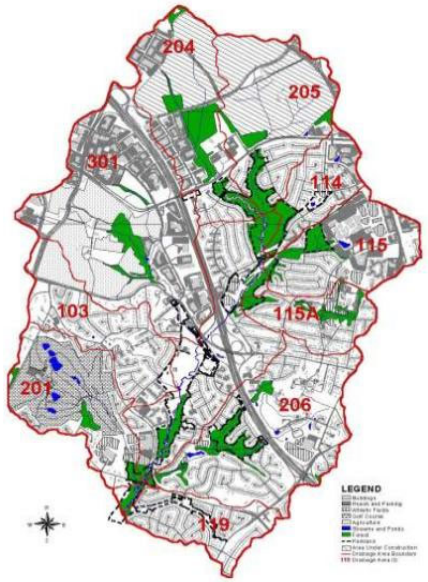
# Confessions of a Nutrient Bean Counter: Updates on Chesapeake Bay Nutrient Crediting

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# Key Themes Today

1. Bean Counting Confessions
2. Revisiting Stream Restoration
3. Shoreline and Wetland Restoration
4. Planting Trees, Forests and Meadows
5. Schueler Street Cleaning Buzz-kill
6. Next up for CSN in 2020

Chesapeake Bay Program
*A Watershed Partnership*

# CBP Expert Panel Process




**BMP EXPERT PANEL** → **URBAN STORMWATER WORKGROUP** → **WATERSHED TECHNICAL WORKGROUP** → **WATER QUALITY GIT**

# *Urban BMP Expert Panels Completed Since 2013*

## Major BMPs

- BMPs for New and Redevelopment Projects
- Urban Stream Restoration
- Stormwater Retrofits
- Urban Nutrient Management
- Street Cleaning
- Nutrient Discharges from Grey Infrastructure
- Residential Stewardship Practices

## Contributing BMPs

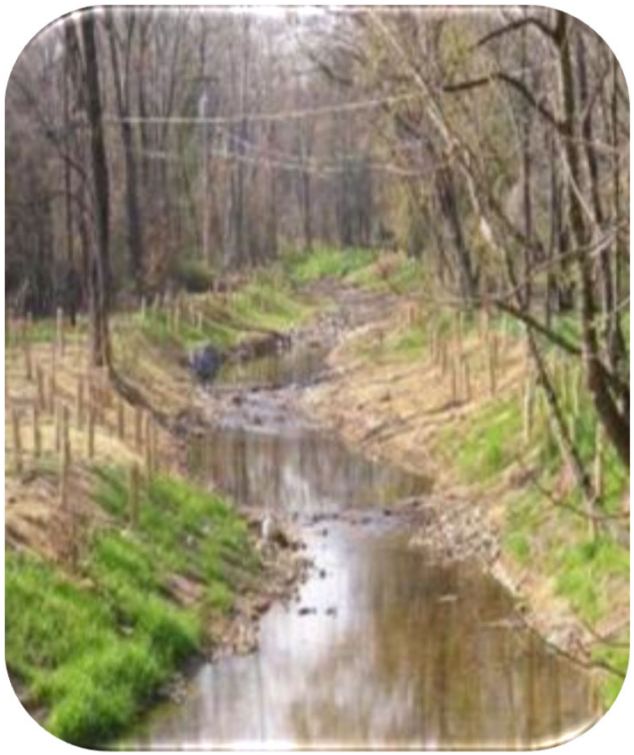
- Enhanced Erosion and Sediment Control
- Floating Treatment Wetlands
- Septic System Upgrades
- Impervious Cover Disconnection
- Urban Tree Planting
- Urban Canopy Expansion
- Shoreline Management Practices
- Filter Strips

Some concerns about foreign influence……


←---*Ukranian watershed practices*

# Stream restoration: a rapidly growing BMP for the urban sector

- Hundreds of miles of stream restoration built or in the pipeline
- High use by large MS4s and in MD,VA, PA and DC
- Rapidly evolving market for both the public and private sector
- Regulators and the restoration industry seek better standards of practice



# 5 New Stream Restoration Groups

The Bay Program formed five groups to revisit the stream restoration expert panel report

1. Verifying Stream Restoration Practices
2. Crediting Outfall Stabilization Practices
3. Standards for Protocol 1 (Prevented Sediment)
4. Adjusting Protocol 2/3 to Capture Floodplain/Stream Reconnection
5. Applying Protocols to Legacy Sediment Removal Projects

# Our profound thanks to the stream experts!

Rich Starr, Kathy Hoverman, Tim Schueler, Kip Mumaw, Neely Law, Meghan Fellows, Sandra Davis, Jennifer Rauhofer, Josh Burch, Scott Cox, Drew Altland, Lisa Fraley-McNeal, Bono, Joe Berg, Josh Running, Jeff White, Matt Meyer, Reid Cook, Ralph Spagnolo, Tess Thompson, Joe Sweeney, Ray Bahr, Steven Reiling, Tracey Harmon, Brock Reggi, Karen Coffman, Ryan Cole, Bill Brown, Liz Ottinger, Carrie Traver, Allison Santoro, Tupac Shakur, Ted Brown, Chris Stone, Erik Michelsen, Neil Weinstein, Nick Noss, James Kaiser, Bill Stack, Scott Lowe, John Hottenstein, Jeremy Hanson, Sujay Kaushal, Joel Moore, Kim Kardashian, Jens Geratz, Sean Crawford, Jeff Hartfrandt, Denise Clearwater, Paul Mayer, Aaron Blair, Durelle Scott, Greg Noe, Chris Becraft, David Wood, Art Parola, Benjamin Ehrhart, Ward Oberholtzer, Kelly Lennon, Megan McCollough, Cory Anderson, the Notorious B.I.G.

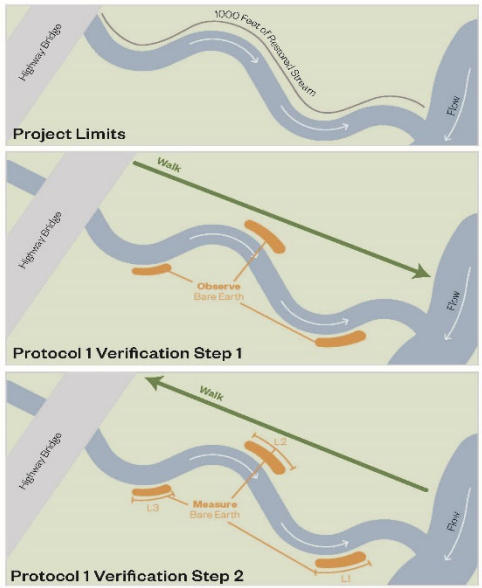
# Group 1: Verifying Stream Restoration Projects

**Focus**: Develop a system to cost-effectively verify individual projects every five years

**Status:** Approved June 18 by USWG

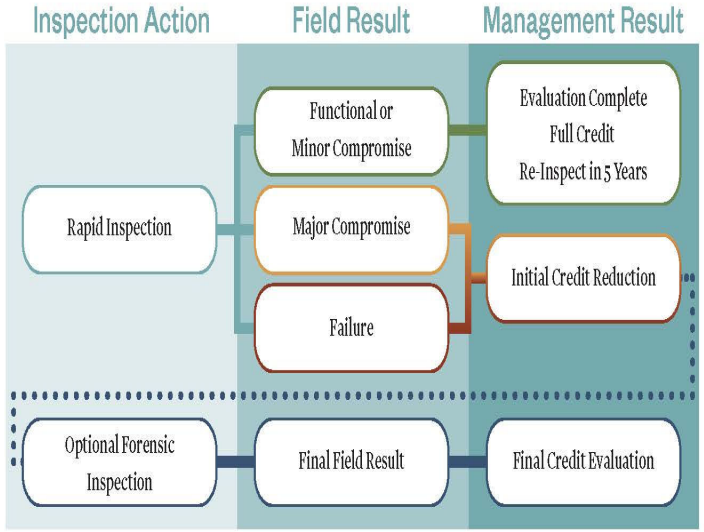
**Product:** Memo on methods, with visual indicators

# Visual Indicators to Inspect for Stream Projects




| Defining Loss of Pollutant Reduction Function for Protocol 1 | |
|---|---|
| **Criteria for Loss** | **Key Visual Indicators** |
| Evidence of bank or bed instability such that the project delivers more sediment downstream than designed, | • Severe bank undercutting (bare earth exposed)<br>• Incising bed (bed erosion evident)<br>• Flanking or downstream scour of channel structures<br>• Failure or collapse of bank armoring practices |

| Status | % Failing * |
|---|---|
| **Functioning** | **0 to 10% of reach** |
| **Showing Major Compromise** | **20 to 40% of reach** |
| **Project Failure** | **50% or more of reach** |



# Recommendations for Crediting Outfall Restoration Projects

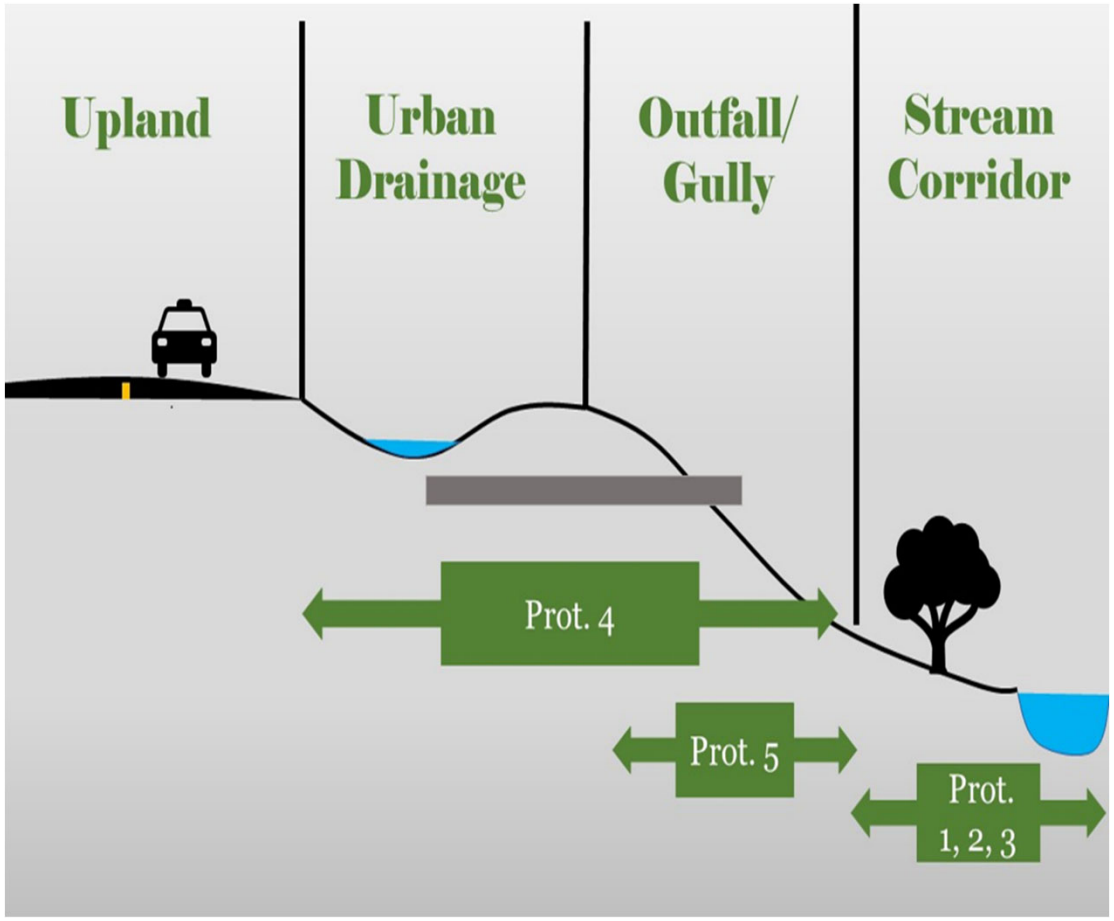
# Group 2: Crediting Outfall Restoration Projects

**Focus**: Decide whether to establish a new crediting protocol for this class of projects

**Status:** CBP Approved 10/15/2019

**Product:** New Protocol "5" along with supporting technical memo

# Eroding Outfalls as an Urban Sediment Delivery Hotspot



# Outfall Restoration Practices

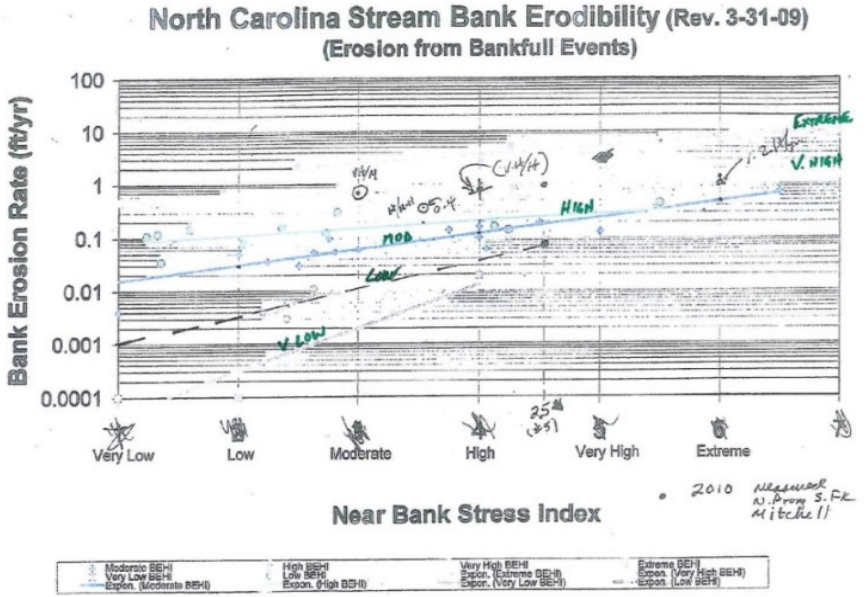
*Stone step pools below outfall: courtesy Anne Arundel County DPW*

# Group 3:
# Revisiting the Prevented Sediment Protocol

**Focus**: Agreement on best practices for applying the protocol in the field and office, and setting limits on the degree of armoring allowed

**Status:** Approved by USWG on 10/15/2019!

**Product:** Technical memo with revised protocol and incentives for better on-site data collection




| Bulk Density | (lbs/ft$^3$) |
|---|---|
| Expert Panel Report Case Study Example (Schueler and Stack 2014) | 125 |
| Carroll County Average of 5 sites and 39 samples | 56 |
| James Madison University Arboretum, Virginia (Mumaw 2015) | 80 |
| Paxton Creek, PA range of 9 samples | 67 - 76 |
| Case Study Projects in North Carolina (Doll et al. 2018) | 52 - 88 |


Imbricated Rip-Rap
Flow

# Three Armoring Categories

| ***Non-Creditable Armoring*** | ***Creditable w/ Limits*** | ***Creditable Armoring*** |
|---|---|---|
| • Concrete retaining walls<br>• Gabions<br>• Dumped rip-rap<br>• Sheet piling/planking<br>• Block walls<br>• Geogrid/concrete/gabion mattresses<br>• Non-biodegradable soil stabilization mats/systems | • Angular riprap stone installed for bank protection<br>• Imbricated rip rap<br>• Berm/pool cascades<br>• Boulder revetments | • Rocks used for localized toe protection<br>• Root-wad revetments?<br>• Any soft-armoring bioengineering practices such as live stakes, coir logs etc.<br>• Riffle weir series |

# Group 4 and 5:
# Revisiting the Hyporheic Box/Floodplain Reconnection/Legacy Sediments Protocols 2 and 3

**Focus**: Agreement on best practices for applying these protocols to enhance stream and floodplain reconnection

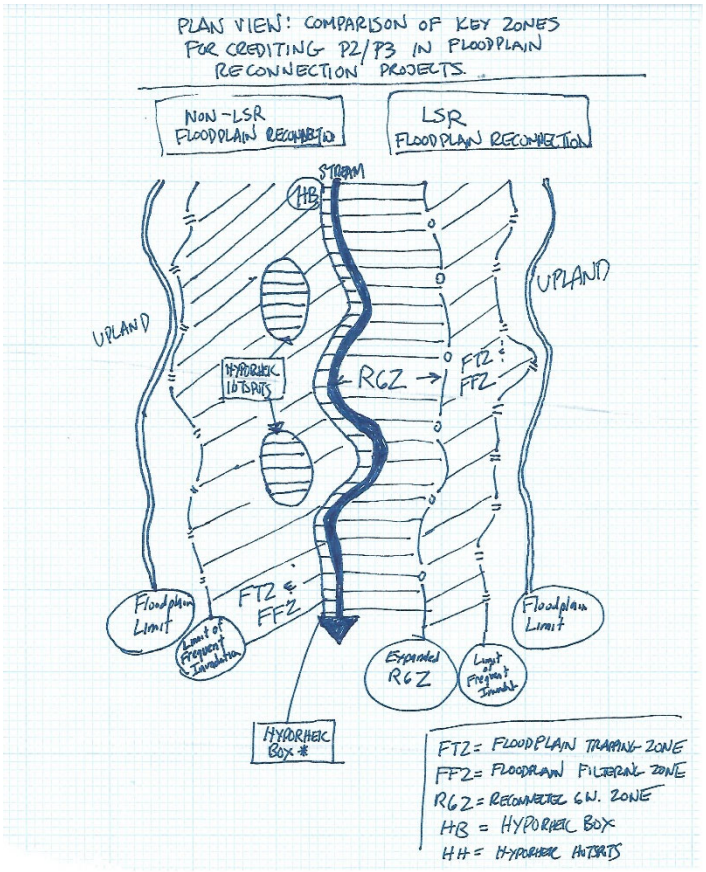
**Status:** Intensive work this fall, hope to finish in 1st quarter of 2020

**Product:** Technical memos with revised or new protocols to compute reductions

# Sediment and nutrient dynamics in the floodplain

Courtesy of Greg Noe, USGS

# Next Steps to Support Better Stream Restoration

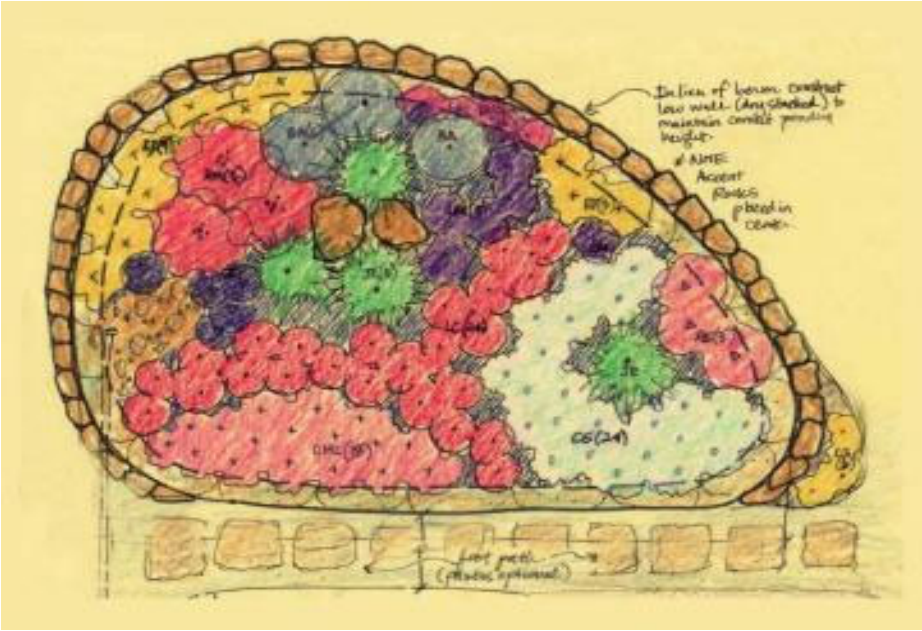



- Finish up floodplain reconnection credits
- Resiliency to extreme flooding
- Uplift achieved after 5 years?
- Focused stream research programs

# Urban Forest Planting

- Acres of tree planting projects in urban pervious land intended to establish forest ecosystem processes and function
- Trees are planted in a contiguous area
- Urban forest planting projects need a planting and maintenance plan that meets state planting density standards to establish urban forests

# Conservation Landscaping Credit



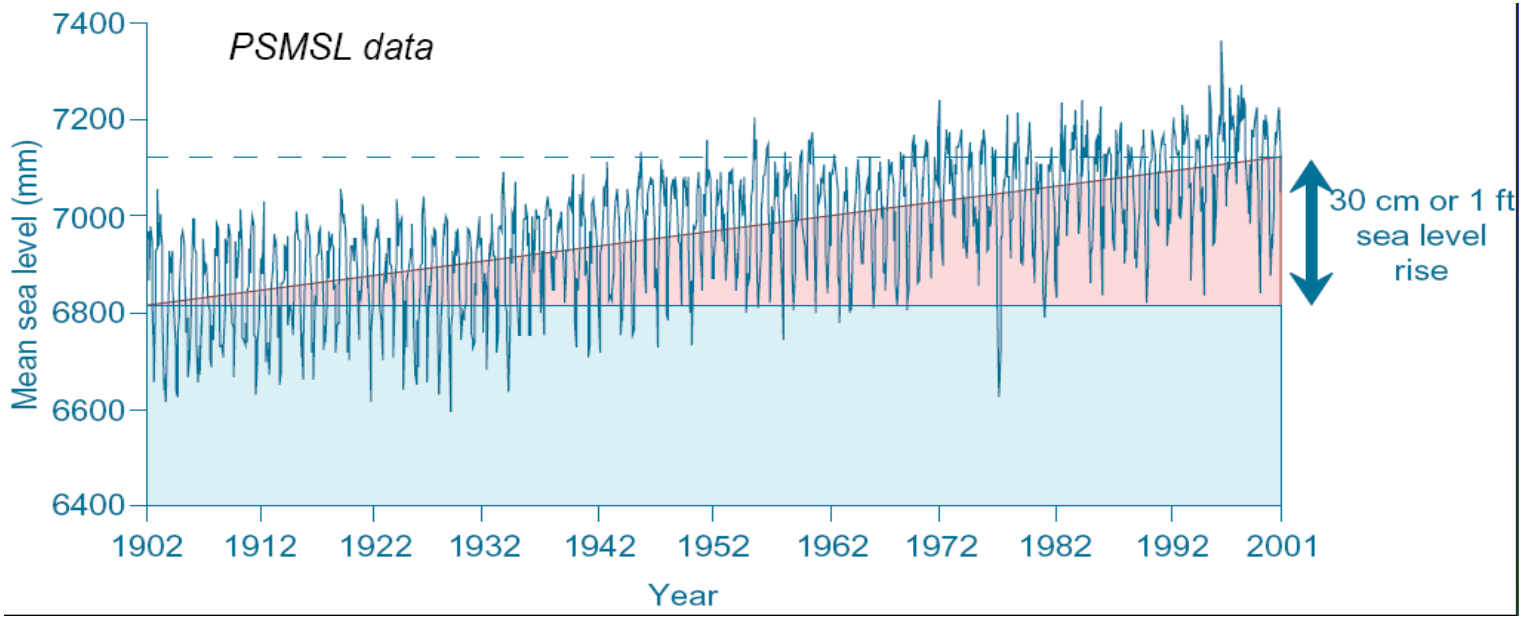
Convert Turf to Conservation Landscaping

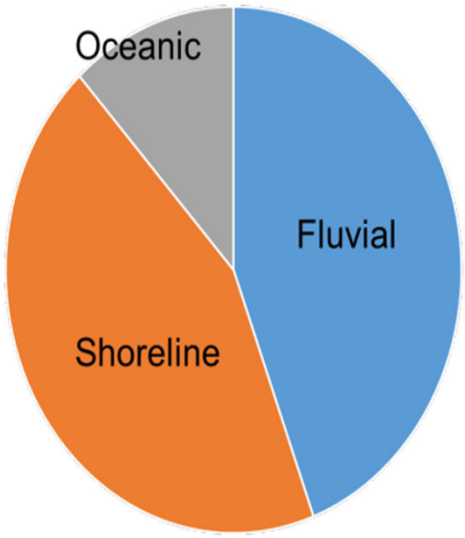
Approved Summer 2018

Nitrogen and Phosphorus Credit

See CSN for more details

# Updated Credit for Shoreline Management Projects


PSMSL data
Mean sea level (mm)
7400
7200
7000
6800
6600
6400
1902
1912
1922
1932
1942
1952
1962
1972
1982
1992
2001
Year
30 cm or 1 ft
sea level
rise


Oceanic
Fluvial
Shoreline

# Key Changes to Shoreline EPR in 2018/2019

- Nutrient reduction NOW allowed for prevented sediment protocol
- Updated Expert Panel Report and Fact Sheet released in 2018
- 2019 correction to allow for how sand is handled in the Protocol 1
- Final EPR just released

# Non-Tidal Wetland Restoration

# Restoration of Floodplain Wetlands

| Non-Tidal Wetland [1] Removal Rates | | | |
|---|---|---|---|
| **Wetland Category** | Pollutant Removal Rate (%) | | |
| | **Total N** | **Total P** | **TSS** |
| **Restoration [3]** | 42% | 40% | 31% |
| **Creation [3]** | 30% | 33% | 27% |
| **Rehabilitation [3]** | 16% | 22% | 19% |
| **Enhancement [3]** | NR | NR | NR |

[1] mostly rural study sites, dominated by floodplain wetlands, but not exclusively

[2] Original support for CBP wetland restoration rate used for Protocol 3 in 2013 stream restoration EPR

[3] definitions as outlined in expanded lit review and EPR currently under review (CBP, 2019)

NR= Not recommended

# Street Cleaning

# The Science of Street Cleaning


30 years of controversy about the impact of street sweeping on the water quality of stormwater runoff

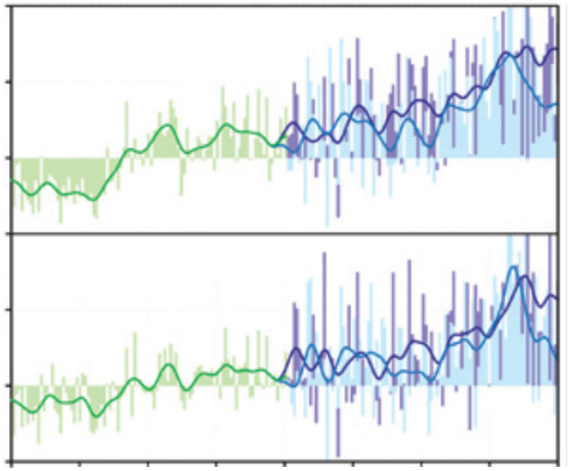
# Removal for Street Cleaning Using Advanced Sweeping Technology

| Practice # | Approx Passes/Yr [2] | TSS Removal (%) | TN Removal (%) | TP Removal (%) |
|---|---|---|---|---|
| SCP-1 | ~100 | 21 | 4 | 10 |
| SCP-2 | ~50 | 16 | 3 | 8 |
| SCP-3 | ~25 | 11 | 2 | 5 |
| SCP-4 | ~10 | 6 | 1 | 3 |
| SCP-5 | ~6 | 4 | 0.7 | 2 |
| SCP-6 | ~4 | 2 | 0 | 1 |
| SCP-7 | ~15 | 7 | 1 | 4 |
| SCP-8 | ~20 | 10 | 2 | 5 |

# Next Steps at CSN in 2020

- MS4 Basics Webcast Series
- Nutrient performance boosters for RR and ST Practices
- Next Generation Stormwater Design Specifications – ten years after
- Crediting incentives for improving functional uplift
- More climate-resilient stormwater practices

# Managing Climate Change, Flooding Risk and Urban Stormwater Infrastructure



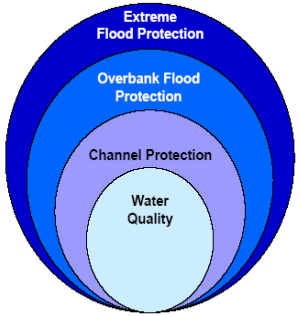



Figure 4.4-1 Representation of the Unified Stormwater Sizing Criteria

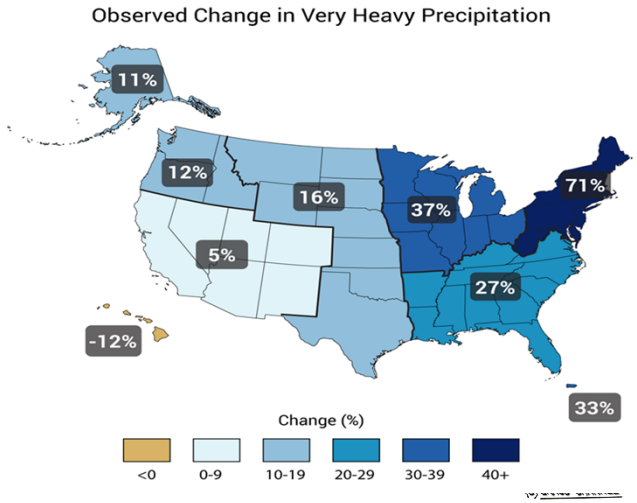
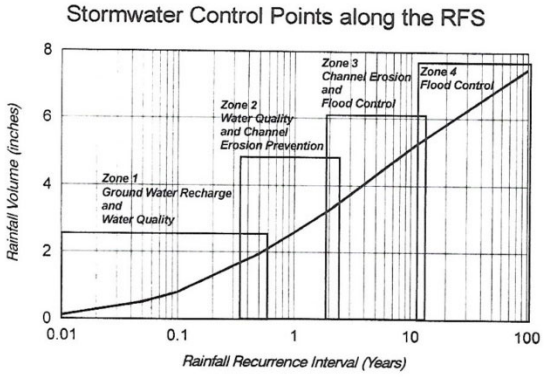
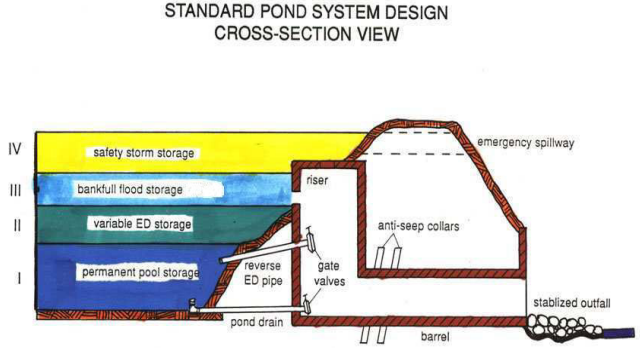


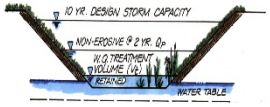

FIGURE 2.5: FOUR CLASSES OF RAINFALL DISTRIBUTION




Source: Schueler, T. R. 1992. Design of Stormwater Wetland Systems. MWCOG


(c) DRY SWALE




(d) WET SWALE

# Questions and Answers

Get current at:  www.chesapeakestormwater.net