

Living Shorelines KEY REFERENCES: VIRGINIA



Using the Key References Guide

This reference guide is intended as a companion to the CBLP-Shorelines Certificate Program. It provides a collection of resources including guidance documents, manuals, websites, digital tools, videos, and regulations used to develop and deliver the course. Resources that are integral to completing the course are linked in the Course Overview section.

This course also utilizes a companion webpage <u>https://certified.cblpro.org/cblp-shorelines-workshop-materials/</u> that includes the required key references, course materials, video links, and assignments.

Other optional resources that practitioners may find useful are also included. Many of the linked resources are not under the control of CBLP and may change or become unavailable. This guide was developed for Virginia and includes state and local laws, regulations, and permitting information that may not apply to practitioners in other states. Consult your state's regulatory authorities for regions outside of Virginia.

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Introduction

The Code of Virginia defines a living shoreline as "a shoreline management practice that provides erosion control and water quality benefits; protects, restores, or enhances natural shoreline habitat; and maintains coastal processes through the strategic placement of plants, stone, sand fill, and other structural and organic materials. When practicable, a living shoreline may enhance coastal resilience and attenuation of wave energy and storm surge."

In 2020, the Virginia General Assembly enacted legislation which made living shorelines the required approach to shoreline management unless the best available science shows that a living shoreline is not suitable. Resources related to this legislation and other federal, state and local laws are listed in the Permitting section of this guide.

Within the Chesapeake Bay Region, living shorelines are considered a shoreline best management practice eligible for nitrogen, phosphorus, and sediment total maximum daily load reductions to meet the Chesapeake Bay Watershed Restoration goals.

The Living Shoreline Collaborative (LSC) is a group of regional and state partners working together to scale up implementation of resilient practices along shorelines in the tidal James River watershed. The LSC is convened by the James River Association, led by a steering committee of regional and state living shoreline practitioners, private businesses, advisors, and educators, and supported by funding from a National Fish and Wildlife Foundation Grant and Virginia Environmental Endowment. The mission of the LSC is to provide access to best practices, information and data to ensure thriving living shorelines through education, outreach, monitoring, training and implementation with a network of partners and communities in the James Watershed and beyond.

As the demand for living shorelines increases, the demand for consistently trained, experienced living shoreline professionals and a means to connect those professionals with employers and property owners is increasing. Recognizing this need, the James River Association and steering committee partners proposed to establish a Training team, led by Wetlands Watch staff and the Chesapeake Bay Landscape Professional (CBLP) program, and funded through a National Fish and Wildlife Foundation INSR grant. The Training Team of regional and local experts and practitioners was convened in 2021, conducted a refined needs assessment, developed standardized materials and a process to establish a cost-effective means of engaging and consistently training and upskilling living shoreline practitioners throughout Virginia and eventually other Bay states. The goal is to grow a network of skilled practitioners to support living shoreline programs and project implementation, connect clients with trusted service providers, and improve capacity of existing shoreline businesses to implement more living shorelines. The goal is to pilot the series in Hampton Roads, Virginia to meet the needs of LSC partners, then refine and adapt for delivery throughout the Chesapeake Bay Region.

The program, CBLP-Shorelines, is designed to provide a hands-on, interactive professional development experience from site evaluation, to living shoreline designs and permitting, construction, maintenance and monitoring and concluding with a "learn as you do" living shoreline installation led by experienced living shoreline professionals. The focus of all work will be on living shoreline projects that fall under the Virginia Group 1 and 2 General Permits. Participants will be exposed to professional best practices and interact with experienced practitioners, regulators, advisors, and contractors as instructors. Participants will also understand the limitations of their own knowledge and experience and when to call an expert or partner with others to ensure the living shorelines they work on are correctly designed, permitted, installed, maintained and monitored according to state and federal regulations and to meet the goals and objectives of the client.

Course Overview

Day 1: Site Assessment & Design Considerations

Learning Objectives

- Field and classroom introduction to Terminology, Tools and Methodology for living shoreline project site assessments to inform design and suitability of living shoreline practices for Virginia Type 1 and 2 general permits.
- Introduction and practice performing online desktop analyses including tools and methodology of existing conditions, erosion rates, future predictions with sea level rise, and other digital data available for use.
- Guided field evaluation of potential living shoreline sites using checklist. Introduction to tools used in site assessment.
- Become familiar with planting zones and suitable plants for each
- Be aware of design considerations relevant to the RPA and Chesapeake Bay Act; develop a whole property approach
- Become familiar with interpreting site assessment data to inform living shoreline feasibility and design
 options
- Understand living shoreline design options including various types of sills and appropriate conditions and materials for each

Pre-class Work:

1) Review and be familiar with the following resources:

- <u>VIMS Living Shoreline Design Guidelines</u>
- <u>VIMS online Shoreline Management Handbook</u> (Permit Information, Laws and Jurisdictions)
- VMRC Wetlands Guidance & Wetlands Regulations (Sections IV, V)
- Incorporating Oysters into Living Shorelines
- <u>Site Assessment Terms</u>

2) Watch the following videos:

- Designing for Sea Level Rise Case History by Tim Stromberg
- Planting Considerations for Living Shorelines
- **3) Perform a desktop analysis** using the <u>Site Assessment form</u> and <u>Desktop Analysis Guide</u> provided, and Site Map provided. Bring a printed copy of the desktop analysis to Day 1 of the Living Shorelines Essentials Workshop.
 - a) Become familiar with the entire Site Assessment form, terminology, and key features to evaluate during the desktop analysis as well as the site visit
 - b) Perform the Desktop Analysis fill in forms with the background information provided and the results of the desktop analysis
 - c) Bring completed form to Day 1 of the Living Shoreline Essentials Workshop

Learning Objectives

Design

- Develop a living shoreline design and permit application using site assessment data and pre-design consultations w/ regulators and property owners.
- Understand how existing and future site conditions, regulatory compliance, and property owner-specific attitudes, goals and level of protection needed inform living shoreline feasibility, design options, materials selection, and permitting.
- Understand living shoreline and hybrid design options including various types of sills and appropriate conditions and materials, and the pros and cons for each.
- Incorporate future conditions into site design
- Develop graphics and site plans to meet permitting requirements

Permitting

- Become familiar with the regulatory agencies and jurisdictions related to General Permits 1 & 2
- Learn requirements of the Joint Permit Application and how to complete
- Understand factors that trigger additional review or delays in permit processing
- Be familiar with locality requirements prior to starting work

Pre-class Work:

- 1) Review
 - Permitting Terminology
 - <u>Case Studies</u> provided to understand how the design can impact the permit application process
 - JPA and criteria for VMRC General Permits Group 1 & Group 2
- Develop living shoreline drawings (cross-sections & plan view needed for permits) and email a digital copy of drawings to <u>stacie@cblpro.org</u> by COB March 15.
 - Drawings may be hand drawn or computer drawn
- 3) Answer the following questions pertaining to your design:
 - What level of protection is needed and how does the design meet the need?
 - How have you incorporated planning for future conditions into the design?
 - What other approaches were considered?

Learning Objectives

- Become familiar with general equipment requirements and considerations
- Explore additional site assessment and field verification tools
- Become familiar with construction materials and identify where and how to source them
- Understand how to establish site access and employ protection strategies to minimize damage to surrounding area
- Become familiar with construction sequencing
- Understand planting protocols and techniques
- Understand common maintenance tasks over the lifespan of a living shoreline
- Learn to identify maintenance needs through site inspection and develop a written maintenance plan for homeowner/contractor
- Understand the role of monitoring in determining adaptive management strategies and become familiar with monitoring protocols
- Identify business opportunities related to maintenance and monitoring services

Pre-class Work:

- 1. Review
 - Monitoring materials
 - Maintenance Plan <u>Templates</u> & Checklist
- 2. Watch
 - Construction Sequencing Jim Cahoon

General Information on Living Shorelines

Resource:	Understanding Living Shorelines	Contractions State(Laboration State(Laborations))
Туре:	Website	Understanding Living Shorelines
Source:	NOAA	We are supported What is a long charation? Manual on the particular intervention Image: Charation intervention
Resource:	Living Shorelines 101	These learning the second seco
Туре:	Video	
Source:	Virginia Institute of Marine Science	
Resource:	Guidance for Considering the Use of Living Shorelines	Relations for Constanting The law of Structures
Туре:	Guidance document	
Source:	NOAA	
Resource:	National Map of Living Shoreline Projects	
Туре:	Storymap	
Source:	NOAA	Living Shorelines
Resource:	Integrated Shoreline Management Handbook	The manual sector manual sector as as in the sec
Туре:	Guidance Document	Center for Coastal Resources Management
Source:	Virginia Institute of Marine Science	Shoreline Management Handbook
Resource:	Tidal Wetlands Guidance	TELL VITANI
Туре:	Guidance document	CALLER ALL CALLER AND
Source:	Virginia Marine Resources Commission	 Security Security 2014 (Security 2014) Security Security 2014 (Security 2014) Security 2014 (Security 2014)
Resource:	Living Shorelines on the Nansemond River	Living Sharolings on the
Туре:	Storymap	Nansemond River
Source:	Chesapeake Bay Foundation	
Resource:	Shoreline Decision Support Tool	Shortfare Decision Support Teel Institution - Construction Construction Construction Construction Construction - Construction Construction Construction Construction Construction - Construction Construction Construction Construction Construction
Туре:	Online Tool	the second
Source:	Virginia Institute of Marine Science	There the There is a second set of the second second second second second second second second second second the second second second second secon
Resource:	Shoreline Management BMPs	NUMBER OF AN AN ADVANCES
Туре:	Guidance Document	
Source:	Chesapeake Stormwater Network	Martine State S

Site Evaluation

Resource: Type: Source: Description: desktop analys	Desktop Analysis Instruction Guide Document Chesapeake Bay Landscape Professional Program Collection of tools and step-by-step instructions for completing the sis assignment.	Image: State
Resource: Type: Source: Description: analysis.	Google Earth Digital/Desktop Tool Google Downloadable software with a suite of tools for conducting desktop	
Resource: Type: Source: Description: conversions.	Google Earth Tools for Site Data Collection Digital Tool Virginia Institute of Marine Science Google Earth tools for finding mean tide range and NAVD88 to MLW	
Resource: Type: Source: Description: information on	Nautical Chart Viewer Digital Tool NOAA Interactive map viewer used in desktop analysis; gives offshore depths, navigation channels, and submarine pipelines.	
Resource: Type: Source: Description: NAVD88.	Flood Insurance Studies Report Federal Emergency Management Agency (FEMA) Jurisdiction reports provide storm surge stillwater elevations relative to	Image: Instance Image: Instance Image: Imag
Resource: Type: Source: Description:	Shoreline Change Viewer Digital Tool Virginia Institute of Marine Science View historical shoreline imagery and find rates of shoreline change.	
Resource: Type: Source: Description: specific area.	Sea Level Curves Digital Tool AdaptVA Select from various models to find sea level rise prediction curves for a	

Interactive SAV Map **Resource:** Website/Digital Tool Type: Virginia Institute of Marine Science Source: Historical record of storm and significant weather phenomena data from **Description**: January 1950 to October 2022.

Resource:	Tidal Range & Current Conditions
Туре:	Digital Tool
Source:	NOAA
Description:	Provides information from NOAA Stations, including wind speed and
direction, and v	vater currents.

Resource:	Chesapeake Bay Environmental Forecast System
Туре:	Website
Source:	Virginia Institute of Marine Science
Description:	Environmental forecasts, including salinity, temperature, and acidification,

that can assist in evaluating a site for marsh plant and oyster suitability.

Resource:	Site Assessment Tools	Living Shoreline Design Training Copensed by
Туре:	Powerpoint	Prestivetship Lyanning Determining Site Specific Parameters for Living Shoreline Design Karen Dahring
Source:	Virginia Institute of Marine Science	Programad by Control of Control Excess Manager Internet and Control of Contro
Description:	Presentation of tools for completing a desktop analysis and site evaluation.	Control Sales (Sales Control Sales Sales)
Resource:	Significant Wave Height Prediction Curves	Dec. 2015 Million Here & Hanger (Marketter Sym- Here and Hanger (Marketter Sym Here
Туре:	Online Drainage Manual	
Source:	Virginia Department of Transportation	
Description:	Includes prediction curves for determining a design wave	
Resource:	NOAA Shoreline Website	NDM Showing Wester
Туре:	Website/Digital Tools	Concept Section 2 Sec
Source:	NOAA	Terretarian and an an and an an and an an and an
Description:	Collection of tools for shoreline change analysis and boundary	
determination.		The second secon
Resource:	Digital Shoreline Analysis System	MATRIX COMPT Q
Туре:	Digital Tool (ArcGIS extension download)	Digital Shoreline Analysis System
Source:	NOAA	
Description:	Requires ArcGIS 10.4-10.6; computes rate of shoreline change	Overview Substantian of the set
Resource:	Shoreline Management in the Chesapeake Bay	Shoreline Management
Туре:	PDF	In Chesapeake Bay C 3 Hummu, 2 and 2 Hore
Source:	Virginia Institute of Marine Science	
Description:	Pages 1 - 22 provide good background on Virginia's coastal processes.	
Other informati	on may be outdated.	The second s





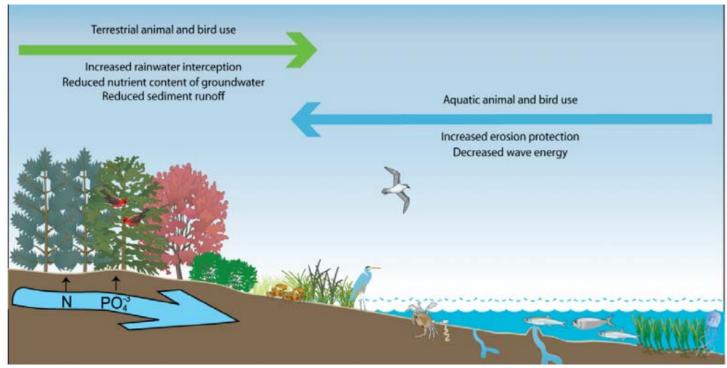


CBEFS

Resource:National Data Buoy CenterType:Digital ToolSource:NOAADescription:Provides current and historical data including storm surge, wavefrequency and magnitude.



Resource:	Storm Events Database	NOAA MAVIRMALEEN JERN-FORMATION
Туре:	Website	In COLOR ENVIRONMENT AL INFO LINOM (ON Info Color Index) Info Info Color Info
Source:	NOAA	Interview Net of them between creates to record, our to need on 150% (Ref. 2004 Administration and the sectors) Net of the sectors of the secto
Description :	Historical record of storm and significant weather phenomena data	Numer 1 vision for formation Core significant index operations of the number of manual to any production of the number of manual to any production of the number of manual to any production of the number
from January 1	950 to October 2022.	national services and a service of a service service of the servic



Source: Virginia Institute of Marine Science Center for Coastal Resource Management

Design & Construction

Resource:	Designing for Sea Level Rise Case History	
Туре:	Video	DESIGNMENT FOR STALLEVEL WITE CASE HISTORY advancements were according to a second many memory comments and increases and advancements and advancements
Source:	Tim Stromberg, Stromberg, Garrigan & Associates	
Description:	Details regulatory factors and design decisions in re-developing the	2- 18/1
Ryan Resilien	ce Lab's living shoreline site design to adapt to sea level rise.	• 1 • • • • • • • • • • • • • • • • • •
Resource:	Living Shoreline Design Guidelines for Shore Protection in	
	Virginia's Estuarine Environments	Schrige Mannelson Berniger Brainsteiner für Bilter Production im Wegennist / Retrieven Berniemssent mann 14
Туре:	Guidance Document	there is the second sec
Source:	Virginia Institute of Marine Science	
Description:	Advises consultants, designers, contractors, and other professionals	
on the use of I	iving shoreline strategies.	
Resource:	Incorporating Oysters Into Living Shorelines	incurporating Option Into Living Secondaria
Туре:	Report	
Source:	Chesapeake Bay Foundation	the second as
Description:	Overview of factors related to oyster suitability and methods; includes	Final Berlin Law
spec sheets fo	r six oyster products.	Here 1 Marcardon and an an an an a
Resource:	Natrx ExoForms	Berni Wanter and Entry Will I'''. Natrx ExoForms"
Туре:	PDF	
Source:	Natrx	structures de plante baser de transmissione de la developa developa de la developa de la developa de la developa de la developa
Description:	Spec sheet for Natrx ExoForms	
Resource:	Living Shoreline Engineering Guidelines (2022 Update)	() trues
Туре:	Guidance Document	Anny Honorem (Symmetry Contempo
Source:	Stevens Institute of Technology	
Description:	Updated engineering guidelines for living shorelines	
Resource:	Living Shoreline Sea-Level Resiliency	
Туре:	Report	Living Shareline See Level Benkhmeys Professionance and Adaptates Management of Existing Stars Year 3 Summary Report
Source:	Virginia Institute of Marine Science	-02013010
Description:	Evaluation of sand, rock, and plant-based living shorelines to	1. Carton
determine resi	lience to sea level rise, informs resilient design methods.	Judy 2013
Resource:	Living Shoreline Design Alternatives	1111
Туре:	Website	Center for Coastal Resources Management
Source:	Virginia Institute of Marine Science	
Description:	Overview of three categories of design approaches to living	Integration Design Alternatives Animate Statement Statement Statement

shorelines: non-structural, sills & breakwaters, and shellfish reefs

Resource: Neighborhood Wetland Stewardship: Project Management Manual

Guidance Document Type:

Source: The Lafayette Wetlands Partnership

Description: Provides information on available resources, project planning, site plan development, permitting, material acquisition, volunteer recruitment, and monitoring.

Plants

Resource:	Planting Considerations for Living Shorelines	
Туре:	Video	
Source:	Florida Sea Grant	LIVING
Description :	Information for installing marsh vegetation.**Note: this video contains	SHORELINES
information on	planting both marshes and mangroves, however, mangroves are not	
relevant to Virg	ginia.	
Resource:	Field Guide to Virginia Salt and Brackish Marsh Plants	
Туре:	Guidance Document	Field Guide to Virginia Salt and Brackish Marsh Plants
Source:	Virginia Institute of Marine Science	tor No.9

Description: Printable, illustrated field guide that includes color photographs for

identification, marsh planting zone, plant height, and bloom period

Resource:	Plants for Freshwater Marsh	UTWS
Туре:	Website	() () () () () () () () () ()
Source:	Virginia Institute of Marine Science	
Description:	Lists common plants found in Virginia's tidal freshwater marshes and	Safety Fue autors
includes color pl	hotos and descriptions	Reporter Ball Scoredy Laws And Lawson P

Resource:	Virginia Invasive Plant Species List	
Туре:	Website, PDF	Addres SCR Blans Parks
Source:	Virginia Department of Conservation and Recreation (DCR)	Harkund Imentage Road Robot Trainige • Ranni Roamania Ranni Roamania Mananian Tamina •
Description :	Current list of invasive species as identified by DCR as posing a threat to	Federate Stands Salar Salar Salar Katika Falansi + Katika Falansi + Katika Falansi + Katika Falansi + Katika Salar Salar Katika Salar Salar
Virginia's fores	ts, marshes, wetlands, and waterways.	Investina Nyachin Finishing Diray Enventionen Convertionen Frähligklich

Resource:	Native Plant Finder	Verpinia Department of Conservation and Recreation CONSERVE_PROTECT_ENJOY.
Туре:	Digital Tool	Bullage Construction Parmy Readables
Source:	Virginia Department of Conservation and Recreation (DCR)	Australia Mage 4 Austra
Description:	Online form for identifying suitable native plants for particular site	State Stream Str
characteristics.		Contraction Contracti

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Resource:	Regional Native Plant Guides	
Туре:	Website/PDF	
Source:	VA DEQ Coastal Zone Management Program	New Vegets Neesse Plant Vegets a Network Regional Campaigns
Description:	Downloadable regional guides; the website also includes links to recorded	And and a second
webinars on a	variety of topics related to native plants and other resources	Annual Constant Const
Resource:	Delaware Wetland Plant Field Guide	The Delaware
Туре:	PDF	Wetland Plant
Source:	Delaware Department of Natural Resources and Environmental Control	Field Guine
Description:	Downloadable field guide with color photos, includes native and some	Sequencity (MICL) Reference () Annument Property
non-native pla	nts. Note: Species listed as native for Delaware may not also be native to	
Virginia.		
Resource:	Wetland Plant Catalog	AND
Туре:	PDF	Apparent and another in the second of the se
Source:	Environmental Concern	An Under State State An Under State State An Under Under State An Under Under State An Under Under State
Description:	Wholesale plant catalog, includes plant size, water & salinity tolerance, and	And States States - participant - final states - fin
notes		Research and Section 2012 and
	Wetland One size List	to estimate planes inc
Resource:	Wetland Species List	search our species list Refer to requirements where the two payments is the second of the two the payments is the second of the
Туре:	Website	Parentianti, fai da valo da antida dina e dan data faing presenta da faine a da cana faing
Source:	Wetland Plants Inc	
Description:	Searchable plant list with growing conditions	
Resource:	Tidal Wetland Plants	Tidal Wetland Plants
Туре:	PDF	Contraction of the second seco
Source:	Lynnhaven River NOW	Anno constraint Anno constraint A
Description:	Brief list of plants by marsh zone.	A second se
Resource:	Native Plants for Wetlands Restoration & Enhancement	Native Plants For Wetland Restoration And Inhancement: A Source Guide
Туре:	PDF	
Source:	City of Norfolk, VA	The second secon
Description:	Source guide includes select species and list of suppliers.	
Resource:	Planting Guidance	Angeles in the Antonio Social Antoni
Туре:	PDF	- Salarian In tender, History, An Andi - Salarian Internet, History, Andreas - Salarian Internet, History, Andreas -
Source:	North Carolina Coastal Federation	The second secon
Description:	Information on plants, planting techniques, tools, and timing.	

Permitting

Code of Virginia **Resource:**

Website Type:

Source: Virginia's Legislative Information System

Virginia's law regarding living shorelines, including the **Description**:

Commonwealth's definition, development of the general permit, and guidance.

Resource:	Shoreline Management Laws & Jurisdictions	
Туре:	Website	
Source:	Virginia Institute of Marine Science	
Description:	Summary of local, state and federal regulations and jurisdictional	
boundaries relevant to living shorelines.		





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Resource:	Tidewater Joint Permit Application	6.4 Secondard Landon, Marcine Landon, Santa Landon, Landon Landon,
Туре:	PDF	 A constraint of the second seco
Source:	US Army Corps of Engineers	The second secon
Description:	Downloadable, fillable permit application	 The second second
Resource:		
Resource.	US Army Corps of Engineers, Norfolk District	March Annual March (March - Small - Sm
Type:	US Army Corps of Engineers, Norfolk District Website	
_		And a state of the

Corps of Engineers.

Resource:	VMRC General Permit Flowchart	AGENCY ROLLS.	VIRGINIA'S TUDEWA LIVING SHORE	ITER JOINT PERMIT APPL LINES, GROUP 1 & 2 GENE
Туре:	PDF	Description rule à carecta, rule de la constant,		
Source:	Chesapeake Bay Landscape Professional Program	CONSTRUCTION AND ADDRESS AD		••
Description :	A flowchart outlining the review processes associated with a Virginia	La constante de la constante d		
Marine Resour	ces Commission Group 1 or 2 General Permit for living shorelines.			

Resource:	Overview of Regulatory Agencies	TIDEWATER JPA REVIEW
Туре:	PDF	LVF Market data data data data data data data da
Source:	Chesapeake Bay Landscape Professional Program	VARC DEQ INT Production designs and the second seco
Description :	Provides an overview of the roles of local, state, and federal agencies	Notice Production in Constrained International Internation
involved in per	mitting living shoreline projects	Image: Construction of the construction of

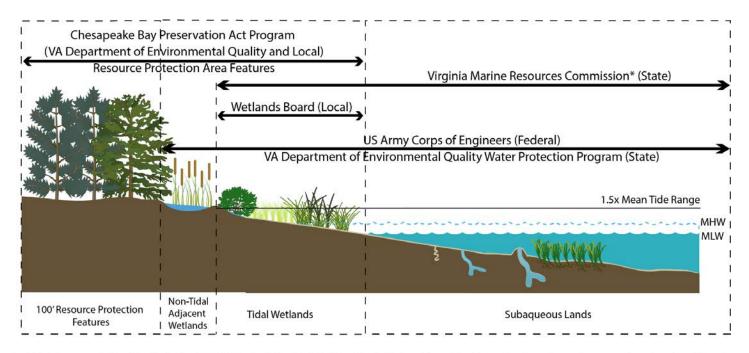
Resource:	Virginia Marine Resources Commission Regulation Index (Habitat)	
Туре:	Website	Type Bane Basers Constants Basers Constants
Source:	Virginia Marine Resources Commission	
Description:	A list of all habitat permit types issued by VMRC, including those	Marine Resources Commission Regulation Index
-	ving shorelines, and links to the associated regulations.	Along a fite equation more gain to ensure (a fit is equal works) and the equation to a set of equations for a second of equations in the ensure (a fit is
1		
Resource:	Living Shoreline Group 1 General Permit	HARD to be address that the contraction of the second
Туре:	PDF	Internet mental metric institution in the formation of the second
Source:	Virginia Marine Resources Commission	(a) (a) (a) (b) (b) (b) (b) (b) (b) (b) (b) (b) (b) (b)
Description:	Complete regulation authorizing the Group 1 General Permit	 The second second
Resource:	Living Shoreline Group 2 General Permit	All of a set of a
Туре:	PDF	Characteristica e constrainte a constrainte de constrainte de constrainte de constrainte de constrainte a constrai
Source:	Virginia Marine Resources Commission	The set of
Description:	Complete regulation authorizing the Group 2 General Permit	See the second secon
Resource:	Local Government Contact Guide	Millionatury constant and an and a
Туре:	Website	de iller and the
Source:	AskHRGreen	
Description:	Provides contact information for local government staff; scroll down	Living on the Water
page to find th	e list	CIVILING OFFICE PRODUCE CONCERNMENT OF PROPERTIES
Resource:	National ESA Critical Habitat Mapper	Sectorial States Q
Туре:	Website/Digital Tool	Field Japachan Fahing & Japabeel Menocity Martin Sale. Devinement Maginto Menorica & Sarekan Menor (A Menocity
Source:	NOAA	National ESA Critical Habitat Mapper M available qualid data of circus habitat proposed and designment by Kickle Reference under the Entergenent Species Act Applications (2) Complexity (
Description:	Interactive mapping to identify critical habitat and endangered species	May i hanna Per hanna 2014 may mara basan basharan if Almo yang serarahay we al awisis
information, as	s well as associated regulatory rules	Sind and any part for to state of the state
Resource:	Essential Fish Habitat Mapper	Experience Q
Туре:	Website/Digital Tool	Text Species Dong & Subsch Proving March 1.16 Sectioned Agent Research Start (A
Source:	NOAA	The (PH Bagaer is an interactive tool for overage important Address for managed first spence, the provide lots to supporting materials, excluding theory or supported parts, and the ability to sharehold GS data.
Description:	Mapping tool to identify geographic information on managed fish	Neg Racond The second activity of and activity of the decision activity of the spectra space, price or the triat These second activity of the second activity of the spectra space activity of the spectra
species and ha	abitat areas of particular concern	Key 4/2 space prevent with two per for status and a classical status for the format of the form
Resource:	USFWS Information for Planning and Consultation	PLAN Long lower If a C Information for Planning and Consultation
Туре:	Website/Digital Tool	IPaC is a project planning tool that streamlines the USFWS
Source:	NOAA	GIT STANTED (LOCIN)
Description:	Project planning tool, videos and FAQ for the environmental review	
process		Integrate the environmental review process into your project design away and with vitil complements and against interview many to provide

Resource:	Section 7 Consultations in the Greater Atlantic Region	
Туре:	Website	
Source:	NOAA	
Description:	Information on federal agency consultations relating to the	
Endangered Species Act		

Resource:	Fish & Wildlife Information Service
Туре:	Website/Digital Tool
Source:	Virginia Department of Wildlife Resources
Description:	Mapping and report tool that identifies conservation species, along
with their conse	ervation status, potentially found within a specified area

Resource:	Virginia Department of Historic Resources		nia Department of Historic Resources	Sector Base
Туре:	Website	and have a function of the	en longer and the second s	
Source:	Virginia Department of Historic Resources	Andrea Manageri Manis Antonio A Tarin Maninga Manistram Manistram	Regional Preservation Offices Indiversal preservation (Univ You an user o Issuer Issuer method lagent, table (Index Issuer) and a General (Issuer Ingen) Issuer (Inc. 1) and (Index Issuer) and a General (Issuer) Angent Issuer (Inc. 1) and (Index Issuer) and (Index Issuer) Ingeneration (Inc. 1) and (Index Issuer) (Index Issuer) Ingeneration (Inc. 1) and (Index Issuer) (Index Issuer) Index Issuer (Int. 1) and (Index Issuer) (Index Issuer) Index Issuer (Int. 1) and (Index Issuer) (Index Issuer) Index Issuer (Int. 1) and (Int	Managari Jaka Anna (199 Anna 201 Jaka Katalanana
Description :	Contact information for Regional Preservation Offices and information	Parris & Parris Briefs Higher Biller Higher Biller Bagers & Typerature	 Comparison to compare there is second to prefix the comparison precision of the comparison precision and comparison precision. Experimental and herein any second prefix the comparison of the comparison precision precision. Experimental and herein any second precision of the comparison of the comp	240.04/2010/01-0-2400 National Performance National Performance Stationarial Processor
on historic prop	perties.	Bank Securitary Banky & Planky (13.8) So Dwitte	the fract the legisle state the segment of a second set.	

NOAA



* VMRC has oversight authority for the Tidal Wetlands Act and administers the Act in localities without a wetlands zoning ordinance and local wetlands board.

Virginia Shorezone Jurisdictions: legally defined shoreline resources and the relevant local, state and federal authorities. Note that some authorities cross resource boundaries and most resources have at least two responsible regulatory authorities. Symbols courtesy of the Integration and Application Network (ian.umces.edu/symbols/), University of Maryland Center for Environmental Science.

Maintenance & Monitoring

Resource:	Maintaining Your Shoreline Stabilization Practice
Туре:	Guidance Document
Source:	Maryland Department of Environment
Description:	Provides information on maintaining different types of shoreline
stabilization pro	jects including non-structural (e.g., beach nourishment, slope grading and
terracing, marsh creation) and structural (e.g., revetment, bulkheads, jetties and groins).	

Resource:	<u>Neighborhood Wetland Stewardship: Project Management Manual</u>	
Туре:	Guidance Document	
Source:	The Lafayette Wetlands Partnership	
Description :	Provides information on available resources, project planning, site plan	
development, permitting, material acquisition, volunteer recruitment, and monitoring.		

Resource:	Six Steps to Create Your Living Shoreline	
Туре:	Website/PDF	
Source:	Chesapeake Bay Foundation	
Description:	List breaking down steps for a homeowner to design, permit, install, and	
maintain a living shoreline		

Resource:	VCAP Manual
Туре:	Guidance Document
Source:	Virginia Association of Soils and Water Conservation Districts
Description :	Provides guidelines for annual maintenance of VCAP living shoreline
projects (page	88)

Resource:	Living Shoreline Maintenance and Troubleshooting	
Туре:	Website	198
Source:	Delaware Living Shoreline Committee	
Description :	Provides a list of common problems that could occur after installation of	
living shoreline	and solutions to those problems.	







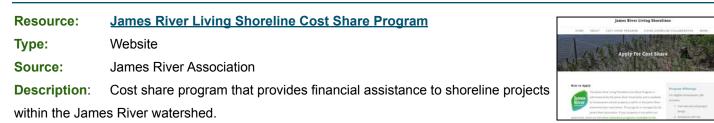




Cost Share Programs

Resource: Type: Source: Description: educational as	Virginia Conservation Assistance ProgramWebsiteVirginia Association of Soil and Water Conservation DistrictCost share program that provides financial incentives and technical andsistance to Virginia property owners installing Best Management Practices.	Virginia Conservation Automatical Automatical Automatica Automatical Automatical Automat
Resource:	Living Shoreline and Shoreline Buffers	LIVING SHORELINES &
Type:	Website	SHORELINE BUFFERS
Source:	Elizabeth River Project	Our Cost-Sharing Programs Protect Your Kome

Description: Cost share program that provides financial assistance to shoreline projects within the Elizabeth River watershed.



- Website Type:
- Source: Lynnhaven River NOW

Description: Cost share program that provides financial assistance to shoreline projects within the Lynnhaven River watershed.

Resource:	Fight the Flood Program	peren caracter annucles and an antica active angular
Туре:	Website	Grants and Loans
Source:	Middle Peninsula Planning District Commission	A BURKET
Description:	Program to help connect property owners in the Middle Peninsula with	There's no should allow it, making substantial charges and improvements to properties an the Model Information to help property owners faith the Flood stars more. And hars what the Table
funding mecha	nisms.	Indicating spectra can be deployed on the spectra of the spectr

Resource:	Agricultural BMP Cost-Share (VACS) Program	
Туре:	Website/PDF	Constraints of Constraints of Alexandres of the Alexandres of
Source:	Virginia Association of Soil and Water Conservation	Lad and Rate Constructor
Description: planning.	Information on various cost share programs that support conservation	Mover time Aprice Target April Control Barry Cost Shares (VACS) Program April Cost Shares (VACS) April Cost Shares (VACS) April Cost Shares (VACS) April Cost Shares April









Resources for Homeowners & Clients

Resource: Type: Source: Description: discussing livir	Living Shoreline Outreach Implementation Plan PDF Chesapeake Bay Program Bay-wide resource that includes talking points and strategies for ng shorelines.	LIVING SHORELINE OUTREACH Deservoir a
Resource: Type: Source: Description: property owned	Living Shorelines: Better for Property Owners and the Environment PDF Virginia Institute of Marine Science Brochure that provides information on living shorelines and benefits to rs.	<section-header><text><text><text></text></text></text></section-header>
Resource: Type: Source: Description: shoreline stabi	Weighing Your Options PDF NC NERR Guidebook detailing various living shoreline approaches and other lization methods.	Weighing Your Options
Resource: Type: Source: Description:	Virginia Conservation Assistance Program PDF Virginia Association of Soil and Water Conservation Brochure that provides overview of VCAP program and benefits	
Resource: Type: Source: Description: methods.	Natural & Structural Measures for Shoreline Stabilization PDF SAGE Brochure providing an overview of various shoreline stabilization	
Resource: Type: Source: Description: shorelines. Resource:	Tidal Wetland Restoration PDF Lynnhaven River NOW Brochure for homeowners with information on tidal wetlands and living Waterfront Homeowners Fight Erosion with Living Shorelines	<complex-block></complex-block>
Type: Source: Description:	Video Chesapeake Bay Foundation Testimonial video from homeowners throughout Hampton Roads.	

Resource:	Living Shoreline Success on the Eastern Branch of the Elizabeth River
Туре:	Video
Source:	Elizabeth River Project / Wetlands Watch
Description:	Testimonial video from a Norfolk homeowner
Resource:	Living Shoreline Poster



LIVING SHORELINES

Resource:	Living Shoreline Poster
Туре:	PDF
Source:	New York Sea Grant

NOAR

Description: Visual overview of a residential property, showing a whole-property approach to maximizing ecological and runoff reduction benefits.

Resource:	Living Shorelines for the Chesapeake Bay Watershed
Туре:	PDF
Source:	Chesapeake Bay Foundation
Description: shorelines.	12-page brochure for homeowners explaining the benefits of living



LIVING SHORELINES SUPPORT RESILIENT COMMUNITIES

Living shorelines use plants or other natural elements—sometimes in combination with harder shoreline structures—to stabilize estuarine coasts, bays, and tributaries.



Case Histories



Case Study: Successful Living Shoreline Group II General Permit Project Name: Elizabeth River Living Shoreline Location: Eastern shoreline of Broad Creek, Norfolk, VA

Project Summary: To protect and restore an existing salt marsh shoreline from erosion, a homeowner worked with the Elizabeth River Project to permit 164 linear feet of hybrid living shoreline.

Project Description: This living shoreline project consisted of two sections of oyster castles (40 linear feet and 50 linear feet) and one section of coir logs (74 linear feet). The two Oyster Castle sills were built by stacking Oyster Castles 2- or 3-

high with oyster shells placed on top of sills and channelward. The coir logs used for the single coir log section were either 12" or 16" in diameter. All three sections were placed above mean low water. Behind the hybrid living shoreline, clean sand (48 cubic yards) was placed and graded to existing elevation then planted with salt marsh vegetation (*Spartina alterniflora* and *Spartina patens*). Goose exclusion fence was placed around the perimeter of the planting area.

Project Materials:

- Clean commercial borrow pit sand
- Coconut fiber coir logs
- Oyster Castles
- Spartina alterniflora
- Spartina patens
- Goose exclusion fencing
- Wooden stakes

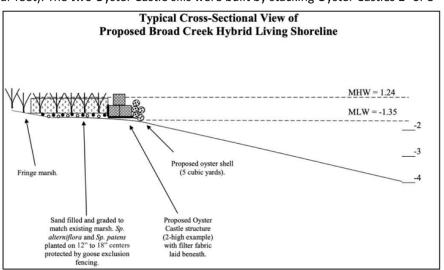
Steps to Reduce Impacts: To

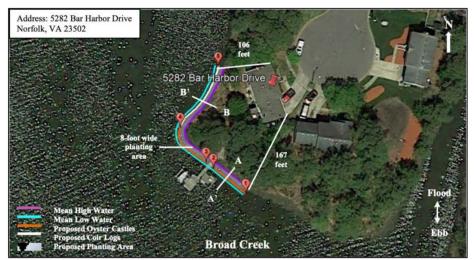
reduce impacts to buffer area, all material was delivered to homeowner driveway then

mobilized using a wheelbarrow or concrete buggy. To reduce impact to existing salt marsh, plywood walking/driving paths were placed. Oysters existing within living shoreline site were salvaged and moved channel-ward beyond project footprint.

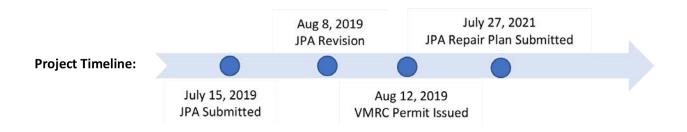
Project Encroachment: This living shoreline encroached on 1,312 square feet of nonvegetated wetlands (mudflat) with a maximum 20 feet encroachment channelward of mean high water and 5 feet of mean low water.

Project Results: This project with modifications qualified for a Virginia Marine Resource Commission's Living Shoreline Group 2 General Permit based on project materials, fetch exceeding ½ mile in one direction, and created marsh totaling





8 feet in width. Since this project met the requirements for the General Permit, a separate wetlands permit was not required. Two years after the living shoreline was installed, the living shoreline was considered unsuccessful due to improper elevations. Therefore, a repair plan was submitted under the JPA as a revision to install additional coir logs, clean sand, oyster shell, and native vegetation. The revision did not require additional authorization because repairs were within existing project footprint and elevations did not exceed original proposed grade.





Case Study: Successful Living Shoreline Group 1 General Permit Project Name: Hampton River Living Shoreline Location: Western shoreline of Herberts Creek, Hampton, VA

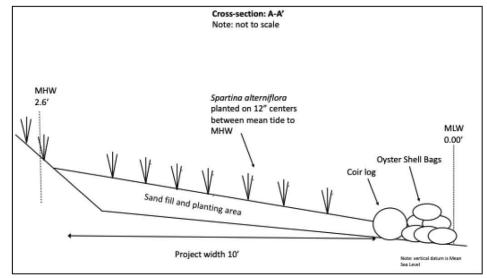
Project Summary: To combat shoreline erosion, a homeowner worked with the Elizabeth River Project and the James River Association to permit and install 160 linear feet of living shoreline along shoreline in Hampton River.

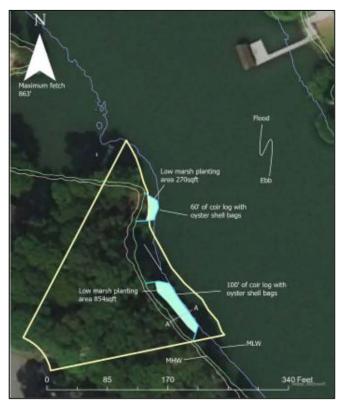
Project Description: Along the section of shoreline where the living shoreline was to be installed was rubble concrete. Before living shoreline installation began, all rubble concrete was removed. This living shoreline project consisted of two sections (100 linear feet and 60 linear feet) of 16" coconut fiber coir logs covered by oyster shell bags that were placed at mean low water and tied to mean high water. Behind each coir log section, clean coarse grade sand was placed then planted with native salt marsh vegetation (*Spartina alterniflora*).

Project Materials:

- Clean commercial borrow pit sand
- Coconut fiber coir logs
- Oyster shell bags
- Spartina alterniflora

Steps to Reduce Impacts: Steps were taken to reduce disturbance to existing salt marsh vegetation. Oysters existing within living shoreline site were hand-harvested and placed among oyster shell bags at the completion of project.





Project Encroachment: This living shoreline encroached on 1,124 square feet of non-vegetated wetlands (mudflat) with a maximum 15 feet encroachment channelward of mean high water.

Project Results: This project qualified for a Virginia Marine Resources Commission's Living Shoreline Group I General Permit based on project materials (no riprip), fetch not exceeding ½ mile in any direction, project footprint located landward of mean low water, and sand not placed in manner that raised elevation of existing wetland above elevation of jurisdictional wetlands. Since this project met the requirements for the General Permit, a separate wetlands permit was not required.

Project Timeline:





Case Study: Permitting a Living Shoreline Requiring a Subaqueous Permit

Project Name: Poquoson River Hybrid Living Shoreline **Location:** Northwest shoreline of Poquoson River, VA

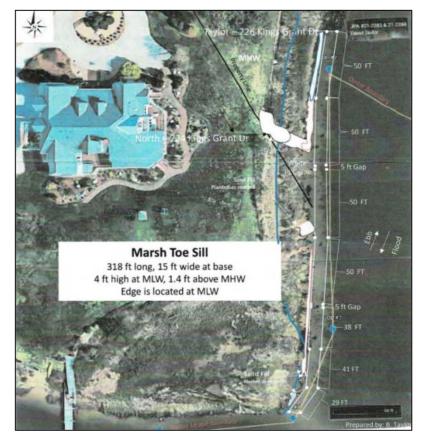
Project Summary: To reduce wave generated erosion along a shoreline, two homeowner worked with a marine construction company to install 154 linear feet of hybrid living shoreline along the Poquoson River.

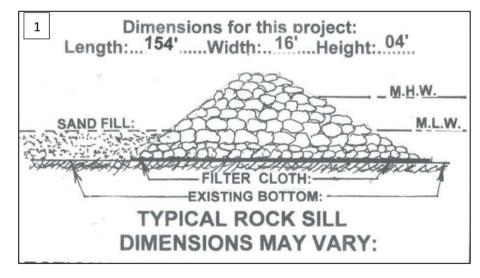
Project Description: This JPA proposed to install a rock sill in front of a vegetated wetland along two properties. The rock sill to be installed consisted of armor stone sill that would be placed on filter cloth and approximately 154 feet long, 2 feet high and 16 feet in base width. To improve wetland habitat, project proposed to place clean sand and plant appropriate wetland plants in front of marsh fringe.

Project Materials:

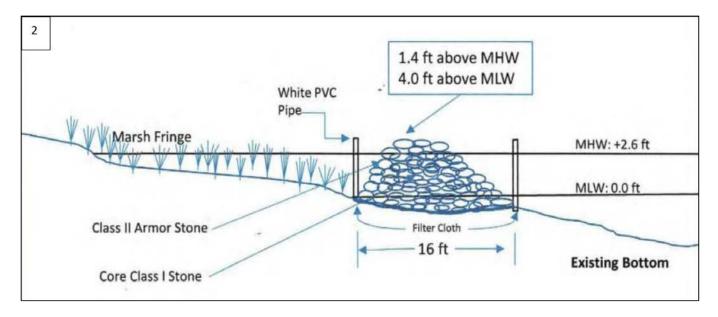
- Quarry Stone Class II
- Filter cloth
- Clean, coarse sand

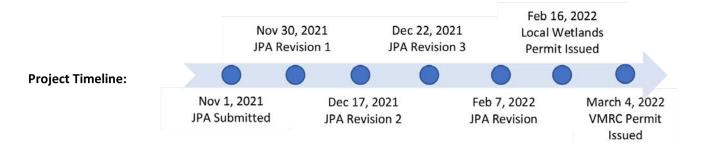
Steps to Reduce Impacts: To reduce impacts to upland area, all project activities took place through a common access point. To access project site, wooden mats were placed to reduce impacts to vegetated area.





Project Results: This project with modifications was approved for a Virginia Marine Resource Commission Subaqueous permit. Modifications to the original JPA included improved project site drawings and increased clarity in project design. Specifically, original drawing was of a typical rock sill (1) and needed to be site specific (2). Additionally, project sill height did not account for local sea level rise, and area of beach nourishment, limits of vegetated wetlands and benchmarks were missing in design. After modifications to original JPA, the site was evaluated further due to potential impact on submerged aquatic vegetation and sill location encroaching on oyster leasing ground. After further review, this project did not impact submerged aquatic vegetation but did encroach on oyster leasing ground. Therefore, the applicants had to obtain permission from the oyster lease holder to encroach on leasing ground. In total, this JPA had four revisions before receiving permits. This project also required a wetlands permit from the York County Wetlands Board due to project location within tidal wetlands.





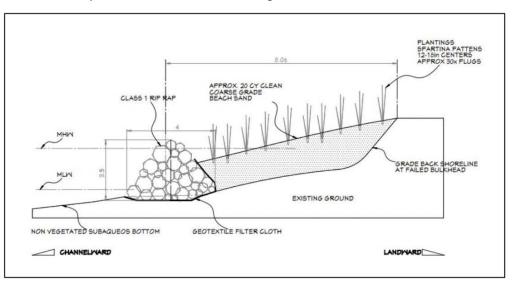


Case Study: Successful Living Shoreline Group II General Permit Project Name: Poquoson River Hybrid Living Shoreline Location: Eastern shoreline of Cabin Creek, Poquoson, VA

Project Summary: To mitigate severe erosion and undermining due to failed bulkhead, a homeowner worked with a marine construction company to install 90 linear feet of hybrid living shoreline along the Poquoson River.

Project Description: The original project proposed was to replace a failing, wooden bulkhead with a rip rap revetment of approximately 90 linear feet. Additionally, the project included the installation of a 4-foot boardwalk landward of mean high water for safer water access. After the Poquoson Wetlands Board and Virginia Marine Resource Commission visited

the project site, it was recommended that a new site plan be created to incorporate a living shoreline to meet regulatory requirements. Working with the homeowner, the marine construction company developed a site plan that replaced the failing bulkhead with a class 1 rip rap revetment and hybrid living shoreline along 40% of the shoreline. Once the failing bulkhead was removed, rip rap was installed along 40 linear feet of the shoreline

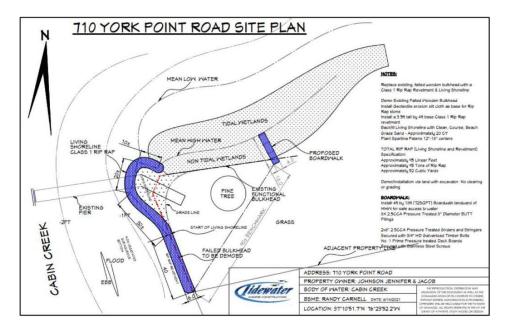


and a living shoreline that incorporated a rock sill was installed along 60 linear feet of shoreline. Behind the hybrid living shoreline, clean sand was placed, then planted with salt marsh vegetation (*Spartina patens*).

Project Materials:

- Class I rip rap
- Geotextile erosion silt cloth
- Rap stone
- Clean coarse beach grade sand
- Spartina patens

Steps to Reduce Impacts: No clearing or grading was required for this project. Rip rap installed over non-vegetated subaqueous sandy bottom.



Project Encroachment: This living shoreline encroached on 300 square feet of subaqueous bottom with a maximum 3 feet encroachment channelward of mean high water and 3 feet mean low water.

Project Results: A portion of this living shoreline project qualified for a Virginia Marine Resource Commission's Living Shoreline Group 2 General Permit based on project material (riprap sill) and project location in subaqueous bottoms. The remaining portion of the living shoreline project required a wetlands permit from the Poquoson Wetlands Board due to placement of sand fill landward of existing bulkhead. No permit was required for the boardwalk due to location being landward of mean high water.



Resource: Type:	<u>Captain Sinclair Marsh Sill Success</u> PDF	Captain Sinclair Marsh- Sill Success
Source:	Old Dominion University	Maura K. Boswell, P.E., Ph.D. Candidate, Virginia Sea Grant Graduate Research Felow Navid Tarividati, P.D. Assistant Professor
Description:	Case study of the Captain Sinclair marsh sill project.	Sea Grant OLD DOMINION
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Resource:	VIMS Story Maps	Ung Storeiner Ling Storeiner Ling Storeiner
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Living Shoreline Collaborative Program Partners:

Virginia Institute of Marine Science Center for Coastal Resources Management, Virginia Department of Conservation & Recreation, Wetlands Watch, Elizabeth River Project, Chesapeake Bay Landscape Professional Program, City of Hampton, City of Norfolk, Virginia Commonwealth University, Bay Environmental Inc., Chesapeake Bay Foundation, Friend of the Rappahannock, Virginia Association of Soil & Water Conservation Districts, Dialogue & Design Associates.

Funded by:

Virginia Environmental Endowment National Fish and Wildlife Foundation

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Pilot Workshop Instructors:

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Stacie McGraw, Wetlands Watch, CBLP Donna Milligan, Virginia Institute of Marine Science Rachael Peabody, Virginia Marine Resources Commission Joe Rieger, Elizabeth River Project Justin Shafer, City of Norfolk Tracy Skrabal, Consultant Ryan Walsh, James River Association Aaron Wendt, Virginia DCR Shoreline Erosion Advisory Service