HABITAT CONSERVATION PLAN

BIOLOGICAL MONITORING PROGRAM

San Marcos Springs/River Aquatic Ecosystem

ANNUAL REPORT

December 2023

Prepared for:

Edwards Aquifer Authority
900 East Quincy
San Antonio, Texas 78215

Prepared by:

BIO-WEST, Inc.
1812 Central Commerce Court
Round Rock, Texas 78664

BIO-WEST

TABLE OF CONTENTS

List of Figures

List of Tables

EXECUTIVE SUMMARY

The Edwards Aquifer Habitat Conservation Plan (EAHCP) Biological Monitoring Program continued to track biota and habitat conditions of the San Marcos Springs/River ecosystem in 2023 through a series of routine and Critical Period monitoring activities outlined in this report. Monitoring in the San Marcos system consisted of routine surveys specific to EAHCP Covered Species: Fountain Darter (*Etheostoma fonticola*), Texas Wild-rice (*Zizania texana*), and San Marcos Salamander (*Eurycea nana*). Community-level monitoring data were also collected on aquatic vegetation, fish, and benthic macroinvertebrates. In addition, reduced river discharge triggered Critical Period and species-specific low-flow sampling events starting in spring. The results from 2023 biological monitoring provide valuable data to further assess spatiotemporal trends of aquatic biota in the San Marcos Springs/River ecosystem, as well as an opportunity to better understand ecological responses under the extreme low-flow conditions observed.

In 2023, exceptional drought conditions persisted in central Texas as low precipitation and higher ambient temperatures experienced in 2022 continued. Exceptional drought conditions occurred throughout central Texas from January through August, impacting large portions of the Hill Country over the Edwards Aquifer Contributing Zone. As a result, river discharge in the San Marcos River was near or below 10^{th} percentile conditions the entire year and represented the lowest flows observed since the inception of biological monitoring in 2000. Annual median daily mean discharge was lower in 2023 (88 cfs) than during previous low-flow monitoring events in 2006 (116 cfs), 2009 (96 cfs), 2011 (117 cfs), and 2022 (119 cfs). Flows first dropped below 85 cfs in April, triggering Critical Period sampling that was coupled with routine sampling. Additional species-specific sampling was triggered as flows declined, eventually hitting the lowest daily mean discharge observed since 1956 in September (66 cfs). Three low-flow habitat evaluations were also conducted this year as discharge declined. Low water levels during the final habitat evaluation in late August documented slightly degraded habitat conditions at Spring Lake and Spring Lake Dam. Further downstream, wetted width of the river channel was reduced, and aquatic vegetation coverage decreased, though high-quality Fountain Darter habitat persisted. Although precipitation events in October resulted in a small pulse, discharge conditions remained near 10^{th} percentile levels through fall 2023.

The most conspicuous impact of low summer water levels on Covered Species within the San Marcos system was desiccation of stream edge areas occupied by Texas Wild-rice. As water levels dropped, Texas Wild-rice stands became dewatered in some areas, and terrestrial vegetation eventually took over. This resulted in substantial reductions to overall Texas Wild-rice coverage, dropping from over 15,000 m^2 in January to 8,210 m^2 in October. This represents the lowest coverage of Texas Wild-rice mapped since 2016, although coverage is still considerably above pre-EAHCP levels. Continued monitoring of Texas Wild-rice will be important in light of the ongoing drought and uncertainty of future flow conditions.

In addition to Texas Wild-rice, the influence of extremely low springflows was also evident on abiotic habitat and aquatic vegetation conditions which influence Fountain Darter populations. Water temperatures remained consistent in spring areas but were elevated relative to typical years in downstream areas. Under these extreme low-flow conditions, the maximum optimal water temperature threshold for Fountain Darter egg production (26 °C) was exceeded at City Park, Rio Vista, I-35, and Wastewater Treatment Plant more commonly and for longer durations than in previous years. Despite this, Fountain Darter population metrics indicated increased densities at City Park and I-35 study reaches in both spring and fall, suggesting that exceedance of these laboratory-derived temperature thresholds may not be a strong predictor of wild Fountain Darter population performance. However, the health and condition of individual Fountain Darters was not analyzed, and application of laboratory derived temperature thresholds to wild populations is nuanced for several reasons. For example, although McDonald et al. (2007) did vary temperature for their laboratory trials, those temperature fluctuations do not exactly match natural diel patterns observed in the wild. Given availability of a tremendous amount of water temperature data in these systems, additional research is needed to evaluate the influence of naturally occurring diel temperature fluctuations on wild Fountain Darter population dynamics while accounting for variation in habitat quality and quantity.

System-wide vegetation coverage remained similar from 2018 to 2023 while coverages among specific taxa changed. During this time, Texas Wild-rice and *Cabomba* increased the most in coverage with Texas Wild-rice becoming the most dominant species in the system in 2023. Conversely, *Potamogeton* and *Hydrilla* decreased. Reductions in *Hydrilla* were influenced by active HCP removal efforts. Another notable change in taxa from 2018 to 2023 was the increase in bryophyte abundance. Within the study reach in 2023, total aquatic vegetation coverage declined from spring to fall across all reaches. Ubiquitous declines in vegetation coverage during 2023 were mainly attributed to decreased coverage of Texas Wild-rice due to low flows and recreation. However, Texas Wild-rice still remained the dominant vegetation taxa in all study reaches, and coverage of other taxa remained minimal in comparison. In general, Fountain Darter density and occurrence were higher in fall due to enhanced suitable habitat provided by bryophytes intermixed with other vegetation types. However, overall habitat suitability depicted degraded habitat conditions that conflicted with abundance and occurrence results, as said indices did not pick up on this observed habitat improvement, since they are based on dominant vegetation type. Conflicting results could be due to changes in vegetation composition (e.g., Texas Wild-rice coverage) and changes in microhabitat conditions unaccounted for in HSC models (e.g., % bryophyte within). Reductions in wetted habitat altered the river channel and the vegetation assemblage mainly within the I-35 reach. Amphibious species that could survive as emergent outcompeted other taxa.

Trends in San Marcos Salamander densities were variable among sites in 2023 and over the past five years. However, all sites showed relatively low densities in fall 2023, and low-flow impacts (e.g., siltation) to salamander habitats were noted. At a community scale, fish and macroinvertebrate community-level responses to low flows were not readily apparent. In general, no long-term temporal trends in overall or spring-associated fish diversity, richness, and relative density are evident from fish community monitoring data. Macroinvertebrate Index of Biotic Integrity (IBI) scores were generally consistent with past years.

Overall, 2023 biological monitoring provided insights into the current condition of the EAHCP Covered Species in the San Marcos Springs/River, as well as flow-ecology relationships of the broader aquatic community. During the lowest flow conditions observed since 1956, the system proved resilient. Texas Wild-rice coverage did substantially drop due to decreasing amounts of wetted habitat. However, total coverage of Texas Wild-rice remains over 8,000 m^2, well above pre-EAHCP levels. Reductions in wetted habitats did not negatively impact Fountain Darter population metrics, as catch rates and percent occurrence were comparable to previous data and densities increased in recent years. The sustained high densities observed at multiple reaches throughout 2022 and 2023 suggest that population increases may be driven by enhanced benthic habitat complexity due to increased amounts of bryophytes within riverine habitats. San Marcos Salamander habitat impacts were noted and densities declined at all sites in fall 2023, therefore additional monitoring is needed to examine future trends. Fish community and macroinvertebrate bioassessments revealed a healthy riverine community with a diversity of taxa similar to previous years. In summary, results from 2023 demonstrated resilience of aquatic communities and Covered Species populations to the extreme low-flow conditions observed. Subsequent monitoring efforts will provide opportunities to better understand the dynamics of this complex ecological system and further examine responses to varying hydrologic conditions.

INTRODUCTION

The Edwards Aquifer Habitat Conservation Plan (EAHCP) was established in 2012 and supports the issuance of an Incidental Take Permit that allows the "incidental take" of threatened and endangered species (i.e., Covered Species) (Table 1) from otherwise lawful activities in the San Marcos Springs/River. Section 6.3.1 of the HCP established a continuation of biological monitoring in the San Marcos Springs/River. This biological monitoring program was first established in 2000 (formerly known as the Edwards Aquifer Authority [EAA] Variable Flow Study) and its original purpose was to evaluate the effects of variable flow on the biological resources, with an emphasis on threatened and endangered species. However, the utility of the HCP biological monitoring program has surpassed its initial purpose (EAHCP 2012), and biological data collected since the implementation of this monitoring program (BIO-WEST 2001–2023) now serves as the foundation for several underlying sections in the HCP, which include: (1) long-term biological goals (LTBGs) and management objectives (Section 4.1); (2) determination of potential impacts to Covered Species, "incidental take" assessment, and Environmental Impact Statement alternatives (Section 4.2); and (3) establishment of core adaptive-management activities for triggered monitoring and adaptive-management response actions (Section 6.4.4). As the HCP proceeds, biological monitoring program data, in conjunction with other available information, are essential to adaptive management. Current and future data collection will help assess the effectiveness and efficiency of certain HCP mitigation and restoration activities conducted in the San Marcos Springs/River and calculate the HCP habitat baseline and net disturbance determination and annual "incidental take" estimate (EAHCP 2012).

Table 1. Covered Species directly sampled for under the Edwards Aquifer Habitat Conservation Plan in the San Marcos Springs/River ecosystem.

SCIENTIFIC NAME	COMMON NAME	ESA STATUS
Plants		
Zizania texana	Texas Wild-rice	Endangered
Amphibians		
Eurycea nana	San Marcos Salamander	Threatened
Fish		
Etheostoma fonticola	Fountain Darter	Endangered

This report provides the methodology and results for biological monitoring activities conducted in 2023 within the San Marcos Springs/River ecosystem. In addition to routine monitoring, Critical Period and species-specific low-flow sampling were triggered. The results include summaries of current physiochemical conditions, as well as current conditions of floral and faunal communities, all of which encompasses both routine and low-flow sampling. For all aquatic organisms, historic observations (BIO-WEST 2001–2023) are also used to provide context to current conditions.

METHODS

Study Location

The upper San Marcos River (San Marcos, Hays County, Texas) is fed by the Edwards Aquifer and originates at a series of spring upwellings in Spring Lake, which was impounded in the mid-1800s (Bousman and Nickels 2003). From the headwaters, the river flows about eight kilometers (km) before its confluence with the Blanco River, traversing two additional impoundments, Rio Vista Dam, and Capes Dam. The upper San Marcos River watershed is dominated by urban landcover and is subjected to recreational use. Spring inputs from the Edwards Aquifer provide stable physiochemical conditions, and springflow conditions are dictated by aquifer recharge and human water use (Sung and Li 2010). The upper San Marcos River maintains diverse assemblages of floral and faunal communities (Bowles and Arsuffi 1993; Owens et al. 2001) that include multiple endemic organisms, such as Texas Wild-rice (*Zizania texana*), Comal Springs Riffle Beetle (*Heterelmis comalensis*), San Marcos Salamander (*Eurycea nana*), and Fountain Darter (*Etheostoma fonticola*) among others.

Sampling Strategy

Based on the long-term biological goals (LTBGs), and management objectives outlined in the HCP, study areas were established to conduct long-term monitoring and quantify population trends of the Covered Species (EAHCP 2012). The sampling locations selected are designed to cover the entire extent of Covered Species habitats, but they also allow for holistic ecological interpretation while maximizing resources (Figures 1–3). Comprehensive sampling within the established study area varies temporally and spatially among Covered Species. The current sampling strategy includes five spatial resolutions:

1. System-wide sampling
    a. Texas Wild-rice mapping: 1 event/year (summer)
    b. Aquatic vegetation mapping: 5-year intervals (spring)
2. Select longitudinal locations
    a. Water temperature: assessed year-round at permanent monitoring stations
3. Reach sampling
    a. Aquatic vegetation mapping: 2 events/year (spring, fall)
    b. Fountain Darter drop-net sampling: 2 events/year (spring, fall)
    c. Fountain Darter random-station dip-net surveys: 3 events/year (spring, summer, fall)
4. Springs Sampling
    a. San Marcos Salamander surveys: 2 events/year (spring, fall)
5. River section/segment
    a. Fountain Darter timed dip-net surveys: 3 events/year (spring, summer, fall)
    b. Fish community surveys: 2 events/year (spring, fall)
    c. Macroinvertebrate community sampling: 2 events/year (spring, fall)

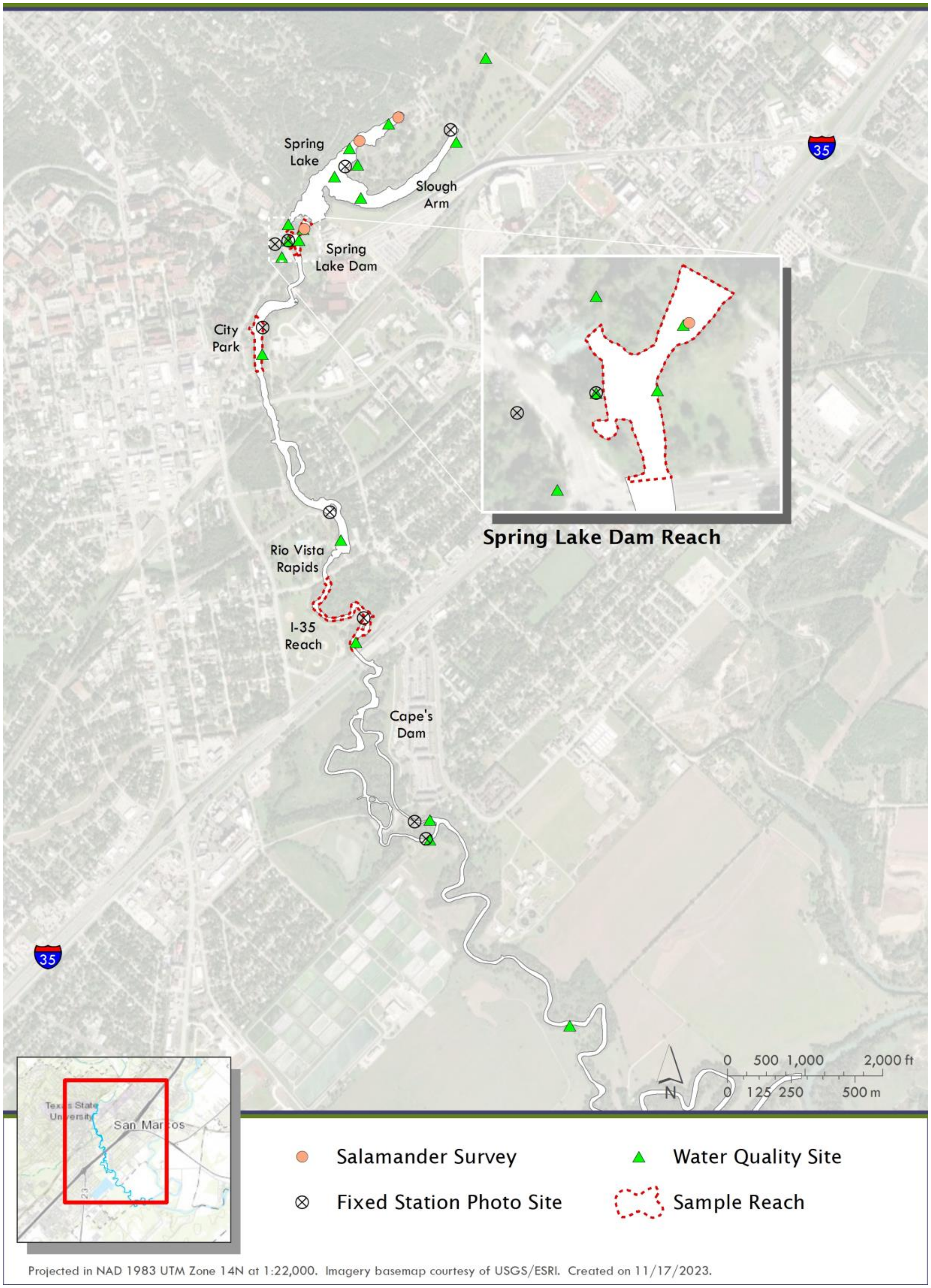


Figure 1. Upper San Marcos River sample reaches, San Marcos Salamander survey sites, water quality sampling sites, and fixed-station photography sites.

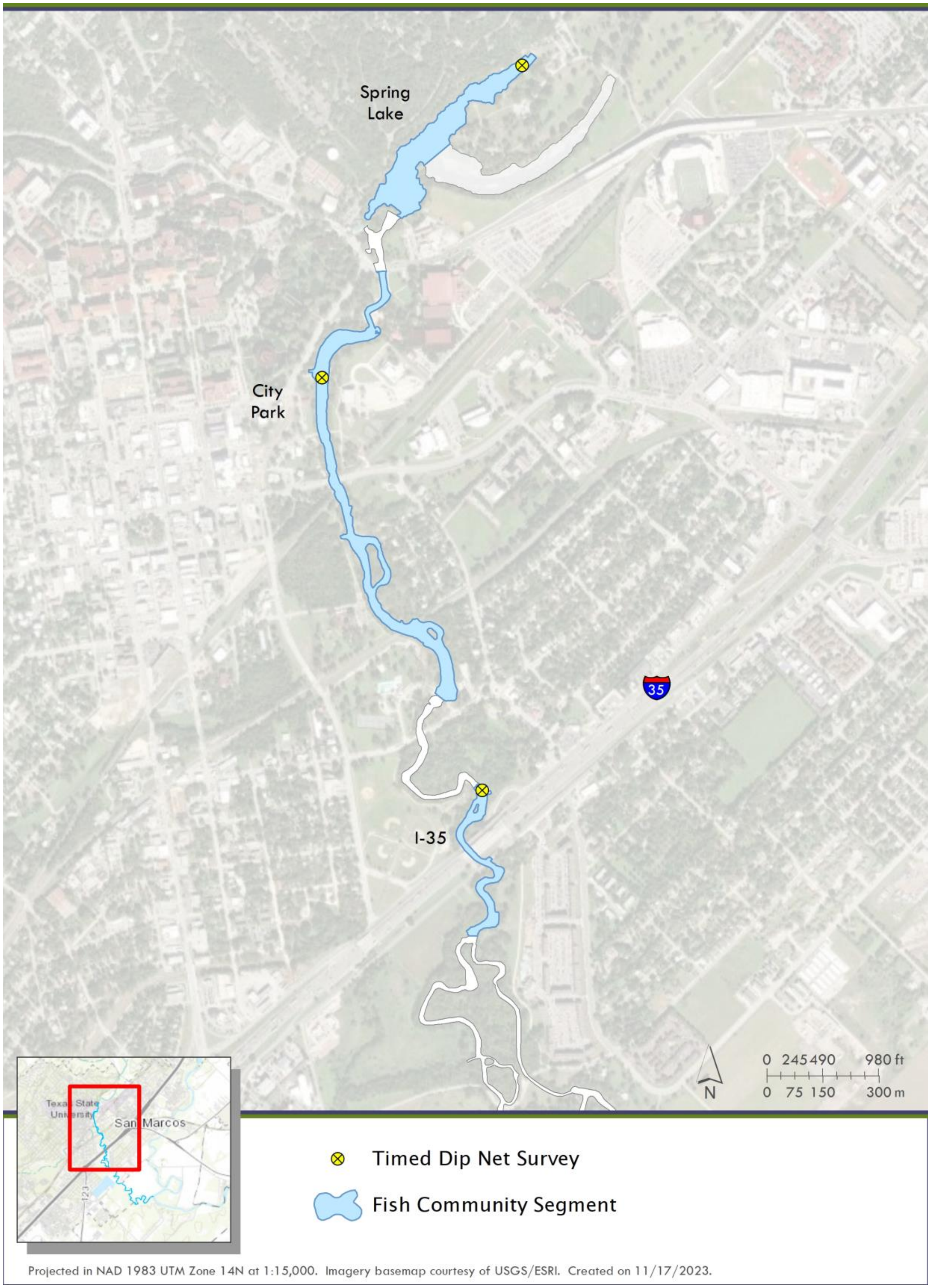


Figure 2. Fish community sampling segments and dip-net timed survey sections for the upper San Marcos River.

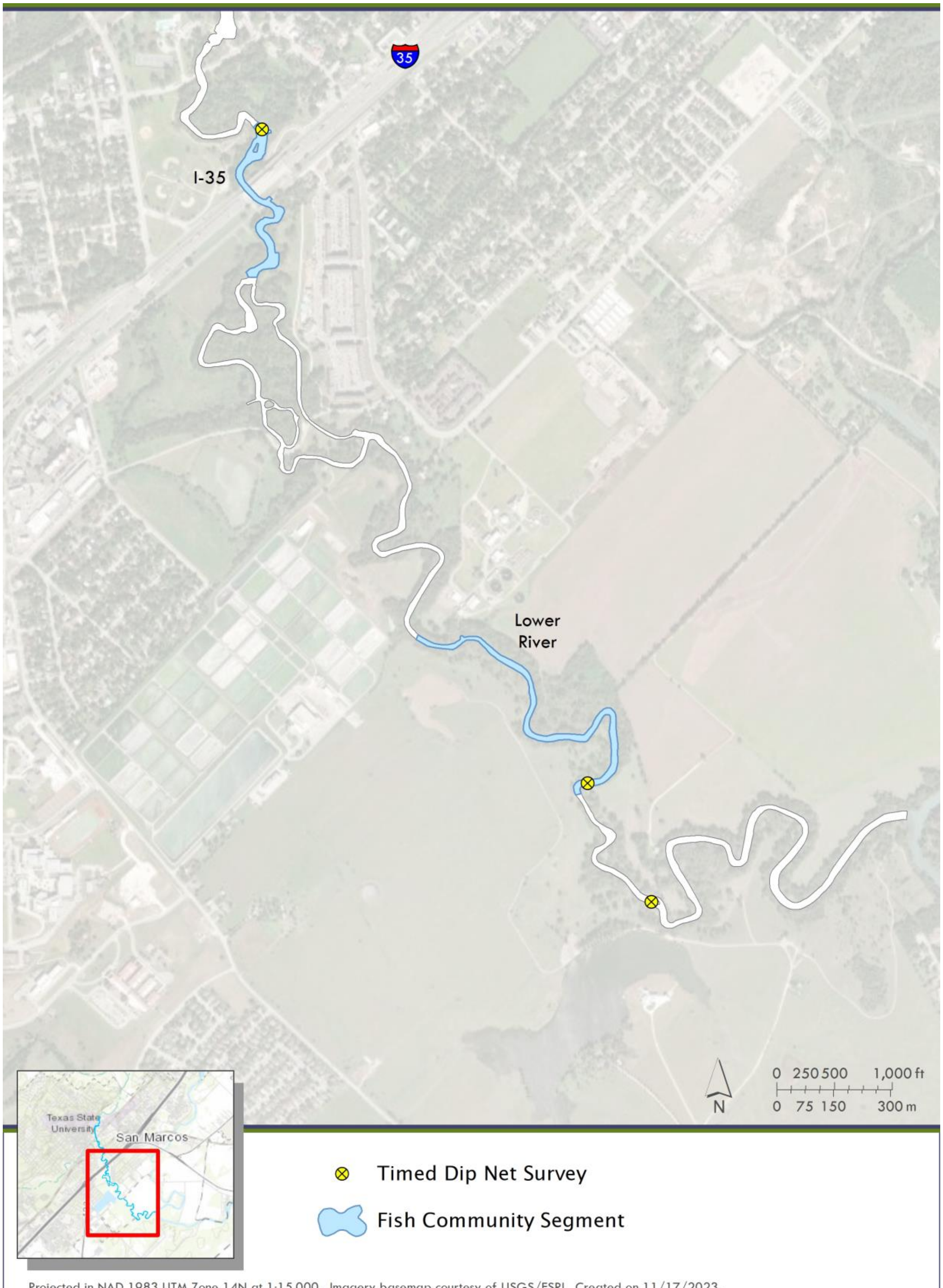


Figure 3. Fish community sampling segments and dip-net survey sections for the lower San Marcos River.

In addition to annual comprehensive sampling outlined above, low-flow sampling may also be conducted, but is dependent on HCP flow triggers, which include Critical Period low-flow sampling and species-specific sampling (EAHCP 2012). Due to sustained low flows, one Critical Period monitoring event (coupled with routine spring monitoring) and several species-specific triggers were met throughout the year. Texas Wild-rice physical measurements were triggered from January through the remainder of the year, San Marcos Salamander surveys were triggered from August through October, and Fountain Darter surveys were triggered in August (Appendix A). Critical Period habitat assessment results are presented in Appendix B.

The remaining methods sections provide brief descriptions of the procedures utilized for comprehensive routine, Critical Period, and species-specific sampling efforts. A more-detailed description of the gear types used, methodologies employed, and specific GPS coordinates can be found in the Standard Operating Procedures Manual for the HCP biological monitoring program for the San Marcos Springs/River ecosystem (EAA 2017).

San Marcos River Discharge

River hydrology in 2023 was assessed using U.S. Geological Survey (USGS) stream gage data from January 1 through October 31. Mean daily discharge expressed in cubic feet per second (cfs) was acquired from USGS gage #08170500, which represents cumulative river discharge that encompasses springflow and local runoff contributions from the Sink Creek drainage. It should be noted that some of these data are provisional and are subject to revision at a later date (USGS 2023). The annual distribution of mean daily discharge was compared for the past 5 years using boxplots. The distribution of 2023 mean daily discharge was also summarized by month using boxplots. Monthly discharge levels were compared with long-term (1956–present) 10th, 50th (i.e., median), and 90th percentiles.

Water Temperature

Spatiotemporal trends in water temperature (°C) were assessed using temperature data loggers (HOBO Tidbit v2 Temp Loggers) at the 11 permanent monitoring stations established in 2000. Data loggers recorded water temperature every 10 minutes and were downloaded at regular intervals. Prior to analysis, data processing was conducted to locate potential data logger errors per station by comparing time-series for the current year with previous years. Timeframes displaying temperatures that deviated substantially from historical data and didn't exhibit ecologically rational trends (e.g., discontinuities, ascending drift) were considered unreliable and omitted from the dataset. For analysis, the distribution of water temperatures for the current year was assessed among stations based on 4-hour intervals and summarized using boxplots. Water temperatures were also compared with maximum optimal temperature requirements for Fountain Darter larval (≥25 °C) and egg (≥26 °C) production (McDonald et al. 2007). Further, 25 °C is also the designated water temperature threshold within the HCP Fountain Darter LTBG study reaches (Spring Lake Dam, City Park, I-35) (EAHCP 2012). In the case of stations that surpassed either water temperature threshold during the year, the general timeframes in which those exceedances occurred are discussed in the text.

Aquatic Vegetation

Mapping

The team used a kayak for visual observations to complete aquatic vegetation mapping in sample reaches during the spring full system/routine monitoring, summer low-flow monitoring, and fall monitoring events. A Trimble GPS unit and external Tempest antenna set on the bow of the kayak was used to collect high accuracy (10–60 centimeter [cm]) geospatial data. A data dictionary with pre-determined attributes was loaded into the GPS unit for data collection in the field. Discrete patch dimensions and the type and density of vegetation were recorded from the kayak. In some instances, an accompanying free diver was used to provide additional detail and to verify surface observations. The discreteness of an individual vegetation patch was determined by the dominant species located within the patch compared to surrounding vegetation. Once a patch of vegetation was visually delineated, the kayak was maneuvered around the perimeter of the vegetation patch to collect geospatial data with the GPS unit, thus creating a vegetation polygon. Attributes assigned to each polygon included species type and percent cover of each of the four most-dominant species. The type of substrate (silt, sand, gravel, cobble, organic) was identified if substrate was a dominant feature within the patch. Rooted aquatic vegetation, floating aquatic vegetation, bryophytes, and algae were mapped as separate features. Only aquatic vegetation patches 1 meter (m) in diameter or larger were mapped as polygons. However, all Texas Wild-rice was recorded, with individual Texas Wild-rice plants too small to delineate as polygons mapped as points instead.

Data Processing and Analysis

During data processing, Microsoft Pathfinder was used to correct spatial data and create shapefiles. Spatial data were projected using the Projected Coordinate System NAD 1983 Zone 14N. Post processing was conducted to clean polygon intersections, check for and correct errors, and calculate cover for individual discrete polygons as well as totals for all encountered aquatic plant species.

Vegetation types are described in the Results and Discussion sections by genus, except for Texas Wild-rice for which the common name is used. Vegetation community composition among taxa and grouped by native vs. invasive taxa are compared for the last five years using stacked bar graphs. Total surface area of aquatic vegetation, measured in square meters (m^2), is presented for each season using bar graphs and is compared with long-term averages (2001–present) from spring, fall, high-flow events, and low-flow events. High-flow and low-flow averages were calculated from Critical Period events. These events are based on predetermined river discharge triggers (Appendix A), which result in additional mapping events to assess flow-related impacts to the vegetation community. All total coverages were calculated solely based on rooted plant taxa.

Texas Wild-rice Annual Observations

Mapping and Physical Observations

In addition to aquatic vegetation mapping in the LTBG study reaches, Texas Wild-rice was mapped within Spring Lake and eight river segments using the same methods described above during routine summer mapping in July (Figure 4). Moreover, physical measurements were quantified during routine monitoring in spring and fall. Eighteen additional sampling events occurred during species-specific events triggered in January (n = 2), February (n = 1), March (n = 2), April (n = 1), May (n = 1), June (n = 2), July (n = 2), August (n = 2), September (n = 4), and October (n = 1).

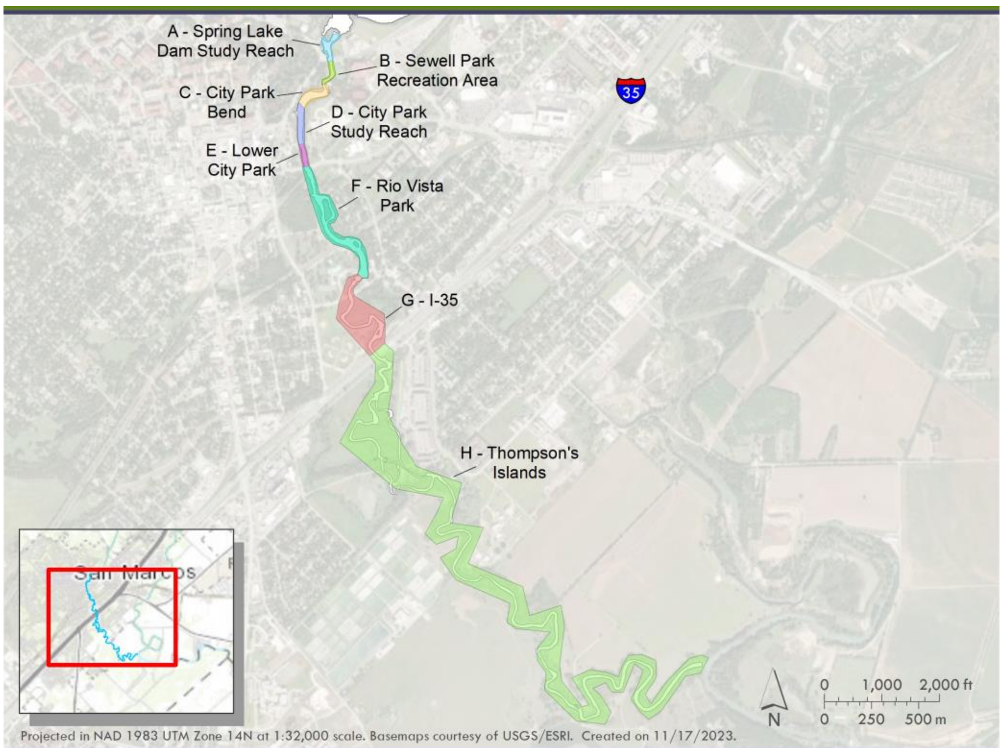


Figure 4. Designated river segments for monitoring Texas Wild-rice coverage.

At the beginning of the initial sampling activities in 2000, Texas Wild-rice stands throughout the San Marcos River were assessed and documented as being in "vulnerable" areas if they possessed one or more of the following characteristics: (1) occurred in shallow water (<0.5 feet); (2) revealed extreme root exposure because of substrate scouring; or (3) generally appeared to be in poor condition. The areal coverage of Texas Wild-rice stands in vulnerable locations were determined in 2023 by GPS mapping (see Aquatic Vegetation Mapping for details) in most instances. However, areal coverage of some smaller stands was measured using a method originally developed by the Texas Parks and Wildlife Department (J. Poole, pers. comm.). To do this, maximum length and maximum width were measured. The length measurement was taken at the water surface parallel to streamflow and included the distance between the bases of the roots to the tip of the longest leaf. The width was measured at the widest point perpendicular to the stream current. Percent cover was then estimated within the rectangle formed from the maximum length and maximum width measurements. The total area of the rectangle was then multiplied by the percent cover to estimate the areal coverage for each small stand.

Data Processing and Analysis

Annual trends in total Texas Wild-rice coverage (m^2) within Spring Lake and all river segments are presented from 2001–present. Changes in Texas Wild-rice coverage (m^2, %) from April to August this year are also compared between the eight river segments. Results for changes in Texas Wild-rice coverage in Spring Lake can be found in Appendix E.

The conditions of vulnerable Texas Wild-rice stands were assessed by combining quantitative and qualitative observational measurements from the following metrics: (1) percent of stand that was emergent, (2) percent of emergent portions that were seeding, (3) percent of stand covered with vegetation mats or algae buildup, and (4) categorical estimation of root exposure. Water depth was measured in feet (ft) at the shallowest point in the Texas Wild-rice stand and velocity in feet per second (ft/s) was measured at the upstream edge of each stand. All results from the physical observations and vulnerable stands monitoring can be found in Appendix D.

Fountain Darter

Drop-Net Sampling

Drop-net sampling was utilized to quantify Fountain Darter densities and habitat utilization during the spring and fall monitoring events at established sample reaches (Figure 1). Drop-net stations were selected using a random-stratified design. In each study reach, two sample stations per vegetation strata were randomly selected based on dominant aquatic vegetation (including open areas) mapped prior to sampling (see Aquatic Vegetation Mapping for details). At each sample station, all organisms were first trapped using a 2 m^2 drop-net. Organisms were then collected by sweeping a 1 m^2 dip-net along the river bottom within the drop-net. If no fish were collected after the first ten dip-net sweeps, the station was considered complete, and if fish were collected, an additional five sweeps were conducted. If any Fountain Darters were collected on sweep 15, additional sweeps were conducted until no Fountain Darters were collected.

Most fishes collected were identified to species and enumerated. Two morphologically similar species, Western Mosquitofish (*Gambusia affinis*) and Largespring Gambusia (*Gambusia geiseri*), which are known to hybridize, were classified by genus (*Gambusia* sp.). Larval and juvenile fishes too small to confidently identify to species in the field were also classified by genus. All Fountain Darters and the first 25 individuals of other fish taxa were measured (total length expressed in millimeters [mm]).

Physiochemical habitat data were collected at each drop-net location. Water depth (ft) and velocity (ft/s) data were collected at the upstream end of drop-net samples using a HACH FH90 flowmeter and adjustable wading rod. Water-velocity measurements were collected at 15 cm above the river bottom to characterize flows that directly influence Fountain Darters. Mean-column velocity was measured at 60% of water depth when depths were less than three feet. At depths of three feet or greater, water velocities were measured at 20% and 80% of depth and averaged to estimate mean column velocity. Water quality was measured within each drop-net using a HydroTech multiprobe, which included water temperature (degrees Celsius [°C]), pH, dissolved oxygen (milligrams per liter [mg/L], percent saturation), and specific conductance (microsiemens per centimeter [µs/cm]). Mid-column water quality was measured at water depths less than three feet, whereas bottom and surface values were measured and averaged at depths of three feet or greater. Lastly, vegetation composition (%) was visually estimated and dominant substrate type was recorded within each drop-net sample.

Dip-Net Sampling

Dip-net sampling was used to provide additional metrics for assessing Fountain Darter population trends and included qualitative timed surveys and random-station presence/absence surveys. All sampling was conducted using a 40x40 cm (1.6-mm-mesh) dip net, and surveys for both methods were conducted in spring, summer, and fall.

Timed dip-net sampling was conducted to examine patterns in Fountain Darter catch rates and size structure along a more extensive longitudinal gradient compared to drop-net sampling. Surveys were conducted within established survey sections and for a fixed amount of search effort (Spring Lake: 0.5 hour, City Park: 1.0 hour, I-35: 1.0 hour, Cypress Tree: 0.5 hour, Todd Island: 0.5 hour) (Figures 2 and 3). In each study reach, a single surveyor used a dip-net to collect Fountain Darters in a downstream to upstream fashion. Collection efforts mainly focused on suitable Fountain Darter habitat, specifically in areas with dense aquatic vegetation. Non-wadeable habitats (>1.4 m) were not sampled. All Fountain Darters collected were enumerated, measured (mm), and returned to the river at point of collection.

Random-station presence/absence surveys were implemented to assess Fountain Darter occurrence. During each monitoring event, sample stations were randomly selected within the vegetated area of each reach (Spring Lake: 10, Spring Lake Dam: 25, City Park: 20, I-35: 15) (Figure 1). At each random-station, presence/absence was recorded during four independent dips. To avoid recapture, collected Fountain Darters were returned to the river in areas adjacent to the random station being sampled. Habitat variables recorded at each station included dominant aquatic vegetation and presence/absence of bryophytes and algae.

Data Analysis

Key demographic parameters used to evaluate Fountain Darter observations included population performance, size structure, and recruitment. Population performance was assessed using drop-net, timed dip-net, and random dip-net data. Counts of darters per drop-net sample were standardized as density (darters/m^2). Timed dip-net total darter counts per study reach were standardized as catch-per-unit-effort (CPUE; darters/person-hour [p-h]) for each sampling event. Random dip-net occurrence per station was based on whether or not a Fountain Darter was observed during any of the four dips and percent occurrence was calculated per sampling event at each reach as: (sum[darter presence]/sum[random stations])*100. Fountain Darter density, CPUE, and occurrence were compared among seasons using boxplots. In addition, density and CPUE seasonal observations were compared to the past five years and long-term observations (2001–present). Occurrence values were only compared to observations from the past five years due to the fact that Texas Wild-rice was excluded from sampling prior to 2017. Lastly, temporal trends in Fountain Darter density were assessed per sampling event for each study reach for the past five years using boxplots and compared to their respective long-term (2001–present) medians and quartiles (25th and 75th percentile).

Size structure and recruitment were assessed among seasons. Fall and spring were assessed by combining drop-net and timed dip-net data, and summer was assessed using timed dip-net data only. Boxplots coupled with violin plots were used to display the distribution of darter lengths per sampling event for each season for the past five years. Boxplots show basic length-distribution statistics (i.e., median, quartiles, range) and violin plots visually display the full distribution of lengths relative to each sampling event using kernel probability density estimation (Hintze and Nelson 1998). Recruitment was quantified as the percent of darters ≤20 mm during each sampling event. Based on a linear model built by Brandt et al. (1993) that looked at age-length relationships of laboratory-reared Fountain Darters, individuals of this size are likely less than 3 months old and not sexually mature (Brandt et al. 1993; Schenck and Whiteside 1976). Percent recruitment ±95% confidence intervals (beta distribution percentiles; McDonald 2014) were shown for the past five years by season and compared to their respective long-term averages.

Habitat use was assessed based on population performance and size structure among vegetation strata using drop-net and random station dip-net observations. Fountain Darter density by vegetation taxa was compared based on current, five-year, and long-term (2001–present) observations using boxplots. Long-term comparisons of Texas Wild-rice were not provided since 2020 was the first year this species was sampled via drop-netting. In addition, Texas Wild-rice was not sampled during spring or fall drop-netting due to river discharge dropping below 120 cfs. Proportion of occurrence was also calculated among vegetation types sampled during random-station dip-netting for the current year. Lastly, boxplots coupled with violin plots were used to display the distribution of darter lengths by vegetation taxa using drop-net data to examine habitat use among size classes for the current year. Open habitats and Texas Wild-rice were omitted from analysis due to limited darter counts (i.e., less than 3 darters total).

Habitat suitability was quantified to examine reach-level changes in habitat quality for Fountain Darters through time. First, Habitat Suitability Criteria (HSC) ranging from 0 (unsuitable habitat) to 1 (most suitable habitat) were built based on occurrence data for all vegetation types (including open habitat) that have been sampled using logistic regression (Manly et al. 1993). Resulting HSC were then multiplied by the areal coverage of each vegetation strata mapped during a biomonitoring event, and results were summed across vegetation strata to calculate a weighted usable area for each reach. To make data comparable between reaches of different sizes, the total weighted usable area of each reach was then divided by the total area of the reach, resulting in an Overall Habitat Suitability Index (OHSI) for each reach during each sampling event. Following this method, temporal trends of Fountain Darter OHSI ±95% CI were calculated per sampling event for each study reach (Spring Lake Dam, City Park, I-35) for the past five years. Long-term (2003–present) OHSI and 95% CI averages were also calculated to provide historical context to recent observations. Specific details on the analytical framework used for developing OHSI and evaluating its efficacy as a Fountain Darter habitat index, including methods to build HSC, can be found in Appendix H.

Fish Community

Mesohabitat, Microhabitat, and Seine Sampling

Fish community sampling was conducted in the spring and fall monitoring events to quantify fish assemblage composition/structure and to assess Fountain Darters in river segments and habitats (e.g., deeper areas) not sampled during drop-net and timed dip-net surveys. The following nine monitoring segments were sampled: Spring Lake, Sewell Park, Veterans Plaza, Rio Vista Park, Crooks Park, I-35, Thompson Island, Wastewater Treatment Plant, and Smith Property (Figures 2 and 3). Deeper habitats were sampled using visual transect surveys, and shallow habitats were sampled via seining.

A total of three mesohabitat transects were sampled at each segment during visual surveys. At each transect, four divers swam from bank-to-bank at approximately mid-column depth, enumerating all fishes observed and identifying them to species. After each mesohabitat transect was completed, microhabitat sampling was also conducted along four, five-meter-long PVC pipe segments (micro-transect pipes) placed on the stream bottom and spaced evenly along the original transect. Divers started at the downstream end and swam up the pipe searching through the vegetation, if present, and substrate within approximately 1 m of the pipe. All fishes observed were identified to species and enumerated. For both surveys, any individuals that could not be identified to species were classified by genus. At each micro-transect-pipe, total area surveyed (m^2), aquatic vegetation composition (%), and substrate composition (%) were recorded. Water depth (ft) and velocity (ft/s) data were collected in the middle of each micro-transect-pipe using a Marsh McBirney Model 2000 portable flowmeter and adjustable wading rod. At each micro-transect pipe, water-velocity measurements were taken 15 cm from the bottom, mid-column, and at the surface. Standard water-quality parameters were also recorded once at each transect using a handheld water-quality sonde.

In shallow habitats, at least three transects were sampled within each monitoring segment (except Spring Lake) via seining. At each of these, multiple seine hauls were pulled until the entire wadeable area had been covered. After each seine haul, fish were identified, measured (mm), and enumerated. To prevent recapture on subsequent seine hauls, captured fish were placed in a holding bucket containing river water. After completion of the transect, all fish were released from holding buckets. Total area surveyed (m^2) was visually estimated for each seining transect. Habitat data from each seine haul location included substrate and vegetation composition (%); water depth (ft); and velocity (ft/s) measured at 15 cm above the river bottom, at mid-column, and at the surface. Fish taxonomy herein follows the most recent guide published by the American Fisheries Society (AFS 2023).

Data Analysis

To evaluate fish community results, all analyses were conducted using fishes identified to species; fishes identified to genus or family were excluded. Total counts of species from independent samples were first quantified as density (fish/m^2) to standardize abundance among the three gear types used. Results from multiple sites were combined to assess spatial longitudinal differences between Spring Lake, Upper River (Sewell Park, Veterans Plaza),

Middle River (Rio Vista Park, Crooks Park, I-35), and Lower River (Thompson Island, Wastewater Treatment Plant, Smith Property) (hereafter 'study segments').
Based on microhabitat sampling, temporal trends in Fountain Darter density were assessed per sampling event for each study reach for the past five years using boxplots and compared to their respective long-term (2014–present) medians and quartiles. Overall species richness and diversity using the Shannon's diversity index (Spellerberg and Fedor 2003) for each study segment was assessed for the past five years and plotted with bar graphs. Richness and relative density (%; [sum(species *x* density)/sum(all species density)]*100) of spring-associated fishes (Table 2) were also quantified and presented in the same manner as species richness and diversity.

Table 2. Spring-associated fishes within the San Marcos Springs system based on Craig et al. (2016).

SCIENTIFIC NAME	COMMON NAME
Dionda nigrotaeniata	Guadalupe Roundnose Minnow
Notropis amabilis	Texas Shiner
Alburnops chalybaeus	Ironcolor Shiner
Astyanax argentatus	Mexican Tetra
Gambusia geiseri	Largespring Gambusia
Etheostoma fonticola	Fountain Darter
Percina apristis	Guadalupe Darter
Percina carbonaria	Texas Logperch

San Marcos Salamander

Visual Surveys

Salamander surveys were conducted during the spring, summer species-specific, and fall monitoring events at three sites within Spring Lake and the San Marcos River (Figure 1), which were previously described as habitat for San Marcos Salamander (Nelson 1993). Two of the sites are located within Spring Lake: the Hotel Site is adjacent to the old hotel, and the Riverbed Site was located across from the former Aquarena Springs boat dock. The third survey area, called the Spring Lake Dam Site, is located in the main river channel immediately downstream of Spring Lake Dam in the eastern spillway. This site is subdivided into three smaller areas to allow greater coverage of suitable salamander habitat.

SCUBA gear was used to sample habitats in Spring Lake, while a mask and snorkel were used in the site below Spring Lake Dam. For each sample, an area of macrophyte-free rock was outlined using flagging tape, and three timed surveys (five minutes each) were conducted by overturning rocks >5 cm wide and counting the number of San Marcos Salamanders observed underneath. Following each timed search, the total number of rocks surveyed was recorded to estimate the number of San Marcos Salamanders per rock in the area searched. The three surveys were averaged to yield the number of San Marcos Salamanders per rock. Densities of suitably sized rocks at each sampling site were determined using quadrats (0.25 m^2). Three random samples were taken in each area by randomly throwing the quadrat into the sampling area and counting the number of appropriately sized rocks. The three samples were then averaged to yield a density estimate of the number of suitable rocks in the sampling area. The area of each site was determined by measuring each sampling area with a tape measure.

Data Analysis

Salamander densities (salamanders/m^2) are presented for each season using bar graphs and are compared with long-term (2001–present) spring, fall, high-flow event, and low-flow event averages. High-flow and low-flow averages were calculated from Critical Period events. These events are based on predetermined river discharge triggers (Appendix A), which result in additional survey events to assess flow-related impacts to the San Marcos Salamander population. Temporal trends in salamander density were also assessed per sampling event for each study site for the past five years using bar graphs.

Macroinvertebrates

Rapid Bioassessment Sampling

Rapid Bioassessment Protocols (RBPs) are tools for evaluating biotic integrity and overall habitat health, based on the community of organisms present (Barbour et al. 1999). Macroinvertebrates are the most frequently used biological units for RBPs because they are ubiquitous, diverse, and there is an acceptable working knowledge of their taxonomy and life histories (Poff et al. 2006, Merritt et al. 2008).

BIO-WEST performed sampling and processing of freshwater benthic macroinvertebrates, following Texas RBP standards (TCEQ 2014). Macroinvertebrates were sampled with a D-frame kick net (mesh size 500 micrometers [µm]) by disturbing riffle or run habitat (consisting primarily of cobble-gravel substrate) for five minutes while moving in a zig-zag fashion up-stream. Invertebrates were then randomly distributed in a tray and subsamples were taken by scooping out random portions of material and placing them into a separate sorting tray.

All macroinvertebrates were picked from the tray before another subsample was taken. This process was continued until a minimum of 140 individuals were picked to represent a sample. If the entire sample did not contain 140 individuals, the process was repeated again until this minimum count was reached. Macroinvertebrates were collected in this fashion from Spring Lake, Spring Lake Dam, City Park, and I-35 reaches, during spring and fall sampling (Figure 1).

Sample Processing and Data Analysis

Picked samples were preserved in 80% denatured ethanol, returned to the laboratory, and identified to TCEQ-recommended taxonomic levels (TCEQ 2014). This is usually genus, though members of the family Chironomidae (non-biting midges) and class Oligochaeta (worms) were retained at those taxonomic levels. The 12 ecological measures or metrics of the Texas RBP benthic index of biotic integrity (B-IBI) were calculated for each sample. Each metric represents a functional aspect of the macroinvertebrate community, related to ecosystem health, and sample values are scored from 1 to 4 based on benchmarks set by reference condition streams for the state of Texas. The aggregate of all 12 metric scores for a sample represent the B-IBI score for the reach that sample was taken from. The B-IBI point-scores for each sample are compared to benchmark ranges and are described as having aquatic-life-uses as “Exceptional”, “High”, “Intermediate”, or “Limited”. In this way, point-scores were calculated and the aquatic-life-use for each sample reach was evaluated. Temporal trends in B-IBI scores were assessed per sampling event for each study site for the past five years using bar graphs.

RESULTS and DISCUSSION

In 2023, central Texas experienced a continuation of low precipitation and higher ambient temperatures observed in 2022. Exceptional (as designated by the National Weather Service [NWS]) drought conditions occurred throughout central Texas from January through August, covering large portions of the Hill Country. Drought conditions eased slightly to the NWS extreme classification during fall. As described in the next section, river discharge in the San Marcos River was below median historical conditions for the entire year and represents the lowest flows observed since 1956 when the U.S. Geological Survey (USGS) gage was installed. Median mean daily discharge was lower in 2023 (88 cfs) than during previous low-flow years in 2006 (116 cfs), 2009 (96 cfs), 2011 (117 cfs), and 2022 (119 cfs). Minimum mean daily discharge in 2023 declined to the lowest discharge (66 cfs) observed since 1956. Furthermore, low flows have persisted since fall 2022, and unlike previous low-flow years, flows did not return to normal levels by this fall (2023). Over this extended period of low flows, habitat conditions throughout the San Marcos River declined, namely with reduced wetted areas in most reaches.

San Marcos River monthly median discharge decreased throughout the year triggering three full system habitat evaluations at 85 cfs, 70 cfs, and 65 cfs. Habitat quality documented for the Covered Species varied spatially during the evaluations at these three flow tiers. At 85 cfs in June, habitat quality for the San Marcos Salamander and Fountain Darter (i.e., aquatic vegetation) remained suitable at Spring Lake and Spring Lake Dam despite lower water levels, algae build up, and siltation. Suitable Fountain Darter habitat also persisted further downstream at City Park and I-35, though total wetted area was reduced at I-35. Texas Wild-rice was impacted the most under these drought conditions due to reductions in wetted area and terrestrial competitors.

At 70 and 65 cfs in August, habitat conditions for all Covered Species appeared consistent with those observed in June, with some exceptions. By the end of August, habitat conditions were mostly similar to previous evaluations at Spring Lake and Spring Lake Dam. However, lower water levels resulted in degraded habitat quality in some areas that exhibited higher-than-average amounts of algae build up and siltation. All reaches experienced declines in aquatic vegetation coverage and wetted area. Warmer water temperatures above 25 °C were documented at stations further downstream from Spring Lake but were infrequent. See Appendix B for a complete summary of Critical Period low-flow habitat evaluation memorandums.

In summary, total river discharge in the San Marcos River System in 2023 was the lowest since the inception of biological monitoring in 2000. Noticeably lower water levels impacted Texas Wild-rice, while other vegetation more suitable for Fountain Darter habitat was less affected. Based on past low-flow years, it remains important to keep tracking the system-wide habitat conditions for the Covered Species as these lower-than average discharge levels continue to persist. The remaining sections in the Results and Discussion describe current trends in river discharge, water temperature, Covered Species populations, and select floral and faunal communities through the San Marcos Springs/River system during this low-flow year.

River Discharge

Over the last five years, annual median daily mean discharge in the San Marcos River decreased from 2019 (232 cfs) to 2023 (88 cfs), with 2023 values representing the lowest median annual flows observed since 1956 (59 cfs). Maximum mean daily discharge was lowest in 2023 (205 cfs) and highest in 2021 (579 cfs), with 2021 being the only year where mean daily discharge exceeded 400 cfs. Minimum mean daily discharge mirrored median trends, decreasing from 2019 (155 cfs) to 2023 (66 cfs). Variation in discharge (i.e., interquartile range) was generally low and was highest in 2019 (64 cfs), 2021 (57 cfs), and 2022 (60 cfs) relative to 2020 (24 cfs) and 2023 (11 cfs) (Figure 5A).

Monthly median discharge trends in 2023 varied minimally around or slightly below long-term 10th percentile magnitudes. Median discharge only exceeded 100 cfs in May (101 cfs). After May, median discharge decreased through September (70 cfs), then slightly increased in October (80 cfs). Variation in discharge within months was also minimal, with interquartile ranges from 1–11 cfs (Figure 5B).

Routine spring sampling occurred in April, when daily discharge ranged from 82–104 cfs. As flows descended below 100 cfs following the spring sampling event, species-specific sampling remained engaged, which included a habitat assessment and biweekly Texas Wild-rice physical measurements. Discharge further decreased below 80 cfs in August, requiring additional habitat assessments, Texas Wild-rice physical measurements, aquatic vegetation mapping, Fountain Darter dip-netting (n = 1 event), and salamander surveys (n = 3 events). Mean daily discharge remained below long-term 10th percentile (80 cfs) in October during routine fall sampling (Figure 5B).

Water Temperature

Median water temperature varied about 2 °C among stations and ranged from 21.4 °C at Spring Lake Deep to 23.3 °C at I-35. Variation in water temperature (i.e., interquartile range) exhibited a longitudinal gradient, generally increasing from upstream to downstream. Temperature regimes in Spring Lake had minimal variability (0.0–0.2 °C) and variation in riverine stations generally increased with distance downstream from the Chute (1.2 °C) to Wastewater Treatment Plant (3.7 °C) (Figure 6). Longitudinal trends in 2023 matched expectations based on previous years and are typical within spring-associated ecosystems, where water temperatures increase in magnitude and variation further downstream from spring inputs (Kollaus and Bonner 2012).

Fountain Darter egg and/or larval production thresholds were never exceeded in Spring Lake, but exceedances increased with distance from spring source at riverine stations from Spring Lake Dam to Wastewater Treatment Plant. Total number of days water temperatures exceeded the Fountain Darter larval production threshold ranged from 20 to 40 days. Total exceedance time was approximately 20 days at Spring Lake Dam and City Park, approximately 30 days at Rio Vista Park and Thomspon Island, and approximately 40 days at I-35 and Wastewater Treatment Plant. Across stations, water temperature most frequently exceeded 25 °C in August (9–12 days) and September (2–12 days). Median total days of larval production exceedance per month generally increased from March (1 day) to August (12 days) and decreased by October (2 days). In August and September, one to two 4-hour measurements above this threshold were typically observed per day at downstream riverine stations but reached 3 measurements per day at Thompson Island Artificial and Wastewater Treatment Plant.

Across stations, water temperatures exceeded the Fountain Darter egg production threshold from 3 to 28 days per month during June to September. Total exceedance days was minimal at City Park (8 days) and Rio Vista Park (3 days) but was higher from I-35 (13 days) to Wastewater Treatment Plant (24 days). Across all stations, median total days of egg production exceedance per month generally increased from May (0 days) to August (10 days) and decreased to September (4 days). Total daily 4-hour measurements above this threshold were zero to one per day across all stations except Thompson Island Artificial and Wastewater Treatment Plant in August (1–3 per day) and September (0–6 per day).

Among the study reaches, temporal patterns in exceedance of the 26 °C optimal egg production threshold were noted when 2023 exceedance frequencies were compared to previous years. Although the threshold was not exceeded at Spring Lake Dam, exceedances were more common at downstream study reaches in 2022 and 2023. At City Park, the egg production threshold was not exceeded in 2020 or 2021, whereas it was exceeded for 31 days in 2022 and 8 days in 2023. At I-35, the threshold was not exceeded from 2020-2022 but was exceeded for 13 days in 2023. However, based on patterns in Fountain Darter population demography at these study reaches in summer and fall 2023, elevated water temperatures in summer 2023 did not have a strong negative affect on overall population state or recruitment rates (see subsequent sections for more details).

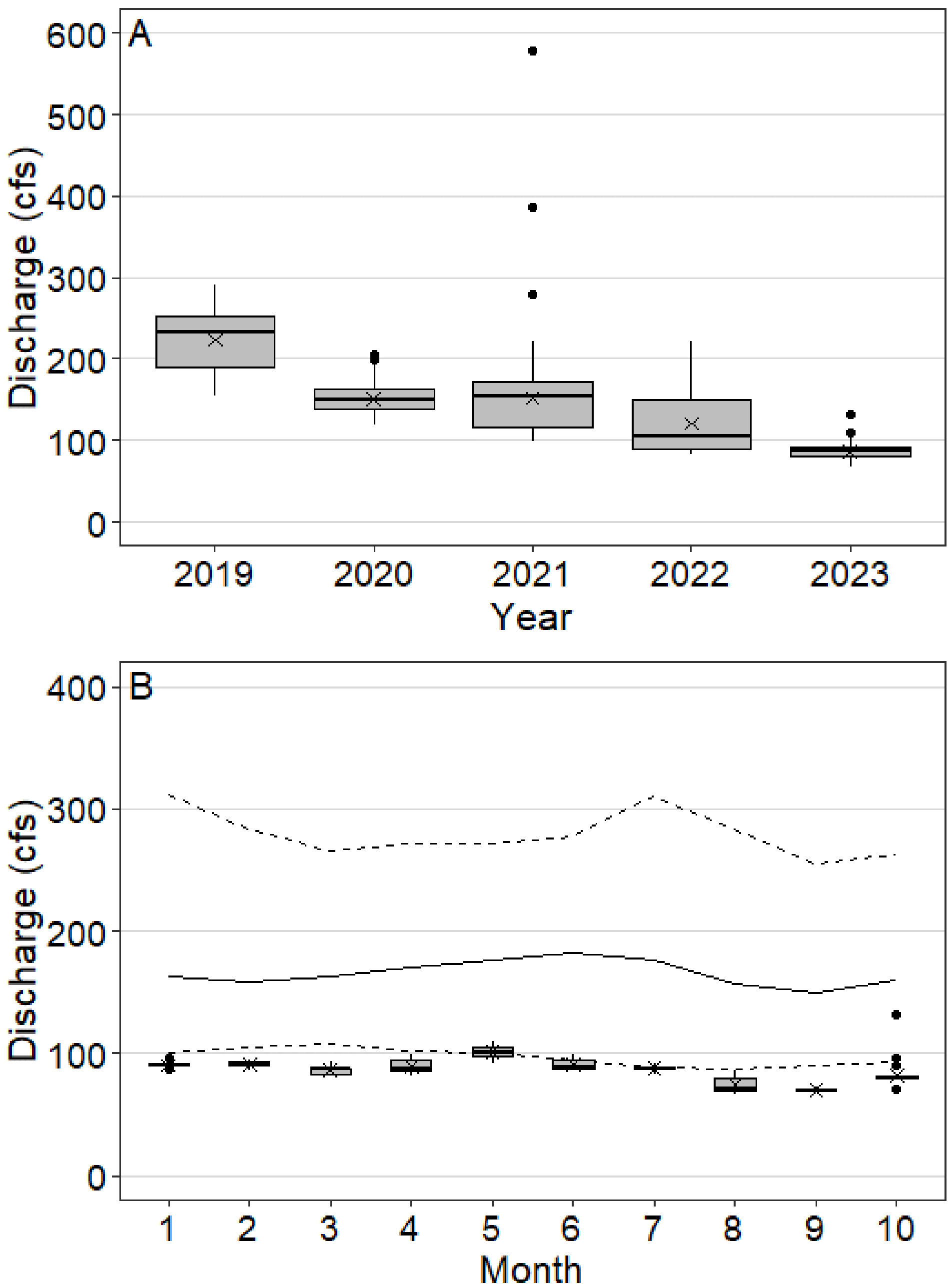


Figure 5. **Boxplots displaying San Marcos River mean daily discharge annually from 2019–2023 (A) and among months (January–October) in 2023 (B). Each month is compared to the 10th percentile (lower dashed line), median (solid line), and 90th percentile (upper dashed line) of their historical (1956–2023) daily means. The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range, and outliers beyond this are designated with solid black circles.**

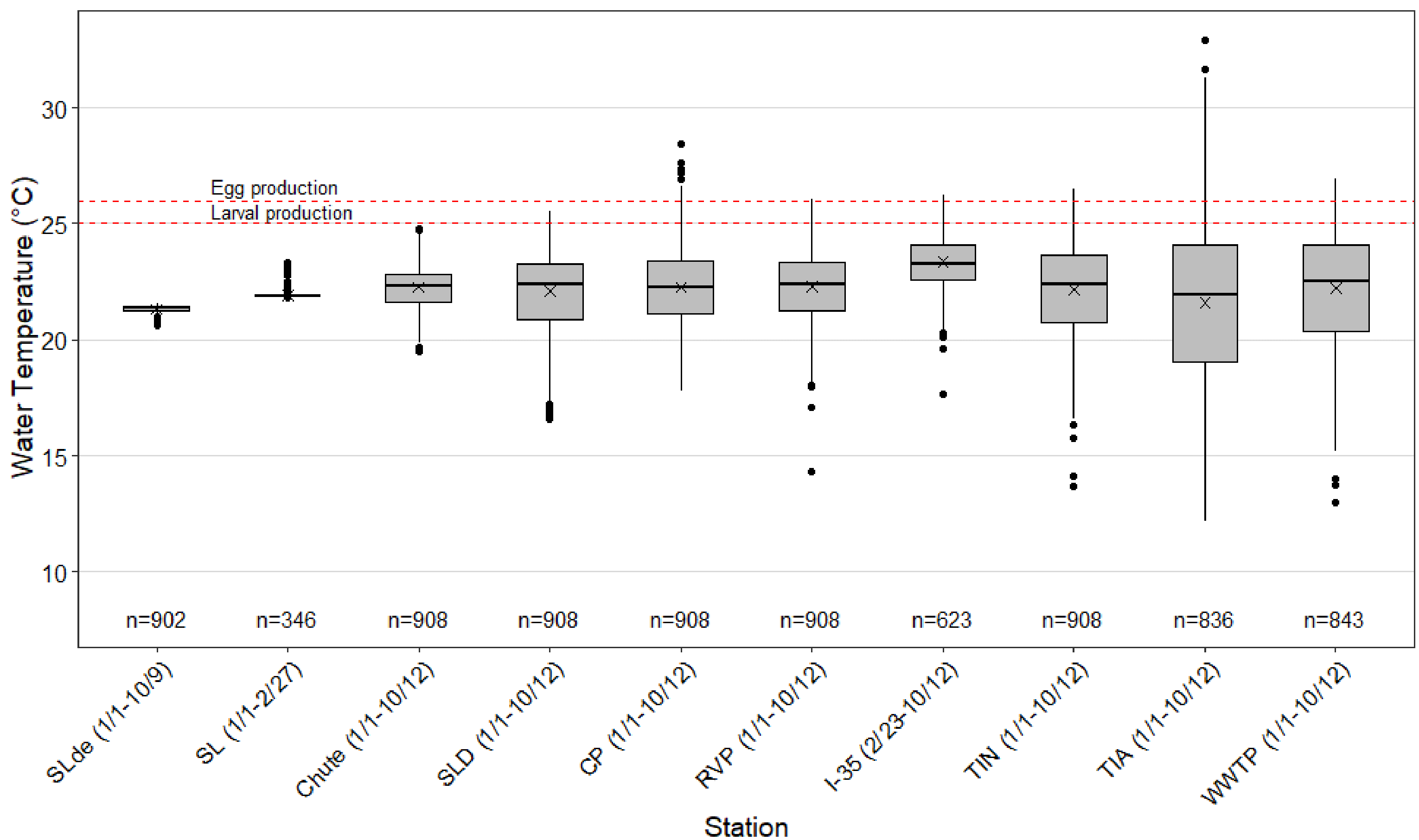


Figure 6. **Boxplots displaying 2023 water temperatures at logger stations (data collection timeframe [Month/Day]). Water temperature data are based on measurements collected at 4-hour increments. Stations include Spring Lake Deep (SLde), Spring Lake (SL), Chute, Spring Lake Dam (SLD), City Park (CP), Rio Vista Park (RVP), I-35, Thompson's Island Natural Channel (TIN), Thompson's Island Artificial Channel (TIA), and Wastewater Treatment Plant (WWTP). The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range, and outliers beyond this are designated with solid black circles. The "n" values along the x-axis represent the number of individual temperature measurements in each distribution. The red dashed lines indicate maximum optimal temperatures for Fountain Darter larval (≥25 °C) and egg (≥26 °C) production (McDonald et al. 2007).**

Aquatic Vegetation

HCP Benchmark Full System Mapping

The HCP full system baseline vegetation mapping occurred in April to May 2023 and marks the third HCP benchmark mapping event since implementation of the EAHCP. Previous full system mapping events occurred in 2013 and 2018. In each event, aquatic vegetation was mapped from Spring Lake Dam to just below Stoke's Park/ Thompson's Island. Due in part to HCP restoration activities, there was an increase in percent composition of native aquatic vegetation between 2013 and 2018 (BIO-WEST 2018). Texas Wild-rice was the native species to increase the most during this period.

Overall San Marcos River discharge decreased between 2018 and 2023. The San Marcos River system experienced flows near the historical median in 2018 (~160 cfs), but annual medians steadily declined from 2019 to 2023, bottoming out at 88 cfs in 2023 (Figure 5A). Despite a reduction in flow across the five year period, aquatic vegetation coverage was approximately 38,000 m^2 (Table 3). Although total amount of vegetation was similar, coverages among taxa changed. In 2018, coverage of Texas Wild-rice was 10,224 m^2 (Figure 7). Coverage of Texas Wild-rice increased by 2023 (15,317 m^2) becoming the dominant aquatic plant species in the system. *Cabomba* had the second largest increase in coverage over the five year period which was likely a result of restoration planting and natural expansion during reduced flow conditions. Plant species with reduced cover between 2018 and 2023 include *Potamogeton* and *Hydrilla*. *Hydrilla* was reduced as a direct result of removal efforts associated with HCP restoration. Many locations where *Hydrilla* was dense in 2018 are now occupied by Texas Wild-rice or other native species. Additionally, *Potamogeton* has slowly been replaced by Texas Wild-rice in several areas. Other notable observations made during the mapping event include the expansion of *Myriophyllum aquaticum*, *Alternanthera philoxeroides,* and *Panicum repens* to new sections of the river. Furthermore, there was a notable increase in bryophyte abundance in slackwater areas which have increased as flows declined. 2023 was unique to previous years in that it was the first year that bryophyte coverage was large enough to map in the San Marcos system. Coverage of this non-rooted plant reached 1,284 m^2 in 2023.

Table 3. A comparison of the notable changes in vegetation assemblages observed in the 2013, 2018, and 2023 HCP Benchmark mapping events.

Taxa	2013 Coverage (m^2)	2018 Coverage (m^2)	2023 Coverage (m^2)
Cabomba	3,114	1,039	5,080
Hydrilla	18,927	12,685	6,045
Hygrophila	10,778	7,112	4,720
Ludwigia	139	330	415
Potamogeton	3,053	1,233	118
Sagittaria	2,556	3,485	1,948
Nuphar	123	125	287
Hydrocotyle	173	220	613
Zizania	4,892	10,224	15,317
Other species	9,608	1,921	3,804
Total	**53,363**	**38,374**	**38,347**

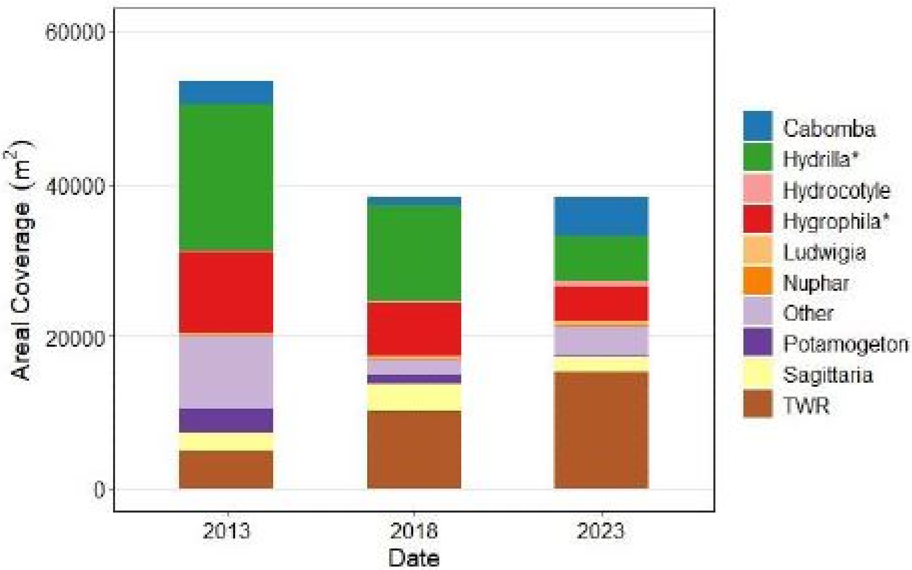


Figure 7. Aquatic vegetation (m^2) composition among taxa during full system mapping of the San Marcos Springs and River in 2013, 2018, and 2023.

Long-term Biological Goal Reach Mapping

Long-term biological goal reach mapping occurred in spring and fall, as well as one low-flow event in July.

Spring Lake Dam Reach

The Spring Lake Dam reach has been a popular recreation area over the past decade, when access is allowed. In 2023, recreation impacts to the vegetation community were noticeable and compounded by prolonged low flows. Since the beginning of the year, this reach was marked by shallower depths and slower velocity culminating in the establishment of a gravel bar island near the confluence of Sessoms Creek. Spring 2023 vegetation coverage was near the long-term average (1,469 m^2) but down compared to spring 2022 (2,077 m^2; Figure 8). As flows decreased in 2023, vegetation coverage decreased by 256 m^2 to 1,213 m^2 in the July low-flow event. Much of the vegetation loss during this time was observed in species other than Texas Wild-rice which decreased slightly from 1,073 m^2 in the spring to 1,033 m^2 in the July low-flow event. Vegetation coverage continued to decline throughout the year and fall mapping recorded a total vegetation coverage of 982 m^2. Of the total vegetation coverage in fall, 80% (786 m^2) was Texas Wild-rice, with only 196 m^2 of other species (Figure 9), including *Potamogeton illinoensis* and *Hydrocotyle verticillata*. Bryophytes were associated with *Hydrocotyle verticillata* in both the spring and fall.

City Park Reach

Total vegetation coverage in City Park reach was lower than long-term averages in the spring (3,215 m^2), declined well below long-term low-flow averages in July (2, 227 m^2), and was markedly lower than fall averages by fall of 2023 (1,667 m^2; Figure 8). City Park reach maintains the highest vegetation coverage among study reaches but also receives the greatest impact from recreation as tubing, wading, and swimming are all popular activities here. Based on this, large variations in vegetation coverage are common, yet long-term seasonal patterns (spring to fall decrease) tend to remain consistent (Figure 8). However, in 2023, typical recreational impacts were exacerbated by continued and sustained low flows. Texas Wild-rice was dominant within this reach accounting for 92-96% of total vegetation across 2023 mapping events despite decreasing from spring (2,954 m^2) to summer (2,142 m^2) and fall (1,585 m^2) (Figure 9). *Cabomba caroliniana*, which has been observed to increase in both Comal and San Marcos systems during low flows, was the second most dominant species and exhibited improved persistence compared to previous years. Another interesting change in vegetation assemblage was the presence of bryophytes associated with *Cabomba* and Texas Wild-rice in 2023 amounting to 236 m^2 in spring and persisting into fall.

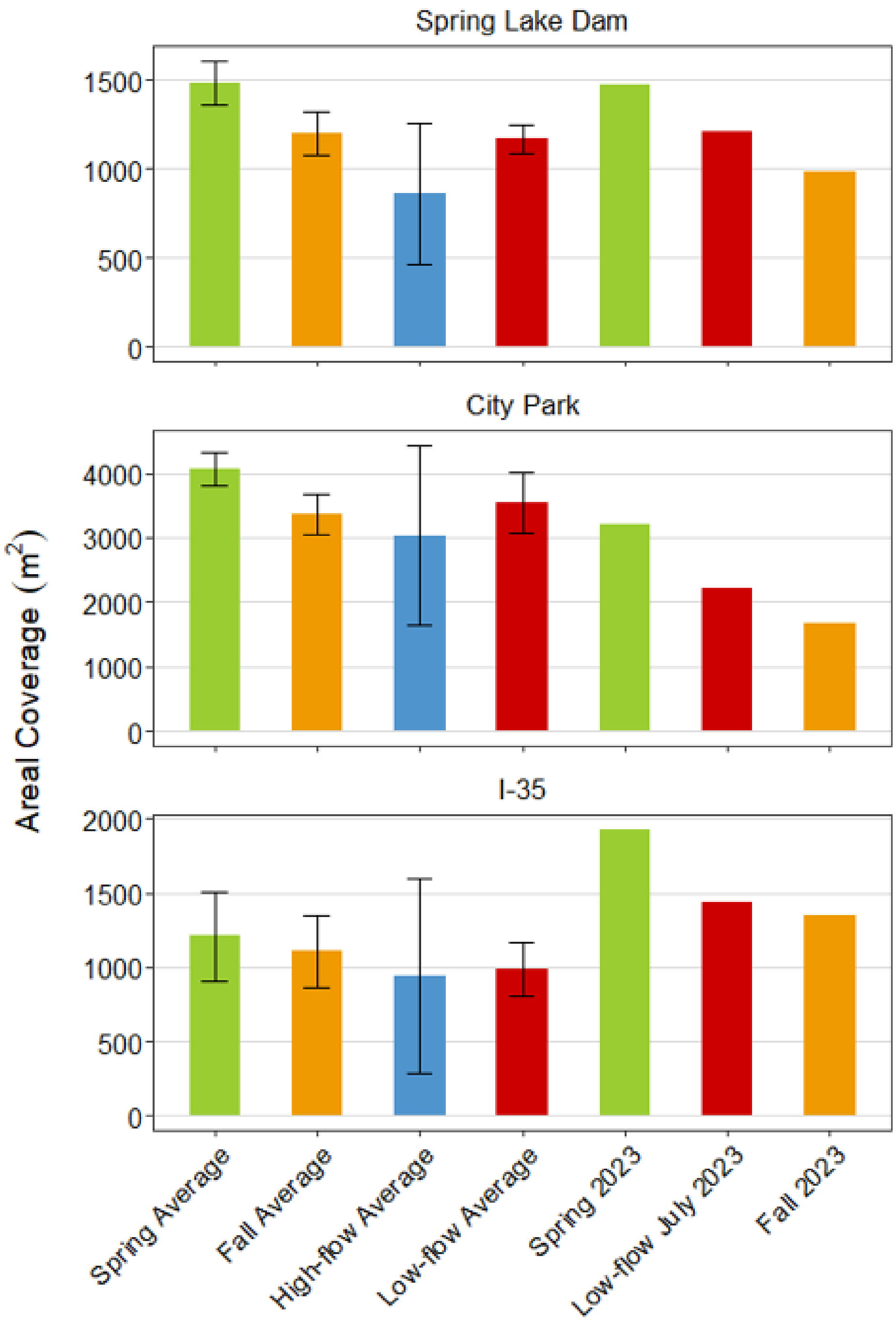


Figure 8. **Areal Coverage (m^2) of aquatic vegetation among study reaches in the San Marcos River. Long-term (2001–2023) study averages are provided with error bars representing 95% confidence intervals.**

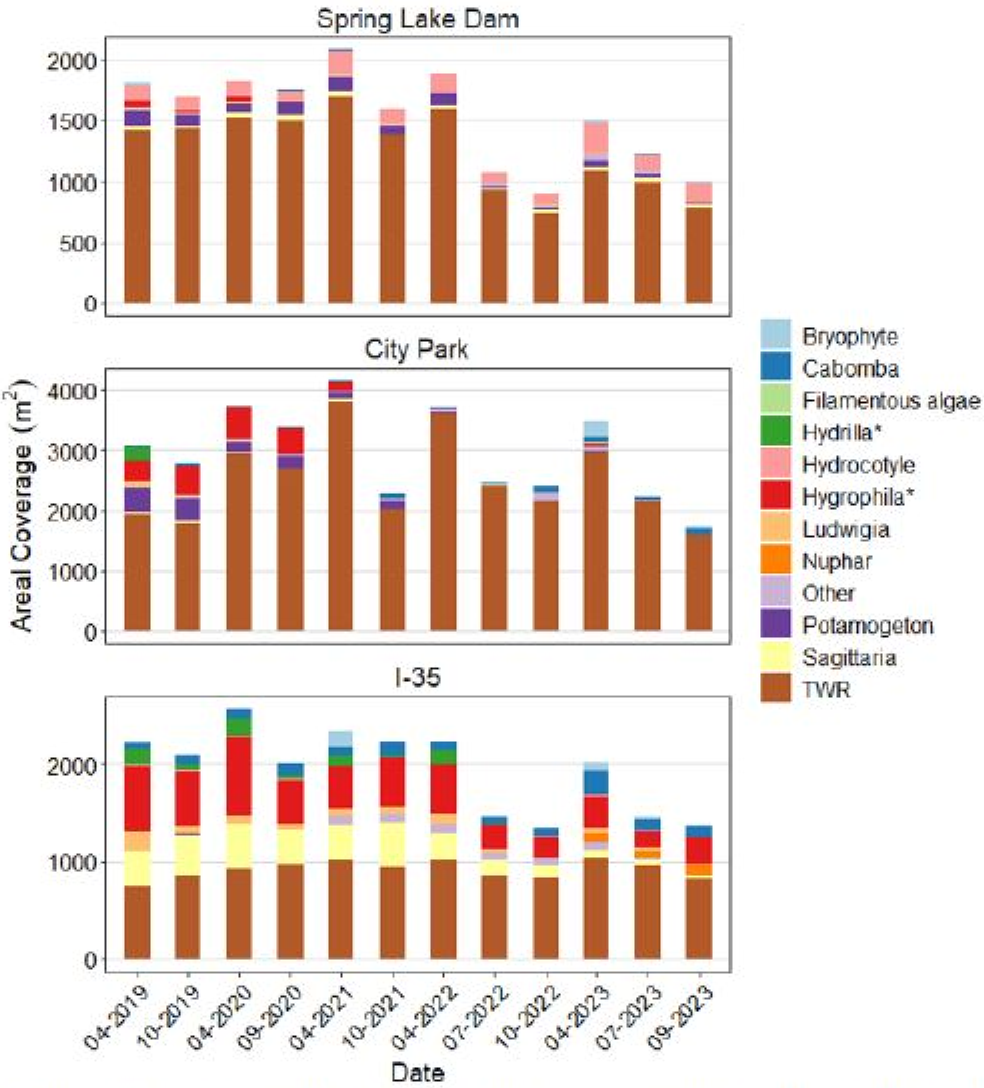


Figure 9. **Aquatic vegetation (m²) composition among taxa (top row) from 2019–2023 in the San Marcos River. (*) in the legend denote non-native taxa.**

I-35 Reach

Texas Wild-rice was the dominant species in the I-35 reach, accounting for 54-66% of total vegetation coverage across mapping events in 2023 (Figure 9). Texas Wild-rice coverage decreased from spring (1,030 m^2) to summer (950 m^2) and fall (822 m^2). As the drought persisted approximately 450 m^2 of submerged aquatic habitat in the lower section became dewatered. This changed the cover and distribution of vegetation in the area. Amphibious species such as *Hygrophila polysperma* and *Sagittaria platyphylla* continued to survive as emergent plants while species like *Cabomba caroliniana* declined or shifted to deeper water. Additionally, bryophytes were present in all three mapping events with the highest coverage of 82 m^2 occurring in spring. Although bryophytes are sporadically observed in the historical data, their persistence in this reach throughout the year is uncommon. However, slower water velocities resulting from low-flow conditions likely allowed for this unrooted vegetation to persist.

Texas Wild-rice

Texas Wild-rice Mapping

In 2023, Texas Wild-rice was mapped three times, during the full system mapping event early in the year, during the annual summer mapping event in July/August, and during the low-flow (<80 cfs) sampling event in September/October. Low flows increased above the 80 cfs trigger but remained below 90 cfs for the remainder of the fall. Full system maps are located in Appendix C. Results of the 2023 full system mapping event demonstrated Texas Wild-rice coverage was 15,317 m^2, an increase from the 2022 annual mapping event. However, Texas Wild-rice coverage decreased throughout the remainder of 2023. The coverage during the annual mapping event in July/August was 11,821 m^2, while the coverage during the low-flow sampling event in September/October was 8,211 m^2. This represents the lowest coverage of Texas Wild-rice mapped since 2016 and suggests a continuing trend of decreasing Texas Wild-rice coverage since its peak in April 2021 (Figure 10).

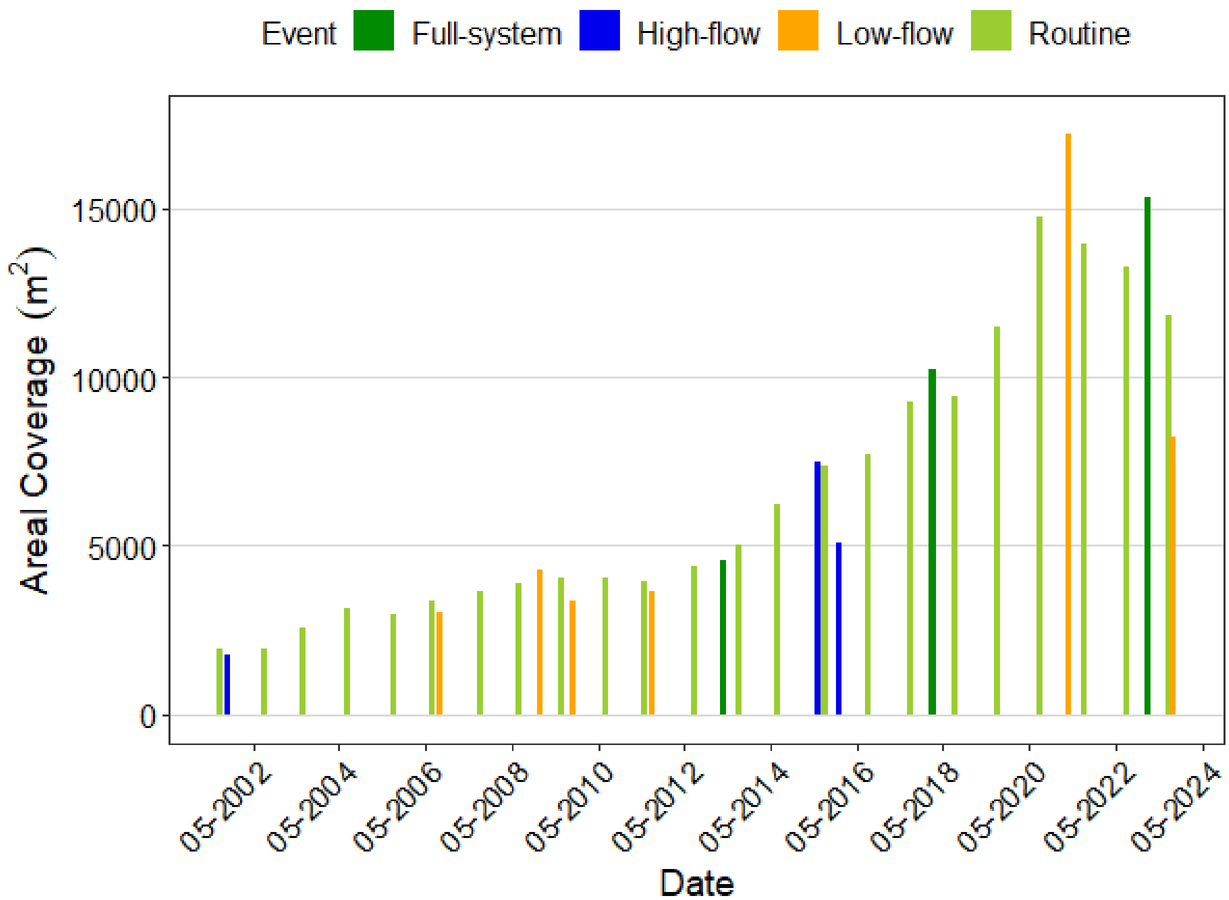


Figure 10. Texas Wild-rice areal coverage (m^2) from 2001–2023 in the upper San Marcos River.

This year's annual (summer) mapping event occurred during substantially reduced discharge (~70–90 cfs) and high levels of recreation in the river. Reduced water levels from low flows led to some Texas Wild-rice becoming dewatered and stranded on islands or along banks. As flows continued to decrease, reaching a low of approximately 66 cfs in August, the soil dried out causing these Texas Wild-rice stands to perish and be replaced by terrestrial or riparian vegetation. Recreation in the summer of 2023 also had negative impacts to Texas Wild-rice coverage located adjacent to several public access areas, including the Spring Lake Dam and City Park study reaches.

Between the July/August 2022 and July/August 2023 annual mapping events, Texas Wild-rice coverage decreased by 1,452 m^2, with losses in five of eight segments and Spring Lake. The largest percent loss (24%) in Texas Wild-rice occurred in Segment F, Veramendi Park to Rio Vista Park, with cover decreasing by 500 m^2 (Table 4). A large portion of Texas Wild-rice around the Purgatory Creek confluence was lost due to lower water levels that left several Texas Wild-rice stands desiccated. Texas Wild-rice cover also decreased substantially (nearly 300 m^2) in Segment E, Lower City Park. Losses in this segment were largely attributed to recreation as pathways were created through the rice. Texas Wild-rice declined slightly in several other segments. Much of the Texas Wild-rice (71 m^2) in Segment B, Sewell Park, was replaced by emergent or terrestrial plant species as the water level decreased. However, most of this loss had already occurred by late 2022.

Although Texas Wild-rice was lost in some areas, it expanded in three segments. The largest percent increases occurred in the most downstream segments. Segment H, below I-35, continued to increase in Texas Wild-rice coverage (84 m^2). In recent years, Texas Wild-rice has steadily increased throughout this segment largely as a result of heightened natural expansion above Cape's dam coupled with reduced overall flow conditions and the limited nature of large flow pulses experienced the past few years. In contrast to trends in previous years, Segment A increased in Texas Wild-rice cover by 29 m^2 (Table 4).

In summary, due to dropping water levels, Texas Wild-rice declined steadily across 2023 sampling events. The cumulative effects of low flow and recreation resulted in observable losses during the September/October mapping event. Plants were extirpated in areas where the substrate had been desiccated or eroded away by foot traffic or shear velocity flows. While similar losses were apparent in 2022, the prolonged period of dewatering in 2023 exacerbated the impacts to Texas Wild-rice (Figure 11).

Table 4. Change in cover amount (m^2) of Texas Wild-rice between July/August 2022 and July/August 2023 annual mapping.

RIVER SEGMENT	JULY/AUGUST 2022 COVERAGE	JULY/AUGUST 2023 COVERAGE	COVERAGE CHANGE	PERCENT CHANGE
A. Spring Lake Dam Study Reach	1,004	1,033	+29	+3
B. Sewell Park	1,017	946	-71	-7
C. City Park bend	3,802	3,277	-525	-14
D. City Park Study Reach	2,424	2,173	-251	-10
E. Lower City Park	1,516	1,223	-293	-19
F. Veramendi Park to Rio Vista Park	2,126	1,626	-500	-24
G. I-35 Study Reach	866	954	+88	+10
H. Below I-35	419	503	+84	+20
Spring Lake	99	86	-13	-13

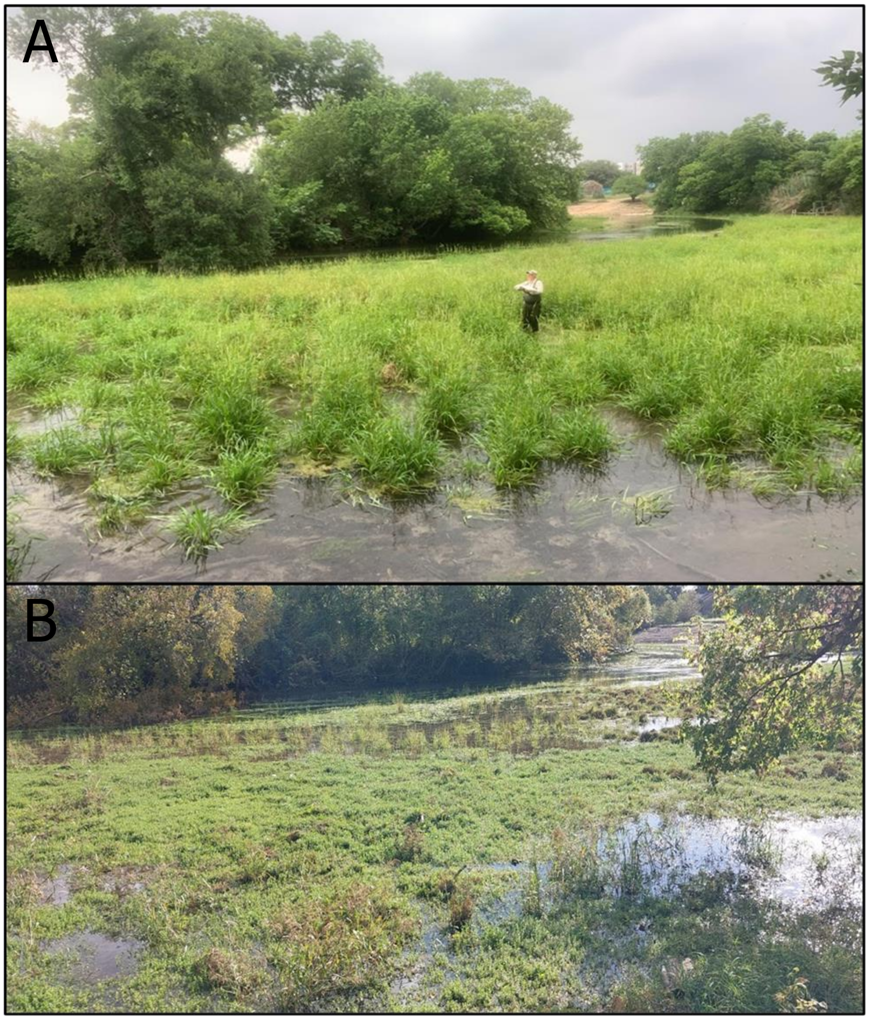


Figure 11. (A) A large stand of emergent Texas Wild-rice at upper City Park in May 2023. (B) The same area at upper City Park in September 2023, after dewatering led to its replacement by terrestrial vegetation (*Ceratopteris thalictroides* and *Bacopa monnieri*).

Fountain Darter

A total of 528 Fountain Darters were observed at 48 drop-net stations across spring and fall 2023. Drop-net densities ranged from 0.00–37.00 fish/m^2. Community summaries and raw drop-net data are included in Appendix E and Appendix G, respectively. Habitat conditions observed during drop-netting can be found in Table 5. Texas Wild-rice was not sampled in 2023 due to river discharge dropping below 120 cfs. Timed dip-netting resulted in a total of 551 Fountain Darters during 10.50 person-hours (p-h) of effort. Site CPUE ranged from 6–112 fish/p-h. Lastly, Fountain Darters were present at 99 out of 240 random-stations and reach-level percent occurrence among monitoring events ranged from 0–73%. A summary of occurrences per reach and vegetation taxa can be found in Table 6.

Table 5. Habitat conditions observed during 2023 drop-net sampling. Physical habitat parameters include counts of dominant vegetation (median % composition) and dominant substrate type sampled. Depth-velocity and water quality parameters include medians (min-max) of each variable among all drop-net samples.

HABITAT PARAMETERS	SLD	CP	I-35
Vegetation			
Bryophyte[1]	0	2 (95%)	0
Cabomba[1]	0	4 (93%)	4 (98%)
Hydrocotyle[1]	4 (100%)	0	0
Hygrophila[1]	0	2 (88%)	4 (95%)
Ludwigia[1]	0	0	2 (100%)
Open	4 (100%)	4 (100%)	4 (100%)
Potamogeton[2]	4 (95%)	2 (90%)	0
Sagittaria[2]	4 (100%)	0	4 (95%)
Substrate			
Cobble	8	0	0
Gravel	5	5	2
Sand	0	2	8
Silt	3	7	8
Depth-velocity			
Water depth (ft)	0.8 (0.2–2.3)	2.1 (0.8–3.0)	1.9 (0.5–3.4)
Mean column velocity (ft/s)	0.4 (0.0–2.1)	0.2 (0.0–0.7)	0.2 (0.0–1.4)
15-cm column velocity (ft/s)	0.3 (0.0–2.1)	0.1 (0.0–0.5)	0.2 (0.0–1.3)
Water quality			
Water temperature (°C)	22.2 (21.8–22.8)	22.4 (21.1–23.4)	22.2 (18.8–23.4)
DO (ppm)	7.8 (6.8–8.5)	8.8 (7.4–9.9)	8.6 (7.0–10.3)
DO % saturation	89.2 (78.7–99.2)	101.2 (85.7–115.5)	94.8 (79.9–120.2)
pH	7.4 (4.3–7.9)	7.5 (4.3–7.9)	7.6 (4.3–8.0)
Specific conductance (µs/cm)	639 (624–650)	640 (628–651)	646 (621–650)

[1]Denotes ornate vegetation taxa with physical characteristics that create complex structure
[2]Denotes long broad or ribbon-like, austere-leaved vegetation taxa

Table 6. **Summary of vegetation types sampled among reaches during 2023 random-station surveys in the San Marcos Springs/River and the percent occurrence of Fountain Darters in each reach and vegetation type. Raw numbers represent the sum of detections per reach-vegetation type combination.**

VEGETATION TYPE	SL	SLD	CP	I-35	Total	Occurrence
Cabomba[1]	13	0	13	9	**35**	**62.9**
Ceratophyllum[1]	5	0	0	0	**5**	**0.0**
Heteranthera[1]	0	2	0	0	**2**	**0.0**
Hydrocotyle[1]	0	10	0	0	**10**	**90.0**
Hygrophila[1]	0	0	0	14	**17**	**71.4**
Limnophila[1]	0	0	0	1	**1**	**100.0**
Ludwigia[1]	0	0	0	3	**3**	**66.7**
Myriophyllum[1]	3	0	0	0	**3**	**33.3**
Nasturtium[1]	0	0	1	0	**1**	**100.0**
Nuphar[2]	0	0	0	1	**1**	**0.0**
Potamogeton[2]	0	2	0	0	**2**	**50.0**
Sagittaria[2]	19	1	0	3	**23**	**34.8**
Texas Wild-Rice[2]	0	45	66	29	**140**	**31.4**
Total	**40**	**60**	**80**	**60**	**240**	**41.2**
Occurrence	**15.0**	**25.0**	**52.5**	**60.0**	**-**	**-**

[1]Denotes ornate vegetation taxa with physical characteristics that create complex structure
[2]Denotes long broad or ribbon-like, austere-leaved vegetation taxa

Population Demography

Seasonal population trends

Median Fountain Darter density in 2023 was slightly higher in fall (3.00 darters/m^2) than spring (2.25 darters/m^2) and upper quartiles were similar (~9.00 darters/m^2). For both seasons, median density and variability (i.e., interquartile range) in 2023 were slightly higher than 5-year and long-term expectations (Figure 12A). Median catch rates in 2023 decreased from spring (53 darters/p-h) to fall (30 darters/p-h). Median CPUE in spring was slightly higher than historical data, while summer and fall were similar. Upper quartiles and variability in 2023 were lower than historical trends, which can be attributed to lower sample sizes associated with timed dip-netting (Figure 12B). Similar to catch rates, median percent occurrence decreased from spring (43%) to fall (30%). Median percent occurrence approximated 5-year trends across seasons and the upper quartile in fall was notably higher in 2023 (+15%) (Figure 12C).

In summary, population indices met expectations in 2023 and generally aligned with 5-year and long-term data. The only exceptions to this were slightly higher than typical overall density and occurrence in fall which can be attributed to increases of these metrics at City Park and I-35 (see next section). Specifically, darter densities were high within bryophytes which were more prevalent than normal within City Park in 2023. In addition to high densities within species-specific patches, bryophytes were also observed associated with Texas Wild-rice and other taxa, which likely contributed to high darter occurrence in fall. Presence of non-rooted bryophytes within other vegetation taxa such as Texas Wild-rice increased structural complexity of these habitats, thus increasing suitability for Fountain Darters (Alexander and Phillips 2012, Edwards and Bonner 2022).

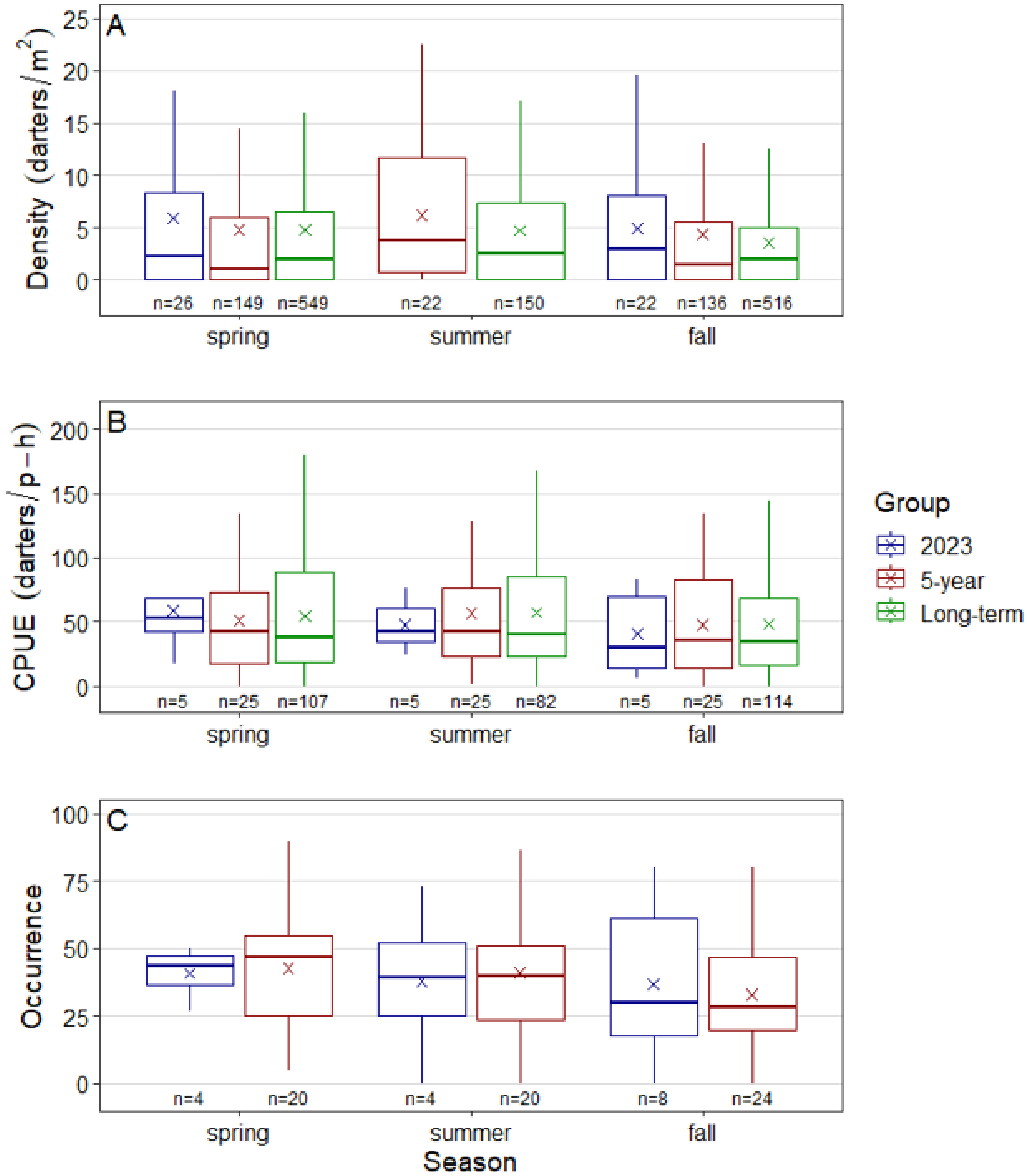


Figure 12. **Boxplots comparing Fountain Darter density from drop-net sampling (A), catch-per-unit-effort (CPUE) from timed dip-netting (B), and proportional occurrence from random station dip-netting (C) among seasons in the San Marcos Springs/River. Temporal groups include 2023, 5-year (2019–2023), and long-term (2001–2023) observations. The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range. The "n" values along the x-axes represent the number of discrete samples per category.**

Drop-net sampling density trends

Patterns in Fountain Darter density in 2023 differed spatially and in some cases deviated from general seasonal- and reach-specific expectations. Median density at Spring Lake Dam was below the long-term median (1.50 darters/m^2) in the spring (0.50 darters/m^2) and increased near it in fall (1.00 darters/m^2). At City Park, median density increased from spring (4.50 darters/m^2) to fall (9.50 darters/m^2). Both median and upper quartile estimates in this reach were substantially higher than long-term expectations (2.00 and 6.00 darters/m^2, respectively). Median density at I-35 was higher than the long-term upper quartile (5.50 darters/m^2) in spring (7.00 darters/m^2). The median decreased in fall (3.25 darters/m^2), but was still above long-term expectations (2.00 darters/m^2) (Figure 13).

Median density the past five years were not strongly correlated ($r < 0.70$) across reaches, suggesting asynchronous trends among reaches. Median and upper quartiles showed an increasing trend overall from 2019–2023 at City Park and I-35 (Figure 13). Positive increases in density at City Park and I-35 in 2023 do not correspond well with patterns in overall coverage of suitable vegetation types or OHSI observed over this time period, as both have decreased. Instead, it appears that density within multiple vegetation types (*Cabomba*, *Hygrophila*, *Ludwigia*, and *Sagittaria*) increased sharply in 2023 (see Figure 15). This increase was most likely related to higher prevalence of bryophytes and algae within these other vegetation types due to lower velocity conditions. Further, bryophyte patches large enough for drop-net sampling established on the stream bottom at City Park in fall, which represents the first opportunity to sample within this taxon in the San Marcos River and best explains the large increase in density observed (See subsequent section for more details on density trends).

Results suggest that extended periods of reduced flows from 2022–2023 did not have an apparent negative effect on Fountain Darter density, and monitoring this year instead indicates increased population densities. Findings in 2022 provided evidence to suggest population resistance to reduced flows may be a function of increased recruitment as documented in other studies of stream fishes (McCargo and Peterson 2010; Katz and Freeman 2015). As stated above, high overall recruitment and substantial increases in density at City Park in 2023 are likely due to increased coverage of bryophytes within other vegetation types. The resulting increase in complexity of benthic habitats occupied by darters has potentially increased carrying capacity, thereby limiting potential density-dependent regulation (i.e., negative feedbacks) (Dennis et al. 2006; Boettiger 2018).

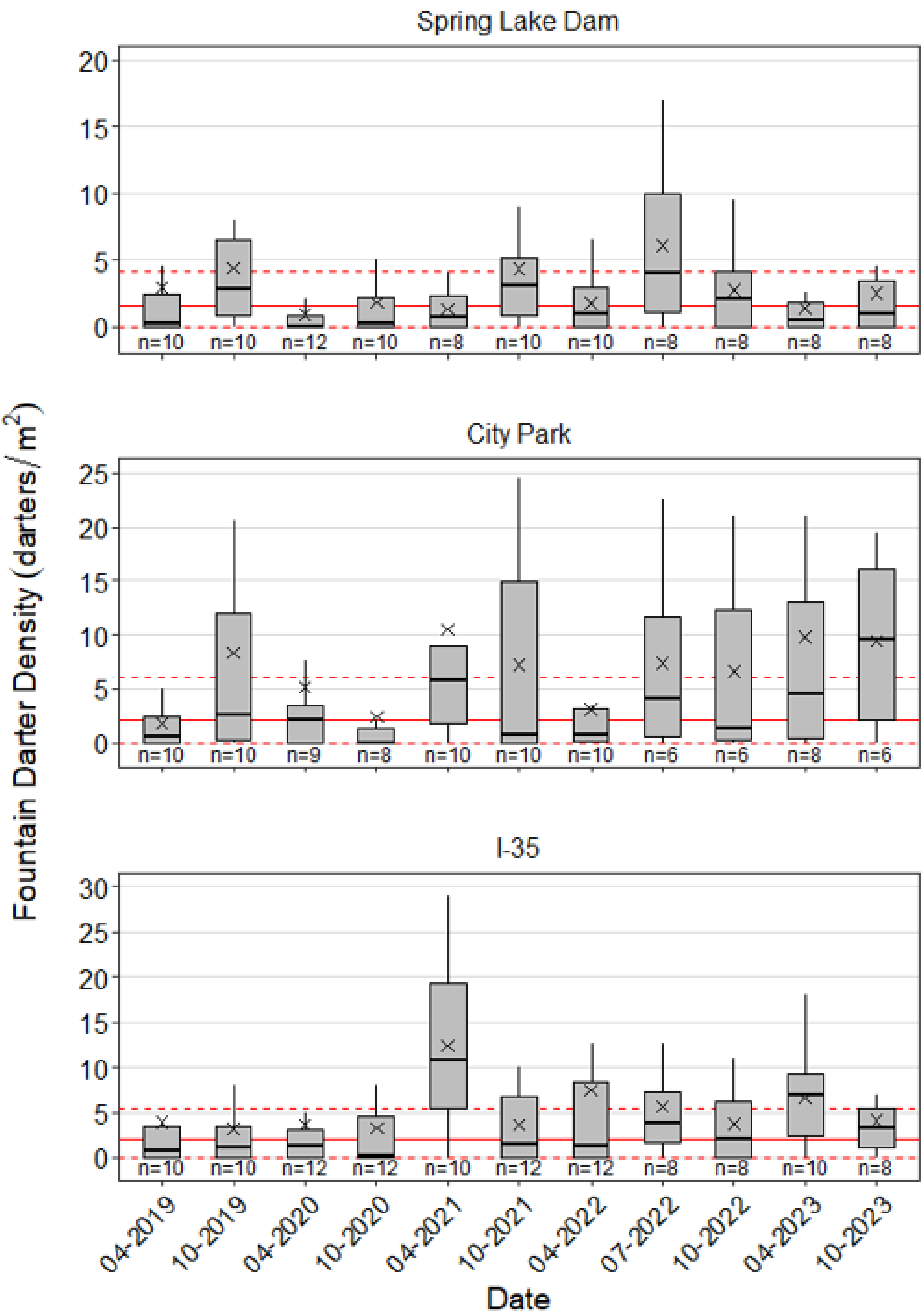


Figure 13. **Boxplots displaying temporal trends in Fountain Darter density (darters/m^2) among study reaches from 2019–2023 during drop-net sampling in the San Marcos River. The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range. The "n" values along the x-axes represent the number of drop-net samples in each category. Solid and dashed red lines denote long-term (2001–2023) medians and interquartile ranges, respectively.**

Size structure and recruitment trends

Five-year trends in Fountain Darter size structure and recruitment displayed consistent patterns among seasons, though event-specific discrepancies were observed within spring and fall events. In general, smaller darters were more frequently observed in spring during the peak reproductive period, as seen by lower median lengths (19–21 mm). Violin plots with distributions that are left-skewed and greater levels of recruitment in spring further support this trend. Patterns in size structure aligned with long-term trends in spring 2023. In recent years, recruitment has been high in spring, being above the 95% confidence interval of historic data in 2019 (61.1%), 2021 (59.5%), and 2022 (57.3%); and similar to the long-term mean in 2020 and 2023 (46.5%). Summer median lengths (25–28 mm) were high with distributions more frequently left-skewed towards larger darters. As such, summer recruitment rates (14.9–26.0%) were lower relative to spring but approximated long-term expectations the past five years. In fall, median lengths (24–29 mm) and recruitment (16.0–39.2%) were mostly comparable to summer. That said, fall recruitment rates in 2019 (31.3%) and 2022 (29.2%) were much higher than expected (Figure 14).

Results do not provide evidence that the continuation of low flows altered size structure or suppressed recruitment of darters. Size structure consistent with previous years suggests Fountain Darter growth was not attenuated in 2023, which conflicts with studies on other riverine darter species and may be influenced by stable water temperatures in this spring-dominated system (Marsh-Matthews and Matthews 2010, Katz and Freeman 2015). Fountain Darter recruitment rates were substantially higher than expected in 2022 and fell back to normal levels in 2023, yet densities increased overall during this time period. This suggests that survival was likely high in 2023. However, survival was not specifically analyzed, and it should be noted that low-flow restrictions on sampling in Texas Wild-rice prevented sampling this taxon in 2023 and this may have influenced overall median densities.

Relative effects of density-independent versus density-dependent factors on population dynamics are currently unknown for Fountain Darters and would help provide a more complete understanding of demographic processes through time (Bellier et al. 2016, Grossman et al. 2017). Regardless, recent trends in recruitment coupled with results from occurrence and abundance indices clearly demonstrate maintaining suitable habitat is important for population persistence (Duncan et al. 2016, Dunn and Angermeier 2019).

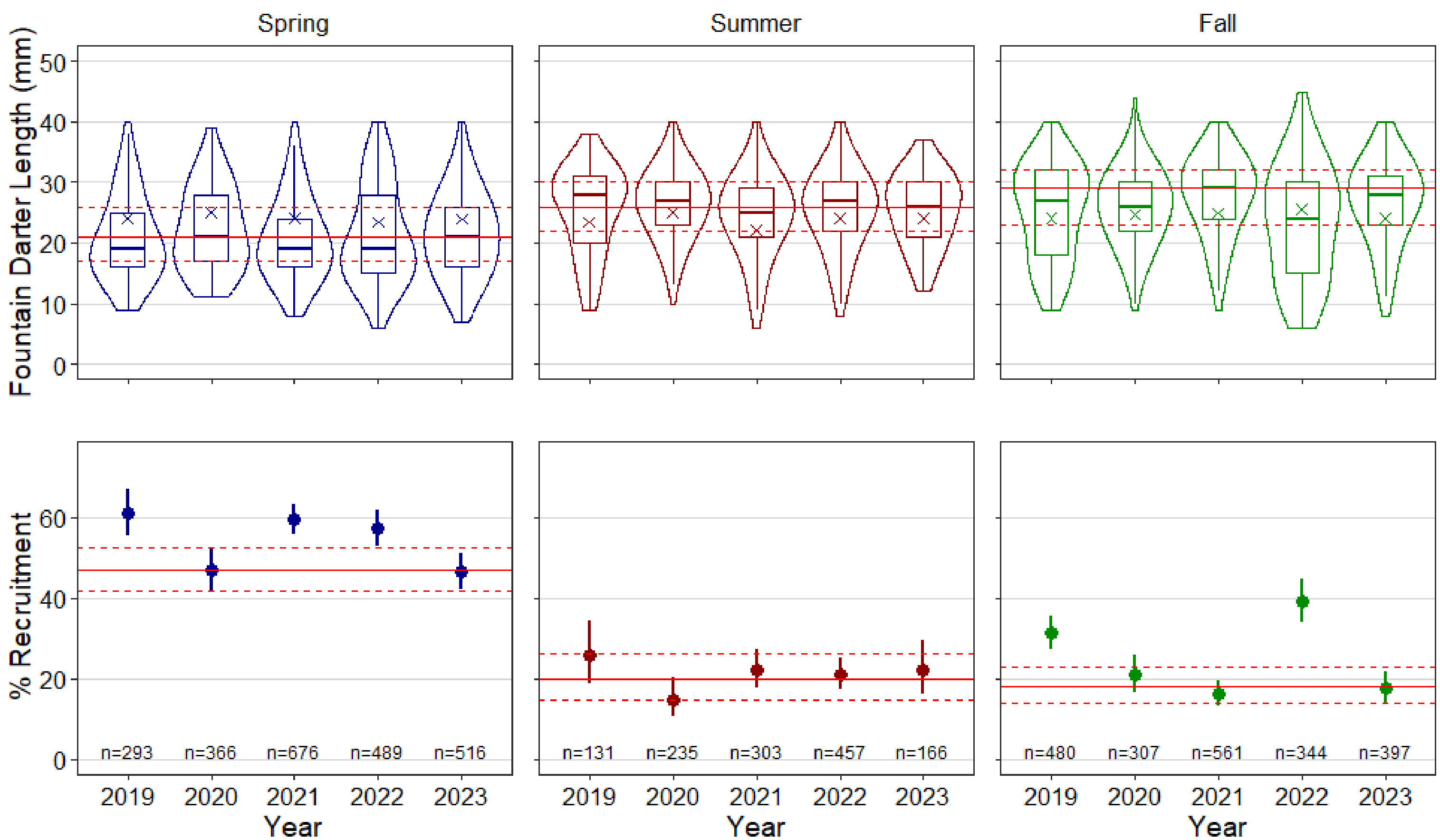


Figure 14. **Seasonal trends of Fountain Darter size structure (mm; top row) and percent recruitment (bottom row) in the San Marcos River from 2019–2023. Spring and fall trends are based on drop-net and timed dip-net data in aggregate, whereas summer trends are based on timed dip-net data only. Size structure is displayed with boxplots (median, quartiles, range) and violin plots (probability density; polygons outlining boxplots). The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range. The "n" values along the x-axis of the top row represent the number of Fountain Darter length measurements in each distribution. Recruitment is the percent relative abundance (± 95% CI) of darters ≤20 mm. Long-term (2001–2023) trends in size structure are represented by median (solid red line) and interquartile range (dashed red lines). Recruitment is compared to the long-term mean percentage (solid red line) and 95% CI (dashed red lines).**

Habitat Use and Suitability

Density trends among vegetation taxa

Median densities in 2023 were highest in *Cabomba* (15.50 darters/m^2) and bryophyte (13.25 darters/m^2). Taxa with intermediate median estimates included *Hygrophila* (7.50 darters/m^2), and *Ludwigia* (5.25 darters/m^2). Fountain Darter densities within *Cabomba*, *Hygrophila*, and *Ludwigia* were substantially higher this year compared to historical data. Patches of bryophyte typically do not persist in the San Marcos River, though establishment of multiple patches in fall 2023 (i.e., City Park) allowed this taxon to be sampled for the first time and high Fountain Darter densities observed closely resembled bryophyte densities in the Comal system (16.50 darters/m^2). Median densities were low for the remaining taxa, which included *Sagittaria* (2.50 darters/m^2), *Hydrocotyle* (1.75 darters/m^2), *Potamogeton* (1.25 darters/m^2), and open habitats (0.00 darters/m^2). Densities in *Potamogeton* and open habitat aligned with historical expectations, whereas, densities in *Sagittaria* were higher than expected. Median density in *Hydrocotyle* was slightly lower than historical trends, though its upper quartile estimate was much lower (Figure 15).

Current patterns of vegetation use continue to generally support previous research, showing higher Fountain Darter densities occur within ornate vegetation that provides complex structure near the benthos (Schenck and Whiteside 1976; Linam et al. 1993; Alexander and Phillips 2012; Edwards and Bonner 2022). Substantial deviations in taxa-specific densities from historical data for several taxa are possibly due to several factors associated with reduced flows. Higher densities than expected in *Hygrophila*, *Ludwigia*, *Cabomba*, and *Sagittaria* are likely related to increased prevalence of bryophytes within these taxa which creates greater structural complexity (Alexander and Phillips 2012, Edwards and Bonner 2022). Lower current velocities due to persistent low flows have allowed bryophytes to proliferate in riverine areas where they are typically limited under average San Marcos river discharge conditions.

Size structure among vegetation taxa

Boxplot summary statistics and violin plots showed that Fountain Darter size structure varied among vegetation taxa sampled in 2023. Open was omitted from analysis due to zero counts in this habitat. The lowest median lengths occurred in *Potamogeton* (17 mm) and bryophyte (21 mm), were intermediate in *Hygrophila* (24 mm) and *Cabomba* (24 mm), and highest in *Ludwigia* (27 mm), *Sagittaria* (31 mm), and *Hydrocotyle* (32 mm). Size structure distributions were left-skewed for *Potamogeton*, which differed from previous years' data as this taxon usually harbors larger individuals. This distribution could be influenced by the fact that there were more *Potamogeton* samples in the spring, when recruitment is higher, than in the fall. Bryophyte displayed the strongest left-skewness and was an important habitat for recent recruits in fall 2023. Distributional shape in *Cabomba* was more uniform and aligns with 2022 observations. In contrast, *Ludwigia* displayed an inverse distribution compared to 2022 and yielded a greater proportion of larger adults in 2023. Year-to-year variation in size structure among vegetation taxa such as *Ludwigia*, which can occur in a variety of hydraulic habitats, is potentially related to the depth and velocity conditions present within random drop-net stations. The remaining taxa aligned with observations the past several years (Figure 16; BIO-WEST 2022 and 2023).

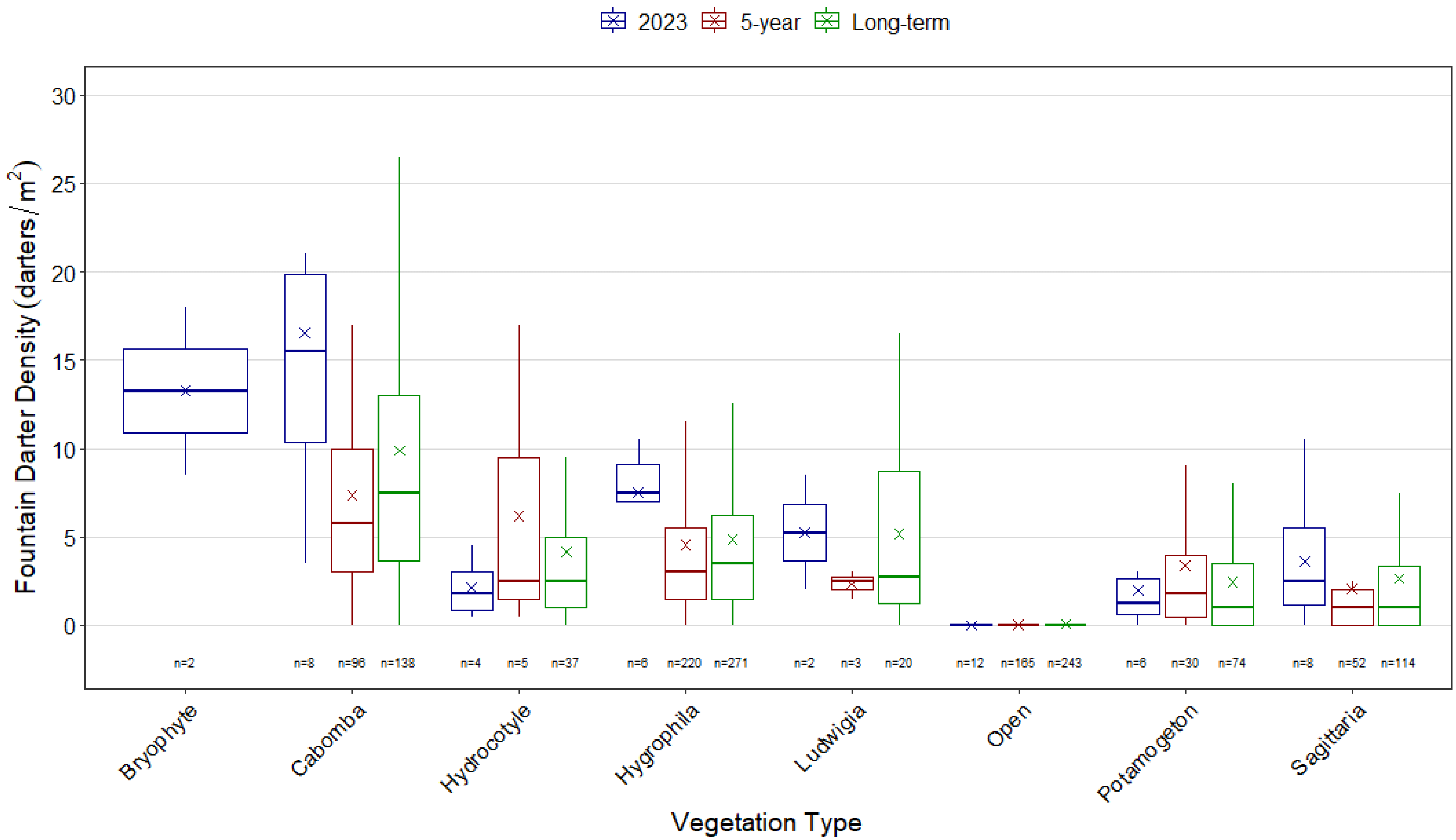


Figure 15. **Boxplots displaying 2022, 5-year (2019–2023), and long-term (2001–2023) drop-net Fountain Darter density (darters/m^2) among vegetation types in the San Marcos River. The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range. The "n" values along the x-axes represent drop-net sample sizes per group.**

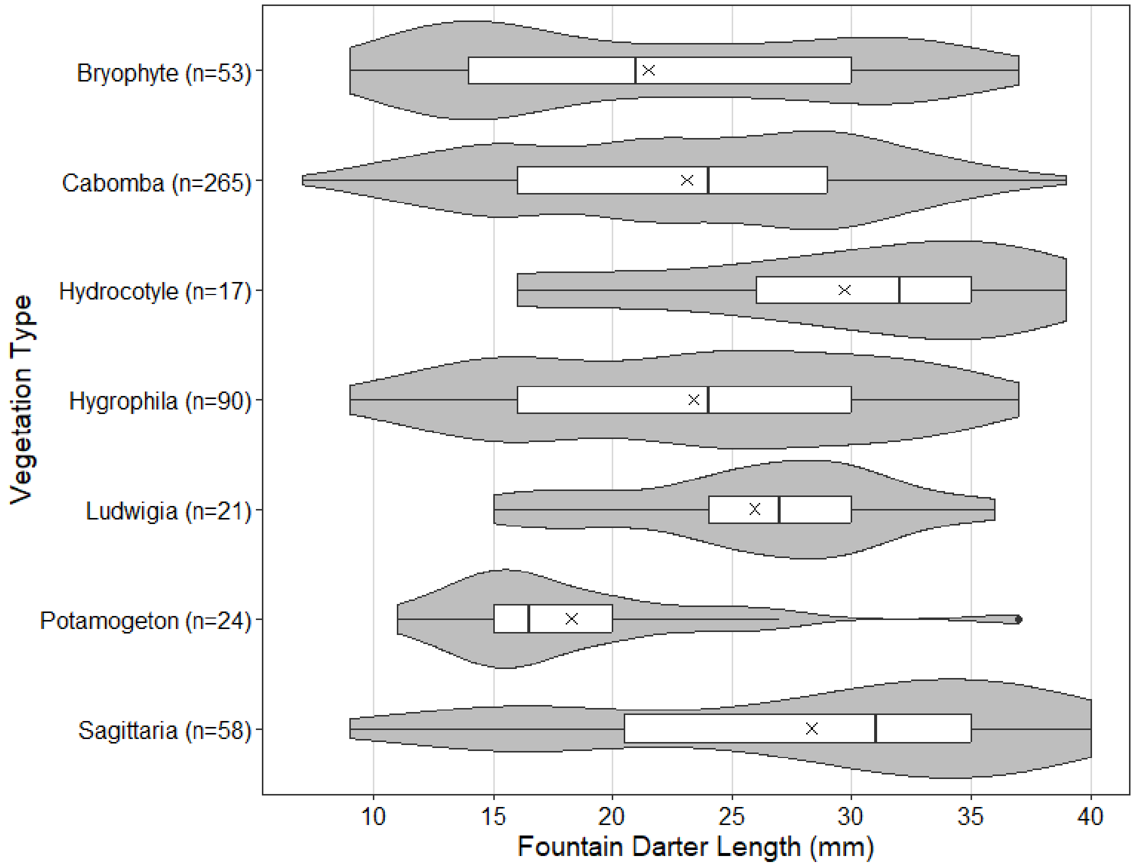


Figure 16. **Boxplots and violin plots (grey polygons) displaying Fountain Darter lengths among dominant vegetation types during 2023 drop-net sampling in the San Marcos River. The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range, and outliers beyond this are designated with solid black circles. The "n" values represent the number of Fountain Darter length measurements per vegetation type.**

Habitat suitability

Fountain Darter Overall Habitat Suitability Index (OHSI) values at Spring Lake Dam were above the long-term mean from 2019 to spring 2022 (0.12–0.16), whereas habitat suitability fluctuated around the long-term mean from summer 2022 to fall 2023 (0.10–0.15). City Park habitat suitability has remained below the long-term expectations since 2019 and decreased to the lowest level observed over the past five years in 2023. Trends in habitat suitability at I-35 were above the long-term mean from 2019 to spring 2022 (0.12–0.15) and fell below it from summer 2022 to fall 2023 (0.09–0.12) (Figure 17). Decreased OHSI in 2023 was mainly driven by decreases in Texas Wild-rice coverage, which despite having low suitability criteria, is strongly associated with changes in OHSI due to its dominance within study reaches. Although increases in intermixed bryophytes resulted in increased Fountain Darter densities in 2023, this is not captured by the OHSI which assigns long-term taxa-specific density based on dominant vegetation. So, a patch of *Sagittaria* with intermixed bryophytes (and thus high Fountain Darter density) would be assigned the long-term *Sagittaria* density for OHSI calculations. As a result, the current OHSI model does not accurately reflect the increased habitat complexity observed in City Park and I-35 during 2023. Microhabitat conditions (e.g., % bryophyte within, hydraulics) unaccounted for in this analysis also appear to influence habitat conditions and incorporating additional covariates to future HSC models could provide better realizations of overall suitability.

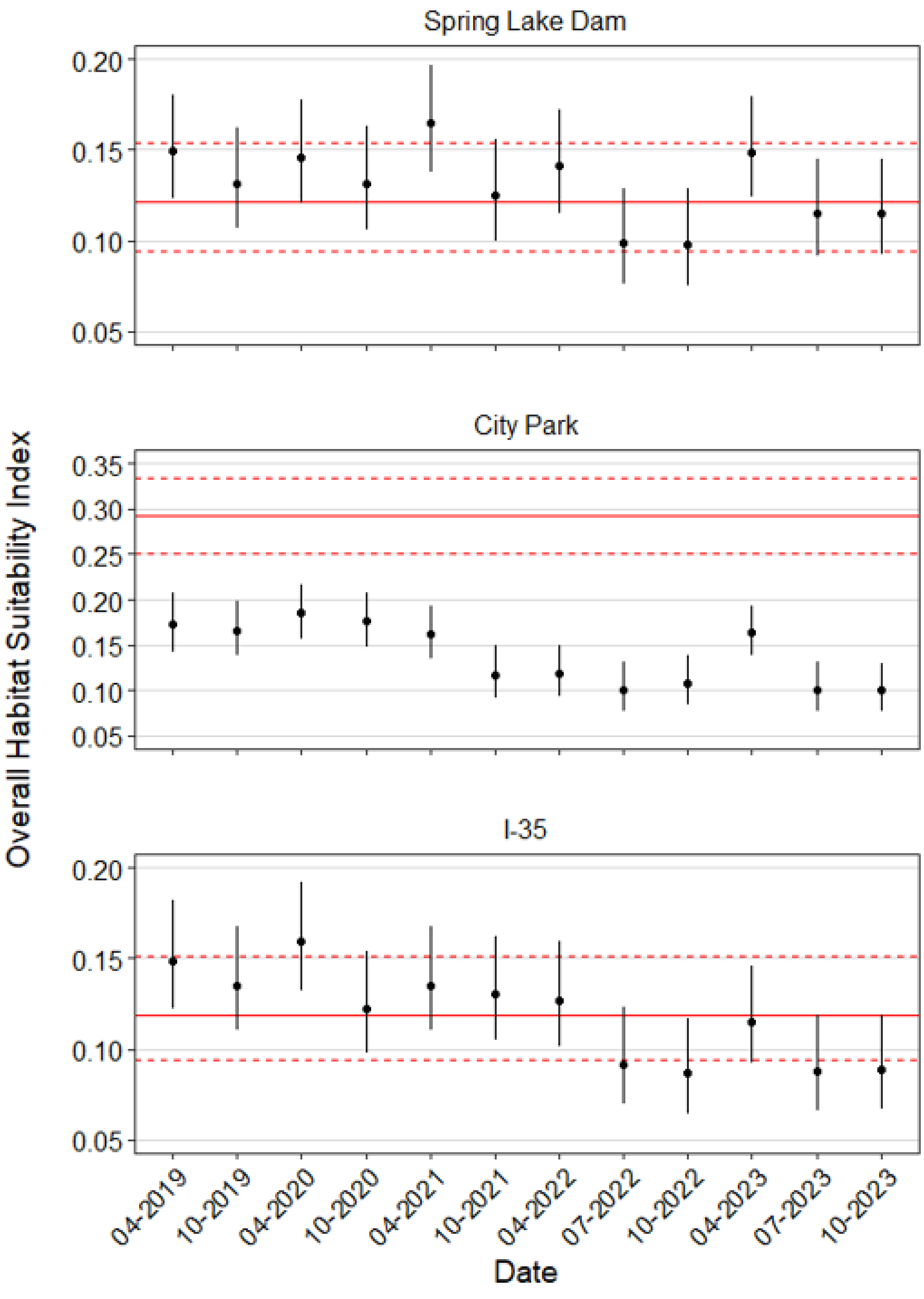


Figure 17. **Overall Habitat Suitability Index (OHSI) (±95% CI) from 2019–2023 among study reaches in the San Marcos River. Solid and dashed red lines denote means of long-term (2003–2023) OHSI and 95% CI, respectively.**

Drop-net results demonstrate darters are consistently spatially clustered within smaller patches of more suitable habitat. However, less suitable taxa may still provide important habitat to help fulfill life history requirements, such as dispersal corridors that facilitate connectivity among suitable taxa (Fagan 2002). This in total suggests management strategies should still consider expanding coverages of suitable taxa, in addition to maintaining diverse vegetation assemblages to enhance resistance and resilience potential during and after environmental perturbations (Duncan et al. 2016, Dunn and Angermeier 2018).

Fish Community

A total of 7,680 fishes represented by 10 families and 30 unique species were observed in the San Marcos Springs system during 2023 sampling. The fish community assemblage showed somewhat discrete spatial patterns shifts in structure (percent relative abundance), particularly between the lower river and upstream segments. At the three most upstream segments, assemblages were dominated by Mexican Tetra (*Astyanax argentatus*; 34.6%), Guadalupe Roundnose Minnow (*Dionda nigrotaeniata*; 15.9–24.6%) or Largespring Gambusia (*Gambusia geiseri*; 53.8%), whereas the Lower River was dominated by Mimic Shiner (*Paranotropis volucellus*; 32.4%) and Texas Shiner (*Notropis amabilis*; 12.1%). Fountain Darter ranked 9th in abundance at Spring Lake (1.6%) and Lower River (2.6%), 4th at Upper River (7.5%), and 5th at Middle River (5.9%) (Appendix E, Table E2).

Trends in species richness and diversity varied between and within study segments. In general, species richness and diversity was highest at Lower River. Species richness was also high at Upper River, though diversity was lower and more similar to that of Spring Lake. Middle River displayed species richness levels similar to Spring Lake while diversity quantities were more intermediate. Five-year trends in species richness and diversity displayed slight increases at Lower River. At the Middle River, diversity until spring 2023 when it sharply declined. Community-based metrics at Spring Lake were lower than other segments and were generally more stable over time (Figure 18).

Trends in spring fishes' species richness and relative density were incongruent with community-level observations. Spring fishes' richness was high and stable at the Upper River and Middle River. Total number of spring fish species was also stable at Spring Lake, though richness did not exceed four species. Spring fishes' richness at Lower River was more variable than upstream river segments. Relative density of spring fishes was high and stable in the upstream reaches of Spring Lake and Upper River. At the Middle River, relative density was also high but more variable than upstream segments. Spring fishes' relative density decreased at Lower River but accounted for 60-80% of the assemblage in fall 2021 and summer 2022 (Figure 19). Decreases in the total species and relative density of spring fishes with increasing distance from springflow influence is well documented (Hubbs 1995; Kollaus and Bonner 2012; Craig et al. 2016).

Temporal trends in Fountain Darter density from 2019–2023 were based on microhabitat sampling data. In 2023, median density was below the long-term median at Spring Lake during spring and fall, which is supported by observations of degraded habitat conditions noted during this timeframe. Variation in density (i.e., interquartile range) has decreased since spring 2022, where the upper quartile was substantially higher. At the Middle River, median density was above the long-term with greater variability in the spring and then dropped to zero in the fall. Reductions in median density documented during fall 2023 may be influenced by a flow pulse that passed immediately before fall fish community sampling and increased river discharge from 85 cfs to over 400 cfs. Lastly, median Fountain Darter density in 2023 at Upper River and Lower River continued to show typical historical patterns with densities at or close to zero (Figure 20).

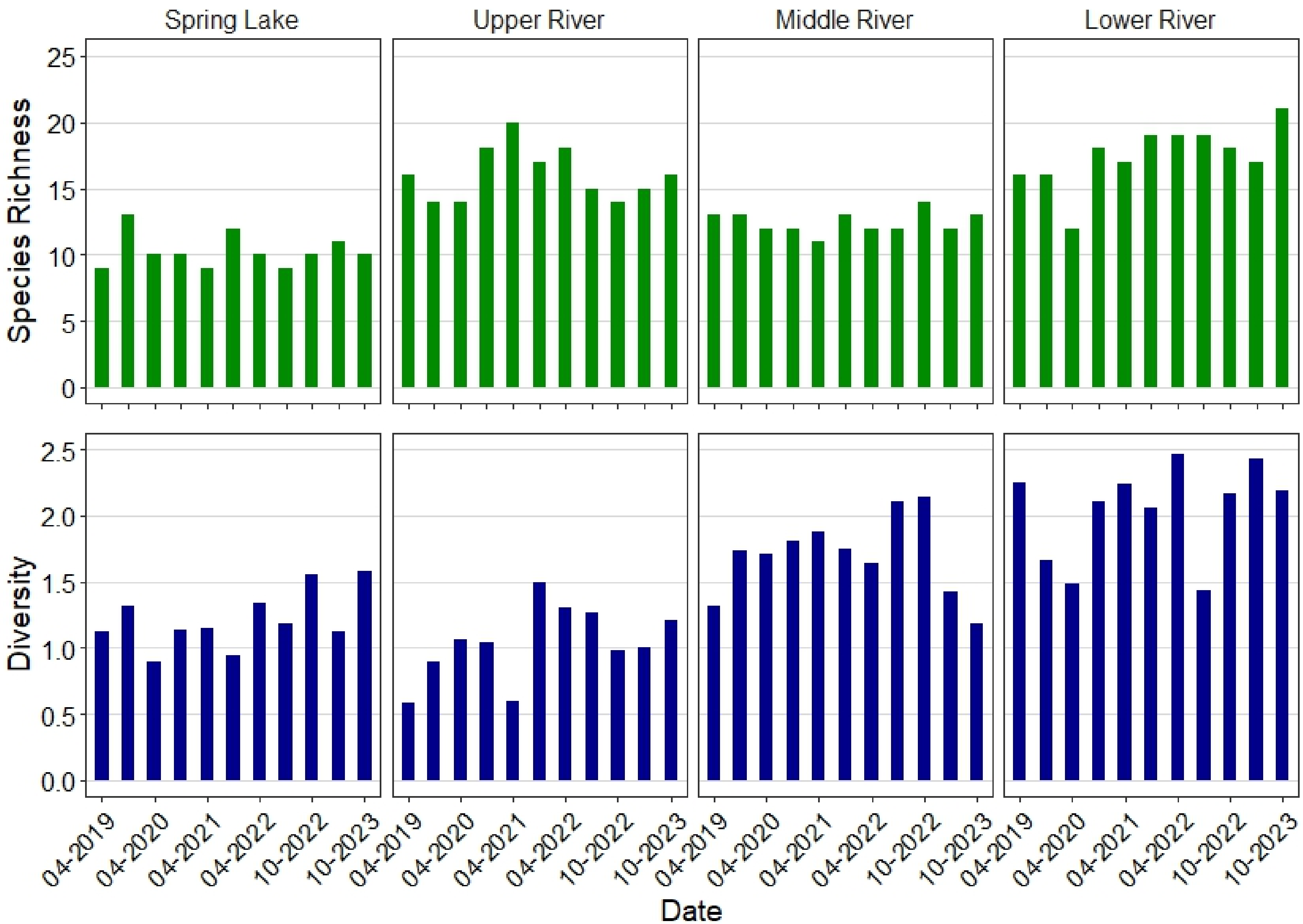


Figure 18. **Bar graphs displaying species richness (top row) and diversity (bottom row) from 2019–2023 based on all three fish community sampling methods in the San Marcos Springs/River.**

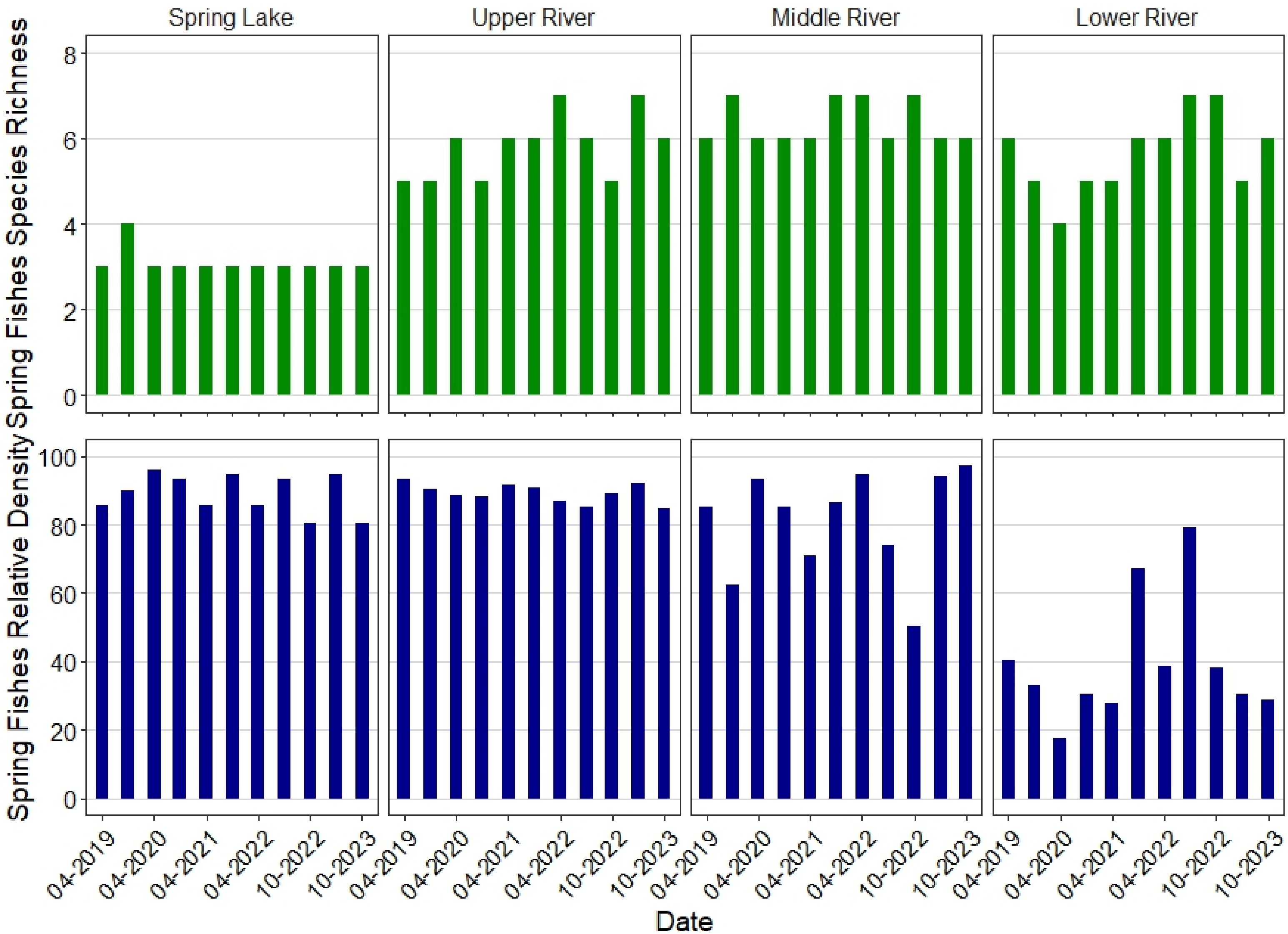


Figure 19. **Bar graphs displaying spring fish richness (top row) and relative density (RD; %) (bottom row) from 2019–2023 based on all three fish community sampling methods in the upper San Marcos Springs/River.**

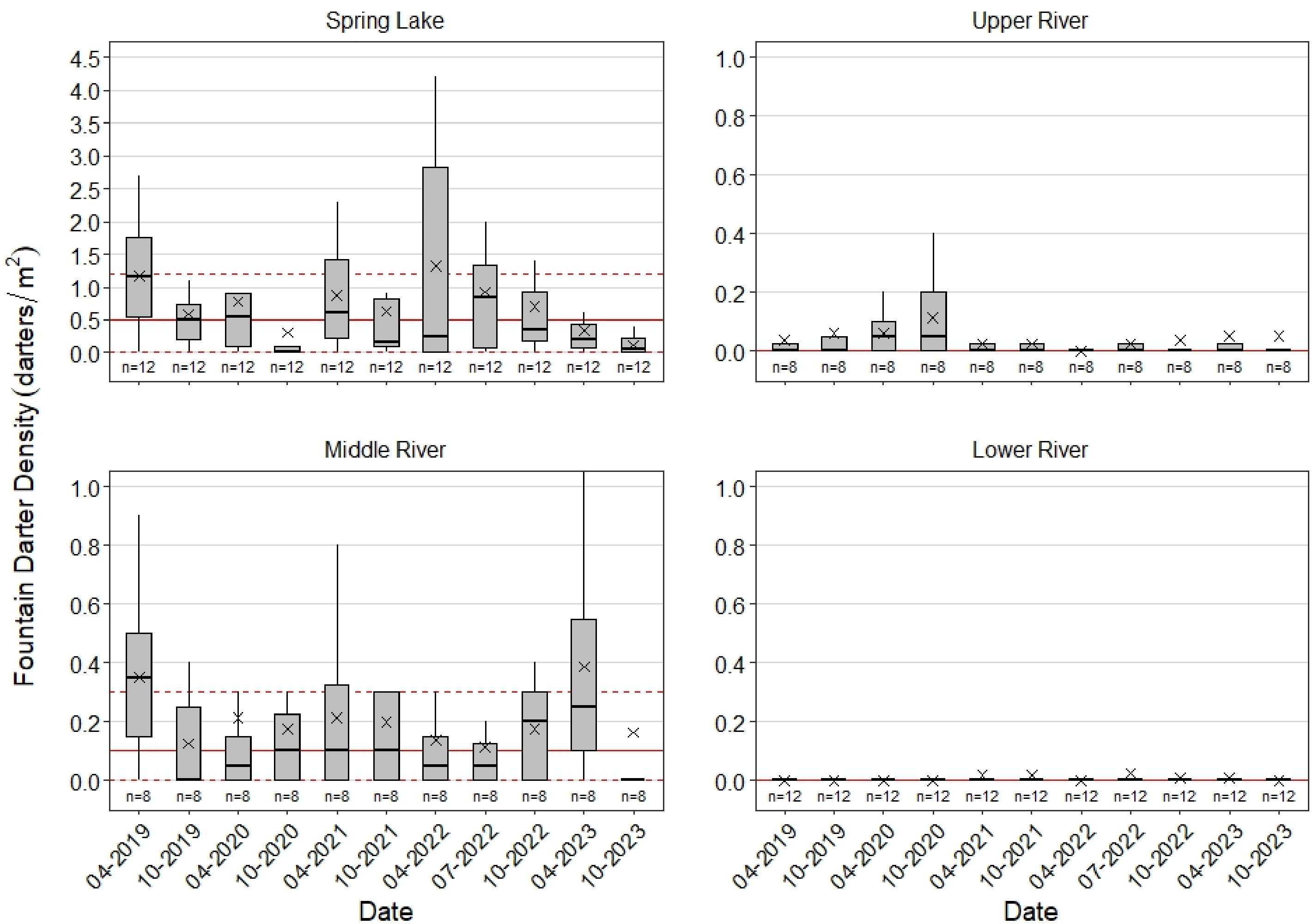


Figure 20. **Boxplots displaying temporal trends in Fountain Darter density (darters/m²) among study reaches from 2019–2023 during fish community microhabitat sampling in the San Marcos Springs/River. The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range. The "n" values along the x-axes represent the number of microhabitat samples per category. Solid and dashed red lines denote long-term (2014–2023) medians and interquartile ranges, respectively.**

San Marcos Salamander

In 2023, a total of 915 San Marcos salamanders were observed in spring (217 salamanders), three separate low-flow sampling events in the summer / early fall (555 salamanders), and fall (143 salamanders) and densities ranged from 1.51–30.86 salamanders/m^2 (Figure 21). At the Hotel Site, salamander densities in 2023 were lower than the long-term average for the spring, species-specific low-flow events, and fall. Fall 2023 density observations at Hotel Site fell outside the confidence interval boundary, suggesting a meaningful difference. San Marcos salamander densities at Riverbed were higher than long-term averages in the spring and low-flow events but were lower in the fall. In spring and fall 2023 densities fell outside the confidence interval boundary. Similar to the Hotel Site, densities at Spring Lake Dam in 2023 were lower than the long-term average for all events, with densities falling outside the confidence intervals in the fall and low-flow events (Figure 21).

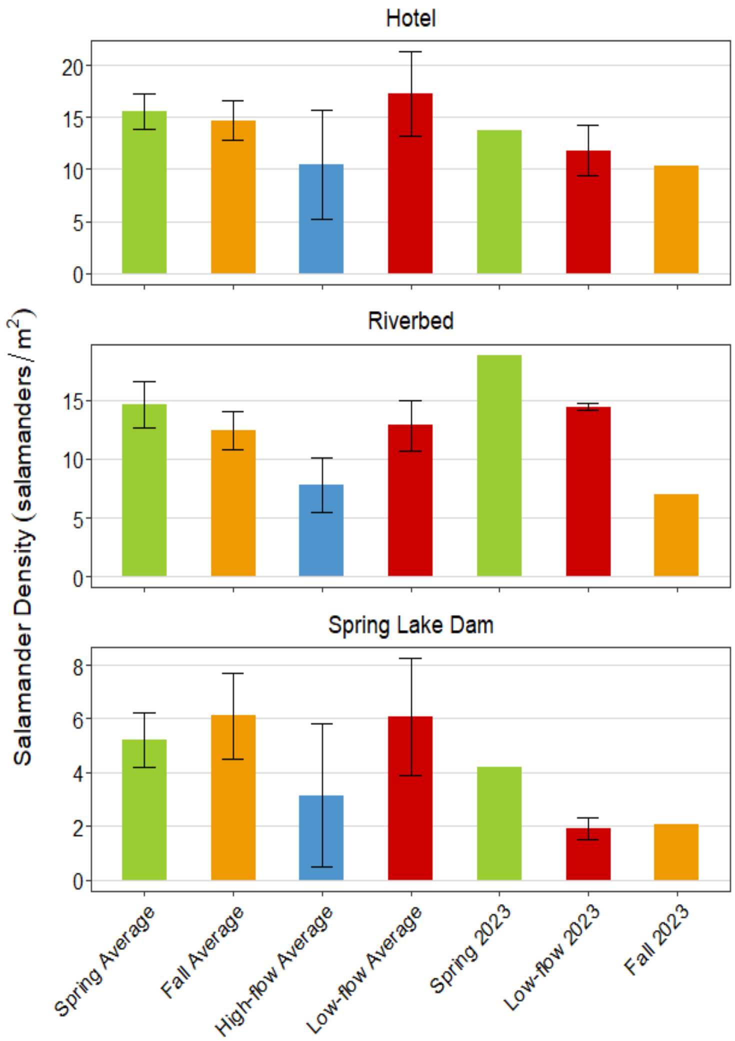


Figure 21. San Marcos Salamander density (salamanders/m^2) among sites in 2023, with the long-term (2001–2023) average for each sampling event. Error bars for long-term averages represent 95% confidence intervals.

Five-year trends at the Hotel Site did not display any distinct patterns in density from 2019 to spring 2022 but a noticeable increase occurred during the last two events in 2022. After this increase, densities in 2023 decreased again and generally remained lower than the previous five years. At the Riverbed Site, density was variable, but the fall 2023 event had the lowest densities observed over the past five years. Density at Spring Lake Dam demonstrated a cyclical but decreasing pattern over the past five years (Figure 22). Subsequent monitoring will help provide insights on how salamander densities change following this low-flow year.

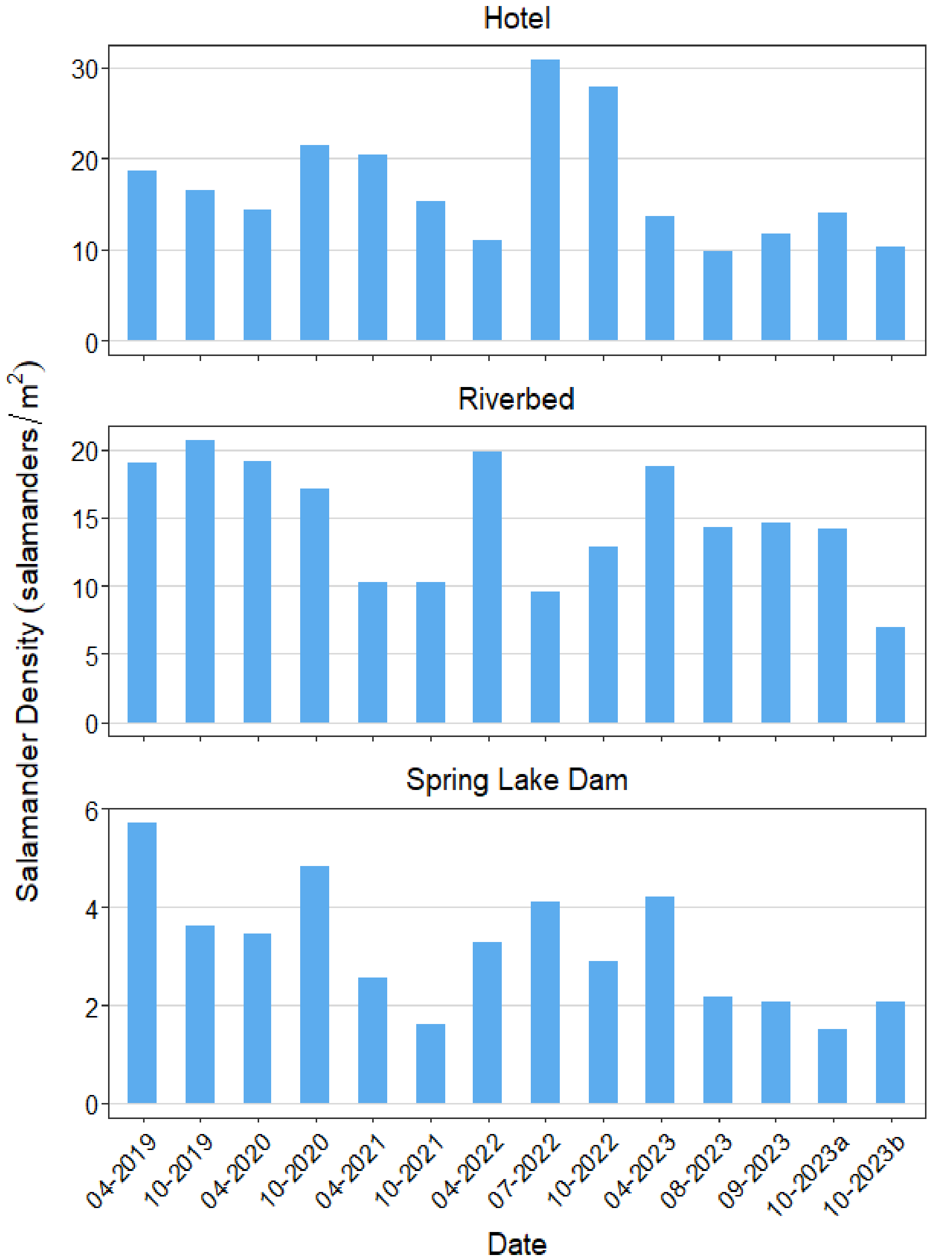


Figure 22. **San Marcos Salamander density (salamanders/m^2) among sites from 2019–2023 in the San Marcos Springs/River.**

Macroinvertebrates

Benthic Macroinvertebrate Rapid Bioassessment

Benthic macroinvertebrate rapid bioassessment data was collected during both the spring and fall sampling events in 2023 (raw data presented in Appendix F). At Spring Lake, habitats sampled this year included emergent vegetation, root wads, and sand. Similar habitats were sampled at City Park, with the addition of debris jams. Cobble/gravel habitats were sampled at Spring Lake Dam and I-35 in addition to what was sampled at City Park. No supplemental snag samples were taken. A total of 641 and 648 individual macroinvertebrates, representing 33 and 34 unique taxa were sampled in spring and fall, respectively. Metric scoring criteria for calculating the B-IBI can be found in Table 7. The Cumulative scores and corresponding aquatic-life-use designations are displayed in Figure 23. Altogether, 43 unique taxa were represented among all samples from 2023. Overall scores and aquatic-life-use designations in 2023 generally aligned with four years prior and indicates stable trends. Spring Lake was described as “Intermediate” for both seasons, while Spring Lake Dam and I-35 were described as “High” during both seasons. Aquatic-life-use at City Park was “High” during spring and “Intermediate” during fall (Figure 23).

Table 7. Metric value scoring ranges for calculating the Texas RBP B-IBI (TCEQ 2014).

METRIC	SCORING CRITERIA			
	4	3	2	1
Taxa richness	>21	15–21	8–14	<8
EPT taxa abundance	>9	7–9	4–6	<4
Biotic index (HBI)	<3.77	3.77–4.52	4.56–5.27	>5.27
% Chironomidae	0.79–4.10	4.11–9.48	9.49–16.19	<0.79 or >16.19
% Dominant taxon	<22.15	22.15–31.01	31.02–39.88	>39.88
% Dominant FFG	<36.50	36.50–45.30	45.31–54.12	>54.12
% Predators	4.73–15.20	15.21–25.67	25.68–36.14	<4.73 or >36.14
Ratio of intolerant: tolerant taxa	>4.79	3.21–4.79	1.63–3.20	<1.63
% of total Trichoptera as Hydropsychidae	<25.50	25.51–50.50	50.51–75.50	>75.50 or no Trichoptera
# of non–insect taxa	>5	4–5	2–3	<2
% Collector–gatherers	8.00–19.23	19.24–30.46	30.47–41.68	<8.00 or >41.68
% of total number as Elmidae	0.88–10.04	10.05–20.08	20.09–30.12	<0.88 or >30.12

Spring Lake and City Park scored lower than the other sites, likely due to differences in available habitats. Lower scores were expected at Spring Lake as these lentic communities are naturally different compared to swift flowing “least-disturbed reference streams”. It is interesting that Aquatic-life-use at City Park in spring was described as “High”, which only occurred one other time (i.e., 2020) during the past five years. At City Park, lower scores in fall compared to Spring Lake Dam and I-35 were also not surprising. Lotic habitats at City Park consists of runs, while the other riverine sites of Spring Lake Dam and I-35 display riffles with cobble and gravel substrates more similar to reference streams. As such, higher scores at Spring Lake Dam and I-35 are best explained by greater prevalence of fluvial specialists, resulting in greater taxa diversity overall. It should also be noted that most reference streams do not exhibit the stenothermal conditions present within the upper San Marcos River and this may result in differing community composition. Based on this, the level of score is less important in the spring-fed San Marcos River sample reaches than the consistency or trends in results per reach over time. Additional monitoring will yield a robust reference dataset and allow for the development of scoring criteria specific to this unique ecosystem, providing a more accurate realization of ecological health through time.

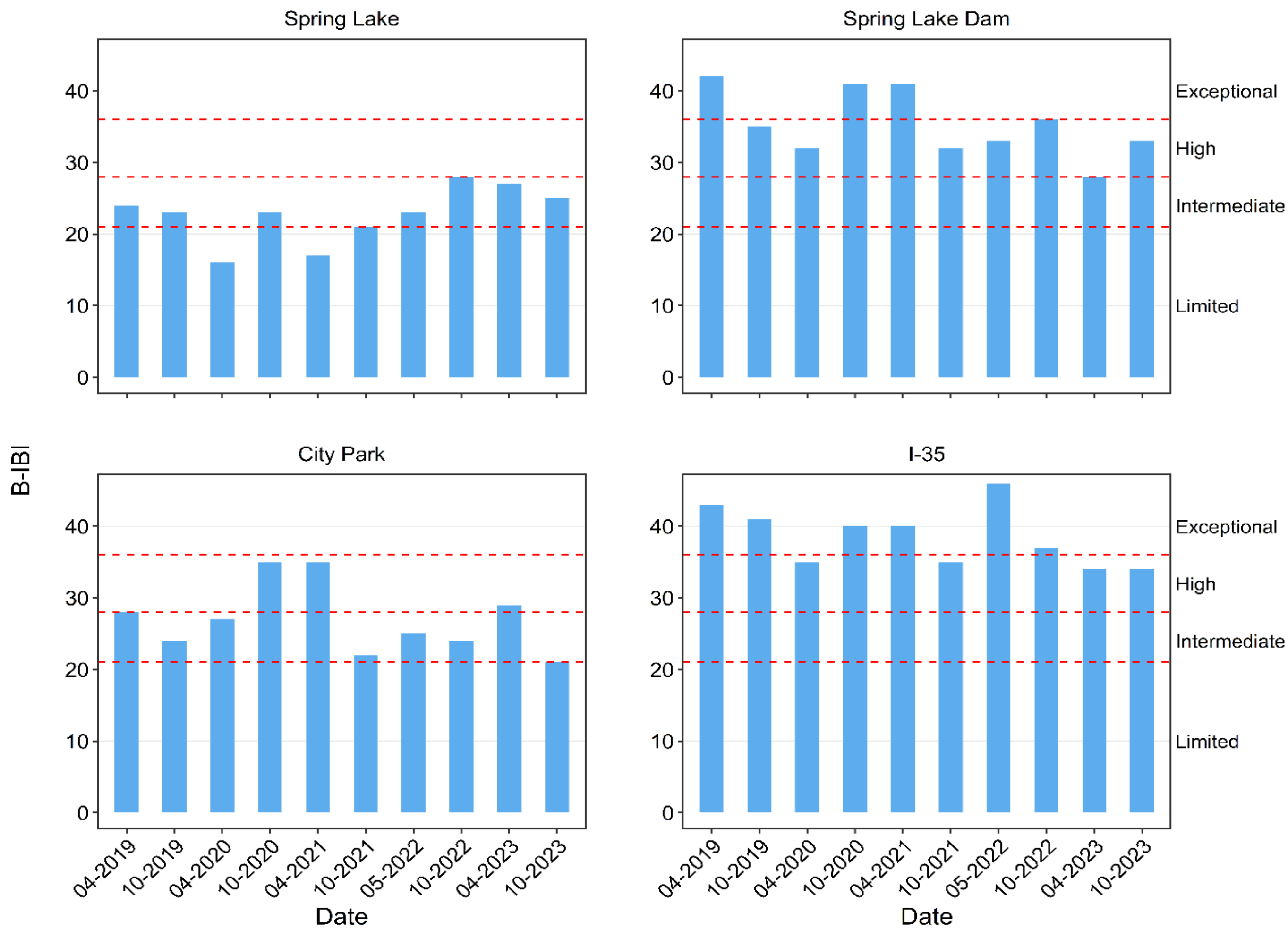


Figure 23. **Benthic macroinvertebrate Index of Biotic Integrity (B-IBI) scores and aquatic-life-use point-score ranges from 2019–2023 in the San Marcos Springs/River.**

CONCLUSION

Results from the 2023 biological monitoring in the San Marcos Springs/River system indicated overall declining trends in discharge and variable trends in Covered Species population metrics. Based on monthly analysis of daily mean discharge, the system was near or below 10^{th} percentile flow conditions for the duration of the year, resulting in the lowest flow conditions observed in 23 years of biological monitoring. Low variation in water temperature continued to occur at more stable reaches closer to springs (i.e., Spring Lake), whereas higher variation occurred at less stable reaches farther from springs (i.e., Wastewater Treatment Plant). Although exceedance frequency and duration of Fountain Darter larval and egg production thresholds increased throughout the summer, habitat conditions appear to have had a more direct impact on Fountain Darter populations.

Habitat evaluations during low-flow events in the summer demonstrated slightly degraded habitat conditions for the Covered Species. Low water levels at Spring Lake and Spring Lake Dam increased siltation and algae build up, influencing habitat conditions for both San Marcos Salamanders and Fountain Darters. Habitat condition in downstream riverine reaches also declined slightly as wetted width of the river channel was reduced and aquatic vegetation coverage decreased. This led to reductions in Texas Wild-rice coverage and habitat availability for Fountain Darters. No temporal trends in fish community diversity/richness or macroinvertebrate bioassessment scores were apparent, suggesting that sustained flows in 2023 did not degrade the ecological health of the San Marcos system.

Total aquatic vegetation coverage declined from spring to fall across all study reaches with ubiquitous declines mainly attributed to decreased coverage of Texas Wild-rice due to low flows and recreation. Although Texas Wild-rice dominated assemblage structure throughout the upper reaches of the system, the species declined to its lowest coverage observed since 2016 and was the Covered Species most impacted by reduced flows. Reduced river discharge led to some Texas Wild-rice becoming dewatered and stranded on islands or along bank habitats. Unlike previous low-flow years, stranded Texas Wild-rice eventually perished and gave way to terrestrial vegetation. Vegetation varied at City Park as bryophytes increased in abundance for the first time observed in the biological monitoring program. Fountain Darter density and occurrence were higher at City Park due to enhanced suitable habitat provided by bryophytes intermixed with other vegetation types. However, overall habitat suitability indices did not pick up on this observed habitat improvement, since they are based on dominant vegetation type. Reductions in wetted habitat altered the river channel and the vegetation assemblage mainly within the I-35 reach. Amphibious species (e.g., *Hygrophila* and *Sagittaria*) that could survive as emergent outcompeted other taxa. Trends in San Marcos Salamander densities were variable among sites in 2023 and over the past five years. However, all sites showed relatively low densities in fall 2023, and low-flow impacts (e.g., siltation) to salamander habitats were observed in Spring Lake.

Overall, 2023 biological monitoring captured the response of the San Marcos Springs/River aquatic community to the lowest flow conditions observed since 1956. Results indicated that the San Marcos Springs/River was resilient to the sustained low-flow conditions in 2023. Texas Wild-rice coverage remains well above pre-HCP levels despite reduced wetted habitat and substantial declines in coverage since the beginning of the year. Vegetation coverage varied throughout the system, yet low flows allowed bryophytes to establish throughout rooted vegetation and along the benthos. This increased benthic habitat complexity provided by bryophytes positively impacted Fountain Darter populations as observed in the higher densities over the past two years. Fountain Darter catch rates and percent occurrence were comparable to previous years. No obvious trends in salamanders, fish assemblage composition, spring fishes, or macroinvertebrates were noted. Despite declines in Covered Species habitats from low flows, populations persist and are expected to rebound when typical flows return. Subsequent monitoring efforts will provide opportunities to better understand the dynamics of this complex ecological system and how it responds to future hydrologic conditions.

REFERENCES

Alexander, M.L., and C.T. Phillips. 2012. Habitats used by the endangered Fountain Darter (*Etheostoma fonticola*) in the San Marcos River, Hays County, Texas. The Southwestern Naturalist 57:449-452.

(AFS) American Fisheries Society. 2023. Common and Scientific Names of Fishes from the United States, Canada, and Mexico, 8th edition. American Fisheries Society, Special Publication 37, Bethesda, Maryland.

Barbour M.T., J., Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid bioassessment protocols for use in wadeable streams and rivers: periphyton, benthic macroinvertebrates and fish. 2nd ed., Office of Water, United States Environmental Protection Agency, Washington. EPA 841-B-99-002.

Bellier E., M. Kéry, and M. Schaub. 2016. Simulation-based assessment of dynamic N-mixture models in the presence of density dependence and environmental stochasticity. Methods in Ecology and Evolution 7:1029-1040.

BIO-WEST. 2001. Comprehensive and critical period monitoring program to evaluate the effects of variable flow on biological resources in the San Marcos Springs River aquatic ecosystem. 2000 Draft Report. Prepared for Edwards Aquifer Authority, 33 pp.

BIO-WEST. 2002. Comprehensive and critical period monitoring program to evaluate the effects of variable flow on biological resources in the San Marcos River Aquatic Ecosystem. 2001 Annual Report. Prepared for Edwards Aquifer Authority, 26 pp. plus Appendices.

BIO-WEST. 2003. Comprehensive and critical period monitoring program to evaluate the effects of variable flow on biological resources in the San Marcos River aquatic ecosystem. 2002 Annual Report. Prepared for Edwards Aquifer Authority, 42 pp. plus Appendices.

BIO-WEST. 2004. Comprehensive and critical period monitoring program to evaluate the effects of variable flow on biological resources in the San Marcos River aquatic ecosystem. 2003 Annual Report. Prepared for Edwards Aquifer Authority, 30 pp. plus Appendices.

BIO-WEST. 2005. Comprehensive and critical period monitoring program to evaluate the effects of variable flow on biological resources in the San Marcos River aquatic ecosystem. 2004 Annual Report. Prepared for Edwards Aquifer Authority, 57 pp. plus Appendices.

BIO-WEST. 2006. Comprehensive and critical period monitoring program to evaluate the effects of variable flow on biological resources in the San Marcos River aquatic ecosystem. 2005 Annual Report. Prepared for Edwards Aquifer Authority, 33 pp. plus Appendices.

BIO-WEST. 2007. Comprehensive and critical period monitoring program to evaluate the effects of variable flow on biological resources in the San Marcos River aquatic ecosystem. 2006 Annual Report. Prepared for Edwards Aquifer Authority, 54 pp. plus Appendices.

BIO-WEST. 2008. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the San Marcos River Aquatic Ecosystem. 2007 Prepared for Annual Report. Edwards Aquifer Authority, 33 pp. plus Appendices.

BIO-WEST. 2009. Comprehensive and critical period monitoring program to evaluate the effects of variable flow on biological resources in the San Marcos River aquatic ecosystem. 2008 Annual Report. Prepared for Edwards Aquifer Authority, 36 pp. plus Appendices.

BIO-WEST. 2010. Comprehensive and critical period monitoring program to evaluate the effects of variable flow on biological resources in the San Marcos River aquatic ecosystem. 2009 Annual Report. Prepared for Edwards Aquifer Authority, 60 pp. plus Appendices.

BIO-WEST. 2011. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the San Marcos River Aquatic Ecosystem. 2010 Annual Report. Prepared for Edwards Aquifer Authority, 44 pp. plus Appendices.

BIO-WEST. 2012. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the San Marcos River Aquatic Ecosystem. 2011 Annual Report. Prepared for Edwards Aquifer Authority, 51 pp. plus Appendices.

BIO-WEST. 2013. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the San Marcos River Aquatic Ecosystem. 2012 Annual Report. Prepared for Edwards Aquifer Authority, 44 pp. plus Appendices.

BIO-WEST. 2014. Habitat Conservation Plan Biological Monitoring Program. San Marcos Springs/River Aquatic Ecosystem. 2013 Annual Report. Prepared for Edwards Aquifer Authority, 80 pp. plus Appendices.

BIO-WEST. 2015. Habitat Conservation Plan Biological Monitoring Program. San Marcos Springs/River Aquatic Ecosystem. 2014 Annual Report. Prepared for Edwards Aquifer Authority, 67 pp. plus Appendices.

BIO-WEST. 2016. Habitat Conservation Plan Biological Monitoring Program. San Marcos Springs/River Aquatic Ecosystem. 2015 Annual Report. Prepared for Edwards Aquifer Authority, 68 pp. plus Appendices.

BIO-WEST. 2017. Habitat Conservation Plan Biological Monitoring Program. San Marcos Springs/River Aquatic Ecosystem. 2016 Annual Report. Prepared for Edwards Aquifer Authority, 53 pp. plus Appendices.

BIO-WEST. 2018. Habitat Conservation Plan Biological Monitoring Program. San Marcos Springs/River Aquatic Ecosystem. 2017 Annual Report. Prepared for Edwards Aquifer Authority, 60 pp. plus Appendices.

BIO-WEST. 2019. Habitat Conservation Plan Biological Monitoring Program. San Marcos Springs/River Aquatic Ecosystem. 2018 Annual Report. Prepared for Edwards Aquifer Authority, 55 pp. plus Appendices.

BIO-WEST. 2020. Habitat Conservation Plan Biological Monitoring Program. San Marcos Springs/River Aquatic Ecosystem. 2019 Annual Report. Edwards Aquifer Authority. 50 pp. plus Appendices.

BIO-WEST. 2021. Habitat Conservation Plan Biological Monitoring Program. San Marcos Springs/River Aquatic Ecosystem. 2020 Annual Report. Edwards Aquifer Authority. 54 pp. plus Appendices.

BIO-WEST. 2022. Habitat Conservation Plan Biological Monitoring Program. San Marcos Springs/River Aquatic Ecosystem. 2021 Annual Report. Edwards Aquifer Authority. 57 pp. plus Appendices.

BIO-WEST. 2023. Habitat Conservation Plan Biological Monitoring Program. San Marcos Springs/River Aquatic Ecosystem. 2022 Annual Report. Edwards Aquifer Authority. 52 pp. plus Appendices.

Boettiger, C. 2018. From noise to knowledge: how randomness generates novel phenomena and reveals information. Ecology Letters 21(8):1255-1267.

Bousman, C.B., and D.L. Nickels. 2003. Archaeological Testing of the Burleson Homestead at 41HY37 Hays County, Texas. Center for Archaeological Studies, Archaeological Studies Report No. 4, San Marcos, Texas.

Bowles, D.E., and T.L. Arsuffi. 1993. Karst aquatic ecosystems of the Edwards Plateau region of central Texas, USA: A consideration of their importance, threats to their existence, and efforts for their conservation. Aquatic Conservation: Marine and Freshwater Ecosystems 3:317-329.

Brandt, T.M., K.G. Graves, C.S. Berkhouse, T.P. Simon, and B.G. Whiteside. 1993. Laboratory spawning and rearing of the endangered fountain darter. The Progressive Fish-Culturist 55:149-156.

Craig, C.A., K.A. Kollaus, K.P.K. Behen, and T.H. Bonner. 2016. Relationships among spring Flow, habitats, and fishes within evolutionary refugia of the Edwards Plateau. Ecosphere 7: DOI: 10.1002/ecs2.1205.

Dennis, B., J. M. Ponciano, S. R. Lele, M. L. Taper, D. F. Staples. 2006. Estimating density dependence, process noise, and observation error. Ecological Monographs 76(3):323-341.

Duncan, R.S., B.R. Kuhajda, C.A. Hodges, and A.L. Messenger. 2016. Population Structure and Habitat Use of the Endangered Watercress Darter. Journal of Fish and Wildlife Management 7:499-508.

Dunn, C.G., and P.L. Angermeier. 2019. Remaining populations of an upland stream fish persist in refugia defined by habitat features at multiple scales. Diversity and Distributions 25:385-399.

(EAA) Edwards Aquifer Authority. 2017. Standard Operating Procedures for the Habitat Conservation Plan (HCP) Biological Monitoring Program for the San Marcos Springs/River Ecosystem. 32 pp. plus Appendices.

(EAHCP) Edwards Aquifer Habitat Conservation Plan. 2012. Edwards Aquifer Recovery Implementation Program: Habitat Conservation Plan. Prepared for Edwards Aquifer Authority, 414 pp. plus Appendices.

Edwards, C.R., and T.H. Bonner. 2022. Vegetation associations of the endangered Fountain Darter *Etheostoma fonticola*. Endangered Species Research 47:1-13.

Fagan, W. F. 2002. Connectivity, fragmentation, and extinction risk in dendritic metapopulations. Ecology 83(12):3243-3249.

Grossman, G. D., R. F. Carline, T. Wagner. 2017. Population dynamics of brown trout (Salmo trutta) in Spruce Creek Pennsylvania: A quarter-century perspective. Freshwater Biology 62(7):1143-1154.

Hintze, J.L., and R.D. Nelson. 1998. Violin plots: A Box Plot-Density Trace Synergism. The American Statistician 52:181-184.

Hubbs, C. 1995. Springs and spring runs as unique aquatic systems. Copeia 4:989-991.

Katz, R.A., and M.C. Freeman. 2015. Evidence of population resistance to extreme low flows in a fluvial-dependent fish species. Canadian Journal of Fisheries and Aquatic Sciences 72:1776-1787.

Kollaus, K.A., and T.H. Bonner. 2012. Habitat associations of a semi-arid fish community in a karst spring-fed stream. Journal of Arid Environments 76:72-79.

Linam, G.W., K.B. Mayes, and K.S. Saunders. 1993. Habitat utilization and population size estimate of Fountain Darters, *Etheostoma fonticola*, in the Comal River, Texas. Texas Journal of Science 45:341-348.

Manly, B.F.J., L.L. McDonald, and D.L. Thomas. 1993. Resource Selection by Animals: Statistical Design and Analysis for Field Studies. Chapman & Hall, London. 177 pp.

Marsh-Matthews, E.C., and W.J. Matthews. 2010. Proximate and residual effect of exposure to simulated drought on prairie stream fishes. American Fisheries Society Symposium 73:461-486.

McCargo, J. W., and J. T. Peterson. 2010. An evaluation of the influence of seasonal base flow and geomorphic stream characteristics on coastal plain stream fish assemblages. Transactions of the American Fisheries Society 139:29-48.

McDonald, D.L., T.H. Bonner, E.L. Oborny, and T.M. Brandt. 2007. Effects of fluctuating temperatures and gill parasites on reproduction of the Fountain Darter, *Etheostoma fonticola*. Journal of Freshwater Ecology 22:311-318.

McDonald, J.H. 2014. Handbook of Biological Statistics. 3rd ed., Sparky House Publishing, Baltimore, Maryland.

Merritt R.W., K.W. Cummins, and M.B. Berg (eds). 2008. An introduction to the aquatic insects of North America. 4th edn. Kendall Hunt, Iowa.

Nelson, J. 1993. Population size, distribution, and life history of *Eurycea nana* in the San Marcos River. Master's Thesis, Southwest Texas State University, 43 pp.

Owens, C.S., J.D. Madsen, R.M. Smart, and M. Stewart. 2001. Dispersal of native and nonnative aquatic plant species in the San Marcos River, Texas. Journal of Aquatic Plant Management 39:75-79.

Poff, N.L., J.D. Olden, N.K.M. Vieira, D.S. Finn, M.P. Simmons, and B.C. Kondratieff. 2006. Functional trait niches of North American lotic insects: traits-based ecological applications in light of phylogenetic relationships. Journal of the North American Benthological Society 25:730–755.

Schenck, J.R., and B.G. Whiteside. 1976. Distribution, habitat preference and population size estimate of *Etheostoma fonticola*. Copeia 76:697-703.

Shoemaker, L. G., A. K. Barner, L. S. Bittleston, A. I. Teufel. 2020. Quantifying the relative importance of variation in predation and the environment for species coexistence. Ecology Letters 23(6):939-950.

Spellerberg, I.F. and P.J. Fedor. 2003. A tribute to Claude Shannon (1916-2001) and a plea for more rigorous use of species richness, species diversity, and the 'Shannon-Wiener' Index. Global Ecology & Biogeography 12:177-179.

Sung, C.Y., and M.H. Li. 2010. The effect of urbanization on stream hydrology in hillslope watershed in central Texas. Hydrological Processes 24:3706-3717.

(TCEQ) Texas Commission on Environmental Quality. 2014. Surface water quality monitoring procedures, Volume 2: Methods for collection and analyzing biological assemblage and habitat data. Water Quality and Planning Division, Texas Commission on Environmental Quality. RG-416.

(USGS) United States Geological Survey. 2023. Provisional Data Statement. https://m.waterdata.usgs.gov/tx/nwis/?provisional [accessed 12/8/2023].

APPENDIX A: CRITICAL PERIOD MONITORING SCHEDULE

SAN MARCOS RIVER/SPRINGS
Critical Period Low-Flow Sampling – Schedule and Parameters

FLOW TRIGGER (+ or - 5 cfs)	PARAMETERS
120 cfs	Wild-Rice vulnerable stands - Every 5 cfs decline (maximum weekly)
100 cfs	Full Sampling Event
100 - 85 cfs	Habitat Evaluations - Every 5 cfs decline (maximum weekly)
85 cfs	Full Sampling Event
85 - 60 cfs	Habitat Evaluations - Every 5 cfs decline (maximum weekly)
60 cfs	Full Sampling Event
60 - 25 cfs	Habitat Evaluations - Every 5 cfs decline (maximum weekly)
25 cfs	Full Sampling Event
25 - 0 cfs	Habitat Evaluations - Every 5 cfs decline (maximum weekly)
10 - 0 cfs	Full Sampling Event
RECOVERY	
25 - 85 cfs	Full Sampling Event (dependent on flow stabilization)
85 - 125 cfs	Full Sampling Event (dependent on flow stabilization)

PARAMETER DESCRIPTION

Wild-Rice Monitoring	Physical changes vulnerable stands
Fall Sampling Event	Aquatic Vegetation Mapping - including Texas Wild-Rice Fountain Darter Sampling Drop Net, Dip net (Presence/Absence), and Visual Parasite evaluations Fish Community Sampling Salamander Sampling - Visual Fish Sampling - Exotics/Predation (85 cfs and below) Water Quality - Suite I and Suite II
Habitat Evaluations	Photographs

SAN MARCOS RIVER/SPRINGS
Species-Specific Triggered Sampling

FLOW RATE (+ or – 10 cfs)	SPECIES	FREQUENCY	PARAMETERS
≤80 cfs or ≥ 50 cfs continuing until flow rate restores to ≥100 cfs	Fountain Darter	Every other month	Aquatic vegetation mapping at Spring Lake Dam reach, City Park reach, and IH-35 reach
≤80 cfs or ≥ 50 cfs continuing until flow rate restores to ≥100 cfs	Fountain Darter	Every other month	Conduct dip net sampling/visual parasite evaluations at 50 sites in high quality habitat to include fifteen (15) sites in Spring Lake Dam reach; twenty (20) sites in City Park reach, and fifteen (15) sites in IH-35 reach.
≤50 cfs	Fountain Darter	Monthly	Aquatic vegetation mapping at Spring Lake Dam reach, City Park reach, and IH-35 reach
≤50 cfs	Fountain Darter	Weekly	Conduct dip net sampling/visual parasite evaluations at 50 sites in high quality habitat to include fifteen (15) sites in Spring Lake Dam reach; twenty (20) sites in City Park reach, and fifteen (15) sites in IH-35 reach.
≤80 cfs or ≥ 50 cfs	San Marcos Salamander	Every other week	Salamander surveys (SCUBA and snorkel) will be conducted at the Hotel Area, Riverbed area, and eastern spillway of Spring Lake Dam
<50 cfs	San Marcos Salamander	Weekly	Salamander surveys (SCUBA and snorkel) will be conducted at the Hotel Area, Riverbed area, and eastern spillway of Spring Lake Dam
100 cfs	Texas Wild-Rice	Once	Mapping of Texas Wild-Rice coverage for the entire San Marcos River will be conducted
≤100 cfs or ≥60 cfs	Texas Wild-Rice	Every other week	Physical parameters of Texas Wild-Rice will be monitored in designated "vulnerable" areas
<80 cfs	Texas Wild-Rice	Monthly	Mapping of Texas Wild-Rice coverage for the entire San Marcos River will be conducted
<80 cfs	Texas Wild-Rice	Weekly	Physical visual observations of Texas Wild-Rice will occur

APPENDIX B: LOW-FLOW CRITICAL PERIOD HABITAT EVALUATION

Habitat Evaluation

MEMORANDUM

TO:	Kristy Kollaus, Chad Furl
FROM:	Ed Oborny (BIO-WEST)
DATE:	**June 28, 2023**
SUBJECT:	EAHCP Critical Period Habitat Evaluation – 85 cfs – San Marcos System

SAN MARCOS SYSTEM: 85 cfs Habitat Evaluation

The EAHCP 85 cfs Habitat Evaluation was triggered for the San Marcos River in June and conducted on June 22nd. Per contractual requirement, the next habitat evaluation for the San Marcos River is scheduled for 80 cfs. As of this memorandum, the total system discharge in the San Marcos River is approximately 85 cfs (Figure 1).

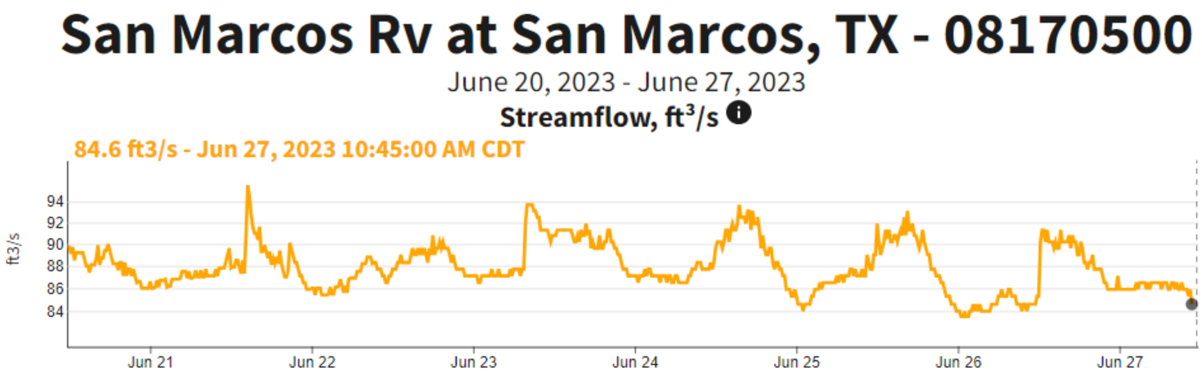


Figure 1. Total San Marcos River discharge over the past week (USGS 08170500 at San Marcos, Texas.

Water temperature is a key component system-wide as it is an underlying driver of spring-related aquatic assemblages. Recent trends in water temperature (°C) for June 2023 were assessed using temperature data loggers (HOBO Tidbit v2 Temp Loggers) at 8 permanent monitoring stations in the upper San Marcos River. Data for each monitoring station are based on 10-minute intervals and dates for recent trends extended from the last day that each data logger was downloaded to 16 days prior. Therefore, a maximum of 16 days were analyzed, rather than the usual 14 days. Two-week trends were examined from 6/1/2023 – 6/16/2023 at all stations except I-35 (6/1 – 6/15). At all stations, data were compared to long-term water temperature data measured at 4-hour intervals in June from 2001 – 2022 or to the greatest temporal extent available (Table 1). For analysis, two-week trends were compared to long-term data using boxplots to visualize differences in central tendency (i.e., median) and variation (e.g., interquartile range) (Figure 2). Drought conditions remain evident with June 2023 water temperatures being higher than the long-term monthly average at each station. However, at this time there are no water temperatures noted as a concern at stations longitudinally down the San Marcos River (Table 1, Figure 2).

Table 1. **Summary of boxplot descriptive statistics comparing recent two-week and long-term trends in water temperature (°C) at 8 monitoring stations in the upper San Marcos Springs River for the month of June.**

Station	Period	Lower Whisker	Lower Box	Median	Upper Box	Upper Whisker	Interquartile Range
Chute	Two-week	22.13	22.49	22.75	23.16	24.07	0.67
Chute	Long-term	20.75	21.59	21.92	22.15	22.98	0.56
Spring Lake Dam	Two-week	22.13	22.75	23.18	23.86	25.19	1.10
Spring Lake Dam	Long-term	21.50	22.16	22.42	22.85	23.87	0.69
City Park	Two-week	21.84	22.66	23.18	24.07	25.72	1.42
City Park	Long-term	21.67	22.28	22.66	23.12	24.38	0.84
Rio Vista Park	Two-week	22.08	22.75	23.23	24.03	25.67	1.27
Rio Vista Park	Long-term	21.34	22.27	22.72	23.40	25.08	1.13
I-35	Two-week	22.11	22.82	23.38	24.20	25.91	1.37
I-35	Long-term	21.67	22.39	22.80	23.52	25.22	1.13
Thompson Island - Natural	Two-week	22.06	22.99	23.59	24.41	26.01	1.42
Thompson Island - Natural	Long-term	21.11	22.50	23.03	23.84	25.84	1.34
Thompson Island - Artificial	Two-week	22.18	23.16	23.79	24.63	26.16	1.47
Thompson Island - Artificial	Long-term	21.63	22.62	23.28	24.03	26.05	1.40
Waste Water Treatment Plant	Two-week	22.20	23.28	23.93	24.73	26.13	1.45
Waste Water Treatment Plant	Long-term	21.71	22.69	23.28	23.97	25.87	1.28

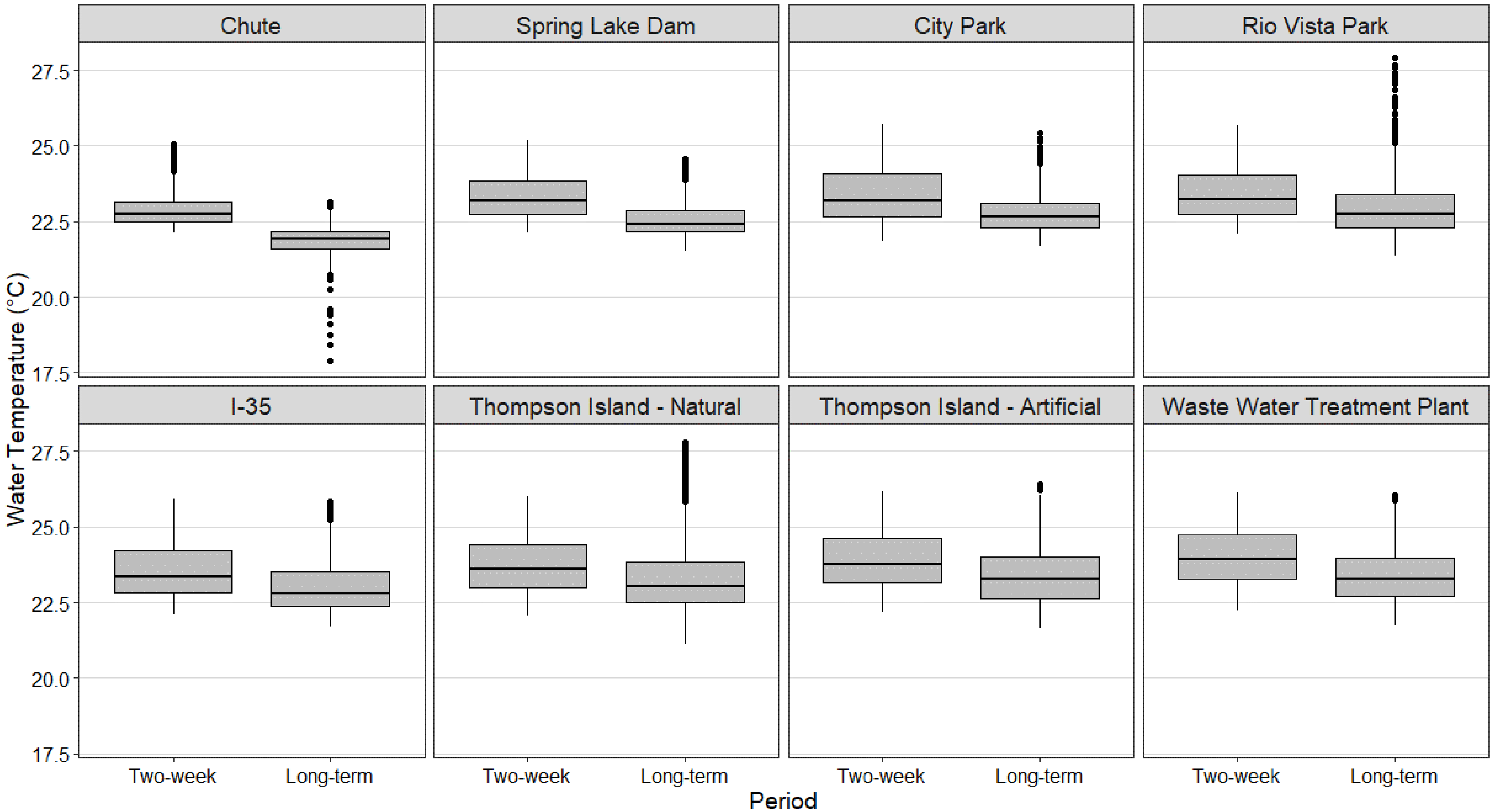


Figure 2. **Boxplots comparing recent two-week and long-term water temperature trends at eight monitoring stations from Chute to Waste Water Treatment Plant for the month of June 2023. The thick horizontal line in each box is the median and the upper / lower bounds of each box represents the interquartile range. Whiskers represent minimum / maximum values up to 1.5 times the interquartile range, and outliers beyond this are designated with solid black circles.**

Under current EAHCP flow-triggered conditions, Texas Wild-rice vulnerable stand surveys are being conducted every other week with the last event being conducted on June 23rd. Figure 3 highlights on-going impacts occurring to Texas Wild-rice in these vulnerable areas.

Figure 3: Texas Wild-rice vulnerable areas on June 23, 2023.

Another key factor is the condition of Spring Lake as it and the Spring Lake Dam spillway are the only two locations that support the presence all three listed species (Fountain Darter, San Marcos Salamander, and Texas Wild-rice). The following pictorial habitat evaluation highlights the current condition of Spring Lake, Spring Lake Dam and longitudinally down the San Marcos River with respect to threatened and endangered species habitat conditions.

SPRING LAKE AND SPRING LAKE DAM

Habitat conditions for San Marcos Salamanders and Fountain Darters in Spring Lake remain suitable but slightly degraded compared to earlier this spring (Figure 4). The reduced water flow throughout Spring Lake coupled with summer time sunlight / day length has resulted in higher-than-average levels of algal build up and siltation within San Marcos Salamander habitat. This was notably evident at the San Marcos salamander sampling location near the Hotel. Habitat in this area is still supporting small patches of clear, clean substrate but the greater portion of the site has considerable algal build-up (Figure 5).

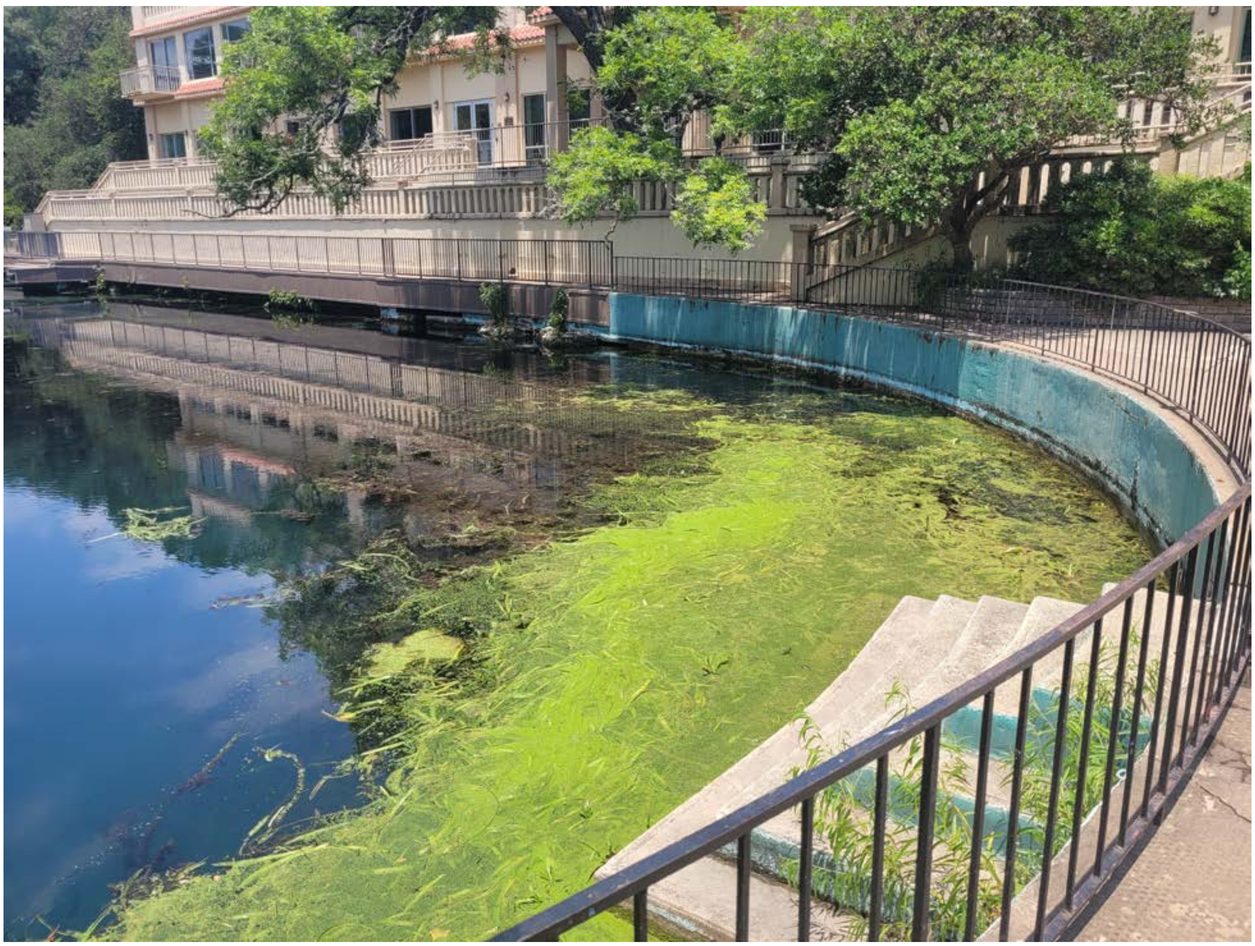


Figure 4: Headwaters of Spring Lake with floating aquatic vegetation (June 22, 2023).

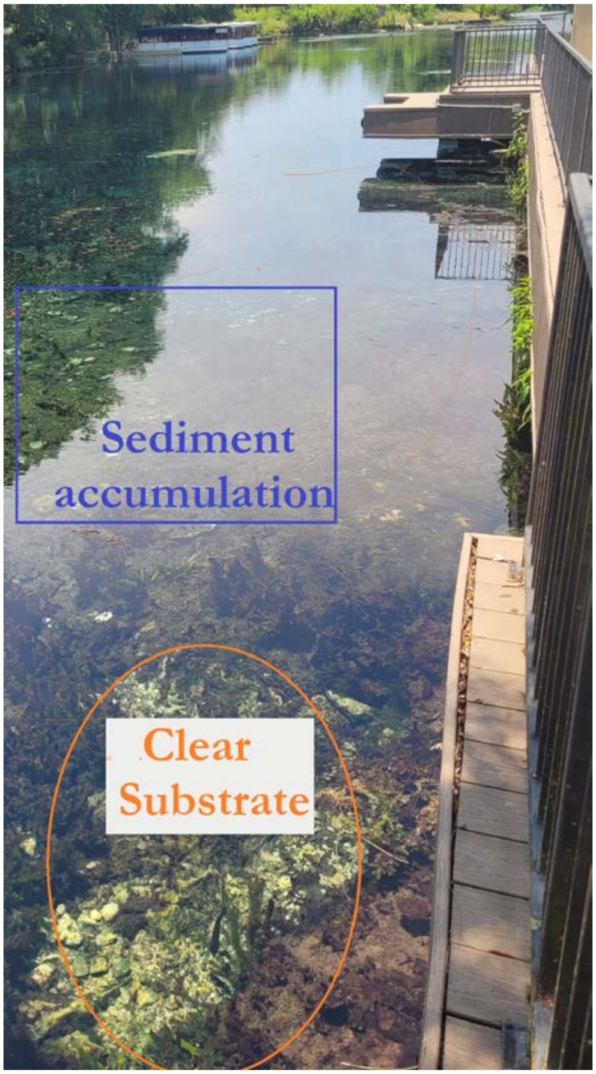


Figure 6 highlights the continued recreational impacts to Texas Wild-rice in the Spring Lake Dam reach, but also the protection afforded by the exclusion zone. Although overall protective, Figure 3 provides an illustration of a recreation path from one side of Sewell Park to the other using the exclusion zone sign as a marker.

Aquatic vegetation within the Spring Lake Dam (Figure 6) and City Park (Figure 7) study reaches continue to be dominated by Texas Wild-rice, a lot of which is emergent at this time. Figures 8 and 9 highlight the typical summer time recreational impacts to aquatic vegetation in the City Park reach looking downstream and Rio Vista stretch looking upstream, respectively. The I35 study reach (Figure 10) continues to support a more diverse aquatic vegetation community, albeit it quite shallow in several locations. Finally, the San Marcos River is maintaining Fountain Darter habitat and suitable water temperatures in the river below the Texas Parks and Wildlife Department (TPWD) outfall.

The following photographs (Figures 6 through 11) highlight Fountain Darter and Texas Wild-rice habitat conditions moving downstream in the San Marcos River.

Figure 5: Hotel site for San Marcos Salamanders (June 22, 2023).

Overall, water levels and Covered Species habitat conditions in June 2023 remain similar to those observed earlier this year in April and consistent with those observed late last summer / fall 2022. Lower-than-average water levels continue to expose wetted area to recreational activities that impact Covered Species habitat. Texas Wild-rice in vulnerable areas (i.e., low water depth) continues to be the Covered Species impacted to the greatest extent under these hydrological conditions. The turnover of Spring Lake is presently reduced causing increased algal growth and siltation at certain locations in the lake. However, San Marcos Salamander and Fountain Darter habitat within the lake and Eastern spillway remains suitable. The higher quality Fountain Darter habitat in the I35 study reach (compared to the Spring Lake Dam and City Park study reaches) remains shallow, but mostly wetted as shown in Figure 10. Should the extreme drought worsen, monitoring activities are in place to continue to track habitat conditions for HCP covered species in the San Marcos River.

Please don't hesitate to contact me if you have any questions or concerns.

Ed

Figure 6: Spring Lake Dam looking upstream towards dam on June 22, 2023.

Figure 7: City Park habitat conditions looking upstream on June 22, 2023.

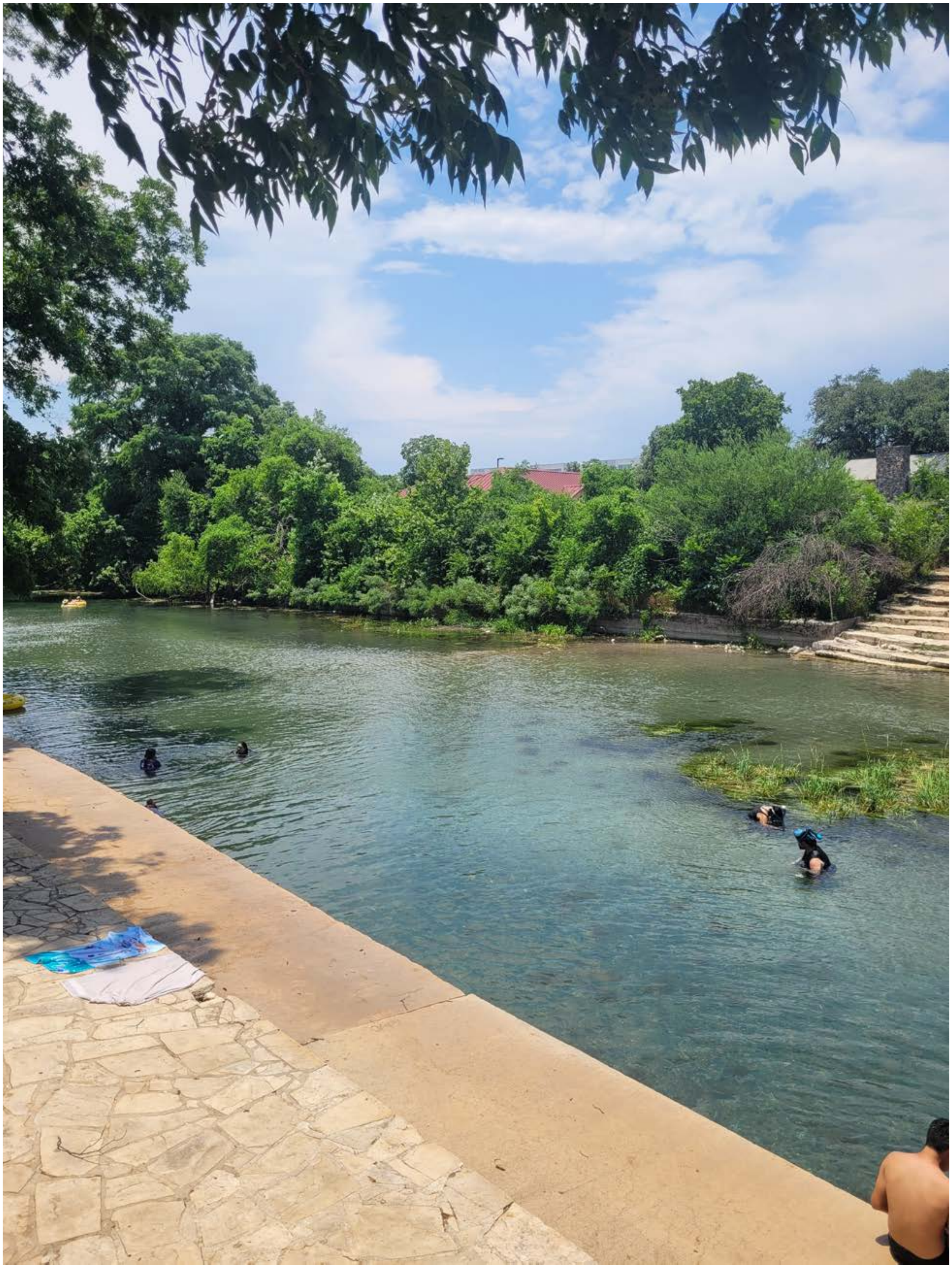


Figure 8: City Park habitat conditions looking downstream on June 22, 2023.

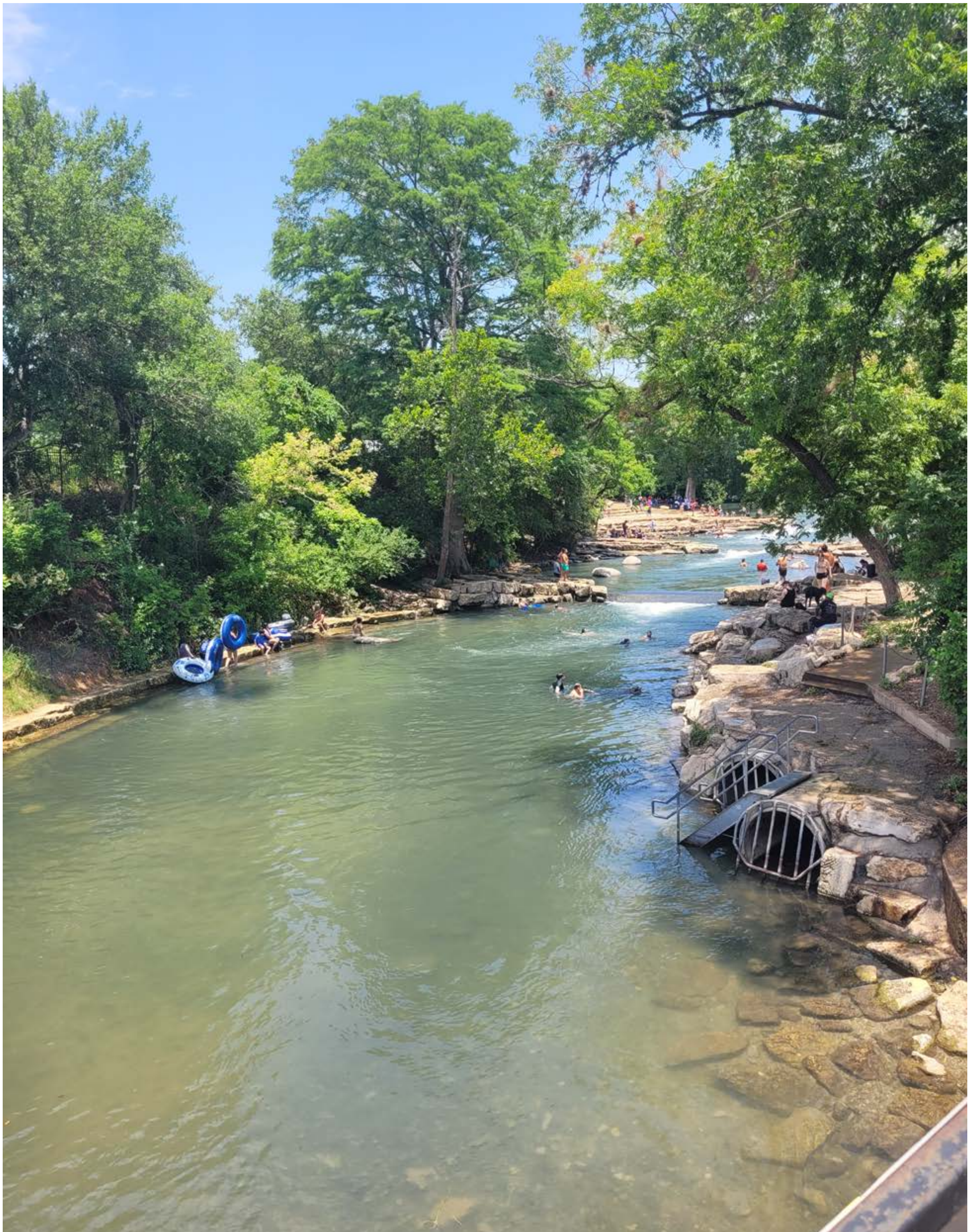


Figure 9: Rio Vista habitat conditions looking upstream on June 22, 2023.

Figure 10: I35 habitat conditions on June 22, 2023.

Figure 11: San Marcos River channel below TPWD outfall on June 22, 2023.

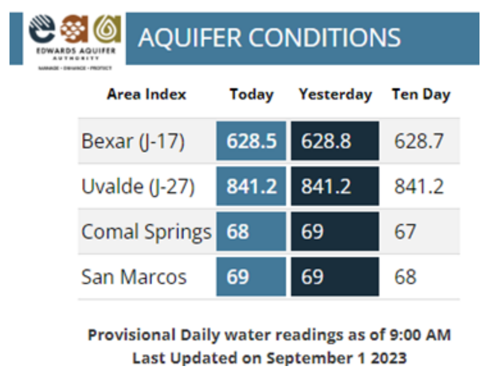
MEMORANDUM

TO:	Kristy Kollaus, Chad Furl
FROM:	Ed Oborny (BIO-WEST)
DATE:	**September 1, 2023**
SUBJECT:	EAHCP Critical Period Habitat Evaluations – San Marcos System

Habitat Evaluations (70 cfs and 65 cfs)

The Spring 2023 Comprehensive Biological Monitoring effort for the San Marcos System was completed in April 2023. That monitoring event doubled for the 85 cfs full Critical Period monitoring trip since total system discharge during that routine monitoring ranged from approximately 80 cfs to 92 cfs. Mid-May rains and resulting recharge increased total system daily discharge to over 100 cfs briefly towards the end of May. However, subsequent hot and dry conditions has led to total system discharge steadily declining this summer. As total system discharge declined, the 85 cfs Habitat Evaluation was triggered, conducted on June 22nd and reported via memorandum format to EAA. Subsequently, the 70 cfs habitat evaluation was conducted on August 21st and the 65 cfs habitat evaluation was conducted on August 29th. Per contractual requirement, the next habitat evaluation for the San Marcos River is scheduled for 60 cfs which would also trigger a full Critical Period sampling event. As of this memorandum, the total system discharge in the San Marcos River is approximately 70 cfs (Figure 1).

All continued activities associated with Critical Period biological monitoring (**Task 2**) and low-flow monitoring (**Task 3**) have been completed through August. This memorandum highlights habitat conditions this summer in the San Marcos system. Figure 1 shows the total system discharge at the USGS San Marcos River gage over the past 30 days. As of September 1st, J-17 aquifer conditions are reported as 628.5 (see image to right).



AQUIFER CONDITIONS

Area Index	Today	Yesterday	Ten Day
Bexar (J-17)	628.5	628.8	628.7
Uvalde (J-27)	841.2	841.2	841.2
Comal Springs	68	69	67
San Marcos	69	69	68

Provisional Daily water readings as of 9:00 AM
Last Updated on September 1 2023

Key ecological information regarding study reaches and full-system sampling are included relative to Critical Period and low-flow monitoring for comparison. Recent one-month trends in water temperature (°C) for August Critical Periods were assessed using temperature data loggers (HOBO Tidbit v2 Temp Loggers) at 8 permanent monitoring stations in the upper San Marcos River. Data for each monitoring station are based on 10-minute intervals and dates for recent trends extended from the last day that each data logger was downloaded to the first of the month. One-month trends were examined from 8/1 – 8/31 (n = 31 days) for all stations, which were also compared to long-term water temperature data measured at 4-hour intervals in August from 2001 – 2022 or to the greatest temporal extent available. For analysis, one-month trends were compared to long-term data using boxplots to visualize differences in central tendency (i.e., median) and variation (e.g., interquartile range). Drought conditions remain evident with August 2023 water temperatures being higher than the long-term monthly average at each station. Although elevated, temperatures are not noted as a potential concern for Fountain Darters until you reach Thompson Island longitudinally down the San Marcos River (Table 1, Figure 2).

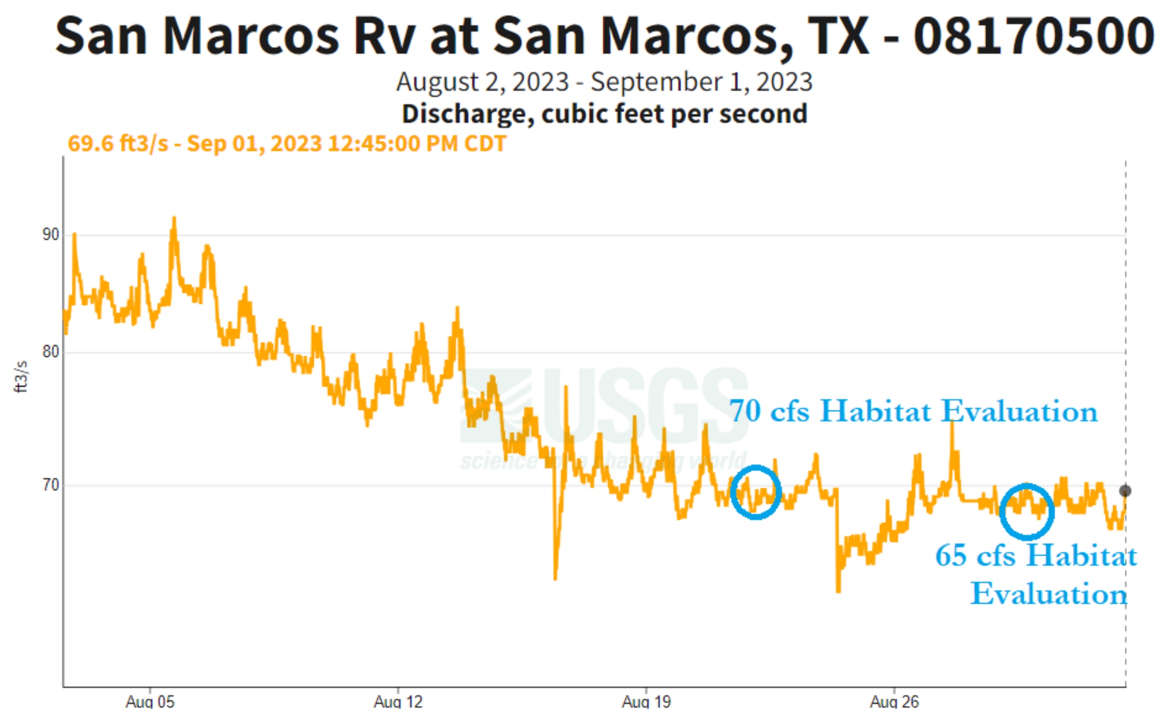


Figure 1: Total system discharge over the past 30 days at USGS gage on the San Marcos River.

Table 1. Summary of boxplot descriptive statistics comparing recent one-month and long-term trends in water temperature (°C) at 8 monitoring stations in the upper San Marcos Springs River for the month of August.

Station	Period	Lower Whisker	Lower Box	Median	Upper Box	Upper Whisker	Interquartile Range
Chute	1-month	22.56	22.87	23.21	23.83	25.11	0.96
Chute	Long-term	21.45	22.39	22.61	23.04	24.00	0.65
Spring Lake Dam	1-month	22.42	23.28	23.93	24.92	25.94	1.64
Spring Lake Dam	Long-term	21.15	22.71	23.07	23.76	25.33	1.06
City Park	1-month	22.54	23.42	23.95	24.63	26.13	1.21
City Park	Long-term	21.67	22.77	23.21	24.24	26.45	1.47
Rio Vista Park	1-month	22.42	23.18	23.86	24.87	26.16	1.69
Rio Vista Park	Long-term	21.01	22.80	23.23	24.12	26.09	1.32
I-35	1-month	22.51	23.42	24.17	25.31	26.48	1.88
I-35	Long-term	21.70	22.78	23.33	24.12	25.74	1.34
Thompson Island - Natural	1-month	22.61	23.71	24.56	25.62	26.57	1.91
Thompson Island - Natural	Long-term	21.29	23.01	23.58	24.51	26.74	1.50
Thompson Island - Artificial	1-month	22.85	24.94	25.79	26.43	28.64	1.48
Thompson Island - Artificial	Long-term	21.61	23.23	24.21	25.09	27.72	1.86
Waste Water Treatment Plant	1-month	23.14	24.29	25.09	26.11	26.92	1.82
Waste Water Treatment Plant	Long-term	21.70	23.33	23.88	24.78	26.92	1.45

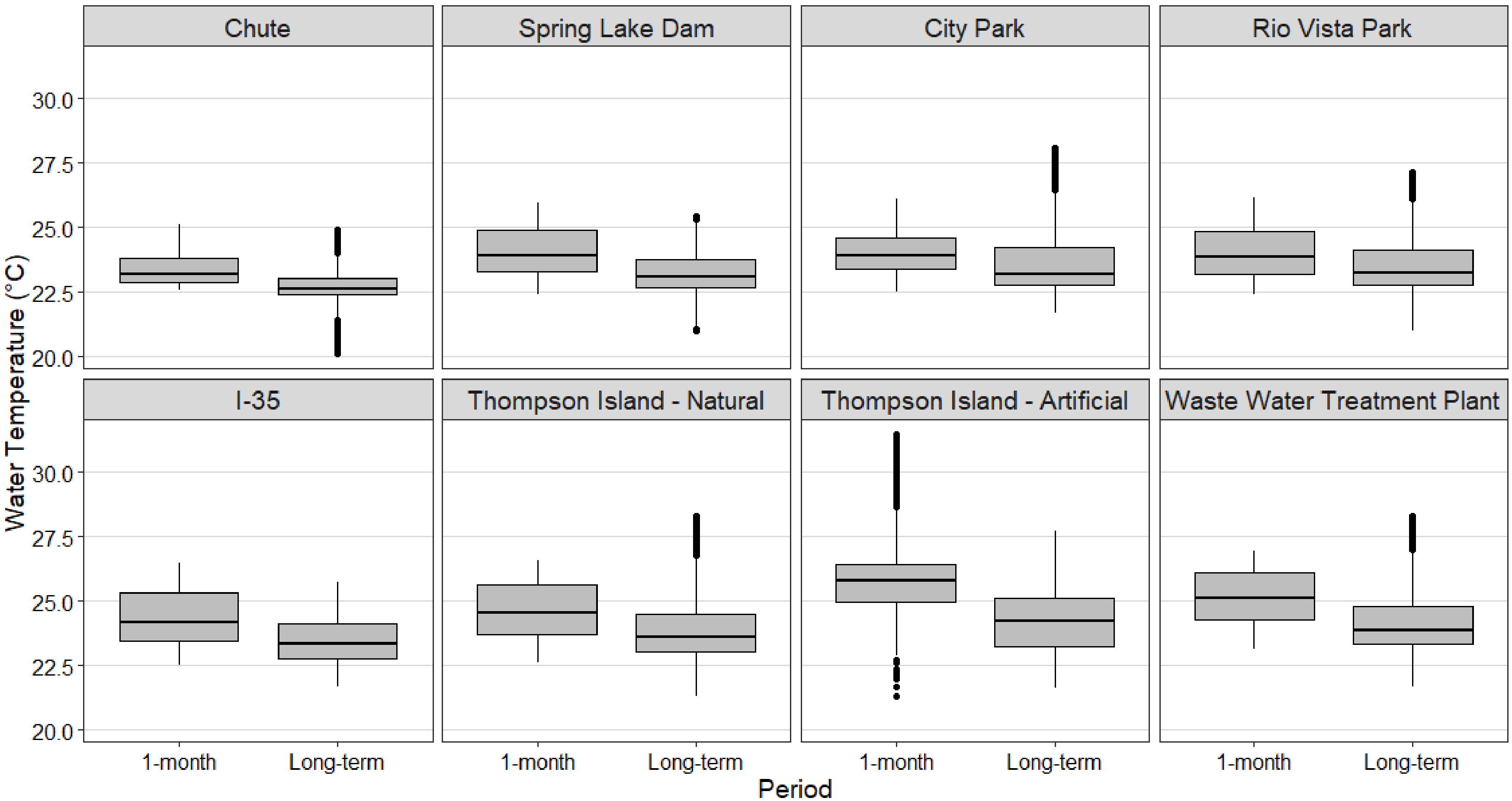


Figure 2. **Boxplots comparing recent one-month and long-term water temperature trends at eight monitoring stations from Chute to Waste Water Treatment Plant for the month of August. The thick horizontal line in each box is the median and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range, and outliers beyond this are designated with solid black circles.**

Under current EAHCP flow-triggered conditions, Texas Wild-rice vulnerable stand surveys are being conducted weekly with the last event being conducted on August 30th. Figure 3 highlights on-going impacts occurring to Texas Wild-rice in these vulnerable areas in August. Over the course of this past month, extreme decline in plant health has been observed in most areas. However, some colonies in lesser recreated areas remain healthy.

Figure 3: Texas Wild-rice vulnerable areas in August 2023.

Another key factor is the condition of Spring Lake as it and the Spring Lake Dam spillway are the only two locations that support the presence all three listed species (Fountain Darter, San Marcos Salamander, and Texas Wild-rice). The following pictorial habitat evaluation highlights the current condition of Spring Lake, Spring Lake Dam and longitudinally down the San Marcos River with respect to threatened and endangered species habitat conditions.

SPRING LAKE AND SPRING LAKE DAM

Habitat conditions for San Marcos Salamanders and Fountain Darters in Spring Lake remain suitable but slightly degraded compared to earlier this summer. The reduced water flow throughout Spring Lake coupled with summer time sunlight / day length has resulted in higher-than-average levels of algal build up and siltation within San Marcos Salamander habitat this

August. This was notably evident at the San Marcos salamander sampling location near the Hotel. Habitat in this area is still supporting small patches of clear, clean substrate directly associated with spring openings but the greater portion of the site has considerable algal and silt build-up (Figure 4).

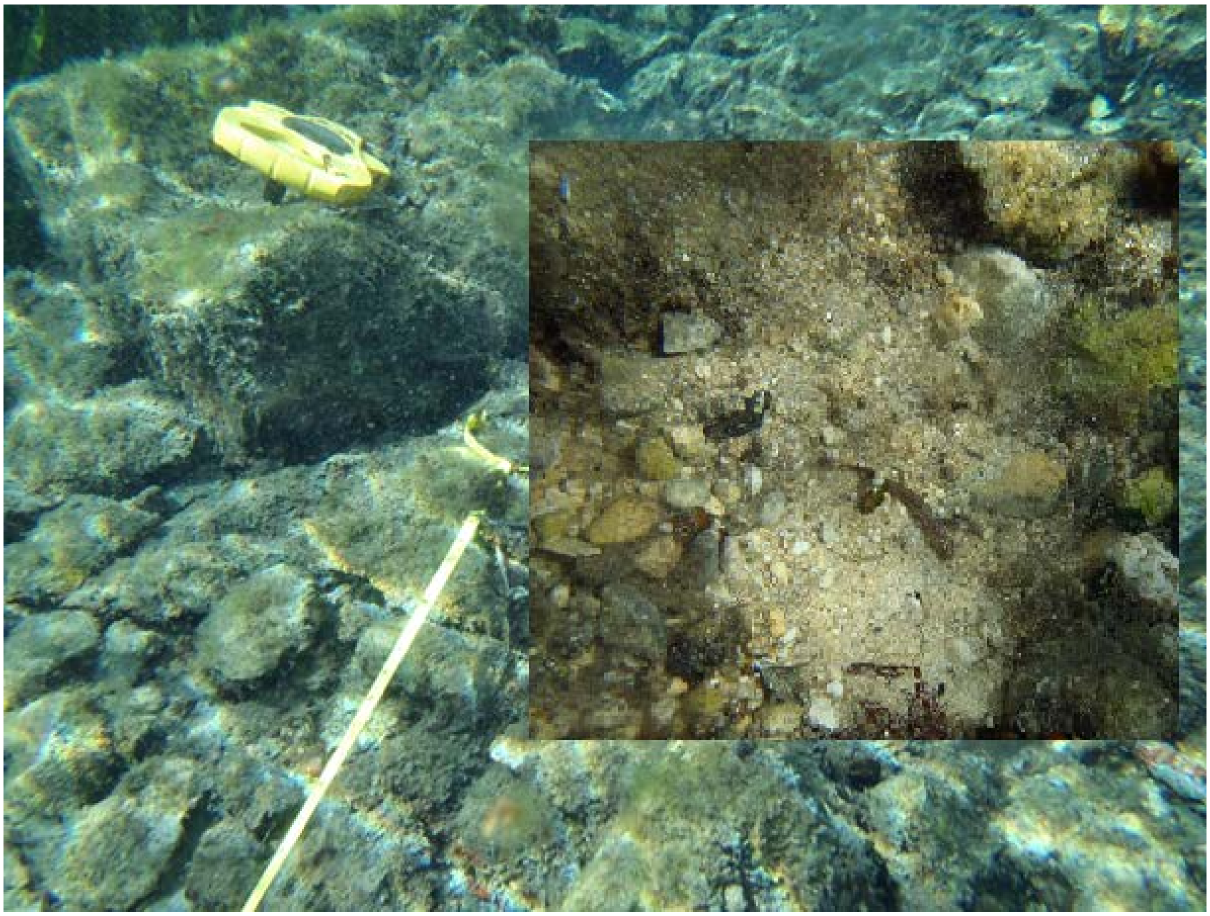


Figure 4: San Marcos salamander habitat at the Hotel Study Site on August 29, 2023. Clear substrate is still present at spring openings with salamanders of all size classes observed.

Figure 5 shows the habitat conditions for all three covered species below Spring Lake Dam. Either the salamander sign was stolen or it is not getting the love the two endangered species are 😊. The area is quite shallow, Texas Wild-rice is emergent in places and crispy brown, and floating matts of vegetation are not being moved downstream by low flow. There is a notable *Hydrocotyle* expansion in this upper area, which is suitable habitat for both the San Marcos salamander and Fountain Darter (Figure 5).

Figure 5: Covered Species habitat in the Eastern Spillway below Spring Lake Dam on August 29, 2023. Brown Texas Wild-rice and floating vegetation (top) and expansion of *Hydrocotyle* (bottom).

Figure 6 highlights the continued recreational impacts to the Spring Lake Dam reach this summer, but also the continued protection afforded by the exclusion zone.

Figure 6: Spring Lake Dam at the confluence of Sessom's Creek on August 21, 2023. Note the chairs in the water.

From Spring through August 2023, all three San Marcos Study reaches exhibited submerged aquatic vegetation declines in coverage. The decreases in aquatic vegetation has a lot to do with summer time recreational pressure but also that the system is at flow conditions that have not been experience since the inception of this biological monitoring program over 23 years ago. The extreme low flow conditions have aquatic vegetation going emergent and converting to terrestrial vegetation in river bottom areas that are no longer wet.

Aquatic vegetation and Fountain Darter dip netting are key monitoring components as they comprise the equation / criteria for Fountain Darter refugia salvage activities described in Section 6.4.4 (**San Marcos Springs and River Ecosystem Adaptive Management Activities**) in the EAHCP. Those trigger conditions for the Fountain Darter in the San Marcos system are as follows:

- *Less than 50 percent mean aquatic vegetation (Variable Flow Study monitoring reaches including Spring Lake) AND less than 20 percent darter abundance,*

OR

- *Less than 25 percent mean aquatic vegetation (Variable Flow Study monitoring reaches including Spring Lake) AND less than 30 percent darter abundance.*

The results of the July calculations are presented below.

JULY

Approximate* percentage aquatic vegetation of mean - 84%

Percent darter abundance - 50%

*Please note that the vegetation coverages used for the calculations below are draft at this time because we have not had time to polish them up for maps yet.

As evident above, these results are considerably above the EAHCP refugia trigger. The current trigger for this sampling is every other month, so both submerged aquatic vegetation mapping in the three study reaches and random, 50-site Fountain Darter dip netting will be conducted in September.

Overall, water levels and Covered Species habitat conditions in August are similar to slightly degraded to those observed earlier this June. Water temperature remains suitable in Spring Lake and longitudinally down the river. Lower-than-average water levels continue to expose wetted area to recreational activities that impact Covered Species habitat. Texas Wild-rice in vulnerable areas (i.e., low water depth) continues to be the Covered Species impacted to the greatest extent under these hydrological conditions. The turnover of Spring Lake continues to be reduced well below average, causing increased algal growth and siltation in most of the lake. However, San Marcos Salamander and Fountain Darter habitat within the lake and Eastern spillway remains suitable with individuals being collected and/or observed of multiple size classes in both areas on August 29th. The more diverse Fountain Darter habitat in the I35 study reach (compared to the Spring Lake Dam and City Park study reaches) remains shallow with some areas going completely dry (Figure 9), but overall, remains mostly wetted.

Should the extreme drought worsen, monitoring activities are in place to continue to track habitat conditions for EAHCP covered species in the San Marcos River. With no significant rainfall over the next two weeks, a full Critical Period monitoring event (< 60 cfs) may be triggered in September. However, with a few rains, it is likely the next full monitoring event will be conducted in conjunction with the Fall Routine sampling later in October. Meanwhile, all Task 2 and Task 3 low-flow sampling components that are actively triggered at this time will be continued throughout September.

Please don’t hesitate to contact me if you have any questions or concerns. Ed

Figure 7: City Park habitat conditions looking upstream on June 22, 2023 (left ~ 85 cfs) and on August 21st (right ~ 70 cfs). Note the dry, brown vegetation (aquatic and terrestrial) during August.

Figure 8: Rio Vista habitat conditions looking upstream on June 22, 2023 (left ~ 85 cfs) and on August 21st (right ~ 70 cfs). There is no aquatic vegetation in this reach during the summer months.

Figure 9: I35 habitat conditions habitat conditions on June 22, 2023 (upper left ~ 85 cfs), August 21st (upper right ~ 70 cfs) and August 29th (lower center ~ 65 cfs).

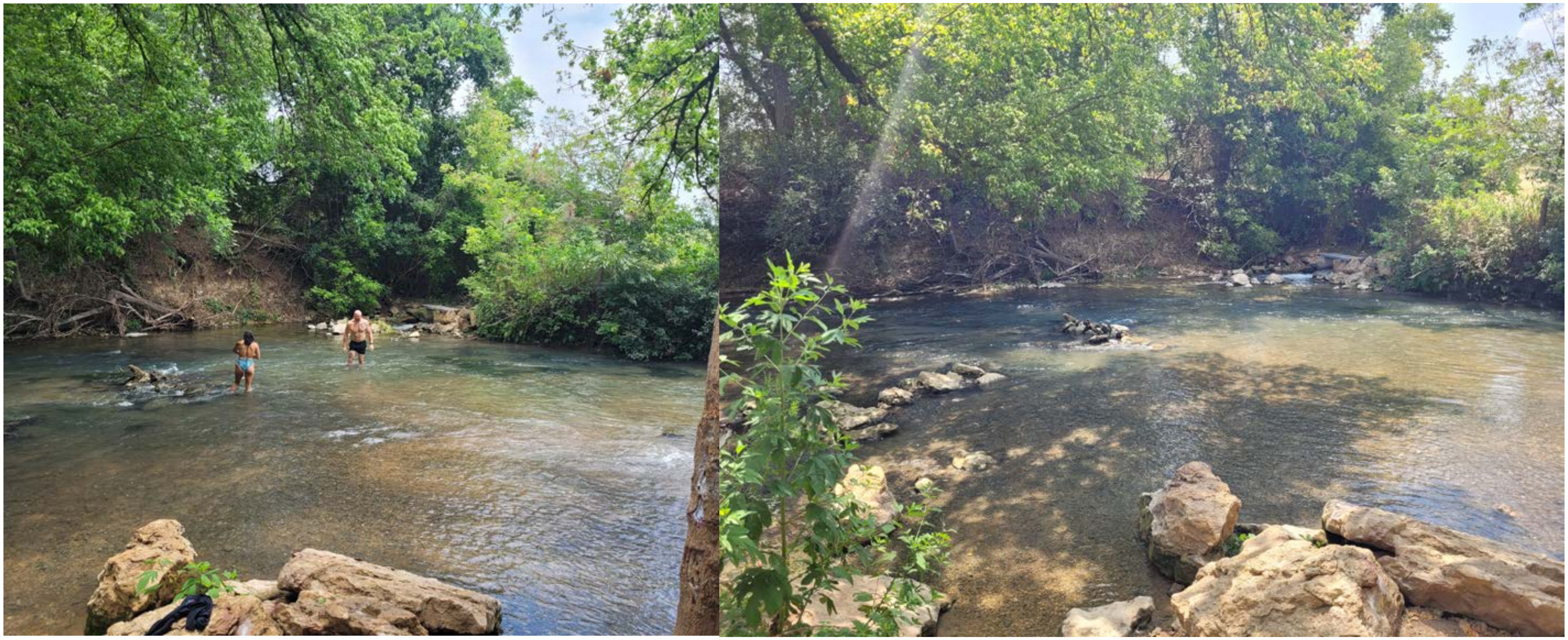


Figure 10: San Marcos River channel at TPWD outfall on June 22, 2023 (left ~ 85 cfs) and on August 21st (right ~ 70 cfs).

APPENDIX C: AQUATIC VEGETATION MAPS

Long-term Biological Goals Study Reaches

Figure C1. **Map of aquatic vegetation coverage at Spring Lake Dam Study Reach in spring 2023.**

Figure C2. **Map of aquatic vegetation coverage at Spring Lake Dam Study Reach in summer 2023 during Fountain Darter species specific low-flow sampling event (July).**

Figure C3. Map of aquatic vegetation coverage at Spring Lake Dam Study Reach in fall 2023.

Figure C4. Map of aquatic vegetation coverage at City Park Study Reach in spring 2023.

Figure C5. **Map of aquatic vegetation coverage at City Park Study Reach in summer 2023 during Fountain Darter species specific low-flow sampling event (July).**

Figure C6. **Map of aquatic vegetation coverage at City Park Study Reach in fall 2023.**

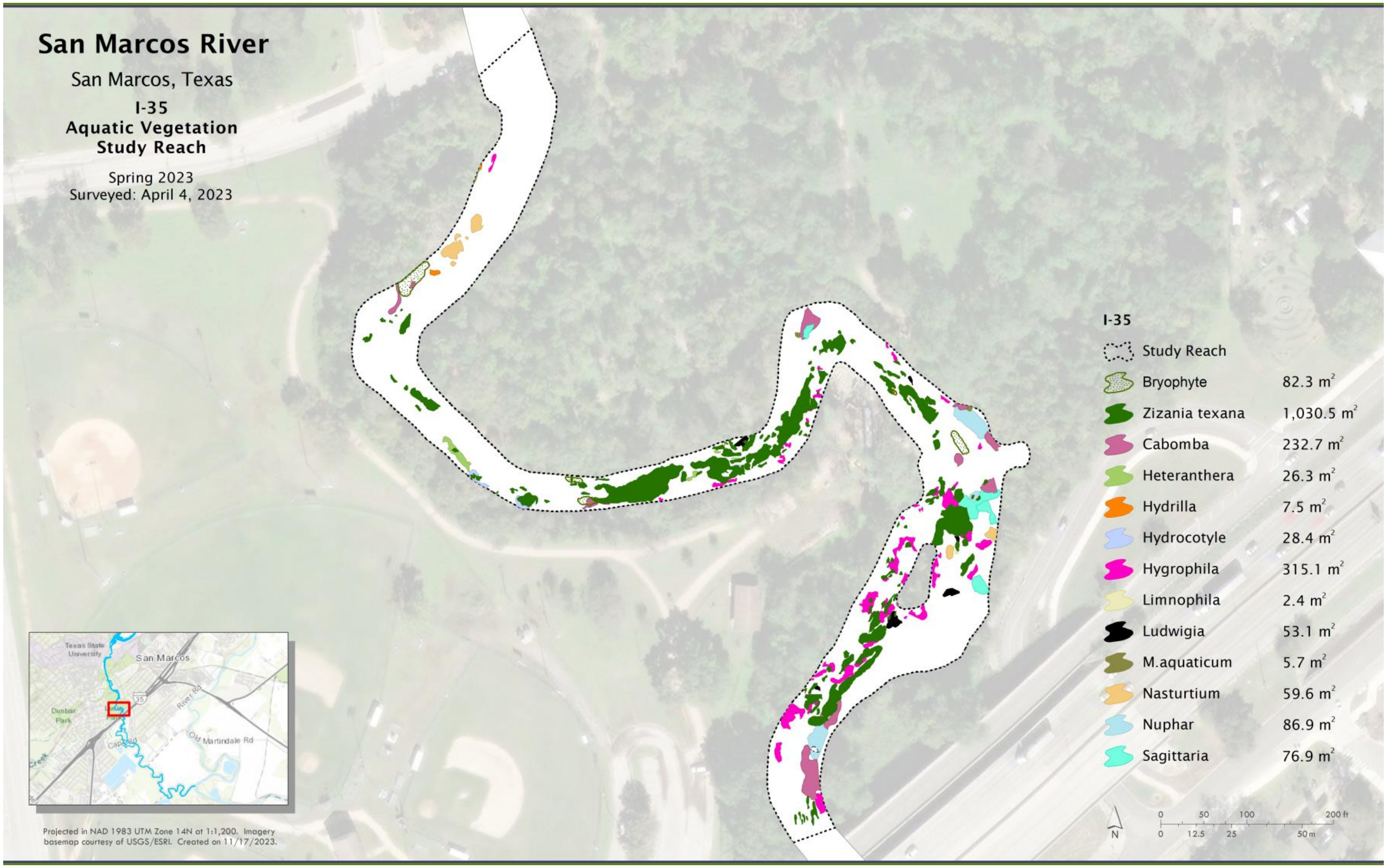


Figure C7. Map of aquatic vegetation coverage at I-35 Study Reach in spring 2023.

Figure C8. **Map of aquatic vegetation coverage at I-35 Study Reach in summer 2023 during Fountain Darter species specific low-flow sampling event (July).**

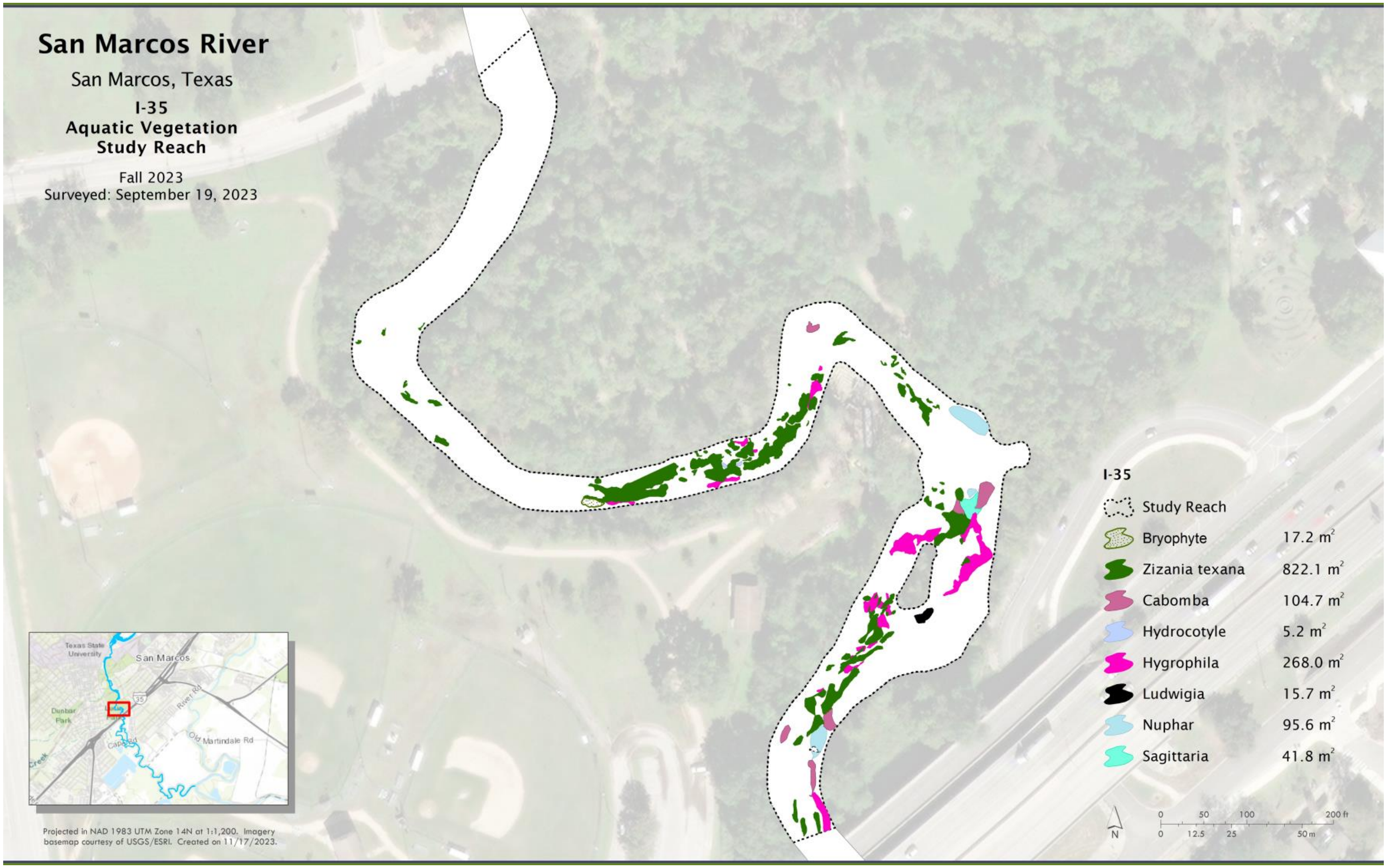


Figure C9. **Map of aquatic vegetation coverage at I-35 Study Reach in fall 2023.**

Texas Wild-rice Annual Mapping

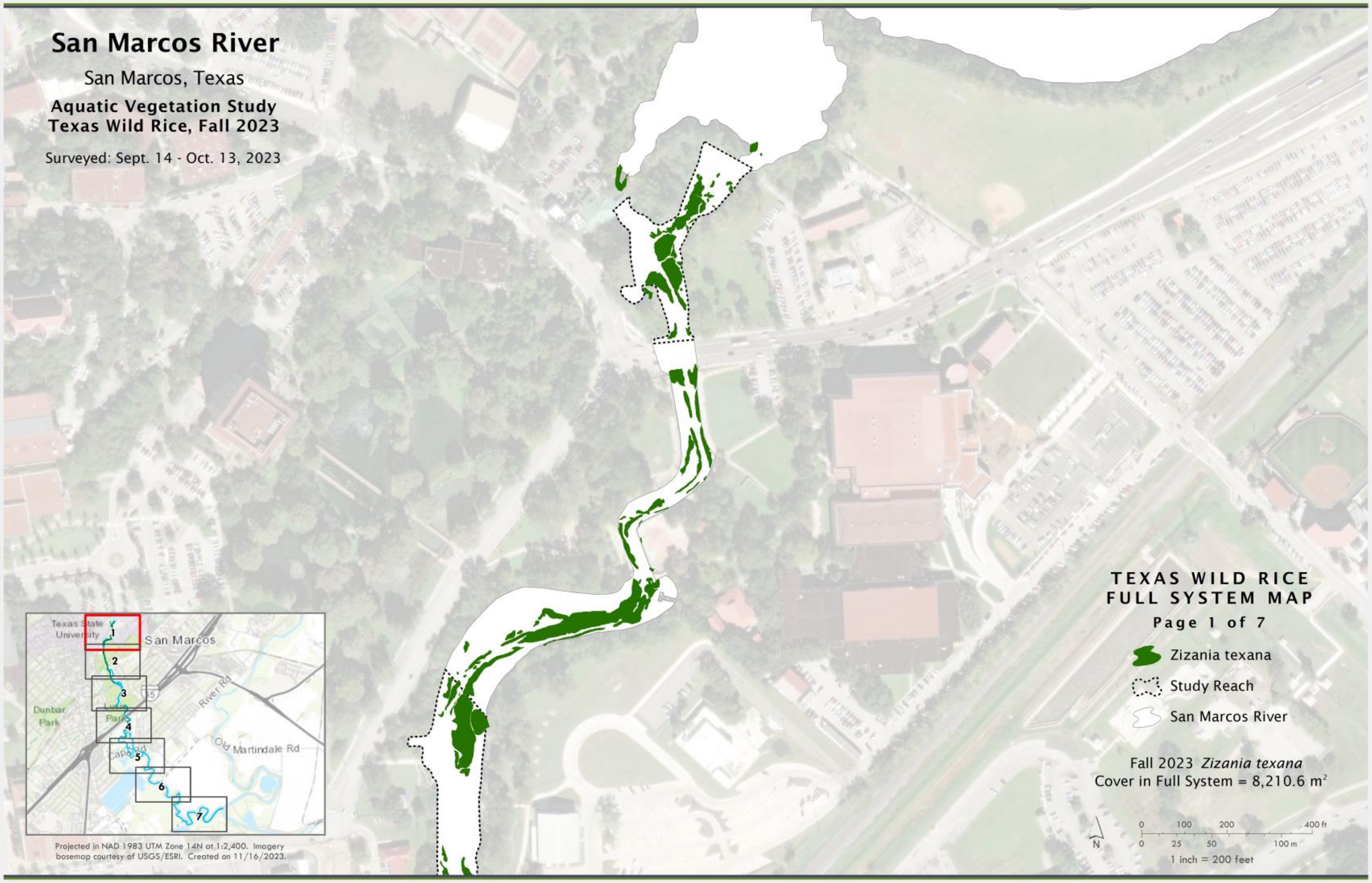


Figure C10. Map of Texas Wild-rice coverage from Spring Lake to City Park in summer/fall 2023.

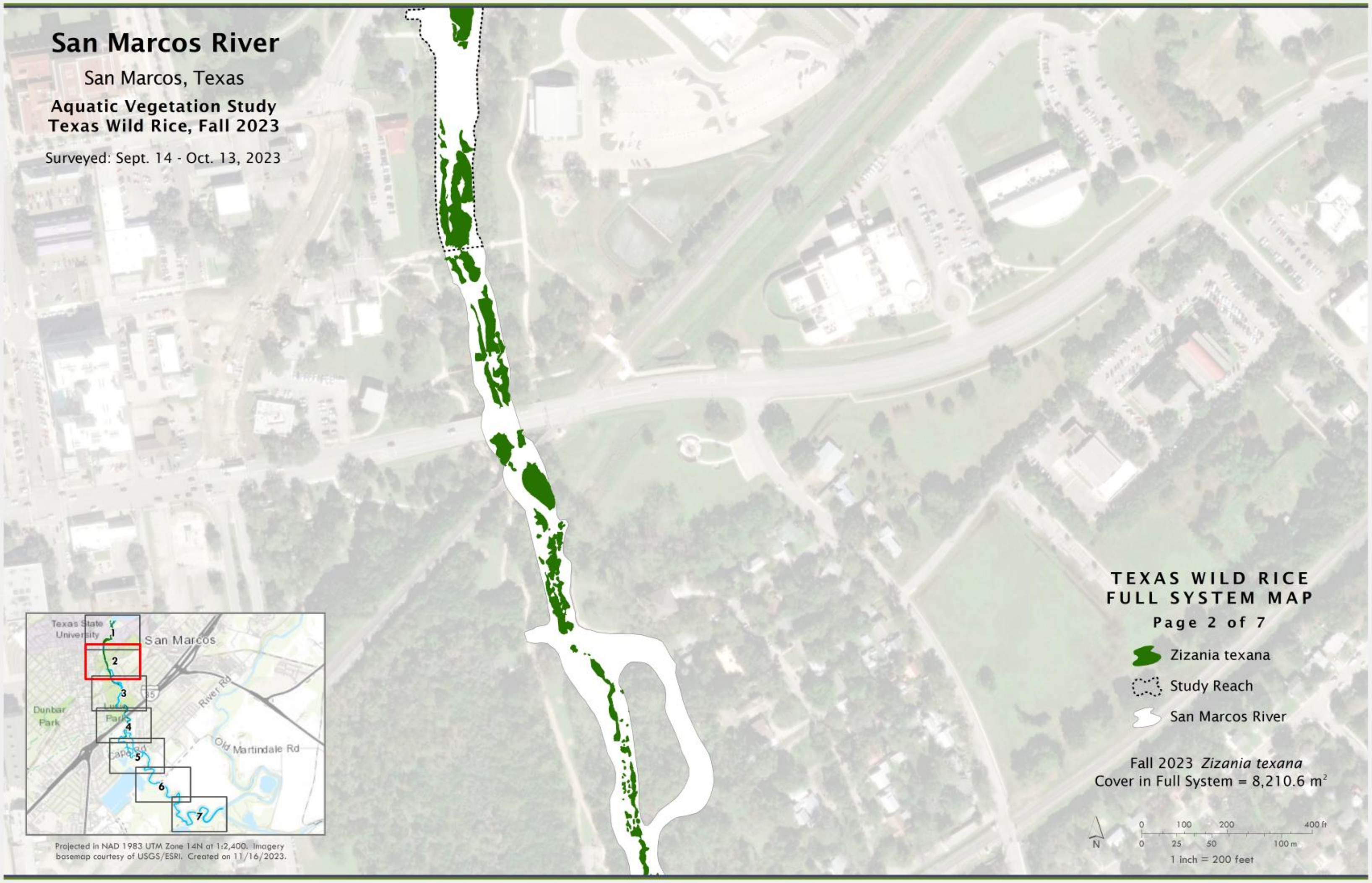


Figure C11. Map of Texas Wild-rice coverage from City Park to Cheatham Street in summer/fall 2023.

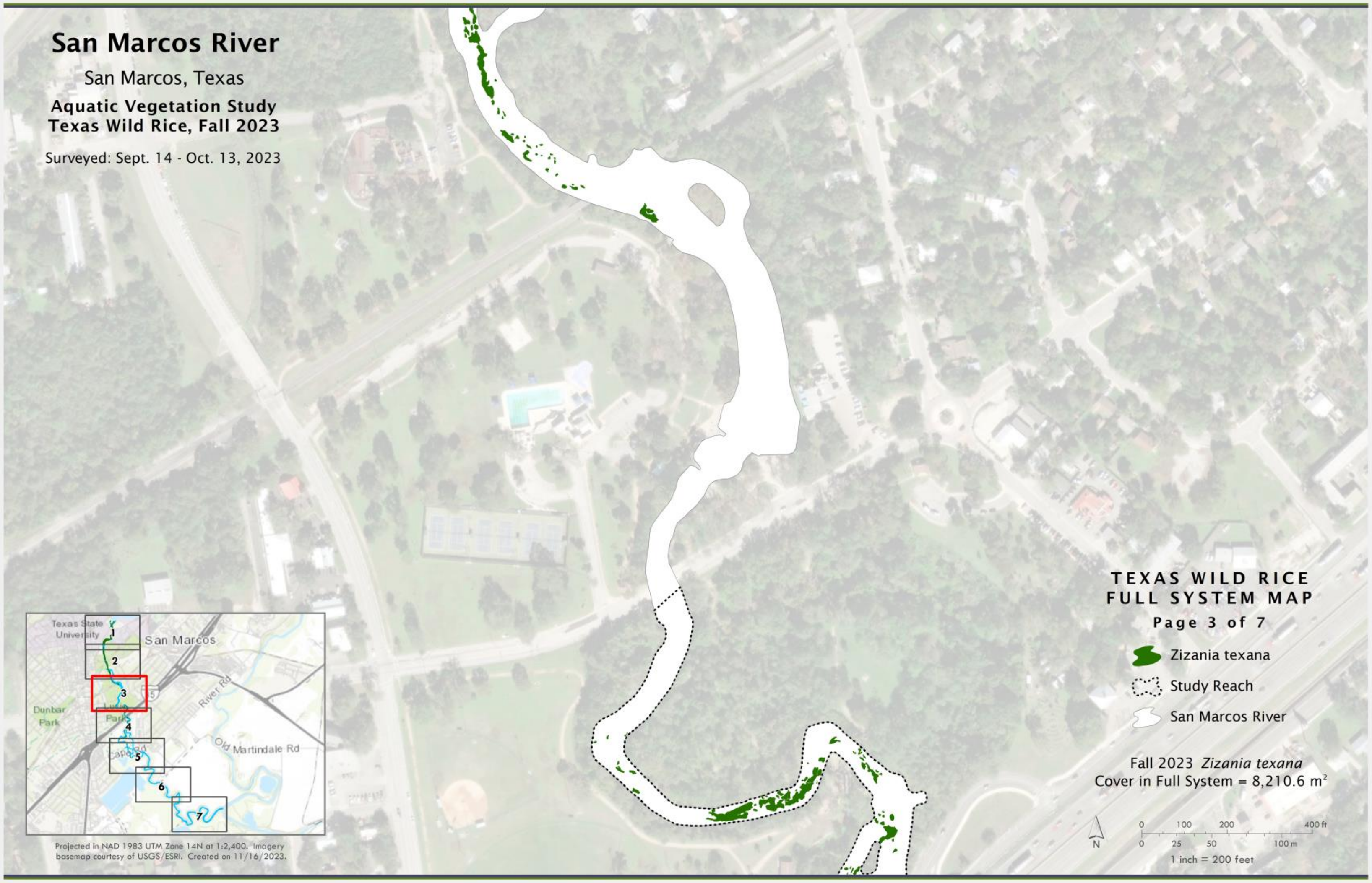


Figure C12. Map of Texas Wild-rice coverage from Cheatham Street to I-35 in summer/fall 2023.

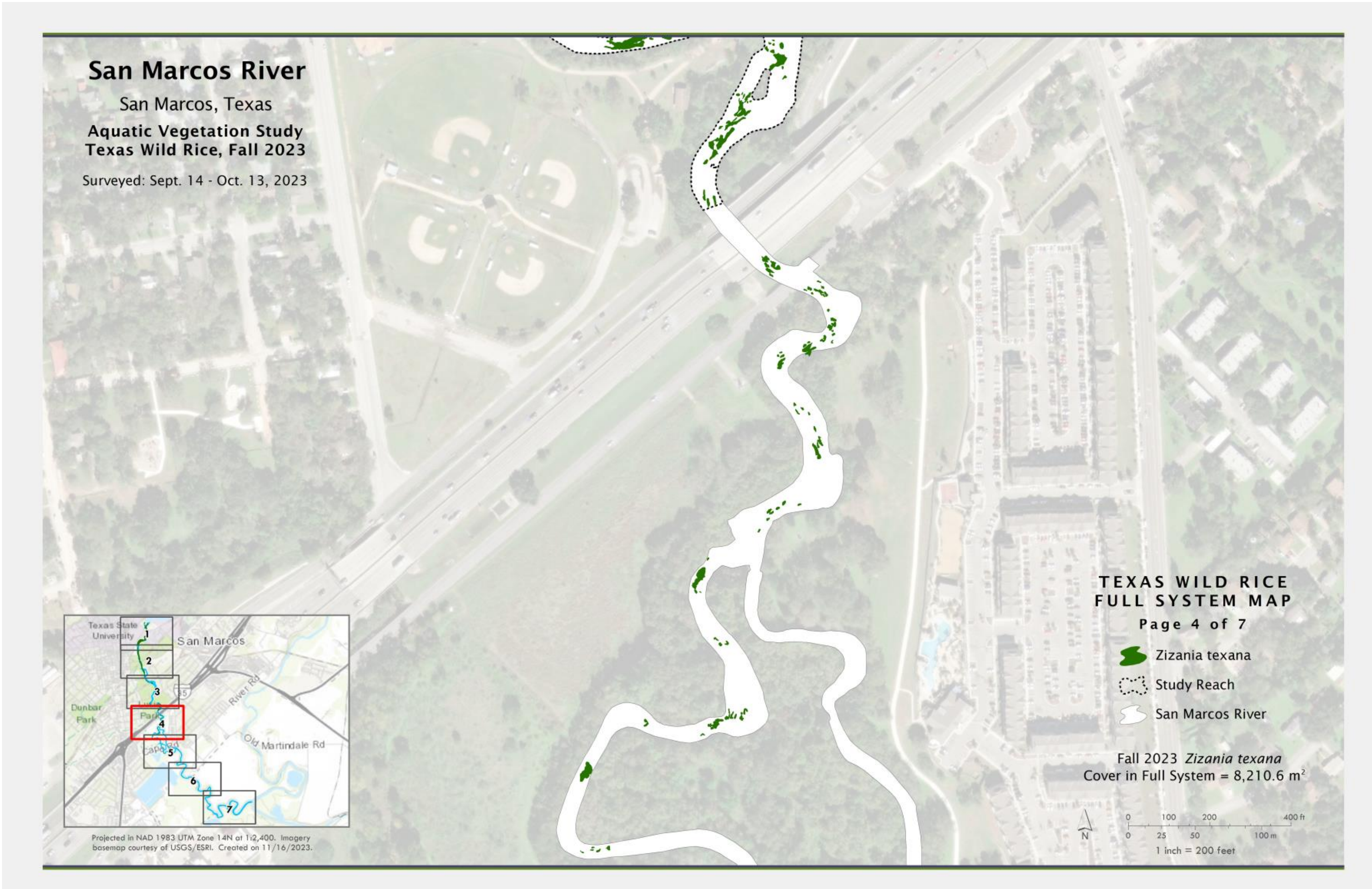


Figure C13. **Map of Texas Wild-rice coverage from Cheatham Street to about Stokes Park in summer/fall 2023.**

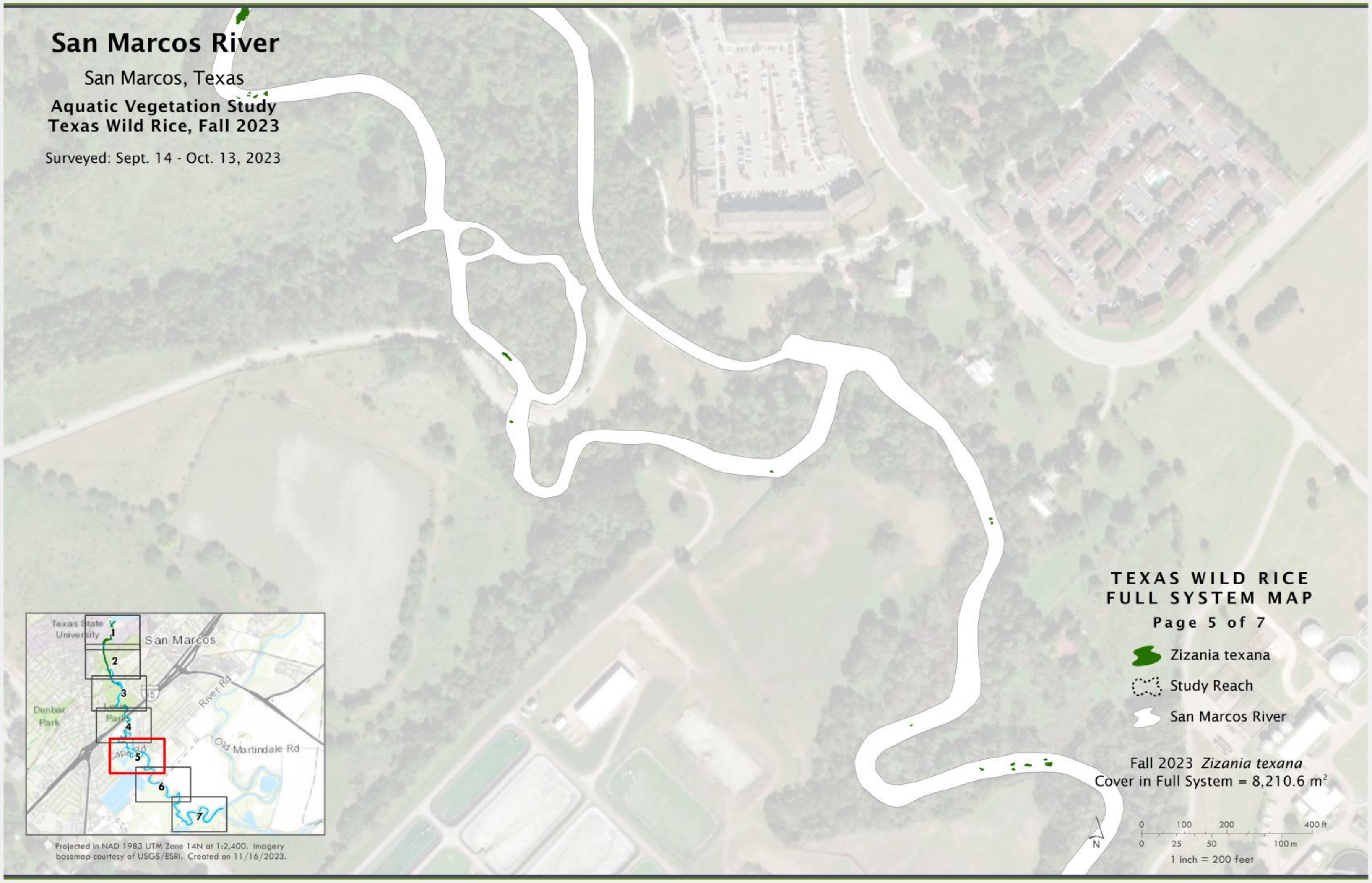


Figure C14. **Map of Texas Wild-rice coverage from about Stokes Park to Wastewater Treatment Plant in summer/fall 2023.**

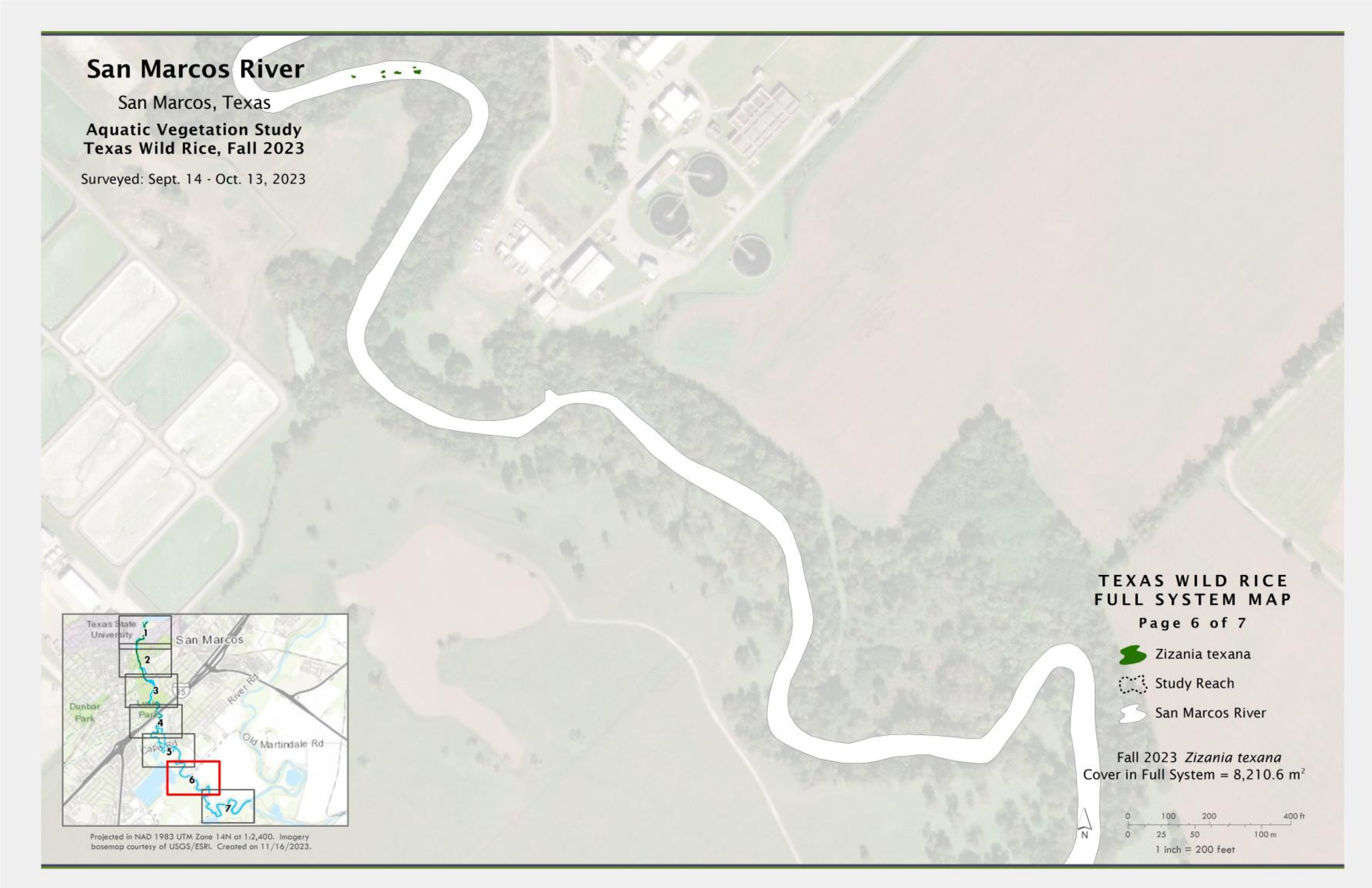


Figure C15. **Map of Texas Wild-rice coverage from Wastewater Treatment Plant to about Cypress Tree Island in summer/fall 2023.**

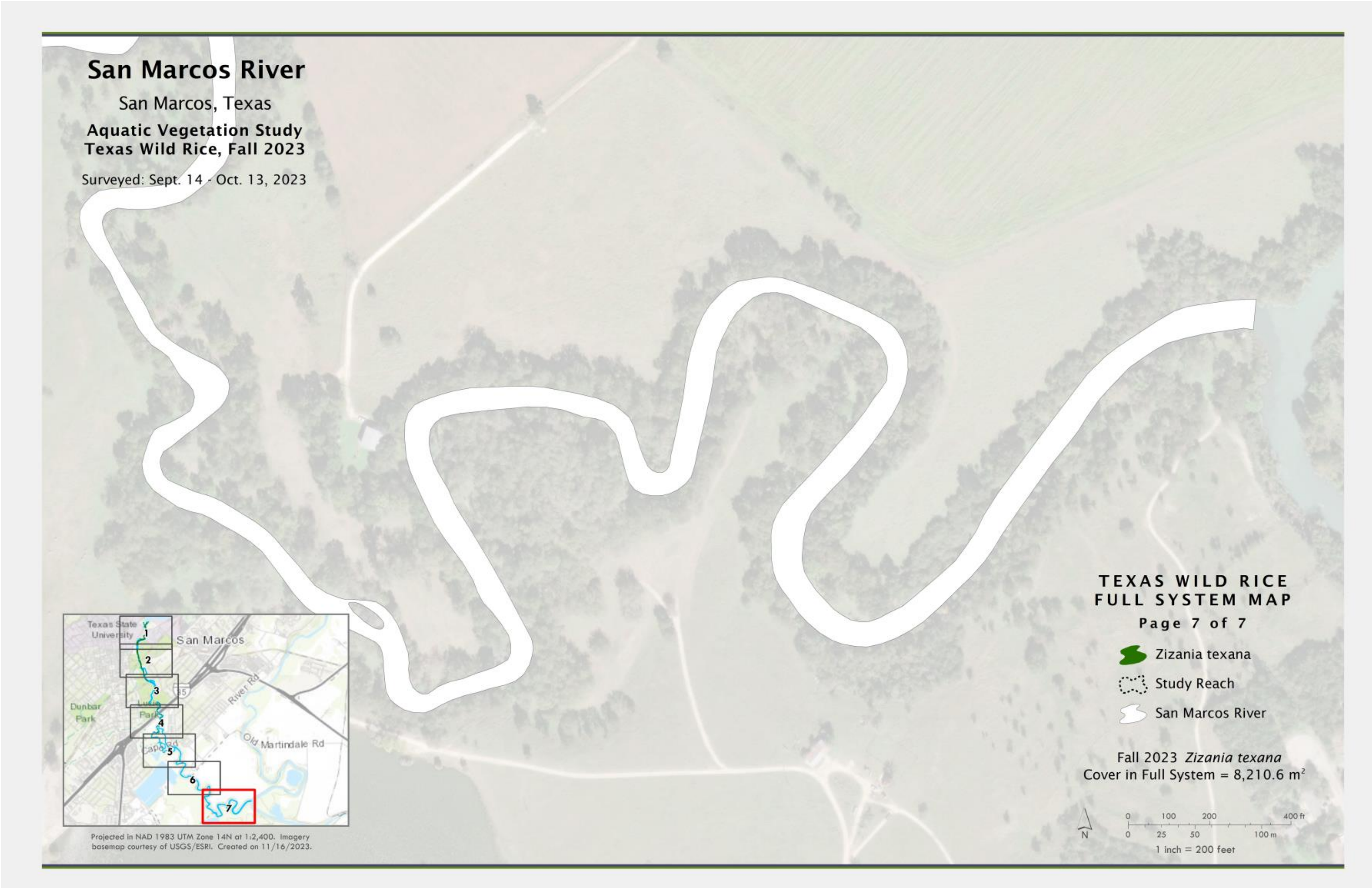


Figure C16. **Map of Texas Wild-rice coverage from about Cypress Tree to the Blanco River confluence in summer/fall 2023.**

HCP BENCHMARK FULL SYSTEM MAPPING

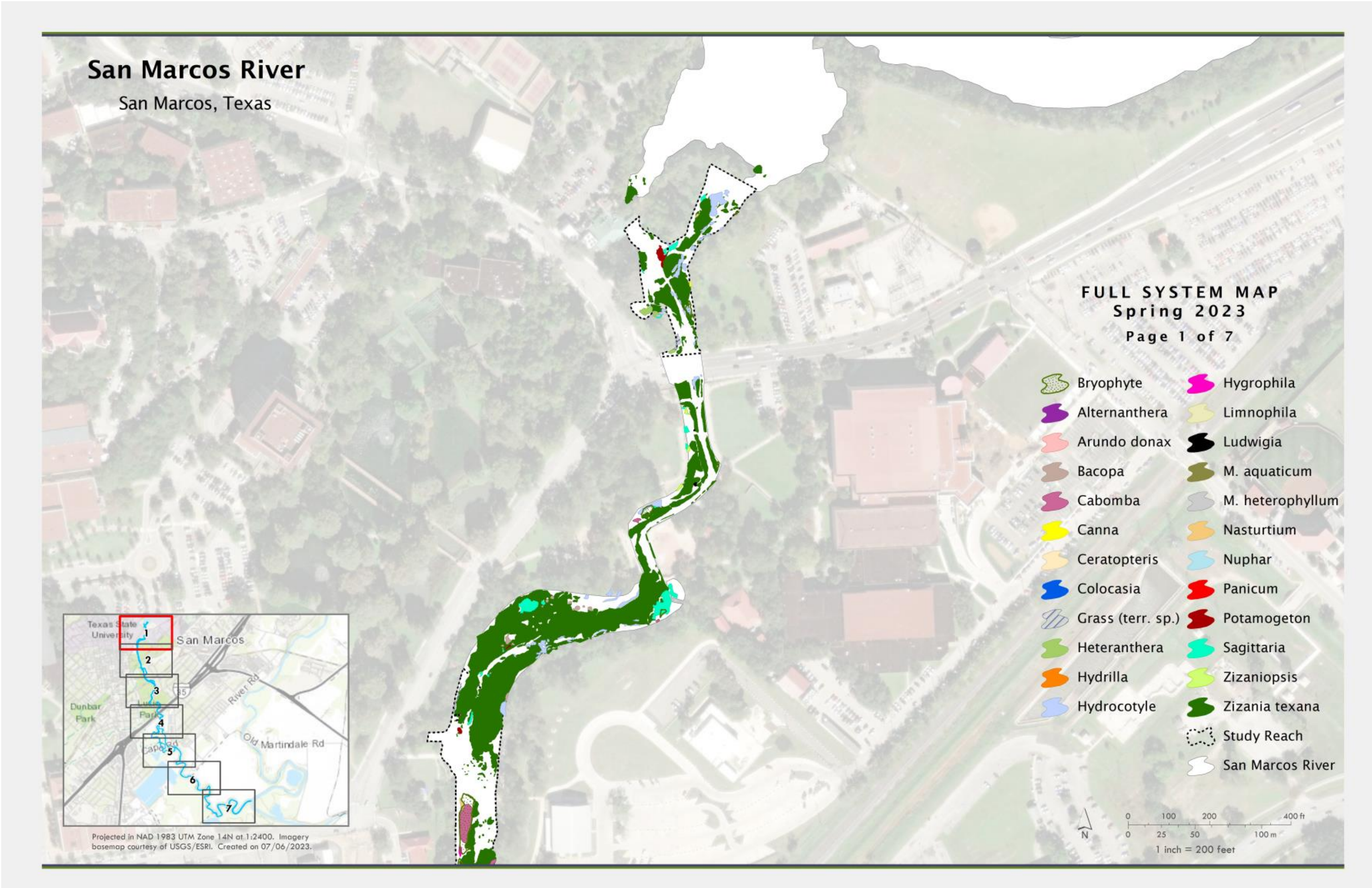


Figure C17. **Map of aquatic vegetation coverage at segment 1 in 2023.**

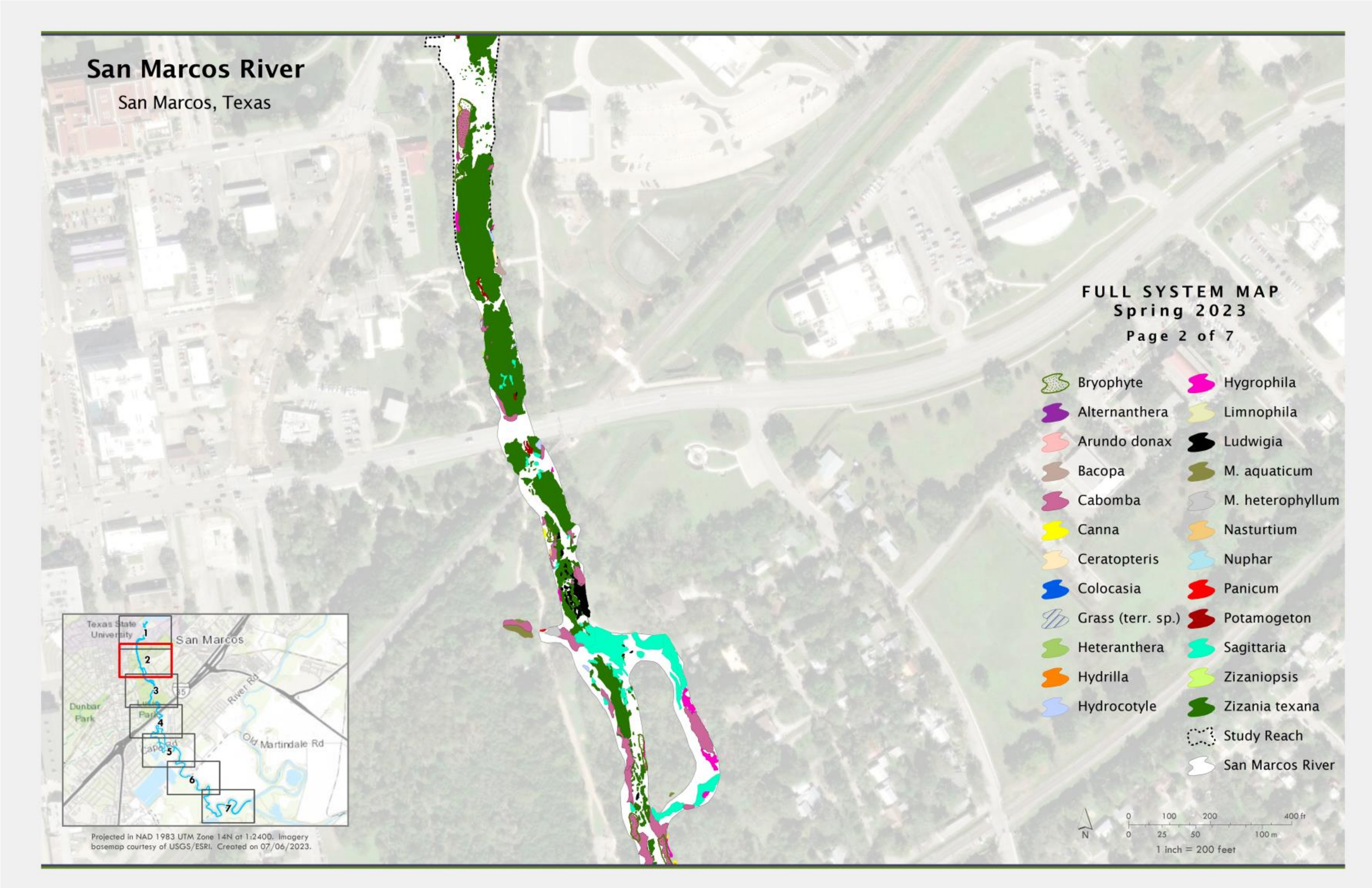


Figure C18. Map of aquatic vegetation coverage at segment 2 in 2023.

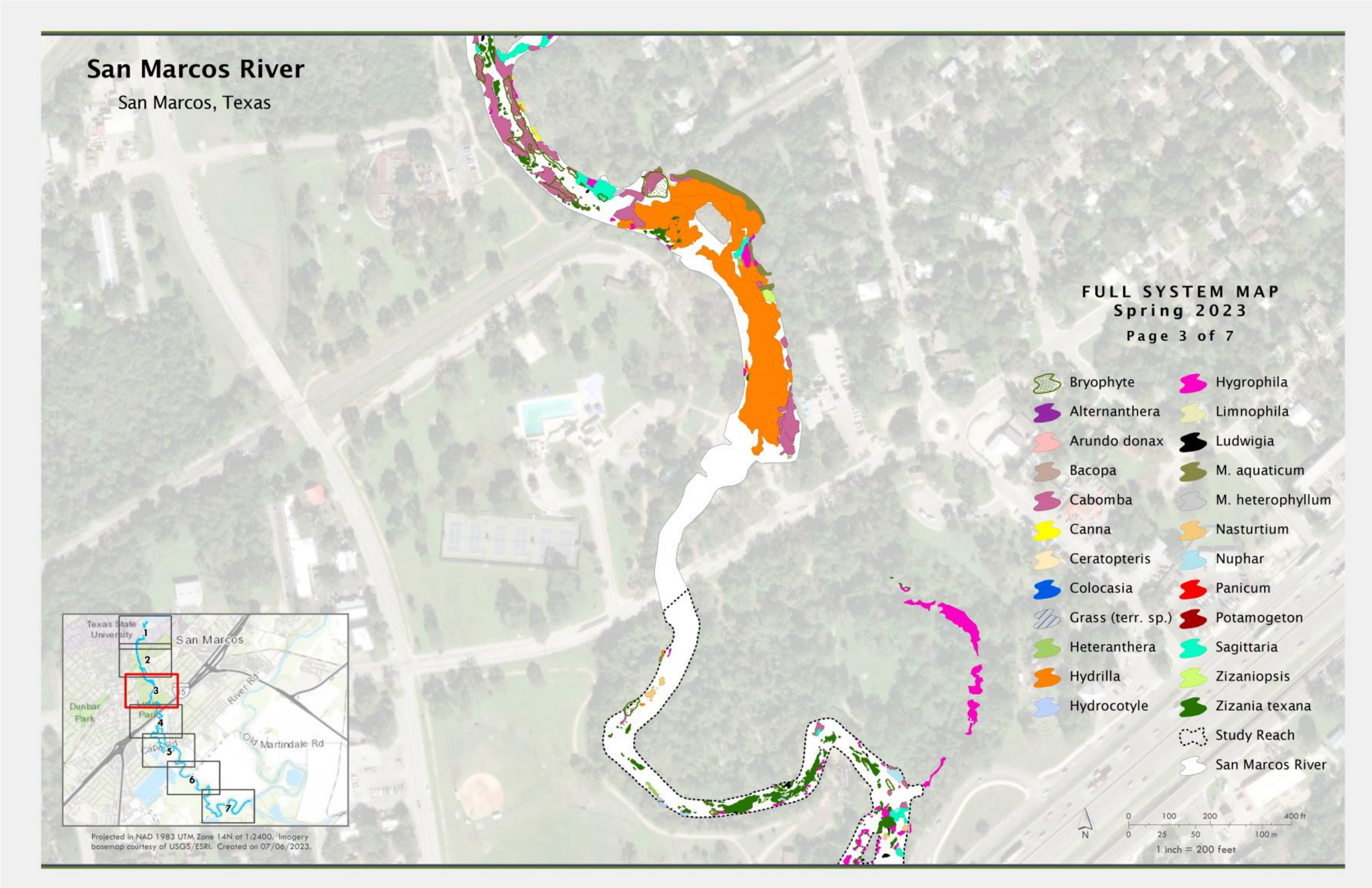


Figure C19. Map of aquatic vegetation coverage at segment 3 in 2023.

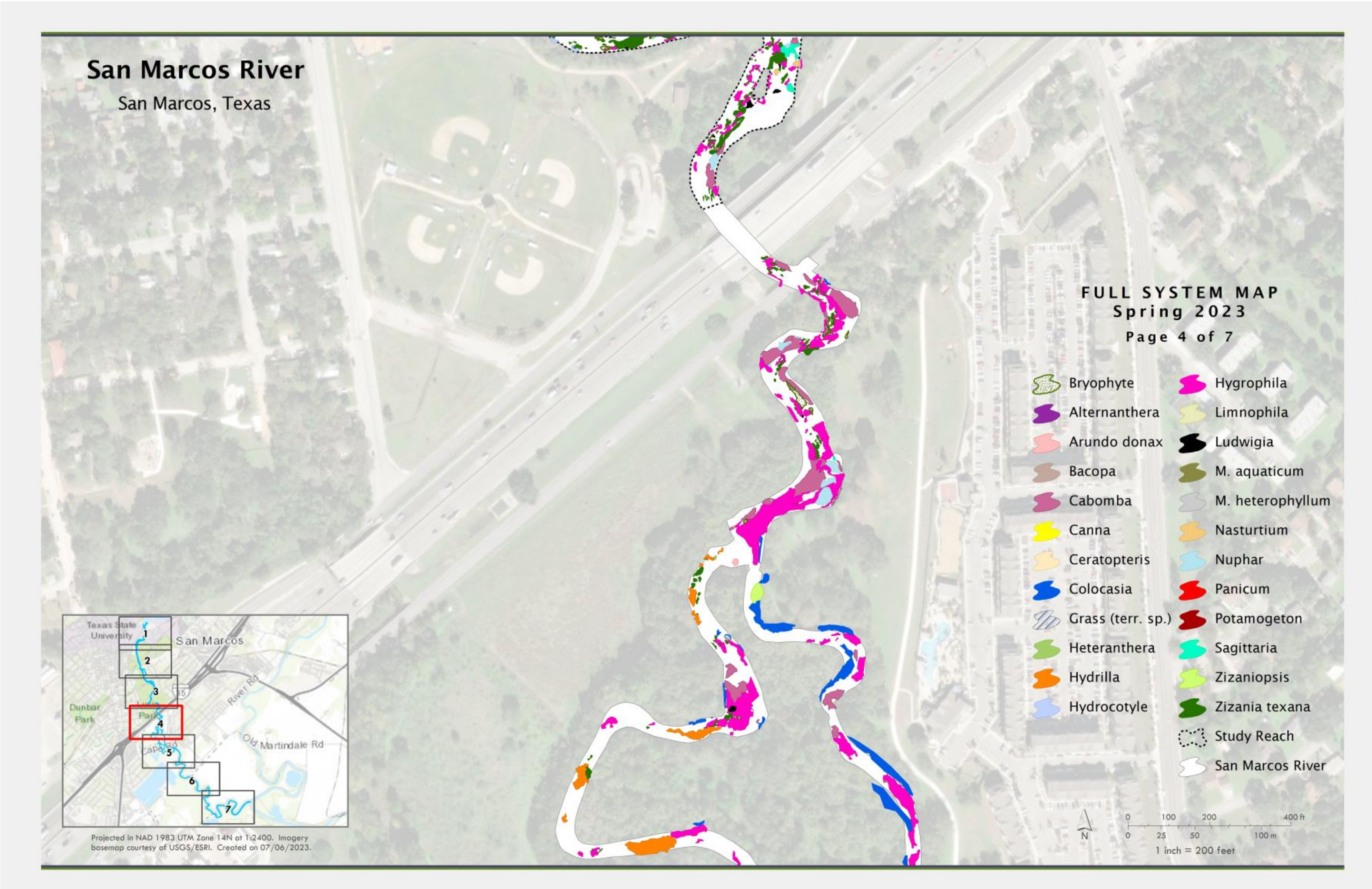


Figure C20. **Map of aquatic vegetation coverage at segment 4 in 2023.**

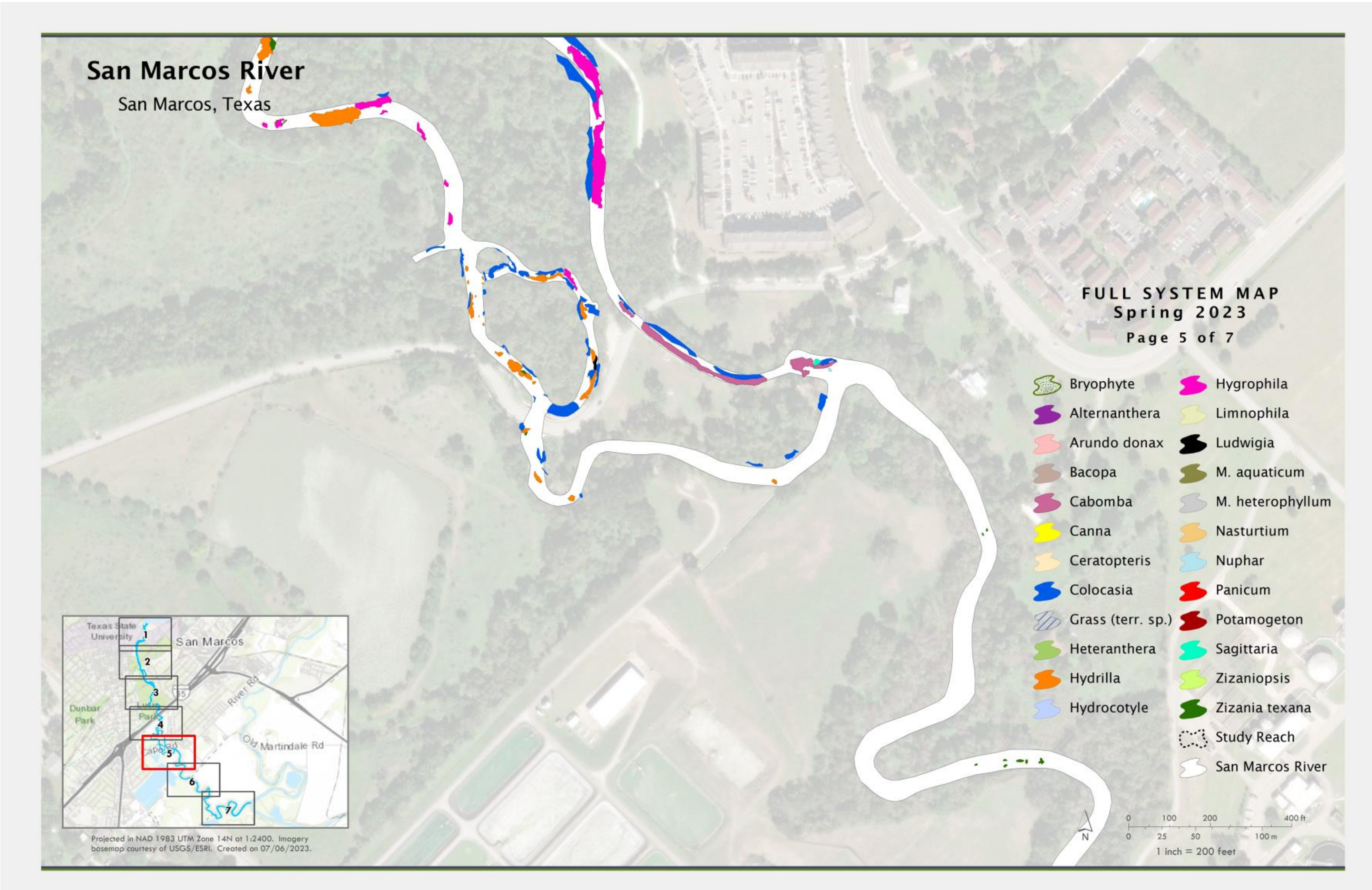


Figure C21. **Map of aquatic vegetation coverage at segment 5 in 2023. Below Thompson's Island, Texas Wild-Rice was the only vegetation mapped.**

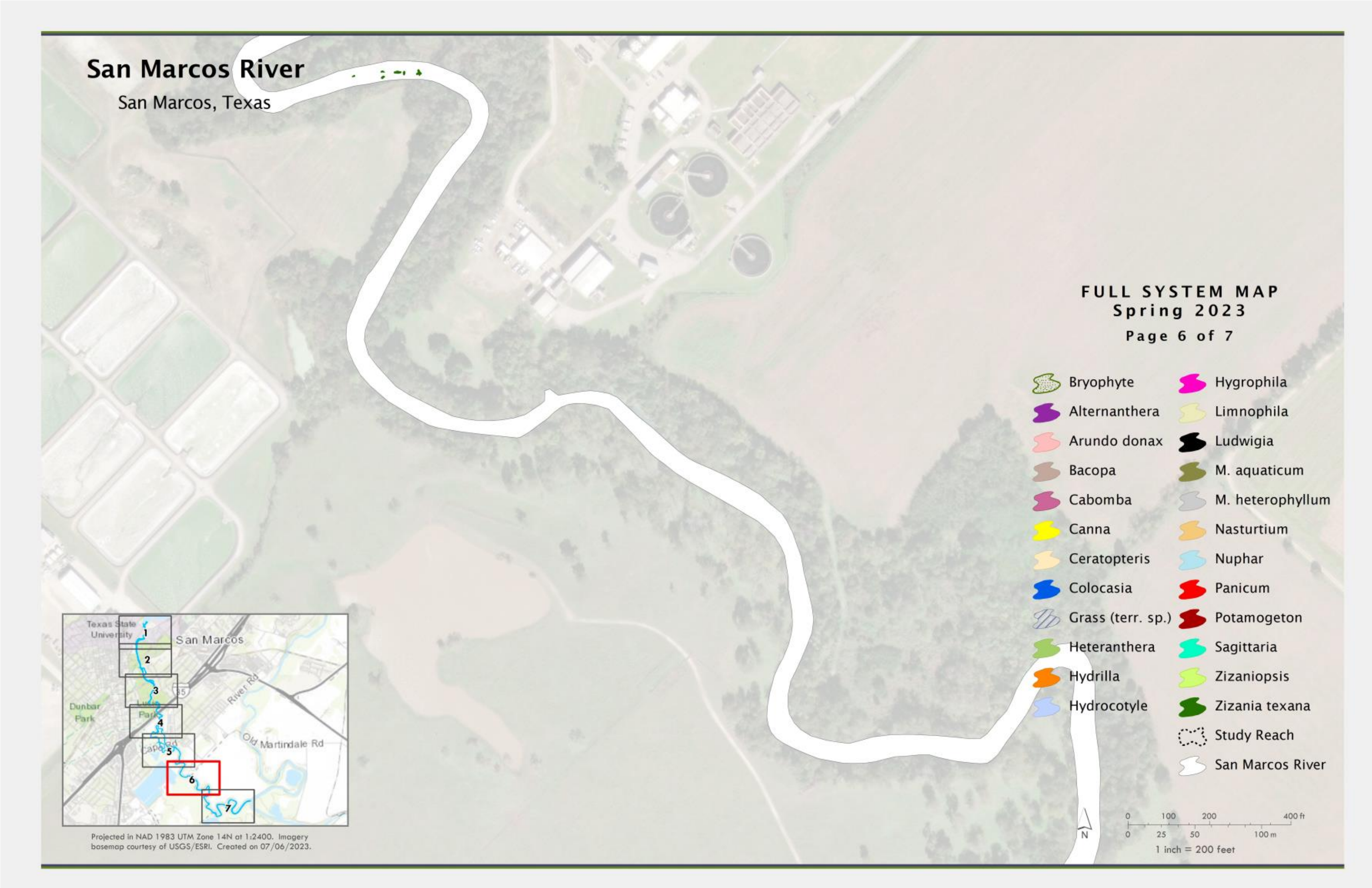


Figure C22. Map of aquatic vegetation coverage at segment 6 in 2023. Below Thompson's Island, Texas Wild-Rice was the only vegetation mapped.

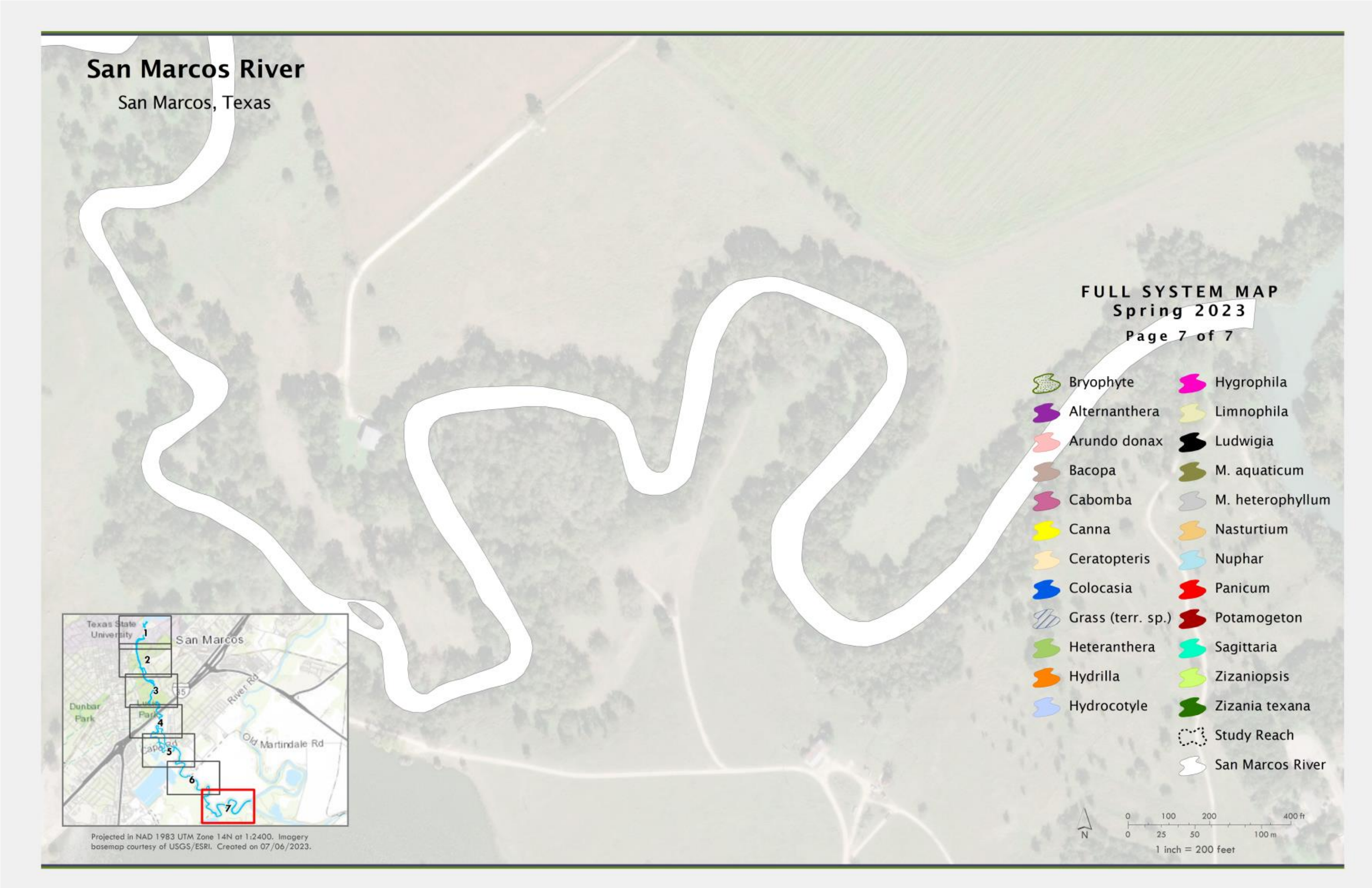


Figure C23. Map of aquatic vegetation coverage at segment 7 in 2023. Below Thompson's Island, Texas Wild-Rice was the only vegetation mapped.

APPENDIX D: TEXAS WILD-RICE PHYSICAL OBSERVATIONS

For the 2023 annual mapping event, 239 stands and 281 points of Texas Wild-rice (TWR) were mapped. The extent of Texas Wild-rice was unchanged compared to previous years and the most downstream extent of rice was located at the power line right of way as it crosses the river at A.E. Wood State Fish Hatchery (29.8664456N; -97.9271326W). About 34% of Texas Wild-rice stands were found at water depths ≥ 3 ft. Similarly, about 31% of Texas Wild-rice stands were found at depths between 0 and 1 ft (Table D1). Approximately 37% of Texas Wild-rice stands were found to be associated with another aquatic plant species, which was higher compared to previous years. One non-native aquatic plant species, *Hygrophila polysperma*, and one native aquatic plant species, *Cabomba caroliniana*, were the most commonly associated aquatic plant species with Texas Wild-rice (Table D2). Plant community associations have changed considerably over the last few years, as native plants have become more widespread along the river. Lastly, there were 39 Texas Wild-rice stands in bloom at the time of mapping and bloom percentage ranged from 10 to 90%.

Table D1. Distribution of Texas Wild-rice stands based on water depth (n=239) during annual mapping in July/August 2023.

WATER DEPTH (ft)	# OF TWR STANDS	FREQUENCY (%)
0 to 0.9	74	31
1.0-1.9	49	20
2.0-2.9	35	15
3.0 +	81	34

Table D2. Associated species found with Texas Wild-rice stands (n=89) during annual mapping in July/August 2023.

SPECIES	# OF TWR STANDS	FREQUENCY (%)
Hygrophila polysperma	46	52
Cabomba caroliniana	11	12
Sagittaria platyphylla	10	11
Heteranthera dubia	6	7
Other species	16	18

Observations for vulnerable Texas Wild-rice were conducted 20 times during 2023, which was the most sampling conducted in one year throughout the entirety of this monitoring program (Table D3). These qualitative measurements included the following categories: 1) the percent of the stand that was emergent (including the percent with seed or flower); and 2) the percent covered with vegetation mats or algae buildup and a categorical estimation of root exposure. Rectangular study plots, established around chosen vulnerable stands in GIS were used to locate and identify vulnerable Texas Wild-rice stands for sampling. Individual stands are mapped in GIS to provide length, width and cover estimates. Water depth and flow measurements were taken at the upstream edge of each Texas Wild-rice stand. San Marcos River mean daily discharge at the spring biological monitoring event was 98 cfs, which was below the historical average (186 cfs) and the highest discharge of all 20 events. River discharge dropped to ~66 cfs by late August then increased to ~80 cfs by fall (Table D3).

As in the previous year, physical observations were made for vulnerable Texas Wild-rice stands within three general study areas: 1) Spring Lake Dam / Sewell Park location; 2) Veramendi Park; and 3) I-35. These study areas are heavily trafficked with river recreation, due to their location near river access points that allow recreationists to enter, exit or linger for the duration of a given day. Therefore, during peak recreation season, Texas Wild-rice patches at these locations are typically subjected to harsher disturbances compared to patches located in other reaches of the river. At the end of this appendix, coverage of each vulnerable stand, percent of stands at water depths less than 0.50 feet, and index of root exposure for stands can be found in Table D4, Figure D4, and Figure D5, respectively.

Table D3. The dates of Texas Wild-rice observations conducted in 2023 with corresponding average daily discharge in the San Marcos River.

PHYSICAL OBSERVATIONS EVENT	EVENT TYPE	DATE	MEAN DAILY DISCHARGE (cfs)
1	Low Flow Physical Observation	January 4	91
2	Low Flow Physical Observation	January 20	91
3	Low Flow Physical Observation	February 24	89
4	Low Flow Physical Observation	March 9	88
5	Low Flow Physical Observation	March 24	82
6	Low Flow Physical Observation	April 7	87
7	Spring Biological Monitoring	April 26	98
8	Low Flow Physical Observation	May 12	96
9	Low Flow Physical Observation	June 9	88
10	Low Flow Physical Observation	June 23	88
11	Low Flow Physical Observation	July 10	85
12	Low Flow Physical Observation	July 24	88
13	Low Flow Physical Observation	August 11	77
14	Low Flow Physical Observation	August 31	69
15	Low Flow Physical Observation	September 9	69
16	Low Flow Physical Observation	September 15	70
17	Low Flow Physical Observation	September 21	69
18	Fall Biological Monitoring	September 28	70
19	Low Flow Physical Observation	October 6	79
20	Low Flow Physical Observation	October 21	80

http://nwis.waterdata.usgs.gov/tx

Spring Lake Dam/Sewell Park Reach

The Texas Wild-rice stands in this reach varied in coverage and health throughout 2023. In general, Texas Wild-rice stands in this reach were negatively impacted primarily by foot traffic followed by silt accretion and dewatering. All stands except #1 became increasingly fragmented by foot traffic. Stand #7 had large percentages of the stand elevated above the water surface causing the stand to perish. Stand #7 was highly eroded along the long edge, with clear walking paths throughout (Figure D2). Stands that were not in the path of recreation (e.g., stand #2 and stand #4/5) not only maintained their footprint but also expanded. However, dense cover decreased with decreasing flows and coverage generally decreased as the year progressed. During spring sampling, velocity at individual stands ranged from 0.39 to 1.61 ft/s and about 30% of stands were in water less than 0.50 ft. Root exposure from scouring was noted in this section, with only moderate scouring at stand #3 and #4/5, while scouring at #7 was high. Fall sampling velocity ranged from 0.0 to 2.06 ft/s. Stand #8 was entirely gone by fall sampling. occurred in water depths less than 0.50 ft, with much of the growth converted to emergent leaves. Root exposure was extreme around all stands except for stand #1. Blooming was minimal in both spring and fall (Figure D1).

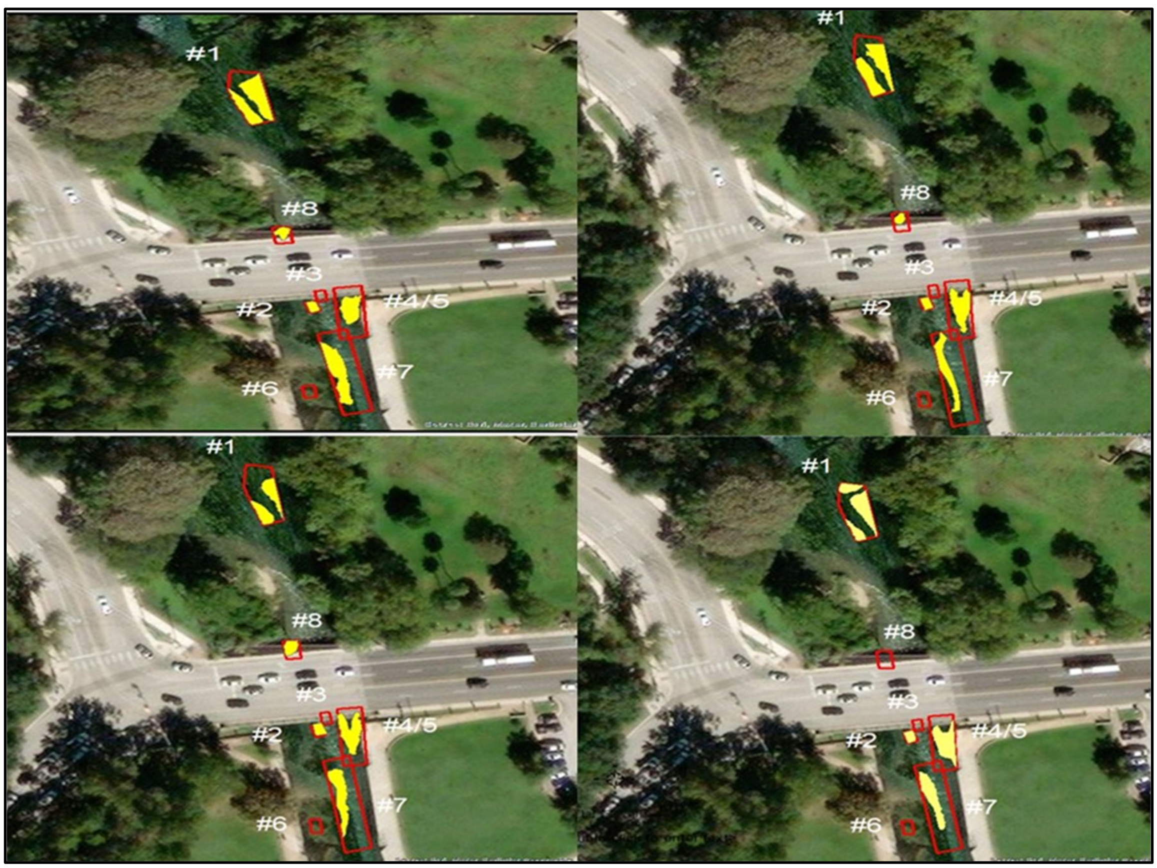


Figure D1. **Event I, 2023 (top left); Event 5, 2023 (top right); Event 11, (bottom left); and Fall 2023 (bottom right) vulnerable Texas Wild-rice plots in the Spring Lake Dam / Sewell Park location. Yellow polygons indicated Texas wild-rice stands. Red rectangles indicate the stand plots. Projected in NAD 1983 UTM 14N at 1:2,250 scale.**

Veramendi Park

Total cover of vulnerable Texas Wild-rice stands in Veramendi Park was highest during the first low-flow sampling event and subsequently decreased thereafter. During the spring sample period, velocities ranged from 0.76 to 1.14 ft/s. All stands occurred in water depths greater than 0.50 ft. Root exposure was moderate across all stands and blooming was minimal. During the fall, sampling velocities ranged from 0.34 to 1.89 ft/s. No stands occurred in water less than 0.50 ft in water depth. Root exposure was moderate to extreme. Since the beginning of 2023, stand #1 had disappeared. Stand #3 was impacted by recreation, while Stand #2, located away from the main channel and recreational pathway, was maintained through most of the year until August when plants began thinning considerably (Figure D2).

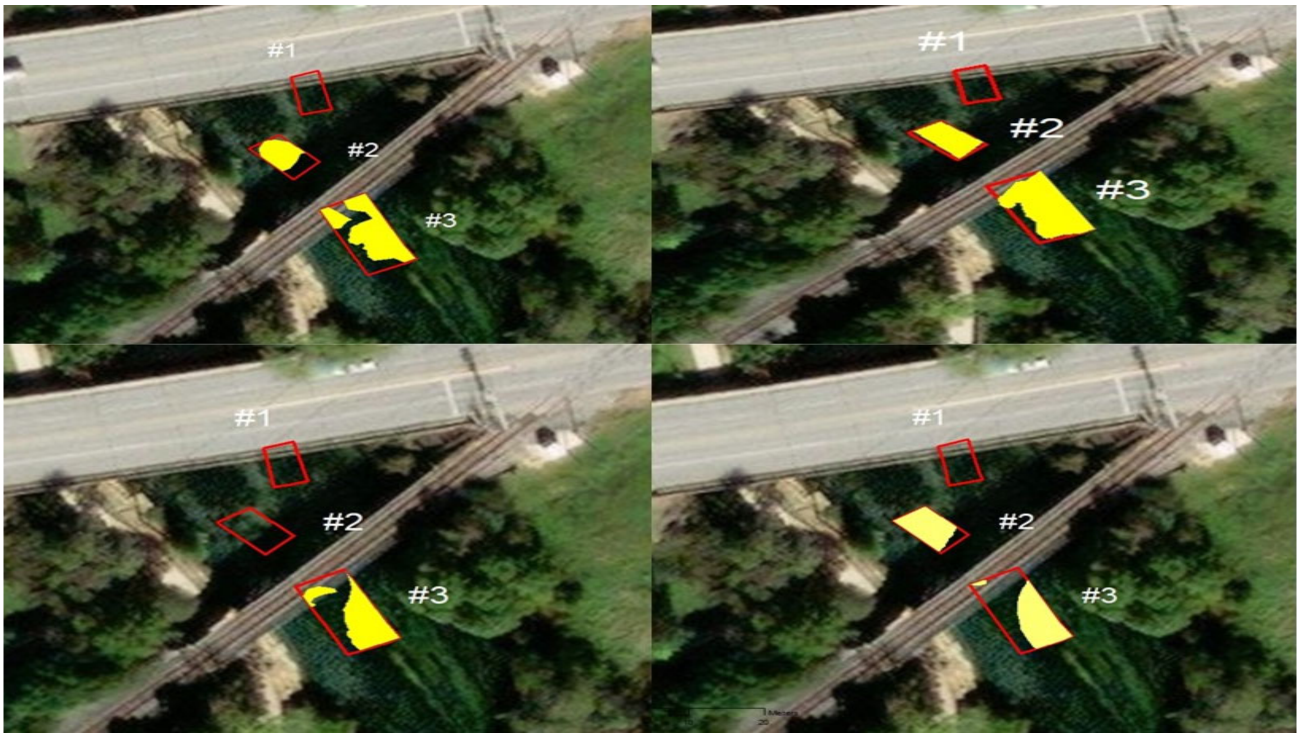


Figure D2. **Event I, 2023 (top left); Event 5, 2023 (top right); Event 11, (bottom left); and Fall 2023 (bottom right) vulnerable Texas Wild-rice plots in the Veramendi Park location. Yellow polygons indicated Texas wild-rice stands. Red rectangles indicate the stand plots. Projected in NAD 1983 UTM 14N at 1:2,250 scale.**

I-35 Reach

The coverages of vulnerable Texas Wild-rice stands in this reach was lowest during low-flow event 1 and maintained a high degree of cover, with some exceptions throughout the year. The vulnerable stands were more impacted by reduced water depths and flow compared to Texas Wild-rice stands in the other study areas. Current velocities for spring sampling ranged from 0.23 to 1.41 ft/s. No stands were observed in water depths 0.50 ft or less. On average, root exposure was moderate around all stands. During fall sampling, velocities ranged from 0.31 to 1.90 ft/s. Root exposure was noted as moderate. Due to lower river flows by late 2022, water flow at stand #7 was diverted, leaving this stand completely dewatered and subsequently dead. Stand #7 remained dry for the duration of 2023. Flowering was minimal in both spring and fall sampling. Similar to 2022, this reach saw several patches expand throughout 2023. This was followed by fragmentation that depended on changes in the water current and recreational pressure. Although this section has lost the most stands of vulnerable Texas Wild-rice, some individual stands continue to do well (Figure D3).

Figure D3. **Event I, 2023 (top left); Event 5, 2023 (top right); Event 11, (bottom left); and Fall 2023 (bottom right) vulnerable Texas wild-rice plots in the I-35 location. Yellow polygons indicated Texas wild-rice stands. Red rectangles indicate the stand plots. Projected in NAD 1983 UTM 14N at 1:2,250 scale.**

Table D4. **Cover (m²) of individual vulnerable Texas Wild-rice stands during selected sampling events throughout 2023. Sites labeled 'Gone' denotes vulnerable stands were absent and 'Point' denotes vulnerable stands were present, but cover was not large enough to calculate an area.**

LOCATION	LOW-FLOW EVENT I	LOW-FLOW EVENT V	LOW-FLOW EVENT XI	FALL 2023
Sewell Park 1	76	71	42	60
Sewell Park 2	8	8	9	8
Sewell Park 3	Gone	Gone	Gone	Gone
Sewell Park 4/5	32	42	44	45
Sewell Park 6	Gone	Gone	Gone	Gone
Sewell Park 7	59	43	47	42
Sewell Park 8	10	6	12	Gone
Sum of Cover	**185**	**170**	**154**	**155**
Veramendi 1	Gone	Gone	Gone	Gone
Veramendi 2	27	37	30	36
Veramendi 3	127	95	59	51
Sum of Cover	**154**	**132**	**89**	**87**
I-35-1	6	2	5	3
I-35-2	1	4	3	Gone
I-35-3	2	2	2	2
I-35-4	71	83	90	89
I-35-5	3	3	6	Gone
I-35-6	Gone	Gone	Gone	Gone
I-35-7	Gone	Gone	Gone	Gone
I-35-8	Gone	18	20	20
I-35-9	Gone	Gone	Gone	Gone
I-35-10	Gone	Gone	Gone	Gone
Sum of Cover	**83**	**112**	**126**	**114**

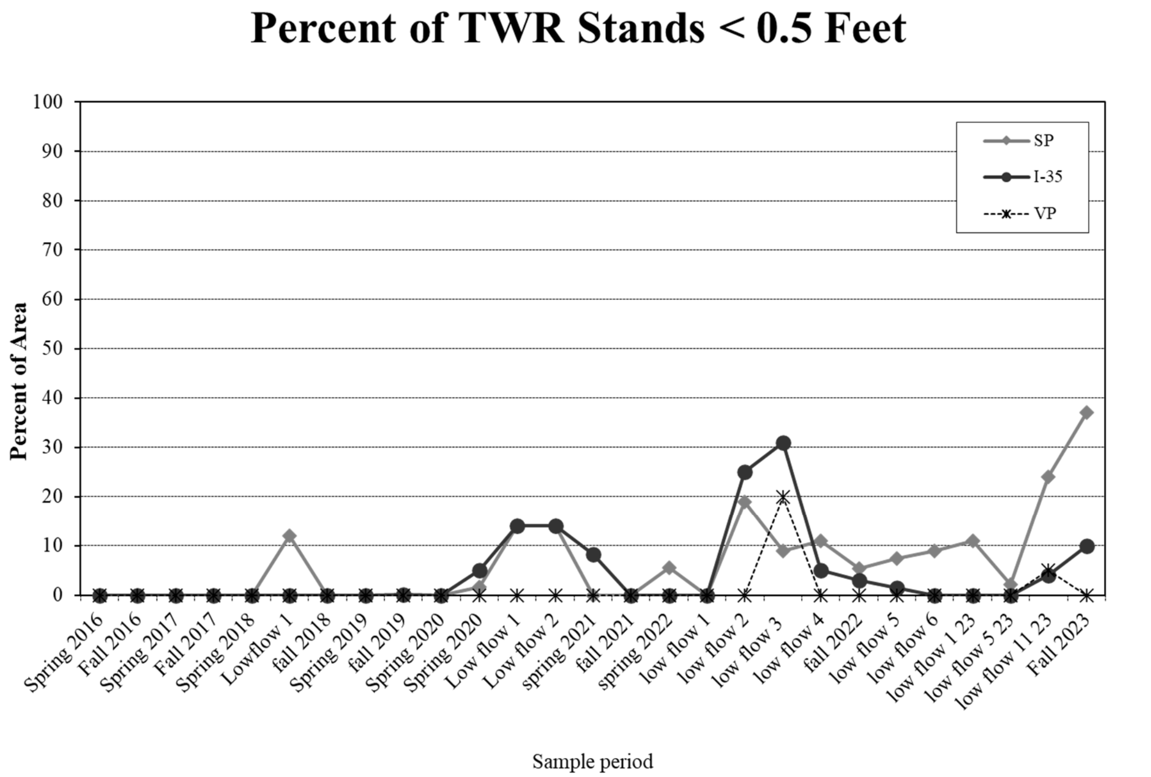


Figure D4. **Percent of Texas Wild-rice stands at water depths less than 0.5 feet 2016–2023.**

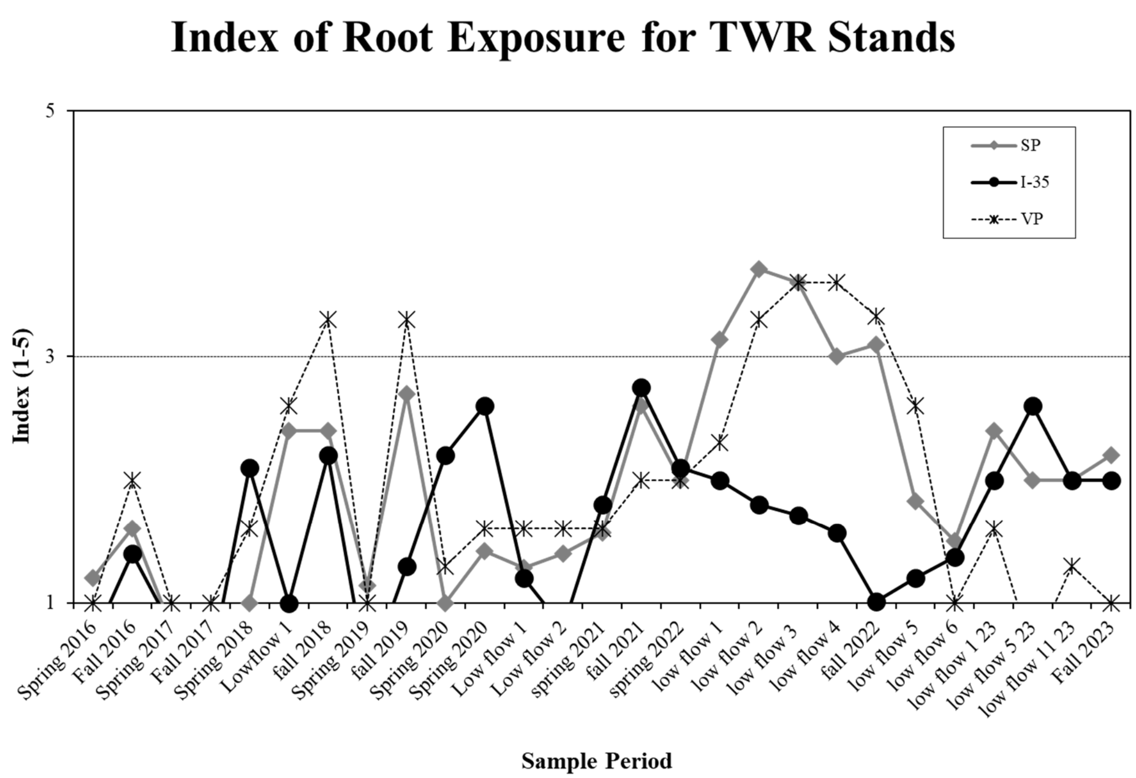


Figure D5. **Index for root exposure of Texas Wild-rice stands from 2016–2023.**

APPENDIX E: TABLES AND FIGURES

TABLES

Texas Wild-rice Mapping

Table E1. **Change in cover amount (m^2) of Texas Wild-rice between April 2023 full system mapping and July/August 2023 annual mapping among the Habitat Conservation Plan Long-term Biological Goals (HCP LTBG) river segments.**

HCP LTBG RIVER SEGMENTS	APRIL 2023 FULL SYSTEM MAPPING COVERAGE	JULY/AUGUST 2023 ANNUAL MAPPING COVERAGE	COVERAGE CHANGE	PERCENT CHANGE
Spring Lake	90	86	-4	-4
Spring Lake Dam to Rio Vista Park	13,642	10,278	-3,364	-25
I-35 Study Reach	1,032	954	-78	-8
Below I-35	553	503	-50	-9

HCP Benchmark Full System Mapping

Table E2. Submerged aquatic vegetation coverages mapped during the 2023 HCP Benchmark full system event.

Taxa	Coverage (m^2)
Bryophyte	1,284
Zizania	15,317
Acmella	2
Alternanthera	21
Arundo donax	13
Bacopa	79
Cabomba	5,080
Canna	44
Ceratophyllum	113
Ceratopteris	17
Colocasia	1,939
Grass (terrestrial sp.)	130
Heteranthera	137
Hydrilla	6,045
Hydrocotyle	613
Hygrophila	4,720
Limnophila	70
Ludwigia peploides	21
Ludwigia repens	415
Myriophyllum aquaticum	665
Myrio heterophyllum	123
Nasturtium	86
Nuphar	287
Panicum repens (Torpedo grass)	5
Potamogeton	118
Sagittaria	1,948
Zizaniopsis	220

Fish Assemblage Results:
Drop-Net and Fish Community Sampling

Table E3. **Overall number (#) and percent relative abundance (%) of fishes collected from the three long-term biological goals study reaches during drop-net sampling in 2023.**

TAXA	SPRING LAKE DAM		CITY PARK		I-35	
	#	**%**	**#**	**%**	**#**	**%**
Leuciscidae						
*Alburnops chalybaeus**	0	0.00	1	0.09	1	0.23
Dionda nigrotaeniata	0	0.00	0	0.00	1	0.23
Ictaluridae						
Ameiurus natalis	1	0.23	0	0.00	9	2.06
Poeciliidae						
Gambusia sp.	314	71.20	759	71.67	173	39.59
Poecilia latipinna	1	0.23	1	0.09	0	0.00
Centrarchidae						
*Ambloplites rupestris**	0	0.00	6	0.57	14	3.20
Lepomis miniatus	52	11.79	10	0.94	22	5.03
Lepomis sp.	1	0.23	6	0.57	13	2.97
Micropterus nigricans	3	0.68	1	0.09	0	0.00
Percidae						
Etheostoma fonticola	62	14.06	269	25.40	197	45.08
Cichlidae						
*Herichthys cyanoguttatus**	7	1.59	6	0.57	7	1.60
Total	**441**		**1059**		**437**	

Asterisks (*) denotes introduced species

Table E4. Overall number (#) and percent relative abundance (%) of fishes collected during fish community sampling in 2023.

TAXA	SPRING LAKE		UPPER RIVER		MIDDLE RIVER		LOWER RIVER	
	#	%	#	%	#	%	#	%
Anguillidae								
Anguilla rostrata	1	0.02	0	0.00	0	0.00	0	0.00
Leuciscidae								
*Alburnops chalybaeus**	0	0.00	17	0.64	55	7.32	0	0.00
Cyprinella venusta	0	0.00	0	0.00	0	0.00	66	7.83
Dionda nigrotaeniata	850	24.64	14	0.53	119	15.85	11	1.30
Notropis amabilis	0	0.00	281	10.66	281	37.42	102	12.10
Paranotropis volucellus	0	0.00	0	0.00	0	0.00	273	32.38
Pimephales vigilax	0	0.00	0	0.00	0	0.00	24	2.85
Catastomidae								
Moxostoma congestum	0	0.00	0	0.00	2	0.27	0	0.00
Characidae								
*Astyanax argentatus**	1192	34.55	89	3.38	31	4.13	11	1.30
Ictaluridae								
Ameiurus natalis	0	0.00	2	0.08	1	0.13	0	0.00
Loricariidae								
Loricariidae sp.	0	0.00	11	0.42	4	0.53	64	7.59
Fundulidae								
Fundulus notatus	0	0.00	0	0.00	0	0.00	1	0.12
Poeciliidae								
Gambusia affinis	0	0.00	78	2.96	5	0.67	8	0.95
Gambusia geiseri	0	0.00	1418	53.79	8	1.07	0	0.00
Gambusia sp.	730	21.16	0	0.00	90	11.98	0	0.00
Poecilia formosa	0	0.00	0	0.00	0	0.00	2	0.24
*Poecilia latipinna**	0	0.00	45	1.71	18	2.40	1	0.12
Centrarchidae								
*Ambloplites rupestris**	0	0.00	6	0.23	0	0.00	14	1.66
*Lepomis auritus**	69	2.00	236	8.95	13	1.73	62	7.35
Lepomis gulosus	0	0.00	0	0.00	0	0.00	1	0.12
Lepomis macrochirus	90	2.61	9	0.34	0	0.00	94	11.15
Lepomis megalotis	4	0.12	0	0.00	0	0.00	3	0.36
Lepomis microlophus	113	3.28	1	0.04	0	0.00	3	0.36
Lepomis miniatus	26	0.75	79	3.00	1	0.13	2	0.24
Lepomis sp.	106	3.07	53	2.01	42	5.59	12	1.42
Micropterus salmoides	189	5.48	52	1.97	21	2.80	11	1.30
Percidae								
Etheostoma fonticola	54	24.64	198	7.51	44	5.86	22	2.61
Etheostoma spectabile	0	0.00	0	0.00	0	0.00	26	3.08

Percina aptristis	0	0.00	26	0.99	3	0.40	9	1.07
Percina carbonaria	0	0.00	0	0.00	0	0.00	14	1.66
Cichlidae								
*Herichthys cyanoguttatus**	26	0.75	17	0.65	13	1.73	7	0.83
*Oreochromis aureus**	0	0.00	4	0.15	0	0.00	0	0.00
Total	**3450**		**2636**		**751**		**843**	

Asterisks (*) denotes introduced species

FIGURES

Aquatic Vegetation

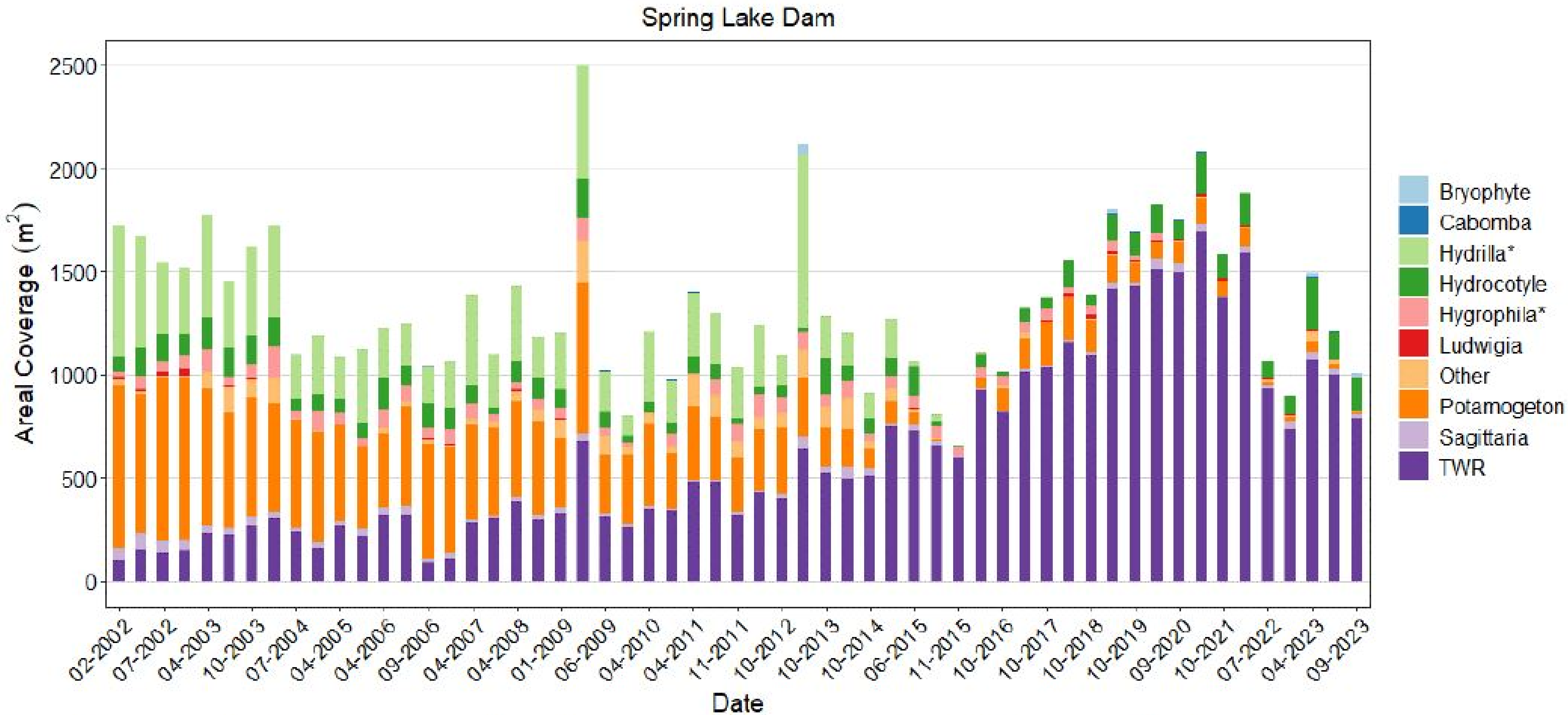


Figure E1. **Aquatic vegetation composition (m^2) among select taxa from 2002–2023 at Spring Lake Dam.**

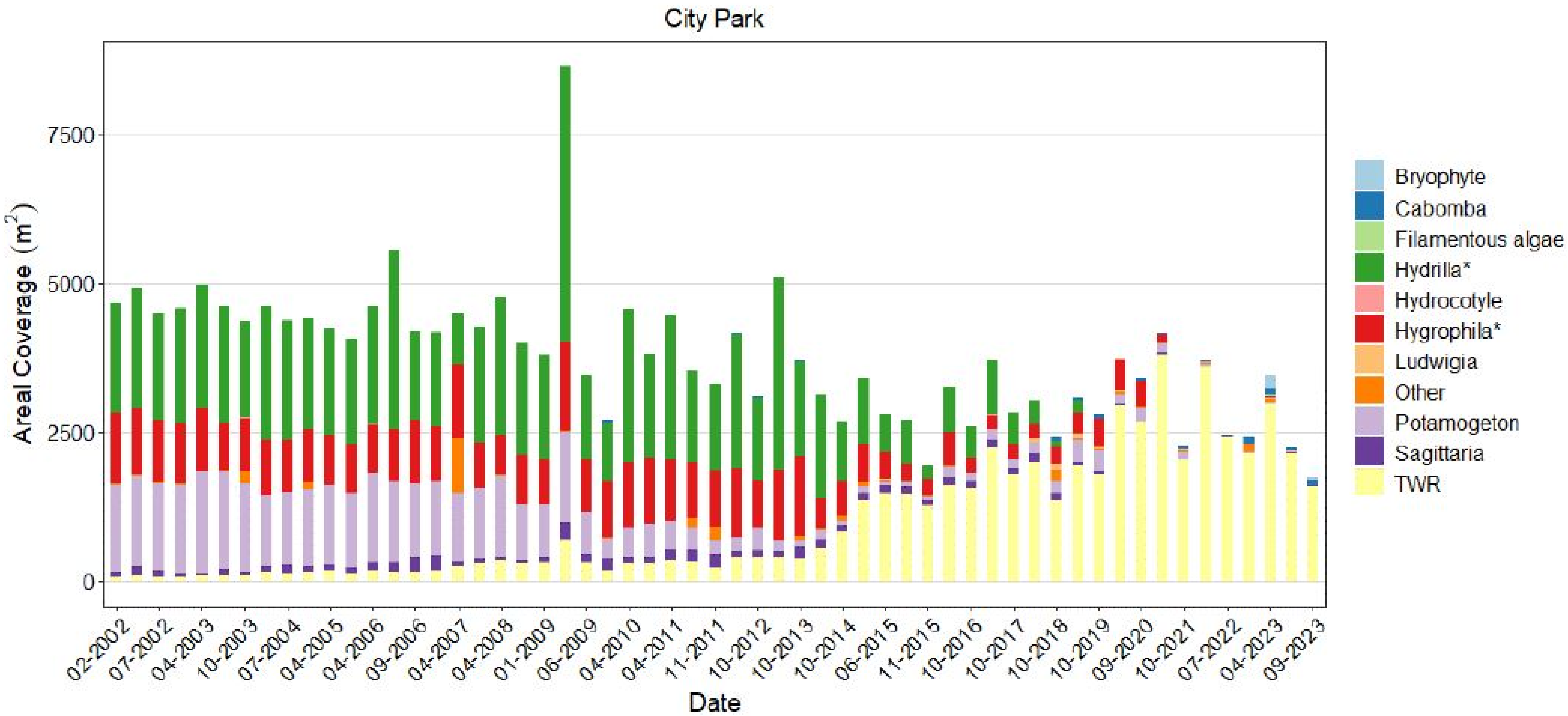


Figure E2. **Aquatic vegetation composition (m²) among select taxa from 2002–2023 at City Park.**

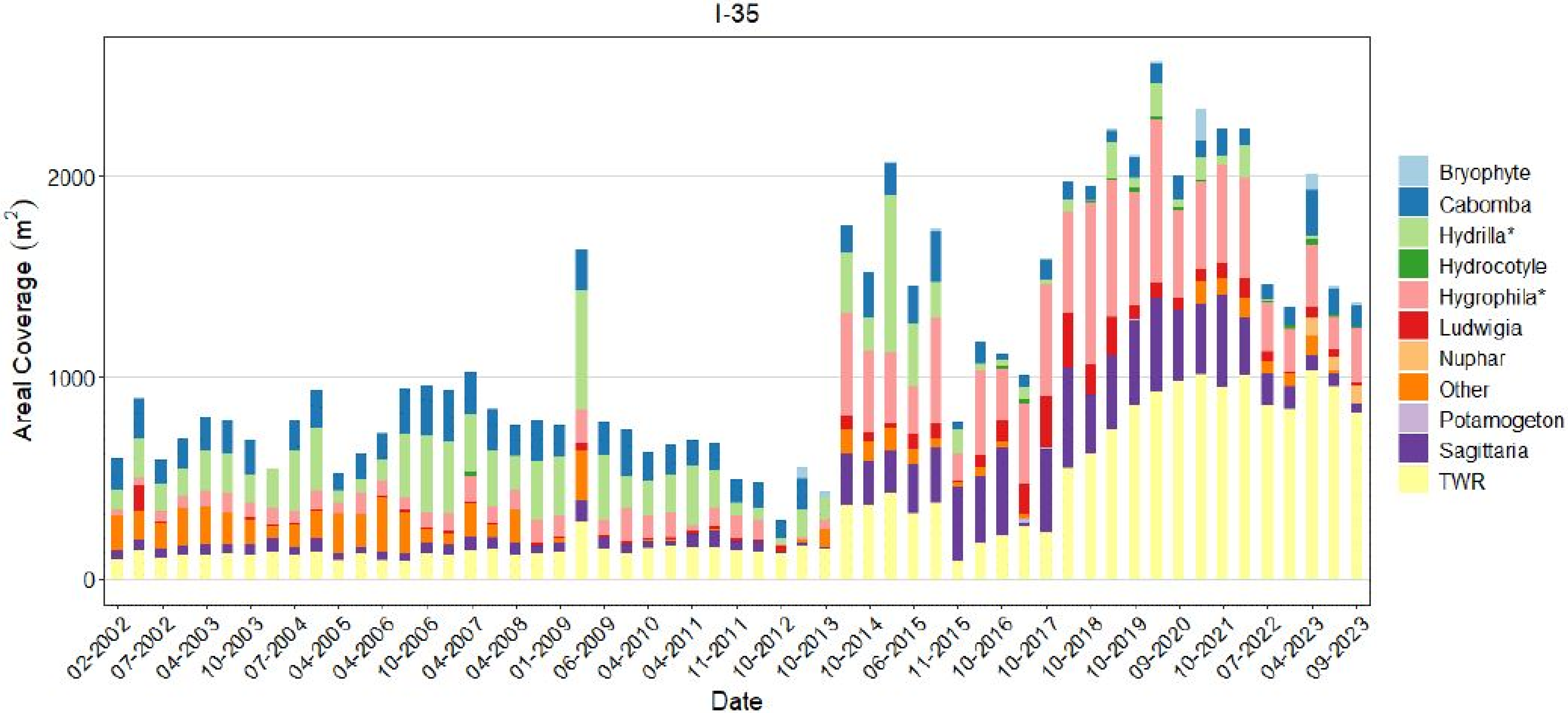


Figure E3. **Aquatic vegetation composition (m^2) among select taxa from 2002–2023 at I-35.**

Fountain Darter

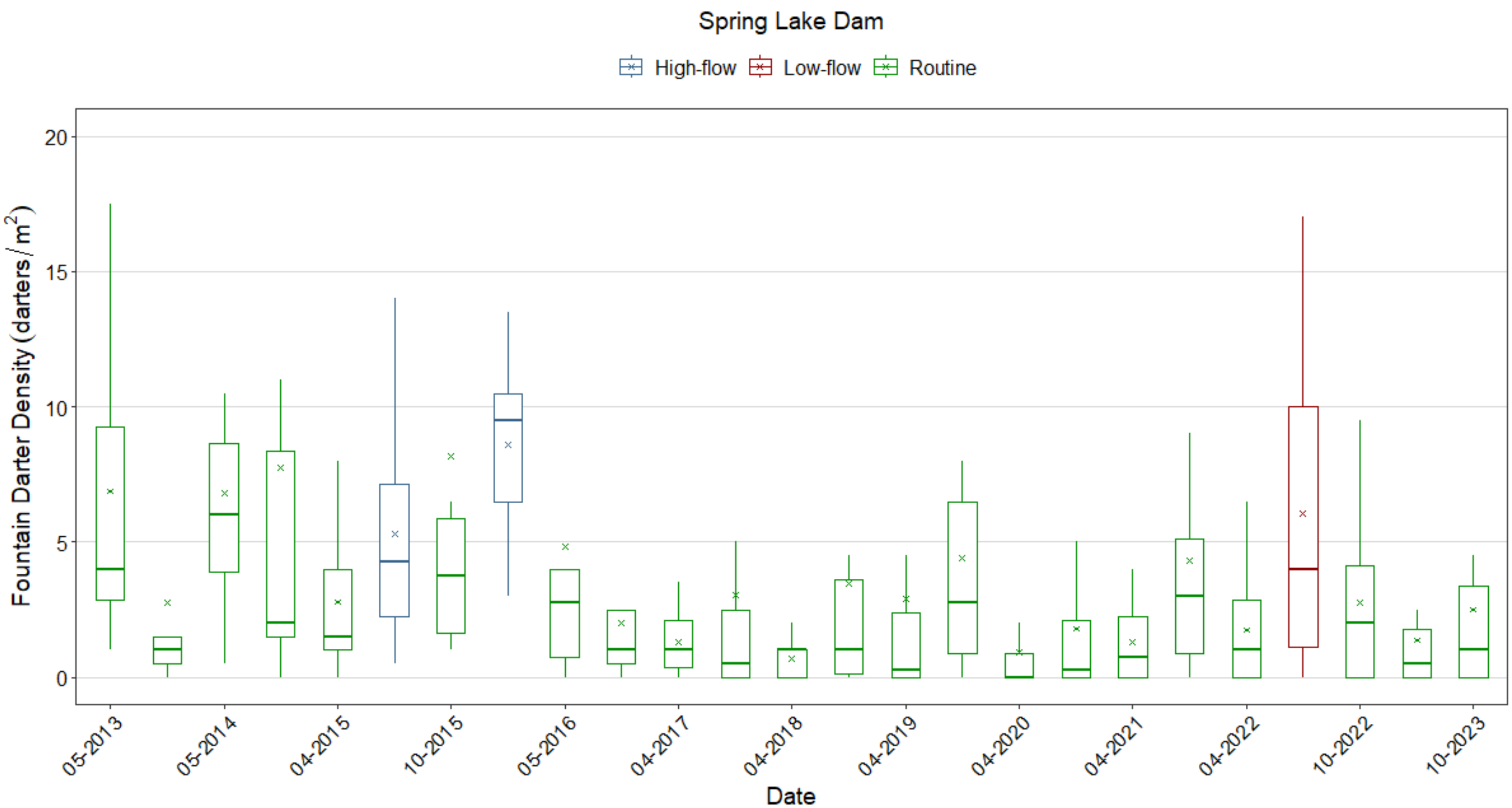


Figure E4. **Boxplots displaying temporal trends in Fountain Darter density (darters/m^2) from 2013–2023 during drop-net sampling at Spring Lake Dam. The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range.**

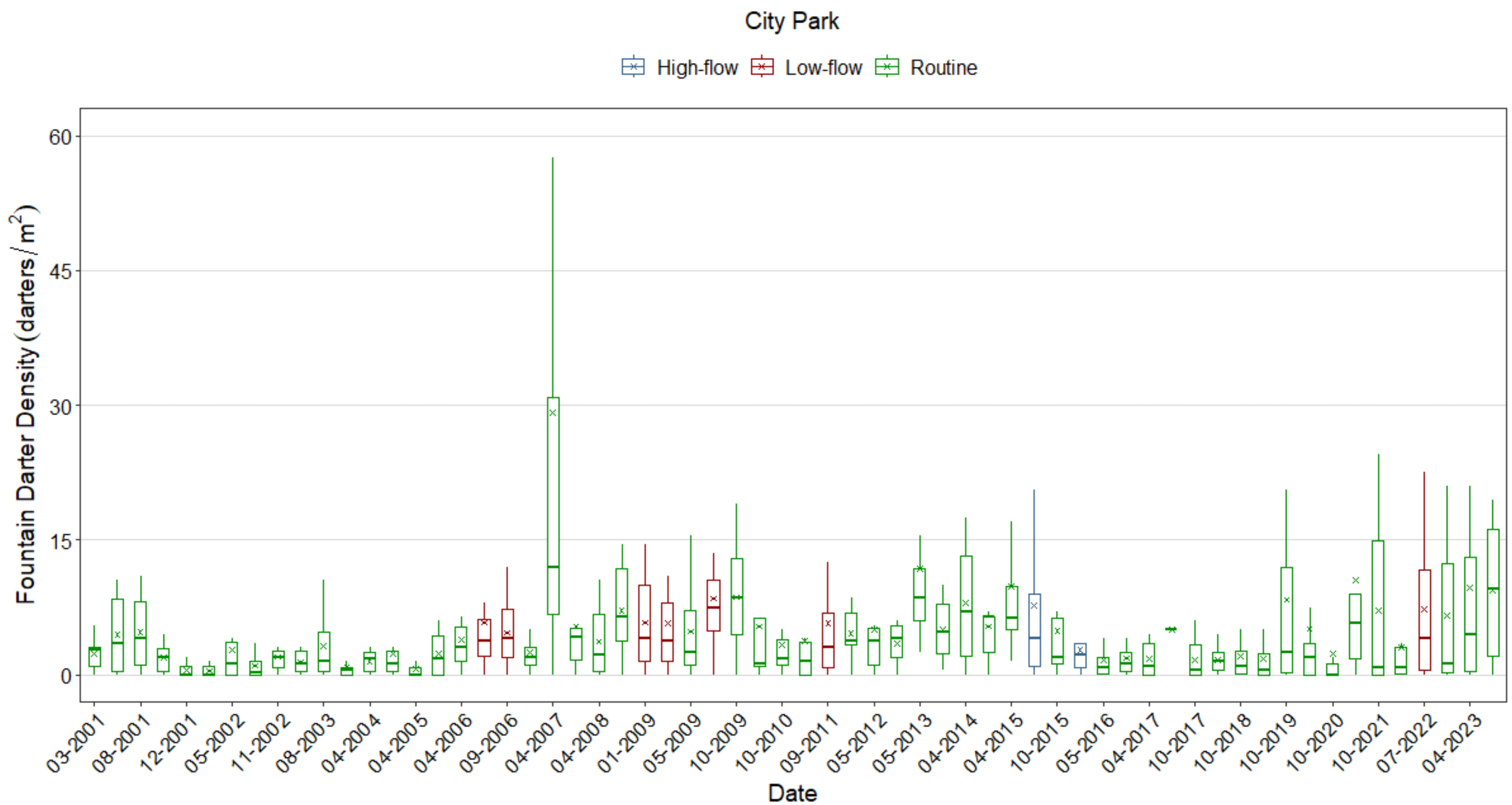


Figure E5. **Boxplots displaying temporal trends in Fountain Darter density (darters/m^2) from 2001–2023 during drop-net sampling at City Park. The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range.**

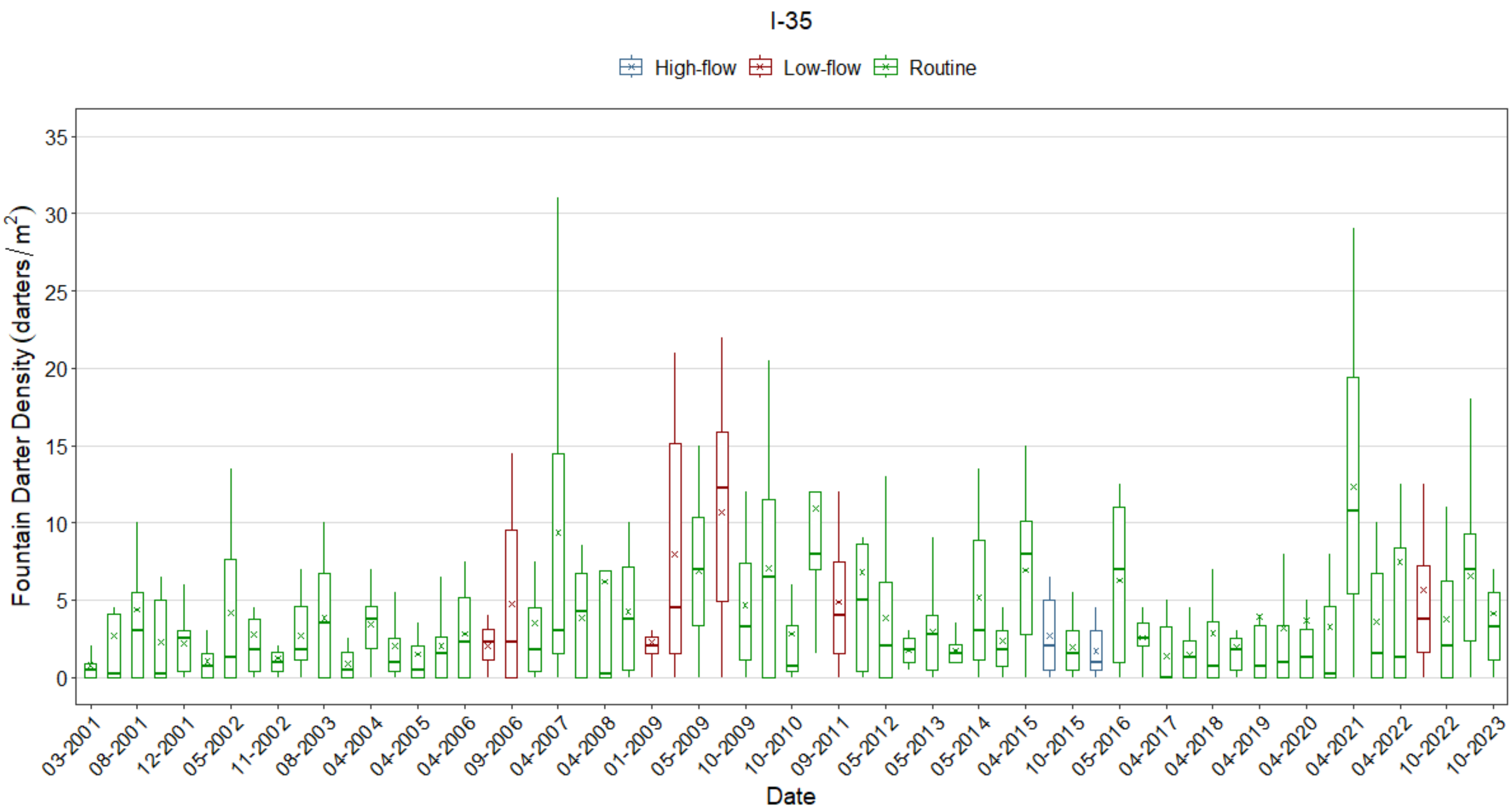


Figure E6. **Boxplots displaying temporal trends in Fountain Darter density (darters/m^2) from 2001–2023 during drop-net sampling at I-35. The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range.**

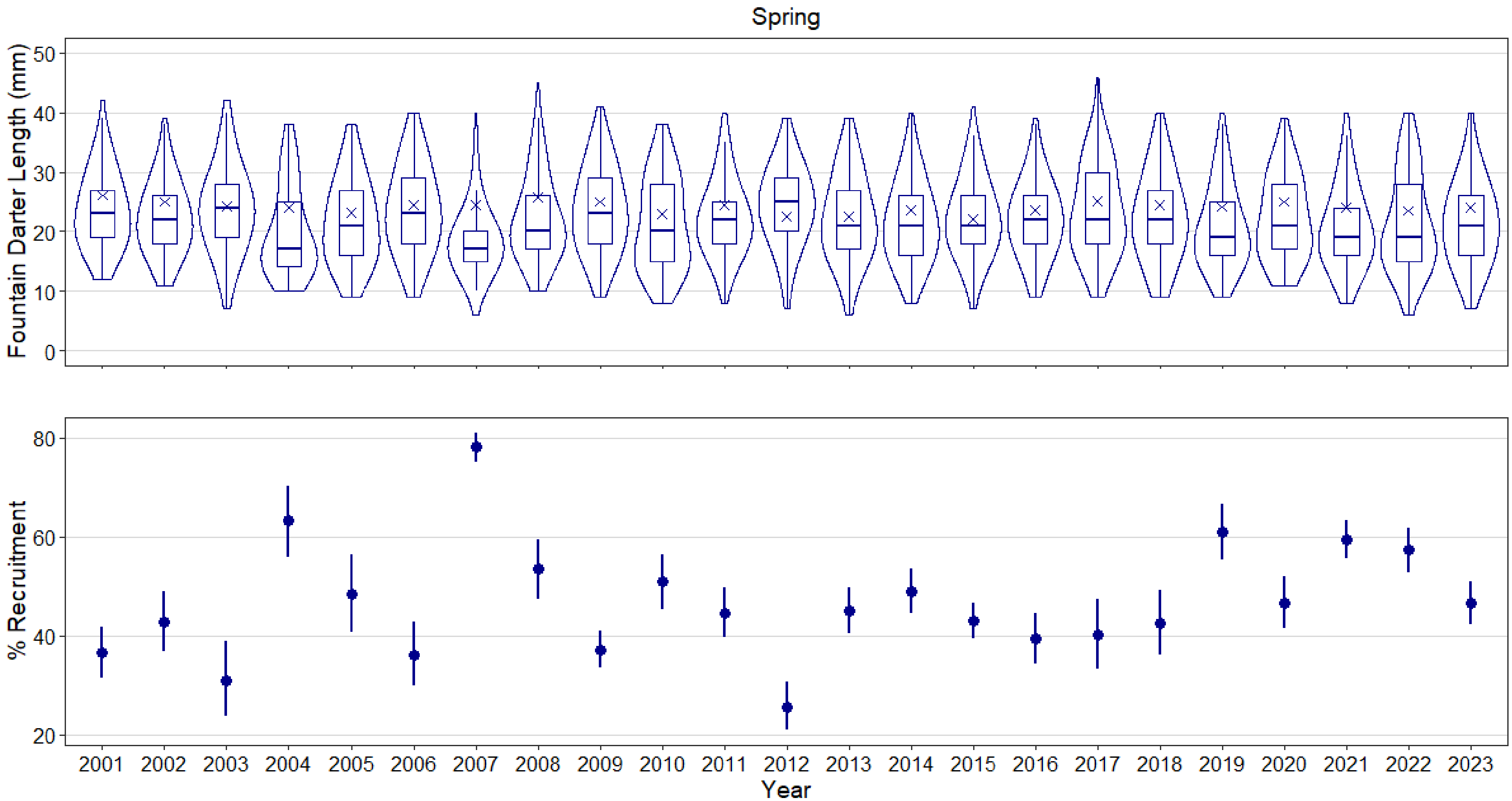


Figure E7. Fountain Darter size structure (mm; top row) and percent recruitment (bottom row) in the San Marcos Springs and River during spring sampling (i.e., drop-net and timed dip-net data) events from 2001–2023. Size structure is displayed with boxplots (median, quartiles, range) and violin plots (probability density; polygons outlining boxplots). The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range. Recruitment is the percent relative abundance (± 95% CI) of darters ≤20 mm.

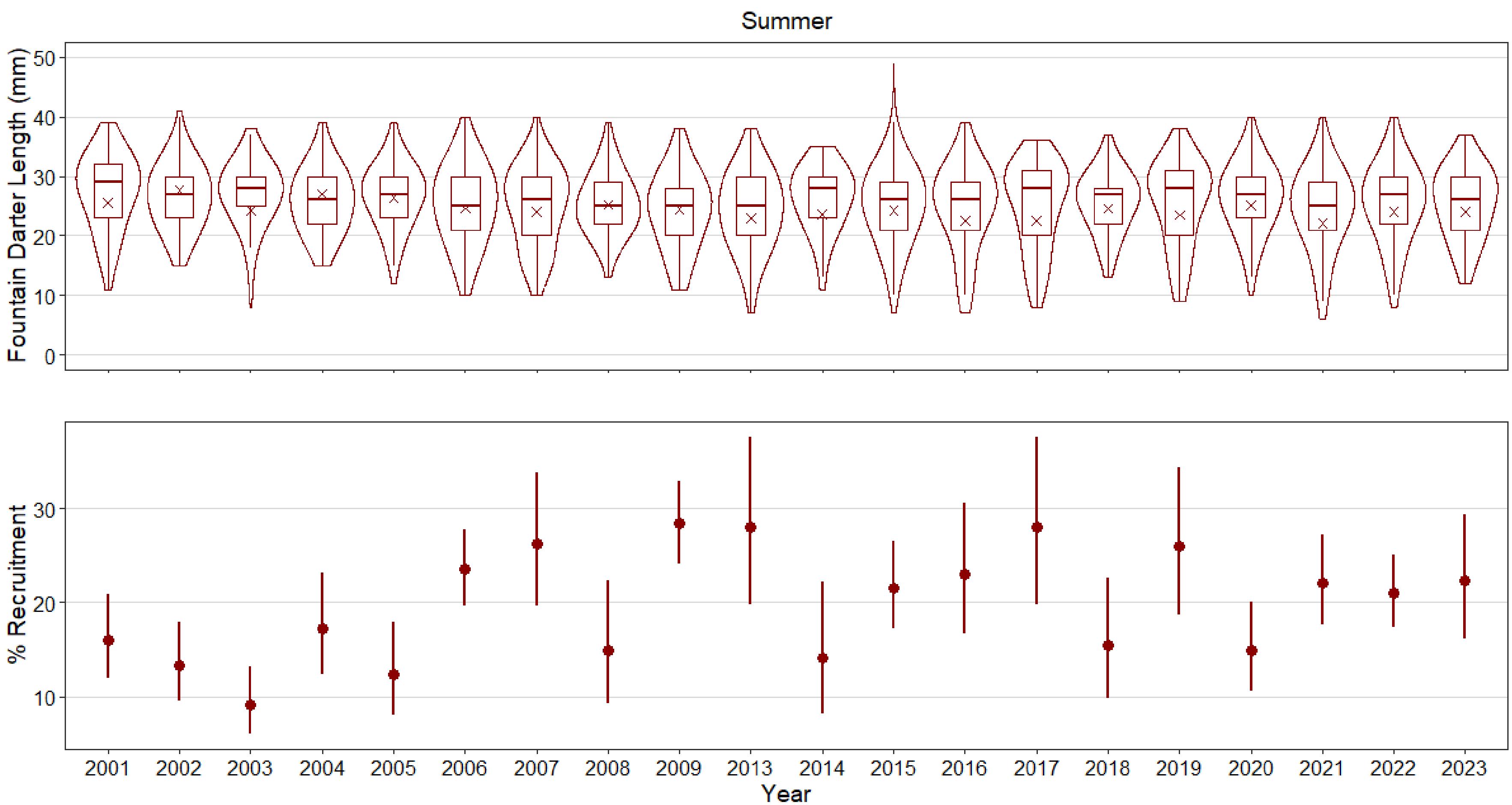


Figure E8. **Fountain Darter size structure (mm; top row) and percent recruitment (bottom row) in the San Marcos Springs and River during summer sampling (i.e., drop-net and timed dip-net data) events from 2001–2023. Size structure is displayed with boxplots (median, quartiles, range) and violin plots (probability density; polygons outlining boxplots). The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range. Recruitment is the percent relative abundance (± 95% CI) of darters ≤20 mm.**

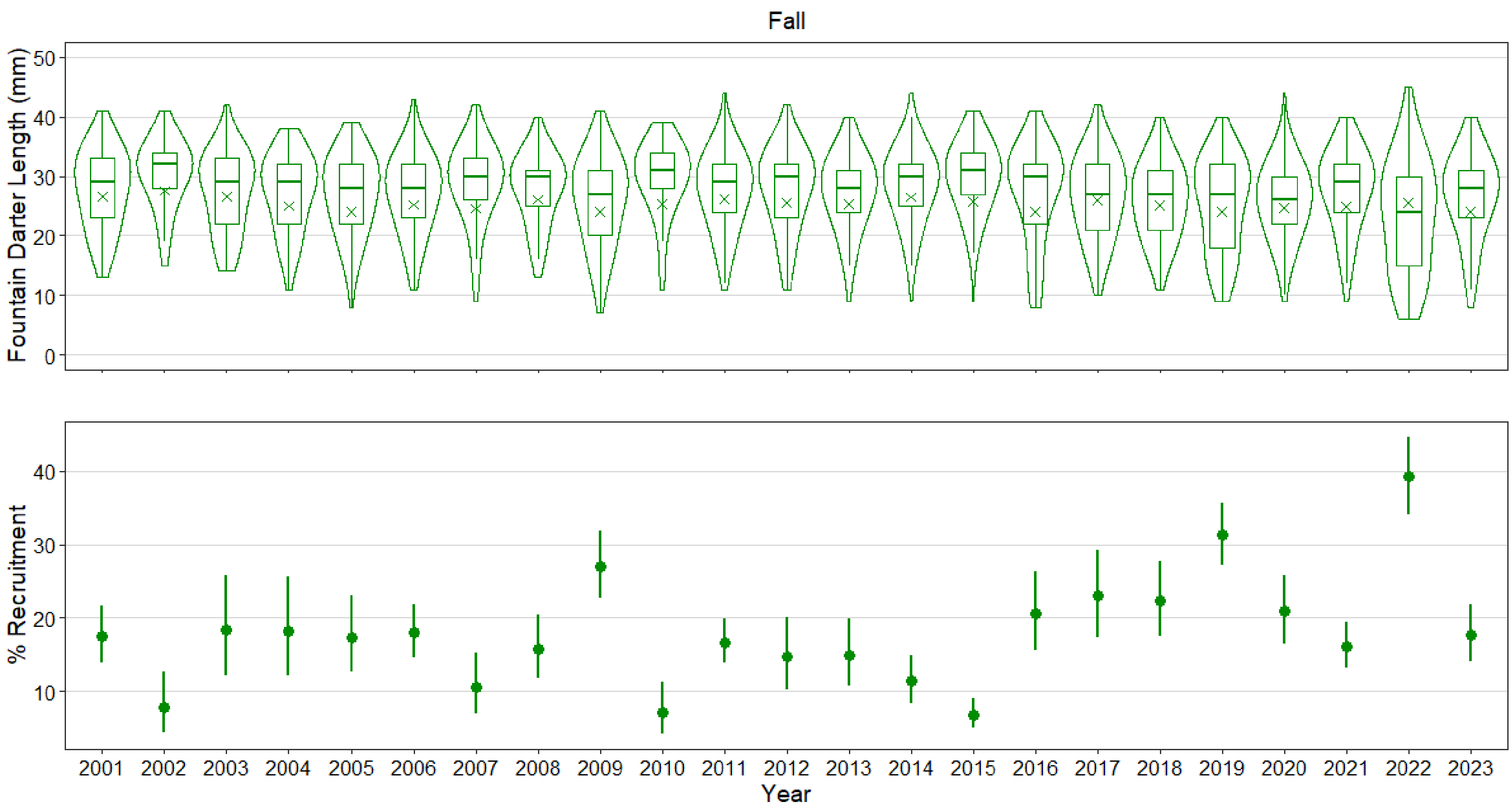


Figure E9. **Fountain Darter size structure (mm; top row) and percent recruitment (bottom row) in the San Marcos Springs and River during fall sampling (i.e., drop-net and timed dip-net data) events from 2001–2023. Size structure is displayed with boxplots (median, quartiles, range) and violin plots (probability density; polygons outlining boxplots). The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range. Recruitment is the percent relative abundance (± 95% CI) of darters ≤20 mm.**

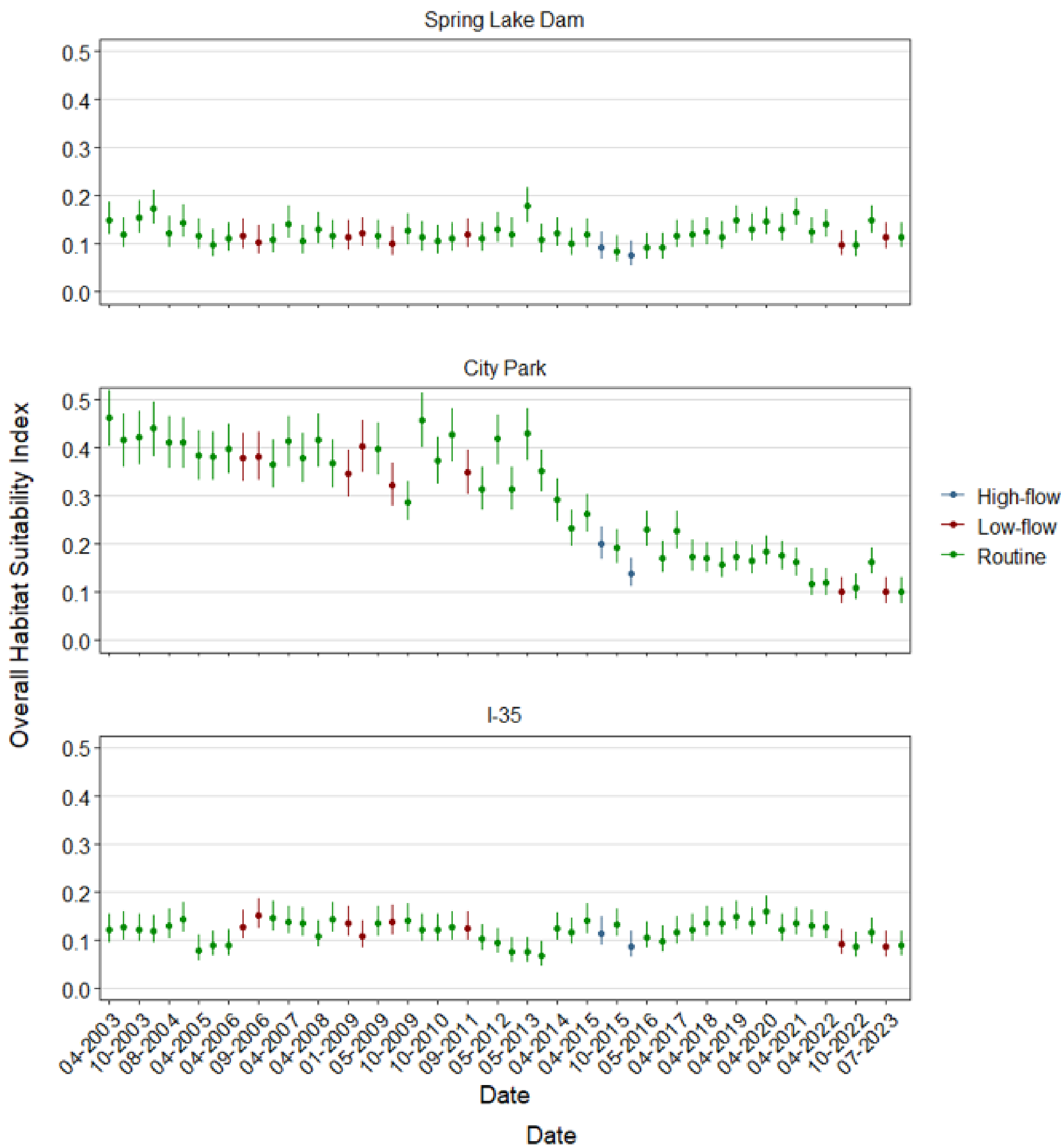


Figure E10. **Overall Habitat Suitability Index (OHSI) (±95% CI) from 2003–2023 among study reaches in the San Marcos River.**

Fish Community

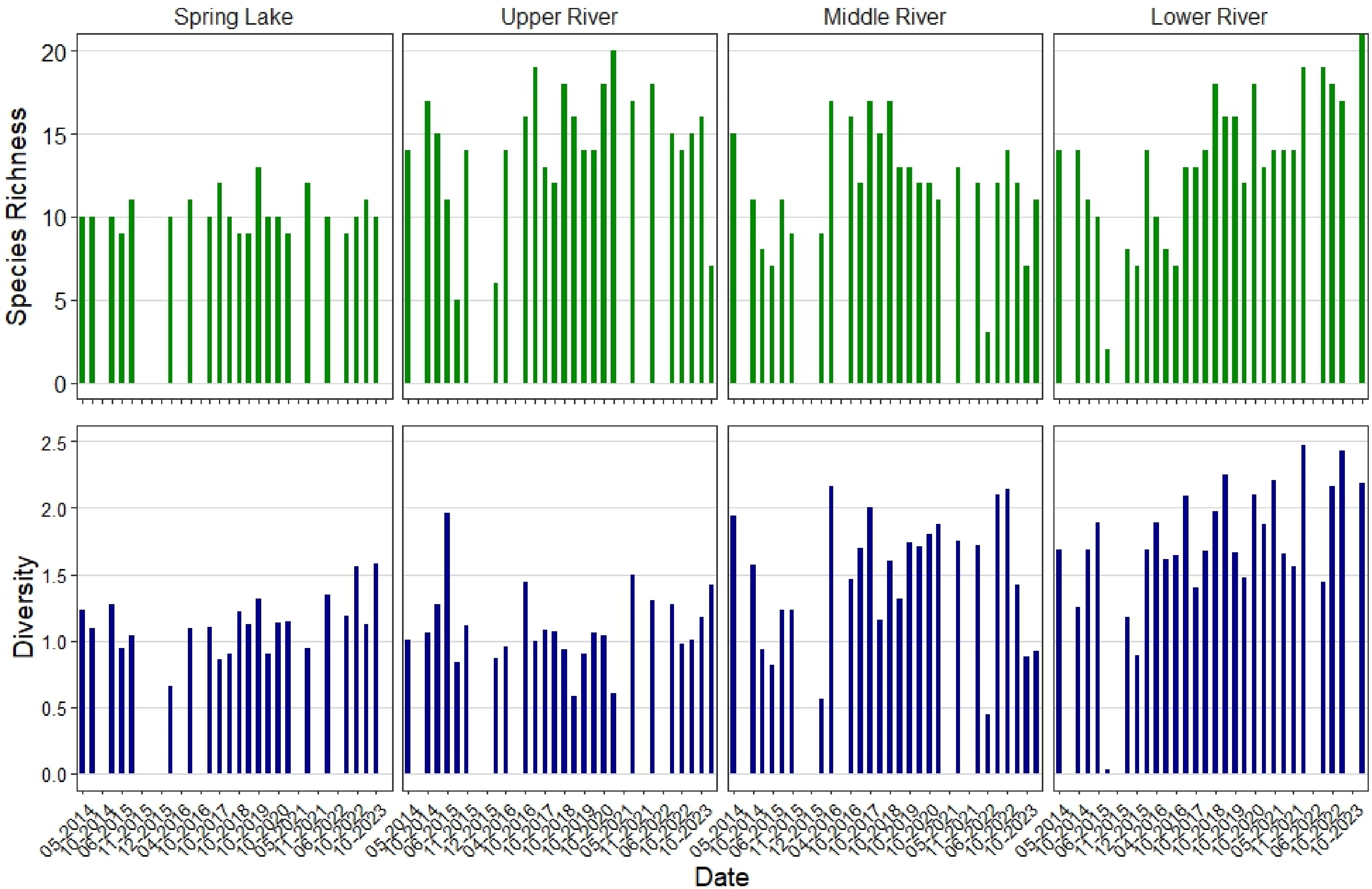


Figure E11. **Bar graphs displaying temporal trends in species richness and diversity among study reaches from 2014–2023 during fish community sampling in the San Marcos Springs/River.**

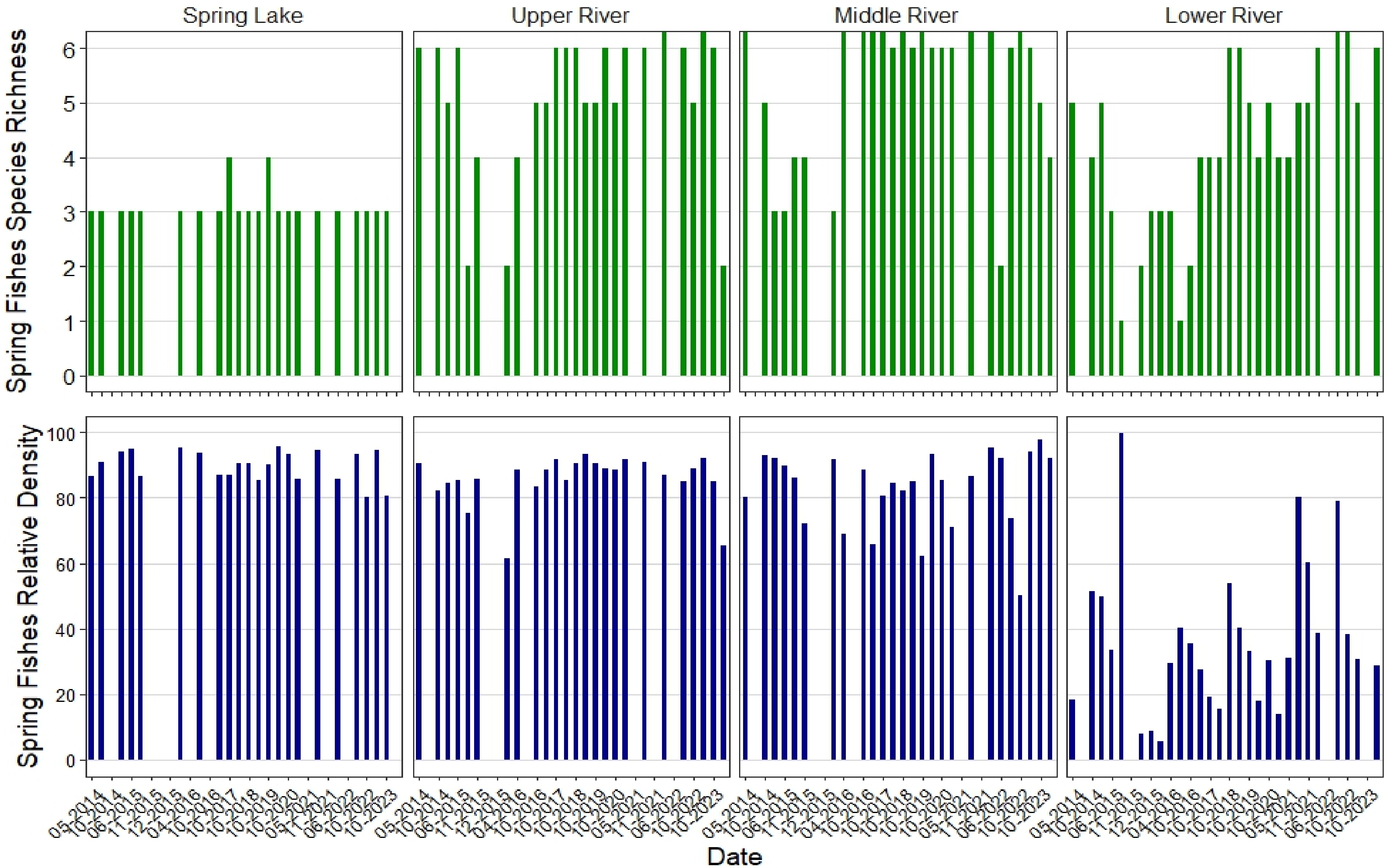


Figure E12. **Bar graphs displaying temporal trends in spring fishes species richness and percent relative density among study reaches from 2014–2023 during fish community sampling in the San Marcos Springs/River.**

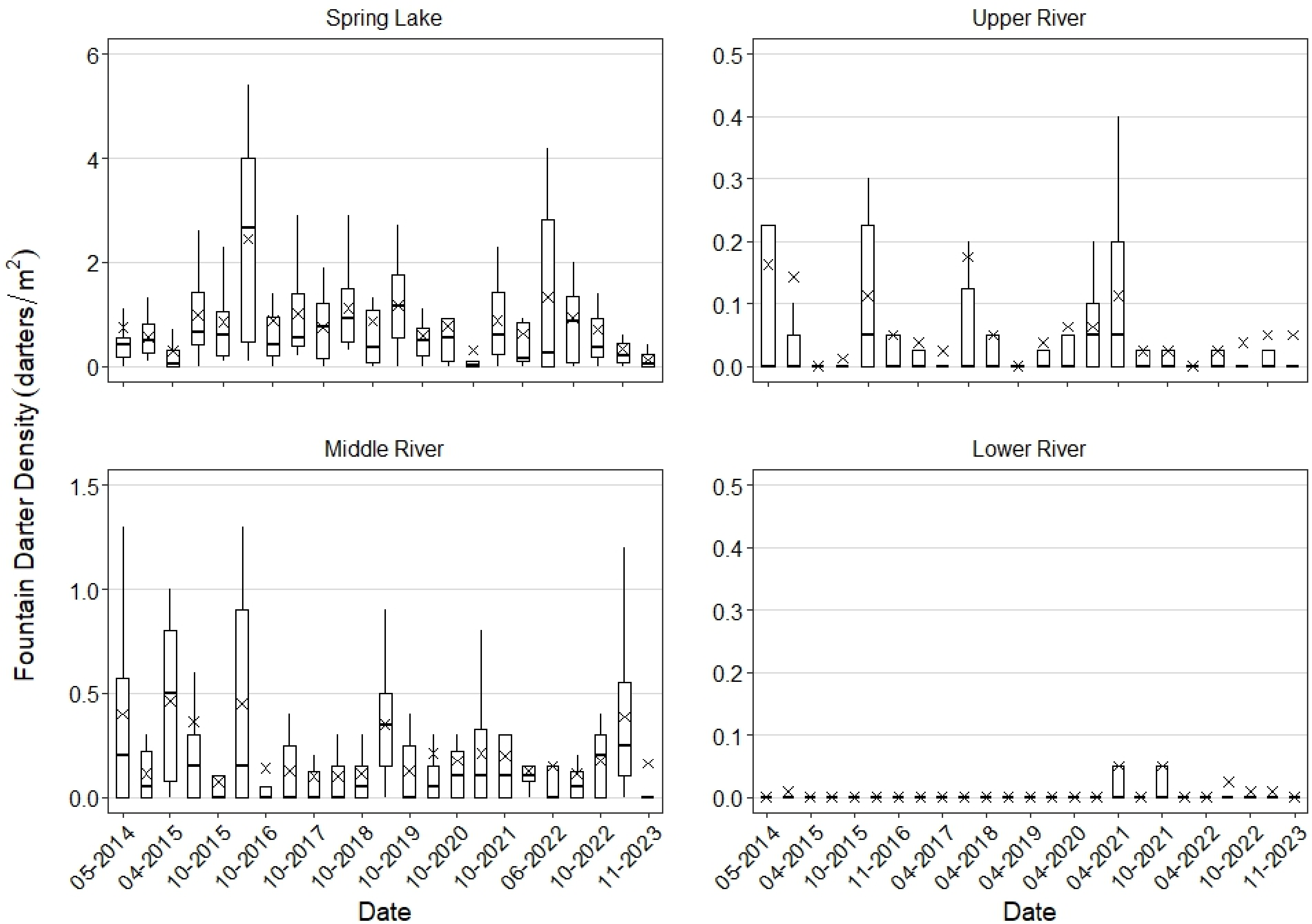


Figure E13. Boxplots displaying temporal trends in Fountain Darter density (darters/m^2) among study reaches from 2014–2023 during fish community microhabitat sampling in the San Marcos Springs/River. The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range.

San Marcos Salamander

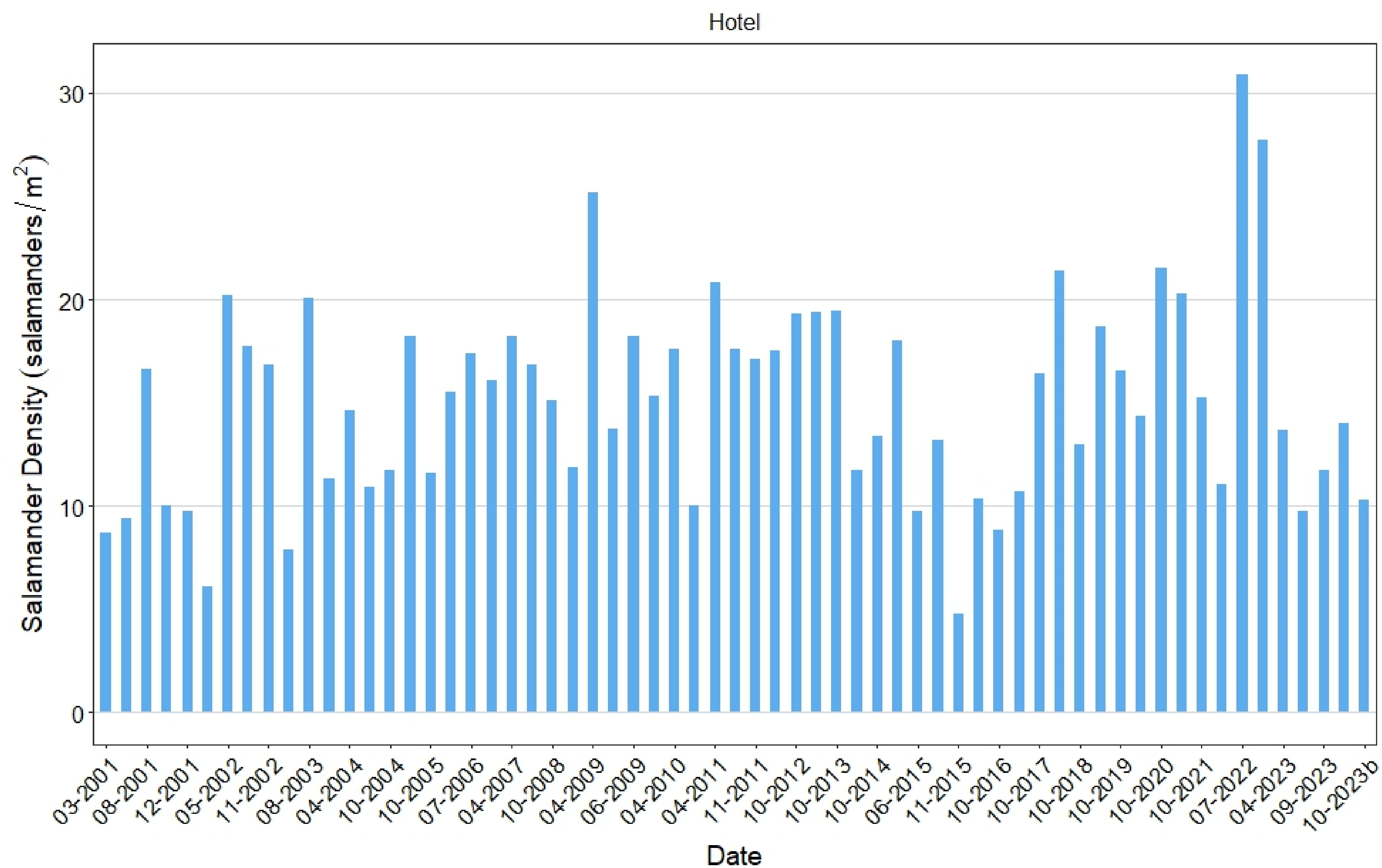


Figure E14. **San Marcos Salamander density from 2001–2023 at the Hotel Site.**

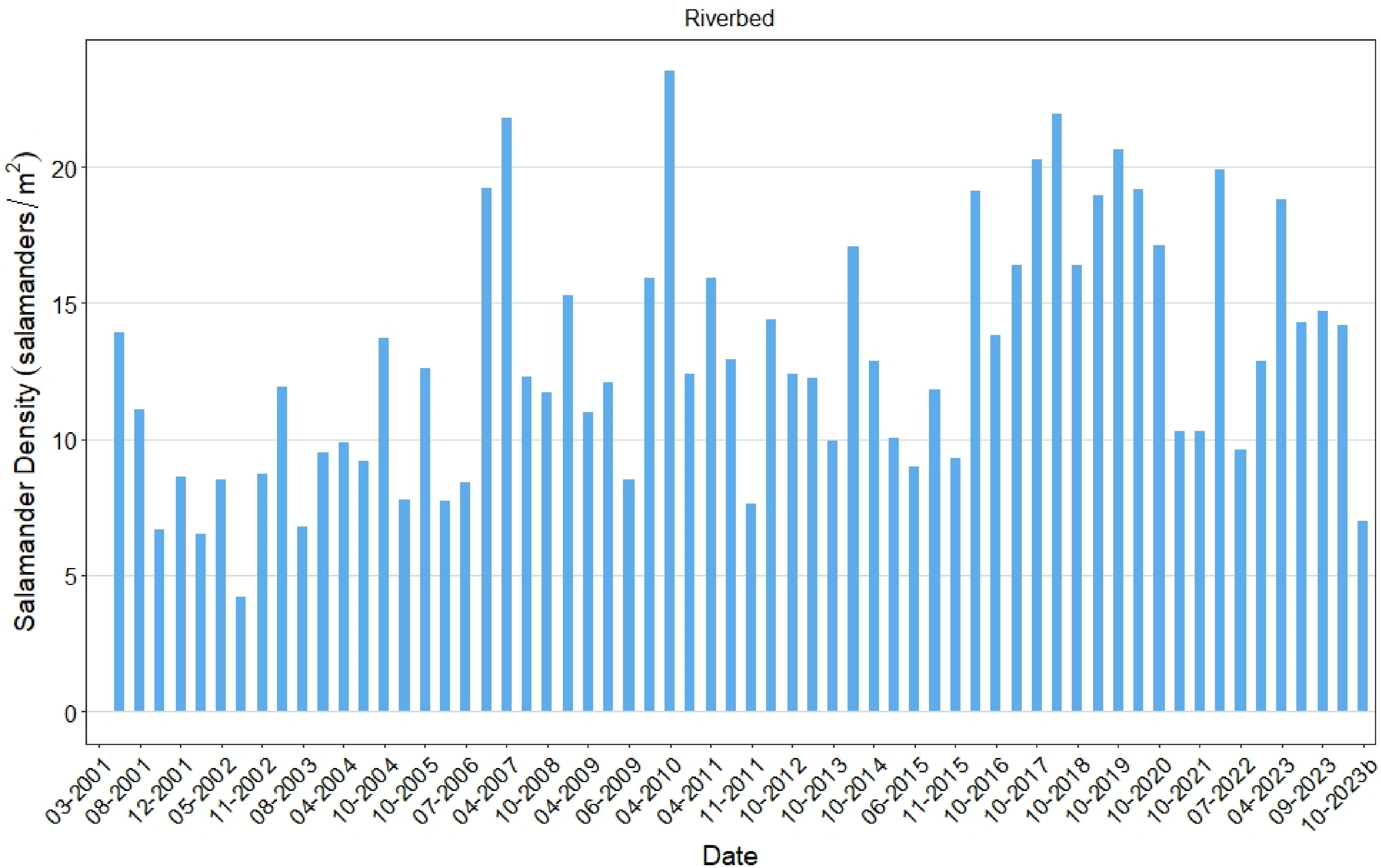


Figure E15. **San Marcos Salamander density from 2001–2023 at the Riverbed Site.**

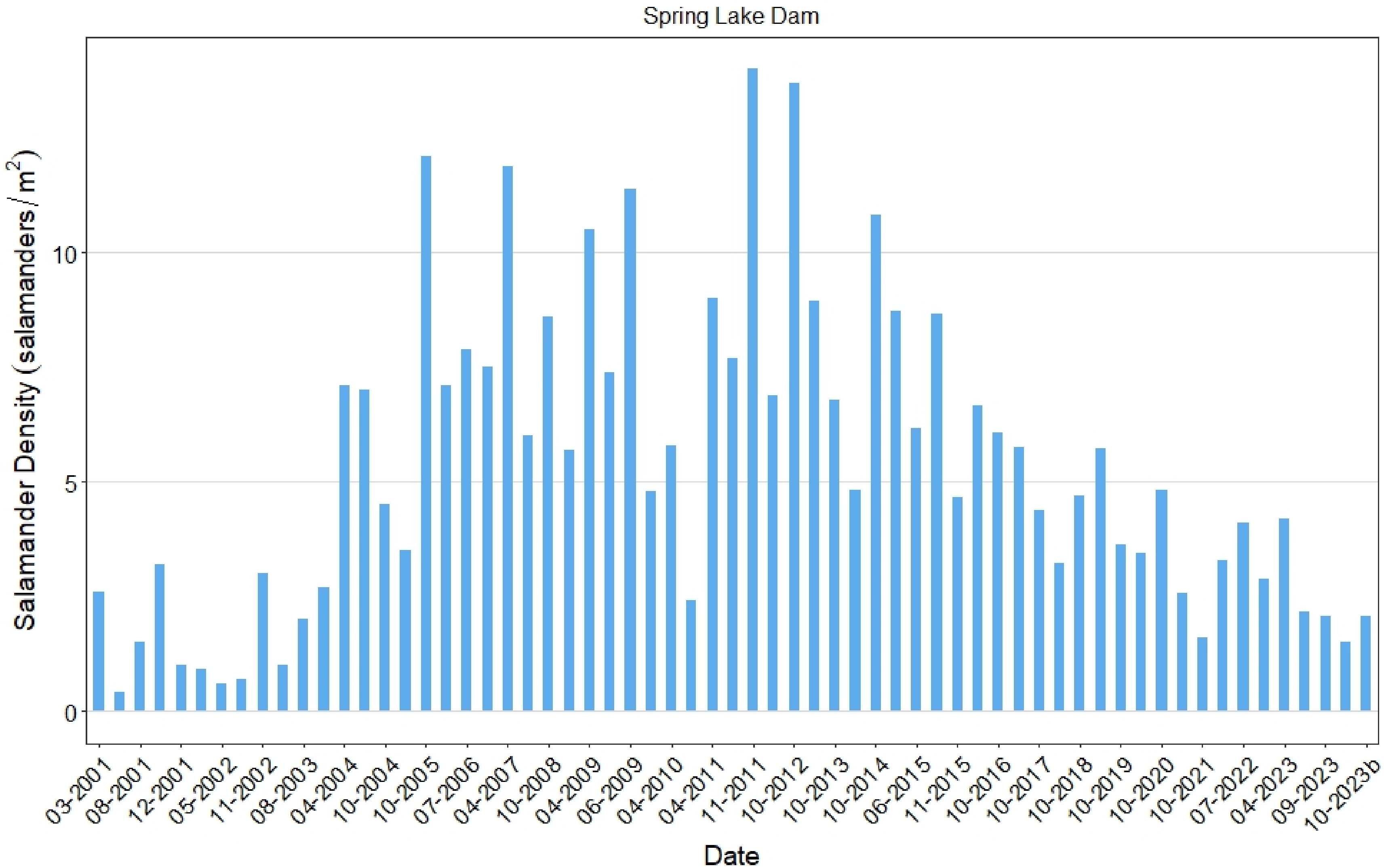


Figure E16. San Marcos Salamander density from 2001–2023 at the Spring Lake Dam Site.

APPENDIX F: MACROINVERTEBRATE RAW DATA

Site	Date	Season	Class	Order	Family	FinalID	Counts
Spring Lake	2023-04-26	Spring	Malacostraca	Aphipoda	Hyalellidae	Hyalella	78
Spring Lake	2023-04-26	Spring	Malacostraca	Decapoda	Palaemonidae	Palaemon	2
Spring Lake	2023-04-26	Spring	Insecta	Diptera	Ceratopogonidae	Bezzia complex	4
Spring Lake	2023-04-26	Spring	Insecta	Diptera	Chironomidae	Chironomidae	10
Spring Lake	2023-04-26	Spring	Insecta	Ephemeroptera	Baetidae	Callibaetis	33
Spring Lake	2023-04-26	Spring	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	16
Spring Lake	2023-04-26	Spring	Insecta	Odonata	Coenagrionidae	Enallagma	3
Spring Lake	2023-04-26	Spring	Insecta	Trichoptera	Leptoceridae	Nectopsyche	1
Spring Lake	2023-04-26	Spring	Gastropoda		Physidae	Physa	2
Spring Lake	2023-04-26	Spring	Gastropoda		Planorbidae	Planorbella	1
Spring Lake	2023-04-26	Spring	Gastropoda		Pleuroceridae	Elimia	4
Spring Lake	2023-10-18	Fall	Malacostraca	Aphipoda	Hyalellidae	Hyalella	144
Spring Lake	2023-10-18	Fall	Malacostraca	Decapoda	Cambaridae	Cambaridae	1
Spring Lake	2023-10-18	Fall	Insecta	Diptera	Ceratopogonidae	Bezzia complex	4
Spring Lake	2023-10-18	Fall	Insecta	Diptera	Chironomidae	Chironomidae	5
Spring Lake	2023-10-18	Fall	Insecta	Ephemeroptera	Baetidae	Callibaetis	2
Spring Lake	2023-10-18	Fall	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	21
Spring Lake	2023-10-18	Fall	Insecta	Odonata	Coenagrionidae	Enallagma	1
Spring Lake	2023-10-18	Fall		Tricladida	Dugesiidae	Dugesia	2
Spring Lake	2023-10-18	Fall	Gastropoda		Pleuroceridae	Elimia	5
Spring Lake	2023-10-18	Fall	Clitellata			Hirudinea	1
Spring Lake	2023-10-18	Fall	Clitellata			Oligochaeta	14
Spring Lake Dam	2023-04-26	Spring	Malacostraca	Aphipoda	Hyalellidae	Hyalella	48
Spring Lake Dam	2023-04-26	Spring	Insecta	Coleoptera	Psephenidae	Psephenus texanus	2
Spring Lake Dam	2023-04-26	Spring	Malacostraca	Decapoda	Cambaridae	Cambaridae	1
Spring Lake Dam	2023-04-26	Spring	Insecta	Decapoda	Simuliidae	Simulium	35
Spring Lake Dam	2023-04-26	Spring	Insecta	Diptera	Chironomidae	Chironomidae	3
Spring Lake Dam	2023-04-26	Spring	Insecta	Diptera	Stratiomyidae	Euparyphus	1
Spring Lake Dam	2023-04-26	Spring	Insecta	Ephemeroptera	Baetidae	Fallceon	4

Spring Lake Dam	2023-04-26	Spring	Insecta	Ephemeroptera	Leptohyphidae	Leptohyphes	1
Spring Lake Dam	2023-04-26	Spring	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	10
Spring Lake Dam	2023-04-26	Spring	Insecta	Hemiptera	Naucoridae	Ambrysus circumcinctus	12
Spring Lake Dam	2023-04-26	Spring	Insecta	Hemiptera	Naucoridae	Ambrysus lunatus	4
Spring Lake Dam	2023-04-26	Spring	Insecta	Odonata	Coenagrionidae	Argia	7
Spring Lake Dam	2023-04-26	Spring	Insecta	Trichoptera	Helicopsychidae	Helicopsyche	5
Spring Lake Dam	2023-04-26	Spring	Insecta	Trichoptera	Philopotamidae	Chimarra	4
Spring Lake Dam	2023-04-26	Spring		Tricladida	Dugesiidae	Dugesia	6
Spring Lake Dam	2023-04-26	Spring	Gastropoda		Physidae	Physa	1
Spring Lake Dam	2023-04-26	Spring	Gastropoda		Pleuroceridae	Elimia	6
Spring Lake Dam	2023-04-26	Spring	Clitellata			Oligochaeta	3
Spring Lake Dam	2023-10-18	Fall	Malacostraca	Aphipoda	Hyalellidae	Hyalella	17
Spring Lake Dam	2023-10-18	Fall	Insecta	Coleoptera	Elmidae	Phanocerus clavicornis	2
Spring Lake Dam	2023-10-18	Fall	Insecta	Coleoptera	Psephenidae	Psephenus texanus	4
Spring Lake Dam	2023-10-18	Fall	Insecta	Diptera	Empididae	Empididae	1
Spring Lake Dam	2023-10-18	Fall	Insecta	Ephemeroptera	Baetidae	Baetodes	4
Spring Lake Dam	2023-10-18	Fall	Insecta	Ephemeroptera	Baetidae	Fallceon	4
Spring Lake Dam	2023-10-18	Fall	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	5
Spring Lake Dam	2023-10-18	Fall	Insecta	Hemiptera	Naucoridae	Ambrysus circumcinctus	9
Spring Lake Dam	2023-10-18	Fall	Insecta	Hemiptera	Naucoridae	Ambrysus lunatus	1
Spring Lake Dam	2023-10-18	Fall	Insecta	Hemiptera	Naucoridae	Pelocoris	1
Spring Lake Dam	2023-10-18	Fall	Gastropoda	Littorinimorpha	Hydrobiidae	Hydrobiidae	3
Spring Lake Dam	2023-10-18	Fall	Insecta	Megaloptera	Corydalidae	Corydalus	1
Spring Lake Dam	2023-10-18	Fall	Insecta	Odonata	Calopterygidae	Hetaerina	3
Spring Lake Dam	2023-10-18	Fall	Insecta	Odonata	Coenagrionidae	Argia	2
Spring Lake Dam	2023-10-18	Fall	Insecta	Odonata	Coenagrionidae	Enallagma	1
Spring Lake Dam	2023-10-18	Fall	Insecta	Odonata	Libellulidae	Brechmorhoga	6
Spring Lake Dam	2023-10-18	Fall	Insecta	Trichoptera	Helicopsychidae	Helicopsyche	7
Spring Lake Dam	2023-10-18	Fall	Insecta	Trichoptera	Hydropsychidae	Smicridea	5
Spring Lake Dam	2023-10-18	Fall	Insecta	Trichoptera	Leptoceridae	Nectopsyche	3

Spring Lake Dam	2023-10-18	Fall	Insecta	Trichoptera	Philopotamidae	Chimarra	56
Spring Lake Dam	2023-10-18	Fall		Tricladida	Dugesiidae	Dugesia	10
Spring Lake Dam	2023-10-18	Fall	Gastropoda		Pleuroceridae	Elimia	1
Spring Lake Dam	2023-10-18	Fall	Gastropoda		Thiaridae	Melanoides tuberculata	1
Spring Lake Dam	2023-10-18	Fall	Clitellata			Hirudinea	1
Spring Lake Dam	2023-10-18	Fall	Clitellata			Oligochaeta	18
City Park	2023-04-26	Spring	Malacostraca	Aphipoda	Hyalellidae	Hyalella	66
City Park	2023-04-26	Spring	Insecta	Decapoda	Simuliidae	Simulium	1
City Park	2023-04-26	Spring	Insecta	Diptera	Chironomidae	Chironomidae	2
City Park	2023-04-26	Spring	Insecta	Ephemeroptera	Baetidae	Fallceon	5
City Park	2023-04-26	Spring	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	55
City Park	2023-04-26	Spring	Insecta	Hemiptera	Naucoridae	Limnocoris lutzi	2
City Park	2023-04-26	Spring	Gastropoda	Littorinimorpha	Hydrobiidae	Hydrobiidae	13
City Park	2023-04-26	Spring	Insecta	Odonata	Coenagrionidae	Enallagma	2
City Park	2023-04-26	Spring	Insecta	Trichoptera	Glossosomatidae	Protoptila	2
City Park	2023-04-26	Spring	Insecta	Trichoptera	Helicopsychidae	Helicopsyche	9
City Park	2023-04-26	Spring	Insecta	Trichoptera	Leptoceridae	Nectopsyche	16
City Park	2023-04-26	Spring		Tricladida	Dugesiidae	Dugesia	4
City Park	2023-04-26	Spring	Gastropoda		Thiaridae	Melanoides tuberculata	7
City Park	2023-04-26	Spring	Clitellata			Hirudinea	1
City Park	2023-04-26	Spring	Clitellata			Oligochaeta	1
City Park	2023-10-18	Fall	Malacostraca	Aphipoda	Hyalellidae	Hyalella	55
City Park	2023-10-18	Fall	Malacostraca	Decapoda	Cambaridae	Cambaridae	1
City Park	2023-10-18	Fall	Insecta	Diptera	Chironomidae	Chironomidae	3
City Park	2023-10-18	Fall	Insecta	Ephemeroptera	Baetidae	Fallceon	3
City Park	2023-10-18	Fall	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	46
City Park	2023-10-18	Fall	Insecta	Odonata	Coenagrionidae	Argia	1
City Park	2023-10-18	Fall	Insecta	Trichoptera	Leptoceridae	Nectopsyche	3
City Park	2023-10-18	Fall		Tricladida	Dugesiidae	Dugesia	1
City Park	2023-10-18	Fall	Gastropoda		Thiaridae	Melanoides tuberculata	12

City Park	2023-10-18	Fall	Clitellata			Oligochaeta	2
I-35	2023-04-26	Spring	Malacostraca	Aphipoda	Hyalellidae	Hyalella	5
I-35	2023-04-26	Spring	Insecta	Coleoptera	Elmidae	Macrelmis texana	1
I-35	2023-04-26	Spring	Insecta	Ephemeroptera	Baetidae	Fallceon	1
I-35	2023-04-26	Spring	Insecta	Ephemeroptera	Leptohyphidae	Leptohyphes	1
I-35	2023-04-26	Spring	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	2
I-35	2023-04-26	Spring	Insecta	Ephemeroptera	Leptophlebiidae	Thraulodes	14
I-35	2023-04-26	Spring	Insecta	Hemiptera	Naucoridae	Ambrysus circumcinctus	4
I-35	2023-04-26	Spring	Insecta	Hemiptera	Naucoridae	Limnocoris lutzi	16
I-35	2023-04-26	Spring	Insecta	Odonata	Coenagrionidae	Argia	1
I-35	2023-04-26	Spring	Insecta	Odonata	Gomphidae	Erpetogomphus	1
I-35	2023-04-26	Spring	Insecta	Odonata	Libellulidae	Libellulidae	1
I-35	2023-04-26	Spring	Insecta	Trichoptera	Glossosomatidae	Protoptila	14
I-35	2023-04-26	Spring	Insecta	Trichoptera	Helicopsychidae	Helicopsyche	28
I-35	2023-04-26	Spring	Insecta	Trichoptera	Leptoceridae	Nectopsyche	22
I-35	2023-04-26	Spring	Insecta	Trichoptera	Philopotamidae	Chimarra	3
I-35	2023-04-26	Spring		Tricladida	Dugesiidae	Dugesia	7
I-35	2023-04-26	Spring	Gastropoda		Pleuroceridae	Elimia	14
I-35	2023-04-26	Spring	Gastropoda		Thiaridae	Melanoides tuberculata	9
I-35	2023-04-26	Spring	Clitellata			Oligochaeta	4
I-35	2023-10-18	Fall	Malacostraca	Aphipoda	Hyalellidae	Hyalella	4
I-35	2023-10-18	Fall	Insecta	Coleoptera	Elmidae	Hexacylloepus	1
I-35	2023-10-18	Fall	Insecta	Diptera	Chironomidae	Chironomidae	1
I-35	2023-10-18	Fall	Insecta	Ephemeroptera	Baetidae	Baetis	1
I-35	2023-10-18	Fall	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	3
I-35	2023-10-18	Fall	Insecta	Ephemeroptera	Leptophlebiidae	Thraulodes	21
I-35	2023-10-18	Fall	Insecta	Hemiptera	Naucoridae	Ambrysus circumcinctus	1
I-35	2023-10-18	Fall	Insecta	Hemiptera	Naucoridae	Limnocoris lutzi	11
I-35	2023-10-18	Fall	Insecta	Odonata	Coenagrionidae	Argia	1
I-35	2023-10-18	Fall	Insecta	Odonata	Libellulidae	Brechmorhoga	1

I-35	2023-10-18	Fall	Insecta	Trichoptera	Glossosomatidae	Protoptila	31
I-35	2023-10-18	Fall	Insecta	Trichoptera	Helicopsychidae	Helicopsyche	13
I-35	2023-10-18	Fall	Insecta	Trichoptera	Leptoceridae	Nectopsyche	11
I-35	2023-10-18	Fall		Tricladida	Dugesiidae	Dugesia	2
I-35	2023-10-18	Fall	Gastropoda		Pleuroceridae	Elimia	14
I-35	2023-10-18	Fall	Gastropoda		Thiaridae	Melanoides tuberculata	36
I-35	2023-10-18	Fall	Clitellata			Oligochaeta	3

APPENDIX G: DROP-NET RAW DATA

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2961	City Park	Hyg-1	2023-04-19	1	Procambarus sp.		12
2961	City Park	Hyg-1	2023-04-19	1	Lepomis miniatus	112	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	14	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	12	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	25	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	34	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	16	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	18	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	23	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	20	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	15	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	9	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	16	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	17	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	10	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	1	Etheostoma fonticola	16	1
2961	City Park	Hyg-1	2023-04-19	1	Etheostoma fonticola	14	1
2961	City Park	Hyg-1	2023-04-19	1	Etheostoma fonticola	10	1
2961	City Park	Hyg-1	2023-04-19	2	Lepomis miniatus	50	1
2961	City Park	Hyg-1	2023-04-19	2	Palaemonetes sp.		1
2961	City Park	Hyg-1	2023-04-19	2	Etheostoma fonticola	15	1
2961	City Park	Hyg-1	2023-04-19	2	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	3	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	3	Procambarus sp.		1
2961	City Park	Hyg-1	2023-04-19	3	Etheostoma fonticola	15	1
2961	City Park	Hyg-1	2023-04-19	3	Lepomis sp.	12	1
2961	City Park	Hyg-1	2023-04-19	3	Palaemonetes sp.		1
2961	City Park	Hyg-1	2023-04-19	4	Etheostoma fonticola	16	1
2961	City Park	Hyg-1	2023-04-19	4	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	4	Procambarus sp.		4
2961	City Park	Hyg-1	2023-04-19	5	Procambarus sp.		15
2961	City Park	Hyg-1	2023-04-19	5	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	5	Etheostoma fonticola	20	1
2961	City Park	Hyg-1	2023-04-19	5	Etheostoma fonticola	11	1
2961	City Park	Hyg-1	2023-04-19	5	Etheostoma fonticola	16	1
2961	City Park	Hyg-1	2023-04-19	5	Etheostoma fonticola	13	1
2961	City Park	Hyg-1	2023-04-19	5	Etheostoma fonticola	14	1
2961	City Park	Hyg-1	2023-04-19	5	Etheostoma fonticola	10	1

2961	City Park	Hyg-1	2023-04-19	6	Procambarus sp.		2
2961	City Park	Hyg-1	2023-04-19	6	Ambloplites rupestris	91	1
2961	City Park	Hyg-1	2023-04-19	6	Etheostoma fonticola	25	1
2961	City Park	Hyg-1	2023-04-19	6	Etheostoma fonticola	16	1
2961	City Park	Hyg-1	2023-04-19	6	Lepomis sp.	12	1
2961	City Park	Hyg-1	2023-04-19	6	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	7	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	7	Etheostoma fonticola	18	1
2961	City Park	Hyg-1	2023-04-19	8	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	8	Etheostoma fonticola	11	1
2961	City Park	Hyg-1	2023-04-19	8	Procambarus sp.		1
2961	City Park	Hyg-1	2023-04-19	9	Procambarus sp.		3
2961	City Park	Hyg-1	2023-04-19	10	Procambarus sp.		2
2961	City Park	Hyg-1	2023-04-19	11	Procambarus sp.		5
2961	City Park	Hyg-1	2023-04-19	11	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	12	Etheostoma fonticola	32	1
2961	City Park	Hyg-1	2023-04-19	12	Etheostoma fonticola	31	1
2961	City Park	Hyg-1	2023-04-19	12	Procambarus sp.		1
2961	City Park	Hyg-1	2023-04-19	12	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	13	No fish collected		
2961	City Park	Hyg-1	2023-04-19	14	Lepomis miniatus	52	1
2961	City Park	Hyg-1	2023-04-19	14	Etheostoma fonticola	21	1
2961	City Park	Hyg-1	2023-04-19	15	Etheostoma fonticola	15	1
2961	City Park	Hyg-1	2023-04-19	15	Procambarus sp.		1
2961	City Park	Hyg-1	2023-04-19	16	No fish collected		
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	9	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	9	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	9	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	9	1

2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	9	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	9	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	15	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	15	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	16	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	12	1
2961	City Park	Hyg-1	2023-04-19	1	Gambusia sp.	20	1
2961	City Park	Hyg-1	2023-04-19	2	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	2	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	2	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	2	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	2	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	2	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	2	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	2	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	2	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	2	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	3	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	3	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	3	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	4	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	4	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	4	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	4	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	4	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	4	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	4	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	5	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	5	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	5	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	5	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	5	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	5	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	5	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	5	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	5	Etheostoma fonticola	16	1
2961	City Park	Hyg-1	2023-04-19	6	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	6	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	6	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	6	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	6	Gambusia sp.		1

2961	City Park	Hyg-1	2023-04-19	6	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	6	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	7	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	7	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	7	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	7	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	7	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	7	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	7	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	7	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	8	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	8	Gambusia sp.		1
2961	City Park	Hyg-1	2023-04-19	8	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	13	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	37	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	20	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	22	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	15	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	10	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	16	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	26	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	39	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	30	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	33	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	7	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Etheostoma fonticola	36	1
2962	City Park	Hyg-2	2023-04-19	2	Etheostoma fonticola	25	1
2962	City Park	Hyg-2	2023-04-19	2	Etheostoma fonticola	30	1
2962	City Park	Hyg-2	2023-04-19	2	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	2	Procambarus sp.		1
2962	City Park	Hyg-2	2023-04-19	3	Etheostoma fonticola	25	1
2962	City Park	Hyg-2	2023-04-19	3	Etheostoma fonticola	20	1
2962	City Park	Hyg-2	2023-04-19	3	Etheostoma fonticola	13	1
2962	City Park	Hyg-2	2023-04-19	3	Procambarus sp.		1
2962	City Park	Hyg-2	2023-04-19	3	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	4	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	4	Etheostoma fonticola	15	1
2962	City Park	Hyg-2	2023-04-19	5	Etheostoma fonticola	21	1
2962	City Park	Hyg-2	2023-04-19	5	Etheostoma fonticola	16	1
2962	City Park	Hyg-2	2023-04-19	6	Gambusia sp.		1

2962	City Park	Hyg-2	2023-04-19	7	Procambarus sp.		1
2962	City Park	Hyg-2	2023-04-19	7	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	8	Etheostoma fonticola	16	1
2962	City Park	Hyg-2	2023-04-19	8	Procambarus sp.		1
2962	City Park	Hyg-2	2023-04-19	8	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	9	Etheostoma fonticola	16	1
2962	City Park	Hyg-2	2023-04-19	9	Etheostoma fonticola	9	1
2962	City Park	Hyg-2	2023-04-19	9	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	9	Procambarus sp.		1
2962	City Park	Hyg-2	2023-04-19	10	Procambarus sp.		1
2962	City Park	Hyg-2	2023-04-19	11	Procambarus sp.		2
2962	City Park	Hyg-2	2023-04-19	12	No fish collected		
2962	City Park	Hyg-2	2023-04-19	13	Etheostoma fonticola	30	1
2962	City Park	Hyg-2	2023-04-19	13	Etheostoma fonticola	14	1
2962	City Park	Hyg-2	2023-04-19	14	Procambarus sp.		1
2962	City Park	Hyg-2	2023-04-19	14	Etheostoma fonticola	16	1
2962	City Park	Hyg-2	2023-04-19	14	Etheostoma fonticola	11	1
2962	City Park	Hyg-2	2023-04-19	15	No fish collected		
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	7	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	30	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	10	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	15	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	15	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	20	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	20	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.	20	1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1

2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	1	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	2	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	2	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	2	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	2	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	2	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	2	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	2	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	2	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	2	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	3	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	3	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	3	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	3	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	3	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	3	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	3	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	3	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	4	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	4	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	4	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	4	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	4	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	6	Gambusia sp.		1
2962	City Park	Hyg-2	2023-04-19	9	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	25	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	22	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	20	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	9	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	10	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	12	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	18	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	23	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	15	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	16	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	21	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	12	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Herichthys cyanoguttatus	36	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	28	1

2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	24	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	33	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	22	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	13	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	15	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	12	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	25	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	20	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	19	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	16	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	10	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	11	1
2963	City Park	Cabo-1	2023-04-19	1	Procambarus sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Procambarus sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Etheostoma fonticola	18	1
2963	City Park	Cabo-1	2023-04-19	2	Etheostoma fonticola	16	1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Etheostoma fonticola	16	1
2963	City Park	Cabo-1	2023-04-19	3	Etheostoma fonticola	24	1
2963	City Park	Cabo-1	2023-04-19	3	Etheostoma fonticola	28	1
2963	City Park	Cabo-1	2023-04-19	3	Etheostoma fonticola	9	1
2963	City Park	Cabo-1	2023-04-19	3	Etheostoma fonticola	22	1
2963	City Park	Cabo-1	2023-04-19	3	Etheostoma fonticola	12	1
2963	City Park	Cabo-1	2023-04-19	3	Procambarus sp.		4
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Etheostoma fonticola	16	1
2963	City Park	Cabo-1	2023-04-19	4	Etheostoma fonticola	30	1
2963	City Park	Cabo-1	2023-04-19	4	Etheostoma fonticola	11	1
2963	City Park	Cabo-1	2023-04-19	4	Etheostoma fonticola	26	1
2963	City Park	Cabo-1	2023-04-19	4	Etheostoma fonticola	20	1
2963	City Park	Cabo-1	2023-04-19	4	Etheostoma fonticola	13	1
2963	City Park	Cabo-1	2023-04-19	4	Etheostoma fonticola	28	1
2963	City Park	Cabo-1	2023-04-19	4	Etheostoma fonticola	22	1
2963	City Park	Cabo-1	2023-04-19	4	Etheostoma fonticola	25	1
2963	City Park	Cabo-1	2023-04-19	4	Procambarus sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Palaemonetes sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	5	Etheostoma fonticola	14	1
2963	City Park	Cabo-1	2023-04-19	5	Etheostoma fonticola	16	1
2963	City Park	Cabo-1	2023-04-19	5	Etheostoma fonticola	21	1
2963	City Park	Cabo-1	2023-04-19	5	Gambusia sp.		1

2963	City Park	Cabo-1	2023-04-19	6	Etheostoma fonticola	23	1
2963	City Park	Cabo-1	2023-04-19	6	Etheostoma fonticola	16	1
2963	City Park	Cabo-1	2023-04-19	6	Etheostoma fonticola	26	1
2963	City Park	Cabo-1	2023-04-19	6	Etheostoma fonticola	29	1
2963	City Park	Cabo-1	2023-04-19	6	Etheostoma fonticola	22	1
2963	City Park	Cabo-1	2023-04-19	6	Etheostoma fonticola	10	1
2963	City Park	Cabo-1	2023-04-19	6	Etheostoma fonticola	21	1
2963	City Park	Cabo-1	2023-04-19	6	Procambarus sp.		2
2963	City Park	Cabo-1	2023-04-19	7	Etheostoma fonticola	21	1
2963	City Park	Cabo-1	2023-04-19	7	Etheostoma fonticola	24	1
2963	City Park	Cabo-1	2023-04-19	7	Etheostoma fonticola	15	1
2963	City Park	Cabo-1	2023-04-19	7	Etheostoma fonticola	20	1
2963	City Park	Cabo-1	2023-04-19	7	Etheostoma fonticola	17	1
2963	City Park	Cabo-1	2023-04-19	8	Etheostoma fonticola	20	1
2963	City Park	Cabo-1	2023-04-19	8	Etheostoma fonticola	28	1
2963	City Park	Cabo-1	2023-04-19	8	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	9	Etheostoma fonticola	23	1
2963	City Park	Cabo-1	2023-04-19	9	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	10	Etheostoma fonticola	21	1
2963	City Park	Cabo-1	2023-04-19	10	Etheostoma fonticola	24	1
2963	City Park	Cabo-1	2023-04-19	10	Etheostoma fonticola	23	1
2963	City Park	Cabo-1	2023-04-19	10	Etheostoma fonticola	31	1
2963	City Park	Cabo-1	2023-04-19	10	Procambarus sp.		1
2963	City Park	Cabo-1	2023-04-19	10	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	11	No fish collected		
2963	City Park	Cabo-1	2023-04-19	12	Etheostoma fonticola	22	1
2963	City Park	Cabo-1	2023-04-19	12	Etheostoma fonticola	17	1
2963	City Park	Cabo-1	2023-04-19	12	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	13	Etheostoma fonticola	20	1
2963	City Park	Cabo-1	2023-04-19	13	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	14	Lepomis miniatus	48	1
2963	City Park	Cabo-1	2023-04-19	14	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	14	Etheostoma fonticola	29	1
2963	City Park	Cabo-1	2023-04-19	15	Etheostoma fonticola	33	1
2963	City Park	Cabo-1	2023-04-19	15	Etheostoma fonticola	16	1
2963	City Park	Cabo-1	2023-04-19	16	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	16	Etheostoma fonticola	15	1
2963	City Park	Cabo-1	2023-04-19	16	Procambarus sp.		1
2963	City Park	Cabo-1	2023-04-19	17	No fish collected		
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	16	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	16	1

2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	22	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	20	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	20	1
2963	City Park	Cabo-1	2023-04-19	1	Etheostoma fonticola	11	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	12	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	18	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	18	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	15	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	16	1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1

2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	1	Gambusia sp.	10	1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1

2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	2	Etheostoma fonticola	16	1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1

2963	City Park	Cabo-1	2023-04-19	3	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	3	Etheostoma fonticola	16	1
2963	City Park	Cabo-1	2023-04-19	3	Etheostoma fonticola	16	1
2963	City Park	Cabo-1	2023-04-19	3	Etheostoma fonticola	24	1
2963	City Park	Cabo-1	2023-04-19	4	Etheostoma fonticola	16	1
2963	City Park	Cabo-1	2023-04-19	4	Etheostoma fonticola	20	1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	4	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	5	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	5	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	6	Etheostoma fonticola	10	1
2963	City Park	Cabo-1	2023-04-19	7	Etheostoma fonticola	24	1
2963	City Park	Cabo-1	2023-04-19	7	Etheostoma fonticola	24	1
2963	City Park	Cabo-1	2023-04-19	10	Etheostoma fonticola	21	1
2963	City Park	Cabo-1	2023-04-19	10	Etheostoma fonticola	24	1
2963	City Park	Cabo-1	2023-04-19	10	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	10	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	10	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	10	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	10	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	12	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	12	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	12	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	13	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	14	Gambusia sp.		1

2963	City Park	Cabo-1	2023-04-19	14	Gambusia sp.		1
2963	City Park	Cabo-1	2023-04-19	16	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Etheostoma fonticola	21	1
2964	City Park	Cabo-2	2023-04-19	1	Etheostoma fonticola	31	1
2964	City Park	Cabo-2	2023-04-19	1	Etheostoma fonticola	15	1
2964	City Park	Cabo-2	2023-04-19	1	Etheostoma fonticola	13	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	10	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	25	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	12	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	14	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	16	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	21	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	13	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	8	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	11	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	18	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	9	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	15	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Palaemonetes sp.		2
2964	City Park	Cabo-2	2023-04-19	1	Ambloplites rupestris	20	1
2964	City Park	Cabo-2	2023-04-19	2	Etheostoma fonticola	27	1
2964	City Park	Cabo-2	2023-04-19	2	Etheostoma fonticola	33	1
2964	City Park	Cabo-2	2023-04-19	2	Etheostoma fonticola	13	1
2964	City Park	Cabo-2	2023-04-19	2	Etheostoma fonticola	23	1
2964	City Park	Cabo-2	2023-04-19	2	Etheostoma fonticola	15	1
2964	City Park	Cabo-2	2023-04-19	2	Palaemonetes sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Etheostoma fonticola	14	1
2964	City Park	Cabo-2	2023-04-19	3	Etheostoma fonticola	12	1
2964	City Park	Cabo-2	2023-04-19	3	Etheostoma fonticola	16	1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	4	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	4	Palaemonetes sp.		1
2964	City Park	Cabo-2	2023-04-19	4	Etheostoma fonticola	14	1
2964	City Park	Cabo-2	2023-04-19	4	Etheostoma fonticola	22	1
2964	City Park	Cabo-2	2023-04-19	4	Etheostoma fonticola	9	1
2964	City Park	Cabo-2	2023-04-19	4	Procambarus sp.		1
2964	City Park	Cabo-2	2023-04-19	5	Etheostoma fonticola	15	1
2964	City Park	Cabo-2	2023-04-19	5	Etheostoma fonticola	17	1
2964	City Park	Cabo-2	2023-04-19	5	Etheostoma fonticola	24	1

2964	City Park	Cabo-2	2023-04-19	5	Gambusia sp.		5
2964	City Park	Cabo-2	2023-04-19	6	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	6	Etheostoma fonticola	21	1
2964	City Park	Cabo-2	2023-04-19	7	Etheostoma fonticola	21	1
2964	City Park	Cabo-2	2023-04-19	7	Etheostoma fonticola	22	1
2964	City Park	Cabo-2	2023-04-19	7	Etheostoma fonticola	19	1
2964	City Park	Cabo-2	2023-04-19	7	Procambarus sp.		1
2964	City Park	Cabo-2	2023-04-19	8	Procambarus sp.		1
2964	City Park	Cabo-2	2023-04-19	8	Etheostoma fonticola	36	1
2964	City Park	Cabo-2	2023-04-19	8	Etheostoma fonticola	23	1
2964	City Park	Cabo-2	2023-04-19	9	Procambarus sp.		2
2964	City Park	Cabo-2	2023-04-19	9	Etheostoma fonticola	18	1
2964	City Park	Cabo-2	2023-04-19	9	Etheostoma fonticola	20	1
2964	City Park	Cabo-2	2023-04-19	10	No fish collected		
2964	City Park	Cabo-2	2023-04-19	11	Procambarus sp.		1
2964	City Park	Cabo-2	2023-04-19	11	Etheostoma fonticola	23	1
2964	City Park	Cabo-2	2023-04-19	11	Etheostoma fonticola	15	1
2964	City Park	Cabo-2	2023-04-19	12	Procambarus sp.		1
2964	City Park	Cabo-2	2023-04-19	12	Etheostoma fonticola	20	1
2964	City Park	Cabo-2	2023-04-19	12	Etheostoma fonticola	14	1
2964	City Park	Cabo-2	2023-04-19	12	Etheostoma fonticola	25	1
2964	City Park	Cabo-2	2023-04-19	12	Etheostoma fonticola	32	1
2964	City Park	Cabo-2	2023-04-19	12	Etheostoma fonticola	17	1
2964	City Park	Cabo-2	2023-04-19	13	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	13	Procambarus sp.		1
2964	City Park	Cabo-2	2023-04-19	13	Etheostoma fonticola	16	1
2964	City Park	Cabo-2	2023-04-19	14	Etheostoma fonticola	25	1
2964	City Park	Cabo-2	2023-04-19	14	Etheostoma fonticola	16	1
2964	City Park	Cabo-2	2023-04-19	14	Etheostoma fonticola	21	1
2964	City Park	Cabo-2	2023-04-19	14	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	15	Procambarus sp.		1
2964	City Park	Cabo-2	2023-04-19	15	Etheostoma fonticola	20	1
2964	City Park	Cabo-2	2023-04-19	15	Etheostoma fonticola	22	1
2964	City Park	Cabo-2	2023-04-19	16	No fish collected		
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1

2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	9	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	11	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	12	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	12	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	12	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	10	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	10	1
2964	City Park	Cabo-2	2023-04-19	1	Gambusia sp.	21	1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	2	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1

2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	3	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	4	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	4	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	5	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	5	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	5	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	5	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	5	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	6	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	14	Etheostoma fonticola	16	1
2964	City Park	Cabo-2	2023-04-19	14	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	14	Gambusia sp.		1
2964	City Park	Cabo-2	2023-04-19	15	Etheostoma fonticola	20	1
2964	City Park	Cabo-2	2023-04-19	15	Etheostoma fonticola	22	1
2965	City Park	Open-1	2023-04-19	1	No fish collected		
2965	City Park	Open-1	2023-04-19	2	No fish collected		
2965	City Park	Open-1	2023-04-19	3	No fish collected		
2965	City Park	Open-1	2023-04-19	4	No fish collected		
2965	City Park	Open-1	2023-04-19	5	No fish collected		
2965	City Park	Open-1	2023-04-19	6	No fish collected		
2965	City Park	Open-1	2023-04-19	7	No fish collected		
2965	City Park	Open-1	2023-04-19	8	No fish collected		
2965	City Park	Open-1	2023-04-19	9	No fish collected		
2965	City Park	Open-1	2023-04-19	10	No fish collected		
2966	City Park	Open-2	2023-04-19	1	No fish collected		
2966	City Park	Open-2	2023-04-19	2	No fish collected		
2966	City Park	Open-2	2023-04-19	3	No fish collected		
2966	City Park	Open-2	2023-04-19	4	No fish collected		
2966	City Park	Open-2	2023-04-19	5	No fish collected		
2966	City Park	Open-2	2023-04-19	6	No fish collected		
2966	City Park	Open-2	2023-04-19	7	No fish collected		
2966	City Park	Open-2	2023-04-19	8	No fish collected		

2966	City Park	Open-2	2023-04-19	9	No fish collected		
2966	City Park	Open-2	2023-04-19	10	No fish collected		
2967	City Park	Pota-1	2023-04-19	1	Gambusia sp.	18	1
2967	City Park	Pota-1	2023-04-19	1	Gambusia sp.	21	1
2967	City Park	Pota-1	2023-04-19	1	Etheostoma fonticola	12	1
2967	City Park	Pota-1	2023-04-19	2	Gambusia sp.	20	1
2967	City Park	Pota-1	2023-04-19	2	Gambusia sp.	13	1
2967	City Park	Pota-1	2023-04-19	2	Lepomis sp.	12	1
2967	City Park	Pota-1	2023-04-19	3	Gambusia sp.	21	1
2967	City Park	Pota-1	2023-04-19	4	Gambusia sp.	23	1
2967	City Park	Pota-1	2023-04-19	5	Lepomis sp.	14	1
2967	City Park	Pota-1	2023-04-19	6	No fish collected		
2967	City Park	Pota-1	2023-04-19	7	No fish collected		
2967	City Park	Pota-1	2023-04-19	8	No fish collected		
2967	City Park	Pota-1	2023-04-19	9	No fish collected		
2967	City Park	Pota-1	2023-04-19	10	No fish collected		
2967	City Park	Pota-1	2023-04-19	11	No fish collected		
2967	City Park	Pota-1	2023-04-19	12	No fish collected		
2967	City Park	Pota-1	2023-04-19	13	No fish collected		
2967	City Park	Pota-1	2023-04-19	14	Etheostoma fonticola	20	1
2967	City Park	Pota-1	2023-04-19	15	No fish collected		
2968	City Park	Pota-2	2023-04-19	1	Gambusia sp.	18	1
2968	City Park	Pota-2	2023-04-19	1	Gambusia sp.	20	1
2968	City Park	Pota-2	2023-04-19	1	Gambusia sp.	11	1
2968	City Park	Pota-2	2023-04-19	1	Etheostoma fonticola	11	1
2968	City Park	Pota-2	2023-04-19	1	Lepomis sp.	9	1
2968	City Park	Pota-2	2023-04-19	2	Ambloplites rupestris	13	1
2968	City Park	Pota-2	2023-04-19	3	No fish collected		
2968	City Park	Pota-2	2023-04-19	4	No fish collected		
2968	City Park	Pota-2	2023-04-19	5	No fish collected		
2968	City Park	Pota-2	2023-04-19	6	Micropterus salmoides	40	1
2968	City Park	Pota-2	2023-04-19	7	No fish collected		
2968	City Park	Pota-2	2023-04-19	8	No fish collected		
2968	City Park	Pota-2	2023-04-19	9	No fish collected		
2968	City Park	Pota-2	2023-04-19	10	No fish collected		
2968	City Park	Pota-2	2023-04-19	11	Lepomis sp.	15	1
2968	City Park	Pota-2	2023-04-19	12	No fish collected		
2968	City Park	Pota-2	2023-04-19	13	No fish collected		
2968	City Park	Pota-2	2023-04-19	14	No fish collected		
2968	City Park	Pota-2	2023-04-19	15	No fish collected		
3053	City Park	Open-1	2023-10-25	1	No fish collected		

3053	City Park	Open-1	2023-10-25	2	No fish collected		
3053	City Park	Open-1	2023-10-25	3	No fish collected		
3053	City Park	Open-1	2023-10-25	4	No fish collected		
3053	City Park	Open-1	2023-10-25	5	No fish collected		
3053	City Park	Open-1	2023-10-25	6	No fish collected		
3053	City Park	Open-1	2023-10-25	7	No fish collected		
3053	City Park	Open-1	2023-10-25	8	No fish collected		
3053	City Park	Open-1	2023-10-25	9	No fish collected		
3053	City Park	Open-1	2023-10-25	10	No fish collected		
3054	City Park	Open-2	2023-10-25	1	No fish collected		
3054	City Park	Open-2	2023-10-25	2	No fish collected		
3054	City Park	Open-2	2023-10-25	3	No fish collected		
3054	City Park	Open-2	2023-10-25	4	No fish collected		
3054	City Park	Open-2	2023-10-25	5	No fish collected		
3054	City Park	Open-2	2023-10-25	6	No fish collected		
3054	City Park	Open-2	2023-10-25	7	No fish collected		
3054	City Park	Open-2	2023-10-25	8	No fish collected		
3054	City Park	Open-2	2023-10-25	9	No fish collected		
3054	City Park	Open-2	2023-10-25	10	No fish collected		
3055	City Park	Bryo-1	2023-10-25	1	Gambusia sp.	15	1
3055	City Park	Bryo-1	2023-10-25	1	Gambusia sp.	12	1
3055	City Park	Bryo-1	2023-10-25	1	Gambusia sp.	14	1
3055	City Park	Bryo-1	2023-10-25	1	Gambusia sp.	20	1
3055	City Park	Bryo-1	2023-10-25	1	Gambusia sp.	10	1
3055	City Park	Bryo-1	2023-10-25	1	Gambusia sp.	10	1
3055	City Park	Bryo-1	2023-10-25	1	Gambusia sp.	14	1
3055	City Park	Bryo-1	2023-10-25	1	Gambusia sp.	12	1
3055	City Park	Bryo-1	2023-10-25	1	Gambusia sp.	14	1
3055	City Park	Bryo-1	2023-10-25	1	Gambusia sp.	10	1
3055	City Park	Bryo-1	2023-10-25	1	Gambusia sp.	12	1
3055	City Park	Bryo-1	2023-10-25	2	Procambarus sp.		2
3055	City Park	Bryo-1	2023-10-25	2	Gambusia sp.	16	1
3055	City Park	Bryo-1	2023-10-25	2	Gambusia sp.	15	1
3055	City Park	Bryo-1	2023-10-25	2	Gambusia sp.	15	1
3055	City Park	Bryo-1	2023-10-25	2	Gambusia sp.	12	1
3055	City Park	Bryo-1	2023-10-25	2	Gambusia sp.	15	1
3055	City Park	Bryo-1	2023-10-25	2	Gambusia sp.	10	1
3055	City Park	Bryo-1	2023-10-25	2	Gambusia sp.	10	1
3055	City Park	Bryo-1	2023-10-25	2	Gambusia sp.	10	1
3055	City Park	Bryo-1	2023-10-25	2	Gambusia sp.	15	1
3055	City Park	Bryo-1	2023-10-25	2	Gambusia sp.	12	1

3055	City Park	Bryo-1	2023-10-25	2	Gambusia sp.	10	1
3055	City Park	Bryo-1	2023-10-25	2	Gambusia sp.	13	1
3055	City Park	Bryo-1	2023-10-25	2	Etheostoma fonticola	14	1
3055	City Park	Bryo-1	2023-10-25	2	Etheostoma fonticola	15	1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	3	Etheostoma fonticola	34	1
3055	City Park	Bryo-1	2023-10-25	3	Etheostoma fonticola	16	1
3055	City Park	Bryo-1	2023-10-25	3	Etheostoma fonticola	15	1
3055	City Park	Bryo-1	2023-10-25	3	Etheostoma fonticola	14	1
3055	City Park	Bryo-1	2023-10-25	3	Etheostoma fonticola	14	1
3055	City Park	Bryo-1	2023-10-25	4	Procambarus sp.		5
3055	City Park	Bryo-1	2023-10-25	4	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	4	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	4	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	4	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	4	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	4	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	4	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	4	Etheostoma fonticola	35	1
3055	City Park	Bryo-1	2023-10-25	4	Etheostoma fonticola	23	1
3055	City Park	Bryo-1	2023-10-25	4	Etheostoma fonticola	12	1
3055	City Park	Bryo-1	2023-10-25	4	Etheostoma fonticola	11	1
3055	City Park	Bryo-1	2023-10-25	5	Procambarus sp.		3
3055	City Park	Bryo-1	2023-10-25	5	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	5	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	5	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	5	Etheostoma fonticola	33	1
3055	City Park	Bryo-1	2023-10-25	5	Etheostoma fonticola	21	1

3055	City Park	Bryo-1	2023-10-25	5	Etheostoma fonticola	31	1
3055	City Park	Bryo-1	2023-10-25	6	Procambarus sp.		3
3055	City Park	Bryo-1	2023-10-25	6	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	6	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	6	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	6	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	6	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	6	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	6	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	6	Etheostoma fonticola	31	1
3055	City Park	Bryo-1	2023-10-25	6	Etheostoma fonticola	26	1
3055	City Park	Bryo-1	2023-10-25	6	Etheostoma fonticola	13	1
3055	City Park	Bryo-1	2023-10-25	7	Procambarus sp.		1
3055	City Park	Bryo-1	2023-10-25	7	Etheostoma fonticola	22	1
3055	City Park	Bryo-1	2023-10-25	8	Procambarus sp.		3
3055	City Park	Bryo-1	2023-10-25	8	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	8	Etheostoma fonticola	30	1
3055	City Park	Bryo-1	2023-10-25	8	Etheostoma fonticola	19	1
3055	City Park	Bryo-1	2023-10-25	9	Procambarus sp.		1
3055	City Park	Bryo-1	2023-10-25	9	Etheostoma fonticola	14	1
3055	City Park	Bryo-1	2023-10-25	9	Etheostoma fonticola	16	1
3055	City Park	Bryo-1	2023-10-25	10	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	10	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	11	Procambarus sp.		8
3055	City Park	Bryo-1	2023-10-25	11	Etheostoma fonticola	24	1
3055	City Park	Bryo-1	2023-10-25	12	Procambarus sp.		1
3055	City Park	Bryo-1	2023-10-25	12	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	13	Procambarus sp.		3
3055	City Park	Bryo-1	2023-10-25	13	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	13	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	13	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	13	Etheostoma fonticola	37	1
3055	City Park	Bryo-1	2023-10-25	13	Etheostoma fonticola	33	1
3055	City Park	Bryo-1	2023-10-25	13	Etheostoma fonticola	12	1
3055	City Park	Bryo-1	2023-10-25	14	Etheostoma fonticola	18	1
3055	City Park	Bryo-1	2023-10-25	14	Etheostoma fonticola	14	1
3055	City Park	Bryo-1	2023-10-25	15	Procambarus sp.		1
3055	City Park	Bryo-1	2023-10-25	12	Gambusia sp.		1
3055	City Park	Bryo-1	2023-10-25	1	Procambarus sp.		7
3055	City Park	Bryo-1	2023-10-25	1	Etheostoma fonticola	11	1
3055	City Park	Bryo-1	2023-10-25	1	Etheostoma fonticola	22	1

3055	City Park	Bryo-1	2023-10-25	1	Etheostoma fonticola	15	1
3055	City Park	Bryo-1	2023-10-25	1	Etheostoma fonticola	26	1
3055	City Park	Bryo-1	2023-10-25	1	Etheostoma fonticola	13	1
3055	City Park	Bryo-1	2023-10-25	1	Etheostoma fonticola	11	1
3055	City Park	Bryo-1	2023-10-25	1	Etheostoma fonticola	12	1
3055	City Park	Bryo-1	2023-10-25	1	Etheostoma fonticola	16	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	14	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	16	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	18	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	25	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	20	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	19	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	24	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	11	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	19	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	22	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	18	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	16	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	25	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	29	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	22	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	10	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	15	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	18	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	17	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	18	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	21	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	18	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	20	1
3056	City Park	Bryo-2	2023-10-25	1	Gambusia sp.	15	1
3056	City Park	Bryo-2	2023-10-25	1	Lepomis miniatus	31	1
3056	City Park	Bryo-2	2023-10-25	1	Etheostoma fonticola	30	1
3056	City Park	Bryo-2	2023-10-25	1	Etheostoma fonticola	31	1
3056	City Park	Bryo-2	2023-10-25	1	Etheostoma fonticola	31	1
3056	City Park	Bryo-2	2023-10-25	2	Procambarus sp.		5
3056	City Park	Bryo-2	2023-10-25	2	Etheostoma fonticola	23	1
3056	City Park	Bryo-2	2023-10-25	2	Etheostoma fonticola	31	1
3056	City Park	Bryo-2	2023-10-25	2	Etheostoma fonticola	27	1
3056	City Park	Bryo-2	2023-10-25	2	Etheostoma fonticola	32	1
3056	City Park	Bryo-2	2023-10-25	2	Etheostoma fonticola	30	1
3056	City Park	Bryo-2	2023-10-25	2	Etheostoma fonticola	15	1

3056	City Park	Bryo-2	2023-10-25	2	Etheostoma fonticola	9	1
3056	City Park	Bryo-2	2023-10-25	2	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	2	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	2	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	2	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	2	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	2	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	2	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	2	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	2	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	2	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	2	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	2	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	3	Procambarus sp.		2
3056	City Park	Bryo-2	2023-10-25	3	Etheostoma fonticola	25	1
3056	City Park	Bryo-2	2023-10-25	3	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	3	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	3	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	3	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	4	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	4	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	4	Etheostoma fonticola	15	1
3056	City Park	Bryo-2	2023-10-25	4	Etheostoma fonticola	14	1
3056	City Park	Bryo-2	2023-10-25	5	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	5	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	5	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	5	Etheostoma fonticola	14	1
3056	City Park	Bryo-2	2023-10-25	5	Notropis chalybaeus	30	1
3056	City Park	Bryo-2	2023-10-25	6	Procambarus sp.		1
3056	City Park	Bryo-2	2023-10-25	6	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	6	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	7	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	7	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	7	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	7	Procambarus sp.		1
3056	City Park	Bryo-2	2023-10-25	7	Etheostoma fonticola	23	1
3056	City Park	Bryo-2	2023-10-25	7	Etheostoma fonticola	32	1
3056	City Park	Bryo-2	2023-10-25	8	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	8	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	9	No fish collected		
3056	City Park	Bryo-2	2023-10-25	10	No fish collected		

3056	City Park	Bryo-2	2023-10-25	11	Procambarus sp.		5
3056	City Park	Bryo-2	2023-10-25	11	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	12	Procambarus sp.		1
3056	City Park	Bryo-2	2023-10-25	12	Etheostoma fonticola	35	1
3056	City Park	Bryo-2	2023-10-25	12	Gambusia sp.		1
3056	City Park	Bryo-2	2023-10-25	13	Procambarus sp.		1
3056	City Park	Bryo-2	2023-10-25	14	Procambarus sp.		1
3056	City Park	Bryo-2	2023-10-25	15	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	1	Lepomis miniatus	75	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	10	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	15	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	20	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	20	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	20	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	10	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	15	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	13	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	10	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	22	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	21	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	14	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	15	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	20	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	13	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	17	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	11	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	10	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	20	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	15	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	18	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	17	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	12	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	10	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	18	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	18	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	20	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	11	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	20	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	20	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	15	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	10	1

3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	16	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	15	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	20	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	16	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	11	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	14	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	12	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	15	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	13	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	29	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	10	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	15	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	10	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	11	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	12	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	10	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	15	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	12	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	12	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	22	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	10	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	12	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	13	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	15	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	15	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	10	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	12	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	13	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	15	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	1	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	1	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	1	1
3057	City Park	Cab-1	2023-10-25	1	Gambusia sp.	1	1
3057	City Park	Cab-1	2023-10-25	1	Procambarus sp.		3
3057	City Park	Cab-1	2023-10-25	1	Etheostoma fonticola	22	1
3057	City Park	Cab-1	2023-10-25	1	Etheostoma fonticola	39	1
3057	City Park	Cab-1	2023-10-25	1	Etheostoma fonticola	34	1
3057	City Park	Cab-1	2023-10-25	1	Etheostoma fonticola	22	1
3057	City Park	Cab-1	2023-10-25	1	Etheostoma fonticola	29	1
3057	City Park	Cab-1	2023-10-25	1	Herichthys cyanoguttatus	34	1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1

3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	2	Procambarus sp.		8
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	30	1
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	28	1
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	37	1
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	27	1
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	29	1
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	26	1
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	35	1
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	30	1
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	28	1
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	29	1
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	26	1
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	29	1
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	28	1
3057	City Park	Cab-1	2023-10-25	2	Etheostoma fonticola	20	1
3057	City Park	Cab-1	2023-10-25	2	Herichthys cyanoguttatus	25	1
3057	City Park	Cab-1	2023-10-25	2	Herichthys cyanoguttatus	40	1
3057	City Park	Cab-1	2023-10-25	3	Procambarus sp.		3
3057	City Park	Cab-1	2023-10-25	3	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	3	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	3	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	3	Etheostoma fonticola	30	1
3057	City Park	Cab-1	2023-10-25	3	Etheostoma fonticola	29	1
3057	City Park	Cab-1	2023-10-25	3	Etheostoma fonticola	32	1
3057	City Park	Cab-1	2023-10-25	3	Palaemonetes sp.		2
3057	City Park	Cab-1	2023-10-25	3	Poecilia latipinna	18	1

3057	City Park	Cab-1	2023-10-25	4	Procambarus sp.		5
3057	City Park	Cab-1	2023-10-25	4	Etheostoma fonticola	33	1
3057	City Park	Cab-1	2023-10-25	4	Etheostoma fonticola	29	1
3057	City Park	Cab-1	2023-10-25	4	Etheostoma fonticola	21	1
3057	City Park	Cab-1	2023-10-25	4	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	4	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	4	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	4	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	5	Lepomis miniatus	65	1
3057	City Park	Cab-1	2023-10-25	5	Ambloplites rupestris	147	1
3057	City Park	Cab-1	2023-10-25	5	Procambarus sp.		3
3057	City Park	Cab-1	2023-10-25	5	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	5	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	5	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	5	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	5	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	5	Etheostoma fonticola	28	1
3057	City Park	Cab-1	2023-10-25	5	Etheostoma fonticola	32	1
3057	City Park	Cab-1	2023-10-25	5	Etheostoma fonticola	29	1
3057	City Park	Cab-1	2023-10-25	5	Etheostoma fonticola	29	1
3057	City Park	Cab-1	2023-10-25	5	Etheostoma fonticola	37	1
3057	City Park	Cab-1	2023-10-25	5	Etheostoma fonticola	32	1
3057	City Park	Cab-1	2023-10-25	5	Etheostoma fonticola	26	1
3057	City Park	Cab-1	2023-10-25	5	Etheostoma fonticola	35	1
3057	City Park	Cab-1	2023-10-25	5	Etheostoma fonticola	28	1
3057	City Park	Cab-1	2023-10-25	6	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	6	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	6	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	6	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	6	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	7	No fish collected		
3057	City Park	Cab-1	2023-10-25	8	Procambarus sp.		1
3057	City Park	Cab-1	2023-10-25	8	Etheostoma fonticola	27	1
3057	City Park	Cab-1	2023-10-25	8	Etheostoma fonticola	29	1
3057	City Park	Cab-1	2023-10-25	9	Procambarus sp.		2
3057	City Park	Cab-1	2023-10-25	9	Etheostoma fonticola	28	1
3057	City Park	Cab-1	2023-10-25	9	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	10	Procambarus sp.		2
3057	City Park	Cab-1	2023-10-25	11	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	11	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	11	Gambusia sp.		1

3057	City Park	Cab-1	2023-10-25	11	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	11	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	11	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	11	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	12	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	12	Gambusia sp.		1
3057	City Park	Cab-1	2023-10-25	12	Procambarus sp.		1
3057	City Park	Cab-1	2023-10-25	1	Palaemonetes sp.		2
3057	City Park	Cab-1	2023-10-25	6	Ambloplites rupestris	80	1
3057	City Park	Cab-1	2023-10-25	12	Etheostoma fonticola	34	1
3057	City Park	Cab-1	2023-10-25	13	Procambarus sp.		1
3057	City Park	Cab-1	2023-10-25	13	Etheostoma fonticola	31	1
3057	City Park	Cab-1	2023-10-25	14	Lepomis miniatus	53	1
3057	City Park	Cab-1	2023-10-25	15	No fish collected		
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	10	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	10	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	10	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	10	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	10	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	16	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	10	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	12	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	19	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	14	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	12	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	10	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	15	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	10	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	10	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	13	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	15	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	15	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	15	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.	10	1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1

3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	1	Etheostoma fonticola	30	1
3058	City Park	Cab-2	2023-10-25	1	Etheostoma fonticola	30	1
3058	City Park	Cab-2	2023-10-25	1	Etheostoma fonticola	17	1
3058	City Park	Cab-2	2023-10-25	1	Etheostoma fonticola	32	1
3058	City Park	Cab-2	2023-10-25	1	Etheostoma fonticola	30	1
3058	City Park	Cab-2	2023-10-25	1	Etheostoma fonticola	30	1
3058	City Park	Cab-2	2023-10-25	1	Etheostoma fonticola	25	1
3058	City Park	Cab-2	2023-10-25	1	Etheostoma fonticola	31	1
3058	City Park	Cab-2	2023-10-25	1	Etheostoma fonticola	27	1
3058	City Park	Cab-2	2023-10-25	1	Etheostoma fonticola	30	1
3058	City Park	Cab-2	2023-10-25	2	Etheostoma fonticola	30	1
3058	City Park	Cab-2	2023-10-25	2	Etheostoma fonticola	29	1
3058	City Park	Cab-2	2023-10-25	2	Etheostoma fonticola	29	1
3058	City Park	Cab-2	2023-10-25	2	Procambarus sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1

3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	2	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	3	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	3	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	3	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	3	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	3	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	3	Etheostoma fonticola	27	1
3058	City Park	Cab-2	2023-10-25	3	Etheostoma fonticola	25	1
3058	City Park	Cab-2	2023-10-25	4	No fish collected		
3058	City Park	Cab-2	2023-10-25	5	Etheostoma fonticola	32	1
3058	City Park	Cab-2	2023-10-25	5	Etheostoma fonticola	33	1
3058	City Park	Cab-2	2023-10-25	5	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	5	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	5	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	5	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	5	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	5	Procambarus sp.		4
3058	City Park	Cab-2	2023-10-25	5	Ambloplites rupestris	68	1
3058	City Park	Cab-2	2023-10-25	5	Herichthys cyanoguttatus	38	1
3058	City Park	Cab-2	2023-10-25	6	Etheostoma fonticola	34	1
3058	City Park	Cab-2	2023-10-25	6	Etheostoma fonticola	29	1

3058	City Park	Cab-2	2023-10-25	3	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	6	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	6	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	6	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	7	Lepomis miniatus	87	1
3058	City Park	Cab-2	2023-10-25	7	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	8	No fish collected		
3058	City Park	Cab-2	2023-10-25	9	Etheostoma fonticola	28	1
3058	City Park	Cab-2	2023-10-25	9	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	10	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	10	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	11	Lepomis miniatus	75	1
3058	City Park	Cab-2	2023-10-25	11	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	12	Gambusia sp.		1
3058	City Park	Cab-2	2023-10-25	12	Etheostoma fonticola	25	1
3058	City Park	Cab-2	2023-10-25	13	No fish collected		
3058	City Park	Cab-2	2023-10-25	14	No fish collected		
3058	City Park	Cab-2	2023-10-25	15	Herichthys cyanoguttatus	25	1
2969	I-35	Cabo-1	2023-04-20	1	Gambusia sp.	26	1
2969	I-35	Cabo-1	2023-04-20	1	Gambusia sp.	10	1
2969	I-35	Cabo-1	2023-04-20	1	Gambusia sp.	17	1
2969	I-35	Cabo-1	2023-04-20	1	Etheostoma fonticola	29	1
2969	I-35	Cabo-1	2023-04-20	1	Etheostoma fonticola	30	1
2969	I-35	Cabo-1	2023-04-20	1	Etheostoma fonticola	12	1
2969	I-35	Cabo-1	2023-04-20	1	Etheostoma fonticola	14	1
2969	I-35	Cabo-1	2023-04-20	1	Etheostoma fonticola	15	1
2969	I-35	Cabo-1	2023-04-20	1	Etheostoma fonticola	20	1
2969	I-35	Cabo-1	2023-04-20	1	Lepomis miniatus	70	1
2969	I-35	Cabo-1	2023-04-20	1	Lepomis miniatus	74	1
2969	I-35	Cabo-1	2023-04-20	1	Ambloplites rupestris	18	1
2969	I-35	Cabo-1	2023-04-20	1	Ambloplites rupestris	14	1
2969	I-35	Cabo-1	2023-04-20	1	Ambloplites rupestris	12	1
2969	I-35	Cabo-1	2023-04-20	1	Procambarus sp.		2
2969	I-35	Cabo-1	2023-04-20	1	Palaemonetes sp.		1
2969	I-35	Cabo-1	2023-04-20	1	Lepomis sp.	10	1
2969	I-35	Cabo-1	2023-04-20	2	Etheostoma fonticola	24	1
2969	I-35	Cabo-1	2023-04-20	2	Gambusia sp.	30	1
2969	I-35	Cabo-1	2023-04-20	2	Gambusia sp.	35	1
2969	I-35	Cabo-1	2023-04-20	2	Gambusia sp.	25	1
2969	I-35	Cabo-1	2023-04-20	2	Gambusia sp.	37	1
2969	I-35	Cabo-1	2023-04-20	2	Gambusia sp.	11	1

2969	I-35	Cabo-1	2023-04-20	2	Ambloplites rupestris	22	1
2969	I-35	Cabo-1	2023-04-20	2	Palaemonetes sp.		1
2969	I-35	Cabo-1	2023-04-20	3	Etheostoma fonticola	14	1
2969	I-35	Cabo-1	2023-04-20	3	Etheostoma fonticola	21	1
2969	I-35	Cabo-1	2023-04-20	3	Etheostoma fonticola	15	1
2969	I-35	Cabo-1	2023-04-20	3	Etheostoma fonticola	16	1
2969	I-35	Cabo-1	2023-04-20	3	Palaemonetes sp.		1
2969	I-35	Cabo-1	2023-04-20	3	Procambarus sp.		2
2969	I-35	Cabo-1	2023-04-20	3	Gambusia sp.	10	1
2969	I-35	Cabo-1	2023-04-20	3	Gambusia sp.	20	1
2969	I-35	Cabo-1	2023-04-20	3	Gambusia sp.	7	1
2969	I-35	Cabo-1	2023-04-20	3	Gambusia sp.	9	1
2969	I-35	Cabo-1	2023-04-20	3	Lepomis sp.	11	1
2969	I-35	Cabo-1	2023-04-20	4	Gambusia sp.	38	1
2969	I-35	Cabo-1	2023-04-20	4	Gambusia sp.	22	1
2969	I-35	Cabo-1	2023-04-20	4	Etheostoma fonticola	12	1
2969	I-35	Cabo-1	2023-04-20	4	Lepomis sp.	12	1
2969	I-35	Cabo-1	2023-04-20	4	Lepomis sp.	11	1
2969	I-35	Cabo-1	2023-04-20	4	Palaemonetes sp.		1
2969	I-35	Cabo-1	2023-04-20	5	Procambarus sp.		4
2969	I-35	Cabo-1	2023-04-20	5	Etheostoma fonticola	25	1
2969	I-35	Cabo-1	2023-04-20	5	Etheostoma fonticola	11	1
2969	I-35	Cabo-1	2023-04-20	6	Procambarus sp.		1
2969	I-35	Cabo-1	2023-04-20	6	Etheostoma fonticola	14	1
2969	I-35	Cabo-1	2023-04-20	6	Etheostoma fonticola	32	1
2969	I-35	Cabo-1	2023-04-20	6	Etheostoma fonticola	10	1
2969	I-35	Cabo-1	2023-04-20	6	Etheostoma fonticola	7	1
2969	I-35	Cabo-1	2023-04-20	6	Procambarus sp.		2
2969	I-35	Cabo-1	2023-04-20	7	Etheostoma fonticola	35	1
2969	I-35	Cabo-1	2023-04-20	7	Etheostoma fonticola	17	1
2969	I-35	Cabo-1	2023-04-20	7	Etheostoma fonticola	11	1
2969	I-35	Cabo-1	2023-04-20	7	Etheostoma fonticola	15	1
2969	I-35	Cabo-1	2023-04-20	7	Palaemonetes sp.		1
2969	I-35	Cabo-1	2023-04-20	7	Procambarus sp.		2
2969	I-35	Cabo-1	2023-04-20	7	Lepomis sp.	10	1
2969	I-35	Cabo-1	2023-04-20	8	Etheostoma fonticola	11	1
2969	I-35	Cabo-1	2023-04-20	8	Palaemonetes sp.		4
2969	I-35	Cabo-1	2023-04-20	8	Gambusia sp.	10	1
2969	I-35	Cabo-1	2023-04-20	9	Procambarus sp.		1
2969	I-35	Cabo-1	2023-04-20	10	Etheostoma fonticola	14	1
2969	I-35	Cabo-1	2023-04-20	10	Etheostoma fonticola	10	1

2969	I-35	Cabo-1	2023-04-20	10	Palaemonetes sp.		1
2969	I-35	Cabo-1	2023-04-20	10	Procambarus sp.		1
2969	I-35	Cabo-1	2023-04-20	11	Lepomis sp.	10	1
2969	I-35	Cabo-1	2023-04-20	11	Lepomis sp.	18	1
2969	I-35	Cabo-1	2023-04-20	11	Etheostoma fonticola	14	1
2969	I-35	Cabo-1	2023-04-20	11	Etheostoma fonticola	15	1
2969	I-35	Cabo-1	2023-04-20	12	No fish collected		
2969	I-35	Cabo-1	2023-04-20	13	Etheostoma fonticola	32	1
2969	I-35	Cabo-1	2023-04-20	13	Procambarus sp.		3
2969	I-35	Cabo-1	2023-04-20	14	Lepomis miniatus	55	1
2969	I-35	Cabo-1	2023-04-20	14	Procambarus sp.		1
2969	I-35	Cabo-1	2023-04-20	14	Lepomis sp.	10	1
2969	I-35	Cabo-1	2023-04-20	14	Etheostoma fonticola	9	1
2969	I-35	Cabo-1	2023-04-20	15	Etheostoma fonticola	27	1
2969	I-35	Cabo-1	2023-04-20	16	Etheostoma fonticola	21	1
2969	I-35	Cabo-1	2023-04-20	16	Palaemonetes sp.		2
2969	I-35	Cabo-1	2023-04-20	16	Gambusia sp.	10	1
2969	I-35	Cabo-1	2023-04-20	17	No fish collected		
2969	I-35	Cabo-1	2023-04-20	1	Ambloplites rupestris	12	1
2969	I-35	Cabo-1	2023-04-20	1	Etheostoma fonticola	14	1
2969	I-35	Cabo-1	2023-04-20	1	Etheostoma fonticola	14	1
2969	I-35	Cabo-1	2023-04-20	1	Etheostoma fonticola	12	1
2969	I-35	Cabo-1	2023-04-20	1	Etheostoma fonticola	12	1
2969	I-35	Cabo-1	2023-04-20	1	Gambusia sp.	10	1
2969	I-35	Cabo-1	2023-04-20	1	Gambusia sp.	10	1
2969	I-35	Cabo-1	2023-04-20	1	Gambusia sp.	10	1
2969	I-35	Cabo-1	2023-04-20	1	Gambusia sp.	10	1
2969	I-35	Cabo-1	2023-04-20	1	Ambloplites rupestris	18	1
2969	I-35	Cabo-1	2023-04-20	6	Etheostoma fonticola	10	1
2970	I-35	Lud-1	2023-04-20	1	No fish collected		
2970	I-35	Lud-1	2023-04-20	2	Procambarus sp.		3
2970	I-35	Lud-1	2023-04-20	3	Procambarus sp.		2
2970	I-35	Lud-1	2023-04-20	4	Procambarus sp.		2
2970	I-35	Lud-1	2023-04-20	5	Procambarus sp.		1
2970	I-35	Lud-1	2023-04-20	6	Procambarus sp.		2
2970	I-35	Lud-1	2023-04-20	7	Etheostoma fonticola	30	1
2970	I-35	Lud-1	2023-04-20	8	Etheostoma fonticola	28	1
2970	I-35	Lud-1	2023-04-20	8	Procambarus sp.		2
2970	I-35	Lud-1	2023-04-20	9	Procambarus sp.		1
2970	I-35	Lud-1	2023-04-20	10	Etheostoma fonticola	34	1
2970	I-35	Lud-1	2023-04-20	10	Procambarus sp.		1

2970	I-35	Lud-1	2023-04-20	11	Procambarus sp.		2
2970	I-35	Lud-1	2023-04-20	12	Procambarus sp.		2
2970	I-35	Lud-1	2023-04-20	12	Gambusia sp.	12	1
2970	I-35	Lud-1	2023-04-20	13	No fish collected		
2970	I-35	Lud-1	2023-04-20	14	No fish collected		
2970	I-35	Lud-1	2023-04-20	15	Etheostoma fonticola	25	1
2970	I-35	Lud-1	2023-04-20	16	Procambarus sp.		1
2971	I-35	Hyg-1	2023-04-20	1	Procambarus sp.		2
2971	I-35	Hyg-1	2023-04-20	1	Etheostoma fonticola	34	1
2971	I-35	Hyg-1	2023-04-20	1	Etheostoma fonticola	28	1
2971	I-35	Hyg-1	2023-04-20	1	Etheostoma fonticola	26	1
2971	I-35	Hyg-1	2023-04-20	1	Gambusia sp.	25	1
2971	I-35	Hyg-1	2023-04-20	1	Gambusia sp.	24	1
2971	I-35	Hyg-1	2023-04-20	1	Gambusia sp.	20	1
2971	I-35	Hyg-1	2023-04-20	2	Procambarus sp.		8
2971	I-35	Hyg-1	2023-04-20	2	Etheostoma fonticola	32	1
2971	I-35	Hyg-1	2023-04-20	2	Etheostoma fonticola	26	1
2971	I-35	Hyg-1	2023-04-20	2	Etheostoma fonticola	35	1
2971	I-35	Hyg-1	2023-04-20	2	Etheostoma fonticola	30	1
2971	I-35	Hyg-1	2023-04-20	2	Gambusia sp.	35	1
2971	I-35	Hyg-1	2023-04-20	2	Gambusia sp.	22	1
2971	I-35	Hyg-1	2023-04-20	2	Gambusia sp.	32	1
2971	I-35	Hyg-1	2023-04-20	3	Etheostoma fonticola	37	1
2971	I-35	Hyg-1	2023-04-20	3	Gambusia sp.	28	1
2971	I-35	Hyg-1	2023-04-20	3	Gambusia sp.	29	1
2971	I-35	Hyg-1	2023-04-20	4	Procambarus sp.		3
2971	I-35	Hyg-1	2023-04-20	4	Gambusia sp.	30	1
2971	I-35	Hyg-1	2023-04-20	5	Procambarus sp.		2
2971	I-35	Hyg-1	2023-04-20	5	Etheostoma fonticola	30	1
2971	I-35	Hyg-1	2023-04-20	5	Ameiurus natalis	20	1
2971	I-35	Hyg-1	2023-04-20	5	Ameiurus natalis	18	1
2971	I-35	Hyg-1	2023-04-20	5	Gambusia sp.	22	1
2971	I-35	Hyg-1	2023-04-20	6	Procambarus sp.		2
2971	I-35	Hyg-1	2023-04-20	7	Ameiurus natalis	30	1
2971	I-35	Hyg-1	2023-04-20	8	Ameiurus natalis	31	1
2971	I-35	Hyg-1	2023-04-20	8	Etheostoma fonticola	35	1
2971	I-35	Hyg-1	2023-04-20	8	Etheostoma fonticola	25	1
2971	I-35	Hyg-1	2023-04-20	9	Procambarus sp.		1
2971	I-35	Hyg-1	2023-04-20	10	Procambarus sp.		1
2971	I-35	Hyg-1	2023-04-20	10	Ameiurus natalis	18	1
2971	I-35	Hyg-1	2023-04-20	10	Etheostoma fonticola	20	1

2971	I-35	Hyg-1	2023-04-20	11	Procambarus sp.		2
2971	I-35	Hyg-1	2023-04-20	12	Palaemonetes sp.		1
2971	I-35	Hyg-1	2023-04-20	12	Etheostoma fonticola	24	1
2971	I-35	Hyg-1	2023-04-20	13	Etheostoma fonticola	35	1
2971	I-35	Hyg-1	2023-04-20	14	No fish collected		
2971	I-35	Hyg-1	2023-04-20	15	Procambarus sp.		1
2971	I-35	Hyg-1	2023-04-20	2	Gambusia sp.	22	1
2972	I-35	Hyg-2	2023-04-20	1	Procambarus sp.		7
2972	I-35	Hyg-2	2023-04-20	1	Gambusia sp.	21	1
2972	I-35	Hyg-2	2023-04-20	1	Gambusia sp.	22	1
2972	I-35	Hyg-2	2023-04-20	1	Gambusia sp.	28	1
2972	I-35	Hyg-2	2023-04-20	1	Gambusia sp.	31	1
2972	I-35	Hyg-2	2023-04-20	1	Gambusia sp.	24	1
2972	I-35	Hyg-2	2023-04-20	1	Etheostoma fonticola	24	1
2972	I-35	Hyg-2	2023-04-20	1	Etheostoma fonticola	26	1
2972	I-35	Hyg-2	2023-04-20	1	Etheostoma fonticola	22	1
2972	I-35	Hyg-2	2023-04-20	1	Ameiurus natalis	18	1
2972	I-35	Hyg-2	2023-04-20	2	Procambarus sp.		6
2972	I-35	Hyg-2	2023-04-20	2	Etheostoma fonticola	18	1
2972	I-35	Hyg-2	2023-04-20	2	Etheostoma fonticola	23	1
2972	I-35	Hyg-2	2023-04-20	2	Gambusia sp.	21	1
2972	I-35	Hyg-2	2023-04-20	2	Gambusia sp.	22	1
2972	I-35	Hyg-2	2023-04-20	2	Gambusia sp.	16	1
2972	I-35	Hyg-2	2023-04-20	3	Procambarus sp.		4
2972	I-35	Hyg-2	2023-04-20	3	Etheostoma fonticola	26	1
2972	I-35	Hyg-2	2023-04-20	3	Etheostoma fonticola	24	1
2972	I-35	Hyg-2	2023-04-20	3	Etheostoma fonticola	30	1
2972	I-35	Hyg-2	2023-04-20	3	Etheostoma fonticola	28	1
2972	I-35	Hyg-2	2023-04-20	4	Procambarus sp.		4
2972	I-35	Hyg-2	2023-04-20	4	Etheostoma fonticola	18	1
2972	I-35	Hyg-2	2023-04-20	4	Etheostoma fonticola	22	1
2972	I-35	Hyg-2	2023-04-20	4	Ameiurus natalis	20	1
2972	I-35	Hyg-2	2023-04-20	4	Gambusia sp.	22	1
2972	I-35	Hyg-2	2023-04-20	4	Gambusia sp.	21	1
2972	I-35	Hyg-2	2023-04-20	5	Etheostoma fonticola	26	1
2972	I-35	Hyg-2	2023-04-20	5	Procambarus sp.		2
2972	I-35	Hyg-2	2023-04-20	6	Procambarus sp.		3
2972	I-35	Hyg-2	2023-04-20	6	Etheostoma fonticola	25	1
2972	I-35	Hyg-2	2023-04-20	7	Etheostoma fonticola	20	1
2972	I-35	Hyg-2	2023-04-20	7	Gambusia sp.	21	1
2972	I-35	Hyg-2	2023-04-20	7	Gambusia sp.	28	1

2972	I-35	Hyg-2	2023-04-20	8	Gambusia sp.	20	1
2972	I-35	Hyg-2	2023-04-20	8	Etheostoma fonticola	26	1
2972	I-35	Hyg-2	2023-04-20	9	Etheostoma fonticola	26	1
2972	I-35	Hyg-2	2023-04-20	9	Etheostoma fonticola	30	1
2972	I-35	Hyg-2	2023-04-20	9	Gambusia sp.	37	1
2972	I-35	Hyg-2	2023-04-20	9	Gambusia sp.	16	1
2972	I-35	Hyg-2	2023-04-20	10	No fish collected		
2972	I-35	Hyg-2	2023-04-20	11	No fish collected		
2972	I-35	Hyg-2	2023-04-20	12	No fish collected		
2972	I-35	Hyg-2	2023-04-20	13	Gambusia sp.	26	1
2972	I-35	Hyg-2	2023-04-20	13	Procambarus sp.		1
2972	I-35	Hyg-2	2023-04-20	14	No fish collected		
2972	I-35	Hyg-2	2023-04-20	15	No fish collected		
2972	I-35	Hyg-2	2023-04-20	1	Gambusia sp.	21	1
2972	I-35	Hyg-2	2023-04-20	1	Gambusia sp.	22	1
2972	I-35	Hyg-2	2023-04-20	3	Etheostoma fonticola	24	1
2972	I-35	Hyg-2	2023-04-20	4	Ameiurus natalis	20	1
2972	I-35	Hyg-2	2023-04-20	4	Etheostoma fonticola	22	1
2973	I-35	Sag-1	2023-04-20	1	Etheostoma fonticola	40	1
2973	I-35	Sag-1	2023-04-20	1	Etheostoma fonticola	17	1
2973	I-35	Sag-1	2023-04-20	1	Etheostoma fonticola	27	1
2973	I-35	Sag-1	2023-04-20	1	Etheostoma fonticola	26	1
2973	I-35	Sag-1	2023-04-20	1	Ambloplites rupestris	25	1
2973	I-35	Sag-1	2023-04-20	1	Ambloplites rupestris	12	1
2973	I-35	Sag-1	2023-04-20	1	Gambusia sp.	10	1
2973	I-35	Sag-1	2023-04-20	1	Gambusia sp.	20	1
2973	I-35	Sag-1	2023-04-20	1	Procambarus sp.		1
2973	I-35	Sag-1	2023-04-20	1	Palaemonetes sp.		1
2973	I-35	Sag-1	2023-04-20	2	Ambloplites rupestris	185	1
2973	I-35	Sag-1	2023-04-20	2	Procambarus sp.		3
2973	I-35	Sag-1	2023-04-20	2	Etheostoma fonticola	15	1
2973	I-35	Sag-1	2023-04-20	2	Etheostoma fonticola	9	1
2973	I-35	Sag-1	2023-04-20	2	Gambusia sp.	9	1
2973	I-35	Sag-1	2023-04-20	2	Gambusia sp.	10	1
2973	I-35	Sag-1	2023-04-20	3	Procambarus sp.		1
2973	I-35	Sag-1	2023-04-20	3	Lepomis miniatus	60	1
2973	I-35	Sag-1	2023-04-20	3	Gambusia sp.	20	1
2973	I-35	Sag-1	2023-04-20	3	Gambusia sp.	18	1
2973	I-35	Sag-1	2023-04-20	3	Gambusia sp.	10	1
2973	I-35	Sag-1	2023-04-20	3	Gambusia sp.	7	1
2973	I-35	Sag-1	2023-04-20	4	Gambusia sp.	25	1

2973	I-35	Sag-1	2023-04-20	4	Procambarus sp.		1
2973	I-35	Sag-1	2023-04-20	5	Procambarus sp.		1
2973	I-35	Sag-1	2023-04-20	5	Gambusia sp.	10	1
2973	I-35	Sag-1	2023-04-20	5	Gambusia sp.	12	1
2973	I-35	Sag-1	2023-04-20	6	No fish collected		
2973	I-35	Sag-1	2023-04-20	7	Procambarus sp.		1
2973	I-35	Sag-1	2023-04-20	7	Gambusia sp.	26	1
2973	I-35	Sag-1	2023-04-20	7	Gambusia sp.	27	1
2973	I-35	Sag-1	2023-04-20	8	Ambloplites rupestris	74	1
2973	I-35	Sag-1	2023-04-20	8	Gambusia sp.	10	1
2973	I-35	Sag-1	2023-04-20	8	Gambusia sp.	9	1
2973	I-35	Sag-1	2023-04-20	8	Procambarus sp.		2
2973	I-35	Sag-1	2023-04-20	9	Ambloplites rupestris	15	1
2973	I-35	Sag-1	2023-04-20	9	Gambusia sp.	18	1
2973	I-35	Sag-1	2023-04-20	9	Gambusia sp.	20	1
2973	I-35	Sag-1	2023-04-20	9	Gambusia sp.	7	2
2973	I-35	Sag-1	2023-04-20	10	Procambarus sp.		2
2973	I-35	Sag-1	2023-04-20	10	Gambusia sp.	10	1
2973	I-35	Sag-1	2023-04-20	11	Procambarus sp.		2
2973	I-35	Sag-1	2023-04-20	12	Etheostoma fonticola	16	1
2973	I-35	Sag-1	2023-04-20	12	Procambarus sp.		1
2973	I-35	Sag-1	2023-04-20	13	Procambarus sp.		1
2973	I-35	Sag-1	2023-04-20	14	No fish collected		
2973	I-35	Sag-1	2023-04-20	15	No fish collected		
2973	I-35	Sag-1	2023-04-20	1	Gambusia sp.	10	1
2973	I-35	Sag-1	2023-04-20	1	Gambusia sp.	10	1
2973	I-35	Sag-1	2023-04-20	2	Gambusia sp.	10	1
2973	I-35	Sag-1	2023-04-20	2	Gambusia sp.	10	1
2973	I-35	Sag-1	2023-04-20	2	Gambusia sp.	10	1
2973	I-35	Sag-1	2023-04-20	2	Gambusia sp.	9	1
2974	I-35	Sag-2	2023-04-20	1	Procambarus sp.		4
2974	I-35	Sag-2	2023-04-20	1	Lepomis miniatus	75	1
2974	I-35	Sag-2	2023-04-20	1	Lepomis miniatus	86	1
2974	I-35	Sag-2	2023-04-20	1	Lepomis miniatus	87	1
2974	I-35	Sag-2	2023-04-20	1	Etheostoma fonticola	33	1
2974	I-35	Sag-2	2023-04-20	1	Etheostoma fonticola	32	1
2974	I-35	Sag-2	2023-04-20	1	Gambusia sp.	20	1
2974	I-35	Sag-2	2023-04-20	1	Gambusia sp.	13	1
2974	I-35	Sag-2	2023-04-20	1	Gambusia sp.	11	1
2974	I-35	Sag-2	2023-04-20	1	Gambusia sp.	10	1
2974	I-35	Sag-2	2023-04-20	1	Lepomis sp.	9	1

2974	I-35	Sag-2	2023-04-20	2	Gambusia sp.	10	1
2974	I-35	Sag-2	2023-04-20	2	Gambusia sp.	20	1
2974	I-35	Sag-2	2023-04-20	2	Gambusia sp.	18	1
2974	I-35	Sag-2	2023-04-20	2	Ambloplites rupestris	15	1
2974	I-35	Sag-2	2023-04-20	2	Etheostoma fonticola	38	1
2974	I-35	Sag-2	2023-04-20	2	Etheostoma fonticola	23	1
2974	I-35	Sag-2	2023-04-20	2	Etheostoma fonticola	25	1
2974	I-35	Sag-2	2023-04-20	2	Procambarus sp.		2
2974	I-35	Sag-2	2023-04-20	3	Procambarus sp.		8
2974	I-35	Sag-2	2023-04-20	3	Ambloplites rupestris	84	1
2974	I-35	Sag-2	2023-04-20	3	Etheostoma fonticola	16	1
2974	I-35	Sag-2	2023-04-20	3	Etheostoma fonticola	35	1
2974	I-35	Sag-2	2023-04-20	3	Etheostoma fonticola	20	1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.	22	1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.	21	1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	4	Lepomis miniatus	74	1
2974	I-35	Sag-2	2023-04-20	4	Procambarus sp.		4
2974	I-35	Sag-2	2023-04-20	4	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	5	Procambarus sp.		3
2974	I-35	Sag-2	2023-04-20	5	Etheostoma fonticola	22	1
2974	I-35	Sag-2	2023-04-20	5	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	6	Procambarus sp.		5
2974	I-35	Sag-2	2023-04-20	6	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	6	Etheostoma fonticola	16	1
2974	I-35	Sag-2	2023-04-20	7	Procambarus sp.		3
2974	I-35	Sag-2	2023-04-20	7	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	8	Procambarus sp.		4
2974	I-35	Sag-2	2023-04-20	8	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	8	Herichthys cyanoguttatus	46	1
2974	I-35	Sag-2	2023-04-20	9	Procambarus sp.		1
2974	I-35	Sag-2	2023-04-20	9	Etheostoma fonticola	18	1
2974	I-35	Sag-2	2023-04-20	10	Procambarus sp.		1
2974	I-35	Sag-2	2023-04-20	11	Lepomis miniatus	62	1
2974	I-35	Sag-2	2023-04-20	11	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	12	Procambarus sp.		4
2974	I-35	Sag-2	2023-04-20	12	Lepomis miniatus	57	1
2974	I-35	Sag-2	2023-04-20	13	Etheostoma fonticola	17	1
2974	I-35	Sag-2	2023-04-20	13	Etheostoma fonticola	12	1
2974	I-35	Sag-2	2023-04-20	13	Lepomis sp.	10	1
2974	I-35	Sag-2	2023-04-20	13	Procambarus sp.		3

2974	I-35	Sag-2	2023-04-20	13	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	14	Procambarus sp.		2
2974	I-35	Sag-2	2023-04-20	15	Procambarus sp.		1
2974	I-35	Sag-2	2023-04-20	1	Gambusia sp.	13	1
2974	I-35	Sag-2	2023-04-20	1	Gambusia sp.	10	1
2974	I-35	Sag-2	2023-04-20	1	Gambusia sp.	10	1
2974	I-35	Sag-2	2023-04-20	1	Gambusia sp.	10	1
2974	I-35	Sag-2	2023-04-20	1	Gambusia sp.	10	1
2974	I-35	Sag-2	2023-04-20	1	Gambusia sp.	10	1
2974	I-35	Sag-2	2023-04-20				
2974	I-35	Sag-2	2023-04-20	2	Gambusia sp.	10	1
2974	I-35	Sag-2	2023-04-20	2	Gambusia sp.	10	1
2974	I-35	Sag-2	2023-04-20	2	Gambusia sp.	10	1
2974	I-35	Sag-2	2023-04-20	2	Gambusia sp.	10	1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	3	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	3	Etheostoma fonticola	16	1
2974	I-35	Sag-2	2023-04-20	5	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	5	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	6	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	7	Gambusia sp.		1
2974	I-35	Sag-2	2023-04-20	8	Gambusia sp.		1
2975	I-35	Open-1	2023-04-20	1	No fish collected		
2975	I-35	Open-1	2023-04-20	2	No fish collected		
2975	I-35	Open-1	2023-04-20	3	No fish collected		
2975	I-35	Open-1	2023-04-20	4	No fish collected		
2975	I-35	Open-1	2023-04-20	5	No fish collected		
2975	I-35	Open-1	2023-04-20	6	No fish collected		
2975	I-35	Open-1	2023-04-20	7	No fish collected		
2975	I-35	Open-1	2023-04-20	8	No fish collected		

2975	I-35	Open-1	2023-04-20	9	No fish collected		
2975	I-35	Open-1	2023-04-20	10	No fish collected		
2976	I-35	Cab-2	2023-04-20	1	Herichthys cyanoguttatus	51	1
2976	I-35	Cab-2	2023-04-20	1	Procambarus sp.		8
2976	I-35	Cab-2	2023-04-20	1	Etheostoma fonticola	20	1
2976	I-35	Cab-2	2023-04-20	1	Etheostoma fonticola	22	1
2976	I-35	Cab-2	2023-04-20	1	Etheostoma fonticola	28	1
2976	I-35	Cab-2	2023-04-20	1	Etheostoma fonticola	24	1
2976	I-35	Cab-2	2023-04-20	1	Etheostoma fonticola	26	1
2976	I-35	Cab-2	2023-04-20	1	Etheostoma fonticola	25	1
2976	I-35	Cab-2	2023-04-20	1	Etheostoma fonticola	16	1
2976	I-35	Cab-2	2023-04-20	1	Palaemonetes sp.		3
2976	I-35	Cab-2	2023-04-20	1	Lepomis miniatus	53	1
2976	I-35	Cab-2	2023-04-20	1	Gambusia sp.	9	1
2976	I-35	Cab-2	2023-04-20	1	Gambusia sp.	15	1
2976	I-35	Cab-2	2023-04-20	1	Gambusia sp.	10	1
2976	I-35	Cab-2	2023-04-20	1	Lepomis sp.	10	1
2976	I-35	Cab-2	2023-04-20	2	Lepomis sp.	18	1
2976	I-35	Cab-2	2023-04-20	2	Gambusia sp.	9	1
2976	I-35	Cab-2	2023-04-20	2	Etheostoma fonticola	20	1
2976	I-35	Cab-2	2023-04-20	2	Etheostoma fonticola	21	1
2976	I-35	Cab-2	2023-04-20	3	Procambarus sp.		2
2976	I-35	Cab-2	2023-04-20	3	Herichthys cyanoguttatus	51	1
2976	I-35	Cab-2	2023-04-20	3	Gambusia sp.	10	1
2976	I-35	Cab-2	2023-04-20	3	Gambusia sp.	21	1
2976	I-35	Cab-2	2023-04-20	4	Gambusia sp.	10	1
2976	I-35	Cab-2	2023-04-20	4	Etheostoma fonticola	20	1
2976	I-35	Cab-2	2023-04-20	4	Palaemonetes sp.		1
2976	I-35	Cab-2	2023-04-20	5	Procambarus sp.		1
2976	I-35	Cab-2	2023-04-20	6	Lepomis miniatus	58	1
2976	I-35	Cab-2	2023-04-20	6	Etheostoma fonticola	22	1
2976	I-35	Cab-2	2023-04-20	6	Etheostoma fonticola	27	1
2976	I-35	Cab-2	2023-04-20	6	Procambarus sp.		2
2976	I-35	Cab-2	2023-04-20	6	Gambusia sp.	10	1
2976	I-35	Cab-2	2023-04-20	7	Etheostoma fonticola	31	1
2976	I-35	Cab-2	2023-04-20	8	Etheostoma fonticola	28	1
2976	I-35	Cab-2	2023-04-20	9	Lepomis miniatus	51	1
2976	I-35	Cab-2	2023-04-20	9	Etheostoma fonticola	22	1
2976	I-35	Cab-2	2023-04-20	9	Etheostoma fonticola	20	1
2976	I-35	Cab-2	2023-04-20	9	Etheostoma fonticola	25	1
2976	I-35	Cab-2	2023-04-20	9	Procambarus sp.		2

2976	I-35	Cab-2	2023-04-20	10	Lepomis miniatus	53	1
2976	I-35	Cab-2	2023-04-20	10	Etheostoma fonticola	37	1
2976	I-35	Cab-2	2023-04-20	11	Procambarus sp.		1
2976	I-35	Cab-2	2023-04-20	12	Procambarus sp.		1
2976	I-35	Cab-2	2023-04-20	12	Etheostoma fonticola	35	1
2976	I-35	Cab-2	2023-04-20	13	Ambloplites rupestris	105	1
2976	I-35	Cab-2	2023-04-20	14	No fish collected		
2976	I-35	Cab-2	2023-04-20	15	No fish collected		
2976	I-35	Cab-2	2023-04-20	1	Gambusia sp.	10	1
2976	I-35	Cab-2	2023-04-20	1	Gambusia sp.	10	1
2976	I-35	Cab-2	2023-04-20	1	Gambusia sp.	10	1
2976	I-35	Cab-2	2023-04-20	1	Gambusia sp.	9	1
2976	I-35	Cab-2	2023-04-20	1	Etheostoma fonticola	26	1
2976	I-35	Cab-2	2023-04-20	2	Gambusia sp.	9	1
2976	I-35	Cab-2	2023-04-20	3	Gambusia sp.	10	1
2977	I-35	Lud-2	2023-04-20	1	Procambarus sp.		12
2977	I-35	Lud-2	2023-04-20	1	Etheostoma fonticola	18	1
2977	I-35	Lud-2	2023-04-20	1	Etheostoma fonticola	28	1
2977	I-35	Lud-2	2023-04-20	2	Etheostoma fonticola	25	1
2977	I-35	Lud-2	2023-04-20	2	Procambarus sp.		3
2977	I-35	Lud-2	2023-04-20	3	Gambusia sp.	9	1
2977	I-35	Lud-2	2023-04-20	3	Gambusia sp.	21	1
2977	I-35	Lud-2	2023-04-20	3	Procambarus sp.		6
2977	I-35	Lud-2	2023-04-20	3	Etheostoma fonticola	60	1
2977	I-35	Lud-2	2023-04-20	3	Etheostoma fonticola	16	1
2977	I-35	Lud-2	2023-04-20	3	Ameiurus natalis	10	1
2977	I-35	Lud-2	2023-04-20	4	Procambarus sp.		1
2977	I-35	Lud-2	2023-04-20	5	Procambarus sp.		6
2977	I-35	Lud-2	2023-04-20	5	Etheostoma fonticola	27	1
2977	I-35	Lud-2	2023-04-20	5	Etheostoma fonticola	24	1
2977	I-35	Lud-2	2023-04-20	5	Etheostoma fonticola	26	1
2977	I-35	Lud-2	2023-04-20	6	Procambarus sp.		2
2977	I-35	Lud-2	2023-04-20	6	Etheostoma fonticola	15	1
2977	I-35	Lud-2	2023-04-20	6	Etheostoma fonticola	30	1
2977	I-35	Lud-2	2023-04-20	6	Etheostoma fonticola	31	1
2977	I-35	Lud-2	2023-04-20	7	Etheostoma fonticola	30	1
2977	I-35	Lud-2	2023-04-20	7	Procambarus sp.		1
2977	I-35	Lud-2	2023-04-20	8	Etheostoma fonticola	36	1
2977	I-35	Lud-2	2023-04-20	8	Etheostoma fonticola	24	1
2977	I-35	Lud-2	2023-04-20	8	Procambarus sp.		2
2977	I-35	Lud-2	2023-04-20	9	No fish collected		

2977	I-35	Lud-2	2023-04-20	10	Procambarus sp.		1
2977	I-35	Lud-2	2023-04-20	11	Gambusia sp.	10	1
2977	I-35	Lud-2	2023-04-20	12	Procambarus sp.		2
2977	I-35	Lud-2	2023-04-20	13	Procambarus sp.		1
2977	I-35	Lud-2	2023-04-20	14	Etheostoma fonticola	19	1
2977	I-35	Lud-2	2023-04-20	15	Etheostoma fonticola	21	1
2977	I-35	Lud-2	2023-04-20	16	Procambarus sp.		1
2977	I-35	Lud-2	2023-04-20	1	Etheostoma fonticola	28	1
2978	I-35	Open-2	2023-04-20	1	No fish collected		
2978	I-35	Open-2	2023-04-20	2	No fish collected		
2978	I-35	Open-2	2023-04-20	3	No fish collected		
2978	I-35	Open-2	2023-04-20	4	No fish collected		
2978	I-35	Open-2	2023-04-20	5	No fish collected		
2978	I-35	Open-2	2023-04-20	6	No fish collected		
2978	I-35	Open-2	2023-04-20	7	No fish collected		
2978	I-35	Open-2	2023-04-20	8	No fish collected		
2978	I-35	Open-2	2023-04-20	9	No fish collected		
2978	I-35	Open-2	2023-04-20	10	No fish collected		
3059	I-35	Cab-1	2023-10-31	1	Lepomis miniatus	38	1
3059	I-35	Cab-1	2023-10-31	1	Lepomis miniatus	25	1
3059	I-35	Cab-1	2023-10-31	1	Lepomis miniatus	29	1
3059	I-35	Cab-1	2023-10-31	2	Dionda nigrotaeniata	58	1
3059	I-35	Cab-1	2023-10-31	2	Lepomis miniatus	34	1
3059	I-35	Cab-1	2023-10-31	2	Etheostoma fonticola	30	1
3059	I-35	Cab-1	2023-10-31	2	Lepomis sp.	18	1
3059	I-35	Cab-1	2023-10-31	3	Procambarus sp.		1
3059	I-35	Cab-1	2023-10-31	3	Etheostoma fonticola	27	1
3059	I-35	Cab-1	2023-10-31	4	No fish collected		
3059	I-35	Cab-1	2023-10-31	5	Lepomis miniatus	33	1
3059	I-35	Cab-1	2023-10-31	5	Etheostoma fonticola	32	1
3059	I-35	Cab-1	2023-10-31	5	Etheostoma fonticola	29	1
3059	I-35	Cab-1	2023-10-31	5	Procambarus sp.		2
3059	I-35	Cab-1	2023-10-31	6	No fish collected		
3059	I-35	Cab-1	2023-10-31	7	No fish collected		
3059	I-35	Cab-1	2023-10-31	8	No fish collected		
3059	I-35	Cab-1	2023-10-31	9	Procambarus sp.		1
3059	I-35	Cab-1	2023-10-31	10	Lepomis miniatus	45	1
3059	I-35	Cab-1	2023-10-31	11	Etheostoma fonticola	28	1
3059	I-35	Cab-1	2023-10-31	11	Etheostoma fonticola	27	1
3059	I-35	Cab-1	2023-10-31	11	Etheostoma fonticola	26	1
3059	I-35	Cab-1	2023-10-31	11	Procambarus sp.		1

3059	I-35	Cab-1	2023-10-31	12	No fish collected		
3059	I-35	Cab-1	2023-10-31	13	No fish collected		
3059	I-35	Cab-1	2023-10-31	14	No fish collected		
3059	I-35	Cab-1	2023-10-31	15	Palaemonetes sp.		1
3060	I-35	Cab-2	2023-10-31	1	Palaemonetes sp.		1
3060	I-35	Cab-2	2023-10-31	1	Etheostoma fonticola	26	1
3060	I-35	Cab-2	2023-10-31	1	Etheostoma fonticola	29	1
3060	I-35	Cab-2	2023-10-31	2	Etheostoma fonticola	35	1
3060	I-35	Cab-2	2023-10-31	2	Etheostoma fonticola	30	1
3060	I-35	Cab-2	2023-10-31	2	Etheostoma fonticola	33	1
3060	I-35	Cab-2	2023-10-31	2	Etheostoma fonticola	35	1
3060	I-35	Cab-2	2023-10-31	2	Etheostoma fonticola	31	1
3060	I-35	Cab-2	2023-10-31	2	Etheostoma fonticola	32	1
3060	I-35	Cab-2	2023-10-31	2	Etheostoma fonticola	28	1
3060	I-35	Cab-2	2023-10-31	2	Etheostoma fonticola	33	1
3060	I-35	Cab-2	2023-10-31	2	Gambusia sp.	25	1
3060	I-35	Cab-2	2023-10-31	2	Palaemonetes sp.		1
3060	I-35	Cab-2	2023-10-31	2	Procambarus sp.		4
3060	I-35	Cab-2	2023-10-31	3	Lepomis miniatus	72	1
3060	I-35	Cab-2	2023-10-31	3	Etheostoma fonticola	31	1
3060	I-35	Cab-2	2023-10-31	3	Etheostoma fonticola	13	1
3060	I-35	Cab-2	2023-10-31	3	Procambarus sp.		3
3060	I-35	Cab-2	2023-10-31	4	Procambarus sp.		4
3060	I-35	Cab-2	2023-10-31	5	Lepomis miniatus	38	1
3060	I-35	Cab-2	2023-10-31	5	Etheostoma fonticola	34	1
3060	I-35	Cab-2	2023-10-31	5	Etheostoma fonticola	23	1
3060	I-35	Cab-2	2023-10-31	5	Etheostoma fonticola	20	1
3060	I-35	Cab-2	2023-10-31	5	Etheostoma fonticola	30	1
3060	I-35	Cab-2	2023-10-31	5	Etheostoma fonticola	25	1
3060	I-35	Cab-2	2023-10-31	5	Etheostoma fonticola	25	1
3060	I-35	Cab-2	2023-10-31	5	Etheostoma fonticola	28	1
3060	I-35	Cab-2	2023-10-31	5	Procambarus sp.		3
3060	I-35	Cab-2	2023-10-31	6	Procambarus sp.		1
3060	I-35	Cab-2	2023-10-31	6	Etheostoma fonticola	35	1
3060	I-35	Cab-2	2023-10-31	7	Procambarus sp.		3
3060	I-35	Cab-2	2023-10-31	7	Palaemonetes sp.		1
3060	I-35	Cab-2	2023-10-31	7	Etheostoma fonticola	29	1
3060	I-35	Cab-2	2023-10-31	7	Etheostoma fonticola	26	1
3060	I-35	Cab-2	2023-10-31	8	Palaemonetes sp.		1
3060	I-35	Cab-2	2023-10-31	9	Etheostoma fonticola	28	1
3060	I-35	Cab-2	2023-10-31	9	Procambarus sp.		2

3060	I-35	Cab-2	2023-10-31	10	Etheostoma fonticola	32	1
3060	I-35	Cab-2	2023-10-31	10	Etheostoma fonticola	31	1
3060	I-35	Cab-2	2023-10-31	11	No fish collected		
3060	I-35	Cab-2	2023-10-31	12	Procambarus sp.		3
3060	I-35	Cab-2	2023-10-31	13	No fish collected		
3060	I-35	Cab-2	2023-10-31	14	Procambarus sp.		3
3060	I-35	Cab-2	2023-10-31	14	Etheostoma fonticola	38	1
3060	I-35	Cab-2	2023-10-31	15	No fish collected		
3061	I-35	Hyg-1	2023-10-31	1	Herichthys cyanoguttatus	24	1
3061	I-35	Hyg-1	2023-10-31	1	Procambarus sp.		6
3061	I-35	Hyg-1	2023-10-31	2	Herichthys cyanoguttatus	28	1
3061	I-35	Hyg-1	2023-10-31	2	Etheostoma fonticola	35	1
3061	I-35	Hyg-1	2023-10-31	2	Etheostoma fonticola	30	1
3061	I-35	Hyg-1	2023-10-31	2	Procambarus sp.		8
3061	I-35	Hyg-1	2023-10-31	2	Gambusia sp.	14	1
3061	I-35	Hyg-1	2023-10-31	2	Gambusia sp.	10	1
3061	I-35	Hyg-1	2023-10-31	3	Procambarus sp.		7
3061	I-35	Hyg-1	2023-10-31	4	Etheostoma fonticola	32	1
3061	I-35	Hyg-1	2023-10-31	4	Etheostoma fonticola	30	1
3061	I-35	Hyg-1	2023-10-31	4	Procambarus sp.		6
3061	I-35	Hyg-1	2023-10-31	5	Procambarus sp.		4
3061	I-35	Hyg-1	2023-10-31	6	No fish collected		
3061	I-35	Hyg-1	2023-10-31	7	Gambusia sp.	20	1
3061	I-35	Hyg-1	2023-10-31	7	Procambarus sp.		1
3061	I-35	Hyg-1	2023-10-31	8	Procambarus sp.		1
3061	I-35	Hyg-1	2023-10-31	9	Procambarus sp.		2
3061	I-35	Hyg-1	2023-10-31	10	No fish collected		
3061	I-35	Hyg-1	2023-10-31	11	Procambarus sp.		4
3061	I-35	Hyg-1	2023-10-31	11	Etheostoma fonticola	30	1
3061	I-35	Hyg-1	2023-10-31	12	Procambarus sp.		1
3061	I-35	Hyg-1	2023-10-31	12	Etheostoma fonticola	25	1
3061	I-35	Hyg-1	2023-10-31	13	No fish collected		
3061	I-35	Hyg-1	2023-10-31	14	Procambarus sp.		1
3061	I-35	Hyg-1	2023-10-31	15	No fish collected		
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	26	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	20	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	15	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	15	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	15	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	15	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	10	1

3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	25	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	15	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	15	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	20	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	18	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	15	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	17	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	21	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	15	1
3062	I-35	Hyg-2	2023-10-31	1	Gambusia sp.	15	1
3062	I-35	Hyg-2	2023-10-31	1	Etheostoma fonticola	12	1
3062	I-35	Hyg-2	2023-10-31	1	Procambarus sp.		5
3062	I-35	Hyg-2	2023-10-31	2	Procambarus sp.		4
3062	I-35	Hyg-2	2023-10-31	2	Gambusia sp.	16	1
3062	I-35	Hyg-2	2023-10-31	2	Gambusia sp.	15	1
3062	I-35	Hyg-2	2023-10-31	3	Gambusia sp.	20	1
3062	I-35	Hyg-2	2023-10-31	3	Gambusia sp.		1
3062	I-35	Hyg-2	2023-10-31	3	Gambusia sp.		1
3062	I-35	Hyg-2	2023-10-31	3	Etheostoma fonticola	34	1
3062	I-35	Hyg-2	2023-10-31	3	Etheostoma fonticola	34	1
3062	I-35	Hyg-2	2023-10-31	3	Procambarus sp.		3
3062	I-35	Hyg-2	2023-10-31	4	Procambarus sp.		1
3062	I-35	Hyg-2	2023-10-31	4	Etheostoma fonticola	32	1
3062	I-35	Hyg-2	2023-10-31	4	Gambusia sp.		1
3062	I-35	Hyg-2	2023-10-31	5	Procambarus sp.		3
3062	I-35	Hyg-2	2023-10-31	6	Procambarus sp.		4
3062	I-35	Hyg-2	2023-10-31	6	Gambusia sp.		1
3062	I-35	Hyg-2	2023-10-31	6	Gambusia sp.		1
3062	I-35	Hyg-2	2023-10-31	6	Gambusia sp.		1
3062	I-35	Hyg-2	2023-10-31	6	Gambusia sp.		1
3062	I-35	Hyg-2	2023-10-31	6	Herichthys cyanoguttatus	26	1
3062	I-35	Hyg-2	2023-10-31	6	Etheostoma fonticola	16	1
3062	I-35	Hyg-2	2023-10-31	7	Procambarus sp.		3
3062	I-35	Hyg-2	2023-10-31	7	Etheostoma fonticola	32	1
3062	I-35	Hyg-2	2023-10-31	7	Etheostoma fonticola	34	1
3062	I-35	Hyg-2	2023-10-31	8	Procambarus sp.		1
3062	I-35	Hyg-2	2023-10-31	8	Etheostoma fonticola	34	1
3062	I-35	Hyg-2	2023-10-31	9	Etheostoma fonticola	28	1
3062	I-35	Hyg-2	2023-10-31	10	Procambarus sp.		3
3062	I-35	Hyg-2	2023-10-31	11	Etheostoma fonticola	20	1
3062	I-35	Hyg-2	2023-10-31	12	Procambarus sp.		1

3062	I-35	Hyg-2	2023-10-31	13	Procambarus sp.		1
3062	I-35	Hyg-2	2023-10-31	13	Etheostoma fonticola	23	1
3062	I-35	Hyg-2	2023-10-31	14	Procambarus sp.		1
3062	I-35	Hyg-2	2023-10-31	15	Etheostoma fonticola	29	1
3062	I-35	Hyg-2	2023-10-31	16	Etheostoma fonticola	23	1
3062	I-35	Hyg-2	2023-10-31	17	Etheostoma fonticola	28	1
3062	I-35	Hyg-2	2023-10-31	18	Gambusia sp.		1
3062	I-35	Hyg-2	2023-10-31	18	Gambusia sp.		1
3062	I-35	Hyg-2	2023-10-31	18	Procambarus sp.		1
3063	I-35	Sag-1	2023-10-31	1	Etheostoma fonticola	11	1
3063	I-35	Sag-1	2023-10-31	1	Procambarus sp.		1
3063	I-35	Sag-1	2023-10-31	2	Procambarus sp.		1
3063	I-35	Sag-1	2023-10-31	3	Etheostoma fonticola	14	1
3063	I-35	Sag-1	2023-10-31	4	No fish collected		
3063	I-35	Sag-1	2023-10-31	5	No fish collected		
3063	I-35	Sag-1	2023-10-31	6	Procambarus sp.		1
3063	I-35	Sag-1	2023-10-31	7	Etheostoma fonticola	34	1
3063	I-35	Sag-1	2023-10-31	8	No fish collected		
3063	I-35	Sag-1	2023-10-31	9	Procambarus sp.		1
3063	I-35	Sag-1	2023-10-31	9	Palaemonetes sp.		1
3063	I-35	Sag-1	2023-10-31	10	No fish collected		
3063	I-35	Sag-1	2023-10-31	11	No fish collected		
3063	I-35	Sag-1	2023-10-31	12	No fish collected		
3063	I-35	Sag-1	2023-10-31	13	No fish collected		
3063	I-35	Sag-1	2023-10-31	14	No fish collected		
3063	I-35	Sag-1	2023-10-31	15	No fish collected		
3063	I-35	Sag-1	2023-10-31				
3064	I-35	Sag-2	2023-10-31	1	Herichthys cyanoguttatus	25	1
3064	I-35	Sag-2	2023-10-31	1	Etheostoma fonticola	29	1
3064	I-35	Sag-2	2023-10-31	2	Gambusia sp.	25	1
3064	I-35	Sag-2	2023-10-31	2	Gambusia sp.	10	1
3064	I-35	Sag-2	2023-10-31	2	Etheostoma fonticola	31	1
3064	I-35	Sag-2	2023-10-31	2	Etheostoma fonticola	30	1
3064	I-35	Sag-2	2023-10-31	2	Procambarus sp.		2
3064	I-35	Sag-2	2023-10-31	3	Procambarus sp.		1
3064	I-35	Sag-2	2023-10-31	4	Etheostoma fonticola	34	1
3064	I-35	Sag-2	2023-10-31	4	Etheostoma fonticola	33	1
3064	I-35	Sag-2	2023-10-31	5	Etheostoma fonticola	28	1
3064	I-35	Sag-2	2023-10-31	5	Procambarus sp.		2
3064	I-35	Sag-2	2023-10-31	6	Procambarus sp.		3
3064	I-35	Sag-2	2023-10-31	7	Procambarus sp.		6

3064	I-35	Sag-2	2023-10-31	7	Etheostoma fonticola	30	1
3064	I-35	Sag-2	2023-10-31	8	No fish collected		
3064	I-35	Sag-2	2023-10-31	9	Procambarus sp.		1
3064	I-35	Sag-2	2023-10-31	9	Etheostoma fonticola	28	1
3064	I-35	Sag-2	2023-10-31	10	No fish collected		
3064	I-35	Sag-2	2023-10-31	11	No fish collected		
3064	I-35	Sag-2	2023-10-31	12	Procambarus sp.		3
3064	I-35	Sag-2	2023-10-31	13	Etheostoma fonticola	25	1
3064	I-35	Sag-2	2023-10-31	13	Etheostoma fonticola	30	1
3064	I-35	Sag-2	2023-10-31	13	Procambarus sp.		1
3064	I-35	Sag-2	2023-10-31	14	Procambarus sp.		1
3064	I-35	Sag-2	2023-10-31	15	No fish collected		
3065	I-35	Open-1	2023-10-31	1	No fish collected		
3065	I-35	Open-1	2023-10-31	2	No fish collected		
3065	I-35	Open-1	2023-10-31	3	No fish collected		
3065	I-35	Open-1	2023-10-31	4	No fish collected		
3065	I-35	Open-1	2023-10-31	5	No fish collected		
3065	I-35	Open-1	2023-10-31	6	No fish collected		
3065	I-35	Open-1	2023-10-31	7	No fish collected		
3065	I-35	Open-1	2023-10-31	8	No fish collected		
3065	I-35	Open-1	2023-10-31	9	No fish collected		
3065	I-35	Open-1	2023-10-31	10	No fish collected		
3066	I-35	Open-2	2023-10-31	1	No fish collected		
3066	I-35	Open-2	2023-10-31	2	No fish collected		
3066	I-35	Open-2	2023-10-31	3	No fish collected		
3066	I-35	Open-2	2023-10-31	4	No fish collected		
3066	I-35	Open-2	2023-10-31	5	No fish collected		
3066	I-35	Open-2	2023-10-31	6	No fish collected		
3066	I-35	Open-2	2023-10-31	7	No fish collected		
3066	I-35	Open-2	2023-10-31	8	Notropis chalybaeus	56	1
3066	I-35	Open-2	2023-10-31	9	No fish collected		
3066	I-35	Open-2	2023-10-31	10	No fish collected		
3066	I-35	Open-2	2023-10-31	11	No fish collected		
3066	I-35	Open-2	2023-10-31	12	No fish collected		
3066	I-35	Open-2	2023-10-31	13	No fish collected		
3066	I-35	Open-2	2023-10-31	14	No fish collected		
3066	I-35	Open-2	2023-10-31	15	No fish collected		
2953	Spring Lake Dam	Open-1	2023-04-18	1	No fish collected		
2953	Spring Lake Dam	Open-1	2023-04-18	2	No fish collected		
2953	Spring Lake Dam	Open-1	2023-04-18	3	No fish collected		
2953	Spring Lake Dam	Open-1	2023-04-18	4	No fish collected		

2953	Spring Lake Dam	Open-1	2023-04-18	5	No fish collected		
2953	Spring Lake Dam	Open-1	2023-04-18	6	No fish collected		
2953	Spring Lake Dam	Open-1	2023-04-18	7	No fish collected		
2953	Spring Lake Dam	Open-1	2023-04-18	8	No fish collected		
2953	Spring Lake Dam	Open-1	2023-04-18	9	No fish collected		
2953	Spring Lake Dam	Open-1	2023-04-18	10	No fish collected		
2954	Spring Lake Dam	Open-2	2023-04-18	1	No fish collected		
2954	Spring Lake Dam	Open-2	2023-04-18	2	No fish collected		
2954	Spring Lake Dam	Open-2	2023-04-18	3	No fish collected		
2954	Spring Lake Dam	Open-2	2023-04-18	4	No fish collected		
2954	Spring Lake Dam	Open-2	2023-04-18	5	No fish collected		
2954	Spring Lake Dam	Open-2	2023-04-18	6	No fish collected		
2954	Spring Lake Dam	Open-2	2023-04-18	7	No fish collected		
2954	Spring Lake Dam	Open-2	2023-04-18	8	No fish collected		
2954	Spring Lake Dam	Open-2	2023-04-18	9	No fish collected		
2954	Spring Lake Dam	Open-2	2023-04-18	10	No fish collected		
2955	Spring Lake Dam	Pota-1	2023-04-18	1	No fish collected		
2955	Spring Lake Dam	Pota-1	2023-04-18	2	No fish collected		
2955	Spring Lake Dam	Pota-1	2023-04-18	3	No fish collected		
2955	Spring Lake Dam	Pota-1	2023-04-18	4	No fish collected		
2955	Spring Lake Dam	Pota-1	2023-04-18	5	No fish collected		
2955	Spring Lake Dam	Pota-1	2023-04-18	6	No fish collected		
2955	Spring Lake Dam	Pota-1	2023-04-18	7	Procambarus sp.		1
2955	Spring Lake Dam	Pota-1	2023-04-18	8	No fish collected		
2955	Spring Lake Dam	Pota-1	2023-04-18	9	No fish collected		
2955	Spring Lake Dam	Pota-1	2023-04-18	10	No fish collected		
2956	Spring Lake Dam	Pota-2	2023-04-18	1	Etheostoma fonticola	27	1
2956	Spring Lake Dam	Pota-2	2023-04-18	1	Etheostoma fonticola	16	1
2956	Spring Lake Dam	Pota-2	2023-04-18	2	Etheostoma fonticola	14	1
2956	Spring Lake Dam	Pota-2	2023-04-18	2	Etheostoma fonticola	15	1
2956	Spring Lake Dam	Pota-2	2023-04-18	2	Etheostoma fonticola	19	1
2956	Spring Lake Dam	Pota-2	2023-04-18	3	Etheostoma fonticola	15	1
2956	Spring Lake Dam	Pota-2	2023-04-18	4	Etheostoma fonticola	16	1
2956	Spring Lake Dam	Pota-2	2023-04-18	5	No fish collected		
2956	Spring Lake Dam	Pota-2	2023-04-18	6	No fish collected		
2956	Spring Lake Dam	Pota-2	2023-04-18	7	Etheostoma fonticola	15	1
2956	Spring Lake Dam	Pota-2	2023-04-18	7	Etheostoma fonticola	13	1
2956	Spring Lake Dam	Pota-2	2023-04-18	8	No fish collected		
2956	Spring Lake Dam	Pota-2	2023-04-18	9	No fish collected		
2956	Spring Lake Dam	Pota-2	2023-04-18	10	No fish collected		
2956	Spring Lake Dam	Pota-2	2023-04-18	11	Etheostoma fonticola	15	1

2956	Spring Lake Dam	Pota-2	2023-04-18	12	Etheostoma fonticola	20	1
2956	Spring Lake Dam	Pota-2	2023-04-18	13	No fish collected		
2956	Spring Lake Dam	Pota-2	2023-04-18	14	No fish collected		
2956	Spring Lake Dam	Pota-2	2023-04-18	15	No fish collected		
2956	Spring Lake Dam	Pota-2	2023-04-18	2	Etheostoma fonticola	14	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Procambarus sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	10	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	20	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	10	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	20	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	12	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	28	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	21	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	9	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	16	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	15	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	22	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	18	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	13	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	21	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	30	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	9	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	10	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	12	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	15	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	15	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	20	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.	15	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1

2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	1	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	2	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Gambusia sp.		1

2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	3	Procambarus sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	4	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	5	Micropterus salmoides	31	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	5	Palaemonetes sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	5	Etheostoma fonticola	30	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	5	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	5	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	5	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	5	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	5	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	5	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	5	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	5	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	5	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	6	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	6	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	6	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	6	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	7	Herichthys cyanoguttatus	61	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	7	Palaemonetes sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	7	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	7	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	7	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	7	Etheostoma fonticola	18	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	8	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	8	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	8	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	8	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	8	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	8	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	8	Etheostoma fonticola	10	1

2957	Spring Lake Dam	Sagi-1	2023-04-18	9	No fish collected		
2957	Spring Lake Dam	Sagi-1	2023-04-18	10	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	10	Lepomis miniatus	46	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	11	Procambarus sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	11	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	12	No fish collected		
2957	Spring Lake Dam	Sagi-1	2023-04-18	13	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	13	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	13	Gambusia sp.		1
2957	Spring Lake Dam	Sagi-1	2023-04-18	13	Lepomis miniatus	30	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	13	Herichthys cyanoguttatus	70	1
2957	Spring Lake Dam	Sagi-1	2023-04-18	14	No fish collected		
2957	Spring Lake Dam	Sagi-1	2023-04-18	15	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	25	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	20	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	14	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	12	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	21	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	35	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	31	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	22	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	15	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	18	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	17	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	19	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Lepomis sp.	20	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.	33	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.	44	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.	14	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Lepomis miniatus	48	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Lepomis miniatus	50	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Procambarus sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	3	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	4	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	4	Procambarus sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	5	Procambarus sp.		3
2958	Spring Lake Dam	Sagi-2	2023-04-18	5	Lepomis miniatus	125	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	5	Lepomis miniatus	48	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	5	Micropterus salmoides	36	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	6	Gambusia sp.		1

2958	Spring Lake Dam	Sagi-2	2023-04-18	7	Procambarus sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	8	No fish collected		
2958	Spring Lake Dam	Sagi-2	2023-04-18	9	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	10	Procambarus sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	11	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	12	Lepomis miniatus	58	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	13	No fish collected		
2958	Spring Lake Dam	Sagi-2	2023-04-18	14	No fish collected		
2958	Spring Lake Dam	Sagi-2	2023-04-18	15	Procambarus sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	21	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	21	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	20	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	20	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	1	Gambusia sp.	20	1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	2	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	3	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	3	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	3	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	3	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	3	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	3	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	3	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	3	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	4	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	4	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	4	Gambusia sp.		1
2958	Spring Lake Dam	Sagi-2	2023-04-18	6	Gambusia sp.		1
2959	Spring Lake Dam	Hydro-1	2023-04-18	1	No fish collected		
2959	Spring Lake Dam	Hydro-1	2023-04-18	2	Etheostoma fonticola	26	1
2959	Spring Lake Dam	Hydro-1	2023-04-18	2	Etheostoma fonticola	23	1
2959	Spring Lake Dam	Hydro-1	2023-04-18	2	Procambarus sp.		1
2959	Spring Lake Dam	Hydro-1	2023-04-18	3	Procambarus sp.		1

2959	Spring Lake Dam	Hydro-1	2023-04-18	4	Procambarus sp.		3
2959	Spring Lake Dam	Hydro-1	2023-04-18	4	Etheostoma fonticola	28	1
2959	Spring Lake Dam	Hydro-1	2023-04-18	5	Etheostoma fonticola	20	1
2959	Spring Lake Dam	Hydro-1	2023-04-18	5	Procambarus sp.		1
2959	Spring Lake Dam	Hydro-1	2023-04-18	6	No fish collected		
2959	Spring Lake Dam	Hydro-1	2023-04-18	7	No fish collected		
2959	Spring Lake Dam	Hydro-1	2023-04-18	8	Etheostoma fonticola	39	1
2959	Spring Lake Dam	Hydro-1	2023-04-18	9	No fish collected		
2959	Spring Lake Dam	Hydro-1	2023-04-18	10	Procambarus sp.		1
2959	Spring Lake Dam	Hydro-1	2023-04-18	11	No fish collected		
2959	Spring Lake Dam	Hydro-1	2023-04-18	12	Procambarus sp.		1
2959	Spring Lake Dam	Hydro-1	2023-04-18	13	Procambarus sp.		1
2959	Spring Lake Dam	Hydro-1	2023-04-18	14	No fish collected		
2959	Spring Lake Dam	Hydro-1	2023-04-18	15	No fish collected		
2960	Spring Lake Dam	Hydro-2	2023-04-18	1	Gambusia sp.	15	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	1	Gambusia sp.	20	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	1	Gambusia sp.	10	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	1	Gambusia sp.	14	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	2	Gambusia sp.	12	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	2	Gambusia sp.	35	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	2	Gambusia sp.	10	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	2	Gambusia sp.	14	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	2	Gambusia sp.	13	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	3	Gambusia sp.	10	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	3	Gambusia sp.	15	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	3	Gambusia sp.	49	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	3	Gambusia sp.	26	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	4	Gambusia sp.	15	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	4	Gambusia sp.	17	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	4	Gambusia sp.	21	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	4	Gambusia sp.	10	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	4	Gambusia sp.	26	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	4	Etheostoma fonticola	16	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	5	Gambusia sp.		1
2960	Spring Lake Dam	Hydro-2	2023-04-18	6	Gambusia sp.		1
2960	Spring Lake Dam	Hydro-2	2023-04-18	7	No fish collected		
2960	Spring Lake Dam	Hydro-2	2023-04-18	8	No fish collected		
2960	Spring Lake Dam	Hydro-2	2023-04-18	9	Lepomis miniatus	42	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	9	Etheostoma fonticola	16	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	10	No fish collected		
2960	Spring Lake Dam	Hydro-2	2023-04-18	11	Gambusia sp.	0	1

2960	Spring Lake Dam	Hydro-2	2023-04-18	12	No fish collected		
2960	Spring Lake Dam	Hydro-2	2023-04-18	13	No fish collected		
2960	Spring Lake Dam	Hydro-2	2023-04-18	14	No fish collected		
2960	Spring Lake Dam	Hydro-2	2023-04-18	15	No fish collected		
2960	Spring Lake Dam	Hydro-2	2023-04-18	1	Gambusia sp.	10	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	3	Gambusia sp.	26	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	4	Gambusia sp.	26	1
2960	Spring Lake Dam	Hydro-2	2023-04-18	5	Gambusia sp.		1
2960	Spring Lake Dam	Hydro-2	2023-04-18	5	Gambusia sp.		1
2960	Spring Lake Dam	Hydro-2	2023-04-18	5	Gambusia sp.		1
2960	Spring Lake Dam	Hydro-2	2023-04-18	5	Gambusia sp.		1
2960	Spring Lake Dam	Hydro-2	2023-04-18	5	Gambusia sp.		1
2960	Spring Lake Dam	Hydro-2	2023-04-18	5	Gambusia sp.		1
2960	Spring Lake Dam	Hydro-2	2023-04-18	6	Gambusia sp.		1
3045	Spring Lake Dam	Pota-1	2023-10-25	1	Herichthys cyanoguttatus	34	1
3045	Spring Lake Dam	Pota-1	2023-10-25	1	Gambusia sp.	35	1
3045	Spring Lake Dam	Pota-1	2023-10-25	1	Gambusia sp.	32	1
3045	Spring Lake Dam	Pota-1	2023-10-25	1	Gambusia sp.	30	1
3045	Spring Lake Dam	Pota-1	2023-10-25	1	Gambusia sp.	27	1
3045	Spring Lake Dam	Pota-1	2023-10-25	1	Gambusia sp.	24	1
3045	Spring Lake Dam	Pota-1	2023-10-25	1	Gambusia sp.	22	1
3045	Spring Lake Dam	Pota-1	2023-10-25	2	Gambusia sp.	26	1
3045	Spring Lake Dam	Pota-1	2023-10-25	2	Gambusia sp.	22	1
3045	Spring Lake Dam	Pota-1	2023-10-25	2	Gambusia sp.	22	1
3045	Spring Lake Dam	Pota-1	2023-10-25	2	Gambusia sp.	15	1
3045	Spring Lake Dam	Pota-1	2023-10-25	2	Procambarus sp.		3
3045	Spring Lake Dam	Pota-1	2023-10-25	3	Gambusia sp.	28	1
3045	Spring Lake Dam	Pota-1	2023-10-25	3	Gambusia sp.	42	1
3045	Spring Lake Dam	Pota-1	2023-10-25	3	Etheostoma fonticola	17	1
3045	Spring Lake Dam	Pota-1	2023-10-25	3	Etheostoma fonticola	17	1
3045	Spring Lake Dam	Pota-1	2023-10-25	3	Procambarus sp.		2
3045	Spring Lake Dam	Pota-1	2023-10-25	4	Gambusia sp.	29	1
3045	Spring Lake Dam	Pota-1	2023-10-25	4	Gambusia sp.	24	1
3045	Spring Lake Dam	Pota-1	2023-10-25	4	Gambusia sp.	21	1
3045	Spring Lake Dam	Pota-1	2023-10-25	4	Gambusia sp.	23	1
3045	Spring Lake Dam	Pota-1	2023-10-25	4	Etheostoma fonticola	24	1
3045	Spring Lake Dam	Pota-1	2023-10-25	4	Etheostoma fonticola	23	1
3045	Spring Lake Dam	Pota-1	2023-10-25	5	Gambusia sp.	30	1
3045	Spring Lake Dam	Pota-1	2023-10-25	5	Gambusia sp.	22	1
3045	Spring Lake Dam	Pota-1	2023-10-25	6	Gambusia sp.	23	1
3045	Spring Lake Dam	Pota-1	2023-10-25	7	Etheostoma fonticola	37	1

3045	Spring Lake Dam	Pota-1	2023-10-25	8	No fish collected		
3045	Spring Lake Dam	Pota-1	2023-10-25	9	Etheostoma fonticola	16	1
3045	Spring Lake Dam	Pota-1	2023-10-25	9	Procambarus sp.		1
3045	Spring Lake Dam	Pota-1	2023-10-25	10	Gambusia sp.	30	1
3045	Spring Lake Dam	Pota-1	2023-10-25	11	No fish collected		
3045	Spring Lake Dam	Pota-1	2023-10-25	12	Gambusia sp.	37	1
3045	Spring Lake Dam	Pota-1	2023-10-25	13	No fish collected		
3045	Spring Lake Dam	Pota-1	2023-10-25	14	No fish collected		
3045	Spring Lake Dam	Pota-1	2023-10-25	15	No fish collected		
3046	Spring Lake Dam	Pota-2	2023-10-25	1	Gambusia sp.	26	1
3046	Spring Lake Dam	Pota-2	2023-10-25	1	Gambusia sp.	22	1
3046	Spring Lake Dam	Pota-2	2023-10-25	1	Gambusia sp.	14	1
3046	Spring Lake Dam	Pota-2	2023-10-25	1	Gambusia sp.	18	1
3046	Spring Lake Dam	Pota-2	2023-10-25	1	Gambusia sp.	21	1
3046	Spring Lake Dam	Pota-2	2023-10-25	1	Gambusia sp.	23	1
3046	Spring Lake Dam	Pota-2	2023-10-25	2	Gambusia sp.	35	1
3046	Spring Lake Dam	Pota-2	2023-10-25	2	Gambusia sp.	34	1
3046	Spring Lake Dam	Pota-2	2023-10-25	2	Gambusia sp.	25	1
3046	Spring Lake Dam	Pota-2	2023-10-25	2	Gambusia sp.	21	1
3046	Spring Lake Dam	Pota-2	2023-10-25	2	Gambusia sp.	17	1
3046	Spring Lake Dam	Pota-2	2023-10-25	2	Gambusia sp.	28	1
3046	Spring Lake Dam	Pota-2	2023-10-25	2	Gambusia sp.	28	1
3046	Spring Lake Dam	Pota-2	2023-10-25	2	Etheostoma fonticola	17	1
3046	Spring Lake Dam	Pota-2	2023-10-25	3	Gambusia sp.	25	1
3046	Spring Lake Dam	Pota-2	2023-10-25	3	Gambusia sp.	21	1
3046	Spring Lake Dam	Pota-2	2023-10-25	3	Gambusia sp.	20	1
3046	Spring Lake Dam	Pota-2	2023-10-25	3	Gambusia sp.	28	1
3046	Spring Lake Dam	Pota-2	2023-10-25	3	Gambusia sp.	29	1
3046	Spring Lake Dam	Pota-2	2023-10-25	3	Gambusia sp.	15	1
3046	Spring Lake Dam	Pota-2	2023-10-25	3	Gambusia sp.	25	1
3046	Spring Lake Dam	Pota-2	2023-10-25	3	Gambusia sp.	30	1
3046	Spring Lake Dam	Pota-2	2023-10-25	3	Gambusia sp.	20	1
3046	Spring Lake Dam	Pota-2	2023-10-25	4	Gambusia sp.		1
3046	Spring Lake Dam	Pota-2	2023-10-25	5	Gambusia sp.		1
3046	Spring Lake Dam	Pota-2	2023-10-25	5	Gambusia sp.		1
3046	Spring Lake Dam	Pota-2	2023-10-25	6	Procambarus sp.		1
3046	Spring Lake Dam	Pota-2	2023-10-25	6	Etheostoma fonticola	26	1
3046	Spring Lake Dam	Pota-2	2023-10-25	6	Etheostoma fonticola	20	1
3046	Spring Lake Dam	Pota-2	2023-10-25	7	No fish collected		
3046	Spring Lake Dam	Pota-2	2023-10-25	8	Gambusia sp.		1
3046	Spring Lake Dam	Pota-2	2023-10-25	8	Gambusia sp.		1

3046	Spring Lake Dam	Pota-2	2023-10-25	8	Palaemonetes sp.		1
3046	Spring Lake Dam	Pota-2	2023-10-25	9	No fish collected		
3046	Spring Lake Dam	Pota-2	2023-10-25	10	No fish collected		
3046	Spring Lake Dam	Pota-2	2023-10-25	11	No fish collected		
3046	Spring Lake Dam	Pota-2	2023-10-25	12	No fish collected		
3046	Spring Lake Dam	Pota-2	2023-10-25	13	Procambarus sp.		1
3046	Spring Lake Dam	Pota-2	2023-10-25	14	No fish collected		
3046	Spring Lake Dam	Pota-2	2023-10-25	15	Gambusia sp.		1
3046	Spring Lake Dam	Pota-2	2023-10-25	4	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Gambusia sp.	18	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Gambusia sp.	14	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Gambusia sp.	22	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Gambusia sp.	11	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Gambusia sp.	17	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Gambusia sp.	15	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Gambusia sp.	13	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Gambusia sp.	23	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Gambusia sp.	16	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Gambusia sp.	10	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Gambusia sp.	10	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Gambusia sp.	10	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Etheostoma fonticola	31	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Etheostoma fonticola	40	1
3047	Spring Lake Dam	Sag-1	2023-10-25	1	Procambarus sp.		6
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	24	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	15	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	14	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	15	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	10	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	16	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	14	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	16	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	21	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	16	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	22	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	10	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	10	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	10	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Gambusia sp.	13	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Etheostoma fonticola	39	1
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Herichthys cyanoguttatus	41	1

3047	Spring Lake Dam	Sag-1	2023-10-25	2	Palaemonetes sp.		5
3047	Spring Lake Dam	Sag-1	2023-10-25	2	Procambarus sp.		2
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Procambarus sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Etheostoma fonticola	35	1
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Etheostoma fonticola	33	1
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Etheostoma fonticola	35	1
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Etheostoma fonticola	35	1
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Ameiurus natalis	90	1
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Palaemonetes sp.		7
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	3	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	4	Etheostoma fonticola	38	1
3047	Spring Lake Dam	Sag-1	2023-10-25	4	Etheostoma fonticola	40	1
3047	Spring Lake Dam	Sag-1	2023-10-25	4	Etheostoma fonticola	34	1
3047	Spring Lake Dam	Sag-1	2023-10-25	4	Etheostoma fonticola	35	1
3047	Spring Lake Dam	Sag-1	2023-10-25	4	Herichthys cyanoguttatus	50	1
3047	Spring Lake Dam	Sag-1	2023-10-25	4	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	4	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	4	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	4	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	4	Palaemonetes sp.		4
3047	Spring Lake Dam	Sag-1	2023-10-25	4	Procambarus sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	5	Procambarus sp.		12
3047	Spring Lake Dam	Sag-1	2023-10-25	5	Palaemonetes sp.		2
3047	Spring Lake Dam	Sag-1	2023-10-25	5	Etheostoma fonticola	39	1
3047	Spring Lake Dam	Sag-1	2023-10-25	6	Procambarus sp.		7
3047	Spring Lake Dam	Sag-1	2023-10-25	6	Palaemonetes sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	6	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	7	Palaemonetes sp.		4
3047	Spring Lake Dam	Sag-1	2023-10-25	7	Etheostoma fonticola	37	1
3047	Spring Lake Dam	Sag-1	2023-10-25	7	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	8	Gambusia sp.		3
3047	Spring Lake Dam	Sag-1	2023-10-25	8	Procambarus sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	8	Etheostoma fonticola	32	1
3047	Spring Lake Dam	Sag-1	2023-10-25	8	Etheostoma fonticola	37	1
3047	Spring Lake Dam	Sag-1	2023-10-25	9	Gambusia sp.		3

3047	Spring Lake Dam	Sag-1	2023-10-25	9	Palaemonetes sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	9	Etheostoma fonticola	38	1
3047	Spring Lake Dam	Sag-1	2023-10-25	10	Procambarus sp.		3
3047	Spring Lake Dam	Sag-1	2023-10-25	11	Procambarus sp.		2
3047	Spring Lake Dam	Sag-1	2023-10-25	12	Procambarus sp.		3
3047	Spring Lake Dam	Sag-1	2023-10-25	12	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	12	Etheostoma fonticola	36	1
3047	Spring Lake Dam	Sag-1	2023-10-25	12	Etheostoma fonticola	32	1
3047	Spring Lake Dam	Sag-1	2023-10-25	12	Palaemonetes sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	12	Poecilia latipinna	35	1
3047	Spring Lake Dam	Sag-1	2023-10-25	13	Gambusia sp.		3
3047	Spring Lake Dam	Sag-1	2023-10-25	13	Procambarus sp.		2
3047	Spring Lake Dam	Sag-1	2023-10-25	14	Etheostoma fonticola	39	1
3047	Spring Lake Dam	Sag-1	2023-10-25	14	Etheostoma fonticola	35	1
3047	Spring Lake Dam	Sag-1	2023-10-25	14	Etheostoma fonticola	36	1
3047	Spring Lake Dam	Sag-1	2023-10-25	14	Palaemonetes sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	14	Procambarus sp.		8
3047	Spring Lake Dam	Sag-1	2023-10-25	14	Gambusia sp.		1
3047	Spring Lake Dam	Sag-1	2023-10-25	15	Procambarus sp.		3
3048	Spring Lake Dam	Sag-2	2023-10-25	1	Lepomis miniatus	58	1
3048	Spring Lake Dam	Sag-2	2023-10-25	1	Lepomis miniatus	54	1
3048	Spring Lake Dam	Sag-2	2023-10-25	1	Lepomis miniatus	64	1
3048	Spring Lake Dam	Sag-2	2023-10-25	1	Lepomis miniatus	81	1
3048	Spring Lake Dam	Sag-2	2023-10-25	1	Lepomis miniatus	85	1
3048	Spring Lake Dam	Sag-2	2023-10-25	1	Lepomis miniatus	69	1
3048	Spring Lake Dam	Sag-2	2023-10-25	1	Lepomis miniatus	47	1
3048	Spring Lake Dam	Sag-2	2023-10-25	1	Lepomis miniatus	58	1
3048	Spring Lake Dam	Sag-2	2023-10-25	1	Lepomis miniatus	65	1
3048	Spring Lake Dam	Sag-2	2023-10-25	1	Gambusia sp.	10	1
3048	Spring Lake Dam	Sag-2	2023-10-25	1	Gambusia sp.	12	1
3048	Spring Lake Dam	Sag-2	2023-10-25	2	Lepomis miniatus	80	1
3048	Spring Lake Dam	Sag-2	2023-10-25	2	Lepomis miniatus	95	1
3048	Spring Lake Dam	Sag-2	2023-10-25	2	Lepomis miniatus	58	1
3048	Spring Lake Dam	Sag-2	2023-10-25	2	Lepomis miniatus	60	1
3048	Spring Lake Dam	Sag-2	2023-10-25	2	Lepomis miniatus	55	1
3048	Spring Lake Dam	Sag-2	2023-10-25	2	Herichthys cyanoguttatus	45	1
3048	Spring Lake Dam	Sag-2	2023-10-25	2	Procambarus sp.		1
3048	Spring Lake Dam	Sag-2	2023-10-25	3	Lepomis miniatus	71	1
3048	Spring Lake Dam	Sag-2	2023-10-25	3	Lepomis miniatus	65	1
3048	Spring Lake Dam	Sag-2	2023-10-25	3	Lepomis miniatus	68	1
3048	Spring Lake Dam	Sag-2	2023-10-25	3	Lepomis miniatus	54	1

3048	Spring Lake Dam	Sag-2	2023-10-25	3	Lepomis miniatus	47	1
3048	Spring Lake Dam	Sag-2	2023-10-25	3	Procambarus sp.		2
3048	Spring Lake Dam	Sag-2	2023-10-25	4	Lepomis miniatus	55	1
3048	Spring Lake Dam	Sag-2	2023-10-25	4	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	4	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	4	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	4	Gambusia sp.	10	1
3048	Spring Lake Dam	Sag-2	2023-10-25	5	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	5	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	5	Procambarus sp.		1
3048	Spring Lake Dam	Sag-2	2023-10-25	6	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	6	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	6	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	6	Procambarus sp.		1
3048	Spring Lake Dam	Sag-2	2023-10-25	7	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	7	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	7	Procambarus sp.		2
3048	Spring Lake Dam	Sag-2	2023-10-25	8	Procambarus sp.		1
3048	Spring Lake Dam	Sag-2	2023-10-25	8	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	8	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	8	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	8	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	8	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	8	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	8	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	8	Herichthys cyanoguttatus	47	1
3048	Spring Lake Dam	Sag-2	2023-10-25	9	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	9	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	9	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	9	Gambusia sp.	10	1
3048	Spring Lake Dam	Sag-2	2023-10-25	10	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	10	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	10	Micropterus salmoides	83	1
3048	Spring Lake Dam	Sag-2	2023-10-25	11	No fish collected		
3048	Spring Lake Dam	Sag-2	2023-10-25	12	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	13	No fish collected		
3048	Spring Lake Dam	Sag-2	2023-10-25	14	Lepomis miniatus		1
3048	Spring Lake Dam	Sag-2	2023-10-25	15	No fish collected		
3049	Spring Lake Dam	Hydro-1	2023-10-25	1	Gambusia sp.	30	1
3049	Spring Lake Dam	Hydro-1	2023-10-25	1	Etheostoma fonticola	30	1
3049	Spring Lake Dam	Hydro-1	2023-10-25	2	Gambusia sp.	24	1

3049	Spring Lake Dam	Hydro-1	2023-10-25	3	No fish collected		
3049	Spring Lake Dam	Hydro-1	2023-10-25	4	No fish collected		
3049	Spring Lake Dam	Hydro-1	2023-10-25	5	Etheostoma fonticola	33	1
3049	Spring Lake Dam	Hydro-1	2023-10-25	5	Etheostoma fonticola	37	1
3049	Spring Lake Dam	Hydro-1	2023-10-25	6	Etheostoma fonticola	37	1
3049	Spring Lake Dam	Hydro-1	2023-10-25	6	Etheostoma fonticola	32	1
3049	Spring Lake Dam	Hydro-1	2023-10-25	6	Etheostoma fonticola	34	1
3049	Spring Lake Dam	Hydro-1	2023-10-25	6	Etheostoma fonticola	34	1
3049	Spring Lake Dam	Hydro-1	2023-10-25	7	Etheostoma fonticola	28	1
3049	Spring Lake Dam	Hydro-1	2023-10-25	8	No fish collected		
3049	Spring Lake Dam	Hydro-1	2023-10-25	9	No fish collected		
3049	Spring Lake Dam	Hydro-1	2023-10-25	10	No fish collected		
3049	Spring Lake Dam	Hydro-1	2023-10-25	11	No fish collected		
3049	Spring Lake Dam	Hydro-1	2023-10-25	12	Etheostoma fonticola	35	1
3049	Spring Lake Dam	Hydro-1	2023-10-25	13	No fish collected		
3049	Spring Lake Dam	Hydro-1	2023-10-25	14	Procambarus sp.		1
3049	Spring Lake Dam	Hydro-1	2023-10-25	15	No fish collected		
3050	Spring Lake Dam	Open-1	2023-10-25	1	Gambusia sp.	22	1
3050	Spring Lake Dam	Open-1	2023-10-25	2	No fish collected		
3050	Spring Lake Dam	Open-1	2023-10-25	3	No fish collected		
3050	Spring Lake Dam	Open-1	2023-10-25	4	Gambusia sp.	21	1
3050	Spring Lake Dam	Open-1	2023-10-25	5	No fish collected		
3050	Spring Lake Dam	Open-1	2023-10-25	6	No fish collected		
3050	Spring Lake Dam	Open-1	2023-10-25	7	No fish collected		
3050	Spring Lake Dam	Open-1	2023-10-25	8	No fish collected		
3050	Spring Lake Dam	Open-1	2023-10-25	9	No fish collected		
3050	Spring Lake Dam	Open-1	2023-10-25	10	No fish collected		
3050	Spring Lake Dam	Open-1	2023-10-25	11	No fish collected		
3050	Spring Lake Dam	Open-1	2023-10-25	12	No fish collected		
3050	Spring Lake Dam	Open-1	2023-10-25	13	No fish collected		
3050	Spring Lake Dam	Open-1	2023-10-25	14	No fish collected		
3050	Spring Lake Dam	Open-1	2023-10-25	15	No fish collected		
3051	Spring Lake Dam	Hydro-2	2023-10-25	1	Gambusia sp.	25	1
3051	Spring Lake Dam	Hydro-2	2023-10-25	2	Procambarus sp.		1
3051	Spring Lake Dam	Hydro-2	2023-10-25	2	Gambusia sp.	22	1
3051	Spring Lake Dam	Hydro-2	2023-10-25	3	Gambusia sp.	16	1
3051	Spring Lake Dam	Hydro-2	2023-10-25	3	Gambusia sp.	16	1
3051	Spring Lake Dam	Hydro-2	2023-10-25	3	Gambusia sp.	23	1
3051	Spring Lake Dam	Hydro-2	2023-10-25	4	No fish collected		
3051	Spring Lake Dam	Hydro-2	2023-10-25	5	Gambusia sp.	18	1
3051	Spring Lake Dam	Hydro-2	2023-10-25	5	Gambusia sp.	10	1

3051	Spring Lake Dam	Hydro-2	2023-10-25	6	Etheostoma fonticola	37	1
3051	Spring Lake Dam	Hydro-2	2023-10-25	6	Gambusia sp.	10	1
3051	Spring Lake Dam	Hydro-2	2023-10-25	6	Gambusia sp.	15	1
3051	Spring Lake Dam	Hydro-2	2023-10-25	7	No fish collected		
3051	Spring Lake Dam	Hydro-2	2023-10-25	8	No fish collected		
3051	Spring Lake Dam	Hydro-2	2023-10-25	9	No fish collected		
3051	Spring Lake Dam	Hydro-2	2023-10-25	10	No fish collected		
3051	Spring Lake Dam	Hydro-2	2023-10-25	11	No fish collected		
3051	Spring Lake Dam	Hydro-2	2023-10-25	12	No fish collected		
3051	Spring Lake Dam	Hydro-2	2023-10-25	13	Gambusia sp.	12	1
3051	Spring Lake Dam	Hydro-2	2023-10-25	14	No fish collected		
3051	Spring Lake Dam	Hydro-2	2023-10-25	15	Gambusia sp.	24	1
3052	Spring Lake Dam	Open-2	2023-10-25	1	No fish collected		
3052	Spring Lake Dam	Open-2	2023-10-25	2	No fish collected		
3052	Spring Lake Dam	Open-2	2023-10-25	3	No fish collected		
3052	Spring Lake Dam	Open-2	2023-10-25	4	No fish collected		
3052	Spring Lake Dam	Open-2	2023-10-25	5	No fish collected		
3052	Spring Lake Dam	Open-2	2023-10-25	6	No fish collected		
3052	Spring Lake Dam	Open-2	2023-10-25	7	No fish collected		
3052	Spring Lake Dam	Open-2	2023-10-25	8	No fish collected		
3052	Spring Lake Dam	Open-2	2023-10-25	9	No fish collected		
3052	Spring Lake Dam	Open-2	2023-10-25	10	No fish collected		

APPENDIX F: MACROINVERTEBRATE RAW DATA

Site	Date	Season	Class	Order	Family	FinalID	Counts
Spring Lake	2023-04-26	Spring	Malacostraca	Aphipoda	Hyalellidae	Hyalella	78
Spring Lake	2023-04-26	Spring	Malacostraca	Decapoda	Palaemonidae	Palaemon	2
Spring Lake	2023-04-26	Spring	Insecta	Diptera	Ceratopogonidae	Bezzia complex	4
Spring Lake	2023-04-26	Spring	Insecta	Diptera	Chironomidae	Chironomidae	10
Spring Lake	2023-04-26	Spring	Insecta	Ephemeroptera	Baetidae	Callibaetis	33
Spring Lake	2023-04-26	Spring	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	16
Spring Lake	2023-04-26	Spring	Insecta	Odonata	Coenagrionidae	Enallagma	3
Spring Lake	2023-04-26	Spring	Insecta	Trichoptera	Leptoceridae	Nectopsyche	1
Spring Lake	2023-04-26	Spring	Gastropoda		Physidae	Physa	2
Spring Lake	2023-04-26	Spring	Gastropoda		Planorbidae	Planorbella	1
Spring Lake	2023-04-26	Spring	Gastropoda		Pleuroceridae	Elimia	4
Spring Lake	2023-10-18	Fall	Malacostraca	Aphipoda	Hyalellidae	Hyalella	144
Spring Lake	2023-10-18	Fall	Malacostraca	Decapoda	Cambaridae	Cambaridae	1
Spring Lake	2023-10-18	Fall	Insecta	Diptera	Ceratopogonidae	Bezzia complex	4
Spring Lake	2023-10-18	Fall	Insecta	Diptera	Chironomidae	Chironomidae	5
Spring Lake	2023-10-18	Fall	Insecta	Ephemeroptera	Baetidae	Callibaetis	2
Spring Lake	2023-10-18	Fall	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	21
Spring Lake	2023-10-18	Fall	Insecta	Odonata	Coenagrionidae	Enallagma	1
Spring Lake	2023-10-18	Fall		Tricladida	Dugesiidae	Dugesia	2
Spring Lake	2023-10-18	Fall	Gastropoda		Pleuroceridae	Elimia	5
Spring Lake	2023-10-18	Fall	Clitellata			Hirudinea	1
Spring Lake	2023-10-18	Fall	Clitellata			Oligochaeta	14
Spring Lake Dam	2023-04-26	Spring	Malacostraca	Aphipoda	Hyalellidae	Hyalella	48
Spring Lake Dam	2023-04-26	Spring	Insecta	Coleoptera	Psephenidae	Psephenus texanus	2
Spring Lake Dam	2023-04-26	Spring	Malacostraca	Decapoda	Cambaridae	Cambaridae	1
Spring Lake Dam	2023-04-26	Spring	Insecta	Decapoda	Simuliidae	Simulium	35
Spring Lake Dam	2023-04-26	Spring	Insecta	Diptera	Chironomidae	Chironomidae	3
Spring Lake Dam	2023-04-26	Spring	Insecta	Diptera	Stratiomyidae	Euparyphus	1
Spring Lake Dam	2023-04-26	Spring	Insecta	Ephemeroptera	Baetidae	Fallceon	4

Spring Lake Dam	2023-04-26	Spring	Insecta	Ephemeroptera	Leptohyphidae	Leptohyphes	1
Spring Lake Dam	2023-04-26	Spring	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	10
Spring Lake Dam	2023-04-26	Spring	Insecta	Hemiptera	Naucoridae	Ambrysus circumcinctus	12
Spring Lake Dam	2023-04-26	Spring	Insecta	Hemiptera	Naucoridae	Ambrysus lunatus	4
Spring Lake Dam	2023-04-26	Spring	Insecta	Odonata	Coenagrionidae	Argia	7
Spring Lake Dam	2023-04-26	Spring	Insecta	Trichoptera	Helicopsychidae	Helicopsyche	5
Spring Lake Dam	2023-04-26	Spring	Insecta	Trichoptera	Philopotamidae	Chimarra	4
Spring Lake Dam	2023-04-26	Spring		Tricladida	Dugesiidae	Dugesia	6
Spring Lake Dam	2023-04-26	Spring	Gastropoda		Physidae	Physa	1
Spring Lake Dam	2023-04-26	Spring	Gastropoda		Pleuroceridae	Elimia	6
Spring Lake Dam	2023-04-26	Spring	Clitellata			Oligochaeta	3
Spring Lake Dam	2023-10-18	Fall	Malacostraca	Aphipoda	Hyalellidae	Hyalella	17
Spring Lake Dam	2023-10-18	Fall	Insecta	Coleoptera	Elmidae	Phanocerus clavicornis	2
Spring Lake Dam	2023-10-18	Fall	Insecta	Coleoptera	Psephenidae	Psephenus texanus	4
Spring Lake Dam	2023-10-18	Fall	Insecta	Diptera	Empididae	Empididae	1
Spring Lake Dam	2023-10-18	Fall	Insecta	Ephemeroptera	Baetidae	Baetodes	4
Spring Lake Dam	2023-10-18	Fall	Insecta	Ephemeroptera	Baetidae	Fallceon	4
Spring Lake Dam	2023-10-18	Fall	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	5
Spring Lake Dam	2023-10-18	Fall	Insecta	Hemiptera	Naucoridae	Ambrysus circumcinctus	9
Spring Lake Dam	2023-10-18	Fall	Insecta	Hemiptera	Naucoridae	Ambrysus lunatus	1
Spring Lake Dam	2023-10-18	Fall	Insecta	Hemiptera	Naucoridae	Pelocoris	1
Spring Lake Dam	2023-10-18	Fall	Gastropoda	Littorinimorpha	Hydrobiidae	Hydrobiidae	3
Spring Lake Dam	2023-10-18	Fall	Insecta	Megaloptera	Corydalidae	Corydalus	1
Spring Lake Dam	2023-10-18	Fall	Insecta	Odonata	Calopterygidae	Hetaerina	3
Spring Lake Dam	2023-10-18	Fall	Insecta	Odonata	Coenagrionidae	Argia	2
Spring Lake Dam	2023-10-18	Fall	Insecta	Odonata	Coenagrionidae	Enallagma	1
Spring Lake Dam	2023-10-18	Fall	Insecta	Odonata	Libellulidae	Brechmorhoga	6
Spring Lake Dam	2023-10-18	Fall	Insecta	Trichoptera	Helicopsychidae	Helicopsyche	7
Spring Lake Dam	2023-10-18	Fall	Insecta	Trichoptera	Hydropsychidae	Smicridea	5
Spring Lake Dam	2023-10-18	Fall	Insecta	Trichoptera	Leptoceridae	Nectopsyche	3

Spring Lake Dam	2023-10-18	Fall	Insecta	Trichoptera	Philopotamidae	Chimarra	56
Spring Lake Dam	2023-10-18	Fall		Tricladida	Dugesiidae	Dugesia	10
Spring Lake Dam	2023-10-18	Fall	Gastropoda		Pleuroceridae	Elimia	1
Spring Lake Dam	2023-10-18	Fall	Gastropoda		Thiaridae	Melanoides tuberculata	1
Spring Lake Dam	2023-10-18	Fall	Clitellata			Hirudinea	1
Spring Lake Dam	2023-10-18	Fall	Clitellata			Oligochaeta	18
City Park	2023-04-26	Spring	Malacostraca	Aphipoda	Hyalellidae	Hyalella	66
City Park	2023-04-26	Spring	Insecta	Decapoda	Simuliidae	Simulium	1
City Park	2023-04-26	Spring	Insecta	Diptera	Chironomidae	Chironomidae	2
City Park	2023-04-26	Spring	Insecta	Ephemeroptera	Baetidae	Fallceon	5
City Park	2023-04-26	Spring	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	55
City Park	2023-04-26	Spring	Insecta	Hemiptera	Naucoridae	Limnocoris lutzi	2
City Park	2023-04-26	Spring	Gastropoda	Littorinimorpha	Hydrobiidae	Hydrobiidae	13
City Park	2023-04-26	Spring	Insecta	Odonata	Coenagrionidae	Enallagma	2
City Park	2023-04-26	Spring	Insecta	Trichoptera	Glossosomatidae	Protoptila	2
City Park	2023-04-26	Spring	Insecta	Trichoptera	Helicopsychidae	Helicopsyche	9
City Park	2023-04-26	Spring	Insecta	Trichoptera	Leptoceridae	Nectopsyche	16
City Park	2023-04-26	Spring		Tricladida	Dugesiidae	Dugesia	4
City Park	2023-04-26	Spring	Gastropoda		Thiaridae	Melanoides tuberculata	7
City Park	2023-04-26	Spring	Clitellata			Hirudinea	1
City Park	2023-04-26	Spring	Clitellata			Oligochaeta	1
City Park	2023-10-18	Fall	Malacostraca	Aphipoda	Hyalellidae	Hyalella	55
City Park	2023-10-18	Fall	Malacostraca	Decapoda	Cambaridae	Cambaridae	1
City Park	2023-10-18	Fall	Insecta	Diptera	Chironomidae	Chironomidae	3
City Park	2023-10-18	Fall	Insecta	Ephemeroptera	Baetidae	Fallceon	3
City Park	2023-10-18	Fall	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	46
City Park	2023-10-18	Fall	Insecta	Odonata	Coenagrionidae	Argia	1
City Park	2023-10-18	Fall	Insecta	Trichoptera	Leptoceridae	Nectopsyche	3
City Park	2023-10-18	Fall		Tricladida	Dugesiidae	Dugesia	1
City Park	2023-10-18	Fall	Gastropoda		Thiaridae	Melanoides tuberculata	12

City Park	2023-10-18	Fall	Clitellata			Oligochaeta	2
I-35	2023-04-26	Spring	Malacostraca	Aphipoda	Hyalellidae	Hyalella	5
I-35	2023-04-26	Spring	Insecta	Coleoptera	Elmidae	Macrelmis texana	1
I-35	2023-04-26	Spring	Insecta	Ephemeroptera	Baetidae	Fallceon	1
I-35	2023-04-26	Spring	Insecta	Ephemeroptera	Leptohyphidae	Leptohyphes	1
I-35	2023-04-26	Spring	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	2
I-35	2023-04-26	Spring	Insecta	Ephemeroptera	Leptophlebiidae	Thraulodes	14
I-35	2023-04-26	Spring	Insecta	Hemiptera	Naucoridae	Ambrysus circumcinctus	4
I-35	2023-04-26	Spring	Insecta	Hemiptera	Naucoridae	Limnocoris lutzi	16
I-35	2023-04-26	Spring	Insecta	Odonata	Coenagrionidae	Argia	1
I-35	2023-04-26	Spring	Insecta	Odonata	Gomphidae	Erpetogomphus	1
I-35	2023-04-26	Spring	Insecta	Odonata	Libellulidae	Libellulidae	1
I-35	2023-04-26	Spring	Insecta	Trichoptera	Glossosomatidae	Protoptila	14
I-35	2023-04-26	Spring	Insecta	Trichoptera	Helicopsychidae	Helicopsyche	28
I-35	2023-04-26	Spring	Insecta	Trichoptera	Leptoceridae	Nectopsyche	22
I-35	2023-04-26	Spring	Insecta	Trichoptera	Philopotamidae	Chimarra	3
I-35	2023-04-26	Spring		Tricladida	Dugesiidae	Dugesia	7
I-35	2023-04-26	Spring	Gastropoda		Pleuroceridae	Elimia	14
I-35	2023-04-26	Spring	Gastropoda		Thiaridae	Melanoides tuberculata	9
I-35	2023-04-26	Spring	Clitellata			Oligochaeta	4
I-35	2023-10-18	Fall	Malacostraca	Aphipoda	Hyalellidae	Hyalella	4
I-35	2023-10-18	Fall	Insecta	Coleoptera	Elmidae	Hexacylloepus	1
I-35	2023-10-18	Fall	Insecta	Diptera	Chironomidae	Chironomidae	1
I-35	2023-10-18	Fall	Insecta	Ephemeroptera	Baetidae	Baetis	1
I-35	2023-10-18	Fall	Insecta	Ephemeroptera	Leptohyphidae	Tricorythodes	3
I-35	2023-10-18	Fall	Insecta	Ephemeroptera	Leptophlebiidae	Thraulodes	21
I-35	2023-10-18	Fall	Insecta	Hemiptera	Naucoridae	Ambrysus circumcinctus	1
I-35	2023-10-18	Fall	Insecta	Hemiptera	Naucoridae	Limnocoris lutzi	11
I-35	2023-10-18	Fall	Insecta	Odonata	Coenagrionidae	Argia	1
I-35	2023-10-18	Fall	Insecta	Odonata	Libellulidae	Brechmorhoga	1

I-35	2023-10-18	Fall	Insecta	Trichoptera	Glossosomatidae	Protoptila	31
I-35	2023-10-18	Fall	Insecta	Trichoptera	Helicopsychidae	Helicopsyche	13
I-35	2023-10-18	Fall	Insecta	Trichoptera	Leptoceridae	Nectopsyche	11
I-35	2023-10-18	Fall		Tricladida	Dugesiidae	Dugesia	2
I-35	2023-10-18	Fall	Gastropoda		Pleuroceridae	Elimia	14
I-35	2023-10-18	Fall	Gastropoda		Thiaridae	Melanoides tuberculata	36
I-35	2023-10-18	Fall	Clitellata			Oligochaeta	3

APPENDIX H: FOUNTAIN DARTER HABITAT SUITABILITY ANALYTICAL FRAMEWORK

OBJECTIVES

The goal of this analysis was to develop an index to quantify Fountain Darter habitat suitability within biological monitoring study reaches based on aquatic vegetation composition. Specific objectives included: (1) build Habitat Suitability Criteria (HSC) for each vegetation taxa; (2) use HSC to calculate an Overall Habitat Suitability Index (OHSI) based on vegetation community composition mapped at a given study reach during each monitoring event; (3) evaluate the efficacy of OHSI as a measure of Fountain Darter habitat suitability by testing whether Fountain Darter occurrence can be predicted based on OHSI.

METHODS

Habitat Suitability Criteria

HSC are a form of resource selection function (RSF) defined as any function that is proportional to the probability of use by an organism (Manly et al. 1993). HSC were built separately for the Comal and San Marcos river/springs systems using logistic regression based on random-station dip-net data and drop-net data converted to presence/absence. Logistic regression is a form of classification model that uses presence/absence data to predict probabilities based on a set of covariates (Hastie et al. 2009). The response variable for this analysis, probability of darter occurrence, was used to quantify criteria for each vegetation type, ranging from 0 (i.e., not suitable) to 1 (i.e., most suitable) (Figure G1).

OHSI Calculation

To calculate the OHSI for each monitoring event, HSC values for each vegetation strata were first multiplied by the areal coverage of that vegetation strata, and these values were summed across all vegetation strata within each study reach, to generate a Weighted Usable Area (WUA) of vegetation only as follows:

Eq. 1

$$WUA = \sum_{i=1}^{N}(A_i \ x \ HSC_i)$$

where N is the total number of vegetation types, A_i is the areal coverage of a single vegetation type, and HSC_i is the habitat suitability criteria of that single vegetation type (Yao & Bamal 2014).

This WUA was then divided by the total wetted area within the reach to generate OHSI, as follows:

Eq. 2

$$OHSI = \frac{WUA}{\sum_{i=1}^{N}(A_i)}$$

In this way, OHSI can also be thought of as the proportion of weighted usable area (Yao & Bamal 2014), ranging from 0 (unsuitable overall habitat) to 1 (most suitable overall habitat). Standardizing by reach size allows for a comparison of habitat quality between reaches of different sizes.

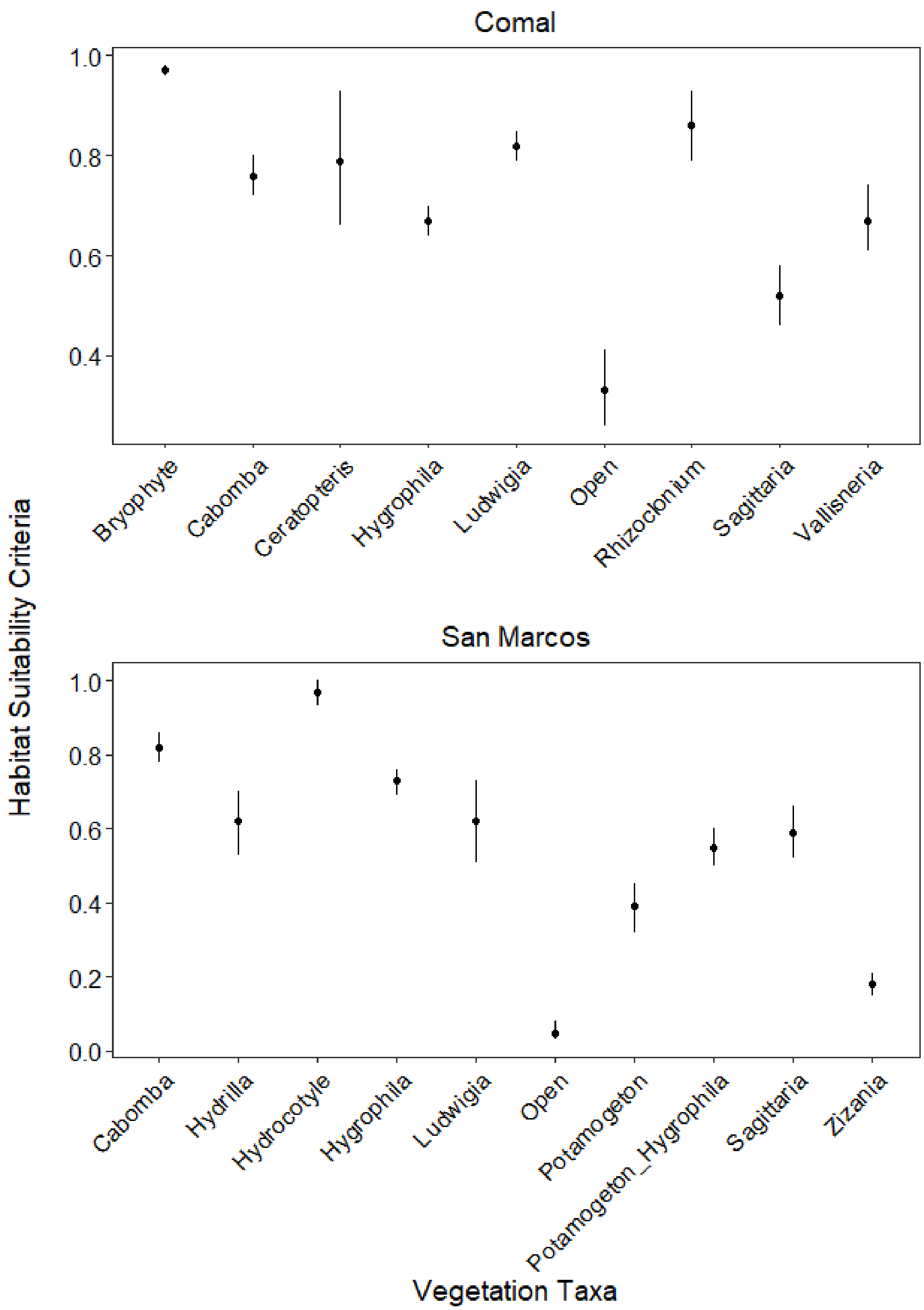


Figure H1. **Aquatic vegetation habitat suitability criteria (±95% CI) built with drop-net and random dip-net datasets using logistic regression.**

OHSI Evaluation

OHSI Evaluation Methods

To examine the relationship between OHSI and Fountain Darter population metrics, random-station dip-net data from 2017-2020 was organized in a way that treats each monitoring event per study reach as independent. This results in the response variable quantified as the proportional occurrence of Fountain Darters per reach at a given monitoring event based on the independent variable OHSI.

To predict Fountain Darter occurrence, two modeling approaches that are able to analyze proportions were used, which included: (1) GLM with a binomial distribution and (2) Random Forest Regression (RF). RF is an ensemble learning technique that builds many decision trees to predict a response variable (Breiman et al. 1984). Each decision tree of the "forest" is built by selecting a random subset of the dataset with replacement and a random set of covariates (Liaw & Wiener 2002). RF are considered more advantageous compared to traditional decision tree models and GLM because they correct for overfitting (Breiman 2001) and can provide more accurate predictions with many covariates (Cutler et al. 2007). For this analysis, we built RF models with 500 trees.

GLMs and RFs were built separately for the Comal and San Marcos systems. First, 50% of each dataset was randomly selected to train each model. Second, 5-fold cross validation (CV) was used to independently test the predictive performance of each model with the remaining 50% of the dataset (i.e., test data). Predictive performance was compared among models based on the correlation (R) and deviance (D) between observed and predicted values. Mean CV R ± standard error (SE) and CV D ± SE were calculated based on predictions from the 5 CV folds. Models with the highest CV R were considered as the best models for making predictions and elaborated on further in the results.

Lastly, figures were built to display fitted predictions across observed OHSI values to examine if there was a positive relationship between Fountain Darter occurrence and OHSI. Fitted predictions were also presented with a LOWESS smoothed function to visualize if trends of OHSI are linear or nonlinear (Milborrow 2020). In sum, if the models displayed strong predictive power and Fountain Darter occurrence showed a positive relationship with OHSI, then OHSI was considered a useful measurement of habitat suitability for Fountain Darters.

OHSI Evaluation Results

Predictive performance for the Comal models showed that RF (0.81 ± 0.18) predictions were more accurate than GLM (0.62 ± 0.20). San Marcos models were similar, showing better predictive accuracy for RF (0.97 ± 0.02) compared to GLM (0.93 ± 0.06) (Table G1). Comparisons between observed vs. predicted occurrence for the RF 5-fold CV demonstrated lowest predictive accuracy at observed proportions about 0.20 or less for the Comal and San Marcos (Figure G2).

Fitted predictions of occurrence as a function of OHSI showed that occurrence increased with increasing OHSI for the Comal and San Marcos. In the Comal, LOWESS smoothed predictions exhibited a non-linear asymptotic trend. Occurrence increased about 0.60 to 0.80 when OHSI increased from about 0.65 to 0.75 and remained around 0.80 at OHSI values >0.75. In the San Marcos, LOWESS smoothed predictions exhibited a more linear trend compared to the Comal and occurrence increased from about 0.25 to 0.55 as OHSI increased from 0.25 to 0.60 (Figure G3).

Table H1. Summary model performance statistics for predicting Fountain Darter occurrence based on OHSI. Summary statistics includes deviance (D) and correlation (R) for training data and 5-fold cross-validation (SE).

	Comal		San Marcos	
	GLM	RF	GLM	RF
Training Data				
Deviance	1.10	1.03	1.23	1.20
Correlation	0.48	0.77	0.70	0.89
Cross-Validation				
Deviance	1.12 (0.05)	1.05 (0.06)	1.24 (0.07)	1.21 (0.05)
Correlation	0.62 (0.20)	0.81 (0.18)	0.93 (0.06)	0.97 (0.02)

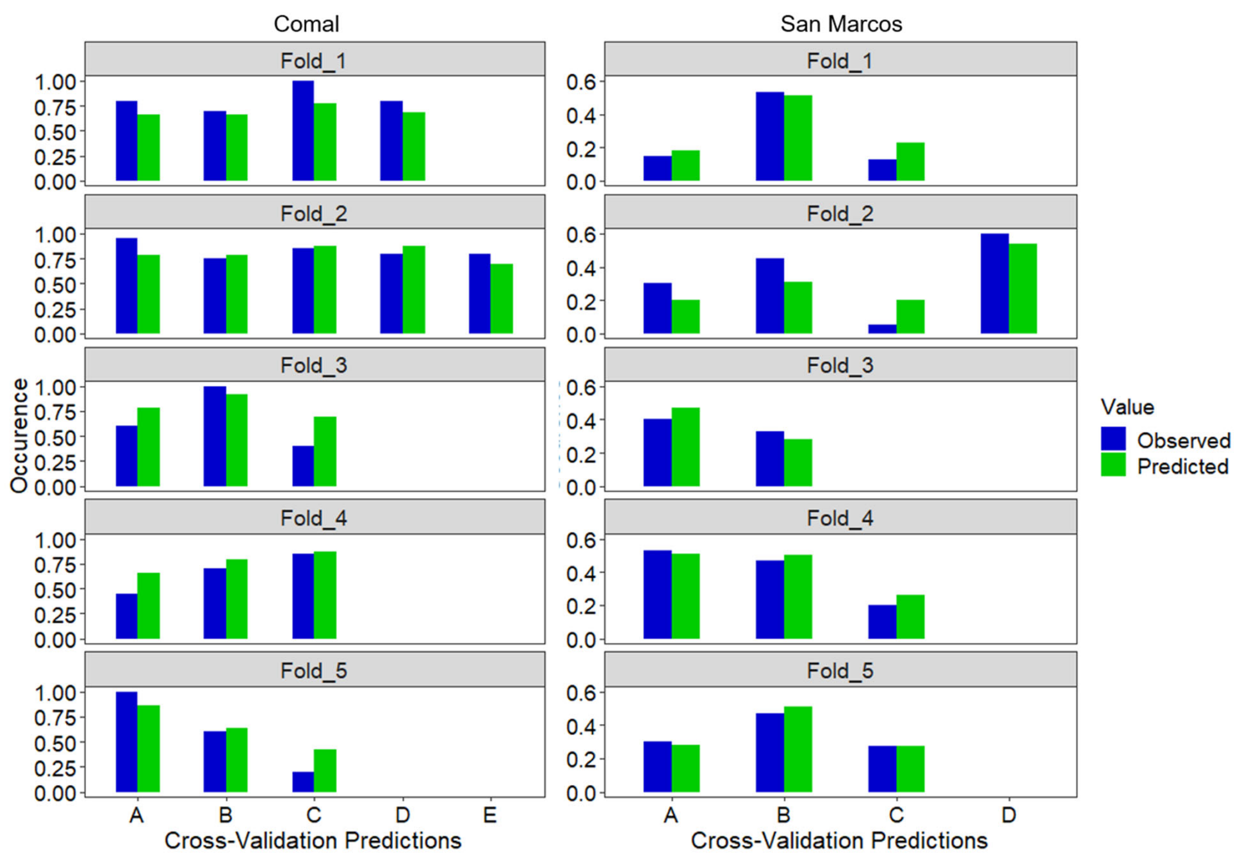


Figure H2. Observed vs. predicted Fountain Darter occurrence in relationship to OHSI from Random Forest 5-fold cross-validation.

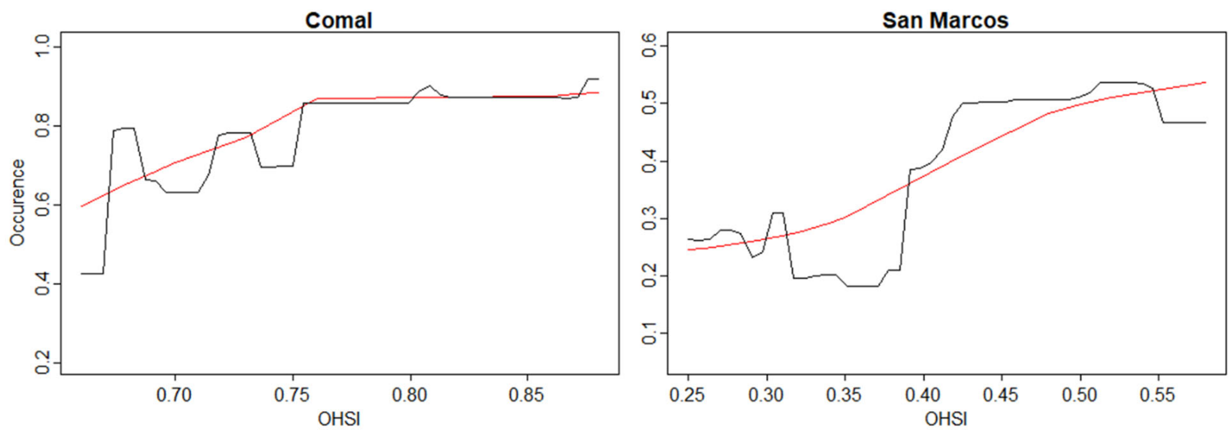


Figure H3. **Fitted occurrence predictions for OHSI in the Comal Springs/River and San Marcos River. The red lines are LOWESS smoothed fitted predictions used to visualize nonlinear trends.**

OHSI EVALUATION DISCUSSION

Model CV R >0.80 for all RFs demonstrate good model performance and that Fountain Darter occurrence can be accurately predicted based on OHSI. Further, similar performance statistics for training data and test data via cross-validation indicated that the training models were not overfit and can reliably predict independent observations in the future. That being said, predictions were least accurate at observed occurrence values about 0.20 or less, which is likely due to smaller sample sizes in this range. As random station dip-net sampling continues during future biomonitoring activities, predictions at these lower occurrence values will likely improve. Fountain Darter occurrence also increased with increasing OHSI. The positive relationship between occurrence and OHSI and good model performance supports that OHSI is an ecologically relevant index for evaluating Fountain Darter habitat suitability based on vegetation community composition.

In sum, this analysis demonstrated that OHSI based on vegetation-specific HSC and reach-level vegetation composition data can accurately predict Fountain Darter occurrence and is a useful measurement for quantifying habitat suitability. However, additional data collection can assist in addressing multiple limitations of this analysis. Firstly, random station dip-net data with simple random sampling is only available from about 2017-2020, which limits the ability to predict occurrence from historical observations. Further, model performance would likely improve at lower occurrence values as additional data are collected and a more robust dataset is generated. Secondly, this analysis assumed that vegetation alone determines Fountain Darter occurrence. For example, decreased predictive accuracy at lower darter occurrence values may be due to other habitat factors (e.g., depth-flow conditions, river discharge) or biotic factors (e.g., competition, predation) rather than due to smaller sample sizes of lower occurrence values; however, a multi-factor ecological model is beyond the scope of this work. In addition, OHSI can only be assessed for vegetation taxa that have been sampled previously and building HSC for rare vegetation taxa not represented may improve predictions. That being said, RF models demonstrated that occurrence can be predicted accurately without including additional habitat variables or vegetation types, supporting that this assumption does not hinder this analysis and does not appear to restrict the inference value of OHSI.

REFERENCES

Breiman, L. Friedman, J.H., Olshen, R. and Stone, C.J. 1984. Classification and Regression Trees. Wadsworth and Brooks, Monterey, CA.

Breiman, L. 2001. Random Forest. Machine Learning 45:5-32.

Cutler, D.R., T.C. Edwards, K.H. Beard, A. Cutler, K.T. Hess, J. Gibson, and J.J. Lawler. 2007. Random forests for classification in ecology. Ecology 88:2783-2792.

Hastie, T., R. Tibshirani, and J. Friedman. 2009. The Elements of Statistical Learning: Data Mining, Inference, and Prediction. Second edition, Springer, New York. 757 pp.

Hayes, J.W., E. Goodwin, K.A. Shearer, J. Hay, and L. Kelly. 2016. Can weighted useable area predict flow requirements of drift-feeding salmonids? Comparison with a net rate of energy intake model incorporating drift-flow processes. Transactions of the American fisheries society, online.

Manly, B.F.J., L.L. McDonald, and D.L. Thomas. 1993. Resource Selection by Animals: Statistical Design and Analysis for Field Studies. Chapman & Hall, London. 177 pp.

Milborrow, S. 2000. Plotting regression surfaces with *plotmo*. 27 pp. http://www.milbo.org/doc/plotmo-notes.pdf

Yao, W., P. Rutschmann, and S. Bamal. 2014. Modeling of river velocity, temperature, bed deformation and its effects on Rainbow Trout (*Oncorhynchus mykiss*) habitat in Lees Ferry, Colorado. Journal of Environmental Restoration 8:887-896.

.