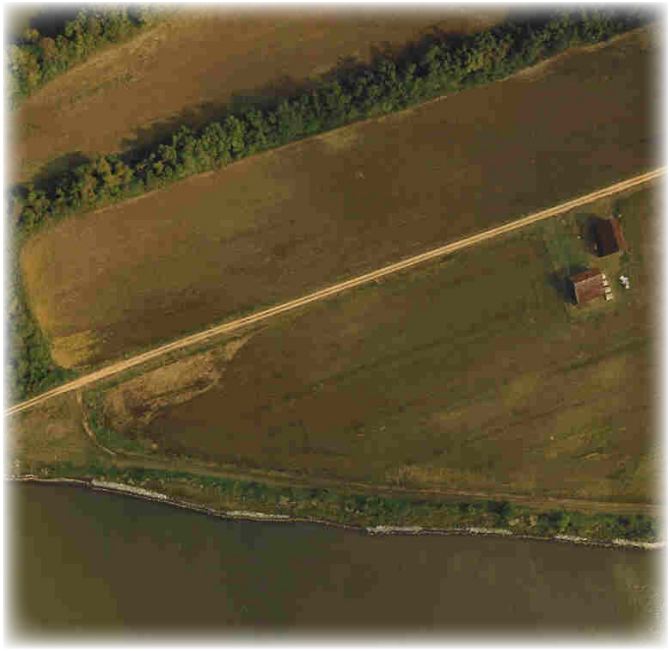
Living Shorelines Tour
Site #4 - *Sills*



Variable height sills found along Site 4 shoreline.

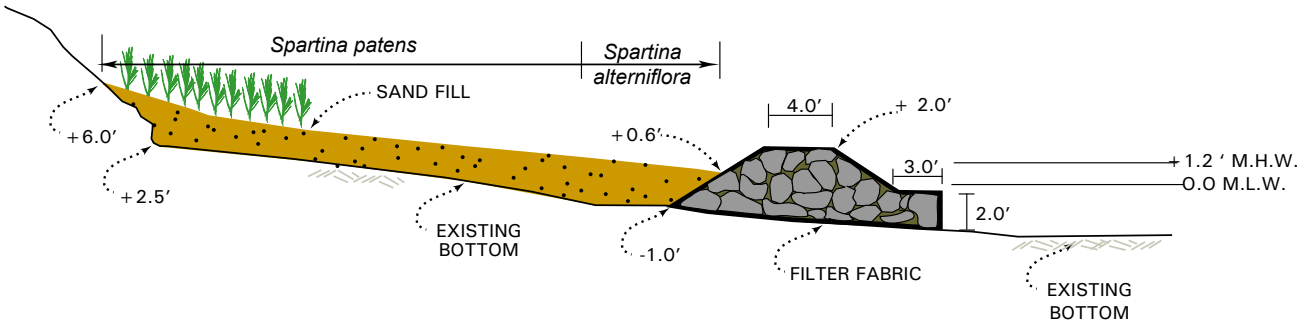
SHORE PROTECTION FUNCTION

In Chesapeake Bay waters, a sill is typically a low-elevation, shore-parallel stone structure installed on the channelward side of a created tidal wetland fringe marsh. Sills are used to establish and protect fringe marsh systems that would not otherwise survive due to high wave energy and erosion. This combination sill and marsh grass technique can be successfully used to create habitat and control erosion on many more shorelines than just marsh planting alone. Based on specific site conditions, raising the sill elevation and/or increasing the width of the marsh may be needed to achieve the desired level of shoreline protection. Ideally, it is the width of the marsh area that will accomplish the goal of protecting the shoreline from erosion. The wider the marsh terrace, the more wave energy is dissipated before it reaches uplands. Marsh widths of 20 feet or wider will achieve greater natural wave attenuation and erosion protection.

DESIGN & CONSTRUCTION ELEMENTS

A low sill parallel to the shore allows marsh vegetation to prosper.

A sill is usually placed at mean low water to retain sand fill material which is then graded and planted with marsh grass. Sills are normally designed with a top elevation between 6-12 inches above mean high water. However, a sill can be designed with a higher elevation (1-2feet above mean high water) to increase shore protection, or with a lower elevation to “overtop” with the daily high tide. Overtopping allows more natural tidal nutrient exchange, and wildlife access.



Typical Sill Section

The shoreline on the northern end of JPPM property was differentially eroded due to prior failed attempts at stabilization with materials like old well rings and rubble. The sill profile and placement reflects an adaptation to this historic shoreline configuration. Take a close look and you may notice that the sill elevations are higher in front of small protruding features and lower where there are minor indentations and embayments.

Sill structure during construction.

The sills here are continuous with no openings. Further south on JPPM, sills were designed with gaps or open segments. The gaps help maintain normal water temperatures behind the sill and allow access to quiescent pools of water, wetlands and edge habitats by larger animals like otters, bait fish and terrapins. To protect shoreline features behind the gaps, the sills curve outward, are higher in elevation and overlap slightly at adjoining sections. Heavier stone weights are specified by coastal engineers in proportion to the anticipated wave energy the structure must withstand. The size of wind-generated waves is a function of the strength of the wind (force), the length of time it blows (duration), and the amount of open water over which it travels (the fetch).

ECOLOGICAL ELEMENTS

Living shoreline approaches improve water quality and enhance habitat for life in the Bay. A principal means to achieve these benefits is through the creation of wetland fringe marshes – seen here and behind most of the sill systems at JPPM. Unfortunately, Chesapeake Bay scientists are warning us that there will be a widespread loss of wetlands due to sea level rise. With approximately 85% of the tidal shoreline under private ownership, landowners can make a critical difference in restoring the Bay through wetland creation and other living shoreline management techniques.

Wetlands are vital to the Bay as they provide a host of "natural services" including:

- Anchoring and stabilizing of shoreline sediments and reducing land losses due to the erosive effects of wind-driven waves and boat wakes
- Filtering and removing nutrients and pollutants and reducing sediment loads from upland sources which helps living resources like fish and submerged aquatic vegetation prosper
- Providing a food source to wildlife like:
  - waterfowl and small mammals that eat seeds of marsh plants and shellfish embedded in developing peat deposits
  - fiddler crabs, snails, amphipods and other invertebrates that feed upon organic matter accumulated in wetland soils
  - fish that are, in part, supported by an aquatic food web based on "detritus" (fragments of dead plant/animal material)

Wildlife that might be found at night along JPPM fringe marshes: luna moth, racoon, red-jointed fiddler crabs, and marsh periwinkle snails.

The marsh behind the sill was created by planting different *Spartina* species adapted to regularly and irregularly flooded tidal zones. Smooth cordgrass (*Spartina alterniflora*) was planted from mid-tide to spring high tide elevation. Saltmeadow hay (*Spartina patens*) was planted from mean high water and above to the high water line of storm tides. A short distance away from the embankment are some groundsel tree shrubs (*Baccharis halimifolia*). Groundsel tree is often confused with high-tide bush (*Iva frutescens),* another common wetland shrub. Groundsel tree supports marsh wrens and other small birds that frequently nest there. Scientists are currently assessing groundsel tree for its potential value in stabilizing tidal shorelines because of its ability to root from a dormant, unrooted cutting. Although it grows naturally in the upper fringes of irregularly flooded tidal fresh and brackish marshes, it may become weedy or invasive in some habitats and its leaves are poisonous to livestock.

PERFORMANCE

The marsh and sill structures at JPPM have held up extremely well since their installation. During a summer 2004 assessment of Tour Site 4, researchers noted that the only significant storm-related activity was the deposition, along the toe of the bank, of a two foot thick band of wrack (algae, plant and animal matter, and drift materials that accumulate on shorelines, usually at the high tide mark). The wrack was most likely deposited after Hurricane Isabel in September 2003.