



Updated Geographic Distributions for Texas Amphibians

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Texas, USA, harbors a rich amphibian fauna, including 44 anuran species and 27 caudate species from a total of 15 families (Tipton et al. 2012; Dixon 2013). This diversity can likely be attributed to the large size of the state (67,805,143 ha) and the variety of habitats it contains. Elevation and average annual precipitation differ dramatically across Texas, ranging from 0–2,667 m and 113–1,597 mm, respectively (Ghebreyesus and Sharif 2021). As a result, myriad habitat types occur throughout the state such as coniferous forests, deciduous forests, shrublands, plains, and desert. Aquatic habitats are likewise variable and include large reservoirs, rivers, creeks, ponds, swamps, aquifers, and springs – all of which harbor amphibians.

Globally, amphibian populations are severely declining (Stuart et al. 2004) and extant populations are often impacted by multiple pressures including habitat loss (Gallant et al. 2007), fungal pathogens (Lips 2016; Stegen et al. 2017), climate change (Menéndez-Guerrero and Graham 2013), chemical pollution (Davidson et al. 2002; Zocche et al. 2013), and the introduction of non-native predators (Kats and Ferrer 2003). Texas contains several imperiled amphibian taxa including four federally endangered species, four federally threatened species, and an additional nine species that are not listed at the federal level, but are designated as either threatened or endangered by the Texas Parks and Wildlife Department. Federally endangered species include the Austin Blind Salamander (*Eurycea waterlooensis*), the Barton Springs Salamander (*Eurycea sosorum*), the Texas Blind Salamander (*Eurycea rathbuni*), and the Houston Toad (*Anaxyrus houstonensis*). Federally threatened species include the Georgetown Salamander (*Eurycea naufragia*), the Jollyville Plateau Salamander (*Eurycea tonkawae*), the Salado Salamander (*Eurycea chisholmensis*), and the San Marcos Salamander (*Eurycea nana*).

Distributional data for amphibian species can be useful for informing research, management, and conservation. For example, presence-only data can be used to develop habitat suitability models (Préau et al. 2018), historical distribution records allow for quantitative measures of range contraction

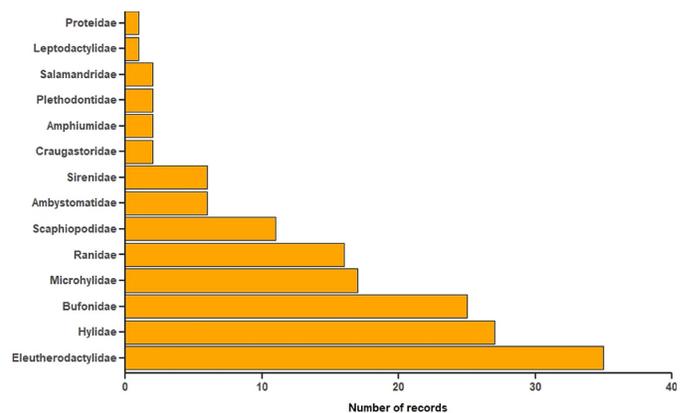


Figure 1. Frequency distribution of county records published for amphibian families in Texas from January 2010 to August of 2022 that were not included in Dixon (2013). Note that Dixon (2013) sporadically includes some records from 2010 to 2012 and those are not included in the figure above. Duplicate records published from 2010 to 2022 (e.g., Guadiana et al. 2020) were not included when making this figure either. Eleutherodactylidae was the anuran family with the greatest number of records (n = 35) whereas Ambystomatidae (n = 6) and Sirenidae (n = 6) were the caudate families with the greatest number of records.

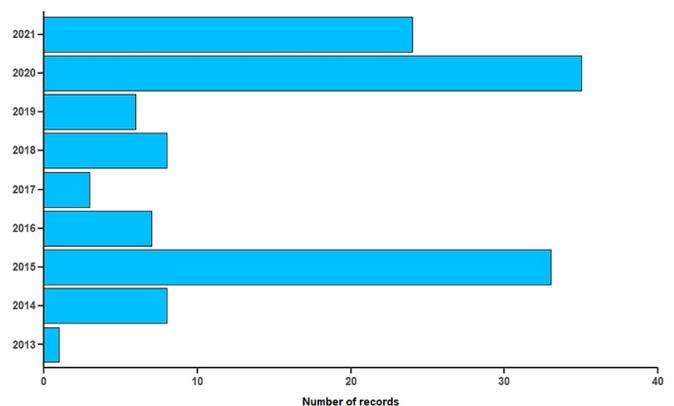


Figure 2. Frequency distribution of amphibian county records published for Texas by year from 2013 to 2021. Note that the annual number of amphibian records is highly variable and likely reflects the fluctuation of sampling effort on behalf of Texan herpetologists. The greatest number of records were published in 2020 (n = 35) and the least number of records in 2013 (n = 1).

(Haney et al. 2022), and contemporary distributional information provides a spatial baseline for future comparisons. Furthermore, contemporary distribution information can identify extant conservation units. Therefore, continuously summarizing the distribution of amphibian species at regional scales should be one of the many priorities of herpetological research.

Raun and Gehlbach (1972) were the first to provide a comprehensive review of reptile and amphibian distributions within Texas. Their review provided county-delineated distribution maps for every herpetile known to occur within the state at the time. However, given the large number of counties within the state ($n = 254$), records still did not exist for many species in occupied counties. The rapid and ongoing publication of county records since Raun and Gehlbach (1972) prompted publication of revised distribution maps. Dr. James Dixon assumed this responsibility with his synthesis “*Amphibians and Reptiles of Texas*” which provided up-to-date county-delineated distribution maps, dichotomous keys, taxonomic synopses, and an extensive bibliography (Dixon 1987). This detailed book was twice revised by Dixon over the course of 26 years (Dixon 2000, 2013); the distribution maps in the most recent synthesis (Dixon 2013) reveal gaps for many reptile and amphibian species. Unsurprisingly, a large number of amphibian county records have been published since Dixon (2013). Many such records are published individually (e.g., Rash and Davis 2020) but several papers have been published that each report a large number of records at once (e.g., Fielder et al. 2020; Pandelis et al. 2022). Tipton et al. (2012) published a field guide to Texas amphibians that includes a county-delineated distribution map for each species found in the state. However, those maps depict an assumed range for each taxon, with many counties indicated as occupied despite a lack of published evidence.

James Dixon unfortunately passed away in 2015 (Forstner et al. 2015; McAllister and Forstner 2015). In his absence, updated distribution maps have only been created for two reptile species (Bassett et al. 2021a; Bassett 2022) and a few amphibian species (Chastain 2022; Robinson et al. 2022). The current paper assimilates all distribution records for Texas amphibians that have been published since Dixon (2013) went into press and summarizes those records with updated maps.

I exhaustively searched all issues of the peer-reviewed journal *Herpetological Review* from 2010 (Volume 41, Issue 1) to 2022 (Volume 53, Issue 2) for published distribution records of reptiles and amphibians in Texas. Dixon (2013) stops consistently including published records beginning with the fourth issue of Volume 41, which is why 2010 was chosen as the starting point for review. Dixon (2013) includes some records published from 2010 to 2012 (e.g., Crump et al. 2010; Cordes and Walker 2011) but omits many (e.g.,

Miller 2010; Anderson et al. 2011). Although distribution maps include some of the records from this time period, I frequently noticed that the associated citations were lacking from Dixon’s (2013) bibliography (e.g., Cordes and Walker 2011). No records published from 2013 and onward are included in Dixon (2013).

Although most county records for herpetofauna in Texas have been reported in *Herpetological Review*, other peer-reviewed venues have been historically and recently used for such reports (e.g., Manning et al. 1995; Fierro-Cabo and Rentfro 2014). To locate distributional records published outside of *Herpetological Review*, I performed a literature search on 30 August 2022 using the online database *Web of Science*, using the following search terms: (amphibian OR frog OR toad OR salamander OR siren OR amphiuma OR Amphibia OR Anura OR Caudata) AND (distribution OR record OR occurrence OR locality) AND (Texas). Results were refined to papers published from 2010 to 2022 and then individually examined.

Databases containing distributional data for Texas herpetofauna such as *iNaturalist*, *VertNet*, *Global Biodiversity Information Facility*, and *The Texas Natural Diversity Database* represent supplemental sources that can be used to update species distribution maps. However, a systematic review of these databases was beyond the scope of this study. Such an investigation warrants individual attention given the nuances associated with such data (particularly the need to verify the identity and locality ascribed to questionable records).

When organizing results from the literature review, I followed current taxonomy as outlined in Crother (2017), which in several instances disagrees with the labeling for earlier maps provided by Dixon (2013). The specific taxonomic differences are as follows. The taxon referred to by Dixon (2013) as *Pseudacris feriarum* is herein referred to as *Pseudacris fouquettei* as per the findings of Lemmon et al. (2007, 2008). The taxon referred to by Dixon (2013) as *Bufo (Rhinella) marinus* is herein referred to as *Rhinella horribilis* as per the findings of Acevedo et al. (2016). The taxon referred to by Dixon (2013) as *Eurycea quadridigitata* is herein referred to as *Eurycea paludicola* as per the findings of Wray et al. (2017).

A total of 153 county records for 43 amphibian species from 14 families have been published since 2010 that supplement the maps provided by Dixon (2013) (Table 1). These records were found in a total of 87 published notes and papers. The number of records for anurans ($n = 134$) was much greater than the number of records for caudates ($n = 19$). The anuran family with the greatest number of records was Eleutherodactylidae ($n = 35$) (Fig. 1). The caudate families with the greatest number of records were Ambystomatidae ($n = 6$) and Sirenidae ($n = 6$) (Fig. 1). There were two instances of duplicate records being published. The Rio Grande Chirping Frog (*Eleutherodactylus cystignathoi-*

Table 1. Amphibian distribution records published from January 2010 to August 2022 for Texas, USA. Records are separated by order (Anura, then Caudata) with species and counties listed alphabetically therein. Species that are listed as threatened or endangered on the state or federal level are demarcated with a superscripted asterisk (*). County names with a superscripted dagger (†) indicate that a duplicate record was published.

Common Name	Scientific Name	County	Source
Anura (Frogs and Toads)			
Great Plains Toad	<i>Anaxyrus cognatus</i>	Andrews Scurry	Hibbitts and Adams 2015a Price and Dimler 2015
Chihuahuan Green Toad	<i>Anaxyrus debilis</i>	Andrews Collingsworth Scurry	Hibbitts and Adams 2015b Fielder et al. 2020 Price and Dimler 2015
Fowler's Toad	<i>Anaxyrus fowleri</i>	Camp Gregg	Pandelis et al. 2022 Pandelis et al. 2022
Houston Toad*	<i>Anaxyrus houstonensis</i> *	Brazos	MacLaren and Forstner 2017
Red-spotted Toad	<i>Anaxyrus punctatus</i>	Collingsworth Scurry	Fielder et al. 2020 Price and Dimler 2015
Texas Toad	<i>Anaxyrus speciosus</i>	Borden Ector Montgomery Wilson	Price and Dimler 2015 Hibbitts and Adams 2015c MacLaren et al. 2018 Bassett and Forstner 2021
Woodhouse's Toad	<i>Anaxyrus woodhousii</i>	Falls Madison	Pandelis et al. 2022 Hornung 2015a
Barking Frog	<i>Craugastor augusti</i>	Brewster Culberson	Graham et al. 2015 Pandelis et al. 2022
Rio Grande Chirping Frog	<i>Eleutherodactylus cystignathoides</i>	Aransas Bandera Bastrop Bell Caldwell Calhoun Collin Colorado Comal DeWitt Duval Fort Bend Goliad† Guadalupe Hays Jim Wells Kendall Kenedy Kleberg Live Oak Matagorda Robertson Rockwall Starr Travis Victoria Waller Webb Willacy	Ruppert and Davis 2019 Mock et al. 2016 Jackson et al. 2012 Magno-Naoe et al. 2015 Lee et al. 2016 Guadiana et al. 2020 McDaniels 2020a Farr and Forstner 2015 Lee 2014 Davis 2021 Cox et al. 2012 Hickel et al. 2015 Cox et al. 2012; Guadiana et al. 2020 Harvey et al. 2014 Magno-Naoe et al. 2015 Cox et al. 2012 Swanson et al. 2016 Guadiana et al. 2020 Cox et al. 2012 Cox et al. 2012 Swanson and Swanson 2017 MacLaren et al. 2015 Bassett et al. 2022 Guadiana et al. 2020 Powell 2014 Davis 2021 Bassett and Forstner 2020a Eversole and Brenk 2021 Guadiana et al. 2020
Cliff Chirping Frog	<i>Eleutherodactylus marnockii</i>	Crockett Presidio	Price and Dimler 2015 Owen et al. 2014
Greenhouse Frog	<i>Eleutherodactylus planirostris</i>	Cameron Harris Nueces Victoria	Guadiana et al. 2020 Simpson et al. 2019 Davis 2021 Davis 2021

Eastern Narrow-mouthed Toad	<i>Gastrophryne carolinensis</i>	DeWitt Kleberg San Patricio	Davis 2021 Walker 2019 Mullaney et al. 2021
Western Narrow-mouthed Toad	<i>Gastrophryne olivacea</i>	Blanco Borden Collingsworth Ellis Foard Hemphill Knox Lipscomb Midland† Rockwall Scurry Sterling Upton Wheeler	Robinson et al. 2014 Price and Dimler 2015 Fielder et al. 2020 Pandelis et al. 2022 Pandelis et al. 2022 Fielder et al. 2020 Pandelis et al. 2022 Fielder et al. 2020 Price and Dimler 2015; Taylor and Graham 2015 Hibbitts and Adams 2015d Price and Dimler 2015 Price and Dimler 2015 Bohannon et al. 2018 Fielder et al. 2020
Cope's Gray Treefrog	<i>Hyla chrysoscelis</i>	Camp Edwards Gregg Medina	Baxter-Bray et al. 2021 Guadiana et al. 2020 Pandelis et al. 2022 Adams 2016
Green Treefrog	<i>Hyla cinerea</i>	Bell Camp Collin Grayson Hill Rockwall Upshur Webb	Troy 2020 Baxter-Bray et al. 2021 McDaniels 2020b Pandelis et al. 2022 McClure 2022 Bassett et al. 2020a Pandelis et al. 2022 Eversole 2022
Squirrel Treefrog	<i>Hyla squirella</i>	Bee Goliad Refugio Willacy	Davis 2021 Davis 2021 Davis 2021 Adams et al. 2016
Gray Treefrog	<i>Hyla versicolor</i>	Gregg	Pandelis et al. 2022
Gulf Coast Toad	<i>Incilius nebulifer</i>	Collin Erath Hamilton Jim Hogg Palo Pinto Rockwall Schleicher	McDaniels 2020c Owen and Hamilton 2015 Bassett and Forstner 2020b Oyervides et al. 2015 Jenkerson et al. 2017 Hibbitts and Adams 2015e Pandelis et al. 2022
Mexican White-lipped Frog*	<i>Leptodactylus fragilis</i> *	Zapata	Adams et al. 2016
Crawfish Frog	<i>Lithobates areolatus</i>	Delta Goliad	Roelke and Streicher 2014 Davis 2021
Rio Grande Leopard Frog	<i>Lithobates berlandieri</i>	La Salle Wilson	Guadiana et al. 2020 Pandelis et al. 2022
Plains Leopard Frog	<i>Lithobates blairi</i>	Jack	Pandelis et al. 2022
American Bullfrog	<i>Lithobates catesbeianus</i>	Bee Blanco Midland Presidio Zapata	Guadiana et al. 2020 Lee and Swanson 2018 Price and Dimler 2015 Giovanetto and Baeza-Tarin 2020 McClure and Falick 2018
Green Frog	<i>Lithobates clamitans</i>	Camp	Baxter-Bray et al. 2021
Pickrel Frog	<i>Lithobates palustris</i>	Camp	Baxter-Bray et al. 2021
Southern Leopard Frog	<i>Lithobates sphenoccephalus</i>	Kleberg Refugio Rockwall Williamson	Duran and Hall 2013 Rash and Davis 2020 Bassett et al. 2020b Marshall et al. 2018

Spotted Chorus Frog	<i>Pseudacris clarkii</i>	Goliad Scurry Wheeler Willacy	Davis 2021 Price and Dimler 2015 Fielder et al. 2020 Guadiana et al. 2020
Cajun Chorus Frog	<i>Pseudacris fouquettei</i>	Camp Waller	Baxter-Bray et al. 2021 MacLaren and Forstner 2018
Strecker's Chorus Frog	<i>Pseudacris streckeri</i>	Guadalupe Kendall Stephens	Bassett et al. 2021b Drukker et al. 2021 Roelke et al. 2014
Mesoamerican Cane Toad	<i>Rhinella horribilis</i>	Brooks Willacy	Guadiana et al. 2020 Oyervides 2016
Couch's Spadefoot	<i>Scaphiopus couchii</i>	Borden Collingsworth Scurry	Price and Dimler 2015 Fielder et al. 2020 Price and Dimler 2015
Hurter's Spadefoot	<i>Scaphiopus hurterii</i>	DeWitt Guadalupe Victoria	Pandelis et al. 2022 Curtis et al. 2015 Pandelis et al. 2022
Mexican Treefrog*	<i>Smilisca baudinii</i> *	Willacy	Guadiana et al. 2020
Plains Spadefoot	<i>Spea bombifrons</i>	Brewster Foard Hall Lipscomb Wheeler	Graham and Kelehear 2014 Bowers 2021 Manning et al. 2015 Fielder et al. 2020 Fielder et al. 2020
Caudata (Salamanders)			
Western Tiger Salamander	<i>Ambystoma mavortium</i>	Borden Nolan	Price and Dimler 2015 Crump and Bennett 2020
Mole Salamander	<i>Ambystoma talpoideum</i>	Bowie Montgomery	Huse 2020 Farr 2021
Eastern Tiger Salamander	<i>Ambystoma tigrinum</i>	Burleson Upshur	MacLaren and Forstner 2019 Pandelis et al. 2021
Three-toed Amphiuma	<i>Amphiuma tridactylum</i>	Camp Trinity	Baxter-Bray et al. 2021 Schalk et al. 2021
Southeastern Dwarf Salamander	<i>Eurycea paludicola</i>	Grimes	Hibbitts and Adams 2015f
Barton Springs Salamander*	<i>Eurycea sosorum</i> *	Hays	Devitt and Nissen 2018
Gulf Coast Waterdog	<i>Necturus beyeri</i>	Liberty	Hollanders 2012
Black-spotted Newt*	<i>Notophthalmus meridionalis</i> *	Calhoun Live Oak	Robinson et al. 2022 Robinson et al. 2020
Lesser Siren*	<i>Siren intermedia</i> *	Bastrop Kinney Limestone Live Oak McMullen Williamson	Bohannon et al. 2022 Davis et al. 2019a Crump et al. 2018 Davis et al. 2019b Miller 2010 Hornung 2015b

des) was reported from Goliad County by Cox et al. (2012) and then later reported by Guadiana et al. (2020) from the same county. Two records exist for the Western Narrow-mouthed Toad (*Gastrophryne olivacea*) from Midland County in Volume 46, Issue 4 of *Herpetological Review* (Price and Dimler 2015; Taylor and Graham 2015). The *Web of Science* literature search revealed two county records supplemental to the search of *Herpetological Review* (Devitt and Nissen 2018; Robinson et al. 2022). The number of amphibian county records published each year from 2013 to 2021 varied widely, with the greatest number of records being reported in 2020 (n = 35) and the smallest number

of records being reported in 2013 (n = 1). County delineated distribution maps were made for all amphibian species occurring in Texas (Figs. 3–73), many of which still show conspicuous gaps (e.g., Fig. 18).

The conspicuous gaps that exist in the presented distribution maps suggest that further work is needed to completely document the true distribution of various amphibian species in Texas. Continued sampling efforts should not only be focused on gaps, which are unlikely to represent true hiatuses, but along the periphery of a species' known distribution as well. For example, the known distribution of the Barking Frog (*Craugastor augusti*) was recently extended westward by

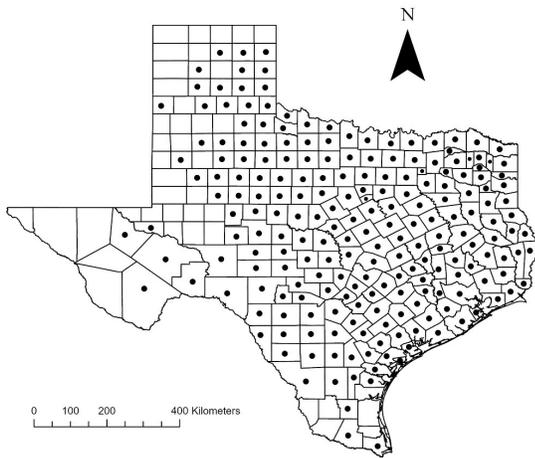


Figure 3. County delineated map of Texas illustrating the known distribution of Blanchard's Cricket Frog (*Acris blanchardi*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

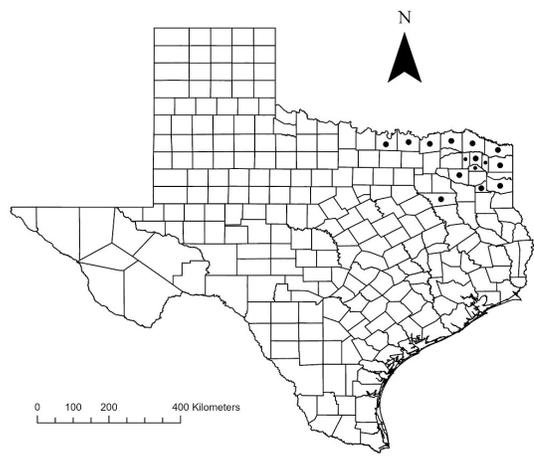


Figure 4. County delineated map of Texas illustrating the known distribution of the American Toad (*Anaxyrus americanus*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

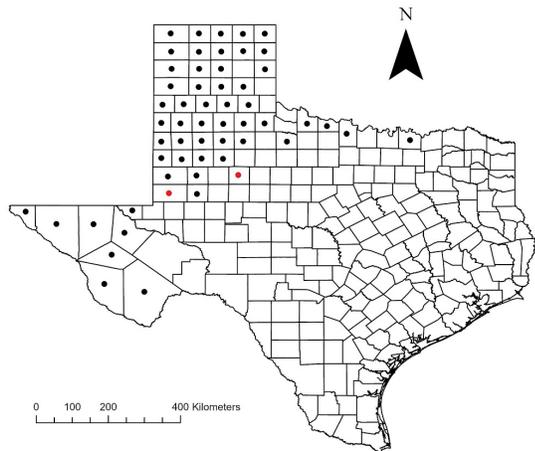


Figure 5. County delineated map of Texas illustrating the known distribution of the Great Plains Toad (*Anaxyrus cognatus*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

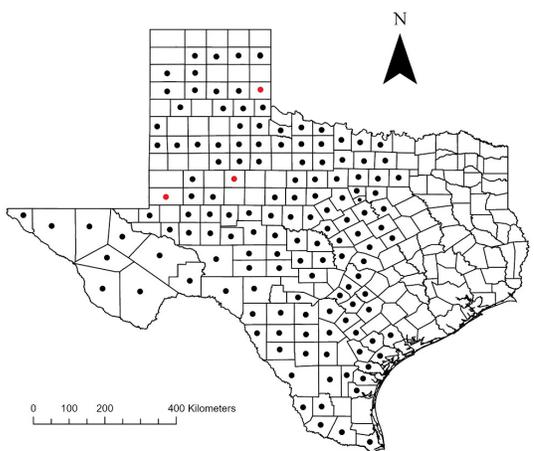


Figure 6. County delineated map of Texas illustrating the known distribution of the Chihuahuan Green Toad (*Anaxyrus debilis*). Black dots indicate occupied counties according to Dixon (2013). Three county records have been published since Dixon (2013), which are demarcated with red dots.

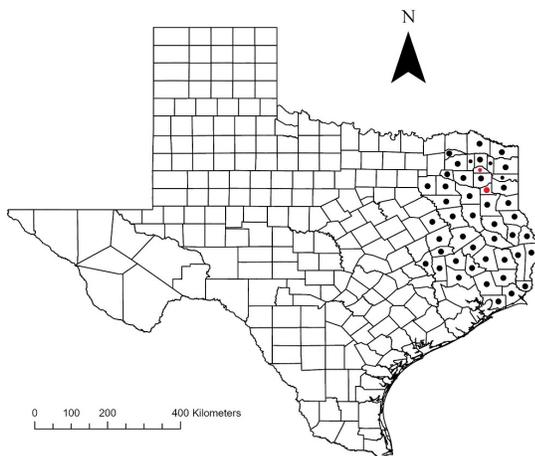


Figure 7. County delineated map of Texas illustrating the known distribution of Fowler's Toad (*Anaxyrus fowleri*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

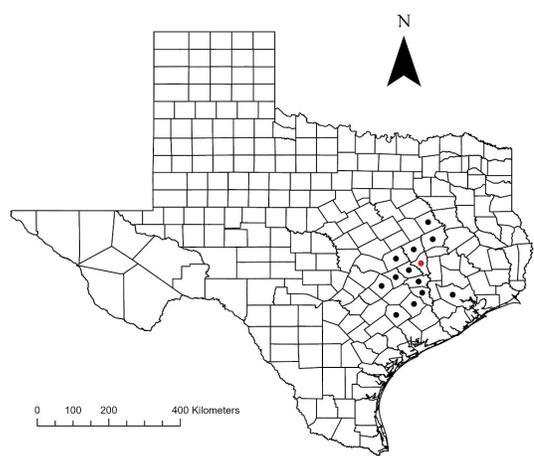


Figure 8. County delineated map of Texas illustrating the known distribution of the Houston Toad (*Anaxyrus houstonensis*). Black dots indicate occupied counties according to Dixon (2013). One county record has been published since Dixon (2013), which is demarcated with a red dot.

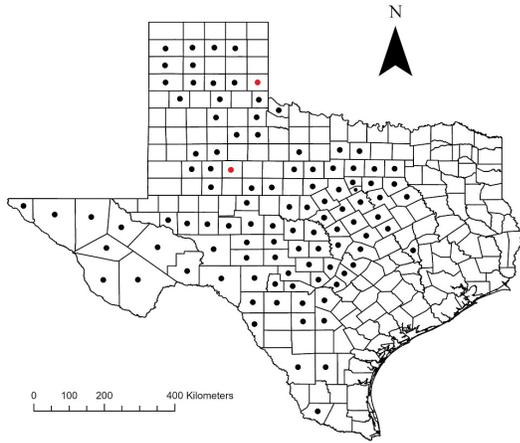


Figure 9. County delineated map of Texas illustrating the known distribution of the Red-spotted Toad (*Anaxyrus punctatus*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

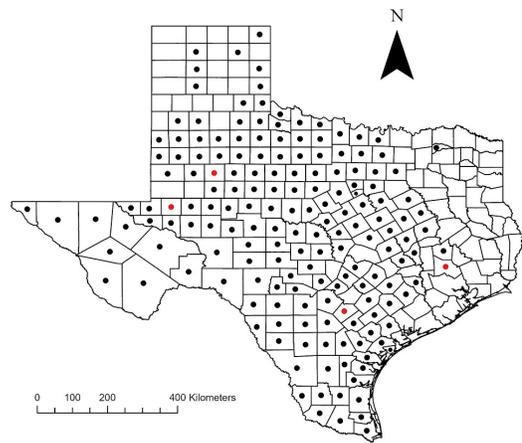


Figure 10. County delineated map of Texas illustrating the known distribution of the Texas Toad (*Anaxyrus speciosus*). Black dots indicate occupied counties according to Dixon (2013). Four county records have been published since Dixon (2013), which are demarcated with red dots.

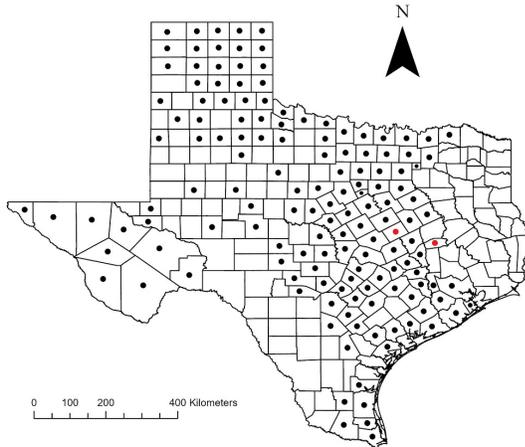


Figure 11. County delineated map of Texas illustrating the known distribution of Woodhouse's Toad (*Anaxyrus woodhousii*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

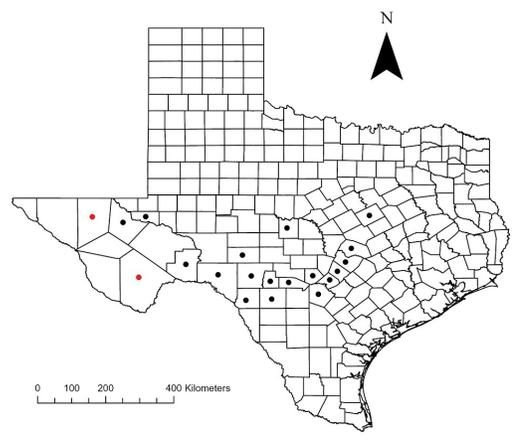


Figure 12. County delineated map of Texas illustrating the known distribution of the Barking Frog (*Craugastor augusti*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

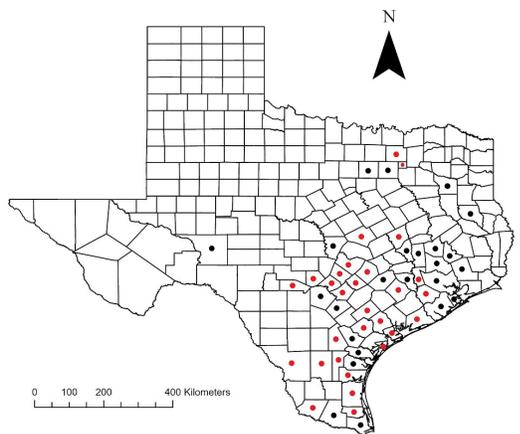


Figure 13. County delineated map of Texas illustrating the known distribution of the Rio Grande Chirping Frog (*Eleutherodactylus cystignathoides*). Black dots indicate occupied counties according to Dixon (2013). Twenty-nine county records have been published since Dixon (2013), which are demarcated with red dots.

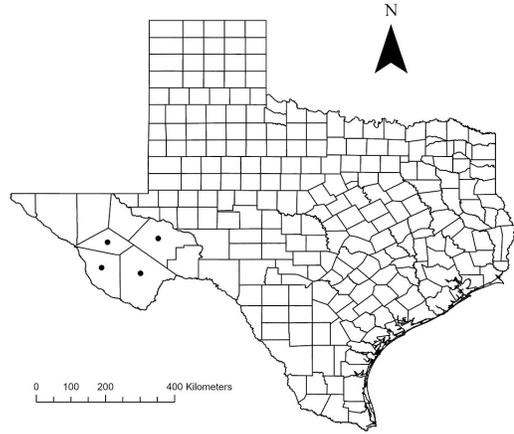


Figure 14. County delineated map of Texas illustrating the known distribution of the Spotted Chirping Frog (*Eleutherodactylus guttillatus*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

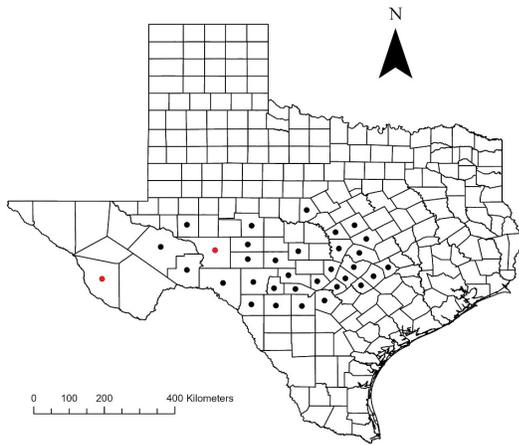


Figure 15. County delineated map of Texas illustrating the known distribution of the Cliff Chirping Frog (*Eleutherodactylus marnockii*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

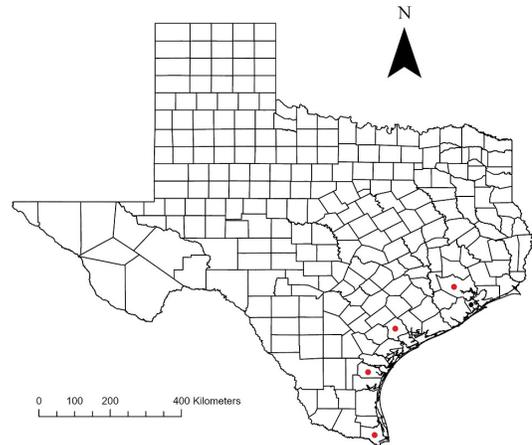


Figure 16. County delineated map of Texas illustrating the known distribution of the Greenhouse Frog (*Eleutherodactylus planirostris*). Black dots indicate occupied counties according to Dixon (2013). Four county records have been published since Dixon (2013), which are demarcated with red dots.

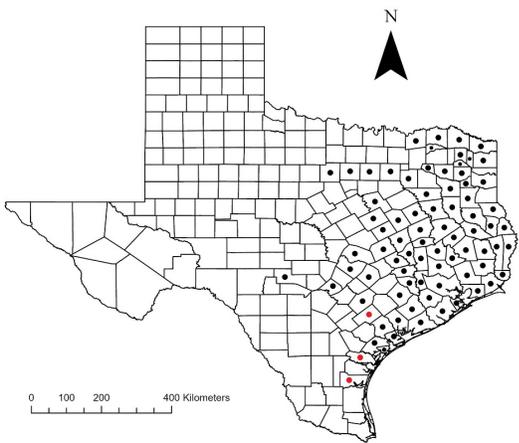


Figure 17. County delineated map of Texas illustrating the known distribution of the Eastern Narrow-mouthed Toad (*Gastrophryne carolinensis*). Black dots indicate occupied counties according to Dixon (2013). Three county records have been published since Dixon (2013), which are demarcated with red dots.

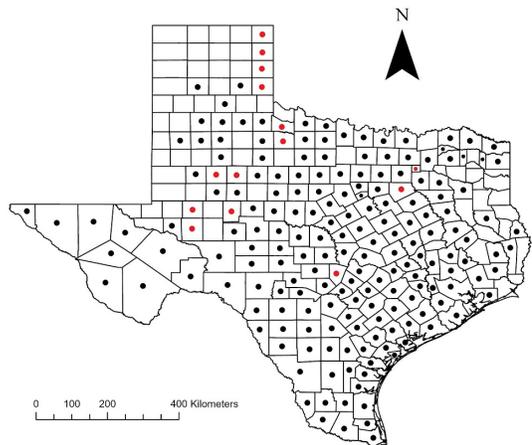


Figure 18. County delineated map of Texas illustrating the known distribution of the Western Narrow-mouthed Toad (*Gastrophryne olivacea*). Black dots indicate occupied counties according to Dixon (2013). Fourteen county records have been published since Dixon (2013), which are demarcated with red dots.

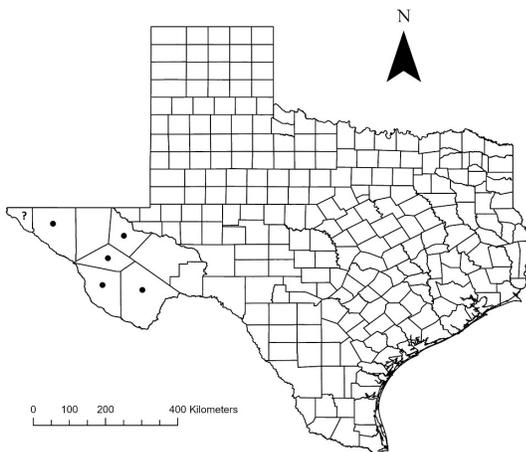


Figure 19. County delineated map of Texas illustrating the known distribution of the Canyon Treefrog (*Hyla arenicolor*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013). A question mark indicates El Paso County, which may have become the type locality for *H. arenicolor* by error (Dixon 2013).

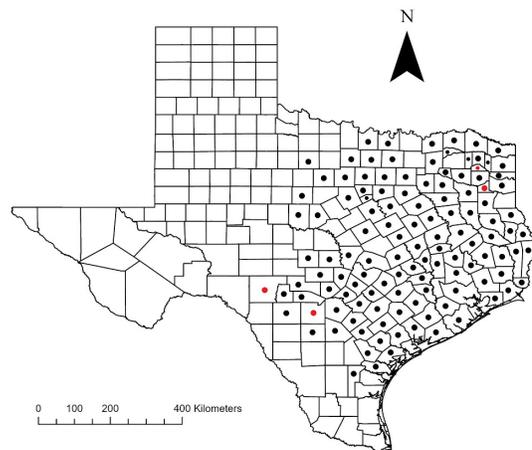


Figure 20. County delineated map of Texas illustrating the known distribution of Cope's Gray Treefrog (*Hyla chrysoscelis*). Black dots indicate occupied counties according to Dixon (2013) but said records do not distinguish between *H. chrysoscelis* and the congeneric *H. versicolor*. Dixon (2013) provided "a composite distribution of both species" due to their identical appearance. Four county records (verified as *H. chrysoscelis* and not *H. versicolor*) have been published since Dixon (2013), which are demarcated with red dots.

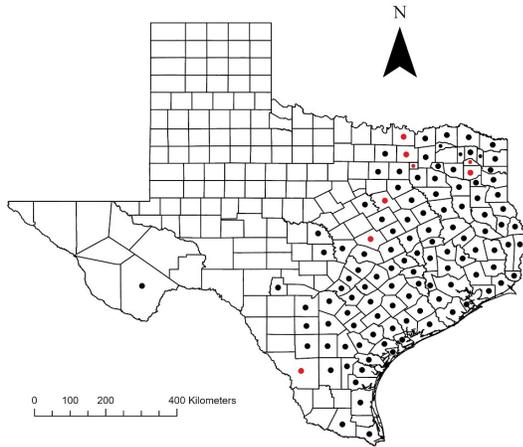


Figure 21. County delineated map of Texas illustrating the known distribution of the Green Treefrog (*Hyla cinerea*). Black dots indicate occupied counties according to Dixon (2013). Eight county records have been published since Dixon (2013), which are demarcated with red dots.

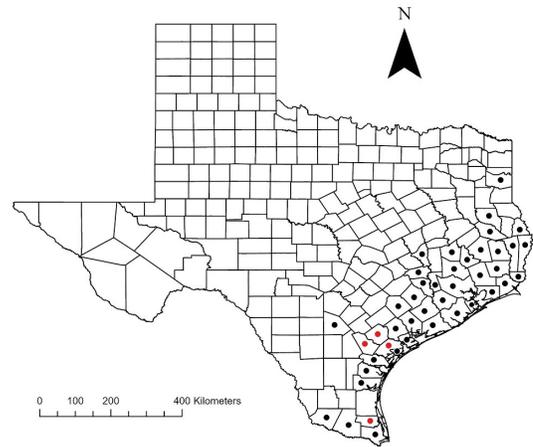


Figure 22. County delineated map of Texas illustrating the known distribution of the Squirrel Treefrog (*Hyla squirella*). Black dots indicate occupied counties according to Dixon (2013). Four county records have been published since Dixon (2013), which are demarcated with red dots.

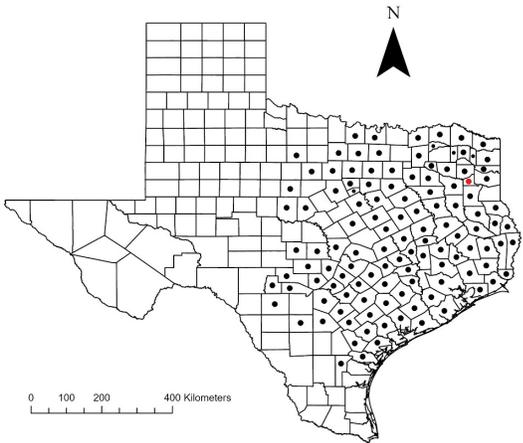


Figure 23. County delineated map of Texas illustrating the known distribution of the Gray Treefrog (*Hyla versicolor*). Black dots indicate occupied counties according to Dixon (2013) but these records do not distinguish between *H. versicolor* and the congeneric *H. chrysoscelis*. Dixon (2013) provided “a composite distribution of both species” due to their identical appearance. One county record (verified as *H. versicolor* and not *H. chrysoscelis*) has been published since Dixon (2013), which is demarcated with a red dot.

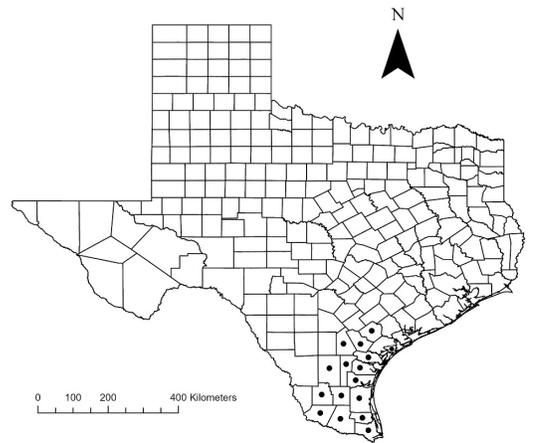


Figure 24. County delineated map of Texas illustrating the known distribution of the Sheep Frog (*Hypopachus variolosus*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

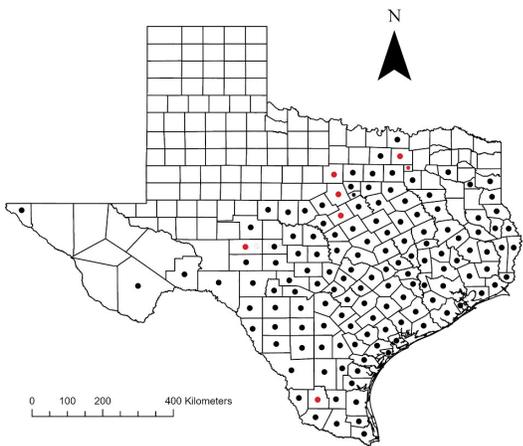


Figure 25. County delineated map of Texas illustrating the known distribution of the Gulf Coast Toad (*Incilius nebulifer*). Black dots indicate occupied counties according to Dixon (2013). Seven county records have been published since Dixon (2013), which are demarcated with red dots.

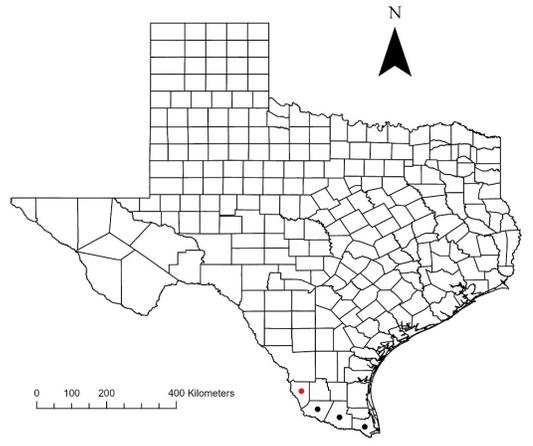


Figure 26. County delineated map of Texas illustrating the known distribution of the Mexican White-lipped Frog (*Leptodactylus fragilis*). Black dots indicate occupied counties according to Dixon (2013). One county record has been published since Dixon (2013), which is demarcated with a red dot.

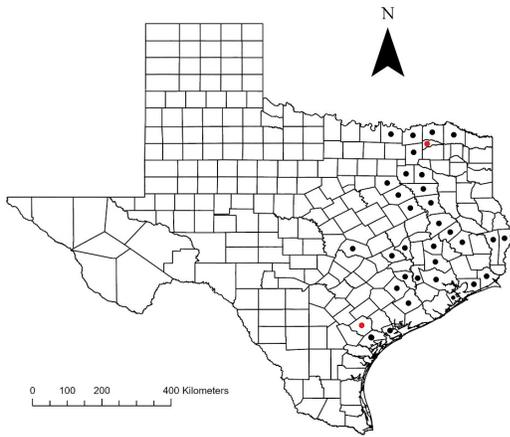


Figure 27. County delineated map of Texas illustrating the known distribution of the Crawfish Frog (*Lithobates areolatus*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

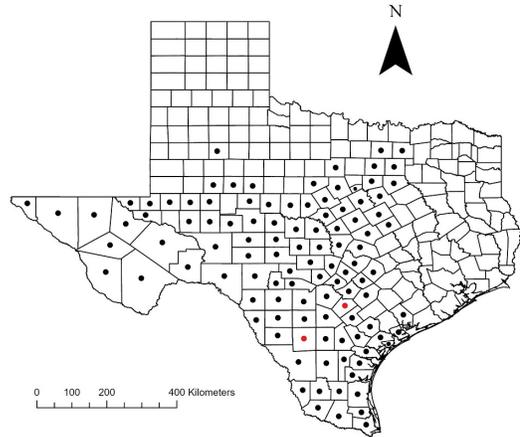


Figure 28. County delineated map of Texas illustrating the known distribution of the Rio Grande Leopard Frog (*Lithobates berlandieri*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

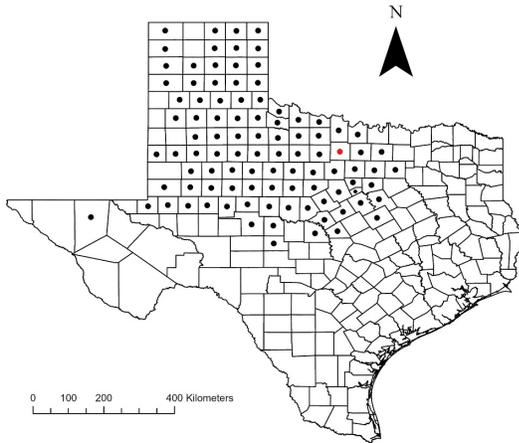


Figure 29. County delineated map of Texas illustrating the known distribution of the Plains Leopard Frog (*Lithobates blairi*). Black dots indicate occupied counties according to Dixon (2013). One county record has been published since Dixon (2013), which is demarcated with a red dot.

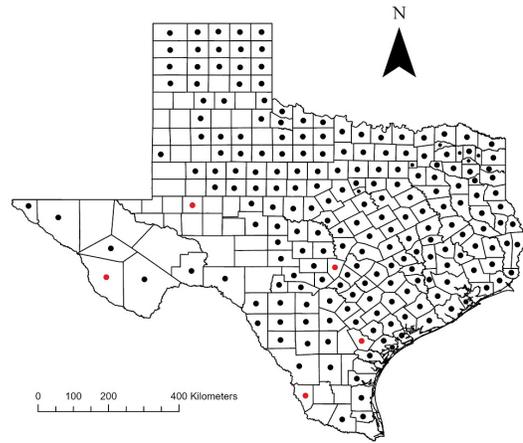


Figure 30. County delineated map of Texas illustrating the known distribution of the American Bullfrog (*Lithobates catesbeianus*). Black dots indicate occupied counties according to Dixon (2013). Five county records have been published since Dixon (2013), which are demarcated with red dots.

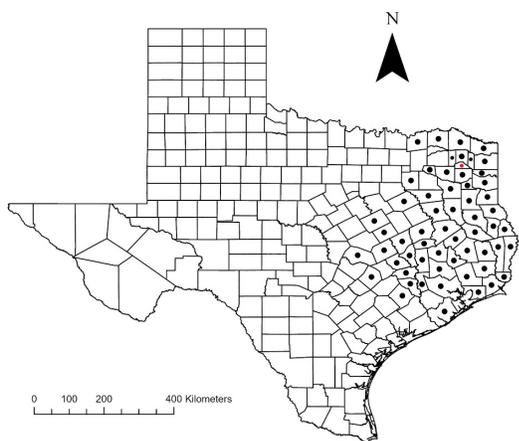


Figure 31. County delineated map of Texas illustrating the known distribution of the Green Frog (*Lithobates clamitans*). Black dots indicate occupied counties according to Dixon (2013). One county record has been published since Dixon (2013), which is demarcated with a red dot.

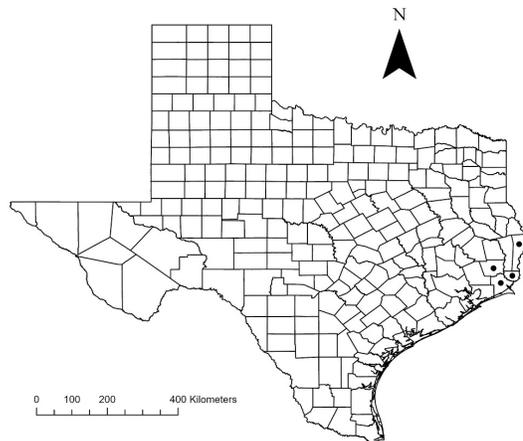


Figure 32. County delineated map of Texas illustrating the known distribution of the Pig Frog (*Lithobates gryllus*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

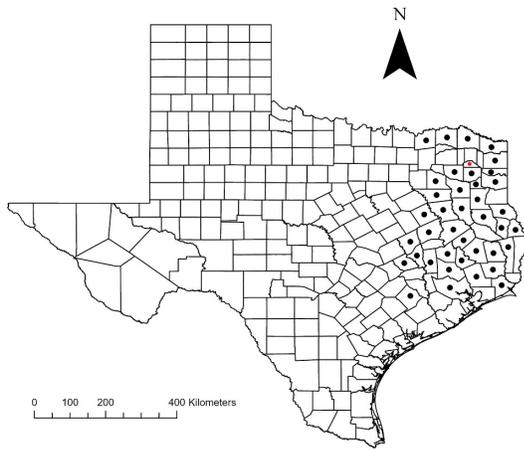


Figure 33. County delineated map of Texas illustrating the known distribution of the Pickerel Frog (*Lithobates palustris*). Black dots indicate occupied counties according to Dixon (2013). One county record has been published since Dixon (2013), which is demarcated with a red dot.

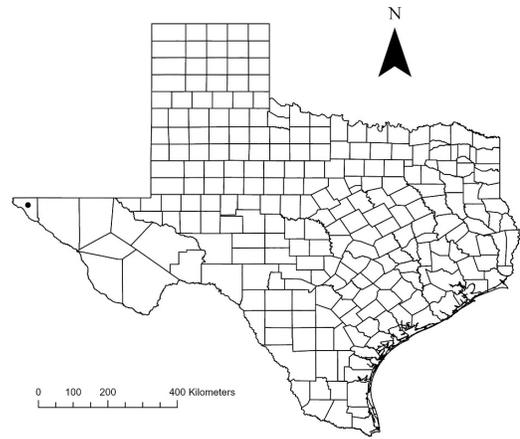


Figure 34. County delineated map of Texas illustrating the known distribution of the Northern Leopard Frog (*Lithobates pipiens*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

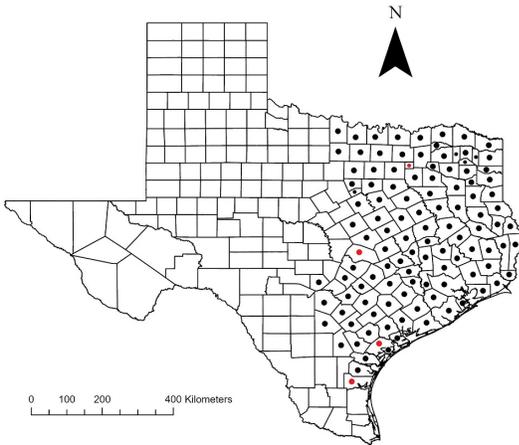


Figure 35. County delineated map of Texas illustrating the known distribution of the Southern Leopard Frog (*Lithobates sphenoccephalus*). Black dots indicate occupied counties according to Dixon (2013). Four county records have been published since Dixon (2013), which are demarcated with red dots.

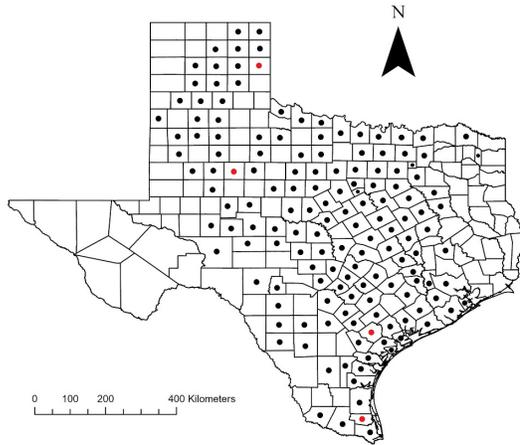


Figure 36. County delineated map of Texas illustrating the known distribution of the Spotted Chorus Frog (*Pseudacris clarkii*). Black dots indicate occupied counties according to Dixon (2013). Four county records have been published since Dixon (2013), which are demarcated with red dots.

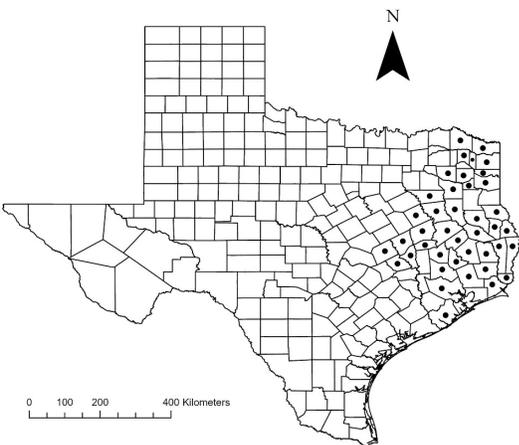


Figure 37. County delineated map of Texas illustrating the known distribution of the Spring Peeper (*Pseudacris crucifer*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

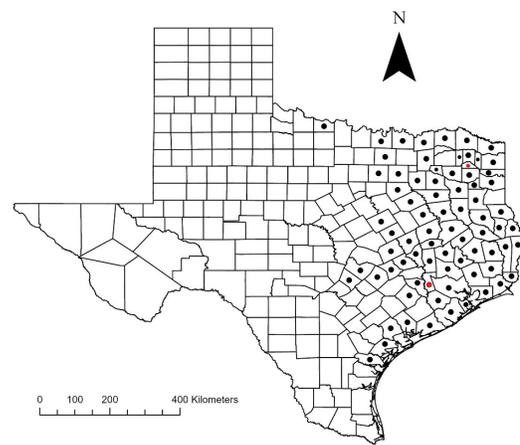


Figure 38. County delineated map of Texas illustrating the known distribution of the Cajun Chorus Frog (*Pseudacris fouquettei*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

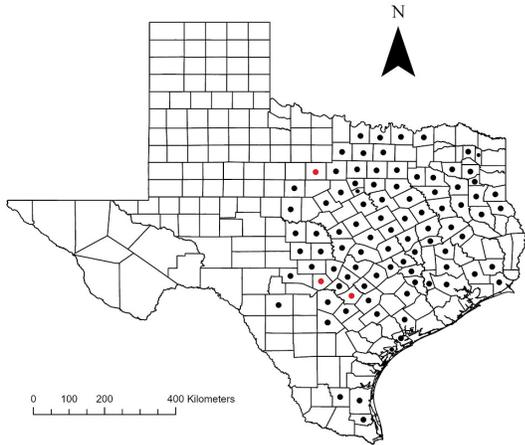


Figure 39. County delineated map of Texas illustrating the known distribution of Strecker’s Chorus Frog (*Pseudacris streckeri*). Black dots indicate occupied counties according to Dixon (2013). Three county records have been published since Dixon (2013), which are demarcated with red dots.

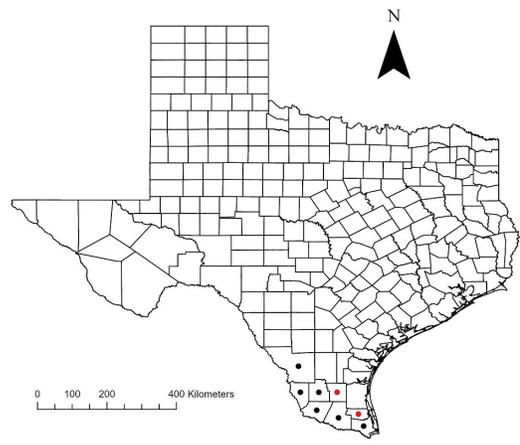


Figure 40. County delineated map of Texas illustrating the known distribution of the Mesoamerican Cane Toad (*Rhinella horribilis*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

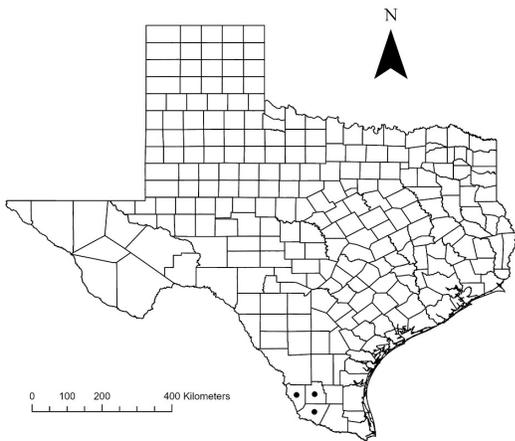


Figure 41. County delineated map of Texas illustrating the known distribution of the Burrowing Toad (*Rhinophrynus dorsalis*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

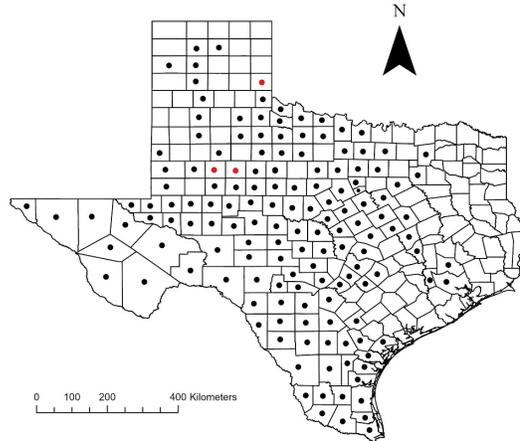


Figure 42. County delineated map of Texas illustrating the known distribution of Couch’s Spadefoot (*Scaphiopus couchii*). Black dots indicate occupied counties according to Dixon (2013). Three county records have been published since Dixon (2013), which are demarcated with red dots.

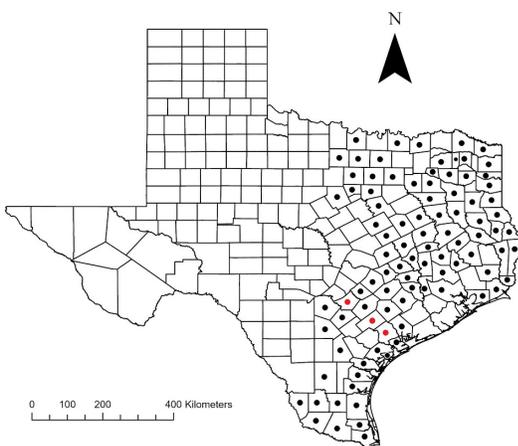


Figure 43. County delineated map of Texas illustrating the known distribution of Hurter’s Spadefoot (*Scaphiopus hurterii*). Black dots indicate occupied counties according to Dixon (2013). Three county records have been published since Dixon (2013), which are demarcated with red dots.

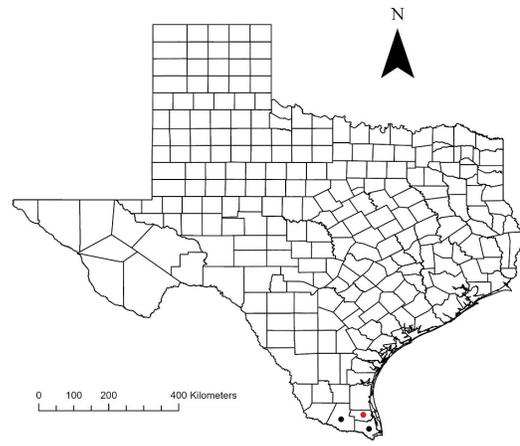


Figure 44. County delineated map of Texas illustrating the known distribution of the Mexican Treefrog (*Smilisca baudinii*). Black dots indicate occupied counties according to Dixon (2013). One county record has been published since Dixon (2013), which is demarcated with a red dot.

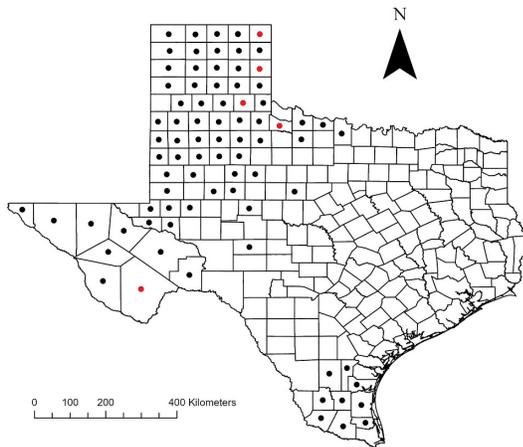


Figure 45. County delineated map of Texas illustrating the known distribution of the Plains Spadefoot (*Spea bombifrons*). Black dots indicate occupied counties according to Dixon (2013). Five county records have been published since Dixon (2013), which are demarcated with red dots.

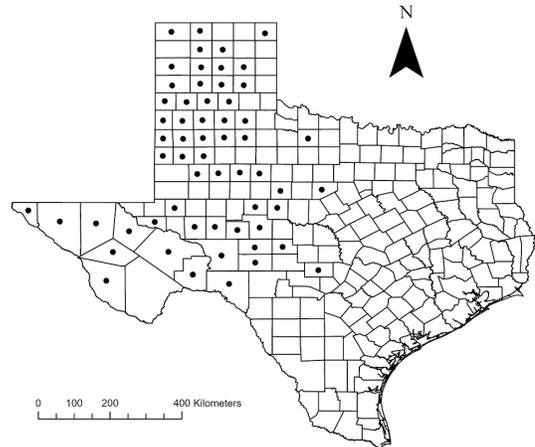


Figure 46. County delineated map of Texas illustrating the known distribution of the Mexican Spadefoot (*Spea multiplicata*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

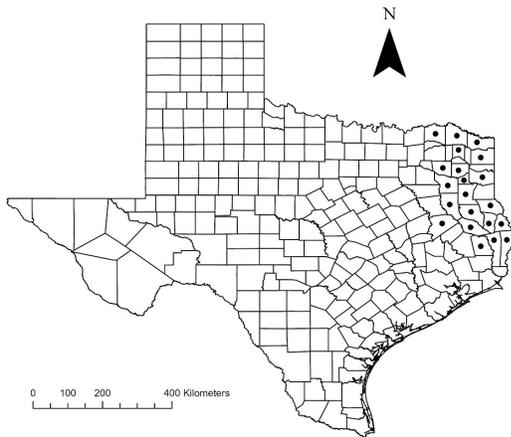


Figure 47. County delineated map of Texas illustrating the known distribution of the Spotted Salamander (*Ambystoma maculatum*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

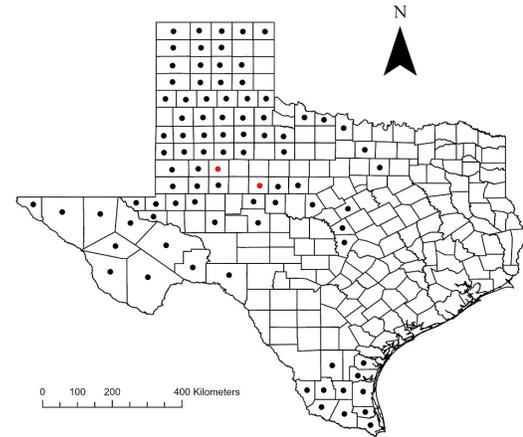


Figure 48. County delineated map of Texas illustrating the known distribution of the Western Tiger Salamander (*Ambystoma mavortium*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

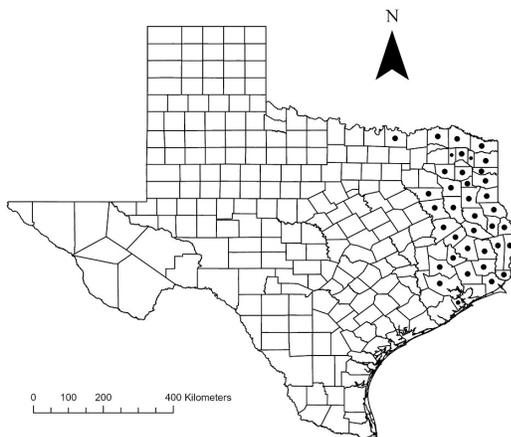


Figure 49. County delineated map of Texas illustrating the known distribution of the Marbled Salamander (*Ambystoma opacum*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

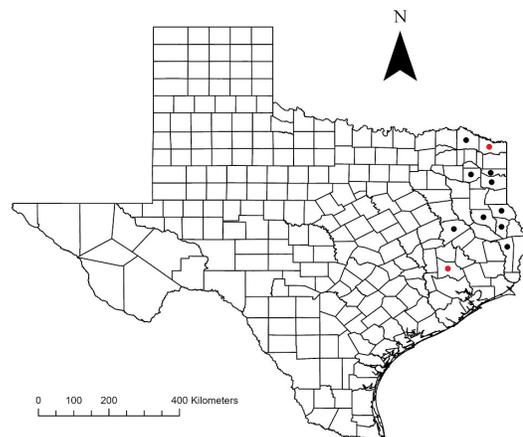


Figure 50. County delineated map of Texas illustrating the known distribution of the Mole Salamander (*Ambystoma talpoideum*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

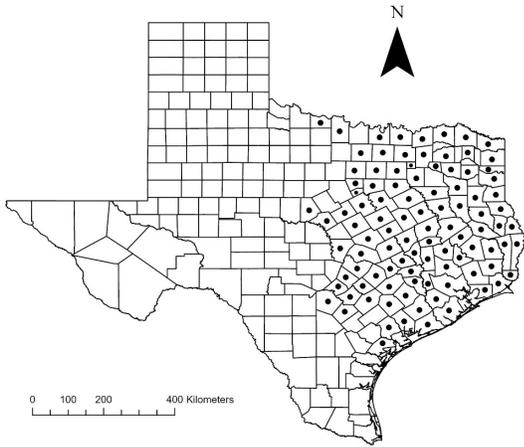


Figure 51. County delineated map of Texas illustrating the known distribution of the Small-mouthed Salamander (*Ambystoma texanum*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

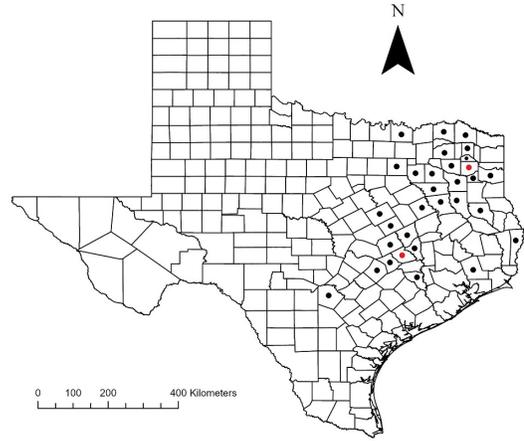


Figure 52. County delineated map of Texas illustrating the known distribution of the Eastern Tiger Salamander (*Ambystoma tigrinum*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

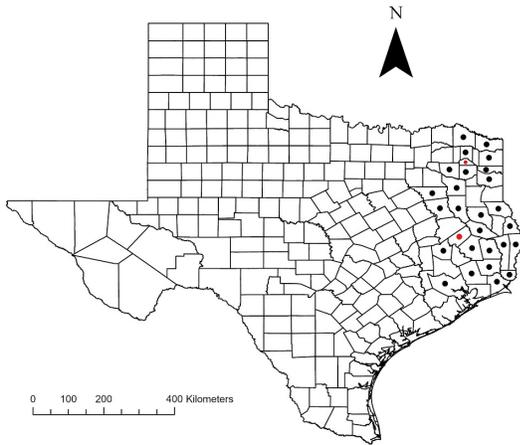


Figure 53. County delineated map of Texas illustrating the known distribution of the Three-toed Amphiuma (*Amphiuma tridactylum*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots.

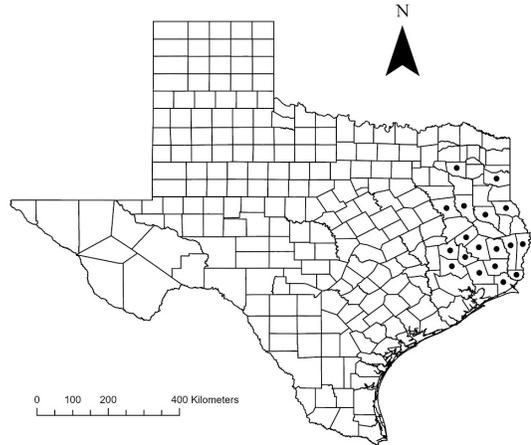


Figure 54. County delineated map of Texas illustrating the known distribution of Holbrook's Southern Dusky Salamander (*Desmognathus auriculatus*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

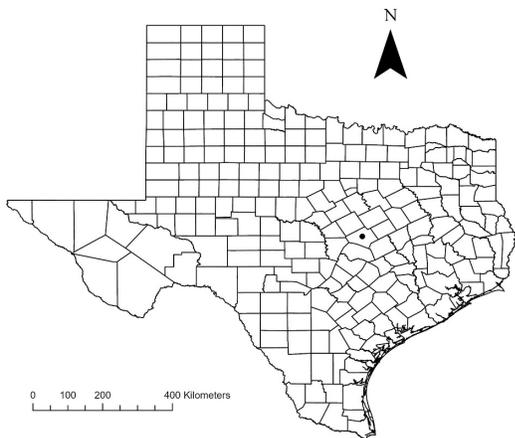


Figure 55. County delineated map of Texas illustrating the known distribution of the Salado Salamander (*Eurycea chisholmensis*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

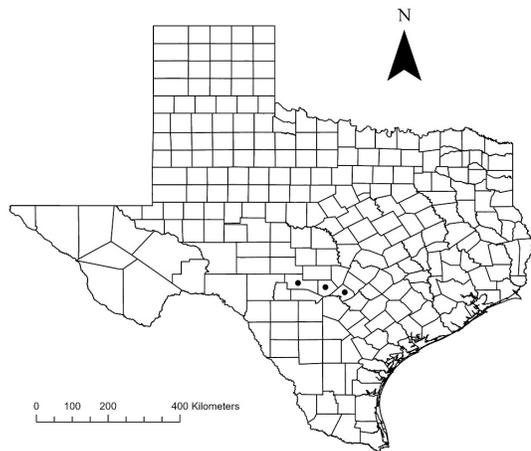


Figure 56. County delineated map of Texas illustrating the known distribution of the Cascade Caverns Salamander (*Eurycea latitans*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

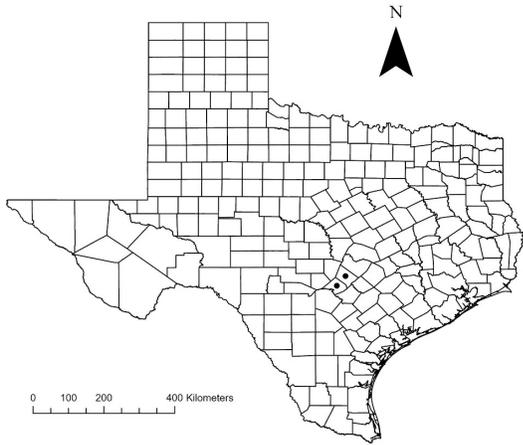


Figure 57. County delineated map of Texas illustrating the known distribution of the San Marcos Salamander (*Eurycea nana*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

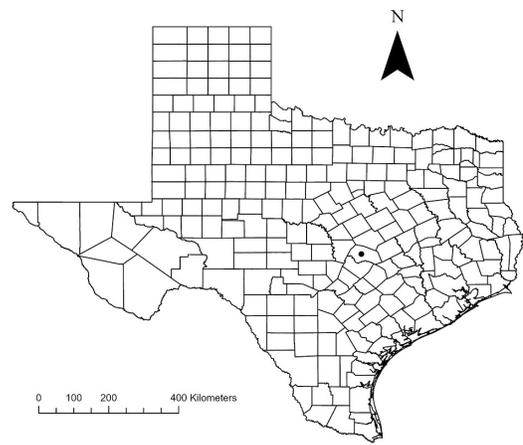


Figure 58. County delineated map of Texas illustrating the known distribution of the Georgetown Salamander (*Eurycea naufragia*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

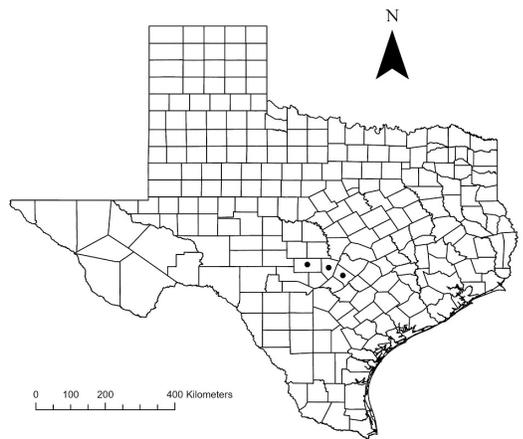


Figure 59. County delineated map of Texas illustrating the known distribution of the Texas Salamander (*Eurycea neotenes*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

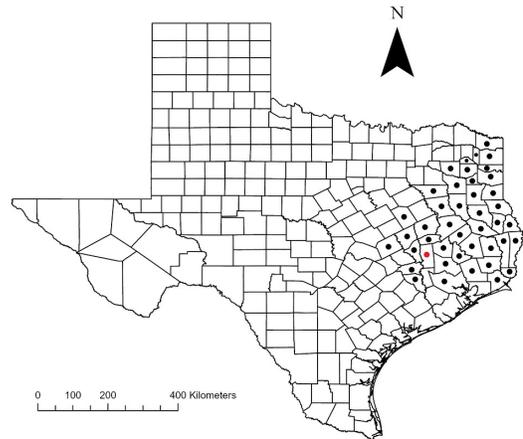


Figure 60. County delineated map of Texas illustrating the known distribution of the Western Dwarf Salamander (*Eurycea paludicola*). Black dots indicate occupied counties according to Dixon (2013). One county record has been published since Dixon (2013), which is demarcated with a red dot.

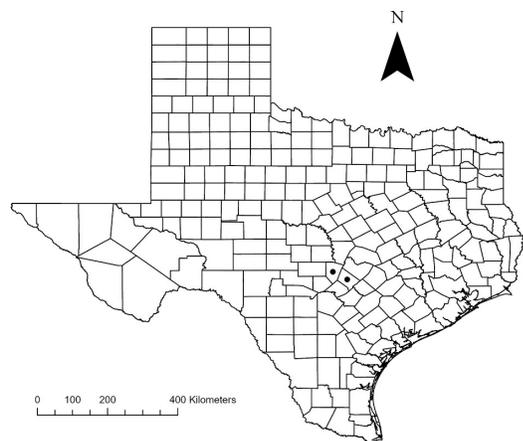


Figure 61. County delineated map of Texas illustrating the known distribution of the Fern Bank Salamander (*Eurycea pterophila*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

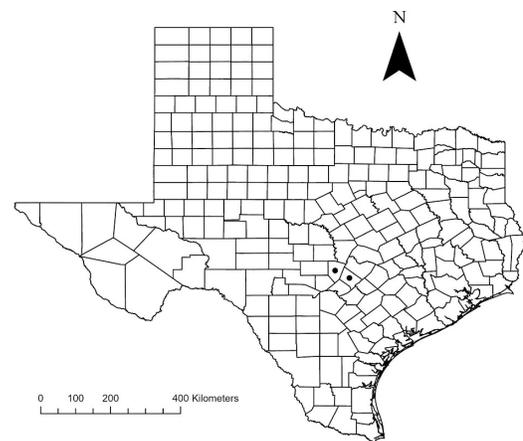


Figure 62. County delineated map of Texas illustrating the known distribution of the Texas Blind Salamander (*Eurycea rathbuni*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

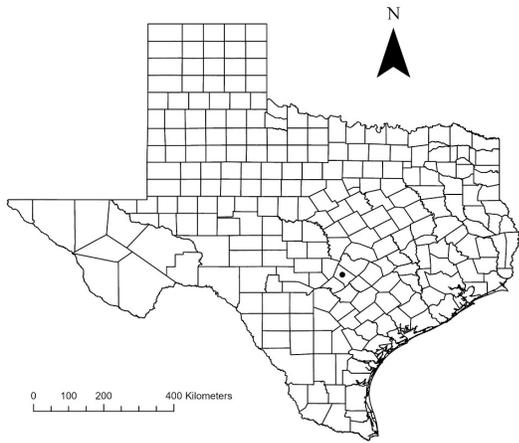


Figure 63. County delineated map of Texas illustrating the known distribution of the Blanco Blind Salamander (*Eurycea robusta*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

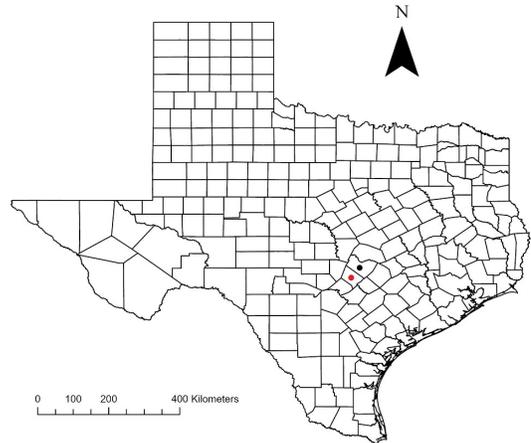


Figure 64. County delineated map of Texas illustrating the known distribution of the Barton Springs Salamander (*Eurycea sosorum*). Black dots indicate occupied counties according to Dixon (2013). One county record has been published since Dixon (2013), which is demarcated with a red dot.

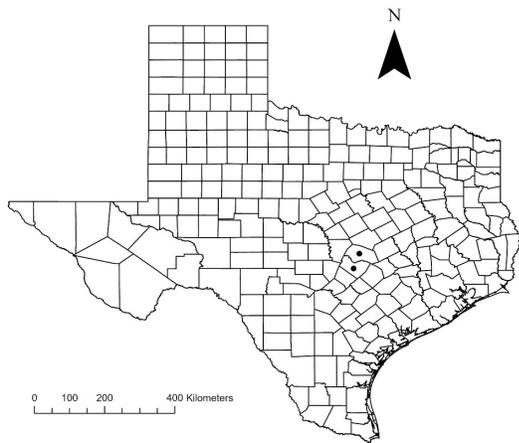


Figure 65. County delineated map of Texas illustrating the known distribution of the Jollyville Plateau Salamander (*Eurycea tonkawae*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

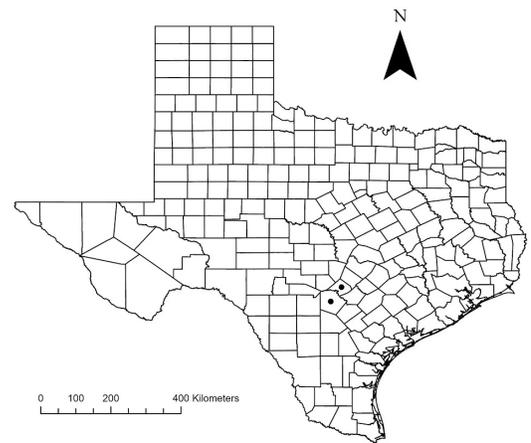


Figure 66. County delineated map of Texas illustrating the known distribution of the Comal Blind Salamander (*Eurycea tridentifera*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

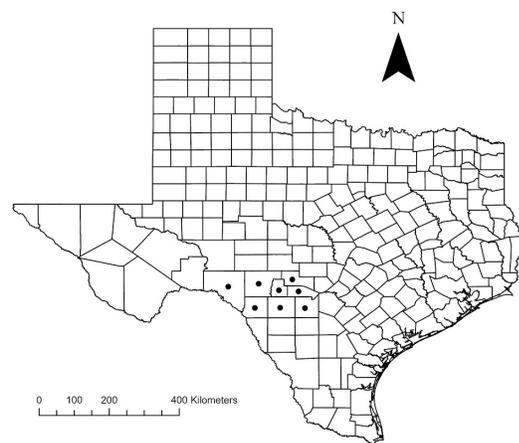


Figure 67. County delineated map of Texas illustrating the known distribution of the Valdina Farms Salamander (*Eurycea troglodytes*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

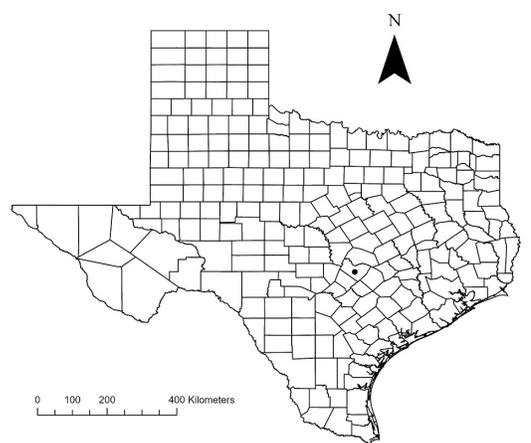


Figure 68. County delineated map of Texas illustrating the known distribution of the Austin Blind Salamander (*Eurycea waterlooensis*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

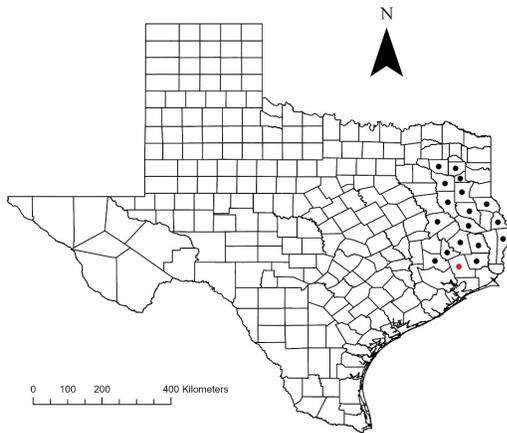


Figure 69. County delineated map of Texas illustrating the known distribution of the Gulf Coast Waterdog (*Necturus beyeri*). Black dots indicate occupied counties according to Dixon (2013). One county record has been published since Dixon (2013), which is demarcated with a red dot.

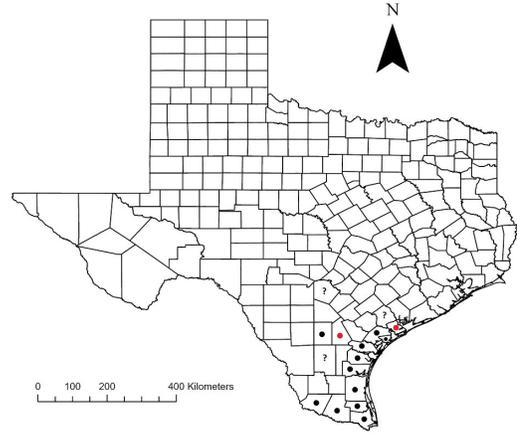


Figure 70. County delineated map of Texas illustrating the known distribution of the Black-spotted Newt (*Notophthalmus meridionalis*). Black dots indicate occupied counties according to Dixon (2013). Two county records have been published since Dixon (2013), which are demarcated with red dots. Note, however, that the Calhoun County record is supported only by eDNA results (Robinson et al. 2022) and that no specimens or photographic vouchers exist. Controversy exists regarding the validity of the Bexar, Duval, Falls, and Victoria County records (demarcated with question marks).

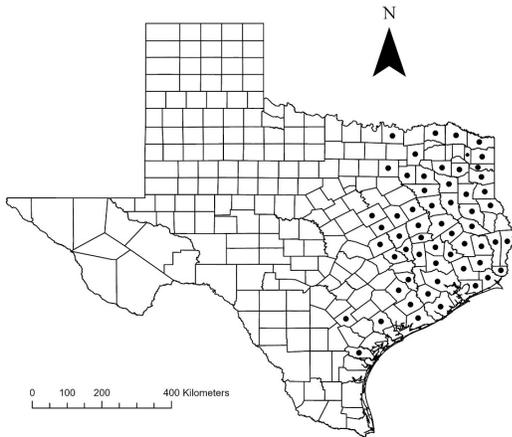


Figure 71. County delineated map of Texas illustrating the known distribution of the Eastern Newt (*Notophthalmus viridescens*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

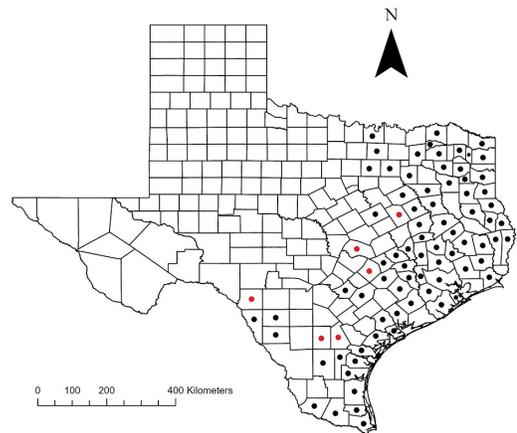


Figure 73. County delineated map of Texas illustrating the known distribution of the Lesser Siren (*Siren intermedia*). Black dots indicate occupied counties according to Dixon (2013). Six county records have been published since Dixon (2013), which are demarcated with red dots.

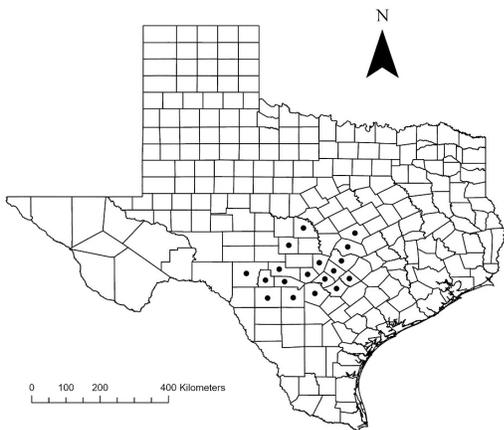


Figure 72. County delineated map of Texas illustrating the known distribution of the Western Slimy Salamander (*Plethodon albagula*). Black dots indicate occupied counties according to Dixon (2013). No county records have been published since Dixon (2013).

Pandelis et al. (2022). Fortunately, there has been an intense effort on behalf of Texan herpetologists over the past three years to sample for amphibian county records. In 2020, 35 amphibian county records were published for the state, followed by 24 in 2021 (Fig. 2). At the time of writing (August 2022), 21 county records have been published in 2022. This contrasts with previous years (e.g., 2016–2019) when the annual number of published amphibian county records averaged less than 10. Although sampling effort currently seems intense (as inferred from the number of records published per year), this sampling effort waxes and wanes over time (Fig. 2).

New county records were published for two of the state's federally endangered species: the Houston Toad (*Anaxyrus houstonensis*) and the Barton Springs Salamander (*Eurycea sosorum*). The *A. houstonensis* record (MacLaren and Forstner 2017) was collected in 1962 from Brazos County but had not been previously reported in the literature (e.g., Dixon 1987, 2000, 2013). It is unknown whether a population persists at the reported locality (Andrew MacLaren pers. comm.). The *E. sosorum* record included specimens collected from Onion Creek and Bear Creek in Hays County (Devitt and Nissen 2018). Dixon (2013) indicates that *E. sosorum* had only been documented from Travis County. However, as discussed by Devitt and Nissen (2018), *E. sosorum* was discovered at Taylor Spring in 2004 and Spillar Ranch in 2012, both of which are situated in Hays County. These records for *A. houstonensis* and *E. sosorum* represent important additions to our understanding of the historic and contemporary distributions of two highly imperiled amphibian species, both of which are endemic to Texas.

The amphibian family with the greatest number of records ($n = 35$) published since 2010 that supplement the maps from Dixon (2013) is Eleutherodactylidae. *Eleutherodactylus cystignathoides* is responsible for the majority of these records ($n = 29$). According to Dixon (2013), *E. cystignathoides* is native to only Cameron and Hidalgo counties in the southernmost portion of the state. Dixon's (2013) field guide reported that *E. cystignathoides* had spread to an additional 22 counties. Given the records summarized here, *E. cystignathoides* is now known from 53 counties (~ 21% of the state). The distribution of the congeneric and non-native Greenhouse Frog (*Eleutherodactylus planirostris*) is likewise expanding, but is presently confined to the coastal portions of Texas. These species are likely establishing new populations through human-mediated jump dispersal, similar to the non-native Mediterranean Gecko (*Hemidactylus turcicus*). The eleutherodactylids that are expanding their distribution in Texas may be accomplishing said jump dispersal by stowing away in potted plants transported across county lines for commercial sale (Olson et al. 2012; Dixon 2013). Dixon (2013) speculated that the spread of *E. cystignathoides* was unlikely to impact any native species. However, a dearth of information exists regarding the ecology of eleutherodactylids native to Texas (e.g., Gaige 1931; Hayes-Odum 1990; Terry 2019). From my own experiences in the field, both the Cliff Chirping Frog (*Eleutherodactylus marnockii*) and *E. cystignathoides* seem to occupy a similar niche (nocturnal, arboreal, and cryptozoic) suggesting a potential for competition. A more detailed examination of the ecology of these two species would be a worthwhile topic for investigation, given that they are now sympatric throughout a large swath of Texas (Figs. 13, 15).

Continued study of amphibians in Texas will be necessary to characterize the dynamic nature of amphibian species

distributions. Various contemporary factors such as human-mediated jump dispersal, climate change, urbanization, fungal pathogens, and the introduction of non-native species may drive contractions, expansions, and shifts in the geographic distributions of Texas amphibians. Future work should statistically compare historic distributions to current distributions and examine the relationship between changes in distribution and potential drivers of these changes.

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