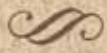


**TEXAS
HORNED LIZARD
WATCH**



**10-YEAR
SUMMARY REPORT**



1997-2006



LEE ANN JOHNSON LINAM

TEXAS HORNED LIZARD WATCH



PHOTO: Petei Zelazny, THLW Volunteer

10-YEAR SUMMARY REPORT

1997~2008



PREPARED BY

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The 2006 season marked the 10th year that Texas volunteer scientists have helped the Texas Parks and Wildlife Department (TPWD) gather data on our official state reptile, the Texas Horned Lizard (THL) (*Phrynosoma cornutum*). During the course of the monitoring project, 186 volunteers have officially submitted data to the program. Three volunteers and their families have collected data from a site during all 10 years. To date, 270 sites have been adopted for monitoring. Data have been gathered from 165 counties. THL have been reported from 146 of those counties. Results have helped shed light on the current distribution of Texas Horned Lizards and characteristics of their habitat.



BACKGROUND

Texas Horned Lizards, one of three horned lizard species in Texas, were historically distributed across much of the state, with the exception of the far eastern edge of the state (Price 1990). They have long been popular icons of Texas culture, and many older Texans can recount personal experiences with horned lizards (Manaster 2002, Welch 1993). However, recent studies (Donaldson *et al.* 1994, Henke 2003), as well as anecdotal accounts, show that THL have declined in much of their range. Concern about declining numbers and over-collection led TPWD to list the species as threatened in 1977 (*Handbook of Texas Online* 2007). Many uncertainties have remained regarding current distribution, causes of decline, and current trends of THL. Because of Texans' fondness for and familiarity with THL, we developed Texas Horned Lizard Watch with the hope that citizen monitors might be able to answer some of those questions about the species.

The monitoring project is self-directed, with volunteers able to access information on horned lizards, descriptions of monitoring protocols, and data sheets in a free monitoring packet, both in printed form (TPWD 2001) and online (www.tpwd.state.tx.us/hornedlizards/). Participants can choose to participate in Texas Horned Lizard Watch at three different levels. The most intensive level consists of conducting transects that collect quantitative data on horned lizard and ant density. Most participants choose a less rigorous approach, Adopt-a-Habitat, in which they adopt sites, such as a ranch, backyard or local park, and provide more qualitative information about the presence or absence of horned lizards and habitat variables. Participants can also participate as Horned Lizard Spotters and report incidental sightings of horned lizards wherever they occur. Data for this summary report was also gleaned from emails and telephone calls that came into TPWD (data was confirmed through follow-up contact) and through several directed survey efforts.

RESULTS

Participation

The number of volunteers formally participating in the watch program has varied since its inception, with a peak of 71 in 1999 (fig. 1) and a general decrease in participation since then. Publicity for the watch was highest in its initial years—probably producing the increased participation in those years. The vast majority of volunteers participate for only one year (fig. 2). Success in seeing a horned lizard does not seem to influence whether or not volunteers continue to participate.

Figure 1. Volunteer participation in Texas Horned Lizard Watch, 1997–2006

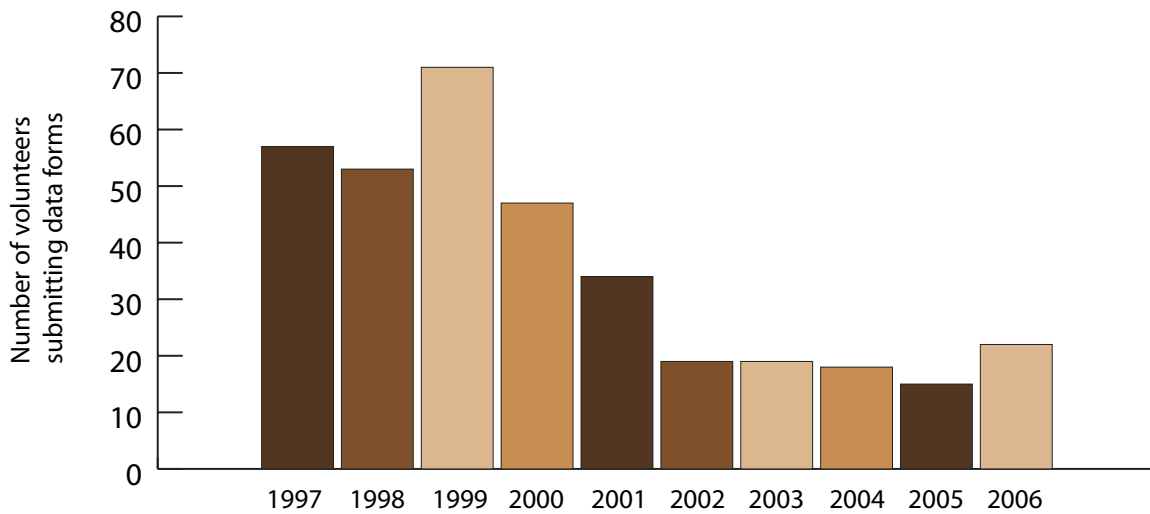
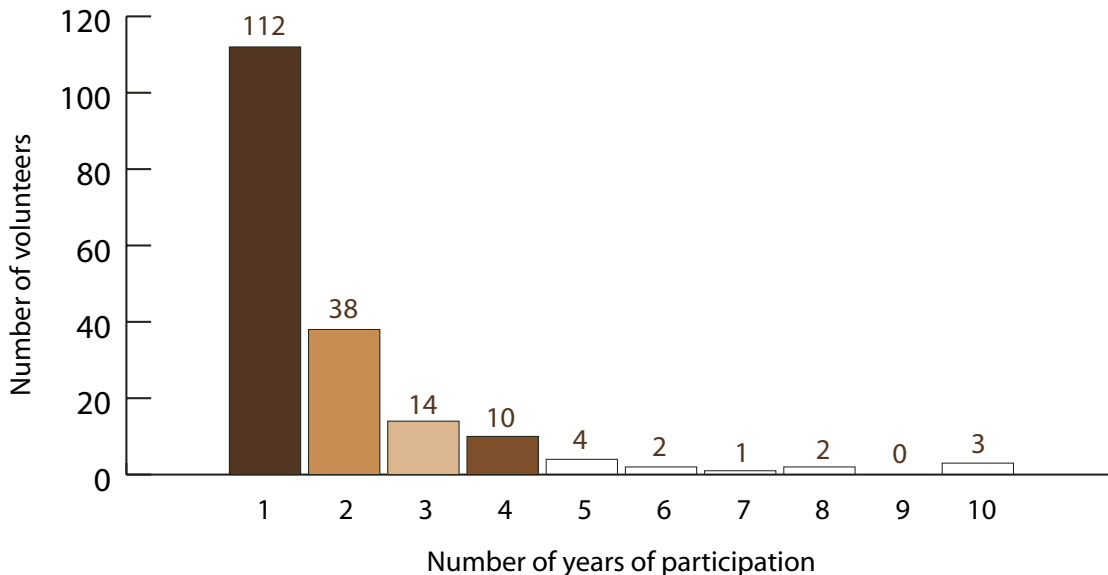


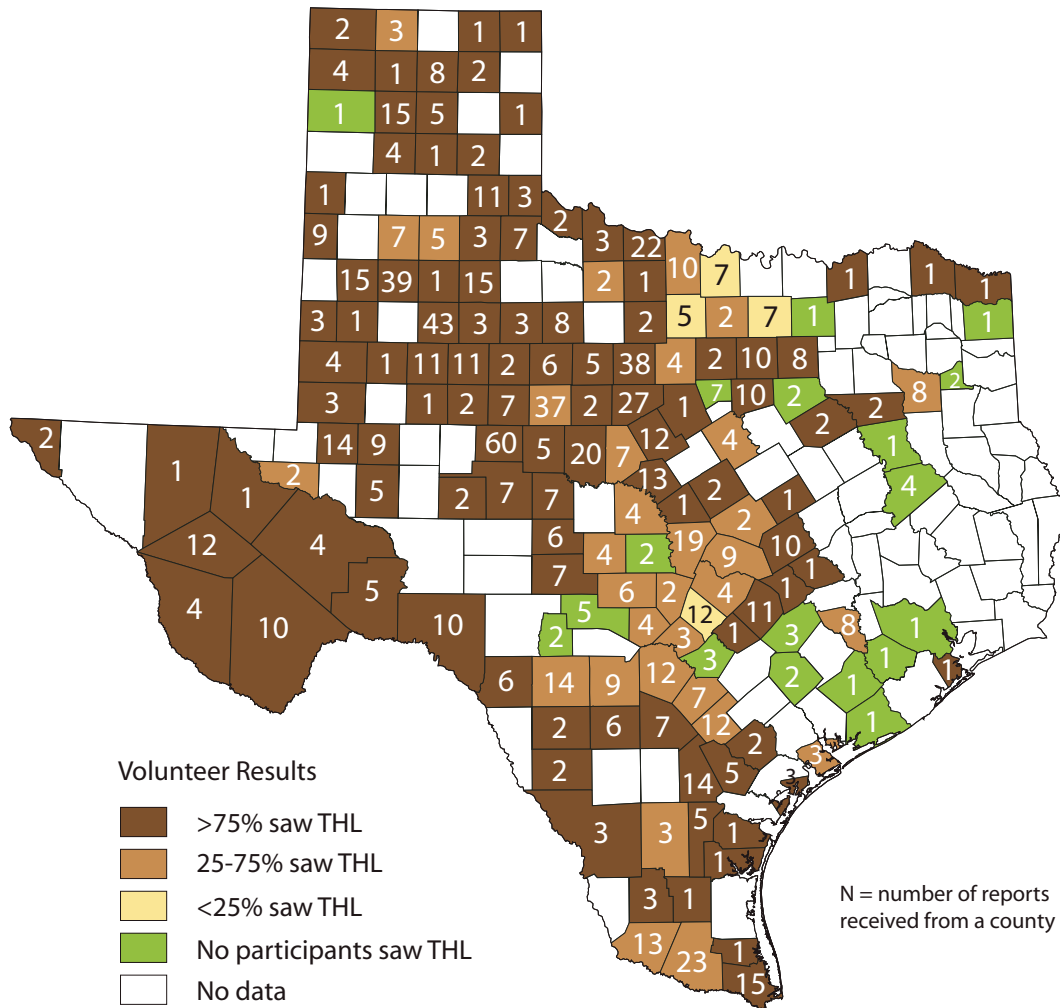
Figure 2. Number of years of participation by Texas Horned Lizard Watch volunteers



Prevalence

A map of THL prevalence based on 10 years of data from Texas Horned Lizard Watch (fig. 3) reveals a complex pattern of distribution.

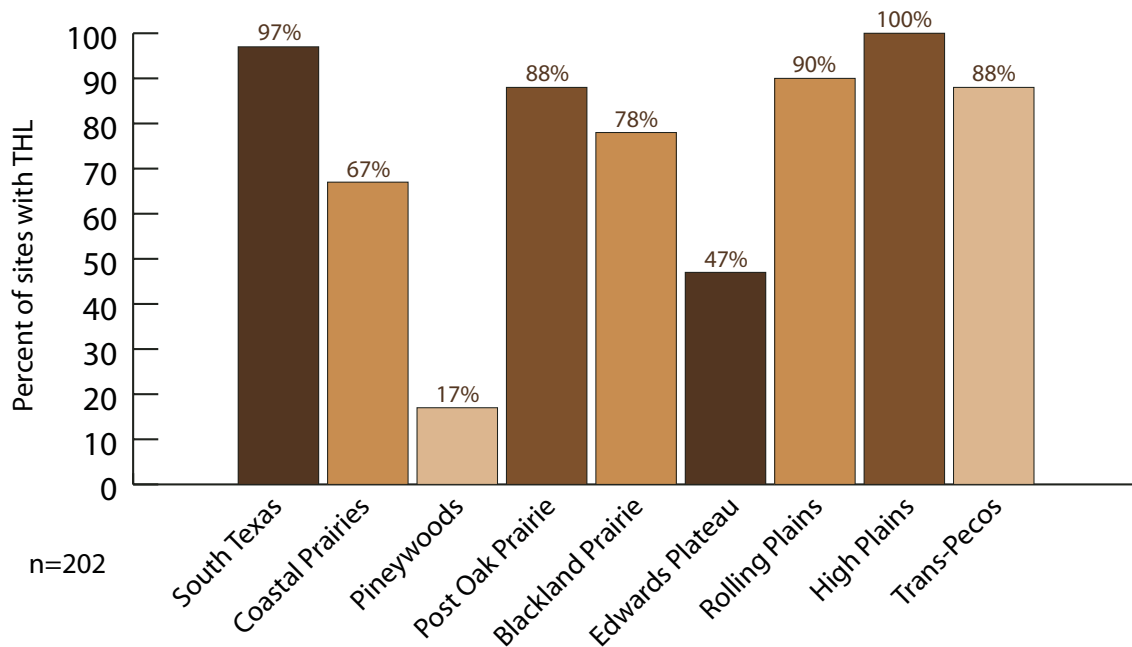
Figure 3. Texas Horned Lizard prevalence based on 1997–2006 Texas Horned Lizard Watch results



THL are apparently rare in the **Coastal Prairie** region of Texas, although they persist in sandy soils of some coastal counties where volunteers have sighted them on barrier islands. Moving inland, THL are still regularly reported from counties within the **Post Oak Savannah** ecoregion. These counties are characterized by sandy soils and less intensive agriculture. Few reports have been received from the **Pineywoods** (fig. 4), perhaps due to historic as well as current scarcity of THL. THL appear to be rare in a belt that follows the counties of the IH-35 corridor north from San Antonio. Urbanization, intensive agriculture in **Blackland Prairie** soils, and prevalence of

red imported fire ants (*Solenopsis invicta*) may be associated with declining trends in this region. Two puzzling exceptions are Tarrant and Dallas counties, where 15 sightings have been made in the past decade. Results are mixed in the **Rolling Plains** and **Edwards Plateau** ecoregions, with some counties reporting THL present and other volunteers, especially those in the more eastern edge, reporting that THL have not been seen in many years. Urbanization and fire ants may be exerting local effects on populations. Horned lizards are prevalent in much of the **South Texas Brush Country**, although some declines are reported along the northern edges of this ecoregion, roughly following US 90 and IH-37. Declines have also been reported for many years in the **Lower Rio Grande Valley**, presumably associated with urbanization and intensive agriculture, although THL still can be commonly encountered in this region. Finally, West Texas remains the stronghold for the species. THL are still widely reported from the **High Plains** and the **Trans-Pecos**, although the species is reported to be less abundant in many urban areas.

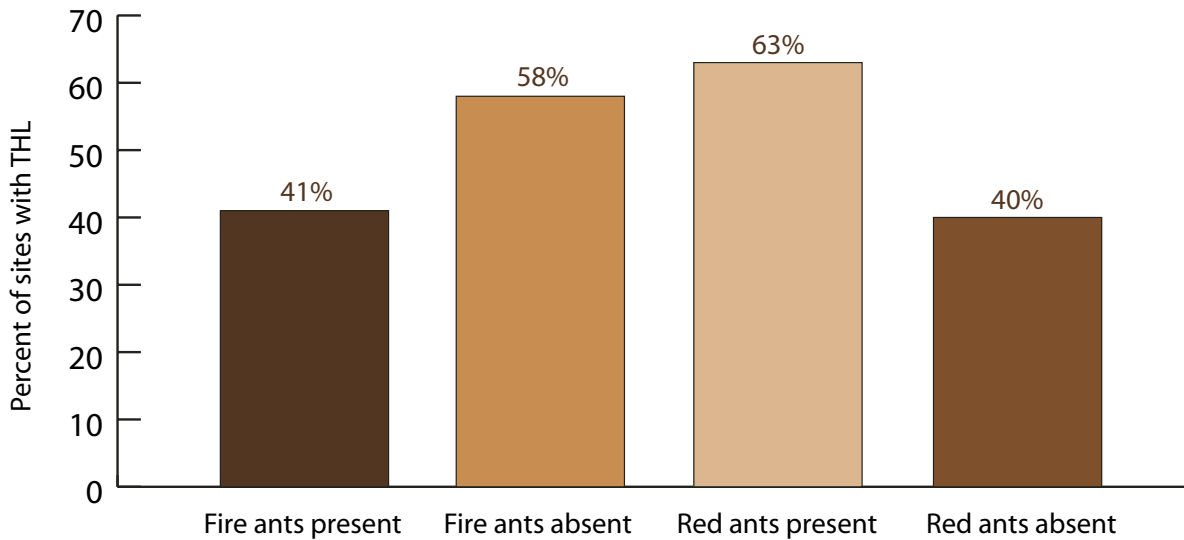
Figure 4. Percent of sites reporting Texas Horned Lizards, by ecoregion, 1997–2006



Habitat Characteristics

Some volunteer data indicate a relationship between the presence of THL and ant species (fig. 5). Presence/absence data show an apparent positive relationship between the presence of Texas Horned Lizards and the presence of harvester ants (*Pogonomyrmex* sp.), their preferred food source (Fisher’s exact test, two-tailed, $p=0.0267$). Data from counties where red imported fire ants are found also suggest that distributions of Texas Horned Lizards and red imported fire

Figure 5. Texas Horned Lizard presence vs. ant species presence, 1997–2006



ants may not be independent ($p=0.0636$). The negative relationship is even stronger for the first five years of data ($p<=0.0001$). In addition, when data from transects was examined using multiple regression, it was found that densities of red imported fire ants and densities of harvester ants were good predictors of the density of horned lizards ($R^2 = 0.70$), with a negative effect from red imported fire ants and a positive effect from harvester ants.

Volunteers also provided data on land use and habitat. Overall, THL were reported most often from lands that were used for residential areas or for ranching (fig. 6), likely reflecting a tendency of volunteers to monitor these types of habitats. Pooled data collected between 1998 and 2006 do not indicate that

Figure 6. Land use where Texas Horned Lizards were sighted, 1998–2006

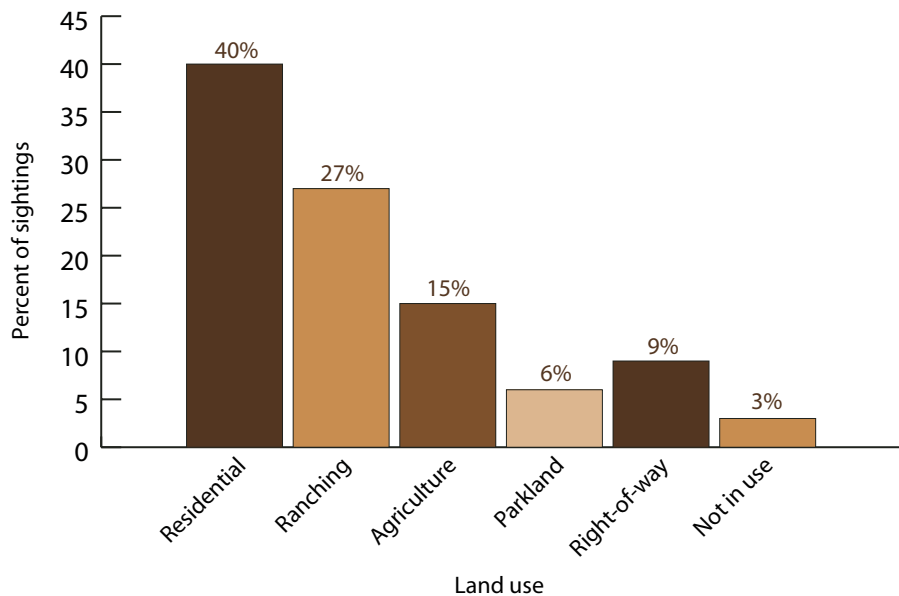
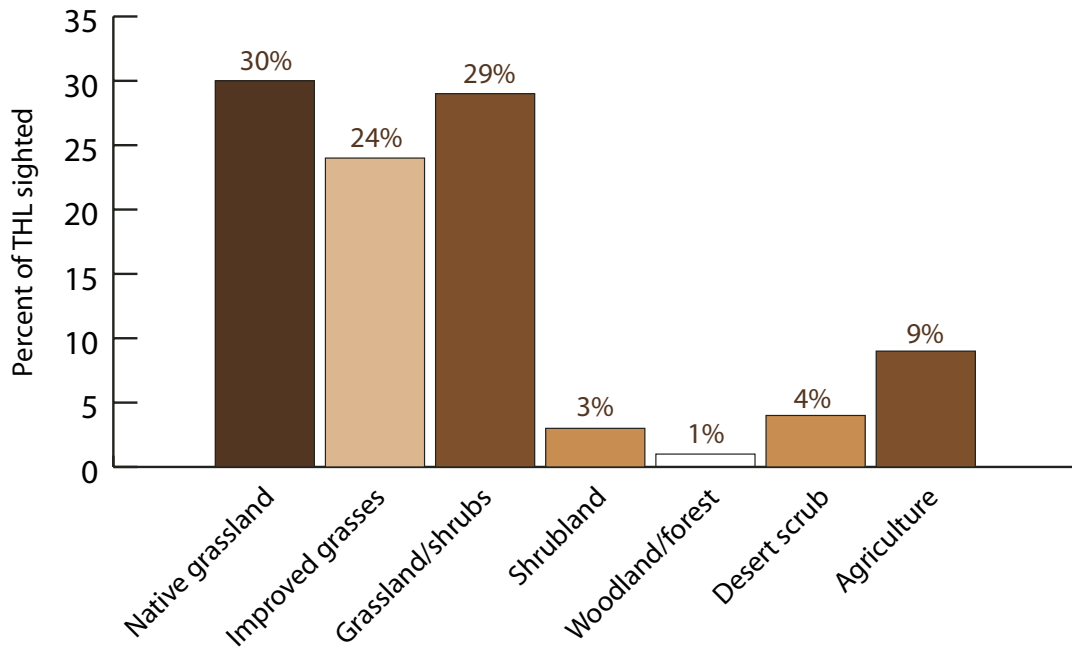
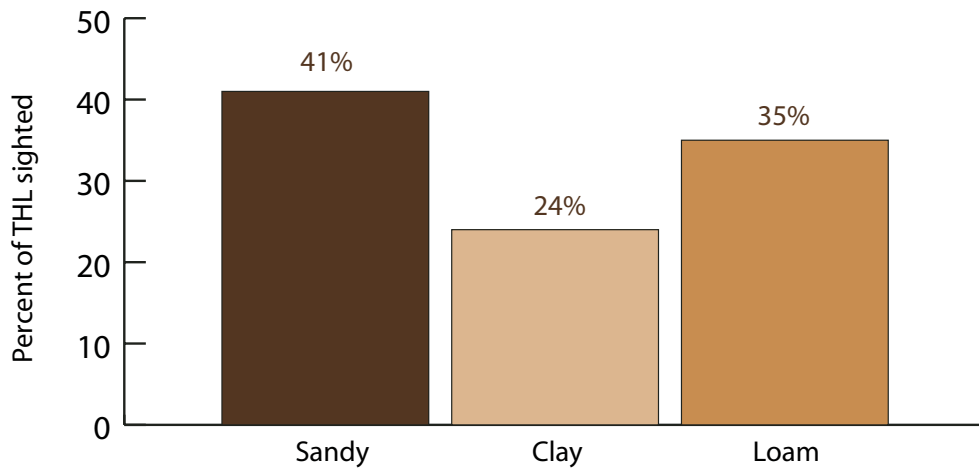


Figure 7. Habitat types where Texas Horned Lizards were found, 1998–2006



THL presence is related to land use; however, volunteers did not tend to sample some habitats (such as agriculture and parkland) frequently. During the sampling period, THL were found most often in native grassland, mixed grass and shrub communities, or in improved grasslands (fig. 7); however, these habitat differences were not statistically significant. THL were reported from sand, clay and loam soils, with no measurable effect from soil type (fig. 8).

Figure 8. Soil types where Texas Horned Lizards were recorded, 2000–2006



Characteristics of Sightings

Many watchers reported approximate size information for THL seen (fig. 9). Total length ranged from less than one inch to over six inches. Most lizards were in the 4-inch size class. Lizards were sighted most frequently in June, July, and May, with even a few rare winter sightings (fig. 10). Young lizards (<1.5”) were seen most often in July and August. Lizards were most often seen when temperatures were between 80 and 89° F (fig. 11), although sightings may reflect some bias against extremely high temperatures on the part of observers. Several lizards were spotted at temperatures greater than 100° F, while several were spotted when temperatures were less than 70° F.

Figure 9. Size classes of Texas Horned Lizards found, 2000–2006

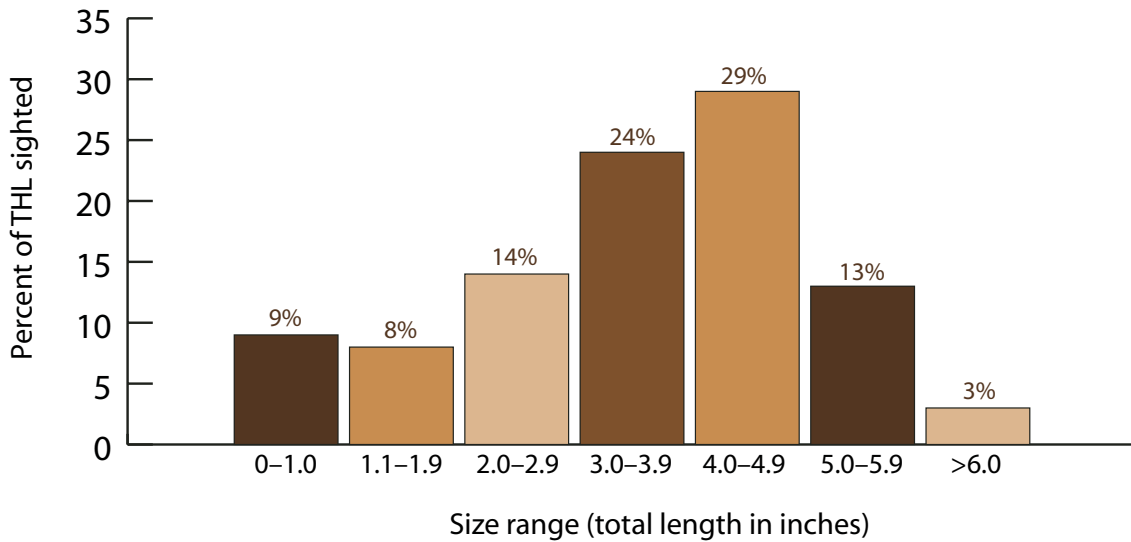


Figure 10. Dates of Texas Horned Lizard sightings, 2000–2006

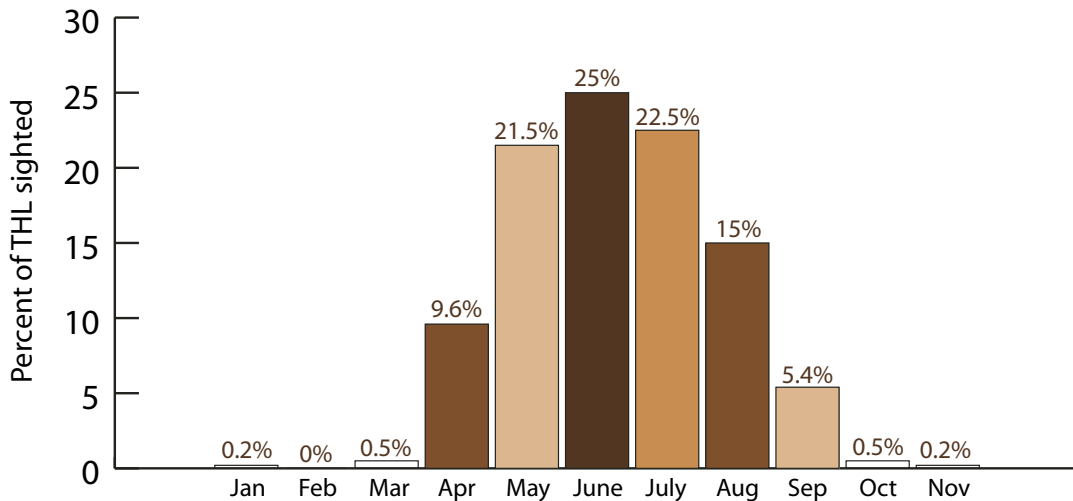
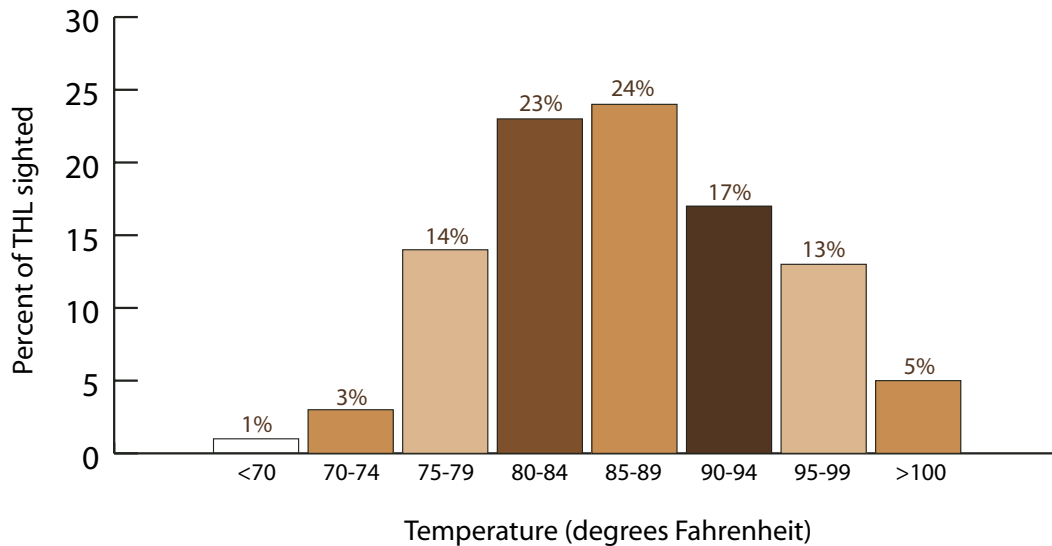


Figure 11. Temperatures when Texas Horned Lizards were sighted, 2000–2006



Trends

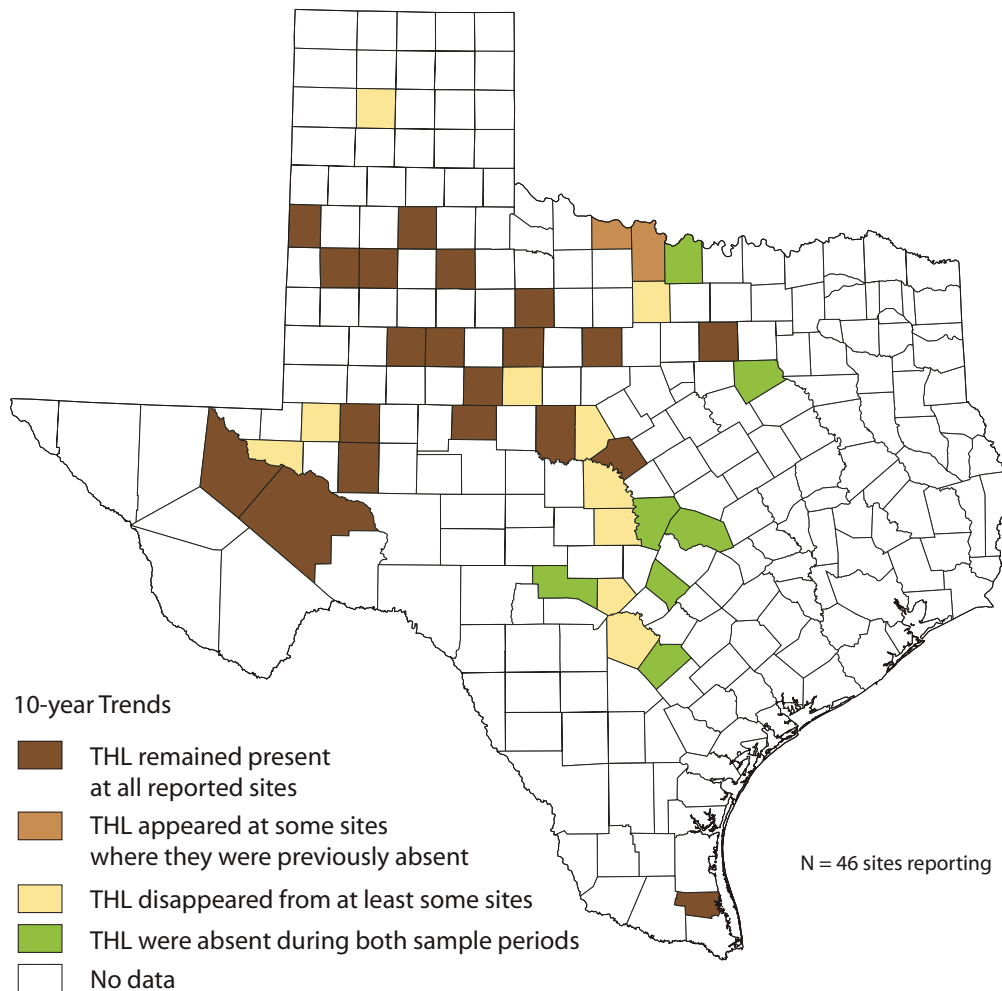
While results of Texas Horned Lizard Watch have shed some light on distribution patterns and on the effects of habitat variables, survey results have not managed to reveal a trend in horned lizard populations over the ten years of the survey. Density estimates from transects conducted by volunteers do not reveal trends in horned lizard or ant abundance. During the first year of the watch, application of quantitative survey techniques was not standardized—leading to large variances in results (table 1). In subsequent years most volunteers chose to not conduct the more standardized and quantitative transects, leading to small sample sizes. Resulting data do not indicate a clear trend in densities.

Table 1. Texas Horned Lizard density per acre at Texas Horned Lizard Watch sites.

	<i>n</i>	Zero Values	Min.	Max.	Mean	St. Dev.
1997	86	43	0.330	436.00	15.68	56.61
1998	11	3	0.035	4.89	0.82	1.40
1999	17	6	0.170	8.42	1.26	2.02
2000	6	3	1.020	3.33	1.03	1.35
2001	7	2	0.080	1.38	0.50	0.49
2002	8	0	0.230	9.00	2.79	3.06
2003	5	2	0.890	2.41	0.97	1.04
2004	4	2	1.030	2.22	0.81	1.06
2005	3	0	1.030	3.48	2.39	1.25
2006	6	2	0.340	1.74	0.65	0.73

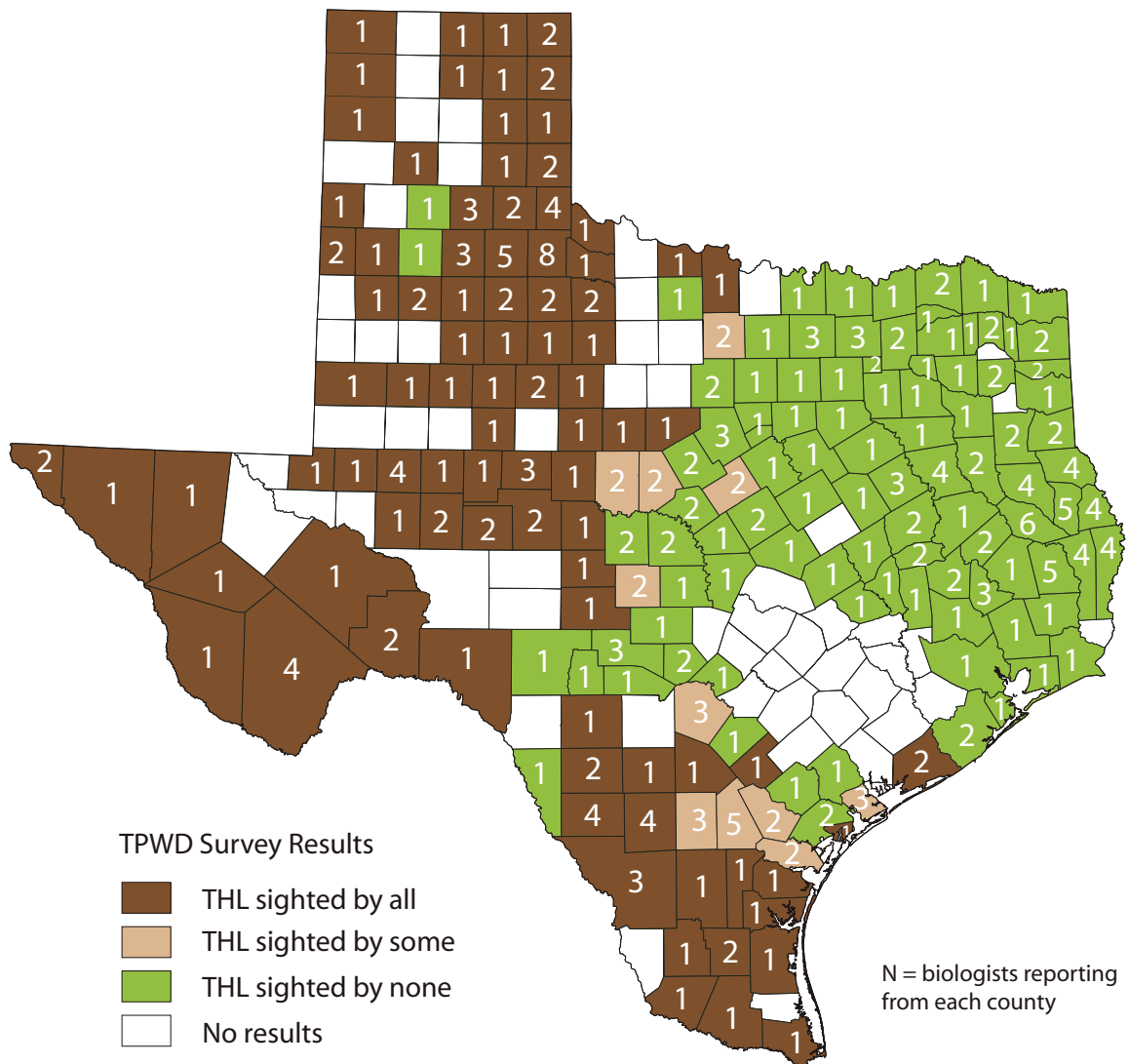
Qualitative data also do not provide insight into trends. Only three sites have been monitored continuously since 1997, with no change in presence or absence noted at these sites. Because there is a high turnover in volunteer participation, in 2007 a mail survey was conducted, seeking updated data on 162 monitoring sites that were established in 1997–99. Volunteers were asked if they had revisited the sites within the last three years and whether horned lizards had been seen at the site. Responses were received for 66 sites, with updated sighting data provided for 47 sites. Only 13 sites reported that their results had changed in the last decade, with 11 of the 13 reporting horned lizards were originally present but now absent. Some geographic patterns may be evident (fig. 12), but sample sizes are too small to draw definite conclusions. When asked their opinions about trends, 40 percent of the original participants thought THL were decreasing, 24 percent thought populations were stable, 16 percent thought they had increased, and 20 percent were unsure.

Figure 12. Trends in horned lizard sightings, Texas Horned Lizard Watch, 1997–1999 vs. 2005–2007



Finally, in an effort to increase sample sizes for recent years, in 2007 an email survey of Texas Parks and Wildlife Department wildlife biologists was conducted. The biologists were asked if they had seen a horned lizard in their counties of responsibility in the past three years. Results showed a definite geographic break, with no sightings in the eastern third of Texas (except for some coastal counties) and sightings in nearly every county of West and South Texas (with the exception of the southern edge of the Edwards Plateau). While results corroborate positive volunteer results in West and South Texas, they failed to confirm the positive volunteer findings in the Post Oak Savannah and the Dallas/Fort Worth area. Horned lizard populations may be so small and scattered in these counties that encountering them is unlikely unless a person lives in those specific habitat areas.

Figure 13. Occurrence of Texas Horned Lizard sightings by TPWD biologists, 2004–2006



CONCLUSIONS AND RECOMMENDATIONS

During its initial 10 years, Texas Horned Lizard Watch has produced both public enthusiasm and insightful results. One notable accomplishment is an ongoing refinement of the current distribution map for the species. Whereas recent scientific surveys (Donaldson *et al.* 1994; Henke 2003) and our survey of TPWD biologists produced pessimistic results for the eastern third of the state (especially in those areas lying north and east of IH-35 and IH-37; see fig. 13), our project volunteers have provided encouraging results from the Post Oak Savannah ecoregion, the barrier islands of coastal counties, and the Dallas/Fort Worth Metroplex. These populations may be small and isolated and merit additional attention to assess their viability and conservation. On the other hand, volunteers confirm some pessimism for Central Texas, especially the eastern Edwards Plateau ecoregion, and have documented a decline of the species in some urban centers in West Texas. The project will continue to try to “fill in the gaps” regarding current distribution of the species.



PHOTO: Angela Slatten, THLW Volunteer

Texas Horned Lizard Watch has also offered some insight into habitat relationships for the species based on simple presence/absence data. Most notably, volunteer results are the most conclusive data set in existence regarding relationships between red imported fire ants and horned lizards. Previous work has postulated that red imported fire ants may have negatively impacted Texas Horned Lizards (Allen *et al.* 2004; Donaldson *et al.* 2004; Henke 2003),

and our volunteer data demonstrate a statistically significant negative relationship between the two species. Red imported fire ants may not have been the primary factor contributing to horned lizard decline; however, these findings suggest that recovery efforts will have to address their management in order to be successful. Volunteer data have also consistently shown a positive relationship between horned lizards and harvester ants and, in some years, suggested a negative relationship between harvester ants and red imported fire ants. Some years of data have implied a relationship between Texas Horned Lizards and land use or soil type, but pooled data do not reveal a clear relationship. More conclusive results for these variables are probably limited by the small number of data sheets from some land use types, as well as a tendency for volunteers with negative results to fail to send in data sheets.

The watch program has not fulfilled all initial expectations, however. It was hoped that the monitoring program might provide a quantitative measure of horned lizard abundance over time. Initial results showed that quantitative measures by so many different volunteers produced results that were highly variable and that many volunteers preferred a less strictly quantitative approach. Furthermore, ongoing research shows that sampling must be very intensive to detect changes in density of the species (based on a personal communication with Chip Ruthven). These results led to a shift in emphasis to qualitative results regarding horned lizards and their habitat. In addition, most volunteers did not choose to continue monitoring year after year, leading to snapshot-type data rather than trend data. When contact was reestablished with some of the early volunteers in 2007, however, many indicated that they would be willing to participate again. The Texas Parks and Wildlife Department is also in the process of making data entry available online, with the hope that this will encourage both continued and new participation.



PHOTO: Rick Underwood, THLW Volunteer

On the whole, Texas Horned Lizard Watch has been very successful in its attempt to engage citizens in meaningful, hands-on research. Participants are overwhelmingly enthusiastic, with many offering much more information and research than required by the data sheets. The personal recollections offered by watch participants were the inspiration for an essay contest conducted from 2001 through 2006 called “Hometown Horned Toads,” that was designed to capture oral histories about people’s experiences with horned lizards and their observations about their decline. Not only have the results of Texas Horned Lizard Watch been poignant, but they have also been significant. Results have been presented at scientific meetings, distribution data has been used in project planning, and habitat relationships have been used to offer management advice. The project will continue and will be modified in future years to increase participation, refine habitat data, assess trends through maintaining contacts with initial participants, and incorporate data on the other two horned lizard species in Texas.

ACKNOWLEDGMENTS

This research has been made possible by the love that Texans have for this unique species. I wish to thank, first and foremost, the volunteers who have participated in Texas Horned Lizard Watch and the landowners who provided access to their property for these volunteers. Special recognition goes to Britton and Gayle Phillips, Beverly Kitzman, and Ed, Linda and Anna Allen, who provided data each year during the first 10 years of the watch program. Appreciation is also expressed to Chip Ruthven and Andy Price for their suggestions in project design and editing of project materials and to Marsha May for her continual assistance in project management and promotion. Funding support for the initial years of the project was provided by the U.S. Fish and Wildlife Service. The Horned Lizard Conservation Society has also provided ongoing support in promoting the goals of Texas Horned Lizard Watch.

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