

Technical Memorandum

To: Bassett Creek Watershed Management Commissioner
From: Barr Engineering Company (Meg Rattei)
Subject: Bassett Creek E. coli Bacteria Monitoring June 2010
Date: August 12, 2010
Project: 23/27-0051.31-2010-507

Background

During June 2010 water samples were collected at six locations along Bassett Creek (Figure 1) to determine the presence and quantity of bacteria in the stream. The samples were analyzed at the Minnesota Department of Health (MDH) Lab in St. Paul for E. coli bacteria. The June 2010 sampling concluded a 2 year monitoring program to investigate E. coli densities in Bassett Creek.

Summary of Results

All June 2010 samples contained E. coli, ranging from 61 MPN (Most Probable Number) per 100 milliliters (mL) to a maximum of 390 MPN / 100 mL. Test results are shown in Table 1 and all values are in MPN / 100 mL. The 2010 E. coli data are graphically presented in Figures 2 and 3. Weather information was recorded on each sample date and is presented in Table 2.

The Minnesota Pollution Control Agency (MPCA) requested that a flow measurement be conducted at each site during the three June 2010 sample dates. Table 3 summarizes the June discharge measurements.

E. coli bacteria were present in Bassett Creek during all June 2010 sample events and concentrations at all sites, except Site 6, exceeded the MPCA standard. On average, Site 3 (North Branch sample location) observed the highest densities and Site 6 (most downstream Main Stem location) observed the lowest densities (Figure 3 and Table 1). Under the State Standard (7050 Rule), E. coli is not to exceed 126 organisms per 100 mL as a geometric mean of not less than five samples representative of conditions within any calendar month, nor shall more than 10 percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 mL. The standard applies only between April 1 and

October 31. None of the locations observed an E. coli density in excess of 1,260 organisms per 100 mL during June of 2010 (Figure 3). However, all locations, except Site 6, observed geometric means higher than 126 organisms per 100 mL (i.e., 142 through 330 MPN / 100 mL). Site 6 observed a geometric mean of 112 organisms per 100 mL (Figure 3 and Table 1).

Geometric mean E. coli densities during June of 2010 were lower than densities observed during the majority of sample events during 2008 through 2010 (Table 4 and Figure 4). To compare E. coli between sample dates, E. coli data from the 6 sample sites were averaged on each sample date using a geometric mean. The average E. coli density for each of the 24 sample dates is presented in Figure 4. Two thirds of sample dates observed E. coli densities that were higher than densities observed during June 2010.

The average E. coli density on each of the 24 sample dates was greater than the MPCA standard which is a maximum of 126 organisms per 100 mL. All averages were greater than 160 organisms per 100 mL, 75 percent were greater than 185 organisms per mL, 50 percent were greater than 290 organisms per mL, and 25 percent were greater than 500 organisms per mL (Table 4 and Figure 4).

A comparison of 2008 through 2010 data indicates, on average, highest E. coli densities were observed at Site 3 (North Branch location) and lowest densities were observed at Site 6 (most downstream Main Stem location). To compare E. coli densities at sample sites, all E. coli data collected from each sample site during 2008 through 2010 were averaged using a geometric mean. Averages from sample locations ranged from a high of 916 organisms per 100 mL at Site 3 to a low of 138 organisms per 100 mL at Site 6 (Table 4 and Figure 5). All sites observed average densities that were higher than the MPCA standard of 126 organisms per 100 mL (Table 4 and Figure 5).

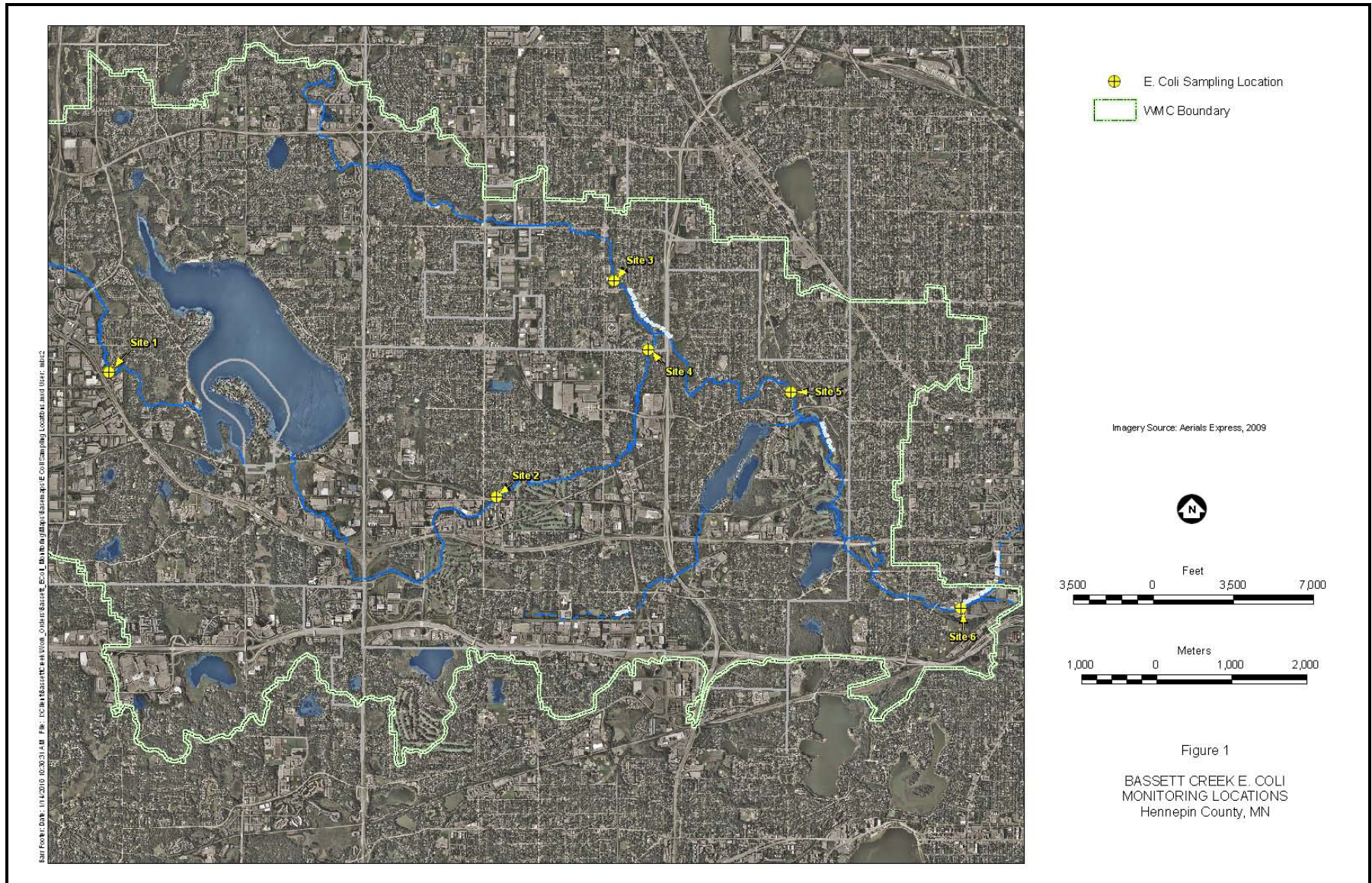
Data collected from the two-year study confirm that Bassett Creek has consistently observed E. coli bacteria densities in excess of the MPCA standard. To compare E. coli data from Bassett Creek to the standard, all samples collected from each site during each month of the 2008 through 2010 monitoring period were averaged using a geometric mean. The monthly average E. coli density for each of the sites during 2008 through 2010 is presented in Figure 6 and Table 5. Sites 3, 4, and 5 failed to meet the MPCA standard during all 8 months of the study. Site 1 failed to meet the standard during 75 percent (i.e., 6 of 8 months) of the study. Site 6 failed to meet the MPCA standard during 38 percent (3 of 8 months) of the study.

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Attachments

1. Figures
2. Tables
3. Sampling Protocol and Locations

Attachment 1: Figures



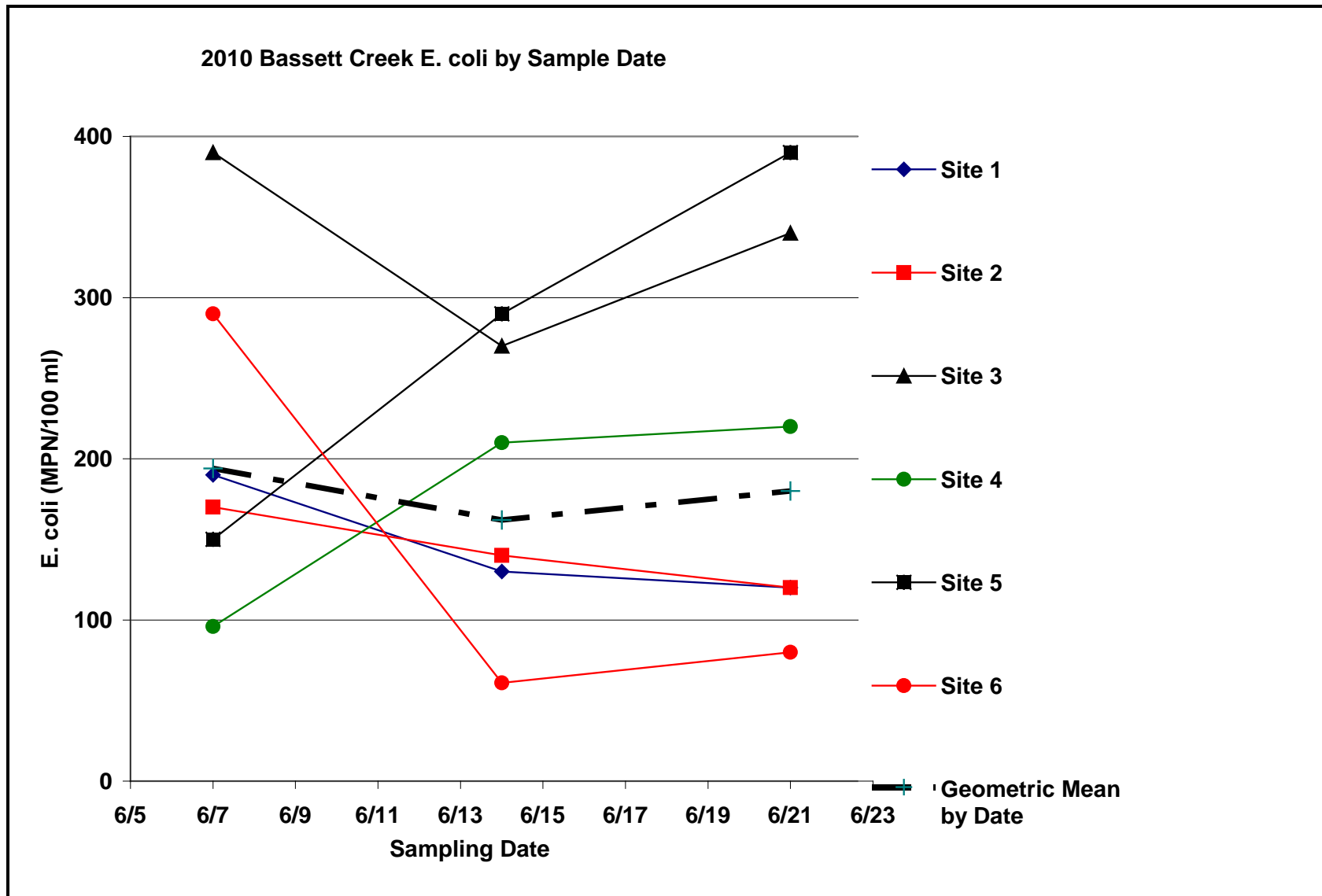


Figure 2. 2010 Bassett Creek E. coli by Sample Date

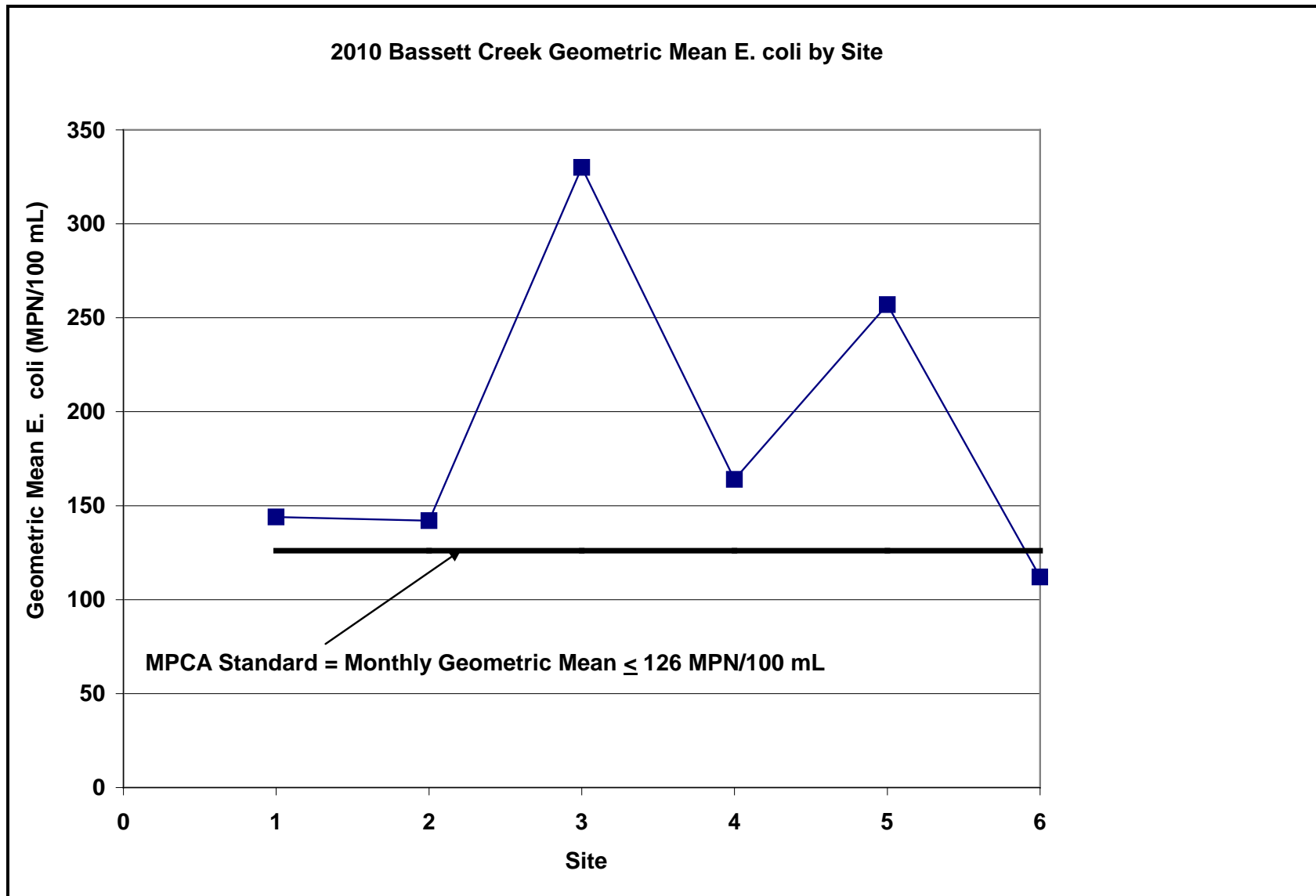


Figure 3. 2010 Bassett Creek Geometric Mean E. coli by Site

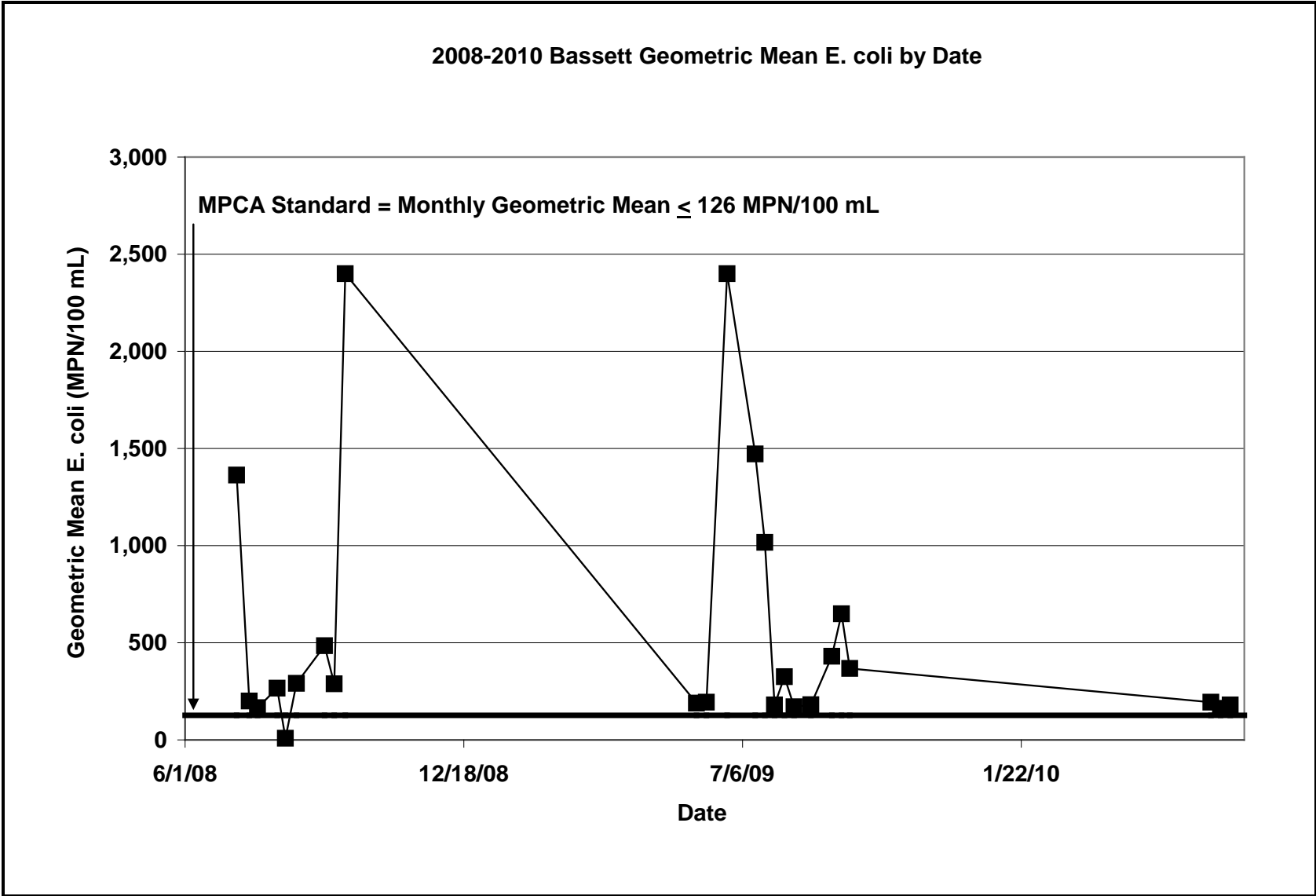


Figure 4. 2008-2010 Bassett Geometric Mean E. coli by Date

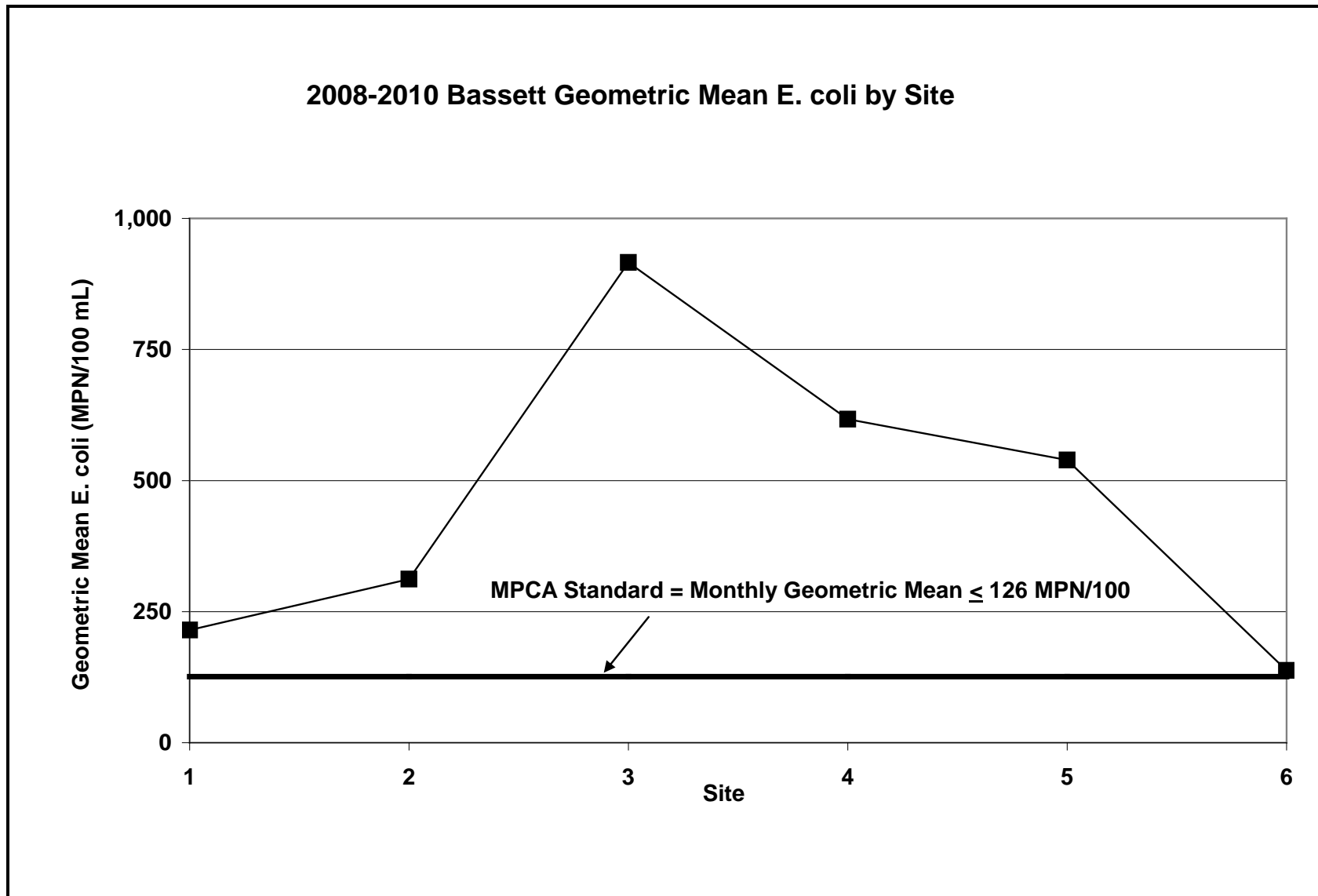


Figure 5. 2008-2010 Bassett Geometric Mean E. coli by Site

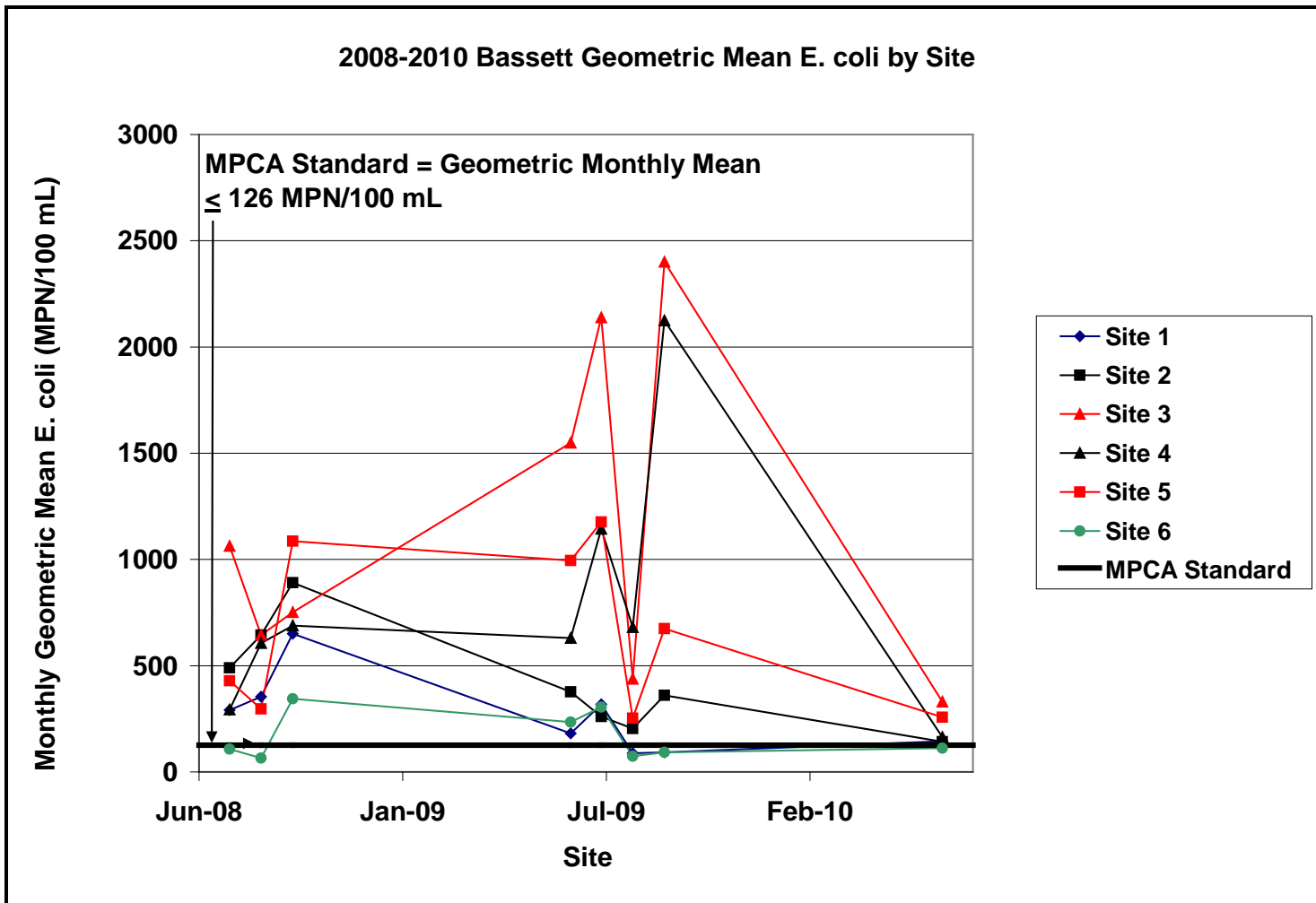


Figure 6. 2008-2010 Bassett Monthly Geometric Mean E. coli by Site

Attachment 2: Tables

Table 1 2010 Bassett E. coli Data, MPN / 100 mL

STORET ID	s005-012	s005-013	s005-014	s005-015	s005-016	s005-017	Geometric Mean by Date
Date	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	
6/7/2010	190	170	390	96	150	290	194
6/14/2010	130	140	270	210	290	61	162
6/21/2010	120	120	340	220	390	80	180
Geometric Mean by Site	144	142	330	164	257	112	178

Table 2 Additional Site and Weather Data

Date	Barr Sampler	Sampler's Recorded Weather	Day of Sampling Rainfall (in)	Previous Day Rainfall (in)	E. coli MPN/100 mL Geometric Mean by Date
6/7/2010	DJM	55°F, Clear Skies, No Wind, Clear Water at all stream sites, Ducks Downstream of Site 2 and Ducks Upstream of Sites 3 and 4.	0.01	Trace	194
6/14/2010	DJM	57°F, Cloudy Skies, Intermittent Showers, Rain Showers during the 3 to 4 days prior to sampling (0.79 inches on 7/11 and 0.01 inches on 7/12); Clear water at Sites 1-5; Ducks downstream of Site 2 and Ducks upstream of Site 4.	0.26	0	162
6/21/2010	DJM	70°F, Cloudy Skies, Clear water at Sites 1-5; Ducks upstream of Sites 2 and 4; Tree removal upstream of Site 1 along stream banks.	0	0	180
* Rainfall data from http://climate.umn.edu/doc/prelim_lcd_msp.htm					

Table 3 Summary of June 2010 Discharge Monitoring Data

STORET ID	Discharge CFS						Avg. by Date
	s005-012	s005-013	s005-014	s005-015	s005-016	s005-017	
Date	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	
6/7/2010	2.24	4.37	2.11	6.05	9.20	15.1	6.51
6/14/2010	7.86	12.9	2.68	13.98	19.13	33.00	14.93
6/21/2010	2.48	8.60	0.17	9.30	10.26	10.55	6.89
Avg. by Site	4.19	8.62	1.65	9.78	12.86	19.55	9.44
CFS: cubic feet per second							

Table 4 2008-2010 Bassett E. coli Data MPN / 100 mL

STORET ID	s005-012	s005-013	s005-014	s005-015	s005-016	s005-017	Geometric Mean by Date
Date	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	
	1	2	3	4	5	6	
7/8/2008	770	2,400	2,400	1,100	1,600	820	1,363
7/17/2008	410	100	650	190	290	43	200
7/23/2008	78	490	770	120	170	35	166
8/6/2008	250	220	650	330	300	100	266
8/12/2008	710	370	710	520	310	23	297
8/20/2008	250	96	580	1,300	280	120	291
9/9/2008	820	820	250	650	920	130	485
9/16/2008	140	360	710	210	580	130	288
9/24/2008	2,400	2,400	2,400	2,400	2,400	2,400	2,400
6/3/2009	27	140	Dry – No Sample	580	1,000	110	189
6/10/2009	91	160	1,000	180	410	49	194
6/25/2009	2,400	2,400	2,400	2,400	2,400	2,400	2,400
7/15/2009	440	980	2,400	2,400	2,400	1,700	1,471
7/22/2009	520	330	1,700	1,600	2,419	980	1,017
7/29/2009	140	55	2,400	390	280	17	180
8/5/2009	99	650	520	1,400	260	96	325
8/12/2009	170	93	310	410	260	47	170
8/24/2009	41	140	520	550	240	89	181
9/8/2009	340	330	2,400	2,000	370	32	431
9/15/2009	38	650	2,400	2,400	1,700	310	649
9/21/2009	60	220	2,400	2,000	490	79	367
6/7/2010	190	170	390	96	150	290	194
6/14/2010	130	140	270	210	290	61	162
6/21/2010	120	120	340	220	390	80	180
Geometric Mean by Site	215	312	916	617	539	138	372

Table 5 2008-2010 Bassett Monthly Geometric Mean E. coli Data MPN / 100 mL

Date	Monthly Geometric Mean E. coli (MPN/100 mL)					
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Jul-08	291	490	1063	293	429	107
Aug-08	354	644	644	606	296	65
Sep-08	651	891	752	689	1086	344
Jun-09	181	377	1549	630	995	235
Jul-09	318	261	2139	1144	1176	305
Aug-09	88	204	438	681	253	74
Sep-09	92	361	2400	2125	675	92
Jun-10	144	142	330	164	257	112
	Exceeds MPCA Standard					

Attachment 3: Sampling Protocol and Locations

Protocol

Samples were collected in 250 mL plastic bottles provided by MDH directly from the stream, utilizing disposable gloves. The bottles were uncapped and filled underwater, temporarily capped and brought to the surface, then excess water poured off to reach the “fill line.” Samples were put on ice immediately after collection and delivered directly to the MDH lab after completion of sampling at the sixth site.

Locations

#1 (STORET ID s005-012)

Location: Plymouth Creek, north of parking lot of building at north corner of Industrial Park Blvd. and Teakwood Ln., Plymouth.

Stream Conditions: Gravel and silt bottom, often shallow flow.

#2 (STORET ID s005-013)

Location: Bassett Creek Main Stem, south of end of Rhode Island Ave., one block south of Phoenix St., Golden Valley, downstream of culverts under railroad embankment.

Stream Conditions: Gravel and silt bottom, often shallow flow

#3 (STORET ID s005-014)

Location: North Branch of Bassett Creek, just north of 32nd Ave. N. between Brunswick Ave. and Adair Ave., Crystal.

Stream Conditions: Silt bottom, very slow to almost stagnant flow in pool caused by woody debris dam in front of box culverts under 32nd Ave. N.

#4 (STORET ID s005-015)

Location: Bassett Creek Main Stem, ~1,000 feet upstream of junction with Bassett Creek North Branch, near a red house near Golden Valley / Crystal boundary.

Stream Conditions: Generally fast flowing, gravel/sand bottom. Waterfowl often present near sampling site.

#5 (STORET ID s005-016)

Location: Bassett Creek Main Stem, back yard of 3900 Bassett Creek Drive, Golden Valley.

Stream Conditions: Silt and sand bottom, usually gently flowing.

#6 (STORET ID s005-017)

Location: Bassett Creek Main Stem, at Met Council WOMP station at (closed) Irving Ave. bridge north of city impound lot, Minneapolis.

Stream Conditions: Rip rap bottom, generally fast flowing.