Living Shoreline Case Study

Sassafras Landing, Assawoman Wildlife Area, Frankford

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Project Details

Goals:
- Shoreline Position, Habitat, Water Quality

Energy Environment:
- Medium
  Boat wakes and wind-driven waves (>½-mile fetch to NE)

Construction Dates:
- June -July 2019 (6 weeks)

Partners:
- DNREC: Division of Fish and Wildlife; Shoreline and Waterway Management Section; Wetland Monitoring and Assessment Program
- Delaware Center for the Inland Bays
- Cardno, Inc.

See the Site Before and After

Pre-Installation June 2019

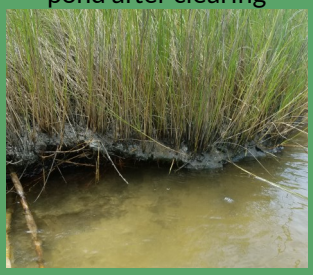
Post-Installation June 2021

Baseline Conditions

Shoreline erosion threatens to breach berm that maintains wildlife impoundment

July 2018
Undercut high marsh bank; low marsh eroded

May 2019
Berm between creek and pond after clearing



Baseline Conditions

Issues:
- Chronic shoreline erosion threatened to breach berm that maintains freshwater impoundment important for waterfowl and habitat diversity
- Low marsh almost completely lost to erosion
- Remaining high marsh dominated by non-native, invasive *Phragmites australis*

Site Characteristics/Important Features to Consider:
- Prominent, highly visible, accessible location within state wildlife management area
- Ongoing shoreline erosion (½-ft. per year on average) despite apparent low energy setting
- Chronic erosion from seasonal boat traffic; more severe erosion from episodic coastal storms
- Unable to grade back existing shoreline; therefore must build outward
- Existing conditions suggest vegetation alone cannot prevent shoreline erosion
- Some type of toe protection(hybrid design) therefore required to ensure longevity
- Design requires understanding of local tidal elevations/datums
- Living shoreline must have resilient design that can adapt to future sea level rise

Living Shoreline Installation

Design Elements:

- Rock toe sill parallel to shoreline to attenuate wave energy, retain fill, and stabilize toe of slope
- Flared gaps between sills to promote flush and faunal movement but avoid direct NE exposure
- Imported sand fill to build out sloping shoreline landward of sill
- Wetland plantings in low marsh, high marsh, and upland transition zones for habitat and stabilization

Permitting:

- State—Delaware Subaqueous Lands Permit
- Federal—Nationwide Permit No. 27 Aquatic Habitat Restoration, Enhancement, and Establishment Activities

Materials and Placement:

- ~380 linear ft. of rock toe sill in 5 segments parallel to shoreline ~30ft. beyond mean low water
- 2-3ft. high sills (1.5:1 side slopes) to +1.0 NAVD88 (0.5' above MHW) built from R4/R5 quarry stone
- 5ft. rock-lined gaps stabilized with oyster shell bags between sill segments
- Washed concrete sand (imported) placed between existing shoreline and sill to raise bottom elevation
- Backfill graded to target elevations to create low marsh and high marsh tidal hydrology
- ~5,200 plugs of smooth cordgrass (*Spartina alterniflora*), salt meadow hay (*S. patens*), and switchgrass (*Panicum virgatum*) installed by volunteers

Monitoring Efforts

Metric	Method
Shoreline position	Vegetated edge (RTK)
Shoreline position	Cross sections (RTK)
Shoreline position	Visual and photos
Habitat	Vegetation (% cover)
Habitat	Nekton (seine)
Habitat	Oysters/mussels (visual)
Water quality	Handheld meter

Measured Environmental Results

- Project continues to meet goals and objectives
- Restored and enhanced 0.3 acres of tidal marsh
- Shoreline remains stable and has completely revegetated with no significant erosion
- Withstood several coastal storms and nor'easters without damage; accretion noted
- Estimated to remove 62lbs. of nitrogen and 3lbs. of phosphorus annually
- Public access, high visibility, and educational signage help project fulfill its demonstration objectives

Adaptive Management/Lessons Learned

Design Elements:

- Regulatory time-of-year restrictions (fisheries) originally conflicted with planting schedule. A waiver was eventually granted to allow plant material installation within the optimal seasonal window
- Understanding site-specific tidal elevations through multiple lines of inquiry (nearby tide station data and biological benchmark survey) helped achieve target hydrology and related design parameters
- Project withstood flooding, high winds, and increased wave attack from two named storms off the Delaware coast with minimal damage within first 3 months after construction
- Performing as-built survey immediately following construction provided accurate baseline for comparing post-construction monitoring results

Project Photos

June 2019
Constructing toe sills

June 2019
Completed toe sills before sand backfill

June 2019
Backfilling and grading

June 2019
Graded shoreline before planting

August 2019
Bagged oyster shells stabilizing gap between segments

June 2020
Aerial view of site during second growing season