Is It Safe to Swim?

Protecting Recreational Water Quality in North Carolina

Prepared by Waterkeepers Carolina and the Waterkeeper Alliance – UPDATED May 28, 2021

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Executive Summary

Riverkeepers and Waterkeepers from the mountains to the coast of North Carolina are working hard to make sure it is safe to swim in our state's waters. This work includes water quality data collection and analysis, as well as advocating for more rigorous and protective water quality standards.

Protecting and restoring waters for recreational use is also an important goal of the Clean Water Act (CWA). This federal law requires the US Environmental Protection Agency (EPA) to publish and periodically revise recommended water quality criteria to reflect the latest scientific knowledge of impacts on health and welfare caused by pollutants in water bodies. But these recommendations are not enforceable in North Carolina unless first adopted by the state's Environmental Management Commission (EMC).

EPA has recommended the use of Escherichia coli, also known as *E. coli*, as a pathogen indicator, i.e., a substance that indicates the potential for human infectious disease, since 1986. For decades, the agency has urged states to adopt *E. coli* standards to preserve recreational water quality in freshwaters. North Carolina is one of only a handful of states that has failed to do so.

E. coli are bacteria commonly found in animals' and people's intestines. The presence of *E. coli* in water is an indicator of recent fecal waste contamination. *E. coli* bacteria enter our waters from various sources, including leaking septic systems, improperly functioning wastewater treatment plants, stormwater runoff, and animal waste mismanagement.

Fecal contamination is a widespread problem in North Carolina

Every single one of our river basins failed safe E. coli criteria at least once in 2020. There were at least 20 failures occurring every week across the state during summer 2020.

Scientific studies have evaluated the connection between water quality and health effects to people who come into contact with water during recreational activities like fishing, swimming, or wading. Although not all *E. coli* bacteria are harmful, numerous studies have demonstrated that *E. coli* concentrations are the best predictor of swimming-associated gastrointestinal illness. Additionally, illnesses such as eye infections, skin irritations, and respiratory disease are common in people who come into contact with fecal-contaminated water. Unlike other species in the fecal coliform group, *E. coli* does not generally grow or reproduce in the environment and is considered the best indicator of fecal pollution and the possible presence of pathogens.

Riverkeepers in North Carolina evaluate *E. coli* levels during summer months to help inform their communities about the safety of recreational contact with waters. Each Riverkeeper works for a local environmental nonprofit organization and strives to protect water quality in a specific watershed. This first-of-its-kind report compiles the results of their water monitoring efforts and includes an analysis of samples collected in each watershed.

However, in the absence of a state *E. coli* standard, government monitoring efforts and discharge limits in state-issued permits will fail to reflect the most current science. As a result, these actions will fail to ensure that North Carolinians can safely fish, swim, or wade in the state's waters. Fortunately, we have an opportunity to change things before next summer.

However, in the absence of a state *E. coli* standard, government monitoring efforts and discharge limits in state-issued permits will fail to reflect the most current science.

The CWA requires states to review their water quality standards every three years to determine whether revisions are necessary to adequately protect water quality. Although delayed by an ongoing pandemic, the EMC plans to conduct this review and solicit public comments in 2021.

As demonstrated below, bacteria pollution is a problem across our state. And while Riverkeepers are committed to evaluating *E. coli* levels and alerting the public about the safety of recreation, we need state regulators to follow science and adopt EPA's recommended standards for *E. coli.*

If you are interested in joining this effort, please consider contacting your local Riverkeeper. You can help track bacteria levels in our water by volunteering to assist Riverkeepers in their monitoring efforts. You can help us advocate for change by calling decision-makers, attending hearings, or submitting comments. And you can support your local Riverkeepers by donating to their organizations. All North Carolinians have a right to enjoy drinkable, fishable, swimmable water, and we need your help to achieve it.

About the Authors

Waterkeepers Carolina is a science-based, environmental advocacy group representing Waterkeeper groups in North Carolina. Waterkeepers Carolina's purpose is to protect and improve the environmental integrity of North Carolina's waterways, safeguard drinking water supplies for our state's residents, and sustain the recreational water resources that North Carolinians hold dear.

Members of Waterkeepers Carolina include:

Cape Fear River Watch • Cape Fear Riverkeeper	**Catawba Riverkeeper Foundation** • Catawba Riverkeeper	**Coastal Carolina Riverwatch** • Crystal Coast Waterkeeper • White Oak - New Riverkeeper
Good Stewards of Rockingham • Dan Riverkeeper	**Haw River Assembly** • Haw Riverkeeper	**Sound Rivers** • Lower Neuse Riverkeeper • Pamlico-Tar Riverkeeper • Upper Neuse Riverkeeper
MountainTrue • Broad Riverkeeper • French Broad Riverkeeper • Green Riverkeeper • Watauga Riverkeeper	**Winyah Rivers Alliance** • Lumber Riverkeeper • Waccamaw Riverkeeper	**Yadkin Riverkeeper** • Yadkin Riverkeeper

Waterkeeper Alliance is a global movement uniting more than 350 Waterkeeper groups around the world, focusing citizen action on issues that affect our waterways, from pollution to climate change. The Waterkeeper movement patrols and protects over 2.75 million square miles of rivers, lakes, and coastlines on six continents.

Why Monitor Bacteria?

Bacteria are everywhere in the environment, including in our rivers, lakes, and streams. Sources of bacteria pollution include municipal wastewater treatment plants, sewage spills, industrial discharges, agricultural runoff, leaky sewer lines or septic systems, and stormwater runoff.

Some bacteria can be harmful to human health. Recreating in water containing disease-causing bacteria, parasites, or viruses (collectively called pathogens) can affect human health. It is impractical to sample for every type of pathogen that may be present in a water body. Therefore, it is common to look instead for pathogen indicators, i.e., a substance that indicates the potential for human infectious disease.

Fecal contamination in recreational waters is associated with an increased risk of gastrointestinal illness. Well-known waterborne diseases spread through water contaminated with fecal bacteria, including cholera, typhoid fever, bacterial dysentery, infectious hepatitis, and cryptosporidiosis. In addition, eye, ear, nose, and throat infections can result from contact with contaminated water.

North Carolina currently uses fecal coliform as a pathogen indicator to measure the suitability of freshwaters for recreational use. In 1972, in response to objections regarding the fecal coliform standard, EPA conducted a series of studies to better assess the relationship between gastrointestinal illnesses and the recreational use of sewage-contaminated waters. These studies demonstrated that *enterococci* are good predictors of gastrointestinal illnesses in marine and fresh recreational waters; *E. coli* are good predictors of such illnesses in freshwaters; and fecal coliforms are poor predictors of gastrointestinal illness. *Escherichia coli*, also known as *E. coli* is a coliform bacterium commonly found in the lower intestine of warm-blooded organisms. *E. coli* is expelled into the environment within fecal matter. The bacterium grows in fresh fecal matter under aerobic conditions for roughly three days, but its numbers decline slowly afterward. In 1986, EPA formally recommended that *E. coli* or *enterococci* replace fecal-coliform bacteria as the indicator pathogen in state water quality standards. Over 30 years later, North Carolina has not adopted either standard for freshwater.

It took federal action to get the standards updated for North Carolina's coastal waters. In 2000, Congress passed the Beaches Environmental Assessment and Coastal Health Act (BEACH Act), which amended the federal Clean Water Act to better protect water quality in states with coastal recreation waters. The law required states to adopt water quality standards for pathogens and pathogen indicators in coastal waters based on EPA criteria. The law also allowed EPA to promulgate new bacteria standards to protect coastal recreation in states that failed to adopt them voluntarily. In 2004, after years of inaction at the state level, North Carolina was one of 21 states for which EPA issued such updated standards. Today, in coastal recreation areas, North Carolina has an *enterococci* standard consistent with the BEACH Act requirements.

Unfortunately, the coastal standard is regularly exceeded in North Carolina; in fact, bacteria contamination causing the closure of shellfishing areas is the number one reason that water bodies fail to meet state water quality standards.

Furthermore, our state water quality standards remain stuck in the last century when it comes to freshwaters. So while state regulators continue to use old standards, Riverkeepers are following the science.

Since 1986, EPA has repeatedly reviewed its recommended recreational water quality criteria based on the latest science. In 2012, the agency further refined its recommendations for pathogen indicators to consist of both a geometric mean and a statistical value threshold for *E. coli* and *enterococci bacteria.* Recommendations also included limits on the magnitude, duration, and frequency of excursions. In addition, EPA recommended Beach Action Values—defined as the 75th percentile of the water quality distribution of values of *E. coli* and *enterococcus* in epidemiological studies—to assist state notification programs.

In 2017, EPA conducted a five-year review of the 2012 recommendations. After further analysis of the scientific support for the 2012 recommendations, evaluation of new scientific developments, and consideration of the perceived barriers to state adoption, the federal agency decided not to amend its recommendations. But North Carolina's Environmental Management Commission still did not listen and neglected to adopt them.

What Are We Doing?

As Riverkeepers, we want to let people know if it is safe to swim in their local waterways and believe North Carolinians should be able to recreate without risking their health. As science-based advocacy organizations, we agree with EPA that measuring *E. coli* is the best way to evaluate the suitability of freshwaters in North Carolina for recreation.

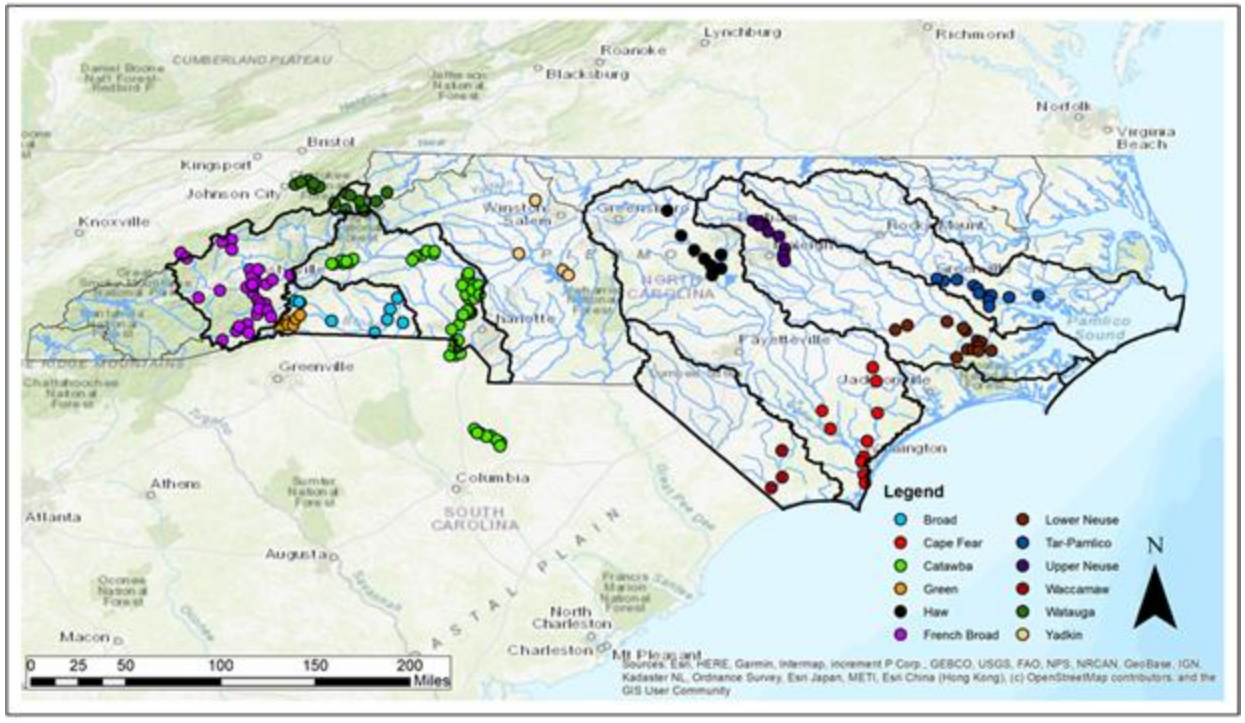
There are several ways of measuring the numbers of *E. coli* bacteria in streams. EPA, along with leading regulatory agencies worldwide, has approved the use of the IDEXX Colilert® Test for the detection of *E. coli*. This method involves collecting water from a stream or river using sterile equipment and adding the Colilert® reagent. This mixture is poured into an IDEXX Quanti-Tray® that separates the sample into equal-sized wells. After incubation, wells containing *E. coli* will turn yellow and fluoresce under a 365nm UV lamp. The number of yellow and fluorescent wells indicates the most probable number (MPN) of *E. coli* present in the water source when sampling took place.

Over the past few years, Waterkeeper Alliance has helped Waterkeepers Carolina purchase and use IDEXX equipment to sample waters in North Carolina for the presence of *E. coli.* Sample collection is conducted according to uniform Standard Operating Procedures, and training is provided annually to ensure the validity of sample analysis. Waterkeeper groups that did not participate in the 2020 bacteria sampling project are equipped, trained, and planning to do so in 2021.

In 2020, Riverkeepers collected samples weekly between Memorial Day and Labor Day (May 25-September 7) on a Thursday or Friday. We selected these dates to ensure assessment during peak recreational use of surface waters during the summer months, and referenced EPA's recommended Beach Action Values (BAVs) to assess the safety of swimming in our waters. EPA describes its recommended BAVs as a "conservative, precautionary tool for making beach notification decisions." Any sample with an *E. coli* concentration above 235 MPN "failed" under the EPA's BAV and triggered a do not swim advisory for that site.

The vast majority of sampling was conducted in North Carolina, although three Riverkeepers whose watersheds extend across state lines also collected data out of state (Figure 1). One hundred and sixty one sites fell within North Carolina and 17 sites in the Catawba, French Broad, and Watauga River basins were located in South Carolina or Tennessee. Overall, 178 sites were sampled in 2020. A total of 2,470 samples were collected across all 178 sites, with 2,200 of those samples located within North Carolina. Interstate efforts are a reminder that policy decisions affecting rivers originating in North Carolina can impact water quality across state lines.

Figure 1: Locations of all NC Riverkeeper Swim Guide sampling sites.



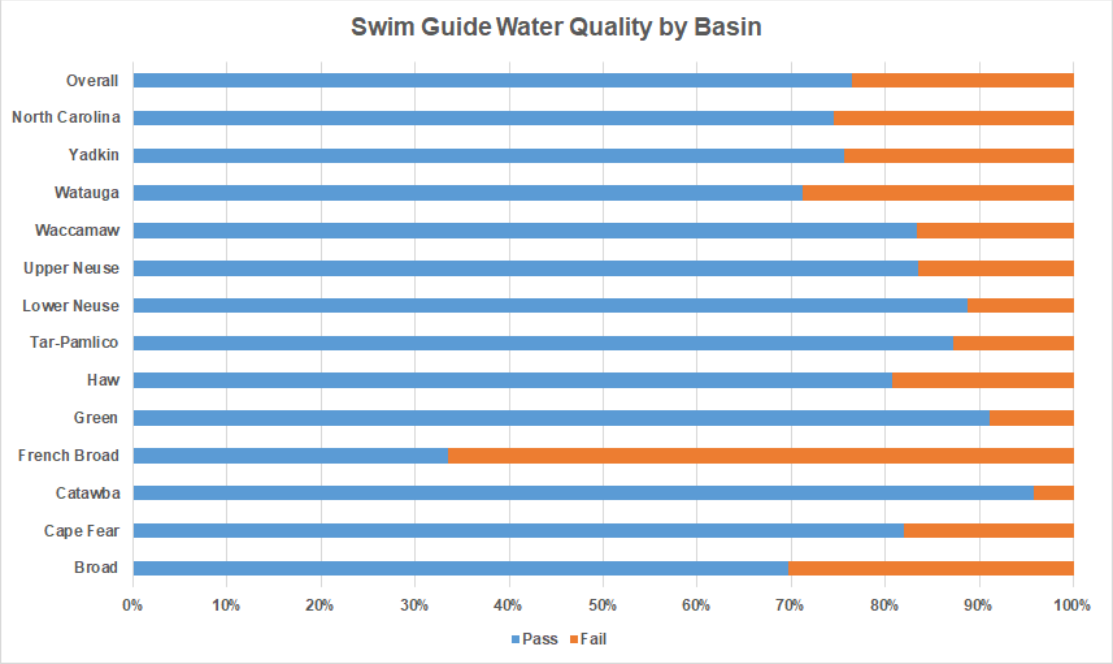
Sampling capacity varied by watershed, as local organizations had different levels of success in augmenting funds from Waterkeeper Alliance with additional support from local funders. We are grateful for all financial support that enables our continued evaluation of bacteria pollution in North Carolina. In the future, Waterkeepers Carolina aims to expand its sampling efforts to include additional watersheds in North Carolina. Although a few members of Waterkeepers Carolina did not participate in the sampling efforts described in this report, we plan to conduct similar sampling efforts annually and, with increased participation, hope to have a fuller understanding of bacterial contamination in our state's waters.

What Did We Find?

A list of figures in this report is summarized in Appendix A. The number of samples and the number of exceedances collected in each river basin across all fifteen weeks were calculated. These were used to calculate the pass and fail rates by dividing the total number of exceedances by the total number of samples for each basin. Figure 2 shows the pass and fail rates for every sample taken overall, every

sample within North Carolina, and every sample within each basin. *E.coli* concentration exceeded the EPA's Beach Action Value in five hundred and eighty-three (23.6%) samples. The remaining 2,200 samples from 161 sites located in North Carolina had a slightly higher exceedance rate of 25.5%.

Figure 2: Overall, North Carolina, and individual basin pass and fail rates. Rates are calculated based on total samples taken that exceed 235 MPN.



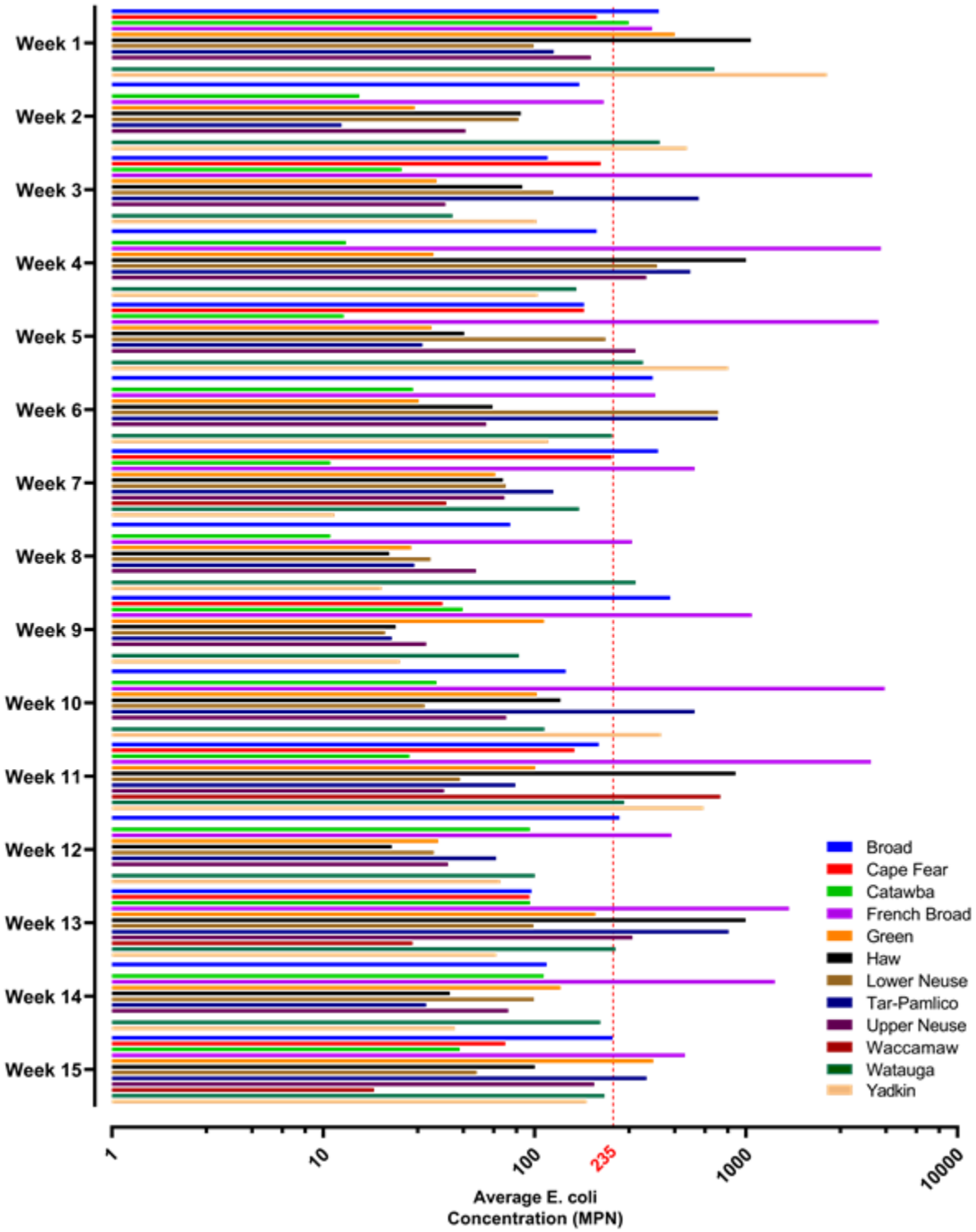
One hundred and twenty sites (67.4%) had at least one single day that exceeded the BAV from May to September. The French Broad River basin was the only basin where every site had at least one exceedance.

E. coli concentration was then averaged for each site across the summer sampling period. Thirty-two sites (18.0%) had a geometric mean greater than 235 MPN. This means that on average, 32 sites failed to meet the EPA's recommended water quality criteria during the 2020 summer. Most of those sites (24 out of 32, or 75.0%) were in the French Broad River basin.

The average *E. coli* concentration exceeded 235 MPN on a cumulative 36 days across the state, but there were no temporal trends within nor across basins. The average *E. coli* exceeded the BAV in at least one river basin every week during the summer (Figure 3). More information about efforts in specific watersheds and Riverkeeper contact information is provided in Appendix B.

Further analysis is underway in different watersheds to evaluate the sources of bacteria, assess the impact of flow rates on observed *E. coli* concentrations, and evaluate seasonal variations.

Figure 3: Basin average E. coli concentration during each week of sampling from Memorial Day to Labor Day, 2020.



The Bottom Line

State regulators continue to use the antiquated Fecal Coliform standard for bacteria in freshwaters, despite decades old guidance from the EPA to use the *E. coli* standard. NC Riverkeepers are following the recommended standard and science to ensure that our waters and our communities are protected from harmful bacterial pollution. Fecal contamination is a widespread problem in the state of North Carolina with every basin failing the safe *E. coli* criteria at least once, and at least 20 failures occurring every week across the state. It's past time for the state to adopt the *E. coli* standard for bacteria in freshwaters. You can help us advocate for change by calling decision-makers, attending hearings, or submitting comments. Contact your local Riverkeeper for more information on how you can help protect North Carolina's freshwaters for drinking, fishing and swimming.

Appendix A: List of Figures

Appendix B: Individual Basin Results

Cape Fear River

Kemp Burdette, the Cape Fear Riverkeeper, works at Cape Fear River Watch to protect waters in the Cape Fear River watershed. The Cape Fear River watershed is the largest in North Carolina, covering over 9,100 square miles of the U.S. in east central North Carolina (Figure 4)*. The Cape Fear is the only major river in the state to flow directly into the Atlantic Ocean, entering the ocean near Cape Fear, from which it takes its name. You can contact Kemp at kemp@cfrw.us or by calling (910) 264-8036.*

A total of 61 samples were collected at 8 sites in the Cape Fear River basin during the reporting period; 11 samples (18.0%) exceeded the EPA recommended Beach Action Value (Figure 4). Samples were collected every other week, and there were only two weeks in which all sampled sites were below the bacteria level indicating it was safe to swim.

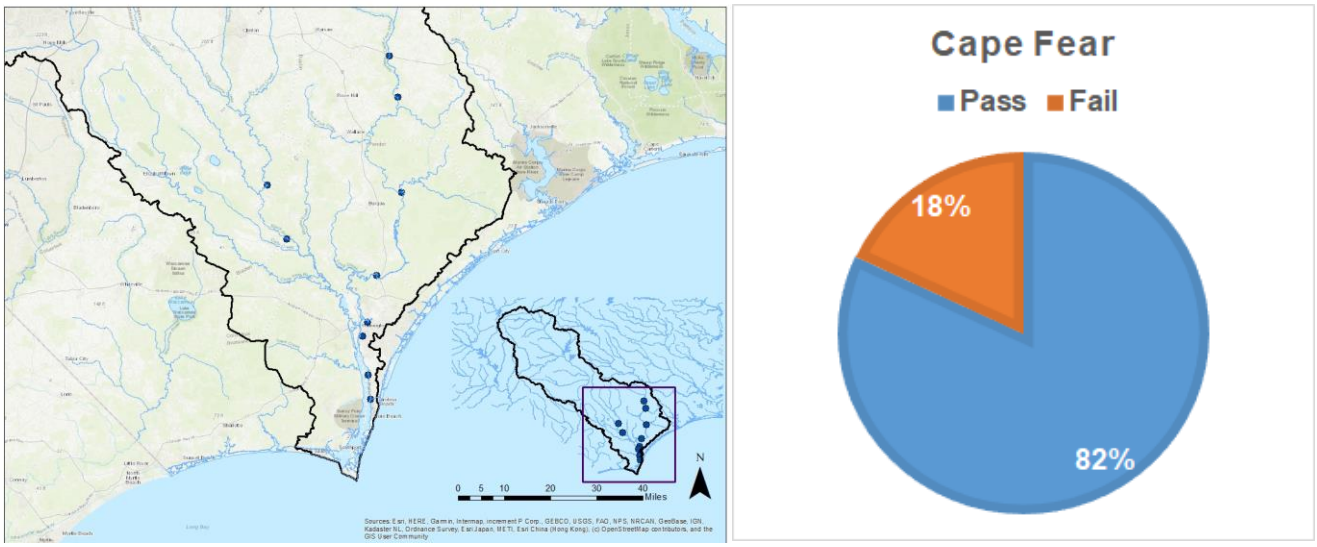


Figure 4: Map of Cape Fear River basin sampling sites and the pass and fail rates of all samples taken.

Catawba River

Brandon Jones, the Catawba Riverkeeper, works at Catawba Riverkeeper Foundation to protect waters in the Catawba River watershed. Beginning in the Blue Ridge Mountains in western McDowell County, the 225-mile long Catawba flows through multiple reservoirs, passes to the west of Charlotte across state lines, and, at the confluence with Wateree Creek, becomes known as the Wateree River (Figure 5). You can contact Brandon at brandon@catawbariverkeeper.org or by calling (704) 679-9494.

A total of 775 samples were collected at 53 sites in the Catawba River basin during the reporting period; 30 samples (4.3%) exceeded the EPA recommended Beach Action Value (Figure 5). Samples were collected weekly for 15 weeks. In 10 of those weeks, at least one site had bacteria levels indicating it was unsafe to swim. 42 of 53 sites (616 samples) were in North Carolina and 11 sites (159 samples) were in South Carolina. Of the North Carolina samples, 33 exceeded 235 MPN, a only slightly higher rate of 5.4% exceedance.

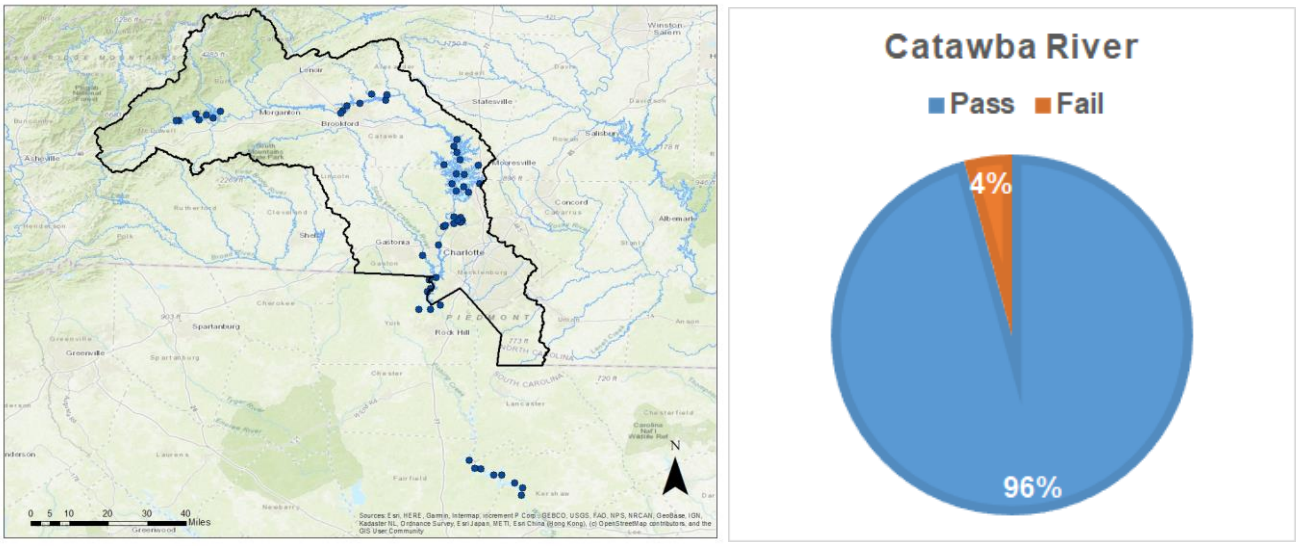


Figure 5: Map of Catawba River basin sampling sites and the pass and fail rates of all samples taken.

Broad River

David Caldwell, the Broad Riverkeeper, works at MountainTrue to protect waters in the Broad River watershed. The Broad River Basin includes 5,419 square miles within both North and South Carolina. From its headwaters along the Eastern Continental Divide and the South Mountains, the streams and rivers in the Broad basin join and flow into the "Big" Broad above the SC state line (Figure 6). You can contact David at david@mountaintrue.org or calling 704-284-9002.

A total of 135 samples were collected at 9 sites in the Broad River basin during the reporting period; 41 samples (30.4%) exceeded the EPA recommended Beach Action Value (Figure 6). During each of the 15 weeks during the sampling period, at least one of the Broad watershed sites had bacteria levels making it unsafe to swim.

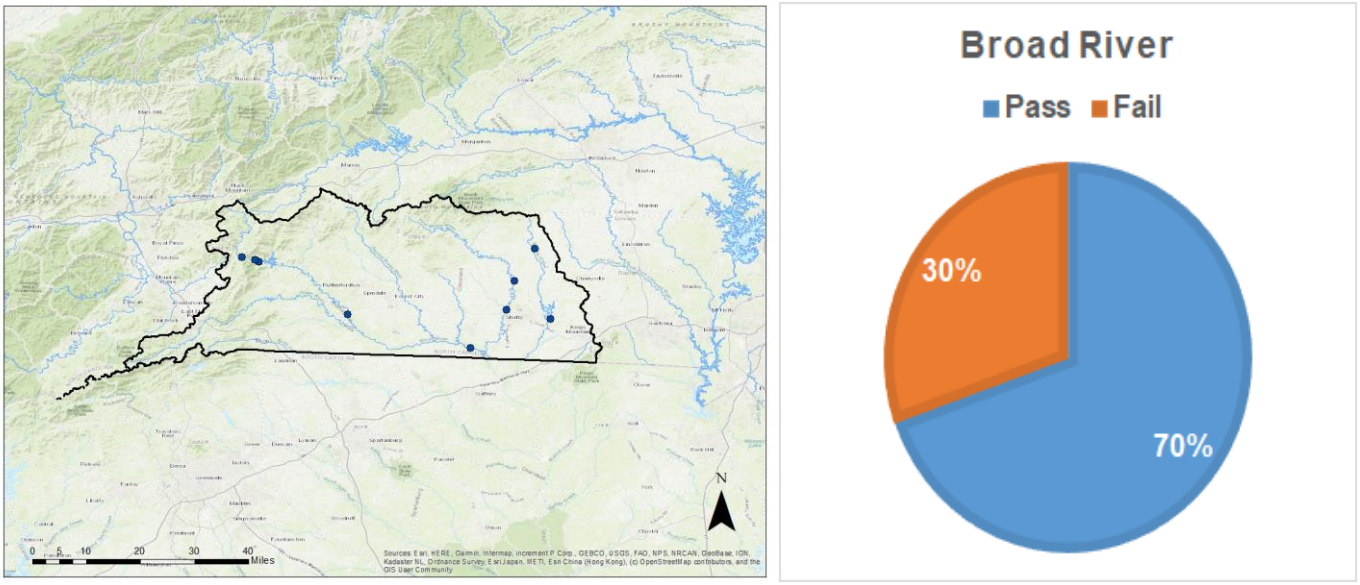


Figure 6: Map of Broad River basin sampling sites and the pass and fail rates of all samples taken.

French Broad River

Hartwell Carson, the French Broad Riverkeeper, works at MountainTrue to protect the waters in the French Broad River watershed. Beginning near the town of Rosman in Transylvania County, North Carolina, the 218-mile long French Broad drains parts of Pisgah National Forest and Cherokee National Forest and cuts through the Appalachian Mountains before joining the Holston River near Knoxville to form the Tennessee River (Figure 7). You can contact Hartwell at hartwell@mountaintrue.org or by calling (828) 258-8737, ext 211.

A total of 478 samples were collected at 35 sites in the French Broad River basin during the reporting period. Three hundred and eighteen samples (66.5%) exceeded the EPA recommended Beach Action Value (Figure 7). During each of the 15 weeks during the sampling period, at least one of the watershed sites had bacteria levels making it unsafe to swim. In 8 of the 15 weeks, at least 20 sites had unsafe levels of bacteria. Two of the 35 sites (30 samples) were located in Tennessee. Of the remaining 448 samples, 315 exceeded 235 MPN, raising the exceedance rate to 70.3%.

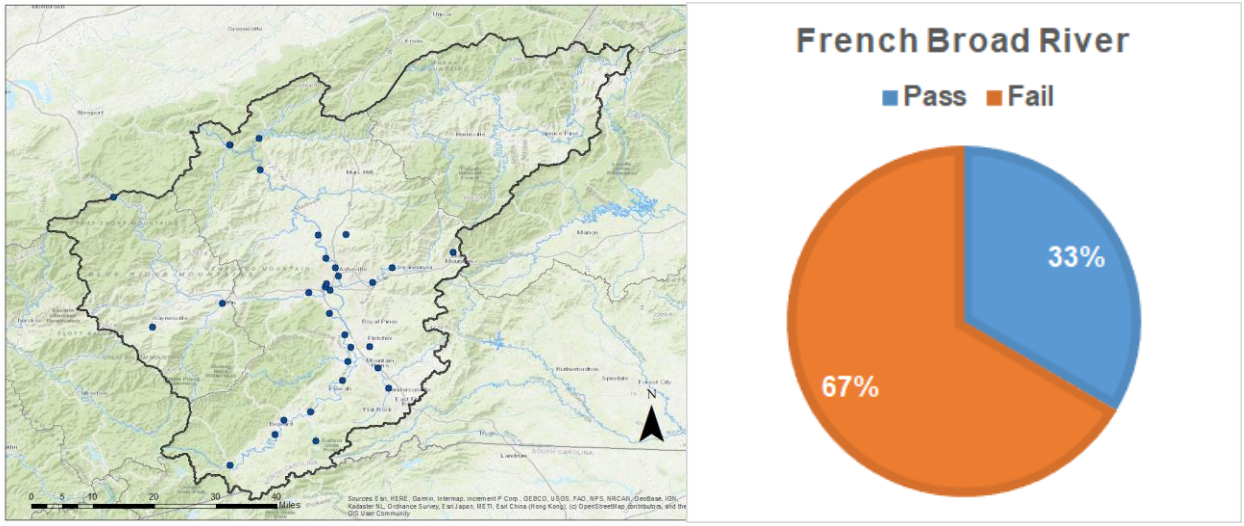
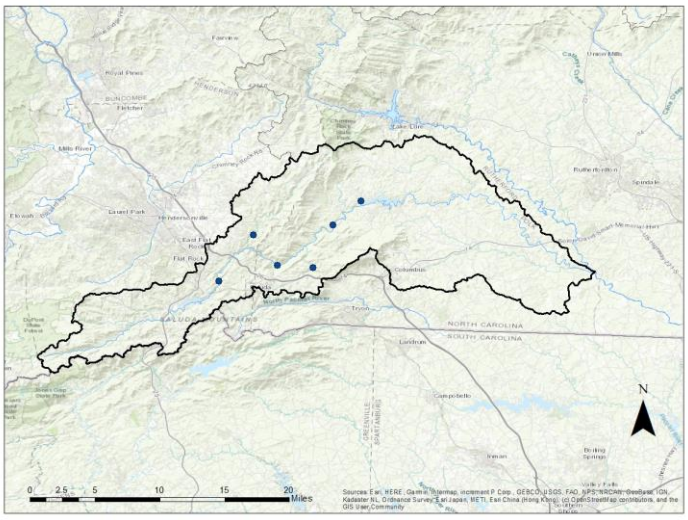


Figure 7: Map of French Broad River basin sampling sites and the pass and fail rates of all samples taken.

Green River

Gray Jernigan, the Green Riverkeeper, works at MountainTrue to protect the waters in the Green River watershed. Beginning at its headwaters on the eastern slope of DuPont State Recreational Forest, the Green River drains southern and eastern Henderson County before flowing across Polk County and joining the Broad River on the border with Rutherford County (Figure 8). You can contact Gray at gray@mountaintrue.org or by calling (828) 692-0385 ext. 1004.

A total of 89 samples were collected at 6 sites in the Green River basin during the reporting period; 8 samples (9.00%) exceeded the EPA recommended Beach Action Value (Figure 8). Weekly samples were collected during the 15-week sampling period. During five of those weeks, at least one of the sites had bacteria levels making it unsafe to swim.



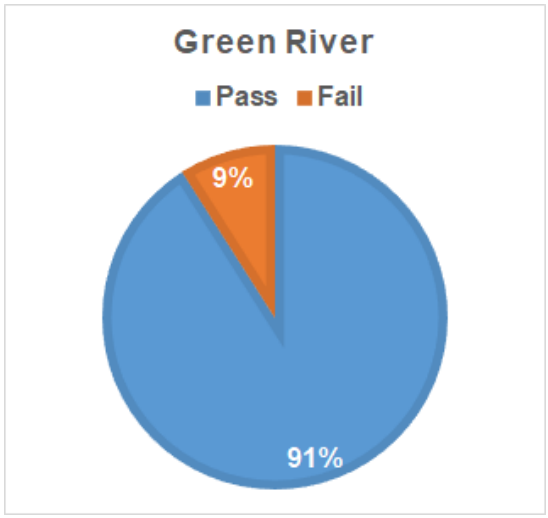
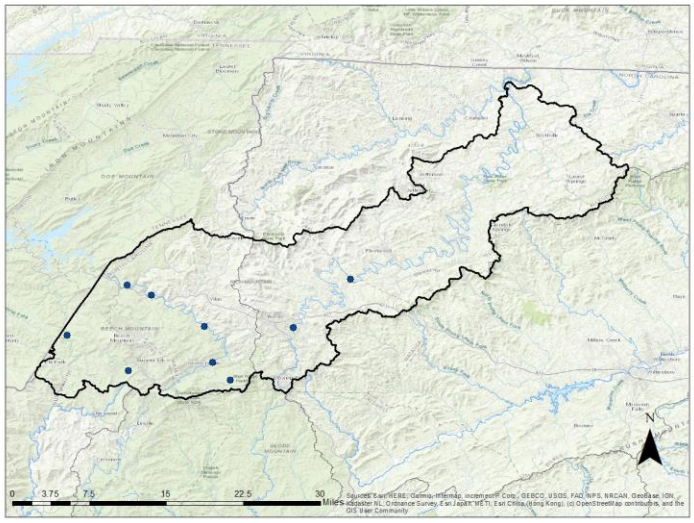


Figure 8: Map of Green River basin sampling sites and the pass and fail rates of all samples taken.

Watauga River

Andy Hill, the Watauga Riverkeeper, works at MountainTrue to protect the waters of the Watauga River watershed. From its headwaters Peak Mountain, the Watauga River flows across Watauga County, North Carolina, before crossing into Tennessee and joining the Holston River (Figure 9). You can reach Andy at andy@mountaintrue.org or by calling (828) 406-2429.

A total of 226 samples were collected at 16 sites in the Watauga basin during the reporting period; 65 samples (28.8%) exceeded the EPA recommended Beach Action Value (Figure 9). During all but one of the 15 weeks during the sampling period, at least one of the Watauga watershed sites had bacteria levels making it unsafe to swim. 10 of the 16 sites sampled were in North Carolina; the other 6 were in Tennessee. 145 samples were collected from those ten sites and 47 exceeded 235 MPN (32.4% exceedance).



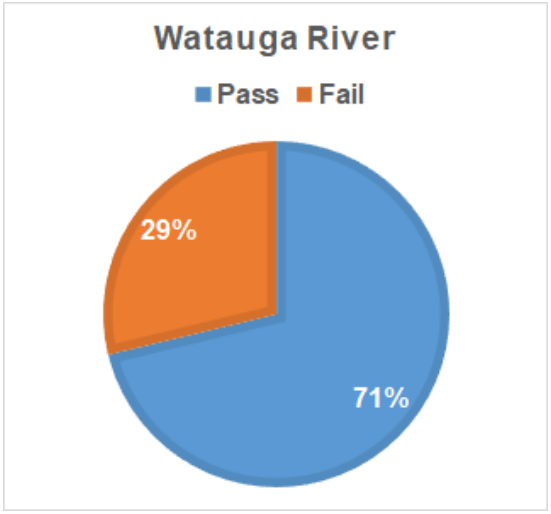


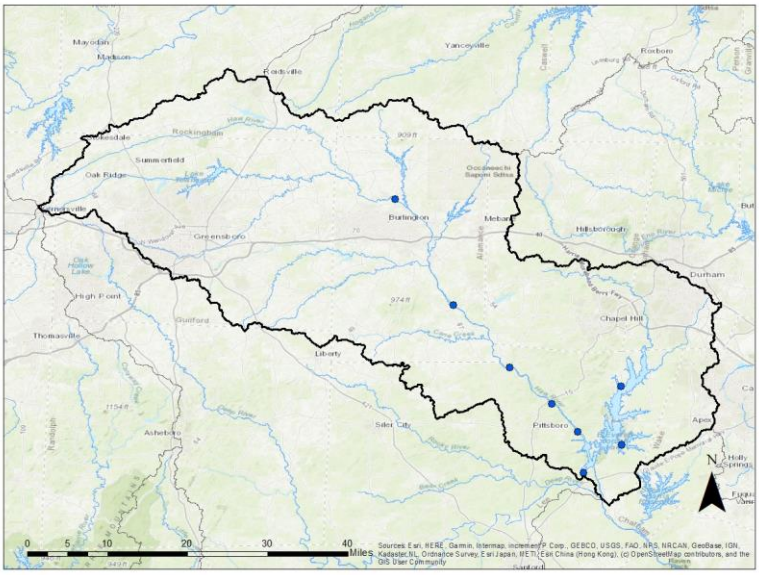
Figure 9: Map of Watauga River basin sampling sites and the pass and fail rates of all samples taken.

Haw River

Haw River Assembly

Emily Sutton, the Haw Riverkeeper, works at Haw River Assembly to protect the waters in the Haw River watershed. Beginning at its headwaters north of Kernersville, the Haw winds through the Piedmont, draining portions of Forsyth, Guilford, Alamance, Orange, and Chatham counties and flowing into the Jordan Lake reservoir shortly before joining the Deep River to form the Cape Fear River (Figure 10). You can contact Emily at emily@hawriver.org or calling (919) 542-5790.

A total of 119 samples were collected at 8 sites in the Haw basin during the reporting period; 23 samples (19.3%) exceeded the EPA recommended Beach Action Value (Figure 10). During each of the 15 weeks during the sampling period, samples were collected weekly, and bacteria levels suggested it was safe to swim at all sampled locations only 6 times during the sampling period.



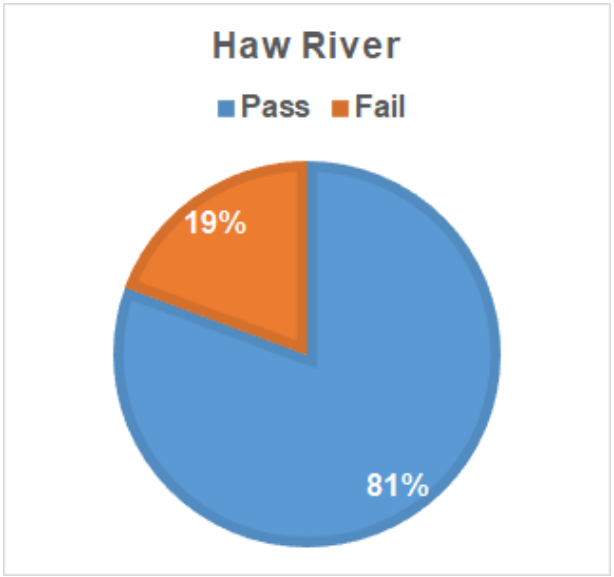


Figure 10: Map of Haw River basin sampling sites and the pass and fail rates of all samples taken.

Upper Neuse River

Matthew Starr, the Upper Neuse Riverkeeper, works at Sound Rivers to protect the waters of the Neuse upstream of the Lenoir-Wayne County line. The Neuse is formed by the confluence of the Flat and Eno Rivers near Durham, North Carolina, and flows past the state capital, Raleigh, and across the coastal plain before entering Pamlico Sound (Figure 11). At 275 miles long, the Neuse is the longest river contained entirely in North Carolina and the only one protected by two Riverkeepers. You can reach Matthew at upperneuserk@soundrivers.org or by calling 252-946-7211.

A total of 163 samples were collected at 11 sites in the Upper Neuse River basin during the reporting period; 27 samples (16.6%) exceeded the EPA recommended Beach Action Value (Figure 11). During 9 of the 15 weeks during the sampling period, at least one of the watershed sites had bacteria levels making it unsafe to swim.

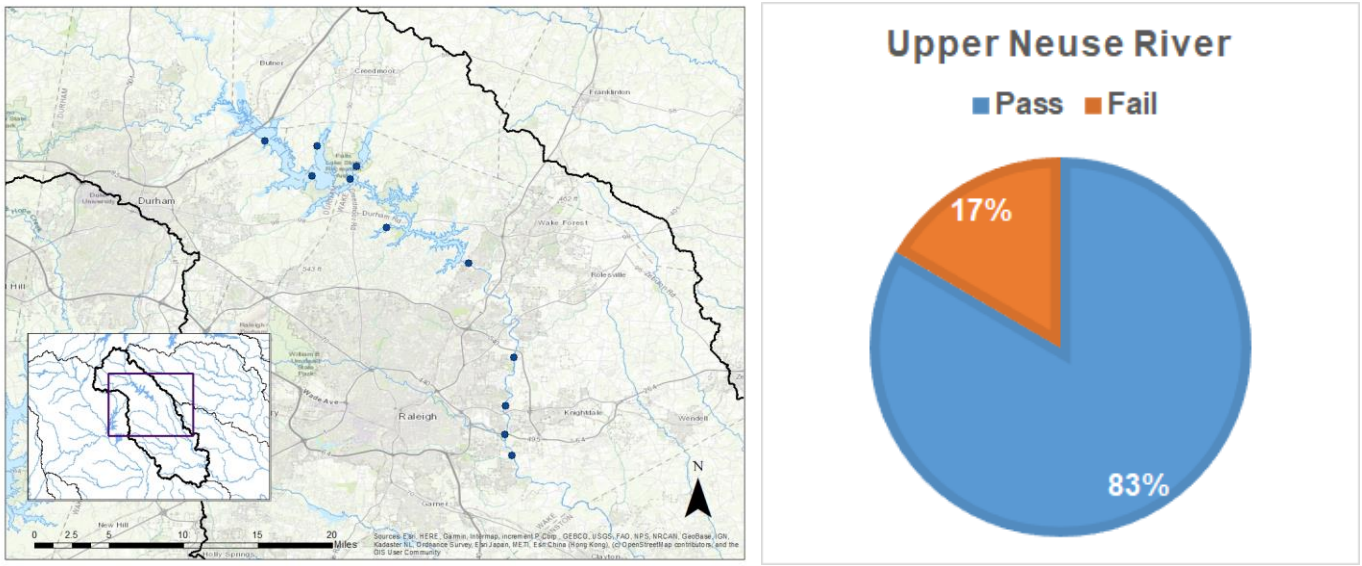


Figure 11: Map of Upper Neuse River basin sampling sites and the pass and fail rates of all samples taken.

Lower Neuse River

Katy Langley Hunt, the Lower Neuse Riverkeeper, works at Sound Rivers to protect the waters of the Neuse from the Lenoir-Wayne County line eastward to the mouth of the Neuse River. The Neuse is formed by the confluence of the Flat and Eno Rivers near Durham, North Carolina, and flows past the state capital, Raleigh, and across the coastal plain before entering Pamlico Sound (Figure 12). At 275 miles long, the Neuse is the longest river contained entirely in North Carolina and the only one protected by two Riverkeepers. You can reach Katy at lowerneuserk@soundrivers.org or by calling (252) 637-7972.

A total of 187 samples were collected at 13 sites in the Lower Neuse River basin during the reporting period; 21 samples (11.2%) exceeded the EPA recommended Beach Action Value (Figure 12). In 10 of the 15 weeks during the sampling period, at least one of the watershed sites had bacteria levels making it unsafe to swim.

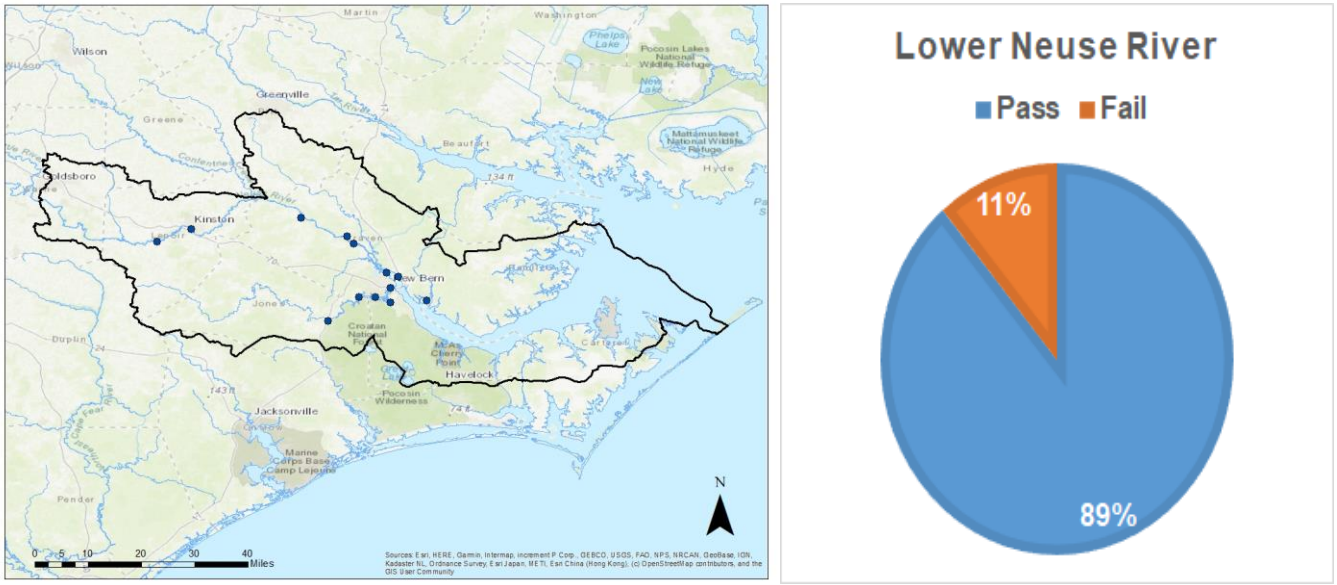


Figure 12: Map of Lower Neuse River basin sampling sites and the pass and fail rates of all samples taken.

Tar-Pamlico River

SOUND RIVERS

Jill Howell, the Pamlico-Tar Riverkeeper, works at Sound Rivers to protect the waters of the Tar and Pamlico River watersheds. The Tar River rises in the north central part of the Piedmont and flows southeast and in Washington, North Carolina it becomes the Pamlico River before emptying into the Pamlico Sound (Figure 13). You can reach Jill at jill@soundrivers.org or by calling (252) 946-7211.

A total of 180 samples were collected at 12 sites in the Tar-Pamlico River basin during the reporting period; 23 samples (12.8%) exceeded the EPA recommended Beach Action Value (Figure 13). During 11 of the 15 weeks during the sampling period, at least one of the watershed sites had bacteria levels making it unsafe to swim.

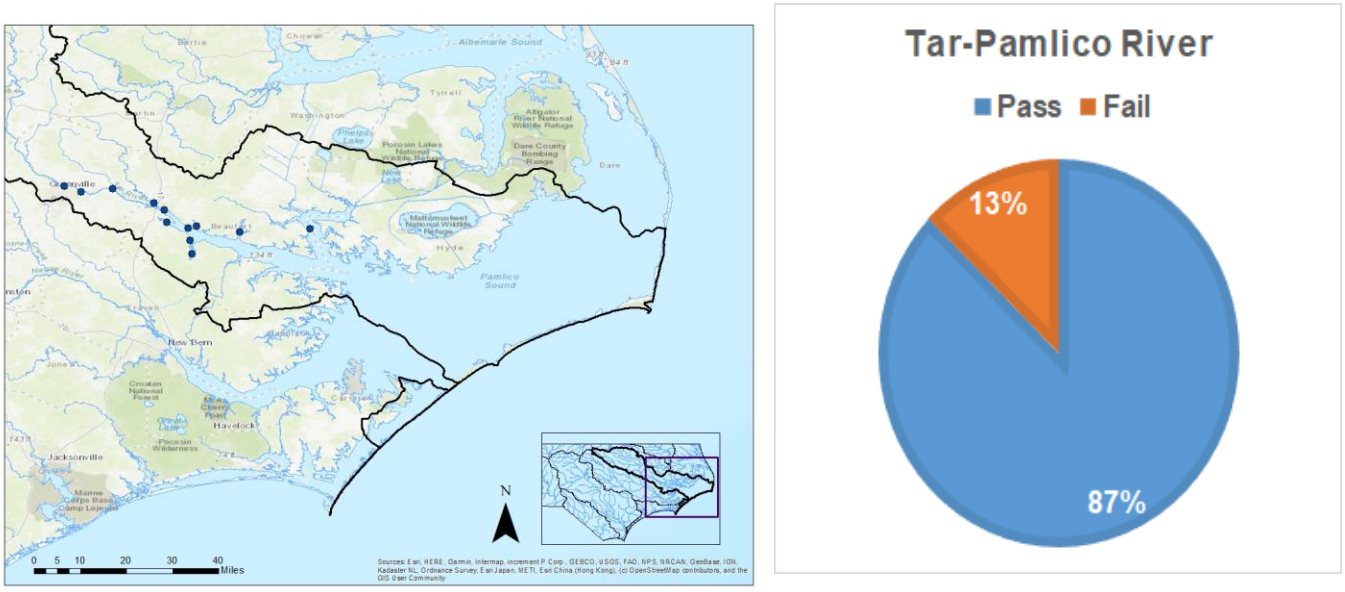


Figure 13: Map of Tar-Pamlico River basin sampling sites and the pass and fail rates of all samples taken.

Waccamaw River

Cara Schildtknecht, the Waccamaw Riverkeeper, works at Winyah Rivers Alliance to protect the waters of the Waccamaw River watershed. The Waccamaw River forms at Lake Waccamaw, a Carolina Bay in Columbus County, North Carolina, flows through the coastal plain and across the border into South Carolina, is joined by the Great Pee Dee and Black Rivers, and empties into Winyah Bay (Figure 14). You can reach Cara at Riverkeeper@winyahrivers.org or by calling (843) 349-4007.

A total of 12 samples were collected at 3 sites in the Waccamaw River basin during the reporting period; 2 samples (16.7%) exceeded the EPA recommended Beach Action Value (Figure 14). Both exceedances occurred on the same day.

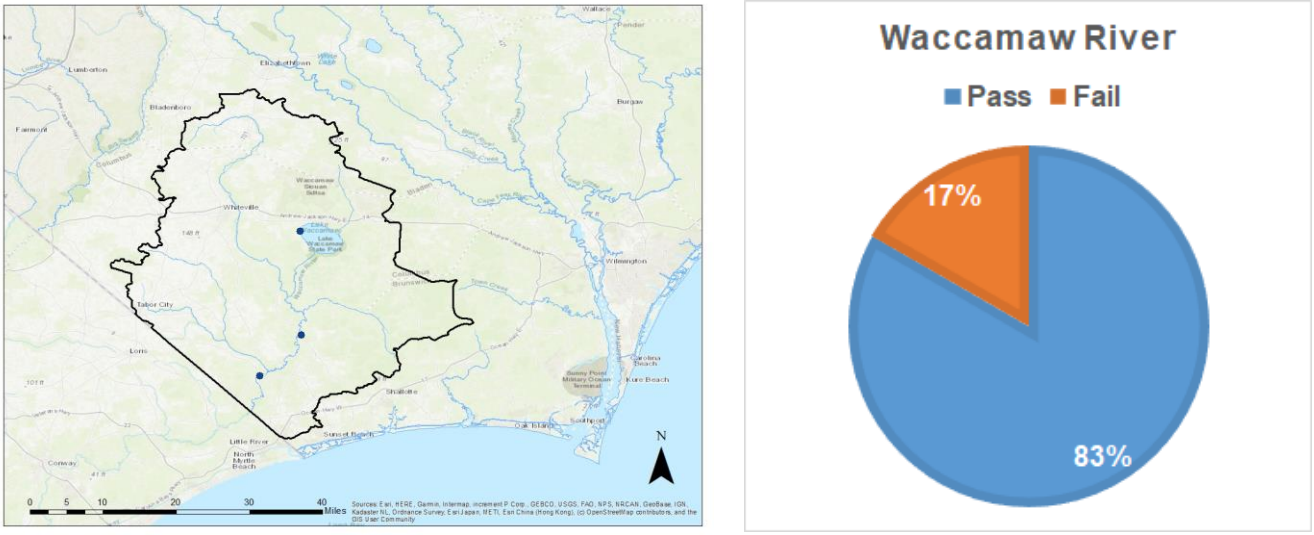
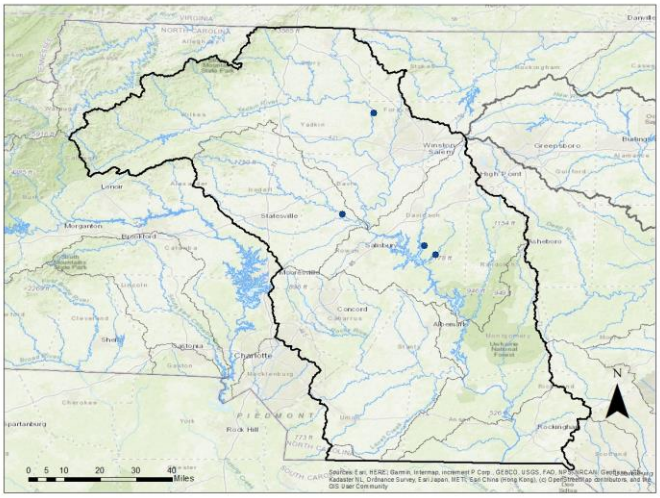


Figure 14: Map of Waccamaw River basin sampling sites and the pass and fail rates of all samples taken.

Yadkin River

Edgar Miller, the Yadkin Riverkeeper, works at Yadkin Riverkeeper Inc. to protect waters in the Yadkin River watershed. From its headwaters near Blowing Rock, the Yadkin River flows east and then south across North Carolina's Piedmont region and through seven man-made reservoirs before its name changes to the Pee Dee River below Lake Tillery (Figure 15). You can reach Edgar at info@yadkinriverkeeper.org or by calling (336) 723-4949.

A total of 45 samples were collected at 4 sites in the Yadkin basin during the reporting period; 11 samples (24.4%) exceeded the EPA recommended Beach Action Value (Figure 15). During 9 of the 15 weeks during the sampling period, at least one of the Yadkin watershed sites had bacteria levels making it unsafe to swim.



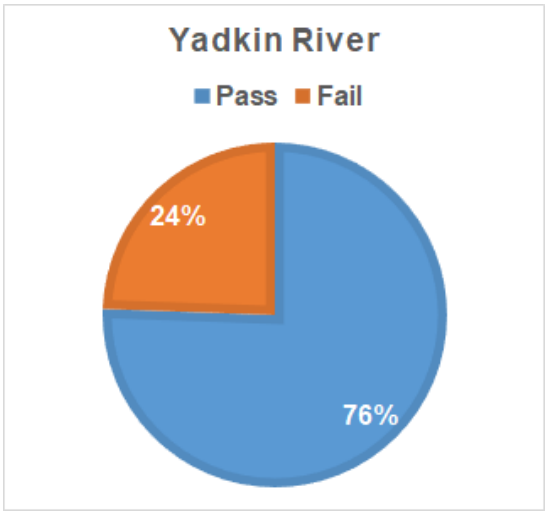
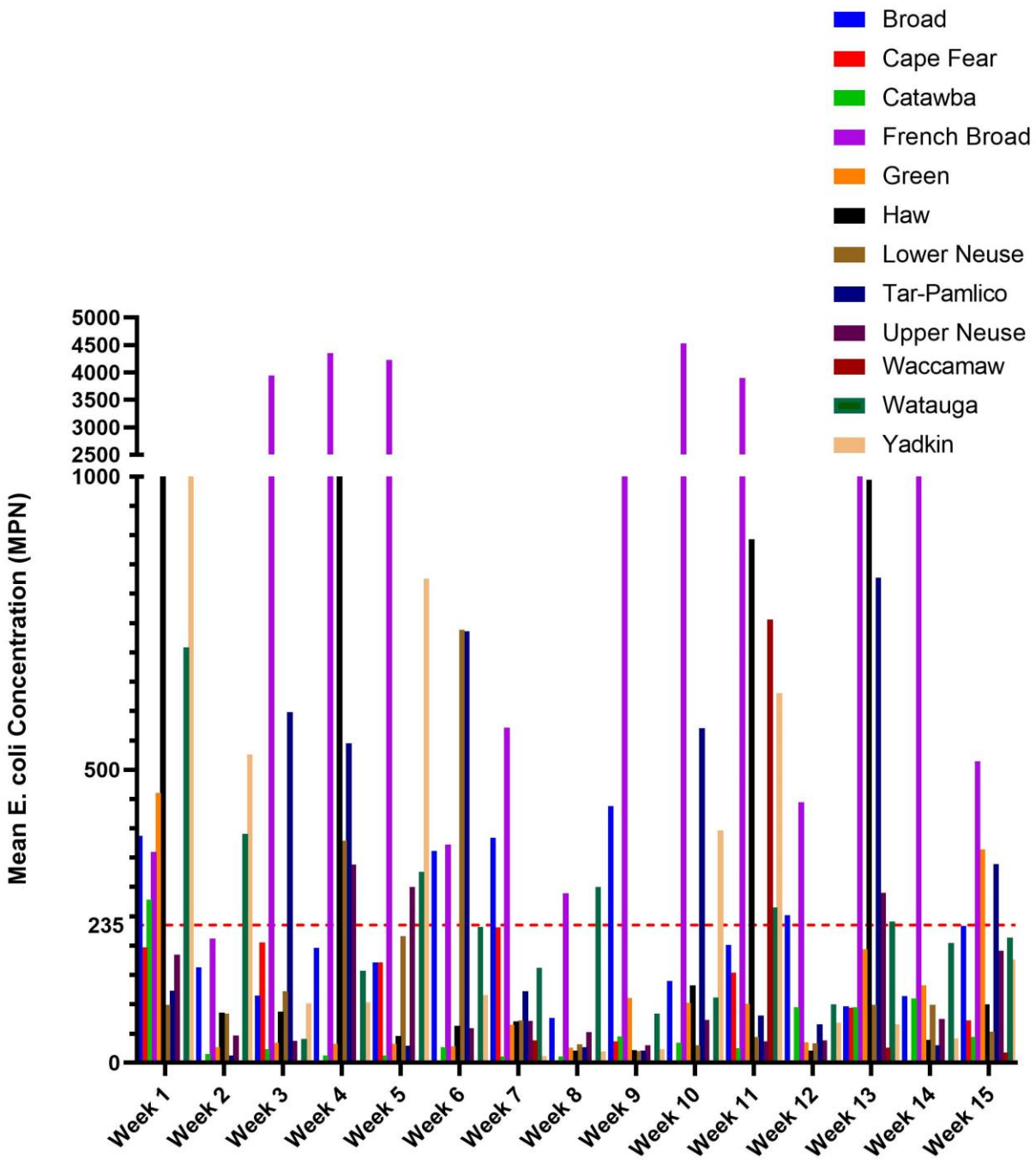


Figure 15: Map of Yadkin River basin sampling sites and the pass and fail rates of all samples taken.


Broad
Cape Fear
Catawba
French Broad
Green
Haw
Lower Neuse
Tar-Pamlico
Upper Neuse
Waccamaw
Watauga
Yadkin
Mean E. coli Concentration (MPN)
5000
4500
4000
3500
3000
2500
1000
500
235
0
Week 1
Week 2
Week 3
Week 4
Week 5
Week 6
Week 7
Week 8
Week 9
Week 10
Week 11
Week 12
Week 13
Week 14
Week 15