

**PETITION TO LIST THE
SPOT-TAILED EARLESS LIZARD (*Holbrookia lacerata*)
UNDER THE U.S. ENDANGERED SPECIES ACT**



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**Petition Submitted to the U.S. Secretary of Interior
Acting through the U.S. Fish and Wildlife Service**

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I. Introduction: Petition Request

WildEarth Guardians hereby petitions the Secretary of the Interior and the U.S. Fish and Wildlife Service (“FWS” or “the Service”) to issue a rule listing the spot-tailed earless lizard (*Holbrookia lacerata* Cope 1880) as Threatened or Endangered under the Endangered Species Act, (“ESA”) 16 U.S.C. § 1531 *et seq.* throughout its historic range and to designate critical habitat for the species. This petition includes all possible *H. lacerata* subspecies. At this time, there are two known subspecies: *H. l. lacerata* and *H. l. subcaudalis*. This petition is filed under 5 U.S.C. § 553(e), 16 U.S.C. § 1533(b)(3)(A) and 50 C.F.R. § 424.19 (1987), bestowing interested persons the right to petition for issuance of a rule.

Spot-tailed earless lizard populations have declined to the point where the species is nearing extinction (see TNC 2009a; TNC 2009b; TNC undated). In fact *H. l. subcaudalis* may already be extinct in the wild (Axtell, pers. com. 2009). *H. lacerata*’s historic range includes south-central Texas in the United States and north-eastern Mexico within the Great Plains.

Agricultural uses of herbicides and pesticides are the biggest threats to the species’ survival in the U.S. (Hammerson et al. 2007; NatureServe 2009). Other threats across the species’ range include conversion of native habitat to cropland, the planting of exotic grasses for livestock, fragmentation of habitat with road construction, urbanization and suburbanization and red imported fire ant (*Solenopsis invicta*) predation (Hammerson et al. 2007; Todd et al. 2008; NatureServe 2009).

Spot-tailed earless lizards need immediate federal protection under the ESA. The species currently receives no protection by Texas state laws or regulations. It is not on the Texas threatened or endangered species lists. ESA listing would benefit *H. lacerata* in several ways, and ultimately, help avert the species’ extinction in the wild.

II. Endangered Species Act Implementing Regulations

Section 424 of the regulations implementing the Endangered Species Act (50 C.F.R. § 424) is applicable to this petition. Subsections that concern the formal listing of the spot-tailed earless lizard as an Endangered or Threatened species are:

424.02(e) “*Endangered species* means a species that is in danger of extinction throughout all or a significant portion of its range.”... (k) “species” includes any species or subspecies that interbreeds when mature. *See also* 16 U.S.C § 1532(6).

(m) “*Threatened species* means any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” *See also* 16 U.S.C § 1532(20).

ESA Section 4 (16 U.S.C. § 1533(a)(1)) sets forth listing factors under which a species can qualify for ESA protection (see also 50 C.F.R. § 424.11(c)):

- A. The present or threatened destruction, modification, or curtailment of habitat or range;
- B. Overutilization for commercial, recreational, scientific, or educational purposes;
- C. Disease or predation;
- D. The inadequacy of existing regulatory mechanisms; and
- E. Other natural or manmade factors affecting its continued existence.

At least four of the factors listed above (A, C, D, and E) set forth in 50 C.F.R. § 424.11(c) and in ESA Section 4 (16 U.S.C. § 1533(a)(1)) have resulted in the continued decline of *H. lacerata* and are causing the species to face extinction or endangerment in the foreseeable future. A taxon needs to meet only one of the listing factors outlined in the ESA to qualify for federal listing.

III. Species Characteristics

A. Taxonomy

Throughout this petition we refer to this species as *H. lacerata* and its common name: spot-tailed earless lizard. The species is separated into two distinct subspecies: the northern spot-tailed earless lizard or the plateau earless lizard (*H. lacerata lacerata* Cope 1880) and the southern spot-tailed earless lizard or southern earless lizard (*H. lacerata subcaudalis* Axtell 1956) (Dixon 1987; Conant 1991; Dixon 2000; ITIS 2009). As addressed above, this petition seeks Endangered or Threatened listing for all subspecies.

Table 1. Taxonomic Hierarchy (adapted from ITIS 2009)

Kingdom	Animalia
Phylum	Chordata
Subphylum	Vertebrata
Class	Reptilia
Order	Squamata
Suborder	Iguania
Family	Phrynosomatidae
Genus	Holbrookia
Species	Holbrookia lacerata Cope, 1880
Subspecies	Holbrookia lacerata lacerata Cope, 1880
Subspecies	Holbrookia lacerata subcaudalis Axtell, 1956

B. General Description

H. lacerata is a small lizard that averages 11.5-15.2 cm (4.5-6.0 in) from the nose to the end of the tail (Conant and Collins 1991). Conant and Collins (1991: 101) described it as:

Most conspicuously spotted of all earless lizards. Three separate sets of markings can be checked: (a) dark dorsal spots *surrounded* by light pigments; (b) about seven rounded dark spots under tail ...; and (c) dusky to black oval streaks at edge

of abdomen (these variable in number – from four to only one, or even absent).
Sexes patterned alike.

Conant and Collins (1991: 101) described the distinctive features of each subspecies; *H. l. lacerata* has “(d)ark blotches usually fused together in pairs, producing the effect of a single row on each side of back; femoral pores average 13,” and *H. l. subcaudalis* has “(t)wo distinct rows of dark blotches down each side of back; femoral pores average 16 under each hind leg.”

Researchers have found home ranges of lizards in the *Phrynomatid* family to be relatively small, less than 0.5-1.0 ha (1.2-1.5 ac). Spot-tailed earless lizards are diurnal. They feed on small invertebrates.

Spot-tailed earless lizards double clutch, laying about 4-12 eggs between May and June and also July and August (Fitch 1970). They lay their eggs underground. The reptiles’ eggs hatch after 4-5 weeks (Fitch 1970).

C. Habitat Requirements

H. lacerata inhabits flat and open prairie and meadows, sand dune, chaparral-shrubland, mixed woodland areas, and graded roads (Axtell 1968; NatureServe 2009). The species also occurs in desert habitats in Mexico. The lizards burrow in soil, fallen logs, and other ground debris. The animals avoid obstructions, such as waterways, buildings, and pavement. Spot-tailed earless lizards require some habitat with sparse vegetation or bare ground to keep its path clear of obstructions.

The Texas Parks and Wildlife Department (TPWD 2005a) described differences in habitat associations between the two *H. lacerata* subspecies. *H. l. lacerata* apparently prefers “caliche soils of the Edwards plateau in moderately open prairie-brushland; also oak-juniper woodlands and mesquite associations” (TPWD 2005a: 1093). *H. l. subcaudalis* is most often found “in association with dark clay and clay-loam soils; includes mesquite-prickly-pear associations; flatter areas” (TPWD 2005a: 1093).

IV. Distribution and Population Trends

A. Distribution

H. lacerata is a species of the Great Plains prairies. The spot-tailed earless lizard historically ranged from Comanche County, Oklahoma (Webb and Ortenburger 1953), across central and southern Texas and down through the Mexican states of Coahuila, Nuevo Leon and Tamaulipas (Axtell 1968; Conant and Collins 1991; Dixon 2000; TPWD 2005; Hammerson et al. 2007). See Figure 1. The spot-tailed earless lizard historically occurred across 75 counties in central and southern Texas (TPWD 2005b). See Figure 2 and Table 2.

Figure 1. *H. lacerata* Range Map (NatureServe 2009)

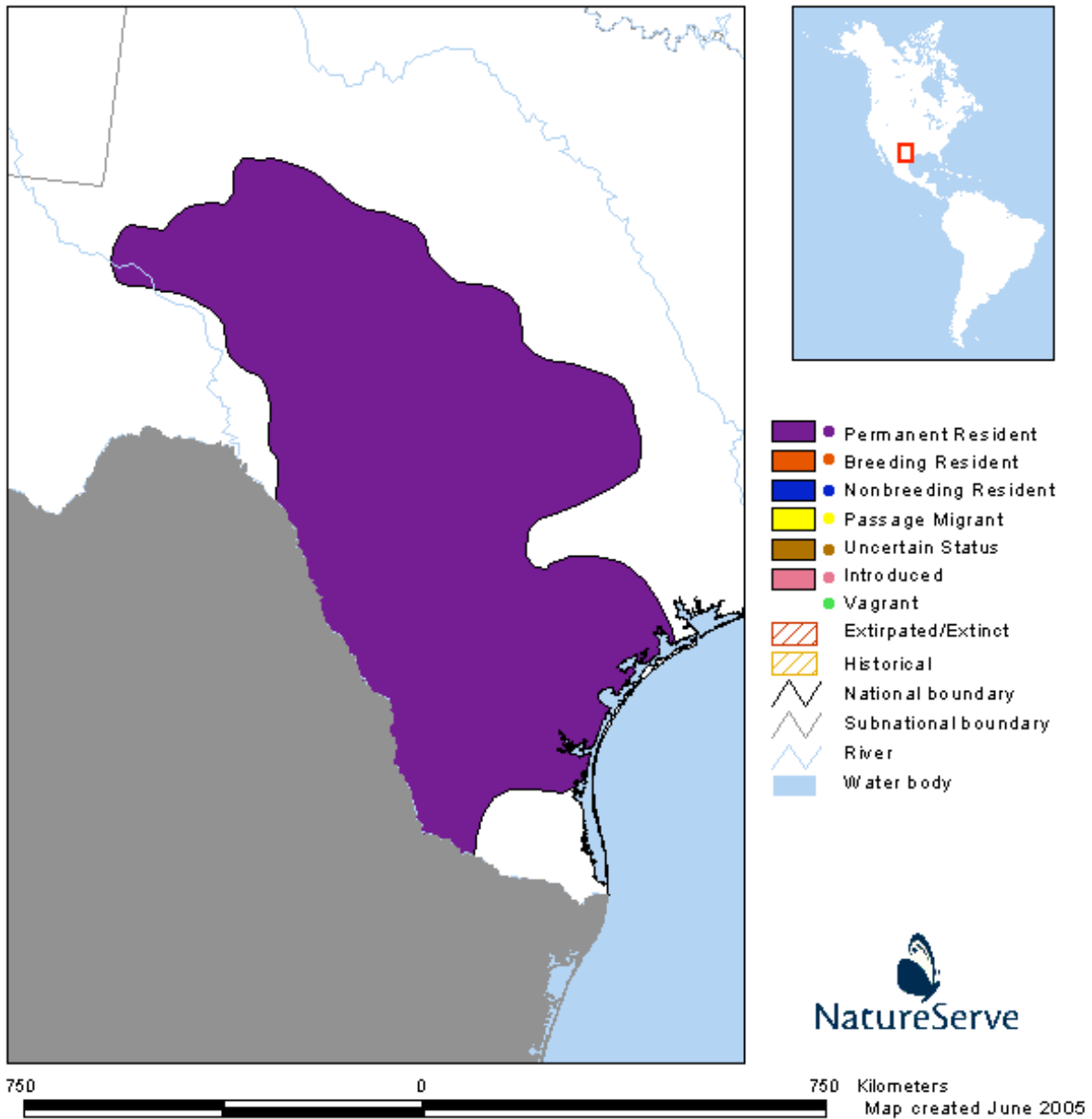
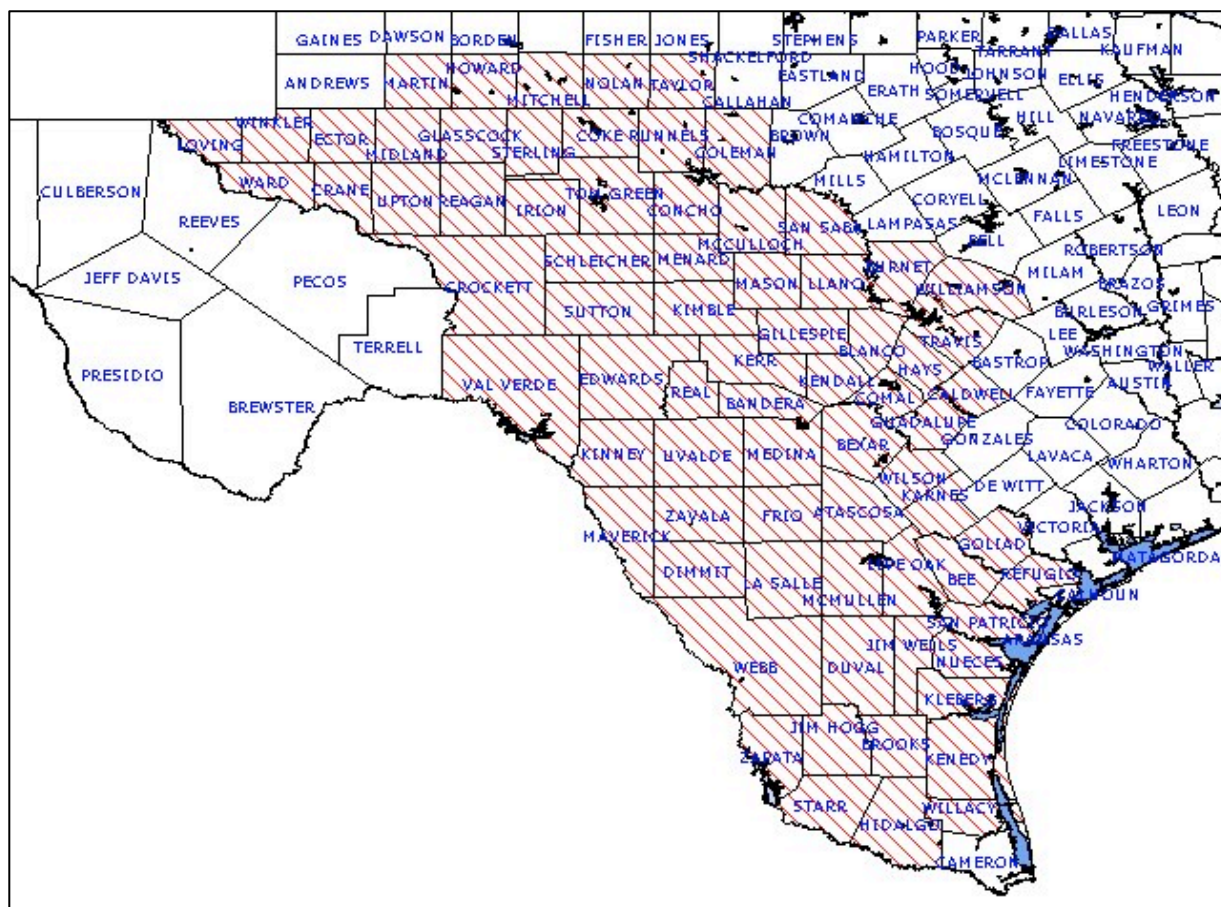
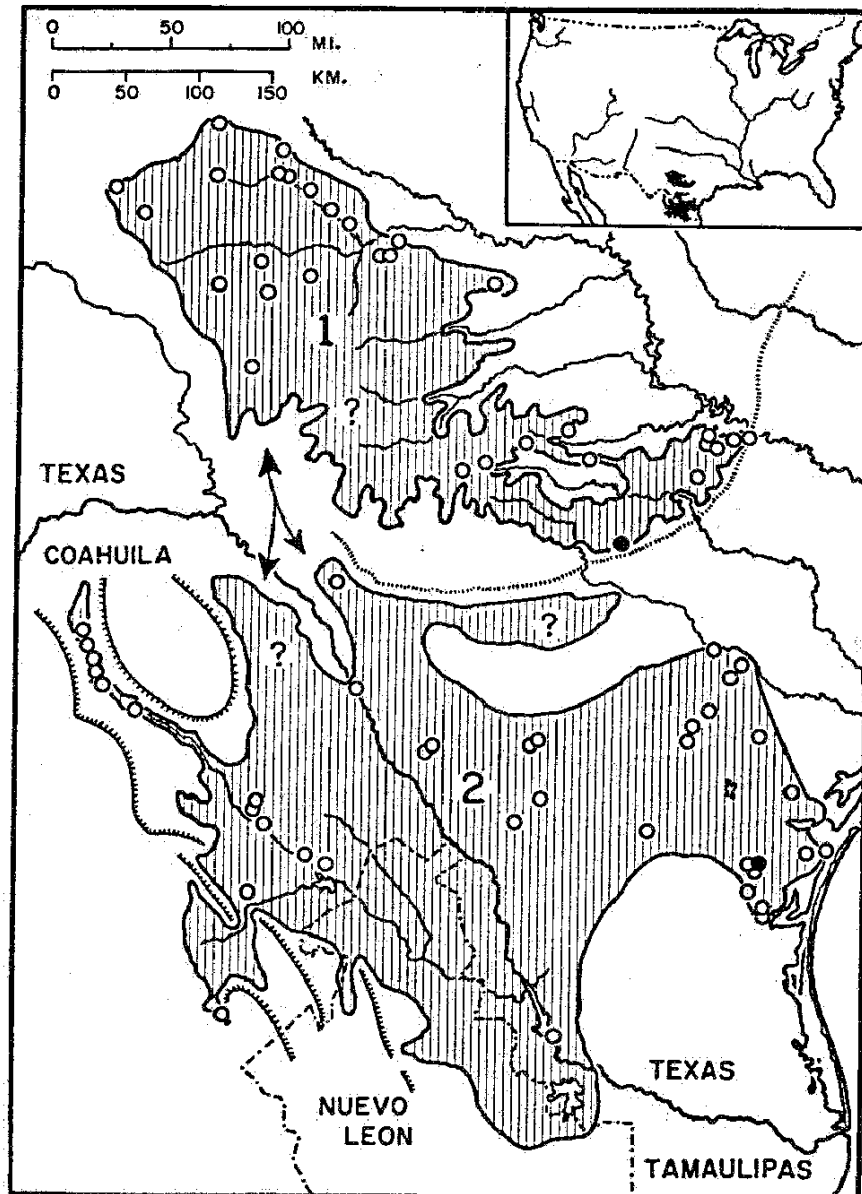


Figure 2. Spot-tailed Earless Lizard Range in Texas (TPWD 2005b)**Table 2. Texas Counties within the Spot-tailed Earless Lizard Range (TPWD 2005b)**

Atascosa	Bandera	Bee	Bexar	Blanco
Brooks	Burnet	Caldwell	Coke	Coleman
Comal	Concho	Crane	Crockett	Dimmit
Duval	Ector	Edwards	Frio	Gillespie
Glasscock	Goliad	Guadalupe	Hays	Hidalgo
Howard	Irion	Jim Hogg	Jim Wells	Karnes
Kendall	Kenedy	Kerr	Kimble	Kinney
Kleberg	La Salle	Live Oak	Llano	Loving
Martin	Mason	Maverick	McCulloch	McMullen
Medina	Menard	Midland	Mitchell	Nolan
Nueces	Reagan	Real	Refugio	Runnels
San Patricio	San Saba	Schleicher	Starr	Sterling
Sutton	Taylor	Tom Green	Travis	Upton
Uvalde	Val Verde	Ward	Webb	Willacy
Williamson	Wilson	Winkler	Zapata	Zavala

The Balcones Escarpment in Texas demarcates the subspecies' ranges and serves as a barrier to genetic exchange (Axtell 1968; Dixon 1987; Dixon 2000; Hammerson et al. 2007). *H. l. lacerata* historically existed from the Edwards Plateau region northwestward (Conant and Collins 1991). *H. l. subcaudalis* resided down through south Texas and northern Mexico. See Figure 3.

Figure 3. Ranges of *H. l. lacerata* and *H. I. subcaudalis* (Axtell 1968: 56.1)



MAP. The solid symbols mark the type-localities; hollow symbols show other localities. The Balcones Escarpment is shown by a line of hatches. Hatched lines indicate upland areas in Mexico.

NatureServe (2009) reported that all populations of spot-tailed earless lizards that once existed along the east coast have been extirpated. The Texas Parks and Wildlife Department reported that the species has been extirpated from eastern portions of its historic range (TPWD 2005a). The Department acknowledged that the *H. lacerata* “has already apparently disappeared from much of its historical range” (TPWD 2005a: 1094). The species apparently no longer occurs in Oklahoma. Thus, the species is absent from a significant portion of its range.

B. Population Status

Researchers and conservation institutions agree that spot-tailed earless lizard populations are declining. The IUCN Red List ranked the spot-tailed earless lizard as Near Threatened in 2007 (Hammerson 2007). The Nature Conservancy (TNC)’s NatureServe (2009) database ranked the species as a G3G4 with a rounded global status of G3 (Vulnerable) in 2005. Hammerson et al. (2007) and NatureServe (2009) reported that the species has been declining since the early 1970s. NatureServe (2009) further stated, “populations on the western periphery of the range and in southern Texas near the Rio Grande are declining; a few populations in this area still remain (R. Axtell, pers. comm., 1997).” NatureServe (2009) reported that *H. lacerata* populations are experiencing a short-term decline of 10-30%. The institution predicted a long-term change of 25% to a decline of 50%. Hammerson et al. (2007) noted that researchers have failed to observe the lizard in places where it was once found.

Recent reports tell the story of a species nearing extinction. In fact, *H. l. subcaudalis* is possibly extinct (Axtell, pers. com. 2009). The Nature Conservancy of Texas received a grant from the Texas Parks and Wildlife Department for a population survey of *H. lacerata*. News reports about TNC’s study indicate that few lizards remain in the wild. As reported by *The Record Live.Com* (2009) of Orange County, Texas:

Mike Duran, a vertebrate zoologist with The Nature Conservancy of Texas, said that while the spot-tailed earless lizard is not officially listed as threatened or endangered, there has been concern among scientists for the status of the reptile for some time, and its demise could underscore important environmental changes. Once thought to reside widely in Texas within a rough circle outlined by Pecos, San Angelo, Austin, Corpus Christi and Laredo, the lizard today is very rarely seen.

“On surveys that we have conducted for The Nature Conservancy within the range of the species, we have never seen it,” Duran said.

He noted that Ralph Axtell, a professor at Southern Illinois University-Edwardsville who is considered the leading expert on the spot-tailed earless lizard, believes it may now be gone from many of the places where it used to reside.

“When you have a species disappearing from its historic range, it’s indicative of something going on with the environment,” Duran said. “In this case, we’re guessing that it’s pesticide use. If pesticide use is so devastating that it’s wiping

out an entire species, that's something we need to take a closer look at.”

He points to another species that was almost driven into extinction by the use of pesticides – the bald eagle. “We saw a tremendous decline in bald eagles,” he said. “They almost became extinct. But studies revealed that the reason for the decline with bald eagles, which may be the case with the spot-tailed earless lizard, was pesticides. We were able to do something about that, and bald eagles are no longer endangered.

Raising awareness of the species is a key step toward conserving it.”

As reported by the *Associated Press* (2009), “The reptiles used to be all over South Texas, but biologists have failed in recent years to find many of the critters that once crawled the dusty wide-open landscape from San Angelo to Laredo. The *Associated Press* article added, “All of the places we're looking for it, we're just not finding it,” said Nature Conservancy zoologist Mike Duran...”

V. Endangered Species Listing Factors

In its most recent ranking report from 2005, NatureServe (2009) concluded that localized threats to spot-tailed earless lizards were “substantial”. And though it found threats “moderate,” it set the immediacy of threats as “high”.

A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

The conversion of native *H. lacerata* habitat to cropland and non-native grasses for livestock production is a significant threat (NatureServe 2009). The Texas Parks and Wildlife Department reported that the eastern portion of the species’ historic range has is now in agricultural production (TPWD 2005a).

Habitat fragmentation by road construction and development has been a major destroyer of spot-tailed earless habitat and continue to be a threat (*Ibid.*). The total human population of the counties included within the spot-tailed earless lizard range increased by 33% between 1990 and 2008 to over 6.2 million people (U.S. Census Bureau 2008) See Table 3 and Figure 4. Five counties in Texas are among the 100 fastest growing counties in the U.S (U.S. Census Bureau 2009). See Table 4. The U.S. has 3,141 counties.

Habitat alteration and destruction, such as clearcutting *H. lacerata*’s woodland habitat, likely exacerbate the spread of red imported fire ants—a threat to lizard populations. A study by Todd et al. (2008) found that the exotic ant abundance increases with disturbances of native species habitat.

Table 3. Human Population Trends in the Texas Counties of the Spot-tailed Earless Lizard Range (U.S. Census Bureau 2008)

County	1990	2000	2008	County	1990	2000	2008
Atascosa	30,533	38,628	43,877	Martin	4,956	4,746	4,513
Bandera	10,562	17,645	20,303	Mason	3,423	3,738	3,882
Bee	25,135	32,359	32,661	Maverick	36,378	47,297	52,279
Bexar	1,185,394	1,392,931	1,622,899	Martin	4,956	4,746	4,513
Blanco	5,972	8,418	9,082	Mason	3,423	3,738	3,882
Brooks	8,204	7,976	7,549	Maverick	36,378	47,297	52,279
Burnet	22,677	34,147	44,488	McCulloch	8,778	8,205	7,943
Caldwell	26,392	32,194	36,899	McMullen	817	851	837
Coke	3,424	3,864	3,480	Medina	27,312	39,304	44,275
Coleman	9,710	9,235	8,577	Menard	2,252	2,360	2,138
Comal	51,832	78,021	109,635	Midland	106,611	116,009	129,494
Concho	3,044	3,966	3,610	Mitchell	8,016	9,698	9,230
Crane	4,652	3,996	4,017	Nolan	16,594	15,802	14,879
Crockett	4,078	4,099	3,802	Nueces	291,145	313,645	322,077
Dimmit	10,433	10,248	9,758	Reagan	4,514	3,326	3,086
Duval	12,918	13,120	12,033	Real	2,412	3,047	2,875
Ector	118,934	121,123	131,941	Refugio	7,976	7,828	7,350
Edwards	2,266	2,162	1,952	Runnels	11,294	11,495	10,273
Frio	13,472	16,252	16,163	San Patricio	58,749	67,138	68,399
Gillespie	17,204	20,814	23,782	San Saba	5,401	6,186	5,881
Glasscock	1,447	1,406	1,212	Schleicher	2,990	2,935	2,819
Goliad	5,980	6,928	7,152	Starr	40,518	53,597	62,249
Guadalupe	64,873	89,023	117,172	Sterling	1,438	1,393	1,257
Hays	65,614	97,589	149,476	Sutton	4,135	4,077	4,270
Hidalgo	383,545	569,463	726,604	Taylor	119,655	126,555	126,791
Howard	32,343	33,627	32,537	Tom Green	98,458	104,010	107,864
Irion	1,629	1,771	1,699	Travis	576,407	812,280	998,543
Jim Hogg	5,109	5,281	5,016	Upton	4,447	3,404	3,149
Jim Wells	37,679	39,326	41,069	Uvalde	23,340	25,926	26,461
Karnes	12,455	15,446	15,051	Val Verde	38,721	44,856	48,053
Kendall	14,589	23,743	32,886	Ward	13,115	10,909	10,549
Kenedy	460	414	388	Webb	133,239	193,117	236,941
Kerr	36,304	43,653	48,269	Willacy	17,705	20,082	20,600
Kimble	4,122	4,468	4,432	Williamson	139,551	249,967	394,193
Kinney	3,119	3,379	3,233	Wilson	22,650	32,408	40,398
Kleberg	30,274	31,549	30,739	Winkler	8,626	7,173	6,675
La Salle	5,254	5,866	5,861	Zapata	9,279	12,182	13,847
Live Oak	9,556	12,309	11,247	Zavala	12,162	11,600	11,678
Llano	11,631	17,044	18,400				
Loving	107	67	42	TOTAL	4,155,990	5,230,696	6,204,741

Figure 4. Total Human Population Growth in the 75 Counties of the Spot-tailed Earless Lizard Historic Range (U.S. Census Bureau 2008)

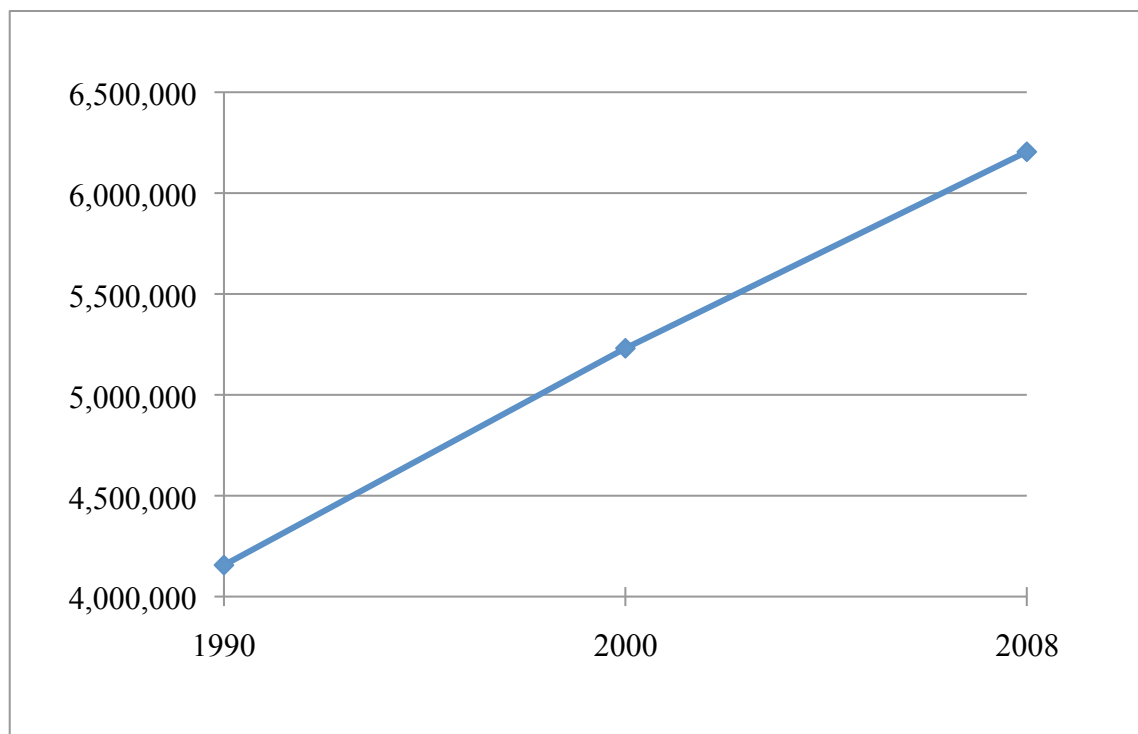


Table 4. Texas Counties in the Spot-tailed Earless Lizard Range that are among the 100 Fastest Growing U.S. Counties with 10,000 or More Population (adapted from U.S. Census Bureau 2009)

Rank	Geographic Area	Population Estimates		Change, 2000 to 2008	
		July 1, 2008	April 1, 2000 Estimates Base	Number	Percent
12	Williamson County, TX	394,193	249,982	144,211	57.7
16	Hays County, TX	149,476	97,575	51,901	53.2
39	Comal County, TX	109,635	78,021	31,614	40.5
47	Kendall County, TX	32,886	23,746	9,140	38.5
95	Guadalupe County, TX	117,172	89,034	28,138	31.6

Note: The April 1, 2000 estimates base reflects changes to the Census 2000 population resulting from legal boundary updates as of January 1 of the estimates year, other geographic program changes, and Count Question Resolution actions. All geographic boundaries for the 2008 population estimates series are defined as of January 1, 2008.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The extent of this threat is currently unknown. The FWS should investigate whether collecting for scientific purposes or the pet trade is a threat in the course of a full status review for this species.

C. Disease or Predation

The scientific literature does not indicate that disease is a known threat to the species. The FWS should investigate whether disease is a threat in the course of a full status review for this species. Gibbons et al. (2000) noted that reptiles can be susceptible to a variety of diseases.

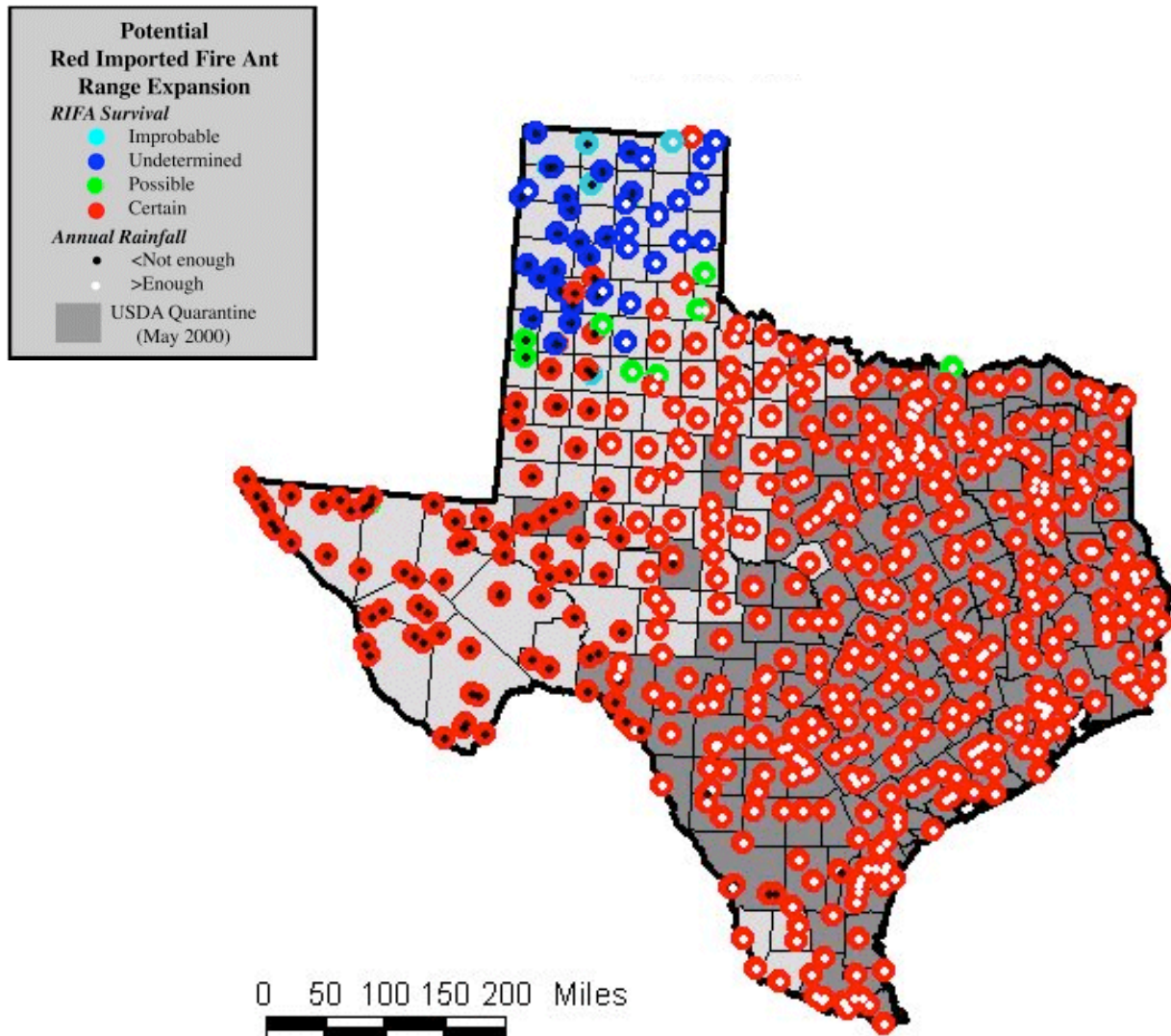
Hammerson et al. (2007) listed the existence of red imported fire ants in the spot-tailed earless lizard's habitat as a threat to the species. The current range of the fire ant covers the entire current spot-tailed earless lizard range. See Figure 5. Humans accidentally introduced red imported fire ants to Alabama in the 1930s; they have since spread across the southern U.S. (Wojick et al. 2001). The ants invaded Texas in the 1950s. *S. invicta*'s range has spread across most of Texas. The ants prey on reptiles and their eggs and are contributing to the decline of native species (Reagan et al. 2000; Allen et al. 2004). Red imported fire ants predate eggs, hatchlings, and adult animals (Wojick et al. 2001). They also sting when disturbed, which can injure and kill victims.

Habitat disturbances can lead to invasions by the ants across specific locations (Zettler et al. 2004). Their colonies multiply in disturbed and early-succession areas. For example, clearcutting in spot-tailed earless lizard woodland habitat could trigger fire ant invasions. Todd et al. (2008: 540) stated:

Additionally, because clearcutting has been shown to negatively affect amphibian and reptile populations (e.g., Russell et al. 2004; Todd and Rothermel 2006), the dual threats of invasive *S. invicta* and habitat alteration may compound negative impacts on reptiles and amphibians, possibly causing greater local population declines than either threat singly.

As noted above, spot-tailed earless lizards burrow into fallen logs and other ground debris and use these as escape habitat and cover in harsh environmental conditions. This can be a trap for the animals in areas where red imported fire ants have invaded; the ants heavily colonize woody debris in clearcut areas (Todd et al. 2008).

Figure 5. Red Imported Fire Ant Range (USDA 2006)



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D. The Inadequacy of Existing Regulatory Mechanisms

H. lacerata has no regulatory protection. The species is a federal Species of Concern, but this designation confers no mandated safeguards.

NatureServe (2009) reported that only 1-2 spot-tailed earless lizard populations are “appropriately protected and managed.” Some of these locations where the lizard may be protected include TNC’s Dolan Falls property between Sonora and Del Rio, Texas; Seminole Canyon State Park west of Comstock, Texas; and Lake Amistad National Recreation Area on the Mexican border near Del Rio, Texas. However, occurrences of the species in these locations have not been confirmed. NatureServe (2009) ranks the spot-tailed earless lizard as a G3 (Vulnerable) species. It ranks the species as S3 (Vulnerable) in Texas.

The IUCN Red List ranks *H. lacerata* as Near Threatened (Hammerson et al. 2008). The international institution lists the species population status as decreasing.

The Texas Comprehensive Wildlife Conservation Strategy of 2005-2020 listed the spot-tailed earless lizard as a species of Species Concern but a Low conservation priority (TWPD 2005a). The Texas Parks and Wildlife Department proposed the following conservation measures for the species in its 2005-2010 Comprehensive Wildlife Conservation Strategy (TWPD 2005a: 1094):

- Perform an update of this species’ current and historical status: Use GIS to identify habitat and historical populations; perform systematic surveys for extant populations; perform museum and literature surveys; create new GIS database.
- Identify secure populations and perform ecological studies.
- Discourage use of insecticides near known populations.
- Discourage conversion of habitat to agriculture near known populations.
- Discourage road building and development near known populations.
- Make the public aware of this species.

As noted above, the Texas wildlife department funded The Nature Conservancy to conduct a survey to find existing populations of spot-tailed earless lizards. The survey along with information provided by The Nature Conservancy and the state are likely raising awareness about the species. Texas’ measures to “discourage” the use of insecticides, habitat conversion to agricultural uses, and road building are important. However, it is doubtful and at best uncertain that these measures will be undertaken to a level that will prevent extinction of *H. lacerata*, especially given the species’ position as Low priority under the state’s conservation strategy. Listing the spot-tailed earless lizard under the Endangered Species Act would provide a legal and regulatory mandate to carry out such measures as well as provide additional funding for research and conservation.

E. Other Natural or Manmade Factors Affecting its Continued Existence

1. Pollutants and Agricultural Chemicals

The most severe threat to the spot-tailed earless lizard's survival is the use of agricultural pesticides and herbicides (NatureServe 2009). Environmental pollutants are likely a major threat to reptiles around the globe (Gibbons et al. 2000). For example, Carbaryl—among the most widely used pesticides in the United States—negatively affects locomotion, energy use, and overall fitness of terrestrial lizards (DuRant 2006; DuRant 2007a; DuRant 2007b). Atrazine, another popular pesticide, is believed to serve as an endocrine disruptor in reptiles (Deb 2005).

2. Movement Obstructions

Spot-tailed earless lizards that try to cross highways usually do not make it alive (NatureServe 2009). Buildings, pavement, and human structures serve as barriers to the lizard's movement. Other barriers include rivers, ponds, and lakes.

3. Climate Change

Climate change poses a fundamental challenge for species survival in coming years and decades. Climate change is already causing a rise in temperatures across the United States and an increase in extreme weather events, such as droughts and increased rainfall (Parmesan et al. 2000; NSC 2003; CCSP 2008; Karl et al. 2009). Temperatures during the latter period of warming have increased at a rate comparable to the rates of warming that conservative projections predict will occur during the next century with continued increases of greenhouse gases. A 2007 report from the Intergovernmental Panel on Climate Change described the rising temperature trend (IPCC 2007: 30):

Eleven of the last twelve years (1995-2006) rank among the twelve warmest years in the instrumental record of global surface temperature (since 1850). The 100-year linear trend (1906-2005) of 0.74 [0.56 to 0.92]°C is larger than the corresponding trend of 0.6 [0.4 to 0.8]°C (1901-2000) given in the TAR (Figure 1.1). The linear warming trend over the 50 years from 1956 to 2005 (0.13 [0.10 to 0.16]°C per decade) is nearly twice that for the 100 years from 1906 to 2005.

As climate change progresses, maximum high and minimum low temperatures are expected to increase, as are the magnitude and duration of regional droughts (IPCC 2001). The most recent IPCC report (IPCC 2007: 48) predicted the follow impacts on ecosystems from climate change:

- The resilience of many ecosystems is *likely* to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g. flooding, drought, wildfire, insects, ocean acidification) and other global change drivers (e.g. landuse change, pollution, fragmentation of natural systems, overexploitation of resources).

- Over the course of this century, net carbon uptake by terrestrial ecosystems is *likely* to peak before mid-century and then weaken or even reverse¹⁶, thus amplifying climate change.
- Approximately 20 to 30% of plant and animal species assessed so far are *likely* to be at increased risk of extinction if increases in global average temperature exceed 1.5 to 2.5°C (*medium confidence*).
- For increases in global average temperature exceeding 1.5 to 2.5°C and in concomitant atmospheric CO₂ concentrations, there are projected to be major changes in ecosystem structure and function, species' ecological interactions and shifts in species' geographical ranges, with predominantly negative consequences for biodiversity and ecosystem goods and services, e.g. water and food supply.

In the spot-tailed earless lizard's Great Plains range, climate change is expected to cause more extreme and frequent weather events that include droughts, heavy rainfall, and heat waves (Karl et al. 2009). Temperatures are expected to increase significantly. See Figure 6. The species may not be able to adapt to these changes. Karl et al. (2009: 126) described the predicted affects of climate change impacts to Great Plains ecosystems:

Climate-driven changes are likely to combine with other human-induced stresses to further increase the vulnerability of natural ecosystems to pests, invasive species, and loss of native species. Changes in temperature and precipitation affect the composition and diversity of native animals and plants through altering their breeding patterns, water and food supply, and habitat availability. In a changing climate, populations of some pests such as red fire ants and rodents, better adapted to a warmer climate, are projected to increase.

Fischlin et al. (2007) proposed that the productivity, structure, and carbon balance of grassland ecosystems are extremely sensitive to climatic shifts. Root and Schneider (2001: 29) addressed how climate is likely to affect animals tied to particular vegetation types, such as the spot-tailed earless lizard:

The anticipated changes in plant ranges will probably have dramatic effects on animals, both on the large biogeographic scale and on the local scale. The ranges of many animals are strongly linked to vegetation. ... Consequently, the ranges of various animals that rely on specific vegetation will change as the ranges of these plants shift, assuming that some other factor is not limiting these animals. If the climate changes more rapidly than the dispersal rates of the plants, it could result in extensive plant die-offs in the south or downslope before individuals can disperse and become established in the north and upslope. Thus the ranges of animals relying on these plants could become compressed, and in some instances, both the plants and the animals could become extinct.

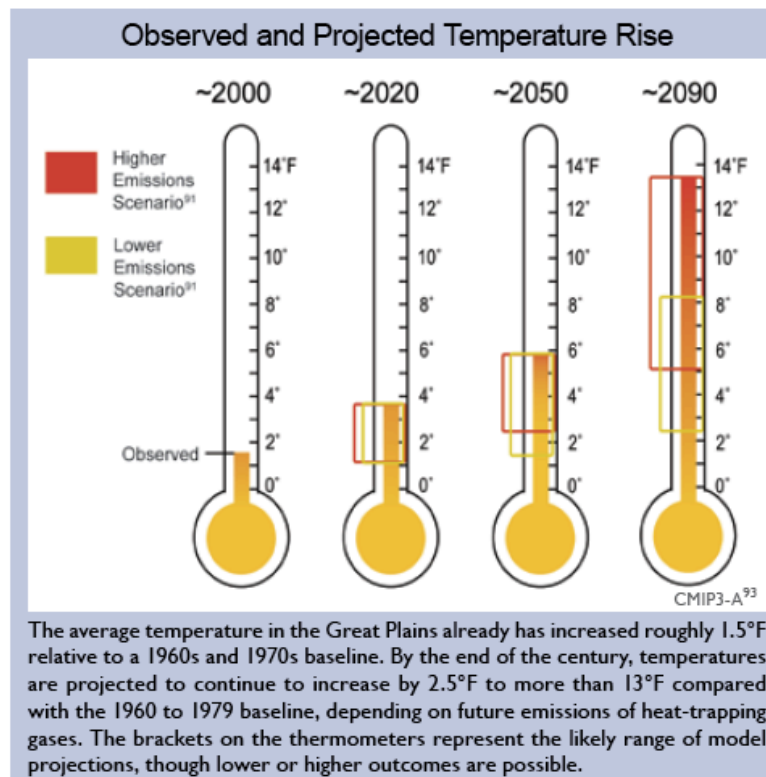
Gibbons et al. (2000: 660) discussed the potential impacts of global climate change on reptiles:

Although many habitats are expected to under go dramatic change (e.g., Guertin et al.1997, Still et al. 1999), predictions of species habitat shifts in response to global warming cannot be based solely on analyses of climate–space changes, because species distributions are also a function of dispersal ability and biotic interactions (Davis et al. 1998). Existing nature reserves will be inadequate to preserve current biodiversity, because an already fragmented landscape will impede the ability of species to respond to climate-induced habitat changes (Halpin 1997). Because of their limited dispersal abilities, reptiles and amphibians are especially vulnerable to rapid habitat changes and may suffer many more extinctions than birds as a result of a rapid rate of climate change (Schneider and Root 1998).

As with the amphibian studies, few researchers have directly assessed effects of climate change on reptiles. It is nonetheless reasonable to expect that climate changes could result in conditions that eliminate or severely restrict species with limited distributions (Schneider and Root 1998), as has been suggested for some Australian lizards (Breerton et al.1995) and crotaline snakes of North America and the neotropics (Greene and Campbell 1993). Additional effects of warming on some reptiles, based on empirical evidence with freshwater turtles, include enhanced juvenile growth rates, earlier ages at maturity, and shifts in functional sex ratios (Frazer et al. 1993).

Climate change may already be negatively affecting the spot-tailed earless lizard.

Figure 6. Predicted Temperature Increases in the Great Plains Due to Climate Change (Karl et al. 2009)



VI. Conclusion

The spot-tailed earless lizard merits listing as Threatened or Endangered throughout its range under the Endangered Species Act. The species is nearing extinction, and its subspecies *H. l. subcaudalis* may already be extinct. It is now extirpated across the eastern coastal areas of its range. Spot-tailed earless lizards face numerous threats including, but not limited to, conversion of habitat for agriculture and development, predation by red imported fire ants, lack of regulatory protection, agricultural chemicals and other pollutants, road obstruction and mortality, and climate change.

1. Requested Designation

WildEarth Guardians hereby petitions the U.S. Fish and Wildlife Service under the Department of Interior to list the spot-tailed earless lizard (*Holbrookia lacerata*), including both of its known subspecies (*H. l. lacerata* and *H. l. subcaudalis*) as an Endangered or Threatened species pursuant to the Endangered Species Act. This listing action is warranted, given the numerous threats this species faces, as well as its extremely low population numbers. Spot-tailed earless lizards are threatened by at least four of the five listing factors: present and threatened destruction, modification and curtailment of habitat and range; predation; the inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting its continued existence.

2. Critical Habitat

Given that threats to habitat within the spot-tailed earless lizard's range are a significant cause of imperilment, WildEarth Guardians requests that critical habitat be designated for this species concurrent with final ESA listing.

VI. Literature Cited

Allen, C.R., D.M. Epperson, and A.S. Garmestani. 2004. Red imported fire ant impacts on wildlife: a decade of research. *American Midland Naturalist*. 152: 88-103.

Associated Press. 2009. Biologists hunt for rare lizards. Associated Press. February 8.

Axtell, R.W. 1968. *Holbrookia lacerata*. *Catalogue of American Amphibians and Reptiles*. 56: 1-2.

CCSP (U.S. Climate Change Science Program). 2008. *Weather and Climate Extremes in a Changing Climate, Regions of Focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands*. T.R. Karl, G.A. Meehl, C.D. Miller, S.J. Hassol, A.M. Waple, and W.L. Murray (eds.). Washington, DC: Department of Commerce, NOAA's National Climate Data Center.

Conant, R. and J.T. Collins. 1991. *A Field Guide to Reptiles and Amphibians: Eastern and Central North America*. Third Edition. Boston, MA: Houghton Mifflin Company.

Deb, G. 2005. Endocrine disruptors: a case study on Atrazine. *Temple Journal of Science, Technology, and Environmental Law*. 24: 397-418.

Dixon, J.R. 1987. *Amphibians and Reptiles of Texas, with Keys, Taxonomic Synopses, Bibliography, And Distribution Maps*. College Station TX: Texas A& M University Press.

Dixon, J. R. 2000. *Amphibians and Reptiles of Texas*. Second Edition. College Station TX: Texas A& M University Press.

DuRant, S.E. 2006. *Sublethal Effects of an Acetylcholinesterase-inhibiting Pesticide on Fitness-related Traits in the Western Fence Lizard (Sceloporous occidentalis)*. Master of Science Thesis. Virginia Polytechnic Institute and State University.

DuRant, E.S., W.A. Hopkins, and L.G. Talent. 2007a. Energy acquisition and allocation in an ectothermic predator exposed to a common environmental stressor. *Comparative Biochemistry and Physiology, Part C*. 145: 422-448.

DuRant, E.S., W.A. Hopkins, and L.G. Talent. 2007b. Impaired terrestrial and arboreal locomotor performance in the western fence lizard (*Sceloporus occidentalis*) after exposure to an AChE-inhibiting pesticide. *Environmental Pollution*. 149: 18-24.

Fischlin, A., G.F. Midgley, J.T. Price, R. Leemans, B. Gopal, C. Turley, M.D.A. Rounsevell, O.P. Dube, J. Tarazona, A.A. Velichk. 2007: *Ecosystems, their properties, goods, and services*. *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds.) Cambridge UK: Cambridge University Press. pp. 211-272.

Fitch, H.S. 1970. Reproductive cycles of lizards and snakes. University Kansas Museum Natural History Miscellaneous Publication 52:1-247.

Gibbons, J.W., D.E. Scott, T.J. Ryan, K.A. Buhlman, T.D. Tuberville, B.S. Mettis, J.L. Greene, T. Mills, Y. Leiden, S. Poppy, and C.T. Winne. 2000. The global decline of reptiles, déjà vu amphibians. *BioScience*. 50(8): 653-666. August.

Halpin, P.N. 1997. Global climate change and natural-area protections: management responses and research directions. *Ecological Applications*. 7(3): 828-843.

Hammerson, G.A., Lavin, P. & Mendoza Quijano, F. 2007. *Holbrookia lacerata*. In: IUCN 2009. IUCN Red List of Threatened Species. Version 2009.1. www.iucnredlist.org. Accessed 01 November 2009.

IPCC (Intergovernmental Panel on Climate Change). 2001. Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change. J.T Houghton., Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, X. Dai, K. Maskell, and C.A. Johnson (eds.). Cambridge, UK and New York, NY: Cambridge University Press.

IPCC (Intergovernmental Panel on Climate Change). 2007. Climate Change 2007: Synthesis Report.

ITIS (Integrated Taxonomic Information System). 2009. Integrated Taxonomic Information System online database. www.itis.gov. [Accessed November 1, 2009].

Karl, T.R., J.M. Melillo, and T.C. Peterson (eds.). 2009. Global Climate Change Impacts in the United States. New York, NY: Cambridge University Press.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. [Accessed: November 1, 2009].

NSC (National Safety Council). 2003. Reporting on Climate Change: Understanding the Science. Washington, DC: National Safety Council, Environmental Health Center.

Parmesan, C., T.L. Root, and M.R. Willig. 2000. Impacts of extreme weather and climate on terrestrial biota. *Bulletin of the American Meteorological Society*. 81(3): 443-450. March.

Reagan, S.R., J.M. Ertel, V.L. Wright. 2000. David and Goliath retold: fire ants and alligators. *Journal of Herpetology*. 34: 475-478.

Root, T.L. and S.H. Schneider. 2002. Climate change: overview and implications for wildlife. *Wildlife Responses to Climate Change: North American Case Studies*. S.H. Schneider and T.L. Root (eds.). Washington DC: Island Press. pp. 1-56.

TheRecordLive.com. 2009. Scientists seek help in search for rare Texas lizard. The Record Live. January 31.

TNC (The Nature Conservancy). 2009a. Nature Conservancy of Texas seeks public's help tracking spot-tailed earless lizard – a vanishing species. The Nature Conservancy. January 28.

TNC (The Nature Conservancy). 2009b. Conservancy seeks public's help tracking rare lizard. The Nature Conservancy. March 24.

TPWD (Texas Parks and Wildlife Department). 2005a. Texas Comprehensive Wildlife Conservation Strategy 2005-2010. Austin, TX: Texas Parks and Wildlife Department. September.

TPWD (Texas Parks and Wildlife Department). 2005b. Rare, Threatened, and Endangered Species of Texas: Spot-tailed earless lizard (*Holbrookia lacerata*), Potential or Known Presence Map.

Todd, B.D., B.B. Rothermel, R.N. Reed, T.M. Luhring, K. Schlatter, L. Trenkamp, and J.W. Gibbons. 2008. Habitat alteration increases invasive fire ant abundance to the detriment of amphibians and reptiles. *Biological Invasions*. 10: 539-546.

U.S. Census Bureau. 2008. 2008 Population Survey. http://www.factfinder.census.gov/home/saff/main.html?_lang=en. [Accessed January 5, 2010].

U.S. Census Bureau. 2009. Table 8: Residential Estimates for the 100 Fastest Growing U.S. Counties with 10,000 or More Population in 2008: April 1, 2000 to July 1, 2008 (CO-EST2008-08). March 19.

Webb, R.G. and A.I. Ortenburger. 1953. Reptiles of the Wichita Mountains Wildlife Refuge, Comanche County, Oklahoma. *Proceedings of the Oklahoma Academy of Science*. 87-92.

Wojcik, D.P., C.R. Allen, R.J. Brenner, E.A. Forsys, D.P. Jouvenaz, and R.S. Lutz. 2001. Red imported fire ants: impact on biodiversity. *American Entomologist*. 47(1): 16-23.

Zettler J.A., M.D. Taylor, C.R. Allen, T.P. Spira. 2004. Consequences of forest clear-cuts for native and nonindigenous ants (Hymenoptera: Formicidae). *Annals of the Entomological Society of America*. 97(3): 513-518.