

MANAGEMENT OF TEXAS HORNED LIZARDS

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Abstract: Texas horned lizards are declining in abundance and distribution in Texas. There are no obvious causes for their decline; however, multiple factors such as widespread pesticide use, habitat loss, over-collection, and fire ants have been suggested as possible reasons. Texas horned lizards are a threatened species in Texas and are listed as a Federal Species of Concern. The ecology and habitat requirements of Texas horned lizards are outlined in this paper and management practices are suggested that should benefit this species.

INTRODUCTION

The Texas horned lizard is a part of the history and culture of Texas. In fact, most Texans have fond memories of growing up with Texas horned lizards. Horned lizards are as much of Texas folklore as cowboys, longhorns, the Alamo, and listening to coyotes howl at the moon. Unfortunately, many young Texans have not experienced the thrill of seeing a horned lizard in their backyard. This is because the Texas horned lizard population has declined in Texas over the past couple of decades.

Many Texans have an intense interest in stopping the population decline of horned lizards. The purpose of this management bulletin is to inform Texans of the current status, life history, and habitat requirements of Texas horned lizards, and to offer management tips that possibly could slow the decline of Texas horned lizards in Texas.



Wyman Meinzer

Texas horned lizards are easily identified by the 2 large spines behind their head.

TAXONOMY AND DESCRIPTION

Much like the bandits of western folklore, Texas horned lizards have used many aliases. Two of the most commonly-used misnomers are horned toads and horned frogs. However, Texas horned lizards are, as their true name implies, lizards! Toads are tailless amphibians with rough, warty skin and live on moist land or in water (i.e., during breeding). Frogs also are tailless amphibians but have smooth skin and are equally adapted to land and water. Horned lizards are reptiles and belong to the Iguanid genus *Phrynosoma*. They have tails and a scaled body. In fact, many of the body scales of horned lizards are enlarged into spine-like structures. Bodies of horned lizards are strongly dorsoventrally flattened, generally contain sharp spines on the back of their head, and have relatively short legs (Pianka and Parker 1975). There are 13 species of horned lizards (Sherbrooke 1981). Seven species occur in the United States and 3 of these species occur in Texas; these include the Texas horned lizard, Roundtail horned lizard, and Mountain short-horned lizard (Fig. 1).

Texas horned lizards can be distinguished from other species of horned lizards in Texas by their 2 very sharp spines that protrude from the back of their head (called occipital spines), 2 rows of fringed scales on their sides (other species of horned lizards have only 1 row of fringed scales), dark brown to sooty-colored dorsal spots edged with lighter colors, and a light-colored stripe down the middle of their back (Stebbins 1954). Adult Texas horned lizards range in length from 3 to 5 inches, excluding their tail (Ballinger 1974). The largest Texas horned lizard on record measured just over 7 inches from tip of snout to tip of tail (Brown and Lucchino 1972). Weights of mature Texas horned lizards range from 0.9 to 3.5 ounces (Munger 1984a).

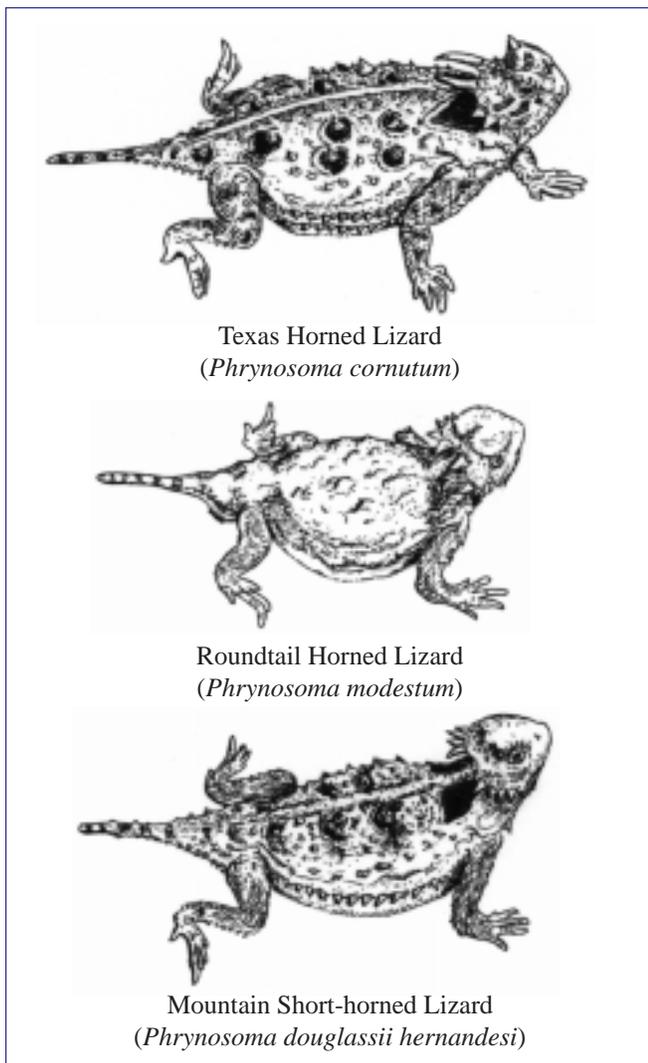


Figure 1. The 3 species of horned lizards occurring in Texas (illustrated by Diane Thompson).

DISTRIBUTION AND CURRENT STATUS

Historically within the United States, Texas horned lizards ranged throughout the south-central United States, from southern Arizona to northwestern Louisiana and from southern Texas to central Kansas (Sherbrooke 1981). Today, Texas horned lizards are found in the southeastern tip of Arizona and Colorado, southern and eastern New Mexico, most of Kansas and Texas, and all of Oklahoma.

They apparently are doing well throughout most of their range except in Texas. The current range of Texas horned lizards in Texas (Fig. 2) appears to be decreasing; they no longer occur in Texas east of an imaginary line from Fort Worth to Corpus Christi (Donaldson et al. 1994), except for small, isolated populations. Because of this decline, they are listed as a threatened species in Texas. The Texas horned lizard was one of the first species listed by Texas as

threatened on 18 July 1977 (Texas Parks and Wildlife Code 1987).

Unfortunately, there is no one obvious reason for the declining populations of Texas horned lizards in Texas. However, several ideas have been proposed (Price 1990). The first reason is a cause-and-effect relationship with red imported fire ants. The ants were first detected in Texas in 1953 (Summerlin and Green 1977) and have since spread throughout much of the state. Fire ants are thought to out-compete native harvester ants for food and space. Harvester ants are the preferred food of Texas horned lizards and if the food resource declines, Texas horned lizard numbers also will decline.

Another reason thought to cause the decline in Texas horned lizards is the widespread use of broadcast insecticides. These insecticides could be detrimental to Texas horned lizards directly by causing illness and death, or indirectly by severely reducing or eliminating their food source (i.e., insects).

A third reason attributed to their decline is over-collection. In the past, Texas horned lizards have been collected for the pet industry, by boy scout troops for trading at jamborees, for the curios trade, and by tourists to take home and show friends (Donaldson et al. 1994).

Some researchers have suggested that Texas horned lizards have declined because of the loss of habitat from urbanization, suburban sprawl, and an increasing trend to convert native rangelands to agricultural crops. The above reasons for the declining population have not been substantiated and are only speculative. Although the Texas horned lizard population appears to be declining over most of Texas, no single reason for their decline occurs statewide (such as fire ants, broadcast insecticide use, and urbanization; and, collection or possession is illegal). Most likely, a combination of factors is causing the decline of Texas horned lizards.

LIFE HISTORY

Texas horned lizards are active from March until October (Potter and Glass 1931, Fair 1995). Cessation of activity occurs with onset of cold weather during autumn (Wright 1949). They exhibit 2 types of activity patterns (Potter and Glass 1931). Activity patterns in the early spring and late fall are unimodal, with the greatest activity occurring during midday. During summer, activity patterns are bimodal, with greatest activity occurring during mid-morning and again during late afternoon. These patterns occur because the lizards are ectotherms and need the proper temperature range to function. The mean critical minimum and maximum temperatures for the species are 49°F and 119°F, respectively, with

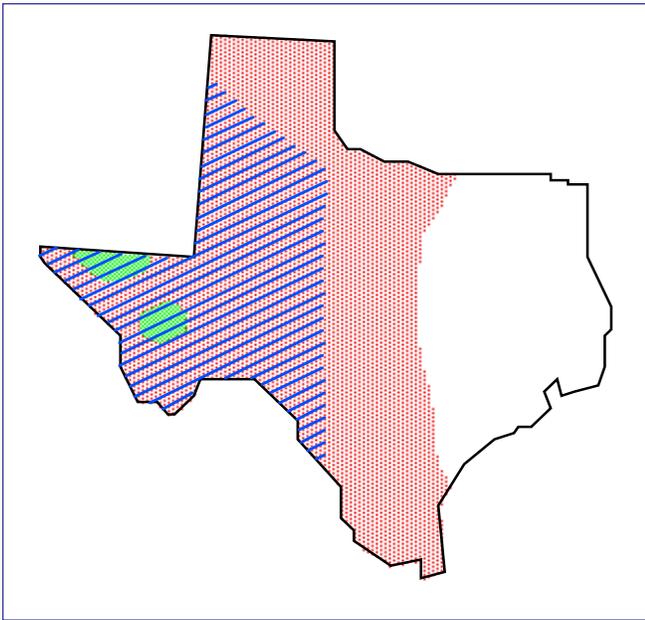


Figure 2. Approximate current range of the Texas horned lizard, roundtail horned lizard, and mountain short-horned lizard in Texas. Abundance of horned lizards varies within their respective ranges.

a mean preferred temperature of 101°F (Prieto and Whitford 1971).

Winter time inactive periods are spent buried 6 to 12 inches under the soil surface, in sheltered areas such as under rocks, stacks of wood, and abandoned animal burrows (Peslak 1985). Also, they seek covered areas under leaf litter near the base of bunch grass or a tree (Fair 1995).

Texas horned lizards breed from shortly after spring emergence until mid-July (Milne and Milne 1950). The gravid female excavates a slanted hole 4 to 6 inches in vertical depth and about 3 inches in diameter (Reeve 1952, Ramsey 1956, Peslak 1985). Eggs are deposited in 2 to 3 layers; each layer is covered with soil (Reeve 1952, Sherbrooke 1981). Once laying is completed, the female refills the hole with excavated soil, rakes the surrounding surface to disguise the nest (Ramsey 1956), and leaves the site (Sherbrooke 1981).

Clutch sizes for Texas horned lizards range from 13 to 45 eggs (Milne and Milne 1950, Ballinger 1974, Pianka and Parker 1975, Sherbrooke 1981); however, Henke (unpubl. data) recently has noted that Texas horned lizards in southern Texas appear to have clutches of <12 eggs. Eggs are elliptical and measure up to 0.75 by 0.5 inches (Sherbrooke 1981). Eggs hatch in 5 to 9 weeks, depending upon cloud cover, soil moisture, and temperature (Ramsey 1956, Sherbrooke 1981, Peslak 1985). The hatchlings emerge as fully functional and independent individuals measuring about 0.75 inch (Blaney and Kimmich 1973, Sherbrooke 1981).

Texas horned lizards are considered dietary specialists (Whitford and Bryant 1979) with 69% of their diet consisting of harvester ants (Pianka and Parker 1975). Feeding may occur at nest entrances or on ant foraging trails (Whitford and Bryant 1979) and mature lizards are capable of eating 70 to 100 ants per day (Sherbrooke 1981). Although ants comprise a majority of the diet, Texas horned lizards are opportunistic predators and will consume crickets, grasshoppers, beetles, centipedes, bees, and caterpillars (Milstead and Tinkle 1969, Munger 1984b). Texas horned lizards do not actively eat fire ants. This may be due to their inability to effectively neutralize fire ant venom; whereas, horned lizards are resistant to the venom of harvester ants (Schmidt et al. 1989). Very little is known about the diet of hatchling and juvenile horned lizards.

Anatomical and physiological adaptations allow horned lizards to live in areas where little free water is available (Milne and Milne 1950). Water requirements are met by licking morning dew from plants, rain harvesting, ingesting food, and metabolic processes (Sherbrooke 1981, 1990; Montanucci 1989).

Mortality factors of Texas horned lizards include predation, traffic accidents, exposure, starvation, and disease. The effect each mortality factor has on the population of Texas horned lizards is unknown. Munger (1986) and Fair and Henke (unpubl. data) found yearly survival rates of 35-86% and 9-54%, respectively; predation was considered to be the leading cause of death in both studies. Predators include bobcats, striped skunks, raccoons, domestic dogs and cats, hawks, owls, roadrunners, shrikes, and snakes (Miller 1948, Anderson and Ogilvie 1957, Sherbrooke 1981, Munger 1986). Young lizards are more vulnerable to predation than adults due to their small size and undeveloped spines (Sherbrooke 1981). However, little is known about mortality factors of hatchling and juvenile horned lizards.

The Texas horned lizard has several defensive behaviors to protect itself from predators. Its rough, irregular appearance combined with cryptic coloration allows them to escape detection (Reeve 1952, Peslak 1985). Other non-aggressive tactics include burrowing into the soil to avoid detection, retreating from predators, inflating its body with air, and various defensive stances (Reeve 1952, Sherbrooke 1981, Peslak 1985). Aggressive actions include hissing and lunging at the predator, biting, jabbing with the occipital horns, or ejecting blood from the conjunctival sac located near the eye (Lambert and Ferguson 1985).

Few studies have determined the longevity of Texas horned lizards. Results from mark-recapture efforts suggest that Texas horned lizards can live to be at least 5 years old. However, scientists believe

that the typical Texas horned lizard survives only 2 to 3 years.

HABITAT

Texas horned lizards occur in a variety of habitats (Donaldson et al. 1994). They inhabit areas from open desert to grasslands and shrublands, from sea level to nearly 6,000 feet in elevation, and on soils varying from pure sands and sandy loams to coarse gravels, conglomerates, and desert pavements (Price 1990). They are typically found in arid and semi-arid habitats that contain bunch grasses, cacti, yucca, mesquite, and acacias. Some reports suggest that Texas horned lizards can be found only in areas of scant vegetation (Whiting et al. 1993). Although Texas horned lizards are easier to see in areas with little or no vegetation, they often use areas with a dense vegetative canopy (Fair 1995).

Texas horned lizards prefer sandy loam and loamy sand soils (>67% sand, <15% silt, and <15% clay) that allow for easy digging of bedding, nesting, and hibernation sites and avoid areas of predominantly clay soils (Fair 1995). Also, soils that contain >2.5% soil moisture content are avoided as bedding and nesting sites (Fair 1995). Perhaps wet soils require greater expenditure of energy in which to dig or wet soils may make it more difficult for horned lizards to meet their thermoregulatory needs. Soils that are slightly alkaline (i.e., >7.4 pH) appear to be preferred by Texas horned lizards (Fair 1995). Texas horned lizards select areas with a soil surface temperature between 74 to 88°F for thermoregulation (Fair 1995) and areas with minimal ground litter for ease of movement (Whiting et al. 1993, Fair and Henke 1997a).

A 'patchy' environment consisting of open areas interspersed with >60% vegetative canopy cover and <100 stems/yard² provides Texas horned lizards with areas needed for escape cover from predators and aids thermoregulation. Habitats containing bare ground also entice newly-fertilized harvester ant queens to colonize the area (DeMers 1993). Texas horned lizard habitat must include active harvester ant mounds, because harvester ants comprise a large portion of the Texas horned lizard diet. Without this feature, few if any Texas horned lizards can be expected to occur in the area.

Texas horned lizards use about 6 acres of habitat (Fair 1995). Because they appear to avoid each other, possibly to reduce competition for food resources (Fair and Henke, unpubl. data), large tracts of contiguous habitat may be required to maintain a sustainable population. Unfortunately, it is unknown what the minimum viable population size is for Texas horned lizards and, consequently, the amount of area needed to sustain a given population.

MANAGEMENT RECOMMENDATIONS

Since the Texas horned lizard is a threatened species, it is illegal to pick up, touch, or possess them in Texas. Handling horned lizards is illegal even if your intentions are good. For example, if you help a Texas horned lizard cross the street or move it to what you believe is better habitat, you are in violation of the law and could be ticketed for your actions. Scientists are required to obtain collecting and handling permits from the Texas Parks and Wildlife Department prior to conducting research on horned lizards.

If you have habitat characteristics consistent with those previously described for Texas horned lizards and you wish to help their population recover in Texas or wish to improve existing habitat to make it more suitable for horned lizards, then the following management recommendations are offered.

1. Survey your property for Texas horned lizards.

The distribution and abundance of Texas horned lizards in Texas is unknown. To answer this question, a program called "Texas Horned Lizard Watch" was developed. The program recommends either a transect survey or a fixed-area survey, depending on the size of the property you wish to assess. Transect surveys are recommended for properties greater than 10 acres and fixed-area surveys are recommended for smaller properties. Surveys should be conducted between May 1 and September 1 during the mid-morning hours on clear days when temperatures are >75°F.

Transect surveys should be straight lines about 200 yards long. One survey route is recom-



Alan Fedynich

Harvester ants are the major food item eaten by Texas horned lizards.



Scott Henke

Presence of horned lizards on a tract of land can be determined by finding their scats (fecal pellets), which contain ant heads and a white uric acid tip.

mended per 100 acres. Multiple routes should be parallel and at least 100 yards apart. Routes should be marked so that they can be used in subsequent surveys. At least 3 counts should be conducted during summer; however, more counts would improve the reliability of the data collected. Slowly walk the survey route and count all Texas horned lizards, harvester ant mounds, and fire ant beds seen within 3 feet of either side of the transect line. Record the time elapsed to conduct the survey.

For fixed area surveys, first determine the size of the area to be sampled. This is needed to calculate the number of observations per unit area. Slowly walk the plot in parallel lines; lines should be about 6 feet apart. Record all Texas horned lizards, harvester ant mounds, and fire ant beds observed, taking care not to double-count lizards or ant beds. Record the time elapsed to conduct the survey.

Additional survey instructions and data sheets can be obtained by writing to:

Texas Horned Lizard Watch
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, Texas 78744 U.S.A.

Surveys are important, even if you believe that your property is not optimal horned lizard habitat. Not finding horned lizards may shed light on why they are not found in that particular area. Also, if your property is being managed for horned lizards, it is important to conduct sur-

veys to determine the success of the management practices.

- 2. Use prescribed fires to remove ground litter.** Texas horned lizards avoid areas with substantial ground litter because ground litter can impede their movements. Burning is a useful tool to decrease ground litter; however, it could be directly harmful to lizards. Therefore, allow the property to build up ground litter (i.e., resting the pasture from livestock grazing, etc.). By doing so, Texas horned lizards will avoid the area. Then, divide your property into several blocks and burn the blocks on a rotational time schedule (i.e., burn 1 block each year during winter or early spring). For example, a 200-acre property could be divided into 10, 20-acre blocks. At the end of a 10-year period, each block would have been burned once and the first block that was burned should contain enough ground litter to start the burning cycle again.
- 3. Avoid overgrazing by livestock.** Texas horned lizards do not appear to be negatively affected by low to moderate grazing of livestock (Fair and Henke 1997a). However, overgrazing by livestock on rangelands may substantially reduce cover needed by horned lizards for thermoregulation or to escape from predators. Thus, if grazing is practiced, try to avoid overgrazing.
- 4. Avoid disking or grading roads during the active period of horned lizards.** Texas horned lizards are active from mid-March through mid-October (Fair 1995) and often cross secondary roads and use the roadsides as resting and bedding sites. Disking or grading roads during this period could kill the lizards directly. Also, road maintenance could uncover them if they are using secondary roads for resting, nesting, or bedding sites, thereby exposing them to predators. This may be particularly critical when the ambient temperature is too cool for the lizards to seek protective cover after being disturbed.
- 5. Avoid the use of broadcast pesticides.** Pesticides could kill horned lizards directly by accumulating toxins within their body or indirectly by killing harvester ants, the main food source of adult Texas horned lizards. Without a stable food supply, horned lizards must emigrate from the area or die. If pesticides are needed, (i.e., to combat fire ants), then spot treatment is recommended rather than broadcast pesticide application.

6. Create 1 yd² areas devoid of vegetation and ground litter.

Being an ectotherm, horned lizards use the sun to regulate their body temperature. Small cleared areas provide horned lizards access to direct sunlight, which is needed to help them maintain optimal body temperature. When their body temperature rises above the preferred level, horned lizards seek shelter. Also, newly-fertilized harvester ant queens seek open areas to establish new colonies. Therefore, the creation of several small open areas per acre of land will serve 2 beneficial purposes for aiding horned lizards.

7. Create a mosaic habitat of open areas intermixed within dense cover.

Such a patchy environment will give horned lizards the proper thermoregulatory mix of habitat and offer sufficient escape cover from predators. Areas where vegetation canopy cover may be up to 100% (i.e., no sunlight reaching the ground) are suitable, as long as the individual stems of plants are not too close together to impede the movement of horned lizards.

8. Remove feral domesticated predators.

Keep in mind that avian predators (i.e., hawks, owls, roadrunners, etc.) are protected by federal law and cannot be killed or trapped. However, feral cats and dogs also are predators of horned lizards and can be removed from an area. Contact the local Humane Society for assistance in removing these domestic predators.

9. Develop a habitat that contains a diversity of native plant species.

A diverse community of native plants will attract a diverse community of insects. Although Texas horned lizards prefer a diet of harvester ants, a number of other insect species are consumed. Also, juvenile Texas horned lizards appear to eat a greater variety of insects than their adult counterparts. By increasing the amount of prey available for horned lizards to consume, you reduce the chances that lack of food will be the limiting factor governing their abundance.

10. Limit driving on secondary roads during peak times of horned lizard activity.

Fair and Henke (1997b) noted that vehicular accidents were a significant mortality factor of horned lizards. Henke and Montemayor (1998) found that April through July resulted in the greatest number of encounters with Texas horned lizards on secondary roads in southern Texas. During these months, more horned lizards were encountered on secondary roads from late after-

noon to sunset in April and May, while morning hours resulted in a greater number of lizard encounters in June and July.

11. Plant native bunch grasses.

If your interests include reclaiming a previous agricultural area or planting a lawn, plant native bunch grass such as buffalo grass. Bunch grass forms clumps that allows horned lizards to easily move among the grass clumps; whereas carpet grasses form a thick mat that can impede horned lizard movement.

12. Become a member of the Horned Lizard Conservation Society.

The Horned Lizard Conservation Society is a nonprofit organization dedicated to the conservation and recovery of declining horned lizard populations. They publish a quarterly newsletter that discusses current events concerning horned lizards, are active in research and recovery of horned lizards, and educate the public concerning horned lizard issues. To become a member, write to:

Horned Lizard Conservation Society
P.O. Box 122
Austin, Texas 78767 U.S.A.

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Prescribed burning to remove thick vegetation litter can improve Texas horned lizard habitat.

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