Cibolo Creek Data Report

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PREPARED IN COOPERATION WITH THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY AND U.S. ENVIRONMENTAL PROTECTION AGENCY

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Texas Stream Team Volunteer Water Quality Monitoring Program
2009 Cibolo Creek Data Summary

This data summary report includes general basin volunteer monitoring activity, general water quality descriptive statistics, tables and graphs, and comparisons to stream standards related to "aquatic life use" criteria.

In alignment with Texas Stream Team's core mission, monitors attempt to collect data that can be used in decision-making processes, to promote a healthier and safer environment for people and aquatic inhabitants. While many assume it is the responsibility of Texas Stream Team to serve as the main advocate for volunteer data use, it has become increasingly important for monitors to be accountable for their monitoring information and how it can be infused into the decision-making process, from "backyard" concerns to state or regional issues. To assist with this effort, Texas Stream Team is coordinating with monitoring groups and government agencies to propagate numerous data use options.

Among these options, volunteer monitors can direction participate by communicating their data to various stakeholders. Some options include: participating in the Clean Rivers Program (CRP) Steering Committee Process (see box insert on this page); providing information during "public comment" periods; attending city council and advisory panel meetings; developing relations with local Texas Commission on Environmental Quality and river authority water specialists; and if necessary, filing complaints with environmental agencies; contacting elected representatives and media; or starting organizing local efforts to address areas of concern.

The Texas Clean Rivers Act established a way for the citizens of Texas to participate in building the foundation for effective statewide watershed planning activities. Each CRP partner agency has established a steering committee to set priorities within its basin. These committees bring together the diverse interests in each basin and watershed. Steering committee participants include representatives from the public, government, industry, business, agriculture, and environmental groups. The steering committee is designed to allow local concerns to be addressed and regional solutions are recommended. For more information about participating in these steering committee meetings and to contribute your views about water quality, contact the appropriate CRP partner agency for your river basin at:
http://www.tceq.state.tx.us/compliance/monitoring/crp/partners.html.

Currently, Texas Stream Team is working with various public and private organizations to facilitate data and information sharing. One component of this process includes interacting with watershed stakeholders at CRP steering committee meetings. A major function of these meetings is to discuss water quality issues and to obtain input from the general public. While participation in this process may not bring about instantaneous results, it is a good place to begin making institutional connections and to learn how to “work” the assessment and protection system that Texas agencies use to keep water resources healthy and sustainable. In general, Texas Stream Team efforts to use volunteer data may include the following:

1. Assist monitors with data analysis and interpretation
2. Analyze watershed-level or site-by-site data for monitors and partners
3. Screen all data annually for values outside expected ranges
4. Network with monitors and pertinent agencies to communicate data
5. Attend meetings and conferences to communicate data
6. Participate in CRP stakeholder meetings
7. Provide a data-viewing forum via the Texas Watch Data Viewer
8. Participate in professional coordinated monitoring processes to raise awareness of areas of concern

Information collected by Texas Stream Team volunteers utilizes a TCEQ and EPA approved quality assurance project plan (QAPP) to ensure data are correct and accurately reflects the environmental conditions of the segment being monitored. All data are screened for completeness, precision and accuracy where applicable, and scrutinized with data quality objective and data validation screening techniques. Sample results are intended to be used for education and research, baseline, local decision-making, problem identification, and other uses deemed appropriate by the data user. Graphs are compiled and situated to assist the data user in obtaining information from the collected data. Where applicable, “time” is located on the “x” or horizontal axis and is chronologically listed from oldest to most recent sampling (left to right respectively). The “y1” or “y2” axes contain the constituent(s) of interest and these scales may be different. Data collected by Texas Stream Team monitors include: pH, specific conductivity, water and air temperature, dissolved oxygen, flow severity, days since last precipitation, total depth, sample depth, Secchi depth, field observations, and others. Note: data collection events may not be evenly distributed over time (through seasons and years); sampling events may occur at different times of the day; sample collection and results documentation may have been completed by different monitors over time at each site; data collected by school groups should undergo additional scrutiny before use; data summary information is subject to change.

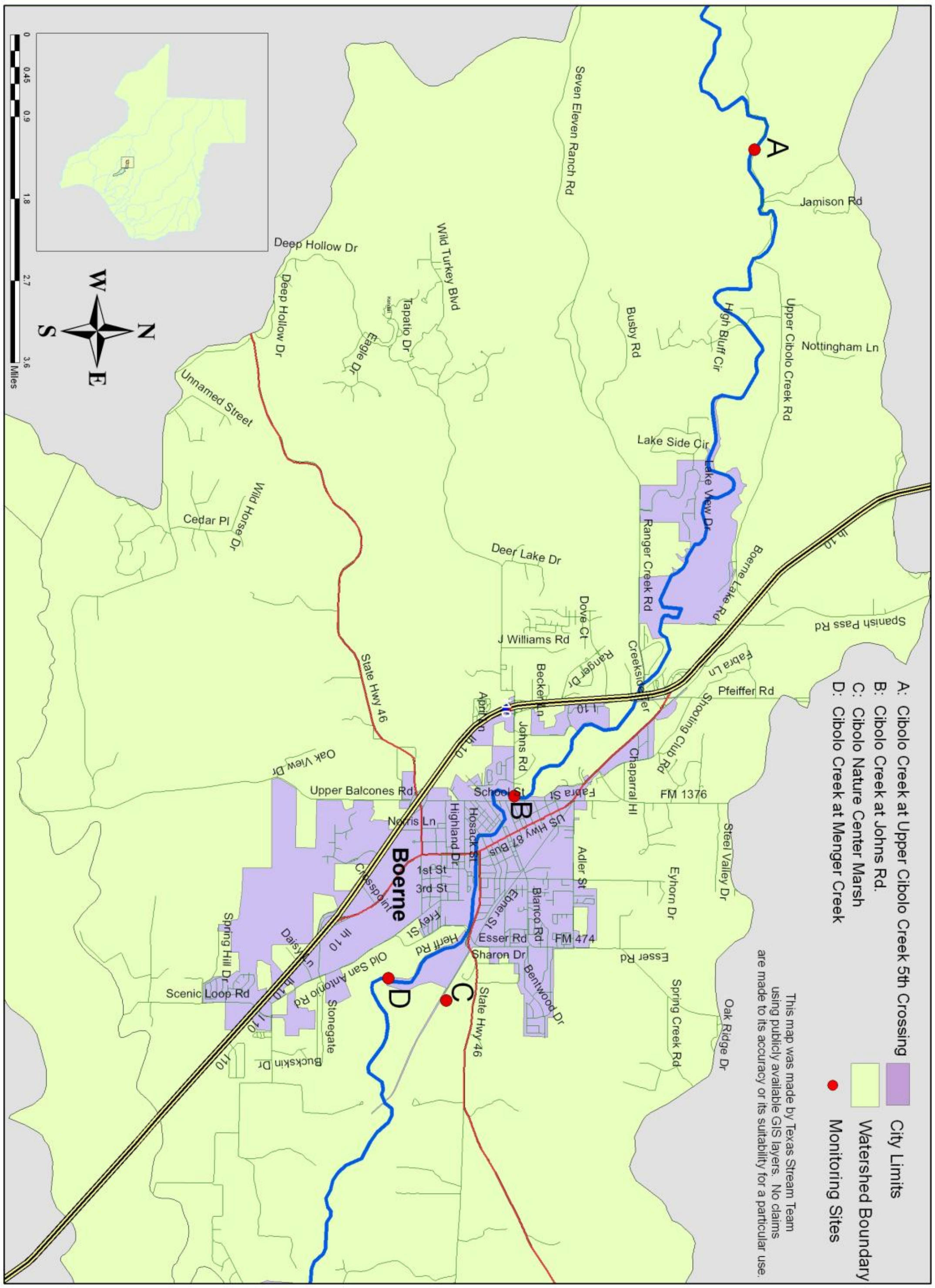
Cibolo Creek Description

Cibolo Creek emerges out of springs in southwestern Kendall County at 29°50’, -98°53’ ten miles northwest of Boerne and runs southeast for 100 miles, forming the Bexar-Comal and the Bexar-Guadalupe county lines, crosses Wilson County, and empties into the San Antonio River five miles northwest of Karnes City in Karnes County at 28°57’, -97°52. It receives flow from Frederick Creek northwest of Boerne and Balcones Creek southeast of Boerne, and provides groundwater for both the Trinity and Edwards aquifers along the way (Cibolo 2006). The clay and sandy loams support oak, juniper, and mesquite in the drier regions and water-tolerant hardwoods, conifers, and grasses in the middle and lower reaches. Cypress and Live Oak Trees line the riverbeds, and catfish, bullheads, sunfish, and white bass provide great fishing opportunities (TSHA 2010 & Cibolo 2006). It has an average flow of 30 cubic feet per second, and therefore is not ideal for many recreational activities (TPWD 2008). However, it offers stunning scenery such as shallow, rocky flats; deep, mossy canyons; and scenic waterfalls (Cibolo 2006). It is a part of the San Antonio River Basin which drains 4,180 mi^2 from Brackenridge Park in San Antonio to its confluence with the Guadalupe River near the Gulf Coast. The Texas Commission on Environmental Quality (TCEQ) has designated it as suitable for contact recreation use and high aquatic life use, and has deemed the upper portion suitable for public water supply and under aquifer protection rules. The aquifer protection domestic water supply designation is applied to water bodies which are capable of recharging the Edwards Aquifer in order to protect the quality of water recharging the aquifer (TCEQ 2000).

Cibolo Creek has been listed on the TCEQ 303(d) list of impaired water bodies since 2004 due to bacterial contamination and since 2006 for impaired fish community (TCEQ 2008a). The TCEQ has also published concerns for the levels of nutrients in Cibolo Creek (TCEQ 2008b). These are shown in the following table. A Total Maximum Daily Load (TMDL) study either has been scheduled or will be scheduled soon for the bacterial contamination in Lower Cibolo Creek. A TMDL establishes an allowable level of a pollutant, and is used to develop an Implementation Plan in order to meet that level. The TCEQ has decided more data is needed to develop a TMDL for the other impaired portions (TCEQ 2008a). The City of Boerne Public Works Department has established the Upper Cibolo Creek Watershed Partnership to develop a Watershed Protection Plan in order to promote awareness and initiate action in reducing non-point source pollution in the watershed. For details, visit http://www.ci.boerne.tx.us/publicworks/UpperCiboloCreekWatershed/tabid/603/Default.aspx

Portion	Area	Impairment	Concern
Upper	From approximately 2 miles upstream of Hwy 87 in Boerne to a point 1.5 km. (0.9 miles) upstream of the confluence of Champee Springs in Kendall County	Bacteria	Ammonia
	From the confluence with Balcones Creek to approximately 2 miles upstream of Hwy 87 in Boerne		Impaired habitat Orthophosphorus
Mid	From approximately 0.5 miles upstream of Buffalo Lane in Cibolo to the west of Bracken in Comal County	Bacteria	Ammonia Nitrate
	From IH 10 to Bexar CR 320		Total Phosphorus Orthophosphorus Nitrate Ammonia
	From Bexar CR 320 to approximately 0.5 miles upstream of Buffalo Ln. in Cibolo		Ammonia Nitrate Orthophosphorus Total Phosphorus
Lower	The lower 5 miles of the creek	Bacteria	Nitrate
	From 5 miles upstream of confluence with the San Antonio River to FM 541	Bacteria Impaired Fish Community	
	From FM 541 to the confluence with Clifton Branch	Bacteria	Impaired Fish Community
	From confluence with Clifton Branch to the confluence with Elm Creek		Nitrate Orthophosphorus
	From the confluence with Elm Creek to a point 100 meters downstream of IH 10 in Bexar/Guadalupe County		Total Phosphorus Nitrate Orthophosphorus

CIBOLO CREEK WATERSHED
Volunteer Monitoring Locations



Data Summary

The data collected at the four sites shown on this map is from the upper portion of Cibolo Creek (Segment 1908), as designated by the TCEQ. The following standards are taken from the 2000 Water Quality Standards, which can be accessed at http://www.epa.gov/waterscience/standards/wqslibrary/tx/tx-wqs.pdf.

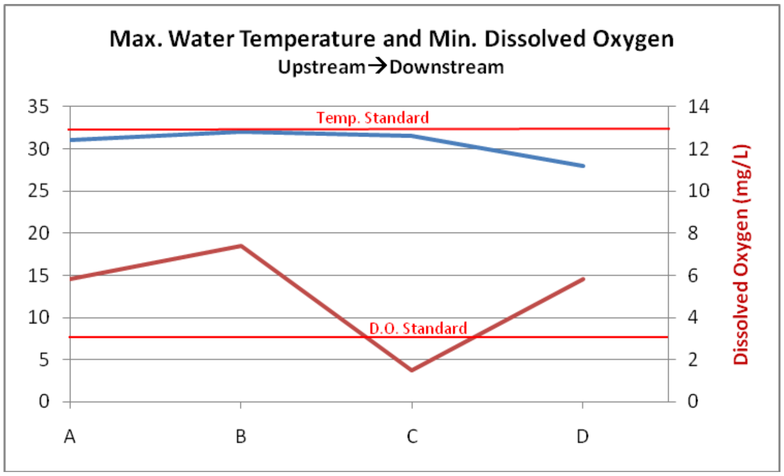
Parameter	Observed Range	Standard	# Exceedence	% Exceedance
Water Temperature	10-32°C	32 °C	1/123	0.008
Dissolved Oxygen	2.5-7.7 mg/L	3 mg/L	2/123	0.02
Specific Conductivity	260-930 µS/cm	896 µS/cm	1/123	0.008
pH (range)	7.5-8.5	6.5-9	0/123	0

Water Temperature Summary

Fish are cold-blooded and therefore depend on the temperature of water to carry out processes such as metabolism and reproduction. Extreme high or low temperatures can threaten their survival, particularly if the temperature changes abruptly. Sources of warm water include powers plants discharging warm water after it has been used for cooling or hydroelectric dams which have hotter or cooler water (depending on the time of year) near the point of release. Temperature also causes dissolved oxygen to decrease as it gets warmer and vice versa. In this data set the mean water temperature was 22 °C. The maximum reading of 32 °C was taken at Cibolo Creek at Johns Road on June 16th, 2005. The minimum of 10 °C was taken at Cibolo at Menger Creek on January 18th, 2008.

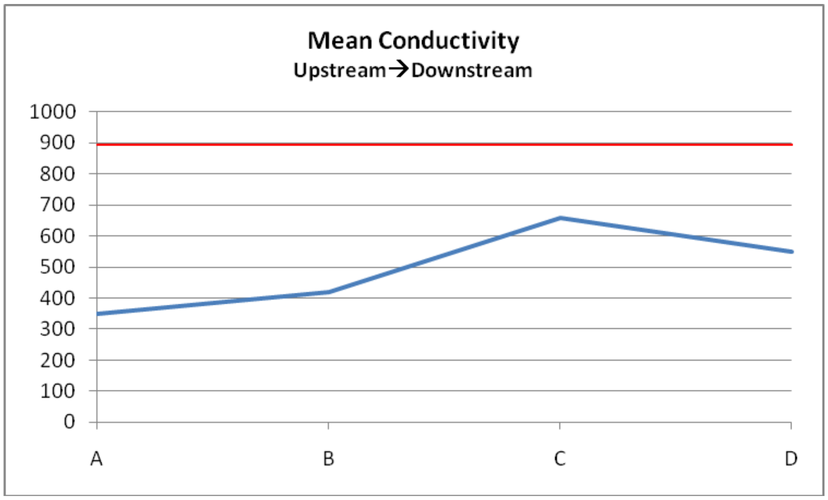
Dissolved Oxygen Summary

Oxygen is necessary for the survival of most organisms. Too little oxygen will lead to asphyxiation of aquatic organisms. Too much oxygen (super-saturation) can cause bubbles to develop in cardiovascular systems, which can be fatal. Dissolved oxygen (DO) levels below 2 mg/L will lead to asphyxiation, and levels above 20 mg/L will lead to super-saturation. High concentrations of nutrients can lead to excessive surface vegetation growth, which may starve subsurface vegetation of sunlight, and therefore limit the amount of dissolved oxygen in a water body due to limited photosynthesis. This process is enhanced when the subsurface vegetation dies and consumes oxygen when decomposing. They may also result from high groundwater inflows as groundwater is typically low in dissolved oxygen due to minimal aeration or high temperatures which reduce oxygen solubility. In this data set, the mean DO value was 8.5 mg/L. The maximum value of 13.7 mg/L was observed at Cibolo Nature Center Marsh on June 20th, 2003. The minimum value of 1.5 mg/L was observed at Cibolo Nature Center Marsh on August 17th, 2007.



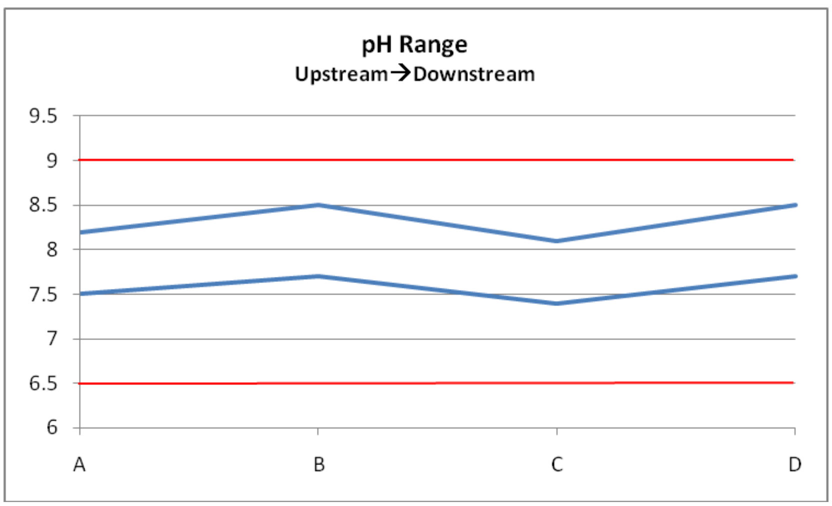
Specific Conductivity Summary

Specific conductivity (SC) is a measure of the ability of a body of water to conduct electricity. A body of water is more conductive if it has more Total Dissolved Solids (TDS) such as nutrients and salts, which indicate poor water quality if they are abundant. High concentrations of nutrients lower dissolved oxygen, the process of which was described in the previous section. High concentrations of salt inhibit water absorption and limit root growth for vegetation, lead to an abundance of more drought tolerant plants, and cause dehydration of fish and amphibians. Sources of TDS include agricultural runoff, domestic runoff, or discharges from wastewater treatment plants. In this data set, the mean SC value was 496 µS/cm. The maximum value of 930 µS/cm was observed at Cibolo at Menger Creek on April 19th, 2007. The minimum value of 260 µS/cm was observed at Cibolo at Menger Creek on October 23rd, 2004.



pH summary

pH is a measure of acidity and alkalinity. The scale ranges from 0 to 14 and is measured in standard units (su), which represent the concentration of hydrogen ions. The range is logarithmic, so every 1 unit change means the acidity changed 10-fold. Sources of low pH (acidic) include acid rain and runoff from acid-laden soils. Acid-rain is mostly caused by coal power plants with minimal contributions from burning other fossil fuels and volcanic emissions. Soil-acidity is caused by excessive rainfall leaching alkaline materials out of soils, acidic parent material, crop decomposition creating hydrogen ions, or high-yielding fields that have drained the soil of all alkalinity. Sources of high pH include geologic composition since limestone increases alkalinity and the dissolving of carbon dioxide in water. Carbon dioxide is water soluble, and as it dissolves it forms carbonic acid, an alkaline molecule. In this dataset, the mean pH value was 7.9 su. The maximum value observed of 8.5 su was observed at 3 different times, Cibolo at Menger Creek on November 16th, 2007, Cibolo at Menger Creek on December 21st, 2007 and Cibolo Creek at Johns Road on February 20th, 2004. The minimum value of 7.4 su was observed at Cibolo Nature Center Marsh on August 17th, 2007. From the data presented in this report, pH values look to stay consistently healthy.

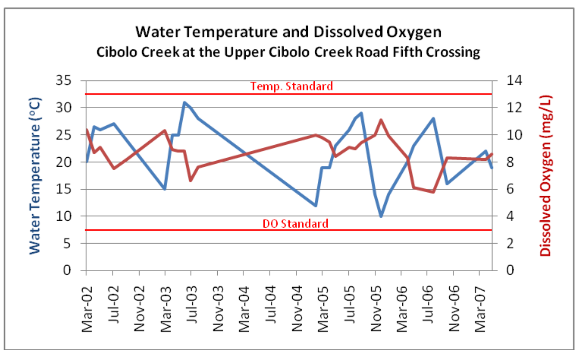


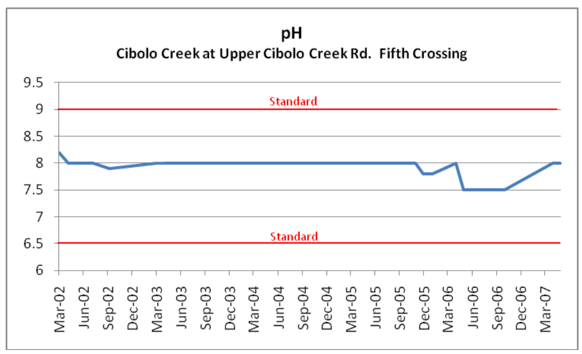
Site by Site Analysis

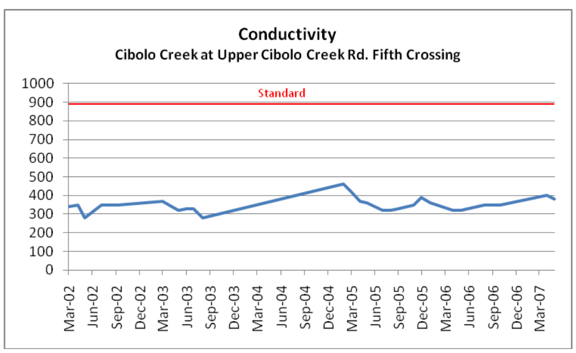
Cibolo Creek at Upper Cibolo Creek Rd. 5th Crossing

There were 31 samples taken from the Cibolo Creek at Upper Cibolo Creek Rd. 5th crossing between March 21st, 2002 and May 18th, 2007. Sample times ranged from 10:00 to 18:00. Total depth measurements ranged from 0.2 - 0.6 meters with an average of 0.5 m. Secchi depth measurements ranged from 0.2 - 0.6 meters with an average of 0.5 m. Water temperature ranged from 10 - 31 °C with an average of 22.5 °C. SC values ranged from 280 µS/cm to 460 µS/cm with an average of 348.9 µS/cm. DO values ranged from 5.8 - 11 mg/L. DO values average 8.8 mg/L. The pH values averaged 7.9 su.

Cibolo Creek at Upper Cibolo Creek 5th Crossing						
Parameter	N	% Complete	Min	Mean	Max	Std. Deviation
Sample Time	31	94	10:00	14:49	18:00	0.1
Total Depth (m)	31	90	0.2	0.5	0.6	0.1
Specific Conductivity (µS/cm)	31	90	280	349	460	38.0
DO (mg/L)	31	90	5.8	8.8	11.1	1.2
pH (su)	31	90	7.5	7.9	8.2	0.2
Air Temperature (˚C)	31	90	13	25	34	6.2
Water Temperature (˚C)	31	90	10	23	31	6.0
Secchi Depth (m)	31	52	0.2	0.5	0.6	0.1



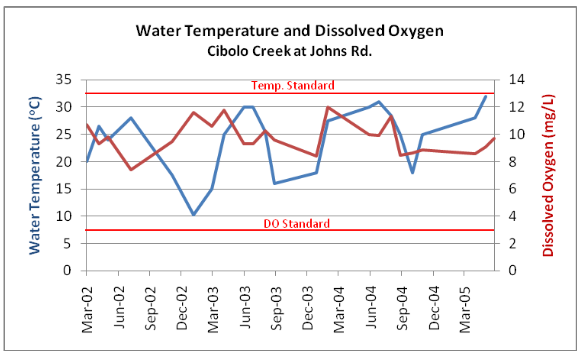


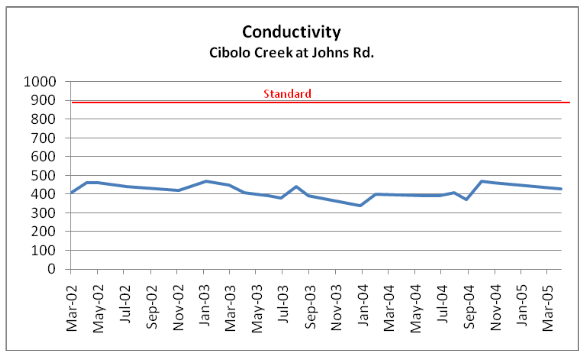


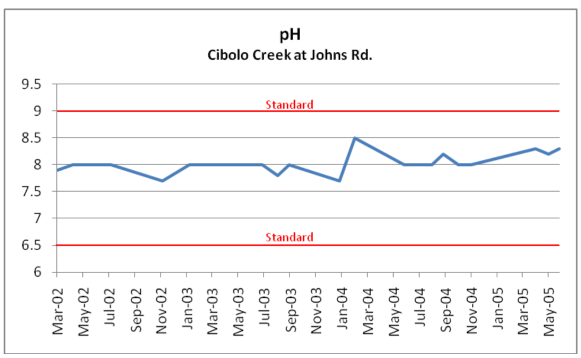
Cibolo Creek at Johns Road

There were 23 samples taken from the Cibolo Creek at Johns Road between March 21st, 2002 and June 16th, 2005. Sampling times ranged from 14:55 to 18:02. Total depth measurements ranged from 0.3 - 1 meters with an average of 0.7 m. Only five Secchi depth measurements were noted at Johns Road that ranged from 0.4 - 1 meters with an average of 0.7 m. Water temperature ranged from 10.3 - 32 °C with an average of 24.12 °C. SC values ranged from 340 µS/cm to 470 µS/cm with an average of 418 µS/cm. DO values ranged from 7.4 - 12 mg/L. DO values average 9.74 mg/L. The pH values average 8.04 su.

Cibolo Creek at Johns Road						
Parameter	N	% Complete	Min	Mean	Max	Std. Deviation
Sample Time	23	96	14:55	16:32	18:02	0.04
Total Depth (m)	23	100	0.28	0.67	1.03	0.18
Specific Conductivity (µS/cm)	23	91	340	418.10	470	36.28
DO (mg/L)	23	100	7.4	9.74	12	1.18
pH (su)	23	100	7.7	8.03	8.5	0.18
Air Temperature (˚C)	23	96	8.9	26.00	38	6.99
Water Temperature (˚C)	23	96	10.3	24.13	32	6.01
Secchi Depth (m)	23	22	0.4	0.736	1	0.28



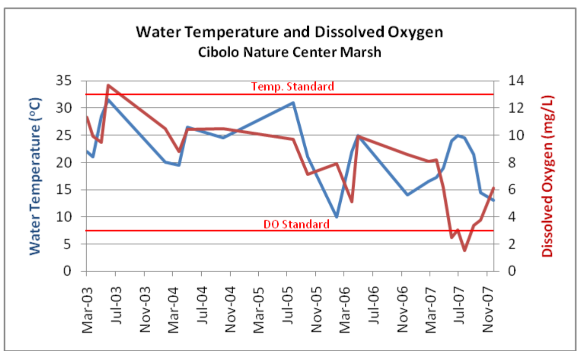


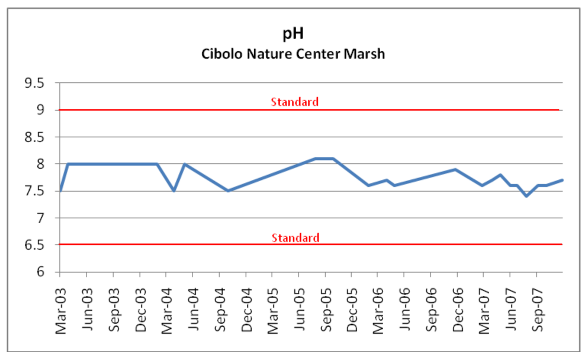


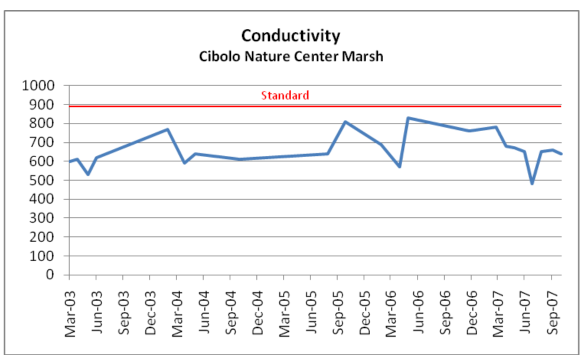
Cibolo Nature Center Marsh

There were 30 samples taken from the Cibolo Nature Center Marsh between March 21st, 2003 and December 18th, 2007. Sampling times ranged from 8:53 to 16:05. Total depth measurements ranged from 0.2 - 0.7 meters with an average of 0.4 m. Secchi Depth measurements ranged from 0.2 - 0.7 meters with an average of 0.4 m. Water temperature ranged from 10 - 31.5 °C with an average of 21.4 °C. SC values ranged from 480 µS/cm to 830 µS/cm with an average of 658 µS/cm. DO values ranged from 0.5 - 13.7 mg/L. DO values average 7.6 mg/L. The pH values average 7.74 su.

Cibolo Nature Center Marsh						
Parameter	N	% Complete	Min	Mean	Max	Std. Deviation
Sample Time	30	97	8:53	11:47	16:05	0.1
Total Depth (m)	30	70	0.2	4.7	51.5	13.6
Specific Conductivity (µS/cm)	30	73	480	658	830	88.1
DO (mg/L)	30	80	1.5	7.6	13.7	3.2
pH (su)	30	80	7.4	7.7	8.1	0.2
Air Temperature (˚C)	30	83	9	22	37	7.1
Water Temperature (˚C)	30	80	10	21	31.5	5.6
Secchi Depth (m)	30	50	0.3	0.4	0.7	0.1



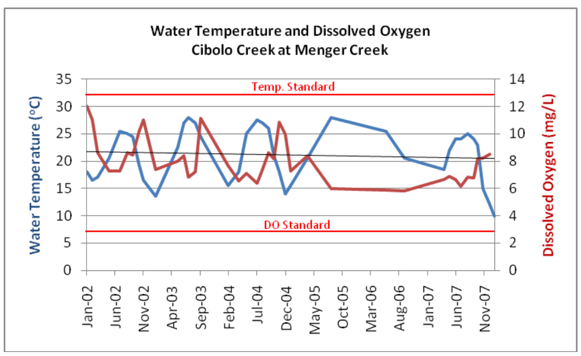


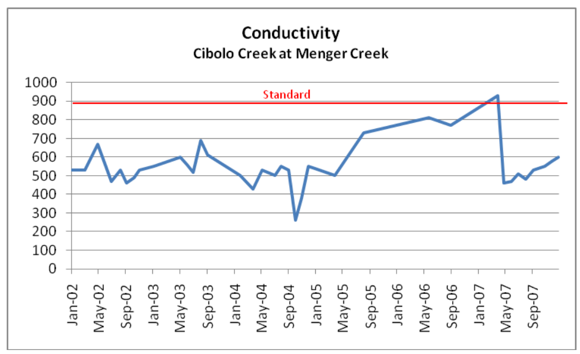


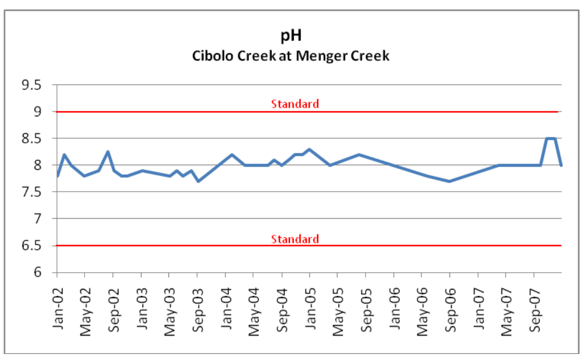
Cibolo Creek at Menger Creek

There were 39 samples taken from the Cibolo Creek at Menger Creek between January 23rd, 2002 and January 17th, 2008. Sample times ranged from 9:24 to 19:35. Total depth measurements ranged from 0.2 - 0.8 meters with an average of 0.4 m. Secchi depth measurements ranged from 0.2 - 0.8 meters with an average of 0.4 m. Water temperature ranged from 10 - 28°C with an average of 21.2 °C. SC values ranged from 260 µS/cm to 930 µS/cm with an average of 551 µS/cm. DO values ranged from 5.8 - 12 mg/L. DO values average 8 mg/L. The pH values average 8 su.

Cibolo Creek at Menger Creek						
Parameter	N	% Complete	Min	Mean	Max	Std. Deviation
Sample Time	39	97	9:24	14:18	19:35	0.1
Total Depth (m)	39	95	0.2	0.4	0.8	0.1
Specific Conductivity (µS/cm)	39	97	260	551	930	116.4
DO (mg/L)	39	95	5.8	8.0	12.0	1.6
pH (su)	39	97	7.7	8.0	8.5	0.2
Air Temperature (˚C)	39	97	3	23	33	5.8
Water Temperature (˚C)	39	97	10	21	28	4.9
Secchi Depth (m)	39	90	0.2	0.4	0.8	0.1







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