Data Report

Upper Cibolo Creek Watershed Intensive Bacteria Surveys

February 2011

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This report was prepared in cooperation with the Texas Commission on Environmental Quality and relevant Texas Stream Team Program Partners.

Funding for the Texas Stream Team is provided by a grant from the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency.

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Introduction

Water Body Location: Cibolo Creek emerges out of springs in southwestern Kendall County 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. Upper Cibolo Creek (Segment 1908), the focus of this report, receives flow from Frederick Creek, Menger Creek, and Ranger Creek in the area covered in this report, and provides groundwater for both the Trinity and Edwards aquifers along the way.

Water Body Description: Cibolo Creek is a part of the San Antonio Watershed which drains 4,134 mi.^{2} from the northeast corner of Bandera County to its confluence with the Guadalupe River near the Gulf Coast. The clay and sandy loams in the San Antonio Watershed 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 Cypress Creek beds, and catfish, sunfish, largemouth bass, and Guadalupe bass are among the fish that live in the creek. Cibolo Creek has an average flow of 30 cubic feet per second, and therefore is not ideal for many recreational activities. However, it offers stunning scenery such as shallow, rock flats; deep, mossy canyons; and scenic waterfalls.

Texas Stream Team: Texas Stream Team is a volunteer based water quality monitoring program. In alignment with Texas Stream Team's core mission, monitors collect surface water quality data that may be used in decision-making processes to promote and protect a healthy and safe environment for people and aquatic inhabitants. Citizen monitoring occurs at set monitoring sites roughly the same time of day once a month. Citizen monitoring data provides a valuable resource of information supplementing professional data collection efforts where resources are limited. The data may be used by professionals to identify water quality trends, target additional data collection, identify pollution events, identify sources and causes of pollution, and show effectiveness of management measures towards improving water quality.

Texas Stream Team volunteer data, however, is not used by the State to assess whether water bodies are meeting the designated surface water quality standards. The primary reason for this is that Texas Stream Team volunteers use different methods than the professional water quality monitoring community. Different methods are utilized by Texas Stream Team due to higher equipment costs, training requirements, and stringent laboratory procedures that are required of the professional community. The Texas Stream Team methods have been chosen because of relative ease of performing the methods in the field, while providing reliable results at low costs. As a result, Texas Stream Team data does not have the same accuracy or precision as professional data and is therefore not directly comparable. However, Texas Stream Team data are valuable records often collected in portions of water body that professionals are not able to monitor or monitor as frequently. This long-term data set is available to and may be considered by the surface water quality professional community to facilitate management and protection of Texas' water resources. For additional information about water quality monitoring methods and procedures, see:

- Texas Stream Volunteer Water Quality Monitoring Manual
- Texas Commission on Environmental Quality (TCEQ) Surface Water Quality Monitoring Procedures for professional monitors

Information collected by Texas Stream Team volunteers is covered under a TCEQ approved quality assurance project plan (QAPP) to ensure a standard set of methods of known quality are used. All data used in data reports are screened by the Texas Stream Team for completeness, precision and accuracy where applicable, and scrutinized with data quality objective and data validation techniques.

The purpose of this report is to provide analysis of data collected by Texas Stream Team volunteers. The data presented in this report should be considered in conjunction with other relevant water quality reports prepared by the following programs in order to provide a holistic view of water quality in this water body:

- Texas Surface Water Quality Standards;
- Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d) (or Texas Integrated Report; formerly the Texas Water Quality Inventory and 303(d) List);
- Texas Clean Rivers Program partners' reports such as Basin Summary Reports and Highlight Reports;
- TCEQ surface water quality special studies;
- TCEQ Total Maximum Daily Load reports;
- TCEQ and Texas State Soil and Water Conservation Board Nonpoint Source Program funded reports, including Watershed Protection Plans.

Questions about this report should be directed to the Texas Stream Team at (512) 245-1346.

Water Quality Terminology

E. *coli* Bacteria

Pathogens are microorganisms such as bacteria, viruses, and protozoans that can cause illness. Pathogens can be transmitted by drinking or swimming in water containing fecal waste, primarily through ingestion. The EPA has determined E. *coli* bacteria to be the best indicator of the degree of pathogens in a water body. *E. coli* levels are therefore monitored to determine if there is a significant risk to human health in relation to contact recreation. Sources of E. *coli* may include livestock, pets, failing septic systems and wastewater treatment plants, or wildlife around the water body.

Data Analysis

On December 8th, 2010, Texas Stream Team coordinated with the City of Boerne, the Cibolo Nature Center, and stakeholders involved in the Upper Cibolo Creek Watershed Partnership to conduct an intensive E. *coli* bacteria survey on 29 sites on Cibolo Creek and its tributaries within Kendall County. Two more intensive surveys were conducted on January 26th and 27th on 41 sites. Samples were collected from downstream to upstream within 3 hours in order to provide an E. *coli* bacteria "snapshot." These surveys were used to assist the City of Boerne in identifying areas with elevated levels of E. *coli*.

The results of the three intensive bacteria surveys led to the theory that the highest E. *coli* quantities are within the area closely surrounding the city center; the downstream area of Frederick Creek may be a problem area; and the variability of values at each site indicates the high likelihood of no constant loading source. Upper Cibolo Creek is on the 2010 303(d) List of Impaired Water Bodies because bacteria counts exceeded the single sample standard of 394 cfu/100mL, and geometric mean (average) standard of 126 cfu/100 mL between 12/1/2001 and 11/30/2008. It has been listed for bacteria since 2006.

The impaired assessment unit of Upper Cibolo Creek runs from a point just southeast of Northrup Park to the upper end of the segment. These intensive surveys showed 34 out of 35 samples collected in that assessment unit (sites C13-C24) were under the single sample *E. coli* bacteria standard. The one high value of 653 cfu/100mL was observed at site C20 on Cibolo Creek just upstream of Sparkling Springs Dr. on 1/27/2011. An abundance of duck feces was noted there. Domestic waterfowl are suspected to be a main contributor of bacteria because many high counts were observed when an abundance of waterfowl was noted.

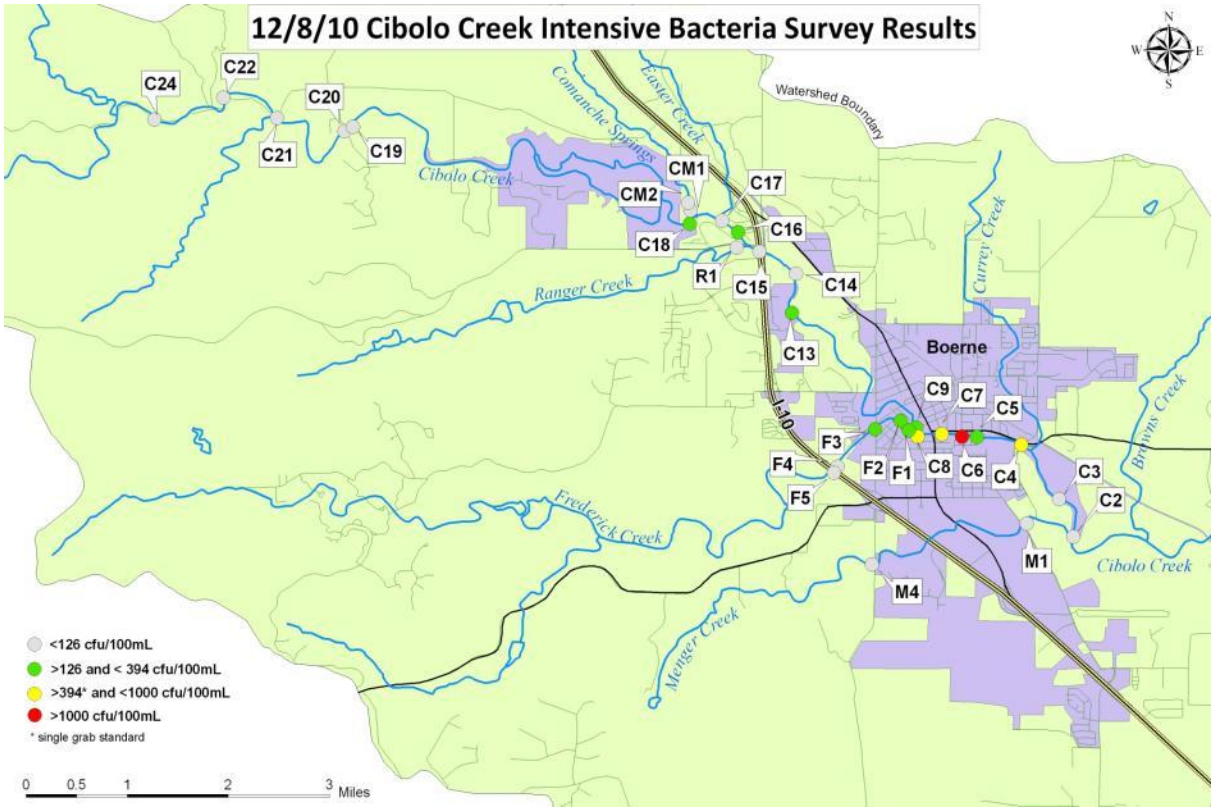
For the three surveys, 8 out of 110 samples on Cibolo Creek and its tributaries exceeded the single sample standard. Seven of those were on Cibolo Creek, and one was at the site F3, where Frederick Creek meets School St. Six of the Cibolo Creek exceedances were downstream of the Frederick Creek confluence. On Frederick Creek, between the confluence with Cibolo Creek and School St., 8 out of 9 samples were above the geometric mean standard (126 cfu/100mL), which is used here only as a reference point since these are single samples.

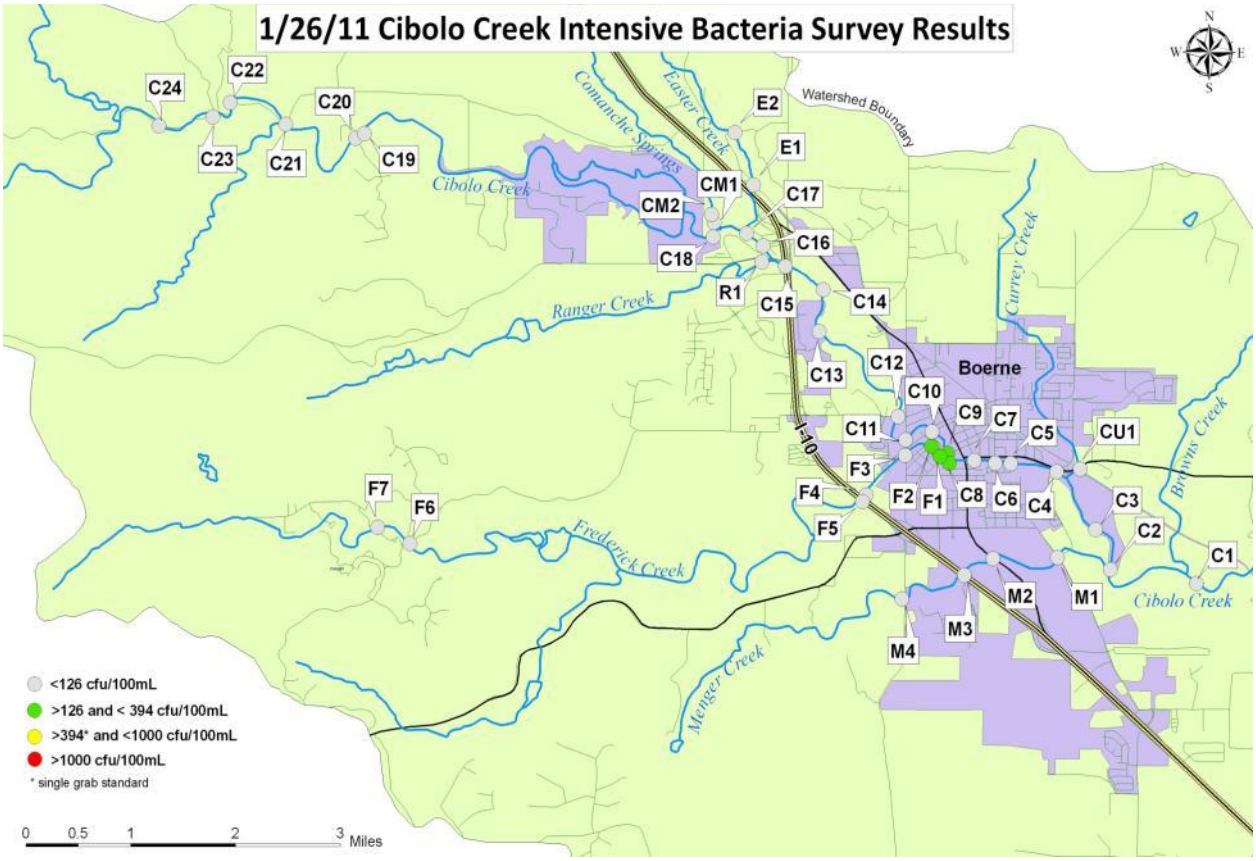
The geometric mean of the 67 samples collected on Cibolo Creek is 33.4 cfu/100mL, well below the standard of 126 cfu/100mL. The highest value (1,430 cfu/100 mL) was observed on 12/8/10 at Cibolo Creek at Boerne Park near the restrooms. Monitors noted an abundance of ducks and visible duck feces in the area. Eighteen samples on Cibolo Creek exceeded the geometric mean standard, and 14 of these were observed downstream of Northrup Park where the land use is predominately residential and commercial.

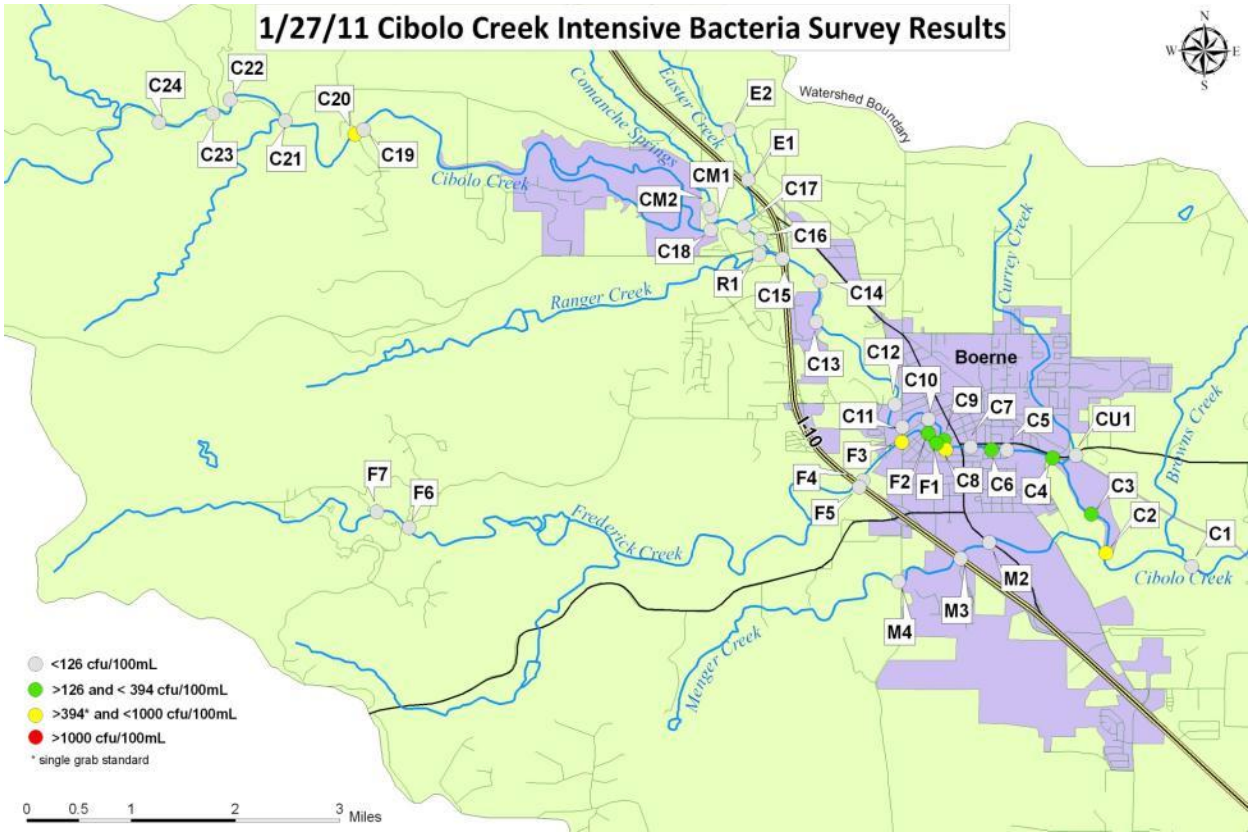
Samples collected downstream of the Wastewater Treatment Plant Discharge near Currey Creek at SH 46 were under the single standard *E. coli* bacteria standard for seven out of eight observations, indicating the likelihood that it is not a contributing source of E. *coli* bacteria. No tributaries other than Frederick Creek exhibited *E. coli* values greater than 126 cfu/100mL. Field blanks, which were conducted on 10% of samples for quality assurance, yielded no bacteria growth.

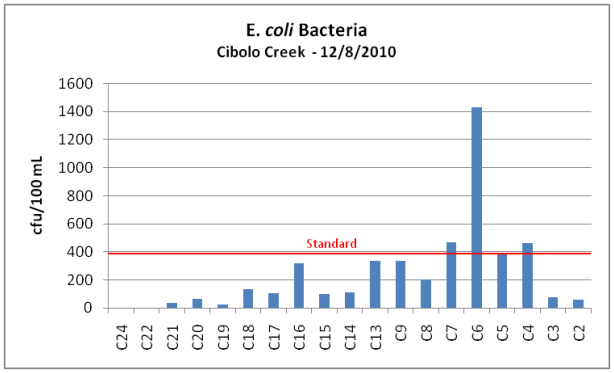
Cibolo Creek Sites	
C1	Nature Preserve Near Old USGS gage
C2	Menger Creek Confluence
C3	Cibolo Nature Center Picnic Area
C4	Herff Rd.
C5	Boerne Park Upstream of Dam
C6	Boerne Park Near Restrooms
C7	Boerne Park Roughly 100m Downstream of Main St.
C8	Thiessen St. Downstream
C9	Thiessen St. Upstream
C10	San Antonio Ave.
C11	School St.
C12	Johns Rd.
C13	Northrup Park Roughly 150 Yards Southeast of Volleyball Courts
C14	Northrup Park at End of Gravel Road in NE Corner
C15	I-10
C16	Roughly 60 Yards NE of First Bend in Oak Acres Ln.
C17	Namaste Retreat
C18	Private Property
C19	Sparkling Springs Dr. Downstream
C20	Sparkling Springs Dr. Upstream
C21	Upper Cibolo Creek Rd. First Crossing
C22	Upper Cibolo Creek Rd. Second Crossing
C23	Upper Cibolo Creek Rd. Fourth Crossing
C24	Upper Cibolo Creek Rd. Fifth Crossing

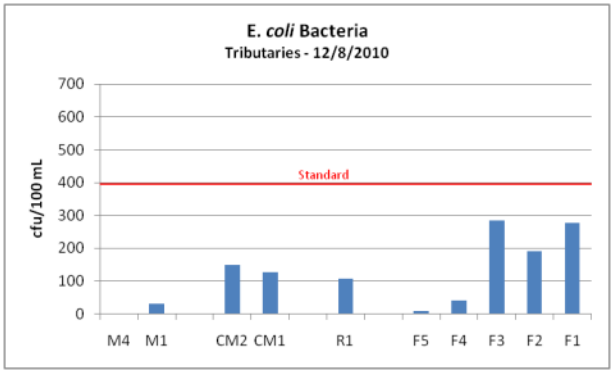
Tributary Sites	
Menger Creek	
M1	Old San Antonio Rd.
M2	Near Main St. by Pizza Hut Parking Lot
M3	I-10
M4	Upper Balcones Rd.
Currey Creek	
CU1	Agricultural Hertiage Museum
Frederick Creek	
F1	Thiessen St.
F2	Graham St.
F3	School St.
F4	I-10 Downstream
F5	I-10 Upstream
F6	Tapatio Springs Golf Resort - Blue Heron Blvd.
F7	Tapatio Springs Golf Resort Near Antelope Hill
Ranger Creek	
R1	Ranger Creek at Low Water Crossing Private Drive Off Ranger Creek Rd.
Comanche Springs	
CM2	Private Property Low Water Crossing Upstream
CM1	Private Property Low Water Crossing Downstream
Easter Creek	
E2	Fabra Rd.
E1	I-10 E. Frontage Rd.

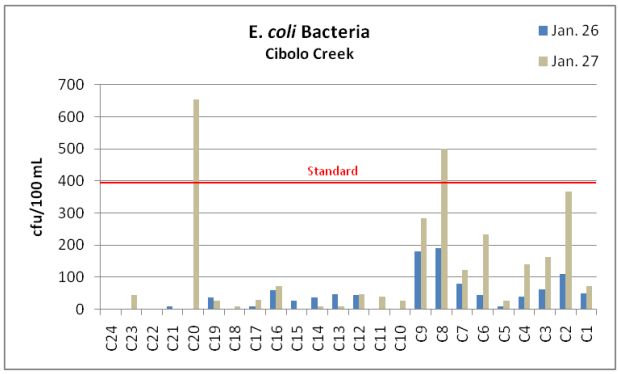

12/8/10 Cibolo Creek Intensive Bacteria Survey Results
N
W
E
S
C24
C22
C20
C21
C19
Comanche Springs
Easter Creek
Watershed Boundary
Cibolo Creek
CM1
CM2
C17
C18
C16
R1
C15
C14
Currey Creek
Ranger Creek
Boerne
C13
C9
C7
C5
I-10
F3
F4
F2
F1
C8
C6
C4
C3
Browns Creek
F5
C2
Frederick Creek
M1
Cibolo Creek
M4
Menger Creek
<126 cfu/100mL
>126 and < 394 cfu/100mL
>394* and <1000 cfu/100mL
>1000 cfu/100mL
* single grab standard
0
0.5
1
2
3
Miles

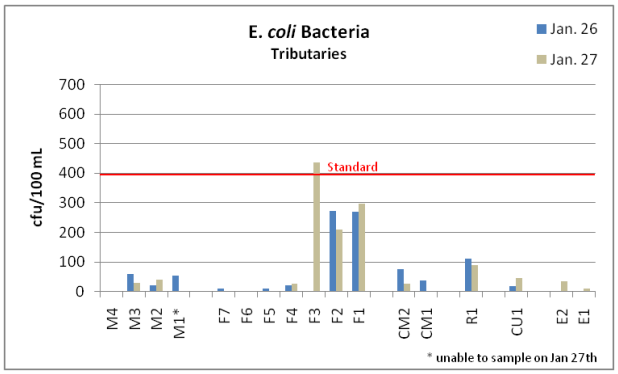

1/26/11 Cibolo Creek Intensive Bacteria Survey Results
N
W
E
S
C24
C22
C20
C23
C21
C19
Comanche Springs
Easter Creek
E2
Watershed Boundary
E1
Cibolo Creek
CM1
CM2
C17
C18
C16
R1
C15
C14
Currey Creek
Ranger Creek
C13
C12
Boerne
C10
C9
C7
C11
C5
CU1
I-10
F3
F7
F6
F4
F2
F1
C8
C6
C4
C3
Browns Creek
F5
C2
C1
Frederick Creek
M2
M1
Cibolo Creek
M3
M4
Menger Creek
<126 cfu/100mL
>126 and < 394 cfu/100mL
>394* and <1000 cfu/100mL
>1000 cfu/100mL
* single grab standard
0
0.5
1
2
3
Miles

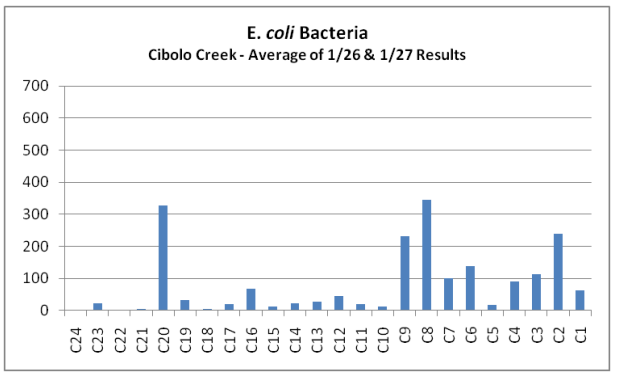

1/27/11 Cibolo Creek Intensive Bacteria Survey Results
N
W
E
S
Watershed Boundary
Comanche Springs
Easter Creek
Cibolo Creek
Ranger Creek
Currey Creek
Boerne
Browns Creek
Frederick Creek
Menger Creek
I-10
C24
C22
C20
C23
C21
C19
E2
E1
CM1
CM2
C17
C16
C18
R1
C15
C14
C13
C12
C10
C9
C7
C5
CU1
C11
F3
F4
F2
F1
C8
C6
C4
C3
C2
C1
F5
F7
F6
M2
M3
M4
<126 cfu/100mL
>126 and < 394 cfu/100mL
>394* and <1000 cfu/100mL
>1000 cfu/100mL
* single grab standard
0
0.5
1
2
3
Miles

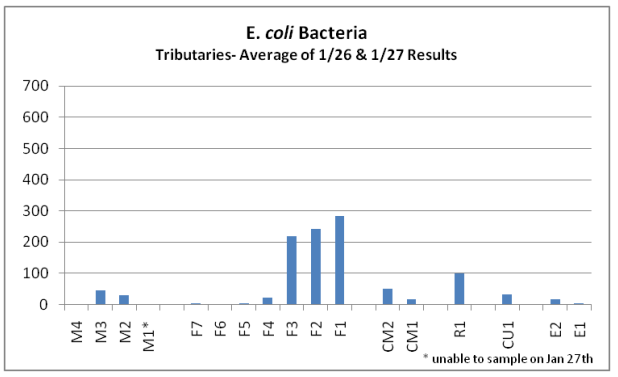

E. coli Bacteria
Cibolo Creek - 12/8/2010
cfu/100 mL
1600
1400
1200
1000
800
600
400
200
0
Standard
C24 C22 C21 C20 C19 C18 C17 C16 C15 C14 C13 C9 C8 C7 C6 C5 C4 C3 C2


E. coli Bacteria
Tributaries - 12/8/2010
cfu/100 mL
700
600
500
400
300
200
100
0
Standard
M4 M1 CM2 CM1 R1 F5 F4 F3 F2 F1


E. coli Bacteria
Cibolo Creek
Jan. 26
Jan. 27
cfu/100 mL
700
600
500
400
300
200
100
0
Standard
C24 C23 C22 C21 C20 C19 C18 C17 C16 C15 C14 C13 C12 C11 C10 C9 C8 C7 C6 C5 C4 C3 C2 C1


E. coli Bacteria
Tributaries
Jan. 26
Jan. 27
cfu/100 mL
700
600
500
400
300
200
100
0
Standard
M4 M3 M2 M1* F7 F6 F5 F4 F3 F2 F1 CM2 CM1 R1 CU1 E2 E1
* unable to sample on Jan 27th


E. coli Bacteria
Cibolo Creek - Average of 1/26 & 1/27 Results
700
600
500
400
300
200
100
0
C24 C23 C22 C21 C20 C19 C18 C17 C16 C15 C14 C13 C12 C11 C10 C9 C8 C7 C6 C5 C4 C3 C2 C1


E. coli Bacteria
Tributaries- Average of 1/26 & 1/27 Results
700
600
500
400
300
200
100
0
M4 M3 M2 M1* F7 F6 F5 F4 F3 F2 F1 CM2 CM1 R1 CU1 E2 E1
* unable to sample on Jan 27th