

# **Report to the North Carolina General Assembly Environmental Review Commission**



## **Consolidated Report on Basinwide Water Resources Management Plans & Hydrologic Models**

**November 1, 2024**

**Division of Water Resources**

**NORTH CAROLINA DEPARTMENT OF  
ENVIRONMENTAL QUALITY**

**Pursuant to G.S. 143-215.8B(d) and G.S. 143-355(p)**

General Statute (G.S.) [§143-215.8B\(d\)](#) and [G.S. §143-355\(p\)](#) requires the Environmental Management Commission (EMC) and the North Carolina Department of Environmental Quality (DEQ) report to the Environmental Review Commission (ERC) on or before November 1 of even-numbered years. Per statute, the biennial report shall include:

- I. Basinwide Water Resources Management Plans (Basin Plans)
  - A. Progress in developing and implementing basin plans.
  - B. Public involvement and public education in connection with basinwide planning.
  - C. A written statement on the water quality and quantity conditions that are identified over the course of preparing or revising the basin plan.
  
- II. Progress on Developing Basinwide Hydrologic Models

This biennial report provides a summary of DEQ’s progress on the development and implementation of basinwide water resources management plans (basin plans) between July 1, 2022, and June 30, 2024.

## I. Progress in Developing and Implementing Basinwide Water Resources Management Plans (Basin Plans)

Basin plans are prepared for each of North Carolina’s 17 major river basins and are used to communicate with policy makers, government officials, entities required to adhere to water quality standards (wastewater managers and operators, stormwater engineers, contractors and developers, etc.), and the public on water resource issues. When applicable, basin plans include recommendations and explanations regarding why there are long-term management strategies in place for rivers designated as nutrient sensitive waters (NSW) as well as those waters identified as having significant or outstanding water quality. Numerous federal, state and local agencies as well as watershed groups, universities and the public are contacted throughout the basin planning process.

Between July 1, 2022, and June 30, 2024, DEQ actively worked on developing and implementing updated versions of the Yadkin-Pee Dee, Broad, and Cape Fear river basin plans. Below is a summary of progress made on developing those basin plans as well as statements about public involvement and education. In July 2022, the EMC approved the fourth edition to the Yadkin-Pee Dee River Basinwide Water Resources Management Plan. Work began and has continued in updating the Cape Fear and Broad river basin plans. Over the next two years, DEQ will focus on completing and presenting those basin plans to the EMC and begin working in the Hiwassee, Little Tennessee, Savannah, and Lumber river basins. Table 1 includes the anticipated timeframes for each of the basin plans as well as EMC members serving as Basin Liaisons. Basin

Liaisons are voluntary roles agreed upon by the EMC to help facilitate discussions about water resource issues in the river basins.

Table 1: Basinwide Water Resources Management Plan (Basin Plan) Schedule

River Basin	Plan Last Approved by EMC	EMC Basin Liaison	Present to EMC Committee <sup>1</sup>	Present to EMC <sup>1</sup>
Yadkin <sup>2</sup>	2008	Chrisopher Duggan	May 2022	July 2022
Broad <sup>2</sup>	2008	Kevin Tweedy	Fall 2024	Winter 2025
Cape Fear <sup>2</sup>	2005	Upper: Jill Weese Lower: Yvonne Bailey	Spring 2025	Summer 2025
Hiwassee	2012	Marion Deerhake	Spring 2025	Summer 2025
Little Tennessee	2012	Marion Deerhake	Spring 2025	Summer 2025
Savannah	2012	Marion Deerhake	Spring 2025	Summer 2025
Lumber	2010	Dr. Jackie MacDonald Gibson	Fall 2025	Winter 2026
Catawba	2010	Charlie Carter	Fall 2026	Fall 2026
French Broad	2011	Bill Yarborough	Winter 2026	Spring 2026
New River	2011	J.D. Solomon	Winter 2027	Spring 2027
Watauga	2018	J.D. Solomon	Winter 2027	Spring 2027
Neuse	2009	Upper: Dr. Herbert Kim Lyerly Lower: Steve Keen	Fall 2027	Fall 2027
Roanoke	2012	Joe Reardon	Fall 2028	Fall 2028
Tar-Pamlico	2015	Tim Baumgardner	Fall 2028	Winter 2029
Chowan	2021	Robin Smith	Spring 2030	Summer 2030
Pasquotank	2021	Robin Smith	Spring 2030	Summer 2030
White Oak	2021	Michael Ellison	Fall 2030	Winter 2031
<sup>1</sup> Winter (December – March), Spring (March -June), Summer (June – September), Fall (September – December). Dates listed are tentative and subject to change. <sup>2</sup> Focus of this annual report.				

## Yadkin-Pee Dee River Basin

### **A. Plan Development**

In July 2022, the EMC's Water Quality Committee (WQC) approved the [2022 Yadkin-Pee Dee Water Resources Management Plan](#) (basin plan). It is the fourth basin plan to be developed for the basin. Many of the recommendations focused on identifying point and nonpoint sources of pollution to better manage nutrient inputs and target watershed planning initiatives, as well as best management practices (BMPs).

### **B. Public Involvement**

DWR communicated via phone, virtual meetings, and emails to engage stakeholders during the development of the basin plan. The basin plan was available for a 30-day public comment prior to its completion, and extensions were granted upon request. DEQ received comments from the Conservation Trust of North Carolina, Duke Energy, the Yadkin RiverKeeper, the North Carolina Farm Bureau, the North Carolina Department of Agriculture & Consumer Services' (NCDA&CS) Division of Soil and Water Conservation (DSWC) and North Carolina Forest Service (NCFS), the North Carolina Wildlife Resources Commission, and an individual who lives in the basin. Comments were acknowledged and addressed accordingly within the basin plan.

### **C. Water Quality and Quantity Conditions**

Turbidity, metals, fecal coliform bacteria, nutrients, chlorophyll *a*, pH, and dissolved oxygen were identified as parameters of concern in several watersheds across the Yadkin-Pee Dee River basin. DWR continues to work with stakeholders throughout the basin to identify sources of pollution. Because several wastewater dischargers are seeking expansions in the Rocky River watershed, the Rocky River steady-state computer model for dissolved oxygen is being updated. The computer model is used to determine assimilative capacity for new and/or expanding point source dischargers. The update is funded by several wastewater dischargers in the watershed and is scheduled to be completed by the Fall of 2024. The computer model does not, however, evaluate nutrients. A more dynamic model would be required to evaluate nutrients in the watershed.

In High Rock Lake, eutrophic conditions, algal blooms, and water quality impairments continue to be a concern for state and local resource agencies, as well as stakeholders. Beginning in 2022, an informal engagement process was initiated to bring together a wide range of stakeholders to discuss the need for a Nutrient Management Strategy specific to the High Rock Lake watershed. A steering committee and several technical advisory groups were formed which included individuals and organizations representing various interests and perspectives across the watershed. In early 2024, the Steering Committee released a recommendations

document to guide the High Rock Lake Nutrient Management Strategy rulemaking process. The strategy is expected to address a wide range of nutrient sources including, but not limited to, impervious surfaces, stormwater runoff, agriculture and wastewater. More information about the High Rock Lake Nutrient Management Strategy can be found on DWR's [website](#).

## Cape Fear River Basin

### **A. Plan Development**

DEQ is actively working to complete the fourth update to the Cape Fear River basin plan. The basin plan focuses on chemical, physical, and biological impairments identified in the basin, as well as existing nutrient management strategies or rules put into place to protect water resources. Because of the widespread concerns over emerging compounds, including per- and polyfluoroalkyl substances (commonly referred to as PFAS) and 1,4-dioxane, DEQ is incorporating resources available for understanding PFAS and 1,4-dioxane and referencing special studies that have been conducted in the basin.

### **B. Public Involvement**

DWR continues to communicate via phone, virtual and in-person meetings, as well as emails, to engage stakeholders in the development of the basin plan. As part of plan development, basin planners worked closely with the Cape Fear River Assembly in 2022 to develop and distribute an online stakeholder engagement survey. The goal of the survey was to understand how the public uses the basin plan, generate interest in basin planning and its purpose, and gauge public concerns and issues that should be addressed in the plan. DWR received over 200 responses to the survey. Results will be summarized in the basin plan.

Staff continue to participate in stakeholder meetings throughout the basin, presenting information about water resources concerns in specific watersheds, and working with internal and external stakeholders to review recommendations for addressing point and nonpoint sources of pollution, water demand, and monitoring needs. Once internal review is complete, the Cape Fear River basin plan will be released for a 60-day public comment period. The public will be notified through various listservs, a press release, and on DEQ's website and social media channels.

### **C. Water Quality and Quantity Conditions**

Turbidity, dissolved oxygen, emerging compounds, biological integrity, fecal coliform bacteria, metals, aquatic habitat, instream flow, water availability, algal blooms, and nutrients continue to be concerns throughout the basin. The basin plan will include basinwide and watershed-specific recommendations that will address both point and nonpoint sources of pollution to

target watershed planning initiatives and the implementation of best management practices (BMPs). The basin plan will also include a chronological history of nutrient concerns surrounding the Jordan Lake watershed, as well as the middle portion of the Cape Fear River. Nutrient concerns throughout the basin have led to permitting strategies for wastewater discharge. These strategies will be included in the plan along with future needs and recommendations on how to address those needs.

## Broad River Basin Plan

### **A. Plan Development**

DWR is actively working to complete the fourth update to the Broad River basin plan. The basin plan focuses on chemical, physical, and biological impairments identified in the basin, as well as issues related to sediment and erosion control.

### **B. Public Involvement**

DWR continues to communicate via phone, virtual and in-person meetings, field tours with the local soil and water conservation districts' (SWCD) and regional office staff, as well as emails to engage stakeholders in the development of the Broad River basin plan. Staff continue to work with internal and external stakeholders to review recommendations for addressing point and nonpoint sources of pollution, water demand, and monitoring needs. Once internal review is complete, the basin plan will be released for a 30-day public comment period. The public will be notified through listservs and press releases on DEQ's website and social media channels.

### **C. Water Quality and Quantity Conditions**

The majority of the impairments in the Broad River basin are due to impacts to benthic macroinvertebrate and fish communities followed by turbidity. Fecal coliform bacteria, nutrients and temperature are also parameters of concern. The basin plan will include basinwide and watershed-specific recommendations to address both point and nonpoint sources of pollution in an effort to target watershed planning initiatives and the implementation BMPs.

## Statewide Activities

For the implementation of recommendations presented in a basin plan, DWR relies heavily on internal and external partners. Implementation can include changes to regulatory directives or the creation of new directives, voluntary management measures, and/or public education, outreach and engagement. Basin planners work continually with several watershed groups across the state, as well as many programs within DWR, to address major issues identified in each of the river basins. Not all basins have an active watershed group, however, and basin planners are continuing to work with local leaders to identify potential opportunities to share recommendations presented in the basin plans. Examples of ongoing activities include:

- Basin plans approved in 2021 and 2022 included a recommendation for basin planners to work collaboratively with DWR’s wastewater programs and the Modeling & Assessment Branch (MAB) to better understand point sources in the basins. Basin planners are working with DWR permit writers and providing recommendations to ensure permitted facilities are collecting the appropriate chemical, physical and biological parameters necessary to help manage and mitigate impacts from wastewater dischargers.
- The Chowan, Pasquotank and White Oak river basin plans were approved by the EMC in 2021. The basin plans have been used by stakeholders, non-profit organizations, internal and external agencies, as well as researchers, to support water quality management and protection efforts in the region. These efforts include communicating water quality issues identified in each river basin, grant applications to support water quality initiatives, the development of a stakeholder-driven algal bloom resiliency project, garnering support from residents to use the NCDEQ-DWR [Fish Kill & Algal Bloom Report Dashboard](#), as well as guiding several discussions by researchers and residents on the causes of nutrient inputs, algal blooms, and their associated algal toxins. In addition to the basin plans, the [Chowan River Basin StoryMap](#) was recently updated and re-released with improved functionality, and the [Pasquotank River Basin Plan StoryMap](#) has averaged approximately two online visits per day between July 2023 and July 2024. A StoryMap has been developed for the White River basin and will be available online once it is finalized.
- Basin planners continue to participate in coalition and association meetings in the Cape Fear, Neuse and Yadkin river basins, as well as several non-profit and voluntary watershed group meetings statewide, to understand water resource needs and concerns. They also continue to provide guidance on voluntary measures that can be put in place to protect our water resources and participate in educational opportunities

that may arise (e.g., presentations to watershed groups and teachers on nonpoint sources of pollution, water quality assessments, state regulatory structure, etc.).

### Statewide Total Impairments: 2022 Integrated Report (IR)

Chemical, physical, and biological parameters are assessed regularly to determine how well waterbodies are meeting their best intended use (e.g., support aquatic life, fish consumption, recreation, shellfish harvesting, water supply). Every two years, DEQ uses water quality assessment results for each monitored waterbody to produce the Integrated Report (IR). The Integrated Report is submitted to the U.S. Environmental Protection Agency (EPA) on even numbered years to fulfill reporting requirements for Section 303(d) and Section 305(b) of the federal Clean Water Act (CWA). Each IR includes data collected during a five-year assessment window.

In North Carolina, waterbodies are assigned an assessment unit (AU) number. AUs vary in size and do not represent the total number of miles or acres that exceed numeric or narrative water quality standards. Parameters (e.g., pH, temperature, turbidity, biological health, bacteria levels, metals) are assessed independently. An AU can have multiple assessments depending on the amount of data and information collected.

*Table 2: Number and Findings of Water Quality Assessment Units (AUs) Assessed for the 2022 Integrated Report*

Determining if a waterbody meets or exceeds criteria to protect its best intended use depends on the frequency of exceedances of the numeric or narrative water quality standard. Water quality assessment methods are approved by the EMC and explained in detail in the [Integrated Report Methodology](#) available on DWR’s Modeling and Assessment Branch’s (MAB) website.

<b>Water Quality Standards</b>	<b>Number of Assessment Units (AU) Assessed<sup>1</sup></b>
Meeting Water Quality Standards or Data Inconclusive	2,394 (63%)
Exceeding Water Quality Standards	1,388 (37%)
<b>Total # Assessed<sup>2</sup></b>	<b>3,782</b>

Because North Carolina’s 2024 303(d) list of impaired waters has not been approved by the EPA by the time of this report, DWR is reporting on water quality assessments from North Carolina’s 2022 CWA Section 303(d) list of impaired waters which was approved by EPA on April 30, 2022. The five-year assessment window for the 2022 CWA Section 303(d) list of impaired

<sup>1</sup> AUs vary in size and do not represent total number of miles or acres. An AU can have multiple assessments depending on the amount of data and information collected and available for assessment.

<sup>2</sup> Number of AUs impaired for fish consumption for mercury are not included in the total # of AUs assessed.



waters was 2016 through 2020. Thirty-seven percent (37%) of the assessed waters were exceeding criteria for at least one water quality parameter (Table 2). Parameters included chemical, physical, and biological characteristics that impact water quality (Table 3).

Nearly half (663) of North Carolina’s impairments are in shellfish growing areas designated by DEQ’s Division of Marine Fisheries (DMF) as conditionally-approved open or closed, prohibited, or restricted for shellfish harvesting. Eighty (80) AUs are currently on the CWA Section 303(d) list for one or more metals. All waters continue to be impaired for mercury in fish tissue due to fish consumption advisories issued by the North Carolina Department of Health and Human Services (DHHS).

*Table 3: Water Quality Parameters Identified on the 2022 Clean Water Act Section 303(d) List of Impaired Waters and the Number of Assessment Units (AU) in North Carolina Associated with Each*

Water Quality Parameters	Number of North Carolina Assessment Units (AU) <sup>1</sup> Exceeding Criteria
<b>BACTERIA</b> Includes Enterococcus and Fecal Coliform bacteria measured/monitored for recreational waters and Shellfish Growing Areas	663
<b>BIOLOGICAL</b> Includes benthic and fish aquatic habitat monitoring	395
<b>CHEMICAL/PHYSICAL</b> Includes chlorophyll <i>a</i> , dissolved oxygen, pH, turbidity	201
<b>METALS</b> Includes arsenic, copper, mercury, nickel, zinc	80
<b>FISH CONSUMPTION ADVISORIES<sup>2</sup></b> Includes fish tissue advisories for arsenic, dioxin, hexavalent chromium, PCBs	49
<b>Total AUs Exceeding Criteria</b>	1,388
<sup>1</sup> AUs vary in size and do not represent the total number of miles or acres. An AU can have multiple assessments, depending on the amount of data and information collected and available for assessment.	
<sup>2</sup> Does not include statewide fish tissue advisory for mercury.	

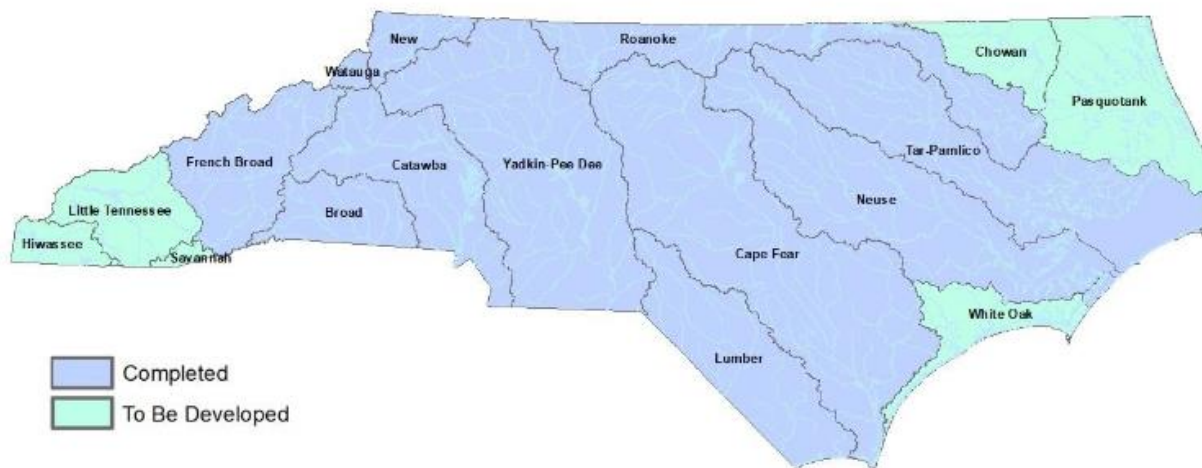
Emerging compounds are relatively unknown compounds that are increasingly being detected in soil, groundwater, surface water, and air. As science advances, laboratories can detect these compounds, and researchers are discovering new details about their adverse effects on human health and the environment. Because the science and research on emerging contaminants is expanding quickly, DEQ created the [Emerging Compounds: Resources](#) and the [Emerging Compounds](#) webpages. These webpages include reports and tasks completed by the DEQ Secretary’s Science Advisory Board (e.g., [GenX Investigation](#)). Basin plans will reference these materials on a basin-by-basin basis.

## II. Progress on Developing Basinwide Hydrologic Models

DEQ hosts hydrologic models (Figure 3) for the Tar-Pamlico, Roanoke, Broad, and French Broad river basins through OASIS (Operational and Simulations of Integrated Systems). Combined OASIS models are available for the Cape Fear-Neuse rivers, Yadkin-Pee Dee-Lumber rivers, and New-Watauga rivers. For the Catawba River basin, a hydrologic model is available through CHEOPS (Computerized Hydroelectric Operations Software). The CHEOPS model is currently being updated by the Catawba-Wateree Water Management Group (CWWMG), and it is expected to be completed in 2025 after which the model will be shared with DEQ.

In 2022, funding was secured to host the OASIS hydrologic models on an independent server. Between 2022 and 2024, DWR migrated all existing models to the new server. These models are available to anyone who requests access. They can be used to evaluate potential impacts to stream flow from proposed projects and help identify the recurrence at which stream flow could be low enough to produce water shortages and limiting a facility's ability to meet current or projected water demand. Between 2022 and 2024, DWR reevaluated their data management workflow to create a more efficient process for gathering information for basin planning and hydrologic modeling purposes. More information about the hydrologic models can be found on DWR's Modeling and Assessment Branch's (MAB) [website](#).

Figure 3: Status of Hydrologic Model Development for North Carolina's 17 River Basins



## Conclusion

DEQ continues to make progress in developing and implementing basinwide water resources management plans as demonstrated by the work performed on the Yadkin-Pee Dee, Broad, and Cape Fear river basin plans, as well as various statewide activities over the last two years. In the coming years, DEQ will continue to focus on completing the Broad and Cape Fear river basin plans, and staff will begin working on plans for several of the western basins (including the Hiwassee, Little Tennessee, and Savannah rivers), as well as the Lumber River basin (Table 1). More information about basin planning can be found on DWR's Basin Planning Branch's [website](#).

This report is submitted to meet the requirements of G.S. 143-215.8B(d) and G.S. 143-355(p), which requires annual reporting on the development of basinwide water quality management plans and the progress on developing hydrologic models.