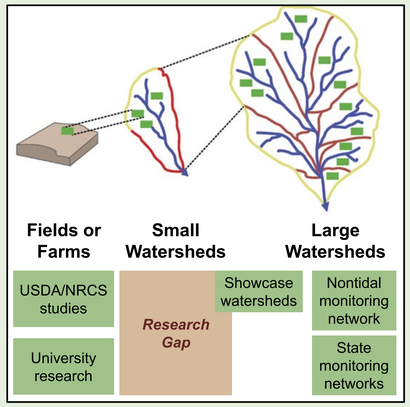
Monitoring Small Agricultural Watersheds to Motivate and Evaluate Conservation Actions

USGS science for a changing world

Motivation for the Study

Farmers throughout the Chesapeake Bay watershed are volunteering to use conservation practices on their land. Many of these practices can lower nutrient and sediment loads in local streams. However, it is difficult to identify the effect of conservation practices in larger rivers. Therefore, additional research in small watersheds can be used to guide effective water-quality management strategies in agricultural landscapes.



Many Chesapeake Bay water-quality studies are performed at field/farm scales or in large watersheds, leaving a research gap in small watersheds.

In a 2021 report, a federal monitoring team of experts from the USGS, USEPA, and NRCS identified the need for **enhanced monitoring at finer scales to better connect conservation practices with water-quality changes.** This study is designed to address the lack of long-term monitoring studies in small agricultural watersheds.

Through partnership with local communities and long-term monitoring of agricultural streams, this study can help identify how streams are responding to agricultural conservation activities.

Objectives

The overall objectives of this study are:

1. To build partnerships with agricultural communities.
2. To evaluate the effects of agricultural conservation practices on water-quality responses.

Site Selection

Based on feedback from scientific and conservation partners, five study watersheds were selected in 2024. These watersheds met the following criteria:

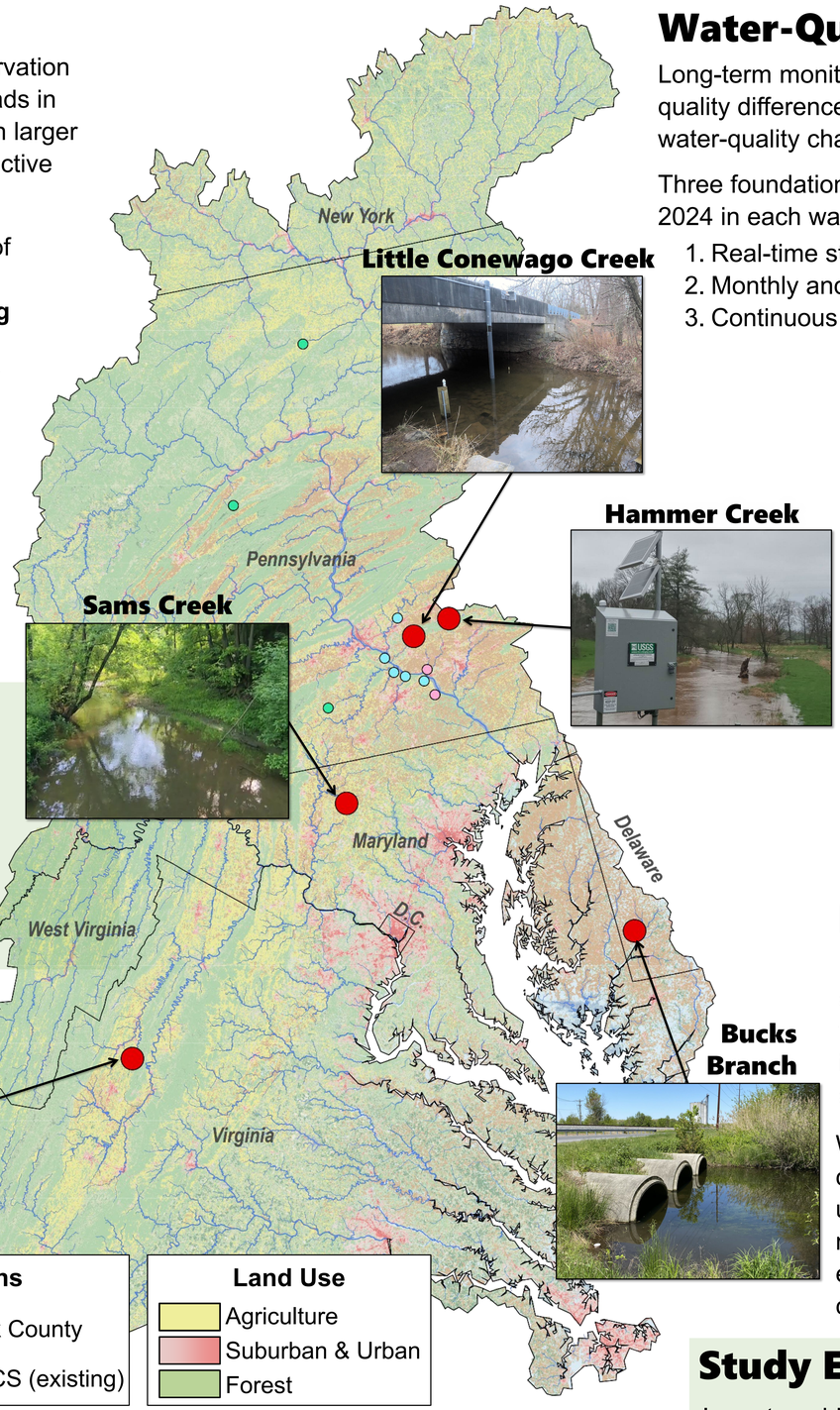
1. **Size**: "small" watersheds: less than 20 mi^2.
2. **Land Use**: intensive agricultural areas.
3. **Location**: representative watershed settings.
4. **Partnership**: areas where agricultural partnerships could be developed or strengthened
5. **Conservation**: areas targeted for future agricultural conservation practices.

Nested Watersheds

Little Conewago Creek and War Branch are nested within existing study areas, providing an opportunity to assess upstream and downstream water-quality patterns.

Conservation Priority Areas

All watersheds are focus areas for future conservation through local TMDLs, NRCS initiatives, and/or local partnerships.



Watershed	State	Area (mi^2)	Major River Basin	Major Geology	Common Ag. Activities
Hammer Cr.	PA	12.8	Susquehanna	Carbonate	Cattle, poultry, crops
Little Conewago Cr.	PA	5.2	Susquehanna	Siliciclastic	Cattle, poultry, crops
Sams Cr.	MD	11.0	Potomac	Siliciclastic	Cattle, crops
Bucks Br.	DE	6.8	Eastern Shore	Sand	Poultry, crops
War Br.	VA	11.2	Potomac	Carbonate	Cattle, poultry

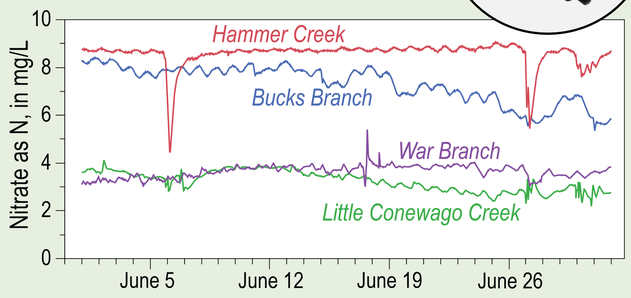
Water-Quality Monitoring

Long-term monitoring is designed to identify water-quality differences across agricultural watersheds and water-quality changes over time.

Three foundational types of data collection began in 2024 in each watershed:

1. Real-time streamflow
2. Monthly and storm-targeted water-quality samples
3. Continuous water-quality data

Continuous Nitrate Data



15-minute nitrate-as-N concentrations are being measured at each station. These data reveal detailed nitrogen patterns and, with streamflow, can be used to calculate loads. Explaining these and other water-quality patterns relies on detailed knowledge of watershed activities.

Building Partnerships

In addition to the federal, state, and academic partners who are supporting this work, this study is focused on increased engagement with local agricultural communities.

Working together with local agricultural communities can strengthen our understanding of water-quality responses. These partnerships can ensure that we're fully accounting for conservation actions taken by farmers.

Study Expansion and Collaboration

In partnership with NRCS, five additional agricultural stations will be installed in Pennsylvania, with three in the Chesapeake Bay watershed.

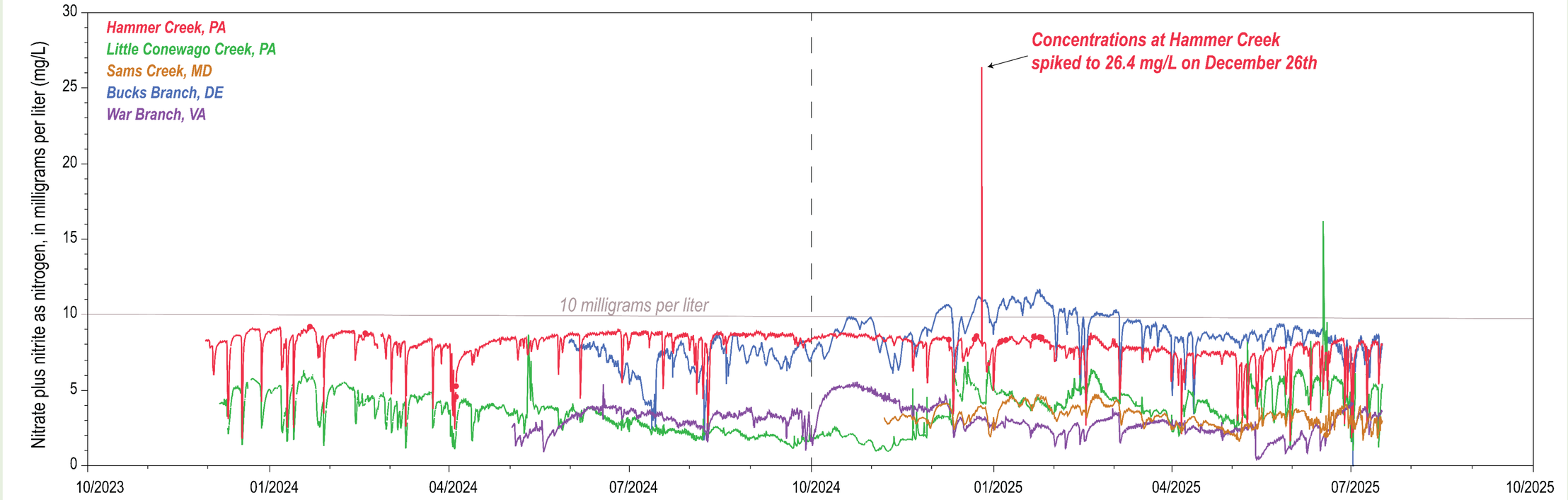
We're working with other partners and agencies to add data collection and additional interpretative work to this study, such as benthic monitoring and geospatial analyses.

This study provides many collaborative opportunities with the USGS research community. We want to work with you!

Monitoring Small Agricultural Watersheds to Motivate and Evaluate Conservation Actions

Ongoing Data Collection

Continuous streamflow and water-quality data and water-quality samples continue to be collected from the study watersheds.



Recent Outreach Events

On May 20th, partners attending the Chesapeake Choose Clean Water conference visited the **War Branch** monitoring station with USGS.

wmra.org/2025-06-03/assessing-stream-health-in-virginia-with-biology-and-chemistry

On June 23rd, EPA regional leadership and local partners in Delaware visited the **Bucks Branch** monitoring stations with USGS.

Monitoring Small Agricultural Watersheds to Motivate and Evaluate Conservation Actions

What Questions Would You Like This Study To Address?

1. How do conservation practices affect nonpoint source nutrient and sediment loads?
2. How can type and placement of conservation practices effectively reduce nonpoint agricultural loads?
3. How much nutrient and sediment load is contributed by different agricultural sectors of the watershed?
4. What are the relations between nutrient inputs and watershed export?
5. How do legacy nutrient applications affect present-day conditions?
6. How much sediment is delivered from streambanks, overland runoff, or resuspension of in-channel material?
7. How are nutrient and sediment loads affected by changing weather patterns?
8. What important nutrient and sediment processes are not being accurately represented in the CB watershed model?

For More Information...

usgs.gov/small-ag-monitoring

USGS Points of Contact

- **Pennsylvania:** Emily Woodward ewoodward@usgs.gov & Hilary Dozier hdozier@usgs.gov
- **Maryland:** Alex Soroka asoroka@usgs.gov
- **Delaware:** Josh Kasper jkasper@usgs.gov
- **Virginia:** Spencer Tassone stassone@usgs.gov

USGS Chesapeake Studies Assoc. Coordinator: Jimmy Webber jwebber@usgs.gov