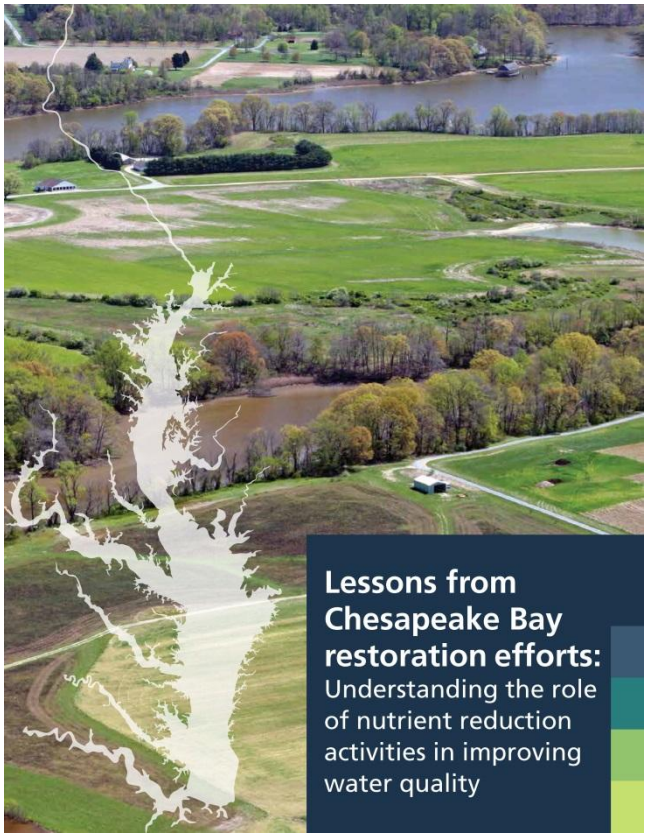

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Chesapeake Bay Program
Science. Restoration. Partnership.

What's New?

Christina Lyerly
University of Maryland Center for Environmental Science

Tidal Monitoring and Analysis Workgroup Meeting
November 13, 2013

Authors: Christina M. Lyerly, Ana L. Hernández Cordero, Katherine L. Foreman and William C. Dennison

Not the Lessons!

- What works
  1. Wastewater treatment plant upgrades
  2. Reductions of point source NO_x emissions and atmospheric N deposition
  3. Multiple agricultural practices
- Challenges
  4. Lag times
  5. Changes in nutrient sources and land-use practices
- What we need
  6. Identification of all nutrient sources and targeted BMPs
  7. Stormwater management

The Report Has Expanded

- More than 40 case studies reviewed
- 41 pages + over 80 references
- Presented at the Coastal and Estuarine Research Federation conference (November 5th)
- Accepted as a poster presentation at the December 2013 Maryland Water Monitoring Council conference
- Scheduled for release January 2014

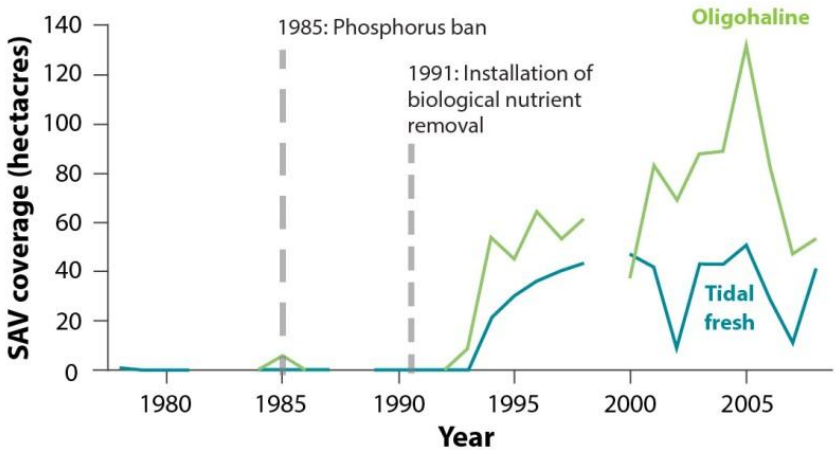
General Changes

- Revised language
  - This resulted in _____ → This contributed to or led to _____
  - X is _____ → X may be as much as _____
- Copy-editing
- Incorporation of most rewording suggestions
- Addition of a glossary

Upper Patuxent River

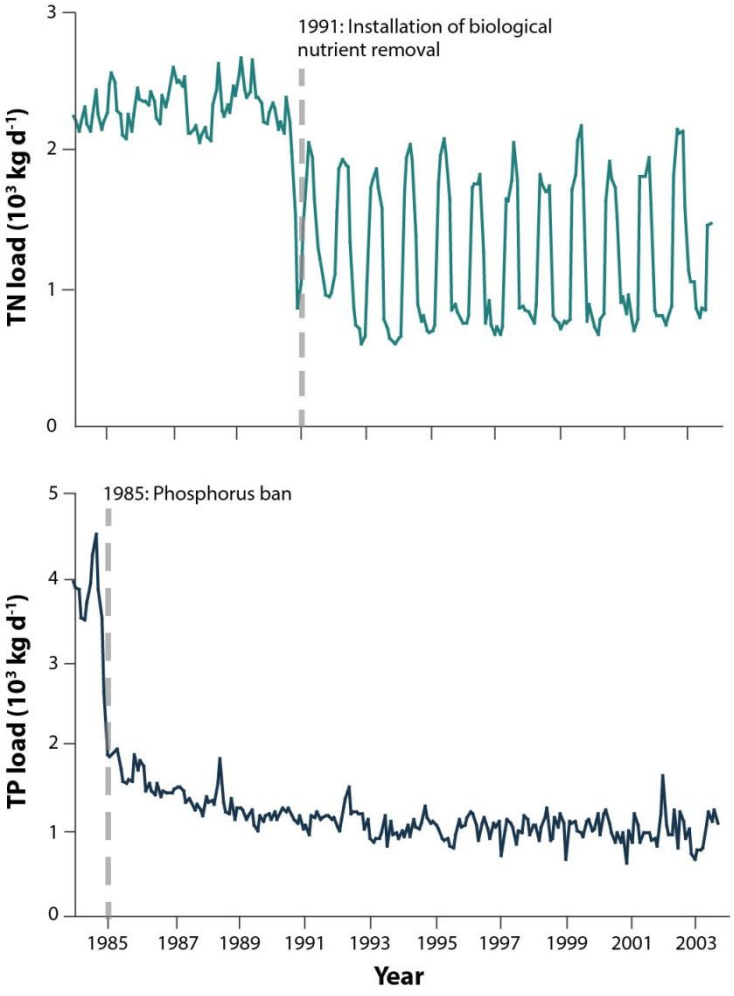
- Decreased nitrogen—not phosphorus—loads are what did the trick

Changes in submerged aquatic vegetation (SAV) (1978–2008)



Data from Boynton et al., 2008

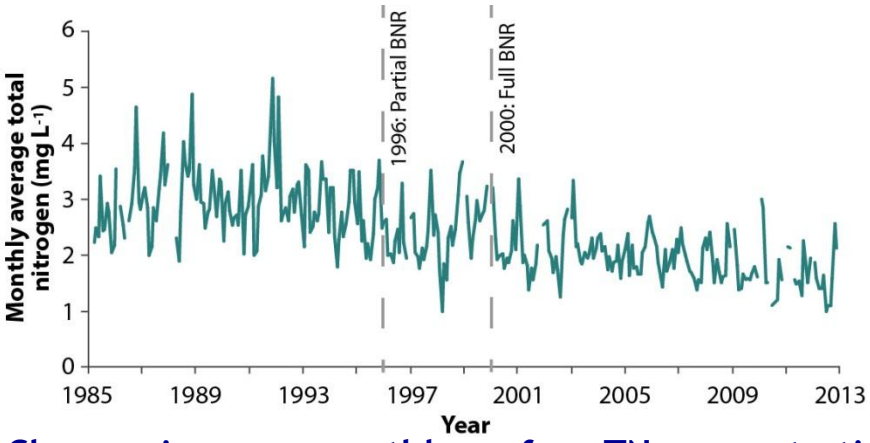
Changes in TN and TP loads (1984–2004)



Data from Testa et al., 2008

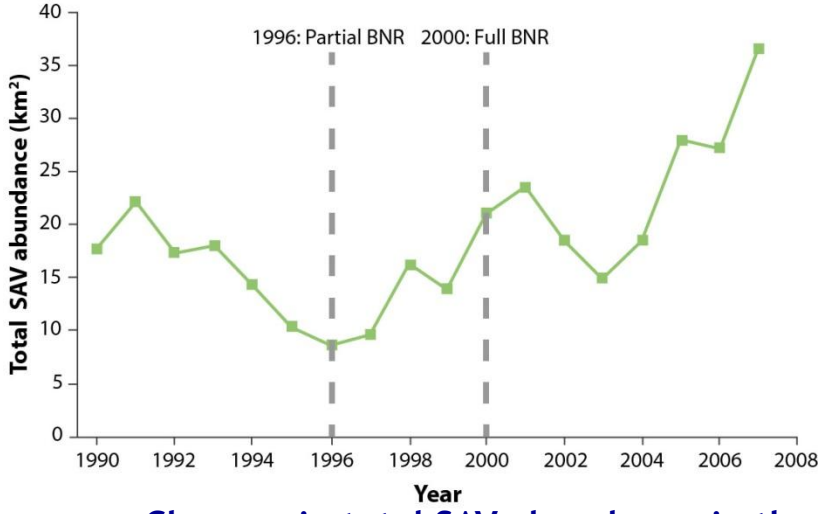
Upper Potomac River

- Piscataway Creek data added
- SAV abundance data added
- And… we captured the seasonal variation in the importance of WWTP loads vs. nonpoint sources



Changes in mean monthly surface TN concentrations at a monitoring station near Piscataway Creek (1985–2013)

Data from Romano and Buchanan, 2011

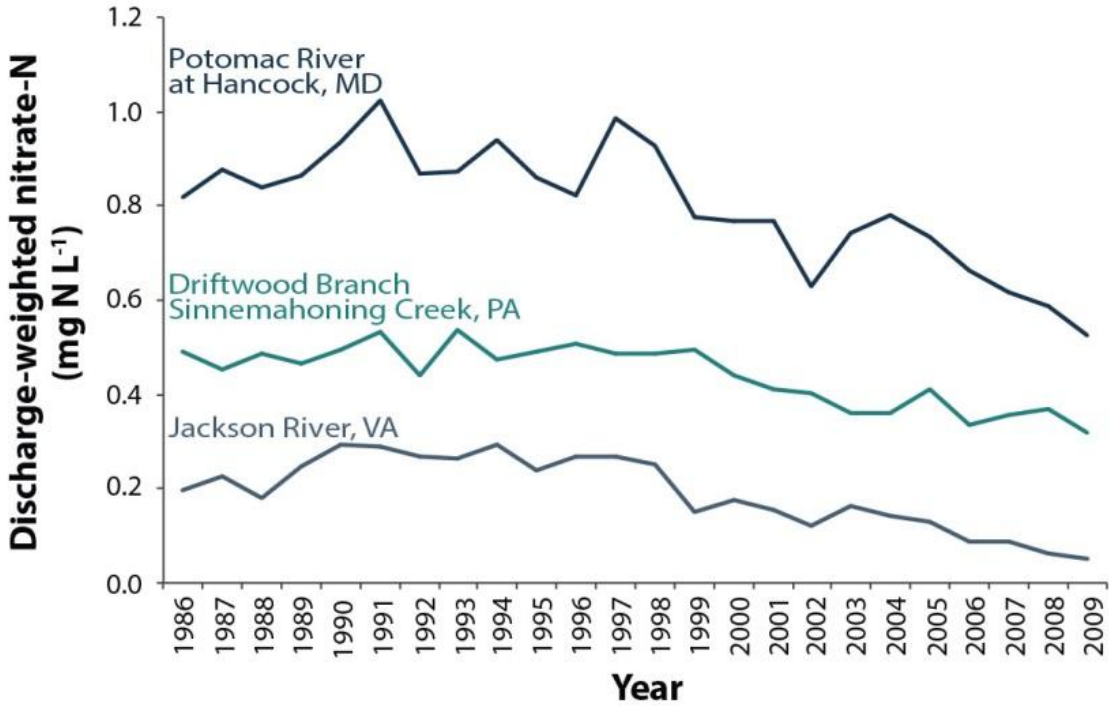


Changes in total SAV abundance in the Upper Potomac River (1990–2008)

Data from Ruhl and Rybicki, 2010

Point Source Air Emissions and Surface Water Quality

- Keith Eshleman et al. has been published!

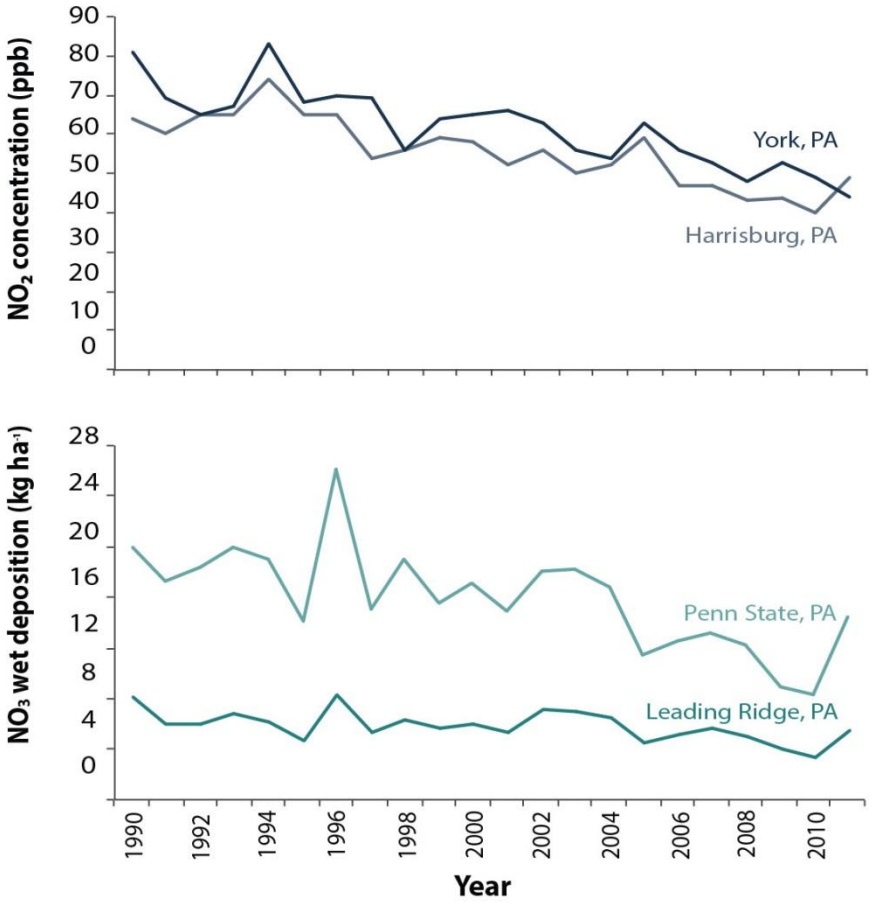


Changes in nitrate-N concentrations at 3 water quality monitoring stations (1986–2009)

Data from Eshleman et al., 2013

Data from the NADP and the U.S. EPA NO_2 Monitoring Program

- The sites have changed to those *in*—not just *near*—the Bay Watershed



Changes in NO_2 emissions (top) and wet atmospheric nitrate deposition (bottom) (1990-2011)

Animal Waste and Ammonia

- From one big long paragraph covering research on the waste of both poultry and cattle to →
- One case study focused on upgrades in poultry house ventilation systems and…
- One case study discussing recent research on cattle feed

Photo © jlastras

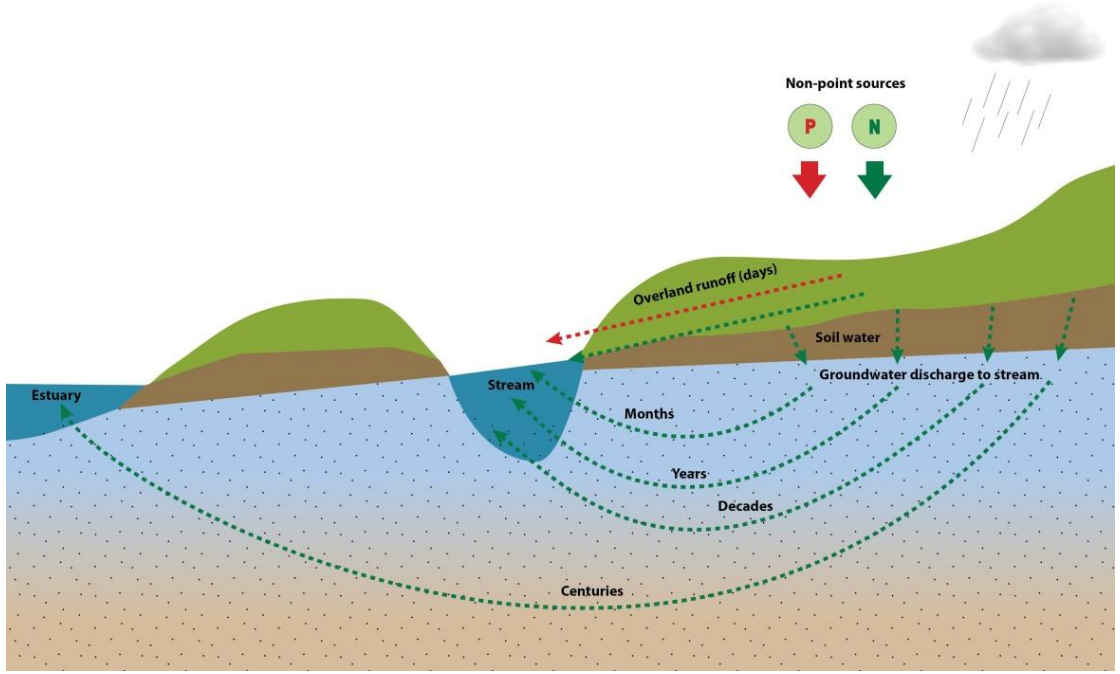
Rotational Grazing

- The jury is still out
- Lower observed groundwater nitrate concentrations than confined feeding farms but…
- Very high dissolved organic nitrogen concentrations

Photo © Jeff Vanuga, USDA NRCS

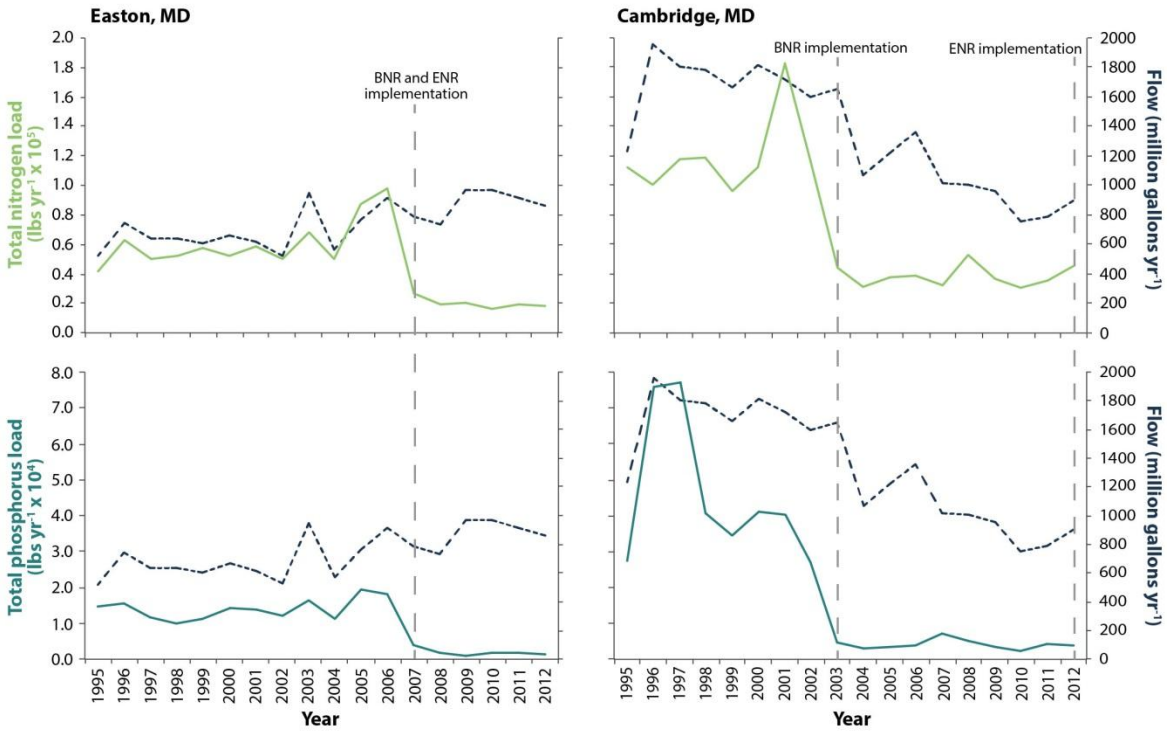
Lag Times

- Not much has changed
- Toned down some of the language—uncertainty exists
- Paragraphs restructured and edited for a clearer explanation



Choptank River

- Expanded the case study
- Added population growth and wastewater treatment plant upgrades



Changes in flow, TN and TP loads from the Easton and Cambridge wastewater treatment plants (1995-2012)

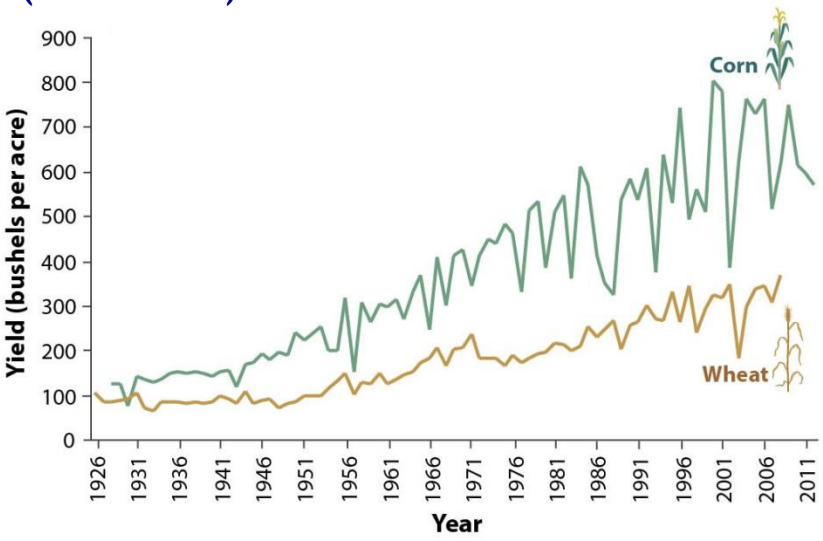
Data from Karrh, 2012

Choptank River cont….

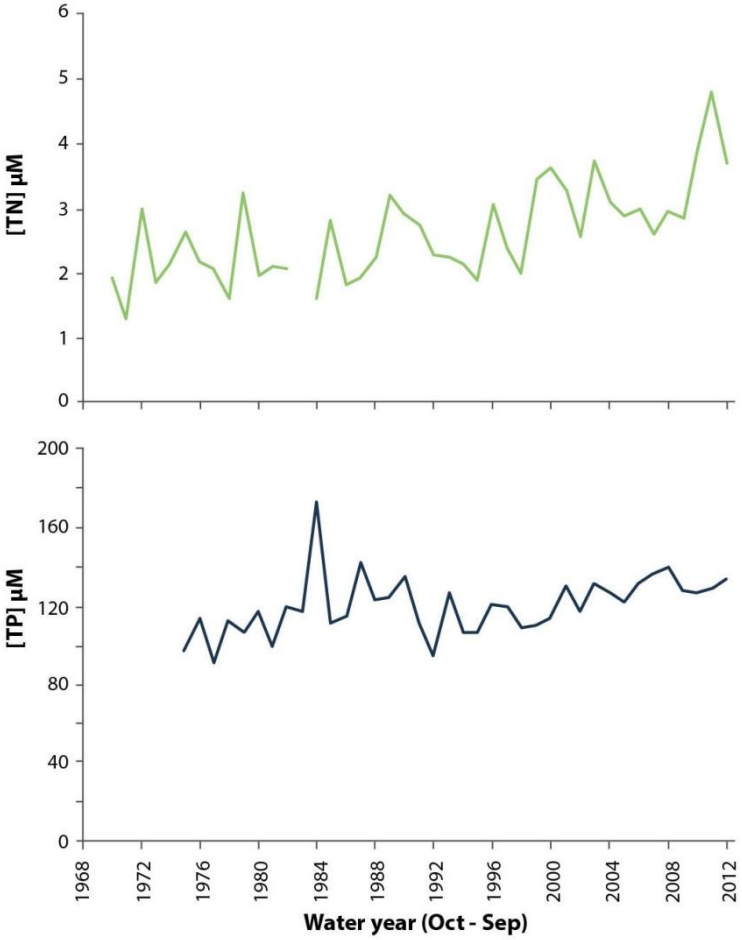
- We tracked down crop data

Increases in TN and TP at Greensboro water quality monitoring station (1968–2012)

Increases in wheat and corn yields in 5 counties near the Choptank River (1926–2011)



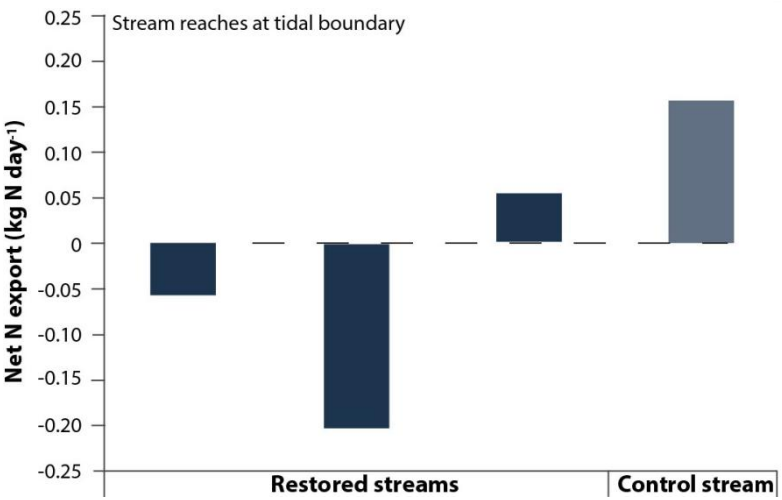
Data from the USDA National Agricultural Statistics Service

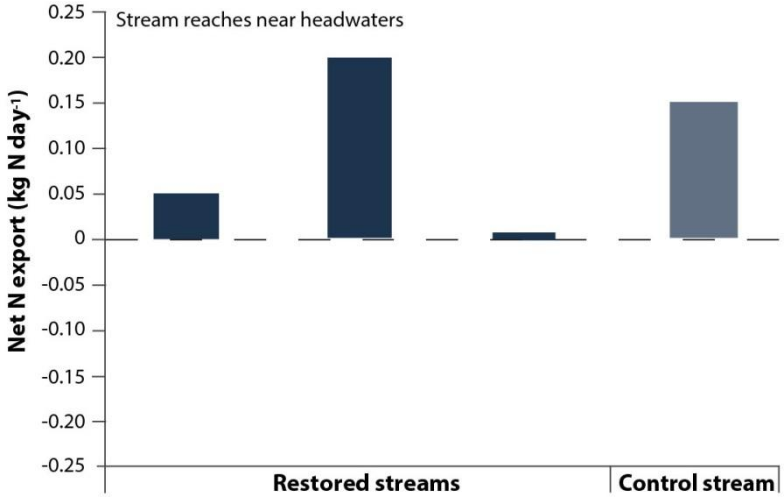


Data from Fisher, 2006

Anne Arundel County…Location Matters

- Clarified graphics and the case study





Tidal Boundary Streams: 2 out of 3 restored streams retained nitrogen…Partial success

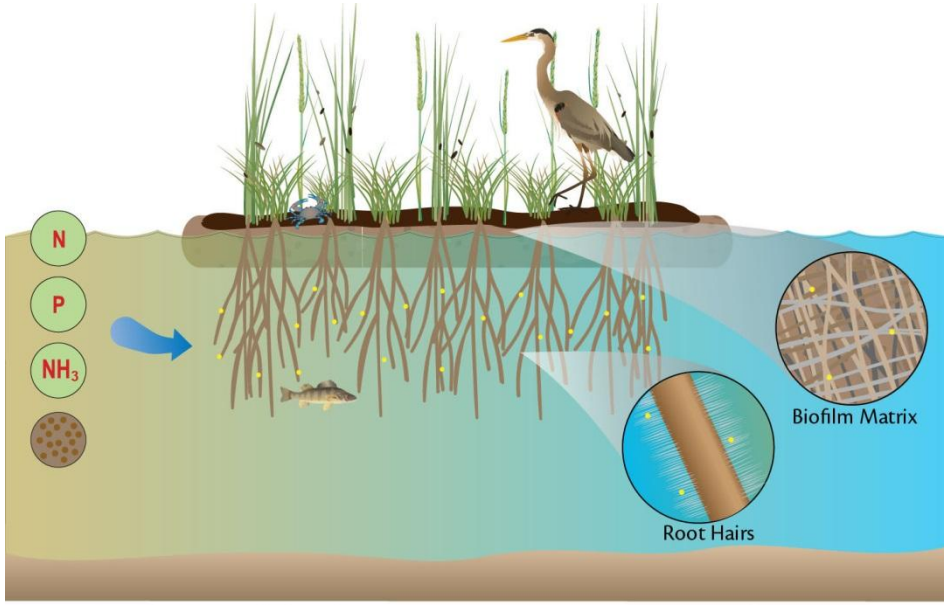
Headwaters Streams: 0 out of 3 restored streams retained nitrogen…No success

Positive Export Values = No Nitrogen Retention = Restored Streams Not Doing Their Jobs!

Data from Filoso and Palmer, 2009

Floating Wetlands

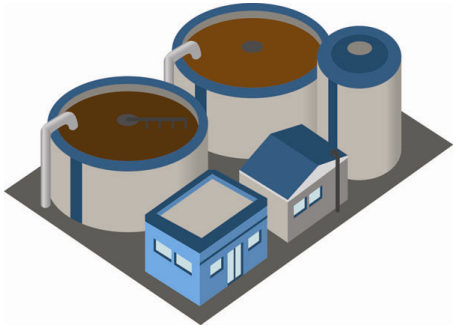
- We used more careful language
  - Floating wetlands are being given a try but…
  - We do not yet know if they will work on the necessary scale and in open systems

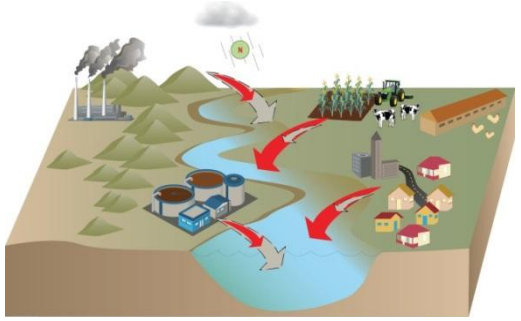


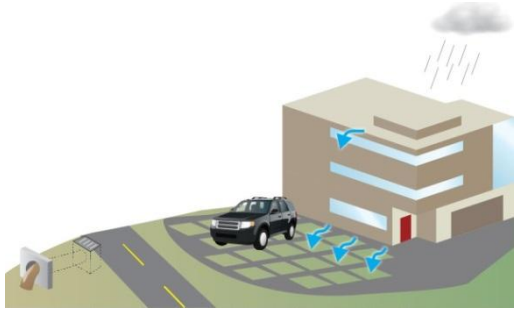
Floating wetlands are currently being studied to assess their potential to improve water quality

Conclusions vs. Recommendations…

1. What Works
   - The Clean Water Act works
   - The Clean Air Act works
   - Multiple practices that reduce agricultural nutrient loads work
2. Challenges
   - Delays in improvements necessitates patience, persistence and perspiration
   - We are not trying hard enough
3. What We Need
   - Location, location, location should guide restoration efforts
   - Innovative practices are needed to up our game







Thanks for Your Feedback!

Photo © Jane Thomas

clyerly@umces.edu