Gilleland Creek Intensive Bacteria Survey Addendum

March 18, 2010

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

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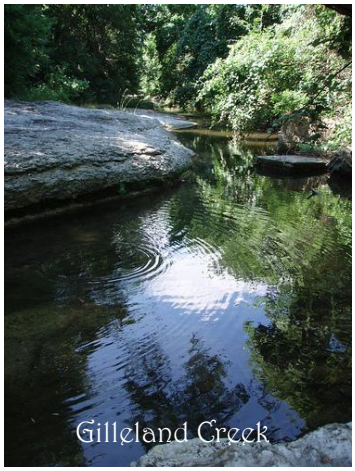
Introduction



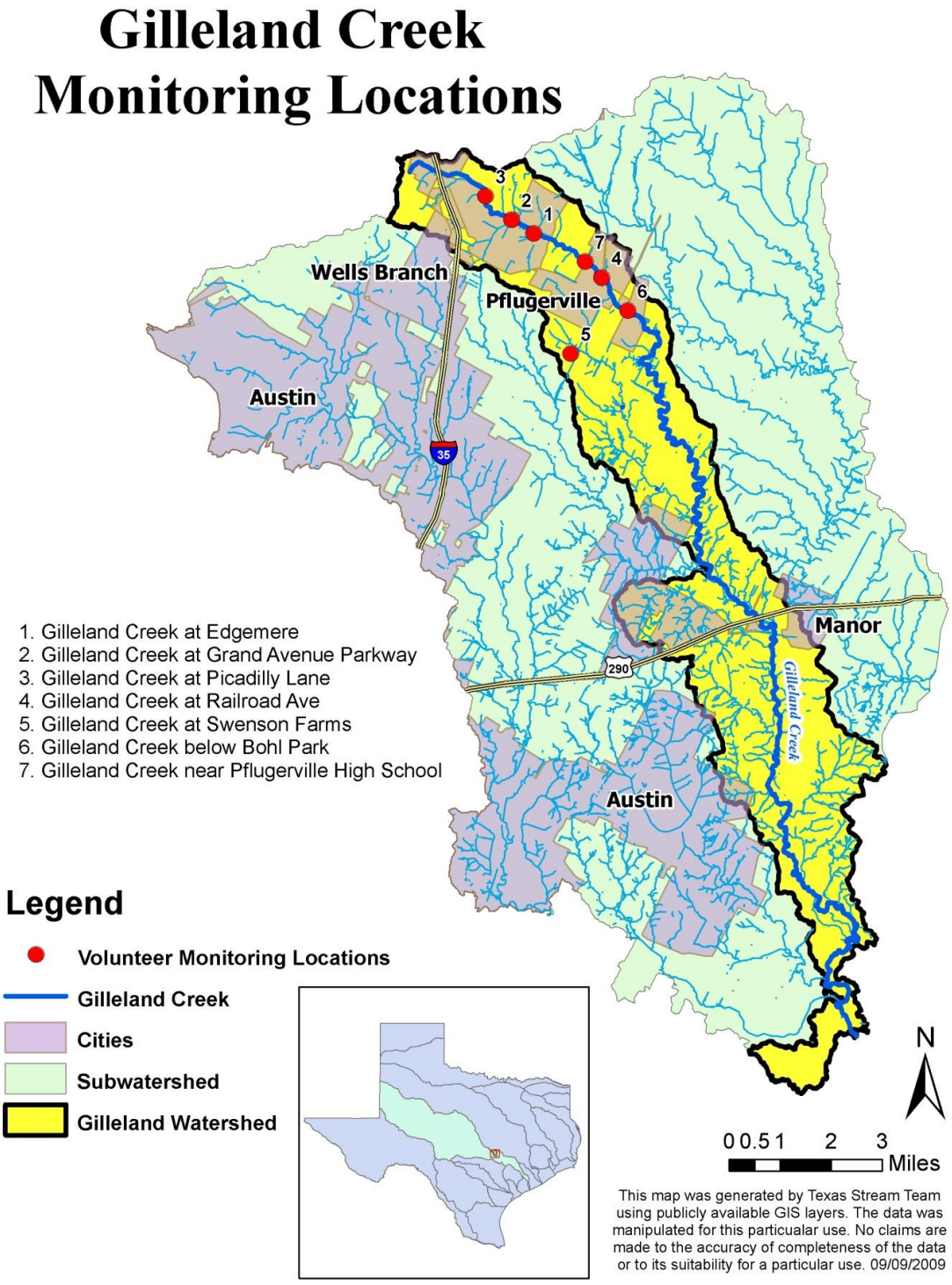
Gilleland Creek finds its natural origin at Ward Spring northwest of Pflugerville, but runoff has caused the beginning of Gilleland Creek to be upstream near the intersection of I-35 and TX 45 Toll. It flows southeast for approximately 32 miles, draining about 76 mi^2 (197 km^2). The majority of the 6.5 million gallons per day that flow into the Colorado River come from six wastewater treatments plants that pipe treated wastewater into the creek. The land use in the watershed is primarily undeveloped and agricultural with increasing residential development.[i]

In 2004, Gilleland Creek was placed on the Texas Commission on Environmental Quality (TCEQ) 303(d) List of Impaired Water Bodies because of repeated high bacteria levels. As a result, the TCEQ contracted the Lower Colorado River Authority (LCRA) to develop a Total Maximum Daily Load (TMDL) program, which determines the extent to which a pollutant load can be reduced, and an Implementation Plan, which describes how that can be carried out. On December 3rd and 15th, 2008, the Texas Stream Team along with LCRA, TCEQ, the City of Austin, the City of Pflugerville, and the Texas Department of Transportation conducted an intensive bacteria survey.

This document is an addendum to that survey, which is available at http://txstreamteam.rivers.txstate.edu/Data/Data-Reports.html. It is intended to assist with the carrying out of the Implementation Plan. The following data was collected by volunteer monitors for the Texas Stream Team and the LCRA. The standard established by the EPA for a single sample of E. *coli* bacteria in surface water is 394 cfu / 100 mL. The standard for a geometric mean is 126 cfu / 100mL. A cfu is a colony forming unit. This is a measure of how many bacteria there are in every 100 mL could multiply into a colony. At this level, 1 in 125 people might get sick if the water is ingested. At least ten samples from the last seven years with approximately the same interval between sample times are required for a water body to be listed on the 303(d) list.[ii] The assessment period for Gilleland Creek bacteria spans from 10/29/05 to 2/15/2010, and the data covered in this report shows the geometric mean for this period is 143.97 cfu / 100mL.

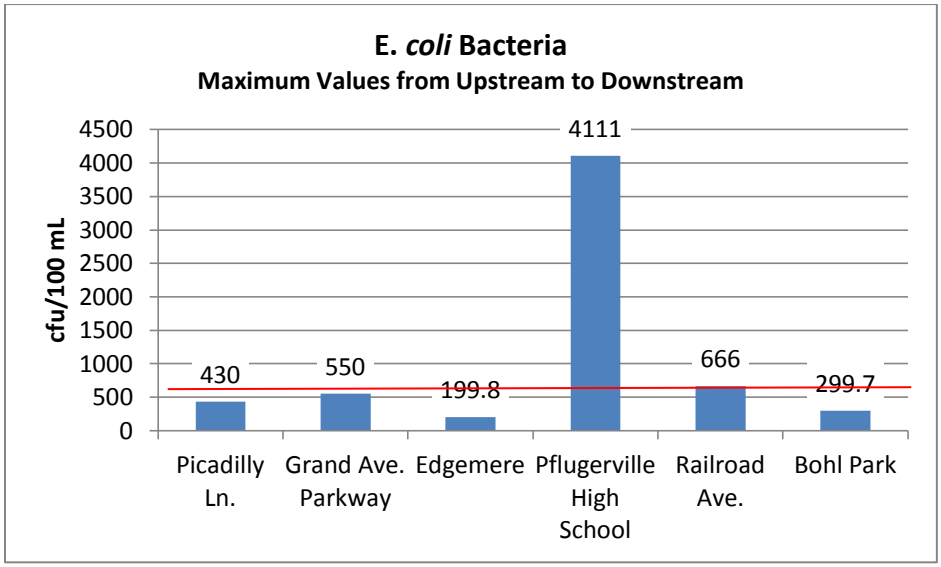
In alignment with Texas Stream Team's core mission, monitors attempt to collect quality-assured data that can be used by government agencies and other decision-making entities to promote a healthier and safer environment for people and aquatic inhabitants. Information collected by Texas Stream Team volunteers utilizes a TCEQ and EPA approved quality assurance project plan (QAPP) to ensure data are correct and accurately reflects the environmental conditions being monitored. All data are screened for completeness, precision and accuracy where applicable, and scrutinized with data quality objective and data validation techniques. Sample results are intended to be used for education and research, baseline, local decision making, problem identification, and others uses deemed appropriate by the data user. The data for this assessment came from the Colorado River Watch Network and the Texas Stream Team database. The graphs are displayed in order from upstream to

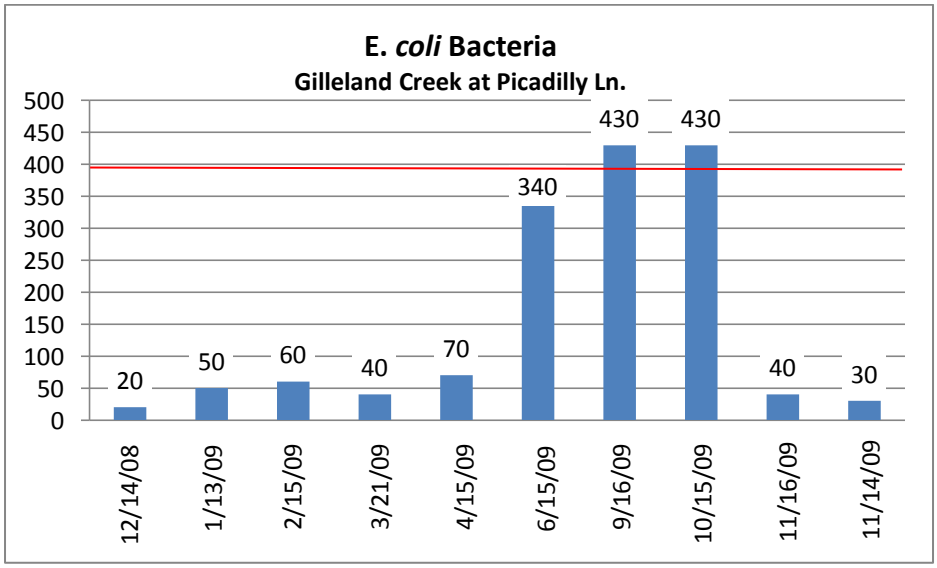
downstream, with the exception of Swenson Farms which is located on a tributary. TCEQ standards are marked in red. The conductivity standard is a maximum mean. The temperature standard is a maximum. The dissolved oxygen standard is a minimum. The pH standard is a range.

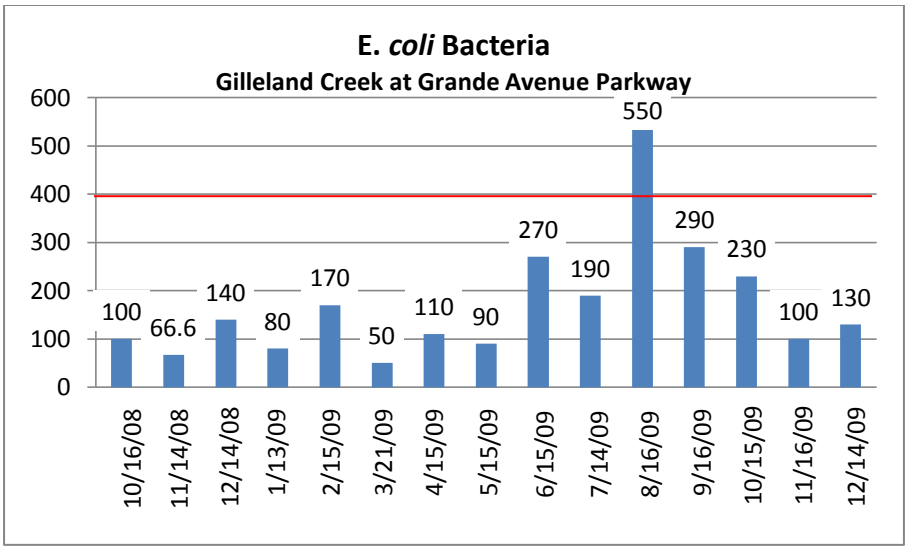


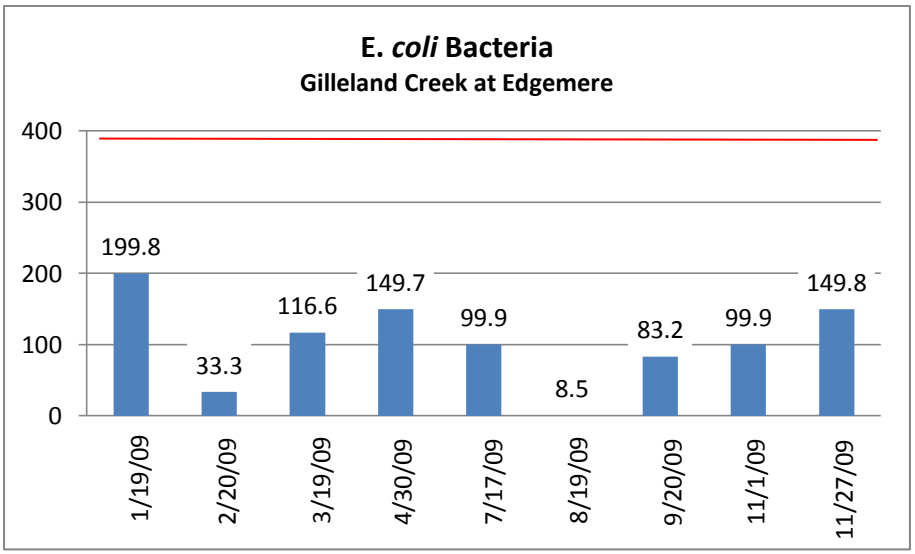
Summary of Colorado River Watch Network and Texas Stream Team E. *coli* Data

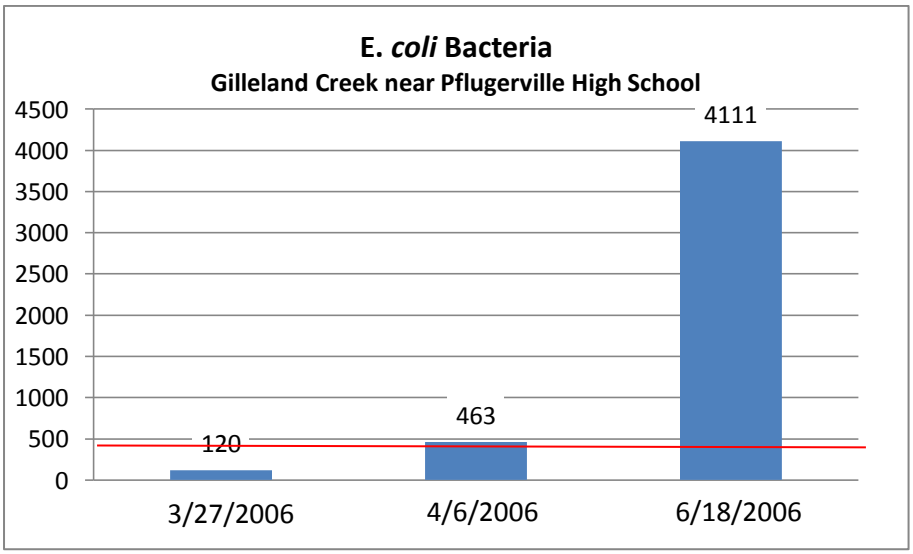
Site Name	Min.	Avg.	Max.	Std. Dev.	% Exceedence	# Exceedence
Picadilly Ln.	20	151	430	174.13	20	2/10
Grand Ave. Parkway	50	171.11	550	127.69	6.67	1/15
Edgemere	17	103.58	199.8	61.03	0	0/18
Pflugerville High School	120	1564.67	4111	2211.85	66.67	2/3
Railroad Ave.	30	262.18	666	199.87	25	5/20
Bohl Park	183.2	241.38	299.7	45.57	0	0/6
Swenson Farms	83.2	202.57	399.6	123.45	17	1/6
All (avg.)	*71.91*	*385.21*	*950.87*	*420.51*	*19.33*	*11/78*

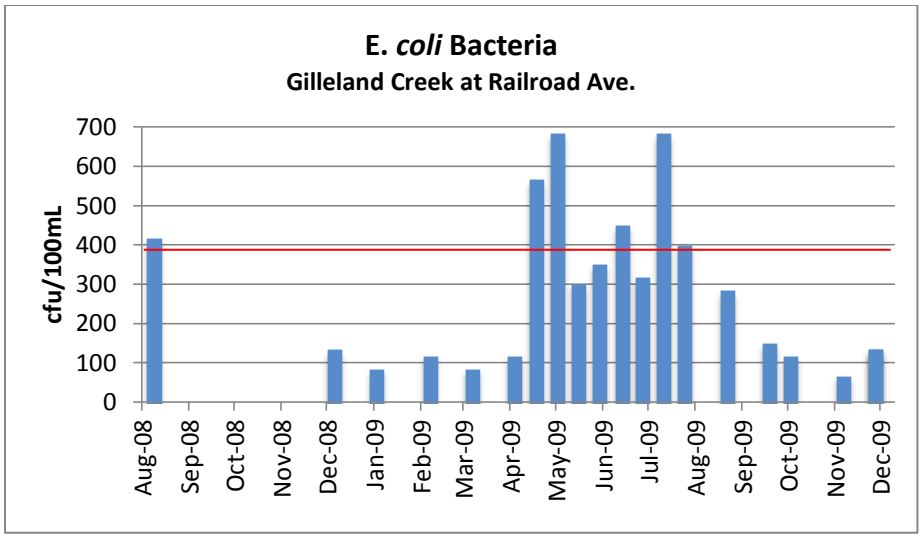


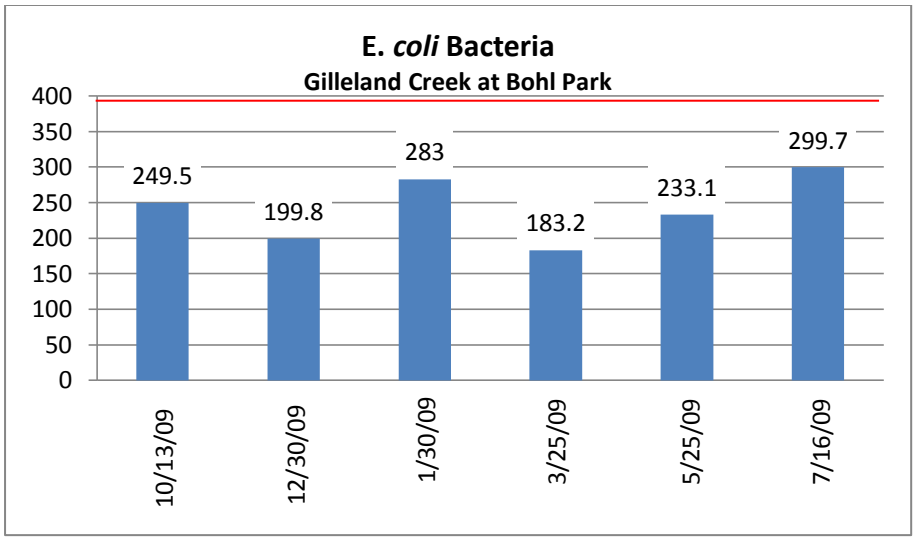


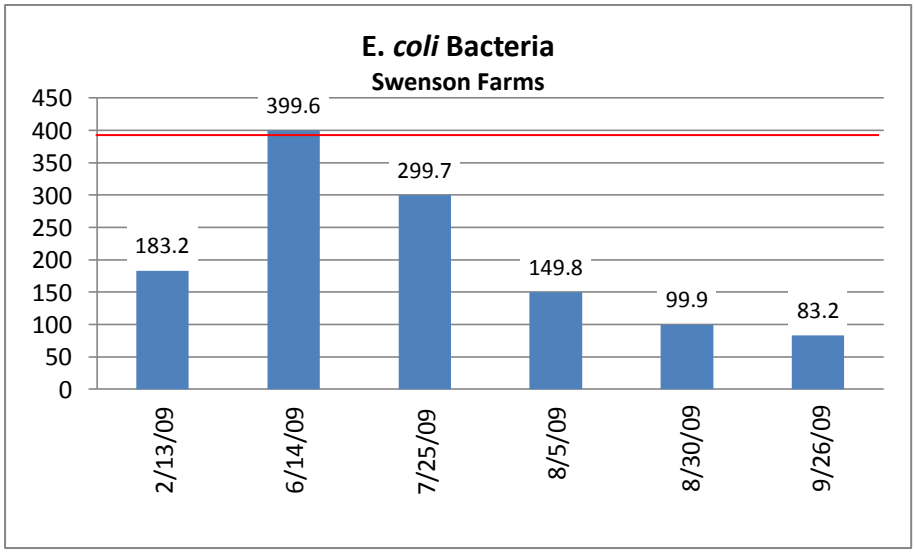

E. coli Bacteria
Gilleland Creek at Grande Avenue Parkway
600
500
400
300
200
100
0
100
66.6
140
80
170
50
110
90
270
190
550
290
230
100
130
10/16/08
11/14/08
12/14/08
1/13/09
2/15/09
3/21/09
4/15/09
5/15/09
6/15/09
7/14/09
8/16/09
9/16/09
10/15/09
11/16/09
12/14/09


E. coli Bacteria
Gilleland Creek at Edgemere
400
300
200
100
0
199.8
33.3
116.6
149.7
99.9
8.5
83.2
99.9
149.8
1/19/09
2/20/09
3/19/09
4/30/09
7/17/09
8/19/09
9/20/09
11/1/09
11/27/09


E. coli Bacteria
Gilleland Creek near Pflugerville High School
4500
4000
3500
3000
2500
2000
1500
1000
500
0
120
463
4111
3/27/2006
4/6/2006
6/18/2006


E. coli Bacteria
Gilleland Creek at Railroad Ave.
cfu/100mL
700
600
500
400
300
200
100
0
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09


E. coli Bacteria
Gilleland Creek at Bohl Park
400
350
300
250
200
150
100
50
0
249.5
199.8
283
183.2
233.1
299.7
10/13/09
12/30/09
1/30/09
3/25/09
5/25/09
7/16/09


E. coli Bacteria
Swenson Farms
450
400
350
300
250
200
150
100
50
0
183.2
399.6
299.7
149.8
99.9
83.2
2/13/09
6/14/09
7/25/09
8/5/09
8/30/09
9/26/09

Follow-up Volunteer Monitor Results

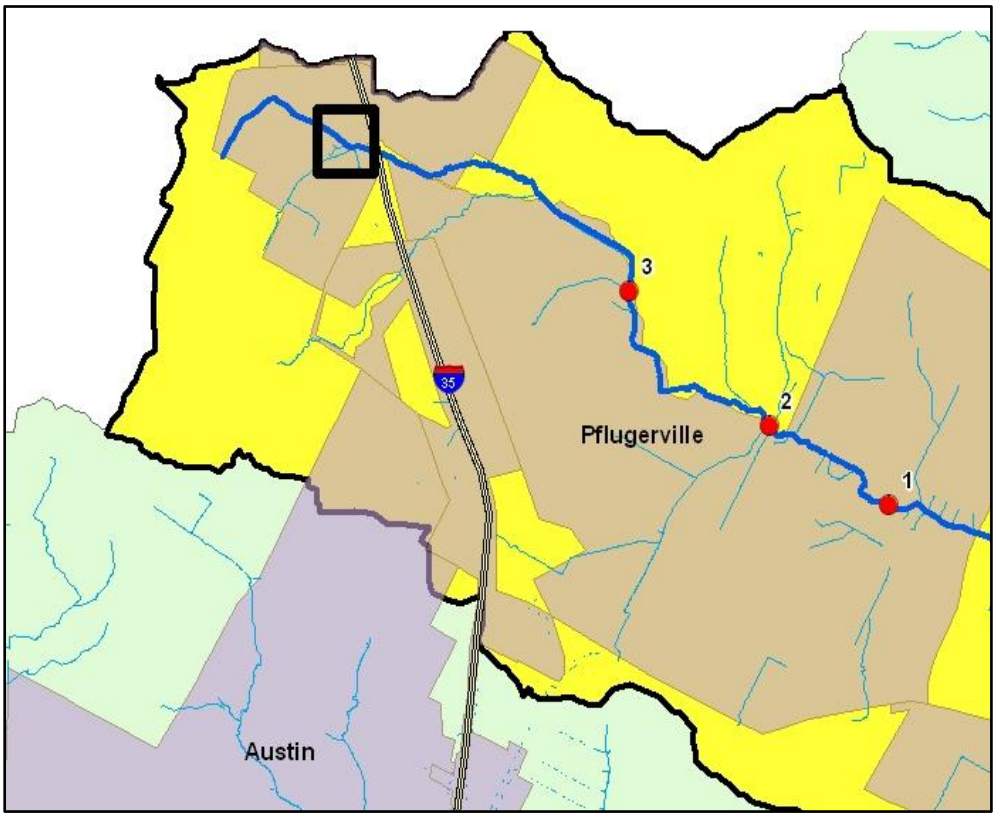
The December 2008 Intensive Bacteria Survey found one site at the headwaters of Gilleland Creek which exhibited 1615 cfu / 100 mL of E. *coli* bacteria. In order to learn more about the source of this contamination, a volunteer monitor, Russell Seguin, has tested for E. c*oli* monthly since February 2009 at the Gilleland Creek headwaters 50 m upstream from the green drainage pipe suspected to be a source of bacteria and 50 m downstream from the green drainage pipe. In December 2009, Nick Maulding, a Texas Stream Team intern, conducted additional bacteria tests at seven locations approximately 500 feet apart in the Gilleland Creek headwaters (See pg. 11).

The data appears to show this green pipe as a source of flow during dry periods but not necessarily as a contributor of bacteria. Three of the nine monthly monitoring events since the intensive survey have shown there to be no flow upstream of the green pipe and adequate flow downstream. According to the National Oceanic and Atmospheric Administration, there was no significant rainfall prior to these three events. The flow in this area is all runoff due to the fact the Gilleland Creek finds its natural origin at Ward Spring, downstream of this area. The lack of runoff upstream of this pipe during dry periods implicates it as a possible source of continual flow.

There is no correlation between high precipitation values and high bacteria values. On February 24th, 2009 and November 16, 2009 there was 0.11 in. of rain in the preceding five days. However, there was 350 cfu / 100 mL in February and 867 cfu / 100 mL in November. Furthermore, the highest rainfall amount of 1.22 in. yielded the lowest E. *coli* value (See Figures 2 & 3). The rainfall amounts marked in blue are based on the preceding five days of precipitation from the Austin Great Hills Weather Station operated by the National Oceanic and Atmospheric Administration.

Bacterial concentrations mostly decrease downstream of the green pipe. Three out of four of the monitoring events during which there was adequate flow upstream of the green pipe for monitoring showed the E. *coli* values decreased significantly downstream of the green pipe (See Figure 1). The December 2009 monitoring events shows an average of 107.5 cfu / 100mL upstream of the pipe and 73.33 cfu / 100mL downstream of the pipe and 97.2 cfu / 100mL upstream and 100 cfu / 100mL downstream (See Figures 4 & 5). Furthermore, LCRA Lab tests show an average of 360 cfu / 100 mL upstream and 218.5 cfu / 100mL downstream (See pg. 13).

The following map shows the area of interest. The proceeding map references the map on page three.



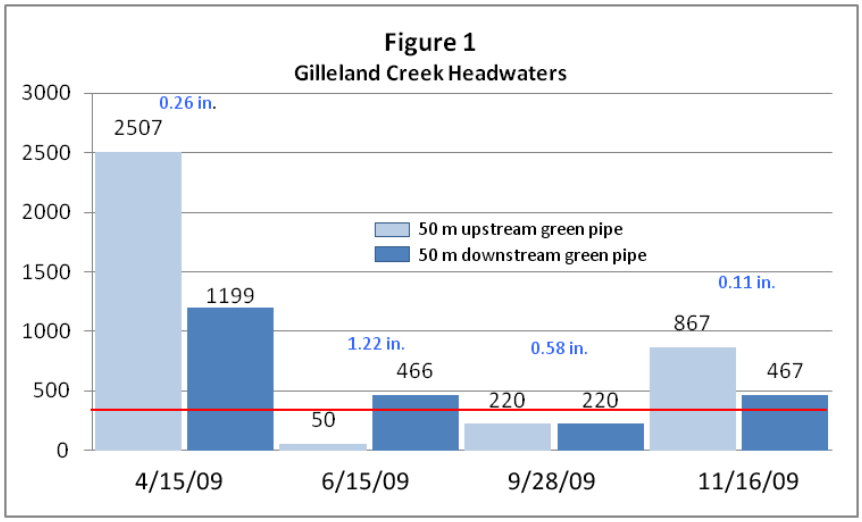


Figure 1
Gilleland Creek Headwaters
3000
2500
2000
1500
1000
500
0
0.26 in.
2507
1199
1.22 in.
50
466
0.58 in.
220
220
0.11 in.
867
467
50 m upstream green pipe
50 m downstream green pipe
4/15/09
6/15/09
9/28/09
11/16/09

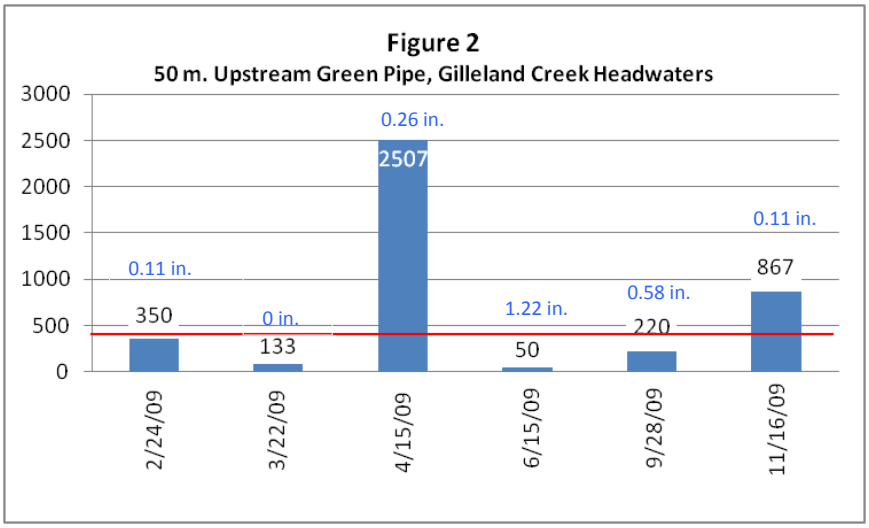


Figure 2
50 m. Upstream Green Pipe, Gilleland Creek Headwaters
3000
2500
2000
1500
1000
500
0
0.11 in.
350
0 in.
133
0.26 in.
2507
1.22 in.
50
0.58 in.
220
0.11 in.
867
2/24/09
3/22/09
4/15/09
6/15/09
9/28/09
11/16/09

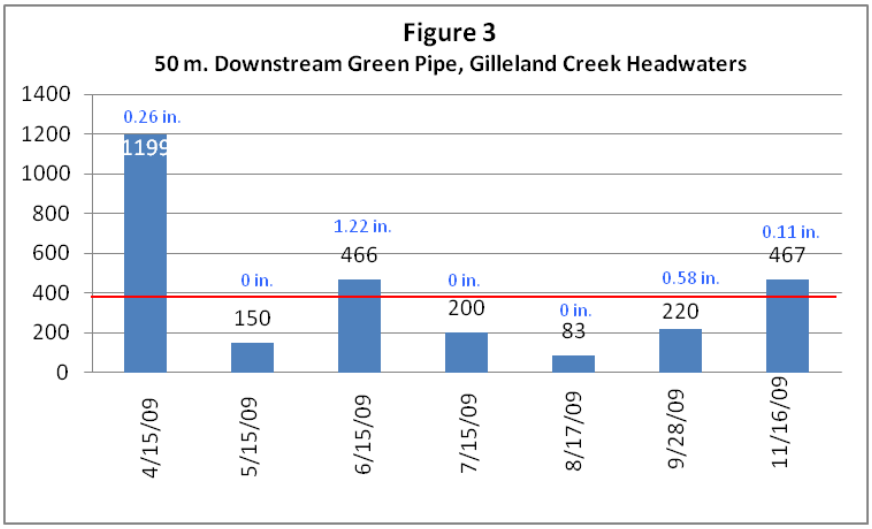
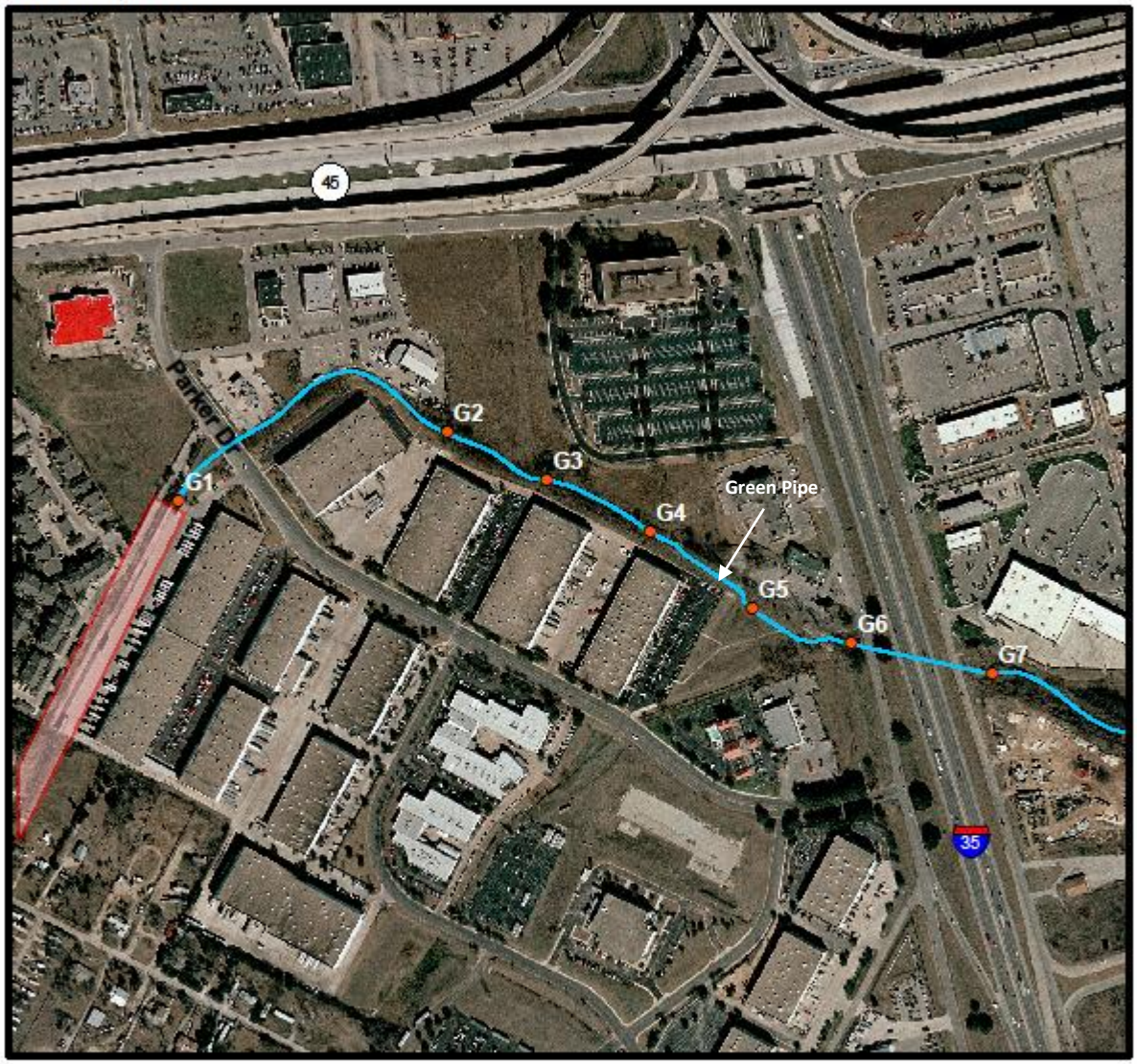


Figure 3
50 m. Downstream Green Pipe, Gilleland Creek Headwaters
1400
1200
1000
800
600
400
200
0
0.26 in.
1199
0 in.
150
1.22 in.
466
0 in.
200
0 in.
83
0.58 in.
220
0.11 in.
467
4/15/09
5/15/09
6/15/09
7/15/09
8/17/09
9/28/09
11/16/09

Gilleland Creek: Sample Locations

Austin, Texas



Gilleland Creek

Sample Locations

Modified Area of Interest

Feet

0 250 500

N

Map by Nicholas Maulding
Data from Capital Area Council of Governments,
Texas Stream Team, and samples gathered by author

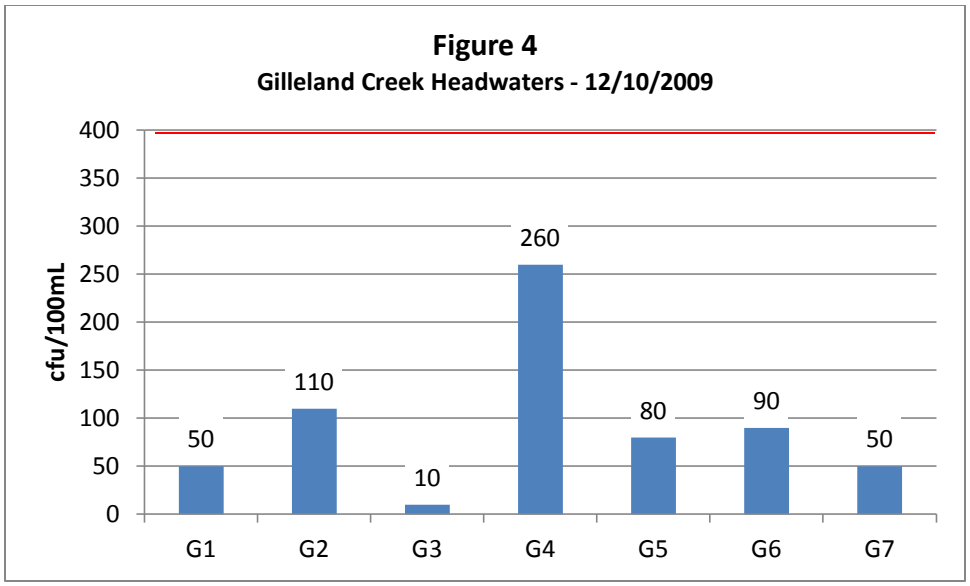


Figure 4
Gilleland Creek Headwaters - 12/10/2009
cfu/100mL
400
350
300
250
200
150
100
50
0
50
110
10
260
80
90
50
G1
G2
G3
G4
G5
G6
G7

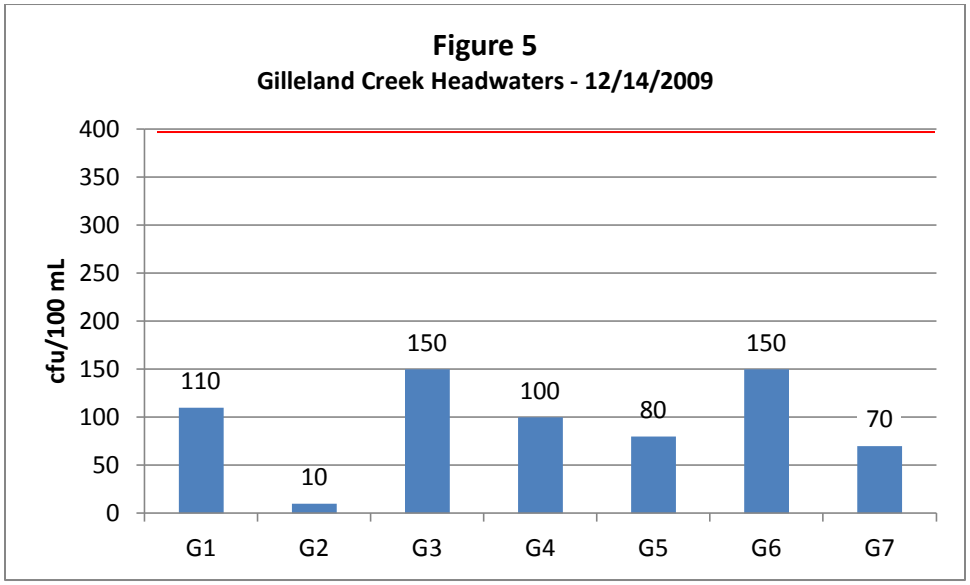


Figure 5
Gilleland Creek Headwaters - 12/14/2009
cfu/100 mL
400
350
300
250
200
150
100
50
0
110
10
150
100
80
150
70
G1
G2
G3
G4
G5
G6
G7

LCRA Lab Results

Date	Site	Location	E. *coli* cfu / 100 mL
4/22/2009	G1A Lammes Candies	Several hundred yards upstream of the green pipe by Lammes Candy's office, where water is coming out of a 2-3 ft diameter cement pipe that seems to be draining the parking lot; this was where the very first water enter the creek (dry before the pipe)	548
4/22/2009	G1	50 m upstream from the green pipe, a meter upstream from where the concrete sluice begins in small pool	172
4/22/2009	G2	Gilleland headwaters just below green pipe	199
4/22/2009	G3	Gilleland headwaters 15m below green pipe after concrete lined channel	238

[i] Lower Colorado River Authority, *Gilleland Creek: A TMDL for Bacteria, n.d., available from http://waterquality.lcra.org/gill/; Internet, accessed 17 March 2010.*

[ii] Texas Commission on Environmental Quality, *2008 Guidance for Assessing and Reporting Surface Water Quality in Texas, 19 March 2008, available from* http://www.tceq.state.tx.us/assets/public/compliance/monops/water/08twqi/2008_guidance.pdf; Internet, accessed 17 March 2010, 29.