

How To Get Started: **Basic Site Suitability & Feasibility Considerations**

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March 16, 2016

Delaware Living Shoreline Training Workshop
Lewes, Delaware



How To Get Started

- General Site Evaluation based on location
- Basic Considerations
 - Land Uses
 - Planted Tidal Marshes
 - Fiber Logs & Mats
 - Hybrid Structures
 - Living Reefs
 - Do No Harm to other resources
 - Construction Access
- Weighing Multiple Factors
 - Environmental & Anthropogenic
- Living Shoreline Alternative Selection Tools

Delaware Shoreline Regions



- Delaware River
- Delaware Bay
- Inland Bays
- Atlantic Ocean coast

Each region has its own character & influences

Tidal tributaries within each region are varied

No simple One-Size-Fits-All design process for living shorelines

Site-Specific Evaluations

Necessary to determine suitability & feasibility for Living Shorelines

Site Evaluation Process

Each shoreline professional has a method for conducting site evaluations

Not all parameters have equal weight, professional judgment necessary

This workshop has data collection suggestions and tools for basic site evaluations for initial suitability determinations

More complex data collection may be necessary to develop concept design & permit application package

Ask First

Is shoreline management necessary?

Is there a risk problem that needs to be addressed?

Extra scrutiny for all
currently undefended, natural shorelines

Especially those with valuable living resources
riparian forest, tidal marsh, oysters, SAV

Parameters Typically Used in the Design of Living Shorelines

Source: [Living Shorelines Engineering Guidelines](#) 2015

System Parameters

Erosion History
Sea Level Rise
Tidal Range

Ecological Parameters

Water Quality
Soil Type
Sunlight Exposure

Hydrodynamic Parameters

Wind Waves
Boat Wakes
Currents
Ice
Storm Surge

Terrestrial Parameters

Upland Slope
Shoreline Slope
Width
Nearshore Slope
Offshore Depth
Soil Bearing Capacity

Parameters Typically Used in the Design of Living Shorelines

Source: [Living Shorelines Engineering Guidelines](#) 2015

Additional Parameters

Permits/Regulatory

End Effects

Constructability

Native/Invasive Species

Debris Impact

Project Monitoring

Property Owner Interest

Just a few of the basic considerations for some of these parameters are reviewed in this presentation

**MOST
SUITABLE**

Upper
reaches of
narrow
creeks

**Least
Suitable**

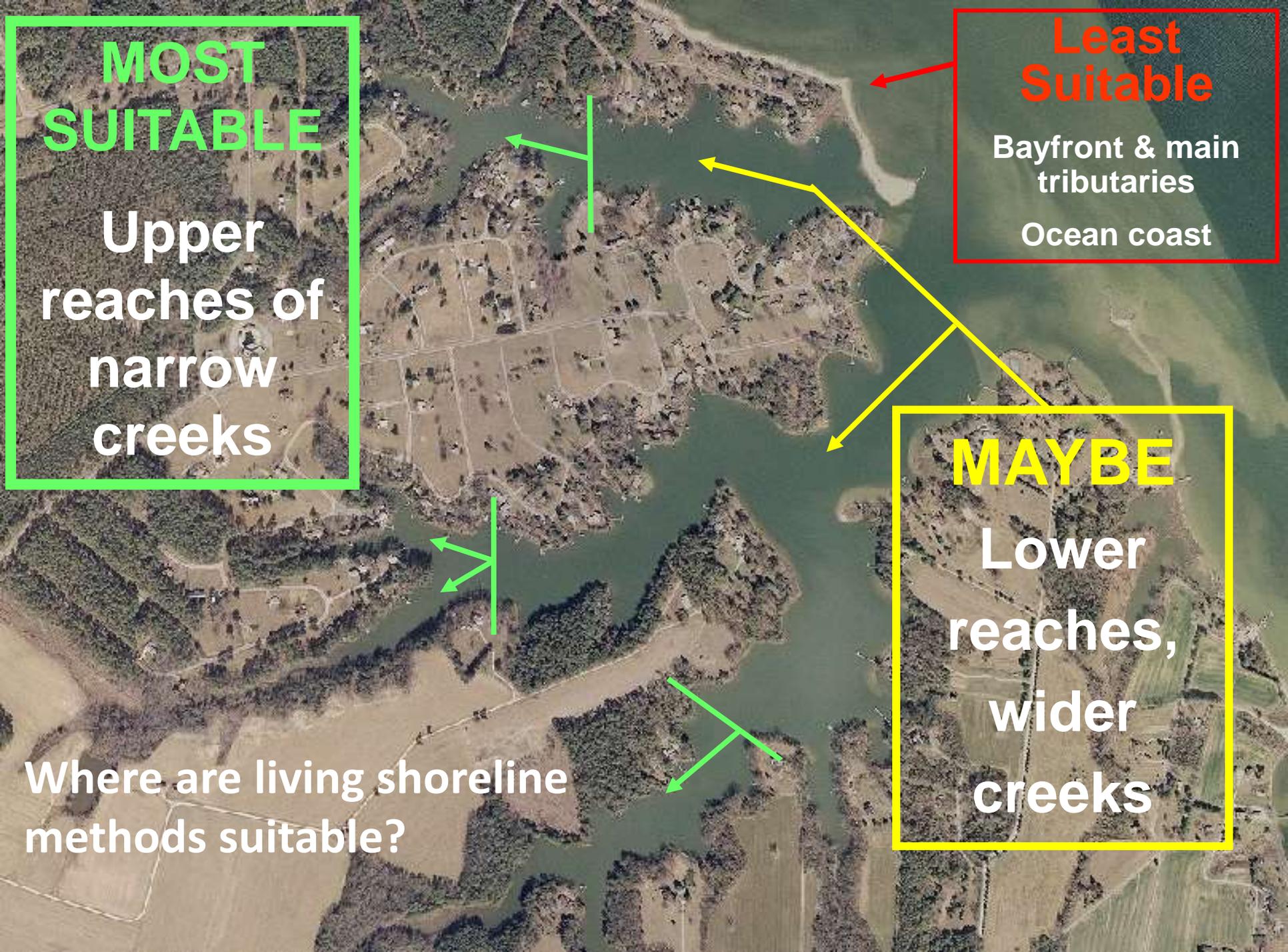
Bayfront & main
tributaries

Ocean coast

MAYBE

Lower
reaches,
wider
creeks

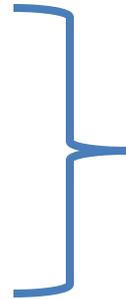
Where are living shoreline
methods suitable?



Fetch

Distance across water that wind can blow to generate waves

- Very low <0.5 mile
- Low 0.5 - 1 mile
- Medium 1 - 5 miles
- High 5 - 15 miles
- Very high > 15 miles



Most Suitable
for Living Shorelines

Hybrid only



Probably Not Suitable

Boat Wakes



Heavy boat traffic in narrow waterways will produce severe wave climate not indicated by other parameters, such as fetch

Shorelines near public boat ramps & marinas may be especially vulnerable

Look for presence or absence of docks, marinas, marked channels

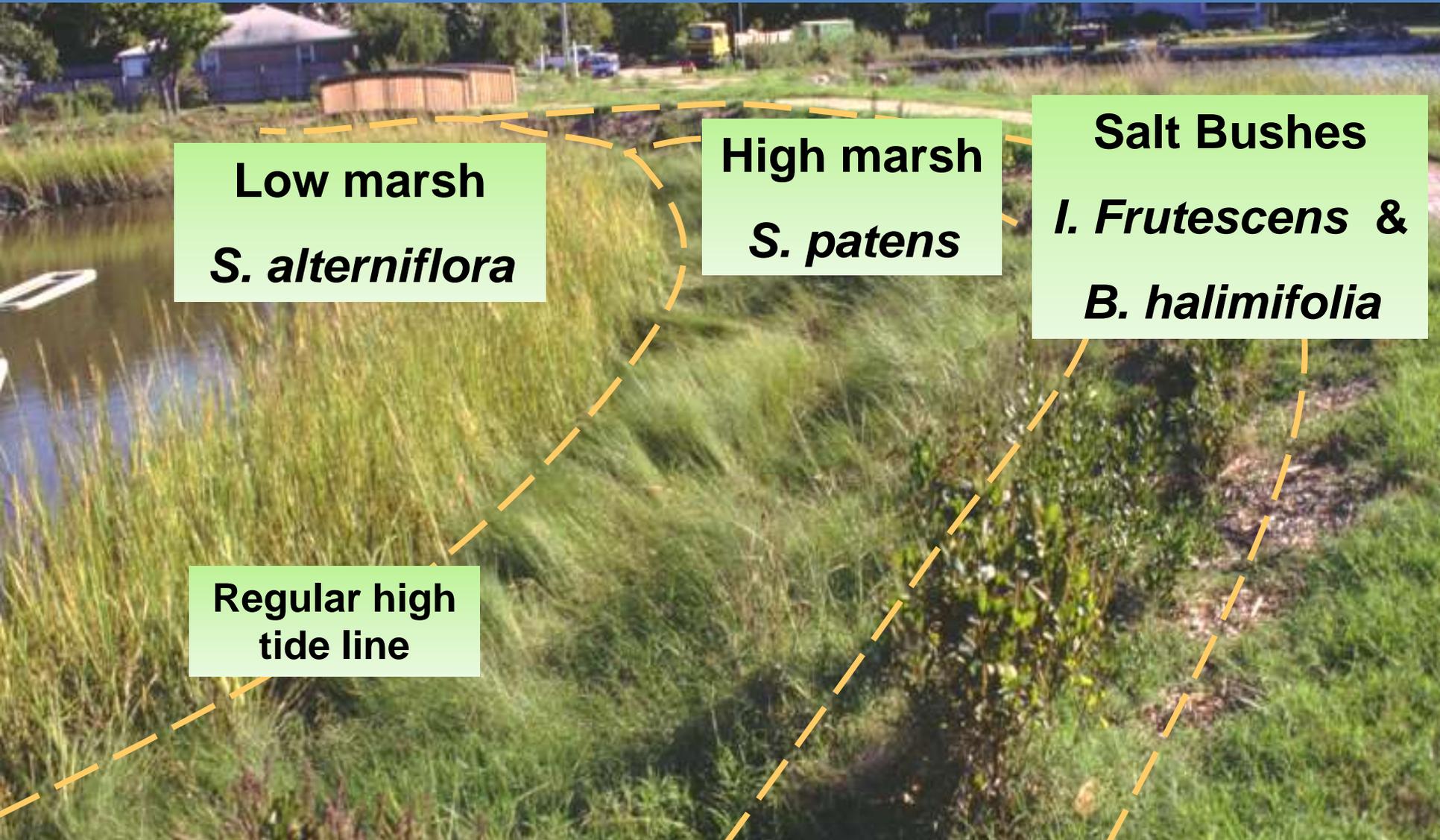
Local knowledge and judgment calls are required to weigh this parameter

Basic Planted Tidal Marsh Considerations

- Existing marshes indicate salinity & minimum target elevations
- If no marsh is present, determine limiting factors & overcome them
 - Not enough sunlight
 - Elevation too low
 - Excessive wave action or boat wakes
 - Sediment too mucky
- Wait for accretion or add sand fill
- Locate stormwater outfalls & runoff patterns that may interfere with project success



Planted salt marsh must be sloped so it drains at low tide;
plant failure may be caused by standing water



Low marsh
S. alterniflora

High marsh
S. patens

Salt Bushes
I. Frutescens &
B. halimifolia

**Regular high
tide line**

Basic Planted Tidal Marsh Considerations

- TLC required 1st growing season
 - Someone has to be responsible for regular inspections
 - Maintenance access must be available



- Temporary grazing exclusion may be necessary
 - Canada geese & mute swans
 - Deer & wild horses
 - Muskrats & nutria



Basic Fiber Log & Mat Considerations

- Easily lifted out of place by the force of water
 - Most suitable sites are low flow velocity
 - Staking & anchoring essential if they are in the water
 - Full contact with ground should be maintained
 - Routine inspections necessary, access should be available
- Temporary, biodegradable
 - May or may not need to be replaced, additional logs added to maintain desired elevations



Basic Fiber Log & Mat Considerations

- Planting into logs has mixed results
 - Saturation is important for wetland plants
 - Marsh plants easily grow into them
- Seeding with ribbed mussels possible
 - Especially where adjacent marsh not already colonized with mussels



Basic Hybrid Structure Considerations

- Firm or soft bottom type & expected settling
- Height in relation to tide range
- Structural integrity with expected wave climate
- Fish & crab movement in-out of marsh
- Navigation interference
- Ice in winter

Hybrid Structure Tidal Openings

When should they be included?

- Sill crest height > MHW
- Sill length > 100 Ft ??
 - No definitive standard
 - May need more or less
- Site-specific
 - Tidal ponds
 - Natural or created channels
 - Open ends
 - Recreation access



Tidal openings allow access for marine wildlife, but they also introduce wave energy into the planted marsh.

Stable embayments eventually form

Basic Living Reef Considerations

- Are there any natural reefs in vicinity to mimic?
- What is the local tide range & extreme tide potential?
Will the reef remain submerged or be exposed ?
- Is the wave climate low enough for loose shell or is some type of containment needed?
- Are there any navigation or public health concerns?

Basic Do No Harm Considerations

- Existing Riparian Buffers & Wetlands
 - avoid completely OR is temporary disturbance feasible
- Oyster Reefs
- Anadromous Fish – time of year restrictions
- Horseshoe Crabs – resting & spawning areas
- Migratory Shorebirds
- Beach Nesting Birds

Constructability must be determined EARLY in planning process



- Construction access from land or water?
- Any marsh crossings required? May need to use mats
- Machine size?
 - Excavator reach
 - Bobcat
 - Wheelbarrows for hand placement
- Soft substrates – machines can get stuck

Basic Land Use Considerations

- Public parks & preserves
 - public safety, recreation access
- Residential
 - parcel size, adjacent parcel land uses, navigation areas
- Commercial
 - aesthetics, absentee owners, maintenance
- Agriculture
 - incompatible practices, e.g. herbicides, introduced plant species
- Industrial
 - legacy fill & toxic contamination

Living Shoreline Suitability

Anthropogenic (People) Factors

More

Less

- | | | |
|------------------------|---------|----------------|
| • Property owner | Willing | Not interested |
| • Parcel size | Large | Small |
| • Upland improvements | At risk | Not threatened |
| • Development setback | Wide | Narrow |
| • Accessory structures | Absent | Present |
| • Adjacent parcels | Same | Different |
| • Recreation uses | Passive | Active |

Living Shoreline Suitability Environmental Factors

	<u>More</u>	<u>Less</u>
• Riparian buffer	Open	Developed
• Natural marsh	Present	Absent
• Amount of sunlight	Full sun	Shaded
• Wind wave action	Minor	Heavy
• Boat wakes	Rare	Frequent
• Nearshore	Shallow	Deep
• Bottom substrate	Hard sand	Soft mud
• SAV other special habitat	Absent	Present

SAGE Alternatives Analysis Tool

Green softer techniques

Gray harder techniques



Living Shoreline Methods

<http://www.sagecoast.org/info/information.html>

Hard copies also available

North Carolina Alternatives Analysis Tool

Weighing Your Options



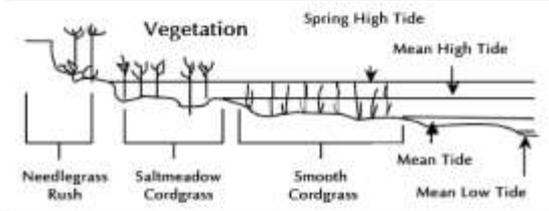
How to Protect Your Property from Shoreline Erosion:
A handbook for estuarine property owners in North Carolina



VEGETATION

What is it and how does it work?

Salt tolerant plants, such as smooth cordgrass, saltmeadow cordgrass, and needlegrass rush, are planted along the shoreline in 10–40 foot wide patches, forming a marsh fringe. Once the marsh is established, it is very effective at blocking wave energy—a 15-foot wide marsh can reduce the incoming wave energy by over 50 percent. Plant roots extend a foot or more below the surface, and further stabilize the shoreline.



Best for property that...

- has low-energy shoreline
- has little boat wake traffic
- has a gentle, wide slope (low sediment bank)
- faces a "fetch" (the distance over water that the wind

blows) of less than 3 miles or, if fetch is more than 3 miles, is protected from waves by sandbars or shallow mudflats

- if fetch exceeds 1 mile, an oyster reef, coir log, riprap toe, or sill may help stabilize the plants (see photos below)

Ecosystem costs & considerations

Ecosystem Service	Effect of Vegetation Planting on Ecosystem Value	
Wave erosion and sea level rise protection	●	marshes dissipate wave energy, provide stability, and trap sediments
Water quality	●	marsh systems filter runoff and improve water quality
Animal habitat	●	salt marshes provide food and protection for finfish and shellfish, mammals and shorebirds
Carbon storage	●	both marsh plants and the soil beneath them store significant amounts of carbon
Fish production	●	marshes provide protection and habitat for juvenile fish
	●	adult fish prowl the edges of salt marshes seeking prey
Ecosystem diversity	●	plants and animals thrive, increasing species diversity
Recreation	☹	planting a salt marsh will replace beach area (depends if you like beaches)
	☹	if you want a pier, it may need to be higher in the areas where it crosses the marsh

How to Get Started

Summary

- **No simple One-Size-Fits-All** design process for living shorelines
 - Site-Specific Evaluations are necessary
- **Multiple parameters without equal weight** should be considered
- **Basic considerations** for different project types helps determine what may be feasible at any given site
- **Alternative analysis tools** are available to support best professional judgement & help inform clients

Questions about How to Get Started?



Contact Information

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