District of Columbia Citizen Science Water Quality Monitoring Report

2024

ALLIANCE for the Chesapeake Bay

DEPARTMENT OF ENERGY & ENVIRONMENT

GOVERNMENT OF THE DISTRICT OF COLUMBIA
MURIEL BOWSER, MAYOR

Executive Summary

The DC Citizen Science Water Quality Monitoring Program has gathered and shared water quality data for 24 sites since 2019. With six years of data, we can examine trends in recreational water quality criteria: *E. coli* bacteria, turbidity, and pH. This has helped us understand which sites consistently have good water quality, where restoration is needed, and how rain influences water quality. We've found a few key takeaways:

1 Precipitation

After rain, pollutants including bacteria can be washed into streams and rivers across DC through **stormwater runoff.** We consistently found higher bacteria levels after rain.

2 Mainstem vs. Tributaries

Mainstem river sites have higher **water volume** than streams, which helps dilute bacteria. Streams usually weave closer to urbanized areas, so stormwater runoff has a more immediate effect on them.

3 Wastewater infrastructure

A major source of bacteria is from wastewater systems. DC Water's Clean Rivers Project builds new overflow tunnels and fixes aging sewer pipes. Sites affected by completed projects have better water quality.

Good Recreational Water Quality

Kingman Island (AR-3)
Buzzard Point (AR-6)
Washington Channel (AR-7)
Tidal Basin (PR-6)
Columbia Island (PR-7)

What do these have in common?

They are on the **mainstem** of rivers, so they get a lot of water flowing through the sites, which dilutes these sites' bacteria levels. They are also generally further **downstream** and far from combined sewer outfalls.

Poor Recreational Water Quality

Hickey Run (AR-2)
Watts Branch (WB-1 & WB-2)
Rock Creek at Juniper St. (RC-1)
Normanstone Run (RC-7)

What do these have in common?

These sites are particularly unsafe for human and pet contact. They are small **streams**, so they have relatively little water flow. These sites' bacteria levels are heavily influenced by precipitation and weaknesses in wastewater infrastructure.

We encourage you to check the water quality before recreating and avoid contact with water for 72 hours after rain. During the summer, weekly results can be found on the Chesapeake Monitoring Cooperative's Data Explorer, the Alliance for the Chesapeake Bay website, and social media. Share this data and knowledge with your community to raise awareness about water quality in the District.

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Introduction

Swimming has been illegal in District waters since the 1970s. The swim ban was established to protect human health as waters throughout the District have historically suffered from poor water quality. Today, recreation along waters in the District is increasingly popular, despite variable water quality. In order for people to safely enjoy our local waterways, timely water quality data needs to be available to the public so they can make informed decisions about their potential water-contact recreation activities like rowing, boating, kayaking, fishing, and walking on trails with stream crossings.

In 2018, the District of Columbia Department of Energy and Environment (DOEE) awarded a grant to Anacostia Riverkeeper and their partners to establish a volunteer-based water quality monitoring program in District waters and provide up-to-date information about the safety of the water near popular recreation sites. The summer of 2024 marked the sixth year of this project, with Alliance for the Chesapeake Bay currently implementing the project along with partners; Anacostia Riverkeeper, Nature Forward, and Rock Creek Conservancy.

As in most urban watersheds, sewage and stormwater runoff are the biggest contributors to high bacteria levels in District waters. DC's wastewater system is split into two types: a combined sewer system (CSS) and a Municipal Separate Stormwater Sewer System (MS4). In areas serviced by CSS, rainwater and sewage are combined, which can lead to overflows of sewage (CSOs) into rivers after rain events. MS4 maintains separate piping for rainwater and sewage, and rainwater flows directly into waterways without being treated.

Climate change is leading to more significant storm events, increasing stormwater runoff and the frequency of CSOs. Infrastructural improvements have made important strides in mitigating stormwater and improving water quality across the District. Tunnels built by the DC Water Clean Rivers Project have reduced CSOs by holding excess water from heavy rain events that would otherwise overflow into the river. The Anacostia Tunnel was completed in 2018, the Northeast Boundary Tunnel was completed in 2023, and the Potomac River Tunnel broke ground in May 2024 and is set to be completed in 2030.

This report covers key data and takeaways from citizen science monitoring from the 2024 season and gives insight into recreational water quality near popular recreation sites across the District.

Project Overview

Volunteer citizen science monitors collect water quality samples and measurements on Wednesday mornings from 24 sites across the Anacostia River, Potomac River, and Rock Creek for 20 weeks from May to September. At each site, monitors measure air temperature, water temperature, and pH, collect water samples for bacteria and turbidity analysis, and record observations about the site (stream flow, odor, debris, recreation, etc.). Water samples are then analyzed at Anacostia Riverkeeper's lab with results reported weekly on social media, the Alliance for the Chesapeake Bay website, and the Chesapeake Monitoring Cooperative's Data Explorer.

What are we monitoring?

Fecal Indicator Bacteria (*E. coli*)

Bacteria can enter waterways from sewage and stormwater runoff. The program analyzes *E. coli*, which serves as an "indicator" of potentially harmful pathogens that can cause illness in humans.

Turbidity

Turbidity is a measure of water clarity, or how much "stuff" is suspended in the water. Suspended sediment can act as a vector for bacteria, so higher turbidity is thought to be associated with higher bacteria.

Acidity or Alkalinity (pH)

pH is the measure of how acidic or alkaline a waterbody is on a scale of 0 (very acidic) to 14 (very alkaline).

Water and Air Temperature

Temperature has daily and seasonal cycles and affects both the biological and physical characteristics of an ecosystem.

How do we analyze samples?

Monitors collect two water samples per site and deliver them to Anacostia Riverkeeper's lab to analyze *E. coli* and turbidity. pH is measured directly at each site using Hydrion litmus paper strips.

E. coli samples are analyzed using the IDEXX Colilert system. Each sample is mixed with a Colilert reagent, poured into a quanti-tray, and placed in an incubator at 35℃ for 24 hours. The quanti-tray is then examined under blacklight to count how many wells glow, indicating the amount of *E. coli* in the sample. *E. coli* is reported in Most Probable Number of Coliform Forming Units (MPN) per 100mL of sample.

Turbidity samples are assessed using a LaMotte 2020we/wi turbidimeter, which passes light through the sample to measure its clarity. If a lot of light passes through, turbidity is low, and vice versa. Turbidity is reported in Nephelometric Turbidity Units (NTU).

When is water safe for recreation?

While there are natural bacteria that occur in our waterways, harmful bacteria from the feces of humans and other warm-blooded animals can enter waterways through stormwater runoff and leaks or overflows from the sewer system. The District has recreational water quality standards to reduce the risk of illness from water contact while recreating in rivers and streams. The District's standards use two measures of *E. coli* (Single Sample Value and Geometric Mean), turbidity, and pH in its water quality criteria. **For a site to pass recreational standards in a given week, it needs to meet all of the below criteria.**

Water Quality Criteria

Single Sample *E. coli*
passes below **410** MPN/100ml

Geometric Mean *E. coli*
passes below **126** MPN/100ml

pH
passes between **6-8.5**

Turbidity
passes below **20** NTU

Single Sample Value (SSV) is the *E. coli* level from the most recent Wednesday's monitoring at each site.

Geometric Mean (GeoMean) is a special average of the last five weeks of single sample *E. coli* values for each site. GeoMean gives a better general sense of a site's water quality, accounting for fluctuations over a longer period of time.

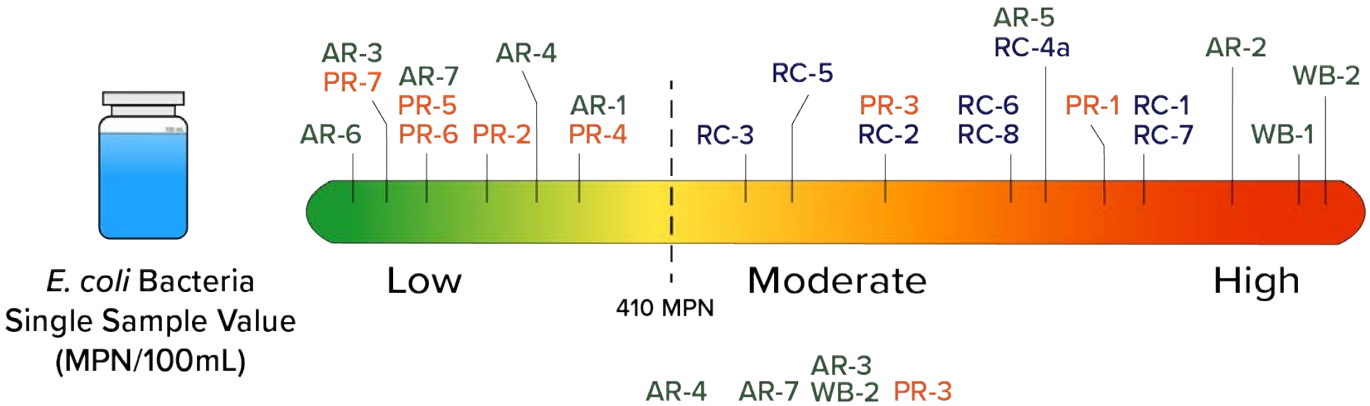
In 2024, we adjusted how we report weekly results to align with current District recreational water quality standards. In social media posts and in this report, a green icon indicates the site passed all criteria, a yellow icon indicates it failed one criteria, and a red icon indicates it failed more than one criteria in a given week.

*Water quality is generally worse after rain. To track trends with rain, we define "dry" and "wet" conditions, where a "wet" day indicates there was more than 0.5 inches of rain in the 72-hours before sampling.

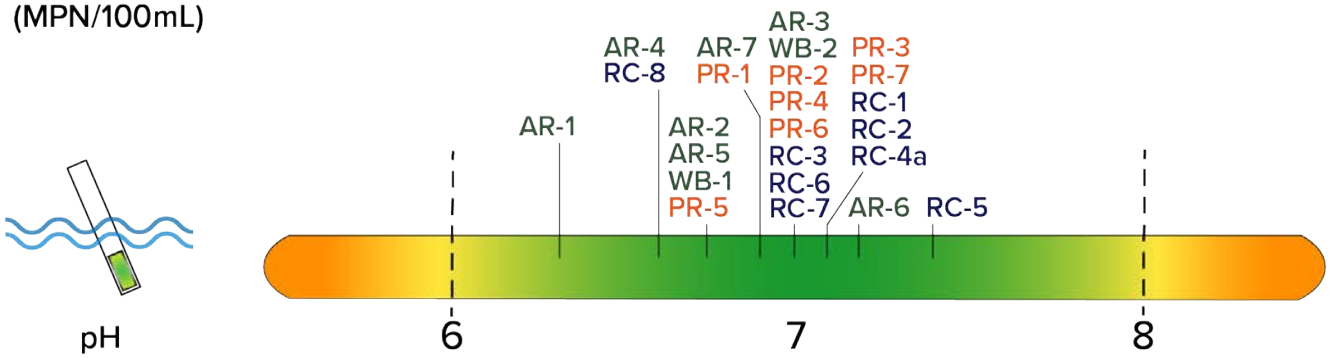
2024 DC Recreational Water Quality Snapshot

2024 Water Quality Averages for All Sites

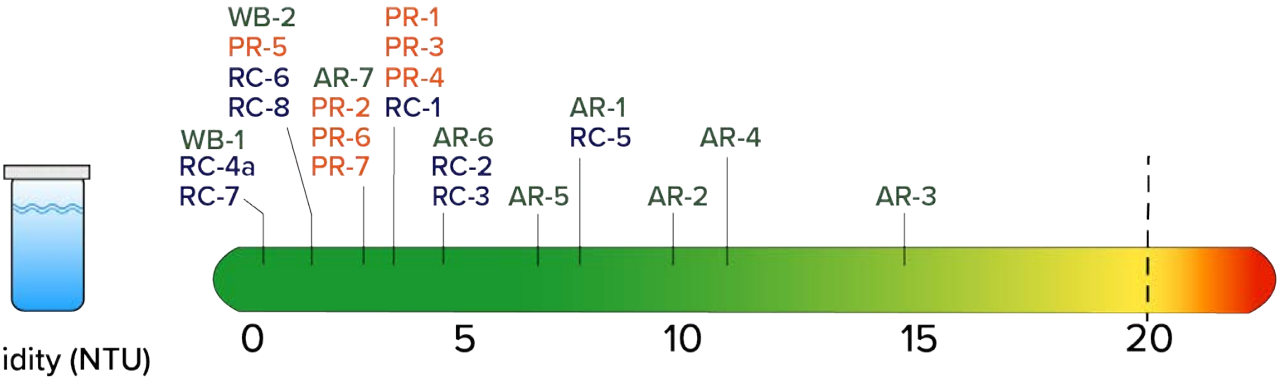
In 2024, water quality results showed similar trends to previous years. The graphic below shows the average values for key water quality criteria for every site in 2024. The dashed line shows the "passing" level for each criteria. While bacteria levels ranged across the monitored sites, all other measures of water quality including pH and turbidity were almost always within the acceptable range.



E. coli Bacteria Single Sample Value (MPN/100mL)



pH



Turbidity (NTU)

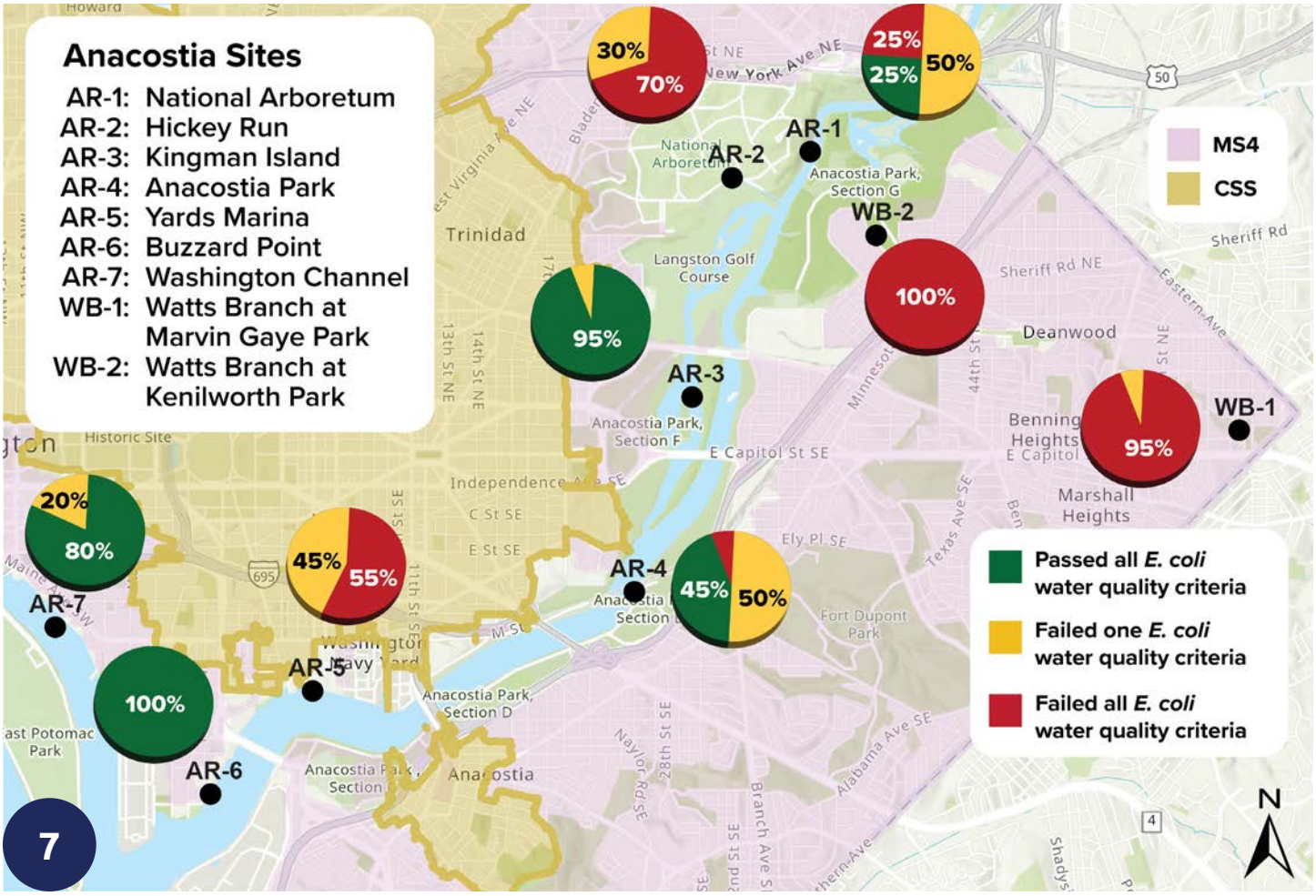
*Value is the mean per site for each water quality criteria for the 2024 season.

**Note that Geometric Mean *E. coli* is not included here because it is already a calculated special average of 5-weeks of data.

Anacostia River

The program monitors nine sites in the Anacostia watershed: six sites on the mainstem of the river and three in tributary streams. Mainstem sites show consistently better water quality than tributaries, given the increased flow and volume of water. Multiple mainstem locations, especially those far from CSOs, continued to show consistently passing water quality in 2024 — Buzzard Point (AR-6), Kingman Island (AR-3), and Washington Channel (AR-7). Buzzard Point passed both SSV and GeoMean *E. coli* criteria every week of sampling! The National Arboretum (AR-1) and Anacostia Park (AR-4) had more variable results. Yards Marina (AR-5) was particularly unpredictable this year with high bacteria levels on some weeks even in dry conditions. Watts Branch (WB-1 and WB-2), a major tributary flowing through Ward 7, failed water quality standards every week and continues to be a focused area in need of restoration work.

Percentage of weeks each site passed *E. coli* water quality criteria (2024)



*Graphic shows percent passing of District criteria for Single Sample *E. coli* and Geometric Mean *E. coli*.

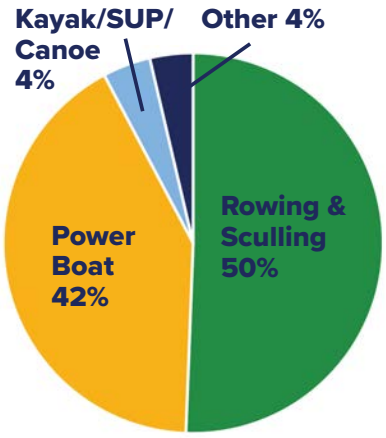
Recreational Use

Monitors observed 245 people recreating on the Anacostia River on Wednesday mornings. The most common activities were rowing/sculling and power boating. The Washington Channel (AR-7) and Anacostia Park Boat Ramp (AR-4) are great places to recreate given easy access and relatively good water quality. While shallow, Kingman Lake (AR-3) is a great spot for water-based recreation as well, including free opportunities like DOEE's Anacostia Green Boats program. Buzzard Point (AR-6) had the best water quality in 2024, however it does not currently have a safe access point.

"I row several times a week on the Anacostia and have come to love how it is both part of the city and a serene retreat from it. Monitoring gives me a chance to do a tiny bit to improve the health of this urban treasure.

- Susan Driano

Anacostia Recreation



Anacostia Watershed Summary

Better Water Quality for Recreation

Buzzard Point (AR-6)
Kingman Island (AR-3)
Washington Channel (AR-7)
Anacostia Park (AR-4)

mainstem sites passed

57%

of the time

tributary sites passed

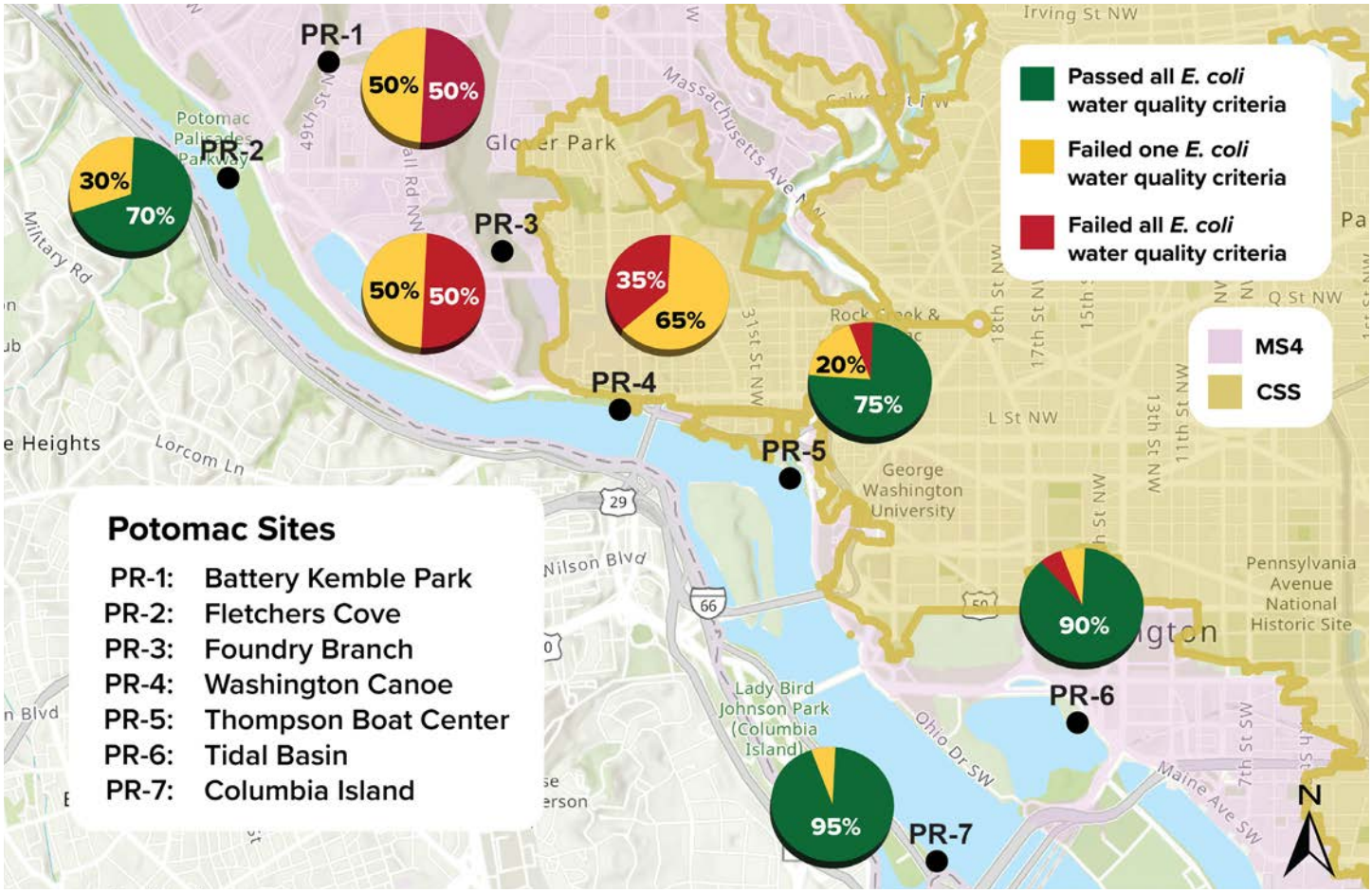
0%

of the time

Potomac River

There are seven sites monitored in the Potomac River watershed, with five on the mainstem and two in tributaries within the District. Columbia Island (PR-7) passed recreational water quality standards the most consistently each week, passing GeoMean every week and only failing Single Sample Value once. The next best sites were Thompson Boat Center (PR-5) and Tidal Basin (PR-6). These sites often met recreational water quality standards, but bacteria levels occasionally spiked during especially wet days. Fletchers Cove (PR-2) had relatively good results throughout the summer, but failed the criteria twice in dry conditions, indicating possible pollution sources separate from runoff during rain. Washington Canoe Club (PR-4), which is located directly next to a combined sewer outfall, and tributary sites Battery Kemble Park (PR-1) and Foundry Branch (PR-3) had extremely variable results in both dry and wet conditions.

Percentage of weeks each site passed *E. coli* water quality criteria (2024)



*Graphic shows percent passing of District criteria for Single Sample *E. coli* and Geometric Mean *E. coli*.

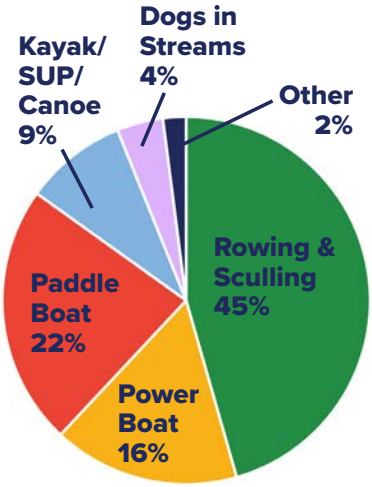
"Our family spends a lot of time fishing on the Potomac River. My son found out about the program and was interested in getting involved to help the quality and safety of the water in the place where he enjoys spending so much time.

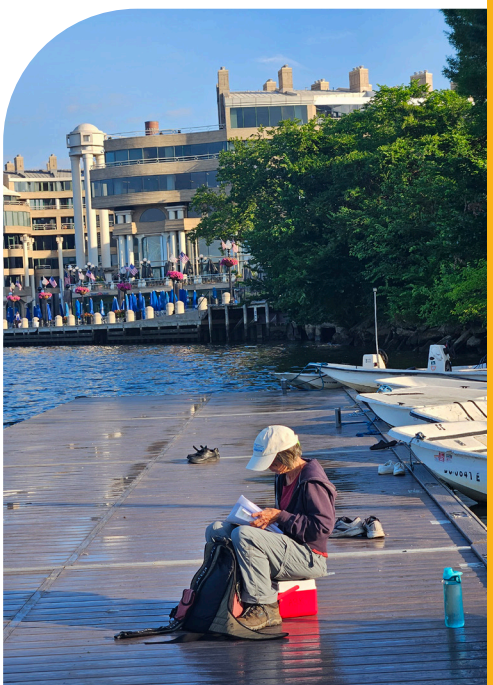
- Emma and Fisher Blankenbaker

Recreational Use

The Potomac River has the most recreation compared to the Anacostia River and Rock Creek, with 695 recreators observed by monitors through the 2024 season. Rowing/sculling, power boating, and paddle/swan boating make up most of the water-based activities. Thompson Boat Center (PR-5) and Fletchers Cove (PR-2) have rental programs and are great places to get out on the water. The Tidal Basin's (PR-6) swan boat rental program continues to be a popular activity, accounting for almost 1/4 of all observed recreation. Columbia Island (PR-7), located near a marina toward the Virginia side of the river, had the best water quality in 2024, suggesting that this stretch of the river is good for recreation.

Potomac Recreation





Potomac River Watershed Summary

Better Water Quality for Recreation

Columbia Island (PR-7)
Tidal Basin (PR-6)
Thompson Boat Center (PR-5)
Fletchers Cove (PR-2)

mainstem sites passed

65%

of the time

tributary sites passed

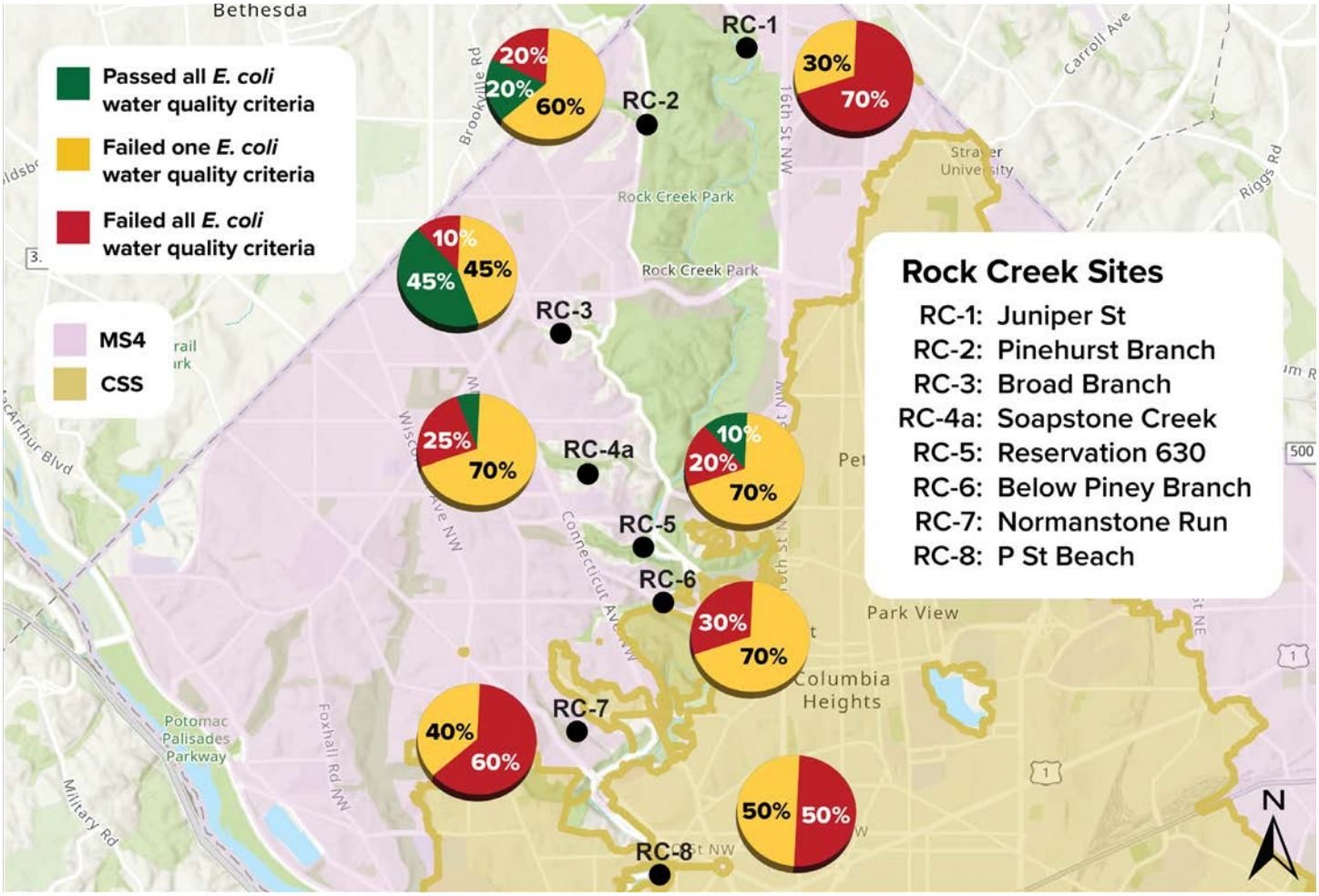
0%

of the time

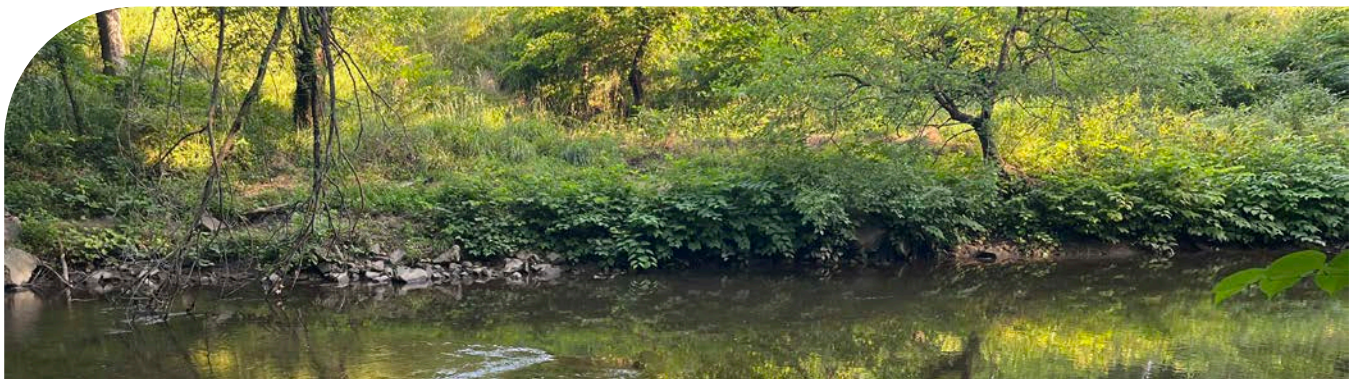
Rock Creek

Monitoring sites in Rock Creek span from the northern point of DC down to near where Rock Creek converges with the Potomac River. Despite its lush forest cover, Rock Creek and its streams continue to see generally poor overall water quality. Juniper St. (RC-1) and Normanstone Run (RC-7) had the worst water quality in 2024, never passing both *E. coli* criteria. While many sites passed Single Sample *E. coli* criteria in dry conditions, only a few sites ever passed all water quality criteria, emphasizing the variability of bacteria levels week to week in tributary streams. Broad Branch (RC-3) had the best water quality this year, though the site was often stagnant and had low water levels. DOEE is actively investigating illicit sanitary discharges in Pinehurst Branch (RC-2), Soapstone Creek (RC-4a), and Normanstone Run (RC-7) and will continue to find and ensure the repair of illicit connections.

Percentage of weeks each site passed *E. coli* water quality criteria (2024)



*Graphic shows percent passing of District criteria for Single Sample *E. coli* and Geometric Mean *E. coli*.



Rock Creek Watershed Summary

sites passed

12%

of the time in dry conditions

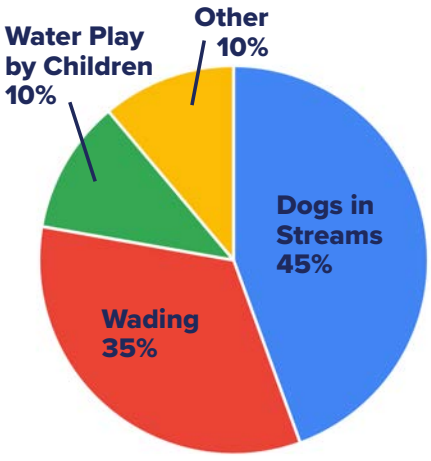
sites passed

4%

of the time in wet conditions

> "I love that I'm creating the data that will help us advocate for more swimmable water in the future! Also, throughout the summer I watched a family of ducklings at my site grow into full size ducks, which was wonderful!
>
> **- Anne Bernier**

Rock Creek Recreation



Recreational Use

Only 9 people were observed recreating in the water in Rock Creek in 2024. This was mostly dogs playing in the creek, though a few people were observed wading into the water. Rock Creek Conservancy and NPS implemented the #RecreateResponsibly campaign in 2020 to educate visitors about safe ways to enjoy Rock Creek. Rock Creek Park offers a great retreat from the city and can be enjoyed in many ways without water contact. Please protect yourself by staying on trails and out of the creek.

THANK YOU TO OUR VOLUNTEERS!

This project would not succeed without the dedication of all our citizen science volunteers who, for the past six years, have spent their Wednesday mornings collecting samples for this project. We thank them for their time, enthusiasm, and commitment to the District's waterways.

In 2024, the program trained 91 volunteers from all 8 DC wards, collected over 1,026 water samples, and provided over 1,920 data points in weekly water quality updates to DC recreators.

"It's a great way to get out along the rivers and enjoy them and their wildlife. To be able to help towards the goal of swimmable rivers in DC is important.

- Jeff Howdeshell

"I'm out in nature somewhere almost every day, so contributing data adds more purpose to my adventures.

- Nicholas Carson

"I spend a lot of time in the parks and on the rivers. I want to help improve water quality, and I've also learned a lot about how various factors affect the health of our waterways.

- Shannon Semler

"In a small way, I feel I am helping to advance the sustainability goals of the city. And I love my weekly little science kit!

- Nancy Skinkle

2024 Season Summary

2,400
data points

540
bacteria samples

91
volunteers

21.5 mi.
of water monitored

Conclusion

In the sixth year of the DC Citizen Science Water Quality Monitoring program, we continued to capture vital data about the health of District waterways to provide residents with the resources to make informed decisions about their potential water-based recreation.

Sites at Kingman Island, Buzzard Point, Washington Channel, Fletchers Cove, Thompson Boat Center, Tidal Basin, and Columbia Island consistently passed the District's recreational water quality standards. Other mainstem sites have more variability in water quality. Tributary streams consistently fail water quality standards, and should generally be avoided. Regardless of a site's historical passing rate, we encourage everyone to check weekly results during the summer before recreating.

The 2024 monitoring season had relatively little rainfall, with drought conditions present for much of the area, especially in the Potomac River watershed. This may have contributed to large increases in bacteria levels measured at some sites after only minimal rainfall perhaps due to pollutants accumulating on land and being washed into waterways all at once. Results from the 2024 monitoring season emphasize the importance of collecting weekly data across the District to continue to understand patterns in the changes to local water quality. We look forward to measuring the impact of more MS4 improvements across the District, fixes in some illicit connections identified near Watts Branch, and the continued construction of the Potomac River Clean Rivers Project Tunnel.

DOEE has funded our work in order to advance scientific and community understanding of safety in our beautiful waterways. Ultimately, all District waterways should be safe and clean enough to support swimming, fishing, and other recreation as well as a healthy aquatic ecosystem. The need to reduce bacterial pollution continues. Let's get the bacteria out and DC back in the water.

Want to become a monitor?

Training for the next season will begin in Spring 2025. The interest form can be found on the Alliance for the Chesapeake Bay's website. Follow us on social media or reach out to monitor@anacostiariverkeeper.org to stay updated.

Interested in the data?

Check out the Chesapeake Monitoring Cooperative's Data Explorer to see the full data, or email monitor@anacostiariverkeeper.org for specific questions. During the summer, check social media for weekly results.

DEPARTMENT OF ENERGY & ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

WE ARE WASHINGTON DC
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ALLIANCE
for the Chesapeake Bay

ANACOSTIA RIVERKEEPER®

ROCK CREEK CONSERVANCY

nature forward

Appendix

Do you want to dig into the data more? You'll find more graphics displaying water quality data below.
Questions? Contact monitor@anacostiariverkeeper.org

Fig. 1: Percent of All DC Sites Passing Single Sample *E. coli* vs. Rainfall

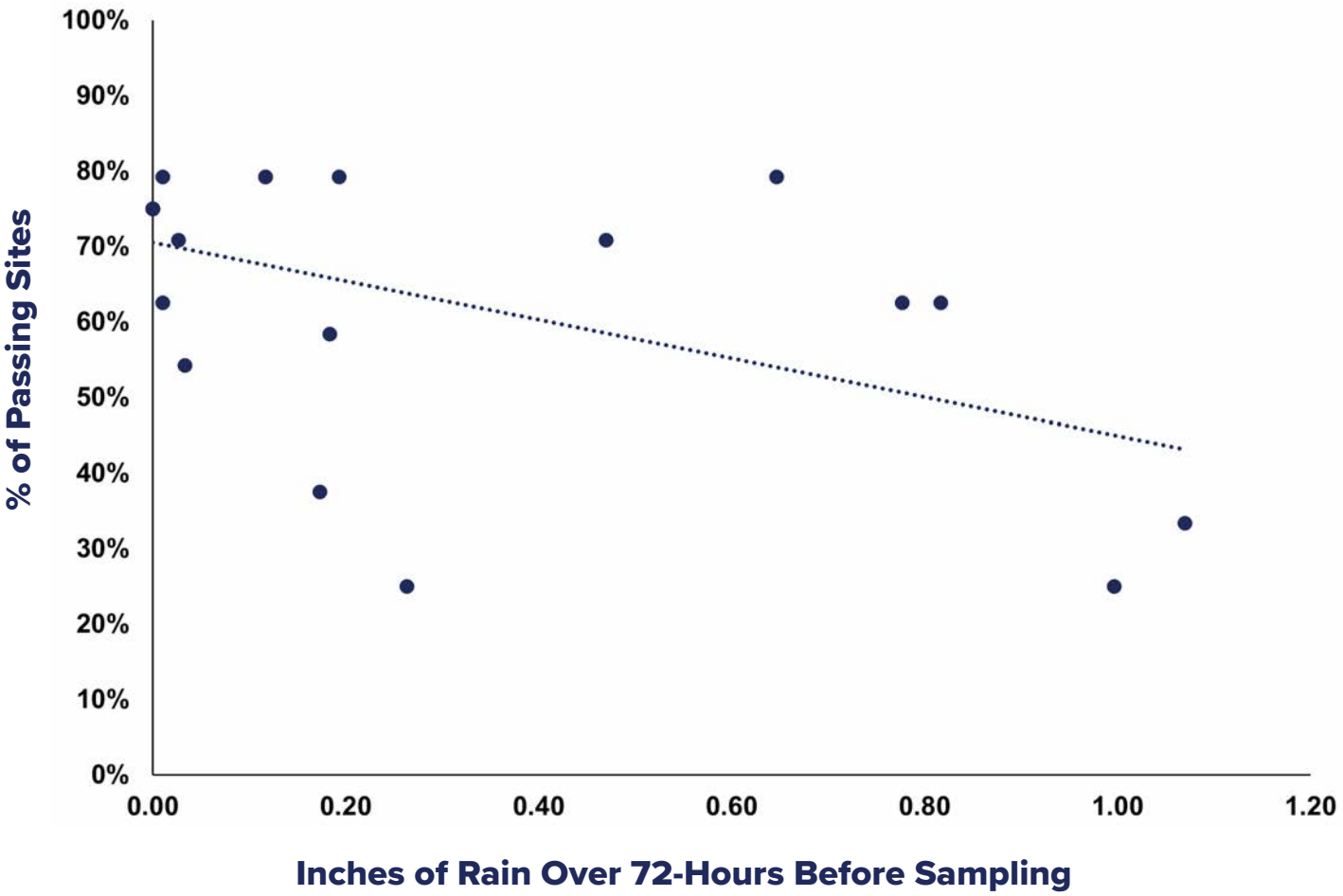


Fig. 2 Percent of Sites Passing Single Sample *E. coli* Under Dry and Wet Conditions (2024)

Watershed	All Sites		Mainstem Sites		Tributary Streams	
	Dry	Wet	Dry	Wet	Dry	Wet
Anacostia	60.4%	50.0%	85.4%	70.8%	10.4%	8.3%
Potomac	79.6%	77.1%	90.0%	92.0%	53.6%	40.0%
Rock Creek	60.8%	40.0%	N/A	N/A	60.8%	40.0%

*"Wet" conditions are defined as more than 0.5 inches of rain in the 72 hours before sampling with rain data from the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS).
**All Rock Creek sites are considered tributaries for this table.

Fig. 3: Anacostia Watershed Sites Single Sample *E. coli* and Rainfall (2024)

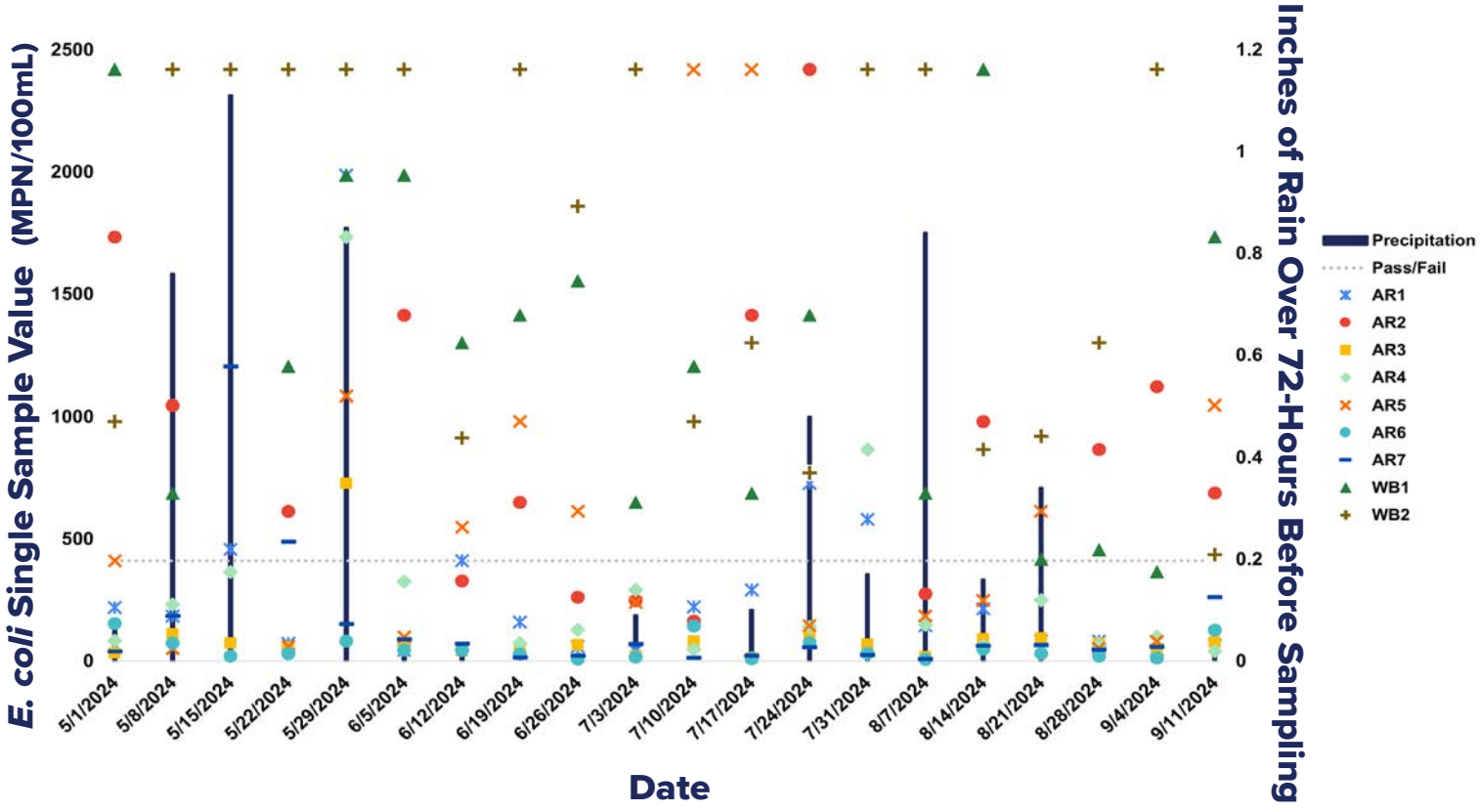


Fig. 4: Potomac Watershed Sites Single Sample *E. coli* and Rainfall (2024)

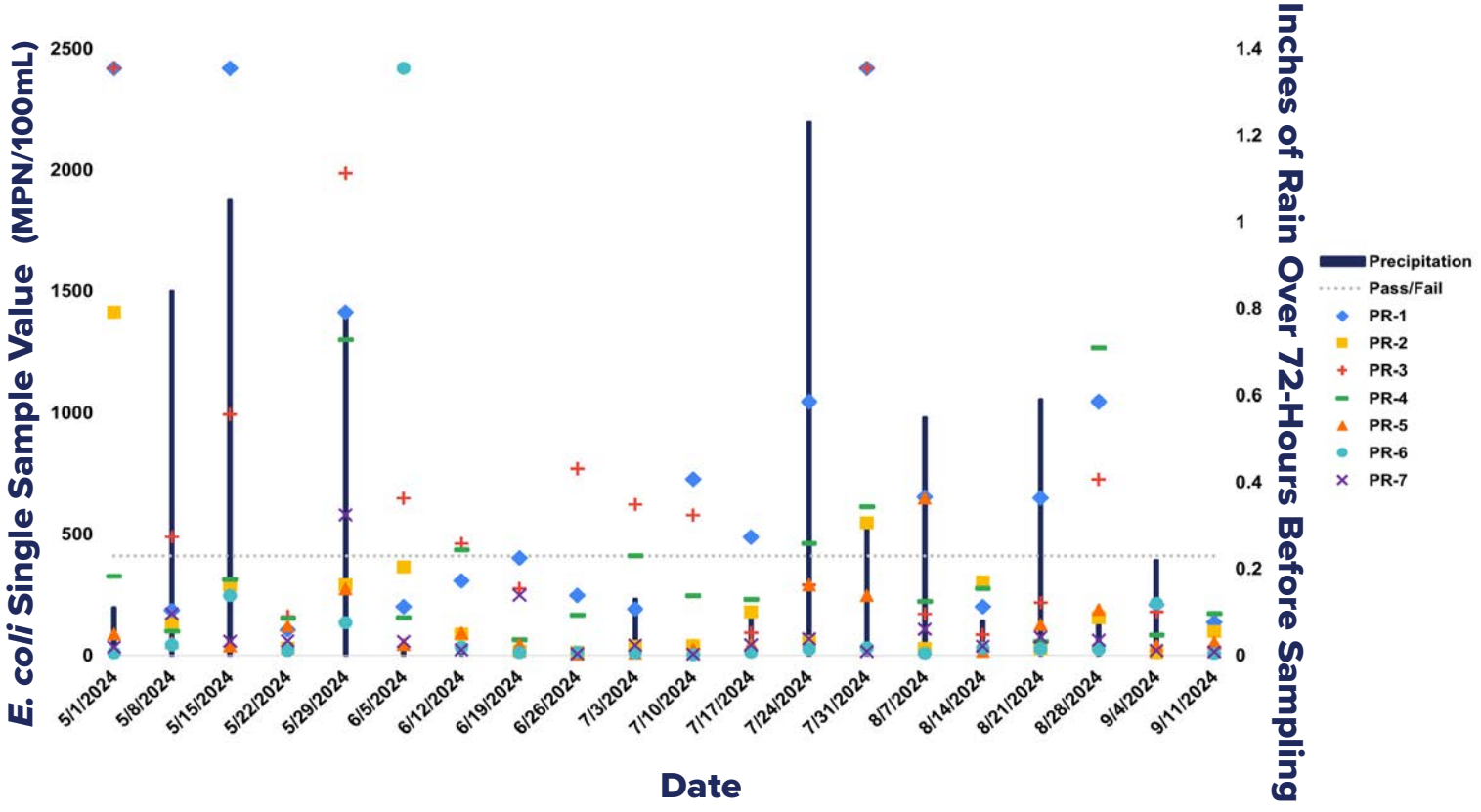


Fig. 5: Rock Creek Watershed Sites Single Sample *E. coli* and Rainfall (2024)

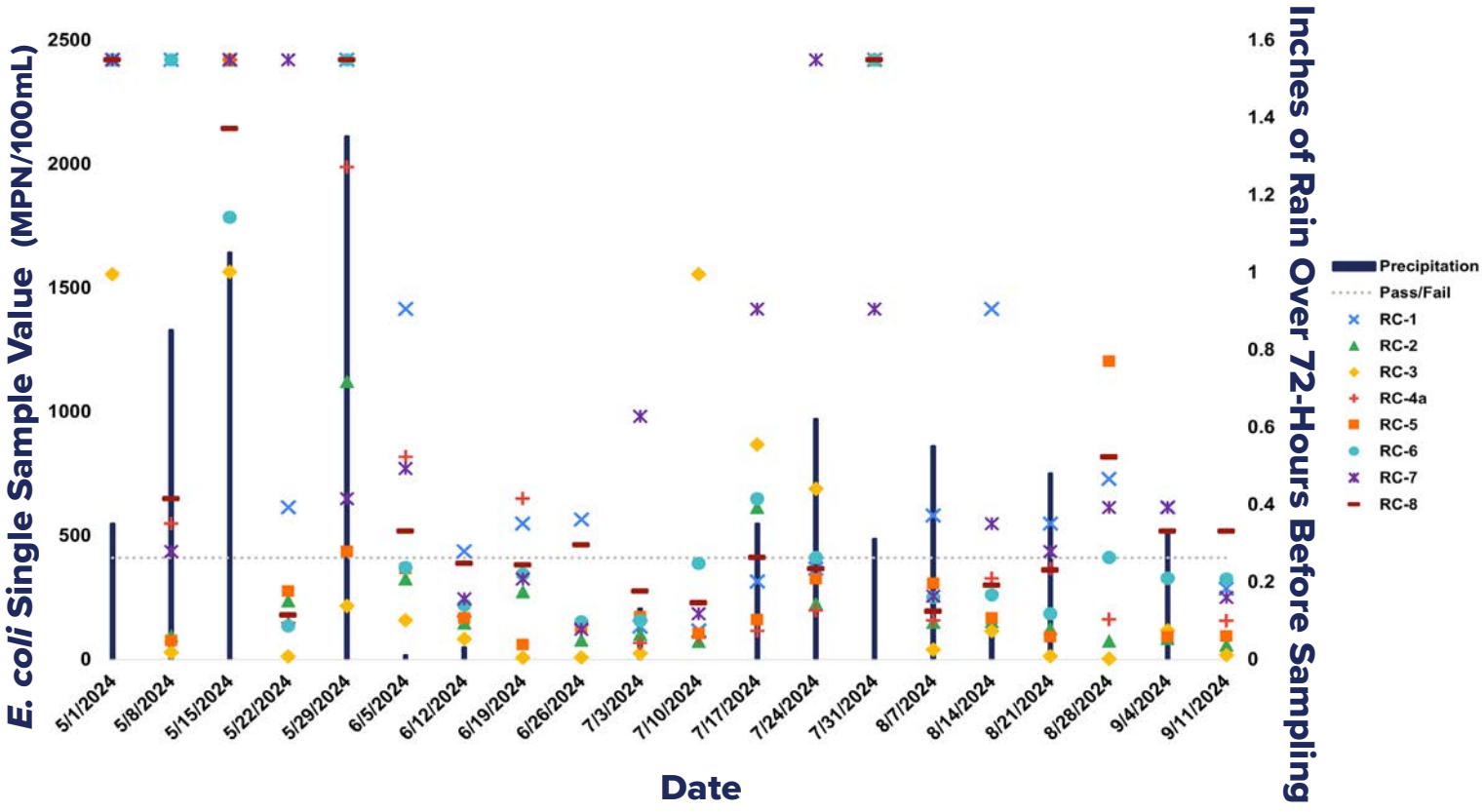
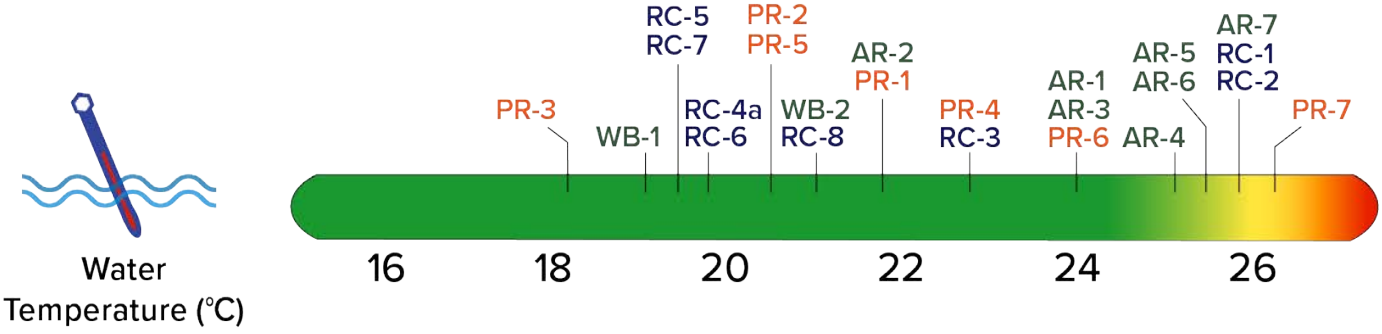


Fig. 6: Average Water Temperature for All Sites (2024)



*Value is the mean per site for the 2024 season.