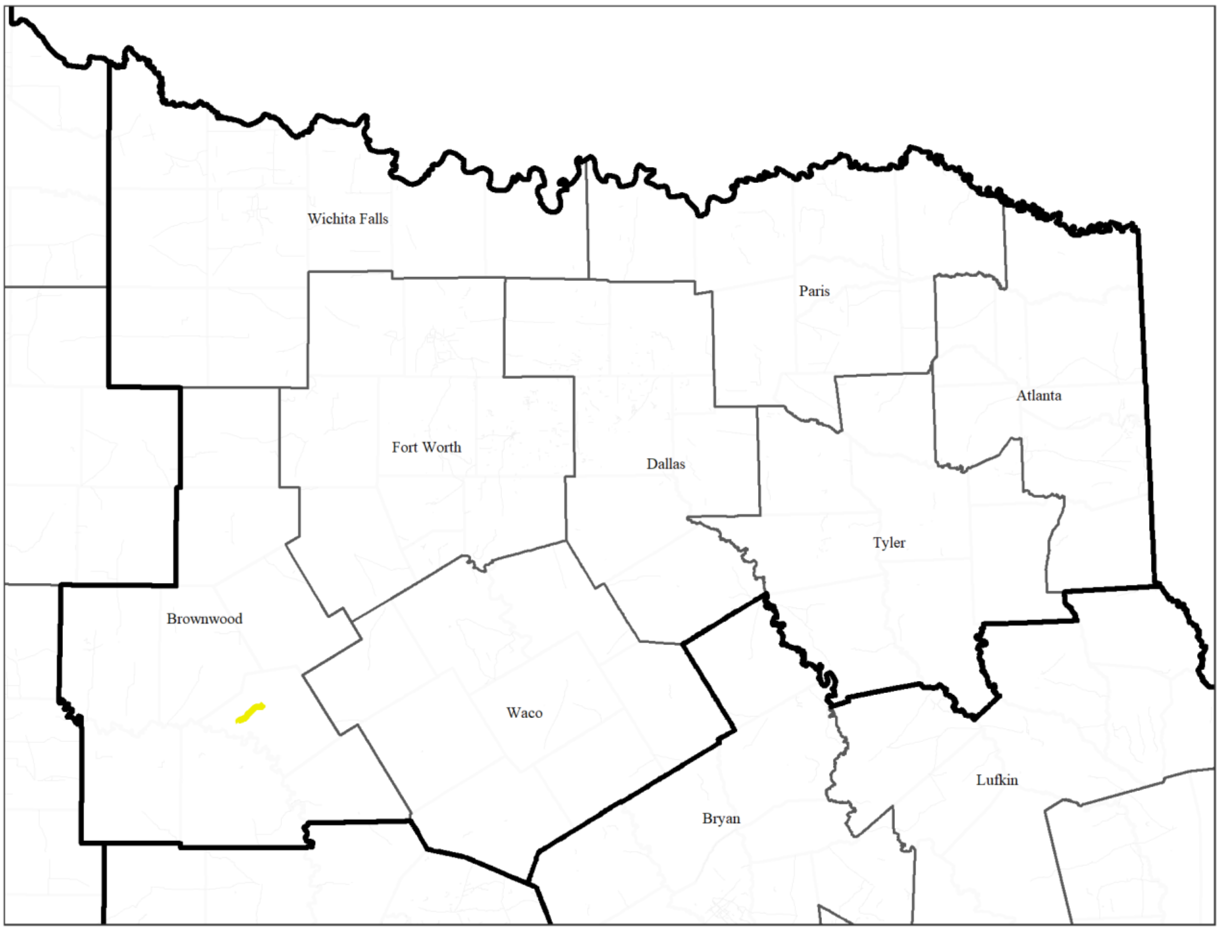
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



● Alive ▲ Dead

Graptemys versa

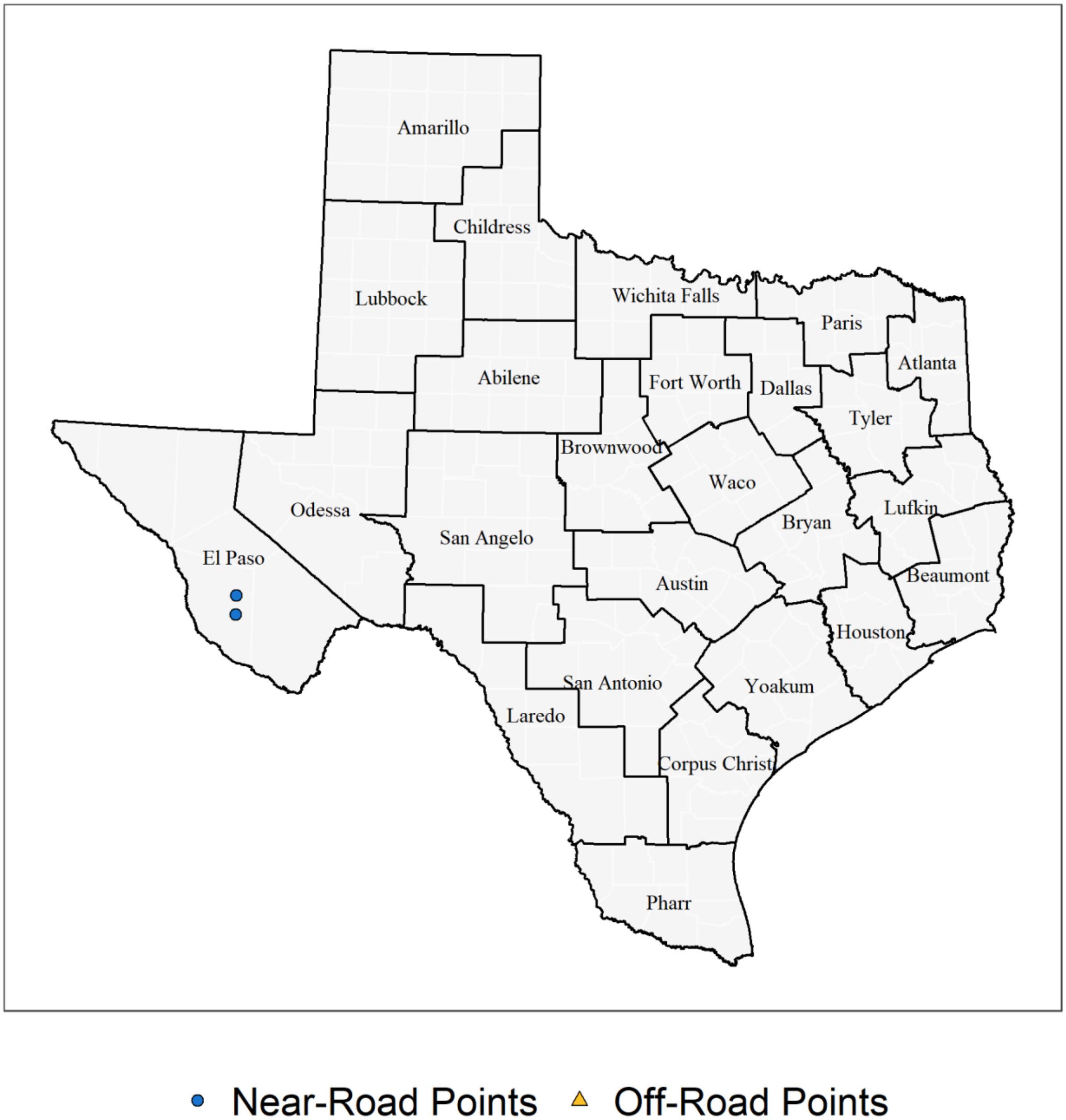
Texas Map Turtle



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

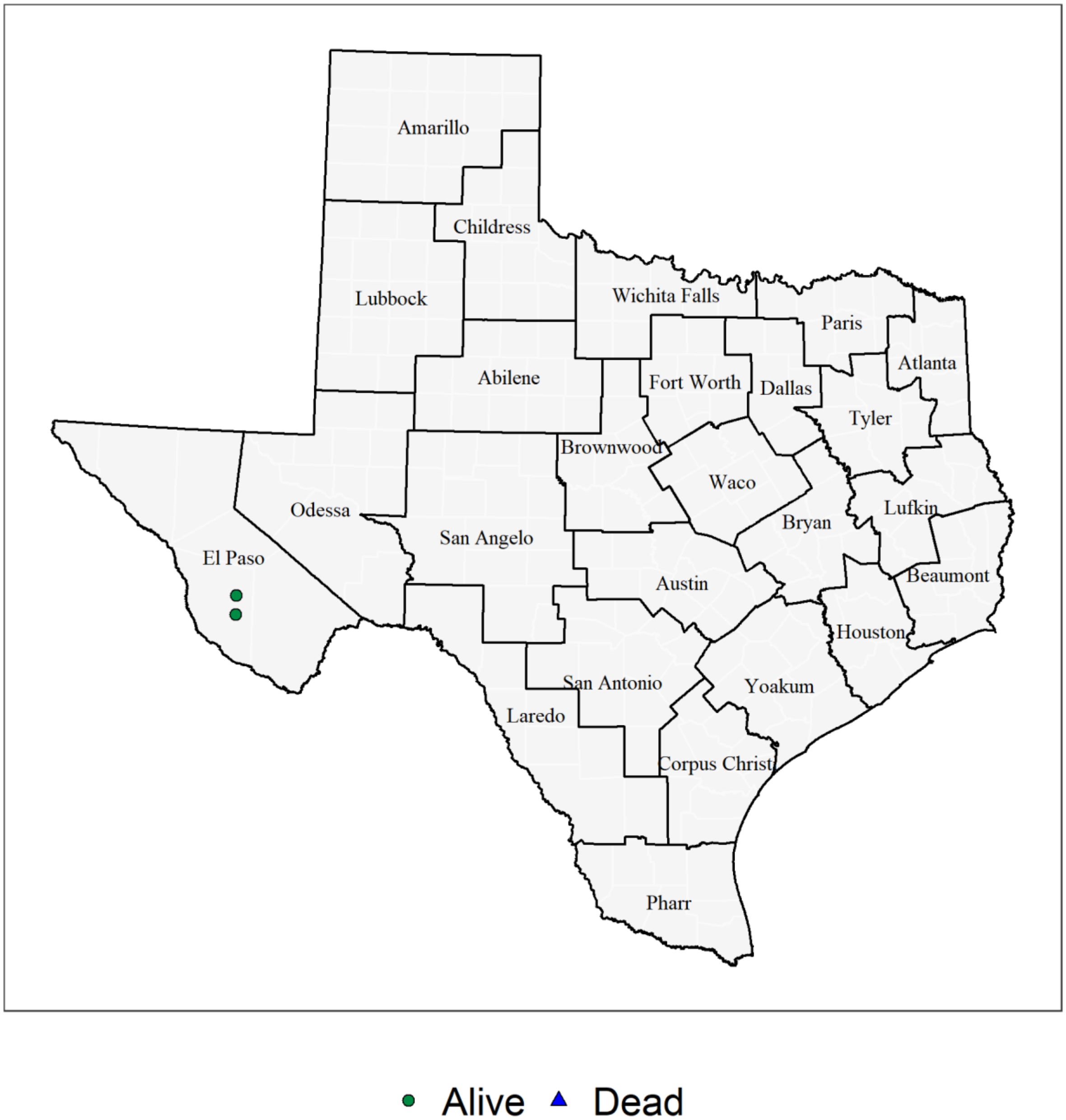
Kinosternon hirtipes

Chihuahuan Mud Turtle



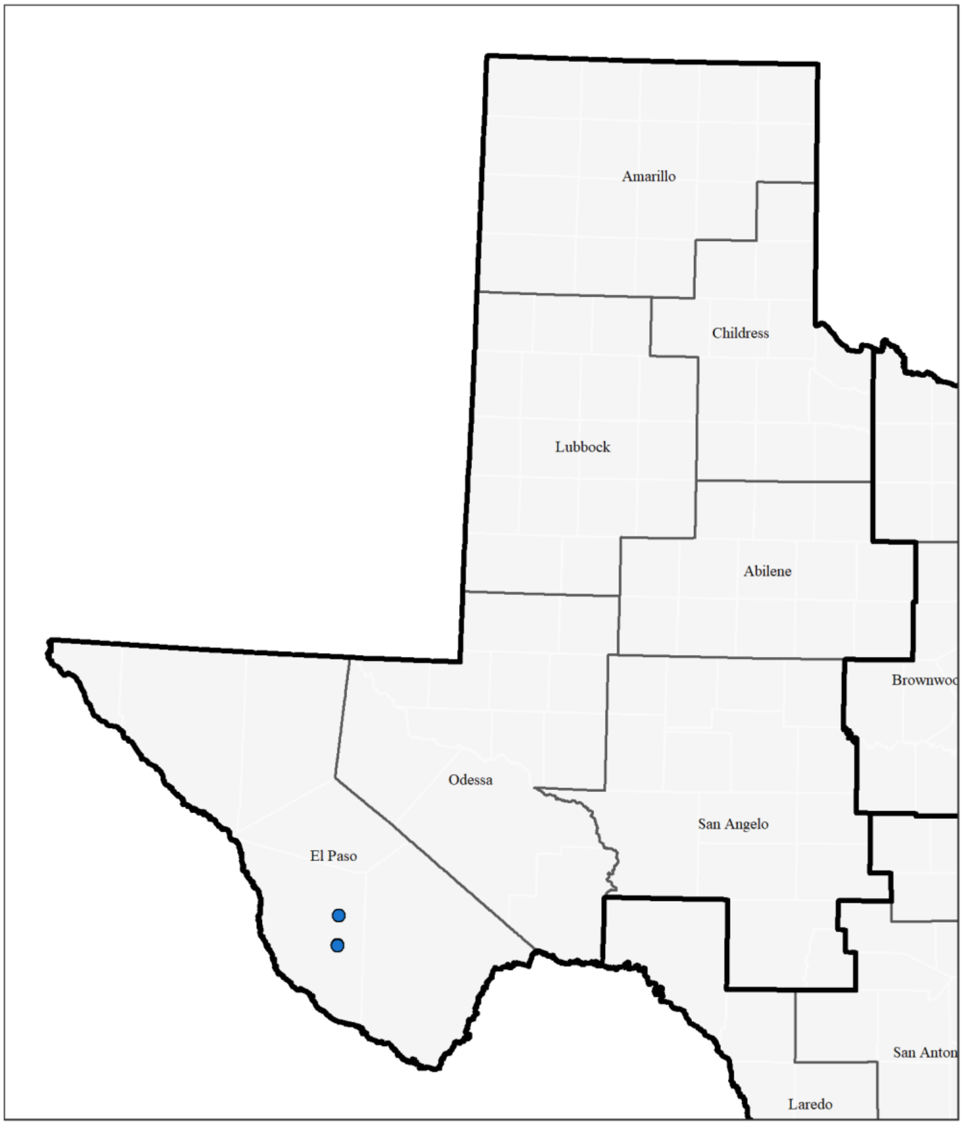
Kinosternon hirtipes

Chihuahuan Mud Turtle



Kinosternon hirtipes

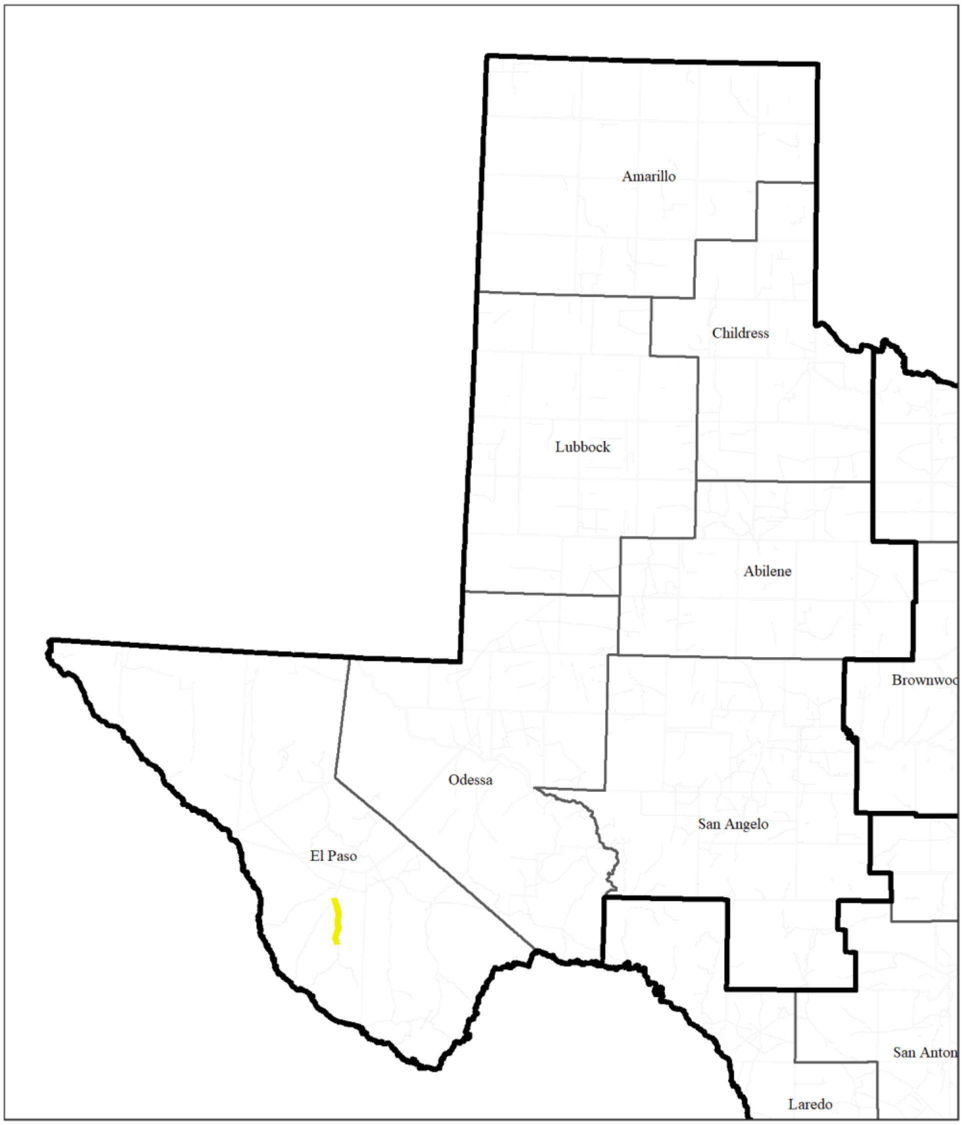
Chihuahuan Mud Turtle



• Near-Road Points △ Off-Road Points

Kinosternon hirtipes

Chihuahuan Mud Turtle

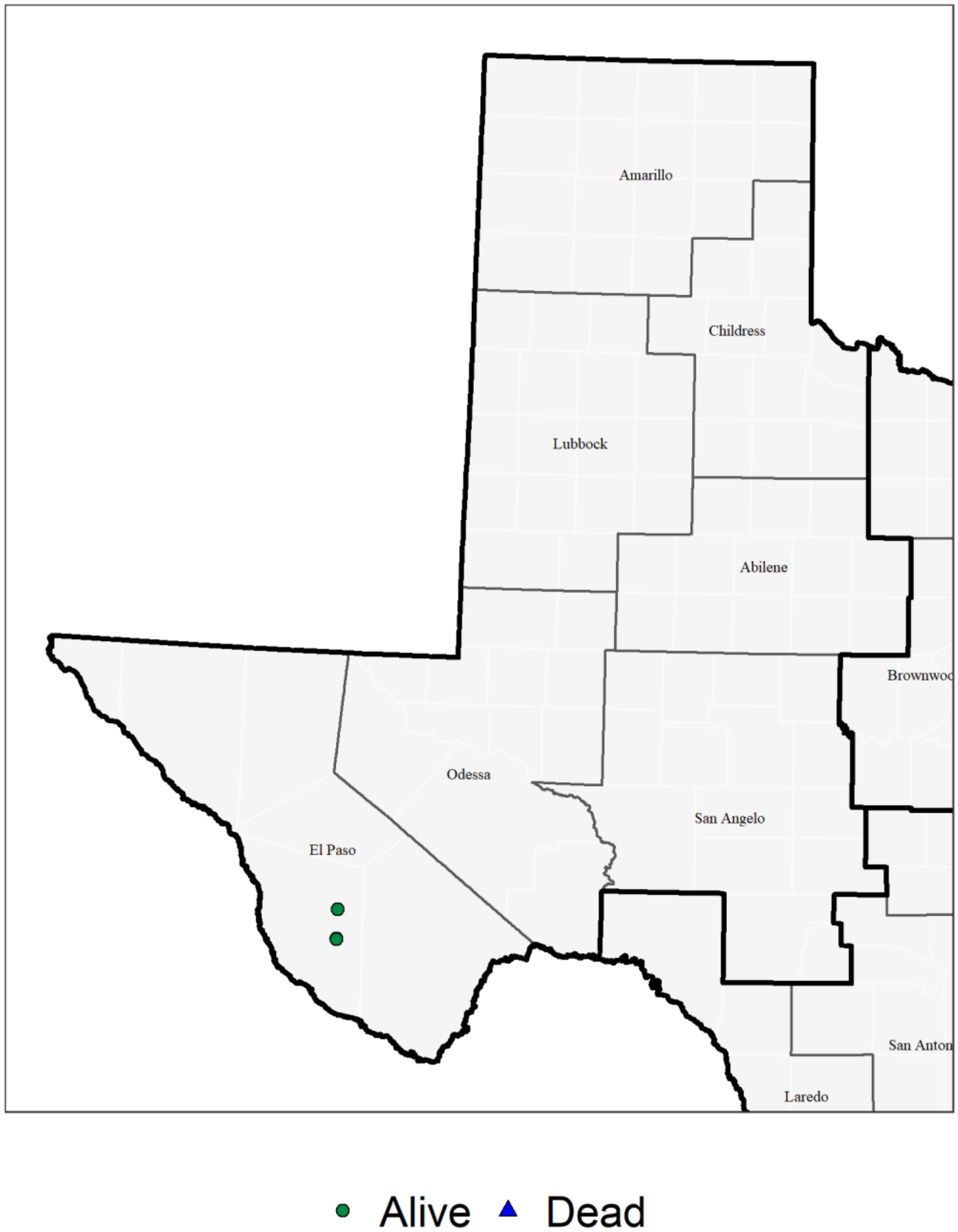


Points Per Section 1-2 3-4 5-6 7+

Kinosternon hirtipes

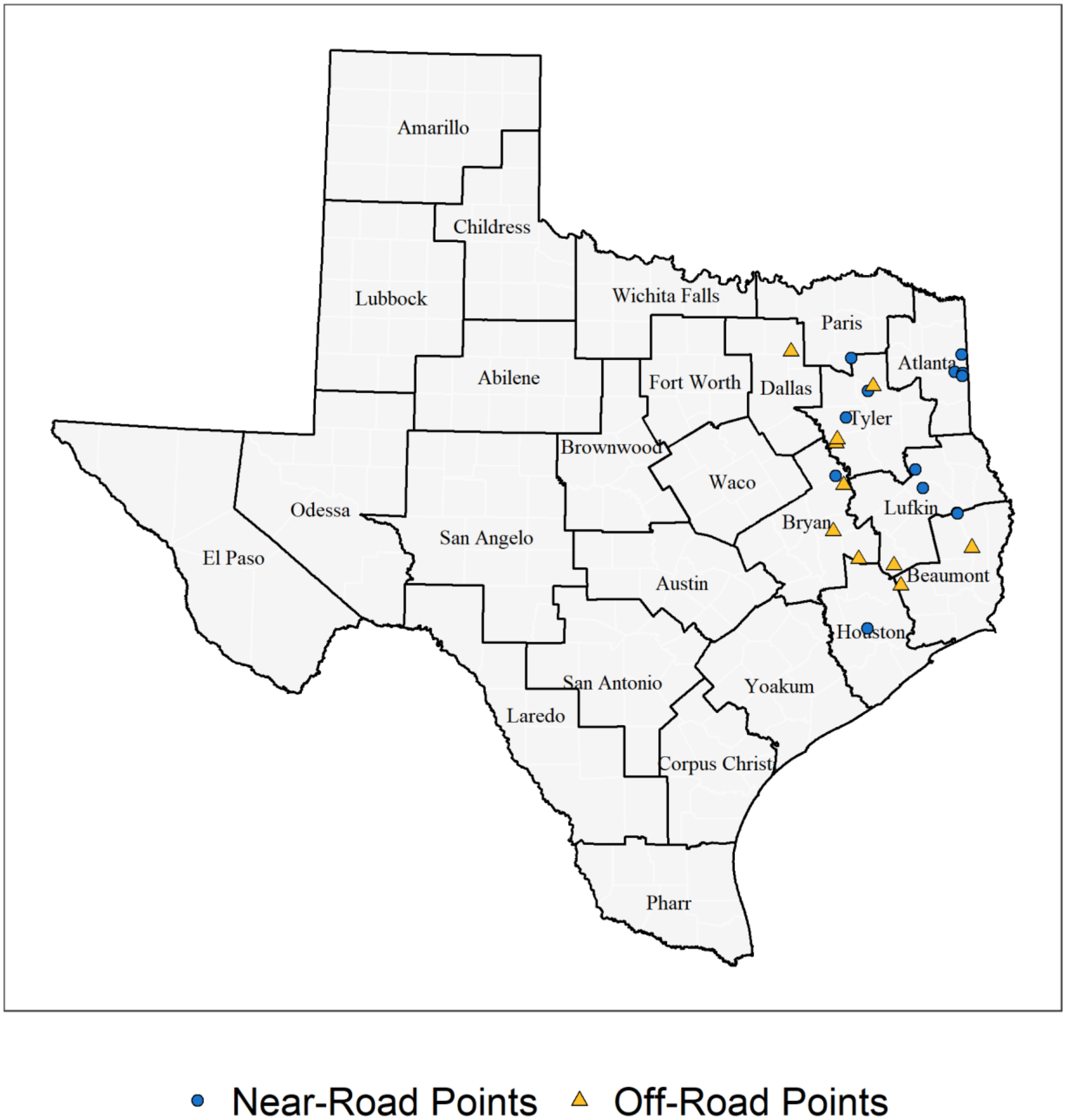
Chihuahuan Mud Turtle

Texas A&M NRI Natural Resources Institute



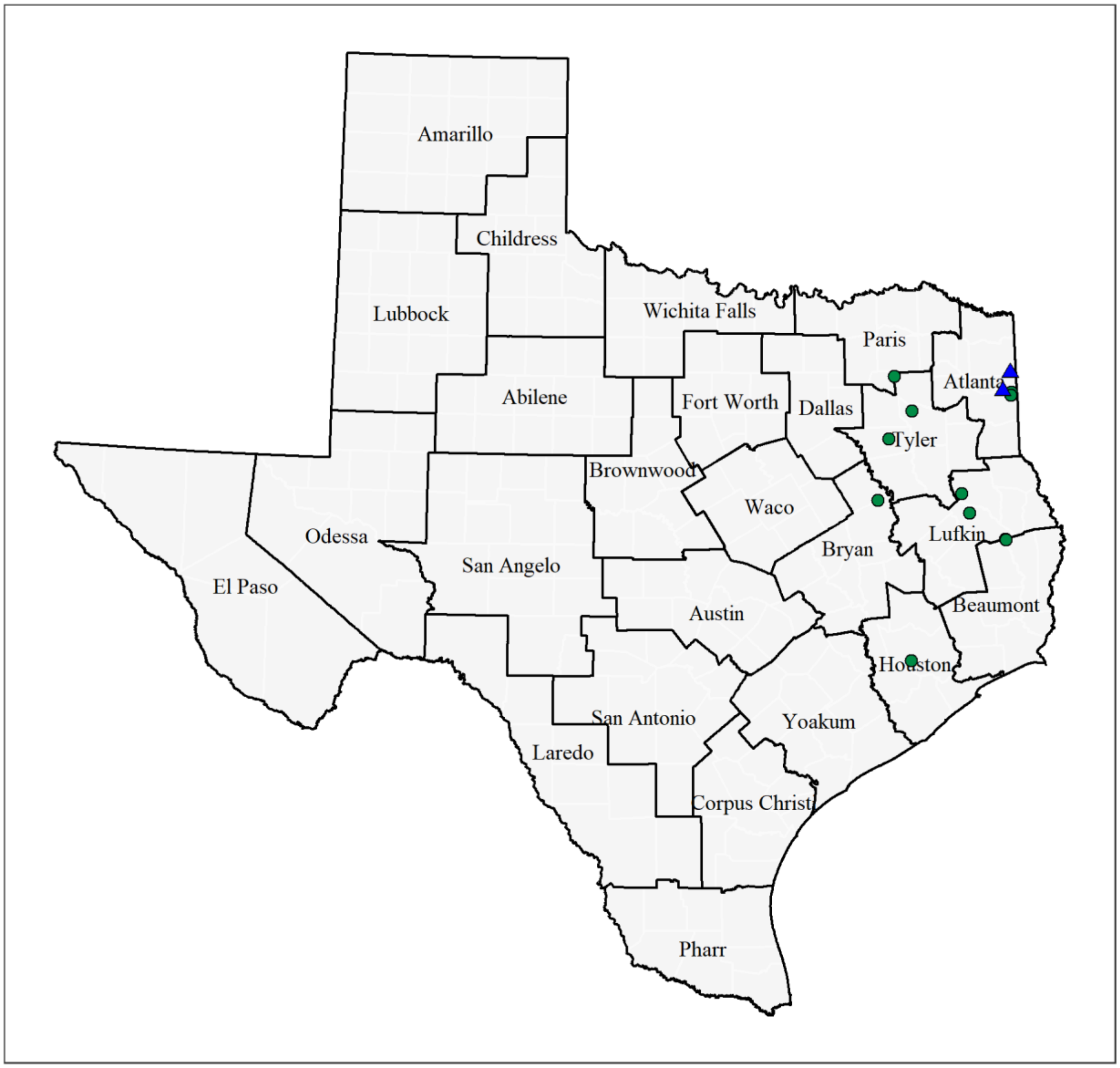
Macrochelys temminckii

Alligator Snapping Turtle



Macrochelys temminckii

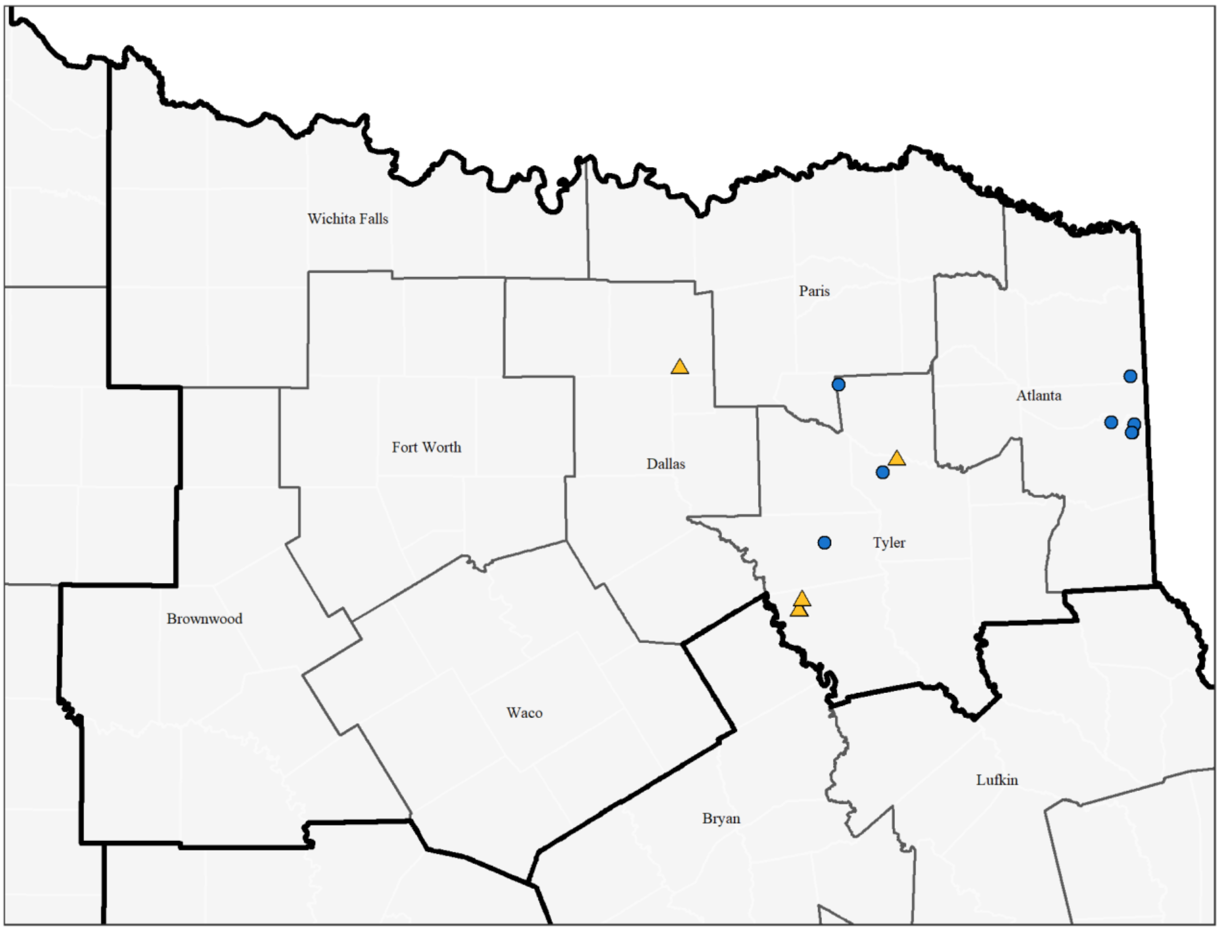
Alligator Snapping Turtle



• Alive ▲ Dead

Macrochelys temminckii

Alligator Snapping Turtle

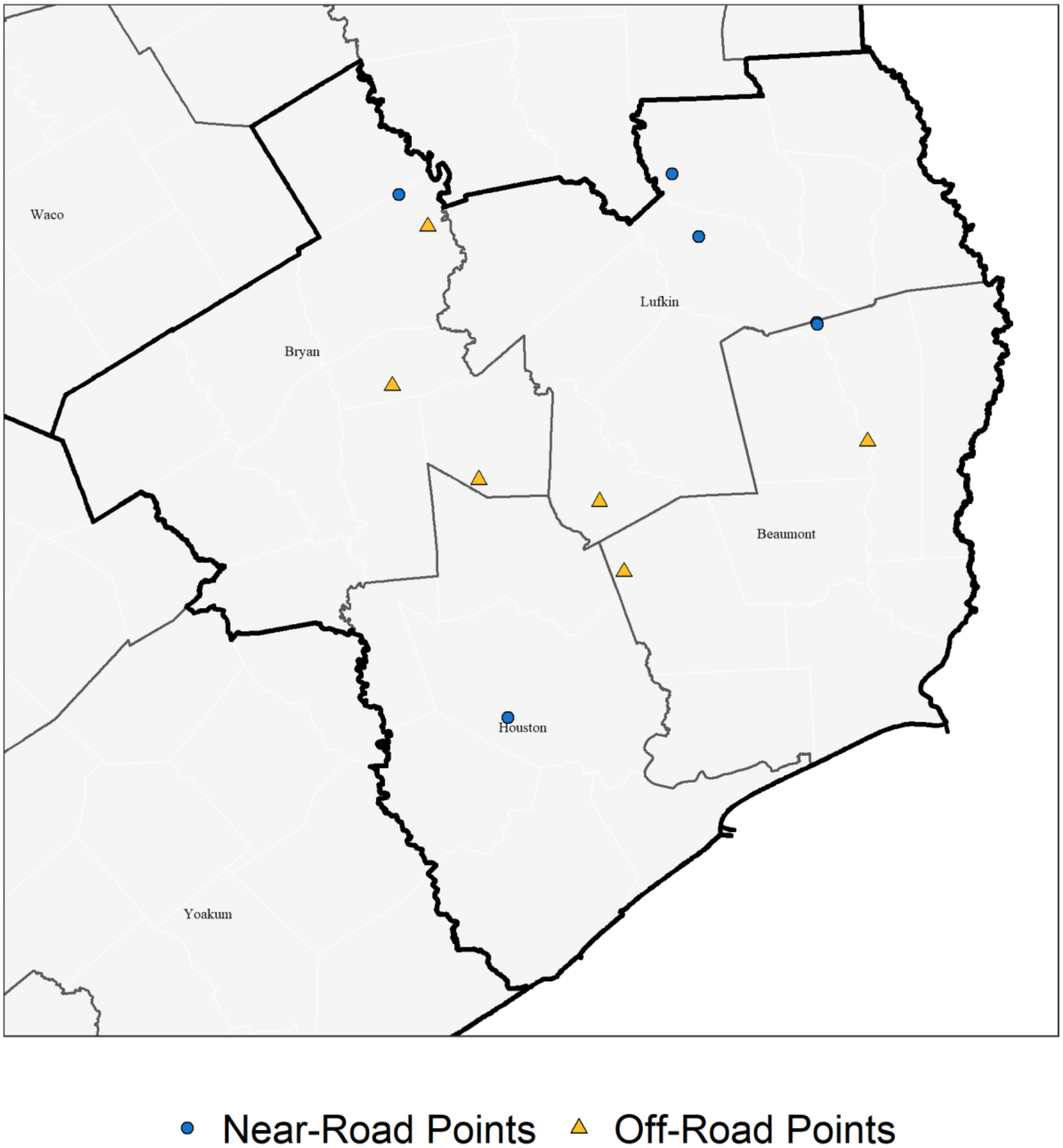


● Near-Road Points △ Off-Road Points

Macrochelys temminckii

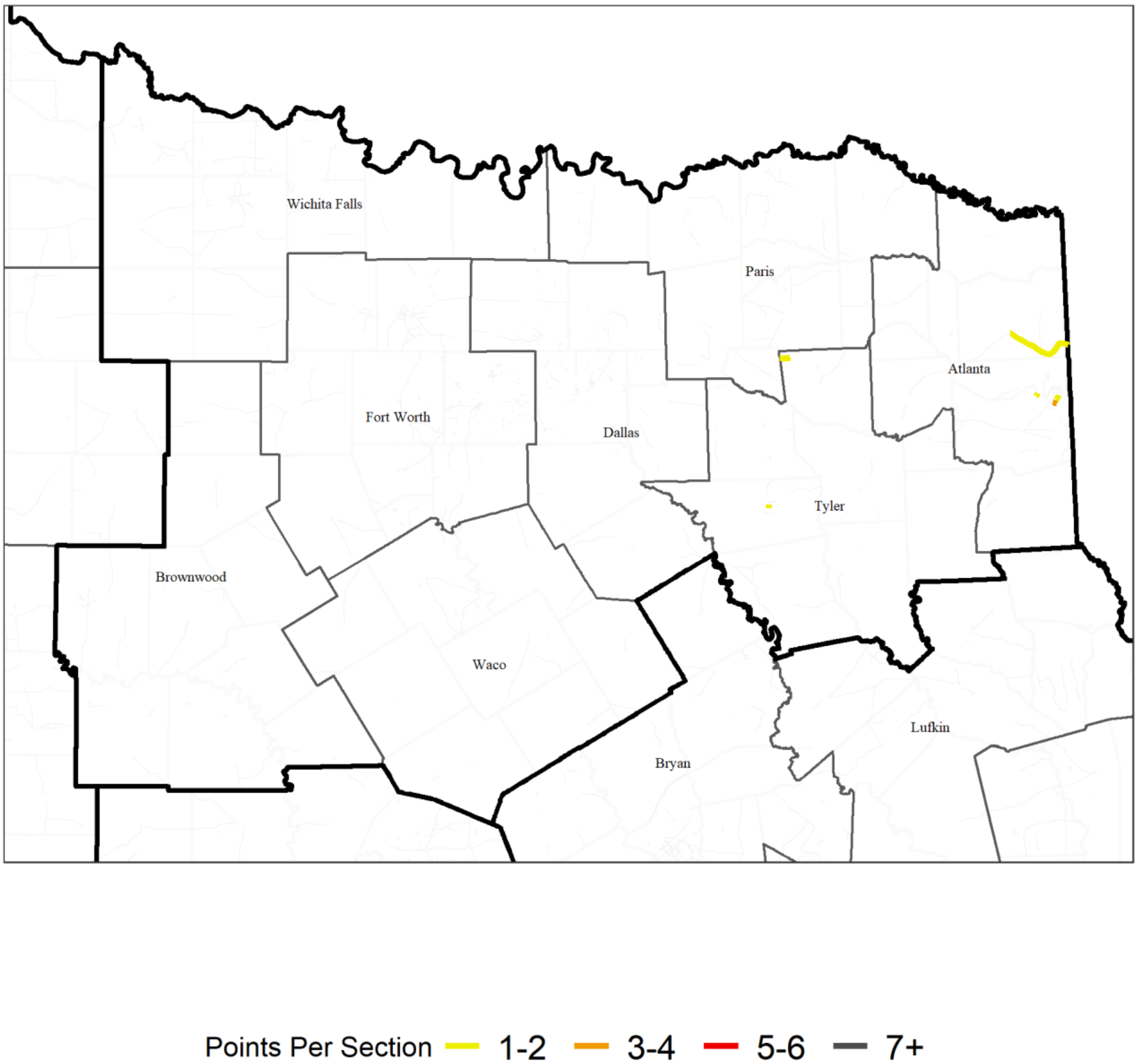
Alligator Snapping Turtle

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Macrochelys temminckii

Alligator Snapping Turtle



Macrochelys temminckii

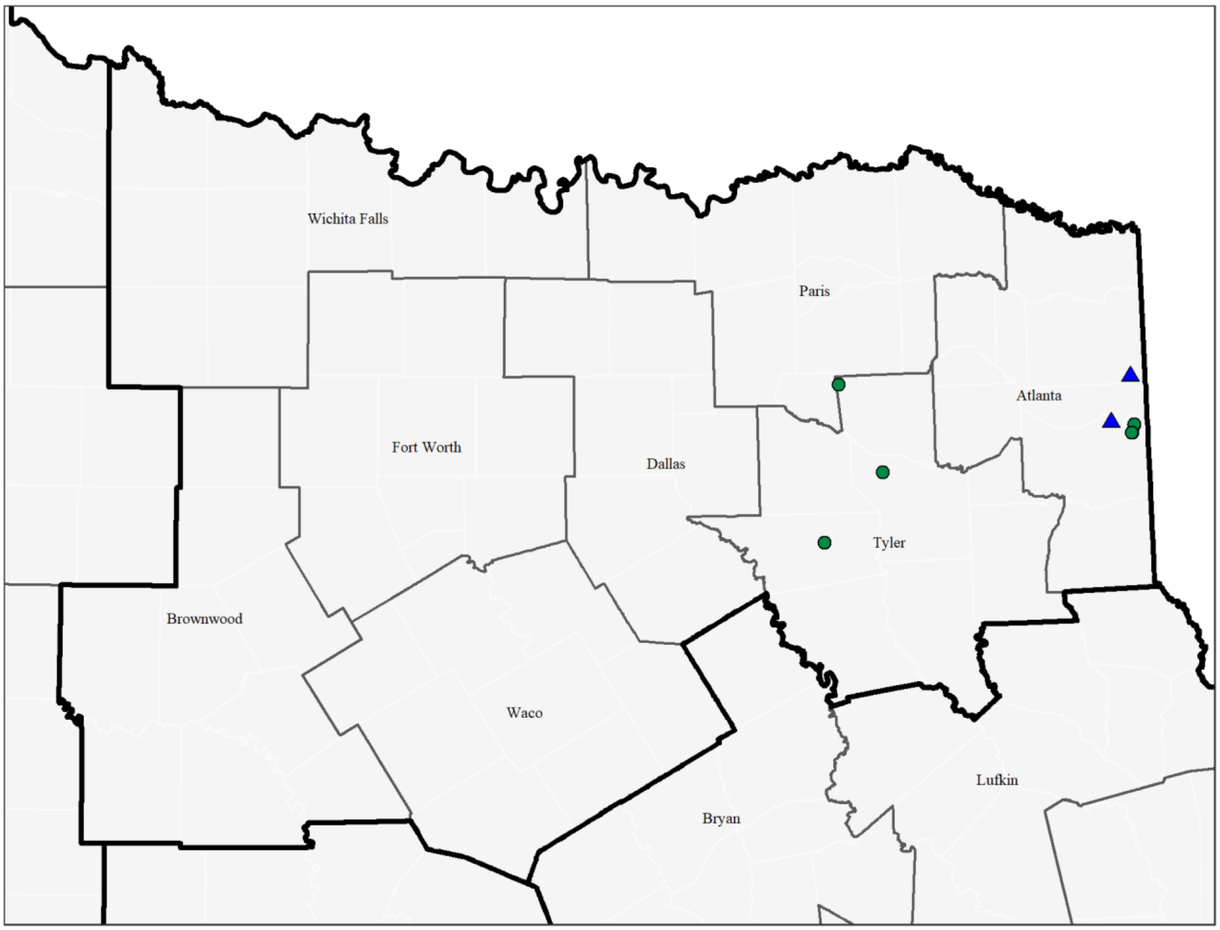
Alligator Snapping Turtle

Points Per Section 1-2 3-4 5-6 7+

Macrochelys temminckii

Alligator Snapping Turtle

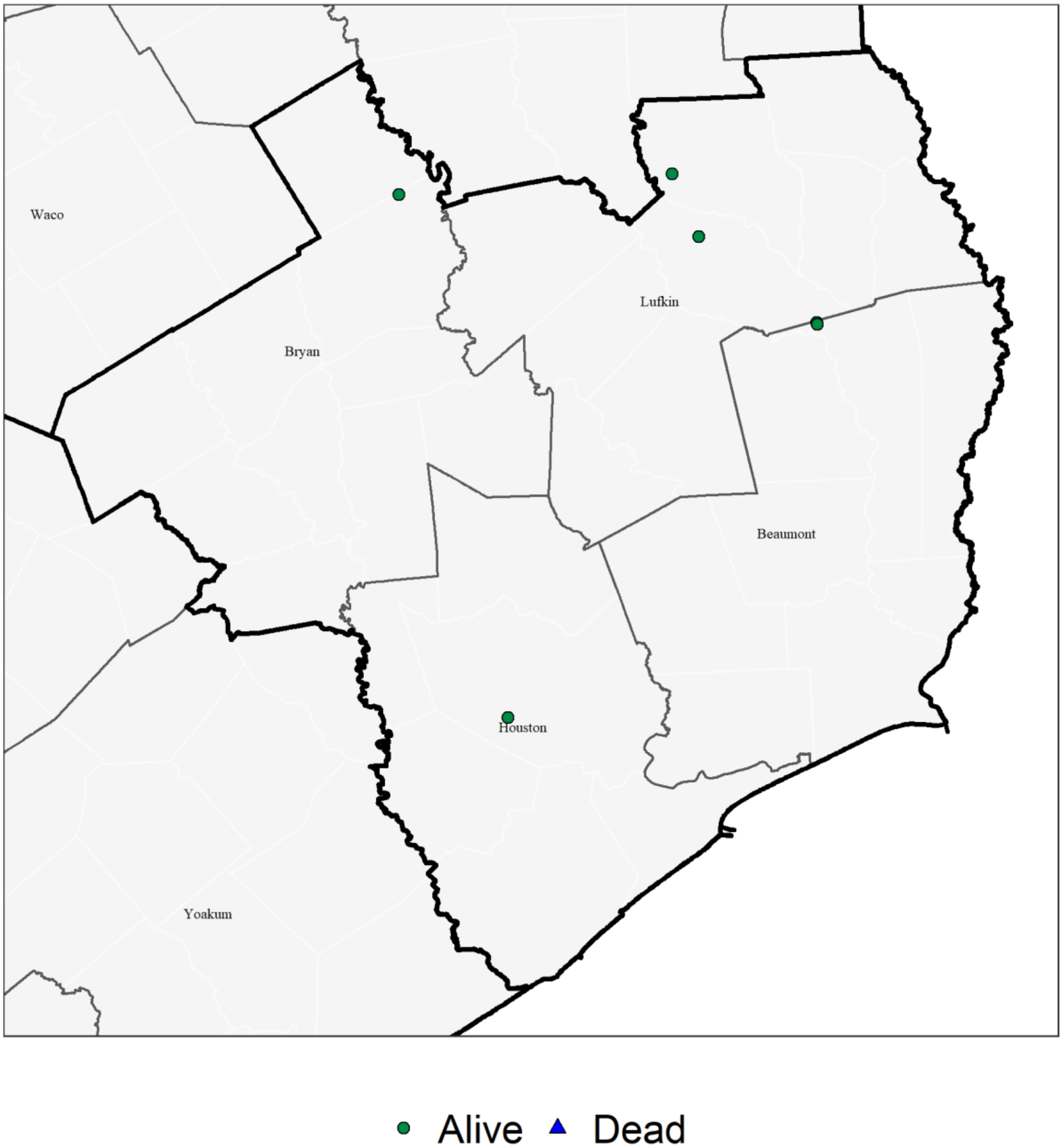
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



● Alive ▲ Dead

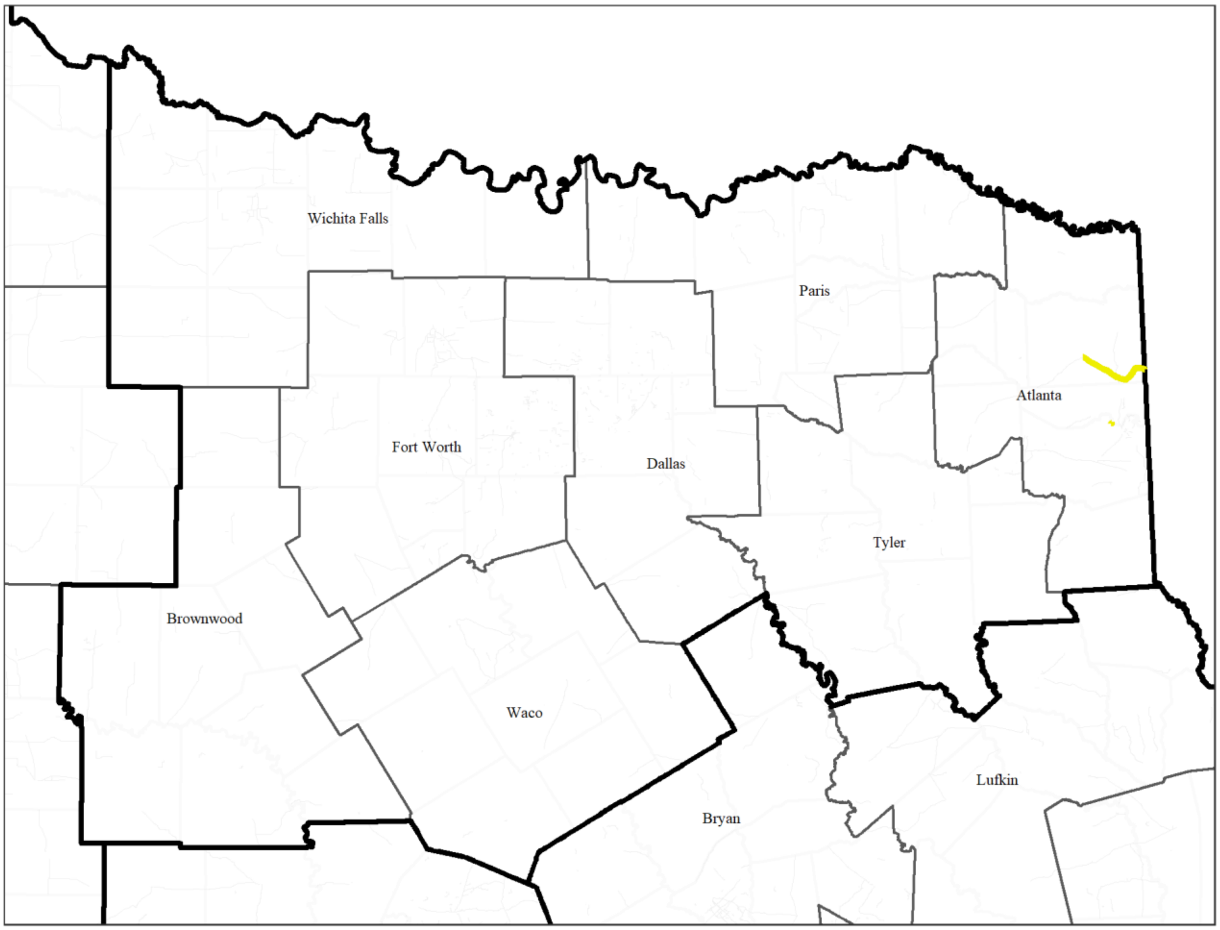
Macrochelys temminckii

Alligator Snapping Turtle



Macrochelys temminckii

Alligator Snapping Turtle



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Malaclemys terrapin

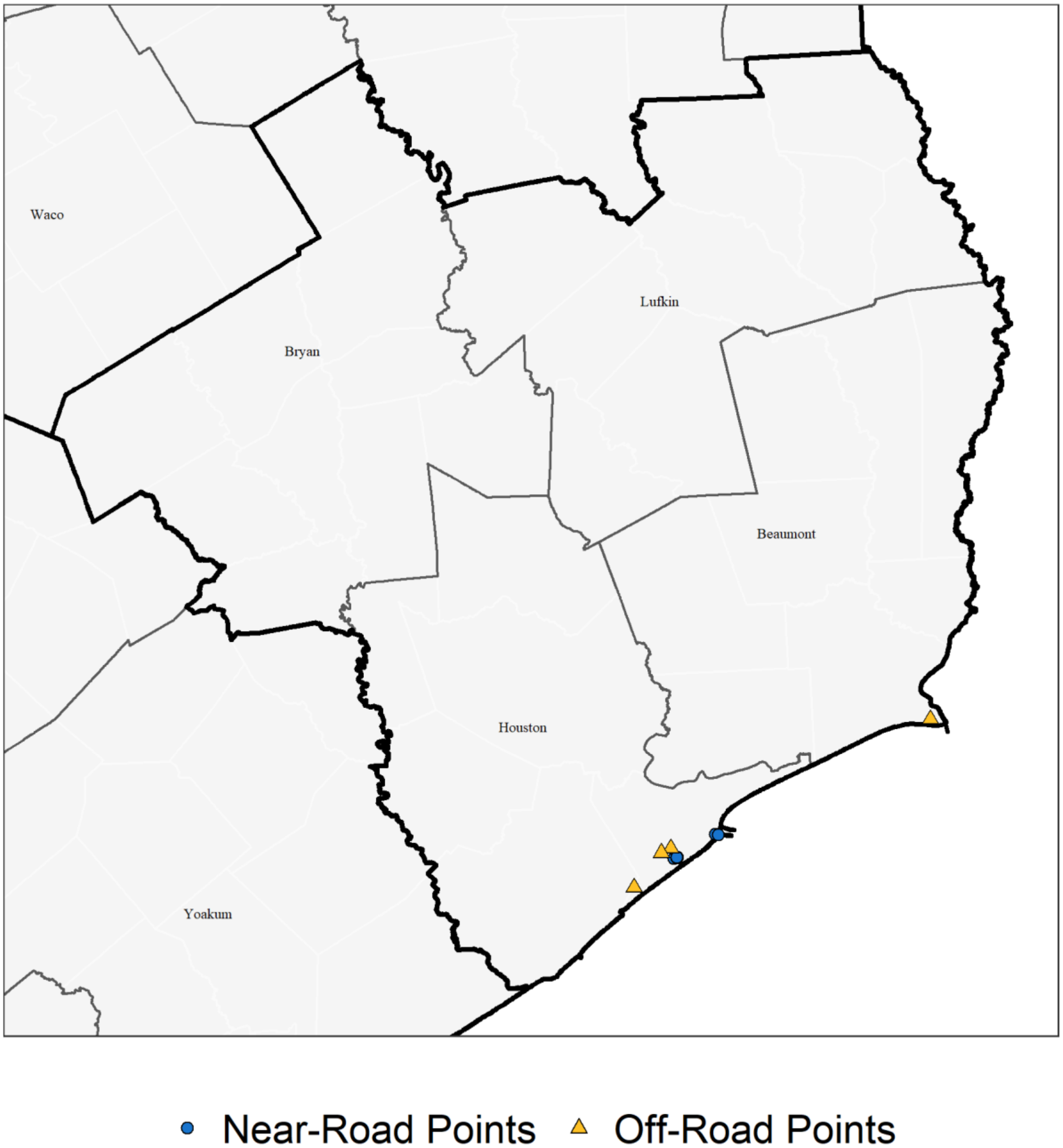
Diamondback Terrapin

Malaclemys terrapin

Diamondback Terrapin

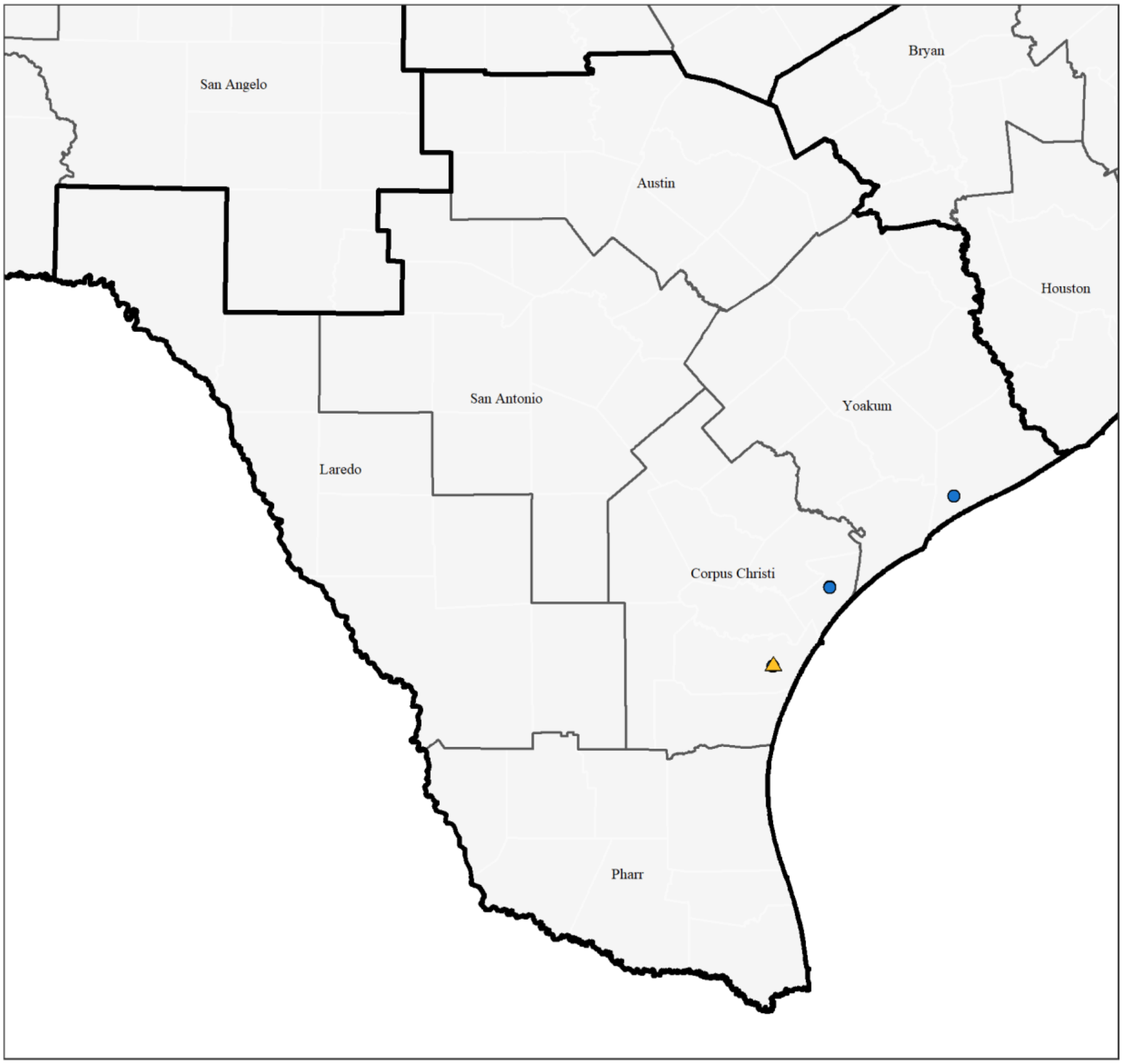
Malaclemys terrapin

Diamondback Terrapin



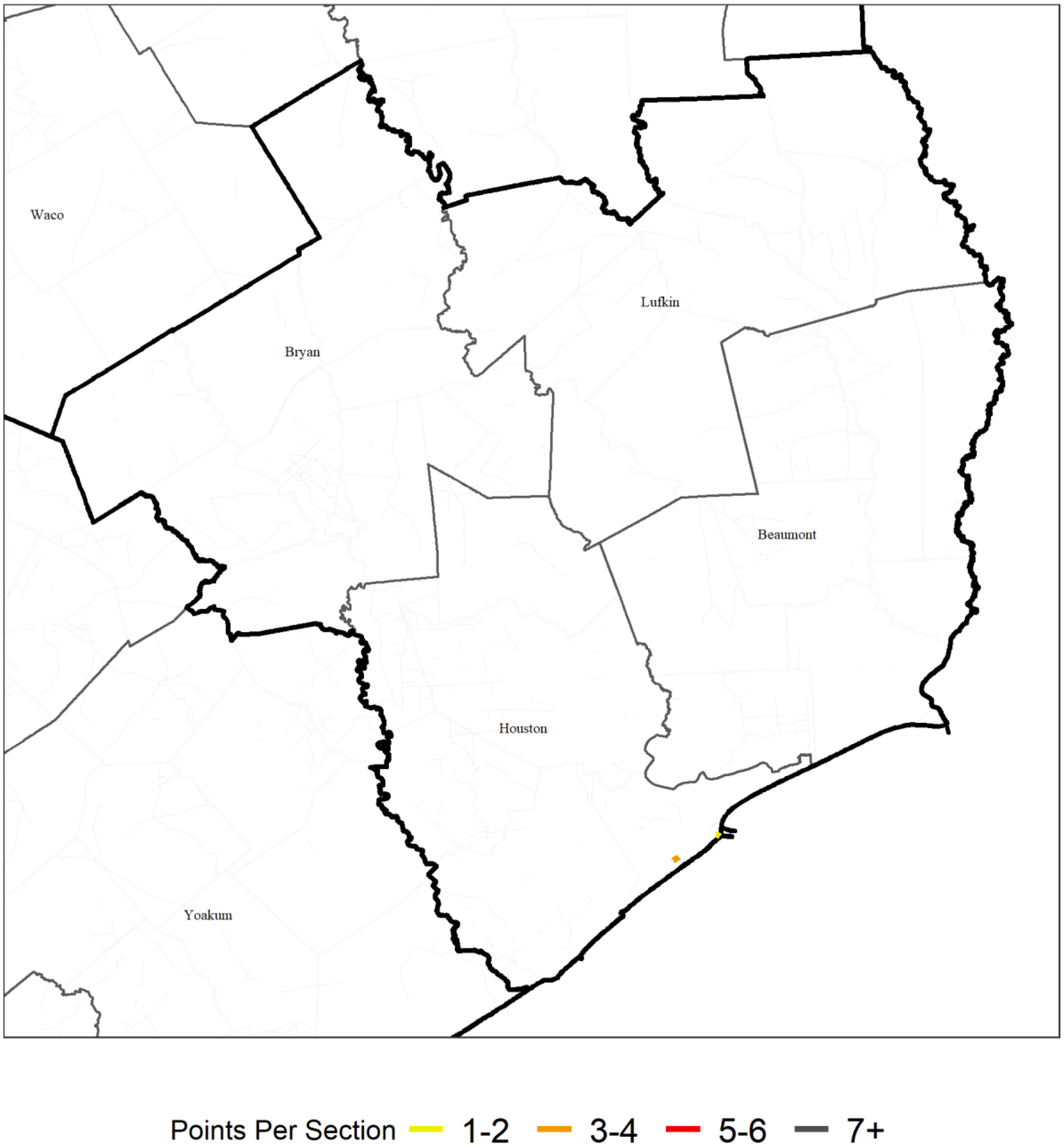
Malaclemys terrapin

Diamondback Terrapin



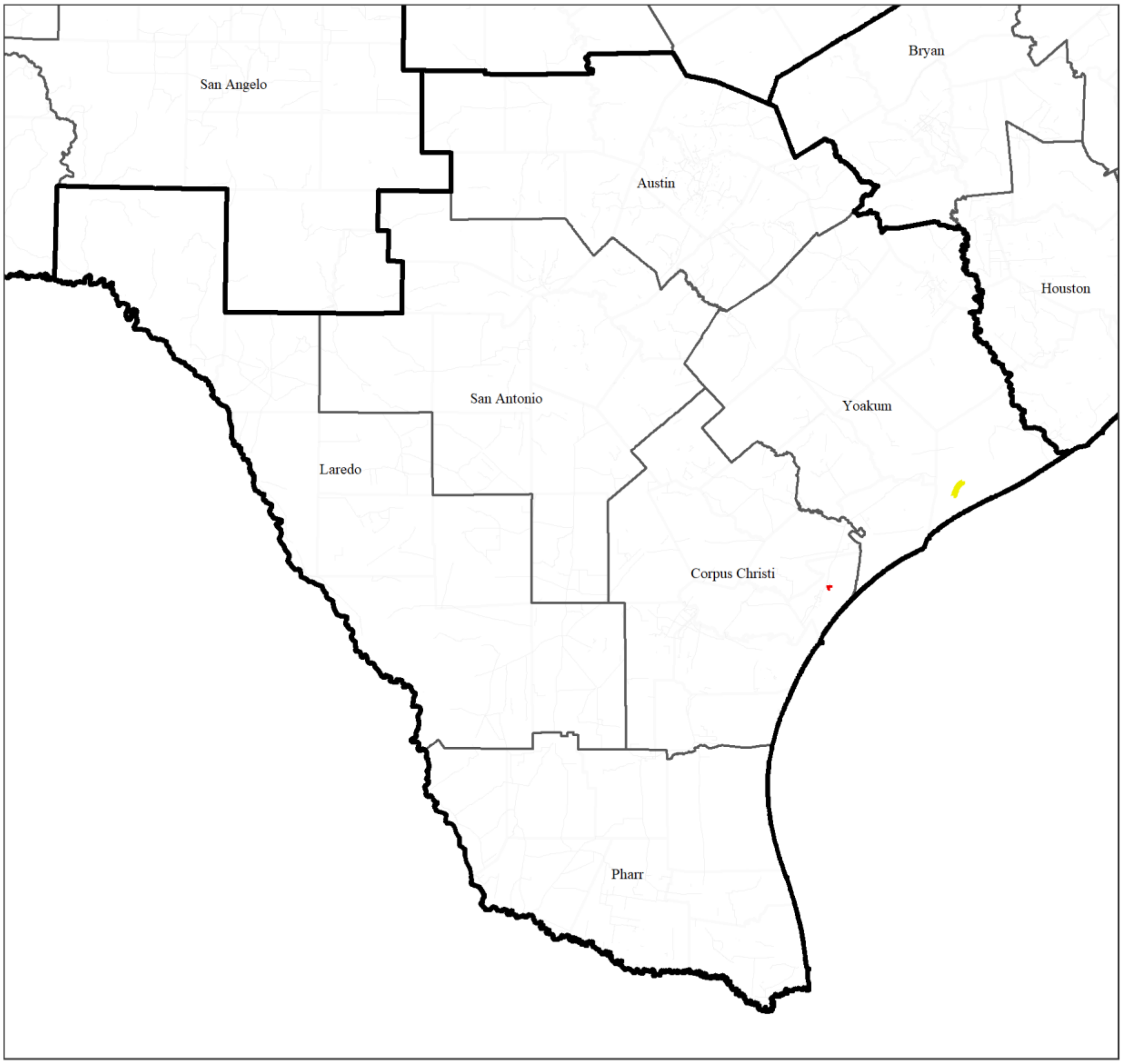
● Near-Road Points △ Off-Road Points

Malaclemys terrapin
Diamondback Terrapin



Malaclemys terrapin

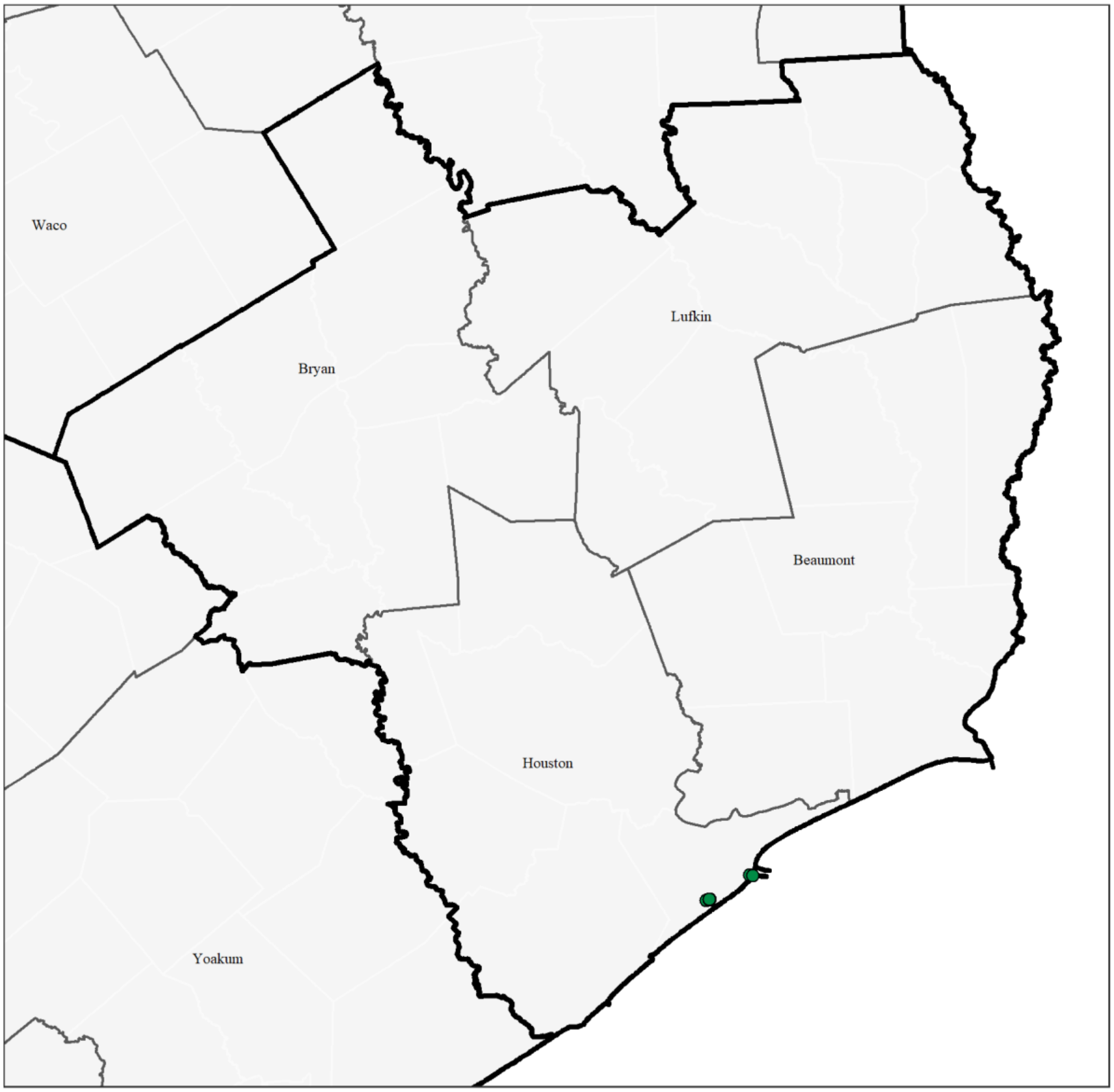
Diamondback Terrapin



Points Per Section 1-2 3-4 5-6 7+

Malaclemys terrapin

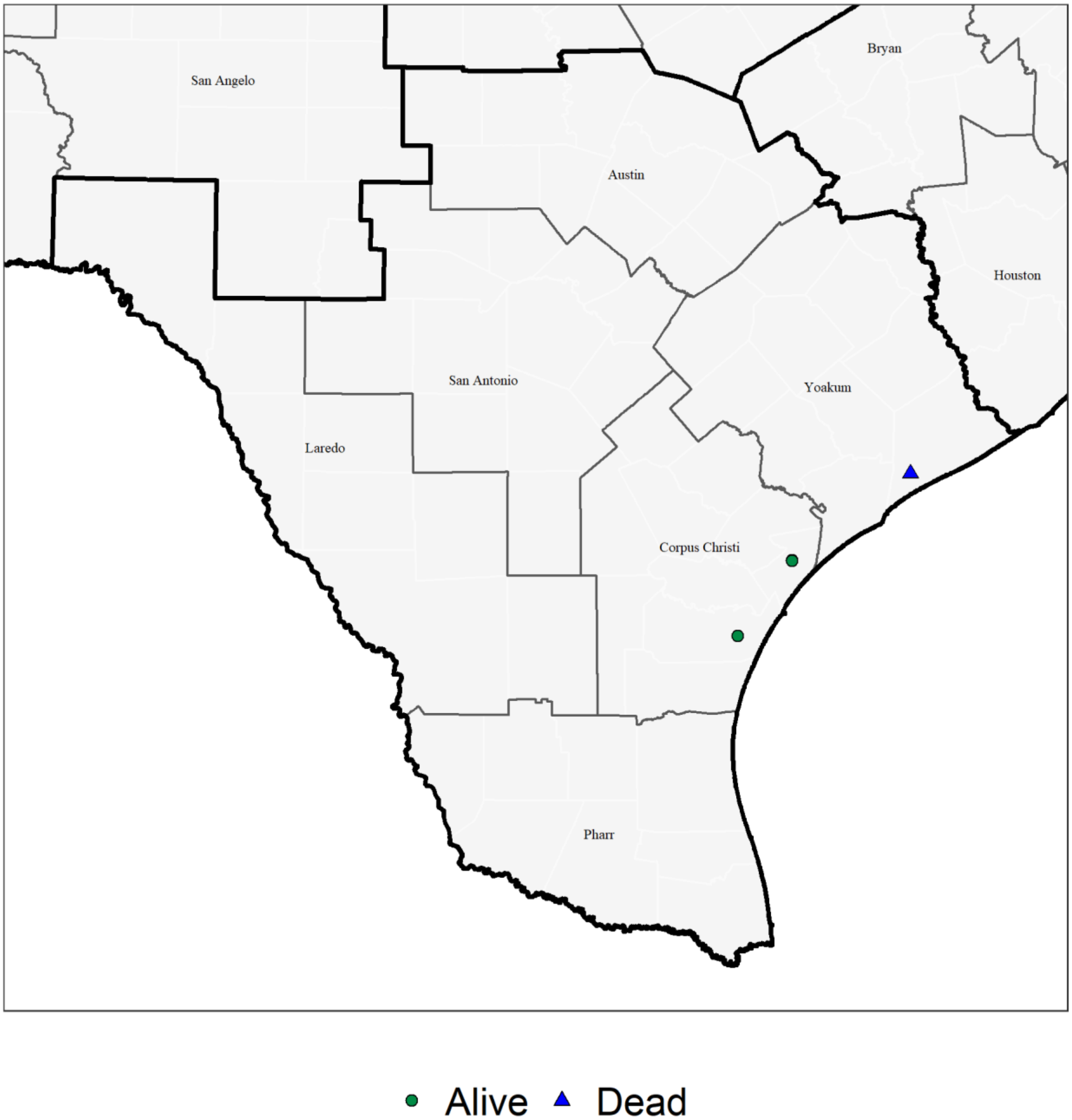
Diamondback Terrapin



● Alive ▲ Dead

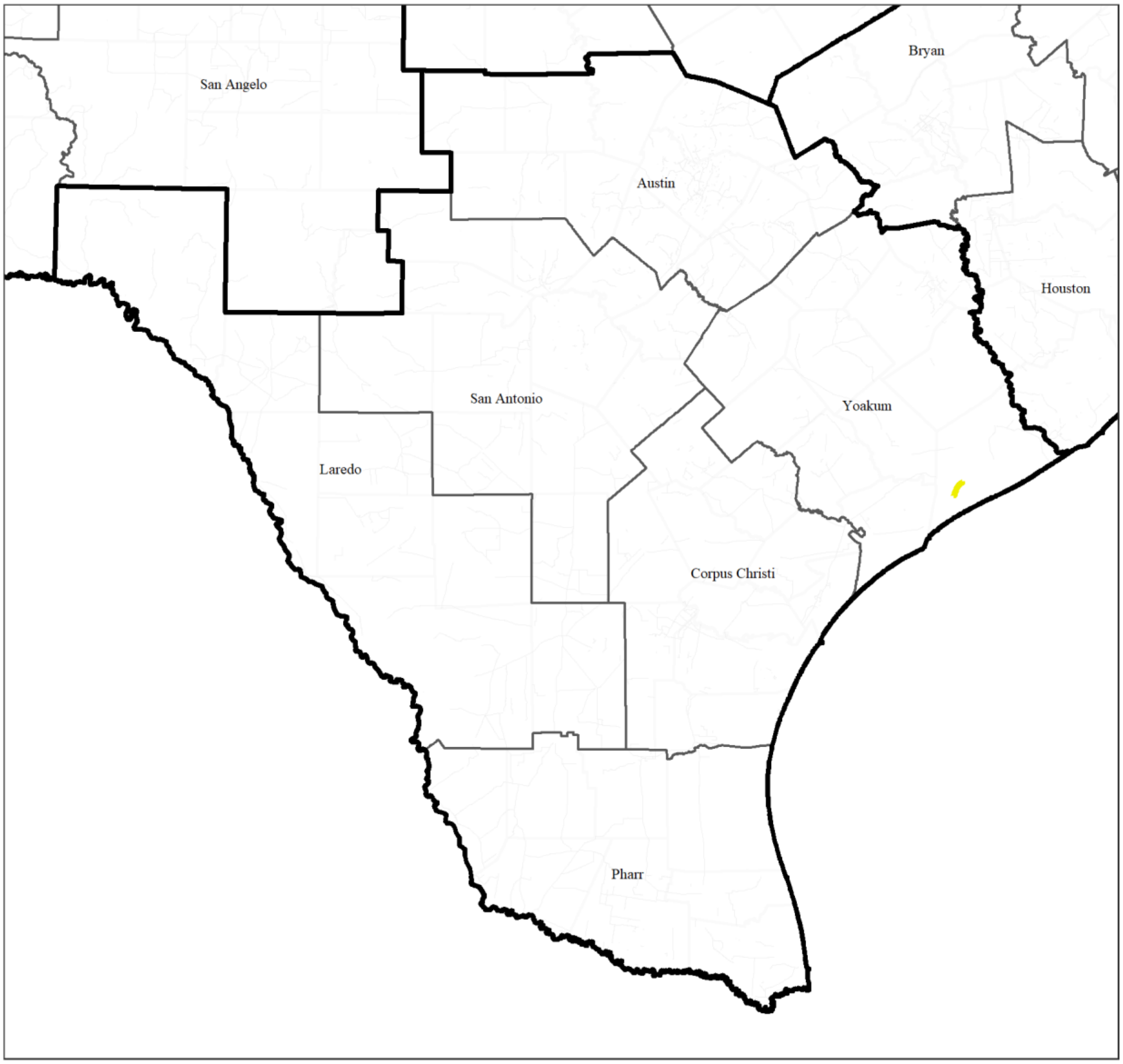
Malaclemys terrapin

Diamondback Terrapin



Malaclemys terrapin

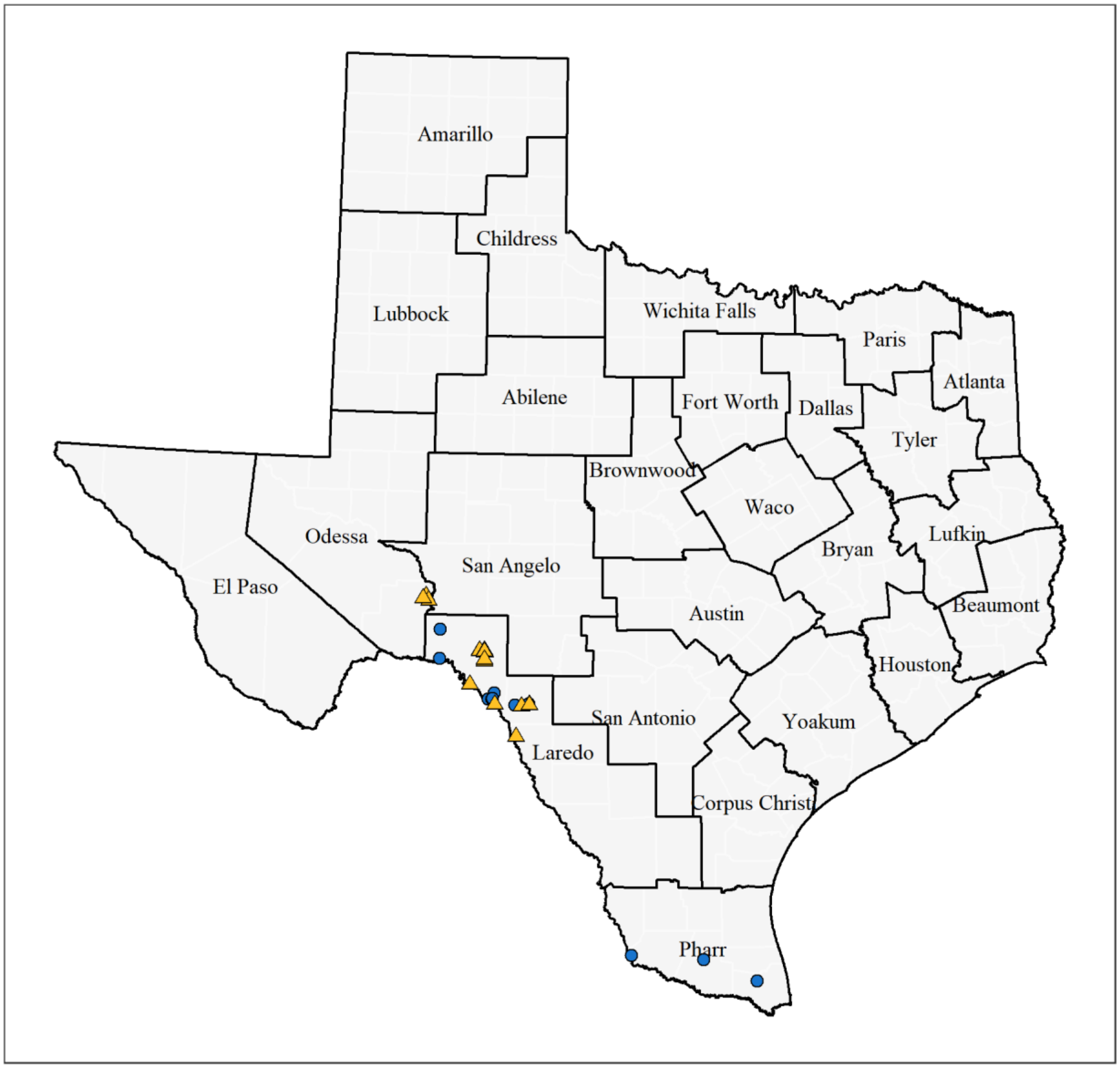
Diamondback Terrapin



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Pseudemys gorzugi

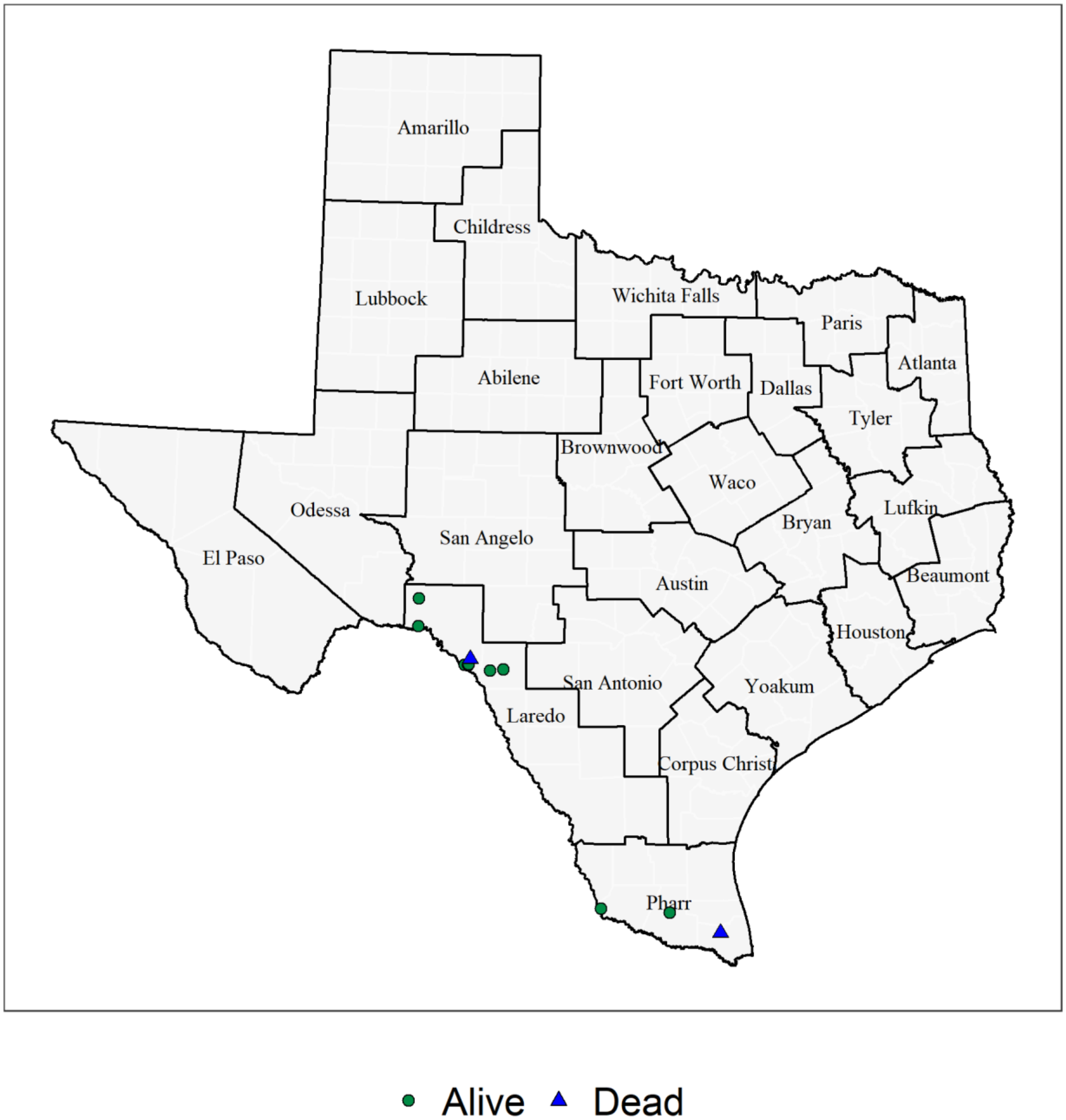
Rio Grande Cooter



Near-Road Points   Off-Road Points

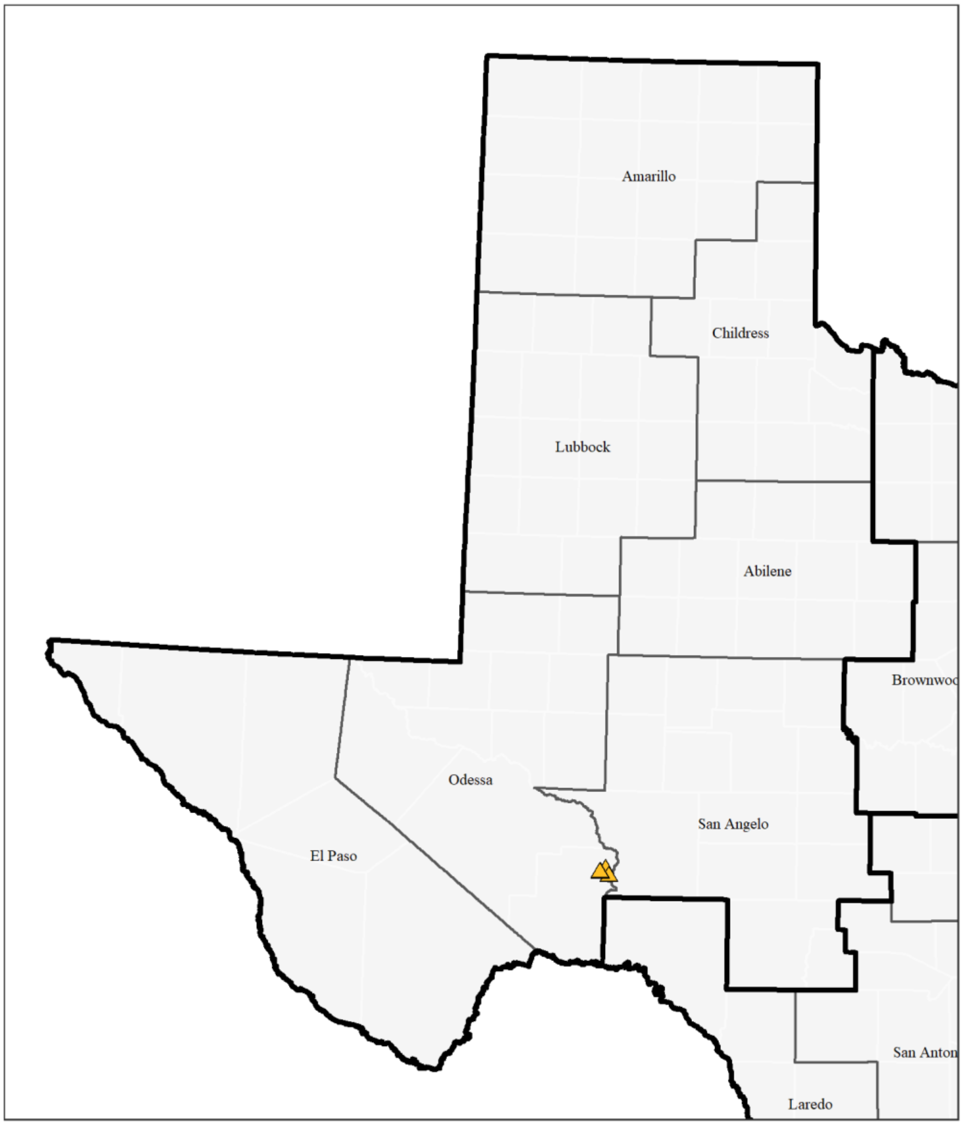
Pseudemys gorzugi

Rio Grande Cooter



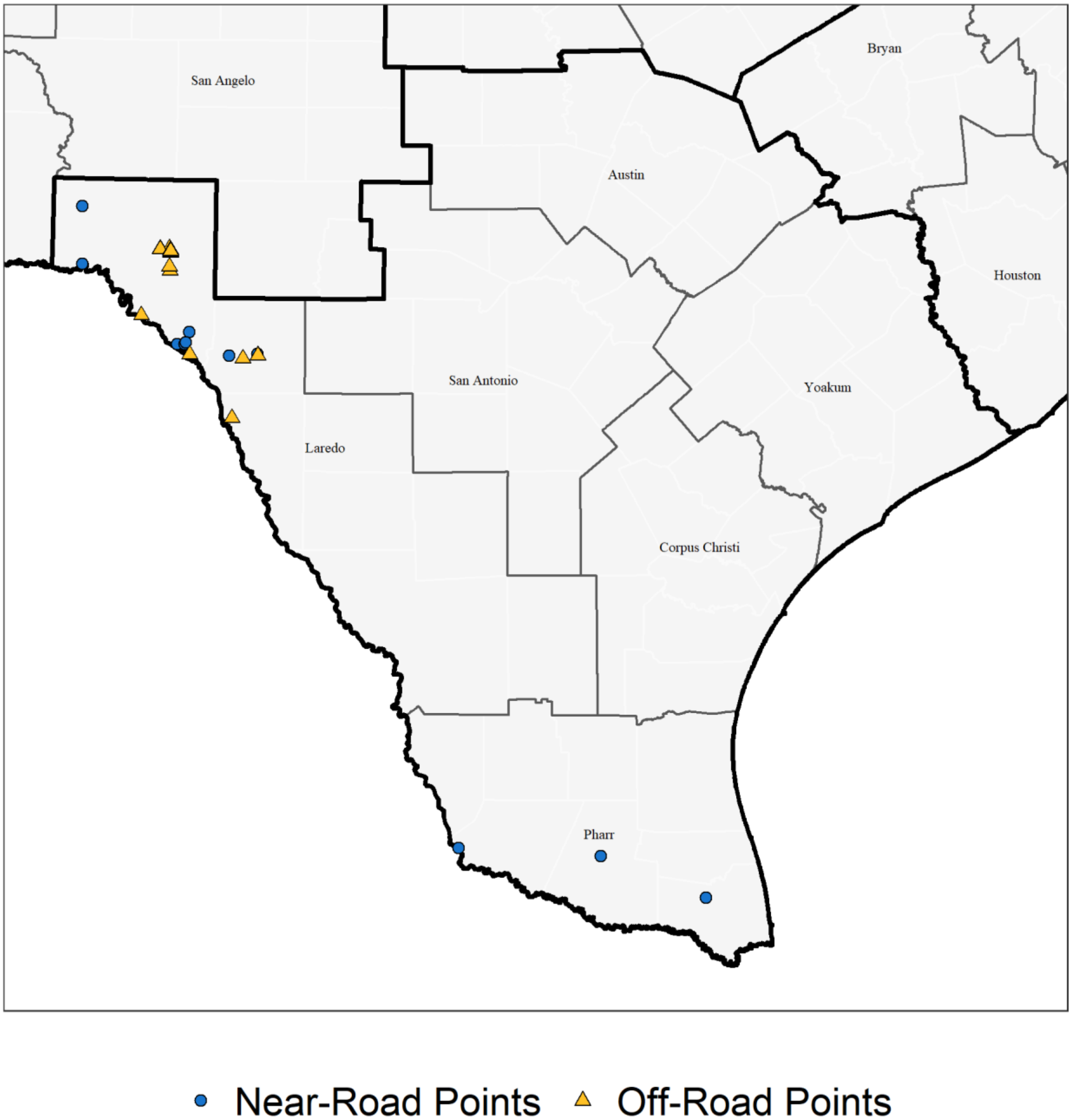
Pseudemys gorzugi

Rio Grande Cooter



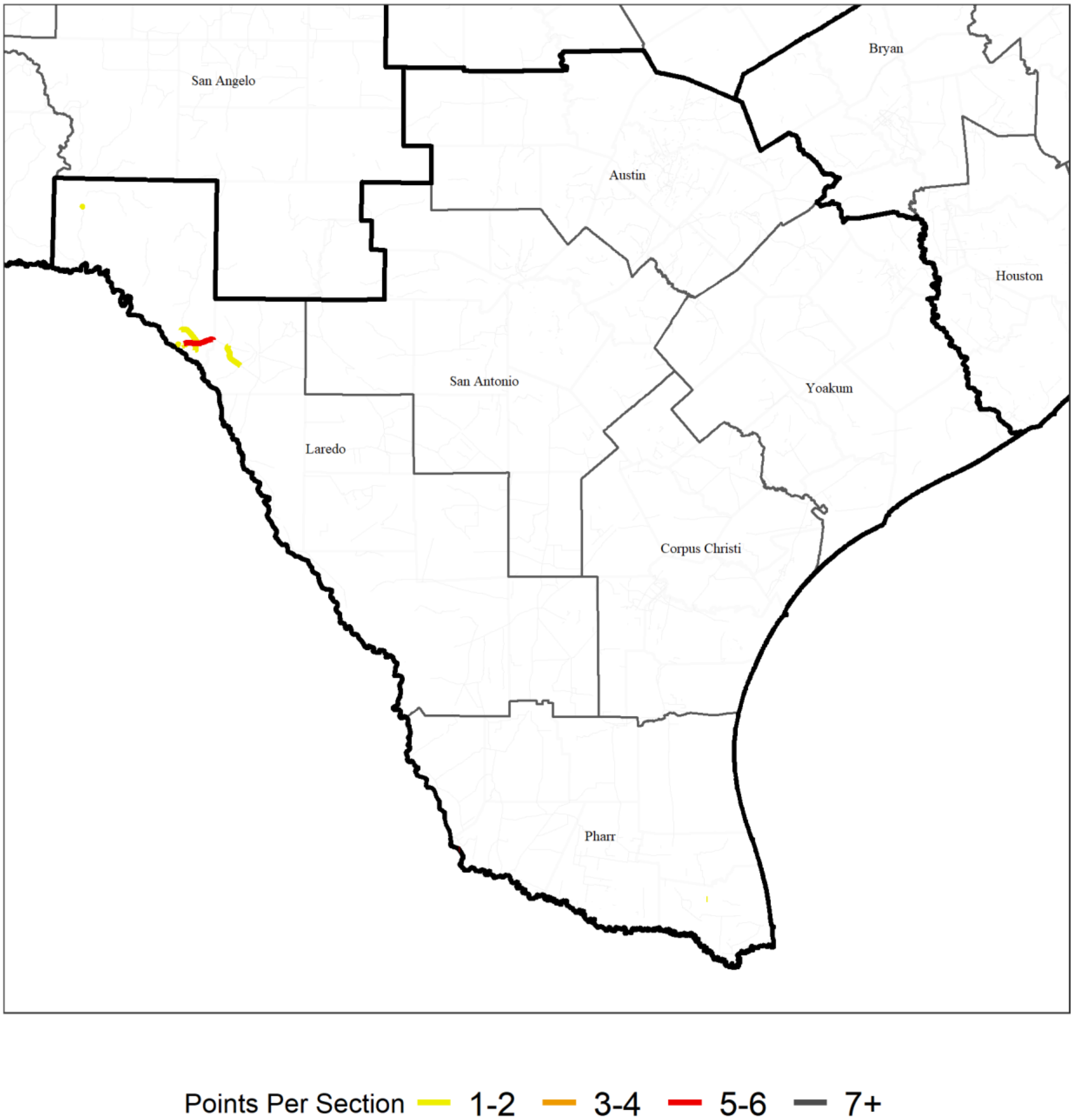
● Near-Road Points △ Off-Road Points

Pseudemys gorzugi
Rio Grande Cooter

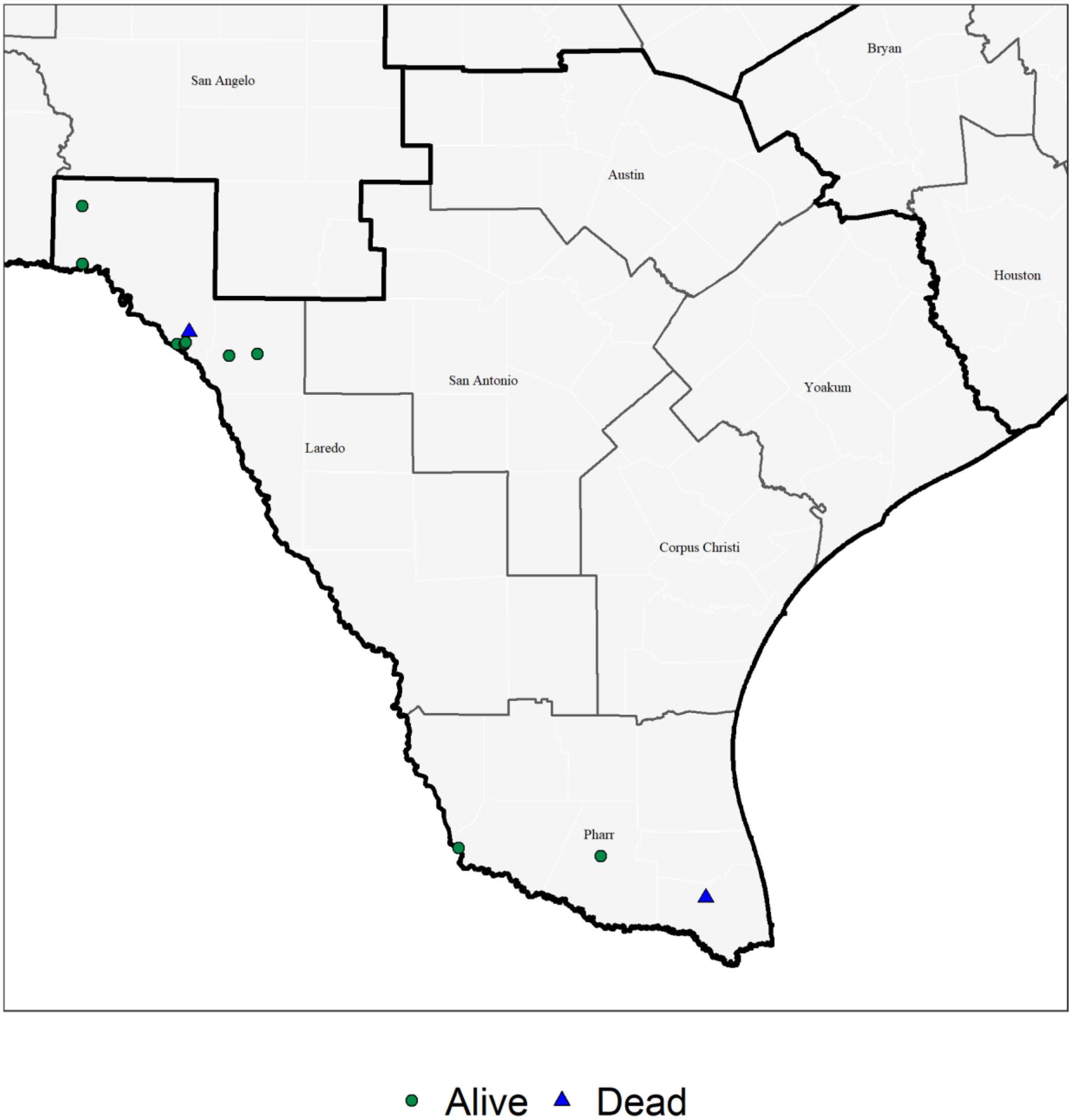


Pseudemys gorzugi

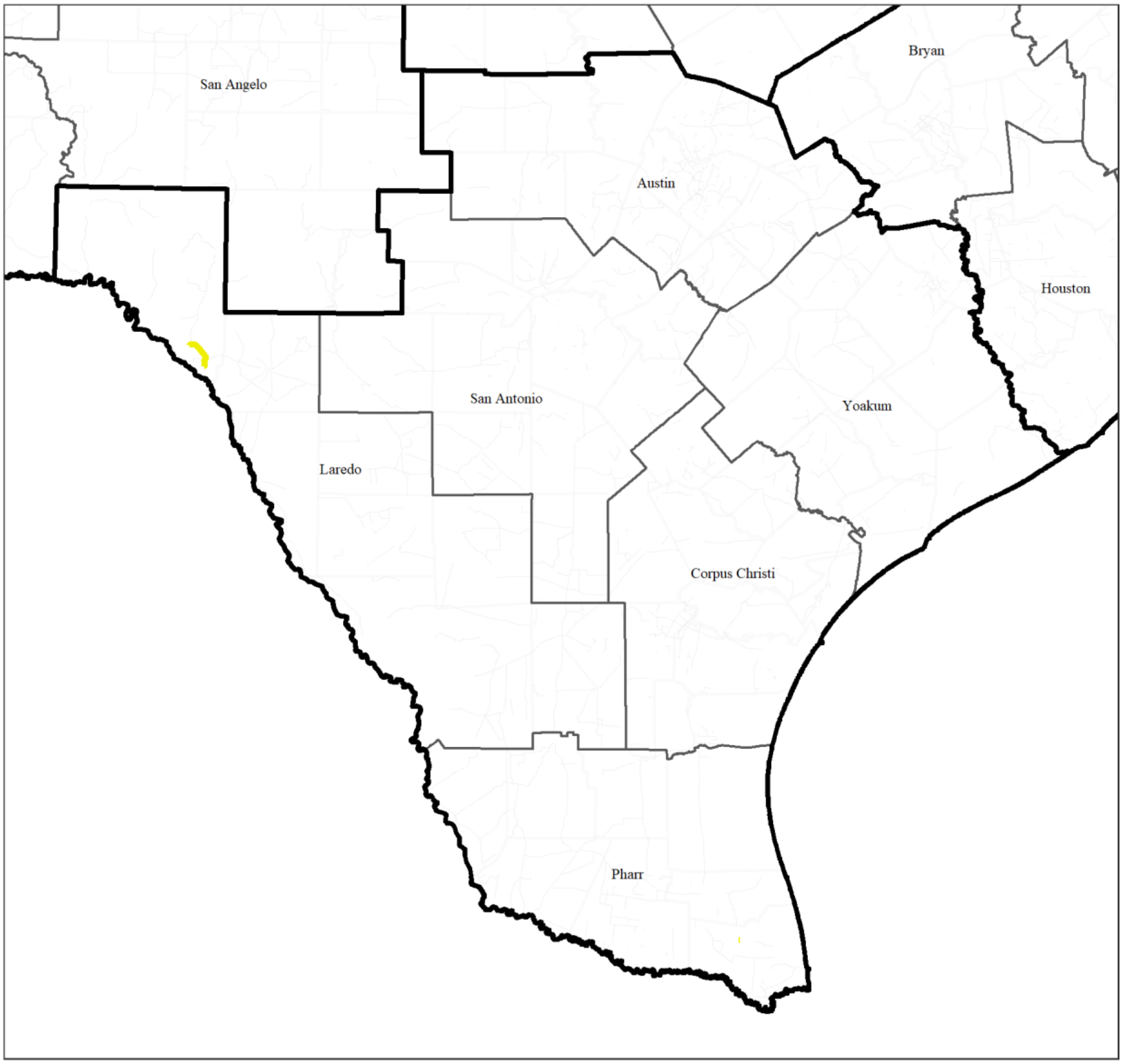
Rio Grande Cooter



Pseudemys gorzugi
Rio Grande Cooter



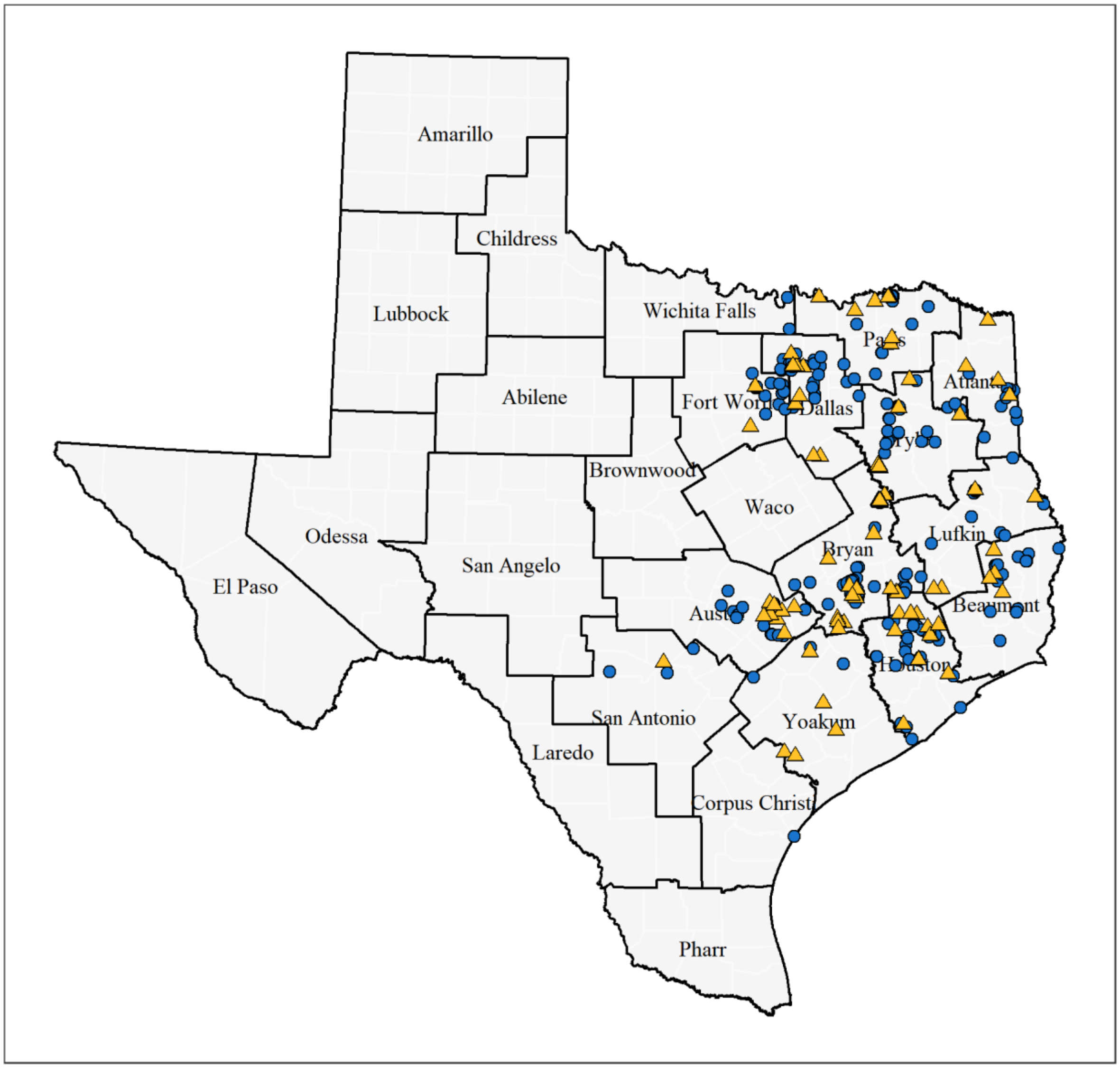
Pseudemys gorzugi
Rio Grande Cooter



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Terrapene carolina

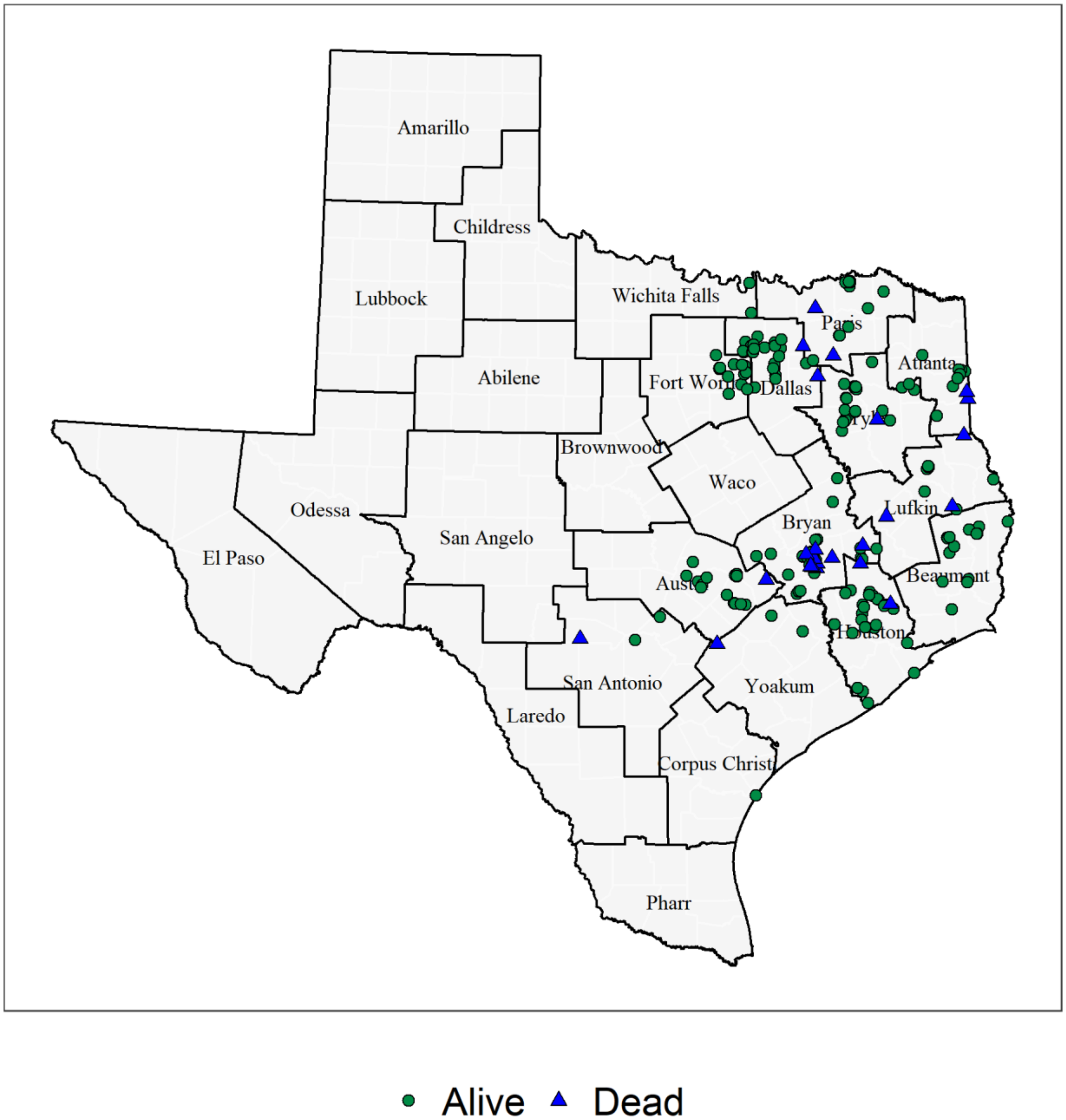
Common Box Turtle



• Near-Road Points △ Off-Road Points

Terrapene carolina

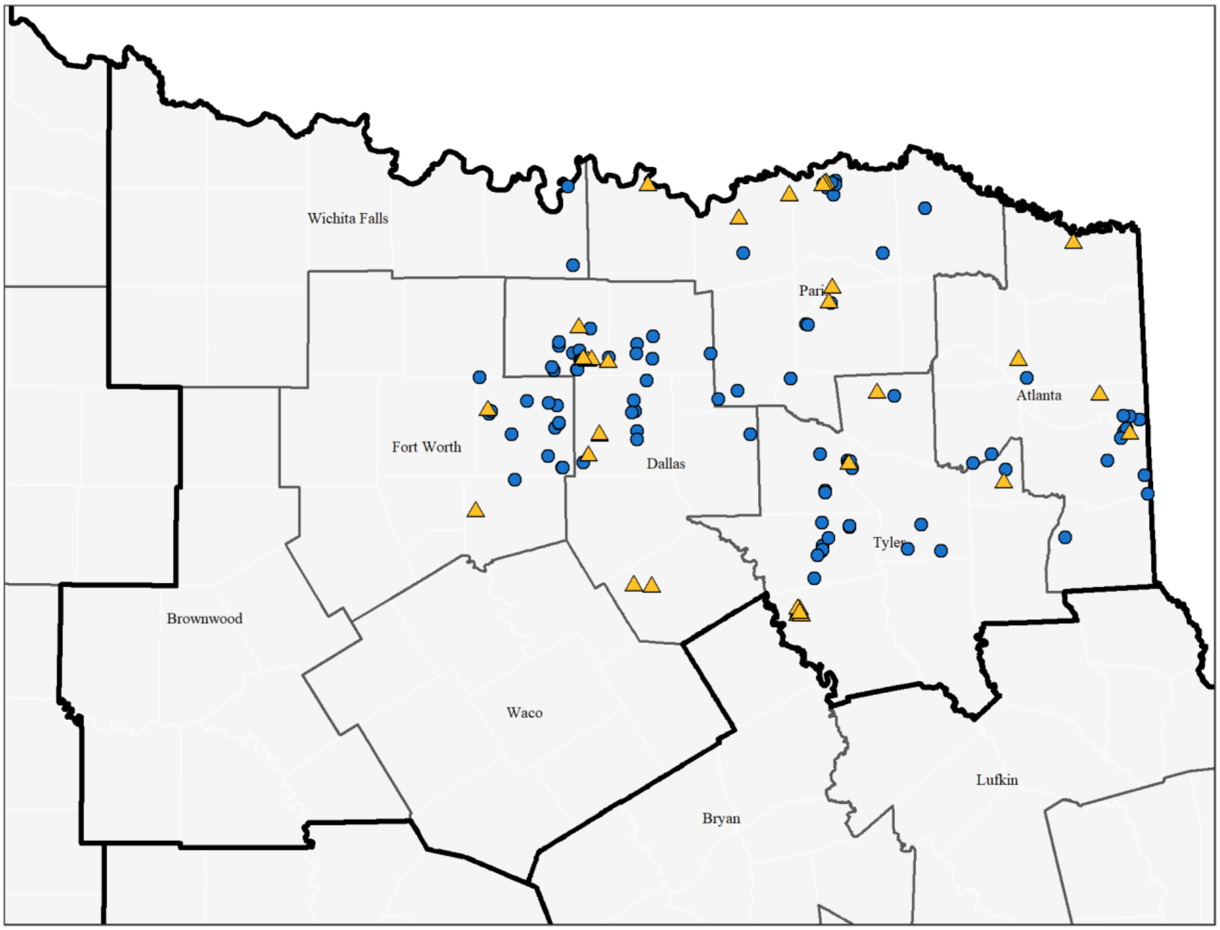
Common Box Turtle



Terrapene carolina

Common Box Turtle

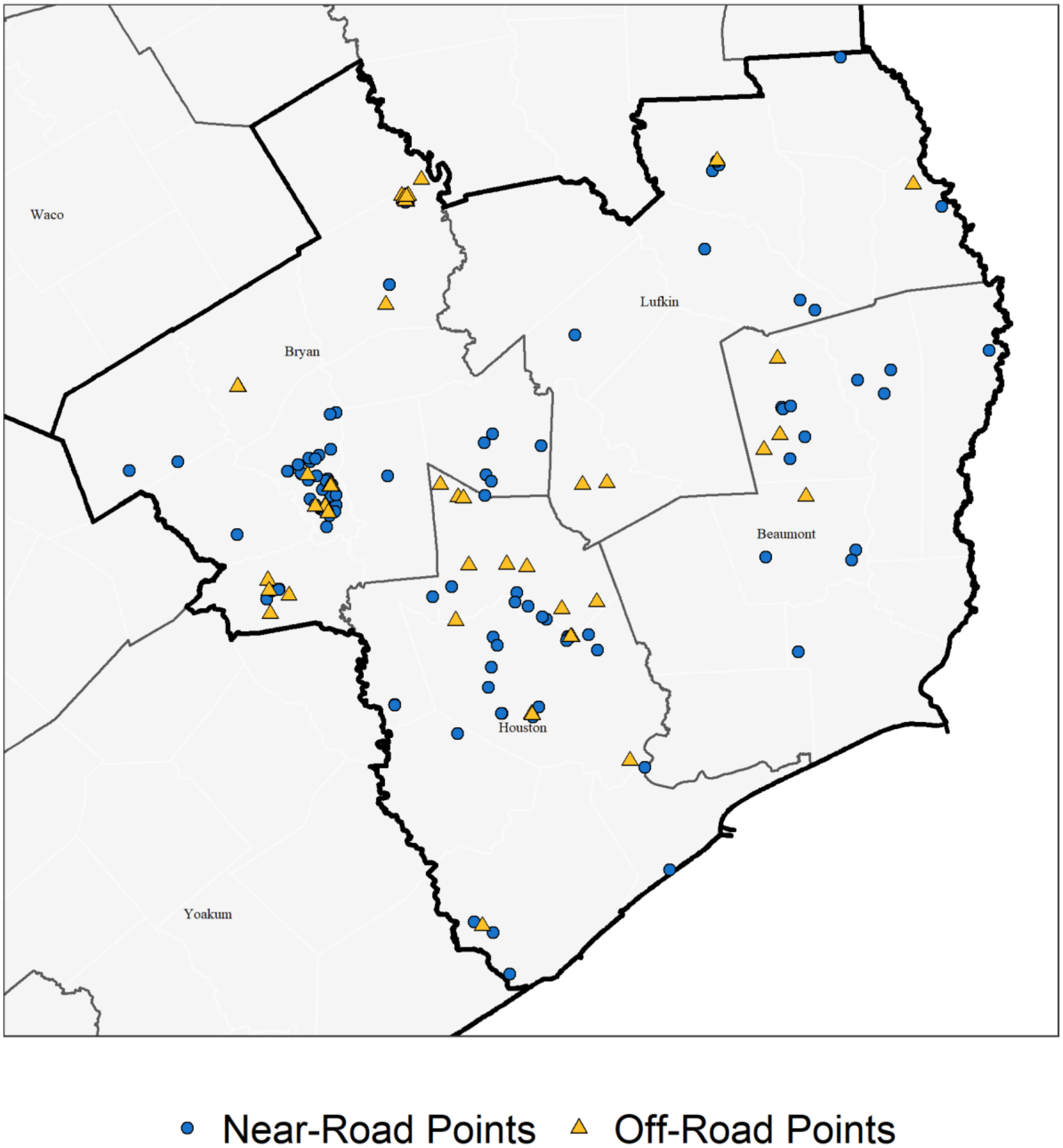
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Near-Road Points Off-Road Points

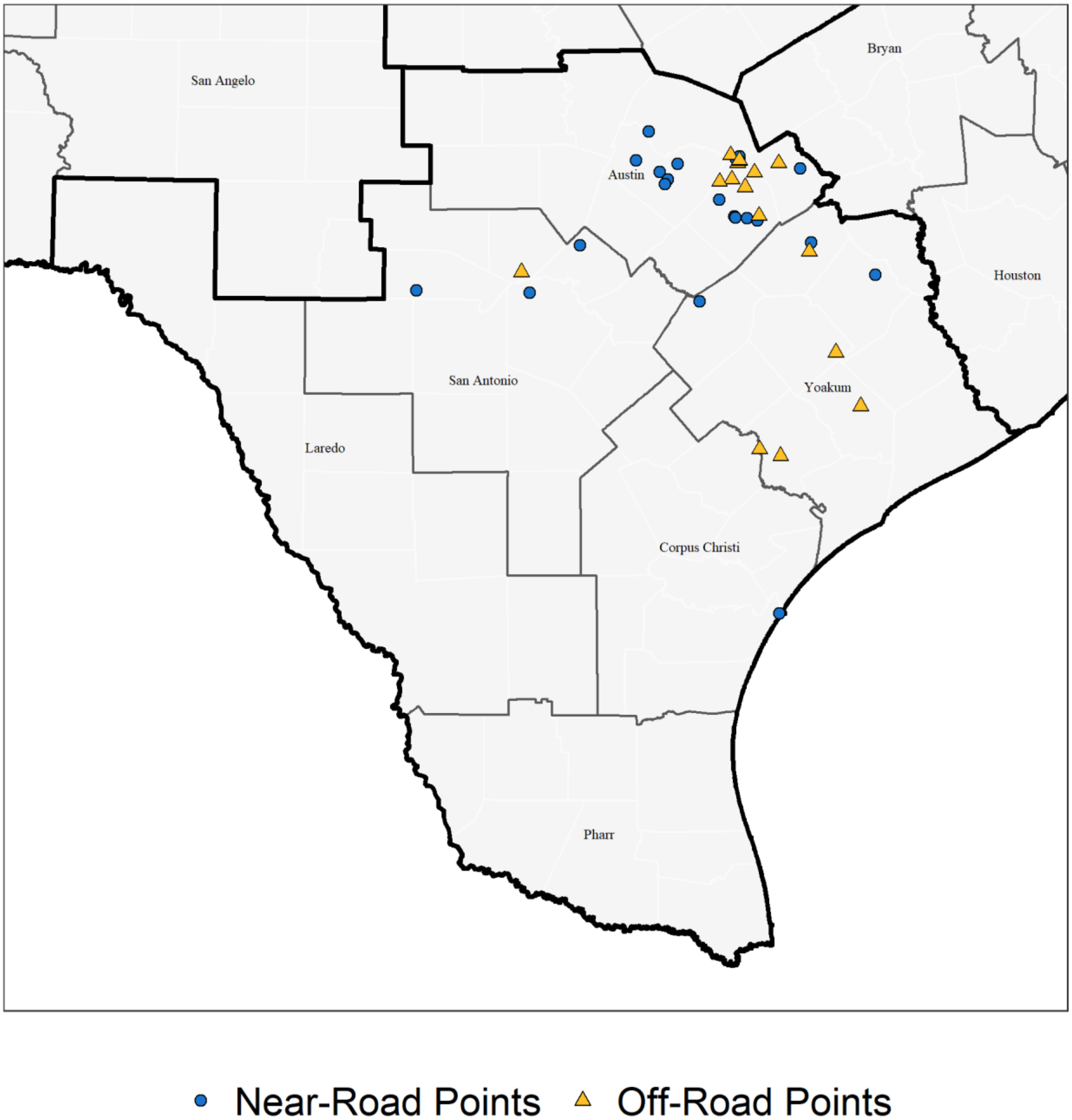
Terrapene carolina

Common Box Turtle



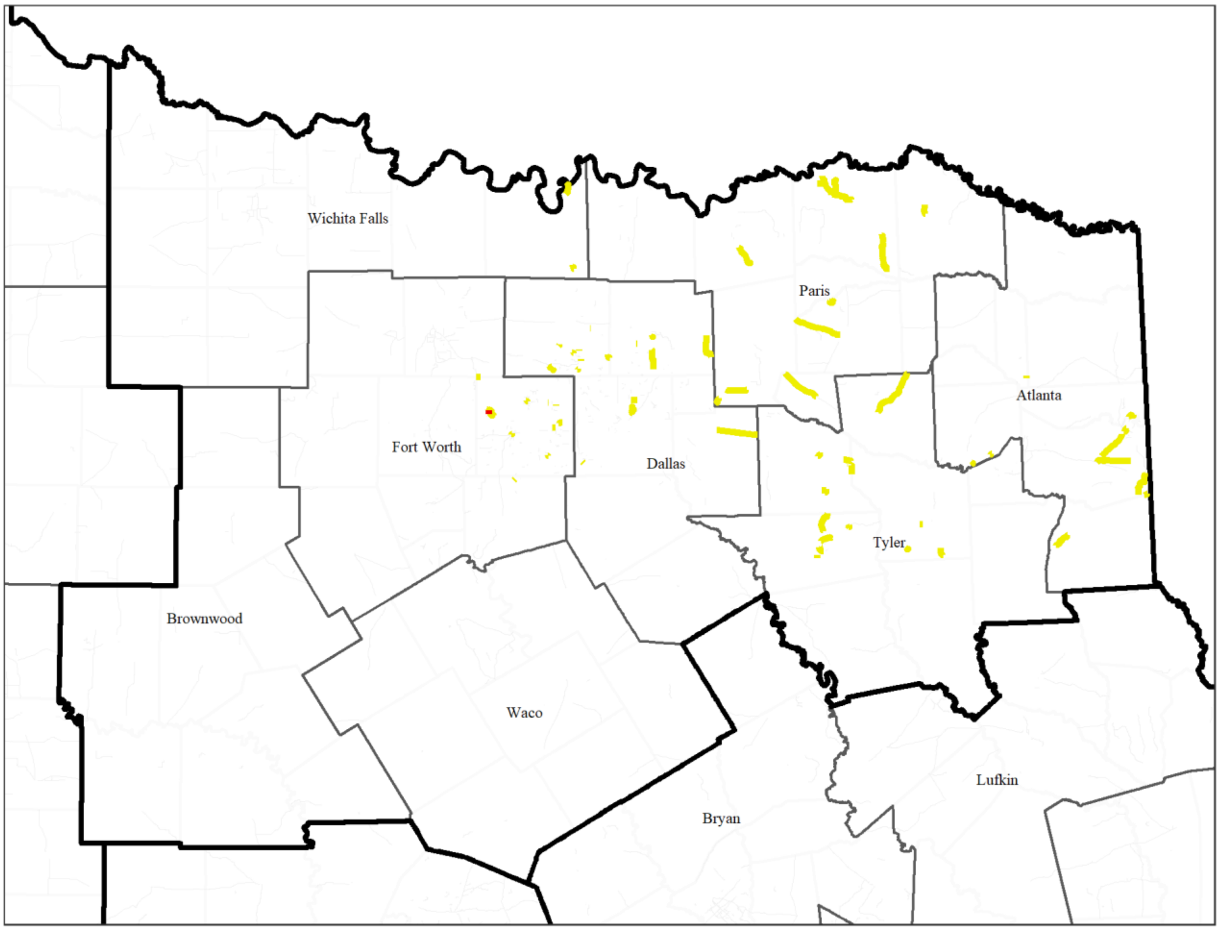
Terrapene carolina

Common Box Turtle



Terrapene carolina

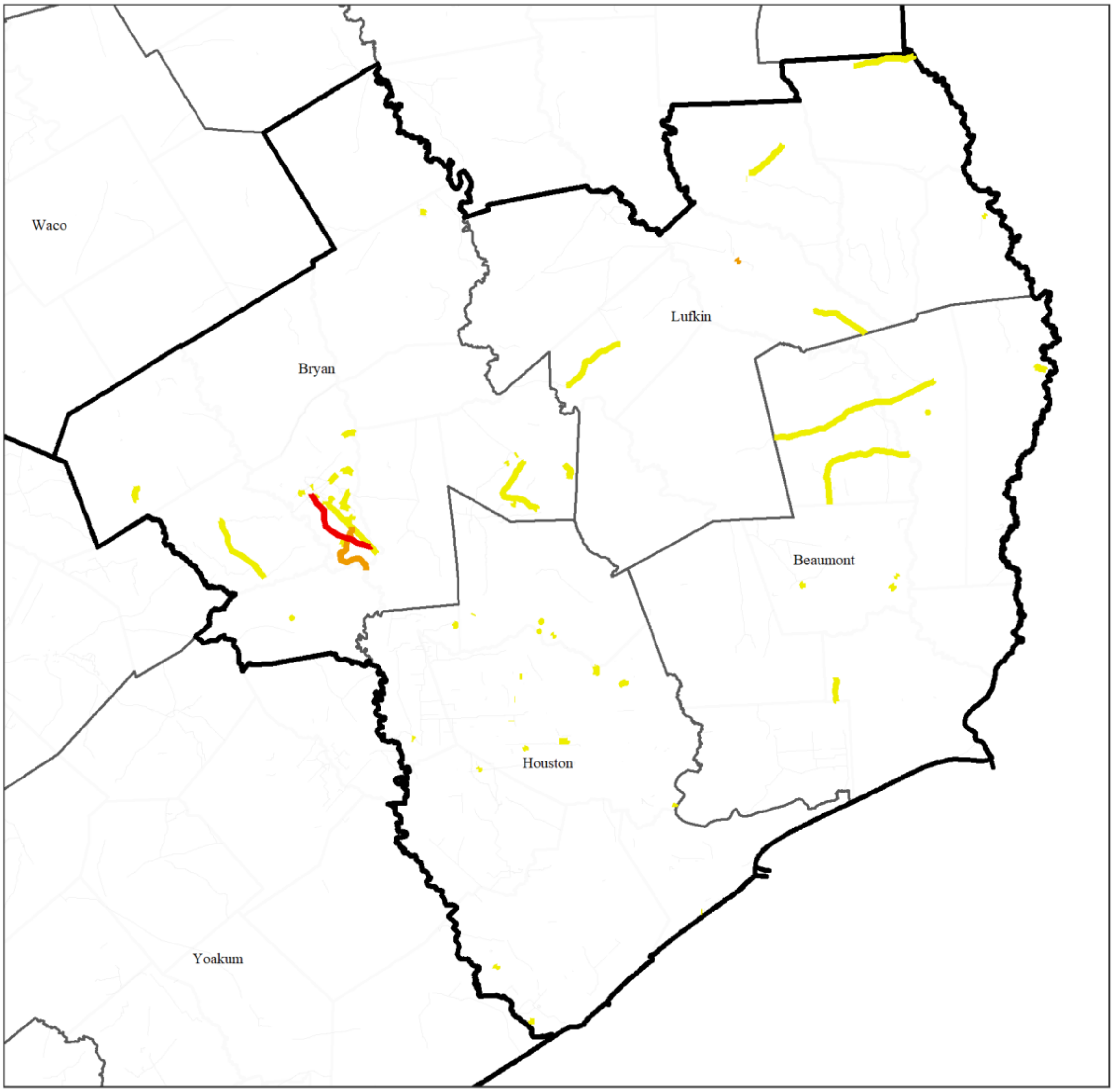
Common Box Turtle



Points Per Section 1-2 3-4 5-6 7+

Terrapene carolina

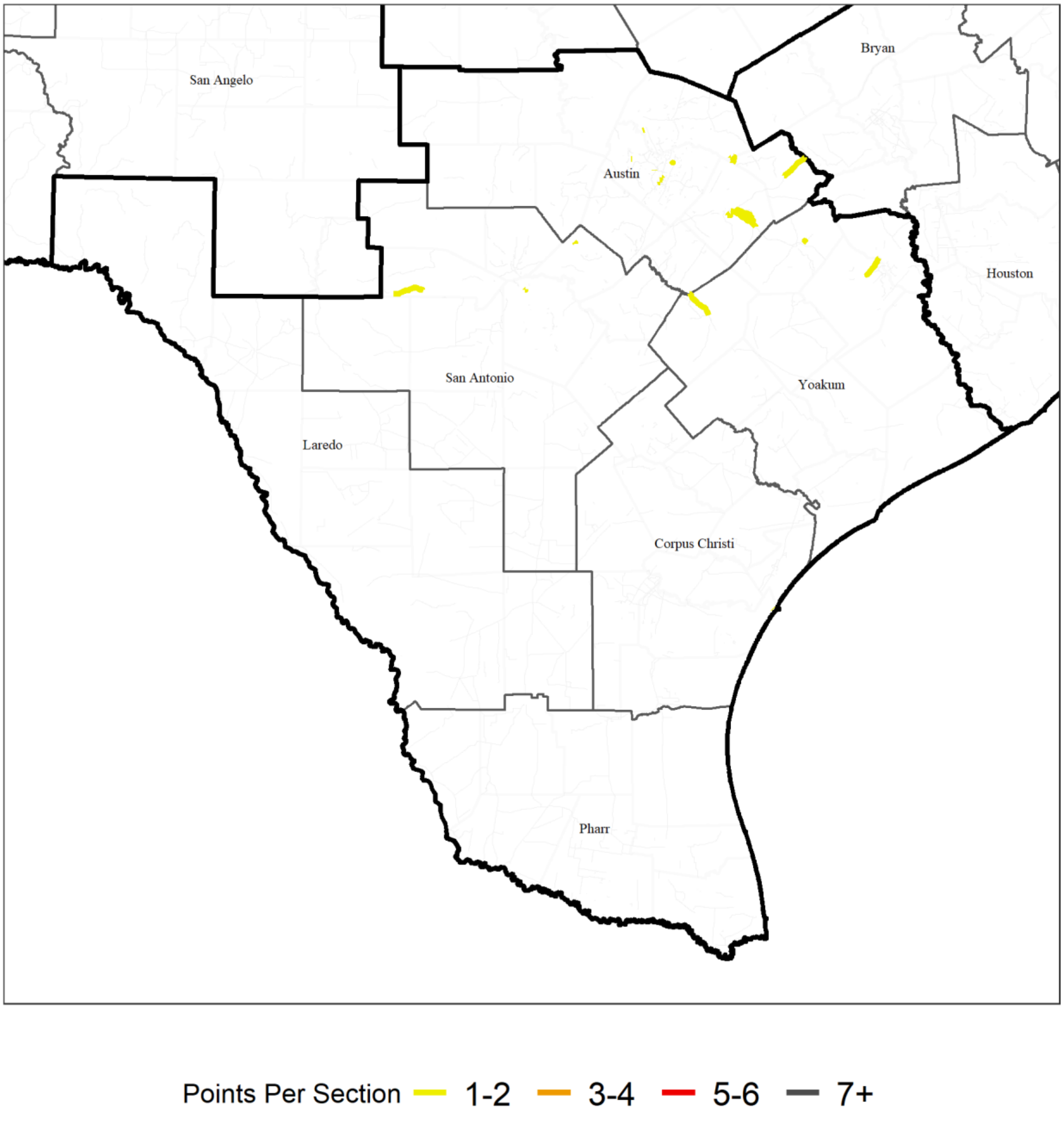
Common Box Turtle



Points Per Section 1-2 3-4 5-6 7+

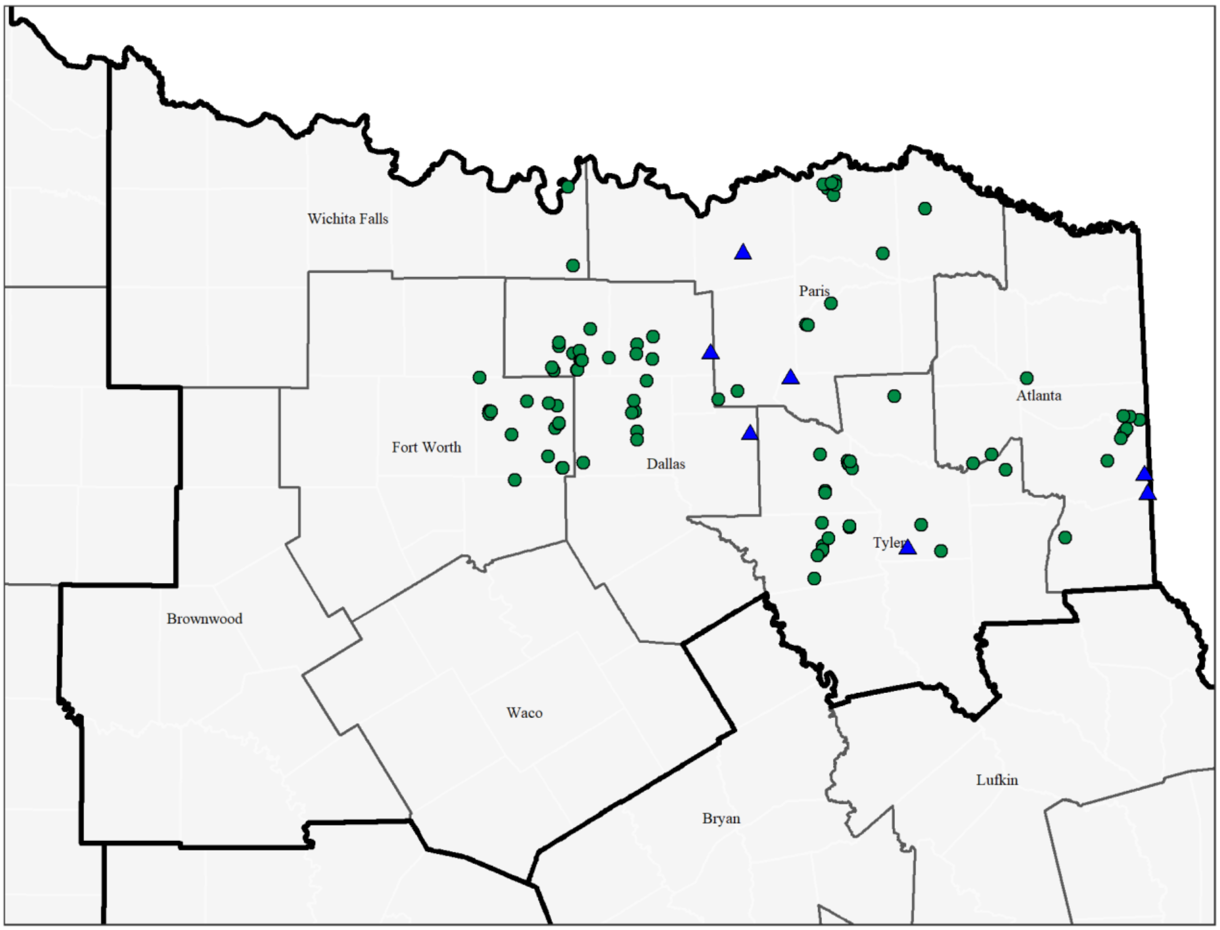
Terrapene carolina

Common Box Turtle



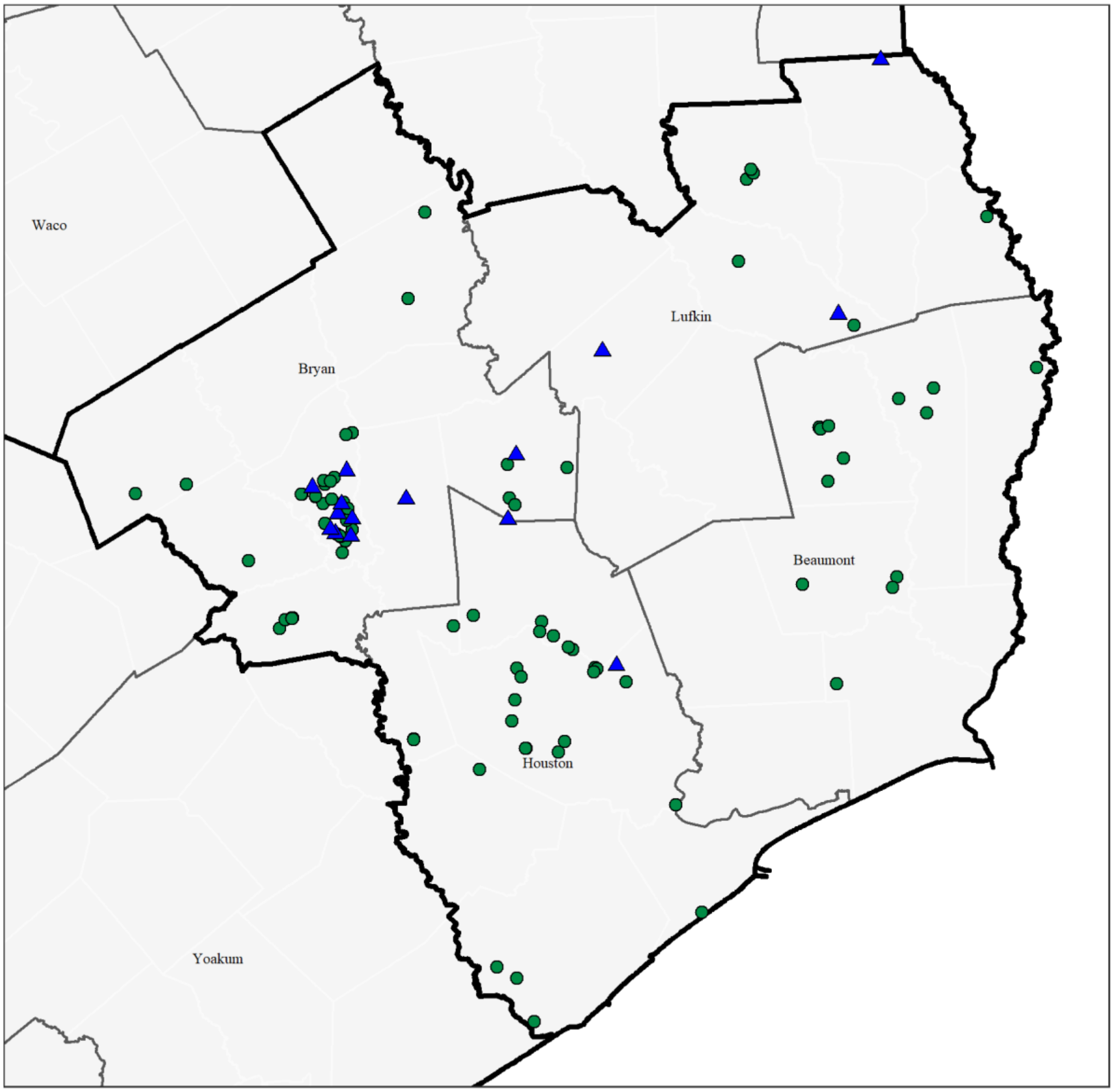
Terrapene carolina

Common Box Turtle



Terrapene carolina

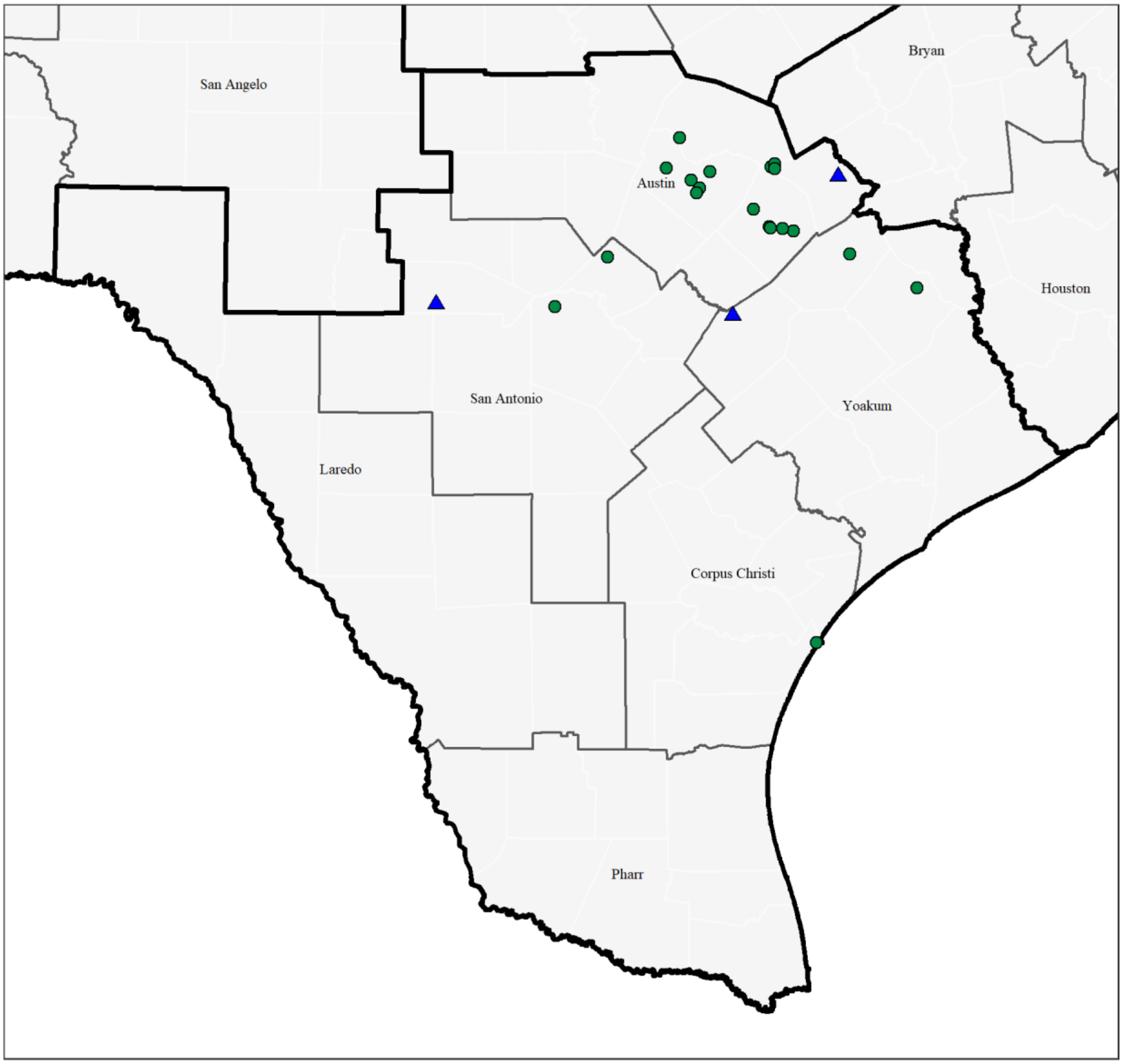
Common Box Turtle



• Alive ▲ Dead

Terrapene carolina

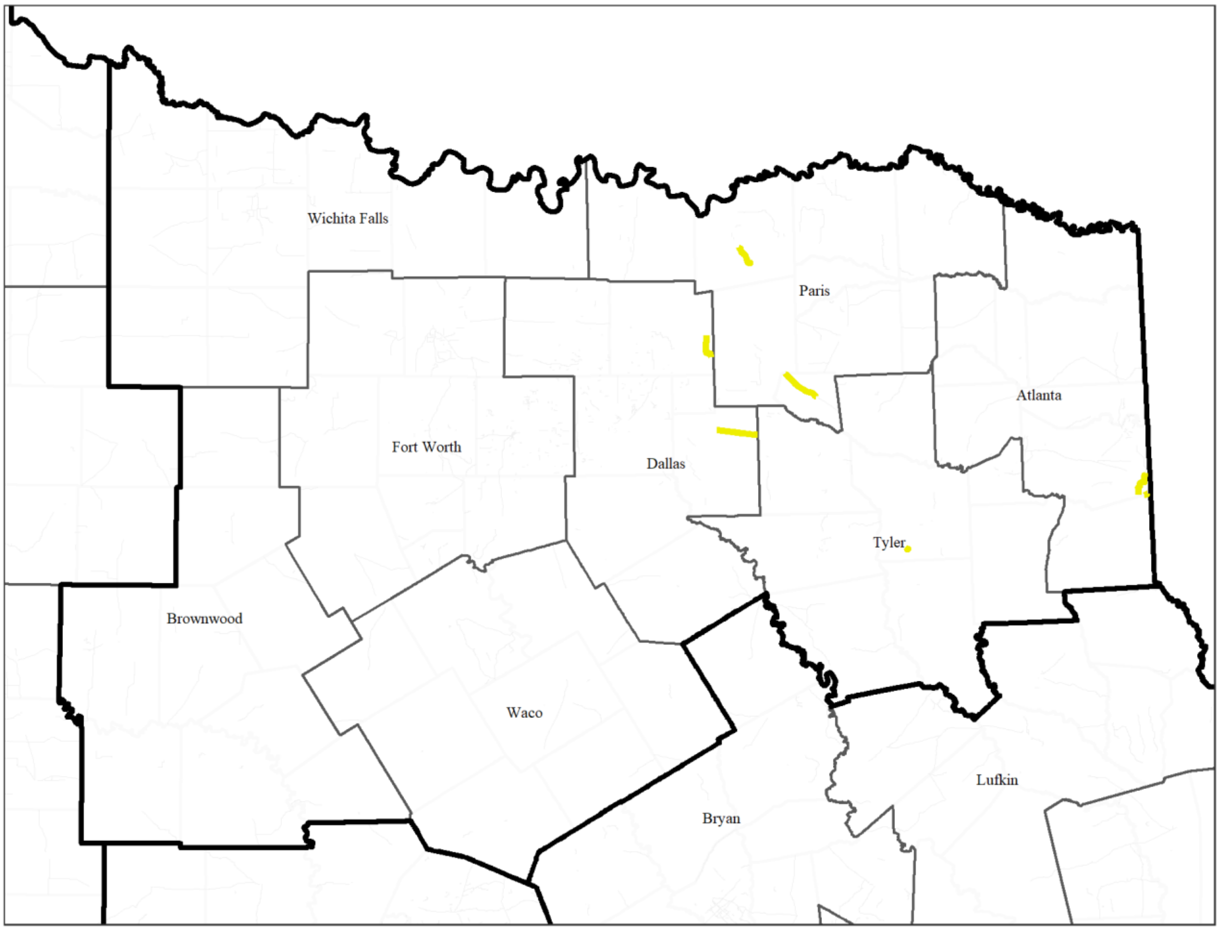
Common Box Turtle



Alive Dead

Terrapene carolina

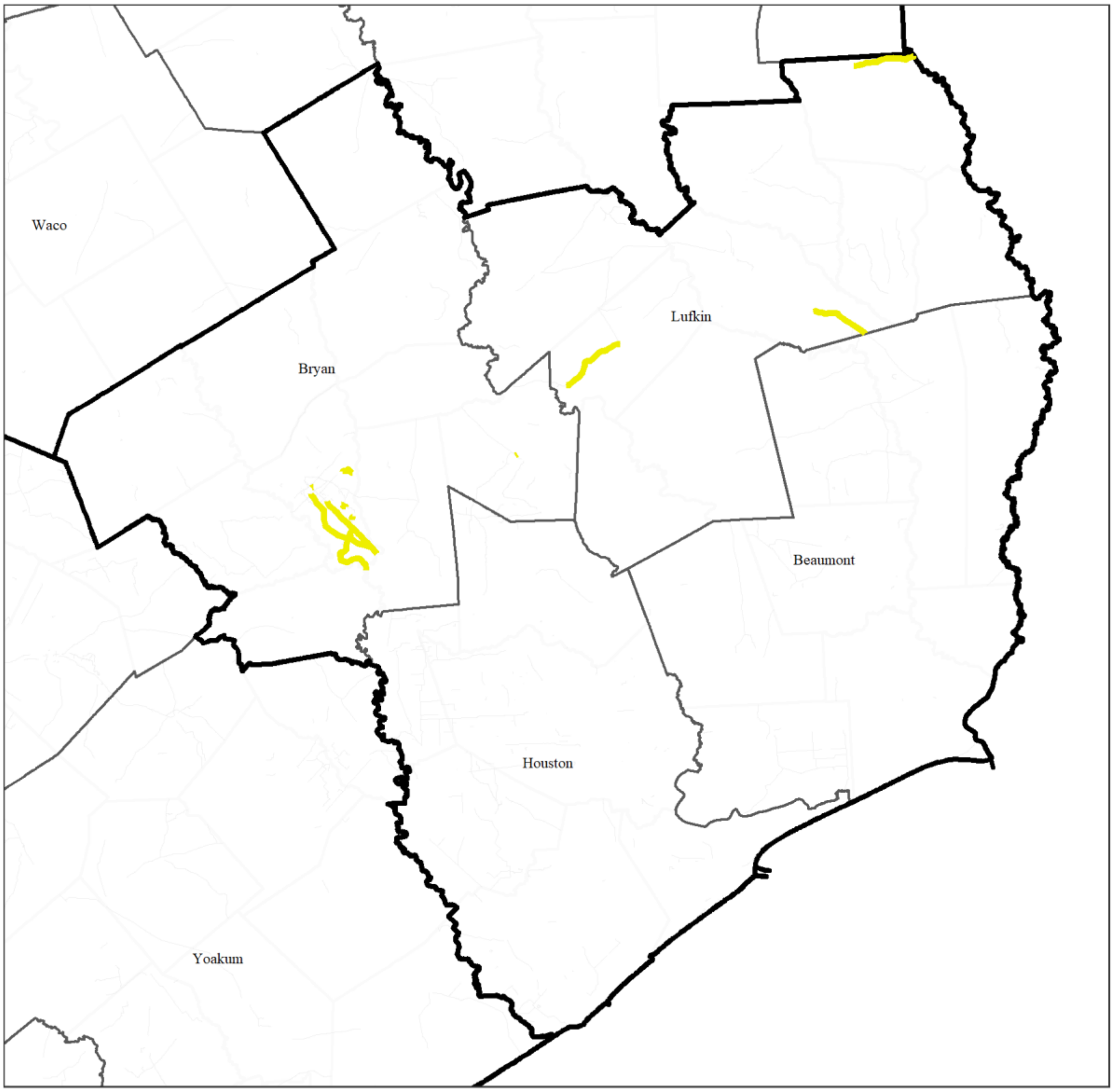
Common Box Turtle



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Terrapene carolina

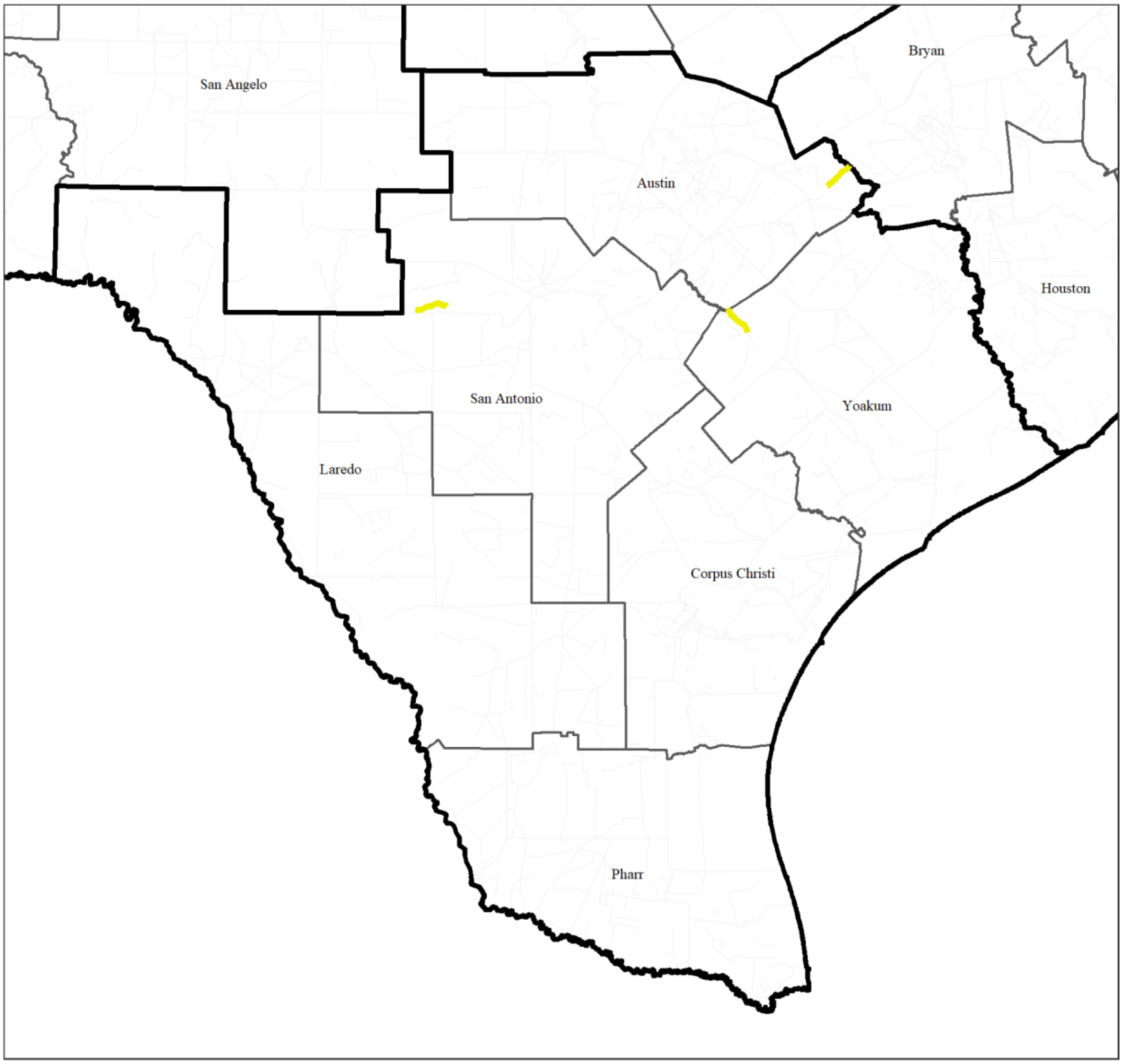
Common Box Turtle



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Terrapene carolina

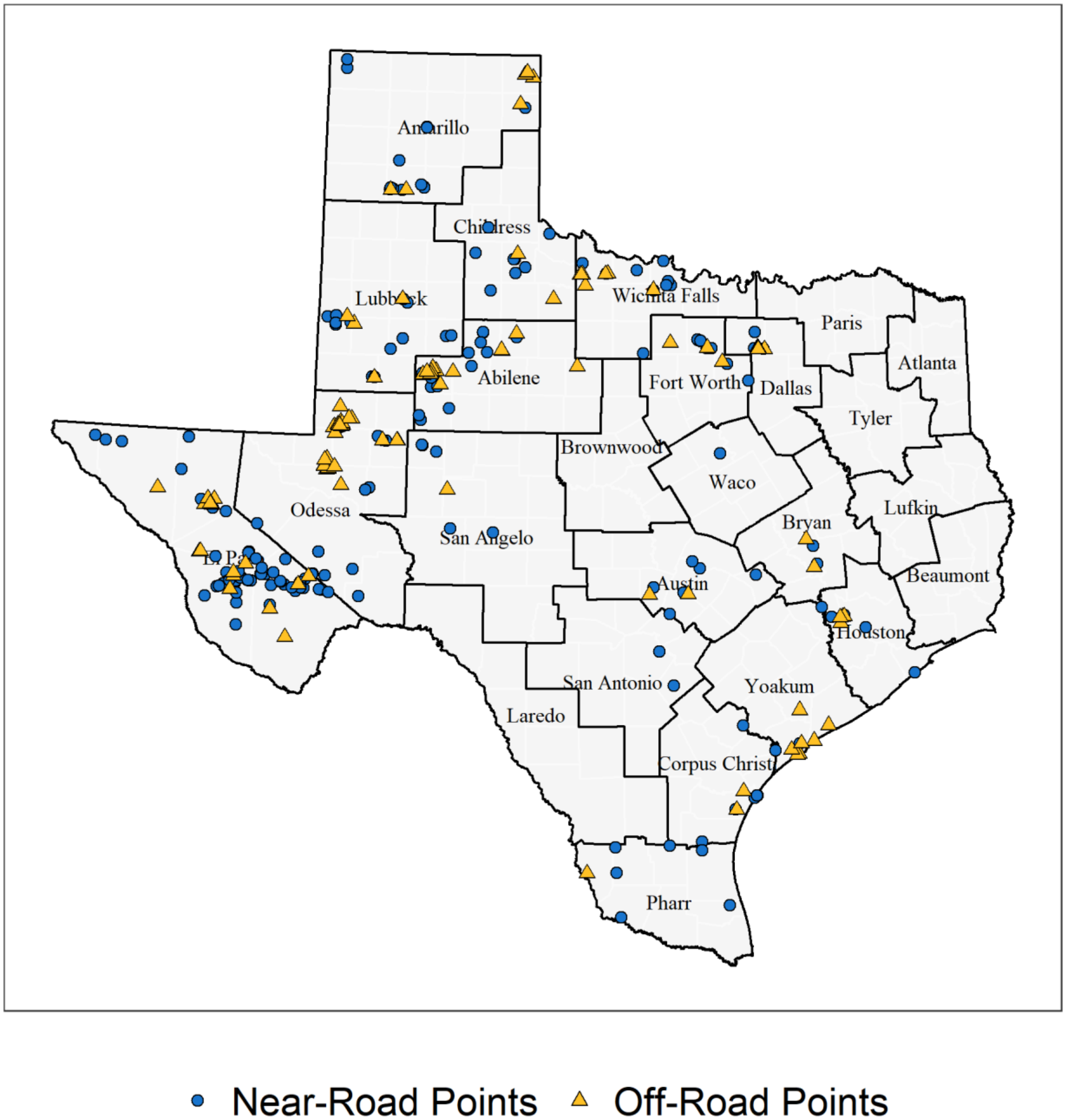
Common Box Turtle



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

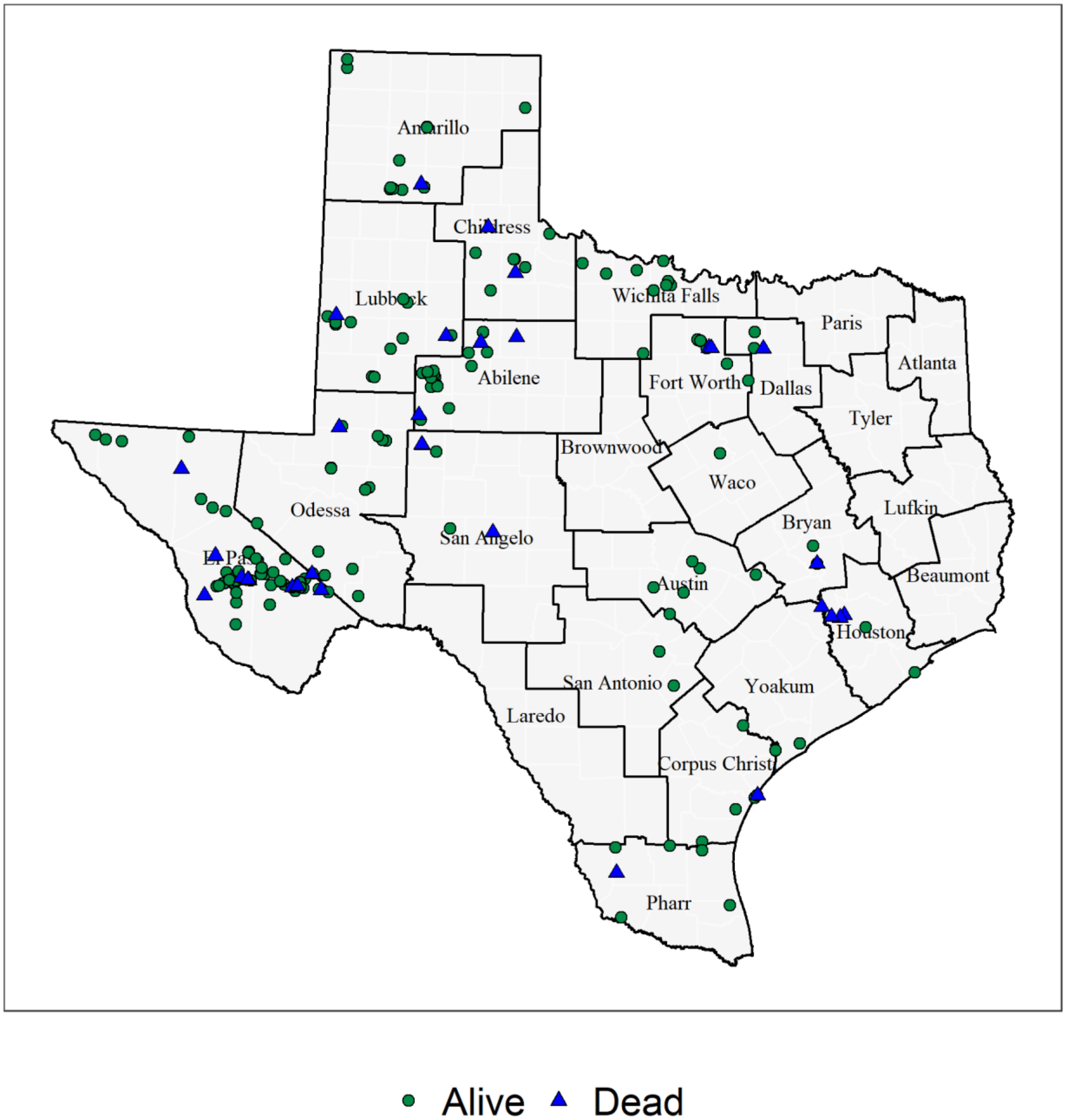
Terrapene ornata

Ornate Box Turtle



Terrapene ornata

Ornate Box Turtle



Terrapene ornata

Ornate Box Turtle

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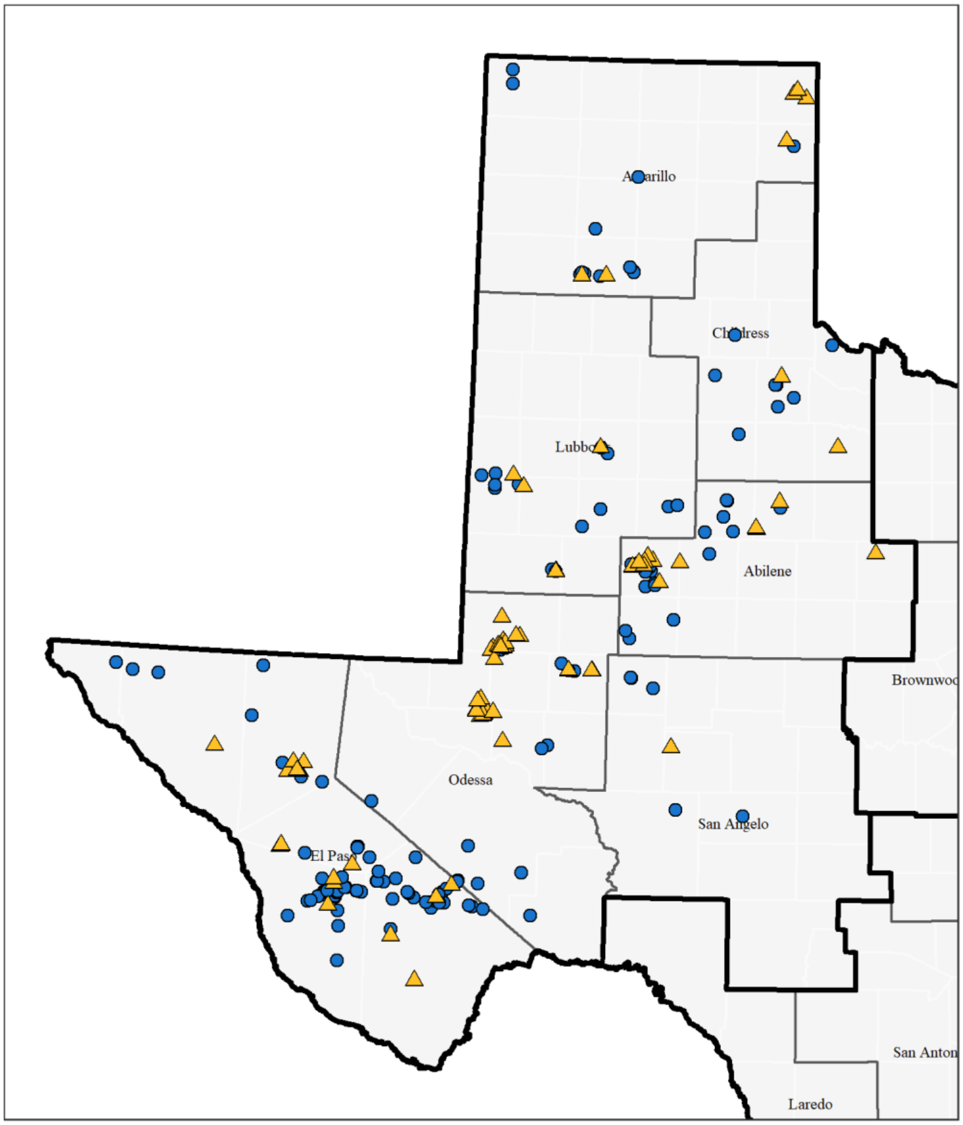
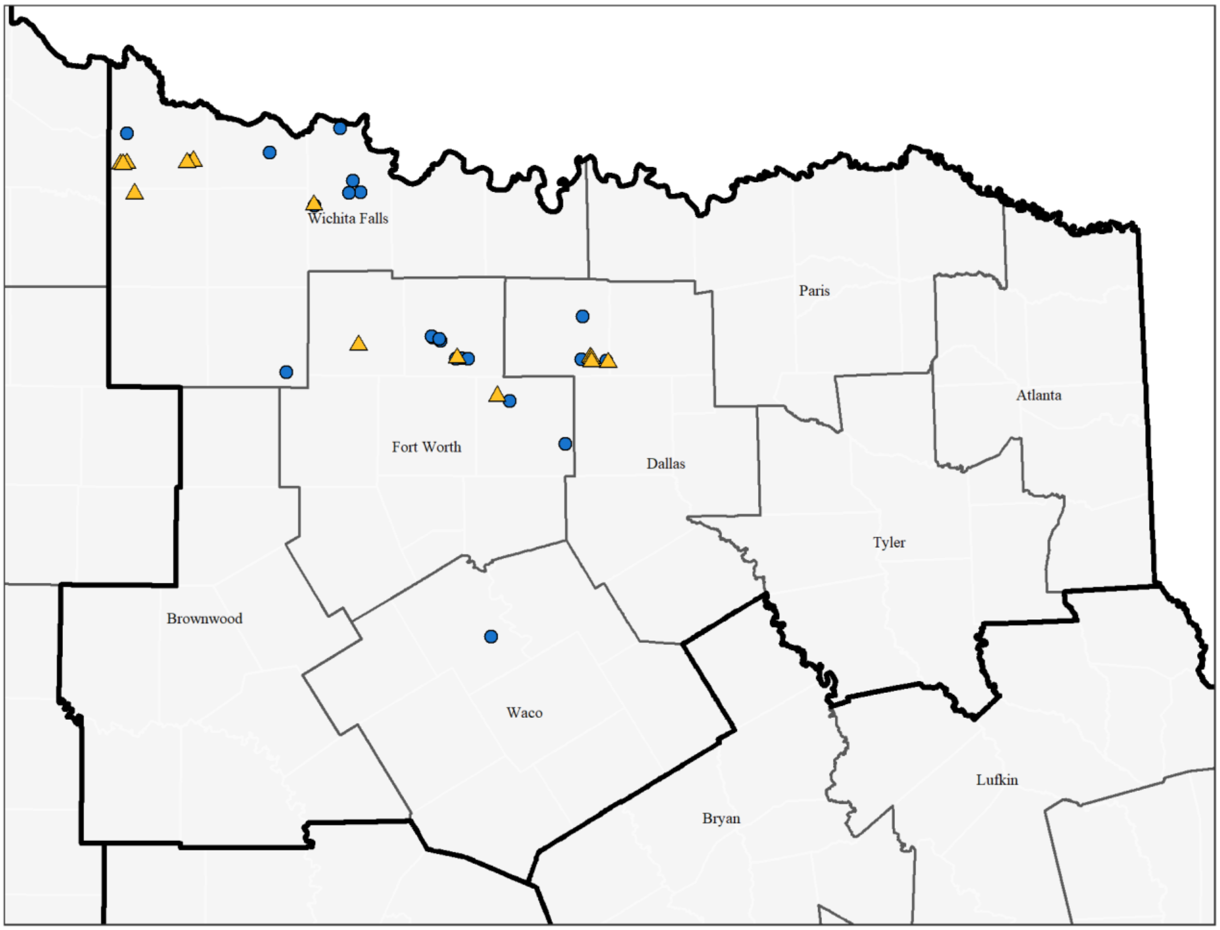


• Near-Road Points △ Off-Road Points

Terrapene ornata

Ornate Box Turtle

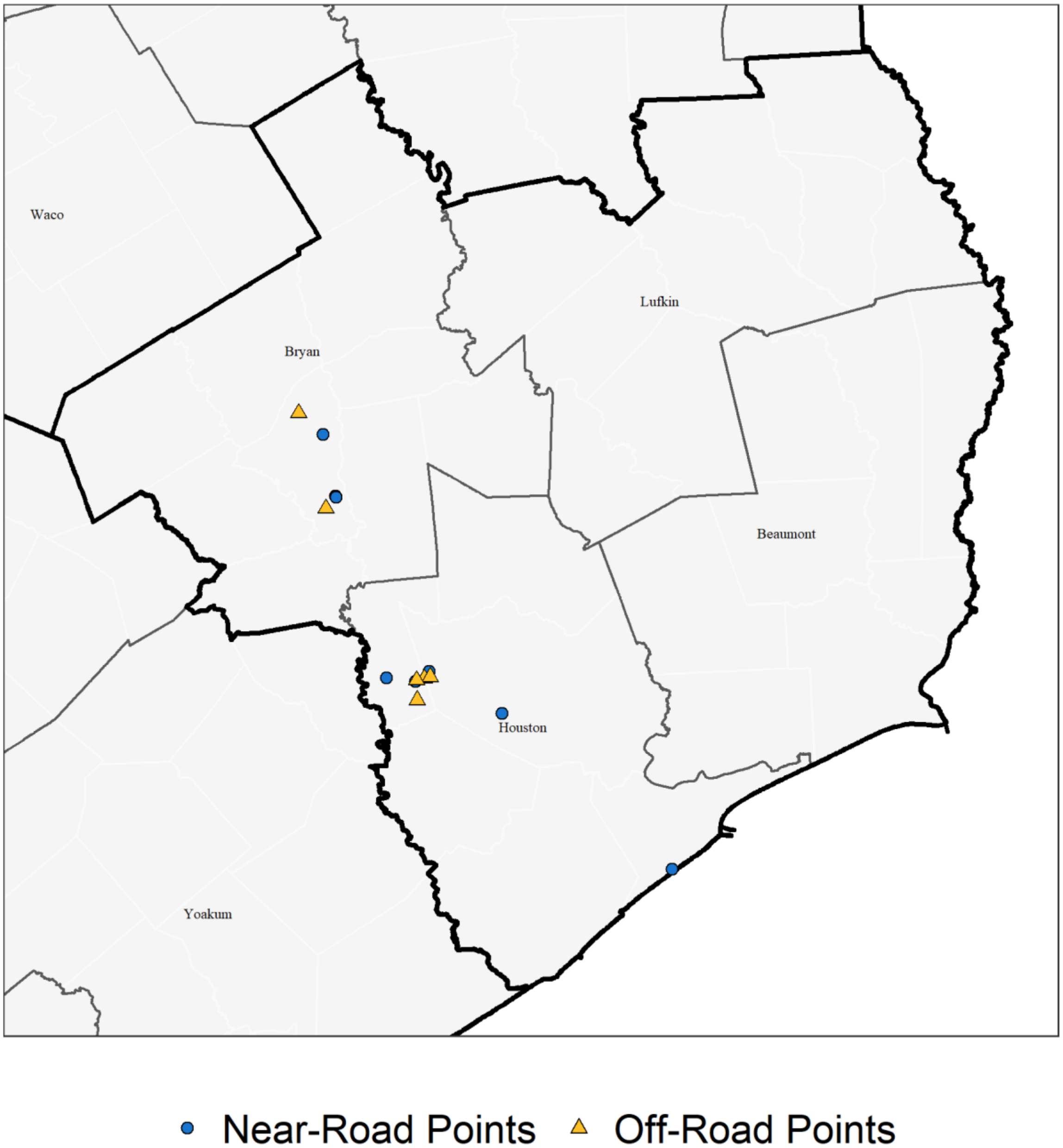
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



• Near-Road Points △ Off-Road Points

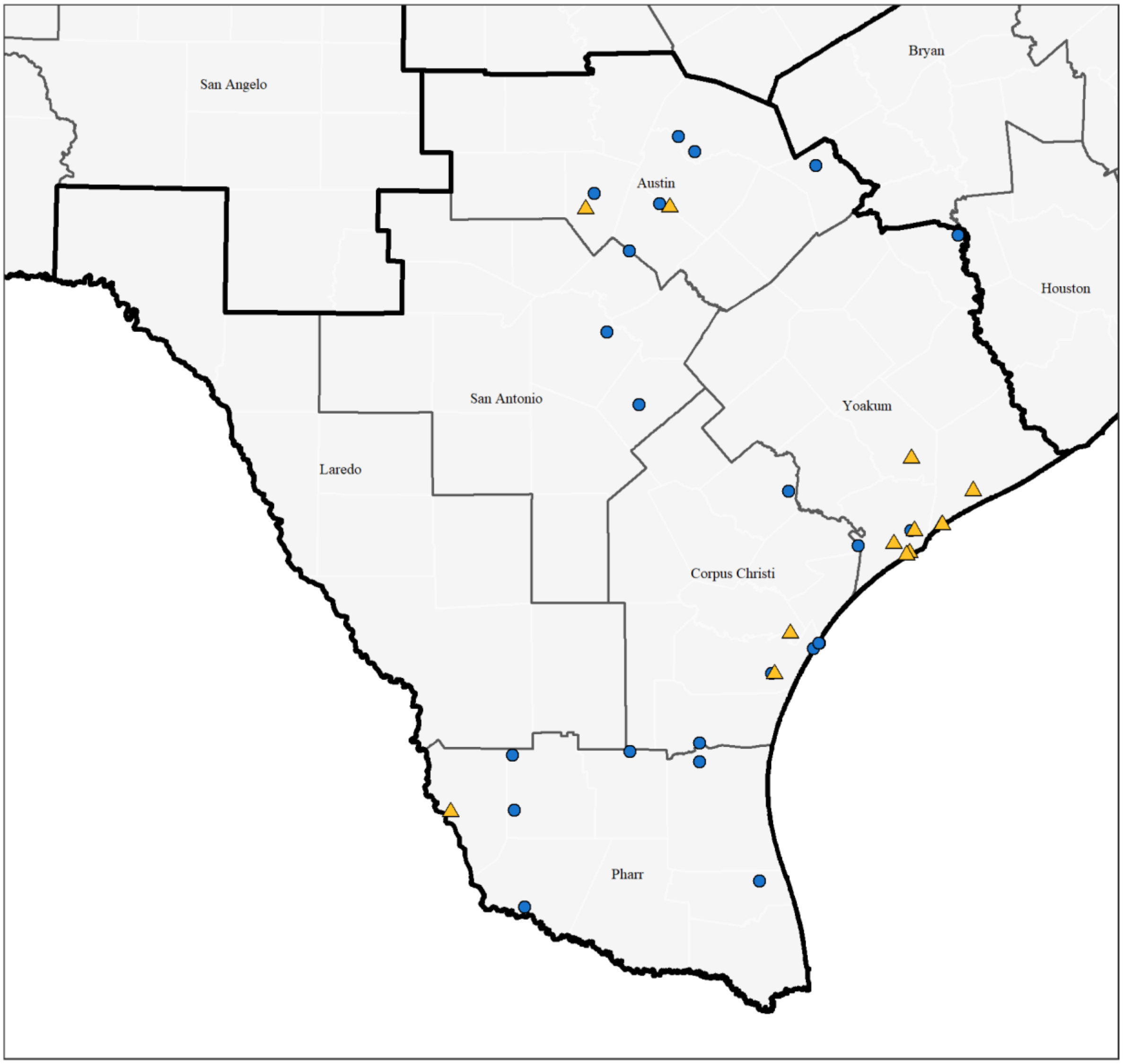
Terrapene ornata

Ornate Box Turtle



Terrapene ornata

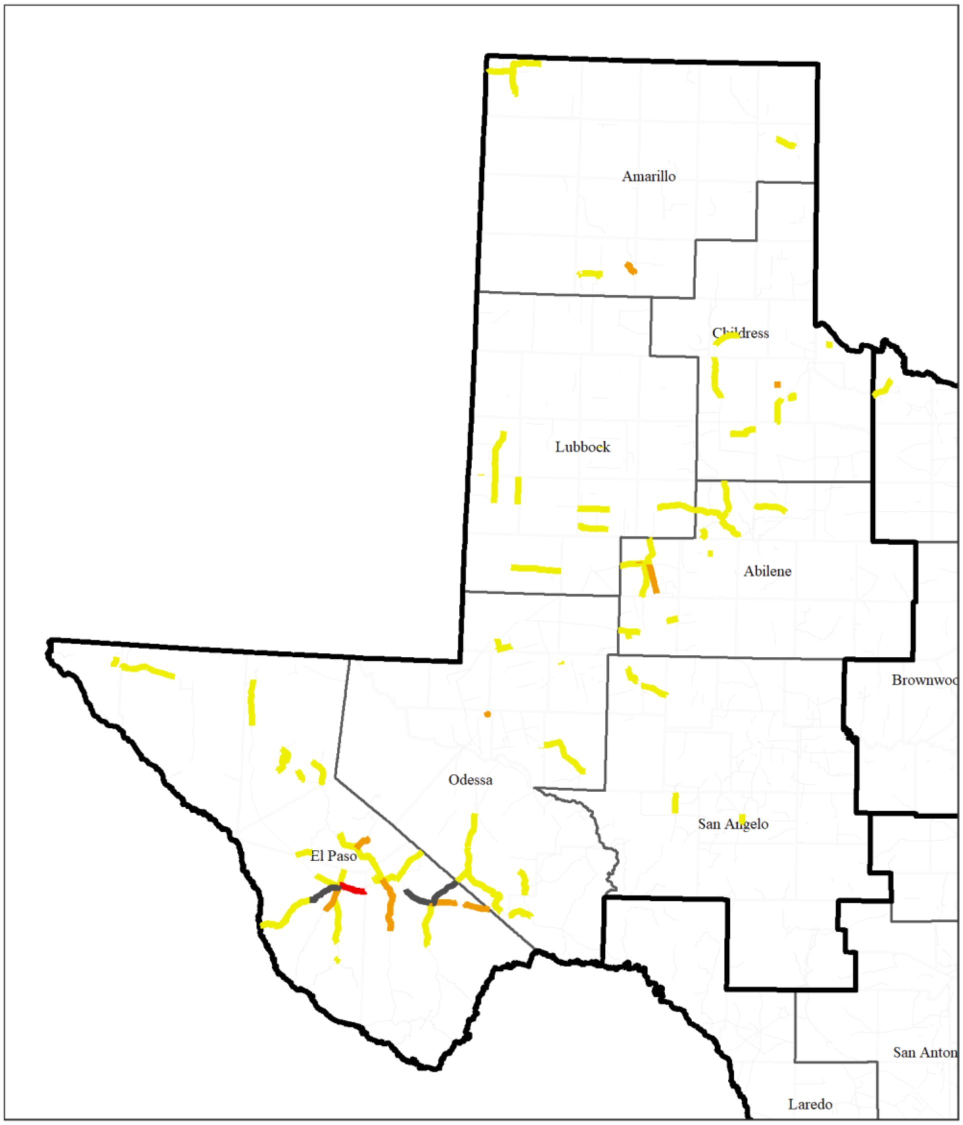
Ornate Box Turtle



Near-Road Points   Off-Road Points

Terrapene ornata

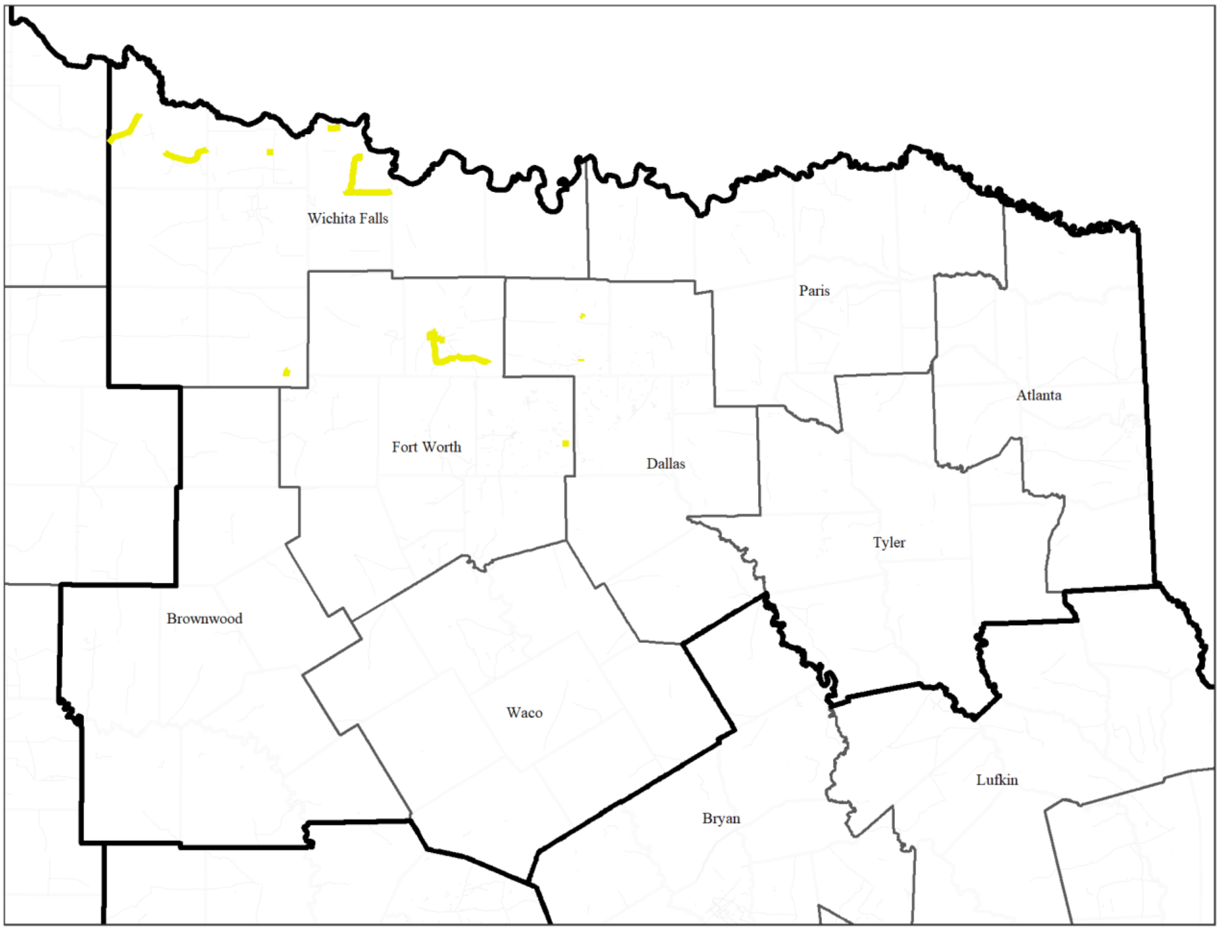
Ornate Box Turtle



Points Per Section 1-2 3-4 5-6 7+

Terrapene ornata

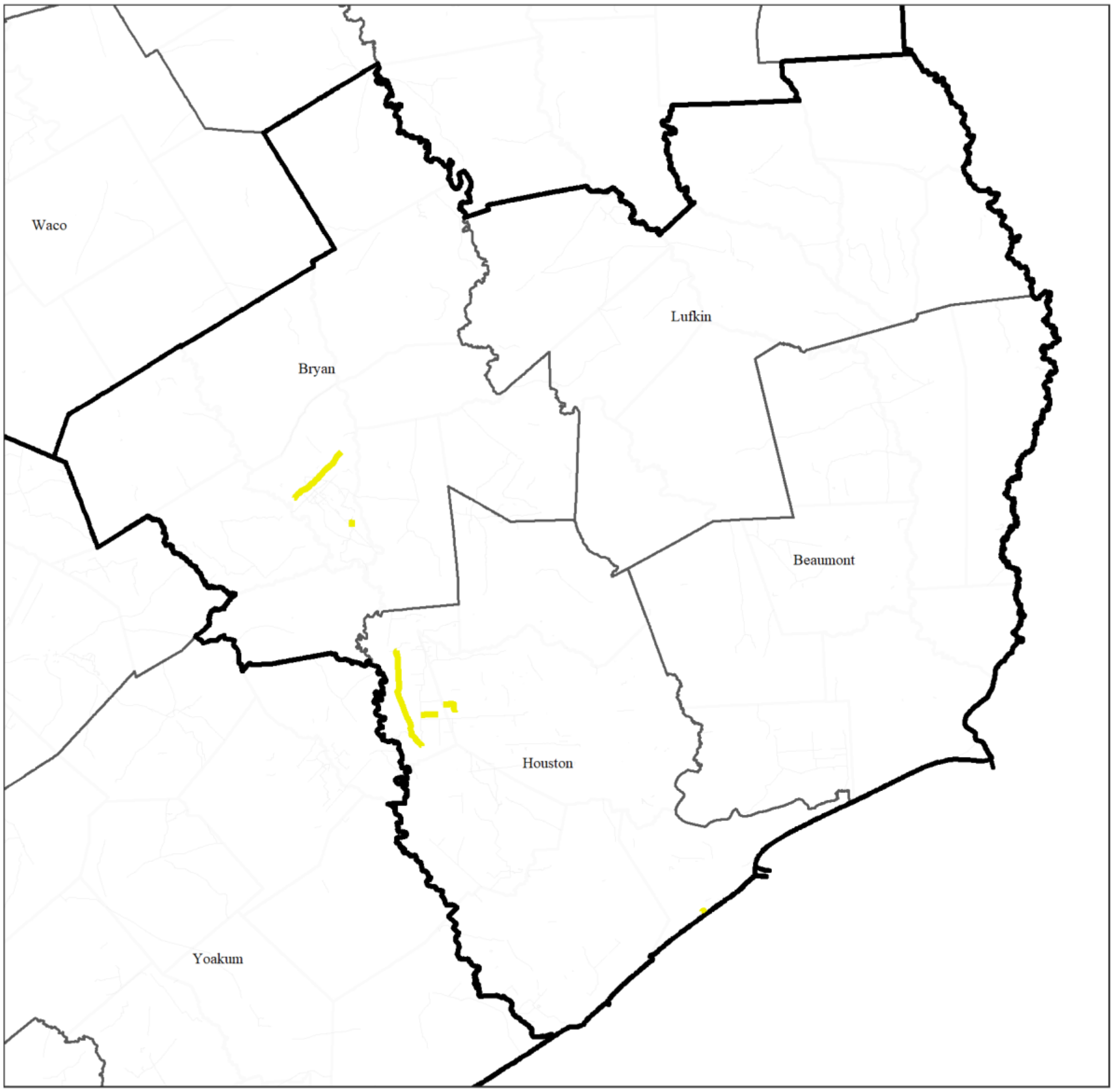
Ornate Box Turtle



Points Per Section 1-2 3-4 5-6 7+

Terrapene ornata

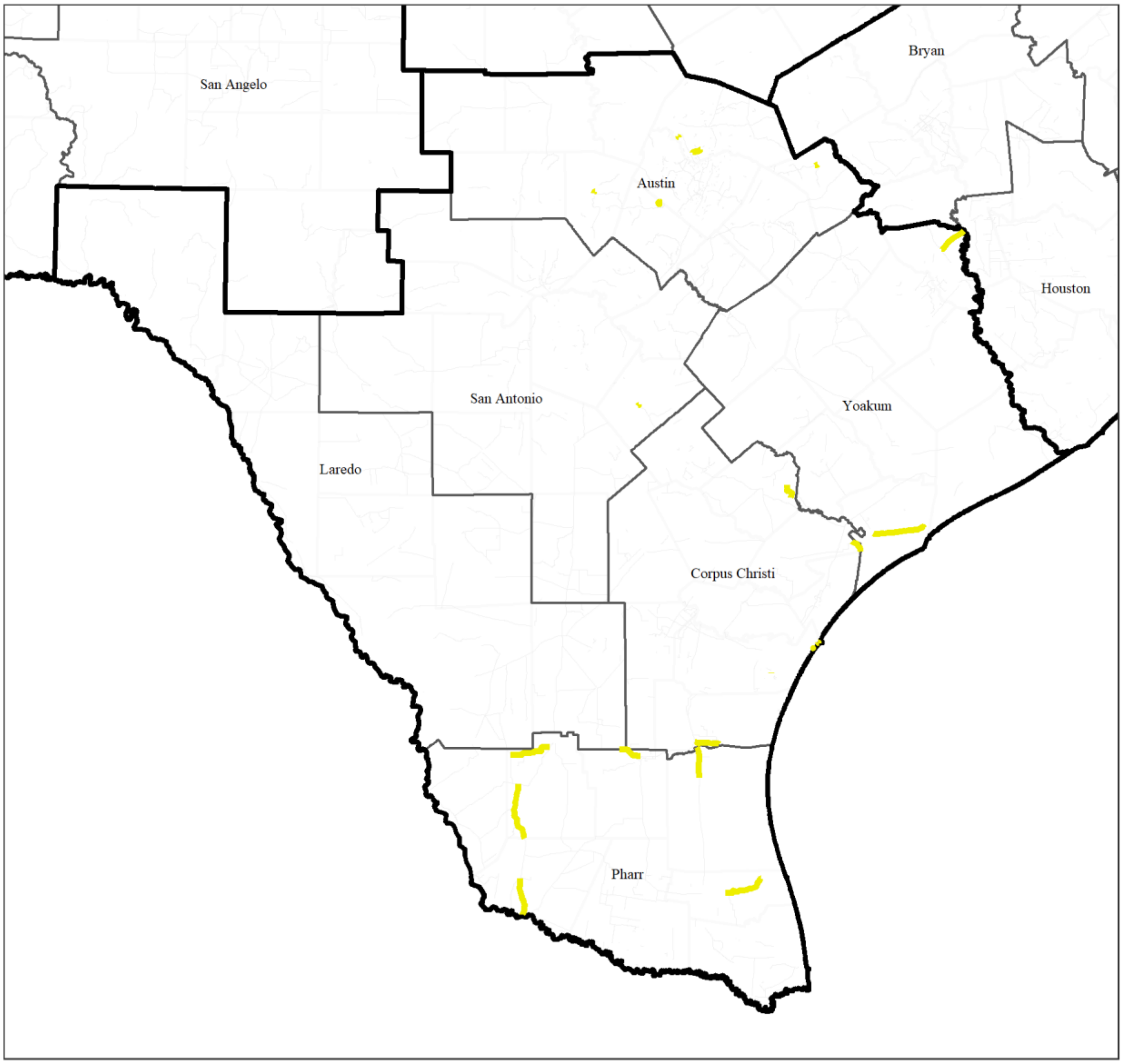
Ornate Box Turtle



Points Per Section 1-2 3-4 5-6 7+

Terrapene ornata

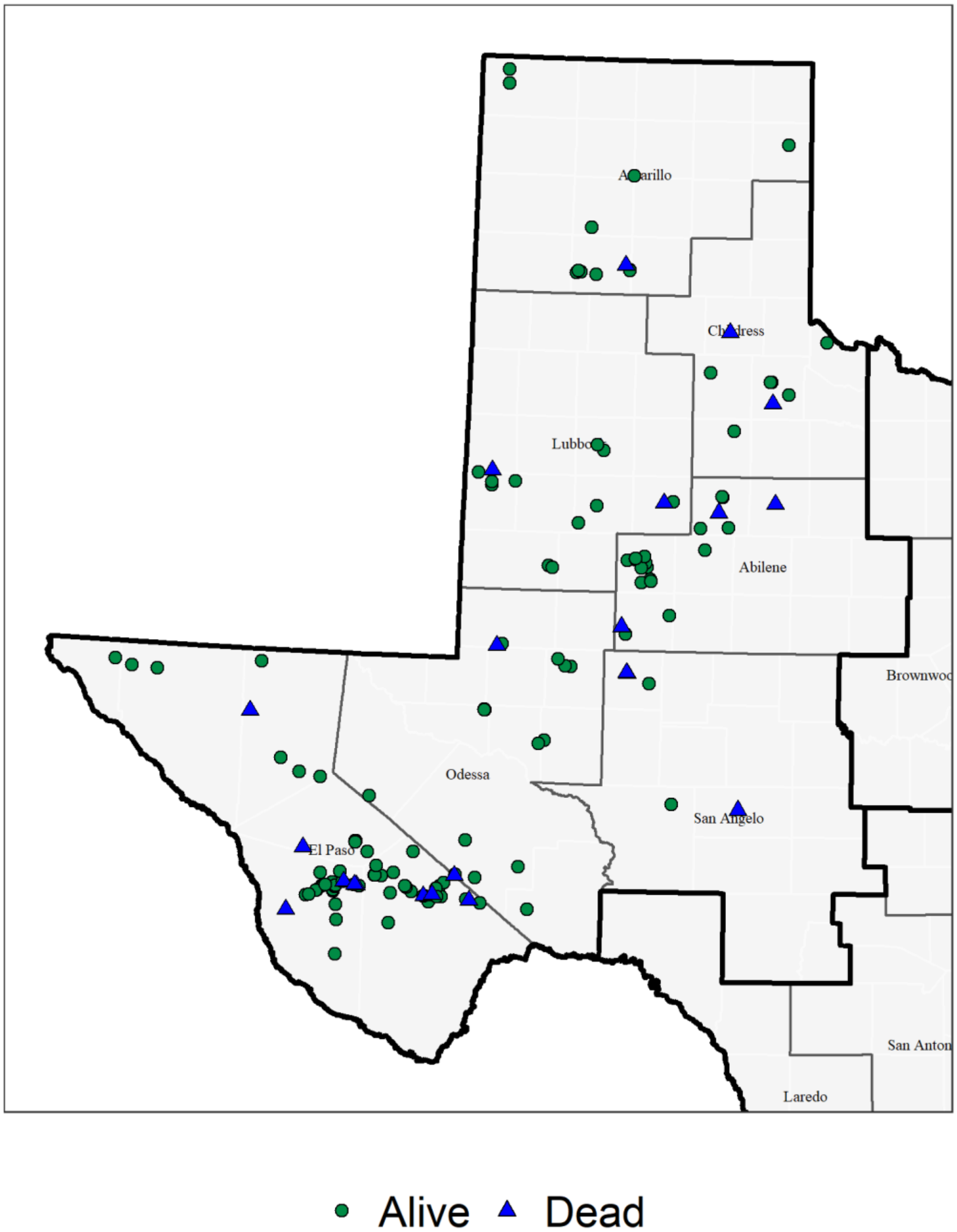
Ornate Box Turtle



Points Per Section 1-2 3-4 5-6 7+

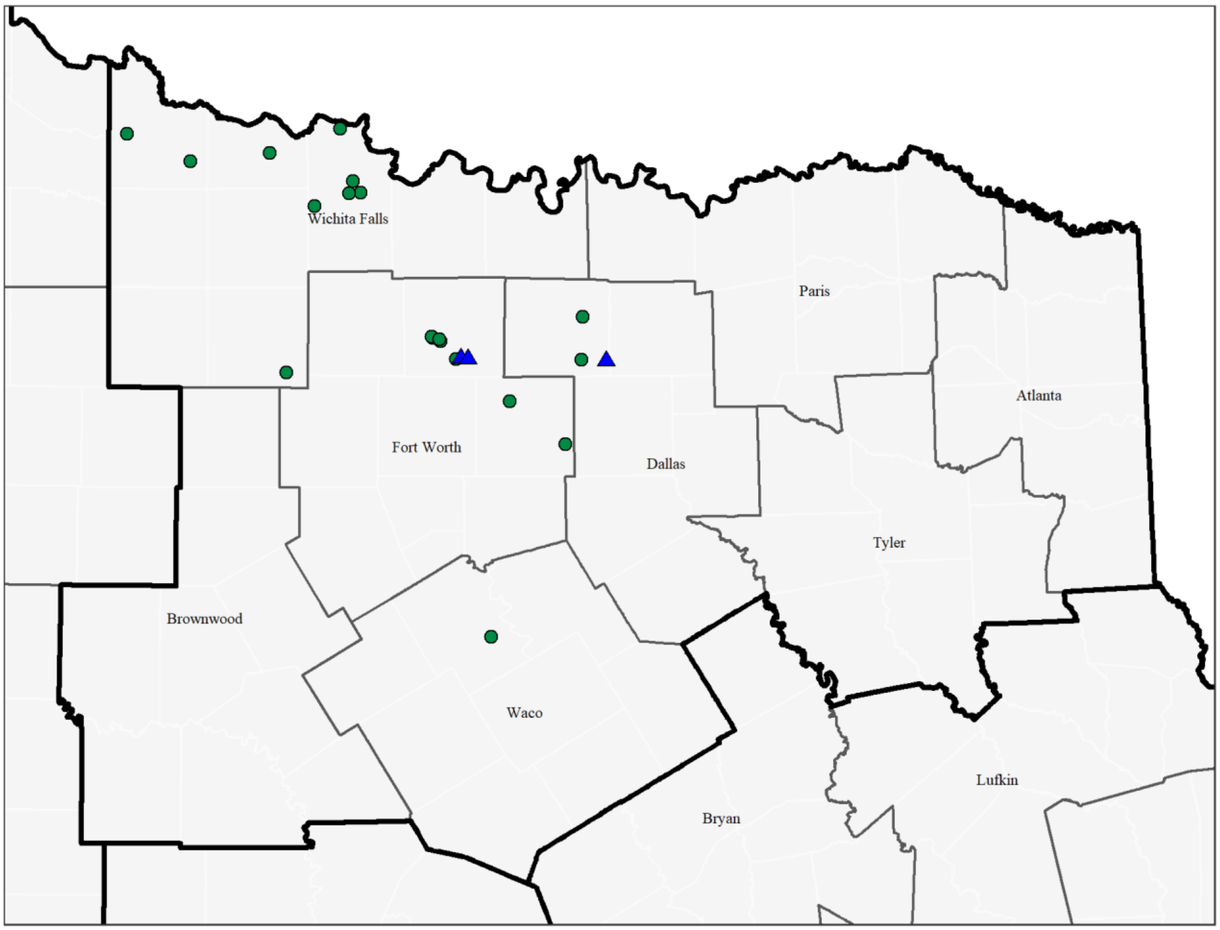
Terrapene ornata

Ornate Box Turtle



Terrapene ornata

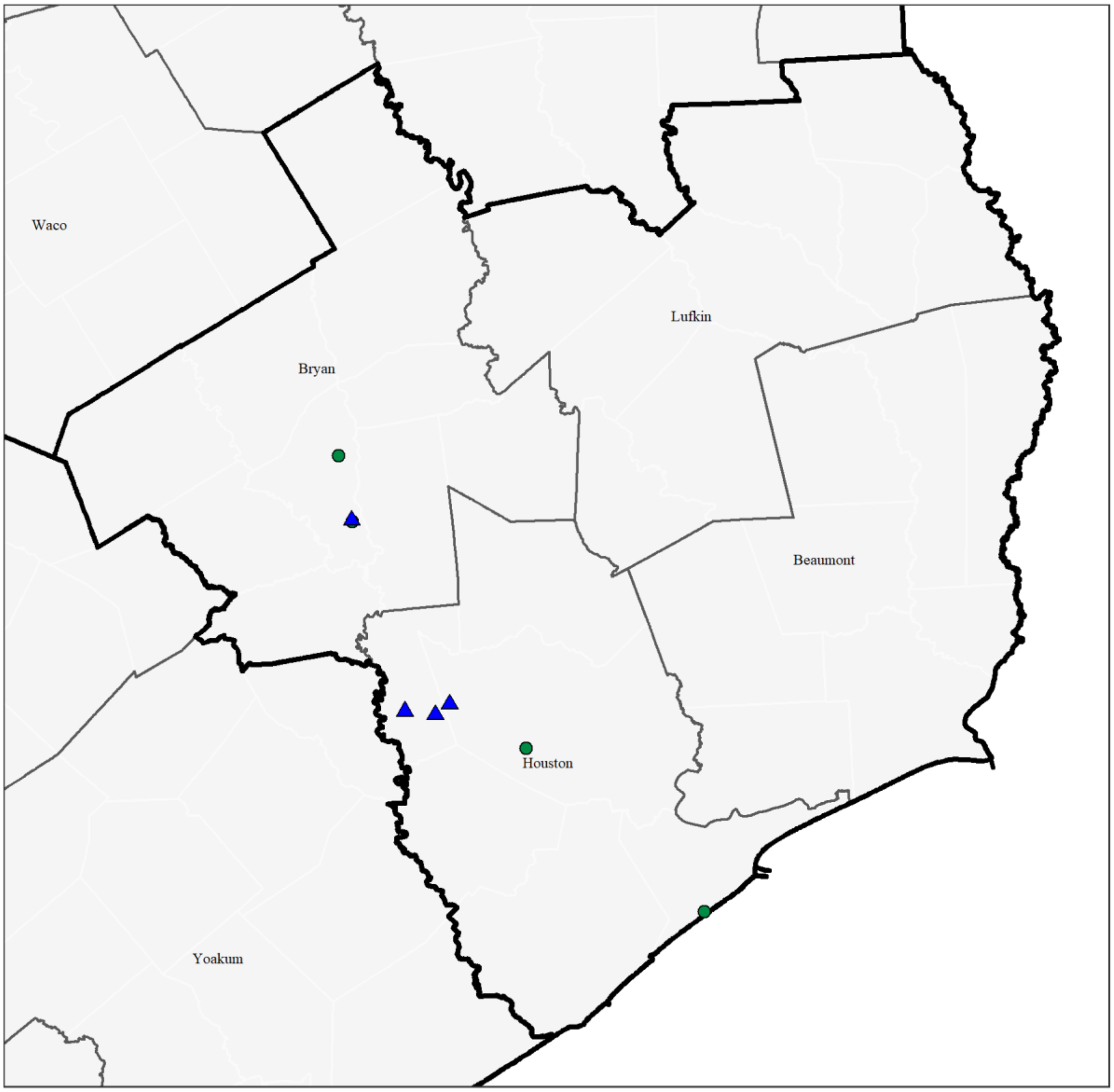
Ornate Box Turtle



● Alive ▲ Dead

Terrapene ornata

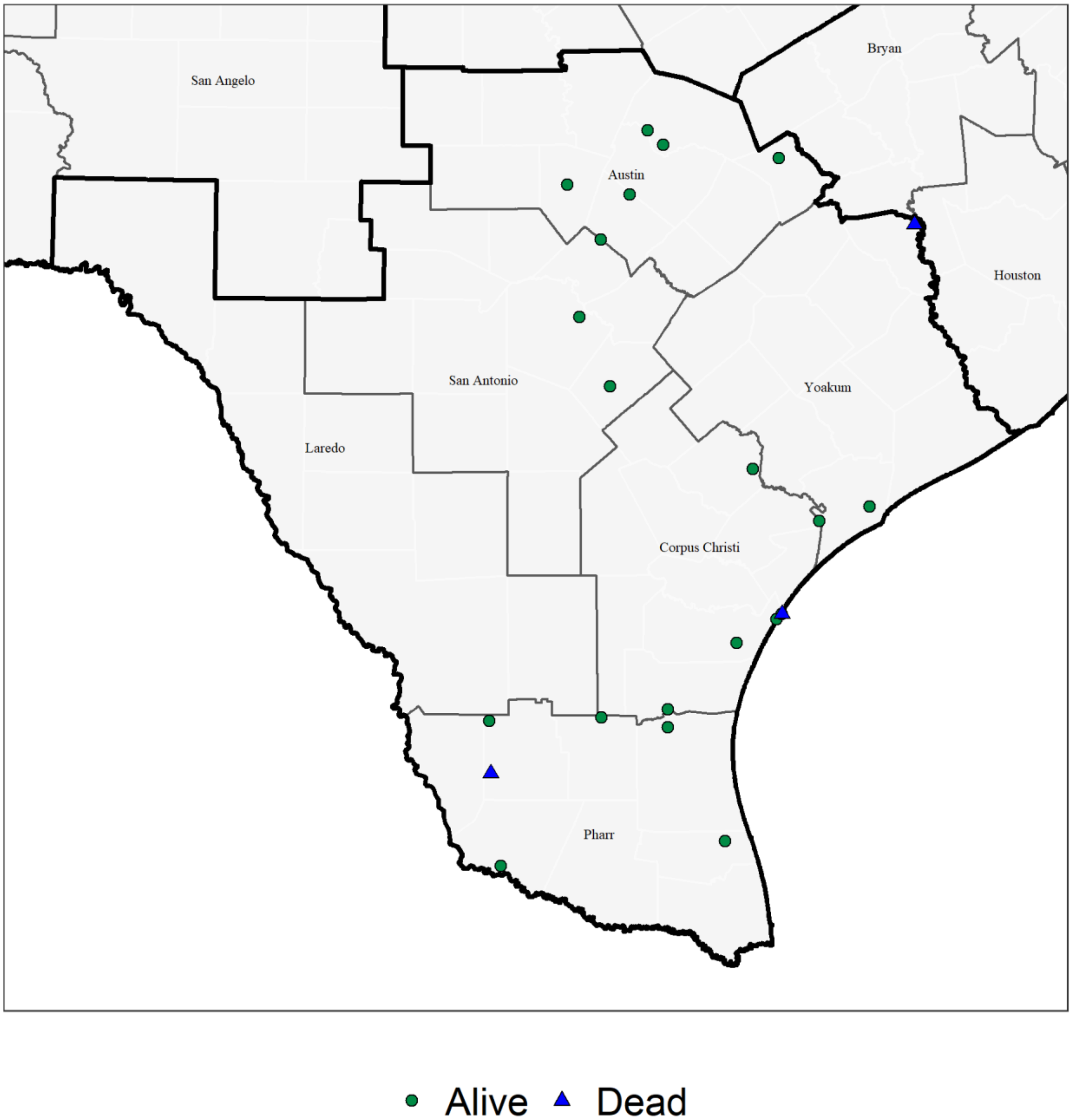
Ornate Box Turtle



● Alive ▲ Dead

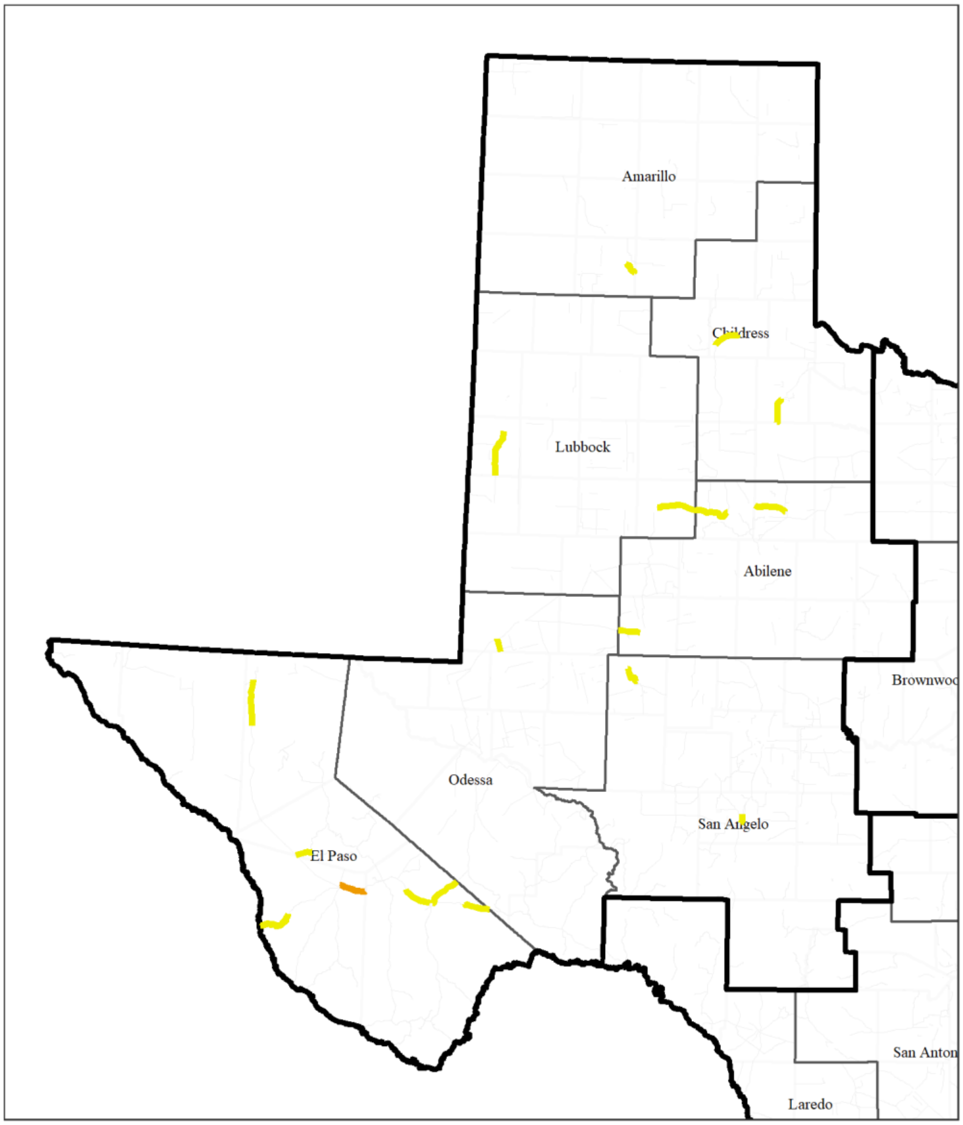
Terrapene ornata

Ornate Box Turtle



Terrapene ornata

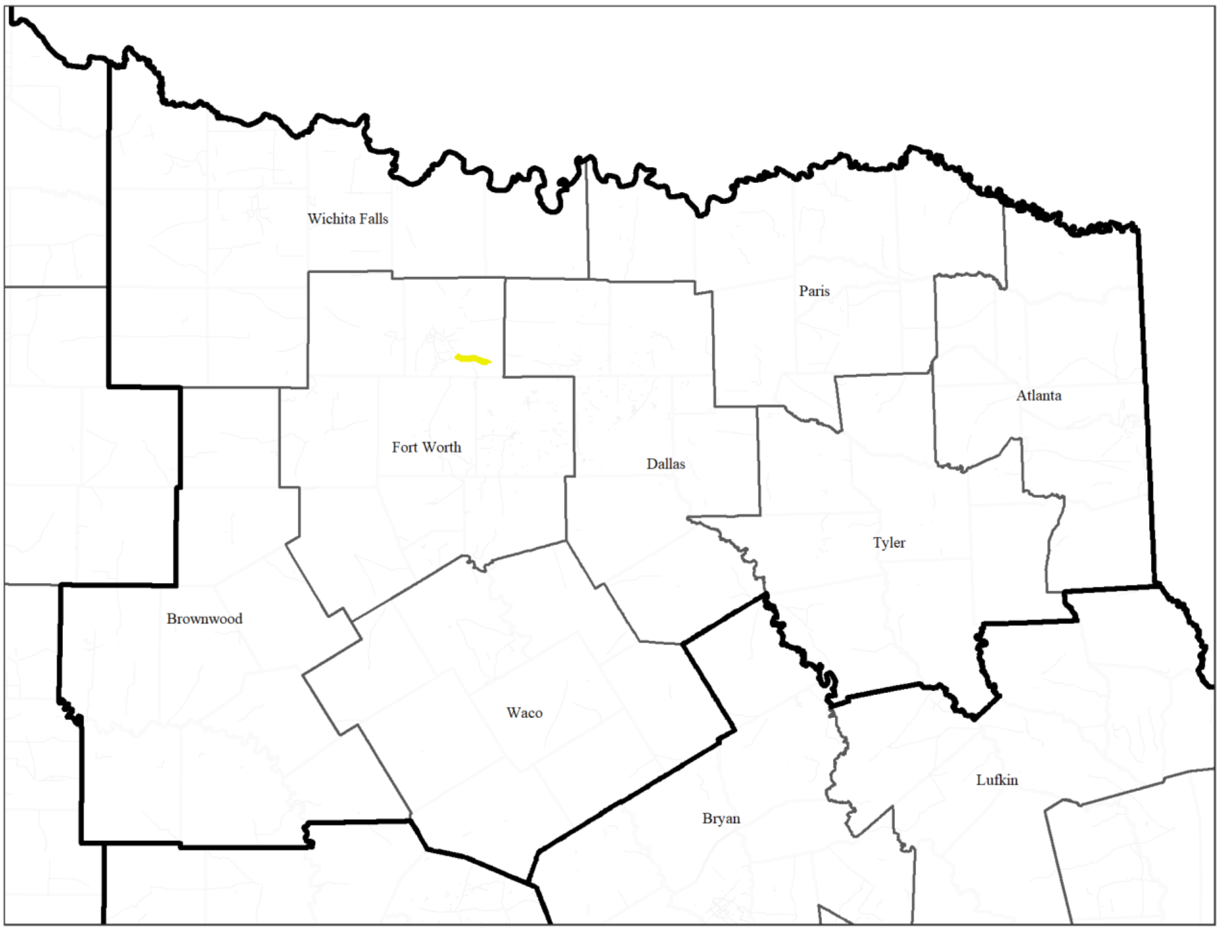
Ornate Box Turtle



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Terrapene ornata

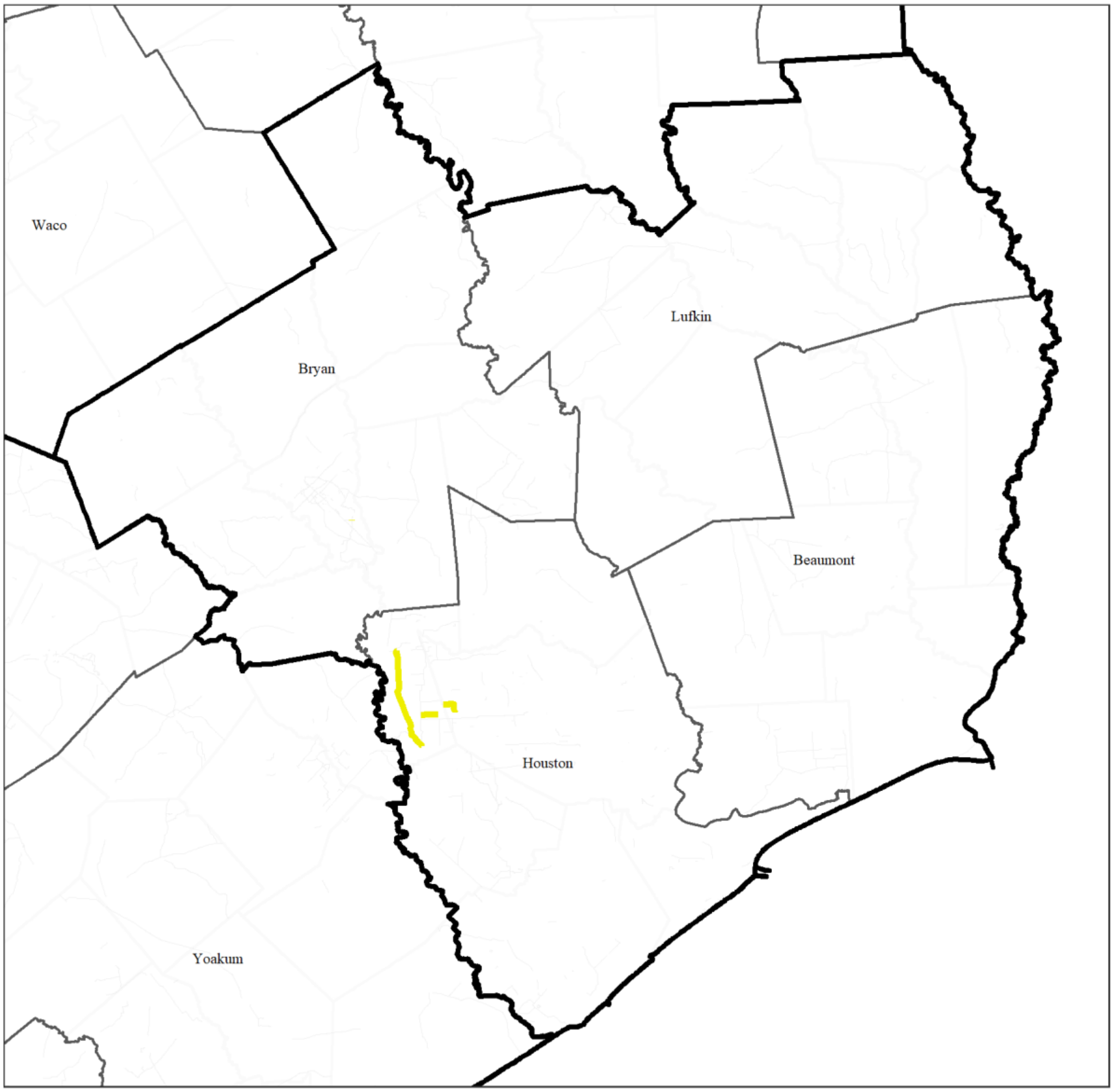
Ornate Box Turtle



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Terrapene ornata

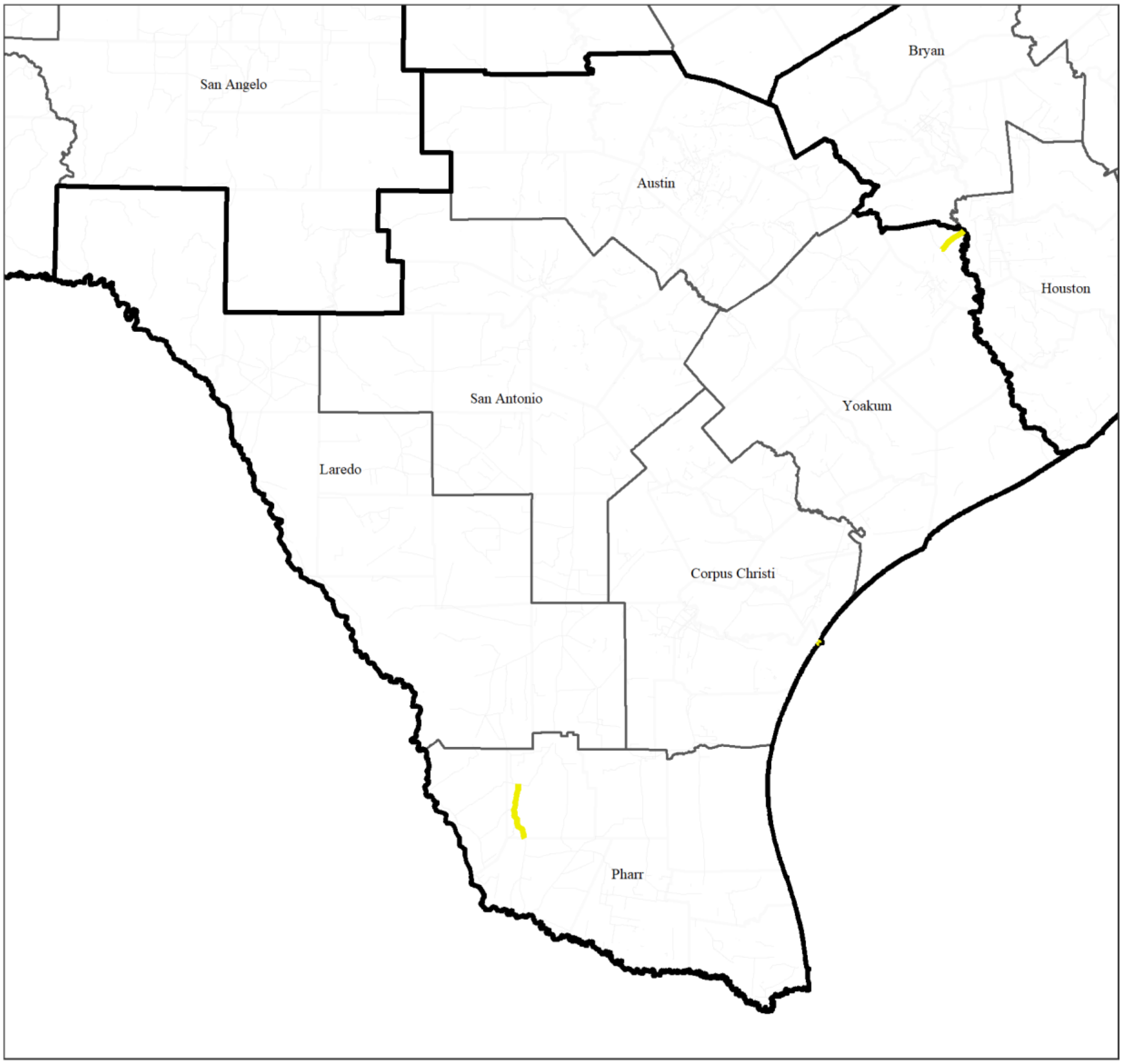
Ornate Box Turtle



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Terrapene ornata

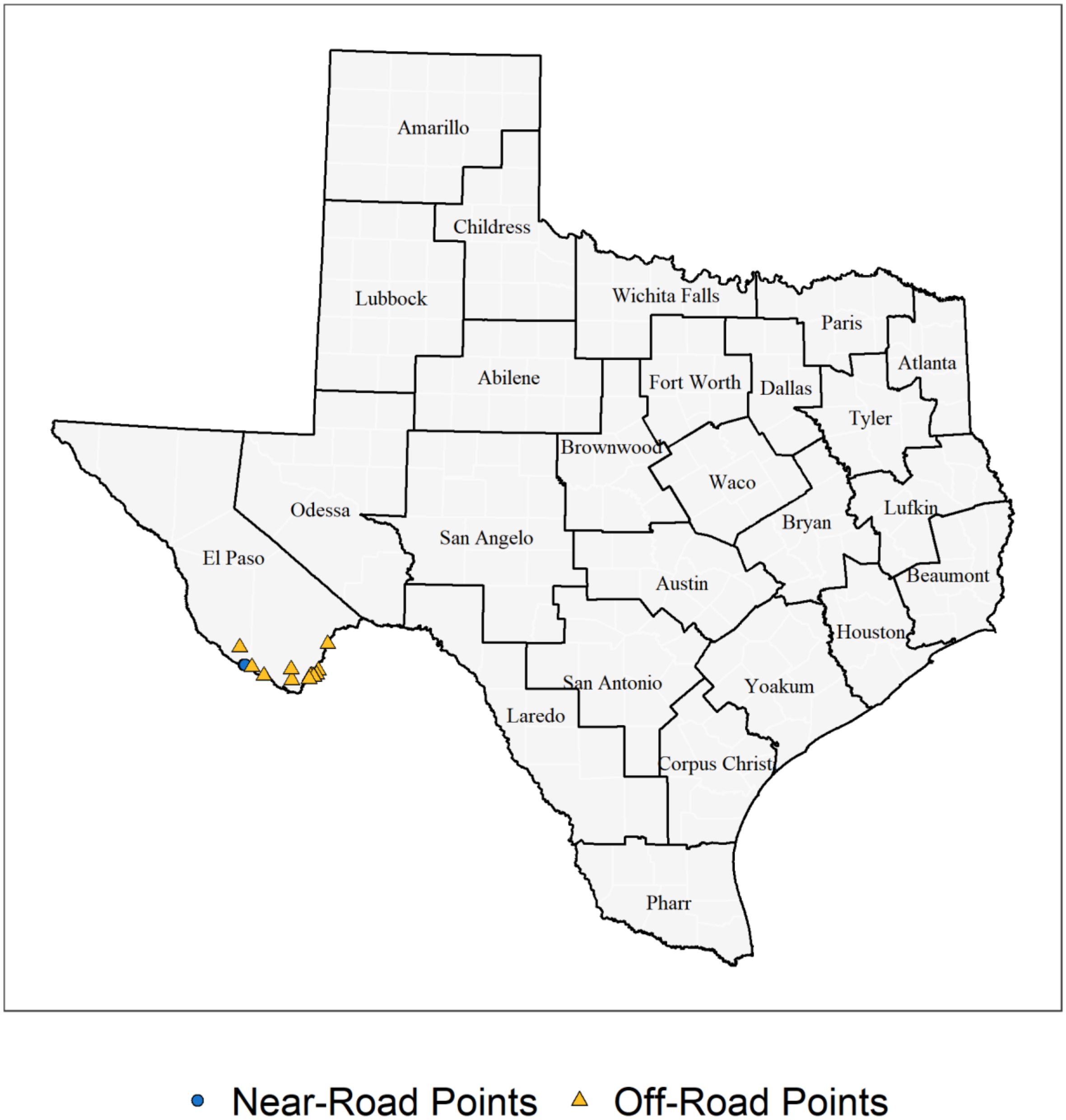
Ornate Box Turtle



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Trachemys gaigeae

Big Bend Slider

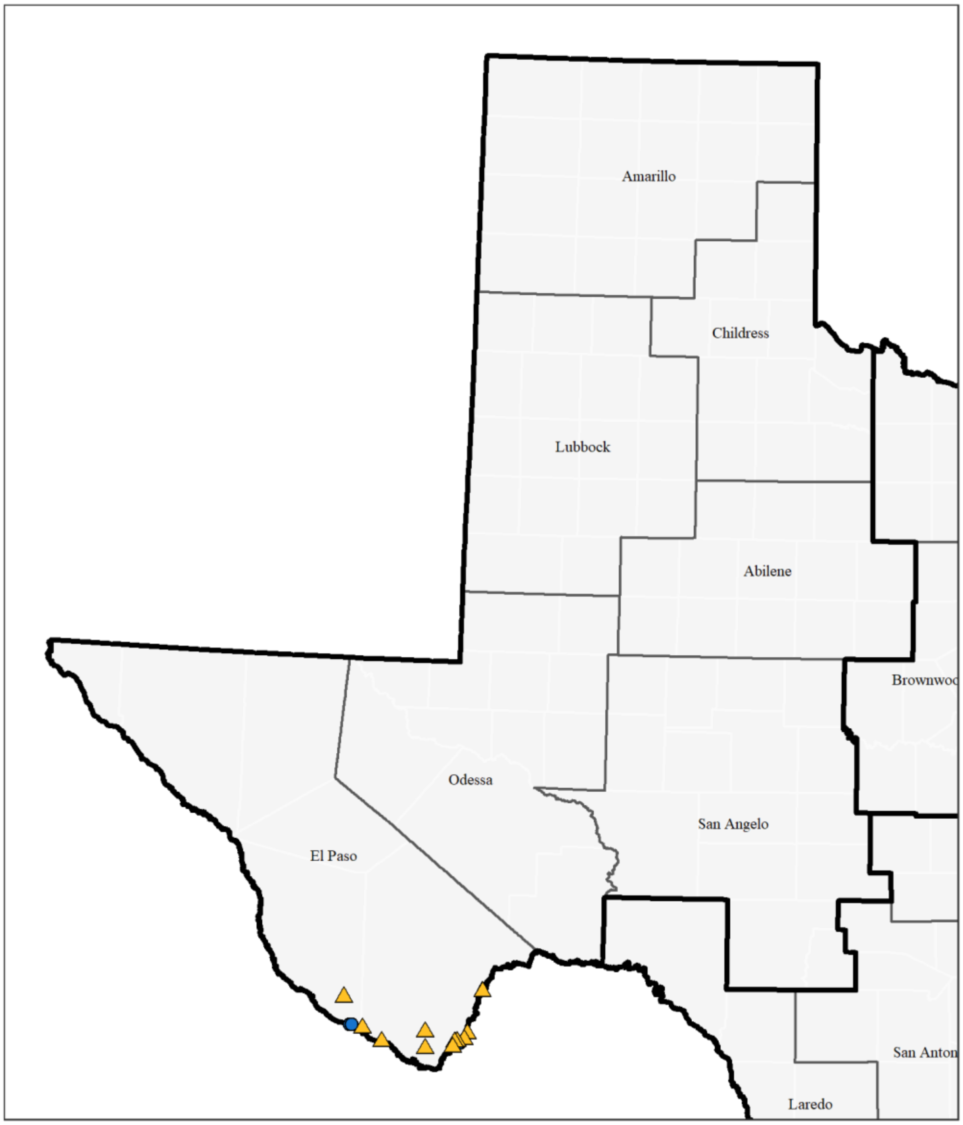


Trachemys gaigeae

Big Bend Slider

Trachemys gaigeae

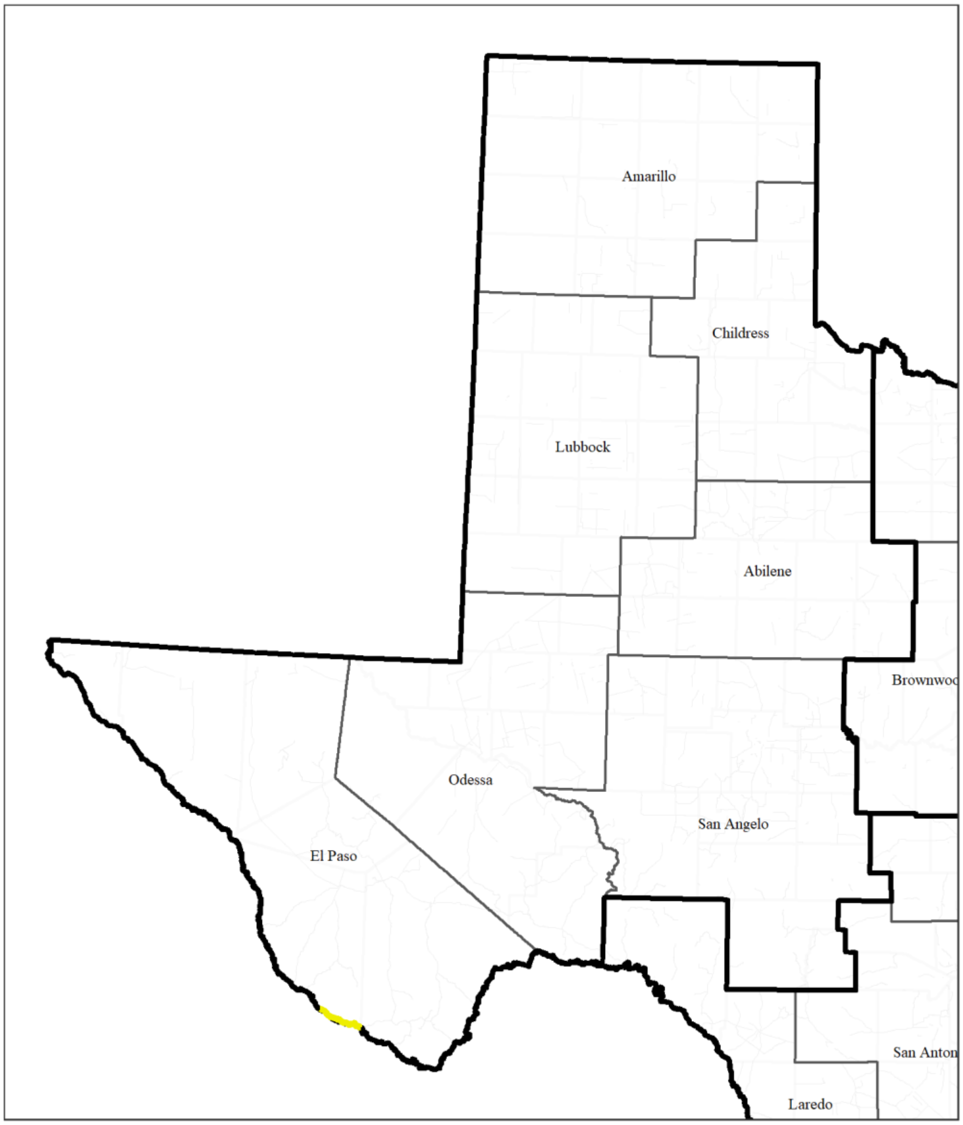
Big Bend Slider



• Near-Road Points △ Off-Road Points

Trachemys gaigeae

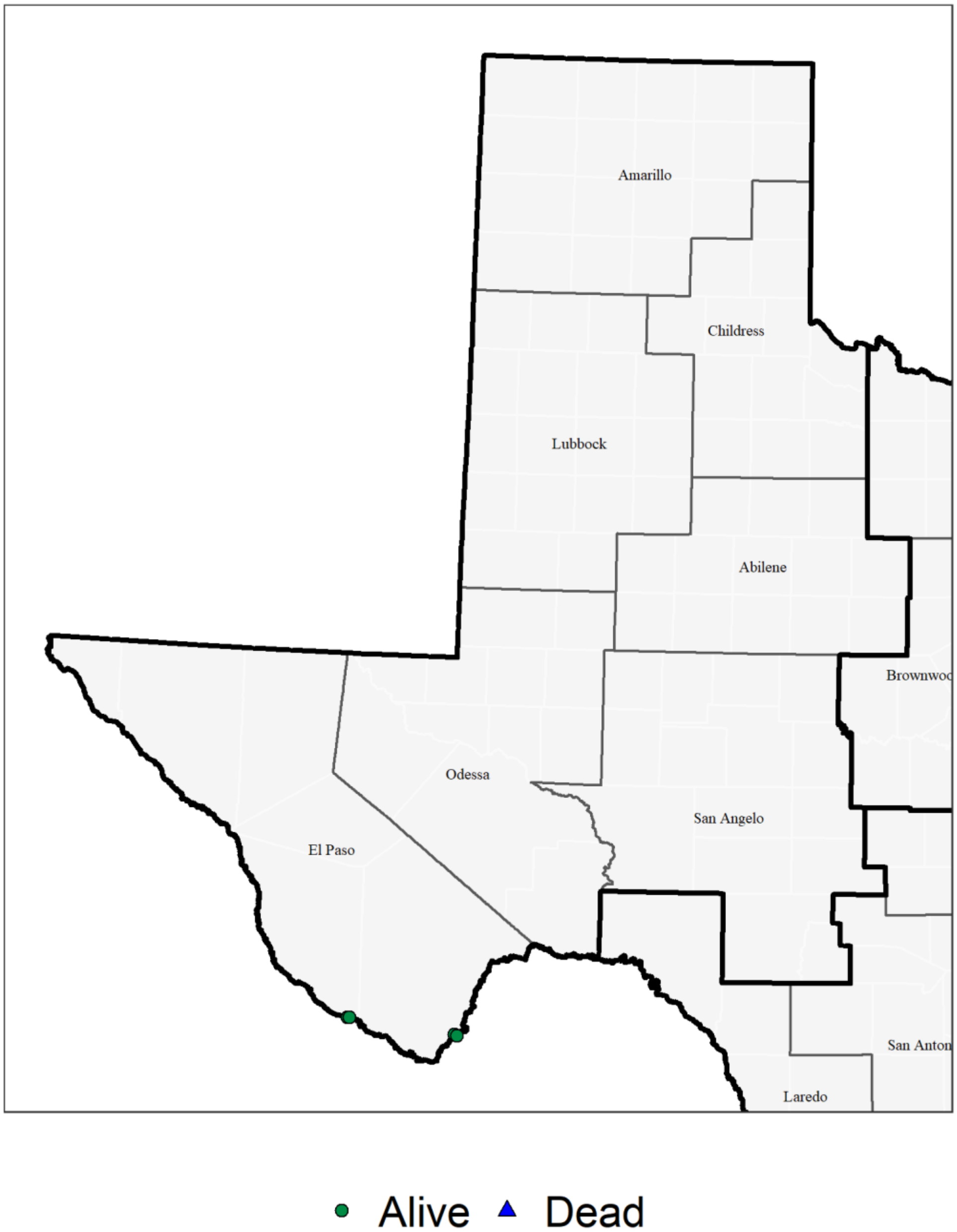
Big Bend Slider



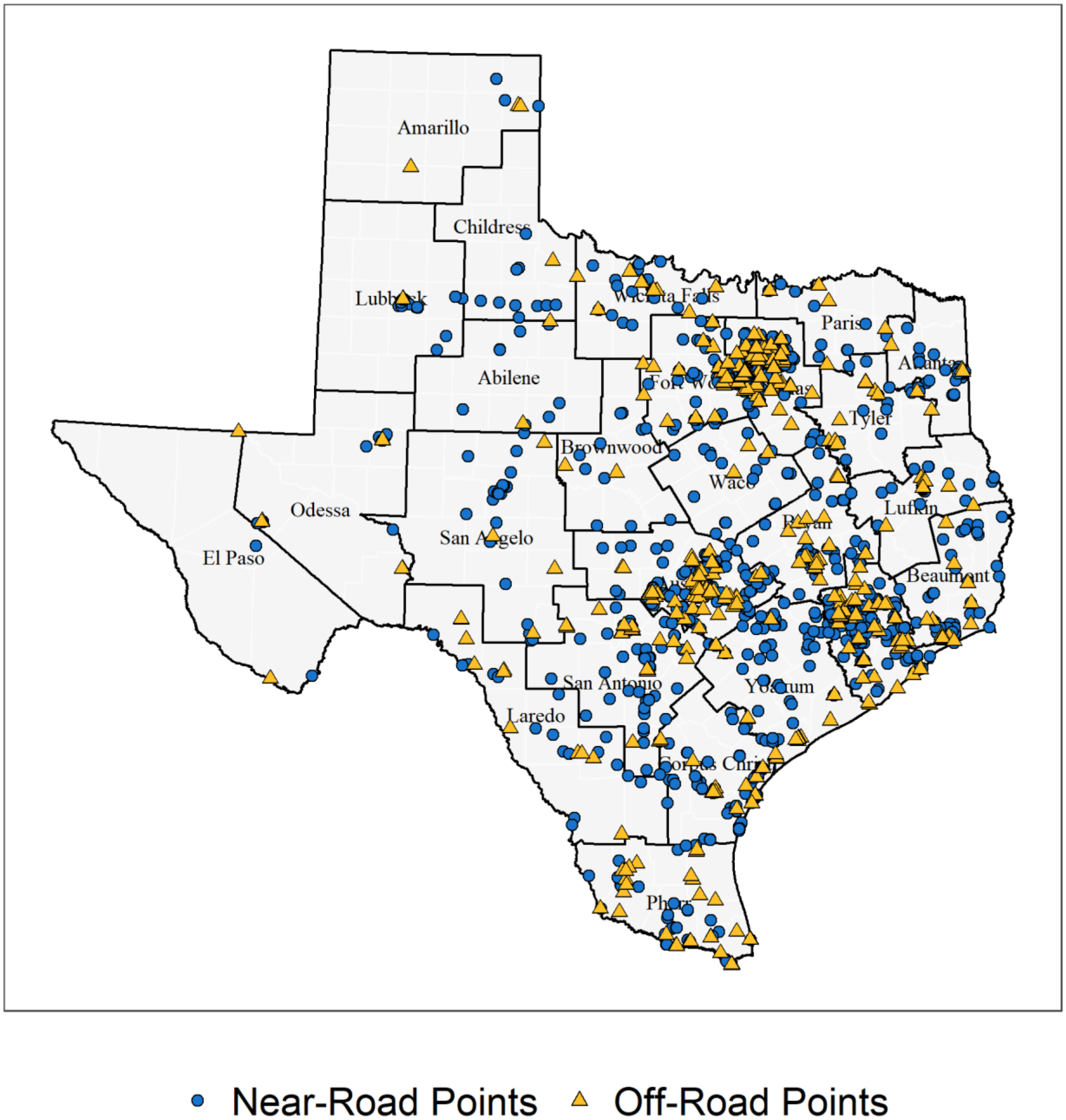
Points Per Section 1-2 3-4 5-6 7+

Trachemys gaigeae

Big Bend Slider



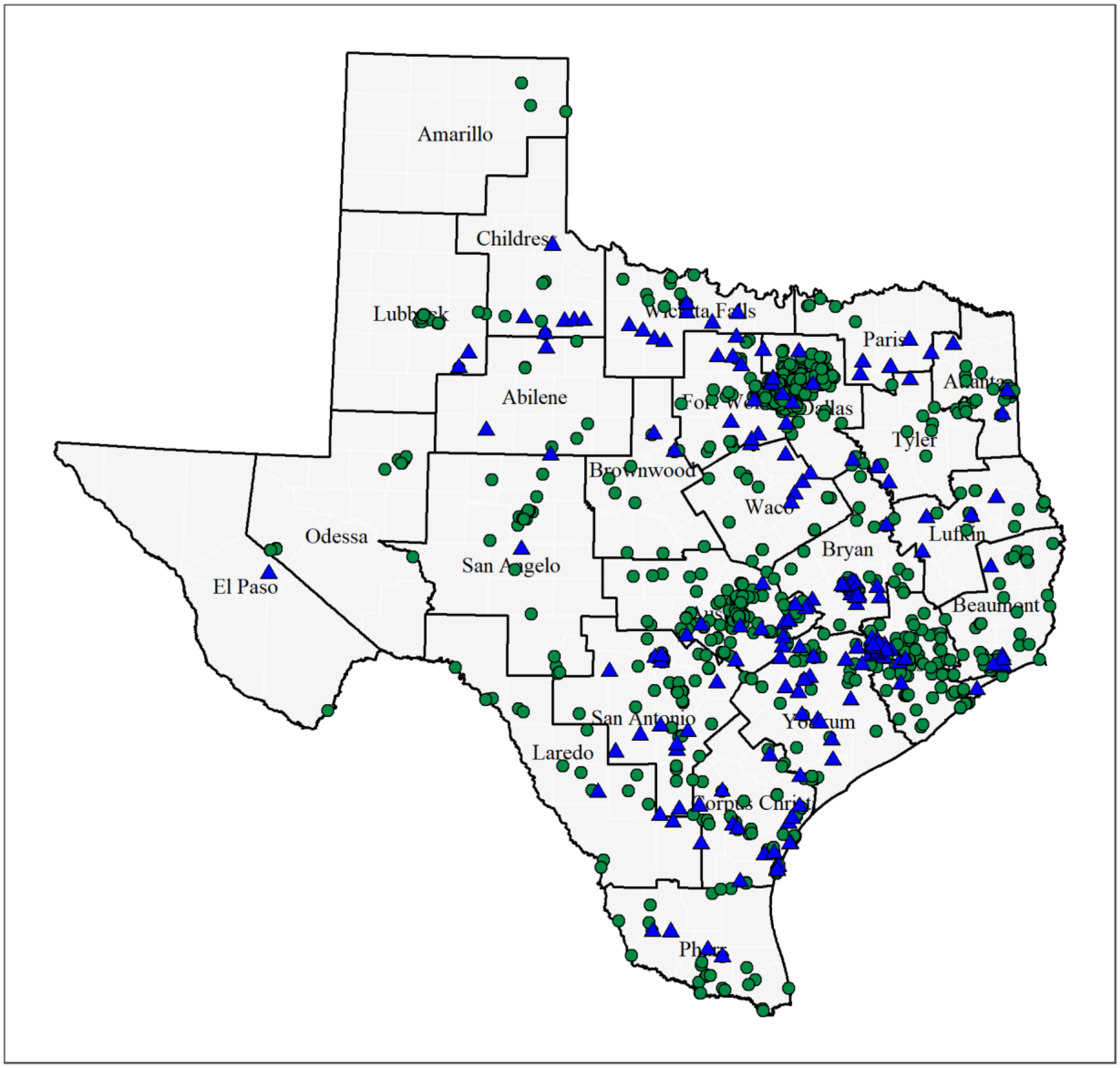
Trachemys scripta
Pond Slider



Trachemys scripta

Pond Slider

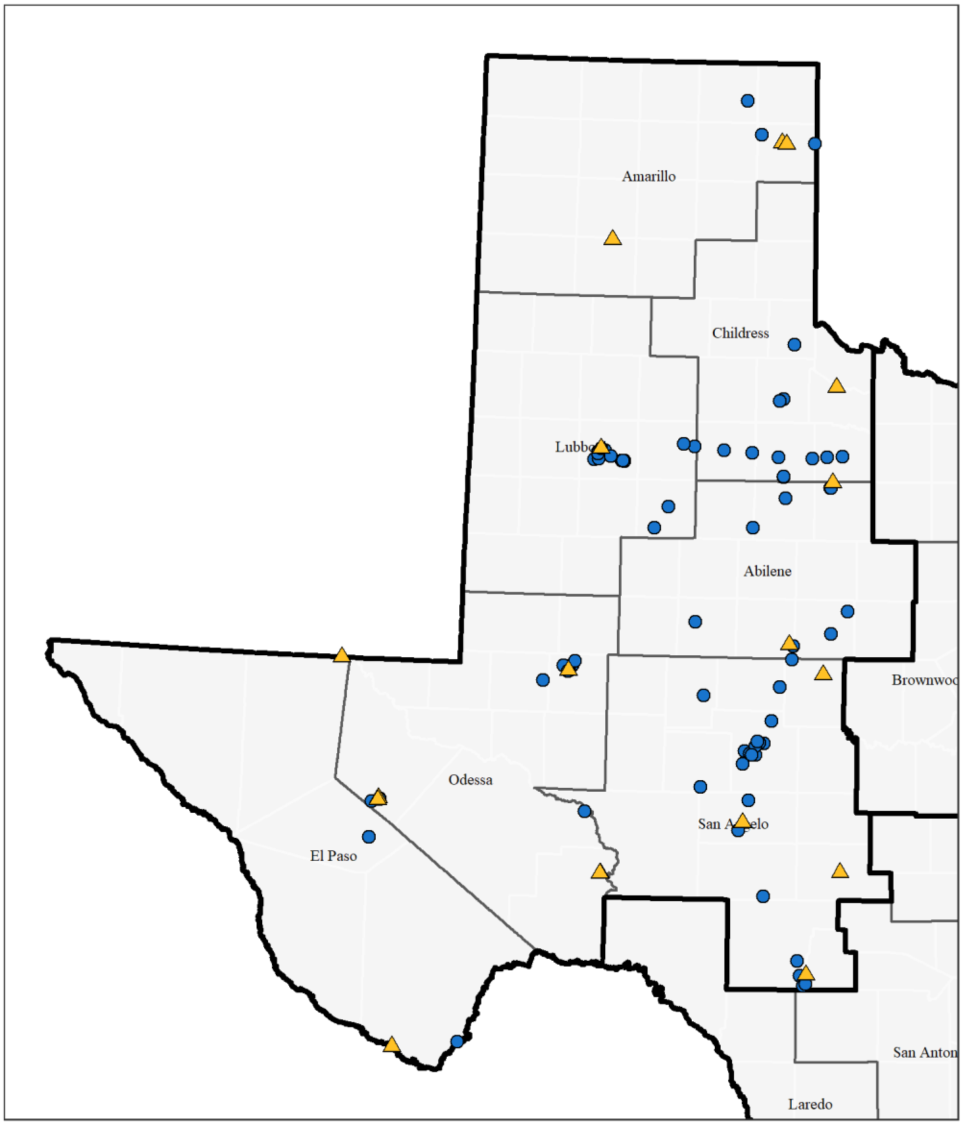
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



• Alive ▲ Dead

Trachemys scripta

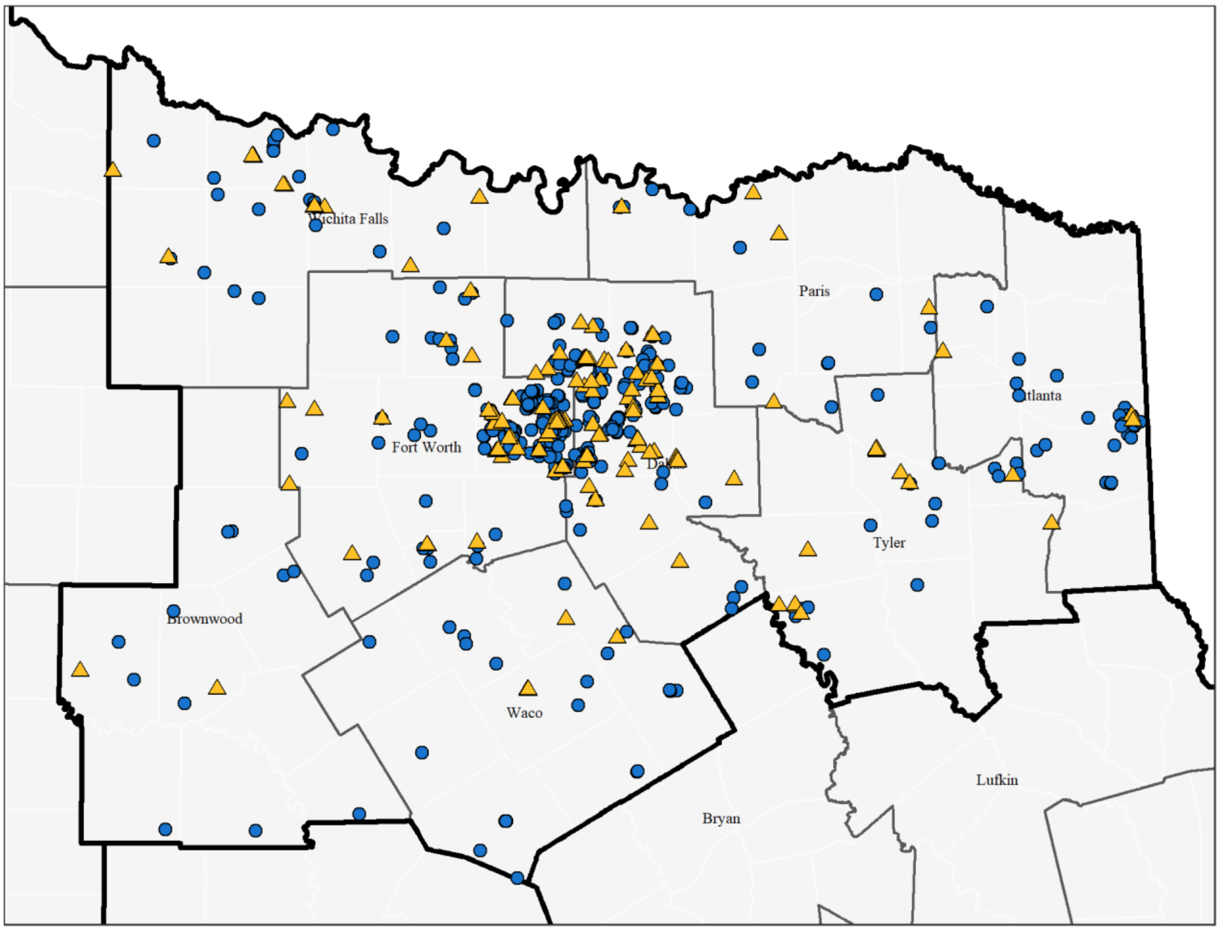
Pond Slider



• Near-Road Points △ Off-Road Points

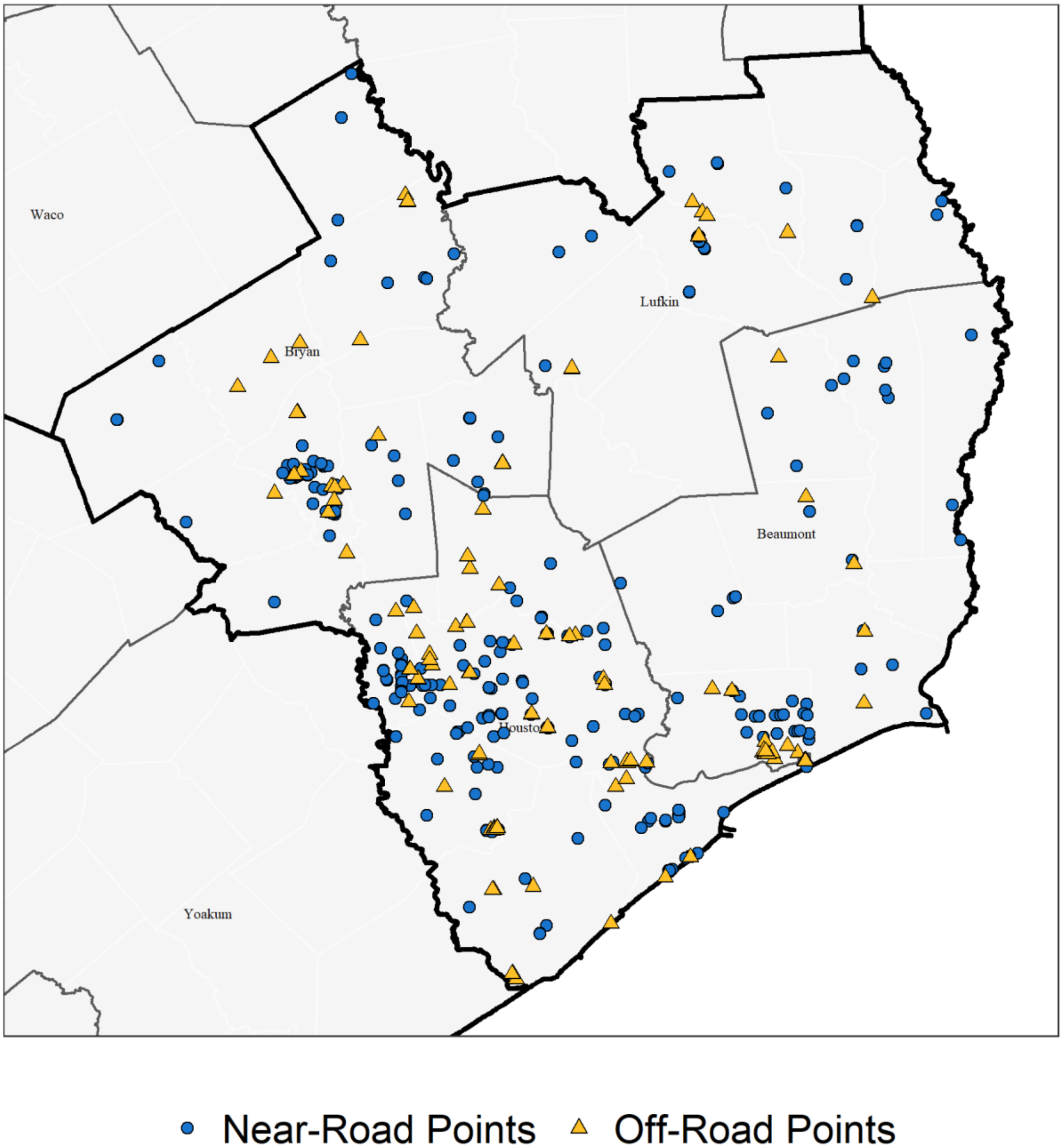
Trachemys scripta

Pond Slider



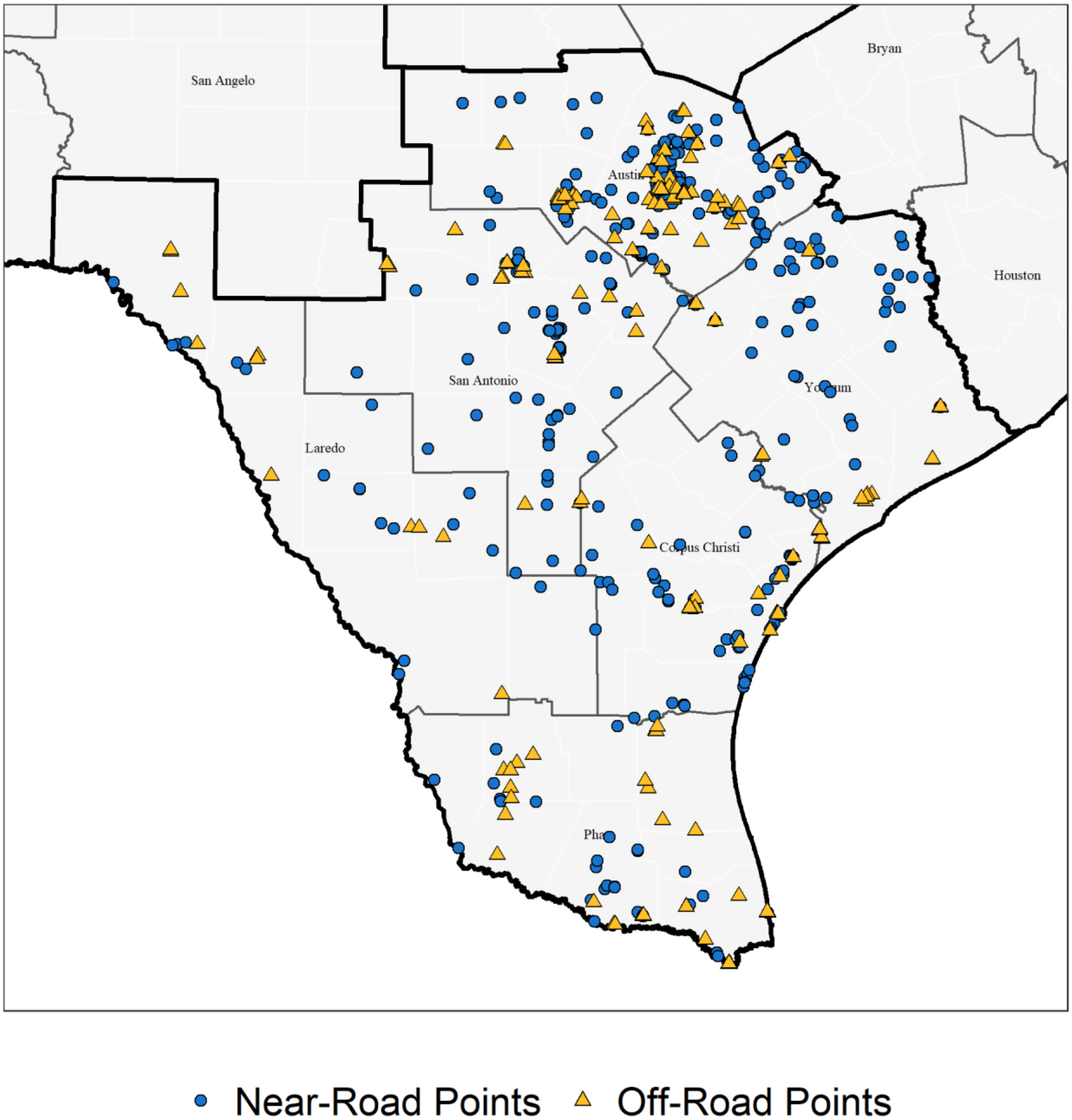
Trachemys scripta

Pond Slider



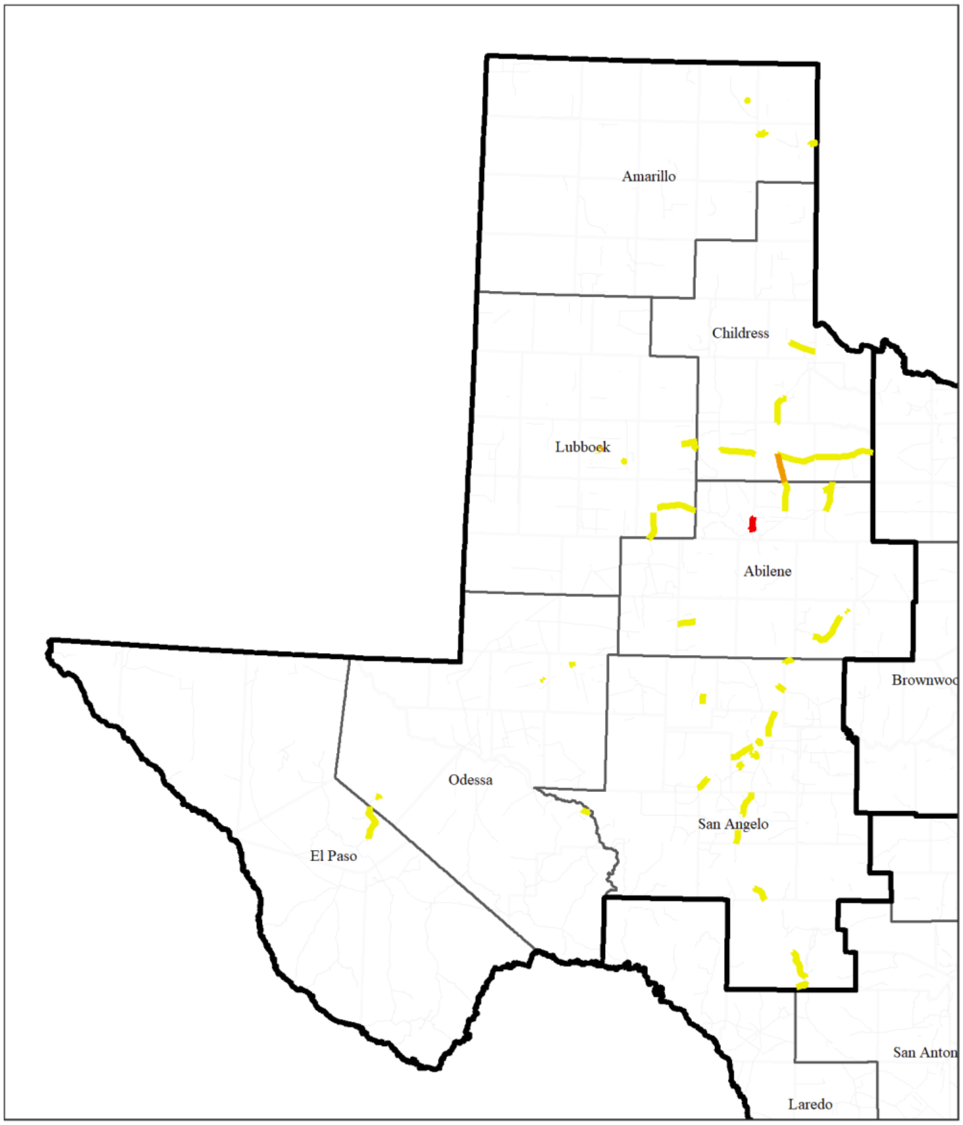
Trachemys scripta

Pond Slider



Trachemys scripta

Pond Slider

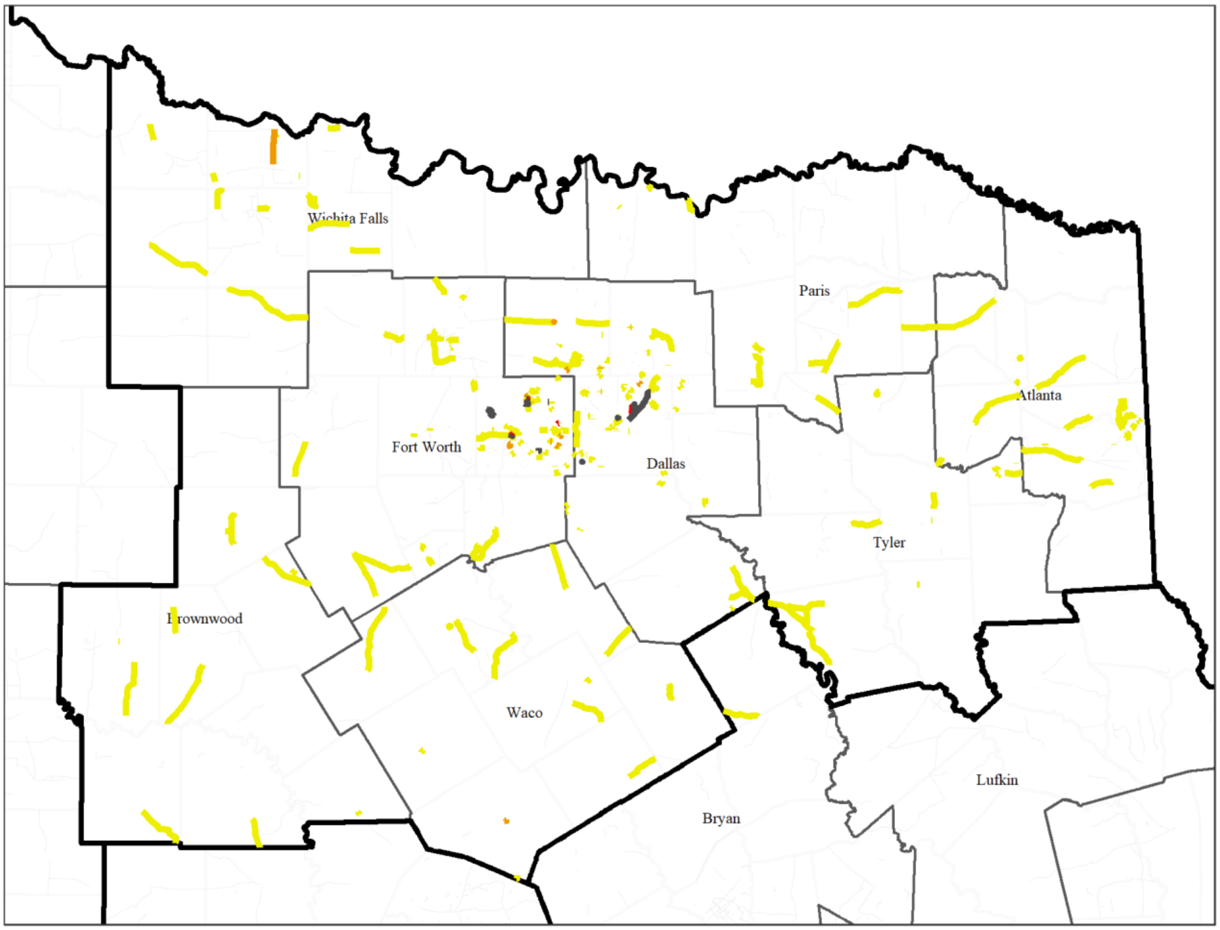


Points Per Section 1-2 3-4 5-6 7+

Trachemys scripta

Pond Slider

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE

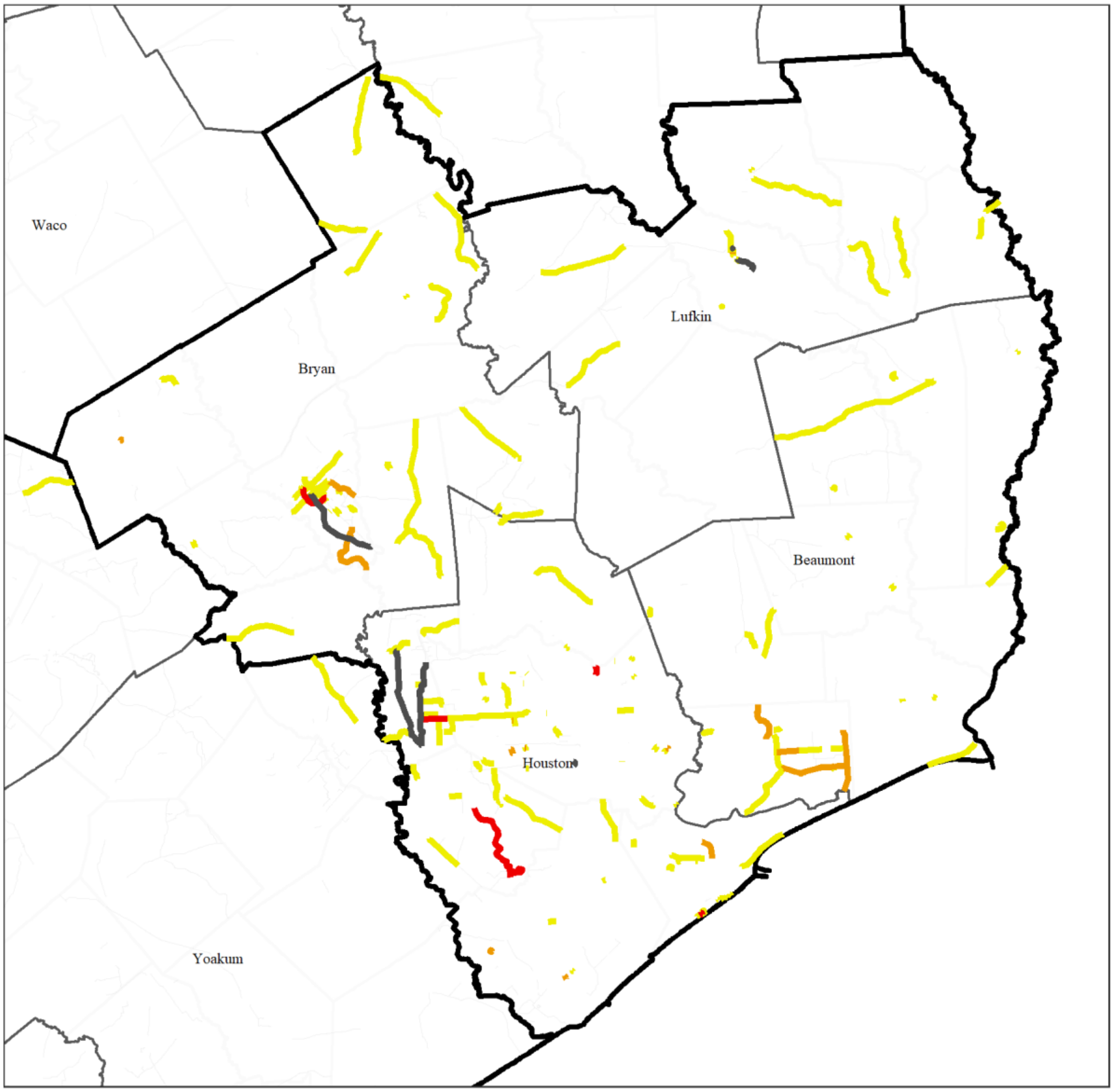


Points Per Section 1-2 3-4 5-6 7+

Trachemys scripta

Pond Slider

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE

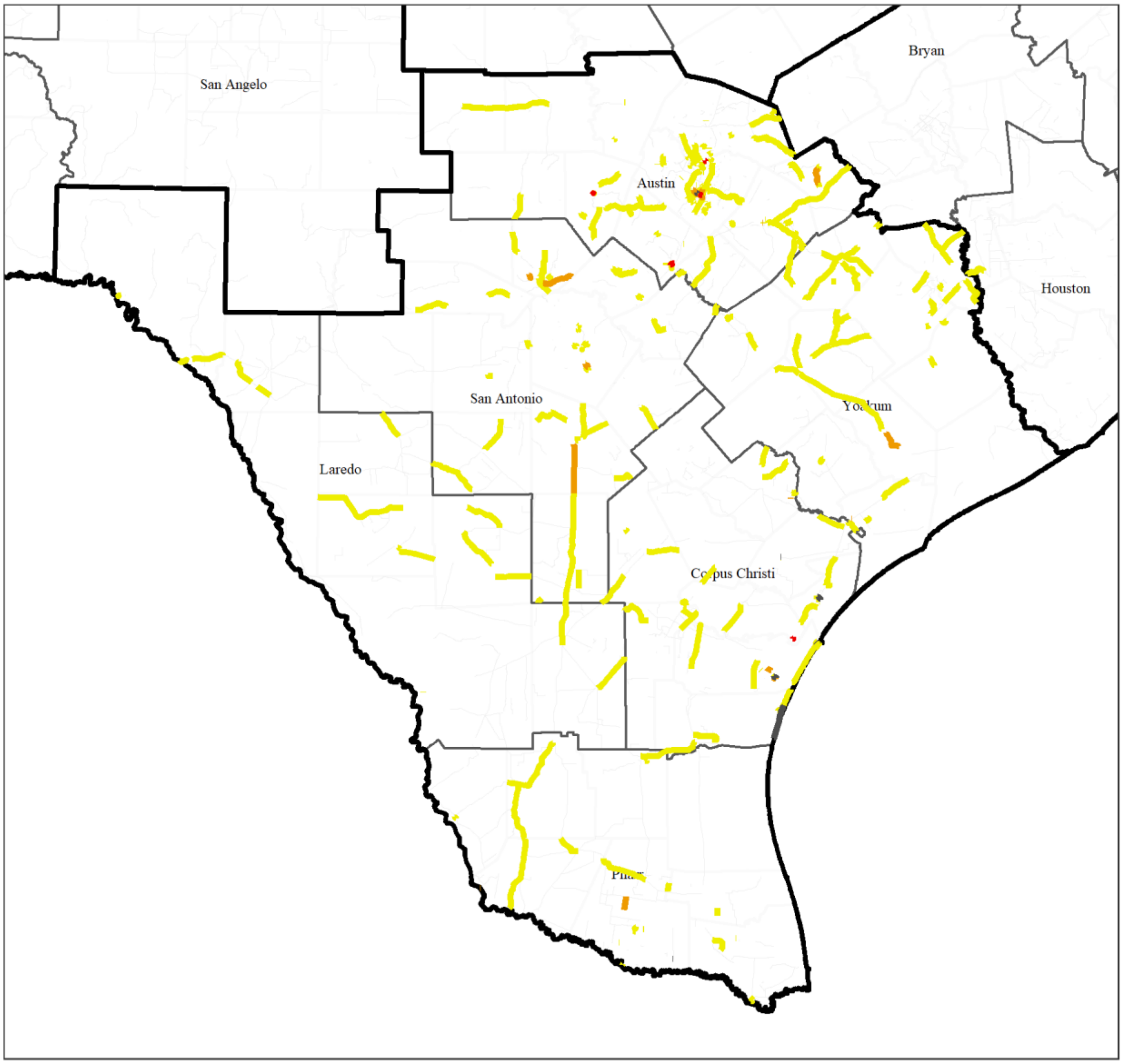


Points Per Section 1-2 3-4 5-6 7+

Trachemys scripta

Pond Slider

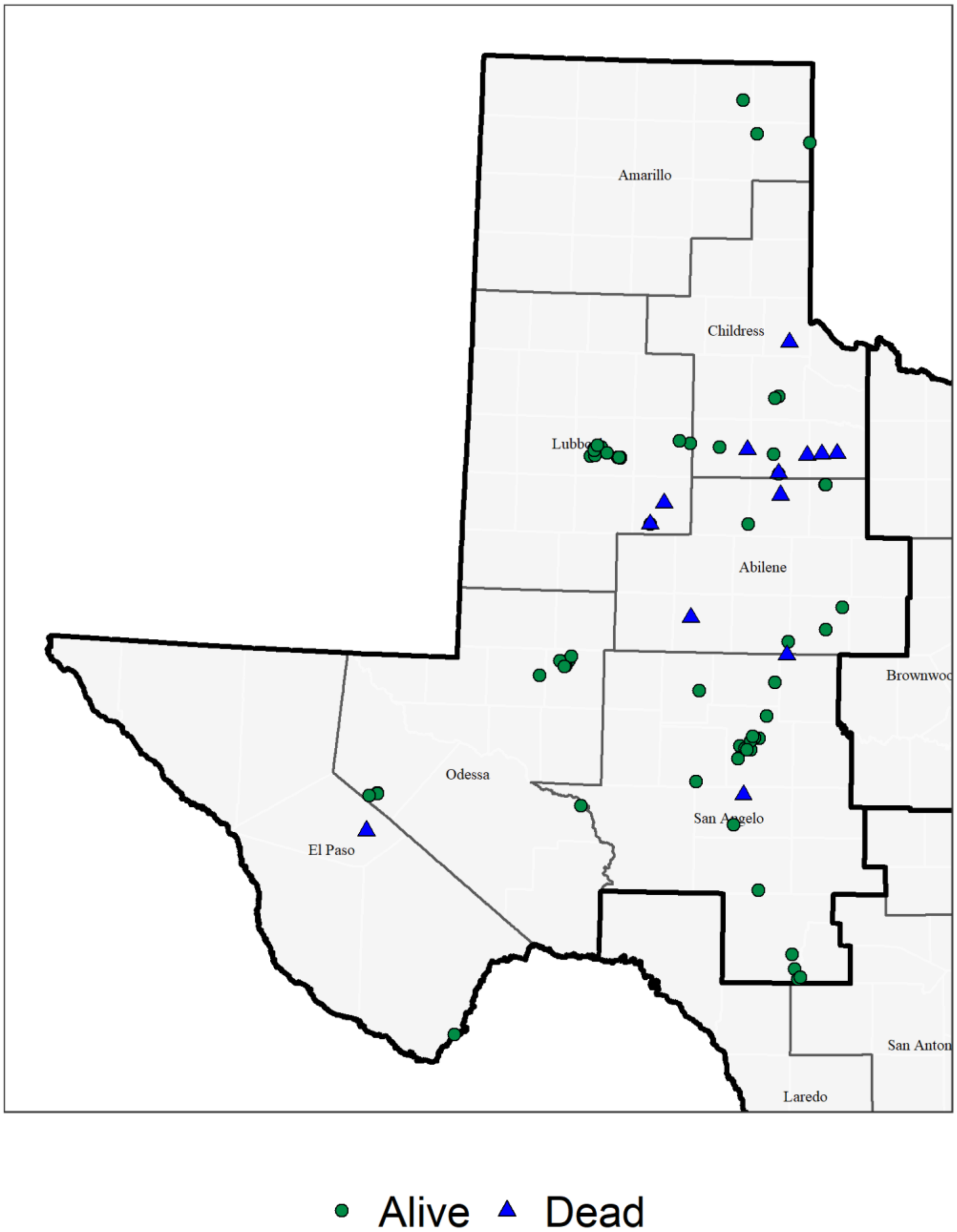
TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



Points Per Section 1-2 3-4 5-6 7+

Trachemys scripta

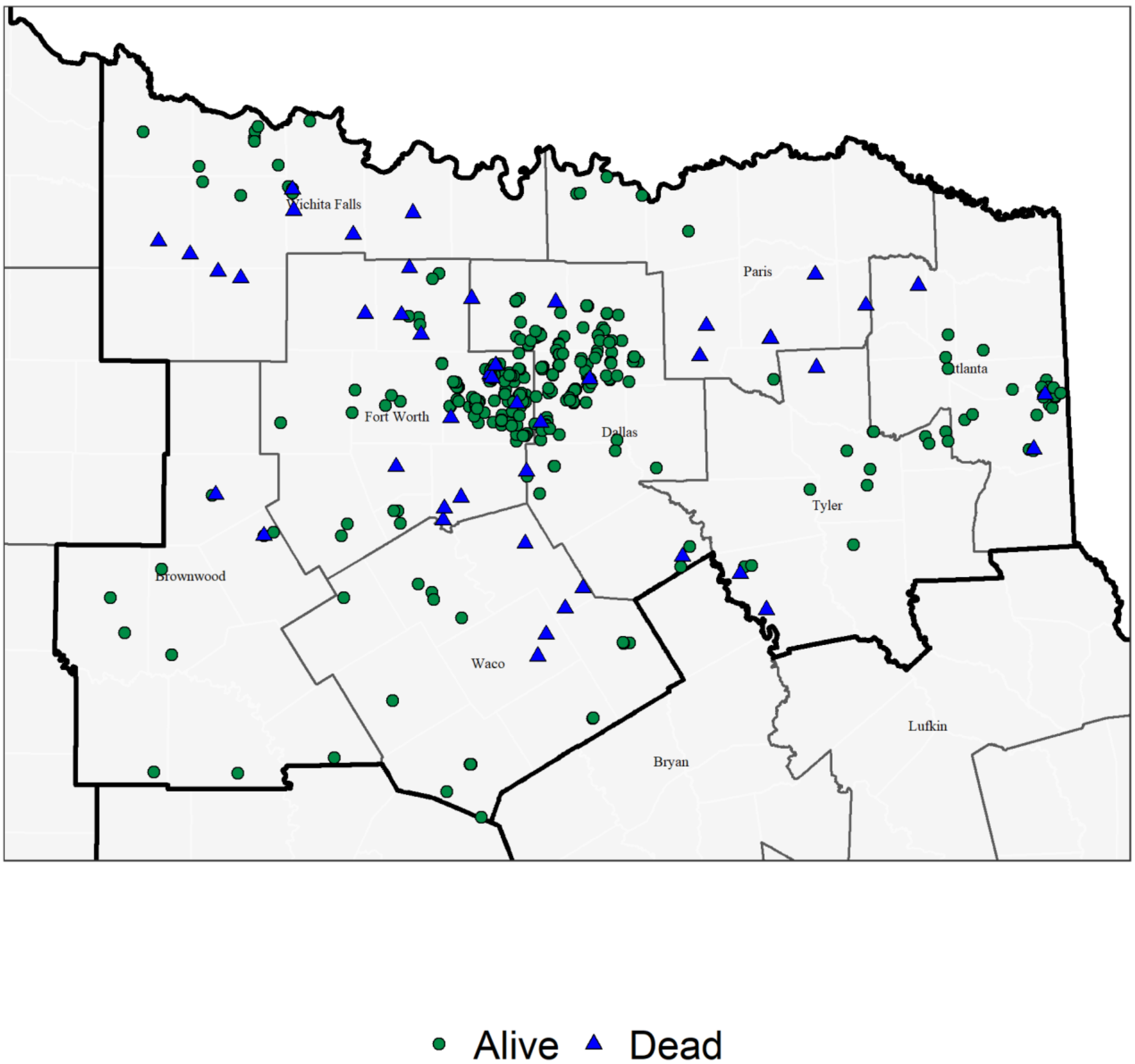
Pond Slider



Trachemys scripta

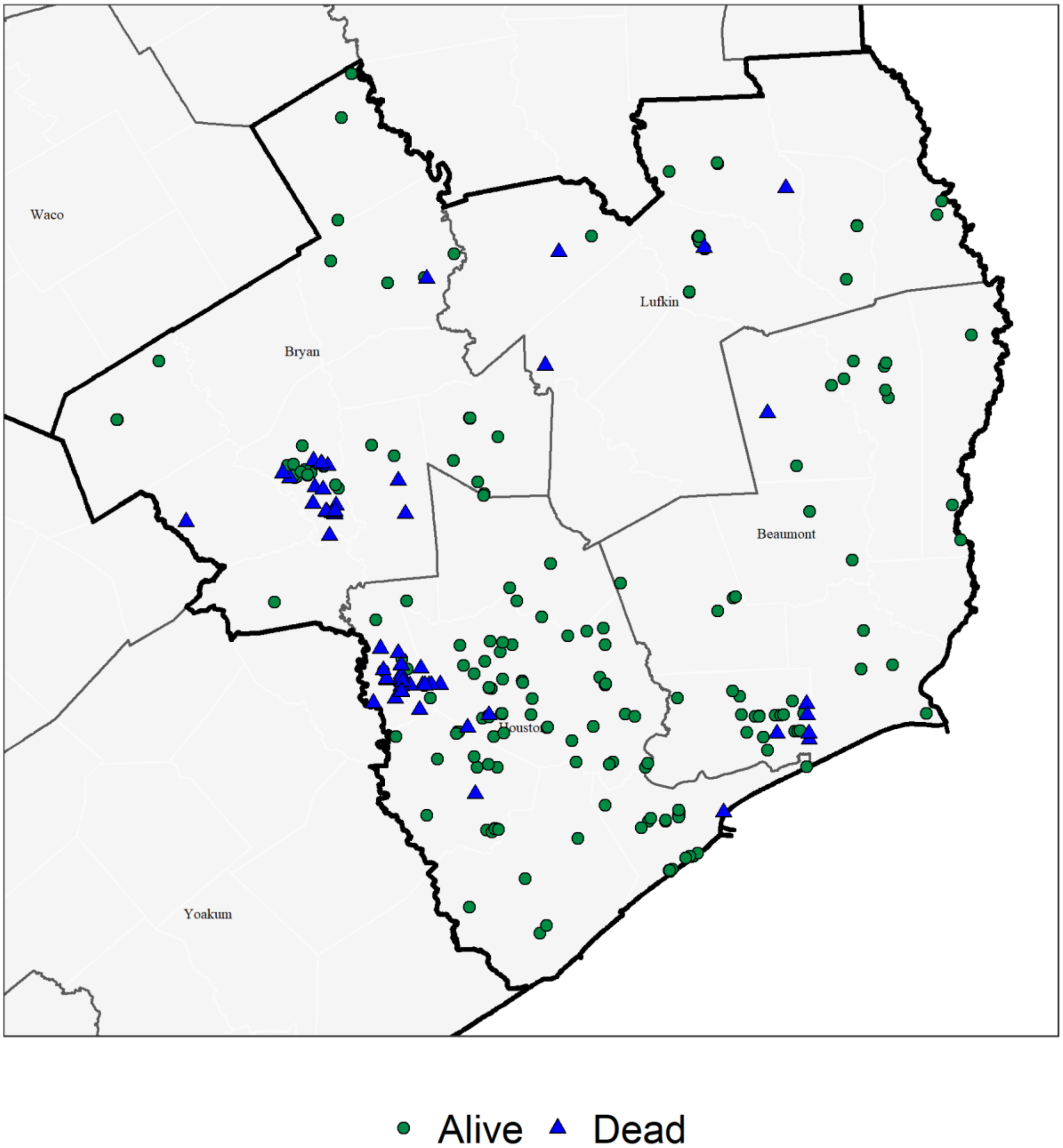
Pond Slider

TEXAS A&M NRI NATURAL RESOURCES INSTITUTE



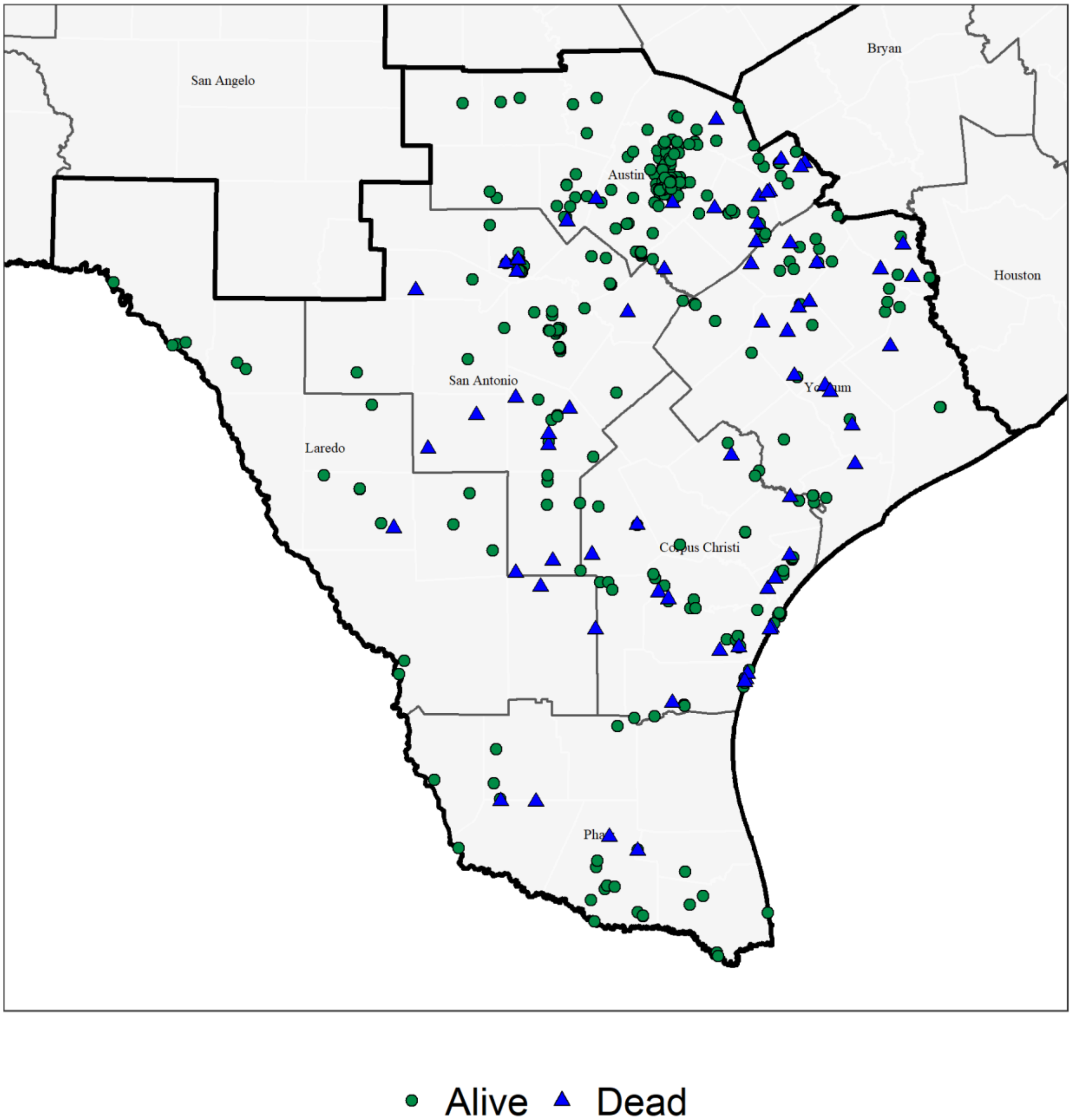
Trachemys scripta

Pond Slider



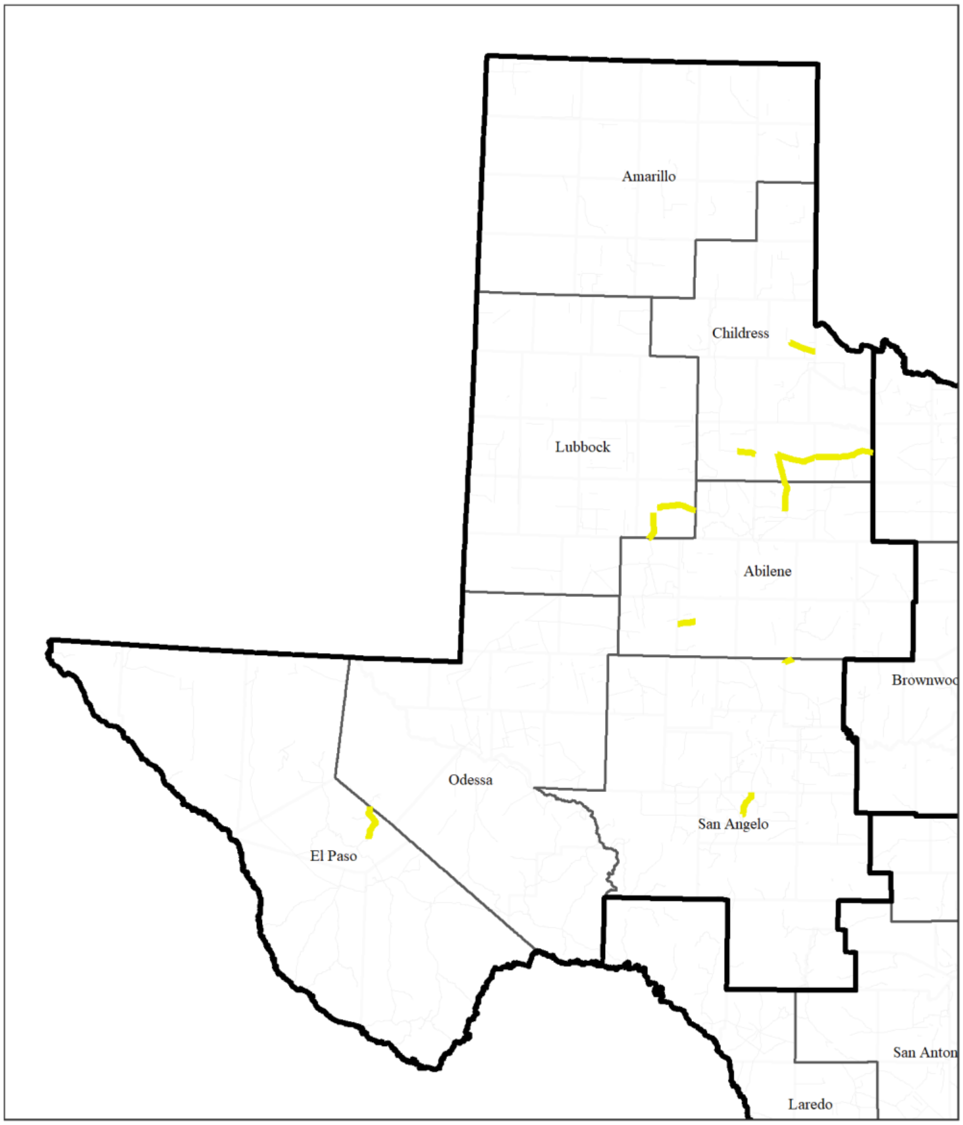
Trachemys scripta

Pond Slider



Trachemys scripta

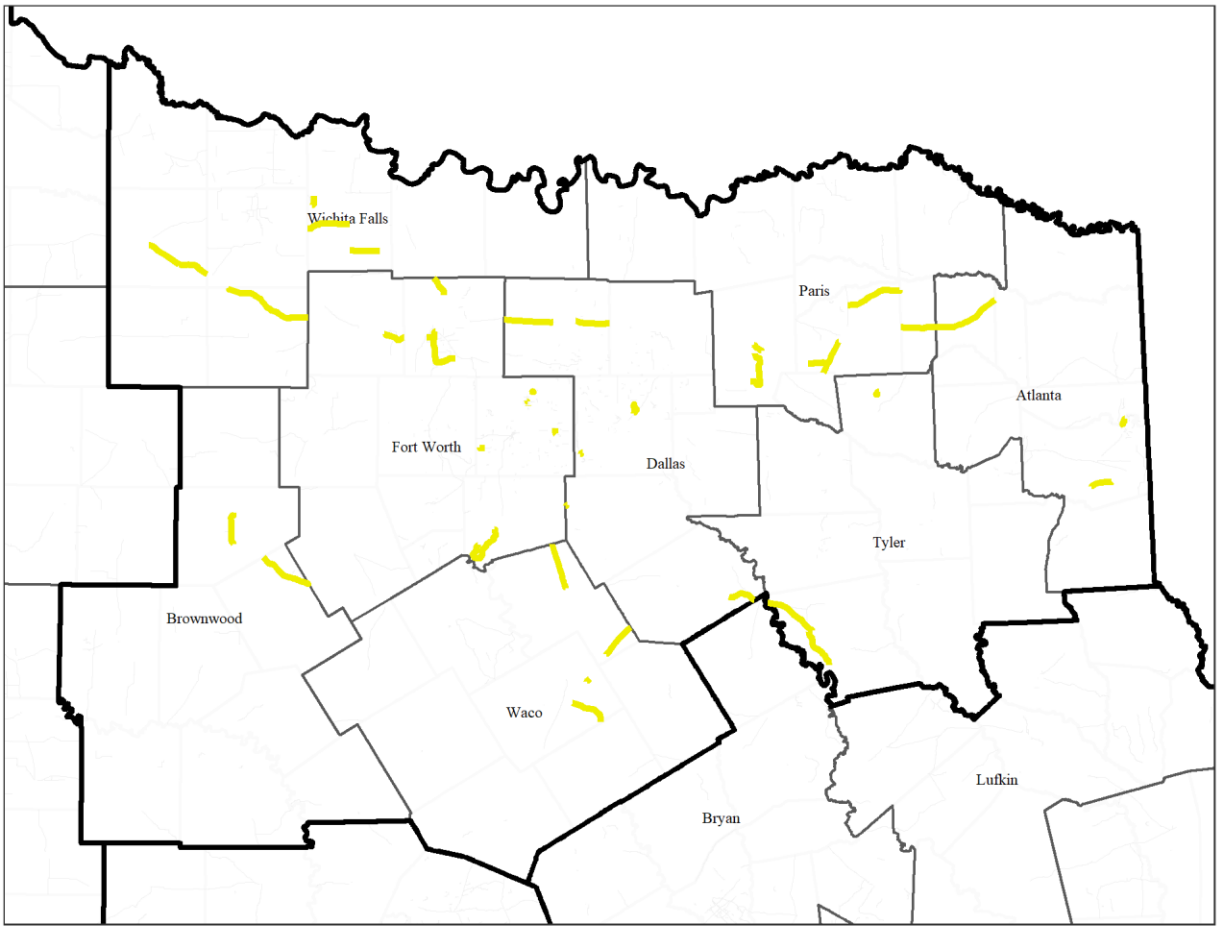
Pond Slider



Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Trachemys scripta

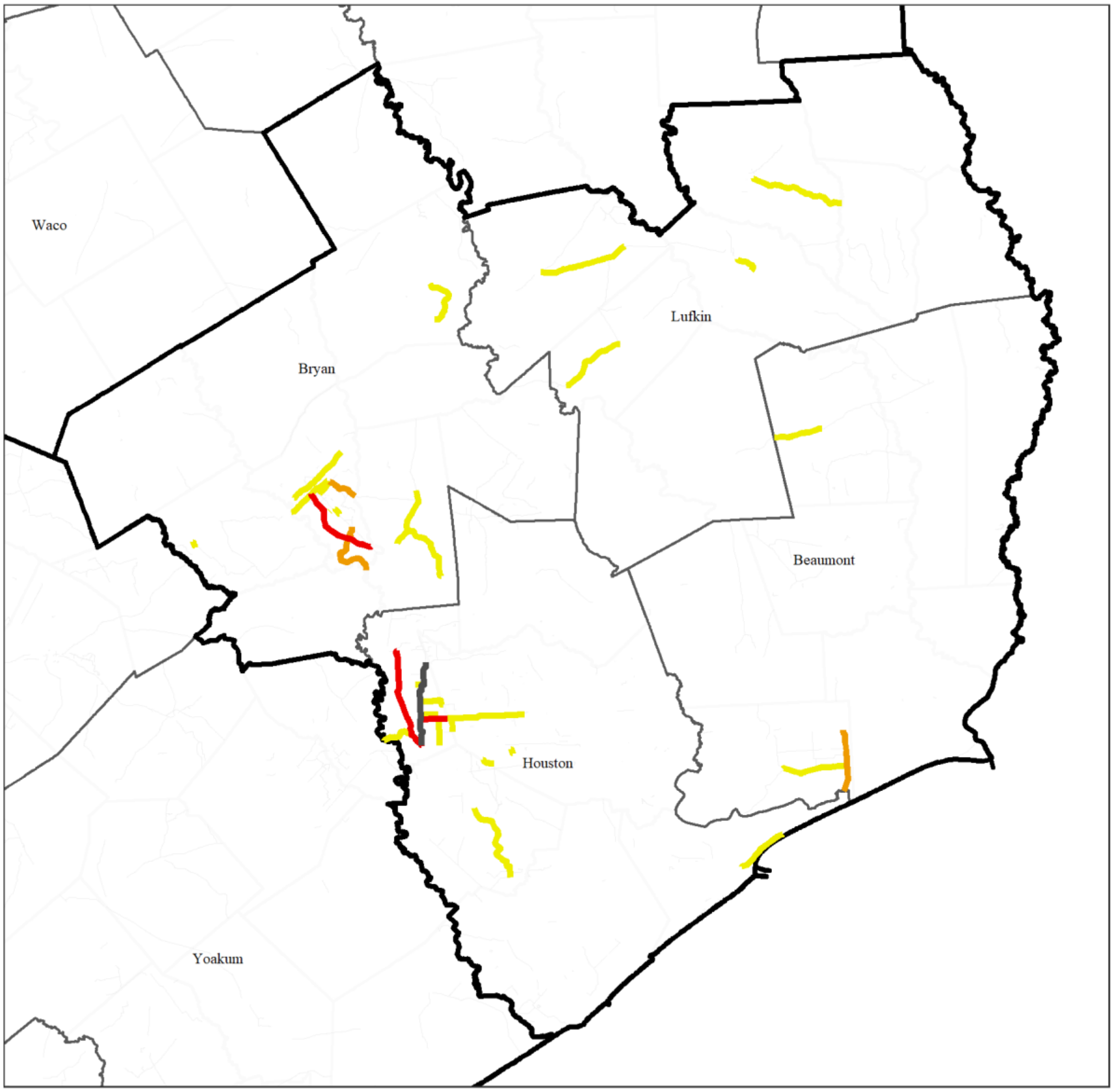
Pond Slider



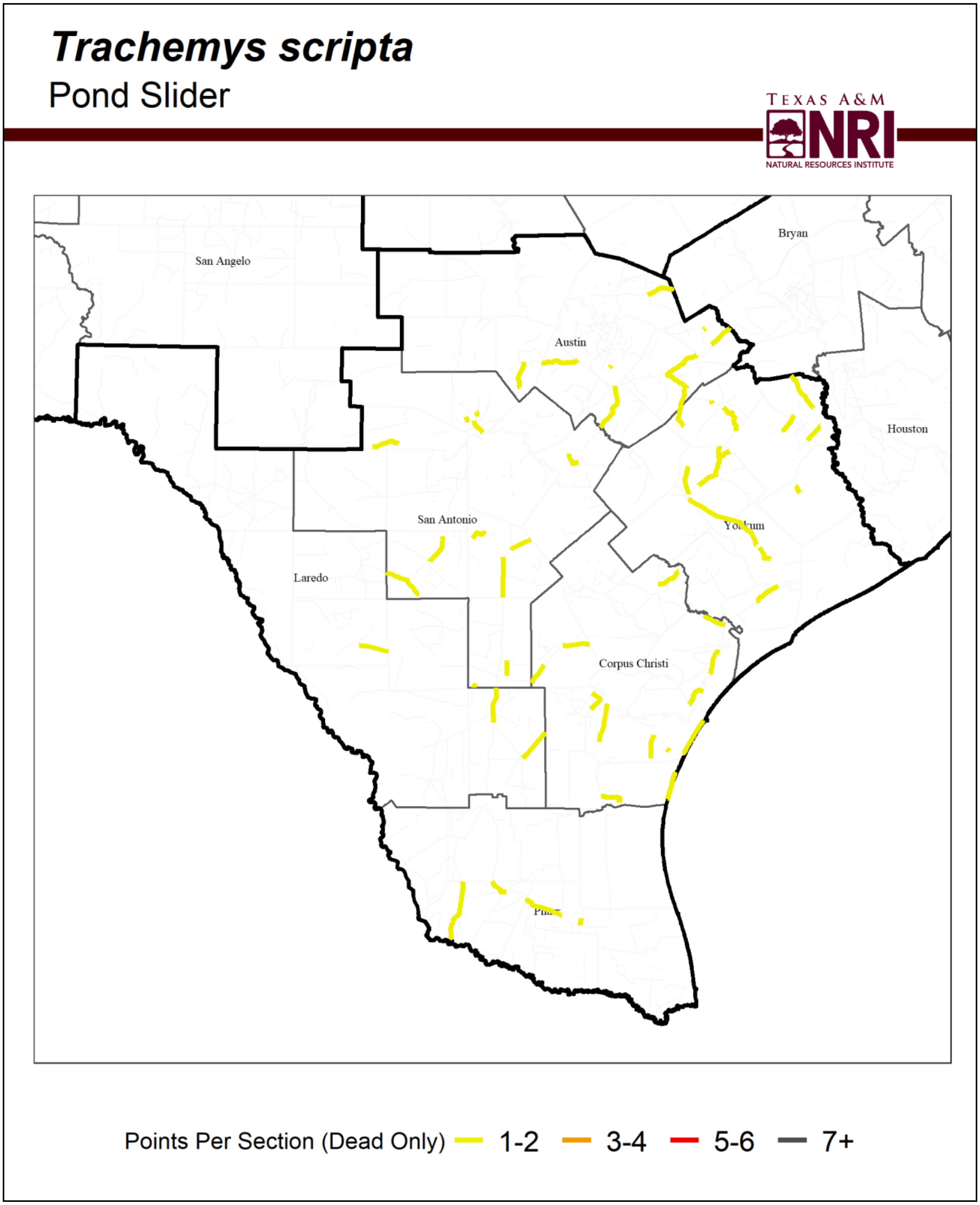
Points Per Section (Dead Only) 1-2 3-4 5-6 7+

Trachemys scripta

Pond Slider



Points Per Section (Dead Only) 1-2 3-4 5-6 7+


Trachemys scripta
Pond Slider
TEXAS A&M
NRI
NATURAL RESOURCES INSTITUTE
San Angelo
Bryan
Austin
Houston
San Antonio
Laredo
Corpus Christi
Points Per Section (Dead Only)
1-2
3-4
5-6
7+

Appendix B.

Appendix B contains informational tables for each of the Texas Species of Greatest Conservation Need (SGCN) herpetofauna. Each page features one species, with common and scientific name and a representative picture of the species. Also included is a brief description of the species relationship to roads, based on information from the final Research Report, supplemented with expert opinion. Finally, there is a summary table of control sections with the highest number of observations of that species, with the total number of observations on that control section (# Obs) and the total number of dead observations on that control section (# Dead). Control section names are taken from the TxDOT open GIS data portal (https://gis-txdot.opendata.arcgis.com; last downloaded 20 December 2018), column “CTRL_SEC_1”. These data correspond with the species maps in Appendix A.State-wide maps:

B1. Amphibians – Frogs and Toads

Amphibian – Frog/Toad: Houston Toad (*Anaxyrus houstonensis*)

Brief Description:
All toads will cross roads especially when roads are near wetlands in which they breed. Some evidence suggests Houston Toads avoid crossing large areas with open canopy so road width will likely affect toad crossing.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
27103	1	0
53001	1	0
AA0180	1	0
AA0190	1	0
AA5219	1	0

Amphibian – Frog/Toad: Woodhouse's Toad (*Anaxyrus woodhousei*)

Brief Description:
All toads will cross roads especially when roads are near wetlands in which they breed.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
AA0540	7	0	LC1484	2	0	31302	1	0
AA0732	5	0	LD0337	2	0	332601	1	0
114202	3	0	LG0274	2	0	35202	1	0
237101	3	0	LQ0147	2	0	35602	1	0
AA3420	3	0	124502	1	0	51401	1	1
10504	2	0	128701	1	0	79404	1	0
4320	2	0	13201	1	0	80202	1	0
79402	2	0	241702	1	1	87403	1	0
84403	2	1	25703	1	0	95501	1	0
AA0051	2	0	29801	1	0	AA0132	1	0
AA0279	2	0	31101	1	0	AA0243	1	0
AA0799	2	0	31204	1	0	AA0284	1	0

Amphibian – Frog/Toad: Sheep Frog (*Hypopachus variolosus*)

Brief Description:
This species can be frequently encountered on roads during and after heavy rains.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
111701	5	0	105201	1	1	AA0141	1	0
180701	4	1	155801	1	0	AA0150	1	0
32902	4	0	237303	1	0	AA0182	1	0
44703	4	0	25505	1	0	AA0229	1	0
170301	3	0	3901	1	0	AA0245	1	0
188901	3	1	43305	1	0	AA0258	1	0
AA0134	3	0	51601	1	0	AA0300	1	0
AA0220	3	0	51703	1	0	AA0303	1	0
111703	2	0	AA0103	1	0	AA0308	1	0
32710	2	0	AA0121	1	0	AA0404	1	0
54206	2	0	AA0122	1	0	AA0737	1	1
10212	1	0	AA0127	1	0	AA3524	1	1

Amphibian – Frog/Toad: Mexican White-lipped Frog (*Leptodactylus fragilis*)

Brief Description:
This species is rarely observed on roads but frequently calls from roadside ditches within its limited Texas distribution.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
321701	7	0
253001	1	0
32902	1	0

Amphibian – Frog/Toad: Crawfish Frog (*Lithobates areolatus*)

Brief Description:
During this species short breeding season they are frequently encountered on roads but after breeding they rarely move from their burrows

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
AA0240	6	1	AA0004	2	0	A18032	1	0
AA5066	6	5	AA0167	2	0	AA0002	1	0
52302	5	2	AA0309	2	0	AA0003	1	0
AA0518	5	1	AA5025	2	0	AA0005	1	0
AA5067	5	0	AA5055	2	0	AA0008	1	0
AA3708	4	0	AA5062	2	0	AA0096	1	0
AA0009	3	1	11801	1	0	AA0101	1	0
270701	2	2	253801	1	0	AA0195	1	0
294101	2	0	43501	1	0	AA0253	1	0
305101	2	0	64603	1	0	AA0325	1	0
34005	2	2	84005	1	0	AA0397	1	0
93104	2	2	9101	1	1	AA0483	1	0

Amphibian – Frog/Toad: Cajun Chorus Frog (*Pseudacris fouquettei*)

Brief Description:
This species commonly calls from roadside ditches but is rarely encountered on roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
AA0101	3	0	AA7153	2	0	54303	1	0
AA5025	3	0	107901	1	0	59703	1	0
FD0366	3	0	11802	1	0	AA0003	1	0
111201	2	0	12301	1	0	AA0004	1	0
271501	2	0	140203	1	0	AA0008	1	0
AA0167	2	0	244802	1	0	AA0122	1	0
AA0172	2	0	288001	1	0	AA0165	1	0
AA0227	2	0	320502	1	0	AA0174	1	0
AA0253	2	0	33601	1	0	AA0309	1	0
AA0325	2	0	33602	1	0	AA0316	1	0
AA2412	2	0	33603	1	0	AA0368	1	0
AA3650	2	0	34002	1	0	AA0433	1	0

Amphibian – Frog/Toad: Strecker's Chorus Frog (*Pseudacris streckeri*)

Brief Description:
This species commonly calls from roadside ditches but is rarely encountered on roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
AA0102	5	0	AA0445	2	0	57102	1	0
AA0081	4	0	AA2240	2	0	AA0033	1	0
AA1590	4	0	AA3028	2	0	AA0039	1	0
LO1898	4	0	AA3340	2	1	AA0063	1	0
AA0078	3	0	AA3820	2	0	AA0065	1	0
AA0983	3	0	AA5067	2	0	AA0082	1	0
21603	2	0	AA5070	2	0	AA0146	1	0
AA0080	2	0	AA9271	2	0	AA0154	1	0
AA0150	2	0	119901	1	0	AA0220	1	0
AA0159	2	0	14406	1	0	AA5068	1	1
AA0433	2	0	15005	1	0	AA5077	1	0
AA0442	2	0	18004	1	0	AA7711	1	1

Amphibian – Frog/Toad: Mexican Burrowing Toad (*Rhinophrynus dorsalis*)

Brief Description:
This species can be found on roads after heavy rains within its limited distribution in South Texas.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
321701	4	0
32902	4	1
110304	3	0
AA0364	2	0
32901	1	0
AA0124	1	0

Amphibian – Frog/Toad: Mexican Smilisca (*Smilisca baudinii*)

Brief Description:
This species commonly calls from roadside wetlands but is rarely encountered on roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
32710	2	0
68401	2	0
105703	1	0
180101	1	0
22007	1	0
3910	1	0
S00282	1	0

B2. Amphibians – Salamanders

Amphibian – Salamander: Southern Dusky Salamander (*Desmognathus auriculatus*)

Brief Description:
This species is not known to cross roads in Texas but could be found in the right of way at stream crossings.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
30405	1	0
AA0110	1	0

Amphibian – Salamander: Salado Salamander (*Eurycea chisholmensis*)

Brief Description:
This aquatic species does not cross roads but could be found in spring fed streams in road right of ways.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
none		

Amphibian – Salamander: Cascade Caverns Salamander (*Eurycea latitans*)

Brief Description:
This aquatic species does not cross roads but could be found in spring fed streams in road right of ways.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
LI1982	1	0

Amphibian – Salamander: San Marcos Salamander (*Eurycea nana*)

Brief Description:
This aquatic species does not cross roads but could be found in spring fed streams in road right of ways.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
B01175	1	0

Amphibian – Salamander: Georgetown Salamander (*Eurycea naufragia*)

Brief Description:
This aquatic species does not cross roads but could be found in spring fed streams in road right of ways.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
AA0961	7	0
AA0959	1	0

Amphibian – Salamander: Texas Salamander (*Eurycea neotenes*)

Brief Description:
This aquatic species does not cross roads but could be found in spring fed streams in road right of ways.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
7206	2	0
B00205	2	0
104202	1	0
AA0269	1	0
AA0572	1	0
LR4512	1	0
LR4801	1	0
LR4810	1	0

Amphibian – Salamander: Fern Bank Salamander (*Eurycea pterophila*)

Brief Description:
This aquatic species does not cross roads but could be found in spring fed streams in road right of ways.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
none		

Amphibian – Salamander: Texas Blind Salamander (*Eurycea rathbuni*)

Brief Description:
This species in strictly aquatic and found in aquifers. Road construction activities and pollutants from road runoff are its only potential dangers.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
B01175	1	0
LW0658	1	0

Amphibian – Salamander: Barton Springs Salamander (*Eurycea sosorum*)

Brief Description:
This aquatic species does not cross roads but could be found in spring fed streams in road right of ways.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
LC1193	4	0

Amphibian – Salamander: Jollyville Plateau Salamander (*Eurycea tonkawae*)

Brief Description:
This aquatic species does not cross roads but could be found in spring fed streams in road right of ways.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
LZ4693	2	0

Amphibian – Salamander: Comal Blind Salamander (*Eurycea tridentifera*)

Brief Description:
This species in strictly aquatic and found in aquifers. Road construction activities and pollutants from road runoff are its only potential dangers.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
none		

Amphibian – Salamander: Austin Blind Salamander (*Eurycea waterlooensis*)

Brief Description:
This species in strictly aquatic and found in aquifers. Road construction activities and pollutants from road runoff are its only potential dangers.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
LC1193	2	0

Amphibian – Salamander: Black Spotted Newt (Notophthalmus meridionalis)

Brief Description:
This species is semi-aquatic and it spends most of its life in and around ephemeral wetlands. These wetlands may occur in road right of ways but it does not cross roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
43305	7	0
AA3415	1	0
LD3558	1	0

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Amphibian – Salamander: Lesser Siren (*Siren intermedia*)

Brief Description:
These large aquatic salamanders are known to cross roads during flooding and use roadside ditches or wetlands that are in road right of ways.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
43305	2	0

B3. Reptiles – Lizards

Reptile – Lizard: Reticulated Gecko (*Coleonyx reticulatus*)

Brief Description:
This species is commonly encountered on cliffs and road cuts but rarely crosses roads within it limited distribution in West Texas.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
35805	15	0
95709	8	0
291301	6	0
95710	3	0

Reptile – Lizard: Reticulate Collared Lizard (*Crotaphytus reticulatus*)

Brief Description:
This species is frequently found basking on roads and right of ways.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
194203	1	0
241602	1	1
AA0102	1	0
AA0116	1	0
AA0133	1	0
AA0355	1	0
AA0446	1	0
AA1004	1	0
AA1020	1	0

Reptile – Lizard: Spot-tailed Earless Lizard (*Holbrookia lacerata*)

Brief Description:
This species prefers open habitats and are commonly seen on roads, both alive and dead.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
AA1203	27	14	228002	2	0	237501	1	0
AA1212	24	3	AA0103	2	0	242801	1	0
AA0209	12	2	AA0131	2	0	39603	1	0
AA0408	12	3	AA0246	2	0	55502	1	1
AA0331	7	0	AA0314	2	0	82602	1	0
AA0799	7	5	AA1473	2	0	86902	1	1
AA0078	6	0	AA2002	2	0	87601	1	0
AA1202	6	2	AA6130	2	1	AA0055	1	0
AA0002	5	0	15903	1	1	AA0093	1	1
AA0109	5	0	15905	1	0	AA0140	1	0
AA1810	5	3	20105	1	0	AA0195	1	1
164701	2	0	227801	1	0	AA0236	1	0

Reptile – Lizard: Keeled Earless Lizard (*Holbrookia propinqua*)

Brief Description:
This species prefers sandy habitat and does not seem to be commonly encountered on the hard surface of roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
LZ4953	8	0	LF1872	1	0
25504	3	0	LJ8387	1	0
AA0633	3	0	LT9295	1	0
FD4951	3	0	LW7295	1	0
32702	2	0	LW7430	1	0
18004	1	0			
33105	1	0			
3910	1	0			
AA0110	1	0			
AA0217	1	0			
FD2206	1	0			
FD2213	1	0			

Reptile – Lizard: Slender Glass Lizard (*Ophisaurus attenuatus*)

Brief Description:
This species is commonly encountered on roads through their grassland habitat and have high rates of mortality or roadways.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
FD2206	613	126	FD2377	3	0	AA0326	1	0
FD4951	165	116	AA0257	2	2	AA0715	1	0
61703	147	97	FD2345	2	0	AA0799	1	0
FD2205	32	25	122701	1	0	AA4140	1	1
FD2203	16	12	185203	1	1	AA4850	1	0
43305	7	7	38601	1	0	AA6335	1	0
AA0120	5	1	44705	1	0	B28945	1	0
FD2351	5	1	51706	1	1	FD0238	1	0
226303	4	4	54303	1	1	FD2329	1	0
FD2210	4	2	80403	1	1	FD2331	1	0
FD2330	3	0	AA0207	1	1	FD2332	1	0
FD2353	3	1	AA0227	1	1	LJ9402	1	1

Reptile – Lizard: Texas Horned Lizard (*Phrynosoma cornutum*)

Brief Description:
This iconic species is commonly encountered on roads where it seems to bask and forage. Their use of crypsis as a defense and their slow running speed make them susceptible to road mortality.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
AA0109	19	1	36001	5	0	AA0037	3	0
229702	14	1	AA5306	5	3	AA0151	3	0
128302	12	2	14007	4	4	AA0350	3	0
87101	11	3	269303	4	4	AA0406	3	2
86608	9	6	27603	4	0	AA0413	3	0
AA0209	9	1	AA0408	4	1	10603	2	0
AA0060	8	1	10502	3	2	10606	2	1
AA0438	8	0	128303	3	1	15904	2	0
115505	7	3	2103	3	1	186601	2	0
AA0002	7	0	242502	3	2	198101	2	0
AA0799	7	3	55606	3	0	2104	2	1
AA0600	6	2	AA0012	3	0	2105	2	0

Reptile – Lizard: Greater Short-horned Lizard (*Phrynosoma hernandesi*)

Brief Description:
This species is rarely encountered on roads in Texas due to its habitat preferences. It is only found above 5000' in several West Texas mountain ranges.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
41501	1	0
FD0082	1	0

Reptile – Lizard: Dunes Sagebrush Lizard (*Sceloporus arenicolus*)

Brief Description:
This species has been shown to avoid even small roads, so there is little risk of road mortality but roads fragment their habitat which contributes to population decline.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
118901	1	0
237101	1	0
514	1	0

B4. Reptiles – Snakes

Reptile – Snake: Scarlet Snake (*Cemophora coccinea*)

Brief Description:
This rare species is commonly encountered on roads in other parts of the USA indicating that the few Texas road records are due to its overall scarcity.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
35004	1	0
AA4094	1	0
FD2344	1	0
LT9410	1	0

Reptile – Snake: Black-striped Snake (*Coniophanes imperialis*)

Brief Description:
This species is restricted to a small area of South Texas where it seems to be common but not commonly seen on roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
3910	1	0
43302	1	1
FD2777	1	0
LL1338	1	0
LP7885	1	1

Reptile – Snake: Western Diamondback Rattlesnake (*Crotalus atrox*)

Brief Description:
This species is common across much of the western 2/3rds of Texas and also is one of the most commonly encountered snakes both live and dead on Texas roadways.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
225701	56	6	35802	19	11	AA0060	13	1
95709	56	7	35803	19	5	AA0209	13	4
291301	47	0	AA0101	19	11	128302	12	5
2105	41	9	AA0258	19	7	229702	12	0
10402	34	17	2106	18	7	87101	12	2
86608	31	9	43305	18	11	FD0006	12	4
51703	29	15	86607	18	4	222601	11	0
35801	27	18	2103	17	3	32901	11	8
35805	26	6	2107	17	3	48501	11	3
41503	26	5	AA0037	16	0	122701	10	6
95710	21	6	122704	15	7	143501	10	1
2102	20	10	269401	14	8	55605	10	4

Reptile – Snake: Timber Rattlesnake (*Crotalus horridus*)

Brief Description:
This large rattlesnake is uncommonly encountered in the eastern third of Texas. It is also frequently found dead on roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
123701	4	3	277803	2	1	140902	1	1
35201	4	3	53001	2	2	141201	1	0
AA3336	4	3	81302	2	0	141202	1	1
47507	3	2	AA0055	2	1	150702	1	1
58401	3	0	AA0346	2	0	160602	1	1
AA3424	3	3	AA3225	2	1	18601	1	1
12204	2	2	AA3420	2	0	195401	1	1
170601	2	2	109601	1	1	21112	1	1
170602	2	1	117901	1	1	21306	1	1
194701	2	2	13408	1	1	24402	1	1
208001	2	2	139901	1	0	249002	1	1
21204	2	1	140203	1	1	264101	1	0

Reptile – Snake: Prairie Rattlesnake (*Crotalus viridis*)

Brief Description:
Like other rattlesnakes, this species is also frequently found dead on roads in their prairie habitats.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
86608	26	6	35406	2	2	136701	1	1
87101	8	4	41503	2	1	137002	1	0
2103	6	2	55706	2	2	152002	1	0
35404	6	2	87405	2	1	16802	1	1
35602	6	4	AA0188	2	0	171805	1	1
AA0037	6	0	AA0485	2	2	188801	1	1
162601	4	2	10502	1	1	2003	1	0
216101	4	0	10505	1	0	2005	1	0
AA5302	3	1	10506	1	0	2006	1	1
10406	2	0	10603	1	0	2007	1	1
218401	2	0	10604	1	1	201102	1	0
237101	2	0	128302	1	0	226201	1	1

Reptile – Snake: Texas Indigo Snake (*Drymarchon melanurus*)

Brief Description:
This species is of South Texas is commonly found on roads, especially near rivers, creeks, or dry arroyos.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
AA0239	4	3	150101	1	0	2405	1	1
AA0609	3	1	170301	1	0	264901	1	1
FD2477	3	0	194101	1	0	269303	1	1
FD2988	3	0	201202	1	1	29908	1	1
3907	2	1	23502	1	1	32704	1	1
43301	2	2	23503	1	1	32705	1	1
AA0035	2	2	23505	1	1	32901	1	0
AA3081	2	2	23603	1	0	32904	1	0
FD2748	2	1	23703	1	0	37104	1	0
LD3558	2	0	237301	1	1	37506	1	0
122902	1	0	2402	1	1	3805	1	1
142601	1	0	2404	1	1	42108	1	1

Reptile – Snake: Speckled Racer (*Drymobius margaritiferus*)

Brief Description:
This species is restricted to a tiny area of South Texas where it can be encountered on a few roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
LD3558	7	0
142601	1	1

Reptile – Snake: Plains Hognose Snake (*Heterodon nasicus*)

Brief Description:
This species is commonly encountered on roads in the western half of Texas.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
AA0109	5	0	220201	1	0	87003	1	0
AA0131	4	0	29801	1	1	96702	1	1
AA0799	3	1	29802	1	1	AA0232	1	0
104102	2	0	3501	1	1	AA0242	1	0
55810	2	0	36001	1	1	AA0600	1	0
7702	2	0	41203	1	0	AA0615	1	0
AA0078	2	0	45401	1	0	AA0728	1	0
LQ7778	2	0	46104	1	1	AA0828	1	0
128004	1	0	55603	1	0	AA1685	1	1
137002	1	1	55811	1	0	AA2419	1	0
164402	1	1	6805	1	0	AA5011	1	0
201102	1	0	76101	1	0	AA5306	1	0

Reptile – Snake: Northern Cat-eyed Snake (*Leptodeira septentrionalis*)

Brief Description:
This species is restricted to the southern tip of Texas where it can be found on roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
66901	3	1
269303	1	1
43301	1	0
43305	1	1
AA1000	1	0
LD3558	1	0

Reptile – Snake: Brazos River Watersnake (*Nerodia harteri*)

Brief Description:
This Texas endemic is semi-aquatic and is rarely found away from the Brazos River. They rarely cross roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
8010	3	0
AA0546	2	0
36204	1	0
73601	1	0

Reptile – Snake: Concho Watersnake (*Nerodia paucimaculata*)

Brief Description:
This Texas endemic is semi-aquatic and is rarely found away from the Concho or Colorado River. They rarely cross roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
82803	4	0
AA0261	2	0
LR9930	1	0

Reptile – Snake: Louisiana Pinesnake (*Pituophis ruthveni*)

Brief Description:
This federally threatened species has only been seen less than 10 times in East Texas in the last 20 years. Unfortunately one of those sightings was a road mortality.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
AA1510	1	0
FD0236	1	0

Reptile – Snake: Western Massasauga (*Sistrurus tergeminus*)

Brief Description:
This prairie species is commonly encountered on roads, especially in north central Texas.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
36005	7	2	10506	1	0	29202	1	0
AA0209	7	1	10605	1	0	35405	1	1
10604	5	1	10607	1	0	35406	1	0
AA2166	4	2	1104	1	0	36002	1	1
2006	3	3	112702	1	0	36004	1	0
AA0109	3	0	13302	1	1	36101	1	0
10606	2	2	136701	1	0	36501	1	0
122701	2	1	137002	1	0	36502	1	0
332601	2	1	198101	1	0	43705	1	0
41202	2	1	226201	1	1	46002	1	0
55807	2	2	237802	1	0	513	1	1
AA0220	2	0	253302	1	0	65104	1	0

Reptile – Snake: Mexican Black-headed Snake (*Tantilla atriceps*)

Brief Description:
This species is very rare in Texas but has been found crossing roads in the South Texas brush country.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
51703	1	0

Reptile – Snake: Big Bend Blackhead Snake (*Tantilla cucullata*)

Brief Description:
This West Texas species can be found on roads near its preferred rocky habitats.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
41501	4	1
10402	2	2
128003	2	0
2107	2	0
2201	2	0
41502	2	0
55605	2	0
10403	1	0
16005	1	0
22906	1	0
35803	1	0
87101	1	0
95710	1	0

Reptile – Snake: Common Garter Snake (*Thamnophis sirtalis*)

Brief Description:
This species can be found crossing roads near prairies in the blackland prairie and coastal praires of Texas.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
AA0279	1	1
AA0907	1	0
C00415	1	0
LA3206	1	0
LB9436	1	0
LQ0147	1	0
LY9983	1	0

Reptile – Snake: Texas Lyre Snake (*Trimorphodon vilkinsonii*)

Brief Description:
This West Texas species can be found on roads near its preferred rocky habitats.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
95709	8	0
10408	2	1
35805	2	0
FD0007	2	0
255201	1	0
291301	1	0
35803	1	0
FD0006	1	0
FD0298	1	1
FD0443	1	0
FD0475	1	0

B5. Reptiles – Turtles

Reptile – Turtle: Smooth Softshell Turtle (*Apalone mutica*)

Brief Description:
This species is highly aquatic and rarely crosses roads. Unfortunately, like most aquatic turtles, females that are searching for nesting sites are most frequently hit on roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
29001	1	0
FD2846	1	0

Reptile – Turtle: Spiny Softshell Turtle (*Apalone spinifera*)

Brief Description:
This highly aquatic species is a habitat generalist and females can be found crossing roads in search of nest sites in the eastern 2/3rds of Texas.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
62601	14	0	B00950	3	0	AA0799	2	1
44104	11	0	B02905	3	0	AA1008	2	0
B01171	11	0	B23606	3	0	B00002	2	0
B00356	7	0	H01590	3	0	B00380	2	0
LJ0267	7	0	LE6540	3	0	C00174	2	0
11312	5	0	LI7496	3	0	C01716	2	0
902	5	0	105201	2	0	C03901	2	0
AA2076	4	0	106801	2	0	LI7255	2	0
B00846	4	0	AA0093	2	0	LI8616	2	0
LC0635	4	0	AA0136	2	0	LJ0896	2	0
LJ0641	4	0	AA0432	2	0	LJ1767	2	0
AA0413	3	0	AA0475	2	0	LN1396	2	0

Reptile – Turtle: Common Snapping Turtle (*Chelydra serpentina*)

Brief Description:
This turtle can be encountered crossing roads after heavy rains or when females are searching for nesting sites.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
AA0799	10	1	1513	2	0	10606	1	1
LJ0641	7	0	18001	2	2	11707	1	1
LC0635	6	0	9T8960	2	0	120003	1	1
LI9297	6	0	AA0161	2	0	12104	1	0
B01320	5	0	AA4166	2	1	12204	1	1
FD2199	4	0	B01260	2	0	129001	1	0
LN4826	4	0	LC6005	2	0	13610	1	1
54004	3	0	LK0043	2	0	13814	1	0
AA2076	3	0	LN6165	2	2	143301	1	1
LB6833	3	0	LP1249	2	0	145401	1	0
LK2969	3	0	TL0032	2	0	1501	1	0
11312	2	0	100602	1	1	156802	1	0

Reptile – Turtle: Texas Tortoise (*Gopherus berlandieri*)

Brief Description:
This terrestrial species ranges over a wide area with most individuals encountering roads in their lifetime. They are commonly found crossing roads in South Texas and are susceptible to road mortality.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
AA4538	21	0	AA0455	2	1	25504	1	1
AA0336	5	0	104201	1	0	32703	1	1
32901	3	0	120502	1	1	32804	1	0
43305	3	0	142501	1	1	32807	1	1
51709	3	1	179901	1	0	33102	1	1
122701	2	1	194203	1	0	3715	1	1
23604	2	0	194301	1	0	37506	1	1
309901	2	0	22007	1	0	3804	1	0
32904	2	1	2304	1	0	3805	1	0
51706	2	1	23505	1	0	38303	1	1
AA0021	2	0	237302	1	1	43306	1	0
AA0133	2	1	237303	1	1	51701	1	1

Reptile – Turtle: Cagle's Map Turtle (*Graptemys caglei*)

Brief Description:
This endemic turtle rarely leaves their riverine habitat and rarely cross roads. Like other turtles the females are most often encountered out of water when they search for nesting sites.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
15401	3	0
58401	3	0
LK4285	3	0
15403	2	0
265001	2	0
8805	2	0
84202	1	0
AA1005	1	0
LX9889	1	0
LY0218	1	0

Reptile – Turtle: Texas Map Turtle (*Graptemys versa*)

Brief Description:
This endemic turtle rarely leaves their riverine habitat and rarely cross roads. Like other turtles the females are most often encountered out of water when they search for nesting sites.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
26514	4	0	B02905	2	0	AA0011	1	0
26508	3	0	LB5712	2	0	AA0102	1	0
B02788	3	0	LB8176	2	0	AA0113	1	0
LC2678	3	0	LR9930	2	0	B00841	1	0
LU5198	3	0	102903	1	1	B01171	1	0
1513	2	0	175301	1	0	FD2199	1	0
210001	2	0	201004	1	0	LB7637	1	0
26510	2	0	2701	1	0	LJ4319	1	0
3505	2	0	29001	1	0	LN1509	1	0
AA0657	2	0	313601	1	0	LQ2792	1	0
AA0799	2	0	47401	1	0	AA0011	1	0
AA5010	2	0	61501	1	0	AA0102	1	0

Reptile – Turtle: Chihuahuan Mud Turtle (*Kinosternon hirtipes*)

Brief Description:
This species is restricted to one creek system in West Texas where it rarely encounters roads and road mortality is not an issue.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
95601	2	0

Reptile – Turtle: Alligator Snapping Turtle (*Macrochelys temminckii*)

Brief Description:
This large aquatic species rarely leaves the water. Like other turtles the females are most often encountered out of water when they search for nesting sites.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
FD2880	3	0
FD2889	2	0
54609	1	1
72504	1	0
AA2403	1	1
AA4817	1	0
FD3435	1	0
LP7252	1	0

Reptile – Turtle: Diamondback Terrapin (*Malaclemys terrapin*)

Brief Description:
This species rarely leaves its salt marsh habitat and is rarely impacted by roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
58501	5	0
LJ9402	3	0
LJ8942	2	0
AA0243	1	1

Reptile – Turtle: Rio Grande Cooter (*Pseudemys gorzugi*)

Brief Description:
This turtle rarely leaves their riverine habitat and rarely cross roads. Like other turtles the females are most often encountered out of water when they search for nesting sites.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
2301	6	0
AA0432	5	0
362101	1	1
AA0002	1	0
AA0117	1	0
AA0195	1	0
AA0524	1	1
LG6144	1	0
LG6159	1	0

Reptile – Turtle: Common Box Turtle (*Terrapene carolina*)

Brief Description:
This terrestrial species ranges over a wide area with most individuals encountering roads in their lifetime. They are commonly found crossing roads in eastern 2/3rds of Texas and are susceptible to road mortality.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
54004	6	2	C00550	2	0	11601	1	1
LI6651	5	0	C00823	2	0	123701	1	0
B00630	4	0	FD1678	2	0	145401	1	0
54005	3	1	FD2899	2	0	145502	1	0
LQ2431	3	0	LD5445	2	0	15302	1	1
188101	2	0	LL8904	2	0	181001	1	0
24401	2	1	LM7713	2	0	18603	1	0
AA0158	2	0	LY9506	2	0	19002	1	0
AA0346	2	0	101401	1	1	192001	1	0
AA0428	2	0	101703	1	0	20008	1	0
AA0632	2	0	109902	1	0	20303	1	1
AA0869	2	0	110601	1	0	204101	1	0

Reptile – Turtle: Ornate Box Turtle (*Terrapene ornata*)

Brief Description:
This terrestrial species ranges over a wide area with most individuals encountering roads in their lifetime. They are commonly found crossing roads in western 2/3rds of Texas and are susceptible to road mortality.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
128302	10	0	10403	2	0	53401	2	1
86608	8	3	201102	2	0	55803	2	0
2102	7	2	2105	2	0	86607	2	0
2008	5	3	269401	2	0	AA0199	2	1
10406	4	0	29303	2	0	AA0799	2	2
2103	4	0	29502	2	0	AA3420	2	0
AA0600	4	0	29801	2	1	LQ7778	2	0
AA0728	4	0	35202	2	2	10405	1	0
237101	3	0	40901	2	2	10502	1	1
332601	3	0	41501	2	0	10504	1	0
35803	3	0	46105	2	0	10604	1	1
LJ8108	3	0	48501	2	0	111501	1	0

Reptile – Turtle: Big Bend Slider (*Trachemys gaigeae*)

Brief Description:
This turtle rarely leaves their riverine habitat and rarely cross roads. Like other turtles the females are most often encountered out of water when they search for nesting sites.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead
FD0436	7	0
95709	1	0

Reptile – Turtle: Pond Slider (*Trachemys scripta*)

Brief Description:
This turtle is commonly seen crossing roads and commonly moves across land between water bodies throughout the state. They are frequently found live and dead on roads.

Control sections with the highest number of observations

CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead	CTRL_SEC _1	# Obs	# Dead
LI7496	44	1	FD4862	10	0	AA0120	7	0
LT1648	27	0	LC0017	10	0	AA0326	7	0
LP7252	24	0	LJ2310	10	0	LI8824	7	0
LJ0641	19	0	ZB1235	10	0	LI9917	7	0
AA0413	16	0	FD4951	9	2	LJ1795	7	0
LI8616	16	1	LE6540	9	0	LT5491	7	0
902	13	0	LJ8403	9	0	LZ4953	7	0
115701	12	1	54004	8	6	100602	6	6
62601	12	0	LC0635	8	0	AA0799	6	1
LF8782	12	1	52302	7	7	FD2353	6	0
B00356	11	0	54301	7	6	LI2649	6	0
C00595	10	0	9T8960	7	0	LJ1105	6	0