From Gray to Green
Dealing with Coastal Erosion Through a Spectrum of Control Methods

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(WHOI Sea Grant & Cape Cod Cooperative Extension)

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The Risk Is Increasing

December 2013

Sea Level Rise: Understanding and Applying Trends and Future Scenarios for Analysis and Planning

SLR

Global ↑↑↑↑↑↑ ↓↓↓↓↓↓ Massachusetts

‘‘...robust increase in the frequency of North Atlantic tropical cyclones.’’

Coastal Adaptation

On Cape Cod we manage at parcel scale
What is Erosion?
The Erosion Problem: Education Perspectives

It’s all sediment transport!
What is Erosion???..... just more leaving than coming in

Accretion | Static Equilibrium | Erosion
Perpendicular Transport.......Blocked input

1.3mi
Shoreline Stabilization
The Spectrum of Coastal Erosion Control Methods

Do nothing

1. Will system recover by itself?

2. How far is the structure from the water?
The Spectrum of Coastal Erosion Control Methods

Do nothing

Vegetation

Plant Natives:
Root systems stabilize. Take up water. Break the impact of raindrops or wave-splash. Slow down runoff

Remove Invasive
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
The Spectrum of Coastal Erosion Control Methods

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The Spectrum of Coastal Erosion Control Methods

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**Beach nourishment = Fill of a CRA**

**Sacrificial**  

**Cobble (Mixed)**
The Spectrum of Coastal Erosion Control Methods

- Do nothing
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Popponesset Beach

Before

South Cape Beach

Repair

After

Repair
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Diameter 12”-20”
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Photo Credit: 2Fathom
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**WPA:** Coastal engineering structure means, but is not limited to, any breakwater, bulkhead, groin, jetty, revetment, seawall, weir, riprap or any other structure that is designed to **alter wave, tidal or sediment transport processes** in order to protect inland or upland structures from the effects of such processes.
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- Groin

Notch

Direction of Longshore Current

Wave Crest

Direction of Incoming Waves

Deposition

Erosion

Coastal Structure

Downdrift
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- Jetty

Source: MORIS: CZM's Online Mapping Tool
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1.3mi
A beach undergoing net longterm retreat will maintain its natural width.

Beach loss eventually occurs in front of a seawall for a beach experiencing net longterm retreat.

Images adapted from *Natural Hazard Considerations for Purchasing Coastal Real Estate in Hawaii - A Practical Guide of Common Questions and Answers*, by University of Hawaii Sea Grant College Program, 2006.
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How the “Spectrum” could be used:

- Notice of Intent (NOI) → → → → Alternative Analysis

...start at top and move down, explaining why each one isn’t suitable.
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- Not a complete list
  (and methods are being invented/modified)
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- Very few projects only employ 1 method, and when we are determining if it’s a CES we need to use the “hardest” aspect of the project.
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Combination
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Combination methods:
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Questions?

↑ Resilience ≠ ↓ Natural Systems