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# ECOLOGICAL ANALYSES OF MACROINVERTEBRATES AND FISH SPECIES IN SIX STREAMS ON A LOUISIANA MILITARY BASE FROM 2001 TO 2019

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# ECOLOGICAL ANALYSES OF MACROINVERTEBRATES AND FISH SPECIES IN SIX STREAMS ON A LOUISIANA MILITARY BASE FROM 2001 TO 2019

by

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Abstract

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An in-depth ecological analysis of how and why the aquatic community changes over time was conducted for 6 streams on the Fort Polk military base in Louisiana using data collected from 2001 to 2019. Fort Polk is a unique location as nineteen first-order streams are located on the premises belonging to three separate drainages. The primary goal was to determine whether temporal or between-drainage variation has a larger effect on community structure. To accomplish this the effects of disturbance on fish and macroinvertebrate assemblages was determined temporally and between drainages. Several hypotheses were drawn from this: 1) temporally, assemblages exhibit fluctuations in diversity around disturbance events, but eventually recover to a base-state; 2) the 2012 drought caused a reduction in both fish and macroinvertebrate assemblage diversity and overall quantity in comparison to the other years; and 3) fish assemblages will vary between drainages more so than macroinvertebrate assemblages. A secondary goal was to determine the overall assemblage diversity of the drainages. It was found that 1) there was no recognizable pattern to assemblage diversity fluctuations and recovery; 2) the 2012 drought did not cause a significant reduction in fish or macroinvertebrate assemblages compared to subsequent years; and 3) fish assemblages

differed by watershed more than macroinvertebrate assemblages, which often differed significantly by year. These ecological analyses present a more comprehensive picture of the ecosystems in the region.

## Introduction

Headwater streams are an often overlooked, but are highly crucial aspects of our waterways, making up approximately 80 percent of riverine networks in the United States alone (Cole et al. 2003; Meyer et al. 2003). These streams provide a multitude of services to wetland communities, as well as to humans. They assist in mitigating floods, maintaining water quality, cycling nutrients, and maintaining habitats for plant and animal communities. As stream systems are interconnected allowing for the flow of nutrients, organisms, and organic matter, the health and diversity of headwater streams directly relates to downstream processes, including fish and macroinvertebrate assemblages and water quality characteristics (Hawkins et al. 1982; Meyer et al. 2003).

The interconnectedness of stream systems allows for the movement of organisms to inhabit the most ideal environments. Headwaters provide unique habitats for a diverse array of aquatic organisms, as small streams often differ in chemical, biotic, and physical attributes (Lowe and Likens 2005; Meyer et al. 2007). These headwater species include both permanent residents and migrants who travel depending on the season or their particular life stages (Lowe and Likens 2005; Meyer et al. 2007). Even ephemeral streams can support diverse communities if the dry periods are predictable, allowing for the aquatic organisms to move downstream when the waters fall too low (Meyer et al. 2007). Headwater streams can be important areas of refuge for organisms from flow and temperature extremes, predators, competitors, and larger bodied invasive organisms (Meyer et al. 2007). Other habitat benefits of headwater streams include offering safer spawning and rearing areas than second or third-order streams, serving as a source of colonists and food, and establishing migration corridors in the landscape (Meyer et al. 2007).

The headwater stream itself is not the only influencing factor in riverine environments. Downstream water quality is influenced by the terrestrial habitat components of headwater stream watersheds, providing pathways for the transfer of energy and nutrients into the stream primarily in the form of plant material such as woody debris (Chen et al. 2005). Woody debris provides instream habitat for numerous organisms, including fish, amphibians, and macroinvertebrates (Chen et al. 2005). Depending on the size and type of woody debris, it can potentially influence the stream habitat for as long as 300 years (Chen et al. 2005; Grove et al. 2009). This predominantly stable habitat can promote sustained aquatic biodiversity (Dutterer and Allen 2008). However, improper management of riparian vegetation can modify the organic materials being deposited in ways that damage the habitat and decrease diversity (Reeves et al. 2003). Common anthropogenic disturbances to headwater streams include vegetation removal through burning or harvesting manually, channelization (a decrease in sinuosity), increased sedimentation, dam and bridge construction, and water treatment facilities, among others. Variability of these disturbances may create habitat quality gradients in watersheds, forming pockets of refugia from the more severe disturbance effects.

Nitrogen and phosphorus are nutrients which are transferred by headwaters throughout the watershed. Nitrogen, in particular, is highly soluble, easily transported in water, and highly influenced by hydrologic flow paths and speed of discharge (Cirmo and McDonnell 1997; Band et al. 2001). In the environment, it functions to regulate primary production for both aquatic and terrestrial habitats (Alexander et al. 2007). Nitrogen levels have risen in the last 50 years because of increased food and energy production (Galloway et al. 2004). This has led to disruptions of forest ecosystem processes, acidification of water bodies, and eutrophication, hypoxia, and algal blooms in coastal regions (Alexander et al. 2007). Fire management often increases nitrogen and phosphorus levels from runoff as short-term nitrogen is made available to plants from the burned organic material. Low intensity burns can cause increased nitrogen in understory plants, but may also lead to leeching of nitrogen into nearby streams (Murphy et al. 2006). Prescribed burns which reduce woody materials usually burn at a lower intensity than wildfires (Stephan et al. 2012). Though quantities have increased in recent years, nitrogen can be the limiting nutrient for aquatic ecosystems; therefore, it is vital that both short- and long-term effects of burning should be considered for headwater stream management (Felix 2012).

As water runoff from precipitation events influence streams locally and downstream, along with affecting stream hydrology and morphology via erosion and sediment deposition, vegetation buffer regions are crucial to maintain the overall health of waterways. Vegetation buffers, or riparian buffers, close to the banks of streams filter the runoff before it reaches the stream. These regions can modify, dilute, or absorb pollutants or other potentially detrimental materials before they enter the waterway (Meyer et al. 2003). It has been suggested that the inclusion of these vegetation buffer zones may be the most important component in maintaining stream health over other large factors such as watershed size, soil composition, or presence of barren land

(Lammert and Allan 1999; Williams et al. 2005). Functional buffers can range from 2 to 200 meters wide from the edge of a stream depending on the surrounding conditions; however, a buffer of 15 meters or more is usually required under most common conditions (Castelle et al. 1993). As riparian buffers often contain trees and other woody plants, these areas can influence streams in other ways as well. Organic litter can provide shade, reduce autotrophic production, and contribute large amounts of detritus and nutrients (Vannote et al. 1980; Aagaard et al. 2004). Detritus from some vegetative species have inhibitory properties on decomposition and other stream functions which often provides little cover and few nutrients for aquatic organisms (Friberg and Winterbourn 1996). If riparian vegetation is removed, less nutrients and cover are provided for the instream biota, and the fish and macroinvertebrate assemblages will be drastically altered (Delong and Brusven 1993; Aagaard et al. 2004). If a stream system is undisturbed, the species richness and diversity increase as one travels further downstream in a consistent pattern (Corbacho et al. 2003).

Fish and macroinvertebrates are often the most prevalent assemblages in headwater streams, though amphibian and reptile communities may be present as well. North of Mexico, the southern US has more native fish than any other region in North America (Warren et al. 2000). However, many species are threatened or endangered; in Texas alone, 13 species are federally listed and 32 species are state listed (TPWD 2018). Habitat degradation is the primary cause of native fish decline, reducing and fragmenting ranges which isolates fish populations, limiting mobility, food, and gene flow (Angermeier 1995; Warren et al. 2000). Channelization, sedimentation, and flow alteration have contributed to a 125% increase in state and/or federally listed fish species of this region (Warren et al. 2000). In headwater streams, three landscape attributes influence fish population dynamics (Schlosser 1995). The first is the functional interactions at the transitional border between terrestrial and aquatic communities in terms of resource supply and predator-prey interaction, both spatially and temporally. The second is large-scale spatial habitat relationships in terms of resource use and fish movement. The third is presence or absence of refugia in the face of extreme environmental conditions in terms of fish survival, emigration, and immigration rates (Schlosser 1995). To generalize, the interconnected streams and the surrounding watershed habitats are highly important for the survival and proliferation of fish populations.

Macroinvertebrates are among the most diverse and ubiquitous of freshwater organisms (Clarke et al. 2008). In comparison to fish which are often higher-level predators, macroinvertebrates are an important link between energy sources (algae, detritus, etc.) and the top predators in aquatic systems (Allan 1995). They have a wide range of life-history traits, allowing them a broad range of habitat variability; with community dynamics recurrently changing in response to water quality and hydromorphological elements (Alvarez-Cabria et al. 2009). This wide range of habitat variability (i.e. tolerance) is the primary reason benthic macroinvertebrates are utilized as indicators of stream health.

Indices of biotic integrity metrics are frequently used when measuring stream health, the most common being fish index of biotic integrity (F-IBI) and benthic index of biotic integrity (B-IBI), utilizing fish and macroinvertebrate assemblages, respectively. While chemical measurements of water quality alone are useful, the IBI metrics incorporate chemical, physical, and biological processes which provides a more comprehensive picture of the aquatic environment (Karr and Chu 1999). It is also recommended to conduct both F-IBI and B-IBI evaluations as fish and macroinvertebrate assemblages offer insights on different temporal and geographic scales; macroinvertebrates providing a localized, short-term assessment and fish providing a broader range, long-term assessment (TCEQ 2014).

In addition to IBI metrics, multivariate analyses are commonly used by ecologists to measure community structure (Gerth and Herlihy 2006; Wang et al. 2003; Williams et al. 2005). Standard parametric multivariate tools are often inappropriate for examining complex, large-scale questions as the data rarely meets the necessary assumptions of these tests (Williams et al. 2005). Univariate analyses are unable to adequately express the complex relationships between dependent and independent variables as the response variables are intercorrelated (McCune and Mefford 2011). Randomized procedure multivariate analyses (such as nonmetric multidimensional scaling) provide the best method for representing complex community structure patterns (Williams et al. 2005).

The objective of this study was to analyze the ecological changes in the aquatic community in depth, over time and geography, for 6 streams on the Fort Polk military base using data collected from 2001 to 2019. The primary goal was to determine whether temporal or between-drainage variation had a larger effect on community structure. To accomplish this the effects of disturbance on fish and macroinvertebrate assemblages was determined by geography between drainages and temporal patterns. The presence or absence of dynamic equilibrium, a state of balance between continuing processes, was also determined for each of the tributaries. Several hypotheses were made: 1) assemblages exhibit temporal fluctuations in diversity around disturbance events, but eventually recover to a base-state, as areas prone to disturbance often have taxa with higher tolerance levels (Ross et al. 1985); 2) fish assemblages vary between drainages more so than macroinvertebrate assemblages, due to the differences in availability of movement between the two (Williams et al. 2003; 2005); 3) the 2012 drought caused a reduction in both fish and macroinvertebrate assemblages in comparison to the other years, as droughts have been shown to reduce densities especially in macroinvertebrate assemblages (Hakala and Hartman 2004; Iversen et al. 1978). A secondary goal was to determine the overall diversity of the drainages to acquire a clearer picture of the taxa in each stream. To accomplish this the species richness, species diversity (Simpson and Shannon), and presence of habitat indicator species were determined. Disturbances and equilibrium were examined using nonmetric multidimensional scaling. Habitat indicators were determined using indicator species analysis; incorporating fish, macroinvertebrate, and habitat (watershed, hydrology, etc.) data. I also continued the health monitoring of Fort Polk streams using bioindicators (IBIs) for the summer of 2019, as mentioned previously. These ecological analyses serve to acquire a more comprehensive picture of the drainage basins in the region which can be utilized for future management of the streams on Fort Polk and the basins in general.

Study area

Fort Polk is a military base located in western-central Louisiana which has been active since 1939 (Dudley 2017). It consists of the primary base and a satellite base, the Joint Readiness Training Center (JRTC) and the Peason Ridge Training Area (PRTA), respectively. In terms of acreage, the JRTC encompasses approximately 51,000 acres, with over half of the property used continuously for military training and housing, while the co-owned PRTA and adjacent Kisatche National Forest land covers over 200,000 acres. Nineteen first-order streams are located on the premises belonging to three separate drainages: the Calcasieu River, the Red River, and the Sabine River (Figure 1). These first-order streams are prone to flashy conditions which, in general, leads aquatic species to be fairly tolerant of disturbance (Conner and Suttkus 1986). As dictated by a previously established survey rotation, the following six streams were surveyed in 2019 and are the focus of this study: Whiskey Chitto Creek from the Calcasieu, Lyles and Tiger Creeks from the Red River, and Bayou Zourie, Dowden, and Martin Creeks from the Sabine River. Whiskey Chitto and Bayou Zourie are located on the JRTC, while the remaining streams are located on the PRTA; all originate on military land (Figure 2).

The Calcasieu River flows southward approximately 320 km from its origin, passing through the Kisatchie National Forest, until emptying in the Gulf of Mexico (USGS 2019). It is predominantly lowland coastal plain, and passes through areas of intensive petroleum refining (Douglas 1974, USGS 2019). The Sabine River travels approximately 820 km from northeastern Texas, through Louisiana, to the Gulf of Mexico (USGS 2019). It also passes through areas of intensive petroleum refining activities.  The Red River flows eastward at a fairly high gradient for approximately 2,200 km from the headwaters in Texas, through Arkansas and Louisiana, until its confluence with the Mississippi River (Tyson 1981).  Along with length and gradient, watershed area differs between the three rivers, with the Calcasieu, Sabine, and Red River watersheds encompassing approximately 22,000 square km, 25,000 square km, and 83,000 square km, respectively (Table 1).

The Calcasieu headwater tributaries on Ft. Polk are slow flowing black water streams with loamy soil. It is fairly common to encounter pools up to 2 meters deep at high water along with occasional rocky riffles (Felix 2012). Whiskey Chitto in particular, is a large tributary compared to the other six headwater streams, extending past the borders of Fort Polk for an approximate total length of 140 km and flowing directly into the Calcasieu River.  The watershed area draining to the survey location is approximately 74 square km (Table 1).  The Sabine and Red River headwater tributaries on Peason Ridge are shallower in general with loamy to sandy soil (Felix 2012). The length of these tributaries range from approximately 3 km for Tiger Creek to approximately 30 km for Bayou Zourie, with average length for the three remaining streams around 14 km (Table 1).  The watershed areas draining to the survey locations range from 2 square km for Tiger Creek to 26 square km for Martin Creek (Table 1).  In addition to their relatively shorter length, these five streams feed directly into other tributaries, not the main river. Tiger Creek in particular has the most intermediate tributaries before reaching the Red River.  It flows directly into Odom Creek, which empties into Little Sandy Creek, Kisatchie Bayou, Old River, Cane River, until finally reaching the Red River by Colfax, LA. This confluence of tributaries may influence the species found within the streams. Wooded riparian buffers surround the vast majority of stream area, with dominant ground species associated with loblolly and longleaf pine as well as those of bald cypress tree groves (Williams et al. 2005). The prevalence of wood debris in the rivers creates habitat for fish and macroinvertebrates. The few unvegetated stream banks occur predominantly along sandbars (Felix 2012).

The land which became Fort Polk was purchased by the U.S. Army in 1941; prior to their acquiring the area it had been extensively logged (Williams et al. 2005). The cleared land provided ideal training grounds for the testing of fast-moving cavalry maneuvers, as the landscape resembled European battlefields during WWII (Dudley 2017). After WWII, it was used intermittently for trainings before becoming fully operational once more for the Korean War in the 1950s. By 1962, it was officially designated an infantry-training center (Williams et al. 2005). Currently, live-fire exercises and troop maneuvers are conducted on the premises (Williams et al. 2005).

The Fort Polk area has undergone numerous anthropogenic disturbances including the previously mentioned extensive logging prior to 1939, localized logging in 2003 around Odom and Tiger Creeks of the Red River, and the construction of roads, bridges, and culverts across the base (Dudley 2017). During the logging prior to military ownership, timber bridges were established across many streams of the area for transportation of goods; however, more durable bridges and major surfaced roadways were required for military activities (Grubh 2006). Culverts became one of the most common crossing types, with round single culverts ranging from 30 inches to 6 feet predominating due to their ease of placement and high weight capabilities (Dudley 2017). To install these culverts, the bed area is excavated and replaced with washed gravel, then the culvert is placed, backfilled, and paved. However, more recent innovations have tried to limit the impacts to natural hydrology, incorporating arch culverts and modified placement techniques for box culverts (Grubh 2006). Fort Polk underwent further modification with the construction of a range complex to facilitate combined arms training in association with the Digital Multipurpose Battle Area Course (DMPBAC) in 2003 (Dudley 2017). The area around Tiger and Odom creeks was clear-cut to create firing lanes and further road systems and stream crossings for the transport of large equipment. The riparian zone around these streams was decimated, though it began to reemerge after construction concluded (Dudley 2017).

Prior to the military presence on Fort Polk, the longleaf pine ‘fire climax’ community was maintained by wildfires started from seasonal lightning strikes (Bridges and Orzell 1989). As wildfires are difficult to control and can be devastating, a prescribed two- to three-year burn cycle was implemented to maintain the forested regions (Williams et al. 2005). Current base activities utilize the roads frequently, and the streams are fed by surface water runoff across the entire base. However, there is still a significant amount of intact stream characteristics, even in areas of high disturbance (Williams et al. 2005). This means that the areas directly adjacent to and above these riparian corridors are relatively intact with respect to soil and vegetation, filtering the majority of pollutants before it enters the stream system. One reason for the prevalence of riparian corridors is the U.S. Army is mandated to ensure their activities do not have a negative impact on the aquatic communities and water chemistry on their training bases. Stream health has been monitored using index of biotic integrity (IBI) measurements since 2001.

## Materials and Methods

### *Collection of 2019 Samples and Habitat Data*

Six streams were surveyed twice in the summer of 2019, in late May ($21^{st}$ - $22^{nd}$) and early August ($5^{th}$ – $6^{th}$), to maximize the potential species collected as both fish and macroinvertebrates peak in diversity during the summer months (Williams et al. 2007). Study streams were determined from the ongoing monitoring rotation in years past on the Fort Polk military base (19 total streams with six streams sampled per year on a three-year rotation). A Calcasieu River Drainage stream, Whiskey Chitto, and a Sabine River Drainage stream, Bayou Zourie, were surveyed on Fort Polk's main base and four streams were surveyed on the satellite base, Peason Ridge. Peason Ridge streams consisted of Dowden and Martin Creeks from the Sabine River Drainage, and Lyles and Tiger Creeks from the Red River Drainage (Figure 1). Protocols established during previous surveys of Fort Polk were utilized to maintain consistency (Williams et al. 2002, 2005, 2007; Felix 2012; Dudley 2017). Each survey location was approximately 100 meters of stream section in length beginning at a stream crossing for ease of access and for the monitoring of military activities on the stream systems. Each 100-meter section consisted of substrate, woody debris, and multiple mesohabitat characteristics (including riffles, runs, and pools) of the overall stream reach; therefore, each site was representative of conditions within the stream.

Habitat data were recorded using the Texas Commission on Environmental Quality Surface Water Quality Monitoring - Habitat Assessment Worksheet B Part III of III (Habitat Quality Index, https://www.tceq.texas.gov/waterquality/monitoring/swqm_procedures.html), as Louisiana does not have a comparable assessment form. Fish were collected using an electroshocking backpack and fish landing nets starting from downstream and moving upstream for the entire 100-meter section. The collected fish were anesthetized in the field with tricaine methanesulfonate and preserved in a 10% formalin solution. Macroinvertebrates were collected using two methods: grab sampling (D-frame kick nets) and substrate samples (Surber). Dip nets were used by 1 to 2 people in approximately 20 subsamples in a variety of mesohabitats per site (Barbour et al. 1992). A single Surber sample was taken for five minutes per site, as riffles were often a minor mesohabitat within the reach. The Surber was placed along a riffle, facing upstream, and the substrate was disturbed to dislodge and capture any buried macroinvertebrates. Surber sampling offers the potential of detecting rare or elusive taxa not represented by dip net sampling (Storey et al. 1991). The macroinvertebrate samples were preserved in the field in 70% ethanol and triple-bagged to prevent leakage.

*Identification of 2019 samples*

Fish samples were rinsed after 3 days to remove the formalin solution and identified to species. Two identification books were utilized, Douglas' *Freshwater Fishes of Louisiana* (1974) and Thomas and colleagues' *Freshwater Fishes of Texas* (2007), as Douglas' guide offers accurate species descriptions and ranges though some of the scientific names are obsolete. The kick net and Surber samples were sifted and the macroinvertebrates identified to family. This level of identification was determined to be sufficient for the statistical analyses to be performed (Bowman and Bailey 1997). All identified organisms were preserved in 70% ethanol and kept in jars organized to the level of identification.

*Previous Data*

Data from previous survey years (2001-2004, 2012, and 2016) were utilized for the statistical analyses. The 2001 fish and macroinvertebrate data were acquired with a 3-man field crew from all sites except Bayou Zourie, which was not surveyed until 2012. Subsequent collection years had field crews of 4 to 6 individuals. The 2002 macroinvertebrate data was collected from all sites, sans Bayou Zourie, and fish data was collected from Whiskey Chitto only. In 2001 and 2002, fish were identified in the field, enumerated, then released (except for voucher specimens). In 2003 and 2004, macroinvertebrate data were collected from Whiskey Chitto only. Fish and macroinvertebrate data from 2012 and 2016 were acquired from all sites following the same procedures used in 2019.

*Statistical analyses*

As Louisiana does not have a bioassessment metric system, and ecoregion 35 (Southern Central Plains) encompasses both eastern Texas and western Louisiana, the Texas Commission on Environmental Quality (TCEQ) Benthic Index of Biotic Integrity (B-IBI) was used (TCEQ, 2007). IBI scores from the sampled fish were calculated, as was a combined B-IBI score from the kick net samples and the Surber samples. Previously calculated scores from 2012 and 2016 data was also utilized. As 2012 was the first year Bayou Zourie was surveyed and HQI scores were implemented, data from 2001-2004 were not used in the IBI or HQI calculations.

The software, PC-ORD (version 6, MjM Software Design, Gleneden Beach, OR), was utilized for diversity indices, the indicator species analysis (ISA), the nonmetric multidimensional scaling (NMS), and the canonical correspondence analysis (CCA). All yearly data were used in these analyses, unless otherwise specified. For each site in a given year, diversity indices, species richness, and species evenness was determined through the Row and Column Summary function in PC-ORD; this included both Shannon's Diversity Index and Simpson's Diversity Index. From these data, two-way ANOVAs were conducted in Excel (Analysis Toolpak add-in, Office 365, Microsoft Corporation) to determine any significant variation between the sites or the years. Species richness values were recalculated with rarefaction in the program, EcoSim7 (2015 Open Access, Zenodo) to adjust richness by sample size, as sampled quantities varied between sites (McCabe and Gotelli 2000). The indicator species analysis (ISA) in PC-ORD allowed for the determination of habitat indicators for both fish and macroinvertebrate species. Habitat factors and geographic levels used include stream site (such as Tiger Creek), watershed or river drainage (such as the Red River drainage), and hydrology (such as discharge using USGS gauges on the Calcasieu and Sabine Rivers). Nonmetric Multidimensional Scaling allowed for the determination of relative similarity between sites over time and geographically for the various species. When running NMS, Sorenson and all other default settings were used, as there was not a specific need to modify the settings. The data were graphed in the appropriate dimension, utilizing Excel for 2D graphs and SigmaPlot (Version 10.0, Systat Software Inc., San Jose, CA) for 3D graphs. Polygons were drawn to delineate sites, watersheds, and years. Multi-response Permutation Procedures (MRPP) were utilized to test for significance between the watersheds and between the years for fish, macroinvertebrate, and the combined fish and macroinvertebrate data. Euclidean was used in MRPP as Sorenson would not allow for negative numbers. For the combined fish and macroinvertebrate data, 2003 and 2004 yearly data were not used for Whiskey Chitto, as well as 2002 data for Dowden, Lyles, Martin, and Tiger Creeks, as there was no fish data for those years at those sites. The NMS data from each site were also graphed separately and flowlines were added between the years to see if any sites were potentially in dynamic equilibrium. Canonical Correspondence Analysis (CCA), a multivariate ordination technique, was also run in PC-ORD using the default settings with the habitat variables precipitation, discharge, gauge height, HQI scores, year, and watershed. Because of the lack of 2001 data for Bayou Zourie, the program was run with only 2012, 2016, and 2019 combined fish and macroinvertebrate data. Precipitation data was collected from the NOAA site (https://www.ncdc.noaa.gov/cdo-web/), averaging the data from three nearby locations (Alexandria International Airport, Alexandria Esler Field, and Boyce3WNW Global Summary) to provide an accurate estimation of rainfall at Fort Polk during survey years. Discharge and gauge height values were acquired from the USGS water gauge website (https://waterdata.usgs.gov/nwis).

Results

Spanning 18 noncontinuous years, 6 streams were sampled for fish and macroinvertebrate assemblages on Fort Polk. Over 21,000 individuals were collected in total, with approximately 2,200 of those organisms being fish (Tables 2 and 3). By year, the quantity of fish ranged from 213 individuals in 2002 to 668 individuals in 2019, with a mean of 443 individuals (Table 3). The three most common species across all years were *Lepomis megalotis, Cyprinella venusta,* and *Fundulus olivaceus* with 230, 215, and 215 individuals collected, respectively (Table 4). *Lythrurus umbratilis, Fundulus notatus, Gambusia affinis, Moxostoma poecilurum, Aphredoderus sayanus,* and *Notropis sabinae* were also prevalent during certain years (Table 4). When examining the highest quantity of individuals collected at a single site per year, *Cyprinella venusta* was the most prolific in 2001 and 2002 at Whiskey Chitto, with 78 and 64 individuals, respectively (Table 3). Lyles Creek was the location for the greatest quantity collected for 2012, 2016, and 2019 (Table 3). In 2012, 23 *L. megalotis* were collected, in 2016 *L. marginatus* and *A. sayanus* both had 24 individuals, and in 2019 *L. umbratilis* was the most prevalent with 30 individuals for Lyles Creek (Table 3).

By site, the quantity of fish ranged from 191 individuals at Martin Creek to 609 individuals at Whiskey Chitto over all surveyed years combined, with a mean of 369 individuals (Table 2). Besides the three most common species (*L. megalotis, C. venusta,* and *F. olivaceus), L. umbratilis, A. sayanus, Lythrurus fumeus, L. marginatus, Luxilus chrysocephalus,* and *G. affinis* were highly common species for certain sites (Table 4). When examining the highest quantity of individuals collected in a single year by site, Bayou Zourie had 21 *L. megalotis* in 2016, Dowden Creek had 36 *L. fumeus* in 2001, Lyles Creek had 40 *F. olivaceus* in 2001, Martin Creek and Tiger Creek had 31 and 26 *L. umbratilis* in 2001 respectively, and Whiskey Chitto had 78 *C. venusta* in 2001 (Table 2).

Over 18,000 macroinvertebrates were collected, with nearly 10,000 from 2019 alone (Table 3). By year, the quantity of macroinvertebrates ranged from 365 individuals in 2012 to 9,727 individuals in 2019, with a mean of approximately 2,700 individuals (table 3). The three most common families across all years were *Diptera Chironomidae, Coleoptera Elmidae*, and *Trichoptera Hydropsychidae* with 9,530, 1,768, and 1,135 individuals, respectively (Table 4). *Ephemeroptera Baetidae, Ephemeroptera Caenidae, Ephemeroptera Heptageniidae*, *Ephemeroptera Tricorythidae*, and *Hemiptera Gerridae* were also prevalent during certain years (Table 5). For each year, *D. Chironomidae* was by far the most common family with quantities nearly double to over six times the quantity of the second most common family (Table 5).

By site, the quantity of macroinvertebrates ranged from 545 individuals at Martin Creek to 8,185 individuals at Whiskey Chitto, with a mean of 3,150 individuals (Table 2). Besides the three most common families (*D. Chironomidae*, *C. Elmidae*, and *T. Hydropsychidae*), *Diptera Simulidae, E. Baetidae*, *E. Caenidae*, *H. Gerridae*, and *Oligochaeta* were highly common taxa for certain sites (Table 4). When examining the highest quantity of individuals collected in a single year by site, Tiger Creek had 690 *C. Elmidae* in 2019, while the remaining sites had Bayou Zourie, Dowden Creek, Lyles Creek, Martin Creek, and Whiskey Chitto had 1,103, 1,987, 470, 115, and 1,607 *D. Chironomidae* individuals, respectively in 2019 (Table 2).

Species richness, evenness, Shannon's Diversity Index, and Simpson's Diversity Index were calculated in PC-ORD. For the combined fish and macroinvertebrate data, species richness ranged from 17 at the 2012 Tiger Creek site to 62 at the 2019 Whiskey Chitto site (Figure 3a). Species evenness ranged from 0.406 at the 2019 Bayou Zourie site to 0.912 at the 2016 Whiskey Chitto site (Figure 3b). The Shannon's Diversity Index scores ranged from 1.556 at the 2019 Bayou Zourie site to 3.205 at the 2012 Whiskey Chitto site (Figure 3c). The Simpson's Diversity Index scores ranged from 0.5504 at the 2019 Bayou Zourie site to 0.945 at the 2012 Whiskey Chitto site (Figure 3d). Although the highest values from each of the ranges were from Whiskey Chitto, there was not a significant difference between the sites when two-way ANOVAs were run ($p > 0.05$). However, there was a significant difference between the years, with p-values of 0.0029, 0.0003, 0.0183, and 0.0028 for species richness, species evenness, Shannon's Diversity Index, and Simpson's Diversity Index (DI), respectively (Figures 3a-d). The year 2019 in particular, differed from the other years, having higher species richness, and lower species evenness and diversity scores (Figures 3a-d). Different findings were acquired after applying rarefaction to the species richness values in EcoSim. 2019 had relatively lower values than previous years for the combined fish and macroinvertebrate data, though this was not significant ($p = 0.129$; Figures 21a).

Both site and year were significantly different for the macroinvertebrate data, with p-values of 0.0242, 0.0361, 0.0238, and 0.0269 for species richness, species evenness, Shannon's DI, and Simpson's DI, respectively for site; and p-values of 0.0009, 0.001, and 0.0422 for species richness, evenness, and Simpson's DI, respectively for year, though year was not significant for the Shannon's DI (p = 0.1178). Whiskey Chitto had consistently high scores, with the highest species richness, Shannon's DI, and Simpson's DI average scores of all the sites at 27, 2.178, and 0.7937, respectively (Figures 4a-d). Lyles Creek had consistently lower average scores than most sites, with the lowest average scores of 0.4942, 1.2816, and 0.505 for species evenness, Shannon's DI, and Simpson's DI, respectively (Figures 4a-d). Lyles Creek had a species richness score of 15.4 with only Martin Creek having a lower score of 13.4. When comparing by year, 2019 had the highest species richness score (30.8) and the lowest species evenness (0.4238) and diversity scores (Shannon = 1.4316; Simpson = 0.5195). The year 2002 had the highest diversity scores (Shannon = 2.0962; Simpson = 0.767), while 2012 had the highest species evenness (0.7624) and the lowest species richness (12.2). Different findings were acquired after applying rarefaction to the species richness values in EcoSim. For the macroinvertebrate data, both year and site had significant differences (p = 0.016 and 0.01, respectively), with relatively lower values for 2019 and Lyles Creek and relatively higher values for 2012 and Whiskey Chitto Creek (Figure 21c).

Only year was significant for species richness (p = 0.0424), species evenness (p = 0.0063), and Shannon's DI (p = 0.0483) using the fish data. Neither year nor site was significant for the Simpson's DI. As with the combined data and the macroinvertebrate data, 2019 had the highest average species richness (17.8); however, unlike the combined or macroinvertebrate data, 2019 did not have the lowest average evenness or diversity scores (Figures 5a-d). The year 2001 had the lowest average evenness score (0.693) and Shannon's DI score (1.7192), while 2016 had the highest (0.878) evenness score and

2019 had the highest Shannon's DI (2.4224). Similar findings were acquired after applying rarefaction to the species richness values in EcoSim as 2019 had relatively higher values than previous years for the fish data, though this was not significant ($p = 0.0603$; Figure 21b).

Indices of biotic integrity (IBI) scores varied between sites and years. Fish IBI (F-IBI) scores ranged from intermediate to high with Lyles Creek, Tiger Creek, and Whiskey Chitto in the intermediate range in 2012, Whiskey Chitto remaining and Martin Creek decreasing to the intermediate range in 2016, and only Martin Creek remaining in the intermediate range in 2019, though at the highest level for the range (Figure 6). With the exception of Dowden and Martin Creeks, F-IBI scores from all the sites were sustained or increased from 2012 (Figure 6). However, the ANOVA for F-IBI scores was not significant between sites or years ($p = 0.57$, $p = 0.191$ respectively).

Macroinvertebrate benthic IBI (B-IBI) scores exhibited more variation than the fish IBI scores, ranging from Limited to Exceptional (Figure 7). Bayou Zourie and Dowden Creek were Intermediate and Lyles was Limited in 2012, Bayou Zourie decreased to Limited in 2016 then increased to the highest score in that range in 2019, while Lyles and Martin Creeks decreased to Intermediate in 2019 (Figure 7). Whiskey Chitto was in the Exceptional range in 2012 and 2016, while Tiger Creek increased to Exceptional in 2019 (Figure 7). The remaining sites and years fluctuated in the High range (Figure 7). As with the fish IBI, the B-IBI ANOVA was not significant for site or year ($p = 0.117$, $p = 0.644$ respectively).

The habitat quality index (HQI) scores steadily increased from 2012, with the most variation between sites in 2016 (Figure 8). In 2012, Bayou Zourie, Lyles Creek, and Tiger Creek had scores in the Intermediate range, with Bayou Zourie and Lyles Creek remaining in that range for 2016, and none in that range in 2019. All other sites and years had scores in the High range (Figure 8). Unlike the fish IBI and B-IBI scores, the HQI ANOVA was significant for variation between years (p = 0.006), though not quite significant for variation between sites (p = 0.059). In comparison to previous years, all streams sampled in 2019 were improved or stable in their indices of biotic integrity (F-IBI and B-IBI) and Habitat Quality Index (HQI) scores with the exception of B-IBI scores in Lyles and Martin Creeks.

Relating to differences in fish species by watershed, 5 fish species were determined to be significant indicators using Indicator Species Analysis (ISA): *C. venusta* (p = 0.0106) and *Percina sciera* (p = 0.0148) in the Calcasieu drainage system, and *Lepomis cyanellus* (p = 0.027), *L. chrysocephalus* (p = 0.0096), and *Noturus phaeus* (p = 0.0098) in the Red River drainage system (Table 6). No indicator species were determined for the Sabine drainage system. There were 14 macroinvertebrate families which were determined to be significant indicators, 12 of which were indicators for the Calcasieu drainage system (Table 7). *Coleoptera Hydrophilidae* (p = 0.0104) was significant for the Red River watershed, and *Hemiptera Corixidae* (p = 0.0164) was significant for the Sabine River watershed. For the Calcasieu River watershed, *Coleoptera Dryopidae* (p = 0.0192), *Diptera Empididae* (p = 0.0084), *Ephemeroptera Isonychiidae* (p = 0.0002), *E. Tricorythidae* (p = 0.0016), *Hemiptera Veliidae* (p =

0.0256), *Hydrachnidae* (p = 0.005), *Lepidoptera Pyralidae* (p = 0.0498), *Megaloptera Corydalidae* (p = 0.019), *Odonata Gomphidae* (p = 0.0134), *Trichoptera Calamoceratidae* (p = 0.0498), *T. Hydropsychidae* (p = 0.0006), *and T. Odontoceridae* (p = 0.0498) were all indicator species (Table 7).

Relating to differences in fish species by year, 8 fish species were determined to be significant indicators using ISA: *Lepomis punctatus* (p = 0.0352) and *L. umbratilis* (p = 0.0084) in 2001, *Ameiurus natalis* (p = 0.0304) in 2012, and *Etheostoma artesiae* (p = 0.0046), *F. notatus* (p = 0.0004), *L. megalotis* (p = 0.0334), *Notropis texanus* (p = 0.0466), and *Pimephales vigilax* (p = 0.0054) in 2019 (Table 8). No indicator species were determined for the year 2016 (Table 8). There were 17 macroinvertebrate families which were determined to be significant indicators. The year 2002 had 8 families, *C. Hydrophilidae* (p = 0.036), *Diptera Tabanidae* (p = 0.0384), *Ephemeroptera Caenidae* (p = 0.0422), *H. Gerridae* (p = 0.0016), *Megaloptera Sialidae* (p = 0.0246), *Odonata Coenagrionidae* (p = 0.0012), *Odonata Corduliidae* (p = 0.0082), and *O. Gomphidae* (p = 0.0322; Table 9). *Ephemeroptera Ameletidae* (p = 0.0228) was an indicator of 2012. The remaining 8 families were indicators of the year 2019 (Table 9).

For Nonmetric Multidimensional Scaling (NMS) through PC-ORD, two dimensional graphs were considered optimal for the combined fish and macroinvertebrates data and the macroinvertebrate data both by watershed and by year (Figures 9-12). Three dimensional graphs were considered optimal for the fish data both by watershed and by year (Figures 13-14). The MRPP was utilized to test for significant differences. For the combined data of fish and macroinvertebrates categorized by watershed and for the macroinvertebrate data categorized by watershed, there was significant overlap within and between the sites and watersheds; the MRPP had p-values of 0.4638 and 0.2308 for the combination data and macroinvertebrate data, respectively (Figures 9 and 11). For the fish data categorized by watershed, there is very little overlap, with a p-value of 0.00005 (Figure 13). For all the data, fish, macroinvertebrate, and the combination, categorized by year, there is very little overlap; with p-values of 0.0274, 0.00003, and 0.00004, respectively (Figures 10, 12, and 14).

The Nonmetric Multidimensional Scaling graphs of each site with flowlines were highly variable; however, some patterns could be discerned. For the two-dimensional combined fish and macroinvertebrate data, 2019 had x-axis values which were more negative than most if not all the other data points, while 2001 had y-axis values which were more positive than most if not all the other data points (Figure 15a-f). Lyles had 2001 and 2019 data points close together, almost forming a polygon shape, for both the macroinvertebrate data and the combination data (Figures 15c and 16c). For the two-dimensional macroinvertebrate data, 2019 had x-axis values which were more positive than most if not all the other data points, 2012 had x-axis values which were more negative than most if not all the other data points, and 2016 had y-axis values which were all negative (Figure 16a-f). For Martin and Tiger Creek macroinvertebrate data, 2019 was fairly close to the 2002 data point, though not to the extent as Lyles Creek' 2001 and 2019 datapoints (Figure 16c-e). For the three-dimensional fish data, 2001 had x-axis values which were more positive than most if not all the other data points, while the y-axis and z-axis did not have a discernable pattern between the years (Figure 17a-f).

For the Canonical Correspondence Analyses (CCA), three dimensions were determined to be the most optimal for fish, macroinvertebrate, and the combination data; however, only the combination data was significant ($p = 0.012$; Figure 18a-b). When color-coded by year, it emerges that precipitation, discharge and gauge height were more associated with 2019 data, as the variables had negative x-axis values and the majority of the 2019 data points were more negative than 2001, 2012, or 2016 data points (Figure 18a). Year variables (2016 and 2019) were associated with the corresponding data points (i.e. 2016 and 2019 datapoints respectively; Figure 18a) as were the watershed variables (Red and Sabine; Figure 18b).

## Discussion

The relationship between fish, macroinvertebrates and their environment depends on both spatial and temporal scales (Wiens et al. 1986; Lohr and Fausch 1997; Vinson and Hawkins 1998; Lammert and Allan 1999). Zoogeographic history, climate and geomorphology impact regional species pools at large scales (Vinson and Hawkins 1998; Willams et al. 2002) while local species assemblages are formed by the influence of smaller scale biotic and abiotic factors on regional pools (Williams et al. 2005). Lotic systems, in particular, have a shifting mosaic of biotic and abiotic conditions formed by spatial and temporal changes (Resh et al. 1988). Factors such as rapid water volume changes, movement of substrate, and anthropogenic disturbances can cause this shifting mosaic (Resh et al. 1988). My ecological analyses demonstrated variation in fish and macroinvertebrate assemblages between years and between watersheds on Fort Polk military base, suggesting a shifting mosaic of aquatic factors.

When examining my secondary goal of the overall diversity of the streams, Whiskey Chitto was the most prolific of the sites, having the largest quantity of fish (609 individuals) and macroinvertebrates (8,185 individuals), along with the highest average species richness (27) and diversity (Shannon = 2.178; Simpson = 0.7937). As the tributary is the longest and most riverine of the study streams on Fort Polk, it offers the most stable mesohabitats as it is less likely to dry up during droughts (Ward et al. 2002). This riverine habitat is also the preference of the two significant fish indicator species for Whiskey Chitto Creek (i.e. the Calcasieu drainage basin), *C. venusta* and *P. sciera* (Table 6). The three other species which were determined to be significant indicators of the Red River drainage system using ISA, *L. cyanellus, L. chrysocephalus*, and *N. phaeus,* were also supported by the species' habitat preferences. The Red River tributaries are the smallest in length, which corresponds to *L. cyanallus'* tolerance of small streams in comparison to other species. Finally, *L. chrysocephalus* and *N. phaeus* are found predominantly in the Red River basin of Western Louisiana in general; *N. phaeus* in particular is considered endemic to the basin (Thomas et al. 2007; Douglas 1974). A total of 14 macroinvertebrate families were determined to be significant indicators of watersheds, 12 of which were indicators for the Calcasieu drainage system, and 1 each for the Red and Sabine drainage systems (Table 7). *Coleoptera Hydrophilidae* was an indicator species for the Red River watershed, and *H. Corixidae* for the Sabine River watershed. For the Calcasieu River watershed, *C. Dryopidae, D. Empididae, E. Isonychiidae, E. Tricorythidae, H. Veliidae, Hydrachnidae, L. Pyralidae, M. Corydalidae, O. Gomphidae, T. Calamoceratidae, T. Hydropsychidae, and T.*

*Odontoceridae* were all indicator taxa (Table 7). The vast dichotomy between the quantity of indicator species for the Calcasieu and the other two basins is most likely because of the habitats present in each, as Whiskey Chitto in the Calcasieu is one of the most pristine of the stream sites, offering better and more varied habitat than the other tributaries (Dudley 2017).

When examining the overall diversity by year, the unmodified species richness and overall quantity of individuals collected for 2019 was predominantly higher than previous years; however, the species richness with rarefaction, species evenness and diversity values were quite low when examining the combined fish and macroinvertebrate data (Figure 3a-d; Figure 21a-c). This was most likely because of the decrease in species evenness related to the recorded increase in a few macroinvertebrate species. For example, the *Chironomidae* increased from 2,086 individuals in the years 2001, 2002, 2012, and 2016 collectively, to 5,808 individuals in 2019 alone. Further support for this is found when the species richness, evenness, and diversity were calculated separately for fish and macroinvertebrates. The macroinvertebrate values follow the same trend as the combined data, while the fish species evenness and diversity are far more uniform across the years and the species richness with rarefaction is relatively (though not significantly) higher than other years (Figures 3-5, and 21). In association with this, nearly half of the fish indicator species and macroinvertebrate indicator families were designated for 2019 when examining the ISA by year, with the remaining indicator taxa in 2001, 2002, and 2012 (Tables 8 and 9). The increase in overall quantity of individuals collected and the relative quantity of indicator taxa in 2019 could be because of improved sampling techniques, increases in habitat quality, or hydrological changes. Additional study is needed to determine which is the most likely reason; however, the CCA results offer tentative support for the latter reason. From these results, it is suggested that hydrological variables such as precipitation, discharge and gage height are more associated with 2019 data. This may be because 2019 was a wetter year with more discharge (Figure 20). With the current data, the hypothesis that the 2012 drought caused a reduction in both fish and macroinvertebrate assemblages in comparison to the other years was not entirely supported, as 2012 had neither the lowest nor the highest quantity of individuals, species richness, diversity, or indicator taxa.

The attainment levels of each site was determined in accordance with my tertiary goal, monitoring stream health on Fort Polk. As the two-way ANOVAs were not significant for F-IBI or B-IBI scores, comparisons between year and watershed are limited; however, general findings can be stated for 2019 in terms of aquatic life use (ALU) attainment levels. Sites are considered to be in attainment if these F-IBI and B-IBI scores indicate support of the designated use under current TCEQ guidance (Williams et al. 2020). Dowden, Tiger, and Whiskey Chitto creeks were classified as fully supported attainment because of their F-IBI and B-IBI scores falling in the Exceptional or High range. Bayou Zourie and Lyles Creek were classified fully supported with concerns, as the F-IBI was in the High range while the B-IBI was in the Limited and Intermediate range, respectively (Figures 6-7). Martin Creek was classified as not supporting water quality standards, as both the F-IBI and B-IBI were in the Intermediate range (Figures 6-7). This prompted Martin Creek to be placed on Louisiana's 303(d) list of impaired waterbodies (Williams et al. 2020). Water quality in all streams was improved or stable in comparison to 2016 data, with the exception of Lyles and Martin creeks B-IBI scores. As HQI scores significantly differed by year with the values steadily increasing, habitat degradation is likely not the cause for the decreased B-IBI scores (Figure 8). A few potential causes of the decrease in B-IBI scores for Lyles and Martin creeks include natural fluctuations in the macroinvertebrate population, human error when sampling or sifting, changes in water quality (i.e. pollution), or a combination, though further study is needed for a definitive answer.

The findings from the NMS suggest an interesting contrast between fish and macroinvertebrate assemblages for year and drainage basin. For the combination of fish and macroinvertebrate data, and macroinvertebrate data separately, there is not much difference between the watersheds (i.e., the polygons overlap), but there is a significant difference between the years (i.e., there is limited polygon overlap). Fish assemblages, on the other hand, have significant differences between years and between watersheds (Figures 13-14). This likely related to the fact that fish in an area may be separated by many stream kilometers if they are in different tributaries, while macroinvertebrates with terrestrial or aerial adult life stages may only be separated by a few kilometers or less. This allows for greater gene flow and more uniform species distribution within the macroinvertebrate assemblages than within the fish assemblages (Anderson and Wallace 1995). Macroinvertebrates, therefore, generally respond to more local environmental conditions while fish are influenced by occurrences within drainages (Lammert and Allan 1999; Williams 2003b). This decisively supports the hypothesis that fish assemblages vary between drainages more so than macroinvertebrate assemblages. The significance of year in both assemblages illustrates that the communities are changing or fluctuating through the years.

Further support is found in the CCA findings. As with the NMS data, both watershed and year appear to be associated with their respective data points, for example the Red River variable is associated with the Red River tributary datapoints and the 2019 variable is associated with the 2019 datapoints (Figures 18-19), suggesting year and drainage basin are among the stronger variables influencing taxa assemblages. This, also, corresponds to previous studies in the southeastern USA. Kaller and colleagues (2005; 2007) determined that spatial and temporal changes were the most important variables for the structuring of macroinvertebrate assemblages, as opposed to disturbances like timber removal and localized physiochemistry. Williams and colleagues (2002; 2005; 2007) found similar tolerances to disturbance, as it was determined that timber harvests did not have significant effects on fish or macroinvertebrate assemblages. This is related to the high natural disturbance regime of coastal plains streams.

The NMS flowlines, or trajectories, for each site were predominantly inconclusive in relation to the presence of dynamic equilibrium, or disturbance recovery to a base-state. The majority of the trajectories were in random patterns, with yearly points occasionally in specific quadrants and length of the arrow inconsistent with length of time (Figures 15-17). Matthews and colleagues (2013) characterized three types of trajectory patterns: non-directional (random), directional, and directional with return (hook or loop) with each of these either being gradual (short arrow lengths) or saltatory (sudden long arrow lengths). Their study of a fish dataset in Oklahoma exhibited a directional with return loop pattern which prompted them to describe the community as "loosely stable" overall following several disturbance events (Matthews et al. 2013). This loose stability suggests a form of dynamic equilibrium for the assemblages; as small scale changes occur but large scale relative abundances are maintained (Ward et al. 2002). On Fort Polk, the majority of the trajectories could be classified as either non-directional or directional with return (hook). Lyles Creek appears to be the only site in a loose dynamic equilibrium for the combination data and the macroinvertebrate data, as the 2001 and 2019 data points are close together almost forming a loop, though the fish assemblages are not as the points differ on the z-axis (Figures 15c, 16c, and 17c). As there are only 3-7 data points for a given graph, it is difficult to pinpoint an exact pattern. Therefore, the hypothesis, assemblages exhibit temporal fluctuations in diversity around the disturbance events, but will eventually recover to a base-state cannot yet be supported. Matthews and colleagues (2013) had a multitude of data points spanning 40 years per graph, suggesting more data is needed for any conclusive statement about Fort Polk tributaries. What is evident is that the communities are not static, they fluctuate over the years.

In conclusion, the hypothesis that fish assemblages vary between drainages more so than macroinvertebrate assemblages was supported, the hypothesis that the 2012 drought caused a reduction in both fish and macroinvertebrate assemblages in comparison to the other years was rejected, and the hypothesis assemblages exhibit temporal fluctuations in diversity around the disturbance events, but will eventually recover to a base-state was inconclusive. These ecological analyses serve to provide a more comprehensive picture of the drainage ecosystems in the region.

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Tables and Figures

Tables

| Stream | Length | | Watershed Area | River | Length | | Watershed Area | |
|---|---|---|---|---|---|---|---|---|
| Name | Site (km) | Total (km) | Site (sq km) | Name | Miles | Km | Acres | Sq Km |
| Bayou Zourie | 4.97 | 30.697 | 12.299 | Sabine | 510 | 821 | 6300911 | 25498.9 |
| Dowden | 6.263 | 15.647 | 19.64 | Sabine | 510 | 821 | 6300911 | 25498.9 |
| Lyles | 2.838 | 12.856 | 9.645 | Red | 1360 | 2189 | 20533316 | 83095.45 |
| Martin | 8.078 | 13.843 | 25.707 | Sabine | 510 | 821 | 6300911 | 25498.9 |
| Tiger | 2.259 | 2.958 | 2.393 | Red | 1360 | 2189 | 20533316 | 83095.45 |
| Whiskey Chitto | 19.924 | 139.015 | 74.179 | Calcasieu-Mermentau | 200 | 322 | 5368981 | 21727.51 |

Table 1: Length of streams and rivers, and area of watersheds affiliated with the Fort Polk area. Site (km) length is the distance from the beginning of the tributary to the surveyed site, whereas total length (km) is the distance from the beginning of the tributary to its confluence with a larger tributary.

a)

| Site | Total Organisms | Total Fish | Total Macroinvertebrates |
|---|---|---|---|
| Bayou Zourie | 1886 | 291 | 1595 |
| Dowden | 5112 | 249 | 4863 |
| Lyles | 1899 | 587 | 1312 |
| Martin | 736 | 191 | 545 |
| Tiger | 2686 | 288 | 2398 |
| Whiskey Chitto | 8794 | 609 | 8185 |
| All Sites | 21113 | 2215 | 18898 |

b)

| | Maximum per Site | | Maximum Collected in Single Year per Site | | |
|---|---|---|---|---|---|
| Site | Quantity | *Species* | Quantity | *Species* | Year |
| Bayou Zourie | 57 | *Lepomis megalotis* | 21 | *Lepomis megalotis* | 2016 |
| Dowden | 52 | *Lepomis megalotis* | 36 | *Lythrurus fumeus* | 2001 |
| Lyles | 66 | *Fundulus olivaceus* | 40 | *Fundulus olivaceus* | 2001 |
| Martin | 37 | *Lythrurus umbratilis* | 31 | *Lythrurus umbratilis* | 2001 |
| Tiger | 36 | *Lythrurus umbratilis* | 26 | *Lythrurus umbratilis* | 2001 |
| Whiskey Chitto | 178 | *Cyprinella venusta* | 78 | *Cyprinella venusta* | 2001 |
| All Sites | 230 | *Lepomis megalotis* | - | - | - |

c)

| | Maximum per Site | | Maximum Collected in Single Year per Site | | |
|---|---|---|---|---|---|
| Site | Quantity | *Order Family* | Quantity | *Order Family* | Year |
| Bayou Zourie | 1123 | *Diptera Chironomidae* | 1103 | *Diptera Chironomidae* | 2019 |
| Dowden | 3011 | *Diptera Chironomidae* | 1987 | *Diptera Chironomidae* | 2019 |
| Lyles | 774 | *Diptera Chironomidae* | 470 | *Diptera Chironomidae* | 2019 |
| Martin | 250 | *Diptera Chironomidae* | 115 | *Diptera Chironomidae* | 2019 |
| Tiger | 693 | *Coleoptera Elmidae* | 690 | *Coleoptera Elmidae* | 2019 |
| Whiskey Chitto | 3769 | *Diptera Chironomidae* | 1607 | *Diptera Chironomidae* | 2019 |
| All Sites | 9530 | *Diptera Chironomidae* | - | - | - |

Table 2: Quantities of total organisms (a), fish (b), and macroinvertebrates (c) by site in the tributaries of Fort Polk, LA.

a)

| Year | Total Organisms | Total Fish | | Total Macroinvertebrates | |
|---|---|---|---|---|---|
| | | # Sites | Quantity | # Sites | Quanitity |
| 2001 | 1456 | 5 | 501 | 5 | 955 |
| 2002 | 4614 | 1 | 213 | 5 | 4401 |
| 2003 | 1356 | 0 | - | 1 | 1356 |
| 2004 | 927 | 0 | - | 1 | 927 |
| 2012 | 731 | 6 | 366 | 6 | 365 |
| 2016 | 1634 | 6 | 467 | 6 | 1167 |
| 2019 | 10395 | 6 | 668 | 6 | 9727 |
| All | 21113 | 6 | 2215 | 6 | 18898 |

b)

| Year | Maximum Species | | Maximum at Single Site per Year | | |
|---|---|---|---|---|---|
| | Quanitity | *Species* | Quantity | *Species* | Site |
| 2001 | 93 | *Lythrurus umbratilis* | 78 | *Cyprinella venusta* | Whiskey Chitto |
| 2002 | 64 | *Cyprinella venusta* | 64 | *Cyprinella venusta* | Whiskey Chitto |
| 2003 | - | - | - | - | - |
| 2004 | - | - | - | - | - |
| 2012 | 58 | *Lepomis megalotis* | 23 | *Lepomis megalotis* | Lyles Creek |
| 2016 | 62 | *Lepomis megalotis* | 24 | *L. marginatus and Aphredoderus sayanus* | Lyles Creek |
| 2019 | 98 | *Lepomis megalotis* | 30 | *Lythrurus umbratilis* | Lyles Creek |
| All | 230 | *Lepomis megalotis* | - | - | - |

c)

| Year | Maximum Family | | Maximum at Single Site per Year | | |
|---|---|---|---|---|---|
| | Quanitity | *Order Family* | Quantity | *Order Family* | Site |
| 2001 | 549 | *Diptera Chironomidae* | 286 | *Diptera Chironomidae* | Lyles Creek |
| 2002 | 1169 | *Diptera Chironomidae* | 774 | *Diptera Chironomidae* | Whiskey Chitto |
| 2003 | 869 | *Diptera Chironomidae* | 869 | *Diptera Chironomidae* | Whiskey Chitto |
| 2004 | 372 | *Diptera Chironomidae* | 372 | *Diptera Chironomidae* | Whiskey Chitto |
| 2012 | 52 | *Diptera Chironomidae* | 35 | *Hemiptera Gerridae* | Lyles Creek |
| 2016 | 711 | *Diptera Chironomidae* | 675 | *Diptera Chironomidae* | Dowden Creek |
| 2019 | 5808 | *Diptera Chironomidae* | 1987 | *Diptera Chironomidae* | Dowden Creek |
| All | 9530 | *Diptera Chironomidae* | - | - | - |

Table 3: Quantities of total organisms (a), fish (b), and macroinvertebrates (c) by year from tributaries on Fort Polk.

a)

| Most Common Fish Species | | | |
|---|---|---|---|
| Site | *Species 1* (quantity) | *Species 2* (quantity) | *Species 3* (quantity) |
| Bayou Zourie | *Lepomis megalotis* (57) | *Fundulus olivaceus* (46) | *Gambusia affinis* (26) |
| Dowden | *Lepomis megalotis* (52) | *Lythrurus fumeus* (37) | *Lythrurus umbratilis* (21) |
| Lyles | *Fundulus olivaceus* (66) | *Lythrurus umbratilis* (60) | *Aphredoderus sayanus* (59) |
| Martin | *Lythrurus umbratilis* (37) | *Lepomis marginatus* (32) | *Lepomis megalotis* (24) |
| Tiger | *Lythrurus umbratilis* (36) | *Fundulus olivaceus* (33) | *Luxilus chrysocephalus* (28) |
| Whiskey Chitto | *Cyprinella venusta* (178) | *Moxostoma poecilurum* (44) | *Lepomis megalotis* (42) |
| All Sites | *Lepomis megalotis* (230) | *Cyprinella venusta* (215) | *Fundulus olivaceus* (215) |

b)

| Most Common Macroinvertebrate Families | | | |
|---|---|---|---|
| Site | *Family 1* (quantity) | *Family 2* (quantity) | *Family 3* (quantity) |
| Bayou Zourie | *Diptera Chironomidae* (1123) | *Ephemeroptera Baetidae* (170) | *Trichoptera Hydropsychidae* (92) |
| Dowden | *Diptera Chironomidae* (3011) | *Coleoptera Elmidae* (207) | *Diptera Simulidae* (179) |
| Lyles | *Diptera Chironomidae* (774) | *Ephemeroptera Caenidae* (205) | *Hemiptera Gerridae* (89) |
| Martin | *Diptera Chironomidae* (250) | *Ephemeroptera Caenidae* (72) | *Oligochaeta* (34) |
| Tiger | *Coleoptera Elmidae* (693) | *Diptera Chironomidae* (603) | *Ephemeroptera Caenidae* (256) |
| Whiskey Chitto | *Diptera Chironomidae* (3769) | *Coleoptera Elmidae* (817) | *Trichoptera Hydropsychidae* (809) |
| All Sites | *Diptera Chironomidae* (9530) | *Coleoptera Elmidae* (1768) | *Trichoptera Hydropsychidae* (1135) |

Table 4: Three most common fish species (a) and macroinvertebrate families (b) by site on Fort Polk.

a)

| Year | *Species 1* (quantity) | *Species 2* (quantity) | *Species 3* (quantity) |
|---|---|---|---|
| 2001 | *Lythrurus umbratilis* (93) | *Cyprinella venusta* (85) | *Fundulus olivaceus* (64) |
| 2002 | *Cyprinella venusta* (64) | *Moxostoma poecilurum* (32) | *Notropus sabinae* (22) |
| 2003 | - | - | - |
| 2004 | - | - | - |
| 2012 | *Lepomis megalotis* (58) | *Fundulus olivaceus* (41) | *Aphredoderus sayanus* (36) |
| 2016 | *Lepomis megalotis* (62) | *Fundulus olivaceus* (46) | *Aphredoderus sayanus* (44) |
| 2019 | *Lepomis megalotis* (98) | *Fundulus notatus* (59) | *Gambusia affinis* (56) |
| All | *Lepomis megalotis* (230) | *Cyprinella venusta* (215) | *Fundulus olivaceus* (215) |

b)

| Year | *Family 1* (quantity) | *Family 2* (quantity) | *Family 3* (quantity) |
|---|---|---|---|
| 2001 | *Diptera Chironomidae* (549) | *Diptera Ceratopogonidae* (86) | *Ephemeroptera Heptageniidae* (56) |
| 2002 | *Diptera Chironomidae* (1169) | *Trichoptera Hydropsychidae* (569) | *Ephemeroptera Caenidae* (445) |
| 2003 | *Diptera Chironomidae* (869) | *Trichoptera Hydropsychidae* (131) | *Ephemeroptera Heptageniidae* (58) |
| 2004 | *Diptera Chironomidae* (372) | *Coleoptera Elmidae* (219) | *Ephemeroptera Tricorythidae* (111) |
| 2012 | *Diptera Chironomidae* (52) | *Hemiptera Gerridae* (39) | *Trichoptera Hydropsychidae* (29) |
| 2016 | *Diptera Chironomidae* (711) | *Trichoptera Hydropsychidae* (83) | *Ephemeroptera Heptageniidae* (56) |
| 2019 | *Diptera Chironomidae* (5808) | *Coleoptera Elmidae* (1072) | *Ephemeroptera Baetidae* (451) |
| All | *Diptera Chironomidae* (9530) | *Coleoptera Elmidae* (1768) | *Trichoptera Hydropsychidae* (1135) |

Table 5: Three most common fish species (a) and macroinvertebrate families (b) by year on Fort Polk.

| Fish Indicator Species Analysis | | | | | |
|---|---|---|---|---|---|
| *Species* | Max Group | Observed Indicator Value | Mean | St. dev. | p value |
| *Cyprinella venusta* | Calcasieu | 85.2 | 34.9 | 13.47 | 0.0106 |
| *Lepomis cyanellus* | Red | 64.6 | 36.3 | 11.48 | 0.027 |
| *Luxilus chrysocephalus* | Red | 66.7 | 25.5 | 12.21 | 0.0096 |
| *Noturus phaeus* | Red | 66.7 | 25.4 | 11.9 | 0.0098 |
| *Percina sciera* | Calcasieu | 69.1 | 30.1 | 11.9 | 0.0148 |

Table 6: Fish Indicator Species Analysis (ISA) by watershed.

| Macroinvertebrate Indicator Species Analysis | | | | | |
|---|---|---|---|---|---|
| *Order Family* | Max Group | Observed Indicator Value | Mean | St. dev. | p value |
| *Coleoptera Dryopidae* | Calcasieu | 44.4 | 19.9 | 8.64 | 0.0192 |
| *Coleoptera Hydrochidae* | Red | 46.7 | 18.2 | 8.27 | 0.0104 |
| *Diptera Empididae* | Calcasieu | 50 | 19.8 | 8.63 | 0.0084 |
| *Ephemeroptera Isonychiidae* | Calcasieu | 78.3 | 23.8 | 9.59 | 0.0002 |
| *Ephemeroptera Tricorythidae* | Calcasieu | 69.1 | 21.8 | 9.22 | 0.0016 |
| *Hemiptera Corixidae* | Sabine | 50.5 | 23.9 | 9.66 | 0.0164 |
| *Hemiptera Veliidae* | Calcasieu | 62.6 | 34 | 11.92 | 0.0256 |
| *Hydrachnida* | Calcasieu | 54.5 | 22 | 9.53 | 0.005 |
| *Lepidoptera Pyralidae* | Calcasieu | 28.6 | 12 | 5.76 | 0.0498 |
| *Megaloptera Corydalidae* | Calcasieu | 51.6 | 25.1 | 10.4 | 0.019 |
| *Odonata Gomphidae* | Calcasieu | 62.4 | 37.5 | 9.07 | 0.0134 |
| *Trichoptera Calamoceratidae* | Calcasieu | 28.6 | 11 | 6.18 | 0.0498 |
| *Trichoptera Hydropsychidae* | Calcasieu | 81 | 32.1 | 10.85 | 0.0006 |
| *Trichoptera Odontoceridae* | Calcasieu | 28.6 | 11.2 | 6.12 | 0.0498 |

Table 7: Macroinvertebrate Indicator Species Analysis (ISA) by watershed.

| Fish Indicator Species Analysis | | | | | |
|---|---|---|---|---|---|
| *Species* | Max Group | Observed Indicator Value | Mean | St. dev. | p value |
| *Lepomis punctatus* | 2001 | 40 | 15.1 | 10.49 | 0.0352 |
| *Lythrurus umbratilis* | 2001 | 58.9 | 28.9 | 9.17 | 0.0084 |
| *Ameiurus natalis* | 2012 | 47.6 | 23.6 | 10 | 0.0304 |
| *Etheostoma artesiae* | 2019 | 71.1 | 28 | 11.94 | 0.0046 |
| *Fundulus notatus* | 2019 | 80.8 | 22.7 | 9.34 | 0.0004 |
| *Lepomis megalotis* | 2019 | 44.7 | 30.3 | 6.64 | 0.0334 |
| *Notropis texanus* | 2019 | 49 | 28 | 10.44 | 0.0466 |
| *Pimephales vigilax* | 2019 | 66.7 | 19.8 | 10.6 | 0.0054 |

Table 8: Fish Indicator Species Analysis (ISA) by year.

| Macroinvertebrate Indicator Species Analysis | | | | | |
|---|---|---|---|---|---|
| *Order Family* | Max Group | Observed Indicator Value | Mean | St. dev. | p value |
| *Coleoptera Hydrophilidae* | 2002 | 46.3 | 20.2 | 9.93 | 0.036 |
| *Diptera Tabanidae* | 2002 | 47.7 | 22.6 | 11.3 | 0.0384 |
| *Ephemeroptera Caenidae* | 2002 | 52.7 | 33.3 | 9.57 | 0.0422 |
| *Hemiptera Gerridae* | 2002 | 67.2 | 25.1 | 9.25 | 0.0016 |
| *Megaloptera Sialidae* | 2002 | 57.2 | 27.3 | 12.46 | 0.0246 |
| *Odonata Coenagrionidae* | 2002 | 87.6 | 33.9 | 13.45 | 0.0012 |
| *Odonata Corduliidae* | 2002 | 62.1 | 24.1 | 10.71 | 0.0082 |
| *Odonata Gomphidae* | 2002 | 52.6 | 31.5 | 9.5 | 0.0322 |
| *Ephemeraptera Ameletidae* | 2012 | 50 | 17.2 | 9.67 | 0.0228 |
| *Collembola Isotomidae* | 2019 | 83.3 | 21.8 | 11.39 | 0.0002 |
| *Diptera Chironomidae* | 2019 | 67.3 | 39.4 | 8.23 | 0.0022 |
| *Diptera Simuliidae* | 2019 | 94.1 | 29.6 | 13.03 | 0.0008 |
| *Ephemeraptera Baetidae* | 2019 | 66.6 | 33.9 | 9.87 | 0.0052 |
| *Gastropoda Viviparidae* | 2019 | 50 | 15.8 | 10.21 | 0.0244 |
| *Hemiptera Nepidae* | 2019 | 55.6 | 18.9 | 9.62 | 0.0112 |
| *Odonata Aeshnidae* | 2019 | 55.6 | 27.5 | 8.89 | 0.0094 |
| *Odonata Calopterygidae* | 2019 | 55.4 | 22.2 | 9.23 | 0.005 |

Table 9: Macroinvertebrate Indicator Species Analysis (ISA) by year.

Figures

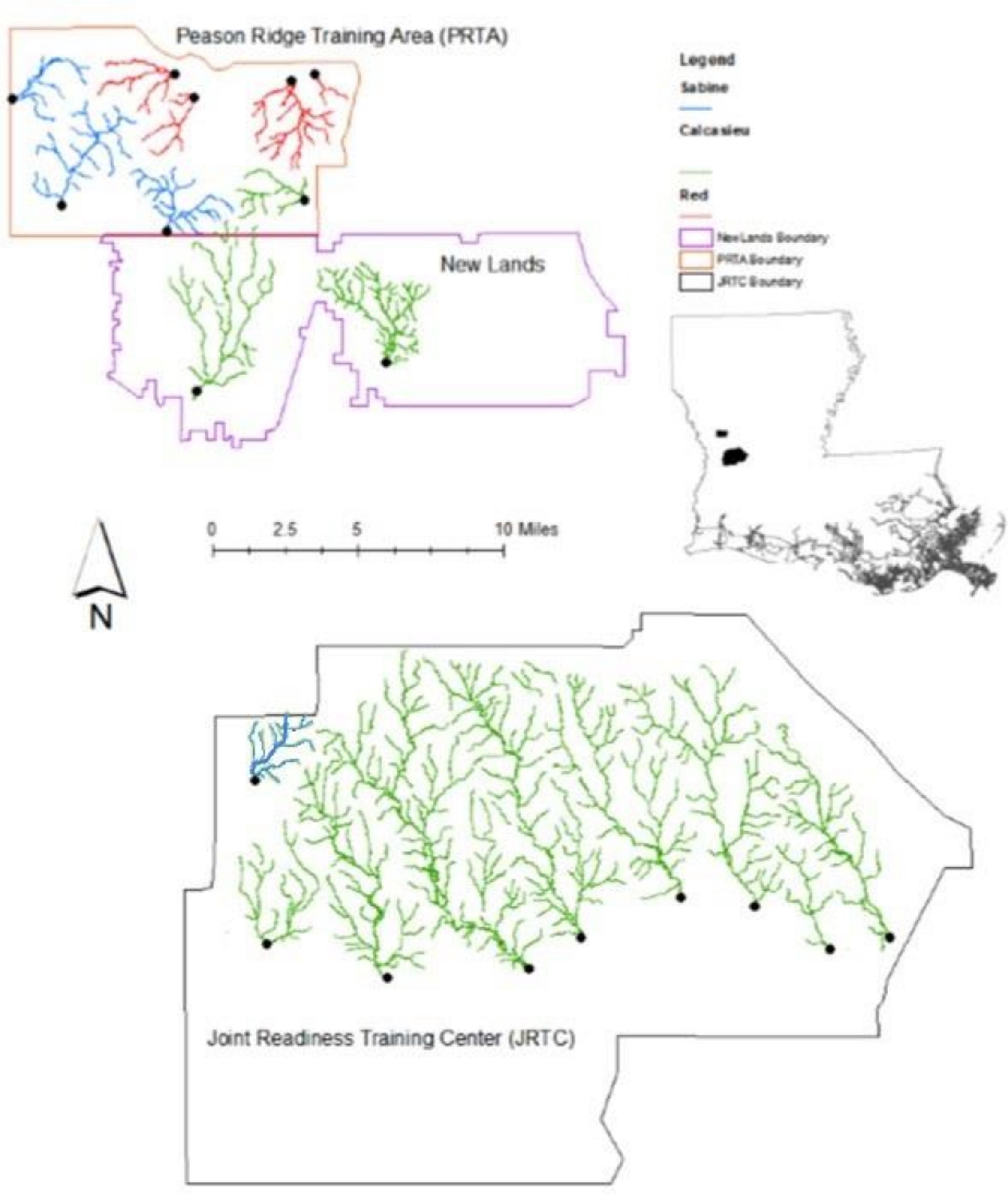



Figure 1: 19 streams of Fort Polk on the Peason Ridge Training Area (PRTA) and the Joint Readiness Training Center (JRTC). Tributaries of the Calcasieu, Red, and Sabine Rivers are in green, red, and blue, respectively.

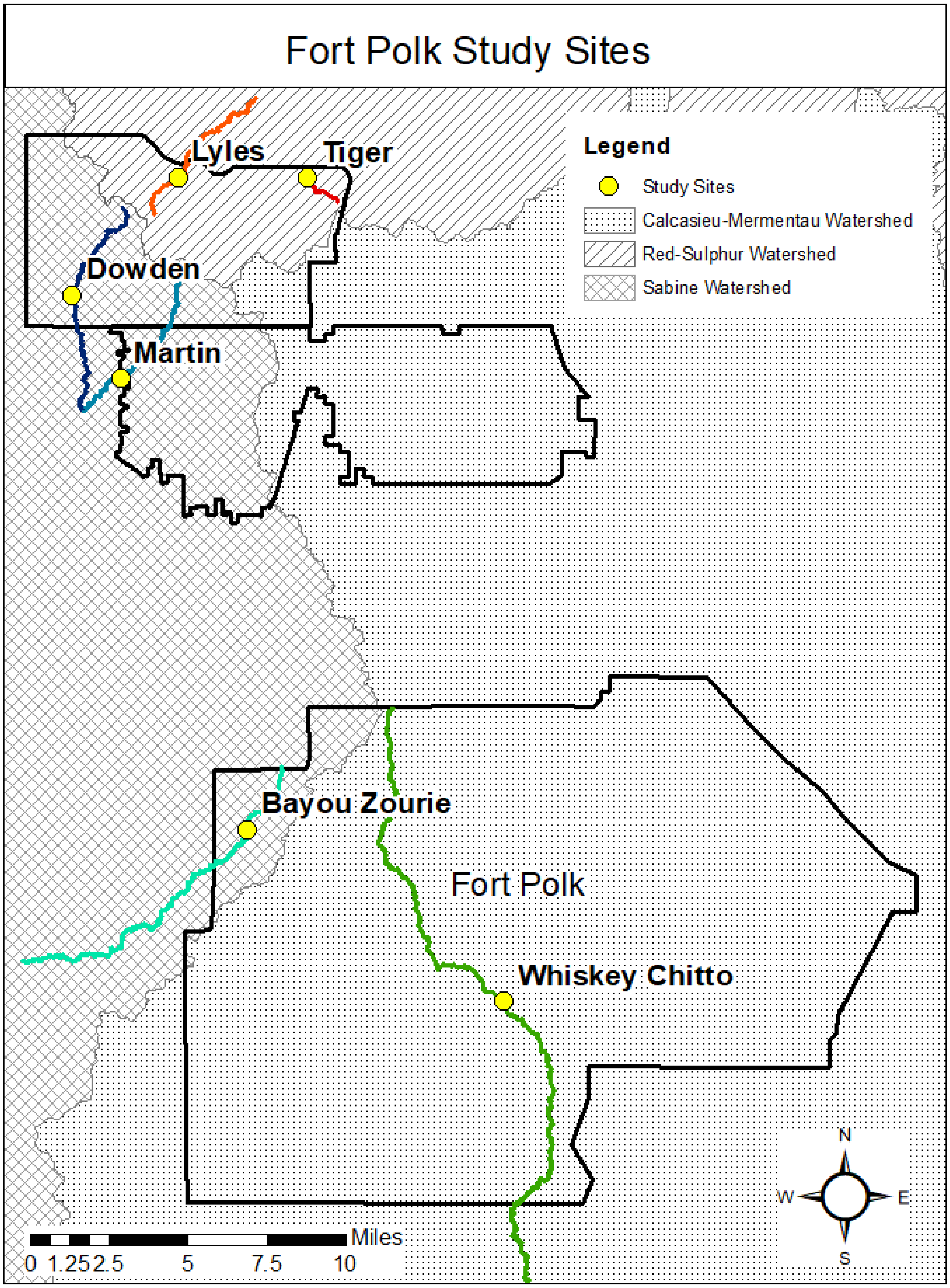
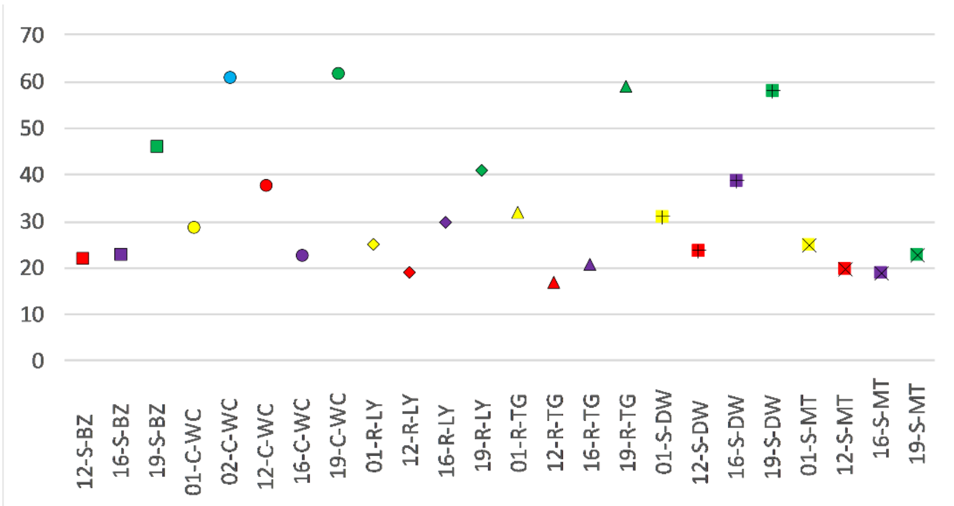


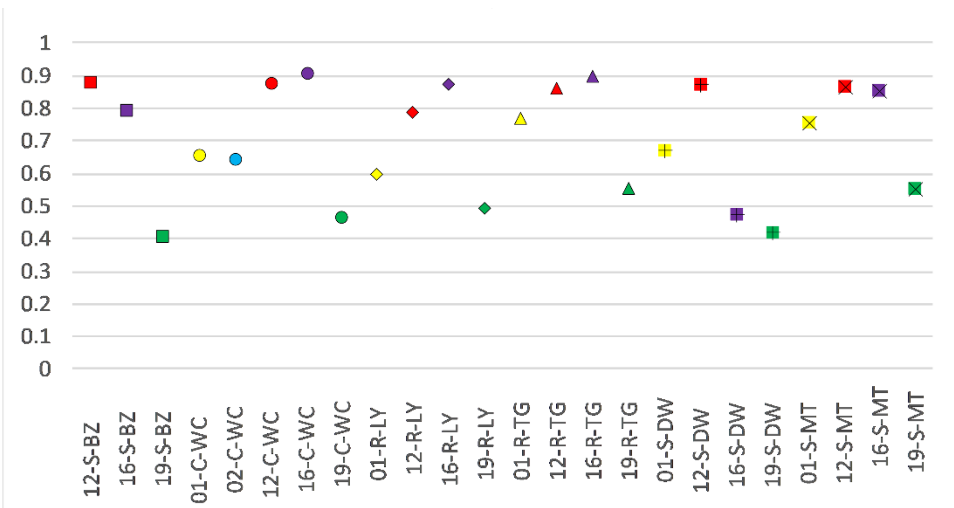

Figure 2: The 6 Fort Polk tributaries surveyed in 2019.

a)



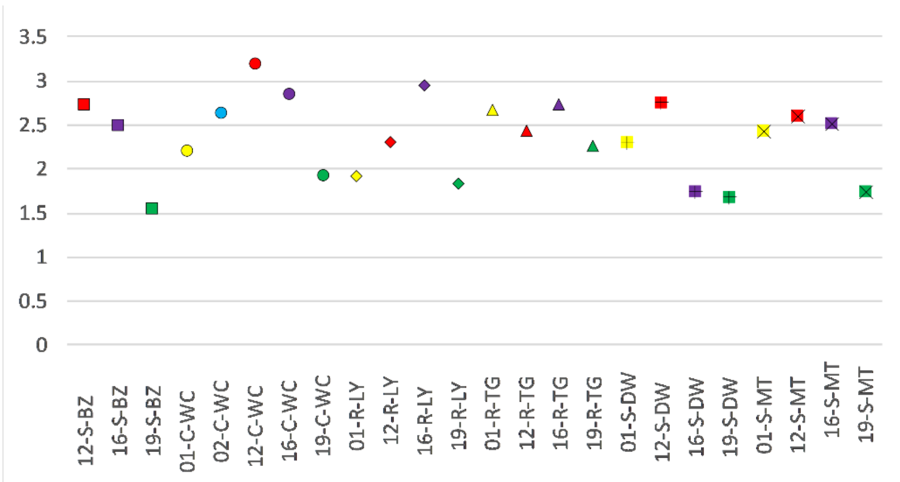
70
60
50
40
30
20
10
0
12-S-BZ
16-S-BZ
19-S-BZ
01-C-WC
02-C-WC
12-C-WC
16-C-WC
19-C-WC
01-R-LY
12-R-LY
16-R-LY
19-R-LY
01-R-TG
12-R-TG
16-R-TG
19-R-TG
01-S-DW
12-S-DW
16-S-DW
19-S-DW
01-S-MT
12-S-MT
16-S-MT
19-S-MT


b)



1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
12-S-BZ
16-S-BZ
19-S-BZ
01-C-WC
02-C-WC
12-C-WC
16-C-WC
19-C-WC
01-R-LY
12-R-LY
16-R-LY
19-R-LY
01-R-TG
12-R-TG
16-R-TG
19-R-TG
01-S-DW
12-S-DW
16-S-DW
19-S-DW
01-S-MT
12-S-MT
16-S-MT
19-S-MT

c)




d)

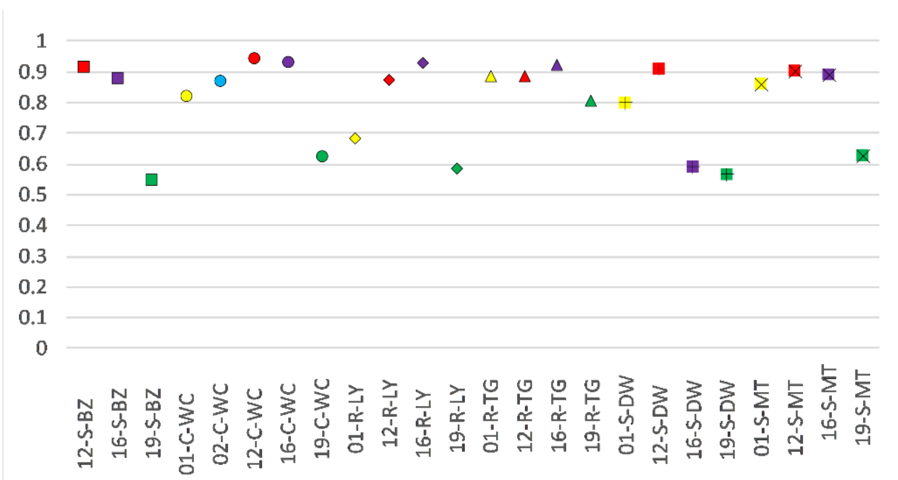
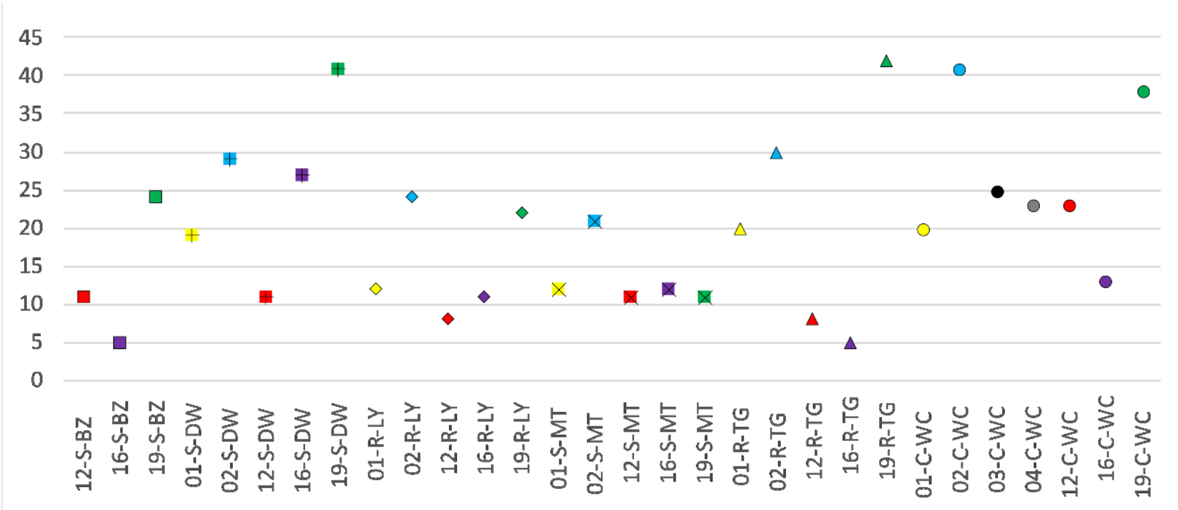


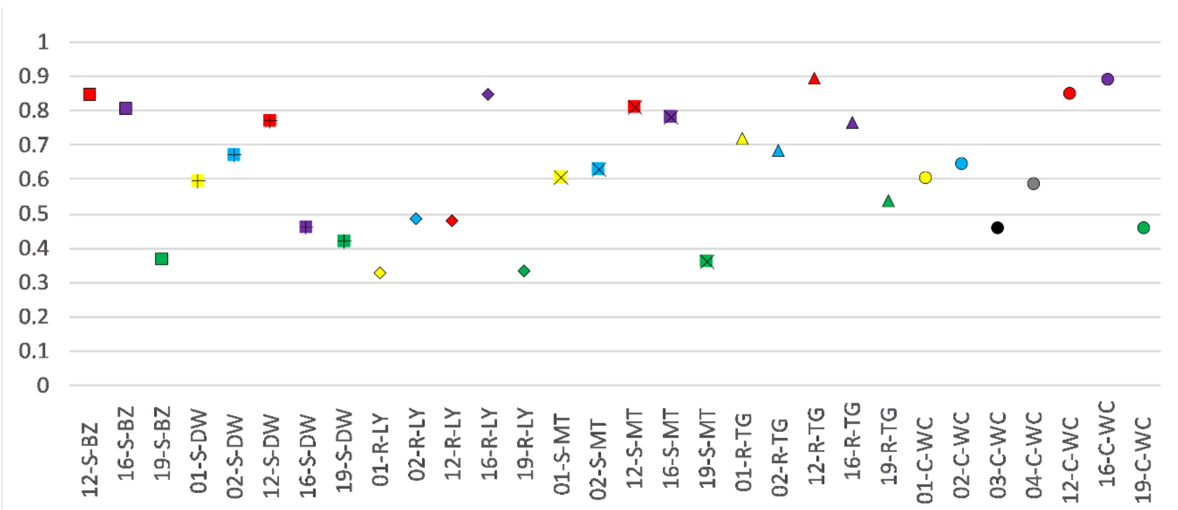

Figure 3: Diversity related measurements using combined fish and macroinvertebrate data. a) The species richness of the combined fish and macroinvertebrate data (p = 0.0029, 0.1074 by year and site, respectively); b) the species evenness of the combined fish and macroinvertebrate data (p = 0.0003, 0.1663 by year and site, respectively); c) the Shannon's Diversity Index of the combined fish and macroinvertebrate data (p = 0.0183, 0.3846 by year and site, respectively); d) the Simpson's Diversity Index of the combined fish and macroinvertebrate data (p = 0.0028, 0.1751 by year and site, respectively). The symbol colors delineate year, 2001 is yellow, 2002 is light blue, 2012 is red, 2016 is purple, and 2019 is green. X-axis site notations are as follows: BZ = Bayou Zourie (square), DW = Dowden (+ square), LY = Lyles (diamond), MT = Martin (x square), TG = Tiger (triangle), and WC = Whiskey Chitto (circle); C = Calcasieu River, R = Red River, S = Sabine River; numbers equate to the years surveyed, 12 = 2012, 16 = 2016, etc.

a)



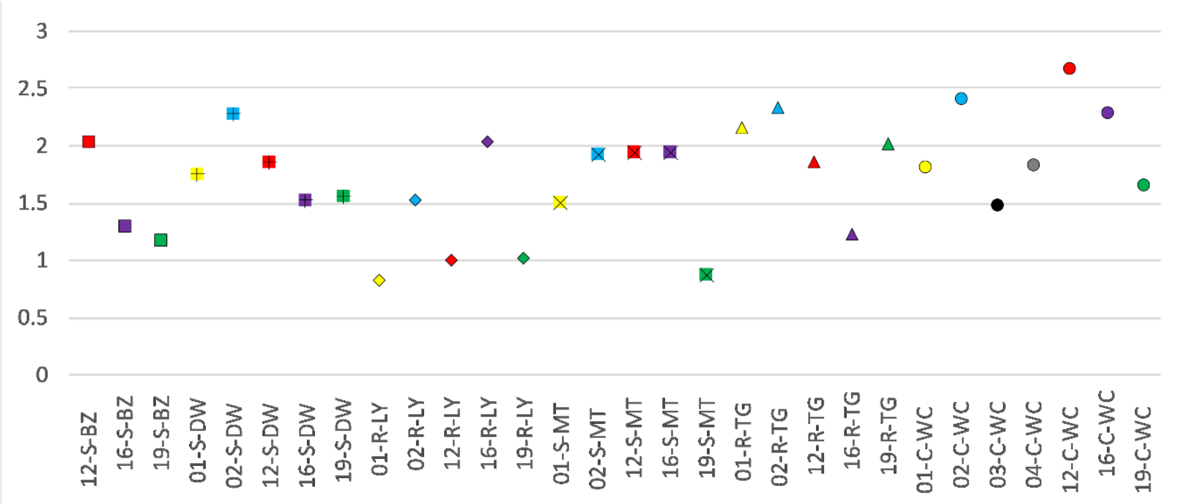
45
40
35
30
25
20
15
10
5
0
12-S-BZ
16-S-BZ
19-S-BZ
01-S-DW
02-S-DW
12-S-DW
16-S-DW
19-S-DW
01-R-LY
02-R-LY
12-R-LY
16-R-LY
19-R-LY
01-S-MT
02-S-MT
12-S-MT
16-S-MT
19-S-MT
01-R-TG
02-R-TG
12-R-TG
16-R-TG
19-R-TG
01-C-WC
02-C-WC
03-C-WC
04-C-WC
12-C-WC
16-C-WC
19-C-WC


b)



1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
12-S-BZ
16-S-BZ
19-S-BZ
01-S-DW
02-S-DW
12-S-DW
16-S-DW
19-S-DW
01-R-LY
02-R-LY
12-R-LY
16-R-LY
19-R-LY
01-S-MT
02-S-MT
12-S-MT
16-S-MT
19-S-MT
01-R-TG
02-R-TG
12-R-TG
16-R-TG
19-R-TG
01-C-WC
02-C-WC
03-C-WC
04-C-WC
12-C-WC
16-C-WC
19-C-WC

c)




d)

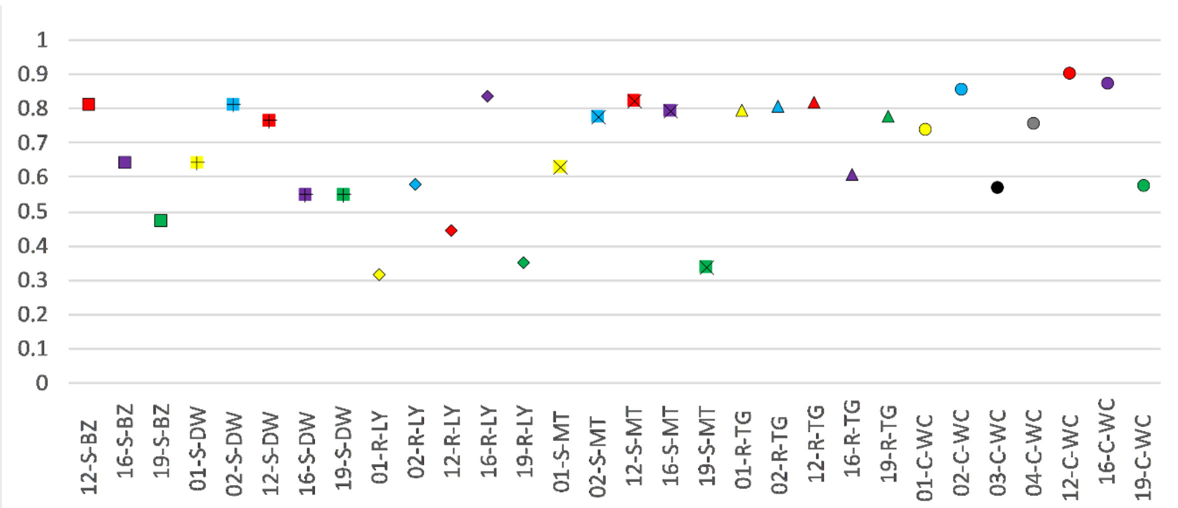
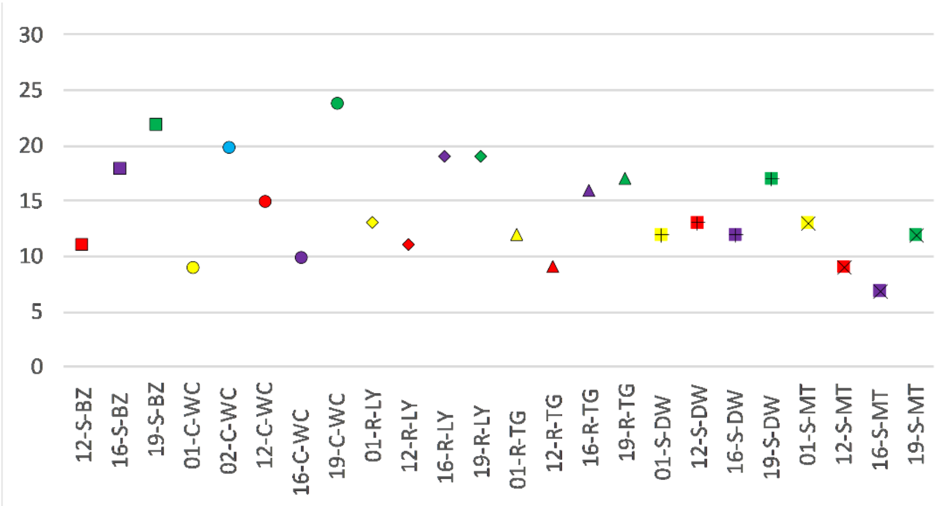
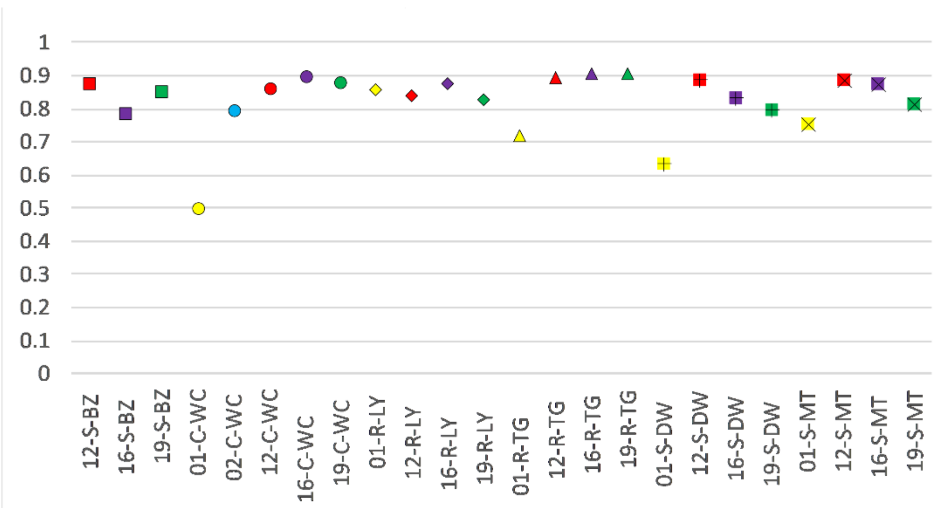



Figure 4: Diversity related measurements using macroinvertebrate data. a) The species richness of the macroinvertebrate data ($p = 0.0009, 0.0242$ by year and site, respectively); b) the species evenness of the macroinvertebrate data ($p = 0.00103, 0.03605$ by year and site, respectively); c) the Shannon's Diversity Index of the macroinvertebrate data ($p = 0.1178, 0.0238$ by year and site, respectively); d) the Simpson's Diversity Index of the macroinvertebrate data ($p = 0.0422, 0.0269$ by year and site, respectively). The point colors delineate year, 2001 is yellow, 2002 is light blue, 2012 is red, 2016 is purple, and 2019 is green. X-axis site notations are as follows: BZ = Bayou Zourie (square), DW = Dowden (+ square), LY = Lyles (diamond), MT = Martin (x square), TG = Tiger (triangle), and WC = Whiskey Chitto (circle); C = Calcasieu River, R = Red River, S = Sabine River; numbers equate to the years surveyed, 12 = 2012, 16 = 2016, etc.

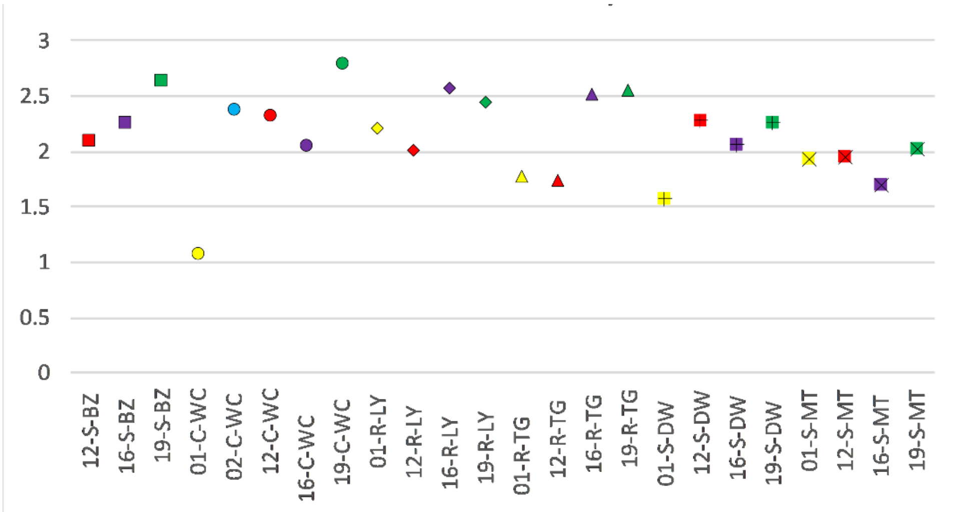
a)


30
25
20
15
10
5
0
12-S-BZ
16-S-BZ
19-S-BZ
01-C-WC
02-C-WC
12-C-WC
16-C-WC
19-C-WC
01-R-LY
12-R-LY
16-R-LY
19-R-LY
01-R-TG
12-R-TG
16-R-TG
19-R-TG
01-S-DW
12-S-DW
16-S-DW
19-S-DW
01-S-MT
12-S-MT
16-S-MT
19-S-MT

b)


1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
12-S-BZ
16-S-BZ
19-S-BZ
01-C-WC
02-C-WC
12-C-WC
16-C-WC
19-C-WC
01-R-LY
12-R-LY
16-R-LY
19-R-LY
01-R-TG
12-R-TG
16-R-TG
19-R-TG
01-S-DW
12-S-DW
16-S-DW
19-S-DW
01-S-MT
12-S-MT
16-S-MT
19-S-MT

c)




d)

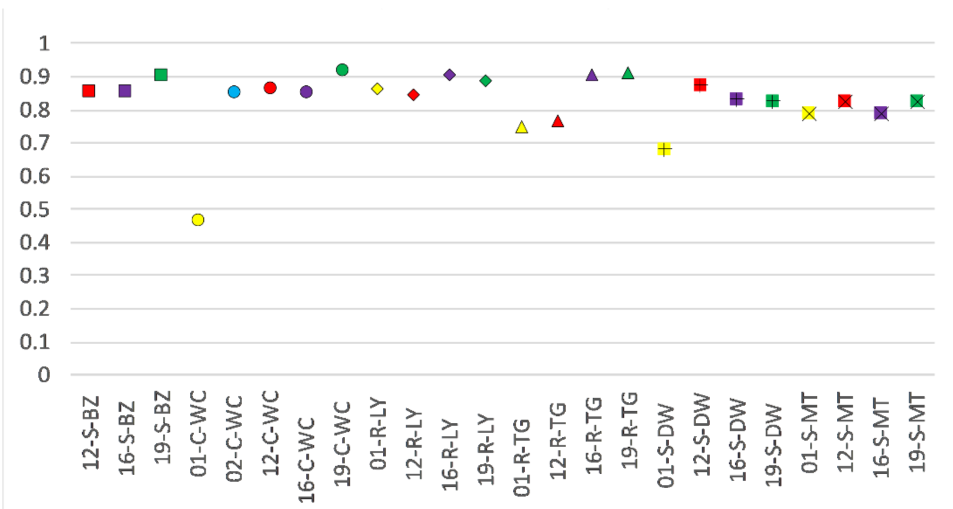



Figure 5: Diversity related measurements using fish data. a) The species richness of the fish data ($p$ = 0.0424, 0.3179 by year and site, respectively); b) the species evenness of the fish data ($p$ = 0.0063, 05526 by year and site, respectively); c) the Shannon's Diversity Index of the fish data ($p$ = 0.0483, 0.5921 by year and site, respectively); d) the Simpson's Diversity Index of the fish data ($p$ = 0.0509, 0.6471 by year and site, respectively). The point colors delineate year, 2001 is yellow, 2002 is light blue, 2012 is red, 2016 is purple, and 2019 is green. X-axis site notations are as follows: BZ = Bayou Zourie (square), DW = Dowden (+ square), LY = Lyles (diamond), MT = Martin (x square), TG = Tiger (triangle), and WC = Whiskey Chitto (circle); C = Calcasieu River, R = Red River, S = Sabine River; numbers equate to the years surveyed, 12 = 2012, 16 = 2016, etc.

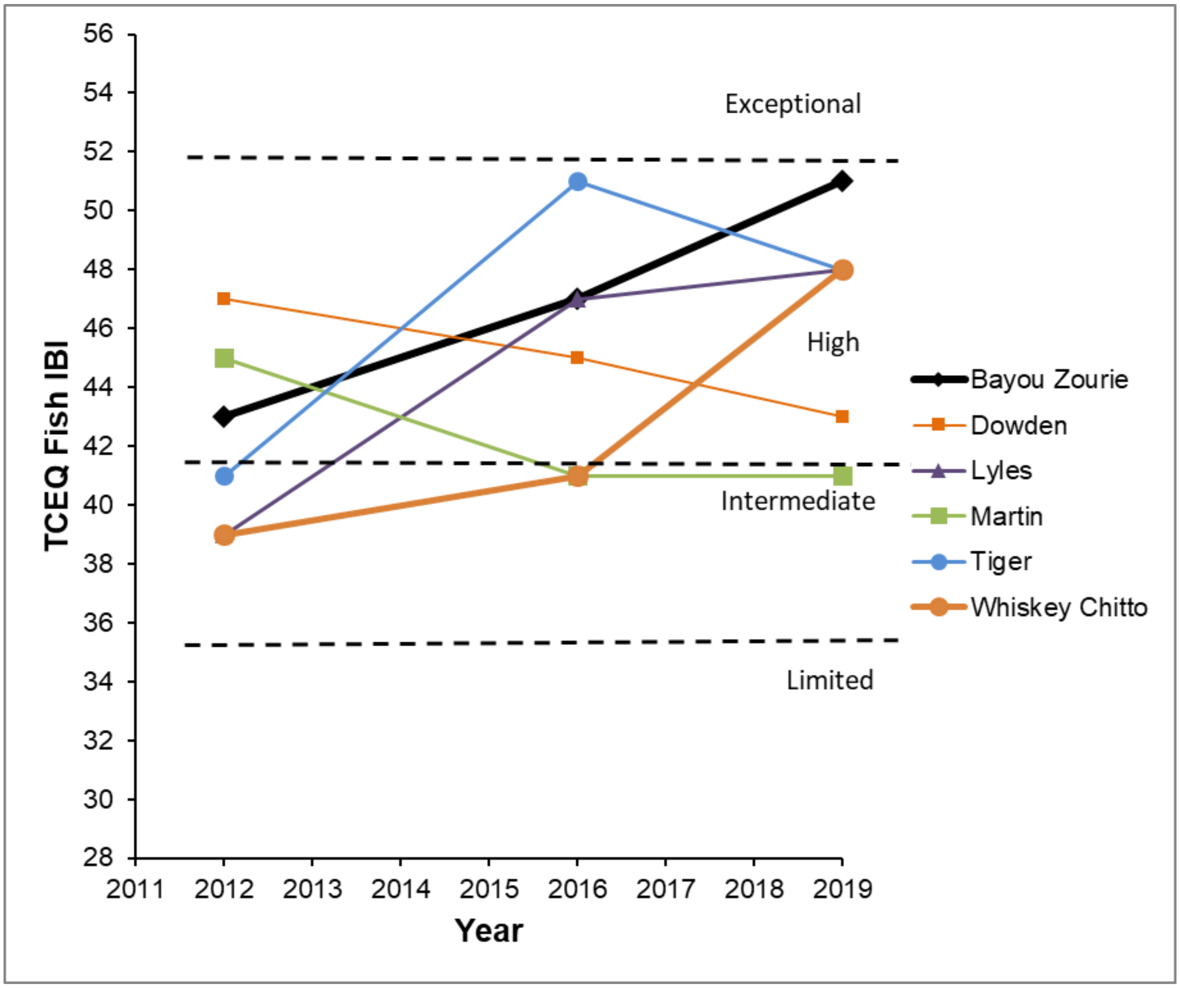



Figure 6: Fish Index of Biotic Integrity (IBI) scores for each tributary from 2012 to 2019 (p = 0.1909, 0.5704 for year and site, respectively).

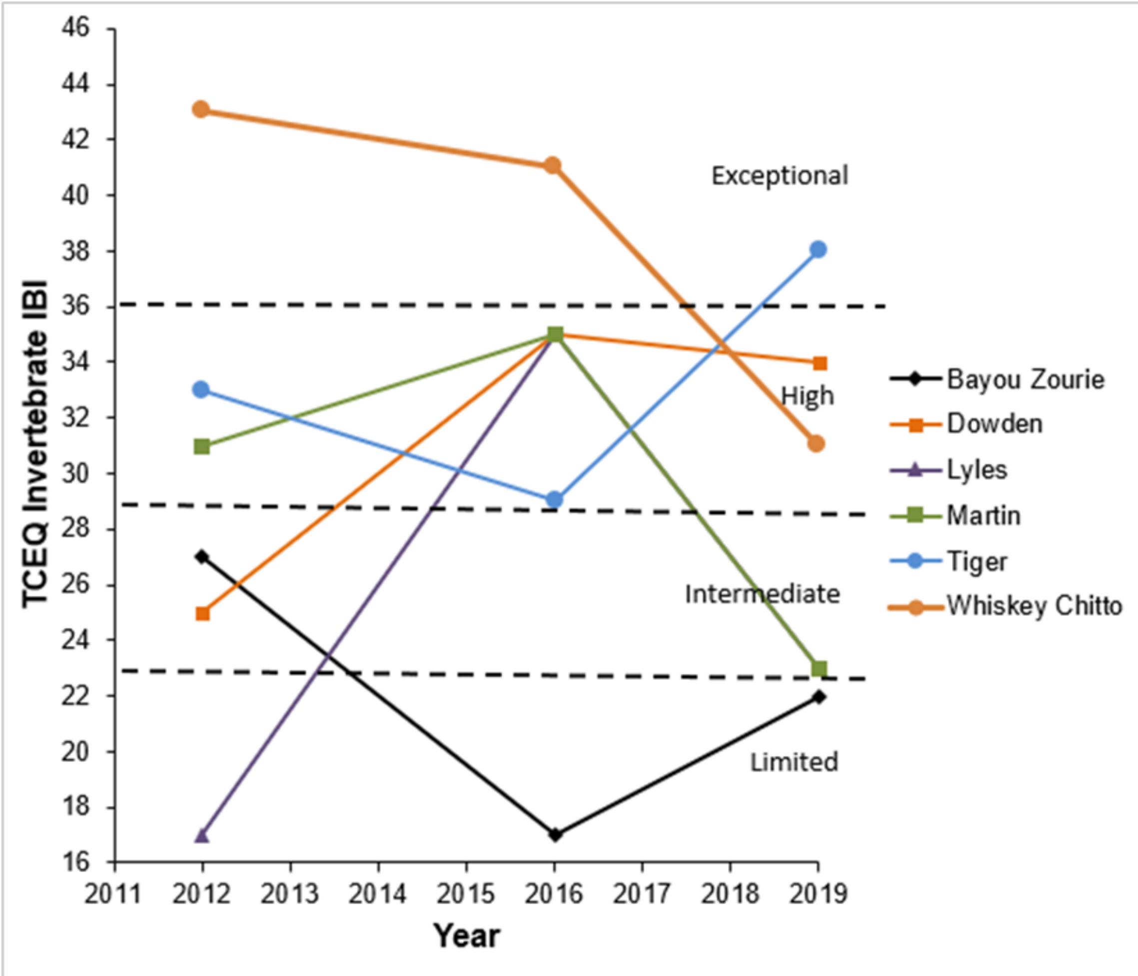



Figure 7: Macroinvertebrate Benthic Index of Biotic Integrity (B-IBI) scores for each tributary from 2012 to 2019 ($p = 0.6444$, $0.1166$ for year and site, respectively).

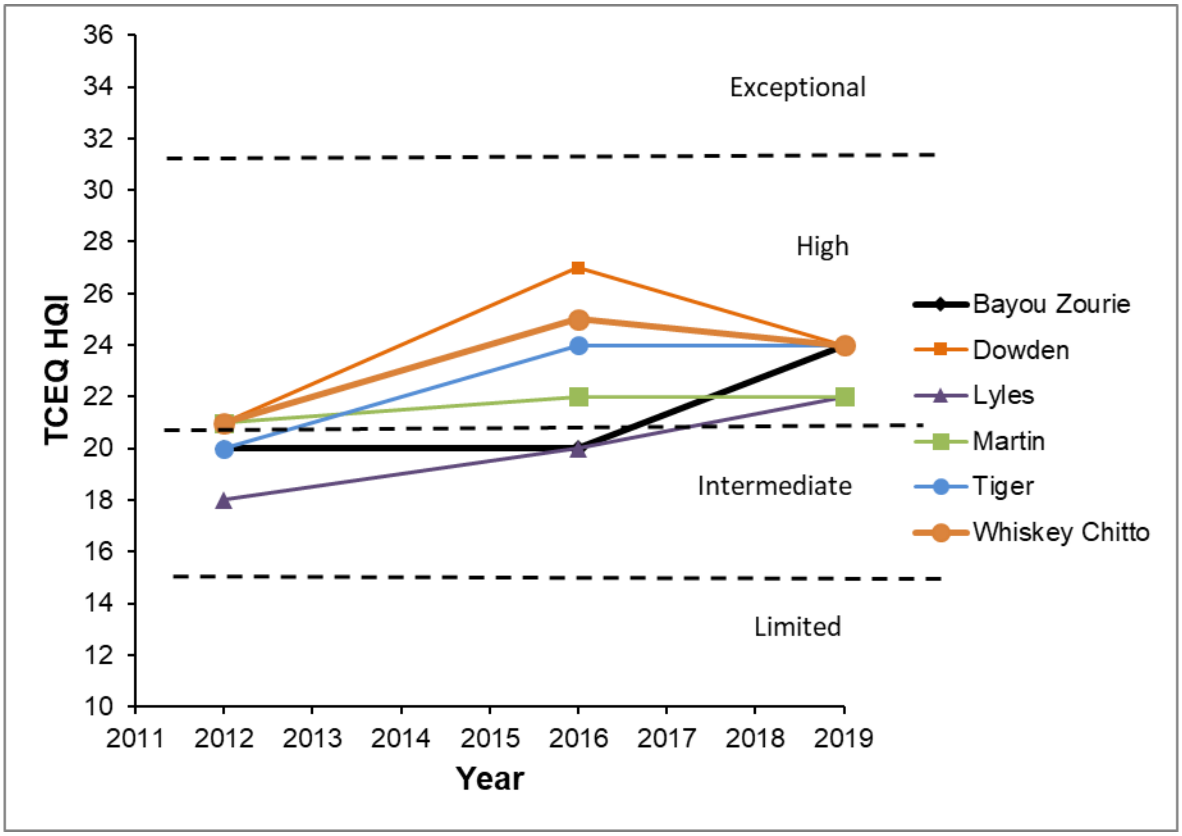



Figure 8: Habitat Quality Index (HQI) scores for each tributary from 2012 to 2019 ($p = 0.0059$, 0.0587 for year and site, respectively).

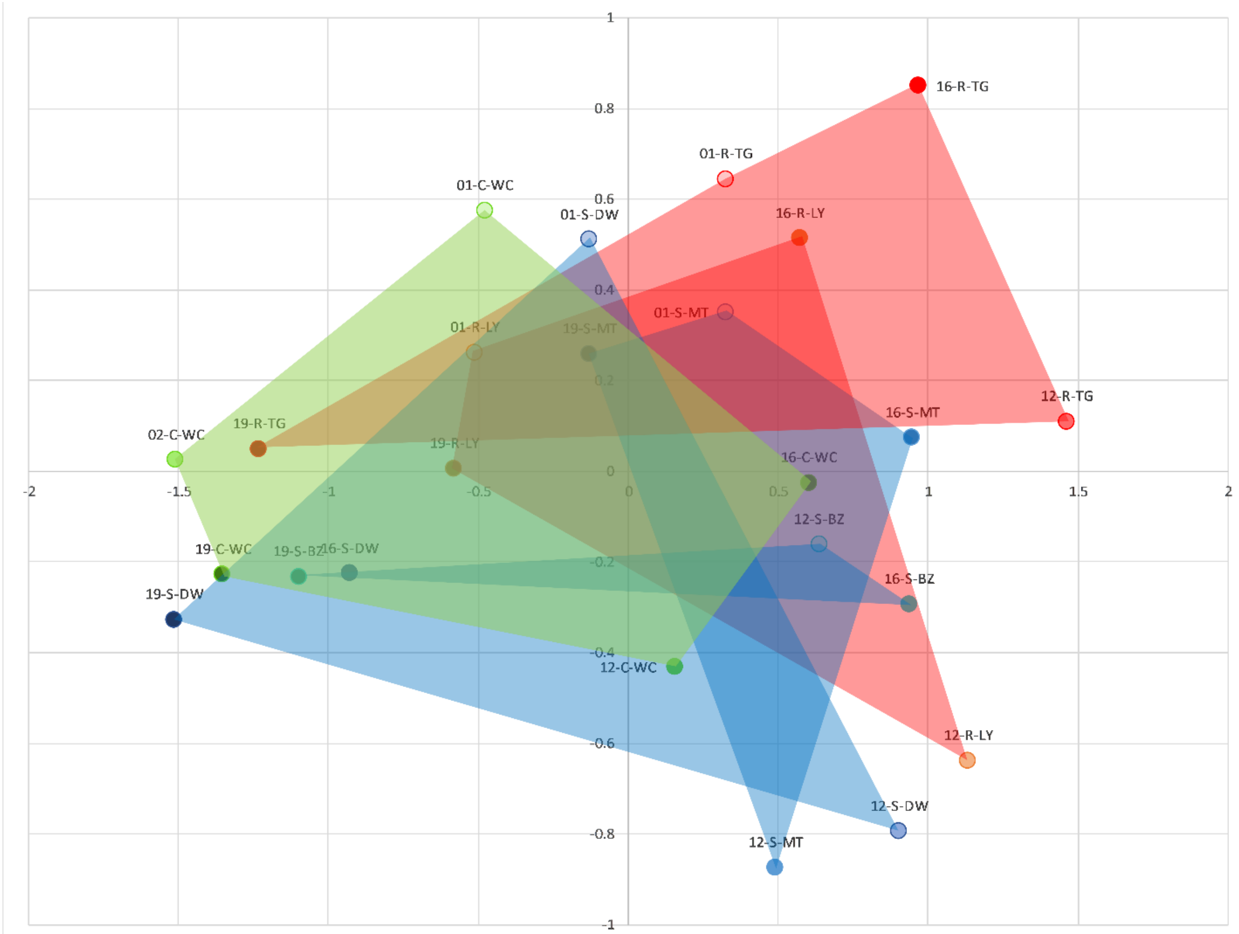



Figure 9: Nonmetric Multidimensional Scaling (NMS) of fish and macroinvertebrate data by watershed. There is not a significant separation of polygons (p = 0.4638). Each polygon is a site; Calcasieu tributaries are green, Red River tributaries are red, and Sabine tributaries are blue.

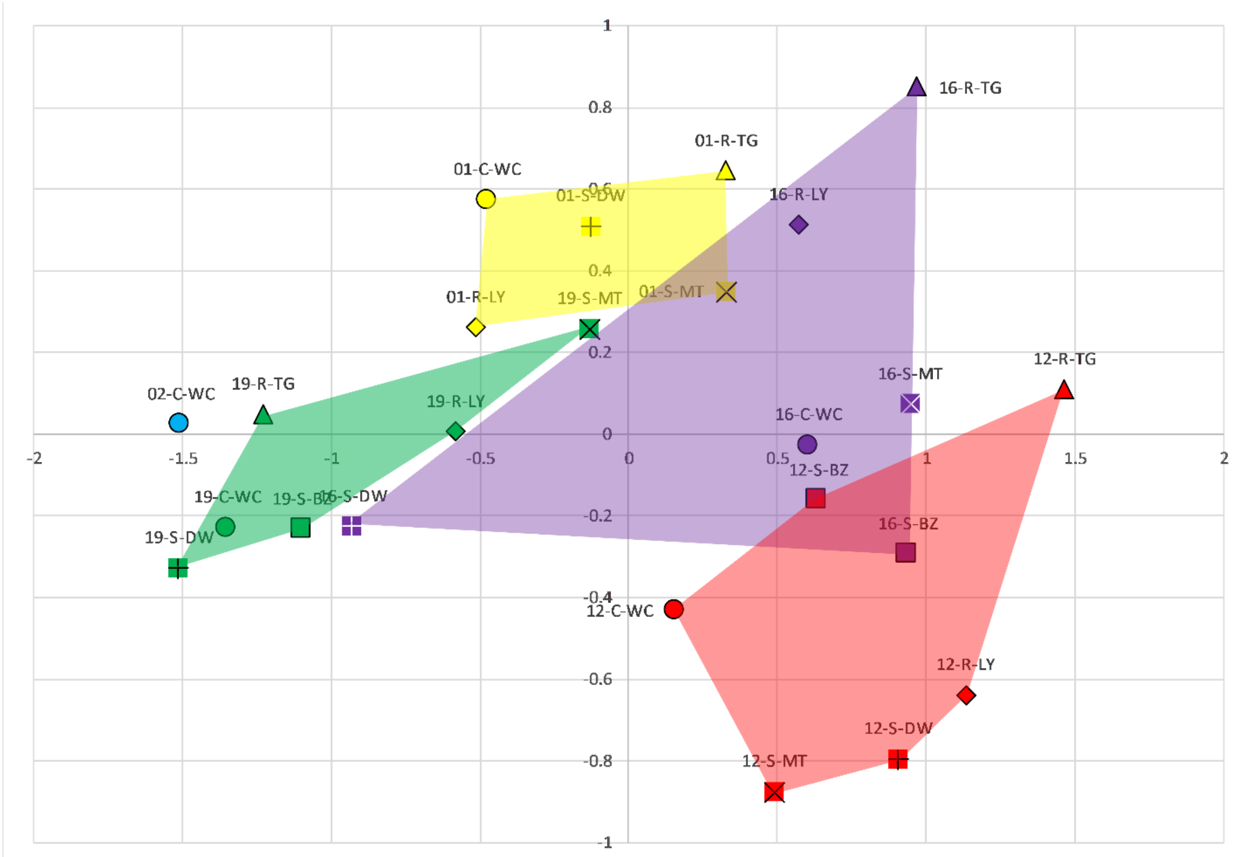



Figure 10: Nonmetric Multidimensional Scaling (NMS) of fish and macroinvertebrate data by year. There is a clear separation of polygons (p = 0.00004). Each polygon is a year; 2001 is yellow, 2012 is red, 2016 is purple, and 2019 is green.

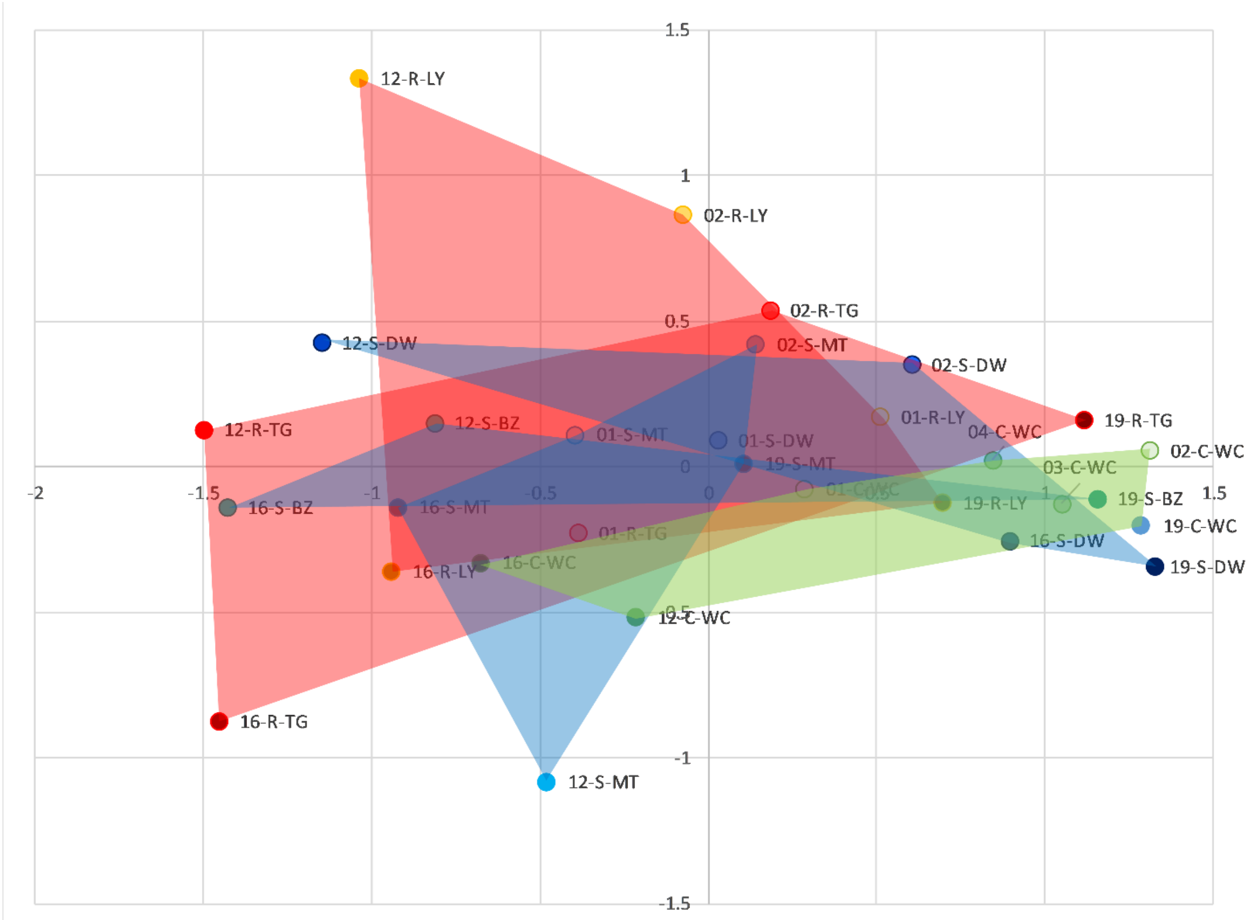



Figure 11: Nonmetric Multidimensional Scaling (NMS) of macroinvertebrate data by watershed. There is not a significant separation of polygons ($p = 0.2308$). Each polygon is a site; Calcasieu tributaries are green, Red River tributaries are red, and Sabine tributaries are blue.

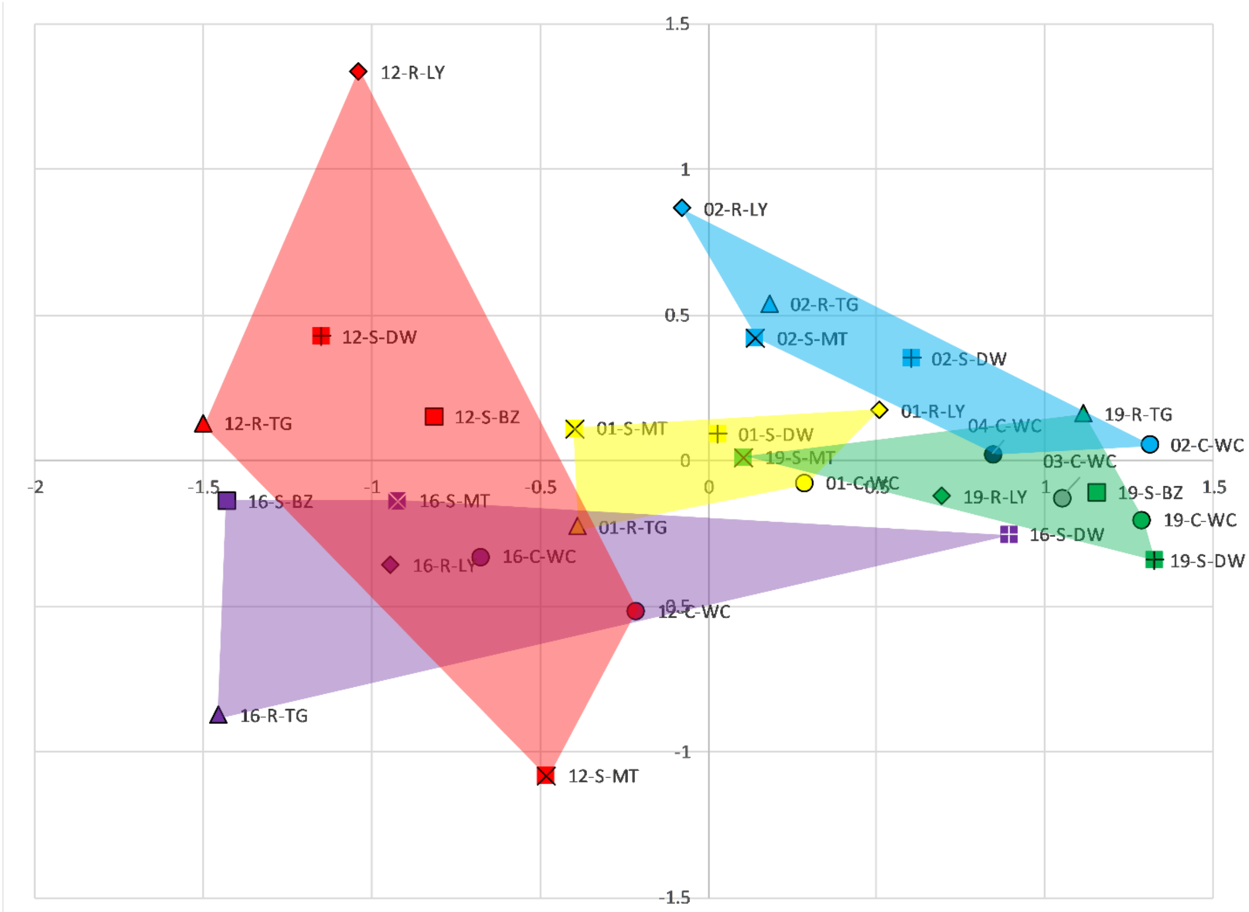



Figure 12: Nonmetric Multidimensional Scaling (NMS) of macroinvertebrate data by year. There is a clear separation of polygons ($p = 0.00003$). Each polygon is a year; 2001 is yellow, 2012 is red, 2016 is purple, and 2019 is green.

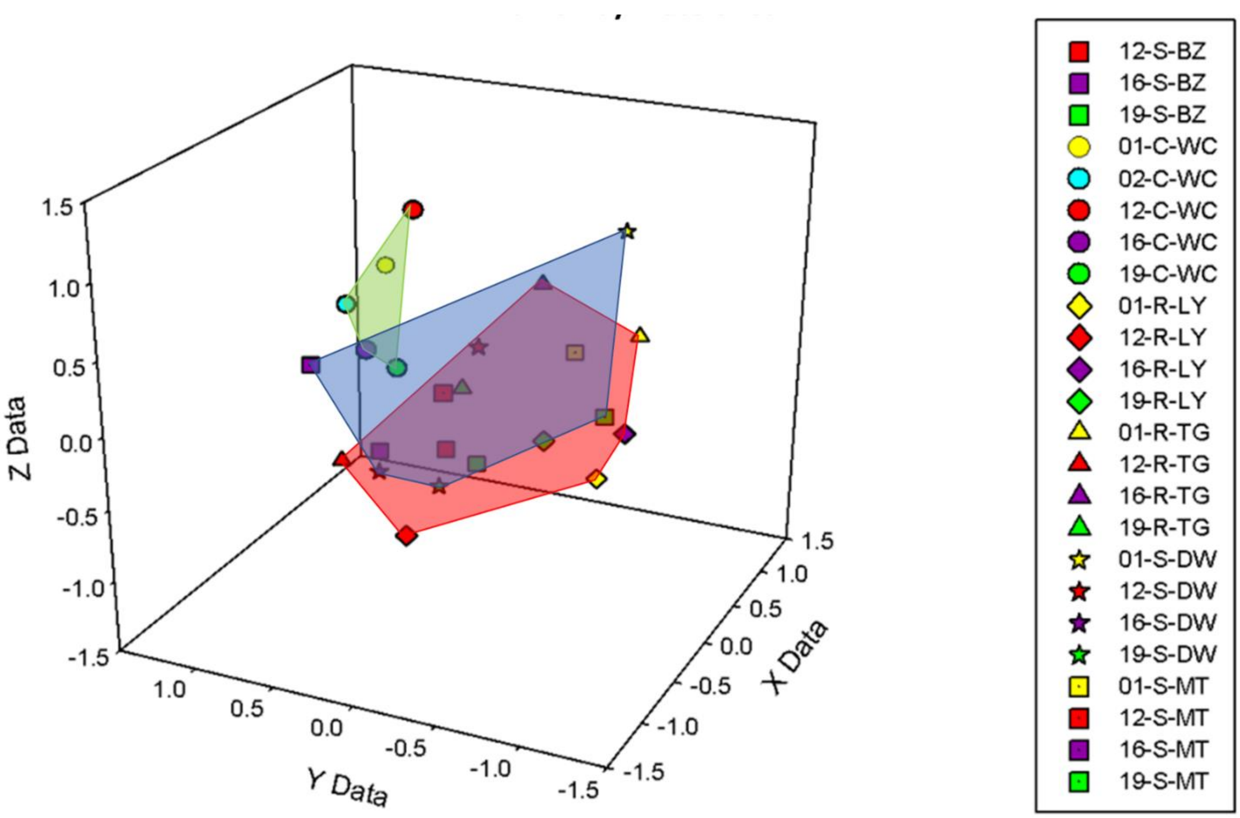



Figure 13: Nonmetric Multidimensional Scaling (NMS) of fish data by watershed. There is a significant separation of polygons ($p = 0.00005$). Each polygon is a watershed; Calcasieu tributaries are green, Red River tributaries are red, and Sabine tributaries are blue. The Calcasieu points are clustered above zero on all axes. The Red points are predominantly clustered along the negative z-axis, while the Sabine points are predominantly clustered along the positive z-axis.

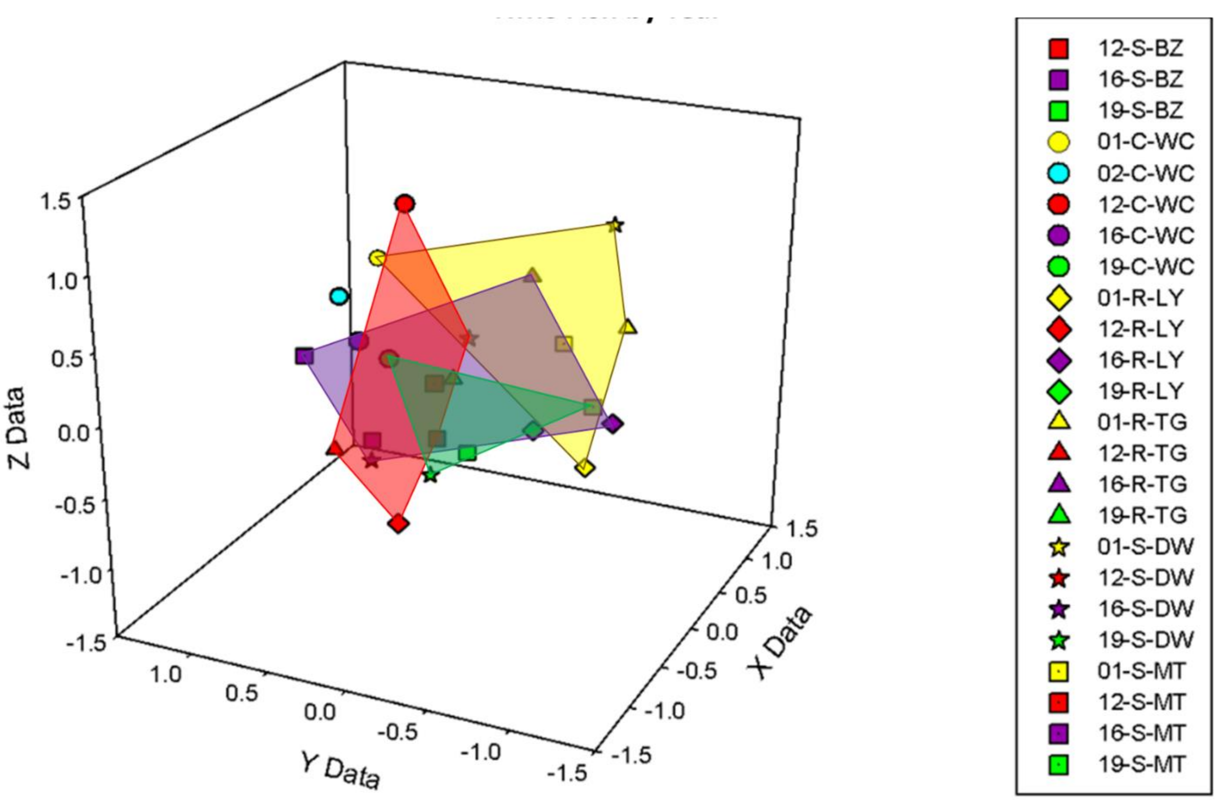
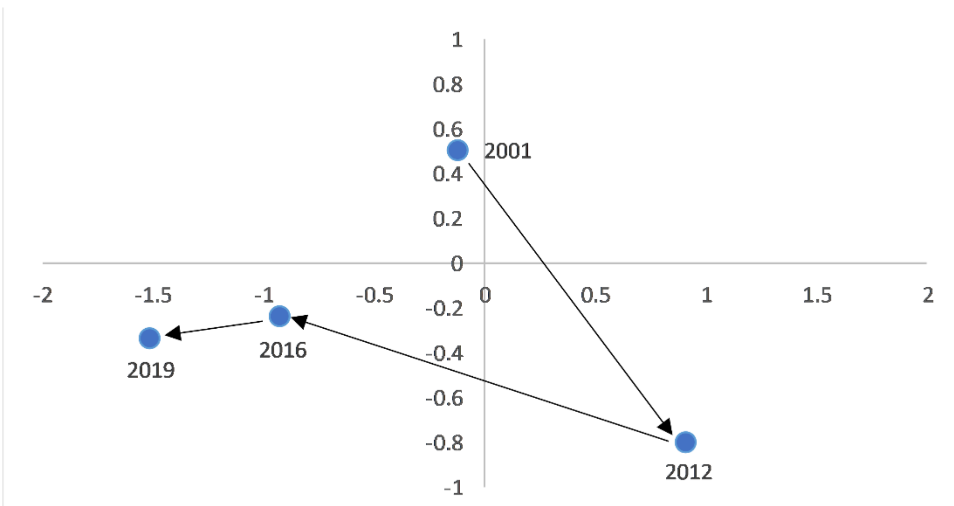



Figure 14: Nonmetric Multidimensional Scaling (NMS) of fish and macroinvertebrate data by year. There is a significant separation of polygons (p = 0.0274). Each polygon is a year; 2001 is yellow, 2012 is red, 2016 is purple, and 2019 is green. Points from 2001 are clustered between 0.5 and 1.5 on the x-axis, 2012 points are clustered between -1.0 and 0.5 on the x-axis, 2016 points are more dispersed on the x-axis but are clustered between -0.5 and 0.5 on the z-axis, and 2019 points are clustered around 0 on the x-axis and between -0.5 and 0 on the z-axis.

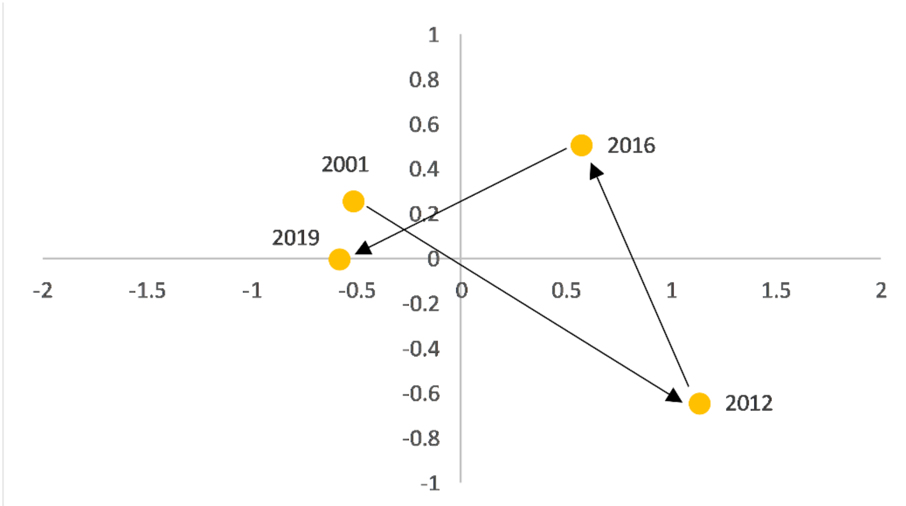
a)


1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2012
2016
2019

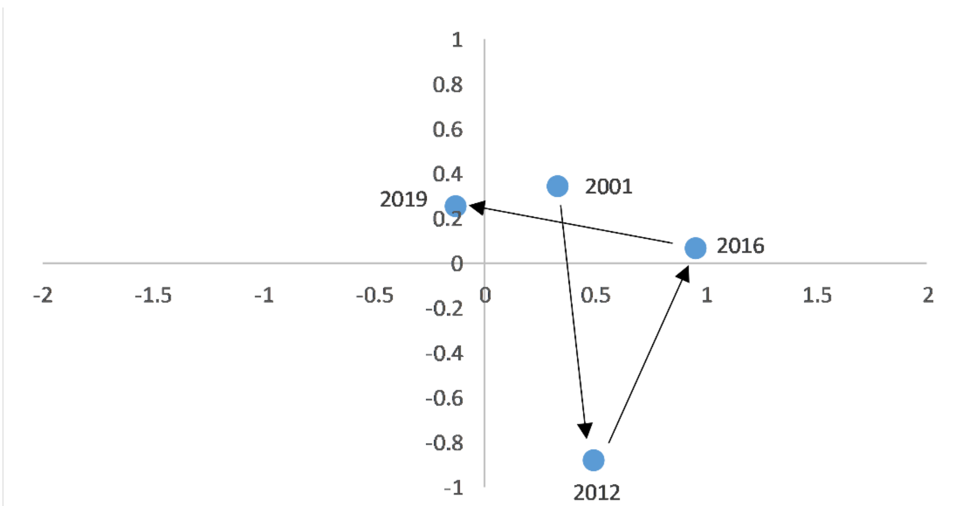
b)


1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2001
2012
2016
2019

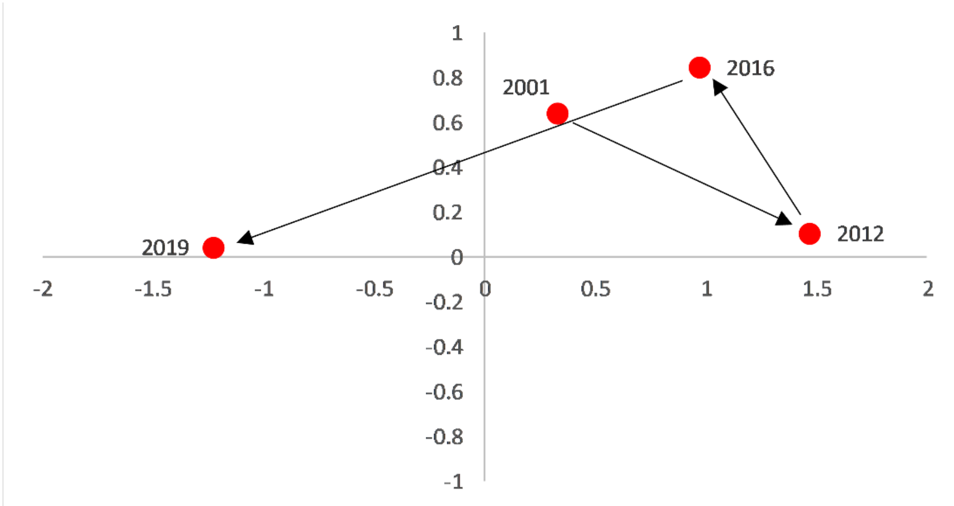
c)




d)



e)




f)

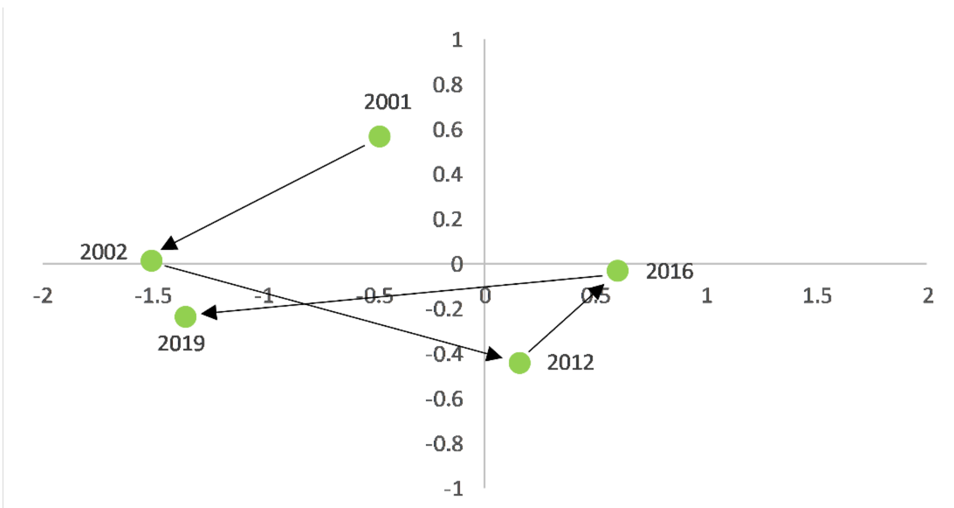
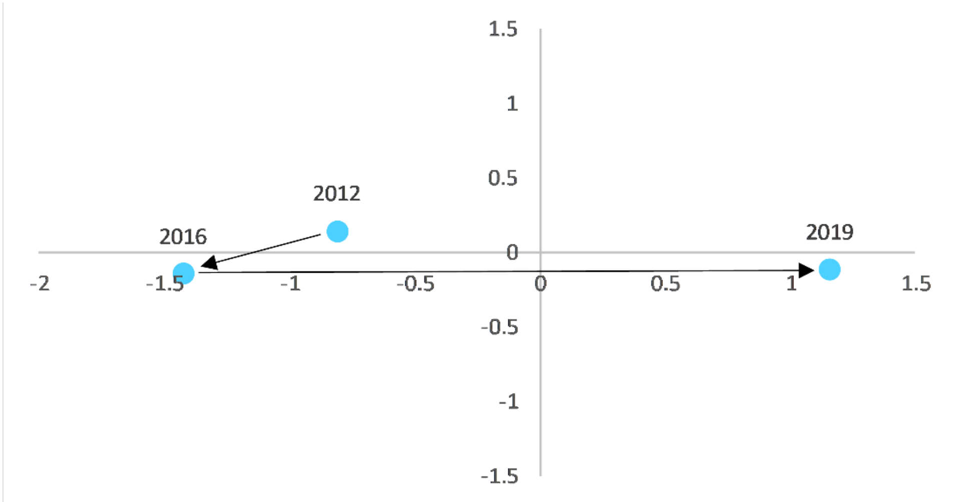
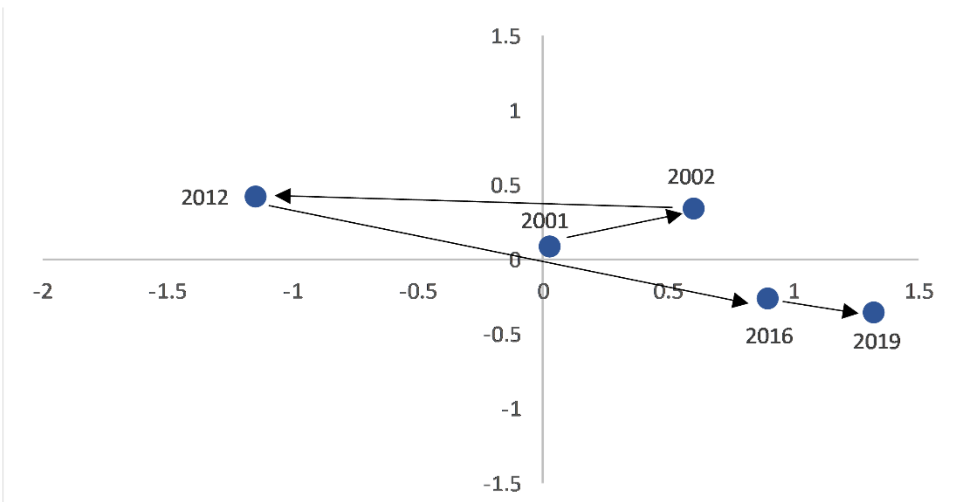



Figure 15: NMS flowlines or trajectories using combined fish and macroinvertebrate data. a) Bayou Zourie; b) Dowden; c) Lyles; d) Martin; e) Tiger; and f) Whiskey Chitto.

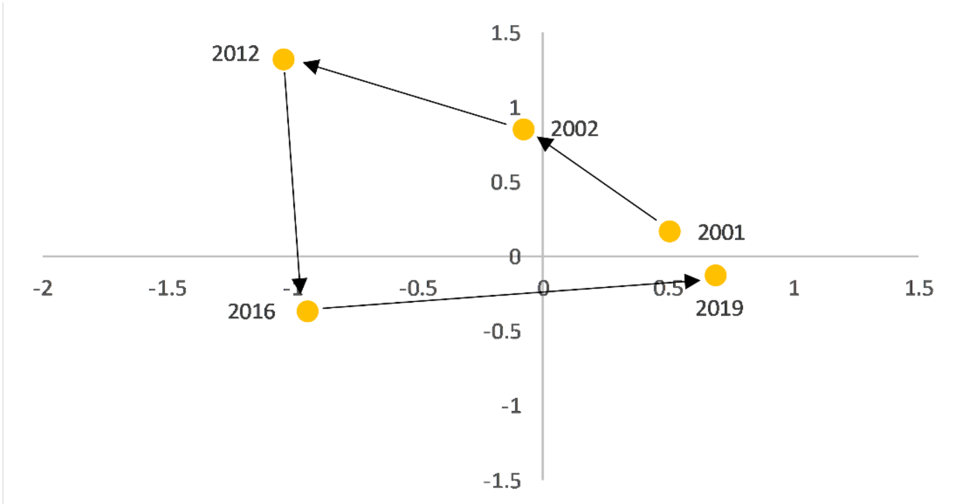
a)


1.5
1
0.5
2012
2016
2019
0
-2
-1.5
-1
-0.5
0
0.5
1
1.5
-0.5
-1
-1.5

b)

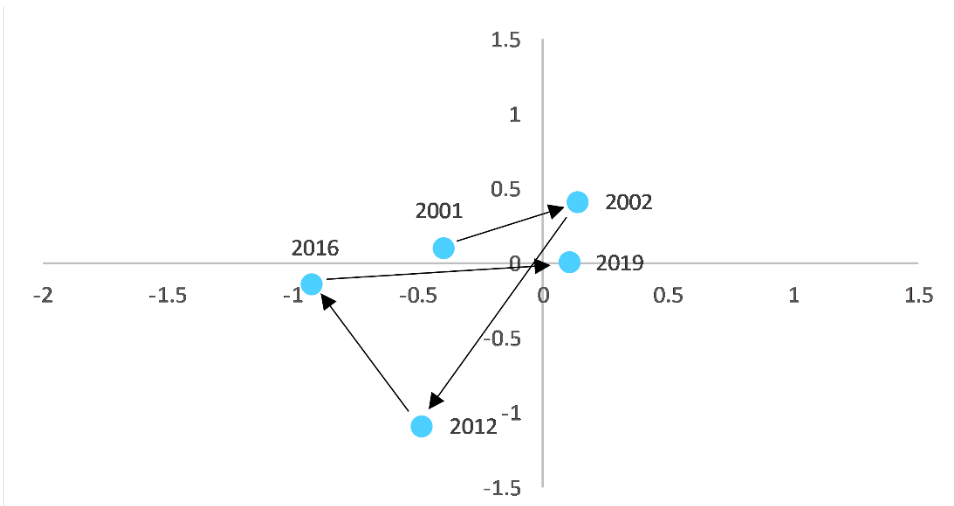

1.5
1
2002
2012
0.5
2001
0
-2
-1.5
-1
-0.5
0
0.5
1
1.5
-0.5
2016
2019
-1
-1.5

c)



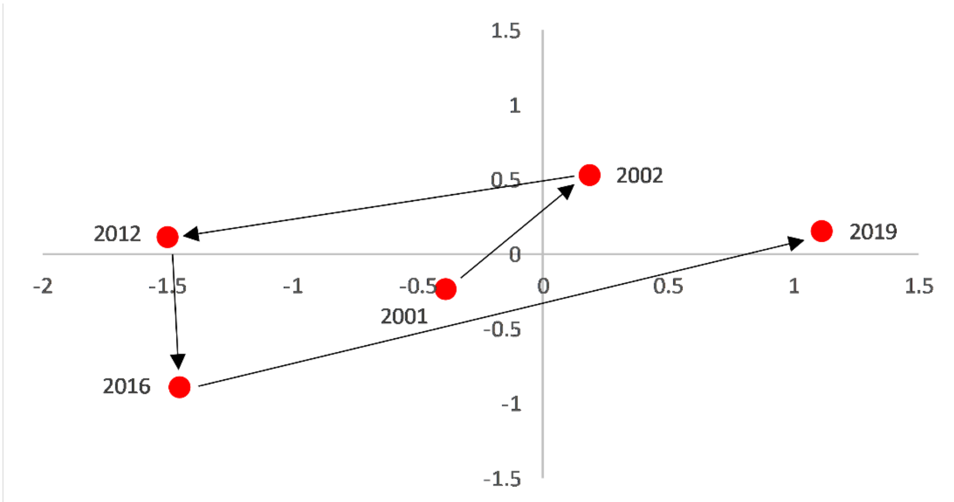
1.5
2012
1
2002
0.5
2001
0
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2016
2019
-0.5
-1
-1.5


d)



1.5
1
0.5
2001
2002
2016
0
2019
-2
-1.5
-1
-0.5
0
0.5
1
1.5
-0.5
2012
-1
-1.5

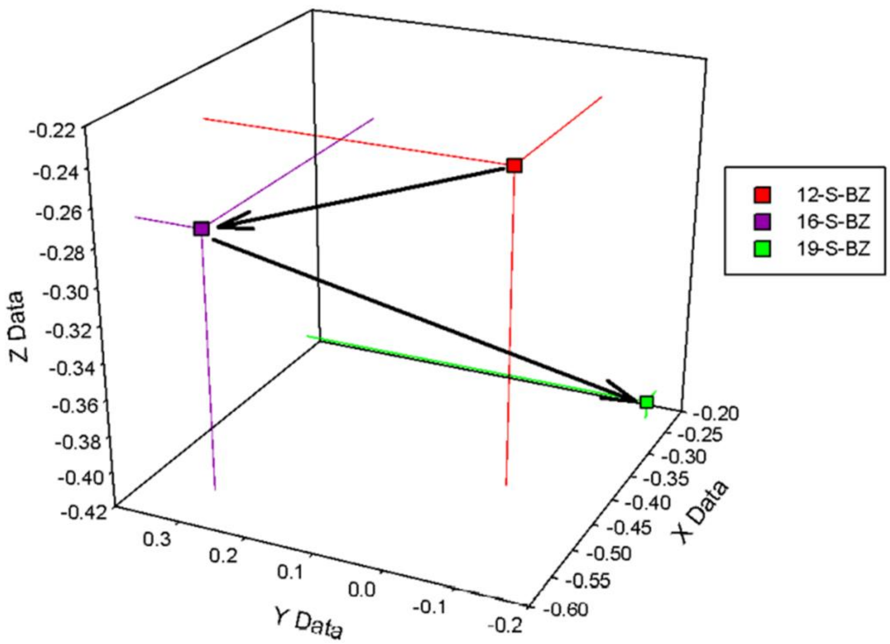
e)




f)

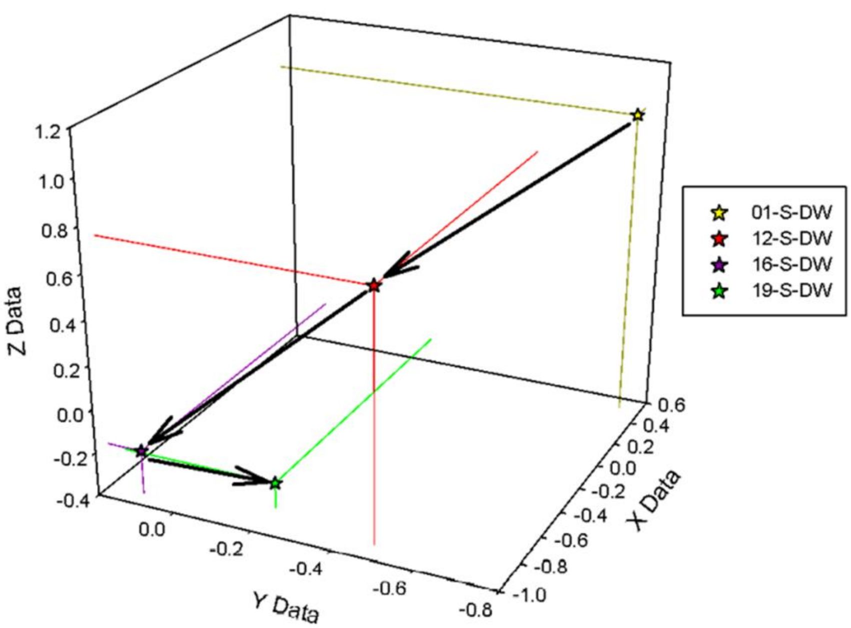

Figure 16: NMS flowlines or trajectories using macroinvertebrate data. a) Bayou Zourie; b) Dowden; c) Lyles; d) Martin; e) Tiger; and f) Whiskey Chitto.

a)



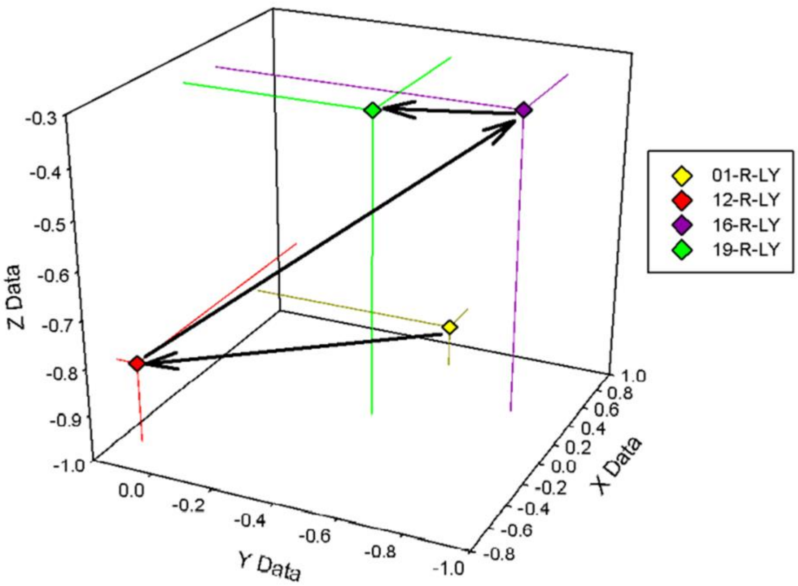
-0.22
-0.24
-0.26
-0.28
-0.30
-0.32
-0.34
-0.36
-0.38
-0.40
-0.42
Z Data
0.3
0.2
0.1
0.0
-0.1
-0.2
Y Data
-0.20
-0.25
-0.30
-0.35
-0.40
-0.45
-0.50
-0.55
-0.60
X Data
12-S-BZ
16-S-BZ
19-S-BZ


b)

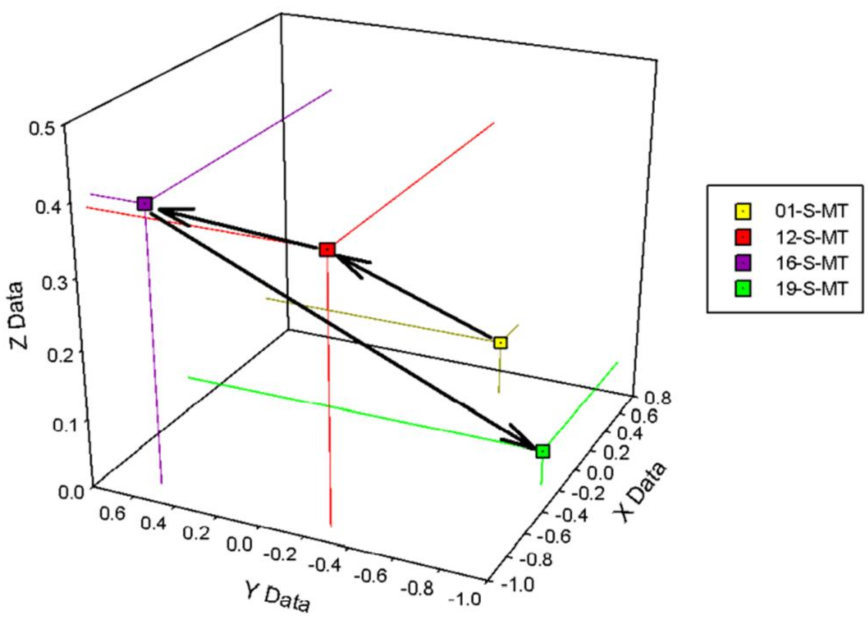


1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
Z Data
0.0
-0.2
-0.4
-0.6
-0.8
Y Data
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
X Data
01-S-DW
12-S-DW
16-S-DW
19-S-DW

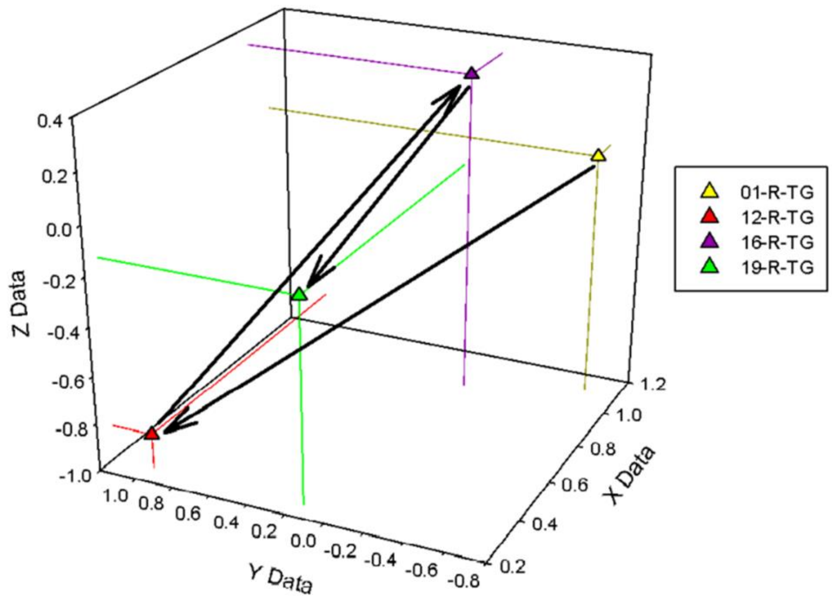
c)


-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1.0
Z Data
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
Y Data
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
X Data
01-R-LY
12-R-LY
16-R-LY
19-R-LY

d)


0.5
0.4
0.3
0.2
0.1
0.0
Z Data
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
Y Data
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
X Data
01-S-MT
12-S-MT
16-S-MT
19-S-MT

e)




f)

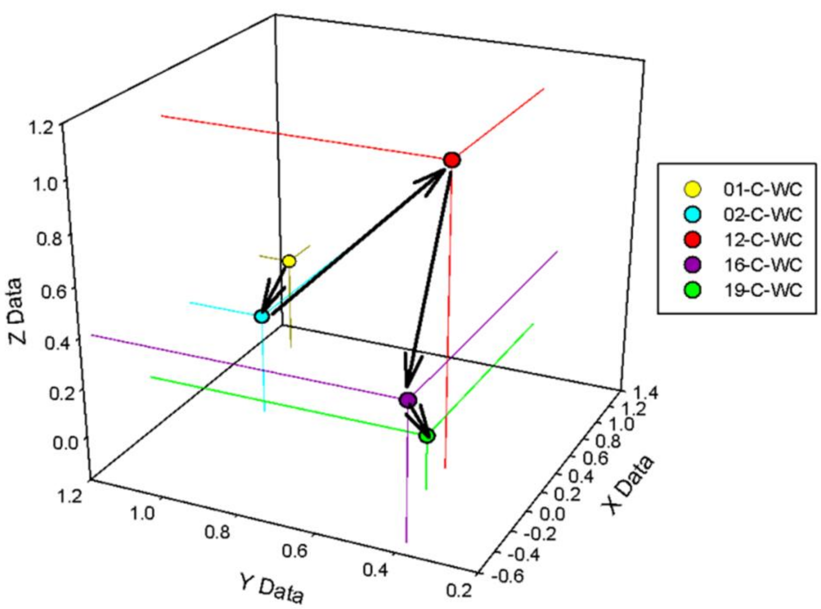



Figure 17: NMS flowlines or trajectories using fish data, with leading lines for orientation of points. a) Bayou Zourie; b) Dowden; c) Lyles; d) Martin; e) Tiger; and f) Whiskey Chitto. 2001 is yellow, 2012 is red, 2016 is purple, and 2019 is green.

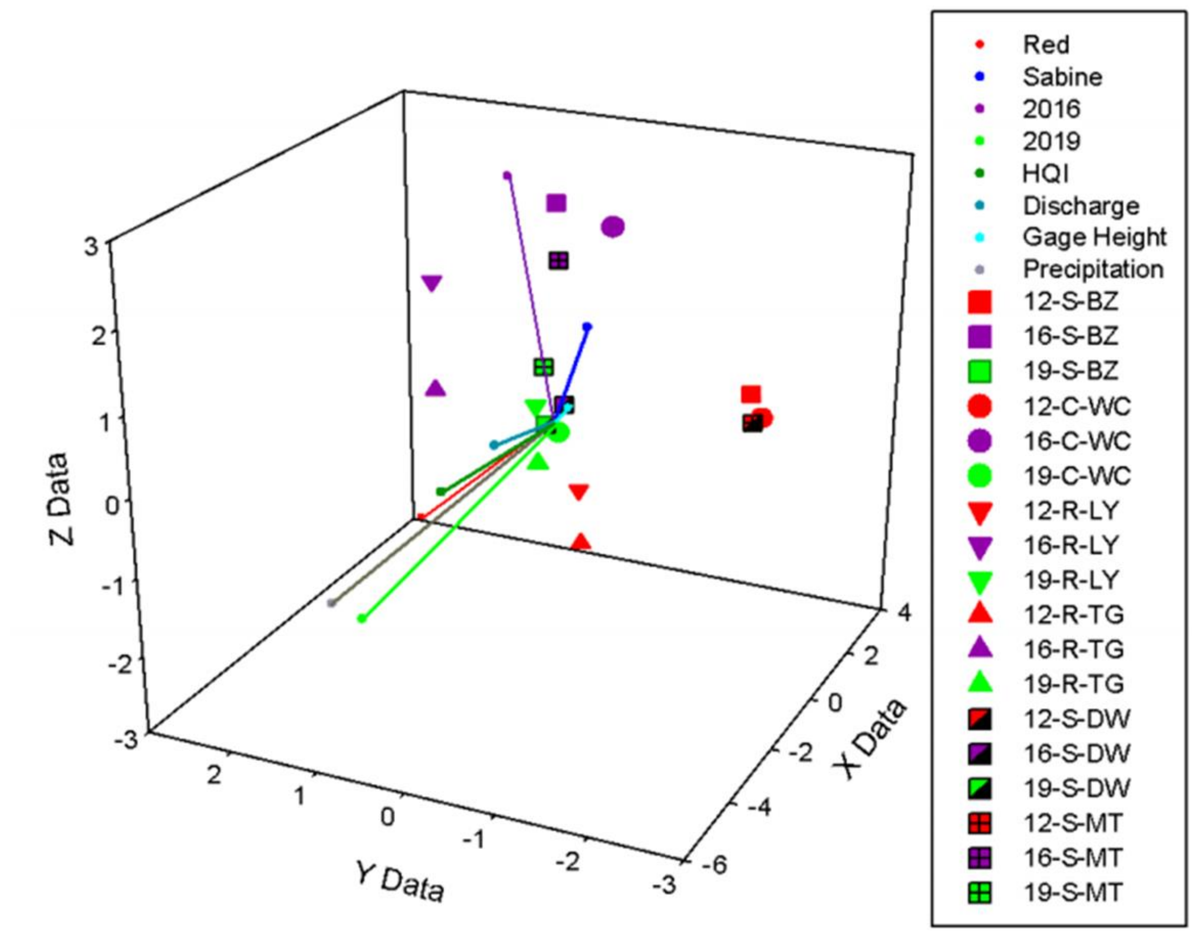



Figure 18: Canonical Correspondence Analysis (CCA) utilizing both fish and macroinvertebrate data by year. Correspondence variables (lines) include watershed (Red and Sabine), year (2016 and 2019), and habitat variables (HQI, discharge, gage height, and precipitation). Points are color-coded by year: 2012 is red, 2016 is purple, and 2019 is lime green.

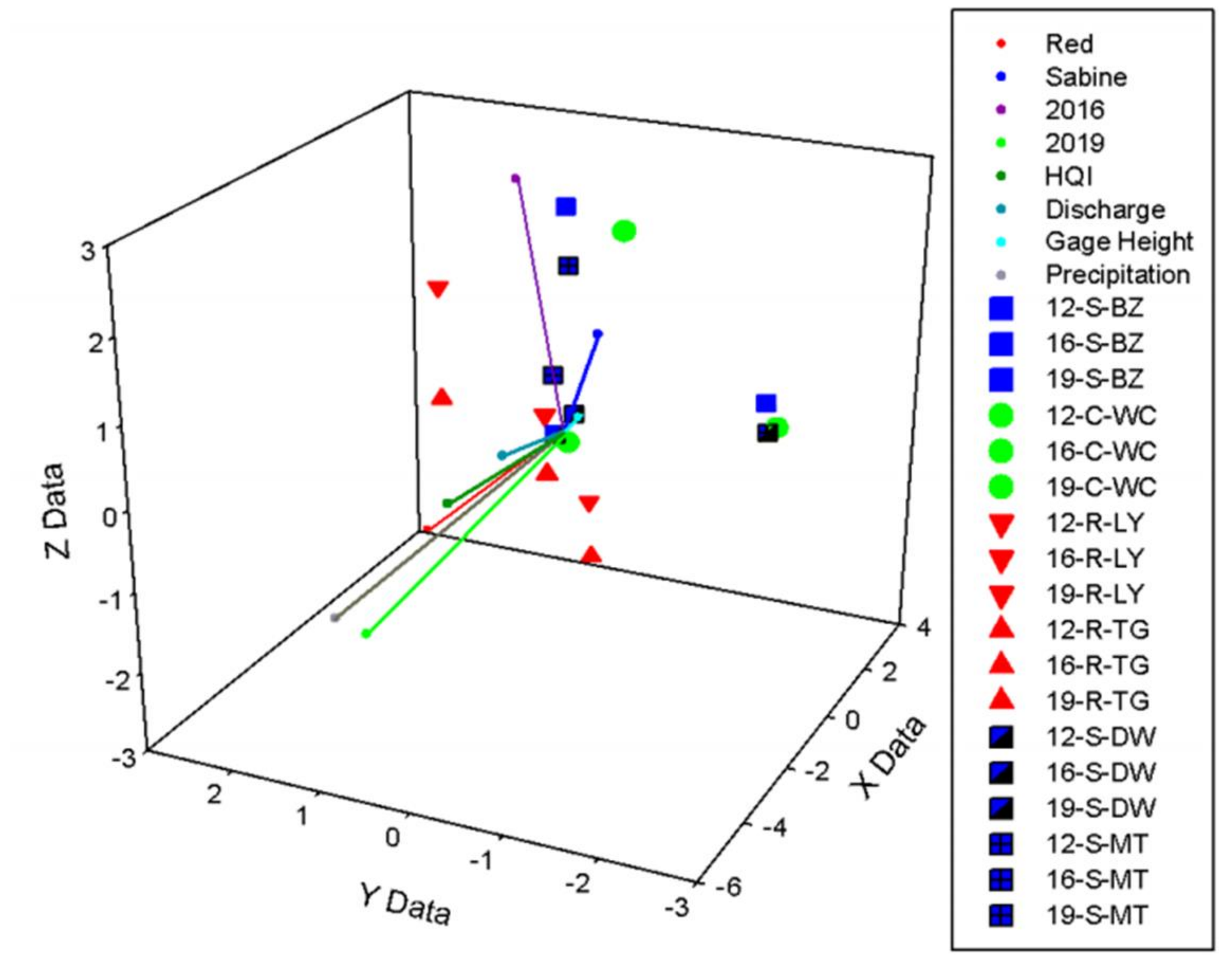



Figure 19: CCA utilizing both fish and macroinvertebrate data by watershed. Correspondence variables (lines) include watershed (Red and Sabine), year (2016 and 2019), and habitat variables (HQI, discharge, gage height, and precipitation). There is a significant relationship between the site points and the variables ($p = 0.012$), unlike CCA utilizing just fish or macroinvertebrate data ($p = 0.446$, $0.444$, respectively). Points are color-coded by watershed: Calcasieu is lime green, Red River is red, and Sabine is blue.

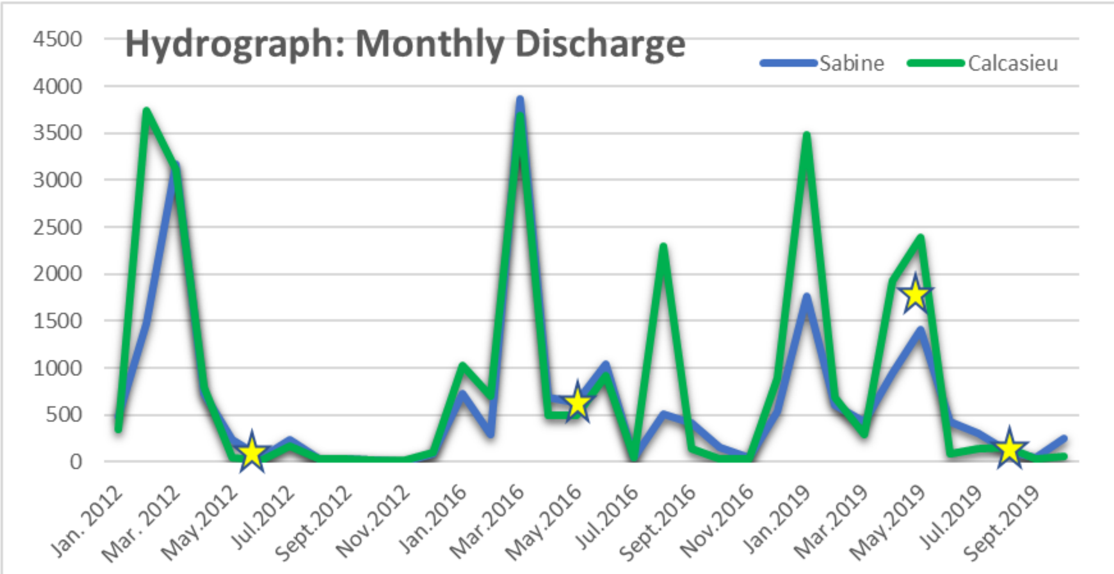
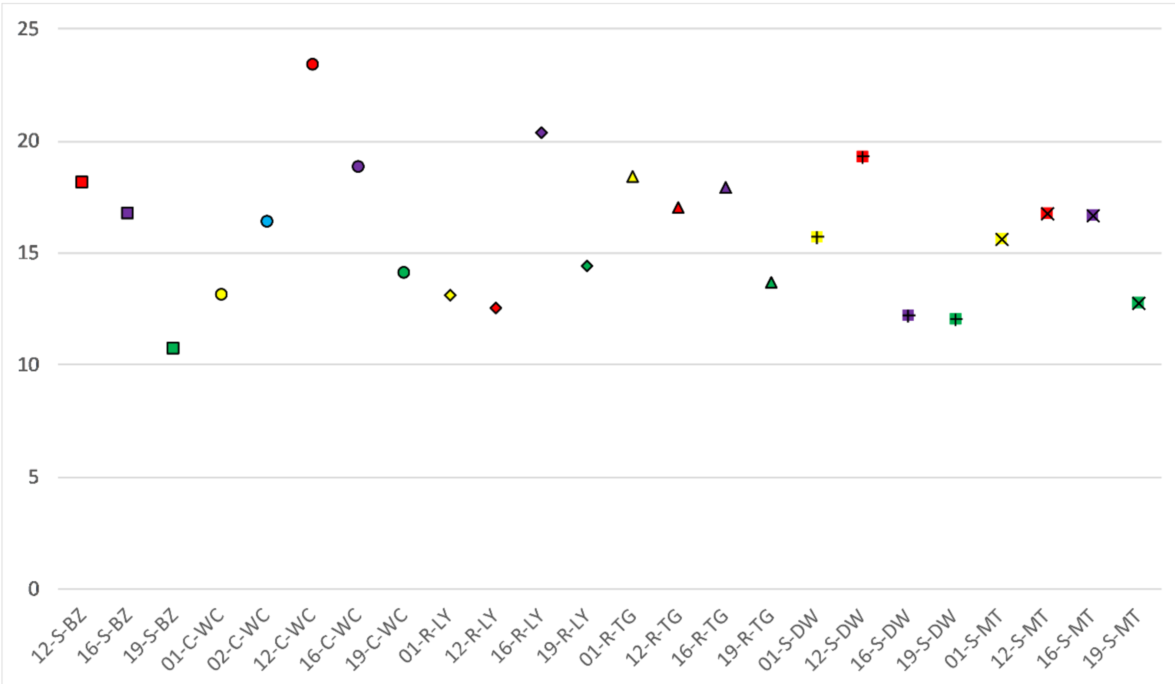
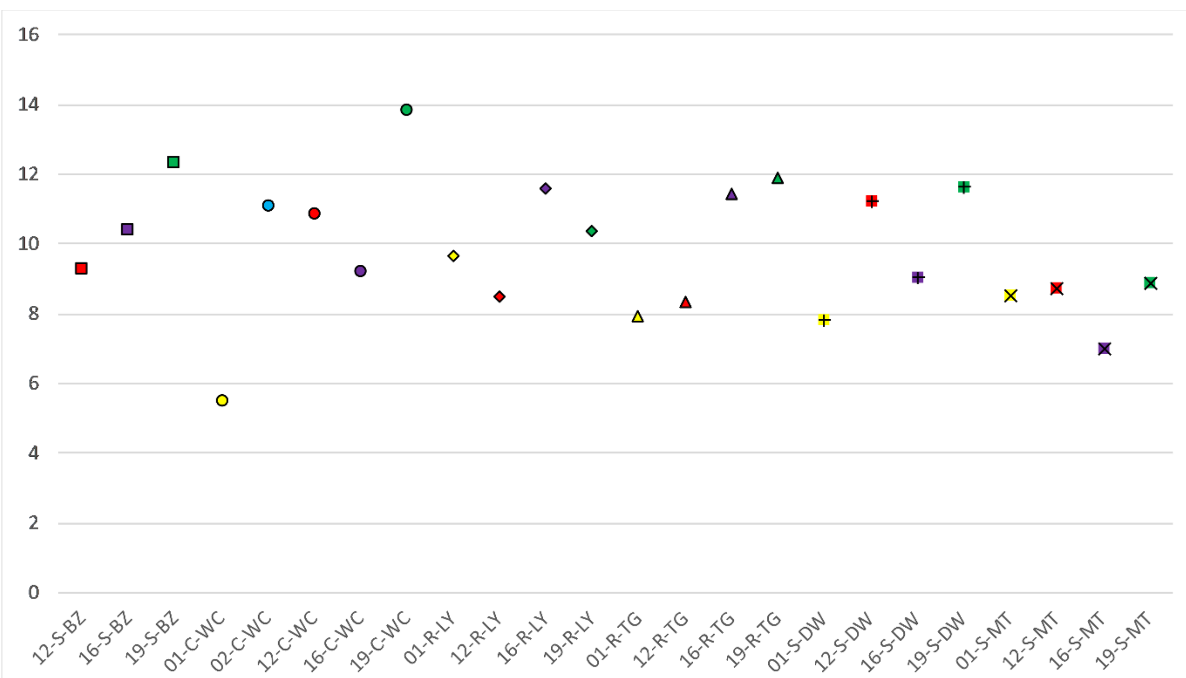



Figure 20: Hydrograph of monthly discharge for the years 2012, 2016, and 2019. Sample dates are indicated by a star. No data was available for the Red River.

a)


25
20
15
10
5
0
12-S-BZ
16-S-BZ
19-S-BZ
01-C-WC
02-C-WC
12-C-WC
16-C-WC
19-C-WC
01-R-LY
12-R-LY
16-R-LY
19-R-LY
01-R-TG
12-R-TG
16-R-TG
19-R-TG
01-S-DW
12-S-DW
16-S-DW
19-S-DW
01-S-MT
12-S-MT
16-S-MT
19-S-MT

b)


16
14
12
10
8
6
4
2
0
12-S-BZ
16-S-BZ
19-S-BZ
01-C-WC
02-C-WC
12-C-WC
16-C-WC
19-C-WC
01-R-LY
12-R-LY
16-R-LY
19-R-LY
01-R-TG
12-R-TG
16-R-TG
19-R-TG
01-S-DW
12-S-DW
16-S-DW
19-S-DW
01-S-MT
12-S-MT
16-S-MT
19-S-MT

c)

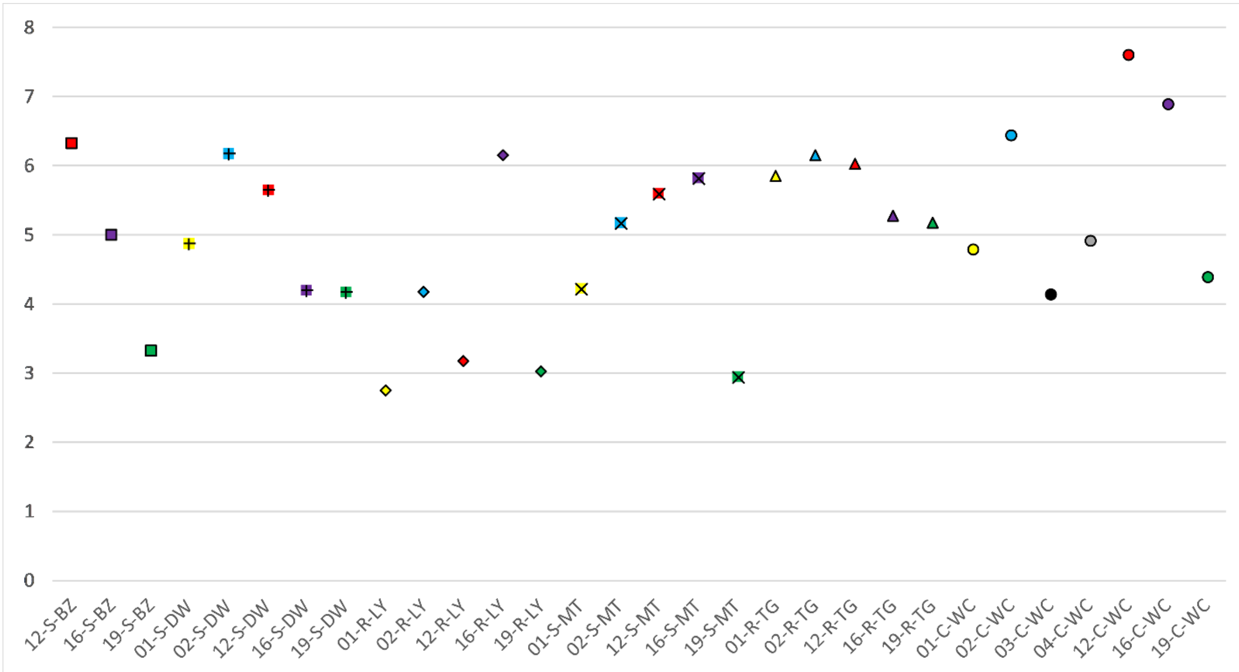



Figure 21: Species richness with rarefaction using Fort Polk taxa quantities. a) Combined fish and macroinvertebrate data (p = 0.129, 0.688 by year and site, respectively); b) Fish data (p = 0.0603, 0.602 by year and site, respectively); c) Macroinvertebrate data (p = 0.016, 0.01 by year and site, respectively). The point colors delineate year, 2001 is yellow, 2002 is light blue, 2012 is red, 2016 is purple, and 2019 is green. X-axis site notations are as follows: BZ = Bayou Zourie (square), DW = Dowden (+ square), LY = Lyles (diamond), MT = Martin (x square), TG = Tiger (triangle), and WC = Whiskey Chitto (circle); C = Calcasieu River, R = Red River, S = Sabine River; numbers equate to the years surveyed, 12 = 2012, 16 = 2016, etc.

Appendices

Appendix A: Images

Figure A1: Bayou Zourie Creek

Figure A2: Dowden Creek

Figure A3: Lyles Creek

Figure A4: Martin Creek

Figure A5: Tiger Creek

Figure A6: Whiskey Chitto Creek

Appendix B: TCEQ guidelines

Table B1. Texas Commission on Environmental Quality (TCEQ) Benthic Index of Biotic Integrity (B-IBI) metrics for ecoregions 33, 34, and 35.

| | Scoring Criteria | | |
|---|---|---|---|
| | 5 | 3 | 1 |
| Total Taxa | > 30 | 17-30 | < 17 |
| Diptera Taxa | > 10 | 6-10 | < 6 |
| Ephemeroptera Taxa | (*b*) | > 3 | 3 |
| Intolerant Taxa | > 4 | 2-4 | < 2 |
| % EPT Taxa | > 18.9 | 10.8-18.9 | < 10.8 |
| % Chironomidae | (*a*) | < 40.2 | ≥ 40.2 |
| % Tolerant Taxa | < 16 | 16-24.3 | > 24.3 |
| % Grazers (SCR, SHR) | > 9 | 5.2-9 | < 5.2 |
| % Gatherers(CG) | > 12.5 | 7.3-12.5 | < 7.3 |
| % Filterers(FC) | (*a*) | > 16.3 | ≤ 16.3 |
| % Dominance (3 Taxa) | < 57.7 | 57.7-71.6 | > 71.6 |

*Aquatic life score: > 36 exceptional, 29-36 high, 22-28 intermediate, < 22 limited
(*a*) The discriminatory power was less than optimal for this bioregion, so the metric was assigned only two scoring categories.
(*b*) The median value for this bioregion was less than the metric-selection criterion (< 5.5 for taxa richness metrics; < 12 for percentage metrics expected to decrease with disturbance), so the metric was assigned only two categories.

Table B2. Texas Commission on Environmental Quality (TCEQ) Index of Biotic Integrity (IBI) metrics for ecoregions 33 and 35.

| | Scoring Criteria | | |
|---|---|---|---|
| | 5 | 3 | 1 |
| Total number of Fish Species | > 20 | 7-20 | < 7 |
| Number of Native Cyprinid Species | > 4 | 2-4 | < 2 |
| Number of Benthic Invertevore Species | > 4 | 3-4 | < 3 |
| Number of Sunfish Species | > 4 | 3-4 | < 3 |
| Number of Intolerant Species | > 3 | 2-3 | < 2 |
| Percent of Individuals as Tolerant Species (Excluding Gambusia) | < 26 | 26-50 | > 50 |
| Percent of Individuals as Omnivores | < 9 | 9-16 | >16 |
| Percent of Individuals as Invertivores | > 65 | 33-65 | < 33 |
| Percent of Individuals as Piscivores | > 9 | 5-9 | < 5 |
| Number of Individuals | > 28 | 14-28 | < 14 |
| Percent of Individuals as Non-Native Species | < 1.4 | 1.4-2.7 | < 2.7 |
| Percent of Individuals with disease or anomaly | < 0.6 | 0.6-1 | > 1 |

**Aquatic life use: ≥ 52 exceptional, 42-51 high, 36-41 intermediate, <36 limited

Appendix C: Community Metrics

| **Table C1**: Combined fish and macroinvertebrate community metrics | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Site** | **Mean** | **Stand.Dev.** | **Sum** | **Min** | **Max** | **S** | **E** | **H** | **D** | **Skewness** | **Kurtosis** |
| 12-S-BZ | 0.707 | 2.391 | 104 | 0 | 16 | 22 | 0.883 | 2.729 | 0.9161 | 4.481 | 21.626 |
| 16-S-BZ | 0.735 | 3.01 | 108 | 0 | 21 | 23 | 0.797 | 2.5 | 0.8798 | 5.686 | 33.713 |
| 19-S-BZ | 11.388 | 92.189 | 1674 | 0 | 1103 | 46 | 0.406 | 1.556 | 0.5504 | 11.567 | 137.302 |
| 01-C-WC | 2.612 | 12.983 | 384 | 0 | 112 | 29 | 0.659 | 2.218 | 0.8263 | 6.792 | 48.336 |
| 02-C-WC | 21.177 | 88.034 | 3113 | 0 | 774 | 61 | 0.647 | 2.66 | 0.8764 | 6.558 | 47.621 |
| 12-C-WC | 1.605 | 4.287 | 236 | 0 | 28 | 38 | 0.881 | 3.205 | 0.945 | 3.943 | 17.675 |
| 16-C-WC | 0.741 | 2.221 | 109 | 0 | 12 | 23 | 0.912 | 2.86 | 0.9326 | 3.446 | 11.573 |
| 19-C-WC | 18.156 | 133.846 | 2669 | 0 | 1607 | 62 | 0.472 | 1.949 | 0.626 | 11.636 | 138.675 |
| 01-R-LY | 3.544 | 24.084 | 521 | 0 | 286 | 25 | 0.596 | 1.92 | 0.6812 | 11.244 | 132.021 |
| 12-R-LY | 1.034 | 4.369 | 152 | 0 | 35 | 19 | 0.787 | 2.318 | 0.8726 | 5.436 | 32.813 |
| 16-R-LY | 1.32 | 3.988 | 194 | 0 | 24 | 30 | 0.871 | 2.962 | 0.9315 | 4.146 | 18.71 |
| 19-R-LY | 5.007 | 38.893 | 736 | 0 | 470 | 41 | 0.492 | 1.828 | 0.5855 | 11.869 | 142.753 |
| 01-R-TG | 1.088 | 4.343 | 160 | 0 | 39 | 32 | 0.772 | 2.676 | 0.8856 | 6.47 | 47.778 |
| 12-R-TG | 0.367 | 1.481 | 54 | 0 | 11 | 17 | 0.863 | 2.444 | 0.8834 | 5.722 | 36.542 |
| 16-R-TG | 0.585 | 1.883 | 86 | 0 | 11 | 21 | 0.901 | 2.743 | 0.9232 | 3.794 | 14.565 |
| 19-R-TG | 14.007 | 74.086 | 2059 | 0 | 690 | 59 | 0.557 | 2.273 | 0.8042 | 7.727 | 63.094 |
| 01-S-DW | 1.646 | 8.79 | 242 | 0 | 97 | 31 | 0.674 | 2.315 | 0.8006 | 9.377 | 97.652 |
| 12-S-DW | 0.646 | 2.235 | 95 | 0 | 20 | 24 | 0.871 | 2.768 | 0.9124 | 5.667 | 40.824 |
| 16-S-DW | 7.306 | 56.214 | 1074 | 0 | 675 | 39 | 0.475 | 1.739 | 0.5932 | 11.655 | 139.012 |
| 19-S-DW | 20.85 | 165.011 | 3065 | 0 | 1987 | 58 | 0.418 | 1.695 | 0.57 | 11.755 | 140.796 |
| 01-S-MT | 1.014 | 4.477 | 149 | 0 | 39 | 25 | 0.755 | 2.43 | 0.8614 | 6.68 | 49.21 |
| 12-S-MT | 0.612 | 2.213 | 90 | 0 | 14 | 20 | 0.868 | 2.599 | 0.9049 | 4.601 | 21.931 |
| 16-S-MT | 0.29 | 1.634 | 63 | 0 | 12 | 19 | 0.856 | 2.521 | 0.8949 | 4.981 | 26.607 |
| 19-S-MT | 1.306 | 9.626 | 192 | 0 | 115 | 23 | 0.557 | 1.748 | 0.6262 | 11.472 | 135.891 |
| AVERAGES: | 4.912 | 30.93 | 722 | 0 | 341.6 | 32.8 | 0.707 | 2.361 | 0.8035 | 7.363 | 66.53 |

3528 cells in main matrix
Percent of cells empty = 77.693
Matrix total = 0.17329E+05
Matrix mean = 0.49118E+01
Variance of totals of Sites = 0.10077E+07
CV of totals of Sites = 139.03%

S = Richness = number of non-zero elements in row
E = Evenness = H / ln (Richness)
H = Diversity = - sum (Pi*ln(Pi)) = Shannon`s diversity index
D = Simpson`s diversity index for infinite population = 1 - sum (Pi*Pi)
where Pi = importance probability in element i (element i relativized by row total)

**Table C2**: Fish community metrics

| Site | Mean | Stand.Dev. | Sum | Min | Max | S | E | H | D | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12-S-BZ | 1.34 | 3.378 | 67 | 0 | 16 | 11 | 0.877 | 2.104 | 0.8554 | 2.943 | 8.615 |
| 16-S-BZ | 1.94 | 4.888 | 97 | 0 | 21 | 18 | 0.785 | 2.27 | 0.8556 | 3.257 | 9.96 |
| 19-S-BZ | 2.54 | 4.833 | 127 | 0 | 20 | 22 | 0.854 | 2.641 | 0.909 | 2.265 | 4.335 |
| 01-C-WC | 2.18 | 11.115 | 109 | 0 | 78 | 9 | 0.499 | 1.095 | 0.4705 | 6.754 | 46.769 |
| 02-C-WC | 4.26 | 10.586 | 213 | 0 | 64 | 20 | 0.798 | 2.391 | 0.859 | 4.292 | 21.515 |
| 12-C-WC | 1.6 | 3.758 | 80 | 0 | 21 | 15 | 0.861 | 2.332 | 0.8719 | 3.52 | 14.833 |
| 16-C-WC | 1.18 | 2.939 | 59 | 0 | 12 | 10 | 0.898 | 2.067 | 0.8584 | 2.563 | 5.498 |
| 19-C-WC | 2.96 | 4.953 | 148 | 0 | 19 | 24 | 0.884 | 2.808 | 0.9251 | 2.02 | 3.589 |
| 01-R-LY | 3.48 | 8.495 | 174 | 0 | 40 | 13 | 0.86 | 2.206 | 0.8632 | 2.991 | 8.85 |
| 12-R-LY | 2.08 | 5.435 | 104 | 0 | 23 | 11 | 0.841 | 2.017 | 0.8462 | 2.831 | 7.382 |
| 16-R-LY | 3.14 | 6.158 | 157 | 0 | 24 | 19 | 0.876 | 2.579 | 0.9046 | 2.417 | 5.349 |
| 19-R-LY | 3.04 | 6.636 | 152 | 0 | 30 | 19 | 0.83 | 2.445 | 0.8866 | 2.915 | 8.94 |
| 01-R-TG | 1.24 | 4.265 | 62 | 0 | 26 | 12 | 0.717 | 1.781 | 0.7482 | 4.888 | 25.565 |
| 12-R-TG | 0.68 | 2.236 | 34 | 0 | 11 | 9 | 0.892 | 1.74 | 0.7682 | 4.21 | 17.824 |
| 16-R-TG | 1.48 | 2.866 | 74 | 0 | 11 | 16 | 0.908 | 2.518 | 0.9065 | 2.062 | 3.374 |
| 19-R-TG | 2.36 | 4.402 | 118 | 0 | 16 | 17 | 0.904 | 2.562 | 0.9118 | 1.828 | 2.055 |
| 01-S-DW | 1.5 | 5.828 | 75 | 0 | 36 | 12 | 0.635 | 1.579 | 0.6841 | 5.193 | 28.023 |
| 12-S-DW | 0.98 | 2.227 | 49 | 0 | 9 | 13 | 0.89 | 2.284 | 0.8788 | 2.59 | 6.119 |
| 16-S-DW | 1.04 | 2.864 | 52 | 0 | 16 | 12 | 0.834 | 2.073 | 0.8314 | 3.884 | 16.692 |
| 19-S-DW | 1.46 | 4.107 | 73 | 0 | 27 | 17 | 0.799 | 2.264 | 0.8249 | 5.263 | 31.626 |
| 01-S-MT | 1.62 | 5.034 | 81 | 0 | 31 | 13 | 0.754 | 1.935 | 0.7907 | 4.658 | 24.62 |
| 12-S-MT | 0.64 | 1.782 | 32 | 0 | 10 | 9 | 0.891 | 1.958 | 0.8281 | 3.708 | 15.897 |
| 16-S-MT | 0.56 | 1.74 | 28 | 0 | 8 | 7 | 0.874 | 1.7 | 0.7908 | 3.431 | 11.168 |
| 19-S-MT | 1 | 2.814 | 50 | 0 | 16 | 12 | 0.818 | 2.033 | 0.8248 | 3.938 | 17.444 |
| AVERAGES: | 1.846 | 4.722 | 92.29 | 0 | 24.38 | 14.2 | 0.82 | 2.141 | 0.8289 | 3.518 | 14.418 |

1200 cells in main matrix
Percent of cells empty = 71.667
Matrix total = 0.22150E+04
Matrix mean = 0.18458E+01
Variance of totals of Sites = 0.23830E+04
CV of totals of Sites = 52.89%

S = Richness = number of non-zero elements in row
E = Evenness = H / ln (Richness)
H = Diversity = - sum (Pi*ln(Pi)) = Shannon`s diversity index
D = Simpson`s diversity index for infinite population = 1 - sum (Pi*Pi)
where Pi = importance probability in element i (element i relativized by row total)

**Table C3:** Macroinvertebrate community metrics

| Site | Mean | Stand.Dev. | Sum | Min | Max | S | E | H | D | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12-S-BZ | 0.381 | 1.597 | 37 | 0 | 14 | 11 | 0.847 | 2.031 | 0.8108 | 6.916 | 56.159 |
| 16-S-BZ | 0.113 | 0.659 | 11 | 0 | 6 | 5 | 0.804 | 1.295 | 0.6446 | 7.886 | 68.146 |
| 19-S-BZ | 15.948 | 113.365 | 1547 | 0 | 1103 | 24 | 0.37 | 1.176 | 0.4742 | 9.405 | 90.692 |
| 01-S-DW | 1.722 | 10.007 | 167 | 0 | 97 | 19 | 0.594 | 1.749 | 0.645 | 9.205 | 88.058 |
| 02-S-DW | 6.557 | 27.348 | 636 | 0 | 246 | 29 | 0.675 | 2.274 | 0.8122 | 7.444 | 62.804 |
| 12-S-DW | 0.474 | 2.232 | 46 | 0 | 20 | 11 | 0.773 | 1.854 | 0.7637 | 7.437 | 62.577 |
| 16-S-DW | 10.536 | 69.07 | 1022 | 0 | 675 | 27 | 0.461 | 1.519 | 0.5512 | 9.481 | 91.894 |
| 19-S-DW | 30.845 | 202.743 | 2992 | 0 | 1987 | 41 | 0.422 | 1.566 | 0.5489 | 9.557 | 93.004 |
| 01-R-LY | 3.577 | 29.073 | 347 | 0 | 286 | 12 | 0.33 | 0.82 | 0.3158 | 9.749 | 95.643 |
| 02-R-LY | 3.052 | 19.31 | 296 | 0 | 186 | 24 | 0.483 | 1.534 | 0.5811 | 9.125 | 86.42 |
| 12-R-LY | 0.495 | 3.617 | 48 | 0 | 353 | 8 | 0.478 | 0.995 | 0.4444 | 9.29 | 88.812 |
| 16-R-LY | 0.381 | 1.489 | 37 | 0 | 10 | 11 | 0.848 | 2.033 | 0.8342 | 4.979 | 26.281 |
| 19-R-LY | 6.021 | 47.697 | 584 | 0 | 470 | 22 | 0.332 | 1.026 | 0.3493 | 9.789 | 96.196 |
| 01-S-MT | 0.701 | 4.154 | 68 | 0 | 39 | 12 | 0.607 | 1.509 | 0.6315 | 8.555 | 77.662 |
| 02-S-MT | 2.495 | 11.403 | 242 | 0 | 85 | 21 | 0.634 | 1.93 | 0.7766 | 6.165 | 39.636 |
| 12-S-MT | 0.598 | 2.414 | 58 | 0 | 14 | 11 | 0.81 | 1.943 | 0.8234 | 4.692 | 21.689 |
| 16-S-MT | 0.361 | 1.582 | 35 | 0 | 12 | 12 | 0.781 | 1.94 | 0.7935 | 6.1 | 39.544 |
| 19-S-MT | 1.464 | 11.696 | 142 | 0 | 115 | 11 | 0.364 | 0.872 | 0.3384 | 9.729 | 95.37 |
| 01-R-TG | 1.01 | 4.403 | 98 | 0 | 39 | 20 | 0.718 | 2.151 | 0.7959 | 7.294 | 59.739 |
| 02-R-TG | 3.371 | 14.267 | 327 | 0 | 127 | 30 | 0.685 | 2.331 | 0.8069 | 7.455 | 61.373 |
| 12-R-TG | 0.206 | 0.841 | 20 | 0 | 5 | 8 | 0.895 | 1.861 | 0.82 | 4.744 | 23.073 |
| 16-R-TG | 0.124 | 0.754 | 12 | 0 | 7 | 5 | 0.767 | 1.234 | 0.6111 | 8.291 | 74.268 |
| 19-R-TG | 20.01 | 90.723 | 1941 | 0 | 690 | 42 | 0.541 | 2.022 | 0.78 | 6.244 | 40.866 |
| 01-C-WC | 2.835 | 13.898 | 275 | 0 | 112 | 20 | 0.611 | 1.83 | 0.7445 | 6.735 | 47.67 |
| 02-C-WC | 29.897 | 107.253 | 2900 | 0 | 774 | 41 | 0.65 | 2.412 | 0.8584 | 5.307 | 30.805 |
| 03-C-WC | 13.979 | 89.423 | 1356 | 0 | 869 | 25 | 0.463 | 1.492 | 0.5722 | 9.322 | 89.619 |
| 04-C-WC | 9.557 | 45.356 | 927 | 0 | 372 | 23 | 0.588 | 1.843 | 0.7599 | 6.606 | 47.462 |
| 12-C-WC | 1.608 | 4.554 | 156 | 0 | 28 | 23 | 0.856 | 2.684 | 0.9079 | 4.047 | 18.178 |
| 16-C-WC | 0.515 | 1.715 | 50 | 0 | 11 | 13 | 0.894 | 2.292 | 0.8768 | 4.233 | 19.534 |
| 19-C-WC | 25.99 | 164.471 | 2521 | 0 | 1607 | 38 | 0.46 | 1.672 | 0.5811 | 9.46 | 91.601 |
| AVERAGES: | 6.494 | 36.57 | 629.9 | 0 | 334.7 | 20 | 0.625 | 1.73 | 0.6751 | 7.508 | 62.826 |

2910 cells in main matrix
Percent of cells empty = 79.416
Matrix total = 0.18898E+05
Matrix mean = 0.64942E+01
Variance of totals of Sites = 0.79353E+06
CV of totals of Sites = 141.41%

S = Richness = number of non-zero elements in row
E = Evenness = H / ln (Richness)
H = Diversity = - sum (Pi*ln(Pi)) = Shannon`s diversity index
D = Simpson`s diversity index for infinite population = 1 - sum (Pi*Pi)
where Pi = importance probability in element i (element i relativized by row total)

Appendix D: Canonical Correspondence Analysis of non-combined fish and macroinvertebrate data

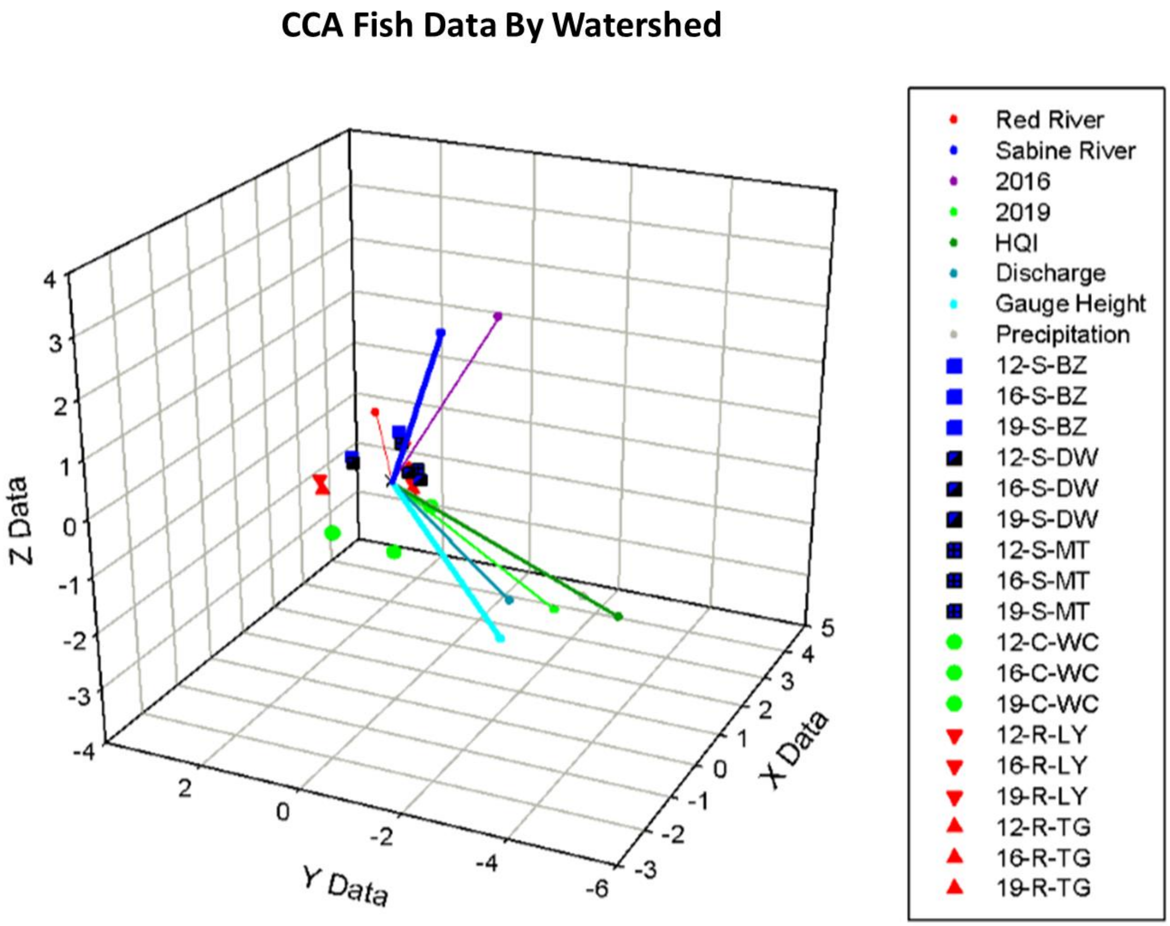



Figure D1: CCA utilizing fish data by watershed (p = 0.446).

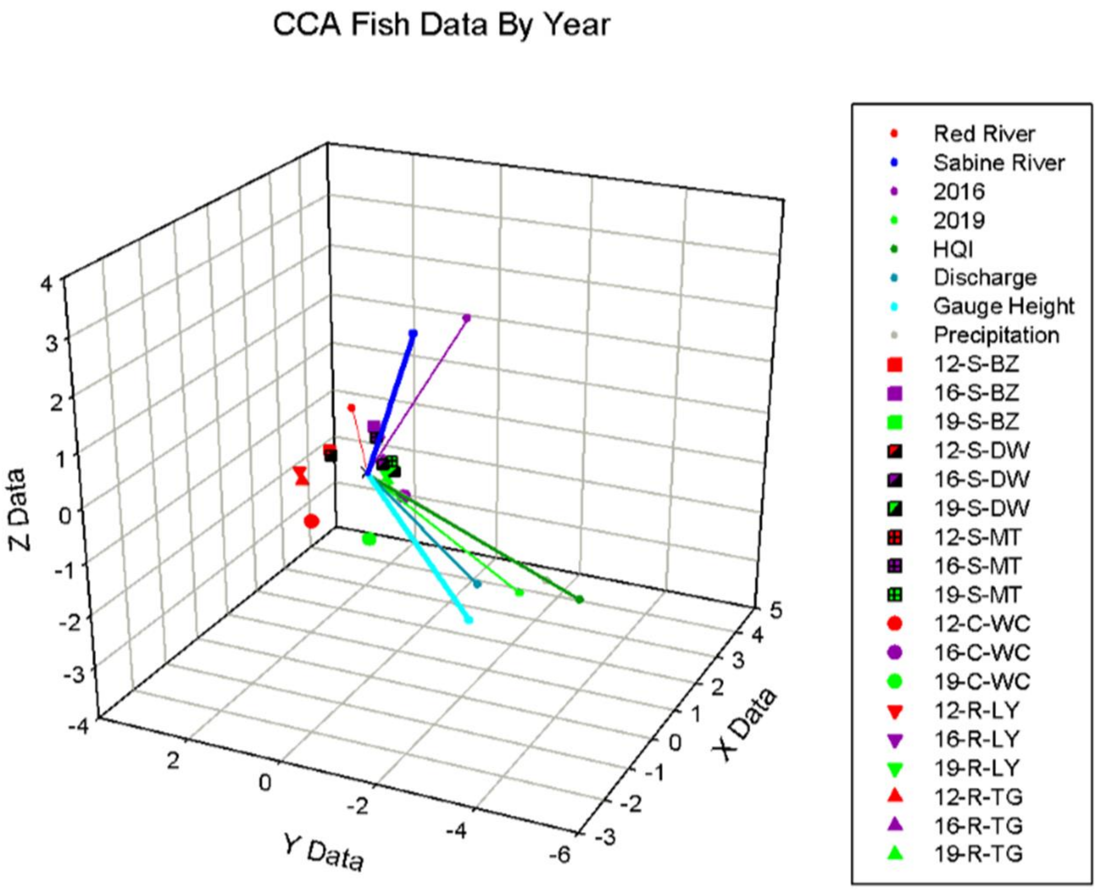



Figure D2: CCA utilizing fish data by year (p = 0.446).

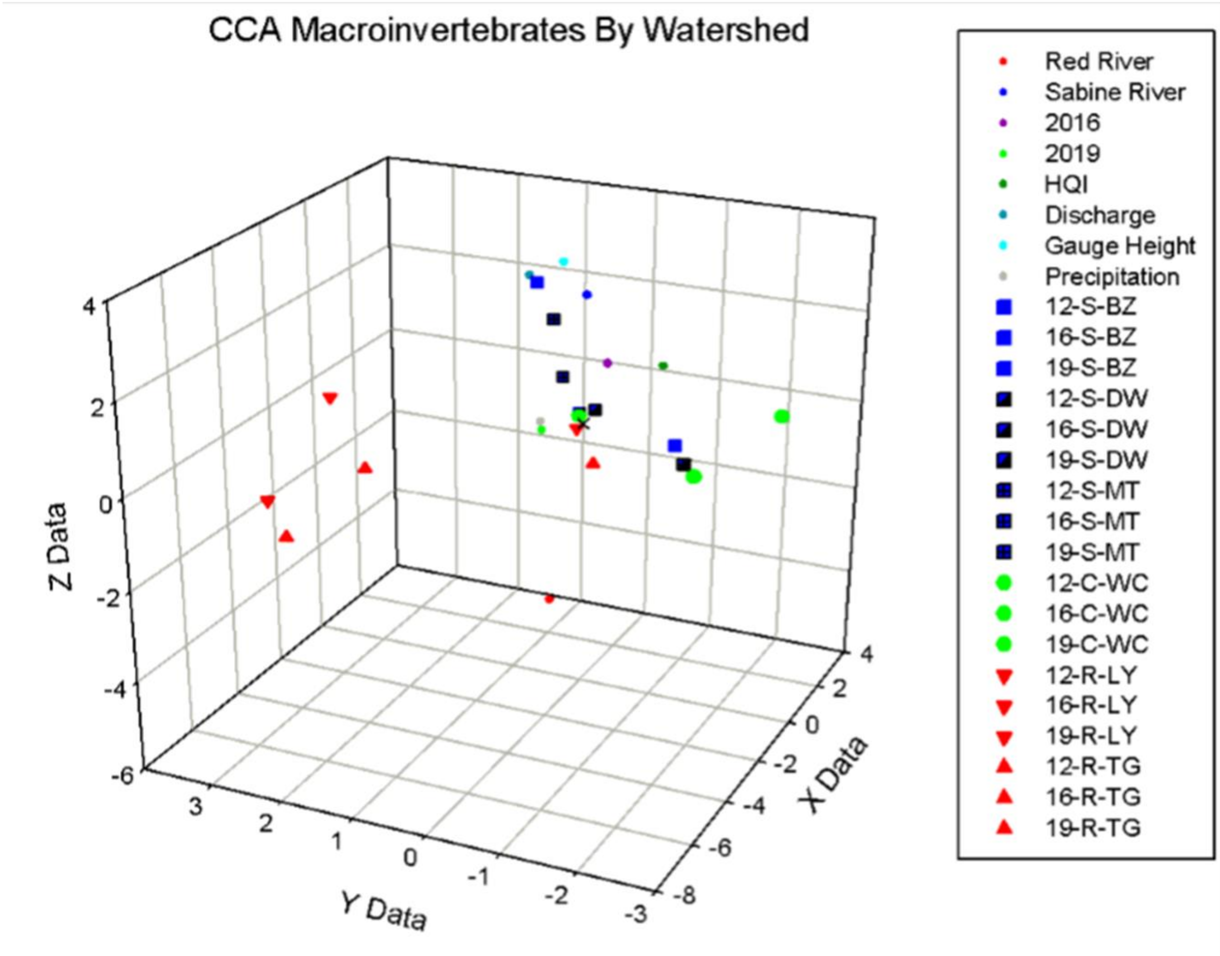



Figure D3: CCA utilizing macroinvertebrate data by watershed (p = 0.444).

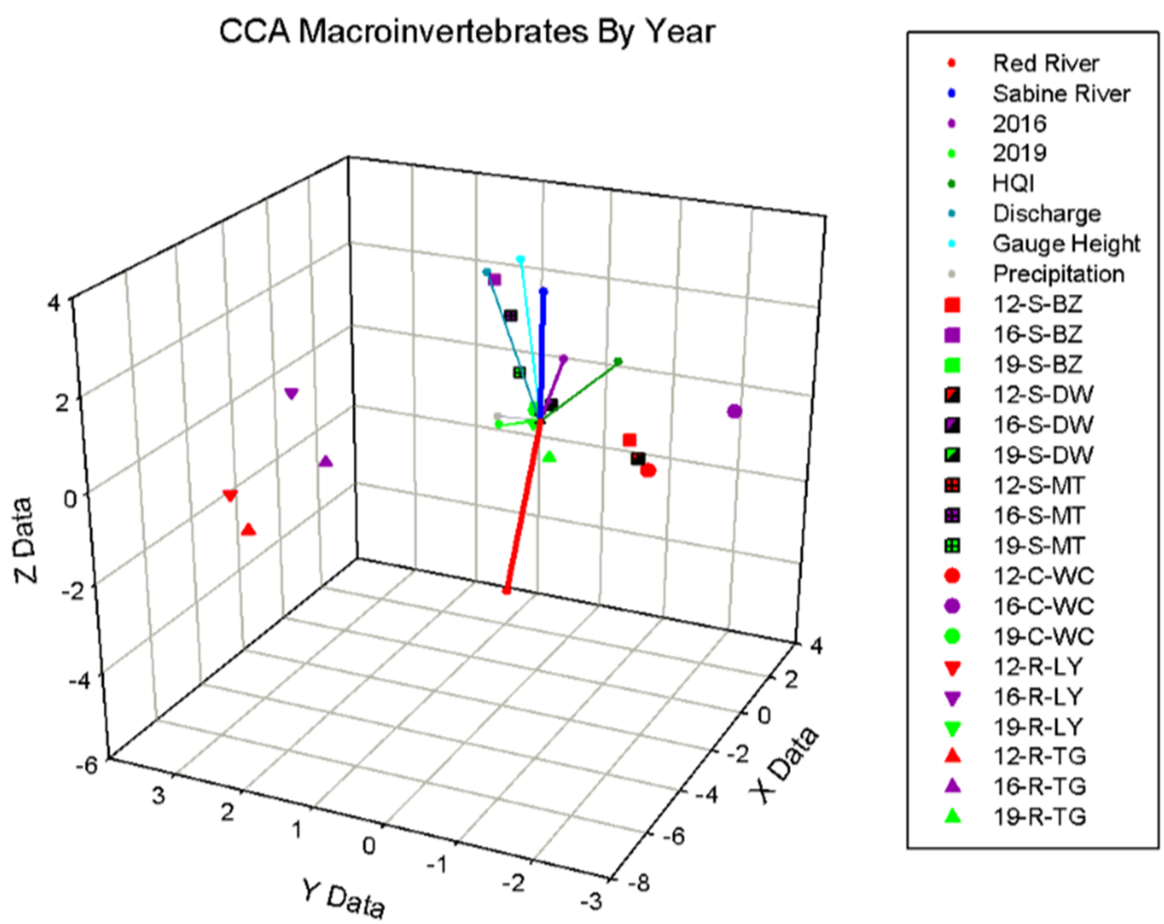



Figure D4: CCA utilizing macroinvertebrate data by year (p = 0.444).

Appendix E: Raw abundances

| **Table E1:** Fish assemblages 2001-2019 | | | | |
|---|---|---|---|---|
| Date | Year | Stream Name | *Genus species* | Abundance |
| 7/1/2001 | 2001 | Dowden | *Aphredoderus sayanus* | 4 |
| 7/1/2001 | 2001 | Dowden | *Cyprinella venusta* | 2 |
| 7/1/2001 | 2001 | Dowden | *Elassoma zonatum* | 1 |
| 7/1/2001 | 2001 | Dowden | *Etheostoma gracile* | 1 |
| 7/1/2001 | 2001 | Dowden | *Fundulus olivaceus* | 1 |
| 7/1/2001 | 2001 | Dowden | *Lepomis cyanellus* | 1 |
| 7/1/2001 | 2001 | Dowden | *Lepomis macrochirus* | 2 |
| 7/1/2001 | 2001 | Dowden | *Lepomis marginatus* | 2 |
| 7/1/2001 | 2001 | Dowden | *Lythrurus fumeus* | 36 |
| 7/1/2001 | 2001 | Dowden | *Lythrurus umbratilis* | 21 |
| 7/1/2001 | 2001 | Dowden | *Micropterus punctulatus* | 2 |
| 7/1/2001 | 2001 | Dowden | *Minytrema melanops* | 2 |
| 7/1/2001 | 2001 | Lyles | *Aphredoderus sayanus* | 11 |
| 7/1/2001 | 2001 | Lyles | *Erimyzon oblongus* | 24 |
| 7/1/2001 | 2001 | Lyles | *Esox americanus* | 3 |
| 7/1/2001 | 2001 | Lyles | *Etheostoma chlorosoma* | 11 |
| 7/1/2001 | 2001 | Lyles | *Etheostoma whipplei* | 4 |
| 7/1/2001 | 2001 | Lyles | *Fundulus olivaceus* | 40 |
| 7/1/2001 | 2001 | Lyles | *Gambusia affinis* | 3 |
| 7/1/2001 | 2001 | Lyles | *Lepomis cyanellus* | 7 |
| 7/1/2001 | 2001 | Lyles | *Lepomis marginatus* | 6 |
| 7/1/2001 | 2001 | Lyles | *Luxilus chrysocephalus* | 24 |
| 7/1/2001 | 2001 | Lyles | *Lythrurus umbratilis* | 8 |
| 7/1/2001 | 2001 | Lyles | *Notropis atrocaudalis* | 31 |
| 7/1/2001 | 2001 | Lyles | *Noturus phaeus* | 2 |
| 7/1/2001 | 2001 | Martin | *Aphredoderus sayanus* | 2 |
| 7/1/2001 | 2001 | Martin | *Cyprinella venusta* | 5 |
| 7/1/2001 | 2001 | Martin | *Erimyzon oblongus* | 1 |
| 7/1/2001 | 2001 | Martin | *Etheostoma chlorosoma* | 1 |
| 7/1/2001 | 2001 | Martin | *Etheostoma gracile* | 1 |
| 7/1/2001 | 2001 | Martin | *Fundulus olivaceus* | 13 |
| 7/1/2001 | 2001 | Martin | *Gambusia affinis* | 2 |
| 7/1/2001 | 2001 | Martin | *Lepomis macrochirus* | 6 |
| 7/1/2001 | 2001 | Martin | *Lepomis marginatus* | 12 |

| | | | | |
|---|---|---|---|---|
| 7/1/2001 | 2001 | Martin | *Lepomis megalotis* | 1 |
| 7/1/2001 | 2001 | Martin | *Lepomis punctatus* | 1 |
| 7/1/2001 | 2001 | Martin | *Lythrurus umbratilis* | 31 |
| 7/1/2001 | 2001 | Martin | *Notropis atrocaudalis* | 5 |
| 7/1/2001 | 2001 | Tiger | *Erimyzon oblongus* | 2 |
| 7/1/2001 | 2001 | Tiger | *Etheostoma chlorosoma* | 1 |
| 7/1/2001 | 2001 | Tiger | *Fundulus olivaceus* | 6 |
| 7/1/2001 | 2001 | Tiger | *Ichthyomyzon gagei* | 1 |
| 7/1/2001 | 2001 | Tiger | *Lepomis marginatus* | 3 |
| 7/1/2001 | 2001 | Tiger | *Lepomis punctatus* | 1 |
| 7/1/2001 | 2001 | Tiger | *Luxilus chrysocephalus* | 15 |
| 7/1/2001 | 2001 | Tiger | *Lythrurus umbratilis* | 26 |
| 7/1/2001 | 2001 | Tiger | *Notropis atrocaudalis* | 2 |
| 7/1/2001 | 2001 | Tiger | *Notropis sabinae* | 3 |
| 7/1/2001 | 2001 | Tiger | *Noturus phaeus* | 1 |
| 7/1/2001 | 2001 | Tiger | *Semotilus atromaculatus* | 1 |
| 6/17/2001 | 2001 | Whiskey Chitto | *Ammocrypta vivax* | 3 |
| 6/17/2001 | 2001 | Whiskey Chitto | *Cyprinella venusta* | 78 |
| 6/17/2001 | 2001 | Whiskey Chitto | *Fundulus olivaceus* | 4 |
| 6/17/2001 | 2001 | Whiskey Chitto | *Gambusia affinis* | 3 |
| 6/17/2001 | 2001 | Whiskey Chitto | *Lythrurus umbratilis* | 7 |
| 6/17/2001 | 2001 | Whiskey Chitto | *Micropterus punctulatus* | 1 |
| 6/17/2001 | 2001 | Whiskey Chitto | *Notropis volucellus* | 11 |
| 6/17/2001 | 2001 | Whiskey Chitto | *Noturus nocturnus* | 1 |
| 6/17/2001 | 2001 | Whiskey Chitto | *Percina sciera* | 1 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Ammocrypta vivax* | 2 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Cyprinella venusta* | 64 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Esox americanus* | 1 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Fundulus olivaceus* | 14 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Gambusia affinis* | 8 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Hybognathus nuchalis* | 12 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Lepomis marginatus* | 2 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Lepomis megalotis* | 11 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Lepomis miniatus* | 2 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Lythrurus fumeus* | 4 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Lythrurus umbratilis* | 7 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Micropterus punctulatus* | 7 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Minytrema melanops* | 6 |

| | | | | |
|---|---|---|---|---|
| 8/1/2002 | 2002 | Whiskey Chitto | *Moxostoma poecilurum* | 32 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Notropis sabinae* | 22 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Notropis volucellus* | 4 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Noturus gyrinus* | 1 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Noturus nocturnus* | 1 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Percina sciera* | 8 |
| 8/1/2002 | 2002 | Whiskey Chitto | *Pimephales vigilax* | 5 |
| | 2012 | Bayou Zourie | *Ameiurus natalis* | 4 |
| | 2012 | Bayou Zourie | *Aphredoderus sayanus* | 8 |
| | 2012 | Bayou Zourie | *Etheostoma gracile* | 3 |
| | 2012 | Bayou Zourie | *Fundulus olivaceus* | 12 |
| | 2012 | Bayou Zourie | *Gambusia affinis* | 9 |
| | 2012 | Bayou Zourie | *Lepomis gulosus* | 1 |
| | 2012 | Bayou Zourie | *Lepomis macrochirus* | 1 |
| | 2012 | Bayou Zourie | *Lepomis marginatus* | 8 |
| | 2012 | Bayou Zourie | *Lepomis megalotis* | 16 |
| | 2012 | Bayou Zourie | *Notropis atrocaudalis* | 3 |
| | 2012 | Bayou Zourie | *Percina sciera* | 2 |
| | 2012 | Dowden | *Ameiurus natalis* | 1 |
| | 2012 | Dowden | *Aphredoderus sayanus* | 2 |
| | 2012 | Dowden | *Erimyzon oblongus* | 1 |
| | 2012 | Dowden | *Fundulus olivaceus* | 1 |
| | 2012 | Dowden | *Hybognathus hayi* | 5 |
| | 2012 | Dowden | *Labidesthes sicculus* | 2 |
| | 2012 | Dowden | *Lepomis cyanellus* | 1 |
| | 2012 | Dowden | *Lepomis marginatus* | 4 |
| | 2012 | Dowden | *Lepomis megalotis* | 9 |
| | 2012 | Dowden | *Micropterus punctulatus* | 6 |
| | 2012 | Dowden | *Micropterus salmoides* | 2 |
| | 2012 | Dowden | *Notropis texanus* | 9 |
| | 2012 | Dowden | *Noturus gyrinus* | 6 |
| | 2012 | Lyles | *Ameiurus natalis* | 1 |
| | 2012 | Lyles | *Aphredoderus sayanus* | 14 |
| | 2012 | Lyles | *Erimyzon sucetta* | 22 |
| | 2012 | Lyles | *Fundulus olivaceus* | 11 |
| | 2012 | Lyles | *Gambusia affinis* | 1 |
| | 2012 | Lyles | *Lepomis cyanellus* | 3 |
| | 2012 | Lyles | *Lepomis megalotis* | 23 |

| | | | | |
|---|---|---|---|---|
| | 2012 | Lyles | *Notemigonus crysoleucas* | 3 |
| | 2012 | Lyles | *Notropis atrocaudalis* | 13 |
| | 2012 | Lyles | *Notropis texanus* | 12 |
| | 2012 | Lyles | *Percina sciera* | 1 |
| | 2012 | Martin | *Aphredoderus sayanus* | 5 |
| | 2012 | Martin | *Esox americanus* | 1 |
| | 2012 | Martin | *Fundulus olivaceus* | 1 |
| | 2012 | Martin | *Lepomis gulosus* | 2 |
| | 2012 | Martin | *Lepomis macrochirus* | 3 |
| | 2012 | Martin | *Lepomis marginatus* | 4 |
| | 2012 | Martin | *Lepomis megalotis* | 10 |
| | 2012 | Martin | *Lepomis miniatus* | 2 |
| | 2012 | Martin | *Micropterus punctulatus* | 4 |
| | 2012 | Tiger | *Ameiurus natalis* | 1 |
| | 2012 | Tiger | *Ammocrypta vivax* | 3 |
| | 2012 | Tiger | *Fundulus olivaceus* | 11 |
| | 2012 | Tiger | *Gambusia affinis* | 1 |
| | 2012 | Tiger | *Lepomis cyanellus* | 1 |
| | 2012 | Tiger | *Lepomis marginatus* | 2 |
| | 2012 | Tiger | *Notropis sabinae* | 1 |
| | 2012 | Tiger | *Notropis volucellus* | 11 |
| | 2012 | Tiger | *Noturus nocturnus* | 3 |
| | 2012 | Whiskey Chitto | *Ameiurus natalis* | 1 |
| | 2012 | Whiskey Chitto | *Aphredoderus sayanus* | 7 |
| | 2012 | Whiskey Chitto | *Cyprinella lutrensis* | 6 |
| | 2012 | Whiskey Chitto | *Cyprinella venusta* | 12 |
| | 2012 | Whiskey Chitto | *Etheostoma chlorosoma* | 2 |
| | 2012 | Whiskey Chitto | *Fundulus olivaceus* | 5 |
| | 2012 | Whiskey Chitto | *Gambusia affinis* | 2 |
| | 2012 | Whiskey Chitto | *Hybognathus hayi* | 21 |
| | 2012 | Whiskey Chitto | *Labidesthes sicculus* | 4 |
| | 2012 | Whiskey Chitto | *Lepomis cyanellus* | 1 |
| | 2012 | Whiskey Chitto | *Lepomis macrochirus* | 5 |
| | 2012 | Whiskey Chitto | *Micropterus punctulatus* | 6 |
| | 2012 | Whiskey Chitto | *Minytrema melanops* | 1 |
| | 2012 | Whiskey Chitto | *Notropis texanus* | 1 |
| | 2012 | Whiskey Chitto | *Percina sciera* | 6 |
| 5/16/2016 | 2016 | Bayou Zourie | *Ameiurus melas* | 1 |

| | | | | |
|---|---|---|---|---|
| 5/16/2016 | 2016 | Bayou Zourie | *Ameiurus natalis* | 3 |
| 5/16/2016 | 2016 | Bayou Zourie | *Aphredoderus sayanus* | 7 |
| 5/16/2016 | 2016 | Bayou Zourie | *Erimyzon oblongus* | 2 |
| 5/16/2016 | 2016 | Bayou Zourie | *Esox americanus* | 1 |
| 5/16/2016 | 2016 | Bayou Zourie | *Etheostoma gracile* | 2 |
| 5/16/2016 | 2016 | Bayou Zourie | *Fundulus olivaceus* | 19 |
| 5/16/2016 | 2016 | Bayou Zourie | *Gambusia affinis* | 2 |
| 5/16/2016 | 2016 | Bayou Zourie | *Lepomis macrochirus* | 20 |
| 5/16/2016 | 2016 | Bayou Zourie | *Lepomis megalotis* | 21 |
| 5/16/2016 | 2016 | Bayou Zourie | *Lepomis miniatus* | 2 |
| 5/16/2016 | 2016 | Bayou Zourie | *Lepomis spp.* | 1 |
| 5/16/2016 | 2016 | Bayou Zourie | *Lythrurus fumeus* | 8 |
| 5/16/2016 | 2016 | Bayou Zourie | *Micropterus punctulatus* | 1 |
| 5/16/2016 | 2016 | Bayou Zourie | *Notropis atrocaudalis* | 1 |
| 5/16/2016 | 2016 | Bayou Zourie | *Notropis texanus* | 3 |
| 5/16/2016 | 2016 | Bayou Zourie | *Noturus nocturnus* | 2 |
| 5/16/2016 | 2016 | Bayou Zourie | *Percina maculata* | 1 |
| 5/16/2016 | 2016 | Bayou Zourie | *Percina sciera* | 1 |
| 5/17/2016 | 2016 | Dowden | *Aphredoderus sayanus* | 10 |
| 5/17/2016 | 2016 | Dowden | *Elassoma zonatum* | 4 |
| 5/17/2016 | 2016 | Dowden | *Erimyzon oblongus* | 2 |
| 5/17/2016 | 2016 | Dowden | *Esox americanus* | 2 |
| 5/17/2016 | 2016 | Dowden | *Etheostoma artesiae* | 1 |
| 5/17/2016 | 2016 | Dowden | *Fundulus olivaceus* | 4 |
| 5/17/2016 | 2016 | Dowden | *Gambusia affinis* | 1 |
| 5/17/2016 | 2016 | Dowden | *Lepomis gulosus* | 2 |
| 5/17/2016 | 2016 | Dowden | *Lepomis megalotis* | 16 |
| 5/17/2016 | 2016 | Dowden | *Lepomis miniatus* | 7 |
| 5/17/2016 | 2016 | Dowden | *Lepomis spp.* | 1 |
| 5/17/2016 | 2016 | Dowden | *Lythrurus fumeus* | 1 |
| 5/17/2016 | 2016 | Dowden | *Noturus nocturnus* | 2 |
| 5/17/2016 | 2016 | Lyles | *Ameiurus melas* | 3 |
| 5/17/2016 | 2016 | Lyles | *Ameiurus natalis* | 3 |
| 5/17/2016 | 2016 | Lyles | *Aphredoderus sayanus* | 24 |
| 5/17/2016 | 2016 | Lyles | *Erimyzon oblongus* | 12 |
| 5/17/2016 | 2016 | Lyles | *Esox americanus* | 6 |
| 5/17/2016 | 2016 | Lyles | *Etheostoma artesiae* | 2 |
| 5/17/2016 | 2016 | Lyles | *Etheostoma chlorosoma* | 2 |

| | | | | |
|---|---|---|---|---|
| 5/17/2016 | 2016 | Lyles | *Fundulus hybrid* | 9 |
| 5/17/2016 | 2016 | Lyles | *Fundulus notatus* | 5 |
| 5/17/2016 | 2016 | Lyles | *Fundulus olivaceus* | 3 |
| 5/17/2016 | 2016 | Lyles | *Gambusia affinis* | 2 |
| 5/17/2016 | 2016 | Lyles | *Ichthyomyzon gagei* | 3 |
| 5/17/2016 | 2016 | Lyles | *Lepomis cyanellus* | 9 |
| 5/17/2016 | 2016 | Lyles | *Lepomis hybrid* | 1 |
| 5/17/2016 | 2016 | Lyles | *Lepomis marginatus* | 24 |
| 5/17/2016 | 2016 | Lyles | *Lepomis megalotis* | 6 |
| 5/17/2016 | 2016 | Lyles | *Luxilus chrysocephalus* | 10 |
| 5/17/2016 | 2016 | Lyles | *Lythrurus umbratilis* | 22 |
| 5/17/2016 | 2016 | Lyles | *Notropis atrocaudalis* | 8 |
| 5/17/2016 | 2016 | Lyles | *Noturus phaeus* | 3 |
| 5/17/2016 | 2016 | Lyles | *Semotilus atromaculatus* | 1 |
| 5/16/2016 | 2016 | Martin | *Cyprinella venusta* | 1 |
| 5/16/2016 | 2016 | Martin | *Fundulus olivaceus* | 8 |
| 5/16/2016 | 2016 | Martin | *Ichthyomyzon gagei* | 2 |
| 5/16/2016 | 2016 | Martin | *Lepomis macrochirus* | 1 |
| 5/16/2016 | 2016 | Martin | *Lepomis megalotis* | 7 |
| 5/16/2016 | 2016 | Martin | *Lepomis miniatus* | 3 |
| 5/16/2016 | 2016 | Martin | *Lythrurus fumeus* | 6 |
| 5/16/2016 | 2016 | Tiger | *Cyprinella venusta* | 11 |
| 5/16/2016 | 2016 | Tiger | *Etheostoma artesiae* | 2 |
| 5/16/2016 | 2016 | Tiger | *Etheostoma chlorosoma* | 1 |
| 5/16/2016 | 2016 | Tiger | *Etheostoma gracile* | 7 |
| 5/16/2016 | 2016 | Tiger | *Fundulus olivaceus* | 4 |
| 5/16/2016 | 2016 | Tiger | *Gambusia affinis* | 2 |
| 5/16/2016 | 2016 | Tiger | *Hybopsis amnis* | 1 |
| 5/16/2016 | 2016 | Tiger | *Ichthyomyzon gagei* | 1 |
| 5/16/2016 | 2016 | Tiger | *Lepomis cyanellus* | 7 |
| 5/16/2016 | 2016 | Tiger | *Lepomis macrochirus* | 5 |
| 5/16/2016 | 2016 | Tiger | *Lepomis marginatus* | 5 |
| 5/16/2016 | 2016 | Tiger | *Luxilus chrysocephalus* | 10 |
| 5/16/2016 | 2016 | Tiger | *Lythrurus umbratilis* | 3 |
| 5/16/2016 | 2016 | Tiger | *Noturus phaeus* | 9 |
| 5/16/2016 | 2016 | Tiger | *Percina maculata* | 1 |
| 5/16/2016 | 2016 | Tiger | *Semotilus atromaculatus* | 5 |
| 5/16/2016 | 2016 | Whiskey Chitto | *Aphredoderus sayanus* | 3 |

| | | | | |
|---|---|---|---|---|
| 5/16/2016 | 2016 | Whiskey Chitto | *Cyprinella venusta* | 8 |
| 5/16/2016 | 2016 | Whiskey Chitto | *Etheostoma chlorosoma* | 1 |
| 5/16/2016 | 2016 | Whiskey Chitto | *Fundulus olivaceus* | 8 |
| 5/16/2016 | 2016 | Whiskey Chitto | *Hybopsis amnis* | 1 |
| 5/16/2016 | 2016 | Whiskey Chitto | *Ichthyomyzon gagei* | 5 |
| 5/16/2016 | 2016 | Whiskey Chitto | *Lepomis megalotis* | 12 |
| 5/16/2016 | 2016 | Whiskey Chitto | *Lepomis miniatus* | 10 |
| 5/16/2016 | 2016 | Whiskey Chitto | *Lythrurus fumeus* | 9 |
| 5/16/2016 | 2016 | Whiskey Chitto | *Percina sciera* | 2 |
| 5/22/2019 | 2019 | Bayou Zourie | Aphredoderus sayanus | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Lepomis cyanellus | 2 |
| 5/22/2019 | 2019 | Bayou Zourie | Lepomis gulosus | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Lepomis macrochirus | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Lepomis marginatus | 4 |
| 5/22/2019 | 2019 | Bayou Zourie | Lepomis megalotis | 15 |
| 5/22/2019 | 2019 | Bayou Zourie | Lepomis miniatus | 5 |
| 5/22/2019 | 2019 | Bayou Zourie | Micropterus punctulatus | 2 |
| 5/22/2019 | 2019 | Bayou Zourie | Cyprinella venusta | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Lythrurus umbratilis | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Notropis texanus | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Opsopeoedus emiliae | 3 |
| 5/22/2019 | 2019 | Bayou Zourie | Pimephales vigilax | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Esox americanus | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Fundulus notatus | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Fundulus olivaceus | 5 |
| 5/22/2019 | 2019 | Bayou Zourie | Etheostoma artesiae | 3 |
| 5/22/2019 | 2019 | Bayou Zourie | Etheostoma chlorosomum | 2 |
| 5/22/2019 | 2019 | Bayou Zourie | Percina sciera | 1 |
| 5/21/2019 | 2019 | Dowden Creek | Labidesthes sicculus | 1 |
| 5/21/2019 | 2019 | Dowden Creek | Lepomis megalotis | 7 |
| 5/21/2019 | 2019 | Dowden Creek | Notropis texanus | 1 |
| 5/21/2019 | 2019 | Dowden Creek | Esox niger | 1 |
| 5/21/2019 | 2019 | Dowden Creek | Fundulus notatus | 1 |
| 5/21/2019 | 2019 | Dowden Creek | Fundulus olivaceus | 2 |
| 5/21/2019 | 2019 | Dowden Creek | Noturus nocturnus | 2 |
| 5/21/2019 | 2019 | Lyles Creek | Lepomis cyanellus | 4 |
| 5/21/2019 | 2019 | Lyles Creek | Lepomis marginatus | 8 |
| 5/21/2019 | 2019 | Lyles Creek | Lepomis megalotis | 8 |

| | | | | |
|---|---|---|---|---|
| 5/21/2019 | 2019 | Lyles Creek | Lepomis miniatus | 1 |
| 5/21/2019 | 2019 | Lyles Creek | Micropterus punctulatus | 1 |
| 5/21/2019 | 2019 | Lyles Creek | Lythrurus umbratilis | 13 |
| 5/21/2019 | 2019 | Lyles Creek | Notropis spp. | 1 |
| 5/21/2019 | 2019 | Lyles Creek | Esox americanus | 3 |
| 5/21/2019 | 2019 | Lyles Creek | Fundulus notatus | 3 |
| 5/21/2019 | 2019 | Lyles Creek | Fundulus olivaceus | 2 |
| 5/21/2019 | 2019 | Lyles Creek | Etheostoma artesiae | 1 |
| 5/21/2019 | 2019 | Lyles Creek | Ichthyomyzon gagei | 3 |
| 5/21/2019 | 2019 | Lyles Creek | Gambusia affinis | 3 |
| 5/21/2019 | 2019 | Martin Creek | Lepomis cyanellus | 1 |
| 5/21/2019 | 2019 | Martin Creek | Lepomis marginatus | 2 |
| 5/21/2019 | 2019 | Martin Creek | Lepomis megalotis | 5 |
| 5/21/2019 | 2019 | Martin Creek | Lythrurus fumeus | 1 |
| 5/21/2019 | 2019 | Martin Creek | Lythrurus umbratilis | 5 |
| 5/21/2019 | 2019 | Martin Creek | Fundulus olivaceus | 1 |
| 5/21/2019 | 2019 | Martin Creek | Ichthyomyzon gagei | 4 |
| 5/21/2019 | 2019 | Tiger Creek | Aphredoderus sayanus | 1 |
| 5/21/2019 | 2019 | Tiger Creek | Lepomis cyanellus | 7 |
| 5/21/2019 | 2019 | Tiger Creek | Lepomis marginatus | 1 |
| 5/21/2019 | 2019 | Tiger Creek | Lepomis megalotis | 6 |
| 5/21/2019 | 2019 | Tiger Creek | Cyprinella venusta | 9 |
| 5/21/2019 | 2019 | Tiger Creek | Luxilus chrysocephalus | 3 |
| 5/21/2019 | 2019 | Tiger Creek | Lythrurus umbratilis | 3 |
| 5/21/2019 | 2019 | Tiger Creek | Fundulus notatus | 1 |
| 5/21/2019 | 2019 | Tiger Creek | Fundulus olivaceus | 3 |
| 5/21/2019 | 2019 | Tiger Creek | Noturus phaeus | 6 |
| 5/21/2019 | 2019 | Tiger Creek | Etheostoma artesiae | 4 |
| 5/21/2019 | 2019 | Tiger Creek | Percina sciera | 2 |
| 5/21/2019 | 2019 | Tiger Creek | Gambusia affinis | 1 |
| 5/22/2019 | 2019 | Whiskey Chitto | Aphredoderus sayanus | 2 |
| 5/22/2019 | 2019 | Whiskey Chitto | Moxostoma poecilurum | 4 |
| 5/22/2019 | 2019 | Whiskey Chitto | Lepomis megalotis | 6 |
| 5/22/2019 | 2019 | Whiskey Chitto | Lepomis miniatus | 1 |
| 5/22/2019 | 2019 | Whiskey Chitto | Cyprinella venusta | 1 |
| 5/22/2019 | 2019 | Whiskey Chitto | Luxilus chrysocephalus | 1 |
| 5/22/2019 | 2019 | Whiskey Chitto | Lythrurus umbratilis | 5 |
| 5/22/2019 | 2019 | Whiskey Chitto | Notropis sabinae | 1 |

| | | | | |
|---|---|---|---|---|
| 5/22/2019 | 2019 | Whiskey Chitto | Notropis texanus | 2 |
| 5/22/2019 | 2019 | Whiskey Chitto | Opsopeoedus emiliae | 1 |
| 5/22/2019 | 2019 | Whiskey Chitto | Pimephales vigilax | 1 |
| 5/22/2019 | 2019 | Whiskey Chitto | Fundulus notatus | 3 |
| 5/22/2019 | 2019 | Whiskey Chitto | Fundulus olivaceus | 1 |
| 5/22/2019 | 2019 | Whiskey Chitto | Ichthyomyzon gagei | 1 |
| 8/6/2019 | 2019 | Bayou Zourie | Aphredoderus sayanus | 2 |
| 8/6/2019 | 2019 | Bayou Zourie | Lepomis cyanellus | 3 |
| 8/6/2019 | 2019 | Bayou Zourie | Lepomis marginatus | 8 |
| 8/6/2019 | 2019 | Bayou Zourie | Lepomis megalotis | 5 |
| 8/6/2019 | 2019 | Bayou Zourie | Lepomis miniatus | 2 |
| 8/6/2019 | 2019 | Bayou Zourie | Micropterus punctulatus | 1 |
| 8/6/2019 | 2019 | Bayou Zourie | Cyprinella venusta | 1 |
| 8/6/2019 | 2019 | Bayou Zourie | Notropis texanus | 1 |
| 8/6/2019 | 2019 | Bayou Zourie | Fundulus notatus | 9 |
| 8/6/2019 | 2019 | Bayou Zourie | Fundulus olivaceus | 10 |
| 8/6/2019 | 2019 | Bayou Zourie | Etheostoma artesiae | 12 |
| 8/6/2019 | 2019 | Bayou Zourie | Etheostoma chlorosomum | 1 |
| 8/6/2019 | 2019 | Bayou Zourie | Percina sciera | 1 |
| 8/6/2019 | 2019 | Bayou Zourie | Ichthyomyzon gagei | 1 |
| 8/6/2019 | 2019 | Bayou Zourie | Noturus nocturnus | 5 |
| 8/6/2019 | 2019 | Bayou Zourie | Gambusia affinis | 15 |
| 8/5/2019 | 2019 | Dowden Creek | Aphredoderus sayanus | 3 |
| 8/5/2019 | 2019 | Dowden Creek | Lepomis megalotis | 20 |
| 8/5/2019 | 2019 | Dowden Creek | Lepomis marginatus | 2 |
| 8/5/2019 | 2019 | Dowden Creek | Lepomis gulosus | 2 |
| 8/5/2019 | 2019 | Dowden Creek | Lepomis cyanellus | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Lepomis miniatus | 3 |
| 8/5/2019 | 2019 | Dowden Creek | Lepomis macrochirus | 2 |
| 8/5/2019 | 2019 | Dowden Creek | Notropis texanus | 2 |
| 8/5/2019 | 2019 | Dowden Creek | Pimephales vigilax | 3 |
| 8/5/2019 | 2019 | Dowden Creek | Esox americanus | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Fundulus notatus | 7 |
| 8/5/2019 | 2019 | Dowden Creek | Noturus nocturnus | 2 |
| 8/5/2019 | 2019 | Dowden Creek | Etheostoma artesiae | 2 |
| 8/5/2019 | 2019 | Dowden Creek | Gambusia affinis | 8 |
| 8/5/2019 | 2019 | Lyles Creek | Aphredoderus sayanus | 10 |
| 8/5/2019 | 2019 | Lyles Creek | Lepomis cyanellus | 7 |

| | | | | |
|---|---|---|---|---|
| 8/5/2019 | 2019 | Lyles Creek | Lepomis marginatus | 2 |
| 8/5/2019 | 2019 | Lyles Creek | Lepomis megalotis | 5 |
| 8/5/2019 | 2019 | Lyles Creek | Lepomis spp. | 4 |
| 8/5/2019 | 2019 | Lyles Creek | Micropterus punctulatus | 1 |
| 8/5/2019 | 2019 | Lyles Creek | Lythrurus umbratilis | 17 |
| 8/5/2019 | 2019 | Lyles Creek | Notropis atrocaudalis | 6 |
| 8/5/2019 | 2019 | Lyles Creek | Notropis texanus | 1 |
| 8/5/2019 | 2019 | Lyles Creek | Notropis volucellus | 1 |
| 8/5/2019 | 2019 | Lyles Creek | Semotilus atromaculatus | 3 |
| 8/5/2019 | 2019 | Lyles Creek | Fundulus notatus | 10 |
| 8/5/2019 | 2019 | Lyles Creek | Fundulus olivaceus | 10 |
| 8/5/2019 | 2019 | Lyles Creek | Noturus phaeus | 2 |
| 8/5/2019 | 2019 | Lyles Creek | Gambusia affinis | 26 |
| 8/5/2019 | 2019 | Lyles Creek | Erimyzon oblongus | 1 |
| 8/5/2019 | 2019 | Martin Creek | Aphredoderus sayanus | 1 |
| 8/5/2019 | 2019 | Martin Creek | Lepomis marginatus | 14 |
| 8/5/2019 | 2019 | Martin Creek | Lepomis megalotis | 1 |
| 8/5/2019 | 2019 | Martin Creek | Lythrurus fumeus | 1 |
| 8/5/2019 | 2019 | Martin Creek | Lythrurus umbratilis | 1 |
| 8/5/2019 | 2019 | Martin Creek | Notropis texanus | 1 |
| 8/5/2019 | 2019 | Martin Creek | Esox americanus | 1 |
| 8/5/2019 | 2019 | Martin Creek | Fundulus notatus | 9 |
| 8/5/2019 | 2019 | Martin Creek | Gambusia affinis | 2 |
| 8/5/2019 | 2019 | Tiger Creek | Erimyzon oblongus | 2 |
| 8/5/2019 | 2019 | Tiger Creek | Lepomis cyanellus | 6 |
| 8/5/2019 | 2019 | Tiger Creek | Lepomis megalotis | 7 |
| 8/5/2019 | 2019 | Tiger Creek | Cyprinella venusta | 7 |
| 8/5/2019 | 2019 | Tiger Creek | Hybognathus nuchalis | 2 |
| 8/5/2019 | 2019 | Tiger Creek | Lythrurus umbratilis | 4 |
| 8/5/2019 | 2019 | Tiger Creek | Notropis texanus | 10 |
| 8/5/2019 | 2019 | Tiger Creek | Pimephales vigilax | 5 |
| 8/5/2019 | 2019 | Tiger Creek | Fundulus notatus | 7 |
| 8/5/2019 | 2019 | Tiger Creek | Fundulus olivaceus | 9 |
| 8/5/2019 | 2019 | Tiger Creek | Noturus phaeus | 6 |
| 8/5/2019 | 2019 | Tiger Creek | Etheostoma artesiae | 5 |
| 8/5/2019 | 2019 | Tiger Creek | Gambusia affinis | 1 |
| 8/6/2019 | 2019 | Whiskey Chitto | Aphredoderus sayanus | 2 |
| 8/6/2019 | 2019 | Whiskey Chitto | Moxostoma poecilurum | 8 |

| | | | | |
|---|---|---|---|---|
| 8/6/2019 | 2019 | Whiskey Chitto | Lepomis gulosus | 1 |
| 8/6/2019 | 2019 | Whiskey Chitto | Lepomis marginatus | 1 |
| 8/6/2019 | 2019 | Whiskey Chitto | Lepomis megalotis | 13 |
| 8/6/2019 | 2019 | Whiskey Chitto | Lepomis miniatus | 4 |
| 8/6/2019 | 2019 | Whiskey Chitto | Micropterus punctulatus | 5 |
| 8/6/2019 | 2019 | Whiskey Chitto | Cyprinella venusta | 15 |
| 8/6/2019 | 2019 | Whiskey Chitto | Hybognathus nuchalis | 2 |
| 8/6/2019 | 2019 | Whiskey Chitto | Lythrurus umbratilis | 4 |
| 8/6/2019 | 2019 | Whiskey Chitto | Notropis texanus | 5 |
| 8/6/2019 | 2019 | Whiskey Chitto | Pimephales vigilax | 5 |
| 8/6/2019 | 2019 | Whiskey Chitto | Fundulus notatus | 8 |
| 8/6/2019 | 2019 | Whiskey Chitto | Fundulus olivaceus | 7 |
| 8/6/2019 | 2019 | Whiskey Chitto | Noturus nocturnus | 7 |
| 8/6/2019 | 2019 | Whiskey Chitto | Ammocrypta vivax | 3 |
| 8/6/2019 | 2019 | Whiskey Chitto | Etheostoma artesiae | 2 |
| 8/6/2019 | 2019 | Whiskey Chitto | Etheostoma chlorosomum | 2 |
| 8/6/2019 | 2019 | Whiskey Chitto | Etheostoma gracile | 1 |
| 8/6/2019 | 2019 | Whiskey Chitto | Percina sciera | 5 |
| 8/6/2019 | 2019 | Whiskey Chitto | Ichthyomyzon gagei | 18 |

**Table E2:** Macroinvertebrate assemblages 2001-2019

| Date | Year | Stream Name | Order | Family | Order Family | Abundance |
|---|---|---|---|---|---|---|
| 7/1/2001 | 2001 | Dowden | Acariformes | | Acariformes | 4 |
| 7/1/2001 | 2001 | Dowden | Amphipoda | Gammaridae | Amphipoda Gammaridae | 2 |
| 7/1/2001 | 2001 | Dowden | Coleoptera | Elmidae | Coleoptera Elmidae | 2 |
| 7/1/2001 | 2001 | Dowden | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 1 |
| 7/1/2001 | 2001 | Dowden | Decapoda | Palaemonidae | Decapoda Palaemonidae | 3 |
| 7/1/2001 | 2001 | Dowden | Diptera | Ceratopogonidae | Diptera Ceratopogonidae | 2 |
| 7/1/2001 | 2001 | Dowden | Diptera | Chironomidae | Diptera Chironomidae | 97 |
| 7/1/2001 | 2001 | Dowden | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 9 |
| 7/1/2001 | 2001 | Dowden | Ephemeroptera | Leptophlebiidae | Ephemeroptera Leptophlebiidae | 2 |
| 7/1/2001 | 2001 | Dowden | Gastropoda | | Gastropoda | 1 |
| 7/1/2001 | 2001 | Dowden | Hemiptera | Corixidae | Hemiptera Corixidae | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7/1/2001 | 2001 | Dowden | Megaloptera | Sialidae | Megaloptera Sialidae | 1 |
| 7/1/2001 | 2001 | Dowden | Mysidacea | Mysidae | Mysidacea Mysidae | 11 |
| 7/1/2001 | 2001 | Dowden | Odonata | Coenagrionidae | Odonata Coenagrionidae | 5 |
| 7/1/2001 | 2001 | Dowden | Odonata | Corduliidae | Odonata Corduliidae | 4 |
| 7/1/2001 | 2001 | Dowden | Odonata | Gomphidae | Odonata Gomphidae | 5 |
| 7/1/2001 | 2001 | Dowden | Odonata | Libellulidae | Odonata Libellulidae | 1 |
| 7/1/2001 | 2001 | Dowden | Trichoptera | Limnephilidae | Trichoptera Limnephilidae | 13 |
| 7/1/2001 | 2001 | Dowden | Trichoptera | Polycentropodidae | Trichoptera Polycentropodidae | 1 |
| 7/1/2001 | 2001 | Lyles | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 4 |
| 7/1/2001 | 2001 | Lyles | Diptera | Ceratopogonidae | Diptera Ceratopogonidae | 7 |
| 7/1/2001 | 2001 | Lyles | Diptera | Chironomidae | Diptera Chironomidae | 286 |
| 7/1/2001 | 2001 | Lyles | Diptera | Culicidae | Diptera Culicidae | 2 |
| 7/1/2001 | 2001 | Lyles | Diptera | Tabanidae | Diptera Tabanidae | 1 |
| 7/1/2001 | 2001 | Lyles | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 15 |
| 7/1/2001 | 2001 | Lyles | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 10 |
| 7/1/2001 | 2001 | Lyles | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 1 |
| 7/1/2001 | 2001 | Lyles | Hemiptera | Gerridae | Hemiptera Gerridae | 12 |
| 7/1/2001 | 2001 | Lyles | Hemiptera | Veliidae | Hemiptera Veliidae | 1 |
| 7/1/2001 | 2001 | Lyles | Hydroida | Hydridae | Hydroida Hydridae | 1 |
| 7/1/2001 | 2001 | Lyles | Odonata | Gomphidae | Odonata Gomphidae | 1 |
| 7/1/2001 | 2001 | Lyles | Oligochaeta | | Oligochaeta | 7 |
| 7/1/2001 | 2001 | Lyles | Orthoptera | Gryllotalpidae | Orthoptera Gryllotalpidae | 1 |
| 7/1/2001 | 2001 | Martin | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 2 |
| 7/1/2001 | 2001 | Martin | Coleoptera | Hydrophilidae | Coleoptera Hydrophilidae | 3 |
| 7/1/2001 | 2001 | Martin | Diptera | Chironomidae | Diptera Chironomidae | 39 |
| 7/1/2001 | 2001 | Martin | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 4 |
| 7/1/2001 | 2001 | Martin | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 1 |
| 7/1/2001 | 2001 | Martin | Hemiptera | Belostomatidae | Hemiptera Belostomatidae | 2 |
| 7/1/2001 | 2001 | Martin | Hemiptera | Hydrometridae | Hemiptera Hydrometridae | 1 |
| 7/1/2001 | 2001 | Martin | Isopoda | Asellidae | Isopoda Asellidae | 1 |

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|---|---|---|---|---|---|---|
| 7/1/2001 | 2001 | Martin | Odonata | Coenagrionidae | Odonata Coenagrionidae | 1 |
| 7/1/2001 | 2001 | Martin | Odonata | Cordulegastridae | Odonata Cordulegastridae | 1 |
| 7/1/2001 | 2001 | Martin | Odonata | Corduliidae | Odonata Corduliidae | 1 |
| 7/1/2001 | 2001 | Martin | Oligochaeta | | Oligochaeta | 12 |
| 7/1/2001 | 2001 | Tiger | Acariformes | | Acariformes | 1 |
| 7/1/2001 | 2001 | Tiger | Amphipoda | Gammaridae | Amphipoda Gammaridae | 1 |
| 7/1/2001 | 2001 | Tiger | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 3 |
| 7/1/2001 | 2001 | Tiger | Coleoptera | Elmidae | Coleoptera Elmidae | 2 |
| 7/1/2001 | 2001 | Tiger | Coleoptera | Hydrochidae | Coleoptera Hydrochidae | 1 |
| 7/1/2001 | 2001 | Tiger | Diptera | Ceratopogonidae | Diptera Ceratopogonidae | 1 |
| 7/1/2001 | 2001 | Tiger | Diptera | Chironomidae | Diptera Chironomidae | 15 |
| 7/1/2001 | 2001 | Tiger | Diptera | Tabanidae | Diptera Tabanidae | 1 |
| 7/1/2001 | 2001 | Tiger | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 2 |
| 7/1/2001 | 2001 | Tiger | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 9 |
| 7/1/2001 | 2001 | Tiger | Ephemeroptera | Ephemerellidae | Ephemeroptera Ephemerellidae | 1 |
| 7/1/2001 | 2001 | Tiger | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 39 |
| 7/1/2001 | 2001 | Tiger | Ephemeroptera | Tricorythidae | Ephemeroptera Tricorythidae | 1 |
| 7/1/2001 | 2001 | Tiger | Hemiptera | Veliidae | Hemiptera Veliidae | 1 |
| 7/1/2001 | 2001 | Tiger | Nematoda | | Nematoda | 1 |
| 7/1/2001 | 2001 | Tiger | Odonata | Calopterygidae | Odonata Calopterygidae | 3 |
| 7/1/2001 | 2001 | Tiger | Odonata | Cordulegastridae | Odonata Cordulegastridae | 2 |
| 7/1/2001 | 2001 | Tiger | Odonata | Corduliidae | Odonata Corduliidae | 3 |
| 7/1/2001 | 2001 | Tiger | Odonata | Gomphidae | Odonata Gomphidae | 9 |
| 7/1/2001 | 2001 | Tiger | Plecoptera | Perlidae | Plecoptera Perlidae | 2 |
| 6/17/2001 | 2001 | Whiskey Chitto | Coleoptera | Elmidae | Coleoptera Elmidae | 5 |
| 6/17/2001 | 2001 | Whiskey Chitto | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 2 |
| 6/17/2001 | 2001 | Whiskey Chitto | Decapoda | Palaemonidae | Decapoda Palaemonidae | 1 |
| 6/17/2001 | 2001 | Whiskey Chitto | Diptera | Ceratopogonidae | Diptera Ceratopogonidae | 76 |
| 6/17/2001 | 2001 | Whiskey Chitto | Diptera | Chironomidae | Diptera Chironomidae | 112 |

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|---|---|---|---|---|---|---|
| 6/17/2001 | 2001 | Whiskey Chitto | Diptera | Empididae | Diptera Empididae | 1 |
| 6/17/2001 | 2001 | Whiskey Chitto | Diptera | | Diptera | 2 |
| 6/17/2001 | 2001 | Whiskey Chitto | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 5 |
| 6/17/2001 | 2001 | Whiskey Chitto | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 12 |
| 6/17/2001 | 2001 | Whiskey Chitto | Ephemeroptera | Ephemerellidae | Ephemeroptera Ephemerellidae | 2 |
| 6/17/2001 | 2001 | Whiskey Chitto | Ephemeroptera | Ephemeridae | Ephemeroptera Ephemeridae | 1 |
| 6/17/2001 | 2001 | Whiskey Chitto | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 6 |
| 6/17/2001 | 2001 | Whiskey Chitto | Ephemeroptera | Tricorythidae | Ephemeroptera Tricorythidae | 4 |
| 6/17/2001 | 2001 | Whiskey Chitto | Ephemeroptera | | Ephemeroptera | 1 |
| 6/17/2001 | 2001 | Whiskey Chitto | Hirudinea | | Hirudinea | 1 |
| 6/17/2001 | 2001 | Whiskey Chitto | Odonata | Aeshnidae | Odonata Aeshnidae | 1 |
| 6/17/2001 | 2001 | Whiskey Chitto | Odonata | Corduliidae | Odonata Corduliidae | 1 |
| 6/17/2001 | 2001 | Whiskey Chitto | Odonata | Gomphidae | Odonata Gomphidae | 19 |
| 6/17/2001 | 2001 | Whiskey Chitto | Oligochaete | | Oligochaete | 19 |
| 6/17/2001 | 2001 | Whiskey Chitto | Trichoptera | Brachycentridae | Trichoptera Brachycentridae | 2 |
| 6/17/2001 | 2001 | Whiskey Chitto | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 4 |
| 6/17/2001 | 2001 | Whiskey Chitto | Trichoptera | Leptoceridae | Trichoptera Leptoceridae | 1 |
| 8/1/2002 | 2002 | Dowden | Acariformes | | Acariformes | 6 |
| 8/1/2002 | 2002 | Dowden | Amphipoda | Gammaridae | Amphipoda Gammaridae | 1 |
| 8/1/2002 | 2002 | Dowden | Amphipoda | Hyalellidae | Amphipoda Hyalellidae | 2 |
| 8/1/2002 | 2002 | Dowden | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 1 |
| 8/1/2002 | 2002 | Dowden | Coleoptera | Elmidae | Coleoptera Elmidae | 40 |
| 8/1/2002 | 2002 | Dowden | Coleoptera | Scirtidae | Coleoptera Scirtidae | 1 |
| 8/1/2002 | 2002 | Dowden | Decapoda | Palaemonidae | Decapoda Palaemonidae | 10 |
| 8/1/2002 | 2002 | Dowden | Diptera | Ceratopogonidae | Diptera Ceratopogonidae | 21 |
| 8/1/2002 | 2002 | Dowden | Diptera | Chaoboridae | Diptera Chaoboridae | 1 |
| 8/1/2002 | 2002 | Dowden | Diptera | Chironomidae | Diptera Chironomidae | 246 |
| 8/1/2002 | 2002 | Dowden | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 1 |
| 8/1/2002 | 2002 | Dowden | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 7 |

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|---|---|---|---|---|---|---|
| 8/1/2002 | 2002 | Dowden | Ephemeroptera | Leptophlebiidae | Ephemeroptera Leptophlebiidae | 9 |
| 8/1/2002 | 2002 | Dowden | Hemiptera | Corixidae | Hemiptera Corixidae | 22 |
| 8/1/2002 | 2002 | Dowden | Hemiptera | Gerridae | Hemiptera Gerridae | 31 |
| 8/1/2002 | 2002 | Dowden | Megaloptera | Corydalidae | Megaloptera Corydalidae | 1 |
| 8/1/2002 | 2002 | Dowden | Megaloptera | Sialidae | Megaloptera Sialidae | 35 |
| 8/1/2002 | 2002 | Dowden | Mysidacea | Mysidae | Mysidacea Mysidae | 5 |
| 8/1/2002 | 2002 | Dowden | Odonata | Aeshnidae | Odonata Aeshnidae | 1 |
| 8/1/2002 | 2002 | Dowden | Odonata | Coenagrionidae | Odonata Coenagrionidae | 78 |
| 8/1/2002 | 2002 | Dowden | Odonata | Corduliidae | Odonata Corduliidae | 7 |
| 8/1/2002 | 2002 | Dowden | Odonata | Gomphidae | Odonata Gomphidae | 15 |
| 8/1/2002 | 2002 | Dowden | Odonata | Libellulidae | Odonata Libellulidae | 16 |
| 8/1/2002 | 2002 | Dowden | Oligochaeta | | Oligochaeta | 8 |
| 8/1/2002 | 2002 | Dowden | Trichoptera | Leptoceridae | Trichoptera Leptoceridae | 61 |
| 8/1/2002 | 2002 | Dowden | Trichoptera | Limnephilidae | Trichoptera Limnephilidae | 1 |
| 8/1/2002 | 2002 | Dowden | Trichoptera | Molannidae | Trichoptera Molannidae | 2 |
| 8/1/2002 | 2002 | Dowden | Trichoptera | Polycentropodidae | Trichoptera Polycentropodidae | 6 |
| 8/1/2002 | 2002 | Dowden | Trichoptera | Psychomyiidae | Trichoptera Psychomyiidae | 1 |
| 8/1/2002 | 2002 | Lyles | Acariformes | | Acariformes | 1 |
| 8/1/2002 | 2002 | Lyles | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 2 |
| 8/1/2002 | 2002 | Lyles | Coleoptera | Elmidae | Coleoptera Elmidae | 1 |
| 8/1/2002 | 2002 | Lyles | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 1 |
| 8/1/2002 | 2002 | Lyles | Coleoptera | Hydrochidae | Coleoptera Hydrochidae | 4 |
| 8/1/2002 | 2002 | Lyles | Coleoptera | Psephenidae | Coleoptera Psephenidae | 1 |
| 8/1/2002 | 2002 | Lyles | Diptera | Ceratopogonidae | Diptera Ceratopogonidae | 2 |
| 8/1/2002 | 2002 | Lyles | Diptera | Chironomidae | Diptera Chironomidae | 9 |
| 8/1/2002 | 2002 | Lyles | Diptera | Tabanidae | Diptera Tabanidae | 1 |
| 8/1/2002 | 2002 | Lyles | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 7 |
| 8/1/2002 | 2002 | Lyles | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 186 |
| 8/1/2002 | 2002 | Lyles | Ephemeroptera | Ephemerellidae | Ephemeroptera Ephemerellidae | 1 |

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|---|---|---|---|---|---|---|
| 8/1/2002 | 2002 | Lyles | Ephemeroptera | Ephemeridae | Ephemeroptera Ephemeridae | 1 |
| 8/1/2002 | 2002 | Lyles | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 6 |
| 8/1/2002 | 2002 | Lyles | Hemiptera | Corixidae | Hemiptera Corixidae | 2 |
| 8/1/2002 | 2002 | Lyles | Hemiptera | Gerridae | Hemiptera Gerridae | 41 |
| 8/1/2002 | 2002 | Lyles | Megaloptera | Sialidae | Megaloptera Sialidae | 2 |
| 8/1/2002 | 2002 | Lyles | Odonata | Aeshnidae | Odonata Aeshnidae | 1 |
| 8/1/2002 | 2002 | Lyles | Odonata | Coenagrionidae | Odonata Coenagrionidae | 10 |
| 8/1/2002 | 2002 | Lyles | Odonata | Corduliidae | Odonata Corduliidae | 1 |
| 8/1/2002 | 2002 | Lyles | Odonata | Gomphidae | Odonata Gomphidae | 10 |
| 8/1/2002 | 2002 | Lyles | Odonata | Libellulidae | Odonata Libellulidae | 2 |
| 8/1/2002 | 2002 | Lyles | Oligochaeta | | Oligochaeta | 3 |
| 8/1/2002 | 2002 | Lyles | Trichoptera | Limnephilidae | Trichoptera Limnephilidae | 1 |
| 8/1/2002 | 2002 | Martin | Arachnida | Pisauridae | Arachnida Pisauridae | 4 |
| 8/1/2002 | 2002 | Martin | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 2 |
| 8/1/2002 | 2002 | Martin | Coleoptera | Elmidae | Coleoptera Elmidae | 2 |
| 8/1/2002 | 2002 | Martin | Coleoptera | Hydrochidae | Coleoptera Hydrochidae | 1 |
| 8/1/2002 | 2002 | Martin | Coleoptera | Hydrophilidae | Coleoptera Hydrophilidae | 2 |
| 8/1/2002 | 2002 | Martin | Coleoptera | Scirtidae | Coleoptera Scirtidae | 2 |
| 8/1/2002 | 2002 | Martin | Diptera | Chaoboridae | Diptera Chaoboridae | 2 |
| 8/1/2002 | 2002 | Martin | Diptera | Chironomidae | Diptera Chironomidae | 85 |
| 8/1/2002 | 2002 | Martin | Diptera | Tabanidae | Diptera Tabanidae | 2 |
| 8/1/2002 | 2002 | Martin | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 1 |
| 8/1/2002 | 2002 | Martin | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 68 |
| 8/1/2002 | 2002 | Martin | Hemiptera | Corixidae | Hemiptera Corixidae | 1 |
| 8/1/2002 | 2002 | Martin | Hemiptera | Gerridae | Hemiptera Gerridae | 6 |
| 8/1/2002 | 2002 | Martin | Hemiptera | Hydrometridae | Hemiptera Hydrometridae | 1 |
| 8/1/2002 | 2002 | Martin | Hemiptera | Veliidae | Hemiptera Veliidae | 1 |
| 8/1/2002 | 2002 | Martin | Megaloptera | Sialidae | Megaloptera Sialidae | 1 |
| 8/1/2002 | 2002 | Martin | Odonata | Coenagrionidae | Odonata Coenagrionidae | 27 |
| 8/1/2002 | 2002 | Martin | Odonata | Gomphidae | Odonata Gomphidae | 2 |
| 8/1/2002 | 2002 | Martin | Odonata | Libellulidae | Odonata Libellulidae | 16 |
| 8/1/2002 | 2002 | Martin | Oligochaeta | | Oligochaeta | 10 |

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|---|---|---|---|---|---|---|
| 8/1/2002 | 2002 | Martin | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 1 |
| 8/1/2002 | 2002 | Martin | Trichoptera | Leptoceridae | Trichoptera Leptoceridae | 9 |
| 8/1/2002 | 2002 | Tiger | Arachnida | Pisauridae | Arachnida Pisauridae | 3 |
| 8/1/2002 | 2002 | Tiger | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 1 |
| 8/1/2002 | 2002 | Tiger | Coleoptera | Elmidae | Coleoptera Elmidae | 1 |
| 8/1/2002 | 2002 | Tiger | Coleoptera | Hydrochidae | Coleoptera Hydrochidae | 4 |
| 8/1/2002 | 2002 | Tiger | Coleoptera | Psephenidae | Coleoptera Psephenidae | 6 |
| 8/1/2002 | 2002 | Tiger | Coleoptera | Scirtidae | Coleoptera Scirtidae | 2 |
| 8/1/2002 | 2002 | Tiger | Diptera | Ceratopogonidae | Diptera Ceratopogonidae | 9 |
| 8/1/2002 | 2002 | Tiger | Diptera | Chaoboridae | Diptera Chaoboridae | 3 |
| 8/1/2002 | 2002 | Tiger | Diptera | Chironomidae | Diptera Chironomidae | 55 |
| 8/1/2002 | 2002 | Tiger | Diptera | Dixidae | Diptera Dixidae | 3 |
| 8/1/2002 | 2002 | Tiger | Diptera | Simuliidae | Diptera Simuliidae | 2 |
| 8/1/2002 | 2002 | Tiger | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 12 |
| 8/1/2002 | 2002 | Tiger | Ephemeroptera | Baetiscidae | Ephemeroptera Baetiscidae | 2 |
| 8/1/2002 | 2002 | Tiger | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 127 |
| 8/1/2002 | 2002 | Tiger | Ephemeroptera | Ephemerellidae | Ephemeroptera Ephemerellidae | 5 |
| 8/1/2002 | 2002 | Tiger | Ephemeroptera | Ephemeridae | Ephemeroptera Ephemeridae | 4 |
| 8/1/2002 | 2002 | Tiger | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 19 |
| 8/1/2002 | 2002 | Tiger | Ephemeroptera | Tricorythidae | Ephemeroptera Tricorythidae | 1 |
| 8/1/2002 | 2002 | Tiger | Gastropoda | Ancylidae | Gastropoda Ancylidae | 5 |
| 8/1/2002 | 2002 | Tiger | Hemiptera | Gerridae | Hemiptera Gerridae | 21 |
| 8/1/2002 | 2002 | Tiger | Hemiptera | Nepidae | Hemiptera Nepidae | 1 |
| 8/1/2002 | 2002 | Tiger | Odonata | Calopterygidae | Odonata Calopterygidae | 1 |
| 8/1/2002 | 2002 | Tiger | Odonata | Coenagrionidae | Odonata Coenagrionidae | 2 |
| 8/1/2002 | 2002 | Tiger | Odonata | Corduliidae | Odonata Corduliidae | 9 |
| 8/1/2002 | 2002 | Tiger | Odonata | Gomphidae | Odonata Gomphidae | 5 |
| 8/1/2002 | 2002 | Tiger | Oligochaeta | | Oligochaeta | 3 |
| 8/1/2002 | 2002 | Tiger | Trichoptera | Hydroptilidae | Trichoptera Hydroptilidae | 2 |

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|---|---|---|---|---|---|---|
| 8/1/2002 | 2002 | Tiger | Trichoptera | Leptoceridae | Trichoptera Leptoceridae | 12 |
| 8/1/2002 | 2002 | Tiger | Trichoptera | Limnephilidae | Trichoptera Limnephilidae | 5 |
| 8/1/2002 | 2002 | Tiger | Trichoptera | Phryganeidae | Trichoptera Phryganeidae | 1 |
| 8/1/2002 | 2002 | Tiger | Trichoptera | Polycentropodidae | Trichoptera Polycentropodidae | 4 |
| 8/1/2002 | 2002 | Whiskey Chitto | Araneae | Pisauridae | Araneae Pisauridae | 10 |
| 8/1/2002 | 2002 | Whiskey Chitto | Araneae | Tetragnathidae | Araneae Tetragnathidae | 1 |
| 8/1/2002 | 2002 | Whiskey Chitto | Bivalves | | Bivalves | 38 |
| 8/1/2002 | 2002 | Whiskey Chitto | Coleoptera | Dryopidae | Coleoptera Dryopidae | 3 |
| 8/1/2002 | 2002 | Whiskey Chitto | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 1 |
| 8/1/2002 | 2002 | Whiskey Chitto | Coleoptera | Elmidae | Coleoptera Elmidae | 342 |
| 8/1/2002 | 2002 | Whiskey Chitto | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 7 |
| 8/1/2002 | 2002 | Whiskey Chitto | Coleoptera | Haliplidae | Coleoptera Haliplidae | 1 |
| 8/1/2002 | 2002 | Whiskey Chitto | Decapoda | Palaemonidae | Decapoda Palaemonidae | 3 |
| 8/1/2002 | 2002 | Whiskey Chitto | Diptera | Athericidae | Diptera Athericidae | 1 |
| 8/1/2002 | 2002 | Whiskey Chitto | Diptera | Ceratopogonidae | Diptera Ceratopogonidae | 288 |
| 8/1/2002 | 2002 | Whiskey Chitto | Diptera | Chironomidae | Diptera Chironomidae | 774 |
| 8/1/2002 | 2002 | Whiskey Chitto | Diptera | Empididae | Diptera Empididae | 5 |
| 8/1/2002 | 2002 | Whiskey Chitto | Diptera | Ephydridae | Diptera Ephydridae | 3 |
| 8/1/2002 | 2002 | Whiskey Chitto | Diptera | Simuliidae | Diptera Simuliidae | 4 |
| 8/1/2002 | 2002 | Whiskey Chitto | Diptera | Tabanidae | Diptera Tabanidae | 8 |
| 8/1/2002 | 2002 | Whiskey Chitto | Diptera | Tipulidae | Diptera Tipulidae | 36 |
| 8/1/2002 | 2002 | Whiskey Chitto | Diptera | | Diptera | 167 |
| 8/1/2002 | 2002 | Whiskey Chitto | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 105 |
| 8/1/2002 | 2002 | Whiskey Chitto | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 64 |
| 8/1/2002 | 2002 | Whiskey Chitto | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 87 |
| 8/1/2002 | 2002 | Whiskey Chitto | Ephemeroptera | Isonychiidae | Ephemeroptera Isonychiidae | 99 |
| 8/1/2002 | 2002 | Whiskey Chitto | Ephemeroptera | Tricorythidae | Ephemeroptera Tricorythidae | 117 |
| 8/1/2002 | 2002 | Whiskey Chitto | Ephemeroptera | | Ephemeroptera | 13 |
| 8/1/2002 | 2002 | Whiskey Chitto | Gastropoda | | Gastropoda | 5 |
| 8/1/2002 | 2002 | Whiskey Chitto | Hemiptera | Gerridae | Hemiptera Gerridae | 16 |
| 8/1/2002 | 2002 | Whiskey Chitto | Hemiptera | Hebridae | Hemiptera Hebridae | 1 |

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|---|---|---|---|---|---|---|
| 8/1/2002 | 2002 | Whiskey Chitto | Hemiptera | Veliidae | Hemiptera Veliidae | 108 |
| 8/1/2002 | 2002 | Whiskey Chitto | Hemiptera | | Hemiptera | 2 |
| 8/1/2002 | 2002 | Whiskey Chitto | Hydrachnida | | Hydrachnida | 30 |
| 8/1/2002 | 2002 | Whiskey Chitto | Lepidoptera | Tortricidae | Lepidoptera Tortricidae | 3 |
| 8/1/2002 | 2002 | Whiskey Chitto | Lepidoptera | | Lepidoptera | 7 |
| 8/1/2002 | 2002 | Whiskey Chitto | Megaloptera | Corydalidae | Megaloptera Corydalidae | 69 |
| 8/1/2002 | 2002 | Whiskey Chitto | Nematoda | | Nematoda | 2 |
| 8/1/2002 | 2002 | Whiskey Chitto | Nematomorpha | | Nematomorpha | 1 |
| 8/1/2002 | 2002 | Whiskey Chitto | Odonata | Aeshnidae | Odonata Aeshnidae | 2 |
| 8/1/2002 | 2002 | Whiskey Chitto | Odonata | Calopterygidae | Odonata Calopterygidae | 4 |
| 8/1/2002 | 2002 | Whiskey Chitto | Odonata | Coenagrionidae | Odonata Coenagrionidae | 2 |
| 8/1/2002 | 2002 | Whiskey Chitto | Odonata | Corduliidae | Odonata Corduliidae | 17 |
| 8/1/2002 | 2002 | Whiskey Chitto | Odonata | Gomphidae | Odonata Gomphidae | 50 |
| 8/1/2002 | 2002 | Whiskey Chitto | Odonata | | Odonata | 3 |
| 8/1/2002 | 2002 | Whiskey Chitto | Oligochaete | | Oligochaete | 15 |
| 8/1/2002 | 2002 | Whiskey Chitto | Plecoptera | Perlidae | Plecoptera Perlidae | 13 |
| 8/1/2002 | 2002 | Whiskey Chitto | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 568 |
| 8/1/2002 | 2002 | Whiskey Chitto | Trichoptera | Hydroptilidae | Trichoptera Hydroptilidae | 28 |
| 8/1/2002 | 2002 | Whiskey Chitto | Trichoptera | Leptoceridae | Trichoptera Leptoceridae | 9 |
| 8/1/2002 | 2002 | Whiskey Chitto | Trichoptera | Philopotamidae | Trichoptera Philopotamidae | 1 |
| 8/1/2002 | 2002 | Whiskey Chitto | Trichoptera | Polycentropodidae | Trichoptera Polycentropodidae | 1 |
| 8/1/2002 | 2002 | Whiskey Chitto | Trichoptera | | Trichoptera | 23 |
| 8/18/2003 | 2003 | Whiskey Chitto | Araneae | Pisauridae | Araneae Pisauridae | 1 |
| 8/18/2003 | 2003 | Whiskey Chitto | Araneae | Tetragnathidae | Araneae Tetragnathidae | 1 |
| 8/18/2003 | 2003 | Whiskey Chitto | Coleoptera | Elmidae | Coleoptera Elmidae | 47 |
| 8/19/2003 | 2003 | Whiskey Chitto | Coleoptera | Hydrophilidae | Coleoptera Hydrophilidae | 1 |
| 8/18/2003 | 2003 | Whiskey Chitto | Diptera | Ceratopogonidae | Diptera Ceratopogonidae | 19 |
| 8/18/2003 | 2003 | Whiskey Chitto | Diptera | Chironomidae | Diptera Chironomidae | 869 |
| 8/18/2003 | 2003 | Whiskey Chitto | Diptera | Empididae | Diptera Empididae | 3 |
| 8/18/2003 | 2003 | Whiskey Chitto | Diptera | Tabanidae | Diptera Tabanidae | 1 |
| 8/18/2003 | 2003 | Whiskey Chitto | Diptera | Tipulidae | Diptera Tipulidae | 13 |

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|---|---|---|---|---|---|---|
| 8/18/2003 | 2003 | Whiskey Chitto | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 13 |
| 8/18/2003 | 2003 | Whiskey Chitto | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 37 |
| 8/18/2003 | 2003 | Whiskey Chitto | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 58 |
| 8/18/2003 | 2003 | Whiskey Chitto | Ephemeroptera | Isonychiidae | Ephemeroptera Isonychiidae | 57 |
| 8/18/2003 | 2003 | Whiskey Chitto | Ephemeroptera | Tricorythidae | Ephemeroptera Tricorythidae | 47 |
| 8/19/2003 | 2003 | Whiskey Chitto | Hemiptera | Veliidae | Hemiptera Veliidae | 14 |
| 8/18/2003 | 2003 | Whiskey Chitto | Hydrachnida | | Hydrachnida | 1 |
| 8/18/2003 | 2003 | Whiskey Chitto | Lepidoptera | Pyralidae | Lepidoptera Pyralidae | 1 |
| 8/19/2003 | 2003 | Whiskey Chitto | Megaloptera | Corydalidae | Megaloptera Corydalidae | 1 |
| 8/18/2003 | 2003 | Whiskey Chitto | Neuroptera | Sisyridae | Neuroptera Sisyridae | 1 |
| 8/19/2003 | 2003 | Whiskey Chitto | Odonata | Aeshnidae | Odonata Aeshnidae | 1 |
| 8/18/2003 | 2003 | Whiskey Chitto | Odonata | Calopterygidae | Odonata Calopterygidae | 1 |
| 8/18/2003 | 2003 | Whiskey Chitto | Odonata | Calopterygidae | Odonata Calopterygidae | 1 |
| 8/19/2003 | 2003 | Whiskey Chitto | Odonata | Gomphidae | Odonata Gomphidae | 2 |
| 8/18/2003 | 2003 | Whiskey Chitto | Oligochaeta | | Oligochaeta | 31 |
| 8/18/2003 | 2003 | Whiskey Chitto | Orthoptera | Gryllidae | Orthoptera Gryllidae | 1 |
| 8/18/2003 | 2003 | Whiskey Chitto | Trichoptera | Calamoceratidae | Trichoptera Calamoceratidae | 2 |
| 8/19/2003 | 2003 | Whiskey Chitto | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 131 |
| 8/18/2003 | 2003 | Whiskey Chitto | Trichoptera | Leptoceridae | Trichoptera Leptoceridae | 2 |
| 8/18/2003 | 2003 | Whiskey Chitto | Trichoptera | Odontoceridae | Trichoptera Odontoceridae | 2 |
| 9/7/2005 | 2004 | Whiskey Chitto | Amphipoda | | Amphipoda | 2 |
| 9/7/2005 | 2004 | Whiskey Chitto | Araneae | Pisauridae | Araneae Pisauridae | 1 |
| 9/7/2005 | 2004 | Whiskey Chitto | Bivalves | | Bivalves | 37 |
| 9/7/2005 | 2004 | Whiskey Chitto | Coleoptera | Dryopidae | Coleoptera Dryopidae | 1 |
| 9/7/2005 | 2004 | Whiskey Chitto | Coleoptera | Elmidae | Coleoptera Elmidae | 219 |
| 9/7/2005 | 2004 | Whiskey Chitto | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 2 |
| 9/7/2005 | 2004 | Whiskey Chitto | Diptera | Ceratopogonidae | Diptera Ceratopogonidae | 17 |
| 9/7/2005 | 2004 | Whiskey Chitto | Diptera | Chironomidae | Diptera Chironomidae | 372 |
| 9/7/2005 | 2004 | Whiskey Chitto | Diptera | Culicidae | Diptera Culicidae | 1 |
| 9/7/2005 | 2004 | Whiskey Chitto | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 6 |

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|---|---|---|---|---|---|---|
| 9/7/2005 | 2004 | Whiskey Chitto | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 55 |
| 9/7/2005 | 2004 | Whiskey Chitto | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 18 |
| 9/7/2005 | 2004 | Whiskey Chitto | Ephemeroptera | Isonychiidae | Ephemeroptera Isonychiidae | 39 |
| 9/7/2005 | 2004 | Whiskey Chitto | Ephemeroptera | Tricorythidae | Ephemeroptera Tricorythidae | 111 |
| 9/7/2005 | 2004 | Whiskey Chitto | Hemiptera | Veliidae | Hemiptera Veliidae | 4 |
| 9/7/2005 | 2004 | Whiskey Chitto | Hydrachnida | | Hydrachnida | 3 |
| 9/7/2005 | 2004 | Whiskey Chitto | Megaloptera | | Megaloptera | 2 |
| 9/7/2005 | 2004 | Whiskey Chitto | Odonata | Calopterygidae | Odonata Calopterygidae | 1 |
| 9/7/2005 | 2004 | Whiskey Chitto | Odonata | Coenagrionidae | Odonata Coenagrionidae | 3 |
| 9/7/2005 | 2004 | Whiskey Chitto | Odonata | Gomphidae | Odonata Gomphidae | 7 |
| 9/7/2005 | 2004 | Whiskey Chitto | Oligochaeta | | Oligochaeta | 13 |
| 9/7/2005 | 2004 | Whiskey Chitto | Plecoptera | Perlidae | Plecoptera Perlidae | 1 |
| 9/7/2005 | 2004 | Whiskey Chitto | Spider | | Spider | 1 |
| 9/7/2005 | 2004 | Whiskey Chitto | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 47 |
| 9/7/2005 | 2004 | Whiskey Chitto | Trichoptera | Odontoceridae | Trichoptera Odontoceridae | 2 |
| 9/7/2005 | 2004 | Whiskey Chitto | Trichoptera | Philopotamidae | Trichoptera Philopotamidae | 1 |
| | 2012 | Bayou Zourie | Amphipoda | Gammaridae | Amphipoda Gammaridae | 2 |
| | 2012 | Bayou Zourie | Diptera | Ceratopogonidae | Diptera Ceratopogonidae | 3 |
| | 2012 | Bayou Zourie | Diptera | Chironomidae | Diptera Chironomidae | 14 |
| | 2012 | Bayou Zourie | Diptera | Psychodidae | Diptera Psychodidae | 3 |
| | 2012 | Bayou Zourie | Diptera | Tipulidae | Diptera Tipulidae | 1 |
| | 2012 | Bayou Zourie | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 3 |
| | 2012 | Bayou Zourie | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 2 |
| | 2012 | Bayou Zourie | Hemiptera | Corixidae | Hemiptera Corixidae | 1 |
| | 2012 | Bayou Zourie | Hemiptera | Gerridae | Hemiptera Gerridae | 4 |
| | 2012 | Bayou Zourie | Oligochaeta | | Oligochaeta | 3 |
| | 2012 | Bayou Zourie | Trichoptera | Rhyacophilidae | Trichoptera Rhyacophilidae | 1 |
| | 2012 | Dowden | Amphipoda | Gammaridae | Amphipoda Gammaridae | 5 |
| | 2012 | Dowden | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 1 |

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|---|---|---|---|---|---|---|
| | 2012 | Dowden | Diptera | Chaoboridae | Diptera Chaoboridae | 1 |
| | 2012 | Dowden | Diptera | Chironomidae | Diptera Chironomidae | 6 |
| | 2012 | Dowden | Diptera | Tipulidae | Diptera Tipulidae | 4 |
| | 2012 | Dowden | Ephemeroptera | Ameletidae | Ephemeroptera Ameletidae | 3 |
| | 2012 | Dowden | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 3 |
| | 2012 | Dowden | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 1 |
| | 2012 | Dowden | Hemiptera | Corixidae | Hemiptera Corixidae | 20 |
| | 2012 | Dowden | Odonata | Coenagrionidae | Odonata Coenagrionidae | 1 |
| | 2012 | Dowden | Odonata | Libellulidae | Odonata Libellulidae | 1 |
| | 2012 | Lyles | Amphipoda | Gammaridae | Amphipoda Gammaridae | 7 |
| | 2012 | Lyles | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 1 |
| | 2012 | Lyles | Coleoptera | Elmidae | Coleoptera Elmidae | 1 |
| | 2012 | Lyles | Coleoptera | Hydrochidae | Coleoptera Hydrochidae | 1 |
| | 2012 | Lyles | Diptera | Chironomidae | Diptera Chironomidae | 1 |
| | 2012 | Lyles | Hemiptera | Corixidae | Hemiptera Corixidae | 1 |
| | 2012 | Lyles | Hemiptera | Gerridae | Hemiptera Gerridae | 35 |
| | 2012 | Lyles | Odonata | Libellulidae | Odonata Libellulidae | 1 |
| | 2012 | Martin | Amphipoda | Gammaridae | Amphipoda Gammaridae | 1 |
| | 2012 | Martin | Coleoptera | Elmidae | Coleoptera Elmidae | 13 |
| | 2012 | Martin | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 12 |
| | 2012 | Martin | Diptera | Chironomidae | Diptera Chironomidae | 2 |
| | 2012 | Martin | Diptera | Tabanidae | Diptera Tabanidae | 1 |
| | 2012 | Martin | Diptera | Tipulidae | Diptera Tipulidae | 1 |
| | 2012 | Martin | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 14 |
| | 2012 | Martin | Megaloptera | Corydalidae | Megaloptera Corydalidae | 2 |
| | 2012 | Martin | Plecoptera | Perlidae | Plecoptera Perlidae | 3 |
| | 2012 | Martin | Trichoptera | Philopotamidae | Trichoptera Philopotamidae | 8 |
| | 2012 | Martin | Trichoptera | Polycentropodidae | Trichoptera Polycentropodidae | 1 |
| | 2012 | Tiger | Amphipoda | Gammaridae | Amphipoda Gammaridae | 1 |
| | 2012 | Tiger | Coleoptera | Dryopidae | Coleoptera Dryopidae | 5 |

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|---|---|---|---|---|---|---|
| | 2012 | Tiger | Coleoptera | Hydrochidae | Coleoptera Hydrochidae | 1 |
| | 2012 | Tiger | Diptera | Chironomidae | Diptera Chironomidae | 5 |
| | 2012 | Tiger | Ephemeroptera | Ameletidae | Ephemeroptera Ameletidae | 3 |
| | 2012 | Tiger | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 1 |
| | 2012 | Tiger | Ephemeroptera | Leptophlebiidae | Ephemeroptera Leptophlebiidae | 3 |
| | 2012 | Tiger | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 1 |
| | 2012 | Whiskey Chitto | Coleoptera | Dryopidae | Coleoptera Dryopidae | 5 |
| | 2012 | Whiskey Chitto | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 10 |
| | 2012 | Whiskey Chitto | Coleoptera | Elmidae | Coleoptera Elmidae | 2 |
| | 2012 | Whiskey Chitto | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 4 |
| | 2012 | Whiskey Chitto | Coleoptera | Hydrophilidae | Coleoptera Hydrophilidae | 10 |
| | 2012 | Whiskey Chitto | Diptera | Chaoboridae | Diptera Chaoboridae | 5 |
| | 2012 | Whiskey Chitto | Diptera | Chironomidae | Diptera Chironomidae | 24 |
| | 2012 | Whiskey Chitto | Diptera | Empididae | Diptera Empididae | 1 |
| | 2012 | Whiskey Chitto | Diptera | Ephydridae | Diptera Ephydridae | 7 |
| | 2012 | Whiskey Chitto | Diptera | Psychodidae | Diptera Psychodidae | 8 |
| | 2012 | Whiskey Chitto | Diptera | Syrphidae | Diptera Syrphidae | 2 |
| | 2012 | Whiskey Chitto | Diptera | Tipulidae | Diptera Tipulidae | 3 |
| | 2012 | Whiskey Chitto | Ephemeroptera | Ameletidae | Ephemeroptera Ameletidae | 8 |
| | 2012 | Whiskey Chitto | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 1 |
| | 2012 | Whiskey Chitto | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 8 |
| | 2012 | Whiskey Chitto | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 4 |
| | 2012 | Whiskey Chitto | Ephemeroptera | Isonychiidae | Ephemeroptera Isonychiidae | 2 |
| | 2012 | Whiskey Chitto | Hemiptera | Belostomatidae | Hemiptera Belostomatidae | 18 |
| | 2012 | Whiskey Chitto | Lepidoptera | Nepticulidae | Lepidoptera Nepticulidae | 1 |
| | 2012 | Whiskey Chitto | Odonata | Aeshnidae | Odonata Aeshnidae | 3 |
| | 2012 | Whiskey Chitto | Odonata | Gomphidae | Odonata Gomphidae | 1 |
| | 2012 | Whiskey Chitto | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 28 |
| | 2012 | Whiskey Chitto | Trichoptera | Polycentropodidae | Trichoptera Polycentropodidae | 1 |

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|---|---|---|---|---|---|---|
| 5/16/2016 | 2016 | Bayou Zourie | Diptera | Chironomidae | Diptera Chironomidae | 6 |
| 5/16/2016 | 2016 | Bayou Zourie | Hemiptera | Gerridae | Hemiptera Gerridae | 1 |
| 5/16/2016 | 2016 | Bayou Zourie | Hemiptera | Veliidae | Hemiptera Veliidae | 1 |
| 5/16/2016 | 2016 | Bayou Zourie | Odonata | Coenagrionidae | Odonata Coenagrionidae | 2 |
| 5/16/2016 | 2016 | Bayou Zourie | Odonata | Gomphidae | Odonata Gomphidae | 1 |
| 5/17/2016 | 2016 | Dowden | Amphipoda | | Amphipoda | 4 |
| 5/17/2016 | 2016 | Dowden | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 1 |
| 5/17/2016 | 2016 | Dowden | Coleoptera | Elmidae | Coleoptera Elmidae | 16 |
| 5/17/2016 | 2016 | Dowden | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 18 |
| 5/17/2016 | 2016 | Dowden | Coleoptera | Psephenidae | Coleoptera Psephenidae | 3 |
| 5/17/2016 | 2016 | Dowden | Diptera | Ceratopogonidae | Diptera Ceratopogonidae | 3 |
| 5/17/2016 | 2016 | Dowden | Diptera | Chironomidae | Diptera Chironomidae | 675 |
| 5/17/2016 | 2016 | Dowden | Diptera | Simuliidae | Diptera Simuliidae | 18 |
| 5/17/2016 | 2016 | Dowden | Diptera | Thaumaleidae | Diptera Thaumaleidae | 1 |
| 5/17/2016 | 2016 | Dowden | Diptera | Tipulidae | Diptera Tipulidae | 3 |
| 5/17/2016 | 2016 | Dowden | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 32 |
| 5/17/2016 | 2016 | Dowden | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 1 |
| 5/17/2016 | 2016 | Dowden | Ephemeroptera | Ephemeridae | Ephemeroptera Ephemeridae | 6 |
| 5/17/2016 | 2016 | Dowden | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 48 |
| 5/17/2016 | 2016 | Dowden | Ephemeroptera | Isonychiidae | Ephemeroptera Isonychiidae | 30 |
| 5/17/2016 | 2016 | Dowden | Hemiptera | Corixidae | Hemiptera Corixidae | 5 |
| 5/17/2016 | 2016 | Dowden | Odonata | Aeshnidae | Odonata Aeshnidae | 3 |
| 5/17/2016 | 2016 | Dowden | Odonata | Calopterygidae | Odonata Calopterygidae | 4 |
| 5/17/2016 | 2016 | Dowden | Odonata | Libellulidae | Odonata Libellulidae | 1 |
| 5/17/2016 | 2016 | Dowden | Odonata | Macromiidae | Odonata Macromiidae | 1 |
| 5/17/2016 | 2016 | Dowden | Oligochaeta | | Oligochaeta | 14 |
| 5/17/2016 | 2016 | Dowden | Plecoptera | Capniidae | Plecoptera Capniidae | 5 |
| 5/17/2016 | 2016 | Dowden | Plecoptera | Perlidae | Plecoptera Perlidae | 20 |
| 5/17/2016 | 2016 | Dowden | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 82 |
| 5/17/2016 | 2016 | Dowden | Trichoptera | Molannidae | Trichoptera Molannidae | 1 |

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|---|---|---|---|---|---|---|
| 5/17/2016 | 2016 | Dowden | Trichoptera | Philopotamidae | Trichoptera Philopotamidae | 5 |
| 5/17/2016 | 2016 | Dowden | Trichoptera | Polycentropodidae | Trichoptera Polycentropodidae | 22 |
| 5/17/2016 | 2016 | Lyles | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 6 |
| 5/17/2016 | 2016 | Lyles | Diptera | Chironomidae | Diptera Chironomidae | 8 |
| 5/17/2016 | 2016 | Lyles | Diptera | Tipulidae | Diptera Tipulidae | 10 |
| 5/17/2016 | 2016 | Lyles | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 3 |
| 5/17/2016 | 2016 | Lyles | Hemiptera | Gerridae | Hemiptera Gerridae | 1 |
| 5/17/2016 | 2016 | Lyles | Odonata | Aeshnidae | Odonata Aeshnidae | 1 |
| 5/17/2016 | 2016 | Lyles | Odonata | Coenagrionidae | Odonata Coenagrionidae | 1 |
| 5/17/2016 | 2016 | Lyles | Odonata | Corduliidae | Odonata Corduliidae | 1 |
| 5/17/2016 | 2016 | Lyles | Oligochaeta | | Oligochaeta | 2 |
| 5/17/2016 | 2016 | Lyles | Plecoptera | Perlidae | Plecoptera Perlidae | 3 |
| 5/17/2016 | 2016 | Lyles | Trichoptera | Hydroptilidae | Trichoptera Hydroptilidae | 1 |
| 5/16/2016 | 2016 | Martin | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 1 |
| 5/16/2016 | 2016 | Martin | Coleoptera | Elmidae | Coleoptera Elmidae | 1 |
| 5/16/2016 | 2016 | Martin | Diptera | Chironomidae | Diptera Chironomidae | 9 |
| 5/16/2016 | 2016 | Martin | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 1 |
| 5/16/2016 | 2016 | Martin | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 2 |
| 5/16/2016 | 2016 | Martin | Ephemeroptera | Ephemeridae | Ephemeroptera Ephemeridae | 1 |
| 5/16/2016 | 2016 | Martin | Ephemeroptera | Isonychiidae | Ephemeroptera Isonychiidae | 1 |
| 5/16/2016 | 2016 | Martin | Odonata | Aeshnidae | Odonata Aeshnidae | 1 |
| 5/16/2016 | 2016 | Martin | Odonata | LIbellulidae | Odonata LIbellulidae | 1 |
| 5/16/2016 | 2016 | Martin | Oligochaeta | | Oligochaeta | 12 |
| 5/16/2016 | 2016 | Martin | Plecoptera | Perlidae | Plecoptera Perlidae | 4 |
| 5/16/2016 | 2016 | Martin | Turbellaria | | Turbellaria | 1 |
| 5/16/2016 | 2016 | Tiger | Aranea | Piscuridae | Aranea Piscuridae | 1 |
| 5/16/2016 | 2016 | Tiger | Diptera | Chironomidae | Diptera Chironomidae | 2 |
| 5/16/2016 | 2016 | Tiger | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 1 |
| 5/16/2016 | 2016 | Tiger | Hemiptera | Veliidae | Hemiptera Veliidae | 1 |
| 5/16/2016 | 2016 | Tiger | Odonata | Aeshnidae | Odonata Aeshnidae | 1 |
| 5/16/2016 | 2016 | Tiger | Plecoptera | Perlidae | Plecoptera Perlidae | 7 |

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|---|---|---|---|---|---|---|
| 5/17/2016 | 2016 | Whiskey Chitto | Coleoptera | Elmidae | Coleoptera Elmidae | 2 |
| 5/17/2016 | 2016 | Whiskey Chitto | Diptera | Chironomidae | Diptera Chironomidae | 11 |
| 5/17/2016 | 2016 | Whiskey Chitto | Diptera | Simuliidae | Diptera Simuliidae | 1 |
| 5/17/2016 | 2016 | Whiskey Chitto | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 7 |
| 5/17/2016 | 2016 | Whiskey Chitto | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 3 |
| 5/17/2016 | 2016 | Whiskey Chitto | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 4 |
| 5/17/2016 | 2016 | Whiskey Chitto | Ephemeroptera | Isonychiidae | Ephemeroptera Isonychiidae | 8 |
| 5/17/2016 | 2016 | Whiskey Chitto | Ephemeroptera | Leptophlebiidae | Ephemeroptera Leptophlebiidae | 1 |
| 5/17/2016 | 2016 | Whiskey Chitto | Hemiptera | Veliidae | Hemiptera Veliidae | 2 |
| 5/17/2016 | 2016 | Whiskey Chitto | Odonata | Aeshnidae | Odonata Aeshnidae | 2 |
| 5/17/2016 | 2016 | Whiskey Chitto | Odonata | Gomphidae | Odonata Gomphidae | 3 |
| 5/17/2016 | 2016 | Whiskey Chitto | Plecoptera | Perlidae | Plecoptera Perlidae | 5 |
| 5/17/2016 | 2016 | Whiskey Chitto | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Bivalvia | Corbiculidae | Bivalvia Corbiculidae | 2 |
| 5/22/2019 | 2019 | Bayou Zourie | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Coleoptera | Elmidae | Coleoptera Elmidae | 14 |
| 5/22/2019 | 2019 | Bayou Zourie | Coleoptera | Helodidae | Coleoptera Helodidae | 2 |
| 5/22/2019 | 2019 | Bayou Zourie | Decapoda | Cambaridae | Decapoda Cambaridae | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Diptera | Chironomidae | Diptera Chironomidae | 925 |
| 5/22/2019 | 2019 | Bayou Zourie | Diptera | Simuliidae | Diptera Simuliidae | 24 |
| 5/22/2019 | 2019 | Bayou Zourie | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 164 |
| 5/22/2019 | 2019 | Bayou Zourie | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 3 |
| 5/22/2019 | 2019 | Bayou Zourie | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Hemiptera | Veliidae | Hemiptera Veliidae | 2 |
| 5/22/2019 | 2019 | Bayou Zourie | Odonata | Aeshnidae | Odonata Aeshnidae | 6 |
| 5/22/2019 | 2019 | Bayou Zourie | Odonata | Calopterygidae | Odonata Calopterygidae | 1 |
| 5/22/2019 | 2019 | Bayou Zourie | Odonata | Gomphidae | Odonata Gomphidae | 3 |
| 5/22/2019 | 2019 | Bayou Zourie | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 86 |
| 5/22/2019 | 2019 | Bayou Zourie | Trichoptera | Polycentropodidae | Trichoptera Polycentropodidae | 1 |

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|---|---|---|---|---|---|---|
| 5/21/2019 | 2019 | Dowden Creek | Amphipoda | Gammaridae | Amphipoda Gammaridae | 4 |
| 5/21/2019 | 2019 | Dowden Creek | Annelida | Oligochaeta | Annelida Oligochaeta | 25 |
| 5/21/2019 | 2019 | Dowden Creek | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 2 |
| 5/21/2019 | 2019 | Dowden Creek | Coleoptera | Elmidae | Coleoptera Elmidae | 12 |
| 5/21/2019 | 2019 | Dowden Creek | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 2 |
| 5/21/2019 | 2019 | Dowden Creek | Decapoda | Palaemonidae | Decapoda Palaemonidae | 2 |
| 5/21/2019 | 2019 | Dowden Creek | Diptera | Ceratopagonidae | Diptera Ceratopagonidae | 34 |
| 5/21/2019 | 2019 | Dowden Creek | Diptera | Chironomidae | Diptera Chironomidae | 1630 |
| 5/21/2019 | 2019 | Dowden Creek | Diptera | Culicidae | Diptera Culicidae | 2 |
| 5/21/2019 | 2019 | Dowden Creek | Diptera | Simuliidae | Diptera Simuliidae | 156 |
| 5/21/2019 | 2019 | Dowden Creek | Diptera | Tipulidae | Diptera Tipulidae | 23 |
| 5/21/2019 | 2019 | Dowden Creek | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 98 |
| 5/21/2019 | 2019 | Dowden Creek | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 2 |
| 5/21/2019 | 2019 | Dowden Creek | Ephemeroptera | Ephemerellidae | Ephemeroptera Ephemerellidae | 1 |
| 5/21/2019 | 2019 | Dowden Creek | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 20 |
| 5/21/2019 | 2019 | Dowden Creek | Ephemeroptera | Isonychiidae | Ephemeroptera Isonychiidae | 5 |
| 5/21/2019 | 2019 | Dowden Creek | Hemiptera | Corixidae | Hemiptera Corixidae | 6 |
| 5/21/2019 | 2019 | Dowden Creek | Hemiptera | Veliidae | Hemiptera Veliidae | 10 |
| 5/21/2019 | 2019 | Dowden Creek | Hydrocarina | | Hydrocarina | 1 |
| 5/21/2019 | 2019 | Dowden Creek | Megaloptera | Corydalidae | Megaloptera Corydalidae | 3 |
| 5/21/2019 | 2019 | Dowden Creek | Notostraca | Triopsidae | Notostraca Triopsidae | 1 |
| 5/21/2019 | 2019 | Dowden Creek | Odonata | Aeshnidae | Odonata Aeshnidae | 6 |
| 5/21/2019 | 2019 | Dowden Creek | Odonata | Calopterygidae | Odonata Calopterygidae | 2 |
| 5/21/2019 | 2019 | Dowden Creek | Odonata | Coenagrionidae | Odonata Coenagrionidae | 1 |
| 5/21/2019 | 2019 | Dowden Creek | Odonata | Gomphidae | Odonata Gomphidae | 1 |
| 5/21/2019 | 2019 | Dowden Creek | Odonata | Libellulidae | Odonata Libellulidae | 2 |
| 5/21/2019 | 2019 | Dowden Creek | Plecoptera | Perlidae | Plecoptera Perlidae | 3 |
| 5/21/2019 | 2019 | Dowden Creek | Plecoptera | Perlodidae | Plecoptera Perlodidae | 9 |
| 5/21/2019 | 2019 | Dowden Creek | Pulmonata | Ancylidae | Pulmonata Ancylidae | 1 |
| 5/21/2019 | 2019 | Dowden Creek | Pulmonata | Planoribidae | Pulmonata Planoribidae | 15 |

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|---|---|---|---|---|---|---|
| 5/21/2019 | 2019 | Dowden Creek | Pulmonata | Viviparidae | Pulmonata Viviparidae | 1 |
| 5/21/2019 | 2019 | Dowden Creek | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 61 |
| 5/21/2019 | 2019 | Dowden Creek | Trichoptera | Hydroptilidae | Trichoptera Hydroptilidae | 4 |
| 5/21/2019 | 2019 | Dowden Creek | Trichoptera | Lepidostomatidae | Trichoptera Lepidostomatidae | 1 |
| 5/21/2019 | 2019 | Dowden Creek | Trichoptera | Leptoceridae | Trichoptera Leptoceridae | 8 |
| 5/21/2019 | 2019 | Dowden Creek | Trichoptera | Philopotamidae | Trichoptera Philopotamidae | 7 |
| 5/21/2019 | 2019 | Lyles Creek | Araneae | Pisauridae | Araneae Pisauridae | 2 |
| 5/21/2019 | 2019 | Lyles Creek | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 10 |
| 5/21/2019 | 2019 | Lyles Creek | Coleoptera | Elmidae | Coleoptera Elmidae | 1 |
| 5/21/2019 | 2019 | Lyles Creek | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 4 |
| 5/21/2019 | 2019 | Lyles Creek | Collembola | | Collembola | 1 |
| 5/21/2019 | 2019 | Lyles Creek | Diptera | Ceratopagonidae | Diptera Ceratopagonidae | 4 |
| 5/21/2019 | 2019 | Lyles Creek | Diptera | Chironomidae | Diptera Chironomidae | 345 |
| 5/21/2019 | 2019 | Lyles Creek | Diptera | Simuliidae | Diptera Simuliidae | 2 |
| 5/21/2019 | 2019 | Lyles Creek | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 11 |
| 5/21/2019 | 2019 | Lyles Creek | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 1 |
| 5/21/2019 | 2019 | Lyles Creek | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 6 |
| 5/21/2019 | 2019 | Lyles Creek | Hemiptera | Belastomatidae | Hemiptera Belastomatidae | 1 |
| 5/21/2019 | 2019 | Lyles Creek | Odonata | Aeshnidae | Odonata Aeshnidae | 2 |
| 5/21/2019 | 2019 | Lyles Creek | Odonata | Gomphidae | Odonata Gomphidae | 1 |
| 5/21/2019 | 2019 | Lyles Creek | Plecoptera | Perlidae | Plecoptera Perlidae | 3 |
| 5/21/2019 | 2019 | Lyles Creek | Trichoptera | Polycentropodidae | Trichoptera Polycentropodidae | 2 |
| 5/21/2019 | 2019 | Martin Creek | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 1 |
| 5/21/2019 | 2019 | Martin Creek | Collembola | | Collembola | 1 |
| 5/21/2019 | 2019 | Martin Creek | Diptera | Ceratopagonidae | Diptera Ceratopagonidae | 2 |
| 5/21/2019 | 2019 | Martin Creek | Diptera | Chironomidae | Diptera Chironomidae | 77 |
| 5/21/2019 | 2019 | Martin Creek | Odonata | Cordulegastridae | Odonata Cordulegastridae | 1 |
| 5/21/2019 | 2019 | Tiger Creek | Amphipoda | Gammaridae | Amphipoda Gammaridae | 1 |
| 5/21/2019 | 2019 | Tiger Creek | Annelida | Oligochaeta | Annelida Oligochaeta | 2 |

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|---|---|---|---|---|---|---|
| 5/21/2019 | 2019 | Tiger Creek | Araneae | Pisauridae | Araneae Pisauridae | 7 |
| 5/21/2019 | 2019 | Tiger Creek | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 3 |
| 5/21/2019 | 2019 | Tiger Creek | Coleoptera | Elmidae | Coleoptera Elmidae | 553 |
| 5/21/2019 | 2019 | Tiger Creek | Coleoptera | Psephenidae | Coleoptera Psephenidae | 4 |
| 5/21/2019 | 2019 | Tiger Creek | Decapoda | Cambaridae | Decapoda Cambaridae | 1 |
| 5/21/2019 | 2019 | Tiger Creek | Diptera | Ceratopagonidae | Diptera Ceratopagonidae | 13 |
| 5/21/2019 | 2019 | Tiger Creek | Diptera | Chironomidae | Diptera Chironomidae | 355 |
| 5/21/2019 | 2019 | Tiger Creek | Diptera | Empididae | Diptera Empididae | 4 |
| 5/21/2019 | 2019 | Tiger Creek | Diptera | Simuliidae | Diptera Simuliidae | 204 |
| 5/21/2019 | 2019 | Tiger Creek | Diptera | Tipulidae | Diptera Tipulidae | 9 |
| 5/21/2019 | 2019 | Tiger Creek | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 27 |
| 5/21/2019 | 2019 | Tiger Creek | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 8 |
| 5/21/2019 | 2019 | Tiger Creek | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 8 |
| 5/21/2019 | 2019 | Tiger Creek | Ephemeroptera | Oligoneuridae | Ephemeroptera Oligoneuridae | 3 |
| 5/21/2019 | 2019 | Tiger Creek | Hemiptera | Veliidae | Hemiptera Veliidae | 9 |
| 5/21/2019 | 2019 | Tiger Creek | Odonata | Aeshnidae | Odonata Aeshnidae | 6 |
| 5/21/2019 | 2019 | Tiger Creek | Plecoptera | Perlidae | Plecoptera Perlidae | 16 |
| 5/21/2019 | 2019 | Tiger Creek | Plecoptera | Perlodidae | Plecoptera Perlodidae | 14 |
| 5/21/2019 | 2019 | Tiger Creek | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 63 |
| 5/21/2019 | 2019 | Tiger Creek | Trichoptera | Philopotamidae | Trichoptera Philopotamidae | 1 |
| 5/22/2019 | 2019 | Whiskey Chitto | Annelida | Oligochaeta | Annelida Oligochaeta | 1 |
| 5/22/2019 | 2019 | Whiskey Chitto | Araneae | Pisauridae | Araneae Pisauridae | 13 |
| 5/22/2019 | 2019 | Whiskey Chitto | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 3 |
| 5/22/2019 | 2019 | Whiskey Chitto | Coleoptera | Elmidae | Coleoptera Elmidae | 10 |
| 5/22/2019 | 2019 | Whiskey Chitto | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 17 |
| 5/22/2019 | 2019 | Whiskey Chitto | Coleoptera | Helodidae | Coleoptera Helodidae | 20 |
| 5/22/2019 | 2019 | Whiskey Chitto | Coleoptera | Hydrophilidae | Coleoptera Hydrophilidae | 1 |
| 5/22/2019 | 2019 | Whiskey Chitto | Collembola | | Collembola | 9 |
| 5/22/2019 | 2019 | Whiskey Chitto | Decapoda | Palaemonidae | Decapoda Palaemonidae | 3 |
| 5/22/2019 | 2019 | Whiskey Chitto | Diptera | Ceratopagonidae | Diptera Ceratopagonidae | 5 |

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|---|---|---|---|---|---|---|
| 5/22/2019 | 2019 | Whiskey Chitto | Diptera | Chironomidae | Diptera Chironomidae | 1092 |
| 5/22/2019 | 2019 | Whiskey Chitto | Diptera | Simuliidae | Diptera Simuliidae | 9 |
| 5/22/2019 | 2019 | Whiskey Chitto | Diptera | Stratiomyidae | Diptera Stratiomyidae | 1 |
| 5/22/2019 | 2019 | Whiskey Chitto | Diptera | Tipulidae | Diptera Tipulidae | 2 |
| 5/22/2019 | 2019 | Whiskey Chitto | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 35 |
| 5/22/2019 | 2019 | Whiskey Chitto | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 5 |
| 5/22/2019 | 2019 | Whiskey Chitto | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 3 |
| 5/22/2019 | 2019 | Whiskey Chitto | Hemiptera | Nepidae | Hemiptera Nepidae | 1 |
| 5/22/2019 | 2019 | Whiskey Chitto | Hemiptera | Veliidae | Hemiptera Veliidae | 90 |
| 5/22/2019 | 2019 | Whiskey Chitto | Lepidoptera | Pyralidae | Lepidoptera Pyralidae | 5 |
| 5/22/2019 | 2019 | Whiskey Chitto | Odonata | Aeshnidae | Odonata Aeshnidae | 6 |
| 5/22/2019 | 2019 | Whiskey Chitto | Odonata | Calopterygidae | Odonata Calopterygidae | 2 |
| 5/22/2019 | 2019 | Whiskey Chitto | Plecoptera | Perlidae | Plecoptera Perlidae | 3 |
| 5/22/2019 | 2019 | Whiskey Chitto | Trichoptera | Calamoceratidae | Trichoptera Calamoceratidae | 1 |
| 5/22/2019 | 2019 | Whiskey Chitto | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 28 |
| 8/6/2019 | 2019 | Bayou Zourie | Amphipoda | Gammaridae | Amphipoda Gammaridae | 2 |
| 8/6/2019 | 2019 | Bayou Zourie | Bivalvia | Corbiculidae | Bivalvia Corbiculidae | 3 |
| 8/6/2019 | 2019 | Bayou Zourie | Coleoptera | Elmidae | Coleoptera Elmidae | 13 |
| 8/6/2019 | 2019 | Bayou Zourie | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 3 |
| 8/6/2019 | 2019 | Bayou Zourie | Coleoptera | Staphylinidae | Coleoptera Staphylinidae | 1 |
| 8/6/2019 | 2019 | Bayou Zourie | Collembola | | Collembola | 1 |
| 8/6/2019 | 2019 | Bayou Zourie | Diptera | Ceratopagonidae | Diptera Ceratopagonidae | 21 |
| 8/6/2019 | 2019 | Bayou Zourie | Diptera | Chaoboridae | Diptera Chaoboridae | 1 |
| 8/6/2019 | 2019 | Bayou Zourie | Diptera | Chironomidae | Diptera Chironomidae | 178 |
| 8/6/2019 | 2019 | Bayou Zourie | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 6 |
| 8/6/2019 | 2019 | Bayou Zourie | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 43 |
| 8/6/2019 | 2019 | Bayou Zourie | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 8 |
| 8/6/2019 | 2019 | Bayou Zourie | Hemiptera | Veliidae | Hemiptera Veliidae | 10 |
| 8/6/2019 | 2019 | Bayou Zourie | Megaloptera | Sialidae | Megaloptera Sialidae | 1 |
| 8/6/2019 | 2019 | Bayou Zourie | Odonata | Calopterygidae | Odonata Calopterygidae | 3 |

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|---|---|---|---|---|---|---|
| 8/6/2019 | 2019 | Bayou Zourie | Odonata | Gomphidae | Odonata Gomphidae | 14 |
| 8/6/2019 | 2019 | Bayou Zourie | Pulmonata | Viviparidae | Pulmonata Viviparidae | 1 |
| 8/6/2019 | 2019 | Bayou Zourie | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 6 |
| 8/6/2019 | 2019 | Bayou Zourie | Trichoptera | Molannidae | Trichoptera Molannidae | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Amphipoda | | Amphipoda Gammaridae | 13 |
| 8/5/2019 | 2019 | Dowden Creek | Annelida | Hirudinea | Annelida Hirudinea | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Annelida | Oligochaeta | Annelida Oligochaeta | 10 |
| 8/5/2019 | 2019 | Dowden Creek | Coleoptera | Dryopidae | Coleoptera Dryopidae | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Coleoptera | Elmidae | Coleoptera Elmidae | 137 |
| 8/5/2019 | 2019 | Dowden Creek | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 9 |
| 8/5/2019 | 2019 | Dowden Creek | Decapoda | Palaemonidae | Decapoda Palaemonidae | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Diptera | Ceratopagonidae | Diptera Ceratopagonidae | 63 |
| 8/5/2019 | 2019 | Dowden Creek | Diptera | Chironomidae | Diptera Chironomidae | 357 |
| 8/5/2019 | 2019 | Dowden Creek | Diptera | Empididae | Diptera Empididae | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Diptera | Simuliidae | Diptera Simuliidae | 5 |
| 8/5/2019 | 2019 | Dowden Creek | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 21 |
| 8/5/2019 | 2019 | Dowden Creek | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Ephemeroptera | Ephemeridae | Ephemeroptera Ephemeridae | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 45 |
| 8/5/2019 | 2019 | Dowden Creek | Ephemeroptera | Leptophlebidae | Ephemeroptera Leptophlebidae | 66 |
| 8/5/2019 | 2019 | Dowden Creek | Hemiptera | Veliidae | Hemiptera Veliidae | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Hydrocarina | | Hydrocarina | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Megaloptera | Corydalidae | Megaloptera Corydalidae | 9 |
| 8/5/2019 | 2019 | Dowden Creek | Odonata | Aeshnidae | Odonata Aeshnidae | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Odonata | Coenagrionidae | Odonata Coenagrionidae | 4 |
| 8/5/2019 | 2019 | Dowden Creek | Odonata | Gomphidae | Odonata Gomphidae | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Odonata | Libellulidae | Odonata Libellulidae | 1 |
| 8/5/2019 | 2019 | Dowden Creek | Plecoptera | Perlodidae | Plecoptera Perlodidae | 20 |
| 8/5/2019 | 2019 | Dowden Creek | Trichoptera | Hydroptilidae | Trichoptera Hydroptilidae | 34 |

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|---|---|---|---|---|---|---|
| 8/5/2019 | 2019 | Dowden Creek | Trichoptera | Leptoceridae | Trichoptera Leptoceridae | 4 |
| 8/5/2019 | 2019 | Dowden Creek | Trichoptera | Philopotamidae | Trichoptera Philopotamidae | 23 |
| 8/5/2019 | 2019 | Lyles Creek | Araneae | Pisauridae | Araneae Pisauridae | 1 |
| 8/5/2019 | 2019 | Lyles Creek | Coleoptera | Dytiscidae | Coleoptera Dytiscidae | 4 |
| 8/5/2019 | 2019 | Lyles Creek | Coleoptera | Elmidae | Coleoptera Elmidae | 5 |
| 8/5/2019 | 2019 | Lyles Creek | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 1 |
| 8/5/2019 | 2019 | Lyles Creek | Coleoptera | Helodidae | Coleoptera Helodidae | 1 |
| 8/5/2019 | 2019 | Lyles Creek | Collembola | Isotomidae | Collembola Isotomidae | 2 |
| 8/5/2019 | 2019 | Lyles Creek | Diptera | Ceratopagonidae | Diptera Ceratopagonidae | 10 |
| 8/5/2019 | 2019 | Lyles Creek | Diptera | Chironomidae | Diptera Chironomidae | 125 |
| 8/5/2019 | 2019 | Lyles Creek | Diptera | Tipulidae | Diptera Tipulidae | 6 |
| 8/5/2019 | 2019 | Lyles Creek | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 1 |
| 8/5/2019 | 2019 | Lyles Creek | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 8 |
| 8/5/2019 | 2019 | Lyles Creek | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 2 |
| 8/5/2019 | 2019 | Lyles Creek | Gastropoda | Planoribidae | Gastropoda Planoribidae | 1 |
| 8/5/2019 | 2019 | Lyles Creek | Hemiptera | Nepidae | Hemiptera Nepidae | 1 |
| 8/5/2019 | 2019 | Lyles Creek | Hemiptera | Notoneadae | Hemiptera Notoneadae | 1 |
| 8/5/2019 | 2019 | Lyles Creek | Hemiptera | Veliidae | Hemiptera Veliidae | 8 |
| 8/5/2019 | 2019 | Lyles Creek | Odonata | Calopterygidae | Odonata Calopterygidae | 4 |
| 8/5/2019 | 2019 | Lyles Creek | Odonata | Gomphidae | Odonata Gomphidae | 10 |
| 8/5/2019 | 2019 | Martin Creek | Araneae | Pisauridae | Araneae Pisauridae | 1 |
| 8/5/2019 | 2019 | Martin Creek | Diptera | Ceratopagonidae | Diptera Ceratopagonidae | 3 |
| 8/5/2019 | 2019 | Martin Creek | Diptera | Chironomidae | Diptera Chironomidae | 38 |
| 8/5/2019 | 2019 | Martin Creek | Diptera | Simuliidae | Diptera Simuliidae | 1 |
| 8/5/2019 | 2019 | Martin Creek | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 6 |
| 8/5/2019 | 2019 | Martin Creek | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 2 |
| 8/5/2019 | 2019 | Martin Creek | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 3 |
| 8/5/2019 | 2019 | Martin Creek | Hemiptera | Nepidae | Hemiptera Nepidae | 1 |
| 8/5/2019 | 2019 | Martin Creek | Odonata | Gomphidae | Odonata Gomphidae | 6 |

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|---|---|---|---|---|---|---|
| 8/5/2019 | 2019 | Tiger Creek | Amphipoda | | Amphipoda Gammaridae | 1 |
| 8/5/2019 | 2019 | Tiger Creek | Coleoptera | Dryopidae | Coleoptera Dryopidae | 2 |
| 8/5/2019 | 2019 | Tiger Creek | Coleoptera | Elmidae | Coleoptera Elmidae | 137 |
| 8/5/2019 | 2019 | Tiger Creek | Coleoptera | Psephenidae | Coleoptera Psephenidae | 1 |
| 8/5/2019 | 2019 | Tiger Creek | Diptera | Ceratopagonidae | Diptera Ceratopagonidae | 12 |
| 8/5/2019 | 2019 | Tiger Creek | Diptera | Chironomidae | Diptera Chironomidae | 171 |
| 8/5/2019 | 2019 | Tiger Creek | Diptera | Culicidae | Diptera Culicidae | 4 |
| 8/5/2019 | 2019 | Tiger Creek | Diptera | Dixidae | Diptera Dixidae | 5 |
| 8/5/2019 | 2019 | Tiger Creek | Diptera | Empididae | Diptera Empididae | 5 |
| 8/5/2019 | 2019 | Tiger Creek | Diptera | Simuliidae | Diptera Simuliidae | 9 |
| 8/5/2019 | 2019 | Tiger Creek | Diptera | Stratiomyidae | Diptera Stratiomyidae | 2 |
| 8/5/2019 | 2019 | Tiger Creek | Diptera | Tipulidae | Diptera Tipulidae | 6 |
| 8/5/2019 | 2019 | Tiger Creek | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 48 |
| 8/5/2019 | 2019 | Tiger Creek | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 111 |
| 8/5/2019 | 2019 | Tiger Creek | Ephemeroptera | Ephemeridae | Ephemeroptera Ephemeridae | 5 |
| 8/5/2019 | 2019 | Tiger Creek | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 16 |
| 8/5/2019 | 2019 | Tiger Creek | Ephemeroptera | Leptophlebidae | Ephemeroptera Leptophlebidae | 1 |
| 8/5/2019 | 2019 | Tiger Creek | Ephemeroptera | Tricorythidae | Ephemeroptera Tricorythidae | 15 |
| 8/5/2019 | 2019 | Tiger Creek | Hemiptera | Gerridae | Hemiptera Gerridae | 7 |
| 8/5/2019 | 2019 | Tiger Creek | Hemiptera | Veliidae | Hemiptera Veliidae | 13 |
| 8/5/2019 | 2019 | Tiger Creek | Heteroptera | Nepidae | Heteroptera Nepidae | 2 |
| 8/5/2019 | 2019 | Tiger Creek | Isopoda | Asellidae | Isopoda Asellidae | 3 |
| 8/5/2019 | 2019 | Tiger Creek | Lepidoptera | Chrysomelidae | Lepidoptera Chrysomelidae | 1 |
| 8/5/2019 | 2019 | Tiger Creek | Megaloptera | Corydalidae | Megaloptera Corydalidae | 2 |
| 8/5/2019 | 2019 | Tiger Creek | Odonata | Calopterygidae | Odonata Calopterygidae | 6 |
| 8/5/2019 | 2019 | Tiger Creek | Odonata | Coenagrionidae | Odonata Coenagrionidae | 4 |
| 8/5/2019 | 2019 | Tiger Creek | Odonata | Cordulegastridae | Odonata Cordulegastridae | 2 |
| 8/5/2019 | 2019 | Tiger Creek | Odonata | Gomphidae | Odonata Gomphidae | 2 |
| 8/5/2019 | 2019 | Tiger Creek | Odonata | Libellulidae | Odonata Libellulidae | 2 |

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|---|---|---|---|---|---|---|
| 8/5/2019 | 2019 | Tiger Creek | Plecoptera | Perlodidae | Plecoptera Perlodidae | 3 |
| 8/5/2019 | 2019 | Tiger Creek | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 26 |
| 8/5/2019 | 2019 | Tiger Creek | Trichoptera | Hydroptilidae | Trichoptera Hydroptilidae | 1 |
| 8/5/2019 | 2019 | Tiger Creek | Trichoptera | Philopotamidae | Trichoptera Philopotamidae | 6 |
| 8/5/2019 | 2019 | Tiger Creek | Trichoptera | Phryganeidae | Trichoptera Phryganeidae | 4 |
| 8/5/2019 | 2019 | Tiger Creek | Hydrocarina | | Hydrocarina | 1 |
| 8/5/2019 | 2019 | Tiger Creek | Collembola | | Collembola | 1 |
| 8/6/2019 | 2019 | Whiskey Chitto | Annelida | Oligochaeta | Annelida Oligochaeta | 28 |
| 8/6/2019 | 2019 | Whiskey Chitto | Coleoptera | Dryopidae | Coleoptera Dryopidae | 10 |
| 8/6/2019 | 2019 | Whiskey Chitto | Coleoptera | Elmidae | Coleoptera Elmidae | 190 |
| 8/6/2019 | 2019 | Whiskey Chitto | Coleoptera | Gyrinidae | Coleoptera Gyrinidae | 6 |
| 8/6/2019 | 2019 | Whiskey Chitto | Decapoda | Palaemonidae | Decapoda Palaemonidae | 33 |
| 8/6/2019 | 2019 | Whiskey Chitto | Diptera | Ceratopagonidae | Diptera Ceratopagonidae | 66 |
| 8/6/2019 | 2019 | Whiskey Chitto | Diptera | Chironomidae | Diptera Chironomidae | 515 |
| 8/6/2019 | 2019 | Whiskey Chitto | Diptera | Empididae | Diptera Empididae | 6 |
| 8/6/2019 | 2019 | Whiskey Chitto | Diptera | Simuliidae | Diptera Simuliidae | 6 |
| 8/6/2019 | 2019 | Whiskey Chitto | Diptera | Tipulidae | Diptera Tipulidae | 21 |
| 8/6/2019 | 2019 | Whiskey Chitto | Ephemeroptera | Baetidae | Ephemeroptera Baetidae | 33 |
| 8/6/2019 | 2019 | Whiskey Chitto | Ephemeroptera | Caenidae | Ephemeroptera Caenidae | 36 |
| 8/6/2019 | 2019 | Whiskey Chitto | Ephemeroptera | Heptageniidae | Ephemeroptera Heptageniidae | 14 |
| 8/6/2019 | 2019 | Whiskey Chitto | Ephemeroptera | Isonychiidae | Ephemeroptera Isonychiidae | 1 |
| 8/6/2019 | 2019 | Whiskey Chitto | Ephemeroptera | Leptophlebidae | Ephemeroptera Leptophlebidae | 4 |
| 8/6/2019 | 2019 | Whiskey Chitto | Ephemeroptera | Tricorythidae | Ephemeroptera Tricorythidae | 70 |
| 8/6/2019 | 2019 | Whiskey Chitto | Hemiptera | Gerridae | Hemiptera Gerridae | 5 |
| 8/6/2019 | 2019 | Whiskey Chitto | Hemiptera | Nepidae | Hemiptera Nepidae | 1 |
| 8/6/2019 | 2019 | Whiskey Chitto | Hemiptera | Veliidae | Hemiptera Veliidae | 40 |
| 8/6/2019 | 2019 | Whiskey Chitto | Hydrocarina | | Hydrocarina | 2 |
| 8/6/2019 | 2019 | Whiskey Chitto | Lepidoptera | Pyralidae | Lepidoptera Pyralidae | 1 |
| 8/6/2019 | 2019 | Whiskey Chitto | Megaloptera | Corydalidae | Megaloptera Corydalidae | 16 |
| 8/6/2019 | 2019 | Whiskey Chitto | Odonata | Aeshnidae | Odonata Aeshnidae | 7 |

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|---|---|---|---|---|---|---|
| 8/6/2019 | 2019 | Whiskey Chitto | Odonata | Calopterygidae | Odonata Calopterygidae | 9 |
| 8/6/2019 | 2019 | Whiskey Chitto | Odonata | Gomphidae | Odonata Gomphidae | 5 |
| 8/6/2019 | 2019 | Whiskey Chitto | Odonata | Libellulidae | Odonata Libellulidae | 10 |
| 8/6/2019 | 2019 | Whiskey Chitto | Prosobranchia | Viviparidae | Prosobranchia Viviparidae | 1 |
| 8/6/2019 | 2019 | Whiskey Chitto | Trichoptera | Hydropsychidae | Trichoptera Hydropsychidae | 2 |
| 8/6/2019 | 2019 | Whiskey Chitto | Trichoptera | Hydroptilidae | Trichoptera Hydroptilidae | 25 |
| 8/6/2019 | 2019 | Whiskey Chitto | Trichoptera | Leptoceridae | Trichoptera Leptoceridae | 4 |
| 8/6/2019 | 2019 | Whiskey Chitto | Trichoptera | Polycentropodidae | Trichoptera Polycentropodidae | 1 |