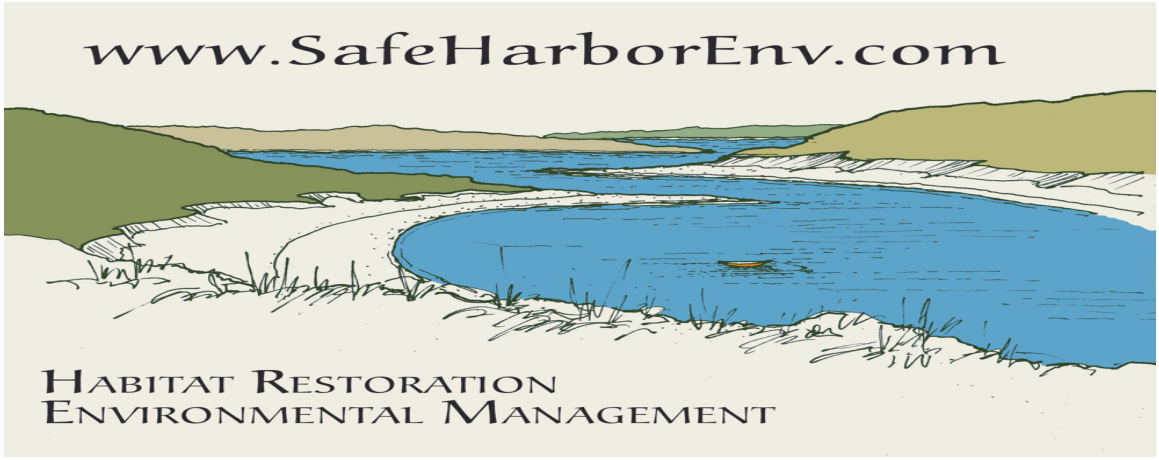

NOURISHMENT GUIDELINES for Bayside Beaches

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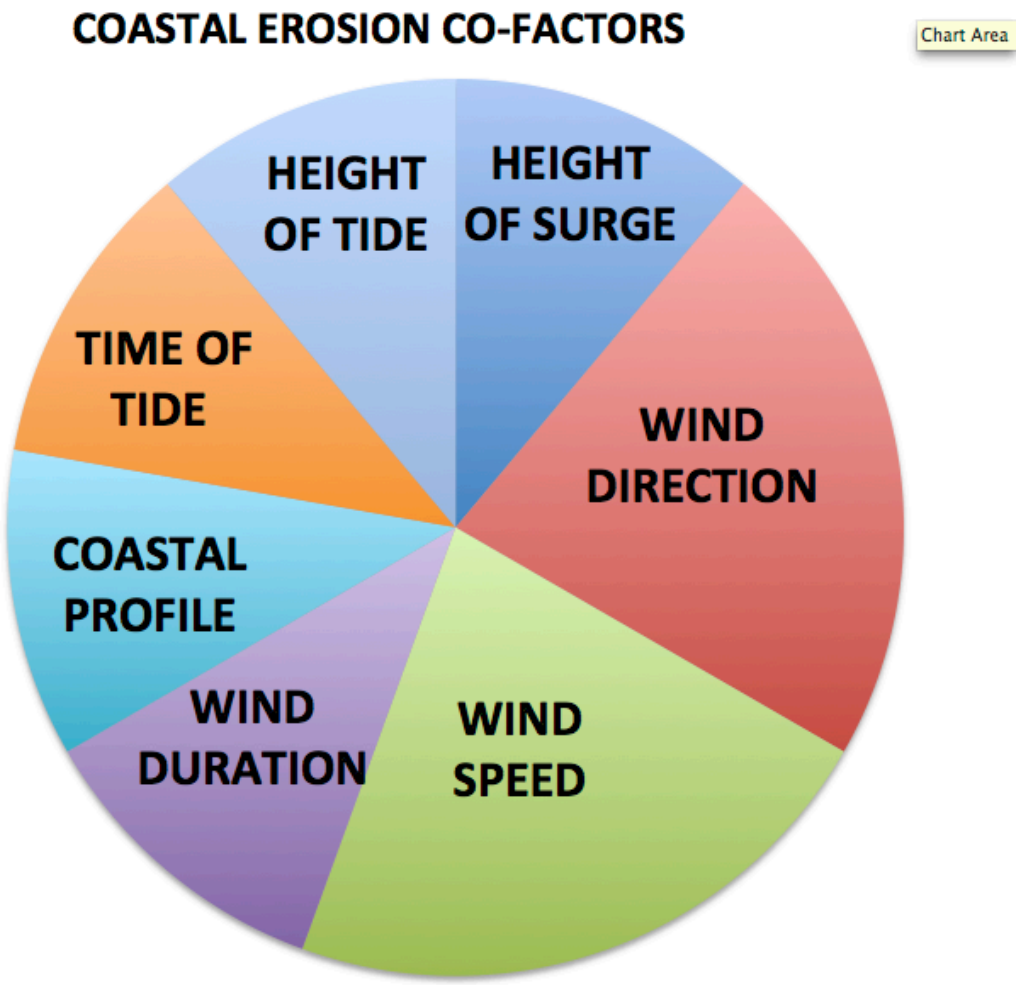
This experience based information is not represented as completely comprehensive.

UNDERSTANDING THE LANDFORM: Cape Cod landforms are bi-modal in origin: Mostly consolidated Coastal Banks, mixed materials, created by the weight of the Glacial Process; Limited Sand Dunes, created by wind and waves of Aeolian Process.

UNDERSTANDING EROSION: Coastal erosion events are a natural part of the Coastal Process but will only occur during a specific synergy of cofactor interactions between Storm Pulse energy and land mass. If specific cofactors are missing, erosion may be less significant, or perhaps non-existent. Most erosion events are 1/3 yd/ft.

UNDERSTANDING NOURISHMENT: On an "as necessary" basis, placement of limited, non-structural, sacrificial sand nourishment on the toe and lower bank, as a preferred management response to Bayside, Coastal Bank erosion. When there is erosion on the toe, lower bank sand drops down as a new toe. This management strategy mimics the Coastal Process but with minimal, net loss of Glacial materials.

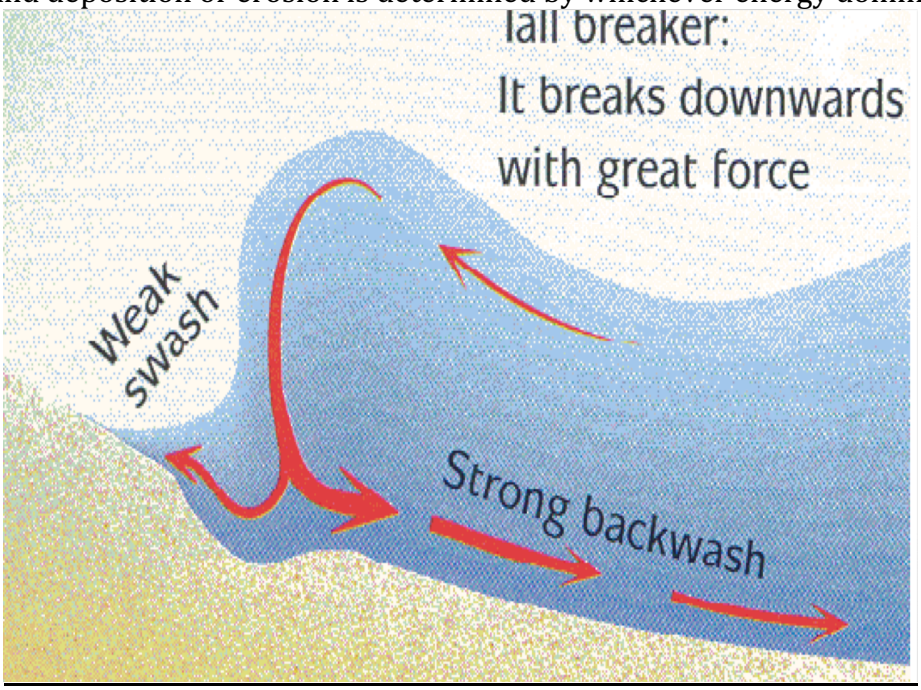
UNDERSTANDING PERFORMABNCE STANDARDS: Beach sand absorbs wave energy, protecting Dunes, Coastal Banks and property. Eroding beaches may be resupplied by sand from the toe of a coastal bank. When the toe is used up, a new section of bank will collapse to create a new toe. This "Coastal Process" inexorably whittles away at the bay side Coastal Bank (and gobbles away the ocean side). Suppose we considered a solution that could be found within the problem itself: Using sand to renourish the toe of the Coastal Bank. This Nourished toe would protect the beach as well as the bank and could be renourished as necessary. The coastal process would continue and property owners would be buying time...with sand.



Experience based, Safe Harbor image, intended as reference with Bayside sites.

WHAT ACTUALLY HAPPENS AT THE POINT OF EROSION:

Image above details wave backwash. Wave energy on beaches is a balanced synergy of bimodal energy: incoming energy ”Swash”; and outgoing energy “Backwash”. Beach sand deposition or erosion is determined by whichever energy dominates.



Gentle, usually summer wind conditions, favor stronger swash patterns, transporting sand from sandbars, where waves interact with them underwater, onto beaches. Aggressive, winter wind conditions favor backwash, transporting eroded sand from the beach, out to sandbars, as deeper water neutralizes backwash currents. These types of waves are responsible for defining seasonal beach profiles.

Image by G. Peabody, showing typical, Bayside Storm event nourishment loss = 1/3 cubic yard/linear foot. ***We recommend nourishing Bayside Coastal Banks with 1 to 1-1/2 cubic yards of clean, compatible, sand nourishment per linear foot***. We encourage neighborhood groups to work together, reducing costs and increasing protection. Every evaluation needs to be site specific and will vary with location.

WHAT ARE THE STEPS OF THE NOURISHMENT PROCESS

Safe Harbor image. There are many definitions of "Clean, Compatible Nourishment"

Nourishment is first delivered to the site from a Town Landing

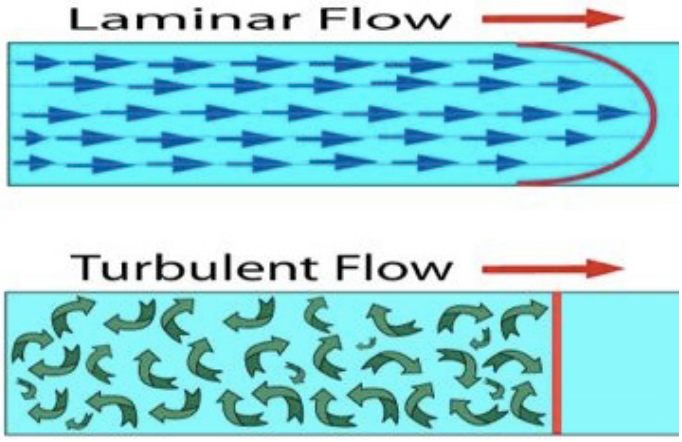
Nourishment is then spread up the lower bank.

Finally, the nourishment is planted and biomimicry is added.

HOW DOES BIOMIMICRY FIT INTO THE NOURISHMENT PROCESS

Biomimicry reduces wind velocity by creating turbulence, collecting sand.

Safe Harbor developed Biomimicry on Cape Cod, we use it to collect "Free Sand".



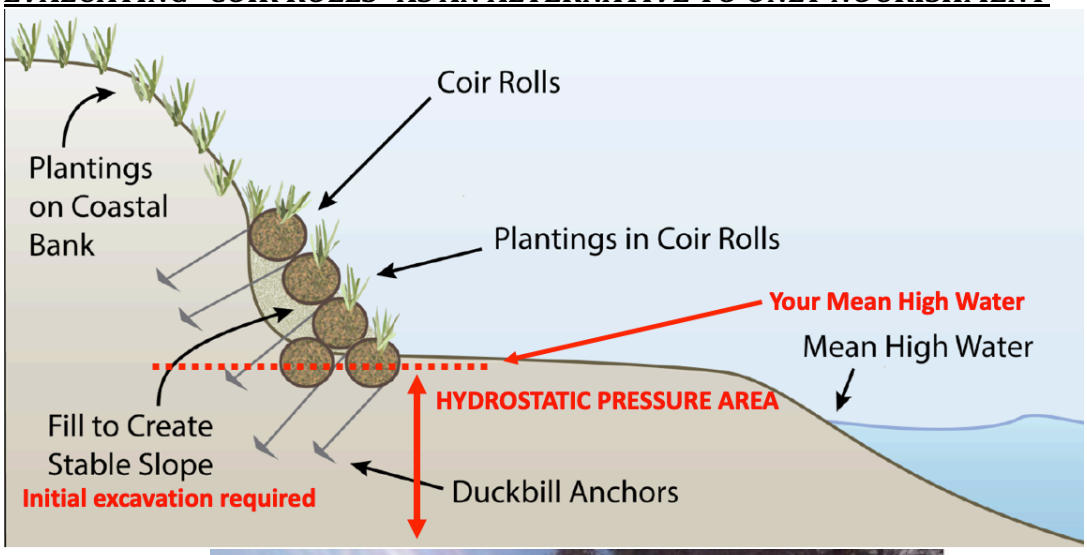
Laminar wind flow, transporting sand, is slowed down, dropping sand.

Truro Erosion Control Projects: Ch. 3 Coastal Management Plan

3.06 General Regulations applicable to all projects.

a) "All projects shall specify dates for commencement and completion. All projects may only begin after Columbus Day and must be completed prior to April 15, provided however that the project area is clear of nesting shorebirds as confirmed by the Conservation agent or their designee. Planting of native material may continue after April 15, provided all materials and access to the site are over the owner's property and not by beach transport."

EVALUATING "COIR ROLLS" AS AN ALTERNATIVE TO ONLY NOURISHMENT



The floating nature of Coconut husk Coir creates significant breakaway pressure during surge events and especially with waves, when hydrostatic pressure liquifies sand around coir anchors, reducing the holding power of anchors. Exposed Coir are NOT rated for wave action velocity zones. For this reason, Coir systems are required to have sand nourishment covering the rolls and Beach Grass plantings in perpetuity

EVALUATING "DRIFT FENCES" AS AN ALTERNATIVE TO ONLY NOURISHMENT

Drift, or Zig-Zag beach fencing is expensive to install but may have built in design issues which, in some cases, impact overall performance. Drift Fencing requires sand nourishment, and re-nourishment as necessary. When experiencing wave over wash conditions, the slats restrict the return of water out wash. This tends to increase out wash velocity, which in turn, increases the potential for out wash sand transport. In many cases, where we examined the ends of Drift Fencing installations, we could not discern differences in sand elevation. In some cases, the slats have been documented trapping seaweed, subsequently blocking inshore sand migration to the Coastal Bank