

Shoreline Management BMP Verification for Chesapeake Bay TMDL WIP

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Virginia Department of Conservation and Recreation

VIMS CCRM Tidal Shoreline Workshop
Keeping Up with Shoreline Changes

July 14, 2022
Gloucester Point, VA





WHAT WE ARE

The Department of Conservation and Recreation (DCR) is the state's lead natural resource conservation agency. DCR protects what Virginians care about - natural habitat, parks, clean water, dams, open space and access to the outdoors.

WHAT WE DO

DCR enables and encourages PEOPLE to enjoy and benefit from Virginia's NATURAL and CULTURAL RESOURCES.

ENJOY THE OUTDOORS

Virginia State Parks and Natural Area Preserves provide a wide variety of outdoor experiences. Every year, more than 10 million people visit state parks and natural areas. From the Atlantic Ocean to Cumberland Gap, DCR offers natural and outdoor recreation and education for everyone.

- 182,000 acres in state parks and natural area preserves
- More than 800 miles of trails
- 262 cabins, 22 family lodges and 1,800 campsites
- 11 swimming beaches and six pools

Nearly every state resident lives within an hour's drive of a state park or natural area preserve. In 2017, park visitors spent \$228 million, of which \$104 million came from out-of-state visitors. For every \$1 of general tax money spent, more than \$12 of out-of-state money came into Virginia because of state parks.

07/14/2022

CONSERVE THE OUTDOORS

Land Conservation: This team works with landowners, land trusts and other state agencies to conserve land. It also provides grants and guidance to fund land conservation and handles DCR's real estate transactions.

Soil and Water Conservation: DCR works with Virginia's 47 soil and water conservation districts, farmers, urban and suburban landowners, and other land managers to reduce harmful runoff in Virginia waters. DCR works to reduce nutrients and sediment that can impact the quality of Virginia's waters, including the nation's largest estuary, the Chesapeake Bay.

Outdoor Planning, Design and Construction: DCR provides comprehensive outdoor-recreation planning that includes grants, financial incentives, training, and technical expertise pertaining to open space use and access. DCR also manages the Scenic Rivers Program and the "Virginia Outdoors Plan." The design and construction staff plans and builds facilities within state parks.

PROTECT THE OUTDOORS

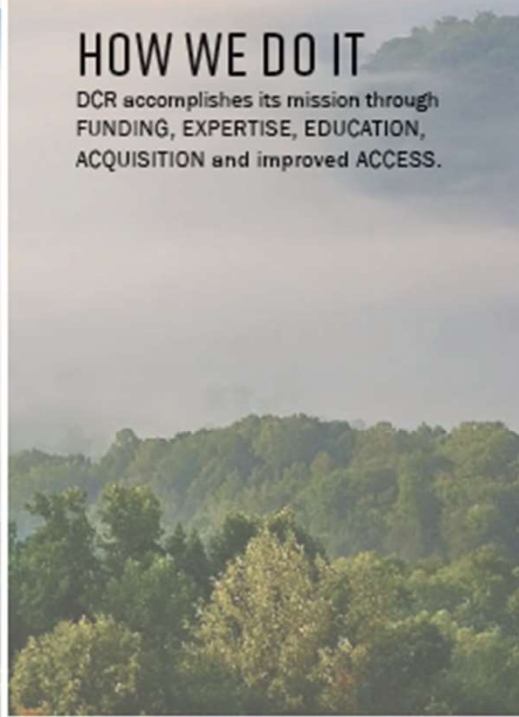
Natural Heritage: This unit manages Natural Area Preserves and develops, maps and shares rare species, habitat and natural community data. Science-based information and prioritization tools are shared with partners to conserve biodiversity, natural resources and ecologically important places. More than 2,200 high-priority conservation sites that have rare plant and animal species, natural communities or significant caves have been identified and must be protected.

Dam Safety and Floodplain Management: The most common natural disaster is flooding. DCR works to keep communities safe and protect homes and property through floodplain management and by ensuring the structural integrity of Virginia's dams.

Policy and Public Communications: DCR guides Virginia policy related to the outdoors and provides public information on outdoor recreation and significant milestones and events pertaining to Virginia's natural resources.

HOW WE DO IT

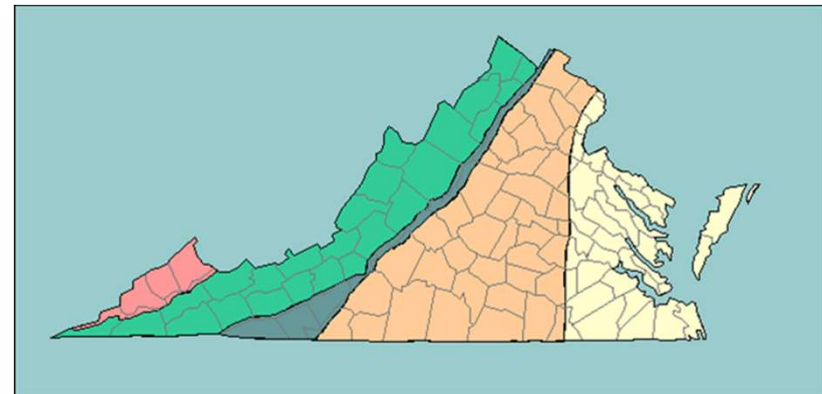
DCR accomplishes its mission through FUNDING, EXPERTISE, EDUCATION, ACQUISITION and improved ACCESS.



Shoreline Erosion Advisory Service

SEAS

- Shoreline Erosion Advisory Service
 - established 1980
 - science-based technical assistance on environmentally sound shoreline mgmt alternatives
 - private property owners & public land mgmt agencies experiencing erosion
 - tidal shorelines or non-tidal streambanks & impoundments



SEAS

- Services
 - on-site field investigation of erosion issues
 - written advisory reports with recommended solutions
 - review designs and plans
 - construction inspections
 - guidance on financial incentive programs
- all SEAS services are **NO COST** to property owners



Living Shoreline Financial Incentives

- Streamlined Permitting
 - VMRC Group 1 and Group 2 General Permits
- Low Interest Loans on Residential/Business & Public Property
 - Middle Peninsula PDC thru DEQ Living Shoreline Loan Program
- Low Interest Loans on Agricultural Property
 - DEQ Agricultural BMP Loan Program
- Cost-Share on Residential Property
 - Virginia Conservation Assistance Program (VCAP) thru SWCDs
 - James River Association cost-share program
 - Elizabeth River Project cost-share program
- Cost-Share on Agricultural Property
 - Virginia Agricultural BMP Cost-Share Program (VACS) – DCR
- Tax Credits on Agricultural Property
 - Virginia Agricultural BMP Cost-Share Program (VACS) – DCR
- Property Tax Exemption
 - HB 526 (2016)



VACS SE-2 Shoreline Stabilization

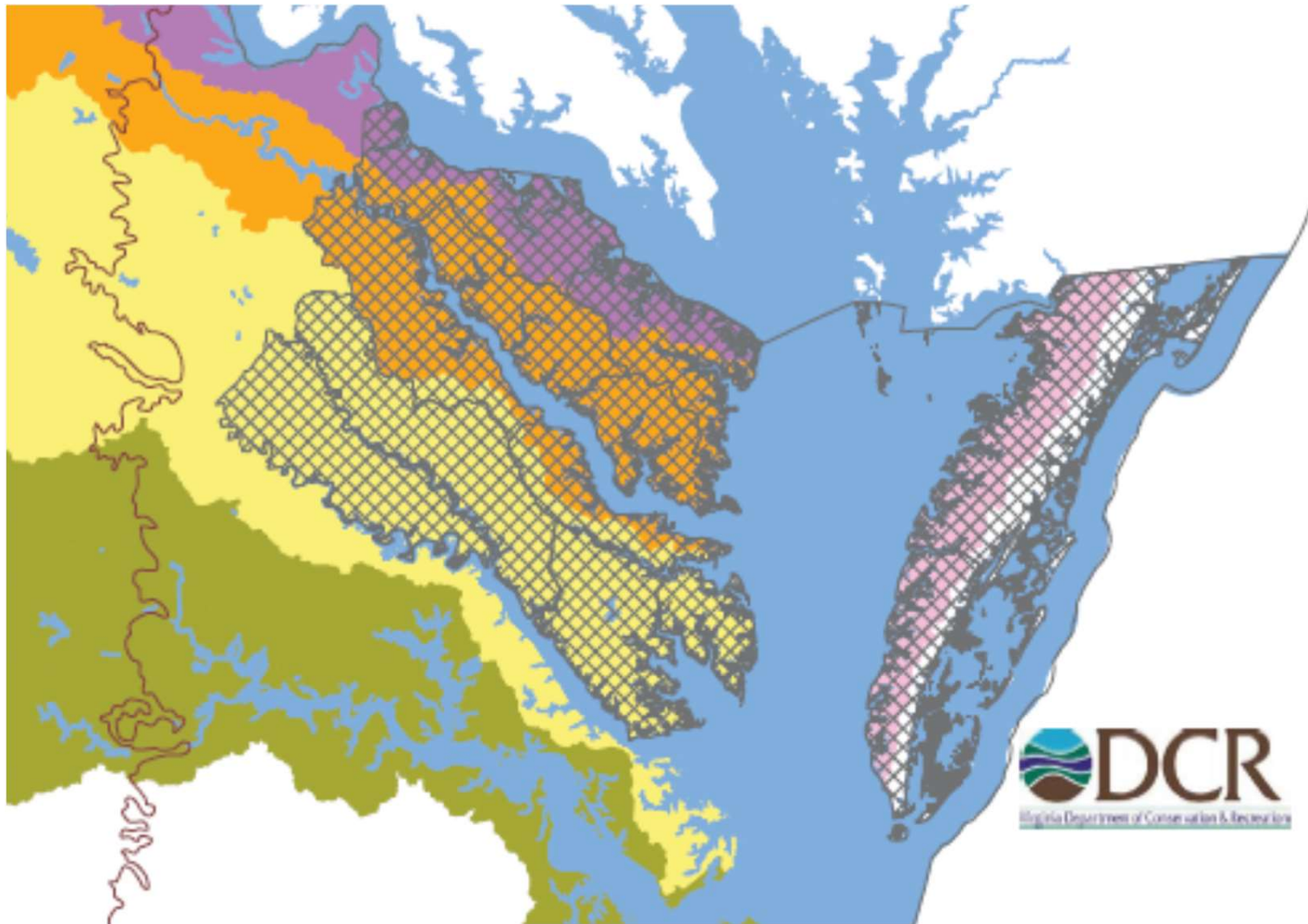
- structures and/or vegetative measures designed to stabilize shorelines of tidally-influenced waters
- cost-share and tax credit
 - land shaping to achieve stable slope
 - revetments, sills (riprap or oyster shell bags), groins, breakwaters, gabions
 - establishment of vegetation
 - engineering and design assistance
- all designs must be reviewed by SEAS
- subject to NRCS Standard 580 Streambank and Shoreline Protection
 - requires design services from Professional Engineer
 - District Engineering Services conduct functional review of design
- 15-year BMP life = landowner maintenance
- 75:25 cost-share rate

NFWF INSR 2021 Grant

NFWF 2021 INSR

- Accelerating the Scale and the Rate of Living Shoreline Implementation in Rural Coastal Virginia
- now thru June 30, 2024
- \$1M federal grant + \$2M match
- funded by National Fish and Wildlife Foundation and U.S. Environmental Protection Agency
 - through Innovative Nutrient and Sediment Reduction Grant Program, a core program under NFWF’s Chesapeake Bay Stewardship Fund
 - additional support for CBSF is provided by U.S. Department of Agriculture’s Natural Resources Conservation Service and U.S. Forest Service, U.S. Department of the Interior’s U.S. Fish and Wildlife Service, and the Altria Group
- *This material is based on work supported by the U.S. Environmental Protection Agency (Assistance Agreement No. CB96358201) and the National Fish and Wildlife Foundation’s Chesapeake Bay Stewardship Fund, which promotes community-based efforts to develop conservation strategies to protect and restore the diverse natural resources of the Chesapeake Bay.*
- *The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the U.S. Government or the National Fish and Wildlife Foundation and its funding sources. Mention of trade names or commercial products does not constitute their endorsement by the U.S. Government, or the National Fish and Wildlife Foundation or its funding sources.*

Rural Coastal Virginia



Objectives

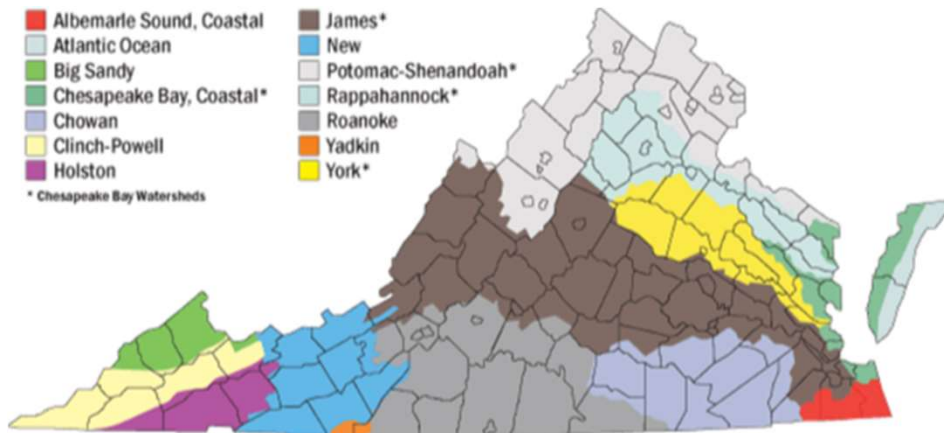
- grow and enhance existing partnerships engaged in living shoreline implementation across Rural Coastal Virginia
- develop cache of shovel-ready living shoreline projects with completed engineering designs on socially vulnerable sites, agricultural sites, & other priority sites
- provide financial incentives to construct new living shorelines on socially vulnerable sites
- document installation of recently implemented shoreline mgmt projects across tidewater Virginia that have not yet been credited towards WIP goals

Shoreline Management & Chesapeake Bay TMDL WIP

Chesapeake Bay Phase III WIP

Basin	WIP3 (ft)	WIP3 (mi)
Potomac	70,051	13.27
Rappahannock	132,484	25.09
York	141,042	26.71
James	79,446	15.05
Eastern Shore	76,977	14.58
SUM	500,000	94.70

- released mid-2019
- guide actions through 2025
- multi-sector blueprint
- BMPs necessary to achieve pollutant reduction targets
- includes basin-level goals for shoreline management BMPs, including living shorelines
- State Lands WIP 2021



Chesapeake Bay Phase III WIP

>500 ideas and suggestions, one of six common themes among programmatic actions

- Enhance promotion of living shoreline techniques to address shoreline erosion

7.1 Multi-Sector Policy Initiatives

- (1) Enhance reporting of BMP implementation
- (4) Pursue the restoration and enhancement of wetland habitats
- (6) Coastal Resilience Master Plan (NNBFs)

7.2 Agricultural Sector Policy Initiatives

- (15) Reinstate Virginia's Agriculture BMP Loan Program
- (20) Make revisions to the Virginia Agricultural BMP Cost-Share Program (VACS)
- (34) Support growth of private sector native plant nurseries

7.4 Developed Lands (incl. MS4) Sector Policy Initiatives

- (43) Establish state cost share for residential homeowners (i.e., VCAP)
- (44) Enhance marketing of funding opportunities (e.g., SLAF) for non-MS4

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

Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects

Submitted by:

Nathan Forand, Kevin DuBois, Jeff Halka, Scott Hardaway, George Janek, Lee Karrh, Eva Koch, Lewis Linker, Pam Mason, Ed Morgereth, Daniel Proctor, Kevin Smith, Bill Stack, Steve Stewart, and Bill Wolinski

Accepted by Urban Stormwater Work Group: April 15, 2014
Approved by Watershed Technical Work Group: February 13, 2015
Approved by Water Quality Goal Implementation Team: July 13, 2015
Amended by WTWG and WQGIT: June, 2017

NOTE: THIS VERSION SUPERCEDES ALL PRIOR VERSIONS

Prepared by:

Sadie Drescher and Bill Stack (Chair), Center for Watershed Protection, Inc. and EPA Chesapeake Bay Program Office (CBPO) Sediment Stream Restoration Coordinator



1

Expert Panel Report

Table 7. Criteria for Chesapeake Bay TMDL pollutant load reduction for shoreline management practices. These are the basic qualifying conditions.

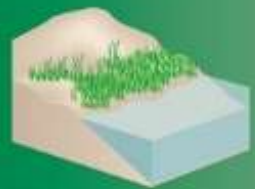
Shoreline Management Practice	The Practice Must Meet these Criteria for TMDL Pollutant Load Reduction ¹
Living Shoreline – a) nonstructural; b) hybrid system including a sill; and c) hybrid system including a breakwater	1. The site is currently experiencing shoreline erosion or is replacing existing armor. The site was graded, vegetated, and excess sediment was removed or used. ² AND 2. When a marsh fringe habitat (a or b) or beach/dune habitat (c) is created, enhanced, or maintained.
Revetment AND/OR Breakwater system without a living shoreline	1. The site is currently experiencing shoreline erosion, AND 2. A living shoreline is not technically feasible or practicable as determined by substrate, depth, or other site constraints. AND 3. When the breakwater footprint would not cover SAV, shellfish beds, and/or wetlands.
Bulkhead/Seawalls	1. The site is currently experiencing shoreline erosion. AND 2. The site consists of port facilities, marine industrial facilities, or other marine commercial areas where immediate offshore depth (e.g., depths deeper than 10 feet 35 feet from shore) precludes living shoreline stabilization or the use of a breakwater or revetment.
¹ Projects that impact the Chesapeake Bay Preservation Act protected vegetation without mitigation receive no Chesapeake Bay TMDL pollutant load reduction. Further, WQGIT agreed to allow States to determine, on a case-by-case basis, when the unintended consequences of negative impacts to wetlands and SAVs caused by these shoreline management techniques, outweigh the benefits, in which case the practice will not be reported to the Bay Program for model credit.	

HOW GREEN OR GRAY SHOULD YOUR SHORELINE SOLUTION BE?

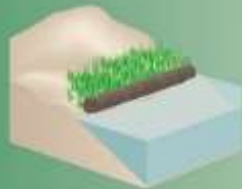
GREEN - SOFTER TECHNIQUES

GRAY - HARDER TECHNIQUES

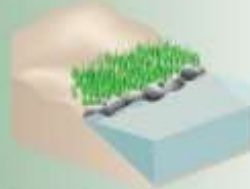
Living Shorelines



VEGETATION ONLY -
Provides a buffer to upland areas and breaks small waves. Suitable only for low wave energy environments.



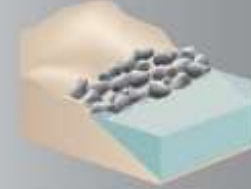
EDGING -
Added structure holds the toe of existing or vegetated slope in place.



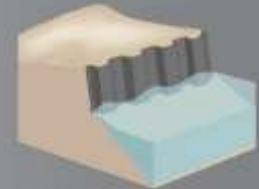
SILLS -
Parallel to existing or vegetated shoreline, reduces wave energy, and prevents erosion. Suitable for most areas except high wave energy environments.



BREAKWATER -
(vegetation optional) - Offshore structures intended to break waves, reducing the force of wave action, and encourage sediment accretion. Suitable for most areas.



REVETMENT -
Lays over the slope of the shoreline and protects it from erosion and waves. Suitable for sites with pre-existing hardened shoreline structures.



BULKHEAD -
Vertical wall parallel to the shoreline intended to hold soil in place. Suitable for areas highly vulnerable to storm surge and wave forces.

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
Protocol 2 – Denitrification	Acres of re-vegetation	85	NA	NA
Protocol 3 - Sedimentation	Acres of re-vegetation	NA	5.289	6,959
Protocol 4 – Marsh Redfield Ratio	Acres of re-vegetation	6.83	0.3	NA
Non-conforming/Existing Practices *	Linear Feet	MD = 0.04756 VA = 0.01218	MD = 0.03362 VA = 0.00861	MD = 164 VA = 42

I call this the default Protocol

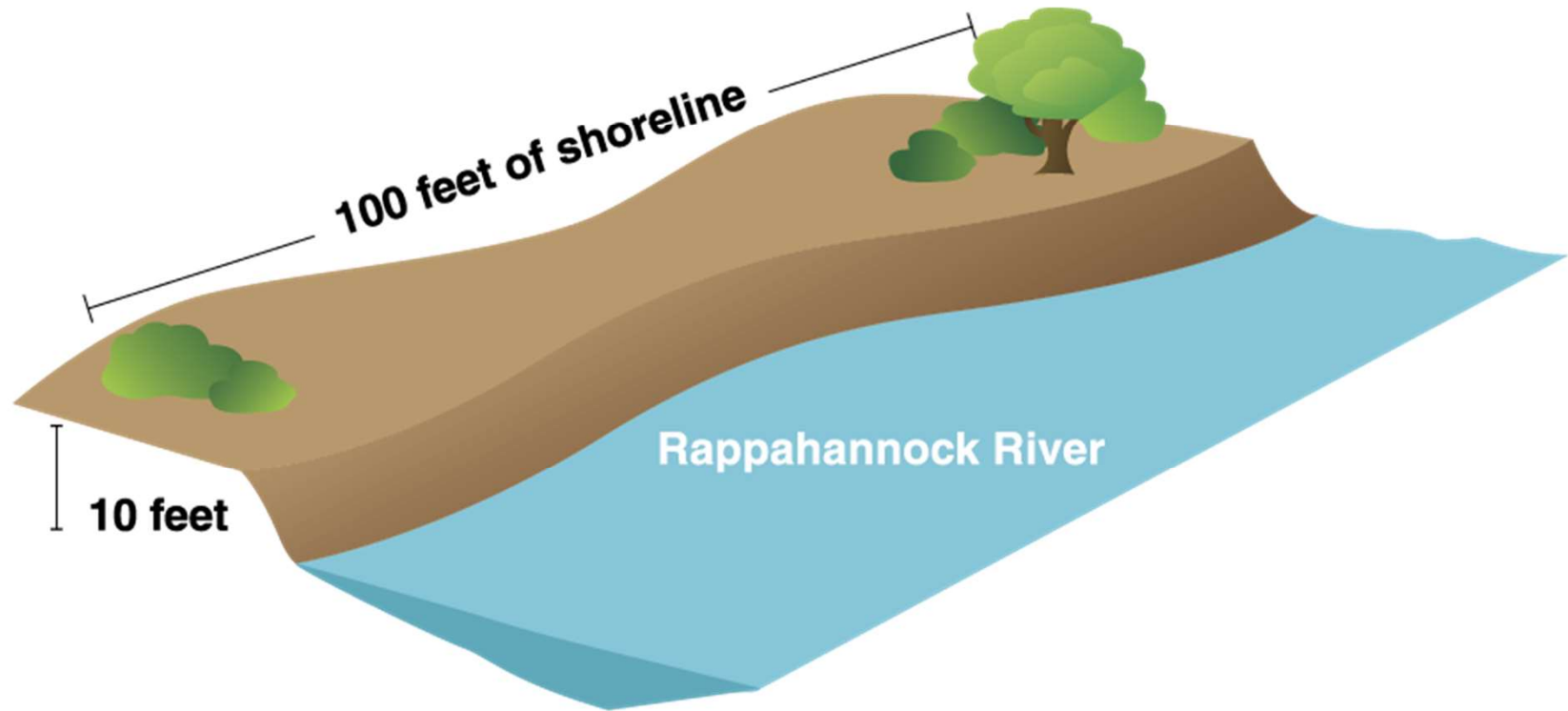


*The WTWG initially recommended reductions for TN and TP be made only after the Modeling Workgroup had an opportunity to evaluate the availability of TN and TP in shoreline sediments in 2017. The WTWG approved the reductions in 2017 following the Modeling Workgroup analysis which estimated an average of 0.00029 lbs TN/lb of TSS and 0.000205 lbs TP/lb of TSS in eroded tidal shoreline sediment. These values can be used directly by jurisdictions for their calculations in Protocol 1, and were adapted for non-conforming/existing practices by multiplying the default TSS reduction for non-conforming projects by the average nutrient concentrations in sediment. Note: the MD numbers also apply to DE and DC. The default rate for sediment is based on fine 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.



Update released on August 1, 2019

- **Updates to non-urban and urban shoreline management nitrogen and phosphorus reduction factors for MD, DE, DC, and VA will change the loads for any scenario including the shoreline management BMP.** Please note that official CBP Progress scenarios will not be re-run. CBP Progress loads will change if you copy
 - Non-Urban Shoreline Management and Urban Shoreline Management TN and TP Reduction Factors:
 - MD - TN lbs/ft: Original = 0.04756/ Revised = 0.08632; TP lbs/ft: Original = 0.03362/ Revised = 0.06102
 - VA - TN lbs/ft: Original = 0.01218/ Revised = 0.03614; TP lbs/ft: Original = 0.00861/ Revised = 0.02555



annual erosion rate = 1 foot

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

Expert Panel Report

Protocol 1 formula

sediment reduction credit = product of 7 variables

1. length of shoreline (ft)
2. erosion rate (ft/yr)
3. bank height (ft)
4. bulk density conversion
5. BMP efficiency
6. sand reduction factor
7. bank instability reduction

where:

- bulk density conversion = 93.6 lbs/ft³
- BMP efficiency = 100%
- sand reduction factor = 0.337
- bank instability reduction = 0% or 50% or 100%

BMP Verification Project

- utilize Expert Panel report and protocols to
 - identify shoreline management BMPs implemented across tidal Virginia since 2008 that qualify for Chesapeake Bay TMDL WIP pollutant reduction credits
 - verify that installation of those BMPs meets specifications set out by USEPA
 - quantify and report earned pollutant reduction credits as part of Commonwealth's efforts to meet WIP goals

BMP Verification Project

- Virginia Dept. of Conservation and Recreation
 - Shoreline Erosion Advisory Service
- Virginia Institute of Marine Science
 - Sea Grant’s Commonwealth Coastal & Marine Policy Fellowship
 - Shoreline Studies Program
 - Center for Coastal Resources Management
- Virginia Marine Resources Commission
 - Habitat Management Division
- Virginia Dept. of Environmental Quality
- Office of the Governor of Virginia / Virginia Tech
 - Virginia Management Fellows Program
- Friends of the Rappahannock & James River Association



Methodology – Permits

- VMRC Habitat Permit Database
 - January 1985-June 2016 (>11,000 records)
 - Records also at VIMS-CCRM database
 - Added July 2016-December 2018 (>5,000 records)
 - Subsequently added Jan 2019 thru June 2021
- Selected permit applications received since 01/01/2008
- Selected permit applications where Structures included
 - Riprap, Revetment, Sill, Breakwater, Living Shoreline, Bioengineered Structure, Coir Log, Marsh Toe Sill
 - >2,500 records + 1,000 records

Methodology – Parameters

- Project Construction Date
 - VMRC permit database
- Protected Shoreline Length (ft)
 - VMRC permit database
- Planted Marsh (ac)
 - VMRC permit database
- Erosion Rate (ft/yr)
 - VIMS Shoreline Studies Program GIS – actual historic shoreline erosion from aerial images (1937-2009)
- Bank Height (ft)
 - VGIN LiDAR digital elevation model files (2009-2013)
- Upland Land Use (Agricultural, Forest, or Urban)
 - National Land Cover Dataset (2011), VBMP Land Cover (2013-2015), VBMP 2013 aerial photography, NAIP 2016 aerial photography, CCRM

Virginia Marine Resources Commission

Habitat Management Division > Habitat Permits

Contact Us |

<< Search Again

Export Results to PDF

Export Results to Excel

Display Results in Google Maps

Search Results: 1 Permits

Search Criteria:

Application Number is like 20150214

Applications received since January 2010 may include a scanned image of the original application, a Google Map of the area, and the permit document (depending on permit status) which can be found in the right-hand column. Additional documents such as revisions, protests, and partner agency comments are only included for applications entered after September 1, 2013.

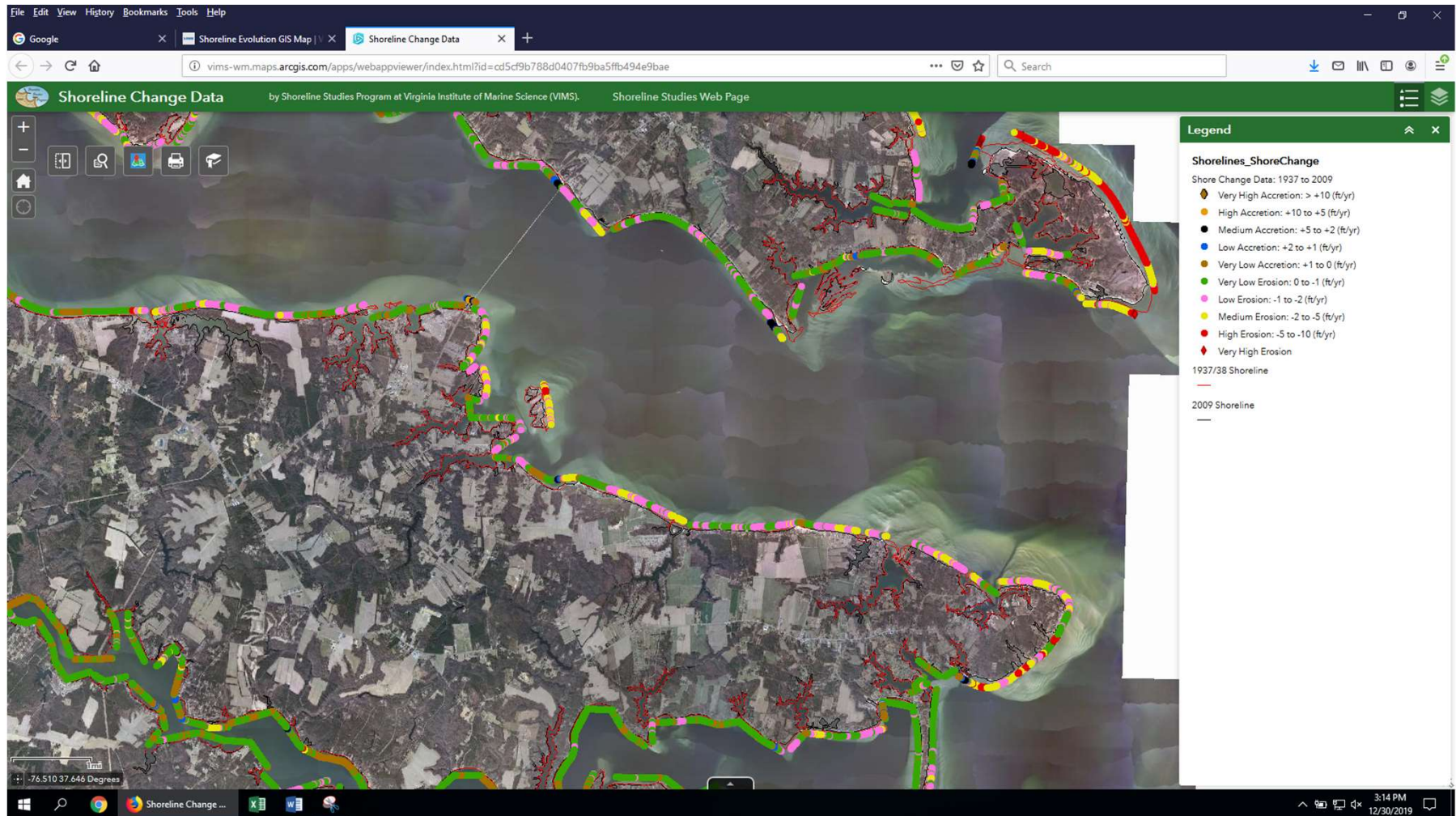
Requires Google Chrome, Mozilla Firefox, Safari, or IE 10.0 or greater. Please turn off pop-up blocker for this site.

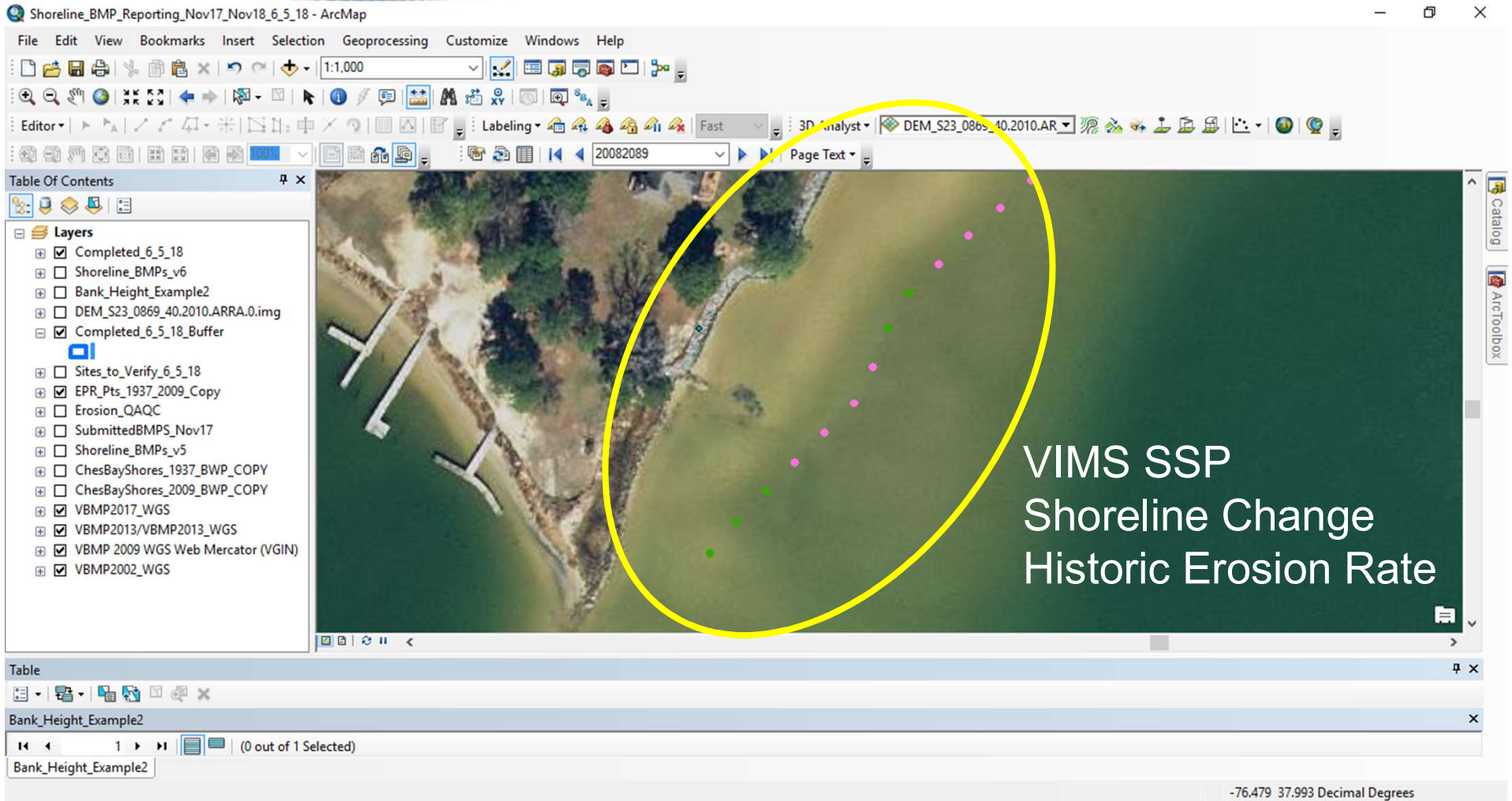
Application Number	Applicant	Date Application Received	Status	Project Description	Locality	Waterway	Local Wetlands Board Action	Application Permit Map Report Add Docs
20150214	NORFOLK, CITY OF	02/18/2015	No Permit Necessary	LaValette Boat Ramp Living Shoreline Project Sill: 167 Linear Feet Sill Fill: 454 Cubic Yards Core Log: 238 Linear Feet Living Shoreline: 405 Linear Feet Fill/Plantings: 9349 Square Feet	Norfolk	Lafayette River	No Permit Required	Application Google Map Report Additional Docs

Protected shoreline length:
From VMRC Permit Database

Planted Acreage:
From VMRC Permit Database

VIMS SSP Shoreline Evolution







Shoreline_BMP_Reporting_Nov17_Nov18_6_5_18 - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

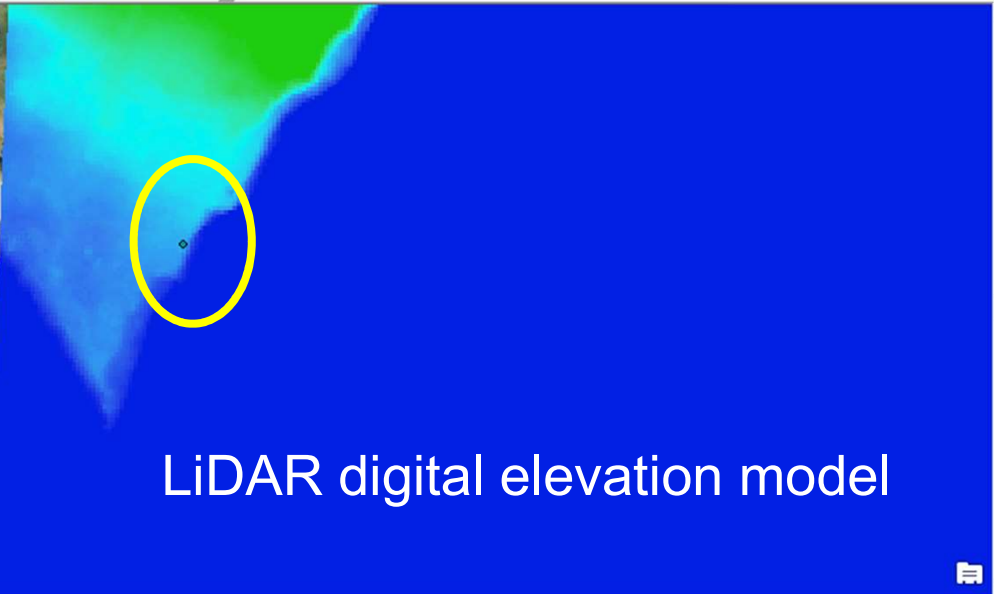

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Editor Labeling Fast 3D Analyst DEM_S23_0869_40.2010.AR

20082089 Page Text

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LiDAR digital elevation model

Table

Bank_Height_Example2

1 (0 out of 1 Selected)

Bank_Height_Example2

-76.481 37.993 Decimal Degrees

Verification

1. VMRC-inspected and deemed 'in compliance'
 - VMRC Inspection Date = BMP 'Installation Date'
 2. Not VMRC-inspected, but visible via aerial imagery (DCR-SEAS desktop verification)
 - Date of Imagery = BMP 'Installation Date'
 3. Not VMRC-inspected and not visible via aerial imagery (DCR-SEAS field verification required)
 - Date of DCR field visit = BMP 'Installation Date'
- 5-year BMP life, renewable upon verification

Outcomes – Verification Categories

Verification		
1024	71.9%	VMRC Inspected, In Compliance
0	0.0%	LWB Inspected, In Compliance
354	24.8%	Desktop Verified by DCR-SEAS
47	3.3%	Field Verified by DCR-SEAS

Shoreline Mgmt BMP Verification Outcomes – Sites, Shoreline

# of Sites	1,425	
# of Sites with Plants	83	5.8%

Length of Protected Shoreline	292,920	feet
	55.48	miles

Planted Area	660,378	square feet
	15.16	acres

Shoreline Mgmt BMP Verification Outcomes – Reduction Credits

	S (tons)	N (lbs)	P (lbs)
Protocol 1 (annual)	18,952.4	32,618.4	23,057.8
	99.7%	95.9%	99.6%

Protocol 2 (annual)	---	1,288.6	---
Protocol 3 (annual)	52.7	---	80.2
Protocol 4 (one-time)	---	103.5	4.5
SUM 3 Marsh Protocols	52.7	1,392.2	84.7
	0.3%	4.1%	0.4%

SUM 4 Protocols	19,005.2	34,010.6	23,142.6
average per site	13.34	23.87	16.24
average per ft	0.0649	0.1161	0.0790

Default Protocol (annual)	6,151.3	10,586.1	7,484.1
	32.4%	31.1%	32.3%

Outcomes – Erosion Rate Analysis

Sites with Erosion Rate \leq (feet/year)			
	1.0	0.5	0.1
#	968	685	109
	67.9%	48.1%	7.6%
S (tons)	7,523.2	3,398.4	148.7
	39.6%	17.9%	0.8%
length (ft)	191,188	134,371	22,691
	65.3%	45.9%	7.7%

Shoreline Mgmt BMP Verification WIP3 Goals vs. Reported Credits

- BMP verification by SEAS
 - reported annual pollutant reductions
 - 34,011 lbs N
 - 23,143 lbs P
 - 19,005 tons S

Major Basin	WIP 3 Goals		
	goal (ft)	reported (ft)	% of goal
Potomac	70,051	44,151	63.0%
Rappahannock	132,484	78,321	59.1%
York	141,042	82,203	58.3%
James	79,446	64,422	81.1%
Eastern Shore	76,977	23,823	30.9%
TOTAL	500,000	292,920	58.6%

* VCAP has reported an additional 7,051 ft of living shorelines (1.4%)

DEQ BMP Warehouse 1/18/2021

Reporting Entity	Sites		Length Restored		Acres Planted	
Alexandria	1	0.1%	620	0.2%	0.00	0.0%
GWMP	1	0.1%	1,549	0.5%	5.45	26.4%
JRA	2	0.1%	225	0.1%	0.00	0.0%
NPS	4	0.3%	3,722	1.1%	0.00	0.0%
USFWS	2	0.1%	9,900	3.0%	0.00	0.0%
JBLE	4	0.3%	5,207	1.6%	0.00	0.0%
VASWCD	37	2.5%	7,051	2.2%	0.00	0.0%
DCR SEAS	1430	96.6%	298,963	91.4%	15.16	73.6%
	1481		327,237		20.61	

Aaron Wendt 
Environmental Specialist

Virginia Department of Conservation and Recreation
Division of Soil and Water Conservation
Shoreline Erosion Advisory Service

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