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Prepared in cooperation with the Town of Apex, Town of Cary, Chatham County, City of Durham, Town of Hillsborough, Town of Morrisville, Orange County, Orange Water and Sewer Authority, and Central Pines Regional Council

Triangle Area Water Supply Monitoring Project, North Carolina

Project Mission Statement

The Triangle Area Water Supply Monitoring Project (TAWSMP) is a regional partnership evaluating water quality in Triangle area drinking-water supplies and their tributaries. Focused studies on emerging contaminants, as well as long-term monitoring of nutrients and streamflow, provide timely information to local and regional stakeholders to use in modeling, assessments, and research.

Project Goal

Determine whether nutrients or emerging contaminants are impacting Triangle area drinking-water supplies, identify their potential sources, and assess whether their concentrations are worsening over time.

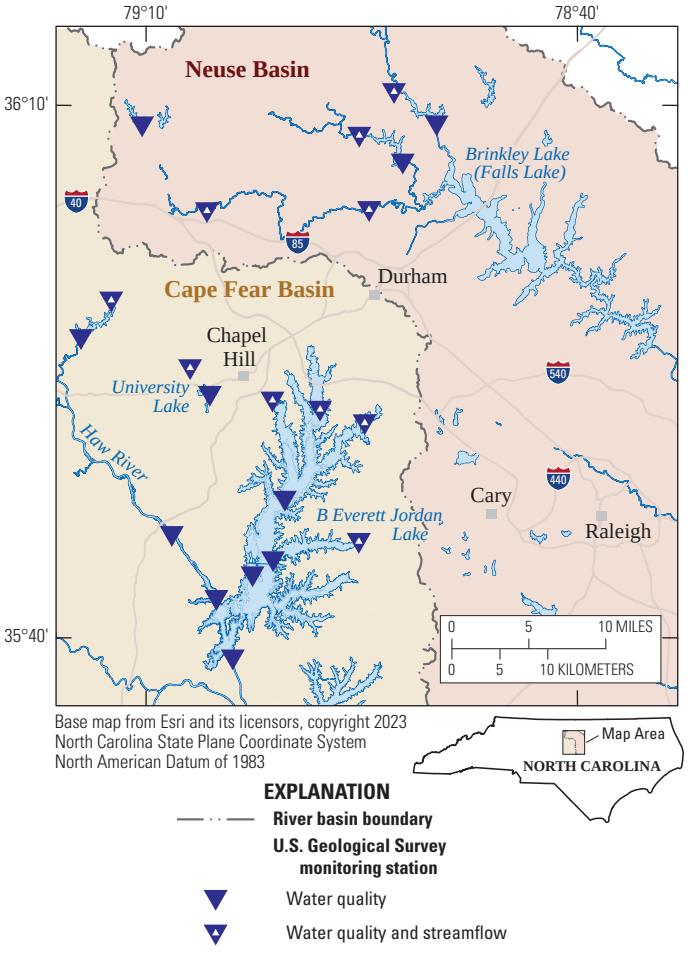


Figure 1. Triangle Area Water Supply Monitoring Project area showing current water-quality and streamflow monitoring locations.

Project Objectives

1. Collect water-quality samples, including nutrients and emerging contaminants, to monitor water quality in Triangle area surface-water-supply reservoirs and their tributaries (table 1, fig. 1)
2. Measure and monitor streamflow in tributaries to quantify water availability
3. Analyze water-quality and streamflow information to assess conditions in drinking-water supplies and their tributaries

Project Background and History

Much of the North Carolina Triangle area—which encompasses the area including and surrounding the cities of Raleigh, Durham, and Chapel Hill, North Carolina—relies on rivers and surface-water reservoirs for drinking water. The area's landscape has profoundly changed to accommodate a rapidly growing population. Urban and suburban growth add sources of nutrients and contaminants to the landscape and increase regional water demand. The quality of drinking-water supplies in the Triangle area may be at risk from potential sources of contamination. Climate change and regional water use can also affect the amount of available drinking water. The TAWSMP began in 1988 after the construction of B. Everett Jordan Lake and Brinkley Lake (Falls Lake) were completed. The former is part of the Cape Fear Basin and the latter is part of the Neuse Basin (fig. 1).

In partnership with the U.S. Geological Survey (USGS), several Triangle area municipalities established a long-term water-quality and streamflow monitoring program to quantify changes in water quality and water availability over time and evaluate the relative risk of potential water-supply contaminants. Each phase of the TAWSMP lasts approximately 3–5 years (fig. 2) and usually has a specific water-quality focus reflecting the changing needs of local partners. The USGS publishes reports to summarize the results of these monitoring efforts. More information on project history can be found in Diaz and Fanelli (2024).

Table 1. Water-quality constituents and properties measured through the long-term monitoring program or during one of the focused contaminant studies.

Long-term monitoring	Focused studies on contaminants
Nitrogen	Pesticides and other synthetic organic compounds
Phosphorus	Organic wastewater compounds
Chlorophyll *a*	Cyanotoxins and taste-and-odor compounds
Sediment and (or) turbidity	*Cryptosporidium* and *Giardia* species parasites
Major ions	Mercury
Iron and manganese	Chromium
pH	Bromide[1]
Specific conductance at 25 degrees Celsius	1,4-Dioxane[1]
Dissolved oxygen	Per- and polyfluoroalky substances[1] (PFAS)
Water temperature	

[1]Monitoring in progress during current project phase.

Current Phase Activities

TAWSMP Phase IX began in 2022 and will continue until 2027, with a particular focus on sampling the following emerging contaminants at all monitoring locations:

- 1,4-Dioxane
- Bromide
- Per- and polyfluoroalkyl substances (PFAS)

A synthesis report will be released near the end of the phase to summarize results. The USGS continues to perform routine nutrient, water-quality, and streamflow monitoring, which includes the following:

- Bimonthly sampling at nine surface-water reservoir locations and four contributing streams and rivers
- Stormwater runoff sampling at select tributary locations to augment State-led sampling efforts
- Streamflow monitoring at 10 streamgages in the area, which provide real-time streamflow information

Why is streamflow monitoring important?

Streamflow monitoring helps quantify the amount of water flowing in and out of surface-water reservoirs. The USGS operates streamgages for the TAWSMP, which measure the amount of water flowing in a stream or river over time. Streamflow information can be used for the following:

Source and transport.—Determine where nutrients and contaminants are coming from, how they are being transported, and how much is contributed by individual streams and rivers

Reservoir management and modeling.—Understand the changes caused by reservoir operations and conduct long-term water management planning

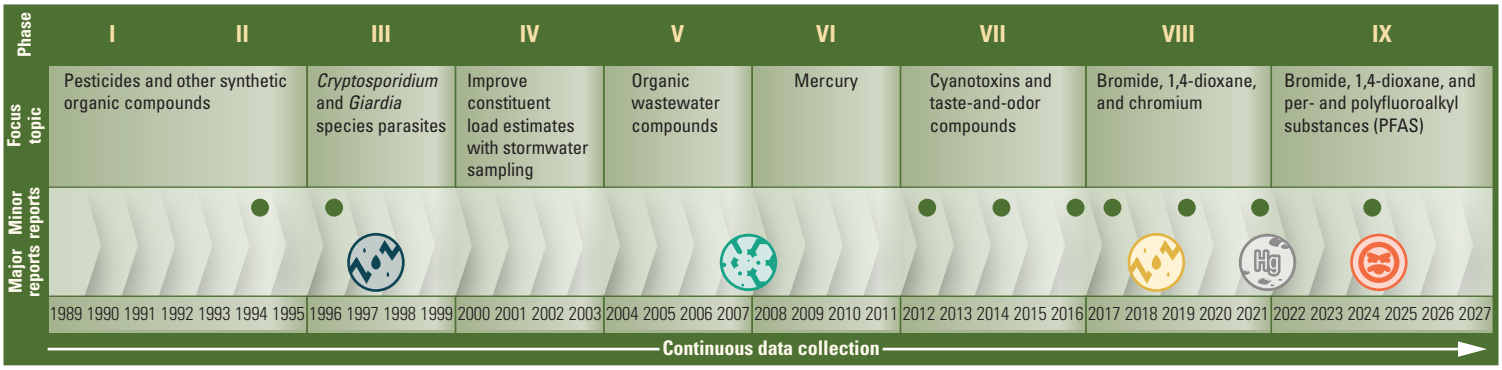
Trends analysis.—Assess the impacts of management activities or climate change on water availability over time

Eric von Amsberg collecting a water-quality sample at the Haw River below B. Everett Jordan Dam near Moncure monitoring station (U.S. Geological Survey identifier 02098198). Photograph by Ryan Rasmussen, U.S. Geological Survey.

Deanna Hardesty taking water-quality measurements at the University Lake at intake near Chapel Hill monitoring station (U.S. Geological Survey identifier 0209749990). Photograph by Ryan Rasmussen, U.S. Geological Survey.

Ryan Rasmussen retrieving water-quality samples from an automated sampler during a flooding event at the Northeast Creek at SR 1100 near Genlee monitoring station (U.S. Geological Survey identifier 0209741955). Photograph by Stephen Harden, U.S. Geological Survey.

TAWSMP Timeline and Major Report Summaries



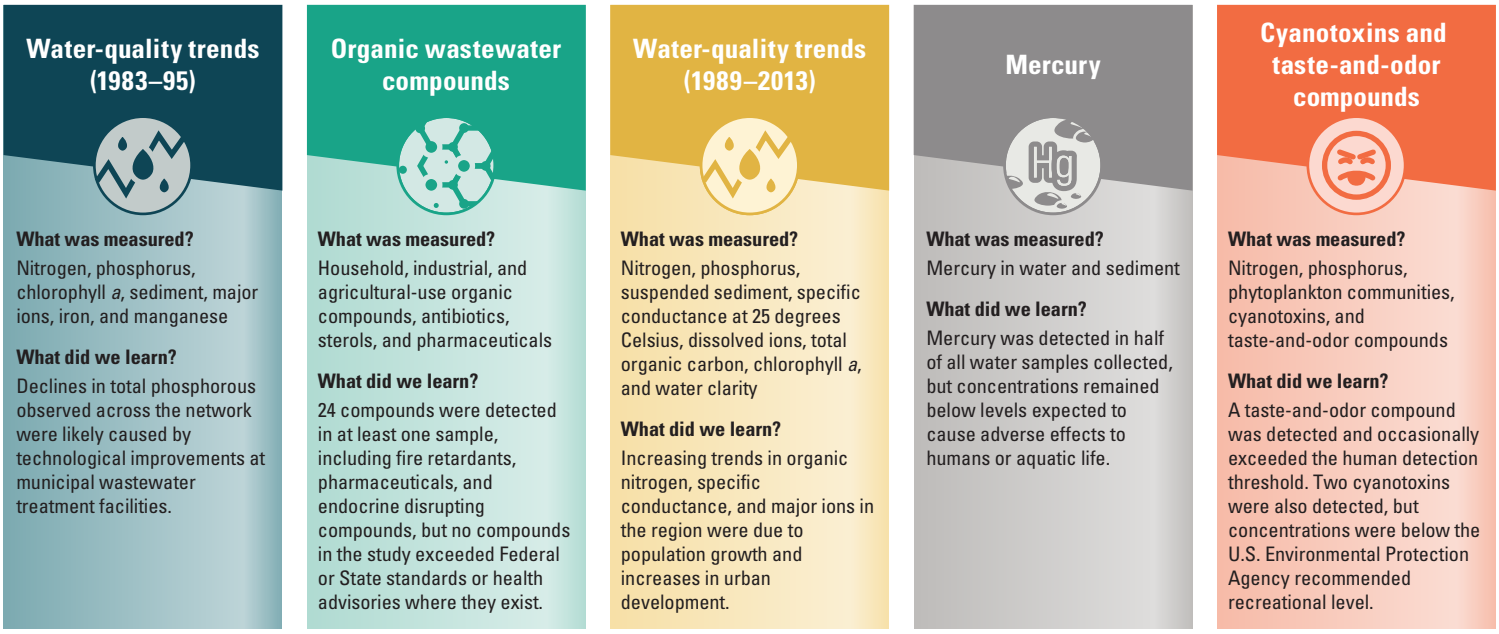
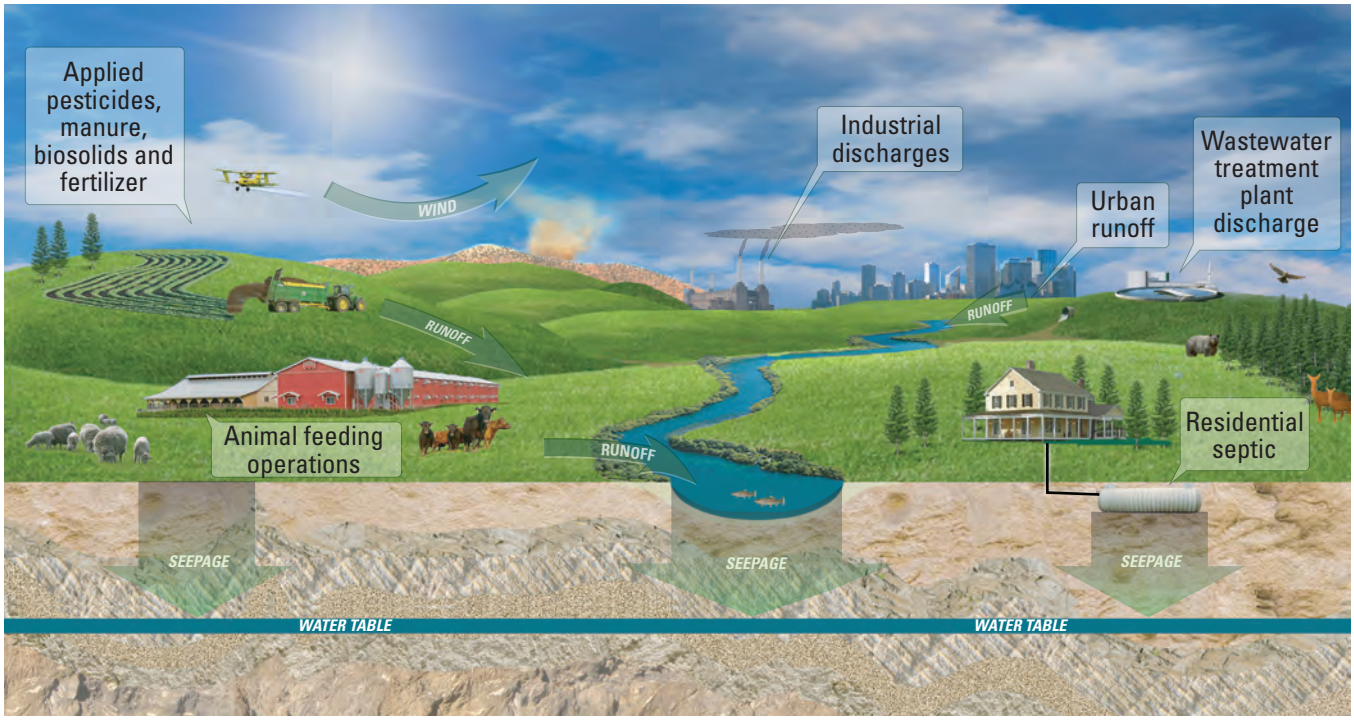


Figure 2. Triangle Area Water Supply Monitoring Project (TAWSMP) timeline including the years for each phase, the focus topic for each phase, and the years for which major and minor reports were published, which typically follows phase completion. More details on each phase can be found in Diaz and Fanelli (2024). A report summarizing phase VIII and IX activities is planned to be published once phase IX data collection is complete.

Why is water-quality monitoring important?

Nutrients.—Nutrients from wastewater treatment plants, urban stormwater runoff, or agricultural facilities may be transported into streams and rivers, which then flow into surface-water reservoirs. Excess nutrients increase algal growth, especially in warmer seasons. These algae sometimes produce compounds that make water taste or smell unpleasant, or cyanotoxins that can be harmful if ingested by humans or animals. Nutrient and streamflow data collected through the TAWSMP are used by the USGS, academic researchers, and regional stakeholders (including the North Carolina Department of Environmental Quality) to support nutrient and sediment loading models. These models quantify the amount of nutrients and sediments entering water-supply reservoirs and can assess whether those loads are responding to management practices aimed to reduce nutrient and sediment loading.

Contaminants.—Contaminants from manufacturing and industrial facilities, urban and agricultural stormwater runoff, and wastewater treatment plants may also be discharged into streams and rivers. All municipal water suppliers conduct monitoring at their water-supply treatment plants as required by State and Federal regulations to ensure public drinking water is safe. This includes periodic water-quality monitoring for contaminants listed on the U.S. Environmental Protection Agency's unregulated contaminant monitoring rule (UCMR), which evaluates a rotating suite of emerging contaminants every 5 years in treated drinking water. Contaminant monitoring through the TAWSMP complements UCMR monitoring efforts by allowing for more prolonged and flexible monitoring of source water. Together, these water-quality monitoring efforts can be used to comprehensively assess potential contamination risks to Triangle area water supplies.



NOT TO SCALE

Modified from Bright and others, 2013

Many sources can contaminate water flowing into surface-water supplies used for drinking-water sources, including urban and agricultural runoff, and industrial and wastewater effluent. Water-quality monitoring helps managers and scientist keep track of potential contaminants and determine whether they are putting a water supply at risk of contamination.

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