

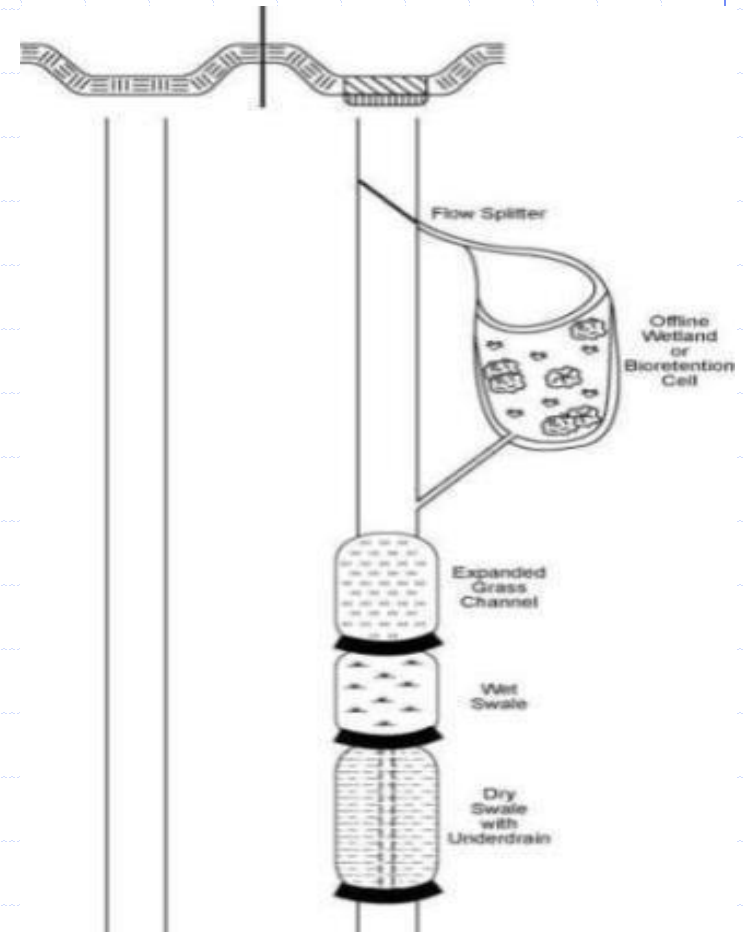
Roadside Ditch Management in the Chesapeake Bay Watershed



Photo Credit: Schneider, 2014

Roadside Ditch Management in the Bay Watershed

- ▶ STAC Report Re-plumbing the Bay” released
- ▶ Agricultural Ditch Expert Panel Launched
- ▶ Pilot CBP Ditch Mapping Project
- ▶ Talbot County Ditch Retrofit and Monitoring
- ▶ EPA Leadership to Get Cross Sector Review
- ▶ Roadside Ditch Management Team Formed



STAC Report

“Re-plumbing the Chesapeake Bay watershed by improving roadside ditch management” released in 2016. K

Key findings:

- ▶ Ditches increase downstream flooding, export sediment, nutrients and bacteria, degrade aquatic habitat and promote invasive species
- ▶ Changes in how ditches are maintained and operated can reduce those impacts
- ▶ Local and state road agencies should be able to get credit for shifting to better RDM practices

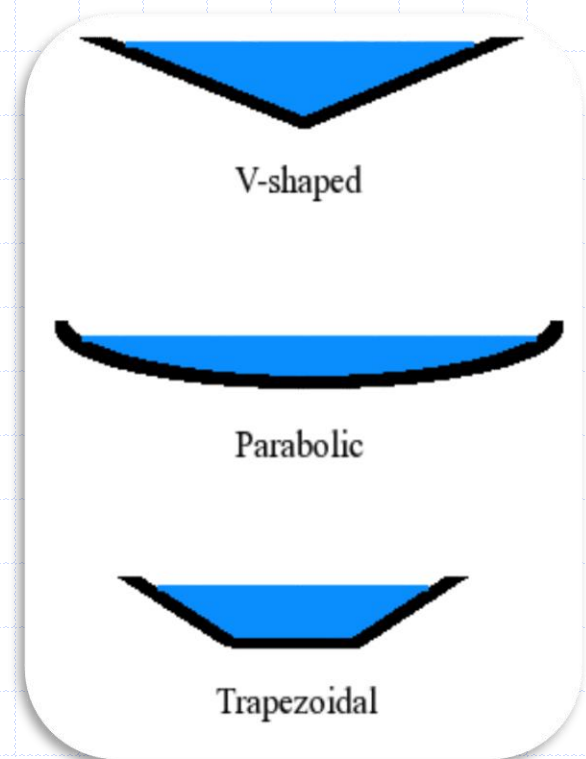


Roadside Ditch Management Team

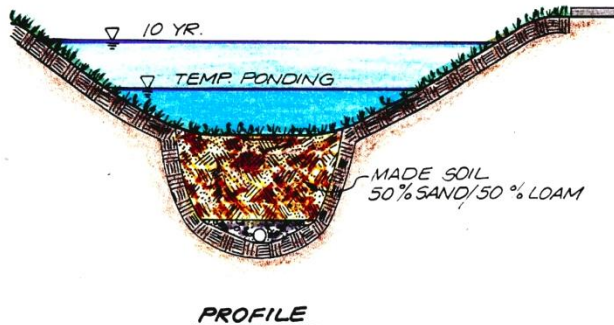
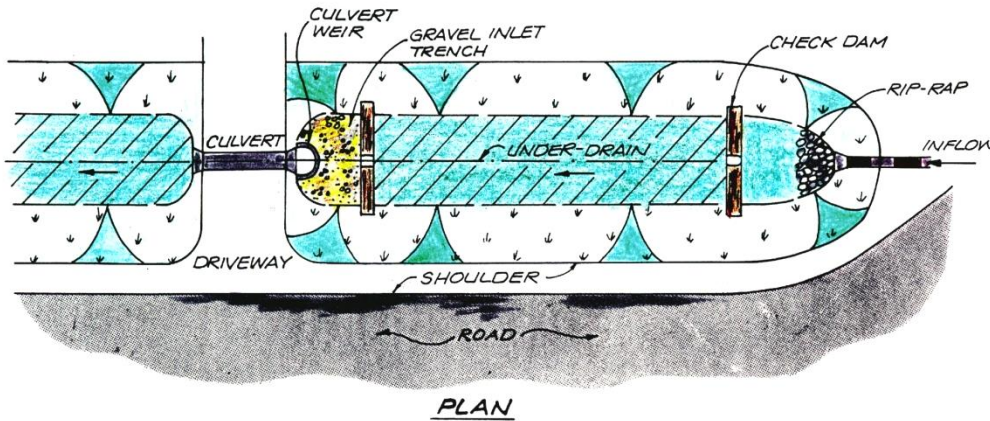
- ◆ Jeff Allenby, Chesapeake Conservancy
- ◆ Steve Bloser, PSU Center for Dirt and Gravel Road Studies
- ◆ Chris Brosch, DE Dept of Agriculture
- ◆ Kathleen Boomer, Nature Conservancy
- ◆ Eric Chase, PSU Center for Dirt and Gravel Road Studies
- ◆ Reid Christianson, Center for Watershed Protection
- ◆ Mark Dubin, University of Maryland
- ◆ Clint Gill, DE Dept of Agriculture
- ◆ Jeremy Hanson, Virginia Tech
- ◆ Lucinda Power, US EPA CBPO
- ◆ Tim Rosen, Mid Shore River Keeper
- ◆ Rebecca Schneider, Cornell University
- ◆ Bill Wolinski, Talbot County DPW (MD)

What do we mean by roadside ditches?

- Not the engineered open channels found along most urban roads and highways
- Not the ditches that drain farm fields
- Includes the ditches adjacent to paved, gravel or dirt roads along exurban, rural, farms and forests
- These ditch network can be a net source of sediment, nutrients and stormwater flows to the stream network
- Ditches require routine sediment cleanouts to preserve the hydraulic capacity



If it was designed
as a BMP, then it
still is a BMP



(a) DRAINAGE CHANNEL



(b) GRASS CHANNEL



(c) DRY SWALE



(d) WET SWALE

RDM Team Charge: Determine if RDM Credits can be defined in the context of existing expert panels or whether a new expert panel needs to be launched

Team met three times and came to consensus on a technical memo on crediting options for work group consideration

Approach reflects variability in ditch conditions across the Bay watershed:

- Coastal plain vs. headwater states
- Road type (dirt, gravel or paved)
- Ditch engineering standards (none to very sophisticated)
- Adjacent land use (agricultural, forest, rural or suburban)



CBP Urban Expert Panel Reports

Relating to Ditch Retrofit and Treatment

Ditch Retrofit or Treatment	Notes	Status
Dry Channel Regenerative Stormwater Conveyance	Urban Retrofit EPR Stream Restoration EPR	Approved
Retrofit of Existing Stormwater Conveyance System	Urban Retrofit EPR	Approved
Swale Enhancements (media)	Urban Retrofit EPR	Approved
Swale Conversions (swale upgrade)	Urban Retrofit EPR	Approved
Swale Restoration	Urban Retrofit EPR	Approved
Dry Swale, Wet Swale, Bioretention, Grass Channel, Constructed Wetlands	State Stormwater Performance Standards EPR	Approved
Soil Amendment	ICD EPR	Approved
Filter Strip Retrofit	Urban Filter Strip EPR	Approved

CBP Urban Expert Panel Reports On Ditch Stabilization and Maintenance

BMP	Notes	Status
Stabilized Drainage Ways	Enhanced Erosion and Sediment Control EPR	Approved
ESC for Dirt and Gravel Roads	Scenario Builder Appendix	Approved
Lined Ditch Sediment Cleanouts	Street/Storm Drain Cleaning EPR	Approved

CBP Agricultural Expert Panel Reports Relating to Ditch Management Practices

BMP	RDM Practices	Status
Agricultural Ditch BMP *	Ditch Enhancement or Treatment	Launched 8/30/2016
Water Control Structures	Ditch Treatment	Approved
Phosphorus-absorbing Systems	Ditch Treatment	Interim
Grass Buffer Strips	Not Sure if it Applies	Approved

** Although agricultural ditches share many characteristics with roadside ditches, they were not part of the charge for the RDM team. Two team members serve on the agricultural ditch panel*

Proposed Classification of Roadside Ditch Management Practices

1. Ditch Buffers
2. Ditch Elimination
3. Ditch Slope/Length Reduction
4. Ditch Stabilization
5. Ditch Maintenance
6. Ditch Treatment
7. Ditch Retrofits

Ditch Buffers

- Excludes crop or livestock production from the public road right of way and a narrow vegetated buffer from the ditch
- No applications of fertilizer, manure or pesticides allowed in the buffer
- Some examples on the eastern shore, but unclear whether they can always be cost-shared .
-

Ditch Elimination

This practice involves eliminating a roadside ditch to:

- (a) reduce or eliminate flow volumes introduced into streams
- (b) reduce or eliminate sediment and nutrient runoff to streams
- (c) disconnect the road network from the stream network.

This is accomplished by raising the road profile, removing berms, and out-sloping the road in order to move water to areas where it can be infiltrated prior to reaching the stream network.

Generally only applies to dirt and gravel roads



Ditch Slope/Length Reduction

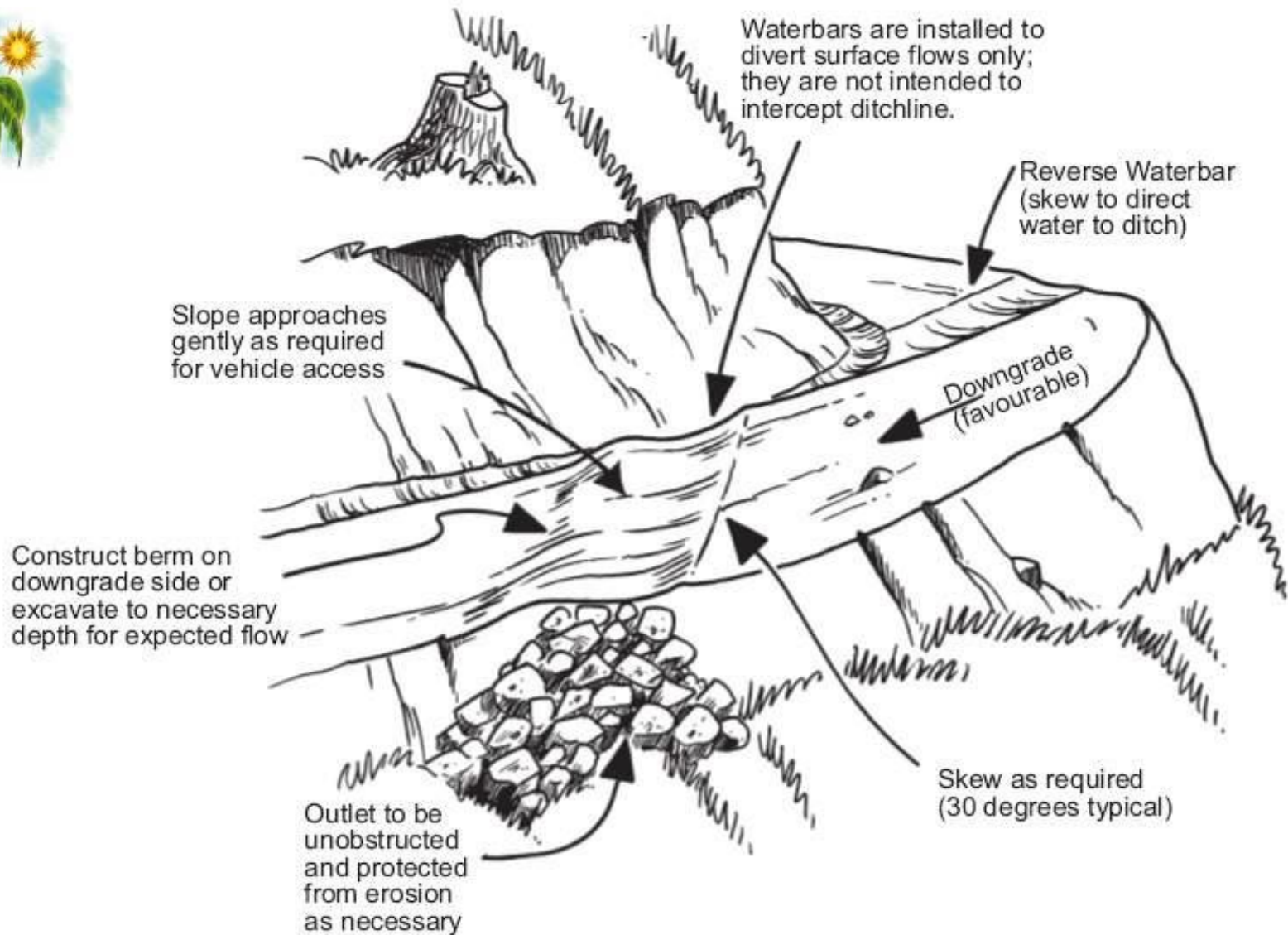
This practice involves modifying a roadside ditch to:

- (a) Reduce flow volumes in the ditch
- (b) Reduce sediment and nutrient runoff to streams
- (c) Minimize the road connection to the stream network.

Accomplished by road design improvements such
installation of drainage cross pipes (culverts), turnouts
(bleeders or lead-off ditches), broad-based dips or grade
breaks

Generally only applies to dirt and gravel roads





Design of Water Bars

Ditch Stabilization

- Restore a failed ditch that is an active source of sediment and nutrient loads exported to downstream waters.
- Involves stabilizing the banks and ditch channel and rapidly establishing dense vegetative cover to prevent further ditch erosion.
- “Stabilized drainage way” practice is specified in most state ESC manuals, roadway construction specs or forest road design manuals.

Ditch Maintenance

- The practice involves routine removal of mobile sediments and organic matter that are trapped in the roadside ditch network
- Sediments removed must be safely disposed in upland areas of the watershed.
- Also involves rapid vegetative stabilization to ensure “clean” ditch does not produce further erosion



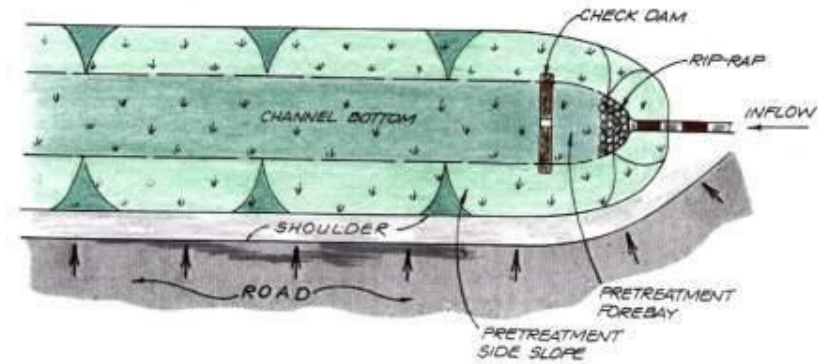
Ditch Treatment

Involves modifying the ditch to improve its stormwater treatment function by:

- (a) Incorporating media amendments into ditch soils
- (b) special check dams or in-ditch bioreactors to boost nutrient removal
- (c) re-shaping ditch contours to increase hydraulic residence time

Note: Many of these techniques are described in the PED report to USWG and the Ag Ditch Expert Panel

Grass Channels



PLAN



PROFILE



LIMITED INFILTRATION

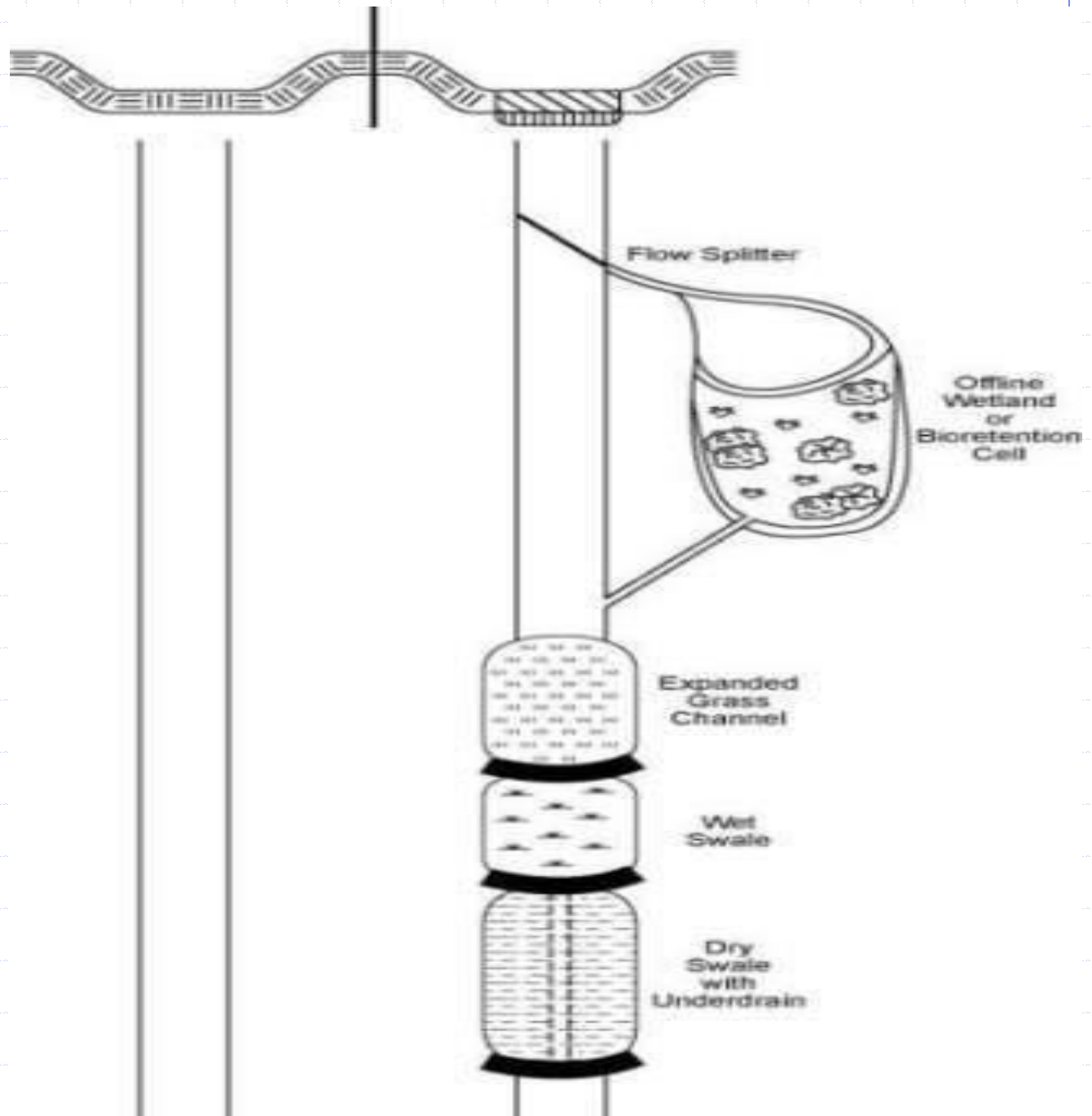
TYPICAL SECTION

Retrofit Ditch to be Stormwater BMP

Increase stormwater treatment (ST) and/or runoff reduction (RR) by excavating additional on-line or off-line runoff storage volume within an existing ditch segment, via:

- (a) Retrofit of existing stormwater conveyance systems
- (b) Converting existing ditch to a Dry Swale, Wet Swale, Bioretention Area or Sand Filter
- (c) Restoring Ditch Function by Major Sediment Cleanout/Vegetative Harvesting
- (d) Enhancing Ditch via Soil or Media Amendments
- (e) Dry Channel Regenerative Stormwater Conveyance Systems (for steeper ditches)
- (f) Continuous Monitoring and Adaptive Control (CMAC) Retrofits

Retrofits within Roadside Ditches

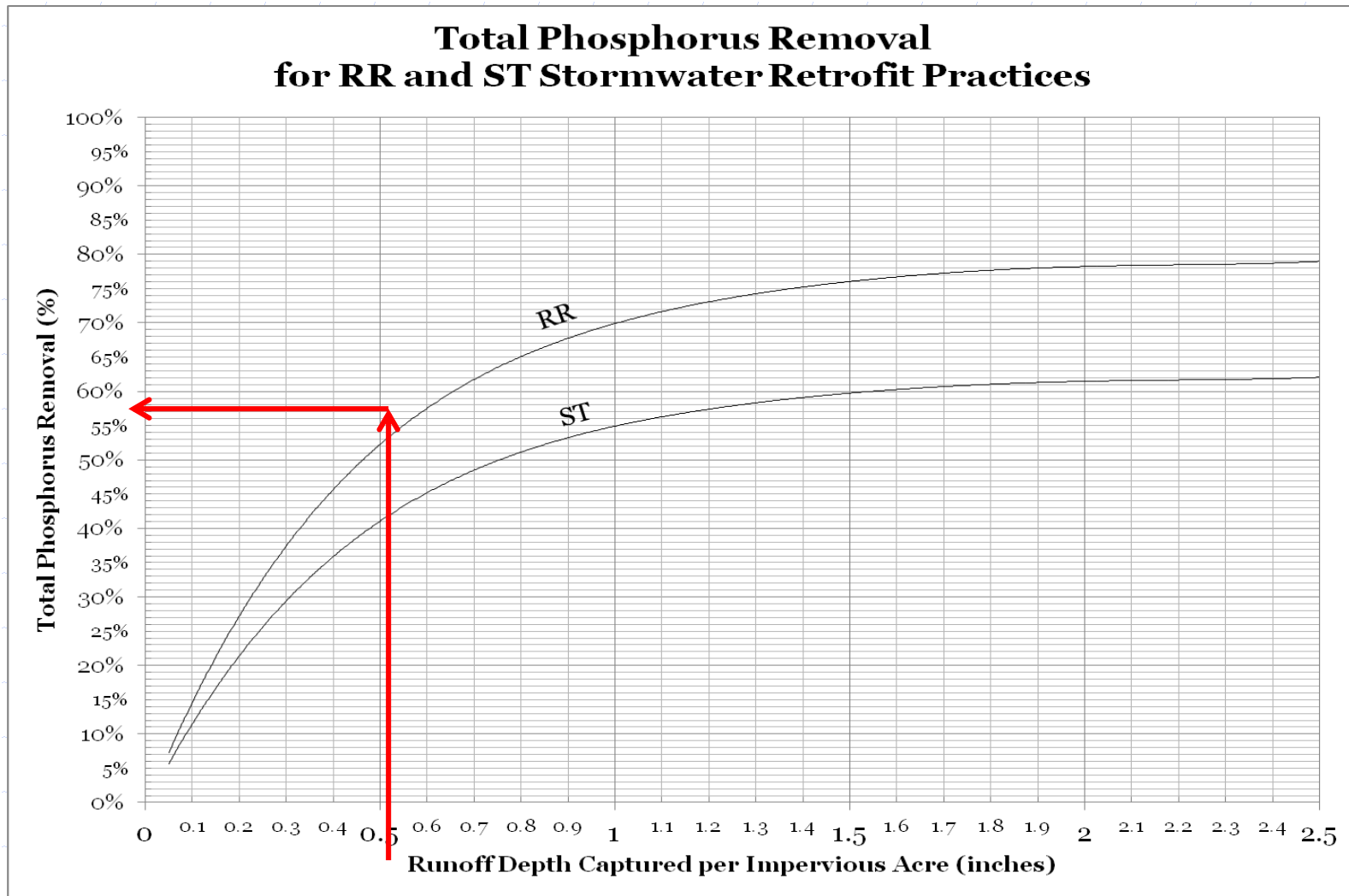


The Adjustor Curve Protocol to Determine Retrofit Removal Rates

Developed by 4 Different Urban Expert Panels:

- Stormwater Retrofit
- New State Stormwater Performance Standards (LID)
- Filter Strip Retrofit Expert Panel
- Floating Treatment Wetland

Removal is tied to runoff capture and runoff reduction



Similar curves were developed for TN and TSS

On-line Ditch Retrofit



RDM Crediting Options

Option 1: Launch an New Expert Panel. Must follow rigorous BMP review protocol established by CBP WQGIT, 2015 that require at least a year and a half to reach consensus and get full CBP approval.

Option 2: Add to Charge of an Ongoing Panel

Option 3: Conduct a Threshold Review. Ascertain if there is sufficient BMP monitoring data and/or engineering models to warrant launching a new expert panel

Option 4: Map RDM Practices into Existing Expert Panel Reports.
USWG developed a new process to determine whether certain BMP variations or innovations can be interpreted or classified in the context of existing expert panel reports

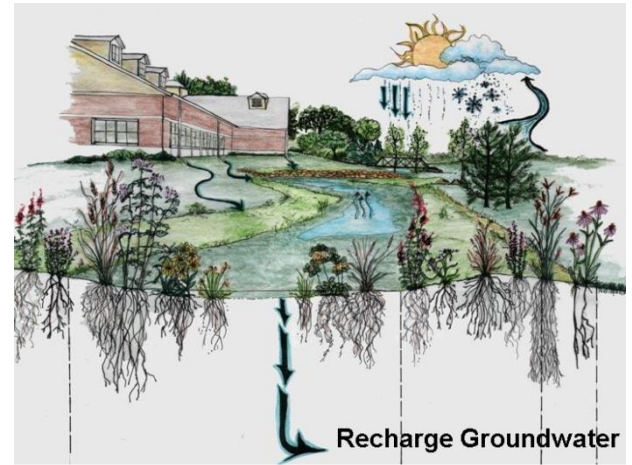
Table 1 Recommended Crediting Options for RDM Practices

RDM Category	Pollutants	Crediting Difficulty	Available Protocol?	Crediting Option	WG?
Buffer	S? N, P	Moderate	Land Use Change?	Option 2	A
Elimination	S only	Easy	WEPP-Road	Option 4	A/U
L/S Reduction	S only	Easy	WEPP-Road	Option 4	A/U
Stabilization	S only	Moderate	ESC Level 2	Option 3	U
Maintenance	S, N/P?	Hard	SD Cleanout	Option 3	U
Treatment	S, N, P	Easy	Adjustor Curves	Option 4	A/U
Retrofit	S, N, P	Easy	Adjustor Curves	Option 4	U
S: Sediment N: Total Nitrogen P: Total Phosphorus WG: Work Group A: Agriculture U: Urban					

Other Cross-Sector Crediting Issues

- How to deal with different land use of the contributing drainage area to the ditch
- Comparable runoff coefficients for urban and non urban land (Appendix D)
- WEPP Forest Road Erosion Predictor
- Consistent reporting and verification of RDM practices

Next Steps



- Seeking Feedback from Agriculture and Urban Workgroups on the Memo by 8/1/17
- Revise Memo and Send Recommendation to WQGIT
- Form small teams to flesh out crediting protocols for individual RDM categories