United States Fish and Wildlife Service
Section 10(a)(1)(A) Scientific Permit Requirements
For Conducting Houston Toad Presence/Absence Surveys

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This document provides guidance on when you might be at risk of "taking" a Houston toad while conducting presence/absence surveys and when it is advisable to have a Section 10(a)(1)(A) permit issued by the U.S. Fish and Wildlife Service (Service) under the Endangered Species Act of 1973, as amended (Act) to be covered for "take." The ultimate decision to apply for a permit is yours. Individuals engaged in activities that have the potential to "take" listed species are responsible for determining whether the likelihood of "take" is great enough to need a section 10(a)(1)(A) permit (see *When a Section 10(a)(1)(A) Scientific Permit is Needed* below for the definition of "take").

If you choose to apply for a permit, this document outlines the Service's process and requirements for conducting presence/absence surveys for the federally listed endangered Houston toad as conditions of holding a section 10(a)(1)(A) permit. Section 10(a)(1)(A) permits, also referred to as recovery, enhancement of survival, or scientific permits, allow for "take" of listed species that may or will occur while conducting research to further the recovery of a listed species (see *When a Section 10(a)(1)(A) Scientific Permit is Needed* below). This document outlines methods to be used and information to be included in annual reports for a section 10(a)(1)(A) permit.

The objective of this document is to identify survey methods that will produce sound scientific information upon which to base decisions and actions for the conservation of the Houston toad. Using consistent survey methodology will also allow for greater comparison and analysis of results, and thereby increase our understanding of this species and its habitat requirements. Please note this document supersedes any previous guidance from the Austin Ecological Services Field Office on conducting presence/absence surveys for the federally endangered Houston toad. Information that relates to the effectiveness of these survey guidelines in conserving the Houston toad is welcome. We will consider modifications of, or alternatives to, these methods and qualifications on a case-by-case basis.

When a Section 10(a)(1)(A) Scientific Permit is Needed

Collecting endangered species is a form of "take," and therefore, is prohibited under Section 9 of the Act, unless the "take" is covered under a Section 10(a)(1)(A) scientific permit. "Take" is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." In addition to collecting, forms of "take" that could occur in the process of conducting Houston toad surveys include crushing individuals; compaction of habitat and oviposition sites; disturbance of cover objects; harm or harassment that may occur with the introduction into the environment of noise, light, chemicals, and biological substances, and possibly other actions that would cause individuals to flee, seek

shelter, or alter or cease normal foraging, anti-predation, or reproductive behavior. For information on how to apply for a 10(a)(1)(A) permit, contact the Region 2 Permits Office at (505)-248-6663 or access the application form directly at http://www.fws.gov/forms/3-200-55.pdf.

Requirements for Conducting Presence/Absence Surveys for the Houston Toad using Audio Recording Devices or Human Observers.

Terms

Breeding Season – The time period that Houston toads have been observed/recorded breeding, including outliers during early and late breeding season years. This time period is January 1st to June 30th.

Peak Breeding Season – A subset of the breeding season when most of the breeding occurs (MacLaren 2019, p. 16), representing the optimal time period to hear chorusing male Houston toads. This time period is February 1st to April 30th.

Project Area – The geographic space and/or property in which the proposed disturbance is planned to take place, plus the surrounding landscape in which all of the monitoring takes place [i.e., the 1.3 kilometer (km) buffer zone]. See the appendix for example project areas.

Core disturbance site – The geographic space and/or property in which the disturbance that prompts the requirement for Houston toad surveys will occur. See the appendix for examples.

Listening post – The location where the audio recording device (ARD) is deployed or where human observers listen for Houston toad vocalizations.

Wetland – Any body of water that a Houston toad can potentially breed in, see the Service's habitat module for the breeding habitat definition (USFWS 2020, pp. 3-4).

General Guidelines

Suitable Habitat

For the Service's detailed definition of suitable Houston toad habitat, refer to our Habitat Module on our website:

- https://www.fws.gov/southwest/es/AustinTexas/ESA_Sci_permits.html

We generally define Houston toad habitat as the mosaic of suitable habitat between breeding habitat. Toads spend a majority of their life cycles in terrestrial habitat, but are difficult to detect when they reside there (Semlitsch and Bodie 2003, pp. 1221-1222). Due to low probability of terrestrial detection, we survey potential breeding ponds, wetlands, and bodies of water during the breeding season when toads are vocalizing.

When assessing a project area for wetlands that have potential to support breeding Houston toads, we suggest viewing the entire project area as one habitat patch. We suggest first

delineating wetlands, then assessing the habitat interspersed between them. Wetlands should be primarily assessed on the amount of suitable habitat surrounding the wetland and the connectivity to other wetlands. Close attention should be paid to drainages and canopied habitat; however, movement and dispersal do not require these habitat types (USFWS 2020, pp. 4-6).

Ground Truthing

Ground truthing toad habitat is vital, as unmapped wetlands or ephemeral bodies of water can be found (Goates et al. 2007, p. 480). In order to have full confidence in a presence or absence finding, ground truthing of the project area is necessary. During the first year of surveys, there must be a two-part process for setting up listening posts:

1. Desktop analysis of the project area using aerial imagery and wetland data should be used to find wetlands that could hold chorusing events. Areas identified through the desktop analysis must then be field verified through a site visit, and any adjustments regarding wetlands or bodies of water should be made at this time. Listening posts should be established based on this initial assessment.

2. During the Houston toad breeding season, habitat must be ground truthed at least three times within 24 hours of at least an inch of rainfall to find any unmapped wetlands or ephemeral bodies of water. We suggest ground truthing early in the breeding season to capture any unmapped wetlands or ephemeral bodies of water for the entirety of the first survey year. If any additional bodies of water are found, then additional listening posts must be added for the duration of the surveys done for this project.

<u>Audio Recording Devices (ARDs)</u>

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) and Audiomoth (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 89 days from February 1st to April 30th (peak breeding season). According to MacLaren (2019, p. 45-46), 64 surveys with a duration of 10 minutes are required to have 95% confidence in absence determinations of Houston toads from any given site. For these estimates to be valid, the surveys must be spread throughout the 89 day period. MacLaren et al. (2018) monitored only sites with robust populations of Houston toad. Consequently, this estimate is an underestimation of the number of surveys required to ensure high confidence in determinations of absence for small populations. This protocol requires 89 days of survey and 1,068 10-minute surveys, resulting in high confidence of determining presence or absence of the Houston toad from any sized population.

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

Deciding where to place automated recording devices can be a complex and challenging process that is often dependent on many aspects that differ among proposed project areas. We recommend reviewing MacLaren et al. (2018a, entire) to understand the complexity of placing audio loggers in habitat to detect Houston toad calls.

Houston toad juveniles have been found to disperse 1.34 km [0.83 miles (mi)] over a five-week period (Vandewege et al. 2012, p. 117). Therefore, all bodies of water (i.e., temporary wet-weather ponds, ditches, stock ponds, creeks, streams, lakes, semi-permanent wetlands, etc.) within a 1300-meter (m) [4,265 feet (ft)] buffer surrounding the proposed core disturbance area – measured from the outer edge – are required to be monitored (project area). An explanation as to why a body of water within the project area was not surveyed must be included in the narrative portion of the annual report. We suggest that detailed proposed monitoring strategies

are shared with the Service prior to conducting any surveys for Houston toads to ensure that all surveys are acceptable towards determining presence or absence of the species.

Houston toads can be detected somewhat reliably (probability of detection > 0.5) beyond 1 km (0.62 mi) in open canopy habitat types (e.g., roads, prairies); however, breeding choruses may not be reliably detected beyond 375 m (1,230 ft) when monitored through wooded areas (MacLaren et al. 2018a, p. 12,996). Therefore, we recommend placing audio recording devices at the water's edge at each body of water to avoid conflicts associated with differential sound attenuation among varying habitat types.

In the event that a body of water within the 1300 m (4,265 ft) buffer occurs on private property and cannot be monitored from within a distance where detection is possible, absence is difficult to confirm, and proposed project sites are at risk for take of Houston toads. As discussed in the previous paragraph, the distance at which Houston toads can be detected is highly dependent upon the habitat that intervenes chorusing individuals and deployed recording devices (MacLaren et. al. 2018a, p. 12,996). Therefore, there is potential that these locations may be successfully monitored from nearby, but this is contingent upon approval from the Service and the recommendations within MacLaren et al. (2018a, p. 12,996). The included appendix shows some basic scenarios for setting up audio loggers. The greater the detail that can be provided to the Service at the time of survey design approval, the easier this decision can be made successfully.

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. This rule is to ensure that no portion of the work area is potentially un-surveyed and to avoid challenging surveyors with the decision of where to place a logger along an exceptionally long body of water.

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

Methods of automated detection of anuran vocalizations in general and Houston toad vocalizations are available (MacLaren et al. 2018b, 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 classifier prepared in the software Kaleidoscope, a product available through Wildlife Acoustics (www.wildlifeacoustics.com), is available from the Service and must be used for all audio analysis. Along with the provided Houston toad classifier, an instruction document for correct use of the classifier is provided on our website that must be followed to correctly analyze audio data.

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 haven't 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.

Human Performed Audio Surveys

The effort required to achieve confidence in a determination of absence of Houston toads from a site using human performed surveys is likely prohibitive for most projects. For this reason, we recommend the use of ARDs for all monitoring scenarios where practicable.

Personnel

Permitted surveyors must be familiar with the calls of anurans in Texas and be able to independently recognize the Houston toad vocalization specifically. Surveyors must possess a reference of the Houston toads vocalization at all times to compare to sounds that occur during acoustic surveys. Multiple surveyors are recommended and encouraged, but at least one member of each listening group must be permitted by the Service.

Required Effort

As stated above, an absolute minimum of 64 surveys 10-minutes in length are required during the 89-day period representing peak breeding activity (February 1st-April 30th) at each potential breeding location. Surveys must occur between 6:00 pm and 6:00 am. When selecting survey dates, and survey times, it is appropriate to use local weather forecasts. Preference should be given to nights, or hours on each night, in which temperatures exceed 16° Celsius (°C) [60.8° Fahrenheit (°F)]. If any measurable amount of rainfall occurred within the previous 24 hours, surveys should be conducted as well. Finally, if forecasts indicate that barometric pressure is falling relative to the previous 24-hour period chances of chorusing are more likely. For more information on abiotic correlates to chorusing to better select for survey dates, see MacLaren et al. (2018c, pp. 623-624) and MacLaren (2019, p. 44).

To ensure the highest probability of hearing Houston toad chorusing, there must be at least two surveys following a drop in barometric pressure in each month of the peak breeding season (February, March, April). If there are not two days in a month that have a barometric pressure drop, then those days or day can be replaced with a survey occurring within 24 hours following rainfall. In the case that there are less than two barometric pressure drops and/or rainfall events within a month, then this must be noted in the narrative portion of the annual report.

Surveys must be as evenly spaced throughout each month of peak breeding activity as possible. One month of surveys must not fall below 15% of the total surveys done. For example, if the minimum required 64 surveys were performed, then the fewest number of surveys that could be done in one month is 10 surveys. If a month of surveys falls below the 15% threshold, an explanation must be included in the narrative portion of the annual report.

Vocalization Playback

If Houston toads are not heard chorusing during the initial 10-minute listening period, the reference recording of the Houston toad call must be used to try to elicit Houston toad chorusing at each suspected Houston toad breeding site. Please follow the methods outlined in MacLaren et al. (2018a, pp. 12,994-12,995) for broadcasting vocalizations. Be sure that your playback vocalization has some way in which it can be distinguished from an actual Houston toad call in order to avoid confusion for audio loggers that may be in the area.

Visual Encounter Surveys

If no toads are heard during that time, a visual search for toads, egg strands, tadpoles, and toadlets should be made if access to the potential breeding site is available. Surveyors must be careful to avoid disturbing toads when approaching a suspected breeding site. For example, surveyors should avoid bright lights and noise. Using red lamps is recommended to avoid disturbance to breeding toads. Visual encounters may be opportunistic and need not occur on each survey night.

Repeated Annual Audio Surveys – and Geographic Footprint

The methods outlined above, for both ARDs and human performed surveys, are to be repeated for three consecutive years with interim monitoring reports submitted each year and a final report detailing all three years of monitoring.

Three years of monitoring are required for a number of reasons. Not all years are good years to stimulate chorus formation in Houston toad. In a drought year we speculate that Houston toads may forego emergence from their over-wintering burrows and not migrate to breeding locations, but could remain within proposed work areas. Three years of repeated annual surveys increases the likelihood that one of those three years will include a period ideal for Houston toad reproduction and subsequent successful detection. Like many species of pond-breeding amphibian, Houston toads exist as metapopulations and are subject to local extinction and colonization dynamics. By requiring three years of monitoring, we are ensuring that we are aware of any potential Houston toads that may disperse through the disturbance area in the future by providing a geographic context for their occurrence. That is, by monitoring within the 1300 m (4,265 ft) buffer around proposed disturbance areas, surveyors are determining that no breeding took place, and that juveniles are unlikely to occur within the work area within that year. This does not protect ponds at the periphery of the 1300 m (4,265 ft) buffer from becoming occupied in years two or three. By surveying repeatedly for three years all ponds within a 3900 m (12,795 ft) radius are potentially accounted for, and absence determinations are likely to remain true for at least a small number of seasons to follow, ensuring work can be completed without take of animals.

Throughout the course of construction on any given project, it may be necessary to remove an entire potential breeding location or a portion of upland habitat that is highly suitable for Houston toads. In these instances, it is suggested that surveyors pay close attention to the work of

Buzo (2008, entire), for determining the category of suitability within their work area or surrounding areas. If work areas are in highly suitable habitat, then consider monitoring all likely breeding locations within a full three dispersal distance buffer around the work area (i.e., 3900 m [12,795 ft]). For medium suitability or marginally suitable habitat, we recommend 2600 m (8,530 ft) and 1300 m (4,265 ft) buffers, respectively, to reflect two and one generation dispersal distances.

If sites have the potential to be occupied within three years of proposed removal of a potential breeding location or a portion of highly suitable upland habitat, then we view them as occupied. Finally, this approach provides consideration for life stages that routinely go undetected despite our exhaustive efforts to survey for adult Houston toads, given that juveniles and females produce no sounds. Juvenile Houston toads occur in large numbers on the landscape and are the most vulnerable of the life stages. Therefore, providing these additional precautions ensures that work performed in sensitive areas does not negatively contribute to an already low chance of surviving to adulthood.

Literature Cited

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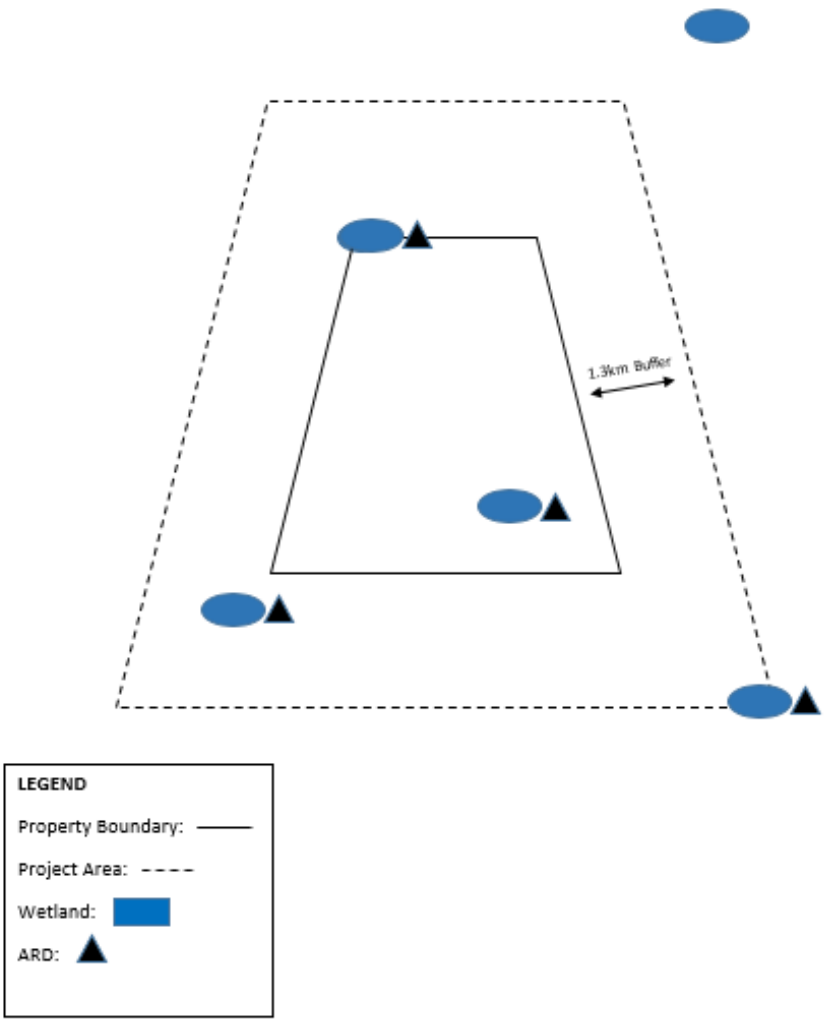
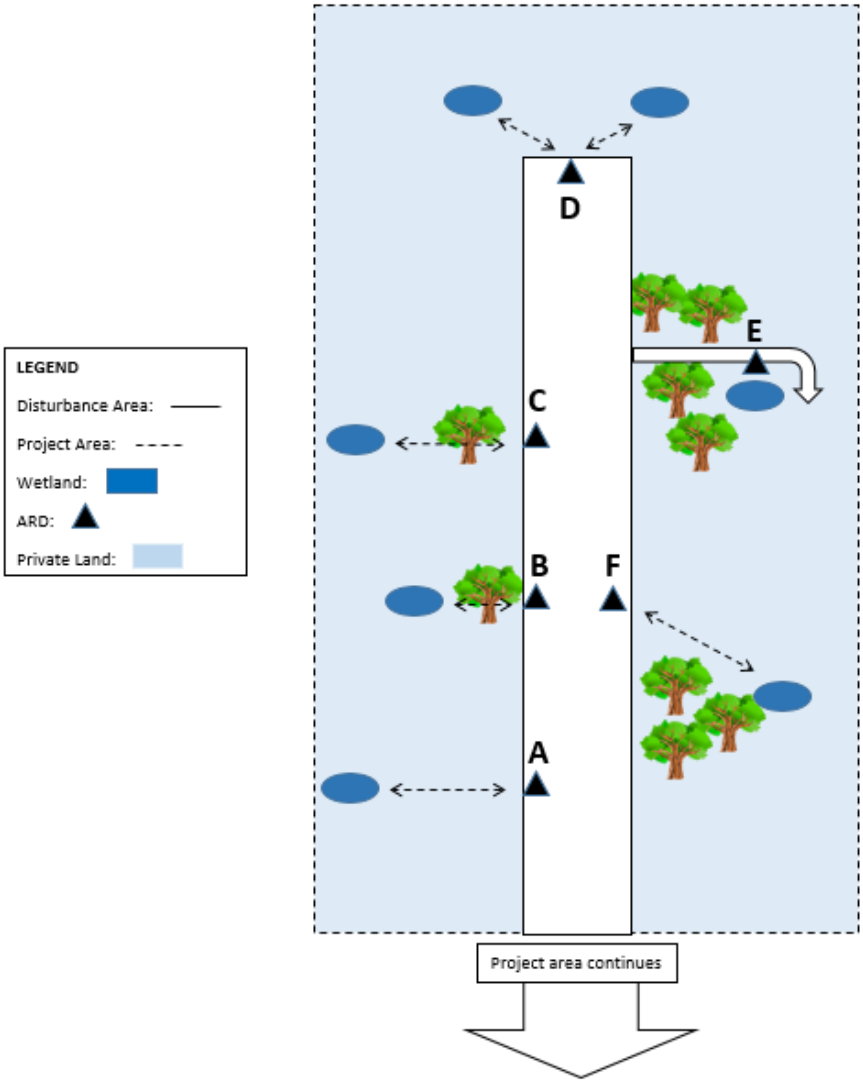
Appendix



Scenario 1: The entire project area is accessible for surveys (property and surrounding buffer zone). All water bodies within the project area must be monitored with an ARD placed as close to the water body as possible.



Scenario 2: You have a property boundary or core disturbance area that is accessible, but do not have access to the buffer zone. (A) A body of water is within 1km of the project area where you can place an ARD. The area between the ARD and body of water is not forested and has no features that would obstruct audio recording. (B) A body of water is within 400m of the project area where you can place an ARD. The area between the ARD and body of water is forested, but because it is within 400m the ARD should be able to capture any toad calls. (C) A body of water is greater than 400m from where an ARD can be placed and is obstructed by forest. This body of water cannot be reliably monitored. (D) Two ponds are within 1km of the disturbance area and can both be captured with one ARD. This is not recommended if there are enough ARDs to monitor each pond individually, to get the best results. However, if limited resources is an issue this is an option. (E) A body of water is too far from the disturbance area to reliably monitor for toad calls. Public roads must be evaluated as a way to get closer to a water body that may not be able to be monitored from the disturbance area. (F) A body of water is beyond 400m from the project area and has forested areas between, however the ARD location can be adjusted to a placement where there is no forested areas and within 1km.