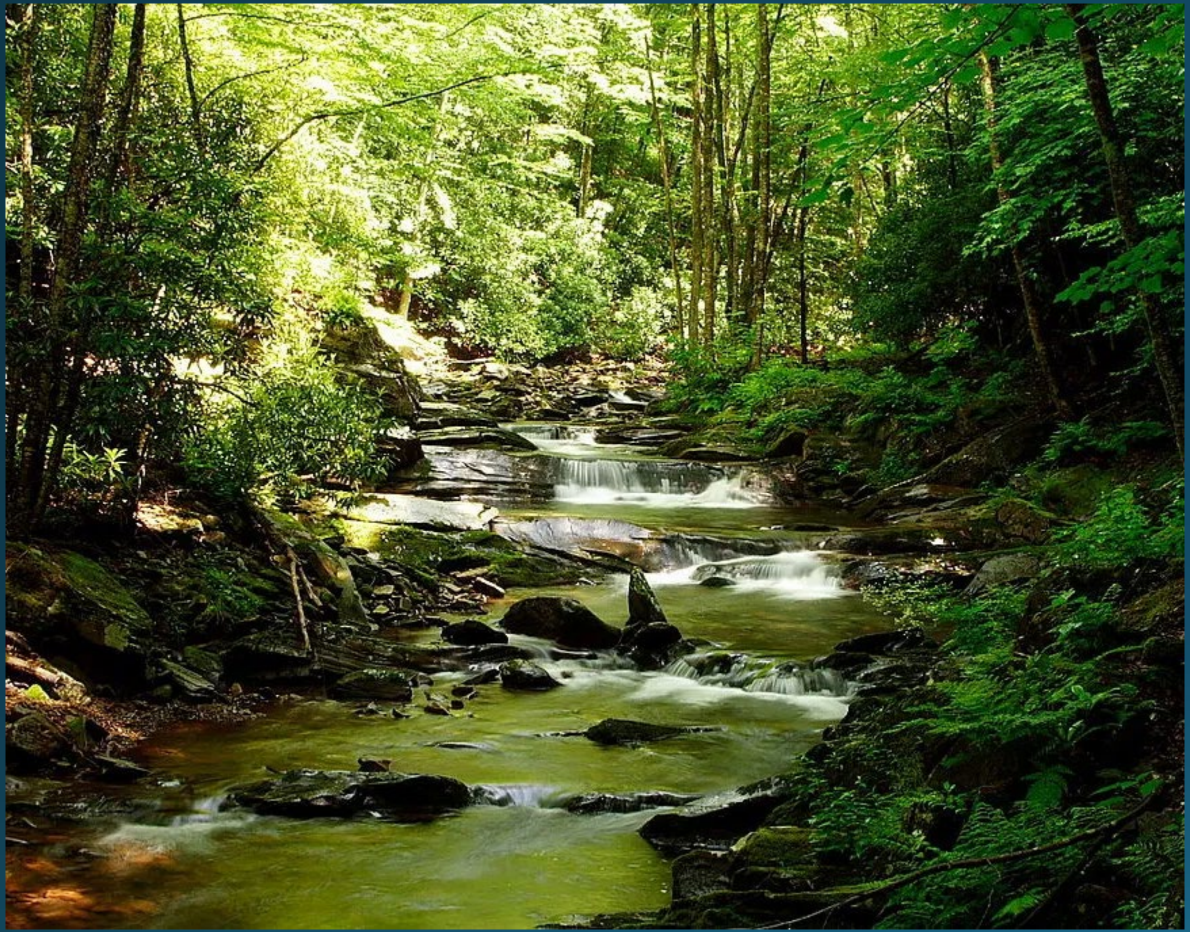
THE INSIDE (THE CHANNEL) STORY OF STREAM RESTORATION

Solange Filoso

Associate Research Professor

University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

Healthy stream



- Dynamic
- Complex
- Diverse

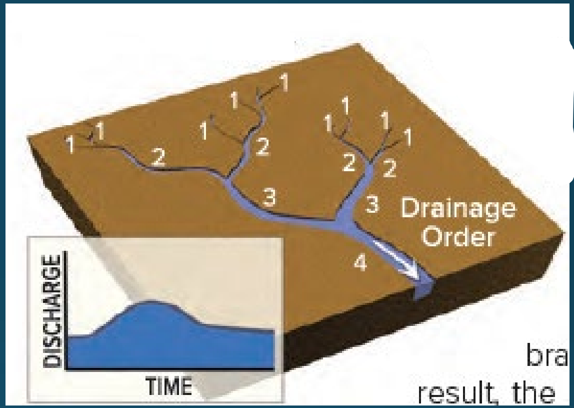
Degraded stream

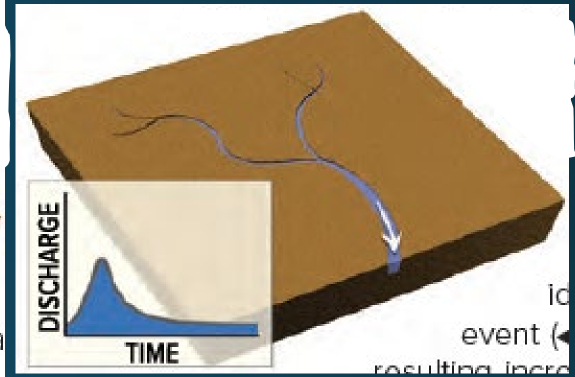
Photo by Sara Caldes

- Homogeneous
- Unstable
- Low biodiversity

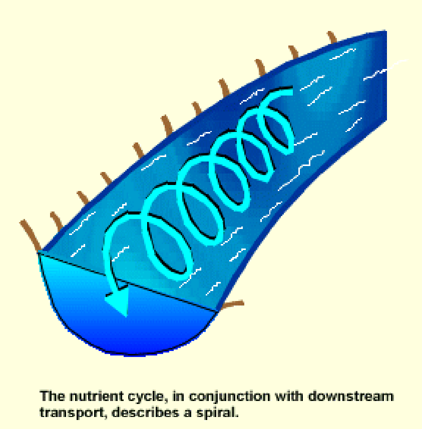
Degraded streams lose their capacity to maintain processes that support important functions

Flood control

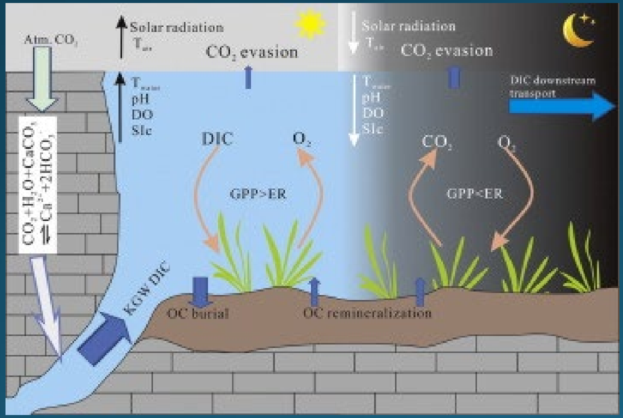


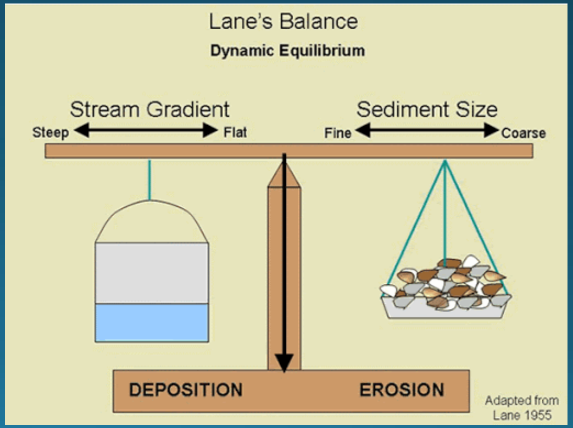


Nutrient cycling (retention & release)



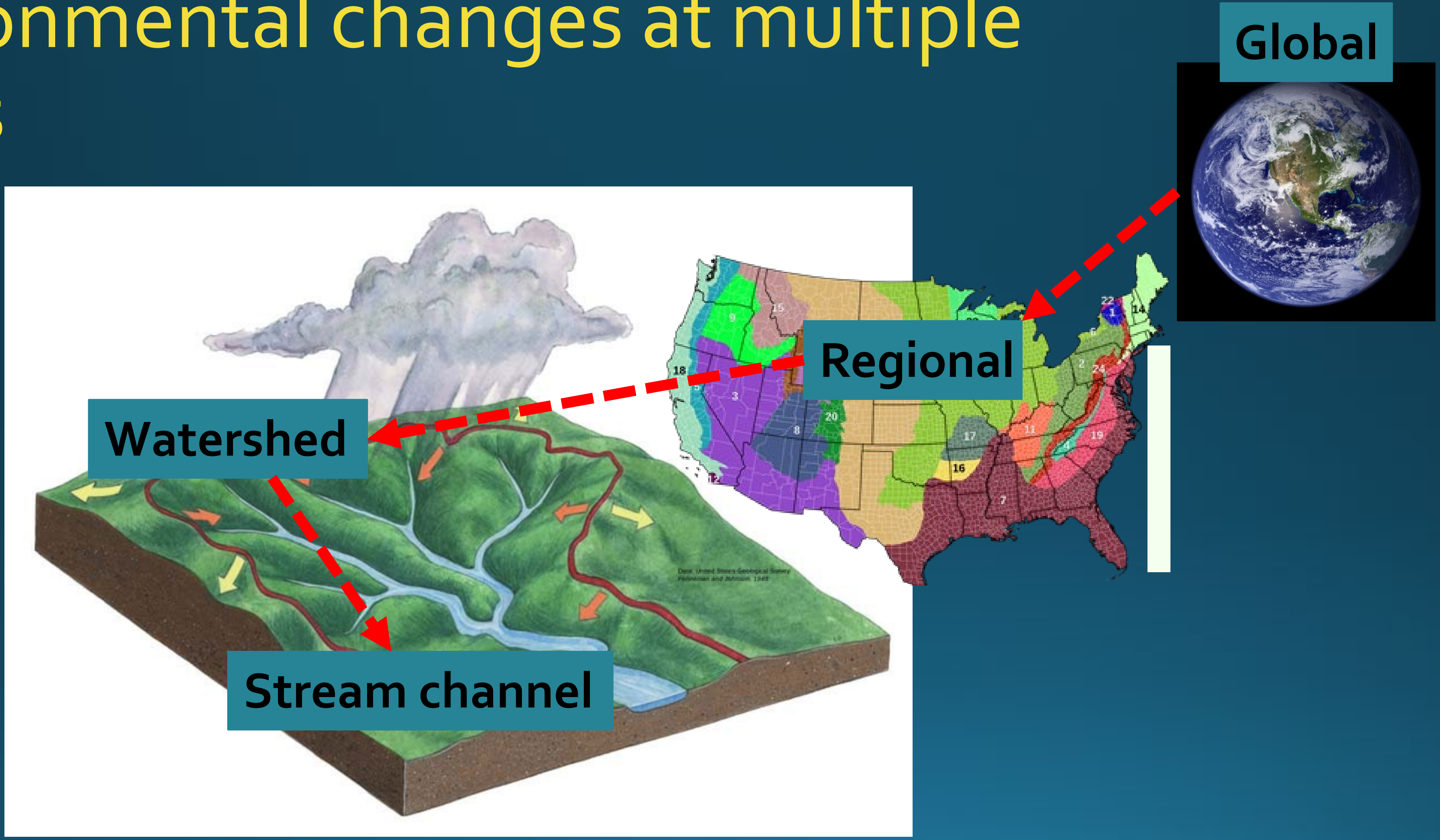
Primary production and respiration





Sediment dynamic

Streams and rivers are integrators of environmental changes at multiple scales



Ultimate stream restoration goal

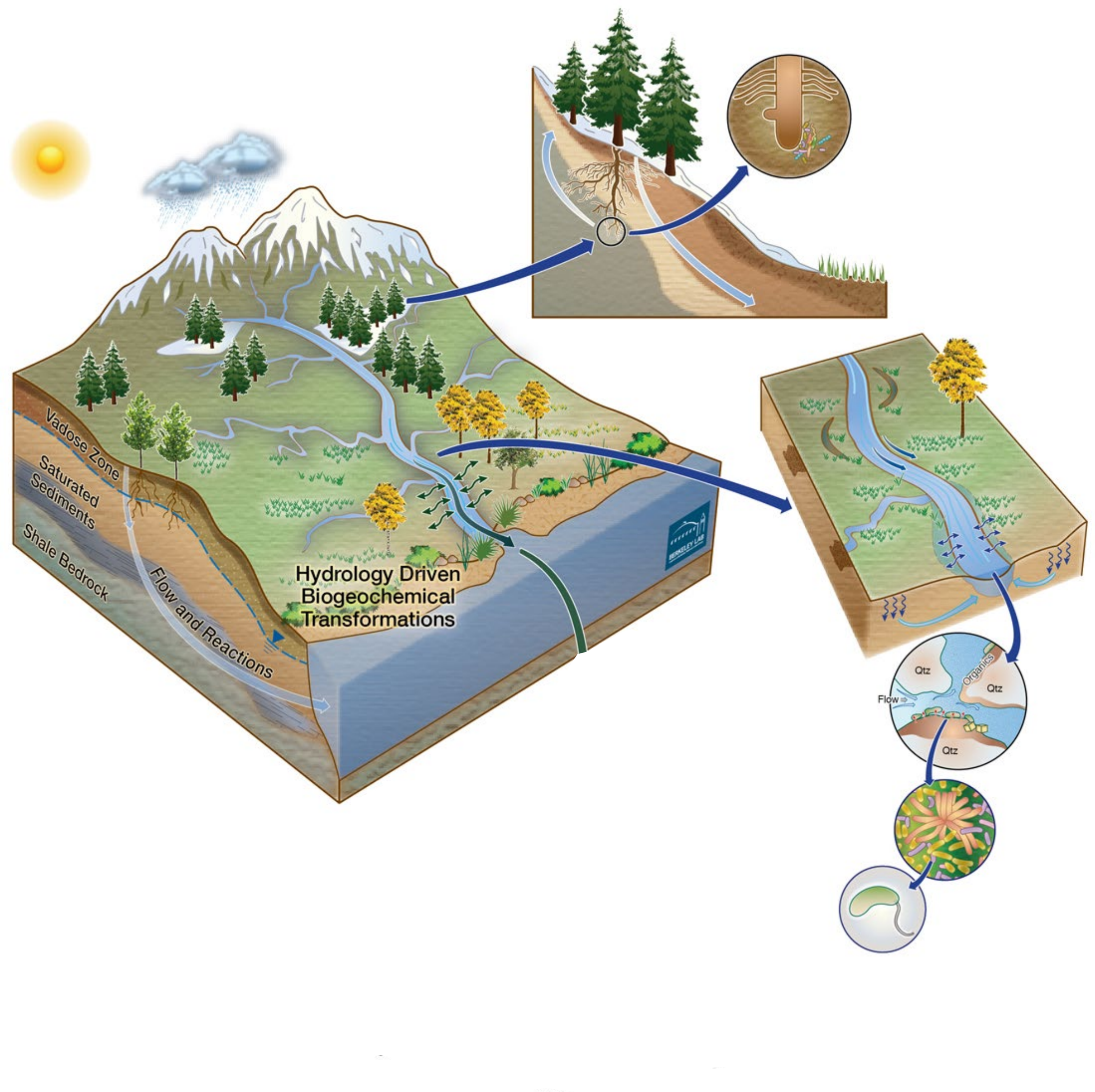
- To move a degraded ecosystem to a trajectory of recovery informed by a reference system while considering local and global environmental changes.

Gann et al. (2019) , Restoration Ecology.

BEFORE

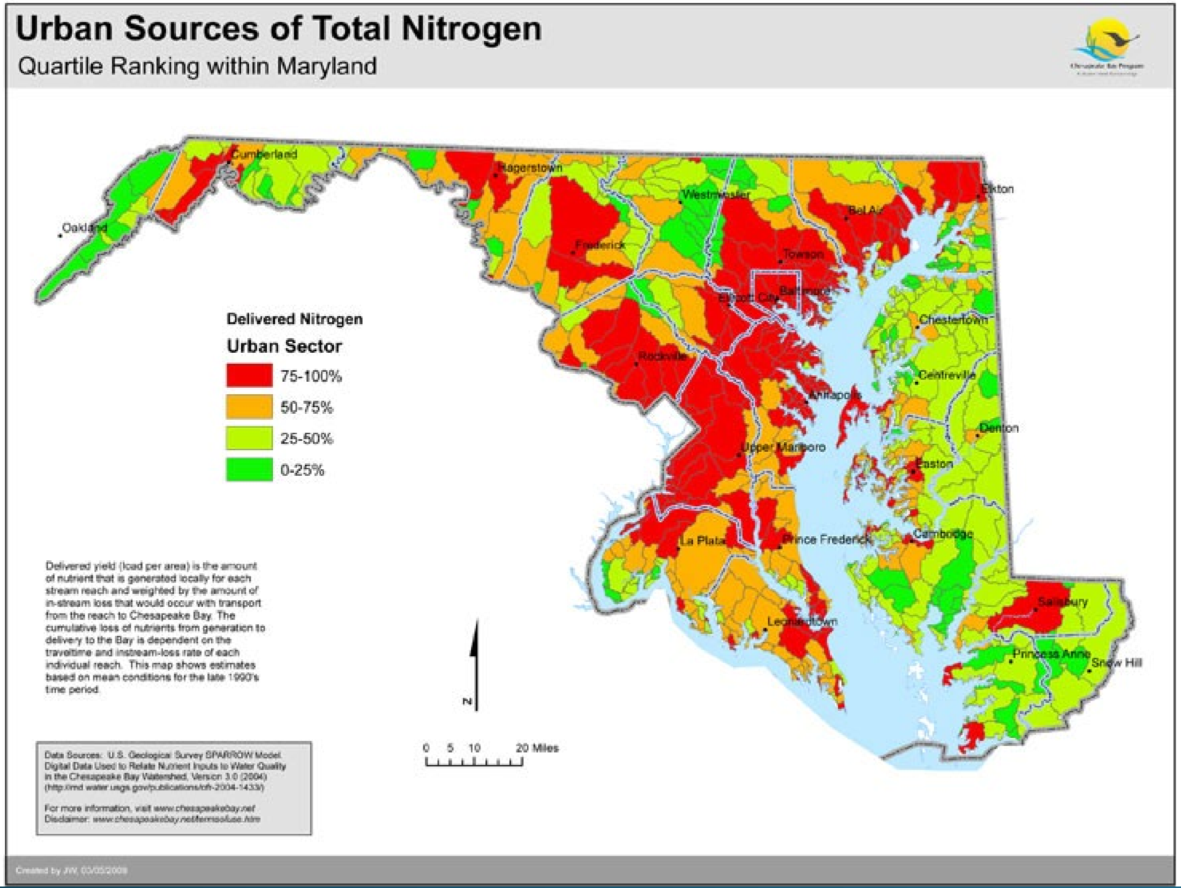
AFTER

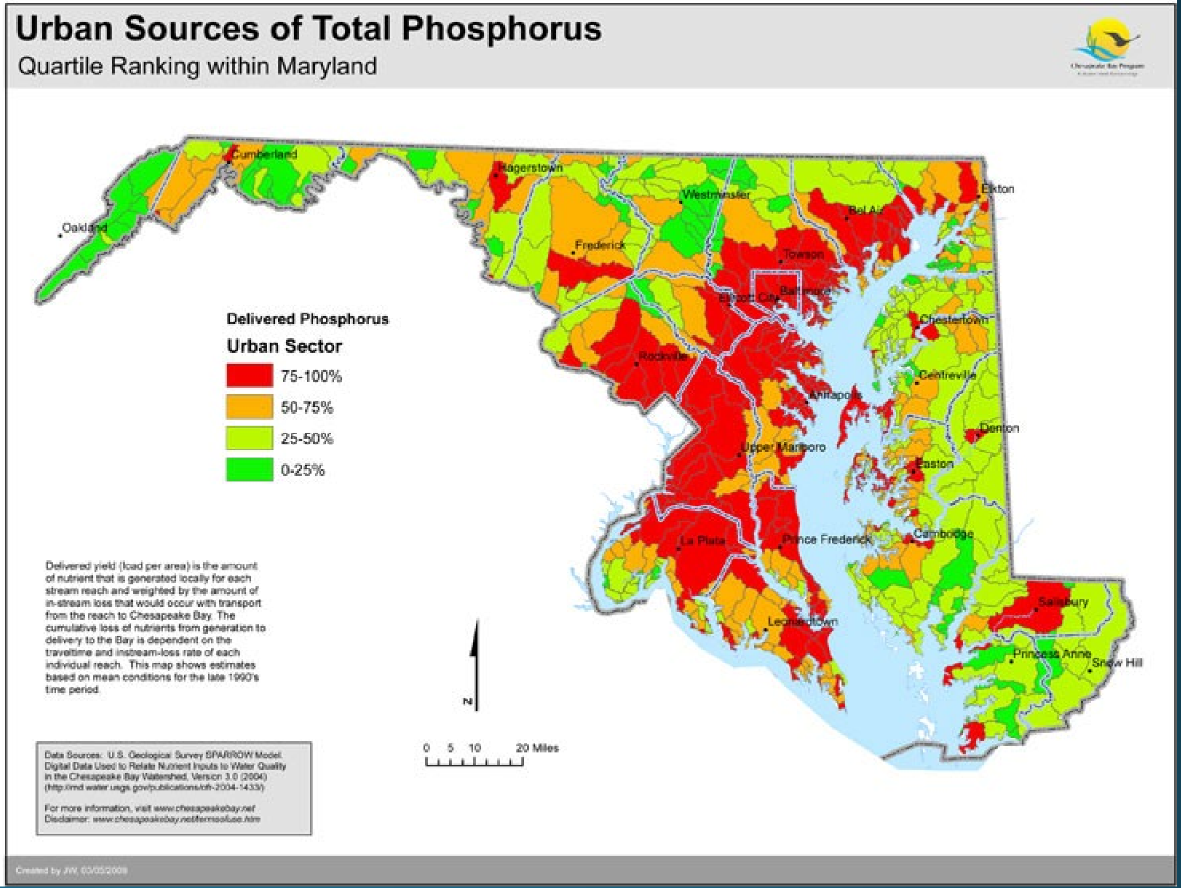
Multiple Scale Processes, Reach Scale Management



Credit: Berkley Lab

Urban Areas in MD are growing pollutant sources





Summary of Streams Monitored

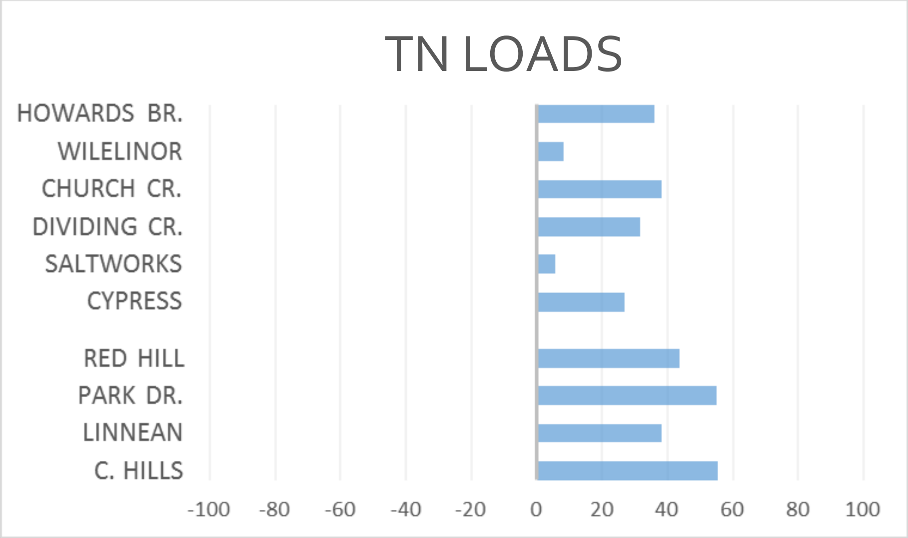
Stream	Drainage area (ha)	Imperviousness (%)	Position in watershed	Watershed	Physiographic region	Restoration method
Dividing Cr.	89	32	Lowland	Magothy	Coastal Plain	Regenerative Stormwater Conveyance
Cabin Br. (Saltworks)	49	55	Lowland	Severn	Coastal Plain	Regenerative Stormwater Conveyance
Church Cr.	227	56	Lowland	South	Coastal Plain	Stream-wetland complex
Cypress Cr.	143	46	Lowland	Magothy	Coastal Plain	Stream-wetland complex
Howard's Br.	96	11	Lowland	Severn	Coastal Plain	Stream-wetland complex
Wilelinor	106	48	Lowland	South	Coastal Plain	Stream-wetland complex
Linnean	13	27	Headwater	Rock Cr.	Piedmont	Regenerative Stormwater Conveyance
Park Drive	1.3	18	Headwater	Anacostia	Coastal Plain	Regenerative Stormwater Conveyance
Clements Cr. (C. Hills)	6	15	Headwater	Severn	Coastal Plain	Step Pool Conveyance
Red Hill Br.	18	25	Headwater	Patuxent	Coastal Plain	Natural Channel Design

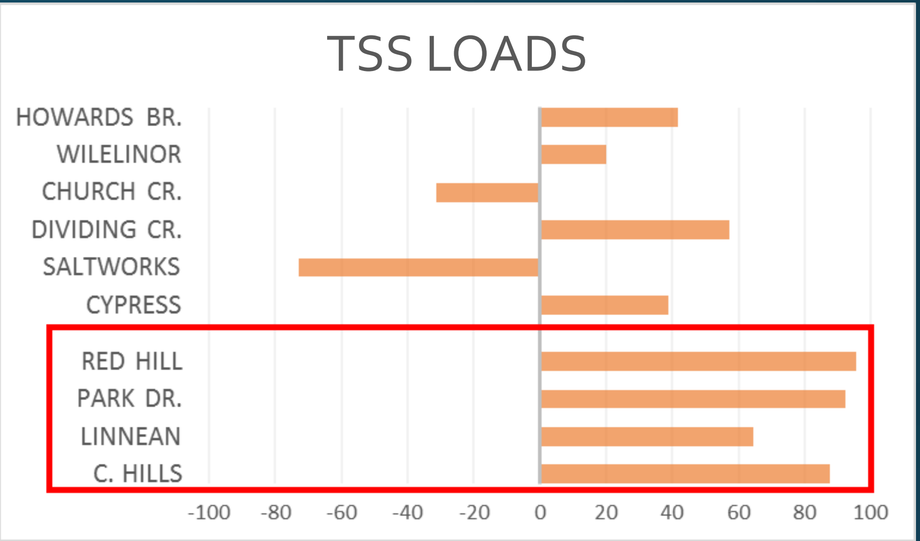
Monitoring Methods

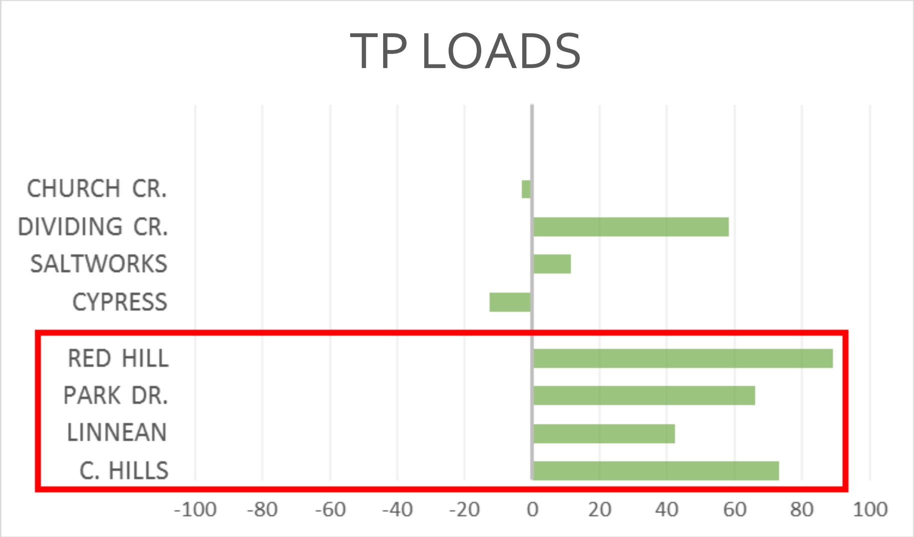
Measuring rain and discharge

Water sampling

Load reduction efficacy varied among streams



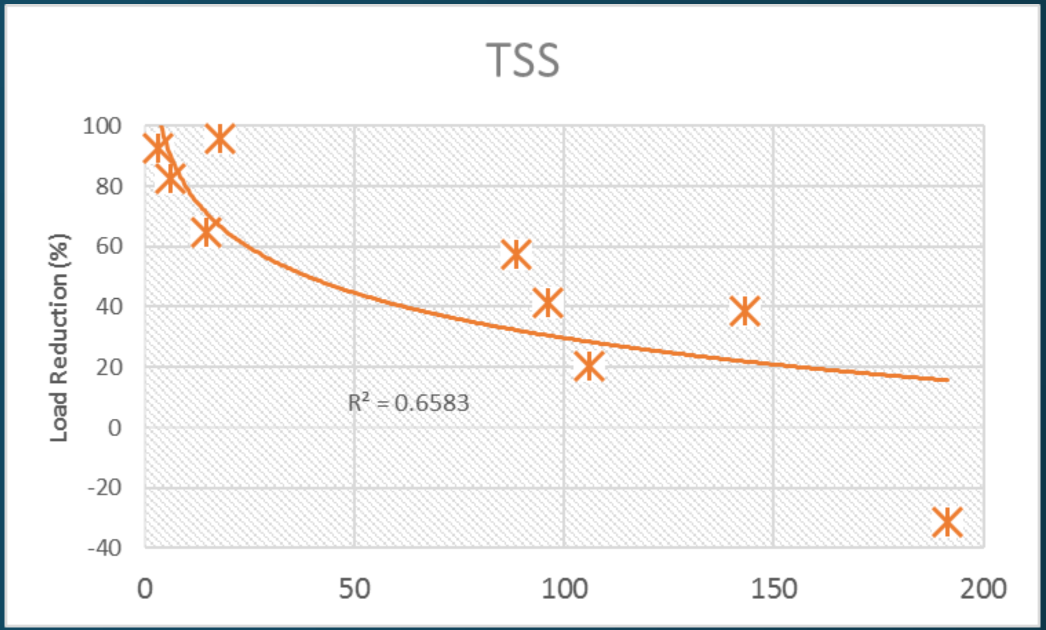




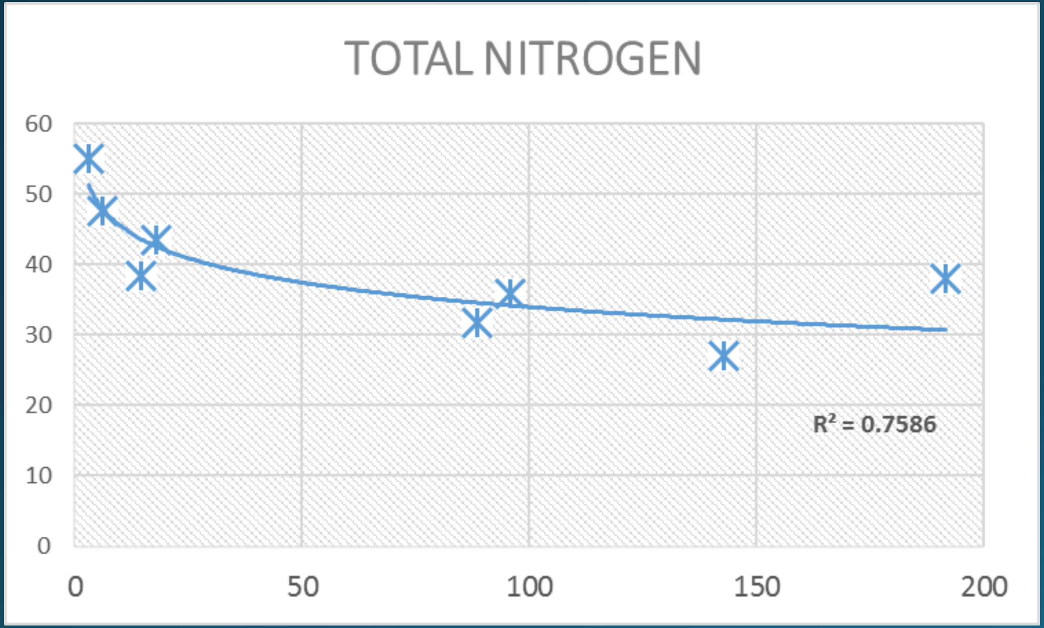
Bars to the left indicate an increase in loads after restoration

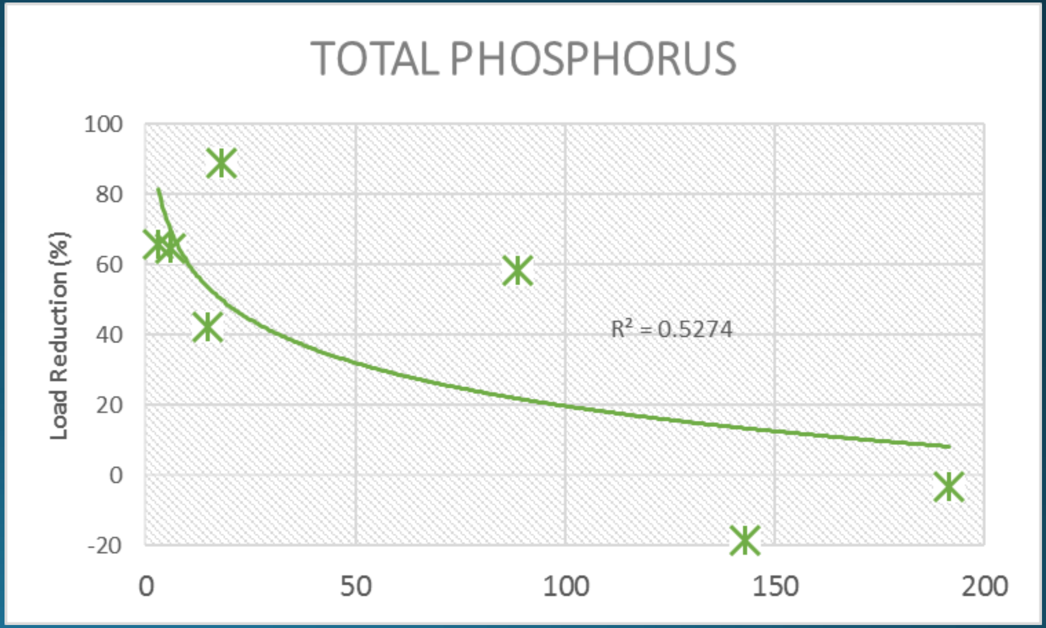
% change compared to pre-restoration load levels

Load reduction is negatively correlated with the drainage area



Load reduction from pre-restoration levels (%)

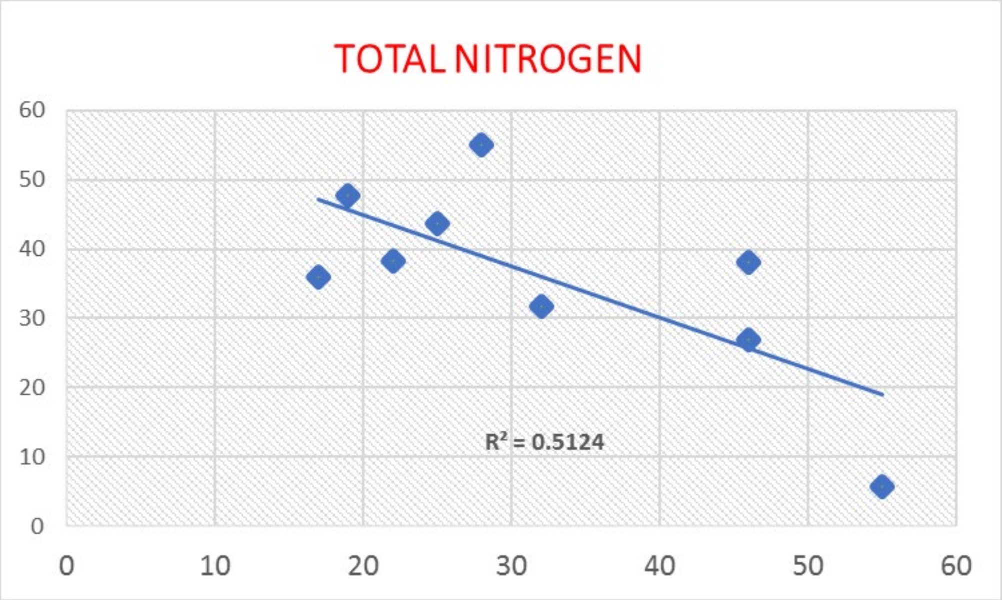


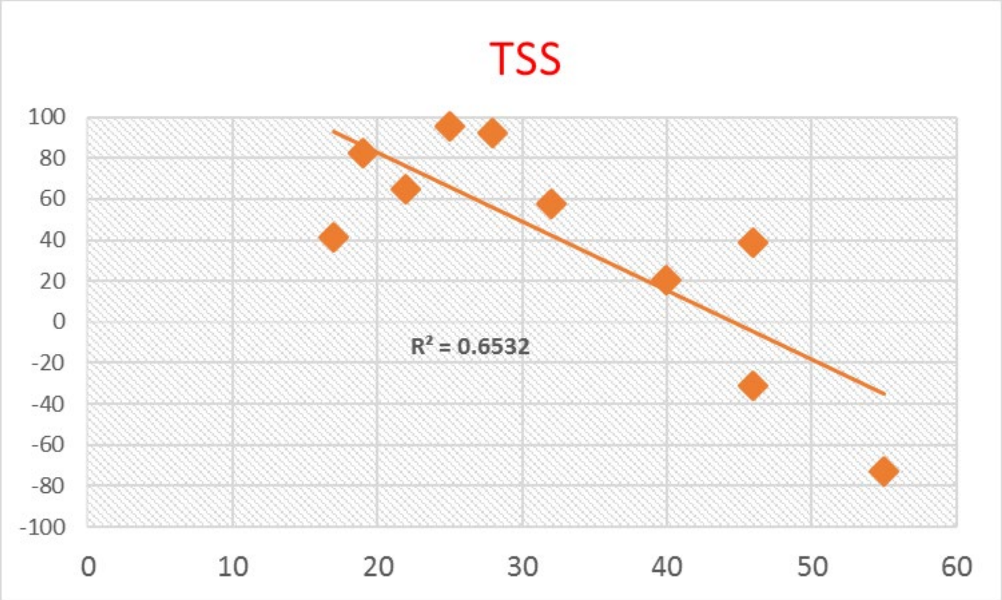


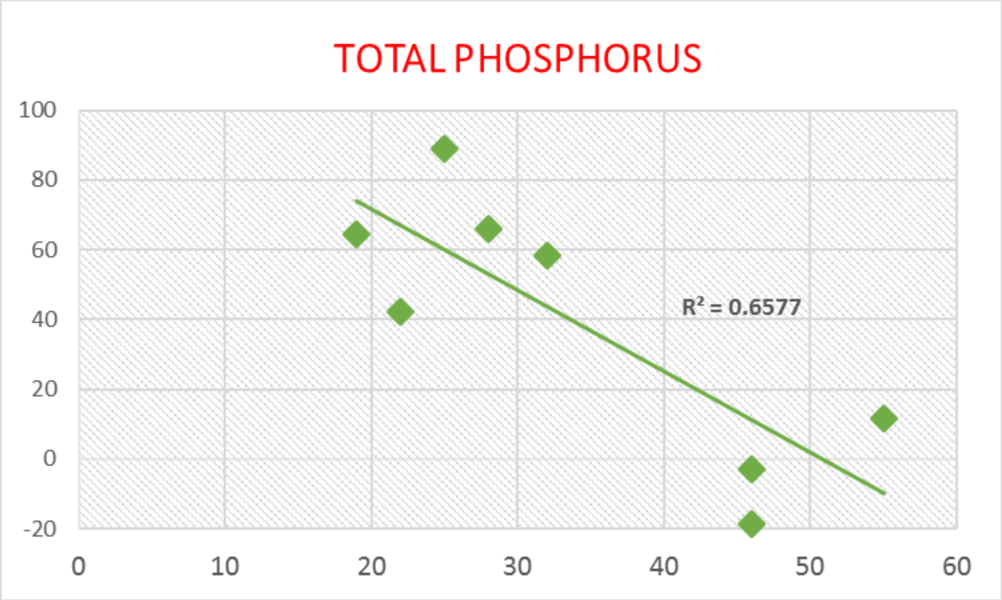
Drainage Area (hectares)

Load reduction is negatively correlated with imperviousness in catchment

Load reduction from pre-restoration levels (%)







% imperviousness

Estuaries and Coasts
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Stream Restoration Performance and Its Contribution to the Chesapeake Bay TMDL: Challenges Posed by Climate Change in Urban Areas

Michael R. Williams[1,3] · Gopal Bhatt[2] · Solange Filoso[1] · Guido Yactayo[2,4]

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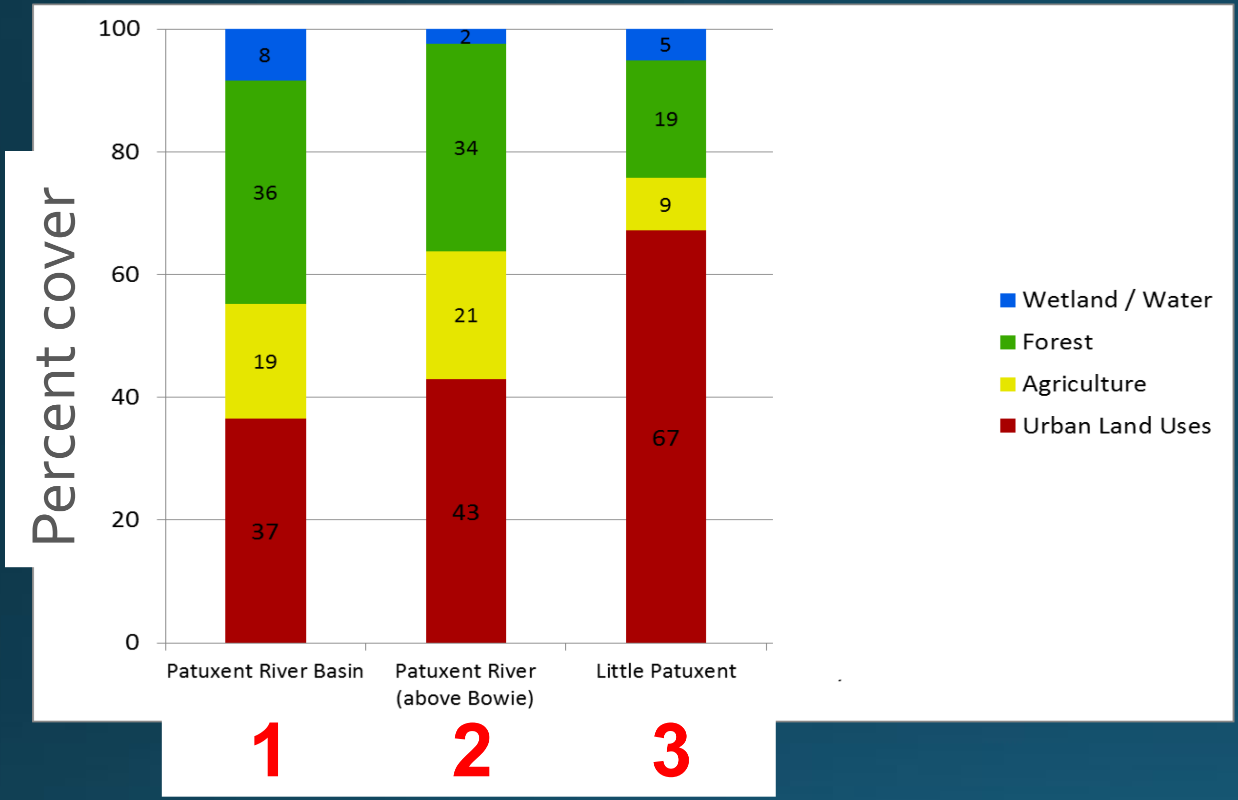
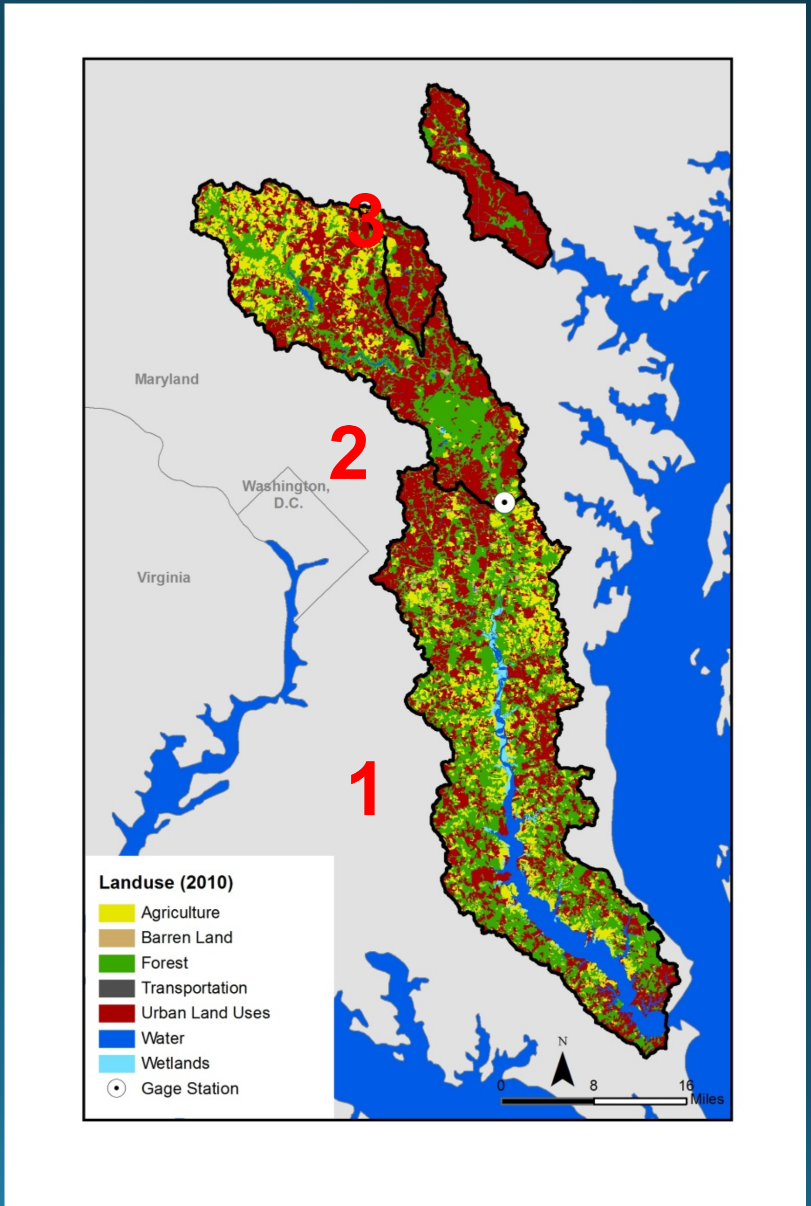
Climate Effects in Urban Watersheds





PREDICTIONS BASED ON URBAN SCENARIOS IN THE PATUXENT WATERSHED:

- 10% to 20% increase in stormflow runoff
- 14% to 26% Total Nitrogen loads
- 14% to 15% Total Phosphorus loads
- 16% to 33% Total Suspended Sediment loads

Conclusion

We need to think more outside the channel, while recognizing challenges such as:

- Lack of riparian and floodplain space;
- legacy impacts from land use changes in the past;
- Socio-economic and institutional barriers.

Source: Vietz et al. (2016), published in Landscape and Urban Planning.

THANKS!

CBTRUST
Chesapeake Bay Trust

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U.S. Department of Commerce
NOAA

Anne Arundel County
Maryland

Severn Riverkeeper

south river federation