Rivanna River Watershed
2021 Stream Health Report

Monitoring Program Results from 2018 to 2020

RIVANNA
CONSERVATION ALLIANCE

Our Mission Working with the community to conserve the Rivanna River and its tributaries through monitoring, restoration, education, and advocacy.

Our Vision We envision a healthy Rivanna River and watershed that benefits an engaged community.

Water Quality Monitoring in 2020

For the Rivanna Conservation Alliance's (RCA) Water Quality Monitoring Program, the disruptions of 2020 offered a master class on adaptation, creativity, and perseverance. We had to rethink everything.

For bacteria monitoring, we used only staff and trained board members to sample until we had protocols in place to keep our volunteers safe. For spring biological monitoring, our certified monitors worked with their own family members to sample. In the fall, when some of us needed a break from family time, we purchased additional equipment so certified monitors could work with each other but stay socially distanced. Throughout the year, staff filled in the gaps as much as possible and completed all the indoor lab work.

Fortunately, we were able to complete all of our monthly and weekly bacteria samples as many more community members looked to that data before heading out to the river. We focused biological monitoring on the highest priority sites, including those in the South Fork Rivanna TMDL (cleanup plan) study area, long-term reference sites, and others.

Unable to shuttle boats together by car, RCA's River Stewards focused on reservoir paddles and bike shuttling from Darden Towe to Riverview. When schools went virtual, we turned our middle school watershed monitoring field trip program into an at-home stream investigation activity. We created water quality testing kits and delivered them to students' doorsteps.

While our monitoring program proved highly resilient to the disruptive forces of 2020, our stream health scores unfortunately did not. The percentage of our sampled streams that failed to meet water quality standards for aquatic life grew from 68 percent in last year's report to 82 percent in this one. We calculate scores using the previous three years of data, in this report, 2018, 2019, and 2020.

Scores in 2018 and 2019 were suppressed, possibly by extreme rain events that scoured stream habitat. Missing data from 2020 also seemed to contribute to some sites falling in

the rankings. Most notably, seven of the nine sites that moved from an assessment of very good or good down to fair were affected by unusually large hatches of black fly larvae that reduced biodiversity in our samples. While the portion of sites that fail the water quality standard is higher than usual in this report, we will need to eye future results to tell whether this was anomalous or part of a trend.

Despite these many challenges, 2020 had its inspiring moments too. We were reminded again that our volunteers are truly the backbone of our monitoring program. Those who could monitor went above and beyond to get it done. 54 volunteers contributed 688 hours of monitoring effort.

Another inspiration was the completion of our first Benthic Trends Analysis, where we analyzed 15 years of our long-term data to identify statistically significant trends in stream health at our 50 sites. We found four sites that improved and only one that got worse. For each site that improved, we were able to identify a large-scale water quality improvement effort that had taken place upstream, such as a major stream restoration, large buffer plantings, or improvements in wastewater treatment. These findings give us hope that efforts to restore stream health make a difference.

Finally, we were greatly inspired to see more people in our community discovering what we've known all along – that our waterways are wonderful and essential places for us to escape, explore, recreate, and recharge. We were reminded that stream health is not just about bugs. It is also about the health of our community. Whatever lies ahead, RCA plans to continue collecting the important data needed to help protect both.

With gratitude,

Lisa Wittenborn,
Executive Director

An important goal of RCA's Water Quality Monitoring Program is to use monitoring activities to increase the community's understanding of water quality and local stream health. RCA's River Stewards support this goal by serving as the community's eyes on the Rivanna, conducting regular paddling investigations of the navigable waterways, reporting any issues or problems to the community, and helping find and implement solutions. RCA's educators also help by engaging students in hands-on monitoring activities that help bring the issue of stream health to life and highlight its importance to our community.

In 2020, RCA's staff and volunteers for both efforts had to think outside the box to continue their important work. Since the River Stewards were unable to drive together to shuttle boats, they focused their paddles mostly on area lakes and reservoirs. They also increased their patrols along the popular Darden Towe to Riverview Park section of the Rivanna, where they could shuttle by bicycle.

With visitation to the Rivanna at an all-time high, the Stewards observed a dramatic increase in trash in and along the River. To help combat this problem, they created a

weekly volunteer cleanup event called Clean Stream Tuesdays. Each week, when possible, volunteers removed trash and debris between the Rivanna River Company and Riverview Park by boat. To address more widespread trash, RCA organized a socially-distanced watershed cleanup event called the Rivanna River Round-Up in the fall. The event involved nearly 100 community volunteers of all ages in collecting trash and debris from our waterways and nearby trails. Collectively, they removed 121 tires, 70 large bags of trash, and lots of bulky debris.

RCA's educators also had to change plans to carry out their activities. When RCA was unable to take Burley Middle School's 6th graders on their annual watershed studies field trip, RCA reimagined the experience as a self-guided activity that students could use to explore their own neighborhood streams. RCA created individual stream testing kits for more than 300 students at Burley and Jack Jouett Middle Schools, giving them a much-needed chance to leave computers behind and learn by getting their hands wet.
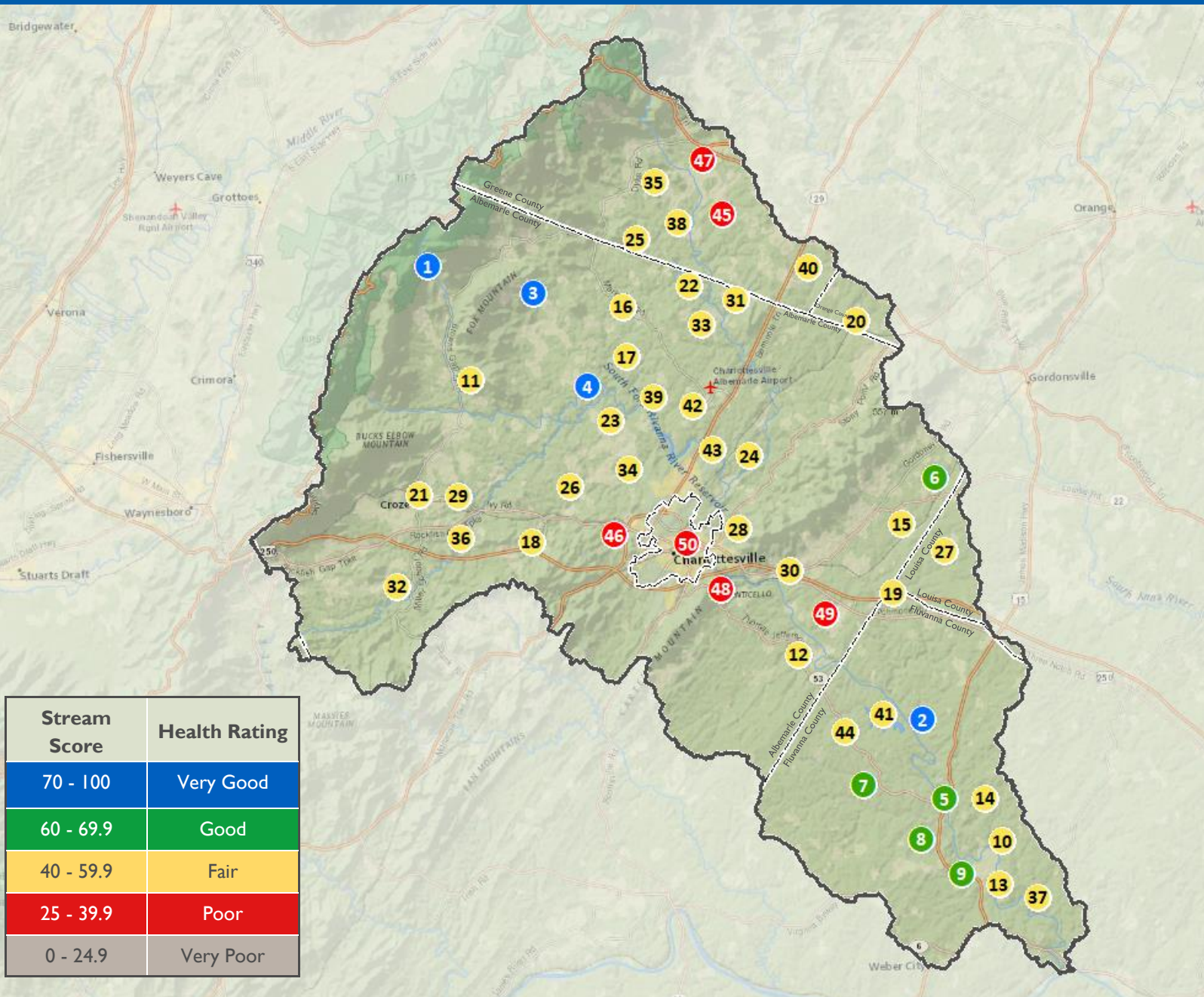

Rebecca George Photography

River Steward and Education Numbers

- 10 steward paddles
- 33 miles of river and reservoir paddled
- 9 river cleanups
- 124 volunteers
- 435 volunteer hours
- 800 youth engaged in hands-on activities
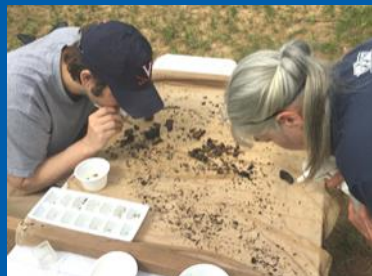- 300 stream testing kits created and distributed to 6th grade science students

Stream Score	Health Rating
70 - 100	Very Good
60 - 69.9	Good
40 - 59.9	Fair
25 - 39.9	Poor
0 - 24.9	Very Poor

How We Evaluate Stream Health

Volunteer monitors follow strict protocols to collect benthic macroinvertebrates with a net.

Volunteers sort, count, and identify the organisms to the family-level.

Each sample produces a score that is determined by factors such as the number, types, pollution sensitivity, and diversity of organisms.

RCA analyzes three years of data to determine the overall rating for the site.

#	Site Name	Change	
1	Doyles River upper at National Park Boundary		
2	Fluvanna County Rural Stream - A		
3	Albemarle County reference stream #2		
4	Moormans River at 601	▲	
5	Cunningham Creek at 15		
6	Turkeysag Creek at 22	▲	
7	Cunningham Creek Middle Fork - Bell Farms Ln	▲	
8	Raccoon Creek at 15		
9	Rivanna River downstream of Palmyra		
10	Long Island Creek at 601	▼	🦟
11	Doyles River at 674	▼	🦟
12	Buck Island Creek at 729	▼	
13	Carys Creek at 15		
14	Ballinger Creek downstream of 625		
15	Mechunk Creek upper at 600		
16	Buck Mountain Creek upper west of 665 - A	▼	
17	Buck Mountain Creek at 665 - A	▼	🦟
18	Ivy Creek in Rosemont		
19	Mechunk Creek at 759	▼	🦟
20	Burnley Branch at Burnley Station Rd	▼	
21	Powells Creek above Lickinghole Creek		
22	Swift Run at 605		🦟
23	Mechums River at 601	▼	🦟
24	North Fork at Forks of Rivanna		
25	Lynch River at 603		🦟
26	Little Ivy Creek at Kingston Road		
27	Beaverdam Creek East Prong		
28	Rivanna River at Darden Towe		
29	Lickinghole Creek near Fairwinds Ln		
30	Rivanna River at Milton		
31	Marsh Run upstream of 641		
32	Mechums River at 692 - B		
33	N Fork Rivanna River at Advance Mills		
34	Ivy Creek at 601		
35	Parker Branch at 633		
36	Stockton Creek at 683 - B		
37	Rivanna River at Rivanna Mills		
38	Roach/Buffalo River north of 648	▼	🦟
39	Fishing Creek west of Willwood Dr		
40	Preddy Creek west of Rosewood Dr		
41	Rivanna River at Crofton - A		
42	Naked Creek at 844 - B		
43	South Fork at Forks of Rivanna		
44	Lake Monticello Trib #1 into Jackson Cove		
45	Quarter Creek in Twin Lakes		
46	Morey Creek south of Bellair		
47	Stanardsville Run near N Ridge Wy		
48	Moores Creek near Woolen Mills		
49	Carroll Creek in Glenmore		
50	Meadow Creek west of Locust Lane Ct		

RCA's Level III Biological Monitoring Program collects data at 50 long-term monitoring sites twice annually throughout the Rivanna River


An adult dragonfly hatches along the Rivanna River.

watershed. Monitors sample benthic macroinvertebrates, the small organisms that live along the bottom of rivers and streams. Because these organisms vary in sensitivity to pollution in known ways, the types and diversity at each site can generate a stream health score. These scores show how conditions are changing over time.

Streams rated as Very Good (blue) and Good (green) meet Virginia's water quality standard for aquatic life. Those rated as Fair (yellow), Poor (red), or Very Poor do not. A large portion of the Rivanna watershed streams score as Fair or Good, and it is common for sites to switch between these two ratings from report to report. Eight sites changed from Good to Fair and two sites changed from Fair to Good since the last report. This overall downward trend is likely due in part to record rainfalls in the reporting period, primarily 2018, and associated high flows and stream scouring. Monitors were unable to collect samples at 13 sites in 2020, giving the 2018-2019 data even more weight. Some 2020 samples were comprised primarily of blackfly larvae*, resulting in low biodiversity and lower scores. These sites are noted in the table with a black fly icon (🦟). One site moved from Good to Very Good due to the addition of new, high-scoring data collected in spring 2020.

*VADEQ directed RCA to include these as valid samples in our analyses.

82% of the sites RCA sampled from 2018-2020 failed to meet Virginia's water quality standard for aquatic life.

Pie chart: 8.0%, 10.0%, 70.0%, 12.0%
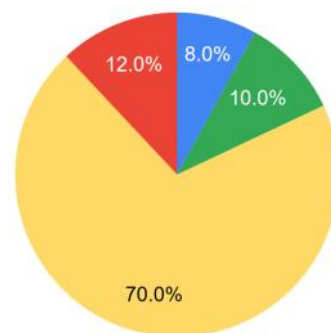
The color and direction of the arrows in the table (▼) show how ratings changed from the previous report. You can find past reports at rivannariver.org.

RCA's Level III Bacteria Monitoring Program analyzes *Escherichia coli (E. coli)* levels at 18 locations in the Rivanna River watershed. Samples are collected monthly from March through November. High recreation sites on the Rivanna are also tested weekly throughout the summer.

E. coli are naturally occurring bacteria found in the guts of humans and other animals. They signal the presence of waste pollution and suggest that other pathogenic organisms may also be present. When *E. coli* levels are too high, swimming or wading in the water are considered unsafe.

In an urban area like Charlottesville, sewer overflows, damaged sewer pipes, and animal waste are typically the most significant sources of bacteria contamination. RCA's bacteria monitoring helps protect public health and water quality by identifying these issues in our local waterways.

In 2020, VADEQ adopted a revised water quality standard for recreational use of freshwater in order to keep up with the best available science. The new standard allows for higher concentrations of *E. coli* but requires more frequent monitoring. VADEQ uses a six-year period of data to determine if a site is officially "impaired," but shorter periods of data can be used to evaluate whether a site is failing to

Sites fail to support the revised standard if any hold:
- There are 10 or more samples in a 90-day period and *E. coli* levels exceed 410 counts per 100 ml more than 10% of the time.
- There are 10 or more samples in a 90-day period and the geometric mean of the *E. coli* levels exceeds 126 counts per 100 ml.
- There are fewer than 10 samples in a 90-day period and *E. coli* levels exceed 410 counts per 100 ml in two or more samples during the period.
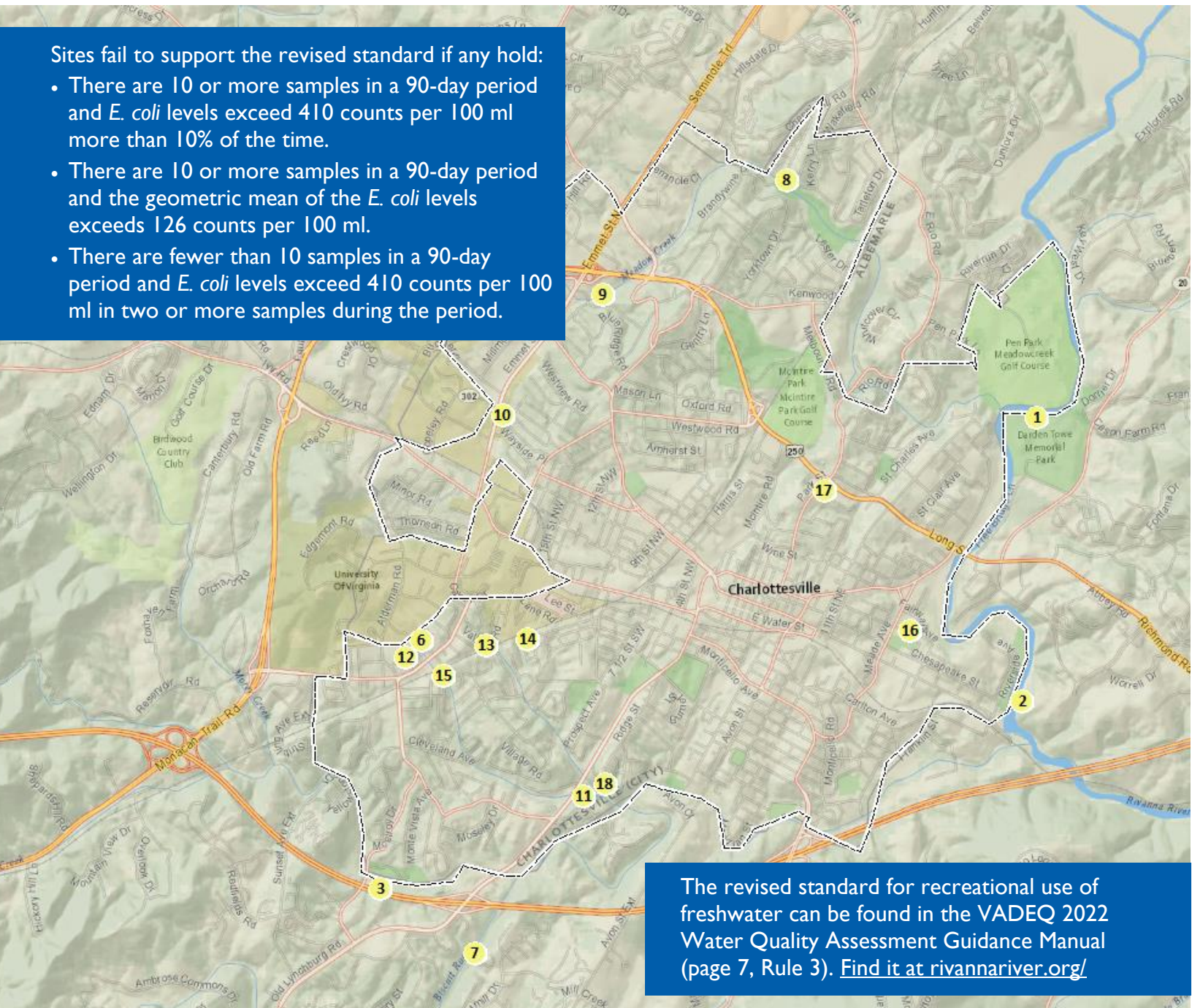
The revised standard for recreational use of freshwater can be found in the VADEQ 2022 Water Quality Assessment Guidance Manual (page 7, Rule 3). Find it at rivannariver.org/
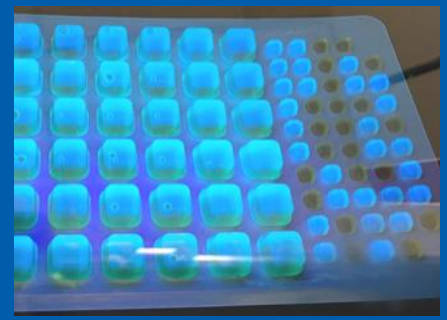
How We Measure Bacteria Levels

Volunteers collect water samples from the monitoring sites using sterile sample bottles, and return the samples back to RCA's certified lab.

Staff then process and analyze the samples. They dissolve a growth medium into the water sample, pour it into a tray, then seal and incubate it.

After 24 hours they read the sample, recording a Most Probable Number (MPN), which is equivalent to the *E. coli* count per 100 ml.

During the 2020 sampling season, RCA's two weekly sites had 18 samples collected in a 90-day period: Darden Towe and Riverview. Because *E. coli* levels exceeded 410 MPN 11.1% of the time at Darden Towe and 22.2% of the time at Riverview Park, both fail to support the revised standard.

Of the 16 sites that had fewer than ten samples in a 90-day period, 12 fail to support the standard because they had two or more samples above 410 MPN within 90 days. Four sites had zero or only one sample above 410 MPN within 90 days. For these sites, available data are insufficient to determine if they are supporting the standard.

Photo courtesy of Doug Rogers

Table 1. Assessment using weekly samples: 6/6/2020 - 9/3/2020 (90-day window)						
Site #	Site Code	Samples (#)	Minimum and Maximum** (MPN)	Samples above 410 MPN (#)	Geometric mean* (MPN)	Fails to Support Standard
1	Rivanna River - Darden Towe	18	15.8 - 1553.1	11.1% (2)	113.1	Yes
2	Rivanna River - Riverview Park	18	17.1 - 1413.6	22.2% (4)	103.1	Yes

* Both sites have geometric means below the threshold of 126 counts per 100 ml. These sites meet the geometric mean part of the revised standard. Both fail to fully support the standard due to having greater than 10 percent of samples exceeding 410 counts per 100 ml (as measured by MPN).

Table 2. Data from monthly samples: 2/4/20 - 11/9/20					
Site #	Site Code	Samples (#)	Minimum and Maximum** (MPN)	Samples above 410 MPN (#)	Fails to Support Standard
3	Moores Creek Upper - Azalea Park	9	25.6 - 203.5	0.0% (0)	Insuf. data
4	Rivanna River - Crofton (not pictured)	7	5.2 - 155.3	0.0% (0)	Insuf. data
5	Rivanna River - Palmyra (not pictured)	7	13.4 - 61.2	0.0% (0)	Insuf. data
6	Eastern Tributary to Lodge Creek	11	9.6 - 920.8	9.1% (1)	Insuf. data
7	Biscuit Run	9	24.6 - 579.4	22.2% (2)	Yes
8	Meadow Creek - SE Brandywine Dr	11	45.7 - 2419.6	27.3% (3)	Yes
9	Meadow Creek - Meadowbrook Rd	10	41.0 - 980.4	30.0% (3)	Yes
10	Meadow Creek - Copeley Rd	10	51.2 - 920.8	30.0% (3)	Yes
11	Rock Creek - Southeast of 5th St	12	59.8 - 1732.9	33.3% (4)	Yes
12	Western Tributary to Lodge Creek	12	3.0 - 1732.9	33.3% (4)	Yes
13	Rock Creek - Valley Road Extension	11	48.0 - 2419.6	36.4% (4)	Yes
14	Rock Creek Tributary - Paton St	11	5.2 - 1299.7	36.4% (4)	Yes
15	Lodge Creek - South of JPA	8	76.7 - 1986.3	50.0% (4)	Yes
16	Meade Creek - Meade Park	13	101.7 - 1533.1	53.9% (7)	Yes
17	Schenks Branch near Rescue Station	14	142.6 - 2419.6	57.1% (8)	Yes
18	Lodge Creek - Southeast of 5th St	14	58.1 - 2419.6	71.4% (10)	Yes

** The upper detection limit for *E. coli* using the Colilert method is 2419.6 MPN per 100 ml of water.

Thank you to all who made this report possible.

2020 Data Collected by the Following Volunteer Monitors:

*denotes monitors that have gone through the certification process

Rick Barnett	Alice Frei*	Kevin Mathias	Julie Reed*	Katie Spicer*
Harriet Bell	Olivia Emery	Neil Means*	Kristinia Reid Black*	Leigh Surdukowski*
Tammy Bowers*	Warner Granade	Vicki Metcalf*	Ami Riscassi*	Jim Surdukowski
Rick Bowers	Jill Greiner*	Brit Minor	Susan Roark	Kim Swartz
Pat Burkett*	Tana Herndon*	Becky Minor*	Cece Rosenberg*	Ida Swenson*
Sara Byers*	Gareth Hunt	Maggie Morris	Liz Schley*	John Tansey
Tina Colom*	Beth Kuhn*	Jeff Pacelli*	Donna Shaunesey*	Ted Thomas
Sandy DiCarlo*	Nicholas Kuhn	Shelley Pence	Karen Siegrist	Bob Troy*
John Edelen*	Gabriel Leggieri*	Art Petty	Marilyn Smith*	Laura Troy*
Mark Foley	Keggie Mallett	Dot Preis*	David Smith*	Laurel Williamson
Anne Forrester	Ben Masters*	Olivia Raines	Steve Spence*	

Thank you to RCA's Science Advisory Committee and landowners who allow river access.

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The Rivanna River watershed drains 769 square miles of land from Shenandoah National Park to the confluence with the James River at Columbia, Virginia. The Rivanna River is an invaluable asset to the communities in the watershed, providing drinking water and contributing to the cultural, recreational, environmental and economic resources of the region. It also has regional importance because the Rivanna River is a tributary to the James River and the Chesapeake Bay.