HABITAT CONSERVATION PLAN

BIOLOGICAL MONITORING PROGRAM

Comal Springs / River Aquatic Ecosystem

ANNUAL REPORT

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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

A variety of continued monitoring activities were conducted in the Comal Springs/River ecosystem in 2018 as part of the Edwards Aquifer Habitat Conservation Plan (HCP) Biological Monitoring Program. 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 track overall condition 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 2018 Edwards Aquifer HCP Biological Monitoring in the Comal System.

From a hydrology perspective, the Comal Springs/River ecosystem experienced a wide range of conditions over the course of 2018. At the end of 2017, total system discharge was near the long-term average, and it stayed this way through spring 2018. However, the region experienced a relatively dry late spring and summer which resulted in declining system discharge throughout summer 2018. Just as a low-flow Critical Period threshold was about to be triggered in early September 2018, conditions changed drastically. Central Texas experienced the wettest September on record in many locations, and the Edwards Aquifer climbed over 35 feet in September (as measured at J-17 index well). This rainy pattern continued into October and spring flows remained well above average through the remainder of the fall.

Despite the observed fluctuation in hydrologic condition over the course of the year, water quality constituents remained within typically observed ranges. Water temperatures measured using temperature thermistors throughout the system showed no exceedances of the TCEQ water quality standard of 26.7˚C and were below any lethal temperature thresholds for the Fountain Darter. Annual average dissolved carbon dioxide and pH measurements collected by Texas Master Naturalist volunteers remained similar to previous years.

Although a range of hydrologic conditions were observed, no severe scouring flood events occurred in the Comal system during 2018, and aquatic vegetation coverage generally remained stable in most reaches. Full system benchmark aquatic vegetation mapping was conducted in 2018 and compared to the original full system map generated in 2013 to evaluate long-term changes in the aquatic plant community system-wide. Thanks to ongoing aquatic vegetation restoration activities in the system, this analysis demonstrated a substantial reduction in the overall coverage of *Hygrophila*, the dominant non-native plant in the system, and a subsequent increase in coverage of several native vegetation types used in restoration plantings.

Abundant and stable aquatic vegetation resulted in quality Fountain Darter habitat, with no obvious changes evident in dip net results, and overall population estimates based on drop net densities and current vegetation coverage similar to long-term averages. Length frequencies of Fountain Darters were similar to previous years, with recruitment noted in all reaches. Fountain Darters continue to be most abundant in native aquatic vegetation that provides dense cover at the substrate level, such as bryophytes.

Fish community sampling in 2018 documented a diverse and dynamic fish community dominated by mosquitofish, Fountain Darters, and other spring-associated fishes. One native species which hadn't been previously documented from the system, the Blackstripe Topminnow *Fundulus notatus,* was captured in 2018 fish community sampling. This demonstrates the importance of large long-term datasets in understanding fish community dynamics. Based on repeat visual surveys, Comal salamander abundance continues to remain high in most of the spring run areas monitored. Although abundance was relatively low during previous drought conditions when much of their spring run habitat was desiccated, salamander observations have been high since 2016, when compared to historical averages.

Macroinvertebrate monitoring activities conducted during 2018 included drift-net sampling of spring orifices for aquifer invertebrates, cotton lure sampling at specific springs for Comal Springs riffle beetle, and use of rapid bioassessment protocols (RBP) to evaluate community structure in individual reaches. No adult Comal Springs riffle beetles were collected in 2018 drift-nets, and cotton lure data show a reduction in average lure density compared to the long-term average. Recent attempts to standardize exact placement of cotton lures may be resulting in lower overall numbers collected, but will provide a consistent and reproduceable baseline moving forward. Rapid bioassessment metrics resulted in aquatic life use scores in the various reaches ranging from "Limited" to "Exceptional". The RBP protocol is designed for use in wadeable streams, and therefore, lentic areas near spring upwellings generally scored low, while more lotic environments downstream scored highest. It should also be noted that this protocol is based on comparison to reference streams which are not as spring-dominated as the Comal system. Continued sampling of the Comal and San Marcos springs systems will eventually allow for development of a macroinvertebrate bioassessment protocol specific to these unique environments.

In summary, biological monitoring described herein demonstrates that the Comal Springs/River ecosystem continues to maintain quality habitat for the HCP covered species. Additional habitat improvements are being 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. Two notable patterns observed in recent biological monitoring data include an increase in Comal salamander observations and a decrease 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. Additional monitoring will be crucial 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, successful execution of the biological monitoring program is mandatory to adequately assess these topics relative to HCP Phase II decisions and guide management decisions aimed at protection of the species during low-flow conditions. Additionally, the HCP 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 and critiques. Adjustments have been made as appropriate. Most recently, the National Academy of Science conducted a thorough review (NRC 2015), which led to the formation of an HCP Biological Working Group (BWG) and subsequent adjustments to the program in 2017.

It is important to understand that many different sampling components are included in the HCP biological monitoring program and several sampling location strategies are employed. The sampling locations selected are designed to cover the entire extent of endangered species habitats in both systems, but they also allow for holistic ecological interpretation while 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:

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

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

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

4. Springs Sampling
    - Endangered Comal invertebrate sampling
    - Comal Springs salamander sampling

5. 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 2018 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 extremely 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 the following three invertebrates: Comal Springs dryopid beetle *Stygoparnus comalensis*, Comal Springs riffle beetle *Heterelmis 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 (spring and fall) and scheduled annual activities were conducted in 2018. 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 2018). 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 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. Landa Lake flow partitioning measurements were conducted by EAA scientists during 2018.

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 events were triggered in 2018.

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 2018.

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 events were triggered in 2018.

Water Quality Sampling and Fixed Station Photography

Conventional parameters (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. Study locations, methods, sampling schedule, and results of the comprehensive water and stormwater monitoring conducted under the HCP are presented in a standalone report (SWCA 2018a Draft).

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 2018.

Fixed Station Photography

In addition to the 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 2018 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 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 meter (m) in diameter were mapped by recording a single point. Vegetation stands less than 0.5 m in diameter were not mapped.

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

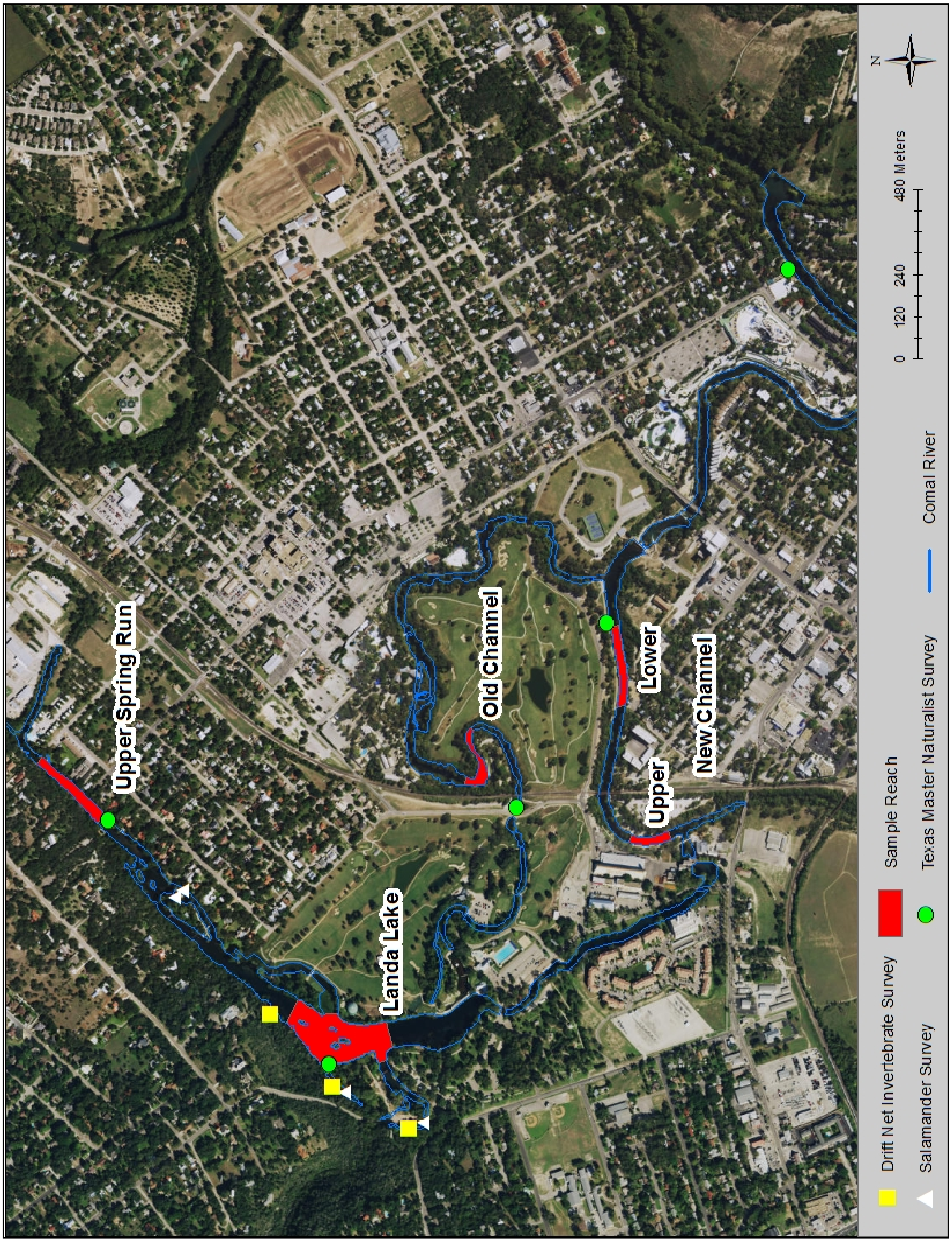


Figure 2. Invertebrate, Comal Springs salamander, Texas Master Naturalist, and biomonitoring (includes aquatic vegetation mapping, drop net sampling, presence/absence dip-net sampling, and macroinvertebrate community sampling) sample areas within the Comal River study area.

In January 2018, full system (Blieders Creek to the Guadalupe River confluence) aquatic vegetation mapping occurred as the first HCP benchmark mapping event. Benchmark mapping is scheduled every five years for the duration of the HCP. Benchmark mapping is used to gauge long-term changes in the plant community system wide, evaluate fountain darter habitat on a large scale and determine impacts of restoration efforts in the Long-term Biological Goal reaches and restoration reaches.

Fountain Darter Sampling

Drop-net Sampling

A drop-net is a sampling device originally designed by the USFWS to sample Fountain Darters and other benthic fish species. The net encloses a known area (2 square meters [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 centimeters (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 (*Palaemonetes* sp.) was also recorded for each dip-net sweep.

Drop-net data collected over the entire study period (2001-2018) 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 (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-centimeter (cm) x 40 cm (1.6-millimeter [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 5 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 (clay, silt, sand, gravel, cobble, boulder, bedrock) was recorded, along with the dominant type of aquatic vegetation (e.g., *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 2018 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 2018. For fish community monitoring, the Comal system was split into the following six segments: (1) Blieder's Creek, (2) Upper Spring Run, (3) Landa Lake, (4) New Channel, (5) Old Channel, and (6) 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 (if present) 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. Then, to prevent recapture on subsequent seine hauls, captured fish were placed in a bucket containing river water. 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. Densities are calculated by dividing the abundance of each species captured by area sampled (m^2). Individual densities are averaged across each site per season to determine average densities of each species. Data are also collected in a way that allow calculation of catch-per-unit-effort (CPUE) by gear type and taxa.

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 2018 sampling events (Figure 2). Each survey began at the downstream-most edge of the sampling area. Crews turned over rocks located on the substrate surface to dislodge salamanders while moving upstream toward the main spring orifice. A dive mask and snorkel or viewing box 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 1-hour survey was conducted from the Landa Park Drive Bridge upstream to just below the head spring orifice. Spring Run 3 was surveyed for 1 hour from the pedestrian bridge closest to Landa Lake upstream to just below the head spring orifice. 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. 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 2018, spring and fall. Sampling followed the methods of the Cotton Lure 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 they 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/May and October/November; the length of time lures were deployed ranged from 28 to 30 days. Lures lost, disturbed, or buried by sedimentation were not included in subsequent analyses. Numbered tags placed on the banks of Spring Run 3 and Western Shoreline were utilized when possible to identify lure locations.

All Comal Springs riffle beetles collected with cotton lures were identified, counted, and returned to their spring of origin during the spring sampling effort. During the fall, 25% of the sampled adult Comal Springs riffle beetles were given to personnel from the U.S. Fish and Wildlife Service (USFWS) San Marcos Aquatic Resources Center (SMARC) for refuge housing at the Uvalde facility. 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

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 habitat consisting primarily of cobble-gravel substrate, when available, for 5 minutes while moving in a zig-zag fashion up-stream. When suitable cobble-gravel substrate was not available, the riffle sample was supplemented with a snag sample. Snag sampling entailed collecting submerged wood "snags" 0.5–2.5 cm in diameter and placing them in a sieve bucket. Snag materials were washed thoroughly in the bucket to remove attached organisms. Invertebrates from riffle and snag samples were then combined in a sorting tray and randomly distributed. Subsamples for riffle or riffle+snag 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 (3 May) and fall (29 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 2018 comprehensive sampling during three different periods: Spring routine full event (April 15–May 7), Summer Fountain Darter dip netting (July 19-20), and Fall routine full event (October 1–November 31). In addition to comprehensive sampling, HCP full system benchmark aquatic vegetation mapping was conducted in January 2018.

Comal Springflow

Total system discharge in 2018 was below the historic average for a majority of the year. This is after two years of above average monthly mean flows for most of 2016 and 2017 (Figure 3). However, after a relatively dry summer, a rainy September pushed the average discharge above the historic average in September 2018 and it remained above average for the remainder of the year.

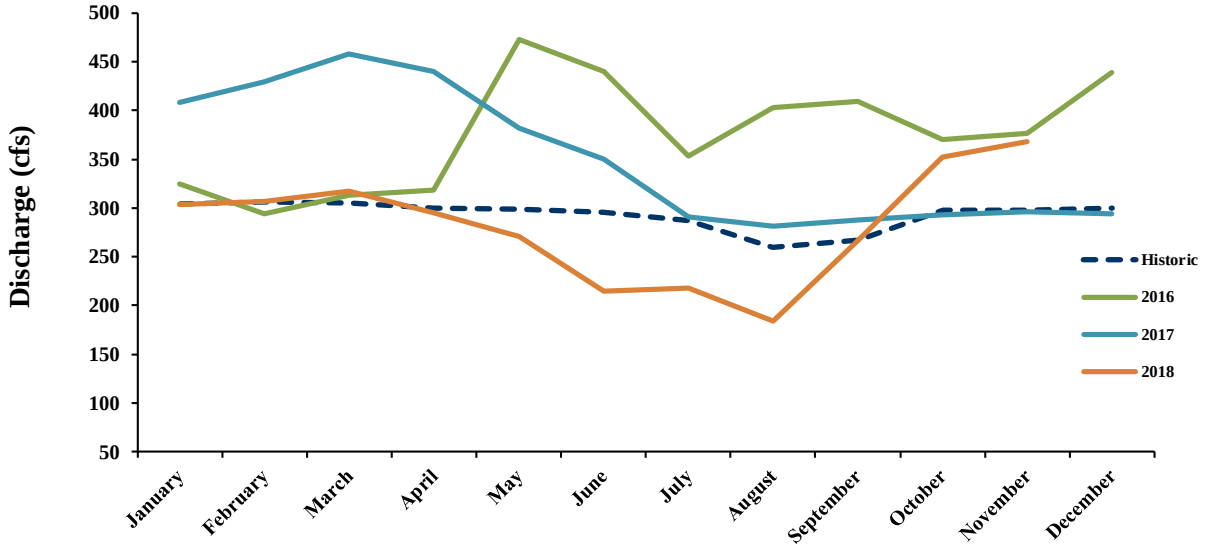


Figure 3. Mean monthly discharge in the Comal River 2016–2018, with historical period of 1934–2018 as dashed line.

The lowest total springflow (daily average) observed in 2018 occurred on August 30 and 31 at 161 cubic feet per second (cfs, Table 1). This is the lowest daily mean discharge observed since January 21, 2015. The 2018 annual average daily discharge was 276 cfs which is 84 cfs lower than the 2017 annual average daily discharge (360 cfs). In 2018, 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 (2000–2018), 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

During spring and fall routine sampling events in 2018, discharge was measured at nine sites in the Comal River (Figure 4). In contrast to patterns in long-term averages, discharge in all spring runs was lower in the spring than fall due to September precipitation/recharge events which resulted in increased total system discharge. Overall, the fall 2018 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. In 2018, discharge for the Old Channel was lower in the spring than in the fall (56 cfs vs. 65 cfs) and like the Spring Run sites, the fall measurement was above the long-term average (Figure 6). The study team began measuring discharge at Upper Spring Run (Liberty St.) in 2011. Unlike all other sites with measured discharge, Figure 6 reveals that discharge was higher in spring (21cfs) than fall (19 cfs), with both seasons being higher than the long-term average (2011–2018).

Spring 2018 flow-partitioning measurements were higher than Fall 2017 at all locations except for Spring Island Lower Near and totals at all locations increased in the fall (Table 2). This corresponds with the average daily discharge in the Comal system for 2018 (Figure 3). Of the transects measured from both events in 2018, Spring Island Lower Near contributed the least to overall discharge in spring and fall (approximately 13%) (Table 3). However, areas on the far side of Spring Island contribute substantially to overall system discharge. Since 2014, the area around and upstream of Spring Island has contributed approximately 36–54% of the total system discharge, with the majority of that coming down the western (far) channel. Continued data collection under various hydrologic scenarios will be useful in understanding the spatial distribution of springflow in this area.

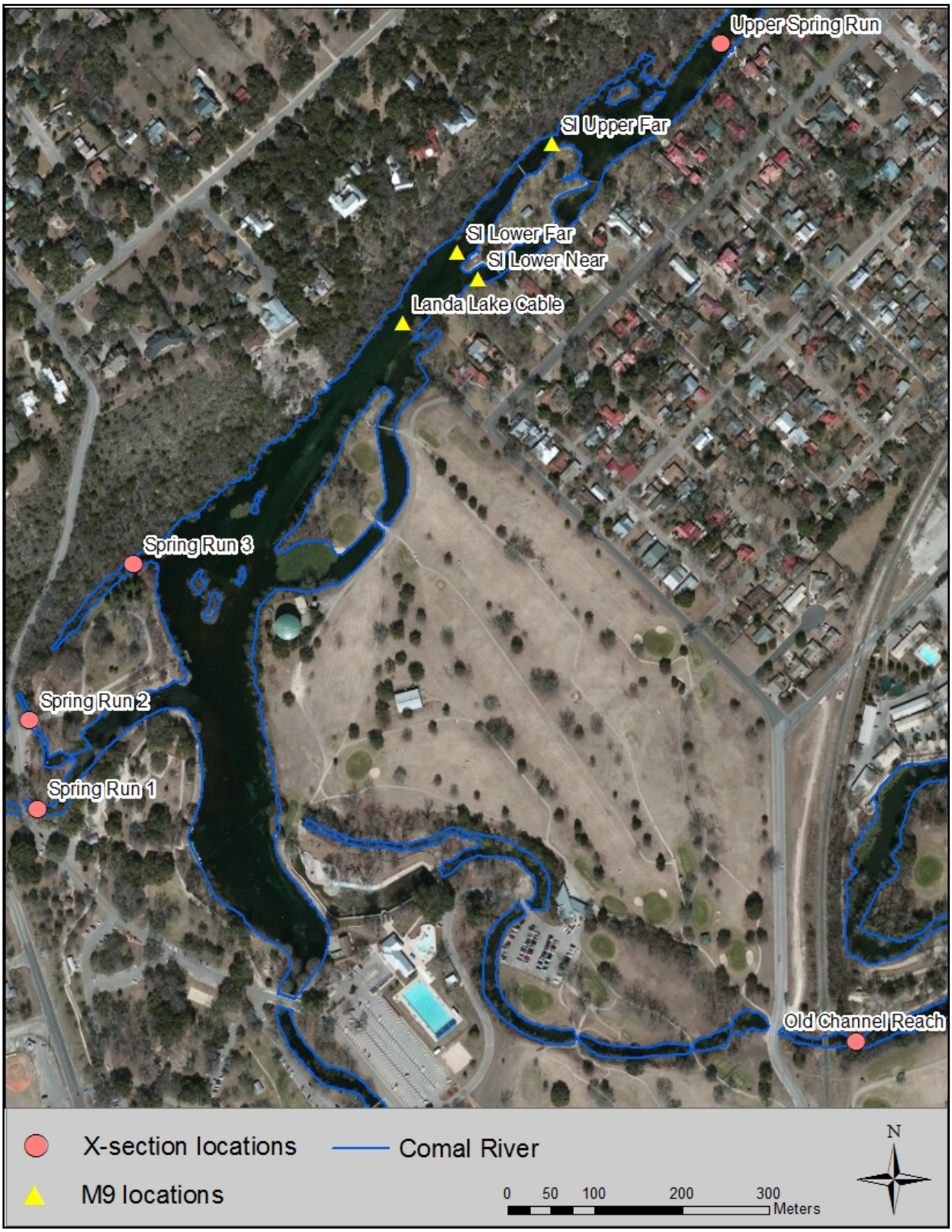


Figure 4. **Cross-section and flow partitioning (M9) discharge collection locations in the Comal River.**

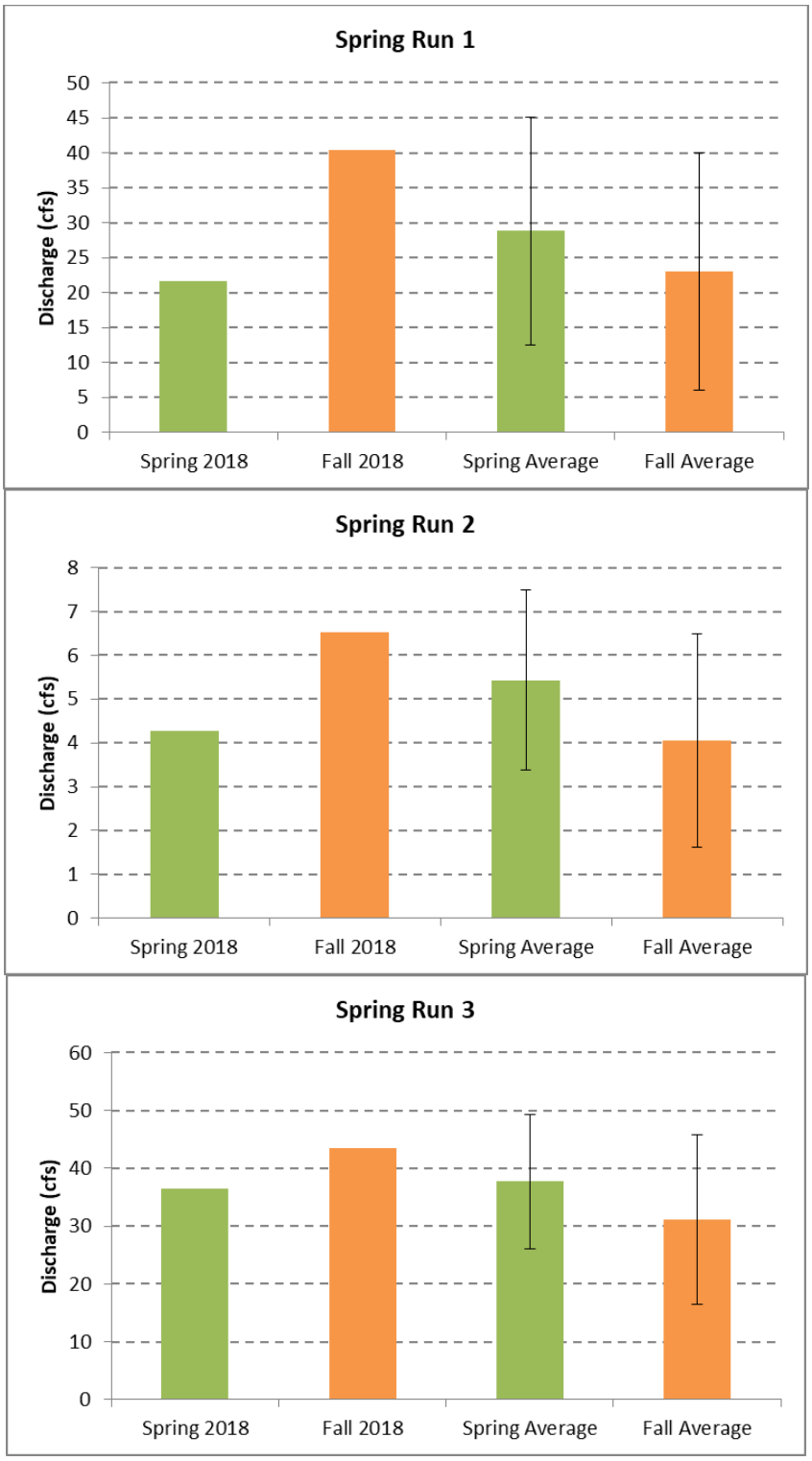


Figure 5. **Measured discharge for Spring runs 1, 2, and 3. Averages represent April/May values (spring) and October/November values (fall) from 2003 to 2018. *Note y-axis differences for discharge.**

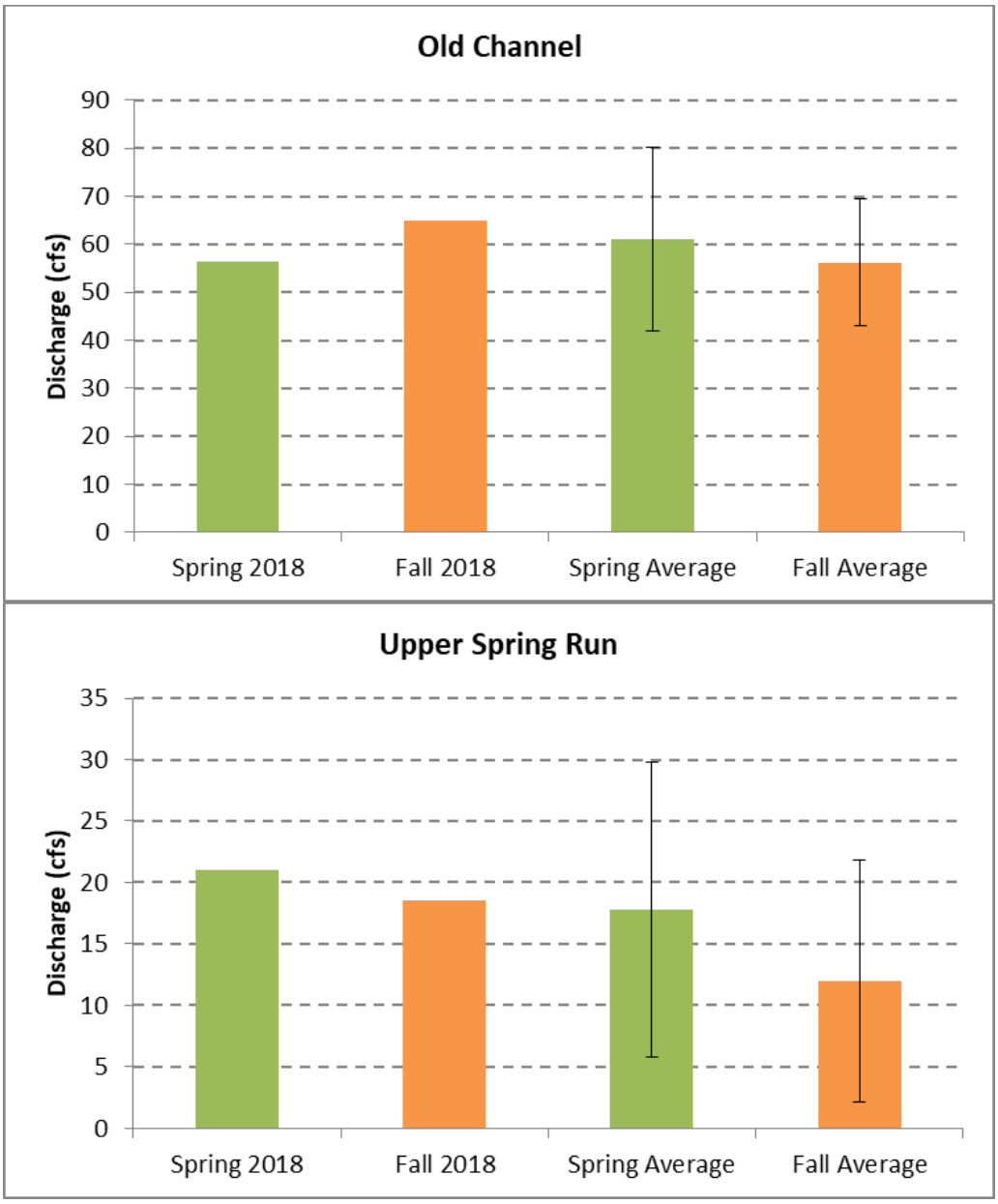


Figure 6. **Measured discharge for the Old Channel and Upper Spring Run reaches. Averages represent April/May (spring) and October/November values (fall) from 2003–2018 for the Old Channel, and 2011–2018 for Upper Spring Run. *Note differences in y-axis for discharge.**

Table 2. Flow partitioning data from five transects in 2014–2018.

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 Oct 2017	283	-	49.4	51.3	40.1	120.4
2 May 2018	274	-	53.9	75.8	34.7	129.3
26 Oct 2018	366	-	67.2	80.4	47.9	153.8

Table 3. Percentage of total discharge in the Comal River (USGS gage 08169000) from each flow partitioning transect in 2014–2018.

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

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 2018 (Appendix C). Gaps in readings on some graphs indicate data-quality events (e.g., 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 (e.g., 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. During the low flows of 2014, the Heidelberg thermistor was moved approximately 75 feet 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.

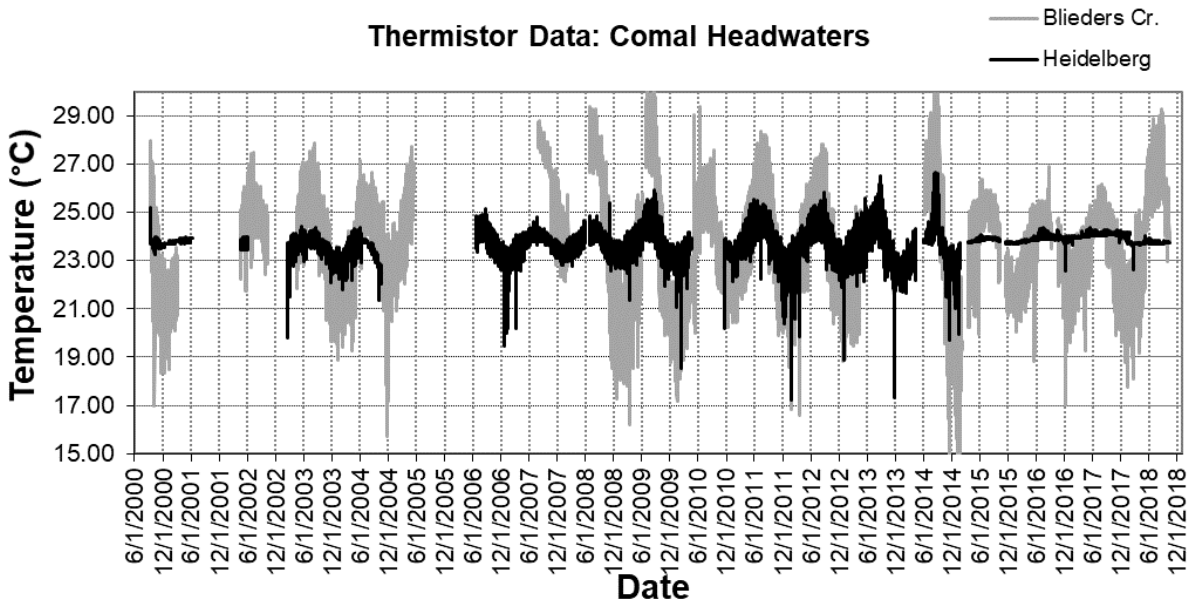


Figure 7. Water temperature (°C) data at Comal headwaters from 2000 to 2018.

As is typical, sites like the Other Place, New Channel, and Old Channel had wider temperature fluctuations than sites closer to spring inputs in 2018, but none of the sites exceeded the TCEQ water quality standard of 26.7 ºC (Appendix C). 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. 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). Such temperature-mediated reproductive output helps 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). However, other factors such as differences in available habitat also influence these patterns.

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 2018. A more in-depth look at water quality can be found in the 2018 EAA HCP Expanded Water Quality Report (SWCA 2018a, Draft).

Texas Master Naturalist Monitoring

Water quality data collected by Master Naturalist volunteers in 2018 showed similarly to years past that CO_2 concentrations continue 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 2018 (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 (2006–2018). 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.

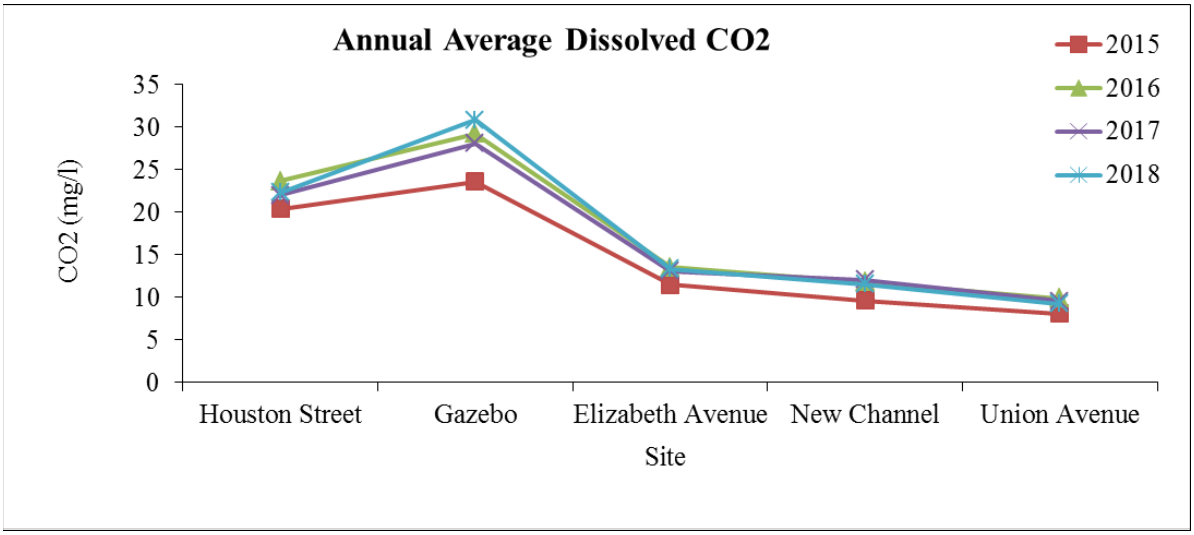


Figure 8. Annual average dissolved carbon dioxide (CO_2) concentrations at five sites on the Comal River system (2015–2018).

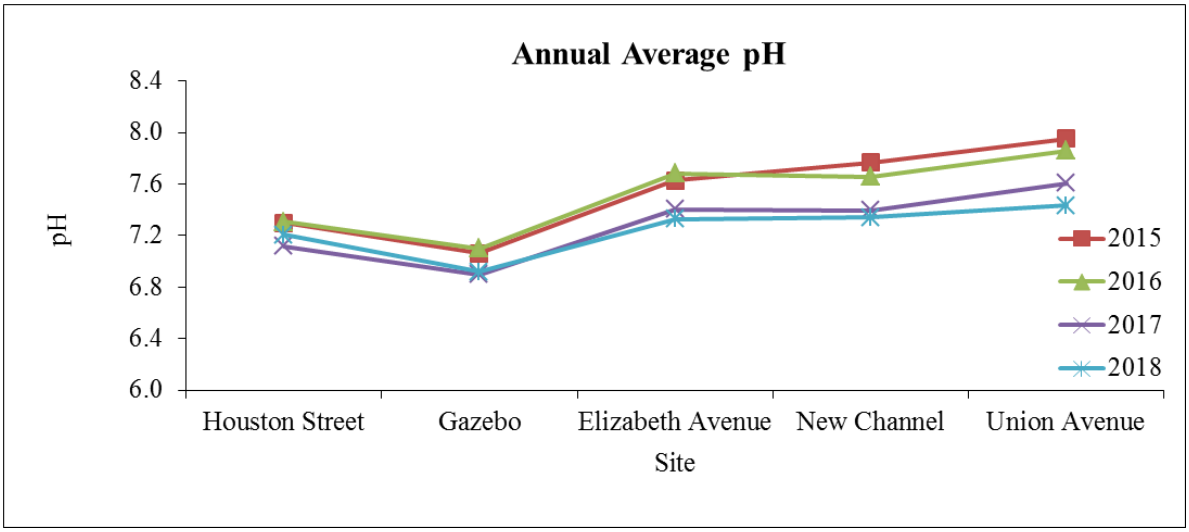


Figure 9. Annual average pH values at five sites on the Comal River system (2015–2018).

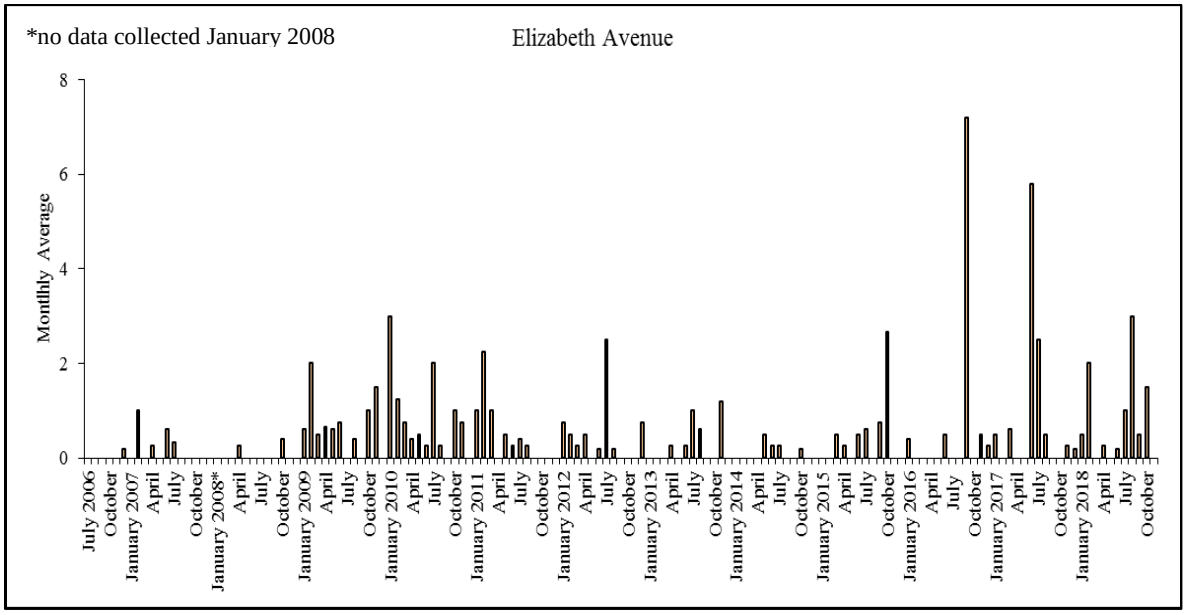


Figure 10. Average recreational use counts at the Elizabeth Avenue site (2006–2018).

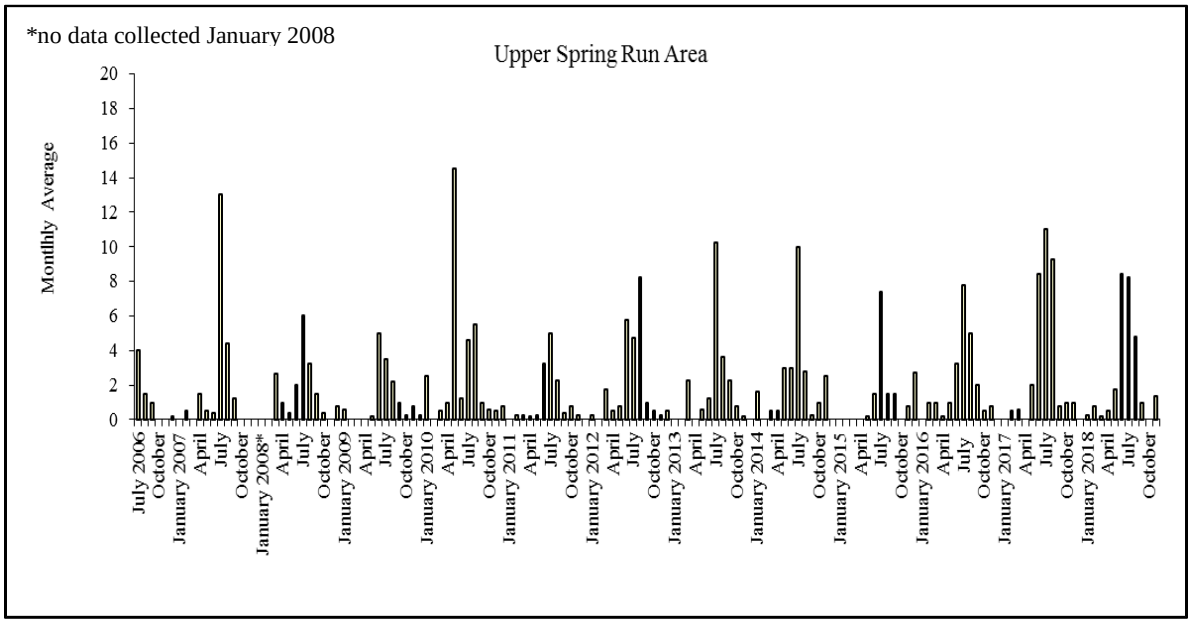


Figure 11. Average recreational use counts at the Upper Spring Run site (2006–2018).

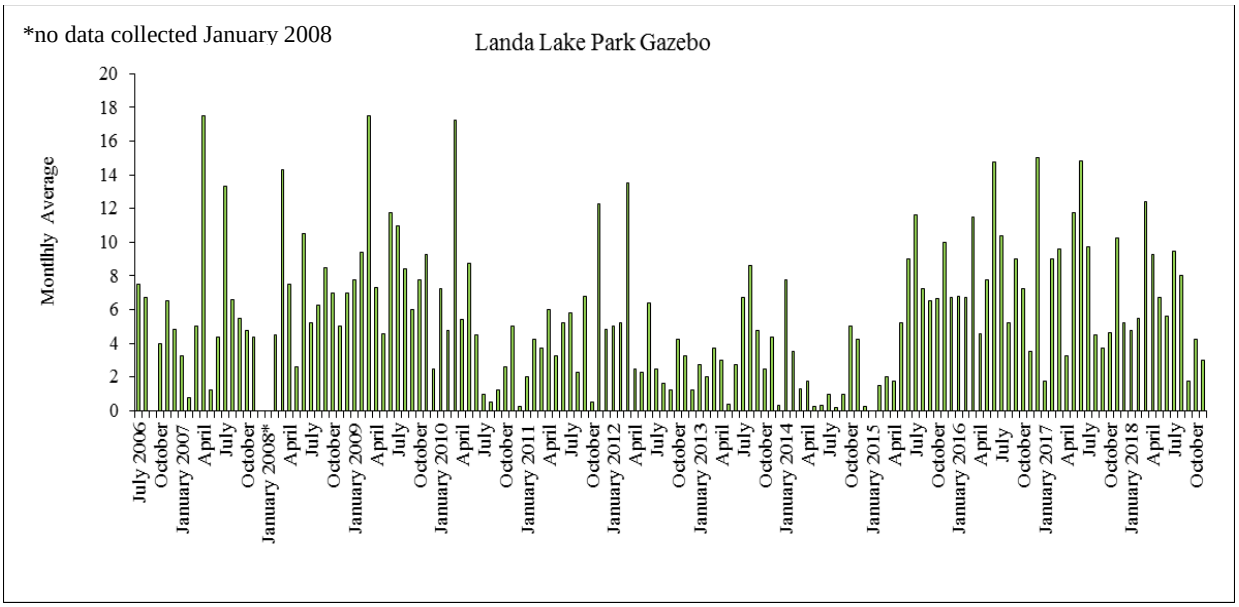


Figure 12. Average recreational use counts at the Landa Lake Park Gazebo site (2006–2018).

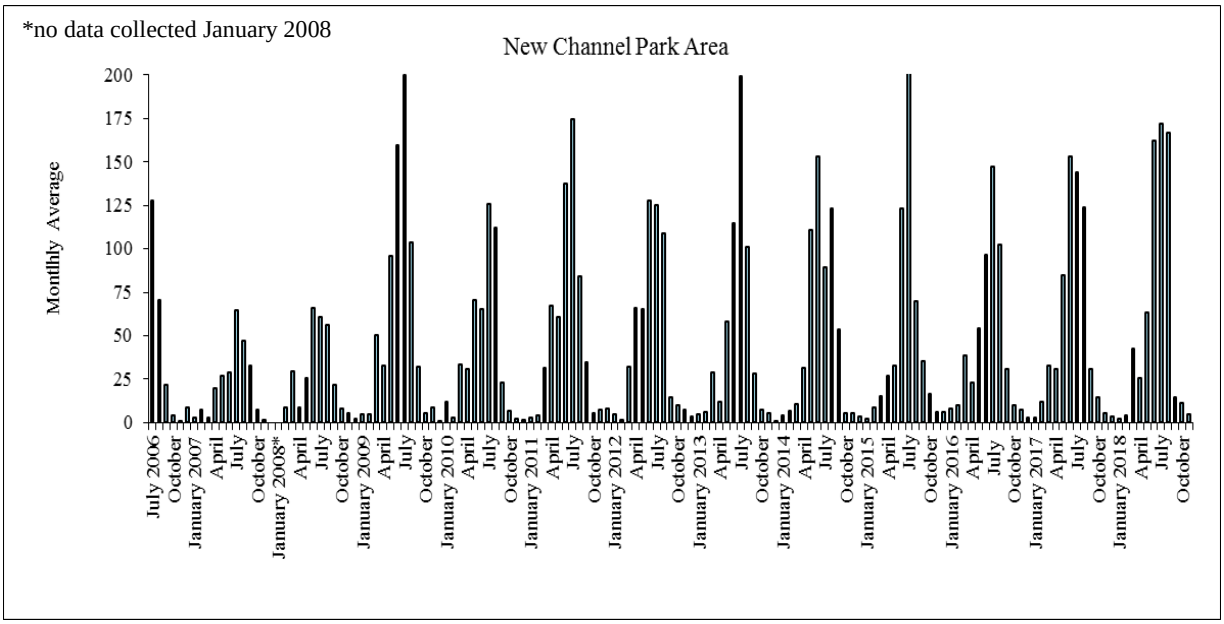


Figure 13. Average recreational use counts at the New Channel site (2006–2018).

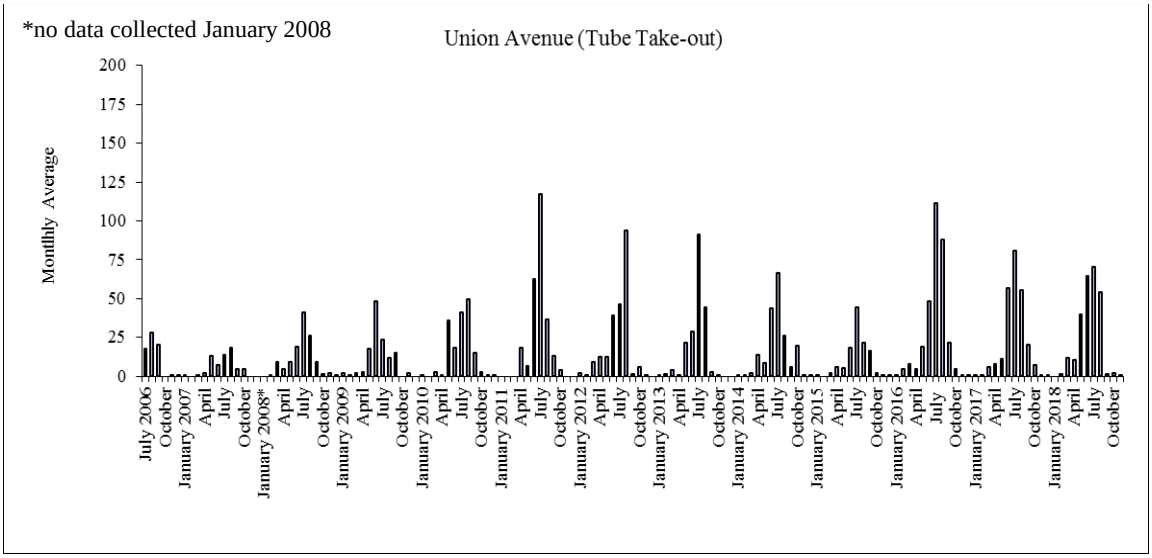


Figure 14. Average recreational use counts at the Union Avenue site (2006–2018).

Aquatic Vegetation Mapping

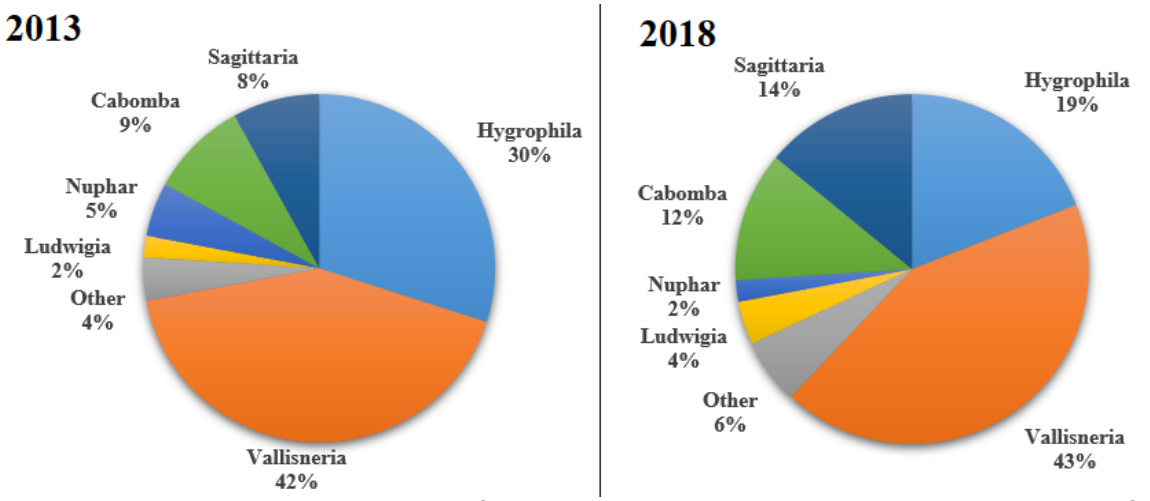
Aquatic vegetation maps for full-system benchmark mapping and for all study reaches during both Comprehensive monitoring periods are presented in Appendix B. The maps are organized by individual reach with successive mapping events ordered chronologically. While less dominant species may not be represented on the maps, the Comal vegetation community is a natural mosaic with intermixed stands that can contain several aquatic plant species, thus their coverage is estimated and included into the total vegetation calculations.

HCP Full System Mapping

The HCP full system mapping occurred in January 2018. As expected, changes in the aquatic vegetation community were evident between 2013 and 2018. Some of these changes can be linked to restoration activities (i.e., removal of non-native *Hygrophila* and planting of native target vegetation including *Ludwigia*, *Sagittaria*, and *Cabomba*) while other changes were naturally induced or a result of some other artificial disturbance occurring within the system. From 2013 to 2015 the Comal River suffered from some of the lowest river discharges in decades followed by some very large flood events recorded in 2016 and 2017.

Baseline 2013 mapping of the aquatic vegetation community (excluding bryophytes) recorded a total aquatic vegetation cover reaching over 89,000 m^2. The total vegetation cover for 2018 full system mapping (excluding bryophytes) was approximately 73,000 m^2. This decrease was mostly exhibited in the lower reaches of the Comal River below the tube chute where a large reduction in vegetation, mostly *Hygrophila*, occurred. Despite the overall loss in vegetation from 2013 to 2018, the trending makeup of the aquatic vegetation community of the Comal is an increase in dominance of native aquatic plant species. Figure 15 shows an increasing trend in the percent composition of native aquatic vegetation. Native species including *Sagittaria*, *Cabomba*, and *Ludwigia* all show an increase in relative percent composition in the Comal River aquatic vegetation community compared to 2013. Non-native *Hygrophila* decreased substantially from

30% in 2013 to 19% in 2018. Appendix B contains a full map set of the 2018 HCP benchmark mapping event.



2013 Total Aquatic Vegetation:	**89,731** (m^2)
Cabomba	8,195
Hygrophila	26,612
Ludwigia	1,859
Nuphar	4,316
Sagittaria	7,330
Vallisneria	37,886
Other species	3,535

2018 Total Aquatic Vegetation:	**73,397** (m^2)
Cabomba	9,129
Hygrophila	13,796
Ludwigia	3,028
Nuphar	1,387
Sagittaria	10,061
Vallisneria	31,882
Other species	4,117

Figure 15. Percent composition of aquatic plant species in the Comal System from the 2013 baseline mapping event compared to the 2018 benchmark mapping event.

Not only has the composition of the aquatic plant community changed since 2013 but the distribution of several native plant species has also changed. In 2013, baseline mapping showed *Potamogeton* limited to only two small patches. One patch located in Spring Run 3 and the second patch located below the outlet for Mill Pond. In 2018, *Potamogeton* was mapped in abundance in the Old Channel. Some locations of *Potamogeton* in the Old Channel occurred where aquatic vegetation had not been seen before, notably in the fast flume section of Old Channel below Landa Lake dam. *Potamogeton* was also prevalent in the Old Channel around Golf Course Drive bridge. The distribution of *Cabomba* also expanded in the upper reaches of the Comal River in Upper Spring Run and the Old Channel where it was not abundant in 2013. The change in distribution for both of these species was a direct result of aquatic vegetation restoration between 2014 and 2018.

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. 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). Since bryophytes are non-rooted plants, their coverage is more susceptible to disturbances (e.g. 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 2018 was similar to long-term averages (Figure 16). Vegetation coverage typically decreases from spring to fall due to recreational stress during summer and often lower spring flows during late summer. In July and August of 2018 spring flows were well below monthly average and low flows persisted until early September. However, higher spring flows returned in September and vegetation in this reach did not decline to levels observed in past low flow years.

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

Species	Spring 2018 Cover m^2	Fall 2018 Cover m^2
Bryophyte	1,463	914
Ludwigia	26	3
Sagittaria	920	686
Total	2,409	1,603

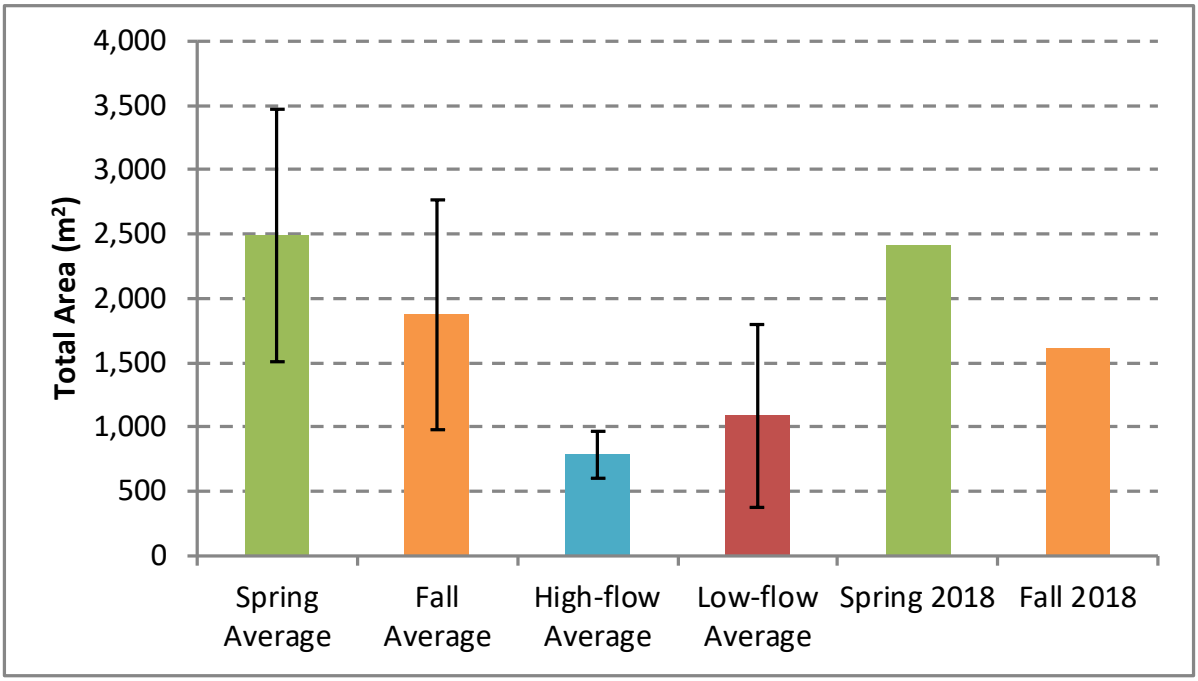


Figure 16. Total surface area (m^2) of aquatic vegetation in the Upper Spring Run Reach. Long-term study averages are provided with bars representing one standard deviation from the mean.

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 2018 was no exception with both spring and fall total vegetation coverage similar to seasonal averages (Figure 17). 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 along the eastern shoreline, and central lake locations. However, *Sagittaria* has also decreased along the western shoreline. *Vallisneria* has also expanded to new locations while retreating in others but has maintained a relatively consistent coverage over time. *Ludwigia*, *Cabomba*, and *Potamogeton* coverages have all benefited from restoration efforts (Table 5). Yet, coverages for these species are variable in Landa Lake due to a variety of factors including water depth, floating vegetation mats and paddle boat traffic. The 2018 Comal Aquatic Plant Restoration Report provides more information regarding the restoration of native aquatic vegetation (BIO-WEST 2018b).

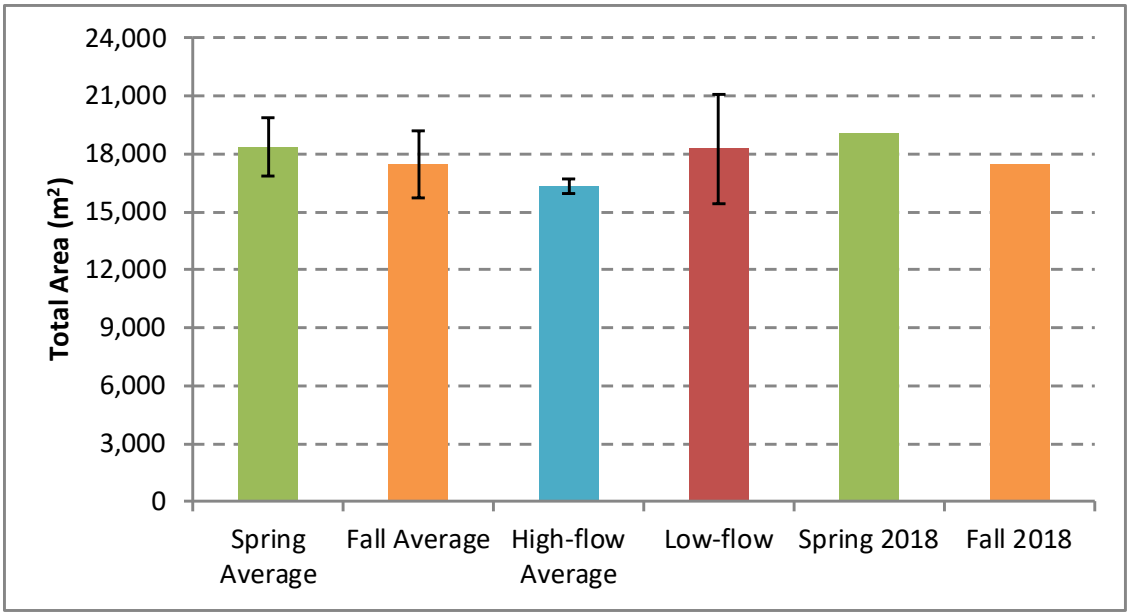


Figure 17. Total surface area (m^2) of aquatic vegetation in the Landa Lake Reach. Long-term study averages are provided with bars representing one standard deviation from the mean.

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

Species	Spring 2018 Cover m^2	Fall 2018 Cover m^2
Bryophyte	2,393	2,061
Bacopa	9	0
Cabomba	165	308
Colocasia	26	0
Ludwigia	572	364
Nuphar	12	3
Potamogeton	16	29
Sagittaria	3,027	2,937
Vallisneria	12,799	11,796
Total	19,020	17,499

Old Channel Reach

The Old Channel reach saw perhaps the most dramatic changes in the vegetation community over the course of 2018. In spring, this reach was still dominated by non-native *Hygrophila* which has been prolific here since 2004. However, by June all *Hygrophila* in this reach had been removed, and subsequently, native aquatic plants were planted. Since removal of *Hygrophila*, the occurrence of bryophytes in this reach has increased. Bryophytes are now able to settle onto the river bed and attach to underwater structure. Previously restored *Ludwigia* and *Cabomba* are expanding naturally in this reach and growing conditions have improved due to riparian restoration measures.

Seasonal mapping shows slightly below average vegetation cover for both spring and fall (Figure 18). This can be directly attributed to *Hygrophila* removal. There was little difference between spring and fall cover comparatively since restored native vegetation and bryophyte cover in fall made up for removed *Hygrophila* in spring (Table 6**)**. As more space is restored with native plants in this reach vegetation cover will likely increase. However, a natural vegetation community will likely be less dense because it is not as shade-tolerant compared to the *Hygrophila* dominated community that has been prominent in this reach over the last 10 years.

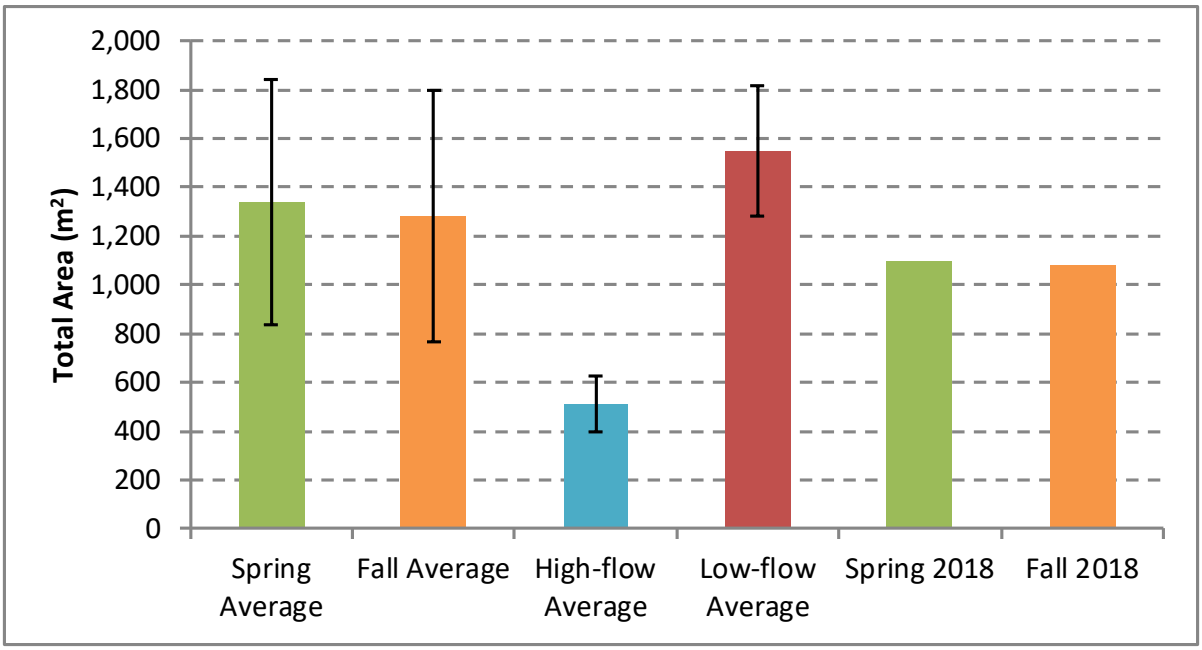


Figure 18. **Total surface area (m²) of aquatic vegetation in the Old Channel Reach. Long-term study averages are provided with bars representing one standard deviation from the mean.**

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

Species	Spring 2018 Cover m²	Fall 2018 Cover m²
Bryophyte	220	688
Cabomba	44	113
Hygrophila	663	0
Ludwigia	116	240
Nuphar	54	32
Sagittaria	0	6
Total	1,097	1,079

Upper New Channel Reach

The Upper New Channel reach is 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. In 2018, both spring and fall mapping showed relatively high vegetation coverage with fall coverage being significantly higher than the average (Figure 19, Table 7).

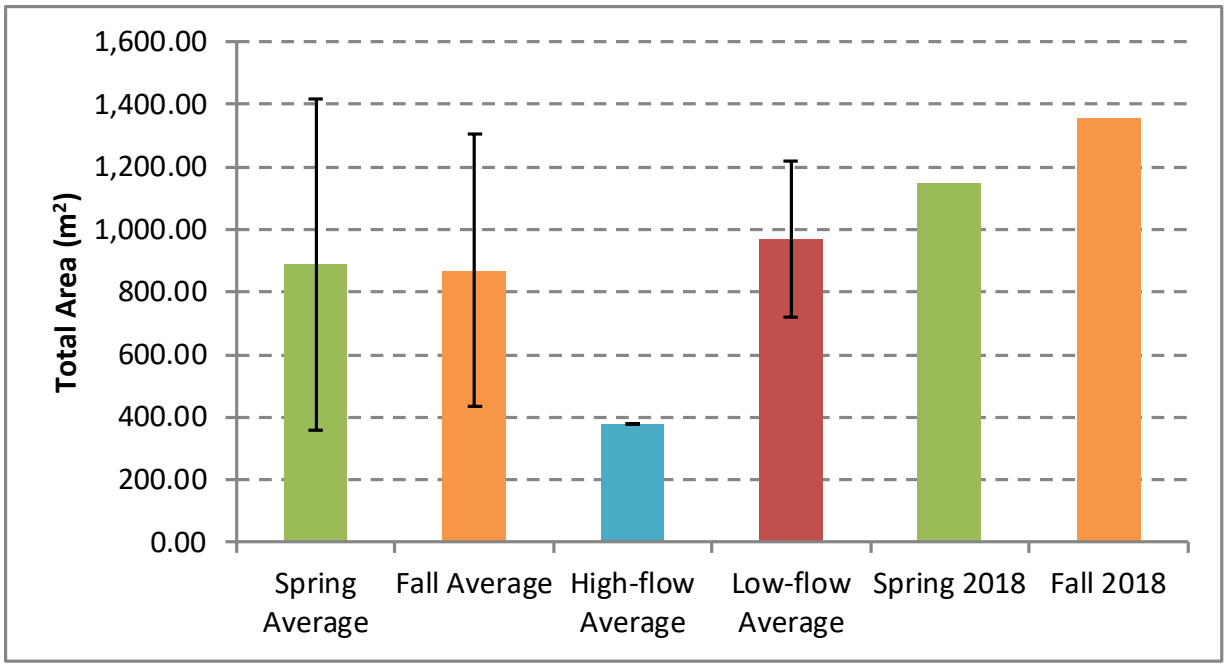


Figure 19. **Total surface area (m²) of aquatic vegetation in the Upper New Channel. Long-term study averages are provided with error bars representing one standard deviation from the mean.**

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

Species	Spring 2018 Cover m²	Fall 2018 Cover m²
Bryophyte	278	434
Cabomba	6	29
Hygrophila	760	788
Ludwigia	103	107
Nuphar	2	0
Total	1,148	1,356

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. During the spring 2018 event vegetation in this reach was thinned due to some localized river bed scour. Vegetation coverage recovered by fall. (Figure 20). Both dominant species in this reach (*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).

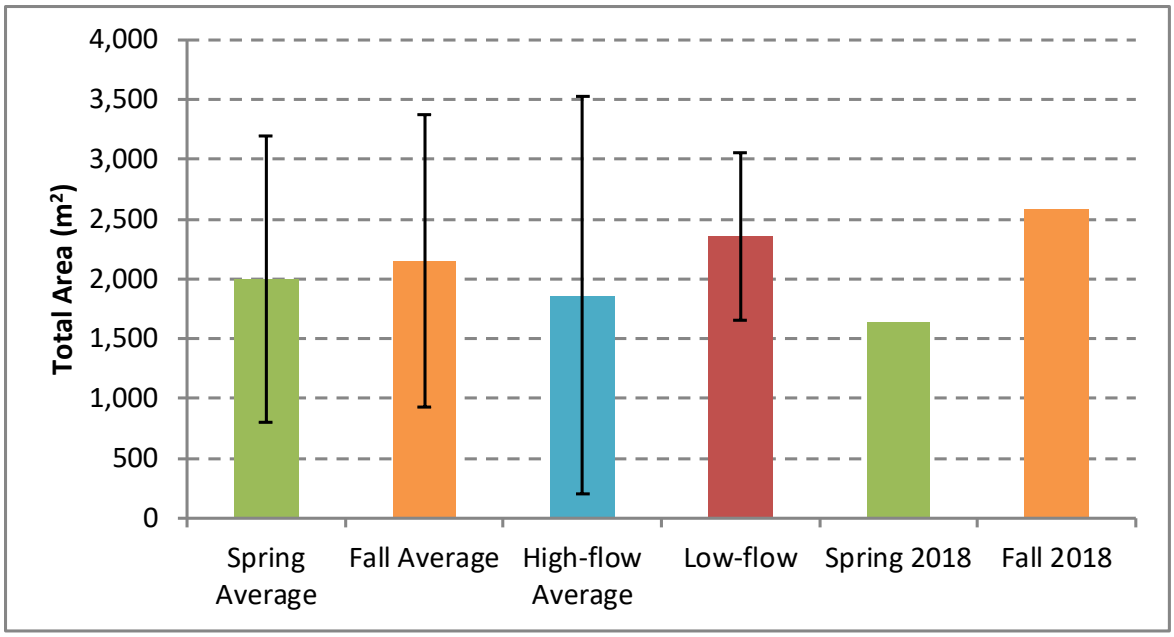


Figure 20. **Total surface area (m^2) of aquatic vegetation in the Lower New Channel Reach. Long-term study averages are provided with error bars representing one standard deviation from the mean.**

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

Species	Spring 2018 Cover m^2	Fall 2018 Cover m^2
Cabomba	1,056	2,004
Hygrophila	575	575
Sagittaria	6	0
Total	1,637	2,579

Fountain Darter Sampling Results

Drop Nets

A total of 65 drop-net samples were conducted during 2018 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 2018 allowed the execution of five drop-net samples in spring and eight in the fall 2018. Raw drop-net data for 2018 are included in Appendix D. From these drop-net samples, a total of 1,661 Fountain Darters were collected in 2018, with 868 darters collected during spring sampling, and 793 collected during fall sampling. Although effort has varied slightly between events, the number of Fountain Darters captured per sampling event has ranged from 103 to 1,058 (mean=511) in 54 separate sampling events since the beginning of the comprehensive monitoring study in 2000.

Table 9. Number of drop-net samples collected in each vegetation type per reach during 2018 sampling efforts.

VEGETATION	SPRING (May 1–3)				FALL (OCTOBER 29–31)				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	1	2	2	2	2	15
Ludwigia	2	2	2			2	2		10
Hygrophila				2				2	4
Sagittaria	2	2			2	2			8
Vallisneria		2				2			4
Cabomba		2				2	2	2	8
Open	2	2	2	2	2	2	2	2	16
TOTAL	8	12	6	5	6	12	8	8	65

Drop-net data collected from 2000 to 2018 show that average densities of Fountain Darters in the various vegetation types ranged from 1.1/m^2 in open sites to 26.9/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 (26.9/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 significant portion of the available habitat.

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 2018.

Sample Type	Mean Density (m^2)	Standard Deviation
Open	1.1	3.1
Green Algae	2.2	3.2
Ceratopseris	3.6	4.3
Sagittaria	5.2	13.1
Vallisneria	6.1	10.2
Hygrophila	7.3	8.6
Cabomba	10.4	11.1
Ludwigia	13.4	15.9
Filamentous Algae	26.1	23.0
Bryophytes	26.9	19.7

Cabomba, *Ludwigia*, *Sagittaria*, and *Vallisneria* are also relatively common, and therefore, also provide substantial amounts of Fountain Darter habitat. Although nonnative *Hygrophila* was once a dominant vegetation type in many reaches, recent vegetation restoration activities have substantially reduced or removed *Hygrophila* coverage within most study reaches. In particular, this nonnative plant is no longer present in the Upper Spring Run and Landa Lake reaches. Unlike the San Marcos River, the Comal River is dominated by native vegetation, which has become even more prevalent following HCP restoration activities (BIOWEST 2018b).

Fountain Darter normalized population estimates in all reaches (Figure 21) were based on vegetation composition and abundance, and the long-term average density of Fountain Darters found in specific vegetation types from 2000–2018. Population abundance estimates are similar for spring, fall, and low-flow events from 2000–2018. However, high flow events usually lead to a decrease in vegetation coverage and a resulting decrease in population estimates. Overall normalized population estimates in 2018 were slightly higher than long-term averages.

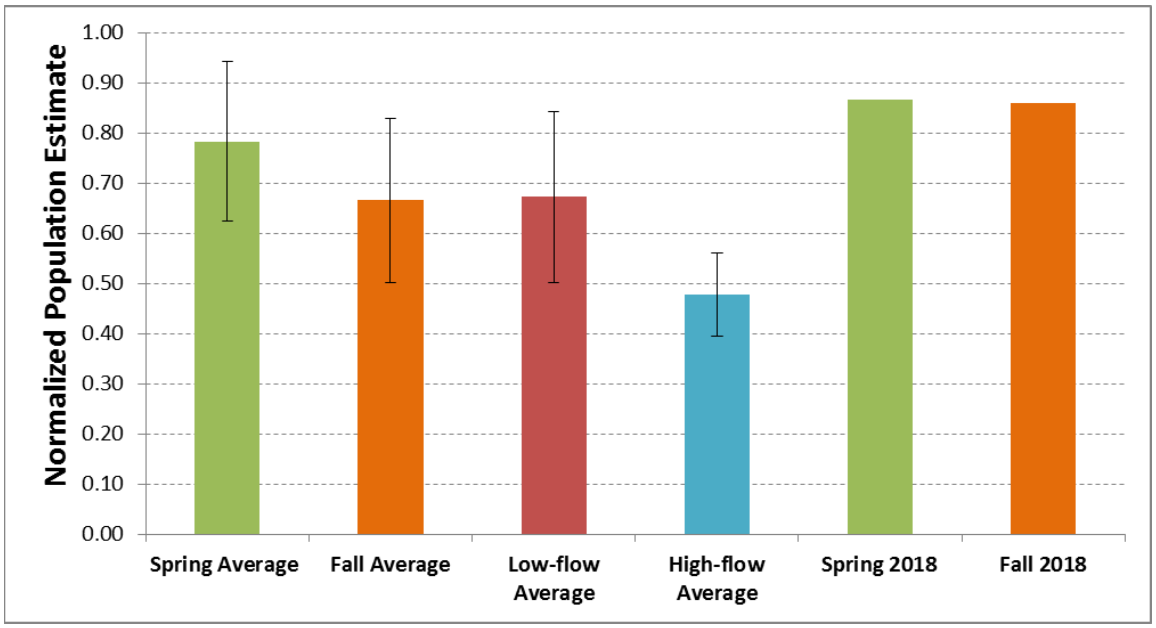


Figure 21. Normalized Fountain Darter population estimates in the Comal River based on coverage of various vegetation types in the study reaches and average density of Fountain Darters in each type. Long-term study averages are provided with bars representing one standard deviation from the mean.

The length frequency distribution for Fountain Darters collected by drop nets from the Comal system during spring (n = 10,833) and fall (n = 9,139) sampling events from 2000 to 2018 is presented in Figure 22 along with 2018 specific results. Both collection events in 2018 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 22). The overall similarities in patterns between 2018 and long-term conditions confirms a consistent Fountain Darter life-stage distribution relative to previous years.

Excluding Fountain Darters, approximately 143,829 other specimens representing 24 other fish taxa have been collected by drop netting from the Comal system during the study period (2000–

2018). 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, Largemouth Bass *Micropterus salmoides*, Western Mosquitofish, and Redspotted Sunfish *Lepomis miniatus* were the most common fish collected in 2018. The high abundance of Largemouth Bass was the result of a drop net landing on a recently hatched group of bass fry in the Upper Spring Run Reach during the spring sampling. At this site, 1,110 juvenile (10-25mm) Largemouth Bass were collected.

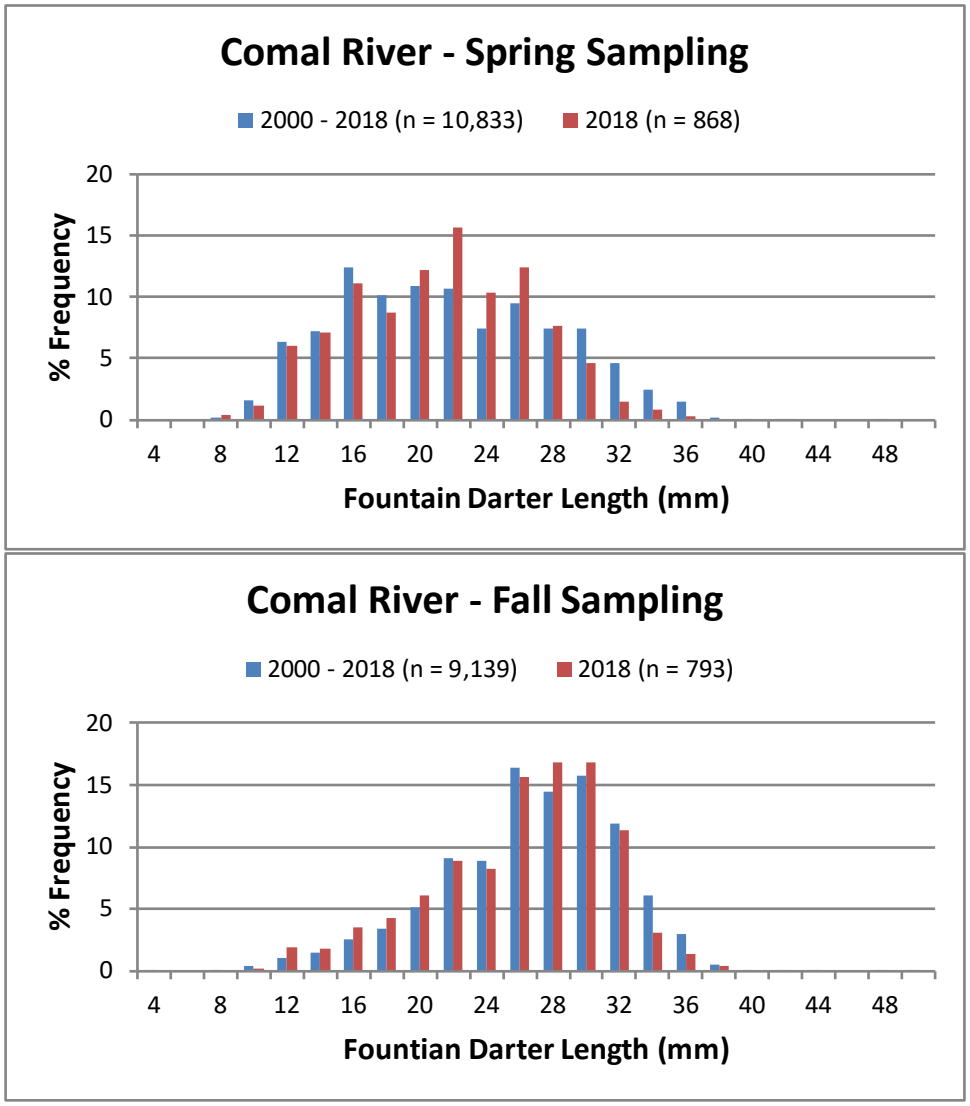


Figure 22. Length frequency distribution of Fountain Darters collected from the Comal system during all routine spring (top) and fall (bottom) drop-net events (2000–2018) and during 2018 only.

As mentioned, seven species collected during drop netting from 2000 to 2018 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 in the San Marcos River system

feed mainly on algal derived detritus, 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. 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 2018), based on data from fish community sampling (see Fish Community section) they are present in the system.

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

Family	Scientific Name	Common Name	Status	2018	2000-2018
Cyprinidae	*Campostoma anomalum*	Central stoneroller	N		1
	Dionda nigrotaeniata	Guadalupe roundnose minnow	N	19	1,107
	Notropis amabilis	Texas shiner	N	29	361
	Notropis volucellus	Mimic shiner	N		34
	Notropis sp.	Shiner	N		3
	Pimephales vigilax	Bullhead minnow	N		4
Characidae	*Astyanax mexicanus*	Mexican tetra	I	15	484
Ictaluridae	*Ameiurus melas*	Black bullhead	N		1
	Ameiurus natalis	Yellow bullhead	N	9	134
Loricariidae	*Pterygoplichthys sp.*	Sailfin catfish	I		90
Poeciliidae	*Gambusia* sp.	Mosquitofish	N	518	130,168
	Poecilia latipinna	Sailfin molly	I		4,713
Centrarchidae	*Ambloplites rupestris*	Rock bass	I		27
	Lepomis auritus	Redbreast sunfish	I		148
	Lepomis cyanellus	Green sunfish	N		57
	Lepomis gulosus	Warmouth	N	3	39
	Lepomis macrochirus	Bluegill	N	8	275
	Lepomis megalotis	Longear sunfish	N		264
	Lepomis microlophus	Redear sunfish	N		3
	Lepomis miniatus	Redspotted sunfish	N	123	2,505
	Lepomis sp.	Sunfish	N/I	44	903
	Micropterus punctulatus	Spotted bass	N		4
	Micropterus salmoides	Largemouth bass	N	1115	1,588
Percidae	*Etheostoma fonticola*	Fountain darter	N	1661	27,807
	Etheostoma lepidum	Greenthroat darter	N	8	77
Cichlidae	*Herichthys cyanoguttatus*	Rio Grande cichlid	I	19	767
	Oreochromis aureus	Blue tilapia	I	1	72
Total				3,572	171,636

[a] N= Native, I=Introduced.
[b] Includes Fountain Darter and unknown fishes.

Dip Nets

Dip-net Timed Surveys

Timed dip-net collections were conducted three times during routine sampling events in the Comal River during 2018: May (spring), July (summer), and October (fall). For the second year in a row the average number of darters collected from timed dip-net surveys in 2018 was higher

than the long-term average for all three sampling occasions. Size class 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. 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.

Random Presence / Absence Survey

In 2018, presence/absence dip netting was conducted within four reaches on the Comal River during the routine spring (May), summer (July), 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 84% during the spring, dropped slightly to 78% during summer sampling effort, and increased to 80% by fall (Figure 23). The spring sample was equal to 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.

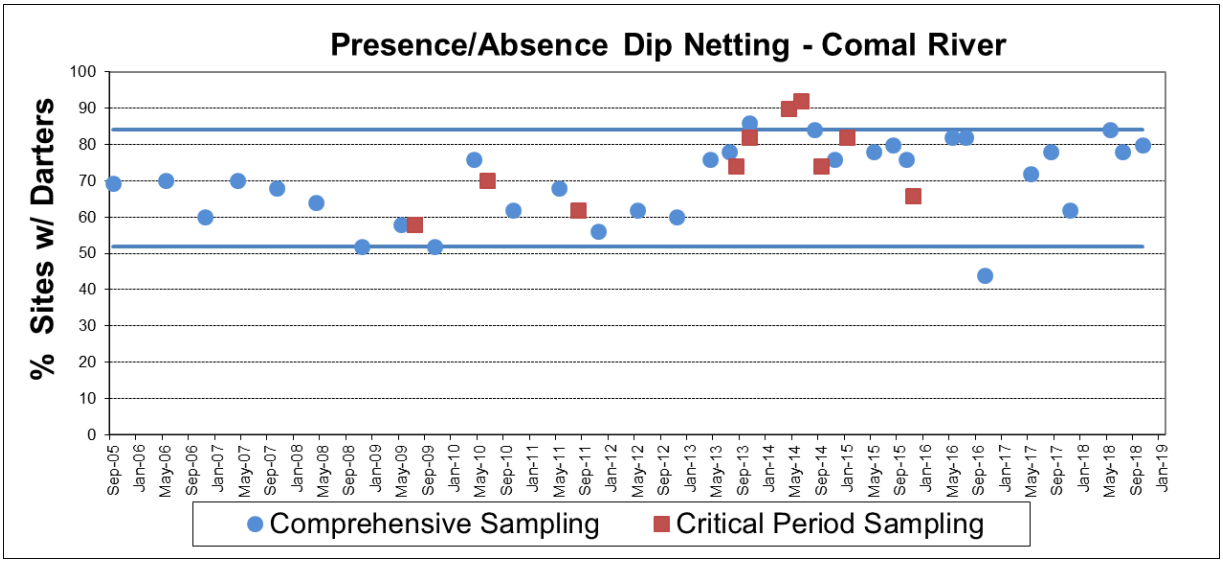


Figure 23. Percentage of sites (*n*=50) in which Fountain Darters were present. Solid blue lines mark 5th and 95th percentiles for comprehensive sampling.

Visual Observations

Fountain Darters were again observed in the deepest portions of Landa Lake (depths greater than 2 m) during both 2018 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. In spring 2018, bryophyte coverage and Fountain Darter observations were slightly lower than in 2017, with 60% coverage of bryophytes and 29 Fountain Darters observed. This decreased again in fall 2018 to 40% coverage of bryophytes and 19 Fountain Darters observed. 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 2018 and it will be interesting to track the typical corresponding bryophyte regeneration moving forward into 2019.

Fish Community Sampling

Twenty-five species of fishes and 4,755 individuals were identified and enumerated among four locations on the Comal River in May (Spring) and November (Fall) 2018 (Table 12). Most observed individuals are only reported to the genus level, since species-level identification is often uncertain based on underwater observations. Mosquitofish was the most abundant taxa, representing approximately 25% of all fishes encountered. Fountain Darter ranked second in abundance, comprising 17% of all individuals encountered. Other abundant taxa included Mexican Tetra *Astyanax mexicanus* (9%) and Largemouth Bass (8%). Uncommon species included Yellow Bullhead *Ameiurus natalis* (1 individual), Channel Catfish *Ictalurus punctatus* (2 individual), and Green Sunfish *Lepomis cyanellus* (3 individuals). One new species for the project, the Blackstripe Topminnow *Fundulus notatus* was collected while seining in the New Channel reach during the fall of 2018 (Table 12).

Six years of fish community sampling since 2013 has resulted in enumeration of 63,495 fishes representing 28 species. Species richness is similar to the long-term drop-net database (2000–2018), which has identified more than 161,000 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 (SWCA 2018b). 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. Fishes captured in the Comal River/Springs ecosystems in 2000–2018 drop-net sampling and fish community sampling from 2015 to 2018. Total percent relative abundance (Total %) is reported. N=native, I=introduced.

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS	DROP NET (2000–2018)		FISH COMMUNITY (2015–2018)					
				Total #	Total %	2015 #	2016 #	2017 #	2018#	Total #	Total %
Cyprinidae	*Campostoma anomalum*	Central Stoneroller	N	1	0.00	0	0	0	0	0	0.00
	Cyprinella venusta	Blacktail Shiner	N	0	0.00	0	21	6	4	31	0.15
	Dionda nigrotaeniata	Guadalupe Roundnose Minnow	N	1,107	0.64	257	181	126	187	751	3.59
	Notropis amabilis	Texas Shiner	N	361	0.21	416	1,101	0	150	1667	7.97
	Notropis volucellus	Mimic Shiner	N	34	0.02	13	71	32	5	121	0.58
	Pimephales vigilax	Bullhead Minnow	N	4	0.00	0	0	0	0	0	0.00
Characidae	*Astyanax mexicanus*	Mexican Tetra	I	484	0.28	249	248	262	432	1191	5.69
Ictaluridae	*Ameiurus melas*	Black Bullhead	N	1	0.00	0	0	0	0	0	0.00
	Ameiurus natalis	Yellow Bullhead	N	134	0.08	7	0	7	1	15	0.07
	Ictalurus punctatus	Channel Catfish	N	0	0.00	5	0	1	2	8	0.04
Loricariidae	*Pterygoplichthys* sp.	Suckermouth Armored Catfish	I	90	0.05	11	8	4	20	43	0.21
Fundulidae	*Fundulus notatus*	Blackstripe Topminnow	N	0	0.00	0	0	0	1	1	0.00
Poeciliidae	*Gambusia affinis*	Western Mosquitofish	N	-	-	168	2	0	91	261	1.25
	Gambusia geiseri	Largespring Gambusia	N	-	-	122	137	37	377	673	3.22
	Gambusia sp.	Mosquitofish	N	130,138	75.84	5,549	942	671	1,170	8,332	39.82
	Poecilia latipinna	Sailfin Molly	I	4,713	2.75	27	0	0	14	41	0.20
Centrarchidae	*Ambloplites rupestris*	Rock Bass	I	27	0.02	4	2	3	6	15	0.07
	Lepomis auritus	Redbreast Sunfish	I	148	0.09	290	114	72	176	652	3.12
	Lepomis cyanellus	Green Sunfish	N	57	0.03	6	24	3	3	36	0.17
	Lepomis gulosus	Warmouth	N	39	0.02	5	5	0	20	30	0.14
	Lepomis macrochirus	Bluegill	N	275	0.16	106	14	31	65	216	1.03
	Lepomis megalotis	Longear Sunfish	N	264	0.15	38	40	21	18	117	0.56
	Lepomis microlophus	Redear Sunfish	N	3	0.00	0	0	2	0	2	0.01
	Lepomis miniatus	Redspotted Sunfish	N	2,505	1.46	100	50	48	125	323	1.54
	Lepomis sp.	Sunfish	N/I	903	0.53	369	185	75	150	779	3.72
	Micropterus dolomieu	Smallmouth Bass	I	0	0.00	0	0	0	0	0	0.00
	Micropterus punctulatus	Spotted Bass	N	4	0.00	0	0	0	0	0	0.00
	Micropterus salmoides	Largemouth Bass	N	1,588	0.93	146	137	353	388	1024	4.89
Percidae	*Etheostoma fonticola*	Fountain Darter	N	27,808	16.20	1,177	634	352	804	2,967	14.18
	Etheostoma lepidum	Greenthroat Darter	N	77	0.04	128	135	124	86	473	2.26
	Etheostoma sp.	Unidentified darter	N	0	0	232	100	179	418	929	4.44
Cichlidae	*Herichthys cyanoguttatus*	Rio Grande Cichlid	I	767	0.45	69	31	19	38	157	0.75
	Oreochromis aureus	Blue Tilapia	I	72	0.04	3	59	1	4	67	0.32
Total				171,634	100	9,497	4,241	2,429	4,755	20,922	100

Comal Springs Salamander Visual Observations

Biologists recorded the most Comal springs salamander observations to date in 2018 (n=280), with fall sampling having the second-most salamander observations in a single sampling event since the inception of the monitoring program in 2000 (Table 13). Fall and spring 2018 salamander observations exceeded the long-term average (2001–2018) across all sites with the exception of the Spring Island Run location. Spring sampling yielded less salamander observations than fall sampling, which is a consistent pattern seen throughout the long-term salamander monitoring. The greatest difference in observations from the long-term average came from spring and fall sampling in both Spring Run areas and the Spring Island Outfall (Table 13).

Spring Run 1 had the most salamander observations for both spring and fall 2018 (n=132). In fall 2018, Spring Run 1 had the greatest number of salamander observations in a single sampling

event (n=74, Figure 25). Spring Run 1 also had the greatest number of observations recorded in a single sampling event during spring sampling efforts (n=58). In both spring and fall 2018, Spring Run 3 had the second most salamander observations (Figure 26), with Spring Island East Outfall having the third most (Figure 24). As is typical, counts were lower in Spring Island Run, with only three salamanders documented in this area in 2018.

Table 13. Total Comal Springs salamander observations for spring and fall routine sampling 2018 and the long-term average observation.

SEASON	2018 SAMPLING EVENT				
	Spring Run 1	Spring Run 3	Spring Island Run	Spring Island Outfall	Totals
Spring	58	41	2	28	129
Fall	74	40	1	36	151
Total	132	81	3	64	280
Average 2001–2018	23	17	4	13	

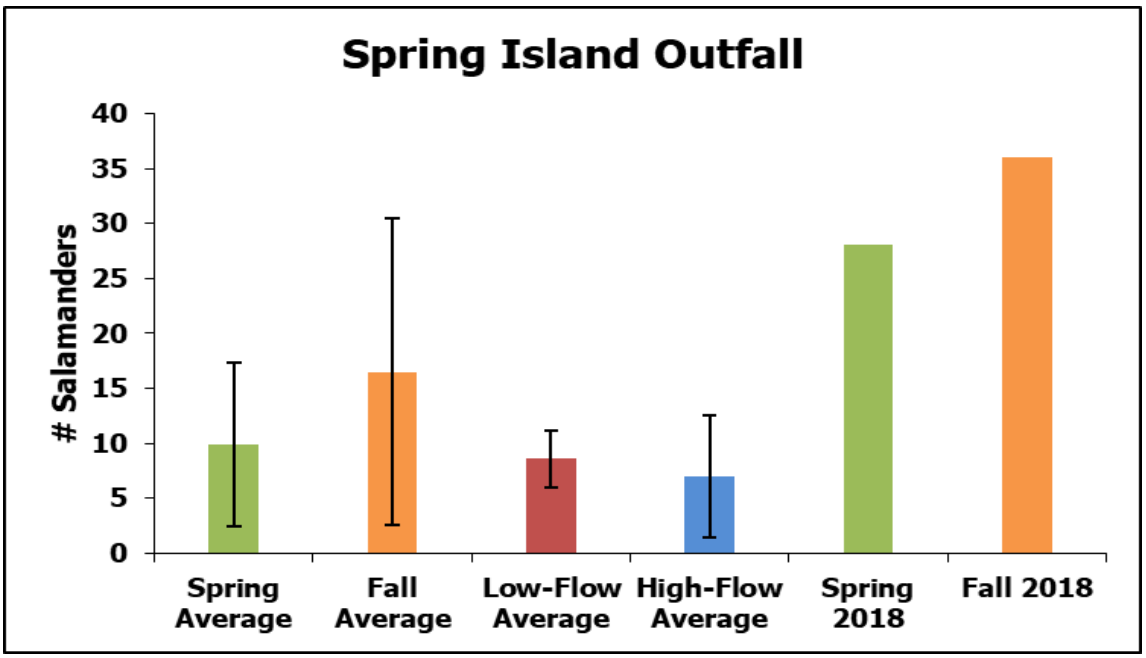


Figure 24. Comal Springs salamander observations at the Spring Island East Outfall in 2018, with the long-term average for each sampling event. Long-term study averages are provided with error bars representing the standard deviation of the mean.

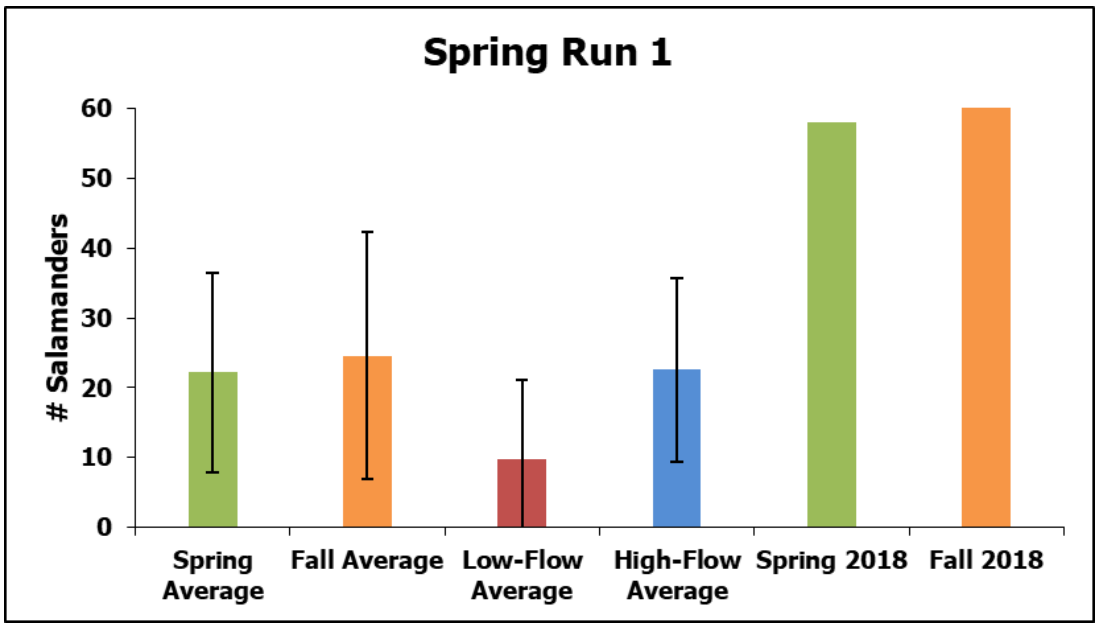


Figure 25. Comal Springs salamander observations at Spring Run 1 in 2018, with the long-term average for each sampling event. Long-term study averages are provided with error bars representing the standard deviation of the mean.

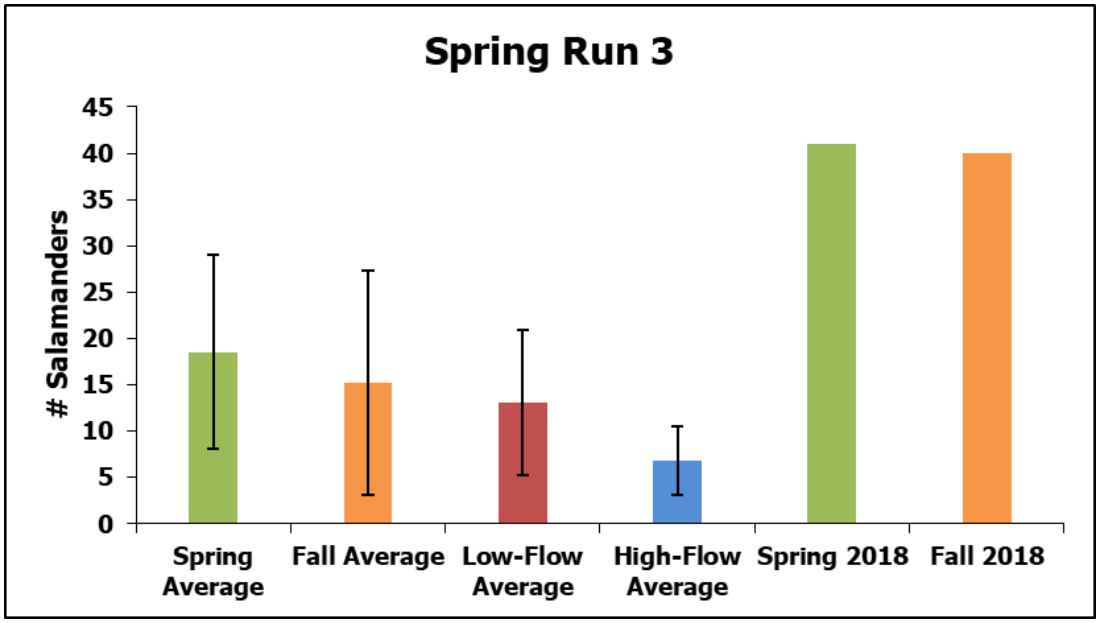


Figure 26. Comal Springs salamander observations at Spring Run 3 in 2018, with the long-term average for each sampling event. Long-term study averages are provided with error bars representing the standard deviation of the mean.

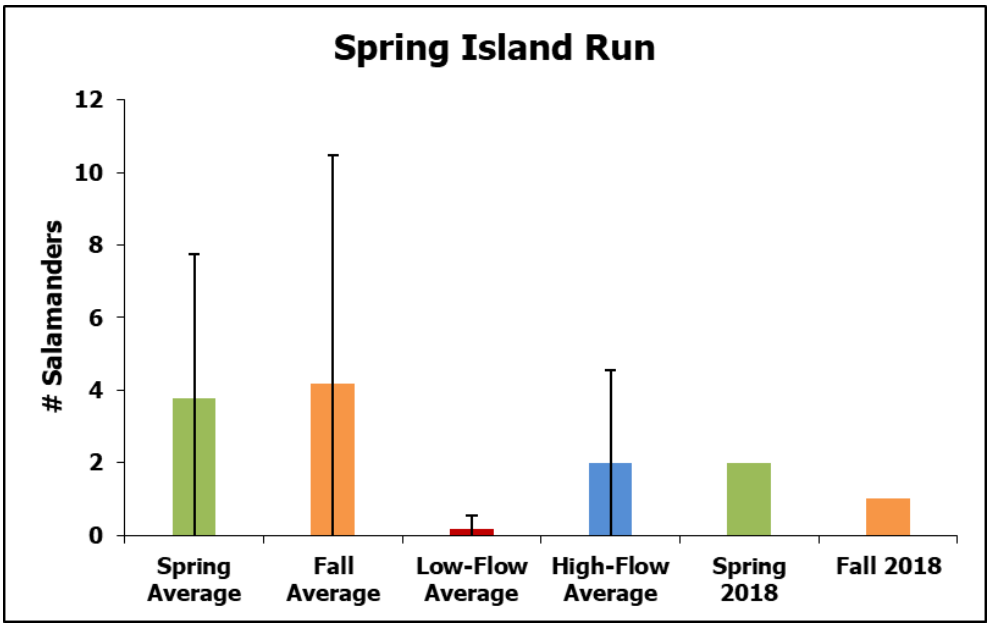


Figure 27. Comal Springs salamander observations at the Spring Island Run (Spring Run 6) in 2018, with the long-term average for each sampling event. Long-term study averages are provided with error bars representing the standard deviation of the mean.

Spring Island East Outfall, Spring Run 1, and Spring Run 3 were all above the long-term average and higher than previous years (Figures 24, 25, and 26), with the exception of 2017 wherein relatively higher salamander numbers were also recorded. Historically, Spring Island East Outfall has contributed low observations of salamanders, which has been attributed to disturbance (i.e., swimmers and waders). However, the higher than average post-drought discharge conditions have stimulated high abundances of bryophytes, which provides refuge for young salamanders. Also, the human activity coupled with appropriate refuge may limit the pressure of predatory fish on salamanders. Higher-than-normal observations in 2018 could be attributed to increased recruitment or prey abundance in recent times; however, this remains speculation at this time.

Comal Macroinvertebrate Sampling

Both drift-net and cotton-lure sampling were used to assess population dynamics of federally listed Comal invertebrate species in 2018.

Drift-net Sampling

In 2018, a total of 1,436 groundwater invertebrates were collected during drift net sampling efforts among both seasons, with 336 at Spring Run 1, 532 at Spring Run 3, and 568 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 *Lirceolus* (isopods) having the second-most observations in drift net collections. No adult Comal Spring riffle beetles were collected during 2018 drift net activities. From 2004 – 2018 drift samples have collected 1.7 ± 2.4 adults per year; however, from 2010 – 2018 sampling events collected 0.6 ± 1.0 adults per year.

Table 14. Total numbers of troglobitic and endangered species collected at each site during May and November 2018. Federally endangered species are designated with (E). A=adult; L=larvae; P=probable pupae.

	Run 1	Run 3	Upwelling
Total Drift Net Time (hrs)	48	48	48
Crustaceans			
Amphipoda			
Crangonyctidae			
Stygobromus pecki (E)	17	26	52
Stygobromus russelli	3		2
Stygobromus bifurcatus			
Stygobromus flagellatus			
Stygobromus spp.	183	152	489
All *Stygobromus*	203	178	543
Hadziidae			
Mexiweckelia hardeni	36	143	2
Sebidae			
Seborgia relicta	10	29	13
Bogidiellidae			
Artesia subterranea	3		
Parabogidiella americana			
Ingolfiellidae			
Ingolfiella n. sp		1	
Isopoda			
Asellidae			
Lirceolus (spp.)	51	169	8
Cirolanidae			
Cirolanides texensis			
Cirolanides n. sp.		1	1
Thermosbaenacea			
Monodellidae			
Tethysbaena texana			1
Turbellaria			
Kenkiidae			
Sphalloplana mohri	2		
Arachnids			
Hydrachnoidea			
Hydryphantidae			
Almuerzothyas comalensis	24		
Insects			
Coleoptera			
Dytiscidae			
Comaldessus stygius	2 A	9 L	
Haideoporus texanus			
Dryopidae			
Stygoparnus comalensis (E)	3 L, 2 A	1 L, 1 A	
Elmidae			
Heterelmis comalensis (E)			

Two adults and three larvae of Comal Springs dryopid beetles were collected from Spring Run 1 and one adult and one larvae from Spring Run 3. Similar to 2017, no Edwards Aquifer diving beetles were collected in drift net sampling in 2018. As in previous years, Comal Springs riffle beetle 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 (52), and the highest number of immature *Stygobromus* species (489, Table 14).

Comal Springs Riffle Beetle

There were two cotton lure sampling efforts (spring, fall) in 2018 for Comal Springs riffle beetle. The use of tags to place and relocate lures was extremely helpful in recovering lures; only four lures were lost in spring, while all lures were recovered in fall. Figures 28 and 29 summarize the densities of adult Comal Springs riffle beetle from 2018 in the context of the long-term study. In 2018, the number of adult Comal Springs riffle beetle collected from lures at all localities were lower than the long-term average from previous years. Numbers of adult beetles sampled per lure from Spring Run 3 ranged from 0 – 9 in spring and 0 – 3 in fall. Even more remarkable regarding this site was the depauperate numbers of larvae sampled during both seasons with a total of four in spring and one in fall. The number of adult Comal Springs riffle beetle collected on lures at the Western Shoreline ranged from 0 – 30 in spring and 0 – 9 in fall. Lures retrieved from Spring Island collected 0 – 9 adult beetles in spring and 0 – 16 in fall.

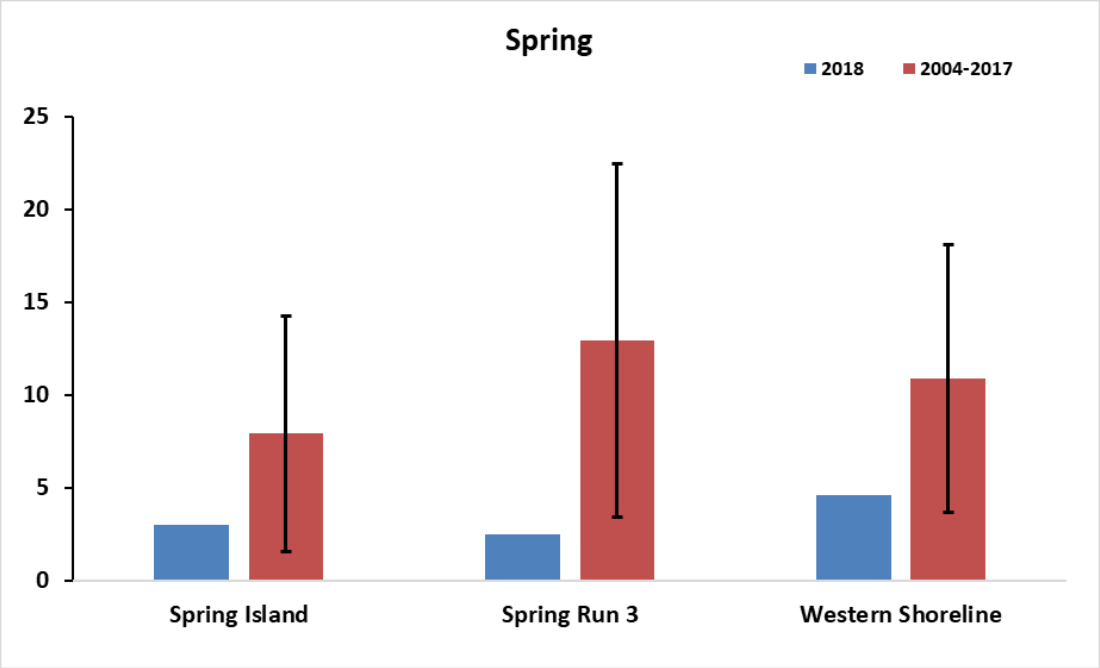


Figure 28. Mean densities of adult Comal Springs riffle beetles sampled during the spring season of 2018 compared to long-term (2004-2017) mean densities. Error bars represent one standard deviation of the mean.

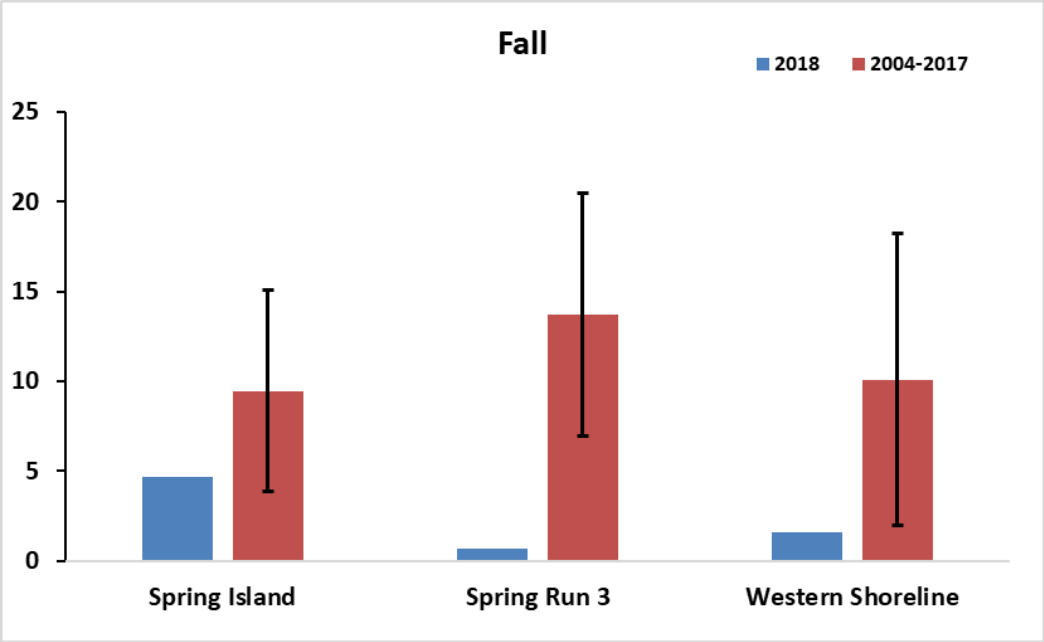


Figure 29. Mean densities of adult Comal Springs riffle beetles sampled during the fall season of 2018 compared to long-term (2004-2017) mean densities. Error bars represent one standard deviation of the mean.

For the second year in a row, Comal Springs riffle beetle densities are well below long-term averages. Due to the nature of the monitoring technique (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, human disturbance, or other stochastic factors can result in loss of cotton lures. Similarly, variation in placement of lures by only a few feet can drastically influence capture rates. To reduce the influence of such factors, efforts are being made to standardize exact lure placement and minimize lure loss to stochastic events. 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 1,366 and 926 individual macroinvertebrates, representing 41 and 46 unique taxa were sampled in spring and fall, respectively (raw data presented in Appendix C). Altogether, 62 unique taxa were represented among all samples from 2018. Metric values for each metric are reported, while metric scores for calculating the B-IBI can be found in Table 15. All samples in 2018 consisted of kick samples with no snag sampling supplements.

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 a “Limited” habitat in spring but showed qualities of an “Intermediate” supporting habitat in fall. Landa Lake is described from these assessments as being “Limited” in supporting a balanced, integrated, adaptive community of organisms. 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

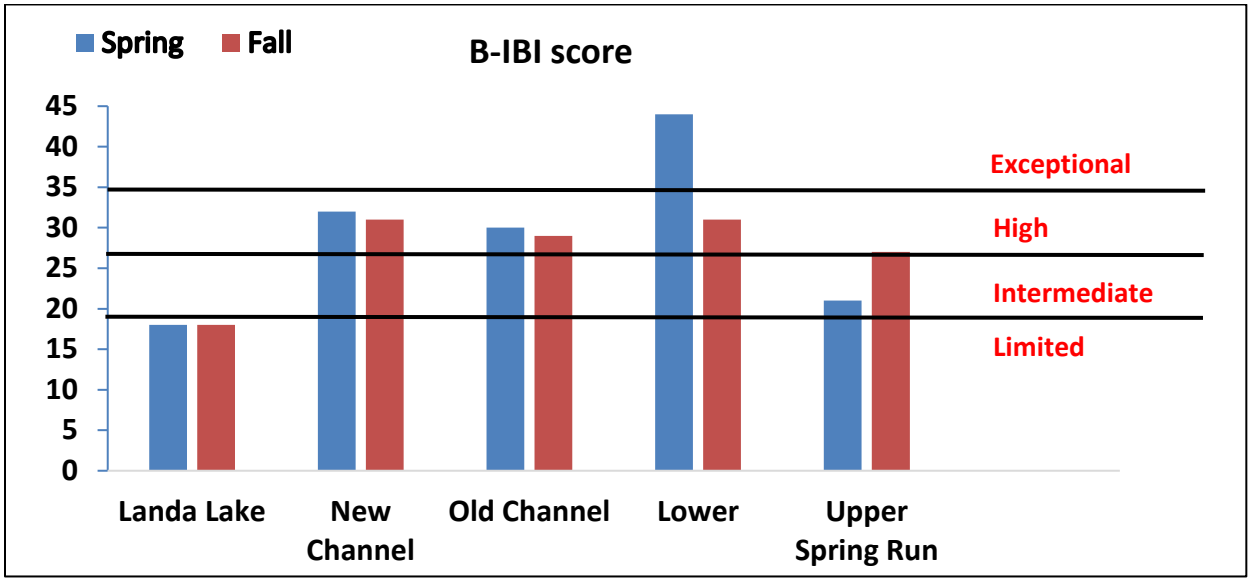


Figure 30. Benthic macroinvertebrate Index of Biotic Integrity (B-IBI) scores and aquatic-life-use point-score ranges for Comal Springs sample sites. "Exceptional" indicates highest quality habitats relative to reference streams used to develop the index.

In summary, areas of more lentic-type habitat (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 San Marcos and Comal rivers.

CONCLUSION

In conclusion, the Comal Spring/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 were variable in 2018 which included an average spring, a dry summer, and an extremely wet fall period. Despite this variability, the system continues to maintain 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.

Two notable patterns observed in recent years include an increase in Comal salamander observations and a decrease in the density of Comal Springs riffle beetles observed on cotton lures. A variety of factors could potentially be influencing these patterns and future monitoring will be crucial in evaluating responses of these two HCP covered species to a suite of ever-changing hydrologic and climatic conditions as well as human-induced influences. 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.

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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

APPENDIX B-1: AQUATIC VEGETATION MAPS

Full System – Comal

Comal River

New Braunfels, Texas

Aquatic Vegetation Study
Spring 2018

Surveyed: Jan. 23 - Mar. 09, 2018

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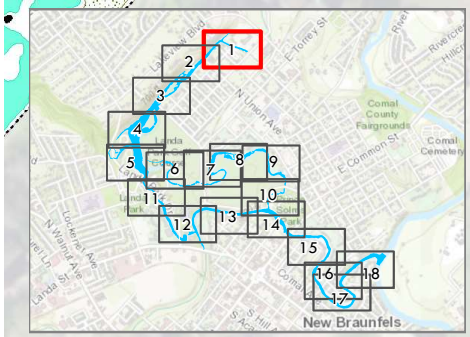

FULL SYSTEM MAP

Page 1 of 18

- Comal River
- Study Reach

- Bryophyte
- Algae
- Bacopa
- Cabomba
- Canna
- Ceratopteris
- Chara
- Colocasia
- Eleocharis
- Hygrophila
- Justicia
- Limnophila
- Ludwigia
- Nuphar
- Polygonum
- Potamogeton
- Pseudacoris
- Sagittaria
- Vallisneria
- Xanthosoma
- Zizaniopsis

N

0 50 100 200 ft
0 10 20 40 m

1 inch = 100 feet

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

Comal River

New Braunfels, Texas

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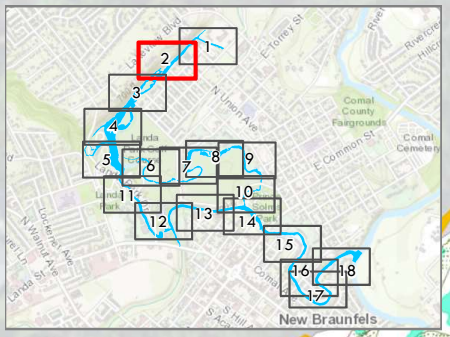

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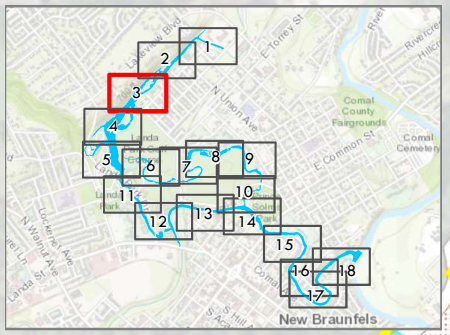

FULL SYSTEM MAP

Page 3 of 18

- Comal River
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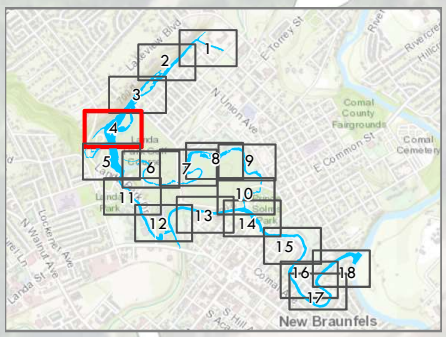

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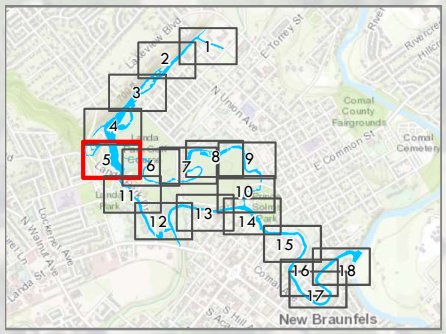

FULL SYSTEM MAP

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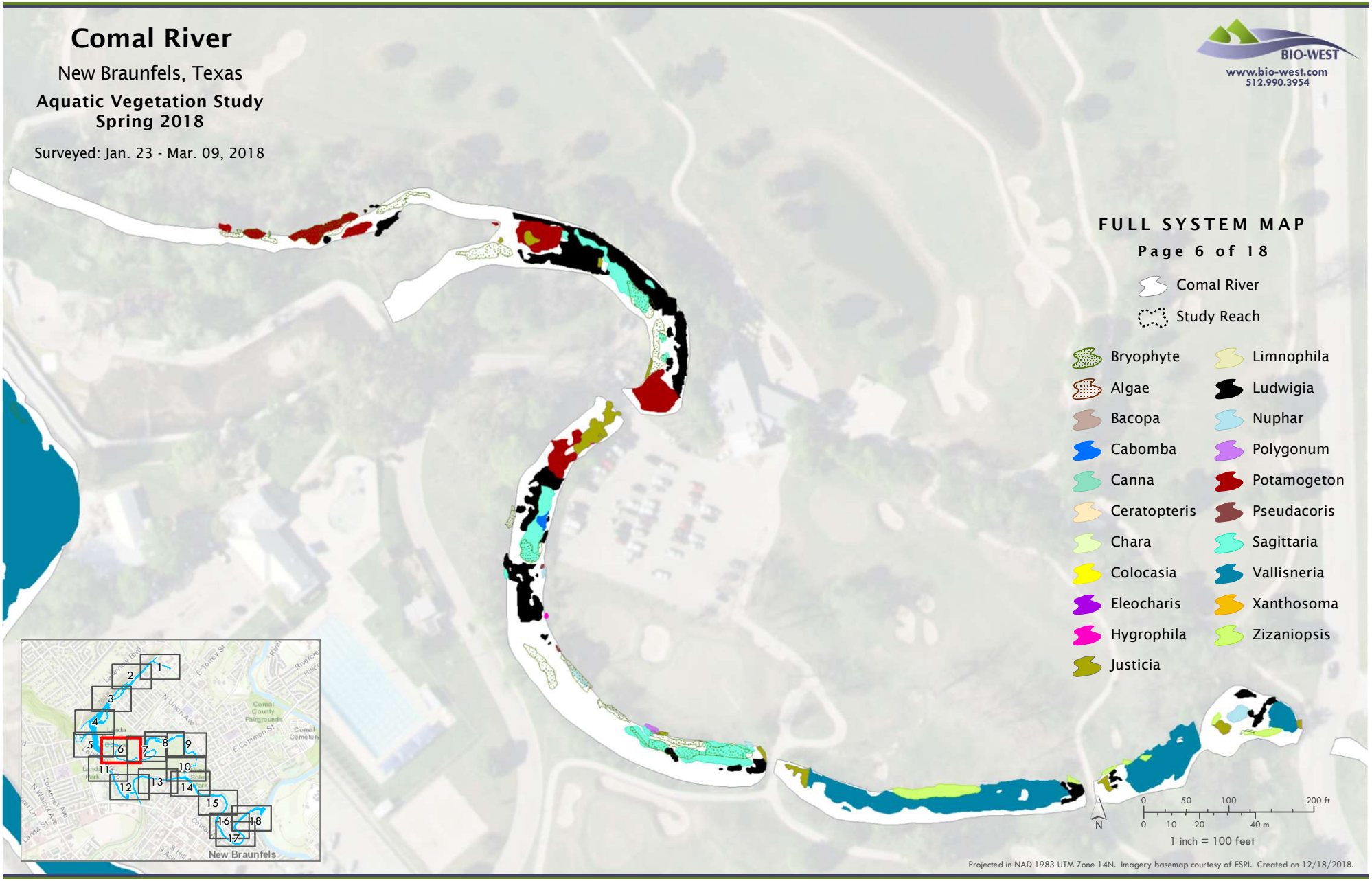

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

Comal River

New Braunfels, Texas

Aquatic Vegetation Study
Spring 2018

Surveyed: Jan. 23 - Mar. 09, 2018

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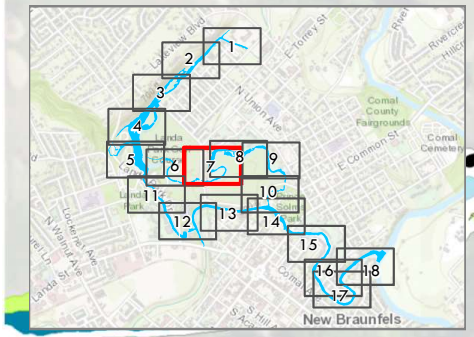


FULL SYSTEM MAP

- Comal River
- Study Reach

- Bryophyte
- Algae
- Bacopa
- Cabomba
- Canna
- Ceratopteris
- Chara
- Colocasia
- Eleocharis
- Hygrophila
- Justicia
- Limnophila
- Ludwigia
- Nuphar
- Polygonum
- Potamogeton
- Pseudacoris
- Sagittaria
- Vallisneria
- Xanthosoma
- Zizaniopsis

N

0 50 100 200 ft
0 10 20 40 m

1 inch = 100 feet

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

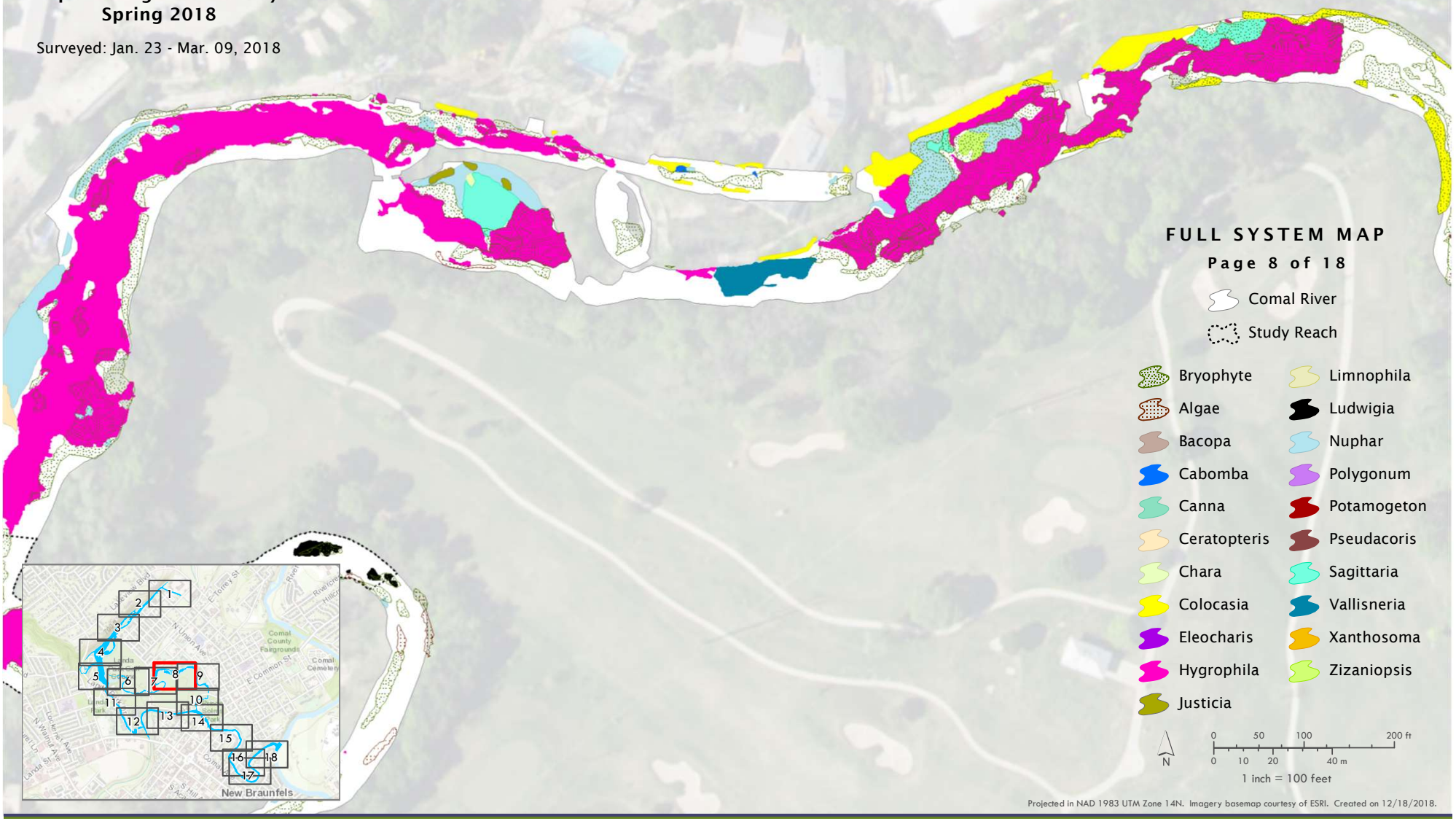
Comal River

New Braunfels, Texas

Aquatic Vegetation Study
Spring 2018

Surveyed: Jan. 23 - Mar. 09, 2018

BIO-WEST
www.bio-west.com
512.990.3954



Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

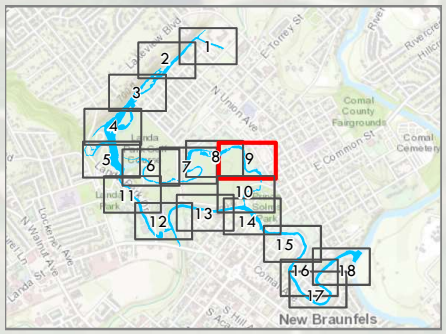
Comal River

New Braunfels, Texas

Aquatic Vegetation Study
Spring 2018

Surveyed: Jan. 23 - Mar. 09, 2018

BIO-WEST
www.bio-west.com
512.990.3954



FULL SYSTEM MAP

- Comal River
- Study Reach

- Bryophyte
- Algae
- Bacopa
- Cabomba
- Canna
- Ceratopteris
- Chara
- Colocasia
- Eleocharis
- Hygrophila
- Justicia
- Limnophila
- Ludwigia
- Nuphar
- Polygonum
- Potamogeton
- Pseudacoris
- Sagittaria
- Vallisneria
- Xanthosoma
- Zizaniopsis

N

0 50 100 200 ft
0 10 20 40 m
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Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

Comal River

New Braunfels, Texas

Aquatic Vegetation Study
Spring 2018

Surveyed: Jan. 23 - Mar. 09, 2018

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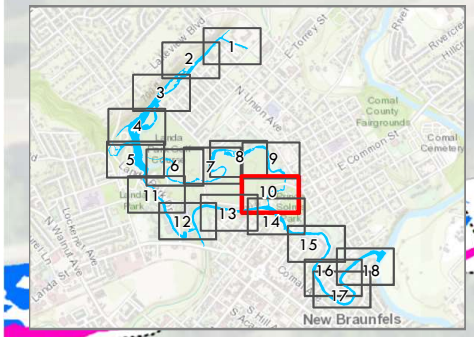

FULL SYSTEM MAP

- Comal River
- Study Reach

- Bryophyte
- Algae
- Bacopa
- Cabomba
- Canna
- Ceratopteris
- Chara
- Colocasia
- Eleocharis
- Hygrophila
- Justicia
- Limnophila
- Ludwigia
- Nuphar
- Polygonum
- Potamogeton
- Pseudacoris
- Sagittaria
- Vallisneria
- Xanthosoma
- Zizaniopsis

N

0 50 100 200 ft
0 10 20 40 m
1 inch = 100 feet

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

Comal River

New Braunfels, Texas

Aquatic Vegetation Study
Spring 2018

Surveyed: Jan. 23 - Mar. 09, 2018

BIO-WEST
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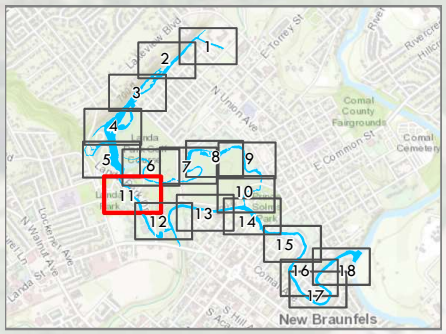

FULL SYSTEM MAP

- Comal River
- Study Reach

- Bryophyte
- Algae
- Bacopa
- Cabomba
- Canna
- Ceratopteris
- Chara
- Colocasia
- Eleocharis
- Hygrophila
- Justicia
- Limnophila
- Ludwigia
- Nuphar
- Polygonum
- Potamogeton
- Pseudacoris
- Sagittaria
- Vallisneria
- Xanthosoma
- Zizaniopsis

N

0 50 100 200 ft
0 10 20 40 m
1 inch = 100 feet

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

Comal River

New Braunfels, Texas

Aquatic Vegetation Study
Spring 2018

Surveyed: Jan. 23 - Mar. 09, 2018

BIO-WEST
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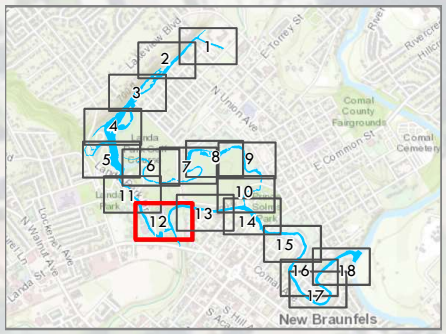
512.990.3954



FULL SYSTEM MAP

Page 12 of 18

- Comal River
- Study Reach

- Bryophyte
- Algae
- Bacopa
- Cabomba
- Canna
- Ceratopteris
- Chara
- Colocasia
- Eleocharis
- Hygrophila
- Justicia
- Limnophila
- Ludwigia
- Nuphar
- Polygonum
- Potamogeton
- Pseudacoris
- Sagittaria
- Vallisneria
- Xanthosoma
- Zizaniopsis

N

0 50 100 200 ft
0 10 20 40 m
1 inch = 100 feet

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

Comal River

New Braunfels, Texas

Aquatic Vegetation Study
Spring 2018

Surveyed: Jan. 23 - Mar. 09, 2018

BIO-WEST
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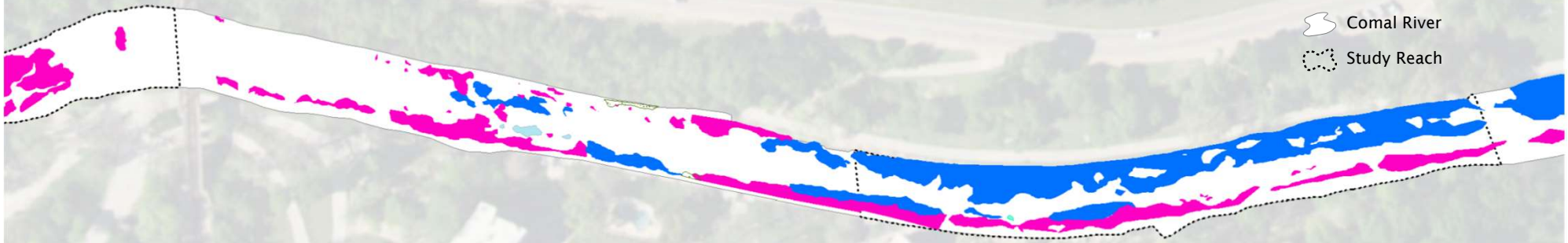
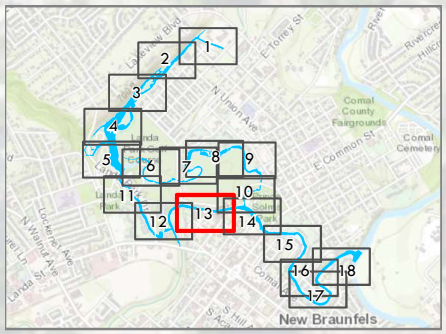
FULL SYSTEM MAP



Comal River
Study Reach



Bryophyte
Algae
Bacopa
Cabomba
Canna
Ceratopteris
Chara
Colocasia
Eleocharis
Hygrophila
Justicia
Limnophila
Ludwigia
Nuphar
Polygonum
Potamogeton
Pseudacoris
Sagittaria
Vallisneria
Xanthosoma
Zizaniopsis

N

0 50 100 200 ft
0 10 20 40 m

1 inch = 100 feet

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

Comal River

New Braunfels, Texas

Aquatic Vegetation Study
Spring 2018

Surveyed: Jan. 23 - Mar. 09, 2018

BIO-WEST
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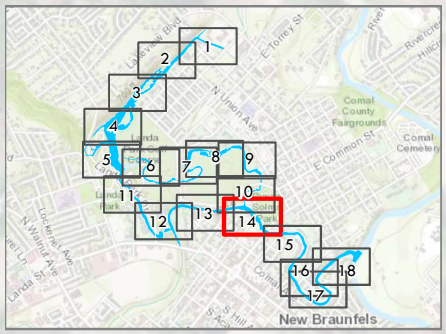

FULL SYSTEM MAP

Page 14 of 18

- Comal River
- Study Reach

- Bryophyte
- Algae
- Bacopa
- Cabomba
- Canna
- Ceratopteris
- Chara
- Colocasia
- Eleocharis
- Hygrophila
- Justicia
- Limnophila
- Ludwigia
- Nuphar
- Polygonum
- Potamogeton
- Pseudacoris
- Sagittaria
- Vallisneria
- Xanthosoma
- Zizaniopsis

N

0 50 100 200 ft
0 10 20 40 m

1 inch = 100 feet

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

Comal River

New Braunfels, Texas

Aquatic Vegetation Study
Spring 2018

Surveyed: Jan. 23 - Mar. 09, 2018

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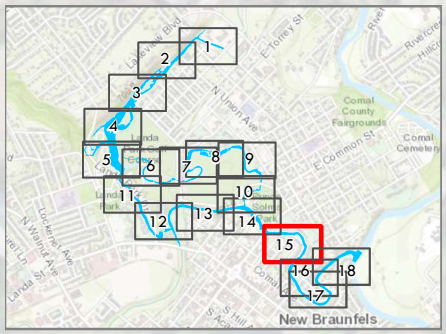

FULL SYSTEM MAP

Page 15 of 18

- Comal River
- Study Reach

- Bryophyte
- Algae
- Bacopa
- Cabomba
- Canna
- Ceratopteris
- Chara
- Colocasia
- Eleocharis
- Hygrophila
- Justicia
- Limnophila
- Ludwigia
- Nuphar
- Polygonum
- Potamogeton
- Pseudacoris
- Sagittaria
- Vallisneria
- Xanthosoma
- Zizaniopsis

N

0 50 100 200 ft
0 10 20 40 m

1 inch = 100 feet

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

Comal River

New Braunfels, Texas

Aquatic Vegetation Study
Spring 2018

Surveyed: Jan. 23 - Mar. 09, 2018

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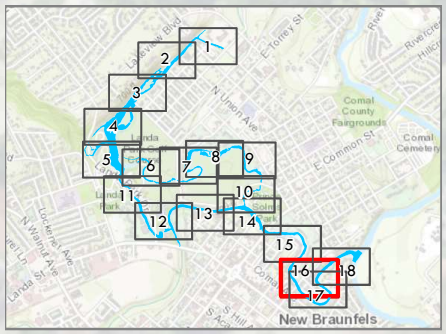
FULL SYSTEM MAP

Page 16 of 18

- Comal River
- Study Reach

- Bryophyte
- Algae
- Bacopa
- Cabomba
- Canna
- Ceratopteris
- Chara
- Colocasia
- Eleocharis
- Hygrophila
- Justicia
- Limnophila
- Ludwigia
- Nuphar
- Polygonum
- Potamogeton
- Pseudacoris
- Sagittaria
- Vallisneria
- Xanthosoma
- Zizaniopsis



N

0 50 100 200 ft
0 10 20 40 m
1 inch = 100 feet

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

Comal River

New Braunfels, Texas

Aquatic Vegetation Study
Spring 2018

Surveyed: Jan. 23 - Mar. 09, 2018

BIO-WEST
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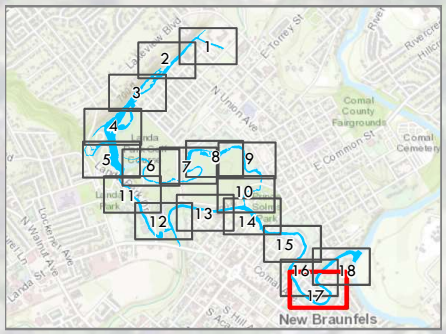

FULL SYSTEM MAP

Page 17 of 18

- Comal River
- Study Reach

- Bryophyte
- Algae
- Bacopa
- Cabomba
- Canna
- Ceratopteris
- Chara
- Colocasia
- Eleocharis
- Hygrophila
- Justicia
- Limnophila
- Ludwigia
- Nuphar
- Polygonum
- Potamogeton
- Pseudacoris
- Sagittaria
- Vallisneria
- Xanthosoma
- Zizaniopsis

N

0 50 100 200 ft
0 10 20 40 m

1 inch = 100 feet

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

Comal River

New Braunfels, Texas

Aquatic Vegetation Study
Spring 2018

Surveyed: Jan. 23 - Mar. 09, 2018

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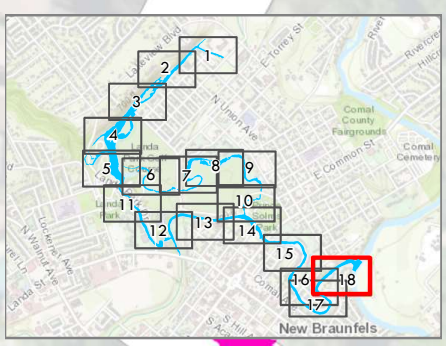

FULL SYSTEM MAP

Page 18 of 18

- Comal River
- Study Reach

- Bryophyte
- Algae
- Bacopa
- Cabomba
- Canna
- Ceratopteris
- Chara
- Colocasia
- Eleocharis
- Hygrophila
- Justicia
- Limnophila
- Ludwigia
- Nuphar
- Polygonum
- Potamogeton
- Pseudacoris
- Sagittaria
- Vallisneria
- Xanthosoma
- Zizaniopsis

N

0 50 100 200 ft
0 10 20 40 m
1 inch = 100 feet

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/18/2018.

APPENDIX B-2: AQUATIC VEGETATION MAPS

Study Reaches – Comal

Comal River

New Braunfels, Texas

UPPER SPRING RUN
Aquatic Vegetation
Study Reach

Spring 2018
Surveyed: April 27, 2018

BIO-WEST
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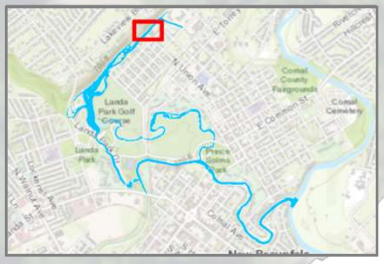


Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/10/2018.

Upper Spring Run

Study Reach	
Bryophyte	1,463.0 m²
Algae	552.0 m²
Ludwigia	26.3 m²
Sagittaria	919.9 m²

N

0 25 50 100 ft
0 5 10 20 m

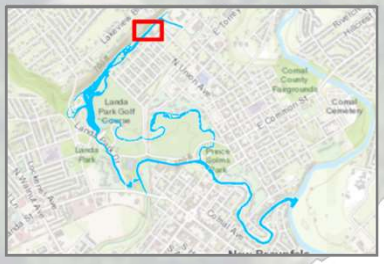
Comal River

New Braunfels, Texas

UPPER SPRING RUN
Aquatic Vegetation
Study Reach

Fall 2018
Surveyed: October 04, 2018

BIO-WEST
www.bio-west.com
512.990.3954



Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/10/2018.

Upper Spring Run

Study Reach	
Bryophyte	914.0 m²
Algae	138.7 m²
Ludwigia	3.2 m²
Sagittaria	685.6 m²

N

0 25 50 100 ft
0 5 10 20 m

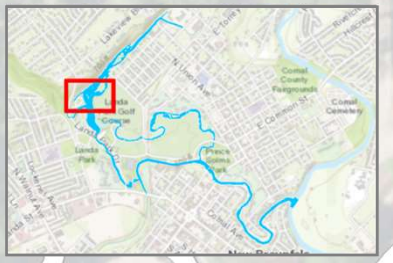
Comal River

New Braunfels, Texas

LANDA LAKE
Aquatic Vegetation
Study Reach

Spring 2018
Surveyed: April 23, 2018

BIO-WEST
www.bio-west.com
512.990.3954



Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/10/2018.

Landa Lake

Study Reach	
Bryophyte	2,393.4 m²
Bacopa	9.0 m²
Cabomba	164.6 m²
Colocasia	26.2 m²
Ludwigia	572.4 m²
Nuphar	12.5 m²
Potamogeton	15.7 m²
Sagittaria	3,027.3 m²
Vallisneria	12,798.8 m²

N

0 25 50 100 ft
0 5 10 20 m

Comal River

New Braunfels, Texas

LANDA LAKE
Aquatic Vegetation
Study Reach

Fall 2018
Surveyed: October 09, 2018

BIO-WEST
www.bio-west.com
512.990.3954

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/10/2018.

Landa Lake

Study Reach	
Bryophyte	2,061.1 m²
Cabomba	308.5 m²
Ludwigia	364.4 m²
Nuphar	2.96 m²
Potamogeton	28.94 m²
Sagittaria	2,937.3 m²
Vallisneria	11,795.8 m²

N

0 25 50 100 ft
0 5 10 20 m

Comal River

New Braunfels, Texas

OLD CHANNEL
Aquatic Vegetation
Study Reach

Spring 2018
Surveyed: May 01, 2018

BIO-WEST
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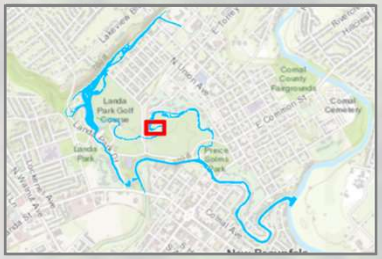

Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/10/2018.

Old Channel

Study Reach	
Bryophyte	220.3 m²
Cabomba	44.0 m²
Hygrophila	663.2 m²
Ludwigia	116.1 m²
Nuphar	53.7 m²

N

0 10 20 40 ft
0 2.5 5 10 m

Comal River

New Braunfels, Texas

OLD CHANNEL
Aquatic Vegetation
Study Reach

Fall 2018
Surveyed: October 11, 2018

BIO-WEST
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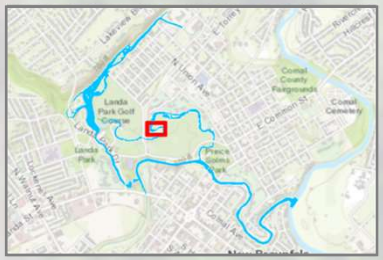
512.990.3954



Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/10/2018.

Old Channel

Study Reach	
Bryophyte	688.3 m²
Cabomba	112.6 m²
Ludwigia	239.8 m²
Nuphar	31.7 m²
Sagittaria	6.4 m²

N

0 10 20 40 ft
0 2.5 5 10 m

Comal River

New Braunfels, Texas

UPPER NEW CHANNEL
Aquatic Vegetation
Study Reach

Spring 2018
Surveyed: April 24, 2018

BIO-WEST
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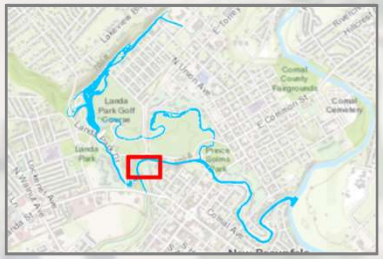


Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/10/2018.

Upper New Channel

Study Reach	
Bryophyte	278.0 m²
Cabomba	6.2 m²
Hygrophila	759.8 m²
Ludwigia	102.5 m²
Nuphar	1.5 m²

N

0 25 50 100 ft
0 5 10 20 m

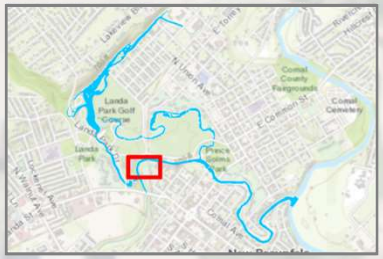
Comal River

New Braunfels, Texas

UPPER NEW CHANNEL
Aquatic Vegetation
Study Reach

Fall 2018
Surveyed: October 12, 2018

BIO-WEST
www.bio-west.com
512.990.3954



Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/10/2018.

Upper New Channel

Study Reach	
Bryophyte	434.2 m²
Cabomba	28.9 m²
Hygrophila	785.8 m²
Ludwigia	106.8 m²

N

0 25 50 100 ft
0 5 10 20 m

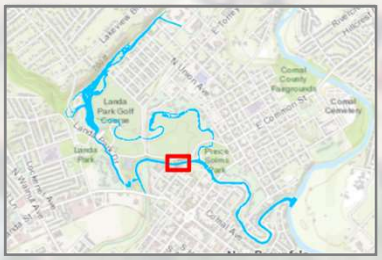
Comal River

New Braunfels, Texas

LOWER NEW CHANNEL
Aquatic Vegetation
Study Reach

Spring 2018
Surveyed: April 24, 2018

BIO-WEST
www.bio-west.com
512.990.3954



Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/10/2018.

Lower New Channel

Study Reach	
Cabomba	1,056.4 m^2
Hygrophila	574.8 m^2
Sagittaria	5.9 m^2

N

0 20 40 80 ft
0 5 10 20 m

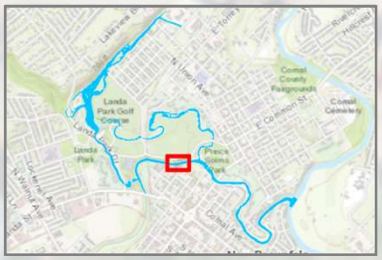
Comal River

New Braunfels, Texas

LOWER NEW CHANNEL
Aquatic Vegetation
Study Reach

Fall 2018
Surveyed: October 12, 2018

BIO-WEST
www.bio-west.com
512.990.3954



Projected in NAD 1983 UTM Zone 14N. Imagery basemap courtesy of ESRI. Created on 12/10/2018.

Lower New Channel

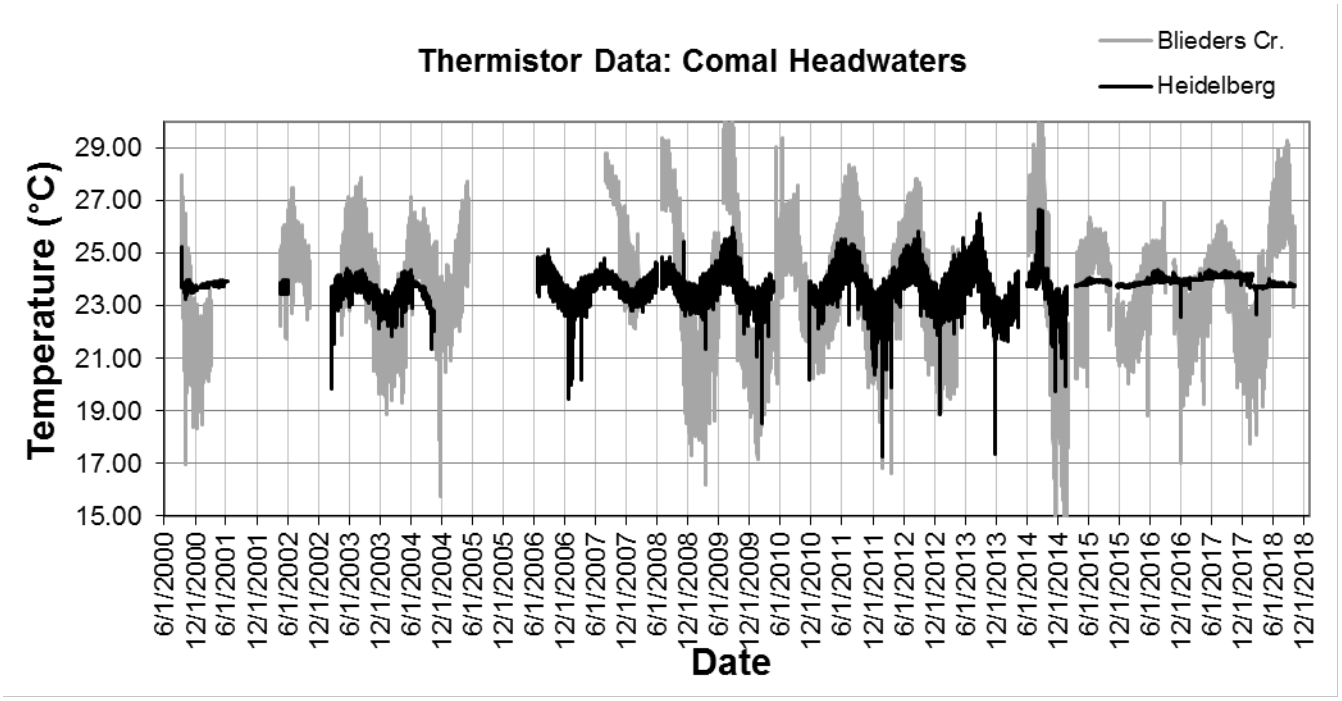
Study Reach	
Cabomba	2,003.7 m²
Hygrophila	574.8 m²

N

0 20 40 80 ft
0 5 10 20 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
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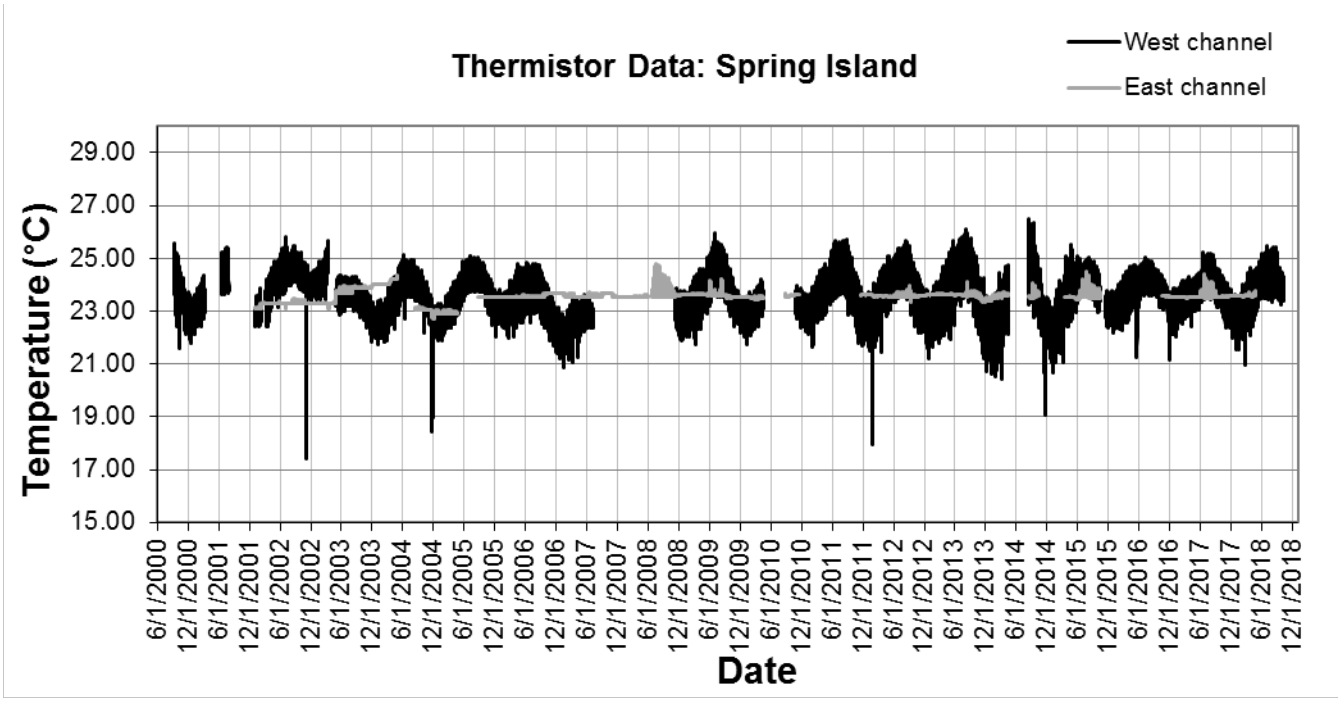
6/1/2018
12/1/2018
Date


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
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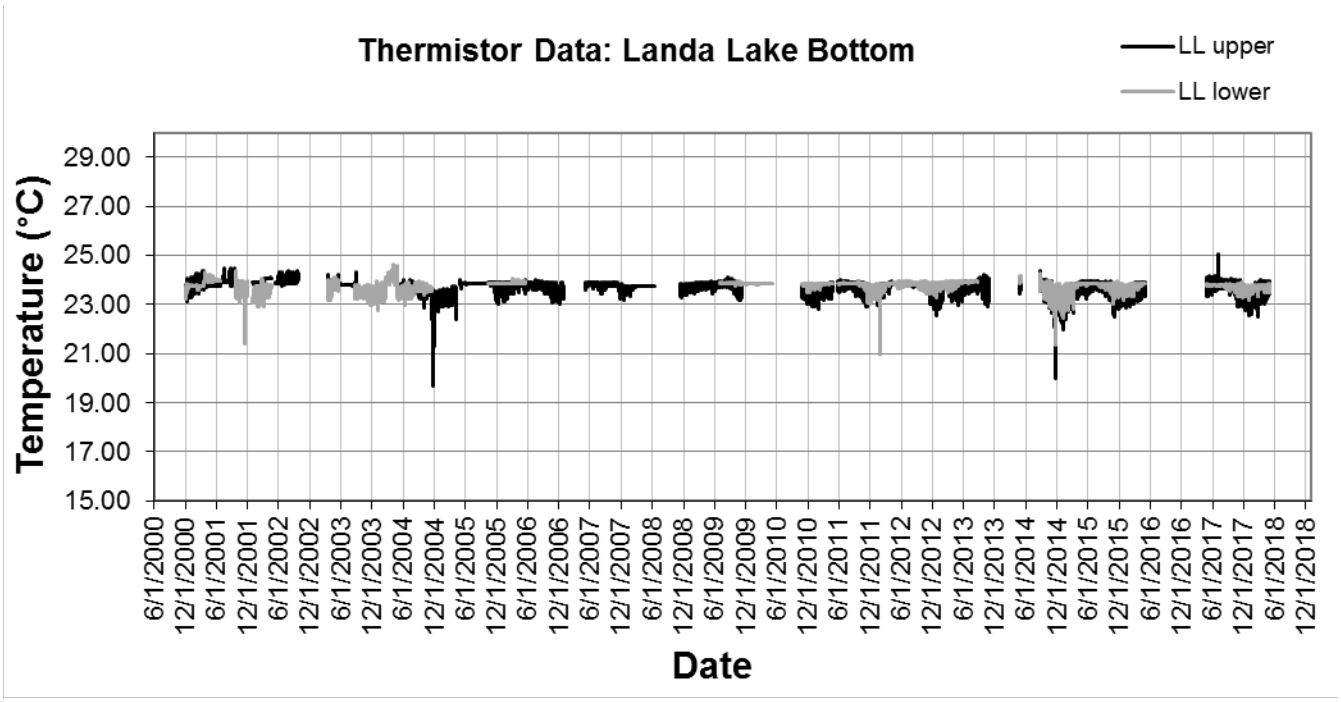
6/1/2018
12/1/2018
Date


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
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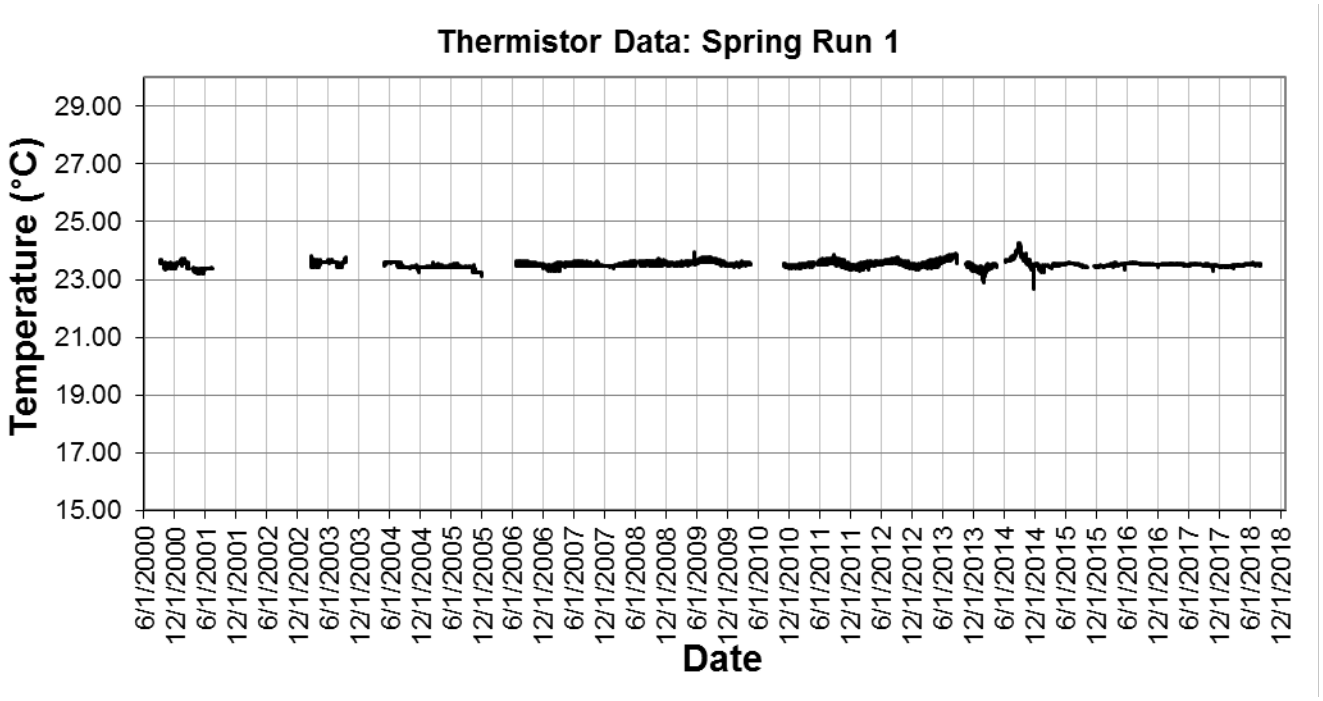
6/1/2017
12/1/2017
6/1/2018
12/1/2018
Date


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
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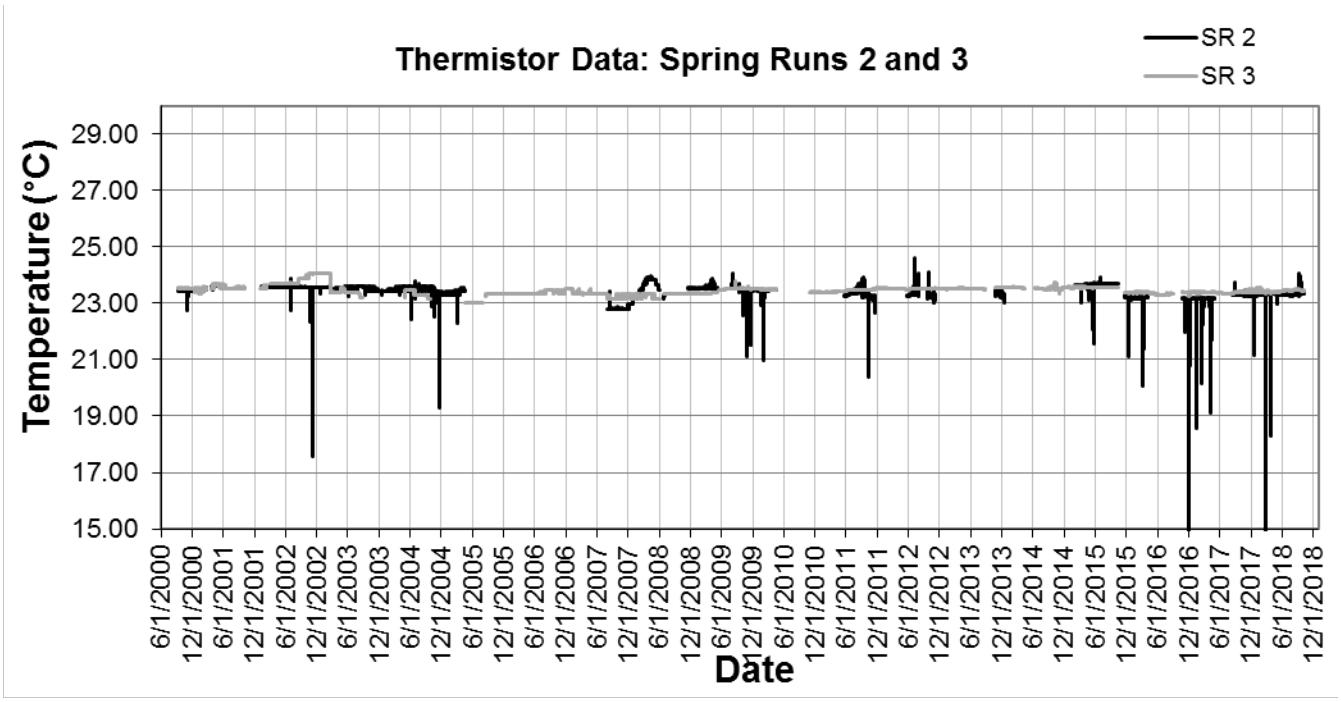
6/1/2018
12/1/2018
Date


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
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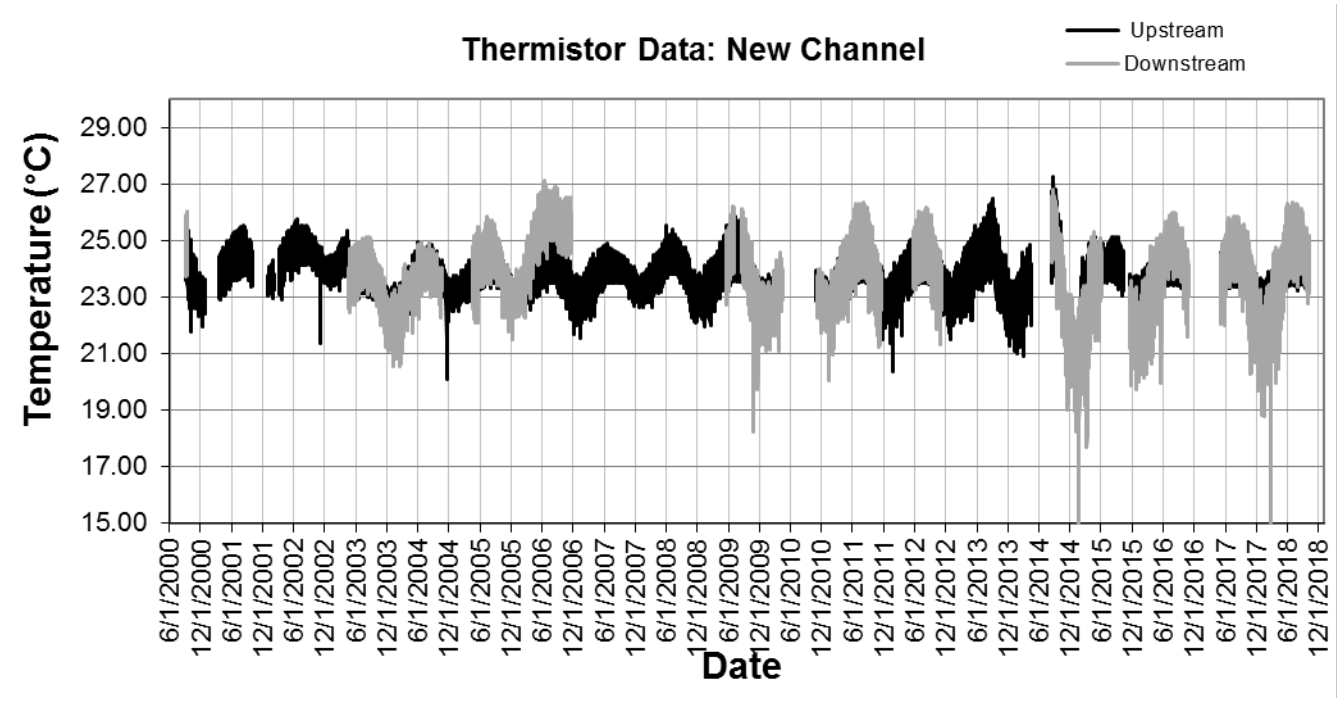
12/1/2018
Date


Thermistor Data: New Channel
Upstream
Downstream
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
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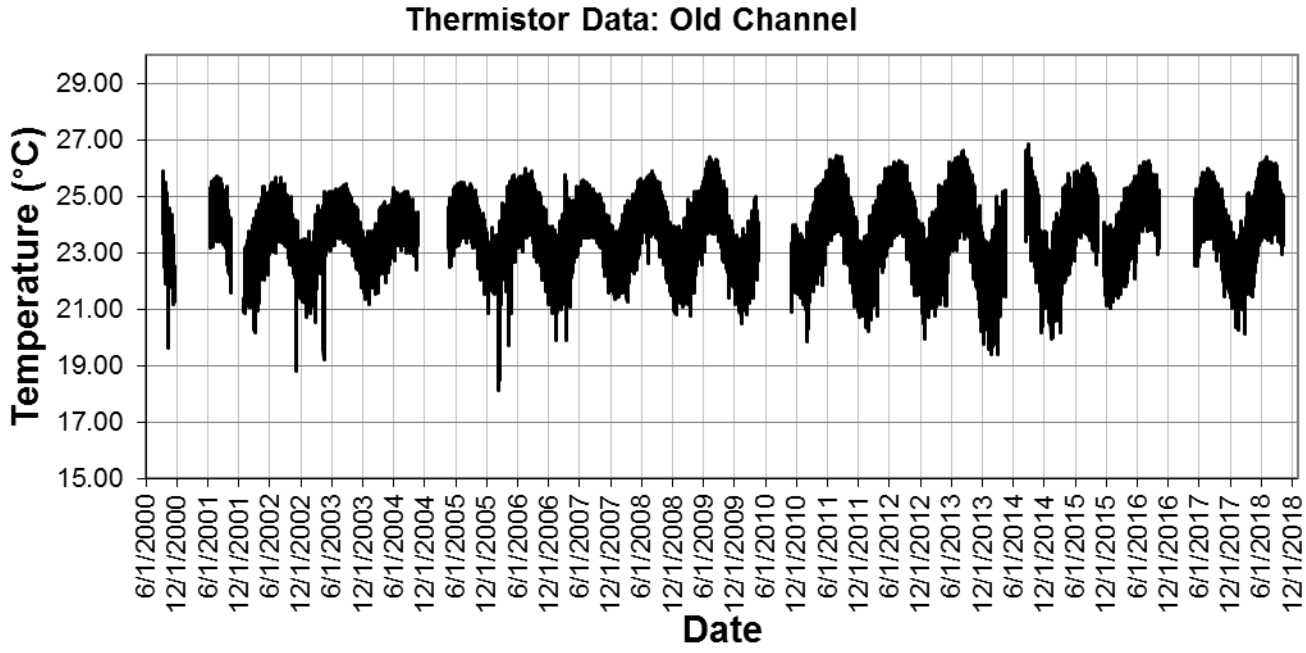
6/1/2018
12/1/2018
Date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Temperature (°C)
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23.00
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6/1/2000
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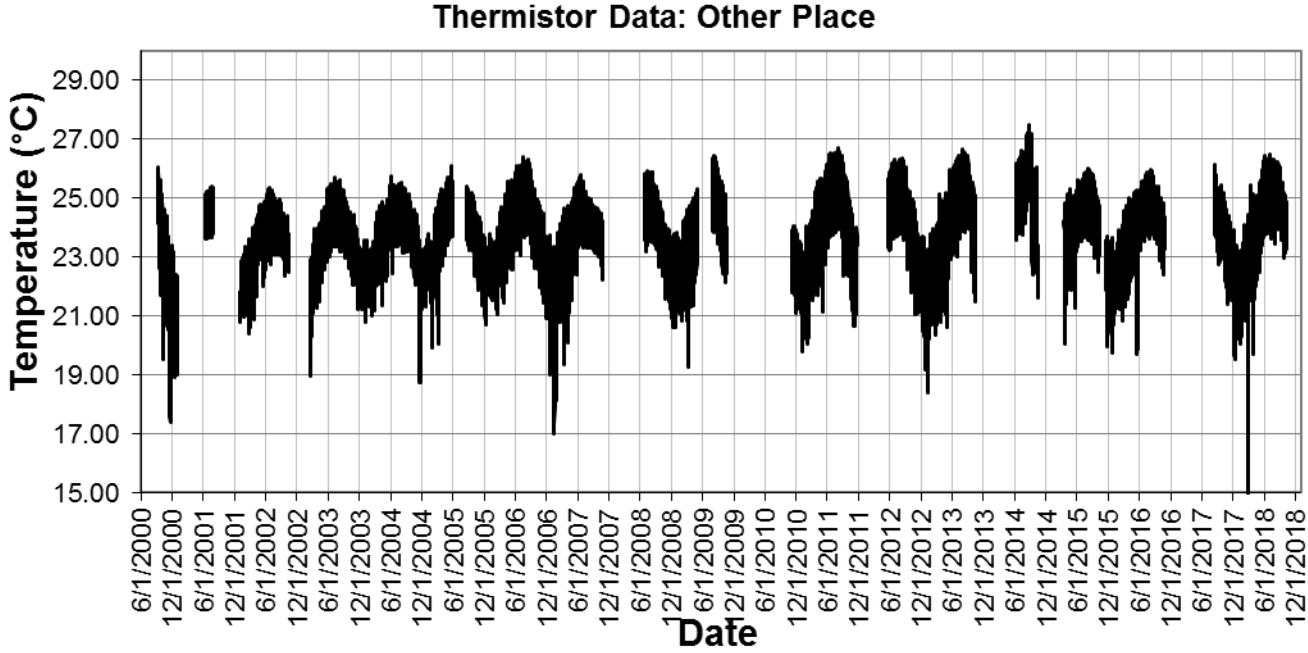
Date


Thermistor Data: Other Place
Temperature (°C)
29.00
27.00
25.00
23.00
21.00
19.00
17.00
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6/1/2000
12/1/2000
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6/1/2017
12/1/2017
6/1/2018
12/1/2018
Date

Macroinvertebrate Raw Data

Spring

Order	Family	FinalID	No.	Tolerance Value	Functional Feeding Guild 1	Functional Feeding Guild 2
Trombidiformes		Acari	4	6	Predator	
Arhynchobdellida	Erpobdellidae	Mooreobdella tetragon	1			
Lumbriculida	Lumbriculidae	Lumbriculidae	3			
Neotaenioglossa	Pleuroceridae	Elimia	1	2.5	Scraper	
Neotaenioglossa	Thiaridae	Terabia	15		Scraper	
Coleoptera	Dytiscidae	Liodessus	1	5	Predator	
Coleoptera	Psephinidae	Psephenus	5	4	Scraper	
Diptera	Ceratopogonidae	Ceratopogon	1			
Diptera	Chironomidae	Dicrotendipes	1			
Ephemeroptera	Baetidae	Fallceon	1	4	Gather/Collector	Scraper
Ephemeroptera	Baetidae	Procloeon	1			
Ephemeroptera	Tricorythidae	Tricorythodes	12	5	Gather/Collector	
Odonata	Coenagrionidae	Enallagma	2	6	Predator	
Amphipoda	Talitridae	Hyalella	288	8	Gather/Collector	Shredder
Tricladida		Planariidae	1			
Trombidiformes		Acari	1	6	Predator	
		Oligochaeta	7	8	Gather/Collector	
Neotaenioglossa	Pleuroceridae	Elimia	8	2.5	Scraper	
Neotaenioglossa	Thiaridae	Terabia	4		Scraper	
Coleoptera	Elmidae	Macrelmis	69	4	Scraper	
Coleoptera	Elmidae	Microcylloepus pusillus	7			
Coleoptera	Psephinidae	Psephenus	8	4	Scraper	
Diptera	Chironomidae	Chironomidae	42	6	Gather/Collector	Filterer/Collector
Diptera	Simuliidae	Simulium	2	4	Filterer/Collector	
Ephemeroptera	Baetidae	Fallceon	90	4	Gather/Collector	Scraper
Ephemeroptera	Leptophlebiidae	Traverella	1	2	Filterer/Collector	

Ephemeroptera	Tricorythidae	Tricorythodes	2	5	Gather/Collector	
Odonata	Coenagrionidae	Argia	10	6	Predator	
Odonata	Libellulidae	Brechmorhoga	3	6	Predator	
Trichoptera	Heliocopyschidae	Helicopsyche	22	2	Scraper	
Trichoptera	Hydrobiosidae	Atopsyche	2	0	Predator	
Trichoptera	Hydroptilidae	Leucotrichia	7	3	Gather/Collector	Scraper
Trichoptera	Leptoceridae	Nectopsyche	1	3	Shredder	Gather/Collector
Amphipoda	Talitridae	Hyalella	66	8	Gather/Collector	Shredder
Tricladida		Planariidae	16			
Lumbriculida	Lumbriculidae	Lumbriculidae	21			
Tubificida	Naididae	Branchiura sowerbyi	4			
Neotaenioglossa	Hydrobiidae	Hydrobiidae	1	7	Scraper	
Neotaenioglossa	Pleuroceridae	Elimia	1	2.5	Scraper	
Neotaenioglossa	Thiaridae	Terabia	21		Scraper	
Coleoptera	Psephinidae	Psephenus	8	4	Scraper	
Diptera	Chironomidae	Dicrotendipes	1			
Ephemeroptera	Baetidae	Fallceon	5	4	Gather/Collector	Scraper
Ephemeroptera	Caenidae	Caenis	1			
Ephemeroptera	Ephemeridae	Hexagenia	3	6	Gather/Collector	
Ephemeroptera	Heptageniidae	Stenacron	3	4	Gather/Collector	Scraper
Ephemeroptera	Leptophlebiidae	Thraulodes	1	2	Gather/Collector	
Ephemeroptera	Tricorythidae	Tricorythodes	17	5	Gather/Collector	
Odonata	Coenagrionidae	Argia	10	6	Predator	
Odonata	Libellulidae	Libellulidae	1		Predator	
Trichoptera	Heliocopyschidae	Helicopsyche	7	2	Scraper	
Trichoptera	Leptoceridae	Nectopsyche	3	3	Shredder	Gather/Collector
Amphipoda	Talitridae	Hyalella	66	8	Gather/Collector	Shredder
Tricladida		Planariidae	3			
Trombidiformes		Acari	3	6	Predator	
Lumbriculida	Lumbriculidae	Lumbriculidae	5			

Tubificida	Naididae	Branchiura sowerbyi	6			
Neotaenioglossa	Pleuroceridae	Elimia	17	2.5	Scraper	
Neotaenioglossa	Thiaridae	Terabia	22		Scraper	
Coleoptera	Elmidae	Microcylloepus pusillus	2			
Coleoptera	Psephinidae	Psephenus	2	4	Scraper	
Diptera	Chironomidae	Cricotopus/Orthocladius complex	1			
Diptera	Chironomidae	Pseudochironomus	3	5	Gather/Collector	
Diptera	Chironomidae	Rheotanytarsus	1			
Diptera	Simuliidae	Simulium	1	4	Filterer/Collector	
Ephemeroptera	Baetidae	Camelobaetidius	1			
Ephemeroptera	Baetidae	Fallceon	16	4	Gather/Collector	Scraper
Ephemeroptera	Heptageniidae	Stenacron	1	4	Gather/Collector	Scraper
Ephemeroptera	Leptohyphidae	Vacupernius packeri	7	4	Gather/Collector	
Ephemeroptera	Leptophlebiidae	Thraulodes	5	2	Gather/Collector	
Ephemeroptera	Tricorythidae	Tricorythodes	10	5	Gather/Collector	
Lepidoptera	Pyralidae	Pyralidae	1			
Odonata	Coenagrionidae	Argia	3	6	Predator	
Odonata	Gomphidae	Erpetogomphus	2	1	Predator	
Odonata	Libellulidae	Brechmorhoga	1	6	Predator	
Trichoptera	Heliocopyschidae	Helicopsyche	19	2	Scraper	
Trichoptera	Hydrobiosidae	Atopsyche	1	0	Predator	
Trichoptera	Hydroptilidae	Alisotrichia	1			
Trichoptera	Hydroptilidae	Hydroptila	1	2	Scraper	
Trichoptera	Hydroptilidae	Leucotrichia	2	3	Gather/Collector	Scraper
Trichoptera	Leptoceridae	Nectopsyche	33	3	Shredder	Gather/Collector
Trichoptera	Philopotamidae	Chimarra	2	2	Filterer/Collector	
Trichoptera	Polycentropodidae	Polyplectropus	1	6	Filterer/Collector	Predator
Amphipoda	Talitridae	Hyalella	21	8	Gather/Collector	Shredder
Tricladida		Planariidae	4			

Lumbriculida	Lumbriculidae	Lumbriculidae	5			
Rhynchobdellida	Glossiphoniidae	Helobdella triserialis	1			
Neotaenioglossa	Hydrobiidae	Hydrobiidae	1	7	Scraper	
Neotaenioglossa	Pleuroceridae	Elimia	4	2.5	Scraper	
Neotaenioglossa	Thiaridae	Terabia	5		Scraper	
Coleoptera	Dytiscidae	Liodessus	2	5	Predator	
Coleoptera	Elmidae	Microcylloepus pusillus	1			
Coleoptera	Psephinidae	Psephenus	13	4	Scraper	
Diptera	Chironomidae	Dicrotendipes	8			
Diptera	Chironomidae	Rheotanytarsus	5			
Ephemeroptera	Baetidae	Procloeon	9			
Ephemeroptera	Tricorythidae	Tricorythodes	7	5	Gather/Collector	
Odonata	Coenagrionidae	Argia	3	6	Predator	
Amphipoda	Talitridae	Hyalella	225	8	Gather/Collector	Shredder

Fall

Class	Order	Family	FinalID	No.	Tolerance Value	Functional Feeding Guild 1	Functional Feeding Guild 2
	Decopoda	Cambaridae	Cambaridae	1	5	Gather/Collector	
Clitellata	Lumbriculida	Lumbriculidae	Lumbriculidae	6			
Gastropoda	Neotaenioglossa	Pleuroceridae	Elimia	1	2.5	Scraper	
Gastropoda	Neotaenioglossa	Thiaridae	Melanoides tuberculata	1		Scraper	
Gastropoda	Neotaenioglossa	Thiaridae	Terabia	27		Scraper	
Insecta	Diptera	Chironomidae	Rheotanytarsus	1			
Malacostraca	Amphipoda	Talitridae	Hyalella	169	8	Gather/Collector	Shredder
Clitellata	Lumbriculida	Lumbriculidae	Lumbriculidae	1			
Gastropoda	Basommatophora	Physidae	Physa	1	9	Scraper	
Gastropoda	Basommatophora	Planorbidae	Helisoma	1			
Gastropoda	Neotaenioglossa	Hydrobiidae	Hydrobiidae	2	7	Scraper	
Gastropoda	Neotaenioglossa	Pleuroceridae	Elimia	2	2.5	Scraper	
Gastropoda	Neotaenioglossa	Thiaridae	Terabia	4		Scraper	
Insecta	Coleoptera	Dryopidae	Helichus	1			
Insecta	Coleoptera	Elmidae	Hexacylloepus ferrugineus	2	2	Scraper	
Insecta	Coleoptera	Elmidae	Macrelmis	63	4	Scraper	
Insecta	Coleoptera	Elmidae	Microcylloepus pusillus	5			
Insecta	Coleoptera	Psephinidae	Psephenus	12	4	Scraper	
Insecta	Diptera	Chironomidae	Eukiefferiella	1			
Insecta	Diptera	Chironomidae	Rheotanytarsus	24			
Insecta	Ephemeroptera	Baetidae	Fallceon	5	4	Gather/Collector	Scraper
Insecta	Lepidoptera	Pyralidae	Petrophila	1	5	Scraper	

Insecta	Megaloptera	Corydalidae	Corydalus cornutus	2			
Insecta	Odonata	Coenagrionidae	Argia	10	6	Predator	
Insecta	Trichoptera	Heliocopyschidae	Helicopsyche	5	2	Scraper	
Insecta	Trichoptera	Hydrobiosidae	Atopsyche	3	0	Predator	
Insecta	Trichoptera	Polycentropodidae	Polyplectropus	1	6	Filterer/Collector	Predator
Malacostraca	Amphipoda	Talitridae	Hyalella	50	8	Gather/Collector	Shredder
Turbellaria	Tricladida		Planariidae	1			
Clitellata	Lumbriculida	Lumbriculidae	Lumbriculidae	12			
Clitellata	Rhynchobdellida	Glossiphoniidae	Helobdella triserialis	2			
Gastropoda	Neotaenioglossa	Pleuroceridae	Elimia	2	2.5	Scraper	
Gastropoda	Neotaenioglossa	Thiaridae	Terabia	48		Scraper	
Insecta	Coleoptera	Psephinidae	Psephenus	8	4	Scraper	
Insecta	Diptera	Chironomidae	Chironominae	1			
Insecta	Diptera	Chironomidae	Rheotanytarsus	2			
Insecta	Ephemeroptera	Baetidae	Fallceon	9	4	Gather/Collector	Scraper
Insecta	Ephemeroptera	Heptageniidae	Stenacron	1	4	Gather/Collector	Scraper
Insecta	Ephemeroptera	Tricorythidae	Tricorythodes	14	5	Gather/Collector	
Insecta	Lepidoptera	Pyralidae	Petrophila	1	5	Scraper	
Insecta	Odonata	Coenagrionidae	Argia	7	6	Predator	
Insecta	Odonata	Gomphidae	Erpetogomphus	1	1	Predator	
Insecta	Trichoptera	Heliocopyschidae	Helicopsyche	3	2	Scraper	
Malacostraca	Amphipoda	Talitridae	Hyalella	59	8	Gather/Collector	Shredder
Turbellaria	Tricladida		Planariidae	2			
Arachnida	Trombidiformes		Acari	2	6	Predator	
Clitellata	Lumbriculida	Lumbriculidae	Lumbriculidae	2			
Gastropoda	Neotaenioglossa	Pleuroceridae	Elimia	3	2.5	Scraper	
Gastropoda	Neotaenioglossa	Thiaridae	Terabia	89		Scraper	

Insecta	Diptera	Chironomidae	Ablabesmyia	1			
Insecta	Diptera	Chironomidae	Rheotanytarsus	5			
Insecta	Ephemeroptera	Baetidae	Fallceon	1	4	Gather/Collector	Scraper
Insecta	Ephemeroptera	Leptohyphidae	Vacupernius packeri	4	4	Gather/Collector	
Insecta	Ephemeroptera	Tricorythidae	Tricorythodes	21	5	Gather/Collector	
Insecta	Lepidoptera	Crambidae	Crambidae	1			
Insecta	Trichoptera	Heliocopyschidae	Helicopsyche	11	2	Scraper	
Insecta	Trichoptera	Hydroptilidae	Leucotrichia	1	3	Gather/Collector	Scraper
Insecta	Trichoptera	Leptoceridae	Nectopsyche	10	3	Shredder	Gather/Collector
Insecta	Trichoptera	Leptoceridae	Oecetis	1			
Insecta	Trichoptera	Polycentropodidae	Polyplectropus	1	6	Filterer/Collector	Predator
Malacostraca	Amphipoda	Talitridae	Hyalella	6	8	Gather/Collector	Shredder
Arachnida	Trombidiformes		Acari	1	6	Predator	
Clitellata	Lumbriculida	Lumbriculidae	Lumbriculidae	5			
Clitellata	Rhynchobdellida	Glossiphoniidae	Placobdella	1			
Gastropoda	Neotaenioglossa	Hydrobiidae	Hydrobiidae	2	7	Scraper	
Gastropoda	Neotaenioglossa	Pleuroceridae	Elimia	6	2.5	Scraper	
Gastropoda	Neotaenioglossa	Thiaridae	Terabia	13		Scraper	
Insecta	Coleoptera	Dytiscidae	Liodessus	3	5	Predator	
Insecta	Coleoptera	Elmidae	Microcylloepus pusillus	1			

Insecta	Coleoptera	Psephinidae	Psephenus	28	4	Scraper	
Insecta	Diptera	Chironomidae	Ablabesmyia	1			
Insecta	Diptera	Chironomidae	Dicrotendipes	2			
Insecta	Diptera	Chironomidae	Rheotanytarsus	2			
Insecta	Ephemeroptera	Tricorythidae	Tricorythodes	11	5	Gather/Collector	
Insecta	Odonata	Coenagrionidae	Argia	1	6	Predator	
Insecta	Trichoptera	Hydroptilidae	Oxyethira	1	2	Gather/Collector	
Malacostraca	Amphipoda	Talitridae	Hyalella	112	8	Gather/Collector	Shredder
Malacostraca	Decapoda	Cambaridae	Cambarinae	1			
Turbellaria	Tricladida		Planariidae	1			

APPENDIX D: DROP NET RAW DATA

SiteCode 2256 Date 5/1/2018 Reach Upper Spring Run Site_No R1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2256	1	Procambarus sp.		35
2256	1	Etheostoma fonticola	22	1
2256	1	Etheostoma fonticola	20	1
2256	1	Etheostoma fonticola	23	1
2256	1	Etheostoma fonticola	24	1
2256	1	Etheostoma fonticola	14	1
2256	1	Etheostoma fonticola	22	1
2256	1	Etheostoma fonticola	21	1
2256	1	Etheostoma fonticola	29	1
2256	1	Etheostoma fonticola	20	1
2256	1	Etheostoma fonticola	12	1
2256	1	Palaemonetes sp.		6
2256	1	Astyanax mexicanus	15	1
2256	1	Etheostoma fonticola	19	1
2256	1	Etheostoma fonticola	28	1
2256	1	Etheostoma fonticola	22	1
2256	1	Etheostoma fonticola	25	1
2256	1	Etheostoma fonticola	20	1
2256	1	Etheostoma fonticola	16	1
2256	1	Etheostoma fonticola	15	1
2256	1	Etheostoma fonticola	18	1
2256	1	Etheostoma fonticola	20	1
2256	1	Etheostoma fonticola	13	1
2256	1	Etheostoma fonticola	14	1
2256	1	Etheostoma fonticola	15	1
2256	1	Etheostoma fonticola	11	1
2256	2	Etheostoma fonticola	22	1
2256	2	Etheostoma fonticola	24	1
2256	2	Etheostoma fonticola	28	1
2256	2	Etheostoma fonticola	28	1

2256	2	Etheostoma fonticola	18	1
2256	2	Etheostoma fonticola	16	1
2256	2	Etheostoma fonticola	22	1
2256	2	Etheostoma fonticola	29	1
2256	2	Etheostoma fonticola	21	1
2256	2	Etheostoma fonticola	24	1
2256	2	Etheostoma fonticola	22	1
2256	2	Etheostoma fonticola	25	1
2256	2	Etheostoma fonticola	17	1
2256	2	Etheostoma fonticola	28	1
2256	2	Etheostoma fonticola	18	1
2256	2	Etheostoma fonticola	23	1
2256	2	Etheostoma fonticola	20	1
2256	2	Etheostoma fonticola	14	1
2256	2	Etheostoma fonticola	26	1
2256	2	Dionda nigrotaeniata	18	1
2256	2	Procambarus sp.		16
2256	2	Palaemonetes sp.		4
2256	2	Etheostoma fonticola	20	1
2256	2	Etheostoma fonticola	25	1
2256	2	Etheostoma fonticola	31	1
2256	2	Etheostoma fonticola	26	1
2256	2	Etheostoma fonticola	14	1
2256	2	Etheostoma fonticola	14	1
2256	2	Etheostoma fonticola	11	1
2256	3	Procambarus sp.		12
2256	3	Etheostoma fonticola	21	1
2256	3	Etheostoma fonticola	20	1
2256	3	Etheostoma fonticola	25	1
2256	3	Etheostoma fonticola	24	1
2256	3	Etheostoma fonticola	26	1
2256	3	Etheostoma fonticola	23	1
2256	3	Etheostoma fonticola	21	1
2256	3	Etheostoma fonticola	19	1
2256	3	Etheostoma fonticola	29	1

2256	3	Etheostoma fonticola	11	1
2256	3	Palaemonetes sp.		8
2256	3	Etheostoma fonticola	26	1
2256	3	Etheostoma fonticola	24	1
2256	3	Etheostoma fonticola	16	1
2256	3	Etheostoma fonticola	18	1
2256	3	Etheostoma fonticola	26	1
2256	3	Etheostoma fonticola	27	1
2256	3	Etheostoma fonticola	12	1
2256	3	Etheostoma fonticola	21	1
2256	3	Etheostoma fonticola	15	1
2256	4	Etheostoma fonticola	22	1
2256	4	Etheostoma fonticola	27	1
2256	4	Etheostoma fonticola	26	1
2256	4	Etheostoma fonticola	25	1
2256	4	Etheostoma fonticola	25	1
2256	4	Etheostoma fonticola	21	1
2256	4	Etheostoma fonticola	25	1
2256	4	Etheostoma fonticola	25	1
2256	4	Etheostoma fonticola	12	1
2256	4	Etheostoma fonticola	21	1
2256	4	Procambarus sp.		15
2256	4	Palaemonetes sp.		3
2256	4	Etheostoma fonticola	24	1
2256	4	Etheostoma fonticola	18	1
2256	5	Procambarus sp.		9
2256	5	Palaemonetes sp.		3
2256	5	Etheostoma fonticola	26	1
2256	5	Etheostoma fonticola	22	1
2256	5	Etheostoma fonticola	21	1
2256	5	Etheostoma fonticola	21	1
2256	5	Etheostoma fonticola	27	1
2256	5	Etheostoma fonticola	23	1
2256	5	Etheostoma fonticola	28	1
2256	5	Etheostoma fonticola	25	1

2256	5	Etheostoma fonticola	25	1
2256	6	Etheostoma fonticola	26	1
2256	6	Etheostoma fonticola	24	1
2256	6	Etheostoma fonticola	25	1
2256	6	Palaemonetes sp.		1
2256	7	Etheostoma fonticola	13	1
2256	8	Etheostoma fonticola	30	1
2256	8	Palaemonetes sp.		1
2256	8	Procambarus sp.		1
2256	9	Procambarus sp.		1
2256	9	Etheostoma fonticola	28	1
2256	9	Etheostoma fonticola	23	1
2256	9	Palaemonetes sp.		4
2256	10	No fish collected		
2256	11	Etheostoma fonticola	28	1
2256	11	Etheostoma fonticola	18	1
2256	11	Etheostoma fonticola	19	1
2256	11	Procambarus sp.		1
2256	12	No fish collected		
2256	13	Procambarus sp.		1
2256	13	Etheostoma fonticola	24	1
2256	13	Dionda nigrotaeniata	17	1
2256	14	No fish collected		
2256	15	Procambarus sp.		1
2256	15	Etheostoma fonticola	24	1
2256	15	Etheostoma fonticola	12	1
2256	16	Etheostoma fonticola	20	1
2256	17	Etheostoma fonticola	29	1
2256	18	No fish collected		

SiteCode 2257 Date 5/1/2018 Reach Upper Spring Run Site_No R2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2257	1	Etheostoma fonticola	15	1
2257	1	Etheostoma fonticola	20	1
2257	1	Etheostoma fonticola	20	1
2257	1	Etheostoma fonticola	21	1
2257	1	Etheostoma fonticola	18	1
2257	1	Etheostoma fonticola	21	1
2257	1	Etheostoma fonticola	30	1
2257	1	Etheostoma fonticola	22	1
2257	1	Etheostoma fonticola	22	1
2257	1	Etheostoma fonticola	21	1
2257	1	Etheostoma fonticola	20	1
2257	1	Etheostoma fonticola	21	1
2257	1	Etheostoma fonticola	27	1
2257	1	Etheostoma fonticola	19	1
2257	1	Etheostoma fonticola	25	1
2257	1	Etheostoma fonticola	29	1
2257	1	Etheostoma fonticola	25	1
2257	1	Etheostoma lepidum	48	1
2257	1	Procambarus sp.		23
2257	1	Etheostoma fonticola	19	1
2257	1	Etheostoma fonticola	15	1
2257	1	Etheostoma fonticola	20	1
2257	1	Etheostoma fonticola	22	1
2257	1	Etheostoma fonticola	30	1
2257	1	Etheostoma fonticola	17	1
2257	1	Etheostoma fonticola	20	1
2257	1	Etheostoma fonticola	21	1
2257	1	Etheostoma fonticola	27	1
2257	1	Etheostoma fonticola	21	1
2257	1	Etheostoma fonticola	21	1

2257	1	Etheostoma fonticola	13	1
2257	1	Etheostoma fonticola	15	1
2257	2	Etheostoma fonticola	29	1
2257	2	Etheostoma fonticola	19	1
2257	2	Etheostoma fonticola	25	1
2257	2	Etheostoma fonticola	22	1
2257	2	Etheostoma fonticola	26	1
2257	2	Etheostoma fonticola	21	1
2257	2	Etheostoma fonticola	20	1
2257	2	Etheostoma fonticola	20	1
2257	2	Etheostoma fonticola	27	1
2257	2	Etheostoma fonticola	25	1
2257	2	Etheostoma fonticola	19	1
2257	2	Etheostoma fonticola	14	1
2257	2	Procambarus sp.		24
2257	2	Palaemonetes sp.		25
2257	2	Gambusia sp.	26	1
2257	3	Etheostoma fonticola	20	1
2257	3	Etheostoma fonticola	19	1
2257	3	Etheostoma fonticola	30	1
2257	3	Etheostoma fonticola	19	1
2257	3	Etheostoma fonticola	21	1
2257	3	Etheostoma fonticola	16	1
2257	3	Etheostoma fonticola	19	1
2257	3	Etheostoma lepidum	40	1
2257	3	Palaemonetes sp.		9
2257	3	Procambarus sp.		12
2257	4	Dionda nigrotaeniata	15	1
2257	4	Etheostoma fonticola	21	1
2257	4	Etheostoma fonticola	41	1
2257	4	Etheostoma fonticola	13	1
2257	4	Etheostoma fonticola	26	1
2257	4	Etheostoma fonticola	26	1
2257	4	Etheostoma fonticola	23	1
2257	4	Etheostoma fonticola	15	1

2257	4	Etheostoma fonticola	16	1
2257	4	Etheostoma fonticola	27	1
2257	4	Etheostoma fonticola	7	1
2257	4	Etheostoma fonticola	15	1
2257	4	Etheostoma fonticola	24	1
2257	4	Etheostoma lepidum	48	1
2257	4	Etheostoma fonticola	25	1
2257	4	Etheostoma fonticola	26	1
2257	4	Etheostoma fonticola	22	1
2257	4	Etheostoma fonticola	23	1
2257	4	Etheostoma fonticola	17	1
2257	4	Etheostoma fonticola	12	1
2257	4	Etheostoma fonticola	26	1
2257	4	Etheostoma fonticola	21	1
2257	4	Etheostoma fonticola	27	1
2257	4	Etheostoma fonticola	15	1
2257	4	Etheostoma fonticola	17	1
2257	4	Palaemonetes sp.		19
2257	4	Etheostoma fonticola	12	1
2257	4	Procambarus sp.		11
2257	5	Micropterus salmoides	110	1
2257	5	Lepomis sp.	10	1
2257	5	Lepomis miniatus	25	1
2257	5	Etheostoma fonticola	22	1
2257	5	Etheostoma fonticola	18	1
2257	5	Etheostoma fonticola	19	1
2257	5	Etheostoma fonticola	20	1
2257	5	Etheostoma fonticola	21	1
2257	5	Palaemonetes sp.		9
2257	5	Procambarus sp.		6
2257	6	Etheostoma fonticola	25	1
2257	6	Etheostoma fonticola	28	1
2257	6	Etheostoma fonticola	25	1
2257	6	Etheostoma fonticola	22	1
2257	6	Etheostoma fonticola	23	1

2257	6	Etheostoma fonticola	11	1
2257	6	Procambarus sp.		3
2257	6	Palaemonetes sp.		1
2257	7	Etheostoma fonticola	15	1
2257	7	Etheostoma fonticola	26	1
2257	7	Etheostoma fonticola	25	1
2257	7	Etheostoma fonticola	24	1
2257	7	Etheostoma fonticola	26	1
2257	7	Etheostoma fonticola	21	1
2257	7	Etheostoma fonticola	32	1
2257	7	Etheostoma fonticola	30	1
2257	7	Etheostoma fonticola	25	1
2257	7	Etheostoma fonticola	20	1
2257	7	Etheostoma fonticola	24	1
2257	7	Etheostoma fonticola	25	1
2257	7	Etheostoma fonticola	25	1
2257	7	Etheostoma fonticola	23	1
2257	7	Palaemonetes sp.		1
2257	8	Lepomis sp.	12	1
2257	8	Etheostoma fonticola	28	1
2257	8	Palaemonetes sp.		1
2257	9	Etheostoma fonticola	22	1
2257	9	Etheostoma fonticola	22	1
2257	9	Etheostoma fonticola	25	1
2257	9	Etheostoma fonticola	21	1
2257	9	Etheostoma fonticola	27	1
2257	9	Etheostoma fonticola	29	1
2257	9	Lepomis sp.	19	1
2257	9	Procambarus sp.		2
2257	9	Palaemonetes sp.		1
2257	10	Etheostoma fonticola	26	1
2257	10	Etheostoma fonticola	20	1
2257	10	Etheostoma fonticola	25	1
2257	10	Etheostoma fonticola	30	1
2257	10	Etheostoma fonticola	26	1

2257	10	Procambarus sp.		2
2257	11	Etheostoma fonticola	22	1
2257	12	Etheostoma fonticola	22	1
2257	13	Etheostoma fonticola	25	1
2257	13	Etheostoma fonticola	22	1
2257	13	Etheostoma fonticola	30	1
2257	13	Etheostoma fonticola	20	1
2257	14	Etheostoma fonticola	26	1
2257	15	Procambarus sp.		1
2257	15	Etheostoma fonticola	26	1
2257	16	No fish collected		

SiteCode 2258 Date 5/1/2018 Reach Upper Spring Run Site_No S1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2258	1	Micropterus salmoides	17	1
2258	1	Micropterus salmoides	13	1
2258	1	Micropterus salmoides	14	1
2258	1	Micropterus salmoides	12	1
2258	1	Micropterus salmoides	10	1
2258	1	Micropterus salmoides	13	1
2258	1	Micropterus salmoides	13	1
2258	1	Micropterus salmoides	15	1
2258	1	Micropterus salmoides	16	1
2258	1	Micropterus salmoides	14	1
2258	1	Micropterus salmoides	10	1
2258	1	Micropterus salmoides	13	1
2258	1	Micropterus salmoides	14	1
2258	1	Micropterus salmoides	10	1
2258	1	Micropterus salmoides	13	1
2258	1	Micropterus salmoides	17	1
2258	1	Micropterus salmoides	16	1
2258	1	Micropterus salmoides	14	1
2258	1	Micropterus salmoides	17	1
2258	1	Micropterus salmoides	12	1
2258	1	Micropterus salmoides	20	1
2258	1	Micropterus salmoides	25	1
2258	1	Micropterus salmoides	22	1
2258	1	Micropterus salmoides	12	1
2258	1	Micropterus salmoides	12	1
2258	1	Micropterus salmoides		185
2258	1	Procambarus sp.		21
2258	2	Micropterus salmoides		540
2258	2	Procambarus sp.		45
2258	2	Astyanax mexicanus	31	1

2258	2	Palaemonetes sp.		1
2258	3	Lepomis miniatus		1
2258	3	Procambarus sp.		10
2258	3	Micropterus salmoides		103
2258	4	Lepomis miniatus	25	1
2258	4	Lepomis miniatus	37	1
2258	4	Herichthys cyanoguttatus	44	1
2258	4	Procambarus sp.		23
2258	4	Micropterus salmoides		109
2258	5	Herichthys cyanoguttatus	76	1
2258	5	Procambarus sp.		5
2258	5	Micropterus salmoides		45
2258	6	Procambarus sp.		16
2258	6	Micropterus salmoides		49
2258	7	Lepomis miniatus	77	1
2258	7	Procambarus sp.		5
2258	7	Micropterus salmoides		16
2258	8	Procambarus sp.		6
2258	8	Micropterus salmoides		20
2258	9	Lepomis miniatus	68	1
2258	9	Micropterus salmoides		3
2258	10	Procambarus sp.		5
2258	10	Micropterus salmoides		8
2258	11	Lepomis miniatus	75	1
2258	11	Lepomis miniatus	80	1
2258	11	Procambarus sp.		1
2258	11	Micropterus salmoides		2
2258	12	Micropterus salmoides		4
2258	12	Procambarus sp.		2
2258	13	Procambarus sp.		1
2258	14	Micropterus salmoides		1
2258	15	No fish collected		

SiteCode 2259 Date 5/1/2018 Reach Upper Spring Run Site_No S2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2259	1	Herichthys cyanoguttatus	131	1
2259	1	Lepomis miniatus	65	1
2259	1	Lepomis miniatus	56	1
2259	1	Lepomis miniatus	87	1
2259	1	Lepomis miniatus	40	1
2259	1	Lepomis sp.	13	1
2259	1	Procambarus sp.		1
2259	2	Lepomis miniatus	65	
2259	2	Lepomis miniatus	103	
2259	2	Lepomis miniatus	79	
2259	2	Herichthys cyanoguttatus	64	
2259	2	Herichthys cyanoguttatus	48	
2259	2	Herichthys cyanoguttatus	50	
2259	2	Procambarus sp.		2
2259	2	Palaemonetes sp.		1
2259	3	No fish collected		
2259	4	Lepomis miniatus	60	1
2259	4	Procambarus sp.	4	1
2259	5	Lepomis miniatus	97	1
2259	5	Procambarus sp.		2
2259	6	Lepomis miniatus	78	1
2259	6	Procambarus sp.		1
2259	7	Procambarus sp.		1
2259	8	No fish collected		
2259	9	Lepomis miniatus	64	1
2259	9	Gambusia sp.	9	1
2259	10	Micropterus salmoides	60	1
2259	10	Lepomis macrochirus	76	1
2259	11	No fish collected		
2259	12	Lepomis miniatus	76	1

2259	13	No fish collected		
2259	14	No fish collected		
2259	15	Lepomis miniatus	66	1

SiteCode 2260 Date 5/1/2018 Reach Upper Spring Run Site_No L1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2260	1	Procambarus sp.		7
2260	1	Astyanax mexicanus	31	1
2260	1	Astyanax mexicanus	31	1
2260	1	Etheostoma lepidum	32	1
2260	1	Etheostoma fonticola	25	1
2260	1	Etheostoma fonticola	27	1
2260	1	Etheostoma fonticola	29	1
2260	1	Etheostoma fonticola	29	1
2260	1	Etheostoma fonticola	33	1
2260	1	Etheostoma fonticola	33	1
2260	1	Etheostoma fonticola	28	1
2260	1	Etheostoma fonticola	25	1
2260	1	Etheostoma fonticola	14	1
2260	1	Etheostoma fonticola	24	1
2260	1	Lepomis sp.	14	1
2260	1	Lepomis sp.	11	1
2260	1	Lepomis sp.	15	1
2260	1	Etheostoma fonticola	24	1
2260	1	Palaemonetes sp.		3
2260	2	Lepomis sp.	15	1
2260	2	Lepomis sp.	12	1
2260	2	Lepomis sp.	15	1
2260	2	Lepomis sp.	13	1
2260	2	Lepomis sp.	12	1
2260	2	Astyanax mexicanus	38	1
2260	2	Procambarus sp.		9
2260	3	Astyanax mexicanus	33	1
2260	3	Dionda nigrotaeniata	42	1
2260	3	Procambarus sp.		16
2260	3	Etheostoma fonticola	20	1

2260	3	Etheostoma fonticola	23	1
2260	3	Etheostoma fonticola	28	1
2260	3	Etheostoma fonticola	28	1
2260	3	Palaemonetes sp.		1
2260	4	Astyanax mexicanus	35	1
2260	4	Etheostoma fonticola	30	1
2260	4	Etheostoma fonticola	20	1
2260	4	Etheostoma fonticola	18	1
2260	5	Micropterus salmoides	34	1
2260	5	Etheostoma fonticola	22	1
2260	5	Lepomis sp.	11	1
2260	5	Procambarus sp.		10
2260	6	Astyanax mexicanus	35	1
2260	6	Etheostoma fonticola	30	1
2260	6	Etheostoma fonticola	27	1
2260	7	Procambarus sp.		1
2260	7	Etheostoma fonticola	25	1
2260	8	Etheostoma fonticola	20	1
2260	8	Etheostoma fonticola	30	1
2260	8	Etheostoma fonticola	13	1
2260	8	Lepomis sp.	15	1
2260	9	Etheostoma fonticola	25	1
2260	9	Etheostoma fonticola	26	1
2260	9	Lepomis sp.	18	1
2260	9	Lepomis sp.	20	1
2260	9	Palaemonetes sp.		1
2260	9	Procambarus sp.		2
2260	10	Etheostoma lepidum	31	1
2260	11	Etheostoma fonticola	23	1
2260	11	Etheostoma fonticola	26	1
2260	12	Etheostoma fonticola	27	1
2260	13	Lepomis sp.	16	1
2260	14	No fish collected		
2260	15	Lepomis sp.	12	1
2260	15	Procambarus sp.		4

2260	2	Etheostoma fonticola	24	1
2260	2	Etheostoma fonticola	12	1

SiteCode 2261 Date 5/1/2018 Reach Upper Spring Run Site_No L2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2261	1	Etheostoma fonticola	28	1
2261	1	Etheostoma fonticola	19	1
2261	1	Dionda nigrotaeniata	40	1
2261	1	Lepomis miniatus	31	1
2261	1	Lepomis miniatus	33	1
2261	1	Lepomis miniatus	45	1
2261	1	Lepomis miniatus	30	1
2261	1	Gambusia sp.	34	1
2261	1	Palaemonetes sp.		6
2261	1	Lepomis sp.	15	1
2261	1	Procambarus sp.		5
2261	2	Gambusia sp.	14	1
2261	2	Astyanax mexicanus	23	1
2261	2	Lepomis miniatus	33	1
2261	2	Procambarus sp.		4
2261	2	Palaemonetes sp.		8
2261	3	Lepomis miniatus	29	1
2261	3	Lepomis miniatus	30	1
2261	3	Procambarus sp.		5
2261	3	Micropterus salmoides	30	1
2261	3	Etheostoma fonticola	23	1
2261	3	Etheostoma fonticola	20	1
2261	3	Gambusia sp.	11	1
2261	3	Gambusia sp.	12	1
2261	3	Palaemonetes sp.		1
2261	4	Herichthys cyanoguttatus	52	1
2261	4	Procambarus sp.		6
2261	4	Palaemonetes sp.		1
2261	4	Micropterus salmoides	50	1
2261	4	Etheostoma fonticola	32	1

2261	5	Procambarus sp.		6
2261	5	Lepomis sp.	12	1
2261	5	Palaemonetes sp.		3
2261	5	Gambusia sp.	10	1
2261	6	Procambarus sp.		3
2261	6	Lepomis sp.	17	1
2261	6	Gambusia sp.	10	1
2261	7	Procambarus sp.		5
2261	7	Palaemonetes sp.		2
2261	8	Palaemonetes sp.		2
2261	9	Procambarus sp.		3
2261	9	Palaemonetes sp.		2
2261	9	Etheostoma fonticola	25	1
2261	10	No fish collected		
2261	11	Etheostoma fonticola	28	1
2261	12	Palaemonetes sp.		1
2261	13	Etheostoma fonticola	27	1
2261	13	Procambarus sp.		1
2261	14	Procambarus sp.		1
2261	15	No fish collected		

SiteCode 2262 Date 5/1/2018 Reach Upper Spring Run Site_No O1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2262	10	No fish collected		
2262	1	No fish collected		
2262	2	No fish collected		
2262	3	No fish collected		
2262	4	No fish collected		
2262	5	No fish collected		
2262	6	No fish collected		
2262	7	No fish collected		
2262	8	No fish collected		
2262	9	No fish collected		

SiteCode 2263 Date 5/1/2018 Reach Upper Spring Run Site_No O2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2263	1	Notropis amabilis	20	1
2263	1	Notropis amabilis	21	1
2263	1	Notropis amabilis	18	1
2263	1	Notropis amabilis	16	1
2263	1	Notropis amabilis	19	1
2263	1	Notropis amabilis	17	1
2263	1	Notropis amabilis	18	1
2263	1	Notropis amabilis	15	1
2263	1	Notropis amabilis	19	1
2263	1	Notropis amabilis	18	1
2263	1	Notropis amabilis	18	1
2263	1	Notropis amabilis	16	1
2263	1	Notropis amabilis	17	1
2263	1	Notropis amabilis	16	1
2263	1	Notropis amabilis	16	1
2263	2	No fish collected		
2263	3	Notropis amabilis	20	1
2263	4	Notropis amabilis	18	1
2263	4	Notropis amabilis	16	1
2263	5	No fish collected		
2263	6	No fish collected		
2263	7	Notropis amabilis	20	1
2263	8	No fish collected		
2263	9	No fish collected		
2263	10	Etheostoma fonticola	10	1
2263	11	No fish collected		
2263	12	No fish collected		
2263	13	No fish collected		
2263	14	No fish collected		
2263	15	No fish collected		

SiteCode 2264 Date 5/1/2018 Reach Landa Lake Site_No V1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2264	12	No fish collected		
2264	13	Procambarus sp.		2
2264	14	No fish collected		
2264	15	No fish collected		
2264	1	Lepomis miniatus	27	1
2264	1	Lepomis miniatus	72	1
2264	1	Lepomis miniatus	95	1
2264	1	Lepomis miniatus	110	1
2264	1	Etheostoma fonticola	21	1
2264	1	Etheostoma fonticola	25	1
2264	1	Etheostoma fonticola	28	1
2264	1	Etheostoma fonticola	29	1
2264	1	Etheostoma fonticola	17	1
2264	1	Etheostoma fonticola	16	1
2264	1	Procambarus sp.		16
2264	1	Lepomis sp.	11	1
2264	1	Palaemonetes sp.		1
2264	2	Lepomis miniatus	95	1
2264	2	Lepomis miniatus	105	1
2264	2	Gambusia sp.	22	1
2264	2	Etheostoma fonticola	17	1
2264	2	Etheostoma fonticola	30	1
2264	2	Procambarus sp.		5
2264	3	Etheostoma fonticola	20	1
2264	3	Procambarus sp.		3
2264	3	Palaemonetes sp.		1
2264	4	Procambarus sp.		1
2264	5	Etheostoma fonticola	25	1
2264	5	Etheostoma fonticola	30	1
2264	5	Etheostoma fonticola	12	1

2264	5	Procambarus sp.		3
2264	6	Etheostoma fonticola	19	1
2264	6	Procambarus sp.		4
2264	7	Procambarus sp.		4
2264	8	Procambarus sp.		1
2264	9	Procambarus sp.		1
2264	10	Procambarus sp.		2
2264	11	Procambarus sp.		1

SiteCode 2265 Date 5/1/2018 Reach Landa Lake Site_No V2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2265	1	Gambusia sp.	40	1
2265	1	Gambusia sp.	30	1
2265	1	Gambusia sp.	16	1
2265	1	Gambusia sp.	26	1
2265	1	Gambusia sp.	18	1
2265	1	Gambusia sp.	20	1
2265	1	Gambusia sp.	20	1
2265	1	Gambusia sp.	12	1
2265	1	Gambusia sp.	20	1
2265	1	Gambusia sp.	21	1
2265	1	Gambusia sp.	33	1
2265	1	Lepomis miniatus	73	1
2265	1	Gambusia sp.	30	1
2265	1	Gambusia sp.	12	1
2265	1	Gambusia sp.	11	1
2265	1	Gambusia sp.	21	1
2265	1	Gambusia sp.	23	1
2265	1	Gambusia sp.	12	1
2265	1	Gambusia sp.	23	1
2265	1	Gambusia sp.	12	1
2265	1	Gambusia sp.	22	1
2265	1	Gambusia sp.	23	1
2265	1	Gambusia sp.	27	1
2265	1	Gambusia sp.	22	1
2265	1	Gambusia sp.	23	1
2265	1	Etheostoma fonticola	19	1
2265	1	Etheostoma fonticola	20	1
2265	1	Etheostoma fonticola	13	1
2265	1	Dionda nigrotaeniata	28	1
2265	1	Lepomis sp.	14	1

2265	1	Lepomis sp.	13	1
2265	1	Gambusia sp.	22	1
2265	1	Gambusia sp.	27	1
2265	1	Gambusia sp.	20	1
2265	1	Gambusia sp.	22	1
2265	1	Palaemonetes sp.		9
2265	2	Gambusia sp.		1
2265	2	Etheostoma fonticola	16	1
2265	2	Etheostoma fonticola	20	1
2265	2	Etheostoma fonticola	15	1
2265	2	Etheostoma fonticola	16	1
2265	2	Palaemonetes sp.		2
2265	3	Etheostoma fonticola	21	1
2265	3	Etheostoma fonticola	13	1
2265	3	Etheostoma fonticola	22	1
2265	3	Etheostoma fonticola	11	1
2265	3	Procambarus sp.		4
2265	3	Palaemonetes sp.		5
2265	4	Dionda nigrotaeniata	60	1
2265	4	Procambarus sp.		5
2265	4	Etheostoma fonticola	15	1
2265	5	Lepomis miniatus	65	1
2265	5	Lepomis miniatus	30	1
2265	5	Procambarus sp.		2
2265	5	Etheostoma fonticola	21	1
2265	5	Etheostoma fonticola	12	1
2265	6	Etheostoma fonticola	15	1
2265	7	Etheostoma fonticola	20	1
2265	7	Etheostoma fonticola	22	1
2265	7	Etheostoma fonticola	27	1
2265	7	Palaemonetes sp.		2
2265	7	Procambarus sp.		2
2265	8	Etheostoma fonticola	26	1
2265	8	Etheostoma fonticola	20	1
2265	8	Lepomis miniatus	30	1

2265	8	Procambarus sp.		4
2265	9	Etheostoma fonticola	20	1
2265	9	Etheostoma fonticola	21	1
2265	9	Etheostoma fonticola	12	1
2265	9	Procambarus sp.		2
2265	10	Etheostoma fonticola	25	1
2265	10	Etheostoma fonticola	20	1
2265	11	Procambarus sp.		3
2265	11	Palaemonetes sp.		2
2265	12	Procambarus sp.		2
2265	13	Etheostoma fonticola	21	1
2265	14	Procambarus sp.		3
2265	15	Procambarus sp.		2

SiteCode 2266 Date 5/1/2018 Reach Landa Lake Site_No C1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2266	1	Lepomis miniatus	92	1
2266	1	Etheostoma fonticola	29	1
2266	1	Etheostoma fonticola	28	1
2266	1	Etheostoma fonticola	28	1
2266	1	Etheostoma fonticola	24	1
2266	1	Etheostoma fonticola	25	1
2266	1	Etheostoma fonticola	29	1
2266	1	Etheostoma fonticola	28	1
2266	1	Etheostoma fonticola	29	1
2266	1	Etheostoma fonticola	18	1
2266	1	Etheostoma fonticola	21	1
2266	1	Etheostoma fonticola	21	1
2266	1	Etheostoma fonticola	25	1
2266	1	Gambusia sp.	28	1
2266	1	Gambusia sp.	35	1
2266	1	Gambusia sp.	16	1
2266	1	Gambusia sp.	10	1
2266	1	Gambusia sp.	11	1
2266	1	Gambusia sp.	12	1
2266	1	Gambusia sp.	11	1
2266	1	Gambusia sp.	14	1
2266	1	Gambusia sp.	15	1
2266	1	Gambusia sp.	11	1
2266	1	Gambusia sp.	10	1
2266	1	Gambusia sp.	9	1
2266	1	Gambusia sp.	13	1
2266	1	Procambarus sp.		40
2266	1	Palaemonetes sp.		74
2266	1	Etheostoma fonticola	25	1
2266	1	Etheostoma fonticola	28	1

2266	1	Etheostoma fonticola	20	1
2266	1	Gambusia sp.	12	1
2266	1	Gambusia sp.	14	1
2266	1	Gambusia sp.	12	1
2266	1	Gambusia sp.	9	1
2266	1	Gambusia sp.	10	1
2266	2	Etheostoma fonticola	22	1
2266	2	Etheostoma fonticola	30	1
2266	2	Etheostoma fonticola	26	1
2266	2	Etheostoma fonticola	30	1
2266	2	Etheostoma fonticola	22	1
2266	2	Etheostoma fonticola	26	1
2266	2	Gambusia sp.	10	1
2266	2	Gambusia sp.	14	1
2266	2	Gambusia sp.	12	1
2266	2	Procambarus sp.		15
2266	2	Palaemonetes sp.		40
2266	3	Gambusia sp.		36
2266	3	Etheostoma fonticola	25	1
2266	3	Etheostoma fonticola	26	1
2266	3	Etheostoma fonticola	26	1
2266	3	Palaemonetes sp.		19
2266	3	Procambarus sp.		4
2266	4	Etheostoma fonticola	25	1
2266	4	Etheostoma fonticola	20	1
2266	4	Palaemonetes sp.		9
2266	4	Gambusia sp.		4
2266	4	Procambarus sp.		4
2266	5	Palaemonetes sp.		30
2266	5	Procambarus sp.		7
2266	5	Etheostoma fonticola	29	1
2266	5	Etheostoma fonticola	14	1
2266	6	Etheostoma fonticola	24	1
2266	6	Etheostoma fonticola	25	1
2266	6	Etheostoma fonticola	27	1

2266	6	Etheostoma fonticola	24	1
2266	6	Etheostoma fonticola	28	1
2266	6	Etheostoma fonticola	28	1
2266	6	Palaemonetes sp.		6
2266	6	Procambarus sp.		3
2266	7	Etheostoma fonticola	22	1
2266	7	Etheostoma fonticola	23	1
2266	7	Etheostoma fonticola	25	1
2266	7	Etheostoma fonticola	29	1
2266	7	Etheostoma fonticola	25	1
2266	7	Etheostoma fonticola	25	1
2266	7	Etheostoma fonticola	23	1
2266	7	Etheostoma fonticola	24	1
2266	7	Etheostoma fonticola	24	1
2266	7	Etheostoma fonticola	21	1
2266	7	Procambarus sp.		12
2266	7	Gambusia sp.		1
2266	7	Palaemonetes sp.		1
2266	8	Etheostoma fonticola	19	1
2266	8	Etheostoma fonticola	22	1
2266	9	Etheostoma fonticola	24	1
2266	9	Etheostoma fonticola	25	1
2266	9	Procambarus sp.		5
2266	9	Palaemonetes sp.		6
2266	9	Gambusia sp.		1
2266	10	Etheostoma fonticola	22	1
2266	10	Etheostoma fonticola	22	1
2266	10	Etheostoma fonticola	23	1
2266	10	Etheostoma fonticola	24	1
2266	10	Etheostoma fonticola	26	1
2266	10	Etheostoma fonticola	21	1
2266	10	Procambarus sp.		2
2266	10	Palaemonetes sp.		10
2266	10	Gambusia sp.		2
2266	11	Etheostoma fonticola	22	1

2266	11	Etheostoma fonticola	27	1
2266	11	Etheostoma fonticola	24	1
2266	12	Procambarus sp.		1
2266	13	Etheostoma fonticola	24	1
2266	13	Etheostoma fonticola	26	1
2266	13	Procambarus sp.		2
2266	13	Palaemonetes sp.		3
2266	14	Etheostoma fonticola	21	1
2266	15	Lepomis miniatus	50	1
2266	15	Lepomis miniatus	52	1
2266	15	Etheostoma fonticola	19	1
2266	15	Etheostoma fonticola	17	1
2266	15	Etheostoma fonticola	24	1
2266	15	Palaemonetes sp.		3
2266	16	Etheostoma fonticola	21	1
2266	16	Procambarus sp.		1
2266	17	No fish collected		

SiteCode 2267 Date 5/1/2018 Reach Landa Lake Site_No C2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2267	1	Etheostoma fonticola	16	1
2267	1	Etheostoma fonticola	12	1
2267	1	Palaemonetes sp.		6
2267	1	Gambusia sp.	14	1
2267	1	Gambusia sp.	11	1
2267	1	Gambusia sp.	17	1
2267	1	Gambusia sp.	12	1
2267	1	Gambusia sp.	11	1
2267	1	Gambusia sp.	11	1
2267	1	Gambusia sp.	11	1
2267	2	Etheostoma fonticola	14	1
2267	2	Etheostoma fonticola	18	1
2267	2	Gambusia sp.	12	1
2267	3	No fish collected		
2267	4	No fish collected		
2267	5	Lepomis miniatus	40	1
2267	5	Lepomis miniatus	33	1
2267	6	Gambusia sp.	10	1
2267	6	Gambusia sp.	12	1
2267	6	Gambusia sp.	12	1
2267	7	Lepomis miniatus	80	1
2267	7	Etheostoma fonticola	18	1
2267	7	Palaemonetes sp.		1
2267	8	No fish collected		
2267	9	Etheostoma fonticola	15	1
2267	9	Etheostoma fonticola	21	1
2267	9	Palaemonetes sp.		1
2267	10	Procambarus sp.		1
2267	11	Marisa cornuarietis	31	1
2267	11	Palaemonetes sp.		3

2267	12	No fish collected	
2267	13	No fish collected	
2267	14	No fish collected	
2267	15	Procambarus sp.	1

SiteCode 2268 Date 5/2/2018 Reach Landa Lake Site_No L1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2268	1	Gambusia sp.	32	1
2268	1	Gambusia sp.	17	1
2268	1	Gambusia sp.	31	1
2268	1	Gambusia sp.	20	1
2268	1	Gambusia sp.	15	1
2268	1	Gambusia sp.	15	1
2268	1	Gambusia sp.	16	1
2268	1	Gambusia sp.	19	1
2268	1	Gambusia sp.	16	1
2268	1	Gambusia sp.	28	1
2268	1	Lepomis miniatus	35	1
2268	1	Ameiurus natalis	32	1
2268	1	Ameiurus natalis	14	1
2268	1	Palaemonetes sp.		6
2268	1	Gambusia sp.	21	1
2268	1	Gambusia sp.	16	1
2268	1	Gambusia sp.	25	1
2268	1	Gambusia sp.	12	1
2268	1	Gambusia sp.	21	1
2268	1	Gambusia sp.	24	1
2268	1	Gambusia sp.	25	1
2268	1	Gambusia sp.	10	1
2268	1	Gambusia sp.	15	1
2268	1	Gambusia sp.	14	1
2268	1	Gambusia sp.	8	1
2268	1	Gambusia sp.	18	1
2268	1	Gambusia sp.	15	1
2268	1	Gambusia sp.	13	1
2268	1	Gambusia sp.	8	1
2268	1	Gambusia sp.		4

2268	2	Lepomis miniatus	68	1
2268	2	Gambusia sp.		41
2268	2	Palaemonetes sp.		4
2268	3	Gambusia sp.		39
2268	4	Gambusia sp.		35
2268	4	Etheostoma fonticola	17	1
2268	4	Palaemonetes sp.		2
2268	5	Etheostoma fonticola	25	1
2268	5	Gambusia sp.		20
2268	6	Gambusia sp.		4
2268	6	Etheostoma fonticola	15	1
2268	7	Etheostoma fonticola	20	1
2268	7	Gambusia sp.		1
2268	8	Etheostoma fonticola	21	1
2268	8	Gambusia sp.		1
2268	9	Procambarus sp.		1
2268	10	No fish collected		
2268	11	No fish collected		
2268	12	Etheostoma fonticola	17	1
2268	13	No fish collected		
2268	14	Gambusia sp.		2
2268	15	Gambusia sp.		1
2268	15	Palaemonetes sp.		1

SiteCode 2269 Date 5/2/2018 Reach Landa Lake Site_No L2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2269	2	Etheostoma fonticola	15	1
2269	2	Etheostoma fonticola	15	1
2269	2	Etheostoma fonticola	18	1
2269	2	Gambusia sp.		14
2269	2	Etheostoma fonticola	24	1
2269	2	Etheostoma fonticola	20	1
2269	2	Etheostoma fonticola	24	1
2269	2	Etheostoma fonticola	16	1
2269	2	Etheostoma fonticola	20	1
2269	2	Etheostoma fonticola	16	1
2269	2	Etheostoma fonticola	16	1
2269	2	Etheostoma fonticola	27	1
2269	2	Etheostoma fonticola	13	1
2269	2	Etheostoma fonticola	16	1
2269	2	Etheostoma fonticola	16	1
2269	2	Etheostoma fonticola	12	1
2269	2	Etheostoma fonticola	15	1
2269	2	Etheostoma fonticola	11	1
2269	2	Etheostoma fonticola	17	1
2269	3	Etheostoma fonticola	18	1
2269	3	Etheostoma fonticola	20	1
2269	3	Etheostoma fonticola	21	1
2269	3	Etheostoma fonticola	20	1
2269	3	Etheostoma fonticola	14	1
2269	3	Etheostoma fonticola	23	1
2269	3	Etheostoma fonticola	21	1
2269	3	Etheostoma fonticola	16	1
2269	3	Etheostoma fonticola	22	1
2269	3	Etheostoma fonticola	25	1
2269	3	Etheostoma fonticola	18	1

2269	3	Etheostoma fonticola	20	1
2269	3	Etheostoma fonticola	12	1
2269	3	Procambarus sp.		5
2269	3	Gambusia sp.		9
2269	3	Palaemonetes sp.		6
2269	4	Etheostoma fonticola	23	1
2269	4	Etheostoma fonticola	14	1
2269	4	Etheostoma fonticola	15	1
2269	4	Etheostoma fonticola	17	1
2269	4	Etheostoma fonticola	17	1
2269	4	Etheostoma fonticola	20	1
2269	4	Etheostoma fonticola	12	1
2269	4	Etheostoma fonticola	21	1
2269	4	Etheostoma fonticola	17	1
2269	4	Etheostoma fonticola	29	1
2269	4	Etheostoma fonticola	14	1
2269	4	Etheostoma fonticola	12	1
2269	4	Lepomis sp.	12	1
2269	4	Gambusia sp.		1
2269	4	Etheostoma fonticola	15	1
2269	4	Etheostoma fonticola	12	1
2269	5	Procambarus sp.		5
2269	5	Etheostoma fonticola	25	1
2269	5	Etheostoma fonticola	25	1
2269	5	Etheostoma fonticola	24	1
2269	5	Etheostoma fonticola	23	1
2269	5	Etheostoma fonticola	24	1
2269	5	Etheostoma fonticola	16	1
2269	5	Palaemonetes sp.		9
2269	5	Gambusia sp.		1
2269	6	Etheostoma fonticola	24	1
2269	6	Etheostoma fonticola	15	1
2269	6	Etheostoma fonticola	16	1
2269	6	Etheostoma fonticola	17	1
2269	6	Etheostoma fonticola	16	1

2269	6	Palaemonetes sp.		7
2269	6	Procambarus sp.		1
2269	6	Gambusia sp.		3
2269	7	Etheostoma fonticola	12	1
2269	7	Etheostoma fonticola	28	1
2269	7	Etheostoma fonticola	21	1
2269	7	Etheostoma fonticola	18	1
2269	7	Procambarus sp.		4
2269	7	Gambusia sp.		3
2269	8	Procambarus sp.		5
2269	8	Palaemonetes sp.		2
2269	8	Gambusia sp.		6
2269	8	Etheostoma fonticola	22	1
2269	8	Etheostoma fonticola	14	1
2269	9	Etheostoma fonticola	29	1
2269	9	Procambarus sp.		2
2269	10	Procambarus sp.		1
2269	11	Etheostoma fonticola	22	1
2269	12	Etheostoma fonticola	21	1
2269	12	Etheostoma fonticola	17	1
2269	12	Procambarus sp.		2
2269	13	Etheostoma fonticola	31	1
2269	13	Procambarus sp.		1
2269	14	Etheostoma fonticola	29	1
2269	14	Etheostoma fonticola	29	1
2269	14	Etheostoma fonticola	25	1
2269	14	Etheostoma fonticola	16	1
2269	14	Etheostoma fonticola	15	1
2269	14	Etheostoma fonticola	12	1
2269	14	Etheostoma fonticola	15	1
2269	14	Etheostoma fonticola	17	1
2269	14	Etheostoma fonticola	24	1
2269	14	Etheostoma fonticola	18	1
2269	15	Procambarus sp.		1
2269	15	Etheostoma fonticola	14	1

2269	16	Etheostoma fonticola	20	1
2269	16	Etheostoma fonticola	21	1
2269	16	Etheostoma fonticola	13	1
2269	16	Etheostoma fonticola	16	1
2269	17	Etheostoma fonticola	19	1
2269	17	Procambarus sp.		1
2269	18	No fish collected		
2269	2	Etheostoma fonticola	15	1
2269	1	Lepomis miniatus	80	1
2269	1	Etheostoma fonticola	21	1
2269	1	Etheostoma fonticola	23	1
2269	1	Etheostoma fonticola	15	1
2269	1	Etheostoma fonticola	20	1
2269	1	Etheostoma fonticola	19	1
2269	1	Etheostoma fonticola	16	1
2269	1	Etheostoma fonticola	18	1
2269	1	Etheostoma fonticola	21	1
2269	1	Etheostoma fonticola	21	1
2269	1	Etheostoma fonticola	12	1
2269	1	Etheostoma fonticola	22	1
2269	1	Etheostoma fonticola	20	1
2269	1	Gambusia sp.	25	1
2269	1	Gambusia sp.	26	1
2269	1	Gambusia sp.	13	1
2269	1	Gambusia sp.	20	1
2269	1	Gambusia sp.	20	1
2269	1	Gambusia sp.	19	1
2269	1	Gambusia sp.	18	1
2269	1	Gambusia sp.	16	1
2269	1	Gambusia sp.	21	1
2269	1	Gambusia sp.	18	1
2269	1	Gambusia sp.	18	1
2269	1	Palaemonetes sp.		20
2269	1	Etheostoma fonticola	21	1
2269	1	Etheostoma fonticola	12	1

2269	1	Etheostoma fonticola	24	1
2269	1	Etheostoma fonticola	12	1
2269	1	Etheostoma fonticola	14	1
2269	1	Etheostoma fonticola	15	1
2269	1	Etheostoma fonticola	20	1
2269	1	Etheostoma fonticola	14	1
2269	1	Etheostoma fonticola	15	1
2269	1	Etheostoma fonticola	15	1
2269	1	Etheostoma fonticola	11	1
2269	1	Etheostoma fonticola	14	1
2269	1	Gambusia sp.	12	1
2269	1	Gambusia sp.	13	1
2269	1	Gambusia sp.	16	1
2269	1	Gambusia sp.	19	1
2269	1	Gambusia sp.	14	1
2269	1	Gambusia sp.	16	1
2269	1	Gambusia sp.	9	1
2269	1	Gambusia sp.	12	1
2269	1	Gambusia sp.	14	1
2269	1	Gambusia sp.	10	1
2269	1	Gambusia sp.	12	1
2269	1	Gambusia sp.	11	1
2269	1	Gambusia sp.	12	1
2269	1	Gambusia sp.	12	1
2269	1	Gambusia sp.		4
2269	2	Procambarus sp.		3
2269	2	Palaemonetes sp.		23
2269	2	Etheostoma fonticola	31	1
2269	2	Etheostoma fonticola	20	1
2269	2	Etheostoma fonticola	22	1
2269	2	Etheostoma fonticola	26	1
2269	2	Etheostoma fonticola	20	1
2269	2	Etheostoma fonticola	16	1
2269	2	Etheostoma fonticola	17	1
2269	2	Etheostoma fonticola	15	1

SiteCode 2270 Date 5/2/2018 Reach Landa Lake Site_No S1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2270	1	Procambarus sp.		12
2270	1	Palaemonetes sp.		30
2270	1	Etheostoma fonticola	24	1
2270	1	Etheostoma fonticola	17	1
2270	1	Etheostoma fonticola	22	1
2270	1	Etheostoma fonticola	12	1
2270	1	Etheostoma fonticola	18	1
2270	1	Etheostoma fonticola	12	1
2270	1	Etheostoma fonticola	20	1
2270	1	Etheostoma fonticola	17	1
2270	1	Etheostoma fonticola	21	1
2270	1	Etheostoma fonticola	16	1
2270	1	Etheostoma fonticola	22	1
2270	1	Lepomis miniatus	87	1
2270	1	Gambusia sp.	12	1
2270	1	Gambusia sp.	30	1
2270	1	Gambusia sp.	40	1
2270	1	Gambusia sp.	17	1
2270	1	Etheostoma fonticola	21	1
2270	1	Etheostoma fonticola	22	1
2270	1	Etheostoma fonticola	20	1
2270	1	Etheostoma fonticola	20	1
2270	1	Etheostoma fonticola	14	1
2270	1	Etheostoma fonticola	13	1
2270	1	Etheostoma fonticola	17	1
2270	1	Etheostoma fonticola	17	1
2270	1	Etheostoma fonticola	23	1
2270	1	Etheostoma fonticola	17	1
2270	1	Etheostoma fonticola	9	1
2270	1	Lepomis sp.	19	1

2270	1	Etheostoma fonticola	14	1
2270	1	Etheostoma fonticola	13	1
2270	2	Etheostoma fonticola	27	1
2270	2	Etheostoma fonticola	12	1
2270	2	Etheostoma fonticola	17	1
2270	2	Gambusia sp.		1
2270	2	Procambarus sp.		13
2270	2	Palaemonetes sp.		5
2270	3	Procambarus sp.		18
2270	3	Palaemonetes sp.		1
2270	3	Etheostoma fonticola	22	1
2270	4	Procambarus sp.		13
2270	4	Etheostoma fonticola	22	1
2270	4	Etheostoma fonticola	13	1
2270	4	Lepomis miniatus	30	1
2270	4	Palaemonetes sp.		1
2270	5	Etheostoma fonticola	16	1
2270	5	Gambusia sp.	12	1
2270	5	Procambarus sp.		6
2270	5	Palaemonetes sp.		1
2270	6	Procambarus sp.		14
2270	6	Palaemonetes sp.		2
2270	7	Procambarus sp.		15
2270	7	Etheostoma fonticola	33	1
2270	7	Palaemonetes sp.		1
2270	8	Procambarus sp.		3
2270	9	Etheostoma fonticola	19	1
2270	9	Etheostoma fonticola	13	1
2270	9	Etheostoma fonticola	29	1
2270	10	Etheostoma fonticola	18	1
2270	10	Etheostoma fonticola	22	1
2270	10	Etheostoma fonticola	20	1
2270	10	Etheostoma fonticola	31	1
2270	10	Procambarus sp.		8
2270	10	Palaemonetes sp.		2

2270	10	Gambusia sp.	13	1
2270	10	Gambusia sp.	12	1
2270	11	Etheostoma fonticola	21	1
2270	11	Procambarus sp.		4
2270	12	Etheostoma fonticola	23	1
2270	12	Etheostoma fonticola	15	1
2270	12	Etheostoma fonticola	20	1
2270	12	Palaemonetes sp.		7
2270	13	Procambarus sp.		2
2270	13	Etheostoma fonticola	32	1
2270	14	Etheostoma fonticola	23	1
2270	15	No fish collected		

SiteCode 2271 Date 5/2/2018 Reach Landa Lake Site_No S2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2271	1	Lepomis miniatus	62	1
2271	1	Lepomis miniatus	24	1
2271	1	Lepomis sp.	15	1
2271	1	Lepomis sp.	15	1
2271	1	Lepomis sp.	15	1
2271	1	Lepomis sp.	12	1
2271	1	Lepomis sp.	13	1
2271	1	Astyanax mexicanus	21	1
2271	1	Gambusia sp.	13	1
2271	2	Lepomis miniatus	37	1
2271	2	Lepomis sp.	15	1
2271	3	Astyanax mexicanus	16	1
2271	3	Lepomis sp.	13	1
2271	4	Lepomis miniatus	60	1
2271	5	Procambarus sp.		2
2271	6	No fish collected		
2271	7	Lepomis miniatus	56	1
2271	8	Lepomis miniatus	64	1
2271	9	Procambarus sp.		1
2271	10	No fish collected		
2271	11	No fish collected		
2271	12	Lepomis miniatus	136	1
2271	13	No fish collected		
2271	14	No fish collected		
2271	15	No fish collected		

SiteCode 2272 Date 5/2/2018 Reach Landa Lake Site_No O1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2272	1	Procambarus sp.		1
2272	1	Etheostoma fonticola	30	1
2272	1	Etheostoma fonticola	22	1
2272	1	Etheostoma fonticola	25	1
2272	1	Etheostoma fonticola	27	1
2272	1	Etheostoma fonticola	14	1
2272	1	Etheostoma fonticola	18	1
2272	1	Etheostoma fonticola	18	1
2272	1	Etheostoma fonticola	13	1
2272	1	Etheostoma fonticola	17	1
2272	1	Etheostoma fonticola	23	1
2272	2	Etheostoma fonticola	18	1
2272	2	Etheostoma fonticola	27	1
2272	2	Etheostoma fonticola	22	1
2272	2	Etheostoma fonticola	24	1
2272	2	Etheostoma fonticola	18	1
2272	2	Etheostoma fonticola	16	1
2272	2	Etheostoma fonticola	25	1
2272	2	Etheostoma fonticola	25	1
2272	2	Etheostoma fonticola	19	1
2272	2	Etheostoma fonticola	18	1
2272	2	Etheostoma fonticola	12	1
2272	2	Etheostoma fonticola	19	1
2272	2	Procambarus sp.		1
2272	3	Etheostoma fonticola	25	1
2272	3	Etheostoma fonticola	15	1
2272	3	Etheostoma fonticola	14	1
2272	3	Palaemonetes sp.		1
2272	4	Etheostoma fonticola	19	1
2272	4	Etheostoma fonticola	22	1

2272	4	Etheostoma fonticola	17	1
2272	4	Etheostoma fonticola	18	1
2272	4	Etheostoma fonticola	19	1
2272	4	Etheostoma fonticola	14	1
2272	4	Etheostoma fonticola	24	1
2272	4	Etheostoma fonticola	17	1
2272	4	Etheostoma fonticola	14	1
2272	4	Etheostoma fonticola	14	1
2272	4	Etheostoma fonticola	15	1
2272	4	Etheostoma fonticola	11	1
2272	4	Etheostoma fonticola	15	1
2272	5	Etheostoma fonticola	15	1
2272	5	Etheostoma fonticola	13	1
2272	5	Etheostoma fonticola	22	1
2272	5	Etheostoma fonticola	13	1
2272	5	Etheostoma fonticola	19	1
2272	5	Etheostoma fonticola	19	1
2272	5	Etheostoma fonticola	18	1
2272	5	Etheostoma fonticola	15	1
2272	6	Etheostoma fonticola	19	1
2272	7	Etheostoma fonticola	16	1
2272	8	Etheostoma fonticola	19	1
2272	8	Etheostoma fonticola	20	1
2272	8	Etheostoma fonticola	22	1
2272	8	Etheostoma fonticola	9	1
2272	8	Etheostoma fonticola	16	1
2272	9	Etheostoma fonticola	11	1
2272	9	Etheostoma fonticola	12	1
2272	10	Etheostoma fonticola	18	1
2272	11	Etheostoma fonticola	19	1
2272	11	Etheostoma fonticola	16	1
2272	11	Etheostoma fonticola	16	1
2272	11	Etheostoma fonticola	14	1
2272	12	Etheostoma fonticola	23	1
2272	12	Etheostoma fonticola	12	1

2272	13	Etheostoma fonticola	23	1
2272	13	Gambusia sp.	16	1
2272	14	Etheostoma fonticola	20	1
2272	14	Etheostoma fonticola	12	1
2272	15	Etheostoma fonticola	17	1
2272	16	Etheostoma fonticola	16	1
2272	16	Etheostoma fonticola	18	1
2272	16	Etheostoma fonticola	15	1
2272	17	Etheostoma fonticola	20	1
2272	17	Etheostoma fonticola	14	1
2272	18	Etheostoma fonticola	24	1
2272	18	Etheostoma fonticola	22	1
2272	19	Etheostoma fonticola	13	1
2272	19	Etheostoma fonticola	18	1
2272	20	Etheostoma fonticola	20	1
2272	21	No fish collected		

SiteCode 2273 Date 5/2/2018 Reach Landa Lake Site_No O2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2273	1	Ameiurus natalis	29	1
2273	2	No fish collected		
2273	3	No fish collected		
2273	4	No fish collected		
2273	5	No fish collected		
2273	6	No fish collected		
2273	7	No fish collected		
2273	8	No fish collected		
2273	9	No fish collected		
2273	10	No fish collected		
2273	11	No fish collected		

SiteCode 2274 Date 5/2/2018 Reach Landa Lake Site_No R1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2274	1	Etheostoma fonticola	28	1
2274	1	Etheostoma fonticola	13	1
2274	1	Etheostoma fonticola	11	1
2274	1	Procambarus sp.		2
2274	1	Gambusia sp.	13	1
2274	1	Gambusia sp.	10	1
2274	1	Palaemonetes sp.		4
2274	2	Etheostoma fonticola	17	1
2274	2	Etheostoma fonticola	20	1
2274	2	Etheostoma fonticola	21	1
2274	2	Etheostoma fonticola	16	1
2274	2	Etheostoma fonticola	16	1
2274	2	Etheostoma fonticola	16	1
2274	2	Etheostoma fonticola	21	1
2274	2	Etheostoma fonticola	16	1
2274	2	Etheostoma fonticola	15	1
2274	2	Etheostoma fonticola	17	1
2274	2	Procambarus sp.		6
2274	2	Gambusia sp.	12	1
2274	2	Gambusia sp.	12	1
2274	2	Gambusia sp.	11	1
2274	2	Etheostoma fonticola	15	1
2274	2	Etheostoma fonticola	25	1
2274	2	Etheostoma fonticola	14	1
2274	2	Etheostoma fonticola	9	1
2274	2	Palaemonetes sp.		1
2274	3	Etheostoma fonticola	16	1
2274	3	Etheostoma fonticola	12	1
2274	3	Etheostoma fonticola	15	1
2274	3	Etheostoma fonticola	14	1

2274	3	Etheostoma fonticola	12	1
2274	3	Etheostoma fonticola	13	1
2274	3	Etheostoma fonticola	12	1
2274	3	Etheostoma fonticola	11	1
2274	3	Etheostoma fonticola	14	1
2274	4	Etheostoma fonticola	34	1
2274	4	Etheostoma fonticola	27	1
2274	4	Etheostoma fonticola	18	1
2274	4	Etheostoma fonticola	15	1
2274	4	Etheostoma fonticola	18	1
2274	4	Etheostoma fonticola	22	1
2274	4	Etheostoma fonticola	17	1
2274	4	Etheostoma fonticola	15	1
2274	4	Etheostoma fonticola	28	1
2274	4	Etheostoma fonticola	23	1
2274	4	Etheostoma fonticola	16	1
2274	4	Etheostoma fonticola	16	1
2274	4	Etheostoma fonticola	21	1
2274	4	Etheostoma fonticola	13	1
2274	4	Etheostoma fonticola	19	1
2274	4	Etheostoma fonticola	8	1
2274	4	Palaemonetes sp.		2
2274	4	Gambusia sp.	9	1
2274	5	Etheostoma fonticola	27	1
2274	4	Etheostoma fonticola	34	1
2274	4	Etheostoma fonticola	27	1
2274	4	Etheostoma fonticola	18	1
2274	4	Etheostoma fonticola	15	1
2274	4	Etheostoma fonticola	18	1
2274	4	Etheostoma fonticola	22	1
2274	4	Etheostoma fonticola	17	1
2274	4	Etheostoma fonticola	15	1
2274	4	Etheostoma fonticola	28	1
2274	4	Etheostoma fonticola	23	1
2274	4	Etheostoma fonticola	16	1

2274	4	Etheostoma fonticola	16	1
2274	4	Etheostoma fonticola	21	1
2274	4	Etheostoma fonticola	13	1
2274	4	Etheostoma fonticola	19	1
2274	4	Etheostoma fonticola	8	1
2274	4	Palaemonetes sp.		2
2274	4	Gambusia sp.	9	1
2274	5	Etheostoma fonticola	27	1
2274	5	Etheostoma fonticola	14	1
2274	5	Etheostoma fonticola	10	1
2274	5	Etheostoma fonticola	13	1
2274	5	Etheostoma fonticola	20	1
2274	5	Etheostoma fonticola	15	1
2274	5	Etheostoma fonticola	12	1
2274	5	Gambusia sp.	28	1
2274	6	Etheostoma fonticola	21	1
2274	6	Etheostoma fonticola	22	1
2274	6	Etheostoma fonticola	26	1
2274	6	Etheostoma fonticola	12	1
2274	6	Etheostoma fonticola	27	1
2274	6	Etheostoma fonticola	17	1
2274	6	Gambusia sp.	17	1
2274	7	Etheostoma fonticola	24	1
2274	8	Procambarus sp.		4
2274	8	Etheostoma fonticola	20	1
2274	9	Etheostoma fonticola	26	1
2274	9	Etheostoma fonticola	19	1
2274	9	Etheostoma fonticola	22	1
2274	10	Etheostoma fonticola	15	1
2274	10	Etheostoma fonticola	17	1
2274	10	Etheostoma fonticola	25	1
2274	11	Etheostoma fonticola	22	1
2274	12	No fish collected		
2274	13	No fish collected		
2274	14	No fish collected		

2274	15	Etheostoma fonticola	14	1
2274	15	Etheostoma fonticola	24	1
2274	16	No fish collected		

SiteCode 2275 Date 5/2/2018 Reach Landa Lake Site_No R2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2275	1	Etheostoma fonticola	10	1
2275	1	Etheostoma fonticola	26	1
2275	1	Etheostoma fonticola	22	1
2275	1	Etheostoma fonticola	17	1
2275	1	Etheostoma fonticola	10	1
2275	1	Lepomis sp.	15	1
2275	1	Gambusia sp.	15	1
2275	1	Gambusia sp.	12	1
2275	1	Gambusia sp.	15	1
2275	1	Gambusia sp.	11	1
2275	1	Gambusia sp.	10	1
2275	1	Gambusia sp.	12	1
2275	1	Gambusia sp.	14	1
2275	1	Gambusia sp.	15	1
2275	1	Gambusia sp.	9	1
2275	1	Gambusia sp.	10	1
2275	1	Palaemonetes sp.		5
2275	2	Gambusia sp.	31	1
2275	2	Gambusia sp.	9	1
2275	2	Etheostoma fonticola	22	1
2275	2	Etheostoma fonticola	14	1
2275	2	Etheostoma fonticola	22	1
2275	2	Palaemonetes sp.		4
2275	2	Procambarus sp.		4
2275	3	Etheostoma fonticola	23	1
2275	3	Etheostoma fonticola	23	1
2275	3	Etheostoma fonticola	22	1
2275	3	Etheostoma fonticola	18	1
2275	3	Etheostoma fonticola	20	1
2275	3	Etheostoma fonticola	17	1

2275	3	Etheostoma fonticola	12	1
2275	3	Gambusia sp.	15	1
2275	3	Gambusia sp.	12	1
2275	3	Gambusia sp.	9	1
2275	3	Gambusia sp.	10	1
2275	3	Gambusia sp.	12	1
2275	3	Gambusia sp.	11	1
2275	3	Palaemonetes sp.		2
2275	4	Etheostoma fonticola	22	1
2275	4	Etheostoma fonticola	23	1
2275	4	Etheostoma fonticola	28	1
2275	4	Gambusia sp.	10	1
2275	4	Gambusia sp.	34	1
2275	4	Gambusia sp.	20	1
2275	4	Gambusia sp.	19	1
2275	4	Gambusia sp.	32	1
2275	4	Gambusia sp.	17	1
2275	4	Gambusia sp.	18	1
2275	4	Gambusia sp.	12	1
2275	4	Procambarus sp.		2
2275	4	Palaemonetes sp.		1
2275	5	Etheostoma fonticola	23	1
2275	5	Etheostoma fonticola	19	1
2275	5	Etheostoma fonticola	16	1
2275	5	Etheostoma fonticola	23	1
2275	5	Etheostoma fonticola	24	1
2275	5	Etheostoma fonticola	22	1
2275	5	Etheostoma fonticola	10	1
2275	5	Etheostoma fonticola	21	1
2275	5	Etheostoma fonticola	14	1
2275	5	Procambarus sp.		6
2275	5	Gambusia sp.		1
2275	6	Etheostoma fonticola	21	1
2275	6	Etheostoma fonticola	24	1
2275	6	Etheostoma fonticola	23	1

2275	6	Etheostoma fonticola	23	1
2275	6	Etheostoma fonticola	15	1
2275	6	Etheostoma fonticola	18	1
2275	6	Etheostoma fonticola	20	1
2275	6	Etheostoma fonticola	32	1
2275	6	Etheostoma fonticola	18	1
2275	6	Gambusia sp.		1
2275	7	Procambarus sp.		1
2275	7	Etheostoma fonticola	18	1
2275	7	Etheostoma fonticola	24	1
2275	7	Gambusia sp.		2
2275	8	Procambarus sp.		4
2275	8	Etheostoma fonticola	23	1
2275	8	Etheostoma fonticola	35	1
2275	8	Etheostoma fonticola	27	1
2275	9	Etheostoma fonticola	25	1
2275	10	Procambarus sp.		1
2275	11	Etheostoma fonticola	11	1
2275	11	Etheostoma fonticola	20	1
2275	12	No fish collected		
2275	13	Etheostoma fonticola	26	1
2275	14	Etheostoma fonticola	35	1
2275	14	Etheostoma fonticola	21	1
2275	15	No fish collected		

SiteCode 2276 Date 5/3/2018 Reach Old Channel Reach Site_No R1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2276	1	Procambarus sp.		7
2276	1	Dionda nigrotaeniata	22	1
2276	1	Dionda nigrotaeniata	25	1
2276	1	Dionda nigrotaeniata	15	1
2276	1	Etheostoma fonticola	25	1
2276	1	Etheostoma fonticola	21	1
2276	2	Gambusia sp.	28	1
2276	2	Gambusia sp.	18	1
2276	2	Gambusia sp.	20	1
2276	2	Procambarus sp.		4
2276	3	Procambarus sp.		4
2276	4	Etheostoma fonticola	24	1
2276	4	Procambarus sp.		5
2276	4	Astyanax mexicanus	19	1
2276	5	Procambarus sp.		1
2276	6	Procambarus sp.		5
2276	7	Procambarus sp.		3
2276	8	Dionda nigrotaeniata	20	1
2276	8	Dionda nigrotaeniata	27	1
2276	8	Procambarus sp.		1
2276	8	Astyanax mexicanus	17	1
2276	9	Dionda nigrotaeniata	26	1
2276	9	Dionda nigrotaeniata	22	1
2276	9	Etheostoma fonticola	19	1
2276	9	Procambarus sp.		1
2276	10	Procambarus sp.		1
2276	11	Procambarus sp.		1
2276	12	No fish collected		
2276	13	No fish collected		
2276	14	No fish collected		

2276	15	No fish collected	

SiteCode 2277 Date 5/2/2018 Reach Old Channel Reach Site_No R2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2277	1	Gambusia sp.	26	1
2277	1	Gambusia sp.	29	1
2277	1	Gambusia sp.	16	1
2277	1	Gambusia sp.	21	1
2277	1	Gambusia sp.	15	1
2277	1	Gambusia sp.	25	1
2277	1	Etheostoma fonticola	20	1
2277	1	Etheostoma fonticola	12	1
2277	1	Etheostoma fonticola	26	1
2277	1	Etheostoma fonticola	20	1
2277	1	Etheostoma fonticola	26	1
2277	1	Etheostoma fonticola	17	1
2277	1	Procambarus sp.		3
2277	1	Palaemonetes sp.		1
2277	2	Procambarus sp.		7
2277	2	Etheostoma fonticola	14	1
2277	2	Etheostoma fonticola	14	1
2277	2	Etheostoma fonticola	22	1
2277	2	Etheostoma fonticola	11	1
2277	2	Etheostoma fonticola	13	1
2277	2	Dionda nigrotaeniata	22	1
2277	2	Dionda nigrotaeniata	17	1
2277	3	Procambarus sp.		5
2277	3	Etheostoma fonticola	11	1
2277	4	Dionda nigrotaeniata	11	1
2277	4	Etheostoma fonticola	11	1
2277	4	Etheostoma fonticola	25	1
2277	4	Etheostoma fonticola	10	1
2277	4	Gambusia sp.	11	1
2277	4	Procambarus sp.		3

2277	5	Procambarus sp.		2
2277	6	Etheostoma fonticola	23	1
2277	6	Etheostoma fonticola	10	1
2277	7	Procambarus sp.		5
2277	7	Etheostoma fonticola	15	1
2277	7	Etheostoma fonticola	24	1
2277	8	Etheostoma fonticola	27	1
2277	8	Procambarus sp.		2
2277	8	Gambusia sp.	12	1
2277	9	Procambarus sp.		1
2277	10	Palaemonetes sp.		1
2277	11	No fish collected		
2277	12	Procambarus sp.		1
2277	13	No fish collected		
2277	14	Etheostoma fonticola	22	1
2277	14	Procambarus sp.		1
2277	15	Etheostoma fonticola	25	1
2277	16	No fish collected		

SiteCode 2278 Date 5/3/2018 Reach Old Channel Reach Site_No O1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2278	8	No fish collected		
2278	9	No fish collected		
2278	10	No fish collected		
2278	1	No fish collected		
2278	2	Procambarus sp.		1
2278	3	No fish collected		
2278	4	No fish collected		
2278	5	No fish collected		
2278	6	No fish collected		
2278	7	No fish collected		

SiteCode 2279 Date 5/3/2018 Reach Old Channel Reach Site_No O2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2279	1	No fish collected		
2279	2	No fish collected		
2279	3	No fish collected		
2279	4	Etheostoma fonticola	24	1
2279	5	No fish collected		
2279	6	No fish collected		
2279	7	No fish collected		
2279	8	No fish collected		
2279	9	No fish collected		
2279	10	No fish collected		
2279	11	No fish collected		

SiteCode 2280 Date 5/3/2018 Reach Old Channel Reach Site_No L1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2280	1	Etheostoma fonticola	22	1
2280	1	Etheostoma fonticola	28	1
2280	1	Etheostoma fonticola	27	1
2280	1	Etheostoma fonticola	25	1
2280	1	Etheostoma fonticola	23	1
2280	1	Etheostoma fonticola	21	1
2280	1	Etheostoma fonticola	13	1
2280	1	Etheostoma fonticola	14	1
2280	1	Etheostoma fonticola	16	1
2280	1	Etheostoma fonticola	20	1
2280	1	Etheostoma fonticola	16	1
2280	1	Etheostoma fonticola	20	1
2280	1	Etheostoma fonticola	22	1
2280	1	Etheostoma fonticola	24	1
2280	1	Etheostoma fonticola	16	1
2280	1	Etheostoma fonticola	21	1
2280	1	Etheostoma fonticola	19	1
2280	1	Etheostoma fonticola	15	1
2280	1	Etheostoma fonticola	16	1
2280	1	Etheostoma fonticola	26	1
2280	1	Etheostoma fonticola	14	1
2280	1	Procambarus sp.		8
2280	1	Palaemonetes sp.		3
2280	1	Gambusia sp.	10	1
2280	2	Etheostoma fonticola	22	1
2280	2	Procambarus sp.		5
2280	3	Notropis amabilis	27	1
2280	3	Notropis amabilis	30	1
2280	3	Notropis amabilis	24	1
2280	3	Notropis amabilis	25	1

2280	3	Notropis amabilis	22	1
2280	3	Notropis amabilis	25	1
2280	3	Notropis amabilis	24	1
2280	3	Notropis amabilis	22	1
2280	3	Etheostoma fonticola	30	1
2280	3	Procambarus sp.		12
2280	3	Palaemonetes sp.		2
2280	4	Etheostoma fonticola	20	1
2280	4	Etheostoma fonticola	32	2
2280	4	Procambarus sp.		5
2280	5	Etheostoma fonticola	23	1
2280	5	Etheostoma fonticola	22	1
2280	5	Procambarus sp.		3
2280	6	Notropis amabilis	23	1
2280	6	Notropis amabilis	30	1
2280	6	Procambarus sp.		5
2280	6	Etheostoma fonticola	18	1
2280	7	Gambusia sp.	15	1
2280	8	Procambarus sp.		3
2280	9	Etheostoma fonticola	20	1
2280	9	Etheostoma fonticola	11	1
2280	9	Procambarus sp.		1
2280	10	Etheostoma fonticola	28	1
2280	11	No fish collected		
2280	12	Etheostoma fonticola	19	1
2280	12	Etheostoma fonticola	15	1
2280	12	Procambarus sp.		1
2280	13	Etheostoma fonticola	21	1
2280	13	Etheostoma fonticola	25	1
2280	14	No fish collected		
2280	15	Etheostoma fonticola	20	1
2280	16	No fish collected		

SiteCode 2281 Date 5/3/2018 Reach Old Channel Reach Site_No L2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2281	1	Etheostoma fonticola	16	1
2281	1	Etheostoma fonticola	26	1
2281	1	Etheostoma fonticola	27	1
2281	1	Etheostoma fonticola	22	1
2281	1	Etheostoma fonticola	16	1
2281	1	Gambusia sp.	14	1
2281	1	Gambusia sp.	18	1
2281	1	Gambusia sp.	17	1
2281	1	Gambusia sp.	12	1
2281	1	Gambusia sp.	10	1
2281	1	Procambarus sp.		10
2281	1	Palaemonetes sp.		7
2281	2	Procambarus sp.		3
2281	2	Etheostoma fonticola	24	1
2281	2	Etheostoma fonticola	13	1
2281	3	Procambarus sp.		1
2281	3	Gambusia sp.	15	1
2281	3	Dionda nigrotaeniata	18	1
2281	3	Lepomis miniatus	40	1
2281	4	Etheostoma fonticola	21	1
2281	4	Etheostoma fonticola	20	1
2281	4	Etheostoma fonticola	21	1
2281	4	Etheostoma fonticola	20	1
2281	4	Procambarus sp.		6
2281	5	Procambarus sp.		6
2281	5	Etheostoma fonticola	23	1
2281	6	Etheostoma fonticola	23	1
2281	6	Etheostoma fonticola	25	1
2281	6	Procambarus sp.		3
2281	6	Palaemonetes sp.		1

2281	6	Gambusia sp.	12	1
2281	7	Etheostoma fonticola	12	1
2281	7	Procambarus sp.		2
2281	8	Procambarus sp.		1
2281	8	Etheostoma fonticola	30	1
2281	9	Procambarus sp.		4
2281	9	Palaemonetes sp.		1
2281	10	Procambarus sp.		2
2281	11	Procambarus sp.		1
2281	11	Palaemonetes sp.		1
2281	12	Procambarus sp.		2
2281	13	Procambarus sp.		4
2281	14	Procambarus sp.		1
2281	15	No fish collected		

SiteCode 2282 Date 5/2/2018 Reach Upper New Channel Reach Site_No O1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2282	1	No fish collected		
2282	2	No fish collected		
2282	3	Procambarus sp.		1
2282	4	No fish collected		
2282	5	No fish collected		
2282	6	No fish collected		
2282	7	No fish collected		
2282	8	No fish collected		
2282	9	No fish collected		
2282	10	No fish collected		

SiteCode 2283 Date 5/2/2018 Reach Upper New Channel Reach Site_No O2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2283	1	No fish collected		
2283	2	No fish collected		
2283	3	No fish collected		
2283	4	No fish collected		
2283	5	No fish collected		
2283	6	No fish collected		
2283	7	No fish collected		
2283	8	No fish collected		
2283	9	No fish collected		
2283	10	No fish collected		

SiteCode 2284 Date 5/2/2018 Reach Upper New Channel Reach Site_No H1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2284	1	Lepomis gulosus	139	1
2284	1	Procambarus sp.		18
2284	1	Etheostoma fonticola	34	1
2284	1	Etheostoma fonticola	25	1
2284	1	Etheostoma lepidum	39	1
2284	1	Gambusia sp.	10	1
2284	2	Etheostoma fonticola	31	1
2284	2	Etheostoma fonticola	27	1
2284	2	Etheostoma fonticola	22	1
2284	2	Etheostoma fonticola	28	1
2284	2	Etheostoma fonticola	22	1
2284	2	Etheostoma fonticola	24	1
2284	2	Etheostoma fonticola	25	1
2284	2	Procambarus sp.		30
2284	2	Etheostoma lepidum	49	1
2284	2	Lepomis miniatus	69	1
2284	3	Etheostoma fonticola	27	1
2284	3	Etheostoma fonticola	23	1
2284	3	Etheostoma fonticola	21	1
2284	3	Etheostoma fonticola	23	1
2284	4	Herichthys cyanoguttatus	50	1
2284	4	Procambarus sp.		27
2284	4	Etheostoma fonticola	31	1
2284	4	Etheostoma fonticola	21	1
2284	5	Procambarus sp.		8
2284	6	Etheostoma fonticola	26	1
2284	6	Procambarus sp.		15
2284	7	Procambarus sp.		9
2284	8	Etheostoma fonticola	29	1
2284	8	Procambarus sp.		20

2284	9	Etheostoma fonticola	26	1
2284	9	Herichthys cyanoguttatus	58	1
2284	9	Herichthys cyanoguttatus	54	1
2284	9	Procambarus sp.		8
2284	10	Etheostoma fonticola	31	1
2284	10	Procambarus sp.		9
2284	11	Procambarus sp.		4
2284	12	Etheostoma fonticola	24	1
2284	12	Procambarus sp.		18
2284	13	No fish collected		
2284	14	Procambarus sp.		2
2284	15	Procambarus sp.		1

SiteCode 2285 Date 5/2/2018 Reach Upper New Channel Reach Site_No H2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2285	1	Lepomis miniatus	115	1
2285	1	Lepomis miniatus	157	1
2285	1	Lepomis gulosus	120	1
2285	1	Procambarus sp.		5
2285	1	Palaemonetes sp.		4
2285	1	Etheostoma fonticola	21	1
2285	1	Etheostoma fonticola	20	1
2285	1	Etheostoma fonticola	22	1
2285	2	Lepomis gulosus	135	1
2285	2	Lepomis miniatus	52	1
2285	2	Lepomis miniatus	59	1
2285	2	Procambarus sp.		17
2285	2	Palaemonetes sp.		4
2285	3	Gambusia sp.	14	1
2285	3	Procambarus sp.		17
2285	4	Herichthys cyanoguttatus	61	1
2285	4	Procambarus sp.		12
2285	4	Palaemonetes sp.		1
2285	5	Etheostoma lepidum	49	1
2285	5	Procambarus sp.		6
2285	6	Procambarus sp.		7
2285	7	Etheostoma fonticola	25	1
2285	7	Etheostoma fonticola	25	1
2285	7	Procambarus sp.		13
2285	8	Procambarus sp.		6
2285	8	Palaemonetes sp.		1
2285	9	Procambarus sp.		3
2285	10	Lepomis miniatus	72	1
2285	10	Etheostoma fonticola	21	1
2285	10	Procambarus sp.		3

2285	10	Palaemonetes sp.		2
2285	11	Procambarus sp.		4
2285	11	Etheostoma fonticola	30	1
2285	12	Procambarus sp.		4
2285	12	Lepomis miniatus	61	1
2285	13	No fish collected		
2285	14	Procambarus sp.		6
2285	15	No fish collected		

SiteCode 2286 Date 5/2/2018 Reach Upper New Channel Reach Site_No R1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2286	1	Etheostoma fonticola	27	1
2286	1	Etheostoma fonticola	32	1
2286	1	Gambusia sp.	15	1
2286	1	Procambarus sp.		5
2286	2	Etheostoma fonticola	25	1
2286	2	Etheostoma fonticola	16	1
2286	2	Procambarus sp.		2
2286	3	Lepomis macrochirus	82	1
2286	3	Procambarus sp.		9
2286	3	Etheostoma fonticola	21	1
2286	3	Etheostoma fonticola	34	1
2286	3	Etheostoma fonticola	18	1
2286	4	Etheostoma fonticola	28	1
2286	4	Etheostoma fonticola	26	1
2286	4	Procambarus sp.		22
2286	5	Etheostoma fonticola	25	1
2286	5	Lepomis macrochirus	68	1
2286	5	Procambarus sp.		3
2286	6	Etheostoma fonticola	27	1
2286	6	Etheostoma fonticola	29	1
2286	6	Etheostoma fonticola	26	1
2286	6	Procambarus sp.		6
2286	7	Etheostoma fonticola	27	1
2286	7	Procambarus sp.		5
2286	8	Etheostoma fonticola	28	1
2286	8	Procambarus sp.		4
2286	9	Procambarus sp.		1
2286	10	Etheostoma fonticola	27	1
2286	10	Procambarus sp.		4
2286	11	Procambarus sp.		5

2286	12	Procambarus sp.	1
2286	13	Procambarus sp.	2
2286	14	No fish collected	
2286	15	Procambarus sp.	2

SiteCode 2317 Date 10/29/2018 Reach Upper Spring Run Site_No R1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2317	1	Etheostoma fonticola	31	1
2317	1	Etheostoma fonticola	29	1
2317	1	Etheostoma fonticola	31	1
2317	1	Etheostoma fonticola	32	1
2317	1	Etheostoma fonticola	32	1
2317	1	Etheostoma fonticola	27	1
2317	1	Etheostoma fonticola	28	1
2317	1	Etheostoma fonticola	25	1
2317	1	Etheostoma fonticola	29	1
2317	1	Etheostoma fonticola	28	1
2317	1	Etheostoma fonticola	32	1
2317	1	Etheostoma fonticola	28	1
2317	1	Etheostoma fonticola	27	1
2317	1	Etheostoma fonticola	27	1
2317	1	Etheostoma fonticola	30	1
2317	1	Etheostoma fonticola	28	1
2317	1	Etheostoma fonticola	32	1
2317	1	Etheostoma fonticola	26	1
2317	1	Etheostoma fonticola	27	1
2317	1	Etheostoma fonticola	29	1
2317	1	Etheostoma fonticola	30	1
2317	1	Etheostoma fonticola	28	1
2317	1	Etheostoma fonticola	29	1
2317	1	Etheostoma fonticola	32	1
2317	1	Etheostoma fonticola	24	1
2317	1	Etheostoma fonticola	33	1
2317	1	Etheostoma fonticola	27	1
2317	1	Procambarus sp.		44
2317	1	Palaemonetes sp.		1
2317	2	Etheostoma fonticola	30	1

2317	2	Etheostoma fonticola	28	1
2317	2	Etheostoma fonticola	28	1
2317	2	Etheostoma fonticola	32	1
2317	2	Etheostoma fonticola	29	1
2317	2	Etheostoma fonticola	33	1
2317	2	Etheostoma fonticola	25	1
2317	2	Etheostoma fonticola	24	1
2317	2	Etheostoma fonticola	28	1
2317	2	Etheostoma fonticola	31	1
2317	2	Etheostoma fonticola	26	1
2317	2	Etheostoma fonticola	26	1
2317	2	Etheostoma fonticola	35	1
2317	2	Etheostoma fonticola	29	1
2317	2	Etheostoma fonticola	11	1
2317	2	Palaemonetes sp.		1
2317	2	Procambarus sp.		14
2317	3	Etheostoma fonticola	27	1
2317	3	Etheostoma fonticola	30	1
2317	3	Etheostoma fonticola	33	1
2317	3	Etheostoma fonticola	27	1
2317	3	Etheostoma fonticola	15	1
2317	3	Procambarus sp.		1
2317	4	Etheostoma fonticola	29	1
2317	4	Etheostoma fonticola	29	1
2317	4	Etheostoma fonticola	31	1
2317	4	Procambarus sp.		6
2317	5	Etheostoma fonticola	26	1
2317	5	Etheostoma fonticola	30	1
2317	5	Procambarus sp.		4
2317	6	Etheostoma fonticola	29	1
2317	6	Etheostoma fonticola	26	1
2317	6	Etheostoma fonticola	26	1
2317	6	Procambarus sp.		2
2317	7	Procambarus sp.		2
2317	8	Procambarus sp.		3

2317	9	Etheostoma fonticola	28	1
2317	9	Procambarus sp.		2
2317	10	Procambarus sp.		1
2317	11	Etheostoma fonticola	33	1
2317	12	No fish collected		
2317	13	No fish collected		
2317	14	No fish collected		
2317	15	No fish collected		

SiteCode 2318 Date 10/29/2018 Reach Upper Spring Run Site_No R2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2318	1	Palaemonetes sp.		4
2318	1	Gambusia sp.	24	1
2318	1	Etheostoma fonticola	29	1
2318	1	Etheostoma fonticola	35	1
2318	1	Etheostoma fonticola	32	1
2318	1	Etheostoma fonticola	31	1
2318	1	Etheostoma fonticola	34	1
2318	1	Etheostoma fonticola	36	1
2318	1	Procambarus sp.		3
2318	2	Etheostoma fonticola	30	1
2318	2	Etheostoma fonticola	12	1
2318	2	Etheostoma fonticola	30	1
2318	2	Etheostoma fonticola	30	1
2318	2	Palaemonetes sp.		11
2318	2	Procambarus sp.		3
2318	3	Procambarus sp.		5
2318	4	Etheostoma fonticola	35	1
2318	4	Palaemonetes sp.		4
2318	4	Procambarus sp.		2
2318	5	Etheostoma fonticola	15	1
2318	5	Palaemonetes sp.		4
2318	6	Etheostoma fonticola	30	1
2318	6	Palaemonetes sp.		1
2318	6	Procambarus sp.		2
2318	7	Etheostoma fonticola	28	1
2318	8	Etheostoma fonticola	28	1
2318	8	Palaemonetes sp.		3
2318	9	Procambarus sp.		2
2318	9	Palaemonetes sp.		1
2318	10	Etheostoma fonticola	10	1

2318	11	Etheostoma fonticola	32	1
2318	12	No fish collected		
2318	13	Etheostoma fonticola	13	1
2318	14	No fish collected		
2318	15	No fish collected		

SiteCode 2319 Date 10/29/2018 Reach Upper Spring Run Site_No O1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2319	1	No fish collected		
2319	2	No fish collected		
2319	3	No fish collected		
2319	4	No fish collected		
2319	5	No fish collected		
2319	6	No fish collected		
2319	7	No fish collected		
2319	8	No fish collected		
2319	9	No fish collected		
2319	10	No fish collected		

SiteCode 2320 Date 10/29/2018 Reach Upper Spring Run Site_No O2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2320	1	No fish collected		
2320	2	No fish collected		
2320	3	No fish collected		
2320	4	No fish collected		
2320	5	No fish collected		
2320	6	No fish collected		
2320	7	No fish collected		
2320	8	No fish collected		
2320	9	No fish collected		
2320	10	No fish collected		

SiteCode 2321 Date 10/29/2018 Reach Upper Spring Run Site_No S1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2321	1	Procambarus sp.		1
2321	2	Lepomis miniatus	119	1
2321	2	Procambarus sp.		1
2321	3	Procambarus sp.		3
2321	4	No fish collected		
2321	5	Lepomis miniatus	60	1
2321	5	Oreochromis aureus	105	1
2321	6	Lepomis miniatus	70	1
2321	7	No fish collected		
2321	8	No fish collected		
2321	9	No fish collected		
2321	10	No fish collected		
2321	11	Procambarus sp.		1
2321	12	No fish collected		
2321	13	No fish collected		
2321	14	No fish collected		
2321	15	No fish collected		

SiteCode 2322 Date 10/29/2018 Reach Upper Spring Run Site_No S2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2322	1	Lepomis miniatus	100	1
2322	1	Lepomis miniatus	40	1
2322	2	Ameiurus natalis	106	1
2322	3	Lepomis miniatus	55	1
2322	4	Herichthys cyanoguttatus	115	1
2322	4	Palaemonetes sp.		8
2322	5	No fish collected		
2322	6	Ameiurus natalis	46	1
2322	6	Palaemonetes sp.		4
2322	7	No fish collected		
2322	8	Palaemonetes sp.		3
2322	9	No fish collected		
2322	10	Lepomis miniatus	62	1
2322	10	Procambarus sp.		1
2322	11	Procambarus sp.		1
2322	12	Procambarus sp.		1
2322	13	No fish collected		
2322	14	No fish collected		
2322	15	No fish collected		

SiteCode 2323 Date 10/29/2018 Reach Landa Lake Site_No R1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2323	3	Etheostoma fonticola	22	1
2323	3	Etheostoma fonticola	27	1
2323	3	Etheostoma fonticola	24	1
2323	3	Etheostoma fonticola	26	1
2323	3	Etheostoma fonticola	17	1
2323	3	Etheostoma fonticola	20	1
2323	3	Etheostoma fonticola	22	1
2323	3	Etheostoma fonticola	26	1
2323	3	Etheostoma fonticola	30	1
2323	3	Etheostoma fonticola	30	1
2323	3	Etheostoma fonticola	30	1
2323	3	Etheostoma fonticola	30	1
2323	3	Etheostoma fonticola	32	1
2323	3	Etheostoma fonticola	22	1
2323	3	Etheostoma fonticola	25	1
2323	3	Etheostoma fonticola	30	1
2323	3	Etheostoma fonticola	26	1
2323	3	Etheostoma fonticola	14	1
2323	3	Etheostoma fonticola	22	1
2323	3	Etheostoma fonticola	30	1
2323	3	Etheostoma fonticola	22	1
2323	3	Etheostoma fonticola	26	1
2323	3	Etheostoma fonticola	12	1
2323	3	Gambusia sp.	12	1
2323	3	Procambarus sp.		16
2323	3	Palaemonetes sp.		2
2323	4	Etheostoma fonticola	22	1
2323	4	Etheostoma fonticola	30	1
2323	4	Etheostoma fonticola	25	1
2323	4	Etheostoma fonticola	19	1

2323	4	Etheostoma fonticola	27	1
2323	4	Etheostoma fonticola	26	1
2323	4	Etheostoma fonticola	14	1
2323	4	Etheostoma fonticola	32	1
2323	4	Procambarus sp.		6
2323	5	Etheostoma fonticola	21	1
2323	5	Etheostoma fonticola	27	1
2323	5	Etheostoma fonticola	33	1
2323	5	Etheostoma fonticola	26	1
2323	5	Etheostoma fonticola	26	1
2323	5	Etheostoma fonticola	28	1
2323	5	Etheostoma fonticola	27	1
2323	5	Etheostoma fonticola	32	1
2323	5	Etheostoma fonticola	23	1
2323	5	Etheostoma fonticola	22	1
2323	5	Etheostoma fonticola	24	1
2323	5	Etheostoma fonticola	13	1
2323	5	Procambarus sp.		10
2323	6	Etheostoma fonticola	16	1
2323	6	Etheostoma fonticola	31	1
2323	6	Etheostoma fonticola	26	1
2323	6	Etheostoma fonticola	21	1
2323	6	Etheostoma fonticola	15	1
2323	6	Etheostoma fonticola	16	1
2323	6	Procambarus sp.		4
2323	7	Etheostoma fonticola	20	1
2323	7	Etheostoma fonticola	14	1
2323	7	Etheostoma fonticola	30	1
2323	7	Etheostoma fonticola	32	1
2323	7	Etheostoma fonticola	17	1
2323	7	Etheostoma fonticola	17	1
2323	7	Etheostoma fonticola	20	1
2323	7	Etheostoma fonticola	22	1
2323	7	Gambusia sp.	12	1
2323	7	Procambarus sp.		4

2323	8	Etheostoma fonticola	30	1
2323	8	Procambarus sp.		2
2323	9	Etheostoma fonticola	20	1
2323	9	Etheostoma fonticola	16	1
2323	9	Etheostoma fonticola	28	1
2323	9	Etheostoma fonticola	30	1
2323	9	Etheostoma fonticola	30	1
2323	9	Etheostoma fonticola	26	1
2323	9	Etheostoma fonticola	22	1
2323	9	Gambusia sp.	15	1
2323	10	Etheostoma fonticola	21	1
2323	10	Etheostoma fonticola	19	1
2323	10	Procambarus sp.		1
2323	11	Etheostoma fonticola	28	1
2323	11	Etheostoma fonticola	22	1
2323	11	Etheostoma fonticola	20	1
2323	11	Etheostoma fonticola	26	1
2323	11	Etheostoma fonticola	20	1
2323	11	Etheostoma fonticola	21	1
2323	11	Etheostoma fonticola	20	1
2323	11	Etheostoma fonticola	18	1
2323	11	Etheostoma fonticola	16	1
2323	11	Procambarus sp.		3
2323	12	Etheostoma fonticola	27	1
2323	12	Etheostoma fonticola	25	1
2323	12	Etheostoma fonticola	18	1
2323	12	Etheostoma fonticola	24	1
2323	12	Etheostoma fonticola	29	1
2323	12	Etheostoma fonticola	30	1
2323	12	Procambarus sp.		2
2323	13	Etheostoma fonticola	20	1
2323	13	Etheostoma fonticola	22	1
2323	13	Etheostoma fonticola	25	1
2323	13	Etheostoma fonticola	22	1
2323	13	Etheostoma fonticola	19	1

2323	13	Gambusia sp.	11	1
2323	13	Procambarus sp.		1
2323	14	Etheostoma fonticola	25	1
2323	14	Etheostoma fonticola	20	1
2323	15	Etheostoma fonticola	18	1
2323	15	Procambarus sp.		1
2323	16	Etheostoma fonticola	24	1
2323	17	Procambarus sp.		1
2323	1	Etheostoma fonticola	27	1
2323	1	Etheostoma fonticola	21	1
2323	1	Etheostoma fonticola	26	1
2323	1	Etheostoma fonticola	24	1
2323	1	Etheostoma fonticola	17	1
2323	1	Etheostoma fonticola	27	1
2323	1	Etheostoma fonticola	15	1
2323	1	Etheostoma fonticola	28	1
2323	1	Etheostoma fonticola	21	1
2323	1	Etheostoma fonticola	24	1
2323	1	Etheostoma fonticola	27	1
2323	1	Etheostoma fonticola	30	1
2323	1	Etheostoma fonticola	32	1
2323	1	Etheostoma fonticola	17	1
2323	1	Etheostoma fonticola	24	1
2323	1	Etheostoma fonticola	22	1
2323	1	Etheostoma fonticola	21	1
2323	1	Etheostoma fonticola	26	1
2323	1	Etheostoma fonticola	14	1
2323	1	Procambarus sp.		43
2323	1	Palaemonetes sp.		9
2323	2	Etheostoma fonticola	26	1
2323	2	Etheostoma fonticola	27	1
2323	2	Etheostoma fonticola	22	1
2323	2	Etheostoma fonticola	24	1
2323	2	Etheostoma fonticola	33	1
2323	2	Etheostoma fonticola	26	1

2323	2	Etheostoma fonticola	27	1
2323	2	Etheostoma fonticola	27	1
2323	2	Etheostoma fonticola	27	1
2323	2	Etheostoma fonticola	27	1
2323	2	Etheostoma fonticola	31	1
2323	2	Etheostoma fonticola	27	1
2323	2	Etheostoma fonticola	29	1
2323	2	Etheostoma fonticola	31	1
2323	2	Etheostoma fonticola	30	1
2323	2	Etheostoma fonticola	21	1
2323	2	Etheostoma fonticola	26	1
2323	2	Etheostoma fonticola	26	1
2323	2	Procambarus sp.		17
2323	2	Palaemonetes sp.		3
2323	3	Etheostoma fonticola	27	1
2323	3	Etheostoma fonticola	29	1

SiteCode 2324 Date 10/29/2018 Reach Landa Lake Site_No R2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2324	1	Etheostoma fonticola	25	1
2324	1	Etheostoma fonticola	25	1
2324	1	Etheostoma fonticola	18	1
2324	1	Etheostoma fonticola	18	1
2324	1	Etheostoma fonticola	16	1
2324	1	Etheostoma fonticola	23	1
2324	1	Etheostoma fonticola	21	1
2324	1	Etheostoma fonticola	25	1
2324	1	Etheostoma fonticola	20	1
2324	1	Etheostoma fonticola	25	1
2324	1	Etheostoma fonticola	22	1
2324	1	Etheostoma fonticola	29	1
2324	1	Etheostoma fonticola	21	1
2324	1	Etheostoma fonticola	30	1
2324	1	Etheostoma fonticola	25	1
2324	1	Etheostoma fonticola	15	1
2324	1	Etheostoma fonticola	31	1
2324	1	Etheostoma fonticola	29	1
2324	1	Etheostoma fonticola	28	1
2324	1	Etheostoma fonticola	24	1
2324	1	Etheostoma fonticola	19	1
2324	1	Etheostoma fonticola	12	1
2324	1	Etheostoma fonticola	18	1
2324	1	Etheostoma fonticola	23	1
2324	1	Etheostoma fonticola	31	1
2324	1	Etheostoma fonticola	15	1
2324	1	Etheostoma fonticola	19	1
2324	1	Palaemonetes sp.		4
2324	1	Procambarus sp.		18
2324	2	Etheostoma fonticola	28	1

2324	2	Etheostoma fonticola	24	1
2324	2	Etheostoma fonticola	22	1
2324	2	Etheostoma fonticola	30	1
2324	2	Etheostoma fonticola	25	1
2324	2	Etheostoma fonticola	33	1
2324	2	Etheostoma fonticola	35	1
2324	2	Etheostoma fonticola	28	1
2324	2	Etheostoma fonticola	28	1
2324	2	Etheostoma fonticola	23	1
2324	2	Etheostoma fonticola	22	1
2324	2	Etheostoma fonticola	24	1
2324	2	Etheostoma fonticola	17	1
2324	2	Etheostoma fonticola	22	1
2324	2	Etheostoma fonticola	24	1
2324	2	Etheostoma fonticola	23	1
2324	2	Etheostoma fonticola	23	1
2324	2	Etheostoma fonticola	28	1
2324	2	Etheostoma fonticola	22	1
2324	2	Etheostoma fonticola	30	1
2324	2	Etheostoma fonticola	19	1
2324	2	Etheostoma fonticola	17	1
2324	2	Etheostoma fonticola	16	1
2324	2	Etheostoma fonticola	18	1
2324	2	Etheostoma fonticola	21	1
2324	2	Palaemonetes sp.		11
2324	2	Procambarus sp.		13
2324	3	Etheostoma fonticola	20	1
2324	3	Etheostoma fonticola	27	1
2324	3	Etheostoma fonticola	36	1
2324	3	Etheostoma fonticola	31	1
2324	3	Etheostoma fonticola	20	1
2324	3	Etheostoma fonticola	20	1
2324	3	Etheostoma fonticola	24	1
2324	3	Etheostoma fonticola	30	1
2324	3	Etheostoma fonticola	30	1

2324	3	Etheostoma fonticola	29	1
2324	3	Etheostoma fonticola	21	1
2324	3	Etheostoma fonticola	31	1
2324	3	Etheostoma fonticola	24	1
2324	3	Etheostoma fonticola	25	1
2324	3	Etheostoma fonticola	22	1
2324	3	Procambarus sp.		10
2324	3	Palaemonetes sp.		4
2324	4	Etheostoma fonticola	29	1
2324	4	Etheostoma fonticola	28	1
2324	4	Etheostoma fonticola	17	1
2324	4	Etheostoma fonticola	32	1
2324	4	Etheostoma fonticola	32	1
2324	4	Etheostoma fonticola	30	1
2324	4	Etheostoma fonticola	32	1
2324	4	Etheostoma fonticola	17	1
2324	4	Etheostoma fonticola	32	1
2324	4	Etheostoma fonticola	15	1
2324	4	Etheostoma fonticola	31	1
2324	4	Etheostoma fonticola	28	1
2324	4	Etheostoma fonticola	26	1
2324	4	Etheostoma fonticola	31	1
2324	4	Etheostoma fonticola	25	1
2324	4	Etheostoma fonticola	23	1
2324	4	Etheostoma fonticola	27	1
2324	4	Procambarus sp.		17
2324	4	Palaemonetes sp.		3
2324	5	Etheostoma fonticola	27	1
2324	5	Etheostoma fonticola	30	1
2324	5	Etheostoma fonticola	28	1
2324	5	Etheostoma fonticola	28	1
2324	5	Etheostoma fonticola	31	1
2324	5	Etheostoma fonticola	31	1
2324	5	Etheostoma fonticola	19	1
2324	5	Etheostoma fonticola	26	1

2324	5	Etheostoma fonticola	26	1
2324	5	Etheostoma fonticola	18	1
2324	5	Etheostoma fonticola	26	1
2324	5	Etheostoma fonticola	27	1
2324	5	Etheostoma fonticola	29	1
2324	5	Etheostoma fonticola	25	1
2324	5	Etheostoma fonticola	30	1
2324	5	Etheostoma fonticola	17	1
2324	5	Procambarus sp.		6
2324	6	Etheostoma fonticola	23	1
2324	6	Etheostoma fonticola	22	1
2324	6	Etheostoma fonticola	24	1
2324	6	Etheostoma fonticola	20	1
2324	6	Etheostoma fonticola	18	1
2324	6	Etheostoma fonticola	28	1
2324	6	Etheostoma fonticola	20	1
2324	6	Procambarus sp.		1
2324	7	Etheostoma fonticola	21	1
2324	7	Etheostoma fonticola	31	1
2324	7	Etheostoma fonticola	27	1
2324	7	Etheostoma fonticola	17	1
2324	7	Etheostoma fonticola	22	1
2324	7	Etheostoma fonticola	20	1
2324	7	Etheostoma fonticola	30	1
2324	8	Etheostoma fonticola	32	1
2324	8	Etheostoma fonticola	20	1
2324	8	Etheostoma fonticola	26	1
2324	8	Etheostoma fonticola	20	1
2324	8	Etheostoma fonticola	26	1
2324	8	Etheostoma fonticola	17	1
2324	9	Etheostoma fonticola	32	1
2324	9	Etheostoma fonticola	25	1
2324	9	Etheostoma fonticola	31	1
2324	9	Etheostoma fonticola	18	1
2324	9	Procambarus sp.		1

2324	10	Etheostoma fonticola	23	1
2324	10	Procambarus sp.		4
2324	11	Etheostoma fonticola	29	1
2324	11	Etheostoma fonticola	31	1
2324	11	Etheostoma fonticola	20	1
2324	12	No fish collected		
2324	13	Etheostoma fonticola	28	1
2324	13	Etheostoma fonticola	25	1
2324	13	Etheostoma fonticola	19	1
2324	14	Gambusia sp.	16	1
2324	15	Etheostoma fonticola	23	1
2324	16	Procambarus sp.		1

SiteCode 2325 Date 10/29/2018 Reach Landa Lake Site_No V1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2325	1	Etheostoma fonticola	29	1
2325	1	Etheostoma fonticola	27	1
2325	1	Palaemonetes sp.		4
2325	1	Gambusia sp.	30	1
2325	1	Gambusia sp.	29	1
2325	1	Gambusia sp.	25	1
2325	2	Gambusia sp.	22	1
2325	2	Palaemonetes sp.		2
2325	3	Gambusia sp.	35	1
2325	3	Gambusia sp.	31	1
2325	3	Gambusia sp.	28	1
2325	3	Palaemonetes sp.		2
2325	4	Lepomis miniatus	120	1
2325	4	Lepomis miniatus	90	1
2325	4	Lepomis miniatus	75	1
2325	5	Etheostoma fonticola	25	1
2325	5	Etheostoma fonticola	14	1
2325	5	Procambarus sp.		2
2325	6	Etheostoma fonticola	23	1
2325	6	Etheostoma fonticola	16	1
2325	6	Lepomis miniatus	34	1
2325	6	Procambarus sp.		1
2325	7	Etheostoma fonticola	32	1
2325	8	Lepomis miniatus	102	1
2325	9	No fish collected		
2325	10	No fish collected		
2325	11	Palaemonetes sp.		1
2325	12	No fish collected		
2325	13	Procambarus sp.		1
2325	14	Etheostoma fonticola	29	1

2325	15	No fish collected	

SiteCode 2326 Date 10/29/2018 Reach Landa Lake Site_No V2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2326	1	Lepomis miniatus	95	1
2326	1	Gambusia sp.	14	1
2326	1	Palaemonetes sp.		2
2326	1	Procambarus sp.		2
2326	1	Etheostoma fonticola	25	1
2326	2	Etheostoma fonticola	27	1
2326	2	Etheostoma fonticola	27	1
2326	2	Etheostoma fonticola	26	1
2326	2	Lepomis miniatus	83	1
2326	3	Procambarus sp.		4
2326	4	Procambarus sp.		4
2326	4	Etheostoma fonticola	30	1
2326	5	Lepomis miniatus	96	1
2326	5	Etheostoma fonticola	36	1
2326	5	Etheostoma fonticola	32	1
2326	5	Etheostoma fonticola	24	1
2326	5	Procambarus sp.		5
2326	5	Palaemonetes sp.		2
2326	6	Ameiurus natalis	100	1
2326	6	Gambusia sp.	30	1
2326	6	Etheostoma fonticola	28	1
2326	6	Procambarus sp.		4
2326	6	Palaemonetes sp.		2
2326	7	Procambarus sp.		3
2326	7	Etheostoma fonticola	31	1
2326	8	No fish collected		
2326	9	Procambarus sp.		1
2326	10	Procambarus sp.		1
2326	11	Etheostoma fonticola	23	1
2326	11	Procambarus sp.		1

2326	12	Etheostoma fonticola	28	1
2326	13	No fish collected		
2326	14	Procambarus sp.		1
2326	15	Procambarus sp.		3

SiteCode 2327 Date 10/29/2018 Reach Landa Lake Site_No L1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2327	5	Etheostoma fonticola	30	1
2327	5	Etheostoma fonticola	29	1
2327	5	Etheostoma fonticola	27	1
2327	5	Gambusia sp.	10	1
2327	5	Palaemonetes sp.		3
2327	5	Procambarus sp.		1
2327	6	Etheostoma fonticola	30	1
2327	6	Procambarus sp.		1
2327	6	Palaemonetes sp.		1
2327	7	Etheostoma fonticola	27	1
2327	7	Etheostoma fonticola	31	1
2327	7	Etheostoma fonticola	28	1
2327	7	Palaemonetes sp.		2
2327	8	Gambusia sp.	12	1
2327	8	Etheostoma fonticola	27	1
2327	8	Palaemonetes sp.		6
2327	9	Gambusia sp.	15	1
2327	9	Etheostoma fonticola	27	1
2327	9	Palaemonetes sp.		1
2327	9	Procambarus sp.		1
2327	10	Etheostoma fonticola	25	1
2327	10	Etheostoma fonticola	30	1
2327	10	Etheostoma fonticola	21	1
2327	10	Palaemonetes sp.		4
2327	11	Palaemonetes sp.		2
2327	12	No fish collected		
2327	13	No fish collected		
2327	14	Etheostoma fonticola	22	1
2327	15	Palaemonetes sp.		2
2327	1	Gambusia sp.	30	1

2327	1	Gambusia sp.	23	1
2327	1	Gambusia sp.	32	1
2327	1	Gambusia sp.	12	1
2327	1	Gambusia sp.	17	1
2327	1	Gambusia sp.	16	1
2327	1	Gambusia sp.	9	1
2327	1	Etheostoma fonticola	26	1
2327	1	Etheostoma fonticola	30	1
2327	1	Etheostoma fonticola	26	1
2327	1	Etheostoma fonticola	20	1
2327	1	Etheostoma fonticola	30	1
2327	1	Etheostoma fonticola	31	1
2327	1	Palaemonetes sp.		22
2327	1	Procambarus sp.		9
2327	2	Gambusia sp.	12	1
2327	2	Lepomis miniatus	100	1
2327	2	Etheostoma fonticola	30	1
2327	2	Lepomis sp.	25	1
2327	2	Palaemonetes sp.		11
2327	3	Etheostoma fonticola	25	1
2327	3	Etheostoma fonticola	32	1
2327	3	Etheostoma fonticola	24	1
2327	3	Etheostoma fonticola	25	1
2327	3	Gambusia sp.	15	1
2327	3	Palaemonetes sp.		6
2327	4	Gambusia sp.	24	1
2327	4	Palaemonetes sp.		4

SiteCode 2328 Date 10/29/2018 Reach Landa Lake Site_No L2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2328	1	Gambusia sp.	26	1
2328	1	Gambusia sp.	18	1
2328	1	Gambusia sp.	16	1
2328	1	Gambusia sp.	15	1
2328	1	Gambusia sp.	10	1
2328	1	Gambusia sp.	9	1
2328	1	Palaemonetes sp.		3
2328	2	Procambarus sp.		1
2328	2	Palaemonetes sp.		4
2328	3	Palaemonetes sp.		1
2328	4	Etheostoma fonticola	28	1
2328	5	Gambusia sp.	21	1
2328	5	Gambusia sp.	15	1
2328	5	Gambusia sp.	18	1
2328	5	Etheostoma fonticola	26	1
2328	5	Procambarus sp.		1
2328	5	Palaemonetes sp.		1
2328	6	Lepomis miniatus	54	1
2328	7	Palaemonetes sp.		1
2328	8	Gambusia sp.	14	1
2328	9	Etheostoma fonticola	21	1
2328	9	Etheostoma fonticola	25	1
2328	9	Gambusia sp.	21	1
2328	10	No fish collected		
2328	11	No fish collected		
2328	12	No fish collected		
2328	13	No fish collected		
2328	14	Gambusia sp.	17	1
2328	14	Palaemonetes sp.		1
2328	15	Gambusia sp.	26	1

2328	15	Gambusia sp.	30	1

SiteCode 2329 Date 10/30/2018 Reach Landa Lake Site_No S1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2329	1	Lepomis miniatus	110	1
2329	1	Lepomis miniatus	30	1
2329	1	Lepomis miniatus	41	1
2329	1	Lepomis miniatus	30	1
2329	1	Etheostoma fonticola	29	1
2329	1	Etheostoma fonticola	22	1
2329	1	Etheostoma fonticola	20	1
2329	1	Lepomis sp.	20	1
2329	1	Lepomis macrochirus	34	1
2329	1	Palaemonetes sp.		6
2329	1	Procambarus sp.		3
2329	2	Lepomis miniatus	45	1
2329	2	Lepomis miniatus	34	1
2329	2	Lepomis miniatus	22	1
2329	2	Lepomis miniatus	33	1
2329	2	Etheostoma fonticola	28	1
2329	2	Lepomis sp.	19	1
2329	2	Palaemonetes sp.		1
2329	3	Lepomis miniatus	68	1
2329	3	Etheostoma fonticola	28	1
2329	3	Etheostoma fonticola	25	1
2329	3	Palaemonetes sp.		2
2329	3	Procambarus sp.		5
2329	4	Lepomis miniatus	37	1
2329	4	Etheostoma fonticola	31	1
2329	4	Palaemonetes sp.		2
2329	4	Procambarus sp.		2
2329	5	Procambarus sp.		1
2329	6	No fish collected		
2329	7	Procambarus sp.		2

2329	8	Procambarus sp.		2
2329	8	Lepomis miniatus	42	1
2329	9	Etheostoma fonticola	27	1
2329	9	Etheostoma fonticola	30	1
2329	9	Etheostoma fonticola	22	1
2329	10	Lepomis miniatus	49	1
2329	10	Lepomis sp.	24	1
2329	11	Etheostoma fonticola	20	1
2329	11	Lepomis miniatus	55	1
2329	12	No fish collected		
2329	13	No fish collected		
2329	14	No fish collected		
2329	15	No fish collected		

SiteCode 2330 Date 10/30/2018 Reach Landa Lake Site_No S2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2330	1	Procambarus sp.		3
2330	1	Lepomis miniatus	55	1
2330	1	Lepomis miniatus	27	1
2330	1	Lepomis miniatus	27	1
2330	1	Lepomis miniatus	45	1
2330	1	Gambusia sp.	17	1
2330	1	Palaemonetes sp.		2
2330	2	No fish collected		
2330	3	Procambarus sp.		2
2330	3	Lepomis miniatus	63	1
2330	3	Gambusia sp.	34	1
2330	3	Gambusia sp.	25	1
2330	4	Procambarus sp.		3
2330	4	Gambusia sp.	20	1
2330	5	Procambarus sp.		2
2330	5	Lepomis miniatus	96	1
2330	6	No fish collected		
2330	7	Lepomis miniatus	52	1
2330	7	Procambarus sp.		1
2330	8	No fish collected		
2330	9	No fish collected		
2330	10	No fish collected		
2330	11	Procambarus sp.		1
2330	12	No fish collected		
2330	13	No fish collected		
2330	14	No fish collected		
2330	15	Procambarus sp.		1
2330	15	Gambusia sp.	18	1

SiteCode 2331 Date 10/30/2018 Reach Landa Lake Site_No C1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2331	1	Etheostoma fonticola	23	1
2331	1	Etheostoma fonticola	27	1
2331	1	Etheostoma fonticola	22	1
2331	1	Etheostoma fonticola	21	1
2331	1	Etheostoma fonticola	29	1
2331	1	Etheostoma fonticola	24	1
2331	1	Etheostoma fonticola	26	1
2331	1	Etheostoma fonticola	29	1
2331	1	Etheostoma fonticola	27	1
2331	1	Etheostoma fonticola	30	1
2331	1	Etheostoma fonticola	21	1
2331	1	Etheostoma fonticola	15	1
2331	1	Gambusia sp.	12	1
2331	1	Gambusia sp.	10	1
2331	1	Gambusia sp.	7	1
2331	1	Gambusia sp.	15	1
2331	1	Palaemonetes sp.		15
2331	1	Procambarus sp.		1
2331	2	Gambusia sp.	13	1
2331	2	Etheostoma fonticola	32	1
2331	2	Etheostoma fonticola	25	1
2331	2	Etheostoma fonticola	28	1
2331	2	Etheostoma fonticola	27	1
2331	2	Palaemonetes sp.		3
2331	3	Etheostoma fonticola	31	1
2331	3	Etheostoma fonticola	20	1
2331	3	Etheostoma fonticola	28	1
2331	3	Etheostoma fonticola	29	1
2331	3	Etheostoma fonticola	34	1
2331	3	Etheostoma fonticola	25	1

2331	3	Etheostoma fonticola	20	1
2331	3	Etheostoma fonticola	27	1
2331	3	Etheostoma fonticola	22	1
2331	3	Gambusia sp.	17	1
2331	3	Gambusia sp.	10	1
2331	3	Procambarus sp.		1
2331	3	Palaemonetes sp.		5
2331	4	Etheostoma fonticola	25	1
2331	4	Etheostoma fonticola	20	1
2331	4	Gambusia sp.	21	1
2331	5	Etheostoma fonticola	26	1
2331	5	Etheostoma fonticola	32	1
2331	5	Etheostoma fonticola	22	1
2331	6	Etheostoma fonticola	25	1
2331	6	Etheostoma fonticola	30	1
2331	6	Etheostoma fonticola	25	1
2331	6	Etheostoma fonticola	30	1
2331	6	Etheostoma fonticola	25	1
2331	7	Etheostoma fonticola	30	1
2331	7	Etheostoma fonticola	30	1
2331	7	Etheostoma fonticola	27	1
2331	7	Etheostoma fonticola	25	1
2331	8	Etheostoma fonticola	24	1
2331	8	Etheostoma fonticola	25	1
2331	8	Etheostoma fonticola	25	1
2331	8	Procambarus sp.		1
2331	9	Etheostoma fonticola	25	1
2331	9	Etheostoma fonticola	28	1
2331	9	Etheostoma fonticola	24	1
2331	9	Palaemonetes sp.		1
2331	9	Lepomis sp.	15	1
2331	10	Etheostoma fonticola	28	1
2331	10	Etheostoma fonticola	23	1
2331	10	Etheostoma fonticola	22	1
2331	10	Etheostoma fonticola	18	1

2331	10	Etheostoma fonticola	23	1
2331	11	No fish collected		
2331	12	Palaemonetes sp.		1
2331	13	Etheostoma fonticola	27	1
2331	13	Etheostoma fonticola	23	1
2331	14	Etheostoma fonticola	24	1
2331	15	Palaemonetes sp.		1
2331	16	No fish collected		
2331	1	Etheostoma fonticola	29	1
2331	1	Etheostoma fonticola	29	1
2331	1	Etheostoma fonticola	24	1
2331	1	Etheostoma fonticola	30	1
2331	1	Etheostoma fonticola	32	1
2331	1	Etheostoma fonticola	31	1

SiteCode 2332 Date 10/30/2018 Reach Landa Lake Site_No C2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2332	1	Etheostoma fonticola	27	1
2332	1	Etheostoma fonticola	22	1
2332	1	Etheostoma fonticola	23	1
2332	1	Etheostoma fonticola	32	1
2332	1	Etheostoma fonticola	25	1
2332	1	Etheostoma fonticola	33	1
2332	1	Etheostoma fonticola	17	1
2332	1	Etheostoma fonticola	28	1
2332	1	Gambusia sp.	30	1
2332	1	Gambusia sp.	26	1
2332	1	Gambusia sp.	26	1
2332	1	Gambusia sp.	22	1
2332	1	Gambusia sp.	12	1
2332	1	Gambusia sp.	15	1
2332	1	Gambusia sp.	21	1
2332	1	Lepomis miniatus	40	1
2332	1	Lepomis miniatus	32	1
2332	1	Lepomis miniatus	26	1
2332	2	Etheostoma fonticola	25	1
2332	2	Etheostoma fonticola	26	1
2332	2	Etheostoma fonticola	27	1
2332	2	Etheostoma fonticola	27	1
2332	3	Etheostoma fonticola	32	1
2332	3	Etheostoma fonticola	30	1
2332	3	Etheostoma fonticola	27	1
2332	3	Etheostoma fonticola	30	1
2332	3	Etheostoma fonticola	25	1
2332	3	Etheostoma fonticola	27	1
2332	3	Lepomis miniatus	48	1
2332	3	Lepomis miniatus	70	1

2332	3	Gambusia sp.	20	1
2332	3	Gambusia sp.	15	1
2332	3	Gambusia sp.	19	1
2332	3	Palaemonetes sp.		3
2332	4	Etheostoma fonticola	24	1
2332	4	Etheostoma fonticola	20	1
2332	4	Etheostoma fonticola	21	1
2332	4	Gambusia sp.	19	1
2332	5	Etheostoma fonticola	24	1
2332	5	Gambusia sp.	22	1
2332	5	Gambusia sp.	12	1
2332	5	Procambarus sp.		1
2332	6	Procambarus sp.		1
2332	6	Etheostoma fonticola	35	1
2332	6	Etheostoma fonticola	22	1
2332	6	Etheostoma fonticola	31	1
2332	6	Etheostoma fonticola	26	1
2332	7	Etheostoma fonticola	20	1
2332	8	Etheostoma fonticola	26	1
2332	8	Etheostoma fonticola	30	1
2332	9	Procambarus sp.		1
2332	10	No fish collected		
2332	11	Etheostoma fonticola	25	1
2332	11	Etheostoma fonticola	27	1
2332	11	Gambusia sp.	19	1
2332	12	No fish collected		
2332	13	Etheostoma fonticola	32	1
2332	13	Etheostoma fonticola	25	1
2332	14	Etheostoma fonticola	30	1
2332	15	Etheostoma fonticola	27	1
2332	15	Etheostoma fonticola	29	1
2332	15	Etheostoma fonticola	30	1
2332	15	Lepomis sp.	25	1
2332	16	Etheostoma fonticola	23	1
2332	16	Etheostoma fonticola	31	1

2332	16	Procambarus sp.	1
2332	17	Palaemonetes sp.	1

SiteCode 2333 Date 10/30/2018 Reach Landa Lake Site_No O1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2333	1	No fish collected		
2333	2	No fish collected		
2333	3	No fish collected		
2333	4	No fish collected		
2333	5	No fish collected		
2333	6	No fish collected		
2333	7	No fish collected		
2333	8	No fish collected		
2333	9	No fish collected		
2333	10	No fish collected		

SiteCode 2334 Date 10/30/2018 Reach Landa Lake Site_No O2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2334	1	No fish collected		
2334	2	No fish collected		
2334	3	Etheostoma fonticola	18	1
2334	3	Procambarus sp.		1
2334	4	Etheostoma fonticola	18	1
2334	5	Etheostoma fonticola	22	1
2334	6	No fish collected		
2334	7	Etheostoma fonticola	14	1
2334	7	Etheostoma fonticola	18	1
2334	7	Etheostoma fonticola	12	1
2334	8	Etheostoma fonticola	24	1
2334	9	No fish collected		
2334	10	No fish collected		
2334	11	No fish collected		
2334	12	No fish collected		
2334	13	No fish collected		
2334	14	No fish collected		
2334	15	No fish collected		

SiteCode 2335 Date 10/30/2018 Reach Old Channel Reach Site_No C1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2335	1	Herichthys cyanoguttatus	35	1
2335	1	Lepomis miniatus	48	1
2335	1	Lepomis miniatus	30	1
2335	1	Lepomis sp.	18	1
2335	1	Etheostoma fonticola	18	1
2335	1	Etheostoma fonticola	22	1
2335	1	Palaemonetes sp.		10
2335	1	Procambarus sp.		9
2335	2	Procambarus sp.		10
2335	2	Palaemonetes sp.		4
2335	2	Etheostoma fonticola	20	1
2335	2	Etheostoma fonticola	25	1
2335	2	Etheostoma fonticola	27	1
2335	2	Etheostoma fonticola	30	1
2335	2	Etheostoma fonticola	22	1
2335	2	Etheostoma fonticola	29	1
2335	2	Etheostoma fonticola	27	1
2335	2	Etheostoma fonticola	25	1
2335	3	Herichthys cyanoguttatus	20	1
2335	3	Etheostoma fonticola	27	1
2335	3	Etheostoma fonticola	32	1
2335	3	Etheostoma fonticola	35	1
2335	3	Etheostoma fonticola	27	1
2335	3	Etheostoma fonticola	25	1
2335	3	Gambusia sp.	24	1
2335	3	Gambusia sp.	10	1
2335	3	Gambusia sp.	17	1
2335	3	Gambusia sp.	13	1
2335	3	Gambusia sp.	18	1
2335	3	Gambusia sp.	20	1

2335	3	Gambusia sp.	15	1
2335	3	Procambarus sp.		6
2335	3	Palaemonetes sp.		8
2335	4	Palaemonetes sp.		1
2335	4	Procambarus sp.		5
2335	4	Etheostoma fonticola	24	1
2335	5	Lepomis miniatus	97	1
2335	5	Procambarus sp.		4
2335	5	Palaemonetes sp.		3
2335	6	Etheostoma fonticola	30	1
2335	6	Etheostoma fonticola	20	1
2335	6	Lepomis miniatus	34	1
2335	6	Lepomis miniatus	46	1
2335	7	Gambusia sp.	18	1
2335	7	Etheostoma fonticola	33	1
2335	7	Etheostoma fonticola	32	1
2335	7	Etheostoma fonticola	25	1
2335	7	Palaemonetes sp.		2
2335	8	Etheostoma fonticola	25	1
2335	8	Procambarus sp.		1
2335	8	Palaemonetes sp.		2
2335	9	Palaemonetes sp.		2
2335	10	No fish collected		
2335	11	Etheostoma fonticola	25	1
2335	11	Palaemonetes sp.		2
2335	12	Palaemonetes sp.		3
2335	13	No fish collected		
2335	14	No fish collected		
2335	15	No fish collected		

SiteCode 2336 Date 10/30/2018 Reach Old Channel Reach Site_No C2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2336	1	Etheostoma fonticola	22	1
2336	1	Etheostoma fonticola	24	1
2336	1	Etheostoma fonticola	30	1
2336	1	Etheostoma fonticola	12	1
2336	1	Etheostoma fonticola	12	1
2336	1	Procambarus sp.		2
2336	1	Palaemonetes sp.		3
2336	2	Procambarus sp.		4
2336	2	Herichthys cyanoguttatus	25	1
2336	2	Etheostoma fonticola	14	1
2336	2	Palaemonetes sp.		1
2336	3	Etheostoma fonticola	24	1
2336	3	Etheostoma fonticola	25	1
2336	3	Etheostoma fonticola	23	1
2336	3	Etheostoma fonticola	12	1
2336	3	Procambarus sp.		2
2336	3	Palaemonetes sp.		1
2336	4	Procambarus sp.		3
2336	4	Etheostoma fonticola	28	1
2336	5	Procambarus sp.		6
2336	5	Etheostoma fonticola	17	1
2336	5	Etheostoma fonticola	27	1
2336	5	Etheostoma fonticola	15	1
2336	6	Procambarus sp.		2
2336	7	No fish collected		
2336	8	Etheostoma fonticola	21	1
2336	8	Etheostoma fonticola	16	1
2336	8	Etheostoma fonticola	29	1
2336	8	Etheostoma fonticola	13	1
2336	8	Procambarus sp.		1

2336	9	Etheostoma fonticola	30	1
2336	9	Etheostoma fonticola	27	1
2336	9	Etheostoma fonticola	34	1
2336	9	Etheostoma fonticola	34	1
2336	9	Procambarus sp.		2
2336	10	Procambarus sp.		1
2336	11	Procambarus sp.		2
2336	12	No fish collected		
2336	13	Procambarus sp.		3
2336	14	Etheostoma fonticola	27	1
2336	15	No fish collected		

SiteCode 2337 Date 10/30/2018 Reach Old Channel Reach Site_No L1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2337	1	No fish collected		
2337	2	No fish collected		
2337	3	Gambusia sp.	20	1
2337	3	Palaemonetes sp.		1
2337	4	Palaemonetes sp.		1
2337	4	Etheostoma fonticola	30	1
2337	5	Palaemonetes sp.		1
2337	6	Gambusia sp.	27	1
2337	7	Lepomis miniatus	60	1
2337	7	Etheostoma fonticola	30	1
2337	7	Etheostoma fonticola	30	1
2337	7	Etheostoma fonticola	25	1
2337	7	Palaemonetes sp.		1
2337	8	Palaemonetes sp.		1
2337	9	Etheostoma fonticola	29	1
2337	9	Herichthys cyanoguttatus	42	1
2337	9	Palaemonetes sp.		1
2337	10	No fish collected		
2337	11	No fish collected		
2337	12	No fish collected		
2337	13	Etheostoma fonticola	23	1
2337	13	Etheostoma fonticola	25	1
2337	14	No fish collected		
2337	15	No fish collected		

SiteCode 2338 Date 10/30/2018 Reach Old Channel Reach Site_No L2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2338	1	Dionda nigrotaeniata	26	1
2338	1	Etheostoma fonticola	20	1
2338	1	Etheostoma fonticola	26	1
2338	1	Etheostoma fonticola	11	1
2338	1	Gambusia sp.	14	1
2338	1	Gambusia sp.	13	1
2338	1	Palaemonetes sp.		1
2338	2	Etheostoma fonticola	27	1
2338	2	Etheostoma fonticola	33	1
2338	2	Etheostoma fonticola	32	1
2338	2	Etheostoma fonticola	32	1
2338	2	Etheostoma fonticola	27	1
2338	2	Etheostoma fonticola	15	1
2338	2	Etheostoma fonticola	20	1
2338	2	Procambarus sp.		5
2338	3	Gambusia sp.	14	1
2338	4	Etheostoma fonticola	33	1
2338	4	Etheostoma fonticola	22	1
2338	4	Etheostoma fonticola	26	1
2338	4	Herichthys cyanoguttatus	20	1
2338	4	Procambarus sp.		2
2338	5	Etheostoma fonticola	31	1
2338	5	Etheostoma fonticola	12	1
2338	5	Etheostoma fonticola	25	1
2338	5	Procambarus sp.		3
2338	5	Palaemonetes sp.		1
2338	6	Etheostoma fonticola	27	1
2338	6	Etheostoma fonticola	28	1
2338	6	Procambarus sp.		3
2338	7	Etheostoma fonticola	33	1

2338	7	Etheostoma fonticola	28	1
2338	8	Etheostoma fonticola	32	1
2338	8	Etheostoma fonticola	25	1
2338	8	Etheostoma fonticola	28	1
2338	9	Procambarus sp.		2
2338	10	Etheostoma fonticola	34	1
2338	10	Etheostoma fonticola	38	1
2338	10	Etheostoma fonticola	21	1
2338	10	Gambusia sp.	15	1
2338	10	Procambarus sp.		3
2338	11	Etheostoma fonticola	31	1
2338	11	Etheostoma fonticola	30	1
2338	11	Etheostoma fonticola	22	1
2338	11	Etheostoma fonticola	25	1
2338	11	Procambarus sp.		5
2338	12	Gambusia sp.	14	1
2338	12	Procambarus sp.		1
2338	13	No fish collected		
2338	14	Gambusia sp.	14	1
2338	14	Etheostoma fonticola	28	1
2338	14	Etheostoma fonticola	32	1
2338	14	Etheostoma fonticola	27	1
2338	15	Etheostoma fonticola	25	1
2338	16	Etheostoma fonticola	32	1
2338	17	No fish collected		

SiteCode 2339 Date 10/30/2018 Reach Old Channel Reach Site_No O1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2339	1	No fish collected		
2339	2	No fish collected		
2339	3	No fish collected		
2339	4	No fish collected		
2339	5	No fish collected		
2339	6	No fish collected		
2339	7	No fish collected		
2339	8	No fish collected		
2339	9	No fish collected		
2339	10	No fish collected		

SiteCode 2340 Date 10/30/2018 Reach Old Channel Reach Site_No O2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2340	1	No fish collected		
2340	2	No fish collected		
2340	3	No fish collected		
2340	4	No fish collected		
2340	5	No fish collected		
2340	6	Etheostoma fonticola	20	1
2340	7	Etheostoma fonticola	26	1
2340	8	No fish collected		
2340	9	No fish collected		
2340	10	No fish collected		
2340	11	Etheostoma fonticola	25	1
2340	12	No fish collected		
2340	13	No fish collected		
2340	14	No fish collected		
2340	15	Palaemonetes sp.		1

SiteCode 2341 Date 10/30/2018 Reach Old Channel Reach Site_No R1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2341	1	Etheostoma fonticola	20	1
2341	1	Procambarus sp.		8
2341	1	Palaemonetes sp.		4
2341	2	Etheostoma fonticola	29	1
2341	2	Etheostoma fonticola	26	1
2341	2	Etheostoma fonticola	16	1
2341	2	Etheostoma fonticola	34	1
2341	2	Etheostoma fonticola	12	1
2341	2	Etheostoma fonticola	24	1
2341	2	Etheostoma fonticola	22	1
2341	2	Palaemonetes sp.		5
2341	3	Procambarus sp.		15
2341	3	Lepomis miniatus	40	1
2341	3	Etheostoma fonticola	26	1
2341	3	Etheostoma fonticola	27	1
2341	3	Palaemonetes sp.		1
2341	4	Etheostoma fonticola	29	1
2341	4	Etheostoma fonticola	30	1
2341	4	Etheostoma fonticola	33	1
2341	4	Etheostoma fonticola	27	1
2341	4	Etheostoma fonticola	21	1
2341	4	Gambusia sp.	11	1
2341	4	Procambarus sp.		2
2341	4	Palaemonetes sp.		3
2341	5	Etheostoma fonticola	29	1
2341	5	Procambarus sp.		7
2341	6	Etheostoma fonticola	26	1
2341	6	Procambarus sp.		1
2341	6	Palaemonetes sp.		2
2341	7	Procambarus sp.		6

2341	7	Gambusia sp.	12	1
2341	7	Palaemonetes sp.		1
2341	8	Etheostoma fonticola	28	1
2341	8	Etheostoma fonticola	25	1
2341	8	Palaemonetes sp.		1
2341	9	Procambarus sp.		3
2341	10	Etheostoma fonticola	28	1
2341	10	Palaemonetes sp.		1
2341	10	Procambarus sp.		1
2341	11	Procambarus sp.		2
2341	12	Procambarus sp.		2
2341	12	Palaemonetes sp.		1
2341	13	Etheostoma fonticola	25	1
2341	13	Etheostoma fonticola	30	1
2341	13	Etheostoma fonticola	25	1
2341	13	Palaemonetes sp.		1
2341	13	Procambarus sp.		1
2341	14	Procambarus sp.		2
2341	15	No fish collected		

SiteCode 2342 Date 10/30/2018 Reach Old Channel Reach Site_No R2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2342	1	Herichthys cyanoguttatus	25	1
2342	1	Etheostoma fonticola	16	1
2342	1	Etheostoma fonticola	22	1
2342	1	Etheostoma fonticola	12	1
2342	1	Etheostoma fonticola	30	1
2342	1	Etheostoma fonticola	21	1
2342	1	Etheostoma fonticola	36	1
2342	1	Etheostoma fonticola	29	1
2342	1	Etheostoma fonticola	32	1
2342	1	Etheostoma fonticola	29	1
2342	1	Etheostoma fonticola	11	1
2342	1	Etheostoma fonticola	23	1
2342	1	Procambarus sp.		5
2342	1	Etheostoma fonticola	26	1
2342	1	Etheostoma fonticola	26	1
2342	1	Etheostoma fonticola	16	1
2342	1	Etheostoma fonticola	11	1
2342	2	Etheostoma fonticola	28	1
2342	2	Etheostoma fonticola	30	1
2342	2	Etheostoma fonticola	27	1
2342	2	Etheostoma fonticola	37	1
2342	2	Etheostoma fonticola	20	1
2342	2	Etheostoma fonticola	22	1
2342	2	Etheostoma fonticola	16	1
2342	2	Etheostoma fonticola	30	1
2342	2	Etheostoma fonticola	25	1
2342	2	Etheostoma fonticola	24	1
2342	2	Etheostoma fonticola	27	1
2342	2	Etheostoma fonticola	24	1
2342	2	Etheostoma fonticola	27	1

2342	2	Procambarus sp.		4
2342	3	Etheostoma fonticola	30	1
2342	3	Etheostoma fonticola	31	1
2342	3	Etheostoma fonticola	11	1
2342	3	Etheostoma fonticola	27	1
2342	3	Etheostoma fonticola	21	1
2342	3	Etheostoma fonticola	28	1
2342	3	Etheostoma fonticola	25	1
2342	3	Etheostoma fonticola	20	1
2342	3	Etheostoma fonticola	28	1
2342	3	Etheostoma fonticola	17	1
2342	3	Etheostoma fonticola	28	1
2342	3	Etheostoma fonticola	16	1
2342	3	Etheostoma fonticola	26	1
2342	3	Etheostoma fonticola	15	1
2342	3	Etheostoma fonticola	17	1
2342	3	Etheostoma fonticola	28	1
2342	3	Etheostoma fonticola	31	1
2342	3	Etheostoma fonticola	32	1
2342	3	Etheostoma fonticola	24	1
2342	3	Etheostoma fonticola	26	1
2342	3	Procambarus sp.		3
2342	3	Palaemonetes sp.		1
2342	4	Etheostoma fonticola	24	1
2342	4	Etheostoma fonticola	35	1
2342	4	Etheostoma fonticola	26	1
2342	4	Etheostoma fonticola	25	1
2342	4	Etheostoma fonticola	26	1
2342	4	Etheostoma fonticola	26	1
2342	4	Etheostoma fonticola	27	1
2342	4	Etheostoma fonticola	27	1
2342	4	Procambarus sp.		8
2342	5	Etheostoma fonticola	31	1
2342	5	Etheostoma fonticola	30	1
2342	5	Etheostoma fonticola	27	1

2342	5	Etheostoma fonticola	26	1
2342	5	Procambarus sp.		2
2342	6	Etheostoma fonticola	32	1
2342	6	Etheostoma fonticola	30	1
2342	6	Etheostoma fonticola	30	1
2342	6	Procambarus sp.		7
2342	7	Etheostoma fonticola	33	1
2342	7	Etheostoma fonticola	30	1
2342	7	Etheostoma fonticola	25	1
2342	7	Etheostoma fonticola	26	1
2342	7	Procambarus sp.		1
2342	8	Etheostoma fonticola	30	1
2342	8	Etheostoma fonticola	21	1
2342	8	Etheostoma fonticola	26	1
2342	8	Etheostoma fonticola	31	1
2342	8	Etheostoma fonticola	32	1
2342	8	Etheostoma fonticola	18	1
2342	8	Etheostoma fonticola	23	1
2342	8	Procambarus sp.		6
2342	9	Etheostoma fonticola	26	1
2342	9	Etheostoma fonticola	23	1
2342	10	Etheostoma fonticola	30	1
2342	10	Procambarus sp.		1
2342	11	Etheostoma fonticola	16	1
2342	12	Etheostoma fonticola	16	1
2342	12	Etheostoma fonticola	32	1
2342	12	Procambarus sp.		4
2342	13	Etheostoma fonticola	29	1
2342	13	Etheostoma fonticola	26	1
2342	13	Etheostoma fonticola	29	1
2342	13	Procambarus sp.		1
2342	14	Procambarus sp.		1
2342	15	Etheostoma fonticola	29	1
2342	15	Etheostoma fonticola	30	1
2342	15	Etheostoma fonticola	25	1

2342	15	Etheostoma fonticola	27	1
2342	16	Etheostoma fonticola	26	1
2342	16	Procambarus sp.		4
2342	17	Procambarus sp.		1
2342	17	Etheostoma fonticola	30	1
2342	18	Etheostoma fonticola	30	1
2342	18	Procambarus sp.		3
2342	19	Procambarus sp.		1

SiteCode	2343	Date	10/31/2018	Reach	Upper New Channel Reach	Site_No	R1

Fish Data

SiteCode 2344 Date 10/31/2018 Reach Upper New Channel Reach Site_No R2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2344	6	Etheostoma fonticola	30	1
2344	6	Etheostoma fonticola	30	1
2344	6	Etheostoma fonticola	32	1
2344	6	Etheostoma fonticola	32	1
2344	6	Etheostoma fonticola	27	1
2344	6	Etheostoma fonticola	18	1
2344	6	Etheostoma fonticola	20	1
2344	6	Etheostoma fonticola	18	1
2344	6	Etheostoma fonticola	29	1
2344	6	Lepomis miniatus	26	1
2344	6	Palaemonetes sp.		2
2344	7	Etheostoma fonticola	32	1
2344	7	Etheostoma fonticola	31	1
2344	7	Etheostoma fonticola	15	1
2344	7	Etheostoma fonticola	30	1
2344	7	Etheostoma fonticola	27	1
2344	7	Etheostoma fonticola	28	1
2344	7	Etheostoma fonticola	15	1
2344	7	Etheostoma fonticola	14	1
2344	7	Lepomis miniatus	94	1
2344	7	Lepomis miniatus	24	1
2344	7	Procambarus sp.		9
2344	7	Palaemonetes sp.		1
2344	8	Lepomis macrochirus	29	1
2344	8	Etheostoma fonticola	13	1
2344	8	Etheostoma fonticola	14	1
2344	8	Lepomis sp.	18	1
2344	8	Procambarus sp.		3
2344	8	Palaemonetes sp.		2
2344	9	Etheostoma fonticola	22	1

2344	9	Etheostoma fonticola	24	1
2344	9	Procambarus sp.		2
2344	10	Etheostoma fonticola	29	1
2344	10	Etheostoma fonticola	19	1
2344	10	Procambarus sp.		2
2344	11	Lepomis sp.	20	1
2344	11	Procambarus sp.		2
2344	12	Etheostoma fonticola	22	1
2344	12	Etheostoma fonticola	26	1
2344	12	Procambarus sp.		2
2344	13	Etheostoma fonticola	28	1
2344	13	Etheostoma fonticola	28	1
2344	13	Etheostoma fonticola	30	1
2344	14	Etheostoma fonticola	24	1
2344	14	Etheostoma fonticola	20	1
2344	14	Procambarus sp.		1
2344	14	Palaemonetes sp.		1
2344	15	Etheostoma fonticola	31	1
2344	15	Etheostoma fonticola	30	1
2344	16	No fish collected		
2344	1	Procambarus sp.		19
2344	1	Etheostoma fonticola	27	1
2344	1	Etheostoma fonticola	34	1
2344	1	Etheostoma fonticola	30	1
2344	1	Etheostoma fonticola	30	1
2344	1	Herichthys cyanoguttatus	23	1
2344	2	Procambarus sp.		19
2344	2	Etheostoma fonticola	13	1
2344	3	Etheostoma fonticola	28	1
2344	3	Lepomis sp.	18	1
2344	3	Procambarus sp.		19
2344	3	Palaemonetes sp.		1
2344	4	Etheostoma fonticola	33	1
2344	4	Etheostoma fonticola	24	1
2344	4	Etheostoma fonticola	28	1

2344	4	Etheostoma fonticola	28	1
2344	4	Etheostoma fonticola	23	1
2344	4	Etheostoma fonticola	30	1
2344	4	Etheostoma fonticola	38	1
2344	4	Etheostoma fonticola	23	1
2344	4	Etheostoma fonticola	28	1
2344	4	Lepomis miniatus	28	1
2344	4	Etheostoma fonticola	32	1
2344	4	Palaemonetes sp.		1
2344	4	Procambarus sp.		18
2344	5	Etheostoma fonticola	29	1
2344	5	Etheostoma fonticola	22	1
2344	5	Procambarus sp.		12
2344	5	Palaemonetes sp.		1
2344	6	Procambarus sp.		17

SiteCode 2345 Date 10/31/2018 Reach Upper New Channel Reach Site_No H1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2345	1	Lepomis miniatus	28	1
2345	1	Etheostoma fonticola	32	1
2345	1	Gambusia sp.	16	1
2345	1	Procambarus sp.		5
2345	2	Etheostoma fonticola	34	1
2345	2	Etheostoma fonticola	32	1
2345	2	Etheostoma fonticola	32	1
2345	2	Procambarus sp.		9
2345	3	Procambarus sp.		3
2345	4	Lepomis miniatus	27	1
2345	4	Herichthys cyanoguttatus	30	1
2345	4	Procambarus sp.		5
2345	5	Etheostoma fonticola	31	1
2345	5	Etheostoma fonticola	32	1
2345	5	Procambarus sp.		3
2345	6	Lepomis macrochirus	30	1
2345	7	Procambarus sp.		2
2345	8	Lepomis miniatus	27	1
2345	8	Etheostoma fonticola	31	1
2345	8	Procambarus sp.		5
2345	8	Palaemonetes sp.		1
2345	9	Procambarus sp.		1
2345	10	Etheostoma fonticola	30	1
2345	10	Palaemonetes sp.		1
2345	11	Etheostoma fonticola	34	1
2345	11	Etheostoma fonticola	30	1
2345	12	Procambarus sp.		1
2345	13	No fish collected		
2345	14	Etheostoma fonticola	25	1
2345	14	Procambarus sp.		2

2345	15	No fish collected	

SiteCode 2346 Date 10/31/2018 Reach Upper New Channel Reach Site_No H2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2346	1	Etheostoma fonticola	27	1
2346	1	Etheostoma fonticola	26	1
2346	1	Lepomis miniatus	46	1
2346	1	Palaemonetes sp.		14
2346	1	Procambarus sp.		2
2346	2	Etheostoma fonticola	30	1
2346	2	Procambarus sp.		5
2346	2	Palaemonetes sp.		9
2346	3	Lepomis miniatus	71	1
2346	3	Ameiurus natalis	58	1
2346	3	Procambarus sp.		9
2346	3	Palaemonetes sp.		5
2346	4	Gambusia sp.	20	1
2346	4	Herichthys cyanoguttatus	35	1
2346	4	Lepomis macrochirus	36	1
2346	4	Procambarus sp.		7
2346	4	Palaemonetes sp.		4
2346	5	Lepomis miniatus	118	1
2346	5	Astyanax mexicanus	23	1
2346	5	Astyanax mexicanus	37	1
2346	5	Etheostoma fonticola	32	1
2346	5	Etheostoma fonticola	28	1
2346	5	Etheostoma fonticola	20	1
2346	5	Etheostoma fonticola	26	1
2346	5	Gambusia sp.	12	1
2346	5	Palaemonetes sp.		2
2346	5	Procambarus sp.		5
2346	6	Ameiurus natalis	30	1
2346	6	Etheostoma fonticola	27	1
2346	6	Palaemonetes sp.		2

2346	7	Etheostoma fonticola	20	1
2346	7	Etheostoma fonticola	30	1
2346	7	Lepomis miniatus	35	1
2346	7	Palaemonetes sp.		2
2346	7	Procambarus sp.		1
2346	8	Procambarus sp.		3
2346	8	Palaemonetes sp.		1
2346	9	Etheostoma fonticola	26	1
2346	9	Etheostoma fonticola	32	1
2346	9	Palaemonetes sp.		2
2346	9	Procambarus sp.		4
2346	10	Etheostoma fonticola	22	1
2346	10	Procambarus sp.		2
2346	11	Ameiurus natalis	40	1
2346	11	Procambarus sp.		8
2346	12	Procambarus sp.		8
2346	12	Palaemonetes sp.		3
2346	13	Etheostoma fonticola	21	1
2346	13	Procambarus sp.		3
2346	14	Herichthys cyanoguttatus	26	1
2346	14	Procambarus sp.		2
2346	15	Etheostoma fonticola	23	1
2346	15	Procambarus sp.		2
2346	16	Procambarus sp.		2

SiteCode 2347 Date 10/31/2018 Reach Upper New Channel Reach Site_No O1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2347	1	Etheostoma fonticola	32	1
2347	1	Etheostoma fonticola	27	1
2347	1	Palaemonetes sp.		12
2347	1	Procambarus sp.		2
2347	2	Procambarus sp.		1
2347	2	Palaemonetes sp.		1
2347	2	Lepomis miniatus	36	1
2347	3	Procambarus sp.		10
2347	3	Palaemonetes sp.		2
2347	4	Etheostoma fonticola	32	1
2347	4	Procambarus sp.		7
2347	4	Palaemonetes sp.		4
2347	5	Procambarus sp.		2
2347	5	Palaemonetes sp.		2
2347	6	Palaemonetes sp.		1
2347	7	Procambarus sp.		3
2347	8	Procambarus sp.		1
2347	9	No fish collected		
2347	10	Procambarus sp.		1
2347	11	Procambarus sp.		3
2347	12	Etheostoma fonticola	28	1
2347	12	Procambarus sp.		1
2347	13	Procambarus sp.		1
2347	14	Procambarus sp.		1
2347	15	Procambarus sp.		1

SiteCode 2348 Date 10/31/2018 Reach Upper New Channel Reach Site_No O2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2348	1	No fish collected		
2348	2	No fish collected		
2348	3	No fish collected		
2348	4	No fish collected		
2348	5	No fish collected		
2348	6	No fish collected		
2348	7	No fish collected		
2348	8	No fish collected		
2348	9	No fish collected		
2348	10	No fish collected		

SiteCode 2349 Date 10/31/2018 Reach Upper New Channel Reach Site_No C2

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2349	1	No fish collected		
2349	2	No fish collected		
2349	3	No fish collected		
2349	4	No fish collected		
2349	5	No fish collected		
2349	6	No fish collected		
2349	7	No fish collected		
2349	8	No fish collected		
2349	9	No fish collected		
2349	10	No fish collected		

SiteCode 2350 Date 10/31/2018 Reach Upper New Channel Reach Site_No C1

Fish Data

Site Code	Dip Net	Species	Length (mm)	Count
2350	1	Procambarus sp.		4
2350	1	Etheostoma fonticola	30	1
2350	2	Etheostoma fonticola	30	1
2350	2	Etheostoma fonticola	30	1
2350	2	Procambarus sp.		1
2350	2	Palaemonetes sp.		2
2350	2	Gambusia sp.	10	1
2350	2	Gambusia sp.	10	1
2350	2	Gambusia sp.	10	1
2350	3	Procambarus sp.		1
2350	4	Etheostoma fonticola	30	1
2350	4	Etheostoma fonticola	26	1
2350	4	Palaemonetes sp.		2
2350	5	Lepomis miniatus	46	1
2350	6	No fish collected		
2350	7	No fish collected		
2350	8	Procambarus sp.		1
2350	9	Procambarus sp.		2
2350	10	No fish collected		
2350	11	Etheostoma fonticola	24	1
2350	11	Etheostoma fonticola	22	1
2350	11	Procambarus sp.		2
2350	12	Lepomis macrochirus	85	1
2350	13	No fish collected		
2350	14	Etheostoma fonticola	32	1
2350	15	No fish collected		