

Partnership To Monitor

AND IMPROVE
WATER QUALITY
IN ALBEMARLE WATERS



Algal Blooms

Algal blooms returned to the Chowan River and Albemarle Sound in 2015 after a 30-year absence. Blooms have occurred each summer since then and are appearing in new locations such as the Little, Perquimans and Pasquotank rivers and some of their tributaries.

Studying and Addressing Algal Blooms

A broad partnership of the [Albemarle Resource Conservation and Development Council](#) (ARC&D), [Albemarle Commission](#), [Chowan-Edenton Environmental Group](#) (CEEG), [Green Saves Green](#) Little River Keepers, Soil and Water Conservation Districts (SWCD), state agencies, local governments, and universities are monitoring water quality in rivers and creeks in the region to determine and address the sources of nutrients, mainly nitrogen (N) and phosphorus (P), that are contributing to the algal blooms. The Chowan River and Albemarle Sound experienced extensive algal blooms in the 1970's and 1980's, and a NC/VA scientific task force identified and addressed the blooms, which did not appear again significantly until 2015. The blooms have returned each summer since then, and have appeared in rivers and creeks that have not had extensive blooms in the past.

The partnership has been conducting research the past three years to identify nutrient hot spots, likely sources of nutrients, and key areas for additional research. Citizen scientists are collecting water samples from key locations on the Chowan River, Potecasi Creek, Edenton Bay, Little River, Perquimans River and tributary creeks, and tributaries to the Pasquotank River. The samples are sent to two labs for nutrient analysis. Identifying nutrient hotspots and the sources of nutrients are key steps for developing an effective program to address poor water quality and the annual algal blooms.

This regional research effort has been funded by grants from [Clean Water Management Trust Fund](#), [US Fish and Wildlife Service - Partners for Fish and Wildlife](#), Pasquotank SWCD, and the many volunteer citizen scientists who are donating their time.



What We Have Learned

Chowan River Basin

- Chlorophyll-*a* is increasing-- loading from VA is low, main stem Chowan River is relatively high.
- Ammonia levels are generally low.
- Organic N is generally increasing.
- A general increase in Total Kjeldahl N and a reduction in N oxides.

Pasquotank River Basin

- Total phosphorus and organic N are increasing in the Little River.
- Many tributary creeks in the region are showing relatively high total P.

Region Wide

- Unassessed coastal streams could contribute up to 40% of the nutrient load to the Chowan River and Albemarle Sound.
- Cyanobacterial N fixation could equal all N from tributaries combined.

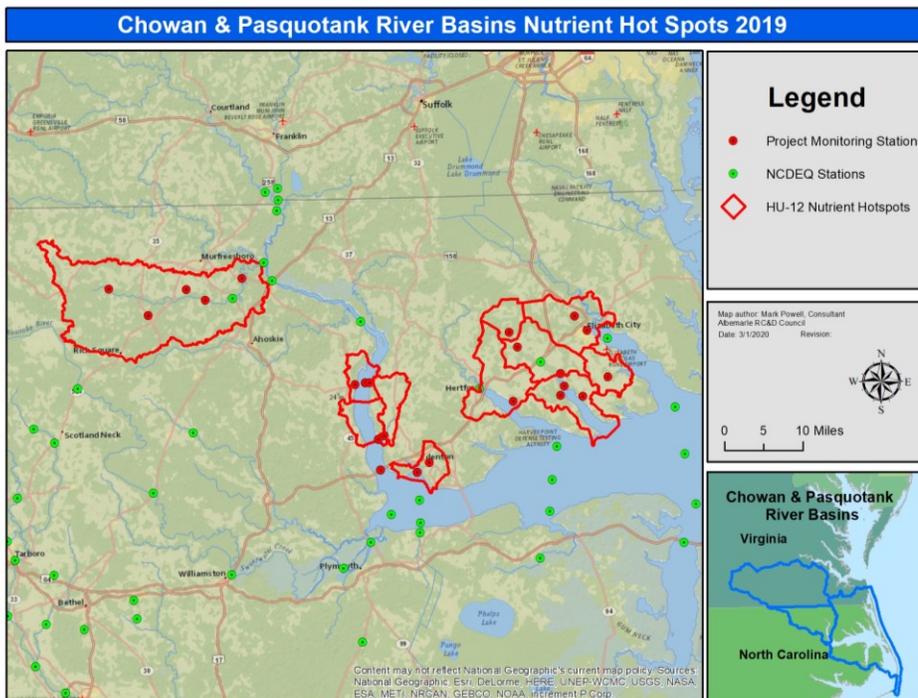
For more information on algal blooms in Albemarle waters visit:

www.albemarleacd.org/fighting-algal-blooms.html

Partnership to Monitor and Improve Water Quality

Dr. Hans Paerl and Dr. Nathan Hall at the UNC Institute of Marine Sciences conducted a study for the partnership, which identified key areas of research:

- 1. Determine nutrient loads from coastal plain tributaries. Nutrient concentrations of coastal plain streams are largely unknown, but the few that have been measured indicate that they have 2-3 times the concentrations of piedmont rivers and could contribute up to 40% of the nutrient load to the Chowan and Albemarle Sound.**
 - a. Measure concentrations of nutrients (N and P) in coastal streams representative of different land uses and soil types.
 - b. Measure stream flow of representative coastal streams to calibrate and validate current models of stream flow in the coastal plain
- 2. Quantify cyanobacterial N fixation as a source of nitrogen to the Albemarle Sound system. The biomass of potentially N-fixing cyanobacterial species has increased 100 fold in the past 20 years. At current levels of cyanobacteria biomass, cyanobacterial N fixation could equal all tributaries combined.**
 - a. Directly measure cyanobacterial N fixation at representative sites throughout the Chowan River and Albemarle Sound.
 - b. Independently assess N fixation using stable N isotope abundance that integrates N fixation rates over time and space
- 3. Investigate the impact of rising water levels on nutrient cycling in riparian zones along the Chowan River and Albemarle Sound. The Albemarle Sound region is experiencing rapid increases in water levels with likely increases in soil moisture in surrounding wetlands. Increased soil saturation may interfere with the process of coupled nitrification/denitrification that removes N from the estuary.**
 - a. Begin to establish time series of soil saturation and N removal from the estuary by nitrification/denitrification at representative sites around the Albemarle Sound
 - b. Conduct experiments and develop models to quantify the impact of the recent increase in water levels on N removal by riparian wetlands.



Citizen science water quality monitoring in 2018 and 2019 in the Chowan and Pasquotank River Basins helped identify possible nutrient hotspots including Potecasi Creek, Arrowhead Beach, Colerain, Rocky Hock Creek, Queen Anne's Creek, Little River, Symonds Creek, Newbegun Creek, and Knobbs Creek. Addressing research area number one above, the project will continue to monitor these creeks and areas, and expand monitoring to more creeks and rivers in the region. The project will study the hotspot watersheds to identify and address specific sources of nutrients.