Living Shoreline Case Study

Delaware Botanic Gardens, Dagsboro

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Project Details

Goals:

- Protect and enhance vegetated shoreline
- Provide for outreach and education

Energy Environment:

- Low

Construction Dates:

- 2020: Summer, multiple volunteer weeks

Partners:

- Delaware Center for the Inland Bays (facilitator, permitting, installation management)
- Delaware Botanic Garden (property manager, volunteer coordination, installation)
- Sovereign Consulting Inc. (design, permitting support, installation oversight and management)
- DNREC (RTK support)
- Drexel University (early concept phase only)

See the Site Before and After

Pre-installation December 2019

Post-installation September 2022

Baseline Conditions

December 2019

Chronic fringe marsh loss

December 2019

Chronic fringe marsh loss

Baseline Conditions

Issues:

- Slow shoreline migration due to a combination of sea level rise, shading, invasive species, and acute storm events; irregular, thin marsh edge

Site Characteristics/Important Features to Consider:

- Depth limited, low amplitude, high frequency waves during inclement conditions
- Occasional wake energy from distance creek channel
- Maximum fetch out of east <0.8 mi
- Slightly sandy silt to muck substrate
- 10ft. wide limit for access of equipment and materials
- The design had to be in-line with the character of the site

Living Shoreline Installation

Design Elements:

- Anchored Branch Toe (ABT)
- Localized marsh platform nourishment and plantings
- Inverted root wads
- Upland, anchored branch revetment with dense matting of briar used in place of filter fabric
- Viewing platform for outreach and education

Permitting:

- State — Delaware Wetland and Subaqueous Lands Permit
- Federal — Army Corps Nationwide Permit No. 54 Living Shorelines

Materials and Placement:

- Optimal reuse of natural materials: ABT and revetment constructed from trees from on-site, cleared while constructing walking paths; trees connected with stainless steel bolts, washers, and nuts
- Plants acquired from local native plant nurseries
- Viewing platform constructed from retail marine lumber

Monitoring Efforts

Monitoring Per Permit Requirements

Metric	Method
Structural integrity	Frequent inspections
Plant survival	Observations with photo documentation
Shoreline position	Inspections with drone footage done periodically

Measured Environmental Results

- More than 500 linear foot shoreline managed
- Approximately 0.2 acres marsh fringe enhanced
- Large observation platform installed adjacent to wetlands for outreach and education
- Innovative techniques successfully demonstrated
- Excellent example of a near 100% natural conventional living shoreline
- Massive volunteer support during installation
- Use of inverted root wads to add unique 3-D habitat structure
- The Project won the American Shore and Beach Preservation Association's 2022 Best Shoreline Award

Adaptive Management/Lessons Learned

Design Elements:

- Unexpected results: The horizontal branches in the ABT had some settling sufficient to create some space in the upper portion of a few of the ABT segments. This was a combination of branches packing together tighter, some sinkage in the muck substrate, and a few branches rotting. Additional branches were added to reestablish branch densities through the entire structure. This was performed once in August 2021 and to a much lesser extent in August 2022
- A small section of the ABT required repair due to a large tree falling on it from uplands
- For future installations, reduce spacing of ABT anchoring sets by about 20% to facilitate cross branch installation
- Noteworthy recovery results: The marsh edge is clearly migrating towards the ABT as projected. In some locations, vegetation is already (as of 9/2022) growing through the ABT

Project Photos

Fall 2021

Drone photography of portion of site showing ABT and platform

Inverted root wads with new shrub plantings

Summer 2020

Construction of ABT