Living Shorelines for New Hampshire

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COASTAL HABITAT
CHaRT

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What are some of the dominant coastal habitats?

Salt Marshes
Seagrass Beds
Coral Reefs
Mudflats
Rocky Intertidal Shore
Shellfish Reef
Mangrove Swamp
Barrier Beach/Dune Systems

Why?

1) **Physical forces (wind, tides) interact with internal process to support a negative feedback system.**

2) **The result is a recognizable ecosystem that has ecological functions and human values.**

Conceptual Model of Salt Marsh Processes

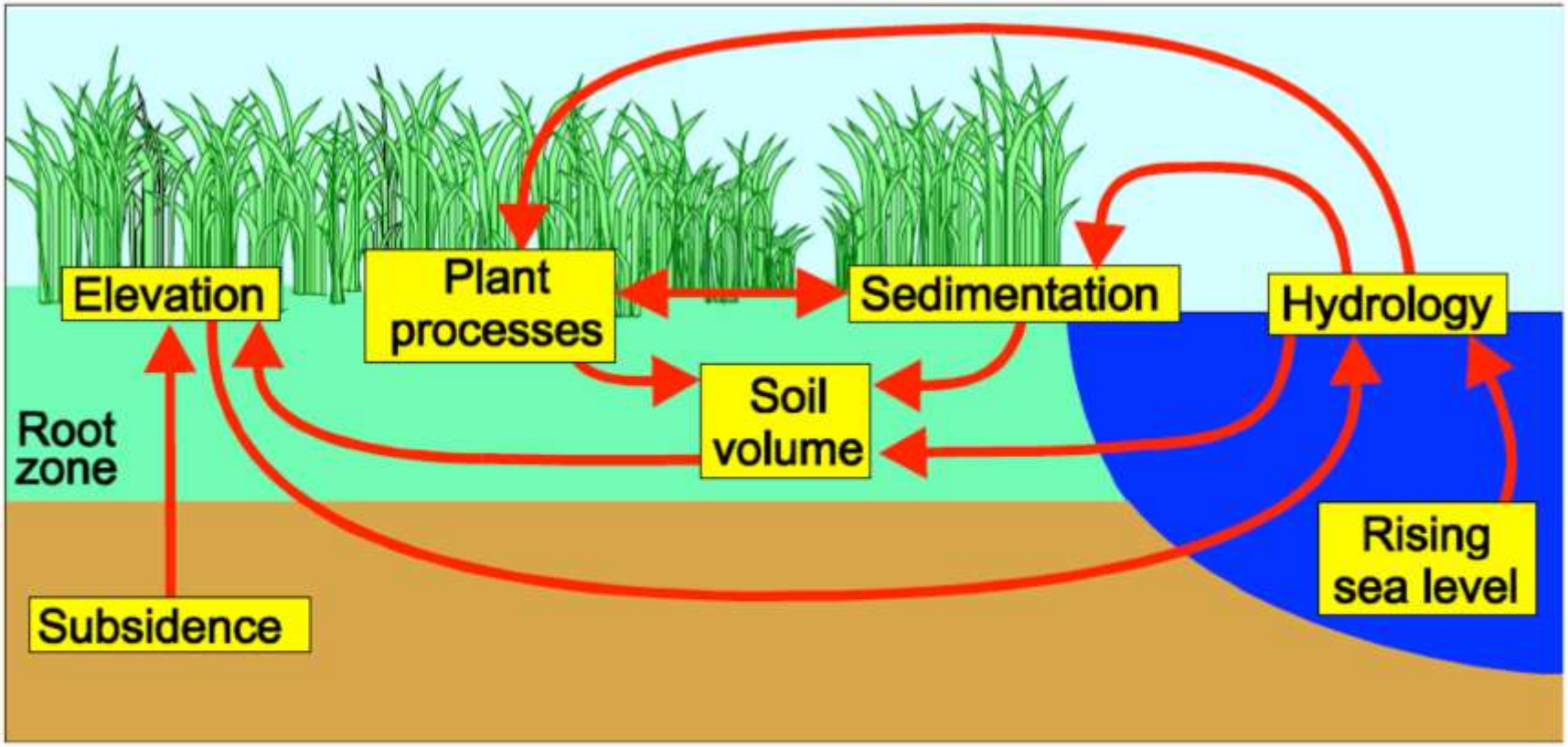
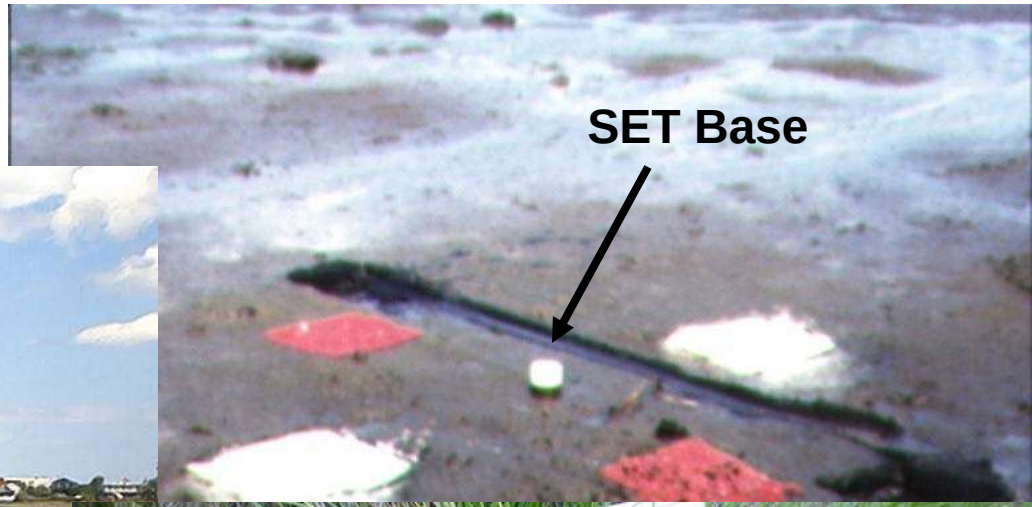
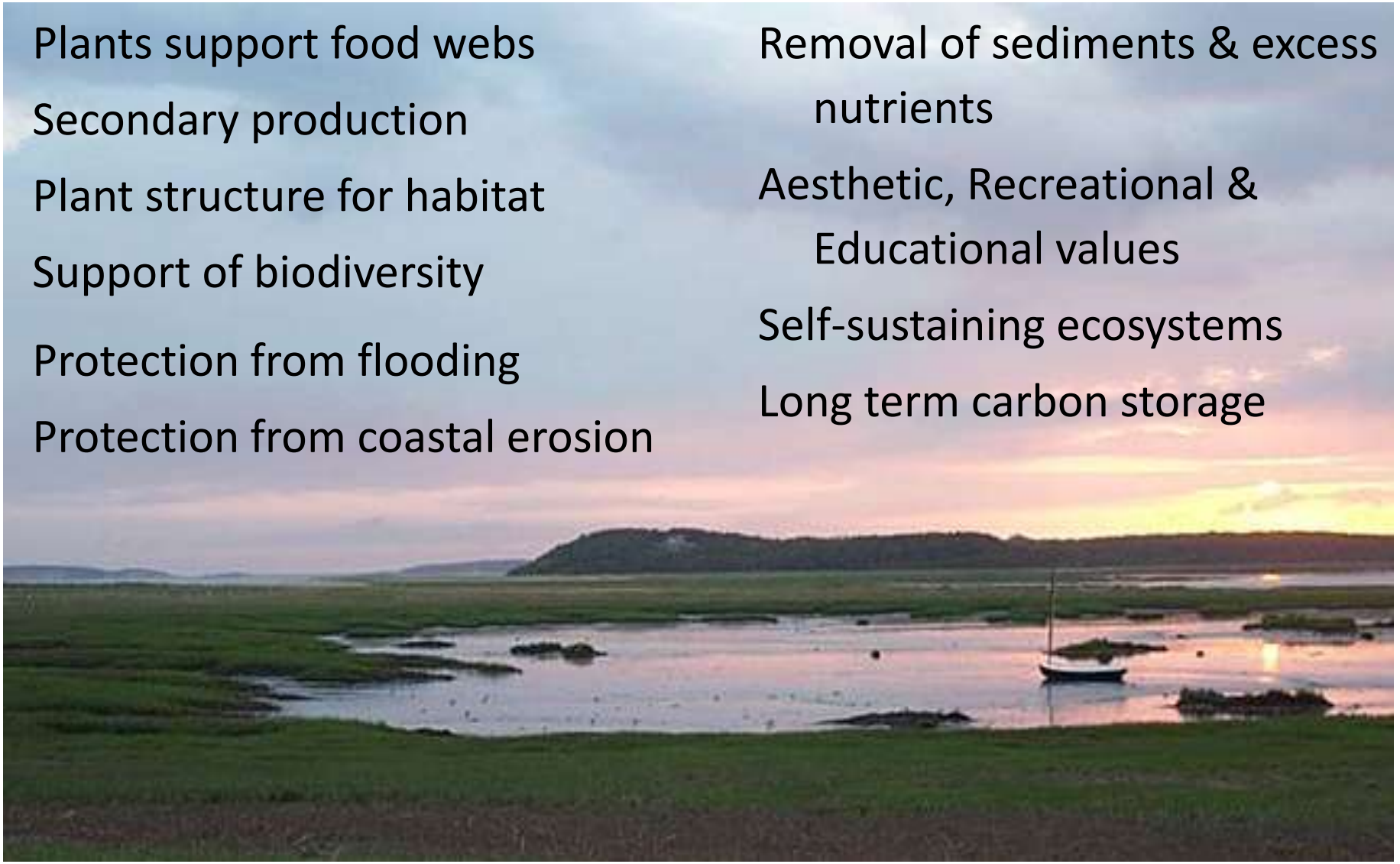


Figure 4. Conceptual model of salt marsh (Cahoon and Lynch http://www.pwrc.usgs.gov/set/).

Surface Elevation Tables (SETs) and Marker Horizons Established . . . and Measured



Salt marshes are among our most productive and valuable ecosystems



Plants support food webs

Secondary production

Plant structure for habitat

Support of biodiversity

Protection from flooding

Protection from coastal erosion

Removal of sediments & excess nutrients

Aesthetic, Recreational & Educational values

Self-sustaining ecosystems

Long term carbon storage

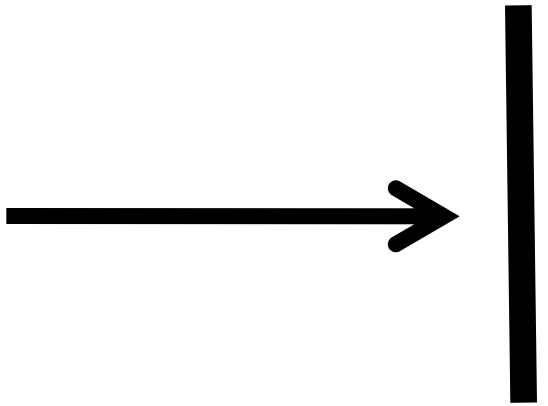
The Case for Building Salt Marshes into Living Shorelines

- Loss of 30% of historical salt marshes
- Future for marshes is not bright - SLR/CC
- Salt marshes and peat develop slowly as sea levels rise – most marshes are over 1,000 years old
- Created marshes erode EVEN if shoreline protected
  - 1993 salt marsh creation lost 20% of area in five years in North Mill Pond
- Salt marshes protect, survive and heal following storms
  - Gittman et al. 2014

THE SALT MARSH SQUEEZE

From Kirsten Howard, NHCP

Marsh migration
+
Shoreline stabilization
=
salt marsh squeeze



Local Living Shoreline Projects

Coastal Habitat Restoration Team: Burdick, Moore, Grizzle, Eberhardt, Ashcraft, Ballestero and Technicians and Students

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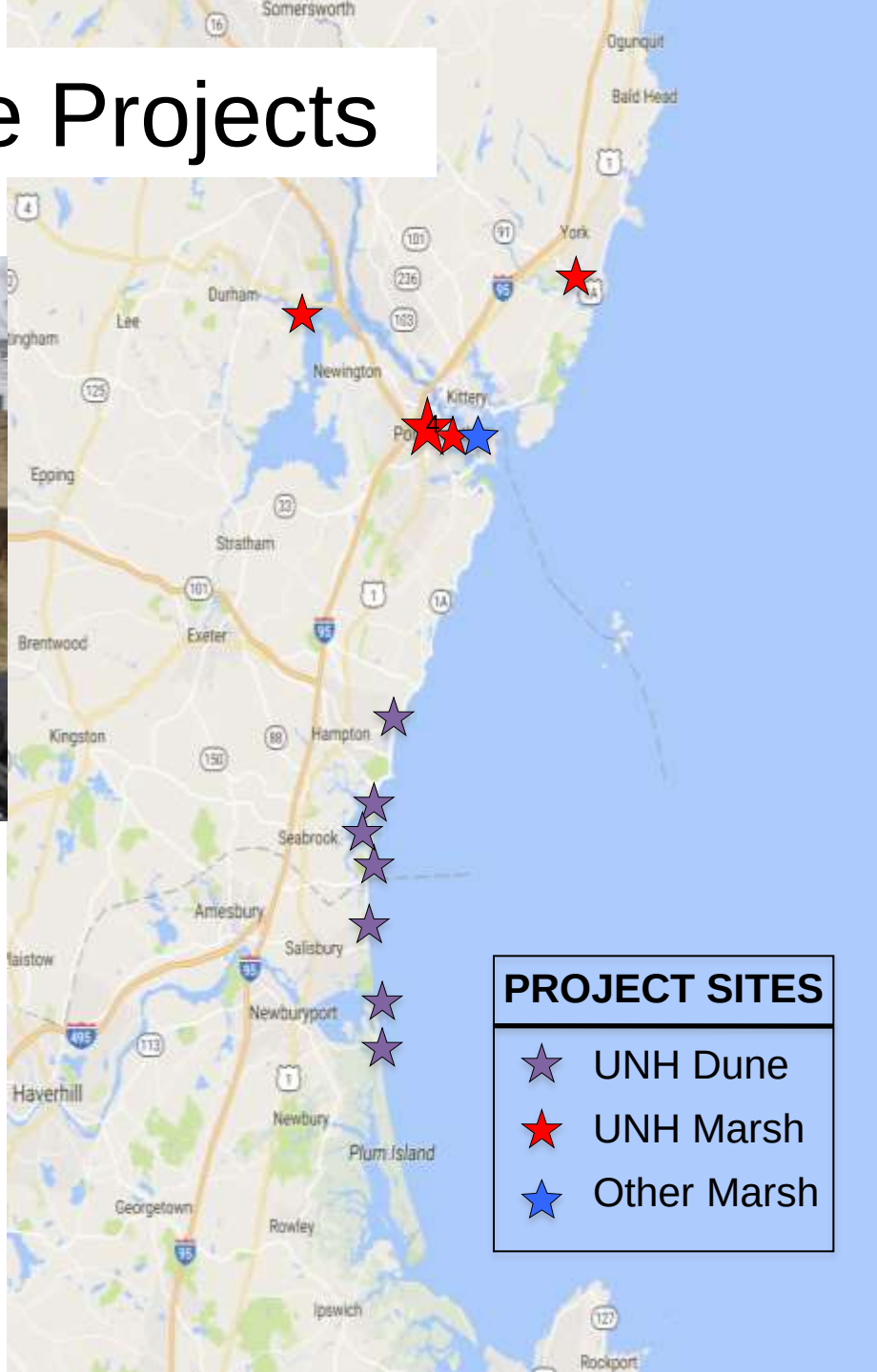
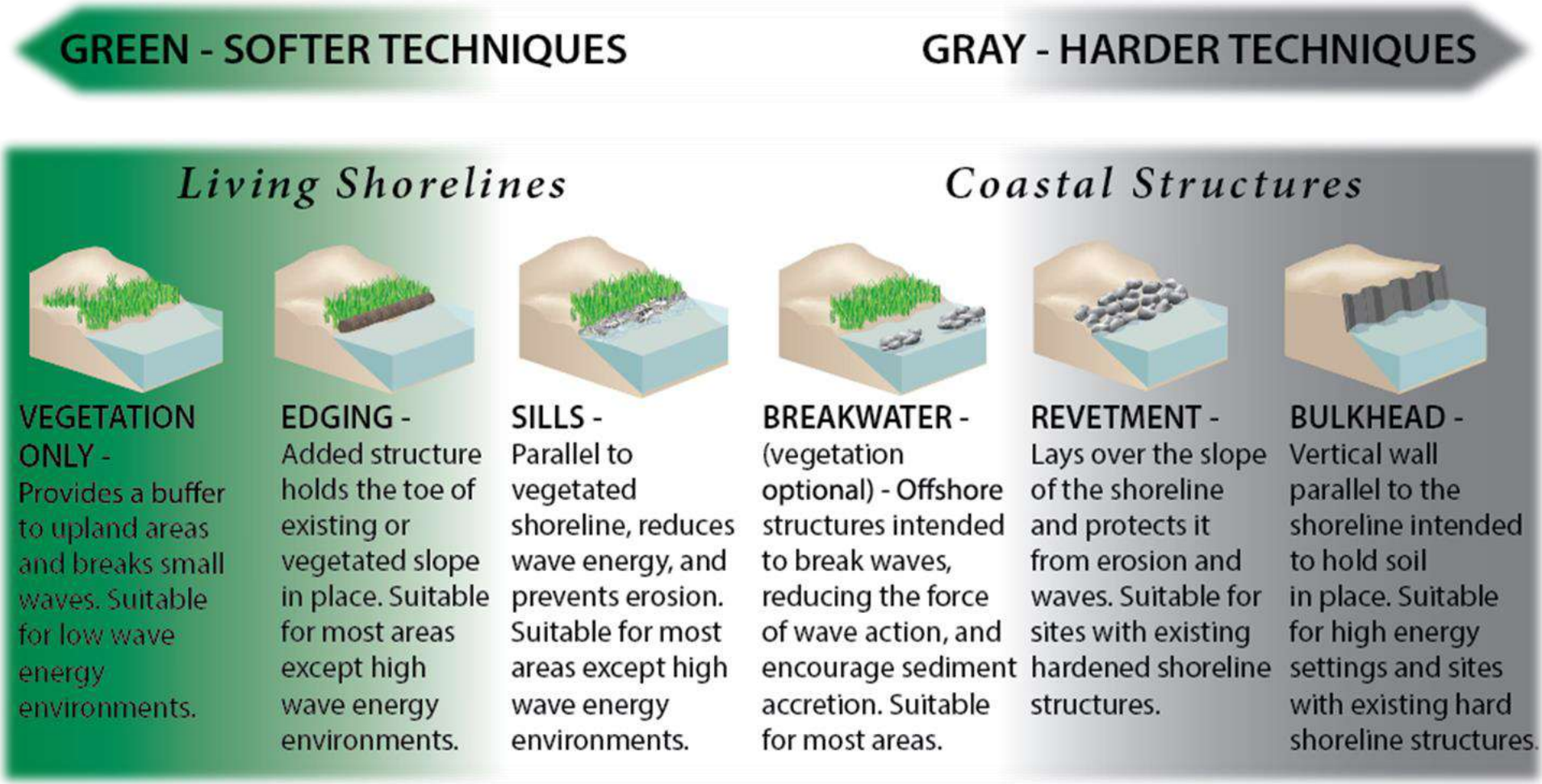


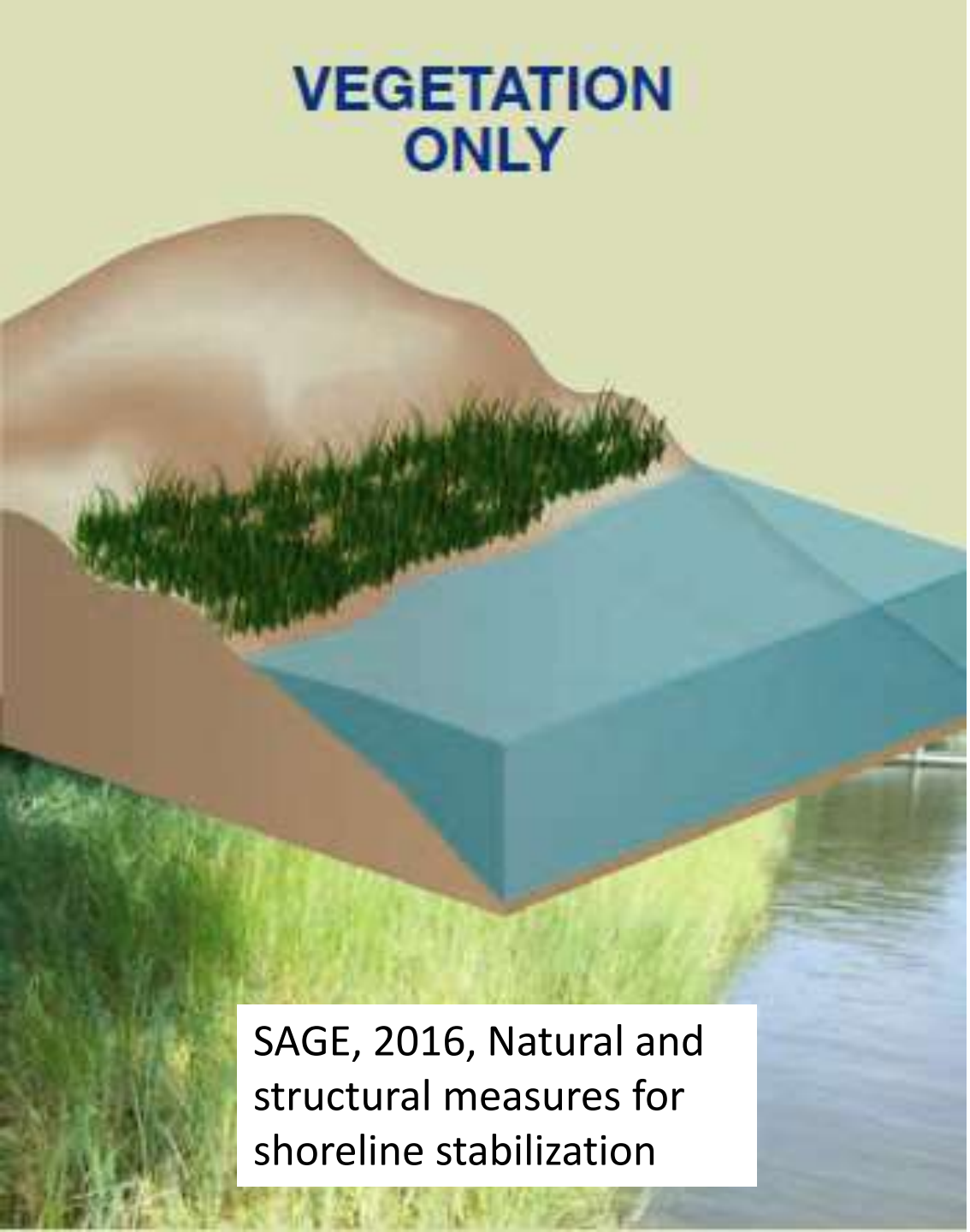
Challenges of northern shoreline projects

- Low light
- Short growing season
- Large tidal range
- Ice

Ranges of Options

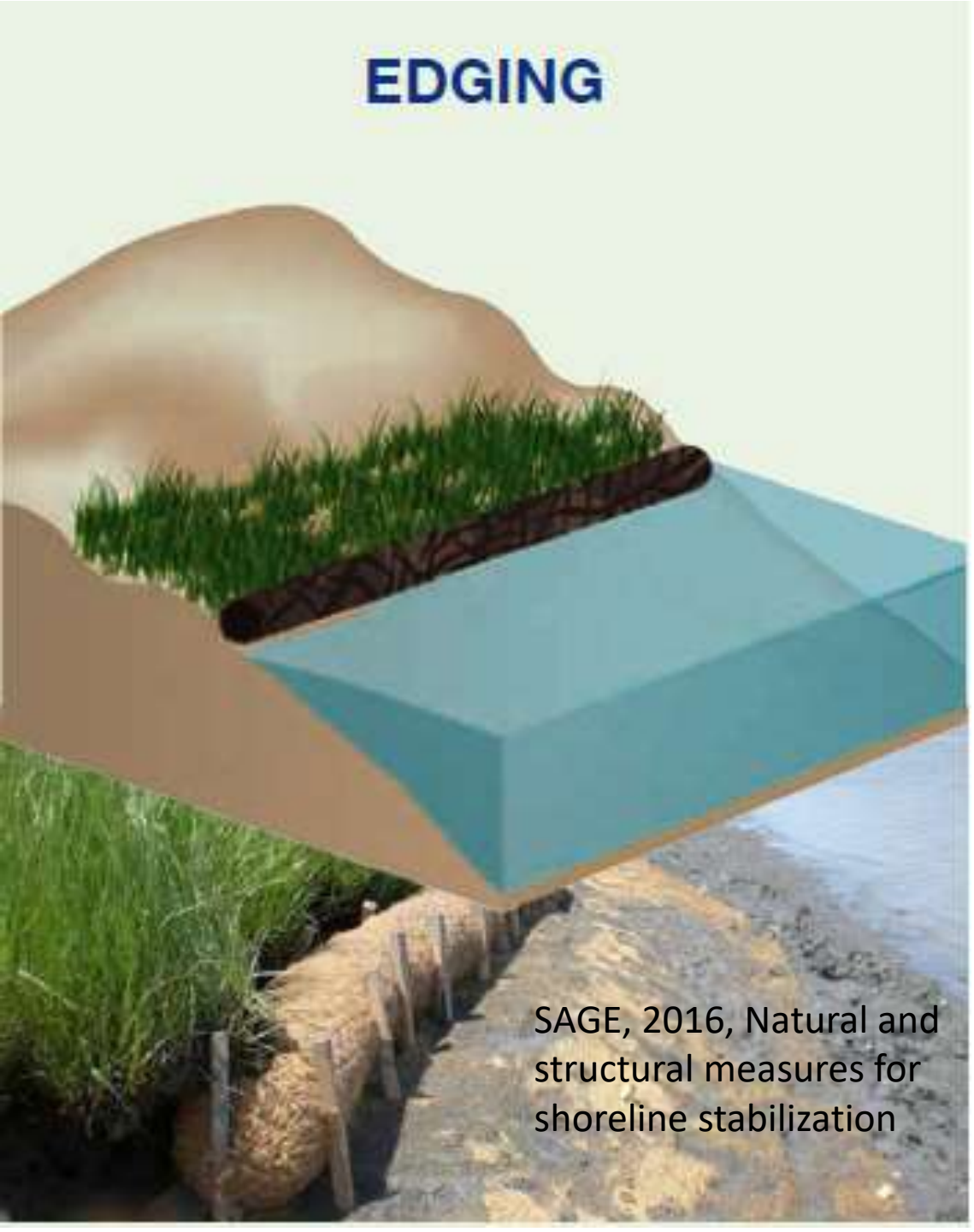


Guidance for Considering Use of Living Shorelines, NOAA 2015



SAGE, 2016, Natural and structural measures for shoreline stabilization

Mill Pond Way berm removal, North Mill Pond, Portsmouth, NH



SAGE, 2016, Natural and structural measures for shoreline stabilization

Brewster Street Mitigation on North Mill Pond (Stantec)

North Mill Pond at Brewster St. Mitigation 2016

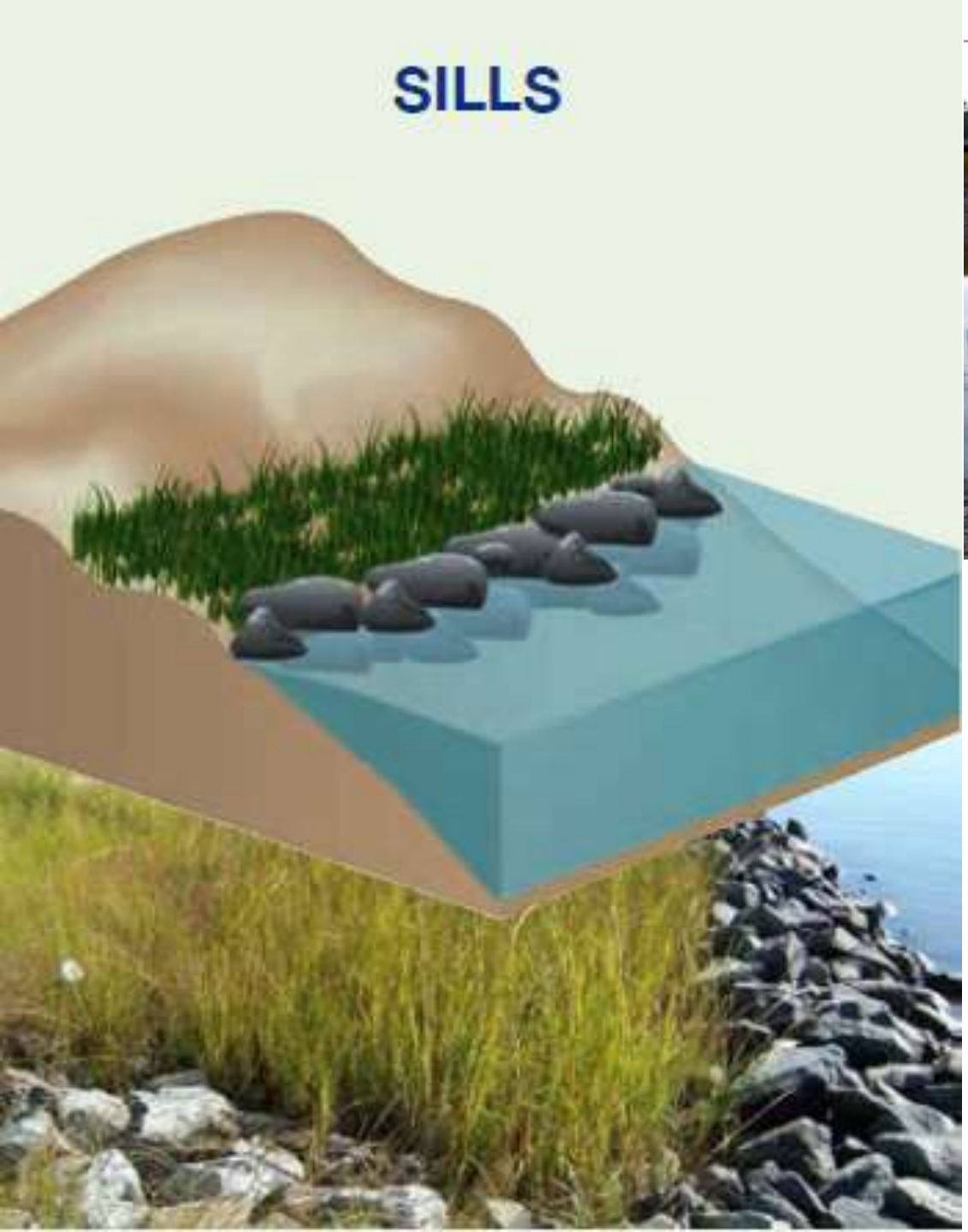
Pre-existing

Fill to Designs Grades

Plant With Plugs

Final Product

Winter Can Be Cruel



Marsh built in South Mill Pond 2001, Portsmouth, in front of seawall and behind sill constructed from existing rocks on site.

SAGE, 2016, Natural and structural measures for shoreline stabilization

Two Case Studies: Living Shoreline Marshes with Sills

1) Cutts Cove, Portsmouth
   - Designed as restoration of salt marsh
   - Approach is to partially remove rip-rap wall
   - Sill provides a 'climate ready' feature for 2060

2) Wagon Hill Farm, Durham
   - Designed to stop erosion
   - Also restores damaged salt marsh
   - Sill provides erosion resistant edge and 'climate ready' feature; TBZ allows for marsh migration

Cutts Cove


95
Forrest St
Cutts Ave
Brigham Ln
Chase Dr
Michael Succi Dr
Sarah Mildred Long Bridge
1

Rip Rap Armor at Cutts Cove

Sarah Mildred Long Bridge Replacement Mitigation Plan January 2014

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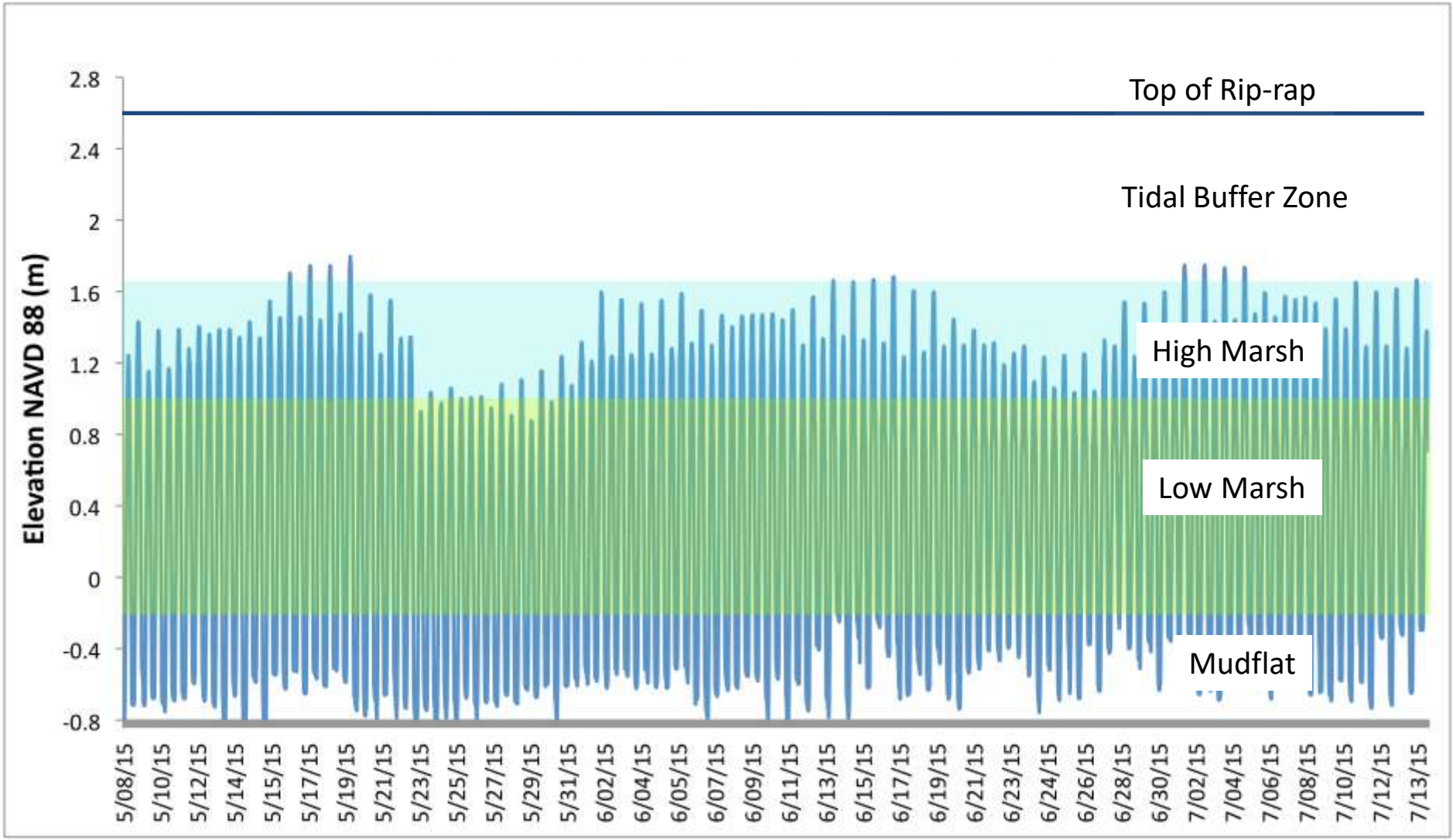
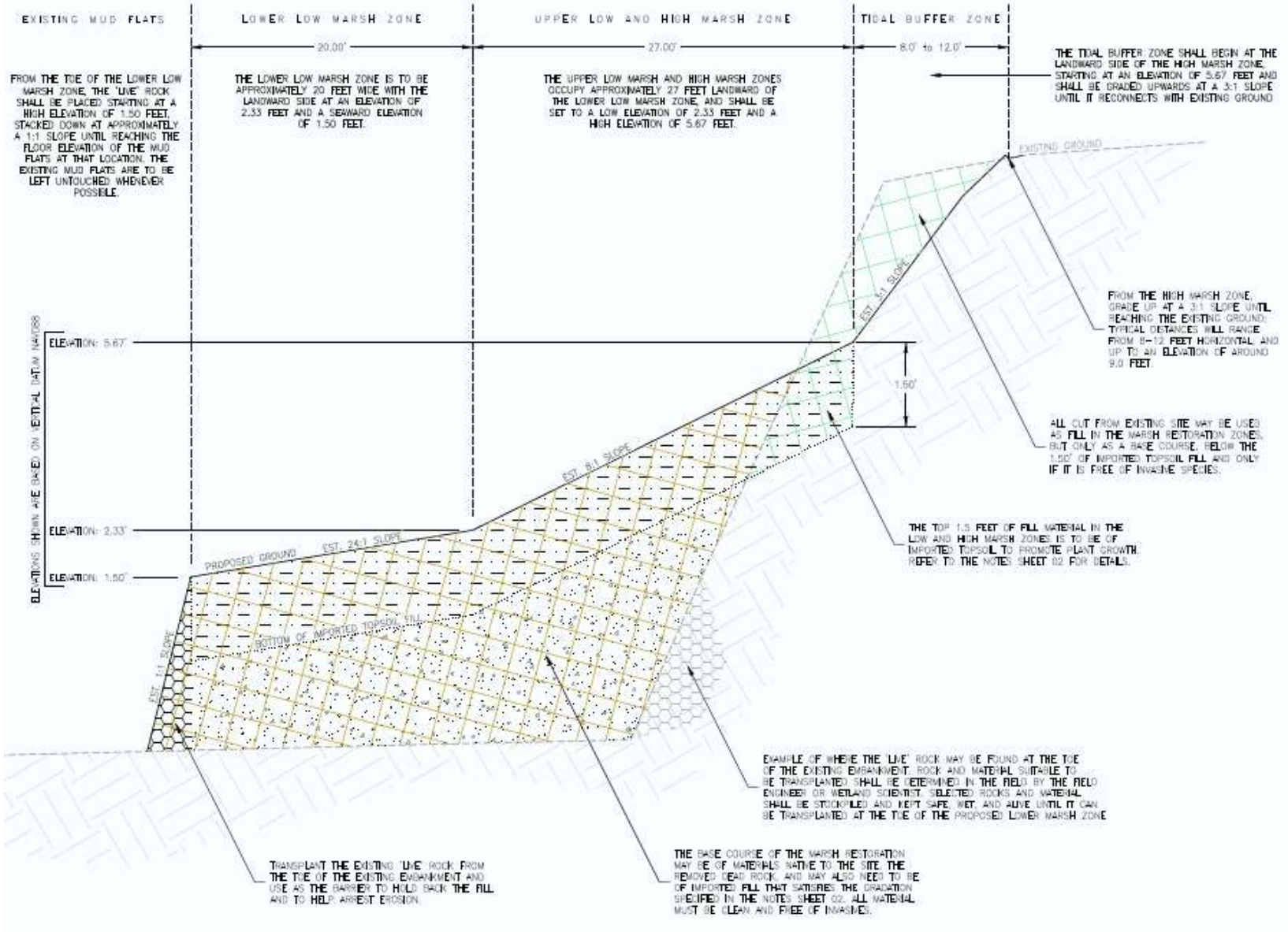
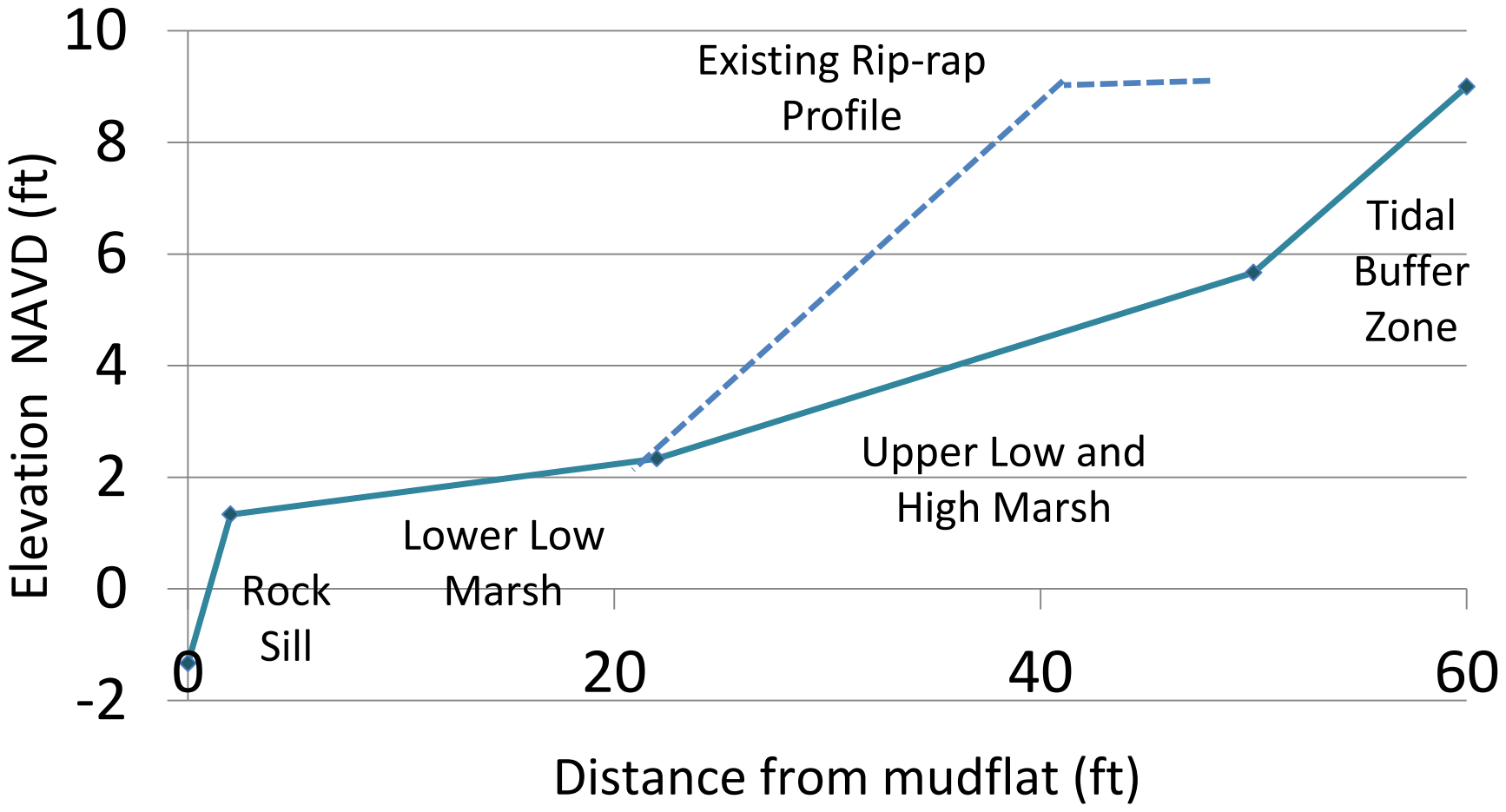
Tides and existing marshes in Cutts Cove



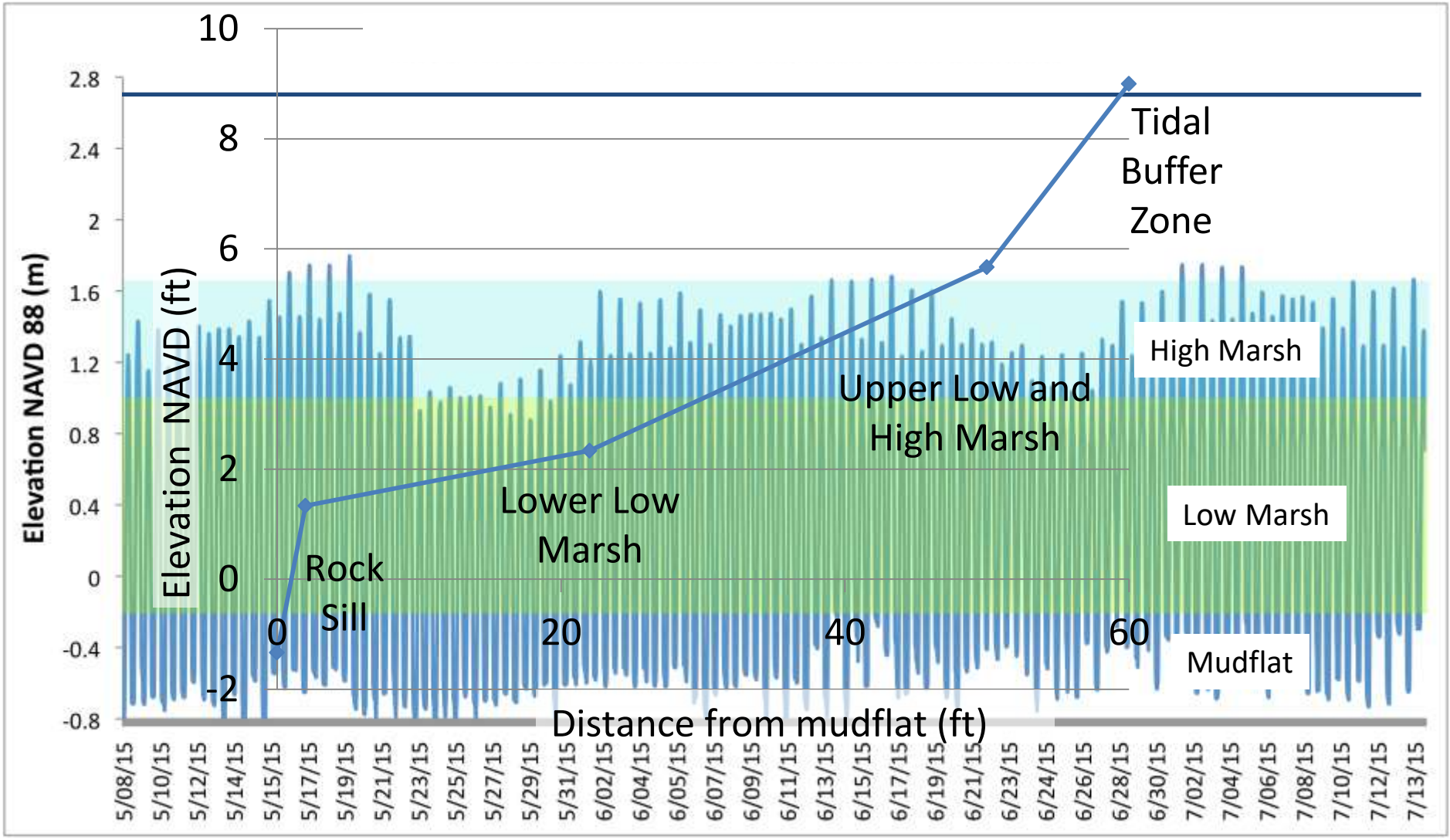
Proposed Cutts Profile



Cutts Profiles and Ecosystems



Tides and existing marshes in Cutts Cove



Construction Sequence

Clear and Grub

Flatten rip-rap wall and build stone edge

Backfill with sandy silt to elevation

Planting and Maintenance

Measures of Success

- Monitoring
  - Erosion
  - Plant establishment and growth
  - Animal use of habitat
- Maintenance

Pre-restoration Fish Sampling

Case Study #2: Wagon Hill Farm

Change from 1992 to 2015

Wagon Hill Farm Issues and Data Collection

Potential Causes of Erosion

- Waves
- Increased foot /pet traffic
- Decreased light
- Increased Sea Level
- Ice Damage
- Plant disease or herbivory
- Lack of Sediment supply
- Eroded shoreline promotes erosion cycle
- Stormwater

Data Collection

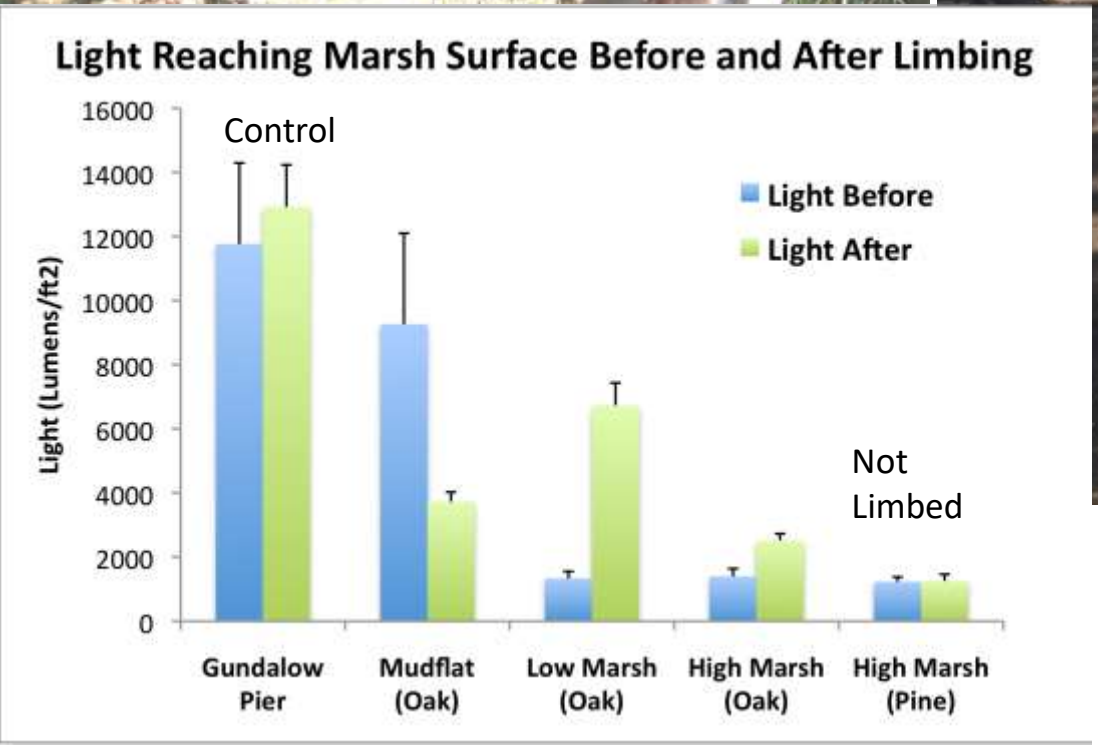
[to eliminate potential causes and inform design]

- High intensity water levels
- Wildlife cameras
- Light meters
- Water level recorders
- Wildlife cameras
- Observations
- Trial structure
- Erosion pins

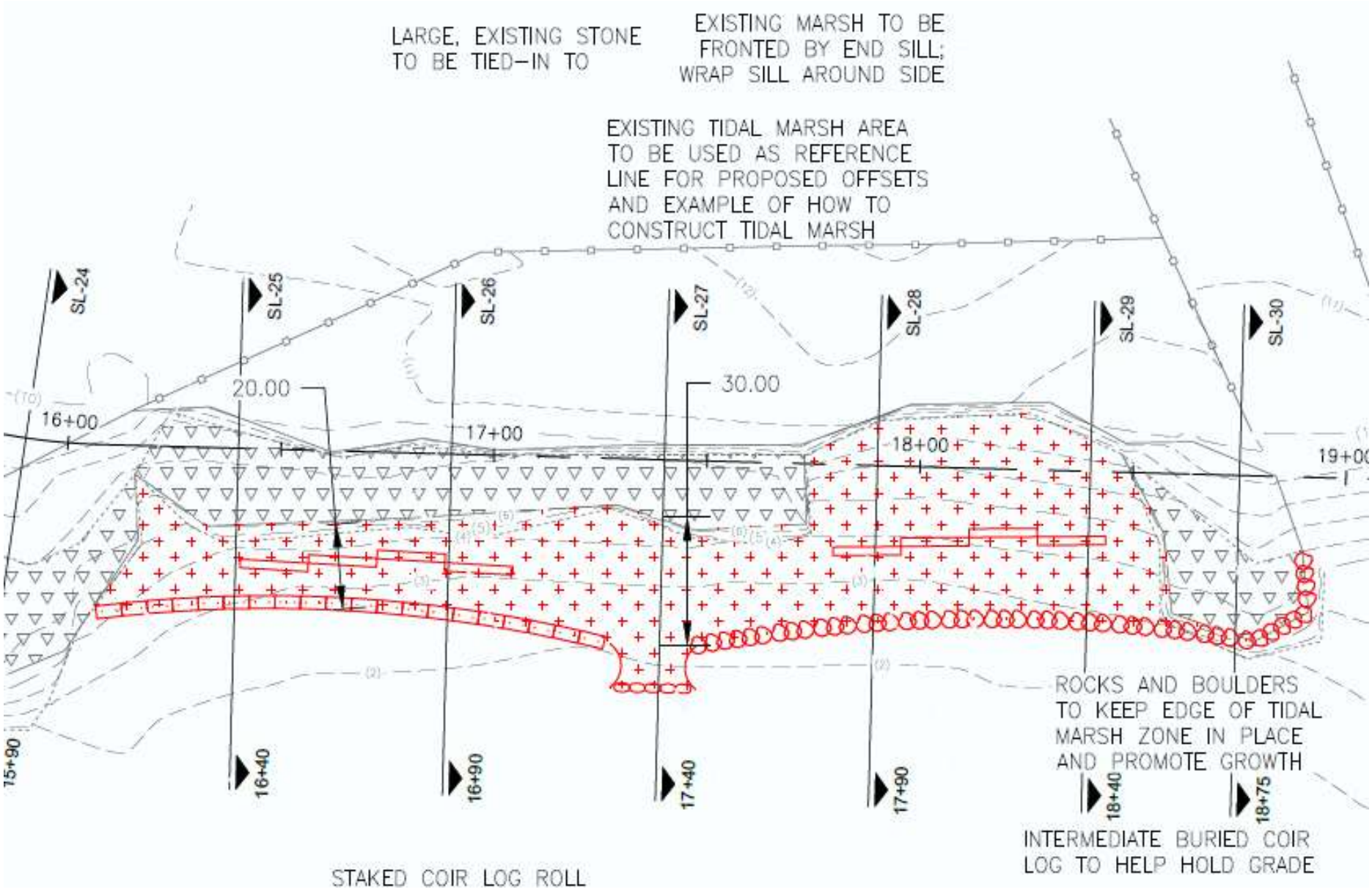
Setting Erosion Pins

Foot Traffic and Boat Waves

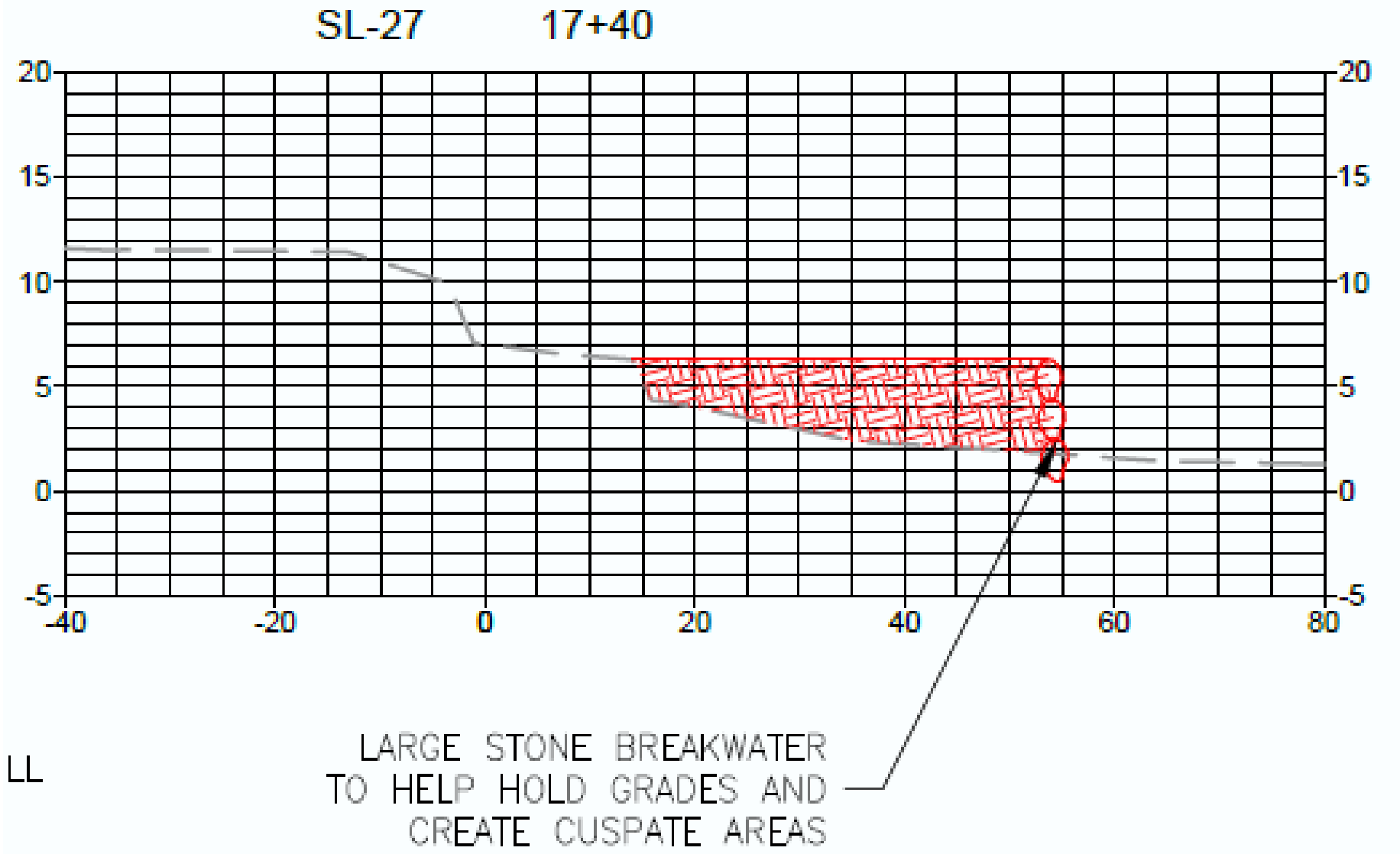
Light can be a big issue for plants



Potential First Phase - Plan



Profile Type 1



Conclusions

- Recognize limited growing season
- Difficulty increases with tidal range and physical exposure to shear stress from waves and ice
- Be aware of conditions that can reduce success: shade and animals (geese, crabs, snails, people)
- Consider management (including people management) at the landscape scale

Thank You!