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Table of Contents

Abstract.....	1
Study Site.....	2
Methods.....	2
Results.....	4
Fish Assemblage.....	4
Water Quality.....	14
Discussion.....	17
Acknowledgments.....	18
References.....	18
Appendix A. Index of Biotic Integrity Results	
Appendix B. Water Quality and Stream Discharge Plots	

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Abstract.-Major improvements to water quality (and subsequently the fish assemblage) have been documented within the San Antonio River since the 1980s; however, segments of the river remain listed as impaired due to elevated *E. coli* concentrations and an impaired fish community. This study evaluated the fish assemblage and water quality (not including *E. coli*) on a seasonal basis over a two year period. Using the index of biotic integrity, the fish assemblage at all three stations rated slightly lower than the standards set by the Texas Commission on Environmental Quality (TCEQ), only receiving an aquatic life use rating of intermediate instead of high. With only a few exceptions, water quality parameters were within ranges known to be supportive of diverse aquatic fauna assemblages and within the TCEQ water quality standards criteria established for the San Antonio River. Exceptions included near anoxic conditions at two sites (both instances occurring following major rises in stream discharge) and routine incidences of water temperatures greater than 32.2°C during the summers.

The lower San Antonio River sub-basin is located in portions of seven counties in south-central Texas and supports a diverse ecological community that relies on the quality, quantity, and timing of water moving through the system. The San Antonio River basin has undergone significant transformation over the past several decades due to urban development in and around Bexar County and changing agricultural practices in the rural portion of the basin. Historically, the majority of the San Antonio River base flow came from area springs, but over the past several decades the river has experienced an evolution from a system driven predominantly by springflow to a system highly influenced by year-round wastewater treatment plant discharges. Wastewater discharges into the San Antonio River are derived primarily from groundwater pumped from the Edwards Aquifer for municipal use, diversions, and runoff from a changing mix of various urban and rural land uses.

The lower San Antonio River stream channel is characterized by a range of well to poorly defined stream bends. Stream banks range from gently sloping to high and steep. Much of the lower San Antonio River floodplain has been cleared up to or near the banks for agricultural and ranching purposes, leaving isolated patches of brushy riparian habitat scattered throughout the basin. Riparian habitats vary in width from a few meters to greater than fifty or sixty meters in undisturbed areas. There are some areas adjacent to the lower San Antonio River covered by dense hardwood canopies which limit the growth of underlying vegetation. Stream canopy ranges from open canopies in urban areas to partially and completely closed canopies. Macrophytes have a limited distribution.

The mainstem is comprised of two stream segments, 1911 and 1901, both having a high aquatic life use designation (Texas Commission on Environmental Quality 2012a). Elevated *E. coli* concentrations landed both segments on the 303(d) list of impaired water bodies in 2000. Subsequent to the initial listing, the fish community had also been identified as impaired. Habitat and nutrients are identified as concerns.

Several accomplishments have been made to address the bacteria impairment, including an approved bacteria TMDL. In addition, the 2006 Upper San Antonio River watershed protection

plan is currently being updated to identify and propose water quality best management practices that will serve to abate or control nonpoint source pollution of *E. coli* bacteria, suspended sediments, and excess nutrients in the Upper San Antonio River watershed (San Antonio River Authority 2013). Though water quality issues still exist, the river has improved dramatically since studies conducted in the 1980s which documented severe organic pollution and a high degree of environmental stress (Twidwell 1984; Twidwell and Davis 1984).

Study Site

Three sites on the San Antonio River were sampled seasonally over the course of two years in order to evaluate fish community integrity and water quality condition (Figure 1). The most upstream site was located at SH 97 in Floresville (Wilson County). Habitat was mostly comprised of long runs with sand substrate through a relatively narrow, entrenched channel. A fair amount of large and small woody debris was distributed throughout the reach. Moving downstream, the next sample station was located at Conquista Crossing downstream of FM 791 and upstream of Falls City (Karnes County). This was a very complex reach containing deep pools with silt substrate and extensive runs and riffles flowing over bedrock. The river splits into three channels within this reach and contained a massive log jam. The Habitat Quality Index scored high here in 2008 (San Antonio River Authority 2013). The most downstream sample station was located in Goliad at and upstream of Goliad State Park (Goliad County). In 2009 and 2010, this station only scored as having an intermediate Habitat Quality Index (San Antonio River Authority 2013). Similar to the Floresville site, habitat was mostly comprised of runs with sand substrate.

Methods

For the purposes of this study, seasons were defined as: spring, March – May; summer, June – August; fall, September – November; and, winter, December – February.

Fish sampling was conducted with boat electrofishing, barge electrofishing, backpack electrofishing, and seining to provide effective coverage of a wide range of habitats. In deeper areas (over approximately one meter) boat electrofishing was typically used. Seining was typically employed to most effectively sample shallower, wadeable areas of slow to moderate velocity. In wadeable areas with large woody debris or coarse substrates that made seining difficult, barge-style or backpack electrofishing with a hand-held wand and 2-3 netters was used. In shallow high-velocity riffles and runs a barge electrofisher with a hand-held wand was used with a seine set at the downstream boundary of the discrete sampling area. Sampling techniques were selected based on which would be most effective at capturing fish at each particular sampling area given the depth, velocity, substrate, and cover conditions present. A minimum sampling effort of 10 seine hauls and 15 minutes of actual shocking time was established for each site; however, sampling continued until all habitats had been effectively sampled and additional new species were not collected.

Once captured, large fish were identified to species, measured (total length in mm), enumerated, and released. Smaller specimens were often fixed in 10% formalin for later identification and measurement in the laboratory. For vouchering purposes, at least one individual of smaller species (e.g., minnows and darters) was retained and digital photographs

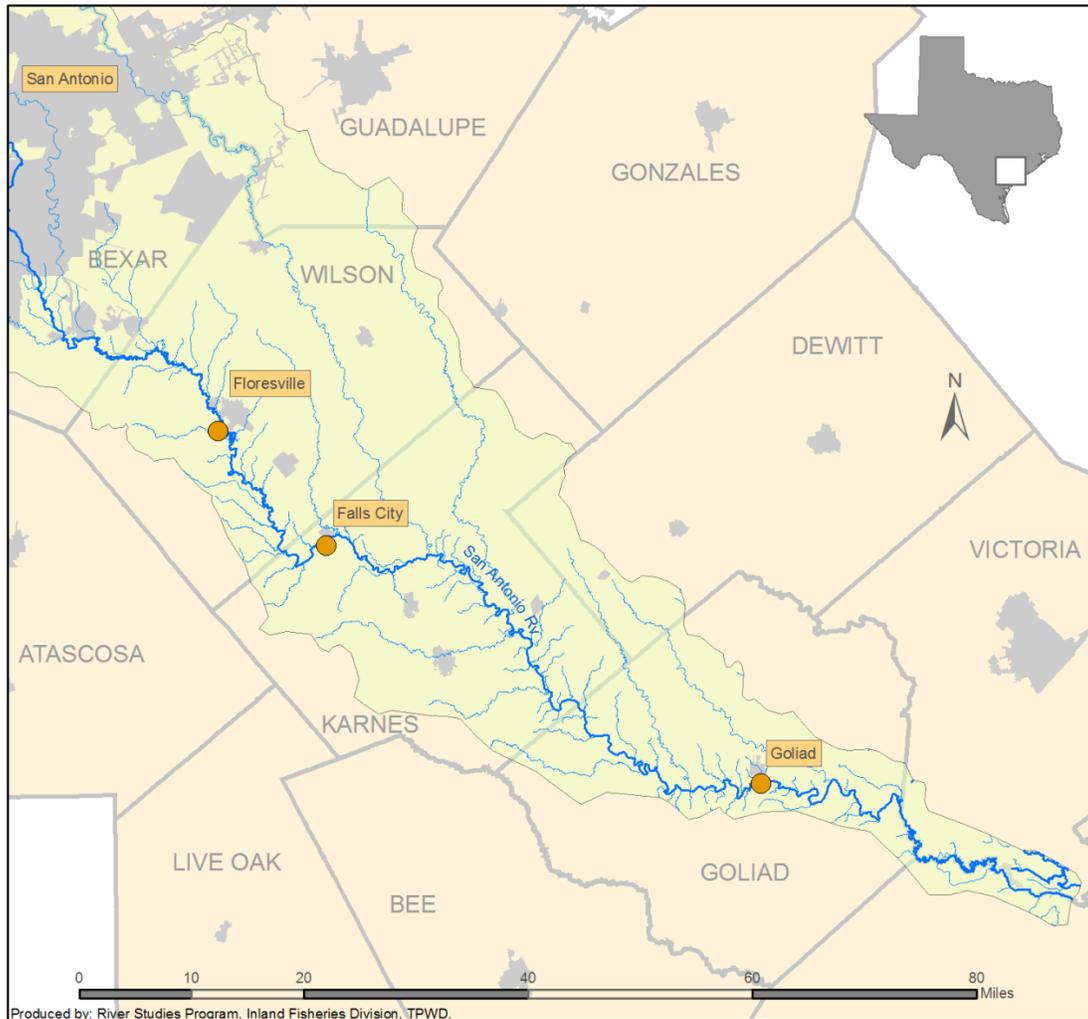


FIGURE 1. Map of the San Antonio River basin and location of the three sample stations included in this study.

were taken of larger species. All specimens were examined for external deformities, disease, lesions, tumors, and skeletal abnormalities. Data was analyzed using index of biotic integrity (IBI) metrics developed for the South Central and Southern Humid, Mixed Land Use Region (Linam et al. 2002). The IBI provides a means of assessing fish assemblage degradation. Results are reported as an aquatic life use. Possible rankings include exceptional, high, intermediate, and limited.

Upon completion of fish sampling, velocity, depth, and substrate were characterized at five points representing each corner and the middle of the sample area. Velocity and depth were measured using a Marsh-McBirney Flowmate Model 2000 portable flow meter and incremental wading rod. Dominant surficial substrates were classified as silt, sand, gravel, cobble, boulder, or bedrock following the standard Wentworth scale based on particle size. Instream cover was assessed at each of the sample areas and recorded as percent cover for leaf litter, small woody

debris, large woody debris (small end diameter of at least 10 cm and a length of at least 1.5 m), undercut bank, overhead cover (within 1 meter of water surface), velocity shelter, artificial structure, periphyton, or aquatic macrophytes. Photos were taken to document mesohabitats and instream cover at each sample site. Physicochemical water quality field parameters were also measured in the center of each sample area with a calibrated multiprobe instrument. These water quality measurements were compiled and reduced to a mean for each day. In addition, a data sonde was deployed to take measurements over an extended time period (an average of 21 days), including the time period that the biological sampling was conducted. Instantaneous measurements served as a quality control check on the values recorded by the long term deployed unit.

Results

Fish Assemblage

Thirty-nine species were collected during the course of this study (Tables 1-4). Conquista Crossing yielded the highest species richness (34), followed closely by Goliad (32). Only 29 species were collected in Floresville. Three species are non-native to Texas and include: common carp *Cyprinus carpio*; blue tilapia *Oreochromis aureus*; and vermiculated sailfin catfish *Pterygoplichthys disjunctivus*. Red shiner *Cyprinella lutrensis* and bullhead minnow *Pimephales vigilax* (two native minnow species) were the most abundant species.

A total of seven native cyprinid species were collected (Table 1). The two upstream stations also contained hybrids of red and blacktail shiners *C. venusta*, likely the result of the limited number of blacktail shiners available to breed with each other. Burrhead chub *Macrhybopsis marconis*, considered a species of special concern (Hubbs et al. 2008), was present at each sample station but was found in greatest numbers at Conquista Crossing, likely due to the abundance of fast runs and riffles there. This minnow species is a broadcast spawner and is very dependent upon flowing water for reproductive success (Perkin et al. 2013).

River carpsucker *Ictiobus bubalus* and gray redhorse *Moxostoma congestum* were the only sucker species collected and were present at all stations. Four catfish species, two of which were found at all three stations (channel catfish *Ictalurus punctatus* and flathead catfish *Pylodictis olivaris*), were collected. In addition tadpole madtom *Noturus gyrinus* was collected at Conquista Crossing and Goliad and blue catfish *I. furcatus* only at Goliad.

Eight centrarchid species were collected over the course of this study (Table 1). Seven were found throughout the river, but did not show up in every seasonal collection. Longear sunfish *Lepomis megalotis* was the most abundant and the only centrarchid species present in every collection.

Darters were only collected at the two downstream stations. Texas logperch *Percina carbonaria* was found at both whereas river darter *P. shumardi* was only collected at Goliad.

Seven species were collected in limited numbers (less than five individuals). These included: alligator gar *Atractosteus spatula*; threadfin shad *Dorosoma petenense*; central stoneroller *Campostoma anomalum*; fathead minnow *P. promelas*; green sunfish *Lepomis cyanellus*; American eel *Anguilla rostrata*; and white crappie *Pomoxis annularis*.

TABLE 1. Fish species collected from three sample stations on the San Antonio River, Texas between May 2012 and February 2014.

Species	Common Name	Floresville SH 97	Conquista Crossing Downstream FM 791	Goliad
<i>Anguilla rostrata</i>	American eel		X	
<i>Aplodinotus grunniens</i>	Freshwater drum			X
<i>Astyanax mexicanus</i>	Mexican tetra	X	X	X
<i>Atractosteus spatula</i>	Alligator gar			X
<i>Campostoma anomalum</i>	Central stoneroller		X	
<i>Cyprinella lutrensis x venusta</i>	Minnow hybrid	X	X	
<i>Cyprinella lutrensis</i>	Red shiner	X	X	X
<i>Cyprinella venusta</i>	Blacktail shiner	X	X	
<i>Cyprinodon variegatus</i>	Sheepshead minnow		X	
<i>Cyprinus carpio</i>	Common carp	X	X	X
<i>Dorosoma cepedianum</i>	Gizzard shad	X	X	X
<i>Dorosoma petenense</i>	Threadfin shad	X	X	X
<i>Gambusia affinis</i>	Western mosquitofish	X	X	X
<i>Herichthys cyanoguttatus</i>	Rio Grande cichlid	X	X	X
<i>Ictalurus furcatus</i>	Blue catfish			X
<i>Ictalurus punctatus</i>	Channel catfish	X	X	X
<i>Ictiobus bubalus</i>	Smallmouth buffalo	X	X	X
<i>Lepisosteus oculatus</i>	Spotted gar	X	X	X
<i>Lepisosteus osseus</i>	Longnose gar	X	X	X
<i>Lepomis cyanellus</i>	Green sunfish	X	X	X
<i>Lepomis gulosus</i>	Warmouth	X	X	X
<i>Lepomis humilus</i>	Orangespotted sunfish	X	X	X
<i>Lepomis macrochirus</i>	Bluegill	X	X	X
<i>Lepomis megalotis</i>	Longear sunfish	X	X	X
<i>Macrhybopsis marconis</i>	Burrhead chub	X	X	X
<i>Micropterus punctulatus</i>	Spotted bass	X	X	X
<i>Micropterus salmoides</i>	Largemouth bass	X	X	X
<i>Moxostoma congestum</i>	Gray redbreast	X	X	X
<i>Notropis buchanani</i>	Ghost shiner	X	X	X
<i>Noturus gyrinus</i>	Tadpole madtom		X	X
<i>Oreochromis aureus</i>	Blue tilapia	X	X	
<i>Percina carbonaria</i>	Texas logperch		X	X
<i>Percina shumardi</i>	River darter			X
<i>Pimephales promelas</i>	Fathead minnow		X	
<i>Pimephales vigilax</i>	Bullhead minnow	X	X	X
<i>Poecilia formosa</i>	Amazon molly	X	X	X
<i>Poecilia latipinna</i>	Sailfin molly	X	X	X
<i>Pomoxis annularis</i>	White crappie	X		
<i>Pterygoplichthys disjunctivus</i>	Vermiculated sailfin catfish	X	X	X
<i>Pylodictis olivaris</i>	Flathead catfish	X	X	X

IBI scores for each collection are presented in Appendix A. Based upon the average of IBI scores, each site ranked as having an intermediate aquatic life use (Tables 5-7). Scores were relatively stable throughout the course of this study. The only seasonal pattern noted occurred at Goliad where the aquatic life use scored as limited during both summers, but as intermediate during every other collection (Figure 2). A slight upward trend in IBI scores was noted at Conquista Crossing (Figure 3). No trend was observed at Floresville (Figure 4). Metrics that consistently rated low at all sites included: number of benthic invertivore species; number of intolerant species (none were collected at Floresville); and, proportion of individuals as piscivores. The number of sunfish species captured was often lacking as well, even though over the course of the study five species were identified as present at each site. Metrics always receiving the highest scores were proportion of individuals as invertivores and proportion of individuals with disease or anomalies. Even though three non-native species were identified, the proportion of the population comprised of such was usually low enough to result in a high score for this metric.

TABLE 6. IBI metric scores, total scores, and aquatic life use classification by season for the San Antonio River at Conquista Crossing (Karnes County, Texas).

	Spring 2012	Summer 2012	Fall 2012	Winter 2013	Spring 2013	Summer 2013	Fall 2013	Winter 2014
Total number of fish species	3	3	3	3	3	5	5	3
Number of native cyprinid species	5	3	3	5	5	3	5	5
Number of benthic invertivore species	1	1	1	1	1	1	1	1
Number of sunfish species	1	1	1	1	1	3	5	3
Number of intolerant species	1	1	1	1	1	1	1	1
% of individuals as tolerant species (excluding western mosquitofish)	1	5	1	1	1	5	1	1
% of individuals as omnivores	5	1	3	5	5	3	3	5
% of individuals as invertivores	5	5	5	5	5	5	5	5
% of individuals as piscivores	1	1	1	1	1	1	1	1
Number of individuals in sample	4	4	3	3	3	3	5	5
% of individuals as non-native species	5	1	5	5	5	1	5	5
% of individuals with disease or other anomaly	5	5	5	5	5	5	5	5
Total score	37	31	32	36	36	36	42	40
Aquatic Life Use	Intermediate	Limited	Limited	Intermediate	Intermediate	Intermediate	High	Intermediate
Average IBI Score = 36 (Intermediate)								

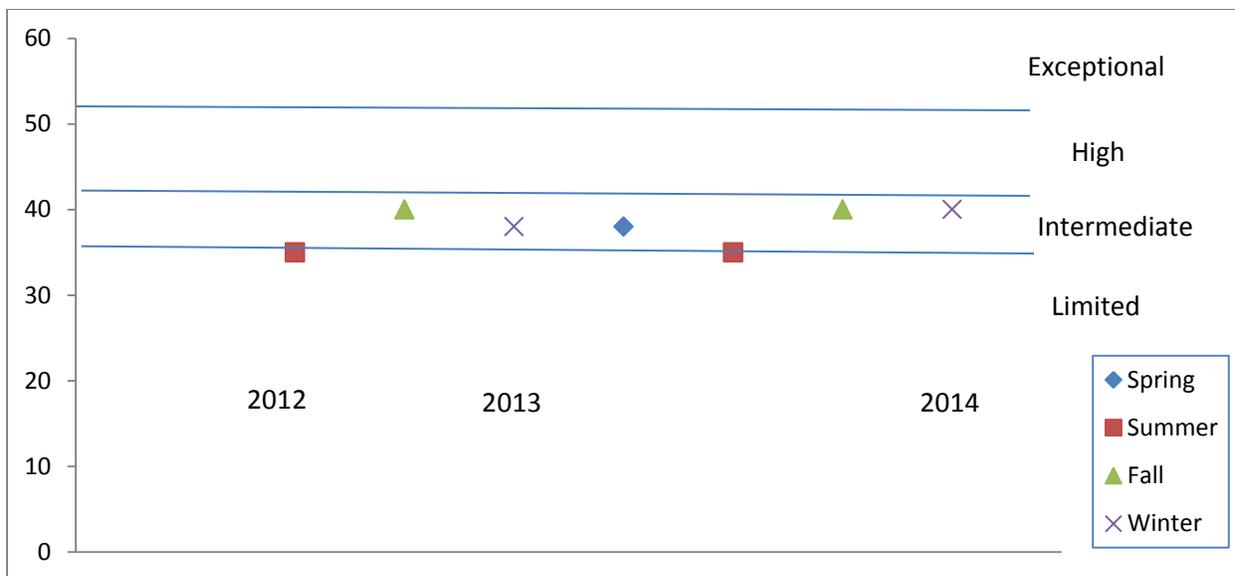


FIGURE 2. IBI score and associated aquatic life use category by season for the San Antonio River at Goliad, Texas (Goliad County).

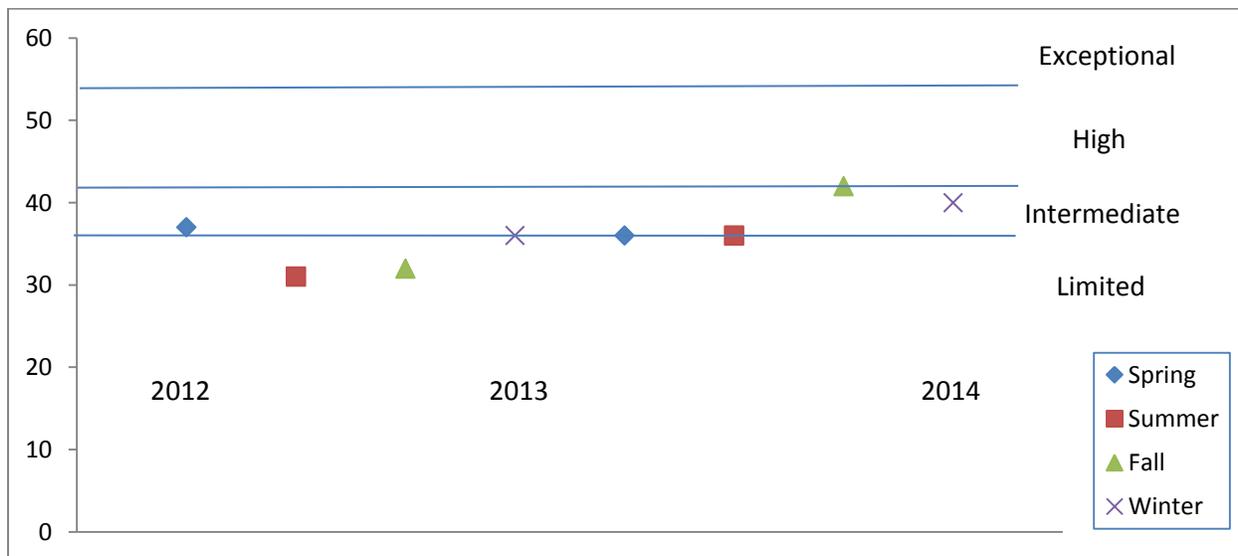


FIGURE 3. IBI score and associated aquatic life use category by season for the San Antonio River at Conquista Crossing (Karnes County, Texas).

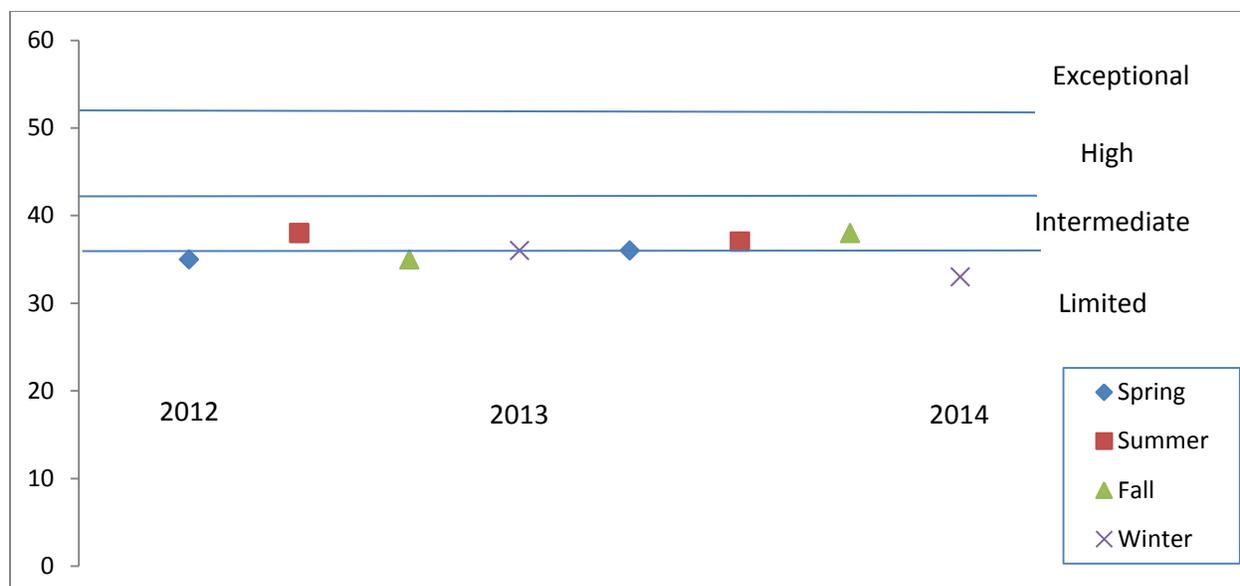


FIGURE 4. IBI score and associated aquatic life use category by season for the San Antonio River at Floresville, Texas (Wilson County).

Water Quality

Water temperature varied widely between seasons with means ranging from 30.9°C in the summer to 16.1°C in the winter (Table 8). Dissolved oxygen mean values followed a similar pattern. Specific conductivity mean values varied somewhat seasonally with the highest values occurring in the summer and winter. pH showed no relationship to season.

TABLE 8. Mean water quality parameters calculated from combined data collected by a data sonde deployed for an average of 21 days each season between April 2012 and February 2014 at three sample stations in the San Antonio River, Texas (Wilson County, Karnes County, Goliad County).

	Fall	Spring	Summer	Winter
Mean Temperature (°C)	21.7	24.2	30.9	16.1
Mean pH	8.1	8.0	8.1	8.2
Mean Specific Conductivity (µS/cm)	860	967	1062	1050
Mean Dissolved Oxygen (mg/L)	7.7	7.0	7.0	9.4

With only a few exceptions, water quality parameters were within ranges known to be supportive of diverse aquatic fauna assemblages and within the Texas Commission on Environmental Quality (TCEQ) water quality standards criteria established for the San Antonio River (Tables 9-11). These criteria are: dissolved oxygen 24 hour mean and minimum of 5.0 mg/L and 3.0 mg/L respectively; pH between 6.5 and 9.0; total dissolved solids maximum annual average of 750 mg/L; and maximum temperature of 32.2°C (TCEQ 2014). Plots of the water quality data parameters relative to each other and to stream discharge are included in Appendix B.

Water temperatures greater than the 32.2°C maximum standard were recorded at each station during both summers (except Conquista Crossing during 2013 when the maximum recorded temperature was 31.9°C). The two highest values recorded by the deployed data sonde (34.1°C and 33.5°C) were recorded at Goliad during the summers of 2013 and 2012 respectively. An even higher value (34.9°C) was recorded in a backwater at Conquista Crossing during the summer of 2012 while conducting fish sampling. During the summer of 2013 at Goliad, water temperatures exceeded 32.2°C an average of 4.75 hrs/day during 18 of the 27 days the data logger was deployed. During the summer of 2012, temperature exceedances (average of 6 hrs/day) occurred all five days at Goliad that the recorder collected data. At Floresville, temperature exceedances were documented 13 of the 20 days readings were captured during the summer of 2012 and 8 of 29 days during the summer of 2013. These high values transpired an average of 5 hrs/day in 2012 and 2.5 hrs/day in 2013. The coldest temperature recorded was 7.6°C during the winter of 2014 at Goliad.

Floresville (spring 2012) and Goliad (fall 2013) did not meet dissolved oxygen criteria. Both of these instances were associated with major water rises following significant rainfall events. During the spring of 2012, stream discharge values rose from less than 200 cfs to 5000 cfs at Floresville over the course of about six days resulting in significant drops in dissolved oxygen from 8 mg/L to near zero (Appendix B, B-3). The 24 hour means were less than 5.0 mg/L for the last seven days of data sonde deployment. Values less than 3.0 mg/L were recorded for sustained periods (lasting an average of 10 hrs/day) during all or part of four of these days. During the fall of 2013 stream discharge increased from 250 cfs to over 2000 cfs in one day at Goliad resulting in the lowest recorded dissolved oxygen value of the study (Table 11; Appendix B, B-17). Dissolved oxygen values recovered quickly with only one 24 hour period having a mean value less than 5.0 mg/L; however, concentrations less than 3.0 mg/L lasted for nearly the entirety of that time.

There are no established water quality standards for specific conductivity in the San Antonio River; however, specific conductivity can be used to estimate total dissolved solids concentration by multiplying specific conductivity by 0.65 (TCEQ 2012b). Based upon this relationship, the total dissolved solids maximum annual average met stream standards. Stream standards for pH were met at all stations.

TABLE 9. Mean, minimum, and maximum values of water quality parameters collected with a data sonde deployed in the San Antonio River at SH 97 (Wilson County, Texas).

	Fall 2012	Fall 2013	Spring 2012	Spring 2013	Summer 2012	Summer 2013	Winter 2013	Winter 2014
Temperature (°C)								
Mean	21.7	23.4	25.8	23.3	31.1	30.5	18.4	15.0
Min	18.3	20.8	21.7	20.8	28.9	28.0	12.6	11.3
Max	24.2	26.8	29.9	26.0	33.0	32.5	22.7	18.8
pH								
Mean	8.0	7.9	7.6	8.1	8.1	8.0	8.1	8.0
Min	7.9	7.8	7.3	8.0	7.9	7.7	7.8	7.8
Max	8.0	8.0	8.1	8.2	8.4	8.3	8.2	8.2
Specific Conductivity (µS/cm)								
Mean	827	976	705	1048	973	1010	1065	1036
Min	614	641	334	912	790	610	934	977
Max	925	1131	1112	1124	1039	1135	1139	1109
Dissolved Oxygen (mg/L)								
Mean	7.6	7.3	5.1	7.4	7.2	6.9	8.7	9.0
Min	7.1	6.0	0.1	6.8	5.7	5.1	7.6	6.6
Max	8.1	7.9	8.2	8.2	11.3	10.7	9.9	11.1

TABLE 10. Mean, minimum, and maximum values of water quality parameters collected with a data sonde deployed in the San Antonio River downstream of FM 791 (Karnes County, Texas).

	Fall 2012	Fall 2013	Spring 2012	Spring 2013	Summer 2012	Summer 2013	Winter 2013
Temperature (°C)							
Mean	20.4	23.2	26.3	23.0	31.2	30.6	17.8
Min	18.0	20.2	20.7	21.0	30.4	28.2	12.3
Max	23.1	26.7	29.2	25.6	32.1	31.9	21.5
pH							
Mean	8.2	7.9	8.1	8.0	8.1	7.8	8.2
Min	8.0	7.7	7.7	8.0	8.0	7.5	8.0
Max	8.3	8.2	8.4	8.1	8.2	8.1	8.7
Specific Conductivity (µS/cm)							
Mean	756	982	889	1098	1076	1111	1080
Min	551	616	220	1000	883	643	921
Max	942	1177	1162	1172	1167	1291	1150
Dissolved Oxygen (mg/L)							
Mean	7.6	7.4	7.4	7.0	6.3	7.2	8.8
Min	7.0	6.3	5.8	6.2	5.0	5.5	7.7
Max	8.0	10.2	8.9	7.7	7.6	10.7	10.1

TABLE 11. Mean, minimum, and maximum values of water quality parameters collected with a data sonde deployed in the San Antonio River at US 77-A (Goliad County, Texas).

	Fall 2012	Fall 2013	Spring 2013	Summer 2012	Summer 2013	Winter 2013	Winter 2014
Temperature (°C)							
Mean	19.0	22.7	22.8	31.4	30.8	16.7	12.6
Min	17.5	19.2	18.3	29.6	27.4	9.8	7.6
Max	21.2	27.1	27.1	33.5	34.1	22.9	17.5
pH							
Mean	8.1	8.2	8.3	8.4	8.5	8.4	8.4
Min	8.0	7.6	8.0	8.3	8.1	8.1	8.2
Max	8.4	8.4	8.5	8.5	8.7	8.5	8.6
Specific Conductivity (µS/cm)							
Mean	707	910	1095	809	1141	1038	1034
Min	429	81	715	747	750	709	957
Max	1089	1162	1261	873	1370	1186	1084
Dissolved Oxygen (mg/L)							
Mean	8.44	7.84	8.28	7.98	7.46	9.73	10.91
Min	8.13	0.03	7.27	6.67	4.99	8.20	8.87
Max	8.75	8.95	9.76	9.68	11.03	10.94	13.14

Discussion

Fish data collected during the course of this study corroborate the impaired fish community listing by TCEQ as all three stations rated as only having an intermediate aquatic life use instead of the designated listing of high. Concurrent work performed at two other sites on the San Antonio River (one upstream and one downstream from those sampled in our study) also yielded intermediate aquatic life uses (BIO-WEST, Inc. 2014). Water quality is a likely contributor to this impairment based upon conditions documented during this study, nutrient concerns reported by TCEQ (2012a), and fish assemblage attributes such as the low number of intolerant and benthic invertivore species collected. TCEQ (2012a) reports no concerns with temperature or dissolved oxygen; however, near anoxic conditions were documented on two occasions in this study and temperatures greater than 32.2°C were regular events during the summers. Texas has been in the throes of a serious drought (starting before the initiation of this study) which certainly could have exacerbated water quality conditions in the river. However, if the conditions observed over the duration of this study are typical of most years there is little doubt the fish community would be impacted to some degree by them. Further analysis of temperature and dissolved oxygen data put in context with stream flow could prove very beneficial in ongoing work targeted at setting instream flow recommendations for the basin (Texas Instream Flow Program 2008).

In general, literature values for fish from the lower San Antonio River basin suggest that most species have an upper temperature limit somewhere around 35°C; however, it is acknowledged that sub-lethal effects occur prior to reaching these water temperature criteria (Texas Instream

Flow Program and San Antonio River Authority 2011). Other fauna such as mussels are also sensitive to high water temperatures. Spooner et al. (2005) found mussels to experience species-specific, sub-lethal stress when exposed to high water temperatures (generally greater than 35°C, but lower for some species). These high water temperatures can eventually lead to death, which is of particular concern given the substantial number of golden orb *Quadrula aurea* documented in the Goliad area (Hammontree et al. 2012). Golden orb are designated as state threatened and are currently a candidate for placement on the federal endangered species list.

Dissolved oxygen concentrations below 3 mg/L are considered stressful (and ultimately lethal over extended periods) to most fish. As reported in the results, such stressful conditions were documented in the river at two of the stations. No fish kills were reported, thus they were either minor or localized enough to not draw attention, or the fish found refuge in tributaries or other safe havens until conditions improved.

TCEQ (2012a) also lists impaired habitat as a concern in the river. A formal habitat evaluation was not conducted as part of this project; however, habitat data was collected with each biological collection and did not seem lacking at the three stations sampled. Thus it appears far more likely that water quality rather than habitat is the main contributor to the impaired fish community.

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Appendix A
Index of Biotic Integrity Results

San Antonio River @ SH 97, Floresville (Site 19100), Wilson Co.			May-12		Ecoregions 33 & 35	
Collector: Linam, Boles, McMillan			Metric Name		Raw Value	
Metric Category	Intermediate Totals for Metrics		Metric Name		Raw Value	
	Drainage Basin Size (km ²)	5000				
Species Richness and Composition	Number of Fish Species	19	Number of Fish Species		19	
	Number of Native Cyprinid Species	4	Number of Native Cyprinid Species		4	
	Number of Benthic Invertebrate Species	0	Number of Benthic Invertebrate Species		0	
	Number of Sunfish Species	3	Number of Sunfish Species		3	
	Number of Intolerant Species	0	Number of Intolerant Species		0	
Trophic Composition	Number of Individuals as Tolerants ^a	815	% of Individuals as Tolerant Species ^a		55.2	
	Number of Individuals as Omnivores	66	% of Individuals as Omnivores		4.5	
	Number of Individuals as Invertebrates	1404	% of Individuals as Invertebrates		95.1	
	Number of Individuals as Piscivores	5	% of Individuals as Piscivores		0.3	
	Number of Individuals (Seine)	1390	Number of Individuals in Sample		139.0	
Fish Abundance and Condition	Number of Individuals (Shock)	86	Number of Individuals/min electrofishing		5.41	
	Number of Individuals in Sample	1476	% of Individuals as Non-native Species		1.4	
	# of Individuals as Non-native species	20	% of Individuals With Disease/Anomaly		0.2	
# of Individuals With Disease/Anomaly	3	Index of Biotic Integrity Numeric Score:		35		
			Aquatic Life Use:		Limited	

^a Excluding western mosquitofish

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

San Antonio River @ SH 97, Floresville (Site 19100), Wilson Co.			
Collector: Linam, McMillan, Burke		August-12	
Metric Category	Intermediate Totals for Metrics	Metric Name	Ecoregions 33 & 35
	Drainage Basin Size (km ²)		Raw Value
	5000		
Species Richness and Composition	Number of Fish Species	Number of Fish Species	21
	Number of Native Cyprinid Species	Number of Native Cyprinid Species	4
	Number of Benthic Invertebrate Species	Number of Benthic Invertebrate Species	1
	Number of Sunfish Species	Number of Sunfish Species	4
	Number of Intolerant Species	Number of Intolerant Species	0
Trophic Composition	Number of Individuals as Tolerants ^a	% of Individuals as Tolerant Species ^a	35.2
	Number of Individuals as Omnivores	% of Individuals as Omnivores	20.5
	Number of Individuals as Invertebrates	% of Individuals as Invertebrates	77.4
	Number of Individuals as Piscivores	% of Individuals as Piscivores	1.9
	Number of Individuals (Seine)	Number of Individuals in Sample	99.0
Fish Abundance and Condition	Number of Individuals (Shock)	Number of Individuals/seine haul	8.63
	Number of Individuals in Sample	Number of Individuals/min electrofishing	0.2
	# of Individuals as Non-native species	% of Individuals as Non-native Species	0.1
	# of Individuals With Disease/Anomaly	% of Individuals With Disease/Anomaly	0.1
		Index of Biotic Integrity Numeric Score:	38
		Aquatic Life Use:	Intermediate

^a Excluding western mosquitofish

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

San Antonio River @ SH 97, Floresville (Site 19100), Wilson Co.			November-12		Ecoregions 33 & 35	
Collector: Linam, Grubh, Keller			Metric Name		Raw Value	
Metric Category	Intermediate Totals for Metrics				IBI Score	
	Drainage Basin Size (km ²)	5000				
Species Richness and Composition	Number of Fish Species	12	Number of Fish Species		12	
	Number of Native Cyprinid Species	3	Number of Native Cyprinid Species		3	
	Number of Benthic Invertebrate Species	0	Number of Benthic Invertebrate Species		0	
	Number of Sunfish Species	1	Number of Sunfish Species		1	
	Number of Intolerant Species	0	Number of Intolerant Species		0	
	Number of Individuals as Tolerants ^a	199	% of Individuals as Tolerant Species ^a		50.4	
Trophic Composition	Number of Individuals as Omnivores	10	% of Individuals as Omnivores		2.5	
	Number of Individuals as Invertebrates	380	% of Individuals as Invertebrates		96.2	
	Number of Individuals as Piscivores	4	% of Individuals as Piscivores		1.0	
	Number of Individuals (Seine)	241	Number of Individuals in Sample		24.1	
Fish Abundance and Condition	Number of Individuals (Shock)	154	Number of Individuals/seine haul		8.95	
	Number of Individuals in Sample	395	Number of Individuals/min electrofishing		0.5	
	# of Individuals as Non-native species	2	% of Individuals as Non-native Species		0.5	
	# of Individuals With Disease/Anomaly	2	% of Individuals With Disease/Anomaly		0.5	
			Index of Biotic Integrity Numeric Score:		35	
			Aquatic Life Use:		Limited	

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

^a Excluding western mosquitofish

San Antonio River @ SH 97, Floresville (Site 19100), Wilson Co.			January-13	Ecoregions 33 & 35	
Collector: Linam, Bilbo, Villarreal			Metric Name	Raw Value	IBI Score
Metric Category	Intermediate Totals for Metrics				
	Drainage Basin Size (km ²)		5000		
Species Richness and Composition	Number of Fish Species		15	Number of Fish Species	15
	Number of Native Cyprinid Species		4	Number of Native Cyprinid Species	4
	Number of Benthic Invertebrate Species		0	Number of Benthic Invertebrate Species	0
	Number of Sunfish Species		2	Number of Sunfish Species	2
	Number of Intolerant Species		0	Number of Intolerant Species	0
	Number of Individuals as Tolerants ^a		88	% of Individuals as Tolerant Species ^a	35.1
Trophic Composition	Number of Individuals as Omnivores		2	% of Individuals as Omnivores	0.8
	Number of Individuals as Invertebrates		244	% of Individuals as Invertebrates	97.2
	Number of Individuals as Piscivores		4	% of Individuals as Piscivores	1.6
	Number of Individuals (Seine)		170	Number of Individuals in Sample	
Fish Abundance and Condition	Number of Individuals (Shock)		81	Number of Individuals/seine haul	18.9
	Number of Individuals in Sample		251	Number of Individuals/min electrofishing	4.40
	# of Individuals as Non-native species		2	% of Individuals as Non-native Species	0.8
	# of Individuals With Disease/Anomaly		0	% of Individuals With Disease/Anomaly	0.0
			Index of Biotic Integrity Numeric Score:		36
			Aquatic Life Use:		Intermediate

^a Excluding western mosquitofish

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

San Antonio River @ SH 97, Floresville (Site 19100), Wilson Co.			April-13		Ecoregions 33 & 35	
Collector: Linam, McMillan, Larralde			Metric Name		Raw Value	IBI Score
Metric Category	Intermediate Totals for Metrics					
	Drainage Basin Size (km ²)	5000				
Species Richness and Composition	Number of Fish Species	16	Number of Fish Species			
	Number of Native Cyprinid Species	4	Number of Native Cyprinid Species			
	Number of Benthic Invertebrate Species	0	Number of Benthic Invertebrate Species			
	Number of Sunfish Species	2	Number of Sunfish Species			
	Number of Intolerant Species	0	Number of Intolerant Species			
	Number of Individuals as Tolerant ^a	172	% of Individuals as Tolerant Species ^a			
Trophic Composition	Number of Individuals as Omnivores	8	% of Individuals as Omnivores			
	Number of Individuals as Invertebrates	341	% of Individuals as Invertebrates			
	Number of Individuals as Piscivores	13	% of Individuals as Piscivores			
	Number of Individuals (Seine)	274	Number of Individuals in Sample			
Fish Abundance and Condition	Number of Individuals (Shock)	89	Number of Individuals/seine haul			
	Number of Individuals in Sample	363	Number of Individuals/min electrofishing			
	# of Individuals as Non-native species	3	% of Individuals as Non-native Species			
	# of Individuals With Disease/Anomaly	1	% of Individuals With Disease/Anomaly			
			Index of Biotic Integrity Numeric Score:		36	
			Aquatic Life Use:		Intermediate	

^a Excluding western mosquitofish

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

San Antonio River @ SH 97, Floresville (Site 19100), Wilson Co.			July-13		Ecoregions 33 & 35	
Collector: Linam, McMillan, Larralde			Metric Name		Raw Value	
Metric Category	Intermediate Totals for Metrics		Metric Name		Raw Value	
	Drainage Basin Size (km ²)	5000				
Species Richness and Composition	Number of Fish Species	14	Number of Fish Species		14	
	Number of Native Cyprinid Species	4	Number of Native Cyprinid Species		4	
	Number of Benthic Invertebrate Species	1	Number of Benthic Invertebrate Species		1	
	Number of Sunfish Species	1	Number of Sunfish Species		1	
	Number of Intolerant Species	0	Number of Intolerant Species		0	
	Number of Individuals as Tolerants ^a	67	% of Individuals as Tolerant Species ^a		40.9	
Trophic Composition	Number of Individuals as Omnivores	11	% of Individuals as Omnivores		6.7	
	Number of Individuals as Invertebrates	144	% of Individuals as Invertebrates		87.8	
	Number of Individuals as Piscivores	8	% of Individuals as Piscivores		4.9	
	Number of Individuals (Seine)	150	Number of Individuals in Sample		15.0	
Fish Abundance and Condition	Number of Individuals (Shock)	14	Number of Individuals/seine haul		0.83	
	Number of Individuals in Sample	164	Number of Individuals/min electrofishing		0.6	
	# of Individuals as Non-native species	1	% of Individuals as Non-native Species		0.0	
	# of Individuals With Disease/Anomaly	0	% of Individuals With Disease/Anomaly		0.0	
			Index of Biotic Integrity Numeric Score:		37	
			Aquatic Life Use:		Intermediate	

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

^a Excluding western mosquitofish

San Antonio River @ SH 97, Floresville (Site 19100), Wilson Co.			October-13		Ecoregions 33 & 35	
Collector: Linam, McMillan, Larralde			Metric Name		Raw Value IBI Score	
Metric Category	Intermediate Totals for Metrics					
Species Richness and Composition	Drainage Basin Size (km ²)	5000				
	Number of Fish Species	15	Number of Fish Species			
	Number of Native Cyprinid Species	3	Number of Native Cyprinid Species			
	Number of Benthic Invertebrate Species	0	Number of Benthic Invertebrate Species			
	Number of Sunfish Species	2	Number of Sunfish Species			
	Number of Intolerant Species	0	Number of Intolerant Species			
Trophic Composition	Number of Individuals as Tolerants ^a	83	% of Individuals as Tolerant Species ^a			
	Number of Individuals as Omnivores	28	% of Individuals as Omnivores			
	Number of Individuals as Invertebrates	584	% of Individuals as Invertebrates			
	Number of Individuals as Piscivores	5	% of Individuals as Piscivores			
	Number of Individuals (Seine)	601	Number of Individuals in Sample			
Fish Abundance and Condition	Number of Individuals (Shock)	18	Number of Individuals/seine haul			
	Number of Individuals in Sample	619	Number of Individuals/min electrofishing			
	# of Individuals as Non-native species	2	% of Individuals as Non-native Species			
	# of Individuals With Disease/Anomaly	0	% of Individuals With Disease/Anomaly			
			Index of Biotic Integrity Numeric Score:		38	
			Aquatic Life Use:		Intermediate	
This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.						

^a Excluding western mosquitofish

San Antonio River @ SH 97, Floresville (Site 19100), Wilson Co.			
Collector: Linam, Botros, Donovan, Sablan, Burke		February-14	Ecoregions 33 & 35
Metric Category	Intermediate Totals for Metrics	Metric Name	Raw Value
	Drainage Basin Size (km ²)		5000
Species Richness and Composition	Number of Fish Species	Number of Fish Species	13
	Number of Native Cyprinid Species	Number of Native Cyprinid Species	2
	Number of Benthic Invertebrate Species	Number of Benthic Invertebrate Species	0
	Number of Sunfish Species	Number of Sunfish Species	1
	Number of Intolerant Species	Number of Intolerant Species	0
	Number of Individuals as Tolerants ^a	% of Individuals as Tolerant Species ^a	62.2
Trophic Composition	Number of Individuals as Omnivores	% of Individuals as Omnivores	5.7
	Number of Individuals as Invertebrates	% of Individuals as Invertebrates	92.3
	Number of Individuals as Piscivores	% of Individuals as Piscivores	1.9
	Number of Individuals (Seine)	Number of Individuals in Sample	195
Fish Abundance and Condition	Number of Individuals (Shock)	Number of Individuals/Seine haul	14
	Number of Individuals in Sample	Number of Individuals/min electrofishing	209
	# of Individuals as Non-native species	% of Individuals as Non-native Species	1
	# of Individuals With Disease/Anomaly	% of Individuals With Disease/Anomaly	1
Index of Biotic Integrity Numeric Score:			33
Aquatic Life Use:			Limited

^a This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score. Excluding western mosquitofish

San Antonio River @ Downstream of FM 791 (Site 19090), Karnes Co.			May-12		Ecoregions 33 & 35	
Collector: Linam, Grubb, Burke, Sabian, Larralde			Metric Name		Raw Value	
Metric Category	Intermediate Totals for Metrics		Metric Name		Raw Value	
	Drainage Basin Size (km ²)	5473				
Species Richness and Composition	Number of Fish Species	17	Number of Fish Species		17	3
	Number of Native Cyprinid Species	5	Number of Native Cyprinid Species		5	5
	Number of Benthic Invertebrate Species	1	Number of Benthic Invertebrate Species		1	1
	Number of Sunfish Species	2	Number of Sunfish Species		2	1
	Number of Intolerant Species	0	Number of Intolerant Species		0	1
Trophic Composition	Number of Individuals as Tolerants ^a	683	% of Individuals as Tolerant Species ^a		69.1	1
	Number of Individuals as Omnivores	28	% of Individuals as Omnivores		2.8	5
	Number of Individuals as Invertebrates	925	% of Individuals as Invertebrates		93.6	5
	Number of Individuals as Piscivores	23	% of Individuals as Piscivores		2.3	1
	Number of Individuals (Seine)	857	Number of Individuals in Sample			4
Fish Abundance and Condition	Number of Individuals (Shock)	131	Number of Individuals/Seine haul		85.7	5
	Number of Individuals in Sample	988	Number of Individuals/min electrofishing		6.52	3
	# of Individuals as Non-native species	12	% of Individuals as Non-native Species		1.2	5
	# of Individuals With Disease/Anomaly	0	% of Individuals With Disease/Anomaly		0.0	5
			Index of Biotic Integrity Numeric Score:		37	
			Aquatic Life Use:		Intermediate	

^a Excluding western mosquitofish
This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

San Antonio River @ Downstream of FM 791 (Site 19090), Karnes Co.			August-12		Ecoregions 33 & 35	
Collector: Linam, Larralde, Linam, Lehman			Metric Name		Raw Value	
Metric Category	Intermediate Totals for Metrics				IBI Score	
	Drainage Basin Size (km ²)	5473				
Species Richness and Composition	Number of Fish Species	17	Number of Fish Species		17	
	Number of Native Cyprinid Species	3	Number of Native Cyprinid Species		3	
	Number of Benthic Invertebrate Species	1	Number of Benthic Invertebrate Species		1	
	Number of Sunfish Species	2	Number of Sunfish Species		2	
	Number of Intolerant Species	1	Number of Intolerant Species		1	
	Number of Individuals as Tolerants ^a	105	% of Individuals as Tolerant Species ^a		24.4	
Trophic Composition	Number of Individuals as Omnivores	74	% of Individuals as Omnivores		17.2	
	Number of Individuals as Invertebrates	348	% of Individuals as Invertebrates		80.9	
	Number of Individuals as Piscivores	6	% of Individuals as Piscivores		1.4	
Fish Abundance and Condition	Number of Individuals (Seine)	367	Number of Individuals in Sample		36.7	
	Number of Individuals (Shock)	63	Number of Individuals/Seine haul		3.58	
	Number of Individuals in Sample	430	Number of Individuals/min electrofishing		5.3	
	# of Individuals as Non-native species	23	% of Individuals as Non-native Species		0.2	
	# of Individuals With Disease/Anomaly	1	% of Individuals With Disease/Anomaly		0.2	
			Index of Biotic Integrity Numeric Score:		31	
			Aquatic Life Use:		Limited	

^a Excluding western mosquitofish

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

San Antonio River @ Downstream of FM 791 (Site 19090), Karnes Co.			November-12		Ecoregions 33 & 35	
Collector: Linam, Kolodziejcyk, Larralde, Donovan			Metric Name		Raw Value	
Metric Category	Intermediate Totals for Metrics				IBI Score	
	Drainage Basin Size (km ²)	5473				
Species Richness and Composition	Number of Fish Species	15	Number of Fish Species		15	3
	Number of Native Cyprinid Species	4	Number of Native Cyprinid Species		4	3
	Number of Benthic Invertebrate Species	0	Number of Benthic Invertebrate Species		0	1
	Number of Sunfish Species	2	Number of Sunfish Species		2	1
	Number of Intolerant Species	0	Number of Intolerant Species		0	1
Trophic Composition	Number of Individuals as Tolerants ^a	597	% of Individuals as Tolerant Species ^a		71.9	1
	Number of Individuals as Omnivores	95	% of Individuals as Omnivores		11.4	3
	Number of Individuals as Invertivores	734	% of Individuals as Invertivores		88.4	5
	Number of Individuals as Piscivores	1	% of Individuals as Piscivores		0.1	1
	Number of Individuals (Seine)	758	Number of Individuals in Sample		75.8	3
Fish Abundance and Condition	Number of Individuals (Shock)	72	Number of Individuals/Seine haul		3.35	5
	Number of Individuals in Sample	830	Number of Individuals/min electrofishing		0.2	1
	# of Individuals as Non-native species	2	% of Individuals as Non-native Species		0.2	5
	# of Individuals With Disease/Anomaly	2	% of Individuals With Disease/Anomaly		0.2	5
			Index of Biotic Integrity Numeric Score:		32	
			Aquatic Life Use:		Limited	

^a Excluding western mosquitofish

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

San Antonio River @ Downstream of FM 791 (Site 19090), Karnes Co.			January-13		Ecoregions 33 & 35	
Collector: Linam, Kolodziejczyk, Larralde			Metric Name		Raw Value	
Metric Category	Intermediate Totals for Metrics		Metric Name		Raw Value	
	Drainage Basin Size (km ²)	5473				
Species Richness and Composition	Number of Fish Species	13	Number of Fish Species		13	3
	Number of Native Cyprinid Species	5	Number of Native Cyprinid Species		5	5
	Number of Benthic Invertebrate Species	0	Number of Benthic Invertebrate Species		0	1
	Number of Sunfish Species	2	Number of Sunfish Species		2	1
	Number of Intolerant Species	0	Number of Intolerant Species		0	1
Trophic Composition	Number of Individuals as Tolerants ^a	803	% of Individuals as Tolerant Species ^a		79.5	1
	Number of Individuals as Omnivores	9	% of Individuals as Omnivores		0.9	5
	Number of Individuals as Invertebrates	1001	% of Individuals as Invertebrates		99.1	5
	Number of Individuals as Piscivores	0	% of Individuals as Piscivores		0.0	1
	Number of Individuals (Seine)	959	Number of Individuals in Sample		95.9	3
Fish Abundance and Condition	Number of Individuals (Shock)	51	Number of Individuals/seine haul		2.13	5
	Number of Individuals in Sample	1010	Number of Individuals/min electrofishing		2.13	1
	# of Individuals as Non-native species	0	% of Individuals as Non-native Species		0.0	5
	# of Individuals With Disease/Anomaly	0	% of Individuals With Disease/Anomaly		0.0	5
			Index of Biotic Integrity Numeric Score:		36	
			Aquatic Life Use:		Intermediate	

^a Excluding western mosquitofish

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

San Antonio River @ Downstream of FM 791 (Site 19090), Karnes Co. Collector: Linam, Kolodziejczyk, McMillan			April-13	Ecoregions 33 & 35	
Metric Category	Intermediate Totals for Metrics	Metric Name	Raw Value	IBI Score	
	Drainage Basin Size (km ²)		5473		
Species Richness and Composition	Number of Fish Species	Number of Fish Species	20	3	
	Number of Native Cyprinid Species	Number of Native Cyprinid Species	6	5	
	Number of Benthic Invertebrate Species	Number of Benthic Invertebrate Species	1	1	
	Number of Sunfish Species	Number of Sunfish Species	1	1	
	Number of Intolerant Species	Number of Intolerant Species	0	1	
Trophic Composition	Number of Individuals as Tolerants ^a	% of Individuals as Tolerant Species ^a	560	72.9	1
	Number of Individuals as Omnivores	% of Individuals as Omnivores	41	5.3	5
	Number of Individuals as Invertebrates	% of Individuals as Invertebrates	698	90.9	5
	Number of Individuals as Piscivores	% of Individuals as Piscivores	26	3.4	1
	Number of Individuals (Seine)	Number of Individuals in Sample	721		3
Fish Abundance and Condition	Number of Individuals (Shock)	Number of Individuals/Seine haul	47	72.1	5
	Number of Individuals in Sample	Number of Individuals/min electrofishing	768	2.83	1
	# of Individuals as Non-native species	% of Individuals as Non-native Species	9	1.2	5
	# of Individuals With Disease/Anomaly	% of Individuals With Disease/Anomaly	3	0.4	5
			Index of Biotic Integrity Numeric Score:		36
			Aquatic Life Use:		Intermediate
This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.					

^a Excluding western mosquitofish

San Antonio River @ Downstream of FM 791 (Site 19090), Karnes Co.			July-13	Ecoregions 33 & 35		
Collector: Linam, McDaniel, Donovan			Metric Name		Raw Value	IBI Score
Metric Category	Intermediate Totals for Metrics					
	Drainage Basin Size (km ²)	5473				
Species Richness and Composition	Number of Fish Species	22	Number of Fish Species			
	Number of Native Cyprinid Species	4	Number of Native Cyprinid Species			
	Number of Benthic Invertebrate Species	1	Number of Benthic Invertebrate Species			
	Number of Sunfish Species	4	Number of Sunfish Species			
	Number of Intolerant Species	1	Number of Intolerant Species			
Trophic Composition	Number of Individuals as Tolerants ^a	133	% of Individuals as Tolerant Species ^a			
	Number of Individuals as Omnivores	139	% of Individuals as Omnivores			
	Number of Individuals as Invertebrates	813	% of Individuals as Invertebrates			
	Number of Individuals as Piscivores	7	% of Individuals as Piscivores			
	Number of Individuals (Seine)	963	Number of Individuals in Sample			
Fish Abundance and Condition	Number of Individuals (Shock)	14	Number of Individuals/seine haul			
	Number of Individuals in Sample	977	Number of Individuals/min electrofishing			
	# of Individuals as Non-native species	28	% of Individuals as Non-native Species			
	# of Individuals With Disease/Anomaly	2	% of Individuals With Disease/Anomaly			
			Index of Biotic Integrity Numeric Score:		36	
			Aquatic Life Use:		Intermediate	

^a Excluding western mosquitofish

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

San Antonio River @ Downstream of FM 791 (Site 19090), Karnes Co.			October-13		Ecoregions 33 & 35	
Collector: Robertson, Hamlett, Burke, Larralde			Metric Name		Raw Value	
Metric Category	Intermediate Totals for Metrics		Metric Name		Raw Value	
	Drainage Basin Size (km ²)	5473				
Species Richness and Composition	Number of Fish Species	25	Number of Fish Species		25	
	Number of Native Cyprinid Species	6	Number of Native Cyprinid Species		6	
	Number of Benthic Invertebrate Species	1	Number of Benthic Invertebrate Species		1	
	Number of Sunfish Species	5	Number of Sunfish Species		5	
	Number of Intolerant Species	1	Number of Intolerant Species		1	
Trophic Composition	Number of Individuals as Tolerants ^a	1771	% of Individuals as Tolerant Species ^a		55.2	
	Number of Individuals as Omnivores	298	% of Individuals as Omnivores		9.3	
	Number of Individuals as Invertebrates	2901	% of Individuals as Invertebrates		90.4	
	Number of Individuals as Piscivores	5	% of Individuals as Piscivores		0.2	
	Number of Individuals (Seine)	2587	Number of Individuals in Sample		258.7	
Fish Abundance and Condition	Number of Individuals (Shock)	621	Number of Individuals/seine haul		35.90	
	Number of Individuals in Sample	3208	Number of Individuals/min electrofishing		0.1	
	# of Individuals as Non-native species	4	% of Individuals as Non-native Species		0.1	
	# of Individuals With Disease/Anomaly	2	% of Individuals With Disease/Anomaly		0.1	
			Index of Biotic Integrity Numeric Score:		42	
			Aquatic Life Use:		High	

^a Excluding western mosquitofish

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

San Antonio River @ Downstream of FM 791 (Site 19090), Karnes Co.			January-14		Ecoregions 33 & 35	
Collector: Linam, Grubh, Nasto			Metric Name		Raw Value	IBI Score
Metric Category	Intermediate Totals for Metrics		Metric Name			
	Drainage Basin Size (km ²)	5473				
Species Richness and Composition	Number of Fish Species	13	Number of Fish Species			
	Number of Native Cyprinid Species	5	Number of Native Cyprinid Species			
	Number of Benthic Invertebrate Species	0	Number of Benthic Invertebrate Species			
	Number of Sunfish Species	3	Number of Sunfish Species			
	Number of Intolerant Species	0	Number of Intolerant Species			
	Number of Individuals as Tolerants ^a	363	% of Individuals as Tolerant Species ^a			
Trophic Composition	Number of Individuals as Omnivores	9	% of Individuals as Omnivores			
	Number of Individuals as Invertebrates	622	% of Individuals as Invertebrates			
	Number of Individuals as Piscivores	1	% of Individuals as Piscivores			
	Number of Individuals (Seine)	478	Number of Individuals in Sample			
Fish Abundance and Condition	Number of Individuals (Shock)	155	Number of Individuals/seine haul			
	Number of Individuals in Sample	633	Number of Individuals/min electrofishing			
	# of Individuals as Non-native species	1	% of Individuals as Non-native Species			
	# of Individuals With Disease/Anomaly	0	% of Individuals With Disease/Anomaly			
			Index of Biotic Integrity Numeric Score:		40	
			Aquatic Life Use:		Intermediate	

^a Excluding western mosquitofish

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

San Antonio River @ Goliad (Site 19036), Goliad Co.			July-12		Ecoregions 33 & 35	
Collector: Linam, Grubh, Lehman			Metric Name		Raw Value	IBI Score
Metric Category	Intermediate Totals for Metrics					
	Drainage Basin Size (km ²)	10175				
Species Richness and Composition	Number of Fish Species	15	Number of Fish Species			
	Number of Native Cyprinid Species	3	Number of Native Cyprinid Species			
	Number of Benthic Invertebrate Species	1	Number of Benthic Invertebrate Species			
	Number of Sunfish Species	2	Number of Sunfish Species			
	Number of Intolerant Species	0	Number of Intolerant Species			
	Number of Individuals as Tolerants ^a	296	% of Individuals as Tolerant Species ^a			
Trophic Composition	Number of Individuals as Omnivores	5	% of Individuals as Omnivores			
	Number of Individuals as Invertivores	383	% of Individuals as Invertivores			
	Number of Individuals as Piscivores	16	% of Individuals as Piscivores			
	Number of Individuals (Seine)	109	Number of Individuals in Sample			
Fish Abundance and Condition	Number of Individuals (Shock)	295	Number of Individuals/seine haul			
	Number of Individuals in Sample	404	Number of Individuals/min electrofishing			
	# of Individuals as Non-native species	0	% of Individuals as Non-native Species			
	# of Individuals With Disease/Anomaly	1	% of Individuals With Disease/Anomaly			
			Index of Biotic Integrity Numeric Score:		35	
			Aquatic Life Use:		Limited	
This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.						

^a Excluding western mosquitofish

San Antonio River @ Goliad (Site 19036), Goliad Co.			November-12		Ecoregions 33 & 35	
Collector: Linam, McMillan, Hernandez			Metric Name		Raw Value	
Metric Category	Intermediate Totals for Metrics		IBI Score			
	Drainage Basin Size (km ²)	10175				
Species Richness and Composition	Number of Fish Species	19	Number of Fish Species			
	Number of Native Cyprinid Species	4	Number of Native Cyprinid Species			
	Number of Benthic Invertebrate Species	0	Number of Benthic Invertebrate Species			
	Number of Sunfish Species	3	Number of Sunfish Species			
	Number of Intolerant Species	0	Number of Intolerant Species			
Trophic Composition	Number of Individuals as Tolerants ^a	310	% of Individuals as Tolerant Species ^a			
	Number of Individuals as Omnivores	37	% of Individuals as Omnivores			
	Number of Individuals as Invertebrates	1087	% of Individuals as Invertebrates			
	Number of Individuals as Piscivores	6	% of Individuals as Piscivores			
Fish Abundance and Condition	Number of Individuals (Seine)	944	Number of Individuals in Sample			
	Number of Individuals (Shock)	186	Number of Individuals/seine haul			
	Number of Individuals in Sample	1130	Number of Individuals/min electrofishing			
	# of Individuals as Non-native species	0	% of Individuals as Non-native Species			
	# of Individuals With Disease/Anomaly	0	% of Individuals With Disease/Anomaly			
			Index of Biotic Integrity Numeric Score:		40	
			Aquatic Life Use:		Intermediate	

^a Excluding western mosquitofish
This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

San Antonio River @ Goliad (Site 19036), Goliad Co.			January-13		Ecoregions 33 & 35			
Collector: Linam, Burke, Sablan			Metric Name		Raw Value	IBI Score		
Metric Category	Intermediate Totals for Metrics		Metric Name					
Species Richness and Composition	Drainage Basin Size (km ²)	10175	Number of Fish Species				18	3
	Number of Fish Species	18	Number of Native Cyprinid Species				4	3
	Number of Native Cyprinid Species	4	Number of Benthic Invertebrate Species				1	1
	Number of Benthic Invertebrate Species	1	Number of Sunfish Species				2	1
	Number of Sunfish Species	2	Number of Intolerant Species				0	1
	Number of Intolerant Species	0	% of Individuals as Tolerant Species ^a				48.4	3
Trophic Composition	Number of Individuals as Omnivores	25	% of Individuals as Omnivores				2.3	5
	Number of Individuals as Invertebrates	1050	% of Individuals as Invertebrates				97.2	5
	Number of Individuals as Piscivores	5	% of Individuals as Piscivores				0.5	1
Fish Abundance and Condition	Number of Individuals (Seine)	731	Number of Individuals in Sample				73.1	5
	Number of Individuals (Shock)	349	Number of Individuals/seine haul				18.47	5
	Number of Individuals in Sample	1080	% of Individuals as Non-native species				0.0	5
	# of Individuals as Non-native species	0	% of Individuals With Disease/Anomaly				0.1	5
# of Individuals With Disease/Anomaly	1	Index of Biotic Integrity Numeric Score:				38		
			Aquatic Life Use:				Intermediate	

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

^a Excluding western mosquitofish

San Antonio River @ Goliad (Site 19036), Goliad Co.			
Collector: Linam, Magnelia, Donovan		April-13	
Metric Category	Intermediate Totals for Metrics	Metric Name	Ecoregions 33 & 35
	Drainage Basin Size (km ²)		Raw Value
Species Richness and Composition	10175		
	21	Number of Fish Species	21
	4	Number of Native Cyprinid Species	4
	2	Number of Benthic Invertebrate Species	2
	2	Number of Sunfish Species	2
	1	Number of Intolerant Species	1
Trophic Composition	1551	Number of Individuals as Tolerant Species ^a	49.1
	55	Number of Individuals as Omnivores	1.7
	3072	Number of Individuals as Invertebrates	97.3
	31	Number of Individuals as Piscivores	1.0
	3024	Number of Individuals in Sample	336.0
Fish Abundance and Condition	134	Number of Individuals/seine haul	7.93
	3158	Number of Individuals/min electrofishing	0.4
	12	% of Individuals as Non-native Species	0.1
	3	% of Individuals With Disease/Anomaly	
Index of Biotic Integrity Numeric Score:			38
Aquatic Life Use:			Intermediate

^a Excluding western mosquitofish

This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

San Antonio River @ Goliad (Site 19036), Goliad Co.			July-13		Ecoregions 33 & 35		
Collector: Linam, Burke, Linam			Metric Name		Raw Value	IBI Score	
Metric Category	Intermediate Totals for Metrics		Metric Name				
	Drainage Basin Size (km ²)	10175					
Species Richness and Composition	Number of Fish Species	19	Number of Fish Species				19
	Number of Native Cyprinid Species	4	Number of Native Cyprinid Species				4
	Number of Benthic Invertebrate Species	1	Number of Benthic Invertebrate Species				1
	Number of Sunfish Species	1	Number of Sunfish Species				1
	Number of Intolerant Species	1	Number of Intolerant Species				1
	Number of Individuals as Tolerants ^a	423	% of Individuals as Tolerant Species ^a				69.0
Trophic Composition	Number of Individuals as Omnivores	22	% of Individuals as Omnivores				3.6
	Number of Individuals as Invertebrates	562	% of Individuals as Invertebrates				91.7
	Number of Individuals as Piscivores	26	% of Individuals as Piscivores				4.2
Fish Abundance and Condition	Number of Individuals (Seine)	511	Number of Individuals in Sample				4
	Number of Individuals (Shock)	102	Number of Individuals/seine haul				46.5
	Number of Individuals in Sample	613	Number of Individuals/min electrofishing				5.83
	# of Individuals as Non-native species	3	% of Individuals as Non-native Species				0.5
	# of Individuals With Disease/Anomaly	0	% of Individuals With Disease/Anomaly				0.0
			Index of Biotic Integrity Numeric Score:		35		
			Aquatic Life Use:		Limited		
This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.							

^a Excluding western mosquitofish

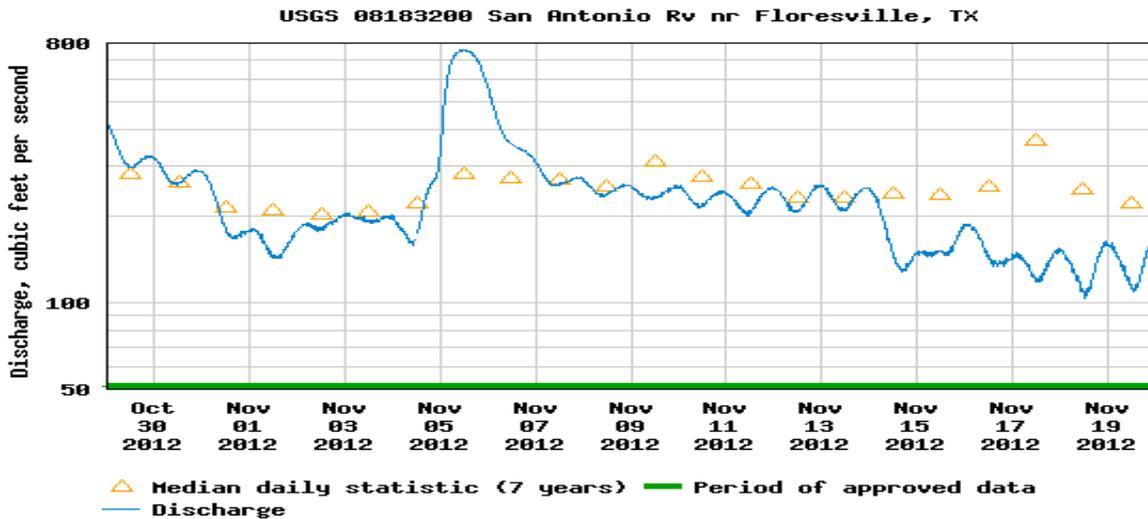
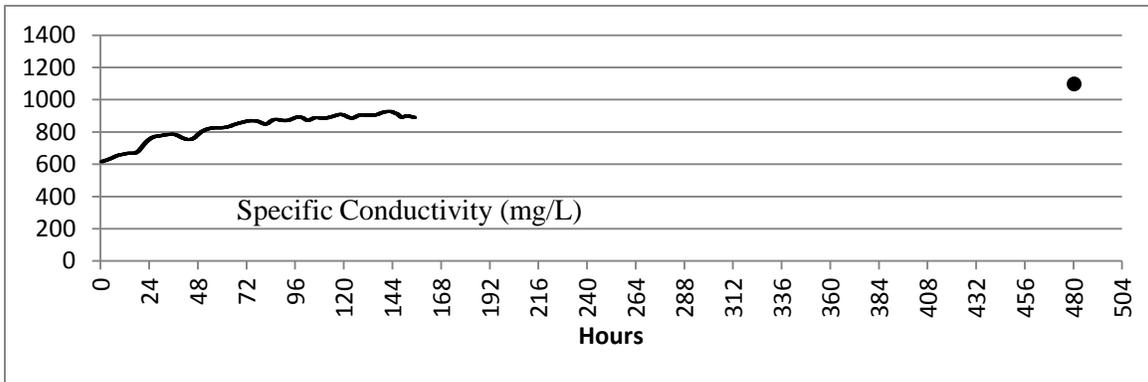
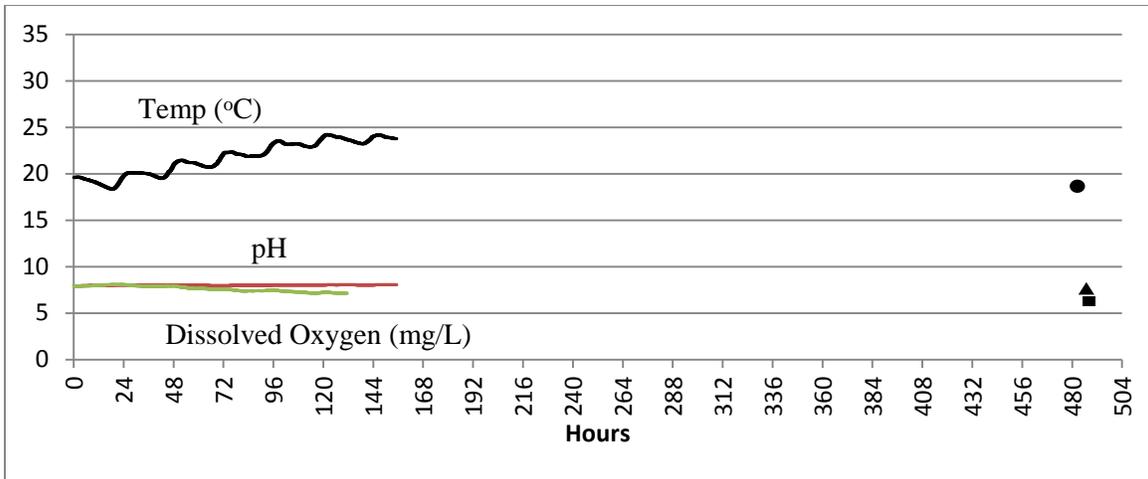
San Antonio River @ Goliad (Site 19036), Goliad Co.			October-13		Ecoregions 33 & 35		
Collector: Linam, Hamlett, Donovan			Metric Name		Raw Value	IBI Score	
Metric Category	Intermediate Totals for Metrics		Metric Name				
	Drainage Basin Size (km ²)	10175					
Species Richness and Composition	Number of Fish Species	22	Number of Fish Species				22
	Number of Native Cyprinid Species	4	Number of Native Cyprinid Species				4
	Number of Benthic Invertebrate Species	2	Number of Benthic Invertebrate Species				2
	Number of Sunfish Species	4	Number of Sunfish Species				4
	Number of Intolerant Species	1	Number of Intolerant Species				1
Trophic Composition	Number of Individuals as Tolerants ^a	995	% of Individuals as Tolerant Species ^a				53.0
	Number of Individuals as Omnivores	159	% of Individuals as Omnivores				8.5
	Number of Individuals as Invertebrates	1701	% of Individuals as Invertebrates				90.7
	Number of Individuals as Piscivores	15	% of Individuals as Piscivores				0.8
	Number of Individuals (Seine)	1512	Number of Individuals in Sample				137.5
Fish Abundance and Condition	Number of Individuals (Shock)	364	Number of Individuals/seine haul				16.55
	Number of Individuals in Sample	1876	Number of Individuals/min electrofishing				0.1
	# of Individuals as Non-native species	1	% of Individuals as Non-native Species				0.0
	# of Individuals With Disease/Anomaly	0	% of Individuals With Disease/Anomaly				0.0
			Index of Biotic Integrity Numeric Score:			40	
			Aquatic Life Use:			Intermediate	
This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.							

^a Excluding western mosquitofish

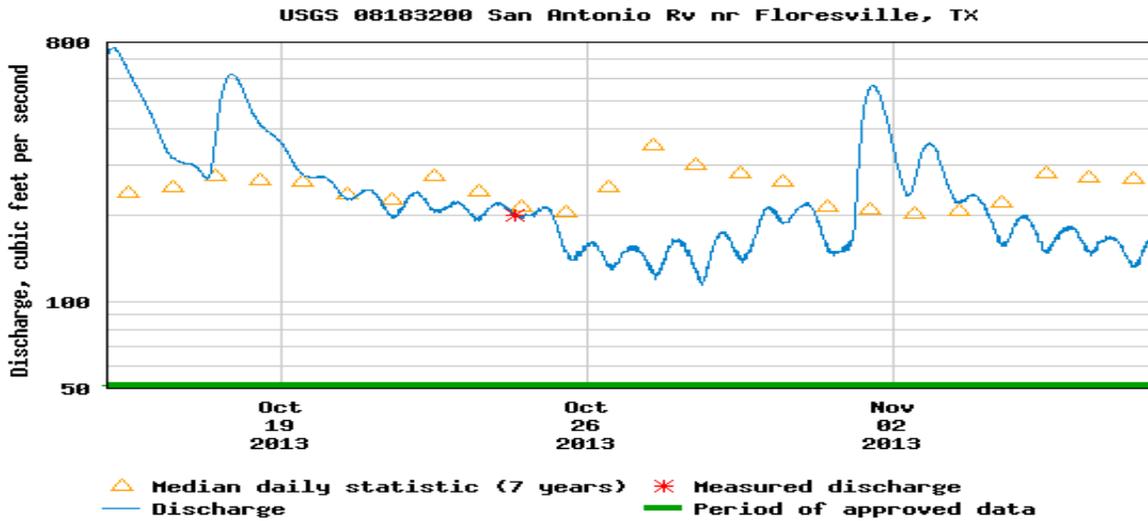
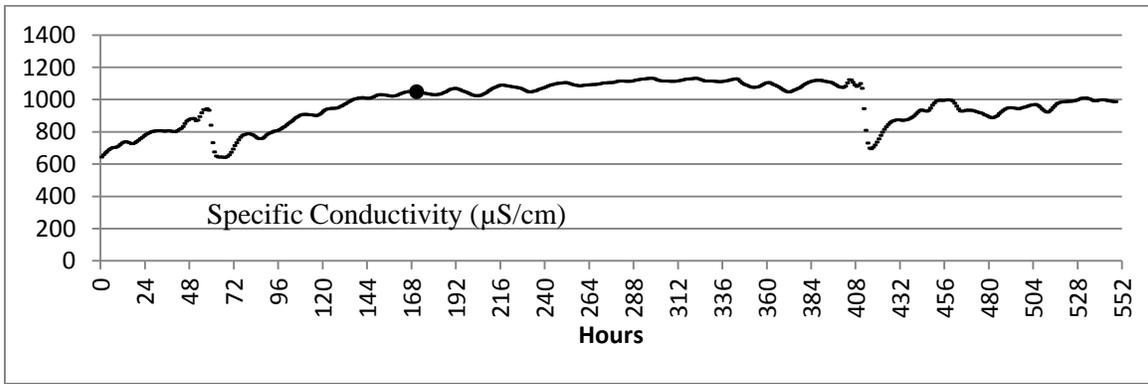
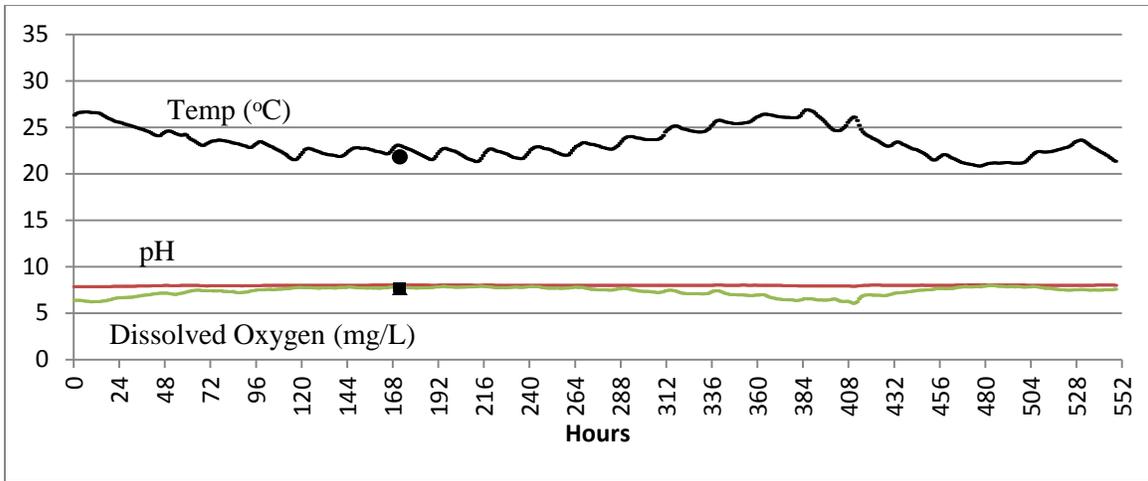
San Antonio River @ Goliad (Site 19036), Goliad Co. Collector: Linam, Boles, Burke			January-14	Ecoregions 33 & 35	
Metric Category	Intermediate Totals for Metrics	Metric Name	Raw Value	IBI Score	
	Drainage Basin Size (km ²)		10175		
Species Richness and Composition	Number of Fish Species	Number of Fish Species	19	3	
	Number of Native Cyprinid Species	Number of Native Cyprinid Species	4	3	
	Number of Benthic Invertebrate Species	Number of Benthic Invertebrate Species	3	3	
	Number of Sunfish Species	Number of Sunfish Species	2	1	
	Number of Intolerant Species	Number of Intolerant Species	2	3	
	Number of Individuals as Tolerants ^a	% of Individuals as Tolerant Species ^a	1513	88.7	1
Trophic Composition	Number of Individuals as Omnivores	% of Individuals as Omnivores	20	1.2	5
	Number of Individuals as Invertebrates	% of Individuals as Invertebrates	1674	98.2	5
	Number of Individuals as Piscivores	% of Individuals as Piscivores	11	0.6	1
Fish Abundance and Condition	Number of Individuals (Seine)	Number of Individuals in Sample	1399	5	
	Number of Individuals (Shock)	Number of Individuals/seine haul	306	5	
	Number of Individuals in Sample	Number of Individuals/min electrofishing	1705	127.2	5
	# of Individuals as Non-native species	% of Individuals as Non-native Species	0	13.91	5
	# of Individuals With Disease/Anomaly	% of Individuals With Disease/Anomaly	0	0.0	5
			Index of Biotic Integrity Numeric Score:	40	
			Aquatic Life Use:	Intermediate	
This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.					

^a Excluding western mosquitofish

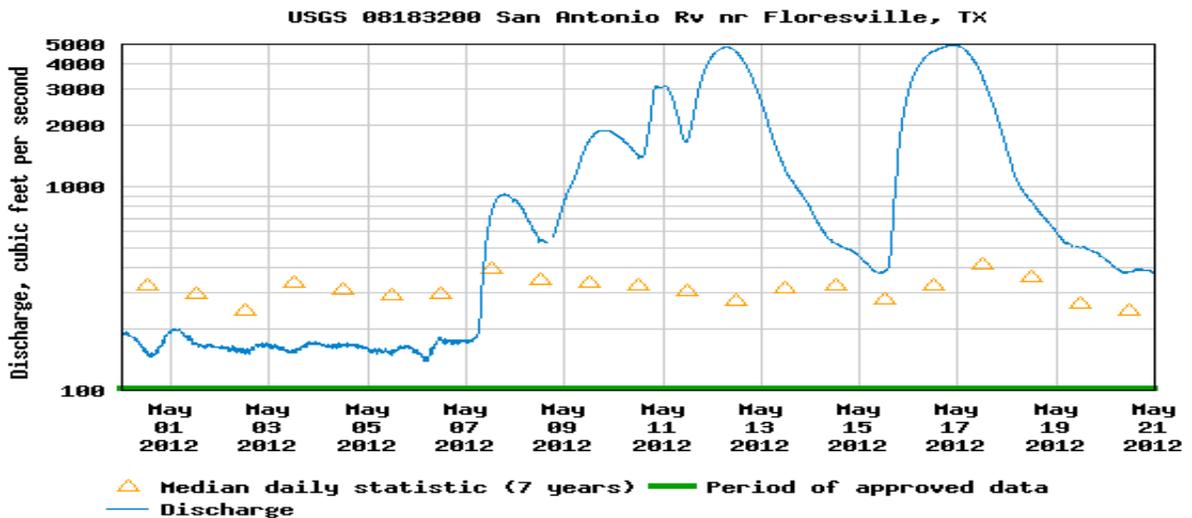
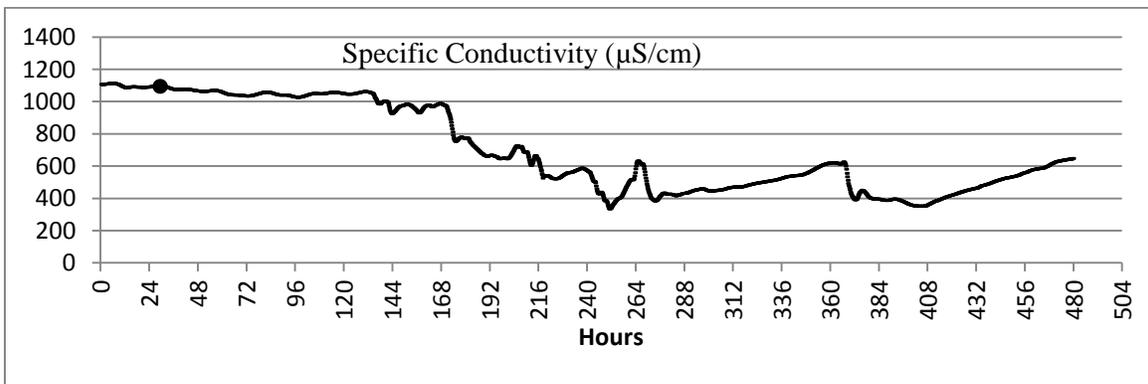
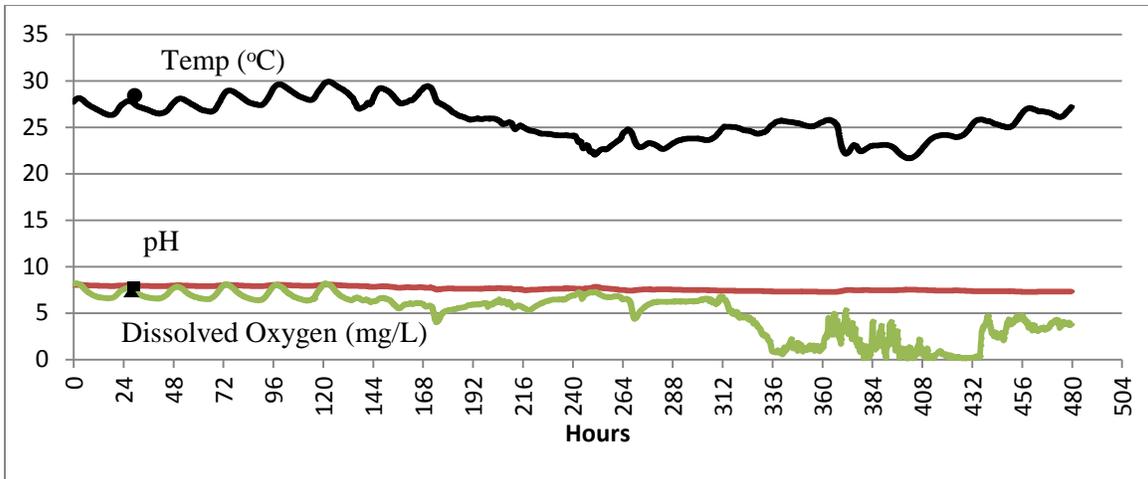
Appendix B
Water Quality and Stream Discharge Plots



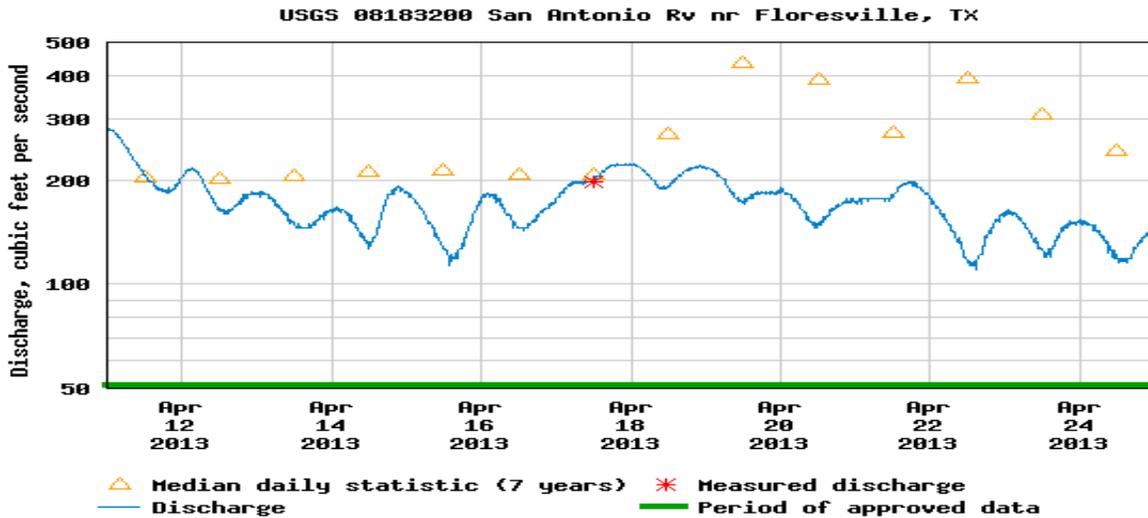
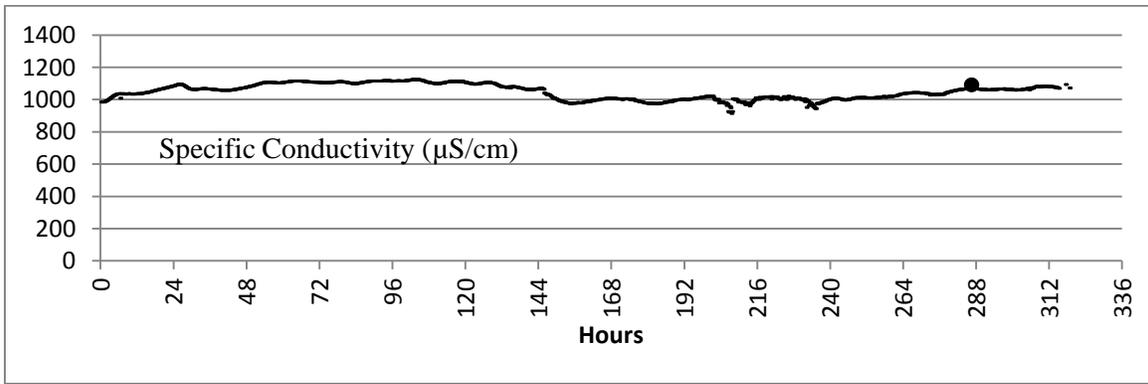
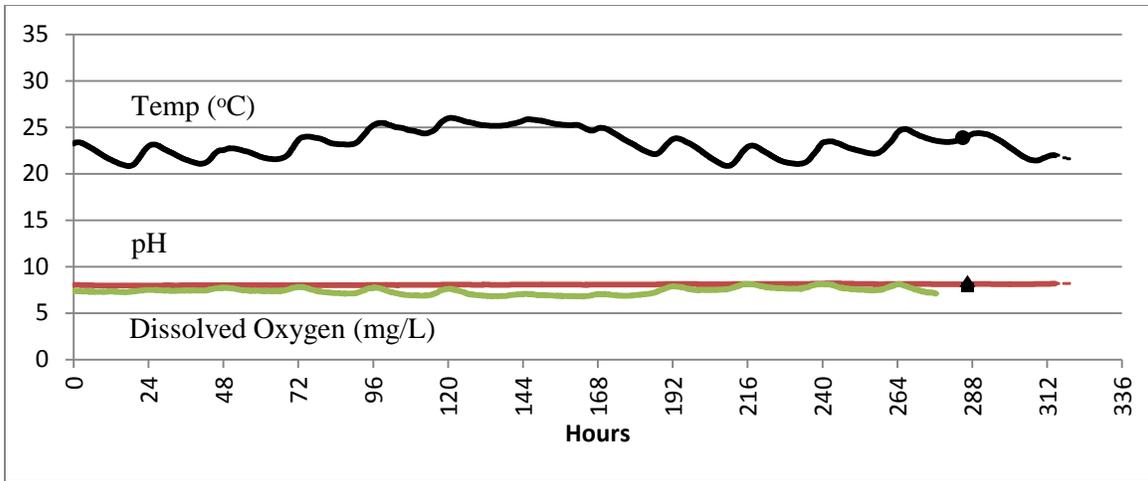
Water quality parameters collected with a data sonde deployed in the San Antonio River at SH 97 (Wilson County, Texas) during fall 2012 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



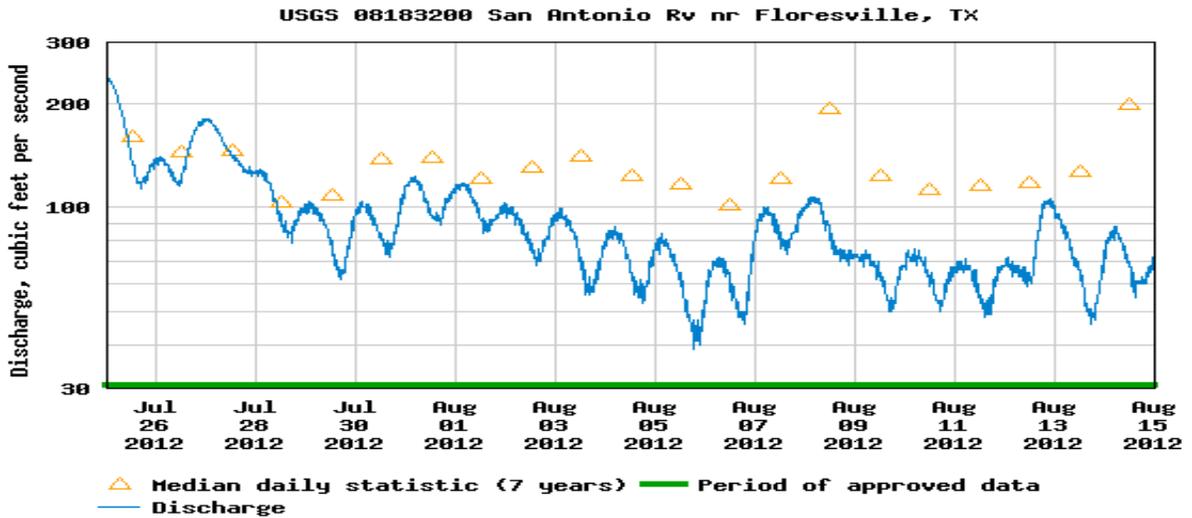
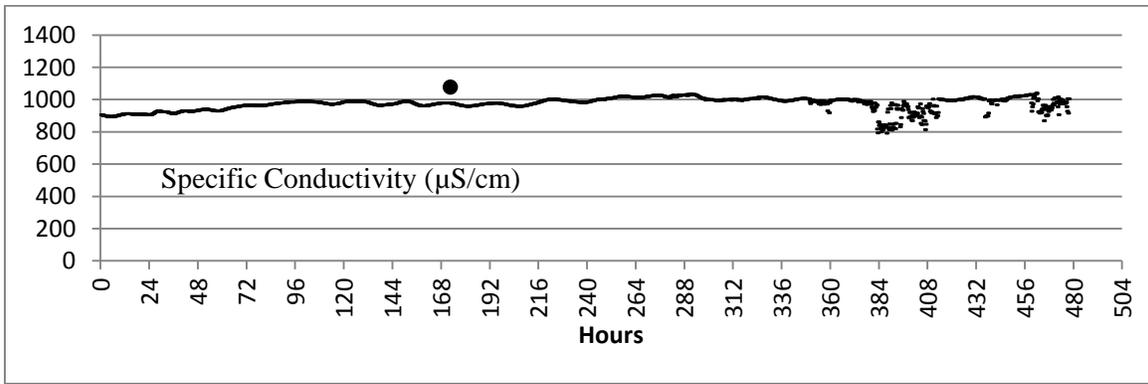
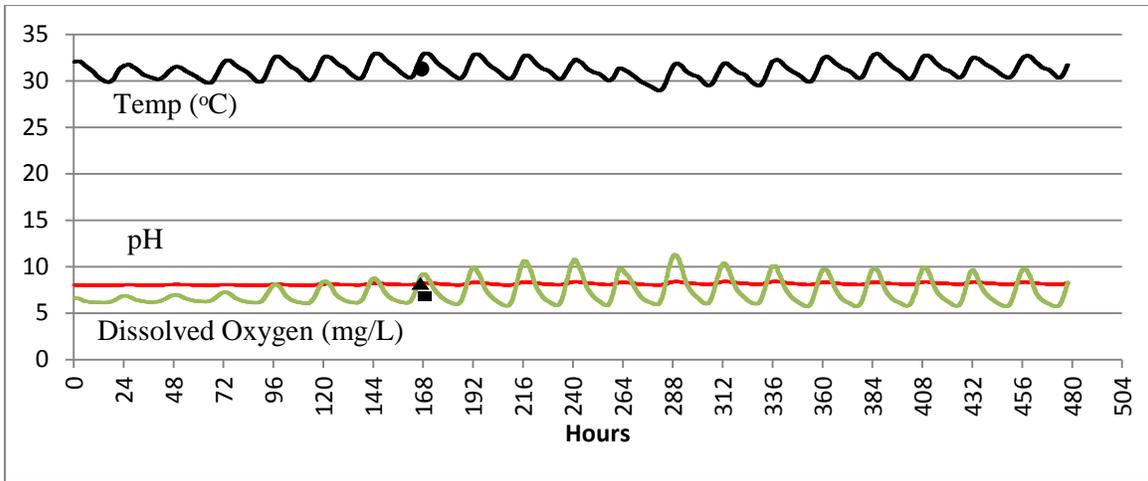
Water quality parameters collected with a data sonde deployed in the San Antonio River at SH 97 (Wilson County, Texas) during fall 2013 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



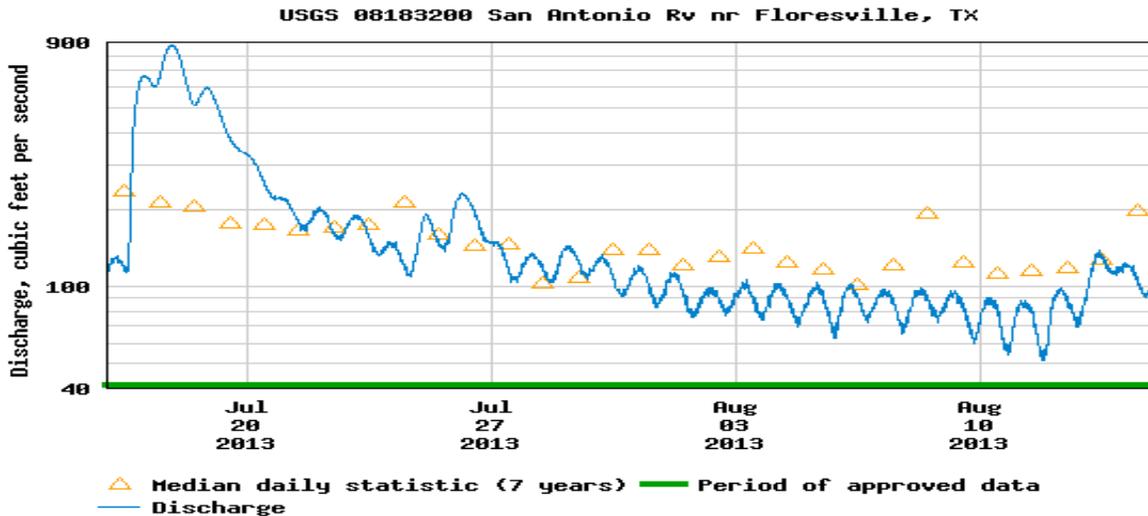
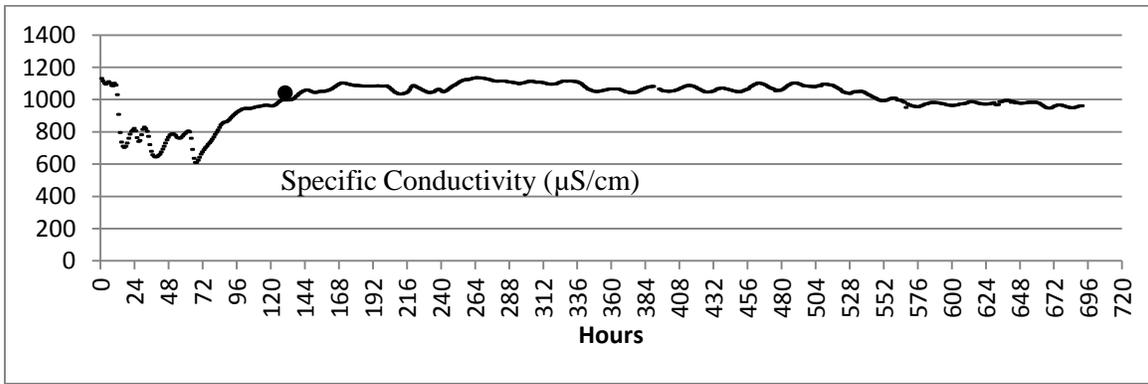
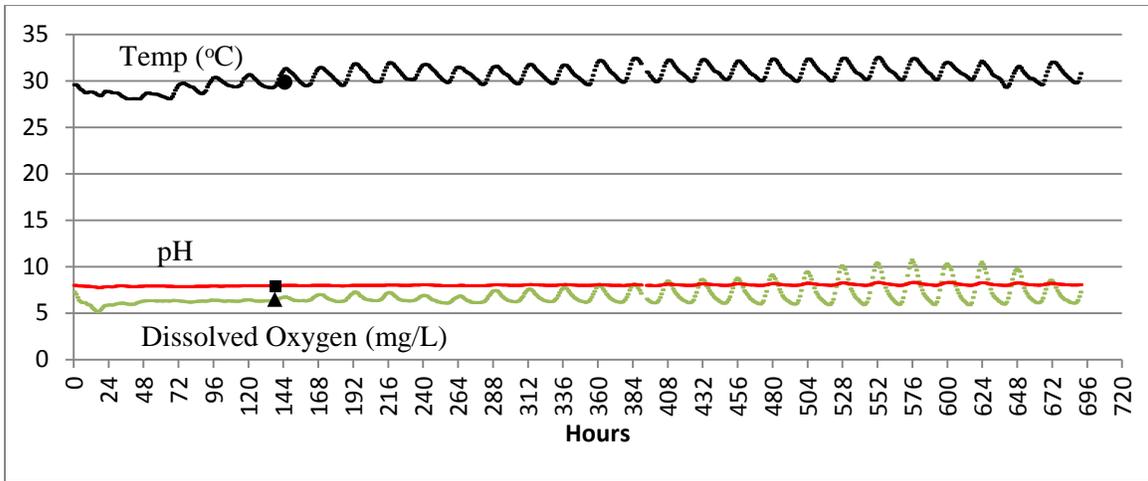
Water quality parameters collected with a data sonde deployed in the San Antonio River at SH 97 (Wilson County, Texas) during spring 2012 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



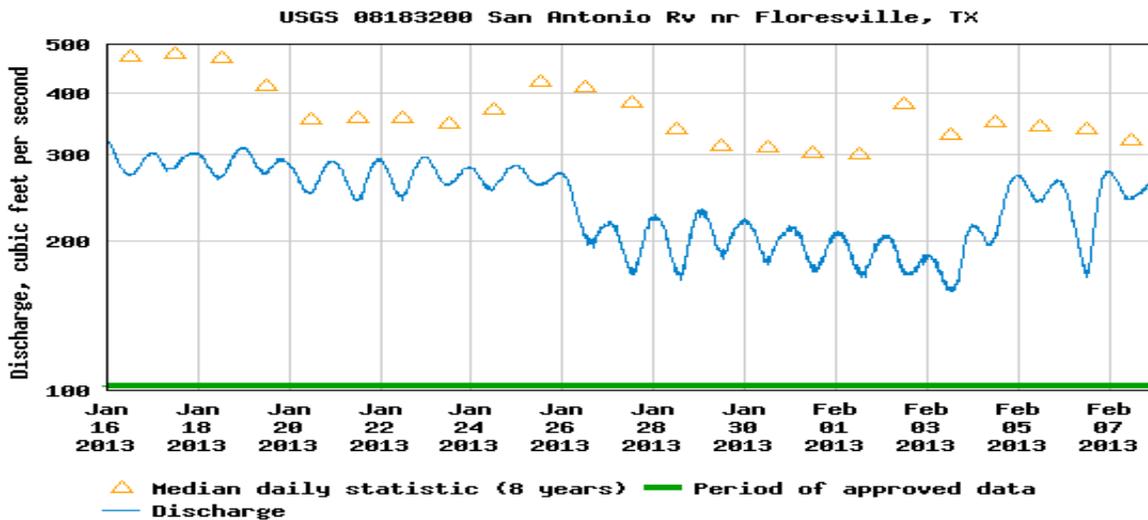
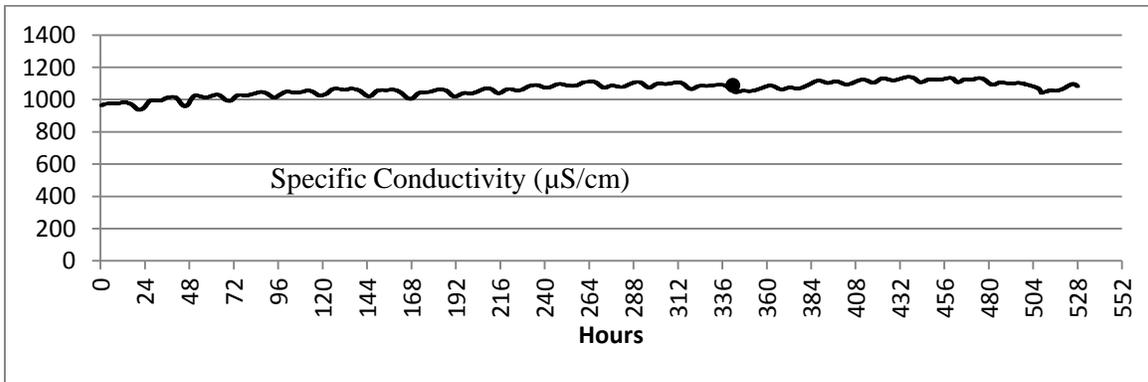
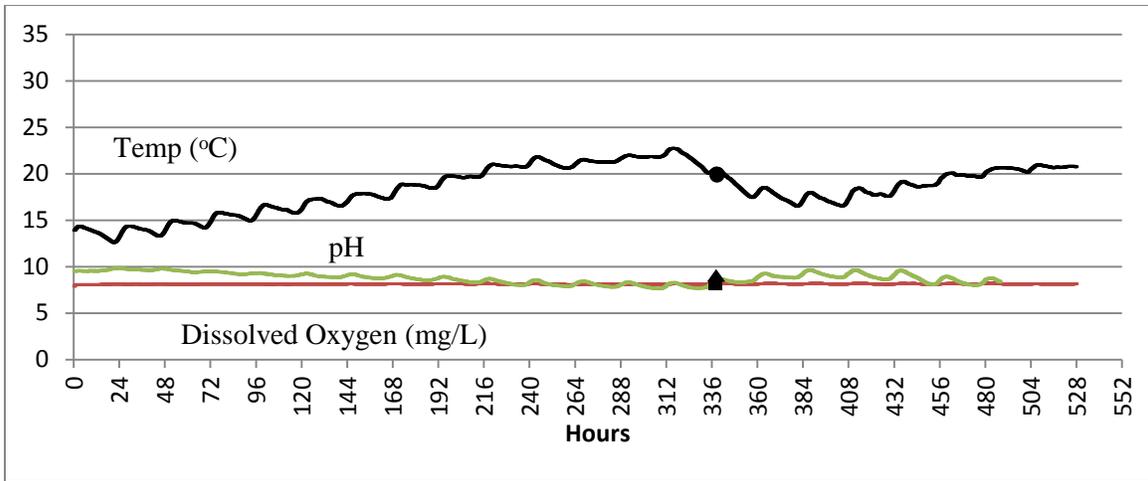
Water quality parameters collected with a data sonde deployed in the San Antonio River at SH 97 (Wilson County, Texas) during spring 2013 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



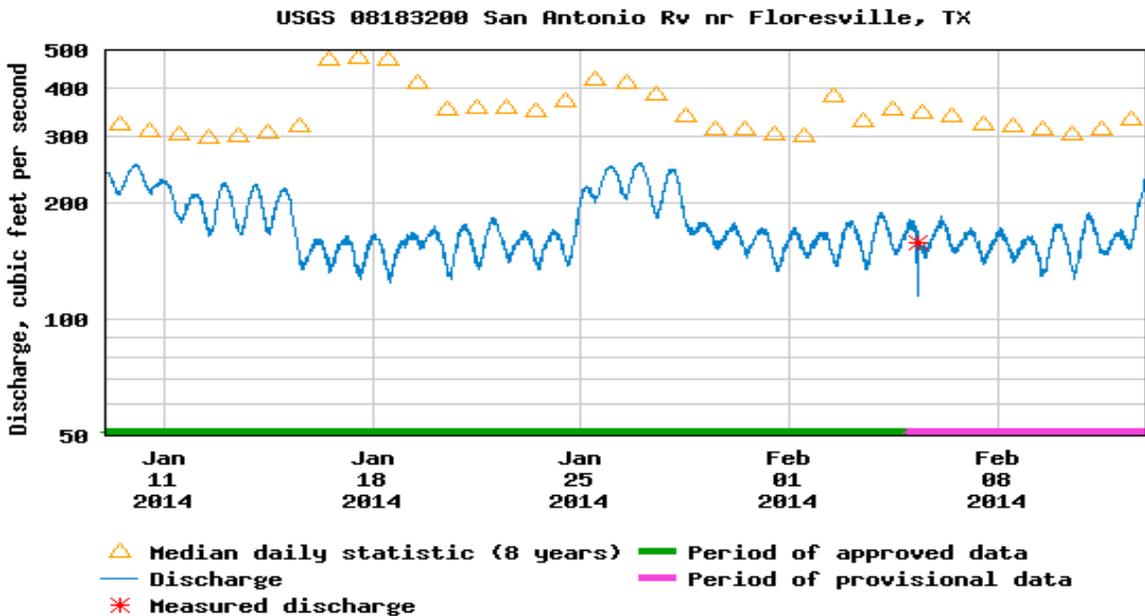
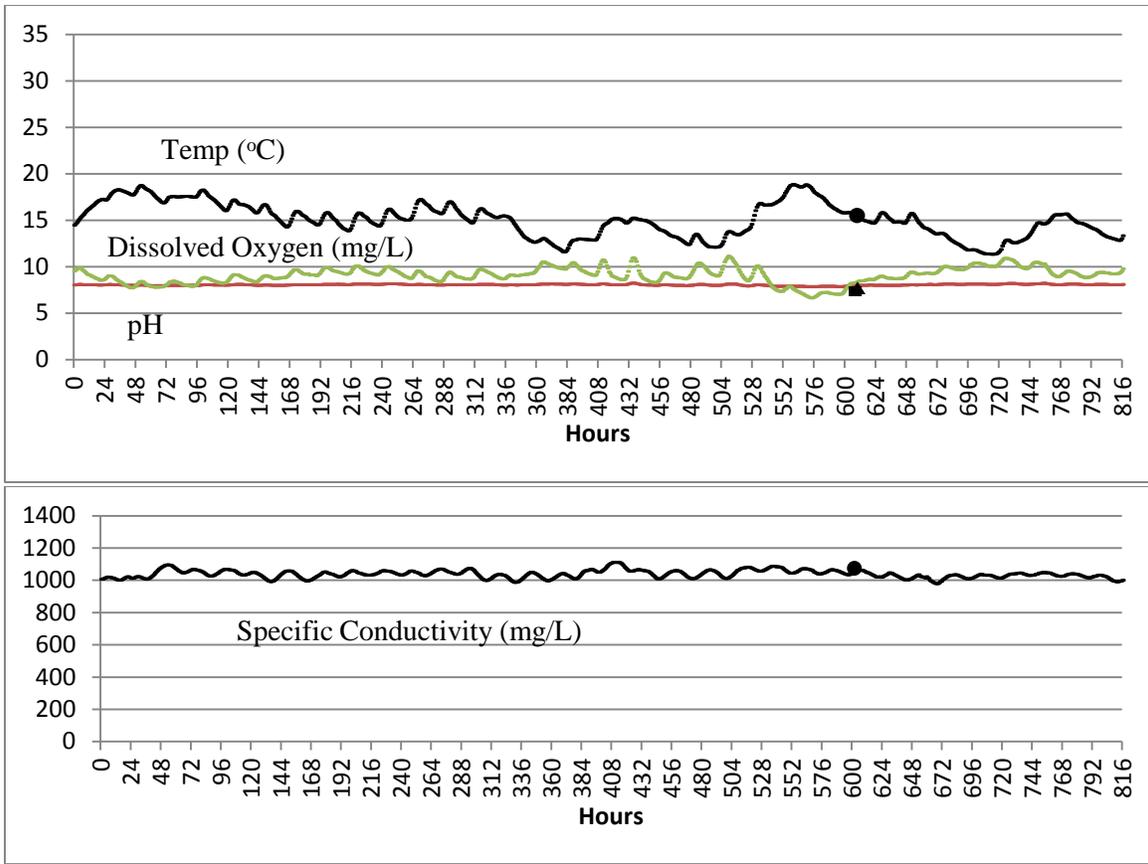
Water quality parameters collected with a data sonde deployed in the San Antonio River at SH 97 (Wilson County, Texas) during summer 2012 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



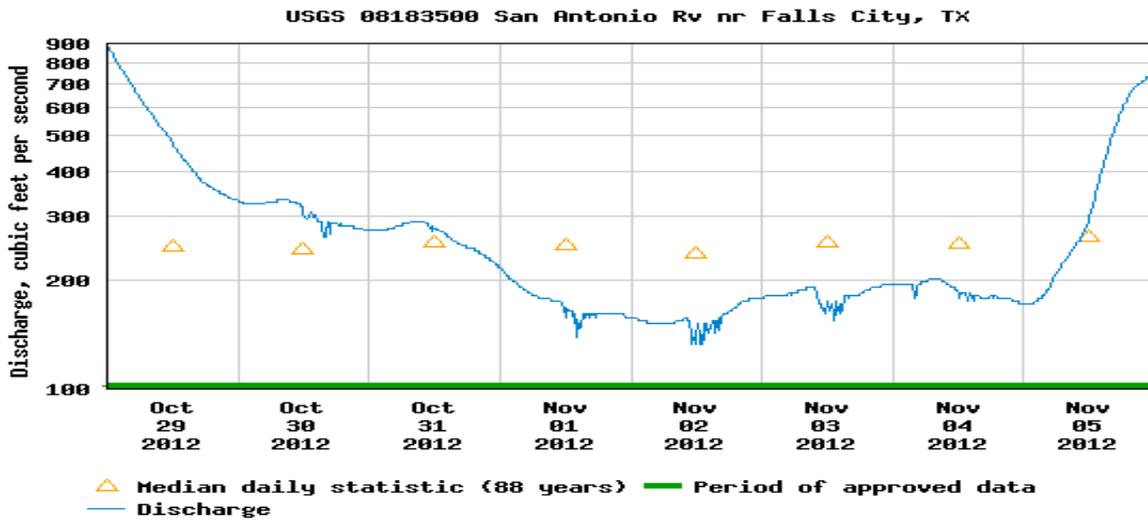
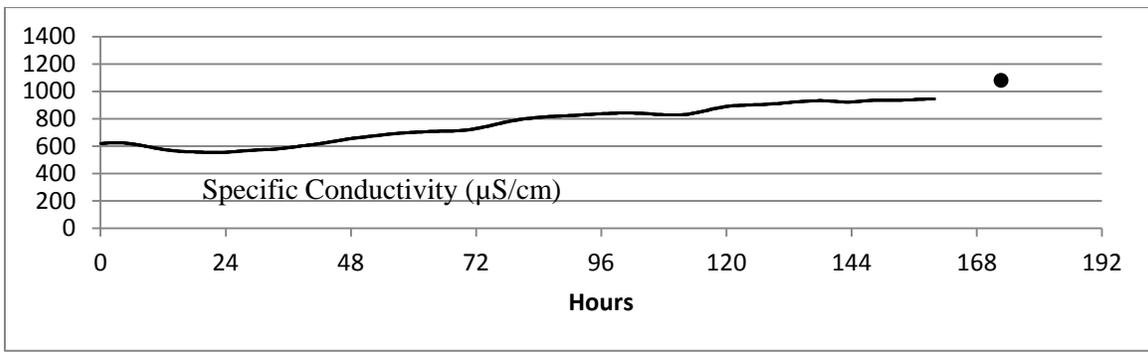
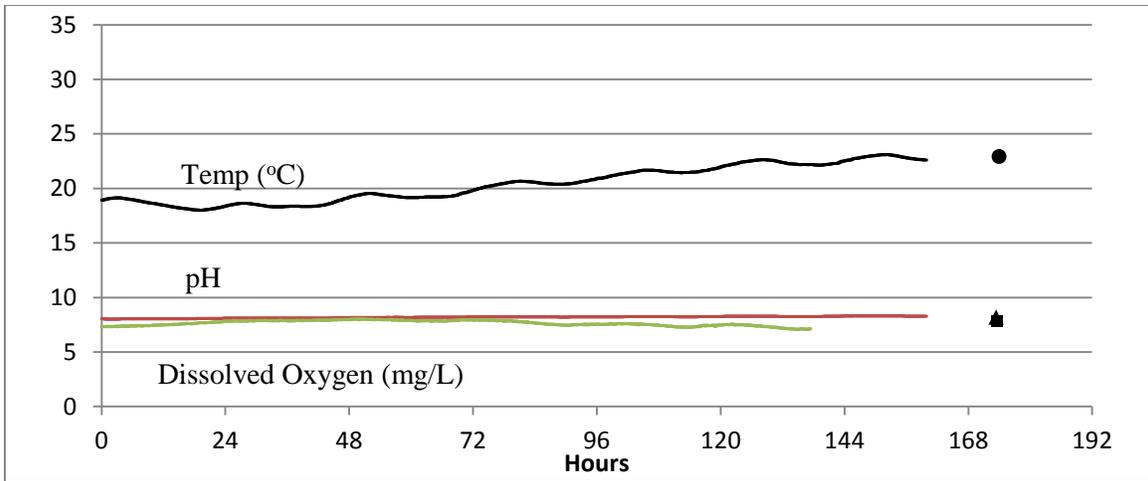
Water quality parameters collected with a data sonde deployed in the San Antonio River at SH 97 (Wilson County, Texas) during summer 2013 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



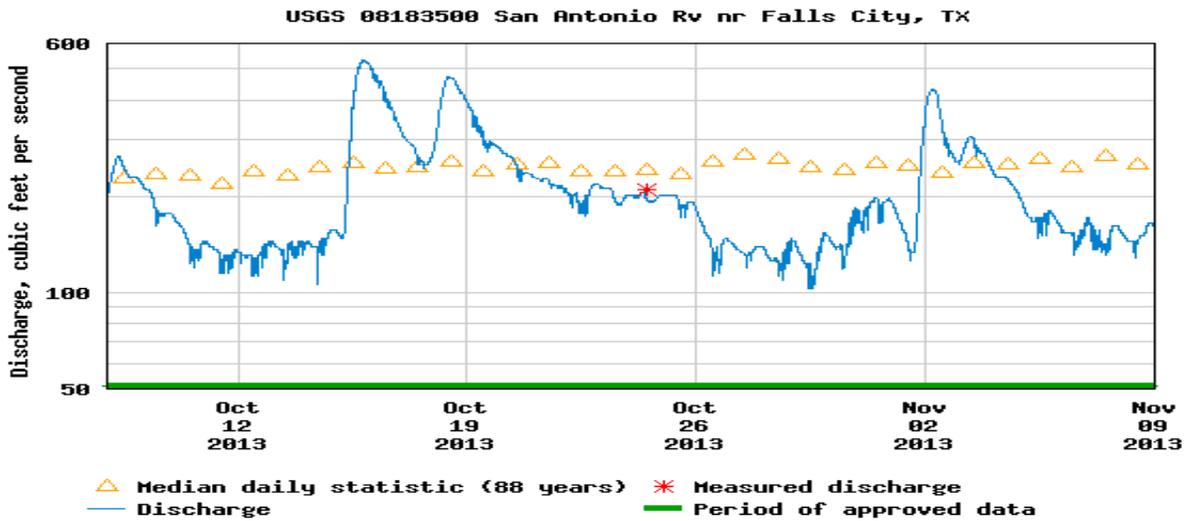
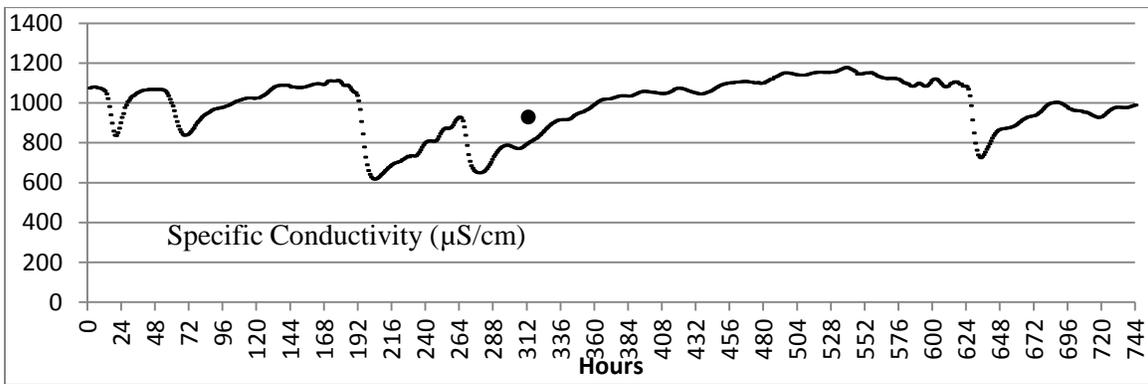
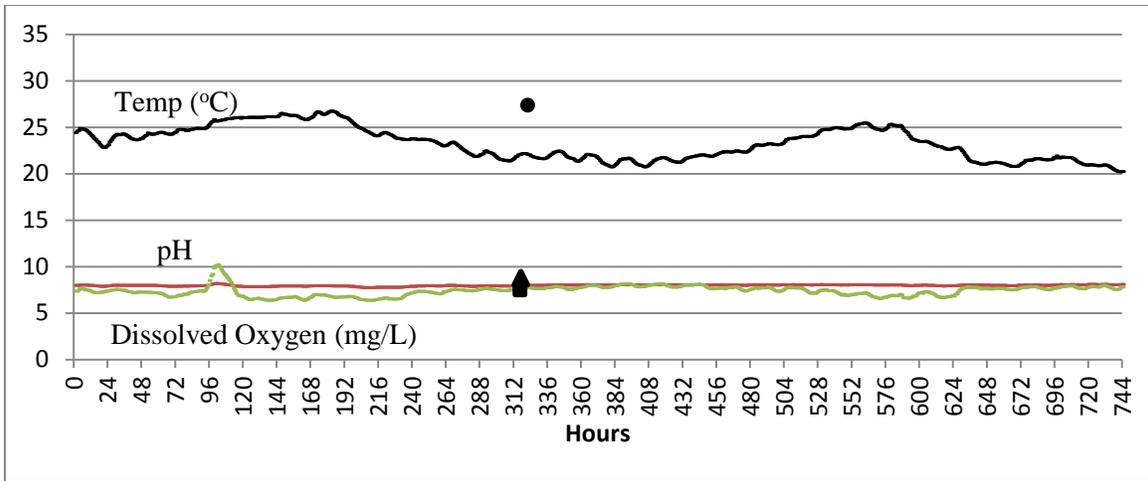
Water quality parameters collected with a data sonde deployed in the San Antonio River at SH 97 (Wilson County, Texas) during winter 2013 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



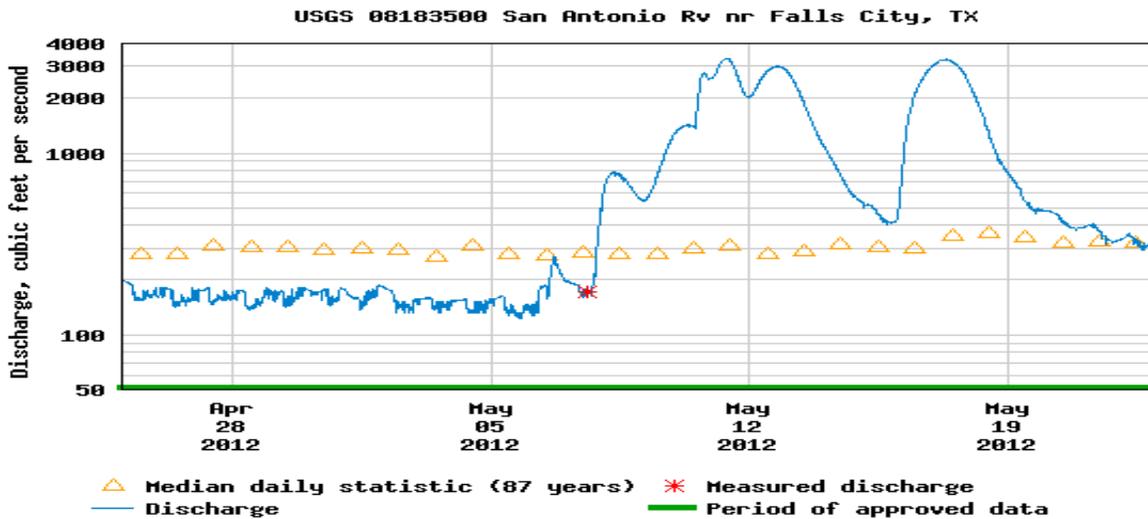
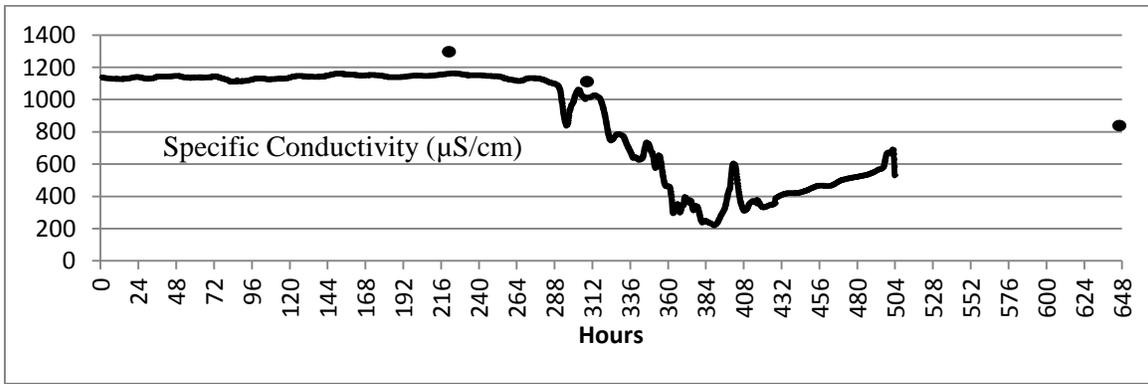
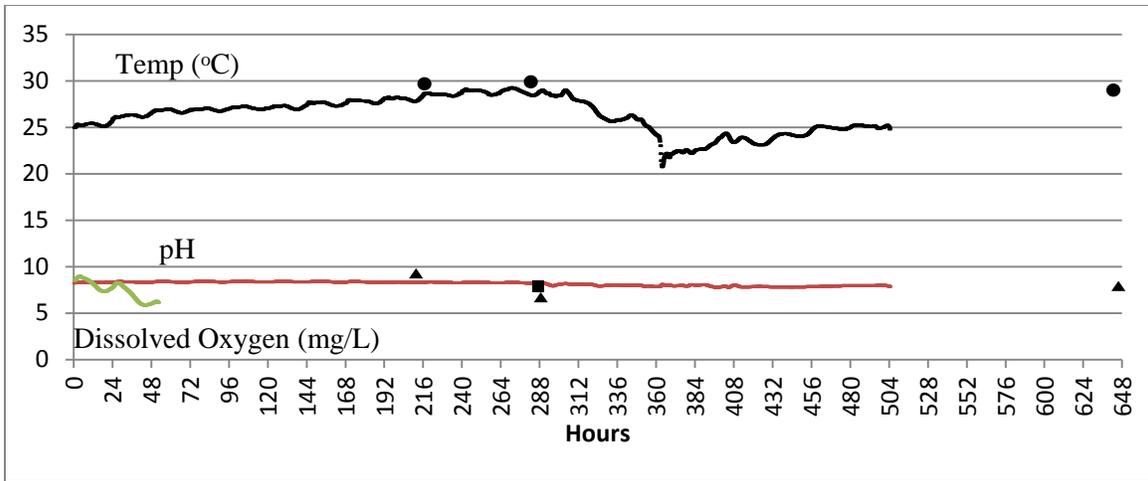
Water quality parameters collected with a data sonde deployed in the San Antonio River at SH 97 (Wilson County, Texas) during winter 2014 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



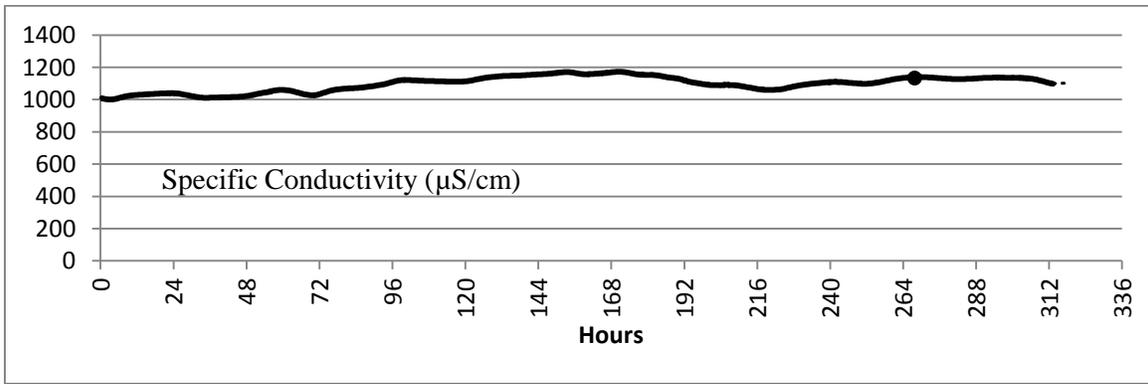
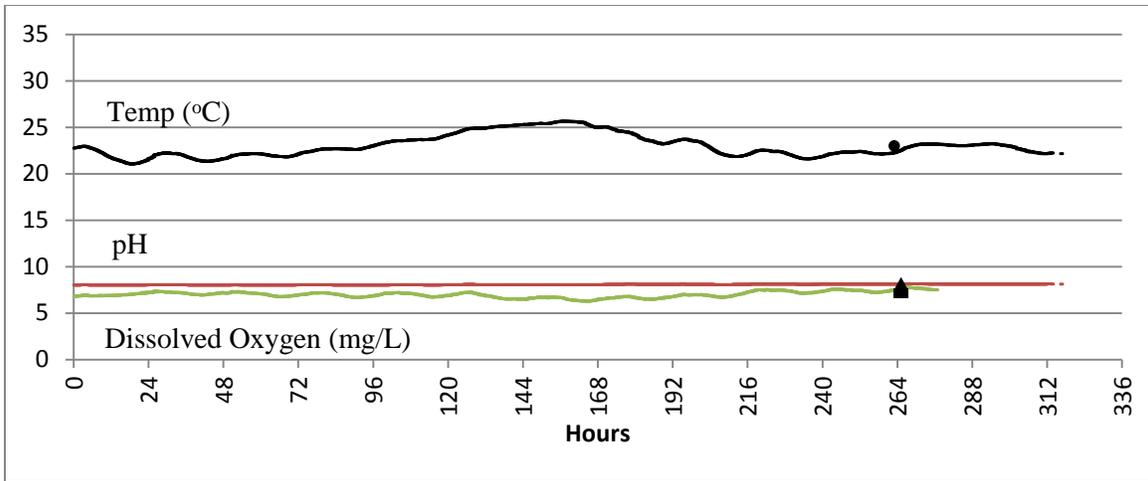
Water quality parameters collected with a data sonde deployed in the San Antonio River downstream of FM 791 (Karnes County, Texas) during fall 2012 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



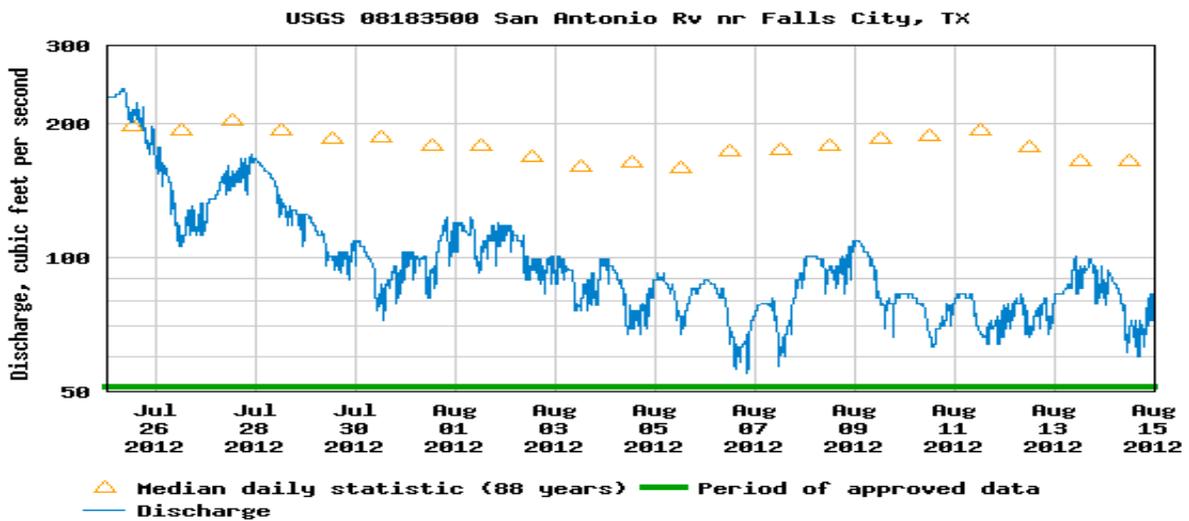
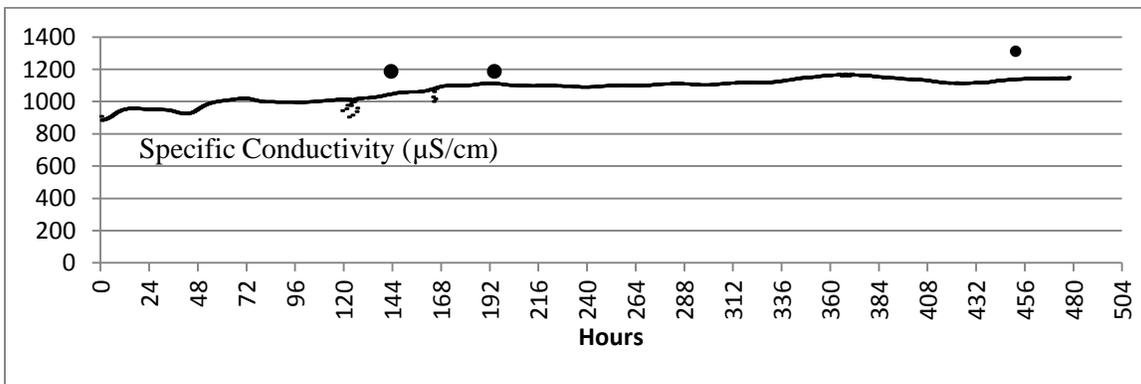
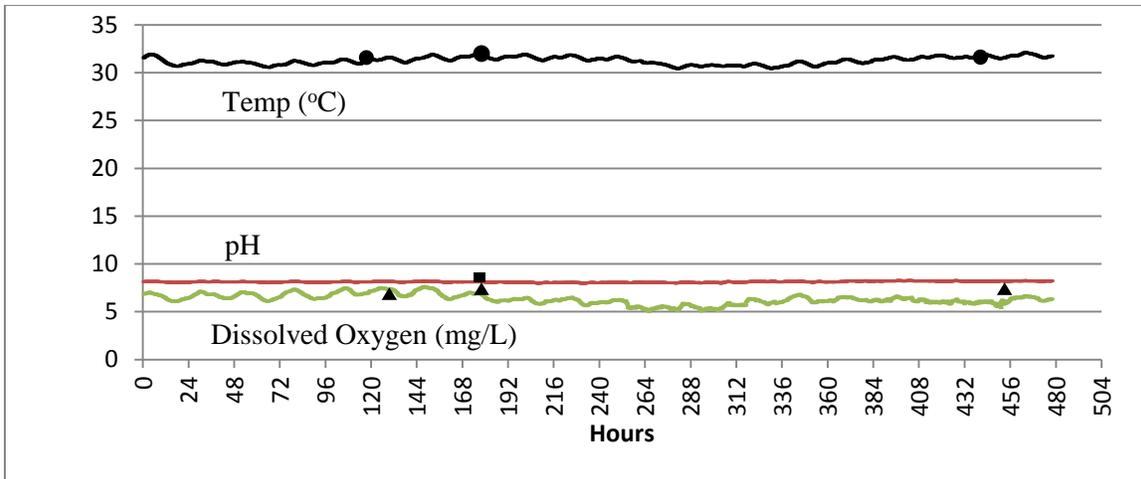
Water quality parameters collected with a data sonde deployed in the San Antonio River downstream of FM 791 (Karnes County, Texas) during fall 2013 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



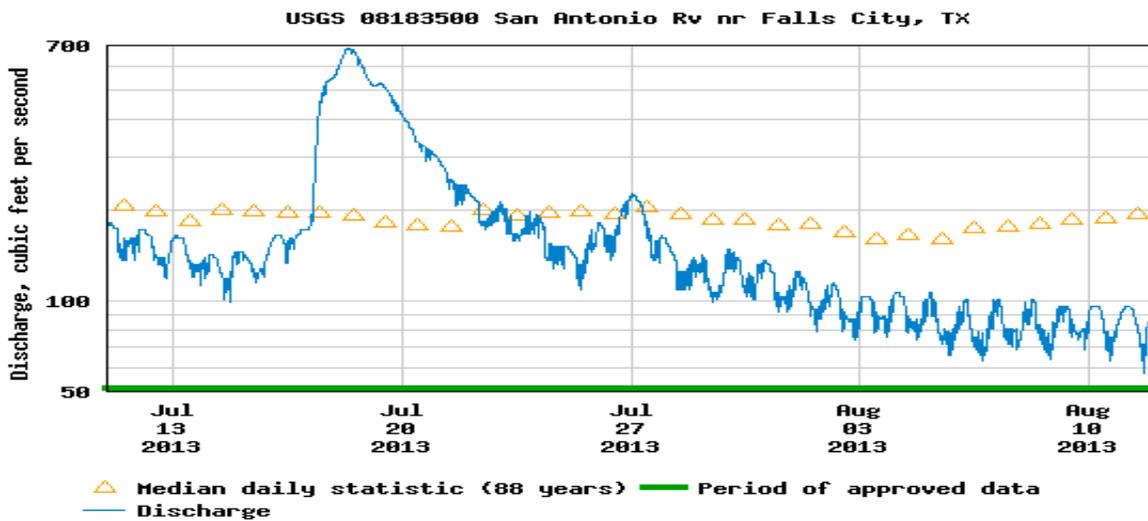
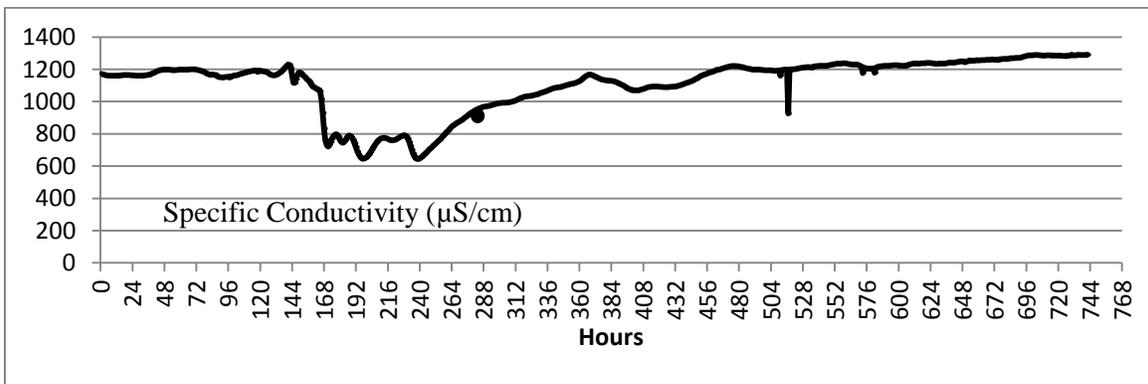
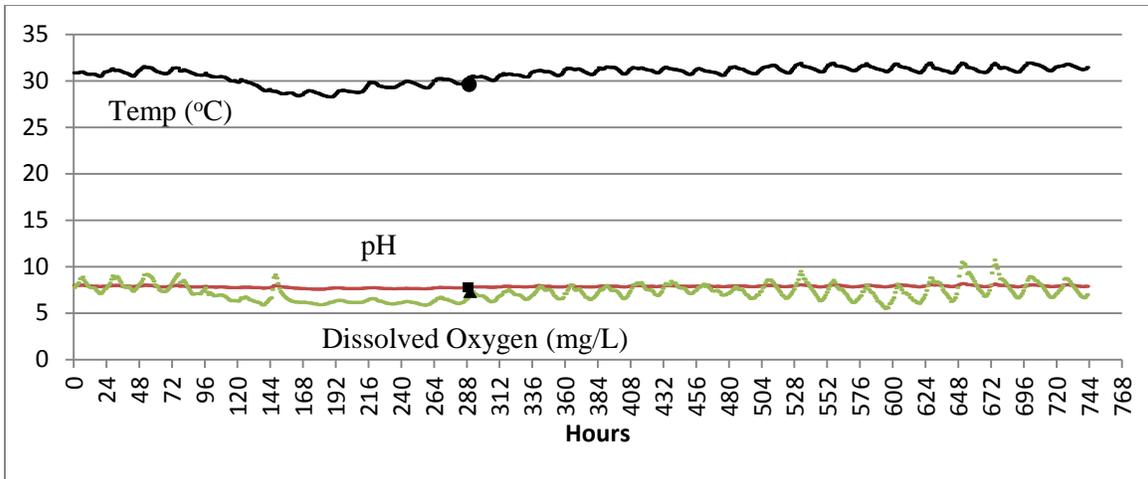
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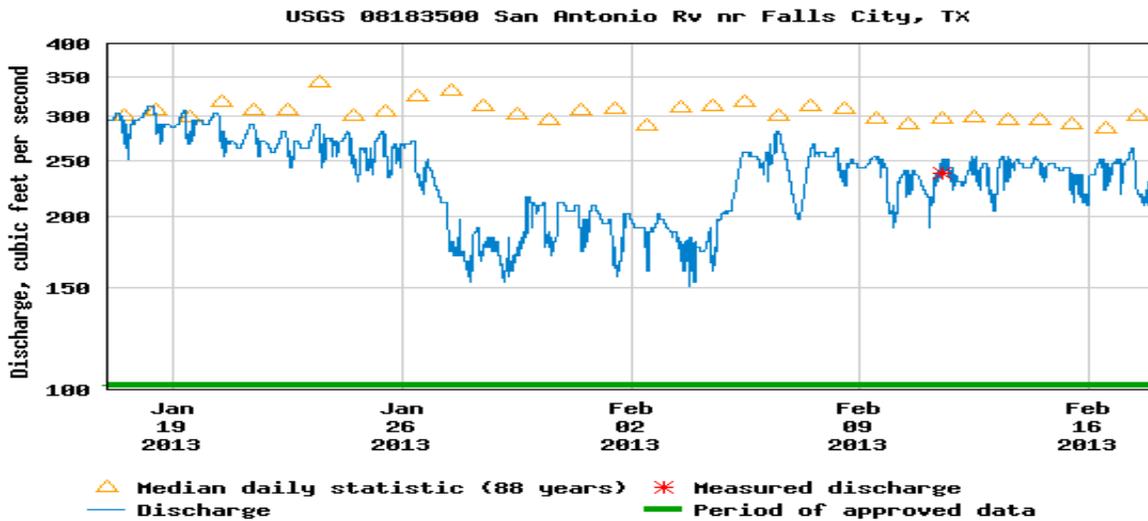
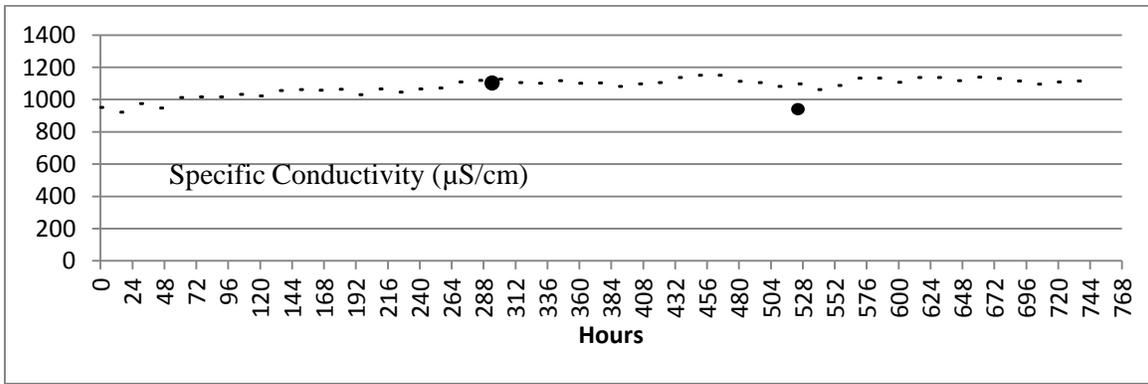
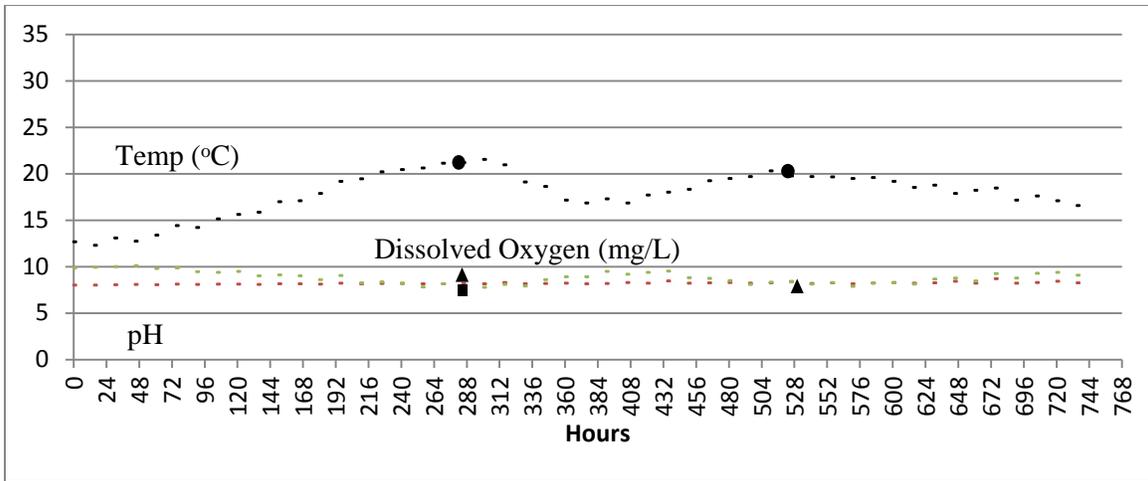
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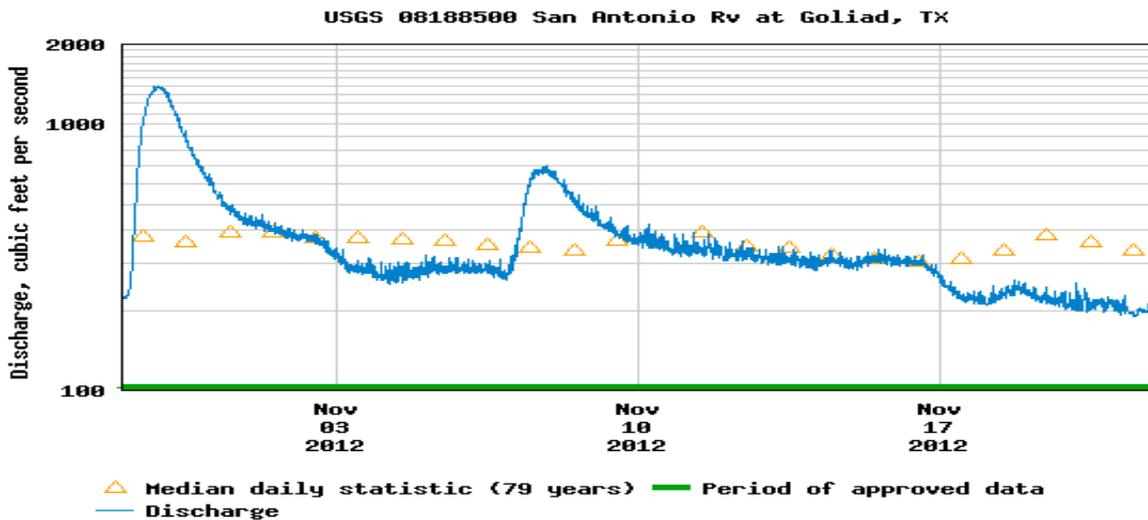
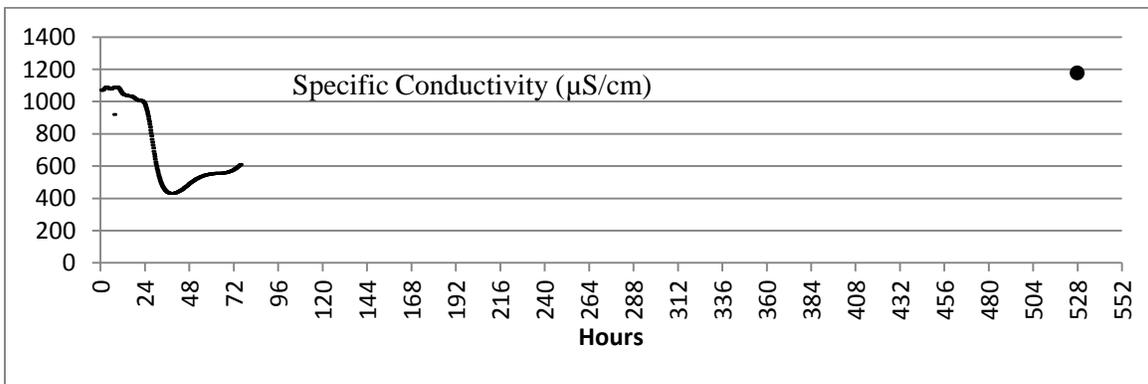
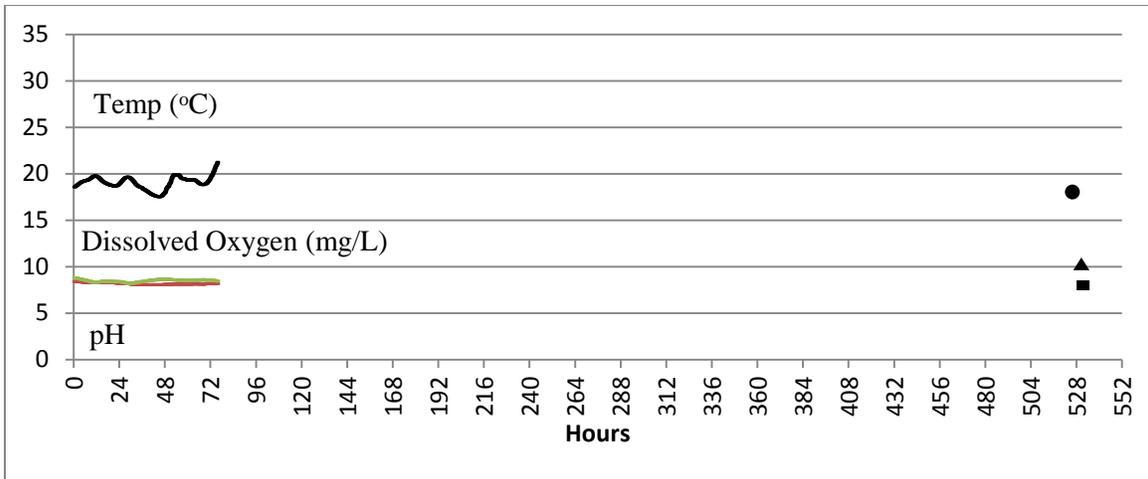
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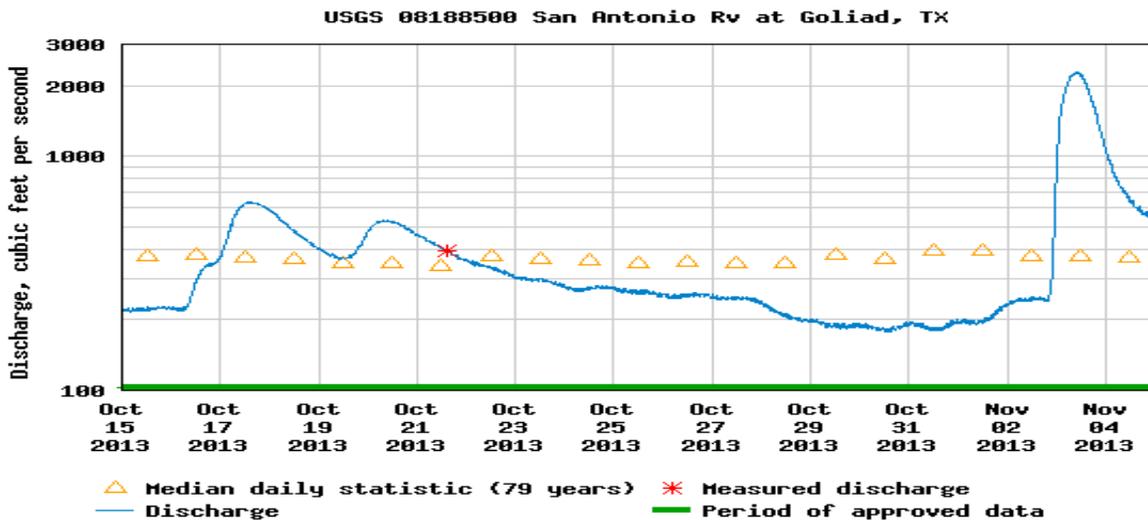
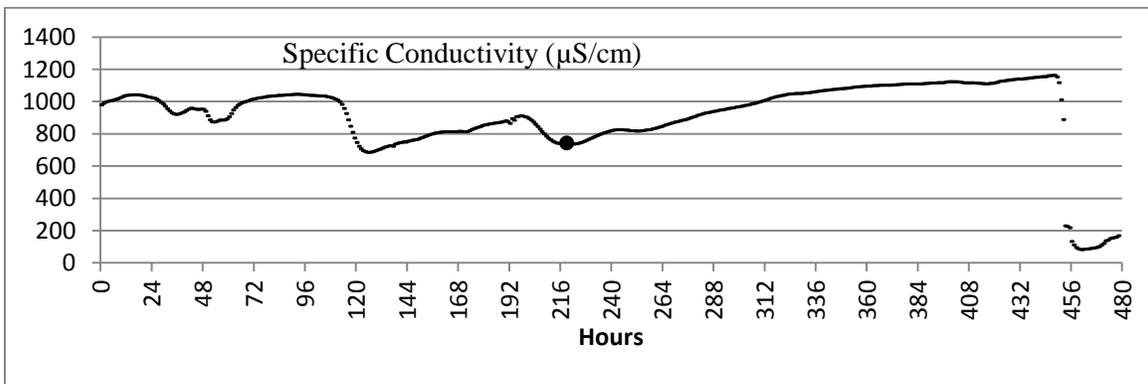
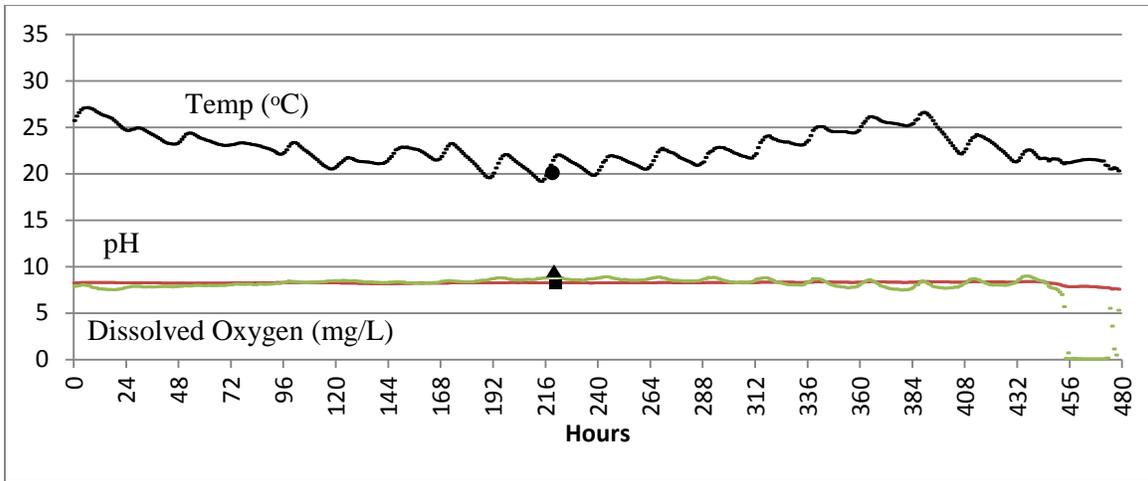
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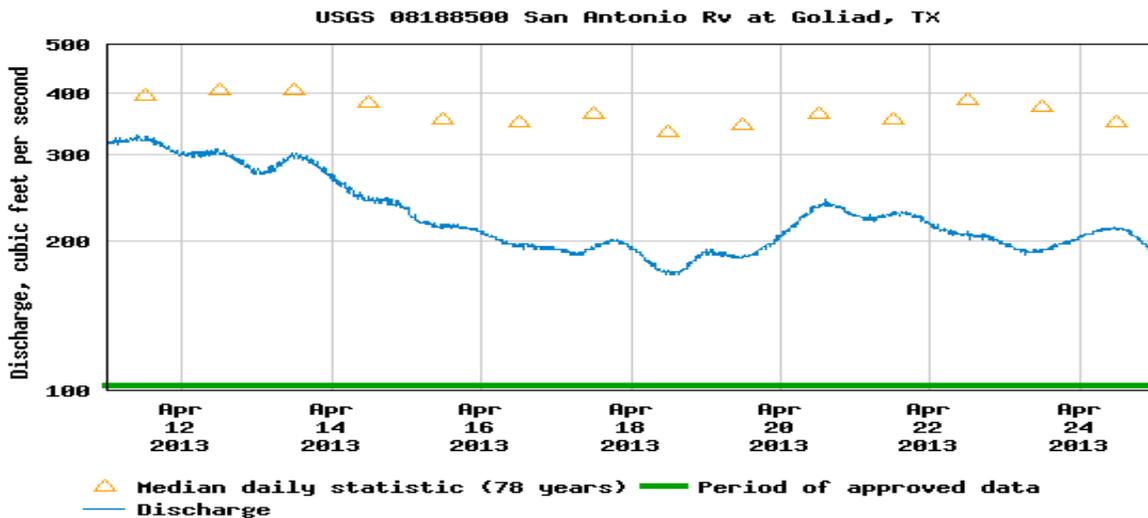
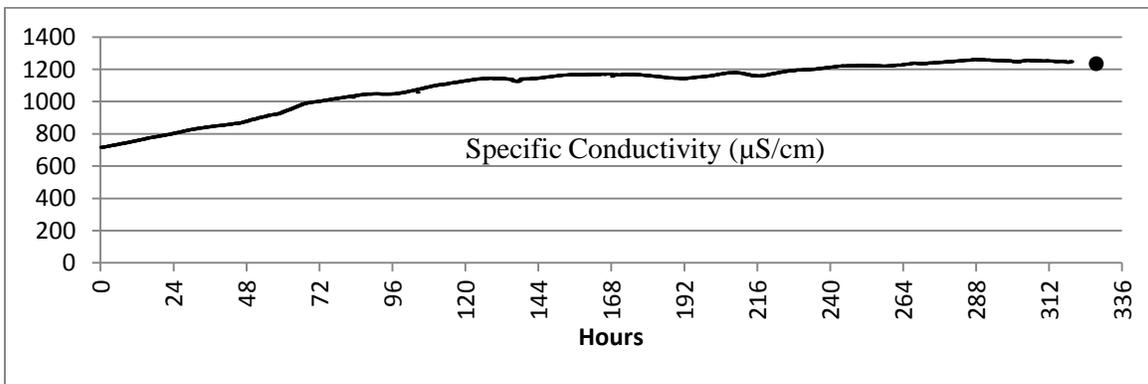
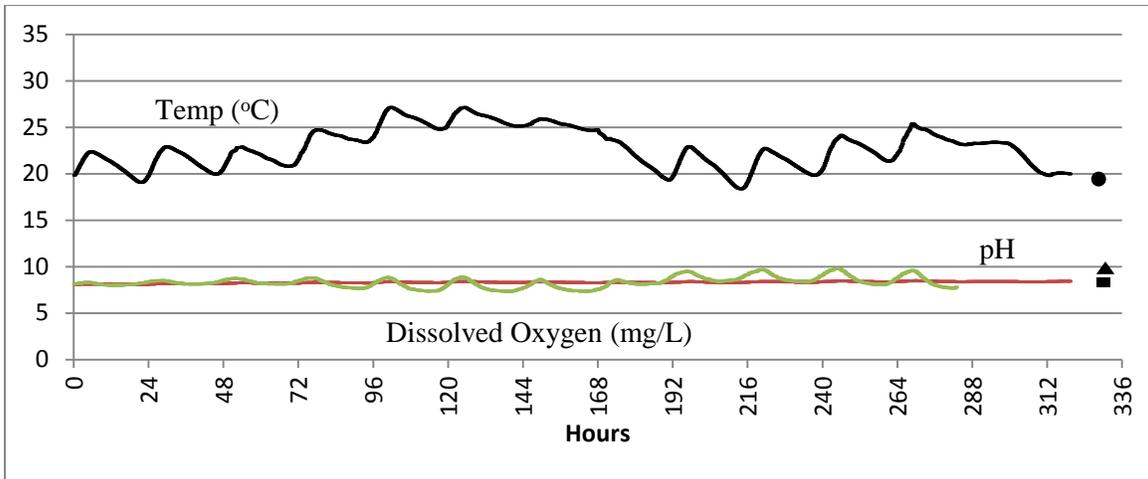
Water quality parameters collected with a data sonde deployed in the San Antonio River downstream of FM 791 (Karnes County, Texas) during winter 2013 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



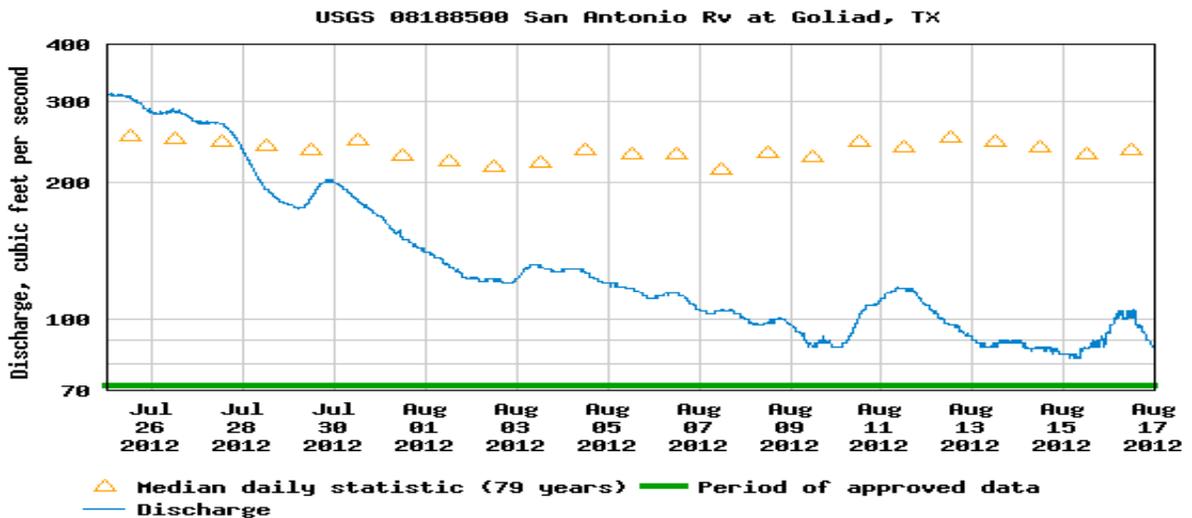
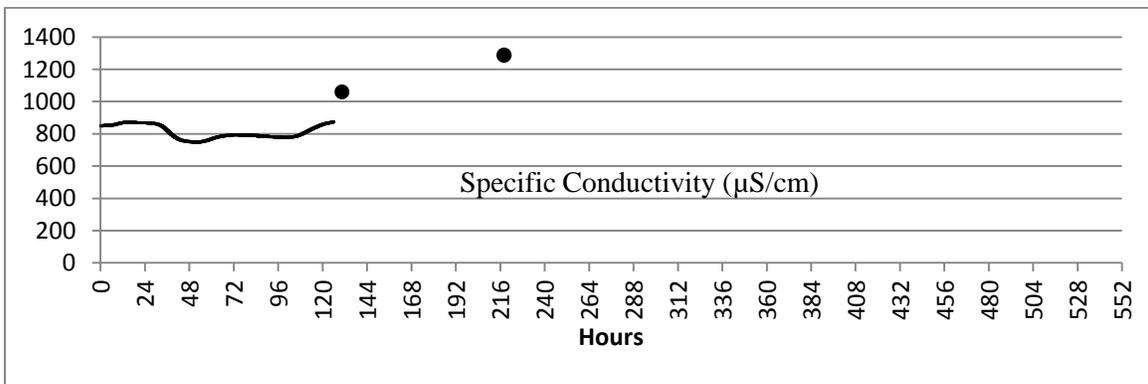
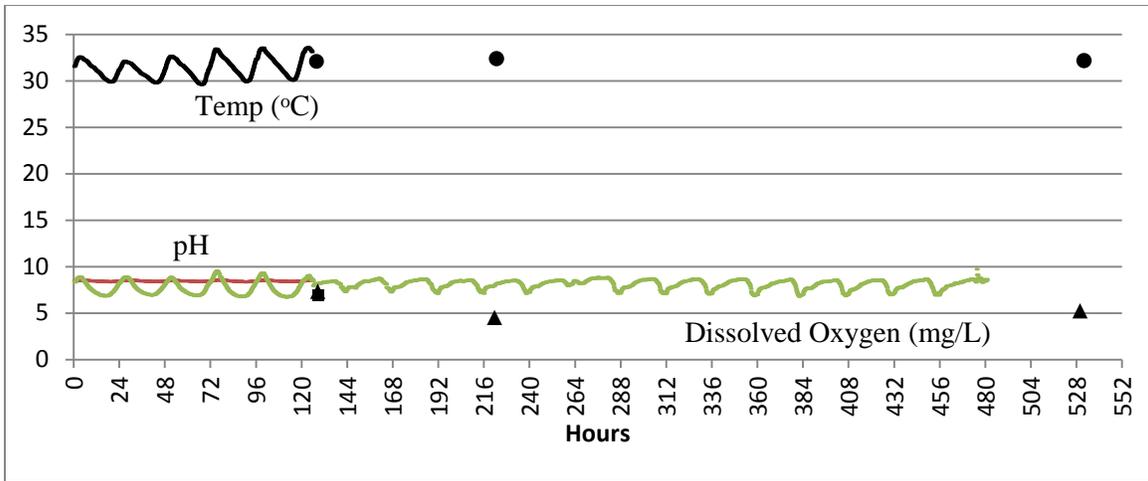
Water quality parameters collected with a data sonde deployed in the San Antonio River at US 77-A (Goliad County, Texas) during fall 2012 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



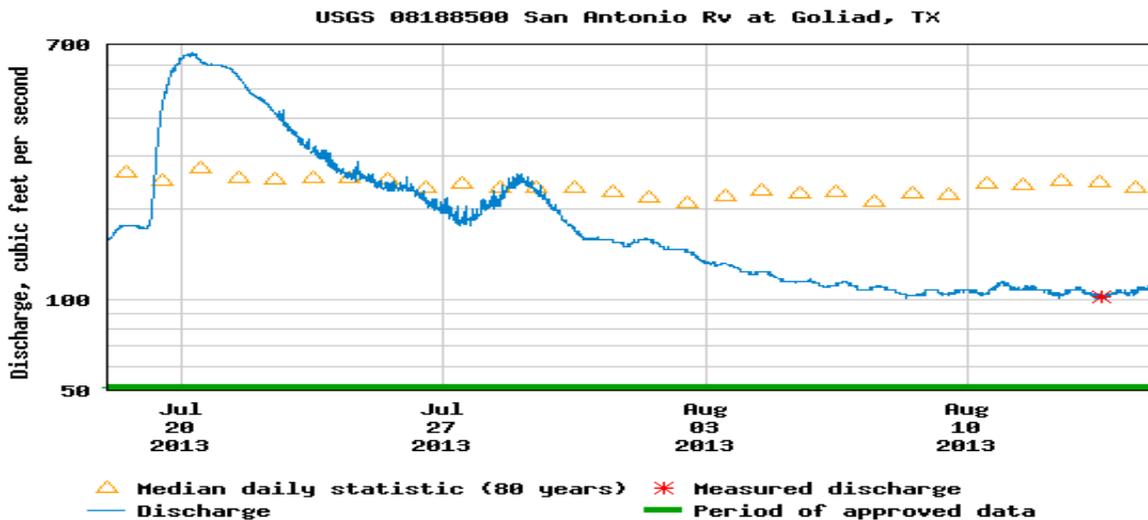
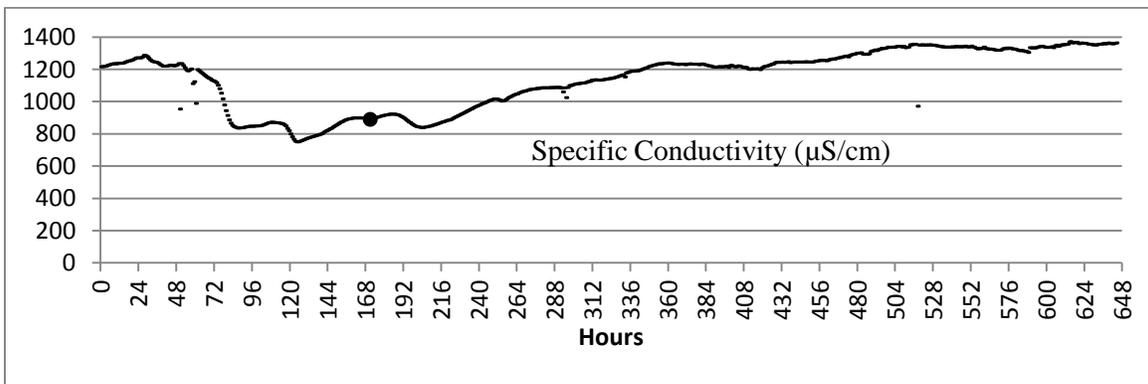
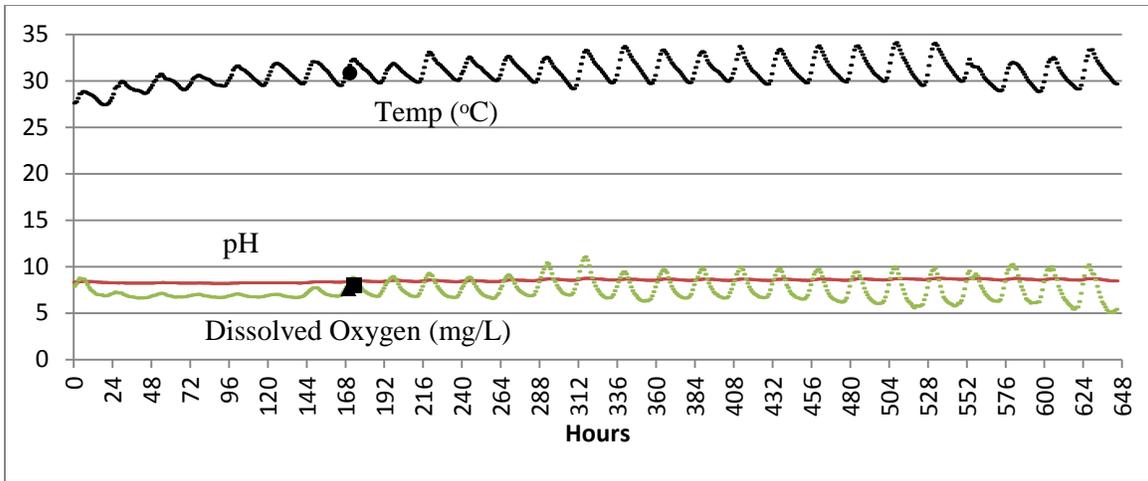
Water quality parameters collected with a data sonde deployed in the San Antonio River at US 77-A (Goliad County, Texas) during fall 2013 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



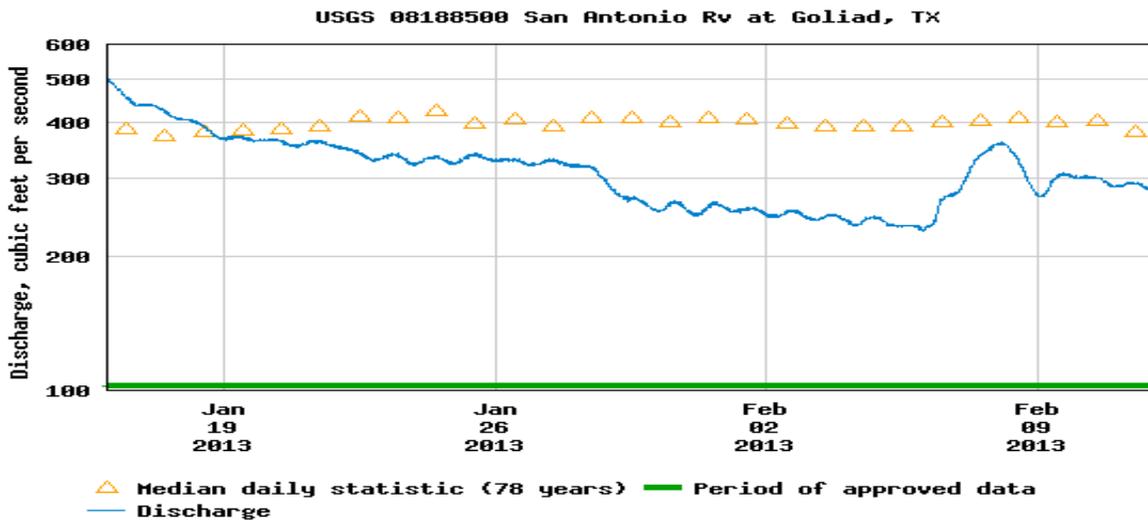
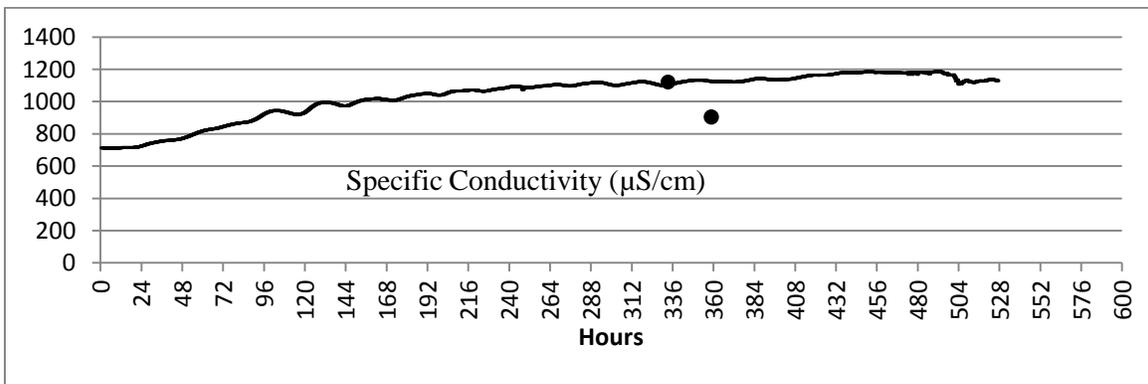
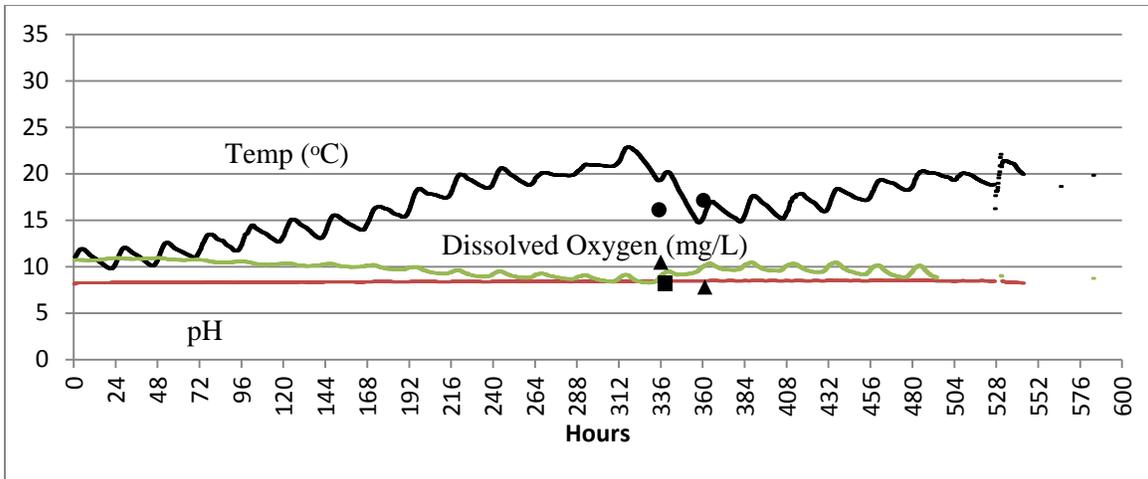
Water quality parameters collected with a data sonde deployed in the San Antonio River at US 77-A (Goliad County, Texas) during spring 2013 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



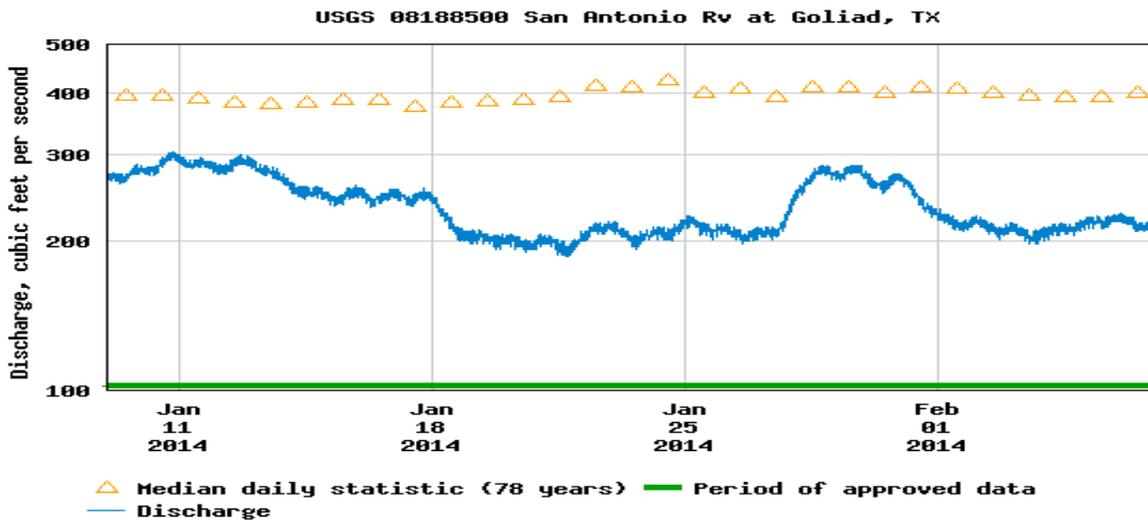
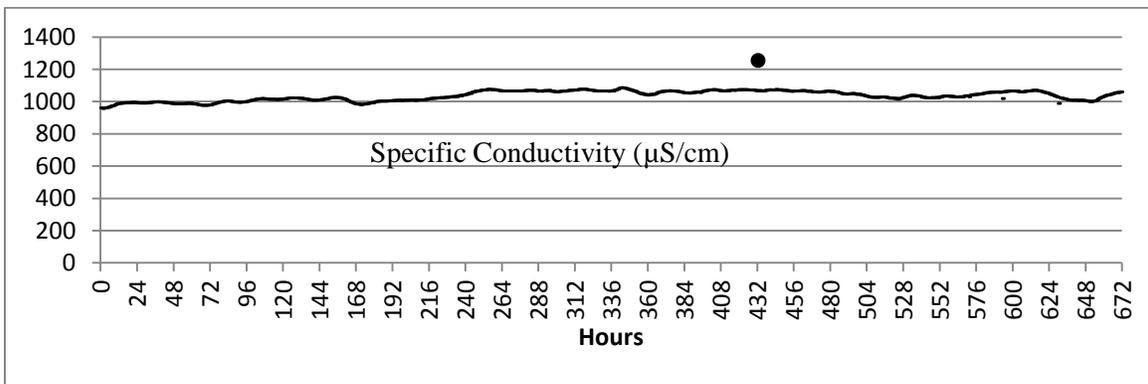
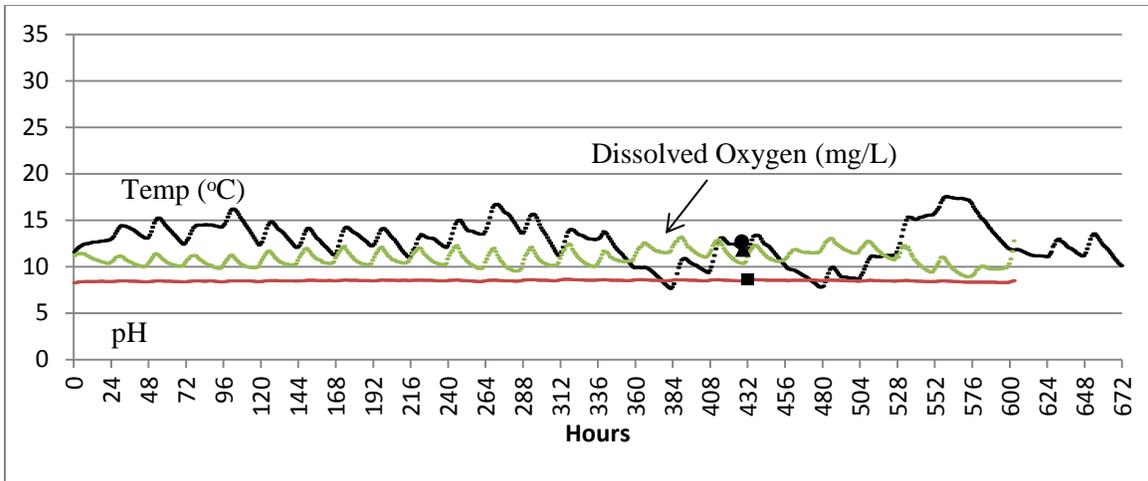
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Water quality parameters collected with a data sonde deployed in the San Antonio River at US 77-A (Goliad County, Texas) during summer 2013 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



Water quality parameters collected with a data sonde deployed in the San Antonio River at US 77-A (Goliad County, Texas) during winter 2013 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



Water quality parameters collected with a data sonde deployed in the San Antonio River at US 77-A (Goliad County, Texas) during winter 2014 plotted against USGS discharge data. The symbols represent the mean value calculated from a series of instantaneous measurements taken during field sampling events (● - temperature, specific conductivity; ■ - pH; ▲ - dissolved oxygen).



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