

Essential Skills for Living Shorelines

Problem Solving & Importance of Site Evaluation

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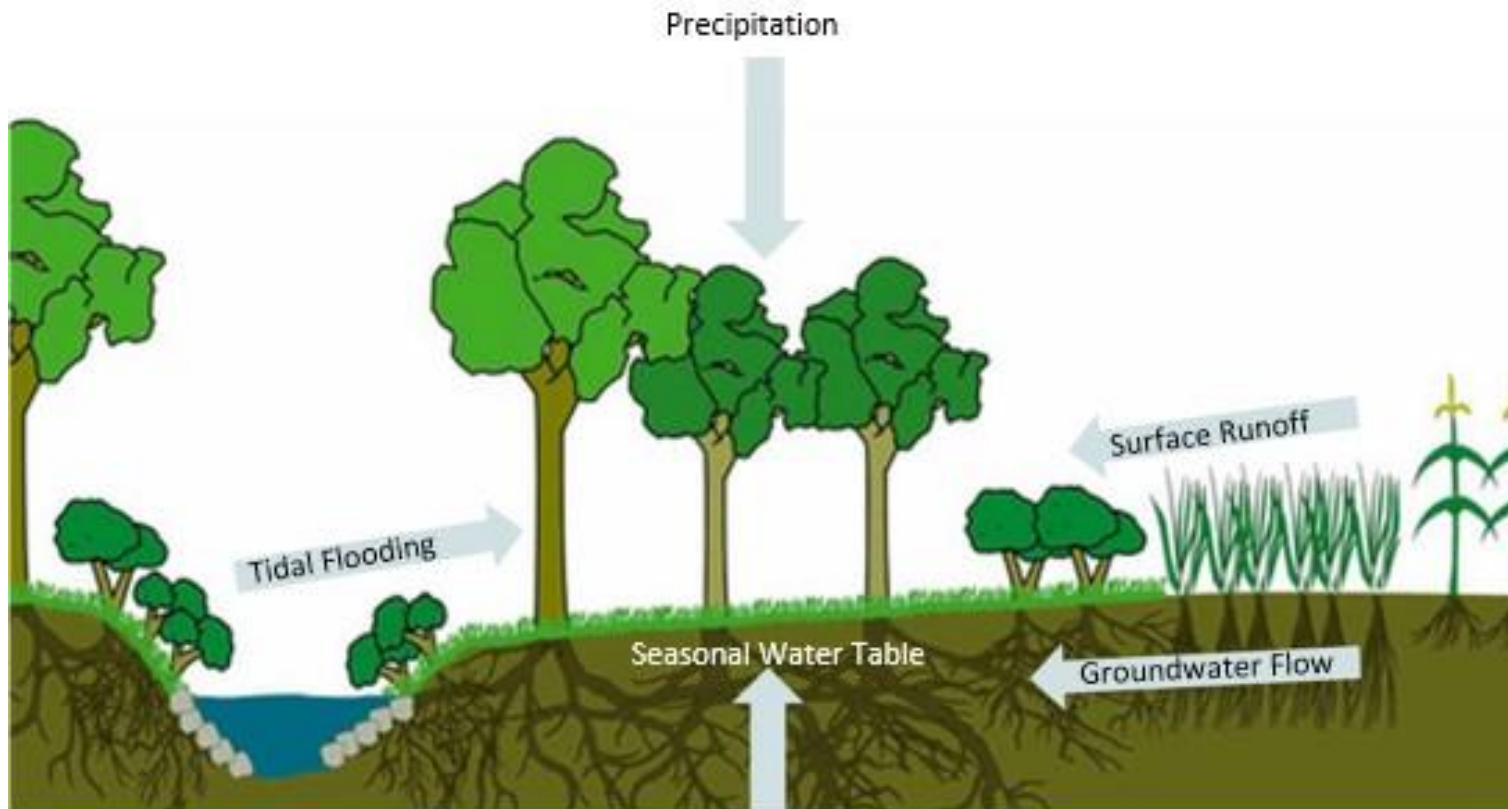
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Shoreline - Water Interactions

Erosion happens when moving water overwhelms forces holding soil in place



MOVING WATER

Precipitation

Surface runoff

Surface flooding

Tidal waves & flooding

Groundwater moving through
root zone

Elevated water tables near or
above ground surface

Natural Feature Benefits

RIPARIAN BUFFERS



TIDAL MARSHES



BEACHES & DUNES



REEFS



Rough surfaces create friction to reduce flow velocity & wave height

Connected root systems hold soil in place & promote water infiltration

Water uptake by plants reduces standing water

Sediment settlement with slower water movement

Nutrient & pollutant uptake by living plants & soil community processing them into less harmful forms

LESS EROSION POTENTIAL

LESS FLOODING

WATER QUALITY IMPROVEMENT

Restoration vs. Living Shorelines

Habitat Restoration

Main Purpose:

Replace lost natural habitat

People are generally absent for habitat quality

Shoreline habitat restoration opportunities regardless of erosion conditions

Living Shorelines for Erosion Protection

Main Purpose:

Solve erosion problems for people using natural features

- Reduce erosion risk
- Human presence normal
- Blend with shoreline activities
e.g. water access, recreation, boating

Identify Shoreline Problems

Blend property owner concerns with expert observations & opinions



Is flooding or erosion the main problem?

Is erosion happening? If so, where? Can it be tolerated and left alone to let nature take its course?

If there is active erosion, what forces might be causing it?

Can simple behavior adjustments solve erosion problem?

Changing water access points

Less frequent mowing

Horticulture practices

Establish goal(s) for intervention project

Property Owner Concerns *other than erosion*

Tidal flooding frequency & extent

Safety

Wildlife *love or hate*

Recreation Access

Boating

Landscape Design Aesthetics *formal vs. informal & natural*

Sentimental Trees & Shoreline Memories

Water Views

Neighbors' Shorelines & Opinions

Local shoreline norms

Established line of defense across parcels



Develop Shoreline Profile *Natural Features*

	Riparian Buffer & Bank	High Marsh Dry Beach	Low Marsh Wet Beach	Nearshore
Natural Features & Plants	Forested - undisturbed	Backshore Trees	Low Marsh perennials	Submerged Aquatic Vegetation
	Forested – disturbed	High Marsh Perennials		Shellfish Reefs
	Perennials & Grasses Only	Dune Perennials		Sand Bars
Fewer Plants	Turf Grass		Sand & Mud Flats	Tidal Flats
	Bare Soil	Dry Sand	Wet Sand	Deep Water
	Developed or Armored			

Source: VIMS Living Shoreline Design Guidelines 2021

Develop Shoreline Profile Bank Height & Slopes

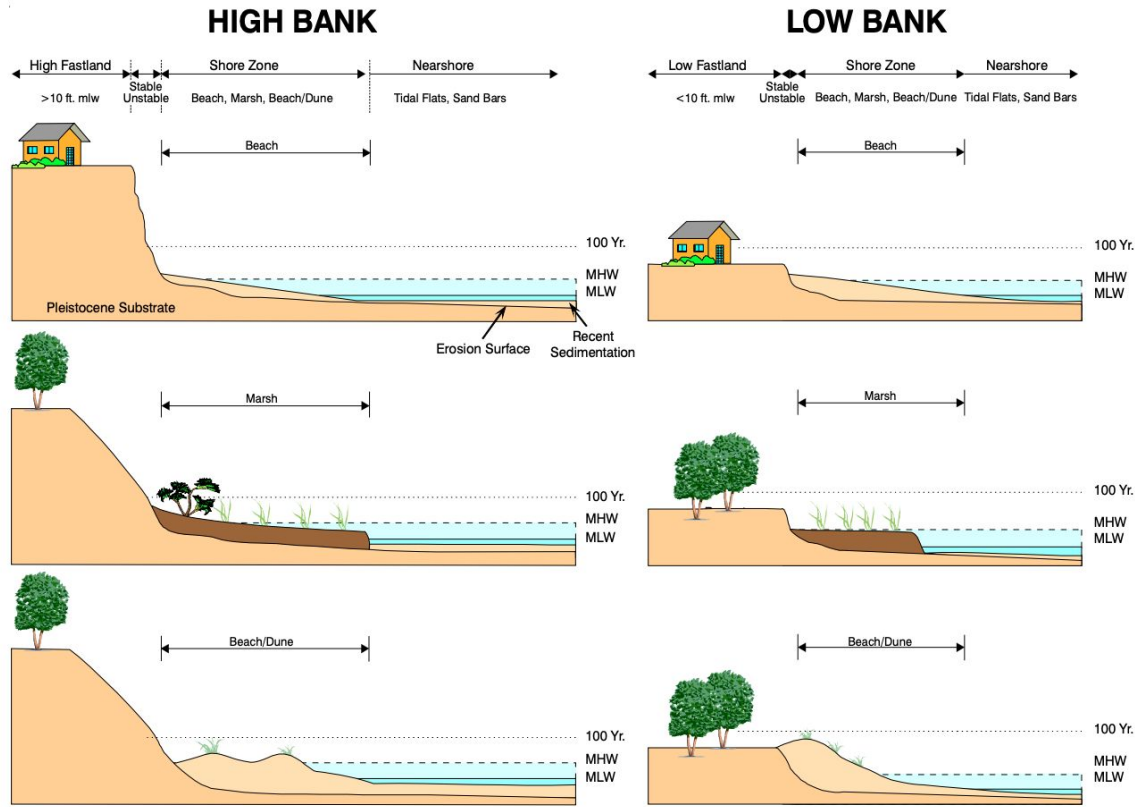
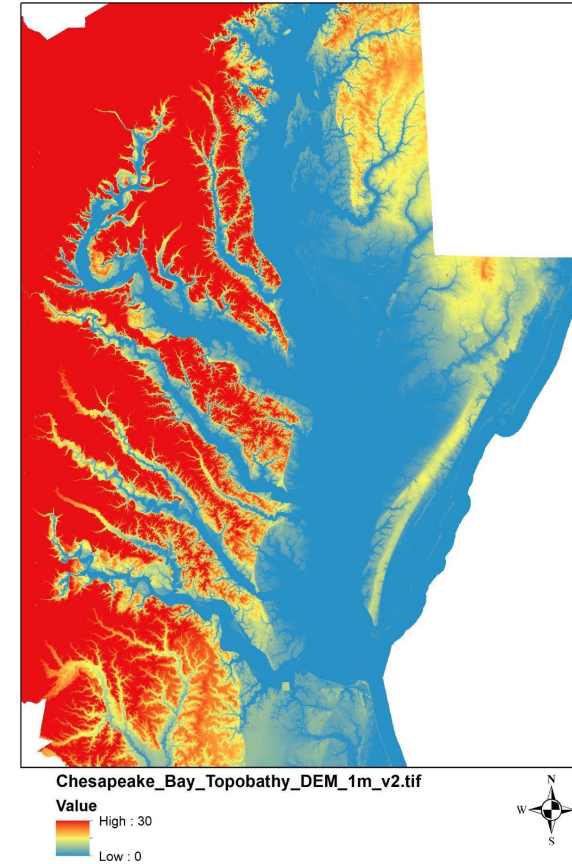


Figure 13
Six typical shoreline profiles around Chesapeake Bay. The stability of the bank face is dependent upon the width and type of shore zone features. Wide beaches/dunes and marsh zones can offer significant wave protection even during storms. (Mean high water (MHW), mean low water (MLW), and 100-year storm surge elevation.)

Source: *Shoreline Management in the Chesapeake Bay*, Hardaway & Byrne



Land Elevations Above 100 ft

High steep banks may require different techniques like bank grading or bank stabilization

May not qualify for expedited general permits

Source: *Topobathymetry Map* provided by D. Milligan, VIMS

Develop Shoreline Profile *Human Uses*

	Riparian Buffer & Bank	High Marsh Dry Beach	Low Marsh Wet Beach	Nearshore
Human Uses	Visible & underground infrastructure	Existing defense structures		Docks – Piers – Boathouses
	Riparian access structures	Recreation uses		
	Stormwater management	Water access improvements & uses		Navigation channels
	Formal landscape			Boat wakes
	Natural landscape			

Source: VIMS Living Shoreline Design Guidelines 2021

Living Shoreline Suitability

What to Look For

- Active erosion threatens valuable asset(s)
- Upland land use change or stormwater management cannot solve problem
- Willing property owner with goals & realistic expectations

- No significant harm to natural or cultural resources
- Construction access & future maintenance/monitoring access is feasible
- No significant land or water use conflicts
- Local reference habitats available **Biological Benchmarks**
- Available space for habitat shifts due to sea level rise

Construction Access Feasibility

How to transport equipment & materials to shoreline by land or water



Access routes through forest areas, across tidal marshes, valuable turf areas

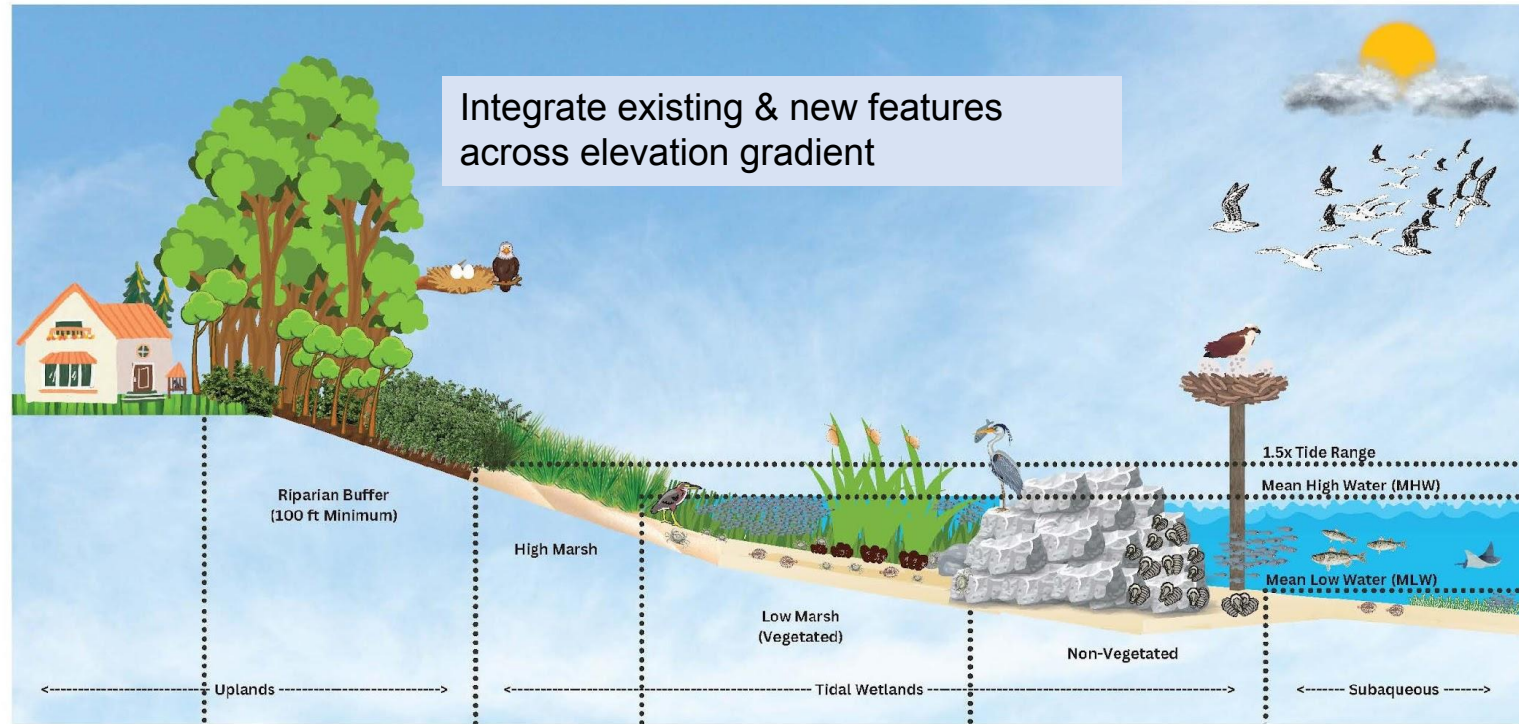
Material stockpiles & equipment staging

Restoration plans

Labor accommodations

Volunteer access & parking

Living Shoreline Potential Practices



UPLAND

- Stormwater management
- Conservation landscaping
- Bank grading & re-planting

TIDAL WETLAND

- Protect existing marsh
- Sand fill & beach nourishment
- Planted tidal marsh & beach

M. Whalen VIMS

SHALLOW WATER

- Stone & oyster sills
- Offshore breakwaters

Getting Ready for Monitoring

How to evaluate project performance

REASONS FOR PROJECT-LEVEL MONITORING

Document how projects are built

Comply with permit conditions for monitoring reports

Track performance over time

Identify maintenance needs

Know when adaptive management is needed



Monitoring Plan Considerations

Document Baseline Conditions *to compare with future monitoring data*

Delineate erosion problem areas

Delineate existing natural features to remain *as part of a living shoreline system*

Establish normal tide & storm water levels *based on observed site conditions*

Establish biological benchmarks *Elevation ranges occupied by natural features*

Biological Benchmarks

Benchmark: A fixed physical object or mark used as a reference point

Biological Benchmark: Reference point is a natural feature

LIVING SHORELINE APPLICATIONS

Determine the elevation range occupied by local plant communities

Establish minimum target elevations for created or restored features

Use higher elevations in each zone to design for sea level rise adaptation & habitat shifts

Biological Benchmarks

Survey multiple elevations along upper and lower limits of plant zones

Low Marsh – High Marsh – Upland Transition

Zones may overlap

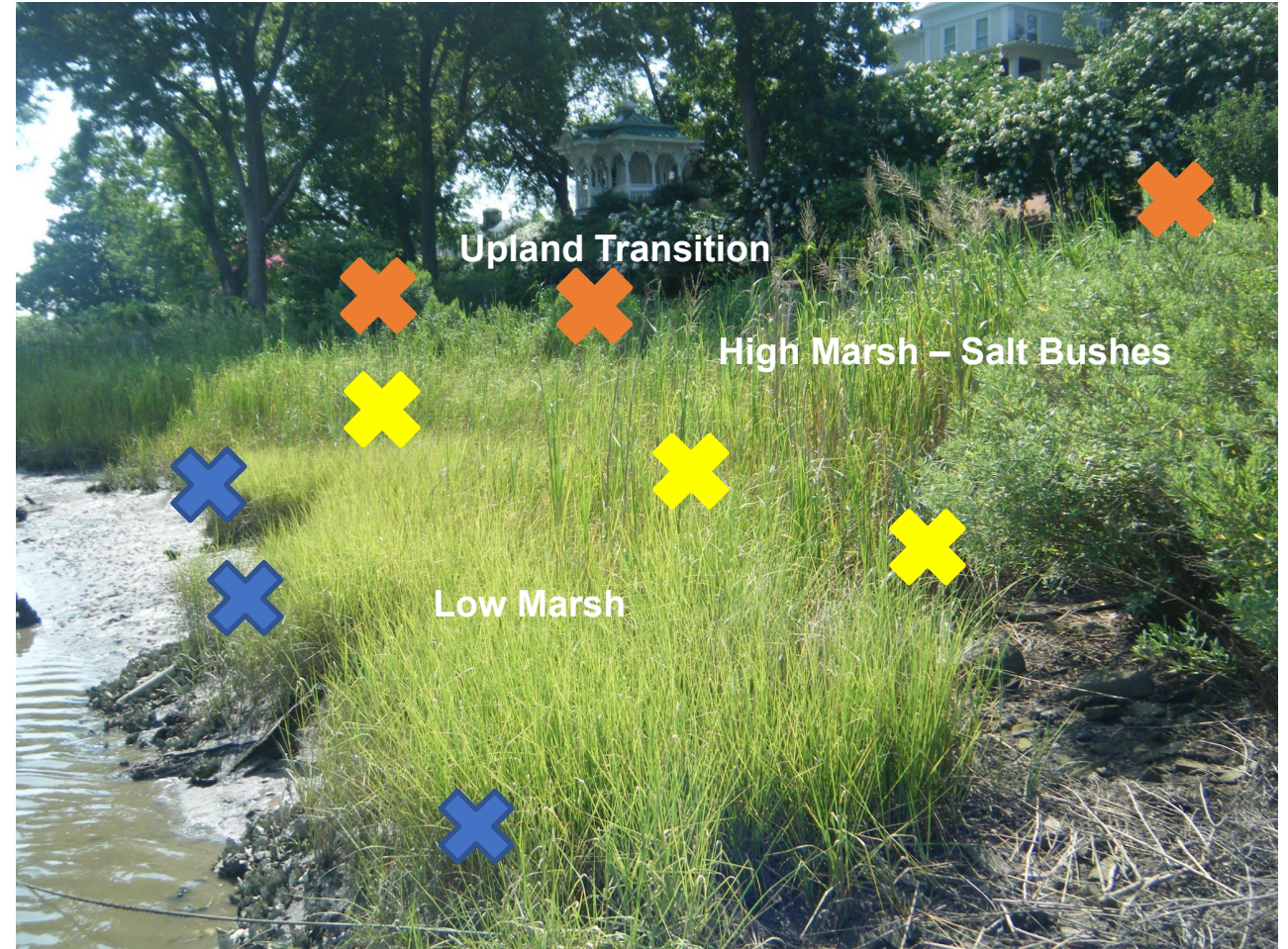
Calculate average elevation range for each zone

Example

Table 10.4 Example of a Biological Benchmark Determination

Biological benchmark form									
Site:	Libertyville Wetland Bank								
Date:	17-Aug-05								
Investigator:	W. I. Priest								
Datum:	NAVD 88								
	Lower limit <i>Spartina alterniflora</i>	Upper limit <i>Spartina alterniflora</i>	Lower limit <i>Phragmites australis</i>	Upper limit <i>Phragmites australis</i>	<i>Juncus roemarianus</i>	Saltbush	Misc. species	Note	
	1.12	2.45	2.45		2.73	3.8	0.65	Creek bottom	
	0.93	2.8	2.17		2.48	3.86	1.36	Ditch bottom	
	0.8	2.77	2.1		2.83	3.61	2.58	Panne	
	0.91	2.65	2.65		3.03	3.59	3.3	Existing grade	
	0.82	2.81	2.82	3.43	2.93	3.46			
	1.24	3.04	2.83		2.9		2.81	S.r.	
		2.93	2.97		2.7		2.86	S.cyno.	
		2.89	3.03				3.04	D.s.	
			2.9				3.22	D.s.	
Mean	0.97	2.79	2.66		2.80	3.66			
Max	1.24	3.04	3.03		3.03	3.86			
Min	0.80	2.45	2.10		2.48	3.46			
N	6	8	9		7	5			
Ave dev	0.14	0.13	0.28		0.14	0.13			
Std dev	0.17	0.18	0.34		0.18	0.16			

Source: W. Priest III 2017



Monitoring Plan Considerations *(continued)*

Define how to perform monitoring *can it be done?*

Confirm monitoring is feasible & safe

Identify who's responsible for monitoring at what stage

Secure future access legally & physically *how can access be maintained?*

Determine key performance indicators *most important things to watch for*

Establish fixed photo stations & permanent markers

Monitoring Plan Considerations *(continued)*

Maintenance Triggers *what to include with maintenance plan?*

How much plant succession is acceptable – when is suppression needed

Grazing exclusion materials & other wildlife management

How to remove trash & large woody debris

Invasive plant control anticipation

Tree and shrub trimming or removal

Sea level rise adaptation (add sand or raise structures)

Site Evaluation Tools

Where to look for help & guidance

VIMS Center for Coastal Resources Management

[Living Shorelines Web Site](#)

[Living Shorelines Story Maps](#)

[AdaptVA Interactive Map](#)

[Shoreline Decision Support Tool](#)

[Coastal Living Guides](#)

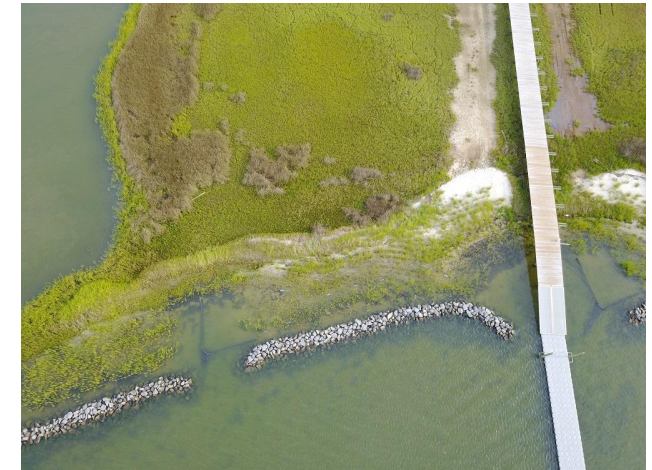
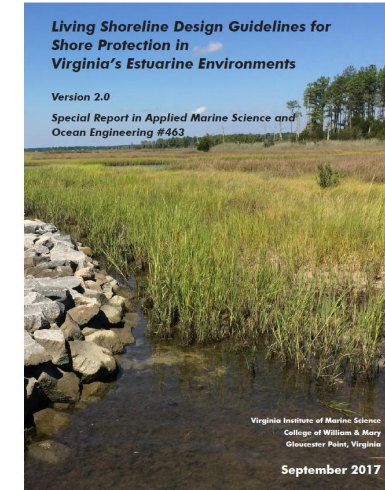
VIMS Shoreline Studies Program

[Living Shorelines Design Guidelines 2021](#)

[Living Shoreline Sea-Level Resiliency reports](#)

[Site Assessment Tools & Worksheet](#)

[Shoreline Change Online Viewer 1937-2017](#)



Site Evaluation Tools

Where to look for help & guidance

VIMS Shoreline Decision Support Tool

Trusted scientific foundation

Combines GIS suitability model + site observations

Re-sizes for different screens

Interactive Help built in

Final Recommendations may or may not make sense

Process of asking questions should be helpful regardless

Shoreline Decision Support Tool

Answer a series of questions and follow the prompts below to arrive at a recommended shoreline erosion control strategy.

[< Back to Introduction and How To](#)

Is the shoreline currently defended with an erosion control structure?	<input type="radio"/> yes, with bulkhead or seawall <input type="radio"/> yes, with revetment (riprap) against the upland <input type="radio"/> no
Is the shoreline part of a residential canal?	<input type="radio"/> yes <input checked="" type="radio"/> no
Is the shoreline part of any of the following?	<input type="radio"/> marina <input type="radio"/> defended shoreline along commercial or industrial area <input type="radio"/> next to road, parking area, or railroad bed <input checked="" type="radio"/> no
Is there submerged aquatic vegetation (SAV) or mangroves within 30 feet of the shoreline, or is the shoreline part of a sand spit?	<input type="radio"/> sav present <input type="radio"/> mangroves present <input type="radio"/> sand spit present <input checked="" type="radio"/> no
The height of the bank at the interface between the shoreline and the upland can limit the type of management solutions that would be effective at countering erosion. Erosion on very high banks (those greater than 30 feet) may not be driven by wave energy, and therefore shoreline management strategies would not be appropriate.	<input type="radio"/> yes <input type="radio"/> no
Is your bank height greater than 30 feet?	<input type="radio"/> yes <input type="radio"/> no

Site Evaluation Tools

Where to look for help & guidance

Free Expert Advice

DCR-Shoreline Erosion Advisory Service *site visits, plan reviews, construction inspections*

VA Institute of Marine Science

VA Marine Resources Commission *Habitat Management Division*

Locality Staff *environmental programs & Wetlands Board staff*

Living Shoreline Professionals Network

Living Shoreline Collaborative

Chesapeake Bay Landscape Professionals

Shoreline Business Partners



Contact Information



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