

# Marsh Elevation Enhancement via Dredged Sediment Placement

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**Narragansett Bay**  
National Estuarine Research Reserve

**NOT a disposal site**



# Important Project Considerations

- Timing
- Available Volume
- Restoration Need\*

\*Driving factor for completed projects in RI

# Important Project Considerations

- Initial marsh condition
- Marsh migration potential
- Sediment source location
- Sediment type (grain size)
- Site accessibility (location and ownership)
- **Project team capacity and expertise**
- **Long-term maintenance and monitoring resources**
- Contractor expertise and equipment
- Public support
- Potential user conflicts

# A Strategy for Developing a Salt Marsh Monitoring and Assessment Program for the State of Rhode Island

Kenneth B. Raposa, Ph.D.<sup>1</sup>, Tom Kutcher<sup>2</sup>, Wenley Ferguson<sup>2</sup>, Marci Cole Ekberg, Ph.D.<sup>2</sup>, Robin L.J. Weber<sup>2</sup>, and Caitlin Chaffee<sup>3</sup>

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March 1, 2016





## Rhode Island Coastal Wetland Restoration Strategy



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March 2018

# Tools in the Toolbox: Intervention Actions

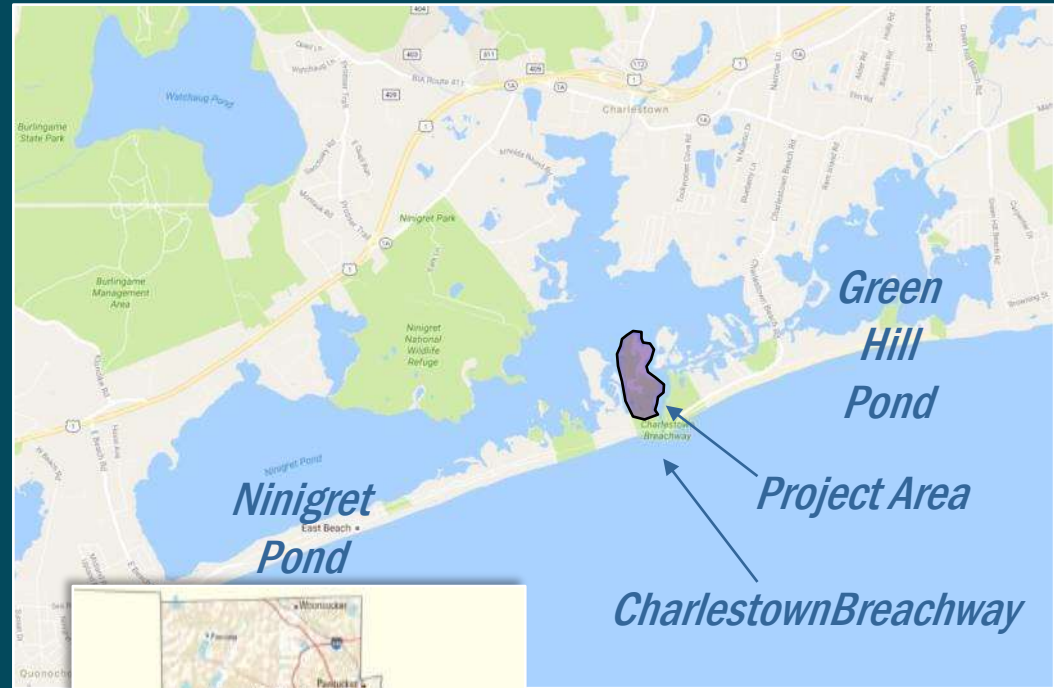
- Land Conservation / Land Use Planning / Regulatory Changes
  - Removal of barriers to future marsh transgression
- 
- Hydrologic modification
  - Elevation enhancement with sediment

**Least intensive  
Long-Term  
Future Benefits**

**Most intensive  
Shorter-Term  
More immediate  
benefits**

# 2014 South Shore Habitat & Community Resilience Project: Project Overview

- Focused on RI southern coastal ponds and back-barrier marshes
- Planning and design for three ponds
- Dredging and marsh restoration in Ninigret Pond



## Partners:



## Funding:





# Observed Impacts to Project Site

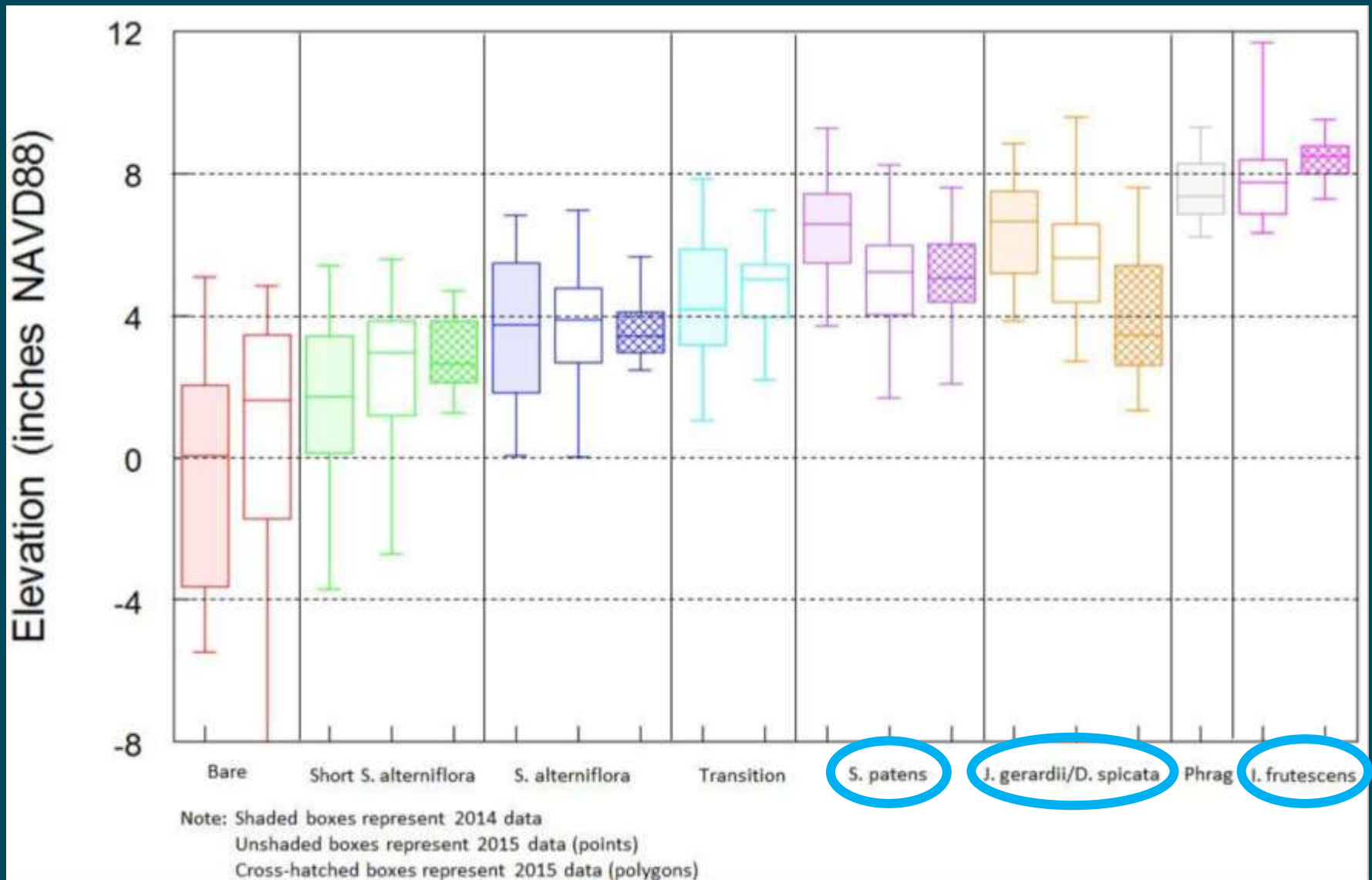
- Vegetation die-off
- Large shallow ponded areas with algal mats
- Loss of high marsh species







# Design: Vegetation Elevation Ranges

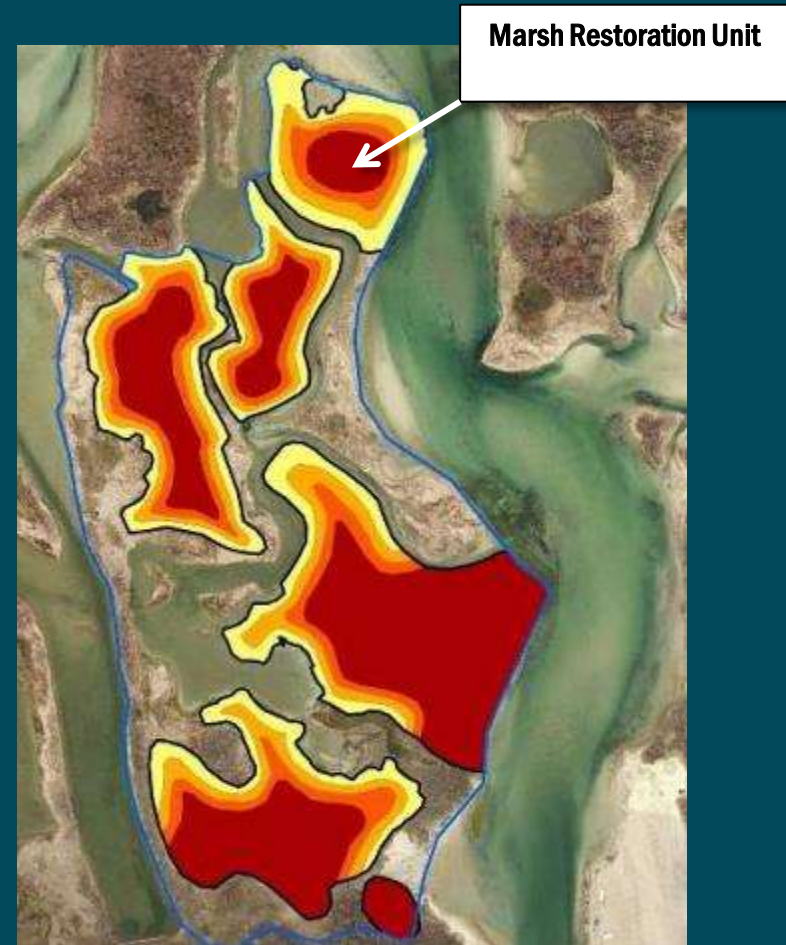


# Material Beneficial Reuse Location and Proposed Pipeline



# Design: Fill Elevations and Grading

- Max target elevation: 1.2 ft NAVD88
  - Compaction
  - Sea Level Rise
- Historic creeks and pools to remain
- Preserved 5 ft perimeter buffer as sediment control





# Minimization of Adverse Impacts

- Time of year restrictions
- Equipment specifications (LGP, discharge pipe size, flow diffusers)
- Sediment control
- Establishment of no-go zones
- Performance specifications for unavoidable impacts to existing habitats

# Minimization of Adverse Impacts

- Construction oversight is key to identifying potential problems!
- Develop RFP to ensure a contractor with the right expertise, equipment and capacity
- Plan and allocate resources for extensive adaptive management post-implementation

























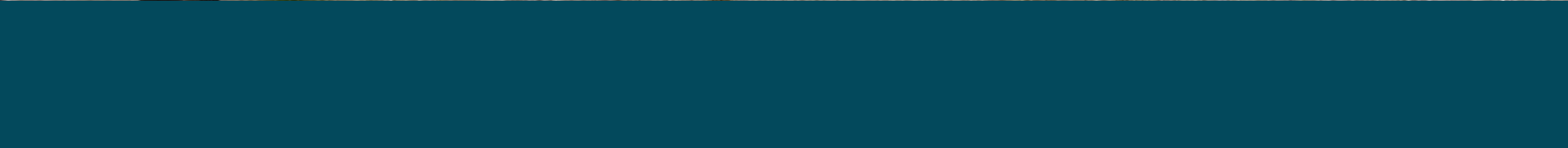
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**Planting effort:  
143 volunteers  
739 hours**



# Adaptive Management



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October 2017  
(photo by CRMC)



Photo Station 5 Southern Marsh Looking East: Before: Fall 2015



After: Post Placement May 2017



1<sup>st</sup> Growing Season September 2017



2<sup>nd</sup> Growing Season September 2018



Photos: Save The Bay



Photo Station 5 Southern Marsh Looking North: Fall 2017



Spring 2018



Fall 2018



Late Fall 2018



*Photos: Save The Bay*



*Distichlis* August 2017



*Distichlis* August 2018



Photos: Save The Bay



*Spartina alterniflora* Planting along creeks: 2018



Revegetation along runnels



May 2017



August 2017





**September 2019**





**September 2019**





**September 2019**



# Ninigret Project Costs

Approx. 68,000 cy dredged

Approx. 20 acres of marsh received material

- Design, Engineering and Permitting: \$110,453
- Construction
  - Mobilization / Demobilization: \$334,400
  - Dredging, spreading and grading of material: \$543,900
  - Alternate dredging: \$530,812
- Planting: \$100,000
- TOTAL: \$1,619,565





Google

# Quonochontaug Marsh, October 2018







Former high marsh areas exhibiting vegetation loss, permanent shallow ponding, transition to low marsh / salt panne vegetation



367 ft

Google earth



Quonnie West 9.3 acres

T2-103m

T1





# Quonochontaug Pond: Predicted Marsh Loss With Three Feet SLR



Map 137



This map is not the product of a professional land survey. It was created for general reference, informational, planning, and guidance use, and is not a legally authoritative source as to the location of natural or manmade features. No warranty is expressed or implied, related to the spatial accuracy, reliability, completeness, or currentness of this map.

- Potential Marsh Zone
- Persistent Marsh Zone
- Potential Marsh Loss
- Open Water and Tidal Flat
- Current Fresh Wetlands
- Protected Open Space
- Hardened Shores
- Buildings
- Parcel Boundaries
- Developed Land
- CRMC Coastal Barriers

## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model



Map produced by Kevin Ruddock, 4/1/2014





URI - EDC UAS Imagery April 17, 2019



September 2019





# Quonnie Project Costs

Approx. 70,000 cy dredged

Approx. 30 acres of marsh received material

- Design, Engineering and Permitting: \$250,000
- Construction
  - Mobilization / Demobilization: \$395,000
  - Dredging, spreading and grading of material: \$1,687,209
- Planting: \$55,990
- Adaptive management: \$85,000
- TOTAL: \$2,473,199

# Monitoring

- Coordination with Save The Bay, SHARP program, NBNERR, RINHS, EPA AED and USFWS
- BACI design, reference site at adjacent National Wildlife Refuge
- Parameters:
  - Elevation
  - Vegetation (above and belowground biomass)
  - Water levels
  - Salinity
  - Accretion rates
  - Nekton
  - Avian surveys
  - Soil chemistry





# Smaller-Scale Applications: Goddard State Park Boat Ramp



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# What can we say so far?

- Hydraulic dredging with direct discharge works for moving sandy material onto a back-barrier marsh
- Few issues with dewatering of sandy material, but some issues with wind!
- Sedimentation controls not necessary with sand if a vegetated buffer is preserved.
- Existing peat can be used to plug ditches for sediment control.
- *Distichilis spicata* is a good colonizer



# What can we say so far?

- Adjustments to grades likely to be necessary 12+ months post-restoration
- Need local entity to oversee adaptive management effort
  - Grading
  - Drainage
  - Invasive species
- Be aware of limitations of equipment and uncertainties related to design and manage expectations accordingly
- Communication between dredging contractor and restoration team is key



**Thanks!**

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**[www.crmc.ri.gov/habitatrestoration/npsaltmarsh.html](http://www.crmc.ri.gov/habitatrestoration/npsaltmarsh.html)**