HABITAT CONSERVATION PLAN

BIOLOGICAL MONITORING PROGRAM

Comal Springs/River Aquatic Ecosystem

ANNUAL REPORT

December 2019

Prepared for:

Edwards Aquifer Authority
900 East Quincy
San Antonio, Texas 78215

Prepared by:

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

BIO-WEST

TABLE OF CONTENTS

List of Figures

List of Tables

EXECUTIVE SUMMARY

The Edwards Aquifer Habitat Conservation Plan (HCP) Biological Monitoring Program for the Comal Springs/River ecosystem was conducted per standard operating protocols and schedules in 2019. Species-specific monitoring activities were focused on tracking populations of the HCP-covered species including the Fountain Darter *Etheostoma fonticola*, multiple endangered Comal Springs invertebrates, and the Comal Springs salamander *Eurycea* spp. Community-level monitoring was also conducted to assess overall conditions of aquatic vegetation, macroinvertebrate, and fish communities. Biological data was evaluated in combination with data on local hydrology and water quality conditions to inform the relationship between flow dynamics and system ecology. This annual report summarizes the methodologies used and the observations made as part of 2019 Edwards Aquifer HCP Biological Monitoring in the Comal System.

The Comal Springs/River ecosystem experienced above average total system discharge for most of 2019 with a drop to near average conditions in the fall. Water temperatures measured using temperature thermistors in the Comal River did not exceed the TCEQ water quality standard of 26.7˚C, and as such, all measurements were well below any lethal temperature thresholds for both adult and juvenile Fountain Darters. Abundant and stable aquatic vegetation in the study reaches resulted in quality Fountain Darter habitat, with both dip-net results and overall normalized population estimates exceeding long-term averages. Length frequencies of Fountain Darters were similar to previous years, with recruitment noted in all reaches and during both spring and fall sample events. Fountain Darters continue to be most abundant in native aquatic vegetation types that provide dense cover at the substrate level, such as bryophytes.

Fish community sampling in 2019 once again documented a diverse and dynamic fish community dominated by Fountain Darters, mosquitofish and other spring-associated fishes. Based on repeat visual timed surveys, Comal salamander abundance continues to remain high in most of the spring run areas monitored. Macroinvertebrate monitoring activities conducted during 2019 included drift-net sampling of spring orifices for aquifer invertebrates, cotton lure sampling at specific springs for Comal Springs riffle beetle *Heterelmis comalensis*, and use of rapid bioassessment protocols (RBP) to evaluate community structure in individual reaches. Comal Springs riffle beetle cotton lure data exhibited increases in lure density compared to 2018 results.

In summary, biological monitoring described herein demonstrates that the Comal Springs/River ecosystem supports quality habitat for the HCP-covered species. Additional habitat improvements continue to be realized as part of ongoing HCP sponsored habitat restoration activities, particularly in regards to restoration of native aquatic vegetation which is a key component of Fountain Darter habitat. Notable patterns observed in 2019 include high occurrence and abundance of Fountain Darters, an increase in Comal salamander observations, and an increase in the density of Comal Springs riffle beetles observed on cotton lures. A variety of factors could potentially be influencing these patterns and continued investigation will be required in 2019 and beyond. Continued monitoring is paramount in evaluating responses of this diverse and dynamic system to a suite of ever-changing hydrologic and climatic conditions.

INTRODUCTION

Section 6.3.1 of the Edwards Aquifer Habitat Conservation Plan (HCP) laid out the path forward for continuation of the biological monitoring program. Originally, the biological monitoring program's (formerly known as the Edwards Aquifer Authority [EAA] Variable Flow Study) main objective was to evaluate the effects of variable flow on the biological resources (particularly threatened/endangered species) within the Comal and San Marcos spring systems. This fundamental objective is still imperative to the success of the HCP, as is continued monitoring of system conditions over time and filling in important data gaps where appropriate and practical. However, the utility of the HCP biological monitoring program has surpassed this original goal and objective. The biological monitoring data collected through this original program (BIO-WEST 2001a–2014a, b) now also serves as (1) the cornerstone for several underlying sections in the HCP, including long-term biological goals and management objectives (HCP Section 4.1); (2) determination of potential impacts to and incidental take assessment relative to the HCP and Environmental Impact Statement alternatives (HCP Section 4.2); and (3) establishment of core adaptive management activities for triggered monitoring and adaptive management response actions (HCP Sections 6.4.3 [Comal] and 6.4.4 [San Marcos]). As the HCP proceeds, biological monitoring program data, in conjunction with other available information, is essential to assess the effectiveness and efficiency of certain HCP mitigation/restoration activities conducted in both the Comal and San Marcos springs systems and calculate the HCP habitat baseline and net disturbance determination and annual incidental "take" estimate.

Over the years, the EAA Variable Flow Study (now HCP biological monitoring program) has undergone numerous reviews, critiques, and revisions. To comprehensively assess the ecosystem, multiple sampling components are presently incorporated in the HCP biological monitoring program with several sampling location strategies employed. The sampling locations selected are designed to cover the entire extent of endangered species habitats in both systems, while allowing for holistic ecological interpretation and maximizing resources where practical and when applicable. As such, the current design employs the following five basic sampling location strategies for the Comal system, with associated sampling components.

The five sampling location strategies are as follows:

System-wide Sampling
Full system aquatic vegetation mapping–once every 5 years (Completed in 2013, 2018 and next scheduled for 2023)

Select Longitudinal Locations
Temperature monitoring—thermistors
Water quality sampling—during Critical Period sampling
Fixed-station photography
Discharge measurements

Reach Sampling (five reaches)
Aquatic vegetation mapping
Fountain Darter drop netting
Fountain Darter presence/absence dip netting

Springs Sampling
Endangered Comal invertebrate sampling
Comal Springs salamander sampling

River Section/Segment Sampling
Fountain darter timed dip-net surveys
Macroinvertebrate community sampling
Fish community sampling

The following section provides a brief description of the methods utilized for 2019 activities, which is followed by a presentation of observations and results. 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 Comal Springs/River ecosystem (EAA 2018).

METHODS

Study Location

Comal Springs, which consists of numerous spring openings, is the largest spring system in Texas. The clear, thermally constant water issues from the downthrown side of the Comal Springs Fault Block. The Comal River extends approximately 5 kilometers to its confluence with the Guadalupe River. Although Comal Springs reportedly has the greatest discharge of any springs in the Southwest, the flows can diminish rapidly during drought conditions. The springs completely ceased to flow for several months in the summer and fall of 1956 during the drought of record. Despite this, Comal Springs is home to several rare, federally listed animal species. This biological monitoring program is directed toward the federally listed species and those covered by the HCP. These include one fish, the Fountain Darter, and three invertebrates: Comal Springs riffle beetle, Comal Springs dryopid beetle *Stygoparnus comalensis*, and Peck's cave amphipod *Stygobromus pecki*. Three additional HCP-covered species monitored in this study include the Comal Springs salamander, Edwards Aquifer diving beetle *Haideoporus texanus*, and Texas troglobitic water slater *Lirceolus smithii*.

Two full routine comprehensive sampling events (i.e., spring and fall) and scheduled annual activities were conducted in 2019. Additionally, Texas Master Naturalist volunteers assisted with weekly water quality measurements and recreational counts on the Comal system. A comprehensive sampling event includes the following sampling components and volunteer activities:

Water Quality / Fixed Station Photography
Thermistor Placement and Retrieval
Weekly Standard Parameters (Volunteer)
Point Water Quality Measurements and Discharge Measurements
Fixed-station Photographs

Aquatic Vegetation
GPS Mapping

Fountain Darter Sampling
Drop Nets
Dip Nets
Visual Observations

Comal Springs Salamander Observations
SCUBA/Snorkel Surveys

Macroinvertebrate Sampling
Drift Nets
Comal Springs Riffle Beetle Surveys
Benthic Macroinvertebrate Rapid Bioassessment

Recreation Observations
Weekly Recreation Counts (Volunteer)

Fish Community Sampling
SCUBA/Seine Surveys

Comal Springflow

Total system discharge data for the Comal River were acquired from United States Geological Survey (USGS) water resources division. Some of the data are provisional, as indicated in the disclaimer on the USGS website and, as such, may be subject to revision at a later date. According to the disclaimer, "recent data provided by the USGS in Texas, including stream discharge, water levels, precipitation, and components from water-quality monitors, are preliminary and have not received final approval" (USGS 2019). The discharge data for the Comal system were taken from USGS gage 08169000 on the Comal River in New Braunfels. This site represents the cumulative discharge of the springs that form the Comal River.

In addition to the cumulative discharge measurement, USGS maintains gages on the Old Channel and New Channel of the Comal River (gages 08168913 and 08168932, respectively). Specific to each comprehensive sampling effort, discharge was also measured at five specific locations: Upper Spring Run, Spring Run 1, Spring Run 2, Spring Run 3, and Old Channel. These data were used to estimate the contribution of each major Spring Run to total discharge in the river and to evaluate the relative proportion of water flowing in the Old Channel and New Channel. All biological monitoring program discharge measurements at these locations were taken using a HACH FH950 portable flow meter. In addition to the five wadeable discharge measurement locations, flow partitioning in Landa Lake was conducted by EAA scientists with a SonTek® RiverSurveyor M9 Acoustic Doppler Current Profiler. The objective is to track the contribution of a major upwelling area around Spring Island to the total system discharge in the Comal River.

Low-flow Sampling

Low-flow Critical Period events can prompt an intensive data collection effort that includes triggers and associated activities as outlined in Appendix A. No low-flow critical period sampling events were triggered in 2019.

HCP Species-specific Triggered Sampling

Appendix A provides a detailed list of sampling requirements for HCP species-specific triggered sampling in the Comal system. No species-specific low-flow sampling was triggered in the Comal River in 2019.

Critical Period High-Flow Sampling

Similar to low-flow Critical Period events, high-flows can trigger an intensive data collection effort with triggers and associated activities outlined in Appendix A. No high-flow Critical Period sampling events were triggered in 2019.

Water Quality Sampling and Fixed Station Photography

Conventional parameters (i.e., water temperature, conductivity, pH, dissolved oxygen, water depth at sampling point, and observations of local conditions) were taken at all drop-net sampling sites and fish community sampling locations using a calibrated, handheld, water quality sonde.

Water Temperature Thermistors

Thermistors (HOBO Tidbit v2 Temp Loggers) set to record water temperature every 10 minutes have been placed at select water quality stations along the Comal River, and are downloaded at regular intervals to provide continuous monitoring of water temperatures in these areas. To provide a more manageable dataset, 10-minute readings are converted into 4-hour averages for analysis in this report. Thermistors were also placed in two deeper locations within Landa Lake using SCUBA. The thermistor locations will not be described in detail here to minimize the potential for tampering.

Water Quality Grab Samples

During Critical Period sampling events, surface-water grab samples are collected at 12 locations along the Comal River to evaluate conventional water chemistry parameters (Figure 1). There were no Critical Period sampling events, and thus no water quality grab sampling events, in 2019.

Fixed Station Photography

In addition to water quality data collection effort, a long-term record of habitat conditions has been maintained via fixed-station photography. Fixed-station photographs allow temporal habitat evaluations. Photographs included upstream, cross-stream, and downstream photographs and were taken at each water quality site shown in Figure 1.

Texas Master Naturalist Monitoring

Volunteers with the Texas Master Naturalist program continued their monitoring efforts in 2019 at select locations along the Comal system. Volunteers collected water quality and recreation data at five sites: Houston Street site within the Upper Spring Run Reach, Gazebo site within the Landa Lake Reach, Elizabeth Avenue site upstream of the Old Channel Reach, New Channel site within the New Channel Reach, and the downstream-most Union Avenue site (Figure 2). Volunteer monitoring was performed on a weekly basis, with surveys conducted primarily on Friday afternoons between 1200hrs and 1500hrs. At each site, an Oakton Waterproof EcoTestr pH 2 was used to measure pH, and a LaMotte Carbon Dioxide Test Kit was used to measure carbon dioxide (CO_2) concentrations in the water column. In addition to water quality measurements, recreational-use data were collected at each site by counting the number of tubers, kayakers, anglers, etc., within the survey site at the time of sampling. Volunteers also took photographs at each site during each sampling event and occasionally made additional notes on recreational use or condition of the river.

Aquatic Vegetation Mapping

Aquatic vegetation mapping at each of the five sample reaches was conducted using a Trimble Geoexplorer 6000 and a Trimble Tempest external antenna capable of submeter accuracy. The antenna and GPS unit were attached, with the antenna on the bow, to a sit-in kayak with a plexiglass window in the bottom. The aquatic vegetation was identified and mapped by gathering coordinates (creating polygons) while maneuvering the kayak around the perimeter of each vegetation type at the water's surface. All vegetation species in mixed stands were assigned a percentage of cover, which was multiplied by the total area of the stand to calculate the surface area of each species. For vegetation maps (Appendix B), only the dominant vegetation type is presented for each polygon. Vegetation stands that measured between 0.5 and 1.0 m in diameter were mapped by recording a single point. Vegetation stands less than 0.5 m in diameter were not mapped due to GPS accuracy.

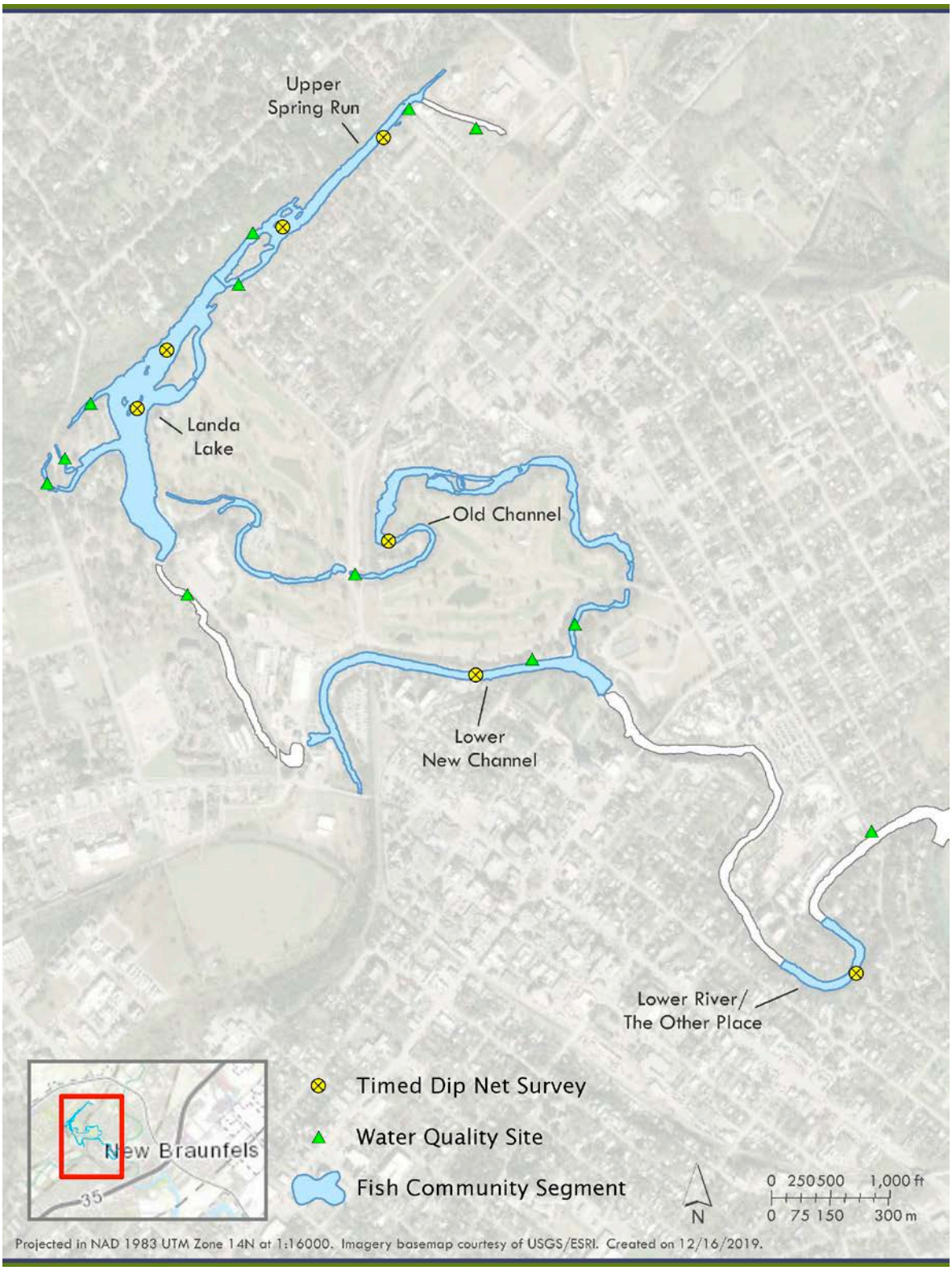


Figure 1. Fish community, water quality, and Fountain Darter timed dip-net surveys within the Comal River study area.

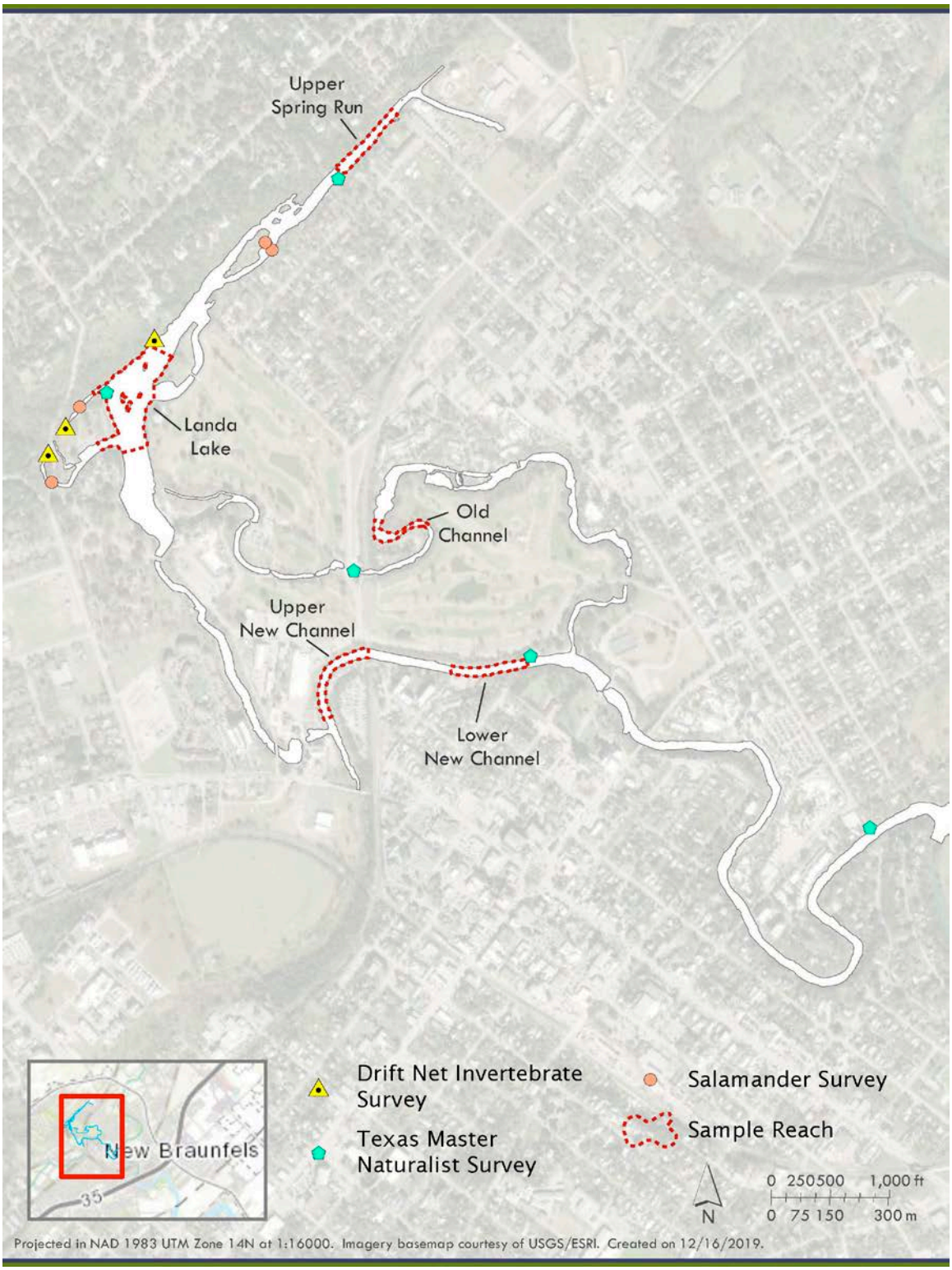


Figure 2. **Invertebrate, Comal Springs salamander, Texas Master Naturalist, and biomonitoring (includes aquatic vegetation mapping, drop net sampling, presence/absence dip-net sampling, and macroinvertebrate community sampling) sample areas within the Comal River study area.**

Fountain Darter Sampling

Drop-net Sampling

A drop-net is a sampling device originally designed by the U.S. Fish and Wildlife Service (USFWS) to sample Fountain Darters and other benthic fish species. The net encloses a known area 2 m^2, preventing the escape of fish occupying that area and allowing for thorough sample collection. A large dip net (1 m^2) is used within the drop net and is swept along the length of the river substrate 15 times in order to ensure complete enumeration of all fish trapped within the drop net. For sampling during this study, a drop-net was placed in randomly selected sites within specific aquatic vegetation types. A stratified-random sampling design was used with random points generated within the dominant vegetation types in each reach (Figure 2) using GIS software.

At each location, the vegetation type, height, and areal coverage were recorded, as were dominant substrate type, mean column velocity, velocity at 15 cm above the bottom, water temperature, conductivity, pH, and dissolved oxygen. In addition, vegetation type, height, areal coverage, and dominant substrate type were noted for the adjacent area within 3 m of the drop net. Fountain Darters were identified, enumerated, measured for total length, and returned to the river at the point of collection. The same data were collected for all other fish species, except for abundant species, in which case only the first 25 individuals were measured. Fish species not readily identifiable in the field were preserved for identification in the laboratory. When collected, all live giant ramshorn snails *Marisa cornuarietis* were counted, measured, and destroyed, while a categorical abundance level was recorded (i.e., none, slight, moderate, or heavy) for the exotic Asian snails *Melanoides tuberculatus* and *Tarebia granifera* and the Asian clam (*Corbicula* sp.). A total count of crayfish (*Procambarus* sp.) and grass shrimp (*Paleon* sp.) was also recorded for each dip-net sweep.

Drop-net data collected over the entire study period (2001 – 2019) were used to calculate mean density of Fountain Darters within each major vegetation type, and thus investigate patterns in habitat utilization. Mean densities of Fountain Darters in each vegetation type were then multiplied by the areal coverage of that type (taken from aquatic vegetation mapping) to generate estimates of Fountain Darter abundance. By summing values for all vegetation types in all reaches, an estimate of Fountain Darter abundance within the study reaches during each sampling event (i.e., spring/fall) was calculated. Since trends are more important in this data than actual values, data were then normalized by dividing all estimates by the maximum value. Resulting normalized population estimates provide a means of estimating changes to Fountain Darter populations based on available habitat.

Dip-net Sampling

In addition to drop-net sampling for Fountain Darters, a dip net of approximately 40 cm x 40 cm (1.6 mm mesh) was used to conduct two separate types of Fountain Darter sampling (timed surveys and random-station presence/absence surveys).

Dip-net Timed Surveys

A dip net was used to sample all habitat types within each river section (see Figure 1 for general sampling locations). Collection was generally conducted by personnel moving upstream through

a section. Attempts were made to sample all habitat types within each section. Habitats thought to contain Fountain Darters, such as along the edges or within clumps of certain aquatic vegetation, were targeted and received the most effort. Areas deeper than 1.4 m were not sampled. Fountain Darters collected were identified, measured, recorded as number per dip-net sweep, and returned to the river at the point of collection.

To balance the effort expended across sampling events, a predetermined time constraint was used for each section (Upper Spring Run: 0.5 hour, Spring Island: 0.5 hour, Landa Lake: 1.0 hour, New Channel: 1.0 hour, Old Channel: 1.0 hour, Lower River: 1.0 hour). The areas of Fountain Darter collection were marked on a base map of the section, and the same general areas are sampled during each survey. Although information regarding the density of Fountain Darters per vegetation type was not gathered with this method (as in drop-net sampling), it did permit a more thorough exploration of various habitats within each reach. Also, spending a comparable length of time in each reach allowed comparisons between data gathered during each sampling event. Dip-net data were used to identify periods of Fountain Darter reproductive activity because this method is efficient at catching small Fountain Darters (<15 mm).

Random-station Dip Netting

During each event, 50 random stations were selected in vegetated areas within each of the four study reaches (Figure 2) using a random point generator in ArcGIS and the most recent vegetation map of that reach. The number of sampling stations within each study reach was distributed based on total area, diversity of vegetation, and previous Fountain Darter abundance estimates of each sample reach. Five stations were chosen in the Upper Spring Run Reach, 20 stations were chosen in the Landa Lake Reach, 20 stations in the Old Channel Reach, and five stations in the New Channel Reach. At each random station four dips were conducted for a total 200 dips per sample period. After each dip, presence or absence of Fountain Darters was recorded. To avoid recapture, Fountain Darters were placed into a plastic tub filled with river water or moved a sufficient distance away from the dip netter. At each station, the dominant surficial substrate (i.e., clay, silt, sand, gravel, cobble, boulder, bedrock) was recorded, along with the dominant type of aquatic vegetation (i.e., *Sagittaria*, bryophytes, open). Also, since bryophytes and algae are key Fountain Darter habitat components and can grow within or attached to other vegetation types, presence/absence of bryophytes and algae at each station was also noted. After four dips were completed and all necessary data were recorded, all organisms were released near the station of capture.

Visual Observations

Visual surveys were conducted in Landa Lake using SCUBA gear to verify continued habitat use in deeper portions of the lake by Fountain Darters and Comal Springs salamanders. To standardize data in relation to any potential diel patterns in behavior, observations were conducted in early afternoon during each sampling event. Since summer 2001, a specially designed grid (0.6 x13.0 m) has been used to quantify the number of Fountain Darters using these deeper habitats. During each survey, all Fountain Darters within the grid were counted and the percentage of bryophyte coverage within the grid was recorded.

Fish Community Sampling

A multifaceted sampling methodology was again employed in 2019 to monitor fish community composition and abundance by using seines in wadeable areas and by conducting visual underwater SCUBA surveys in deeper habitats. This methodology was developed by Dr. Timothy H. Bonner and his students at Texas State University during previous fish community work on the San Marcos River (Behen 2013). Dr. Bonner and crew performed all HCP fish community sampling in the Comal system in 2019. For fish community monitoring, the Comal system was split into the following five segments: (1) Upper Spring Run, (2) Landa Lake, (3) New Channel, (4) Old Channel, and (5) Lower River (Figure 1).

Within the deeper sections of each reach, at least three visual transect surveys were conducted by divers during each sampling event. At each visual transect, four divers swam across the river, perpendicular to the flow, at approximately mid-column depth. Divers identified and enumerated all fish observed. After the divers completed this initial transect, four 5-m-long PVC pipe segments (micro-transect pipes) were placed on the stream bottom, spaced evenly along the original transect and oriented parallel to the river's current. Divers swam to the bottom and surveyed each of the micro-transect pipes. Divers started at the downstream end and swam up the pipe, searching through the vegetation and substrate within approximately 1 m of the pipe to dislodge small benthic-oriented fishes such as darters. Again, all fish observed were identified, counted, and relayed to a data recorder on the surface. Notes on the percent coverage of various substrate and vegetation types were also recorded. After fish surveys were complete, depth and velocity data were collected near the middle of each micro-transect pipe using a Marsh McBirney Model 2000 portable flowmeter and adjustable wading rod. At each micro-transect pipe, velocity measurements were taken at 15 cm from the bottom, mid-column, and near the surface. Standard water quality parameters were also recorded once at each transect using a Hydrotech water quality sonde.

In addition to visual surveys, seining was used to sample the fish community in wadeable areas. At least three seining transects were conducted within each reach during each sampling event, with the exception of Landa Lake, which was not sampled with seining due to depth. At each transect, multiple seine hauls were pulled until the entire wadeable area at that transect had been covered. For example, seines were pulled along the bank on one side of the river, after which the seining crew moved closer to midchannel, taking caution not to sample the same area. The crew continued to move toward the opposite bank with each successive seine haul until either the other bank was reached or water became too deep to seine effectively. Randomly selecting seining transects within the wadeable portion of each reach and using the protocol above ensured that habitats were sampled in similar proportions to their availability. After each seine haul, fish were identified, measured to the nearest mm of total length and enumerated. Seine halls are conducted at sufficient distances apart to prevent recapture on subsequent seine hauls. At each seine haul location, notes on percent coverage of substrate, vegetation, and other cover types were recorded, and water depth and velocity were measured with a portable flowmeter and adjustable wading rod. Velocity measurements were taken at 15 cm, mid-column, and near the surface. After completion of all seine hauls at each transect, fish were released from holding buckets.

Data from underwater observations were combined with seine hauls to examine overall fish community composition during each event. Because areas were measured for each gear type, calculations of catch-per-unit-effort (CPUE) by gear type and taxa were conducted. The total numbers of individuals observed among three gear types: mesohabitat (meso), microhabitat (micro), and seine is calculated along with the number of individuals taken by specific gear. Mean CPUE is calculated as the average catch-per-unit-effort (number of individuals / m^2) of each species among all reaches. Overall relative density (%) is calculated as the relative density of each species by the total densities of all species (similar to the more familiar relative abundance but using density of individuals rather than number of individuals). Species relative density (%) is calculated as the relative density of a species among reaches.

Comal Springs Salamander Visual Observations

Timed visual surveys for Comal Springs salamanders were conducted by two-person crews in Spring Run 1, Spring Run 3, and near Spring Island during both 2019 sampling events (Figure 2). Each survey began at the downstream-most edge of the sampling area. Crews turned over rocks within the top five cm of the substrate surface, and within aquatic vegetation to dislodge salamanders while moving upstream toward the main spring orifice. A dive mask and snorkel were utilized to view organisms as depth permitted. Comal Springs salamander locations were noted, along water depth, and presence/absence of vegetation. To account for any potential diel patterns in behavior, all surveys were initiated in the morning and terminated by early afternoon.

Within Spring Run 1, a one hour survey was conducted from the Landa Park Drive Bridge upstream to just below the head spring orifice. Spring Run 3 was surveyed for one hour from the pedestrian bridge closest to Landa Lake upstream to the second pedestrian bridge. Surveys in the Spring Island area were divided into the following two sections: (1) one 30-minute survey of Spring Run 6 and, (2) one 30-minute survey of the east outfall upwelling area on the east side of Spring Island near Edgewater Drive. This equals 6 person hours of survey during each event. Additionally, Comal Springs salamander visual observations were made during SCUBA surveys for Fountain Darters of deeper locations within Landa Lake outlined above. These visual surveys have been conducted along a deep water transect in Landa Lake since 2001 in an effort to verify continued habitat use of these deeper areas by the Comal Springs salamander.

Macroinvertebrate Sampling

Drift-net Sampling

Macroinvertebrate samples were collected via drift net at three sites in the Comal system. During each comprehensive sampling event, drift nets were placed over the major spring openings of Comal Spring Runs 1 and 3 and a moderate-sized spring upwelling (Spring 7) along the western shoreline of Landa Lake (Figure 2). Drift nets were anchored into the substrate directly over each spring opening, with the net faced perpendicular to the direction of flow. Net openings were circular with a 0.45 m diameter, and the mesh size was 100 micrometers (μm). The tail of the drift net was connected to a detachable, 0.28 m long cylindrical bucket (200 μm mesh), which was removed at 6-hour intervals during sampling, after which cup contents were sorted and invertebrates removed in the field. The remaining bulk samples were preserved in ethanol and sorted later in the laboratory, removing minute organisms overlooked in the field. All Comal

Springs riffle beetles, Peck's cave amphipods, and Comal Springs dryopid beetles captured via drift net were returned to their spring of origin, with the exception of voucher organisms (fewer than 20 living specimens of each species identifiable in the field). All non-endangered invertebrates were preserved in 70% ethanol. Additionally, water quality measurements (temperature, pH, conductivity, dissolved oxygen, and current velocity) were taken at each drift-net site using a Hydrotech multiprobe (MS5) water quality meter and Hach (FH950) handheld flow meter.

Comal Springs Riffle Beetle

Comal Springs riffle beetles were collected from three reaches in the Comal River system during two routine sampling events in 2019, spring and fall. Sampling followed the methods of the Cotton Lure standard operating procedure (SOP) developed for the HCP. This methodology consists of placing lures of 15x15 cm pieces of 60% cotton/40% polyester cloth into spring openings/upwellings in the Comal system, leaving them in situ for approximately 30 days. During this time, the pieces of cloth become inoculated with local organic and inorganic matter, biofilms, and invertebrates, including Comal Springs riffle beetle. Lures were placed in sets of 10 in three areas: (1) Spring Run 3, (2) along the western shoreline of Landa Lake ("Western Shoreline"), and (3) near Spring Island. Lures were deployed and collected at all sites in April and May, as well as October and November. The length of time lures were deployed ranged from 27 to 31 days. Lures lost, disturbed, or buried by sedimentation were not included in subsequent analyses. Numbered spring identification tags placed on the banks of Spring Run 3 and Western Shoreline were utilized when possible to identify lure locations.

Comal Springs riffle beetles collected with cotton lures were identified, counted, and returned to their spring of origin unless otherwise noted. During the spring and fall 2019 sampling, 25% of the sampled adult Comal Springs riffle beetles were given to personnel from the USFWS San Marcos Aquatic Resources Center (SMARC) (upon request) for refuge housing. The sampling crew also recorded counts of *Microcylloepus pusillus* and Peck's cave amphipod (*Stygobromus pecki*) collected on lures. These and any other spring invertebrates collected on the lures were also placed back into their spring of origin. Crews utilized a mask and snorkel to place and remove lures in deeper areas.

Benthic Macroinvertebrate Rapid Bioassessment

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 (500 µm mesh) by disturbing riffle or run habitat consisting primarily of cobble-gravel substrate, for 5 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 Upper Spring Run, Landa Lake, Old Channel, New Channel, and the Lower River reaches, during spring (25 April) and fall (18 October) (Figure 2).

Picked samples were preserved in 70% isopropyl, returned to the laboratory, and identified to TCEQ (2014) taxonomic effort levels, 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 1–4 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.

OBSERVATIONS

The project team conducted 2019 comprehensive sampling during three different periods: spring routine full event (April 15 – May 3), summer Fountain Darter dip netting (August 14 – 15), and fall routine full event (October 15 – November 6).

Comal Springflow

Total system discharge in 2019 was above the historic average for a majority of the year after a below average year for most of 2018 (Figure 3).

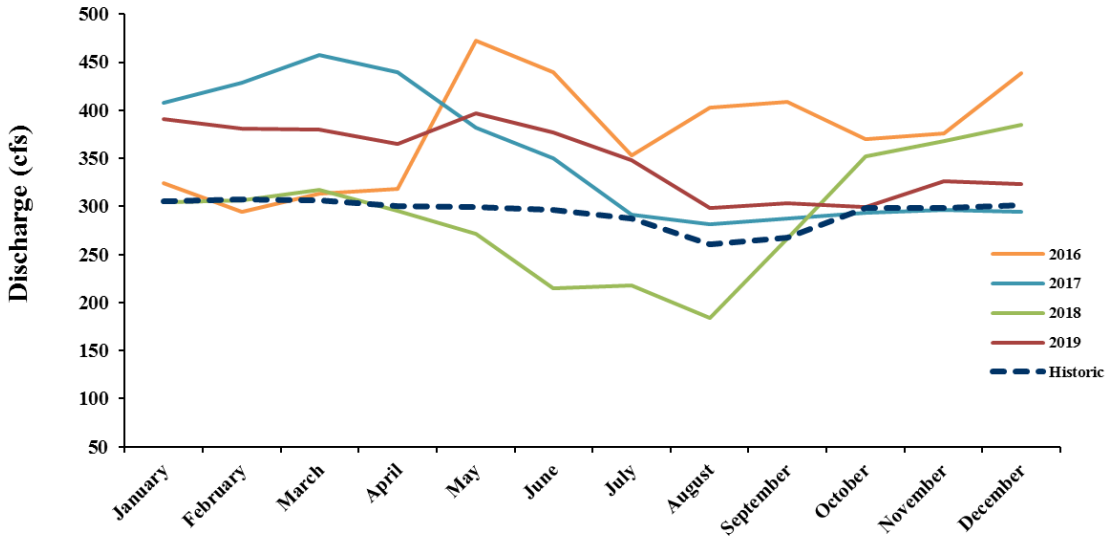


Figure 3. Mean monthly discharge in the Comal River 2016–2019, with historical period of 1934–2019 as dashed line.

The lowest total springflow (daily average) observed in 2019 occurred on October 11 at 281 cubic feet per second (cfs; Table 1). This was 120 cfs higher than the lowest daily average recorded in 2018. The 2019 annual average daily discharge was 352 cfs which is 62 cfs higher than the 2018 annual average daily discharge (290 cfs). In 2019, there were no average daily discharges at or above 1,000 cfs, demonstrating a lack of large flood events which can cause extensive scouring of vegetation in the Upper Spring Run and New Channel reaches.

Table 1. Lowest discharge during each year of the study (2000–2019), and the date it occurred.

YEAR	DISCHARGE (cubic feet per second)	DATE
2000	138	September 7
2001	243	August 25
2002	247	June 27
2003	351	August 29
2004	335	May 28
2005	339	July 14
2006	202	August 25
2007	251	March 8–10
2008	260	June 30
2009	158	July 2
2010	305	August 26, 30
2011	159	September 14
2012	155	September 13
2013	111	September 4
2014	65	August 29, 30
2015	131	January 1–2,5–6
2016	278	February 22
2017	261	August 2–3
2018	161	August 30-31
2019	281	October 11

During spring and fall routine sampling events in 2019, discharge was measured at nine sites in the Comal River (Figure 4). Overall, all 2019 measured discharges were above the long-term average for all three Spring Run sites (Figure 5). Measured discharge in the Old Channel largely reflects the amount of water flowing through the culvert at the downstream end of Landa Lake. As this is a regulated culvert, flows are expected to be more consistent here than the rest of the Comal system. This was shown in 2019, discharge for the Old Channel was similar in both spring and fall (59 cfs vs. 60 cfs) and similar to the long-term averages (Figure 6). The study team began measuring discharge at Upper Spring Run (Liberty St.) in 2011. Similar to all other sites with measured discharge, Figure 6 reveals that discharge was higher in spring (24cfs) than fall (16 cfs), with both seasons being higher than the long-term average (2011–2019).

Spring 2019 flow-partitioning measurements were higher than fall 2018 at all locations and totals at all locations decreased in the fall similar to the nine discharge measurements above (Table 2). This corresponds with the average daily discharge in the Comal system for 2019 (Figure 3). Following trends from years past, the Spring Island Lower Near location contributed the least to overall discharge in spring and fall (approximately 14%) while, areas on the far side of Spring Island contribute substantially (36 – 54%) to overall system discharge (Table 3). Continued data collection under various hydrologic scenarios will be useful in understanding the spatial distribution of springflow in this area.

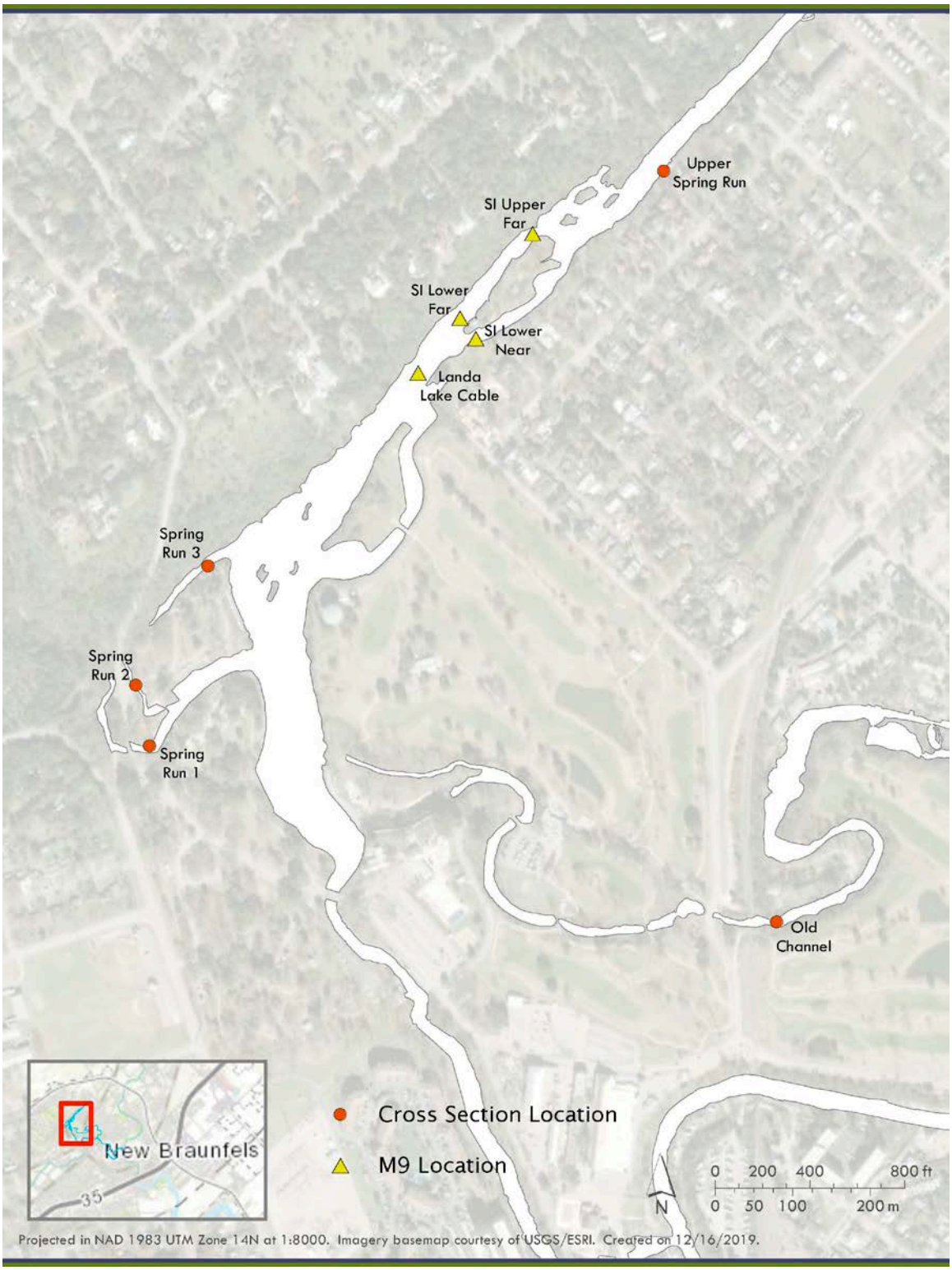


Figure 4. Cross-section and flow partitioning (M9) discharge collection locations in the Comal River.

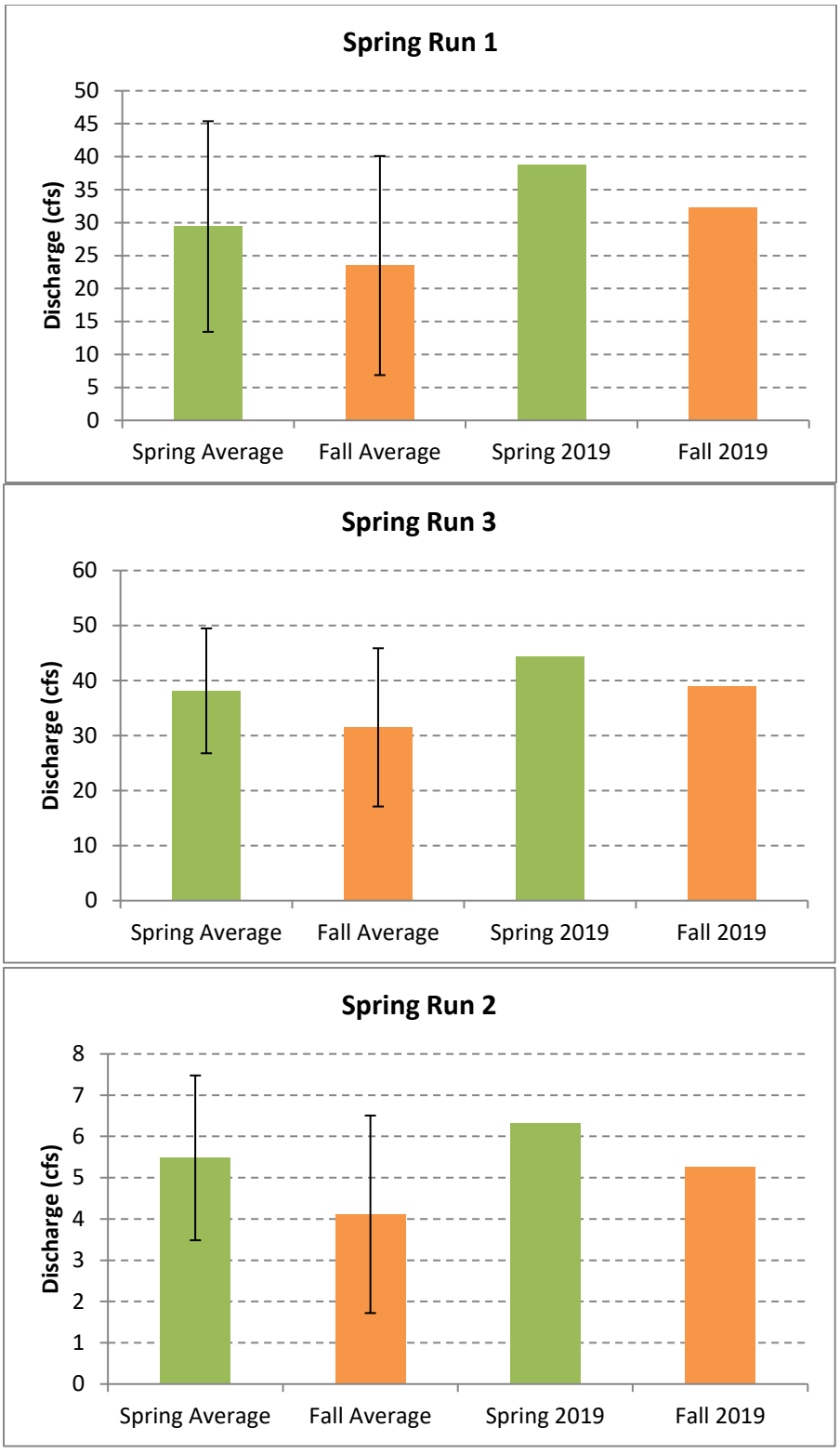


Figure 5. **Measured discharge for Spring runs 1, 2, and 3. Averages represent April/May values (spring) and October/November values (fall) from 2003 to 2019. *Note y-axis differences for discharge.**

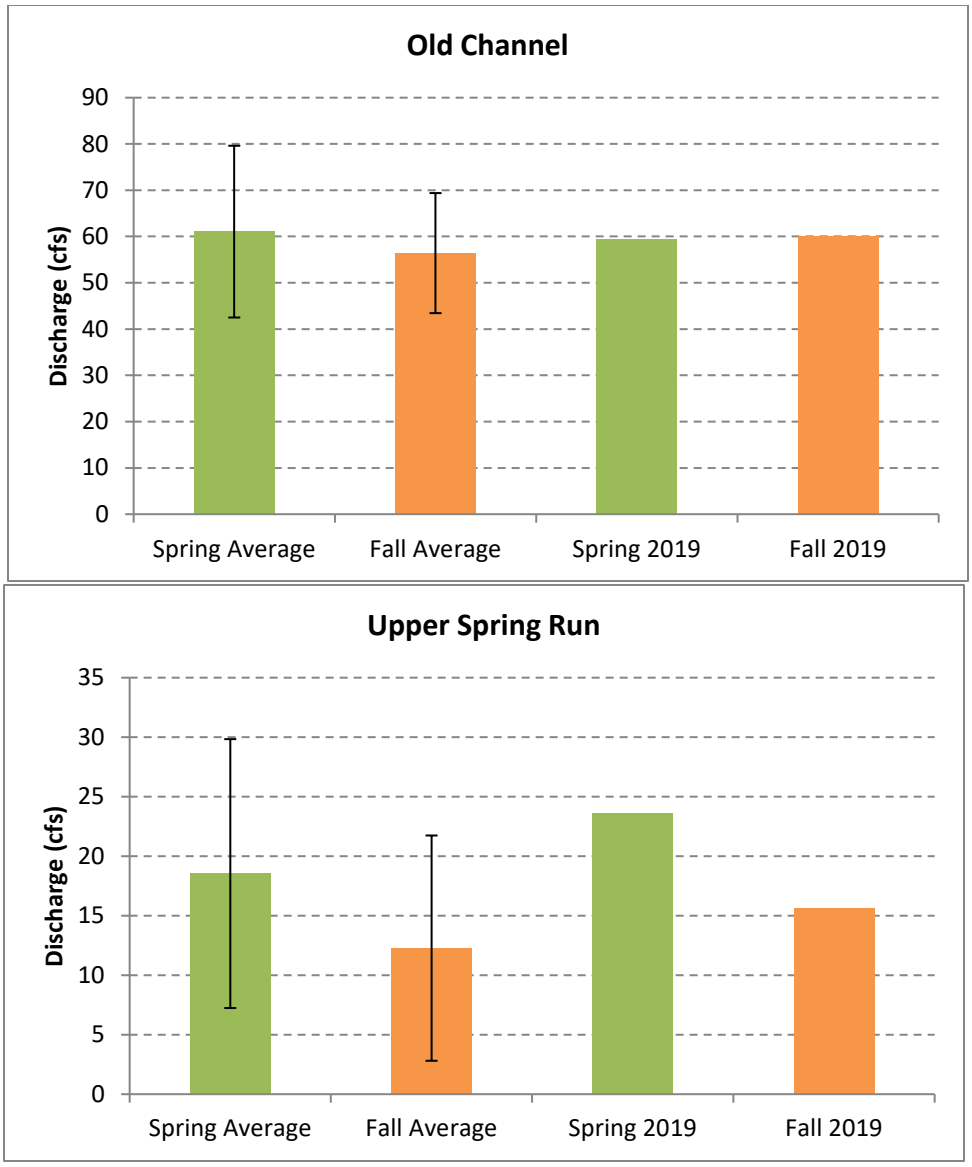


Figure 6. **Measured discharge for the Old Channel and Upper Spring Run reaches. Averages represent April/May (spring) and October/November values (fall) from 2003–2019 for the Old Channel, and 2011–2019 for Upper Spring Run. *Note differences in y-axis for discharge.**

Table 2. Flow partitioning data from five transects in 2014–2019.

DATE	DAILY MEAN DISCHARGE (USGS)	DISCHARGE (CUBIC FEET PER SECOND)				
		Transect 1 Upper Spring Run	Transect 2 SI Upper Far	Transect 3 SI Lower Far	Transect 4 SI Lower Near	Transect 5 Landa lake Cable
15 August 2014	86	1.1	11.9	22.2	9.3	46.5
5 September 2014	67	0.8	11.3	17.3	6.9	29.4
10 September 2014	73	1.1	10.0	21.0	7.5	33.7
17 September 2014	83	1.8	13.0	23.1	7.1	35.3
24 September 2014	85	0.6	12.5	18.9	7.6	32.7
2 October 2014	87	2.0	15.6	25.9	9.3	41.2
8 October 2014	85	1.6	17.3	26.1	8.5	40.1
23 October 2014	91	0.6	12.8	23.8	7.6	39.3
24 April 2015	256	18.9	38.1	54.0	22.0	92.2
3 September 2015	221	18.9	32.0	51.2	29.2	99.1
17 May 2016	343	33.0	51.2	76.7	48.9	141.0
25 October 2016	362	29.1	52.2	79.4	48.8	146.2
3 May 2017	410	42.0	62.5	94.7	56.4	166.0
26 October 2017	283	-	49.4	51.3	40.1	120.4
2 May 2018	274	-	53.9	75.8	34.7	129.3
26 October 2018	366	-	67.2	80.4	47.9	153.8
5 May 2019	342	-	71.9	87.0	56.2	156.6
23 October 2019	287	-	48.8	75.0	41.5	130.7

Table 3. Percentage of total discharge in the Comal River (USGS gage 08169000) from each flow partitioning transect in 2014–2019.

DATE	DAILY MEAN DISCHARGE (USGS)	PERCENTAGE OF TOTAL DISCHARGE				
		Transect 1 Upper Spring Run	Transect 2 SI Upper Far	Transect 3 SI Lower Far	Transect 4 SI Lower Near	Transect 5 Landa Lake Cable
15 August 2014	86	1.3	13.8	25.8	10.8	54.1
5 September 2014	67	1.2	16.9	25.8	10.3	43.9
10 September 2014	73	1.5	13.7	28.8	10.3	46.2
17 September 2014	83	2.2	15.7	27.8	8.6	42.5
24 September 2014	85	0.7	14.7	22.2	8.9	38.5
2 October 2014	87	2.3	17.9	29.8	10.7	47.4
8 October 2014	85	1.9	20.4	30.7	10.0	47.2
23 October 2014	91	0.7	14.1	26.2	8.4	43.2
24 April 2015	256	4.6	14.9	21.1	8.6	36.0
3 September 2015	221	8.6	14.5	23.2	13.2	44.8
17 May 2016	343	9.6	14.9	22.4	14.3	41.1
25 October 2016	362	8.0	14.4	21.9	13.5	40.4
3 May 2017	410	10.2	15.2	23.1	13.8	40.5
26 Oct 2017	283	-	17.5	18.1	14.2	42.5
2 May 2018	274	-	19.7	27.7	12.7	47.2
26 Oct 2018	366	-	18.4	22.0	13.1	42.0
5 May 2019	342	-	21.0	25.4	16.4	45.8
23 October 2019	287	-	17.0	26.1	14.5	45.5

Water Quality Results

Temperature Thermistors

Long-term water temperature data from thermistors provides an overview of the thermal conditions throughout the Comal system from 2000 to 2019 (Appendix C). Gaps in readings on some graphs indicate data-quality events (i.e., theft, thermistor failure); therefore, data were excluded from analysis. As expected, water temperatures are most constant at or near the spring inputs and become more variable downstream as other factors (i.e., runoff, precipitation, and ambient temperature) become more influential.

Four-hour average water temperature data for the Comal headwaters (Blieder's Creek and Heidelberg) are presented in Figure 7. These data exhibit the disparity between an area near a spring input (Heidelberg) and a non-spring area (Blieder's Creek). Blieder's Creek is fed by runoff from the surrounding area, and backup from the springs near the upstream end of the Upper Spring Run Reach. As a result, ambient air temperatures and precipitation events are typically more influential on water temperature, causing fluctuations at Blieder's Creek, whereas water temperatures at Heidelberg are relatively constant due to the constant temperature of the spring inputs. Blieder's creek was the only site with 4 hour average temperatures over the TCEQ water quality standard 26.7 ºC for the Comal River in 2019. These occurred in the summer months between June 28 and September 22, 2019. During the low flows of 2014, the Heidelberg thermistor was moved approximately 23 m downstream to deeper water because its original location began to dry up. This new location is below the confluence of a small spring inflow. As a result, when this spring is flowing, temperatures from this thermistor show less variation than during previous years with similar flow conditions.

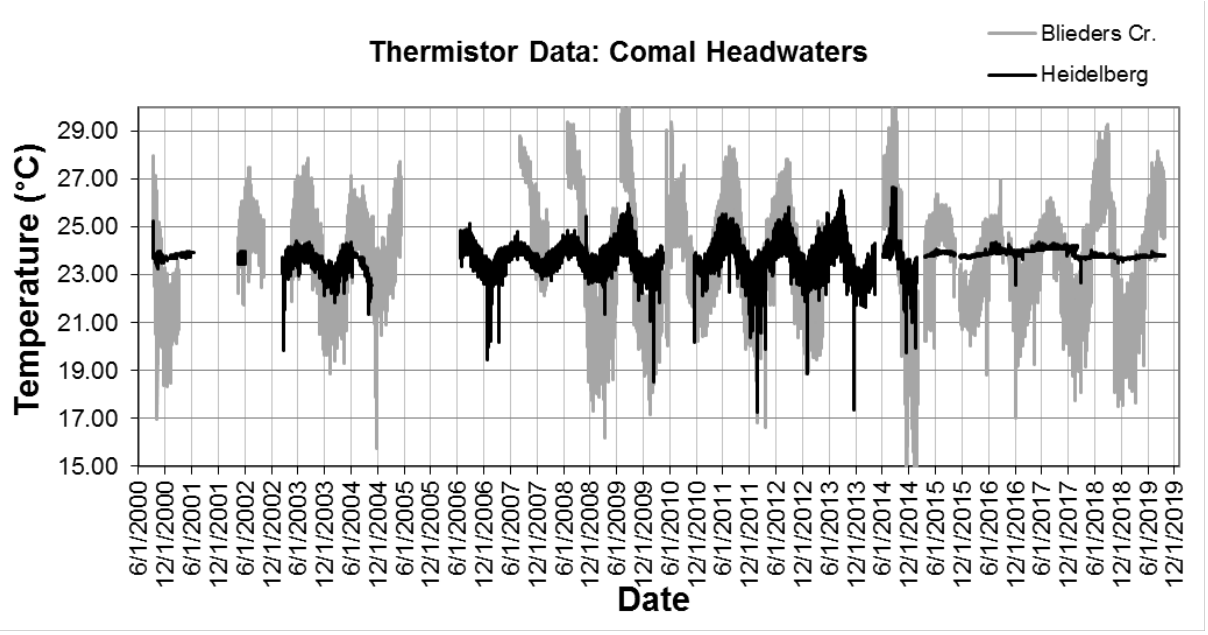


Figure 7. Water temperature (°C) data at Comal headwaters from 2000 to 2019.

As is typical, sites like the Other Place, New Channel, and Old Channel had wider temperature fluctuations than sites closer to spring inputs in 2019, but none of these sites exceeded the TCEQ water quality standard of 26.7 ºC (Appendix C). In addition to the TCEQ water quality standard, the HCP Recovery Implementation Program has outlined four checkpoint temperature ranges as critical for the Fountain Darter based on several laboratory studies. The critical thermal maximum for adult Fountain Darters is 34.8 ºC (Brandt et al. 1993), but laboratory studies have shown reductions in reproductive success at lower temperatures (Bonner et al. 1998, McDonald et al. 2007). When compared to constant temperatures of 24 ºC, fluctuations from 24 – 26 ºC resulted in a 42% decrease in Fountain Darter egg production and a 63% decrease in larval production (McDonald et al. 2007). Three sites including Blieder's creek, New Channel Downstream and the Old Channel all exhibited water temperatures in the late summer having the potential to effect egg and larval production, but none of which approached water temperatures amenable to thermal death for either larval or adult fish. Such temperature-mediated reproductive output may help to explain observed patterns in Fountain Darter abundance and size structure between sites, as those lower in the system typically exhibit lower abundance and stronger seasonal patterns in recruitment when compared to sites near spring upwellings (Landa Lake). Other factors such as differences in available habitat also influence these patterns. Water temperatures in the spring runs and Landa Lake vary little (<1 ºC), typically remaining between 23 – 24 ºC because most of the water comes from the nearly constant temperatures of nearby Edward's Aquifer upwellings.

Water Quality Grab Samples

No water-quality grab samples were collected as part of the biological monitoring program because there were no Critical Period events in 2019.

Texas Master Naturalist Monitoring

Water quality data collected by Master Naturalist volunteers in 2019 exhibited similar observations to years past with CO_2 concentrations continuing to be highest at sites near springs, such as the Houston Street (Upper Spring Run Reach) and Gazebo (Landa Lake/ Spring Run 3) sample sites (Figure 8), whereas pH increased with distance from the springs (Figure 9). Site locations are shown in Figure 2 and listed from upstream (Houston Street) to downstream (Union Avenue). The inverse relationship between these two variables is due to the presence of carbonic acid in spring waters, so as CO_2 concentrations, and thus, carbonic acid concentrations decline going downstream, pH rises in the system. Within sites, year-to-year variation was relatively small in both CO_2 concentrations and pH.

To compare recreational use at the various sites, weekly counts of recreation users collected by the Texas Master Naturalist volunteers were converted to monthly averages and plotted over a long-term survey period (Figures 10 – 14). In 2019 (as in all years), the New Channel received the most recreation pressure, followed by Union Avenue and the Gazebo (Landa Lake). Please note that the y-axis varies for each site for better presentation. As in previous years, recreational use at Elizabeth Street (Old Channel) was low (Figure 10) because this site is not located within a city park or advertised for recreational use. Each site, with the exception of Elizabeth Street, saw peaks in recreation use during the warmer summer months.

The New Channel site has received the most recreation pressure throughout the Texas Master Naturalist monitoring (2006 – 2019). The peak of recreational use is during the summer months of June through September (Figure 13). During the warmer months, the New Channel site becomes a popular destination for tubers and others seeking relief from the heat in the cooler spring-fed water. Much like the New Channel site, recreation pressure at the Union Avenue site can also be substantial during summer because this is a take-out site for many tubers floating the river (Figure 14). However, unlike the New Channel site, this location does not offer long-term attraction such as picnic tables, resulting in fewer alternative or additional recreational activities.

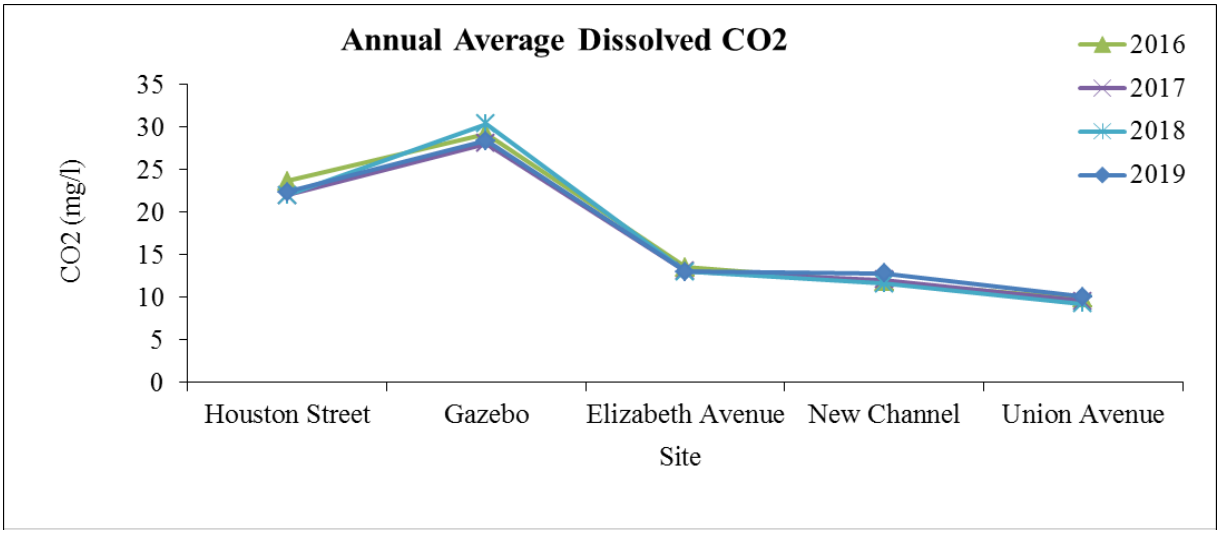


Figure 8. Annual average dissolved carbon dioxide (CO_2) concentrations at five sites on the Comal River system (2016–2019).

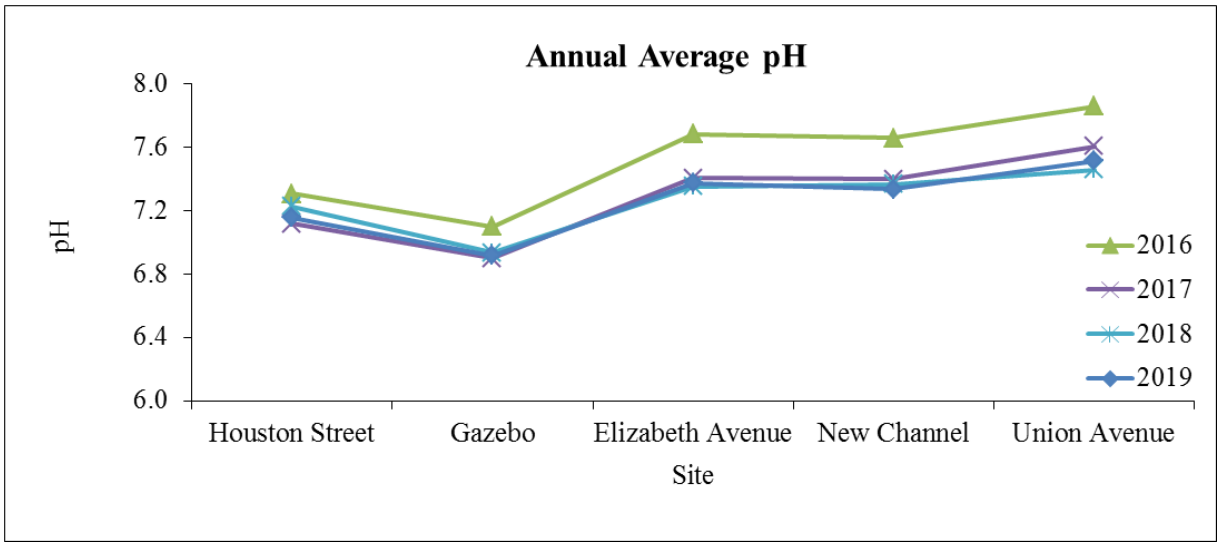


Figure 9. Annual average pH values at five sites on the Comal River system (2016–2019).

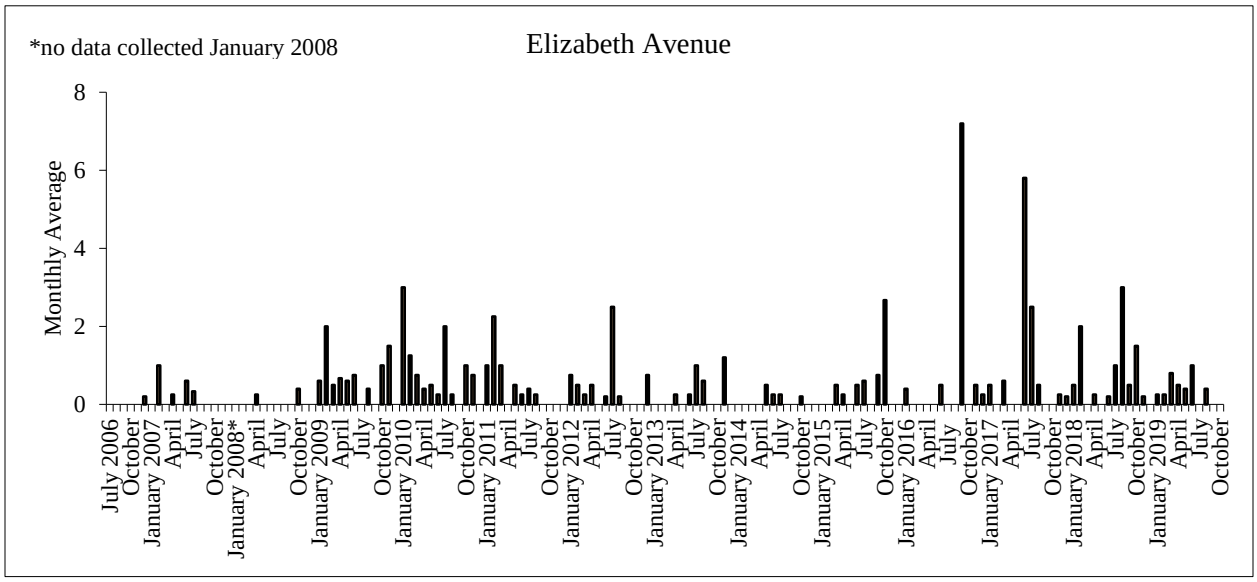


Figure 10. Average daily recreational user counts at the Elizabeth Avenue site (2006–2019).

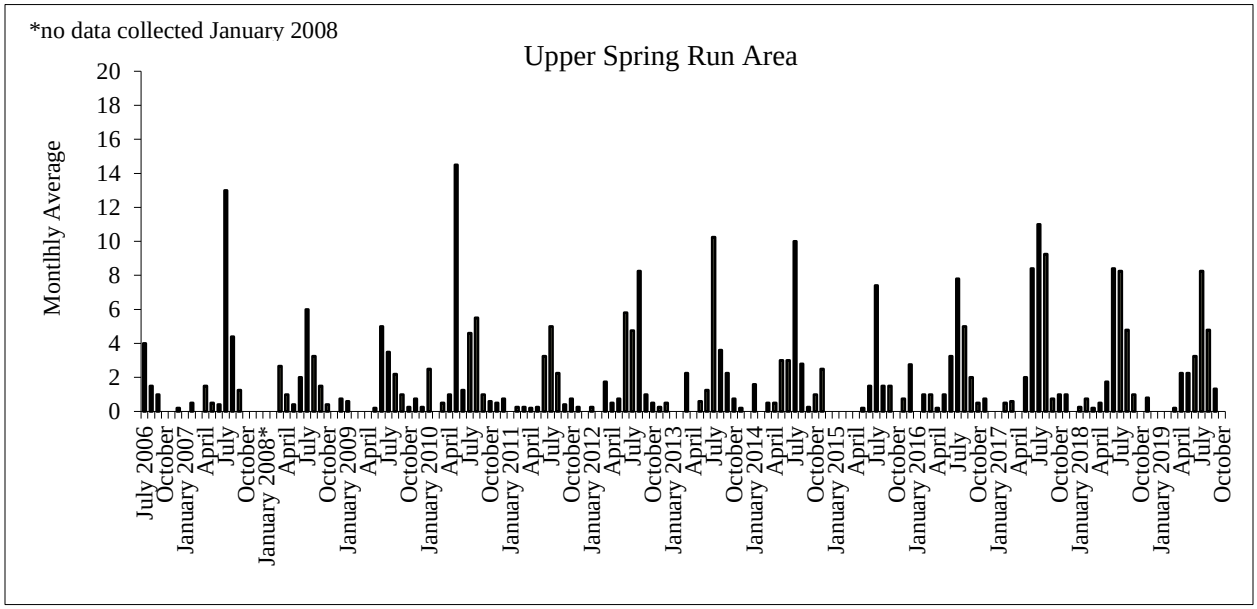


Figure 11. Average daily recreational user counts at the Upper Spring Run site (2006–2019).

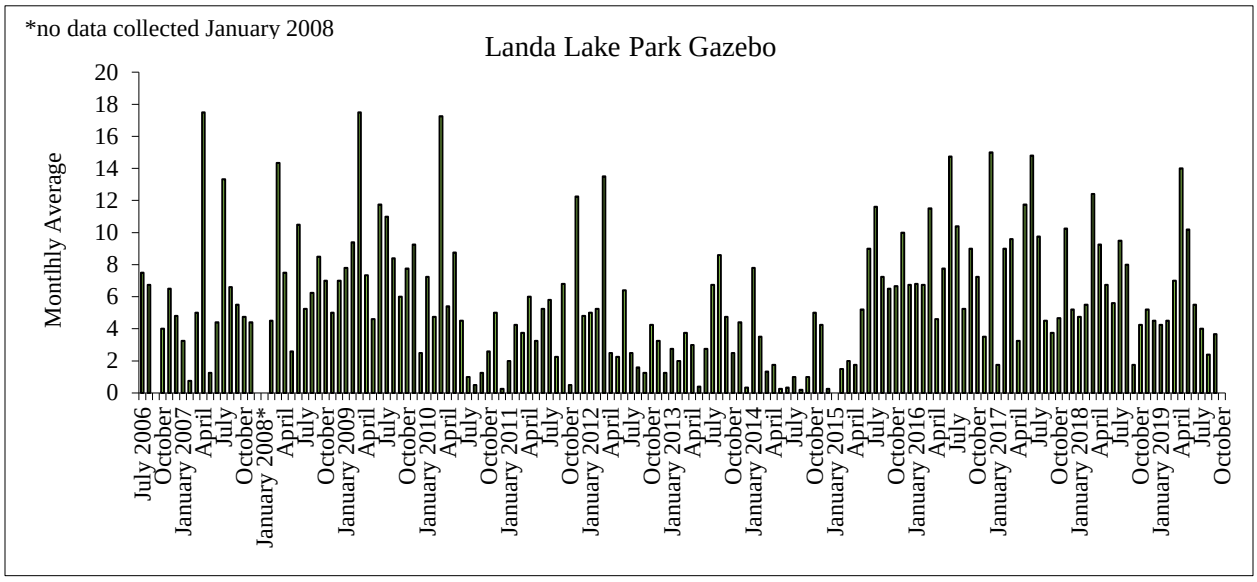


Figure 12. Average daily recreational user counts at the Landa Lake Park Gazebo site (2006–2019).

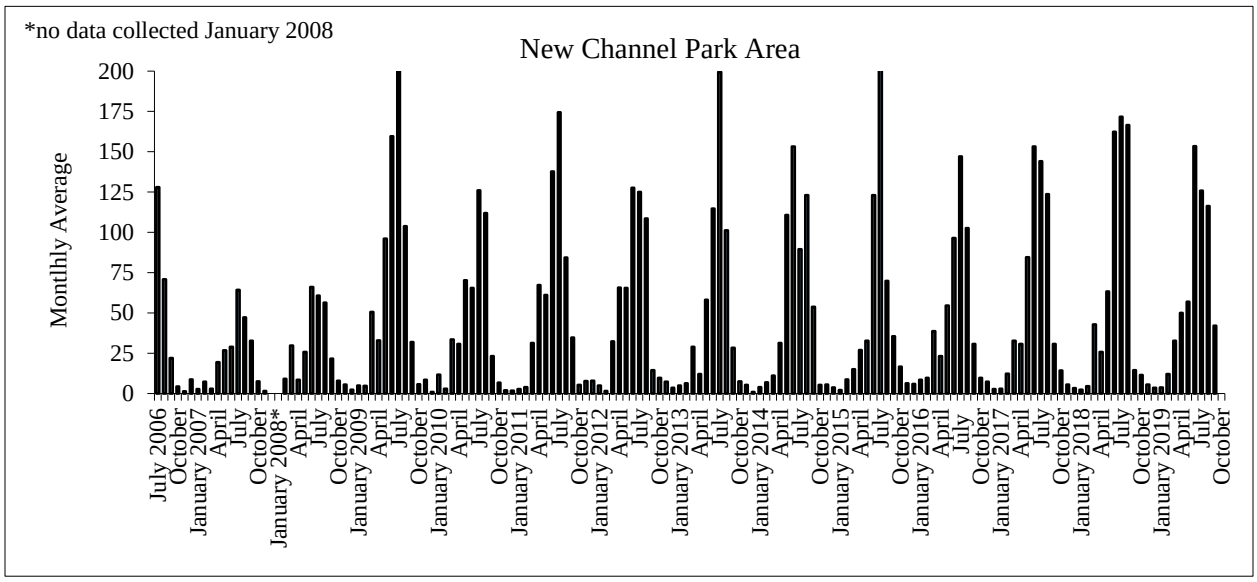


Figure 13. Average daily recreational user counts at the New Channel site (2006–2019).

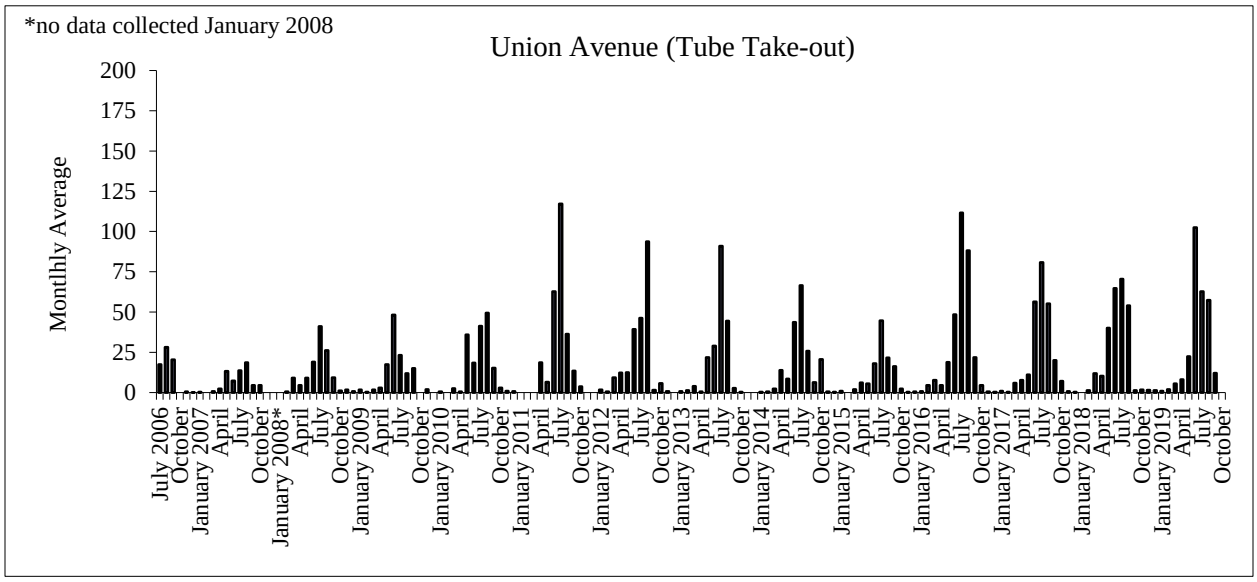


Figure 14. Average daily recreational user counts at the Union Avenue site (2006–2019).

Aquatic Vegetation Mapping

Aquatic vegetation maps for all study reaches during both comprehensive monitoring periods are presented in Appendix B. The maps are organized by individual reach with successive mapping events ordered chronologically. Maps highlight only the single dominant plant species within a mixed stand of aquatic vegetation. While less dominant species may not be represented on the maps their coverage is estimated and included into the total vegetation calculations.

Upper Spring Run Reach

The Upper Spring Run Study Reach is the most upstream study reach in the Comal System. This reach is characterized by a long straight channel, confined by rock walls in many areas, with water inflow from multiple small peripheral spring runs as well as spring upwellings. Occasionally during large storm events, the Upper Spring Run may also receive flow from Bleider's Creek, a major tributary, as well as direct runoff from nearby city streets and residential lots. Additionally, the Upper Spring Run is also an accessible site for public recreation, as multiple private residential lots and one public resort border the reach. The aquatic vegetation community of the Upper Spring Run often responds differently than other study reaches with expansion and declines in vegetation coverage commonly occurring rapidly as a result of flow conditions or summer recreational disturbances. The aquatic plant diversity is lower in this reach compared to other study reaches and is typically dominated by *Sagittaria* and bryophytes (Table 4). *Ludwigia repens* occasionally occurs as a result of planting efforts as part of the HCP habitat restoration program. Since bryophytes are non-rooted plants, their coverage is more susceptible to disturbances (i.e., low flows, storm water pulses) compared to rooted plant species. However, recovery is typically rapid when site conditions improve and growth is expansive under optimal conditions.

Total vegetation coverage in 2019 was lower than the long-term average for spring and near average for fall mapping events (Figure 15). The spring to fall decreasing trend is typical of this reach, as depicted by the large standard deviations, and can be attributed to recreational stress occurring over summer months. Throughout 2019, spring flows remained strong even during the typically dry periods of August and September. Although not calculated as part of vegetation coverage, the distribution of filamentous algae was mapped this year as this species is becoming more persistent. It was common in the reach during both spring and fall mapping events and increased from 484 m^2 to 723 m^2 between the two periods.

Table 4. Seasonal coverage of each aquatic plant species in the Upper Spring Run reach.

Species	Spring 2019 Cover m^2	Fall 2019 Cover m^2
Bryophyte	991.73	686.66
Ludwigia	7.72	16.84
Sagittaria	1,088.16	1,218.51
Total	**2,087.61**	**1,922.00**

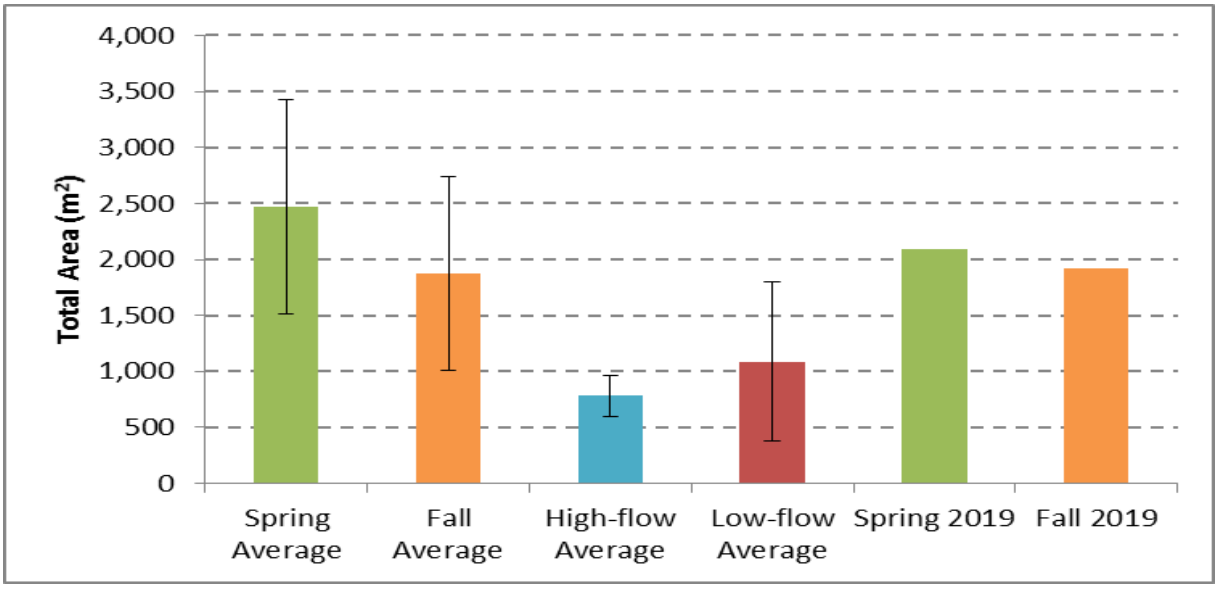


Figure 15. Total surface area (m^2) of aquatic vegetation in the Upper Spring Run Reach. Long-term study averages are provided with bars representing one standard deviation from the mean.

Landa Lake Reach

Aquatic vegetation cover in Landa Lake is typically less variable than other reaches with less impact from high and low flows. Data from 2019 was no exception with both spring and fall total vegetation coverage similar to long-term seasonal averages (Figure 16). Landa Lake is typically dominated by two species: *Vallisneria* (which usually accounts for greater than 50% of the total coverage) and *Sagittaria* (Table 5). Both of these strongly-rooted species tend to remain consistent in coverage season to season. Vegetation mapping over the previous years has shown *Sagittaria* expanding its coverage particularly in the upper 1/3 of the study reach. However,

Sagittaria has also decreased along the western shoreline. *Vallisneria* has also expanded to new locations while retreating in others. Bryophytes were common in Landa Lake as usual but quality decreased as the year progressed with large areas being replaced by filamentous algae, which were much more common in the reach during the fall mapping event reaching 785 m^2. Algae were not mapped in the spring because it was uncommon. The 2019 Comal Aquatic Plant Restoration Report provides more information regarding the restoration of native aquatic vegetation (BIO-WEST 2019b).

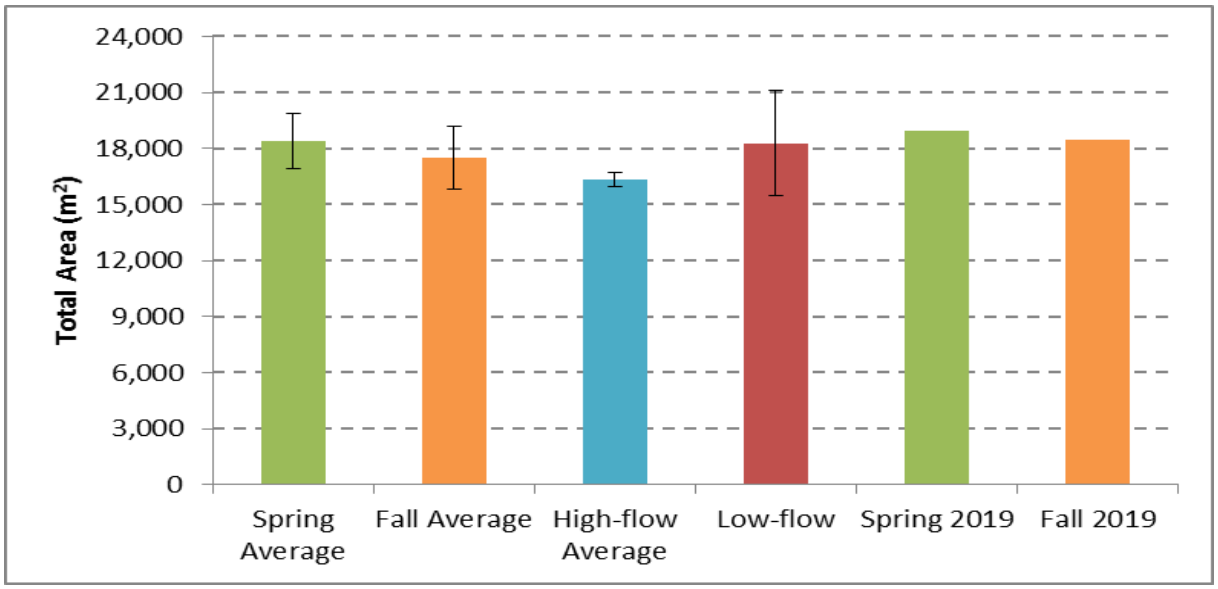


Figure 16. Total surface area (m^2) of aquatic vegetation in the Landa Lake Reach. Long-term study averages are provided with bars representing one standard deviation from the mean.

Table 5. Seasonal coverage of each aquatic plant species in the Landa Lake study reach.

Species	Spring 2019 Cover m^2	Fall 2019 Cover m^2
Bryophyte	2,488.62	1,657.25
Bacopa	9.77	5.36
Cabomba	239.37	297.78
Ludwigia	373.27	576.19
Nuphar	15.24	0.00
Potamogeton	21.62	24.87
Sagittaria	3,453.66	3,733.64
Vallisneria	12,323.29	12,200.79
Total	**18,924.83**	**18,495.88**

Old Channel Reach

The Old Channel reach saw another consecutive year of vegetation cover increases between spring and fall. This year was the first full year in which restoration activities consisted of only native plantings. *Hygrophila* removal was completed in 2018, therefore, no invasive plant removal was undertaken except for minor aquatic gardening. Since removal of *Hygrophila*, the occurrence of bryophytes in this reach has increased. Bryophytes have become more dense and widespread as they are now able to settle onto the river bed and attach to underwater structure. *Ludwigia* and *Cabomba* cover saw coverage increases between spring and fall due to restoration activities but natural expansion of previous plantings contributed greatly to overall increase in cover of aquatic vegetation.

Seasonal mapping shows below average vegetation cover for both spring and fall (Figure 17). However, the overall vegetation cover is increasing and the cover of target HCP restoration species has increased as well (Table 6**)**. As more space is planted with native plants in this reach vegetation cover will increase. As those plants establish and become self-sustaining, natural expansion will increase too. It is likely that this reach will return to maximum vegetation cover within the next few years, with the difference being it will now consist of native aquatic plants instead of a non-native *Hygrophila* dominated community that has been prominent in this reach over the last 10 years.

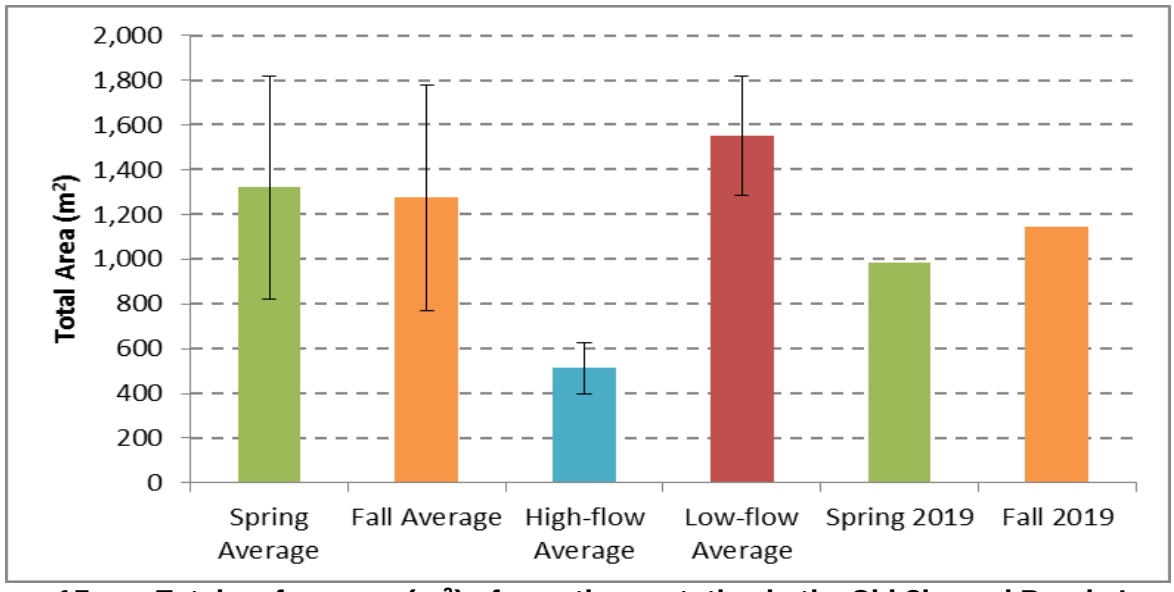


Figure 17. Total surface area (m²) of aquatic vegetation in the Old Channel Reach. Long-term study averages are provided with bars representing one standard deviation from the mean.

Table 6. **Seasonal coverage of each aquatic plant species in the Old Channel study reach.**

Species	Spring 2019 Cover m^2	Fall 2019 Cover m^2
Bryophyte	679.87	607.47
Cabomba	43.03	175.10
Hygrophila	0.20	0.00
Ludwigia	199.60	303.82
Nuphar	41.13	25.26
Sagittaria	17.67	30.74
Total	**981.50**	**1,142.40**

Upper New Channel Reach

The Upper New Channel Reach is the most upstream of two study reaches on the New Channel of the Comal River located directly below the confluence of Dry Comal Creek, a major tributary and urban floodway, which contributes significant and sometimes prolonged flood pulses into the New Channel. For the second consecutive year, both spring and fall 2019 mapping showed greater than average vegetation coverage, with fall coverage being considerably higher than the average (Figure 18). Aquatic vegetation has benefited from the prolonged absence of flood events and flood pulses along Dry Comal Creek. Although *Hygrophila* tends to dominate this reach, a variety of other native species including *Cabomba* and *Ludwigia* continue to persist and expand (Table 7).

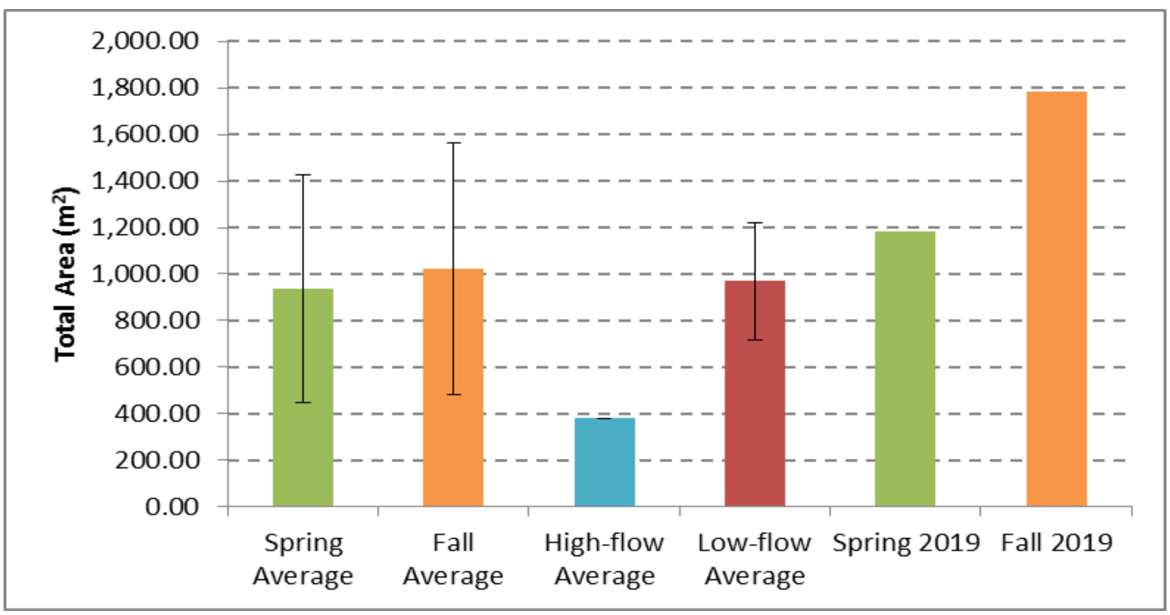


Figure 18. Total surface area (m^2) of aquatic vegetation in the Upper New Channel. Long-term study averages are provided with error bars representing one standard deviation from the mean.

Table 7. Seasonal coverage of each aquatic plant species in the Upper New Channel study reach.

Species	Spring 2019 Cover m^2	Fall 2019 Cover m^2
Bryophyte	187.43	367.99
Bacopa	0.00	1.17
Cabomba	5.47	30.18
Hygrophila	887.48	1,251.45
Ludwigia	104.15	133.16
Total	**1,184.54**	**1,783.94**

Lower New Channel Reach

The Lower New Channel Reach is highly recreated but also susceptible to loss of vegetation from flood pulses coming down Dry Comal Creek. Between the spring and fall 2019 sample events, vegetation in this reach was thinned due to frequent recreation but recovered before fall mapping (Figure 19). Both dominant species in this reach (i.e., *Cabomba* and *Hygrophila*) easily lose biomass as a result of moderate to high flows and recreation but can recover quickly once river conditions stabilize (Table 8).

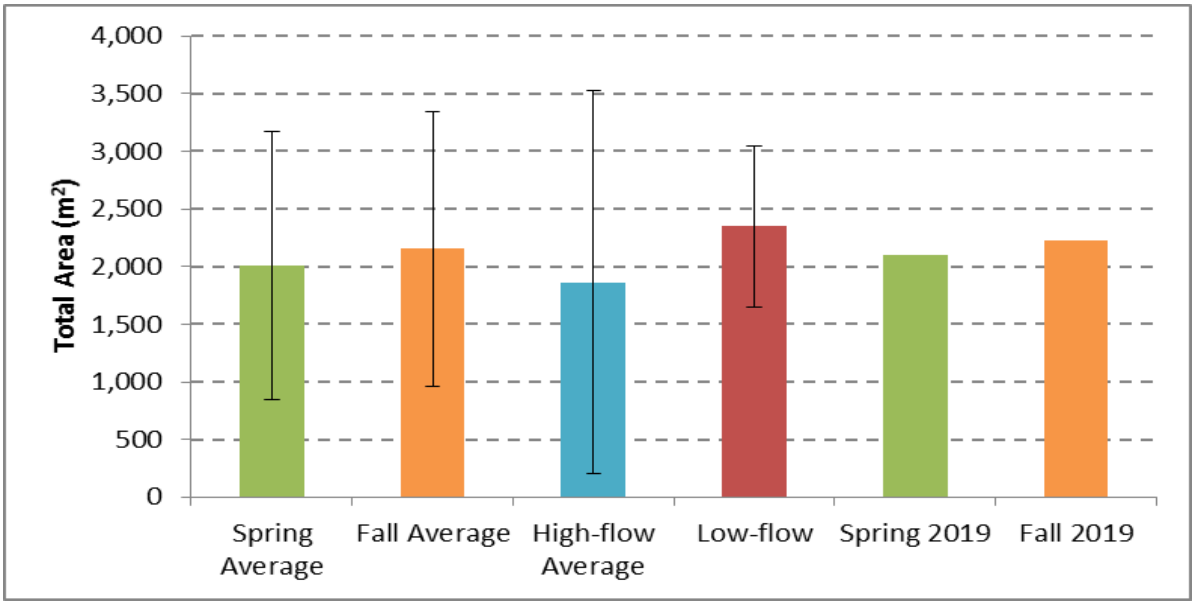


Figure 19. Total surface area (m^2) of aquatic vegetation in the Lower New Channel Reach. Long-term study averages are provided with error bars representing one standard deviation from the mean.

Table 8. Seasonal coverage of each aquatic plant species in the Lower New Channel study reach.

Species	Spring 2019 Cover m^2	Fall 2019 Cover m^2
Cabomba	1,509.44	1,679.15
Hygrophila	594.41	534.66
Ludwigia	0.00	3.35
Sagittaria	0.38	4.28
Total	**2,104.24**	**2,221.44**

Fountain Darter Sampling Results

Drop Nets

A total of 70 drop-net samples were conducted during 2019 comprehensive sampling in the Comal River system. Table 9 shows the number of drop-net samples taken from each vegetation type in each reach during spring and fall sampling efforts. Under high flows, much of the Upper New Channel Reach is too deep to effectively collect drop-net data. However, flow conditions in 2019 allowed the execution of six drop-net samples in spring and eight in the fall 2019. Raw drop-net data for 2019 are included in Appendix D. From these drop-net samples, a total of 1,808 Fountain Darters were collected in 2019, with 1,233 darters collected during spring sampling, and 575 collected during fall sampling. This spring sampling total of 1,233 represents the highest single event total since the initiation of drop netting in 2000. This high total was due to an abnormally high number of Fountain darters collected in the Upper New Channel reach in the spring (n=300, avg=45). During the fall sampling event the total collected in this reach dropped (n=33) closer to average numbers. Further discussion as to why this occurred is presented below.

Table 9. Number of drop-net samples collected in each vegetation type per reach during 2019 sampling efforts.

VEGETATION	SPRING (April 29 – May 1)				FALL (November 4 – 6)				TOTAL
	Upper Spring Run	Landa Lake	Old Channel	Upper New Channel	Upper Spring Run	Landa Lake	Old Channel	Upper New Channel	
Bryophytes	2	2	2	2	2	2	2	2	16
Ludwigia	2	2	2		2	2	2		12
Hygrophila				2				2	4
Sagittaria	2	2			2	2			8
Vallisneria		2				2			4
Cabomba		2	2			2	2	2	10
Open	2	2	2	2	2	2	2	2	16
TOTAL	8	12	8	6	8	12	8	8	70

Drop-net data collected from 2000 to 2019 show that average densities of Fountain Darters in the various vegetation types ranged from 1.0/m^2 in open sites to 27.4/m^2 in bryophyte-dominated sites (Table 10). Although variation is high, native vegetation types that provide thick cover at or near the substrate such as bryophytes (27.4/m^2) and filamentous algae (26.1/m^2) tend to have the highest Fountain Darter densities, whereas open substrate with no vegetation has low densities. Filamentous algae and bryophytes are also most susceptible to scouring during high-flow events and have shown considerable fluctuation in coverage over the long-term study period. These plants do not firmly root to the substrate, and can be easily uprooted by high water velocities. Bryophytes are a key habitat component because they occupy large areas of the Upper Spring Run, Landa Lake, and Old Channel reaches, and thus, make up a large portion of the available habitat. The high numbers of Fountain Darters collected during the spring in the Upper New Channel reach outlined above was a result of one bryophyte site with 205 Fountain Darters collected. This was the highest number collected from any bryophyte site over the lifetime of the project.

Table 10. Fountain Darter mean densities and one standard deviation from the mean per aquatic vegetation per meter squared (m^2) for all drop net samples collected in the Comal Springs / River system from 2000 through 2019.

Sample Type	Mean Density (m^2)	Standard Deviation
Open	1.0	4.2
Green Algae	2.2	3.2
Ceratopteris	3.6	4.3
Sagittaria	5.4	13.1
Vallisneria	5.9	9.9
Hygrophila	7.4	8.5
Cabomba	10.6	11.0
Ludwigia	13.4	16.2
Filamentous Algae	26.1	23.0
Bryophytes	27.4	20.4

Cabomba, *Ludwigia*, *Sagittaria*, and *Vallisneria* are also relatively common, and therefore, also provide large amounts of Fountain Darter habitat. Although nonnative *Hygrophila* was once a dominant vegetation type in many reaches, recent vegetation restoration activities have greatly reduced *Hygrophila* coverage, or removed it, within most study reaches. In particular, this nonnative plant is no longer present in the Upper Spring Run and Landa Lake reaches.

Fountain Darter normalized population estimates in all reaches (Figure 20) were based on vegetation composition and abundance, and the long-term average density of Fountain Darters found in specific vegetation types from 2000–2019. Normalized population abundance estimates are similar for spring, fall, and low-flow events from 2000–2019. However, high flow events usually lead to a decrease in vegetation coverage and a resulting decrease in population estimates. For the third year in a row normalized population estimates in 2019 were slightly higher than long-term averages.

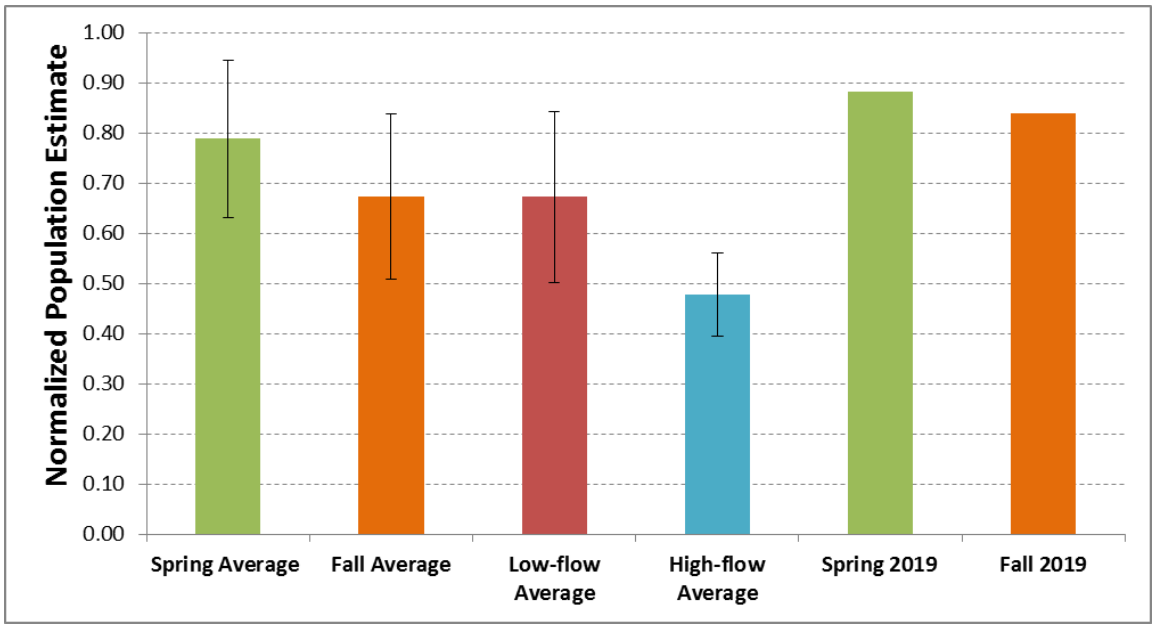


Figure 20. Normalized Fountain Darter population estimates in the Comal River based on coverage of various vegetation types in the study reaches and average density of Fountain Darters in each type. Long-term study averages are provided with bars representing one standard deviation from the mean.

The length frequency distribution for Fountain Darters collected by drop nets from the Comal system during spring (n = 12,065) and fall (n = 9,714) sampling events from 2000 to 2019 is presented in Figure 22 along with 2019 specific results. Both collection events in 2019 follow the long-term trend with spring collections from all reaches showing a larger proportion of small Fountain Darters whereas fall was dominated by larger individuals (Figure 21). The overall similarities in length frequencies between 2019 and the long-term conditions confirm a consistent Fountain Darter life-stage distribution relative to previous years. This trend can also be observed in timed dip-net data presented below.

Excluding Fountain Darters, 144,366 other specimens representing 24 other fish taxa have been collected by drop netting from the Comal system during the study period (2000 – 2019). Of these, seven are considered exotic or introduced (Table 11). Although several of these species are potential predators of Fountain Darters, previous data collected during this study suggests that predation by both native and introduced predators is minimal during average discharge conditions. Other than Fountain Darters, mosquitofishes *Gambusia* spp., Redspotted Sunfish *Lepomis miniatus*, and Guadalupe Roundnose Minnow *Dionda nigrotaeniata* were the most common fish collected in 2019.

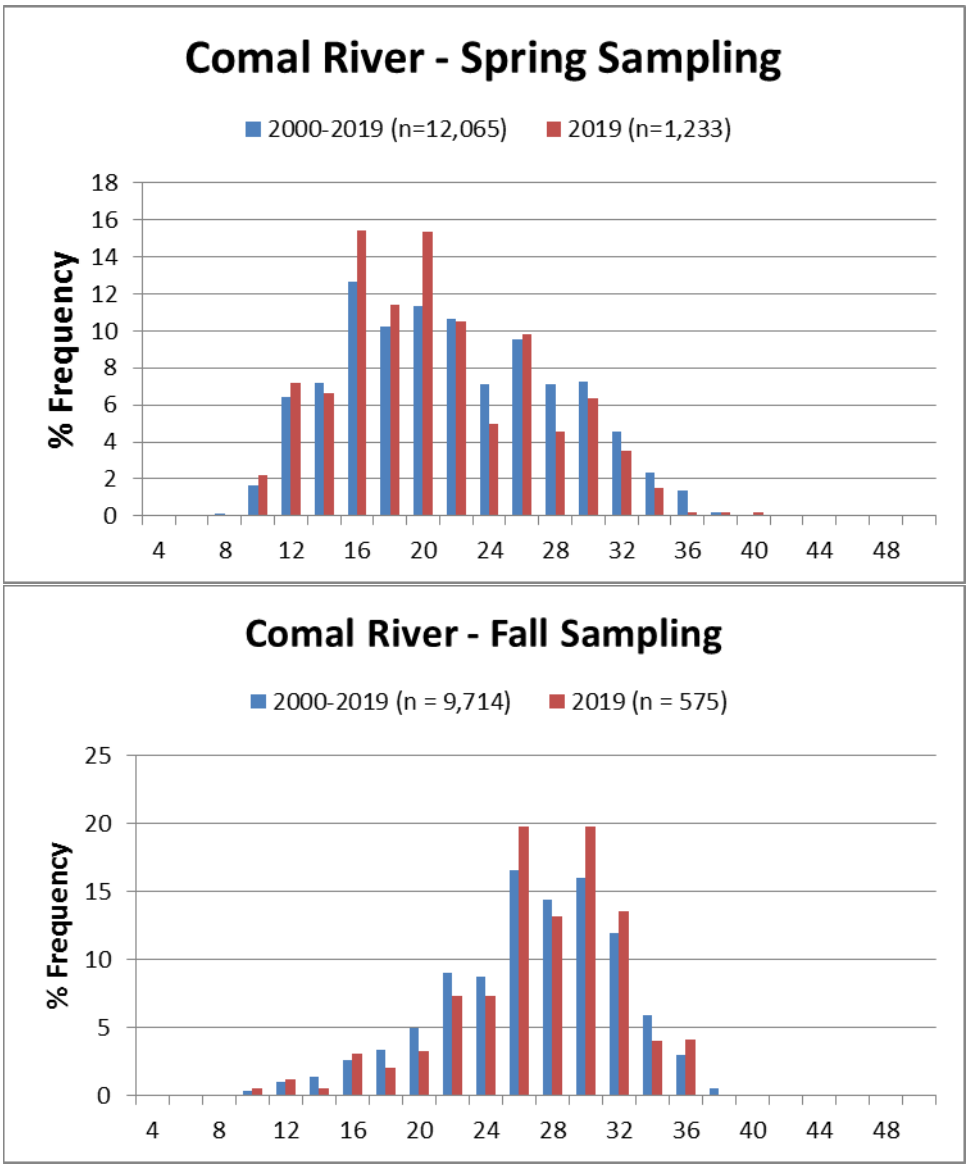


Figure 21. Length frequency distribution of Fountain Darters collected from the Comal system during all routine spring (top) and fall (bottom) drop-net events (2000–2019) and during 2019 only.

As mentioned, seven species collected during drop netting from 2000 to 2019 are considered nonnative or introduced to the system. Most of these species pose little threat to the Fountain Darter. However, exotic Sailfin Catfish (Siluriformes: Loricariidae) may have potential impacts to food web dynamics in the Comal system. Loricariid catfish feed mainly on benthic algae and detritus (Ozedilek 2007), which represents the base of the river's food web. Although algal derived detritus is an abundant food source in the system, competition for this resource may alter food web dynamics (Garret et al. 2002). Additionally, the armored plating and larges spines of Loricariid catfish likely make them resistant of predation from larger native predators. Thus, they potentially serve as a sort of trophic "dead end" in the food web (Pound et al. 2011). Although these fish are rarely captured in drop nets (none in 2019), based on data from fish community sampling (see Fish Community section) they are present in the system. HCP-sponsored efforts

are implemented and continue to remove these and other exotic fishes from the system. Long-term monitoring of the fish community is essential to evaluate the success of these efforts.

Table 11. Fish taxa and the number of each collected during drop-net sampling.

Family	Scientific Name	Common Name	Status[a]	2019	2000-2019
Cyprinidae	*Campostoma anomalum*	Central Stoneroller	N		1
	Dionda nigrotaeniata	Guadalupe Roundnose Minnow	N	87	1,194
	Notropis amabilis	Texas Shiner	N	1	362
	Notropis volucellus	Mimic Shiner	N		34
	Notropis sp.	Shiner	N		3
	Pimephales vigilax	Bullhead Minnow	N		4
Characidae	*Astyanax mexicanus*	Mexican Tetra	I	19	503
Ictaluridae	*Ameiurus melas*	Black Bullhead	N		1
	Ameiurus natalis	Yellow Bullhead	N	4	138
Loricariidae	*Pterygoplichthys* sp.	Sailfin Catfish	I		90
Poeciliidae	*Gambusia* sp.	Mosquitofish	N	248	130,416
	Poecilia latipinna	Sailfin Molly	I		4,713
Centrarchidae	*Ambloplites rupestris*	Rock Bass	I	1	28
	Lepomis auritus	Redbreast Sunfish	I		148
	Lepomis cyanellus	Green Sunfish	N	2	59
	Lepomis gulosus	Warmouth	N	1	40
	Lepomis macrochirus	Bluegill	N	3	278
	Lepomis megalotis	Longear Sunfish	N		264
	Lepomis microlophus	Redear Sunfish	N		3
	Lepomis miniatus	Redspotted Sunfish	N	105	2,610
	Lepomis sp.	Sunfish	N/I	27	930
	Micropterus punctulatus	Spotted Bass	N		4
	Micropterus salmoides	Largemouth Bass	N	25	1,613
Percidae	*Etheostoma fonticola*	Fountain Darter	N	1808	29,616
	Etheostoma lepidum	Greenthroat Darter	N	4	81
Cichlidae	*Herichthys cyanoguttatus*	Rio Grande Cichlid	I	10	777
	Oreochromis aureus	Blue Tilapia	I		72
Total				2345	173,982

[a] N= Native, I=Introduced.

Dip Nets

Dip-net Timed Surveys

Timed dip-net collections were conducted three times during routine sampling events in the Comal River during 2019: May (spring), August (summer), and October (fall). For the third year in a row, the average number of darters collected from timed dip-net surveys in 2019 was higher than the long-term average for all three sampling occasions. Length frequency distributions of Fountain Darters from dip netting correlate well with those of the drop-net method: small Fountain Darters were most abundant in the spring, and larger Fountain Darters dominated fall samples (Figure 22). However, small Fountain Darters are occasionally captured in summer, winter, and fall sampling periods as well. This indicates that there is some reproduction

occurring in all seasons, although perhaps on a limited basis and only in certain areas. Areas that exhibit more continuous reproduction / recruitment based on length frequency data are relatively close to spring upwellings and contain large amounts of bryophytes, such as Landa Lake.

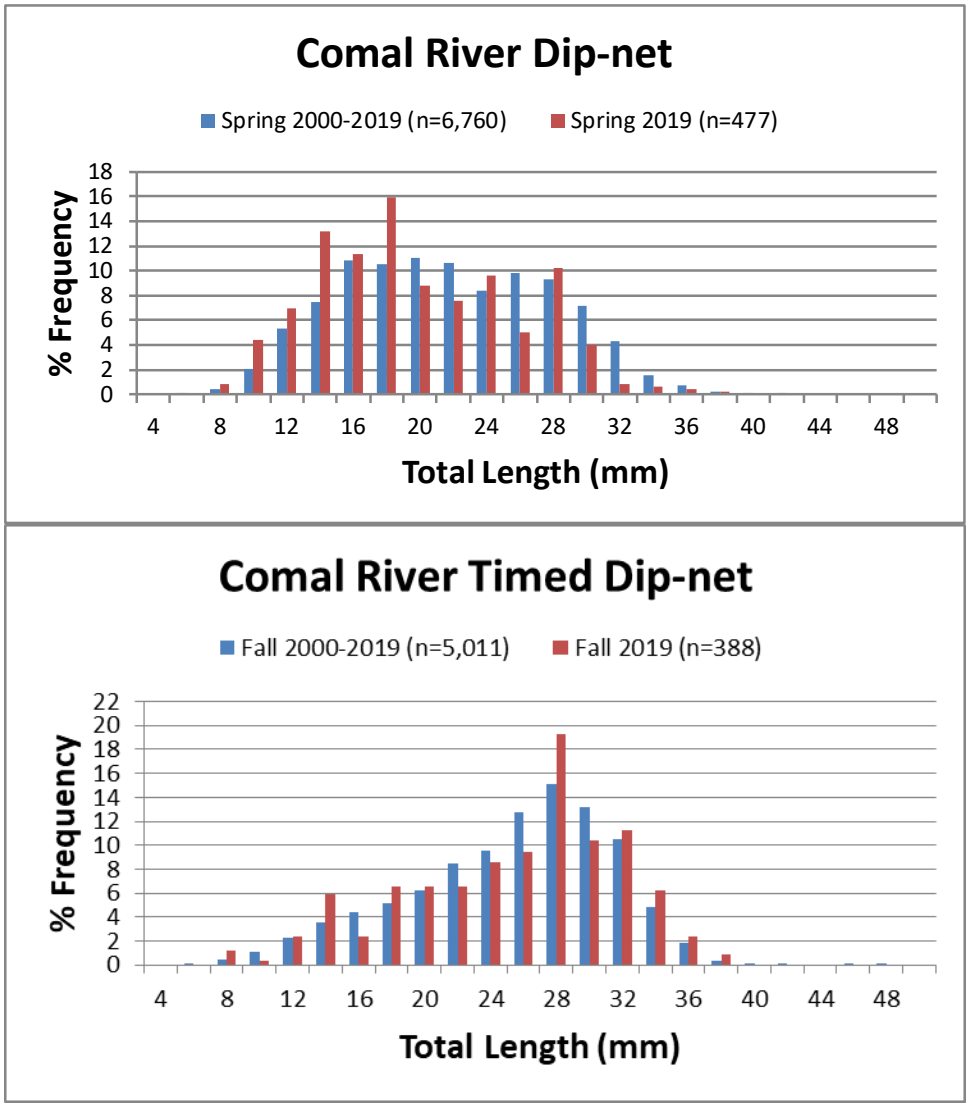


Figure 22. Length frequency distribution of Fountain Darters collected from the Comal system during spring (top) and fall (bottom) timed dip-net events (2000–2019) and during 2019 only.

Random Presence / Absence Survey

In 2019, presence/absence dip netting was conducted within four reaches on the Comal River during the routine spring (May), summer (August), and fall (October) sampling efforts. Although this technique does not provide detailed data on habitat use, and does not allow for quantification of population estimates, it does provide a quick and less-intrusive method of examining large-scale trends in the Fountain Darter population. Therefore, data collected thus far provide a good baseline for comparison with other sampling events. The percentage of sites with Fountain Darters was 96% during the spring, which is the highest recorded since this sampling began in

2005. Percentage of sites dropped to 80% in the summer, and decreased slightly again in the fall to 78% (Figure 23). The spring sample was well above the 95th percentile for the study and both the summer and fall events were within the 5th and 95th percentiles for the study. It is important to continue to closely monitor Fountain Darter presence/absence information to assess potential trends over time as results from this analysis can directly influence adaptive management decisions.

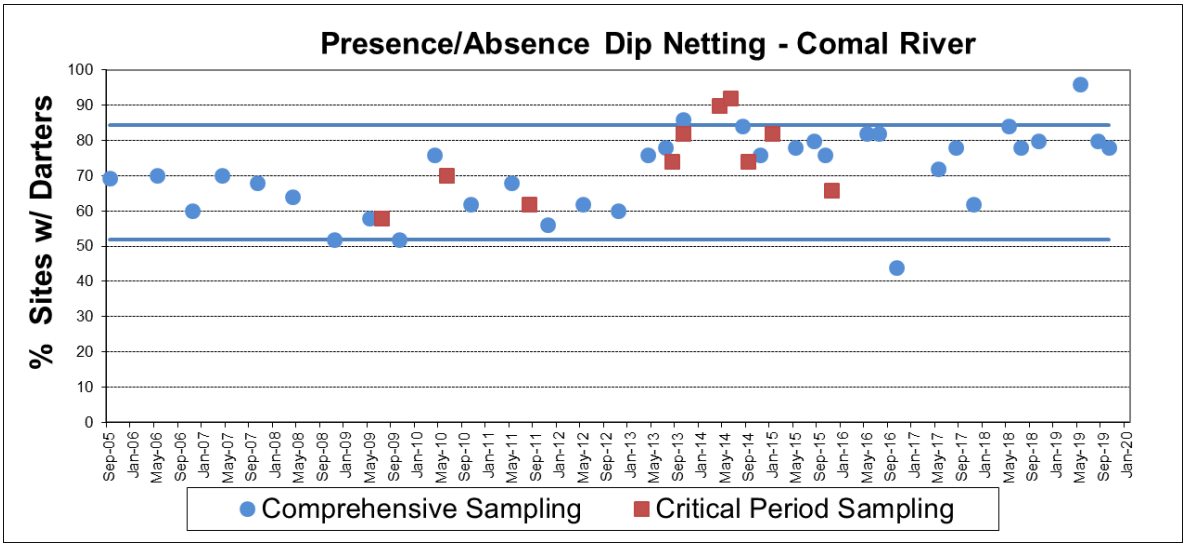


Figure 23. Percentage of sites (*n*=50) in which Fountain Darters were present. Solid blue lines mark 5th and 95th percentiles for comprehensive sampling.

Visual Observations

Fountain Darters were again observed in the deepest portions of Landa Lake (depths greater than 2 m) during both 2019 comprehensive sampling events. Such utilization of deeper habitats within Landa Lake by Fountain Darters has been well documented in all flow conditions observed to date. Specifically, Fountain Darters have been observed in the deepest portions of Landa Lake during every SCUBA survey conducted since the adoption of this methodology in summer 2001. During both events, approximately 70% coverage of bryophytes and 33 Fountain Darters were observed. It was noted that the quality of bryophytes had deteriorated from spring to fall. Over the years, the phenomenon of a fall bryophyte die-off in the deeper portion of Landa Lake tends to happen every several years regardless of springflow conditions. This appeared to be the case in fall 2019 and it will be interesting to track the typical corresponding bryophyte regeneration moving forward.

Fish Community Sampling

Twenty species of fish and 4,861 individuals were identified and enumerated among four locations on the Comal River in spring (May) and fall (November) 2019 (Table 12). Based on densities (number of individuals per m^2), most abundant fishes were Fountain Darter (36% of the fish community), *Etheostoma* (24%; includes both Fountain Darter *and* Greenthroat Darter *E. lepidum*), Large Spring Gambusia *Gambusia geiseri* (8% of the fish community), Guadalupe Roundnose Minnow *Dionda nigrotaeniata* (7%), Mexican Tetra *Astyanax mexicanus* (5.7%),

and Greenthroat Darter (5.4%). The top 5 most abundant fishes within the Comal River are members of the habitat guild known as spring-associated fishes (Craig et al. 2016) which were observed within all reaches.

Seven years of fish community sampling since 2013 has resulted in enumeration of 70,276 fishes representing 28 species. Species richness is similar to the long-term drop-net database (2000 – 2019), which has identified more than 173,000 fishes representing 25 species. Species composition and relative abundance differs between the two methods as Cyprinids, Centrarchids, and Characids are observed in greater abundances with the fish community sampling than the drop-net sampling (Table 12). Seining and visual observation are more effective at enumerating these groups of fishes, which are highly mobile and less susceptible to drop-net capture.

Eight introduced species have been identified based on five years of fish community sampling. Active removal of non-native Blue Tilapia and Suckermouth Catfish is occurring as part of ongoing HCP-sponsored activities. However, relative abundance for both of these species has been variable over the past five years, and no distinct trends in abundance are apparent. Continued monitoring will be important to assess the long-term effectiveness of non-native removal programs.

Table 12. **Fish species taken from five reaches on the Comal River during spring and fall 2019 fish community sampling. Total N is the total numbers of individuals observed among three gear types: mesohabitat (meso), microhabitat (micro), and seine. N per gear type is the number of individuals taken with the gear. Mean CPUE is the average catch-per-unit-effort (number of individuals / m^2) of each species among all reaches. Overall relative density (%) is the relative density of each species by the total densities of all species (similar to the more familiar relative abundance but using density of individuals rather than number of individuals). Species relative density (%) is the relative density of a species among reaches; rows should sum to 100.**

						Species relative density (%) among sites			
Species	Total N	Gear type	N per gear type	Mean CPUE (m2)	Overall relative density (%)	Upper Spring Run	Landa Lake	Old Channel	New Channel
Cyprinella venusta	17	Seine	1	0.0006	0.034		X		100
Dionda nigrotaeniata	1,028	Meso	883	0.1140	7.009	39	20	41	0.2
Notropis amabilis	102	Seine	2	0.0011	0.069	50	X		50
Notropis volucellus	62	Seine	1	0.0006	0.034			100	X
*Astyanax mexicanus**	646	Meso	620	0.0930	5.720	33	10	54	3
Ameiurus natalis	1	Seine	1	0.0006	0.034				100
*Hypostomus plecostomus**	4	Meso	0	0.0000	0.000	X		X	
Gambusia	710	Meso	462	0.0662	4.068	16	9.6	65	9.5
Gambusia affinis	46	Seine	46	0.0258	1.584	26		54	20
Gambusia geiseri	263	Seine	248	0.1389	8.542	13		16	71
*Poecilia latipinna**	3	Seine	3	0.0017	0.103			33	67
*Ambloplites rupestris**	5	Seine	5	0.0028	0.172			100	
Lepomis	188	Meso	167	0.0232	1.424	9.7	1.3	10	79
*Lepomis auritus**	186	Meso	122	0.0160	0.987	3.9		4.2	92
Lepomis cyanellus	1	Seine	1	0.0006	0.034			100	
Lepomis macrochirus	10	Meso	8	0.0019	0.116		49		51
Lepomis megalotis	12	Seine	5	0.0028	0.172			20.0	80
Lepomis miniatus	60	Seine	47	0.0263	1.619	68	X	13	19
Micropterus salmoides	298	Meso	257	0.0370	2.273	40	32	4.5	24
Etheostoma	421	Micro	376	0.3917	24.079	48	33	14	5.9
Etheostoma fonticola	647	Micro	567	0.5906	36.310	28	26	30	16
Etheostoma lepidum	135	Micro	85	0.0885	5.443	53	37	4.7	5.9
*Herichthys cyanoguttatus**	16	Seine	5	0.0028	0.172			X	100

Asterisk (*) denotes introduced species. Capital letter X denotes presence of a species at a reach, recorded by another gear type.

Comal Springs Salamander Visual Observations

A total of 502 Comal Springs Salamanders were observed across all four sampling sites during 2019 monitoring efforts (timed active searches), with a catch-per-unit-effort (CPUE) of 42 observations/person hour (Table 13). This exceeded both the 2000-2019 long-term average (n=56; CPUE=9 observations/person hour; Figures 24 – 27) and the previous maximum recorded within a single year (2018; n=280; CPUE=23 observations/person hour). Contrary to previous years, spring sampling yielded more salamander observations than fall sampling.

Spring Run 1 had the highest total number of observations in 2019 (n=304) and highest CPUE (76 observations/person hour), with spring counts at Spring Run 1 being the maximum ever recorded at a site (n=184; CPUE=92 observations/ person hour). CPUE was higher for Spring Island Outfall (CPUE=42 observations/person hour) than for Spring Run 3 (CPUE=27 observations/person hour) suggesting that salamander densities may actually be higher within Spring Island Outfall. Consistent with previous years, counts were lower in Spring Island Run, with only five salamanders documented in this area in 2019.

Table 13. Comal Springs salamander observations with number of observations and catch per unit effort (CPUE; observations/person hour) for spring and fall routine sampling in 2019 and the long-term average (2001-2019).

SEASON	2019 SAMPLING EVENT				
	Spring Run 1 #	Spring Run 3 #	Spring Island Run #	Spring Island Outfall #	Totals (#(CPUE))
Spring	184	66	3	51	304 (51)
Fall	120	43	2	33	198 (33)
Total	304	109	5	84	502 (42)
Average 2001–2019	25	16	3	12	56 (9)

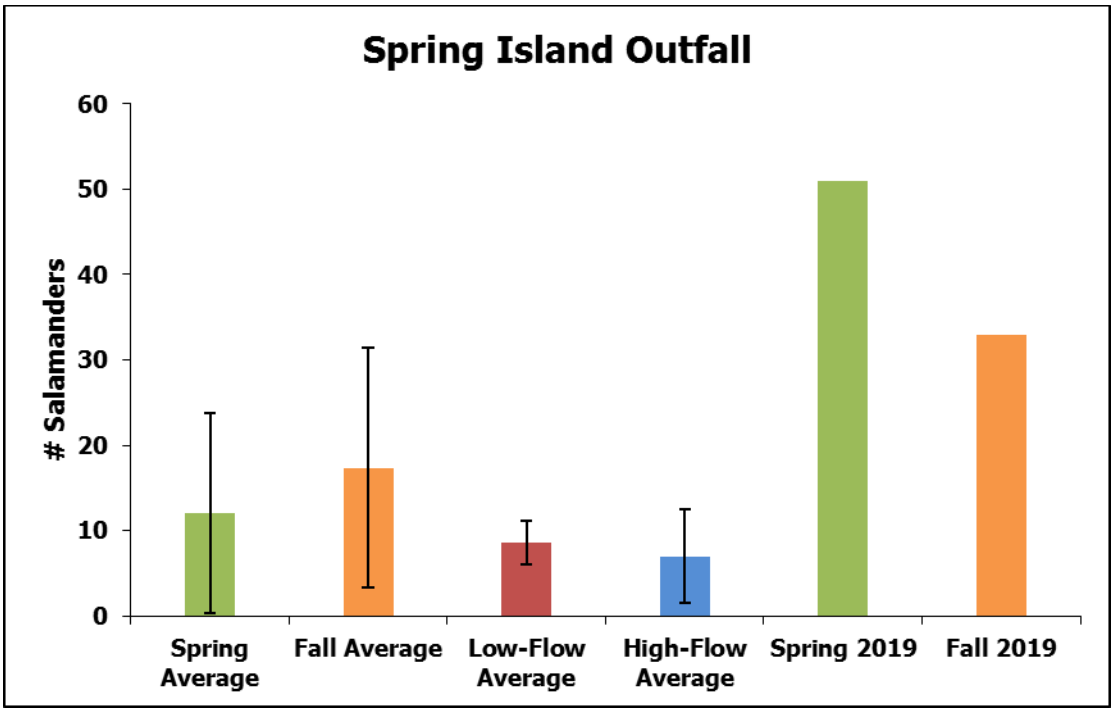


Figure 24. Comal Springs salamander observations at the Spring Island East Outfall in 2019, with the long-term average (2001-2019) for each sampling event. Long-term study averages are provided with error bars representing the standard deviation of the mean.

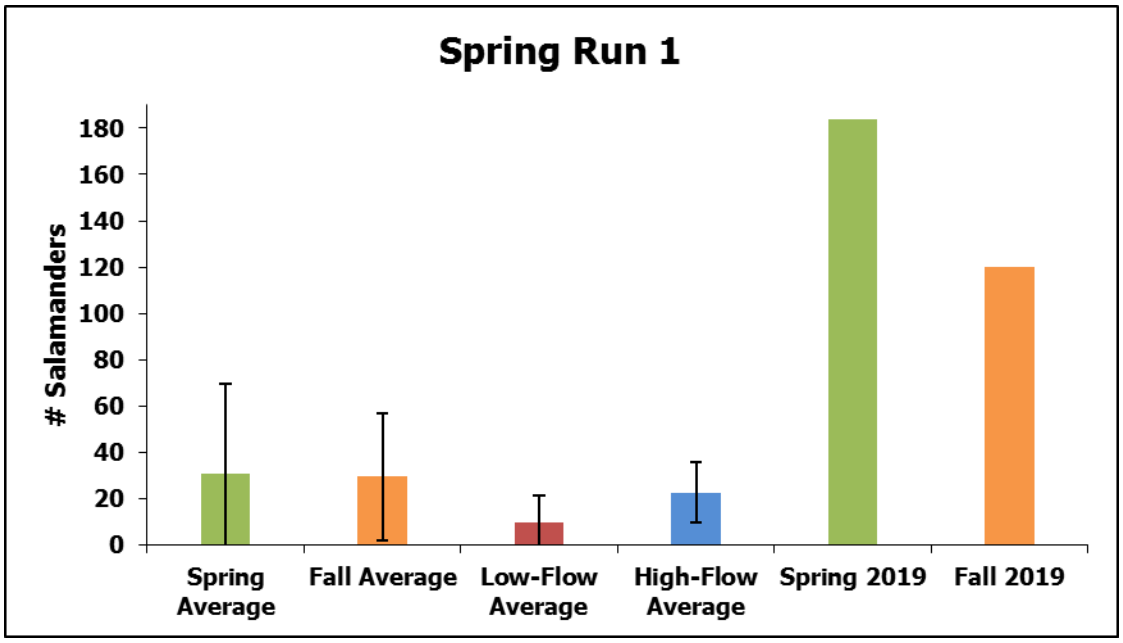


Figure 25. Comal Springs salamander observations at Spring Run 1 in 2019, with the long-term (2001-2019) average for each sampling event. Long-term study averages are provided with error bars representing the standard deviation of the mean.

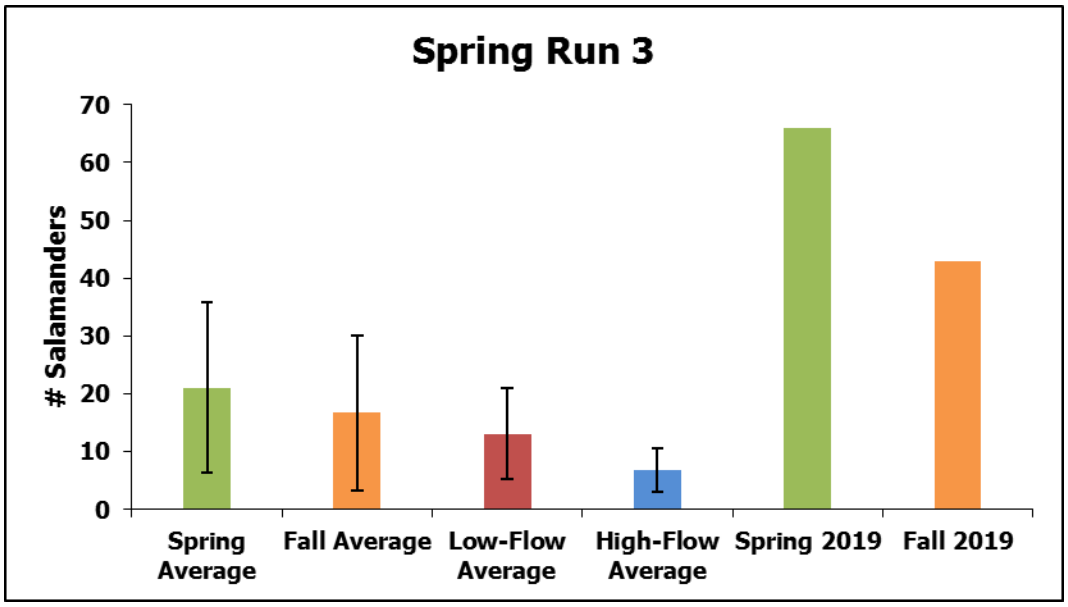


Figure 26. **Comal Springs salamander observations at Spring Run 3 in 2019, with the long-term average (2001-2019) for each sampling event. Long-term study averages are provided with error bars representing the standard deviation of the mean.**

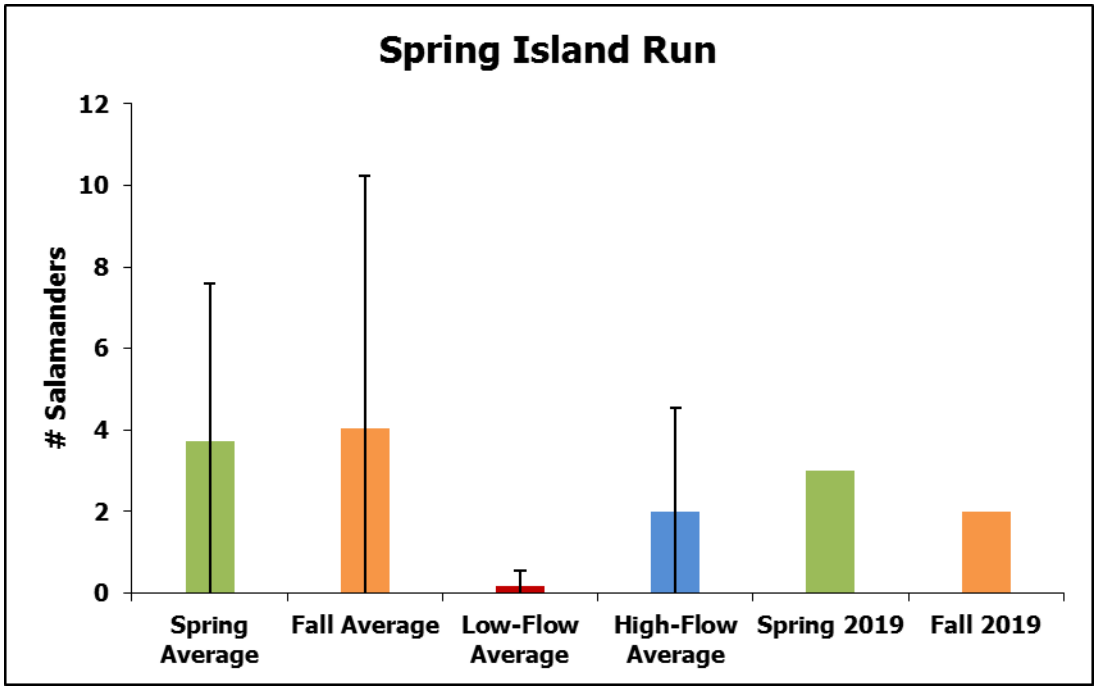


Figure 27. **Comal Springs salamander observations at the Spring Island Run (Spring Run 6) in 2019, with the long-term average (2001-2019) for each sampling event. Long-term study averages are provided with error bars representing the standard deviation of the mean.**

Monitoring in 2019 produced the highest number of salamander observations ever recorded throughout the duration of the biological monitoring program. Salamander abundances within the surface environments of the Comal Springs system have been steadily increasing since the return

of sustained water levels after the 2014 drought. Overall, salamander populations within this spring system are persistent, steadily increasing in abundance in recent years, and successfully recruiting (as evidenced by gravid females and juveniles observed in 2019).

Comal Macroinvertebrate Sampling

Both drift-net and cotton-lure sampling were used to assess population dynamics of federally listed Comal invertebrate species in 2019.

Drift-net Sampling

In 2019, a total of 2,760 groundwater invertebrates were collected during drift net sampling efforts among both seasons, with 622 at Spring Run 1, 259 at Spring Run 3, and 879 at the upwelling along the Western Shoreline of Landa Lake (Spring 7) (Table 14). Across all sites, *Stygobromus* species were the most commonly captured organisms with *Seborgia relicta* (a groundwater Amphipod) having the second-most observations in drift net collections.
Eight larvae and no adult Comal Springs dryopid beetles *Stygoparnus comalensis* were collected in 2019. Edwards Aquifer diving beetles *Haideoporus texanus* were once again not collected during drift net sampling and this species has not been collected since 2012. As in previous years, Comal Springs riffle beetle *Heterelmis comalensis* and Comal Springs dryopid beetle were not collected at the Western Shoreline upwelling. However, this site did have the greatest number of Peck's Cave amphipod *Stygobromus pecki* (45), and the highest number of immature *Stygobromus* species (384, Table 14).

Comal Springs Riffle Beetle

There were two cotton lure sampling efforts (spring, fall) in 2019 for Comal Springs riffle beetle. The use of tags to place and relocate lures was again implemented; only one lure was not recovered from the Western Shoreline in the spring, possibly due to erosion. Figures 28 and 29 summarize the densities of adult Comal Springs riffle beetle from 2019 in the context of the long-term study. In 2019, the number of adult Comal Springs riffle beetle collected from lures at all localities and for both sampling events were higher than the previous year. Numbers of adult beetles sampled per lure from Spring Run 3 ranged from 0 – 12 during spring and 0 – 27 in fall. The number of adult Comal Springs riffle beetle collected on lures at the Western Shoreline ranged from 0 – 20 in spring and 0 – 32 in fall. Lures retrieved from Spring Island collected 0 – 36 adult beetles in spring and 0 – 22 in fall.

Table 14. Total numbers of troglobitic and endangered species collected at each site during May and November 2019. Federally endangered species are designated with (E). A=adult; L=larvae; P=probable pupae.

	Run 1	Run 3	Upwelling	Total
Total Drift Net Time (hrs)	48	48	48	144
Crustaceans				
Amphipoda				
Crangonyctidae				
Stygobromus pecki (E)	25	14	45	84
Stygobromus russelli	1			1
Stygobromus spp.	191	171	384	746
All *Stygobromus*	217	185	429	831
Hadziidae				
Mexiweckelia hardeni	17	171	1	189
Sebidae				
Seborgia relicta	5	556	5	566
Bogidiellidae				
Artesia subterranea	3	3		6
Parabogidiella americana		4		4
Ingolfiellidae				
Ingolfiella n. sp		3		3
Isopoda				
Asellidae				
Lirceolus (spp.)	61	137	14	212
Cirolanidae				
Cirolanides wassenichae		2	1	3
Thermosbaenacea				
Monodellidae				
Hobbsinella edwardensis		1		1
Arachnids				
Hydrachnoidea				
Hydryphantidae				
Almuerzothyas comalensis	96			96
Insects				
Coleoptera				
Dytiscidae				
Comaldessus stygius		8 L, 1 A		9
Haideoporus texanus				0
Dryopidae				
Stygoparnus comalensis (E)	6 L	2 L		8
Elmidae				
Heterelmis comalensis (E)		1 L		1
Total	622	1,259	879	2,760

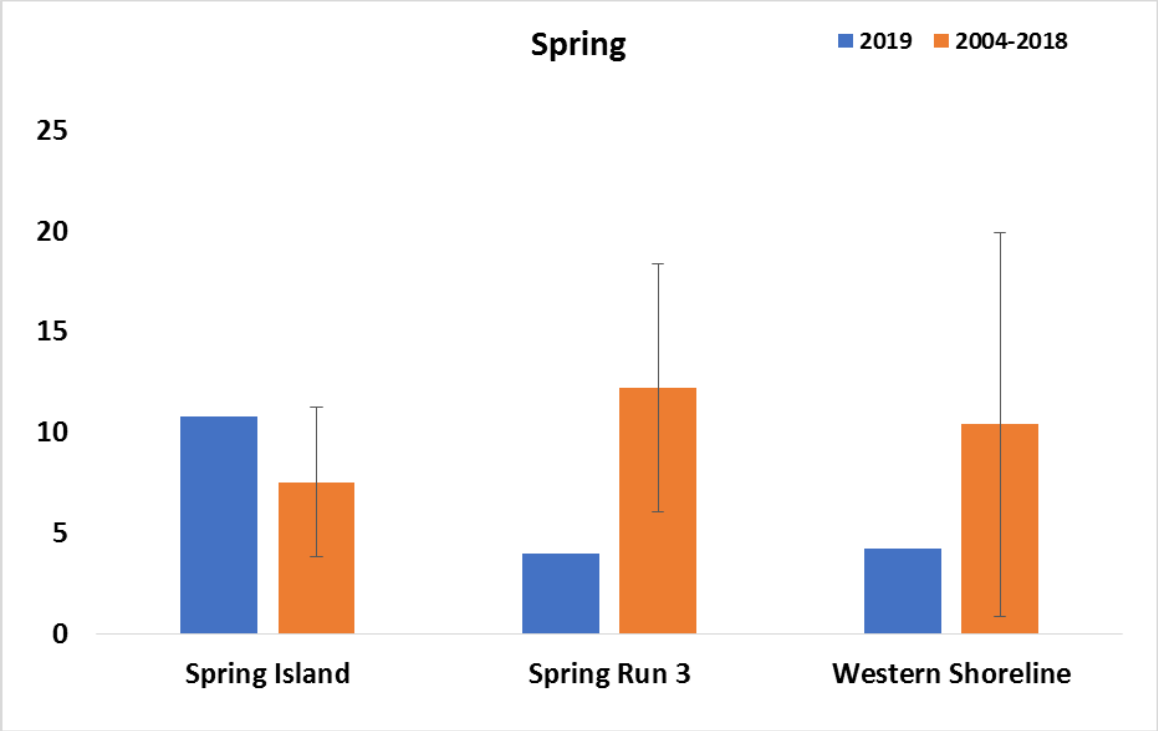


Figure 28. **Mean densities of adult Comal Springs riffle beetles sampled during the spring season of 2019 compared to long-term (2004-2018) mean densities. Error bars represent one standard deviation of the mean.**

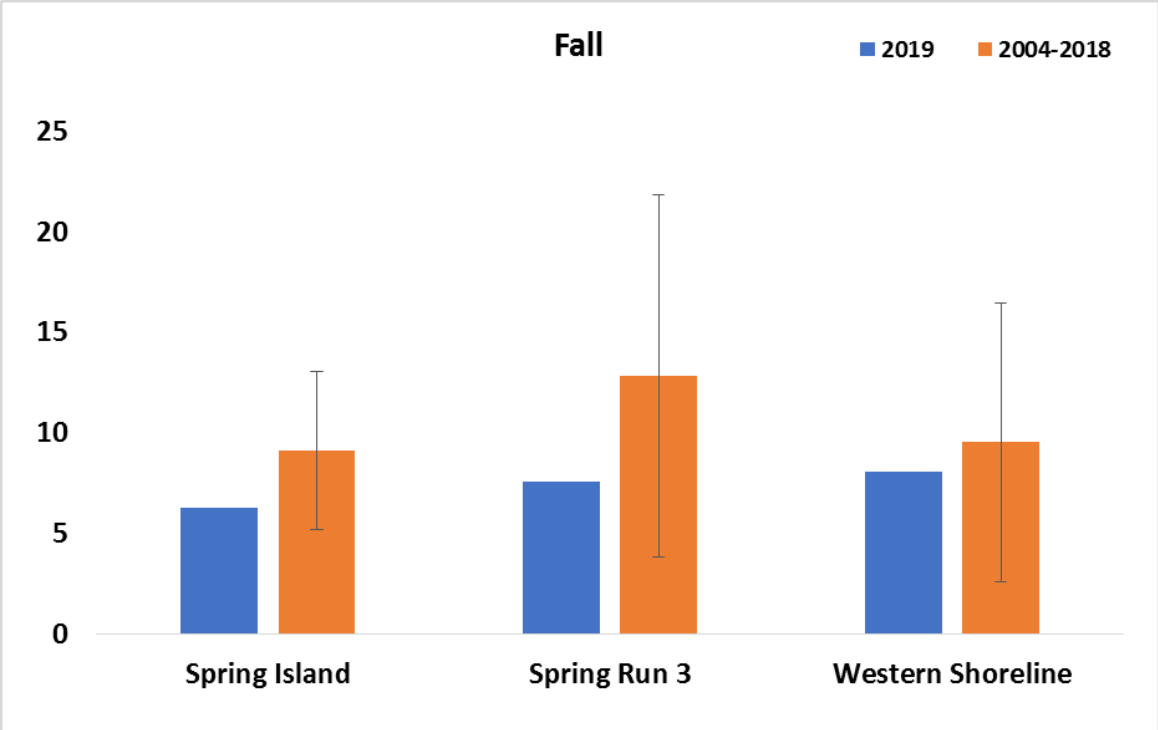


Figure 29. **Mean densities of adult Comal Springs riffle beetles sampled during the fall season of 2019 compared to long-term (2004-2018) mean densities. Error bars represent one standard deviation of the mean.**

For the third consecutive year, Comal Springs riffle beetle densities are below long-term averages, with the exception of the Spring Island spring sampling event. However, it was encouraging to see increased densities in 2019 relative to 2018.

As discussed in past reports, due to the nature of the monitoring technique (i.e., cotton lures left in the system for long periods) and the extremely clumped distribution of Comal Springs riffle beetle, which are associated with small spring orifices, this data is inherently variable in nature. High flow events (not a factor in 2019), human disturbance (reduced in 2019), or other stochastic factors can result in loss of cotton lures. Similarly, variation in placement of lures by only a little may influence capture rates. To reduce the influence of such factors, efforts are being made to standardize exact lure placement and minimize lure loss. However, it was perceived that some springs had decreased in flow intensity while others increased. Continued monitoring is crucial to further evaluate the mechanisms influencing Comal Springs riffle beetle densities on cotton lures.

Benthic Macroinvertebrate Rapid Bioassessment

A total of 831 and 976 individual macroinvertebrates, representing 41 and 48 unique taxa were sampled in spring and fall, respectively (raw data presented in Appendix C). Altogether, 59 unique taxa were represented among all samples from 2019. Metric values for each metric are reported, while metric scores for calculating the B-IBI can be found in Table 15.

The overall results of this metric analysis contribute to the B-IBI scores and assessment of the aquatic-life-use (Figure 30). Upper Spring Run was assessed as an "Intermediate" habitat in spring and fall with regard to supporting a balanced, integrated, adaptive community of organisms. Landa Lake is described from these assessments as being "Limited" in the spring and "Intermediate" in the fall. New Channel and Old Channel showed "High" support of a healthy community for both seasons. The Lower reach was found to have "Exceptional" and "High" support for aquatic life in spring and fall, respectively. It is also important to note that although it is easy to focus on the differences between reaches, the goal of this assessment is to track the "condition" of specific reaches over time as an indicator of trends.

Table 15. 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

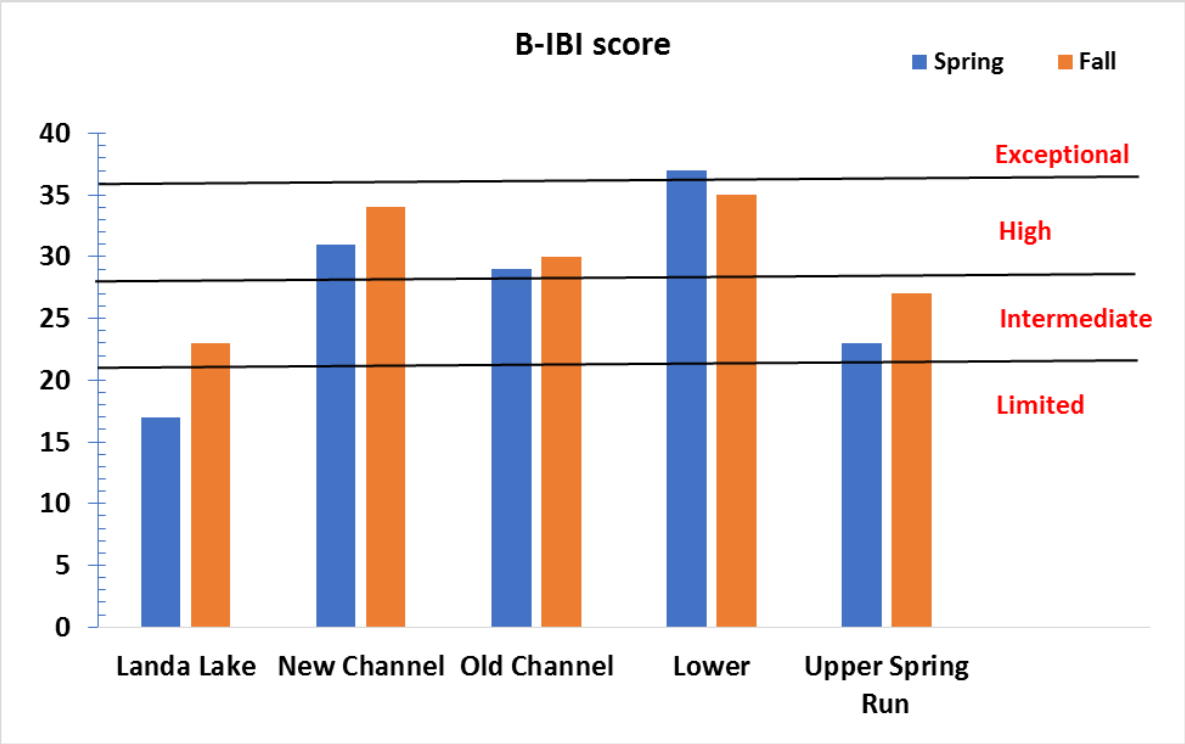


Figure 30. Benthic macroinvertebrate Index of Biotic Integrity (B-IBI) scores and aquatic-life-use point-score ranges for Comal Springs sample sites. "Exceptional" indicates highest quality habitats relative to reference streams used to develop the index.

In summary, areas of more lentic-type habitat (i.e., Landa Lake, Upper Spring Run) near spring sources scored lower, as these communities are different compared to swift flowing "least disturbed reference streams." Downstream areas with more lotic conditions generally scored higher, as habitat is more similar to reference streams. It should also be noted that most reference streams do not exhibit the stenothermal conditions present within the upper Comal River, and this may result in differing community composition. Additional monitoring may allow development of a reference dataset specific to this unique ecosystem, and potentially development of a specific IBI scoring system for unique large spring environments such as the Comal River.

CONCLUSION

In conclusion, the Comal Springs/River ecosystem is a diverse and dynamic system that is influenced by the quantity and quality of water emanating from the Edwards Aquifer. Hydrologic conditions in 2019 included an above average spring followed by an average summer and fall period. Despite this variability, the system continues to maintain high quality habitats that support populations of the HCP-covered species, among a variety of other taxa. Aquatic vegetation communities are thriving, with native vegetation types increasing and non-native varieties decreasing due to ongoing HCP-sponsored restoration activities. At present, this aquatic vegetation regime supports a healthy population of Fountain Darters, among a variety of other native fishes. In addition to aquatic vegetation, spring upwellings in this system provide habitat

for Comal salamanders and a variety of groundwater invertebrates. A number of non-native fish species are still present in the system, with additional monitoring required to determine if HCP-sponsored removal activities are influencing populations of targeted non-natives.

Notable patterns observed in 2019 include high abundance and occurrence of Fountain darters documented in drop-net and dip-net sampling, an increase in Comal salamander observations and an increase in the density of Comal Springs riffle beetles observed on cotton lures. A variety of factors could potentially be influencing these patterns and continued investigation will be required in 2019 and beyond. Continued monitoring for the Comal system is vital to understand the factors influencing all HCP covered species populations, to track community-level responses, and to continue to gauge the success of the HCP.

REFERENCES

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

Behen, K. P. K. 2013. Influence of connectivity and habitat on fishes of the upper San Marcos River. M.S. Thesis, Texas State University.

BIO-WEST 2001a. 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. Edwards Aquifer Authority, San Antonio, TX. 33p.

BIO-WEST 2001b. Comprehensive and Critical Period monitoring program to evaluate the effects of variable flow on biological resources in the Comal Springs / River aquatic ecosystem. 2000 Draft Report. Edwards Aquifer Authority, San Antonio, TX. 35p.

BIO-WEST 2002a. 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. Edwards Aquifer Authority. 26 p. plus Appendices.

BIO-WEST 2002b. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal Springs/River Aquatic Ecosystem. 2001 Annual Report. Edwards Aquifer Authority. 24 p. plus Appendices.

BIO-WEST 2003a. 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. Edwards Aquifer Authority. 42 p. plus Appendices.

BIO-WEST 2003b. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal Springs/River Aquatic Ecosystem. 2002 Annual Report. Edwards Aquifer Authority. 45 p. plus Appendices.

BIO-WEST 2004a. 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. Edwards Aquifer Authority. 30 p. plus Appendices.

BIO-WEST 2004b. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal Springs/River Aquatic Ecosystem. 2003 Annual Report. Edwards Aquifer Authority. 42 p. plus Appendices.

BIO-WEST 2005a. 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. Edwards Aquifer Authority. 57 p. plus Appendices.

BIO-WEST 2005b. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal Springs/River Aquatic Ecosystem. 2004 Annual Report. Edwards Aquifer Authority. 70 p. plus Appendices.

BIO-WEST 2006a. 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. Edwards Aquifer Authority. 33 p. plus Appendices.

BIO-WEST 2006b. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal River Aquatic Ecosystem. 2005 Annual Report. Edwards Aquifer Authority. 43 p. plus Appendices.

BIO-WEST 2007a. 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. Edwards Aquifer Authority. 54 p. plus Appendices.

BIO-WEST 2007b. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal River Aquatic Ecosystem. 2006 Annual Report. Edwards Aquifer Authority. 42 p. plus Appendices.

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

BIO-WEST 2008b. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal River Aquatic Ecosystem. 2007 Annual Report. Edwards Aquifer Authority. 41 p. plus Appendices.

BIO-WEST 2009a. 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. Edwards Aquifer Authority. 36 p. plus Appendices.

BIO-WEST 2009b. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal River Aquatic Ecosystem. 2008 Annual Report. Edwards Aquifer Authority. 41 p. plus Appendices.

BIO-WEST 2010a. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal River Aquatic Ecosystem. 2009 Annual Report. Edwards Aquifer Authority. 45 p. plus Appendices.

BIO-WEST 2010b. 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. Edwards Aquifer Authority. 60 p. plus Appendices.

BIO-WEST 2011a. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal River Aquatic Ecosystem. 2010 Annual Report. Edwards Aquifer Authority. 51 p. plus Appendices.

BIO-WEST 2011b. 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. Edwards Aquifer Authority. 44 p. plus Appendices.

BIO-WEST 2012a. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal River Aquatic Ecosystem. 2011 Annual Report. Edwards Aquifer Authority. 50 p. plus Appendices.

BIO-WEST 2012b. 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. Edwards Aquifer Authority. 51 p. plus Appendices.

BIO-WEST 2013a. Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal River Aquatic Ecosystem. 2012 Annual Report. Edwards Aquifer Authority. 41 p. plus Appendices.

BIO-WEST 2013b. 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. Edwards Aquifer Authority. 44 p. plus Appendices.

BIO-WEST 2014a. Habitat Conservation Plan Biological Monitoring Program. Comal River Aquatic Ecosystem 2013 Annual Report. Edwards Aquifer Authority. 92 p. plus Appendices.

BIO-WEST 2014b. Habitat Conservation Plan Biological Monitoring Program. San Marcos River Aquatic Ecosystem 2013 Annual Report. Edwards Aquifer Authority. 80 p. plus Appendices.

BIO-WEST 2014c. Fountain darter movement under low-flow conditions in the Comal Springs/River Ecosystem. Edwards Aquifer Authority.

BIO-WEST 2014d. Effects of low flow on Fountain Darter reproductive effort. Prepared for the Edward's Aquifer Authority, October 2014. 28 pp.

BIO-WEST 2015a. Habitat Conservation Plan Biological Monitoring Program. Comal River Aquatic Ecosystem 2014 Annual Report. Edwards Aquifer Authority. 98 p. plus Appendices.

BIO-WEST 2015b. Habitat Conservation Plan Biological Monitoring Program. San Marcos River Aquatic Ecosystem 2014 Annual Report. Edwards Aquifer Authority. 67 p. plus Appendices.

BIO-WEST 2016a. Habitat Conservation Plan Biological Monitoring Program. Comal River Aquatic Ecosystem 2015 Annual Report. Edwards Aquifer Authority. 75 p. plus Appendices.

BIO-WEST 2016b. Habitat Conservation Plan Biological Monitoring Program. San Marcos River Aquatic Ecosystem 2015 Annual Report. Edwards Aquifer Authority. 68 p. plus Appendices.

BIO-WEST 2017a. Habitat Conservation Plan Biological Monitoring Program. Comal Springs/River Aquatic Ecosystem 2016 Annual Report. Edwards Aquifer Authority. 64 p. plus Appendices.

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

BIO-WEST 2019a. Habitat Conservation Plan Biological Monitoring Program. San Marcos Springs/River Aquatic Ecosystem 2017 Annual Report. Edwards Aquifer Authority.

BIO-WEST 2019b. 2018 Native Aquatic Vegetation Restoration in Landa Lake and Old Channel of the Comal River. November 2019. Prepared for City of New Braunfels, TX, 44pp.

Bonner, T.H., T.M. Brandt, J.N. Fries, and B.G. Whiteside. 1998. Effects of temperature on egg production and early life stages of the fountain darter. Transactions of the American Fisheries Society 127:971-978.

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. Progressive Fish-Culturalist 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 7:1-13.

Edwards Aquifer Authority (EAA). 2018. Standard Operating Procedures for the Habitat Conservation Plan (HCP) Biological Monitoring Program for the Comal Springs/River Ecosystem. Revised. 35pp. + Appendices.

Garret, G.P., C. hubs, and R.J. Edwards. 2002. Threatened fishes of the world: *Dionda diaboli* Hubbs and Brown, 1956 (Cyprinidae). Environmental Biology of Fishes 65:478.

McDonald, D.L., T.H. Bonner, E.L. Oborny, 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.

Merritt RW, Cummins KW, Berg MB (eds). 2008. An introduction to the aquatic insects of North America. 4th edn. Kendall Hunt, Iowa.

Poff NL, Olden JD, Vieira NKM, Finn DS, Simmons MP, Kondratieff BC. 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.

Pound, K. L., W. H. Nowlin, D. G. Huffman, and T. H. Bonner. 2011. Trophic ecology of a nonnative population of suckermouth catfish (*Hypostomus plecostomus*) in a central Texas spring-fed stream. Environmental Biology of Fishes 90:277-285.

TCEQ 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.

U.S. Geological Survey (USGS). 11/2019. Provisional data for Texas. Location: http://tx.waterdata.usgs.gov/niwis/help/provisional.

APPENDIX A: CRITICAL PERIOD MONITORING SCHEDULES

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

FLOW TRIGGER (+ or - 10 cfs)	**PARAMETER**
200 cfs	Full Sampling Event
150 cfs	Full Sampling Event
120 cfs - 80 cfs	Riffle Beetles and spring discharge - Every 10 cfs decline (maximum weekly)
100 cfs	Full Sampling Event
100 cfs - 50 cfs	Habitat Evaluations - Every 10 cfs decline (maximum weekly)
50 cfs	Full Sampling Event
50 cfs - 0 cfs	Habitat Evaluations - Every 10 cfs decline (maximum weekly)
10 - 0 cfs	Full Sampling Event
RECOVERY	
25 cfs - 100 cfs	Full Sampling Event (dependant on flow stabilization)
100 cfs - 200 cfs	Full Sampling Event (dependant on flow stabilization)

PARAMETER DESCRIPTION

Full Sampling Event	Aquatic Vegetation Mapping Fountain Darter Sampling Drop Net, Dip net (Presence/Absence), and Visual Parasite evaluations Fish Community Sampling Salamander Sampling - Visual Riffle beetle - Cotton lure sampling Fish sampling - Exotics / Predation (100 cfs and below) Water Quality - Suite I and Suite II Flow partitioning - Landa Lake
Riffle Beetle Monitoring	Spring Discharge and wetted perimeter measurements
Habitat Evaluations	Photographs

COMAL RIVER / SPRINGS
Species-Specific Triggered Sampling

Flow Rate (+ or - 5 cfs)	Species	Frequency	Parameter
≤150 or ≥80 cfs	fountain darter	every other month	Aquatic vegetation mapping to include Upper Spring Run reach, Landa Lake, Old Channel reach, and New Channel reach
≤150 or ≥80 cfs	fountain darter	every other month	Conduct Dip net sampling/visual parasite evaluations at five (5) sites in the Upper Spring Reach; twenty (20) sites in Landa Lake; twenty (20) sites in the Old Channel reach and; at five (5) sites in the New Channel reach.
≤60 cfs	fountain darter	weekly	Conduct Dip net sampling/visual parasite evaluations at five (5) sites in the Upper Spring Reach; twenty (20) sites in Landa Lake; twenty (20) sites in the Old Channel reach and; at five (5) sites in the New Channel reach.
≤60 cfs	fountain darter	monthly	Aquatic vegetation mapping at Upper Spring Run reach, Landa Lake, Old Channel reach, and New Channel reach
≤120 cfs	riffle beetle	every 2 weeks	Monitoring via cotton lures at Spring Run 3, western shore of Landa Lake, and Spring Island upwelling
≤120 cfs or ≥80 cfs	salamander	every other week	Salamander snorkel surveys will be conducted at three sites (Spring Runs 1 and 3 and the Spring Island area)
≤80 cfs	salamander	weekly	Salamander snorkel surveys will be conducted at three sites (Spring Runs 1 and 3 and the Spring Island area)

APPENDIX B: AQUATIC VEGETATION MAPS

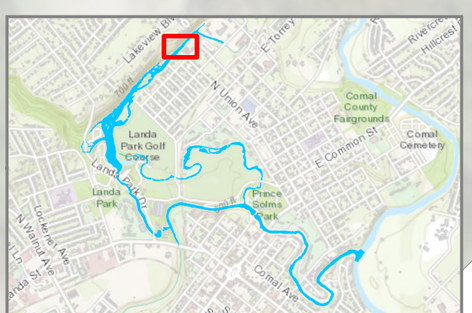
Upper Spring Run Reach

Comal River

New Braunfels, Texas

UPPER SPRING RUN
Aquatic Vegetation
Study Reach

Spring 2019
Surveyed: April 19, 2019



Projected in NAD 1983 UTM Zone 14N at 1:680. Imagery basemap courtesy of USGS/ESRI. Created on 12/15/2019.

Upper Spring Run

Study Reach		
Bryophyte	991.7 m^2	
Algae	484.2 m^2	
Ludwigia	7.7 m^2	
Sagittaria	1,088.2 m^2	

N

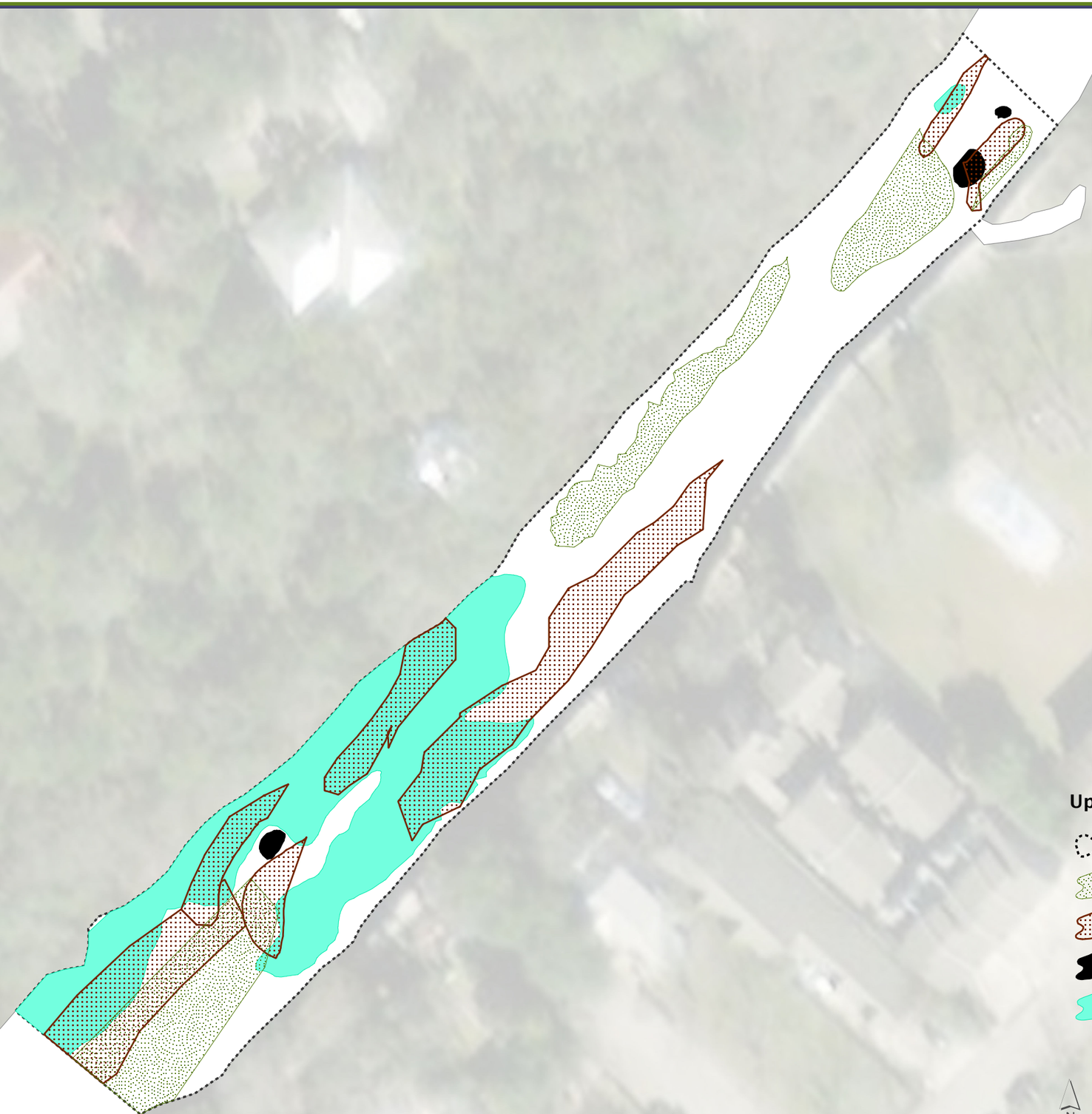
0 25 50 100 ft
0 5 10 20 m

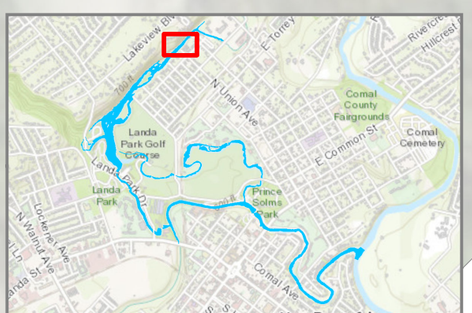
Comal River

New Braunfels, Texas

UPPER SPRING RUN
Aquatic Vegetation
Study Reach

Fall 2019
Surveyed: September 05, 2019





Projected in NAD 1983 UTM Zone 14N at 1:680. Imagery basemap courtesy of USGS/ESRI. Created on 12/15/2019.

Upper Spring Run

Study Reach	
Bryophyte	686.7 m^2
Algae	723.0 m^2
Ludwigia	16.8 m^2
Sagittaria	1,218.5 m^2

N

0 25 50 100 ft
0 5 10 20 m

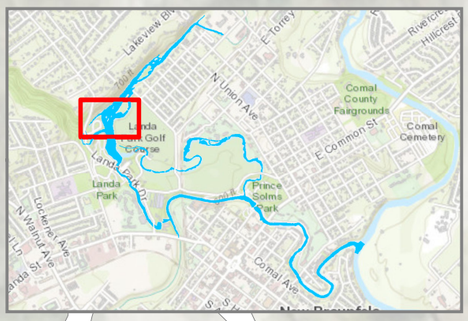
Landa Lake Reach

Comal River

New Braunfels, Texas

LANDA LAKE
Aquatic Vegetation
Study Reach

Spring 2019
Surveyed: April 25, 2019



Projected in NAD 1983 UTM Zone 14N at 1:1200. Imagery basemap courtesy of USGS/ESRI. Created on 12/15/2019.

Landa Lake

Study Reach	
Bryophyte	2,488.6 m^2
Bacopa	9.8 m^2
Cabomba	239.4 m^2
Ludwigia	373.3 m^2
Nuphar	15.2 m^2
Potamogeton	21.6 m^2
Sagittaria	3,453.7 m^2
Vallisneria	12,323.3 m^2

N

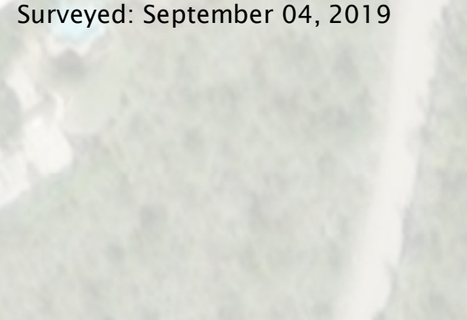
0 25 50 100 ft
0 5 10 20 m

Comal River

New Braunfels, Texas

LANDA LAKE
Aquatic Vegetation
Study Reach

Fall 2019
Surveyed: September 04, 2019



Projected in NAD 1983 UTM Zone 14N at 1:1200. Imagery basemap courtesy of USGS/ESRI. Created on 12/15/2019.

Landa Lake

Study Reach	
Bryophyte	1,657.3 m^2
Algae	785.0 m^2
Bacopa	5.4 m^2
Cabomba	297.8 m^2
Ludwigia	576.2 m^2
Potamogeton	24.9 m^2
Sagittaria	3,733.6 m^2
Vallisneria	12,200.8 m^2

N

0 25 50 100 ft
0 5 10 20 m

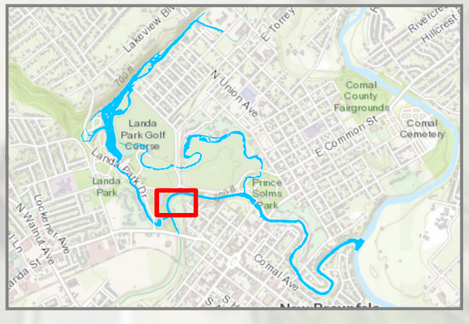
Upper New Channel Reach

Comal River

New Braunfels, Texas

UPPER NEW CHANNEL
Aquatic Vegetation
Study Reach

Spring 2019
Surveyed: April 22, 2019



Projected in NAD 1983 UTM Zone 14N at 1:800. Imagery basemap courtesy of USGS/ESRI. Created on 12/15/2019.

Upper New Channel

Study Reach	
Bryophyte	187.4 m^2
Cabomba	5.5 m^2
Hygrophila	887.5 m^2
Ludwigia	104.2 m^2

N

0 25 50 100 ft
0 5 10 20 m

Comal River

New Braunfels, Texas

UPPER NEW CHANNEL
Aquatic Vegetation
Study Reach

Fall 2019
Surveyed: September 16, 2019

Projected in NAD 1983 UTM Zone 14N at 1:800. Imagery basemap courtesy of USGS/ESRI. Created on 12/15/2019.

Upper New Channel

	Study Reach	
	Bryophyte	368.0 m^2
	Cabomba	30.2 m^2
	Hygrophila	1,251.5 m^2
	Ludwigia	133.2 m^2

N

0 25 50 100 ft
0 5 10 20 m

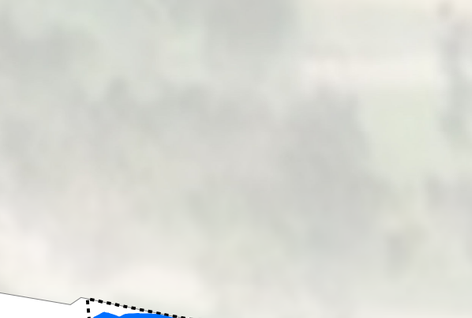
Lower New Channel Reach

Comal River

New Braunfels, Texas

LOWER NEW CHANNEL
Aquatic Vegetation
Study Reach

Spring 2019
Surveyed: April 22, 2019



Projected in NAD 1983 UTM Zone 14N at 1:550. Imagery basemap courtesy of USGS/ESRI. Created on 12/15/2019.

Lower New Channel

Study Reach	
Cabomba	1,509.4 m^2
Hygrophila	594.4 m^2
Sagittaria	0.4 m^2

N

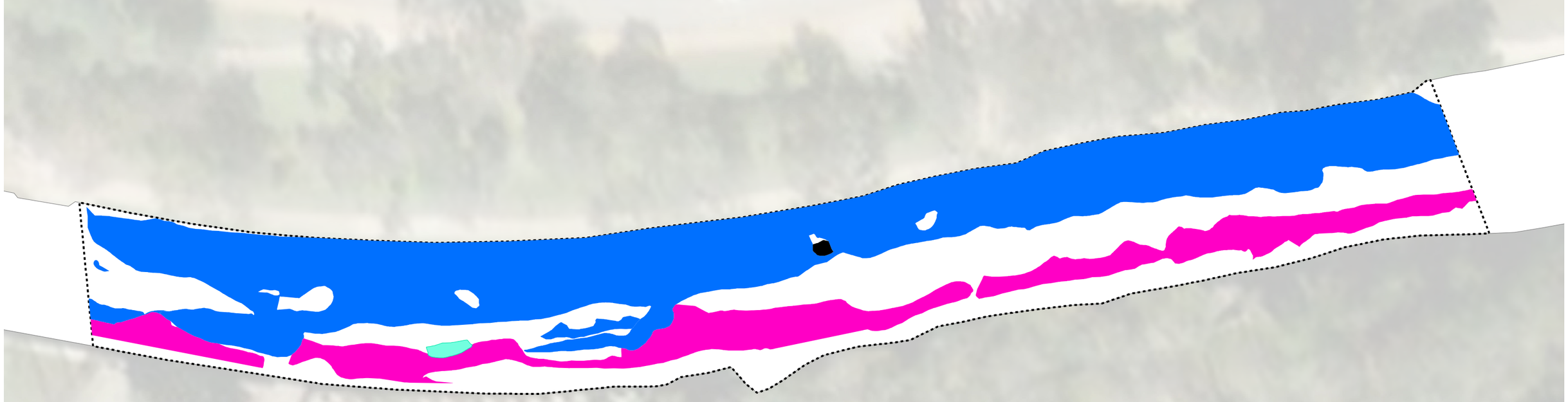
0 20 40 80 ft
0 5 10 20 m

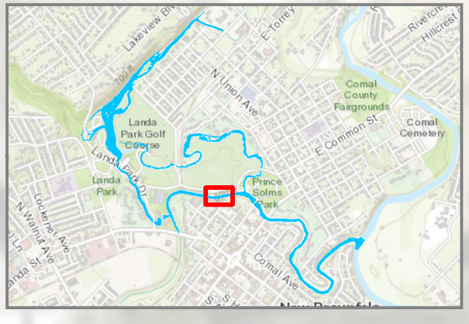
Comal River

New Braunfels, Texas

LOWER NEW CHANNEL
Aquatic Vegetation
Study Reach

Fall 2019
Surveyed: September 16, 2019





Projected in NAD 1983 UTM Zone 14N at 1:550. Imagery basemap courtesy of USGS/ESRI. Created on 12/15/2019.

Lower New Channel

Study Reach	
Cabomba	1,679.2 m^2
Hygrophila	534.7 m^2
Ludwigia	3.4 m^2
Sagittaria	4.3 m^2

N

0 20 40 80 ft
0 5 10 20 m

Old Channel Reach

Comal River

New Braunfels, Texas

OLD CHANNEL
Aquatic Vegetation
Study Reach

Spring 2019
Surveyed: April 19, 2019

Projected in NAD 1983 UTM Zone 14N at 1:450. Imagery basemap courtesy of USGS/ESRI. Created on 12/15/2019.

Old Channel

Study Reach	
Bryophyte	679.9 m^2
Cabomba	43.0 m^2
Hygrophila	0.2 m^2
Ludwigia	199.6 m^2
Nuphar	41.1 m^2
Sagittaria	17.7 m^2

N

0 10 20 40 ft
0 2.5 5 10 m

Comal River

New Braunfels, Texas

OLD CHANNEL
Aquatic Vegetation
Study Reach

Fall 2019
Surveyed: September 09, 2019

Projected in NAD 1983 UTM Zone 14N at 1:450. Imagery basemap courtesy of USGS/ESRI. Created on 12/15/2019.

Old Channel

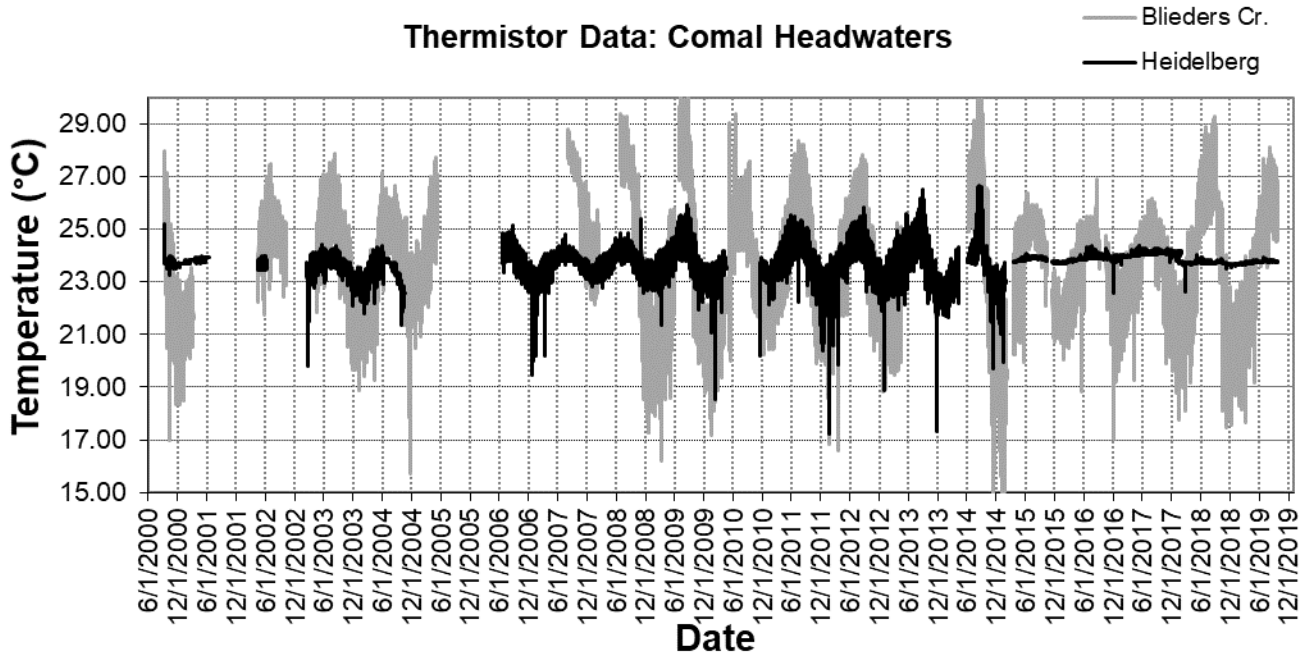
Study Reach	
Bryophyte	607.5 m^2
Cabomba	175.1 m^2
Ludwigia	303.8 m^2
Nuphar	25.3 m^2
Sagittaria	30.7 m^2

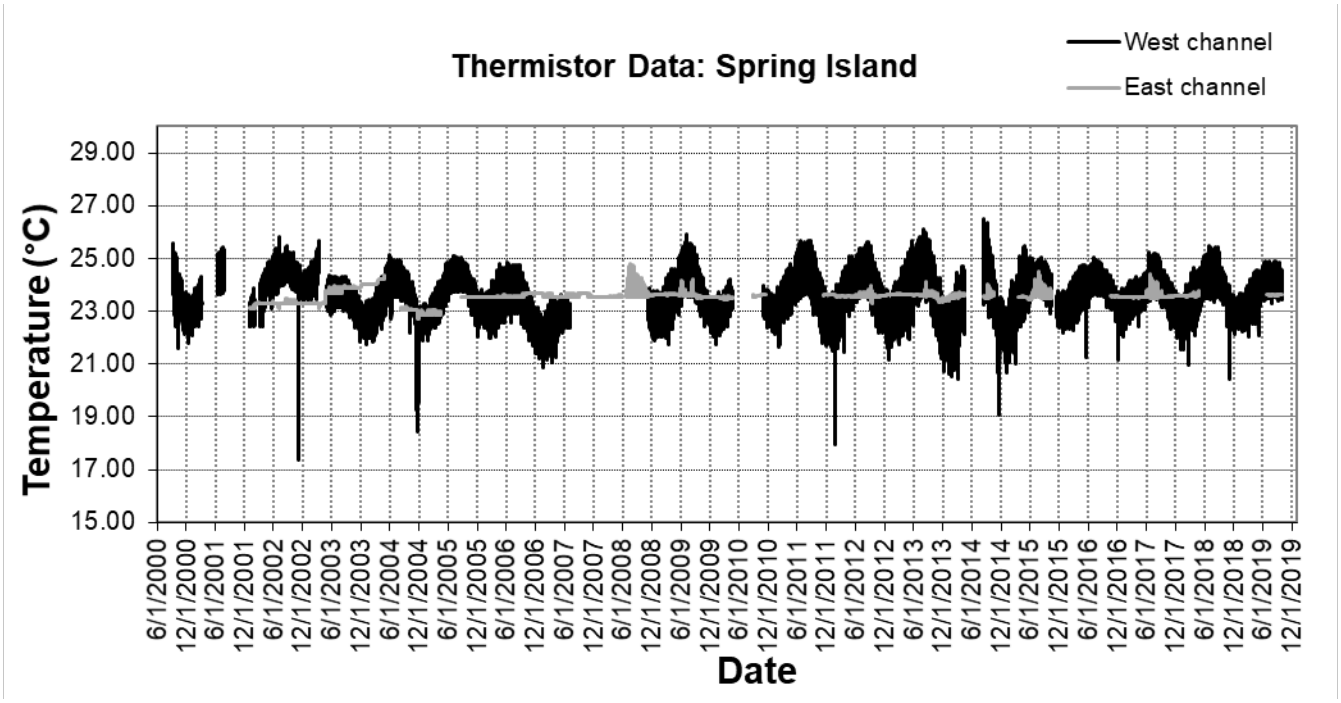
N

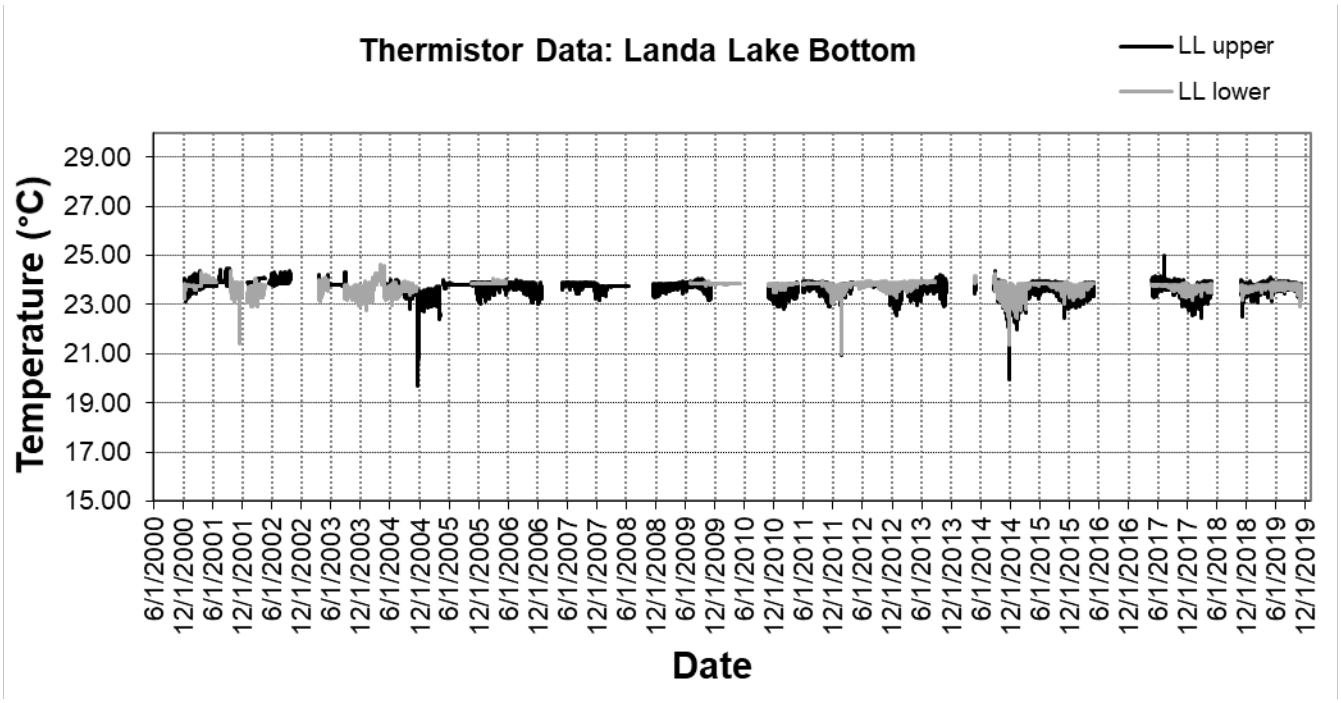
0 10 20 40 ft
0 2.5 5 10 m

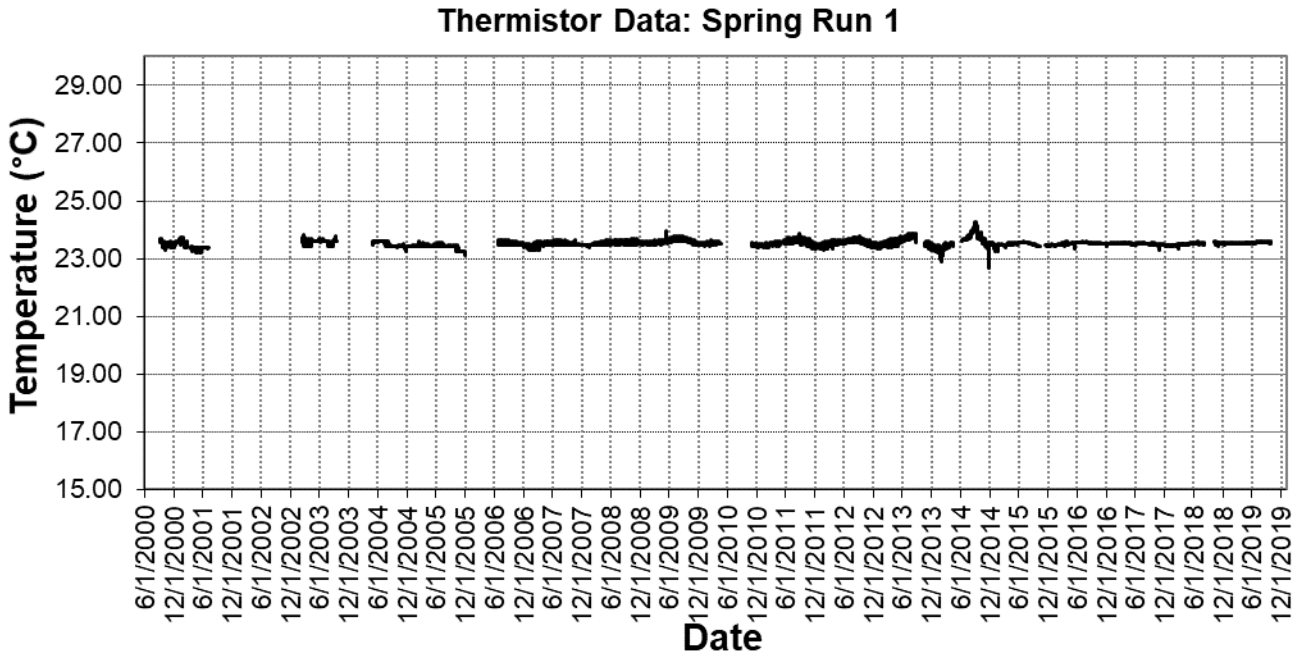
APPENDIX C: DATA AND GRAPHS

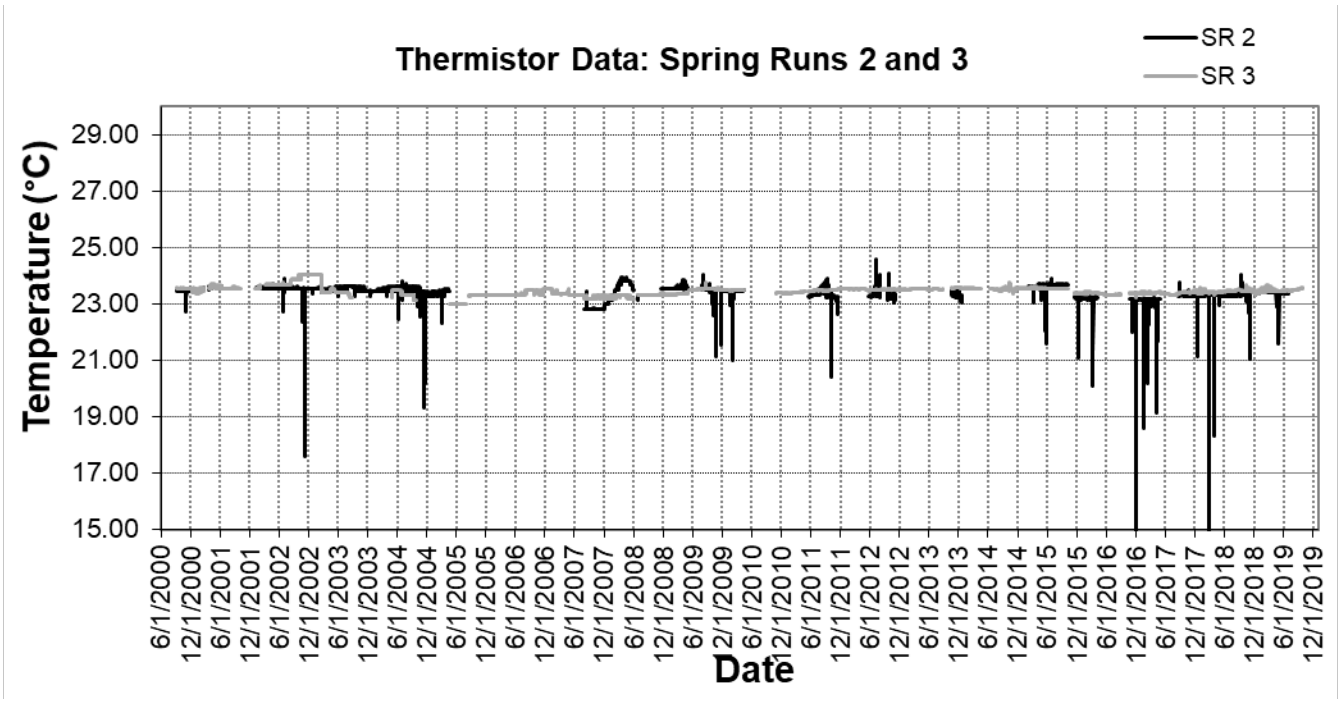
Thermistor Graphs

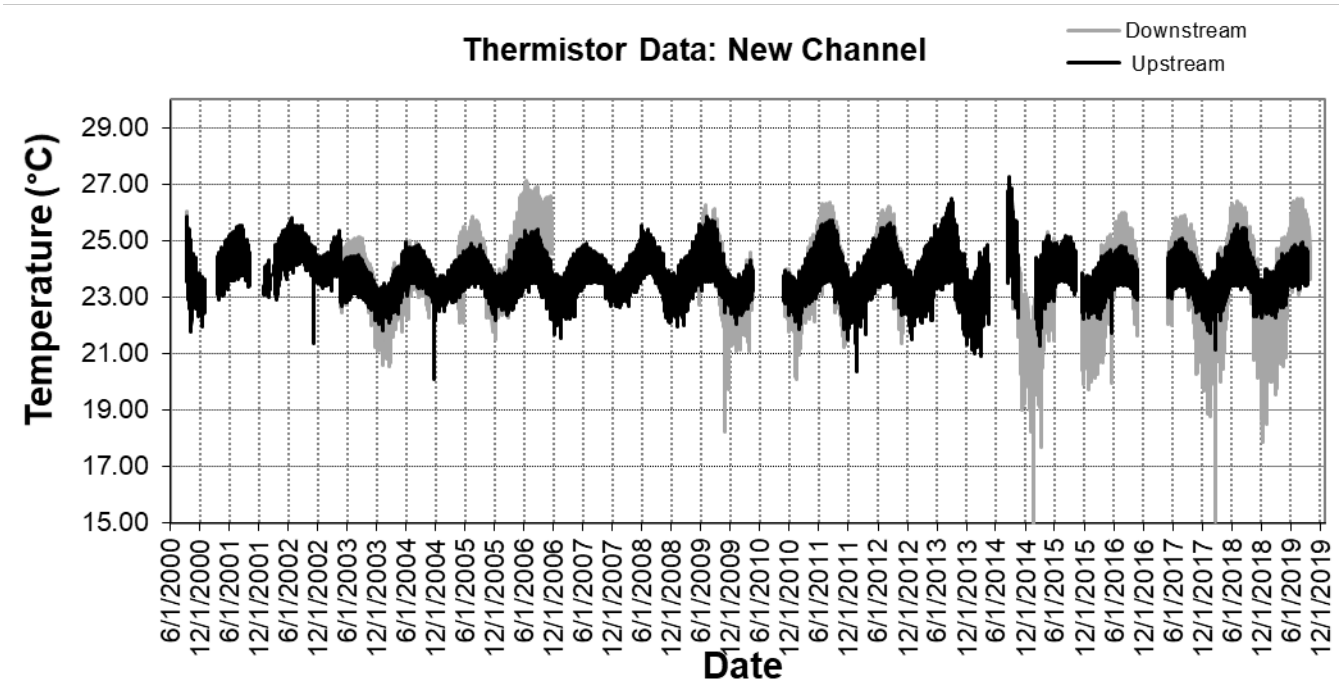

Thermistor Data: Comal Headwaters
Blieders Cr.
Heidelberg
Temperature (°C)
29.00
27.00
25.00
23.00
21.00
19.00
17.00
15.00
6/1/2000
12/1/2000
6/1/2001
12/1/2001
6/1/2002
12/1/2002
6/1/2003
12/1/2003
6/1/2004
12/1/2004
6/1/2005
12/1/2005
6/1/2006
12/1/2006
6/1/2007
12/1/2007
6/1/2008
12/1/2008
6/1/2009
12/1/2009
6/1/2010
12/1/2010
6/1/2011
12/1/2011
6/1/2012
12/1/2012
6/1/2013
12/1/2013
6/1/2014
12/1/2014
6/1/2015
12/1/2015
6/1/2016
12/1/2016
6/1/2017
12/1/2017
6/1/2018
12/1/2018
6/1/2019
12/1/2019
Date

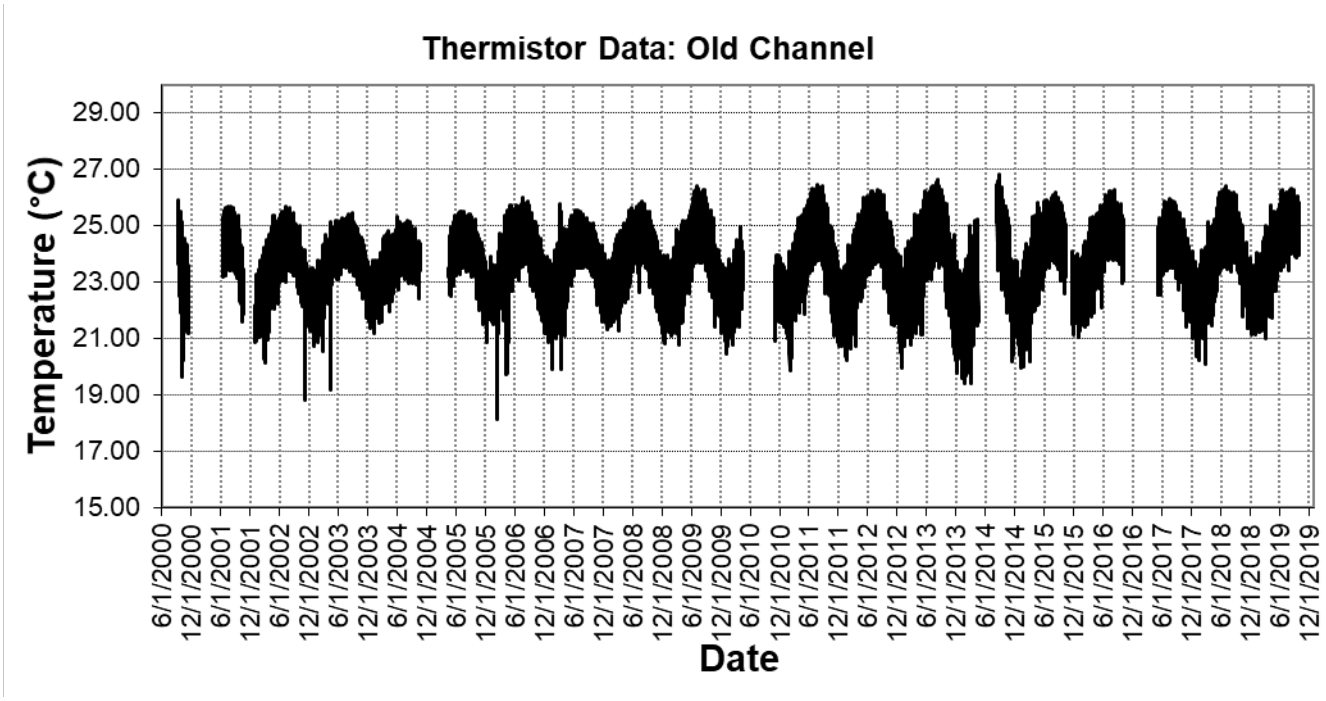

Thermistor Data: Spring Island
West channel
East channel
Temperature (°C)
29.00
27.00
25.00
23.00
21.00
19.00
17.00
15.00
6/1/2000
12/1/2000
6/1/2001
12/1/2001
6/1/2002
12/1/2002
6/1/2003
12/1/2003
6/1/2004
12/1/2004
6/1/2005
12/1/2005
6/1/2006
12/1/2006
6/1/2007
12/1/2007
6/1/2008
12/1/2008
6/1/2009
12/1/2009
6/1/2010
12/1/2010
6/1/2011
12/1/2011
6/1/2012
12/1/2012
6/1/2013
12/1/2013
6/1/2014
12/1/2014
6/1/2015
12/1/2015
6/1/2016
12/1/2016
6/1/2017
12/1/2017
6/1/2018
12/1/2018
6/1/2019
12/1/2019
Date

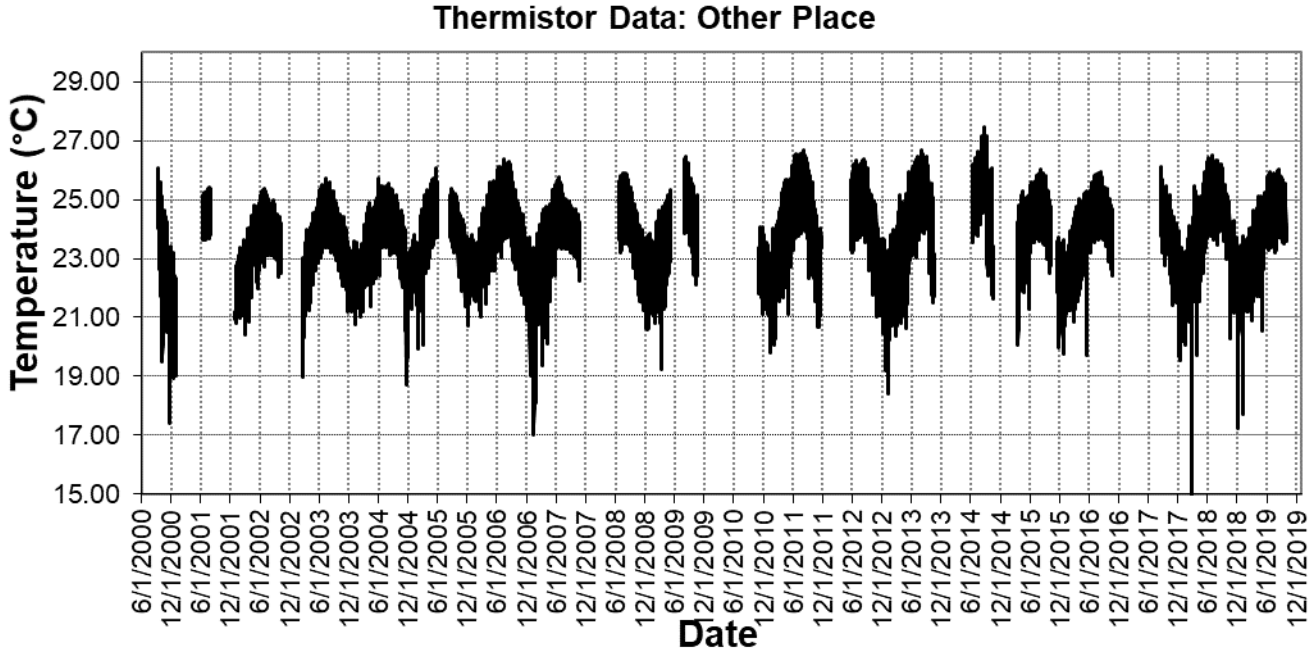

Thermistor Data: Landa Lake Bottom
LL upper
LL lower
Temperature (°C)
29.00
27.00
25.00
23.00
21.00
19.00
17.00
15.00
6/1/2000
12/1/2000
6/1/2001
12/1/2001
6/1/2002
12/1/2002
6/1/2003
12/1/2003
6/1/2004
12/1/2004
6/1/2005
12/1/2005
6/1/2006
12/1/2006
6/1/2007
12/1/2007
6/1/2008
12/1/2008
6/1/2009
12/1/2009
6/1/2010
12/1/2010
6/1/2011
12/1/2011
6/1/2012
12/1/2012
6/1/2013
12/1/2013
6/1/2014
12/1/2014
6/1/2015
12/1/2015
6/1/2016
12/1/2016
6/1/2017
12/1/2017
6/1/2018
12/1/2018
6/1/2019
12/1/2019
Date


Thermistor Data: Spring Run 1
Temperature (°C)
29.00
27.00
25.00
23.00
21.00
19.00
17.00
15.00
6/1/2000
12/1/2000
6/1/2001
12/1/2001
6/1/2002
12/1/2002
6/1/2003
12/1/2003
6/1/2004
12/1/2004
6/1/2005
12/1/2005
6/1/2006
12/1/2006
6/1/2007
12/1/2007
6/1/2008
12/1/2008
6/1/2009
12/1/2009
6/1/2010
12/1/2010
6/1/2011
12/1/2011
6/1/2012
12/1/2012
6/1/2013
12/1/2013
6/1/2014
12/1/2014
6/1/2015
12/1/2015
6/1/2016
12/1/2016
6/1/2017
12/1/2017
6/1/2018
12/1/2018
6/1/2019
12/1/2019
Date


Thermistor Data: Spring Runs 2 and 3
SR 2
SR 3
Temperature (°C)
29.00
27.00
25.00
23.00
21.00
19.00
17.00
15.00
6/1/2000
12/1/2000
6/1/2001
12/1/2001
6/1/2002
12/1/2002
6/1/2003
12/1/2003
6/1/2004
12/1/2004
6/1/2005
12/1/2005
6/1/2006
12/1/2006
6/1/2007
12/1/2007
6/1/2008
12/1/2008
6/1/2009
12/1/2009
6/1/2010
12/1/2010
6/1/2011
12/1/2011
6/1/2012
12/1/2012
6/1/2013
12/1/2013
6/1/2014
12/1/2014
6/1/2015
12/1/2015
6/1/2016
12/1/2016
6/1/2017
12/1/2017
6/1/2018
12/1/2018
6/1/2019
12/1/2019
Date


Thermistor Data: New Channel
Downstream
Upstream
Temperature (°C)
29.00
27.00
25.00
23.00
21.00
19.00
17.00
15.00
6/1/2000
12/1/2000
6/1/2001
12/1/2001
6/1/2002
12/1/2002
6/1/2003
12/1/2003
6/1/2004
12/1/2004
6/1/2005
12/1/2005
6/1/2006
12/1/2006
6/1/2007
12/1/2007
6/1/2008
12/1/2008
6/1/2009
12/1/2009
6/1/2010
12/1/2010
6/1/2011
12/1/2011
6/1/2012
12/1/2012
6/1/2013
12/1/2013
6/1/2014
12/1/2014
6/1/2015
12/1/2015
6/1/2016
12/1/2016
6/1/2017
12/1/2017
6/1/2018
12/1/2018
6/1/2019
12/1/2019
Date


Thermistor Data: Old Channel
Temperature (°C)
29.00
27.00
25.00
23.00
21.00
19.00
17.00
15.00
6/1/2000
12/1/2000
6/1/2001
12/1/2001
6/1/2002
12/1/2002
6/1/2003
12/1/2003
6/1/2004
12/1/2004
6/1/2005
12/1/2005
6/1/2006
12/1/2006
6/1/2007
12/1/2007
6/1/2008
12/1/2008
6/1/2009
12/1/2009
6/1/2010
12/1/2010
6/1/2011
12/1/2011
6/1/2012
12/1/2012
6/1/2013
12/1/2013
6/1/2014
12/1/2014
6/1/2015
12/1/2015
6/1/2016
12/1/2016
6/1/2017
12/1/2017
6/1/2018
12/1/2018
6/1/2019
12/1/2019
Date


Thermistor Data: Other Place
Temperature (°C)
29.00
27.00
25.00
23.00
21.00
19.00
17.00
15.00
6/1/2000
12/1/2000
6/1/2001
12/1/2001
6/1/2002
12/1/2002
6/1/2003
12/1/2003
6/1/2004
12/1/2004
6/1/2005
12/1/2005
6/1/2006
12/1/2006
6/1/2007
12/1/2007
6/1/2008
12/1/2008
6/1/2009
2/1/2009
6/1/2010
12/1/2010
6/1/2011
12/1/2011
6/1/2012
12/1/2012
6/1/2013
12/1/2013
6/1/2014
12/1/2014
6/1/2015
12/1/2015
6/1/2016
12/1/2016
6/1/2017
12/1/2017
6/1/2018
12/1/2018
6/1/2019
12/1/2019
Date

Macroinvertebrate Raw Data

Spring

Site	Season	Class	Order	Family	FinalID	No.	Tolerance Value	Functional Feeding Guild 1	Functional Feeding Guild 2
Landa Lake	Spring	Malacostraca	Decapoda	Palaemonidae	Palaemonetes	2	4	Gather/Collector	
Landa Lake	Spring	Insecta	Odonata	Gomphidae	Aphylla	1		Predator	
Landa Lake	Spring	Malacostraca	Decapoda	Cambaridae	Cambarinae	2			
Landa Lake	Spring	Clitellata			Oligochaeta	5	8	Gather/Collector	
Landa Lake	Spring	Clitellata			Oligochaeta	4	8	Gather/Collector	
Landa Lake	Spring	Gastropoda	Neotaenioglossa	Pleuroceridae	Elimia	1	2.5	Scraper	
Landa Lake	Spring	Malacostraca	Amphipoda	Talitridae	Hyalella	113	8	Gather/Collector	Shredder
Landa Lake	Spring	Insecta	Coleoptera	Psephinidae	Psephenus	2	4	Scraper	
Landa Lake	Spring	Insecta	Ephemeroptera	Baetidae	Fallceon	4	4	Gather/Collector	Scraper
Landa Lake	Spring	Insecta	Diptera	Chironomidae	Thienemanniella	1			
Landa Lake	Spring	Insecta	Ephemeroptera	Baetidae	Procloeon	1			
Landa Lake	Spring	Insecta	Ephemeroptera	Tricorythidae	Tricorythodes	13	5	Gather/Collector	
Landa Lake	Spring	Gastropoda	Neotaenioglossa	Thiaridae	Terabia	10		Scraper	
New Channel	Spring	Insecta	Trichoptera	Hydrobiosidae	Atopsyche	1	0	Predator	
New Channel	Spring	Insecta	Diptera	Chironomidae	Dicrotendipes	2			
New Channel	Spring	Insecta	Diptera	Chironomidae	Orthocladiinae	4			
New Channel	Spring	Insecta	Diptera	Chironomidae	Pseudochironomus	1	5	Gather/Collector	
New Channel	Spring	Insecta	Ephemeroptera	Tricorythidae	Tricorythodes	2	5	Gather/Collector	
New Channel	Spring	Insecta	Trichoptera	Heliocopyschidae	Helicopsyche	10	2	Scraper	
New Channel	Spring	Insecta	Ephemeroptera	Baetidae	Baetodes	6	4	Scraper	
New Channel	Spring	Insecta	Trichoptera	Hydroptilidae	Hydroptila	2	2	Scraper	
New Channel	Spring	Insecta	Diptera	Chironomidae	Rheotanytarsus	11			
New	Spring	Insecta	Odonata	Coenagrionidae	Argia	2	6	Predator	

Channel									
New Channel	Spring	Insecta	Coleoptera	Psephinidae	Psephenus	2	4	Scraper	
New Channel	Spring	Gastropoda	Neotaenioglossa	Pleuroceridae	Elimia	7	2.5	Scraper	
New Channel	Spring	Malacostraca	Amphipoda	Talitridae	Hyalella	10	8	Gather/Collector	Shredder
New Channel	Spring	Gastropoda	Neotaenioglossa	Thiaridae	Terabia	2		Scraper	
New Channel	Spring	Clitellata			Oligochaeta	1	8	Gather/Collector	
New Channel	Spring	Insecta	Diptera	Tipulidae	Tipulidae	1			
New Channel	Spring	Insecta	Coleoptera	Elmidae	Microcylloepus pusillus	14			
New Channel	Spring	Insecta	Ephemeroptera	Baetidae	Fallceon	69	4	Gather/Collector	Scraper
New Channel	Spring	Insecta	Coleoptera	Elmidae	Macrelmis	50	4	Scraper	
New Channel	Spring	Insecta	Trichoptera	Hydroptilidae	Leucotrichia	2	3	Gather/Collector	Scraper
New Channel	Spring	Turbellaria	Tricladida		Planariidae	4			
Old Channel	Spring	Clitellata			Oligochaeta	5	8	Gather/Collector	
Old Channel	Spring	Insecta	Trichoptera	Hydrobiosidae	Atopsyche	2	0	Predator	
Old Channel	Spring	Insecta	Odonata	Coenagrionidae	Argia	4	6	Predator	
Old Channel	Spring	Gastropoda	Neotaenioglossa	Thiaridae	Terabia	7		Scraper	
Old Channel	Spring	Insecta	Ephemeroptera	Baetidae	Fallceon	13	4	Gather/Collector	Scraper
Old Channel	Spring	Insecta	Ephemeroptera	Tricorythidae	Tricorythodes	48	5	Gather/Collector	
Old Channel	Spring	Bivalvia	Veneroida	Corbiculidae	Corbicula fluminea	1	6	Filterer/Collector	
Old Channel	Spring	Malacostraca	Decapoda	Cambaridae	Cambarinae	2			

Old Channel	Spring	Insecta	Coleoptera	Elmidae	Phanocerus clavicornis	1			
Old Channel	Spring	Malacostraca	Amphipoda	Talitridae	Hyalella	44	8	Gather/Collector	Shredder
Old Channel	Spring	Insecta	Hemiptera	Naucoridae	Limnocoris	1	5	Predator	
Old Channel	Spring	Insecta	Lepidoptera	Pyralidae	Petrophila	2	5	Scraper	
Old Channel	Spring	Insecta	Trichoptera	Heliocopyschidae	Helicopsyche	1	2	Scraper	
Old Channel	Spring	Insecta	Coleoptera	Psephinidae	Psephenus	5	4	Scraper	
Old Channel	Spring	Insecta	Ephemeroptera	Heptageniidae	Stenacron	3	4	Gather/Collector	Scraper
Old Channel	Spring	Insecta	Trichoptera	Hydroptilidae	Leucotrichia	2	3	Gather/Collector	Scraper
Old Channel	Spring	Insecta	Trichoptera	Leptoceridae	Nectopsyche	1	3	Shredder	Gather/Collector
Old Channel	Spring	Gastropoda	Neotaenioglossa	Pleuroceridae	Elimia	1	2.5	Scraper	
Old Channel	Spring	Insecta	Coleoptera	Elmidae	Macrelmis	2	4	Scraper	
The Other Place	Spring	Insecta	Coleoptera	Elmidae	Stenelmis	4	7	Gather/Collector	Scraper
The Other Place	Spring	Insecta	Lepidoptera	Pyralidae	Petrophila	1	5	Scraper	
The Other Place	Spring	Insecta	Diptera	Empididae	Hemerodromia	1			
The Other Place	Spring	Insecta	Trichoptera	Hydropsychidae	Smicridea	1	4	Filterer/Collector	
The Other Place	Spring	Insecta	Trichoptera	Hydrobiosidae	Atopsyche	1	0	Predator	
The Other Place	Spring	Insecta	Trichoptera	Leptoceridae	Oecetis	1			
The Other Place	Spring	Insecta	Trichoptera	Hydroptilidae	Hydroptila	1	2	Scraper	
The Other Place	Spring	Insecta	Trichoptera	Leptoceridae	Nectopsyche	9	3	Shredder	Gather/Collector
The Other	Spring	Insecta	Diptera	Chironomidae	Rheotanytarsus	3			

Place									
The Other Place	Spring	Turbellaria	Tricladida		Planariidae	1			
The Other Place	Spring	Insecta	Ephemeroptera	Leptohyphidae	Vacupernius packeri	4	4	Gather/Collector	
The Other Place	Spring	Clitellata			Oligochaeta	1	8	Gather/Collector	
The Other Place	Spring	Clitellata			Hirudinea	1	8	Predator	
The Other Place	Spring	Gastropoda	Neotaenioglossa	Thiaridae	Terabia	48		Scraper	
The Other Place	Spring	Insecta	Ephemeroptera	Tricorythidae	Tricorythodes	25	5	Gather/Collector	
The Other Place	Spring	Clitellata			Oligochaeta	1	8	Gather/Collector	
The Other Place	Spring	Malacostraca	Amphipoda	Talitridae	Hyalella	32	8	Gather/Collector	Shredder
The Other Place	Spring	Gastropoda	Neotaenioglossa	Hydrobiidae	Hydrobiidae	1	7	Scraper	
The Other Place	Spring	Insecta	Odonata	Coenagrionidae	Argia	2	6	Predator	
The Other Place	Spring	Insecta	Ephemeroptera	Leptophlebiidae	Thraulodes	3	2	Gather/Collector	
The Other Place	Spring	Insecta	Coleoptera	Psephinidae	Psephenus	2	4	Scraper	
The Other Place	Spring	Insecta	Trichoptera	Heliocopyschidae	Helicopsyche	9	2	Scraper	
The Other Place	Spring	Insecta	Ephemeroptera	Baetidae	Fallceon	17	4	Gather/Collector	Scraper
Upper Spring Run	Spring	Clitellata			Oligochaeta	4	8	Gather/Collector	
Upper Spring Run	Spring	Gastropoda	Neotaenioglossa	Pleuroceridae	Elimia	10	2.5	Scraper	
Upper Spring Run	Spring	Gastropoda	Neotaenioglossa	Thiaridae	Terabia	3		Scraper	
Upper Spring Run	Spring	Malacostraca	Decapoda	Cambaridae	Cambarinae	3			
Upper Spring Run	Spring	Gastropoda	Neotaenioglossa	Hydrobiidae	Hydrobiidae	3	7	Scraper	

Upper Spring Run	Spring	Gastropoda	Basommatophora	Physidae	Physa	2	9	Scraper	
Upper Spring Run	Spring	Insecta	Ephemeroptera	Tricorythidae	Tricorythodes	10	5	Gather/Collector	
Upper Spring Run	Spring	Insecta	Ephemeroptera	Baetidae	Procloeon	37			
Upper Spring Run	Spring	Insecta	Diptera	Chironomidae	Dicrotendipes	11			
Upper Spring Run	Spring	Insecta	Diptera	Chironomidae	Rheotanytarsus	3			
Upper Spring Run	Spring	Insecta	Diptera	Chironomidae	Pseudochironomus	1	5	Gather/Collector	
Upper Spring Run	Spring	Malacostraca	Amphipoda	Talitridae	Hyalella	55	8	Gather/Collector	Shredder
Upper Spring Run	Spring	Insecta	Coleoptera	Psephinidae	Psephenus	13	4	Scraper	

Fall

Site	Season	Class	Order	Family	FinalID	No.	Tolerance Value	Functional Feeding Guild 1	Functional Feeding Guild 2
Landa Lake	Fall	Insecta	Coleoptera	Psephinidae	Psephenus	3	4	Scraper	
Landa Lake	Fall	Clitellata			Oligochaeta	1	8	Gather/Collector	
Landa Lake	Fall	Gastropoda	Neotaenioglossa	Hydrobiidae	Hydrobiidae	1	7	Scraper	
Landa Lake	Fall	Gastropoda	Basommatophora	Planorbidae	Planorbidae	1			
Landa Lake	Fall	Insecta	Ephemeroptera	Baetidae	Callibaetis	8	4	Gather/Collector	
Landa Lake	Fall	Insecta	Odonata	Coenagrionidae	Enallagma	1	6	Predator	
Landa Lake	Fall	Insecta	Trichoptera	Hydroptilidae	Oxyethira	1	2	Gather/Collector	
Landa Lake	Fall	Gastropoda	Neotaenioglossa	Thiaridae	Terabia	26		Scraper	
Landa Lake	Fall	Malacostraca	Decapoda	Cambaridae	Cambarinae	3			
Landa Lake	Fall	Gastropoda	Neotaenioglossa	Pleuroceridae	Elimia	11	2.5	Scraper	
Landa Lake	Fall	Insecta	Ephemeroptera	Tricorythidae	Tricorythodes	2	5	Gather/Collector	
Landa Lake	Fall	Malacostraca	Amphipoda	Talitridae	Hyalella	107	8	Gather/Collector	Shredder
Landa Lake	Fall	Insecta	Ephemeroptera	Baetidae	Fallceon	1	4	Gather/Collector	Scraper
New Channel	Fall	Clitellata			Oligochaeta	4	8	Gather/Collector	
New Channel	Fall	Insecta	Trichoptera	Hydroptilidae	Leucotrichia	7	3	Gather/Collector	Scraper
New Channel	Fall	Gastropoda	Neotaenioglossa	Hydrobiidae	Hydrobiidae	1	7	Scraper	
New Channel	Fall	Insecta	Diptera	Chironomidae	Eukiefferiella/Tvetenia complex	2			
New Channel	Fall	Turbellaria	Tricladida		Planariidae	8			
New Channel	Fall	Insecta	Coleoptera	Elmidae	Microcylloepus pusillus	24			
New Channel	Fall	Insecta	Odonata	Calopterygidae	Hetaerina	1	6	Predator	
New Channel	Fall	Insecta	Odonata	Coenagrionidae	Argia	16	6	Predator	
New Channel	Fall	Insecta	Megaloptera	Corydalidae	Corydalus cornutus	1			
New Channel	Fall	Insecta	Diptera	Chironomidae	Rheotanytarsus	46			

New Channel	Fall	Gastropoda	Basommatophora	Physidae	Physa	2	9	Scraper	
New Channel	Fall	Insecta	Diptera	Chironomidae	Pentaneura	1			
New Channel	Fall	Insecta	Odonata	Libellulidae	Brechmorhoga	3	6	Predator	
New Channel	Fall	Insecta	Diptera	Stratiomyidae	Stratiomyidae	1			
New Channel	Fall	Insecta	Coleoptera	Elmidae	Macrelmis	74	4	Scraper	
New Channel	Fall	Insecta	Ephemeroptera	Baetidae	Fallceon	22	4	Gather/Collector	Scraper
New Channel	Fall	Insecta	Trichoptera	Hydropsychidae	Smicridea	2	4	Filterer/Collector	
New Channel	Fall	Insecta	Coleoptera	Psephinidae	Psephenus	9	4	Scraper	
New Channel	Fall	Insecta	Trichoptera	Heliocopyschidae	Helicopsyche	12	2	Scraper	
New Channel	Fall	Insecta	Ephemeroptera	Isonychiidae	Isonychia	2			
New Channel	Fall	Malacostraca	Amphipoda	Talitridae	Hyalella	34	8	Gather/Collector	Shredder
New Channel	Fall	Gastropoda	Neotaenioglossa	Pleuroceridae	Elimia	7	2.5	Scraper	
New Channel	Fall	Insecta	Trichoptera	Hydrobiosidae	Atopsyche	6	0	Predator	
New Channel	Fall	Gastropoda	Neotaenioglossa	Thiaridae	Terabia	2		Scraper	
New Channel	Fall	Insecta	Diptera	Chironomidae	Thienemanniella	2			
New Channel	Fall	Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius complex	3			
Old Channel	Fall	Insecta	Ephemeroptera	Leptophlebiidae	Thraulodes	1	2	Gather/Collector	
Old Channel	Fall	Insecta	Ephemeroptera	Tricorythidae	Tricorythodes	17	5	Gather/Collector	
Old Channel	Fall	Insecta	Odonata	Coenagrionidae	Argia	11	6	Predator	
Old	Fall	Insecta	Lepidoptera	Crambidae	Crambidae	1			

Channel									
Old Channel	Fall	Gastropoda	Neotaenioglossa	Hydrobiidae	Hydrobiidae	1	7	Scraper	
Old Channel	Fall	Insecta	Trichoptera	Heliocopyschidae	Helicopsyche	2	2	Scraper	
Old Channel	Fall	Turbellaria	Tricladida		Planariidae	2			
Old Channel	Fall	Insecta	Ephemeroptera	Heptageniidae	Stenacron	3	4	Gather/Collector	Scraper
Old Channel	Fall	Insecta	Trichoptera	Hydropsychidae	Smicridea	1	4	Filterer/Collector	
Old Channel	Fall	Clitellata			Hirudinea	2	8	Predator	
Old Channel	Fall	Insecta	Trichoptera	Hydroptilidae	Leucotrichia	1	3	Gather/Collector	Scraper
Old Channel	Fall	Insecta	Coleoptera	Psephinidae	Psephenus	4	4	Scraper	
Old Channel	Fall	Malacostraca	Amphipoda	Talitridae	Hyalella	64	8	Gather/Collector	Shredder
Old Channel	Fall	Insecta	Diptera	Chironomidae	Pseudochironomus	1	5	Gather/Collector	
Old Channel	Fall	Insecta	Diptera	Chironomidae	Rheotanytarsus	3			
Old Channel	Fall	Insecta	Ephemeroptera	Baetidae	Fallceon	8	4	Gather/Collector	Scraper
Old Channel	Fall	Gastropoda	Neotaenioglossa	Thiaridae	Terabia	21		Scraper	
Old Channel	Fall	Gastropoda	Neotaenioglossa	Pleuroceridae	Elimia	1	2.5	Scraper	
Old Channel	Fall	Clitellata			Oligochaeta	6	8	Gather/Collector	
The Other Place	Fall	Insecta	Trichoptera	Heliocopyschidae	Helicopsyche	7	2	Scraper	
The Other Place	Fall	Insecta	Ephemeroptera	Baetidae	Plauditus	1			
The Other Place	Fall	Insecta	Odonata	Coenagrionidae	Enallagma	1	6	Predator	
The Other Place	Fall	Insecta	Ephemeroptera	Leptohyphidae	Vacupernius packeri	33	4	Gather/Collector	

The Other Place	Fall	Insecta	Ephemeroptera	Tricorythidae	Tricorythodes	19	5	Gather/Collector	
The Other Place	Fall	Clitellata			Oligochaeta	13	8	Gather/Collector	
The Other Place	Fall	Clitellata			Hirudinea	2	8	Predator	
The Other Place	Fall	Clitellata			Hirudinea	1	8	Predator	
The Other Place	Fall	Insecta	Odonata	Libellulidae	Brechmorhoga	1	6	Predator	
The Other Place	Fall	Insecta	Trichoptera	Leptoceridae	Nectopsyche	3	3	Shredder	Gather/Collector
The Other Place	Fall	Insecta	Trichoptera	Philopotamidae	Chimarra	1	2	Filterer/Collector	
The Other Place	Fall	Malacostraca	Decapoda	Cambaridae	Cambarinae	1			
The Other Place	Fall	Insecta	Coleoptera	Psephinidae	Psephenus	2	4	Scraper	
The Other Place	Fall	Insecta	Odonata	Coenagrionidae	Argia	14	6	Predator	
The Other Place	Fall	Malacostraca	Amphipoda	Talitridae	Hyalella	21	8	Gather/Collector	Shredder
The Other Place	Fall	Insecta	Ephemeroptera	Baetidae	Fallceon	9	4	Gather/Collector	Scraper
The Other Place	Fall	Gastropoda	Neotaenioglossa	Pleuroceridae	Elimia	9	2.5	Scraper	
The Other Place	Fall	Gastropoda	Neotaenioglossa	Thiaridae	Terabia	32		Scraper	
The Other Place	Fall	Turbellaria	Tricladida		Planariidae	5			
The Other Place	Fall	Insecta	Diptera	Chironomidae	Ablabesmyia	1			
The Other Place	Fall	Insecta	Diptera	Chironomidae	Pseudochironomus	1	5	Gather/Collector	
The Other Place	Fall	Insecta	Trichoptera	Hydropsychidae	Smicridea	1	4	Filterer/Collector	
The Other Place	Fall	Insecta	Trichoptera	Hydroptilidae	Hydroptila	2	2	Scraper	
Upper	Fall	Clitellata			Hirudinea	3	8	Predator	

Spring Run									
Upper Spring Run	Fall	Insecta	Diptera	Chironomidae	Orthocladiinae	1			
Upper Spring Run	Fall	Insecta	Diptera	Chironomidae	Rheotanytarsus	1			
Upper Spring Run	Fall	Insecta	Diptera	Chironomidae	Ablabesmyia	1			
Upper Spring Run	Fall	Insecta	Diptera	Chironomidae	Dicrotendipes	9			
Upper Spring Run	Fall	Insecta	Ephemeroptera	Tricorythidae	Tricorythodes	6	5	Gather/Collector	
Upper Spring Run	Fall	Turbellaria	Tricladida		Planariidae	3			
Upper Spring Run	Fall	Insecta	Coleoptera	Elmidae	Microcylloepus pusillus	3			
Upper Spring Run	Fall	Insecta	Odonata	Coenagrionidae	Argia	2	6	Predator	
Upper Spring Run	Fall	Insecta	Coleoptera	Dytiscidae	Liodessus	7	5	Predator	
Upper Spring Run	Fall	Insecta	Diptera	Tipulidae	Tipulidae	1			
Upper Spring Run	Fall	Clitellata			Oligochaeta	14	8	Gather/Collector	
Upper Spring Run	Fall	Insecta	Coleoptera	Psephinidae	Psephenus	18	4	Scraper	
Upper Spring Run	Fall	Insecta	Odonata	Coenagrionidae	Enallagma	1	6	Predator	
Upper Spring Run	Fall	Malacostraca	Amphipoda	Talitridae	Hyalella	74	8	Gather/Collector	Shredder
Upper Spring Run	Fall	Gastropoda	Neotaenioglossa	Thiaridae	Terabia	5		Scraper	
Upper Spring Run	Fall	Malacostraca	Amphipoda	Crangonyctidae	Stygobromus	1			
Upper Spring Run	Fall	Insecta	Ephemeroptera	Baetidae	Callibaetis	38	4	Gather/Collector	

APPENDIX D: DROP NET RAW DATA

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2381	Upper Spring Run	S1	4/29/2019	1	Micropterus salmoides	30	1
				1	Lepomis miniatus	70	1
				1	Procambarus sp.		4
				1	Lepomis miniatus	75	1
				1	Lepomis miniatus	67	1
				2	Lepomis miniatus	90	1
				3	Procambarus sp.		12
				3	Lepomis miniatus	76	1
				4	Procambarus sp.		1
				5	Micropterus salmoides	105	1
				6	Procambarus sp.		3
				7	Procambarus sp.		3
				8	Lepomis miniatus	40	1
				8	Lepomis miniatus	85	1
				9	Micropterus salmoides	100	1
				9	Procambarus sp.		3
				9	Lepomis miniatus	85	1
				10	Lepomis miniatus	71	1
				10	Procambarus sp.		1
				11	Lepomis miniatus	91	1
				11	Lepomis miniatus	90	1
				11	Lepomis miniatus	85	1
				12	No fish collected		
				13	No fish collected		
				14	Procambarus sp.		2
				15	Lepomis miniatus	25	1
				15	Procambarus sp.		2
2382		S2		1	Lepomis miniatus	104	1
				1	Procambarus sp.		2
				2	Marisa cornuarietis	30	1
				3	Lepomis miniatus	75	1
				3	Procambarus sp.		5
				4	Procambarus sp.		2
				5	Lepomis miniatus	80	1
				6	Lepomis miniatus	70	1
				6	Procambarus sp.		2
				7	Procambarus sp.		1
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2382	Upper Spring Run	S2	4/29/2019	13	Procambarus sp.		1
				14	No fish collected		
				15	Procambarus sp.		1
2383		R1		1	Etheostoma fonticola	33	1
				1	Procambarus sp.		4
				1	Etheostoma fonticola	10	1
				1	Etheostoma fonticola	18	1
				1	Palaemonetes sp.		1
				1	Etheostoma fonticola	31	1
				1	Etheostoma fonticola	10	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	31	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	28	1
				1	Etheostoma fonticola	33	1
				1	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	14	1
				2	Procambarus sp.		3
				2	Lepomis miniatus	20	1
				2	Etheostoma fonticola	9	1
				2	Etheostoma lepidum	22	1
				2	Etheostoma fonticola	11	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	25	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	12	1
				3	Etheostoma fonticola	23	1
				3	Etheostoma fonticola	31	1
				3	Etheostoma fonticola	29	1
				3	Etheostoma fonticola	18	1
				3	Etheostoma fonticola	25	1
				3	Etheostoma fonticola	30	1
				3	Palaemonetes sp.		1
				3	Procambarus sp.		1
				3	Etheostoma fonticola	10	1
				4	Etheostoma fonticola	35	1
				4	Palaemonetes sp.		1
				5	Procambarus sp.		1
				5	Palaemonetes sp.		1
				6	Etheostoma fonticola	28	1
				6	Etheostoma fonticola	31	1
				6	Etheostoma fonticola	26	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2383	Upper Spring Run	R1	4/29/2019	6	Etheostoma fonticola	29	1
				7	Etheostoma fonticola	18	1
				7	Etheostoma fonticola	21	1
				8	Procambarus sp.		1
				9	Etheostoma fonticola	24	1
				10	Palaemonetes sp.		1
				11	Etheostoma fonticola	27	1
				12	Procambarus sp.		1
				13	Etheostoma fonticola	30	1
				13	Etheostoma fonticola	19	1
				14	No fish collected		
				15	No fish collected		
2384		R2		1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	22	1
				1	Procambarus sp.		15
				1	Etheostoma fonticola	11	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	20	1
				1	Palaemonetes sp.		2
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	10	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	14	1
				2	Etheostoma fonticola	25	1
				2	Procambarus sp.		17
				2	Etheostoma fonticola	26	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2384	Upper Spring Run	R2	4/29/2019	2	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	14	1
				3	Etheostoma fonticola	28	1
				3	Etheostoma fonticola	28	1
				3	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	19	1
				3	Etheostoma fonticola	17	1
				3	Etheostoma fonticola	17	1
				3	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	14	1
				3	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	19	1
				3	Etheostoma fonticola	14	1
				3	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	12	1
				3	Procambarus sp.		7
				3	Etheostoma fonticola	26	1
				4	Etheostoma fonticola	23	1
				4	Procambarus sp.		6
				4	Etheostoma fonticola	25	1
				4	Etheostoma fonticola	15	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	26	1
				4	Etheostoma fonticola	25	1
				4	Etheostoma fonticola	19	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	30	1
				4	Etheostoma fonticola	28	1
				4	Etheostoma fonticola	30	1
				4	Etheostoma fonticola	15	1
				5	Etheostoma fonticola	23	1
				5	Palaemonetes sp.		1
				5	Procambarus sp.		3
				5	Etheostoma fonticola	10	1
				5	Etheostoma fonticola	11	1
				5	Etheostoma fonticola	20	1
				5	Etheostoma fonticola	14	1
				5	Etheostoma fonticola	17	1
				5	Etheostoma fonticola	24	1
				5	Etheostoma fonticola	17	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2384	Upper Spring Run	R2	4/29/2019	5	Etheostoma fonticola	24	1
				5	Etheostoma fonticola	20	1
				5	Etheostoma fonticola	21	1
				5	Etheostoma fonticola	34	1
				5	Etheostoma fonticola	15	1
				5	Etheostoma fonticola	12	1
				6	Etheostoma fonticola	25	1
				6	Etheostoma fonticola	12	1
				6	Etheostoma fonticola	21	1
				6	Etheostoma fonticola	22	1
				6	Etheostoma fonticola	20	1
				6	Etheostoma fonticola	15	1
				7	Etheostoma fonticola	15	1
				7	Etheostoma fonticola	21	1
				7	Etheostoma fonticola	14	1
				8	No fish collected		
				9	Etheostoma fonticola	19	1
				9	Etheostoma fonticola	22	1
				9	Etheostoma fonticola	22	1
				9	Procambarus sp.		1
				10	Etheostoma fonticola	21	1
				10	Procambarus sp.		1
				11	Etheostoma fonticola	27	1
				11	Etheostoma fonticola	22	1
				12	Etheostoma fonticola	22	1
				12	Procambarus sp.		1
				13	Procambarus sp.		1
				14	Etheostoma fonticola	12	1
				15	Etheostoma fonticola	22	1
				16	Procambarus sp.		1
2385		O1		1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	Lepomis miniatus	26	1
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2385	Upper Spring Run	O1	4/29/2019	13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2386		O2		1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
2387		L1		1	Astyanax mexicanus	45	1
				1	Astyanax mexicanus	35	1
				1	Gambusia sp.	40	1
				1	Micropterus salmoides	48	1
				1	Gambusia sp.	26	1
				1	Gambusia sp.	20	1
				1	Gambusia sp.	36	1
				1	Gambusia sp.	40	1
				1	Gambusia sp.	30	1
				1	Gambusia sp.	40	1
				1	Astyanax mexicanus	27	1
				1	Etheostoma fonticola	15	1
				1	Astyanax mexicanus	49	1
				1	Astyanax mexicanus	30	1
				1	Astyanax mexicanus	40	1
				1	Astyanax mexicanus	42	1
				1	Gambusia sp.	20	1
				2	Lepomis miniatus	25	1
				2	Micropterus salmoides	41	1
				2	Lepomis miniatus	27	1
				2	Lepomis miniatus	28	1
				2	Lepomis miniatus	16	1
				2	Lepomis miniatus	18	1
				2	Lepomis miniatus	27	1
				2	Palaemonetes sp.		1
				2	Lepomis miniatus	14	1
				3	Palaemonetes sp.		3
				3	Etheostoma fonticola	20	1
				3	Astyanax mexicanus	40	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2387	Upper Spring Run	L1	4/29/2019	3	Astyanax mexicanus	44	1
				3	Astyanax mexicanus	38	1
				3	Gambusia sp.	10	1
				4	Lepomis miniatus	25	1
				4	Lepomis sp.	14	1
				4	Lepomis miniatus	25	1
				4	Astyanax mexicanus	45	1
				4	Micropterus salmoides	50	1
				4	Etheostoma fonticola	21	1
				4	Palaemonetes sp.		1
				5	No fish collected		
				6	Lepomis sp.	14	1
				7	Etheostoma fonticola	27	1
				8	No fish collected		
				9	Palaemonetes sp.		1
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		
				15	Procambarus sp.		1
2388		L2		1	Gambusia sp.	9	1
				1	Etheostoma fonticola	40	1
				1	Procambarus sp.		1
				1	Gambusia sp.	42	1
				1	Gambusia sp.	32	1
				1	Palaemonetes sp.		2
				2	Astyanax mexicanus	33	1
				2	Gambusia sp.	25	1
				2	Gambusia sp.	26	1
				2	Gambusia sp.	25	1
				2	Lepomis sp.	10	1
				2	Lepomis sp.	15	1
				2	Gambusia sp.	25	1
				2	Lepomis sp.	12	1
				3	Procambarus sp.		1
				3	Gambusia sp.	26	1
				4	Palaemonetes sp.		3
				4	Lepomis miniatus	15	1
				4	Lepomis sp.	16	1
				4	Lepomis miniatus	33	1
				5	Palaemonetes sp.		3

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2388	Upper Spring Run	L2	4/29/2019	5	Lepomis sp.	20	1
				5	Gambusia sp.	21	1
				5	Gambusia sp.	42	1
				6	Palaemonetes sp.		1
				6	Etheostoma fonticola	30	1
				7	Gambusia sp.	33	1
				7	Gambusia sp.	30	1
				7	Gambusia sp.	12	1
				8	Palaemonetes sp.		1
				9	No fish collected		
				10	No fish collected		
				11	Gambusia sp.	15	1
				12	Gambusia sp.	28	1
				13	No fish collected		
				14	Lepomis sp.	15	1
				14	Gambusia sp.	26	1
				14	Lepomis sp.	12	1
				14	Lepomis miniatus	20	1
				15	No fish collected		
2389	Landa Lake	R1		1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	10	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	14	1
				1	Etheostoma fonticola	10	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	9	1
				1	Etheostoma fonticola	14	1
				1	Etheostoma fonticola	24	1
				1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	17	1
				1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	28	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	28	1
				1	Etheostoma fonticola	19	1
				1	Etheostoma fonticola	17	1
				1	Etheostoma fonticola	26	1
				1	Palaemonetes sp.		4
				1	Etheostoma fonticola	13	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2389	Landa Lake	R1	4/29/2019	1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	17	1
				1	Etheostoma fonticola	17	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	17	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	19	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	13	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	11	1
				1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	24	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	11	1
				1	Etheostoma fonticola	25	1
				1	Procambarus sp.		12
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	19	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	13	1
				1	Etheostoma fonticola	24	1
				1	Etheostoma fonticola	24	1
				1	Etheostoma fonticola	15	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2389	Landa Lake	R1	4/29/2019	1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	18	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	29	1
				2	Marisa cornuarietis	40	1
				2	Etheostoma fonticola	10	1
				2	Etheostoma fonticola	12	1
				2	Procambarus sp.		14
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	22	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	21	1
				2	Palaemonetes sp.		4
				2	Etheostoma fonticola	22	1
				3	Etheostoma fonticola	17	1
				3	Etheostoma fonticola	12	1
				3	Etheostoma fonticola	14	1
				3	Etheostoma fonticola	27	1
				3	Etheostoma fonticola	10	1
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	23	1
				3	Etheostoma fonticola	21	1
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	26	1
				3	Etheostoma fonticola	22	1
				3	Etheostoma fonticola	11	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	17	1
				3	Procambarus sp.		5
				3	Palaemonetes sp.		1
				3	Etheostoma fonticola	25	1
				4	Etheostoma fonticola	25	1
				4	Etheostoma fonticola	11	1
				4	Etheostoma fonticola	19	1
				4	Etheostoma fonticola	18	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2389	Landa Lake	R1	4/29/2019	4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	12	1
				4	Etheostoma fonticola	12	1
				5	Procambarus sp.		2
				5	Etheostoma fonticola	11	1
				6	Procambarus sp.		1
				7	No fish collected		
				8	Procambarus sp.		1
				9	Procambarus sp.		1
				9	Etheostoma fonticola	14	1
				10	Etheostoma fonticola	11	1
				10	Etheostoma fonticola	15	1
				11	Etheostoma fonticola	17	1
				12	No fish collected		
				13	Etheostoma fonticola	23	1
				13	Etheostoma fonticola	12	1
				13	Etheostoma fonticola	17	1
				13	Etheostoma fonticola	33	1
				13	Procambarus sp.		1
				13	Etheostoma fonticola	32	1
				14	No fish collected		
				15	No fish collected		
2390		R2		1	Gambusia sp.	17	1
				1	Etheostoma fonticola	17	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	10	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	18	1
				1	Gambusia sp.	15	1
				1	Etheostoma fonticola	13	1
				1	Gambusia sp.	21	1
				1	Procambarus sp.		12
				1	Palaemonetes sp.		7
				1	Etheostoma fonticola	9	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	20	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2390	Landa Lake	R2	4/29/2019	1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	14	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	9	1
				1	Etheostoma fonticola	11	1
				1	Etheostoma fonticola	17	1
				1	Etheostoma fonticola	18	1
				2	Etheostoma fonticola	21	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	10	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	17	1
				2	Palaemonetes sp.		4
				2	Etheostoma fonticola	11	1
				2	Etheostoma fonticola	25	1
				2	Etheostoma fonticola	16	1
				2	Etheostoma fonticola	12	1
				2	Procambarus sp.		10
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	16	1
				2	Etheostoma fonticola	16	1
				2	Etheostoma fonticola	21	1
				2	Etheostoma fonticola	22	1
				2	Etheostoma fonticola	23	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	21	1
				3	Etheostoma fonticola	19	1
				3	Etheostoma fonticola	17	1
				3	Etheostoma fonticola	12	1
				3	Gambusia sp.	15	1
				3	Etheostoma fonticola	20	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2390	Landa Lake	R2	4/29/2019	3	Etheostoma fonticola	8	1
				3	Etheostoma fonticola	19	1
				3	Etheostoma fonticola	21	1
				3	Etheostoma fonticola	31	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	21	1
				3	Etheostoma fonticola	20	1
				3	Palaemonetes sp.		2
				3	Procambarus sp.		7
				3	Etheostoma fonticola	17	1
				4	Etheostoma fonticola	19	1
				4	Etheostoma fonticola	25	1
				4	Etheostoma fonticola	12	1
				4	Etheostoma fonticola	16	1
				4	Etheostoma fonticola	15	1
				4	Etheostoma fonticola	16	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	17	1
				4	Etheostoma fonticola	26	1
				4	Palaemonetes sp.		1
				4	Procambarus sp.		2
				4	Etheostoma fonticola	12	1
				5	Etheostoma fonticola	12	1
				5	Procambarus sp.		8
				5	Etheostoma fonticola	24	1
				5	Etheostoma fonticola	15	1
				5	Etheostoma fonticola	26	1
				5	Etheostoma fonticola	20	1
				5	Etheostoma fonticola	15	1
				5	Etheostoma fonticola	11	1
				5	Etheostoma fonticola	13	1
				5	Etheostoma fonticola	22	1
				5	Etheostoma fonticola	16	1
				5	Etheostoma fonticola	25	1
				5	Etheostoma fonticola	17	1
				5	Etheostoma fonticola	19	1
				5	Etheostoma fonticola	21	1
				5	Palaemonetes sp.		1
				5	Etheostoma fonticola	17	1
				6	Etheostoma fonticola	13	1
				6	Procambarus sp.		2
				6	Etheostoma fonticola	15	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2390	Landa Lake	R2	4/29/2019	6	Etheostoma fonticola	17	1
				6	Etheostoma fonticola	19	1
				6	Etheostoma fonticola	25	1
				6	Etheostoma fonticola	19	1
				6	Palaemonetes sp.		1
				7	Etheostoma fonticola	32	1
				7	Etheostoma fonticola	12	1
				8	Procambarus sp.		3
				8	Etheostoma fonticola	17	1
				8	Etheostoma fonticola	23	1
				8	Etheostoma fonticola	21	1
				9	Etheostoma fonticola	22	1
				9	Etheostoma fonticola	26	1
				9	Etheostoma fonticola	20	1
				9	Procambarus sp.		2
				10	Palaemonetes sp.		1
				10	Etheostoma fonticola	22	1
				10	Etheostoma fonticola	26	1
				10	Etheostoma fonticola	11	1
				10	Etheostoma fonticola	20	1
				11	No fish collected		
				12	Procambarus sp.		3
				12	Palaemonetes sp.		1
				12	Etheostoma fonticola	13	1
				12	Etheostoma fonticola	15	1
				12	Etheostoma fonticola	16	1
				12	Etheostoma fonticola	19	1
				13	Etheostoma fonticola	22	1
				13	Etheostoma fonticola	13	1
				14	Etheostoma fonticola	28	1
				14	Etheostoma fonticola	15	1
				14	Gambusia sp.	10	1
				14	Procambarus sp.		1
				14	Gambusia sp.	12	1
				15	Etheostoma fonticola	20	1
				15	Etheostoma fonticola	25	1
				16	No fish collected		
2391		S1		1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	17	1
				1	Etheostoma fonticola	13	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2391	Landa Lake	S1	4/29/2019	1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	11	1
				1	Etheostoma fonticola	27	1
				1	Palaemonetes sp.		12
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	24	1
				1	Gambusia sp.	11	1
				1	Etheostoma fonticola	19	1
				1	Etheostoma fonticola	13	1
				1	Gambusia sp.	18	1
				1	Gambusia sp.	35	1
				1	Gambusia sp.	27	1
				1	Gambusia sp.	17	1
				1	Gambusia sp.	19	1
				1	Gambusia sp.	16	1
				1	Gambusia sp.	20	1
				1	Gambusia sp.	13	1
				1	Gambusia sp.	10	1
				1	Gambusia sp.	11	1
				1	Procambarus sp.		5
				1	Etheostoma fonticola	19	1
				1	Etheostoma fonticola	28	1
				1	Gambusia sp.	15	1
				1	Etheostoma fonticola	11	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	10	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	11	1
				1	Etheostoma fonticola	17	1
				1	Etheostoma fonticola	24	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	14	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	12	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2391	Landa Lake	S1	4/29/2019	1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	19	1
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	25	1
				2	Micropterus salmoides	52	1
				2	Gambusia sp.	14	1
				2	Gambusia sp.	14	1
				2	Gambusia sp.	11	1
				2	Palaemonetes sp.		1
				2	Etheostoma fonticola	19	1
				2	Etheostoma fonticola	16	1
				2	Etheostoma fonticola	14	1
				2	Etheostoma fonticola	20	1
				2	Procambarus sp.		18
				2	Etheostoma fonticola	25	1
				3	Procambarus sp.		11
				3	Etheostoma fonticola	12	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	10	1
				3	Gambusia sp.	18	1
				3	Etheostoma fonticola	13	1
				3	Etheostoma fonticola	12	1
				3	Etheostoma fonticola	14	1
				3	Etheostoma fonticola	17	1
				3	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	25	1
				3	Gambusia sp.	12	1
				3	Gambusia sp.	20	1
				3	Gambusia sp.	31	1
				3	Etheostoma fonticola	26	1
				3	Etheostoma fonticola	16	1
				4	Etheostoma fonticola	22	1
				4	Gambusia sp.	12	1
				4	Palaemonetes sp.		1
				4	Procambarus sp.		10
				4	Etheostoma fonticola	12	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2391	Landa Lake	S1	4/29/2019	4	Etheostoma fonticola	22	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	25	1
				5	Etheostoma fonticola	24	1
				5	Palaemonetes sp.		2
				5	Gambusia sp.	10	2
				5	Etheostoma fonticola	32	1
				5	Procambarus sp.		11
				5	Etheostoma fonticola	30	1
				5	Etheostoma fonticola	25	1
				6	Procambarus sp.		4
				6	Palaemonetes sp.		1
				6	Gambusia sp.	14	1
				6	Gambusia sp.	14	1
				7	Procambarus sp.		6
				7	Gambusia sp.	9	1
				7	Etheostoma fonticola	13	1
				7	Gambusia sp.	15	1
				8	Procambarus sp.		3
				8	Etheostoma fonticola	20	1
				8	Etheostoma fonticola	24	1
				8	Etheostoma fonticola	17	1
				9	Gambusia sp.	12	1
				9	Palaemonetes sp.		1
				9	Procambarus sp.		3
				10	Etheostoma fonticola	25	1
				10	Etheostoma fonticola	17	1
				10	Etheostoma fonticola	13	1
				10	Procambarus sp.		1
				11	Etheostoma fonticola	12	1
				12	Etheostoma fonticola	31	1
				12	Etheostoma fonticola	17	1
				12	Procambarus sp.		4
				13	Procambarus sp.		1
				14	Procambarus sp.		3
				15	Procambarus sp.		2
				15	Etheostoma fonticola	24	1
				16	Procambarus sp.		1
2392		S2		1	Etheostoma fonticola	17	1
				1	Procambarus sp.		4
				2	No fish collected		
				3	Procambarus sp.		1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2392	Landa Lake	S2	4/29/2019	3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	21	1
				4	Procambarus sp.		1
				5	Micropterus salmoides	36	1
				6	No fish collected		
				7	No fish collected		
				8	Procambarus sp.		1
				9	No fish collected		
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2393		L1		1	Etheostoma fonticola	15	1
				1	Procambarus sp.		4
				1	Palaemonetes sp.		42
				1	Gambusia sp.	15	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	20	1
				1	Micropterus salmoides	156	1
				1	Etheostoma fonticola	16	1
				2	Etheostoma fonticola	20	1
				2	Gambusia sp.	35	1
				2	Gambusia sp.	23	1
				2	Gambusia sp.	33	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	18	1
				2	Etheostoma fonticola	17	1
				2	Palaemonetes sp.		35
				2	Etheostoma fonticola	17	1
				2	Gambusia sp.	20	1
				2	Lepomis miniatus	40	1
				2	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	22	1
				3	Etheostoma fonticola	18	1
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	12	1
				3	Gambusia sp.	18	1
				3	Procambarus sp.		3

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2393	Landa Lake	L1	4/29/2019	3	Palaemonetes sp.		26
				3	Gambusia sp.	20	1
				3	Etheostoma fonticola	12	1
				4	Palaemonetes sp.		9
				4	Procambarus sp.		8
				4	Lepomis miniatus	27	1
				5	Procambarus sp.		6
				5	Gambusia sp.	34	1
				5	Palaemonetes sp.		4
				6	Gambusia sp.	34	1
				6	Procambarus sp.		3
				6	Gambusia sp.	20	1
				6	Etheostoma fonticola	13	1
				7	Gambusia sp.	10	1
				7	Palaemonetes sp.		2
				7	Gambusia sp.	32	1
				7	Etheostoma fonticola	19	1
				7	Etheostoma fonticola	22	1
				8	Etheostoma fonticola	25	1
				8	Etheostoma fonticola	21	1
				8	Palaemonetes sp.		3
				9	Etheostoma fonticola	20	1
				9	Etheostoma fonticola	26	1
				9	Etheostoma fonticola	22	1
				9	Etheostoma fonticola	21	1
				9	Etheostoma fonticola	16	1
				9	Palaemonetes sp.		2
				10	Gambusia sp.	10	1
				10	Etheostoma fonticola	13	1
				11	Etheostoma fonticola	20	1
				11	Palaemonetes sp.		2
				12	Etheostoma fonticola	26	1
				12	Etheostoma fonticola	16	1
				12	Procambarus sp.		1
				13	Etheostoma fonticola	22	1
				14	Palaemonetes sp.		2
				15	Etheostoma fonticola	20	1
				16	No fish collected		
2394		L2		1	Etheostoma fonticola	12	1
				1	Gambusia sp.	32	1
				1	Etheostoma fonticola	10	1
				1	Etheostoma fonticola	13	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2394	Landa Lake	L2	4/29/2019	1	Etheostoma fonticola	13	1
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	19	1
				1	Etheostoma fonticola	26	1
				1	Procambarus sp.		10
				1	Etheostoma fonticola	16	1
				2	Gambusia sp.	11	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	14	1
				2	Etheostoma fonticola	11	1
				2	Gambusia sp.	18	1
				2	Gambusia sp.	35	1
				2	Gambusia sp.	38	1
				2	Etheostoma fonticola	12	1
				2	Gambusia sp.	15	1
				2	Etheostoma fonticola	15	1
				2	Procambarus sp.		8
				2	Palaemonetes sp.		13
				2	Lepomis miniatus	65	1
				2	Gambusia sp.	18	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	22	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	29	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	12	1
				2	Etheostoma fonticola	16	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	11	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	13	1
				2	Etheostoma fonticola	17	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2394	Landa Lake	L2	4/29/2019	2	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	11	1
				3	Gambusia sp.	15	1
				3	Etheostoma fonticola	12	1
				3	Gambusia sp.	17	1
				3	Gambusia sp.	24	1
				3	Gambusia sp.	22	1
				3	Gambusia sp.	25	1
				3	Procambarus sp.		3
				3	Gambusia sp.	20	1
				3	Gambusia sp.	12	1
				3	Palaemonetes sp.		7
				3	Etheostoma fonticola	22	1
				3	Etheostoma fonticola	15	1
				3	Gambusia sp.	12	1
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	13	1
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	31	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	14	1
				3	Etheostoma fonticola	12	1
				3	Etheostoma fonticola	12	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	12	1
				3	Etheostoma fonticola	12	1
				3	Etheostoma fonticola	16	1
				4	Etheostoma fonticola	28	1
				4	Etheostoma fonticola	21	1
				4	Palaemonetes sp.		8
				4	Procambarus sp.		3
				4	Gambusia sp.	29	1
				4	Gambusia sp.	30	1
				4	Etheostoma fonticola	11	1
				4	Etheostoma fonticola	17	1
				4	Etheostoma fonticola	19	1
				4	Etheostoma fonticola	15	1
				4	Etheostoma fonticola	22	1
				4	Etheostoma fonticola	26	1
				4	Etheostoma fonticola	20	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2394	Landa Lake	L2	4/29/2019	4	Etheostoma fonticola	21	1
				4	Etheostoma fonticola	14	1
				4	Etheostoma fonticola	14	1
				5	Etheostoma fonticola	13	1
				5	Etheostoma fonticola	15	1
				5	Etheostoma fonticola	19	1
				5	Etheostoma fonticola	20	1
				5	Etheostoma fonticola	13	1
				5	Etheostoma fonticola	11	1
				5	Etheostoma fonticola	9	1
				5	Etheostoma fonticola	13	1
				5	Etheostoma fonticola	26	1
				5	Gambusia sp.	13	1
				5	Procambarus sp.		9
				5	Etheostoma fonticola	21	1
				5	Etheostoma fonticola	16	1
				5	Etheostoma fonticola	16	1
				5	Etheostoma fonticola	20	1
				5	Etheostoma fonticola	15	1
				5	Etheostoma fonticola	16	1
				6	Etheostoma fonticola	16	1
				6	Etheostoma fonticola	17	1
				6	Procambarus sp.		3
				6	Etheostoma fonticola	12	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	32	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	16	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	10	1
				6	Etheostoma fonticola	24	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	14	1
				6	Etheostoma fonticola	23	1
				7	Palaemonetes sp.		1
				7	Etheostoma fonticola	22	1
				7	Procambarus sp.		2
				7	Etheostoma fonticola	14	1
				7	Etheostoma fonticola	18	1
				8	Ameiurus natalis	72	1
				8	Etheostoma fonticola	30	1
				8	Etheostoma fonticola	11	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2394	Landa Lake	L2	4/29/2019	8	Etheostoma fonticola	15	1
				8	Procambarus sp.		5
				9	Etheostoma fonticola	16	1
				9	Etheostoma fonticola	15	1
				9	Etheostoma fonticola	26	1
				9	Etheostoma fonticola	15	1
				9	Etheostoma fonticola	20	1
				9	Procambarus sp.		3
				10	Etheostoma fonticola	18	1
				10	Etheostoma fonticola	20	1
				10	Etheostoma fonticola	21	1
				10	Etheostoma fonticola	25	1
				10	Etheostoma fonticola	20	1
				10	Etheostoma fonticola	10	1
				10	Etheostoma fonticola	15	1
				10	Etheostoma fonticola	11	1
				10	Etheostoma fonticola	16	1
				11	Etheostoma fonticola	12	1
				11	Etheostoma fonticola	18	1
				11	Etheostoma fonticola	20	1
				11	Procambarus sp.		1
				12	Etheostoma fonticola	15	1
				12	Etheostoma fonticola	10	1
				12	Procambarus sp.		1
				12	Etheostoma fonticola	29	1
				13	Etheostoma fonticola	20	1
				13	Procambarus sp.		3
				13	Etheostoma fonticola	23	1
				13	Etheostoma fonticola	17	1
				13	Etheostoma fonticola	16	1
				14	No fish collected		
				15	No fish collected		
2395		C1	4/30/2019	1	Gambusia sp.	15	1
				1	Dionda nigrotaeniata	17	1
				1	Dionda nigrotaeniata	10	1
				1	Dionda nigrotaeniata	15	1
				1	Lepomis sp.	12	1
				1	Dionda nigrotaeniata	15	1
				1	Dionda nigrotaeniata	19	1
				1	Gambusia sp.	21	1
				1	Gambusia sp.	30	1
				1	Gambusia sp.	10	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2395	Landa Lake	C1	4/30/2019	1	Gambusia sp.	18	1
				1	Gambusia sp.	17	1
				1	Gambusia sp.	11	1
				1	Dionda nigrotaeniata	17	1
				1	Gambusia sp.	10	1
				1	Dionda nigrotaeniata	12	1
				1	Lepomis sp.	12	1
				1	Lepomis sp.	13	1
				1	Gambusia sp.	10	1
				1	Dionda nigrotaeniata	13	1
				1	Palaemonetes sp.		1
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	15	1
				1	Dionda nigrotaeniata	10	1
				1	Dionda nigrotaeniata	13	1
				1	Dionda nigrotaeniata	17	1
				1	Dionda nigrotaeniata	12	1
				1	Dionda nigrotaeniata	15	1
				1	Dionda nigrotaeniata	18	1
				1	Dionda nigrotaeniata	17	1
				1	Dionda nigrotaeniata	17	1
				1	Dionda nigrotaeniata	17	1
				1	Dionda nigrotaeniata	17	1
				1	Dionda nigrotaeniata	11	1
				1	Dionda nigrotaeniata	10	1
				1	Dionda nigrotaeniata	11	1
				2	Dionda nigrotaeniata	14	1
				2	Gambusia sp.	17	1
				2	Dionda nigrotaeniata	16	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	22	1
				2	Etheostoma fonticola	25	1
				3	Gambusia sp.	27	1
				3	Procambarus sp.		8
				3	Ameiurus natalis	22	1
				3	Lepomis sp.	17	1
				3	Gambusia sp.	15	1
				3	Gambusia sp.	14	1
				3	Dionda nigrotaeniata	12	1
				3	Etheostoma fonticola	18	1
				3	Etheostoma fonticola	20	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2395	Landa Lake	C1	4/30/2019	3	Etheostoma fonticola	24	1
				3	Etheostoma fonticola	27	1
				3	Etheostoma fonticola	27	1
				3	Gambusia sp.	13	1
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	12	1
				3	Etheostoma fonticola	26	1
				3	Etheostoma fonticola	24	1
				4	No fish collected		
				5	Dionda nigrotaeniata	16	1
				5	Lepomis sp.	20	1
				6	Etheostoma fonticola	33	1
				6	Procambarus sp.		1
				7	Lepomis sp.	15	1
				7	Lepomis sp.	15	1
				7	Dionda nigrotaeniata	16	1
				7	Ameiurus natalis	17	1
				7	Procambarus sp.		3
				7	Gambusia sp.	16	1
				7	Gambusia sp.	22	1
				7	Palaemonetes sp.		1
				8	Procambarus sp.		1
				8	Etheostoma fonticola	27	1
				9	Procambarus sp.		2
				10	No fish collected		
				11	Gambusia sp.	20	1
				11	Etheostoma fonticola	19	1
				11	Dionda nigrotaeniata	18	1
				12	Etheostoma fonticola	13	1
				13	Etheostoma fonticola	22	1
				13	Dionda nigrotaeniata	15	1
				14	Procambarus sp.		1
				14	Palaemonetes sp.		1
				15	Dionda nigrotaeniata	11	1
				15	Etheostoma fonticola	23	1
				16	Procambarus sp.		1
2396		C2		1	Etheostoma fonticola	23	1
				1	Etheostoma fonticola	20	1
				1	Palaemonetes sp.		51
				1	Gambusia sp.	10	1
				1	Gambusia sp.	9	1
				1	Gambusia sp.	11	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2396	Landa Lake	C2	4/30/2019	1	Lepomis sp.	11	1
				1	Gambusia sp.	10	1
				1	Etheostoma fonticola	31	1
				1	Gambusia sp.	10	1
				1	Gambusia sp.	10	1
				1	Gambusia sp.	10	1
				1	Gambusia sp.	11	1
				1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	17	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	21	1
				2	Palaemonetes sp.		20
				2	Procambarus sp.		2
				2	Lepomis sp.	10	1
				2	Etheostoma fonticola	18	1
				2	Gambusia sp.	10	1
				2	Gambusia sp.	21	1
				2	Gambusia sp.	9	1
				3	Procambarus sp.		1
				3	Gambusia sp.	10	1
				3	Lepomis sp.	12	1
				3	Palaemonetes sp.		7
				4	Gambusia sp.	11	1
				4	Palaemonetes sp.		12
				5	Etheostoma fonticola	20	1
				5	Palaemonetes sp.		12
				5	Etheostoma fonticola	17	1
				5	Etheostoma fonticola	14	1
				5	Etheostoma fonticola	21	1
				5	Etheostoma fonticola	22	1
				5	Etheostoma fonticola	17	1
				5	Etheostoma fonticola	24	1
				5	Etheostoma fonticola	18	1
				5	Etheostoma fonticola	22	1
				6	Etheostoma fonticola	17	1
				6	Micropterus salmoides	145	1
				6	Palaemonetes sp.		6
				7	Etheostoma fonticola	19	1
				7	Palaemonetes sp.		12
				8	Palaemonetes sp.		1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2396	Landa Lake	C2	4/30/2019	9	Palaemonetes sp.		4
				9	Lepomis miniatus	85	1
				10	Palaemonetes sp.		7
				10	Procambarus sp.		1
				11	Procambarus sp.		1
				11	Etheostoma fonticola	25	1
				11	Palaemonetes sp.		5
				11	Etheostoma fonticola	25	1
				12	Procambarus sp.		2
				13	Palaemonetes sp.		4
				14	Palaemonetes sp.		1
				15	No fish collected		
2397		V1		1	Dionda nigrotaeniata	28	1
				1	Palaemonetes sp.		2
				2	Procambarus sp.		1
				2	Lepomis miniatus	71	1
				2	Lepomis miniatus	56	1
				2	Dionda nigrotaeniata	30	1
				3	Lepomis miniatus	85	1
				3	Etheostoma fonticola	23	1
				3	Dionda nigrotaeniata	17	1
				3	Gambusia sp.	20	1
				3	Gambusia sp.	34	1
				3	Gambusia sp.	19	1
				3	Lepomis miniatus	90	1
				3	Lepomis miniatus	105	1
				4	Lepomis miniatus	71	1
				4	Procambarus sp.		1
				4	Lepomis miniatus	87	1
				5	Dionda nigrotaeniata	70	1
				6	Procambarus sp.		1
				6	Dionda nigrotaeniata	12	1
				7	Dionda nigrotaeniata	24	1
				7	Dionda nigrotaeniata	36	1
				8	Dionda nigrotaeniata	17	1
				8	Palaemonetes sp.		1
				8	Lepomis miniatus	69	1
				8	Procambarus sp.		2
				9	No fish collected		
				10	Procambarus sp.		1
				10	Lepomis miniatus	74	1
				10	Lepomis miniatus	31	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2397	Landa Lake	V1	4/30/2019	11	Gambusia sp.	19	1
				12	Etheostoma fonticola	25	1
				12	Procambarus sp.		1
				13	Astyanax mexicanus	15	1
				13	Palaemonetes sp.		1
				14	Procambarus sp.		1
				14	Dionda nigrotaeniata	11	1
				15	No fish collected		
2398		V2		1	Etheostoma fonticola	14	1
				1	Etheostoma fonticola	14	1
				1	Palaemonetes sp.		7
				1	Gambusia sp.	20	1
				1	Gambusia sp.	25	1
				2	Etheostoma fonticola	17	1
				2	Lepomis miniatus	124	1
				2	Gambusia sp.	21	1
				2	Lepomis sp.	10	1
				2	Procambarus sp.		2
				2	Palaemonetes sp.		1
				2	Lepomis miniatus	30	1
				2	Lepomis miniatus	34	1
				3	Dionda nigrotaeniata	22	1
				3	Procambarus sp.		3
				3	Gambusia sp.	24	1
				4	Procambarus sp.		1
				4	Etheostoma fonticola	18	1
				5	Procambarus sp.		1
				6	Gambusia sp.	16	1
				6	Lepomis sp.	13	1
				6	Procambarus sp.		1
				7	Gambusia sp.	30	1
				7	Lepomis miniatus	100	1
				7	Procambarus sp.		1
				7	Etheostoma fonticola	25	1
				8	Palaemonetes sp.		1
				8	Procambarus sp.		1
				9	Gambusia sp.	32	1
				10	Palaemonetes sp.		1
				11	No fish collected		
				12	Gambusia sp.	17	1
				13	Palaemonetes sp.		2
				13	Gambusia sp.	20	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2398	Landa Lake	V2	4/30/2019	14	Lepomis miniatus	38	1
				14	Gambusia sp.	31	1
				15	No fish collected		
2399		O1		1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
2400		O2		1	No fish collected		
				2	No fish collected		
				3	Etheostoma fonticola	19	1
				3	Etheostoma fonticola	21	1
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	Etheostoma fonticola	30	1
				8	Etheostoma fonticola	30	1
				9	No fish collected		
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2401	Old Channel Reach	C1		1	Procambarus sp.		17
				1	Herichthys cyanoguttatus	40	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	20	1
				2	Procambarus sp.		4
				2	Palaemonetes sp.		3
				2	Gambusia sp.	17	1
				2	Etheostoma fonticola	18	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	22	1
				2	Etheostoma fonticola	18	1
				2	Etheostoma fonticola	17	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2401	Old Channel Reach	C1	4/30/2019	2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	22	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	14	1
				3	Procambarus sp.		5
				3	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	21	1
				4	Etheostoma fonticola	13	1
				4	Lepomis miniatus	62	1
				4	Etheostoma fonticola	14	1
				4	Procambarus sp.		3
				4	Etheostoma fonticola	14	1
				4	Etheostoma fonticola	26	1
				5	Etheostoma fonticola	22	1
				5	Procambarus sp.		6
				5	Gambusia sp.	32	1
				5	Gambusia sp.	16	1
				5	Gambusia sp.	32	1
				5	Etheostoma fonticola	26	1
				5	Etheostoma fonticola	20	1
				5	Etheostoma fonticola	24	1
				5	Etheostoma fonticola	21	1
				5	Etheostoma fonticola	19	1
				6	Palaemonetes sp.		4
				6	Etheostoma fonticola	20	1
				6	Etheostoma fonticola	22	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	15	1
				6	Gambusia sp.	21	1
				6	Etheostoma fonticola	15	1
				6	Procambarus sp.		1
				7	Gambusia sp.	22	1
				7	Etheostoma fonticola	29	1
				7	Etheostoma fonticola	19	1
				8	Palaemonetes sp.		2
				8	Etheostoma fonticola	20	1
				8	Etheostoma fonticola	26	1
				8	Etheostoma fonticola	18	1
				9	Etheostoma fonticola	20	1
				10	Etheostoma fonticola	27	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2401	Old Channel Reach	C1	4/30/2019	11	Etheostoma fonticola	19	1
				12	Etheostoma fonticola	16	1
				13	Etheostoma fonticola	18	1
				13	Gambusia sp.	16	1
				13	Etheostoma fonticola	19	1
				14	Astyanax mexicanus	10	1
				14	Etheostoma fonticola	15	1
				14	Etheostoma fonticola	15	1
				14	Etheostoma fonticola	11	1
				14	Etheostoma fonticola	18	1
				14	Procambarus sp.		1
				15	Procambarus sp.		1
2402		C2		1	Procambarus sp.		8
				1	Palaemonetes sp.		2
				1	Etheostoma fonticola	27	1
				2	Etheostoma fonticola	16	1
				2	Palaemonetes sp.		6
				2	Gambusia sp.	11	1
				2	Etheostoma fonticola	11	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	21	1
				2	Procambarus sp.		7
				2	Etheostoma fonticola	25	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	16	1
				2	Etheostoma fonticola	14	1
				3	Etheostoma fonticola	17	1
				3	Etheostoma fonticola	13	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	18	1
				3	Etheostoma fonticola	13	1
				3	Etheostoma fonticola	17	1
				3	Etheostoma fonticola	21	1
				3	Etheostoma fonticola	25	1
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	20	1
				3	Procambarus sp.		9
				3	Astyanax mexicanus	10	1
				3	Palaemonetes sp.		1
				3	Etheostoma fonticola	16	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2402	Old Channel Reach	C2	4/30/2019	4	Gambusia sp.	20	1
				4	Etheostoma fonticola	24	1
				4	Etheostoma fonticola	20	1
				4	Gambusia sp.	14	1
				4	Etheostoma fonticola	29	1
				4	Gambusia sp.	11	1
				4	Etheostoma fonticola	20	1
				4	Gambusia sp.	11	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	18	1
				4	Etheostoma fonticola	22	1
				4	Etheostoma fonticola	21	1
				4	Etheostoma fonticola	19	1
				4	Etheostoma fonticola	16	1
				4	Etheostoma fonticola	12	1
				4	Etheostoma fonticola	25	1
				5	Etheostoma fonticola	17	1
				5	Palaemonetes sp.		2
				5	Procambarus sp.		1
				5	Etheostoma fonticola	13	1
				5	Etheostoma fonticola	25	1
				5	Etheostoma fonticola	26	1
				6	Procambarus sp.		5
				6	Palaemonetes sp.		1
				6	Gambusia sp.	18	1
				6	Etheostoma fonticola	20	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	18	1
				6	Etheostoma fonticola	19	1
				6	Etheostoma fonticola	21	1
				6	Etheostoma fonticola	25	1
				6	Etheostoma fonticola	12	1
				7	Procambarus sp.		2
				7	Etheostoma fonticola	21	1
				7	Etheostoma fonticola	16	1
				8	No fish collected		
				9	Procambarus sp.		3
				9	Etheostoma fonticola	15	1
				10	Gambusia sp.	22	1
				11	Etheostoma fonticola	21	1
				11	Etheostoma fonticola	24	1
				11	Etheostoma fonticola	16	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2402	Old Channel Reach	C2	4/30/2019	11	Etheostoma fonticola	21	1
				12	No fish collected		
				13	Procambarus sp.		1
				13	Etheostoma fonticola	19	1
				14	No fish collected		
				15	No fish collected		
2403		L1		1	Procambarus sp.		14
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	19	1
				1	Dionda nigrotaeniata	26	1
				1	Etheostoma fonticola	16	1
				1	Gambusia sp.	36	1
				1	Gambusia sp.	12	1
				1	Gambusia sp.	21	1
				1	Gambusia sp.	17	1
				1	Palaemonetes sp.		22
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	17	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	19	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	11	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2403	Old Channel Reach	L1	4/30/2019	1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	23	1
				1	Etheostoma fonticola	24	1
				2	Etheostoma fonticola	31	1
				2	Etheostoma fonticola	11	1
				2	Etheostoma fonticola	21	1
				2	Herichthys cyanoguttatus	56	1
				2	Etheostoma fonticola	25	1
				2	Dionda nigrotaeniata	26	1
				2	Procambarus sp.		13
				2	Etheostoma fonticola	10	1
				2	Etheostoma fonticola	14	1
				2	Etheostoma fonticola	16	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	19	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	23	1
				2	Etheostoma fonticola	17	1
				3	Etheostoma fonticola	25	1
				3	Procambarus sp.		4
				3	Gambusia sp.	15	1
				3	Etheostoma fonticola	17	1
				3	Etheostoma fonticola	17	1
				3	Etheostoma fonticola	12	1
				3	Etheostoma fonticola	27	1
				3	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	29	1
				3	Etheostoma fonticola	21	1
				4	Etheostoma fonticola	17	1
				4	Etheostoma fonticola	30	1
				4	Etheostoma fonticola	22	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	22	1
				4	Etheostoma fonticola	25	1
				5	Etheostoma fonticola	14	1
				5	Etheostoma fonticola	32	1
				5	Etheostoma fonticola	20	1
				5	Procambarus sp.		5
				6	Procambarus sp.		8

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2403	Old Channel Reach	L1	4/30/2019	6	Palaemonetes sp.		2
				7	Procambarus sp.		2
				7	Lepomis miniatus	56	1
				7	Etheostoma fonticola	22	1
				8	Gambusia sp.	18	1
				8	Etheostoma fonticola	14	1
				8	Etheostoma fonticola	27	1
				8	Etheostoma fonticola	20	1
				8	Etheostoma fonticola	32	1
				8	Etheostoma fonticola	21	1
				8	Etheostoma fonticola	24	1
				9	Etheostoma fonticola	25	1
				9	Etheostoma fonticola	15	1
				9	Gambusia sp.	10	1
				9	Procambarus sp.		7
				9	Etheostoma fonticola	20	1
				9	Etheostoma fonticola	13	1
				9	Etheostoma fonticola	20	1
				9	Etheostoma fonticola	20	1
				9	Etheostoma fonticola	20	1
				9	Etheostoma fonticola	21	1
				9	Etheostoma fonticola	30	1
				9	Etheostoma fonticola	20	1
				10	Etheostoma fonticola	19	1
				10	Etheostoma fonticola	31	1
				10	Etheostoma fonticola	23	1
				10	Procambarus sp.		2
				11	Etheostoma fonticola	10	1
				11	Dionda nigrotaeniata	26	1
				11	Procambarus sp.		2
				12	No fish collected		
				13	Procambarus sp.		2
				13	Etheostoma fonticola	26	1
				14	Lepomis miniatus	60	1
				14	Lepomis miniatus	35	1
				15	No fish collected		
2404		L2		1	Gambusia sp.	15	1
				1	Gambusia sp.	22	1
				1	Gambusia sp.	15	1
				1	Gambusia sp.	20	1
				1	Gambusia sp.	20	1
				1	Palaemonetes sp.		2

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2404	Old Channel Reach	L2	4/30/2019	1	Gambusia sp.	20	1
				2	Etheostoma fonticola	20	1
				2	Gambusia sp.	30	1
				3	Etheostoma fonticola	20	1
				3	Gambusia sp.	16	1
				4	Palaemonetes sp.		2
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	13	1
				4	Gambusia sp.	20	1
				5	Palaemonetes sp.		1
				6	No fish collected		
				7	Etheostoma fonticola	17	1
				8	Etheostoma fonticola	13	1
				9	No fish collected		
				10	Gambusia sp.	32	1
				11	No fish collected		
				12	Etheostoma fonticola	16	1
				12	Palaemonetes sp.		1
				13	No fish collected		
				14	No fish collected		
				15	Gambusia sp.	17	1
2405		O1		1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	Etheostoma lepidum	20	1
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2406		O2		1	Gambusia sp.	17	1
				1	Gambusia sp.	16	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	22	1
				2	Gambusia sp.	20	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2406	Old Channel Reach	O2	4/30/2019	2	Gambusia sp.	17	1
				2	Gambusia sp.	28	1
				2	Gambusia sp.	27	1
				2	Gambusia sp.	21	1
				2	Gambusia sp.	31	1
				2	Gambusia sp.	41	1
				2	Gambusia sp.	20	1
				3	Gambusia sp.	21	1
				3	Gambusia sp.	14	1
				3	Dionda nigrotaeniata	22	1
				3	Dionda nigrotaeniata	24	1
				3	Gambusia sp.	29	1
				4	Dionda nigrotaeniata	25	1
				5	Dionda nigrotaeniata	28	1
				6	Etheostoma fonticola	16	1
				7	No fish collected		
				8	No fish collected		
				9	Etheostoma fonticola	26	1
				9	Gambusia sp.	18	1
				10	No fish collected		
				11	No fish collected		
				12	Gambusia sp.	21	1
				13	Gambusia sp.	22	1
				13	Gambusia sp.	32	1
				14	Gambusia sp.	29	1
				15	No fish collected		
2407		R1		1	Palaemonetes sp.		4
				1	Procambarus sp.		14
				2	Procambarus sp.		20
				2	Gambusia sp.	12	1
				2	Dionda nigrotaeniata	18	1
				3	Procambarus sp.		10
				4	Gambusia sp.	12	1
				4	Etheostoma fonticola	24	1
				4	Dionda nigrotaeniata	22	1
				4	Gambusia sp.	12	1
				4	Astyanax mexicanus	15	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	11	1
				4	Etheostoma fonticola	30	1
				4	Etheostoma fonticola	19	1
				4	Procambarus sp.		9

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2407	Old Channel Reach	R1	4/30/2019	5	Dionda nigrotaeniata	13	1
				5	Etheostoma fonticola	12	1
				5	Procambarus sp.		5
				5	Etheostoma fonticola	30	1
				5	Etheostoma fonticola	14	1
				5	Etheostoma fonticola	15	1
				5	Palaemonetes sp.		2
				5	Gambusia sp.	11	1
				5	Etheostoma fonticola	14	1
				6	Etheostoma fonticola	18	1
				6	Astyanax mexicanus	17	1
				6	Procambarus sp.		10
				7	Etheostoma fonticola	24	1
				7	Etheostoma fonticola	20	1
				8	Etheostoma fonticola	20	1
				8	Procambarus sp.		3
				8	Lepomis sp.	12	1
				8	Lepomis sp.	12	1
				8	Etheostoma fonticola	24	1
				8	Etheostoma fonticola	14	1
				9	Etheostoma fonticola	22	1
				9	Procambarus sp.		1
				9	Etheostoma fonticola	26	1
				10	Gambusia sp.	10	1
				10	Dionda nigrotaeniata	15	1
				10	Procambarus sp.		2
				10	Etheostoma fonticola	21	1
				10	Etheostoma fonticola	23	1
				10	Gambusia sp.	11	1
				11	No fish collected		
				12	Etheostoma fonticola	16	1
				13	Etheostoma fonticola	15	1
				13	Etheostoma fonticola	14	1
				13	Procambarus sp.		1
				13	Etheostoma fonticola	15	1
				14	Etheostoma fonticola	15	1
				14	Etheostoma fonticola	20	1
				15	Etheostoma fonticola	27	1
				15	Etheostoma fonticola	13	1
				16	Etheostoma fonticola	13	1
				17	Astyanax mexicanus	16	1
				17	Etheostoma fonticola	11	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2407	Old Channel Reach	R1	4/30/2019	18	Procambarus sp.		1
				18	Palaemonetes sp.		1
2408		R2		1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	21	1
				1	Procambarus sp.		14
				1	Dionda nigrotaeniata	18	1
				1	Etheostoma fonticola	28	1
				2	Etheostoma fonticola	20	1
				2	Procambarus sp.		23
				2	Etheostoma fonticola	12	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	16	1
				2	Etheostoma fonticola	13	1
				3	Etheostoma fonticola	10	1
				3	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	18	1
				3	Etheostoma fonticola	17	1
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	17	1
				3	Etheostoma fonticola	19	1
				3	Procambarus sp.		16
				3	Etheostoma fonticola	19	1
				4	Etheostoma fonticola	16	1
				4	Procambarus sp.		2
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	18	1
				4	Etheostoma fonticola	13	1
				4	Etheostoma fonticola	27	1
				4	Etheostoma fonticola	25	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	27	1
				4	Etheostoma fonticola	16	1
				5	Etheostoma fonticola	19	1
				5	Procambarus sp.		2
				6	Etheostoma fonticola	20	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	22	1
				6	Procambarus sp.		7
				7	Etheostoma fonticola	21	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2408	Old Channel Reach	R2	4/30/2019	7	Etheostoma fonticola	15	1
				7	Etheostoma fonticola	10	1
				7	Etheostoma fonticola	15	1
				7	Etheostoma fonticola	24	1
				7	Etheostoma fonticola	11	1
				7	Etheostoma fonticola	13	1
				7	Procambarus sp.		4
				8	Procambarus sp.		10
				9	Etheostoma fonticola	15	1
				10	Procambarus sp.		1
				11	Etheostoma fonticola	22	1
				11	Etheostoma fonticola	20	1
				11	Procambarus sp.		8
				12	Procambarus sp.		3
				12	Etheostoma fonticola	24	1
				12	Etheostoma fonticola	21	1
				13	Etheostoma fonticola	25	1
				13	Etheostoma fonticola	12	1
				13	Procambarus sp.		2
				13	Etheostoma fonticola	22	1
				14	Etheostoma fonticola	19	1
				14	Etheostoma fonticola	10	1
				14	Etheostoma fonticola	24	1
				15	Etheostoma fonticola	17	1
				15	Etheostoma fonticola	16	1
				16	Etheostoma fonticola	20	1
				17	No fish collected		
2409	Upper New Channel	R1	5/1/2019	1	Etheostoma fonticola	31	1
				1	Procambarus sp.		1
				1	Etheostoma fonticola	13	1
				1	Etheostoma fonticola	18	1
				1	Gambusia sp.	14	1
				1	Etheostoma fonticola	11	1
				1	Etheostoma fonticola	24	1
				1	Etheostoma fonticola	23	1
				1	Etheostoma fonticola	17	1
				2	Lepomis cyanellus	42	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	11	1
				2	Etheostoma fonticola	25	1
				2	Etheostoma fonticola	25	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2409	Upper New Channel	R1	5/1/2019	2	Etheostoma fonticola	18	1
				2	Etheostoma fonticola	12	1
				2	Etheostoma fonticola	16	1
				2	Etheostoma fonticola	28	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	20	1
				2	Procambarus sp.		17
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	18	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	21	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	21	1
				3	Procambarus sp.		4
				4	Gambusia sp.	12	1
				4	Etheostoma fonticola	18	1
				4	Etheostoma fonticola	20	1
				5	No fish collected		
				6	Palaemonetes sp.		2
				6	Gambusia sp.	10	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	33	1
				6	Procambarus sp.		5
				7	Dionda nigrotaeniata	15	1
				7	Palaemonetes sp.		1
				8	Palaemonetes sp.		1
				8	Etheostoma fonticola	33	1
				8	Procambarus sp.		1
				9	Etheostoma fonticola	17	1
				10	Etheostoma fonticola	23	1
				11	Etheostoma fonticola	17	1
				12	No fish collected		

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2409	Upper New Channel	R1	5/1/2019	13	Etheostoma fonticola	16	1
				13	Etheostoma fonticola	32	1
				13	Etheostoma fonticola	33	1
				14	Etheostoma fonticola	17	1
				15	No fish collected		
2410		R2		1	Etheostoma fonticola	31	1
				1	Procambarus sp.		62
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	28	1
				1	Etheostoma fonticola	31	1
				1	Etheostoma fonticola	23	1
				1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	14	1
				1	Etheostoma fonticola	16	1
				1	Etheostoma fonticola	26	1
				1	Gambusia sp.	13	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	23	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	22	1
				2	Gambusia sp.	10	1
				2	Etheostoma fonticola	14	1
				2	Etheostoma fonticola	15	1
				2	Gambusia sp.	13	1
				2	Dionda nigrotaeniata	17	1
				2	Etheostoma fonticola	24	1
				2	Etheostoma fonticola	32	1
				2	Etheostoma fonticola	29	1
				2	Gambusia sp.	10	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	18	1
				2	Etheostoma fonticola	34	1
				2	Etheostoma fonticola	29	1
				2	Etheostoma fonticola	29	1
				2	Etheostoma fonticola	29	1
				2	Procambarus sp.		97
				2	Dionda nigrotaeniata	17	1
				2	Etheostoma fonticola	23	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2410	Upper New Channel	R2	5/1/2019	3	Etheostoma fonticola	25	1
				3	Etheostoma fonticola	23	1
				3	Etheostoma fonticola	34	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	25	1
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	25	1
				3	Etheostoma fonticola	22	1
				3	Etheostoma fonticola	31	1
				3	Etheostoma fonticola	21	1
				3	Etheostoma fonticola	35	1
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	29	1
				3	Etheostoma fonticola	14	1
				3	Procambarus sp.		50
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	32	1
				3	Etheostoma fonticola	22	1
				3	Etheostoma fonticola	18	1
				3	Etheostoma fonticola	26	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	29	1
				3	Etheostoma fonticola	31	1
				3	Etheostoma fonticola	28	1
				4	Etheostoma fonticola	31	1
				4	Procambarus sp.		33
				4	Etheostoma fonticola	31	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	25	1
				4	Etheostoma fonticola	24	1
				4	Etheostoma fonticola	29	1
				4	Etheostoma fonticola	32	1
				4	Etheostoma fonticola	30	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	25	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	18	1
				4	Etheostoma fonticola	32	1
				4	Etheostoma fonticola	15	1
				5	Etheostoma fonticola	26	1
				5	Etheostoma fonticola	25	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2410	Upper New Channel	R2	5/1/2019	5	Procambarus sp.		40
				5	Etheostoma fonticola	14	1
				5	Etheostoma fonticola	17	1
				5	Etheostoma fonticola	29	1
				5	Etheostoma fonticola	22	1
				5	Etheostoma fonticola	17	1
				5	Etheostoma fonticola	25	1
				5	Etheostoma fonticola	30	1
				5	Etheostoma fonticola	15	1
				5	Etheostoma fonticola	28	1
				5	Etheostoma fonticola	30	1
				6	Etheostoma fonticola	29	1
				6	Etheostoma fonticola	28	1
				6	Etheostoma fonticola	16	1
				6	Etheostoma fonticola	30	1
				6	Etheostoma fonticola	25	1
				6	Etheostoma fonticola	28	1
				6	Etheostoma fonticola	26	1
				6	Etheostoma fonticola	30	1
				6	Etheostoma fonticola	16	1
				6	Etheostoma fonticola	30	1
				6	Etheostoma fonticola	14	1
				6	Etheostoma fonticola	24	1
				6	Etheostoma fonticola	30	1
				6	Etheostoma fonticola	34	1
				6	Etheostoma fonticola	23	1
				6	Etheostoma fonticola	23	1
				6	Etheostoma fonticola	16	1
				6	Etheostoma fonticola	17	1
				6	Etheostoma fonticola	20	1
				6	Etheostoma fonticola	22	1
				6	Etheostoma fonticola	31	1
				6	Etheostoma fonticola	22	1
				6	Dionda nigrotaeniata	14	1
				6	Gambusia sp.	12	1
				6	Gambusia sp.	10	1
				6	Gambusia sp.	10	1
				6	Gambusia sp.	13	1
				6	Etheostoma fonticola	18	1
				6	Gambusia sp.	10	1
				6	Procambarus sp.		8
				6	Etheostoma fonticola	25	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2410	Upper New Channel	R2	5/1/2019	6	Etheostoma fonticola	16	1
				6	Etheostoma fonticola	25	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	30	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	17	1
				6	Etheostoma fonticola	20	1
				6	Etheostoma fonticola	25	1
				6	Etheostoma fonticola	24	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	14	1
				6	Etheostoma fonticola	17	1
				6	Etheostoma fonticola	34	1
				6	Etheostoma fonticola	27	1
				6	Etheostoma fonticola	16	1
				7	Etheostoma fonticola	26	1
				7	Procambarus sp.		11
				7	Dionda nigrotaeniata	26	1
				7	Etheostoma fonticola	27	1
				7	Etheostoma fonticola	24	1
				7	Etheostoma fonticola	33	1
				7	Etheostoma fonticola	18	1
				7	Etheostoma fonticola	18	1
				7	Etheostoma fonticola	16	1
				7	Etheostoma fonticola	27	1
				7	Etheostoma fonticola	30	1
				7	Etheostoma fonticola	32	1
				7	Etheostoma fonticola	25	1
				7	Etheostoma fonticola	29	1
				7	Etheostoma fonticola	15	1
				7	Etheostoma fonticola	18	1
				7	Etheostoma fonticola	16	1
				7	Etheostoma fonticola	33	1
				7	Etheostoma fonticola	31	1
				7	Etheostoma fonticola	29	1
				8	Etheostoma fonticola	25	1
				8	Etheostoma fonticola	28	1
				8	Etheostoma fonticola	22	1
				8	Etheostoma fonticola	22	1
				8	Etheostoma fonticola	23	1
				8	Etheostoma fonticola	30	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2410	Upper New Channel	R2	5/1/2019	8	Etheostoma fonticola	15	1
				8	Etheostoma fonticola	13	1
				8	Etheostoma fonticola	30	1
				8	Procambarus sp.		7
				8	Etheostoma fonticola	15	1
				8	Etheostoma fonticola	29	1
				8	Etheostoma fonticola	31	1
				8	Etheostoma fonticola	32	1
				8	Etheostoma fonticola	16	1
				8	Etheostoma fonticola	34	1
				8	Etheostoma fonticola	29	1
				8	Etheostoma fonticola	29	1
				8	Etheostoma fonticola	19	1
				8	Etheostoma fonticola	34	1
				8	Etheostoma fonticola	18	1
				8	Etheostoma fonticola	30	1
				8	Etheostoma fonticola	18	1
				8	Etheostoma fonticola	29	1
				8	Etheostoma fonticola	28	1
				8	Etheostoma fonticola	17	1
				8	Etheostoma fonticola	15	1
				8	Etheostoma fonticola	34	1
				9	Etheostoma fonticola	38	1
				9	Etheostoma fonticola	31	1
				9	Dionda nigrotaeniata	20	1
				9	Procambarus sp.		9
				9	Gambusia sp.	8	1
				10	Etheostoma fonticola	18	1
				10	Etheostoma fonticola	39	1
				10	Etheostoma fonticola	29	1
				10	Etheostoma fonticola	27	1
				10	Etheostoma fonticola	25	1
				10	Etheostoma fonticola	28	1
				10	Etheostoma fonticola	13	1
				10	Etheostoma fonticola	29	1
				10	Etheostoma fonticola	16	1
				10	Etheostoma fonticola	26	1
				10	Etheostoma fonticola	16	1
				10	Etheostoma fonticola	13	1
				10	Etheostoma fonticola	28	1
				10	Etheostoma fonticola	15	1
				10	Procambarus sp.		4

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2410	Upper New Channel	R2	5/1/2019	10	Etheostoma fonticola	25	1
				11	Etheostoma fonticola	16	1
				11	Etheostoma fonticola	23	1
				11	Etheostoma fonticola	16	1
				12	Etheostoma fonticola	29	1
				12	Procambarus sp.		4
				12	Etheostoma fonticola	19	1
				12	Etheostoma fonticola	32	1
				12	Etheostoma fonticola	32	1
				12	Etheostoma fonticola	25	1
				12	Etheostoma fonticola	27	1
				12	Etheostoma fonticola	22	1
				12	Etheostoma fonticola	30	1
				13	Etheostoma fonticola	27	1
				13	Etheostoma fonticola	27	1
				13	Etheostoma fonticola	32	1
				13	Procambarus sp.		3
				14	Etheostoma fonticola	15	1
				14	Etheostoma fonticola	30	1
				14	Procambarus sp.		1
				14	Etheostoma fonticola	27	1
				15	Etheostoma fonticola	20	1
				15	Procambarus sp.		2
				16	Etheostoma fonticola	19	1
				16	Etheostoma fonticola	25	1
				16	Etheostoma fonticola	37	1
				16	Etheostoma fonticola	15	1
				16	Procambarus sp.		2
				16	Etheostoma fonticola	29	1
				17	Etheostoma fonticola	19	1
				18	No fish collected		
2411		H1		1	Palaemonetes sp.		12
				1	Etheostoma fonticola	14	1
				1	Etheostoma fonticola	18	1
				1	Gambusia sp.	20	1
				1	Procambarus sp.		16
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	25	1
				2	Etheostoma fonticola	19	1
				2	Etheostoma fonticola	15	1
				2	Palaemonetes sp.		1
				2	Procambarus sp.		23

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2411	Upper New Channel	H1	5/1/2019	2	Etheostoma fonticola	19	1
				3	Procambarus sp.		10
				3	Palaemonetes sp.		6
				3	Etheostoma fonticola	34	1
				4	Etheostoma fonticola	17	1
				4	Procambarus sp.		23
				4	Etheostoma fonticola	15	1
				4	Etheostoma fonticola	24	1
				4	Etheostoma fonticola	22	1
				4	Etheostoma fonticola	22	1
				4	Etheostoma fonticola	26	1
				4	Etheostoma fonticola	17	1
				4	Etheostoma fonticola	21	1
				4	Palaemonetes sp.		2
				4	Ambloplites rupestris	107	1
				4	Etheostoma fonticola	27	1
				5	Palaemonetes sp.		9
				5	Procambarus sp.		9
				5	Etheostoma fonticola	14	1
				6	Procambarus sp.		2
				6	Etheostoma fonticola	27	1
				7	Etheostoma fonticola	26	1
				7	Palaemonetes sp.		5
				7	Lepomis cyanellus	95	1
				7	Etheostoma fonticola	15	1
				7	Etheostoma fonticola	25	1
				7	Etheostoma fonticola	32	1
				7	Etheostoma fonticola	19	1
				7	Etheostoma fonticola	31	1
				7	Etheostoma fonticola	26	1
				7	Etheostoma fonticola	30	1
				7	Procambarus sp.		4
				8	Etheostoma fonticola	32	1
				9	Palaemonetes sp.		1
				9	Etheostoma fonticola	22	1
				10	Etheostoma fonticola	26	1
				10	Procambarus sp.		3
				10	Etheostoma fonticola	26	1
				10	Etheostoma fonticola	20	1
				10	Etheostoma fonticola	30	1
				11	Procambarus sp.		2
				12	Procambarus sp.		1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2411	Upper New Channel	H1	5/1/2019	13	Etheostoma fonticola	22	1
				14	No fish collected		
				15	No fish collected		
2412		H2		1	Etheostoma fonticola	15	1
				1	Gambusia sp.	10	1
				1	Gambusia sp.	18	1
				1	Gambusia sp.	13	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	20	1
				1	Palaemonetes sp.		3
				2	Etheostoma fonticola	34	1
				2	Etheostoma fonticola	18	1
				2	Lepomis miniatus	64	1
				2	Procambarus sp.		3
				2	Palaemonetes sp.		1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	27	1
				3	No fish collected		
				4	Procambarus sp.		3
				5	Procambarus sp.		1
				5	Etheostoma fonticola	17	1
				5	Etheostoma fonticola	22	1
				5	Etheostoma fonticola	19	1
				5	Etheostoma fonticola	21	1
				6	Etheostoma fonticola	19	1
				7	Gambusia sp.	11	1
				7	Procambarus sp.		3
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	Etheostoma fonticola	16	1
				15	No fish collected		
2413		O1		1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2413	Upper New Channel	O1	5/1/2019	6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
2414		O2		1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
2415	City Park	O1	10/15/2019	1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
2416		O2		1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
2417		C1		1	Etheostoma fonticola	33	1
				1	Lepomis sp.	15	1
				2	Lepomis sp.	11	1
				2	Etheostoma fonticola	26	1
				2	Procambarus sp.		2
				2	Lepomis sp.	15	1
				2	Lepomis sp.	11	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2417	City Park	C1	10/15/2019	2	Gambusia sp.	11	1
				2	Etheostoma fonticola	13	1
				2	Gambusia sp.	10	1
				2	Gambusia sp.	12	1
				2	Etheostoma fonticola	13	1
				2	Etheostoma fonticola	15	1
				2	Gambusia sp.	13	1
				2	Lepomis miniatus	26	1
				2	Gambusia sp.	16	1
				2	Gambusia sp.	10	1
				2	Gambusia sp.	12	1
				2	Gambusia sp.	12	1
				2	Gambusia sp.	12	1
				2	Gambusia sp.	15	1
				2	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	20	1
				3	Etheostoma fonticola	27	1
				3	Etheostoma fonticola	32	1
				3	Etheostoma fonticola	31	1
				3	Dionda nigrotaeniata	62	1
				3	Dionda nigrotaeniata	85	1
				3	Dionda nigrotaeniata	70	1
				3	Dionda nigrotaeniata	81	1
				3	Gambusia sp.	12	1
				4	Etheostoma fonticola	23	1
				4	Procambarus sp.		4
				4	Gambusia sp.	10	1
				4	Gambusia sp.	10	1
				4	Dionda nigrotaeniata	60	1
				4	Etheostoma fonticola	22	1
				4	Lepomis miniatus	56	1
				4	Gambusia sp.	10	1
				5	Procambarus sp.		2
				6	Gambusia sp.	12	1
				6	Gambusia sp.	12	1
				6	Gambusia sp.	14	1
				6	Etheostoma fonticola	12	1
				6	Etheostoma fonticola	15	1
				6	Etheostoma fonticola	21	1
				7	Etheostoma fonticola	12	1
				7	Gambusia sp.	10	1
				7	Etheostoma fonticola	15	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2417	City Park	C1	10/15/2019	7	Etheostoma fonticola	15	1
				7	Etheostoma fonticola	18	1
				7	Procambarus sp.		1
				7	Etheostoma fonticola	12	1
				7	Etheostoma fonticola	12	1
				7	Etheostoma fonticola	19	1
				7	Lepomis miniatus	23	1
				8	Etheostoma fonticola	12	1
				8	Etheostoma fonticola	22	1
				8	Gambusia sp.	12	1
				9	Etheostoma fonticola	12	1
				10	No fish collected		
				11	Etheostoma fonticola	12	1
				11	Etheostoma fonticola	13	1
				11	Dionda nigrotaeniata	85	1
				12	No fish collected		
				13	Etheostoma fonticola	20	1
				13	Etheostoma fonticola	10	1
				13	Lepomis sp.	12	1
				13	Gambusia sp.	12	1
				13	Etheostoma fonticola	16	1
				14	No fish collected		
				15	Etheostoma fonticola	27	1
				15	Etheostoma fonticola	35	1
				15	Etheostoma fonticola	32	1
				15	Etheostoma fonticola	15	1
				15	Etheostoma fonticola	29	1
				15	Etheostoma fonticola	18	1
				15	Etheostoma fonticola	32	1
				15	Dionda nigrotaeniata	75	1
				15	Dionda nigrotaeniata	90	1
				15	Procambarus sp.		3
				16	Gambusia sp.	15	1
				16	Etheostoma fonticola	18	1
				16	Lepomis miniatus	54	1
				16	Dionda nigrotaeniata	85	1
				16	Etheostoma fonticola	12	1
				16	Etheostoma fonticola	15	1
				16	Etheostoma fonticola	34	1
				17	Dionda nigrotaeniata	70	1
2418		C2		1	Lepomis sp.	14	1
				1	Lepomis macrochirus	71	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2418	City Park	C2	10/15/2019	1	Etheostoma fonticola	10	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	10	1
				1	Etheostoma fonticola	12	1
				1	Etheostoma fonticola	23	1
				2	Lepomis sp.	13	1
				2	Etheostoma fonticola	10	1
				2	Etheostoma fonticola	16	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	12	1
				2	Etheostoma fonticola	12	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	11	1
				2	Etheostoma fonticola	11	1
				2	Etheostoma fonticola	12	1
				2	Dionda nigrotaeniata	72	1
				2	Lepomis miniatus	51	1
				2	Etheostoma fonticola	15	1
				2	Lepomis sp.	15	1
				2	Etheostoma fonticola	12	1
				2	Lepomis sp.	11	1
				2	Lepomis macrochirus	38	1
				2	Gambusia sp.	10	1
				2	Etheostoma fonticola	35	1
				2	Lepomis miniatus	25	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	16	1
				2	Etheostoma fonticola	11	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	23	1
				2	Etheostoma fonticola	12	1
				2	Etheostoma fonticola	17	1
				2	Etheostoma fonticola	11	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	21	1
				2	Etheostoma fonticola	19	1
				2	Etheostoma fonticola	13	1
				2	Etheostoma fonticola	22	1
				2	Etheostoma fonticola	13	1
				2	Etheostoma fonticola	15	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2418	City Park	C2	10/15/2019	2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	19	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	22	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	14	1
				2	Etheostoma fonticola	22	1
				2	Etheostoma fonticola	16	1
				2	Etheostoma fonticola	18	1
				2	Etheostoma fonticola	15	1
				2	Etheostoma fonticola	12	1
				2	Etheostoma fonticola	27	1
				2	Etheostoma fonticola	12	1
				2	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	15	1
				3	Etheostoma fonticola	14	1
				3	Etheostoma fonticola	17	1
				3	Lepomis macrochirus	28	1
				3	Etheostoma fonticola	22	1
				3	Lepomis sp.	10	1
				3	Lepomis sp.	13	1
				3	Lepomis sp.	11	1
				3	Etheostoma fonticola	17	1
				3	Lepomis sp.	12	1
				3	Lepomis sp.	9	1
				3	Gambusia sp.	14	1
				3	Etheostoma fonticola	35	1
				3	Lepomis macrochirus	27	1
				3	Etheostoma fonticola	15	1
				4	Etheostoma fonticola	16	1
				4	Etheostoma fonticola	12	1
				4	Etheostoma fonticola	13	1
				4	Etheostoma fonticola	31	1
				4	Etheostoma fonticola	35	1
				4	Etheostoma fonticola	35	1
				4	Etheostoma fonticola	10	1
				4	Etheostoma fonticola	13	1
				4	Etheostoma fonticola	30	1
				4	Lepomis miniatus	25	1
				4	Lepomis miniatus	51	1
				4	Lepomis miniatus	53	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2418	City Park	C2	10/15/2019	4	Etheostoma fonticola	12	1
				5	Etheostoma fonticola	12	1
				5	Lepomis miniatus	21	1
				5	Etheostoma fonticola	12	1
				5	Etheostoma fonticola	13	1
				5	Lepomis sp.	15	1
				5	Gambusia sp.	9	1
				6	Procambarus sp.		2
				6	Gambusia sp.	10	1
				6	Gambusia sp.	12	1
				6	Etheostoma fonticola	16	1
				6	Etheostoma fonticola	34	1
				6	Lepomis sp.	12	1
				7	Etheostoma fonticola	35	1
				8	Procambarus sp.		1
				9	Etheostoma fonticola	22	1
				9	Etheostoma fonticola	12	1
				9	Etheostoma fonticola	33	1
				9	Lepomis sp.	15	1
				10	No fish collected		
				11	Etheostoma fonticola	21	1
				12	No fish collected		
				13	Lepomis miniatus	60	1
				14	No fish collected		
				15	No fish collected		
2419		H1		1	Procambarus sp.		1
				2	Gambusia sp.	40	1
				2	Procambarus sp.		1
				2	Etheostoma fonticola	30	1
				2	Gambusia sp.	20	1
				2	Gambusia sp.	18	1
				2	Lepomis miniatus	80	1
				2	Gambusia sp.	9	1
				3	Gambusia sp.	37	1
				4	Lepomis miniatus	52	1
				5	No fish collected		
				6	Gambusia sp.	24	1
				6	Gambusia sp.	32	1
				6	Gambusia sp.	28	1
				6	Gambusia sp.	21	1
				6	Gambusia sp.	10	1
				6	Gambusia sp.	36	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2419	City Park	H1	10/15/2019	6	Gambusia sp.	25	1
				6	Gambusia sp.	34	1
				6	Gambusia sp.	27	1
				6	Gambusia sp.	37	1
				6	Gambusia sp.	31	1
				6	Gambusia sp.	26	1
				7	No fish collected		
				8	Gambusia sp.	15	1
				9	Etheostoma fonticola	33	1
				9	Gambusia sp.	23	1
				9	Gambusia sp.	24	1
				10	Gambusia sp.	31	1
				10	Gambusia sp.	26	1
				10	Gambusia sp.	37	1
				11	Gambusia sp.	10	1
				12	No fish collected		
				13	Etheostoma fonticola	31	1
				14	No fish collected		
				15	Gambusia sp.	26	1
				15	Gambusia sp.	26	1
2420		H2		1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2420	City Park	H2	10/15/2019	1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.	12	1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Lepomis miniatus	45	1
				1	Gambusia sp.	13	1
				1	Gambusia sp.	22	1
				1	Gambusia sp.	15	1
				1	Gambusia sp.	12	1
				1	Gambusia sp.	12	1
				1	Gambusia sp.	7	1
				1	Gambusia sp.	5	1
				1	Gambusia sp.	8	1
				1	Gambusia sp.	10	1
				1	Gambusia sp.		1
				1	Gambusia sp.	10	1
				1	Gambusia sp.	28	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2420	City Park	H2	10/15/2019	1	Poecilia latipinna	35	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	18	1
				1	Etheostoma fonticola	20	1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.	12	1
				1	Gambusia sp.	10	1
				1	Gambusia sp.	18	1
				1	Gambusia sp.	21	1
				1	Gambusia sp.	31	1
				1	Gambusia sp.	16	1
				1	Gambusia sp.	22	1
				1	Gambusia sp.	25	1
				1	Gambusia sp.	14	1
				1	Gambusia sp.	15	1
				1	Gambusia sp.	12	1
				1	Gambusia sp.	18	1
				1	Gambusia sp.	18	1
				1	Gambusia sp.	10	1
				1	Gambusia sp.	21	1
				1	Gambusia sp.	10	1
				1	Gambusia sp.	16	1
				1	Gambusia sp.	22	1
				1	Gambusia sp.	16	1
				1	Gambusia sp.	15	1
				1	Gambusia sp.	20	1
				1	Gambusia sp.	26	1
				1	Gambusia sp.	28	1
				1	Gambusia sp.	17	1
				1	Gambusia sp.	26	1
				1	Gambusia sp.		1
				1	Gambusia sp.	15	1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2420	City Park	H2	10/15/2019	1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1
				1	Gambusia sp.		1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2420	City Park	H2	10/15/2019	1	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Etheostoma fonticola	40	1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Etheostoma fonticola	25	1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Etheostoma fonticola	29	1
				2	Procambarus sp.		2
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				2	Gambusia sp.		1
				3	Gambusia sp.		1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2420	City Park	H2	10/15/2019	3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				3	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2420	City Park	H2	10/15/2019	4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Gambusia sp.		1
				4	Procambarus sp.		2
				4	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2420	City Park	H2	10/15/2019	5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				5	Gambusia sp.		1
				6	Gambusia sp.		1
				6	Lepomis gulosus	156	1
				7	Gambusia sp.		1
				7	Gambusia sp.		1
				7	Gambusia sp.		1
				7	Gambusia sp.		1
				7	Gambusia sp.		1
				8	No fish collected		
				9	Etheostoma fonticola	28	1
				10	Etheostoma fonticola	28	1
				10	Procambarus sp.		1
				10	Gambusia sp.		1
				11	Lepomis sp.	15	1
				11	Lepomis miniatus	59	1
				11	Procambarus sp.		1
				12	No fish collected		
				13	Etheostoma fonticola	31	1
				14	No fish collected		
				15	No fish collected		
2421		L1		1	Gambusia sp.	10	1
				1	Gambusia sp.	11	1
				1	Gambusia sp.	20	1
				1	Gambusia sp.	12	1
				1	Gambusia sp.	15	1
				1	Gambusia sp.	15	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2421	City Park	L1	10/15/2019	1	Gambusia sp.	13	1
				1	Gambusia sp.	15	1
				1	Gambusia sp.	12	1
				1	Gambusia sp.	11	1
				1	Gambusia sp.	10	1
				1	Lepomis miniatus	50	1
				1	Procambarus sp.		11
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	15	1
				1	Etheostoma fonticola	31	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	31	1
				1	Hypostomus plecostomus	30	1
				1	Gambusia sp.	12	1
				2	Etheostoma fonticola	27	1
				2	Gambusia sp.	10	1
				2	Gambusia sp.	12	1
				2	Gambusia sp.	12	1
				2	Etheostoma fonticola	23	1
				2	Etheostoma fonticola	32	1
				2	Etheostoma fonticola	32	1
				2	Etheostoma fonticola	18	1
				3	Procambarus sp.		1
				3	Etheostoma fonticola	24	1
				3	Etheostoma fonticola	25	1
				3	Etheostoma fonticola	27	1
				4	Procambarus sp.		1
				4	Etheostoma fonticola	27	1
				4	Etheostoma fonticola	30	1
				5	Gambusia sp.	25	1
				5	Etheostoma fonticola	27	1
				5	Etheostoma fonticola	26	1
				5	Etheostoma fonticola	28	1
				5	Procambarus sp.		4
				6	Gambusia sp.	13	1
				6	Gambusia sp.	12	1
				6	Gambusia sp.	20	1
				6	Gambusia sp.	9	1
				6	Gambusia sp.	14	1
				6	Gambusia sp.	12	1
				6	Procambarus sp.		1
				6	Etheostoma fonticola	25	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2421	City Park	L1	10/15/2019	6	Etheostoma fonticola	12	1
				6	Etheostoma fonticola	27	1
				7	No fish collected		
				8	Etheostoma fonticola	32	1
				8	Etheostoma fonticola	32	1
				8	Etheostoma fonticola	17	1
				8	Lepomis miniatus	42	1
				8	Procambarus sp.		1
				8	Gambusia sp.	11	1
				9	Procambarus sp.		3
				9	Etheostoma fonticola	31	1
				10	Etheostoma fonticola	18	1
				10	Procambarus sp.		2
				10	Gambusia sp.	16	1
				11	Etheostoma fonticola	24	1
				12	Etheostoma fonticola	29	1
				13	Etheostoma fonticola	23	1
				14	No fish collected		
				15	Procambarus sp.		1
2422		L2		1	Ameiurus natalis	35	1
				1	Procambarus sp.		11
				1	Gambusia sp.	26	1
				1	Ameiurus natalis	66	1
				1	Gambusia sp.	30	1
				1	Gambusia sp.	15	1
				1	Etheostoma fonticola	32	1
				1	Gambusia sp.	22	1
				2	Gambusia sp.	14	1
				2	Procambarus sp.		6
				2	Etheostoma fonticola	32	1
				2	Etheostoma fonticola	35	1
				2	Etheostoma fonticola	29	1
				2	Etheostoma fonticola	30	1
				2	Gambusia sp.	16	1
				3	Etheostoma fonticola	31	1
				3	Gambusia sp.	12	1
				3	Gambusia sp.	11	1
				3	Gambusia sp.	17	1
				3	Gambusia sp.	17	1
				3	Gambusia sp.	18	1
				3	Procambarus sp.		6
				3	Etheostoma fonticola	32	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2422	City Park	L2	10/15/2019	3	Ambloplites rupestris	40	1
				3	Gambusia sp.	10	1
				3	Palaemonetes sp.		1
				4	Gambusia sp.	11	1
				4	Procambarus sp.		1
				4	Gambusia sp.	16	1
				4	Gambusia sp.	16	1
				4	Gambusia sp.	15	1
				4	Gambusia sp.	17	1
				4	Gambusia sp.	32	1
				5	Procambarus sp.		2
				5	Ameiurus natalis	32	1
				6	Ambloplites rupestris	120	1
				6	Procambarus sp.		2
				7	Procambarus sp.		1
				8	Ambloplites rupestris	40	1
				9	Palaemonetes sp.		1
				9	Procambarus sp.		1
				10	Gambusia sp.	15	1
				11	Gambusia sp.	12	1
				11	Procambarus sp.		1
				12	Procambarus sp.		1
				13	Gambusia sp.	25	1
				13	Gambusia sp.	14	1
				13	Procambarus sp.		1
				14	No fish collected		
				15	No fish collected		
2423		PH1		1	Gambusia sp.	12	1
				2	Gambusia sp.	35	1
				2	Gambusia sp.	25	1
				3	Gambusia sp.	25	1
				4	No fish collected		
				5	Etheostoma fonticola	32	1
				6	Etheostoma fonticola	32	1
				7	No fish collected		
				8	Dionda nigrotaeniata	55	1
				9	No fish collected		
				10	No fish collected		
				11	No fish collected		
				12	Lepomis megalotis	83	1
				13	Lepomis megalotis	170	1
				14	Dionda nigrotaeniata	41	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2423	City Park	PH1	10/15/2019	14	Lepomis sp.	23	1
				15	No fish collected		
2424		PH2		1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2445	Upper Spring Run	R1	11/4/2019	1	Procambarus sp.		4
				1	Etheostoma fonticola	35	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	35	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	34	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	24	1
				1	Etheostoma fonticola	10	1
				1	Etheostoma fonticola	32	1
				2	Micropterus salmoides	60	1
				2	Micropterus salmoides	65	1
				2	Etheostoma fonticola	16	1
				2	Procambarus sp.		4
				2	Palaemonetes sp.		1
				2	Micropterus salmoides	70	1
				3	Etheostoma fonticola	34	1
				3	Procambarus sp.		1
				3	Palaemonetes sp.		1
				4	Etheostoma fonticola	30	1
				4	Etheostoma fonticola	26	1
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	Etheostoma fonticola	32	1
				9	Etheostoma fonticola	30	1
				9	Etheostoma fonticola	25	1
				9	Etheostoma fonticola	35	1
				9	Micropterus salmoides	95	1
				10	Palaemonetes sp.		1
				10	Etheostoma fonticola	30	1
				11	Etheostoma fonticola	32	1
				12	Etheostoma fonticola	30	1
				12	Etheostoma fonticola	35	1
				13	Etheostoma fonticola	21	1
				13	Etheostoma fonticola	32	1
				14	Etheostoma fonticola	30	1
				15	No fish collected		
2446		R2		1	Etheostoma fonticola	26	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2446	Upper Spring Run	R2	11/4/2019	1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	24	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	31	1
				1	Etheostoma fonticola	28	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	35	1
				1	Etheostoma fonticola	34	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	30	1
				1	Procambarus sp.	13	1
				1	Palaemonetes sp.		15
				1	Procambarus sp.	9	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	36	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	35	1
				1	Etheostoma fonticola	34	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	33	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	35	1
				1	Etheostoma fonticola	34	1
				2	Etheostoma fonticola	25	1
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	27	1
				2	Etheostoma fonticola	19	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	24	1
				2	Etheostoma fonticola	32	1
				2	Etheostoma fonticola	31	1
				2	Etheostoma fonticola	35	1
				2	Etheostoma fonticola	32	1
				2	Etheostoma fonticola	23	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	29	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2446	Upper Spring Run	R2	11/4/2019	2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	14	1
				2	Procambarus sp.		23
				2	Palaemonetes sp.		12
				2	Etheostoma fonticola	34	1
				3	Etheostoma fonticola	32	1
				3	Etheostoma fonticola	31	1
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	35	1
				3	Etheostoma fonticola	28	1
				3	Etheostoma fonticola	31	1
				3	Etheostoma fonticola	33	1
				3	Etheostoma fonticola	32	1
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	32	1
				3	Procambarus sp.		7
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	27	1
				3	Etheostoma fonticola	22	1
				3	Etheostoma fonticola	30	1
				3	Palaemonetes sp.		5
				4	Etheostoma fonticola	35	1
				4	Etheostoma fonticola	32	1
				4	Etheostoma fonticola	28	1
				5	Etheostoma fonticola	16	1
				5	Palaemonetes sp.		1
				5	Etheostoma fonticola	31	1
				5	Etheostoma fonticola	35	1
				5	Etheostoma fonticola	25	1
				5	Etheostoma fonticola	32	1
				6	Procambarus sp.		6
				6	Etheostoma fonticola	25	1
				6	Etheostoma fonticola	32	1
				6	Etheostoma fonticola	32	1
				6	Etheostoma fonticola	19	1
				6	Etheostoma fonticola	32	1
				6	Lepomis sp.	16	1
				6	Palaemonetes sp.		3
				6	Micropterus salmoides	50	1
				7	Etheostoma fonticola	15	1
				7	Etheostoma fonticola	20	1
				7	Etheostoma fonticola	31	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2446	Upper Spring Run	R2	11/4/2019	7	Procambarus sp.		1
				8	Etheostoma fonticola	16	1
				8	Etheostoma fonticola	18	1
				8	Etheostoma fonticola	15	1
				8	Etheostoma fonticola	17	1
				8	Etheostoma fonticola	35	1
				8	Procambarus sp.		3
				9	Palaemonetes sp.		1
				9	Etheostoma fonticola	32	1
				10	Procambarus sp.		1
				10	Etheostoma fonticola	16	1
				10	Etheostoma fonticola	28	1
				11	Etheostoma fonticola	19	1
				11	Etheostoma fonticola	35	1
				11	Etheostoma fonticola	32	1
				11	Etheostoma fonticola	24	1
				11	Palaemonetes sp.		3
				11	Procambarus sp.		1
				12	Palaemonetes sp.		1
				12	Etheostoma fonticola	22	1
				12	Etheostoma fonticola	22	1
				12	Etheostoma fonticola	32	1
				13	Etheostoma fonticola	32	1
				13	Procambarus sp.		1
				13	Etheostoma fonticola	32	1
				14	Palaemonetes sp.		1
				15	No fish collected		
2447		O1		1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	Etheostoma fonticola	14	1
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2448	Upper Spring Run	O2	11/4/2019	1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
2449		L1		1	Palaemonetes sp.		1
				1	Etheostoma fonticola	15	1
				2	Micropterus salmoides	61	1
				2	Procambarus sp.		1
				2	Micropterus salmoides	50	1
				3	Lepomis miniatus	25	1
				3	Micropterus salmoides	38	1
				4	No fish collected		
				5	No fish collected		
				6	Lepomis miniatus	25	1
				6	Lepomis miniatus	25	1
				6	Lepomis miniatus	37	1
				7	No fish collected		
				8	No fish collected		
				9	Lepomis sp.	15	1
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2450		L2		1	Dionda nigrotaeniata	35	1
				1	Dionda nigrotaeniata	30	1
				1	Dionda nigrotaeniata	35	1
				1	Dionda nigrotaeniata	40	1
				1	Dionda nigrotaeniata	30	1
				1	Dionda nigrotaeniata	46	1
				1	Dionda nigrotaeniata	44	1
				1	Dionda nigrotaeniata	32	1
				1	Dionda nigrotaeniata	39	1
				1	Dionda nigrotaeniata	24	1
				1	Dionda nigrotaeniata	35	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2450	Upper Spring Run	L2	11/4/2019	1	Herichthys cyanoguttatus	25	1
				1	Etheostoma fonticola	12	1
				1	Dionda nigrotaeniata	45	1
				2	Procambarus sp.		1
				2	Herichthys cyanoguttatus	26	1
				2	Micropterus salmoides	48	1
				3	Dionda nigrotaeniata	25	1
				3	Dionda nigrotaeniata	45	1
				3	Dionda nigrotaeniata	47	1
				3	Dionda nigrotaeniata	30	1
				3	Dionda nigrotaeniata	35	1
				3	Procambarus sp.		1
				4	Dionda nigrotaeniata	50	1
				4	Dionda nigrotaeniata	40	1
				4	Lepomis sp.	20	1
				4	Procambarus sp.		1
				5	Dionda nigrotaeniata	28	1
				5	Etheostoma fonticola	34	1
				6	Dionda nigrotaeniata	40	1
				7	No fish collected		
				8	Procambarus sp.		1
				8	Dionda nigrotaeniata	50	1
				9	Procambarus sp.		1
				9	Dionda nigrotaeniata	36	1
				9	Dionda nigrotaeniata	46	1
				10	Dionda nigrotaeniata	40	1
				10	Dionda nigrotaeniata	45	1
				11	Dionda nigrotaeniata	40	1
				12	Procambarus sp.		1
				12	Dionda nigrotaeniata	30	1
				12	Dionda nigrotaeniata	25	1
				12	Etheostoma fonticola	30	1
				12	Etheostoma fonticola	33	1
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2451		S1		1	Micropterus salmoides	40	1
				1	Lepomis miniatus	75	1
				1	Lepomis miniatus	57	1
				1	Micropterus salmoides	32	1
				2	Procambarus sp.		1
				3	No fish collected		

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2451	Upper Spring Run	S1	11/4/2019	4	No fish collected		
				5	Lepomis miniatus	70	1
				5	Dionda nigrotaeniata	33	1
				6	No fish collected		
				7	Lepomis miniatus	35	1
				8	Procambarus sp.		1
				9	No fish collected		
				10	Micropterus salmoides	46	1
				11	Lepomis miniatus	32	1
				11	Lepomis miniatus	75	1
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2452		S2		1	Lepomis miniatus	37	1
				1	Lepomis miniatus	32	1
				2	Lepomis miniatus	90	1
				3	Lepomis miniatus	55	1
				4	Procambarus sp.		1
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
				11	No fish collected		
				12	Micropterus salmoides	125	1
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2453	Landa Lake	R1		1	Gambusia sp.	10	1
				1	Procambarus sp.		3
				1	Palaemonetes sp.		5
				1	Gambusia sp.	9	1
				1	Etheostoma fonticola	29	1
				1	Gambusia sp.	10	1
				1	Gambusia sp.	10	1
				1	Gambusia sp.	18	1
				1	Gambusia sp.	12	1
				1	Gambusia sp.	15	1
				1	Gambusia sp.	18	1
				1	Etheostoma fonticola	25	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2453	Landa Lake	R1	11/4/2019	1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	35	1
				1	Etheostoma fonticola	28	1
				1	Etheostoma fonticola	22	1
				1	Etheostoma fonticola	35	1
				1	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	34	1
				2	Procambarus sp.		6
				2	Gambusia sp.	25	1
				2	Etheostoma fonticola	22	1
				2	Etheostoma fonticola	24	1
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	12	1
				3	Etheostoma fonticola	10	1
				3	Procambarus sp.		2
				3	Palaemonetes sp.		3
				3	Gambusia sp.	13	1
				3	Gambusia sp.	12	1
				3	Etheostoma fonticola	27	1
				3	Etheostoma fonticola	26	1
				3	Etheostoma fonticola	25	1
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	27	1
				3	Etheostoma fonticola	28	1
				3	Gambusia sp.	14	1
				4	Palaemonetes sp.		2
				4	Etheostoma fonticola	11	1
				4	Gambusia sp.	12	1
				4	Etheostoma fonticola	10	1
				4	Etheostoma fonticola	30	1
				4	Etheostoma fonticola	28	1
				4	Procambarus sp.		3
				4	Etheostoma fonticola	26	1
				4	Etheostoma fonticola	26	1
				5	Etheostoma fonticola	33	1
				5	Etheostoma fonticola	27	1
				5	Etheostoma fonticola	26	1
				5	Etheostoma fonticola	22	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2453	Landa Lake	R1	11/4/2019	5	Etheostoma fonticola	26	1
				5	Etheostoma fonticola	30	1
				5	Procambarus sp.		1
				5	Etheostoma fonticola	30	1
				5	Etheostoma fonticola	27	1
				6	Procambarus sp.		2
				6	Etheostoma fonticola	25	1
				6	Etheostoma fonticola	23	1
				6	Etheostoma fonticola	21	1
				6	Etheostoma fonticola	23	1
				7	Etheostoma fonticola	28	1
				7	Gambusia sp.	18	1
				7	Procambarus sp.		2
				8	Etheostoma fonticola	27	1
				8	Etheostoma fonticola	32	1
				8	Procambarus sp.		1
				9	Etheostoma fonticola	25	1
				9	Gambusia sp.	8	1
				9	Procambarus sp.		2
				9	Etheostoma fonticola	24	1
				9	Etheostoma fonticola	22	1
				9	Etheostoma fonticola	26	1
				9	Etheostoma fonticola	26	1
				9	Etheostoma fonticola	26	1
				10	Etheostoma fonticola	18	1
				10	Procambarus sp.		1
				11	Procambarus sp.		1
				11	Etheostoma fonticola	32	1
				11	Etheostoma fonticola	15	1
				12	Palaemonetes sp.		1
				13	Gambusia sp.	19	1
				14	Etheostoma fonticola	30	1
				14	Etheostoma fonticola	25	1
				15	No fish collected		
2454		R2		1	Etheostoma fonticola	23	1
				1	Etheostoma fonticola	24	1
				1	Procambarus sp.		6
				1	Etheostoma fonticola	31	1
				1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	23	1
				1	Etheostoma fonticola	32	1
				2	Procambarus sp.		12

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2454	Landa Lake	R2	11/4/2019	2	Etheostoma fonticola	33	1
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	22	1
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	21	1
				2	Etheostoma fonticola	26	1
				3	Etheostoma fonticola	21	1
				3	Gambusia sp.	15	1
				3	Procambarus sp.		3
				3	Etheostoma fonticola	26	1
				3	Etheostoma fonticola	22	1
				3	Etheostoma fonticola	16	1
				3	Etheostoma fonticola	22	1
				3	Etheostoma fonticola	31	1
				3	Etheostoma fonticola	25	1
				4	Etheostoma fonticola	15	1
				4	Palaemonetes sp.		4
				4	Procambarus sp.		12
				4	Etheostoma fonticola	28	1
				4	Etheostoma fonticola	25	1
				4	Etheostoma fonticola	18	1
				4	Etheostoma fonticola	28	1
				4	Etheostoma fonticola	17	1
				4	Etheostoma fonticola	11	1
				4	Etheostoma fonticola	28	1
				4	Etheostoma fonticola	20	1
				4	Etheostoma fonticola	26	1
				4	Etheostoma fonticola	28	1
				4	Etheostoma fonticola	28	1
				4	Etheostoma fonticola	17	1
				5	Etheostoma fonticola	19	1
				5	Palaemonetes sp.		2
				5	Procambarus sp.		3
				5	Etheostoma fonticola	26	1
				5	Etheostoma fonticola	16	1
				5	Etheostoma fonticola	29	1
				5	Etheostoma fonticola	22	1
				5	Etheostoma fonticola	25	1
				5	Etheostoma fonticola	12	1
				6	Etheostoma fonticola	26	1
				6	Etheostoma fonticola	20	1
				6	Etheostoma fonticola	26	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2454	Landa Lake	R2	11/4/2019	6	Etheostoma fonticola	28	1
				6	Etheostoma fonticola	26	1
				6	Etheostoma fonticola	30	1
				6	Etheostoma fonticola	30	1
				6	Etheostoma fonticola	25	1
				6	Etheostoma fonticola	25	1
				6	Etheostoma fonticola	30	1
				6	Etheostoma fonticola	22	1
				6	Etheostoma fonticola	15	1
				7	Etheostoma fonticola	30	1
				7	Etheostoma fonticola	30	1
				7	Etheostoma fonticola	11	1
				8	Etheostoma fonticola	32	1
				8	Etheostoma fonticola	16	1
				8	Etheostoma fonticola	27	1
				8	Procambarus sp.		3
				9	Etheostoma fonticola	22	1
				10	Etheostoma fonticola	34	1
				10	Etheostoma fonticola	22	1
				10	Etheostoma fonticola	30	1
				10	Etheostoma fonticola	28	1
				10	Etheostoma fonticola	28	1
				10	Etheostoma fonticola	28	1
				10	Etheostoma fonticola	30	1
				10	Etheostoma fonticola	28	1
				10	Etheostoma fonticola	26	1
				10	Procambarus sp.		2
				11	Procambarus sp.		1
				12	Etheostoma fonticola	34	1
				13	Procambarus sp.		1
				14	Etheostoma fonticola	30	1
				15	Etheostoma fonticola	18	1
				16	No fish collected		
2455		V1	11/5/2019	1	Etheostoma fonticola	22	1
				1	Procambarus sp.		5
				1	Lepomis miniatus	21	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	25	1
				2	Procambarus sp.		4
				3	No fish collected		
				4	Lepomis miniatus	35	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2455	Landa Lake	V1	11/5/2019	5	No fish collected		
				6	No fish collected		
				7	Procambarus sp.		2
				8	Procambarus sp.		1
				9	Lepomis miniatus	110	1
				9	Procambarus sp.		3
				10	No fish collected		
				11	No fish collected		
				12	Procambarus sp.		2
				13	No fish collected		
				14	Procambarus sp.		1
				15	No fish collected		
2456		V2	11/4/2019	1	Procambarus sp.		6
				1	Palaemonetes sp.		1
				1	Lepomis miniatus	63	1
				1	Etheostoma fonticola	35	1
				2	Procambarus sp.		3
				2	Lepomis miniatus	17	1
				2	Lepomis miniatus	30	1
				2	Lepomis miniatus	20	1
				2	Palaemonetes sp.		2
				2	Lepomis miniatus	25	1
				2	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	30	1
				3	Procambarus sp.		4
				4	Lepomis miniatus	24	1
				4	Procambarus sp.		4
				4	Lepomis miniatus	75	1
				4	Lepomis miniatus	56	1
				5	Procambarus sp.		1
				6	Palaemonetes sp.		1
				6	Procambarus sp.		4
				7	Procambarus sp.		1
				8	Procambarus sp.		4
				9	Lepomis miniatus	84	1
				9	Procambarus sp.		1
				9	Palaemonetes sp.		1
				10	Etheostoma fonticola	24	1
				10	Lepomis miniatus	87	1
				11	No fish collected		
				12	Palaemonetes sp.		1
				13	Procambarus sp.		2

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2456	Landa Lake	V2	11/4/2019	14	Procambarus sp.		4
				14	Lepomis miniatus	75	1
				15	Lepomis miniatus	30	1
				15	Procambarus sp.		3
2457		S1	11/5/2019	1	Etheostoma fonticola	24	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	31	1
				1	Etheostoma fonticola	29	1
				1	Etheostoma fonticola	31	1
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	30	1
				1	Procambarus sp.		5
				1	Lepomis miniatus	35	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	28	1
				2	Etheostoma fonticola	22	1
				2	Palaemonetes sp.		8
				2	Etheostoma fonticola	27	1
				2	Procambarus sp.		8
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	24	1
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	21	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	20	1
				2	Etheostoma fonticola	31	1
				3	Etheostoma fonticola	27	1
				3	Etheostoma fonticola	31	1
				3	Palaemonetes sp.		6
				3	Procambarus sp.		12
				3	Etheostoma fonticola	23	1
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	28	1
				3	Etheostoma fonticola	29	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2457	Landa Lake	S1	11/5/2019	3	Etheostoma fonticola	27	1
				3	Etheostoma fonticola	25	1
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	21	1
				4	Palaemonetes sp.		1
				4	Procambarus sp.		9
				4	Etheostoma fonticola	30	1
				4	Etheostoma fonticola	23	1
				4	Lepomis miniatus	22	1
				5	Procambarus sp.		1
				5	Etheostoma fonticola	27	1
				5	Etheostoma fonticola	30	1
				5	Etheostoma fonticola	25	1
				5	Etheostoma fonticola	29	1
				5	Etheostoma fonticola	27	1
				5	Etheostoma fonticola	22	1
				5	Palaemonetes sp.		3
				5	Etheostoma fonticola	30	1
				6	Procambarus sp.		4
				6	Lepomis miniatus	22	1
				6	Etheostoma fonticola	28	1
				6	Etheostoma fonticola	30	1
				6	Etheostoma fonticola	27	1
				7	Etheostoma fonticola	18	1
				7	Palaemonetes sp.		1
				7	Etheostoma fonticola	26	1
				7	Etheostoma fonticola	20	1
				7	Procambarus sp.		6
				7	Lepomis miniatus	24	1
				8	Procambarus sp.		5
				8	Etheostoma fonticola	31	1
				8	Etheostoma fonticola	31	1
				8	Palaemonetes sp.		1
				9	Etheostoma fonticola	27	1
				9	Etheostoma fonticola	25	1
				9	Etheostoma fonticola	23	1
				9	Etheostoma fonticola	25	1
				9	Procambarus sp.		2
				9	Etheostoma fonticola	30	1
				10	Palaemonetes sp.		2
				10	Procambarus sp.		3

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2457	Landa Lake	S1	11/5/2019	10	Etheostoma fonticola	33	1
				10	Etheostoma fonticola	32	1
				10	Etheostoma fonticola	30	1
				10	Etheostoma fonticola	28	1
				10	Etheostoma fonticola	25	1
				11	Etheostoma fonticola	30	1
				11	Etheostoma fonticola	32	1
				11	Procambarus sp.		3
				12	Procambarus sp.		2
				12	Etheostoma fonticola	27	1
				12	Etheostoma fonticola	30	1
				13	Procambarus sp.		6
				14	Procambarus sp.		1
				15	Etheostoma fonticola	31	1
				15	Etheostoma fonticola	26	1
				16	No fish collected		
2458		S2		1	Lepomis miniatus	35	1
				1	Procambarus sp.		1
				2	Procambarus sp.		1
				3	Micropterus salmoides	80	1
				3	Procambarus sp.		5
				4	Lepomis miniatus	88	1
				4	Lepomis miniatus	81	1
				4	Procambarus sp.		2
				5	Procambarus sp.		1
				6	No fish collected		
				7	Etheostoma fonticola	26	1
				7	Procambarus sp.		1
				8	Procambarus sp.		1
				9	No fish collected		
				10	Lepomis miniatus	42	1
				10	Procambarus sp.		2
				11	Procambarus sp.		2
				11	Marisa cornuarietis	40	1
				12	Etheostoma fonticola	29	1
				13	No fish collected		
				14	Procambarus sp.		1
				15	No fish collected		
2459		C1	11/4/2019	1	Etheostoma fonticola	33	1
				1	Etheostoma fonticola	19	1
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	29	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2459	Landa Lake	C1	11/4/2019	2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	35	1
				2	Etheostoma fonticola	35	1
				2	Etheostoma lepidum	36	1
				2	Procambarus sp.		4
				2	Palaemonetes sp.		2
				2	Etheostoma fonticola	31	1
				3	Etheostoma fonticola	22	1
				3	Etheostoma fonticola	32	1
				3	Etheostoma fonticola	28	1
				3	Etheostoma fonticola	35	1
				3	Etheostoma fonticola	31	1
				4	Etheostoma fonticola	24	1
				4	Etheostoma fonticola	32	1
				4	Etheostoma fonticola	26	1
				4	Etheostoma fonticola	26	1
				4	Etheostoma fonticola	30	1
				4	Etheostoma fonticola	32	1
				4	Etheostoma fonticola	26	1
				5	Etheostoma fonticola	17	1
				5	Etheostoma fonticola	22	1
				5	Procambarus sp.		2
				5	Etheostoma fonticola	20	1
				6	Etheostoma fonticola	26	1
				6	Etheostoma fonticola	27	1
				6	Etheostoma fonticola	30	1
				6	Etheostoma fonticola	27	1
				7	Etheostoma fonticola	30	1
				7	Procambarus sp.		1
				7	Palaemonetes sp.		1
				8	Etheostoma fonticola	30	1
				9	No fish collected		
				10	Etheostoma fonticola	25	1
				10	Etheostoma fonticola	26	1
				10	Procambarus sp.		1
				10	Etheostoma fonticola	30	1
				11	Etheostoma fonticola	30	1
				11	Etheostoma fonticola	25	1
				11	Etheostoma fonticola	25	1
				12	Etheostoma fonticola	24	1
				12	Etheostoma fonticola	15	1
				13	No fish collected		

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2459	Landa Lake	C1	11/4/2019	14	Etheostoma fonticola	24	1
				14	Procambarus sp.		2
				15	Procambarus sp.		1
2460		C2		1	Lepomis miniatus	84	1
				1	Lepomis miniatus	42	1
				2	Lepomis miniatus	35	1
				3	No fish collected		
				4	No fish collected		
				5	Lepomis miniatus	25	1
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2461		O1	11/5/2019	1	Lepomis miniatus	28	1
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2462		O2		1	Procambarus sp.		1
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2462	Landa Lake	O2	11/5/2019	9	No fish collected		
				10	No fish collected		
2463		L2		1	No fish collected		
				2	Palaemonetes sp.		1
				3	Palaemonetes sp.		1
				4	Etheostoma fonticola	15	1
				5	Procambarus sp.		1
				6	Procambarus sp.		1
				7	No fish collected		
				7	No fish collected		
				8	Procambarus sp.		1
				8	Procambarus sp.		1
				9	No fish collected		
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	Procambarus sp.		1
				15	No fish collected		
2464		L1		1	Etheostoma fonticola	30	1
				1	Gambusia sp.	33	1
				1	Lepomis miniatus	32	1
				1	Palaemonetes sp.		5
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	25	1
				2	Etheostoma fonticola	25	1
				2	Micropterus salmoides	50	1
				2	Lepomis miniatus	30	1
				2	Procambarus sp.		2
				2	Palaemonetes sp.		9
				3	Etheostoma fonticola	23	1
				3	Etheostoma fonticola	26	1
				3	Etheostoma fonticola	23	1
				3	Etheostoma fonticola	21	1
				3	Etheostoma fonticola	35	1
				3	Etheostoma fonticola	23	1
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	21	1
				4	Palaemonetes sp.		6
				4	Procambarus sp.		1
				5	Etheostoma fonticola	25	1
				5	Etheostoma fonticola	30	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2464	Landa Lake	L1	11/5/2019	5	Lepomis miniatus	26	1
				6	Palaemonetes sp.		5
				6	Etheostoma fonticola	31	1
				6	Procambarus sp.		1
				7	Gambusia sp.	32	1
				7	Etheostoma fonticola	31	1
				8	Etheostoma fonticola	27	1
				8	Palaemonetes sp.		1
				8	Etheostoma fonticola	25	1
				9	Procambarus sp.		1
				10	Procambarus sp.		1
				11	Etheostoma fonticola	21	1
				11	Procambarus sp.		2
				11	Etheostoma fonticola	26	1
				12	Etheostoma fonticola	17	1
				12	Procambarus sp.		1
				12	Palaemonetes sp.		4
				12	Etheostoma fonticola	30	1
				13	Etheostoma fonticola	25	1
				13	Etheostoma fonticola	27	1
				13	Etheostoma fonticola	29	1
				14	Palaemonetes sp.		1
				14	Etheostoma fonticola	33	1
				14	Etheostoma fonticola	20	1
				14	Etheostoma fonticola	24	1
				15	Etheostoma fonticola	33	1
				16	No fish collected		
2465	Old Channel Reac	C2		1	Etheostoma fonticola	28	1
				1	Palaemonetes sp.		11
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	33	1
				1	Etheostoma fonticola	26	1
				1	Gambusia sp.	17	1
				2	Etheostoma fonticola	26	1
				2	Gambusia sp.	16	1
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	31	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	21	1
				2	Etheostoma fonticola	27	1
				2	Etheostoma fonticola	27	1
				2	Etheostoma fonticola	14	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2465	Old Channel Reac	C2	11/5/2019	2	Etheostoma fonticola	29	1
				2	Palaemonetes sp.		5
				3	Etheostoma fonticola	22	1
				3	Procambarus sp.		1
				3	Palaemonetes sp.		3
				4	Procambarus sp.		2
				4	Etheostoma fonticola	26	1
				4	Etheostoma fonticola	27	1
				4	Etheostoma fonticola	30	1
				4	Gambusia sp.	12	1
				5	Gambusia sp.	19	1
				5	Etheostoma fonticola	26	1
				5	Etheostoma fonticola	25	1
				6	Etheostoma fonticola	28	1
				6	Etheostoma fonticola	27	1
				6	Etheostoma fonticola	29	1
				7	Etheostoma fonticola	29	1
				7	Etheostoma fonticola	20	1
				8	Procambarus sp.		1
				8	Palaemonetes sp.		3
				9	Palaemonetes sp.		1
				10	No fish collected		
				11	Procambarus sp.		2
				11	Palaemonetes sp.		1
				12	No fish collected		
				13	Etheostoma fonticola	21	1
				13	Etheostoma fonticola	28	1
				13	Procambarus sp.		2
				14	No fish collected		
				15	No fish collected		
2466		C1		1	Palaemonetes sp.		15
				1	Etheostoma fonticola	28	1
				1	Lepomis miniatus	30	1
				1	Etheostoma fonticola	24	1
				1	Etheostoma fonticola	21	1
				1	Etheostoma fonticola	25	1
				1	Procambarus sp.		10
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	29	1
				1	Etheostoma fonticola	29	1
				2	Etheostoma fonticola	27	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2466	Old Channel Reac	C1	11/5/2019	2	Etheostoma fonticola	24	1
				2	Etheostoma fonticola	25	1
				2	Etheostoma fonticola	23	1
				2	Etheostoma fonticola	27	1
				2	Palaemonetes sp.		14
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	26	1
				2	Procambarus sp.		6
				2	Etheostoma fonticola	26	1
				3	Astyanax mexicanus	26	1
				3	Etheostoma fonticola	26	1
				3	Etheostoma fonticola	25	1
				3	Palaemonetes sp.		3
				3	Etheostoma fonticola	32	1
				4	Palaemonetes sp.		3
				4	Etheostoma fonticola	30	1
				4	Etheostoma fonticola	28	1
				5	Etheostoma fonticola	24	1
				5	Etheostoma fonticola	30	1
				5	Etheostoma fonticola	26	1
				5	Palaemonetes sp.		3
				5	Procambarus sp.		4
				5	Etheostoma fonticola	28	1
				5	Etheostoma fonticola	24	1
				5	Etheostoma fonticola	26	1
				6	Palaemonetes sp.		1
				6	Etheostoma fonticola	26	1
				6	Etheostoma fonticola	26	1
				6	Procambarus sp.		3
				7	Etheostoma fonticola	31	1
				8	No fish collected		
				9	Procambarus sp.		1
				10	Etheostoma fonticola	31	1
				11	No fish collected		
				12	Etheostoma fonticola	30	1
				13	No fish collected		
				14	Etheostoma fonticola	25	1
				14	Procambarus sp.		1
				15	Procambarus sp.		1
2467		O1		1	No fish collected		
				2	No fish collected		
				3	No fish collected		

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2467	Old Channel Reac	O1	11/5/2019	4	Notropis amabilis	29	1
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2468		O2		1	Procambarus sp.		1
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
2469		L1		1	Procambarus sp.		5
				1	Palaemonetes sp.		5
				1	Etheostoma fonticola	31	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	31	1
				2	Etheostoma fonticola	30	1
				2	Palaemonetes sp.		3
				2	Lepomis miniatus	51	1
				2	Etheostoma fonticola	30	1
				2	Procambarus sp.		2
				3	Procambarus sp.		1
				3	Palaemonetes sp.		3
				3	Etheostoma fonticola	30	1
				4	Procambarus sp.		1
				5	No fish collected		
				6	Herichthys cyanoguttatus	28	1
				6	Etheostoma fonticola	22	1
				6	Etheostoma fonticola	30	1
				6	Lepomis miniatus	36	1
				7	No fish collected		

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2469	Old Channel Reac	L1	11/5/2019	8	Palaemonetes sp.		1
				9	Etheostoma fonticola	25	1
				10	Etheostoma fonticola	23	1
				11	Procambarus sp.		1
				12	No fish collected		
				13	Etheostoma fonticola	33	1
				13	Etheostoma fonticola	26	1
				14	No fish collected		
				15	No fish collected		
2470		L2		1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
2471		R1		1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	31	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	24	1
				1	Etheostoma fonticola	20	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	31	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	30	1
				1	Palaemonetes sp.		3
				1	Procambarus sp.		7
				1	Gambusia sp.	30	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	29	1
				1	Etheostoma fonticola	24	1
				1	Etheostoma fonticola	32	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2471	Old Channel Reac	R1	11/5/2019	1	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	25	1
				2	Procambarus sp.		7
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	31	1
				2	Etheostoma fonticola	32	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	26	1
				2	Etheostoma fonticola	30	1
				2	Etheostoma fonticola	21	1
				3	Palaemonetes sp.		2
				3	Etheostoma fonticola	25	1
				3	Etheostoma fonticola	27	1
				3	Etheostoma fonticola	24	1
				3	Etheostoma fonticola	29	1
				3	Etheostoma fonticola	30	1
				3	Etheostoma fonticola	27	1
				3	Procambarus sp.		12
				4	Procambarus sp.		6
				4	Etheostoma fonticola	28	1
				4	Etheostoma fonticola	30	1
				4	Etheostoma fonticola	31	1
				5	Etheostoma fonticola	29	1
				5	Etheostoma fonticola	30	1
				5	Etheostoma fonticola	27	1
				5	Lepomis miniatus	38	1
				5	Etheostoma fonticola	32	1
				6	Etheostoma fonticola	27	1
				6	Procambarus sp.		2
				7	Etheostoma fonticola	31	1
				7	Etheostoma fonticola	35	1
				7	Etheostoma fonticola	25	1
				8	Procambarus sp.		5
				9	Etheostoma fonticola	30	1
				9	Etheostoma fonticola	29	1
				10	Etheostoma fonticola	31	1
				10	Etheostoma fonticola	30	1
				10	Procambarus sp.		2
				11	Etheostoma fonticola	28	1
				11	Etheostoma fonticola	29	1
				11	Etheostoma fonticola	26	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2471	Old Channel Reac	R1	11/5/2019	11	Procambarus sp.		2
				12	Procambarus sp.		2
				13	Procambarus sp.		2
				14	Etheostoma fonticola	25	1
				15	Herichthys cyanoguttatus	44	1
				15	Etheostoma fonticola	34	1
				16	Procambarus sp.		1
2472		R2		1	Etheostoma fonticola	29	1
				1	Palaemonetes sp.		1
				1	Procambarus sp.		3
				1	Etheostoma fonticola	32	1
				1	Etheostoma fonticola	29	1
				1	Etheostoma fonticola	25	1
				1	Etheostoma fonticola	27	1
				1	Etheostoma fonticola	11	1
				1	Etheostoma fonticola	32	1
				2	Gambusia sp.	28	1
				2	Procambarus sp.		1
				2	Etheostoma fonticola	21	1
				2	Etheostoma fonticola	26	1
				2	Palaemonetes sp.		1
				3	Etheostoma fonticola	28	1
				3	Procambarus sp.		6
				4	Etheostoma fonticola	25	1
				4	Etheostoma fonticola	28	1
				5	No fish collected		
				6	No fish collected		
				7	Etheostoma fonticola	31	1
				7	Etheostoma fonticola	25	1
				8	Procambarus sp.		4
				9	Etheostoma fonticola	25	1
				9	Procambarus sp.		3
				9	Etheostoma fonticola	24	1
				10	Procambarus sp.		2
				10	Etheostoma fonticola	30	1
				11	No fish collected		
				12	No fish collected		
				13	Etheostoma fonticola	27	1
				13	Procambarus sp.		3
				14	No fish collected		
				15	Procambarus sp.		3
2473	Upper New Chan	R1	11/6/2019	1	Etheostoma fonticola	35	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2473	Upper New Chan	R1	11/6/2019	1	Procambarus sp.		8
				2	Etheostoma fonticola	29	1
				2	Gambusia sp.	22	1
				2	Procambarus sp.		20
				3	Procambarus sp.		7
				4	Procambarus sp.		3
				5	Procambarus sp.		5
				6	No fish collected		
				7	No fish collected		
				8	Procambarus sp.		3
				9	Procambarus sp.		1
				10	Procambarus sp.		1
				11	Palaemonetes sp.		1
				11	Procambarus sp.		2
				12	Procambarus sp.		7
				13	Procambarus sp.		2
				14	Procambarus sp.		2
				15	No fish collected		
2474		R2		1	Palaemonetes sp.		4
				1	Procambarus sp.		6
				1	Etheostoma fonticola	26	1
				1	Etheostoma fonticola	30	1
				1	Etheostoma fonticola	23	1
				1	Etheostoma fonticola	22	1
				1	Gambusia sp.	21	1
				1	Etheostoma fonticola	18	1
				2	Etheostoma fonticola	30	1
				2	Procambarus sp.		2
				3	Procambarus sp.		2
				4	Procambarus sp.		1
				5	Palaemonetes sp.		1
				5	Etheostoma fonticola	36	1
				6	Procambarus sp.		3
				7	Etheostoma lepidum	70	1
				7	Lepomis sp.	11	1
				7	Etheostoma fonticola	25	1
				7	Etheostoma fonticola	28	1
				7	Etheostoma fonticola	26	1
				8	Procambarus sp.		2
				9	No fish collected		
				10	Etheostoma fonticola	25	1
				10	Procambarus sp.		2

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2474	Upper New Chan	R2	11/6/2019	10	Palaemonetes sp.		1
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2475		H1		1	Palaemonetes sp.		8
				1	Lepomis miniatus	70	1
				1	Gambusia sp.	9	1
				1	Gambusia sp.	12	1
				1	Procambarus sp.		2
				1	Etheostoma fonticola	22	1
				2	Palaemonetes sp.		6
				2	Procambarus sp.		4
				3	No fish collected		
				4	Palaemonetes sp.		2
				4	Etheostoma fonticola	23	1
				4	Procambarus sp.		1
				5	Procambarus sp.		2
				6	Procambarus sp.		1
				7	No fish collected		
				8	Etheostoma fonticola	19	1
				8	Palaemonetes sp.		3
				8	Procambarus sp.		3
				8	Gambusia sp.	15	1
				8	Gambusia sp.	14	1
				8	Etheostoma fonticola	15	1
				8	Etheostoma fonticola	24	1
				8	Ameiurus natalis	33	1
				9	Gambusia sp.	10	1
				9	Procambarus sp.		2
				10	No fish collected		
				11	Gambusia sp.	13	1
				12	Procambarus sp.		2
				13	Lepomis gulosus	72	1
				14	Palaemonetes sp.		3
				15	Etheostoma fonticola	25	1
				15	Procambarus sp.		2
				16	No fish collected		
2476		H2		1	Gambusia sp.	28	1
				1	Gambusia sp.	20	1
				1	Gambusia sp.	11	1

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2476	Upper New Chan	H2	11/6/2019	1	Palaemonetes sp.		1
				1	Gambusia sp.	18	1
				1	Gambusia sp.	20	1
				1	Herichthys cyanoguttatus	52	1
				2	Palaemonetes sp.		2
				3	Gambusia sp.	14	1
				4	Etheostoma fonticola	28	1
				5	Gambusia sp.	9	1
				6	No fish collected		
				7	Procambarus sp.		1
				8	No fish collected		
				9	Procambarus sp.		1
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2477		C1		1	Etheostoma fonticola	25	1
				1	Palaemonetes sp.		1
				2	Lepomis macrochirus	30	1
				2	Lepomis macrochirus	37	1
				3	Etheostoma fonticola	15	1
				3	Procambarus sp.		1
				3	Palaemonetes sp.		2
				3	Lepomis macrochirus	30	1
				4	Herichthys cyanoguttatus	30	1
				4	Etheostoma fonticola	24	1
				5	Herichthys cyanoguttatus	28	1
				5	Etheostoma fonticola	23	1
				5	Herichthys cyanoguttatus	42	1
				6	Palaemonetes sp.		1
				7	Etheostoma fonticola	24	1
				7	Etheostoma fonticola	19	1
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
				11	Etheostoma fonticola	20	1
				11	Etheostoma fonticola	30	1
				11	Etheostoma fonticola	24	1
				12	No fish collected		
				13	No fish collected		

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2477	Upper New Chan	C1	11/6/2019	14	No fish collected		
				15	Procambarus sp.		2
2478		C2		1	Etheostoma fonticola	33	1
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	Etheostoma fonticola	19	1
				6	Procambarus sp.		1
				7	No fish collected		
				8	Etheostoma fonticola	17	1
				9	No fish collected		
				10	Procambarus sp.		1
				11	Etheostoma fonticola	20	1
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		
				15	No fish collected		
2479		O1		1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	No fish collected		
				7	No fish collected		
				8	No fish collected		
				9	No fish collected		
				10	No fish collected		
2480		O2		1	No fish collected		
				2	No fish collected		
				3	No fish collected		
				4	No fish collected		
				5	No fish collected		
				6	Gambusia sp.	20	1
				7	No fish collected		
				8	No fish collected		
				9	Procambarus sp.		1
				10	No fish collected		
				11	No fish collected		
				12	No fish collected		
				13	No fish collected		
				14	No fish collected		

SiteCode	Reach	Site_No	Date	Dip_Net	Species	Length	Count
2480	Upper New Chan	O2	11/6/2019	15	No fish collected		