Living Shorelines for All: From Estuary-wide Planning to Pilots on the Ground

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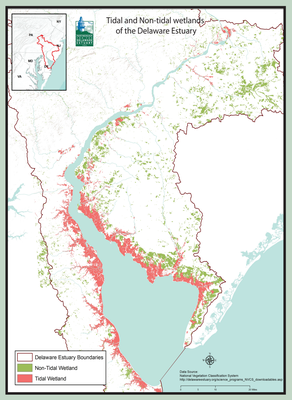
Tidal Wetlands of the Delaware Estuary



Wetlands are critical to the health and function of the human and non-human communities of the Delaware Estuary. Wetlands act as a sponge to absorb storm surges and flooding, protecting coastal communities from the impacts of weather events. Tidal wetlands, in particular, are disappearing at an alarming rate. Wetlands are threatened on two fronts: by both land and by sea.

PROBLEM: Erosion Along Marsh Shorelines

Erosion is a natural process along shorelines that can be accelerated by boat wakes, sea level rise, storms and other factors.

Erosion creates unstable habitats that can threaten marshes and upland habitats, including developed properties.

Erosion control has been and continues to be a long-term problem in coastal areas as indicated in the photo below that shows high rates of erosion in a New Jersey tributary of the Delaware Bay.

A Potential Adaptation Strategy

For tidal wetlands to survive sea level rise, they must grow vertically, or migrate horizontally (upland). Coastal infrastructure often impedes horizontal migration, and sufficient land use controls cannot be universally enacted to facilitate such movement. However, we can help some wetlands to grow vertically by bolstering naturally-occurring growth with a coastal stabilization technique known as 'living shorelines.' Living shorelines help vulnerable wetlands to survive while simultaneously enhancing a site's ecological function.

Living Shorelines were recognized by a 2010 Partnership for the Delaware Estuary report as one of the best ways to help tidal wetlands adapt to sea level rise. Living shorelines are ecologically and (sometimes) economically superior to hard infrastructure. They are routinely installed in other parts of the mid-Atlantic, and have been successfully installed in the Delaware Estuary. So, why aren't living shorelines more common along the coasts in DE, NJ, or PA? Perhaps there are insufficient scientific data that shows where living shorelines would be successful. Perhaps the associated permitting processes do not provide enough guidance. Perhaps people interested in shoreline stabilization immediately opt for bulkheads because they have never heard of a 'living shoreline.'

All three of these may be issues that have stymied the installation of living shorelines in the Delaware Estuary watershed.

Funding for DELSI has been generously provided by:

The Delaware Estuary Living Shoreline Initiative (DELSI) consists of both 1) R&D on living shoreline tactics and 2) area-wide planning to match living shoreline tactics with needs.

1) R&D of the mutually beneficial relationship between marsh plants (cordgrass) and shellfish (ribbed mussels) shoreline tactic- ThePDE and the Rutgers Haskin Shellfish lab pioneered a particular type of living shoreline that capitalizes on the mussel-Spartina alterniflora symbiosis to help stabilize eroding wetland. The mussel-plant method was successfully used in New Jersey's Heislerville Fish and Wildlife Management Area alongside a marina. The pictures below show the conversion of rip-rap to stabilized fringe marsh at this site. A Practitioner's Guide that describes each step of this project can be downloaded at http://www.delawareestuary.org/science_projects_living_shoreline_reports.asp.

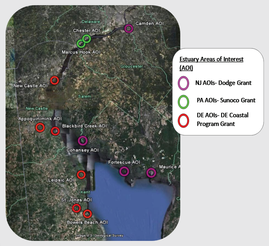
April 2010

May 2010

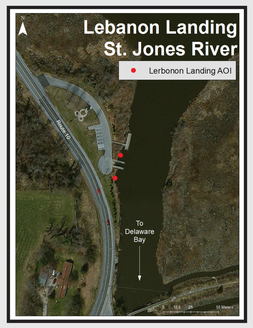
June 2010

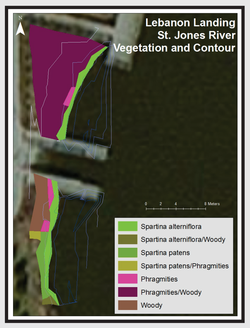
June 2011

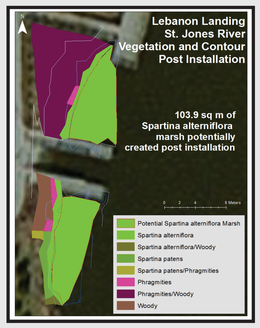
2) Planning and Assessment in 3 States- The second phase of DELSI was a Living Shoreline Planning Study to match appropriate shoreline enhancement and erosion control tactics with local needs for all areas of the Delaware Estuary. The planning effort consisted of an inventory of potentially useful strategies, a GIS study indicating where various tactics may be most effective, field reconnaissance in particular areas of interest reflecting the diverse conditions of the system, and preliminary pilot project schematics specific to areas of interest in the three states. This expansion effort was funded by Delaware Coastal Program, New Jersey Coastal Program, EPA Climate Ready Estuaries, Sunoco, and the Dodge Foundation. The DELSI tactic described in the practitioner's guide represents one of the many strategies included in the living shoreline inventory. When paired with hard armoring tactics, DELSI and other bio-based living shoreline tactics offer diverse ways to adapt our shorelines in an ecologically friendly manor while also combating erosion from sea level rise and other coastal challenges. The areas of interest shown on the map were initially determined through GIS analysis pinpointing sites on public lands where living shorelines were feasible based on energy and existing erosion. PDE is now working with partners to secure funding for installation of demonstration projects at several areas of interest in Delaware and New Jersey, extending from Camden to the southern bayshore.

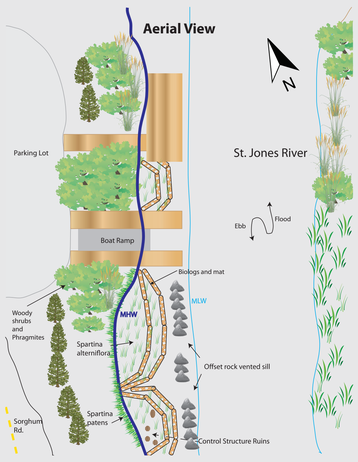


Example of Conceptual Plan for Living Shoreline Demo Project on the St. Jones River

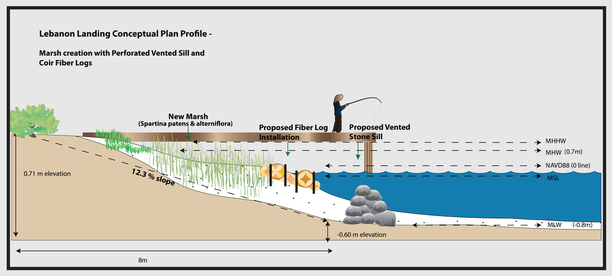






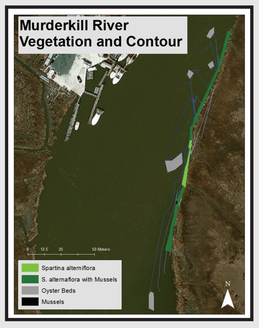


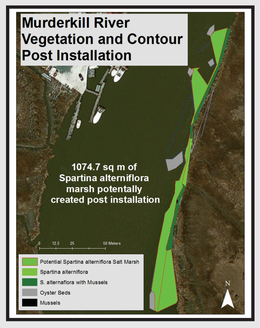
Conceptual plans were developed based on energy at the site, salinity for mussels and oysters, local tidal datum, and elevation from an RTK GPS used in the field. If the site energy was low, a bio-based living shoreline was recommended with marsh creation and coir fiber logs for trapping sediments. If the site had medium-high energy, an appropriate hard structure that still creates habitat was recommended as a breakwater in front of a bio-based living shoreline, as shown in these plans. Elevation data collected with the RTK GPS was imported into ArcGIS to create elevation contours for each area. Contours within the optimal planting zones with the appropriate vegetation were used to guide the potential installation. The area within these planting zones was used to calculate the area of marsh that could be potentially created post installation.



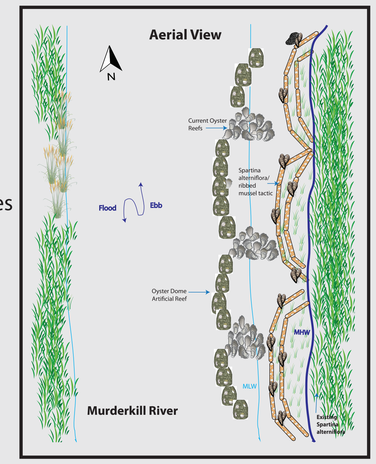
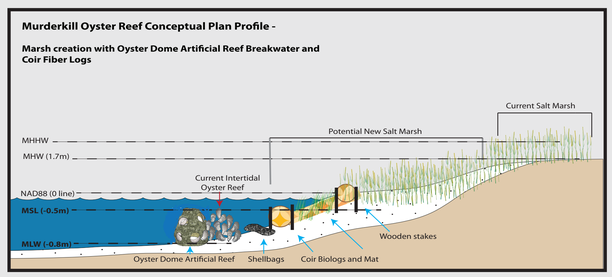
Using the RTK GPS to measure elevations on the St. Jones River

Example of Conceptual Plan for Living Shoreline Demo Project on the Murderkill River





This site was chosen for a possible living shoreline demo project because there are pathcy nearshore oyster reefs at this site, ribbed mussels are very abundant, and it would be easily seen by the public from the northern side of the river. The conceptual plan is a hybrid living shoreline consisting of expanded oyster reefs (subtidal) and mussel/plant augmentation (intertidal). Oyster recruitment structures serve as a breakwaters to slow energy, protect and enhance intertidal oyster beds. A bio-based living shoreline consisting of two rows of coir fiber logs on a fiber mat would be used to trap sediment behind the . oyster reefs allowing seward expansion of vegetation. At this site, the mussel/plant tactic developed by Rutgers and the Partnership on the Maurice River, NJ would therefore be used to increase and protect the saltmarsh.



Intertidal oyster reefs on the Murderkill River