



**Project ID #17-0054**

# **Proctor Creek Watershed Monitoring FY2017: First Quarterly Report**

**Fulton County, GA**

**Project Dates: October 18-19, 2016**

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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 first quarterly monitoring event of the second year of the project.

## 2.0 Methods

### 2.1 Study Design and Methods

This study was conducted in accordance with the methods outlined in the Proctor Creek Watershed Monitoring Quality Assurance Project Plan (USEPA 2015b). Field sampling was performed on October 18-19, 2016. 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 less than 2 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 approximately 165-365  $\mu\text{S}/\text{cm}$  throughout most of the watershed, but was notably higher in two tributaries: AD Williams (PC13; 737  $\mu\text{S}/\text{cm}$ ) and West Highlands (PC15; 579  $\mu\text{S}/\text{cm}$ ). 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 last significant rainfall prior to sampling occurred on September 27, three weeks before this sampling event, with precipitation totaling 1 inch (<http://waterdata.usgs.gov>). Two smaller events occurred on October 7 and October 16, at approximately 0.13 and 0.03 inches, respectively. Discharge was well below the 13-year median daily value throughout October (Figure 3). The USGS Jackson Parkway gauge recorded discharge that fluctuated from 1.3-1.5 cubic feet per second (cfs) over the 2-day sampling period. Discharge measurements for each station are shown in Table 2. There was no flowing water at Lillian Cooper Park (PC14), so no flow measurements or water samples were collected at that station, and velocity was too low to obtain acceptable measurements at North CSO (PC4). Flow in the main channel was also difficult to measure due to a beaver dam at Hollowell (PC5) and deep, slow-moving water at Kerry Circle (PC7). Data at these two stations were outside of quality control acceptance criteria and therefore omitted from the dataset.

### 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 May and October) for fishing and/or recreational waters is a geometric mean of 200 per 100 mL, calculated using at least four samples during a 30-day period (Ga. Comp. R. & Regs. r. 391-3-6-.03(6)). Only one sample was collected at each station during this sampling event, which precludes the calculation of a geometric mean. However, 9 of the 14 samples contained concentrations of *E. coli* higher than that standard (Table 2). Counts were especially high, at 1,000 MPN per 100 mL or more, in Proctor Creek at Burbank (PC1), North Avenue (PC3), and the Greensferry tributary (PC2), but highest overall at 41,060 MPN at the Lindsay Street tributary (PC10) (Figure 4).

### **3.4 Surface Water Chemistry**

Inorganic chemistry data for surface water samples are shown in Tables 3-4. Total nitrogen (TN) was highest at Greensferry (PC2) and Lindsay Street (PC10) (Figure 5), with the dissolved fraction ranging 71-96% across stations in the form of nitrate-nitrite, with two exceptions. At Greensferry, ammonia accounted for 24% of the total with 64% nitrate-nitrite. At North Avenue CSO (PC4), ammonia accounted for 72% of the total, with nitrate-nitrite below detection. There was also a residual concentration of 0.094 mg/L ammonia (3% of TN) downstream of North Avenue CSO at Hollowell (PC5). Total phosphorus levels were highest at Greensferry, with increases in the main channel downstream that declined from Hollowell to Northwest (Figure 6).

At AD Williams (PC13) and West Highlands (PC15), where total organic carbon (TOC) was highest, total alkalinity, calcium, magnesium, potassium, sodium and strontium were also relatively high. Specific conductance at these two stations was also elevated, since higher concentrations of ions increase water conductivity. Concentrations of iron were more than five times higher at North Avenue CSO (PC4) than at any other station, and manganese was elevated both there and at West Highlands (PC15). However, no metals were above water quality standards. 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 bottle blank for dissolved phosphorus, temperature blanks for sample coolers and multi-meter instrument calibrations. Dissolved phosphorus was detected in the bottle blank associated with a new lot of bottles, and was above total phosphorus concentrations in several samples, including those collected in bottles from a previously-verified lot. Therefore, the source of contamination could not be confirmed and results for dissolved phosphorus were omitted from this report. 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 6; 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 first 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 downstream of 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)	<i>E. coli</i> (MPN/100mL)
PC1	Burbank	10/19/16	13:19	19.88	191	7.33	1.7	7.87	0.09	1,069
PC2	Greensferry	10/19/16	12:56	22.29	287	6.96	2.4	5.84	1.21	2,674
PC3	North Avenue	10/19/16	11:44	21.06	251	7.37	1.4	8.22	0.85	18,825
PC4	North CSO	10/19/16	11:57	18.92	316	6.89	4.3	1.73	NA	49
PC5	Hollowell	10/19/16	10:35	19.45	317	7.05	1.4	5.80	NA	721
PC6	Hortense	10/18/16	15:07	20.96	268	7.76	2.1	9.62	1.1*	284
PC7	Kerry Circle	10/18/16	13:47	20.36	332	7.49	2.2	9.05	NA	165
PC8	James Jackson	10/18/16	11:51	17.68	312	7.72	1.4	8.45	1.3*	290
PC9	Northwest	10/18/16	10:20	17.65	315	7.43	1.1	8.18	1.54	477
PC10	Lindsay Street	10/19/16	13:57	22.20	365	6.92	0.5	6.59	NA	41,060
PC11	Grove Park	10/19/16	10:04	18.74	218	6.84	1.8	7.44	0.10	148
PC12	Spring Street	10/18/16	12:55	18.23	165	7.56	1.0	8.70	0.23	113
PC13	AD Williams	10/18/16	10:51	17.50	737	7.68	0.4	8.08	0.02	502
PC14	Lillian Cooper	NO FLOW								
PC15	West Highlands	10/18/16	14:36	18.87	579	7.75	3.6	8.22	0.18	121

\*Discharge 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. Detections are highlighted in grey for clarity.

SURFACE WATER NUTRIENTS/CLASSICALS															
		PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12	PC13	PC15
Analyte (mg/L)	Method	Burbank	Greensferry	North Avenue	North CSO	Hollowell	Hortense	Kerry Circle	James Jackson	Northwest	Lindsay Street	Grove Park	Spring Street	AD Williams	West Highlands
Total Suspended Solids	USGS I-3765-85	4.0 U	4.0 U	4.0 U	7.5 J,QM-4	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.4	4.0 U	4.0 U	4.0 U
Total Organic Carbon	SM 5310B	1.0 U	2.5	1.7	4.3	4.0	1.6	3.9	3.8	3.7	3.6	1.9	2.4	10	9.6
Total Phosphorus	EPA 365.1	0.067	0.46	0.20	0.16	0.20	0.078	0.038	0.021	0.020	0.054	0.029	0.028	0.038	0.010 U
Total Nitrogen	calculated	1.22	4.50	2.39	0.47	2.93	1.69	2.02	1.92	1.82	3.97	0.49	0.80	1.47	1.22
Total Kjeldahl Nitrogen	EPA 351.2	0.22	1.6	0.39	0.47	0.43	0.19	0.22	0.22	0.22 J,QM-1	0.17	0.14	0.14	0.37	0.22 J,QM-1
Ammonia as N	EPA 350.1	0.050 U	1.1	0.050 U	0.34	0.094	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Nitrate/Nitrite as N	EPA 353.2	1.0	2.9	2.0	0.050 U	2.5	1.5	1.8	1.7	1.6	3.8	0.35	0.66	1.1	1.0
Alkalinity, Total (as CaCO <sub>3</sub> )	SM 2320B	62	64	64	77	68	68	82	79	82	74	57	41	200	220
Chloride	EPA 300.0	11	21	17	36	33	22	21	19	20	20	15	13	110	22
Fluoride	EPA 300.0	0.11	0.46	0.36	0.28	0.34	0.30	0.27	0.26	0.24	0.086	0.23	0.35	0.14	0.20
Sulfate as SO <sub>4</sub>	EPA 300.0	13	30	27	23	27	26	45	40	41	60	24	15	8.2	68

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.

QM-1 = Matrix Spike Recovery less than method control limits.

QM-4 = Matrix 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	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	West Highlands
Aluminum	EPA 6010	100 U	100 U	100 U	100 U	100	100 U	100 U	100 U	100 U	100 U	150	100 U	100 U	100 U
Barium	EPA 6010	52	50	47	41	57	46	50	45	49	84	35	30	59	78
Calcium	EPA 6010	17000	21000	21000	25000	24000	22000	30000	28000	29000	34000	19000	12000	41000	57000
Iron	EPA 6010	270	210	260	1900	340	230	180	140	120	100 U	360	130	100 U	360
Lead	EPA 200.8	1.0 U	1.0 U	1.0 U	1.0 U	1.5	1.3	2.1	1.0 U	1.0 U	1.3	1.0 U	1.0 U	1.0 U	2.2
Magnesium	EPA 6010	3300	4700	4500	3700	4900	4500	5500	5400	5600	6100	3600	2700	13000	11000
Manganese	EPA 6010	11	34	34	330	35	15	13	11	8.5	15	32	8.8	7.2	510
Potassium	EPA 6010	3500	5500	4600	4500	5300	4500	5600	5100	5400	5300	3400	3200	7300	6500
Sodium	EPA 6010	9600	20000	16000	24000	23000	16000	19000	18000	19000	20000	14000	11000	84000	43000
Strontium	EPA 6010	89	94	98	110	110	95	120	120	120	210	82	65	240	290
Titanium	EPA 6010	5.0 U,J,QC-5	5.0 U,J,QC-5	5.0 U,J,QC-5	5.0 U,J,QC-5	5.5 J,QC-5	5.0 U,J,QC-5	5.0 U,J,QC-5	5.0 U,J,QC-5	5.0 U,J,QC-5	5.0 U,J,QC-5	5.8 J,QC-5	5.0 U,J,QC-5	5.0 U,J,QC-5	5.0 U,J,QC-5
Zinc	EPA 6010	10 U	11	13	10 U	11	10 U	10 U	10 U	10 U	48	10 U	10 U	10 U	11
Hardness (as CaCO <sub>3</sub> )	SM 2340B	57	72	71	78	80	74	98	92	95	110	61	41	160	190
<b>Freshwater Aquatic Life: Acute Criteria</b>															
Lead		39.9	53.7	52.8	59.5	61.5	55.6	79.6	73.4	76.5	92.2	43.5	26.2	148.5	184.8
Zinc		74.4	90.7	89.6	97.1	99.2	92.8	117.8	111.6	114.7	129.9	78.8	56.3	178.4	206.4
<b>Freshwater Aquatic Life: Chronic Criteria</b>															
Lead		1.6	2.1	2.1	2.3	2.4	2.2	3.1	2.9	3.0	3.6	1.7	1.0	5.8	7.2
Zinc		74.4	90.7	89.6	97.1	99.2	92.8	117.8	111.6	114.7	129.9	78.8	56.3	178.4	206.4

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.

QC-5 = Calibration check standard less than method control limits.

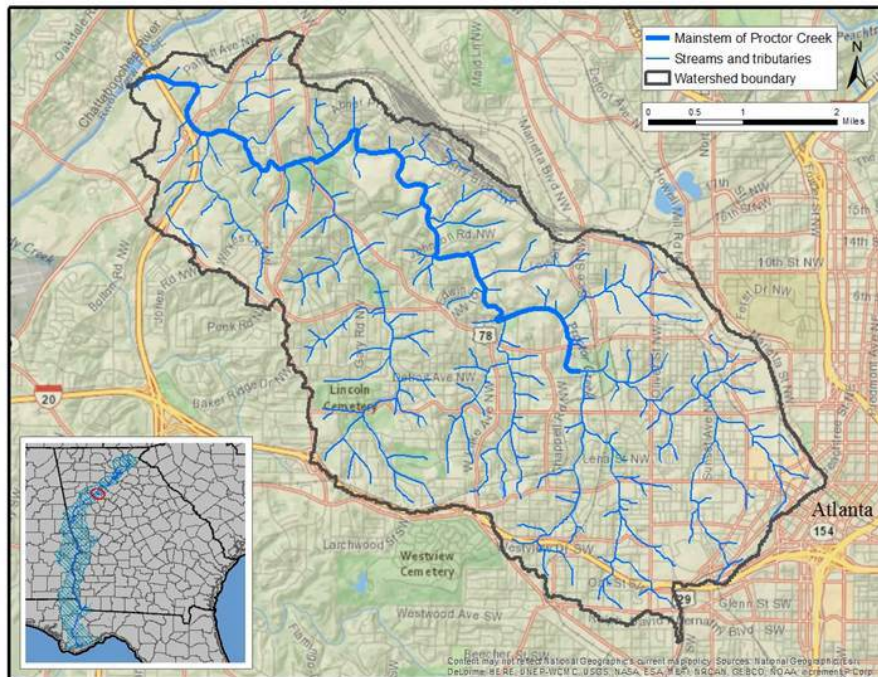
**Table 5:** Total recoverable metals not found in any surface water samples at the minimum reporting limit (MRL) indicated.

Analyte (mg/L)	Method	MRL (mg/L)
Antimony	EPA 200.8	1.0 U
Arsenic	EPA 200.8	1.0 U
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
Selenium	EPA 200.8	2.0 U
Silver	EPA 6010	5.0 U
Thallium	EPA 200.8	1.0 U
Tin	EPA 6010	15 U
Vanadium	EPA 6010	5.0 U
Yttrium	EPA 6010	3.0 U

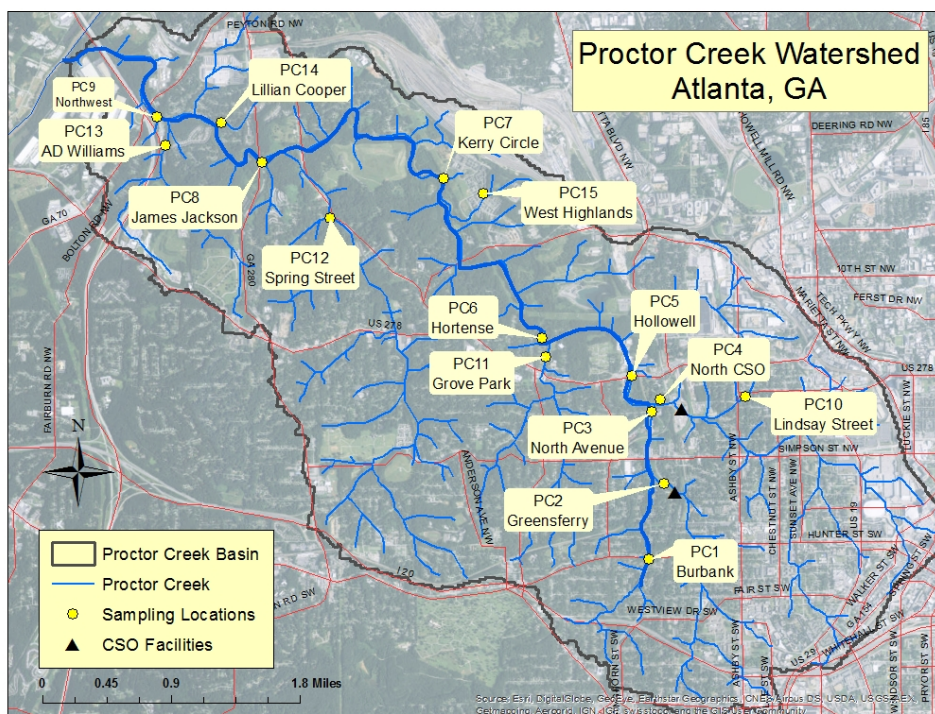
**Table 6:** Field measurement uncertainty ranges for SESD Field Services Branch *in situ* measurements.

Parameter	Units	Measurement Technology	Sensitivity of Primary Equipment
Dissolved Oxygen	mg/L	Luminescent dissolved oxygen probe	± 0.2 mg/L or ± 2%, whichever is greater
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%

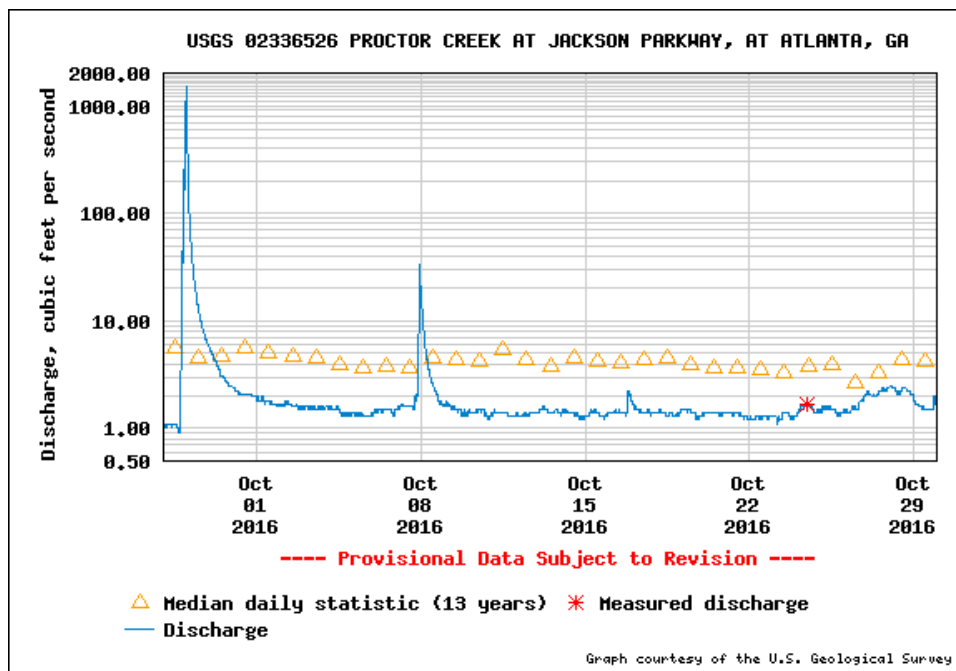
**Figure 1:** Study site location in Fulton County, GA. The Proctor Creek watershed drains to the Chattahoochee River, which flows across the Florida panhandle to the Gulf of Mexico.



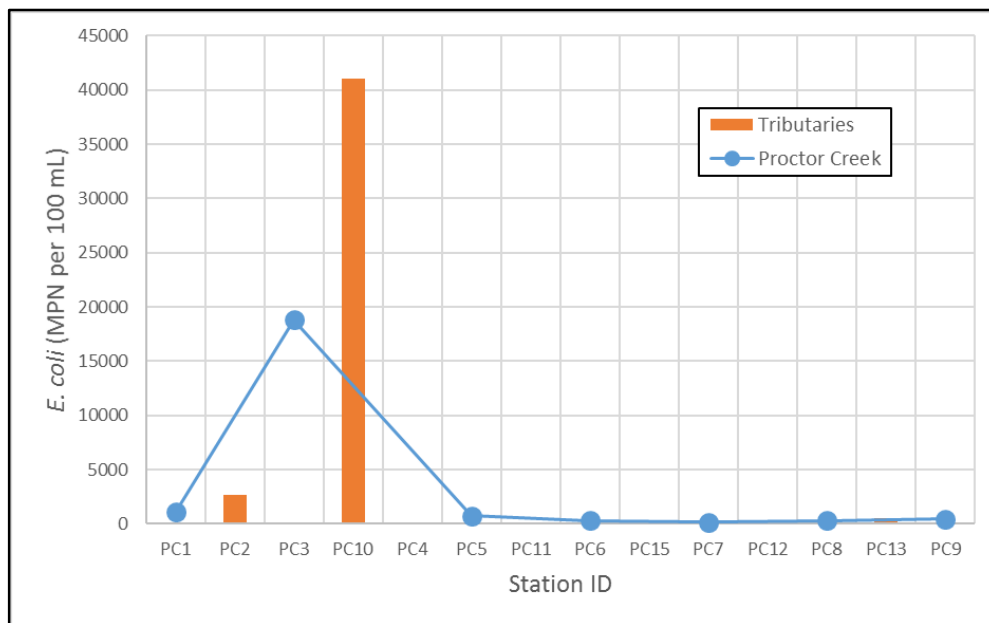
**Figure 2:** Map of sampling locations in the Proctor Creek watershed. The darker blue line indicates the mainstem of Proctor Creek, with tributaries shown in lighter blue. See Table 1 for station descriptions.



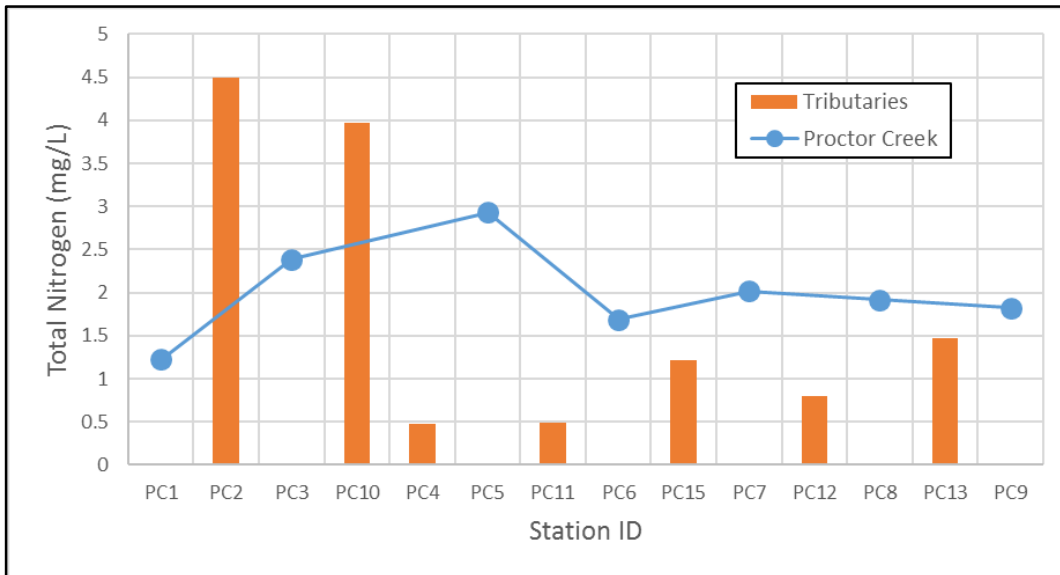
**Figure 3:** Stream discharge from September 27-October 30 2016 at the USGS James Jackson Parkway gauge, located at station PC8. The 13-year median daily statistic is shown for comparison. The current sampling event occurred on October 18-19.



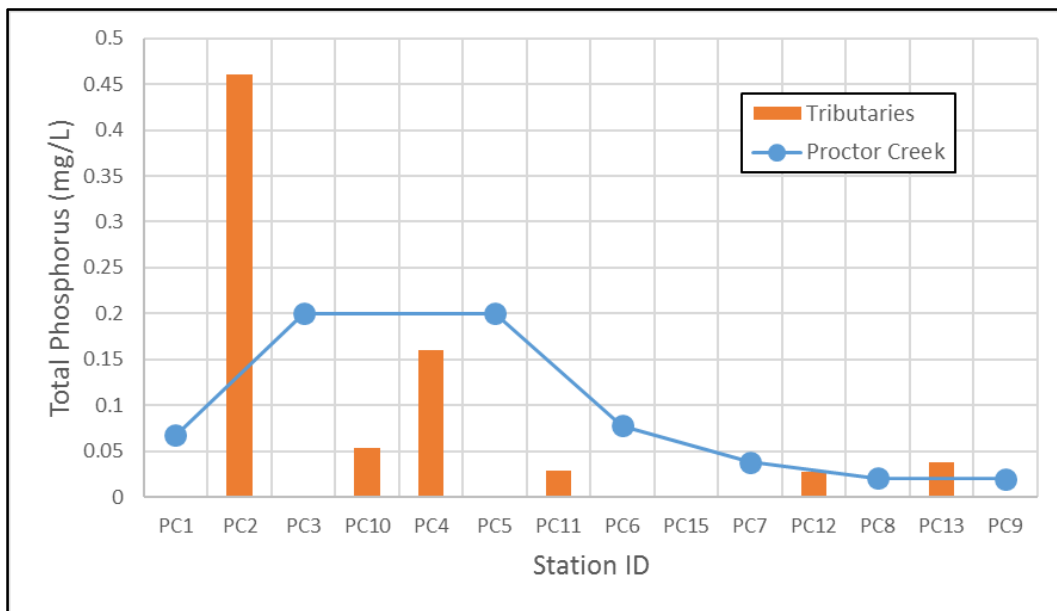
**Figure 4:** *E. coli* (MPN per 100 mL) in Proctor Creek and its tributaries. Locations are shown from upstream to downstream, in order from left to right.



**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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