SWIMMABLE POTOMAC CAMPAIGN

POTOMAC RIVERKEEPER® 20 YEARS
PROTECT • DEFEND • ENJOY!

POTOMAC RIVERKEEPER® NETWORK

POTOMAC RIVERKEEPER NETWORK
MAY 2019 - OCTOBER 2019

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EXECUTIVE SUMMARY

The Potomac River flows through the heart of our nation's capital on its course to the Chesapeake Bay, providing drinking water for six million people and countless recreational opportunities to millions of residents and visitors drawn to its beauty. The popularity of the Nation's River for recreation continues to grow, as anyone who has been to the DC waterfront lately can plainly see. People are coming to the river to kayak, row, fish, stand up paddleboard, and swim, encouraged by easy access, beautiful riverfront parks and public boathouses. The one key thing that's been missing until now is accurate, timely data on whether the Potomac is clean enough to swim and paddle in.

To answer the call, Potomac Riverkeeper (PRK) launched its Citizen Science Water Quality Monitoring Program in 2019. Water samples collected weekly by volunteers are analyzed in certified labs, including on our flagship vessel Sea Dog, and shared with the public every Friday on the free SWIMGuide app. While water quality has improved dramatically since the passage of the Clean Water Act nearly fifty years ago, the Potomac is still burdened with discharges of untreated sewage and polluted stormwater from D.C. and Alexandria, Virginia's outdated sewer systems. Sewage pollution causes spikes in bacteria levels that can make the water unsafe for swimming or paddling, due to the risk of infection or illness from exposure to bacteria in the water.

The good news is that Washington DC and Alexandria are investing billions of dollars to bring their sewer systems into the twenty first century, with plans underway to virtually eliminate this source of pollution by 2030. In the meantime, people continue to flock to the waterfront and go out on the river to catch a fish, take a swim or simply enjoy the view of Kennedy Center or the Washington Monument from the water. The goal of our Swimmable Potomac Campaign and the Citizen Science Water Quality Monitoring Program is to provide the public with timely data that allows them to make informed choices about when and where to recreate on our Nation's River. We know that when people get out on the water and enjoy its beauty, they become our greatest allies in our fight to achieve the vision of a clean, healthy and truly swimmable Potomac River.

PRK's Swimmable Potomac Campaign has two main goals: to make weekly sampling data more readily available to the public regarding the safety of water-based recreation and to make it increasingly safe to use and enjoy the Potomac River for swimming, paddling, paddle boarding, and other primary contact recreation.

The first step is to lift the ban on swimming in Washington DC, which was put in place in the 1970s, when it was almost never safe to go in the water, and replace it with information that can assist the public to make informed choices about when it is safe to swim in the Potomac River. As discussed in more detail below, our water quality monitoring from last summer showed that public health standards for swimming in the Potomac were met roughly 50% of the time. PRKN volunteers collected samples at seven sites in the District of Columbia as part of the DC Citizen Science Volunteer Water Quality Monitoring Program.[1] Sampling at three sites in Maryland and Virginia was led by PRKN. Sample sites on the Potomac are located from Chain Bridge downriver to below the Woodrow Wilson Bridge. Some sampling locations like National Harbor were far safer (85% pass rate) than others, but overall water quality still needs to improve in the Potomac. A fifty percent pass rate for safe human contact is not good enough for the public to feel confident without first confirming which locations show it is actually safe to go in the river!

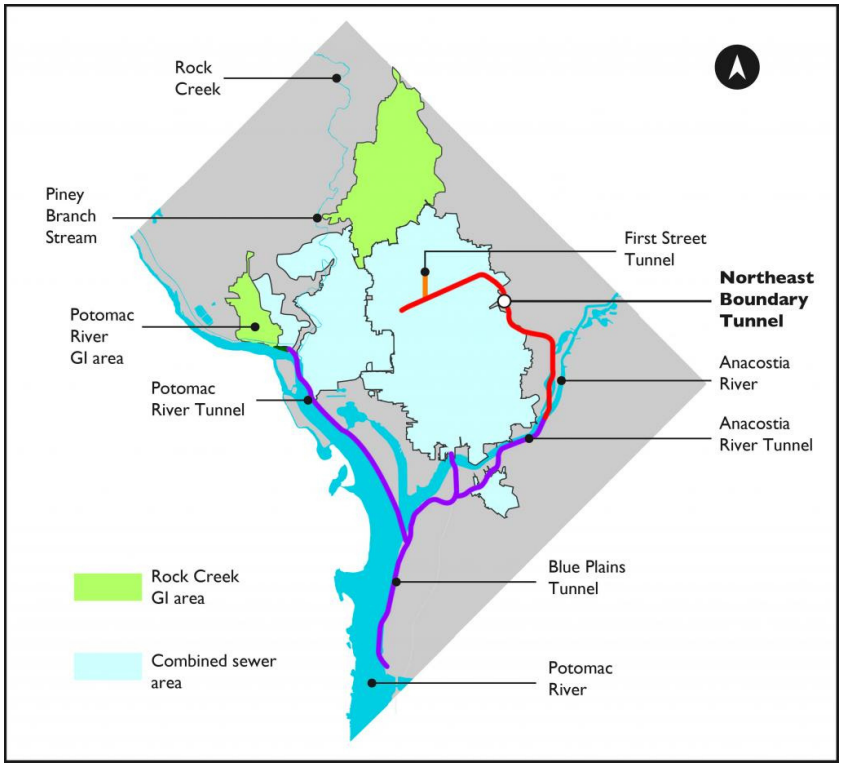
Unfortunately, the swimming ban in DC has prevented people from enjoying our public waters even when it is safe for human contact. National Harbor hosts weekly swim events while DC continues to prohibit people from using this public resource for swimming. The Clean Water Act protects the public's right to clean water by ensuring water quality is safe enough for human contact. Ultimately, our goal is to ensure people are able to use and enjoy recreational opportunities in the Potomac River whenever it is safe, and that it is increasingly safe over time. The public has a right to clean water and a Swimmable Potomac River!

[1] Potomac sampling sites PR1-7 are managed under the DC Citizen Science Water Quality Monitoring, a program of the Department of Energy and Environment (DOEE), implemented by Anacostia Riverkeeper. Anacostia Riverkeeper is the project lead, and DOEE is the funder. District of Columbia Department of Energy and Environment (DOEE) and Anacostia Riverkeeper project (Grant #RFA 2018-1805-WQD-VWQM). See DOEE's Citizen Science webpage: http://doee.dc.gov/service/citizen-science-initiatives

The second step is for DC to complete the Clean River Project by 2030 and achieve its key benchmarks, including 96% system-wide capture of the combined sewer overflows, no more than 4 overflows per year into the Potomac in an average year, and between one and four overflows per year into Rock Creek. Currently, neither the Potomac nor Rock Creek is likely to meet water quality standards after most sewage overflow events. PRKN feels strongly we need effective warnings and improved public notification to encourage river users to stay out of the water after overflow incidents. Our goal is to expand primary contact recreation opportunities for DC-area residents and eventually to communities down river to provide credible data showing when the river is safe! Based on our initial season of water quality monitoring last summer, there may be certain public access points that would be safe for swimming even when there are combined sewer overflows in other parts of the river.

2019 CITIZEN SCIENCE WATER QUALITY MONITORING RESULTS

Over the summer, dozens of volunteers collected and analyzed water samples from the Potomac River from Fletcher's Cove[1] down to National Harbor. The samples are tested for levels of e.coli bacteria, which is commonly found in human sewage and serves as a reliable indicator of overall bacteria levels in the water from these sample locations. Maryland, Virginia and D.C. each have their own regulatory limits for bacteria, and our results were measured against those standards. The results were posted every Thursday evening or Friday morning on Swim Guide, a tool used around the world by Riverkeepers to let the public know whether it is safe to go in the water. Monitoring is a great way to protect public health, track the health and viability of the river, and learn how to improve water quality.



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Here is a summary of Potomac River sampling results for 2019:

- Teams obtained 200 water monitoring samples from 10 sites from early May through early October 2019. Overall, the samples that they collected met public health standards for e. coli bacteria 55.8% of the time.[1]

- The Tidal Basin collection site (PR 6) was the cleanest location, passing the e.coli bacteria test 90% of the time. This location appears to be shielded from regional runoff effects of the greater Potomac River. The National Harbor collection site was a close second with an 85% passing rate. At the other end of the scale, Battery Kemble Creek in Northwest D.C. was the most frequently contaminated site regardless of rain effects as the location passed testing only 5% of the time. Foundry Branch, in Glover Park D.C. performed only slightly better with a 10% pass rate.

- Of the lower three Potomac sites (PR 8, 9 and 10), Oronoco Bay failed the most, likely due to its location near Alexandria's largest sewage discharge pipe and the mouth of Four Mile Run, a tributary of the Potomac into which Alexandria's other combined sewer overflow pipes discharge.

- The results demonstrate a measurable degree of correlation across locations and dates, providing substantial confidence in our testing results.

- Not surprisingly, measurable rainfall in three days prior to testing significantly increased the probability of unsafe e.coli levels. Rainfall triggers both combined sewer overflows and stormwater pollution.

- Beyond tracking rainfall at Reagan National Airport as a runoff indicator, our analysis used US Geologic Service streamflow gauges to correlate flow levels to downstream test results. We learned that the river appeared to recover from even the heaviest rain events in less than a week.

- All results were immediately uploaded to the mobile app "SWIMGuide" and the Virginia Institute of Marine Science (VIMS) web site to provide the public with up-to-date Potomac River swimmable and water quality status.

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POTOMAC RIVER CITIZEN SCIENCE VOLUNTEER WATER QUALITY MONITORING (MARYLAND & VIRGINIA WATERS)

Through the generous support of the Virginia Environmental Endowment, Peterson Companies, National Harbor Marina, SP Marine Management, and Hunting Creek Garden Club, Potomac Riverkeeper Network is initiating a citizen science monitoring program in Virginia and Maryland to gather data on the status of the Potomac River. The program is modeled on a 2018 Anacostia Riverkeeper citizen science program in collaboration with local nongovernmental organizations and DC's Department of Energy and Environment. This volunteer monitoring program will provide up-to-date weekly water quality data to residents and visitors alike. With thousands of people interacting with and recreating on Maryland and Virginia waters each year, it's essential for the public to have current information about the water's quality that may directly affect their well-being and health.

Volunteers will collect water samples where people frequently recreate that will be analyzed to provide up-to-date information on the water quality near you! Part of the fun will be sample analysis that will take place on our new floating laboratory, the Sea Dog - a 42-foot Chesapeake deadrise berthed at National Harbor in Oxon Hill, Maryland. Our vessel is outfitted with an onboard laboratory, the IDEXX Colilert System, to measure E. coli so we can analyze the samples directly. Our volunteer data will also be made public every Friday via **SwimGuide** and Chesapeake Alliance website. Our long-term goal is to use our floating laboratory to help expand our volunteer water quality program to communities further down river.

Analysis Results will be uploaded and reported within 24 hours onto the Chesapeake Monitoring Cooperative and the Chesapeake Data Explorer. Data will be compared with the Virginia health and safety standards to determine whether or not each site currently meets the health standards for e.coli. Once a determination is made, the site status will be publicized through the SwimGuide smartphone app and website. Sampling will begin in early May and continue weekly through September.

DC CITIZEN SCIENCE WATER QUALITY MONITORING

With funding from the DC Department of Energy and Environment (DOEE), implemented by project lead; Anacostia Riverkeeper, and partners; Audubon Naturalist Society, Rock Creek Conservancy, and Alliance for the Chesapeake Bay water quality samples were routinely tested for e.coli levels. This type of bacteria serves as a water quality parameter for human health in recreational waters. This type of bacteria serves as a water quality parameter for human health in recreational waters. Weekly bacterial data collected by the volunteers is made available to the public every Friday, 24 hours after sampling, through the free SwimGuide app. Data is also available from Water Reporter, Chesapeake Monitoring Collective and Anacostia Riverkeeper. We want to make sure river users know when the river is safe for primary human contact and when it is not! This monitoring initiative is one step towards our ultimate goal of making the river swimmable for all to use and enjoy!

DC Citizen Science Water Quality Monitoring program runs from the first week of May 2020 to mid-September 2020. Testing takes place between 7 a.m. and 1 p.m. on Wednesdays or Thursdays. Samples are analyzed and the data is shared with the public on Friday, just in time for weekend recreation.

SEA DOG FLOATING LABORATORY

The Sea Dog was donated by retired Navy Adm. J. Paul Reason and his wife, Dianne.

"The Potomac is my home river, I'm a native Washingtonian."

– Adm. J Paul Reason

LOOKING AHEAD TO 2020 AND BEYOND!

In 2020, we will expand our monitoring locations to include Mallows Bay-Potomac River National Marine Sanctuary in Maryland as well as Little Hunting Creek and Pohick Bay in Virginia. The goal of our expansion "down river" is to provide the public and waterfront communities with even greater coverage of our swimmable analysis of the Potomac River.

Additionally, we will be expanding our monitoring efforts by utilizing our Virginia Department of Environmental Quality Tier III Certified Floating Laboratory and volunteers to help us identify and document sewage pollution fouling our local waterways and threatening public health. Specifically, we are creating "Rapid Response Teams" that, at the direction of our Potomac Riverkeeper, will deploy within 48 hours of an alert to observe, sample, test and document water quality where sewage spills or potential sources of bacteria have been reported to our hotline. Deployments would include testing waterways affected by broken sewer lines, illegal or illicit discharges, leaking septic tanks or other uncontrolled sources of sewage have been reported. Using our pro bono attorney partners, we will assert the interests of public health and clean water to notify local governments and state regulatory agencies, and take direct enforcement action when necessary to hold polluters accountable. We are the only non-profit organization that has the capability to test and properly report sewage incidents that threaten public health then deploy legal remedies to stop pollution throughout the Potomac watershed. Potomac Riverkeeper Network continues to expand its enforcement efforts to help ensure clean water for future generations.

If you are interested in supporting water quality monitoring at these sites or as part of a Rapid Response Team, please contact PRKN by email at volunteer@prknetwork.org. We enjoyed a fantastic start to our Citizen Science Water Quality Monitoring Program in 2019, and we are so eager to expand our mission for clean water in 2020 and beyond! Please join us!

WHAT CAN YOU DO TO HELP?

There are many ways to help us protect the Potomac Watershed. The following actions greatly assist us in our mission to stop pollution, promote safe drinking water, protect healthy river habitats, and enhance public use and enjoyment of the Potomac:

1. Help Our Mission Directly
   - Join our community as a Potomac Riverkeeper Network (PRKN) member*
   - Attend a PRKN river clean up
   - Adopt a freshwater mussel*
   - Report pollution to your Riverkeeper*
   - Attend water quality training (now available on-line) and join our citizen scientist water quality testing*
   - Actively advocate for clean water in your communities

2. Enjoy a River Friendly Life
   - Go fishing and kayaking on the Potomac
   - Use Swim Guide to plan your recreational outings
   - Patronize eco-friendly establishments
   - Participate in river friendly community development

3. Exercise and Inspire Good River Stewardship
   - Attend an Earth Day event
   - Plant a tree
   - Pick up after your pet
   - Pick up trash in/next to the river
   - Recycle and dispose of all trash properly
   - Use a reusable water bottle/ reusable straw
   - Use safe and non-toxic products in your home
   - Make your yard river friendly by planting native plants and using a rain barrel
   - Educate others to raise awareness about clean water

*Visit our website at potomacriverkeepernetwork.org to learn more!

Follow us on social media!

LET'S MAKE THE POTOMAC SWIMMABLE AGAIN!

TECHNICAL APPENDIX

List of Tables and Figures

- Table 1: Sampling locations
- Table 2: Measures of Variation
- Figure 1: A) The geometric mean B) pie charts
- Figure 2: Graphs using the daily means
- Figure 3: Histograms

Acronyms

PRKN……Potomac River Keeper Network

FIB…… Fecal Indicator Bacteria

MPN……Most Probable Units

NTU……Nephelometric Turbidity Units

Background

Potomac Riverkeeper Network's Mission: Our mission is to protect the public's right to clean water in the Potomac and Shenandoah Rivers and their tributaries. We stop pollution to enhance the safety of our drinking water, protect healthy river habitats, and enhance public use and enjoyment.

The Potomac Riverkeeper Network (PRKN) was established in 2000 by the principals of local environmental groups in order to fulfill a niche for a strong advocate to enforce clean water laws for the Potomac River and its tributaries.[1] The Potomac River is located along the eastern coast of the United States and encompasses four states (Virginia, Maryland, West Virginia, Pennsylvania) and Washington D.C. The 14,700 square mile watershed is monitored by the Riverkeepers spanning four states (Virginia, Maryland, West Virginia, and Pennsylvania) and the District of Columbia.[1] PRKN uses an interdisciplinary collaborative approach to the maintenance of safe water for public health for the 5.53 million residents of the Potomac Watershed.[1]

PRKN engages in periodic monitoring of health of the Potomac Watershed. Its main imperative revolves around the health of the people and surrounding ecosystems and seeks to identify and quantify the impact of pollutants on the health of the river and those ecosystems. In doing so, PRKN aims to identify the sources of pollutants that could become hazards to both public and ecosystem health and to address them. The organization endorses open access to easily comprehensible information regarding the health of the recreational water of the Potomac River.

Water Quality Monitoring Parameters

This report is based on the five water quality indicators (water temperature, air temperature, water clarity, pH and fecal indicator bacteria) beginning May 1, 2019 to October 2, 2019. An indicator that is of particular concern is the fecal indicator bacteria (FIB). FIB are a group of bacterial organisms that are normally found in the intestinal tract of animals and birds. Because of this, FIB serve to indicate the presence of fecal contamination if/when detected in bodies of water. The presence of FIB in bodies of water implies the possible presence of pathogens (WHO). E.coli is an indicator bacteria and is thought to be a more specific indicator of fecal contamination and the presence of enteric pathogens than other FIB. For this reason, this investigation used the Most Probable Number (MPN) method in order to quantify the presence of E.coli. There are limitations to the assessment of water quality based on the presence of FIB. Among these is the notion that during certain seasons there is greater activity in recreational water bodies, which leading to an increase in sewage and fecal contamination of those bodies of water (as well as those downstream). There is also a greater diversity of pathogens that are introduced to such environments during those seasons.

Methods

This report is reporting the statistically significant results of five water quality indicators collected throughout the recreational water season in the spring and summer of 2019. PRKN staff and volunteers collected water samples from 10 locations along the Potomac River Basin (Table 1). The 10 locations were sampled weekly beginning on May 1. 2019 and ending October 2, 2019.

Table 1) 2019 Sampling Locations

	NAME	LATITUDE	LONGITUDE	COUNTY
PR-1	BATTERY KEMBLE CREEK [1]	38.92586	-77.0951	Washington D.C
PR-2	FLETCHER'S COVE	38.9187	-77.1031	Washington D.C
PR-3	FOUNDRY BRANCH	38.91414	-77.08126	Washington D.C
PR-4	WASHINGTON CANOE CLUB [1]	38.90431	-77.07193	Washington D.C
PR-5	THOMPSON BOAT CENTER	38.90008	-77.05842 [1]	Washington D.C
PR-6	TIDAL BASIN	38.88495	-77.0355	Washington D.C
PR-7	COLUMBIA ISLAND	38.87637	-77.04671	Washington D.C
PR-8	ORONOCO BAY	38.811825	-77.037683	Alexandria, VA
PR-9	BELLE HAVEN MARINA	38.77654	-77.04784	Alexandria, VA
PR-10	NATIONAL HARBOR	38.784099	-77.018505	Prince George's County, MD

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Field Methods

The Most Probable Number (MPN) Method was used enumerate the presence of fecal coliform bacteria in each of the 10 locations. The purpose is to estimate the population density of microorganism in test samples ranging from 100 to 1 mL of water.

Statistical Software and Methods

The R statistical software as well as Excel (version 16.16.16) was included in statistical analysis and generation of graphs. Measures of variation were generated from the raw data. Geometric mean was created by location from the fecal indicator bacteria in order to compare the FIB presence in the 10 sites. Further, a Student's T test was done to compare the means gathered for FIB in the 10 sites.

Results

The data represented in Figure 2 was calculated by recording the daily values across all 10 sites. Figure 2 is a representation of the five water quality indicators of interest.

TABLE 2) MEASURES OF VARIATION

MEASURE	AIR TEMPERATURE °C	PH	WATER TEMPERATURE °C	FECAL COLIFORM UNITS	WATER CLARITY
MEAN	22.89065	6.986837	22.47741	596.9649	9.444585
MEDIAN	23	7	23	224.7	6.1925
MODE	24	7	25	2419.6	11.9
STANDARD DEVIATION	4.689503	0.7563859	4.464088	764.6413	11.47502
VARIANCE	21.99144	0.5721197	19.92808	584676.4	131.6761

Water Temperature: Water temperature was recorded in degrees Celsius (Figure 2-a). We found that water temperature peaks at 40 degrees Celsius, consistent with routine water quality monitoring done by the United States Geological Survey during the same period f time. Represented in Figure 3-a, the histogram generated depicts a normal distribution. The reported measures of variation determined using the R statistical software. Mean water temperature 22°C (Table 2). The lowest recorded temperature is 10.5°C. The highest recorded temperature is 40°C.

Air Temperature: Figure 2-b represents the recorded air temperature in degrees Celsius. Air temperature follows an overall normal trend given median value (23°C) is greater than the calculated mean (22.89 °C) (Table 2). This is depicted in Figure 3. The lowest recorded air temperature is 9 °C. The highest recorded air temperature is 40 °C.

pH: pH is the measure of the acidity of alkalinity of the water. Figure 2-c represents the recorded pH. As represented in Recorded pH ranged from 4 to 8.5 during the monitoring period and follows a normal trend (Figure 3-c). The mean recorded value is 6.987. The median pH is 7.

Turbidity: The turbidity of water is meant to measure how far light can penetrate into a body of water. The turbidity of the water demonstrated a normal distribution (Figure 3-d). The mean recorded value is 9.444 NTU (Table 2). The median value is 6.19 NTU (Table 2). Recorded turbidity follows a positive skew. The recorded Fecal Coliform Units follows a positive skew (Figure 3-e). Based on the MPN method, the mean recorded value is 596.96 MPN (Table 2). The median recorded value 224.7 MPN.

Bacteria: Of the 10 sites monitored form May 1 to October 2, Battery Kemble Creek demonstrated the greatest presence of fecal indicator bacteria with a reported 5% pass rate (based on 20 samples taken from the site during the aforementioned timeframe) (Figure 1). National Harbor demonstrated an 85% pass rate (Figure 1). As reported in Figure 1, a higher than normal E Coli were detected across all but one site (Tidal Basin) on July 10, 2019. Further, on July 10, 2019, Fairfax, Virginia received approximately 4 inches of rain, directly impacting the Difficult Run Watershed located upstream of the monitored sites.

Discussion

Water quality indicators provide a basis for the understanding and enumeration of the health of bodies of water. The Potomac Riverkeeper targeted its monitoring to frequently used public access points on the Potomac River.

Water temperature was measured in degrees Celsius and was monitored for all 10 sites. Biologically, the temperature of water is imperative for the wellbeing and proliferation of living organisms, including potentially pathogenic bacteria which (along with most living cells) thrive around 37°C. The impact of water temperature extends to being a factor in the observed levels of dissolved oxygen. Cold water can hold more dissolved oxygen, which is important to maintaining healthy populations of some aquatic life, including trout.

The water quality data collected by the riverkeeper network is consistent with routine water quality monitoring done by the United States Geologic Survey (USGS). A pH test measures the alkalinity or acidity of water. A pH of 6 or lower is considered acidic, while one that is 8 or higher is considered to be on the basic. A pH of 7 is considered neutral. Living organisms tend to thrive between a pH of 6.5 to 9. Fluctuations in pH are also indicators of pollution. Based on the data gathered by this organization, the recorded pH ranges between 4 at its most acidic point to 8.5 at its most basic.

The lowest recorded temperature was measured on May 15 at Battery Kemble Creek. The turbidity of water is meant to measure how far light can penetrate into a body of water. Changes in the turbidity (or clarity) of the water can be noticed following heavy rains.

Citations

1. Potomac Riverkeeper Network. (n.d.). *Our Mission*. Retrieved from https://www.potomacriverkeepernetwork.org/mission/
2. The Swim Guide. (n.d.). *What is a recreational water quality standard?* Retrieved from https://www.theswimguide.org/2015/09/04/um-whats-a-recreational-water-quality-standard/
3. Ashbolt, Nicholas J., Grabow, Willie O.K. and Snozzi, Mario. (2010). *Indicators or Microbial Water Quality*. Retrieved from https://www.who.int/water_sanitation_health/dwq/iwachap13.pdf

Potomac River E. Coli Pass/Fail Results - 2019

POTOMAC RIVERKEEPER NETWORK

PR 1 - PR 7 : [1] *1 May19 - 11Sep19* [2] *E. coli geometric mean = 126 MPN/100mL*

PR 8- PR 10: 23 May - 2Oct19 *E. coli single sample value = 235 MPN/100mL*

GEOMETRIC MEAN FOR PR1 THROUGH PR7

		1-May	8-May	15-May	23-May	29-May	5-Jun	12-Jun	19-Jun	26-Jun	2-Jul	10-Jul	17-Jul	24-Jul	31-Jul	7-Aug	14-Aug	21-Aug	28-Aug	4-Sep	11-Sep	18-Sep	25-Sep	2-Oct	Pass Rate
Battery Kemble Creek	PR 1	48	345	548	145	316	459	545	600	946	687	998	964	927	661	911	851	926	807	783	581				5%
Foundry Branch	PR 3	68	238	196	61	164	176	167	227	364	352	446	437	308	151	138	147	252	243	218	325				10%
Fletchers Cove	PR 2	56	549	1860	96	229	250	194	98	98	76	127	88	95	66	108	81	118	93	88	59				70%
Washington Canoe Club	PR 4	81	326	2420	118	370	380	298	149	147	92	139	113	122	80	118	140	198	166	114	92				45%
Thompson Boat Center	PR 5	32	517	2420	43	178	160	84	32	39	27	70	68	92	75	155	98	155	115	98	55				70%
Tidal Basin	PR 6	33	135	727	51	89	115	100	59	65	51	47	34	28	21	18	14	19	19	12	8				90%
Columbia Island	PR 7	37	866	1120	24	177	249	130	81	121	128	163	239	224	133	118	48	72	57	56	34				50%
Oronoco Bay	PR 8				387	921	160	155	197	83	N/A	1011	142	20	74	980	56	186	326	866	866	62	101	131	63%
Belle Haven Marina	PR 9				108	123	122	157	194	2420	687	479	110	19	98	272	144	96	93	28	35	488	317	43	70%
National Harbor	PR 10				33	26	99	18	36	16	6	361	13	3	5	483	9	13	15	10	10	5	437	7	85%

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[2] The first five weeks of data for PR1-7 are single samples, as geometric mean cannot be calculated until after 5 weeks of results. May 29th marks the beginning of geometric mean data.

POTOMAC RIVERKEEPER NETWORK

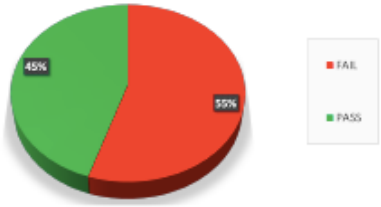
Potomac River Pass/Fail Results

PR 1 - PR 7[1]*: 1 May19 - 11Sep19*[2] *E. coli geometric mean = 126 MPN/100mL*

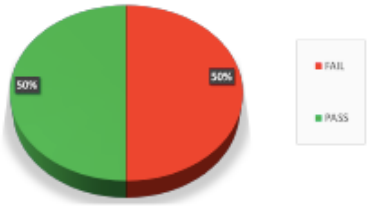
PR 8- PR 10: 23 May - 2Oct19 *E. coli single sample value = 235 MPN/100mL*

Fletchers Cove - PR 2

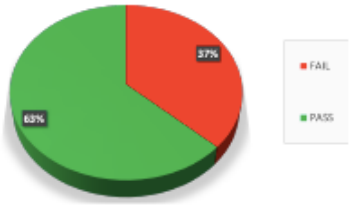
Washington Canoe Club - PR 4



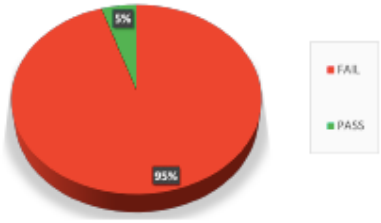
Columbia Island - PR 7



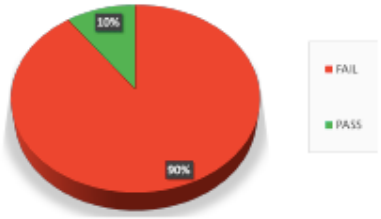
Oronoco Bay - PR 8



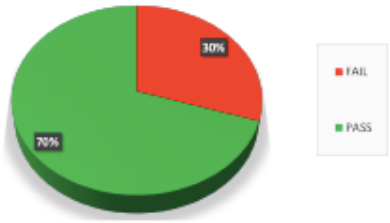
Battery Kemble Creek - PR 1



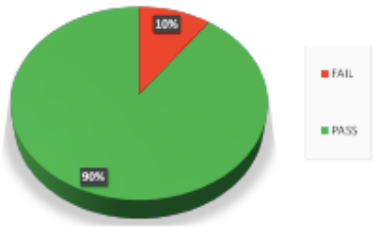
Foundry Branch - PR 3



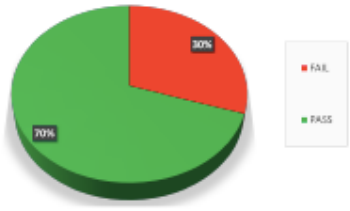
Thompson Boat Center - PR 5



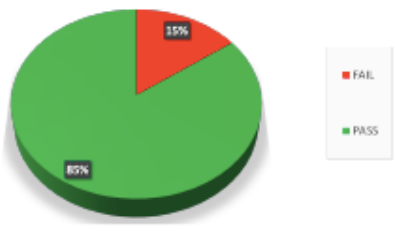
Tidal Basin - PR 6



Belle Haven Marina - PR 9

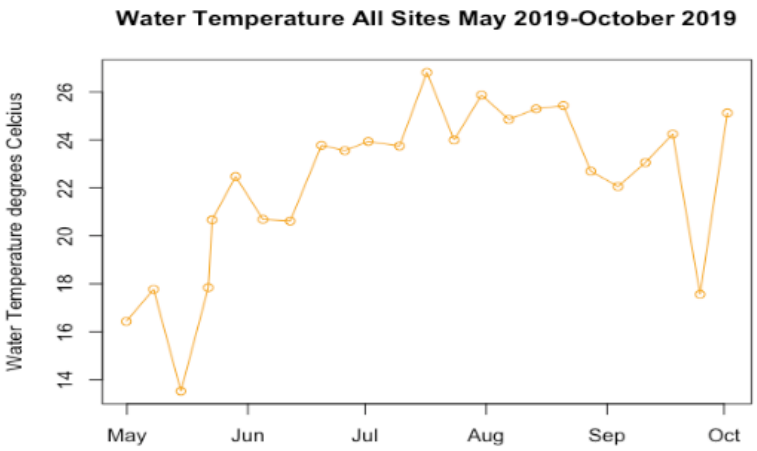


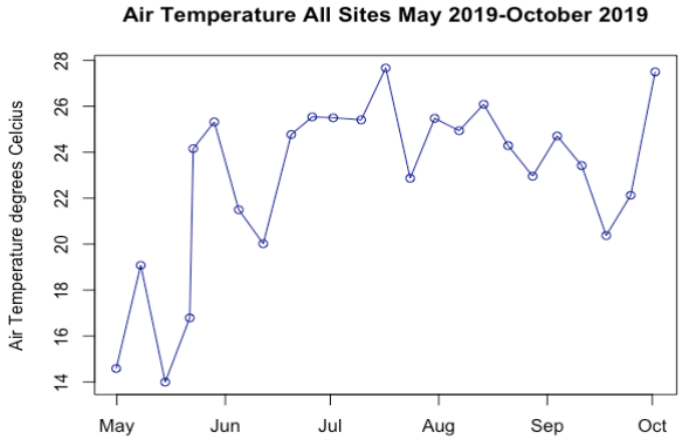
National Harbor - PR 10

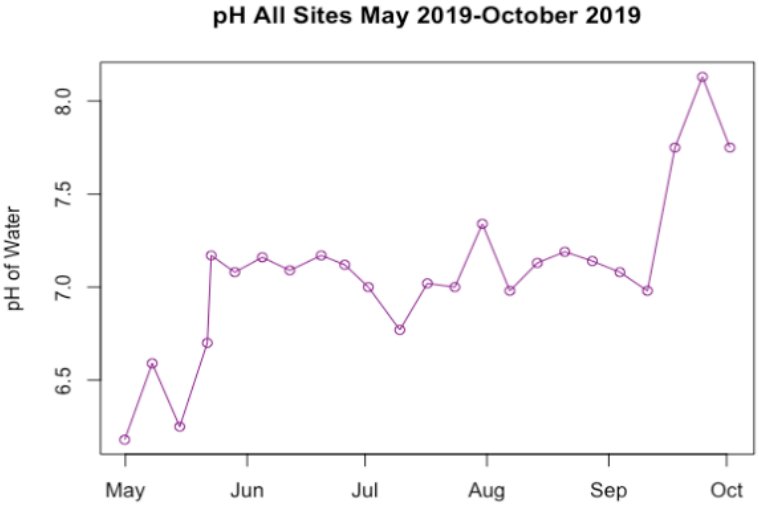


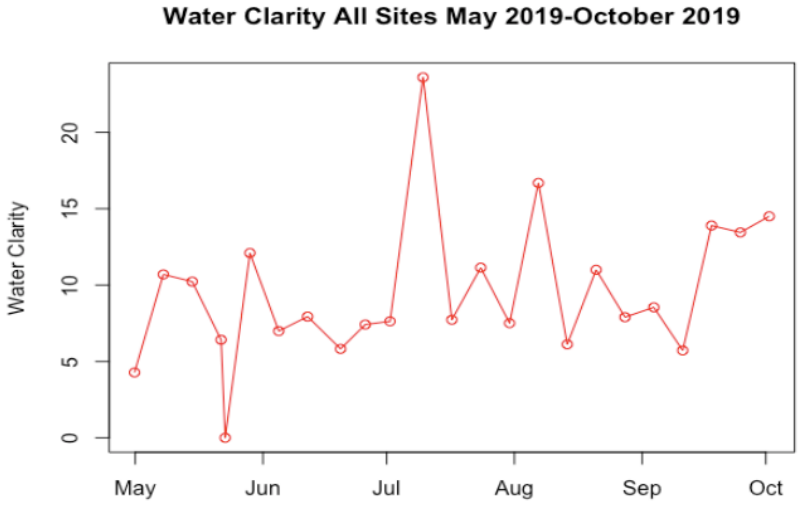
1 Potomac sampling sites PR1-7 are managed under the DC Citizen Science Water Quality Monitoring, a program of the Department of Energy and Environment (DOEE), implemented by Anacostia Riverkeeper. Anacostia Riverkeeper is the project lead, and DOEE is the funder. District of Columbia Department of Energy and Environment (DOEE) and Anacostia Riverkeeper project (Grant #RFA 2018-1805-WQD-VWQM). See DOEE's Citizen Science webpage: http://doee.dc.gov/service/citizen-science-initiatives

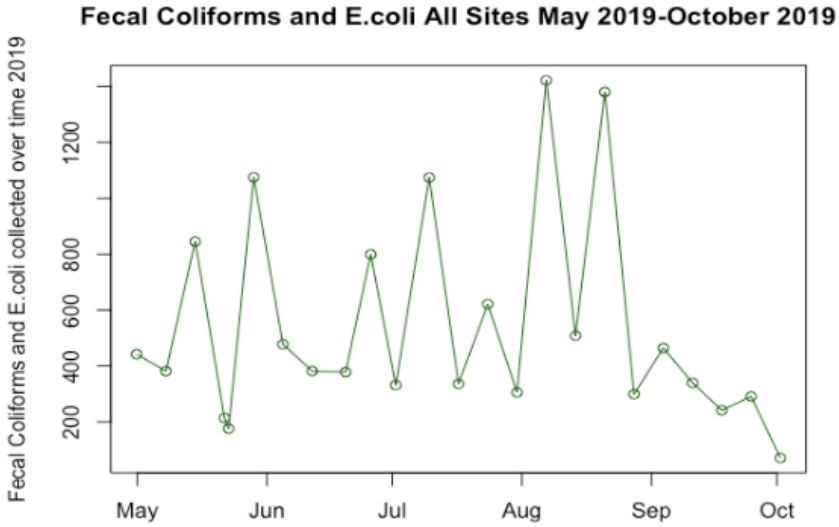
2 The first five weeks of data for PR1-7 are single samples, as geometric mean cannot be calculated until after 5 weeks of results. May 29th marks the beginning of geometric mean data.

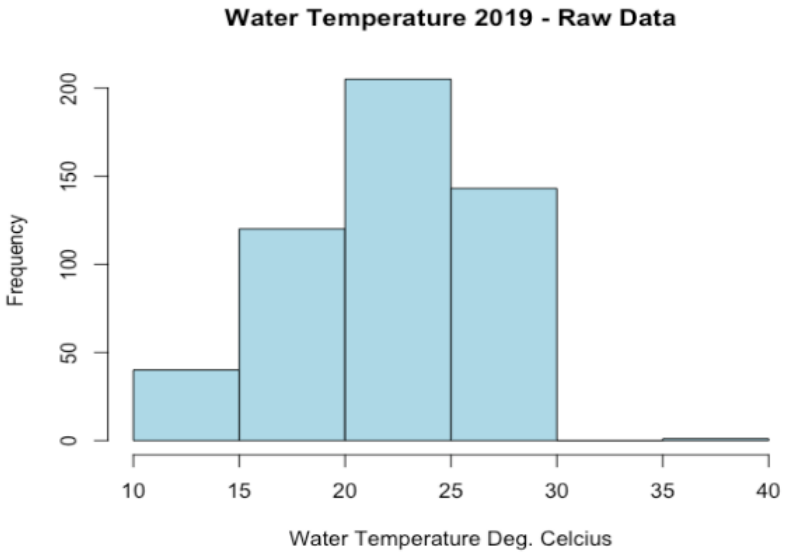

Water Temperature All Sites May 2019-October 2019
Water Temperature degrees Celcius
14
16
18
20
22
24
26
May
Jun
Jul
Aug
Sep
Oct

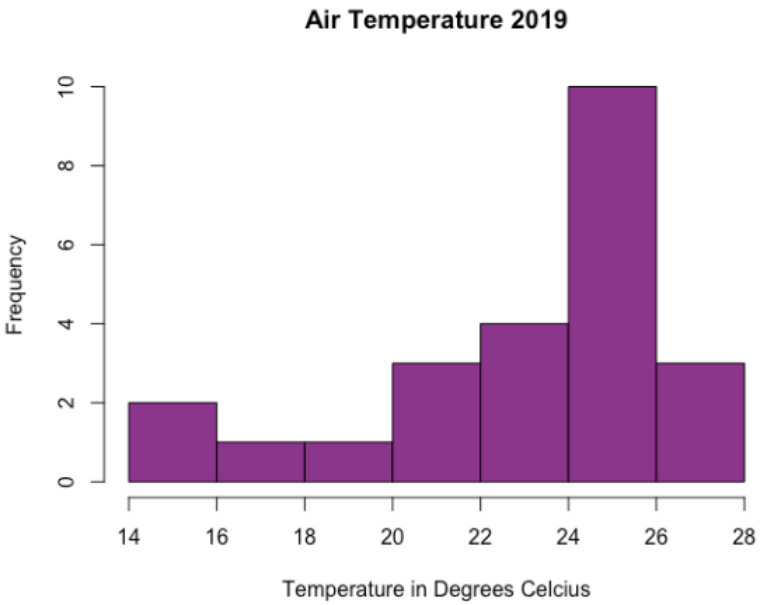

Air Temperature All Sites May 2019-October 2019
Air Temperature degrees Celcius
14
16
18
20
22
24
26
28
May
Jun
Jul
Aug
Sep
Oct

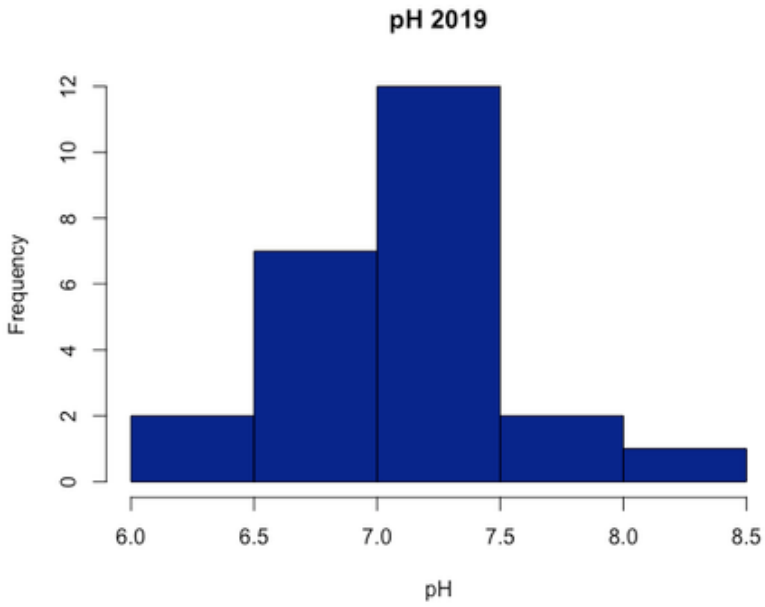

pH All Sites May 2019-October 2019
pH of Water
6.5
7.0
7.5
8.0
May
Jun
Jul
Aug
Sep
Oct

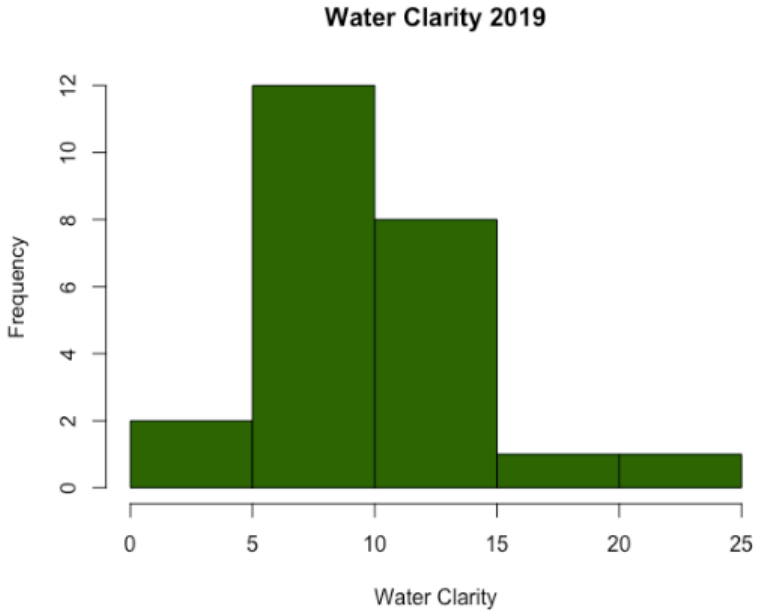

Water Clarity All Sites May 2019-October 2019
Water Clarity
0
5
10
15
20
May
Jun
Jul
Aug
Sep
Oct

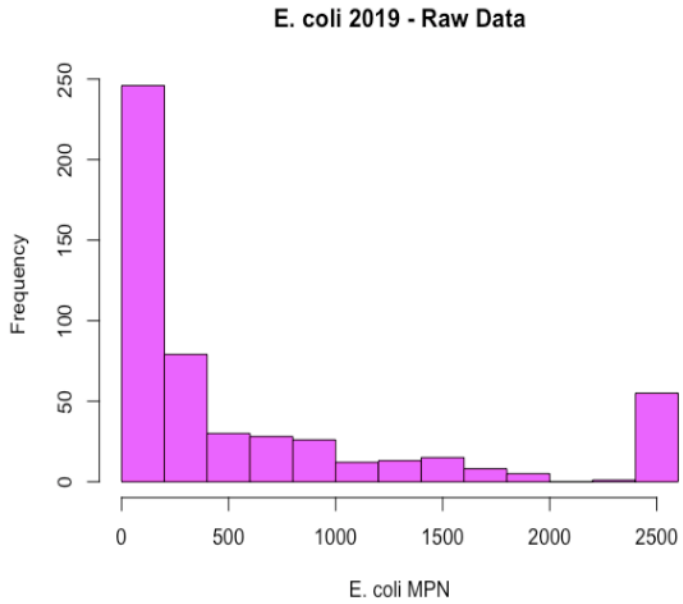

Fecal Coliforms and E.coli All Sites May 2019-October 2019
Fecal Coliforms and E.coli collected over time 2019
200
400
600
800
1200
May
Jun
Jul
Aug
Sep
Oct


Water Temperature 2019 - Raw Data
Frequency
0
50
100
150
200
10
15
20
25
30
35
40
Water Temperature Deg. Celcius


Air Temperature 2019
Frequency
0
2
4
6
8
10
14
16
18
20
22
24
26
28
Temperature in Degrees Celcius


pH 2019
Frequency
0
2
4
6
8
10
12
6.0
6.5
7.0
7.5
8.0
8.5
pH


Water Clarity 2019
Frequency
0
2
4
6
8
10
12
0
5
10
15
20
25
Water Clarity


E. coli 2019 - Raw Data
Frequency
0
50
100
150
200
250
0
500
1000
1500
2000
2500
E. coli MPN

A SPECIAL THANKS TO THE SPONSORS & PARTNERS OF THIS PROJECT

National Marine Sanctuary Foundation
DISCOVER WONDER

The Hunting Creek Garden Club
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Rock Creek Conservancy