FINAL REPORT

As Required by

THE ENDANGERED SPECIES PROGRAM

TEXAS

Grant No. E – 44

Endangered and Threatened Species Conservation

Recreating Habitat Suitable for and Supporting Active Reproduction by the Endangered Houston Toad

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September 12, 2007

FINAL REPORT

STATE: Texas **GRANT NUMBER:** E - 44

GRANT TITLE: Recreating Habitat Suitable for and Supporting Active Reproduction by the Endangered Houston Toad

REPORTING PERIOD: 1 Sept 03 to 31 Aug 07

OBJECTIVE: To gather data regarding the relative success of Houston toads from habitat manipulations on a tract of land in Bastrop County currently and consistently utilized for cattle ranching and hunting, and to disseminate findings through a landowner outreach effort.

Summary Of Progress:

Please see Attachment A.

Significant Deviations:

None.

Location: Bastrop County, Texas

Cost: Costs will be included in the final Financial Status Report.

Prepared by: Craig Farquhar **Date:** September 12, 2007

Approved by: Timothy Birdsong **Date:** 9/12/07

Final Report

Recreating Habitat Suitable for and Supporting Active Reproduction by the Endangered Houston Toad

Submitted to Texas Parks and Wildlife Department
Section 6 Grant E-44

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Abstract

Current conservation efforts must be increased by at least an order of magnitude in order to facilitate recovery of the critically endangered Houston toad. This species is currently known to occur in only three counties in south-central Texas. The situation is such that conservation biologists must take calculated risks by implementing habitat restoration and enhancement activities based on a limited set of best available information, while at the same time conducting research to determine those management actions with the greatest potential to contribute to individual population and overall species recovery. In other words, conservation action for the Houston toad cannot wait for definitive research results. This project included the implementation of a set of management actions believed to be beneficial to the Houston toad along with a monitoring component that was designed to begin identifying those practices with the greatest potential for sustained positive impacts on the toad. Extreme drought conditions during two of the four years of this study severely limited our ability to make definitive conclusions concerning the effects of individual habitat manipulation actions. However, the results of this study, especially when considered in the context of similar studies at other sites being managed for Houston toads, are sufficient to support the continued implementation, expansion and monitoring of specific habitat management practices.

Introduction

The Houston toad is a critically endangered species, endemic to Texas. At the present time considerable momentum exists to create, review, and broadly implement management options for the toad within Bastrop County. Unfortunately nearly all of the management options remain without research documenting relative success or failure. The toad is at a crossroads from which the current low populations must recover or face a very real potential for extinction. Nearly all of the habitat useful to the toad is in private hands. Hence, the development of scientifically-based management plans that optimize the relationship between private landowners and their voluntary management of the species on their properties is essential to this recovery effort. Our investigations sought to implement a research and monitoring program evaluating several management options on a particularly valuable property/landowner combination in Bastrop County. And,

given the fact that substantially increased and sustained conservation action is needed to secure populations of the Houston toad, we concurrently conducted a landowner outreach program so as to facilitate additional habitat restoration efforts using best-available information.

The Bob Long family property in Bastrop County, Texas represents a site of active research for integration of Houston toad recovery and livestock management (Figure 1). Ranch properties in Bastrop County and their owners are a critical component in achieving recovery of Houston toad populations. In an increasingly urbanized environment, the Houston toad has suffered significant and continuing habitat fragmentation rangewide. The remaining Houston toad population remnant is concentrated in Bastrop County, thus efforts seeking to stabilize the declining population and discern options for recovery have focused on this area. Following modifications to the livestock grazing, particularly limiting livestock access to a potential breeding pond on a nearby ranch property (Griffith League Ranch), Houston toads began to utilize stock tanks for spring chorusing where they had not been active in prior years (Forstner and Swannack 2004b). We sought to evaluate this by replicating it on the Bob Long property. We also wanted to evaluate controlled burning as a tool for recovering and enhancing Houston toad habitat. This is yet another management tool that requires data collected before and after burns, in order to assess the outcome on Houston toads. Our schedule sought to examine facets of the proposed controlled burns that might be explicitly useful in evaluating the tool in Houston toad habitat and took into consideration the ecology of the Houston toad specifically.

Objective

To gather data regarding the relative success of Houston toads from habitat manipulations on a tract of land in Bastrop County currently and consistently utilized for cattle ranching and hunting, and to disseminate findings through a landowner outreach effort.

Location

The Long Ranch lies due east of the intersection of Hwy 21 and FM 1441 in Bastrop County, Texas. The property is approximately 540 acres and currently has three manmade ponds (one of which was created during the course of this project) and a multi-acre seasonal wetland.

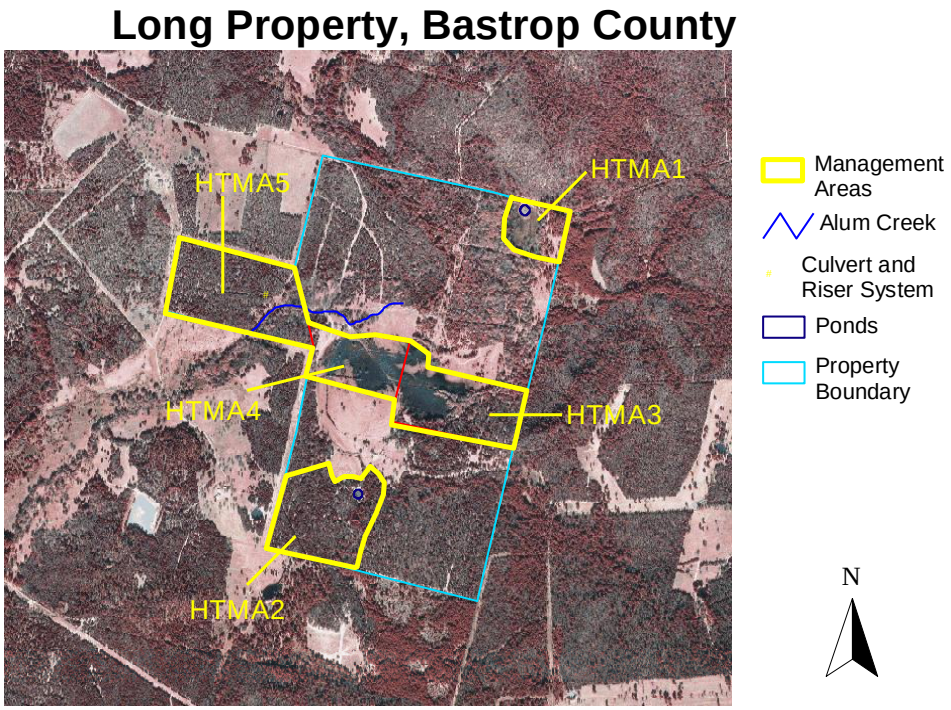

Figure 1. Bob Long property adjacent to the new additions to Bastrop State Park, Bastrop County, TX. Five habitat management areas are delineated for use in evaluating various habitat manipulation effects on Houston toads (and other amphibians) during the proposed three years of monitoring.

Approach

1. Review and oversee habitat changes for the study site. Management options being evaluated are designed for integration with current land use practices such as cattle or other livestock ranching, hunting, and wildlife viewing. The three year budget for these options relies on other sources for funding the habitat changes. Environmental Defense and its subcontractors will implement the habitat changes for the property and have those changes reviewed by Dr. Forstner.

Figure 1 provides an overview of the property and delineates the various research areas proposed for monitoring.

2. Monitor progress of habitat manipulations (Table 1), collect data necessary to evaluate changes, and adaptively modify design (Figure 1) as needed throughout project.

Table 1. Habitat modifications planned for the Bob Long property. Houston toad management areas (HTMA) each designed in accordance with existing habitat parameters and with #2 acting as a control for other plots during the project. Note that fire ant control will be performed ranchwide as other options would be unlikely to provide any chance of success.

Habitat changes	HTMA1	HTMA2	HTMA3	HTMA4	HTMA5
Fire ant control	X	X	X	X	X
Prescribed burn	X		X	X	X
Alternative water sources	X		X	X	X
Seasonal exclusion fencing	X		X	X	X
Native grasses	X		X	X	
Woody cover	X				
Understory thinning			X		
Pond creation					X

In effect many alternatives are to be examined within the context of a property that currently has one year of survey data completed. Each of the management areas will be examined for all amphibians and results will be judged using the 2002 baseline for comparison and to correct for interyear parameter variances such as rainfall and temperatures. Specific evaluations seek to determine the relative success of partial year cattle exclusion vs. all year exclusion, vegetation factors including understory thinning, and whether newly created ponds in densely forested habitat will provide better survival rates for emergent toads than those in open areas adjacent to forested areas.

All adult Houston toads found will be microchipped for permanent identification, weighed, measured, and have blood samples for DNA drawn for analysis. Likewise eggstrings or tadpole cohorts found will be sampled for DNA and analyzed to verify successful Houston toad reproduction.

All work performed will be conducted under the appropriate permitting at both state and federal levels. Existing permits held by Dr. Michael Forstner already cover all of the monitoring projects proposed and will either be amended or new permits secured as needed for any habitat manipulations requiring such.

3. Make study results available through landowner outreach. David Wolfe, senior scientist with Environmental Defense, and his staff will conduct landowner outreach efforts. Efforts will be focused on properties in the vicinity of Bastrop State Park and the property that is the subject of this proposal. Environmental Defense will work with the Houston toad citizen workgroup to identify prospective landowners and build cooperative partnerships with the intent of enhancing, restoring, and protecting toad habitats.

4. Prepare annual and final reports. Annual reports are due 90 days after the annual anniversary of the Grant Agreement and the final is due 90 days after the end of the segment.

Methods

Methods for Approach Item 1

The majority of habitat manipulations were implemented as planned and as listed in Table 1. Methods used for each of the manipulations and the few exceptions to the planned manipulations are described below:

- Fire ant control was not implemented for several reasons, primarily the lack of a suitable, approved fire ant bait application. We also concluded there to be a high degree of uncertainty concerning the potential impacts of fire ant baits on

amphibians in general and on the Houston toad in particular. Furthermore, during the first two years of the project the only approved (USFWS) suitable fire ant bait (i.e., Justice) was unavailable. Indeed, the product was pulled after one production run. We considered use of high pressure steam application to individual fire ant mounds, however this approach was determined to be infeasible at the current time due to the excessively high labor requirements and expenses associated with this technique.

- Burns were implemented in HTMA1, HTMA3 and HTMA4 in 2004 and 2007 by a prescribed burn manager in accordance with prescribed burn plans. Burns that were scheduled for 2005 and 2006 were not implemented due to dry weather and resulting burn bans. A prescribed burn has not yet been implemented in HTMA5.
- Aqua Water Corporation installed a valve and water meter adjacent to HTMA3 in September 2006 to serve as an alternative water supply during periods of cattle exclusion from ponds and wetlands.
- Seasonal exclusion fencing was constructed around HTMA1, HTMA3, HTMA4 and HTMA5. Four-strand barbed wire was installed around the first three areas and electric fence was installed around the latter area.
- Native grasses have not been planted in HTMA1, HTMA3 and HTMA4. The original plan was to convert coastal Bermuda grass in these areas to native grasses, however the landowner's aversion to chemical use on his ranch and the loss of a grazing lease adjacent to the ranch has so far precluded this conversion.
- 250 loblolly pine (*Pinus taeda*) bare-root seedlings were planted adjacent to the pond in HTMA1 in March 2004 in an attempt to establish a corridor of woody cover near the pond. The seedlings, which were approximately 20 inches tall were planted by hand on a gentle slope to the immediate east of the pond.
- Understory thinning was shifted from HTMA3 to HTMA1 in order to facilitate implementation of prescribed fire around the latter area. Thinning was done in October 2005 and accomplished using a rotary flail.
- An ephemeral pond was created in HTMA5 using a skid-steer loader with a mounted bucket in October 2005. An existing swale was contoured and a flash-board riser and culvert were installed to control water level.

Methods for Approach Item 2

Amphibian Surveys

Audio/physical surveys were conducted on the property owned by Bob Long and family at the behest of Environmental Defense. The property has appropriate deep-sand soils and available surface water suitable for amphibian breeding. The audio surveys were conducted by MRJ Forstner, Todd M. Swannack, and Jacob T. Jackson from the spring of 2003 through the spring of 2007. The property was also evaluated both during the breeding season (Jan-April) and outside of that period (May-July) seeking to document juvenile emergence and/or evaluate habitat at the potential breeding ponds. Chorus surveys consisted of five minute (or longer) listening periods at four stations predetermined to efficiently cover the entirety of the property's potential breeding ponds. As the listening stations were established independently of other cataloging efforts they are numbered differently than currently designated zones (Figure 1). Listening post 1 was placed on the western boundary of the large seasonal wetland. This post effectively covered HTMA5 and HTMA4. Listening post 2 was placed on the northern edge of a man-made stock pond which is due south of the ranch house at a distance of approximately 300m thus providing coverage of the HTMA2 area. The size of the central seasonal wetland required that listening post 3 be placed on the SE corner of the wetland. A secondary advantage of this position allowed this post to provide observational data on HTMA. This post helped to delineate calling locations within the wetland and allowed calls originating outside of the wetland to be discriminated. Finally, listening post 4 was placed on the edge of the last remaining large water body, a stock pond in the NE corner of the property and provided survey of the HTMA1 area. Surveys were conducted on nights with favorable climatic conditions for amphibian and specifically, Houston toad, activity. On most nights the drainage of Alum Creek (which bisects the property) was walked while moving to listening post 4. Thus both listening and physical encounter surveys were routinely conducted on the property during the years of the project.

Arthropod Surveys and Temperature profiling of controlled burn effects

As we sought information on the arthropod communities in a pilot study we placed a series of pitfall traps (19L buckest set flush with the ground) within both control (unburned) and treatment areas (burned areas). Sampling was conducted for 1 week at during August 2004, one month prior to the burn and again in Aug 2005 (11 months post burn). Small temperature recording devices (Thermocron) were placed at varying depths (from 1" to 6" below the soil surface) within both burned and unburned areas to document thermal profiles at the subsurface for the burn itself.

Methods for Approach Item 3

In an effort to engage additional private landowners in Houston toad conservation efforts, Environmental Defense conducted landowner outreach using contacts with partner organizations such as the U.S. Fish and Wildlife Service, Pines and Prairies Land Trust and the Lower Colorado River Authority, as well as through a landowner workshop as described in the results section.

Results

Results for Approach Item 1

Prescribed burns were implemented in HTMA1, HTMA3 and HTMA4 in September 2004 and again in January 2007. Results from the September 2004 burns were marginal in all three units. The high density of understory brush and the limited amount of fine fuels in the woodland areas of HTMA1 resulted in a patchwork of burned and unburned areas. The mosaic of wetland plant communities within HTMA3 and HTMA4, along with relatively high fuel moisture also resulted in a patchwork of burned and unburned areas.

The results of the January 2007 burns were considerably more successful in HTMA3 and HTMA4. Relatively low humidity and associated low fuel moistures resulted in a more complete burn of the herbaceous vegetation. In HTMA1 the relatively low humidity

resulted in an extremely hot fire that had to be shut down due to excessive flame lengths. An estimated 3 acres (out of the 78-acre unit) were burned.

Prescribed burn in HTMA3 and HTMA4 in September 2004. High fuel moisture resulted in considerable smoke and a patchwork of burned and unburned areas. Note cattle exclusion fencing in foreground.

Prescribed burn in HTMA3 and HTMA4 in January 2007. Low relative humidity resulted in a more complete burn than that which resulted from the September 2004 burn.

Prescribed burn in HTMA1 in January 2007. This burn was stopped shortly after ignition due to excessive flame lengths (note scorching of loblolly pine on left side of photo).

The water supply line with valve and meter installed by Aqua Water Corporation has not yet been needed to supply water to cattle. The pond in HTMA2 (which is unfenced) and Alum Creek have proven sufficient at providing water to cattle during periods of exclusion from HTMA1, HTMA3, HTMA4 and HTMA5.

Two-wire electric fencing was originally installed around HTMA1 and HTMA5 in December 2002 in order to exclude cattle from these areas during the Houston toad breeding season of January 1 through June 30 each year. This type of fencing proved to be problematic: falling branches tended to short out the fence and reduce the effectiveness of the fence as a barrier to cattle. Standing water in HTMA1 was also a cause for frequent shorting of the fence around this area. Four-strand barbed wire was constructed around HTMA3 and HTMA4 in September 2004 (fence can be seen in first two photos of prescribed burns, above). And the electric fence around HTMA 1 was replaced with four-strand barbed wire in October 2005. The barbed wire fence has

proven effective at excluding cattle during the Houston toad breeding season and has required little maintenance.

Of the 250 loblolly pine seedlings that were planted adjacent to the pond in HTMA1 in March 2004 a total of 6 were still present as of August 2007. These remaining individuals averaged 8 to 12 feet in height.

The understory thinning that was conducted in HTMA1 in October 2005 resulted in an open understory with a ground cover consisting primarily of yaupon (*Ilex vomitoria*) and eastern red cedar (*Juniperus virginiana*) mulch. This thinning effort also resulted in the creation of an effective fire break for HTMA1.

Results of understory thinning along the southern boundary of HTMA1.

A small ephemeral pond was constructed in HTMA5 in October 2005. An existing swale was contoured and a flash-board riser installed to serve as a dam and enable control of

water level. Water has been present intermittently in the pond; however no Houston toad breeding activity has yet been detected.

Ephemeral pond that was constructed in HTMA5. Arrow indicates flash-board riser, which controls water level. Pond has held water for short periods as indicated by growth of sedges, rushes and other water-loving plants.

Results for Approach Item 2

Significant efforts enabled consistent data regarding overall chorusing diversity and seasonality for the amphibians on the property (Appendices 1-5).

Temperature profiles of the arthropod survey sites and associated controls did not detect any significant subsurface temperature spike as a consequence of the prescribed fire (Appendix 6). The arthropod sampling provided a short duration "snapshot" of the arthropod diversity just prior to the burn and a similar view approximately a year later (Table 2; Appendix 7).

Details regarding Houston toads that were captured and marked during the course of the study are provided in Appendix 8.

Table 2. Summary data for the arthropod sampling before and after a controlled burn in the marsh area of the Bob Long property, Bastrop County, Texas in September of 2004. Sampling was completed using pitfall traps and daily sweep net lines of 50m between the pitfall traps. As some invertebrates could not be identified the summary statistics should be regarded as our best estimates.

	Control (unburned)			Treatment (in burn area)				Control (unburned)			Treatment (burned)		
Date	orders	families	#	orders	families	#	Date	orders	families	#	orders	families	#
8/26/04	7	8	60	6	8	92	8/24/04	4	10	23	10	25	370
8/27/04	6	6	20	7	10	555	8/25/05	5	8	34	8	21	206
8/28/04	7	6	38	8	8	208	8/26/04	6	9	26	9	21	530
8/29/04	6	5	18	8	7	372	8/27/04	4	9	26	6	17	612
Totals	8	12	136	9	11	1227		7	21	109	10	28	1718
Mean	6.5	6.25	34	7.25	8.25	307		4.75	9	27	8.25	21	430

Results for Approach Item 3

Outreach efforts resulted in the participation of five additional landowners in habitat restoration and enhancement efforts for the Houston toad. In addition, Environmental Defense conducted a Houston toad workshop at the annual meeting of the Circle D Civic Association on May 20, 2006. Several landowners in this association expressed an interest in program participation and one landowner enrolled in the program and initiated habitat restoration and enhancement projects. The Circle D properties provide a critical linkage between Bastrop State Park and the Boy Scouts Griffith League Ranch.

Details on individual landowner participants are provided below.

Landowner	**Property**	**Comments**
Jim Small	830-acre Small Ranch, which borders the	Submitted and received Safe Harbor permit for entire ranch. Completed initial brush

Landowner	Property	Comments
	northeast corner of Bastrop State Park	thinning and prescribed fire to enhance habitat for Houston toads. Ranch has several existing ponds with documented Houston toad chorusing and breeding. Plan is to continue implementation of prescribed burns to restore and enhance upland habitats.
	 Houston toad breeding pond on Small Ranch	
Boy Scouts, Capitol Area Council	541-acre Lost Pines Scout Reservation, situated to the north of Bastrop State Park and southwest of Griffith League Ranch.	Submitted and received Safe Harbor permit for entire Reservation. Plan is to restore and enhance upland habitats through a combination of brush manipulation and prescribed fire. Breeding ponds will be constructed once upland habitats are suitable to support toads.
Mark Daniels	50 acres situated between Bastrop and	Installed three shallow, concrete-based, ephemeral ponds in January 2004. While

Landowner	Property	Comments
	Buescher State Parks	these ponds have facilitated substantial amphibian activity they have not yet been colonized by Houston toads.
Gordon Walton	100 acres approximately 2 miles southeast of Bastrop State Park	Safe Harbor application was submitted to USFWS in September 2006. The Service is deferring action on this application until completion of a programmatic Safe Harbor Agreement (in final draft format as of August 2007). Built small earthen dams and created two ephemeral ponds in late winter 2003/2004. Plans to use timber thinning and prescribed fire to enhance habitat for the Houston toad.
	 Pond created on Walton Ranch (3 March 2005)	
Andy Wier	11 acres within the	Installed two shallow, approximately 10 ft by

Landowner	Property	Comments
	Circle D Subdivision, adjacent to the eastern boundary of Lost Pines Scout Reservation.	12 ft ponds with plastic liners. Plans to thin sapling loblolly pines, reduce duff layer through raking and transplant native grasses to area around ponds. Houston toads known to occur in a pond approximately 100 meters south of the Wier property.

Pond Created on Wier Property (15 April 2007)

Discussion

Results of multiple habitat manipulations and survey trends for the Houston toad are harshly overridden by the severe drought period starting in 2005 and stretching all the way through to February of 2007 (see Figure 2). Initial trends for the Houston toad showed dramatic increases in chorusing subsequent to cattle exclusion from the pond in HTMA1 during the spring breeding season. Subsequent results are much less clear as subsequent years show activity but not significant activity for the Houston toad on this tract. Pragmatically, it is impossible to extract the cause of this absence from one property alone. In our surveys of other sites in Bastrop County, 2006 was extremely quiet with little amphibian activity. However, the spring of 2007 had much better activity

elsewhere in the county on other tracts than seen on the Long tract for 2007. We note that most of the properties with significant chorusing in 2007 (Griffith League Ranch and Small Ranch) also had ponds within densely canopied forest. We attempted to mitigate the exposed aspect of the breeding pond on the Long tract with brush and woody debris at the pond's edge but the lack of use during 2007 may be reflective of simply decreased numbers of breeding toads and not any particular feature of the tract at this time.

The results of the arthropod sampling are expectedly complex. Arthropod communities cycle dramatically from season to season, but are also influenced by environmental conditions to a large degree. This is a consequent of local microhabitat complexity and food web diversity. In our short term evaluation of the pre- and post-burn community this effect can be seen clearly in the comparison of the 2004 control and treatment plot number of individuals (Table 2). Only 34 individuals were collected in the control (set outside the marsh but only just outside the fire line, compared with more than 1000 in the marsh traps themselves. This difference reflects the difficulty in choosing controls outside but adjacent to the burn area. The controls by necessity were set on the edges of the burn zone and this placed them within partial or complete canopy as compared to the open full sun treatment lines. Post burn data shows the same trend and are consistent with the data prior to the burn. While the number of individuals rose only slightly the overall diversity in the burned areas increased more than 200% after the burn (Table 2).

We also collected temperature data from the subsurface using a small thermal logger (Thermocron iButton, Maxim Technologies). We were able to record the daily fluctuations in temperature and it is apparent from the graphs (Appendix 2) that the controls reflect their canopy moderated temperature sweeps. However, the issue we sought to address was the effect, if any, of the prescribed fire on the subsurface temperatures. We found no temperature shift consequent of the burn, even as little as 1" below the surface of the soils. Thus supporting the accepted paradigm that no real effects of fast moving controlled fire are felt below the surface of the soil where Houston toads are likely to be found during the day. We obviously were not able to detect other potentially harmful effects like gas or moisture changes.

A significant amount of fairly intense management has been completed thus far on the Bob Long property, all phases seeking to increase the suitability and quality of the habitat for the Houston toad. While Houston toads have cycled on the property in keeping with their overall population trends across the County, we saw continuing evidence in 2005, that our habitat restoration and livestock exclusion/grazing cycling efforts continue to bring Houston toads to the property, and do not appear to have done any harm to the toads using the breeding ponds. It is important to consider that Houston toad populations at the breeding ponds in any given year represent predominantly males from the two years prior and females from two and three years prior. This is critical to understanding and managing the toad and its habitat. Any response seen in 2005 was reflective of changes in 2003 and 2004 for males and 2002 and 2003 for females. We saw similar trends for Houston toads at other locations in the County, with 2004 providing overall lower toad activity and 2005 improving. The spring of 2005 was inhospitable to juvenile toads, being of average temperature but overall very dry. As that dry trend continued, or even intensified across the entirety of 2006, the number of adults chorusing decreased. Only three Houston toads were seen on the property in 2007. This reflects two conflicting factors, the relative success of the 2004 breedings (which were successful across the County) and the harsh spring of 2005 (which showed no successful emergence at our study sites on the Griffith League Ranch) and the severely dry year that was 2006 (Figure 2).

For our work on the Bob Long property, the short term trends are important, but it is as important to remember that in the fall of 2007 we are concerned with *how many* toads we will find on the property in the coming springs, not whether or not the property supports toads at all. We began this project as collaborative efforts between the Long family, its management of the property as a cattle ranch, and researchers seeking to incorporate management options that were conducive to Houston toad success alongside the cattle operation. The management strategies evolved in keeping with those goals and going into the third year of the project, we had Houston toad chorusing where there was none prior to the implementation of exclusion and revegetation at the rear pond. This was also the

case on the Griffith League Ranch in 2000-2001. With admittedly limited data, but nonetheless the most data on the topic available, it would be our strong recommendation that cattle exclusion during the breeding/emergence season from known or likely Houston toad breeding ponds is the single most effective immediate management suggestion. Secondary only in the sense of difficulty of implementation, would be controlled burns to bring the badly compromised, severely fire suppressed, and dangerously fuel loaded habitats in Bastrop County back into a more normal forest system.

The prescribed burns on the Long property were successfully completed with no detectable negative effects on amphibian use of the area nor on Houston toad occupancy, and the habitat supports a more diverse arthropod community by one simplistic measure of assessment (total diversity at the family level) after the burn. In the same period, the Long family has entered into a Safe Harbor agreement with the USFWS indicating their long term commitment to their property playing a key role in the recovery of the Houston toad. Management has begun on the property, as the positive aspects of that habitat rehabilitation continue, the Houston toad populations will fluctuate annually, but with the same overall positive trend currently in place for its use of the property as habitat for all it's life stages.

Considering the results to-date on the Long Ranch, as well as the results from monitoring efforts at the other Houston toad study sites we conclude the following:

- Ponds that are created for the purpose of facilitating Houston toad breeding do not necessarily insure a net-benefit to the toad, especially if the surrounding upland habitat conditions are not conducive to toad survival. Indeed, ponds that are created in these circumstances may serve as population sinks (Pulliam 1988). Restoration efforts should first focus on creating suitable upland habitat conditions before any consideration is given to pond construction.
- For the most part, current livestock grazing and forest management practices are degrading Houston toad habitat. A rapid and sustained shift to best management practices (BMPs), as described in the Lost Pines Habitat Conservation Plan for

Bastrop County, Texas (Loomis Austin et al. 2003), is an essential component of toad recovery. Agency staff that work with private landowners (e.g., Texas Parks and Wildlife Department, Natural Resources Conservation Service and Texas Forest Service) need to be educated about these BMPs and then be directed to transfer this information to landowners.

- Management of imported fire ants (*Solenopsis invicta*) on a landscape scale is impractical due to high costs and inefficient in terms of potential positive benefits to Houston toads. However, we believe that treatment of individual mounds in the vicinity of breeding ponds has the potential to greatly increase juvenile survivorship. Studies should be supported and conducted to determine the efficacy of this approach.
- Prescribed fire does not increase the temperature of the subsurface soil to any significant degree, it represents the natural disturbance regime and it is relatively inexpensive to implement. For these reasons it is the tool of choice for restoring, enhancing and maintaining desired woodland structure and composition within the range of the Houston toad. Current woodland conditions generally consist of extremely high densities of understory shrubs (primarily yaupon) and excessive fuel loads. These conditions preclude initial use of fire: They require mechanical thinning first, followed by application of prescribed fire under relatively cool and moist conditions. Subsequent fire should be implemented under increasingly warmer and drier conditions in order to create and maintain relatively low densities of understory shrubs and a herbaceous layer of native warm-season grasses and forbs.
- The viability of the Houston toad is at a critical stage; the population is precariously low and extinction is a distinct possibility within the foreseeable future. A massive and sustained increase in conservation effort is needed to avert the loss of this unique Texas species. An estimated minimum of $1.2 to $1.5 million needs to be invested in conservation actions each year for the next ten years in order to create conditions conducive to recovery. These actions will include a combination of habitat restoration and enhancement, population monitoring, captive breeding and release, and preserve acquisition.

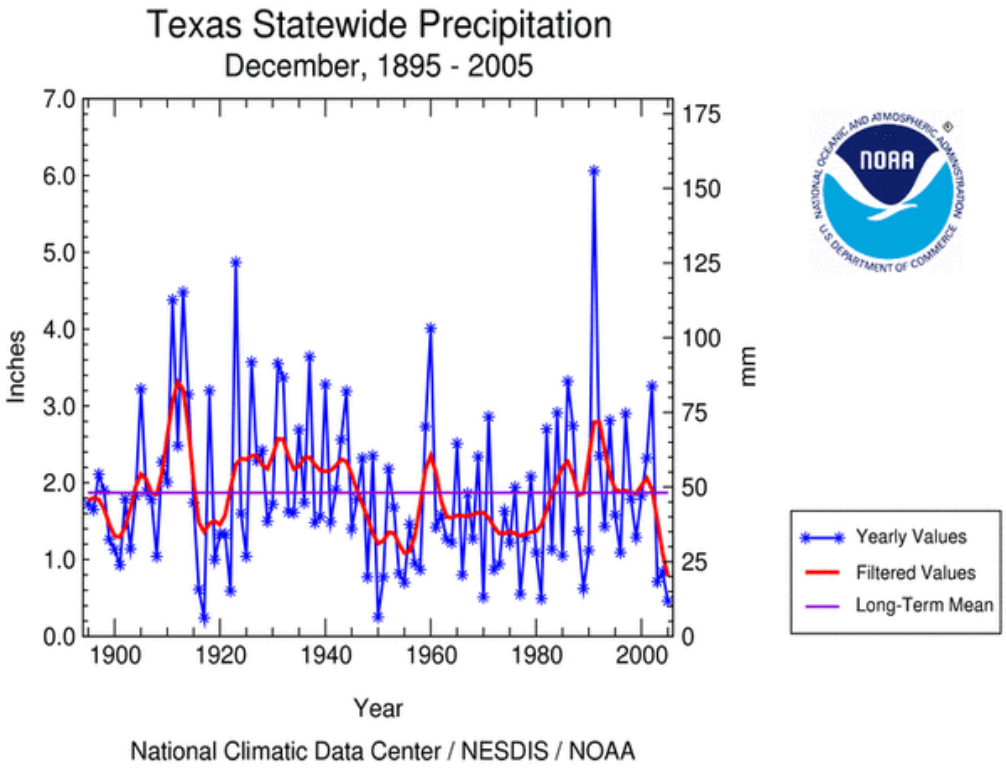

Figure 2. Graph showing the Texas precipitation record for the past 110 years. The drought of the 1950s may have led to the extirpation of Houston toads in several counties. The severity of the situation during the 05-06 period is apparent in the chart. This lack of moisture has a negative effect on toads and is quite likely to have impacted the total numbers of toads found in 2006/2007 and to a lesser degree 2005.

Acknowledgements

The authors wish to acknowledge and thank both the U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department for supporting this project with Section 6 funding. We also express our gratitude to Bob Long and his family for access to their ranch and for their ongoing commitment to the conservation of the Houston toad. Finally, we simply could not have completed all of the work on this project in both the

field and the laboratory without the assistance of our colleagues, assistants, and students across the years of the project and countless volunteer hours of work.

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Appendix 1. Compiled amphibian survey results for the Bob Long property during the 2004 breeding season. The occurrence of *Bufo houstonensis* are highlighted in bold. Audible surveys follow the current guidelines for Houston toad audio surveys provided by the USFWS. Egg, tadpole, and juvenile surveys are conducted during daylight and seek to detect successful reproduction.

Date	Post1-Wetland front	Post2-House	Post3-rear wetland	Post4-back pond	Temp (F)
Jan 18, 04	Significant water	Normal level	As front	Not full but near	64
Feb 19, 04	0	0	0	0	55
Mar 2, 04	3PC	0	10PC, 25RS	0	70.1
Mar 3, 04	0	0	10RS, 2HV	0	71.4
Mar 11, 04	0	0	0	0	59.2
Mar 12, 04	0	0	0	0	64
Mar 13, 04	0	0	0	0	65
Mar 14, 04	0	0	0	0	63.5
Mar 15, 04	0	0	0	0	59.1
Mar 16, 04	0	AC, RS seen	0	2AC	63
Mar 17, 04	0	AC, *Nerodia* seen	0	0	67.2
Mar 18, 04	0	2RS, 5AC, 2 *Nerodia*	0	0	71.5
Mar 19, 04	0	1RS	0	0	71.3
Mar 25, 04	10HV	1AC	1RS	0	71.3
Apr 2, 04	AC	2HV	same as front	AC	64.1
Apr 4, 04	0	1BV	0	0	70.7
Apr 19, 04	0	0	2RS,1HV	0	67.1
Apr 21, 04	0	0	0	0	73.2
Apr 23, 04	None seen	None	None seen	No juveniles found	80.1
May 8, 04	Nearly dry	None	Nearly Dry	None seen	83.3
May 12, 04	DRY	*Chelydra*	Near DRY	No juveniles found	83.6
June 2, 04	DRY	None	Near DRY	No eggs or *Bufo* tads	86

Species Key =	NC=no calls heard	*BX=Bufo sp.* hybrid?	*PS=Psuedacris streckeri*
AC=Acris crepitans		*GC=Gastrophyrne carolinensis*	*PT=Psuedacris triseriatus*
BH=Bufo houstonensis		*GO=Gastrophyrne olivaceous*	*RC=Rana catesbaena*
BS=Bufo speciosus		*HC=Hyla cinerea*	*RCL=Rana clamitans*
BV=Bufo valliceps		*HVC=Hyla versicolor/chrysocelous*	*RS=Rana sphenacephala*
BW=Bufo woodhousei		*PC=Pseudacris clarki*	*SC=Scaphiopus couchi*

Appendix 2. Compiled amphibian survey results for the Bob Long property during the 2005 breeding season. The occurrence of *Bufo houstonensis* are highlighted in bold. Audible surveys follow the current guidelines for Houston toad audio surveys provided by the USFWS. Egg, tadpole, and juvenile surveys are conducted during daylight and seek to detect successful reproduction.

Date	**Post1 & 3 -Wetland (marsh)**	**Post2-House**	**Post4-back pond**
Jan 21, 05	Not at capacity	Not bank full level	Full but not marshy
Feb 13, 05	10HV, 6RS	NC	**3BH,** ~10HV, 10RS
Feb 14, 05	3HV, 6RS	NC	**1BH**, 10HV, ~10RS
Feb 15, 05	NC	NC	NC
Feb 21, 05	25HV, 5RS	NC	**4BH**, 1BV, 25HV,10RS
Mar 6, 05	10HV, 2PS, 10RS	2RS	**10BH**, 10HV, 5RS, 10SH
Mar 12, 05	10HV, 5PS, 10RS	0	10HC, 10HV, 1PS, 6RS
Mar 20, 05	5HV	1BV, 10HC, 10HV, 1PS	5AC, **1BH**, 5HV
Mar 21, 05	**2BH**, 10HC, 10HV, 2RS, 1SH	1RS	4BV, GHC, 10HV, 5RS, 2SH
Mar 25, 05	**2BH**, 10HC, 10HV	2RC	5AC, 5BV, 10HC,10HV,3RS
Apr 7, 05	5HV	3RS	5AC, 3HV
Apr 9, 05	5HC, 5HV	1RC	5AC, 2HV, 2RS
Apr 10, 05	3AC, 10BV, 10HC, 10HV	2AC	2AC, 4BV, 10HC, 10HV
Apr 11, 05	5AC, 5HC, 5HV	2AC	5AC, 2HC
May 7, 05	5AC	NC	NC
May 12, 05	5AC	NC	NC
May 23, 05	None seen	None seen	None seen
Jun 1, 05	None seen	None seen	BV emergents (~40)
Jun 11, 05	None seen	*None*	No juveniles found
Jul 2, 05	Nearly dry	*None*	Many juvenile RS

Species Key =	NC=no calls heard	*BX=Bufo sp.* hybrid?	*PS=Psuedacris streckeri*
AC=Acris crepitans		*GC=Gastrophyrne carolinensis*	*PT=Psuedacris triseriatus*
BH=Bufo houstonensis		*GO=Gastrophyrne olivaceous*	*RC=Rana catesbaena*
BS=Bufo speciosus		*HC=Hyla cinerea*	*RCL=Rana clamitans*
BV=Bufo valliceps		*HVC=Hyla versicolor/chrysocelous*	*RS=Rana sphenacephala*
BW=Bufo woodhousei		*PC=Pseudacris clarki*	*SC=Scaphiopus couchi*

Appendix 3. Houston toad audio survey results for the Bob Long and Family property, Bastrop County, Texas for 2006. Dates marked by an asterisk represent daylight (or daylight and nocturnal) surveys for egg masses and documenting reproduction, emergence, or dispersal.

Date	21 Jan*	2 Feb	16 Feb	21 Feb*	22 Feb	28 Feb	3 Mar	7 Mar	10 Mar	17 Mar	18 Mar
Temp (F)	65	58	71	45	58.4	67.6	69	70.2	70.6	68.7	68.2
Humidity	63	57	87	-	95	77	-	75	87	41	84
Wind	0	0	1.5	0	1.2(3.7)	4.5(8)	0	5.5(8.3)	3.2(4.5)	0.4(0.9)	0.8(2.2)
Post 1	Near empty	0	0	None	0	0	0	0	0	0	0
Post 2	Very low	0	0	None	0	0	0	0	0	0	0
Post 3	Low	0	0	None	0	0	0	0	0	0	0
Post 4	Dry	0	0	None	0	3 RS	0	0	0	0	0
Alum Creek	flowing	0	0		None	None	0	0		1RS	

Date	19 Mar	27 Mar	28 Mar	29 Mar*	30 Mar	1 Apr*	20 Apr	22 Apr	30 Apr	18 May*	26 May*
Temp (F)	69	65.8	60	74.6	69.7	65.4	73.3	74.2	74.6	76	82
Humidity	-	85.1	83.3	63	84.6	62.6	79.7	66.7	39	-	-
Wind	-	0	0	1.2	4.9(8)	0	0	0.6(1.3)	1.7(4.3)	-	-
Post 1	0	N/A	0	None	N/A	None	0	N/A	2HV	None	None
Post 2	0	0	1RS	None	1RS	None	0	0	N/A	None	None
Post 3	0	N/A	0	None	N/A	None	0	5BV:3HV	4HV	None	None
Post 4	0	0	0	None	5RS	None	5BV:5HV	N/A	N/A	BV tads	BV juv.
Alum Creek				None		None					

Species Key =	0=None	BX=Bufo sp. hybrid?	PS=*Pseudacris streckeri*
AC=*Acris crepitans*		GC=*Gastrophyrne carolinensis*	PT=*Pseudacris triseriata*

BH=*Bufo houstonensis*	GO=*Gastrophyrne olivacea*	RC=*Rana catesbeiana*
BS=*Bufo speciosus*	HC=*Hyla cinerea*	RCL=*Rana clamitans*
BV=*Bufo valliceps*	HVC=*Hyla versicolor/chrysoscelis*	RS=*Rana sphenocephala*
BW=*Bufo woodhousei*	PC=*Pseudacris clarki*	SH=*Scaphiopus couchi*

Appendix 4. Houston toad audio survey results for the Bob Long and Family property, Bastrop County, Texas for 2007. Dates marked by an asterisk represent daylight (or daylight and nocturnal) surveys for egg masses and documenting reproduction, emergence, or dispersal.

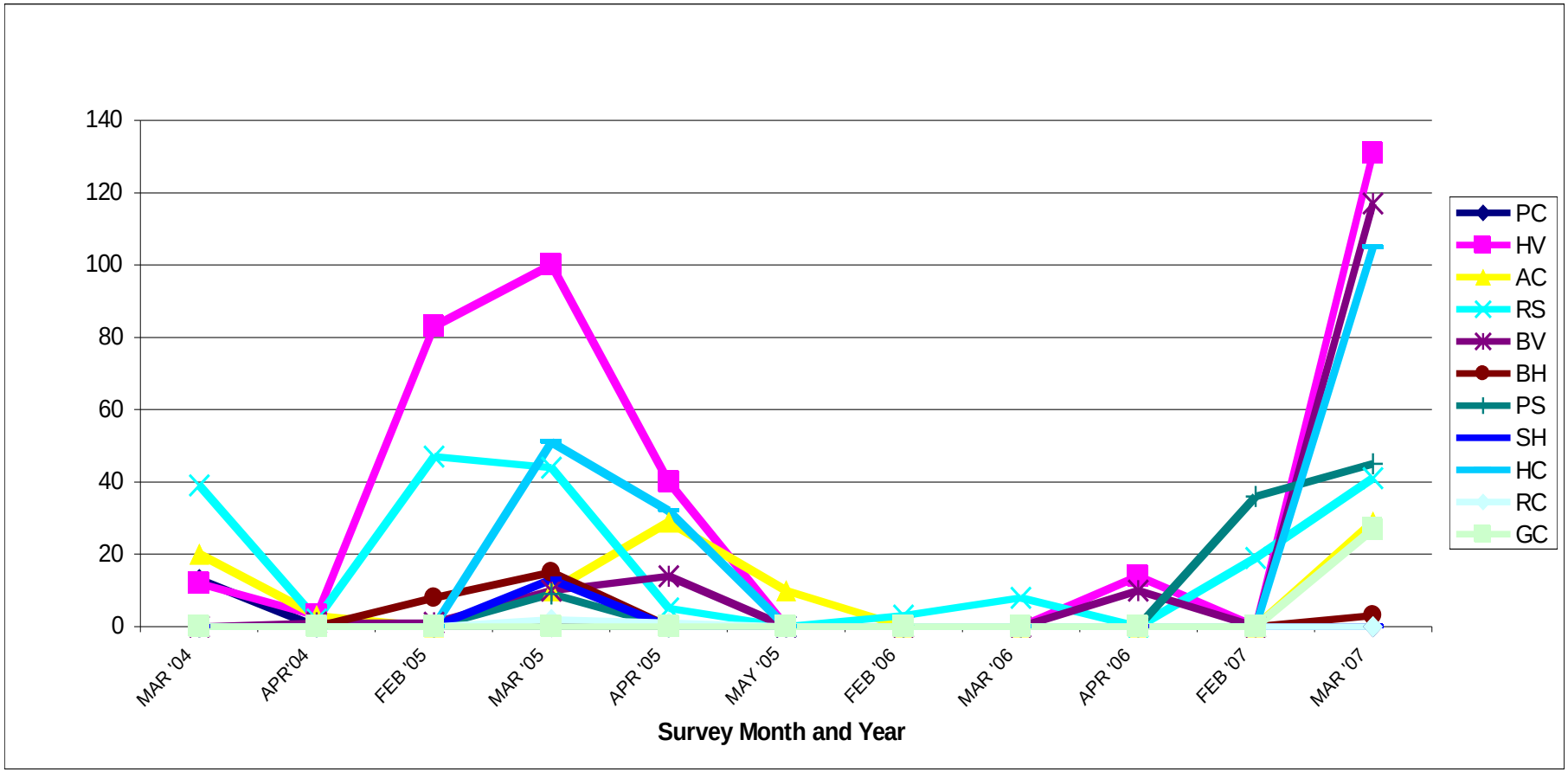
Date	8 Feb	12 Feb	13 Feb	22 Feb	1 Mar	17 Mar	21 Mar	22 Mar*
Temp (F)	70.8	52.5	66.9	54.5	72.8	65.2	69.6	
Humidity	66.8	100	65	45	80	76.7	95	
Wind	0	1.7	0	0	2.3	0	1.4	
Post 1 & 3	10PS;4RS	3RS	6PS;2RS	1RS	1PS;1RS	6BV;10HV;10PS;10RS	15BV;10HC;10HV;2PS;5RS	No eggstrings seen
Post 2	10PS;2RS	3RS	5PS;2RS		1PS;5RS			
Post 4	5PS	1RS	1RS	-	-	-	10BV;5HC;10HV;10PS	

Date	22 Mar	23 Mar	24 Mar	26 Mar	28 Mar	29 Mar	30 Mar	1 Apr*
Temp (F)	70.7	70.2	73	74		69	76.9	
Humidity	78.4	88	84	77		100	77	

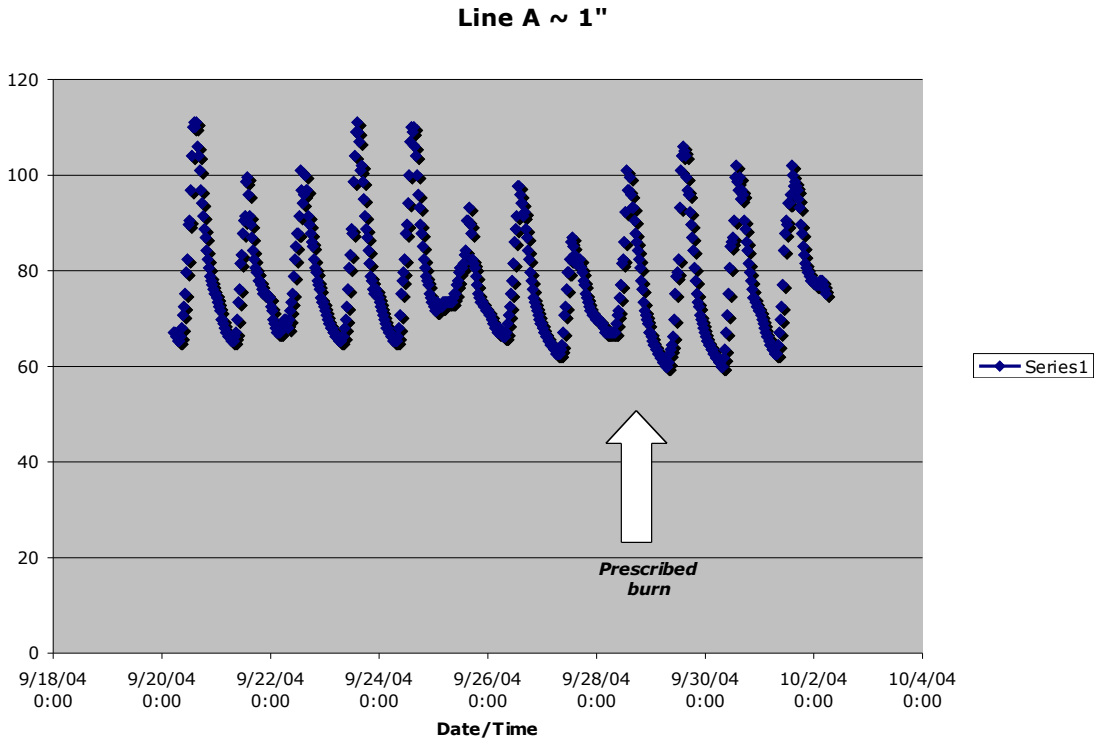
Wind	4.1	3.5	1.6	1.4		8.1	0	
Post 1 & 3	10BV;3GC;10HC;10HV	10BV;10HC;10HV	3BV;3GC;10HC;5HV;5PS;2RS	5AC;10BV;5GC;10HC;10HV	5AC;5GC;10HC;10HV;2RS	2AC;10BV;4GC;20HC;10HV;2RS	10AC;10BV;5GC;10HC;10HV;2RS	No eggstrings seen
Post 2			1PS:1RS			2AC:4HV		
Post 4	6BV;10HC;10HV;1RS	6BV;1GC;1RS	2BV;5HC;5HV;5PS1RS	5BV:5HV:1RS	**3BH**;5BV;1GC;10HV	5AC;5BV;10HV;10PS;4RS 10BV&15RS Seen	4BV;2HV;3RS	

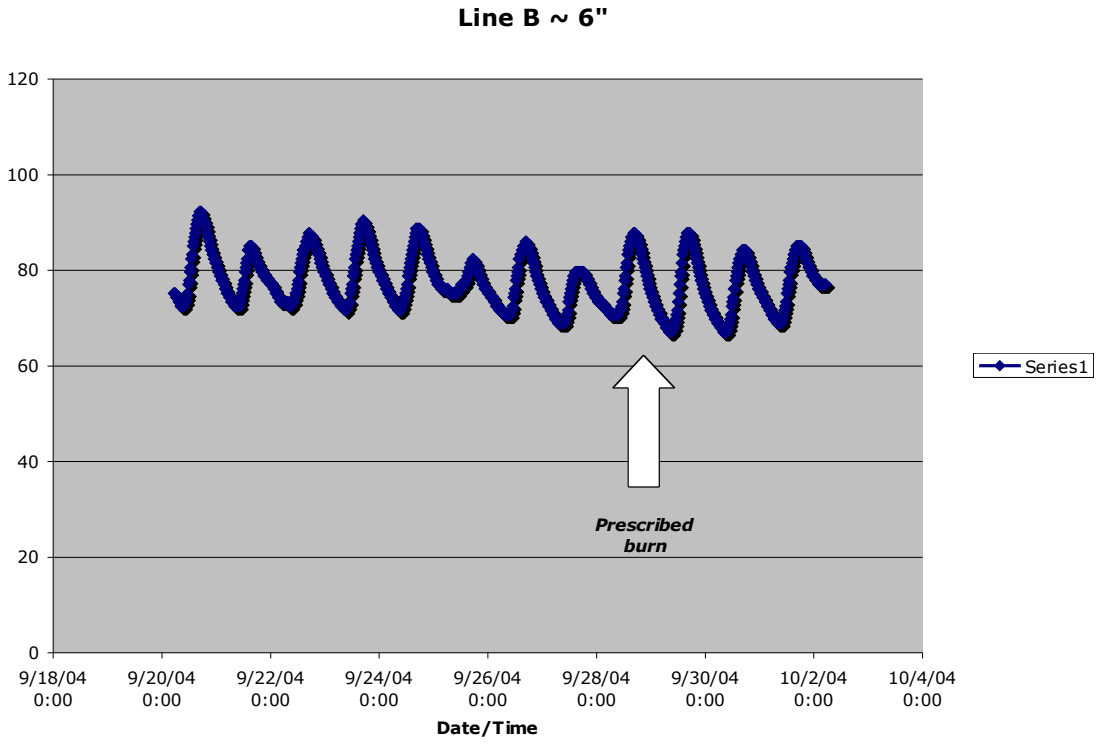
Species Key =	0=None	BX=Bufo sp. hybrid?	PS=*Pseudacris streckeri*
AC=*Acris crepitans*		GC=*Gastrophyrne carolinensis*	PT=*Pseudacris triseriata*
BH=*Bufo houstonensis*		GO=*Gastrophyrne olivacea*	RC=*Rana catesbeiana*
BS=*Bufo speciosus*		HC=*Hyla cinerea*	RCL=*Rana clamitans*
BV=*Bufo valliceps*		HVC=*Hyla versicolor/chrysoscelis*	RS=*Rana sphenocephala*
BW=*Bufo woodhousei*		PC=*Pseudacris clarki*	SH=*Scaphiopus couchi*

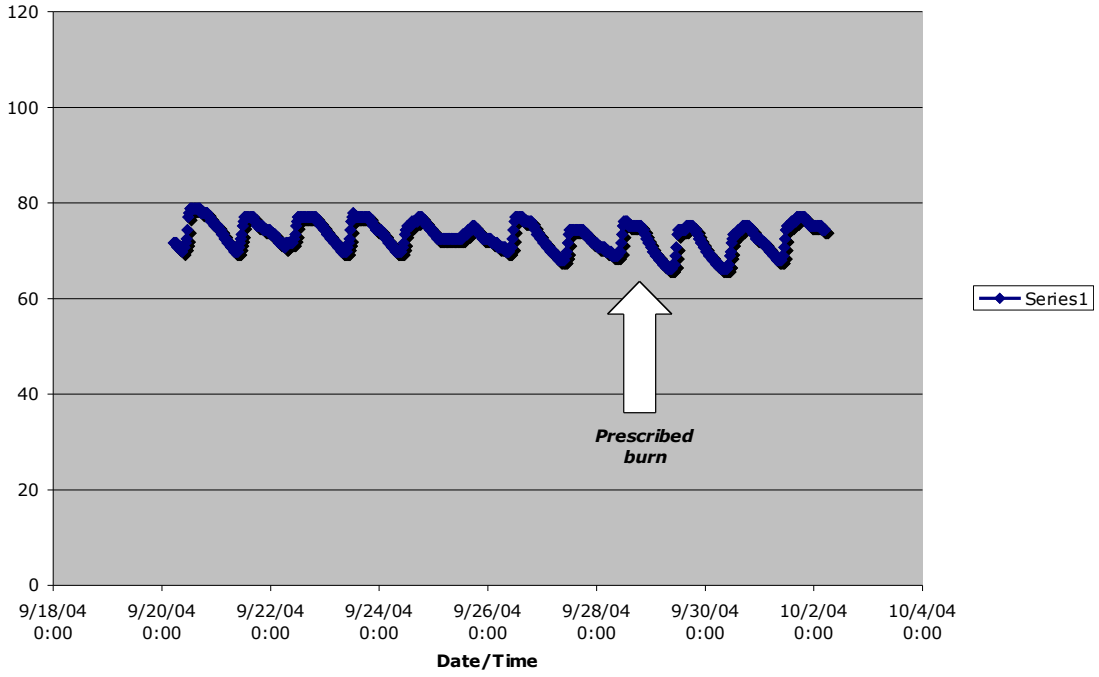
Appendix 5. Graph showing relative abundance of amphibians surveyed on the Bob Long property during the course of the project.

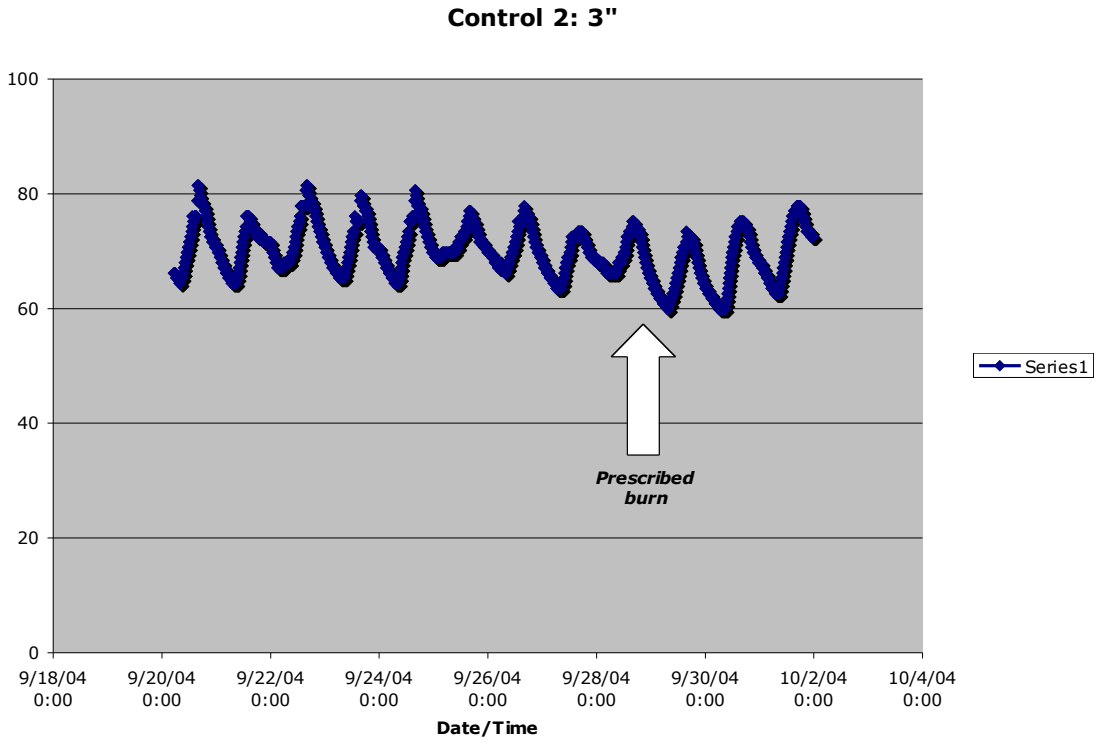


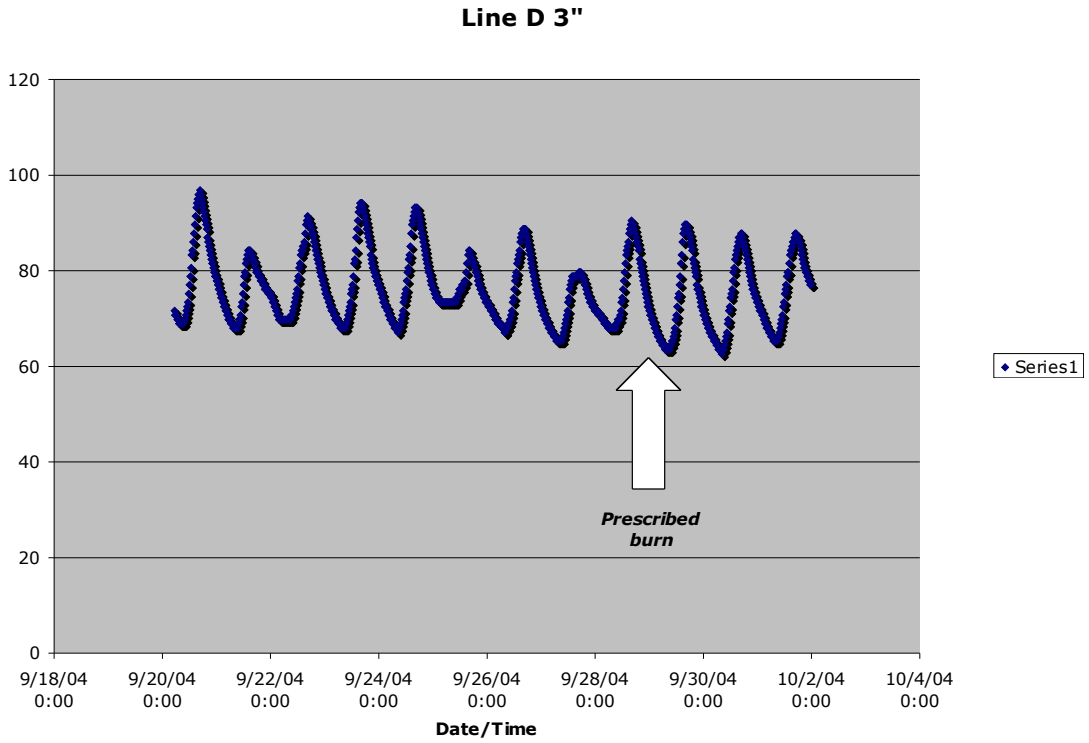
Appendix 6. Temperature recordings using Thermochron iButtons (Maxim technologies). Each figure illustrates the temperature readings for the period from September 18, 2004 through October 4, 2004. The burn occurred on September 29, 2004 and is highlighted with an arrow on each figure. While the temperature profiles vary from plot to plot as a consequence of placement (either within canopy or shrub shade or completely exposed in an open marsh (dry)) there were no temperature changes associated with the burn itself that we could detect, even at as little as 1" below the soil surface.




Line B ~ 6"
120
100
80
60
40
20
0
9/18/04 0:00
9/20/04 0:00
9/22/04 0:00
9/24/04 0:00
9/26/04 0:00
9/28/04 0:00
9/30/04 0:00
10/2/04 0:00
10/4/04 0:00
Date/Time
Prescribed burn
Series1


Control 1"
120
100
80
60
40
20
0
9/18/04 0:00
9/20/04 0:00
9/22/04 0:00
9/24/04 0:00
9/26/04 0:00
9/28/04 0:00
9/30/04 0:00
10/2/04 0:00
10/4/04 0:00
Date/Time
Prescribed burn
Series1


Control 2: 3"
100
80
60
40
20
0
Prescribed burn
Series1
9/18/04 0:00
9/20/04 0:00
9/22/04 0:00
9/24/04 0:00
9/26/04 0:00
9/28/04 0:00
9/30/04 0:00
10/2/04 0:00
10/4/04 0:00
Date/Time


Line D 3"
120
100
80
60
40
20
0
Prescribed burn
Series1
9/18/04 0:00
9/20/04 0:00
9/22/04 0:00
9/24/04 0:00
9/26/04 0:00
9/28/04 0:00
9/30/04 0:00
10/2/04 0:00
10/4/04 0:00
Date/Time

Appendix 7. Arthropod data collected before and after the prescribed burn in the central marsh of the Bob Long property in Bastrop County, Texas. The burn occurred on September 29, 2004. Arthropods were collected in two ways, by pitfall trapping using 19L traps set flush with the ground surface and by sweep net lines of 50m between the pifall locations. Samples were collected for one week prior to the burn and again for the same period one year later.

	Control Lines (outside burn area)			Treatment lines (within burn area)		
Date	order	family	number	order	family	number
8/26/04	Araneae	Lycosidae	1	Araneae	Lycosidae	2
	Araneae	Thomisidae	4	Araneae	Oxyopidae	6
	Araneae	?	2	Araneae	Thomisidae	3
	diptera	Dolichopodidae	2	Araneae	Salticidae	2
	Hemiptera	Tinginidae	4	Araneae	?	9
	Hemiptera	?	4	coleoptera	?	19
	Homoptera	Aphididae	2	Diptera	Bibionidae	1
	Hymenoptera	Formicidae	36	Diptera	?	4
	Lepidoptera	Geometridae	1	Homoptera		5
	Orthoptera	Gryllidae	4	Hymenoptera	Formicidae	32
				Hymenoptera	?	4
				Orthoptera	Gryllidae	3
				Orthoptera	Acrididae	2
	7 Orders	8+ families	60	6 Orders	8+ families	92
8/27/04	Araneae	Lycosidae	2	Araneae	Oxyopidae	5
	Araneae	Thomisidae	1	Araneae	Thomisidae	3
	Coleoptera	???	2	Araneae	Salticidae	10
	Diptera	Bibionidae	1	Araneae	Araneidae	3
	Homoptera	???	6	Araneae	???	7
	Hymenoptera	???	2	Coleoptera	??	29
	Hymenoptera	Formicidae	3	Diptera	Bibionidae	28
	Hymenoptera	Mutiliidae	1	Diptera	???	19
	Orthoptera	Gryllidae	2	Homoptera	???	76
				Hymenoptera	???	3

	Control Lines (outside burn area)			Treatment lines (within burn area)		
Date	order	family	number	order	family	number
8/24/05	Araneae	Salticidae	3	Araneae	Oxyopidae	6
	Araneae	Thomisidae	2	Araneae	Salticidae	23
	Araneae	?	5	Araneae	Thomisidae	9
	Diptera	Phoridae	1	Araneae	Theridiidae	3
	Diptera	Sciaridae	1	Araneae	?	17
	Diptera	?	2	Diptera	Dolichopidae	2
	Hemiptera	Flatidae	1	Diptera	?	1
	Hemiptera	Aphididae	4	Coleoptera	Curculionidae	2
	Hemiptera	Reduvidae	1	Coleoptera	Scarabaeidae	2
	Hemiptera	Delphacide	1	Coleoptera	?	2
	Orthoptera	Gryllidae	1	Hemiptera	Aphididae	200
	Orthoptera	Acrididae	1	Hemiptera	Cicadellidae	14
				Hemiptera	Delphacidae	5
				Hemiptera	Psyllidae	1
				Hemiptera	Tingidae	1
				Hymenoptera	Apidae	16
				Hymenoptera	Formicidae	47
				Hymenoptera	Braconidae	1
				Hymenoptera	Tenthredinidae	1
				Hymenoptera	Chalcididae	1
				Hymenoptera	?	3
				Lepidoptera	Geometrididae	1
				Neuroptera	Ascalaphidae	1
				Orthoptera	Acrididae	6
				Orthoptera	Gryllidae	3
				Orthoptera	Tettigonidae	2
				Orthoptera		
	4 orders	10+families	23	10 orders	25+families	370
8/25/05	Araneae	Oxyopidae	1	Araneae	Oxyopidae	3
	Araneae	Salticidae	3	Araneae	Salticidae	19
	Araneae	Tetragnathidae	1	Araneae	Thomisidae	10
	Araneae	?	10	Araneae	?	7
	Acari	Suborder: Ixodida	1	Diptera	Bibionidae	1
	Diptera	?	1	Diptera	?	10
	Hemiptera	Aphididae	12	Coleoptera	Coccinellidae	3
	Hemiptera	Cicadellidae	2	Coleoptera	Chrysomelidae	1
	Hymenoptera	Brachonidae	1	Coleoptera	Curculionidae	5
	Hymenoptera	Formicidae	2	Coleoptera	?	5

Appendix 7 (cont.)

	Control Lines (outside burn area)			Treatment lines (within burn area)				Control Lines (outside burn area)			Treatment lines (within burn area)		
Date	order	family	number	order	family	number	Date	order	family	number	order	family	number
8/27/04				Hymenoptera	Formicidae	357	8/25/05				Hemiptera	Aphididae	21
Cont.				Lepidoptera	Geometridae	6	Cont.				Hemiptera	Cicadellidae	3
				Orthoptera	Grillidae	6					Hemiptera	Delphacidae	3
				Orthoptera	Acrididae	2					Hemiptera	Psyllidae	2
				Orthoptera	Tettigoniidae?	1					Hemiptera	Tingidae	1
											Hemiptera	Reduviidae	9
											Hemiptera	Membracidae	1
											Hemiptera	?	7
											Hymenoptera	Apidae	25
											Hymenoptera	Formicidae	55
											Hymenoptera	Pompilidae	1
											Orthoptera	Acrididae	7
											Orthoptera	Gryllidae	4
											Orthoptera	Tettigonidae	1
											Psocoptera	?	1
											Thysanoptera	Phlaeothripidae	1
	6 Orders	6+ families	20	7 Orders	10+ families	555		5 orders	8+families	34	8 orders	21+orders	206
8/28/04	Araneae	Thomisidae	3	Araneae	Oxyopidae	1	8/26/05	Araneae	Oxyopidae	2	Araneae	Araneidae	2
	Araneae	Lycosidae	1	Araneae	Salticidae	6		Araneae	Salticidae	3	Araneae	Oxyopidae	8
	Araneae	Araneidae	5	Araneae	Thomisidae	3		Araneae	Thomisidae	3	Araneae	Salticidae	18
	Araneae	???	2	Araneae	???	6		Araneae	Uloboridae	1	Araneae	Thomisidae	8
	coleoptera	???	7	Coleoptera	???	17		Araneae	?	2	Araneae	?	2
	Diptera	Bibionidae	2	Diptera	Bibionidae	77		Coleoptera	?	3	Acari	?	2
	Diptera	???	2	Diptera	???	4		Diptera	Culicidae	1	Coleoptera	Carabidae	6
	Hemiptera	???	1	Hemiptera	Tinginidae	1							
	Homoptera	???	9	Homoptera	???	45							
	Hymenoptera	Formicidae	4	Hymenoptera	Formicidae	41							
	Orthoptera	Gryllidae	2	Lepidoptera	??	1							
				Lepidoptera	Geometridae	2							
				Orthoptera	Gryllidae	4							
	7 Orders	6+ families	38	8 Orders	8+ families	208		6 orders	9+families	26	9 orders	21+families	530
8/29/04	Araneae	Salticidae	2	Araneae	Salticidae	16	8/27/05	Araneae	Araneidae	1	Araneae	Oxyopidae	5
	Araneae	Thomisidae	2	Araneae	Thomisidae	7		Araneae	Salticidae	1	Araneae	Salticidae	22
	Araneae	??	1	Araneae	Oxyopidae	2		Araneae	Thomisidae	2	Araneae	Thomisidae	2
	Chilopoda		1	Araneae	???	12		Araneae	?	2	Araneae	?	8
	Coleoptera	???	4	Coleoptera	???	9		Coleoptera	Curculionidae	2	Coleoptera	Curculionidae	2
	Diptera	Bibionidae	1	Diptera	Bibionidae	154		Coleoptera	Dysticidae	2	Coleoptera	?	14
	Hymenoptera	??	2	Diptera	???	9		Coleoptera	?	2	Diptera	Ulilidae	5
	Hymenoptera	Formicidae	4	Hemiptera	????	1		Diptera	Ephydridae	6	Diptera	?	3
	Orthoptera	Gryllidae	1	Homoptera	???	72		Diptera	Muscidaae	3	Hemiptera	Aphididae	329
				Hymenoptera	???	5		Diptera	Phonidae	1	Hemiptera	Cicadellidae	17
				Hymenoptera	Formicidae	72		Hymenoptera	Formicidae	3	Hemiptera	Delphacidae	3

Appendix 7 (cont.)

	Control Lines (outside burn area)			Treatment lines (within burn area)				Control Lines (outside burn area)			Treatment lines (within burn area)		
Date	order	family	number	order	family	number	Date	order	family	number	order	family	number
8/29/04				Lepidoptera	Geometridae	6	8/27/05		?	1	Hemiptera	Psyllidae	1
Cont.				Orthoptera	Gryllidae	7	Cont.				Hemiptera	Reduviidae	1
											Hemiptera	?	1
											Hymenoptera	Apidae	1
											Hymenoptera	Formicidae	185
											Hymenoptera	Pompilidae	1
											Hymenoptera	Sphecidae	1
											Orthoptera	Acrididae	5
											Orthoptera	Gryllidae	3
											Orthoptera	Tettigonidae	3
	6 Orders	5+ families	18	8 Orders	7+ families	372		4 orders	9+families	26	6 orders	17+families	612

Appendix 8. Tabulated data for all Houston toads (*Bufo houstonensis*) physically collected during the study. Microchip or toe clip marks are provided alongside the allele sizes for a series of microsatellites used in the examination of the population genetics of this species.

Sex	Chip or_Mark_	Additional_data	Date_collected	BC52.10	BC52.10b	bco15	bco15b	BM224	BM224b	IHHH	IHHHb	IYY	IYYb
Male	402	toe clip 402	3/9/03	203	203	238	238	151	151	197	203	324	324
Male	405	toe clip 405	3/11/03	171	199	250	250	145	151	197	197	316	324
Male	406	toe clip 406	3/11/03	199	199	238	238	143	149	197	197	324	324
Male	401	toe clip 401	3/9/03	183	187	250	250	149	149	197	197	324	324
Male	403	toe clip 403	3/9/03	203	203	250	250	143	149	197	203	324	324
Male	404	toe clip 404	3/9/03	183	203	234	238	153	153	197	197	316	316
Male	407	toe clip 407	3/12/03	183	183	234	250	141	145	203	203	324	324
Male	409	toe clip 409		199	199	250	254	143	149	199	199	324	324
Male	410	toe clip 410	3/27/03	187	187	250	250	149	149	199	203	316	328
Male	055049773		2/16/05	187	187	238	250	153	153	197	197	324	328
Male	055278316		2/16/05	171	171	238	258	153	153	197	213	316	324
Male	055316773		2/16/05	183	183	238	254	143	153	197	197	328	328
Male	054885069		2/15/05	183	187	234	250	141	151	197	197	324	324
Male	054613007		2/16/05	179	199	254	254	143	153	197	197	328	328
Male	054857091		2/15/05	183	187	238	238	149	153	197	197	316	316
Male	055257348		2/15/05	183	187	238	250	153	153	199	199	324	328
Male	055301361		3/1/05	187	187	242	254	153	153	197	197	328	328
Male	7	cohort '07	3/27/07	183	183	238	254	149	153	197	197	324	328
Male	7	cohort '07	3/27/07	183	183	238	254	153	153	197	197	328	328