

WIP TMDL pollutant load redux

Chesapeake Bay Phase III Watershed Implementation Plan

Basin	WIP3 (ft)	WIP3 (mi)
Potomac	70,051	13.27
Rappahannock	132,494	25.09
York	141,042	26.71
James	79,446	15.05
Eastern Shore	76,977	14.58
SUM	500,000	94.70

- TMDL – total maximum daily load
- pollution diet to reduce nitrogen, phosphorus, sediment in Ches Bay
- WIP released mid-2019
- guides actions through 2025
- multi-sector blueprint
- BMPs necessary to achieve pollutant reduction targets
- includes basin-level goals for shoreline management BMPs, including living shorelines

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Expert Panel Report

- convened by USEPA Chesapeake Bay Program
- report approved 2015, revised 2017, amended 2019
- review the science and published literature
- develop protocols to estimate pollutant reductions associated with different shoreline erosion BMPs

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Expert Panel Report

Table 1. Summary of shoreline management pollutant load reduction for individual projects.

Protocol	Submitted Unit	Total Nitrogen (lbs per unit)	Total Phosphorus (lbs per unit)	Total Suspended Sediment (lbs per unit)
Protocol 1 - Prevented Sediment	Linear Feet	Project Specific*	Project Specific*	Project Specific
	Acres of re-vegetation	85	NA	NA
Protocol 2 - Denitrification	Acres of re-vegetation	NA	5,289	6,959
Protocol 3 - Sedimentation	Acres of re-vegetation	6.83	0.3	NA
Protocol 4 - Marsh Reestablishment	Linear Feet	MD = 0.04756 VA = 0.02218	MD = 0.03362 VA = 0.00861	MD = 164 VA = 42

Non-conforming/Existing Practices

MD = 0.04756, VA = 0.02218, MD = 0.03362, VA = 0.00861, MD = 164, VA = 42

*The WIPWS initially recommended reductions for TN and TP be made only after the Modeling Workgroup had an opportunity to evaluate the availability of TN and TP in shoreline sediments in 2017. The WIPWS approved the reductions in 2017 following the Modeling Workgroup analysis which estimated an average of 0.00020 for TN of 75% and 0.00020 for TP of 75% of TMDL in eroded tidal shoreline sediments. These values can be used directly by jurisdictions for their calculations in Protocol 1, and were adjusted for non-conforming practices by multiplying the default TSD reduction for non-conforming projects by the average nutrient concentrations in sediments. Note the MD numbers also apply to DE and DC. The default rate for sediment is based on the sediment erosion estimates from Table 3 with a 50% reduction factor applied. The first number applies to MD, DE, and DC and the second number applies to VA.

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Example

100 feet of shoreline
10 feet
Rappahannock River

annual erosion rate = 1 foot

- 15.77 tons of sediment
- 27.14 pounds of nitrogen
- 19.19 pounds of phosphorus

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Methodology

- Project Construction Date – VMRC permit database or other verified source
- Protected Shoreline Length (ft) – VMRC permit database
- Planted Marsh (ac) – VMRC permit database
- Erosion Rate (ft/yr) – VIMS Shoreline Studies Program – actual historic shoreline erosion from aerial images (1937-2009)
- Bank Height (ft) – VGIN LIDAR digital elevation models
- Upland Land Use (Agricultural, Forest, or Urban) – National Land Cover Dataset, VBMP Land Cover, VBMP aerial photography, NAIP aerial photography, VIMS CCRM

Potential L formula

sediment reduction credits = product of 7 variables

1. length of shoreline (ft)	where:
2. erosion rate (ft/yr)	• bulk density conversion = 93.6 lbs/ft ³
3. bank height (ft)	• BMP efficiency = 100%
4. bulk density conversion	• land reduction factor = 0.337
5. BMP efficiency	• bank instability reduction = 20% or 50% or 100%
6. land reduction factor	
7. bank instability reduction	

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Virginia Marine Resources Commission

Potential shoreline length: From VMRC Permit Database

Planted Marsh: From VMRC Permit Database

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Shoreline Mgmt BMP Verification Outcomes – Sites, Shoreline

# of Sites	1,726	
# of Sites with Plants	121	7.0%
Length of Protected Shoreline	356,687 feet	
	67.55 miles	
average per site	206.7 ft/site	
Planted Area	755,168 sq-ft	
	17.34 acres	
average per site	6,241.1 sq-ft/site	



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Shoreline Mgmt BMP Verification Outcomes – Reduction Credits

	S (tons)	N (lbs)	P (lbs)
Protocol 1 (annual)	20,803.2	35,669.1	25,214.4
	99.7%	95.7%	99.6%
Protocol 2 (annual)	---	1,473.6	---
Protocol 3 (annual)	60.3	---	91.7
Protocol 4 (one-time)	---	118.4	5.2
SUM 3 Marsh Protocols	60.3	1,592.0	96.9
	0.3%	4.3%	0.4%
SUM 4 Protocols	20,863.6	37,261.1	25,311.2
average per site	12.09	21.59	14.66
average per ft	0.0585	0.1045	0.0710
Default Protocol (annual)	7,490.4	12,890.7	9,113.4
	35.9%	34.6%	36.0%



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Shoreline Mgmt BMP Verification – WIP3 Goals vs. Reported Credits

Major Basin	WIP 3 Goals		
	goal (ft)	rprtd (ft)	% of goal
Potomac	70,051	55,041	78.6%
Rappahannock	132,484	95,580	72.1%
York	141,042	97,291	69.0%
James	79,446	81,624	102.7%
Eastern Shore	76,977	27,151	35.3%
TOTAL	500,000	356,687	71.3%



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