

**Guidelines for the Establishment, Management, and Operations of Houston Toad  
Conservation banks**

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## Table of Contents

Introduction.....	4
Credits .....	4
Real Estate Assurances .....	5
Amendment and Modification .....	5
Standard Conservation Easement Requirements .....	5
Prohibited activities .....	6
Allowed activities .....	7
Financial Assurances .....	7
Permits and Incidental Take.....	8
Emergency Situations .....	8
Remedial Actions.....	9
Houston Toad Conservation bank Requirements.....	9
Minimum Standards.....	9
Habitat Evaluation .....	12
Crediting Methodology .....	12
Preservation Credits .....	12
Restoration Credits.....	13
Buffer Credits.....	13
Service Area.....	14
Surveys and Monitoring.....	14
Houston Toad Monitoring.....	15
Vegetation Monitoring.....	16
Development of a Management Plan .....	16
Reporting .....	18
Literature Cited .....	19
Appendix A: Checklist for Conservation bank Proposals.....	21
Appendix B: Modified ARD Monitoring Protocol .....	23
Audio Recording Devices (ARDs) .....	23
Recommended Equipment .....	23
Recording Schedule .....	23
Device Placement.....	24
Audio Analysis.....	24
Appendix C: Waterbody Assessment .....	25
Appendix D: Vegetation Monitoring Methods .....	27

Sample Design .....	27
Equipment Needed.....	28
General Description of Sampling Method .....	28
Step-by-Step Procedures .....	28
Waterbody Assessments .....	30
Appendix E: Example of Preservation and Buffer Credit Calculation .....	31

## Introduction

The Houston toad (*Anaxyrus houstonensis*) generally occurs in rolling uplands covered with pine and/or oak forests underlain by deep sandy soils in southeastern Texas. Human activities have eliminated much of the Houston toad habitat within the species' range and as a consequence the species was listed as endangered under the Federal Endangered Species Preservation Act of 1966 (then under the scientific name *Bufo houstonensis*) on October 13, 1970 (35 FR 16047-16048). The Houston toad's endangered status was continued under the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq.*). Loss of forested habitat is an extensive threat to the toad throughout its range where urban development, pipelines, transportation expansion, agricultural conversion, and other human impacts continue to require Section 7 consultations and Section 10 habitat conservation plans (HCPs) under the Endangered Species Act. There is a need for guidelines to establish consistency for Houston toad habitat mitigation that effectively promotes the recovery of the Houston toad and ties mitigation actions to recovery plan objectives.

The U.S. Fish and Wildlife Service (Service) believes that an effective strategy to conserve the Houston toad involves protecting large patches of habitat, as large patches are more resilient to other threats such as wildfires and less total habitat may be required to achieve recovery in a management unit with large contiguous patches of habitat versus smaller fragmented patches (Lehtinen et. al. 1999, pp. 8-11; Sjogrn-Gulve 1994, 1365-1366; Semlitsch 2001, pp. 622-623).

This document provides guidance for those involved in the establishment, management, and operation of Houston toad mitigation banks in Texas. The Service will review mitigation proposals for this species and ensure that they meet the minimum standards described in this document for all mitigation options described below.

All mitigation proposals will be reviewed by both the Austin Ecological Services Field Office and Texas Coastal Ecological Services Field Office, while final review and approval will occur by the Assistant Regional Director – Ecological Services (ARD-ES) or designee. The Service cannot commit to a standard time frame for any proposals received and therefore applicants should not expect a specific timeframe for review and possible approval. A checklist of items required for a conservation bank proposal is included in Appendix A.

This guidance is subject to revision by the Service as new information related to this species and the ecosystem it depends on becomes available. Templates to assist prospective conservation bank owners/sponsors are available and can be found at: [www.fws.gov/southwest/es/AustinTexas/Cons\\_Banking.html](http://www.fws.gov/southwest/es/AustinTexas/Cons_Banking.html).

## Credits

For a conservation bank, a credit is defined as a unit of trade related to habitat representing the accrual or attainment of habitat functions or value at a habitat offset site (conservation bank). Depending on the target species, credits can be measured in different ways (e.g., habitat area, number of mating pairs, etc.). For the Houston toad, the units for credits are measured in area of occupied habitat.

## **Real Estate Assurances**

A perpetual conservation easement that transfers usage rights creating a legally enforceable land preservation agreement between a landowner (grantor) and a qualified land protection organization (grantee), such as a land trust or a governmental agency, is required. The easement holder (grantee) must be qualified pursuant to state laws. The Service (Regional Office - RO) shall approve the form of the conservation easement as well as the entity that will hold the easement. The Owner shall provide the Service with a copy of all easements recorded on the property, and mineral rights through a title report, along with a legal easement. The easement shall contain, among other things, a provision granting to the Service a third party right of enforcement. In the case of land trusts, the organization's board of directors should have in its corporate resolutions the adoption of the National Land Trust Alliance's *Statement of Land Trust Standards and Practices* as guiding the practices of the organization (available from LTA; [www.lta.org](http://www.lta.org) or 202-638-4725). The grantee's board of directors, officers, and staff should not have a conflict of interest concerning the conservation bank or permits issued by the Service or state in which the conservation bank resides. The Service may require written certification that the land trust board of directors, officers and staff, as holders of conservation easements, will not receive benefit, financial or otherwise, from the issuance by the Service of the underlying permit or incidental take authorization, or approval of a conservation bank or other mitigation agreement.

## **Amendment and Modification**

The conservation banking agreement may be amended or modified only with the written approval of all of the parties. As part of this process all proposed amendments and modifications must be consistent with current Service banking guidance and guidance for conservation of the species in effect at the time of the amendment. All amendments and modifications shall be fully set forth in a separate document signed by all parties that shall be appended to the conservation banking agreement. Modifications resulting in the alteration of the number or type of available credits may result in the temporary suspension of credit sales for the duration of the conservation banking agreement re-evaluation process.

Banking agreements that have already been signed as of the date this guidance is made final are not required to be modified, but can amend their banking agreement to align with this guidance document if desired. Other than a minor modification, for any proposal to amend or modify an existing bank agreement, the entire agreement will be re-evaluated to bring it up to current standards according to the most recent version of this guidance. Minor modifications include name changes/updates, address changes/updates, spelling corrections, and grammatical corrections.

## **Standard Conservation Easement Requirements**

The following list contains prohibited and allowed activities on lands under conservation easements for Houston toad conservation banks.

### **Prohibited activities**

1. Any activity on, or use of the conservation bank that is inconsistent with the purposes of the conservation easement.
2. Any legal or de facto division, subdivision or partitioning of the conservation bank.
3. Construction, erecting or placement of any building, billboard or sign, or any other structure or improvement of any kind.
4. Use of off-road vehicles and use of any other motorized vehicles within the Houston toad breeding season (January 1<sup>st</sup> to June 30<sup>th</sup>) except on existing vehicle trails.
5. Recreational activities, including, but not limited to, horseback riding and biking; except for personal, non-commercial, recreational activities of the Grantor, so long as such activities are consistent with the purposes of the Conservation Easement and specifically provided for in the management plan.
6. Depositing or accumulation of soil, trash, ashes, refuse, waste, bio-solids or any other materials.
7. Planting, introduction or dispersal of non-native or exotic plant or animal species.
8. Unseasonable watering; use of fertilizers, pesticides, biocides, herbicides or other agricultural chemicals; weed abatement activities; incompatible fire protection activities; and any and all other activities and uses which may impair or interfere with the purposes of the Conservation Easement. Invasive plant control, including the use of herbicides, is permitted subject to the management plan for the property. Refer to the Houston toad habitat management guidelines found on our website: [https://www.fws.gov/southwest/es/AustinTexas/ESA\\_Sp\\_Htoad.html](https://www.fws.gov/southwest/es/AustinTexas/ESA_Sp_Htoad.html)
9. Agricultural activity of any kind except livestock grazing which may be approved subject to a grazing plan as specifically provided in the management plan. Semlitsch and Bodie (2003, p. 1222) recommend an aquatic buffer of 30-60 meters (m) (98-196 feet [ft]) to reduce effects to a waterbody. Any grazing will be prohibited within 50 m (164 ft) of any waterbody, as juvenile Houston toads have been shown to remain within a 50 m (164 ft) radius of their natal pond for at least 13 weeks post-emergence (Greuter 2004, p. 70).
10. Altering the surface or general topography of the conservation bank, including but not limited to any alterations to habitat, building roads or trails, paving or otherwise covering the conservation bank with concrete, asphalt or any other impervious material except for those habitat management activities specified in the management plan.
11. Removing, destroying, or cutting of trees, shrubs or other vegetation, except as required by law for (a) fire breaks, (b) maintenance of existing foot trails or roads, or (c) prevention or treatment of disease. Any activities proposed under (a), (b), or (c) must be coordinated with the Service prior to implementation.

12. Manipulating, impounding or altering any natural watercourse, body of water or water circulation on the conservation bank, and any activities or uses detrimental to water quality, including but not limited to degradation or pollution of any surface or sub-surface waters.
13. Transferring, encumbering, selling, leasing, or otherwise separating the mineral, air (including wind), or water rights for the conservation bank.
14. Engaging in any use or activity that may violate, or may fail to comply with, relevant federal, state, or local laws, regulations, or policies applicable to Grantor, the conservation bank, or the use or activity in question.

### **Allowed activities**

1. The right to undertake or continue any activity or use of the Property not prohibited by the Conservation Easement provided such use is consistent with the purposes of the Conservation Easement. Prior to making any change in use of the Property, landowner shall notify Grantee and the Service in writing to allow Grantee and the Service a reasonable opportunity to determine whether such change would violate the terms of this Conservation Easement.
2. The right to sell, give, lease, or otherwise convey the Property subject to the terms of the Conservation Easement.
3. With the prior written approval of the Grantee and the Service, the right to restore and enhance native plant and wildlife habitat, consistent with approved wildlife management and soil conservation practices and all applicable laws and regulations governing such practices, provided such restoration does not impair the conservation values that support the Houston toad.
4. Reconstruction of existing structures within the original footprint is allowed outside of the Houston toad breeding season (July 1<sup>st</sup> to December 31<sup>st</sup>) with no disturbance or removal of existing vegetation.
5. Hunting and fishing is allowed on the parcel provided these activities do not occur within habitat areas during the Houston toad breeding season (January 1<sup>st</sup> to June 30<sup>th</sup>). Hunting of feral hogs may occur at any time with care being taken to reduce potential impacts to Houston toads.

### **Financial Assurances**

Conservation bank must identify an adequate funding source to provide for interim and perpetual operation, management, monitoring, and documentation costs. Funding for the start-up and interim management program (e.g., purchase of land, property taxes, initial restoration, or legal fees) should be separate from the requisite endowment for ongoing actions. Letters of credit may be required. The Service's RO shall have final approval over endowment documents. The strategy for long-term funding is normally to establish a long-term management endowment (i.e.,

a fund that generates enough interest each year to cover the costs of the yearly management). This endowment could be established by including the cost of management into the price per credit. As credits are sold, an agreed upon portion of the proceeds can be deposited into a long-term management endowment fund or escrow. The size of the required endowment will depend on certain factors, including; land management activities, rate of inflation, and interest rate, but should always be estimated out for 30 years. A target date and target amount for fully funding the endowment for ongoing actions must be determined. The endowment must be fully funded before all credits are sold, preferably within the first 3-4 years of the conservation bank operation. A master escrow account should be established concurrent with final approval of mitigation by the Service. All credit sales/trades are deposited into escrow and a portion of each credit sale deposited is used to fund for the long-term. In the event the long-term fund is not fully funded by the end of the target date, the owner shall immediately convey the remaining amount.

Some mitigation will also have short-term costs, usually associated with restoration or enhancement of the site, fencing, equipment purchases, or other such start-up costs. An interim management account (i.e., a dedicated, interest bearing account in an amount adequate to cover short-term costs and contingencies) should be established. This account is used to fund management and monitoring of the property until the endowment account is fully funded and mature per the terms of the conservation bank agreement. The interim management account can be replenished by the banker until the endowment is funded. Other potential assurances may include performance bonds or letters of credit; however, an interim management account is usually preferable. The cost of each credit will ultimately be determined by the banker/owner of the conservation bank, and is not the concern of the Service, if the long-term management endowment has been fully funded.

## **Permits and Incidental Take**

Under section 9 of the ESA, it is unlawful for any person to “take” any federally-listed threatened or endangered fish or wildlife species, without special exemption. Consequently, it is a violation of Federal law to take threatened or endangered fish or wildlife species or their habitat without appropriate permits, even if the take is accidental. Take of federally-listed species incidental to a lawful activity may be authorized through section 7 or 10 of the ESA. It is possible for a mitigation manager to establish and operate a conservation bank without any ESA section 7 or 10 authorization (incidental take permit) or state permits, provided that they do not take listed species. However, we do suggest property owners/managers hold their own permits to cover management activities. We recommend consulting with the state permitting authority and the appropriate Service Field Office to determine necessary permitting requirements.

## **Emergency Situations**

The conservation bank owner/manager will not be held responsible for offsetting acts of nature that are unforeseen, or foreseeable but unpredictable, such as catastrophic fire, floods, and hurricanes. The conservation bank owner/manager will notify the Service within 24 hours of occurrence of a catastrophic event, event of force majeure, or unlawful act, and as promptly as reasonably possible shall meet with the Service to discuss the course of action in response to



such occurrence. In the meantime, conservation bank will continue to be managed and maintained according to the existing management plan.

## **Remedial Actions**

Conservation bank must include provisions for a dispute resolution process applicable if the owners of the property fail to meet their obligations under the conservation bank or mitigation agreement. The Service, in consultation with the conservation bank sponsor and easement holder, will decide on the need for remediation.

## **Houston Toad Conservation bank Requirements**

### **Minimum Standards**

1. The site should be located within a Houston toad management unit (Figure 1).
2. The site has at least one breeding pond that has had a chorus of adult male Houston toads detected in the most recent breeding season (January 1<sup>st</sup> to June 30<sup>th</sup>).
3. The site does not have more than one pond (breeding or non-breeding pond) per 101 ha (250 ac). This pond to area ratio is based on the configuration of the Griffith League Ranch discussed in minimum standard 4. Houston toads may have greater breeding success the greater number of chorusing male toads that are present at a wetland (Gaston et. al. 2010, pp. 3-4). By limiting the number of ponds, Houston toads will be more concentrated, resulting in larger choruses and the increased probability of reproduction.
4. The site contains a minimum of 202 hectares (ha) (500 acres [ac]) of contiguous Houston toad forested habitat. For more information, see “Habitat Characteristics of the Houston Toad” on the Austin Ecological Services Field Office website: [https://www.fws.gov/southwest/es/austintexas/ESA\\_Sci\\_permits.html](https://www.fws.gov/southwest/es/austintexas/ESA_Sci_permits.html). The configuration of the habitat patch should have low forest edge (boundary between forest and any other land-cover type) to area ratio, which will reduce the effects of non-habitat land use and edge effects. Edge habitat is known to support fire ants, which threaten Houston toad survival (Porter et al. 1988, p. 916; Stiles and Jones 1998, pp. 343-344; Brown et al. 2012, p. 146). Also, hybridization and competition between the Houston toad and the Woodhouse’s toad (*Anaxyrus woodhousii*) occurs primarily along habitat edges where forests have been cleared (USFWS 1994, p. 78). The minimum size threshold for contiguous forested habitat is based on the configuration of breeding ponds and upland forested habitat at the Griffith League Ranch in Bastrop County from two ponds, which are consistently occupied and support large adult breeding populations. These ponds are embedded within contiguous forested habitat with a minimum of ~720 m (2,362 ft) to the nearest forest edge. A square parcel of land that is 1,440 m (4,724 ft) on each side has an area of 207 ha (512 ac). The total habitat surrounding these ponds on the Griffith League Ranch is 405 ha and 728 ha (1,000 and 1,800 ac), but we acknowledge that setting the minimum standard this large may result in too few eligible parcels meeting that standard. Two scenarios when a property can have less than the

required minimum of 202 ha (500 ac) of contiguous Houston toad forested habitat are as follows:

- a. If an existing property contains at least 202 ha (500 ac) of occupied contiguous, forested habitat that is and will be preserved in perpetuity, then the addition of any acreage (no minimum) of contiguous forested habitat from another property that is adjacent and/or connected to the existing property will be considered. If there are no ponds on the new property and the existing property is occupied, then the new property does not have to be occupied. If the property has ponds and the existing property is occupied, then the new property does not have to be occupied if the total (existing and new) acreage still meets the minimum requirement of a 101 ha (250 ac) to one pond ratio.
  - b. If an existing property contains less than 202 ha (500 ac) of occupied contiguous, forested habitat that is or will be preserved in perpetuity, then the addition of contiguous, forested Houston toad habitat from another property that is adjacent and/or connected to the existing property to have a combined total of 202 ha (500 ac) between the two properties will be considered. For example, if an occupied, 121 ha (300 ac) permanent preserve of forested Houston toad habitat exists, then a proposal for an adjacent 81 ha (200 ac) of forested Houston toad habitat within a property will be considered.
5. Each Houston toad breeding pond must have a 400 m (1,312 ft) buffer of contiguous forested habitat surrounding it, i.e. a breeding pond cannot be less than 400 m (1,312 ft) from the edge of forested habitat. This 400 m (1,312 ft) buffer will reduce edge effects.
    - a. If a breeding pond does not have a 400 m (1,312 ft) buffer of forested habitat from a forested edge at the time of the proposal, the property will still be considered if the required 400 m (1,312 ft) buffer area can be restored.
  6. Each Houston toad breeding pond must be located at least 400 m (1,312 ft) from the property boundary if adjacent properties are not preserved in perpetuity. This acts as an acoustic buffer. An acoustic buffer will reduce the risk of Houston toads leaving the property in response to toads calling from wetlands outside of the property boundary.
  7. Existing or proposed land management activities, and conditions resulting from these activities, support recovery of the species (as per current recovery plan, recovery outlines, recent 5-year review, or other Service-approved document).
  8. The site is sustainable for the purposes of the mitigation as outlined in the original conservation bank or mitigation agreement (e.g., low fire hazard, adaptable to a changing climate, potential or existing urbanization adjacent to the parcel is low, etc.).

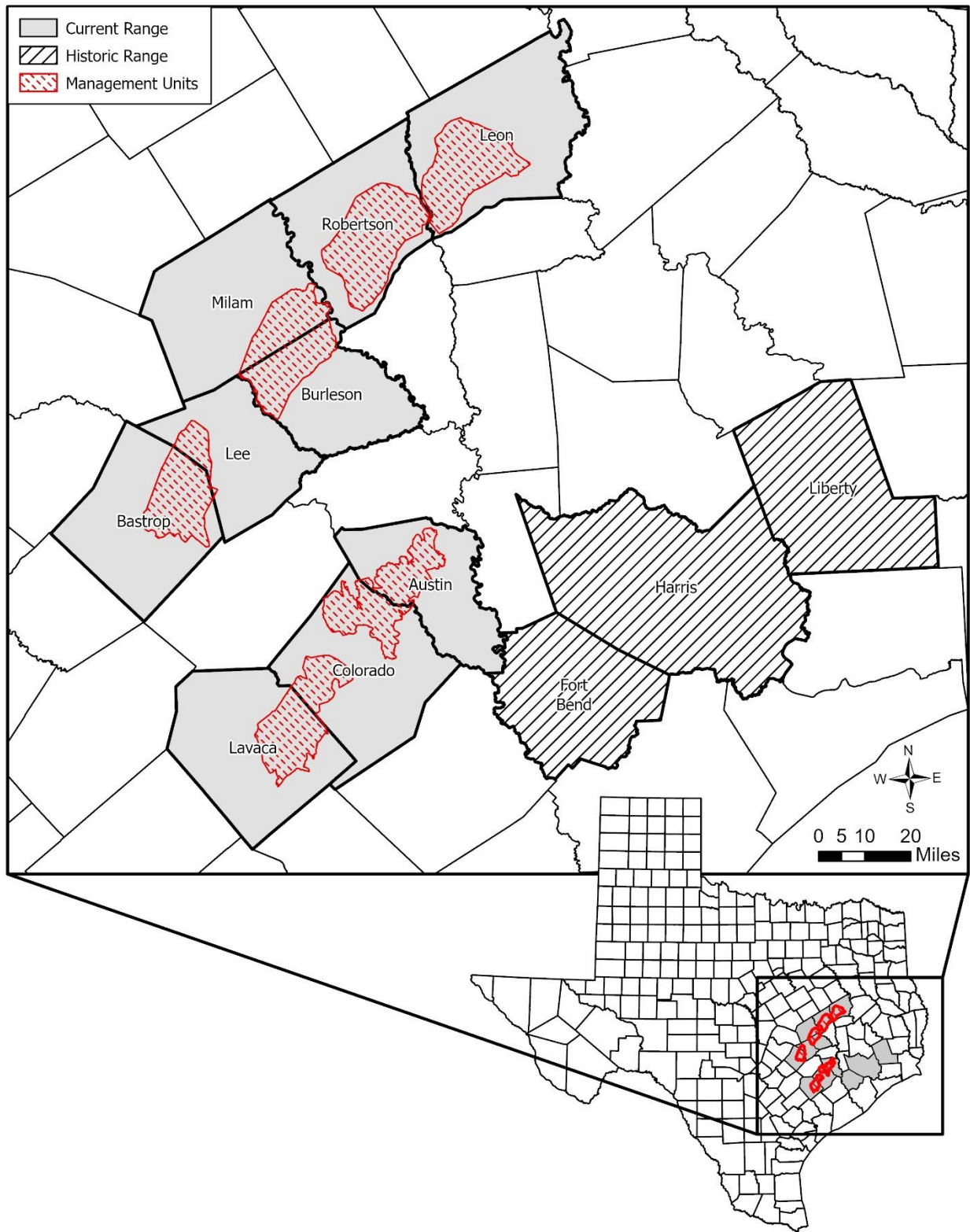


Figure 1. Houston toad current (gray), historic (hatched) range with management units (red).

## **Habitat Evaluation**

For a property proposal, a desktop analysis should be done that includes a general qualitative description of the property and include maps showing: 1) the property boundary with the most up-to-date aerial imagery available, 2) the location and type of any fences, roads, or other infrastructure, 3) the location and perimeter of all water features, 4) which geological formations underlie the property, 5) Natural Resources Conservation Service (NRCS) soil series, 6) Texas Parks and Wildlife Department (TPWD) ecological systems, and 7) LiDAR (Light Detection and Ranging) derived canopy height. Accompanying these maps should be tables that quantitatively describe the length or area of these property attributes.

## **Crediting Methodology**

The process for establishing a conservation bank for the Houston toad will require the evaluation and determination of the number of available credits for each parcel of land submitted for review. If the size of the proposed conservation bank is close to the minimum size standard (202 ha [500 ac]), early coordination with Service biologists should be conducted to ensure that identification of buffer habitats, incompatible land use, or other issues do not prevent the parcel from meeting that standard. Following the approval of all documentation required under the conservation bank or mitigation agreement, credits will be released as determined by the credit release schedule and all applicable performance standards. The proponent of the conservation bank will be required to provide a habitat assessment (including maps) and baseline surveys that identify: 1) the extent of suitable habitat including estimates of canopy cover and soil type, 2) an estimate of “buffer” habitat (see description below), and 3) the presence or absence of Houston toads at each pond or wetland using the “Procedures for conducting presence/absence surveys” for Houston toads on the Service’s website ([https://www.fws.gov/southwest/es/AustinTexas/ESA\\_Sci\\_permits.html](https://www.fws.gov/southwest/es/AustinTexas/ESA_Sci_permits.html)). The Service will make a determination on the amount of Houston toad credits (preservation, restoration, and buffer) that will be available to the proponent.

## **Preservation Credits**

Preservation credits will be valued at one credit per one acre of optimal Houston toad forested habitat provided the habitat consists of contiguous patches and all applicable standards identified in the management plan have been met. Optimal habitat will be defined as follows:

1. Sandy soils typical of providing suitable habitat, such as those in the Fulshear, Kenney, Kuy, Boy, Katy, Segno, Dutek, Straber, Robco, Tremona, Silstid, Catilla, Padina, Tadina, Edge, and Tabor soil series (Buzo 2008, p. 9).
2. An overstory with 60-80 percent canopy cover that is made up of typical native species including, but not limited to, loblolly pine (*Pinus taeda*), post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), and sandjack oak (*Quercus incana*). The overstory should have an average diameter at breast height (DBH) of at least 26 centimeters (cm).
3. An understory consisting of 50-75 percent ground cover with an assemblage of native herbaceous (i.e. no yaupon thickets) ground cover species and a minimal shrub layer.

4. Breeding ponds with shaded edges located within all of the components described above.

### **Restoration Credits**

If there is sub-optimal habitat within the proposed conservation bank, then it can be considered for restoration credits. Restoration credits will be credited at 0.5 credits per acre when accompanied by a restoration plan, with the potential to be credited fully to preservation credits when restored to optimal habitat (performance standards for optimal habitat are demonstrated). Restorable habitat must have the appropriate sandy soils and can include the following:

1. An overstory with less than 60 percent or greater than 80 percent canopy cover that is made up of typical native species including, but not limited to, loblolly pine, post oak, blackjack oak, and sandjack oak.
2. An overstory with 60-80 percent canopy cover that is made up of typical native species including, but not limited to, loblolly pine, post oak, blackjack oak, and sandjack oak. However, the overstory has an average DBH less than 26 cm (10.2 in).
3. An understory with less than 50 percent or greater than 75 percent ground cover with an assemblage of native herbaceous (i.e. no yaupon thickets) ground cover species and a minimal shrub layer.

### **Buffer Credits**

Semlitsch and Bodie (2003, p. 1222) recommend a 50 m (164 ft) terrestrial buffer between forested habitat and non-habitat for amphibians to decrease edge effects from surrounding land use. Buffer habitat will absorb edge effects, making it less suitable habitat for Houston toads. Due to the decreased suitability of buffer habitat, we have determined that the 50 m (164 ft) terrestrial buffer between habitat and non-habitat will be credited as buffer credits. In addition, habitat that does not meet the optimal requirements and cannot be restored will be considered for buffer credit. There are four criteria that will be used to assess buffer acreage:

1. If habitat extends to the property boundary, then buffer credits will start at the boundary and extend 50 m (164 ft) into habitat. Buffering the property boundary will help to mitigate effects of adjacent properties' land use. An exception to this rule can be made if the adjacent property is also preserved in perpetuity for the Houston toad.
2. When canopy cover becomes less than 50 percent, then buffer credits will start at the 50 percent threshold and extend 50 m (164 ft) into forested habitat.
3. Any habitat that is contiguous with optimal habitat, but has less than 50 percent and greater than 0 percent canopy cover.
4. Any habitat with greater than 0 percent canopy cover and unsuitable soils, i.e. soils that are not sandy. Suitable sandy soils are outlined in the preservation credit section above.

An example of how buffer credits will be assessed can be found in Appendix E. All buffer areas will be credited at 0.5 credits per one acre.

## Service Area

The Service Area of a conservation bank defines the area in which the credits may be used to offset project impacts. If projects fall within a conservation bank or in-lieu fee program Service Area, the project proponent may offset their impacts by purchasing the appropriate amount of conservation credits from that property. The designation of Service Areas for a Houston toad conservation bank is based primarily on the conservation needs of the species. Existing Houston toad conservation banks will be “grandfathered” in under these guidelines and will be provided the opportunity to keep their existing Service Area or amend their conservation bank agreement to replace their service areas with the new Service Areas defined below. Any amendments to existing banking agreements will be required to meet the most current Service standard.

The service area for each conservation bank will be the same as the service area for each management unit, as conservation banks will be limited to habitat within management units. Therefore, when service area is discussed, it will be relative to each management unit. The primary service area for each management unit will be the county or counties it overlaps. In essence, mitigation must occur within the management unit that overlaps the county or counties in which the disturbance occurs. The secondary service area for each management unit will be the county or counties in which the adjacent management unit(s) overlaps. The secondary service area only applies if there is no available conservation bank within the primary service area in which the disturbance occurs. Refer to Table 1 and Figure 1 for each management unit and their service areas.

Table 1. Houston toad management units and their primary and secondary service areas.

Management Unit	Primary Service Area	Secondary Service Area
Bastrop-Lee	Bastrop and Lee	Burleson and Milam
Burleson-Milam	Burleson and Milam	Bastrop, Lee, and Robertson
Robertson	Robertson	Burleson, Milam, and Leon
Leon	Leon	Robertson
Austin-Colorado	Austin and Colorado*	Colorado* and Lavaca
Colorado-Lavaca	Colorado* and Lavaca	Austin and Colorado*

\*The Austin-Colorado management unit will service Colorado County north of the Colorado River and the Colorado-Lavaca management unit will service Colorado County south of the Colorado River. The secondary service area for each of these management units will service the opposite side of the river.

## Surveys and Monitoring

The primary purpose of conducting Houston toad surveys within proposed conservation bank is to determine the population dynamics on the property to inform the adaptive management plan.

Similarly, conducting vegetation monitoring will also help to inform the adaptive management plan.

### **Houston Toad Monitoring**

1. Annual audio recording device (ARD) surveys will be required at each pond on the conservation bank in perpetuity. Surveys will follow a modified version of the protocol used for section 10(a)(1)(A) recovery permit holders. The modified protocol can be found in Appendix B.
2. Houston toad population assessments will be performed on the following schedule:
  - a. During the first five years, whichever comes first:
    - i. Three years of population assessments that do not occur during a drought year according to the United States Drought Monitor (<https://droughtmonitor.unl.edu>).
    - ii. Five consecutive years of population assessments.
  - b. After the first 5 years, population assessments will be conducted every other year for an additional 10 years.
  - c. After 15 years, outside organizations can perform population assessments, but population assessments will not be required.
3. Houston toad population assessments will include the following:
  - a. A statistical estimate of the abundance of male and female Houston toads at each individual pond on the property. The Service recommends that estimates of abundance be made with capture mark recapture (CMR) methods using a Cormack-Jolly Seber model (Duarte et al., 2011). Capture mark recapture methods that utilize an open population allow for movement to and from the breeding pond, and Houston toad deaths within a season without violating the model assumptions. In addition, CMR allows for repeated capture of marked individuals between sites (to document movement) and years (to better understand adult survival). Passive integrated transponder (PIT) tags have been used in wild and captive toads with success but other less invasive methods, such as photo identification, should be explored.
  - b. Number of Houston toad egg strands laid in each pond.
  - c. Determination of successful emergence at breeding ponds.
  - d. Gulf coast toad (*Bufo valliceps*) and Woodhouse's toad (*Anaxyrus woodhousii*) abundance, as there is potential for hybridization.
  - e. Abundance of predators (e.g. snakes, fish, turtles) at breeding ponds.

In the case that a property is being added to an adjacent property that is occupied and preserved in perpetuity, then a monitoring plan will be determined on a case-by-case basis.

### **Vegetation Monitoring**

Using the sample design below, vegetation monitoring and waterbody assessments will occur on a 2-year schedule for 15 years, i.e. monitoring will be done every other year. When a major management action occurs (e.g., mechanical clearing or prescribed fire) then vegetation monitoring will occur for 3 consecutive years where the management action occurred (i.e., the management units within the bank), and then return to the 2-year schedule within this 15 year timeframe. After 15 years, vegetation composition profile and waterbody assessments will occur on a two-year schedule in perpetuity. Refer to Appendix D for preferred vegetation monitoring methodology.

### **Development of a Management Plan**

1. A proposal for conservation bank should include a long-term management and monitoring plan identifying the type, condition, and function of the resources to be perpetually conserved with provisions for adaptive management. Management actions for buffer areas should also be included. In addition to detailed resource management needs of the property, the plan should describe control of public access, monitoring of resources, maintenance of facilities, personal recreational activities and any special management requirements necessary to meet the goals and objectives of the property. Management goals and objectives should be clearly stated.
2. Grazing and browsing pressure from white-tailed deer should be managed to prevent over-browsing of herbaceous vegetation. Management and monitoring of white-tailed deer should be conducted to allow for optimal foliage cover. A deer management plan should be developed that includes spotlight and/or mobile survey system on an annual basis to quantify deer populations. Surveys should follow TPWD guidelines. Deer densities should be 6 ha (15 ac) or more per deer. Additional hunting pressure outside of the Houston toad breeding season (July 1<sup>st</sup> – December 31<sup>st</sup>) must be implemented if surveys determine that this density has been exceeded. The techniques used for surveying white-tailed deer and monitoring browsing pressure must be detailed in the management plan.
3. Similar to white-tailed deer, grazing and browsing pressure from exotic ungulates should be managed to prevent over-browsing of herbaceous vegetation. An exotic ungulate management plan should be developed that includes spotlight and/or mobile survey system on an annual basis to quantify exotic ungulate populations. Surveys should follow TPWD guidelines. The goal for exotic ungulate management will be complete eradication from the conservation bank. It is recognized that complete eradication may not be possible on some conservation bank due to immigration, but in these situations populations must not exceed one exotic ungulate for every 40 ha (100 ac) as identified during annual spotlight surveys. Additional hunting pressure outside of the Houston toad breeding season (July 1<sup>st</sup> – December 31<sup>st</sup>) must be implemented if surveys determine that this ratio has been exceeded.



The techniques used for surveying exotic ungulates and monitoring browsing pressure must be detailed in the management plan.

4. Goats and sheep are not permitted on conservation bank. In limited circumstances, cattle may be allowed provided it does not compromise the conservation values of the conservation bank. If cattle grazing is proposed for the conservation bank, a grazing plan with a “light” rotational grazing regime must be reviewed and approved by the Service.
5. Feral hog exclusion fences should be permanently installed around breeding ponds. Guidelines can be found at <http://agrillife.org/feralhogs/files/2011/11/exclusion.pdf>. Feral hogs must be controlled year-round using traps and hunting with a goal of complete eradication from the conservation bank. It is recognized that such goal is likely not achievable, but this goal stresses the importance of removing as many feral hogs as possible. Monthly monitoring by driving all property roads, viewing all potential watering locations, and checking exclusion fences for damage looking for evidence of feral hog damage (e.g., rooting, wallowing, etc.) must be conducted. If evidence is identified, trapping and/or hunting must be initiated immediately. Corral type traps that allow for multiple feral hogs to enter the trap should be the preferred method of control.
6. Methods should be identified and implemented for monitoring and controlling fire ant populations, especially around ponds. Within 50 m (164 ft) of a pond, only boiling water will be used to eradicate fire ant mounds. Beyond 50 m (164 ft) of a pond, approved spot treatments will be used. For more detailed information, refer to the Houston Toad Habitat Management Guidelines found on our website:  
[https://www.fws.gov/southwest/es/AustinTexas/ESA\\_Sp\\_Htoad.html](https://www.fws.gov/southwest/es/AustinTexas/ESA_Sp_Htoad.html)
7. Unauthorized access to conservation banks and wetland and stream banks continues to be an issue. Unauthorized access to conservation banks must be controlled. At a minimum, all property boundaries must be securely fenced (minimum five strand barbwire fence in good condition), patrolled on a regularly occurring basis (once per month), and damage immediately repaired. The use of high fencing is not permitted. Issues related to the management and control of access to conservation bank should be clearly identified in the habitat evaluation documents submitted for initial review, and reported in the annual report.
8. A vegetation management strategy must be created using the Service’s Houston Toad Habitat Management Guidelines  
[https://www.fws.gov/southwest/es/AustinTexas/ESA\\_Sp\\_Htoad.html](https://www.fws.gov/southwest/es/AustinTexas/ESA_Sp_Htoad.html). This management strategy should include a prescribed fire management plan where appropriate.
9. The management plan should include an adaptive management section to identify areas of uncertainty, develop alternative strategies, integrate a monitoring program to evaluate effectiveness, and incorporate feedback loops that link implementation and monitoring to the decision-making process.

## Reporting

In order to evaluate compliance with the terms of the agreements and associated management plan, the owner/manager of the conservation bank will prepare an annual report to the Service by December 31st of that year containing the following information:

1. A statement of funds received and expended in the management of the conservation bank during the previous year.
2. A general description of the status of the biological resources on the conservation bank.
3. The results of any biological monitoring or studies conducted on the conservation bank.
4. The results of any population supplementation conducted on the conservation bank.
5. A description of all management actions taken on the conservation bank, including but not limited to any understory thinning, prescribed fire, and any management actions not taken with an explanation of why such action was not taken.
6. A description of any problems encountered in managing the bank/conservation bank.
7. A description of management actions that the Owner may undertake, according to the management plan, in the coming year and the related annual budget (the "Annual Budget").
8. A summary of the bank/conservation bank and habitats included in the bank/conservation bank, including total acres of habitat protected and managed for the Houston toad.
9. A summary of credit sales and releases that have occurred throughout the life of the bank with an emphasis on those that occurred during the most current complete reporting period.
10. An inventory of any known threats or impacts to the Houston toad and its habitat, the status of the threat or impact (i.e., resolved, ongoing, or unresolved), and a summary of actions taken to reduce such threats or impacts, as applicable.
11. Recommended modifications to the management plan as determined by the adaptive management process.
12. The annual monitoring report prepared by the easement holder, as available.

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## **Appendix A: Checklist for Conservation bank Proposals**

Note: the requirements listed below are for a Proposal. Additional requirements must be met in the conservation bank agreement or the section 7 or section 10 documents.

Please provide the following information and checklist with the submittal of a Final Proposal:

- Proposed Bank/Conservation bank Name – Use a short name based on a geographic feature if possible and include “Conservation Bank” in the name for Conservation Banks; note: name changes may be requested by an agency if the name has been used for another bank or conservation bank (including Wetland/Stream Mitigation Banks);
- Bank Contacts – include the name, address, phone, fax, email, and role in project for: Bank Sponsor, Land Owner, Consultants, Prospective Land Manager, Real Estate Assurance, and Endowment Holder etc (if known);
- The qualifications of the Bank Sponsor/Mitigation sponsor to successfully complete the type(s) of mitigation project(s) proposed, including information describing any past such activities by the Bank Sponsor/Mitigation sponsor;
- General location map and address of the proposed Bank or Conservation bank; if no street address is available, then please include a written description of the location;
- Accurate current map of the proposed Bank or Conservation bank boundaries using a 7.5 minute USGS topographic quadrangle map as a base; if the map will be cropped, include the name of the quadrangle;
- Aerial photo(s) of the proposed Bank or Conservation bank and surrounding properties;
- The objectives of the proposed Conservation Bank/Conservation bank;
- How the Conservation Bank/Conservation bank will be established and operated;
- The general need for and technical feasibility of the proposed Conservation Bank/Conservation bank;
- The proposed ownership arrangements and long-term management strategy for the Conservation Bank/Conservation bank;
- Site conditions description. This must describe the ecological suitability of the site to achieve the objectives of the proposed Conservation Bank/Conservation bank, including the physical, chemical, and biological characteristics of the site and how that site will support the target endangered species and their habitats, and should include: site conditions and habitats, photos of the site, description of wetlands and waters present (if applicable), what is proposed for creation, enhancement, etc., site history including past land uses, surrounding land uses and zoning along with the anticipated future

development in the area;

- Assurance of sufficient water rights to support the long-term sustainability of the Conservation Bank/Conservation bank (if applicable);
- Proposed number and kinds of Credits (and acres) on the property;
- Biological resource survey report (an inventory of all biological resources onsite);
- If needed, a U.S. Army Corps of Engineers-verified map of on-site jurisdictional wetlands and waters, if a permit will be required because of impacts to wetlands or waters of the U.S. (if verification is scheduled but not completed, please note);
- Preliminary Title Report indicating any easements or other encumbrances. Note, any liens and easements on the property that may affect a site's viability will need to be resolved before a site can be approved. Provide a written assessment of all easements and encumbrances describing the easement and how it may affect bank/mitigation site operation or habitat values;
- Any other restrictions on the property;
- An affirmative statement that a Conservation Easement covering the property, or fee title transfer of the property, will occur as part of Bank/Conservation bank Establishment. Include number of acres of Bank/Conservation bank area based on exclusion of any easement areas that allow uses incompatible with conservation.

## **Appendix B: Modified ARD Monitoring Protocol**

### **Audio Recording Devices (ARDs)**

#### *Recommended Equipment*

Any commercially available unit designed for wildlife monitoring is acceptable. Custom devices are also acceptable under the exception that users must provide evidence that their devices meet quality and sensitivity standards comparable to commercially available examples. See examples: Wildlife Acoustics ([www.wildlifeacoustics.com](http://www.wildlifeacoustics.com)) and Audiomoth ([www.openacousticdevices.info](http://www.openacousticdevices.info)).

A Houston toad vocalization possesses a dominant frequency of approximately 2000 Hz, but this can vary depending on the number of species in a chorus (MacLaren 2019, pp. 95 and 106). To ensure that all vocalizations are captured, along with information on co-occurring anurans, we recommend a sample rate of 16,000 Hz, which results in a spectrum of audio ranging from approximately 0-8,000 Hz. We prefer audio files are prepared in .WAV format. Devices must be programmed to write files with the location abbreviated, and military date (YYYYMMDD) and time appearing in each file name (e.g., SITE1\_20200201\_180000.WAV).

#### *Recording Schedule*

The audio loggers must be programmed to record the first 10 minutes of every hour between 6:00 pm and 6:00 am for the 181 days from January 1<sup>st</sup> to June 30<sup>th</sup>.

This recording schedule not only ensures that populations of Houston toads will be heard, if they are present, it also provides users of this protocol protection against common hazards associated with remote acoustic monitoring. For example, devices may turn off unexpectedly due to battery failure, moisture trapped within their enclosures, or a myriad of user errors. By scheduling devices to record on more occasions than are likely needed to reliably detect Houston toad breeding choruses, these common errors are reduced but not eliminated. Further, it is very difficult to predict when environmental conditions (i.e., temperature, humidity, barometric pressure) will be most ideal within the 12-hour period we are suggesting each recording device to monitor, and it is likely that conditions are most suitable for chorusing at a different hour within each night. By recording throughout this 12-hour period, we are ensuring that at least a portion of the period in which conditions are most well suited for breeding are captured.

While the required recording schedule will help to mitigate audio logger malfunctions, any equipment failure will be evaluated on a case-by-case basis, as the timing of the equipment failure can greatly affect the results. For example, equipment failure for two rainy weeks in the middle of March will be a much greater loss than a few dry days at the end of April. Any equipment failure must be reported in the narrative portion of the annual report.

### *Device Placement*

ARDs must be placed at the water's edge of each pond on the conservation bank, including ponds that are not currently identified as breeding ponds. If any body of water exceeds 500 m (1,640 ft) in length (e.g., lake, roadside ditch that is holding water at any time during the project, bayou), loggers must be placed every 500 m (1,640 ft) along its longest dimension.

### *Audio Analysis*

Surveyors have options for determining presence/absence of Houston toads within their collection of audio. This can be done manually by having human listeners review all audio collected, or by visually inspecting spectrographs in search for the distinctive pattern/shape of the Houston toads vocalization. If suspected Houston toad calls are found visually, these portions of audio must be listened to in comparison to a known Houston toad reference to ensure accurate identification. Spectrographs of Houston toad calls are publicly available at: [www.macaulaylibrary.org](http://www.macaulaylibrary.org)

Methods of automated detection of anuran vocalizations in general and Houston toad vocalizations are available (MacLaren et al. 2018, pp. 145-147). These methods use algorithms to search large batches of audio data and locate the distinct vocalization of the Houston toad. A Houston toad recognizer prepared in the software Kaleidoscope, a product available through Wildlife Acoustics ([www.wildlifeacoustics.com](http://www.wildlifeacoustics.com)), is available from the Service and must be used for all audio analysis.

Although some recorders can be deployed with large memory capacity and can function to make recordings for the entire Houston toads survey season, we recommend visiting ARDs at least monthly. This ensures that the recorders have not been stolen or that the batteries and removable digital media are in proper working order. We recommend collecting data from devices during these visits so that analysis and review can be performed throughout the data collection period.

Audio analysis should be reported using the annual reporting guidelines that can be found on the Service's website: [https://www.fws.gov/southwest/ES/AustinTexas/ESA\\_Sci\\_permits.html](https://www.fws.gov/southwest/ES/AustinTexas/ESA_Sci_permits.html)



## Appendix C: Waterbody Assessment

*Photo points should be established at each pond or wetland (bog/marsh) with a minimum of 1 random sample per stream/creek to document conditions from the 4 cardinal direction. GPS coordinates for each photo point should be recorded. Describe each water source in forested area that could be a potential breeding site. Refer to Appendix B to enter additional water feature documentation.*

**Total number of water features on the property:** \_\_\_\_\_

Date observation completed: \_\_\_\_\_ GPS coordinates: \_\_\_\_\_

Photo numbers: North \_\_\_\_\_ East \_\_\_\_\_ South \_\_\_\_\_ West \_\_\_\_\_

➤ Water source (*check one water source type, and indicate whether ponds are manicured below*):

☐ Pond ☐ Creek/Stream ☐ Other (*Describe below*)

☐ Manicured ☐ Not Manicured

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➤ Surface water permanence: ☐ Permanent ☐ Ephemeral

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➤ Amount of pond edge abutting forest (*Check all that apply*):

☐ High (*3/4 of pond edge or more*)

☐ Medium (*approximately half of pond edge*)

☐ Low (*1/4 of pond edge or less*)

☐ Forest edge within 100ft of pond at high water mark

Comments: \_\_\_\_\_

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➤ Tree or shrub vegetation at water's edge (*Provide description and list top 3 species present below*):

☐ Present ☐ Absent

- 
- 
- Herbaceous vegetation characteristics at pond edge (*Describe whether perennial or annual vegetation present & list top 3 species below*):

☐ Heavy

☐ Moderate

☐ Sparse

- 
- List occurrence of invasive species with likelihood to adversely affect Houston toads (*for example, red-imported fire ants, sod-forming or non-native grasses, feral hogs – please list all invasive species identified, and rank presence for each as high, medium or low in the blanks below*).

☐ Invasive species present

☐ No indication of presence found

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## Appendix D: Vegetation Monitoring Methods

### *Sample Design*

1. Obtain a polygon shapefile of the area of interest (AOI). This might consist of a property boundary, polygons delineated in the field with GPS, or polygons drawn in ArcGIS over DOQQ (digital orthophotos) images where the boundaries of the area of interest can be seen.
2. In ArcGIS, determine the area (hectares) of the AOI. If the shapefile does not have an area field, open the attribute table, add and label a field, open the editor to edit the shapefile, select the new area field in the attribute table, select calculate geometry, and determine the area in hectares.
3. In ArcGIS, Layout View, Data Frame Properties, insert a new grid, and select a measured grid over the AOI. Choose a grid interval that has about 100 intersections within the polygon: The AOI ha divided by 100 = area of 1 grid square; square root of 1 grid square area = grid interval. It is convenient, but not necessary, to pick intervals in even units, like 100 m.
4. Create and edit a new polyline shapefile consisting of N-S or E-W lines running along the grids where they intersect the AOI; these are the sample point intercept lines (described below). Add a field to the Attribute Table to calculate the length of these lines (as in step 2). Export the table as a text file.
5. Create a new point shapefile to mark the start and end points of each sample point line. In the Attribute Table, add a field for the point label and a field each for the UTM Northing and UTM Easting. Edit this shapefile to manually enter the ends of the sample lines; in the attribute table, enter the point labels; select the UTM Northing field, Calculate Geometry, Calculate y coordinate; repeat for UTM Easting using the x coordinate. This will show the UTM coordinates of starting and ending points of sample lines. Export the point shapefile to your GPS so you can easily navigate to these points in the field.
6. Open the Sample Point Line Design spreadsheet. Open the text table of sample point lines in Excel, and copy and paste the line IDs and length\_m into these columns of the Excel file (see table 1 and attached file). Make sure the formulas in the Start\_m and No. Points columns are copied into each row. Notice that the Start\_m column re-calculates a random starting point every time you hit Enter; do not worry about that. Finally, enter a point spacing in cell C2 that yields a number of points that a 2-person crew could collect data on in 2 to 5 days. Note also the total line length, which will be the distance walked through habitat.
7. Based on the length of the lines and the numbers of sample points, you can make adjustments to the sample point distance, or to the grid interval (in this case, you will have to repeat steps 3–5), to obtain a do-able number of points and distance sampled in the field.

8. Once the final adjustments have been made, cut and paste your table into a Word document for use in the field. The randomized starting points, of course, will not change in Word. Make sure to keep this final Word version for your records.

### *Equipment Needed*

1. GPS Unit that can do waypoint averaging and can import and export data as shapefiles (e.g. Garmin Map60 series).
2. Two 3-m PVC poles with 1-m marks.
3. Lightweight carpenter's level (optional).
4. Metric measuring tape.
5. Non-stretch cord; length = sample point distance plus two knots.
6. Clipboard, data sheets (see attached), pens with indelible ink.
7. Plant species list with CODES.
8. Plant species field guides.
9. Plant press.

### *General Description of Sampling Method*

Data collectors use the GPS to navigate from starting to ending points (working in both directions for convenience), beginning with the random start point. Once each point is found, one person holds the pole vertically and determines the plant species intercepted within each stratum. The other person enters the data in the spreadsheet and collects GPS coordinates of the sample point. Inter-point spacing is determined by the measured cord (or by navigating to a GPS point).

### *Step-by-Step Procedures*

1. Tie a loop knot, just big enough to slip over a PVC pole, at one end of the cord. Insert a PVC pole into the loop, and hold pole vertically. Holding the tape measure at this pole, position the other pole, vertically, at the pre-determined sample point distance, and securely tie the cord to the pole with a knot that won't slip (such as round turn and two half-hitches). Check measurement.
2. Leave the plant press and field guides at the truck; you may not want to lug them through the sticker-bushes. Take a plastic trash bag along if you need to collect specimens for identification.
3. Use the GPS to find the start or end point of a line. Then use the navigation feature to navigate toward the opposite end.
4. From this end, use the 3-m poles or meter-tape to find the randomized starting sample point along the sample point line. Collect the waypoint-averaged coordinates of this point for your records.
5. At each sample point, hold the pole vertically. It is usually sufficient to let gravity define the vertical, but if wind or dense vegetation is a problem, a lightweight carpenter's level can be used. Plant species within each height stratum are intercepted if they touch the pole. This

requires interpretation; record which interpretation is used for consistency in the future. For heights above 3 m, raise the pole to the 2-m level (using the other pole to judge), and sight along the pole to judge interception. It is not necessary to measure the amount of intercept within each stratum, or the absolute height of plants, only those species intercepted in the stratum.

6. Data collection at each point includes the line number, sequential point number, percent cover of fallen timber within 1 m of the point (see step 10) and the plant species CODE for each species intercepted in the 0–1 m, 1–3 m, 3–5 m, and >5 m strata. Remember to use the BARE code for any stratum that has no intercepted plants. There is no limit to the number of plants that can be intercepted, just add the CODES to a new line (see sample data sheet). When all data is recorded for a point, draw a line below the last line so the person entering this data into a database/spreadsheet can easily see all the intercepts that occurred at each point. Collect a GPS point that includes the label Lx Py (line and point numbers). For Garmin units, the label will be in the IDENT field. Waypoint averaging is optional, but takes more time. Before leaving each point, double check to make sure any strata that did not intercept a plant are labelled BARE.
7. About species CODES: It is much easier and less prone to error to write a code for plant species than to spell the entire name. You can use the USDA PLANTS 4-digit codes, but these have many duplicates that require additional numeric digits. We suggest a 6-digit code (GEN+SPE), which has fewer duplicates for a typical site flora. For varieties, use GEN+VAR. For duplicates, such as *Quercus margaretta* and *Q. marilandica*, the first one alphabetically is a 1 for the 6<sup>th</sup> digit, the second is a 2, etc.
8. Inevitably, some plants intercepted at a point cannot be identified. Label these as sequential unknowns (UNK1, UNK2, etc.). If they can be partially identified to family or genus, label as POAUN1 (unknown Poaceae), CHAUN2 (unknown Chamaesyce), etc. On the reverse side of a data sheet with unknowns, make a list of each unknown with any notes that will help future identification, such as “UNK7 - Forb, 1ce-pinnate leaves, milky sap.” In many cases the unknowns can be resolved when more of the plant is seen at another point. Once an unknown is resolved, note on a data sheet what the unknown is determined to be. When the data is entered into databases, these unknowns can be revised with the identification — provided that the labelling was consistent. Any unknown that occurs frequently can be collected, and either identified when you get back to the truck, or pressed and identified in the lab. Nevertheless, it is likely that a small percentage of intercepts can never be identified. Do not waste time on rare unknowns; as a general rule, we are unlikely to detect significant differences or changes to any species comprising less than  $\pm 5\%$  of cover.
9. To re-position to the next point, loop the cord over one PVC pole at the prior point, aim the tied PVC pole along the navigation line and move it until the cord is tight. Where the line passes through dense thickets that a person cannot walk through, the pole can be pushed or speared through the obstacle and retrieved from the other side. An alternate method may be more practical for longer sample point distances. This requires entering each sample point into a shapefile and exporting to the GPS. In the field, navigate to each point. At the first

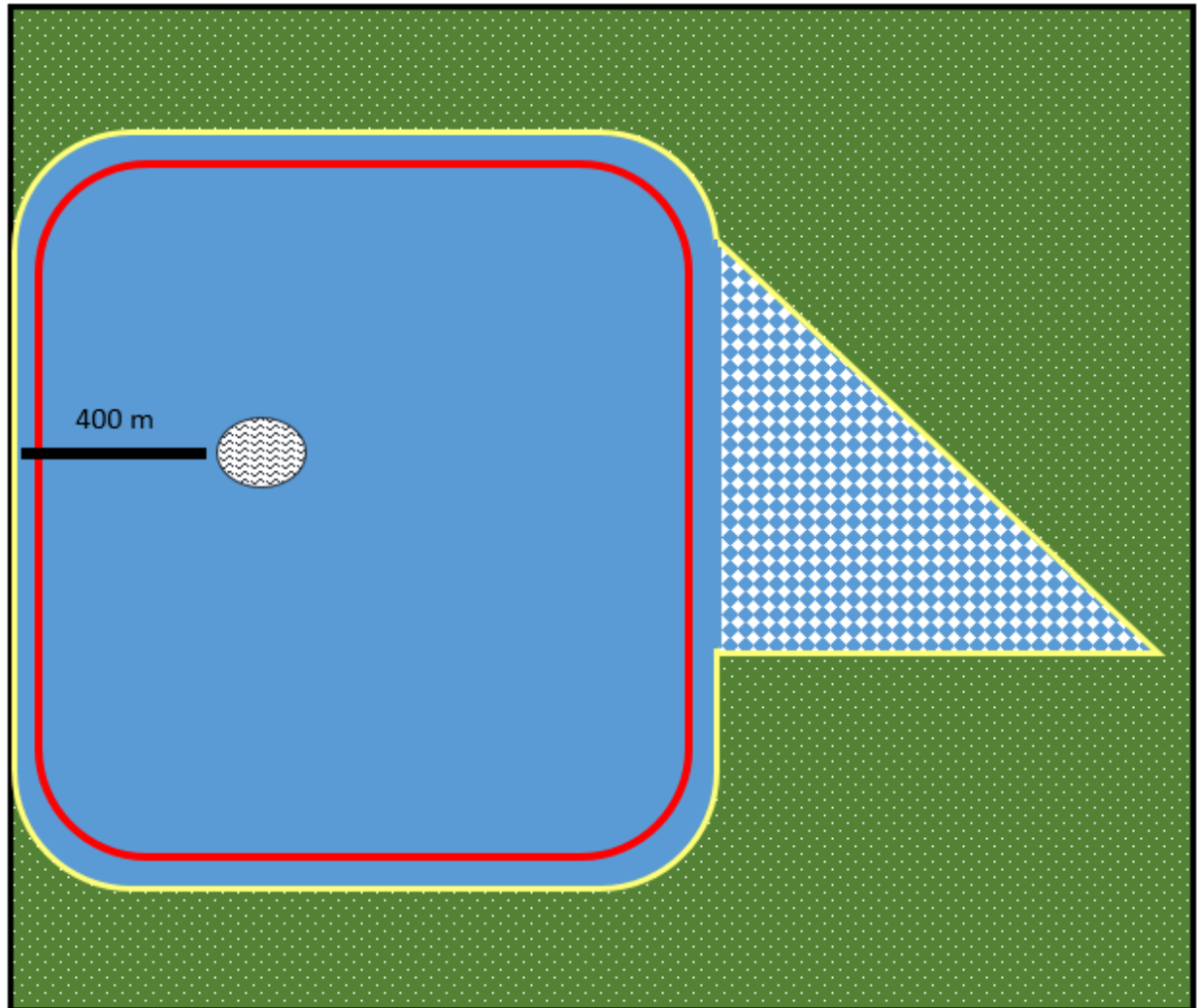
instance that the GPS indicates the point has been reached, lower the PVC immediately below the GPS, striving to avoid bias.







10. At each sample point, the percent cover of fallen timber that is greater than 10 cm in diameter is measured within a 1 m radius of the sample point. Estimates are categorized into 0 percent, 0-25 percent, 26-50 percent, 51-75 percent, and 76-100 percent.
11. After a sample line is complete, go to the next line and proceed in the opposite direction (the order that samples are collected is not important). Be sure to note from which end (N, S, E, or W) the random starting point was offset.

### *Waterbody Assessments*

For each individual waterbody on the property, data required can be found in the worksheet included in Appendix C, which comes from the Houston Toad Safe Harbor Agreement. This includes metrics such as the amount of pond edge adjacent to forest and the pond hydroperiod (e.g., ephemeral, permanent, etc.). In addition, any incidental observations of Houston toad predators or sign of predators should be recorded.

## Appendix E: Example of Preservation and Buffer Credit Calculation



Property Boundary:	
Optimal Habitat:	
Grassland:	
1-50% Canopy Cover:	
Preservation Credit:	
Buffer Credit:	
Breeding Pond:	