Project ID #17-0284

Proctor Creek Watershed Monitoring FY17 Third Quarterly Report

Fulton County, GA

Project Dates: April 11-12, 2017

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The activities described in this report are accredited under the US EPA Region 4 Science and Ecosystem Support Division ISO/IEC 17025 accreditation issued by the ANSI-ASQ National Accreditation Board. Refer to certificate and scope of accreditation AT-1644.

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1.0 Introduction

The Proctor Creek Watershed is located in Fulton County, Georgia, in the city of Atlanta (Figure 1). Nine miles of the main channel of Proctor Creek are currently on the Georgia Environmental Protection Division (EPD) 303(d) list for impairment due to fecal coliform bacteria. The current study is part of a multi-year water quality monitoring project to assess both baseflow and stormflow conditions in the watershed (USEPA 2015b). Multiple locations in the watershed are being sampled on a quarterly basis, while stormwater will be sampled periodically at up to three gauging stations during significant rain events. This report contains results from the third quarterly monitoring event of the second year of the project.

2.0 Methods

This study was conducted in accordance with the methods outlined in the Proctor Creek Watershed Monitoring Quality Assurance Project Plan (USEPA 2015b). Water sampling was performed on April 11-12, 2017. Sampling locations, which included stations in the mainstem of Proctor Creek as well as seven of its tributaries, are listed in Table 1 and shown in Figure 2. Discharge was estimated at most locations using an acoustic Doppler velocimeter and standard stream gauging techniques (USEPA 2016b). Discharge data for Hortense (PC6) and James Jackson (PC8) were obtained via the United States Geological Survey (USGS) real-time streamflow data for Station Numbers 02336517 and 02336526, respectively, available online at http://waterdata.usgs.gov. *In situ* water quality measurements of temperature, pH, specific conductance, dissolved oxygen and turbidity were obtained using YSI multi-parameter sondes (USEPA 2013a).

Water samples for fecal bacteria indicators, nutrients, classical parameters and total recoverable metals were collected in accordance with the SESD standard operating procedure for surface water sampling (USEPA 2013b). All samples, except those for fecal bacteria indicators, were analyzed by the Analytical Support Branch (ASB) at SESD in accordance with the ASB Laboratory Operations and Quality Assurance Manual (USEPA 2016c). Water samples for fecal bacteria analysis were delivered to the EPA Office of Research and Development (ORD) laboratory in Athens, GA for immediate processing (within 6 hours of collection).

Water chemistry data were compared to Georgia Water Quality Standards (WQS), which include freshwater aquatic life criteria at both chronic and acute exposure levels, calculated using hardness concentrations at each station where applicable (Ga. Comp. R. & Regs. r. 391-3-6-.03). Although samples were not collected according to methods used to determine chronic exposure level violations, which require more than one sampling event, these levels were still used for comparison because they are the most protective of aquatic life. Since Proctor Creek is not used as a drinking water source, water chemistry data were not compared to state drinking water standards.

3.0 Results

3.1 *In situ* Water Quality

All *in situ* data are listed in Table 2. Dissolved oxygen (DO) was 2.08 mg/L downstream of the North Avenue CSO outfall (North CSO; PC4), where water flow is minimal and oxygen levels have been consistently low throughout the monitoring study. This DO level is potentially below the state water quality standard of 4.0 mg/L to support warm water species of fish, depending on stream classification and other factors. Specific conductance ranged from 148 to 435 µS/cm at most stations, but was slightly higher at North CSO (548 µS/cm) and West Highlands (PC15; 632 µS/cm). Other *in situ* parameters (temperature, pH and turbidity) were at normal levels and within acceptable limits according to Georgia water quality criteria (Ga. Comp. R. & Regs. r. 391-3-6-.03).

3.2 Precipitation and Discharge

The Proctor Creek watershed received approximately 5 inches of rain the week prior to sampling, from April 3-6 (http://waterdata.usgs.gov). During the sampling period, however, discharge had returned to levels below the 14-year median daily statistic at the USGS Jackson Parkway gauge (#02336526; Figure 3). Discharge measurements for each station are shown in Table 2. Water velocity was too low (<0.1 cfs) to obtain acceptable measurements at North CSO (PC4), Lindsay Street (PC10) or Lillian Cooper (PC14).

3.3 *Escherichia coli*

Data for fecal coliform counts are provided in Table 2, reported as the most probable number (MPN) of *E. coli* per 100 mL. While the Georgia state water quality standard is written in terms of fecal coliform, not specifically *E. coli*, the *E. coli* data provide a conservative estimate of fecal coliform since they are a subset of this group. Therefore, exceedance of the standard by *E. coli* indicates a likely exceedance by fecal coliform bacteria as a whole. The applicable standard for this sampling period (between November and April) for a designated use of 'fishing' is a geometric mean of 1,000 per 100 mL, calculated using at least four samples during a 30-day period, with single measurements not to exceed 4,000 per 100 mL (Ga. Comp. R. & Regs. r. 391-3-6-.03(6). Only one sample was collected at each station during this sampling event, which precludes calculation of a geometric mean. However, samples collected at 5 stations contained concentrations of *E. coli* higher than 1,000 MPN per 100 mL (Table 2). Counts were especially high, and above the 4,000 MPN limit, in the Greensferry tributary (PC2) and in the tributary at Lindsay Street (PC10) (Figure 4).

3.4 Surface Water Chemistry

Inorganic chemistry data for surface water samples are shown in Tables 3-4. Total nitrogen followed the same pattern as previous quarterly data, with peaks at Greensferry (PC2) and Lindsay Street (PC10) (Figure 5). The highest concentrations of total phosphorus were found at Greensferry and North Avenue (PC3) (Figure 6). Dissolved ions such as calcium and sodium were elevated where conductivity was higher, and a few metals were higher at North Avenue CSO (PC4), Kerry Circle (PC7) and West Highlands (PC15) (Table 4). However, no metals were above water quality criteria. Analytes not detected in any water chemistry samples are listed in Table 5.

3.5 Quality Control

Quality control activities associated with field operations included a filter blank for dissolved phosphorus, temperature blanks for sample coolers and multi-meter instrument calibrations. No phosphorus was detected in the filter blank. Temperature blank results indicated that water samples were below 6°C when received by the SESD Analytical Support Branch (ASB). All samples arrived at ASB in good condition and with a complete chain of custody. All YSI water quality instruments used during this study were maintained and calibrated according to requirements of the SESD Operating Procedure for Equipment Inventory and Management (USEPA 2015a). YSI instruments were operated within the ranges established by the manufacturer and therefore were within acceptable field measurement uncertainty guidelines (Table 7; USEPA 2016a). At the end of each sampling day, instruments were end-checked using the appropriate standard for each parameter measured. End check results indicate all instrument measurements were within acceptable limits.

4.0 Discussion

This was the third quarterly sampling event in the second year of a long-term monitoring study. Results of all sampling events will be compiled at the end of the study to provide a comprehensive summary. Two or more years of quarterly data will establish a baseline against which progress may be measured, as various improvement projects move forward in the Proctor Creek watershed.

5.0 References

USEPA. 2013a. Operating Procedure for *In Situ* Water Quality Monitoring, SESDPROC-111-R3, Region 4, SESD, Athens, GA.

USEPA. 2013b. Operating Procedure for Surface Water Sampling, SESDPROC-201-R3, Region 4, SESD, Athens, GA.

USEPA. 2015a. Operating Procedure for Equipment Inventory and Management, SESDPROC-108-R5, Region 4, SESD, Athens, GA.

USEPA. 2015b. Proctor Creek Watershed Monitoring, Quality Assurance Project Plan. SESD Project ID #15-0425. Region 4, SESD, Athens, GA.

USEPA. 2016a. Operating Procedure for Field Measurement Uncertainty, SESDPROC-014-R2, Region 4, SESD, Athens, GA.

USEPA. 2016b. Operating Procedure for Hydrological Studies, SESDPROC-501-R4, Region 4, SESD, Athens, GA.

USEPA. 2016c. SESD Analytical Services Branch Laboratory Operations and Quality Assurance Manual (ASB LOQAM). United States Environmental Protection Agency. Region 4, SESD, Athens, GA.

Table 1: Sampling locations in the mainstem (MAIN) and tributaries (TRIB) of Proctor Creek.

Station ID	Station Name	Location Type	Location Description	Location (Decimal Degrees)	
				Latitude	Longitude
PC1	Burbank	MAIN	Proctor Creek at Burbank Drive	33.75710	-84.42892
PC2	Greensferry	TRIB	Tributary below decommissioned Greensferry CSO	33.76075	-84.42691
PC3	North Avenue	MAIN	Proctor Creek at North Avenue	33.76800	-84.42769
PC4	North CSO	TRIB	Tributary downstream of North Avenue CSO outfall	33.76863	-84.42689
PC5	Hollowell	MAIN	Proctor Creek at Hollowell Parkway	33.77199	-84.42990
PC6	Hortense	MAIN	Proctor Creek at Hortense Place	33.77562	-84.44072
PC7	Kerry Circle	MAIN	Proctor Creek at Kerry Circle	33.79214	-84.45208
PC8	James Jackson	MAIN	Proctor Creek at James Jackson Parkway	33.79461	-84.47417
PC9	Northwest	MAIN	Proctor Creek at Northwest Drive	33.79931	-84.48682
PC10	Lindsay Street	TRIB	Tributary at Lindsay Street Park	33.76941	-84.41611
PC11	Grove Park	TRIB	Tributary at Grove Park	33.77406	-84.44029
PC12	Spring Street	TRIB	Tributary at Spring Street	33.78849	-84.46597
PC13	AD Williams	TRIB	Tributary at Northwest Drive	33.79633	-84.48602
PC14	Lillian Cooper	TRIB	Tributary at Lillian Cooper Shepherd Park	33.79799	-84.47842
PC15	West Highlands	TRIB	Tributary at Hollingsworth Boulevard	33.79076	-84.44724

Table 2: Data from *in situ* water quality measurements, discharge calculations, and fecal bacteria analysis.

Station ID	Station Name	Date	Time	Temp. (°C)	Sp. Cond. (µS/cm)	pH (S.U.)	Turbidity (NTU)	D.O. (mg/L)	Discharge (cfs)	*E. coli* (MPN/100 mL)
PC1	Burbank	4/12/17	11:26	16.77	195	7.38	1.5	9.46	0.47	2,052
PC2	Greensferry	4/12/17	11:03	18.02	316	7.14	2.0	8.03	1.01	9,858
PC3	North Avenue	4/12/17	10:23	17.36	261	7.22	1.4	9.60	1.49	1,475
PC4	North CSO	4/12/17	10:35	16.12	548	7.05	0.9	2.08	<0.1	718
PC5	Hollowell	4/12/17	9:49	16.56	281	7.06	1.3	8.98	1.64	163
PC6	Hortense	4/11/17	14:10	19.41	258	7.78	1.7	10.33	2.51*	121
PC7	Kerry Circle	4/11/17	13:09	17.78	307	7.33	5.3	9.74	3.60	268
PC8	James Jackson	4/11/17	11:55	16.71	288	7.36	3.6	10.48	7.71*	125
PC9	Northwest	4/11/17	10:12	15.52	293	7.15	9.1	9.16	7.59	371
PC10	Lindsay Street	4/12/17	11:59	18.02	435	7.10	0.3	8.83	<0.1	4,989
PC11	Grove Park	4/11/17	14:32	19.11	209	7.66	1.5	9.59	0.64	290
PC12	Spring Street	4/11/17	12:25	17.41	219	7.48	2.6	9.40	1.19	2,237
PC13	AD Williams	4/11/17	10:46	16.09	401	7.50	2.0	9.39	0.63	98
PC14	Lillian Cooper	4/11/17	11:22	15.00	148	7.41	6.4	7.87	<0.1	361
PC15	West Highlands	4/11/17	13:41	17.63	632	7.42	6.4	8.77	0.21	87

*Discharge estimates at PC6 and PC8 were obtained from USGS gauge data available online at http://waterdata.usgs.gov/ga/nwis for station numbers 02336517 and 02336526, respectively.

Table 3: Surface water data for nutrient and classical analyses.

SURFACE WATER NUTRIENTS/CLASSICALS																
		PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12	PC13	PC14	PC15
Analyte (mg/L)	Method	Burbank	Greens-ferry	North Avenue	North CSO	Hollowell	Hortense	Kerry Circle	James Jackson	Northwest	Lindsay Street	Grove Park	Spring Street	AD Williams	Lillian Cooper	West Highlands
Total Phosphorus	EPA 365.1	0.026	0.34	0.078	0.20	0.063	0.044	0.032	0.029	0.029	0.043	0.025	0.049	0.028	0.023	0.011
Dissolved Phosphorus	EPA 365.1	0.017	0.30	0.058	0.041	0.037	0.022	0.013	0.012	0.011	0.040	0.013	0.015	0.015	0.023	0.011
Total Nitrogen	calculated	1.4	4.00	1.92	1.23	2.26	1.78	2.42	1.79	1.66	4.87	0.85	1.38	1.37	0.16	1.28
Total Kjeldahl Nitrogen	EPA 351.2	0.095	1.8	0.12	0.55	0.36	0.28	0.32 J,O	0.19	0.26	0.17	0.27	0.57	0.37	< 0.050 U	0.28
Ammonia as N	EPA 350.1	< 0.050 U	1.3	0.080	0.24	0.13	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	< 0.050 U	0.26	0.16	< 0.050 U	0.30
Nitrate/Nitrite as N	EPA 353.2	1.3	2.2	1.8	0.68	1.9	1.5	2.1	1.6	1.4	4.7	0.58	0.81	1.0	0.16	1.0
Chloride	EPA 300.0	12	19	15	79	17	15	14	14	15	17	14	14	37	9.2	21
Fluoride	EPA 300.0	0.083	0.33	0.20	0.18	0.18	0.17	0.16	0.15	0.16	0.12	0.12	0.10	0.35	0.094	0.23
Sulfate as SO4	EPA 300.0	18	40	32	37	32	32	42	38	36	81	28	22	23	23	84

U = The analyte was not detected at or above the reporting limit.
J = The identification of the analyte is acceptable; the reported value is an estimate.
O = Matrix spike recovery and precision outside method control limits.

Table 4: Surface water data for metals analyses. Detections are highlighted in grey for clarity. Acute and chronic exposure levels for freshwater aquatic life, calculated using hardness values for each station according to Ga. Comp. R. & Regs. r. 391-3-6-.03(5)(e)(ii), are provided for comparison.

SURFACE WATER METALS																
		PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12	PC13	PC14	PC15
Analyte (µg/L)	Method	Burbank	Greens-ferry	North Avenue	North CSO	Hollowell	Hortense	Kerry Circle	James Jackson	Northwest	Lindsay Street	Grove Park	Spring Street	AD Williams	Lillian Cooper	West Highlands
Aluminum	EPA 6010	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	110	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
Antimony	EPA 200.8	< 1.0 U	< 1.0 U	< 1.0 U	3.5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	1.5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Arsenic	EPA 200.8	< 1.0 U	< 1.0 U	< 1.0 U	1.3	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Barium	EPA 6010	60	62	58	65	56	47	55	52	54	89	37	47	50	62	120
Calcium	EPA 6010	19000	29000	26000	44000	29000	27000	33000	30000	29000	49000	21000	21000	30000	13000	82000
Iron	EPA 6010	150	290	250	2400	250	320	350	370	390	< 100 U	280	560	220	900	590
Lead	EPA 200.8	< 1.0 U	< 1.0 U	< 1.0 U	3.0	< 1.0 U	< 1.0 U	1.8	1.4	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Magnesium	EPA 6010	3700	5900	5100	3800	5500	5100	5600	5300	5300	7100	4000	3500	7300	2400	13000
Manganese	EPA 6010	18	94	66	550	64	55	72	64	76	31	56	66	160	190	630
Potassium	EPA 6010	2900	5600	4100	5400	4300	4000	5300	4700	4700	6300	2900	3300	5200	2700	7100
Selenium	EPA 200.8	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	2.4 J,O	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Sodium	EPA 6010	9600	18000	13000	69000	14000	14000	16000	15000	17000	22000	12000	14000	39000	9100	33000
Strontium	EPA 6010	93	120	110	170	120	110	130	130	130	260	87	100	140	85	380
Zinc	EPA 6010	< 10 U	15	< 10 U	34	11	< 10 U	12	< 10 U	< 10 U	70	< 10 U	14	< 10 U	40	45
Hardness (as CaCO3)	SM 2340B	64	96	87	120	95	87	110	98	95	150	68	67	100	42	260
Freshwater Aquatic Life: Acute Criteria																
Lead		46.3	77.5	68.4	103.0	76.5	68.4	92.2	79.6	76.5	136.8	50.0	49.0	81.6	27.1	275.5
Zinc		82.1	115.7	106.5	139.8	114.7	106.5	129.9	117.8	114.7	168.9	86.4	85.3	119.8	57.5	269.2
Freshwater Aquatic Life: Chronic Criteria																
Lead		1.8	3.0	2.7	4.0	3.0	2.7	3.6	3.1	3.0	5.3	1.9	1.9	3.2	1.1	10.7
Zinc		82.1	115.7	106.5	139.8	114.7	106.5	129.9	117.8	114.7	168.9	86.4	85.3	119.8	57.5	269.2

U = The analyte was not detected at or above the reporting limit.

J = The identification of the analyte is acceptable; the reported value is an estimate.

O = Matrix spike recovery and precision outside method control limits.

Table 5: Total recoverable metals not found in any surface water samples at the minimum reporting limit (MRL) indicated.

Analyte (mg/L)	Method	MRL (mg/L)
Beryllium	EPA 6010	3.0 U
Cadmium	EPA 200.8	0.50 U
Chromium	EPA 6010	5.0 U
Cobalt	EPA 6010	5.0 U
Copper	EPA 6010	10 U
Molybdenum	EPA 6010	10 U
Nickel	EPA 6010	10 U
Silver	EPA 6010	5.0 U
Thallium	EPA 200.8	1.0 U
Tin	EPA 6010	15 U
Titanium	EPA 6010	5.0 U
Vanadium	EPA 6010	5.0 U
Yttrium	EPA 6010	3.0 U

Table 6: Field measurement uncertainty ranges for SESD Field Services Branch *in situ* measurements.

Parameter	Units	Measurement Technology	Sensitivity of Primary Equipment
Dissolved Oxygen	mg/L	Luminescent dissolved oxygen probe	greater of ± 0.2 mg/L or ± 2%
Temperature	°C	Thermistor	± 0.5 °C
pH	SU	Glass electrode	± 0.2 SU
Specific Conductivity	µS/cm	Nickel electrode cell	± 0.5%
Turbidity	NTU	Optical probe	± 5%

Figure 1: Study site location in Fulton County, GA. The Proctor Creek watershed drains to the Chattahoochee River, which flows across the Florida panhandle to the Gulf of Mexico.

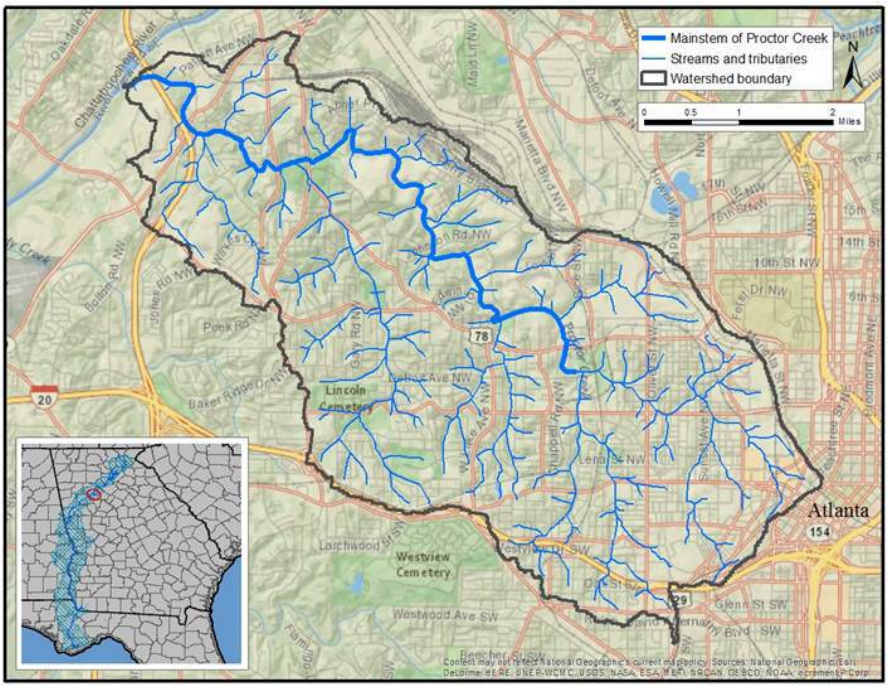


Figure 2: Map of sampling locations in the Proctor Creek watershed. The darker blue line indicates the mainstem of Proctor Creek, with tributaries shown in lighter blue. See Table 1 for station descriptions.

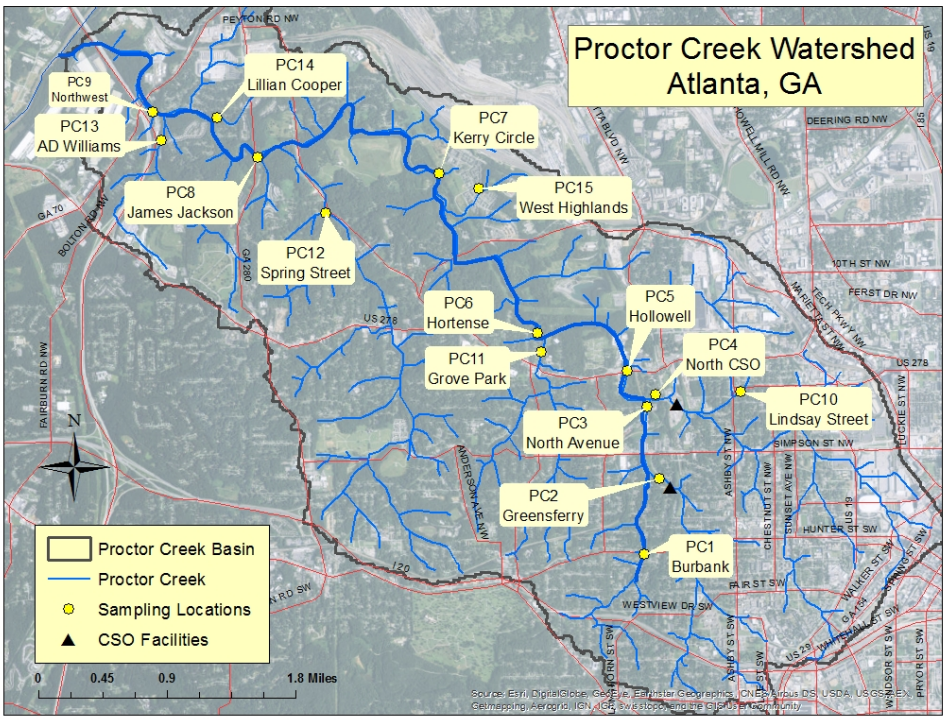


Figure 3: Stream discharge from April 4-14, 2017 at the USGS James Jackson Parkway gauge, located at station PC8. The 14-year median daily statistic is shown for comparison. The current sampling event occurred on April 11-12.

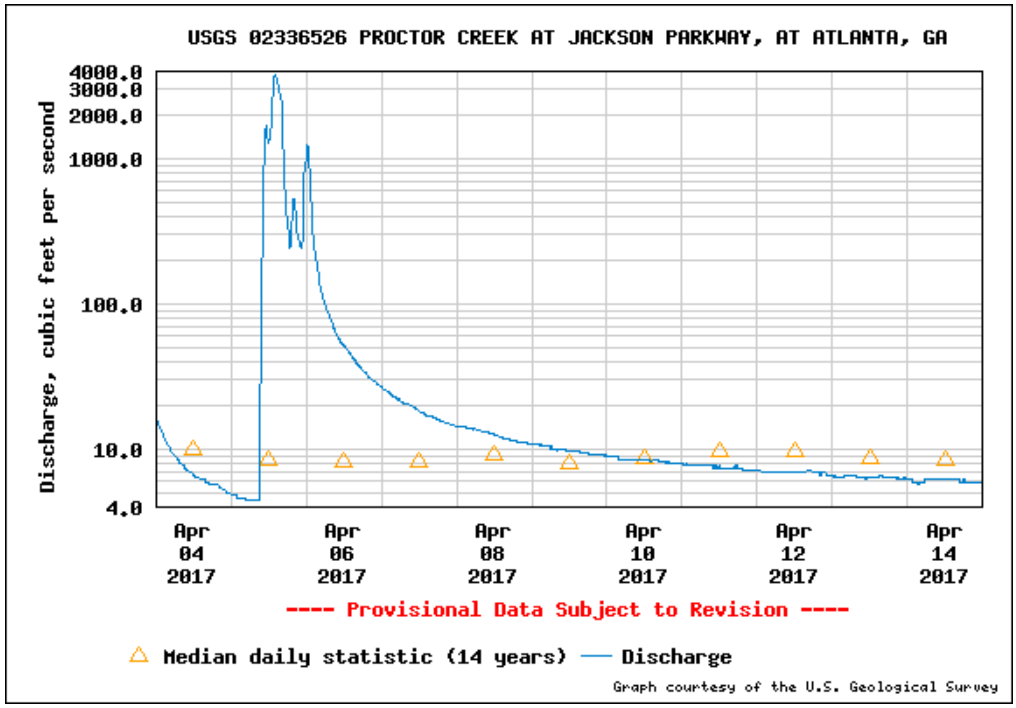


Figure 4: *E. coli* (MPN per 100 mL) in Proctor Creek and its tributaries. Locations are shown from upstream to downstream, in order from left to right.

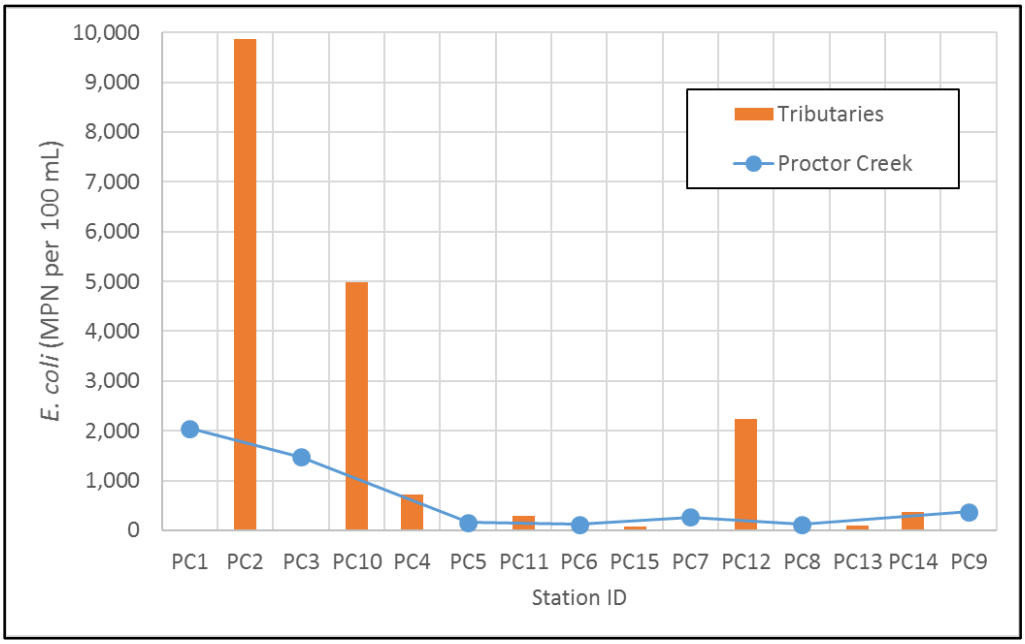


Figure 5: Total nitrogen (mg/L) in Proctor Creek and its tributaries. Locations are shown from upstream to downstream, in order from left to right.

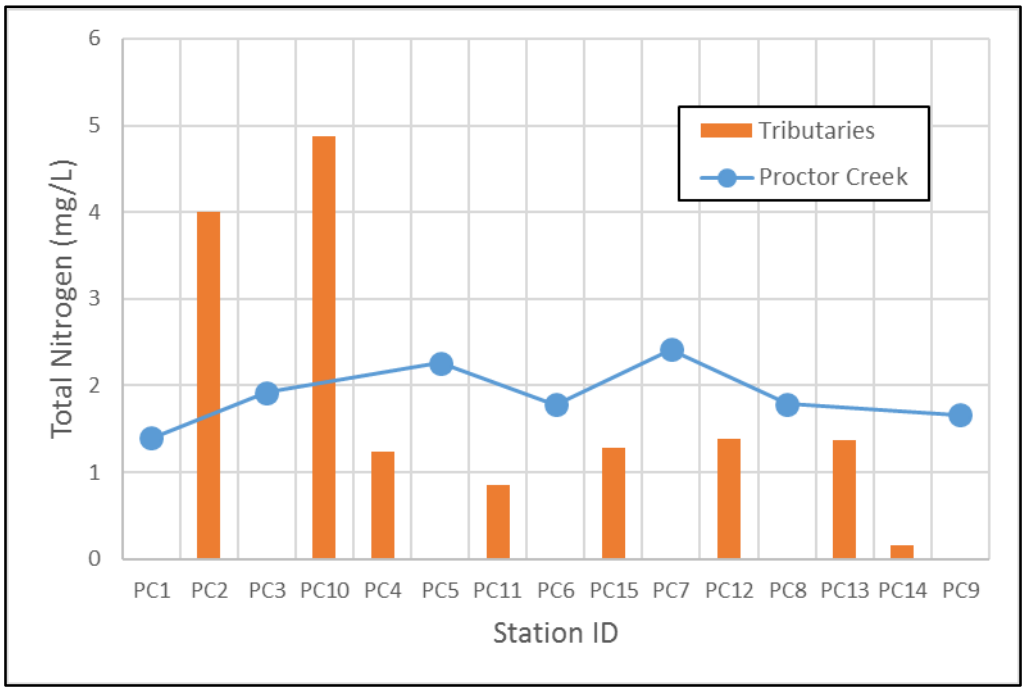
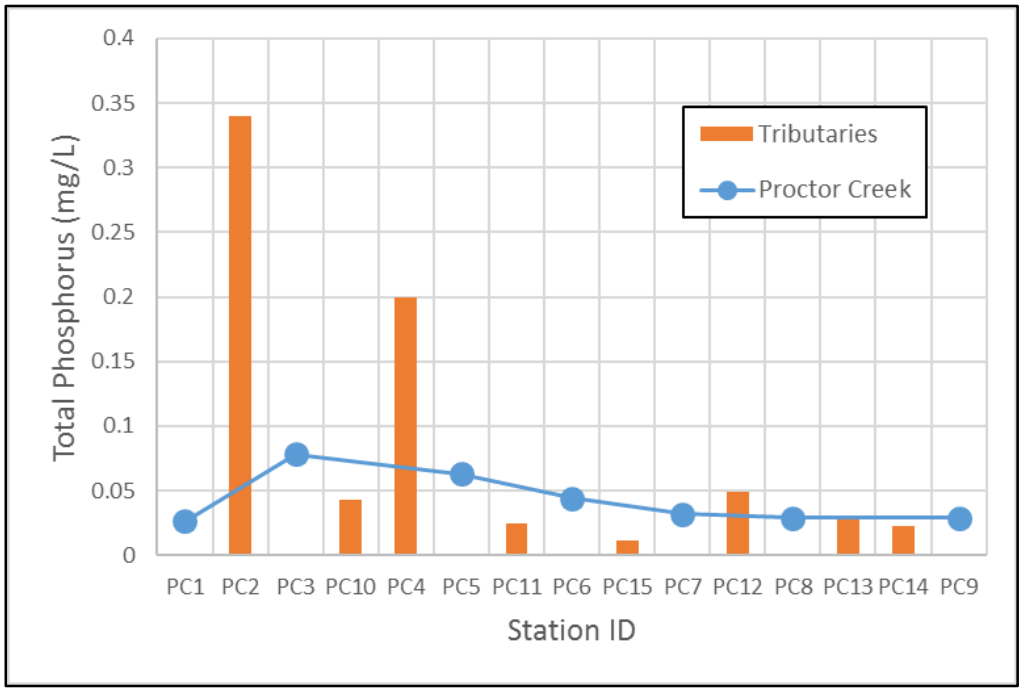


Figure 6: Total phosphorus (mg/L) in Proctor Creek and its tributaries. Locations are shown from upstream to downstream, in order from left to right.



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