Increasing Living Shoreline Benefits by Proper Sequencing of Multiple Habitats

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Typical (simple) Living Shoreline

- Have had mixed success in New England:
- Coir logs do not last long,
- Rock sills can move and cause erosion seaward,
- Rock sills block easy passage by some organisms (e.g. horseshoe crabs).
Acute problems in New England: 1. Thermal Expansion

- ‘Normal’ Weather Drives Salt Marsh Erosion:
  Waves from moderate storms, rather than violent events such as hurricanes, inflict the most loss on coastal wetlands. (PNAS 2015)

Average SST (Sea Surface Temp.) anomaly for Jan. 22-23, 2016 relative to the long-term average from 1981 to present. Courtesy of Vincent Saba, NOAA.
2. Increased frequency of storms and intensity
   Nor’Easters are particularly damaging to shorelines
3. Ice
In New England we have large tidal ranges (6-8ft)
High density of human developments, old groins & sea walls
2002- after Remediation for lead shot
Planted saltmarsh grasses eroded away and consumed by geese.
By 2010, eroding shoreline
Landscape Engineering

Reclamation:

- 2011 dune installed with underlying geotubes
Hurricane Sandy, October 2012
November 2012
Spartina planting, Dune installation were not successful,
First step, wave abatement!
Pilot Study (2014):

- 49m – 64 reef balls
- 3,000 Spartina plugs
Results (2015):

- *Spartina* growth
- 16cm sediment deposited
Living Shoreline:
- Successful
- Expansion warranted
Expansion (2016):
- 372 reef balls placed
- Length: \(~304\) meters
Expansion (2017):
• 200 volunteers
• 20,000 *Spartina* plugs
• Low marsh established
Existing Conditions

Living Breakwater (Reef Balls)  
Spartina alterniflora Marsh  
Unvegetated Sand / Gravel Above Mean High Water

Proposed Conditions

Living Breakwater (Reef Balls)  
Spartina alterniflora Marsh  
Imported Cultch (Bagged Oyster Shell)  
Imported Gravel / Cobble Substrate (Approx. 12")  
Imported Sand / Organic Material (Approx. 12")  
Artificial Wrack (Large Woody Debris / Root Wads Anchored in Place with Stone Ballast)  
Stone Revetment (Covered with Approx. 18" Sand / Organic Material)
High Marsh Restoration (2018):

- Sand, cobble, oyster & slipper shells added
- Woody debris attached with steel cables
- 20,000 *S. patens* plugs planted
High Marsh Results (2018):
• High Marsh established
Dune Restoration (2018):
- 47 Dunes installed
Dune Restoration (2018):
• Beach grass – *Ammophila* sp.
• Seaside goldenrod – *Solidago*
Dune Results (2018):
- Dune established
However, winter storms causing erosion again!
Coastal Restoration Takes Time for:
• Regrowth
• Establishment, amendments
• Stability
Thank You!

Questions?