Efforts to Value Ecosystem Services Associated with an Innovative Application of Stream and Wetland Restoration in Green Infrastructure

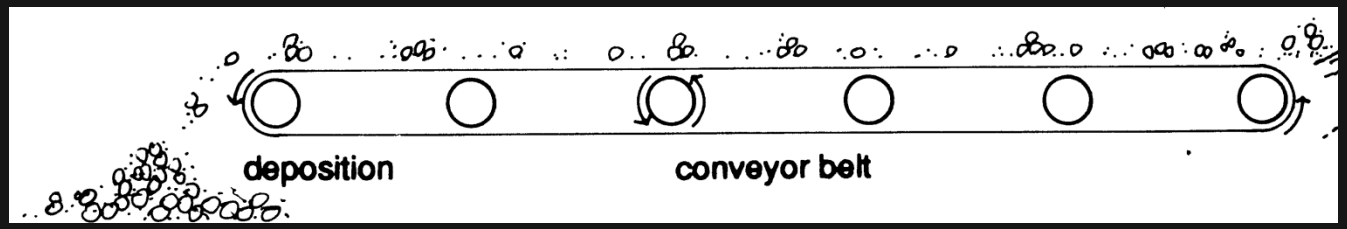
Joe Berg, Biohabitats

jberg@biohabitats.com


Represent ~85% of stream length and function like ag ditches

Our Broken Stream Systems Function as Major Sources & Conveyors of Sediment & Phosphorus

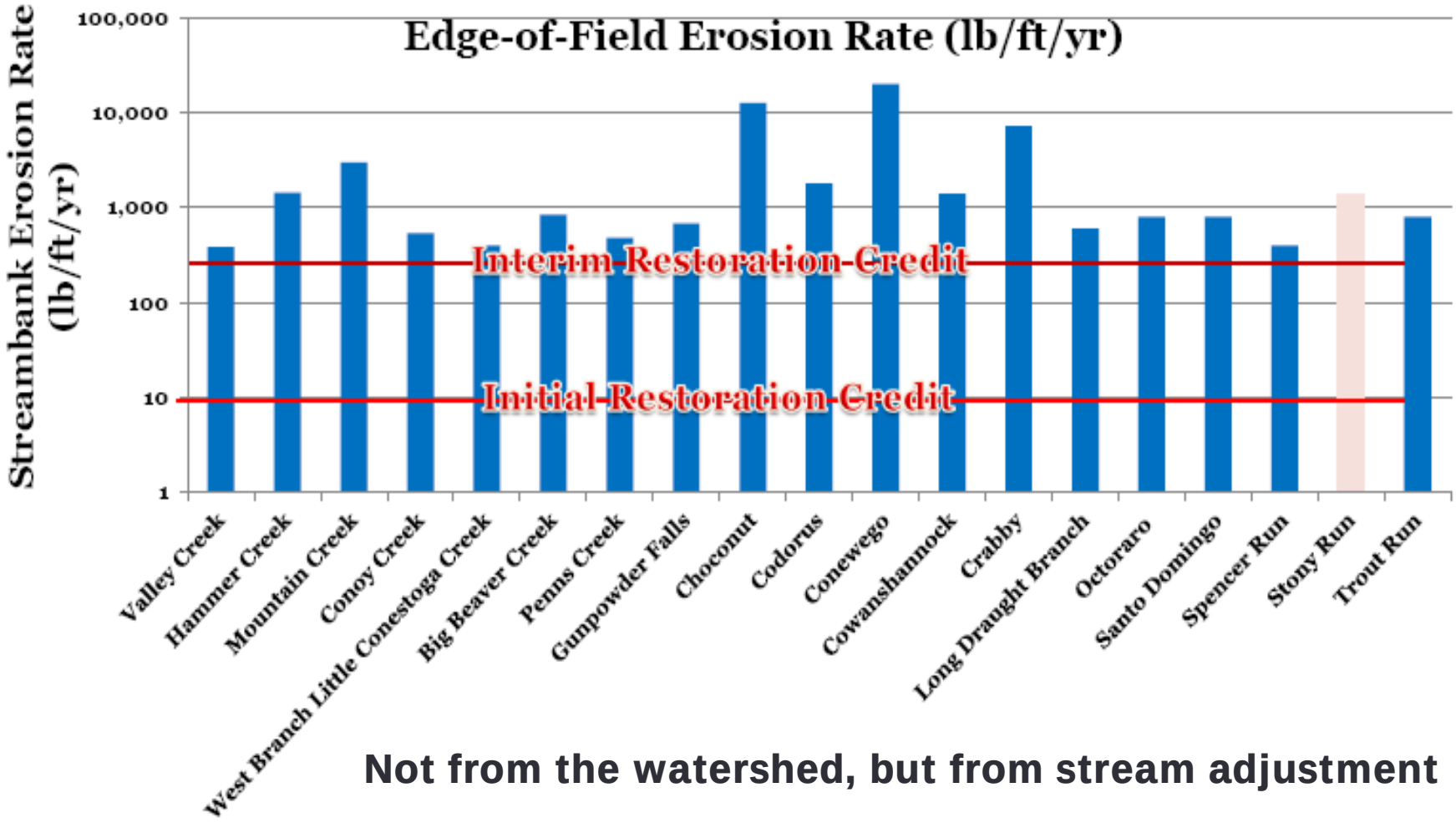
Zone of Erosion/Transport



Zone of Deposition

Adapted from Kondolf, M. (1997). Environmental Management, 21, 533-551.

Why a Universal Restoration Credit Doesn't Make Sense (CWP Literature Review)



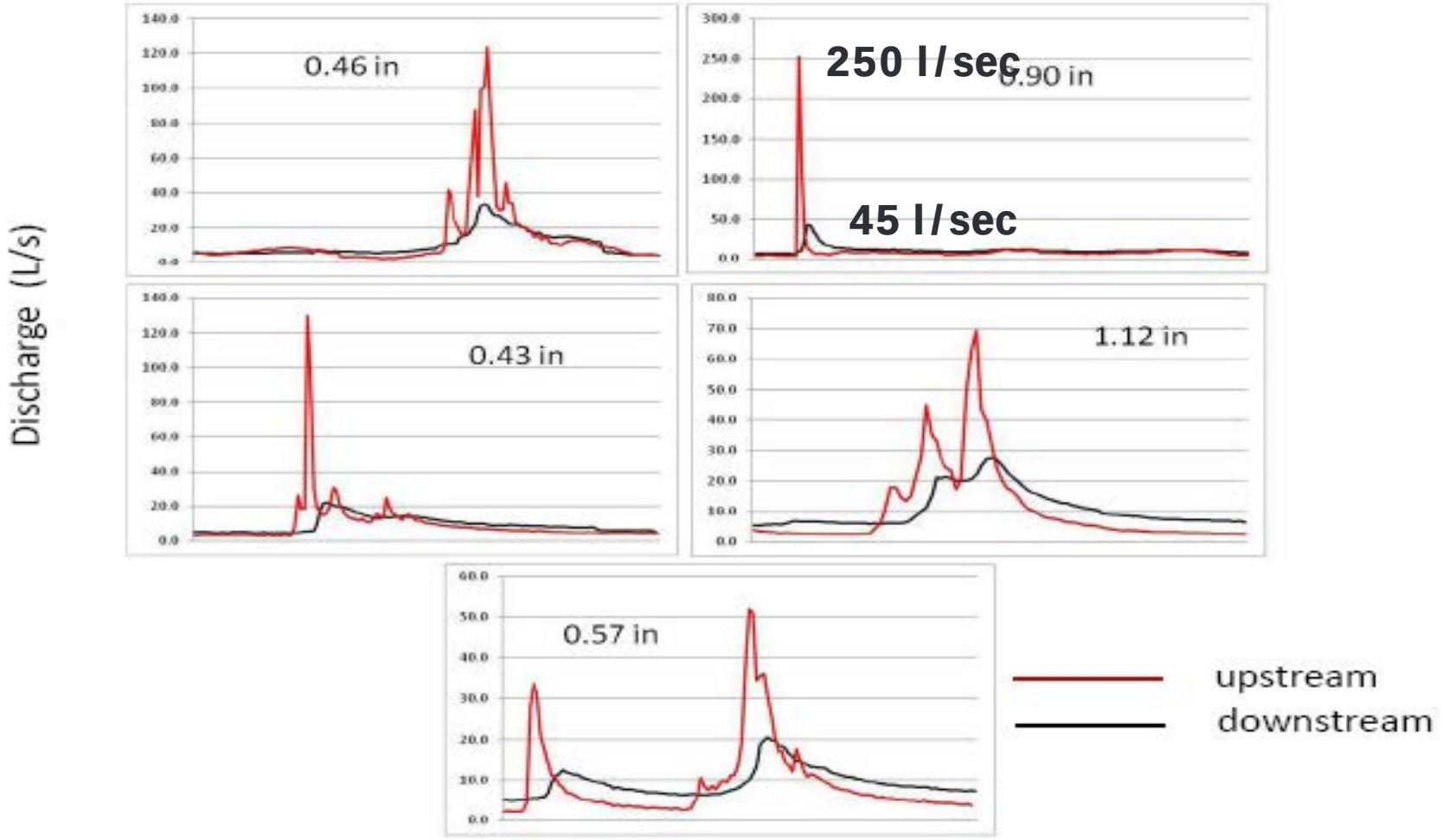
Not from the watershed, but from stream adjustment

Source: Expert Stream Panel Report, Stack 2013

Processes and Services

- Flood reduction – 15% increase in real estate value for homes in vicinity of restored stream
  - Peak attenuation, extended time of concentration
  - Reduce shear stresses / erosion
  - Protects property from erosion loss
  - Aesthetically pleasing element of community
- Increased property value (aesthetics, park amenity, etc.) -$50,000 per lot in development

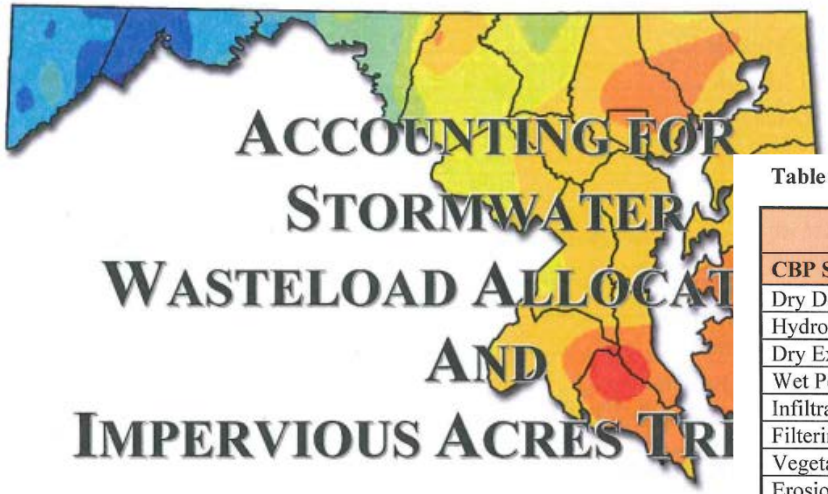
Hydrographs during individual storms WILELINOR



Source: Solange Filoso, University of Maryland

Processes and Services

- Water quality enhancement / TMDL Attainment (TSS, TN, TP, …)
  - $15,000 per lb of PO_4 in Richmond, Va
  - $10 ft^3 – Maryland's cost of BMP treatment
    - 1,000 ft project reconnecting floodplain=~$2 million in comparable water quality benefits
    - Average cost of stream restoration ~50% of status quo stormwater infrastructure (drop structures, pipe, …)
  - Require treatment of 40% of impervious area not previously treated (e.g., highways, parking lots…)



ACCOUNTING FOR STORMWATER WASTELOAD ALLOCAT AND IMPERVIOUS ACRES TRI

GUIDANCE FOR NATIONAL POLLUTANT DISCHARGE ELIMINAT STORMWATER PERMITS

JUNE (DRAFT) 2011

MARYLAND

410-537-3000 | 800-633-6101 | TTY Users: 800-735-2258
MARTIN O'MALLEY, *GOVERNOR* | ANTHONY G. BROWN, *LT. GOVERNOR* | ROBERT M.

Table 4. Structural BMP Retrofit Matrix

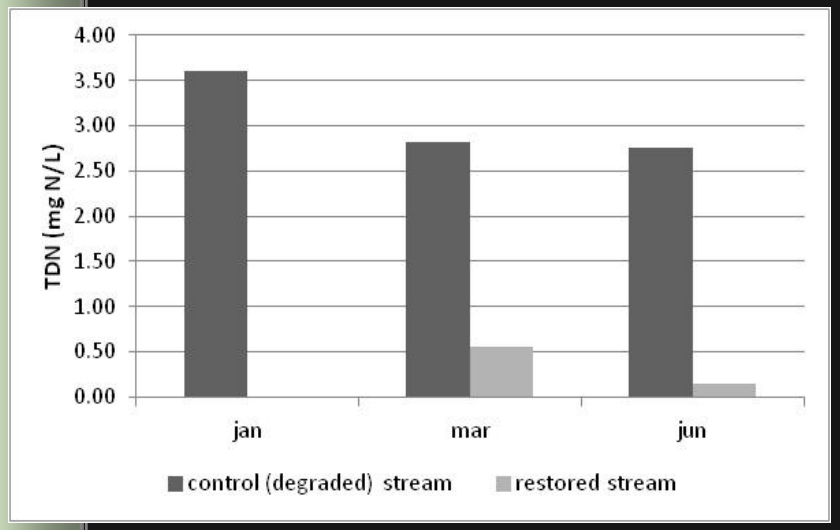
BMP Practice	TN	TP	TSS
CBP Structural BMPs			
Dry Detention Ponds	5%	10%	10%
Hydrodynamic Structures	5%	10%	10%
Dry Extended Detention Ponds	20%	20%	60%
Wet Ponds and Wetlands	20%	45%	60%
Infiltration Practices	80%	85%	95%
Filtering Practices	40%	60%	80%
Vegetated Open Channels	45%	45%	70%
Erosion and Sediment Control	25%	40%	40%
Stormwater Management by Era			
Development Between 1985 - 2002	17%	30%	40%
Urban BMP Retrofit	25%	35%	65%
Development Between 2002 and 2010	30%	40%	80%
Development After 2010	50%	60%	90%
ESD to the MEP from the *Manual*			
Green Roofs	50%	60%	90%
Permeable Pavements	50%	60%	90%
Reinforced Turf	50%	60%	90%
Disconnection of Rooftop Runoff	50%	60%	90%
Disconnection of Non-Rooftop Runoff	50%	60%	90%
Sheetflow to Conservation Areas	50%	60%	90%
Rainwater Harvesting	50%	60%	90%
Submerged Gravel Wetlands	50%	60%	90%
Step Pool Storm Conveyance (MDE)	50%	60%	90%
Micro-Bioretention	50%	60%	90%
Rain Gardens	50%	60%	90%
Grass, Wet, or Bio-Swale	50%	60%	90%
Enhanced Filters	50%	60%	90%
Additional Structural BMP Guidance			
Redevelopment (MDE)	50%	60%	90%
Existing Roadway Disconnect (MDE)	50%	60%	90%
Step Pool Storm Conveyance (MDE)	50%	60%	90%

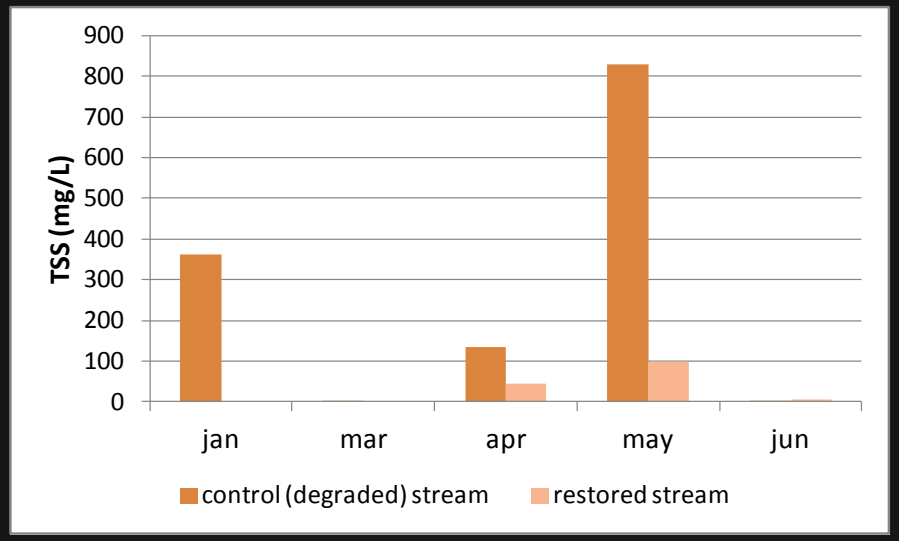
Processes and Services-cont'd

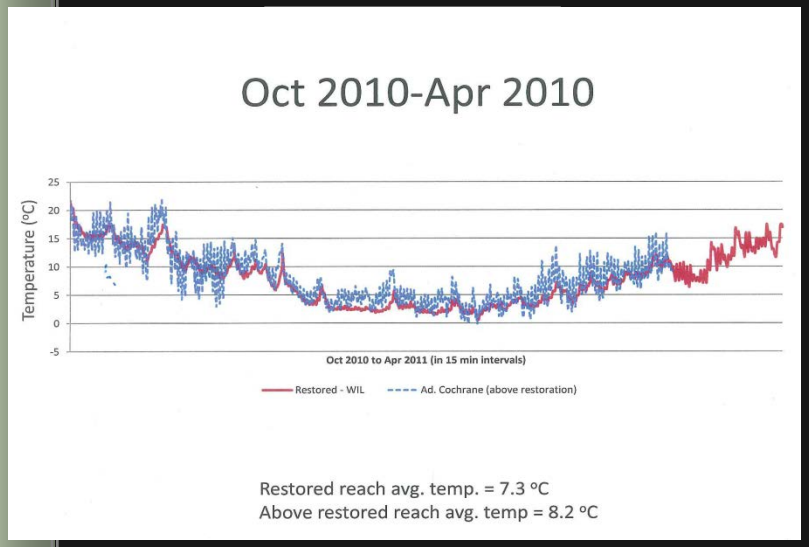
- Improved aquatic habitat – on and off-site
  - Difficult to assign value, but especially critical!
- Infrastructure protection (gravity sewer, roads…)
  - One County in Maryland, valued at $500 million
  - 26 counties, plus watershed groups , cities and incorporated towns, other MS4s (highway departments, utilities,…)

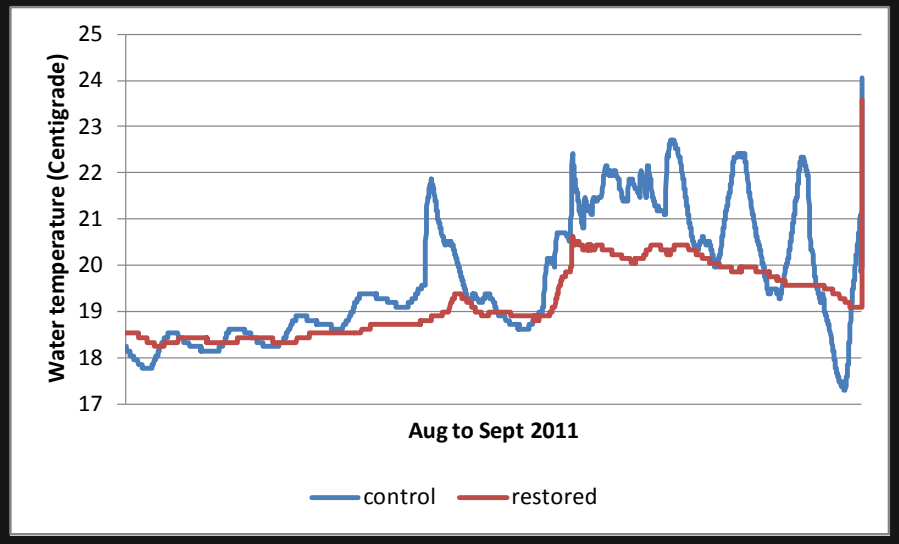
Reconnect Stream

- Raising groundwater elevation to near top of bank
  - would store 8.5 ac-ft of water
- Extend annual baseflow by 19 days
  - may allow successful trout reproduction 3 of 5 years, currently 1 of 5 years
- Significant benefits to
  - Increased hyporheic flow and processing
  - Restoration of degraded wetland hydrology
  - suppression of invasive plants – reduced remineralization of soil organic material

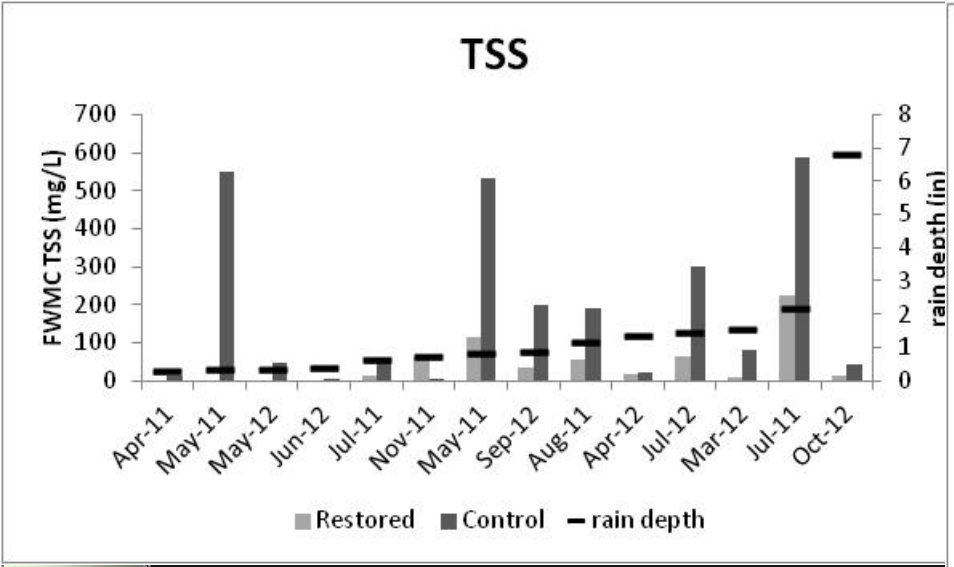


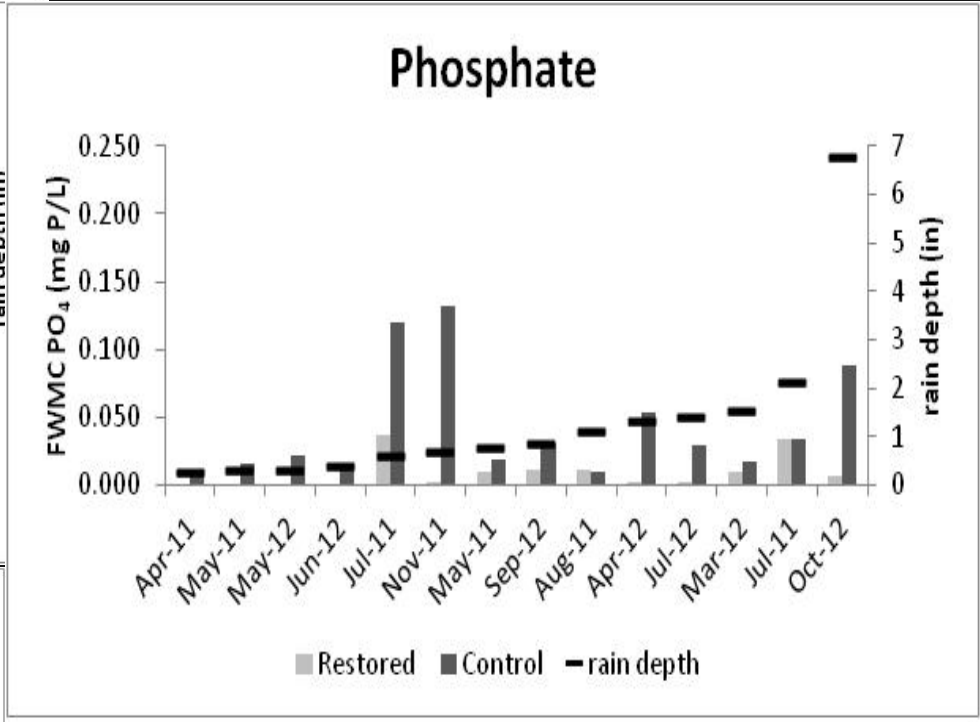


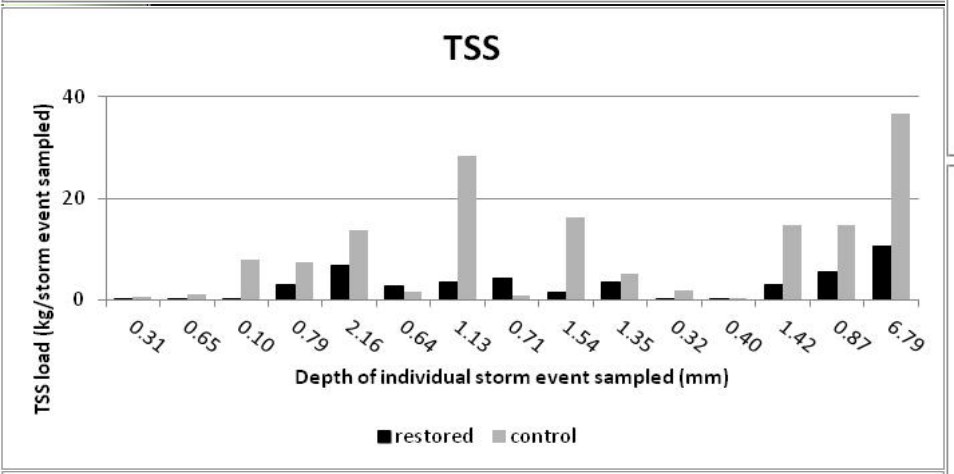


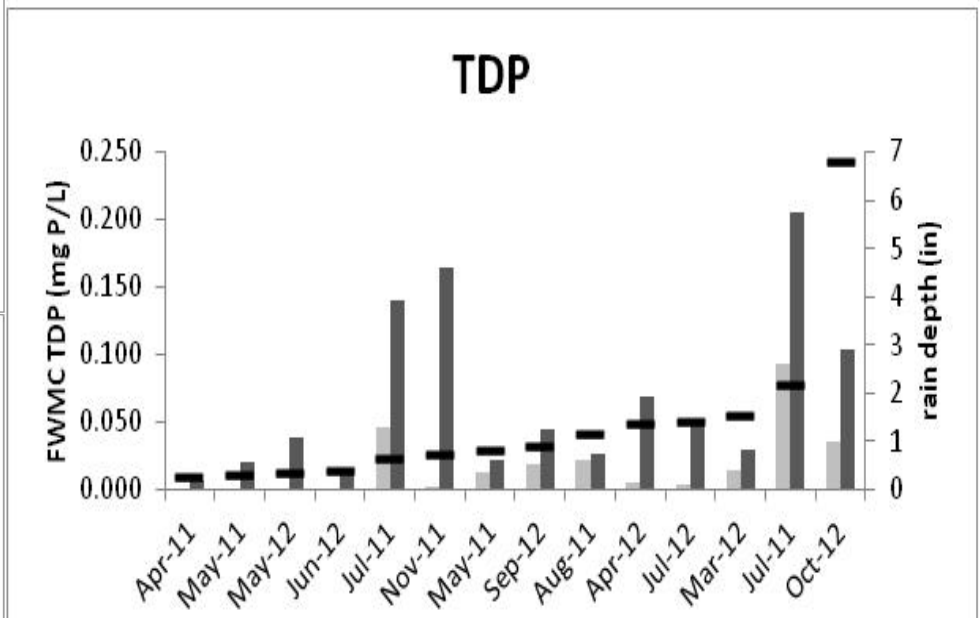


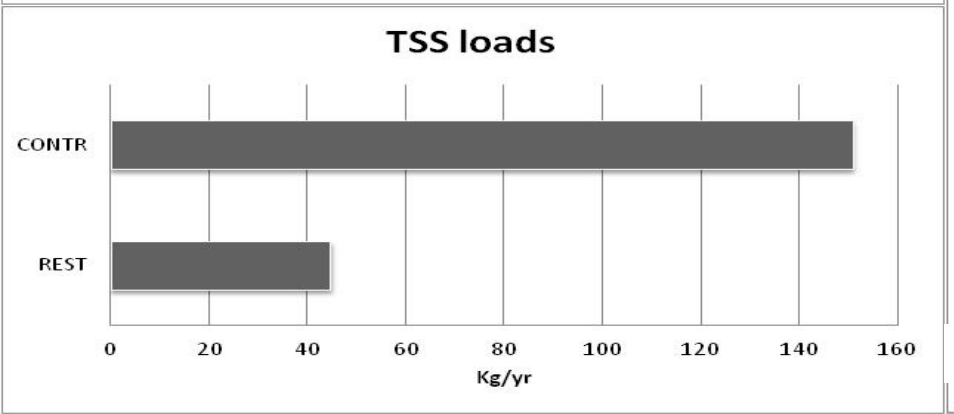
Solange Filoso, University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory











Source: Solange Filoso, University of Maryland

Infrastructure Repair & Replacement

- Existing repair budgets insufficient
- Stormwater Utilities generating $ to close gap
- Stormwater green infrastructure, stream restoration a significant component
- Can be used as agricultural BMPs that don't reduce crop yield, edge of field treatments
- TMDL requirements huge source of revenue, tens of billions of dollars in a decade

Stream Restoration is Expected to Increase Substantially to Meet the WIP Targets

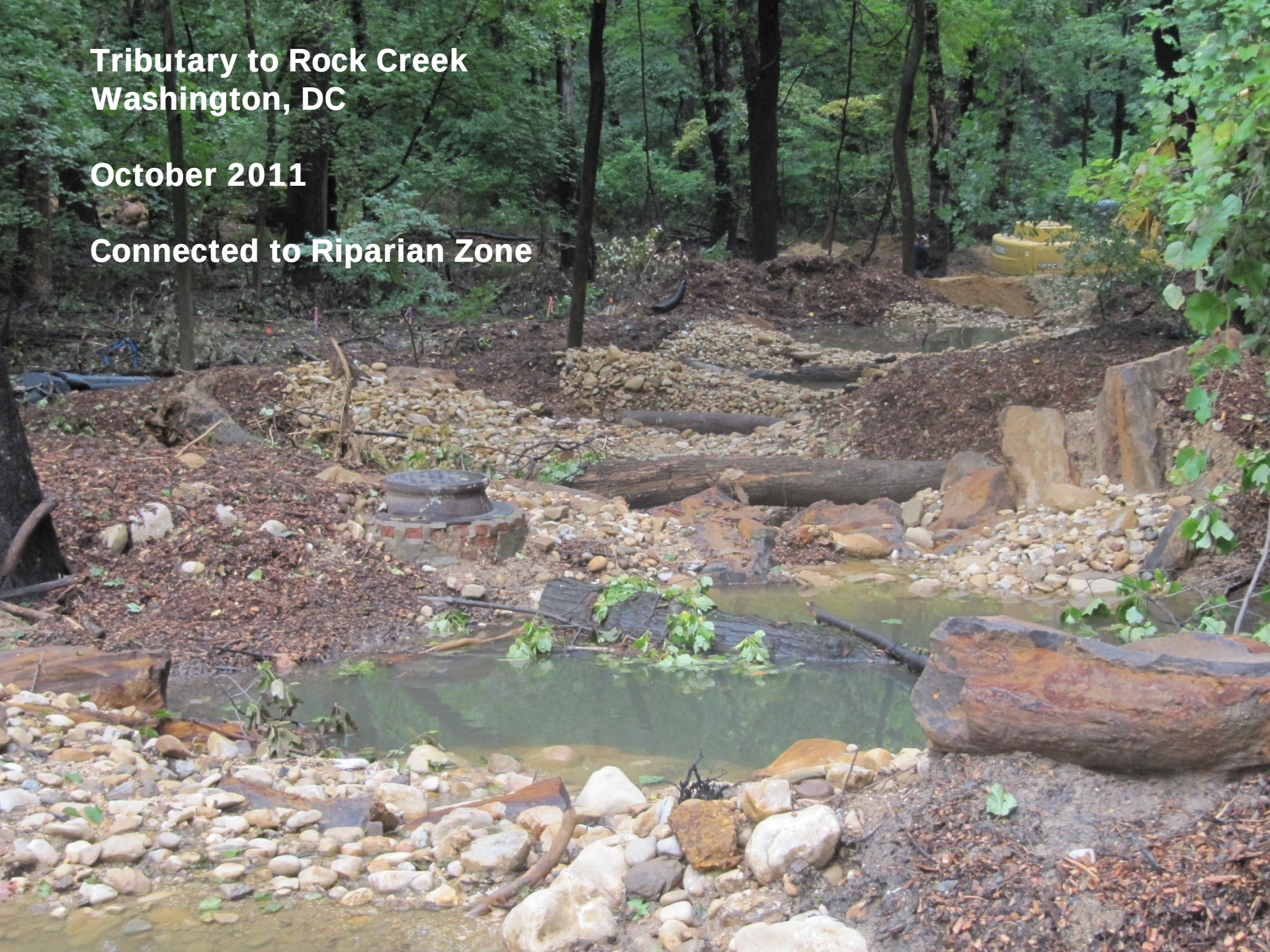
Urban Stream Restoration Expected by 2025 in Bay State Phase 2 Watershed Implementation Plans		
State	Urban Stream Restoration	Non-Urban Stream Restoration
	Linear Feet (Miles)	
Delaware	200 (0.02)	63,202 (12)
District of Columbia	42,240 (8)	0
Maryland	2,092,325 (396)	73,975 (14)
New York	26,500 (5)	337,999 (64)
Pennsylvania	55,000 (10)	529,435 (100)
Virginia	116,399 (22)	104,528 (20)
West Virginia	0	19,618 (3.7)
TOTAL	441 miles	214 miles

[1] Acres under urban and non urban stream restoration in each state by 2025 as reported in the Phase 2 Watershed Implementation Plan submissions to EPA in 2012, as summarized in May and July 2012 spreadsheets provided by Jeff Sweeney, EPA CBPO. Totals are inclusive of historical and planned implementation.

Tributary to Rock Creek
Washington, DC

Pre Restoration

~10 ft Incised


Tributary to Rock Creek
Washington, DC
October 2011
Connected to Riparian Zone


Questions?