Monitoring Small Agricultural Watersheds to Motivate and Evaluate Conservation Actions

The USGS, NRCS, and EPA are planning a new water-quality monitoring effort with Chesapeake Bay partners in small agricultural watersheds.

Objectives:

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

US Geological Survey

- ***MD:*** Alex Soroka
- ***DE:*** Mark Nardi & Josh Kasper
- ***PA:*** John Clune & Hilary Dozier
- ***VA:*** Jimmy Webber & Spencer Tassone

EPA Chesapeake Bay Program Office

- Lee McDonnell
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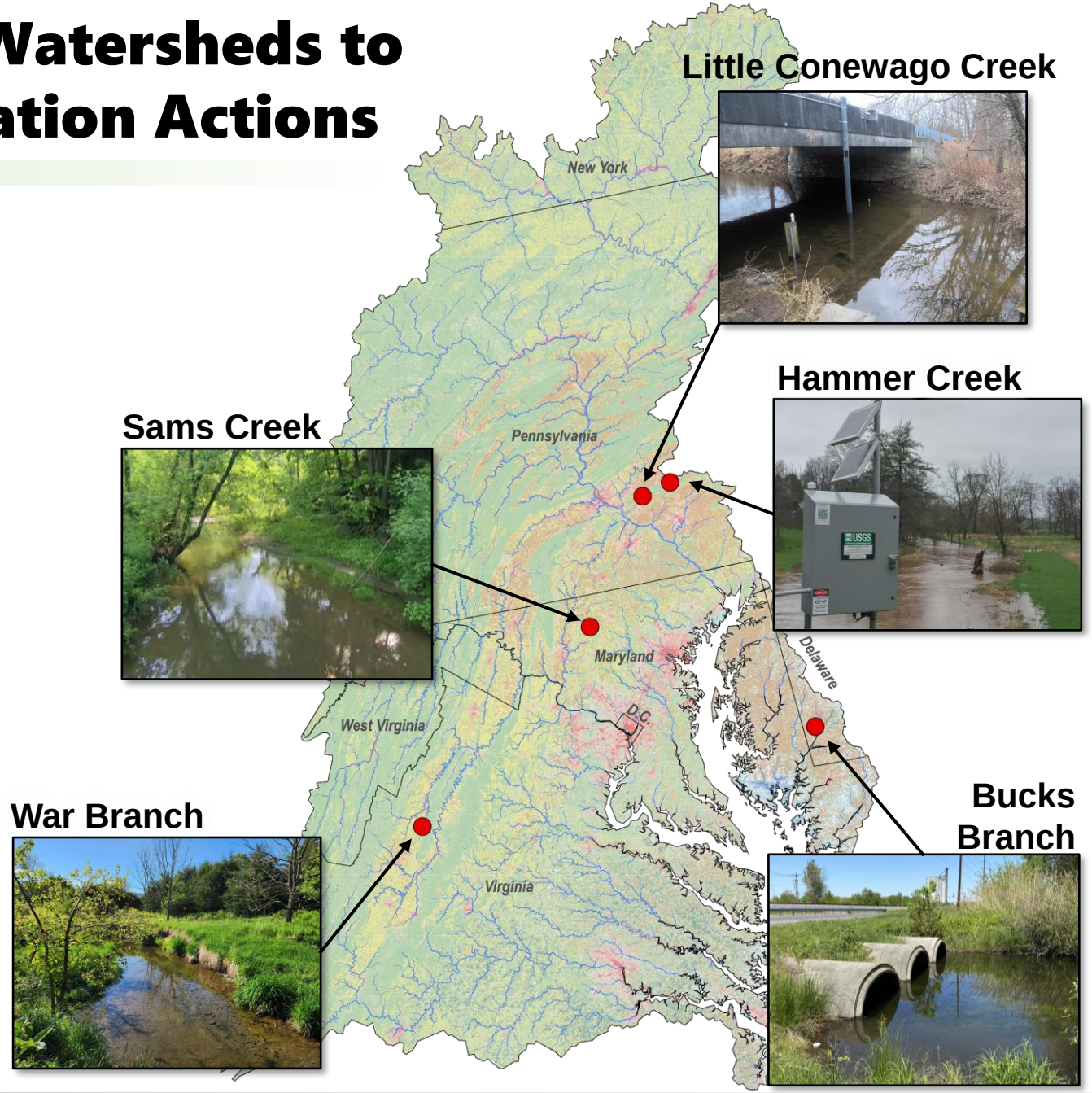
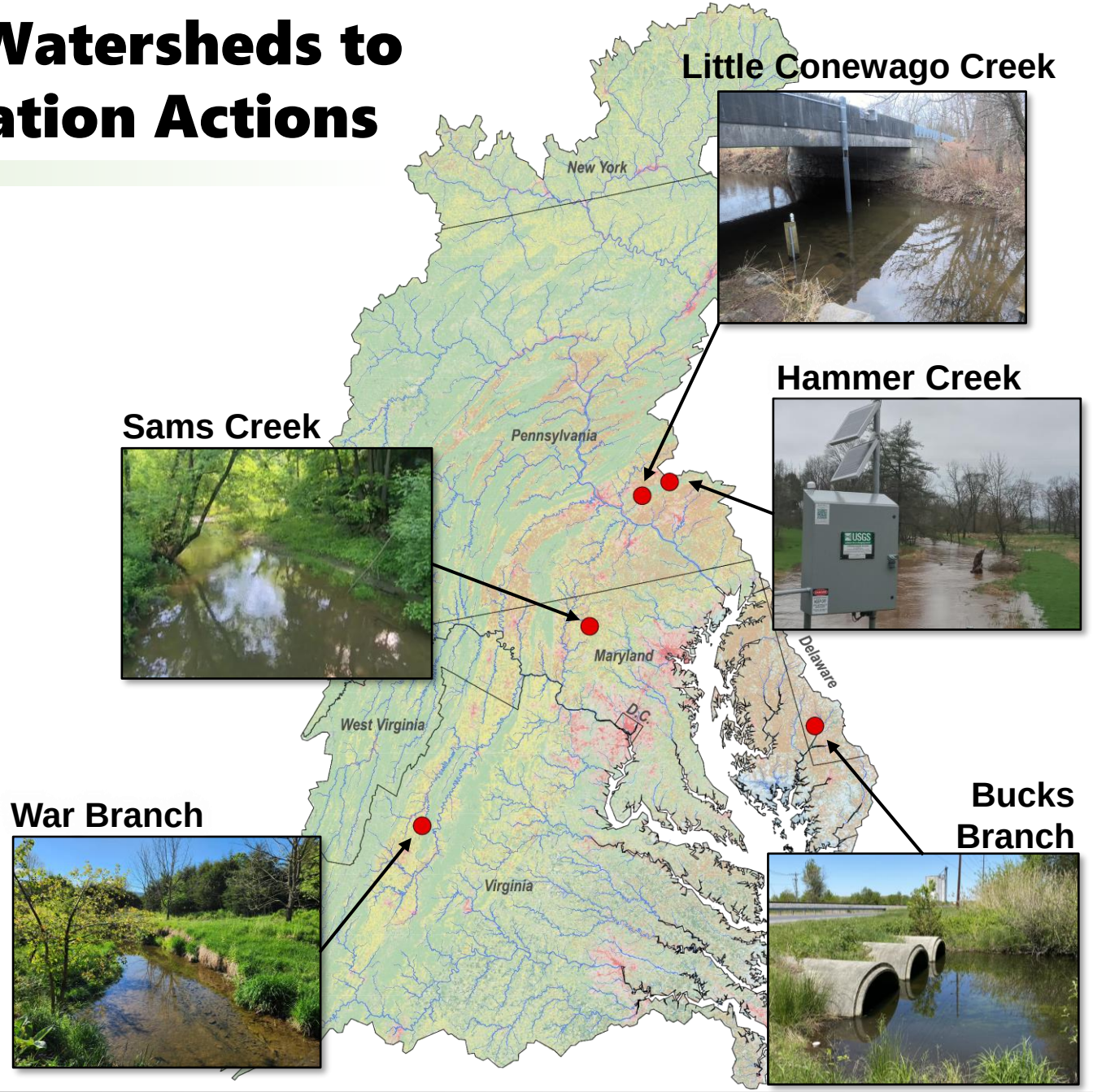


Monitoring Small Agricultural Watersheds to Motivate and Evaluate Conservation Actions

- Program Motivation
- Study Design
- Partnership & Outreach
- Program Expansion & Opportunities



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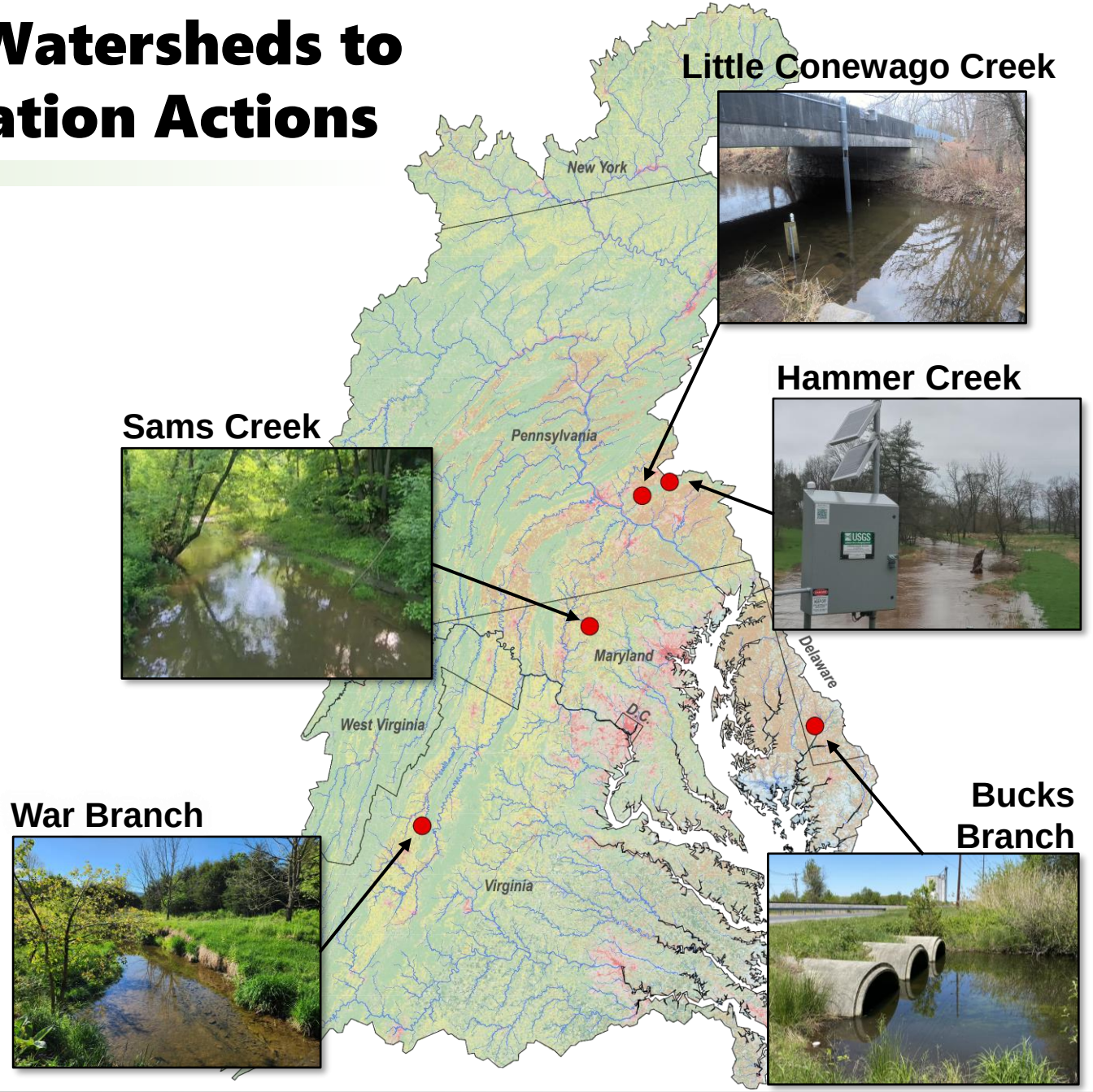
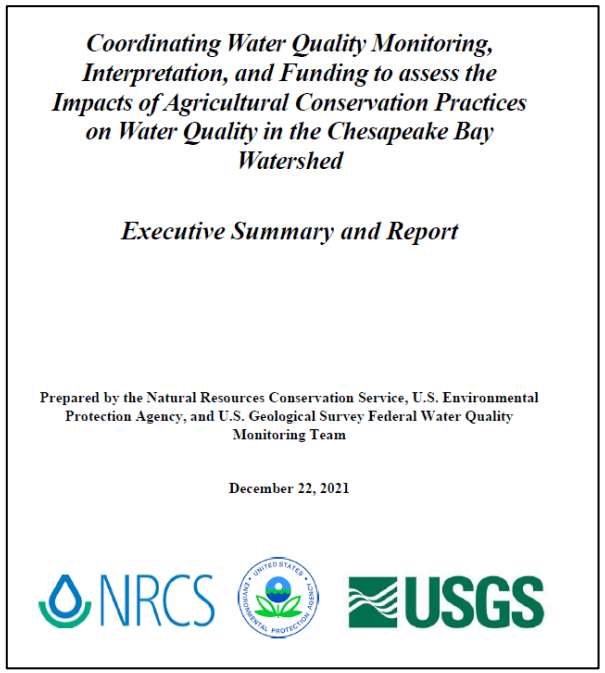


Findings from a federal water-quality monitoring team led to this new study

A federal team was established in August 2020 to assess how the NRCS, EPA, and USGS could further coordinate monitoring and interpretation activities to assess the water-quality effects of agricultural conservation practices.

The team released a report documenting (1) the challenges of evaluating the water-quality effects of agricultural conservation practices and (2) recommendations for future work.

"A major challenge…[is] the need for enhanced **monitoring at finer scales** to better connect… management practices with water quality…changes in the Chesapeake Bay watershed."



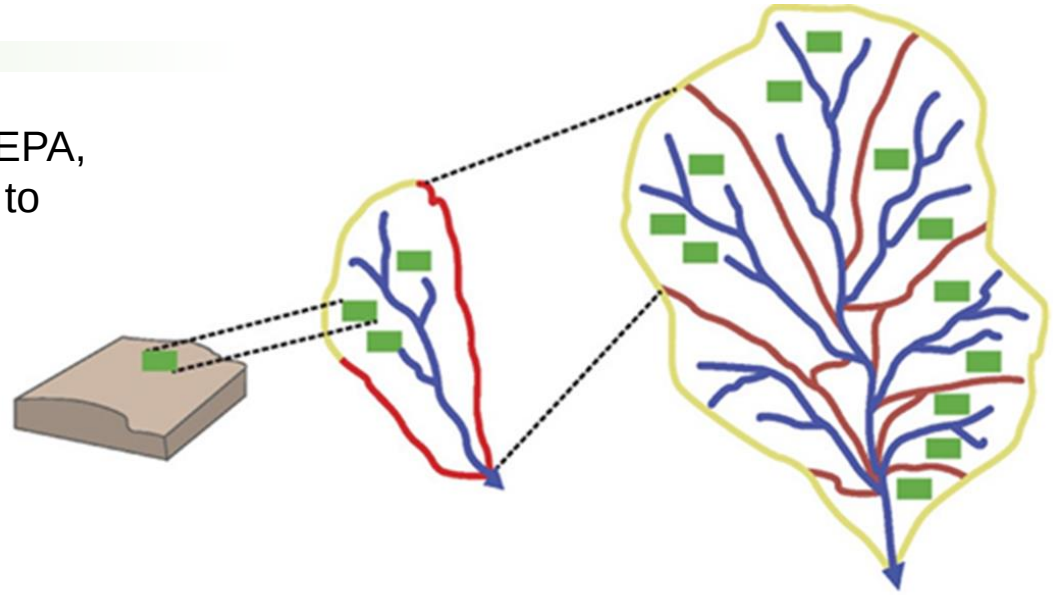
Coordinating Water Quality Monitoring, Interpretation, and Funding to assess the Impacts of Agricultural Conservation Practices on Water Quality in the Chesapeake Bay Watershed

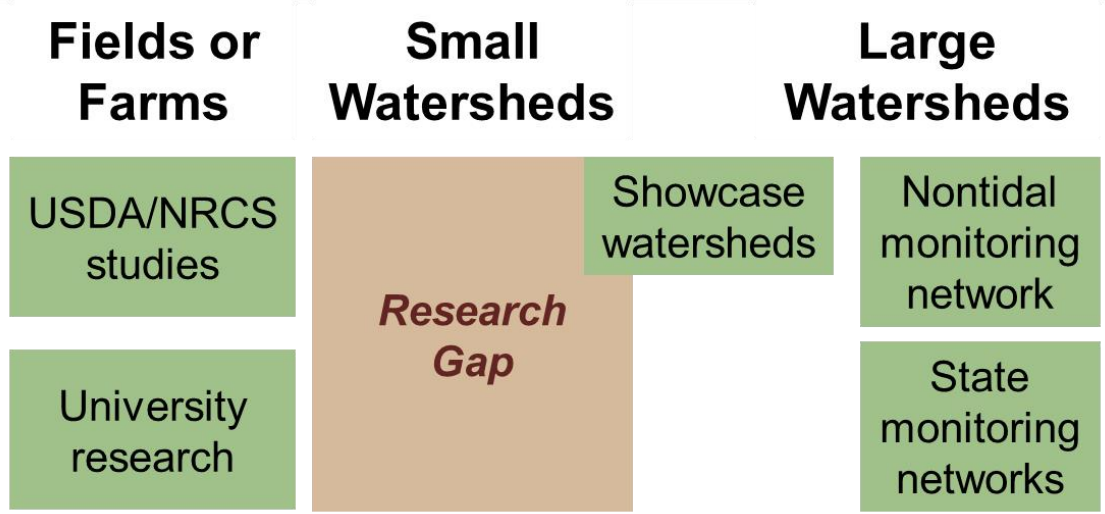
Executive Summary and Report

Prepared by the Natural Resources Conservation Service, U.S. Environmental Protection Agency, and U.S. Geological Survey Federal Water Quality Monitoring Team

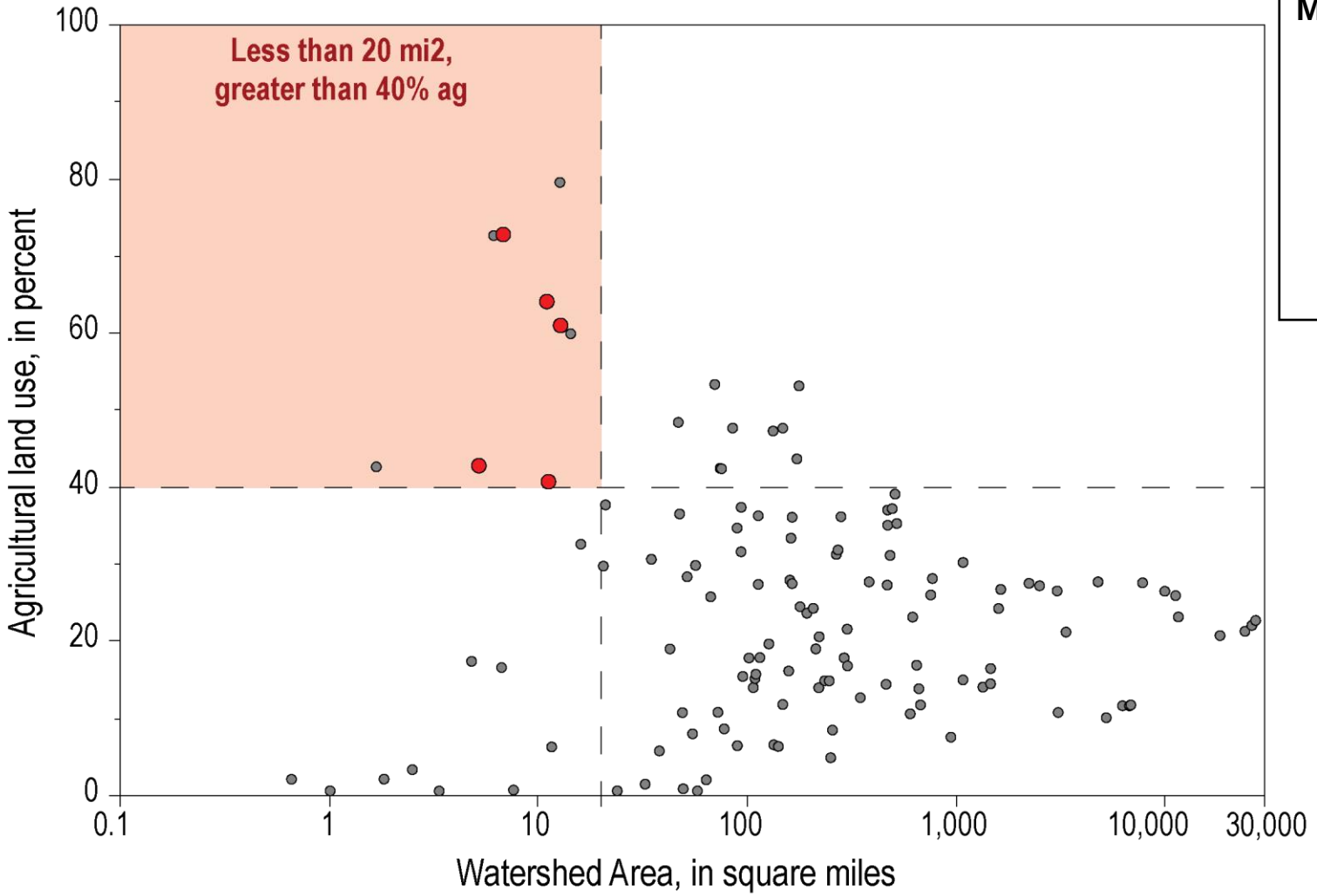
December 22, 2021

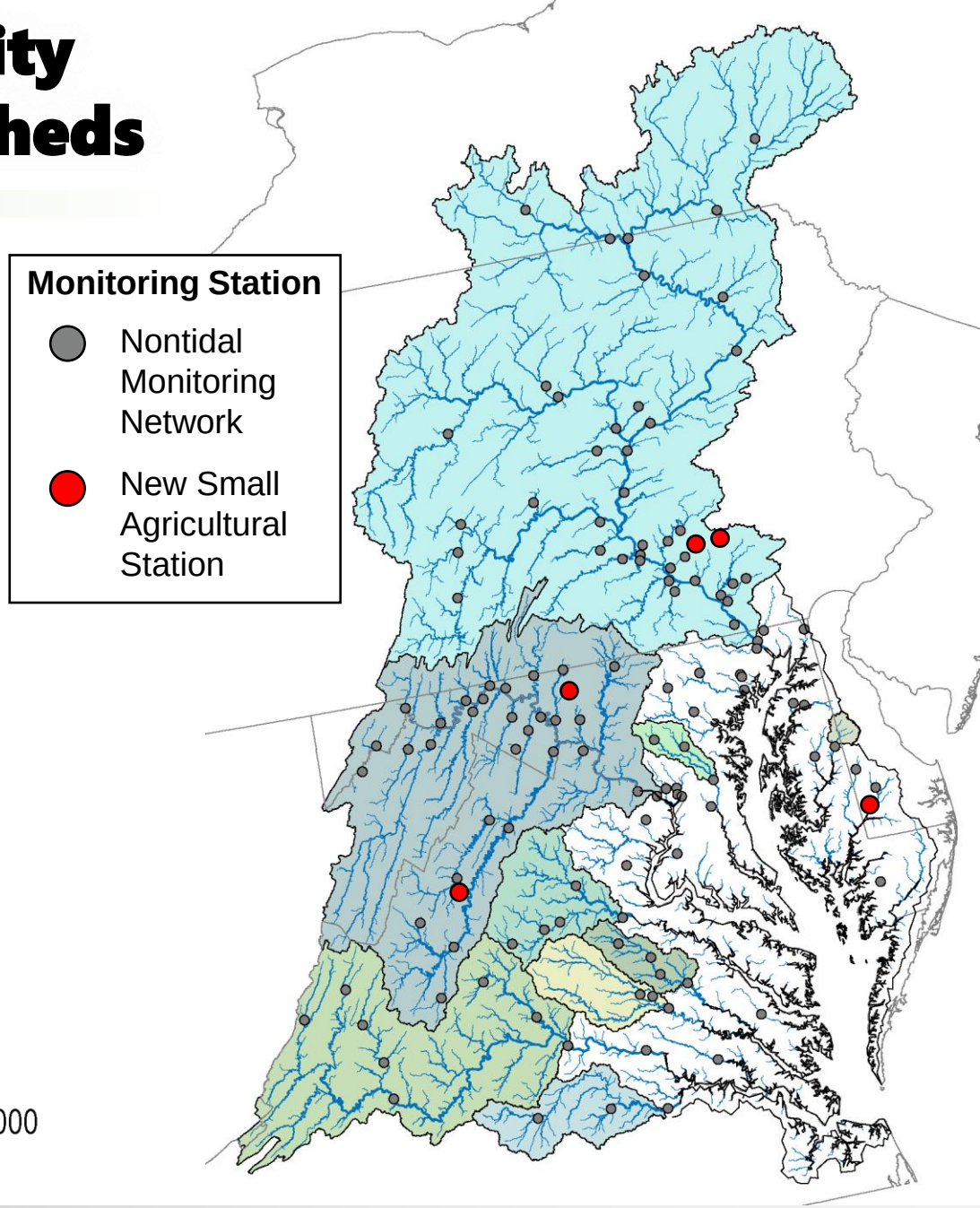
NRCS USGS





There is a lack of long-term water-quality monitoring in small agricultural watersheds





Points represent stations in the Chesapeake Bay Nontidal Monitoring Network

This work is needed to evaluate the water-quality responses of agricultural conservation practices

Expected nutrient and sediment reductions from agriculture are not always observed by monitoring data.

Long-term monitoring in small watersheds can help assess water-quality responses and conservation-practice effects.

BAY JOURNAL

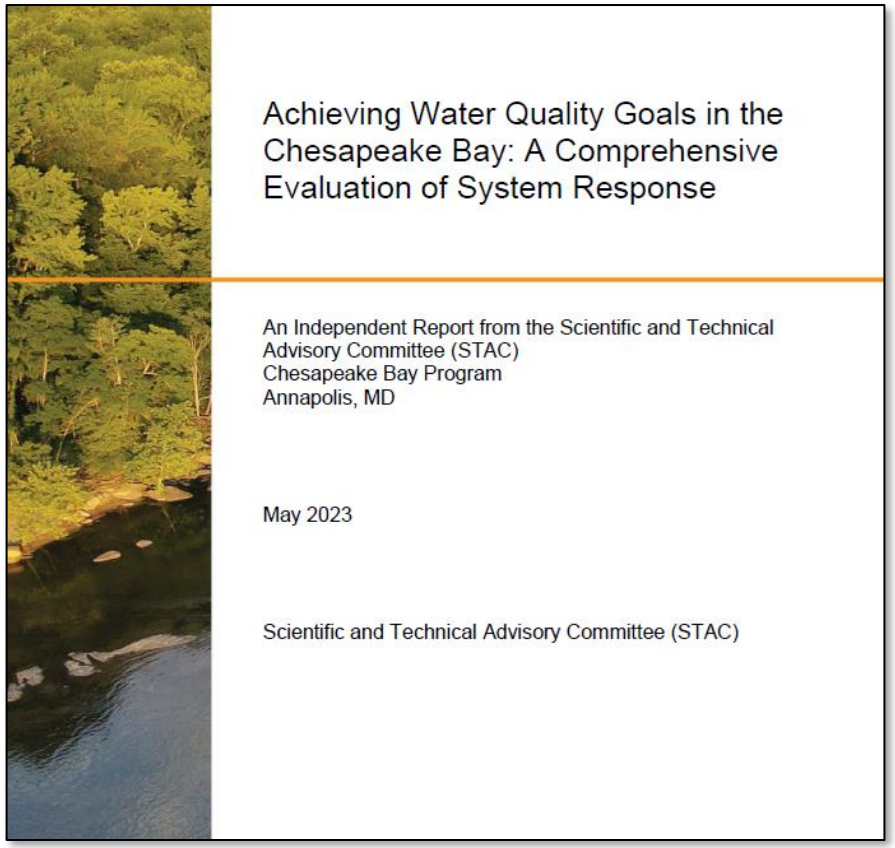
Scientists ponder: How well are ag practices helping the Chesapeake Bay?

Karl Blankenship, January 23, 2024

Once a month, someone from the U.S. Geological Survey drives through the narrow winding roads of Virginia's Rockingham County to a small bridge near the mouth of Smith Creek. There, they collect what could be a lesson for the Chesapeake Bay cleanup effort.

Ag & the Bay
Sowing a Conversation

It comes in the form of water samples carefully captured in a one-liter bottle. Attached to aluminum frame, the bottle is lowered and filled five to seven times across the width of the creek to make sure a full



Achieving Water Quality Goals in the Chesapeake Bay: A Comprehensive Evaluation of System Response

An Independent Report from the Scientific and Technical Advisory Committee (STAC)
Chesapeake Bay Program
Annapolis, MD

May 2023

Scientific and Technical Advisory Committee (STAC)

This work is needed to build partnerships in agricultural communities

Collaboration among researchers, conservationists, academics, and farmers can **build trust** that we're telling an **accurate story**.

The farming community wants monitored information to verify modeled estimates. There is often a sense that conservation efforts are not being fully accounted for by the Bay program.

What is needed to meet Chesapeake Bay water-quality goals in future years?[1]

1. Communication and Trust
2. A Focus on Local Issues
3. Effective Leadership
4. Optimism
5. A Collaborative Community

BAY JOURNAL

Farmers question whether Chesapeake Bay model reflects reality

Karl Blankenship, October 30, 2023

The state-federal Chesapeake Bay Program had a clear message for farmers in September: Their runoff control efforts are accelerating and helping to clean up the Bay.

What's actually happening? That's far less clear.

The Bay Program's report on pollution reductions did, indeed, show that

USGS science for a changing world

USDA NRCS

[1]Feedback from a panel discussion at the Environment Virginia Symposium, April 2024.

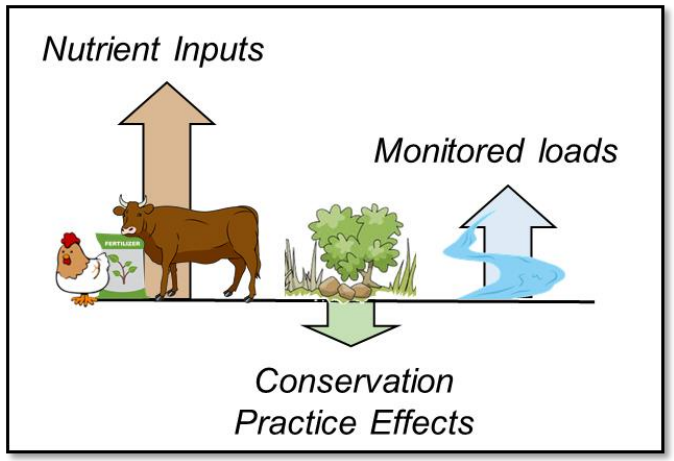
This work builds on lessons learned from the showcase watershed study

In 2010, the USGS partnered with the USDA and the EPA to

> "*…establish showcase projects in small watersheds to test and monitor the benefits of a focused, highly partnered, voluntary approach to conservation*."

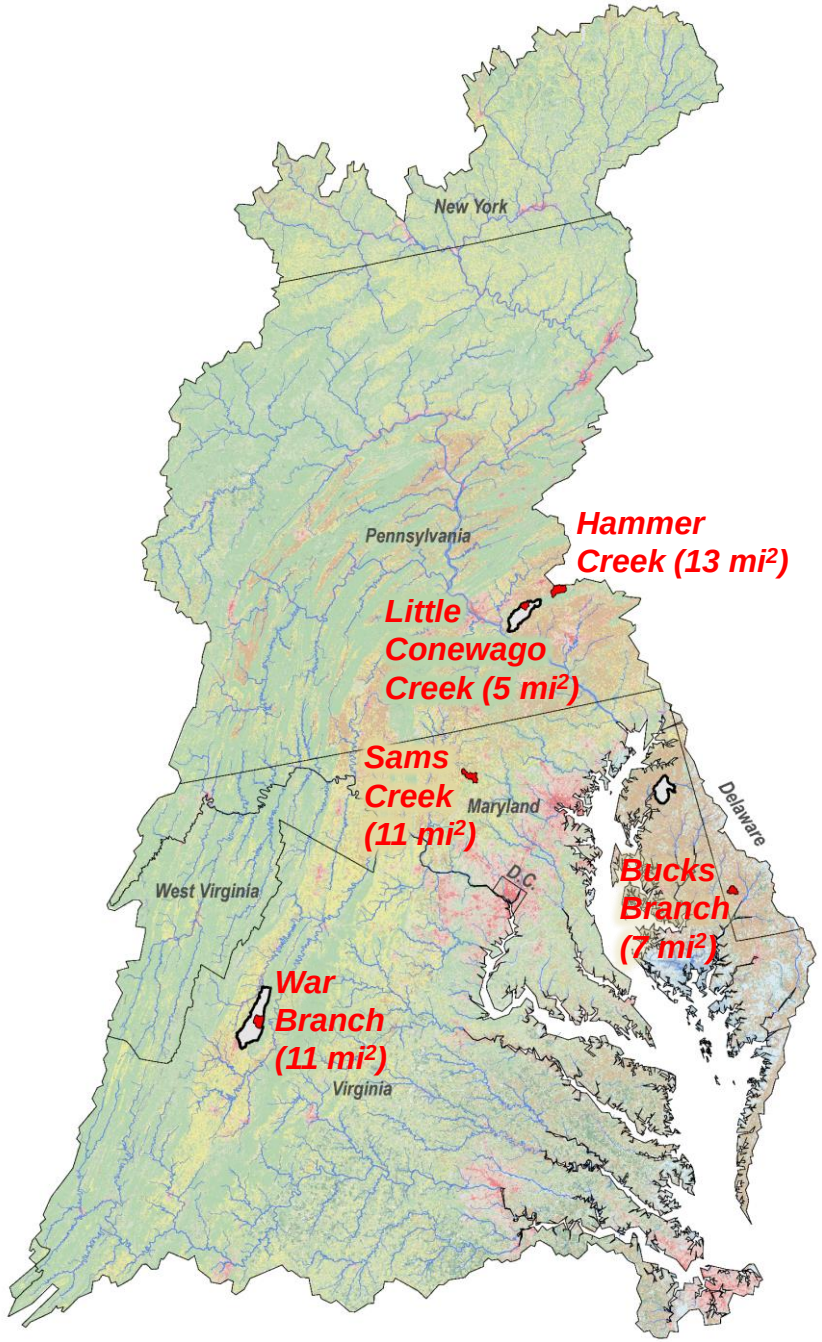
Findings After 10 Years of Monitoring[1]:

- Increasing amounts of conservation practices did not consistently result in decreasing nutrient and sediment loads.
- The ability of conservation practices to reduce nutrient loads was likely overshadowed by increased agricultural nutrient inputs.



We're building on lessons learned from the showcase study by:

1. Monitoring more and smaller agricultural watersheds.
2. Developing collaborative relationships to accurately characterize agricultural and conservation activities.



[1]https://onlinelibrary.wiley.com/doi/10.1111/1752-1688.13197

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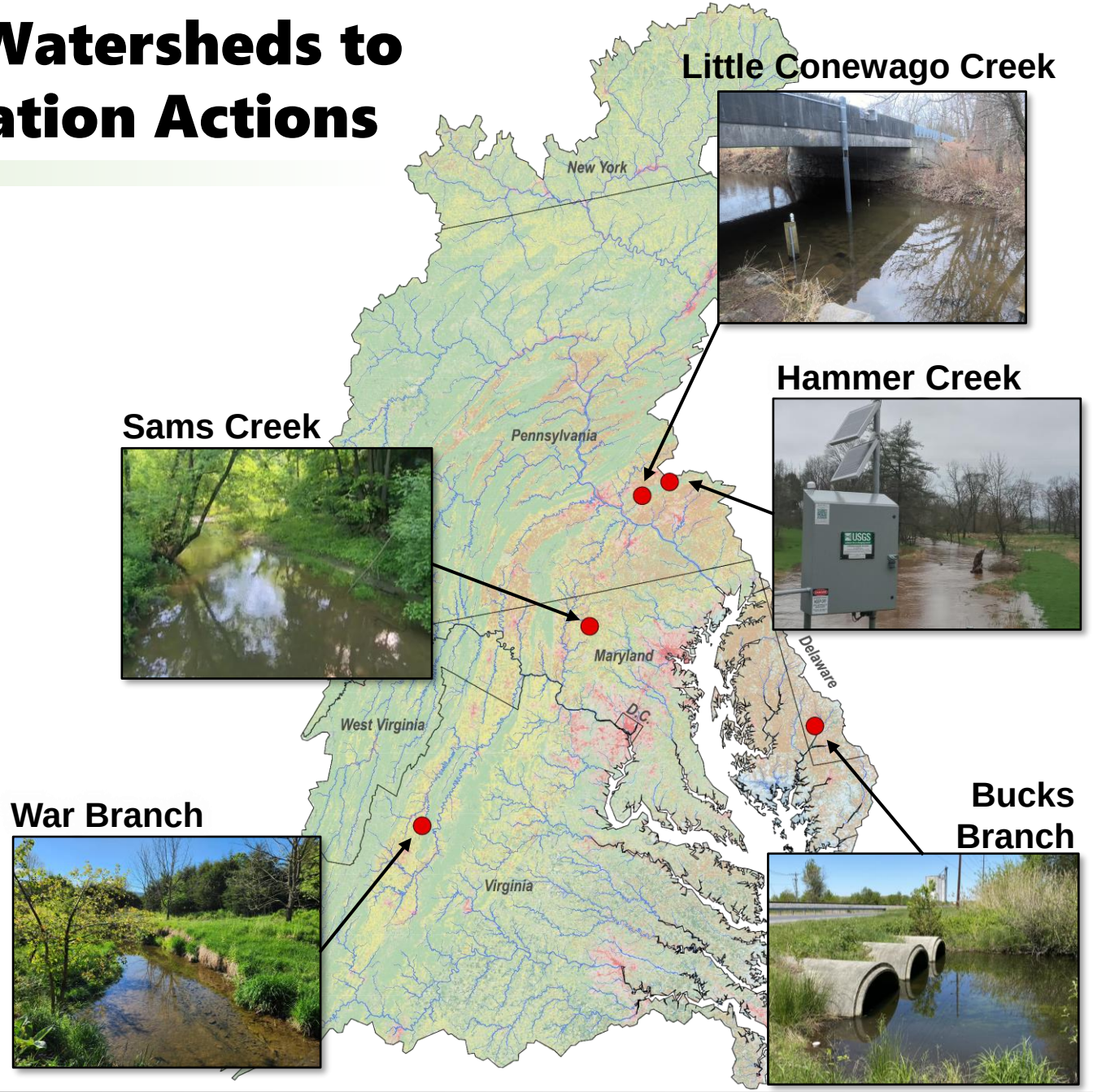


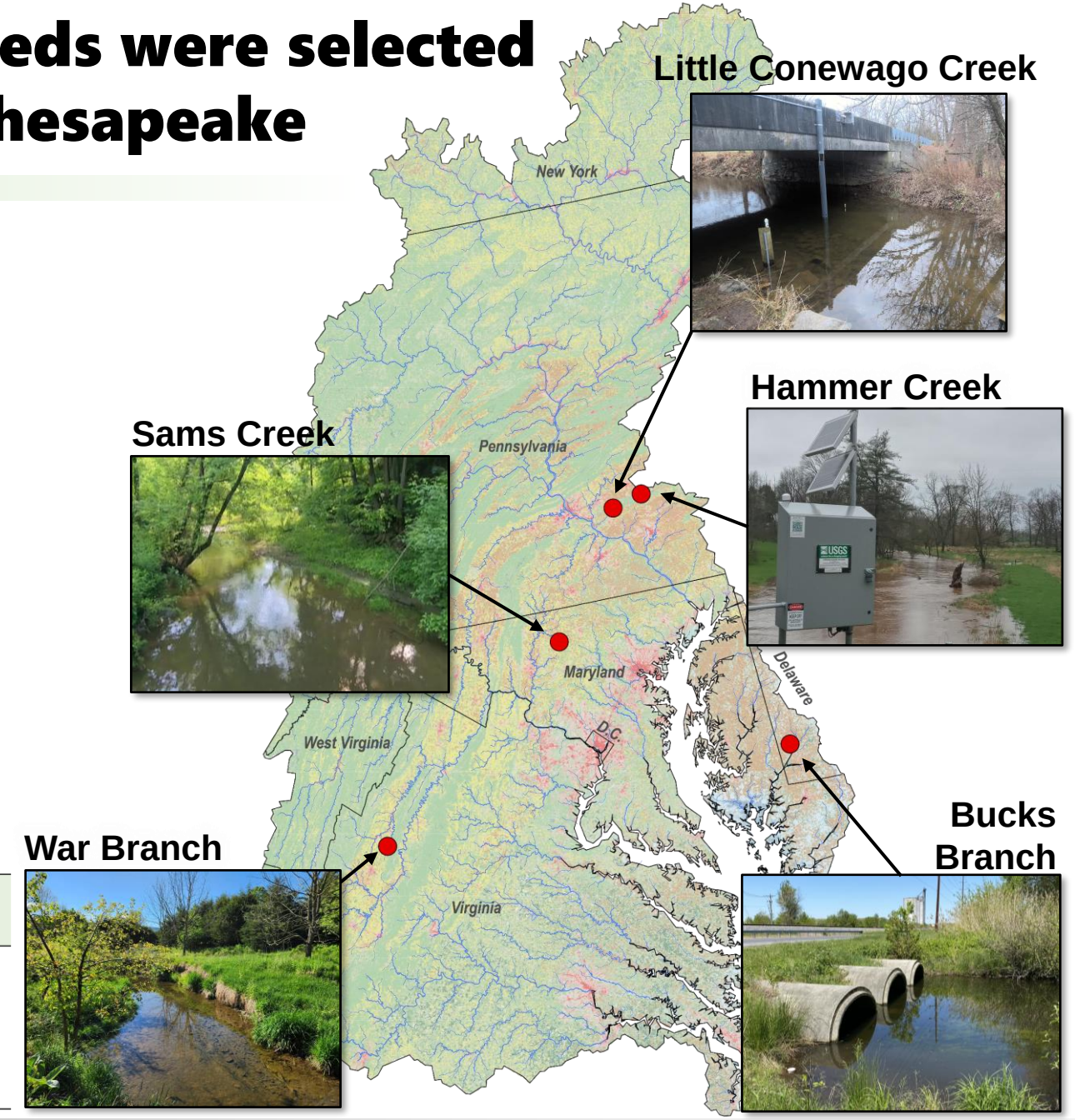
Five “small” agricultural watersheds were selected for monitoring throughout the Chesapeake

Site Selection 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.

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



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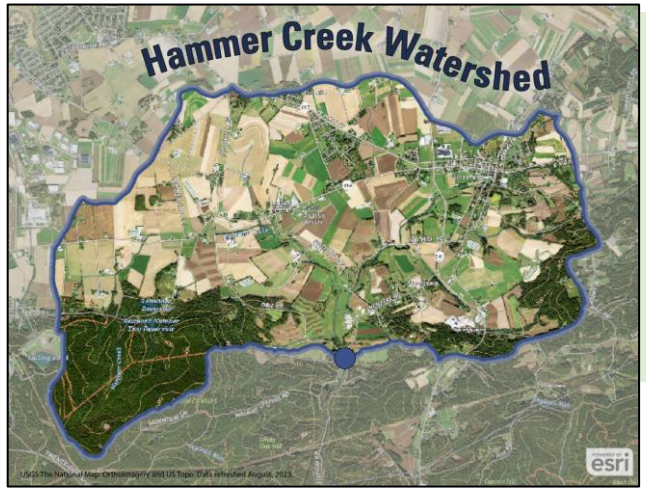
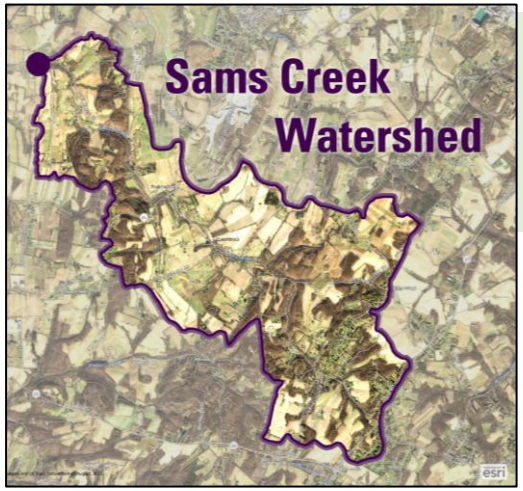
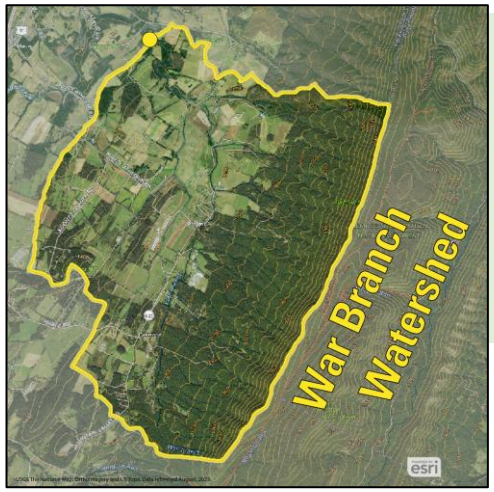


Hammer Creek (PA) is the focus of an upcoming sediment restoration plan, developed by PA DEP.

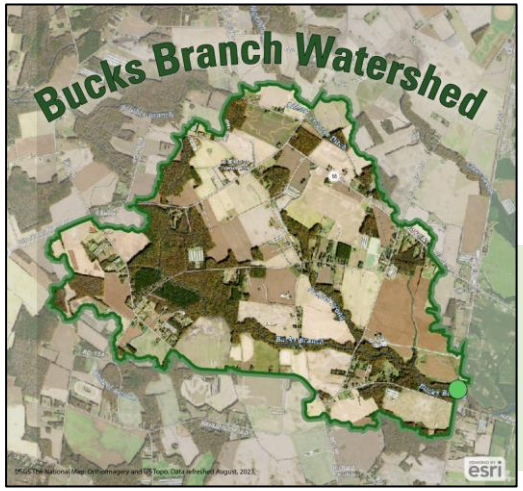


Sams Creek (MD) is within a newly selected NRCS National Water-Quality Initiative watershed and will be a focal point of future conservation efforts.



War Branch (VA) is the focus of ongoing partnership and conservation efforts in the Shenandoah Valley.

Little Conewago Creek (PA) is part of active conservation efforts and is nested within two downstream USGS monitoring stations on Conewago Creek.



Bucks Branch (DE) will enhance a foundation of knowledge on the Delmarva Peninsula about nutrient transport and groundwater lag times.

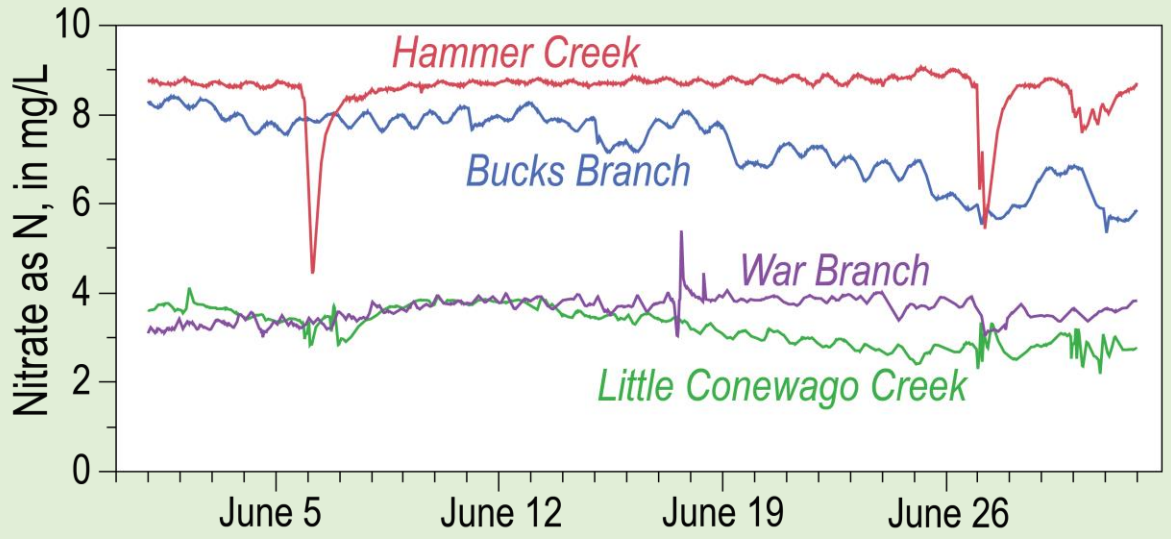
Water-quality conditions will be monitored for multiple years while new conservation practices are installed

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

1. Real-time streamflow
2. Monthly and storm-targeted water-quality samples (nutrient and sediment concentrations)
3. Continuous water-quality data

Additional data may be collected to address specific research questions:

- Benthic macroinvertebrates
- Nitrate synoptic samples
- Nitrate isotopes
- Shallow groundwater data
- In-channel fine sediment
- Riparian habitat assessments
- Toxic contaminants
- Weather data



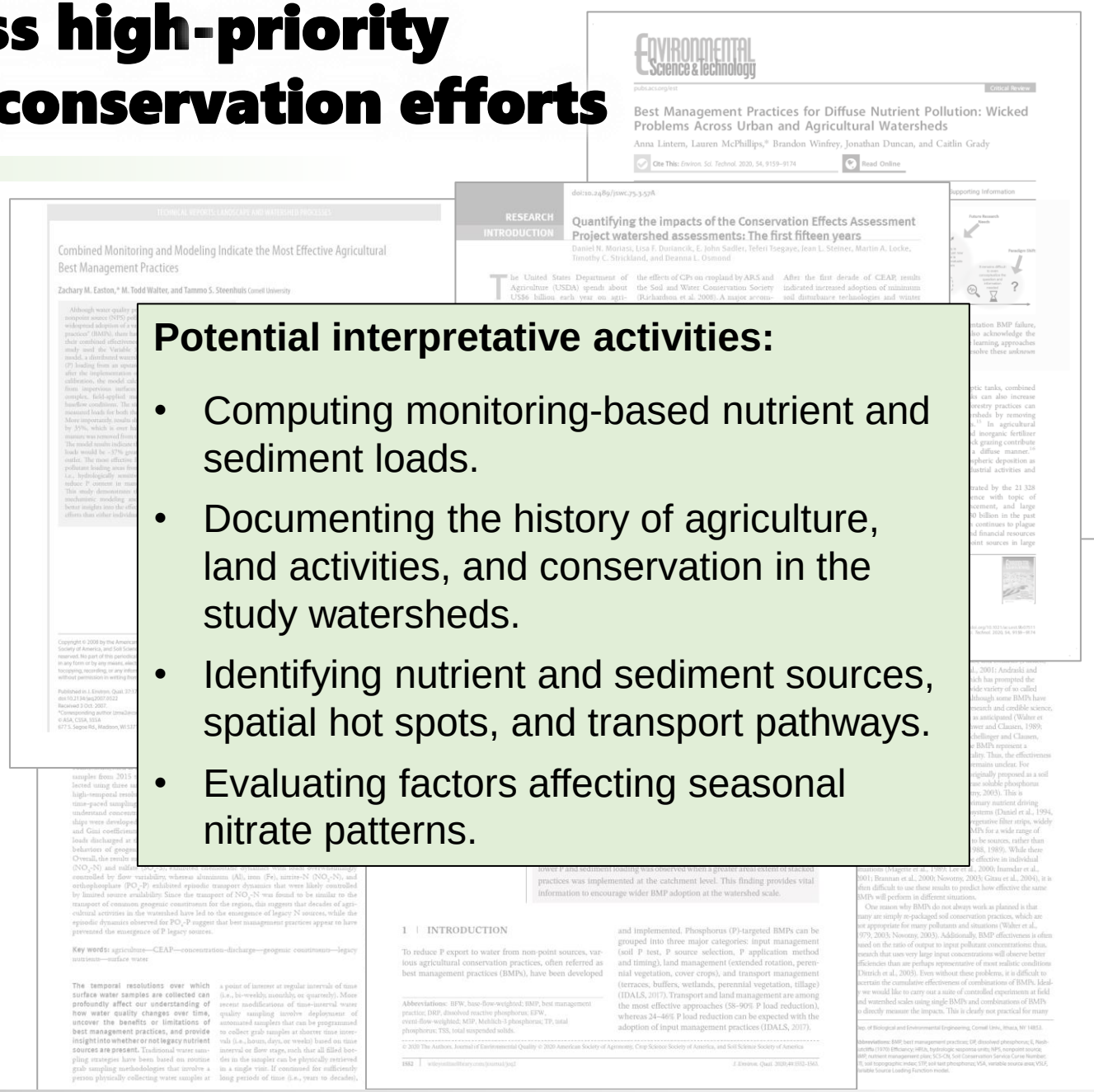
Continuous nitrate concentrations measured from the new monitoring stations will be used to compute loads.

These data will be used to address high-priority questions to inform agricultural conservation efforts

Questions from conservationists, and farmers:

- Are agricultural conservation practices reducing nutrient and sediment loads?
- Are certain practices more effective than others?
- Can practices be more effective when targeted in certain areas?
- Does a suite of practices work more effectively than individual practices?
- How do conservation practices address other priorities, such as restoring habitat and promoting soil health?

Your feedback can help guide our work.
What do you want to learn from this study?



Potential interpretative activities:

- Computing monitoring-based nutrient and sediment loads.
- Documenting the history of agriculture, land activities, and conservation in the study watersheds.
- Identifying nutrient and sediment sources, spatial hot spots, and transport pathways.
- Evaluating factors affecting seasonal nitrate patterns.

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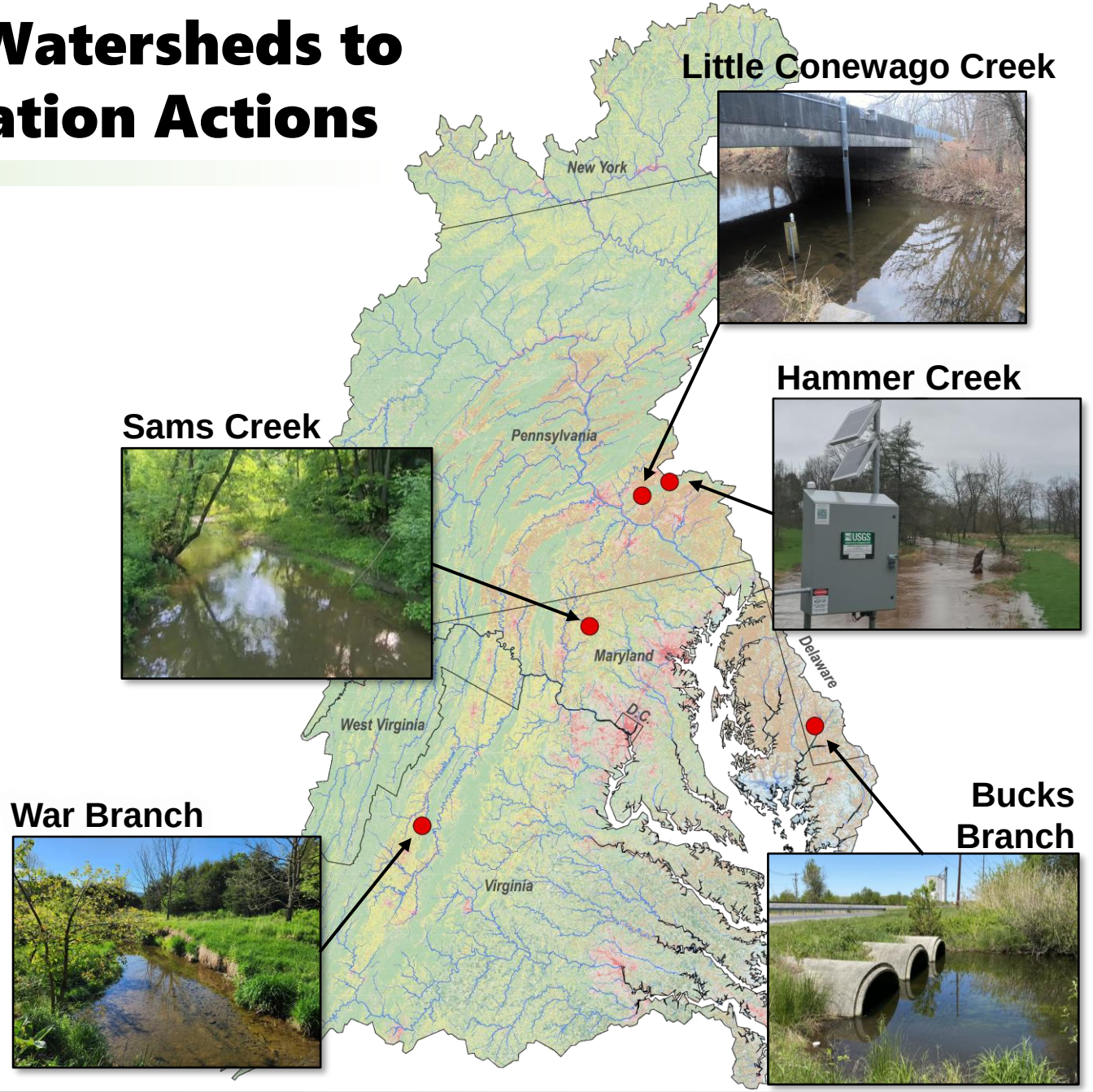


We are building partnerships in small agricultural watersheds

Study Partners

★ Direct funding

★ In-kind support

We are investing in outreach, education, collaboration, and communication in small agricultural watersheds

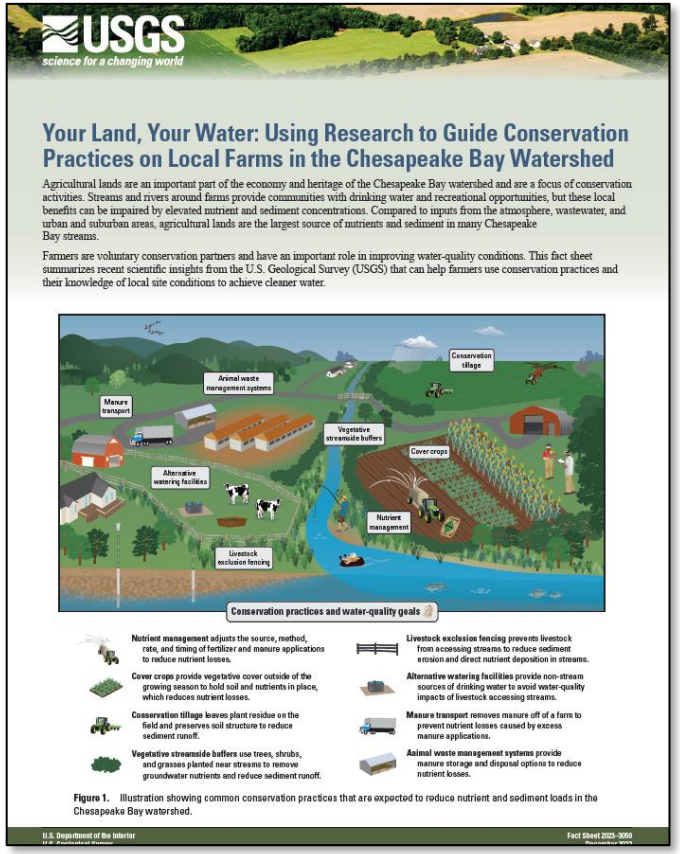
- **Outreach** to people who live and work in agricultural watersheds to raise awareness of our work.
- **Collaboration** with farmers and conservationists to make sure we're telling the right story about these watersheds.
- **Education** for students, in partnership with local schools, to create "outdoor classrooms".
- **Communication** with local communities and with Chesapeake stakeholders to share what we're learning.

Above: Photos from a War Branch (VA) partnership meeting, August 27th, 2024.

Left: Study partners visit Hammer Creek (PA) in September 2023.

We are using multiple tools to build collaboration and communicate findings

Journal articles & **fact sheets** will be used to communicate scientific insights.


USGS science for a changing world

Your Land, Your Water: Using Research to Guide Conservation Practices on Local Farms in the Chesapeake Bay Watershed

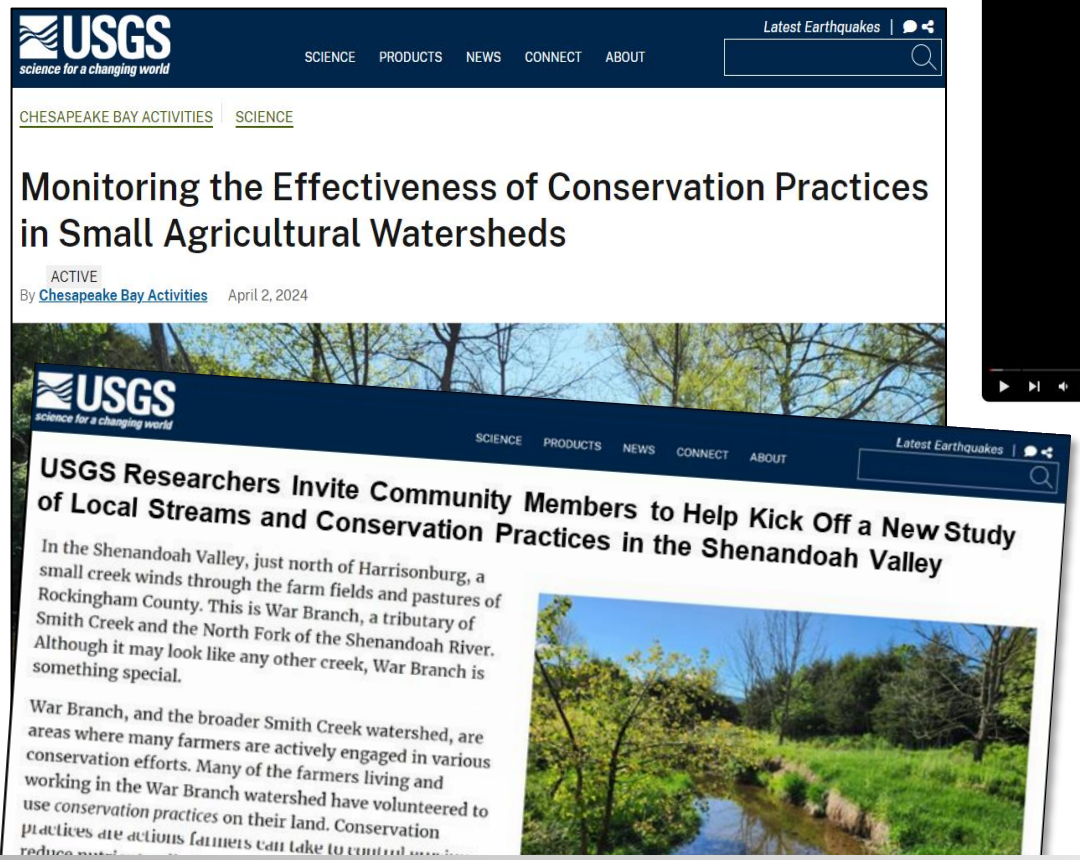
Agricultural lands are an important part of the economy and heritage of the Chesapeake Bay watershed and are a focus of conservation activities. Streams and rivers around farms provide communities with drinking water and recreational opportunities, but these local benefits can be impaired by elevated nutrient and sediment concentrations. Compared to inputs from the atmosphere, wastewater, and urban and suburban areas, agricultural lands are the largest source of nutrients and sediment in many Chesapeake Bay streams.

Farmers are voluntary conservation partners and have an important role in improving water-quality conditions. This fact sheet summarizes recent scientific insights from the U.S. Geological Survey (USGS) that can help farmers use conservation practices and their knowledge of local site conditions to achieve cleaner water.

Figure 1. Illustration showing common conservation practices that are expected to reduce nutrient and sediment loads in the Chesapeake Bay watershed.

U.S. Department of the Interior Fact Sheet 2023–3050

A **project webpage** is being used to share background information and recent progress about the study.
www.usgs.gov/small-ag-monitoring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CHESAPEAKE BAY ACTIVITIES SCIENCE

Monitoring the Effectiveness of Conservation Practices in Small Agricultural Watersheds

ACTIVE

By Chesapeake Bay Activities April 2, 2024

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USGS Researchers Invite Community Members to Help Kick Off a New Study of Local Streams and Conservation Practices in the Shenandoah Valley

In the Shenandoah Valley, just north of Harrisonburg, a small creek winds through the farm fields and pastures of Rockingham County. This is War Branch, a tributary of Smith Creek and the North Fork of the Shenandoah River. Although it may look like any other creek, War Branch is something special.

War Branch, and the broader Smith Creek watershed, are areas where many farmers are actively engaged in various conservation efforts. Many of the farmers living and working in the War Branch watershed have volunteered to use conservation practices on their land. Conservation practices are actions farmers can take to control

A **project video** will be developed to highlight the study, build new partnerships, and engage new audiences.

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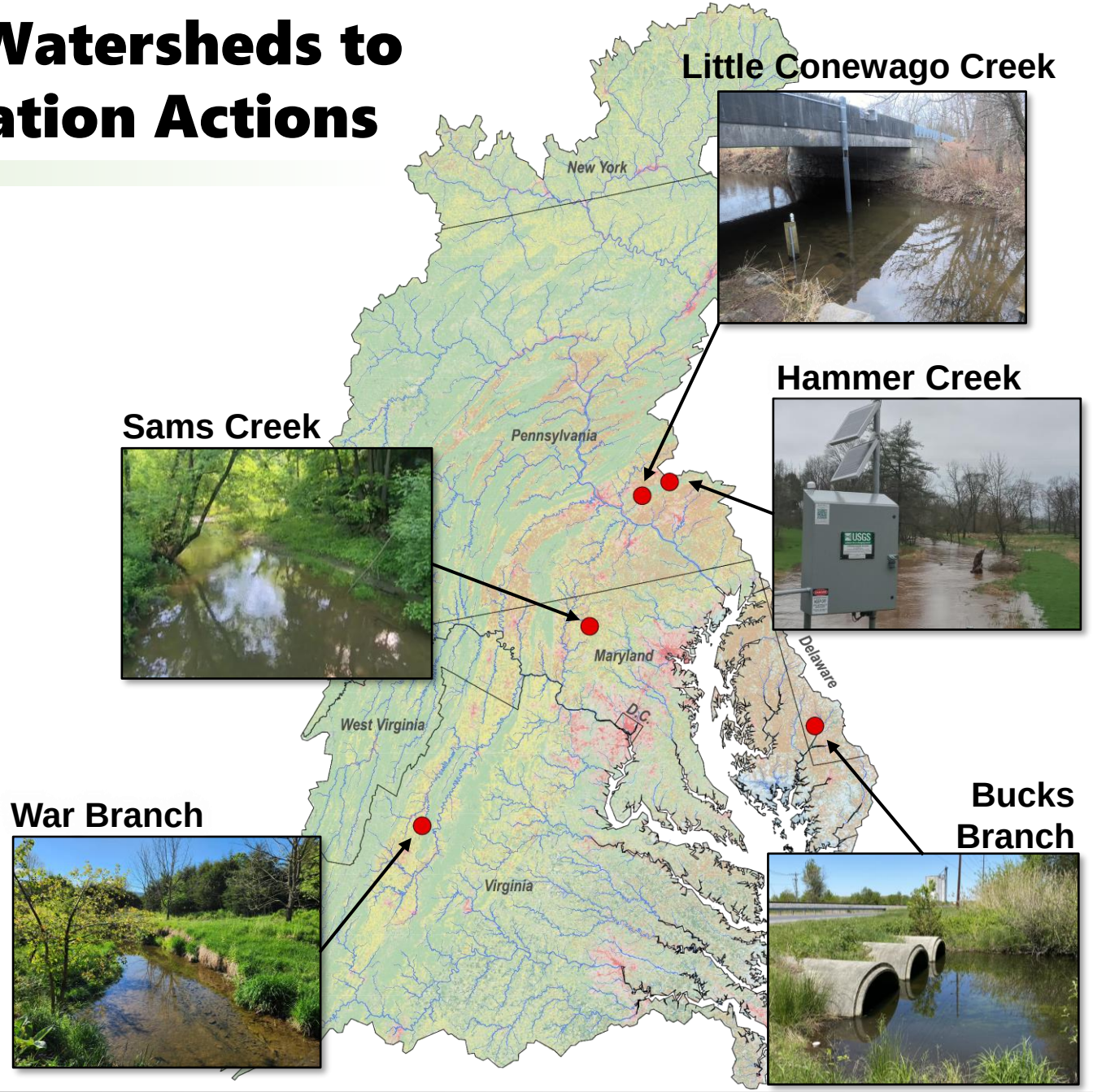


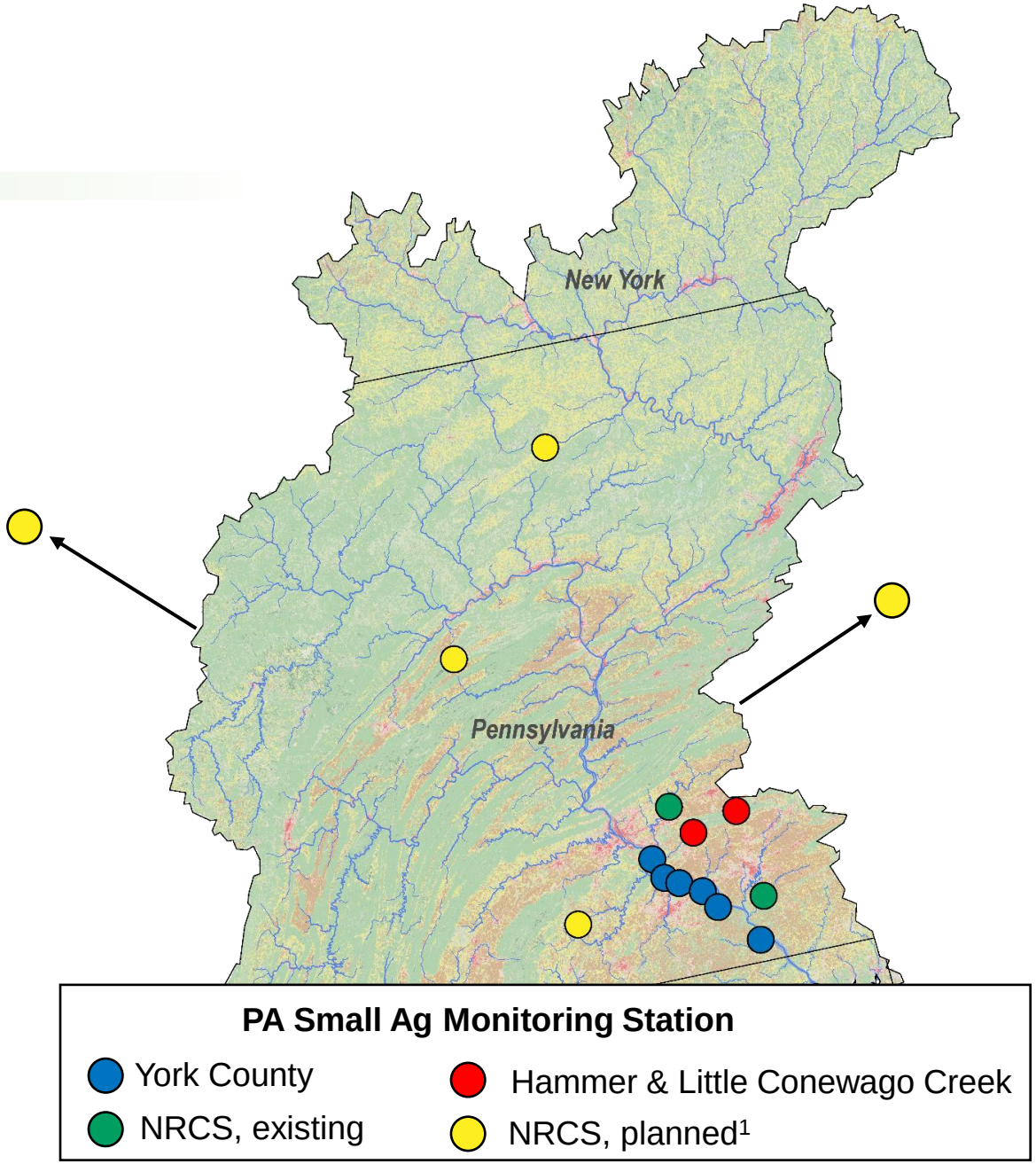
We'd like to monitor additional small agricultural watersheds

Existing small agricultural monitoring stations in Pennsylvania:

- 6 stations in York County
- 2 stations funded by NRCS
- The new **Hammer Creek** and **Little Conewago Creek** stations

In addition to these stations, NRCS is funding **five additional small agricultural monitoring stations in Pennsylvania!**

Interested in your own local monitoring station? Reach out to us to discuss partnership opportunities.



[1]Final locations of planned NRCS stations subject to change

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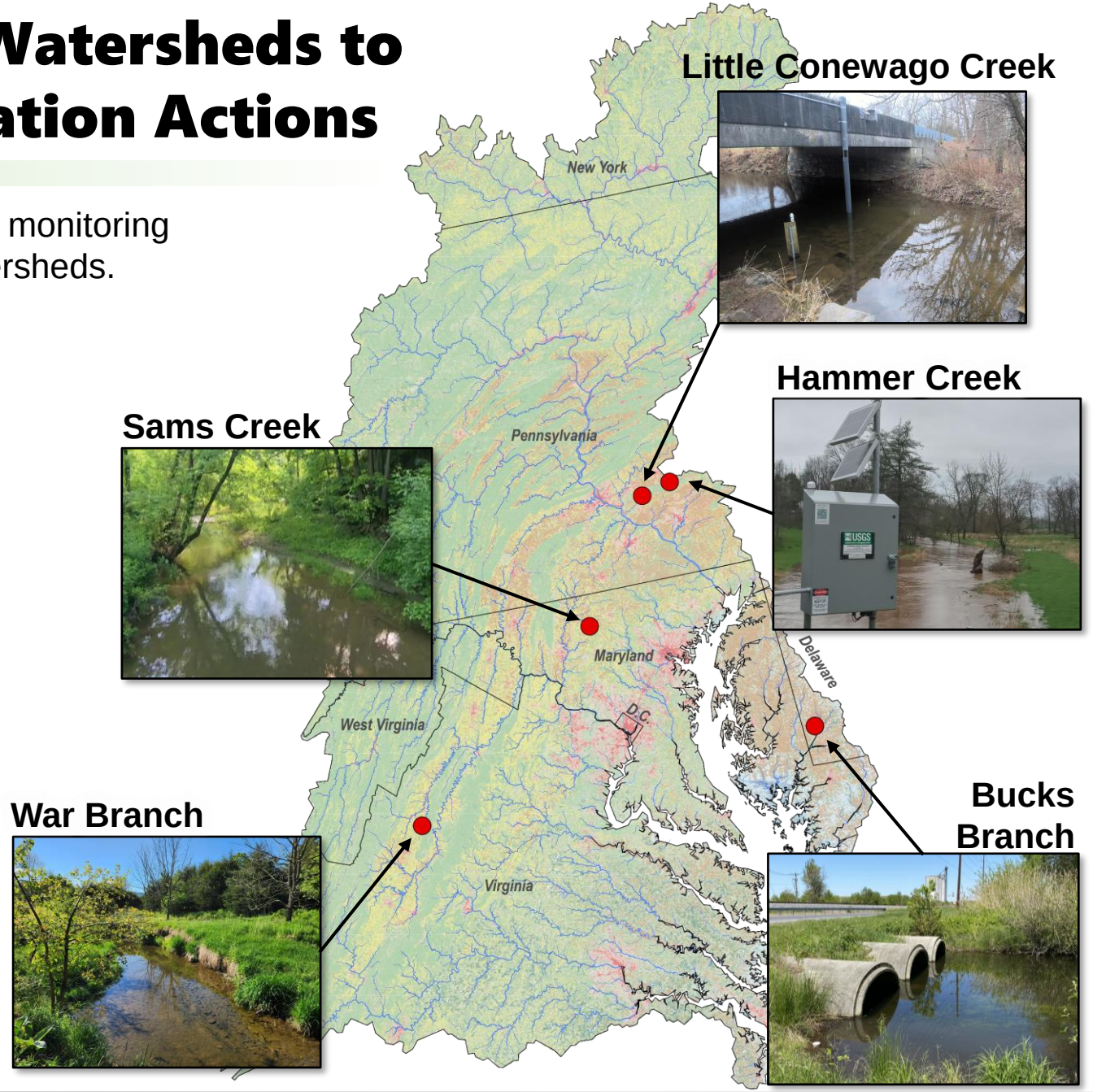

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- Hilary Dozier hdozier@usgs.gov
- ***VA:*** Jimmy Webber jwebber@usgs.gov
  Spencer Tassone stassone@usgs.gov

EPA Chesapeake Bay Program Office

Lee McDonnell McDonnell.Lee@epa.gov
Kaylyn Gootman Gootman.Kaylyn@epa.gov