United States Department of the Interior
FISH AND WILDLIFE SERVICE
Division of Ecological Services
10711 Burnet Road, Suite 200
Austin, Texas 78758
512 490-0057
FAX 490-0974

December 13, 2013

Ms. Bindu Johnson
Federal Highway Administration
Texas Division Office
300 East 8th Street, Room 826
Austin, Texas 78701

Consultation #: 02ETAU00-2006-F-0126-R

Dear Ms. Johnson:

This document transmits the US Fish and Wildlife Service's (Service) revised biological opinion (BO), based on our review of the Texas Department of Transportation's (TxDOT) proposed rehabilitation of U.S. Highway (US) 290 located in Bastrop County, Texas, and its effects on the endandered Houston toad (*Bufo houstonensis*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). The Federal Highway Administration's (FHWA) July 2, 2013, request to reinitiate formal consultation was received on July 8, 2013. Formal consultation was initiated on July 31, 2013, once sufficient information necessary to proceed with the consultation was received by the Service.

FHWA originally conducted a formal section 7 consultation on this project in 2006. A final BO was issued in January 2006 and allowed for incidental take of up to 100 Houston toads and impacts to about 80 acres of Houston toad habitat. The proposed Hwy 290 project was not implemented after the BO was issued and incidental take coverage expired in 2009. TxDOT now wishes to proceed with the proposed project, which has not changed since the original consultation. However, since the original BO was finalized, a great deal has changed for the Houston toad. Severe drought affected the Houston toad and its habitat for a number of years, beginning in 2009 and lasting through 2011, and the catastrophic September/October 2011 Bastrop County Complex Fire (BCCF) burned approximately 32,000 acres and destroyed the canopy cover of a large portion of Houston toad habitat. These stochastic events resulted in lower Houston toad populations than were present in 2006 (Forstner 2013). In light of the changes to the Houston toad and its habitat, we recommended FHWA reinitiate formal section 7 consultation so the Environmental Baseline can be updated, a new jeopardy evaluation conducted, the amount of incidental take could be reevaluated, and new Reasonable and Prudent Measures, with their implementing Terms and Conditions, provided.

This revised BO is based on information provided in the original and revised biological assessments, the previous BO, field investigations, and other sources of information. A complete

administrative record of this consultation is on file in the Austin Ecological Services Field Office (AUESFO). Portions of this BO that have not changed since the original was issued will be incorporated by reference to the original BO and not repeated. The 2006 BO is included as an appendix to this revision.

FHWA has determined this project "May Affect, and is Likely to Adversely Affect" the Houston toad. Critical habitat (CH) has been designated for the Houston toad, but the proposed project is not located within the CH designated area; therefore, no CH would be affected.

Consultation History

The consultation history for the 2006 BO is located in that document. The consultation history below specifically relates to the reinitiation of this consultation.

June 6, 2013:	TxDOT submitted an email to the Service notifying us they were ready to start working on the US 290 project. TxDOT inquired whether the incidental take coverage provided in the original BO, dated July 12, 2006, which expired three years after issuance, could be extended.
June 7, 2013:	Telephone discussions between the Service and TxDOT Austin District. The Service relayed that the environmental baseline conditions for the Houston toad had changed drastically since the original BO was issued and the original jeopardy analysis and incidental take coverage needed to be reevaluated based on current information. The Service recommended TxDOT revise their original BA with current information and forward to FHWA for review, so FHWA could request reinitiation of section 7 formal consultation.
June 21, 2013:	Telephone conversation between the Service and TxDOT to discuss the updated information needed for the BA and the time line for the reinitiation.
June 26, 2013:	TxDOT provided a supplemental BA to the FHWA.
July 2, 2013:	FHWA submitted a reinitiation request to the Service, along with the supplemental BA and a technical report, "Minimizing Wildlife-Motorist Interactions" (Forstner 2013).
July 18, 2013:	The Service emailed TxDOT Austin District requesting additional biological information not addressed in the original or supplemental BAs. This information was needed prior to the reinitiation of the consultation.

July 31, 2013: TxDOT provided the Service with the additional information requested. The Service provided a letter to FHWA reinitiating formal section 7 consultation.

August 20, 2013: The Service conducted a site visit within the US 290 right-of-way of the proposed project to examine the existing drainage structures and Houston toad habitat within the proposed project work zone.

August 22, 2013: The Service submitted an email request to TxDOT requesting clarification of several issues related to the extension of drainage structures across the proposed lanes and new right-of-way.

August 28, 2103: TxDOT provided the Service with supplemental information related to the extension of the cross drainage structures.

October 31, 2013: The Service provided a draft BO to FHWA and TxDOT for review and comment.

November 14, 2013: The Service met with FHWA and TxDOT to discuss their comments on the draft BO. All issues were minor and modifications to the BO were discussed and agreed upon.

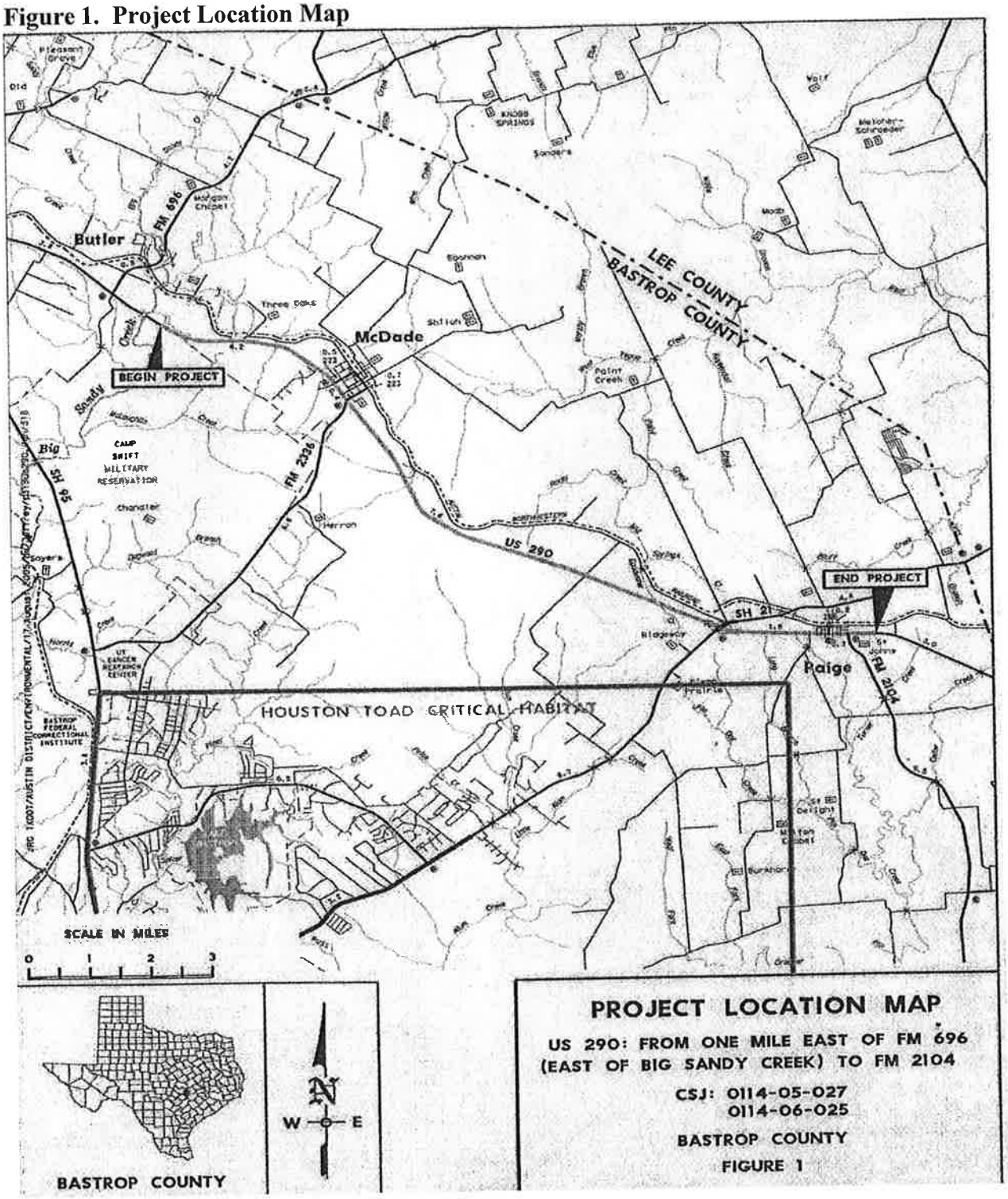
BIOLOGICAL OPINION

Description of Proposed Action

The project description was provided in the 2006 BO. It is summarized below, with additional details on the project construction process included.

There are two separate projects being evaluated together in this BO. Both projects involve upgrading the existing four or five-lane undivided US 290, into a four lane divided highway with a center median and turn lanes. The new highway configuration would match the existing US 290 configuration located immediately to the west of the proposed project. The total project length is about 13.25 miles. Project 1 (western project) (CSJ: 0114-05-037) would begin about one mile east of the intersection of FM 696, near the town of Butler, and extend eastward for 7.864 miles. Project 2 (eastern project) would begin 8.864 miles east of FM 696 and end at FM 2104, near the town of Paige, a distance of about 5.39 miles (**Figure 1**). The new travel lanes would be constructed on the southern side of the existing roadway for the entire length of the western project. For the eastern project, the new lanes would be on the southern side of the existing highway west of SH 21 and on the north side east of SH 21. Once the new construction is complete, the existing US 290 roadbed in the project area would be rehabilitated. The eastern project is proposed to be constructed first, with the western project starting construction in 2018.

Figure 1. Project Location Map



If both projects were constructed at the same time, the total construction timeframe would be about 24 to 26 months. Separately, each project would take about 19 months to build.

The existing US 290 ROW is 416.8 acres, with 92.4 acres paved. In some areas, the current ROW width is less than the necessary 240 feet for the new roadway configuration and would need to be extended in order to construct the enhanced road. About 46.6 acres of additional ROW would be added. Once the project is complete, the ROW will encompass 463.4 acres, of which 166 acres will be paved.

There are 36 existing cross drainage structures (22 concrete box culverts and 14 reinforced concrete pipes) that would require alteration, 14 on the eastern project and 22 on the western project. Four of the existing concrete box drainage structures would be replaced by bridges, two on each project. All of the bridges would have the same layout and dimensions, 25 feet long by 40 feet wide. The bridges will have flat slabs, poured in place, and will completely span the creek drainages.

Construction of the new lanes would follow a typical new road construction process. TxDOT would begin by installing the BMPs to protect construction runoff from entering the drainages. The silt fence barriers would also prevent Houston toads from entering the construction zone. Next, the existing vegetation in the ROW would be grubbed and cleared and the existing grade would be modified to fit the requirements of the new roadway. TxDOT would then extend the existing drainage culverts and construct the new bridges. Once this is complete, base material would be brought in and pavement would be laid over the base. The road would then be prepped for use by adding striping and installing signs, guardrails, etc. Finally, the ROW would be revegetated with native plants based on TxDOT's landscape plan. Once the new lanes are open and in use, the existing road would be closed and improved. This would involve scarification of the existing pavement, excavation of the existing road bed, where needed, installation of the new bridges and modification to the existing drainage pipes, where needed, placement of fill and base material in areas that were excavated, and repaving the road.

Conservation Measures

Impacts to the Houston toad and its habitat would be minimized by restricting construction impacts to the proposed US 290 ROW. In addition, the following conservation measures have been developed by TxDOT to minimize or avoid impacts to the Houston toad or other federally listed species:

1. TxDOT would minimize construction in drainage areas during the Houston toad breeding period (January1 – July 1) to the maximum extent practicable.
2. TxDOT would replace four of the existing box drainage culverts with bridge structures to facilitate Houston toad movement.

3. Best Management Practices (BMPs) would be installed throughout the proposed project in accordance with Texas Commission on Environmental Quality (TCEQ) regulations. BMPs would be inspected and repaired every seven days and after large rainfall events.
4. Additional silt fencing would be installed at the drainage structures being rebuilt to direct the Houston toads away from the construction zone.
5. Within the ROW along drainage features, TxDOT would install native plants to provide appropriate cover for Houston toad use of the drainages.
6. TxDOT would monitor the proposed project area for Houston toad activity before, during, and for one year post-construction.

Action Area

TxDOT has proposed the action area to be bounded by the proposed ROW, portions of some properties adjacent to the proposed ROW, and the drainages that carry water runoff from the project area. The Service considers the action area to be the area potentially directly and indirectly affected by the proposed project activities, including but not limited to, the proposed project site. This is a highway rehabilitation project that would not increase the capacity of the roadway. Therefore, the action area for consultation on the proposed project is the same area as proposed by TxDOT, for reasons that will be discussed in the "Effects of the Proposed Action" section of this consultation. The total action area encompasses 463.4 acres of TxDOT ROW, averaging 240 feet wide along the 13.25 mile project corridor. The action area is located in the Lost Pines ecoregion in Bastrop County. Fifteen close-up aerial photos showing the proposed project boundaries, new and existing ROW, new and existing pavement alignment, existing cross drainage structures and proposed bridge locations, and forested canopy removal boundary are available at the AUESFO.

Status of the Species/Critical Habitat

Description

The Houston toad is one of six members of the Americanus Group (Forstner 2003). They are generally brown and speckled, although individual toad coloration can vary considerably. Some may appear light brown, others almost black, and they may also have a slightly reddish, yellowish, or greyish hue. Two dark bands extend down from each eye to the mouth, and their legs are also banded with darker pigment. A variable white stripe streaks along the sides of the Houston toad's body. The underside is usually pale with small, dark spots. Males have dark throats, which appear bluish when distended. Adult Houston toads are 2 to 3.5 inches long, are covered with raised patches of skin that resemble warts, and have two parotoid glands that contain chemicals that make the toad distasteful and sometimes poisonous to predators (Brown 1971). Although Houston toads are similar in appearance to the closely-related Gulf Coast toad (*Bufo valliceps)* and Woodhouse's toad (*B. woodhouseii)*, the species can be discerned by physical characteristics (Brown 1971).

Current Legal Status

The Houston toad was federally listed as an endangered species on October 13, 1970 (35 FR 16047 – 16048). The Service has assigned the Houston toad a recovery priority number of 2C, meaning that the species has a high recovery potential (the low number), and additionally that the recovery of the species is in conflict with construction or other development projects (48 CFR 43098). Critical habitat for the Houston toad was designated in portions of Bastrop and Burleson counties, Texas on January 31, 1978 (43 FR 4022 – 4026). The Houston toad is also listed as endangered by the State of Texas.

Critical Habitat

Critical habitat includes areas that are essential to the conservation of a threatened or endangered species and that may require special management considerations or protection. Although not described when critical habitat was designated, essential habitat requirements for the Houston toad include seasonally-flooded breeding ponds, deep sandy soil, and forested or woodland areas. The Service designated critical habitat for the Houston toad in 1978 (43 FR 4022), which includes approximately 98,000 acres in the central portion of Bastrop County, and approximately 2,000 acres surrounding Lake Woodrow in Burleson County where toads were known to occur at that time.

Little was known about the habitat requirements of the Houston toad at the time of listing and designation of critical habitat. Since that time, occupied Houston toad habitat has been documented in several additional counties and the area designated as critical habitat in Burleson County is no longer occupied. However, Houston toads were detected in other areas of Burleson County in May 2011 (Dr. Michael Forstner personal communication).

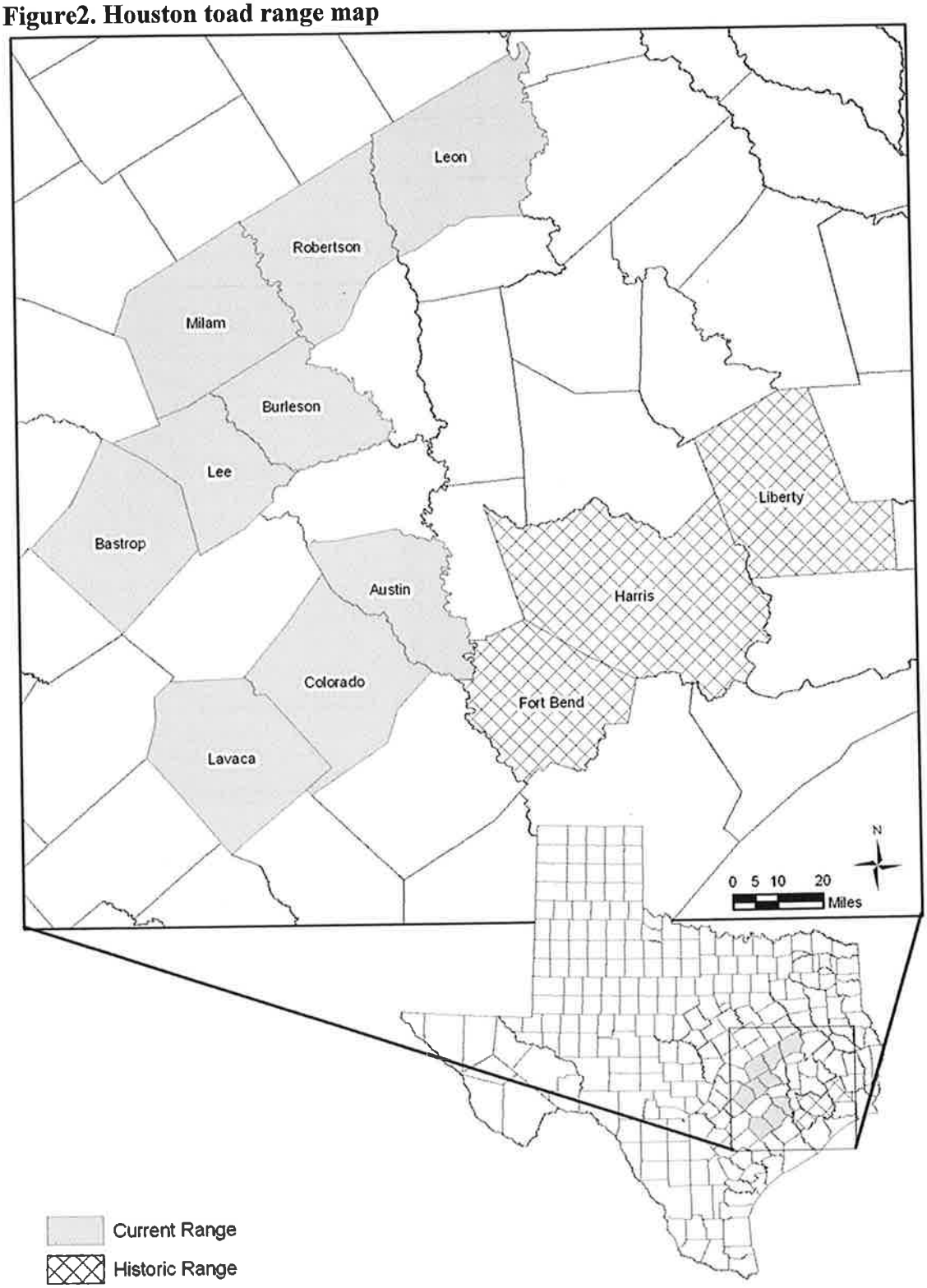
Distribution and Abundance

Distribution

Houston toad populations occur only in Texas and typically only along two parallel bands of geologic formations. According to the Bureau of Economic Geology, one band runs through Bastrop, Lee, Burleson, Milam, Robertson, Leon, and Freestone Counties and includes the Carrizo, Queen City, Reklaw, Sparta, and Weches formations. The other band runs through Austin, Colorado, and Lavaca Counties and includes the Willis and Goliad formations. These geologic formations form various sandy soils, including loamy fine sands and fine sandy loams. Current and historic ranges are shown in **Figure 2**.

Surveys conducted by Yantis from 1989 to 1992 found Houston toads occurring in Bastrop, Burleson, Lee, Milam, Robertson, Leon, Lavaca, Colorado, and Austin Counties. There are also historical records from Fort Bend, Harris, and Liberty Counties, but extensive surveys and

Figure2. Houston toad range map



documentation of the extent of habitat loss and degradation have confirmed the Houston toad's extirpation from these three counties (Hillis et al. 1984, Yantis 1989, 1990, 1991, 1992a).

Houston toads have not been found at the critical habitat site (Woodrow Lake) in Burleson County since 1983, although other populations have been found in the county (Dixon 1983, Yantis 1989, 1990, 1991, 1992a, 1992b).

Range-wide surveys conducted in 2009 indicate that Houston toads may currently be found in as few as six counties (Bastrop, Austin, Milam, Colorado, Leon, and Lee), although only two or possibly three of these counties were thought to have breeding populations.

Abundance

Population estimates for the Houston toad are difficult to develop because of the non-random nature of historical surveys, lack of access to private lands to conduct surveys, lack of methods to extrapolate breeding counts to the population as a whole, and the difficulty in locating the toad in times other than the breeding season (Forstner 2003, Forstner 2006, Forstner et al. 2007). Houston toad numbers in Bastrop State Park have shown an overall, long-term negative trend (Price 2003). The Lost Pines region experienced a severe drought in the 1990's, which may have greatly contributed to the decline, and the region again experienced drought conditions in 2005 and 2006. Low numbers of Houston toads observed during Bastrop County survey efforts in 2006 and 2007 indicate this species continues to decline with regard to abundance over the long-term (Forstner 2006, Forstner et al. 2007). This decline has continued to the present day despite additional intensive countywide survey efforts in 2009 and in 2012 following the BCCF (Forstner and Dixon 2011, Forstner et al. 2012). The record statewide drought of 2011, for example, resulted in the detection of 8 individuals in Bastrop County during the 2011 breeding season and no reproductive events (Forstner et al. 2012). Detections for 2012 and 2013 were increased from the 2011 surveys, but still at numbers that suggest the species continues a decline toward extinction

Available data indicate that the Lost Pines region in Bastrop and Lee Counties continues to support the largest known and best studied population of Houston toads (Sanders 1953; Brown 1971; Yantis 1989, 1990, 1991, 1992a; Dixon 1982; Price 1990a, 1990b, 1990c, 1992, 1993; Forstner 2002a, 2002b, 2003, 2006, Forstner et al. 2007, Forstner and Dixon 2011). The Bastrop County Houston toad population is likely historically part of a larger biologically relevant subpopulation occurring in the area bounded by the Colorado River on the south and extending well into Lee County on the north (Forstner 2003, 2006, Forstner et al. 2007). Houston toad habitat was found north of the critical habitat delineation in Bastrop County and into Lee County in 2000-2001; however, much of this habitat was cleared and converted into pasture by the end of 2001 (Forstner 2006, Forstner et al. 2007).

Past estimates of population size in Bastrop County have ranged from 300 to 2,000 (Brown 1975) based on data collected primarily at Bastrop State Park. However, the observed sex ratio

is on the order of five males to one female, so the effective population size may be much smaller (Forstner 2002a, Forstner 2003, Swannack and Forstner 2004a, Forstner 2006, Forstner et al. 2007, Swannack and Forstner 2007), with possibly only two or three counties in the range thought to have effective breeding populations (Forstner et al. 2007). In 2010, survey results confirmed this assumption by identifying and collecting 21 wild egg strands from three counties (Crump et al. 2010). Eggs were collected from four locations within Bastrop County, one location in Austin County, and one location in Leon County (Crump et al. 2010).

Habitat

Houston toads are associated with sandy soils. Based on 1997 satellite imagery (Service unpublished data), aerial photographs, U.S. Geological Survey topographic maps, and 1977 land cover maps (Texas Department of Water Resources 1978), all of the current known Houston toad populations and a historic locality in Liberty County are associated with tracts of forests dominated by pines and oaks, and other deciduous trees. Historically, localities in Harris County were characterized as coastal prairie (Brown and Thomas1982). At present, Houston toad habitat consists of rolling uplands characterized by pine and/or oak woodlands underlain by deep, sandy soils (Forstner 2003). Tree species vary from one region to the next, but typically include loblolly pine (*Pinus taeda)*, post oak (*Quercus stellate)*, blackjack oak (*Q. marilandica)*, and/or sandjack oak (*Q. incana)*. Although Houston toad occurrence does not appear to be correlated with the presence of a particular tree species, loblolly pine is dominant in the Lost Pines region of Bastrop County and occurs in other counties within the Houston toad's range. The Lost Pines is the most extensive stand of loblolly pines outside of the East Texas pine belt about 100 miles to the east, geographically separated by intervening prairie and savannah. Forests provide habitat partitioning that reduces competition with other toad species, cover to escape from predators and harsh climatic conditions, shade to prevent heating of the sandy soils, and food supplies. Forests also provide habitat continuity needed to maintain dispersal corridors between breeding and terrestrial habitats (Laan and Verboom 1990, Rudolph and Dickson 1990, Welsh 1990, deMaynadier and Hunter 1998, Gibbs 1998, Knutson et al. 1999).

Like the loblolly pines, Houston toads are found in areas of sandy soils (no more than 20 percent clay), which form over the Sparta, Queens City, Carrizo, Willis, Weches, Reklaw, and Goliad formations (Yantis 1991, Forstner 2003). These sandy soils effectively catch rainfall, and little is lost to runoff (Soil Conservation Service 1979). The Calvert Bluff Formation, which is a mudstone with varying amounts of sandstone, lignite, and ironstone, is not known to be associated with Houston toad breeding locations. However, breeding ponds have been found on the Calvert Bluff close to the Carrizo Sand (Forstner 2003). Like most amphibians, the Houston toad and its skin are highly vulnerable to desiccation. To aid against desiccation, they become dormant during harsh weather conditions. They seek protection from the winter cold (hibernation) and summer heat and drought (aestivation) by burrowing into moist sand or hiding under rocks, leaf litter, logs, or in abandoned animal burrows (Forstner 2003). Terrestrial juveniles are found in areas with shade and leaf litter (Greuter and Forstner 2004).

The presence of water is important for the Houston toad. Rainfall may stimulate breeding (Kennedy 1962, Price 1992) and movement (Quinn et al. 1994), prevents desiccation, and provides pools of water for reproduction. Alternately, an abundance of man-made surface water, presently above the historic condition, may be contributing to reduced aggregations of chorusing males, thus negatively affecting reproduction (Gaston et al. 2010). Breeding occurs in shallow, rain-fed puddles and pools that persist long enough (about 60 to 80 days) for the eggs laid to hatch into tadpoles and metamorphose into toadlets (Hillis et al. 1984, Price 1992). Houston toads have also been documented as breeding in permanent ponds and stock tanks within suitable habitat, although stock tanks and ponds with heavily impacted margins caused by frequent cattle disturbance are not used by the toads (Forstner 2001). Shading has been known to decrease pond temperatures, prolong metamorphosis, and delay emergence (Greuter and Forstner 2004).

Life History

Reproduction

The life expectancy of the Houston toad is at least three years and perhaps longer (Price 1992). Captive individuals at the Houston Zoo facility are known to live to 5 years or more (Paul Crump, pers. comm.). Males reach sexual maturity at about one year, but females require one to two years to achieve reproductive maturity (Quinn 1981). In mark-recapture surveys of Houston toads in Bastrop County, observed sex ratios of males to females have been highly skewed in favor of males, ranging from 3:1 to 10:1 (Dixon et al. 1990; Forstner 2002a, 2002b, 2003; Hillis et al. 1984; Swannack and Forstner 2004a, 2007), with Swannack and Forstner hypothesizing the observed male-bias is most likely due to the difference in age at first reproduction. The Houston toad is an "explosive" breeder, appearing in large numbers at breeding ponds where the males call to attract females over a period of a few nights throughout the breeding season (Dixon 1982). Houston toads chorus from January to June (Kennedy 1962, Hillis et al. 1984), with a peak in breeding in February and March. Large numbers of males congregate at a single location while only small numbers of individuals may appear at nearby ponds. Many locations in Bastrop County have failed to reach numbers of chorusing males likely to attract females (Forstner 2002b). Chorusing from individual ponds lasts from three to five days, and may not be synchronized with other ponds in the area. Two or three primary breeding periods separated by two to six week intervals occur at suitable ponds, and males may mate during more than one breeding episode (Hillis et al. 1984). Reported egg-laying dates in the field range from February 18 to June 26 (Kennedy 1962, Dixon 1982, Hillis et al. 1984).

Under suitable environmental conditions, pairs remain in amplexus, the copulatory embrace for toads and frogs, for six hours at minimum and eggs are laid in the early morning hours among vegetation or debris near the bank (Hillis et al. 1984). Reported clutch sizes per female vary from 512 to 6,199 eggs (Kennedy 1962, Quinn and Mengden 1984, Quinn et al. 1987). In wet years, breeding may occur wherever sufficient standing water is present. This species typically uses ephemeral rain pools for breeding, although it has been known to breed in flooded fields and permanent ponds. Often, the most reliable breeding sites for locating Houston toads are

stock ponds and similar impoundments, since they are permanent water bodies. Unfortunately, permanent water bodies tend to support more predators, such as fish, turtles, bullfrogs (*Rana catesbeiana)*, aquatic invertebrates, and snakes (Forstner 2001) that prey on Houston toads. For successful breeding, water must persist for at least 60 days to allow for egg hatching, tadpole maturation, and emergence of toadlets (Hillis et al. 1984, Price 1992).

Development rates of Houston toads vary depending on temperature and other factors. Eggs may hatch within seven days and tadpoles may remain in the pond for 40 to 80 days depending on environmental conditions. Metamorphosis of tadpoles in a given pond generally occurs at approximately the same time over a period of a few hours, resulting in post-metamorphic aggregations of toadlets that remain at the edge of the pond for seven to ten days or more (Hillis et al. 1984, Dixon et al. 1990, Forstner 2002a). Hillis et al. (1984) observed large numbers of toadlets moving as far as 330 feet in daylight from their natal ponds along the same gulleys used by adult toads during the breeding season. Mortality in young is extremely high due to predation and drying of breeding sites, and less than one percent of eggs laid are believed to survive to adulthood (Quinn 1981; Price 1992; Forstner 2002a, 2002b, 2003; Greuter and Forstner 2004). The results from field surveys in 2006 found the Houston toad juvenile survival rate to be approximately 0.03 percent (Forstner 2006). Forstner (2002c) has documented instances of chorusing that did not appear to result in eggs or toadlets; therefore, successful chorusing may not mean successful breeding.

Activity

Many amphibians occupy upland sites at substantial distances from the nearest breeding pond, and members of the Bufo genus are among the most terrestrial anurans. They live on land following metamorphosis and return to water only briefly during the breeding season (Christein and Taylor 1978). Houston toads may range widely throughout upland habitats (Price 1990a, 1992; Dixon et al. 1990; Yantis 1994). Breeding is often followed by aestivation, a state of dormancy, but toads are known to emerge and be active during the non-breeding season (Dodd and Cade 1998, Dixon et al. 1990, Dronen 1991, Forstner 2002a). However, because of the toad's secretive nature, little is known about its distribution and activities during this period. Dronen (1991) reported frequent captures of small (approximately 1.5 inches in body length) Houston toads in pitfall traps during the fall (September through early November) and late winter (late January and early February). Toads were generally captured when temperatures were mild (59 to 77 degrees F) and following periods of rainfall. No Houston toads were captured during colder weather conditions. Forstner (2000, 2001, 2002a) has collected Houston toads throughout the year. Adults were mainly collected between February and May, during the breeding season. However, one male toad was collected in December, which Forstner (2002a) believes is due to a warming that typically occurs in December. Juveniles were collected in all months except January and February. Dixon et al. (1990), Price (1990a), and Yantis (1994) found that during the breeding season adult Houston toads would travel over a mile, sometimes across inhospitable areas such as roads, gravel soils, and pastures. However, telemetry and pit fall trap data indicates

that adult Houston toads do not move more than about 49 feet away from forested canopy cover (Swannack et al. 2004, Swannack and Forstner 2004b).

During the breeding season, adult Houston toads travel between different sites. A marked adult male traveled a minimum of 4,469 feet each way back and forth between two ponds in a two-year period. Another marked individual in the same study covered 1,592 feet within a 24-hour period (Price 1992). Price (unpublished data, 2001) has documented the same individually-marked male and female Houston toads using breeding ponds that are over one mile apart (straight-line distance) and in different watersheds. Mark-recapture studies have documented individual Houston toads traveling up to 3,900 feet to breeding ponds through areas that included gravel roads, divided highways, and pastures (Dixon et al. 1990, Price 1990a, Yantis 1994). Juvenile dispersal of 4,400 feet in a 5 week period has been documented utilizing genetic mark-recapture techniques (Vandewege et al. 2012).

Food Habits

Houston toads feed on a variety of insects and other invertebrates. Bragg (1960) reported that captive Houston toads favored many small to medium-sized carabids (ground beetles), several small beetles of unknown families, several dipteral (flies), green lacewings, and many types of small moths.

Houston toad tadpoles are known to ingest algae and pollen. Hillis et al. (1984) reported tadpoles consuming the jelly envelopes of recently hatched Houston toad eggs (none were observed eating eggs before they hatched) as well as pine pollen. Tadpoles remain on the bottom of the ponds during the day, and at night they feed on material attached to vegetation in water and along the pond's edge (Hillis et al. 1984). Once they leave the pond after metamorphosis, juvenile Houston toads presumably feed on small invertebrates found on the forest floor.

Population Dynamics *(population size, variability and stability)*

The Houston toad's population structure appears to fit the definition of a metapopulation (Soulé 1987, Marsh and Trenham 2001) because it consists of subpopulations in somewhat geographically isolated patches, interconnected through patterns of gene flow, extinction, and re-colonization (Soulé 1987, Marsh and Trenham 2001). In some areas, what were once subpopulations of larger metapopulations are now apparently isolated from each other by urbanization, heavily used roads, and agriculture. Some of these changes may be reversible, allowing currently isolated populations to become part of greater metapopulations. In other cases, the changes have been so extensive that reconnection may no longer be an option. Other populations appear to be naturally isolated by riverine basins and geologic formations, and may historically be part of separate metapopulations.

Hatfield et al.'s 2004 population viability analysis estimated that a population size (carrying capacity of the habitat) of 5,000 breeding females, a minimum of two subpopulations, and a

juvenile survival rate of at least 1percent would be necessary to reduce the likelihood of extinction in 100 years. However, Hatfield et al. (2004) also indicated that if two or three separate subpopulations of Houston toads are protected (with interconnectivity among them), then a carrying capacity of as few as 1,000 female toads (at least 1 year old) would have a low probability of extinction in 100 years.

Forstner (2006) and Forstner et al. (2007) argued that Bastrop may be the only remaining sustainable subpopulation of Houston toads, since chorusing Houston toads confirmed in Lee County in 2000-2001 were not heard in 2006 and 2007 surveys. Forstner had considered the Houston toad to be extirpated in Lavaca County until finding a single male in 2011 and again in 2013, unlikely to remain at any appreciable populations in Lee County, and at very low numbers in Austin, Colorado, and Leon counties (2008). In addition, the estimated female population is thought to be well below 5,000 individuals (Forstner et al. 2007), juvenile survivorship has been estimated at less than 1 percent (Forstner et al. 2007), and there is an observed male-bias in the Houston toad population (Dixon et al. 1990; Forstner 2002a, 2002b, 2003; Hillis et al. 1984; Swannack and Forstner 2004a, 2007). In summary, the population has been on a trend toward extinction in the wild since at least the early 1990s. The BCCF may prove to be the extinction level event that Dr. Forstner proclaimed it to be in the immediate wake of the fire. In all, the numbers of adult breeding individuals in the wild are insufficient to recover the species without intervention and active management.

Reasons for Listing/Threats to Survival

Habitat loss, fragmentation, and degradation are the main threats facing the Houston toad. This includes expanding urbanization, conversion of woodlands to agricultural use, road construction, and wetland destruction or alteration. Extensive clearing of native vegetation near breeding ponds and on the uplands adjacent to these ponds reduces habitat quality, and increases the chances of predation and hybridization. Conversion of native grassland and woodland savannah to Bermuda grass (*Cynodon dactylon)* or other heavy, rhizomatous mat-forming grasses, eliminates habitat because these grasses are generally too dense for the Houston toad to move through.

Draining a wetland or converting an ephemeral wetland to a permanent pond can cause Houston toads to decline in the area around the pond or be eliminated entirely. Survival of eggs, tadpoles, and emerging juveniles may be low in permanent water bodies (Forstner 2003) because they are more likely to harbor predators such as birds, mammals, snakes, turtles, fish, aquatic invertebrates, and bullfrogs (Quinn and Ferguson 1983, p. 8-9; Dixon et al. 1990; Price 1992, p. 6; Price 1993, p. 4) and potential competitors, such as Woodhouse's and Gulf Coast toads (Hillis et al. 1984). Permanent water bodies also have an increased probability of livestock usage (Forstner 2003), which can negatively impact the quality of habitat along the shoreline of breeding ponds (Forstner 2001, Forstner 2003).

Red-imported fire ants (*Solenopsis invicta)* threaten Houston toads by killing young toadlets emerging from ponds (Freed and Neitman 1988, Forstner 2002). They have also been known to drastically reduce the abundance of native insect species that serve as the Houston toad's food source.

Small, sedentary species with restricted distributions, specialized habitat niches, and narrow climatic tolerances are particularly vulnerable to extinction (Welsh 1990, deMaynadier and Hunter 1998). The distribution of the Houston toad appears to be restricted naturally as the result of specific habitat requirements for breeding and development. These natural restrictions make them particularly vulnerable to the negative effects of human-induced changes that result in habitat loss, degradation, and fragmentation. Threats include expanding urbanization, conversion of woodlands to agriculture, logging, mineral production, alteration of watershed drainages, wetland degradation or destruction, species competition and other human-induced processes that contribute to loss of suitable breeding, feeding, or sheltering habitat. In addition, their restrictive habitat requirements make them vulnerable to natural processes such as drought and climate change. Since many of the threats to the Houston toad are interdependent on one another, the following descriptions may address multiple threats.

Drought

Drought conditions can have a severe effect on the Houston toad as breeding ponds fail to fill or dry up before eggs or tadpoles can metamorphose. The low numbers of chorusing males recorded in the late 1990s compared to the numbers encountered in 1989-1990 may be the result of the mid-1990s drought (Price 2003, Forstner 2000), while a 2005-2006 drought may have led to reduced numbers of chorusing males in 2006 and 2007 (Forstner et al. 2007). In 2005-09, central Texas experienced harsh drought conditions with only a single wet year in 2007. Compared to historical droughts of the 20th and 21st centuries, the 2008-2009 Texas drought was one of the most severe droughts on record from a precipitation standpoint alone (Nielsen-Gammon and McRoberts 2009). With a brief respite from significant rains in 2010, 2011 brought an unprecedented lack of rainfall since records began being kept in 1895 (Nielsen-Gammon 2011). Both 2012 and 2013 were closer to "normal" precipitation years during the spring breeding season, but the south central portion of Texas remained in a "moderate" drought in the spring of both 2012 and 2013 (Texas Water Development Board 2013). Although Houston toads persisted through droughts in prehistoric times, habitat loss from anthropogenic impacts has reduced the number of subpopulations and total number of individuals found range-wide (Dr. Michael Forstner, pers. comm.; McHenry and Forstner 2009). This is especially important because low abundance, recruitment, and survivorship of Houston toads significantly affect their ability to rebound from factors that negatively affect their environment (Soulé et al. 1992). Smaller populations are thus at higher risk of extirpation during episodes of drought and may not be recolonized (Blaustein et al. 1994, Forstner 2008). This is especially important as the sex ratio results from Bastrop County indicating fewer females than males exacerbate the situation (Swannack and Forstner 2007). Much of central Texas, including Bastrop County and other portions of the Houston toad's range, has been experiencing extreme drought conditions

from 2008 to 2011. Drought can severely impact Houston toad breeding habitat and reduce the survivorship of juvenile toads.

Habitat Destruction and Landscape Fragmentation

Habitat conversion and fragmentation make the Houston toad more vulnerable to predation, competition, and hybridization. Removal of trees acts to exacerbate the effect of drought on a local scale by increasing heat at ground level and consequent moisture loss from the soil, making the deforested area unsuitable for Houston toads that need to burrow to escape desiccation (Forstner 2003). Excavation and impoundment of seasonal or ephemeral drainages or wetland areas creates permanent open water as opposed to ephemeral ponds and pools. Permanent water is more likely to harbor predators such as birds, mammals, snakes, turtles, fish, aquatic invertebrates, and bullfrogs (Quinn and Ferguson 1983, Dixon et al. 1990) and potential competitors such as Woodhouse's and Gulf Coast toads (Hillis et al. 1984).

Habitat disturbance also encourages the establishment and proliferation of red-imported fire ants. Fire ants are known to prey on newly-metamorphosed toadlets (Freed and Neitman 1988, Dixon et al. 1990, Forstner 2002a), as well as on the invertebrate community that is an important part of the toad's food base (Bragg 1960). Fire ants are associated with open habitats disturbed as a result of human activity (such as old fields, lawns, roadsides, ponds, and other open, sunny habitats), but are absent or rare in late succession or climax communities such as mature forest (Tschinkel 1988). Thus, maintaining large, undisturbed areas of woodlands may help control the spread of fire ants (Porter et al. 1991) and protect native ant populations (Porter et al. 1988, 1991; Suarez et al. 1998).

Paved roads can prevent or hinder dispersal and effectively isolate populations of some invertebrates, small mammals (Mader 1984, Mader et al. 1990), and amphibians (Van Gelder 1973, Reh and Seitz 1990, Soulé et al. 1992, Fahrig et al. 1995, Yanes et al. 1995, Findlay and Houlahan 1997, Gibbs 1998, Vos and Chardon 1998, Knutson et al. 1999). Highways can have serious demographic consequences by increasing mortality and reducing connectivity and migration among remnant habitat patches. Surveys along a 5-mile stretch of Highway 21 adjacent to breeding ponds near Bastrop State Park during 1990 reported 67 percent mortality of Houston toads (12 of 18 individuals) observed in the right-of-way during the breeding season (Dixon 1990, Price 1990c).

Agricultural production may contribute to habitat loss by converting forests to pasture or cropland; draining, filling, or deepening of wetlands; and compacting the soil. Plowing, mowing, applying herbicides, pesticides, and fertilizers, and disturbing aestivating toads can result in direct toad mortalities (Knutson et al. 1999, Little et al. 2002). Habitat conversion to cropland or pasture also encourages the establishment of fire ants. Livestock and hay production are common land uses throughout much of the Houston toad's range (Yantis 1989, 1991). Dense sod-forming grasses, such as Bermuda grass can inhibit the Houston toad's mobility (Yantis 1989). Although Houston toads may migrate across cleared areas (Dixon et. al. 1990), they are

rarely found far from a forested edge (Swannack and Forstner 2004b). Livestock grazing is a common use of woodlands within the range of the Houston toad. Livestock can trample egg clutches, larvae, toadlets, and wetland vegetation in and around breeding pools, and juveniles, adult toads, and vegetation may be crushed by livestock (Dr. Forstner pers. com.). Forstner (2001) reported a dramatic return of wetland vegetation and an increase in Houston toad breeding success with the removal of cattle.

As conversion of forested areas to pastureland continues to occur and more grazing operations are established, landowners are becoming more dependent on permanent water sources. Often times these water sources are created stock ponds. Although the Houston toads utilize permanent water bodies as breeding locations, numerous ponds on the landscape can affect the density of small populations. Smaller or less dense breeding aggregations may attract fewer females, thereby reducing mating probability for males attending smaller choruses, and may have subsequent negative population impacts (Gaston et. al. 2010).

Competition and Hybridization

Competitors of the Houston toad include Woodhouse's toad and the Gulf Coast toad. All three species are found in areas of deep, sandy soils. Breeding activity in the Gulf Coast toad has been observed after the peak in Houston toad breeding activity (Swannack et al. 2004). This temporal difference in breeding activity likely reduces competition between the two species. While the Woodhouse's toad has a breeding season that is similar to the Houston toad, the Woodhouse's toad is found more often in open areas. Hybridization with these species has been documented (Hillis et al. 1984). Most hybrids have been found where the habitat of the Houston toad has been altered from woodlands to pasture or suburban development, allowing invasion by the other species (Hillis et al. 1984; Yantis 1991; Forstner 2002a, 2003). Based on a 2012 county-wide survey following the BCCF in September of 2011, post-fire occurrences of Gulf Coast toads in the catastrophically burned area increased significantly as these animals rapidly colonized previously unoccupied areas in the burn zone (Dr. Forstner, pers. comm.).

Wildfire and Fire Suppression

Frequent and/or severe forest fires may be detrimental to the Houston toad, particularly for small, fragmented populations. Fire suppression is of primary concern, particularly in the wake of the 2011 catastrophic BCCF, but this issue has been regarded as significant at least as early as the recovery plan (Service 1984). On the other hand, periodic controlled burns may be necessary to reduce fuel loads, prevent catastrophic fires, and improve habitat conditions beneath the forest canopy (Yantis 1989, Price 1993). Although necessary to determine the short and long-range effects of various fire regimes, little research has addressed the effects of fire on amphibians (deMaynadier and Hunter 1995). Direct mortality to the Houston toad resulting from wildfires is thought to be low, as amphibians have been shown to survive fire by moving under the soil or seeking refuge within the burrows of other animals (Russell et al. 1999). Short term juvenile amphibian capture and body condition changes post-fire have been recently examined (Brown et

al. 2011) and results indicate that fire does not appear to negatively impact short term terrestrial juvenile amphibian survivorship or health. The most considerable effects to the Houston toad from catastrophic wildfire are the adverse changes to its habitat. The loss of understory vegetation, surface debris (leaf litter and logs), and canopy cover can lead to increased exposure to temperature extremes and predation, loss of habitat availability, and reduced dispersal and foraging capabilities. Soil erosion, which is a typical occurrence following wildfires (Kocher et al. 2009, p. 3), can affect Houston toad breeding habitat by decreasing water quality in ponds.

Pesticide, Fertilizer, and Contaminant Impacts

Because of their semi-permeable skin, development of their eggs and larvae in water, and their position in the food web, amphibians are vulnerable to waterborne and airborne pollutants, such as heavy metals, certain insecticides (particularly cyclodienes, such as endosulfan, endrin, toxaphene, and dieldrin), nitrites, salts, certain organophosphates (such as parathion and malathion), and petroleum hydrocarbons (Harfenist et al. 1989, Little et al. 2002). Pesticides can also change the quality and quantity of amphibian food and habitat (Bishop and Pettit 1992). No progress has been made to evaluate the effects of pesticides or herbicides specifically on the Houston toad (Forstner and Dixon 2011).

Mineral Production Impacts

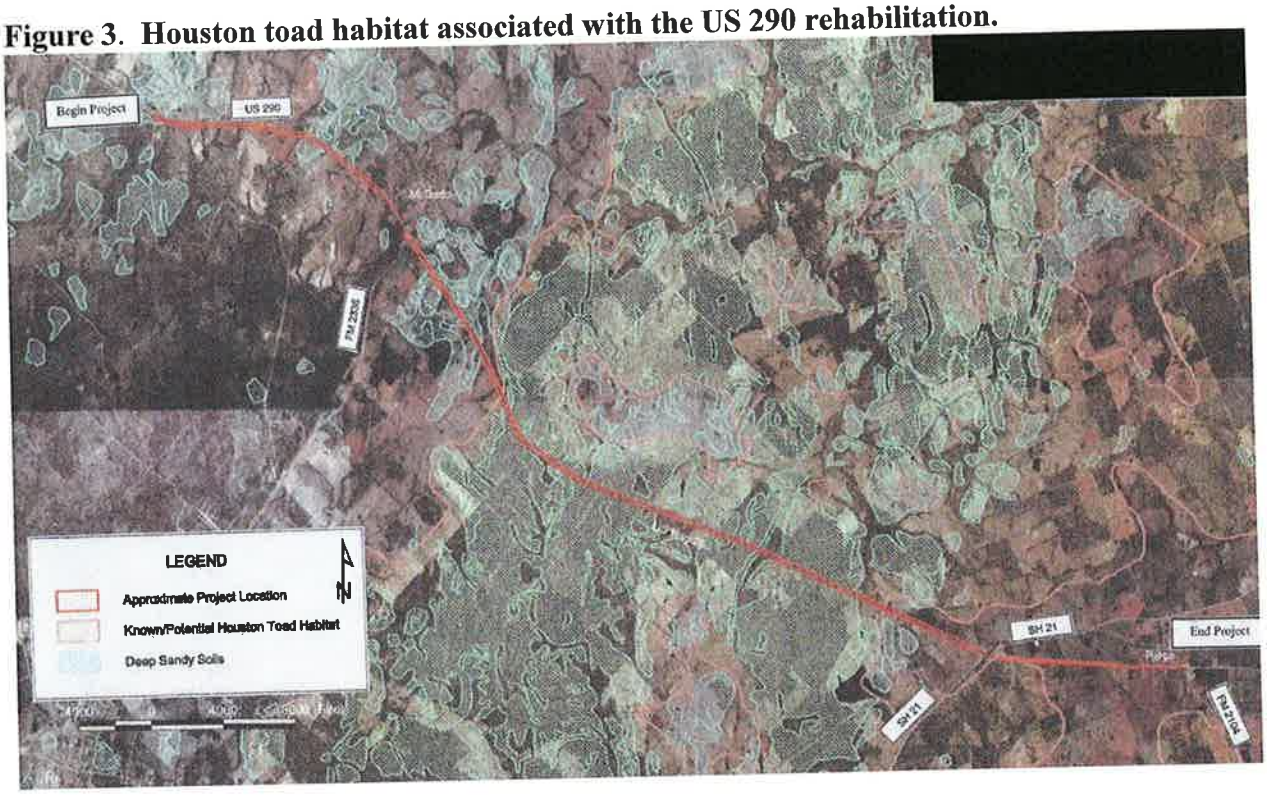
Oil and gas fields occur throughout much of the Houston toad's range. The installation of oil and gas wells, roadways, staging areas, pipelines, and the subsequent maintenance of these facilities can result in toad mortality, habitat loss, and fragmentation. Trenching or construction in areas inhabited by aestivating toads and trapping toads in open trenches or pits can result in toad mortality and reproduction can be disrupted by destroying breeding sites. In addition to oil and gas production, mining operations (including lignite, gravel, and sand) can also result in severe, if not total, habitat loss in areas occupied by the Houston toad. Direct mortality of Houston toads and complete destruction of their habitat may occur in the mine area. In addition, Dixon (1982) identified possible indirect impacts from lignite mining: dewatering may draw down surface waters and dry out the subsurface moisture, which may reduce the carrying capacity of permanent surface ponds and/or ephemeral pools; and leaching of sulphur and weak carbonic acids from the mine may produce poor water quality downstream in areas used by the Houston toad.

Recovery Efforts

Relatively consistent rangewide survey and monitoring efforts for the Houston toad have been ongoing continuously with the current group of researchers since the late 1990s with a focus on the largest remaining population in Bastrop County. A robust research effort has led to numerous contributions on the species' genetics (McHenry & Forstner 2009), habitat modeling (Buzo 2008), ecological monitoring (Swannack et al. 2009), abundance estimates (Duarte et al. 2011), response to prescribed fire (Brown et al 2011), response to red imported fire ants (Brown

et al, 2012), etc. In accord with the draft revised Houston Toad Recovery Plan (unpublished data), the Houston Toad Recovery Team has identified four "focus areas" to concentrate on-the-ground recovery actions for the Houston toad. The geographic extent of these areas is based on habitat suitability models completed for each county within the Houston toad's range utilizing variables of cover, soils, and distance to water (Buzo 2008). **Figure 3** shows the Houston toad habitat in the area of the US 290 projects.

Figure 3. Houston toad habitat associated with the US 290 rehabilitation.



A Houston toad headstarting program was initiated in 2007 by Texas State University, Houston Zoo, Service, and Texas Parks and Wildlife Department (TPWD). The first Breeding and Transfer Plan for the Houston toad has been finalized (Crump and Schad 2012). These actions culminated in the Service, in cooperation with the Houston Zoo, Texas State University, TPWD, and other partners, completing in 2013, the first rounds of captive breeding and re-introductions, continuing headstarting of wild egg strands, and identifying a new location of the Houston toad. Captive breeding and release of Houston toads is not a novel action as the Houston Zoo had a captive breeding program dating back to the 1980s. However, funding and monitoring issues plagued that effort. The Zoo undertook the current attempts of captive breeding in 2012 and information on captive breeding has been updated and revised in each subsequent attempt, leading up to the successes of the spring 2013 captive breeding which resulted in approximately 36k eggs being released into the wild in Bastrop County. Additionally, the Service and partners have been focused on identifying private landowners to enlist in habitat restoration and recovery actions, including releases. Those efforts are rangewide and currently gaining momentum

through a number of landowner outreach events, educator education, and the efforts of the Houston Zoo's media relations. A number of section 7 actions in the last 2 years have also added to our understanding of the species and promoted recovery.

Environmental Baseline

Under section 7(a)(2) of the Act, when considering the effects of the proposed action on federally listed species, the Service is required to take into consideration the environmental baseline. The environmental baseline includes past and present impacts of all Federal, State, or private actions and other activities in the action area (50 CFR 402.02), including Federal actions in the area that have already undergone section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in progress.

The reasons for the decline of the Houston toad throughout its range have been speculated on since the recognition that numbers were dwindling almost immediately after its discovery in the late 1940's and description by Sanders in 1953. Dr. Lauren Brown advocated for saving the Houston toad in the mid-1970's as it disappeared from Harris County (Brown 1975) and following its listing in 1970 under the Endangered Species Conservation Act of 1969 (35 FR 16047). Dr. Andy Price and Jim Yantis with TPWD studied the species and reported on its' extirpation from Liberty, Fort Bend and Harris counties in the 1990's. Dr. James Dixon (Professor Emeritus, Texas A&M University) and the current generation of Houston toad researchers, led by Dr. Michael Forstner of Texas State University, have documented the species' trajectory toward extinction and are largely responsible for the findings that have driven the most recent efforts at managing recovery of the species.

Habitat loss through destruction, fragmentation, and fire suppression and including conversion to agriculture and subsequent urbanization are primary threats to the species' continued existence. Predation, including direct and indirect effects of invasive species (e.g., red-imported fire ants), inter-specific competition, effects from herbicides and pesticides, disease (e.g. Chytrid fungus), and effects from drought are additional significant threats to the species. Despite these threats, the species is thought to be recoverable. Recent headstarting and captive propagation efforts make this plausible so long as sufficient habitat can be identified, restored, maintained, and conserved to provide for multiple sustainable populations across the range.

Status of the species within the action area

The status of the species in the nine county range is better understood today that in past decades due to the broader consistent survey efforts since 2000. However, their numbers do not give reason for optimism. Surveys in 2011 documented a total of 12 chorusing males rangewide. The drought of 2011 was the 1-year drought of record for the State of Texas (Nielsen-Gammon 2011) and part of a longer drought cycle that has been affecting Texas since 2005. Compounding the drought, the wildfire in BCCF in September 2011 burned, largely catastrophically, approximately 40 percent of the remaining habitat in that population (Brown et al. 2012). Dr.

Forstner, a principle investigator of the Houston toad over the last decade or more, has described the BCCF as an extinction-level event for the Houston toad (pers. comm.). An intense countywide survey in 2012 accompanying the human recovery efforts demonstrated that the species weathered the drought and fire, even appearing and breeding in areas that had been catastrophically burned the prior summer/fall (Forstner et. al 2012).

The US 290 project area has been surveyed annually by Dr. Forstner since 2006. Amphibian species have been documented at all surveyed locations adjacent to US 290 (Forstner 2013). Houston toads have been heard calling at a number of breeding ponds located adjacent to the proposed US 290 ROW in every year of the surveys, except 2011(Forstner 2013). Drainages leading into or away from the breeding ponds may cross the project construction zone. TxDOT has proposed to install barrier fencing along the outer edge of the ROW at these drainages to prevent Houston toads from entering the work zone during construction. There are no known Houston toad breeding ponds within the proposed ROW for the US 290 projects.

The 84.6 acres of Houston toad habitat occurring within the new ROW are forested tracts, with deep, sandy soils. All 84.6 acres will be impacted by the project. These forested tracts may be used by Houston toads during non-breeding periods or as dispersal corridors to travel between breeding and non-breeding habitats. In some areas, the habitat that would be affected by the project is located on the outer edge of a larger contiguous forested block. In other areas, the forested habitat is a thin strip running parallel with the highway ROW, with non-forested habitat lining both sides. Generally, these thin forested strips are associated with wet or dry drainage features. About 32.5 and 52.1 acres of Houston toad habitat would be impacted for construction of the eastern and western projects respectively. Most of the Houston toad habitat that would be impacted by the projects is on the southern side of the existing US 290 ROW.

No CH exists within the action area; therefore, no CH would be affected.

Factors affecting the species within the action area

Within the action area for this project, there are no other federal, state, tribal, local or private actions affecting the Houston toad. However, the existing drainage features crossing US 290 in the action area may be hindering dispersal of Houston toads across the highway corridor (Dr. Forstner pers. comm.). Several of the existing drainage culverts have lips on the outer edge that would inhibit of movement of small amphibians into the drainage pipe. There is also one culvert location where the drainage has severely eroded down, causing the pipe entrance to be several feet above the elevation of the drainage. TxDOT is proposing to replace four of the existing drainage structures with bridges to try to facilitate Houston toad dispersal. Hatfield et al. (2004) proposed that interpopulational connectivity is the key to preventing the extinction of the Houston toad.

Effects of the Action

Factors to be considered

Proximity of the action

The proposed construction on US 290 would occur within the occupied range of the Houston toad. However, only a small portion of the range, about 84.6 acres of habitat would be affected during construction. The proposed US 290 ROW is considered the action area because that is where direct and indirect adverse effects to the species are likely to occur due to the project. The construction footprint and cleared ROW would permanently eliminate all 84.6 acres of Houston toad habitat in the action area, although a small amount of habitat would be restored by revegetating the drainages within the project boundary.

Distribution

The effects would be localized to the existing and proposed ROW area surrounding US 290, across the entire 13.25 mile long project corridor. The disturbance would occur in two distinct events, with the eastern project occurring first, impacting about 32.5 acres of Houston toad habitat. The western project would not be initiated until at least 2018 and would impact about 52.1 acres of Houston toad habitat.

Timing

Clearing of Houston toad habitat for the eastern project would commence at the start of construction activities, in late 2013 or early 2014, and would likely occur during portions of the Houston toad breeding period (January 1 thru July 1). However, no breeding habitat occurs within the ROW, therefore habitat clearing should not impacts Houston toads around their breeding locations. TxDOT will attempt to phase their construction so the installation of the new bridges and extended drainage structures would occur outside of the Houston toad breeding period. Clearing of the habitat on the western project would not begin until at least 2018. Since TxDOT has several years available to plan the timing of construction on the western project, vegetation clearing within the ROW must occur outside of the Houston toad breeding season.

Nature of the effect

The effects associated with land clearing and highway construction activities would directly alter the Houston toad population and distribution within the action area, but would not affect the overall population size, variability, or distribution outside of the action area. The project has been designed to minimize impacts to the Houston toad and effects would only occur within the project work zone. TxDOT would attempt to avoid altering the Houston toad's lifecycle by phasing work on the drainages outside of the Houston toad breeding season and by implementing protective measures, such as the installation of barrier silt fencing, to prevent Houston toads from entering the work zone near drainage features.

Duration

Work is proposed to begin on the eastern project in late 2013 and would take about 19 months to complete. Construction on the western project is scheduled to begin in 2018 and would also take about 19 months to complete. The direct effects to the Houston toad would occur at the onset of the project during land clearing activities. Indirect effects, such as alterations of the species ability to carry out their normal lifecycle, including emigration/immigration across the project work zone, would persist until the each project is complete and vegetation is reestablished in the work areas adjacent to the drainages.

Disturbance frequency, intensity, severity

The proposed project would consist of two separate, but related, events. The eastern project would begin immediately and last for about 19 months. All vegetation, including Houston toad habitat, would be removed completely from the proposed ROW at the onset of construction and the disturbance would continue throughout construction on the project. Any Houston toad located in the action area prior to the start of construction would be taken, however, the direct effects to the Houston toad from construction would not extend beyond the initial land clearing. The western project would have similar disturbance effects when construction begins in 2018.

Analysis for effects of the action

Beneficial effects

Conversion of four of the existing drainage box culverts to bridges would benefit the Houston toad by providing appropriate conditions to encourage dispersal along the drainages from the south side of US 290 to habitat on the north side of the highway. The existing drainage culverts are a deterrent to the Houston toad crossing the highway (Dr. Forstner pers. comm.). The improved habitat connectivity would support genetic exchange between Houston toads located north and south of the highway. Houston toads tend to follow natural drainages as young for dispersal and as adults to travel to breeding ponds.

Direct Effects

The direct effects to the Houston toad within the action area would be from the loss of about 84.6 acres of Houston toad non-breeding habitat during initial land clearing of the expanded ROW. Dr. Forstner estimates that one adult and five juvenile Houston toads may be directly taken on each of the projects during land clearing activities (pers. comm.). His estimate is based on the amount of habitat and number of drainage features being impacted by the project. The Houston toad habitat may or may not be occupied at the time the vegetation would be cleared within the ROW. Houston toads may be killed or injured during the land clearing activity if they are present when these activities occur. If a Houston toad is found within the project work zone after

construction has started, construction in that area would cease until the toad has left the area. Houston toads may be harassed due to machinery passing closely to their locations by noise or vibration. Noise disruption may also harass Houston toads if it occurs during their breeding call attempts; however, since TxDOT is not proposing to work at night when male toads would be calling, this should not be an issue. The barrier fencing, installed to prevent Houston toads from entering the construction area, may prevent dispersing toads from using the drainages to cross the highway to reach nearby non-breeding habitat. This alteration of their normal behavior pattern would be a form of harassment.

Indirect effects

Indirect effects from the proposed action would include erosion, increased sedimentation, and increased turbidity within the any of the drainages of road. The increased activity related to construction is expected to harass the Houston toads occurring within the action area by limiting access to available habitat and disrupting migration and/or seasonal movements between breeding ponds and non-breeding habitat. Additionally, Houston toads may be indirectly affected by removal of construction BMPs after construction is complete and normal maintenance of the ROW.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The action area for this consultation is the proposed ROW for US 290, encompassing 463.4 acres. All 84.6 acres of Houston toad habitat within the ROW would be permanently eliminated due to the road rehabilitation project. TxDOT controls access within the ROW and would be able to restrict any future impacts within the ROW. Therefore, no cumulative effects to the Houston toad within the action area are anticipated.

Conclusion

The Houston toad is known to occur in areas of suitable habitat across Bastrop County. Severe drought and the 2011 BCCF have altered habitat availability across a large portion of the Houston toad occupied range. In the breeding season following the wildfire, Houston toads were heard chorusing in ponds adjacent to the US 290 ROW, indicating some Houston toad may have dispersed into new areas because of the drought and fire (Forstner 2013). The proposed action would not impose a permanent physical barrier to Houston toad occupying habitat adjacent to the construction zone, but individuals would be deterred from entering the construction zone during project implementation. Effects to the Houston toad would be confined to the immediate area affected by construction and would only temporarily affect the local population during

construction. The immediate disturbance caused by construction would affect about 84.6 acres of Houston toad habitat, primarily on the south side of the existing US 290 pavement. Direct effects would occur in this area during the initial land clearing phase of construction.

After reviewing the current status of the Houston toad, the environmental baseline for the action area, the effects of the proposed US 290 rehabilitation project, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Houston toad for the following reasons:

1. The total amount of habitat to be permanently lost, 84.6 acres, is only a small fraction of the habitat in Bastrop County and elsewhere within the Houston toad's range;
2. The estimated amount of take is based on the amount of habitat and number of drainages to be impacted, if no Houston toads are present at the time of construction, incidental take could be less than proposed;
3. Converting four of the existing cross drainage structures from culverts to bridges would facilitate Houston toad dispersal across the US 290 corridor into suitable habitat not currently fully utilized.

The conclusions of this BO are based on full implementation of the project as described in the "Description of the Proposed Action" section of this document, including any Conservation Measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by FHWA so that they become binding conditions of any grant or permit issued to TxDOT, as appropriate, for the exemption in section 7(o)(2) to apply. FHWA has a continuing duty to regulate the activity

covered by this incidental take statement. If FHWA (1) fails to assume and implement the terms and conditions or (2) fails to require TxDOT to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, FHWA or TxDOT must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Amount or Extent of Take Anticipated

Dr. Forstner has been monitoring the project area for Houston toad occurrence since the original BO was issued in 2006 and estimates total incidental take of the Houston toad would not exceed 12 individuals (two adults and ten juveniles). His estimate is based on the amount of habitat to be affected and the number of drainages that occur within the proposed project limits. The incidental take would be evenly divided between the two projects. Lethal incidental take in the form of harm, via mortality, and non-lethal incidental take, in the form of harm and/or harassment from construction activities, is anticipated to occur during construction activity and through changes to Houston toad habitat within the construction zone and new ROW across the entire 463.4 acre action area. The Service believes harm and harassment related to construction activity is reasonably certain to occur for those activities involving significant ground disturbance in close proximity to the 84.6 acres of Houston toad habitat that would be cleared for the project. The actual incidental take would be extremely difficult, if not impossible, to monitor due to the cryptic nature of the Houston toad when located in non-breeding habitat; therefore, the amount of incidental take will be monitored by the amount of Houston toad habitat impacted by the proposed projects.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the Houston toad.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the Houston toad:

1. TxDOT must fully implement the Conservation Measures proposed.

2. TxDOT must avoid and/or minimize take of the Houston toad to the maximum extent practicable.

3. TxDOT must provide information and training to all employees and contractors working on the project of the measures proposed to avoid take of the Houston toad.

4. TxDOT must monitor potential take of the Houston toad and provide periodic monitoring reports to the Service.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the FHWA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. TxDOT has proposed a number of Conservation Measures, listed in the BA and the "Description of the Proposed Action" section of this document. TxDOT's proposed Conservation Measures are incorporated as reasonable and prudent measures by reference and must be implemented, as proposed, in conjunction with this project.

2. In addition to the Conservation Measures proposed by TxDOT, the Service has determined the following minimization measures must also be implemented:

- Physical barriers, such as silt fencing, installed on the outer ROW boundary at locations that have been determined to be toad habitat and parallel to drainages in order to deflect Houston toads from entering the construction area, must be inspected on a daily basis and repaired immediately if it is not effectively serving the intended purpose.
- A physical barrier must be installed on the outer ROW boundary adjacent to any pond or other water feature where Houston toads are heard chorusing, or are otherwise known to be present. The physical barriers must extend for the entire length of the pond (at normal pool level), plus 250 feet from the furthest lateral extent of the pond in each direction, and must be maintained for the life of the project.
- The use of herbicides within the action area is restricted to the upland areas of the right-of-way for control of Johnson grass (*Sorghum halepense*). Herbicides may also be used to control vegetation growth adjacent to guard rails during normal maintenance activities post-construction. Herbicides may only be applied between June 1 and November 30 each year, during dry weather conditions, and in accordance will all other label instructions.
- All cross drainage structures that are extended across the new travel lanes must be designed and installed in a manner that does not create a barrier to Houston toad movement across the highway through the drainage. The drainage pipes must be inspected every six months, for five years post construction, to determine if access into and through the pipe is restricted. If an issue is discovered, the Service should be contacted immediately to assist TxDOT in determining the best way to correct the issue without causing take to the Houston toad.
- Project specific locations (PSLs) may be located within the ROW of the project under construction. However, PSLs for the eastern project must not be located in the construction zone for the western project. PSLs located outside of the project

construction zone must be located at least 300 feet from Houston toad non-breeding habitat and 1,000 feet from potential breeding ponds.

- Vehicle or other motorized equipment use is restricted to areas within the construction zone of the proposed US 290 ROW. Vehicle use is prohibited within any upland area or drainage feature located outside of the proposed right-of-way.
- TxDOT must inspect and maintain all BMPs during and post-construction, until disturbed areas have become stabilized. In addition to the proposed weekly BMP inspections, BMPs must be inspected following any precipitation event of ½ inch or more within a 12 hour timeframe. TxDOT must make repairs to damaged or ineffective BMPs within 24 hours or prior to the continuation of work on the project.

3. All TxDOT workers and contractors employed for the proposed work must attend a pre-construction meeting which must include specific instruction on the implementation of TxDOT's proposed Conservation Measures and the Service's Reasonable and Prudent Measures included in this Incidental Take Statement. Instructions specific to the contractor(s) related to implementation of the Conservation Measures and Reasonable and Prudent Measures must be provided to the contractor(s) and documented in writing.

4. FHWA and/or TxDOT must monitor the extent of take through sufficient on-site inspections necessary to determine if the amount of allowable take has been exceeded. TxDOT must provide the Service with a monitoring report each July and January during construction and continuing for one year post construction. The monitoring report must include a summary of construction actions implemented during the previous six month period, any unanticipated actions or delays in project completion, and any known incidental take that has occurred and the reasons for that take.

The Service believes that no more than two adults and ten juvenile Houston toads would be incidentally taken as a result of the proposed projects. Incidental take associated with the eastern and western projects must not exceed one adult and five juvenile Houston toads for each project. The Reasonable and Prudent Measures, with their implementing Terms and Conditions, are designed to minimize the impact of the incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. FHWA must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

Conservation Recommendations

Section 7(a)(1) of the Act directs the FHWA, as well as other federal agencies, to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The Service has no conservation recommendations for FHWA concerning the Houston toad at this time. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations by FHWA.

Reinitiation Notice

This concludes the Service's formal consultation on the action outlined in FHWA's formal consultation request. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) the eastern project is not completed within three years of the date of this BO revision; (3) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (4) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (5) a new species is listed or critical habitat designated that may be affected by the action. Due to the delay in implementation of the western project until 2018, at the earliest, FHWA should contact the Service at least nine months prior to the start of construction in order to determine if new information warrants reevaluation of that portion of this BO. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease immediately pending reinitiation.

Sincerely,

Edith Erfling

Edith Erfling
Field Supervisor
Coastal Ecological Services Field Office

CC: Carlos Swonke, TxDOT ENV, Austin, TX
Cal Newnam, TxDOT Austin District, Austin, TX

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