SUBMERSION SERIES

A new series for quarterly conversations among Bay Program partners hosted by the Water Quality Goal Implementation Team (WQGIT) and experts

Making Science Work For You: How to strengthen the connection between water-quality studies and agricultural conservation efforts

Thursday, September 14, 2023

Welcome to the webinar! We will begin shortly.

Welcome!
Some reminders as we get underway…

- If you don't hear me, please check your audio settings (are your speakers/headphones muted?)
- Please use the Q&A function throughout the webinar to ask questions for our speakers
- We also encourage you to use the Reactions feature of Zoom throughout, to keep things light-hearted and positive

Jeremy Hanson

Coordinator, Chesapeake Bay Program's
Water Quality Goal Implementation Team
Chesapeake Research Consortium

Why are we here?

This is not an average WQGIT meeting

Chesapeake Bay Program
40 years of science, restoration and partnership.

SUBMERSION SERIES

ORC

“The Chesapeake Bay Program partners envision an environmentally and economically sustainable Chesapeake Bay watershed with clean water, abundant life, conserved lands and access to the water, a vibrant cultural heritage and a diversity of engaged stakeholders.”

2014 Watershed Agreement’s Vision Statement

Acknowledgements

This webinar has been a multi-partner team effort (federal agencies, state agencies, university and NGO). Thank you to everyone who contributed, apologies to anyone not listed…

Our wonderful core planning team who made this happen

Jimmy, Kaylyn, August

Our fantastic extended planning team who brought such great ideas and energy

Bill Angstadt, Alisha Mulkey, Breck Sullivan, Joe Wood, Ken Hyer, Kurt Stephenson, Mark Dubin, Alex Soroka, and others

WQGIT Leadership team

Suzanne, Jackie, Sushanth and me

And of course our speakers who worked to bring us quality content and discussion

Zach, Scott, Matt, Lisa, Elizabeth, Jayme, Gary, Mark

Big thanks to Green Fin Studio for their support getting this discussion series off the ground

Lauren and Paula

AND THANK YOU FOR JOINING US TODAY

Today's Moderators

James Webber

Hydrologist
USGS

Dr. Kaylyn Gootman

Life Scientist
US EPA, CBPO

THANK YOU

SUBMERSION SERIES

Questions?

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Recordings available on YouTube @SubmersionSeries

Making Science Work For You:

How to strengthen the connection between water-quality studies and agricultural conservation practices

A Chesapeake Bay Program Submersion Series

September 14, 2023, 12:00 pm to 1:30 pm

Workshop Objectives:

To discuss lessons learned from water-quality studies that can inform the effective use of agricultural conservation practices. To identify how future water-quality studies can better address stakeholder needs.

Discussion Topics:

1. How have water-quality studies provided insights that can inform the effective use of agricultural conservation practices?
2. How can future water-quality studies better address priority stakeholder questions about conservation effects and water-quality responses?

Photos courtesy of Will Parson, Chesapeake Bay Program

Making Science Work For You:

How to strengthen the connection between water-quality studies and agricultural conservation practices

Agenda

Part I: What Have We Learned From Water-Quality Studies?

1. The Importance of Targeting Practices on the Landscape
   Zach Easton (Virginia Tech)
2. Watershed Prioritization for Rapid Gains in Habitat and Water Quality
   Scott Heidel (Pennsylvania Department of Environmental Protection)
2. Water-Quality Trends in Agricultural Watersheds Prioritized for Management
   Jimmy Webber (US Geological Survey)
3. Managing Sediment: Your Land, Your Soil
   Matt Cashman (US Geological Survey)
5. Conservation Easement Assessment Project (CEAP) Watershed Studies
   Lisa Duriancik (US Department of Agriculture - Natural Resources Conservation Service)

Discussion questions will follow Part I

Photos courtesy of Will Parson, Chesapeake Bay Program

Making Science Work For You:

How to strengthen the connection between water-quality studies and agricultural conservation practices

Agenda

Part II: What Do We Need From Future Water-Quality Studies?

1. A Perspective from Maryland
   Elizabeth Hoffman (Maryland Department of Agriculture)
2. What Does NRCS Need From Future Water-Quality Studies?
   Jayme Arthurs (Natural Resources Conservation Service)
3. Feedback from STAC: Considerations for Future Monitoring Studies
   *Gary Shenk (*US Geological Survey, Chesapeake Bay Program*)*
4. Enhancing the Chesapeake Bay Program Monitoring Networks
   Kaylyn Gootman (US Environmental Protection Agency)
5. Studying Water-Quality Responses to Conservation in Small Ag. Watersheds
   *Mark Nardi (*US Geological Survey*)*

Discussion questions will follow Part II

Photos courtesy of Will Parson, Chesapeake Bay Program

Some Considerations About This Workshop

This workshop will discuss water-quality effects of agricultural conservation efforts.

Water-quality effects = nutrient and sediment reductions in nontidal rivers and streams

Conservation efforts = practices and activities designed to reduce nutrient and sediment loads ("best management practices")

This workshop will highlight lessons learned from water-quality studies.

Water-quality studies = efforts to monitor in-stream water-quality conditions (such as streamflow, nutrients, and sediment) and explain observed patterns with statistical tools.

A future workshop may focus on social-science considerations for improving conservation efforts.

- How do we incentivize conservation on the landscape?
- How do we increase the willingness to adopt voluntary conservation efforts?
- How do we effectively communicate scientific findings with the community?

Photo courtesy of Will Parson, Chesapeake Bay Program

Some Considerations About This Workshop

This workshop includes presentations from Chesapeake Bay researchers and managers.

Researchers = scientists, advocates, and partners who generate technical insights that can help inform restoration and conservation in the Chesapeake.

Managers = decision makers from local, state, and federal agencies or other groups who plan changes on the landscape (in coordination with producers and landowners) or changes in policy to improve water-quality conditions.

This workshop was designed to continue conversations about evaluating the effects of agricultural conservation efforts.

In addition to today's presentations, please consider what you know about agricultural conservation efforts.

A "broad scope" of information is relevant to this workshop, including insights about: (1) short-duration and long-term studies, (2) edge-of-field and watershed-scale research, (3) structural and non-structural practices, (4) crop and animal agriculture.

Photo courtesy of Will Parson, Chesapeake Bay Program

Your Feedback Is Important!

You'll be asked to respond to discussion questions via Mentimeter during the workshop.

We'll summarize your anonymous Mentimeter feedback after the workshop and share the summary with all workshop attendees and interested parties.

Please respond to all Mentimeter discussion questions to maximize the value of this workshop!

Are you part of the Chesapeake Bay management or research community?

A. Management
B. Research
C. Both
D. Neither

Making Science Work For You:

How to strengthen the connection between water-quality studies and agricultural conservation practices

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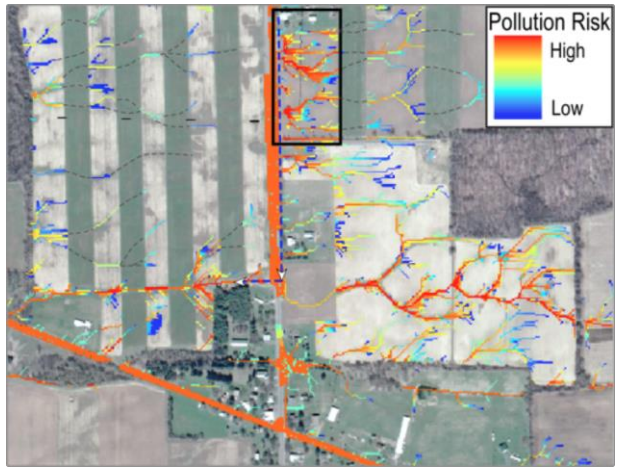
Discussion questions will follow Part I

Photos courtesy of Will Parson, Chesapeake Bay Program

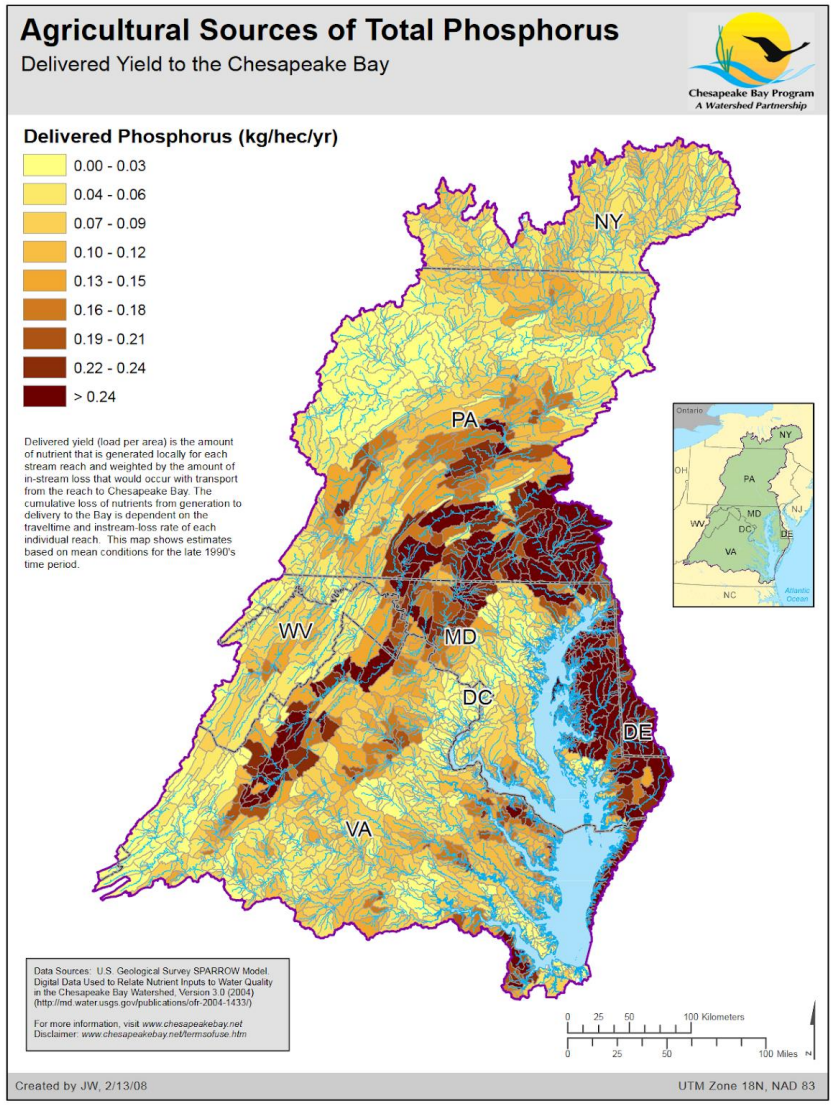
The Importance of Targeting Practices on the Landscape

Zach Easton, Virginia Tech

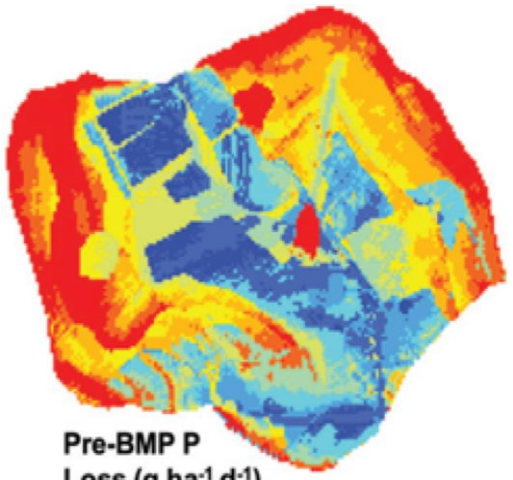
25 acre parcel



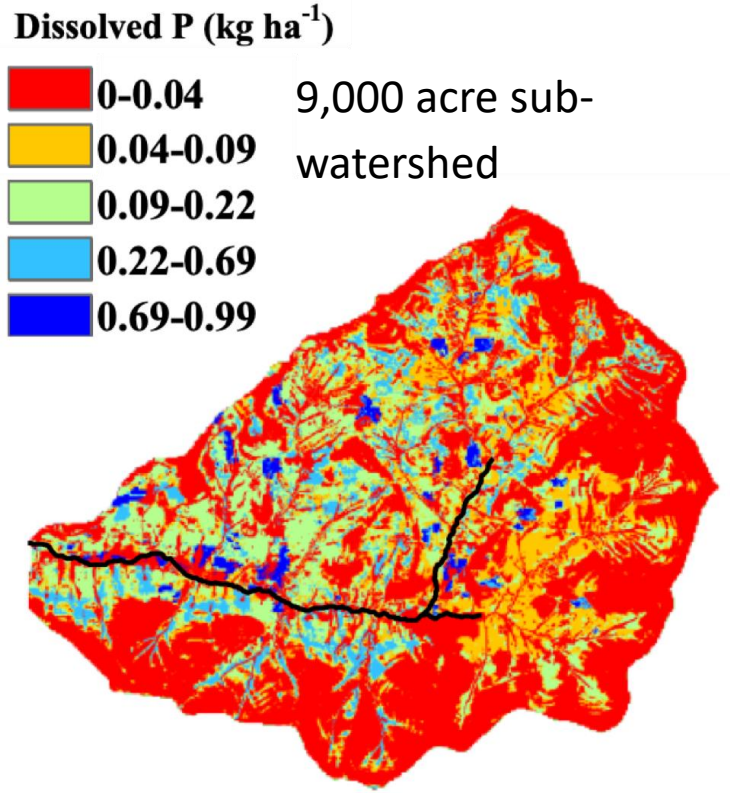
Basin



Nutrient sources and loads are highly variable across the landscape at multiple scales



400 acre farm



9,000 acre sub-watershed

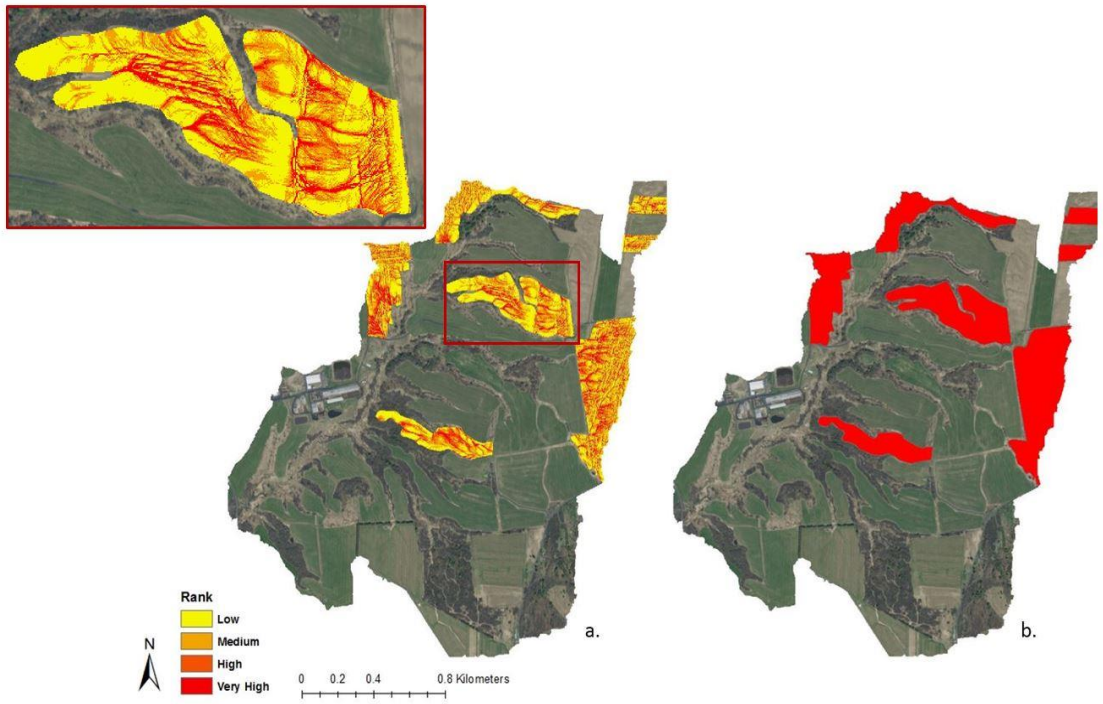
What You Do And Where You Do It Matters

Targeting

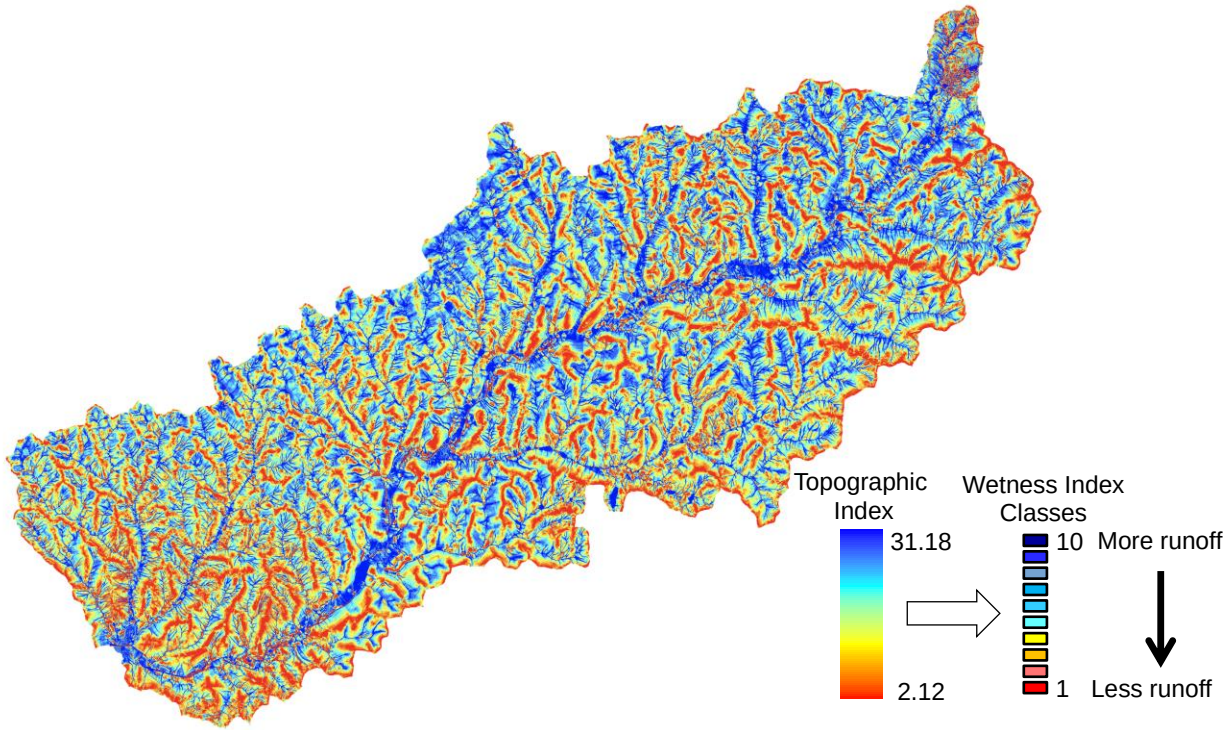
1. Landscape areas or actors produce disproportionate loads
2. Incentives can motivate treatment of those loads
3. Selecting the most effective control measures can reduce loads

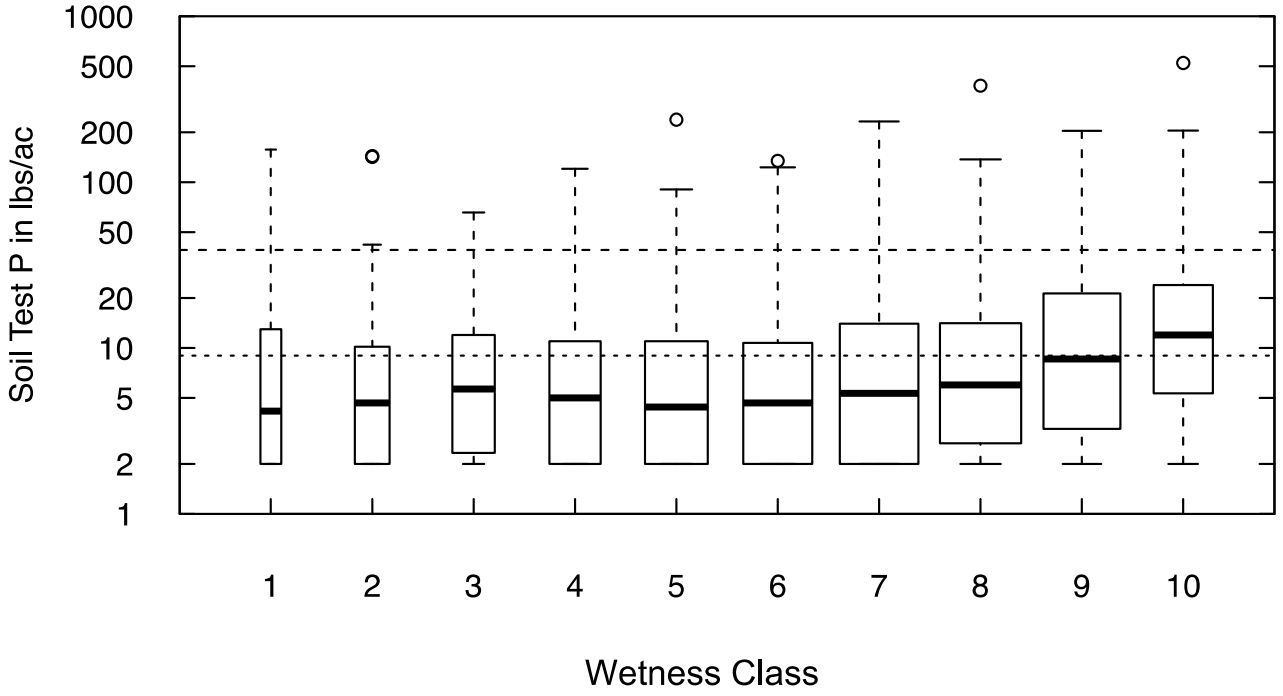
The 4 R's of Targeting

1. **R**ight source
2. **R**ight location
3. **R**ight actors
4. **R**ight treatment option



Twombly et al. 2021. SSSAJ

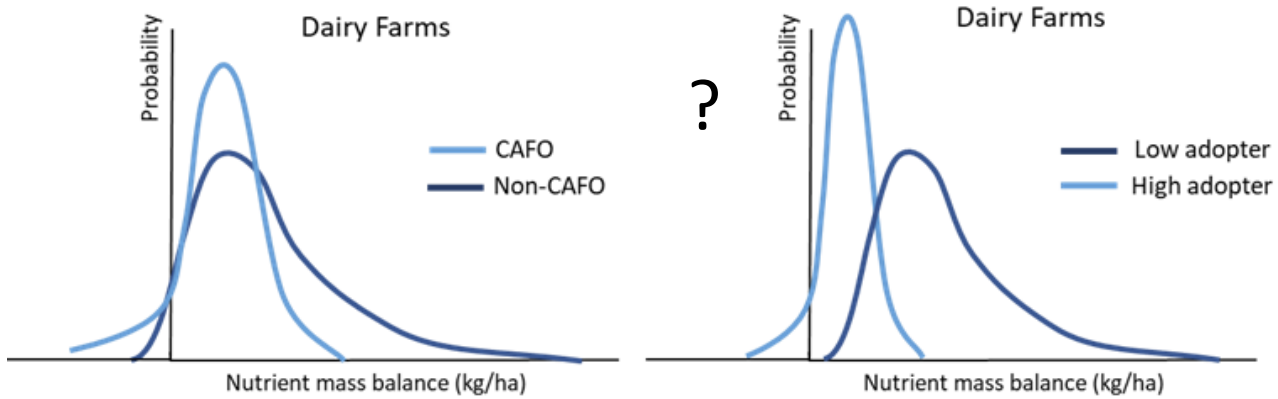


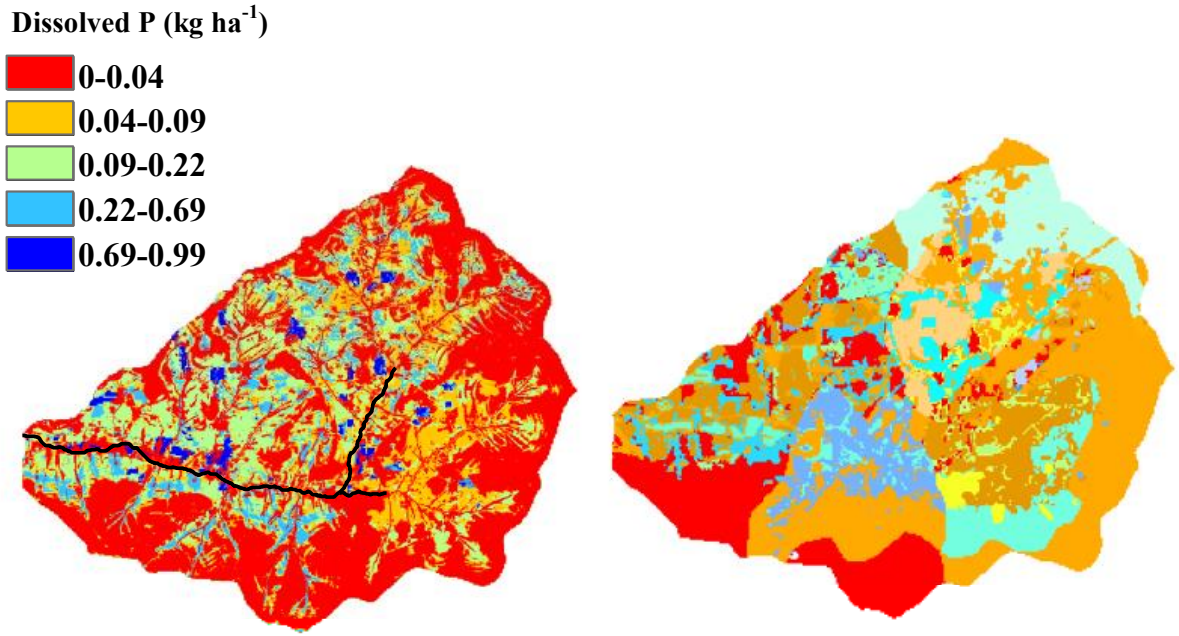


Higher soil wetness index classes correspond to fields that have a greater tendency to become saturated and generate runoff.

Average soil P values by soil wetness index class. The width of each box is proportional to the square root of the number of fields sampled. The dashed horizontal line is the lower limit of “very high” P values (39 lbs/ac) and the dotted horizontal line is the lower limit of the “high” category of P values (9 lbs/ac).

Nutrient loads also vary across land managers





Total Phosphorus Balance Across 58 Dairy Farms in Shenandoah Valley Virginia, 2018

Quartile	Total P balance (kg/ha)
Minimum	-30.9
1st Quartile	1.5
Median	12.4
3rd Quartile	18.7
Maximum	97.6

Pearce & Maguire 2020


Watershed Prioritization for Rapid Gains in Habitat and Water Quality

WQGIT Submersion Series

September 14, 2023

Josh Shapiro, Governor

Richard Negrin, Secretary

Watershed Prioritization

- Select small agricultural watersheds less than 25 square miles (less than 10 is even better)
- Prioritize minimal impairments; low hanging fruit for fast victories and de-listings
- Active restoration partners and cooperative landowners are essential

pennsylvania
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Watershed Selection

- DEP's Integrated Report 2022 (pa.gov)
- Stroud Water Research Center's (MMW) model Model My Watershed
- EPA's Watershed Resources Registry
- Most Effective Basin (MEB) funding

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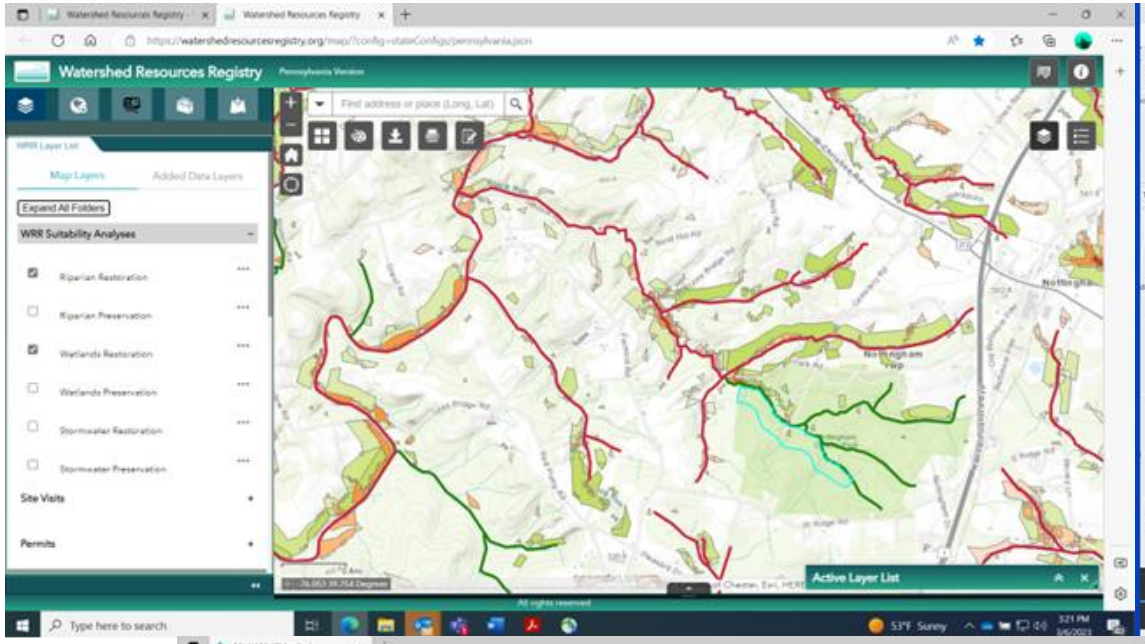
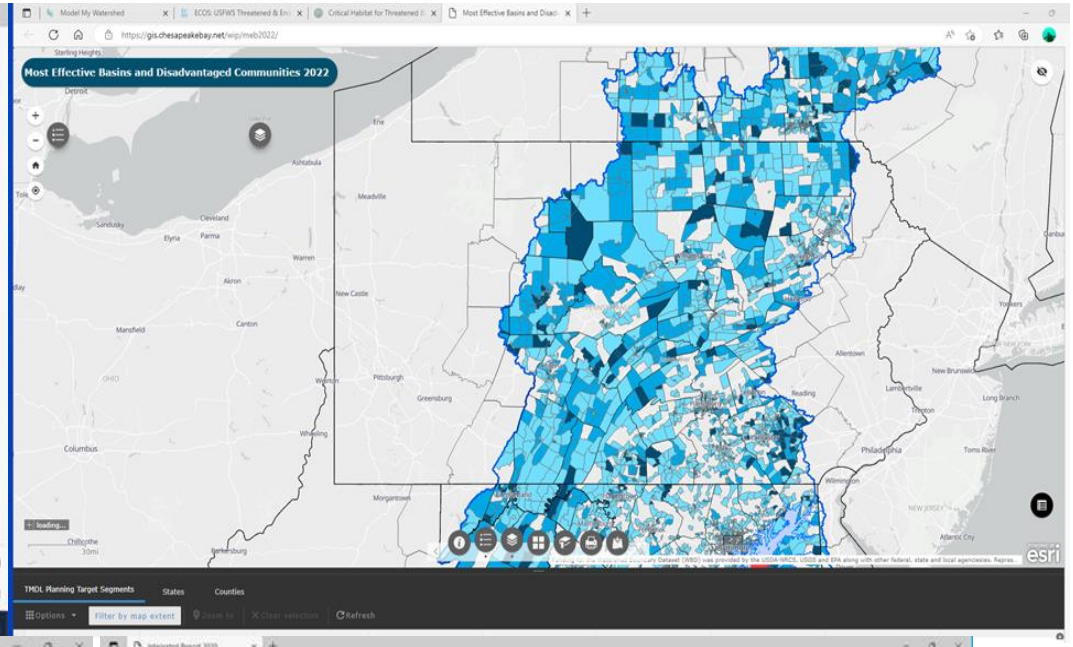
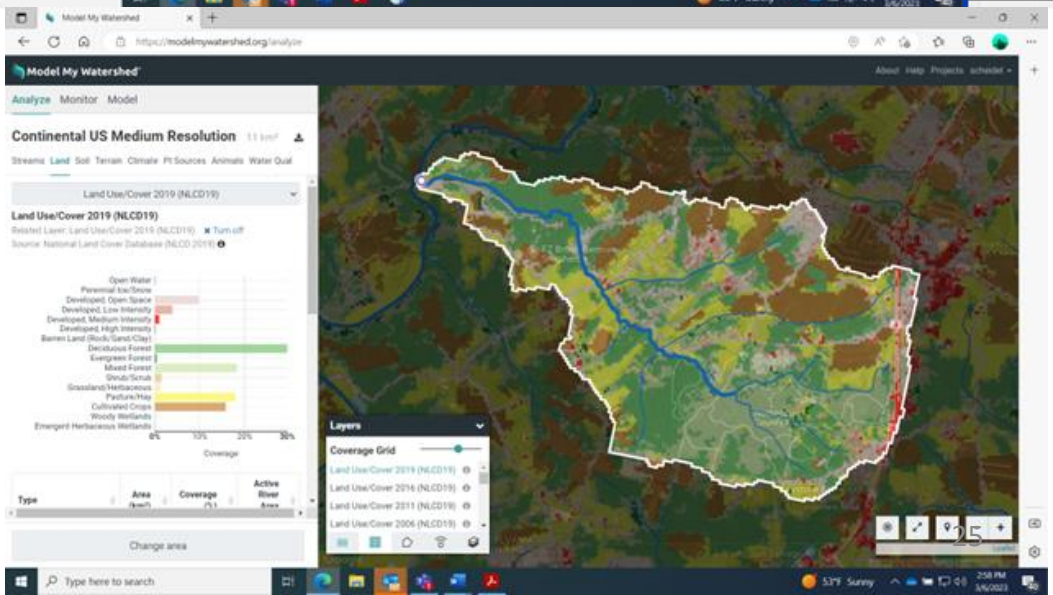
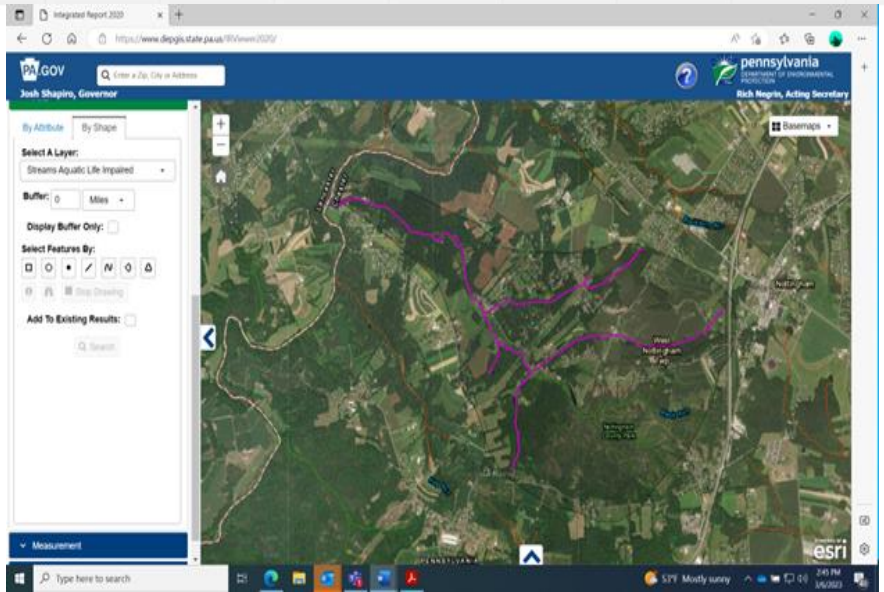
IR, MMW, Registry, MEB









BMP Saturation

- Develop targeted Watershed Implementation Plan or Advanced Restoration Plan
- Watershed Restoration FAQs (state.pa.us)
- Attack the watershed with every BMP needed
- Conduct pre- and post-BMP monitoring and modeling
- Hungry Run, Hammer Creek

Connect the Dots

- Local restoration fits well into Countywide Action Plans, MEBs and Bay WIP
- Use multiple funding sources creatively
- Conservation Districts and Conservation Groups like TU are key to implementation and local landowner buy-in

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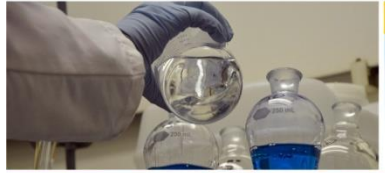

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Scott Heidel

Environmental Group Manager

Chesapeake Bay Partnership Section

Bureau of Watershed Restoration and Nonpoint Source Management

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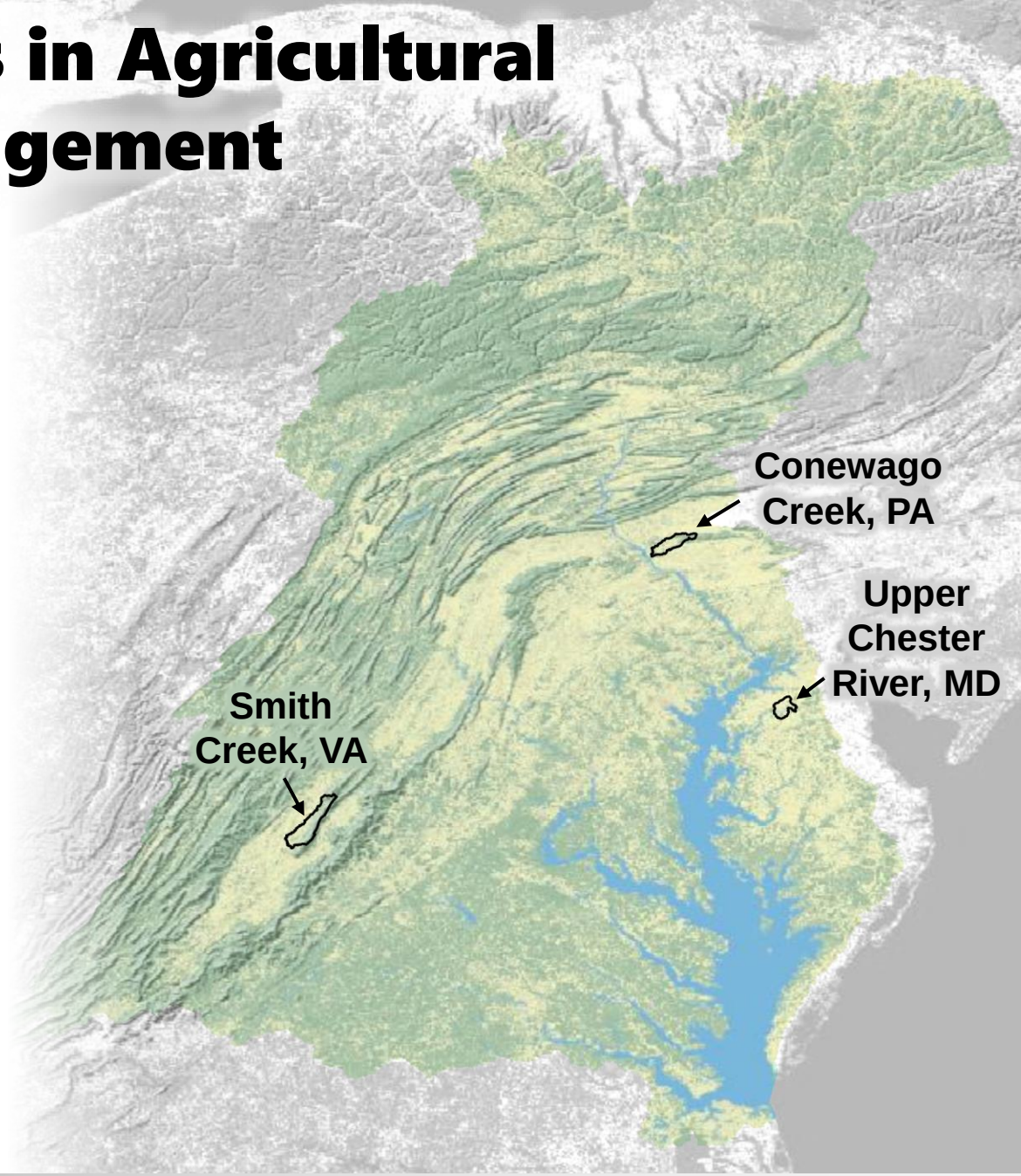
Evaluating Water-Quality Trends in Agricultural Watersheds Prioritized for Management

Jimmy Webber*, Jeff Chanat, John Clune, Olivia Devereux, Natalie Hall, Robert Sabo, Qian Zhang

* jwebber@usgs.gov, U.S. Geological Survey (USGS), Virginia and West Virginia Water Science Center

In 2010, three agricultural “showcase” watersheds were prioritized for enhanced amounts of water-quality conservation and monitoring.

The goal of this study was to assess the water-quality effects of agricultural conservation practices.



Agricultural conservation practices increased over time[1]

The number of conservation practices was at least two times higher in 2020 than 2007 in all watersheds.

x2 Upper Chester River

x4 Smith Creek

x5 Conewago Creek

Increase in the number of practices from 2007 through 2020.

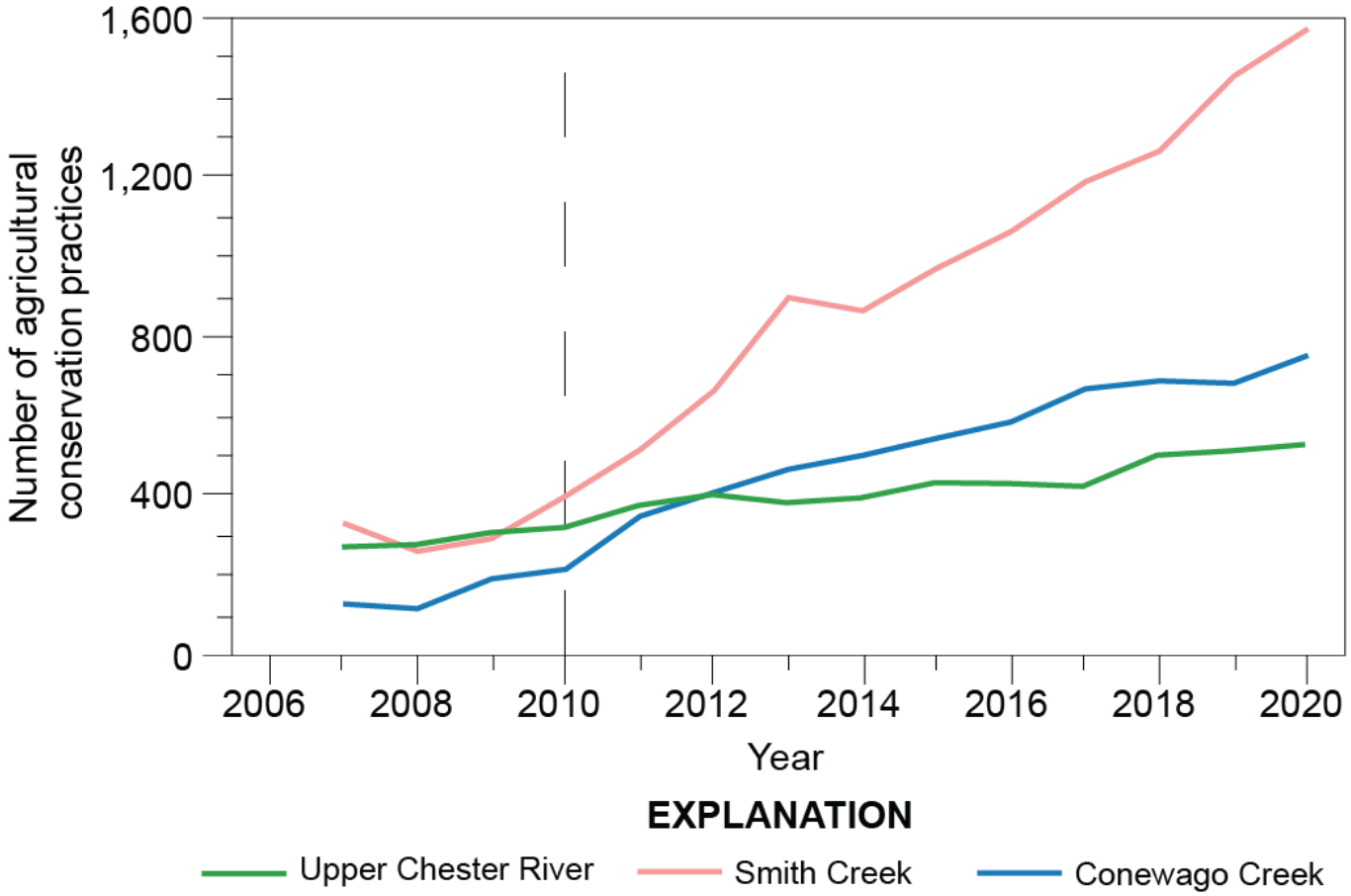
Not all practices were designed to reduce nutrient and sediment loads. With input from NRCS, we identified practices with a "high-impact" potential to reduce loads.

66% Upper Chester River

27% Smith Creek

47% Conewago Creek

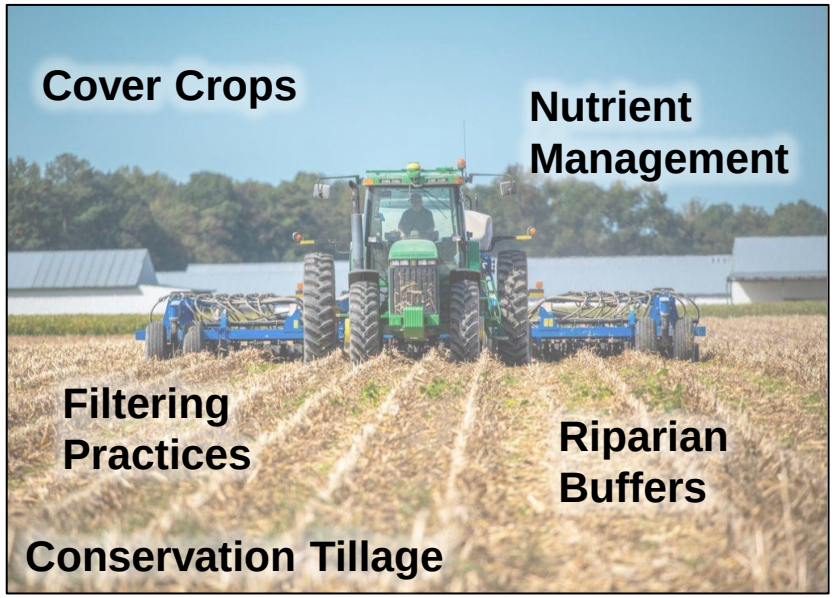
Average percentage of practices with "high-impact" load reduction expectations.



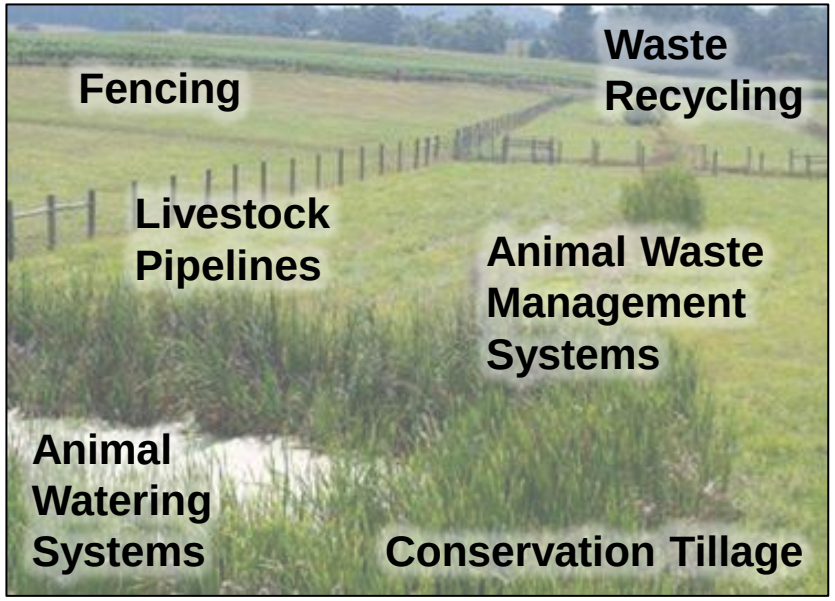
[1]Agricultural conservation practices that received financial or technical assistance from state or federal agencies were summarized from water years 2007 through 2020.

Each watershed had a unique suite of conservation practices

Upper Chester River, MD



Smith Creek, VA

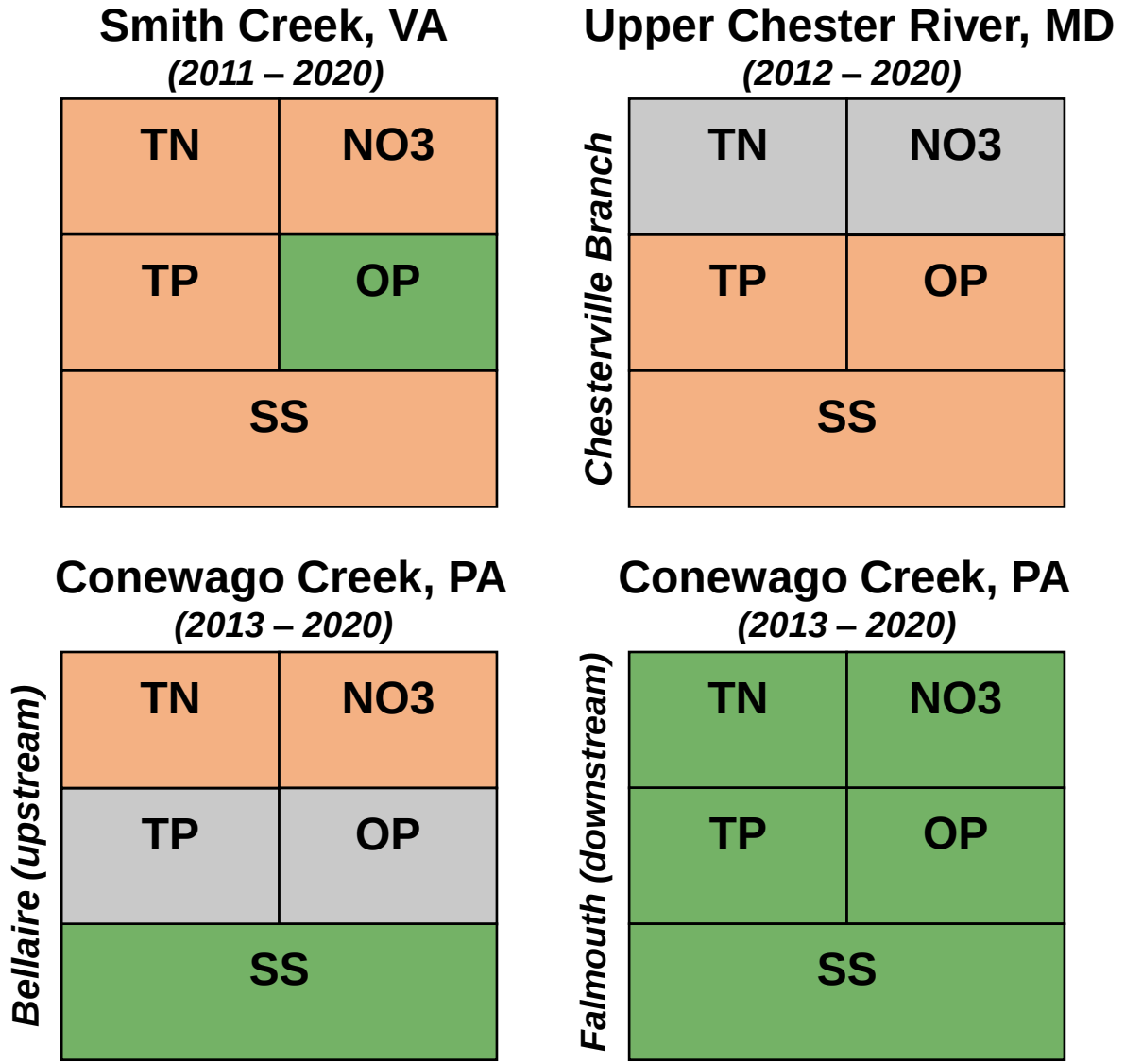


Conewago Creek, PA

Most monitored nutrient and sediment loads did not decrease

9 of 20 FN loads **increased** (45%)

7 of 20 FN loads **decreased** (35%)



TN, total nitrogen; **NO3**, nitrate; **TP**, total phosphorus; **OP**, orthophosphate; **SS**, suspended sediment.

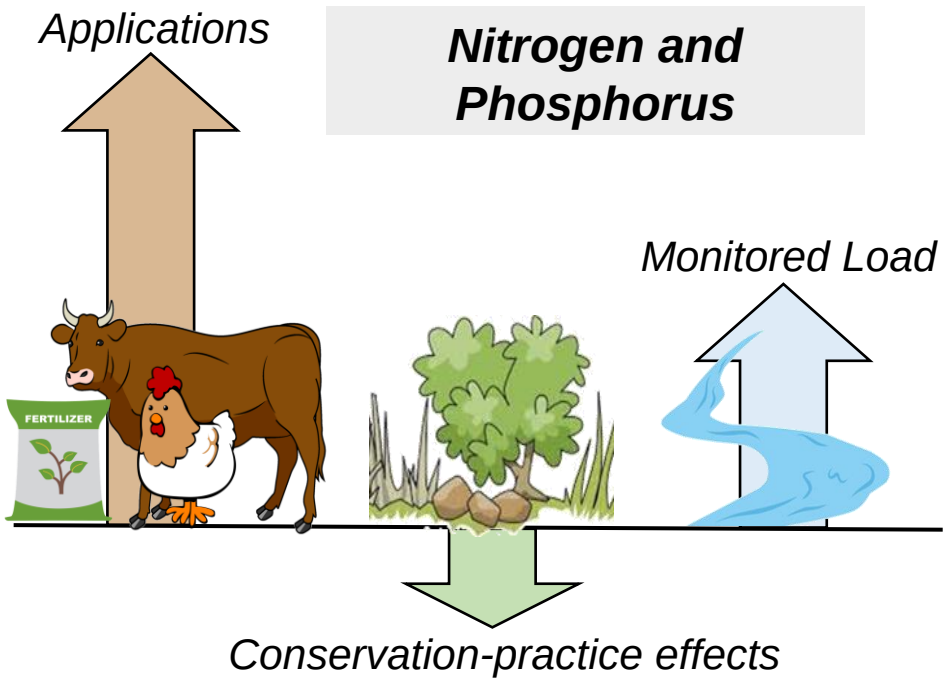
Increasing trend
Decreasing trend
No trend

What are some management implications of this study?

1. The ability of conservation practices to reduce in-stream nutrient loads may have been overshadowed by increased nutrient applications and suspended-sediment loads.

2. Nutrient load reductions may not occur until manure and fertilizer inputs are lowered to align with local crop nutritional requirements, changes that would reduce surplus nutrient inputs.

3. Sustained water-quality monitoring, advancements in statistical tools, and collaborative partnerships are needed to better understand how agricultural nutrient and sediment loads respond to conservation practices.



Managing Sediment:
Your Land, Your Soil

WQ GIT Submersion Series

September 14th, 2023

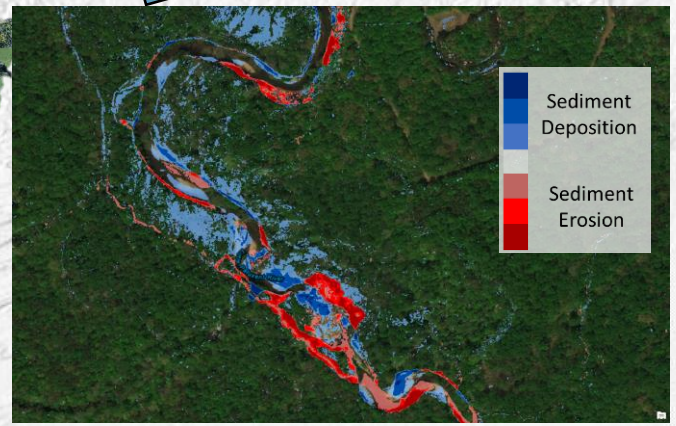
Matthew J Cashman

US Geological Survey

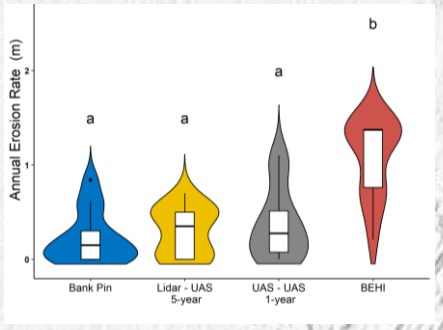
USGS
science for a changing world

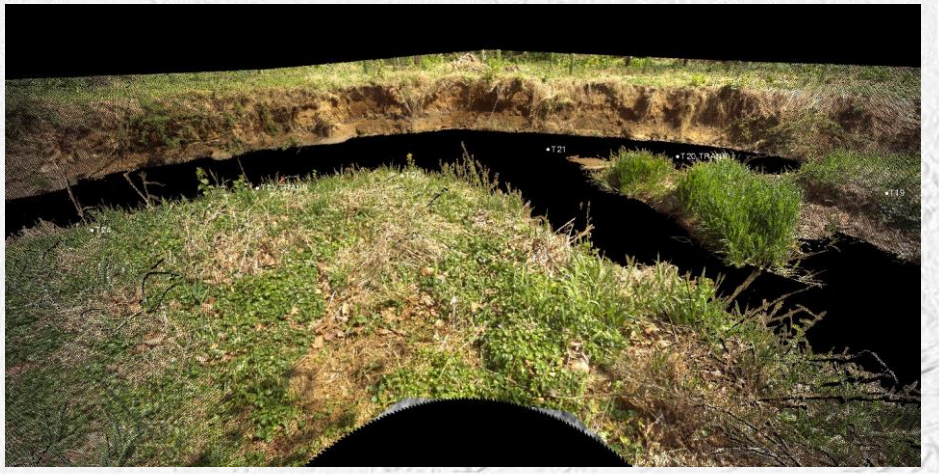
Where is erosion happening?

- New techniques to directly quantify channel erosion, headcuts, and large soil erosion (i.e., rilling)
  - Lidar, UAS/drones, photogrammetry, time-lapse
- Identify hotspots & quantify losses across scales
  - County → Watershed → Reach → Field → Bank
- Directly compare observations and before/after changes against models



Provisional results, for internal communication only. Do not distribute





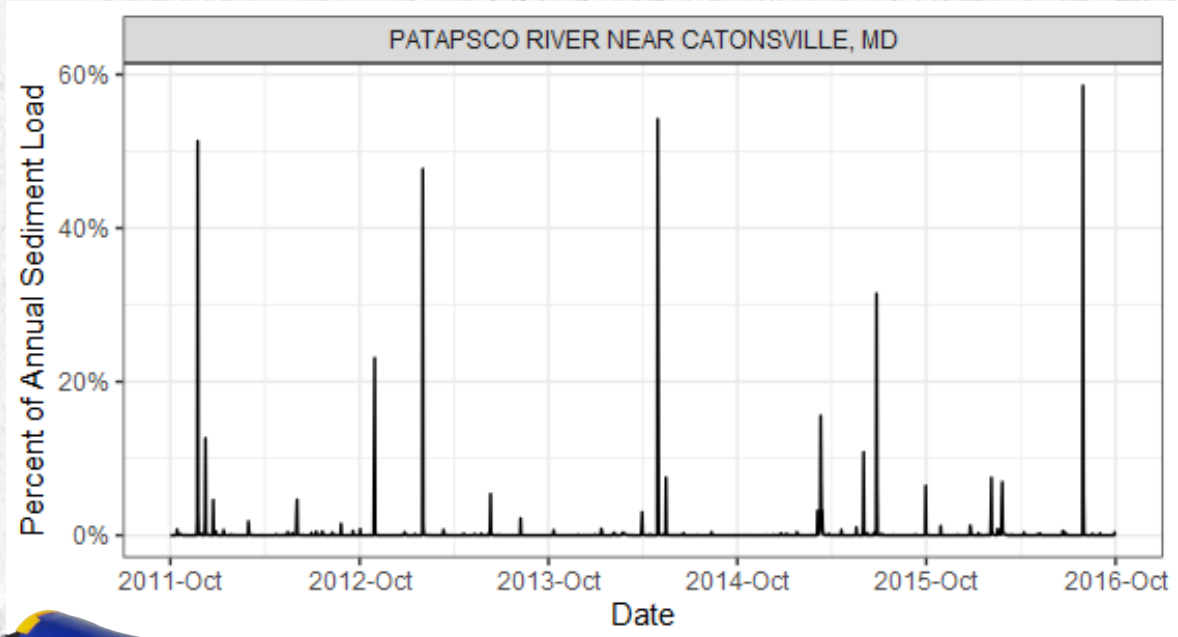
When does it move?

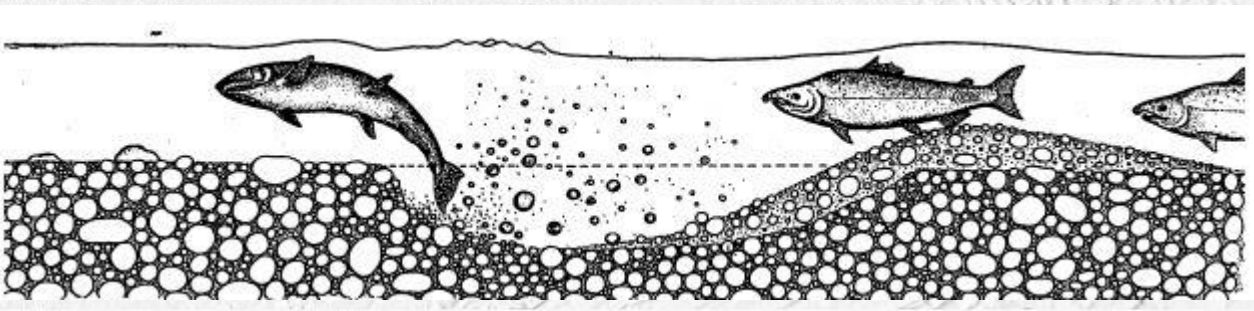
- Time is an crucial aspect of sediment transport

- Most sediment load is in suspension and most suspended sediment is transported during big events
  - Hard to estimate without direct sensors (e.g., turbidity)
  - >30% of the annual load can be transported in one day (or sometimes more)
  - >90% of annual load can be transported in a few days

➢ **If you don't catch the big events you may miss the story!!**

○ But sediment runoff/concentration at lower flows can affect local stream habitat!



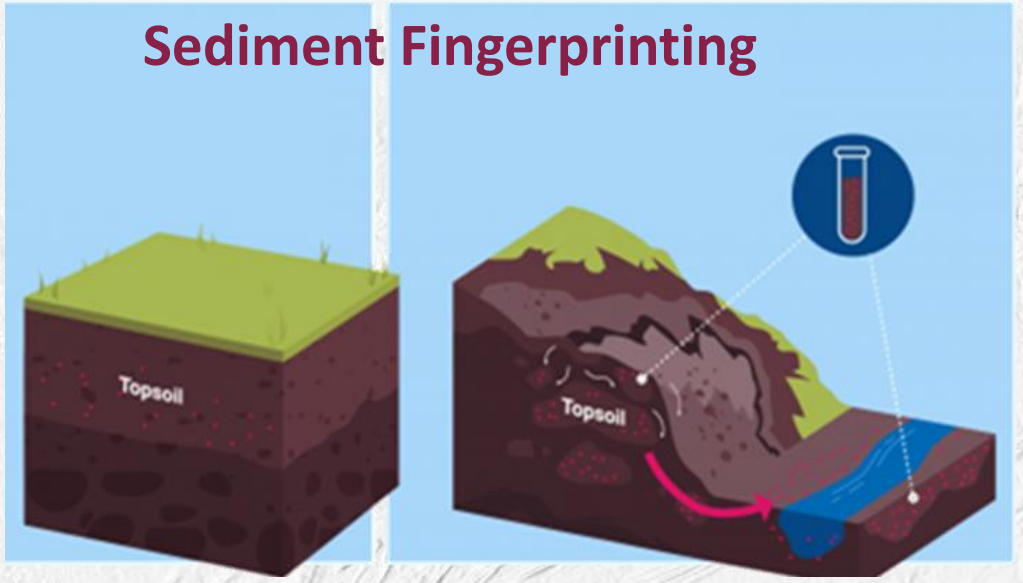


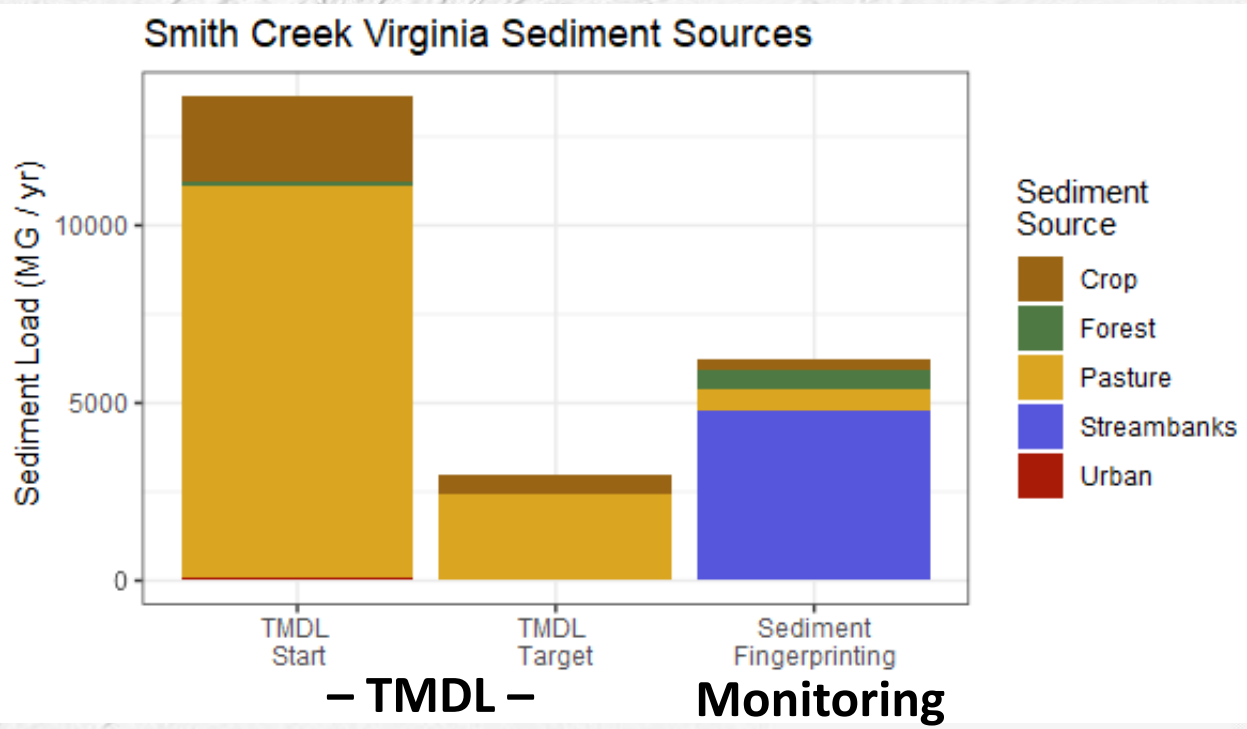
What is the source?

- Source of sediment is often different from models!
  - Few models have robust estimates of channel erosion which has shown to be the major source in many rivers

➢ Do you prioritize stream banks vs uplands? Both require very different management actions.

- Sediment fingerprinting is a monitoring technique to directly identify source of sediment
  - Get % contributions from varying sources
  - Compare to modeled estimates
  - Evaluate changes before/after management activities

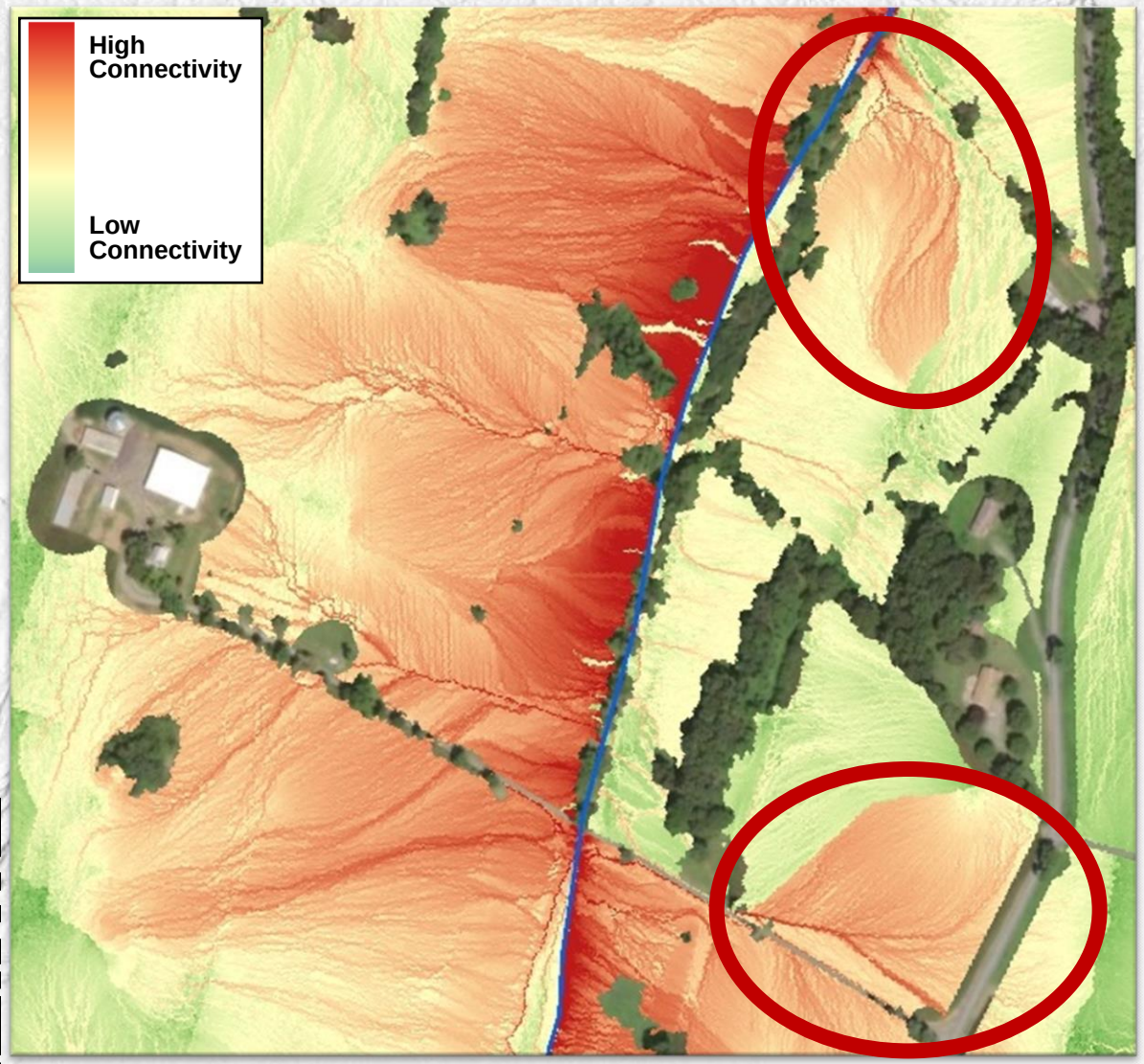




Gellis, A.C., and Gorman Sanisaca, L.. 2018. " Sediment Fingerprinting to Delineate Sources of Sediment in the Agricultural and Forested Smith Creek Watershed, Virginia, USA." *Journal of the American Water Resources Association* 54 (6): 1197–1221. https://doi.org/10.1111/1752-1688.12680.

Why does location matter?

- Not all erosion makes it to the river – “Connectivity”
- i.e., Runoff and eroded soils can be intercepted by vegetation and conservation practices, if they are present
- High-resolution lidar and landcover allows us to identify agricultural areas that are “well-connected” to the stream… and where buffers are being by passed!
  - These are prime areas for management intervention



Clifton, Z. J., Cashman, M. J., Gellis, A. C., Katoski, M. P., Nibert, L. A., & Noe, G. B. (2022). Quantifying connectivity and its effects on sediment budgeting for an agricultural basin, Chesapeake Bay Watershed, United States. *Hydrological Processes*, 36(12), e14777. https://doi.org/10.1002/hyp.14777

How do we show success?

- Continuous sensors (i.e., turbidity) that are used to estimate sediment give statistical power to show differences before/after conservation efforts

- Example of USGS study in New York
  - **Black – BEFORE** turbidity reduction project
  - **RED – AFTER** turbidity reduction project
  - Decreases in sediment at ~ALL runoff

- Before/after changes in erosion rates and sediment sources through fingerprinting (ongoing)

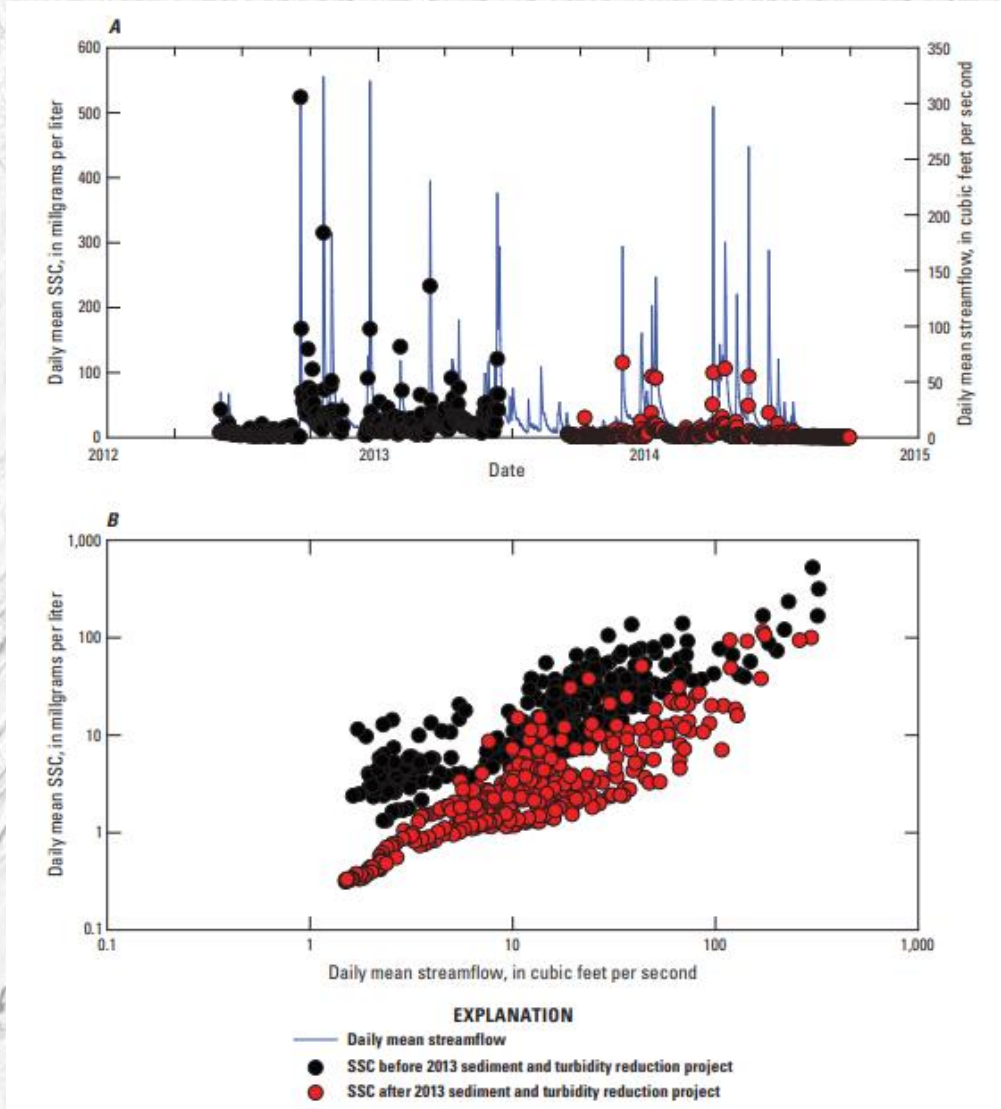


Figure 13. *A*, daily mean suspended-sediment concentration (SSC) and streamflow and *B*, daily mean SSC as a function of daily mean streamflow before and after the sediment and turbidity reduction project at the Warner Creek near Chichester, New York, streamgage.

Siemion, Jason, Michael R. McHale, and Wae Danyelle Davis. Suspended-sediment and turbidity responses to sediment and turbidity reduction projects in the Beaver Kill, Stony Clove Creek, and Warner Creek Watersheds, New York, 2010–14. No. 2016-5157. US Geological Survey, 2016. https://doi.org/10.3133/sir20165157

Conservation Effects Assessment Project (CEAP) Watershed Assessment Studies

Lisa F. Duriancik
CEAP Watersheds Assessments Leader,
USDA NRCS, Resource Assessment Branch,
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Lisa.Duriancik@usda.gov

https://www.nrcs.usda.gov/ceap/watersheds

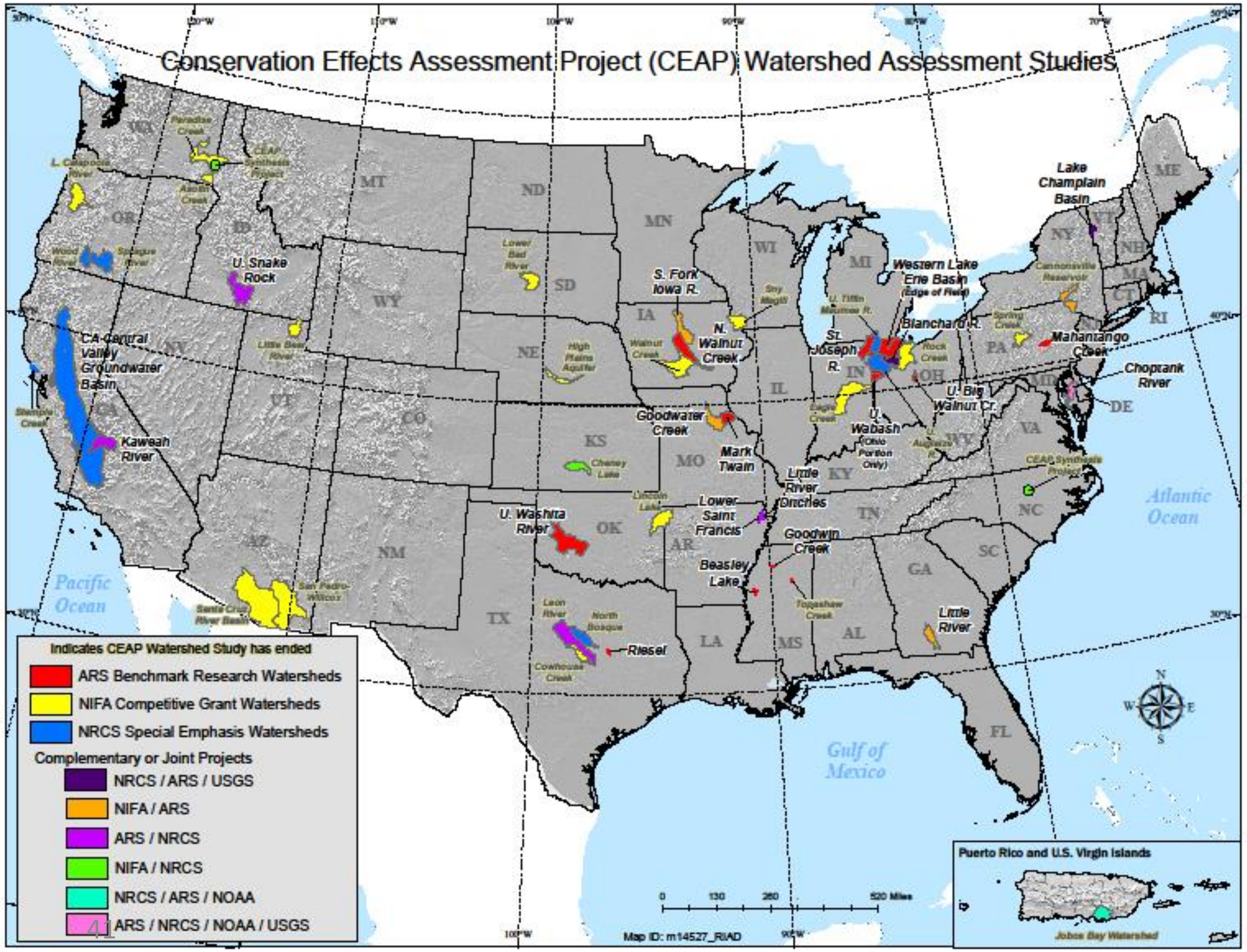
WQGIT Submersion Series
September 14, 2023

Goals of the CEAP Watershed Assessment Studies:

quantify the measurable effects of conservation practices at the watershed scale

enhance understanding of conservation effects in the biophysical setting of a watershed

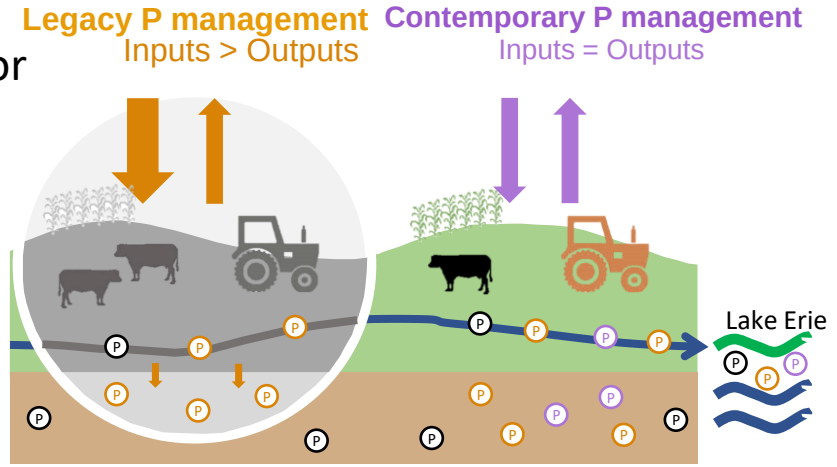
inform local watershed conservation strategies



CEAP WAS Special Projects

Lag Time
Legacy Sources

- Legacy P and N can serve as a chronic source of pollution to surface waters for decades
- Legacy sediment accumulation can shorten the life of reservoirs



Ephemeral Gullies

Managed Aquifer Recharge

Stacked Practices (OH and VT)

MAPHEX – MAnure PHosphorus EXtraction

Buffers in Chesapeake Bay Watershed (riparian and innovative)

Conservation Tradeoffs

Sediment Source Tracking

Soil Health Assessment (SMAF)

ACPF Enhancement & Eastern States

SVI Enhancement

Wetlands Water Benefits (CCV)

Natural Resources Conservation Service,
Agricultural Research Service

What Have We Learned?

- Conservation practices work
- Gains have been made in some cases, but critical concerns still exist
  - Documented measurable improvement in some watersheds, but it is a challenge to do so
- Comprehensive planning needed
  - Watershed and field scale
  - suites vs single practices
- Identifying critical source areas improves effectiveness.

Natural Resources Conservation Service, Agricultural Research Service

Osmond et al., 2012 SWCS. 387 pp. "How to Build Better Ag Conservation Programs to Protect Water Quality"
Tomer et al. 2014, JSWC, 69(5) 365-373

Greatest Opportunities for More Effective Water Quality Conservation:

- Work in smaller watersheds and plan at watershed scale
- Identify specific water quality constituents of concern *and* their sources
- Use systems of conservation practices
  - Address multiple water quality and soil conservation concerns, especially trade-offs
- Consider hydrology:
  - Identify transport pathways
  - most effective conservation practices to intercept or treat the water resource

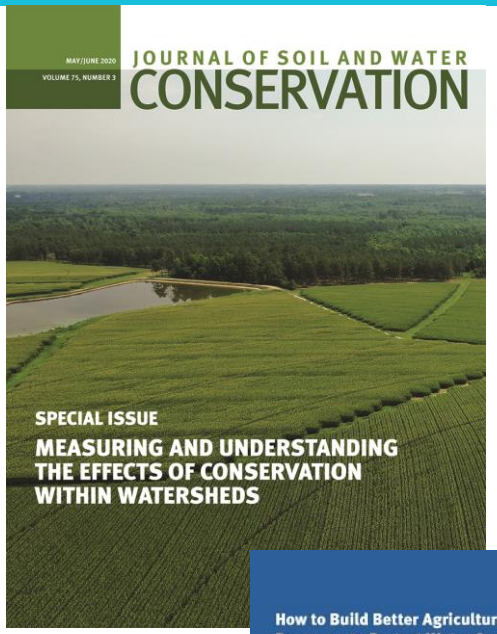
Natural Resources Conservation Service, Agricultural Research Service

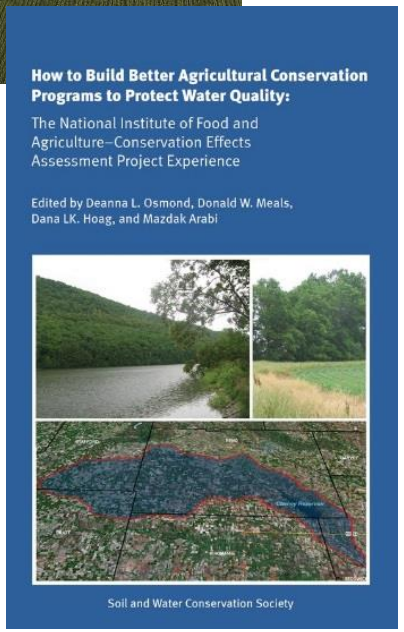
Osmond et al., 2012 SWCS. 387 pp. "How to Build Better Ag Conservation Programs to Protect Water Quality"
Tomer et al. 2014, JSWC, 69(5) 365-373

Bottom Line: Watershed Outcomes

Over 55% of long-term CEAP watersheds have measured water quality benefits from conservation at the small watershed scale, despite the difficulty of isolating the impacts of conservation practices from the wide range of factors affecting water quality.

- 13 of 21 ARS Benchmark CEAP Watersheds demonstrated measurable water quality improvements at sub-watershed or watershed scales for at least one item monitored (Moriasi et al. 2020, doi:10.2489/jswc.75.3.57A).
- 6 of 13 NIFA-CEAP Watersheds attributed water quality improvements to conservation practice implementation (Osmond et al. 2012, SWCS book).
- https://www.nrcs.usda.gov/ceap/watersheds





Natural Resources Conservation Service, Agricultural Research Service

Making Science Work For You:

How to strengthen the connection between water-quality studies and agricultural conservation practices

Agenda

Part II: What Do We Need From Future Water-Quality Studies?

1. A Perspective from Maryland
   Elizabeth Hoffman (Maryland Department of Agriculture)
2. What Does NRCS Need From Future Water-Quality Studies?
   Jayme Arthurs (Natural Resources Conservation Service)
3. Feedback from STAC: Considerations for Future Monitoring Studies
   *Gary Shenk (*US Geological Survey, Chesapeake Bay Program*)*
4. Enhancing the Chesapeake Bay Program Monitoring Networks
   Kaylyn Gootman (US Environmental Protection Agency)
5. Studying Water-Quality Responses to Conservation in Small Ag. Watersheds
   *Mark Nardi (*US Geological Survey*)*

Discussion questions will follow Part II

Photos courtesy of Will Parson, Chesapeake Bay Program

What is needed from Future Studies? Agency Perspective

- Holistic Approach – Incentivizing Treatment Systems
- Getting from Study to Field – Barriers in Adoption
- Measuring Co-Benefits – Ecosystem Values
- Balancing Needs – Thoughtful Prescription

Contact Information

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Evaluation and Reporting Coordinator

elizabeth.hoffman@maryland.gov

What Does NRCS Need From Future Water-Quality Studies?

- Position
- Synergy
- Outcomes
- Innovation

STAC Workshop: Using Local Monitoring Results to Inform the Chesapeake Bay Program's Watershed Model

Workshop Co-Chairs: KC Filippino and Karl Berger

Draft findings and recommendations

March 7-8, 2023

Adapted from presentation by KC Filippino

RECOMMENDATIONS

For the Bay Program to consider

Discuss policy changes to incorporate monitoring

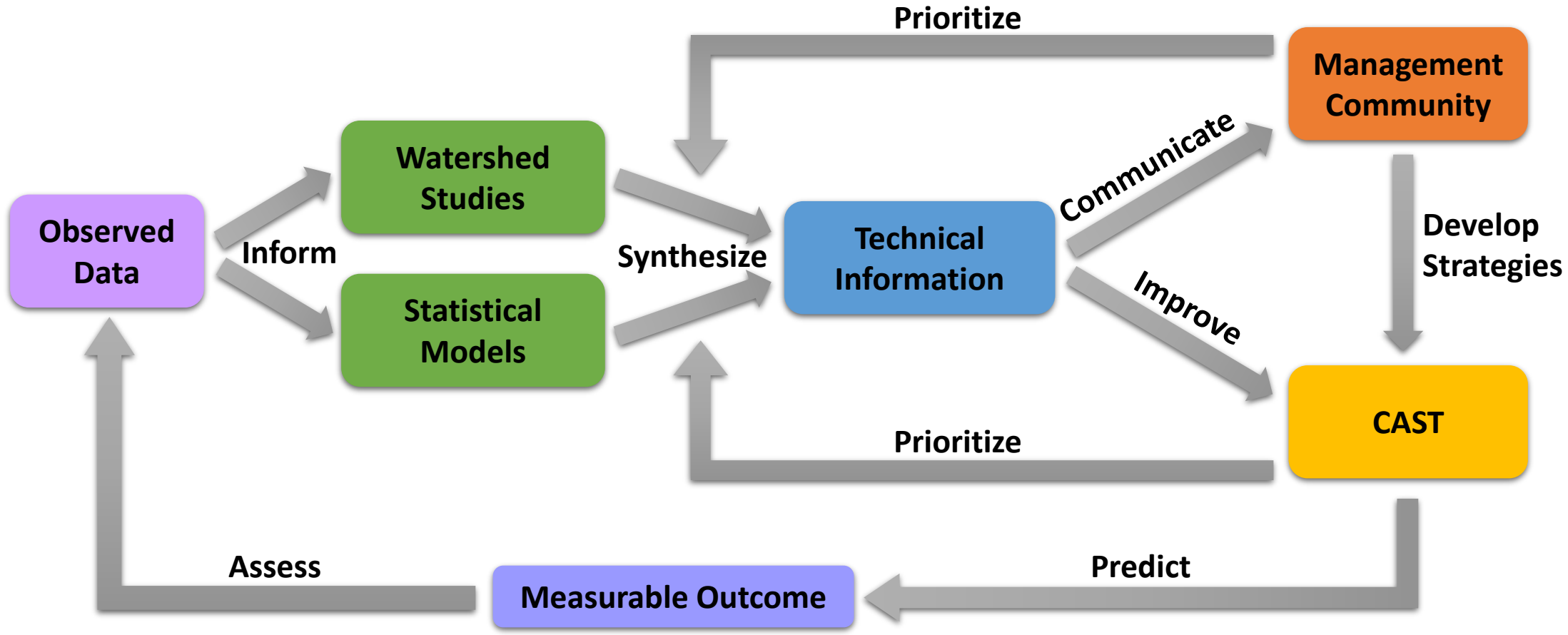
Compare with TMDL expectations

Look for other established data sets

Include local data in model calibration

Include as generalized knowledge

Include as generalized knowledge



Adapted from presentation by Jimmy Webber

Include as generalized knowledge

- Hypothesis-driven – design a study to answer a specific question needed for management
  - Sites
  - Frequencies
  - Parameters
  - Watershed inputs
  - Watershed properties
  - Stream metrics

- New statistical tools
  - Determine causes of loads and trends in small watershed data.
    - Inputs
    - Practices
    - Physical properties in small watersheds.
  - Synoptic data
    - Much collected, little used
    - Stakeholder involvement in community science projects.

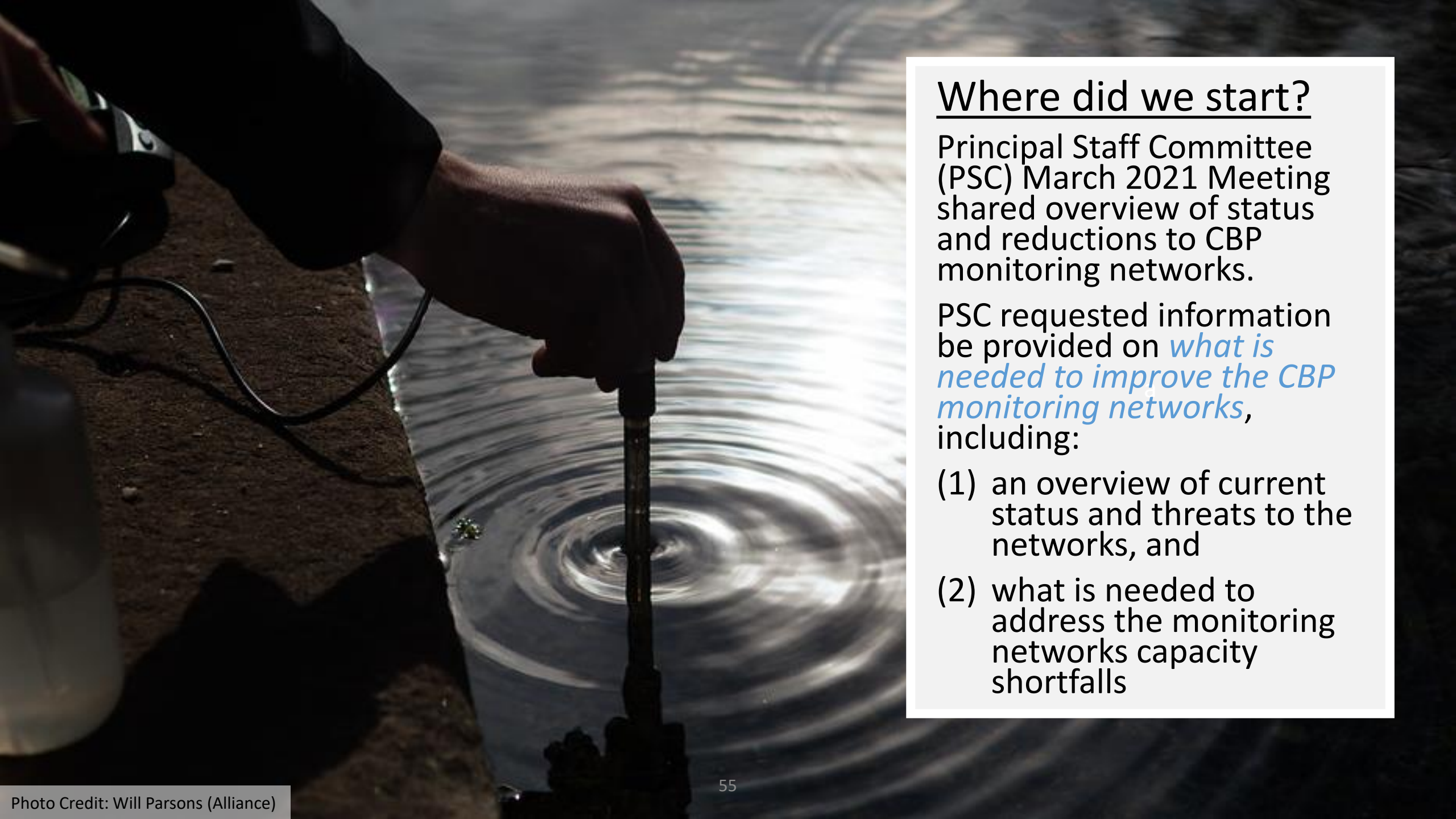
Enhancing the Chesapeake Bay Program Monitoring Networks:
A Report to the Principals' Staff Committee

Dr. Kaylyn S. Gootman, EPA CBP

WQGIT Submersion Series

September 14, 2023

Chesapeake Bay Program
Science. Restoration. Partnership.



Where did we start?

Principal Staff Committee (PSC) March 2021 Meeting shared overview of status and reductions to CBP monitoring networks.

PSC requested information be provided on *what is needed to improve the CBP monitoring networks*, including:

(1) an overview of current status and threats to the networks, and

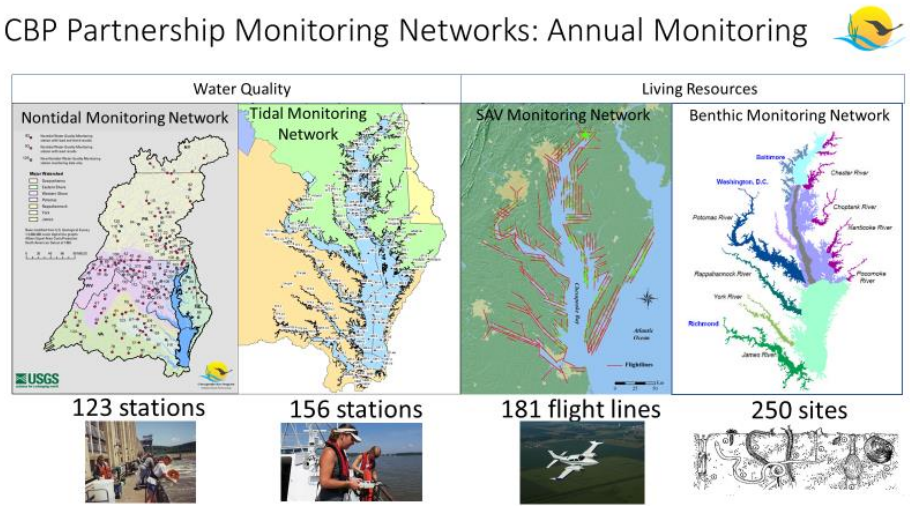
(2) what is needed to address the monitoring networks capacity shortfalls

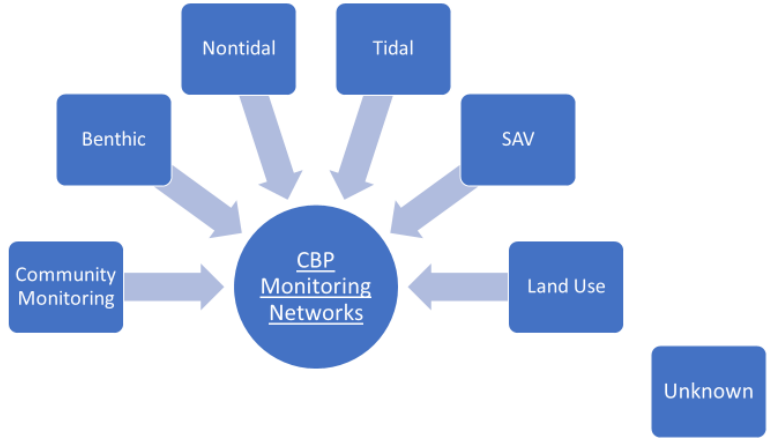
Photo Credit: Will Parsons (Alliance)

Monitoring Review

- The CBP STAR team and the CBP monitoring team, with input from STAC leadership.

- Interactions with the Goal Implementation Teams and partners who operate and maintain CBP monitoring networks to:
  - Evaluate their information needs
  - Determine their priorities
  - Discuss potential enhancements to monitoring efforts



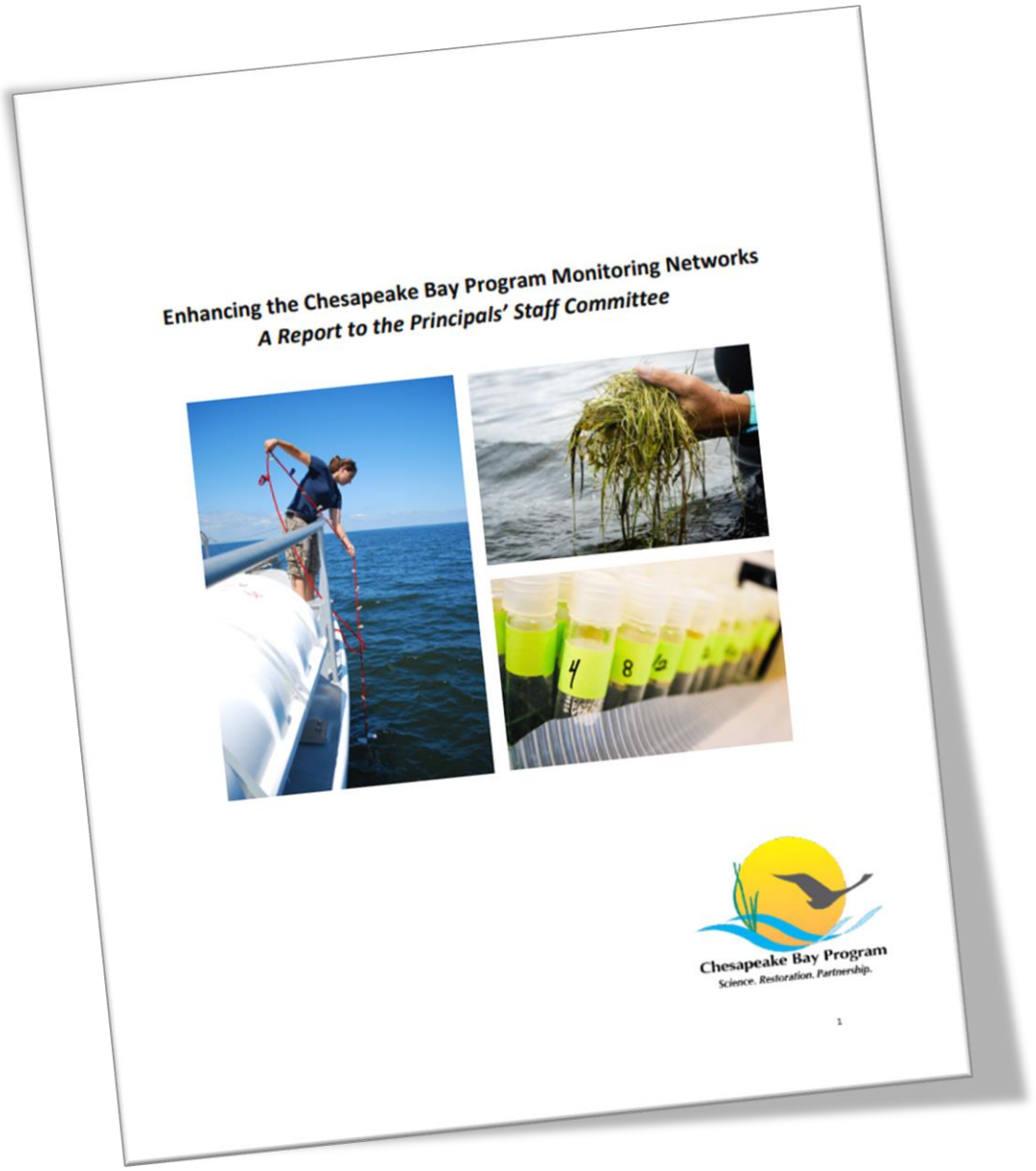


Report Key Findings

1. Continued monitoring is critical

2. Monitoring for many CBP outcomes is insufficient

3. Opportunities for funding exist



The full report can be found here.

Investment Recommendations

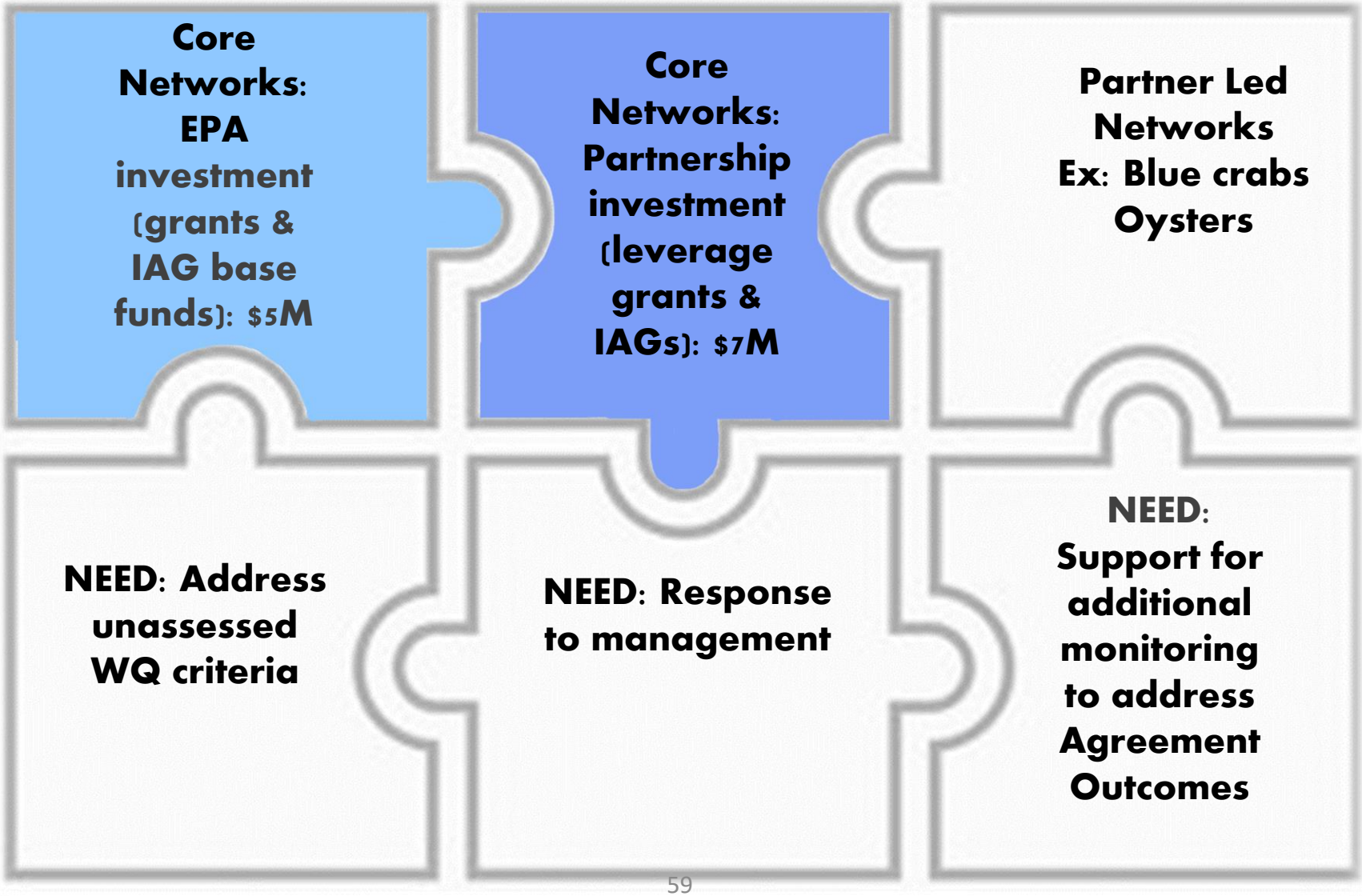
Assess tidal water quality standards to support living resources

Evaluate implementation priorities for watershed-based outcomes

Document CBP progress toward Watershed Agreement goals and outcomes

Recommendations based on CBP needs assessment

Core Networks now. More networks to come.



Recommendations based on CBP needs assessment

Core Networks now. More networks to come.

Small AG Watershed Water Quality Response to Conservation Practice Implementation

Slides by Alex Soroka - asoroka@usgs.gov
Presented by Mark Nardi – mrnardi@usgs.gov

Coordinating efforts to assess water-quality effects of agricul conservation practices

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.

- **NRCS**: Kasey Taylor, Stacey Bradshaw, Elliott Kellner, and Edwin Martinez-Martinez
- **EPA**: Kelly Shenk, Emily Trentacoste, and Bill Richardson
- **USGS**: Scott Phillips, Ken Hyer, and Mark Nardi

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.

Findings led the USGS and EPA to plan a new monito analysis effort.

reducing nutrients and sediment loadings from agricultural lands, including NRCS Conservation Effects Assessment Project, USGS Chesapeake Bay Studies, Chesapeake Bay Program Best Management Practices expert panels.

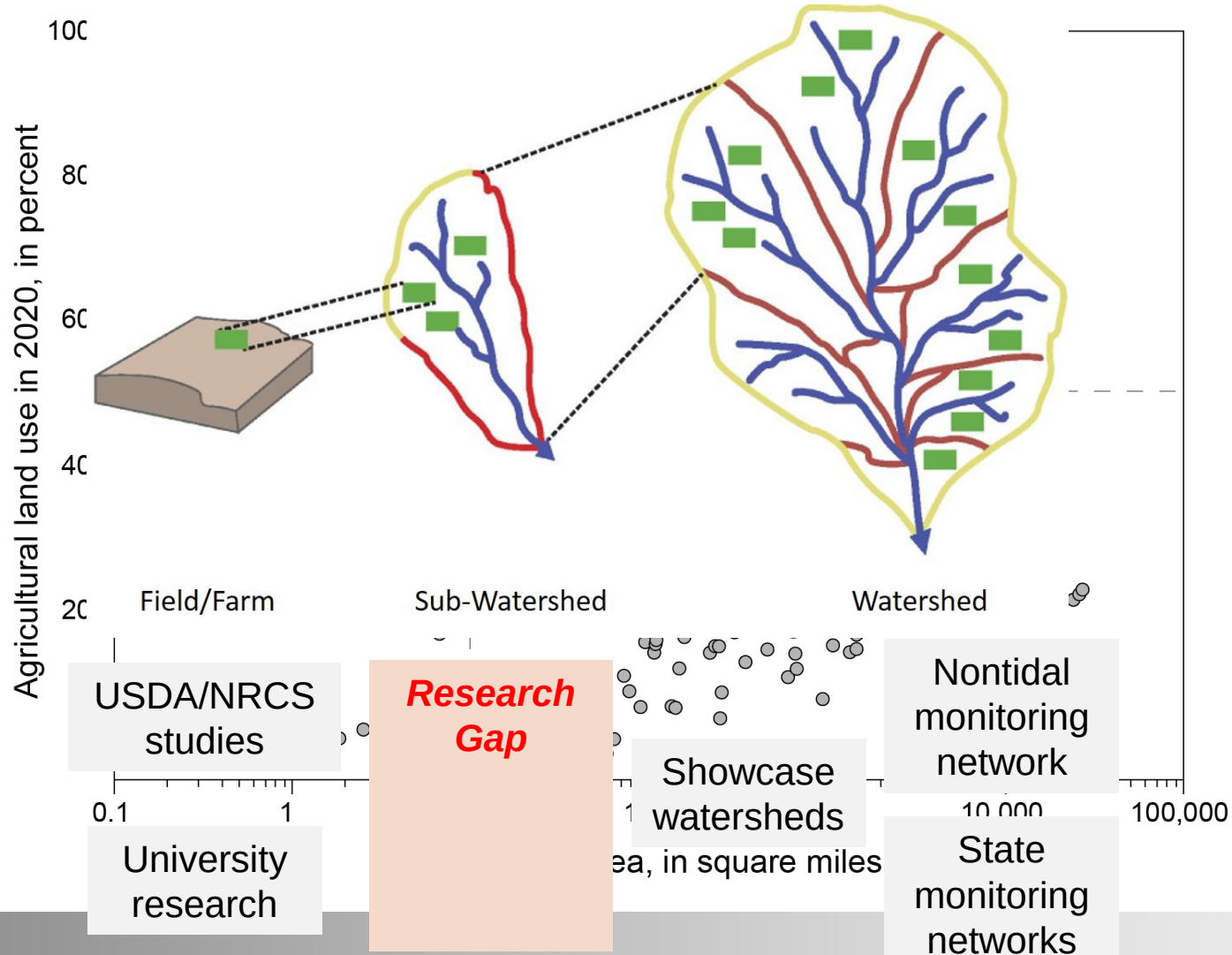
A major challenge identified by the Team was the need for enhanced monitoring at finer scales to better connect implementation of management practices with water quality and sediment changes in the Chesapeake Watershed. Existing monitoring programs were designed to answer specific technical questions (across a range of spatial scales) that do not directly address water quality response to agricultural conservation practices. Table 1 summarizes the scale and objective of existing monitoring activities and highlights the gap in monitoring at the small stream scale.

Table 1: Chesapeake Bay Monitoring Programs – Scale, Objective, and Quality

STUDY SCALE	MONIOTING PROGRAM	OBJECTIVE	QUALITY OF CURRENT NETWORK
Large Rivers (4th order and larger)	1) Nontidal Monitoring Network 2) State Monitoring Networks	1) Integrated trends in water quality across the Chesapeake watersheds 2) Identify impairments of water quality standards	1) Good (100+ station long-term monitoring network) 2) Good (Extensive statewide networks exist)
Streams (2-3rd order)	1) NRCS-USGS Showcase Watershed monitoring	1) Integrated changes of water quality in ag watersheds with substantial ag conservation practice implementation	1) Fair (Relatively few monitoring sites exist)
Small streams (zero-1st order)	1) None identified	1) Evaluate the effects of ag conservation practice	1) Poor (lack of monitoring)

6

Why Small watersheds?



Study area and planned data collection

Location:

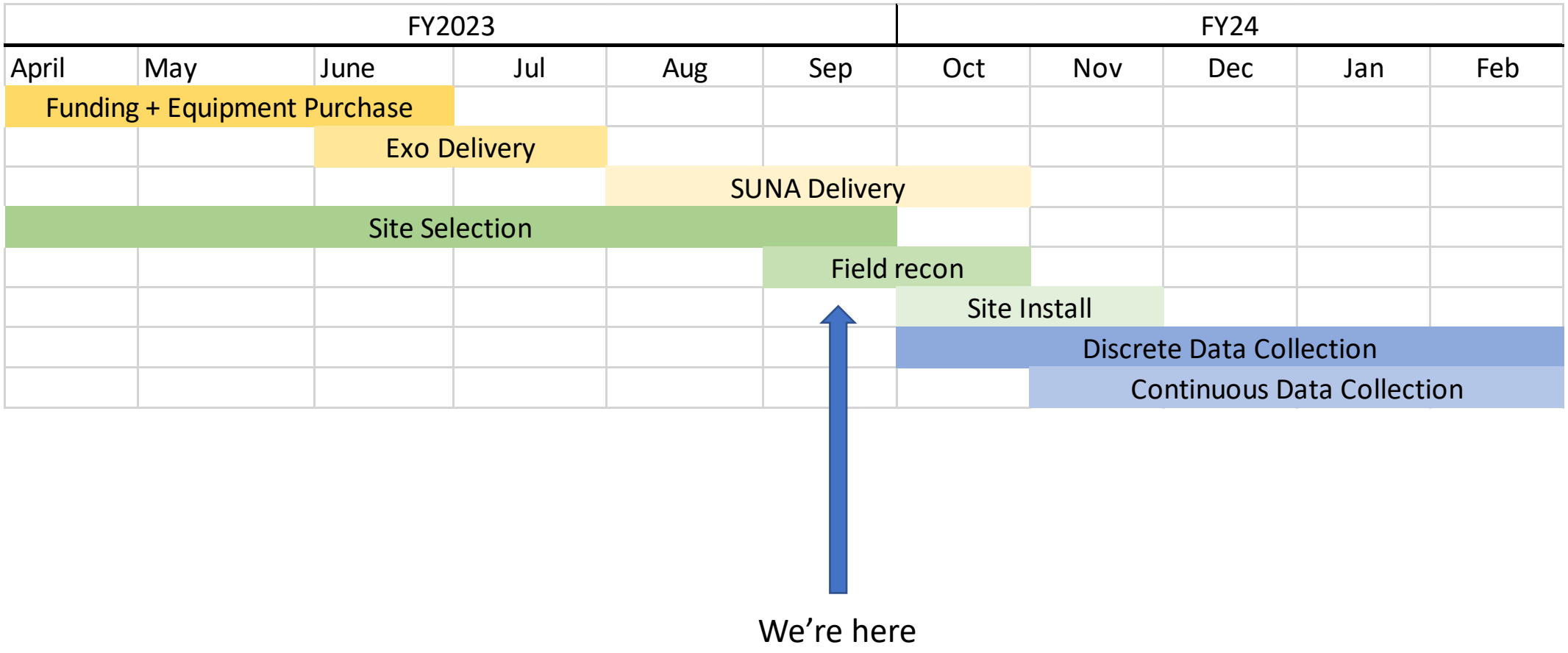
- 5 stations spread across Bay watershed
- <10-15 sq mi area
- >50% Agricultural land use
    - <10% urban land use
- Ideally have previous data collection
- Have cooperating land owners

Data Collection:

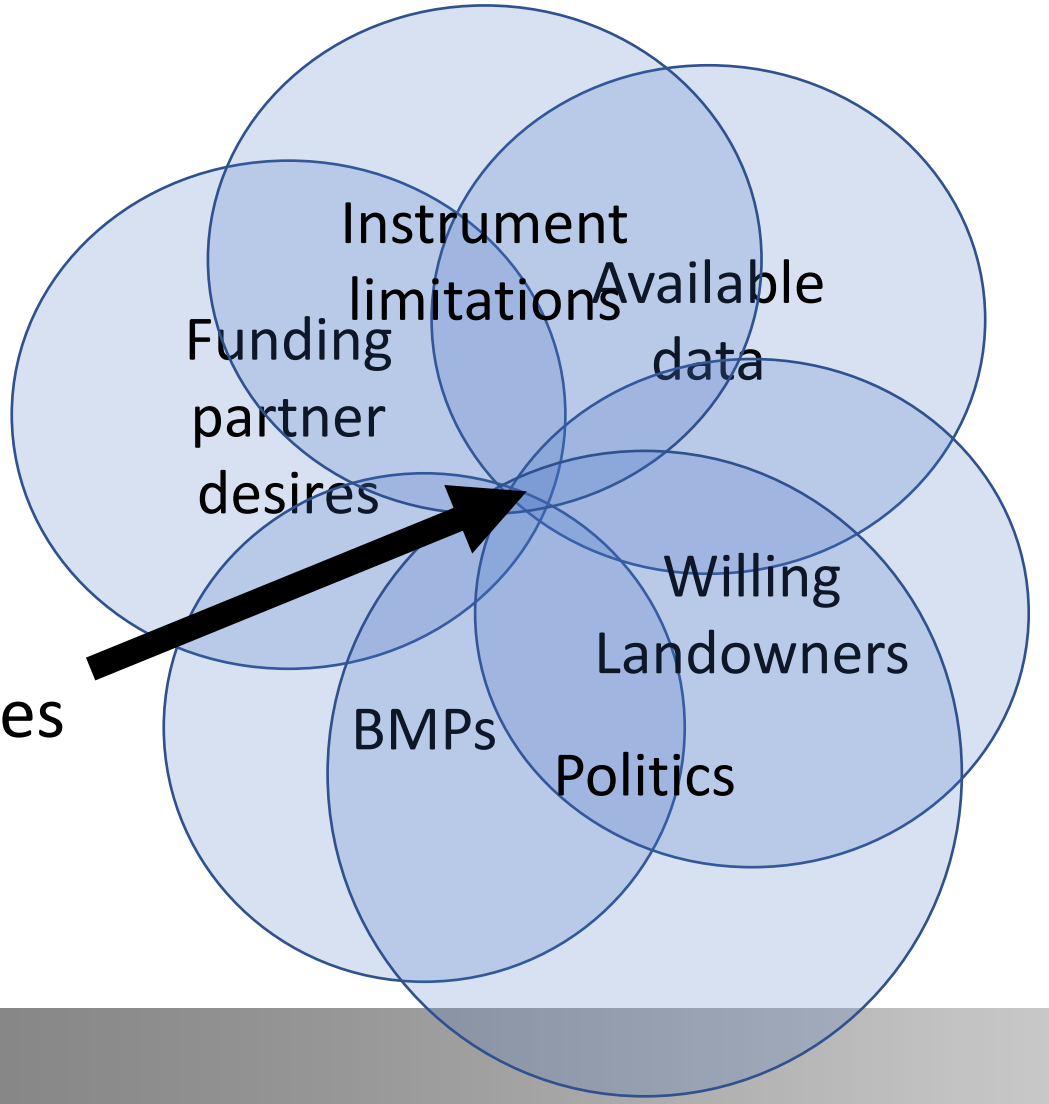
- Discrete sampling on NTN schedule
- Discharge
- Continuous Dissolved Oxygen, pH, Specific Conductivity, temperature, turbidity, nitrate data with a SUNA sensor

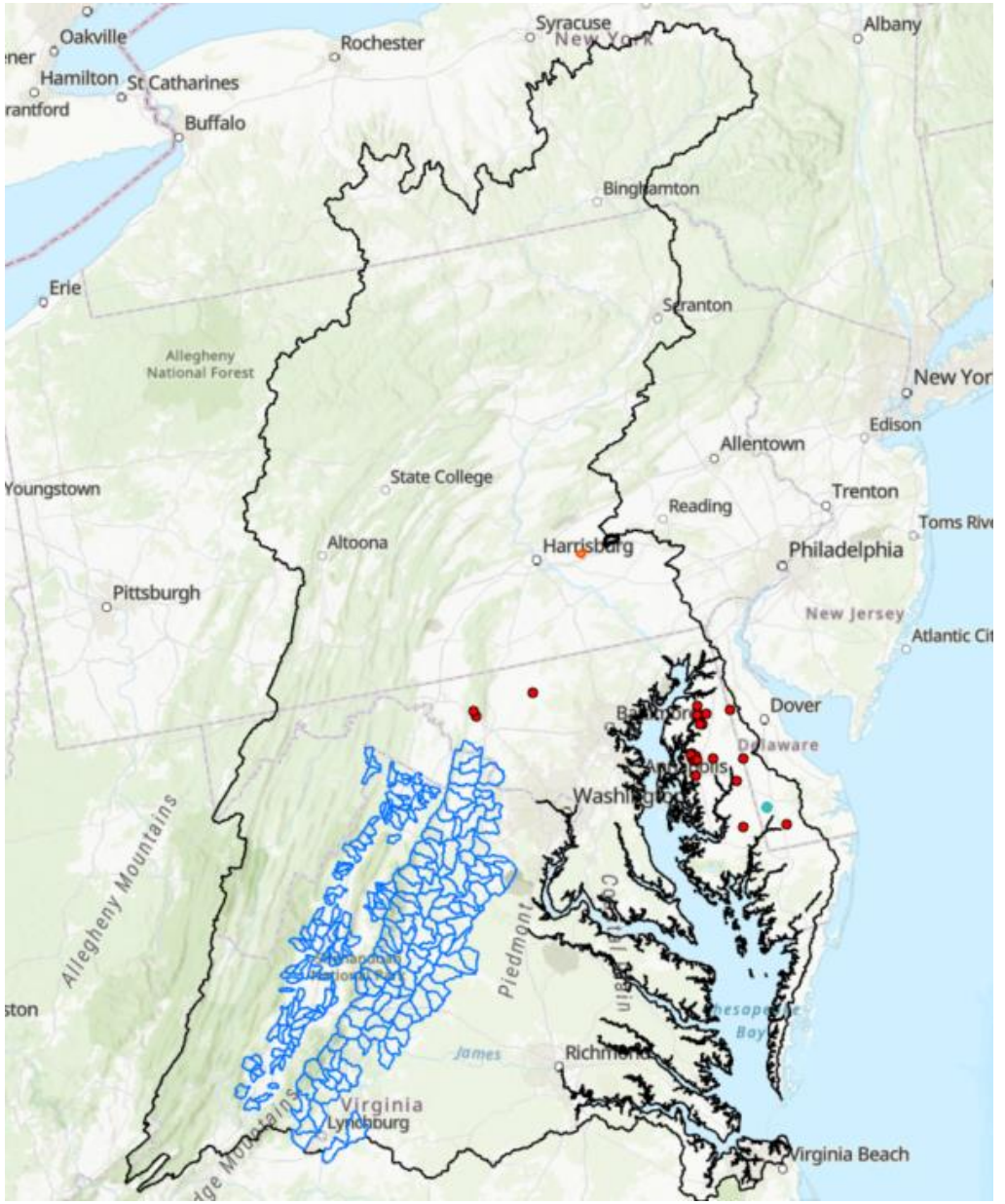
USGS science for a changing world

So, where are we?

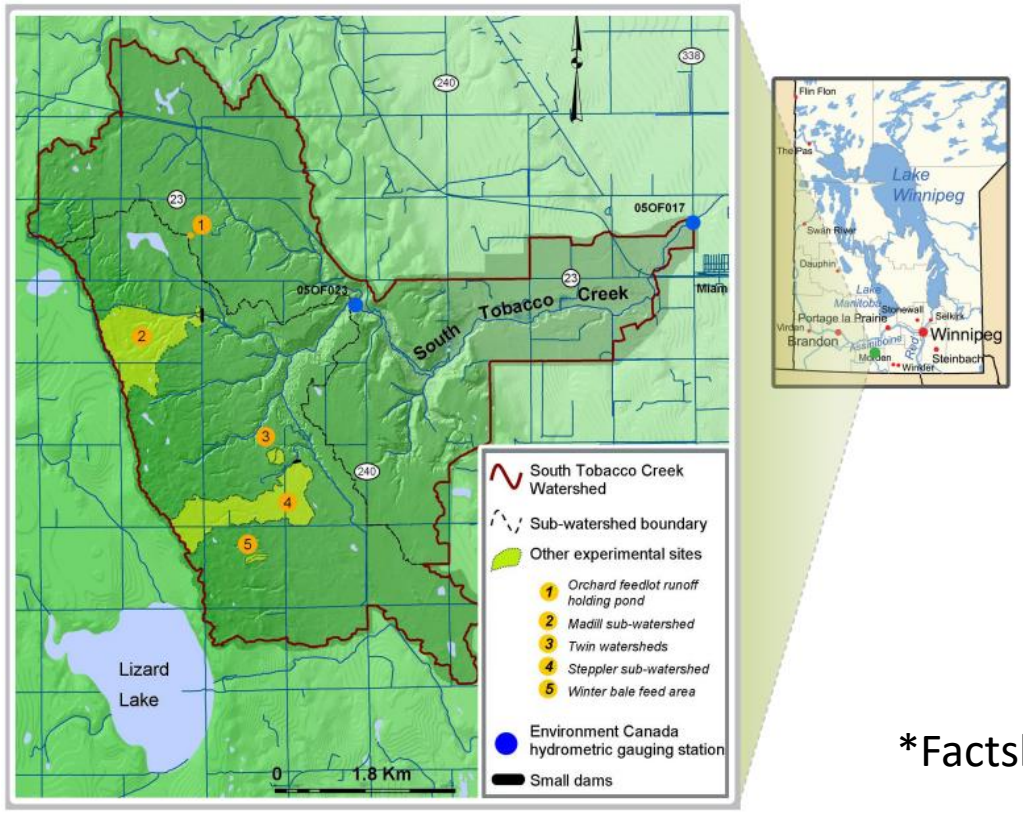


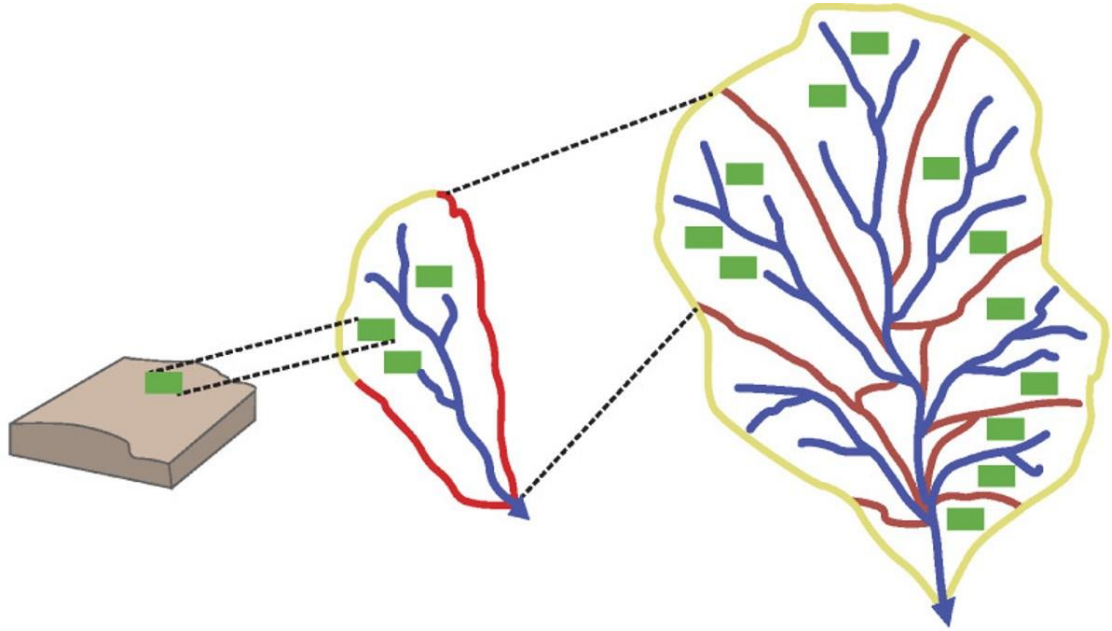
Site selection is complicated





Scale – Observing a Large Mix of Practices or Limited to One or Two?





*Factsheets available at http://www.agr.gc.ca/eng/?id=1297269073820

From: Evaluation of Beneficial Management Practices (BMPs)South Tobacco Creek Watershed
https://publications.gc.ca/collections/collection_2016/aac-aafc/A15-10313-2014-eng.pdf

Making Science Work For You:

How to strengthen the connection between water-quality studies and agricultural conservation practices

Thank you for your participation!

What's Next?

We'll summarize and share the Mentimeter responses with all workshop attendees. You'll receive an email to provide additional feedback about this workshop.

Want to learn more?

Please reach out to our speakers or other workshop attendees to continue these conversations!

Look for announcements about future submersion series workshops!

Photos courtesy of Will Parson, Chesapeake Bay Program