



RACHAEL PEABODY
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Resilient Living Shoreline Designs

MARINE RESOURCES COMMISSION

MISSION:

WE ARE STEWARDS OF
VIRGINIA'S MARINE
AND AQUATIC
RESOURCES FOR
PRESENT AND FUTURE
GENERATIONS

MARINE FISHERIES



Manage
Recreational & Commercial
Fisheries/Landings

MARINE HABITAT

9,000 miles tidal shoreline
1,472,000 acres bottomlands

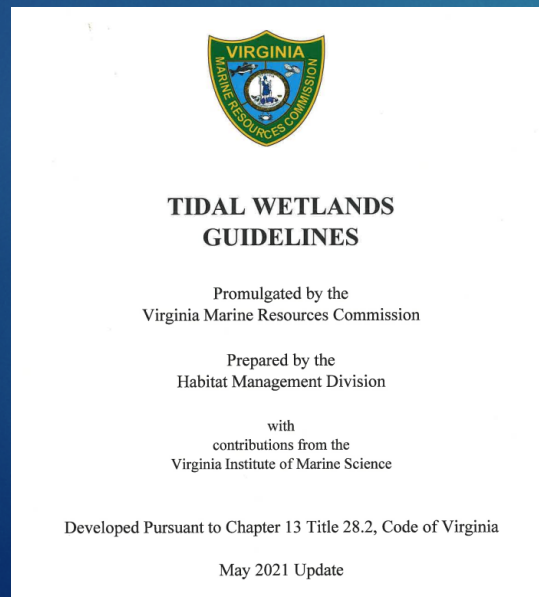


Shellfish Management



Chapter 13 - Tidal Wetlands

- ▶ “The Commission shall preserve and prevent the despoliation and destruction of wetlands while accommodating necessary economic development in a manner consistent with wetlands preservation.”
- ▶ Localities may voluntarily manage this resource through the local wetlands board process.
- ▶ Approximately 9,000 miles of tidal shores

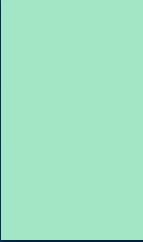


The Role of the Virginia Institute of Marine Science (VIMS)

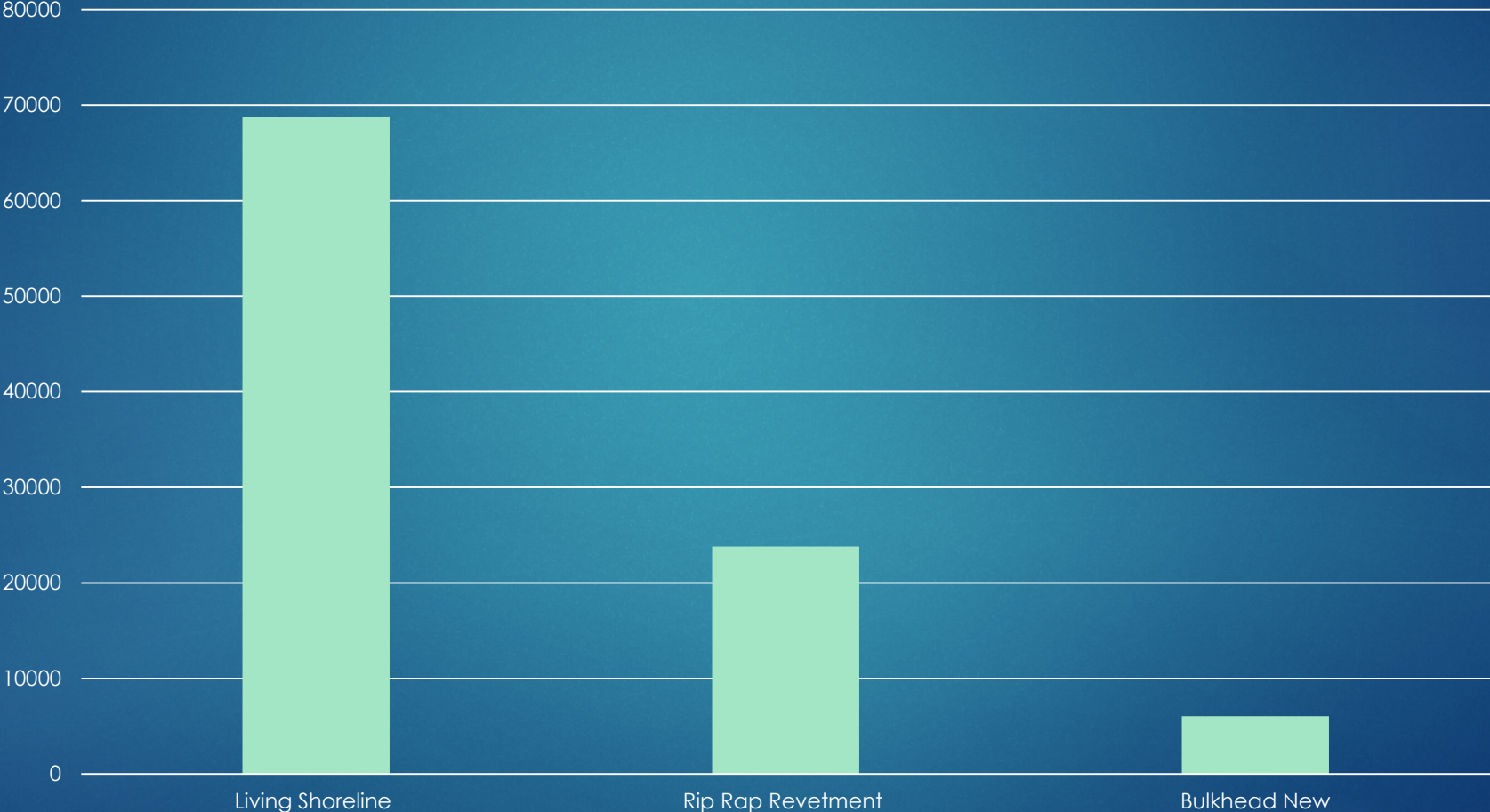
- ▶ Codified scientific arm to the VMRC in marine science
- ▶ **Office of Research & Advisory Services & Center for Coastal Resources Management**
 - ▶ Scientists to advise permit writers on the scientific evaluation of projects.
 - ▶ Will write advisory reports on projects when requested.
 - ▶ Long-term planning, mapping, policy development, and shoreline research.



Typical Erosion Control Structures



2023 Structure Applications



Virginia's No-Net-Loss Policy

- ▶ 2005 Mitigation-Compensation Policy requires the compensation of all permitted tidal wetland losses.
 - ▶ No-net-loss of wetland acreage
 - ▶ New Tidal Wetland Guidelines recognize an equal ecological value in vegetated and non-vegetated wetlands.



Virginia's Living Shoreline Policy

Senate Bill 964

Section 28.2-104.1

July 2011



"Living shoreline" means 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.

LIVING SHORELINES PROMOTE RESILIENCE

5 BENEFITS LIVING SHORELINES HAVE OVER TRADITIONAL COASTAL MANAGEMENT
TECHNIQUES

Living Shorelines or "soft shoreline projects" are a coastal management tool that relies "on natural and nature-based features, such as marshes, dunes, and oyster reefs" to provide shoreline protection while also providing ecological and community benefits.



IMPROVE WATER QUALITY

OYSTER REEFS FILTER
WATER

LIVING SHORELINES PROVIDE
HABITAT, STORE NUTRIENTS, AND
DECREASE SEDIMENT MOVEMENT.

NATURAL BARRIERS TO WAVES

LIVING SHORELINES
ABSORB WAVE ENERGY
TO DECREASE DAMAGE

15FT OF MARSH OR OYSTER REEFS
CAN ABSORB 50% OF INCOMING
WAVE ENERGY



STORE AND ABSORB CARBON

LIVING SHORELINES
CREATE CARBON SINKS

THROUGH CARBON
SEQUESTRATION, VEGETATION (LIKE
MARSHES AND OTHER PLANTS)
ABSORBS CARBON FROM THE
ATMOSPHERE.

REDUCE EROSION

PLANTS, STONE, &
SAND LIMIT STORM
RUNOFF

LIVING SHORELINES PROMOTE
ECOSYSTEM HEALTH WHILE
DECREASING EROSION AND
COASTAL DAMAGE.



KEEP COMMUNITIES SAFE

LIVING SHORELINES
SUPPORT RESILIENT
COMMUNITIES

LIVING SHORELINES STABILIZE COASTS,
REDUCE FLOOD RISKS, SAVE MONEY OVER
TIME, AND PROMOTE RECREATION.



CREATED BY:
SYDNEY O'SHAUGHNESSY



LEARN MORE:
EESI.ORG

Creation of Expedited Living Shoreline Permits

LSGP 1

- ▶ 21 day expedited permit
- ▶ “soft” living shorelines
 - ▶ Fiber logs or shell bags
 - ▶ Sand
 - ▶ Planting



LSGP 2

- ▶ 21 day expedited permit
- ▶ Living shorelines with toe revetments
- ▶ Additional site requirements for approval and APO notifications.



2020 Legislation- Senate Bill 776

- ▶ Established Living Shorelines as the default approach to shoreline control unless the “best available science” indicates the site is not suitable for such methods. (Code of Virginia 28.2-104.1)
- ▶ “ensure protection of shorelines and sensitive coastal habitats from sea level rise and coastal hazards, including guidelines and minimum standards promulgated by the Commission pursuant to subsection COV 28.2-1308
- ▶ “Develop integrated guidance for the management of tidal shoreline systems....for coordination of permit decisions.” COV 28.2-104.1

May 2021 Guideline Updates

- ▶ Update the guidelines based on the best available science.
- ▶ Communicate that living shorelines are the default approach to shoreline stabilization. COV 28.2-104.1
- ▶ Ensure protection of shoreline resources from sea level rise and climate change. COV 28.2-1301
- ▶ Identify preferred shoreline management approaches

Living Shorelines as the Default Approach

Living Shoreline

- Living Shorelines must be the primary approach to shoreline management unless best available science proves one is not suitable.

Rock

- Rock revetments are the next preferred alternative if a LS is not suitable based on best available science.

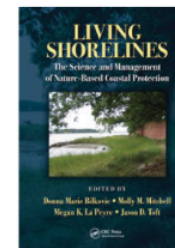
Mixed Media Shoreline

- When a LS is not suitable, living shoreline approaches should be incorporated where possible.



Determining Living Shoreline Suitability

- ▶ Hydrodynamic settings
- ▶ Water Depth
- ▶ Sediment Type
- ▶ Fetch
- ▶ Bank Height
- ▶ Neighboring Properties
- ▶ Subaquatic Vegetation
- ▶ Riparian Vegetation
- ▶ Oyster Reefs
- ▶ Upland Structures
- ▶ Storm Waves
- ▶ Sunlight
- ▶ Boat Wake



Chapter

Practical Living Shorelines

Tailored to Fit in Chesapeake Bay

By *Walter I. Priest*

Book [Living Shorelines](#)

Edition 1st Edition

First Published 2017

Imprint CRC Press

Pages 26

eBook ISBN 9781315151465

Administration of the new Living Shoreline Laws – Learning Lessons

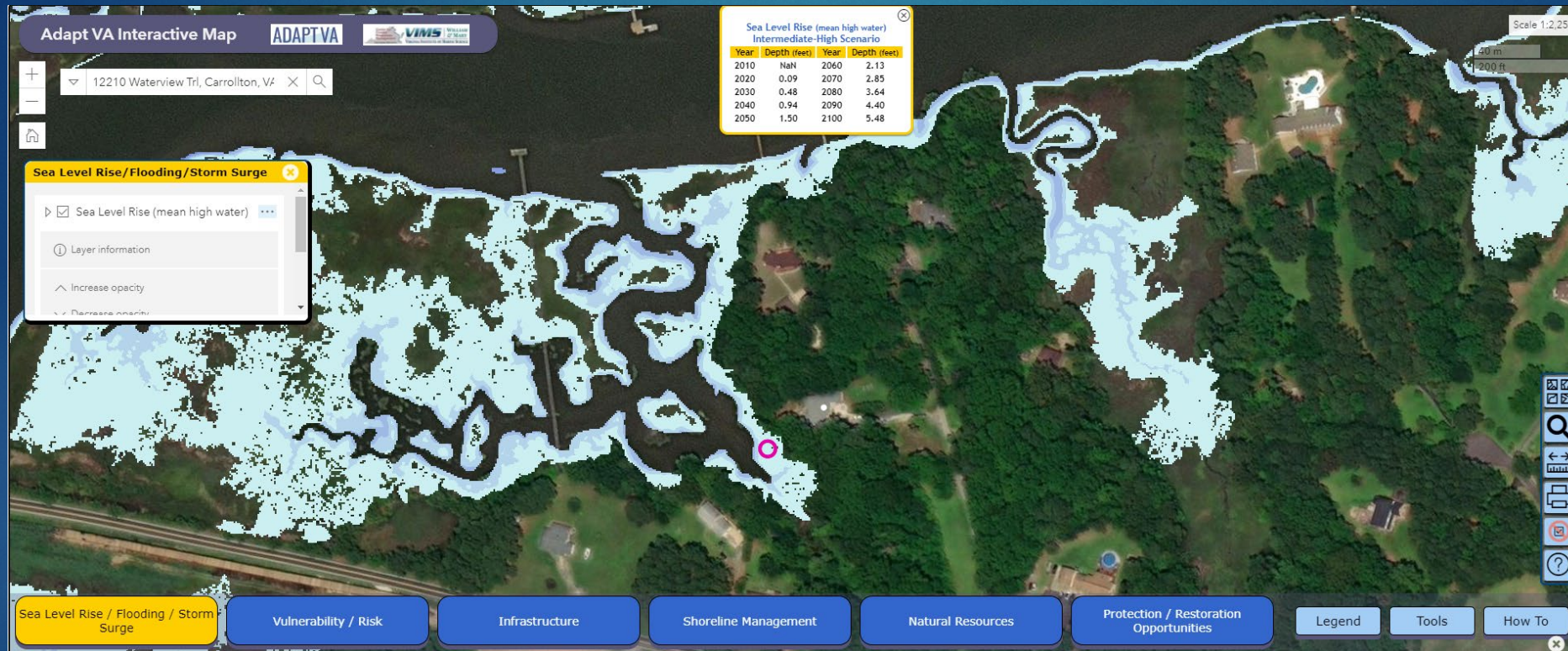
Barriers to Implementation

- Cost of Installation
 - Contractor Availability
 - Design and Permitting Expertise
 - Homeowner Comfort with the Design Concept.
- Preference for lawn that leads to hardened structure
- Competing Natural Resources (SAV, Riparian Buffers)

Incentives to Implementation

- Cost Share Programs
- Expedited Permitting
- Regaining Eroded Property
- Contractors can “upsell” additional services.

Proposed projects must allow the landward migration of existing vegetation over the useful life of the project using the 2017 NOAA Intermediate-High Projection Curve.

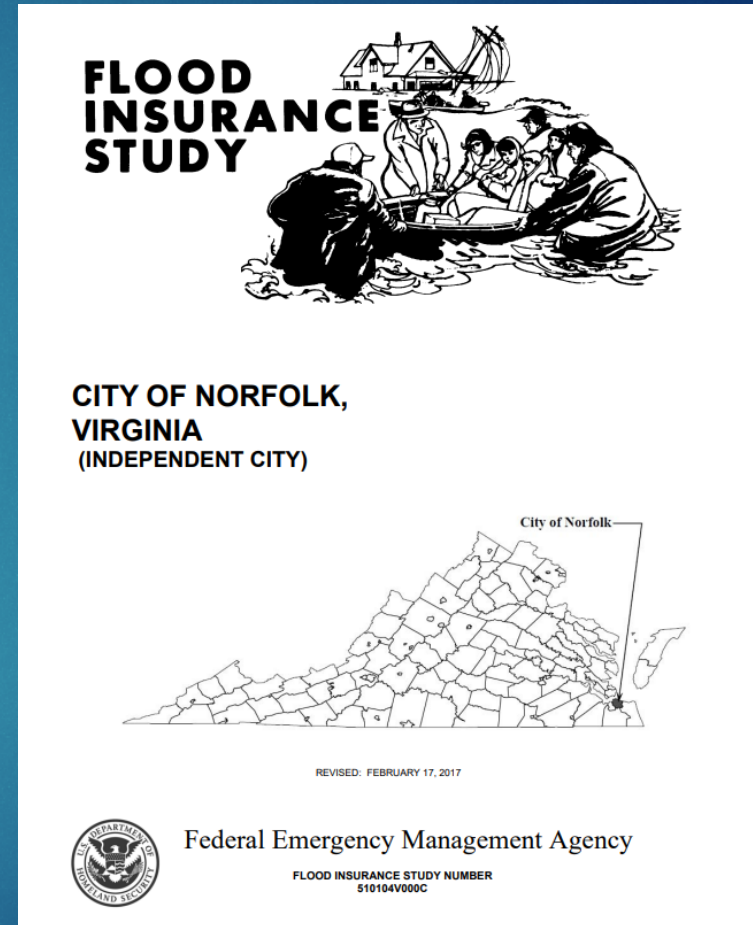


https://cwbi-app.sec.usace.army.mil/rccslc/slcc_calc.html

<https://msc.fema.gov/portal/advanceSearch>

Storm Protection

1. Projects should be designed to mitigate coastal hazards...over the useful life of the project.
2. Projects should ensure that the stabilizing objectives address the most erosive conditions predictable to the site.
3. Project reviews shall include " the 10-year storm event water levels as calculated by NOAA and FEMA " (Storm Surge)
4. The Board must incorporate consideration of long-term sustainability and coastal resource resilience



Designing Resilient Living Shorelines

- ▶ The extent to which living shorelines can mimic the resiliency of natural marshes and oyster reefs will depend on their setting, design and the type of human maintenance provided. Truly resilient projects will require engineers and ecologists to work together to describe the dynamics of shoreline processes under sea level rise and translate this understanding into living shoreline design.”
(Embracing dynamic design for climate-resilient living shorelines, Mitchell/Bilkovic, 2019)”

Design Considerations – Creating a Resilient Design



- **Create a Wide Marsh**

- Provides more space for wave attenuation

- **Establish Dense Stands of Marsh Grasses**

- Fertilize with slow-release fertilizer at planting (Priest, 2017).
- Particularly important when planting directly in sand fill.

- **Consider Sill Placement**

- Place sill channelward of MLW if feasible and permitted.
- Backfill with sand to decrease nearshore depths short-term, leading to shallower depths long-term.
- Maximize distance between sill and bank to enhance wave break zone.



- **Design for Protection**

- Aim for maximum protection within budget, regulations, and site conditions.

- **Use Heavier Materials for Sills**

- Design using materials that can withstand high-intensity storms.
- Heavier material is less likely to be displaced by waves

- **Incorporate Oyster Structures if Conditions Favor Recruitment**

- Oysters can migrate landward or accrete on structures to keep pace with sea level rise.





•Consider Multiple Nature-Based Solutions

- Employ various solutions as lines of defense.

•Restore Upland Buffer

- Provides additional protection to upland structures.
- Buffers dissipate wave energy similarly to marshes.

•Create Stable Slopes

- Design slopes to be less susceptible to erosion from wave action.

•Manage Bank Slope

- Protect as much of the bank face as possible.
- If bank height exceeds sand fill elevation and grading isn't an option, consider terracing.
- VIMS recommends a minimum 3:1 bank slope (Hardaway, et al., 2021).

Up Coming Products Related to Resilient Shorelines

- ▶ Thin layer placement manual and accompanying pilot projects by the Elizabeth River Project
- ▶ Resilient Shoreline Design Resource Document by Wetlands Watch and CZM
- ▶ Beneficial Use of Dredge Sediment Manual by MRC and CZM
- ▶ Updates to MRC's Tidal Wetlands Mitigation and Compensation Policy