ENVIRONMENTAL ASSESSMENT
FOR
PROGRAMMATIC SAFE HARBOR AGREEMENT

FOR THE

HOUSTON TOAD
IN TEXAS

Between Environmental Defense Fund and
U.S. Fish and Wildlife Service

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1.1 INTRODUCTION

On November 25, 2008, Environmental Defense Fund (EDF) submitted an application for an Enhancement of Survival Permit and its associated Safe Harbor Agreement under section 10(a)(1)(A) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). This programmatic Houston Toad Safe Harbor Agreement (programmatic Agreement) seeks to provide a voluntary conservation program for landowners to implement recovery actions for the federally endangered Houston toad (*Bufo houstonensis*) on non-Federal lands in Texas. The proposed programmatic Agreement addresses various conservation activities, including enhancing, restoring, or creating habitat and supplementing or reestablishing populations within the historical range of the Houston toad in Texas. The draft programmatic Agreement is incorporated herein by reference.

1.2 PURPOSE OF THE PROPOSED ACTION

The purpose of issuing a section 10(a)(1)(A) Enhancement of Survival Permit and approval of the proposed programmatic Agreement is to facilitate recovery activities for the benefit of the Houston toad on non-Federal lands within the historic range of this species. Landowners enrolled under this programmatic Agreement can implement conservation activities to benefit the endangered Houston toad and will in turn receive assurances consistent with the Safe Harbor Agreement Policy, as amended (64 FR 3271, 52686, and 69 FR 24084) and related implementing regulations (50 CFR Parts 13 and 17).

1.3 NEED FOR TAKING THE PROPOSED ACTION

The Houston toad is endemic to east central Texas (Dixon 2000). Since the 1980s, the known range of the Houston toad included nine Texas counties (Hillis et al. 1984, Yantis 1989, 1990, 1991, 1992). These included Austin, Bastrop, Burleson, Colorado, Lavaca, Lee, Leon, Milam, and Robertson counties. However, rangewide audio surveys conducted from 2006 to 2009 have resulted in the detection of the species in only six counties (Forstner et al. 2007, Dr. Michael Forstner, Texas State University – San Marcos, pers. comm. 2009).

Habitat loss, fragmentation, and degradation are the most serious threats facing the Houston toad. This includes expanding urbanization, conversion of woodlands to agricultural use, and wetland destruction or alteration. Although Houston toads may migrate across cleared areas (Dixon et al. 1990), they are rarely found far from a forested edge (Forstner 2002). Therefore, extensive clearing of native vegetation can be detrimental to the Houston toad's survival. The Houston toad's habitat has also been negatively impacted by fire suppression throughout its range (Forstner 2006). The lack of fire has increased understory density in woodlands, which has resulted in the decline of native herbaceous vegetation on the forest floor. Dense vegetation likely prohibits Houston toad movement and dispersal. Population viability analyses for the Houston toad indicate that risk of extinction increases with reduced migration and dispersal, survivorship, reproductive success, and sustained reduction of available habitat (Hatfield et al. 2004). Changes in vegetation on the forest floor also negatively affect the abundance and diversity of insect populations, which comprises the Houston toad's prey base.

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.

The Houston toad's distribution appears to be restricted naturally as the result of specific habitat requirements for breeding and development. Small, sedentary species with restricted distributions, specialized habitat niches, and narrow climatic tolerances are especially sensitive to changes in habitat conditions (Welsh 1990, deMaynadier and Hunter 1998). These natural restrictions make them particularly vulnerable to stochastic events and the negative effects of human-induced changes that result in habitat loss, degradation, and fragmentation (Hillis et al. 1984).

A 2004 population viability analysis (Hatfield et al. 2004) indicated that at least 1,000 adult Houston toad females are needed to prevent extinction within a 10-year timeframe. Houston toad breeding pond survey data from 2005 through 2009 indicate the species occurs in relatively low numbers (i.e., likely much less than 1,000 breeding adults) throughout its range (Dr. Michael Forstner, pers. comm. 2009). Houston toad breeding season monitoring in Bastrop County has indicated a significant decline (as much as 90 percent at some sites) in breeding and juvenile emergence from water sources known to support reproductive activity in previous years (Dr. Michael Forstner, pers. comm. 2009). Outside of Bastrop County, Houston toad breeding choruses are rarely made up of more than 20 individual adult males (Forstner 2008; Dr. Michael Forstner, pers. comm. 2009). Data show that chorusing of Houston toads results in reproduction in less than half of all chorusing ponds. Recruitment (i.e., juvenile Houston toads emerging from ponds) occurs in only 1 in 10 chorusing ponds (Swannack and Forstner 2004). The Houston toad juvenile survival rate in the wild has been shown to be approximately 0.03 percent (Forstner 2006). Low occurrence, recruitment, and survivorship of Houston toads significantly affect their ability to rebound from factors that negatively affect their environment (Soulé et al. 1992, Pechman and Wilbur 1994). Such factors may include drought conditions, other stochastic events, fire suppression, habitat fragmentation, and other forms of anthropogenic habitat loss.

Much of central Texas, including Bastrop County and other portions of the Houston toad's range, experienced extreme drought conditions from 2008 to 2009. Drought can severely impact Houston toad breeding habitat and reduce the survivorship of juvenile toads (Dr. Michael Forstner, pers. comm. 2009). Houston toads persisted through droughts in prehistoric times; however, habitat loss from anthropogenic impacts has reduced the number of subpopulations and total number of individuals found rangewide (Dr. Michael Forstner, pers. comm. 2009; McHenry and Forstner 2009). Therefore, the species is less likely to withstand effects of drought conditions within its habitat.

Because the Houston toad largely occurs on privately owned property, the involvement of private landowners is crucial to the conservation and recovery of this species. However, some private landowners may be reluctant to undertake activities that support or attract listed species due to fear of future property-use restrictions. A Safe Harbor Agreement provides assurances that landowners will not be subjected to increased property-use restrictions as a result of increased

Houston toad abundance due to their efforts to improve conditions for this species on their property.

Landowners enrolling in the programmatic Agreement will work collaboratively with EDF to implement conservation activities to restore, create, or improve the quality of Houston toad habitat on their properties. Conservation activities outlined in the programmatic Agreement include the following:

- Brush management to create desired understory conditions and facilitate restoration of native ground cover;
- Forest enhancement/restoration to create favorable canopy conditions;
- Prescribed burning;
- Existing breeding pond enhancement;
- Control of red-imported fire ants;
- New breeding pond creation; and
- Headstarting and/or reintroduction of captive-bred Houston toads.

A programmatic Safe Harbor Agreement is one in which State, local, Tribal governments, or other entities are authorized to enter into a Safe Harbor Agreement with the Service and hold the associated permit. They may then enroll individual landowners within a specified region and convey the permit's authorization and assurances to them through a certificate of inclusion. This programmatic approach is an efficient mechanism encouraging multiple non-Federal landowners to enroll in the Safe Harbor program and participate in species conservation and recovery. Given the rapid decline of Houston toad populations during recent years, it is important to engage many private landowners throughout its range in activities that will create, enhance, or restore habitat in the most efficient manner possible.

1.4 DECISION TO BE MADE BY THE RESPONSIBLE OFFICIAL

The scope of the analysis in this environmental assessment covers the direct, indirect, and cumulative environmental effects of approving the programmatic Agreement and issuing a section 10(a)(1)(A) Enhancement of Survival Permit and anticipated future effects of implementation of the programmatic Agreement (including take authorization). The decisions to be made are whether to issue a permit, which alternative to implement, and whether the alternative to be implemented will have a significant impact on the existing environment, which would require the preparation of an Environmental Impact Statement.

2.0 ALTERNATIVES

This section presents details of the preferred alternative and other alternatives that have been considered. The National Environmental Policy Act (NEPA) requires that Federal agencies consider a range of alternatives that could reduce the environmental impacts of the particular projects under consideration. The analysis of the environmental consequences of these alternatives is discussed in section 4 of this document.

2.1 ALTERNATIVE 1: NO ACTION

In the No Action Alternative, the U.S. Fish and Wildlife Service (Service) would not approve the Safe Harbor Agreement for the Houston toad in Texas or issue the associated section 10(a)(1)(A) Enhancement of Survival Permit. Therefore, a coordinated effort to recover Houston toads on non-Federal properties using a single programmatic Enhancement of Survival Permit and Safe Harbor Agreement would not occur. Houston toad recovery efforts could occur through The actions of individual landowners without the assurances that a Safe Harbor Agreement would provide. However, it is likely that many landowners would not feel comfortable participating in conservation activities on their properties to enhance habitat for a federally endangered species without coverage for their activities under the Act or assurances that they could eventually take their properties back to their baseline conditions.

Under the No Action Alternative, various land management activities, such as agricultural forestry, and wildlife management practices would continue to occur throughout the Houston toad's range. However, landowners might not undertake beneficial actions for the Houston toad on their properties because they would be fearful of attracting endangered species and increasing their legal liability under the Act. Furthermore, there would be no incentive to monitor the effects of these activities on the species or its habitat or to report any activities that may impact the Houston toad to the Service or EDF. Recovery efforts for the species would primarily occur within the areas already being managed for the Houston toad within Bastrop County, Texas, with minor participation of landowners in other counties.

The No Action Alternative provides the baseline for comparison of environmental effects of the preferred alternative.

2.2 ALTERNATIVE 2: RANGEWIDE PROGRAMMATIC AGREEMENT (PREFERRED)

The preferred alternative is approval of the programmatic Agreement and issuance of a section 10(a)(1)(A) Enhancement of Survival Permit to cover incidental take of the Houston toad during the implementation of the programmatic Agreement. The programmatic Agreement and the associated enhancement of survival permit would allow for increased Houston toad populations and habitat that is enhanced, restored, or created through participation in the programmatic Agreement. This alternative is expected to significantly contribute to the recovery of the Houston toad throughout its range.

Under the programmatic Agreement, incidental take coverage would be provided to non-Federal landowners who voluntarily agree to enhance, restore, or create habitat, and/or allow Houston toad populations to be supplemented or established on their enrolled property through headstarting or captive propagation. In addition, neighboring landowners could seek coverage under the programmatic Agreement against new regulatory restrictions should Houston toads move onto their property as a result of their neighboring landowner's conservation activities. Neighboring landowners would have the option to receive regulatory protections and safe harbor assurances under this Agreement by completing a baseline assessment for their property and committing to certain monitoring and notification requirements, as described in the Agreement. Allowing for the inclusion of neighboring landowners under this Agreement is expected to

increase the benefits to the Houston toad by encouraging the participation of landowners who might be concerned about the potential effects of their conservation activities on their neighbors' properties.

Before participating landowners can enroll properties under the programmatic Agreement, they will work directly with EDF to complete a habitat assessment of each property to be enrolled and develop a corresponding Cooperative Agreement. Each Cooperative Agreement will provide (1) the specific details describing and assessing habitat characteristics and land management practices for each enrolled property; (2) a habitat management plan outlining the conservation activities that will take place during the term of the programmatic Agreement and its associated Permit; (3) restrictions on returning the property to its baseline conditions; and (4) the number of acres to be enrolled in the programmatic Agreement. The habitat assessment will be used to help determine the baseline characteristics of the properties to be enrolled. Baseline will consist of (1) habitat conditions (e.g., vegetation, aquatic habitat, and soils) as determined through the habitat assessment, and (2) land management practices on each property prior to the time of enrollment. Habitat characteristics, existing structures and water bodies, and other property features will be documented on a map that will be attached to the corresponding Cooperative Agreement.

EDF will provide copies of the draft Cooperative Agreements to the Service to review, comment, and concur on the baseline determination and recommended conservation activities. The Service must concur with the proposed baseline determination before a landowner is enrolled under this Agreement. A property will be considered enrolled under this Agreement upon the finalization of a Cooperative Agreement between the landowner and EDF, with the concurrence of the Service on the baseline determination. EDF will then issue a certificate of inclusion to the landowner. The certificate of inclusion will document the landowner's participation in this Agreement and convey incidental take authorization and safe harbor assurances from the permit held by EDF to the certificate's recipient.

Under the programmatic Agreement, a landowner may return his or her property to baseline conditions upon the expiration of the Cooperative Agreement and before the expiration of the associated Permit. Once an enrolled property is returned to its baseline conditions, the landowner is no longer covered for incidental take of Houston toads on that property under the programmatic Agreement. Alternatively, at the end of the term of a Cooperative Agreement, and before the expiration of EDF's Permit, a landowner may renew his or her Cooperative Agreement with EDF.

Landowners will work collaboratively with EDF to implement conservation activities to improve the quality of Houston toad habitat on enrolled properties. The goals of the conservation activities are (1) to create or enhance Houston toad breeding, foraging, migrating, and hibernating habitat and/or (2) allow for the establishment of a sustainable Houston toad population through reintroduction or expansion from adjacent properties. Specific conservation measures may include, but are not necessarily limited to, the following:

- Brush management to create desired understory conditions and facilitate restoration of native ground cover

- Forest enhancement/restoration to create favorable canopy conditions
- Prescribed burning
- Existing breeding pond enhancement
- Control of red-imported fire ants
- New breeding pond construction
- Headstarting and/or reintroduction of captively-bred Houston toads

Expected conservation benefits of the programmatic Agreement include the following:

- Enhancement of Houston toad foraging and hibernating habitat by reducing the density of woody understory species, restoring favorable canopy conditions, and facilitating the establishment and maintenance of native herbaceous vegetation and Houston toad prey base
- Creation and enhancement of Houston toad breeding and toadlet emergence habitat
- Facilitation of Houston toad dispersal through the creation and enhancement of habitat linkages throughout the species' range
- Increase in Houston toad population numbers through headstarting and reintroduction efforts
- Facilitation of viable, self-sustaining Houston toad subpopulations

EDF will not enter into any Cooperative Agreement that does not allow enough time for conservation benefits to accrue on a given property. Each Cooperative Agreement will stipulate that conservation activities be implemented for a period that is expected to result in the use of restored, enhanced, or newly created habitat by the Houston toad and to maintain suitable Houston toad habitat through the implementation of the conservation activities outlined in the corresponding Cooperative Agreement for at least 10 consecutive years after conservation benefits begin to accrue.

Because 98 percent of the land in Texas is privately owned, non-Federal landowners play a critical role in recovering species that are federally listed as threatened or endangered. Safe Harbor Agreements provide an incentive to landowners whereby they engage in conservation activities that benefit threatened and endangered species with the assurances that they will not incur any additional restrictions on their property for doing so. A programmatic Safe Harbor Agreement would provide a much more efficient mechanism for enrolling non-Federal landowners in the Safe Harbor program by allowing several landowners to enroll in the programmatic Agreement each year. The Service expects a programmatic Agreement to generate interest and participation in Houston toad conservation throughout the species' range and in a manner that could not be achieved through other means.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Processing individual landowner Safe Harbor Agreements for conservation activities of the Houston toad on non-Federal lands has been discussed. Alternatively, a regional HCP could be developed that would include recovery activities, including the augmentation or reintroduction of Houston toad populations, as part of the proposed mitigation. Some conservation activities, including the augmentation or reintroduction of Houston toad populations from headstarting or captive propagation programs, could also be conducted and authorized under section 7 of the Act on Federal lands or for those projects that have a Federal nexus. Finally, some conservation activities could be conducted under a section 10(a)(1)(A) Research and Recovery Permit. These approaches have been considered, but eliminated from detailed analysis, as explained below.

2.3.1 Individual Agreements

Three individual Safe Harbor Agreements have been completed for the Houston toad in Bastrop County and are currently being implemented. The Long Family Safe Harbor Agreement was finalized in 2004 and covers incidental take resulting from conservation activities on a 540-acre (218 hectares) ranch known to be occupied by Houston toads. The Small Family Safe Harbor Agreement was finalized in 2007 and covers incidental take resulting from conservation activities on an 836-acre (338 hectares) ranch known to be occupied by Houston toads. The Boy Scouts of America/Capital Area Council also enrolled their 541-acre (218 hectares) Lost Pines Scout Reservation in a Safe Harbor Agreement that was finalized in 2007. The Lost Pines Scout Reservation is not known to be occupied by Houston toads, but it is expected that the conservation activities undertaken as part of their Safe Harbor Agreement will create and enhance habitat. It is therefore expected that Houston toads will move onto the property from surrounding areas.

Since 2004, Houston toad habitat has been successfully created, restored, enhanced, and maintained through the implementation of these individual Safe Harbor Agreements. Additionally, they have provided opportunities for researchers and land managers to collect much needed information on the effectiveness of various management activities on the Houston toad and its habitat. The difficulty in processing individual Safe Harbor Agreements is the considerable time involved in developing each individual Agreement. A programmatic Agreement provides a streamlined process through which landowners can be enrolled in a significantly more efficient manner. Processing Safe Harbor Agreements individually would significantly delay the enrollment of many landowners in the Safe Harbor program and subsequently hinder recovery of the Houston toad rangewide.

Landowners that decide to develop individual Safe Harbor Agreements and obtain the necessary permits to contribute to Houston toad recovery often become discouraged with the amount of time and complexity involved in the permitting process. Individual Safe Harbor Agreements may require less processing time than that of a programmatic Agreement, but often still require several months to several years for completion. These time delays for document processing, that are often part of such a piecemeal approach, subsequently delay the implementation of conservation measures for the Houston toad, which are urgently needed. Enrolling landowners

in the Safe Harbor program one at a time also adds significant time and workload for EDF and Service personnel.

Unlike HCPs and other processes that authorize incidental take for a federally listed species, Safe Harbor Agreements provide incidental take coverage for any effects to a listed species resulting from returning an enrolled property to its baseline conditions at the end of the specified duration. This flexibility provides a greater incentive for private landowners to participate in a Safe Harbor Agreement and actively manage their properties for endangered and threatened species.

2.3.2 Habitat Conservation Plans

Habitat Conservation Plans (HCPs) could be developed for individual property owners, regionally, and/or rangewide for the Houston toad. An HCP is typically written to provide incidental take coverage for an otherwise legal activity, through a section 10(a)(1)(B) Incidental Take Permit. An HCP is developed to minimize and mitigate the effects of the activities covered by the HCP on existing populations and suitable habitat. While HCPs include measures to protect, enhance, and/or re-establish covered species, these plans are typically in response to some potential impact on a listed species or its habitat by the covered activities. Also, HCPs are not required to contribute to recovery. Therefore, while an HCP could be developed to implement conservation activities on non-Federal lands, it is not the best conservation tool to apply to a program designed for the purpose of species conservation.

2.3.3 Conservation Activities under Section 7 of the Act

Some conservation activities, such as releasing headstarted or captive-bred Houston toads as a Federal action, may be covered by a section 7 consultation. However, most of the land within the State of Texas is privately owned. Therefore, a Federal nexus would not exist for conservation activities on most areas within the Houston toad's range, which is necessary for section 7 to apply. Furthermore, Federal land managers may be hesitant to conduct Houston toad recovery efforts if there is a possibility of neighboring non-Federal landowners being impacted by a listed species moving onto their properties as a result of these efforts. Neighboring landowners do not receive assurances when conservation activities are covered under section 7 of the Act. Therefore, this alternative was eliminated from consideration.

2.3.4 Conservation Activities under a Section 10(a)(1)(A) Research and Recovery Permit

Some conservation activities can be covered under a section 10(a)(1)(A) Research and Recovery Permit. Landowners do not receive assurances when conservation activities are covered under this type of permit. Therefore, this alternative was eliminated from consideration.

3.0 AFFECTED ENVIRONMENT

The affected environment in this environmental assessment includes the nine-county range of the Houston toad covered by the programmatic Agreement. This range includes Austin, Bastrop, Burleson, Colorado, Lavaca, Lee, Leon, Milam, and Robertson counties. The regional nature of the programmatic Agreement (it potentially covers many sites over a large area) makes it

impossible to characterize each site that may be enrolled. This is especially true as participation is voluntary for landowners, and particular sites that may be enrolled under this programmatic Agreement cannot be predicted. Therefore, the discussion of the affected environment and the environmental consequences will be approached broadly. Areas that may be enrolled under the programmatic Agreement, include any land or water bodies that may be occupied by Houston toads and land or water bodies that may be restored or enhanced to increase the likelihood of being occupied by Houston toads.

Tracts to be enrolled will be selected in priority order according to those landowners with land occupied by existing populations of Houston toads, as well as landowners with tracts adjacent to or near public and private land parcels currently being managed for Houston toad conservation. These parcels include, but are not necessarily limited to Bastrop State Park, the Boy Scouts of America/Capital Area Council's (BSA/CAC) Griffith League Ranch in Bastrop County, Texas, and properties enrolled in individual Safe Harbor Agreements. Selection priority will also be given to larger tracts or tracts that can be restored or enhanced to provide the greatest and most immediate benefit to the Houston toad. Habitat improvements on the properties enrolled in this programmatic Agreement ("enrolled properties") will benefit from conservation efforts on these managed lands already managed for Houston toads by buffering them from incompatible land uses, enlarging the areas capable of supporting Houston toads, and increasing habitat connectivity and the overall amount of suitable habitat, which will facilitate dispersal of Houston toads among lands managed for their conservation.

3.1 VEGETATION

Vegetation within Houston toad habitat include loblolly pine (*Pinus taeda*) and a mixed deciduous woodland interspersed with open grassy areas. The loblolly pine and several associated plant and animal species reach their westernmost range extensions within the historical range of the Houston toad. This loblolly pine-post oak savannah ecosystem is an example of a fire-adapted, fire-climax community (Gould 1962).

Dominant overstory species typically found in Houston toad habitat include loblolly pine, post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*), and eastern red cedar (*Juniperus virginiana*). Some sandjack oak (*Q. incana*) can also be found. Pine trees are usually found in drainages, and the oak species are usually found in more upland areas. However, they can be mixed in various locations throughout the range. American elm (*Ulmus americana*), cedar elm (*U. crassifolia*), hackberry (*Celtis laevigata*), cottonwood (*Populus* sp.), and hickory (*Carya* sp.) are also found along drainages.

Understory vegetation typically includes yaupon (*Ilex vomitoria*), possomhaw (*I. decidua*), southern wax myrtle (*Myrica cerifera*), American beauty berry (*Callicarpa americana*), and farkleberry (*Vaccinium arboretum*). Grapevine (*Vitus* sp.), greenbriar (*Smilax* sp.), and poison ivy (*Toxicodendron radicans*) are also common.

Coarse bunchgrasses, such as little bluestem (*Schizachyrium scoparium*), broomsedge bluestem (*Andropogon virginicus*), pineywoods dropseed (*Sporobolus junceus*), hairyawn muhly (*Muhlenbergia capillaris*), Indiangrass (*Sorastrum nutans*), purpletop (*Tridens flavus*), beaked panicum (*Panicum anceps*), switchgrass (*P. virgatum*), and curly threeawn (*Aristida desmantha*)

are common ground cover. Other ground cover includes various species of cacti (*Opuntia* sp.), yucca (*Yucca* sp.), and a variety of forbs, ferns, lichens, and mosses, especially in openings of the woodland canopies.

Many vegetation communities within the historical range of the Houston toad have been impacted in various areas by land-use activities, such as livestock ranching, crop production, timber harvesting, and residential and commercial development. Livestock management is conducted by private ranch operators using a variety of grazing practices. Such practices vary in their impacts to upland, riparian, and aquatic vegetation. Areas involved in crop production usually result from the conversion of forested habitat to pastures.

Large tracts of land within the post oak savannah ecosystem have been cleared for agricultural use and converted to pastures (Telfair 1999). The current range of the Houston toad is a matrix of forested habitat and non-native pasture land. It is not known how Houston toads use non-native grass pastures. However, it is believed that the conversion of forested habitat to sod-forming non-native grasses, such as Bermuda grass (*Cynodon* spp.) and Bahia grass (*Paspalum notatum*) inhibit Houston toad movement and burrowing capabilities (TPWD 2009).

3.2 WILDLIFE

Wildlife presence at a potential site to be enrolled in the programmatic Agreement will vary greatly depending on location, proximity to urban development, vegetation community, land use, proximity to wetlands, annual precipitation, and proximity to wildlife dispersal corridors.

Common mammal species that occur within the range of the Houston toad include: the white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), coyote (*Canis latrans*), grey fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), bobcat (*Lynx rufus*), oppossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), feral pig (*Sus scrofa*), ringtail (*Bassaricus astutus*), eastern cottontail (*Sylvilagus borealis*), nine-banded armadillo (*Dasypus novemcinctus*), eastern red bat (*Lasiurus borealis*), hispid cotton rat (*Sigmodon hispidus*), hispid pocket mouse (*Perognathus hispidus*), white-footed pocket mouse (*Peromyscus leucopus*), eastern woodrat (*Neotoma floridana*), and fox squirrel (*Sciurus niger*).

Many migratory bird species common to the central flyway are also found in the area. These include: the turkey vulture (*Cathartes aura*), black vulture (*Coragyps atratus*), red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*B. jamaicensis*), wild turkey (*Meleagris gallopavo*), barred owl (*Strix varia*), blue jay (*Cyanocitta cristata*), Carolina chickadee (*Poecile carolinensis*), northern mockingbird (*Mimus polyglottis*), and northern cardinal (*Cardinalis cardinalis*). Other common birds likely to occur on properties within the range of the Houston toad include: the eastern screech owl (*Otus asio*), ruby-throated hummingbird (*Archilochus colubris*), red-bellied woodpecker (*Melanerpes carolinus*), tufted titmouse (*Baeolophus bicolor*), Carolina wren (*Thyrothorus ludovicianus*), white-eyed vireo (*Vireo griseus*), northern parula (*Parula americana*), summer tanager (*Piranga rubra*), indigo bunting (*Passerina cyanea*), painted bunting (*P. ciris*), lark sparrow (*Chondestes grammacus*), and white-throated sparrow (*Zonotrichia albicollis*). The southwestern most range of the pileated woodpecker (*Dryocopus pileatus*) and pine warbler (*Dendroica pinus*), and the western most range of the Kentucky

warbler (*Oporornis formosus*), hooded warbler (*Wilsonia citrine*), and Swainson's warbler (*Limnothlypis swainsonii*) occur within the range of the Houston toad.

Reptile and amphibian species that occur within the range of the Houston toad include: the Gulf Coast toad (*Ollotis* [=*Bufo*] *valliceps valliceps*), Woodhouse's toad (*A. woodhouseii woodhouseii*), bullfrog (*Lithobates* [=*Rana*] *catesbeianus*), Southern leopard frog (*L. sphenocephalus*), gray tree frog (*Hyla versicolor*), green tree frog (*H. cinerea*), Eastern narrowmouth toad (*Gastrophryne carolinensis*), Great plains narrowmouth toad (*G. olivacea*), cliff chirping frog (*Syrrophus marnocki*), spotted chorus frog (*Pseudacris clarki*), Strecker's chorus frog (*Pseudacris streckeri*), Western lesser siren (*Siren intermedia nettingi*), small mouth salamander (*Ambystoma texanum*), central newt (*Notophalmus viridescens louisianensis*), common snapping turtle (*Chelydra serpentine*), stinkpot (*Sternotherus oderatus*), three-toed box turtle (*Terrapene carolina triunguis*), ornate box turtle (*T. ornata ornata*), red-eared slider (*Trachemys scripta elegans*), American alligator (*Alligator mississippiensis*), green anole (*Anolis carolinensis*), Texas horned lizard (*Phrynosoma cornutum*), Texas spiny lizard (*Sceloporus olivaceus*), crevice spiny lizard (*S. poinsettia poinsettia*), ground skink (*Scincella lateralis*), six-lined race runner (*Aspidoscelis* [=*Cnemidophorus*] *sexlineatus sexlineatus*), eastern yellow-bellied racer (*Coluber constrictor flaviventris*), Texas rat snake (*Elaphe obsolete lindheimeri*), eastern hog-nosed snake (*Heterodon pltirhinos*), western coachwhip (*Masticophis flagellum testaceus*), blotched water snake (*Nerodia erythrogaster transversa*), diamondback water snake (*N. rhombifer rhombifer*), bull snake (*Pituophis catenifer sayi*), rough green snake (*Opheodrys aestivus*), rough earth snake (*Virginia striatula*), western cottonmouth (*Agkistrodon piscivorus leucostoma*), and western diamondback rattlesnake (*Crotalus atrox*)(Dixon 2000).

3.3 LISTED, PROPOSED, AND CANDIDATE SPECIES

In addition to the Houston toad, there are four other federally listed animals, two animals that are candidates for Federal listing, and two federally listed plants that occur within the nine-county area where the programmatic Agreement is to be implemented (Table 1). Although the Service regards it as unlikely for most species, the possibility exists that these listed or candidate species may presently occur or may occur in the future on enrolled properties as a direct result of the conservation activities specified in the programmatic Agreement. The large-fruited sand verbena and the Navasota ladies'-tresses are the two most likely species to occur on enrolled properties, but the Agreement includes provisions to avoid impacts to these species.

Table 1 lists these species as well as an assessment as to whether they might be affected by the activities carried out through this agreement. Section 4.2.3 of this document provides further explanation.

Table 1. Other Federally Listed, Proposed, or Candidate Species Occurring in the Programmatic Agreement Area.

Species	Listing Status	Potential to be Impacted?
Animals		

Species	Listing Status	Potential to be Impacted?
American alligator (*Alligator mississipiensis*)	T(S/A)	No
Attwater's greater prairie-chicken (*Tympanuchus cupido attwateri*)	E	Unlikely
Interior least tern (*Sterna antillarum*)	E	No
Whooping crane (*Grus americana*)	E	No
Sharpnose shiner (*Notropis oxyrynchus*)	C	No
Smalleye shiner (*Notropis buccula*)	C	No
Plants		
Large-fruited sand verbena (*Abronia macrocarpa*)	E	Yes
Navasota ladies'-tresses (*Spiranthes parksii*)	E	Yes

Listing Status

E – Endangered
C – Candidate for Federal listing
T(S/A) – Threatened due to similarity of appearance

3.4 CULTURAL RESOURCES

Cultural resources may be found throughout Texas. The regional nature of this programmatic Agreement does not allow predictions as to the specific sites and activities that will be undertaken. The area of potential coverage is large enough to assume that cultural resources are located within the covered area of the programmatic Agreement.

3.5 SOCIOECONOMIC ENVIRONMENT

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations*, mandates that Federal agencies identify and address, as appropriate, disproportionally high and adverse human health or environmental effects of their programs on minority or low-income individuals.

Austin County

Austin County encompasses 652.59 square miles (1,690.20 square kilometers)(U.S. Census Bureau 2009a). The City of Bellville is the county seat of Austin County. Other municipalities include Sealy, Wallis, Industry, Brazos Country, and San Felipe. Manufacturing, trade, service, and local government fuel the County's economic development (Austin County 2008). The median, annual household income is $50,277. Approximately 10.9 percent of the Austin County population falls below the poverty line (U.S. Census Bureau 2009a). Although most of the County is still considered rural, population projections from the Texas State Data Center (2009)

estimate that Austin County will experience a 38.7 percent increase in population from the 2000 census (population 23,590) to 2040 (population estimate of 32,713).

Bastrop County

Bastrop County encompasses 888.35 square miles (2,300.81 square kilometers)(U.S. Census Bureau 2009b). The City of Bastrop is Bastrop County's largest town and the county seat. Other municipalities include Elgin and Smithville. Manufacturing, trade, agriculture, local government, oil production, and tourism drive Bastrop County's economic development (Texas State Historical Association 2009a). The median, annual household income is $51,563. Approximately 12.6 percent of the Bastrop County population falls below the poverty line (U.S. Census Bureau 2009b). Although most of Bastrop County is still considered rural, population projections from the Texas State Data Center (2009) estimate that Bastrop County will experience a 176.7 percent increase in population from the 2000 census (population 57,733) to 2040 (population estimate of 159,776).

Burleson County

Burleson County encompasses 585.78 square miles (1,517.16 square kilometers)(U.S. Census Bureau 2009c). The City of Caldwell is Burleson County's largest town and the county seat. Other municipalities include Somerville and Snook. Manufacturing, trade, agriculture, and local government fuel the County's economic development (Texas State Historical Association 2009b). The median, annual household income is $38,039. Approximately 26.2 percent of the Burleson County population falls below the poverty line (U.S. Census Bureau 2009c). Although most of the County is still considered rural, population projections from the Texas State Data Center (2009) estimate that Burleson County will experience a 49.9 percent increase in population from the 2000 census (population 16,470) to 2040 (population estimate of 24,682).

Colorado County

Colorado County encompasses 962.95 square miles (2,494.03 square kilometers)(U.S. Census Bureau 2009d). The City of Columbus is the county seat. Other municipalities include Eagle Lake and Weimar. Manufacturing, trade, services, mining, oil production, and agriculture fuel the County's economic development (Texas State Historical Association 2009c). The median, annual household income is $39,317. Approximately 14.9 percent of the Colorado County population falls below the poverty line (U.S. Census Bureau 2009d). Although most of the County is still considered rural, population projections from the Texas State Data Center (2009) estimate that Colorado County will experience a 21.5 percent increase in population from the 2000 census (population 20,390) to 2040 (population estimate of 24,779).

Lavaca County

Lavaca County encompasses 969.90 square miles (2,512.03 square kilometers)(U.S. Census Bureau 2009e). The City of Hallettsville is the county seat. Other municipalities include Moulton and Shiner. Between 21 and 30 percent of the land in Lavaca County is considered prime farmland. Natural resources include oil and natural gas. Manufacturing, health care, transportation services, oil production, and agriculture form the basis of Lavaca County's economy (Texas State Historical Association 2009d). The median, annual household income is $38,025. Approximately 13.2 percent of the Colorado County population falls below the poverty line (U.S. Census Bureau 2009e). Lavaca County is considered mostly rural, with little population growth expected over time (Texas State Data Center 2009).

Lee County

Lee County encompasses 628.50 square miles (1,627.81 square kilometers)(U.S. Census Bureau 2009f). The City of Giddings is the largest town and the county seat. Lexington is the only other incorporated municipality in Lee County. Trade, health care, and services drive Lee County's economy (U.S. Census Bureau 2002). The median, annual household income is $44,875. Approximately 12.3 percent of Lee County's population is below the poverty line (U.S. Census Bureau 2009f). Although the County is still considered mostly rural, population projections from the Texas State Data Center (2009) estimate that Lee County will experience a 67.6 percent increase in population from the 2000 census (population 15,657) to 2040 (population estimate of 26,243).

Leon County

Leon County encompasses 1,072.04 square miles (2,776.52 square kilometers)(U.S. Census Bureau 2009g). The City of Centerville is the county seat. Other municipalities include Buffalo (the largest town), Jewett, Leona, Marquez, Normangee, and Oakwood. The oil and gas industries, mining, and agriculture drive Leon County's economy (Texas State Historical Association 2009e). The median, annual household income is $38,742. Approximately 15.4 percent of Leon County's population is below the poverty line (U.S. Census Bureau 2009g). Although the County is still considered mostly rural, population projections from the Texas State Data Center (2009) estimate that Leon County will experience a 23.4 percent increase in population from the 2000 census (population 15,335) to 2040 (population estimate of 18,916).

Milam

Milam County encompasses 1,016.71 square miles (2,633.27 square kilometers)(U.S. Census Bureau 2009h). The City of Cameron is the county seat. Other municipalities include Buckholts, Milano, Rockdale, and Thorndale. Agriculture, mining, manufacturing, trade, and the oil and gas industries drive Milam County's economy (Texas State Historical Association 2009f). The median, annual household income is $39,427. Approximately 17.3 percent of Milam County's population is below the poverty line (U.S. Census Bureau 2009h). Although most of the County is still considered mostly rural, population projections from the Texas State Data Center (2009) estimate that Milam County will experience a 25.2 percent increase in population from the 2000 census (population 24,238) to 2040 (population estimate of 30,334).

Robertson

Robertson County encompasses 854.56 square miles (2,213.30 square kilometers)(U.S. Census Bureau 2009i). The City of Franklin is the county seat. Other municipalities include Calvert and Hearne. Agriculture, mining, and the oil and gas industries drive the local economy (Texas State Historical Association 2009g). The median, annual household income is $35,543. Approximately 19.7 percent of Robertson County's population is below the poverty line (U.S. Census Bureau 2009i). Although most of Robertson County is still considered rural, population projections from the Texas State Data Center (2009) estimate that Robertson County will experience a 39.1 percent increase in population from the 2000 census (population 16,000) to 2040 (population estimate of 22,262).

3.6 WETLANDS

The Army Corps of Engineers has regulatory authority over jurisdictional wetlands and waters of the United States pursuant to section 404 of the Clean Water Act. A wetland delineation of the entire range of the Houston toad is not feasible due to the regional nature of the programmatic Agreement. However, National Wetland Inventory maps indicated that typical water bodies within the Houston toad's range include small lakes, impoundments, emergent wetlands, forested wetlands, small rivers, creeks, and tributaries. These features can be ephemeral, intermittent, or perennial. Ephemeral waters or wetlands hold water during and for a short duration after precipitation events in a typical year. Intermittent areas tend to be fed by groundwater or runoff. Perennial water features are characterized as holding water year-round.

Generally, wetlands and other water bodies serve to provide the following functions and values: ground water storage, ground water discharge, flood storage and velocity reduction, shoreline anchoring, sediment trapping, nutrient retention, food chain support, fish and wildlife habitat, aquatic habitat diversity, and recreation. Wetlands occurring within the Houston toad's range can be characterized by just one or several of the functions or values listed above.

3.7 LAND USE

The existing land uses within the covered area of the programmatic Agreement vary considerably with each specific location. The gradient of potential land uses could include lands used for grazing livestock, oil and gas exploration and/or production, mining operations, recreation, ecological preservation, and residential and commercial development. As the increased demand for rural residential housing continues, particularly in Bastrop County, there is an ongoing conversion from agricultural to residential land usage. Some non-Federal lands within the covered area, particularly within Lee, Milam, and Robertson counties, are used for commercial mining of coal and metal ores. The locations where mining occurs within the covered area are not likely to change, although new mining operations within the covered area could be initiated within the 30-year term of the programmatic Agreement. Recreational land use occurs primarily in Bastrop County with the presence of Bastrop and Buescher State Parks, several public parks and natural areas owned and operated by the Lower Colorado River Authority, and two outdoor wilderness areas owned and operated by the Boy Scouts of America/Capital Area Council.

3.8 WATER RESOURCES

Water resources existing within the nine-county area covered by the programmatic Agreement are likely to vary with each specific tract to be enrolled. The regional nature of this programmatic Agreement does not allow predictions as to the specific sites and activities. Water resources in the area to be covered by the programmatic Agreement come largely from groundwater sources. Other water resources within the covered area include a number of intermittent and perennial creeks and two major rivers. The Colorado River runs through Bastrop and Colorado counties. The Brazos River runs along the western borders of Austin, Burleson, and Milam counties and along the eastern border of Robertson County within the Houston toad's range.

The principal water-bearing resource within the programmatic Agreement area is the Carrizo-Wilcox Aquifer. The Carrizo-Wilcox Aquifer supplies water to 60 Texas counties, including Bastrop, Burleson, Lee, Leon, Milam, and Robertson (Ashworth and Hopkins 1995) within the Houston toad's range. Groundwater pumped from the Carrizo-Wilcox Aquifer is used primarily for municipal public water supply, rural domestic use, and industrial use (Thorkildsen and Price 1991). Approximately 83 percent of the total groundwater removed from the aquifer is for municipal water supply (Thorkildsen and Price 1991).

The Gulf Coast Aquifer also underlies a portion of the Houston toad's range. This aquifer provides water to all or parts of 54 counties in Texas, including Austin, Colorado, and Lavaca. Municipal usage and irrigation account for 90 percent of the total pumpage from this aquifer (Ashworth and Hopkins 1995).

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 ALTERNATIVE 1: NO ACTION

Under the No Action Alternative, the Service would not approve a rangewide programmatic Agreement for the Houston toad nor issue a section 10(a)(1)(A) Enhancement of Survival Permit to cover incidental take that may result either from the conservation activities outlined in the programmatic Agreement or returning the habitat to its baseline conditions. The Lost Pines HCP would continue to provide incidental take coverage for landowners in Bastrop County choosing to engage in forest, agricultural, and wildlife management activities as long as they follow the appropriate guidelines outlined within the Lost Pines HCP. However, this incidental take coverage would not be extended to landowners outside of Bastrop County, thus possibly limiting the number of landowners willing to manage their properties in a manner that is compatible with Houston toad recovery. For this reason, Houston toad recovery efforts for the species would primarily occur within the areas already being managed for the Houston toad within Bastrop County. Various land management activities, such as livestock, forestry, and agricultural practices, would continue to occur in other counties within the Houston toad's range. However, landowners might not undertake beneficial actions for the Houston toad on their properties because they would be fearful of attracting endangered species and increasing their legal liability under the Act. Furthermore, there would be no incentive to monitor the effects of these activities on the habitat or on the species or to report any activities that may impact the Houston toad to the

Service or EDF. The No Action Alternative provides the baseline for comparison of environmental effects of the preferred alternative.

4.1.1 Vegetation

No change to vegetation communities described in section 3.1 above are expected under this alternative. Houston toad conservation on non-Federal lands would not necessarily be part of the considerations in any management of existing vegetation within the covered area. Protection of vegetation that is habitat for the Houston toad would be incidental to existing land uses or the actions of individual landowners.

4.1.2 Wildlife

No change to wildlife species described in section 3.2 above are expected under this alternative. Houston toad conservation on non-Federal lands would not necessarily be part of the considerations in any wildlife management actions within the covered area.

4.1.3 Listed, Proposed, and Candidate Species

No change to listed, proposed, or candidate species described in section 3.3 above are expected under this alternative. Houston toad conservation on non-Federal lands would not necessarily be part of the considerations in any management of listed, proposed, or candidate species within the covered area. Houston toad conservation would continue on Federal lands consistent with section 7 consultations and recovery activities.

4.1.4 Cultural Resources

No change to cultural resources as described in section 3.4 is expected under this alternative.

4.1.5 Socioeconomic Environment

No change to the socioeconomic environment as described in section 3.5 above is expected under this alternative. This alternative will not provide the assurances to non-Federal landowners through a Safe Harbor Agreement to address Houston toads that may disperse onto their properties.

4.1.6 Wetlands

No change to wetlands as described in section 3.6 above is expected under this alternative. The no action alternative may result in a disincentive for non-Federal landowners to create, restore, or enhance ephemeral wetlands and other potential Houston toad breeding sites on their properties for fear that wetlands may provide habitat that could result in more regulatory restrictions. There would likewise be no incentive for non-Federal landowners to create, restore, or maintain the wetland communities associated with Houston toad breeding sites.

4.1.7 Land Use

No change to land use as described in section 3.7 above is expected under this alternative. Houston toad conservation on non-Federal lands would not necessarily be part of the considerations in any existing land use operations. Protection of Houston toad habitat would be incidental to existing land uses or the actions of individual landowners.

4.1.8 Water Resources

No change to water resources as described in section 3.8 above is expected under this alternative. Houston toad conservation on non-Federal lands would not necessarily be a part of the considerations in any existing water resource management. Protection of Houston toad habitat would be incidental to existing water resource uses or the actions of individual landowners.

4.2 ALTERNATIVE 2: RANGEWIDE PROGRAMMATIC AGREEMENT (PREFERRED)

The action under this alternative would be the approval of the programmatic Agreement and issuance of the section 10(a)(1)(A) Enhancement of Survival Permit to EDF. Sites that would be considered for enrollment under the programmatic Agreement are any non-Federal lands within the nine-county range of the Houston toad (Figure 1). Within the permit-covered area, EDF intends to give highest priority of enrollment to those landowners with land adjacent to or near public and private land parcels already being managed for Houston toad conservation. These managed parcels may include, but are not necessarily limited to Bastrop State Park, the BSA/CAC's Griffith League Ranch in Bastrop County, Texas, and properties enrolled in individual Safe Harbor Agreements.

Under the programmatic Agreement, landowners will work collaboratively with EDF and the Service to implement conservation activities to improve the quality of Houston toad habitat on enrolled properties. These conservation activities are expected to create, restore, or maintain Houston toad habitat. Houston toad management activities not pertaining to the programmatic Agreement are already underway on properties in Bastrop County. Expansion and linkage of Houston toad habitat areas between Bastrop State Park and the BSA/CAC's Griffith League Ranch, and also in the areas immediately surrounding these two properties, may be important to the future viability of the Houston toad. The participation of non-Federal landowners in the programmatic Agreement is expected to lead to the expansion of known Houston toad populations and, potentially, the founding of new populations.

Restoration and enhancement of Houston toad habitat within portions of its range outside of Bastrop County are considered vital to the overall viability and recovery of the species. Few, if any, Houston toad conservation activities are currently being implemented to achieve these goals outside of Bastrop County. The combined effects of these efforts are expected to result in enhanced habitat conditions for the Houston toad on a rangewide level.

4.2.1 Vegetation

No direct impacts to vegetation are expected to result from the approval of the programmatic Agreement and the issuance of a section 10(a)(1)(A) Enhancement of Survival Permit.

However, implementing the programmatic Agreement is likely to result in both short-term and long-term beneficial effects on native vegetation that make up Houston toad habitat within covered area of the Agreement. Each property under consideration for enrollment will differ with regard to vegetation conditions. The amount and locations of sites that will be affected by conservation activities conducted under the programmatic Agreement cannot be predicted at this time. Therefore, the effects of specific conservation activities on native and non-native plant species or their ecosystems as a whole are uncertain at this time. As new information on management practices becomes available, the conservation activities within the Agreement may be modified to enhance beneficial effects to both native plant species within the covered area and the Houston toad.

Brush management will be conducted to create desired understory conditions and facilitate native ground cover. The suppression of wildfires has led to a dramatic increase in the understory density within the range of the Houston toad. The positive correlation between insect and plant community diversity on the forest floor is commonly recognized, as explained and demonstrated by Siemann et al. (1998). Thus, a reduction in vegetation community diversity on the forest floor may account for a decline in insect diversity and abundance, which is the food source for the Houston toad. Forest thinning is the practice of removing undesirable vegetation (this may include select trees or understory vegetation) from a forested area. Thinning is expected to increase light availability and penetration, which may increase the herbaceous vegetation diversity on the forest floor. This technique may also provide conditions that will facilitate the survival of native herbaceous plants and prevent the extensive growth of Bermuda grass and other heavy, rhizomatous mat-forming grasses that inhibit Houston toad movement.

Some landowners may choose to conduct forest enhancement and/or restoration on their enrolled properties to restore canopy conditions that are favorable to the Houston toad. Pine and oak species that are native to the area may be transplanted in open areas to establish a forest canopy amongst the restored, native herbaceous plant community. Tree planting that occurs within relatively open areas is expected to produce benefits for the Houston toad within 10 to 20 years of initial planting. These benefits include the creation of shade and micro-climates that will not only support a diverse assemblage of native grasses and forbs, but also provide a more favorable temperature regime for the Houston toad. These conditions are expected to facilitate and enhance Houston toad movement and foraging.

Prescribed burning will also be conducted under the programmatic Agreement. Prescribed burning is a technique used to restore, create, and maintain desired understory and ground cover conditions. Habitat may be subjected to multiple, low-intensity “management” burns following initial understory restoration work (i.e., thinning). The purpose of low-intensity burns is to maintain the open understory and enhance the quality and cover of the native herbaceous vegetation, thereby increasing native insect prey abundance and diversity and improving conditions for Houston toad movement.

Given the high levels of fuel load resulting from decades of fire suppression, burning during the summer months may pose a significant risk to both the Houston toad and public safety. For these reasons, prescribed fires will be limited to the period of July 1 through December 31, outside of the Houston toad’s breeding season, to minimize the possibility of direct toad mortality during burning and to address public safety concerns. This restriction may be modified

in the Agreement in the future if new information on ecosystem effects becomes available that indicates it is preferable to conduct prescribed burning activities during the summer.

McCollough et al. (1998) summarized existing literature on the effects of fire on insects in northern boreal forests and indicated that such effects vary among taxonomic groups, sampling time after fire, and the intent of the research study. Studies have shown that increased light on the forest floor can provide an opportunity for increased herbaceous plant diversity (Halls and Schuster 1965, Thomas et al. 1999). Because of this, it is predicted that maintaining light availability through prescribed burning will increase the diversity of plant species and, subsequently, the diversity of the arthropod community (Siemann et al. 1998). Increased light penetration to the forest floor and regrowth of native herbaceous vegetation are expected to increase in a stepwise fashion following each subsequent thinning and fire treatment in Houston toad habitat.

Fire suppressed forests can become too dense and shaded and accumulate dangerous levels of burnable duff and debris. Therefore, thinning and prescribed burning as forest management tools can reduce the threat of stand-replacing, catastrophic wildfires by reducing wildfire intensity (Pollet and Omi 2002, Hurteau and North 2009, Mitchell et al. 2009). Catastrophic wildfires could have devastating effects to Houston toad habitat. Because wildfires also produce large direct carbon dioxide emissions (Wiedinmyer and Neff 2007), fire suppressed, fuel-loaded forests are also susceptible to large carbon emissions if they burn in a catastrophic wildfire (Hurteau et al. 2008, Hurteau and North 2009). Although effects of fuel treatments on forest carbon are still being investigated, some researchers suggest that fuel-reducing prescribed burning can promote carbon storage by decreasing the risk of carbon loss through stand-replacing, catastrophic wildfires (Hurteau et al. 2008).

Activities related to construction of new breeding ponds or enhancement of existing breeding ponds would likely result in short-term disturbance of vegetation. The disturbance associated with these projects would be relatively small, usually less than one acre for each site, and would not result in a significant change in vegetative structure or distribution.

The cumulative impacts of implementing the proposed programmatic Agreement on native vegetation communities should be beneficial overall. They are also expected to be insignificant due to the anticipated sizes of the enrolled properties compared with the size of the nine-county area covered under the programmatic Agreement.

4.2.2 Wildlife

No direct impacts to wildlife species are anticipated from the approval of the programmatic Agreement or the issuance of a section 10(a)(1)(A) Enhancement of Survival Permit. However, implementing the programmatic Agreement is likely to result in both short-term and long-term effects to these species within the covered area. The number of species that will be affected as a result of conservation activities conducted under the programmatic Agreement cannot be fully predicted at this time. Some effects of implementing this programmatic Agreement could include increased forage, water, and cover resources and increased overall community diversity. Control of the red-imported fire ant is expected to reduce mortality of various wildlife species and the arthropod community that serves as the food base for many amphibian and reptile species. Prescribed burning activities will likely affect each wildlife species differently

depending on the frequency, duration, intensity, and severity of the prescribed burns conducted at any given site enrolled in the Agreement. With most species, young animals are more vulnerable to injury and mortality than mature individuals (Lyon et al. 2008). However, it is generally accepted that any fire-induced mortality that does occur is outweighed by maintaining preferred or required habitat features within an ecosystem (Russell et al. 1999; Lyon and Telfer 2008). Other listed, proposed, and candidate species are known to occur within Houston toad habitat. In these instances, EDF and private landowners will take necessary steps to avoid impacts to these species. More explanation is provided below.

4.2.3 Listed, Proposed, and Candidate Species

No direct impacts to listed, proposed, or candidate species are anticipated from the approval of the programmatic Agreement or the issuance of a section 10(a)(1)(A) Enhancement of Survival Permit. Indirect impacts to listed, proposed, or candidate species could occur during the implementation of this programmatic Agreement. The number of species that will be affected as a result of conservation activities conducted under this programmatic Agreement cannot be fully predicted at this time. Some effects of implementing the programmatic Agreement could include increased forage, water, and cover resources.

Houston toad

The conservation activities outlined in the programmatic Agreement are designed to expand, create, and restore habitat for the Houston toad throughout its range, thereby increasing its population numbers. It is reasonable to expect that some short-term negative effects to Houston toads may occur during the implementation of the programmatic Agreement as well. Houston toads are expected to move onto the enrolled properties after conservation activities have been initiated as a result of an increase in the availability of higher quality habitat. Houston toads may also be reintroduced onto enrolled properties. It is reasonably foreseeable that there may be an increased risk of death or injury to Houston toads during understory thinning, prescribed burning, or pond construction activities.

It is also reasonably foreseeable that there may be a risk of injury or death to Houston toads when and if landowners enrolled in the programmatic Agreement take actions to return their properties to their baseline conditions. For example, landowners may choose to fill in wetlands or other jurisdictional waters of the United States or cut down forests that had been previously created during implementation of the programmatic Agreement. A number of restrictions have been incorporated into the programmatic Agreement on returning properties to baseline conditions. The Service expects these restrictions to minimize the amount of injury or death to Houston toads. They include the following:

- Under no circumstances will a landowner be authorized to purposefully take (e.g., intentionally kill, injure, capture, or transport) a Houston toad in an effort to return the property to baseline conditions or for any other purpose.

- Landowners will notify EDF and the Service prior to the breeding season before he or she plans to return the property to its baseline conditions. Landowners will also allow EDF

and the Service access to enrolled properties to capture Houston toads and move them off the property, if necessary.

- To the extent possible, activities designed to return a property to its baseline conditions will take place between July 1 and December 31 (outside of the Houston toad breeding season and emergence period), when Houston toads are less active.

The conservation activities described in the programmatic Agreement are likely to result in habitat improvement and the expansion and/or reintroduction of Houston toads onto various enrolled properties. Eligibility to return to baseline will be effective after the conservation activities have been fully implemented and the net conservation benefits have had time to accrue. Each Cooperative Agreement will indicate when the participating landowner will be eligible to return his/her property to baseline conditions and by what means this will occur.

The preferred alternative would likely result in substantial long-term benefits to the Houston toad. The Houston toad depends on healthy and mature forest ecosystems with mixed species composition, moderate canopy cover (Forstner 2002a, Forstner 2003), and open understory layer with an herbaceous component and shaded breeding ponds (Kennedy 1962, Brown 1971, Forstner 2003). Unmanaged forests, fire suppressed forests, and forests that sustain other types of land uses, such as agricultural activities, can become less suitable Houston toad habitat over time if not properly managed. These and other changes may reduce the ability of the forest ecosystem to provide quality Houston toad habitat by altering the Houston toad's food base, increasing the risk for catastrophic fires that could destroy large blocks of habitat, and reducing Houston toad reproductive success. Active management of existing forests and minimizing negative impacts from various types of land uses within and adjacent to forested areas is essential to the long-term sustainability of Houston toad habitat within the covered area of the programmatic Agreement. A programmatic Agreement is expected to provide an incentive to private landowners to actively participate in Houston toad recovery on a rangewide scale.

Implementation of the programmatic Agreement is expected to result in the following benefits to the Houston toad:

- Enhancement of Houston toad foraging and hibernating habitat by reducing the density of woody understory species, restoring favorable canopy conditions, and facilitating the establishment and maintenance of native herbaceous vegetation and Houston toad prey base
- Creation and enhancement of Houston toad breeding and toadlet emergence habitat
- Facilitation of Houston toad dispersal through the creation and enhancement of habitat linkages throughout the species' range
- Increase in Houston toad population numbers through headstarting and reintroduction
- Facilitation of viable, self-sustaining Houston toad subpopulations

Other Listed, Proposed, and Candidate Species

- American alligator (*Alligator mississippiensis*) – The American alligator is federally listed as "threatened due to similarity of appearance" (T(S/A); 52 Federal Register 21059 – 21064). Section 4(e) of the Endangered Species Act of 1973, as amended (Act) authorizes the treatment of a species as endangered or threatened species even though it is

not otherwise listed as endangered or threatened, if it is found that: (a) the species so closely resembles a federally listed species in appearance that enforcement personnel would have substantial difficulty in differentiating between listed and unlisted species; (b) the effect of this substantial difficulty is an additional threat to the listed species; and (c) such treatment of an unlisted species will substantially facilitate the enforcement. The U.S. Fish and Wildlife Service (Service) formally recognizes the American alligator as secure; however, several species of crocodiles and caimans are still facing extinction. For this reason, the Service continues to regulate the harvest of American alligators and legal trade in the animals, their skins, and products made from them to prevent the illegal take and trafficking of endangered "look-alike" reptiles.

Although the American alligator's range includes the nine Texas counties included in the programmatic Agreement, the T(S/A) designation of this species has no effect on land management activities by private landowners.

- Attwater's greater prairie chicken (*Tympanuchus cupido attwateri*) – The Attwater's greater prairie chicken (prairie chicken) is federally listed as an endangered species (32 Federal Register 4001). Its distribution includes Austin and Colorado counties, Texas. These counties are included in the Permit area for the programmatic Agreement. The prairie chicken's habitat consists of coastal grassland prairies. Houston toads are not known to occur in this habitat type. Given the habitat characteristics of this species, it is unlikely that any of the conservation activities described in the programmatic Agreement will affect this species.

  To avoid potential effects to the prairie chicken, landowners within Austin and Colorado counties should determine if any of their enrolled properties are potential prairie chicken habitat. This assessment should be conducted by a qualified individual that has experience in assessing habitat conditions for the prairie chicken. It should also be done prior to the commencement of any conservation activities that may impact this species, such as forest restoration activities. No coastal grassland prairie habitat that could serve as potential habitat for the prairie chicken will be converted to forested habitat for the Houston toad.

- Interior least tern (*Sterna antillarum*) – The interior least tern is federally listed as an endangered species (50 Federal Register 21784-21792). This species is known to occur in Leon and Milam counties, Texas. Both counties are included in the Permit area for this Agreement. Interior least terns arrive at Texas breeding areas beginning in early April to early June each year, and spend three to five months on the breeding grounds. Nesting habitat of the interior least tern includes bare or sparsely vegetated sand, shell, and gravel beaches, sandbars, islands, and salt flats associated with rivers and reservoirs. Houston toads are not known to occur in this habitat type, and none of the Houston toad conservation activities are expected to take place in interior least tern habitat. Given the habitat characteristics of this species, it is unlikely that any of the conservation activities described in the Agreement will affect this species.

- Whooping crane (*Grus americana*) – The whooping crane is federally listed as an endangered species (32 Federal Register 4001). Whooping cranes winter on the Aransas National Wildlife Refuge's 22,500 acres (91,054 hectares) of salt flats and marshes on the coast of south Texas. Their winter habitat consists of coastal prairie dotted with swales and ponds. They summer and nest in poorly drained wetlands in Canada's Northwest Territories at Wood Buffalo National Park. Whooping cranes migrate throughout the central portion of the state from the eastern panhandle to the Dallas/Fort Worth area and south through the central Texas area to the coast during October-November and again in April of each year. It is because they migrate through the Houston toad's range that they are listed as occurring in each of the counties within the Permit area of this Agreement. However, none of the conservation activities described in the programmatic Agreement will affect the whooping crane's wintering or migrating habitat.

- Sharpnose shiner (*Notropis oxyrhynchus*) – The sharpnose shiner is a candidate for Federal listing as an endangered or threatened species (67 Federal Register 40657). Sharpnose shiners occur in fairly shallow water in broad, sandy channels with moderate current (Moss and Mayes 1993). This species is currently restricted to the Upper Brazos River system, which flows through a portion of the Houston toad's range, and is noted as occurring in Austin, Burleson, Milam, and Robertson counties. However, none of the conservation activities described in the programmatic Agreement will affect the sharpnose shiner's habitat.

- Smalleye shiner (*Notropis buccula*) – The smalleye shiner is a candidate for Federal listing as an endangered or threatened species (67 Federal Register 40657). Smalleye shiners occur in fairly shallow water in broad, sandy channels with moderate current (Moss and Mayes 1993). This species is currently restricted to the Upper Brazos River system, which flows through a portion of the Houston toad's range, and is noted as occurring in Burleson County. However, none of the conservation activities described in the programmatic Agreement will affect the smalleye shiner's habitat.

- Large-fruited sand verbena (*Abronia macrocarpa*) – The large-fruited sand verbena is federally listed as endangered (53 Federal Register 37975). Its distribution includes Leon and Robertson counties, Texas. These counties are included in the Permit area for the programmatic Agreement. Its habitat consists of open areas of deep sandy soils in post oak woodlands. The large-fruited sand verbena may be sympatric with the Houston toad within the two counties that both species occur. Therefore, the conservation activities outlined as part of the programmatic Agreement and designed to benefit the Houston toad may potentially affect the large-fruited sand verbena.

  To avoid potential effects to the large-fruited sand verbena, landowners within Leon and Robertson counties should determine if any of their enrolled properties are potential large-fruited sand verbena habitat. This assessment should be conducted by a qualified individual that has experience in assessing habitat conditions for the large-fruited sand verbena. It should also be done prior to the commencement of any conservation activities that may impact the large-fruited sand verbena, such as prescribed burning and new pond construction.

Should a landowner choose not to conduct this habitat assessment or if such an assessment fails to exclude the possibility that the large-fruited sand verbena occurs on his or her enrolled property, the landowner will work closely with EDF and the Service to ensure that conservation activities will be carried out in such a way that will avoid effects to the large-fruited sand verbena. This can be achieved by such means as constructing ponds in areas distant from known large-fruited sand verbena habitat or scheduling prescribed burning activities so as not to disrupt the flowering, seed dispersal, or rosette-producing stages of this species. These precautions will be outlined in the landowner's Cooperative Agreement with EDF. Because these life cycle stages (i.e., flowering period and rosette-producing stages) of the large-fruited sand verbena can begin at different time from season to season, the Service will seek information regarding these life cycle stages on lands known to be occupied by the large-fruited sand verbena by species experts each year to adequately advise EDF and enrolled landowners on the commencement of burning activities.

- Navasota ladies'-tresses (*Spiranthes parksii*) – Navasota ladies'-tresses is federally listed as an endangered species (47 Federal Register 19539). Its distribution includes Bastrop, Burleson, Leon, Milam, and Robertson counties, Texas. These counties are included in the Permit area for the programmatic Agreement. Navasota ladies'-tresses habitat consists of lightly wooded stream banks within post oak savannahs of east-central Texas. Navasota ladies'-tresses may be sympatric with the Houston toad within the five counties that both species occur. Therefore, the conservation activities outlined as part of the programmatic Agreement and designed to benefit the Houston toad may potentially affect Navasota ladies'-tresses.

  To avoid potential effects to Navasota ladies'-tresses, landowners within Bastrop, Burleson, Leon, Milam, and Robertson counties should determine if any of their enrolled properties are potential Navasota ladies'-tresses habitat. This assessment should be conducted by a qualified individual that has experience in assessing habitat conditions for Navasota ladies'-tresses. It should also be done prior to the commencement of any conservation activities that may impact Navasota ladies'-tresses, such as prescribed burning and new pond construction.

  Should a landowner choose not to conduct this habitat assessment or if such an assessment fails to exclude the possibility that Navasota ladies'-tresses occur on his or her enrolled property, the landowner will work closely with EDF and the Service to ensure that conservation activities will be carried out in such a way that will avoid effects to Navasota ladies'-tresses. This can be achieved by such means as constructing ponds in areas distant from known Navasota ladies'-tresses habitat or scheduling prescribed burning activities so as not to disrupt the flowering, seed dispersal, or rosette-producing stages of this species. These precautions will be outlined in the landowner's Cooperative Agreement with EDF. Because these life cycle stages of the Navasota ladies'-tresses can differ slightly from season to season, the Service will seek information regarding these life cycle stages on lands known to be occupied by Navasota ladies'-tresses by species experts each year to adequately advise EDF and enrolled landowners on the commencement of burning activities.

4.2.4 Cultural Resources

Many of the conservation activities that will be conducted as part of the programmatic Agreement, such as brush management, breeding pond enhancement, control of red-imported fire ants, and Houston toad head-starting or reintroduction activities, do not typically result in ground disturbance. Therefore, these activities are not expected to impact cultural resources.

Minor to moderate ground disturbance could occur through the implementation of the Agreement from fence installation, forest enhancement and restoration, prescribed burning activities, or construction of new breeding ponds for the Houston toad. Prior to enrolling a property in the programmatic Agreement, EDF will use the National Register of Historic Places National Register Information System to determine if the property is listed in or eligible for listing in the National Register of Historic Places. If a property is listed in or eligible for listing in the National Register of Historic Places, EDF will confer with the appropriate landowner, the Service, and the Texas Historical Commission to determine whether the proposed conservation activities are compatible with the historic integrity of the property. Activities deemed incompatible with the historic integrity of the property will not be conducted. Thus, no direct or indirect impacts to cultural resources are anticipated from the approval of the programmatic Agreement or the issuance of a section 10(a)(1)(A) Enhancement of Survival Permit.

4.2.5 Socioeconomic Environment

No direct impacts to the socioeconomic environment are anticipated from the approval of the programmatic Agreement or the issuance of a section 10(a)(1)(A) Enhancement of Survival Permit. Because participation in the programmatic Agreement is voluntary, no significant effects are expected to the socioeconomic environment within the covered area.

If any participating landowners' voluntary conservation activities are reasonably expected to result in the Houston toad occupying other properties, the Service will use the maximum flexibility under the Act to address incidental take coverage on those neighboring properties under the programmatic Agreement and the associated Permit. The implications to such landowners and the potential need to actively address these implications will be determined on a case-by-case basis. Neighboring landowners will have the option to receive regulatory protections and safe harbor assurances under the Agreement by completing a baseline assessment for their property and committing to monitoring and notification requirements, as described in the Agreement. In such cases, neighboring landowners will enter into a "Neighboring Landowner Cooperative Agreement" (see Attachment E of the Agreement) with EDF and receive a Certificate of Inclusion to enroll their property in this Agreement. Alternatively, neighboring landowners can prepare an individual Safe Harbor Agreement that addresses covered species, baseline environmental conditions, and habitat on the property to be enrolled.

4.2.6 Wetlands

No direct impacts to wetlands are anticipated from the approval of the programmatic Agreement or the issuance of a section 10(a)(1)(A) Enhancement of Survival Permit. Indirect impacts to wetlands could occur during the implementation of the programmatic Agreement. Under this alternative, creeks, springs, seeps, and most other wetland areas would largely remain undisturbed and unaffected by the conservation activities proposed in the programmatic Agreement. However, this alternative is expected to provide an incentive for non-Federal landowners to create, restore, or enhance ephemeral wetlands and other potential Houston toad breeding sites on their properties. Such activities may include fence construction to restrict livestock, bank stabilization, canopy restoration adjacent to ponds, methods to reduce eutrophication, and re-vegetation at pond edges to provide cover for emerging toadlets. Therefore, existing stock tanks and other wetlands would be improved by the conservation activities included under the programmatic Agreement. Restoration of heavily-impacted or disturbed ponds and limitation of livestock access is expected to improve their wetland characteristics and functional values over time.

Ephemeral ponds may be created on select properties in different size and shape configurations to provide new breeding habitat for Houston toads during the implementation of the programmatic Agreement. Pond construction would only take place under the following circumstances: (1) through the recommendation of Houston toad experts and with thoughtful consideration of the best available science that would support the need for new ponds at sites that would not reduce the reproductive success of other known Houston toad chorus ponds in the area and (2) when the surrounding upland habitat conditions are of sufficient quality and extent to support the full life cycle of Houston toads emerging from those ponds.

Under the programmatic Agreement, a landowner may return his or her property to baseline conditions upon the expiration of a Cooperative Agreement and before the expiration of the associated programmatic Permit. Ponds that are created through the implementation of the programmatic Agreement could be filled or otherwise eliminated if landowners choose to return their properties to their baseline conditions. Likewise, landowners may choose to remove fencing or discontinue management and restoration activities that were initiated to enhance or restore Houston toad breeding habitat. In such cases, these wetlands would be returned to the conditions they were in before the programmatic Agreement was implemented.

Depending on site conditions and location, construction techniques, proximity to jurisdictional waters of the United States, and other factors, activities involving the creation, alteration, or elimination of potential Houston toad breeding sites may require a permit from U.S. Army Corps of Engineers. Although this is not expected to be a common occurrence during the implementation of the programmatic Agreement, EDF and all participating landowners will coordinate with Federal, State, and local government offices and comply with all applicable laws and regulations when working in or near wetlands or other jurisdictional waters of the United States.

4.2.7. Land Use

No direct impacts to land use are anticipated from the approval of the programmatic Agreement or the issuance of a section 10(a)(1)(A) Enhancement of Survival Permit. No significant effects are expected to the land uses that occur within the covered area. Enrollment in the programmatic Agreement is voluntary and will be limited to properties that can be maintained, restored, or enhanced to serve as Houston toad habitat. Therefore, no direct or indirect effects to these land uses as a result of the implementation of the programmatic Agreement are expected to occur.

It is expected that the majority of the sites enrolled in the programmatic Agreement will be open rangelands with existing grazing operations. Other undeveloped areas, such as forested lands may also be enrolled. In fact, enrollment priority will be given to non-Federal landowners with land adjacent to or near other properties currently being managed for Houston toad conservation. These undeveloped areas are likely also used for a variety of recreational activities, such as hunting, fishing, hiking, and bird-watching. The conservation activities included in the programmatic Agreement were designed to be consistent with these land uses. However, landowners enrolling in the programmatic Agreement may find they need to slightly modify their current land use practices to be consistent with the terms and conditions of the permit. For example, excluding livestock or directing recreational activities away from potential Houston toad breeding sites may be necessary to achieve the desired conservation benefits for the Houston toad. Such modifications would not constitute a significant impact to land use.

4.2.8. Water Resources

No direct impacts to water resources within the covered area are anticipated from the approval of the programmatic Agreement or the issuance of a section 10(a)(1)(A) Enhancement of Survival Permit. Indirect impacts of implementation of the programmatic Agreement may result in improvements to local water quality and quantity at specific sites, depending on a particular landowner's conservation commitments for wetland restoration. However, such activities are not expected to affect groundwater supplies.

4.3 Cumulative Impacts

The Council on Environmental Quality defines cumulative impacts as the incremental impacts of multiple present and future actions with individually minor, but collectively significant effects. Current impacts to the existing environment within the covered area and impacts from future actions under the Preferred Alternative are described above. Effects to the current environment will be localized across a nine county region according to which properties will be enrolled under the programmatic Agreement. Because of the large area to be covered and the localized nature of the impacts to each property enrolled under the programmatic Agreement, cumulative impacts are anticipated to be beneficial, generally neutral, or insignificant either locally or across the range. However, the programmatic Agreement is expected to result in long-term beneficial effects to the federally endangered Houston toad and its habitat.

5.0 PUBLIC INVOLVEMENT

5.1 AGENCY INVOLVEMENT

The programmatic Agreement and this draft Environmental Assessment will be forwarded to appropriate staff at the Texas Parks and Wildlife Department, U.S. Army Corps of Engineers, Texas Forest Service, Natural Resources Conservation Service, and Texas Department of Agriculture for review during the public review process discussed below. Comments will be incorporated, as applicable.

5.2 PUBLIC REVIEW

This document, along with the Agreement will be made available for public review. The review period will be for 60 days. A Notice of Availability will be published in the Federal Register and will be mailed or e-mailed to interested parties and agencies. It will also be posted on the Service's Region 2 website.

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Figure 1. Texas Counties Included in the Houston Toad Programmatic Safe Harbor Agreement.