

The Chesapeake Bay Watershed Data Dashboard



**Emily Trentacoste, PhD
Environmental Scientist**

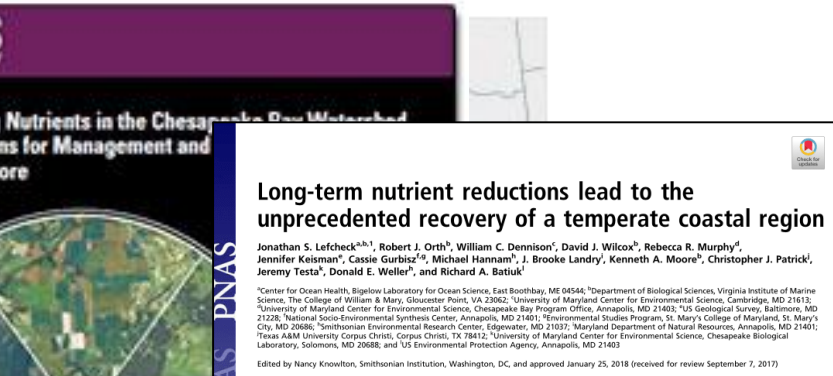
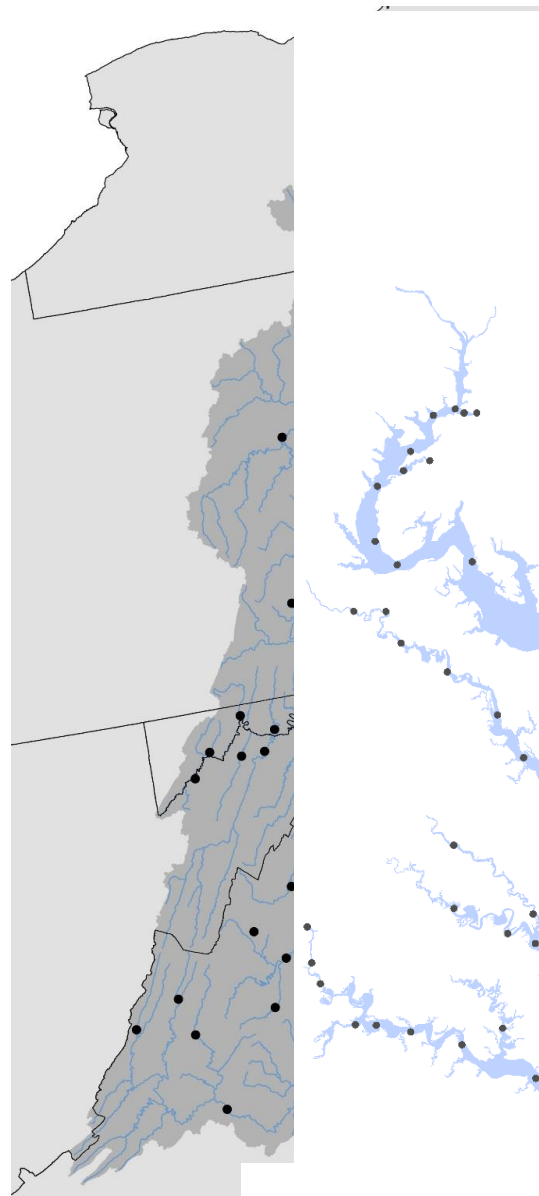
**US EPA Chesapeake Bay Program Office
Local Government Advisory Committee
6/5/2019**

What do 30 years of data look like?

Monitoring & Trends

Modeling & Tools

Research



Chesapeake Bay Dissolved Oxygen Criterion Attainment Deficit: Three Decades of Temporal and Spatial Patterns

Qian Zhang^{1*}, Peter J. Tango², Rebecca R. Murphy³, Melinda K. Forsyth⁴, Richard Tian⁵, Jennifer Keisman⁶, and Emily M. Trentacoste⁷

OPEN ACCESS

Edited by: Jacob Carstensen, Aarhus University, Denmark

Reviewed by: Jens Krøyer, Aarhus University, Denmark; Mikko Väänänen, Åbo Akademi University, Finland

***Correspondence:** Qian Zhang, qzhang@chesapeakebay.net

Specialty section: This article was submitted to Marine Ecosystem Ecology, a section of the journal Frontiers in Marine Science

Received: 30 July 2018
Accepted: 23 October 2018
Published: 21 November 2018

Citation: Zhang Q, Tango PJ, Murphy RR, Forsyth MK, Tian R, Keisman J and Trentacoste EM (2018) Chesapeake Bay Dissolved Oxygen Criterion Attainment Deficit: Three Decades of Temporal and Spatial Patterns. Front. Mar. Sci. 5:422. doi: 10.3389/fmars.2018.00422

Low dissolved oxygen (DO) conditions are a recurring issue in waters of Chesapeake Bay, with detrimental effects on aquatic living resources. The Chesapeake Bay Program partnership has developed criteria guidance supporting the definition of state water quality standards and associated assessment procedures for DO and other parameters, which provides a binary classification of attainment or impairment. Evaluating time series of these two outcomes alone, however, provides limited information on water quality change over time or space. Here we introduce an extension of the existing Chesapeake Bay water quality criterion assessment framework to quantify the amount of impairment shown by space-time exceedance of DO criterion ("attainment deficit") for a specific tidal management unit (i.e., segment). We demonstrate the usefulness of this extended framework by applying it to Bay segments for each 3-year assessment period between 1985 and 2016. In general, the attainment deficit for the most recent period assessed (i.e., 2014–2016) is considerably worse for deep channel (DC; n = 10) segments than open water (OW; n = 32) and deep water (DW; n = 19) segments. Most subgroups – classified by designated uses, salinity zones, or tidal systems – show better (or similar) attainment status in 2014–2016 than their initial status (1985–1987). Some significant temporal trends (p < 0.1) were detected, presenting evidence on the recovery for portions of Chesapeake Bay with respect to DO criterion attainment. Significant, improving trends were observed in seven OW segments, four DW segments, and one DC segment over the 30 3-year assessment periods (1985–2016). Likewise, significant, improving trends were observed in 15 OW, five DW, and four DC segments over the recent 15 assessment periods (2000–2016). Subgroups showed mixed trends, with the Patuxent, Nantuxent, and Choptank Rivers experiencing significant, improving short-term (2000–2016) trends while Elizabeth experiencing a significant, degrading short-term trend. The general lack of significantly improving trends across the Bay

including nutrient pollution, are causing the degradation of coastal habitats, and efforts to restore ecosystems have been largely unsuccessful. We provide an example of successful management of nutrients to the Bay of submersed aquatic vegetation along meters of coastline in Chesapeake Bay, United States that biodiversity conservation can be an aid recovery of coastal systems. Our study provides an environmental policy and provides a road logical restoration.

Keywords: Chesapeake Bay, dissolved oxygen, criterion attainment deficit, temporal and spatial patterns, monitoring, trends

† Should be addressed: Emily M. Trentacoste, etrentacoste@umces.edu

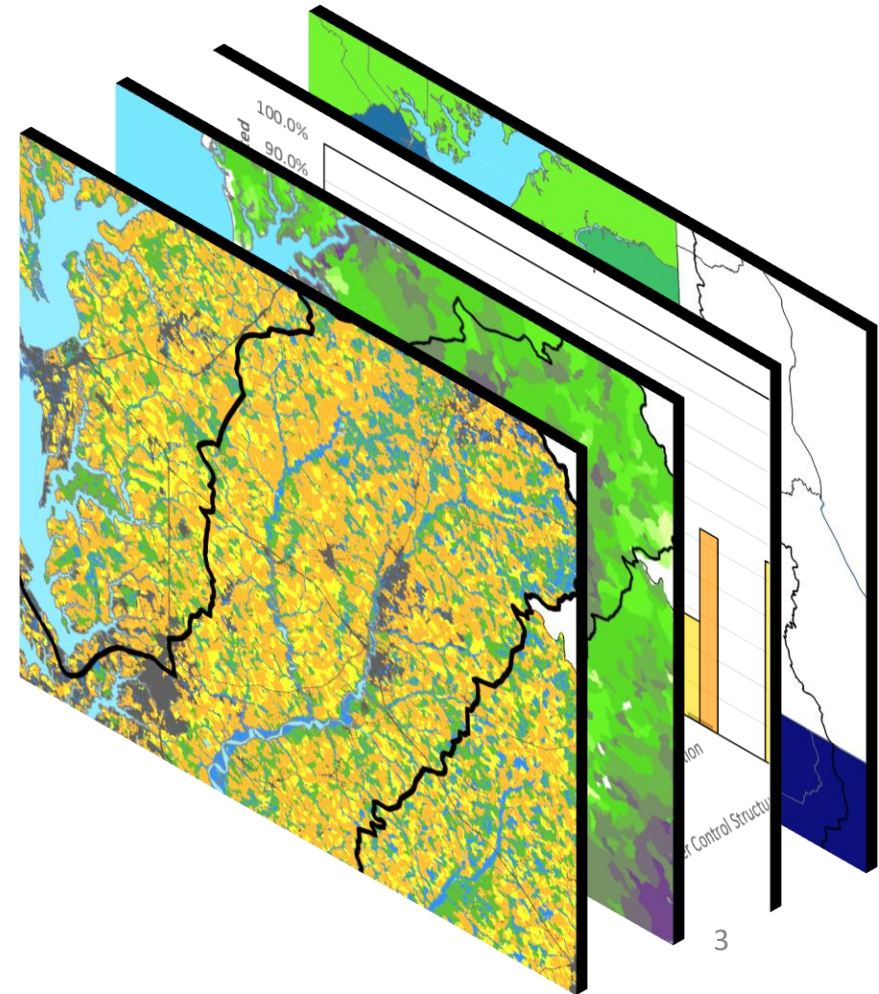
†† Information on this article can be found in the journal Frontiers in Marine Science.

Frontiers in Marine Science | www.frontiersin.org | November 2018 | Volume 5 | Article 422

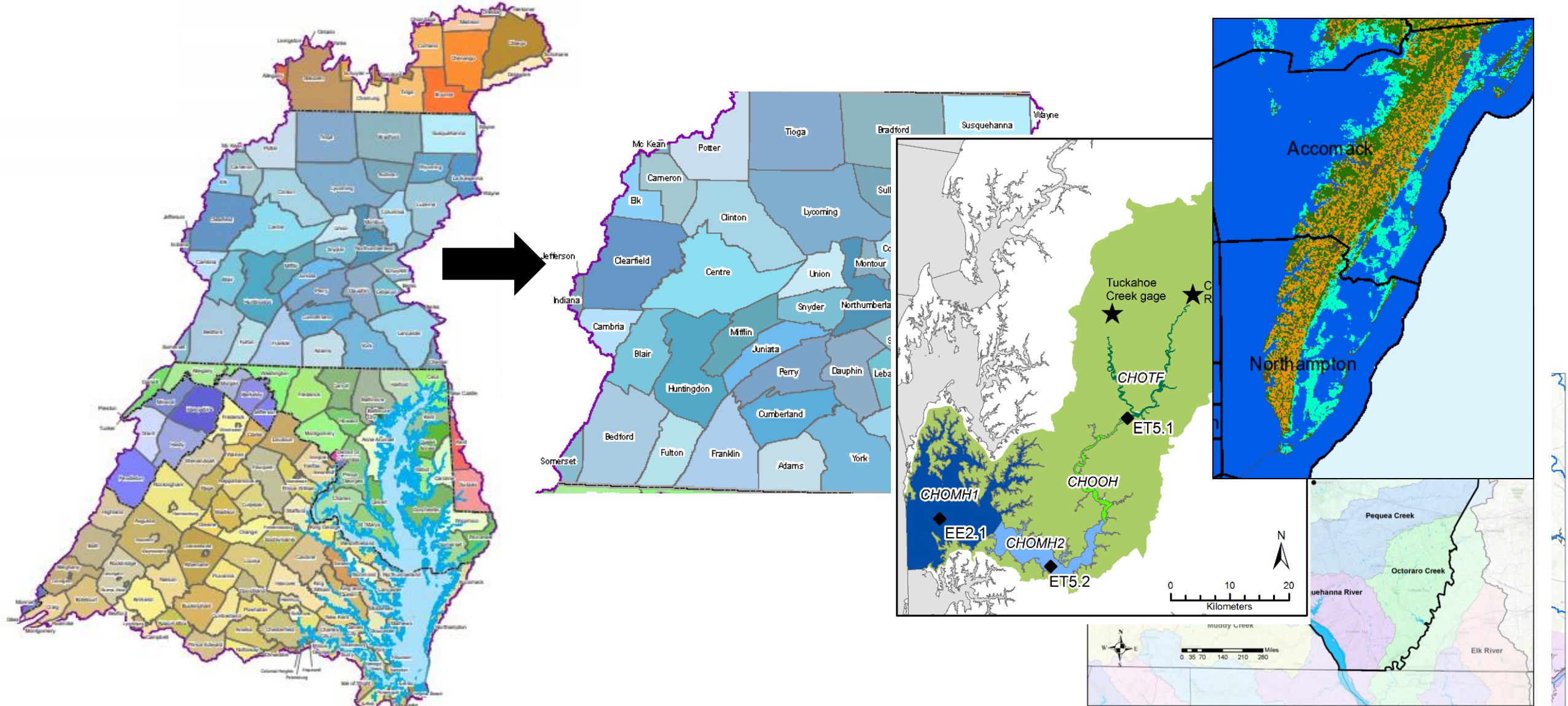
Understanding management implications

The challenge: new data & new expectations for managers

- Assess what's been working and what hasn't
- Develop “local area goals” at finer resolution
- Target/focus restoration efforts
- Plan for urban growth and climate change
- Co-benefits of nutrient and sediment reduction



Telling local stories to demonstrate utility of data

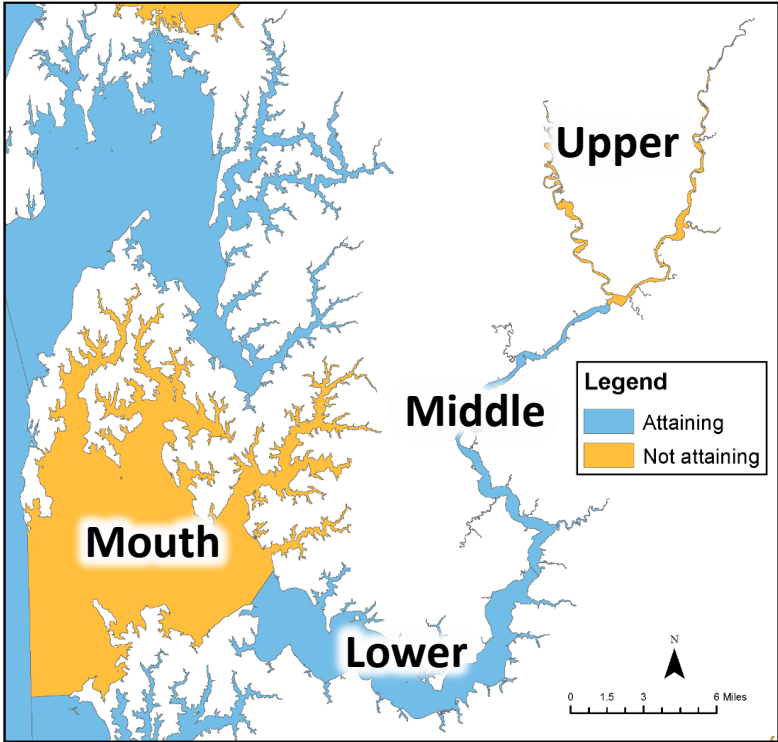


Telling a local story

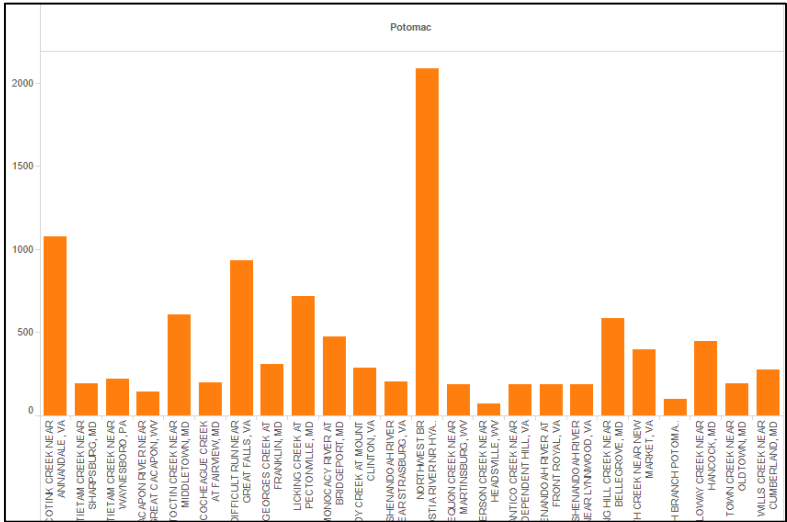
Local water quality

- What's happening with local water quality in my area?
- What's the status?
- What are the trends?

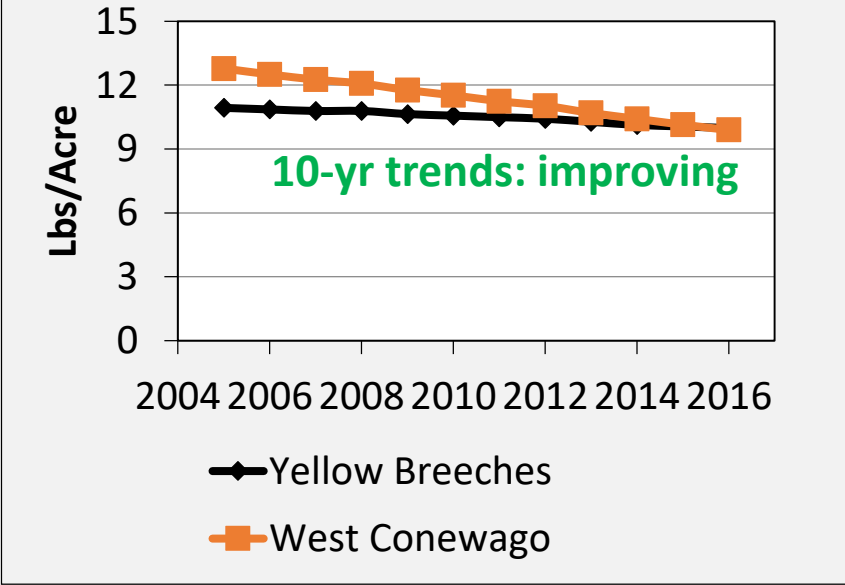
Choptank River water quality standards



Sediment monitoring in Potomac River basin (pounds per acre)



York County nitrogen trends

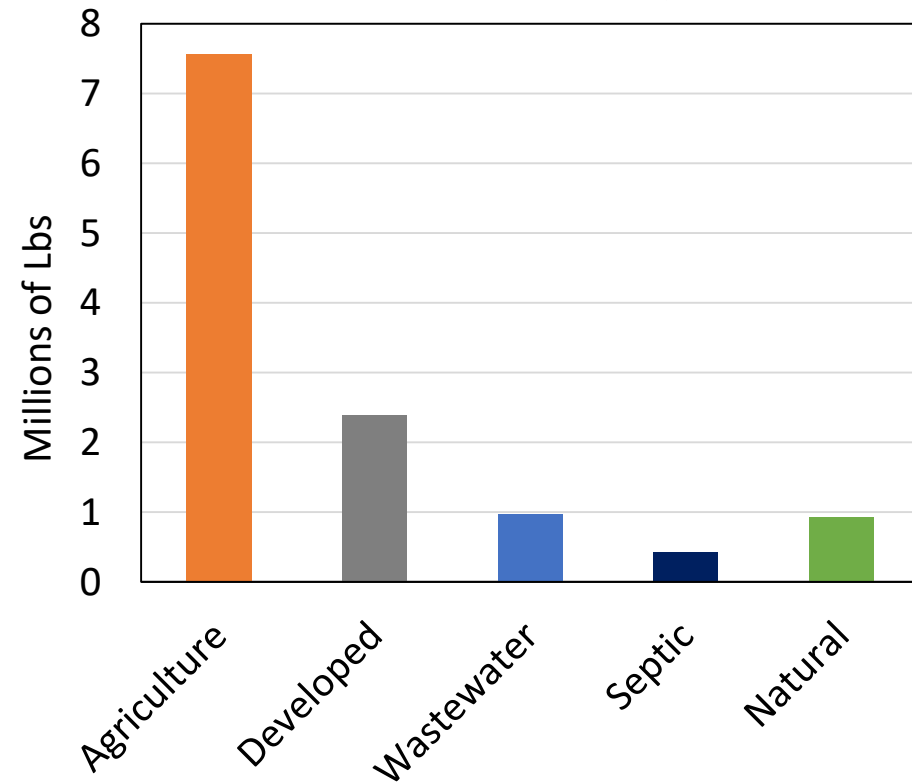


Telling a local story

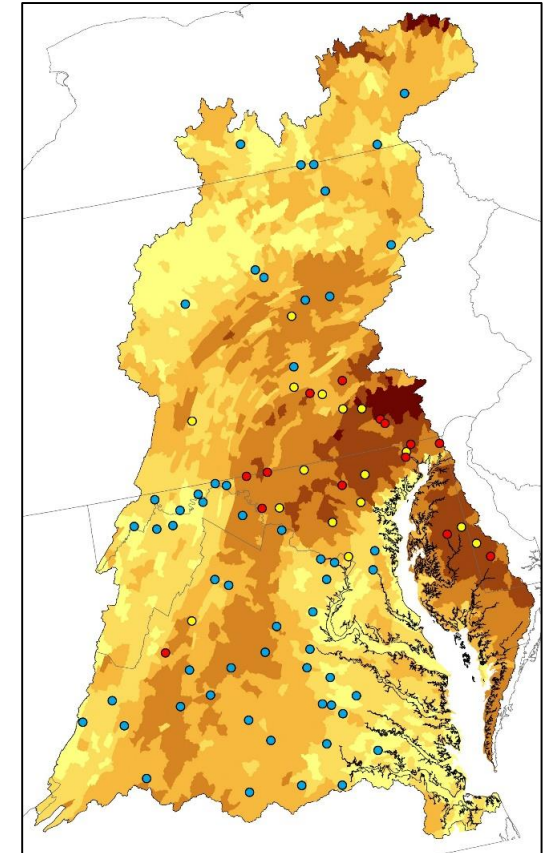
Sources and drivers behind local water quality

- Where does pollution come from?
- Where geographically?
- How is pollution making it to streams? Nitrate from groundwater delivered to streams

York County Nitrogen Delivered to Local Streams (2017 Progress)



High resolution land cover

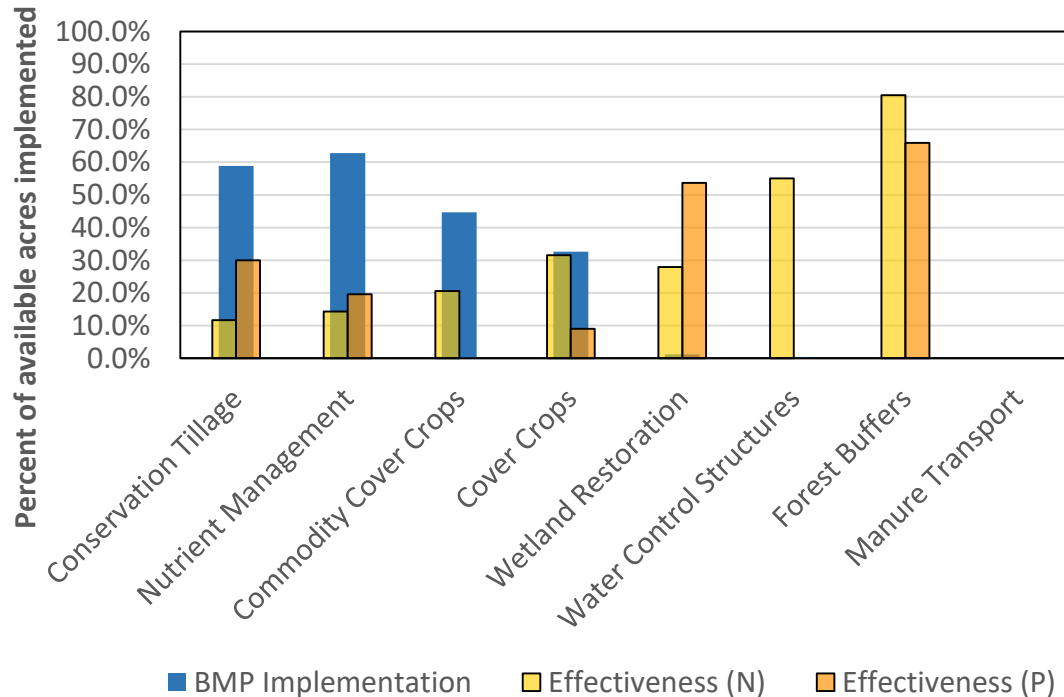


Telling a local story

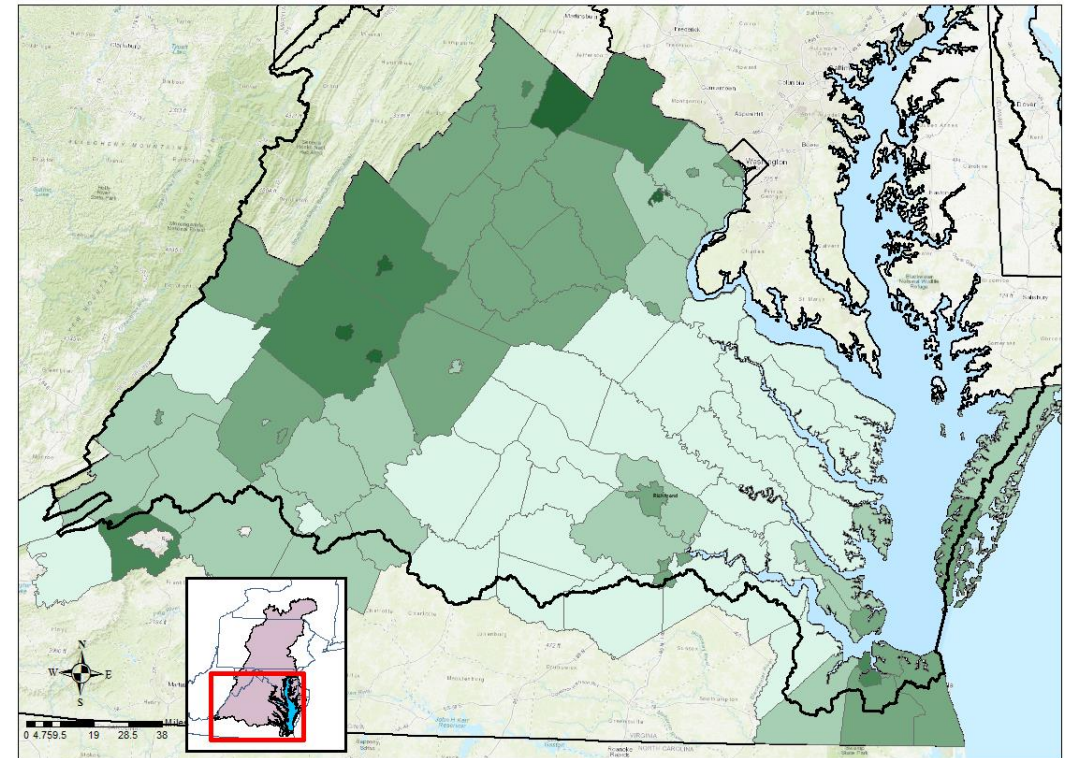
Opportunities for restoration efforts

- What practices address the sources and drivers?
- What are the most effective and cost-effective practices?
- What practices have we been implementing?
- Where do opportunities exist moving forward?

2016 Reported Agricultural Conservation Practice Implementation in the Choptank Watershed



Acres available for buffer implementation by county

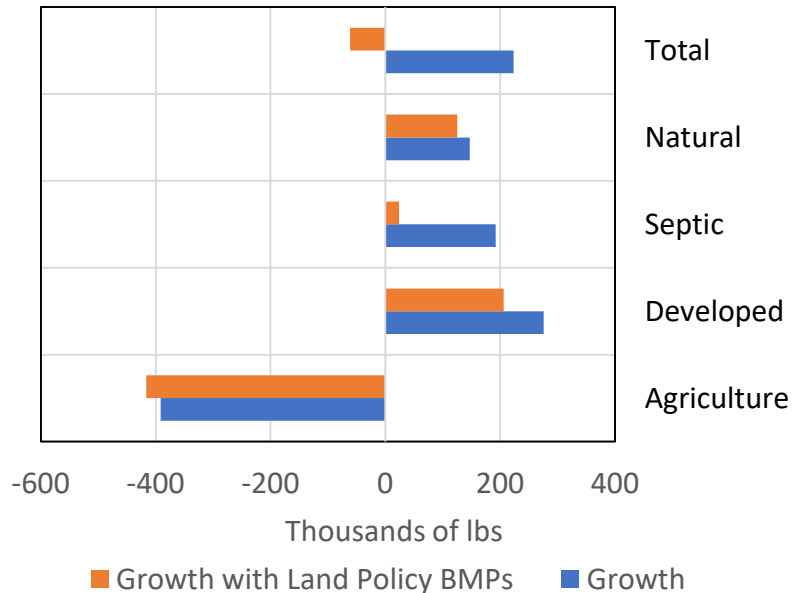


Telling a local story

Planning for future change

- Where are growth and development going to occur?
- What impacts may climate change have and where?
- How can we conserve lands or grow smartly?

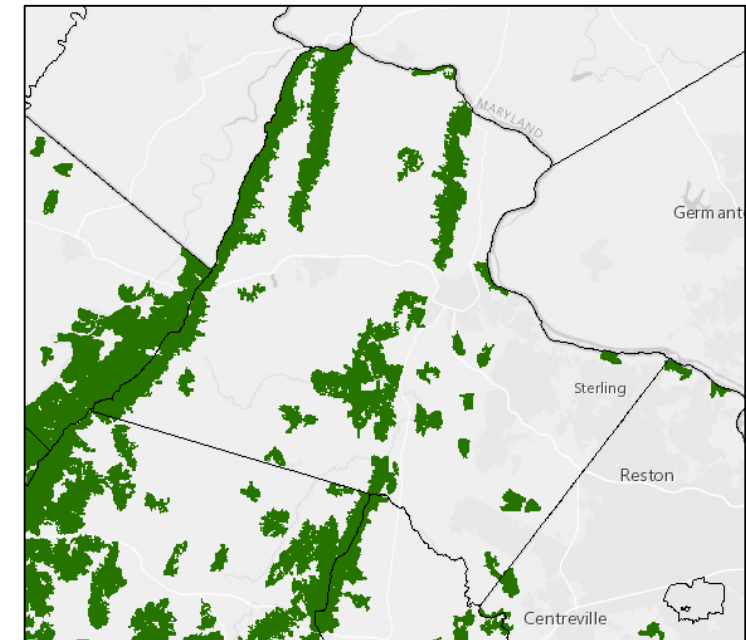
Virginia estimated change in nitrogen load 2018-2025



Lands impacted by 1 meter sea level rise in Virginia



Large forest tracts available for conservation in Loudoun County, VA



Making data accessible, understandable & usable

Chesapeake Bay Watershed Data Dashboard



- Start Here!
- Rivers & Streams
- Tidal Waters
- Targeting Restoration
- Management Practices
- Planning for Change

Get started here...

Understanding Sources

[Click here to open the tool separately in its own window.](#)

This section provides information on land use of nutrients and sediment entering water bodies in geographic areas as estimated by the 2 Chesapeake Bay Watershed Model.



Watersheds with more developed, agricultural, and urban land tend to have higher nutrients and sediment levels in streams than more natural or forested watersheds.



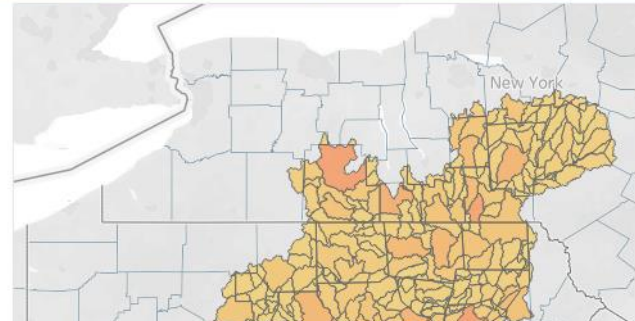
Watersheds with high amounts of nutrients and sediment, especially relative to their size, are some of the most effective places to focus restoration efforts.



Tailoring restoration efforts to focus on an area's specific nutrient and sediment sources is an effective way to target implementation.

Nutrient Application Management

Wastewater Treatment Plants



Breakdown of Land Use



Tidal Segment
(All)

River
(All)

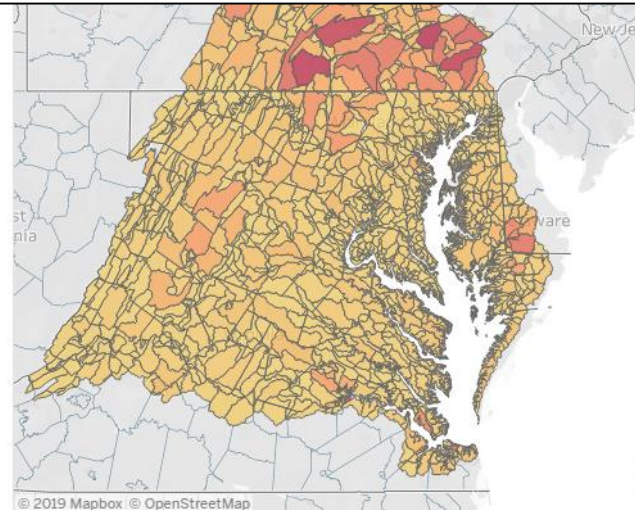
Major River Basin
(All)

County Name
(All)

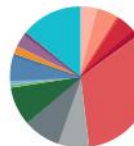
State
(All)

Load Source Minor
(All)

Chesapeake Bay Watershed Data Dashboard

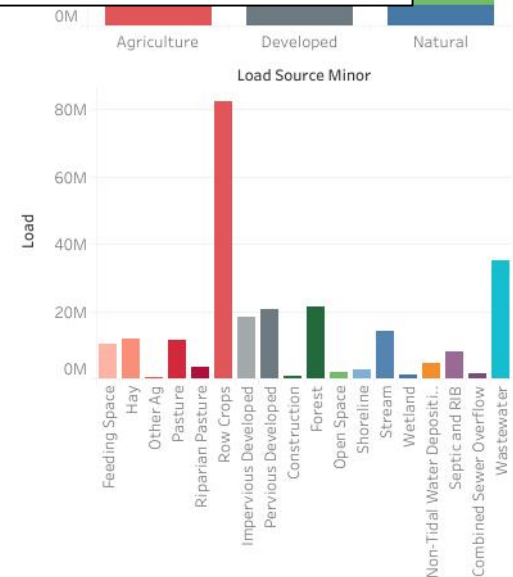


Breakdown of Loads



Total Load: 249,782,870

- Load Source Minor
- Feeding Space
 - Hay
 - Other Ag
 - Pasture
 - Riparian Pasture
 - Row Crops
 - Impervious Dev..
 - Pervious Devel..
 - Construction
 - Forest
 - Open Space
 - Shoreline
 - Stream
 - Wetland
 - Non-Tidal Wate..
 - Septic and RIB
 - Combined Sew..
 - Wastewater



NPS
☒ Nitrogen
☐ Phosphorous
☐ Sediment

EOTS
Delivered to the Bay

Agency
(All)



Thank you!
Emily Trentacoste
trentacoste.Emily@epa.gov

