

**Riverwatch Report on Buffalo River RAP coordinated
Bacteriological Sampling, Summer 2014**

1. Site Selection and Reconnaissance

Prior to the beginning of sampling the following sites were selected to be sampled based on the criteria listed in the approved QAPP

Site #	Waterway	Public Access Site	Stream Class	Municipality	Latitude	Longitude
1	Hunters Creek	Hunter's Creek Park	B	Wales Center	42° 44.289	-78° 32.909
2	Buffalo Creek	Elma Centennial Park	A	Elma	42° 49.360	-78° 35.175
3	Buffalo Creek	Burchfield Nature and Arts Center	B	West Seneca	42° 51.284	-78° 45.187

Site

reconnaissance was conducted for all sites prior to sampling and consisted of following: For each site, photographs were taken, all observations listed in the QAPP were made, GPS coordinates were taken, and site maps were drawn of exact sampling location and surrounding area.

2. Sampling

Bacteriological Sampling in the Upper Buffalo River Watershed was carried out under the Riverwatch program from June 2, 2014 through August 28, 2014. Samples were pulled in the field by the Riverwatch Team and delivered on ice to the Erie County Health Department Lab (ECDHL) for analysis of levels of E. coli bacteria, using EPA method 1603 (Modified M-Tec). All procedures listed in the approved QAPP were followed for all sampling events.

The Riverwatch Team consisted of Citizen Action Program Manager Chris Murawski and two interns, Jon Hughes from Erie Community College and Ellan Lana from Elon University.

Fifteen sampling events were carried out during the season. Each Sampling event consisted of one sample for each of the three sites, one field duplicate, and one field blank. A total of five samples were taken for each event.

Sampling events occurred on the following dates:

June 2 2014, June 9 2014, June 18 2014, June 25 2014, June 30 2014, July 2 2014, July 9 2014, July 14 2014, July 21 2014, July 28 2014, August 4 2014, August 14 2014, August 20 2014, August 25 2014 and August 28 2014.

3. Quality Assurance: Field Duplicates and Field Blanks

For each sampling event, one identical field duplicate and one field blank using sterile water were taken. Which site got the duplicates and blank was determined in the following way:

Sampling event 1- Site 1 = field duplicate, Site 2 = field blank

Sampling event 2- Site 2 = field duplicate, Site 3 = field blank

Sampling event 3- Site 3 = field duplicate, Site 1 = field blank

This pattern was then repeated throughout the sampling season.

4. Data Management

For each sample taken there were three paper documents created:

1. Field Data Collection Sheet and Checklist created by Riverkeeper – filled out in the field
2. Chain of Custody Sheet from ECHDL - filled out in field and delivered to ECHDL along with sample. Copies were made and retained by Riverkeeper at the lab.

3. Lab Results Report from ECHDL- Mailed to Riverkeeper from ECHDL containing results from test.

Upon returning from the field, each Field Data Sheet/Checklist and Chain of Custody Sheet and were hard copied and scanned into digital form, then filed in a hard copy and digital database. Upon receipt of the Lab Report from ECHDL, they were also hard copied and scanned and added to the hard copy and digital databases.

5. Data Analysis and Presentation

Upon Completion of all sampling events, results were recorded from Field Data/Checklist Sheets and Lab Results Reports into a digital database file. These recordings were checked for Quality Assurance and Accuracy by an additional staff member. A Statistical Analysis was completed to calculate interquartile range and determine outliers and Geometric Mean values for each 30 Day period (month) for each site. These values were then displayed graphically and included below in this report. In addition, precipitation values from weather stations nearest to each site were retrieved from the National Oceanic and Atmospheric Association's National Climatic Data Center. Individual site results were plotted in column charts with 48 hour precipitation values displayed on the same chart.

6. Results

Results are displayed in tabular and graphical form below.

Individual Sample Results 2014

Date	Hunters Creek Park	Elma Centennial Park	Burchfield Nature Center
6/2/2014	260	90	90
6/9/2014	6200	10000	2800
6/18/2014	600	200	120
6/25/2014	10000	10000	10000
6/30/2014	260	120	250
7/2/2014	210	80	170
7/9/2014	2700	10000	10000
7/14/2014	5600	10000	10000
7/21/2014	5000	3500	50
7/28/2014	4100	4200	1800
8/4/2014	900	4000	6000
8/14/2014	540	1600	2400
8/20/2014	80	50	100
8/25/2014	130	80	110
8/28/2014	100	1600	180
Season Mean	2445.333	3701.333	2938
Season Geometric Mean	846.9263	1002.647	683.2024
Season Max	10000	10000	10000
Season Min	80	50	50

Monthly Geometric Mean Values Per Sample Location (Geometric Mean calculated from 5 samples for each 30 day month period)		
Hunters Creek Park	June	1203
	July	2305
	August	219
Elma Centennial Park	June	736
	July	2595
	August	528
Burchfield Nature Center	June	597
	July	1089
	August	491

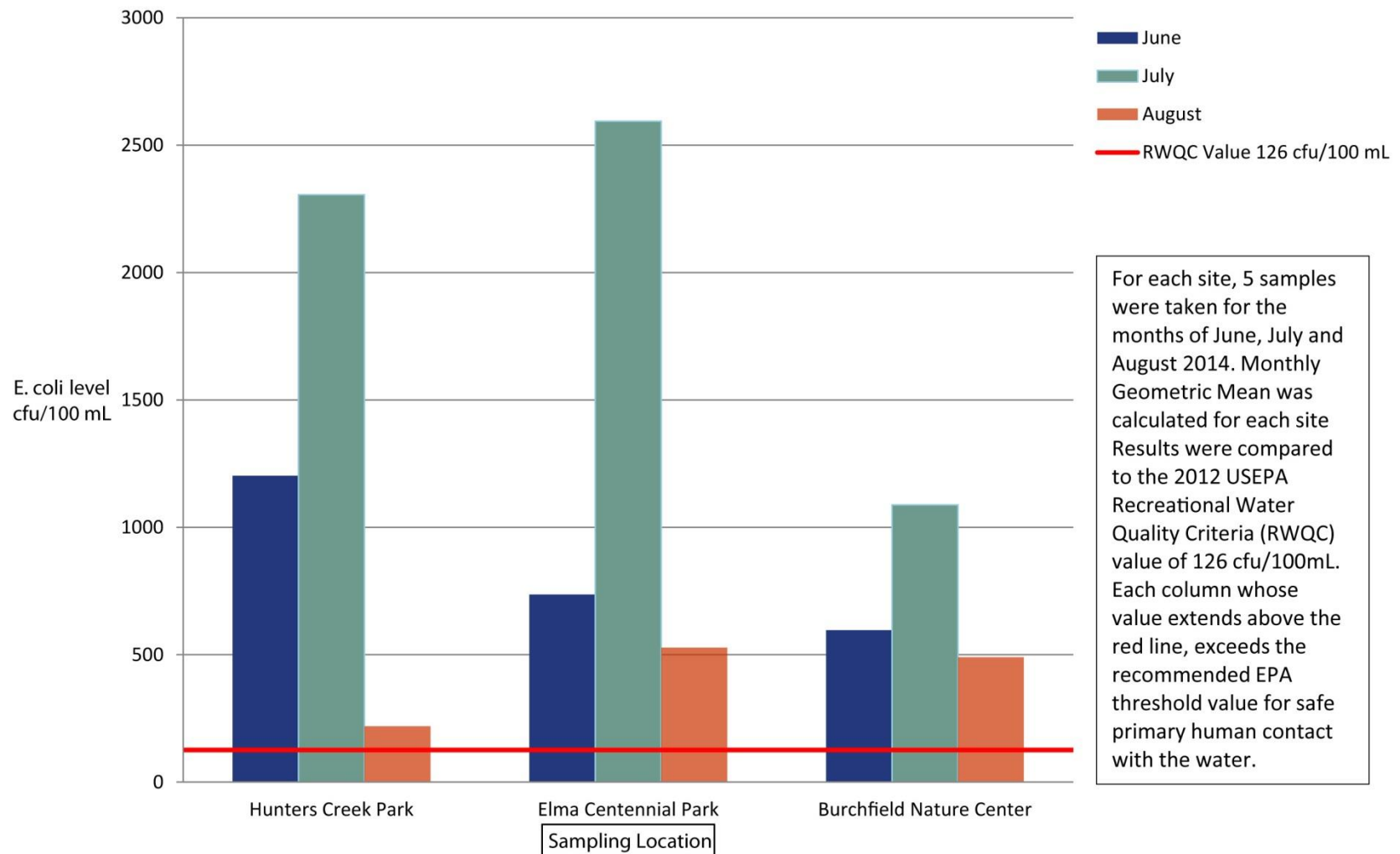
Field Duplicates

Site	Date	Field Sample ID	Field Sample Time	Field Sample Result	Field Duplicate ID	Field Duplicate Time	Field Duplicate Result	Relative Percent Difference
BC01	6/2/2014	BC01_02JUN_14_FS	9:20	260	BC01_02JUN14_FD	9:20	190	31.11%
BC02	6/9/2014	BC02_09JUN14_FS	10:08	10000	BC02_09JUN14_FD	10:00	10000	0.00%
BC03	6/18/2014	BC03_18JUN14_FS	10:21	120	BC03_18JUN14_FD	10:21	190	45.16%
BC01	6/25/2014	BC01_25JUN14_FS	8:57	10000	BC01_25JUN14_FD	8:57	5800	53.16%
BC02	6/30/2014	BC02_30JUN14_FS	9:20	120	BC02_30JUN14_FD	9:20	170	34.48%
BC03	7/2/2014	BC03_02JUL14_FS	9:50	170	BC03_02JUL14_FD	9:50	210	21.05%
BC01	7/9/2014	BC01_09JUL14_FS	8:45	2700	BC01_09JUL14_FD	8:45	2500	7.69%
BC02	7/14/2014	BC02_14JUL14_FS	9:25	10000	BC02_14JUL14_FD	9:25	10000	0.00%
BC03	7/21/2014	BC03_21JUL14_FS	10:07	50	BC03_21JUL14_FD	10:07	110	75.00%
BC02	7/28/2014	BC02_28JUL14_FS	9:27	4200	BC02_28JUL14_FD	9:27	6400	41.51%
BC01	8/4/2014	BC01_4AUG14_FS	8:50	900	BC01_4AUG14_FD	8:50	800	11.76%
BC02	8/14/2014	BC02_14AUG14_FS	9:47	1600	BC02_14AUG14_FD	9:47	1700	6.06%
BC03	8/20/2014	BC03_20AUG14_FS	9:55	100	BC03_20AUG14_FD	9:55	100	0.00%
BC01	8/25/2014	BC01_25AUG14_FS	9:20	130	BC01_25AUG14_FD	9:20	150	14.29%
BC02	8/28/2014	BC02_28AUG14_FS	9:20	1600	BC02_28AUG14_FD	9:20	1400	13.33%

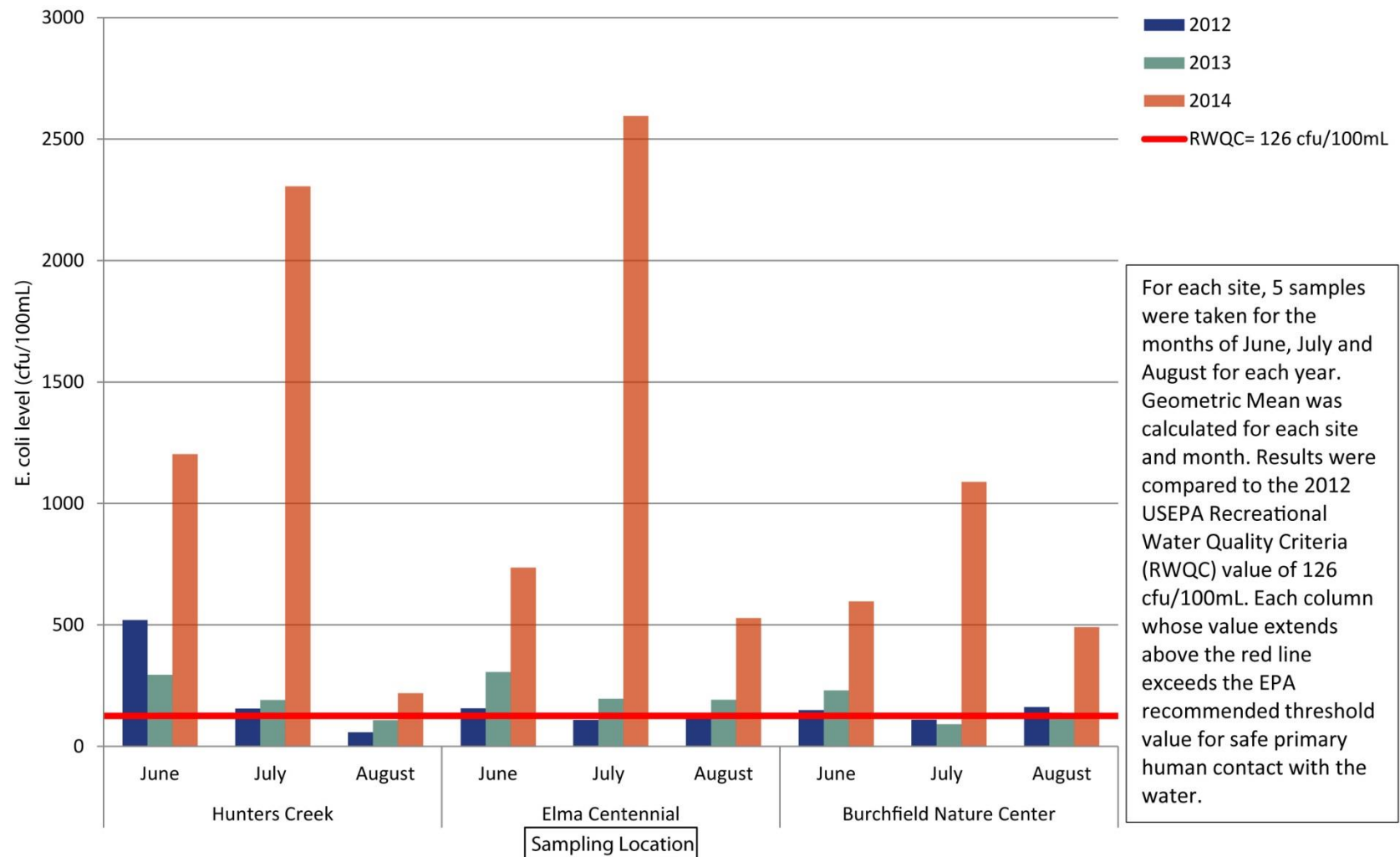
Relative Percent Difference Range	Number of sample sets
0-20	8
21-40	3
41-60	3
61-80	1
81-100	0

Due to the nature of bacteriological sampling, natural variation occurs within running water. While a majority of the duplicate pairs come in with a Relative Percent Difference (RPD) under 20%, several have relatively high RPD values which can be explained by the variation in populations in running waters.

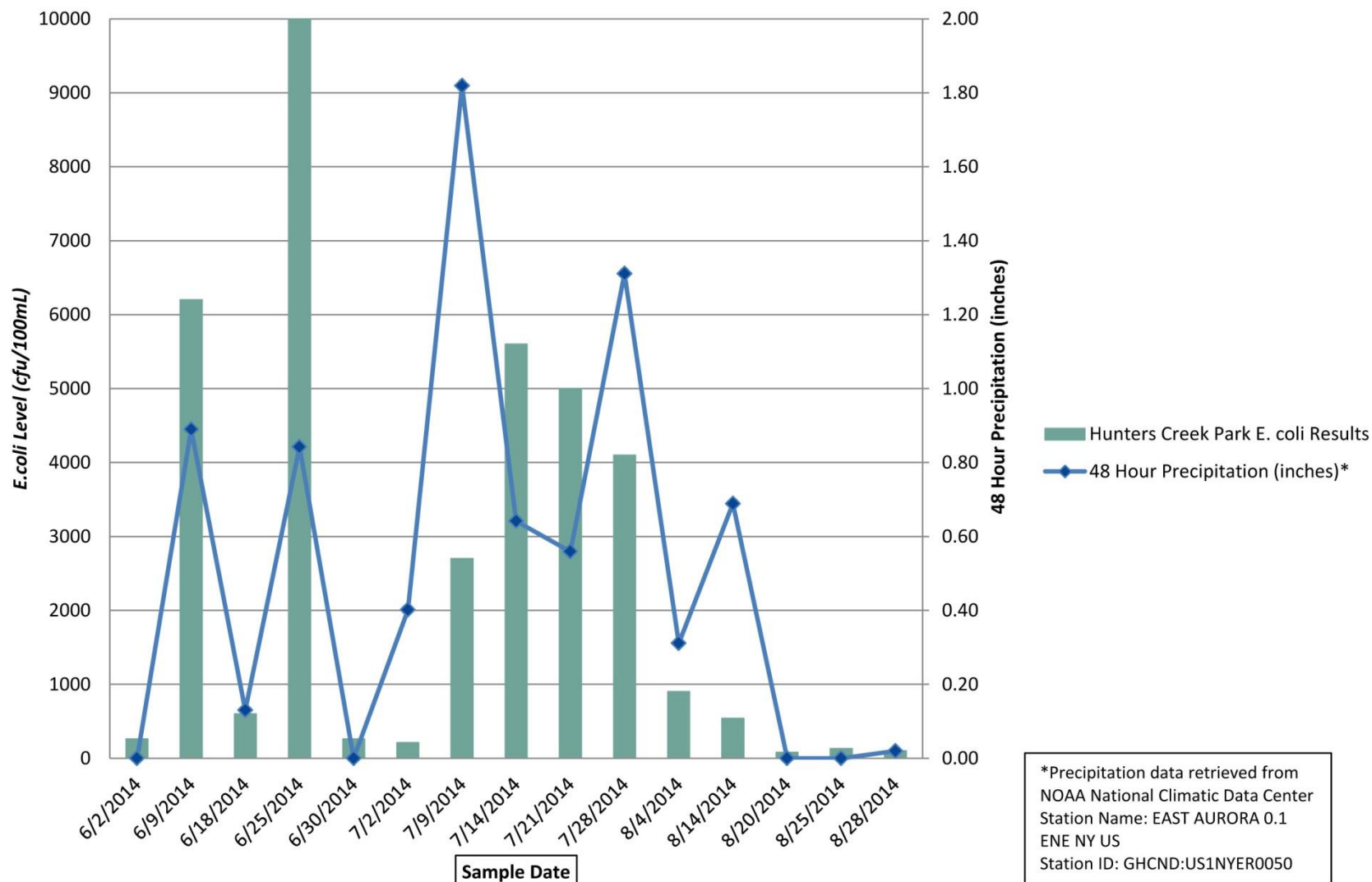
Buffalo River RAP Escherichia coli Monitoring Results 2014 Monthly Geometric Mean Values



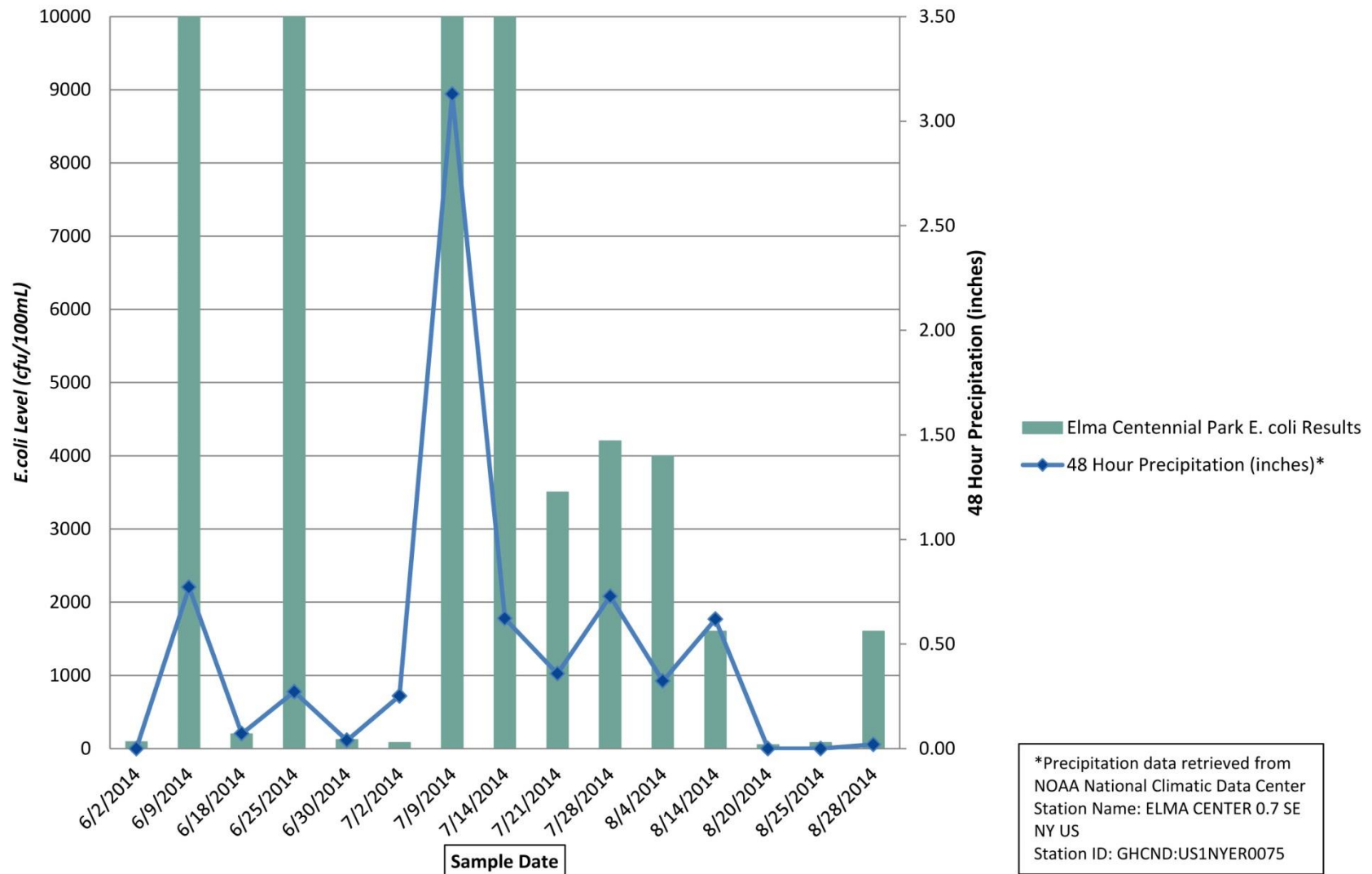
Buffalo River RAP Escherichia coli Monitoring Results 2012-2014 Monthly Geometric Mean



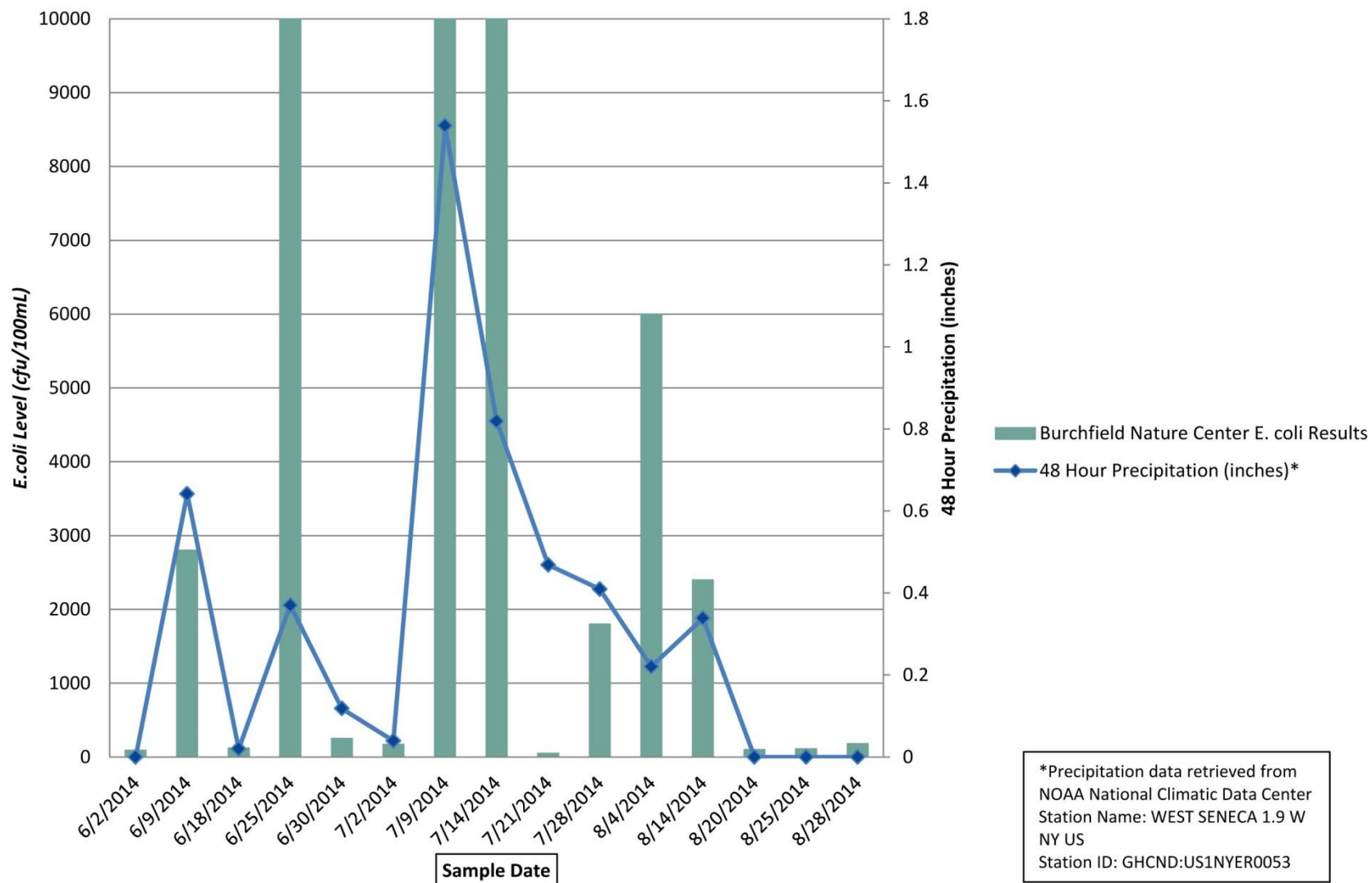
Hunter's Creek Park Individual *Escherichia coli* Monitoring Results



Elma Centennial Park Individual *Escherichia coli* Monitoring Results



Burchfield Nature Center Individual *Escherichia coli* Monitoring Results



Year to Year comparisons

Year	Seasonal Mean	Seasonal Geometric Mean	48 Hour Precipitation Totals
Hunters Creek Park			
2012	532.27	182.42	2.77
2013	673.33	166.90	1.40
2014	2445.33	846.93	7.61
Elma Centennial			
2012	1016.13	226.08	3.25
2013	182.00	132.72	1.32
2014	3701.33	1002.65	7.20
Burchfield Nature Center			
2012	803.47	137.77	3.81
2013	189.33	138.17	1.40
2014	2938.00	683.20	4.98

7. Narrative Summary: 2014 Monitoring

Sample results values for the 2014 campaign returned the highest *E. coli* levels of the 3 seasons of monitoring. When compared to the 2012 EPA Recreational Water Criteria standard of 126 cfu/100mL for geometric mean values, all 9 sites and sample periods (3 months X 3 Sample Sites = 9 sampling periods) exceeded the recommended threshold to protect human health. This is compared to 6 of 9 for 2013 and 6 out of 9 sample periods for 2012. This increase corresponds with an increase in 48 hour precipitation in 2014 compared to both previous years. The following Table shows the magnitude of the increase for each site.

Site	Percent Increase in 48 hour precipitation totals for all sample dates from 2012 to 2014	Percent Increase in 48 hour precipitation totals for all sample dates from 2013 to 2014
Hunters Creek	174%	443%
Elma Centennial Park	121%	445%
Burchfield Nature Center	30%	255%

Based on the sampling results, it is apparent that there is a significant input of bacteriological solutions on these 3 sampling locations, especially during wet weather. The sources of this pollution are currently unknown and further investigation is recommended.