Efficacy of Using Environmental DNA (eDNA) to Detect Alligator Snapping Turtles

FINAL REPORT
of Research Activities

(February 2023 – June 2025)



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(Submitted: 31 July 2025)

TABLE OF CONTENTS

List of Tables 2
List of Figures 3
General Introduction 4
Identified Problem 6
Objective 7
General Approach and Methods 7
Locality and Abiotic Descriptors of Survey Sites 7
eDNA Sampling Protocol and Collection 8
Laboratory Protocol for Processing Water Samples 9
Results and Discussion 9
Task 1A – Collection of water samples for eDNA survey and analyses 9
Task 1B – Collection of local habitat covariates that may influence eDNA 10
Task 2A – eDNA efficacy and variables that influence detectability 11
Abiotic Variables 11
Sample Size Recommendations to Maximize eDNA Detection 18
Task 2B – Seasonal effects on eDNA detectability 20
Task 2C – Developed and recommended protocols for eDNA surveys 22
Task 3 – Contribute eDNA data to public databases 23
Project Summary 23
Literature Cited 24
Appendix 1 28

LIST OF TABLES

Table 1. East Texas sampling sites alphabetically listed within lotic and lentic habitat classification types. GPS locations are identified by latitude and longitude. All sites were sampled for alligator snapping turtle eDNA each month with the Navasota falling outside AST range and serving as a negative control site*.

Table 2. Summary statistics of environmental and abiotic metrics of samples with negative and positive AST eDNA detection within lotic sites excluding the Navasota River negative control site.

Table 3. Summary statistics of environmental and abiotic metrics of samples with negative and positive AST eDNA detection within lentic sites.

Table 4. Summary statistics for comparisons of negative and positive AST eDNA detections with relation to each abiotic variable. Data were analyzed **Overall** (all sites) and then **Lotic** and **Lentic** sites were analyzed separately.

Table 5. AST eDNA positivity rates for sites that had at least one positive (+) eDNA detection among the three stream locations (Up-, Mid-, and Downstream positions). Percent (%) positive eDNA detections within each site is shown in the last column. The total number of positive eDNA detections among each stream position is shown for these sites (n = 24) with percent positivity rates indicating that upstream sites had the highest detection rates.

Table 6a. Monthly AST eDNA sample positivity rates, split by lotic sites (Bonaldo Creek, East Fork San Jacinto River, Gus Engeling Wildlife Management Area, and Harrison Bayou) and lentic sites (Boggy Slough, Buzzard Slough, Caddo Lake, Ratcliff Lake, and Swede Johnson Bayou). The Navasota River, a lotic site serving as a negative control, was omitted.

Table 6b. Monthly AST eDNA site positivity rates, split by lotic sites (Bonaldo Creek, East Fork San Jacinto River, Gus Engeling Wildlife Management Area, and Harrison Bayou) and lentic sites (Boggy Slough, Buzzard Slough, Caddo Lake, Ratcliff Lake, and Swede Johnson Bayou). Navasota River, a lotic site which served as a negative control, was omitted.

Table 7. Goodness of fit 3 x 2 contingency table (df = 2) analysis for comparisons of expected versus observed AST eDNA positivity rates among stream locations within the 24 sites with at least one positive eDNA detection (Table 3).

Appendix 1. Raw date of abiotic variables recorded for all months and for all sites showing eDNA detection results of positive (+) and negative (−) for the alligator snapping turtle. These data have been uploaded to the TxNDD in February 2025 and Dryad in July 2025.

LIST OF FIGURES

Figure 1. Map of the ten sites in eastern Texas sampled for alligator snapping turtle eDNA (March 2023 – February 2024), including Bonaldo Creek (BOC), Boggy Slough (BOS), Buzzard Slough (BUS), Caddo Lake (CAL), East Fork San Jacinto River (ESJ), Gus Engeling Wildlife Management Area (GUE), Harrison Bayou (HAB), Navasota River (NAR), Ratcliff Lake (RAL), and Swede Johnson Bayou (SJB). The Navasota River site (NAR, orange point, lower left) served as a negative control, while the remaining nine sites were determined to have ASTs, following baited hoop trap surveys (Rosenbaum et al. 2022, 2023a, 2023b).

Figure 2. Overall AST eDNA detection rates (±SE) averaged across all months for the four lotic sites (excluding the negative control site, Navasota River; n = 142) and five lentic sites (n = 180).

Figure 3. AST eDNA detection rates by site across all months. Lotic sites included Navasota River (NAR*; negative control) Bonaldo Creek (BOC), East Fork San Jacinto River (ESJ), Gus Engeling Wildlife Management Area (GUE), and Harrison Bayou (HAB) shown by light green bars. Lentic sites included Boggy Slough (BOS), Buzzard Slough (BUS), Caddo Lake (CAL), Ratcliff Lake (RAL), and Swede Johnson Bayou (SJB) shown by dark green bars. NAR (lotic) and RAL and SJB (lentic) had no eDNA detection,

Figure 4. Statistical results (Table 4) graphically presented in box-plots showing medians of environmental variables (flow rate, temperature, pH, dissolved oxygen, salinity, and turbidity for all positive (n = 41) versus negative (n = 281) AST eDNA samples across all sites (n =9) excluding the negative control (Navasota River). Each asterisk indicates significance at the 0.05, 0.01, and 0.001 levels, respectively.

Figure 5. Statistical results (Table 4) graphically presented in box-plots showing means of environmental variables (flow rate, temperature, pH, dissolved oxygen, salinity, and turbidity for positive (n = 35) versus negative (n = 107) AST eDNA samples across all lotic sites (n = 4) excluding the negative control (Navasota River). Each asterisks indicates significance at the 0.05, 0.01, and 0.001 levels, respectively.

Figure 6. Statistical results (Table 4) graphically presented in box-plots showing means of environmental variables (flow rate, temperature, pH, dissolved oxygen, salinity, and turbidity for positive (n = 6) versus negative (n = 174) AST eDNA samples across all lentic sites (n = 5). Each asterisk indicates significance at the 0.05, 0.01, and 0.001 levels, respectively.

Figure 7. Predicted detection probability of AST eDNA in lotic versus lentic habitats across different water temperatures. Points represent individual sampling events. Shaded ribbons represent 95% confidence intervals.

Figure 8. Monthly (March 2023 to February 2024) AST eDNA detection rates (±SE) averaged across 27 sampling sites (3 monthly samples each from 9 sites) excluding the Navasota River negative control site, from March 2023 to February 2024.

GENERAL INTRODUCTION

The alligator snapping turtle is a large, long-lived turtle that is broadly distributed in freshwater systems that drain into the Gulf of Mexico ranging from Texas to the Florida panhandle (Pritchard 2006, Thomas et al. 2014). Within its range, terrestrial sightings are uncommon as they spend most of their time in oxbows, swamps, rivers, bayous, ponds, lakes and deep streams (Reed et al. 2002). However, overland movements by females have been related to nesting (Harrel et al. 1996). Despite of their large body size, alligator snapping turtles are considered omnivorous or opportunistic scavengers (Elsey 2006) that consume a variety of prey items including animal (e.g., crayfish, fish, insects, mussels, snakes, snails, mammals) and plant matter (e.g., acorns, roots, fruits) (Sloan et al. 1996, Harrel & Stringer 1997, Elsey 2006, East et al. 2013). This species is sexually dimorphic with males larger than females. The largest recorded male measured 80 cm in carapace length (Lovich 1993). Studies on their reproductive biology in wild populations are lacking, but in captivity, the species appears to breed annually, with reproductive success highly influenced by foraging success and levels of harvesting and exploitation (Tucker & Sloan 1997).

This species exhibits site fidelity (Trauth et al. 2016), and possesses a slow growth rate, produces small clutch sizes, and has delayed reproductive maturity (Reed et al. 2002, Moore et al 2014). This unique combination of life history traits makes it particularly susceptible to human-induced population declines (Pritchard 2006). Wild populations of alligator snapping turtles were heavily harvested for meat from the 1960s through the 1980s, causing declines throughout its range in the southeastern United States (Pritchard 1989, Boundy & Kennedy 2006). Other factors, such as agricultural land use and urban development, also affect population changes of aquatic turtles (Marchand & Litvaitis 2004, Sterrett et al. 2011). Few studies have directly assessed the effects of habitat alteration on wild populations of alligator snapping turtles (Riedle et al. 2005, Shipman & Riedle 2008, East et al. 2013). Drastic declines of alligator snapping turtle in Oklahoma and Kansas have been attributed in part to stream channelization and thermal alteration from dam impoundments (Shipman et al. 1995, Riedle et al. 2005), but incidental drowning from abandoned fishing lines and ingested hooks are also common (Shipman & Riedle 1994, Enge et al. 2014). Dams are barriers that decrease or eliminate dispersal between downstream and upstream populations within drainages (Riedle et al. 2008), inhibiting already limited dispersal capabilities. Likewise, alteration of the stream riparian zones for agriculture or urban development often result in loss of suitable nesting habitats for the species (Baxley et al. 2014) because of increased sedimentation, increased submerged debris, and attraction of mesopredator density (Burger & Garber 1995, Baxley et al. 2014). Additional research is needed to elucidate the status and distribution of alligator snapping turtle populations across a range of freshwater systems. Its range of distribution in Texas urgently needs additional and comprehensive survey to fill gaps in our understanding of populations persistence and overall conservation status in the state of Texas.

Our current understanding of the population trends for alligator snapping turtles in wild populations is limited, with studies mainly focusing on their demographic status described from

populations in Louisiana, Oklahoma, Missouri, Kansas, and Arkansas (Sloan & Taylor 1997, Tucker & Sloan 1997, Riedle et al. 2005, Shipman & Riedle 2008, East al. 2013, Trauth et al. 2016, Huntzinger et al. 2019). Rapid population declines due to commercial harvesting created concerns among state natural resource and conservation agencies that lead to the protection of the species throughout its entire range, except in Louisiana and Mississippi, where harvest is legal (Ernst & Lovich 2009). It is suggested that populations of alligators snapping turtles are imperiled in Texas because they were harvested to support Louisiana's commercial harvest from at least 1984 to 1986 (Riedle et al. 2008). Because this harvest was legal until recently, it is possible that after the turtle was afforded legal protection in Texas, those illegally harvested individuals in Texas waters were collected and smuggled across the states' shared boundary to support the Louisiana market (Boundy & Kennedy 2006). In Texas, alligator snapping turtles are currently listed as a threatened species by Texas Parks and Wildlife Department (TPWD 2012) and a permit is required for all activities involving this species.

In Texas, information on the distribution and status of the alligator snapping turtles is still lacking. Until recently, much of what is known about the species in Texas was from an extensive survey conducted by Rudolph et al. (2002) across 22 counties within the major drainages of the Red River in the north to the Brazos River to determine the distribution of alligator snapping turtles in Texas. Rudolph et al. (2002) confirmed the presence of the species in 17 sites ranging from the Sulphur to the San Jacinto drainage including eight new county records (Angelina, Jasper, Leon, Nacogdoches, San Jacinto, Collin, Sabine and San Augustine counties). More recent surveys expanded the list of counties where the species have been documented including Montgomery County (one record, a dead adult female found at Spring Creek; Munscher et al. 2019) and Harris County (Munscher et al. 2020). A recent study by Munscher et al. (2020) in Buffalo Bayou in Harris County, Texas documented the presence of a reproductive and active population (23 males, 22 females and 12 juveniles). Findings from Munscher et al. (2020) are encouraging for the species' long-term persistence in southeastern freshwater systems in Texas, especially those impacted by urbanization. Another recently completed effort examined the distribution and occupancy of Texas alligator snapping turtles has been conducted by the co-PIs (Drs. Schalk and Saenz) that was supported by a State Wildlife Grant (SWG). These efforts re-surveyed the sites originally surveyed by Rudolph et al. (2002) and were expanded to additional counties that lack a verifiable county record for this species. Surveys from 2020 and 2021 resulted in 227 alligator snapping turtles detected (Rosenbaum et al. 2022, 2023a). The results from these efforts suggest that the species is distributed throughout eastern Texas within counties that contain the San Jacinto, Trinity, Neches, Sabine, Cypress, and Sulphur watersheds. Alligator snapping turtles were not detected within the Red River watershed in northeastern Texas even though it has been documented there previously (Rosenbaum et al. 2022). In this study, the site occupancy estimate was 0.82 and mean estimated density was 8 individuals per channel kilometer (Rosenbaum et al. 2022). These findings indicate that this species has an extensive range across Texas, but population status will remain uncertain until a standardized survey protocol is developed, and more survey sites are

considered within the known distribution in Texas. Therefore, current data for the state is needed considering our understanding of this turtle species and its overall range-wide decline.

The cryptic nature of the alligator snapping turtle makes population assessments and surveys difficult. Traditionally, population assessments or distributional surveys have utilized hoop traps across much of their range (Rosenbaum et al. 2023a, 2023b). Hoop traps, while successful at capturing alligator snapping turtles, can be prone to biases in capture rates and do not eliminate potential disturbance or injury during trapping events. If stakeholders are interested in simply determining the presence or absence of alligator snapping turtles at a site, more recent methodologies have emerged that can be standardized across space and time to reduce survey bias and be easily utilized by a variety of individuals, regardless of skill level. Environmental DNA (eDNA) is growing in its applicability to monitor a diversity of species of interest to natural resource managers including endangered, cryptic, and invasive species (Feist et al. 2018, Katz et al. 2021). However, before eDNA surveys can be utilized in large scale surveys to assess a species' distribution or presence, its critical to determine the factors that affect the efficacy of this method. Previous studies have used *ex situ* mesocosm or laboratory experiments to evaluate rates of DNA shedding or persistence (Klymus et al. 2015, Sansom & Sassoubre 2017). However, these highly controlled studies lack the realism of that natural resource managers experience under *in situ* field conditions.

To understand the utility of this method to detect the presence of alligator snapping turtles, it is imperative to determine what factors affect its persistence and in turn, its detectability in the environment (Kessler et al. 2019). There are three processes that affect detection of eDNA: production, transport, and degradation (Goldberg et al. 2015), and we aim to quantify the factors that affect these three processes during collection of our eDNA samples. eDNA production rates could be affected by the number of individuals with an area as well as individual activity or metabolism (Kessler et al. 2019). Transport distances may also be affected by flow rate within aquatic ecosystems and thus will be measured during each sampling period. Temperature and UV light are known to affect the persistence of eDNA as it degrades quickly at higher temperatures and higher UV exposure (Goldberg et al. 2015; Kessler et al. 2019). Probability of detection of eDNA may also be affected by amount of water filtered during each survey, which could be affected by turbidity (Schalk and Saenz, unpublished data).

Identified Problem:

The USFWS has released a Species Status Assessment (SSA) for alligator snapping turtles (*Macrochelys temminckii*) and for potential federal listing as threatened under the Endangered Species Act. Ultimately, a SSA is concerned with the viability of a species, which is dependent on a species' resiliency, redundancy, and representation. Current information on the status, distribution, and abundance of alligator snapping turtles is lacking, and development of a comprehensive conservation and management plan at either the state or federal level is not

possible. Further, development of these management actions is dependent on reliable methodologies that can quantify the parameters of interest.

Objective:

To provide USFWS with concise and accurate data from Texas necessary to determine if the alligator snapping turtle warrants listing. Our research, in the state of Texas, has accomplished the following objectives: (1) Conduct repeated site surveys to evaluate the efficacy of using eDNA approaches in determining the presence of alligator snapping turtles (Task 1), (2) Evaluate how abiotic variables may influence eDNA detection and develop protocols and recommendations that can be utilized by diverse stakeholders in Texas (Task 2), and (3) Contribute results to public databases to inform future monitoring efforts (Task 3).

General Approach and Methods:

We accomplished the outlined objectives of this research by repeated eDNA surveys across ten sites that included both reservoir and riverine habitats. Each site was previously surveyed for alligator snapping turtles using hoop nets and eDNA in 2020 and 2021. These sites were surveyed an additional twelve times to test the efficacy of using eDNA in surveying alligator snapping turtles. These repeated site surveys across seasons, allowed us to assess detectability of this species using this non-invasive survey method. We collected local habitat covariates (e.g., temperature and current velocity) to further evaluate the potential environmental variables that influence eDNA detectability thus providing explanatory power to variability in detection of threatened and endangered species.

Locality and Abiotic Descriptors of Survey Sites: Ten sites were selected based on recent surveys using baited hoop traps (Fig. 1; Rosenbaum et al. 2023a; 2023b). Nine of the sites were determined to have ASTs, while the tenth site (Navasota River) was outside of AST range and served as a negative control. Five of the sites are classified as still-water "lentic" sites, while the other five (including the negative control) are classified as "lotic," having current flow (Table 1). Each site's abiotic metrics were sampled monthly for potential seasonal changes. Water temperature, pH, salinity, conductivity, and total dissolved solids (TDS) were measured with a multi-parameter meter (APERA Instruments PC60). An APERA Instruments SX716 DO meter was used to measure dissolved oxygen and a Swoffer Model 2100 flow meter was used to measure both surface and benthic current velocities of the stream channels.

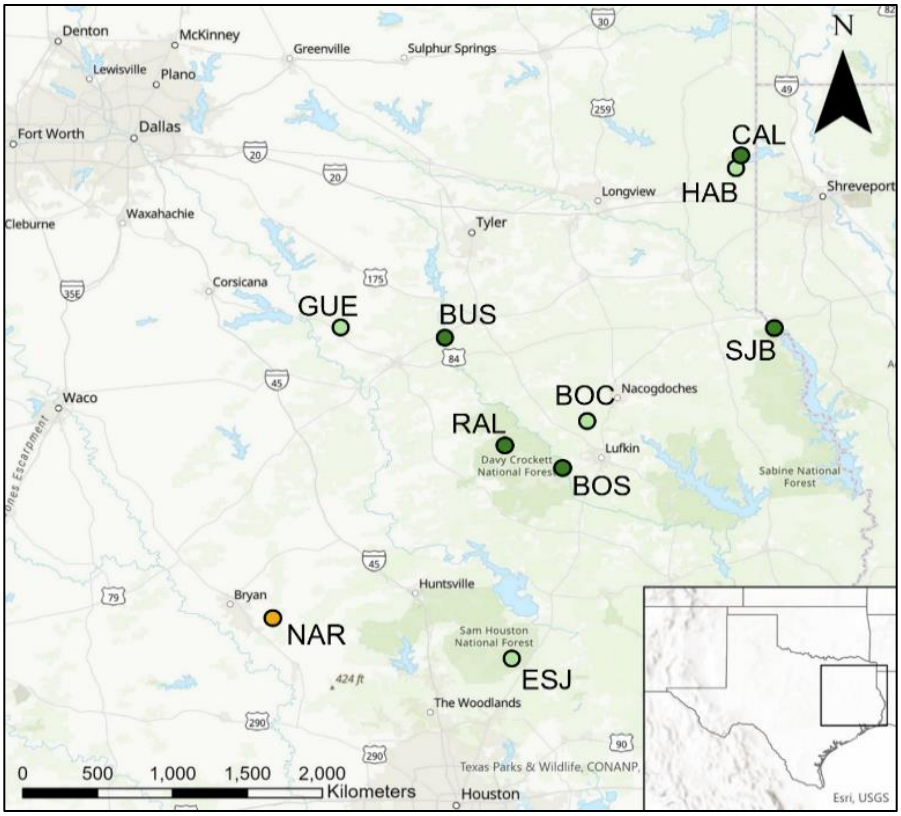


Figure 1. The ten sites in eastern Texas sampled for alligator snapping turtle eDNA (March 2023 – February 2024), including Bonaldo Creek (BOC), Boggy Slough (BOS), Buzzard Slough (BUS), Caddo Lake (CAL), East Fork San Jacinto River (ESJ), Gus Engeling Wildlife Management Area (GUE), Harrison Bayou (HAB), Navasota River (NAR), Ratcliff Lake (RAL), and Swede Johnson Bayou (SJB). Lentic sites are indicated by dark green points, while lotic sites are indicated by light green points. The Navasota River site (NAR, orange point, lower left) is lotic and served as a negative control, while the remaining nine sites were determined to have ASTs, following baited hoop trap surveys (Rosenbaum et al. 2022, 2023a, 2023b).

eDNA Sampling Protocol and Collection: We collected monthly water samples for eDNA at the ten survey sites (Table 1) across east Texas from March 2023-February 2024. During each month, at each site, three samples were taken, spaced approximately 100 meters apart. Starting with down-stream sites, water samples were collected in 1.0 L plastic jars (Nalgene®) and stored on ice within 30 minutes of collection for transportation to the laboratory for filtration. Immediately following each sample collection, we measured the abiotic metrics of temperature, pH, salinity, conductivity, total dissolved solids, dissolved oxygen, turbidity, and stream current velocity.

Table 1. East Texas sampling sites alphabetically listed within lotic and lentic habitat classification types. GPS locations are identified by latitude and longitude. All sites were sampled for alligator snapping turtle eDNA each month with the Navasota falling outside AST range and serving as a negative control site (designated by an *). In accordance with Texas Governmental Code regarding private landowner confidential information (Section 403.454), permissions have been obtained for disclosure of site locality.

Site Name	Site Code	Latitude	Longitude	Habitat Type
Bonaldo Creek	BOC	31.50040	-94.79010	Lotic
East Fork San Jacinto River	ESJ	30.42450	-95.12471	Lotic
Gus Engeling WMA	GUE	31.91994	-95.88110	Lotic
Harrison Bayou	HAB	32.64130	-94.13220	Lotic
Navasota River*	NAR*	30.60740	-96.18220	Lotic
Boggy Slough	BOS	31.28653	-94.89582	Lentic
Buzzard Slough, Neches NWR	BUS	31.87540	-95.42240	Lentic
Caddo Lake	CAL	32.69820	-94.11090	Lentic
Ratcliff Lake	RAL	31.38769	-95.15384	Lentic
Swede Johnson Bayou	SJB	31.91730	-93.96260	Lentic

Laboratory Protocol for Processing Water Samples: Water samples were filtered in the laboratory within 48 hours of collection at 500-600 mmHg vacuum pressure using a Rocker 400® vacuum pump. Each 1.0 L was filtered with two 250 mL filter funnels each containing a 0.45 µm pore filter. Filtration continued until the entire 1.0 L sample was filtered or a filtering time of 4 h was reached. Each of the two filters were then removed from the filter funnels, folded, and placed together in 2mL microcentrifuge tubes (VWR®) with site and date labels. Tubes were then frozen at -20°C and shipped to Tangled Bank Conservation for eDNA amplification. Presence/absence qPCR assays were performed using three primers from the mtDNA control region of the *M. temminckii* genome. The primer set was run in triplicate, and samples were considered positive if two of the three runs tested positive for eDNA.

RESULTS & DISCUSSION

Task 1A – Collection of water samples for eDNA survey and analyses

eDNA Surveys were conducted from March 2023 to February 2024. Ten sites across east Texas were sampled, with three 1.0 L water samples collected from three stream locations (i.e. upstream, midstream, and downstream) within each site per month (3 samples x10 sites x 12 months = 360 samples). We collected a total of 358 samples because sampling locations at Harrison Bayou were dry in September 2023.

The ten sites used in this study were previously surveyed for alligator snapping turtles using both hoop nets and eDNA surveys with only a single eDNA sample collected at each site. By conducting repeated monthly surveys for eDNA over the time course of a year, we were able to use the eDNA results to determine the most effective months of year that yield the highest rates of eDNA detectability.

eDNA Analyses by Tangled Bank Conservation determined either positive or negative detection of AST eDNA for the 358 total water samples collected over 12 months. Ot these samples, 41 tested positive for AST eDNA and yielded an overall 11.5% positive detection rate, with positive detection coming from 7 of the 10 sampling sites (Table 1). Once excluding the negative control site (Navasota River), the positive detection rate increased to 12.7%. Of these 41 positive eDNA samples, 35 of the samples were from lotic (flow or stream current) sites and thus a 24.6% positivity rate, not including the negative control site. The other 6 positive eDNA samples were from lentic sites and thus a 3.3% positivity rate (Fig 2). Excluding the Navasota River (lotic site) used as a negative control, all 4 lotic sites (Fig 3, light green bars) yielded positive samples for eDNA detection at some point over the 12 months, while only 3 of the 5 lentic sites (Fig 3, dark green bars) had positive eDNA detection. These results suggest that lotic sites, rather than lentic sites, have higher rates of detection when monitoring species occurrence.

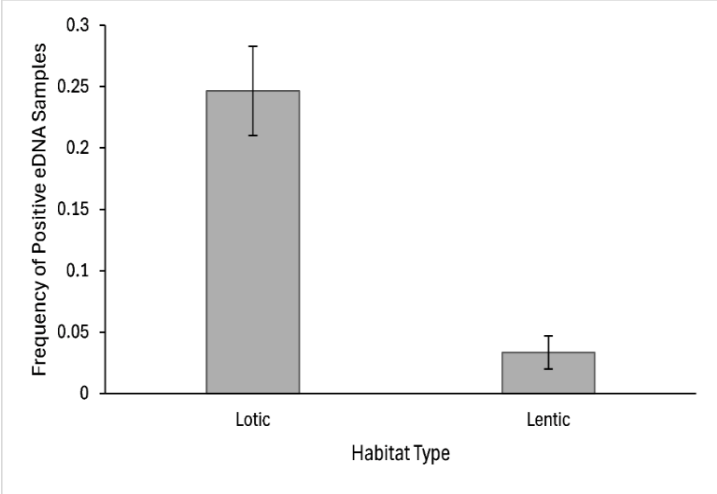


Figure 2. Overall AST eDNA detection rates (±SE) averaged across all months for the four lotic sites (excluding the negative control site, Navasota River; n = 142) and five lentic sites (n = 180).

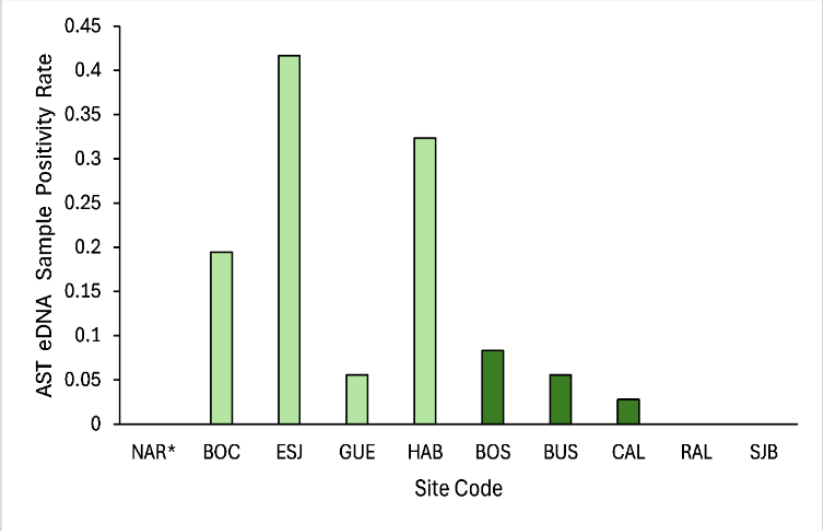


Figure 3. AST eDNA detection rates by site across all months. Lotic sites included Navasota River (NAR*, negative control), Bonaldo Creek (BOC), East Fork San Jacinto River (ESJ), Gus Engeling Wildlife Management Area (GUE), and Harrison Bayou (HAB) shown by light green bars. Lentic sites included Boggy Slough (BOS), Buzzard Slough (BUS), Caddo Lake (CAL), Ratcliff Lake (RAL), and Swede Johnson Bayou (SJB) shown by dark green bars. NAR (lotic) and RAL and SJB (lentic) had no eDNA detection,

Task 1B – Collection of local habitat covariates that may influence eDNA

Local Habitat Covariates or abiotic variables at each stream location within each sampling site were recorded immediately following eDNA collection. We identified eight abiotic variables which included: stream current velocity or flow rate (m/s), water temperature (°C), pH, dissolved

oxygen (mg/L, later used to calculate %DO), salinity (ppt), surface turbidity (NTU), conductivity (µS/cm), and total dissolved solids (ppm). The measure of these environmental variables allowed for determining if such variables potentially influence eDNA detection and specifically what abiotic conditions are associated with the greatest eDNA detectability. Because these abiotic and environmental variables were collected monthly with eDNA samples, we can provide an evaluation for seasonal changes in these variables to developed specific sampling recommendations and refine survey protocols to maximize eDNA detectability for alligator snapping turtles.

Task 2A – eDNA efficacy and variables that influence detectability

Abiotic Variables:

The collection of eight abiotic variables to evaluate stream water chemistry at each sampling site allowed for comparison of the abiotic variables than may influence eDNA detectability between positive and negative eDNA samples in addition to comparing differences in water chemistry between lotic and lentic stream sites (Table 2 and 3).

Table 2. Summary statistics of environmental and abiotic metrics of samples with negative and positive AST eDNA detection within lotic sites excluding the Navasota River negative control site (NAR).

eDNA Sample Result	Sample Mean	Mean flow rate (m/s)	Water Temp (C)	pH	% DO	Salinity (ppt)	Surface Turbidity (NTU)	Conductivity (µS/cm)	TDS (ppm)
NEGATIVE	n	107	107	106	99	106	107	106	106
	Mean	0.09	19.26	6.74	61.83	0.07	23.34	145.91	103.79
	SE	0.01	0.63	0.03	2.47	0.00	1.44	4.39	3.12
POSITIVE	n	35	35	34	28	34	35	34	34
	Mean	0.13	17.25	6.81	67.89	0.08	23.89	159.41	113.22
	SE	0.03	0.77	0.05	4.24	0.01	2.64	10.02	7.09

Table 3. Summary statistics of environmental and abiotic metrics of samples with negative and positive AST eDNA detection within lentic sites.

eDNA Result	Sample Mean	Mean flow rate (m/s)	Water Temp (C)	pH	% DO	Salinity (ppt)	Surface Turbidity (NTU)	Conductivity (µS/cm)	TDS (ppm)
NEGATIVE	n	174	174	174	168	174	174	174	174
	Mean	0.00	20.55	6.67	38.10	0.08	10.41	151.10	107.32
	SE	0.00	0.56	0.03	2.09	0.00	0.94	5.75	4.07
POSITIVE	n	6	6	6	6	6	6	6	6
	Mean	0.00	20.93	6.77	36.28	0.10	17.93	195.90	139.22
	SE	0.00	2.49	0.14	11.25	0.01	15.07	18.89	13.23

We specifically investigated six of the eight abiotic variables which included stream current velocity (flow rate), water temperature, pH, dissolved oxygen (DO), salinity, and surface turbidity. Conductivity and total dissolved solids (TDS) were found to be highly correlated with salinity and therefore were not used in statistical analyses. Comparisons between samples with positive and negative eDNA detection were analyzed for each abiotic variable for the entire or overall dataset and for lotic and lentic sites investigated separately. The distribution of data for each abiotic variable for comparisons between samples with positive and negative eDNA were non-normal (Shapiro-Wilk, $P < 0.05$) requiring use of the Mann-Whitney Test and non-parametric procedures (Zar 2010). Analyses were performed and graphed (box-plots) in SigmaPlot®. All statistical results are presented (Table 4) and include the Mann-Whitney U statistic, the T statistic equal to the sum ranks in the smaller sample group for comparison to the population of all possible rankings thus determining the possibility of this T statistic occurring, and associated significance level (P). The sample size, missing data, median, and the 25% and 75% quartiles are also shown. These results are illustrated graphically in Figures 4, 5 and 6.

For all sites, there are statistically significant differences in flow rate ($P = 0.001$), temperature ($P = 0.029$), pH ($P = 0.014$) and percent dissolved oxygen ($P = 0.003$) between the sampling site with negative and positive AST eDNA detection. When factoring out flow rate by investigating potential differences between negative and positive AST eDNA detections in lotic ($P = 0.265$) and lentic ($P = 0.879$) sites separately, %DO is no longer statistically significant. This is most likely because dissolved oxygen within a stream is strongly correlated with current velocity, and flow rates within lotic sites and lentic sites were similar. Within lotic sites we found both temperature ($P = 0.055$) and pH ($P = 0.053$) to be marginally significant and most likely important abiotic variables of consideration in eDNA detection. In lentic sites, no differences were found between negative and positive eDNA detections with relation to the abiotic variables, but interestingly salinity seems to be more of a potential influence for eDNA detection in lentic ($P = 0.089$) versus lotic sites ($P = 0.202$).

Table 4. Summary statistics for comparisons of negative and positive AST eDNA detections with relation to each abiotic variable. Data were analyzed **Overall** (all sites) and then **Lotic** and **Lentic** sites were analyzed separately.

Data Group / Abiotic Variable	U Statistic	T Statistic	P	eDNA Result (−/+)	Sample Size (n)	Missing	Median	25%	75%
OVERALL									
Flow Rate	3948.5	8433.5	0.001	−	281	0	0.00	0.00	0.01
				+	41	0	0.25	0.00	0.21
Temperature	4547.0	5408.0	0.029	−	281	0	21.00	14.15	26.10
				+	41	0	17.70	14.35	21.20
pH	4255.0	7765.0	0.014	−	280	1	6.70	6.50	6.93
				+	40	1	6.80	6.68	7.02
%DO	3115.5	6523.5	0.003	−	266	15	49.01	19.03	71.52
				+	34	7	65.95	53.71	85.43
Salinity	4582.5	7437.5	0.061	−	280	1	0.07	0.05	0.10
				+	40	1	0.08	0.07	0.10
Turbidity	3952.5	8429.5	0.001	−	281	0	11.09	4.34	20.15
				+	41	0	18.22	12.03	26.20
LOTIC									
Flow Rate	1638.5	2736.5	0.258	−	107	0	0.02	0.00	0.14
				+	35	0	0.04	0.00	0.24
Temperature	1466.5	2096.5	0.055	−	107	0	20.10	14.20	24.90
				+	35	0	17.50	14.20	20.20
pH	1403.5	2795.5	0.053	−	106	1	6.70	6.55	6.94
				+	34	1	6.80	6.67	7.02
%DO	1181.5	1968.5	0.265	−	98	9	70.52	47.61	81.21
				+	28	7	70.97	57.11	87.39
Salinity	1543.5	2655.5	0.202	−	106	1	0.07	0.05	0.08
				+	34	1	0.08	0.07	0.10
Turbidity	1785.5	2589.5	0.682	−	107	0	19.17	12.73	29.50
				+	35	0	18.50	15.89	26.50
LENTIC									
Flow Rate	456.0	477.0	0.359	−	174	0	0.00	0.00	0.00
				+	6	0	0.00	0.00	0.00
Temperature	521.5	543.5	1.000	−	174	0	21.85	14.08	27.33
				+	6	0	21.75	16.80	25.38
pH	421.5	643.5	0.425	−	174	0	6.72	6.40	6.93
				+	6	0	6.82	6.56	7.03
%DO	485.0	506.0	0.879	−	168	6	34.83	10.67	60.94
				+	6	0	33.06	11.31	65.58
Salinity	309.5	755.5	0.089	−	174	0	0.06	0.04	0.11
				+	6	0	0.11	0.08	0.11
Turbidity	369.0	390.0	0.224	−	174	0	5.39	3.11	12.90
				+	6	0	2.78	1.38	28.08

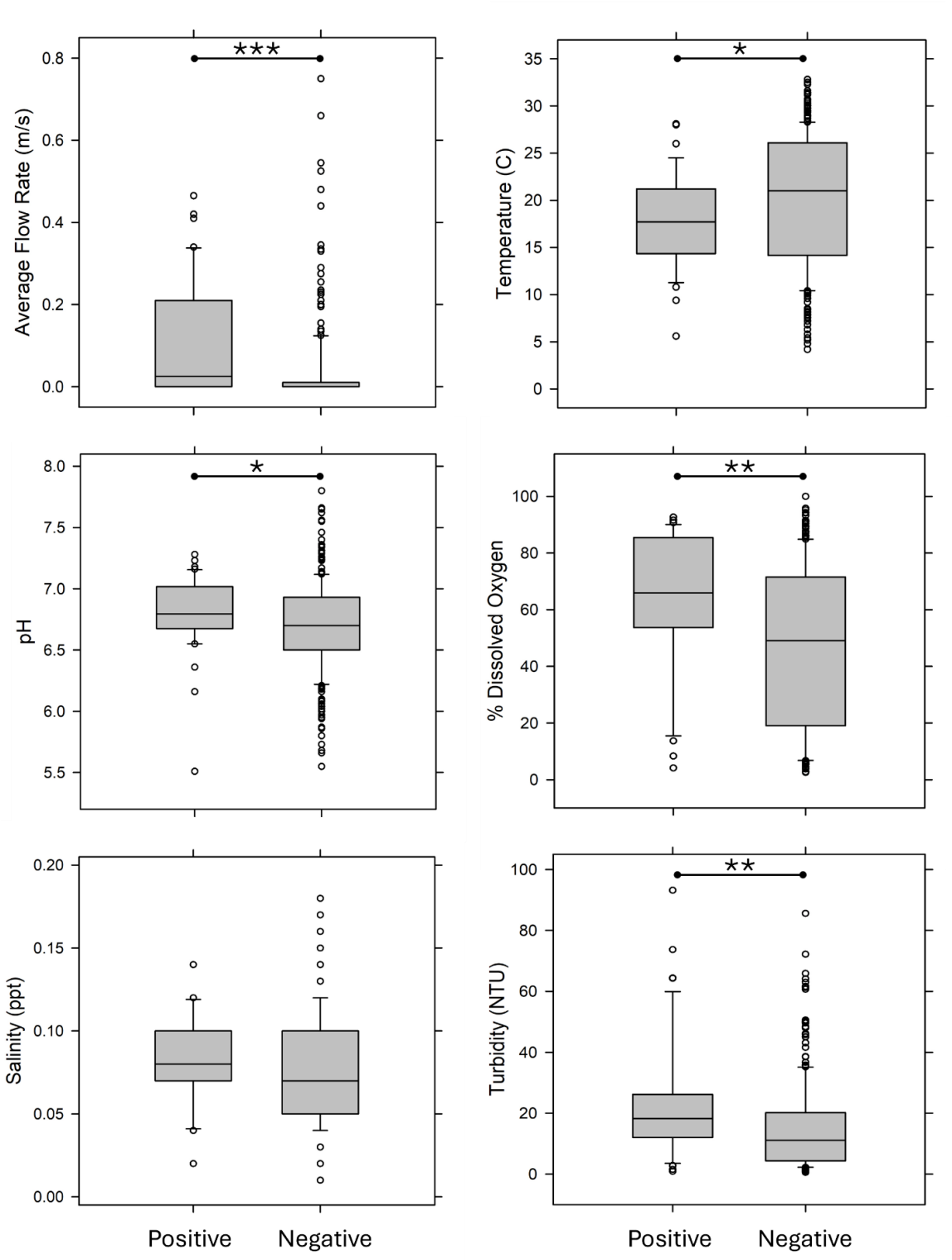


Figure 4. Statistical results (Table 4) graphically presented in box-plots showing medians of environmental variables (flow rate, temperature, pH, dissolved oxygen, salinity, and turbidity for all positive (n = 41) versus negative (n = 281) AST eDNA samples across all sites (n =9) excluding the negative control (Navasota River). Each asterisk indicates significance at the 0.05, 0.01, and 0.001 levels, respectively.

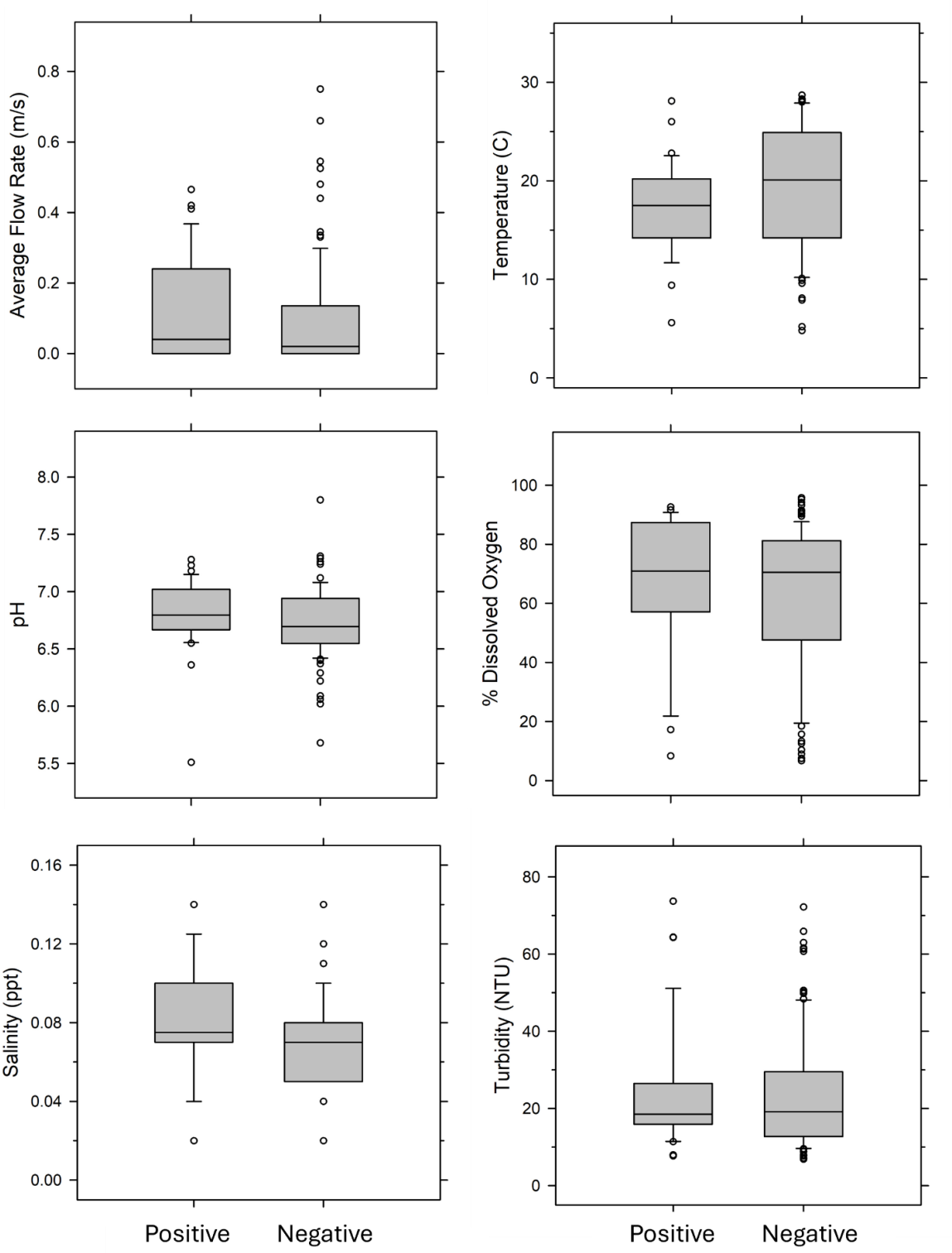


Figure 5. Statistical results (Table @4) graphically presented in box-plots showing means of environmental variables (flow rate, temperature, pH, dissolved oxygen, salinity, and turbidity for positive (n = 35) versus negative (n = 107) AST eDNA samples across all lotic sites (n = 4) excluding the negative control (Navasota River). Each asterisk indicates significance at the 0.05, 0.01, and 0.001 levels, respectively.

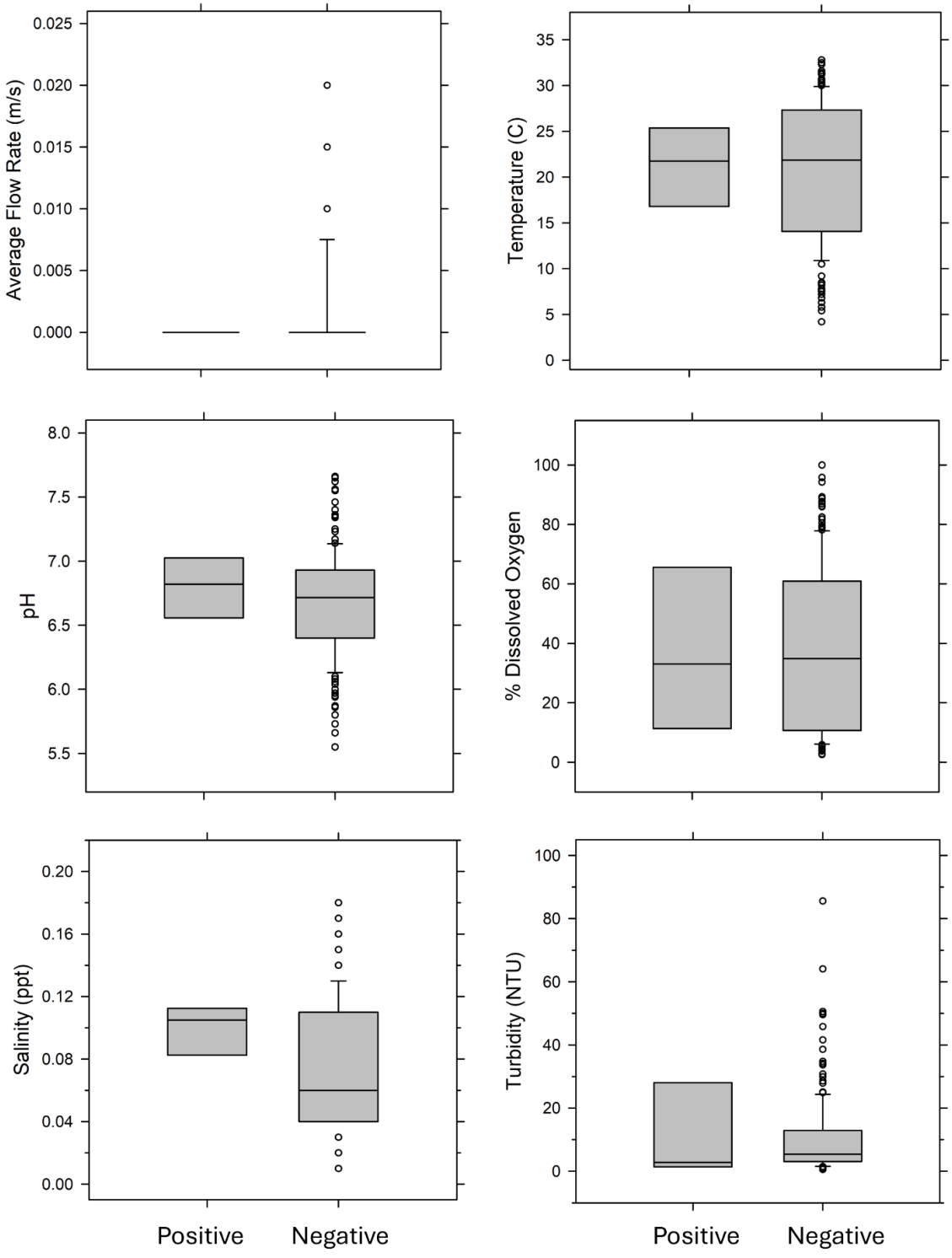


Figure 6. Statistical results (Table @4) graphically presented in box-plots showing means of environmental variables (flow rate, temperature, pH, dissolved oxygen, salinity, and turbidity for positive (n = 6) versus negative (n = 174) AST eDNA samples across all lentic sites (n = 5). Each asterisk indicates significance at the 0.05, 0.01, and 0.001 levels, respectively.

To analyze the influence of environmental variables on eDNA detection, we use R Version 4.4.3 statistical freeware to run several logistic regression models using the general linear model (glm) function. Each model used combinations of environmental variables to find the best-supported model. The global model used the following predictors: habitat type (lotic versus lentic), day of year, average flow rate, water temperature, pH, dissolved oxygen, salinity, and water turbidity. Day of year and water temperature were also included as polynomials (i.e., day of year^2 and water temperature^2) allowing these predictors to peak at intermediate values. All variables in the model were scaled and a bootstrapping approach was used to visualize uncertainty in a predictive graph (Fig 8). The model predicts highest eDNA detection (>0.50 probability) at lotic sites with a water temperature ranging between 20 and 26°C, and a probability of >0.75 for water temperatures of 20-24°C.

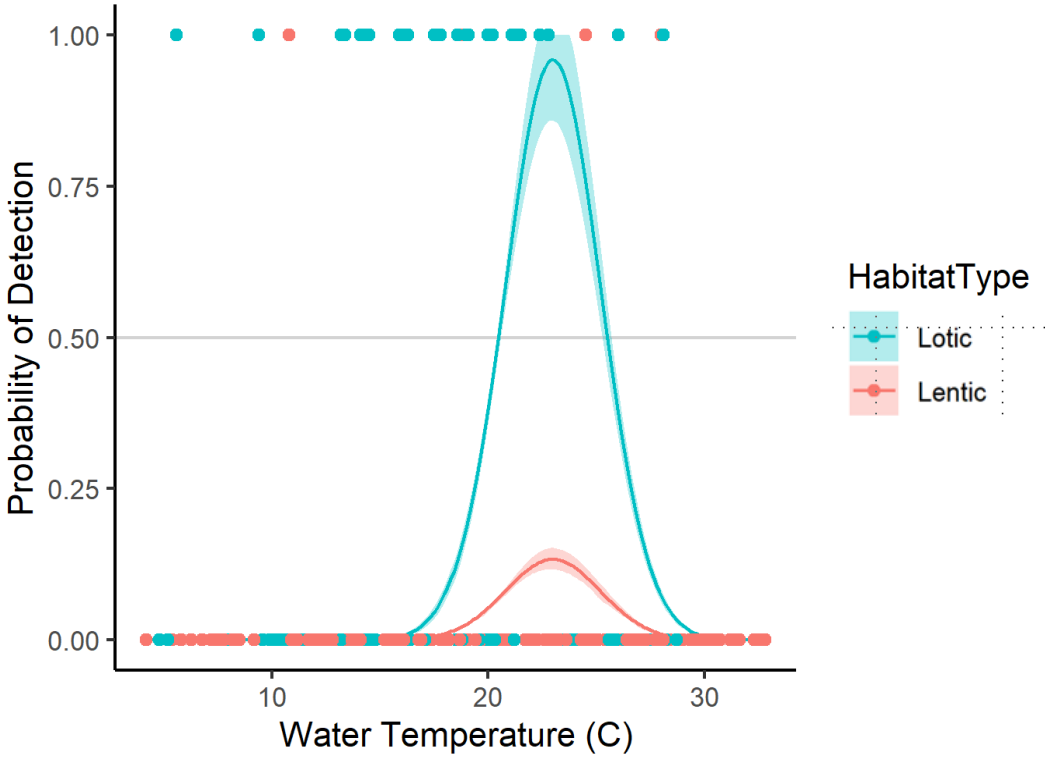


Figure 7. Predicted detection probability of AST eDNA in lotic versus lentic habitats across different water temperatures. Points represent individual sampling events. Shaded ribbons represent 95% confidence intervals.

In summary, positive eDNA samples came from sites with a higher flow rate, lower water temperature, higher percentage of dissolved oxygen, and greater surface turbidity (Fig 4, Table 4). Among lotic sites (excluding the negative control), positive samples came from lower water temperatures and higher pH on average (Fig 5, Table 4). There were no differences between the abiotic variables of positive and negative samples from lentic sites (Fig 6, Table 4). Logistic regression analyses demonstrated significance only in habitat type (lotic vs. lentic sites) and water temperature.

In habitats with flowing water, eDNA tends to remain suspended in the water column, while in stagnant water, it sinks into the sediment (Jane et al. 2015), and thus would not be detectable in a surface water sample. These factors may explain the broad disparity in positive eDNA samples between lotic and lentic sites. Because the sites in this study were previously surveyed for ASTs (Rosenbaum et al. 2022), and these turtles exhibit strong stability in occupancy over time (Rosenbaum et al. 2023a), we are assuming that the turtles were present at all sites except the Navasota River, and our results only reflect if alligator snapping turtle eDNA was detectable.

Environmental DNA persists longer in cooler water temperatures, due to decreased microbial activity breaking down eDNA particles (Pilliod et al. 2013, Strickler et al. 2015). However, cold water can also reduce the rate at which organisms shed DNA (Eichmiller et al. 2016). Further, ASTs are generally active from March through October, so the reduction in detection following November may be attributed to a reduction in AST activity and an associated reduction in the shedding of eDNA.

Sample Size Recommendations to Maximize eDNA Detection:

To recommend effective sample size for eDNA detection, we investigated the positivity detection rates of AST eDNA among stream locations (i.e., upstream, midstream, and downstream) within sites and by month (Table 5). We used these observations (n = 24 sites) that had at least one positive eDNA detection and found an overall positive detection probability of 41 of 72 water samples (3 samples per 24 sites; 56.9%) and equal to the mean detection rate of site by month observations in the last column of Table 5 (mean = 56.9, n = 24, SE = 5.49). We use the overall detection probability of 56.9% for the 24 observations (site x month) that had at least one positive eDNA detection to inform a recommended effective sample size.

With an overall detection probability of 56.9% when collecting 3 samples per site, we may assume that each sample accounts for ≈19% (i.e., 56.9% / 3) detection probability. Using simple additive probability, additional samples may increase the likelihood for eDNA detection by 19% such that 4 samples and 5 samples may provide a detection probability of 76% and 95%, respectively.

We also investigated the statistical power associated with group probabilities. Based on a 56.9% detection rate of 72 samples, an increased n = 96 (i.e., 4 samples per 24 sites) increases power to 0.832; n = 120 (i.e., 5 samples per 24 sites) increases power to 0.868 for the respective group probabilities of 76 and 95%. Based on these simple considerations, we recommend collecting five water samples per site to maximize eDNA detectability, assuming the presence of ASTs. Other sampling considerations are discussed in the Task 2C section of this report.

Table 5. AST eDNA positivity rates for sites that had at least one positive (+) eDNA detection among the three stream locations (Up-, Mid-, and Downstream positions). Percent (%) positive eDNA detections within each site is shown in the last column. The total number of positive eDNA detections among each stream position is shown for these sites (n = 24) with percent positivity rates indicating that upstream sites had the highest detection rates.

			Stream Sampling Location			
Month	Site	Habitat Type	Upstream	Midstream	Downstream	% Positive
Mar-23	BOC	Lotic	−	+	−	33.3
May-23	BOC	Lotic	+	−	−	33.3
Nov-23	BOC	Lotic	+	+	+	100
Feb-24	BOC	Lotic	+	+	−	66.7
Nov-23	BOS	Lentic	+	+	−	66.7
Jan-24	BOS	Lentic	+	−	−	33.3
Jun-23	BUS	Lentic	−	+	+	66.7
Aug-23	CAL	Lentic	+	−	−	33.3
Mar-23	ESJ	Lotic	+	−	−	33.3
Apr-23	ESJ	Lotic	+	+	+	100
Aug-23	ESJ	Lotic	+	−	−	33.3
Oct-23	ESJ	Lotic	+	+	+	100
Nov-23	ESJ	Lotic	+	+	+	100
Dec-23	ESJ	Lotic	+	+	−	66.7
Feb-24	ESJ	Lotic	+	+	−	66.7
Sep-23	GUE	Lotic	+	−	−	33.3
Nov-23	GUE	Lotic	+	−	−	33.3
Apr-23	HAB	Lotic	−	−	+	33.3
May-23	HAB	Lotic	−	+	−	33.3
Jun-23	HAB	Lotic	+	+	+	100
Aug-23	HAB	Lotic	−	+	−	33.3
Oct-23	HAB	Lotic	+	−	+	66.7
Dec-23	HAB	Lotic	+	+	−	66.7
Jan-24	HAB	Lotic	+	−	−	33.3
		Total =	**19**	**14**	**8**	
		% =	**79.2**	**58.3**	**33.3**	
					Mean =	**56.9**
					SE =	**5.49**

Task 2B – Seasonal effects on eDNA detectability

Positive eDNA detections were observed in every month except for July 2023 (Fig. 8). November 2023 had the highest monthly frequency of positive eDNA detections (9 of 41 positive samples across months) with a 22.0% positive detection rate among months. Of the 27 samples collected within November 2023 (3 samples per 10 sites, excluding the Navasota River site), the month of November produced a 33.3% eDNA detection rate (Fig. 8). Additionally, if we consider a three-month sampling period, the month of October, November, and December produced 5, 7, and 4 (Table 7a) positive eDNA detections, respectively. This result may suggest that eDNA sampling may be best conducted in the fall season to maximize eDNA detection rate.

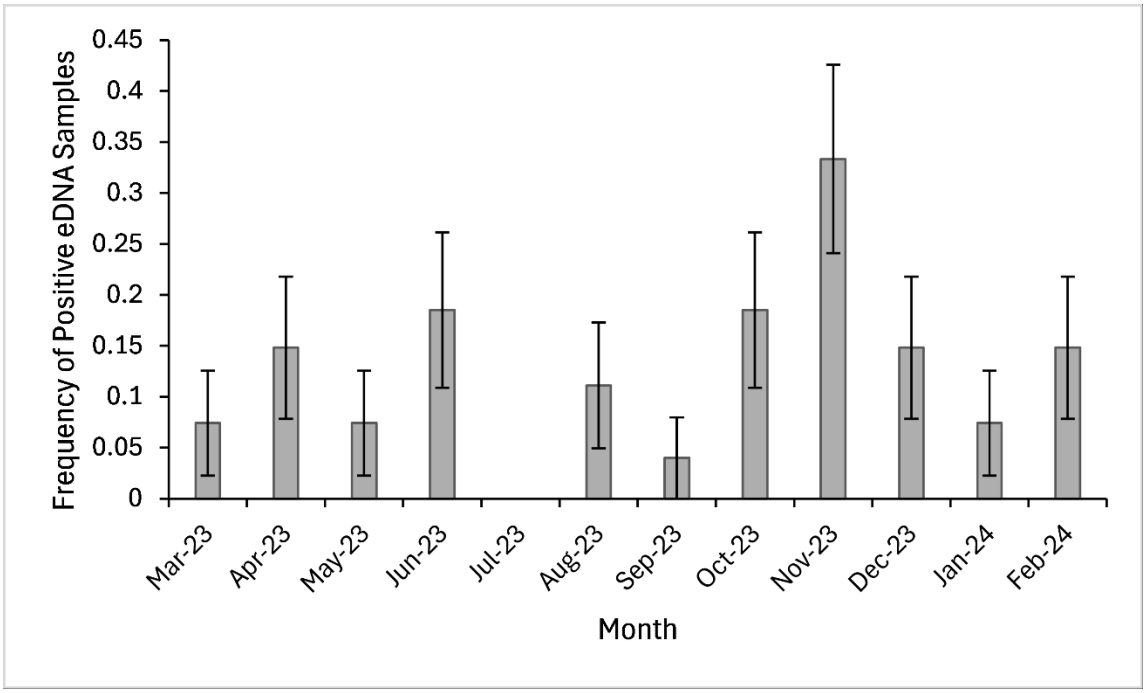


Figure 8. Monthly AST eDNA detection rates (±SE) averaged across 27 samples (3 monthly samples each from 9 sites, excluding the Navasota River negative control site), from March 2023 to February 2024.

The monthly positivity rate of samples at lotic sites for each month was always greater than or equal to that of lentic sites (Table 6a). Among the lotic samples, November had the highest frequency of positive eDNA detections (7 out of 12, 58.3%), while samples among lentic sites, eDNA detection was highest at 13.3% in June and November 2023 with only 2 of 15 positive eDNA detections (Table 6a).

Using site (rather than sample) as the unit of detection (i.e., a site with at least one of three positive samples in each month is considered "positive"), the monthly positivity rate at lotic sites for each month was always greater than that of lentic sites (Table 6b). Among the lotic sites, November had the highest frequency of positive eDNA detections (3 out of 4 sites, 75.0%), while among lentic sites the greatest eDNA detection was only 20% and detected only in the months June 2023, August 2023, November 2023, and January 2024 of the yearly sample (Table 6a, 6b). Lotic sites yielded positive eDNA samples every month except July 2023 (Table 6a, 6b).

Table 6a. Monthly AST eDNA sample positivity rates, split by lotic sites (Bonaldo Creek, East Fork San Jacinto River, Gus Engeling Wildlife Management Area, and Harrison Bayou) and lentic sites (Boggy Slough, Buzzard Slough, Caddo Lake, Ratcliff Lake, and Swede Johnson Bayou). Navasota River, a lotic site which served as a negative control, was omitted.

Month	Lotic # Samples	Lotic # Positives	Lotic % Positive	Lentic # Samples	Lentic # Positives	Lentic % Positive
Mar-23	12	2	16.7	15	0	0.0
Apr-23	12	4	33.3	15	0	0.0
May-23	12	2	16.7	15	0	0.0
Jun-23	12	3	25.0	15	2	13.3
Jul-23	12	0	0.0	15	0	0.0
Aug-23	12	2	16.7	15	1	6.7
Sep-23	10	1	10.0	15	0	0.0
Oct-23	12	5	41.7	15	0	0.0
Nov-23	12	7	58.3	15	2	13.3
Dec-23	12	4	33.3	15	0	0.0
Jan-24	12	1	8.3	15	1	6.7
Feb-24	12	4	33.3	15	0	0.0
		Mean =	**24.6**		**Mean =**	**3.3**
		SE =	**3.6**		**SE =**	**1.5**

Table 6b. Monthly AST eDNA site positivity rates, split by lotic sites (Bonaldo Creek, East Fork San Jacinto River, Gus Engeling Wildlife Management Area, and Harrison Bayou) and lentic sites (Boggy Slough, Buzzard Slough, Caddo Lake, Ratcliff Lake, and Swede Johnson Bayou). Navasota River, a lotic site which served as a negative control, was omitted.

Month	Lotic # Sites	Lotic # Positives	Lotic % Positive	Lentic # Sites	Lentic # Positives	Lentic % Positive
Mar-23	4	2	50.0	5	0	0.0
Apr-23	4	2	50.0	5	0	0.0
May-23	4	2	50.0	5	0	0.0
Jun-23	4	1	25.0	5	1	20.0
Jul-23	4	0	0.0	5	0	0.0
Aug-23	4	2	50.0	5	1	20.0
Sep-23	4	1	25.0	5	0	0.0
Oct-23	4	2	50.0	5	0	0.0
Nov-23	4	3	75.0	5	1	20.0
Dec-23	4	2	50.0	5	0	0.0
Jan-24	4	1	25.0	5	1	20.0
Feb-24	4	2	50.0	5	0	0.0
		Mean =	**41.7**		**Mean =**	**6.7**
		SE =	**5.62**		**SE =**	**2.84**

Task 2C – Developed and recommended protocols for eDNA surveys

The greatest eDNA detectability for alligator snapping turtles was observed at sites with lower water temperature and higher current velocities (flow rates), with a peak eDNA detection in November (Fig. 8). Based on these observations, we recommend selecting potential survey sites that best fit these environmental conditions and sampling regimes for eDNA should target the fall or early winter seasons and specifically in the months of October, November, and December. Such sample timing in the fall season may most accurately reflect the presence or absence of turtles using eDNA as the survey technique. Specifically, the logistic regression model presented here predicted a 50% chance of eDNA detection at lotic sites with water temperatures ranged between 20 and 26°C, and a 75% chance of detection for water temperatures between 22 and 24°C. Conversely, lentic sites with the same environmental temperature range provided less than a 20% detection probability (Fig. 7). Other abiotic variables (i.e., pH, dissolved oxygen, salinity, and turbidity) did not have a significant impact on eDNA detection in this study. The consideration of these variables and abiotic variables may be of less concern in selecting sampling sites for eDNA surveys of the alligator snapping turtle.

We used the number of positive eDNA samples (n = 41) of the total 72 water samples (i.e., three from each of 24 sites) to determine an eDNA detection rate of 56.9% (Table 5) and recommend an effective sample size (n = 5) for the collection of water samples to maximize probability of AST eDNA detection (Task 2A, Page 19). Interestingly, upstream locations had a significantly higher percentage of eDNA detections (19/24 = 79.2%; $X^2 = 8.740$, df = 2, P = 0.013) than the expected overall detection rate of 56.9% (Table 7). Similarly, we found significantly lower detections for downstream locations (8/24 = 33.3%; $X^2 = 9.788$, df = 2, P = 0.007). Midstream locations were not significantly different from expected (14/24 = 58.3%; $x^2 = 0.034$, df = 2, P = 0.983).

Table @7. Goodness of fit 3 x 2 contingency table (df = 2) analysis for comparisons of expected versus observed AST eDNA positivity rates among stream locations within the 24 sites with at least one positive eDNA detection (Table @3).

Location	Chi Square	P-value
Upstream	8.740	0.013
Midstream	0.034	0.983
Downstream	9.788	0.007
Overall	18.562	<0.001

The significantly increased detection probability (i.e., 79.2%) for eDNA in upstream sites may be used to inform future sampling protocols. Midstream sampling locations are in proximity to roads and public access points allowing for accessibility to sampling sites. The increased eDNA detection rates in upstream sites may be associated with the selection of upstream habitats by alligator snapping turtles to avoid disturbances associated with roads, overpasses, and public access. Thus, upstream habitats may have higher concentrations of AST eDNA. Likewise, significantly lower eDNA detections in downstream sites may be associated with increased drainage and runoff

associated with urban road disturbance, gradually diluting eDNA as it travels downstream and farther from the source. These results suggest that increased sampling efforts upstream from access points of disturbance may increase the probability of eDNA detection. We further note that four lentic sites were included in this analysis (i.e., all sites with positive AST eDNA detection). Thus, eDNA detection from the upper, middle, and lower sampling locations within these lake or pond lentic sites were not influence by current.

Task 3 – Contribute eDNA data to public databases

The data collected and the findings reported here for this project would not have been possible without the support of the Texas Comptroller of Public Accounts – Texas Endangered Species Management Research Program. Funding helped to support labor-intensive research efforts in monthly sample collection, travel to field sites across eastern Texas, and the processing of eDNA samples. All data collected as part of this research grant have been uploaded to the **Texas Natural Diversity Database** (TxNDD) in February 2025 and to **Dryad** in July 2025 for use by the public and interested stakeholders. These data are also presented here in this report (Appendix 1) and include the geographic locations of each eDNA sample, the alligator snapping turtle eDNA detection result (positive vs. negative), and the associated habitat and abiotic data for each sampling site and stream location within sites. These data will ultimately contribute to the TxNDD and Dryad databases and will help in their mission to disseminate information on rare species to potentially inform future conservation actions for the alligator snapping turtle.

TxNDD URL: https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/txndd/

Dryad URL: https://doi.org/10.5061/dryad.4qrfj6qpr

PROJECT SUMMARY

Previous efforts suggest that eDNA may be a useful tool to detect alligator snapping turtles, but studies were limited in their temporal scope. Here we examined, seasonally, how water quality within an aquatic system (e.g. flow rate, temperature, pH, turbidity, and other abiotic variables) may influence the detection efficacy of alligator snapping turtle eDNA and provided data that support these general sampling recommendations:

- Lotic rather than lentic sites may be preferred sampling sites as stream currents help suspend eDNA in the water column for eDNA detection.
- Field sites with water temperatures ranging from 22 to 24°C may be best of eDNA detection.
- Sampling regimes should focus eDNA collection during the months of October, November, and December.
- Increased collection of water samples from 3 to 5 samples per site may increase the probability of eDNA detection.
- Increased sampling effort in upstream locations from road and public access points may significantly increase eDNA detection rates.

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Appendix 1. Raw data of abiotic variables recorded for all months and for all sites showing eDNA detection results of positive (+) and negative (−) for the alligator snapping turtle. These data have been uploaded to the TxNDD in February 2025 (https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/txndd/) and Dryad in July 2025 (https://doi.org/10.5061/dryad.4qrfj6qpr) for public access.

Month	Collection Date	Time	Site	Latitude	Longitude	Stream Flow	Surface Current Velocity (m/sec)	Benthic Current Velocity (m/sec)	Water Temp (C)	pH	DO (mg/L)	DO (%)	Conductivity (µS/cm)	TDS (ppm)	Salinity (ppt)	Surface Turbidity (NTU)	Water Sample Volume Filtered (ml)	eDNA Detection
Mar	3/1/2023	1301	BOC1	31.5004	−94.7901	Lotic	0.01	0.01	20.0	6.94	6.03	68.5	110.3	77.9	0.05	16.42	1000	−
Mar	3/1/2023	1330	BOC2	31.4999	−94.7889	Lotic	0.03	0.03	19.1	7.03	5.79	73.0	112.3	79.3	0.06	16.80	1000	+
Mar	3/1/2023	1400	BOC3	31.4990	−94.7886	Lotic	0.02	0.02	19.5	6.90	5.64	64.4	108.4	77.4	0.05	15.97	1000	−
Mar	3/2/2023	1159	RAL1	31.3877	−95.1538	Lentic	0.01	0.01	22.1	7.35	6.90	82.5	86.2	61.1	0.04	3.54	1000	−
Mar	3/2/2023	1220	RAL2	31.3902	−95.1562	Lentic	0.02	0.00	22.6	6.98	5.34	62.6	83.2	59.7	0.04	4.66	1000	−
Mar	3/2/2023	1250	RAL3	31.3929	−95.1576	Lentic	0.01	0.01	23.0	6.76	5.05	60.0	83.7	59.4	0.04	3.47	1000	−
Mar	3/6/2023	946	CAL1	32.6981	−94.1123	Lentic	0.02	0.02	17.3	7.13	4.27	46.3	98.7	72.9	0.05	12.41	1000	−
Mar	3/6/2023	1000	CAL2	32.6983	−94.1110	Lentic	0.01	0.01	17.8	6.98	5.37	57.2	117.0	83.2	0.06	12.89	1000	−
Mar	3/6/2023	1015	CAL3	32.6972	−94.1109	Lentic	0.01	0.01	15.8	6.39	1.91	20.3	98.3	69.7	0.05	5.68	990	−
Mar	3/6/2023	1111	HAB1	32.6434	−94.1312	Lotic	0.38	0.2	15.5	7.31	6.78	73.7	287	205	0.14	14.70	1000	−
Mar	3/6/2023	1125	HAB2	32.6427	−94.1319	Lotic	0.25	0.22	15.3	7.24	6.92	74.3	285	203	0.14	14.98	1000	−
Mar	3/6/2023	1141	HAB3	32.6414	−94.1324	Lotic	0.07	0.02	15.2	7.26	6.87	73.9	288	205	0.14	14.52	1000	−
Mar	3/8/2023	920	BUS1	31.8754	−95.4224	Lentic	0.02	0.01	21.8	7.00	3.81	44.9	222	157	0.11	3.80	1000	−
Mar	3/8/2023	938	BUS2	31.8666	−95.4215	Lentic	0.01	0.01	21.9	6.82	3.14	36.7	234	166	0.12	4.61	1000	−
Mar	3/8/2023	950	BUS3	31.8636	−95.4226	Lentic	0.01	0.01	21.9	6.79	2.96	34.2	215	151	0.11	2.55	1000	−
Mar	3/8/2023	1057	GUE1	31.9201	−95.8810	Lotic	0.03	0.04	20.3	6.68	5.68	65.7	155.7	110	0.08	9.39	992	−
Mar	3/8/2023	1128	GUE2	31.9405	−95.8747	Lotic	0.08	0.08	20.1	6.55	5.71	65.6	160.8	114	0.08	10.94	1000	−
Mar	3/8/2023	1157	GUE3	31.9698	−95.8703	Lotic	0.04	0.04	20.3	6.62	6.09	70.4	162.2	115	0.08	10.39	945	−
Mar	3/13/2023	1025	NAR1	30.6074	−96.1822	Lotic	0.02	0.01	18.9	7.88	7.32	78.8	534	380	0.27	30.25	1000	−
Mar	3/13/2023	1035	NAR2	30.6076	−96.1826	Lotic	0.02	0.00	19.0	7.69	7.21	77.4	538	382	0.27	31.31	1000	−
Mar	3/13/2023	1042	NAR3	30.6079	−96.1818	Lotic	0.03	0.01	19.1	7.66	7.42	79.9	538	382	0.27	27.78	1000	−

Mar	3/15/2023	835	BOS1	31.2866	−94.8958	Lentic	0.01	0.00	13.5	7.56	2.71	26.2	270	192	0.14	0.65	1000	−
Mar	3/15/2023	900	BOS2	31.2899	−94.8959	Lentic	0.01	0.01	15.4	7.55	3.78	38.2	284	193	0.14	0.73	1000	−
Mar	3/15/2023	930	BOS3	31.2916	−94.9003	Lentic	0.02	0.02	15.7	7.65	5.73	57.5	271	192	0.14	1.19	1000	−
Mar	3/15/2023	1220	SJB1	31.9170	−93.9627	Lentic	0.01	0.01	15.8	6.50	0.55	5.5	108.0	77.2	0.06	4.80	1000	−
Mar	3/15/2023	1240	SJB2	31.9176	−93.9619	Lentic	0.01	0.01	15.2	6.33	0.26	2.6	103.9	74.0	0.05	4.49	1000	−
Mar	3/15/2023	1300	SJB3	31.9186	−93.9620	Lentic	0.01	0.01	15.5	6.39	0.77	7.7	99.9	71.6	0.05	9.49	1000	−
Mar	3/21/2023	1445	ESJ1	30.4244	−95.1246	Lotic	0.66	0.3	15.5	7.31	8.80	84.9	206	140	0.10	7.18	1000	−
Mar	3/21/2023	1500	ESJ2	30.4255	−95.1247	Lotic	0.18	0.13	13.2	7.29	8.76	84.8	226	160	0.11	6.86	1000	−
Mar	3/21/2023	1515	ESJ3	30.4262	−95.1255	Lotic	0.15	0.14	13.2	7.23	8.69	84.8	226	160	0.11	7.71	1000	+
Apr	4/3/2023	1030	CAL1	32.6981	−94.1123	Lentic	0.01	0.01	20.6	7.06	5.47	63.14	64.3	45.2	0.03	2.48	1000	−
Apr	4/3/2023	1050	CAL2	32.6983	−94.1110	Lentic	0.01	0.01	21.0	6.71	4.48	52.13	69.0	48.4	0.03	3.80	1000	−
Apr	4/3/2023	1110	CAL3	32.6972	−94.1109	Lentic	0.00	0.00	21.2	6.79	5.23	61.09	81.7	57.8	0.04	4.38	1000	−
Apr	4/3/2023	1315	HAB1	32.6434	−94.1312	Lotic	0.32	0.23	18.6	ND	6.02	65.07	ND	ND	ND	73.7	500	+
Apr	4/3/2023	1346	HAB2	32.6427	−94.1319	Lotic	0.36	0.19	18.7	ND	5.97	64.66	ND	ND	ND	72.2	500	−
Apr	4/3/2023	1442	HAB3	32.6414	−94.1324	Lotic	0.02	0.02	19.6	6.72	5.70	64.50	100.6	71.0	0.05	65.9	500	−
Apr	4/4/2023	1210	BOC1	31.5004	−94.7901	Lotic	0.00	0.00	20.1	6.66	4.71	52.47	102.3	72.6	0.05	26.5	1000	−
Apr	4/4/2023	1203	BOC2	31.4999	−94.7889	Lotic	0.01	0.00	20.1	6.70	4.26	47.46	101.4	71.8	0.05	32.0	1000	−
Apr	4/4/2023	1150	BOC3	31.4990	−94.7886	Lotic	0.01	0.00	20.2	6.79	4.46	49.79	102.0	72.1	0.05	30.2	1000	−
Apr	4/4/2023	1255	RAL1	31.3877	−95.1538	Lentic	0.03	0.01	23.6	6.89	7.29	86.93	84.2	59.6	0.04	2.25	1000	−
Apr	4/4/2023	1300	RAL2	31.3902	−95.1562	Lentic	0.00	0.00	24.6	7.12	7.35	89.30	83.1	59.0	0.04	1.43	1000	−
Apr	4/4/2023	1320	RAL3	31.3929	−95.1576	Lentic	0.00	0.00	24.9	6.96	6.59	80.52	84.5	59.9	0.04	2.46	1000	−
Apr	4/11/2023	1007	NAR1	30.6076	−96.1824	Lotic	0.41	0.02	17.1	7.32	5.87	60.83	240	170	0.12	34.7	650	−
Apr	4/11/2023	1022	NAR2	30.6077	−96.1821	Lotic	0.01	0.00	17.2	7.23	5.76	59.82	247	174	0.12	32.9	650	−
Apr	4/11/2023	1037	NAR3	30.6081	−96.1820	Lotic	0.02	0.00	17.4	7.08	5.88	61.32	245	174	0.12	32.5	600	−
Apr	4/13/2023	935	BUS1	31.8754	−95.4224	Lentic	0.00	0.00	16.9	6.74	1.50	15.48	193.6	140	0.10	6.89	950	−
Apr	4/13/2023	945	BUS2	31.8666	−95.4215	Lentic	0.00	0.01	17.4	6.72	2.23	23.26	191.7	136	0.10	10.58	1000	−
Apr	4/13/2023	1000	BUS3	31.8636	−95.4226	Lentic	0.00	0.00	17.2	6.51	1.85	19.13	188.2	134	0.09	3.58	1000	−
Apr	4/13/2023	1054	GUE1	31.9201	−95.8810	Lotic	0.02	0.03	17.1	6.64	ND	ND	147.5	105	0.07	24.3	1000	−
Apr	4/13/2023	1120	GUE2	31.9405	−95.8747	Lotic	0.17	0.10	18.0	6.45	ND	ND	151.3	107	0.08	23.3	1000	−

Apr	4/13/2023	1200	GUE3	31.9698	−95.8703	Lotic	0.02	0.03	18.5	6.62	ND	ND	150.1	107	0.08	23.6	1000	−
Apr	4/17/2023	820	BOS1	31.2866	−94.8958	Lentic	0.00	0.00	19.0	7.36	3.81	41.06	215	153	0.11	1.64	1000	−
Apr	4/17/2023	830	BOS2	31.2899	−94.8959	Lentic	0.00	0.00	20.7	7.62	6.39	71.24	217	154	0.11	2.00	1000	−
Apr	4/17/2023	840	BOS3	31.2916	−94.9003	Lentic	0.00	0.00	20.8	7.40	6.38	71.27	206	146	0.10	4.64	1000	−
Apr	4/17/2023	1040	SJB1	31.9170	−93.9627	Lentic	0.00	0.00	16.8	6.40	4.04	41.61	79.2	56.4	0.04	12.35	1000	−
Apr	4/17/2023	1055	SJB2	31.9176	−93.9619	Lentic	0.00	0.00	16.8	6.25	2.54	26.16	78.6	55.7	0.04	5.31	910	−
Apr	4/17/2023	1110	SJB3	31.9186	−93.9620	Lentic	0.00	0.00	16.9	6.26	2.23	23.01	77.4	54.9	0.04	5.48	910	−
Apr	4/19/2023	940	ESJ1	30.4244	−95.1246	Lotic	0.41	0.52	17.6	6.98	8.34	87.33	207	147	0.10	19.40	1000	+
Apr	4/19/2023	950	ESJ2	30.4255	−95.1247	Lotic	0.16	0.10	17.8	7.05	8.46	88.96	206	146	0.10	18.21	1000	+
Apr	4/19/2023	1000	ESJ3	30.4262	−95.1255	Lotic	0.41	0.21	17.7	6.97	8.33	87.41	206	146	0.10	18.55	1000	+
May	5/1/2023	927	CAL1	32.6981	−94.1123	Lentic	0.00	0.00	19.1	6.98	4.71	52.46	64.0	45.1	0.03	3.22	1000	−
May	5/1/2023	945	CAL2	32.6983	−94.1110	Lentic	0.01	0.00	19.5	6.81	6.64	74.98	94.5	66.9	0.05	14.76	825	−
May	5/1/2023	1000	CAL3	32.6972	−94.1109	Lentic	0.00	0.00	19.7	6.43	2.87	32.54	75.4	53.7	0.04	4.28	800	−
May	5/1/2023	1030	HAB1	32.6434	−94.1312	Lotic	0.28	0.14	16.3	6.99	8.47	89.54	165.5	118	0.08	35.6	900	−
May	5/1/2023	1045	HAB2	32.6427	−94.1319	Lotic	0.26	0.13	16.3	7.02	8.34	88.16	170.3	121	0.08	34.6	750	+
May	5/1/2023	1100	HAB3	32.6414	−94.1324	Lotic	0.07	0.02	16.4	6.96	8.15	86.23	171.9	122	0.09	34.5	800	−
May	5/3/2023	820	BOC1	31.5004	−94.7901	Lotic	0.00	0.00	17.4	6.64	6.53	71.83	103.3	73.6	0.05	31.7	1000	−
May	5/3/2023	830	BOC2	31.4999	−94.7889	Lotic	0.00	0.00	17.4	6.82	6.53	70.64	104.5	74.2	0.05	29.5	1000	−
May	5/3/2023	840	BOC3	31.4990	−94.7886	Lotic	0.00	0.00	17.5	7.01	6.36	68.94	104.3	74.0	0.05	30.7	1000	+
May	5/3/2023	950	RAL1	31.3877	−95.1538	Lentic	0.00	0.00	23.0	6.91	7.25	87.69	65.5	46.5	0.03	6.59	1000	−
May	5/3/2023	1000	RAL2	31.3902	−95.1562	Lentic	0.00	0.00	22.8	6.58	4.68	56.39	65.4	46.6	0.03	5.04	810	−
May	5/3/2023	1015	RAL3	31.3929	−95.1576	Lentic	0.00	0.00	22.3	6.72	5.85	69.81	64.1	45.8	0.03	8.94	680	−
May	5/8/2023	1000	NAR1	30.6074	−96.1822	Lotic	0.01	0.01	24.5	7.56	6.30	75.54	356	253	0.18	48.6	850	−
May	5/8/2023	1015	NAR2	30.6076	−96.1826	Lotic	0.00	0.00	24.7	7.47	6.17	74.26	358	254	0.18	39.5	700	−
May	5/8/2023	1030	NAR3	30.6079	−96.1818	Lotic	0.01	0.00	24.3	7.43	6.56	78.37	356	254	0.18	48.7	880	−
May	5/10/2023	900	BUS1	31.8754	−95.4224	Lentic	0.00	0.00	22.9	6.74	1.61	18.73	208	148	0.11	2.25	1000	−
May	5/10/2023	920	BUS2	31.8666	−95.4215	Lentic	0.00	0.01	23.0	6.68	2.02	23.55	203	144	0.10	3.14	1000	−
May	5/10/2023	940	BUS3	31.8636	−95.4226	Lentic	0.00	0.00	23.0	6.61	1.21	14.10	204	144	0.10	2.23	1000	−
May	5/10/2023	1020	GUE1	31.9201	−95.8810	Lotic	0.02	0.03	23.3	6.75	5.33	62.49	144.5	102	0.07	19.74	1000	−

May	5/10/2023	1040	GUE2	31.9405	−95.8747	Lotic	0.12	0.12	23.5	6.46	4.05	47.66	146.2	104	0.07	22.0	980	−
May	5/10/2023	1105	GUE3	31.9698	−95.8703	Lotic	0.07	0.03	23.8	6.61	4.61	54.56	144.2	103	0.07	18.98	919	−
May	5/15/2023	815	BOS1	31.2866	−94.8958	Lentic	0.00	0.00	24.6	6.89	0.60	7.29	185.4	131	0.09	2.94	880	−
May	5/15/2023	830	BOS2	31.2899	−94.8959	Lentic	0.00	0.00	25.6	6.99	1.05	13.00	183.4	130	0.09	2.14	1000	−
May	5/15/2023	845	BOS3	31.2916	−94.9003	Lentic	0.00	0.00	26.1	7.10	2.92	36.47	183.1	130	0.09	3.63	1000	−
May	5/15/2023	1025	SJB1	31.9170	−93.9627	Lentic	0.00	0.00	23.0	6.46	2.95	34.78	90.8	64.4	0.05	33.7	725	−
May	5/15/2023	1040	SJB2	31.9170	−93.9615	Lentic	0.00	0.00	23.2	6.48	3.06	36.21	95.2	67.4	0.05	34.2	700	−
May	5/15/2023	1050	SJB3	31.9172	−93.9607	Lentic	0.00	0.00	23.3	6.51	3.29	39.01	96.9	68.6	0.05	34.8	695	−
May	5/17/2023	930	ESJ1	30.4244	−95.1246	Lotic	0.16	0.12	23.0	6.97	6.20	73.09	96.1	68.3	0.05	61.3	550	−
May	5/17/2023	940	ESJ2	30.4255	−95.1247	Lotic	0.41	0.26	23.0	6.90	6.40	75.45	96.5	68.5	0.05	60.7	550	−
May	5/17/2023	950	ESJ3	30.4262	−95.1255	Lotic	0.68	0.41	23.0	6.87	6.30	74.27	96.2	68.4	0.05	61.6	600	−
Jun	6/1/2023	1035	CAL1	32.6981	−94.1123	Lentic	0.00	0.00	27.4	6.74	2.44	31.20	88.0	62.7	0.04	1.68	950	−
Jun	6/1/2023	1045	CAL2	32.6983	−94.1110	Lentic	0.00	0.00	29.8	6.73	5.21	69.51	99.5	70.8	0.05	5.06	1000	−
Jun	6/1/2023	1100	CAL3	32.6972	−94.1109	Lentic	0.00	0.00	29.3	6.53	2.19	28.97	96.2	68.4	0.05	9.55	820	−
Jun	6/1/2023	940	HAB1	32.6434	−94.1312	Lotic	0.04	0.04	21.1	7.28	4.82	54.77	279	198	0.14	25.9	1000	+
Jun	6/1/2023	1000	HAB2	32.6427	−94.1319	Lotic	0.04	0.04	21.3	7.12	4.43	50.54	279	198	0.14	25.0	1000	+
Jun	6/1/2023	1015	HAB3	32.6414	−94.1324	Lotic	0.00	0.00	21.5	7.18	4.87	55.77	282	200	0.14	26.7	1000	+
Jun	6/5/2023	815	BOC1	31.5004	−94.7901	Lotic	0.00	0.00	21.7	6.54	5.02	21.70	92.3	65.1	0.05	35.8	890	−
Jun	6/5/2023	825	BOC2	31.4999	−94.7889	Lotic	0.01	0.00	21.7	6.61	5.36	61.62	92.2	65.2	0.05	35.2	885	−
Jun	6/5/2023	835	BOC3	31.4990	−94.7886	Lotic	0.00	0.00	21.7	6.68	4.98	57.26	92.6	65.7	0.05	38.5	830	−
Jun	6/5/2023	920	RAL1	31.3877	−95.1538	Lentic	0.00	0.00	27.3	6.65	5.10	65.10	73.0	51.9	0.04	3.39	1000	−
Jun	6/5/2023	930	RAL2	31.3902	−95.1562	Lentic	0.00	0.00	27.1	6.59	4.83	61.44	74.0	52.4	0.04	3.02	1000	−
Jun	6/5/2023	945	RAL3	31.3929	−95.1576	Lentic	0.00	0.00	26.4	6.44	2.40	30.14	76.6	54.6	0.04	4.11	1000	−
Jun	6/6/2023	1000	NAR1	30.6074	−96.1822	Lotic	0.00	0.01	24.5	7.21	5.67	68.76	331	235	0.17	71.5	810	−
Jun	6/6/2023	1015	NAR2	30.6076	−96.1826	Lotic	0.00	0.00	24.8	7.10	5.73	69.88	335	242	0.17	62.0	800	−
Jun	6/6/2023	1030	NAR3	30.6079	−96.1818	Lotic	0.00	0.01	24.8	7.03	5.56	67.81	325	232	0.16	81.5	770	−
Jun	6/8/2023	850	BUS1	31.8754	−95.4224	Lentic	0.00	0.00	24.5	6.69	1.64	19.89	170.8	121	0.09	2.82	980	+
Jun	6/8/2023	900	BUS2	31.8666	−95.4215	Lentic	0.00	0.00	24.5	6.71	1.13	13.70	201	143	0.10	6.37	920	+
Jun	6/8/2023	915	BUS3	31.8636	−95.4226	Lentic	0.00	0.00	25.1	6.58	0.46	5.64	196.9	140	0.10	5.78	930	−

Jun	6/8/2023	1025	GUE1	31.9201	−95.8810	Lotic	0.03	0.05	24.1	6.88	5.59	67.29	145.1	103	0.07	36.7	1000	–
Jun	6/8/2023	1040	GUE2	31.9405	−95.8747	Lotic	0.12	0.15	24.0	6.58	3.39	40.73	145.5	104	0.07	33.3	1000	–
Jun	6/8/2023	1105	GUE3	31.9698	−95.8703	Lotic	0.02	0.05	24.9	6.84	5.28	64.51	137.6	98.0	0.07	22.9	1000	–
Jun	6/12/2023	855	BOS1	31.2866	−94.8958	Lentic	0.00	0.00	26.5	6.96	0.70	8.81	197.7	140	0.10	2.18	950	–
Jun	6/12/2023	905	BOS2	31.2899	−94.8959	Lentic	0.00	0.00	28.4	7.00	0.90	11.72	207	146	0.10	2.74	1000	–
Jun	6/12/2023	915	BOS3	31.2916	−94.9003	Lentic	0.01	0.00	29.5	7.17	3.34	44.33	203	145	0.10	2.01	1000	–
Jun	6/12/2023	1115	SJB1	31.9170	−93.9627	Lentic	0.00	0.00	24.4	6.10	0.51	6.17	89.2	64.6	0.05	13.77	750	–
Jun	6/12/2023	1130	SJB2	31.9176	−93.9619	Lentic	0.00	0.00	24.5	5.97	0.22	2.67	99.8	70.6	0.05	12.86	650	–
Jun	6/12/2023	1145	SJB3	31.9186	−93.9620	Lentic	0.00	0.00	24.3	6.08	0.23	2.78	91.2	64.5	0.05	17.74	840	–
Jun	6/14/2023	1000	ESJ1	30.4244	−95.1246	Lotic	0.75	0.75	24.8	6.96	7.17	87.44	168.9	120	0.08	48.4	920	–
Jun	6/14/2023	1020	ESJ2	30.4255	−95.1247	Lotic	0.27	0.19	24.8	6.95	7.02	85.61	166.0	118	0.08	48.0	930	–
Jun	6/14/2023	1035	ESJ3	30.4262	−95.1255	Lotic	0.41	0.25	24.9	6.91	7.00	85.53	164.4	116	0.08	43.1	920	–
Jul	7/5/2023	813	BOC1	31.5004	−94.7901	Lotic	0.00	0.00	25.8	6.55	0.54	6.71	109.4	77.6	0.05	27.2	1000	–
Jul	7/5/2023	825	BOC2	31.4999	−94.7889	Lotic	0.00	0.00	25.9	6.59	0.72	8.96	111.3	78.8	0.06	24.1	1000	–
Jul	7/5/2023	835	BOC3	31.4990	−94.7886	Lotic	0.00	0.00	26.1	6.67	0.83	10.37	112.4	79.8	0.06	22.6	1000	–
Jul	7/5/2023	915	RAL1	31.3877	−95.1538	Lentic	0.00	0.00	31.4	6.79	4.41	60.48	80.6	57.0	0.04	3.44	1000	–
Jul	7/5/2023	925	RAL2	31.3902	−95.1562	Lentic	0.00	0.00	31.2	6.76	3.72	50.84	79.6	56.5	0.04	3.98	1000	–
Jul	7/5/2023	936	RAL3	31.3929	−95.1576	Lentic	0.00	0.00	30.7	6.57	2.12	28.73	82.1	58.0	0.04	3.29	1000	–
Jul	7/6/2023	1020	CAL1	32.6981	−94.1123	Lentic	0.00	0.00	29.0	6.36	1.03	13.55	85.6	60.8	0.04	2.54	1000	–
Jul	7/6/2023	1035	CAL2	32.6983	−94.1110	Lentic	0.00	0.00	30.7	6.67	3.76	50.95	98.9	70.4	0.05	2.89	1000	–
Jul	7/6/2023	1045	CAL3	32.6972	−94.1109	Lentic	0.00	0.00	27.7	6.16	0.53	6.81	94.3	67.0	0.05	2.96	1000	–
Jul	7/6/2023	915	HAB1	32.6434	−94.1312	Lotic	0.04	0.02	25.6	7.12	3.40	42.08	246	175	0.12	16.98	920	–
Jul	7/6/2023	930	HAB2	32.6427	−94.1319	Lotic	0.05	0.03	25.8	7.08	2.40	29.81	249	176	0.12	16.98	1000	–
Jul	7/6/2023	945	HAB3	32.6414	−94.1324	Lotic	0.00	0.01	26.3	7.07	2.56	32.09	251	177	0.12	22.2	1000	–
Jul	7/10/2023	1005	NAR1	30.6074	−96.1822	Lotic	0.01	0.01	32.1	7.51	5.69	78.97	592	420	0.30	23.2	1000	–
Jul	7/10/2023	1015	NAR2	30.6076	−96.1826	Lotic	0.00	0.01	32.4	7.62	6.74	94.01	586	417	0.29	28.5	1000	–
Jul	7/10/2023	1030	NAR3	30.6079	−96.1818	Lotic	0.01	0.02	31.9	7.46	5.53	76.49	586	419	0.30	30.1	1000	–
Jul	7/17/2023	930	BUS1	31.8754	−95.4224	Lentic	0.00	0.00	27.5	6.68	1.36	17.42	167.6	119	0.08	7.4	1000	–
Jul	7/17/2023	940	BUS2	31.8666	−95.4215	Lentic	0.00	0.00	27.5	6.67	0.57	7.30	228	162	0.11	50.0	1000	–

Jul	7/17/2023	950	BUS3	31.8636	−95.4226	Lentic	0.00	0.00	27.2	6.53	0.46	5.86	219	155	0.11	17.77	800	−
Jul	7/17/2023	1040	GUE1	31.9201	−95.8810	Lotic	0.00	0.00	27.2	7.08	6.51	82.96	158.8	113	0.08	18.49	1000	−
Jul	7/17/2023	1105	GUE2	31.9405	−95.8747	Lotic	0.04	0.06	27.5	6.70	3.24	41.51	155.8	111	0.08	27.6	1000	−
Jul	7/17/2023	1130	GUE3	31.9698	−95.8703	Lotic	0.01	0.01	27.9	6.87	4.74	61.16	126.4	92.3	0.06	12.73	1000	−
Jul	7/19/2023	910	ESJ1	30.4244	−95.1246	Lotic	0.01	Shallow	27.9	6.86	6.44	83.10	153.3	109	0.08	7.85	1000	−
Jul	7/19/2023	925	ESJ2	30.4255	−95.1247	Lotic	0.04	0.07	27.9	6.93	5.91	76.26	150.5	105	0.07	8.81	1000	−
Jul	7/19/2023	940	ESJ3	30.4262	−95.1255	Lotic	0.19	0.21	28.0	6.87	5.97	77.17	149.3	106	0.07	7.74	1000	−
Jul	7/20/2023	810	BOS1	31.2866	−94.8958	Lentic	0.00	0.00	29.4	6.95	0.65	8.61	304	215	0.15	5.20	650	−
Jul	7/20/2023	820	BOS2	31.2899	−94.8959	Lentic	0.00	0.00	30.3	7.01	0.39	5.25	307	218	0.15	3.68	925	−
Jul	7/20/2023	830	BOS3	31.2916	−94.9003	Lentic	0.00	0.00	31.6	7.23	1.64	22.57	283	202	0.14	4.97	910	−
Jul	7/20/2023	1015	SJB1	31.9170	−93.9627	Lentic	0.00	0.00	28.0	6.23	0.57	7.37	123.6	87.0	0.06	8.20	650	−
Jul	7/20/2023	1025	SJB2	31.9176	−93.9619	Lentic	0.00	0.00	28.0	6.06	0.42	5.43	157.2	111	0.08	22.5	650	−
Jul	7/20/2023	1040	SJB3	31.9186	−93.9620	Lentic	0.00	0.00	27.8	6.18	0.52	6.70	114.9	81.8	0.06	4.99	700	−
Aug	8/1/2023	1025	CAL1	32.6981	−94.1123	Lentic	0.00	0.00	28.9	6.28	1.76	23.12	91.1	64.7	0.05	5.37	1000	−
Aug	8/1/2023	1045	CAL2	32.6983	−94.1110	Lentic	0.00	0.00	32.5	6.64	2.08	29.06	106.0	75.3	0.05	3.89	1000	−
Aug	8/1/2023	1100	CAL3	32.6972	−94.1109	Lentic	0.00	0.00	28.0	6.16	0.32	4.14	115.6	83.3	0.06	93.2	985	+
Aug	8/1/2023	905	HAB1	32.6434	−94.1312	Lotic	0.00	0.00	25.6	7.08	1.58	19.56	188.7	135	0.09	22.0	990	−
Aug	8/1/2023	925	HAB2	32.6427	−94.1319	Lotic	0.00	0.00	26.0	7.07	0.67	8.35	194.1	138	0.10	13.10	1000	+
Aug	8/1/2023	945	HAB3	32.6414	−94.1324	Lotic	0.00	0.00	27.5	7.03	1.44	18.45	182.5	129	0.09	24.1	875	−
Aug	8/3/2023	1005	NAR1	30.6074	−96.1822	Lotic	0.01	0.00	32.4	7.55	5.57	77.69	672	476	0.34	27.9	1000	−
Aug	8/3/2023	1015	NAR2	30.6076	−96.1826	Lotic	0.00	0.00	32.4	8.27	7.25	100	667	473	0.33	30.2	775	−
Aug	8/3/2023	1030	NAR3	30.6079	−96.1818	Lotic	0.00	0.00	32.3	7.59	5.43	75.61	667	474	0.33	36.1	1000	−
Aug	8/7/2023	810	BOC1	31.5004	−94.7901	Lotic	0.00	0.00	28.1	6.54	0.58	7.51	113.5	80.2	0.06	16.14	1000	−
Aug	8/7/2023	820	BOC2	31.4999	−94.7889	Lotic	0.00	0.00	28.3	6.53	0.52	6.72	113.6	80.7	0.06	16.56	1000	−
Aug	8/7/2023	830	BOC3	31.4990	−94.7886	Lotic	0.00	0.00	28.0	6.57	1.03	13.31	117.5	83.5	0.06	15.24	1000	−
Aug	8/7/2023	910	RAL1	31.3877	−95.1538	Lentic	0.00	0.00	32.8	6.98	5.09	71.48	89.2	63.2	0.04	4.55	1000	−
Aug	8/7/2023	920	RAL2	31.3902	−95.1562	Lentic	0.00	0.00	32.3	6.93	4.39	61.13	89.7	63.0	0.04	3.30	1000	−
Aug	8/7/2023	935	RAL3	31.3929	−95.1576	Lentic	0.00	0.00	32.3	6.74	2.40	33.42	89.4	63.4	0.04	3.11	1000	−
Aug	8/8/2023	845	BUS1	31.8754	−95.4224	Lentic	0.00	0.00	27.4	6.93	1.43	18.29	189.1	134	0.09	10.01	900	−

Aug	8/8/2023	900	BUS2	31.8666	−95.4215	Lentic	0.00	0.00	28.1	6.85	0.70	9.06	254	180	0.13	49.6	1000	−
Aug	8/8/2023	910	BUS3	31.8636	−95.4226	Lentic	0.00	0.00	27.9	6.68	0.52	6.71	227	163	0.11	12.93	850	−
Aug	8/8/2023	1000	GUE1	31.9201	−95.8810	Lotic	0.00	0.00	28.2	7.08	5.84	75.76	170.0	121	0.08	13.31	1000	−
Aug	8/8/2023	1025	GUE2	31.9405	−95.8747	Lotic	0.00	0.00	27.8	6.66	3.30	42.51	160.2	114	0.08	19.45	1000	−
Aug	8/8/2023	1045	GUE3	31.9698	−95.8703	Lotic	0.00	0.00	28.7	6.78	3.90	51.04	117.8	84.0	0.06	13.16	1000	−
Aug	8/9/2023	910	ESJ1	30.4244	−95.1246	Lotic	0.44	Shallow	28.1	6.67	5.87	78.01	133.1	94.4	0.07	7.96	1000	−
Aug	8/9/2023	925	ESJ2	30.4255	−95.1247	Lotic	0.00	0.01	28.0	6.70	5.29	70.18	133.0	94.3	0.07	7.72	1000	−
Aug	8/9/2023	940	ESJ3	30.4262	−95.1255	Lotic	0.16	0.19	28.1	6.70	5.56	73.89	132.6	94.0	0.07	7.99	1000	+
Aug	8/10/2023	810	BOS1	31.2866	−94.8958	Lentic	0.00	0.00	29.7	6.74	0.79	10.52	292	209	0.15	16.71	750	−
Aug	8/10/2023	820	BOS2	31.2899	−94.8959	Lentic	0.00	0.00	30.7	6.80	0.48	6.50	257	183	0.13	3.11	1000	−
Aug	8/10/2023	830	BOS3	31.2916	−94.9003	Lentic	0.00	0.00	30.7	6.98	2.72	36.86	231	164	0.12	13.04	1000	−
Aug	8/10/2023	1015	SJB1	31.9170	−93.9627	Lentic	0.00	0.00	28.1	6.38	0.29	3.76	122.5	87.0	0.06	10.90	600	−
Aug	8/10/2023	1025	SJB2	31.9176	−93.9619	Lentic	0.00	0.00	27.9	6.38	0.35	4.52	113.9	81.1	0.06	9.22	590	−
Aug	8/10/2023	1040	SJB3	31.9186	−93.9620	Lentic	0.00	0.00	28.0	6.40	0.34	4.40	112.6	79.8	0.06	38.6	710	−
Sep	9/5/2023		CAL1	32.6981	−94.1123	Lentic	0.00	0.00	26.6	6.32	1.11	13.99	106.2	78.7	0.05	23.8	1000	−
Sep	9/5/2023		CAL2	32.6983	−94.1110	Lentic	0.00	0.00	28.4	6.68	2.20	28.64	117.1	83.2	0.06	2.26	1000	−
Sep	9/5/2023		CAL3	32.6972	−94.1109	Lentic	0.00	0.00	27.2	6.04	1.84	23.45	168.1	120	0.09	25.1	700	−
Sep	9/5/2023		HAB1	32.6434	−94.1312	Lotic	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY		
Sep	9/5/2023		HAB2	32.6427	−94.1319	Lotic	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY		
Sep	9/5/2023		HAB3	32.6414	−94.1324	Lotic	0.00	0.00	25.9	7.26	1.01	12.57	245	176	0.12	24.8	1000	−
Sep	9/6/2023		BOC1	31.5004	−94.7901	Lotic	0.00	0.00	25.5	6.42	2.50	30.89	104.1	74.1	0.05	10.25	1000	−
Sep	9/6/2023		BOC2	31.4999	−94.7889	Lotic	0.00	0.00	25.5	6.48	2.44	30.14	108.6	76.7	0.05	13.57	1000	−
Sep	9/6/2023		BOC3	31.4990	−94.7886	Lotic	0.00	0.00	25.5	6.46	2.13	26.31	111.6	79.0	0.06	16.63	1000	−
Sep	9/6/2023		RAL1	31.3877	−95.1538	Lentic	0.00	0.00	31.2	7.17	7.01	95.81	96.0	68.8	0.05	4.17	1000	−
Sep	9/6/2023		RAL2	31.3902	−95.1562	Lentic	0.00	Shallow	31.3	7.14	7.40	100	95.6	68.8	0.05	14.70	1000	−
Sep	9/6/2023		RAL3	31.3929	−95.1576	Lentic	0.00	0.00	30.0	6.89	3.54	47.40	97.5	68.7	0.05	5.65	1000	−
Sep	9/7/2023		NAR1	30.6074	−96.1822	Lotic	0.00	0.00	30.8	7.57	6.20	84.16	715	509	0.36	38.5	1000	−
Sep	9/7/2023		NAR2	30.6076	−96.1826	Lotic	0.00	0.00	31.3	7.58	5.94	81.33	729	517	0.36	30.7	1000	−
Sep	9/7/2023		NAR3	30.6079	−96.1818	Lotic	0.00	0.00	30.8	7.57	5.98	81.18	714	506	0.36	46.9	1000	−

Sep	9/18/2023	ESJ1	30.4244	−95.1246	Lotic	0.36	0.33	23.5	6.54	6.33	75.34	145.5	104	0.07	10.22	1000	−
Sep	9/18/2023	ESJ2	30.4255	−95.1247	Lotic	0.08	0.11	23.5	6.57	6.36	75.69	151.0	106	0.08	10.20	1000	−
Sep	9/18/2023	ESJ3	30.4262	−95.1255	Lotic	0.18	0.21	23.5	6.52	6.36	75.69	152.1	108	0.08	9.98	1000	−
Sep	9/19/2023	BUS1	31.8754	−95.4224	Lentic	0.00	0.00	21.7	6.86	2.83	32.54	245	173	0.12	10.10	1000	−
Sep	9/19/2023	BUS2	31.8666	−95.4215	Lentic	0.00	0.00	22.6	6.90	0.91	10.65	356	253	0.18	17.80	825	−
Sep	9/19/2023	BUS3	31.8636	−95.4226	Lentic	0.00	0.00	22.0	6.84	0.96	11.10	304	212	0.15	20.2	1000	−
Sep	9/19/2023	GUE1	31.9201	−95.8810	Lotic	0.00	0.00	22.1	6.94	7.84	90.84	169.8	128	0.09	11.56	1000	−
Sep	9/19/2023	GUE2	31.9405	−95.8747	Lotic	0.03	0.01	22.3	6.09	4.79	55.72	180.1	128	0.09	16.41	1000	−
Sep	9/19/2023	GUE3	31.9698	−95.8703	Lotic	0.00	0.00	22.8	6.56	6.29	73.87	130.5	93.0	0.07	15.96	1000	+
Sep	9/21/2023	BOS1	31.2866	−94.8958	Lentic	0.00	0.00	24.2	6.94	0.89	10.73	333	237	0.17	6.15	980	−
Sep	9/21/2023	BOS2	31.2899	−94.8959	Lentic	0.00	0.00	25.4	6.93	2.90	35.76	218	155	0.11	6.03	1000	−
Sep	9/21/2023	BOS3	31.2916	−94.9003	Lentic	0.00	0.00	26.3	6.72	2.74	34.35	213	151	0.11	13.92	1000	−
Sep	9/21/2023	SJB1	31.9170	−93.9627	Lentic	0.00	0.00	22.7	6.46	0.84	9.85	228	162	0.11	12.34	425	−
Sep	9/21/2023	SJB2	31.9176	−93.9619	Lentic	0.00	0.00	23.6	6.51	0.71	8.47	228	163	0.11	28.6	340	−
Sep	9/21/2023	SJB3	31.9186	−93.9620	Lentic	0.00	0.00	22.2	6.63	0.46	5.34	143.0	101	0.07	8.54	600	−
Oct	10/3/2023	CAL1	32.6981	−94.1123	Lentic	0.00	0.00	20.6	6.40	1.66	18.68	99.9	71.1	0.05	3.13	975	−
Oct	10/3/2023	CAL2	32.6983	−94.1110	Lentic	0.00	0.00	26.0	6.64	4.08	50.87	113.4	80.8	0.06	1.89	1000	−
Oct	10/3/2023	CAL3	32.6972	−94.1109	Lentic	0.00	0.00	23.5	6.20	0.49	5.83	118.8	84.5	0.06	50.6	600	−
Oct	10/3/2023	HAB1	32.6434	−94.1312	Lotic	0.00	0.00	21.3	6.60	1.96	22.36	209	145	0.10	15.89	950	+
Oct	10/3/2023	HAB2	32.6427	−94.1319	Lotic	0.00	0.00	21.2	6.64	1.38	15.71	207	148	0.10	14.99	940	−
Oct	10/3/2023	HAB3	32.6414	−94.1324	Lotic	0.00	0.00	22.4	6.66	1.48	17.25	198.4	142	0.10	26.5	980	+
Oct	10/4/2023	BOC1	31.5004	−94.7901	Lotic	0.00	0.00	23.1	6.46	1.76	20.79	96.3	68.4	0.05	23.7	1000	−
Oct	10/4/2023	BOC2	31.4999	−94.7889	Lotic	0.00	0.00	23.3	6.50	2.41	28.57	97.2	69.0	0.05	20.8	1000	−
Oct	10/4/2023	BOC3	31.4990	−94.7886	Lotic	0.00	0.00	23.3	6.53	1.90	22.53	102.8	72.9	0.05	19.93	1000	−
Oct	10/4/2023	RAL1	31.3877	−95.1538	Lentic	0.00	0.00	27.7	6.88	6.14	78.94	95.2	67.7	0.05	5.19	1000	−
Oct	10/4/2023	RAL2	31.3902	−95.1562	Lentic	0.00	0.00	27.7	6.99	6.05	77.79	95.3	68.1	0.05	11.86	1000	−
Oct	10/4/2023	RAL3	31.3929	−95.1576	Lentic	0.00	0.00	26.8	6.87	3.25	41.12	96.8	69.3	0.05	13.50	1000	−
Oct	10/12/2023	BOS1	31.2866	−94.8958	Lentic	0.00	0.00	19.0	6.98	1.96	21.36	246	175	0.12	1.68	1000	−
Oct	10/12/2023	BOS2	31.2899	−94.8959	Lentic	0.00	0.00	20.2	6.81	2.60	29.02	218	155	0.11	1.48	1000	−

Oct	10/12/2023		BOS3	31.2916	−94.9003	Lentic	0.00	0.00	20.9	6.86	2.84	32.14	206	147	0.10	3.22	1000	−
Oct	10/12/2023		SJB1	31.9170	−93.9627	Lentic	0.00	0.00	18.2	6.43	0.98	10.51	193.9	139	0.10	10.16	1000	−
Oct	10/12/2023		SJB2	31.9176	−93.9619	Lentic	0.00	0.00	18.7	6.75	3.94	42.67	179.8	128	0.09	15.93	450	−
Oct	10/12/2023		SJB3	31.9186	−93.9620	Lentic	0.00	0.00	17.9	6.51	0.62	6.61	165.5	118	0.08	24.9	695	−
Oct	10/13/2023	1138	ESJ1	30.4244	−95.1246	Lotic	0.34	0.34	20.0	6.75	ND	ND	142.9	101	0.07	18.5	1000	+
Oct	10/13/2023	1153	ESJ2	30.4255	−95.1247	Lotic	0.01	0.16	20.2	6.81	ND	ND	142.3	102	0.07	19.13	1000	+
Oct	10/13/2023	1208	ESJ3	30.4262	−95.1255	Lotic	0.32	0.34	20.1	6.75	ND	ND	143.5	102	0.07	20.5	1000	+
Oct	10/13/2023	910	NAR1	30.6074	−96.1822	Lotic	0.00	0.00	22.0	7.76	ND	ND	370	264	0.19	55.3	1000	−
Oct	10/13/2023	925	NAR2	30.6076	−96.1826	Lotic	0.00	0.00	22.3	7.67	ND	ND	371	264	0.19	40.5	1000	−
Oct	10/13/2023	940	NAR3	30.6079	−96.1818	Lotic	0.00	0.00	22.3	7.69	ND	ND	374	266	0.19	45.9	1000	−
Oct	10/17/2023	1530	BUS1	31.8754	−95.4224	Lentic	0.00	0.00	25.5	7.23	ND	ND	239	172	0.12	6.47	1000	−
Oct	10/17/2023	1545	BUS2	31.8666	−95.4215	Lentic	0.00	0.00	26.5	7.66	ND	ND	309	220	0.16	85.6	800	−
Oct	10/17/2023	1600	BUS3	31.8636	−95.4226	Lentic	0.00	0.00	27.9	6.96	ND	ND	304	217	0.15	6.60	1000	−
Oct	10/17/2023	1300	GUE1	31.9201	−95.8810	Lotic	0.00	0.00	14.2	7.80	ND	ND	163.2	115	0.08	10.71	1000	−
Oct	10/17/2023	1325	GUE2	31.9405	−95.8747	Lotic	0.06	0.07	14.2	6.56	ND	ND	167.0	118	0.08	12.86	1000	−
Oct	10/17/2023	1350	GUE3	31.9698	−95.8703	Lotic	0.00	0.00	14.8	7.07	ND	ND	150.5	107	0.08	12.36	1000	−
Nov	11/1/2023		CAL1	32.6981	−94.1123	Lentic	0.00	0.00	7.2	6.70	7.58	63.46	84.5	59.3	0.04	0.89	1000	−
Nov	11/1/2023		CAL2	32.6983	−94.1110	Lentic	0.00	0.00	13.1	6.60	7.92	76.15	124.9	88.5	0.06	1.15	1000	−
Nov	11/1/2023		CAL3	32.6972	−94.1109	Lentic	0.00	0.00	12.5	5.95	1.68	15.94	91.8	64.9	0.05	11.04	880	−
Nov	11/1/2023		HAB1	32.6434	−94.1312	Lotic	0.06	0.09	10.2	6.91	7.97	71.72	167.5	117	0.08	19.19	920	−
Nov	11/1/2023		HAB2	32.6427	−94.1319	Lotic	0.11	0.11	10.2	6.82	7.94	71.45	151.5	108	0.08	19.34	875	−
Nov	11/1/2023		HAB3	32.6414	−94.1324	Lotic	0.00	0.01	10.2	6.88	7.89	71.00	150.3	107	0.08	18.37	875	−
Nov	11/3/2023	1515	ESJ1	30.4244	−95.1246	Lotic	0.43	0.41	13.4	6.71	ND	ND	139.1	98.9	0.07	17.50	1000	+
Nov	11/3/2023	1530	ESJ2	30.4255	−95.1247	Lotic	0.09	0.13	13.3	6.73	ND	ND	140.3	99.9	0.07	20.7	1000	+
Nov	11/3/2023	1545	ESJ3	30.4262	−95.1255	Lotic	0.27	0.18	13.3	6.66	ND	ND	140.5	99.9	0.07	18.22	1000	+
Nov	11/3/2023	915	NAR1	30.6074	−96.1822	Lotic	0.00	0.00	14.2	7.78	ND	ND	348	247	0.17	37.2	1000	−
Nov	11/3/2023	925	NAR2	30.6076	−96.1826	Lotic	0.00	0.00	14.2	7.66	ND	ND	349	248	0.18	35.2	1000	−
Nov	11/3/2023	935	NAR3	30.6079	−96.1818	Lotic	0.00	0.00	14.0	7.66	ND	ND	349	247	0.17	35.7	1000	−
Nov	11/6/2023		BOC1	31.5004	−94.7901	Lotic	0.00	0.00	16.1	6.55	6.41	65.78	87.7	62.3	0.04	17.73	1000	+

Nov	11/6/2023		BOC2	31.4999	−94.7889	Lotic	0.00	0.00	15.9	6.70	6.47	66.11	86.5	61.8	0.04	18.27	1000	+
Nov	11/6/2023		BOC3	31.4990	−94.7886	Lotic	0.00	0.00	16.0	6.75	6.31	64.62	91.6	64.4	0.05	17.69	1000	+
Nov	11/6/2023		RAL1	31.3877	−95.1538	Lentic	0.00	0.00	19.4	6.94	9.11	100	95.2	65.5	0.05	4.04	1000	−
Nov	11/6/2023		RAL2	31.3902	−95.1562	Lentic	0.00	0.00	19.4	7.07	8.58	94.26	89.0	63.0	0.04	3.52	1000	−
Nov	11/6/2023		RAL3	31.3929	−95.1576	Lentic	0.00	0.00	19.4	6.57	5.98	65.69	87.9	62.7	0.04	10.22	1000	−
Nov	11/7/2023		BOS1	31.2866	−94.8958	Lentic	0.00	0.00	16.9	6.95	2.61	27.24	231	158	0.11	1.40	1000	−
Nov	11/7/2023		BOS2	31.2899	−94.8959	Lentic	0.00	0.00	18.8	6.98	4.26	46.23	228	162	0.11	0.93	1000	+
Nov	11/7/2023		BOS3	31.2916	−94.9003	Lentic	0.00	0.00	19.0	7.16	5.90	64.29	219	155	0.11	2.73	1000	+
Nov	11/7/2023	1310	BUS1	31.8754	−95.4224	Lentic	0.00	0.00	27.4	7.25	ND	ND	231	164	0.12	8.25	1000	−
Nov	11/7/2023	1325	BUS2	31.8666	−95.4215	Lentic	0.00	0.00	30.1	6.89	ND	ND	288	205	0.14	64.1	750	−
Nov	11/7/2023	1340	BUS3	31.8636	−95.4226	Lentic	0.00	0.00	30.5	6.83	ND	ND	257	182	0.13	9.33	1000	−
Nov	11/7/2023	1605	GUE1	31.9201	−95.8810	Lotic	0.01	0.00	18.6	6.99	ND	ND	156.5	110	0.08	11.29	1000	−
Nov	11/7/2023	1630	GUE2	31.9405	−95.8747	Lotic	0.14	0.11	18.8	6.41	ND	ND	158.9	114	0.08	13.01	1000	−
Nov	11/7/2023	1655	GUE3	31.9698	−95.8703	Lotic	0.05	0.00	19.0	6.67	ND	ND	159.8	113	0.08	21.2	1000	+
Nov	11/7/2023		SJB1	31.9170	−93.9627	Lentic	0.00	0.00	15.2	6.53	0.61	6.14	176.5	126	0.09	13.26	600	−
Nov	11/7/2023		SJB2	31.9176	−93.9619	Lentic	0.00	0.00	16.1	6.50	0.41	4.21	188.4	135	0.10	8.05	500	−
Nov	11/7/2023		SJB3	31.9186	−93.9620	Lentic	0.00	0.00	15.5	6.22	0.57	5.78	156.4	111	0.08	22.9	885	−
Dec	12/1/2023	1125	ESJ1	30.4244	−95.1246	Lotic	0.52	0.53	14.5	6.82	9.23	91.52	151.5	109	0.08	11.09	1000	−
Dec	12/1/2023	1135	ESJ2	30.4255	−95.1247	Lotic	0.01	0.14	14.5	6.87	9.15	90.73	153.5	109	0.08	11.42	1000	+
Dec	12/1/2023	1150	ESJ3	30.4262	−95.1255	Lotic	0.4	0.26	14.5	6.78	9.01	89.34	154.1	110	0.08	11.49	1000	+
Dec	12/1/2023	910	NAR1	30.6074	−96.1822	Lotic	0.00	0.00	14.4	7.58	9.90	97.95	339	242	0.17	31.5	1000	−
Dec	12/1/2023	920	NAR2	30.6076	−96.1826	Lotic	0.00	0.00	14.6	7.58	9.89	98.28	339	244	0.17	31.2	1000	−
Dec	12/1/2023	930	NAR3	30.6079	−96.1818	Lotic	0.00	0.00	14.7	7.59	9.85	98.09	342	244	0.17	31.7	1000	−
Dec	12/4/2023	1000	BUS1	31.9201	−95.8810	Lentic	0.00	0.00	11.5	7.34	5.20	48.22	225	160	0.11	1.93	1000	−
Dec	12/4/2023	1015	BUS2	31.9405	−95.8747	Lentic	0.00	Shallow	11.3	6.89	5.81	53.63	295	208	0.15	45.8	825	−
Dec	12/4/2023	1025	BUS3	31.9698	−95.8703	Lentic	0.00	Shallow	12.5	6.74	5.02	47.62	277	196	0.14	7.13	1000	−
Dec	12/4/2023		CAL1	32.6981	−94.1123	Lentic	0.00	0.00	7.8	6.72	7.05	59.90	76.7	54.9	0.04	0.85	1000	−
Dec	12/4/2023		CAL2	32.6983	−94.1110	Lentic	0.00	0.00	11.0	6.54	8.92	81.77	109.0	77.3	0.05	2.24	1000	−
Dec	12/4/2023		CAL3	32.6972	−94.1109	Lentic	0.00	0.00	10.9	6.00	0.89	8.14	88.0	62.7	0.04	5.94	1000	−

Dec	12/4/2023	1140	GUE1	31.8754	−95.4224	Lotic	0.00	0.00	10.8	6.94	9.25	84.41	152.4	110	0.08	9.68	1000	−
Dec	12/4/2023	1155	GUE2	31.8666	−95.4215	Lotic	0.15	0.04	10.9	6.53	8.19	74.91	158.3	114	0.08	9.57	1000	−
Dec	12/4/2023	1215	GUE3	31.8636	−95.4226	Lotic	0.09	0.06	11.4	6.64	9.31	86.14	160.1	115	0.08	10.65	1000	−
Dec	12/4/2023		HAB1	32.6434	−94.1312	Lotic	0.00	0.00	9.6	7.24	6.02	53.41	139.2	98.7	0.07	13.23	1000	−
Dec	12/4/2023		HAB2	32.6427	−94.1319	Lotic	0.00	0.00	9.4	7.02	6.44	56.87	167.1	119	0.08	12.36	1000	+
Dec	12/4/2023		HAB3	32.6414	−94.1324	Lotic	0.00	0.00	9.4	7.00	6.55	57.84	157.8	113	0.08	14.54	1000	+
Dec	12/6/2023		BOC1	31.5004	−94.7901	Lotic	0.00	0.00	10.5	6.29	7.07	64.07	99.9	70.8	0.05	18.08	1000	−
Dec	12/6/2023		BOC2	31.4999	−94.7889	Lotic	0.00	0.00	10.6	6.22	6.95	63.12	92.5	65.8	0.05	18.59	1000	−
Dec	12/6/2023		BOC3	31.4990	−94.7886	Lotic	0.00	0.00	10.7	6.74	6.90	62.82	83.6	62.3	0.04	17.43	1000	−
Dec	12/6/2023		RAL1	31.3877	−95.1538	Lentic	0.00	0.00	13.7	6.58	8.15	79.41	84.7	59.9	0.04	8.19	1000	−
Dec	12/6/2023		RAL2	31.3902	−95.1562	Lentic	0.00	0.00	12.2	6.77	8.30	78.20	84.6	59.7	0.04	4.30	1000	−
Dec	12/6/2023		RAL3	31.3929	−95.1576	Lentic	0.00	0.00	11.2	6.63	6.22	57.28	83.4	59.0	0.04	3.47	1000	−
Dec	12/7/2023		BOS1	31.2866	−94.8958	Lentic	0.00	0.00	8.4	7.46	4.65	40.09	226	160	0.11	0.90	1000	−
Dec	12/7/2023		BOS2	31.2899	−94.8959	Lentic	0.00	0.00	12.4	6.78	5.69	53.85	254	180	0.13	0.89	1000	−
Dec	12/7/2023		BOS3	31.2916	−94.9003	Lentic	0.00	0.00	12.5	6.95	6.29	59.67	258	183	0.13	1.09	1000	−
Dec	12/7/2023		SJB1	31.9170	−93.9627	Lentic	0.00	0.00	8.5	6.40	0.72	6.22	170.4	121	0.09	14.51	1000	−
Dec	12/7/2023		SJB2	31.9176	−93.9619	Lentic	0.00	0.00	7.5	6.40	0.81	6.83	169.5	120	0.08	12.76	650	−
Dec	12/7/2023		SJB3	31.9186	−93.9620	Lentic	0.00	0.00	7.6	6.21	0.83	7.02	142.9	102	0.07	21.3	750	−
Jan	1/2/2024		BOC1	31.5004	−94.7901	Lotic	0.00	0.00	7.9	6.06	8.41	71.63	85.5	61.1	0.04	19.17	1000	−
Jan	1/2/2024		BOC2	31.4999	−94.7889	Lotic	0.00	0.00	7.9	6.02	8.58	73.07	83.2	59.1	0.04	19.98	1000	−
Jan	1/2/2024		BOC3	31.4990	−94.7886	Lotic	0.00	0.00	8.1	6.40	8.56	73.26	80.9	57.1	0.04	19.30	1000	−
Jan	1/2/2024		RAL1	31.3877	−95.1538	Lentic	0.00	0.00	10.9	6.19	9.42	86.16	78.3	55.6	0.04	4.56	1000	−
Jan	1/2/2024		RAL2	31.3902	−95.1562	Lentic	0.00	0.00	9.2	6.59	9.78	85.95	79.6	56.7	0.04	3.51	1000	−
Jan	1/2/2024		RAL3	31.3929	−95.1576	Lentic	0.00	0.00	8.4	6.46	8.24	71.04	83.3	58.7	0.04	3.76	1000	−
Jan	1/3/2024		BOS1	31.2866	−94.8958	Lentic	0.00	0.00	8.2	6.78	7.60	65.20	230	163	0.11	1.48	1000	−
Jan	1/3/2024		BOS2	31.2899	−94.8959	Lentic	0.00	0.00	10.5	6.82	7.80	70.68	245	174	0.12	0.73	1000	−
Jan	1/3/2024		BOS3	31.2916	−94.9003	Lentic	0.00	0.00	10.8	6.93	7.61	69.44	241	171	0.12	1.53	1000	+
Jan	1/3/2024		SJB1	31.9170	−93.9627	Lentic	0.00	0.00	5.8	6.40	0.68	5.50	146.9	104	0.07	8.18	750	−
Jan	1/3/2024		SJB2	31.9176	−93.9619	Lentic	0.00	0.00	6.8	6.23	0.78	6.47	147.9	105	0.07	20.2	700	−

Jan	1/3/2024		SJB3	31.9186	−93.9620	Lentic	0.00	0.00	6.3	5.97	0.87	7.12	120.4	84.6	0.06	5.40	650	−
Jan	1/4/2024		CAL1	32.6981	−94.1123	Lentic	0.00	0.00	4.2	6.50	8.32	64.53	95.0	67.4	0.05	0.58	1000	−
Jan	1/4/2024		CAL2	32.6983	−94.1110	Lentic	0.00	0.00	7.6	6.55	10.50	88.77	112.0	79.4	0.06	2.60	1000	−
Jan	1/4/2024		CAL3	32.6972	−94.1109	Lentic	0.00	0.00	5.4	6.10	2.32	18.56	77.2	58.8	0.04	5.24	1000	−
Jan	1/4/2024		HAB1	32.6434	−94.1312	Lotic	0.00	0.00	5.2	6.59	7.16	56.99	203	146	0.10	10.24	1000	−
Jan	1/4/2024		HAB2	32.6427	−94.1319	Lotic	0.00	0.00	4.8	6.61	7.79	61.37	199.3	142	0.10	12.05	1000	−
Jan	1/4/2024		HAB3	32.6414	−94.1324	Lotic	0.00	0.00	5.6	6.59	7.89	63.45	201	143	0.10	11.70	1000	+
Jan	1/12/2024	925	BUS1	31.9201	−95.8810	Lentic	0.00	0.00	12.6	7.34	7.10	67.50	263	188	0.13	12.94	1000	−
Jan	1/12/2024	940	BUS2	31.9405	−95.8747	Lentic	0.00	0.00	11.5	6.91	7.53	69.83	253	181	0.13	41.6	975	−
Jan	1/12/2024	955	BUS3	31.9698	−95.8703	Lentic	0.00	0.00	12.1	6.76	7.44	69.94	256	183	0.13	16.96	1000	−
Jan	1/12/2024	1103	GUE1	31.8754	−95.4224	Lotic	0.00	0.00	10.6	6.69	10.04	91.19	159.8	114	0.08	9.40	1000	−
Jan	1/12/2024	1128	GUE2	31.8666	−95.4215	Lotic	0.21	0.18	10.4	6.56	9.47	85.61	164.3	117	0.08	11.02	1000	−
Jan	1/12/2024	1155	GUE3	31.8636	−95.4226	Lotic	0.08	0.05	10.6	6.65	9.94	90.28	162.6	116	0.08	13.08	1000	−
Jan	1/13/2024	1257	ESJ1	30.4244	−95.1246	Lotic	0.68	0.64	9.9	6.96	10.72	95.78	121.8	86.8	0.06	49.8	600	−
Jan	1/13/2024	1309	ESJ2	30.4255	−95.1247	Lotic	0.14	0.17	10.3	6.87	10.56	95.24	123.2	87.7	0.06	50.6	600	−
Jan	1/13/2024	1319	ESJ3	30.4262	−95.1255	Lotic	0.22	0.2	10.1	6.86	10.49	94.17	122.2	87.1	0.06	50.2	600	−
Jan	1/13/2024	1102	NAR1	30.6074	−96.1822	Lotic	0.00	0.00	9.8	7.21	10.87	96.90	307	218	0.15	58.8	700	−
Jan	1/13/2024	1112	NAR2	30.6076	−96.1826	Lotic	0.00	0.00	11.7	7.32	10.67	99.40	306	217	0.15	54.6	700	−
Jan	1/13/2024	1122	NAR3	30.6079	−96.1818	Lotic	0.00	0.00	9.9	7.37	10.94	97.75	310	221	0.16	59.6	675	−
Feb	2/5/2024		CAL1	32.6981	−94.1123	Lentic	0.00	0.00	11.9	5.80	3.90	36.50	29.0	20.8	0.01	11.15	910	−
Feb	2/5/2024		CAL2	32.6983	−94.1110	Lentic	0.00	0.00	12.7	5.73	3.66	34.88	30.8	21.8	0.02	12.53	910	−
Feb	2/5/2024		CAL3	32.6972	−94.1109	Lentic	0.00	0.00	11.9	5.87	4.63	43.33	60.9	43.3	0.03	15.62	990	−
Feb	2/5/2024		HAB1	32.6434	−94.1312	Lotic	0.21	0.18	11.6	6.98	8.84	82.16	141.1	100	0.07	45.0	550	−
Feb	2/5/2024		HAB2	32.6427	−94.1319	Lotic	0.21	0.24	11.6	6.46	8.76	81.42	141.6	101	0.07	46.1	550	−
Feb	2/5/2024		HAB3	32.6414	−94.1324	Lotic	0.04	0.02	11.7	6.46	8.71	81.14	144.7	103	0.07	45.1	550	−
Feb	2/7/2024		BOS1	31.2866	−94.8958	Lentic	0.00	0.00	12.2	6.76	5.80	54.65	157.2	112	0.08	1.49	1000	−
Feb	2/7/2024		BOS2	31.2899	−94.8959	Lentic	0.00	0.00	14.3	6.60	4.80	47.39	173.9	124	0.09	1.49	1000	−
Feb	2/7/2024		BOS3	31.2916	−94.9003	Lentic	0.00	0.00	14.0	6.64	3.99	39.13	160.4	114	0.08	2.20	1000	−
Feb	2/7/2024		SJB1	31.9170	−93.9627	Lentic	0.00	0.00	12.2	6.21	1.28	12.06	88.2	62.6	0.04	12.14	875	−

Feb	2/7/2024		SJB2	31.9176	−93.9619	Lentic	0.00	0.00	11.7	5.94	0.81	7.55	91.2	64.9	0.05	12.63	850	−
Feb	2/7/2024		SJB3	31.9186	−93.9620	Lentic	0.00	0.00	11.9	5.86	3.44	32.19	82.3	60.4	0.04	11.12	1000	−
Feb	2/9/2024	900	BUS1	31.9201	−95.8810	Lentic	0.00	0.00	16.3	6.74	5.98	61.63	128.5	91.1	0.06	29.9	900	−
Feb	2/9/2024	915	BUS2	31.9405	−95.8747	Lentic	0.00	0.00	16.0	6.38	5.70	58.37	131.2	93.2	0.07	30.8	925	−
Feb	2/9/2024	930	BUS3	31.9698	−95.8703	Lentic	0.00	0.00	16.2	6.37	4.99	51.32	132.6	94.2	0.07	27.9	1000	−
Feb	2/9/2024	1702	ESJ1	30.4244	−95.1246	Lotic	0.42	0.24	16.2	6.89	9.07	93.27	143.9	103	0.07	34.8	975	−
Feb	2/9/2024	1718	ESJ2	30.4255	−95.1247	Lotic	0.02	0.00	16.2	6.88	9.01	92.66	142.6	103	0.07	42.3	950	+
Feb	2/9/2024	1733	ESJ3	30.4262	−95.1255	Lotic	0.65	0.17	16.1	6.83	8.93	91.64	145.2	103	0.07	37.4	960	+
Feb	2/9/2024	1033	GUE1	31.8754	−95.4224	Lotic	0.02	0.01	14.7	6.60	8.29	82.56	147.3	105	0.07	20.1	1000	−
Feb	2/9/2024	1054	GUE2	31.8666	−95.4215	Lotic	0.26	0.25	14.8	6.37	7.92	79.04	152.4	109	0.08	22.6	1000	−
Feb	2/9/2024	1116	GUE3	31.8636	−95.4226	Lotic	0.05	0.07	14.6	6.42	8.31	82.58	151.0	108	0.08	21.2	1000	−
Feb	2/9/2024	1503	NAR1	30.6074	−96.1822	Lotic	0.00	0.00	16.6	6.91	9.06	93.96	366	260	0.18	48.5	850	−
Feb	2/9/2024	1513	NAR2	30.6076	−96.1826	Lotic	0.00	0.00	17.1	7.11	9.44	98.93	367	260	0.18	43.9	800	−
Feb	2/9/2024	1523	NAR3	30.6079	−96.1818	Lotic	0.00	0.00	16.3	7.21	9.19	94.71	378	270	0.19	49.5	850	−
Feb	2/12/2024		BOC1	31.5004	−94.7901	Lotic	0.01	0.01	14.0	5.68	7.84	76.89	43.6	31.4	0.02	63	710	−
Feb	2/12/2024		BOC2	31.4999	−94.7889	Lotic	0.23	0.25	14.1	5.51	8.56	84.14	44.2	31.7	0.02	64.3	700	+
Feb	2/12/2024		BOC3	31.4990	−94.7886	Lotic	0.01	0.01	14.2	6.36	7.83	77.13	43.9	31.2	0.02	64.4	700	+
Feb	2/12/2024		RAL1	31.3877	−95.1538	Lentic	0.00	0.00	14.1	5.66	7.62	74.90	41.0	29.2	0.02	23.3	850	−
Feb	2/12/2024		RAL2	31.3902	−95.1562	Lentic	0.00	0.00	12.8	5.66	4.49	42.88	42.9	30.6	0.02	18.59	850	−
Feb	2/12/2024		RAL3	31.3929	−95.1576	Lentic	0.00	0.00	13.7	5.55	6.79	66.16	30.4	21.6	0.02	23.7	800	−