

Flat-Tailed Horned Lizard (*Phrynosoma mcallii*)

Legal Status

State: Species of Special Concern

Federal: Bureau of Land Management Sensitive, U.S. Forest Service Sensitive

Critical Habitat: N/A

Recovery Planning: N/A (Note:

A Flat-tailed Horned Lizard Rangelwide Management

Strategy [Flat-tailed Horned Lizard Interagency Coordinating Committee 2003] has been developed.)

Notes: The species has been proposed for listing by the U.S. Fish and Wildlife Service (USFWS) on four separate occasions (1993, 2001, 2005, 2010). On March 15, 2011, the USFWS published a proposed rule determining that the flat-tailed horned lizard does not require protection under the federal Endangered Species Act (ESA) (76 FR 14210–14286).



Photo courtesy of Brock Ortega, Dudek.

Taxonomy

The flat-tailed horned lizard (*Phrynosoma mcallii*) was first described in 1852 by Hallowell, and is one of eight recognized horned lizard species in North America (Flat-tailed Horned Lizard Interagency Coordinating Committee [ICC] 2003). The flat-tailed horned lizard is closely related to the Goode's horned lizard (*P. goodei*) and desert horned lizard (*P. platyrhinos*), which it may hybridize with where their ranges overlap (Jones and Lovich 2009). Both of these two species can be differentiated from the flat-tailed horned lizard by their shorter occipital horns and lack of a dark mid-dorsal stripe (Jones and Lovich 2009). Descriptions of the species' physical characteristics can be found in Stebbins (1954) and Rorabaugh and Young (2009).

Distribution

General

The northern range limit of the flat-tailed horned lizard is in the Coachella Valley and extends southeast to the Imperial and Borrego valleys and into Baja California, Mexico. The western limit of the species' range is Anza-Borrego Desert State Park in eastern San Diego County, and to the east they are found in Glamis and Ogilby northwest of Yuma, Arizona, and then into the lower Colorado subdivision of the Sonoran Desert in Arizona (Jones and Lovich 2009). (Figure SP-R5)

Distribution and Occurrences within the Plan Area

Historical

The flat-tailed horned lizard has one of the most restricted ranges of all North American horned lizards (Stebbins 1985). The historic range of the flat-tailed horned lizard in California was approximately 1.8 to 2.2 million acres, primarily in Imperial County, but also in central Riverside and eastern San Diego Counties (Flat-tailed Horned Lizard ICC 2003). The historic western boundary was formed by Fish Creek, Vallecito, and the Santa Rosa Mountains. In addition another valley of habitat stretches to the west beyond Ocotillo and Coyote Wells where Interstate-8 meets Highway 92. The southern extent stretched into the Yuha Basin, ending at the Sierra Juarez and Coyote mountains. The eastern extent of the flat-tailed horned lizard range extended to the Algodones Dunes and is limited by the Chocolate and Cargo Muchacho Mountains (Hodges 1997). There are 216 historical (i.e., before 1990) occurrences of flat-tailed horned lizard in the Plan Area and an additional 269 occurrences of unknown observation date (Figure SP-R5) (CDFW 2013; Dudek 2013).

Recent

About 50% of the flat-tailed horned lizard historic range in California has been lost due to urban and agricultural development (Flat-tailed Horned Lizard ICC 2003). However, the rate of habitat loss and fragmentation are not even across this species' range, with closer to more than 90% habitat loss in Riverside County. From a niche model

using abiotic variables, Barrows et al. (2008) estimated that within the Coachella Valley there was originally 32,164 hectares (79,479 acres) of potential habitat for the fringe-toed lizard. From this they calculated a 91% to 95% loss of potential habitat when considering current conditions that would render that potential habitat unsuitable (Barrows et al. 2008).

The current known range for flat-tailed horned lizard begins near the confluence of the San Gorgonio and Whitewater rivers in Riverside County, and extends south and east through the Coachella Valley into Imperial County. Flat-tailed horned lizard are found on both sides of the Salton Sea, extending west into Borrego Valley with small extensions into the lower portions of the Coyote Creek Watershed, around Clark Dry Lake, north of the Fish Creek Mountains and southwest along San Felipe Creek. They are found on the Carrizo Wash east of Bow Willow, and may be found within the Carrizo Badlands. Their range extends east across East Mesa and the Algodones Dunes to Pilot Knob Mesa. Though their range extends into Arizona, the California population is separated by the Chocolate Mountains, Cargo Muchacho Mountains and the agricultural development near Yuma, Arizona (Turner et al. 1980, Wright 2003, NatureServe 2011). There are 1,794 recent (i.e., since 1999) occurrences of flat-tailed horned lizard in the southern portion of the Plan Area (Figure SP-R5) (CDFW 2013; Dudek 2013).

Natural History

Habitat Requirements

Flat-tailed horned lizards occupy the hottest and most barren areas of the Sonoran Desert. Suitable habitat is characterized as stabilized sand dunes that fall within the creosote-white bursage series of Sonoran Desert Scrub community (Turner and Brown 1982; Jones and Lovich 2009). They also occur in loose, active sand dunes, although often at the dune periphery or in more stable regions within the active dune habitat. Historically they have been found in extremely active dune hummock habitats in the western Coachella Valley where they have now been extirpated. They tend to occur at higher densities in eolian habitats that are more stable than those preferred by fringe-

toed lizards (*Uma* spp.), but there is substantial overlap in the habitat occupied by these lizards (Barrows, pers. comm. 2012).

Flat-tailed horned lizard is primarily associated with fine, moderately active eolian sands (Barrows and Allen 2010). Barrows et al. (2008) included six soil classifications in the model used to identify potential distributions of flat-tailed lizard: Myoma fine sand 5–15% slope (MaD), Myoma fine sand 0–5% slope (MaB), Coachella fine sand 0–2% slope (CpA), Coachella fine sandy loam 0–2% slope (CsA), Niland sand 2–5% slope (NaB) (Soil Conservation Service 1980, cited in Barrows et al. 2008), and a previously mapped region of ephemeral surface sand availability (Barrows and Allen 2007a, cited in Barrows et al. 2008).

Flat-tailed horned lizards occur at elevations from below sea level to about 250 meters (820 feet) above mean sea level (Arizona Game and Fish Department 2003). They are found where the substrate is composed of fine sands or silica. They are also found in areas that lack windblown sands such as the saltbush flats north of the Salton Sea, and the badlands in the Yuha Basin and Borrego Valley (Flat-tailed Horned Lizard ICC 2003). Flat-tailed horned lizards do not normally occur in habitats characterized as rocky mountainous areas, new alluvial areas with sloping terrain, major dune systems, marshes and tamarisk-arrow weed thickets, and agricultural and developed areas (Turner et al. 1980).

Table 1. Habitat Associations for Flat-tailed Horned Lizard

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Supporting Information
Sand or pavement, creosote-white bursage	Dispersal, refugia, breeding	Dispersal, breeding (all life stages)	fine, moderately active eolian sands	Flat-tailed Horned Lizard ICC 2003

Foraging Requirements

Flat-tailed horned lizard feed almost exclusively on harvester ants (*Pogonomyrmex* spp.), but opportunistically eat small beetles, caterpillars, and termites (Flat-tailed Horned Lizard ICC 2003). The percentage of ants in their diet is greater than other horned lizard

species and in one study was found to be 97% of the prey items found in flat-tailed horned lizard stomachs (Flat-tailed Horned Lizard ICC 2003).

Reproduction

Mating usually occurs in May and June, but may start in April when adult flat-tailed horned lizards emerge from hibernation. Clutch size and number is dictated by the abundance of resources, and during a typical year females will lay one clutch of 4 to 6 eggs. With favorable conditions the females lay two clutches per season. The first clutch emerges in July and the second emerges around September. Reproduction may be at least doubled in wet years as opposed to dry years (Grant 2005). In dry conditions only the late season clutch will be produced (Young and Young 2000). Females travel outside of their home range to excavate a deep (80 to 100 centimeters [32 to 39 inches]) burrow where the eggs are deposited just below the level where the sand becomes visibly moist (Young and Young 2000). Hatchlings emerge from July through October. Flat-tailed horned lizards typically reach sexual maturity within their second year (Flat-tailed Horned Lizard ICC 2003) but may breed in their first year (Barrows and Allen 2009). Their typical life span is four years, but they have been documented to live up to six years (Flat-tailed Horned Lizard ICC 2003). This species has a relatively low mean longevity and extremely low reproductive rates relative to other Phrynosomatids. This combination renders this species extremely vulnerable to local extinctions over fairly quick time periods if habitats are fragmented or compromised with anthropogenic structures and activity (Barrows 2012, pers. comm.; Barrows and Allen 2009).

Table 2. Key Seasonal Periods for Flat-tailed Horned Lizard

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Breeding				✓	✓	✓	✓	✓	✓	✓	✓	
Adult												
Hibernation	✓	✓								✓	✓	✓

Sources: Flat-tailed horned lizard ICC 2003; Barrows 2012, pers. comm.

Activity Patterns and Movement

Flat-tailed horned lizards are most active in the spring and fall, when they are active on the surface most hours of the day. During this period they are also active on the surface through the night (Flat-tailed Horned Lizard ICC 2003). During the increased summer temperatures their activity pattern shifts to two periods, morning and evening (Flat-tailed Horned Lizard ICC 2003). The optimum air temperature range for active flat-tailed horned lizards appears to be 35.2°C to 40.2°C (95.4°F to 104.4°F). They seek refuge in burrows or under the sand when daytime surface temperatures exceed 41.0°C (105.8°F) (Wright 2002; Wone and Beauchamp 2003).

Adult flat-tailed horned lizard are obligatory hibernators, spending most of the winter months (mid-October to mid-February) in burrows 5 to 10 centimeters (2 to 4 inches) below the surface (Flat-tailed Horned Lizard ICC 2003). Juvenile activity is also reduced during the winter, but they are occasionally seen foraging on warm winter days. It is thought that due to their smaller size they are not able to maintain a sufficient amount of fat reserves to remain in hibernation through the winter (Muth and Fisher 1992).

Home ranges for flat-tailed horned lizards can vary by population, sex, size of the individual, climatic conditions, or density of lizards, but typically are in the range of 1 to 10 acres, but can much larger at times. In some populations it is thought that flat-tailed horned lizard do not permanently maintain distinct home ranges, but rather shift their spatial use area over time (Flat-tailed Horned Lizard ICC 2003). Home ranges appear to vary in relation to resource conditions and sex. On study site near Yuma, Arizona Young and Young (2000) found that mean home range sizes for males was 6.2 acres during a dry year and significantly larger at 25.5 acres during a wet year. In contrast, mean female home ranges were 3.2 acres in a dry year and relatively the same at 4.7 acres in a wet year. This study also observed a wide variation in movement patterns among individuals, with a few home ranges estimated at greater than 85 acres.

Table 3. Movement Distances for Flat-tailed Horned Lizard

Type	Distance/Area	Location of Study	Citation
Mean Home	0.12 acre	Yuha Desert MA	Turner and Medica 1982
Range	6.7 acres	West Mesa MA	Muth and Fisher 1992
	8.8 acres	Yuma Desert MA	Miller 1999
Male mean annual home range	1.7-25.5 acres	Yuma Desert	Young and Young 2000
Female mean annual home range	2.4–12.6 acres	Yuma Desert	Young and Young 2000

Ecological Relationships

Of their known natural predators round-tailed ground squirrel (*Spermophilus tereticaudus*) and the loggerhead shrike (*Lanius ludovicianus*) were highlighted as major predators (76 FR 14210–14268). Other native predators include kestrels and roadrunners. These predators occur naturally though recent scientific literature suggests that the populations of some of these predators are now higher as a result of manmade changes to the landscape, resulting in increased predation of flat-tailed horned lizards localized near developed areas (76 FR 14210–14268). In addition, feral dogs and cats can prey on flat-tailed horned lizard. Recent studies have found a clear negative impact on flat-tailed horned lizard presence to at least 450 meters (1,476 feet) away from disturbance (Young and Young 2005).

Flat-tailed horned lizard has a relatively low mean longevity and extremely low reproductive rates relative to other Phrynosomatids. This combination renders this species extremely vulnerable to local extinctions over fairly quick time periods if habitats are fragmented or compromised with anthropogenic structures and activity.

Population Status and Trends

Global: Vulnerable (NatureServe 2011)

State: Imperiled (NatureServe 2011)

Within Plan Area: same as above

There are three regionally descriptive populations of flat-tailed horned lizard in California: Coachella Valley; the west side of the Salton Sea/Imperial Valley; and the east side of the Imperial Valley (NatureServe 2011; 76 FR 14214). The population in the Coachella Valley is divided into two segments by I-10. The two populations within the Imperial Valley are divided by I-8 and the Coachella Canal into four segments (Algodones Dunes, East Mesa, West Mesa/Anza Borrego, and Yuha) (Wright 2002). As discussed above, about 50% of the flat-tailed horned lizard historic range in California has been lost due to urban and agricultural development (Flat-tailed Horned Lizard ICC 2003). Most of this habitat conversion has occurred in the Imperial Valley between the Salton Sea and the U.S./Mexican border. However, the USFWS determined that current threats to the species identified in the 1993 proposed rule for listing the species as endangered are not as significant as formerly believed and available data do not indicate the species is likely to become endangered in the foreseeable future throughout all or a significant portion of its range (76 FR 14210-14286).

Threats and Environmental Stressors

The major identified threats to this species are habitat fragmentation and population isolation, agricultural development, urbanization, OHV use, highways, canals, railroads, military activities, utilities, predation, mining and mineral material extraction, geothermal power development, oil and gas development, wind turbines, landfills, exotic plants, fire, pesticide use, land disposal, cattle grazing, and other ground disturbance activities (Flat-tailed Horned Lizard ICC 2003; 76 FR 14223). Unregulated border patrol activities and related infrastructure development are also threats (Barrows and Allen 2009; Barrows 2012, pers. comm.). On March 15, 2011 the USFWS published the proposed rule for their determination that the flat-tailed horned lizard does not require protection under the federal ESA (76 FR 14210-14286). The proposed rule included an evaluation of potential

current threats, including agricultural and urban development, energy generation facilities, invasive plants, OHV use, military training, overutilization (e.g., collecting), and disease and predation. Generally, the USFWS concluded that while some level of threat to flat-tailed lizard and its habitat still exists from these factors, the level of threat is not substantial and does not justify listing of the species (76 FR 14210–14286). Nonetheless, these factors should still be considered threats to consider in the DRECP.

In a study examining boundary processes between natural and anthropogenic desert landscape the flat-tailed horned lizard demonstrated an unambiguous negative response to the anthropogenic habitat edges (Barrows et al. 2006). This effect was likely a result of road avoidance or road associated mortalities and predation from birds that may occur more often or be more abundant along habitat edges given the greater availability of resources in suburban areas (Barrows et al. 2006).

Conservation and Management Activities

On June 7, 1997, a Conservation Agreement, deemed a long-term agreement by its signatories, was signed by several federal and state agencies to implement the Flat-tailed Horned Lizard Rangeland Management Strategy (RMS) (updated in 2003). The following agencies are signatories to the Conservation Agreement:

- USFWS, Region 1
- USFWS, Region 2
- BLM, California State Office
- BLM, Arizona State Office
- Bureau of Reclamation, Lower Colorado Region
- U.S. Marine Corps Air Station, Yuma
- U.S. Naval Air Facility, El Centro
- Arizona Game and Fish Department
- California Department of Fish and Game
- California Department of Parks and Recreation.

The purpose of the RMS is to provide guidance for the conservation and management of the habitat for flat-tailed horned lizard (Flat-tailed Horned Lizard ICC 2003). The RMS identifies five Management Areas (MAs)—four in California and one in Arizona—that are to be maintained and managed in perpetuity. The four MAs in California are West Mesa, East Mesa, Yuha Desert, and Borrego Badlands (Anza-Borrego Desert State Park and Ocotillo Wells State Off-Highway Vehicle Area). The BLM, in coordination with the U.S. Navy manages the West Mesa and East Mesa MAs. BLM also manages the Yuha Desert MA. The California Department of Parks and Recreation manages the Borrego Badlands MA.

The Conservation Agreement remains in effect today, and the RMS continues to be implemented by all Conservation Agreement signatory agencies. As of 2009, the total management area is approximately 485,000 acres, of which 458,759 acres (95%) are under signatory ownership (76 FR 14217). Also, as of 2009, approximately 424 acres (0.09%) of the management area has been approved for development (76 FR 14217).

The RMS requires that an annual report be prepared by the Interagency Coordinating Committee to monitor plan compliance (Flat-tailed Horned Lizard ICC 2009).

The RMS calls for the following nine planning actions:

- Planning Action 1 – Delineate and designate five flat-tailed horned lizard MAs and one flat-tailed horned lizard Research Area.
- Planning Action 2 – Define and implement management actions necessary to minimize loss or degradation of habitat.
- Planning Action 3 – Within the MAs, rehabilitate damaged and degraded habitat, including closed routes and other small areas of past intense activity.
- Planning Action 4 – Attempt to acquire through exchange, donation, or purchase from willing sellers all private lands within MAs.
- Planning Action 5 – Maintain or establish effective habitat corridors between naturally adjacent populations.

- Planning Action 6 – Coordinate activities and funding among the signatory agencies with Mexican agencies.
- Planning Action 7 - Promote the Strategy through law enforcement and education.
- Planning Action 8 – Encourage and support research that will promote the conservation of flat-tailed horned lizards or desert ecosystems and will provide information needed to define and implement necessary management actions effectively.
- Planning Action 9 – Continue inventory and monitoring.

Every year the ICC reports on the progress of the nine planning actions. These reports, which are current to December 31, 2008, can be found on the Arizona USFWS website (<http://www.fws.gov/southwest/es/arizona/Flat.htm>).

The northern range of flat-tailed horned lizard, where habitat has been reduced to 3 to 4% of its original extent within the Coachella Valley, falls within the Coachella Valley Multiple Species Habitat Conservation Plan (CV MSHCP). The flat-tailed horned lizard is a covered species in the CV MSHCP, which would protect and manage approximately 44.5% of the remaining habitat. As of 2009, 94% of the projected protection of 4,219 acres habitat in the Thousand Palms conservation area and 34% of the projected protection of 5,134 acres in the Dos Palmas conservation area had been conserved (76 FR 14218).

Implementation of the Lower Colorado River Multi-Species Conservation Plan would have minor effect on the flat-tailed horned lizard because most the activities covered by the Plan are outside the range of the species and because the habitat is under the control of the Bureau of Reclamation, which is signatory to the Conservation Agreement discussed above (76 FR 14219). Impacts to approximately 128 acres of flat-tailed horned lizard habitat will be mitigated by acquisition of 230 acres in the Dos Palmas conservation area (76 FR 14219).

Data Characterization

Additional surveys are needed outside the RMS MAs to firmly delineate the boundaries on the exterior portions of flat-tailed horned lizard range in the United States (Foreman 1997).

Management and Monitoring Considerations

As mentioned above the Flat-tailed Horned Lizard RMS was developed in 2003 by local state and federal agencies to help manage for this species within its existing geographic range. The primary threat to this species is permanent habitat loss through urban and agricultural expansion (Young 2010). The threat of predation by both native and non-native predators is increased within several hundred meters along the edge between native intact habitat and agricultural development. Currently management agencies are focused on monitoring population size as a means of detecting long term trends for flat-tailed horned lizards. It is the recommendation of Young (2010) that these monitoring efforts be altered to focus on covering larger areas utilizing scat surveys in place of current methods such as mark release recapture. Presence/absence surveys are much less expensive than obtaining population estimates, and will allow monitoring funds to be used in a manner that will reliably map and update the distribution of the species.

Species Modeled Habitat Distribution

This section provides the results of habitat modeling for flat-tailed horned lizard, using available spatial information and occurrence information, as appropriate. For this reason, the term “modeled suitable habitat” is used in this section to distinguish modeled habitat from the habitat information provided in Habitat Requirements, which may include additional habitat and/or microhabitat factors that are important for species occupation, but for which information is not available for habitat modeling.

There are 624,072 acres of modeled suitable habitat for flat-tailed horned lizard in the Plan Area. Appendix C includes a figure showing the modeled suitable habitat in the Plan Area.

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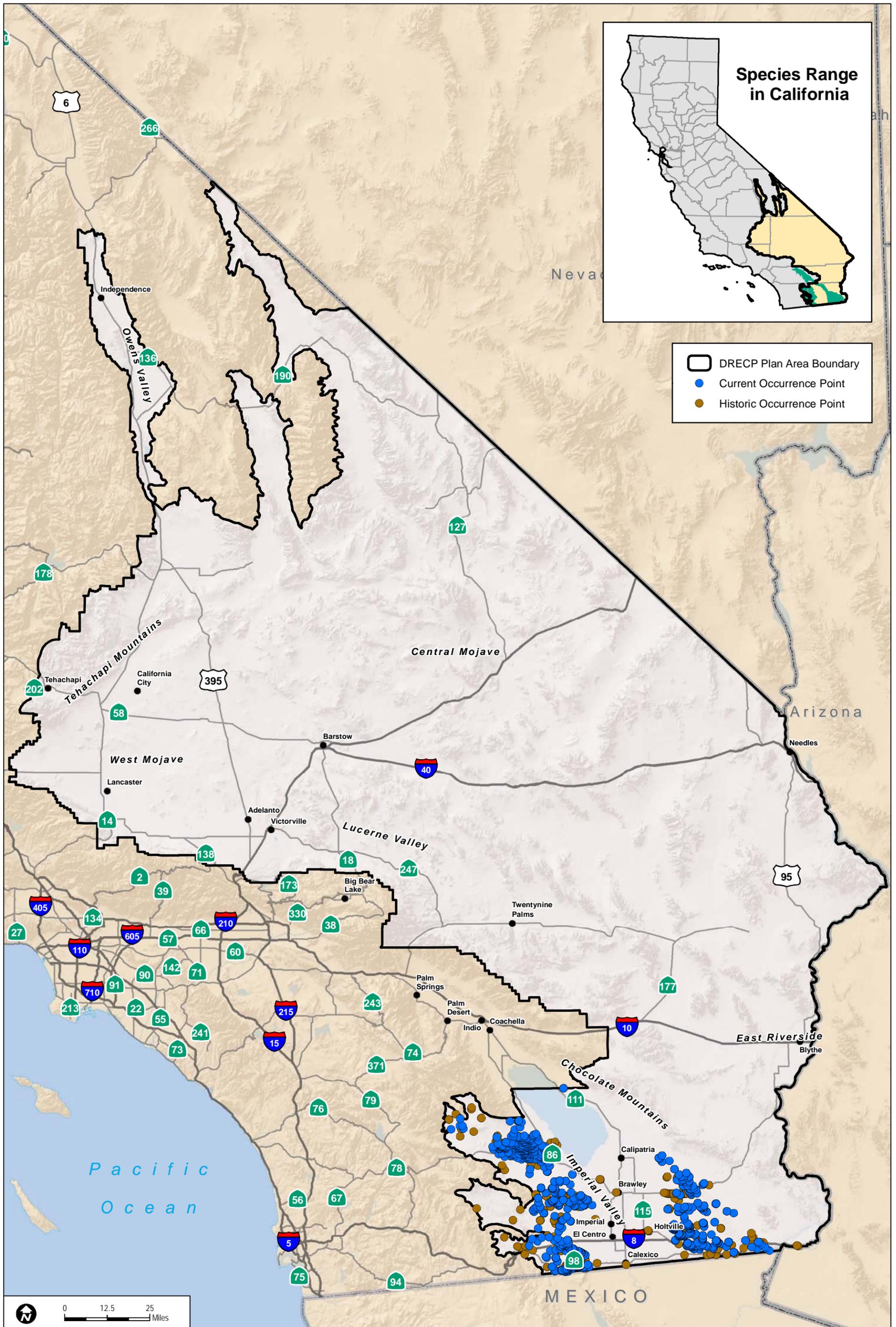
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Sources: ESRI (2014); DRECP Species Occurrence Database (2013), CWHR (2008)

FIGURE SP-R02
Flat-tailed Horned Lizard Occurrences in the Plan Area