

Essential Skills for Living Shorelines

Problem Solving & Importance of Site Evaluation

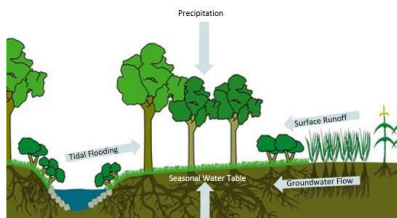
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Shoreline - Water Interactions

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



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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



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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 <i>e.g. water access, recreation, boating</i>
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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





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Property Owner Concerns *other than erosion*

Tidal flooding frequency & extent

Safety

Wildlife *love or hate*

Recreation Access

Boating

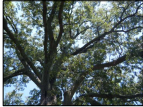
Landscape Design Aesthetics *formal vs. informal & natural*

Sentimental Trees & Shoreline Memories

Water Views

Neighbors' Shorelines & Opinions

Established line of defense across parcels









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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
	Turf Grass		Sand & Mud Flats	Tidal Flats
Fewer Plants	Bare Soil	Dry Sand	Wet Sand	Deep Water
	Developed or Armored			

Source: VIMS Living Shoreline Design Guidelines 2017



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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		Navigation channels
	Stormwater management	Water access improvements & uses		
	Formal landscape			Boat wakes
	Natural landscape			

Source: VIMS Living Shoreline Design Guidelines 2017



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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



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Construction Access Feasibility

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



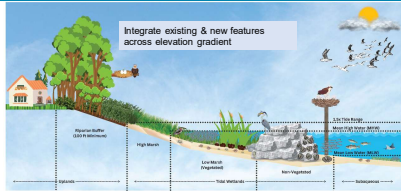
R. Martin

Access routes through forest areas, across tidal marshes, valuable turf areas
Material stockpiles & equipment staging
Restoration plans
Labor accommodations
Volunteer access & parking



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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

SHALLOW WATER

Stone & oyster sills
Offshore breakwaters



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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



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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*



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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



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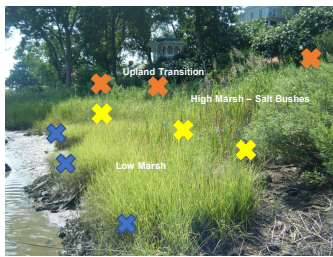
Biological Benchmarks

- 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

Table 1: Example of a Biological Benchmark Survey

Zone	Survey Point	Elevation (ft)	Plant Community
Low Marsh	1	1.2	Smooth Cordgrass
	2	1.5	Smooth Cordgrass
	3	1.8	Smooth Cordgrass
	4	2.1	Smooth Cordgrass
High Marsh	5	2.5	Salt Marshes
	6	2.8	Salt Marshes
	7	3.1	Salt Marshes
	8	3.4	Salt Marshes
Upland Transition	9	3.8	Upland Transition
	10	4.1	Upland Transition
	11	4.4	Upland Transition
	12	4.7	Upland Transition

Source: W. Priest III 2017



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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



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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)



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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](#)
- [Living Shorelines Research](#)

VIMS Shoreline Studies Program

- [Living Shorelines Design Guidance](#) 2017
- [Living Shoreline Sea-Level Resiliency](#) reports
- [Living Shoreline Case Studies](#)
- [Shoreline Erosion Trend Maps](#) 1937-2017



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