Contractor: J.F. Brennan Company, Inc.

Submitter: Dan McCauley, Hydrographer

Category: Mitigation or Adaptation to Climate Change

Project: 2016-2017 Ninigret Marsh Restoration Project

Figure 1 The project

The Problem:

Sea level in Rhode Island has been rising at an increasing rate, particularly over the last 30 years. Observations by the Coastal Resources Management Council (CRMC) in many of Rhode Island's salt marshes, including the marshes in Ninigret Pond, confirm that salt marshes are beginning to drown in place, converting to mud flats or open water. Why is this a problem? Salt marshes perform many important functions, including acting as a natural buffer to storms and providing protection for communities along our shorelines, filtering nutrients that would otherwise pollute waterways, and absorbing carbon, which contributes to climate change.

Within the Charlestown breach-way in Ninigret Pond, sand has been accumulating as it is swept in by shoreline currents. As it enters the pond, it covers eelgrass beds—an important habitat—and makes navigation difficult for the many boaters who enjoy the ponds many resources including fishing, clamming and hunting.

To resolve the problems the CRMC and their partners designed a project that used sediment dredged from the breach-way channel to build up the elevation of the adjacent marsh. The goals of the project were to preserve the functions of the existing salt marsh, making it more resilient to future sea level rise and storm events, to slow the entry of sediment into the pond, and to improve navigation by creating a deeper breach way channel.

Environmental Benefits

The project was designed to redevelop and startup areas of the marsh that died due to the constant flooding of the marsh. The project additionally helped rebuild and strengthen existing saltwater marshes by only allowing the tidal water to rise and fall across the marsh for short durations, ensuring the native species take hold and further strengthen the plant community within the marsh.

Additional benefits to a strong and productive marsh include:

- The ability to filter nutrients that would otherwise pollute waterways.
- Healthy marshes absorb carbon, which contributes to climate change.
- 70% of the commercial fish in Rhode Island depend on salt marshes for all or part of their lives, including 63 fish species that use marshes as nurseries.
- Increased water depth in the breach-way is beneficial to motor vessels and human-powered watercraft.
- Bird and fish habitats and ecosystem stability are benefited
- By restoring the marsh and eliminating stagnate pools and channels, breeding grounds for mosquitos, which are a carrier for the West Nile Virus, were reduced.

Figure 2 Picture of dead marsh

Unique challenges

A few of the unique challenges included working in shallow conditions with very swift changes in the tidal cycles and flows in the breach-way. Working in these areas required planning to get fuel and the crew to the equipment, as well as moving equipment from cut to cut, conducting surveys to QC production operations, and producing daily reports.

In some situations keeping fuel levels at lower levels needed to be done to aid in shallow water operations. In addition, due to the local conditions, we were not able to take large fuel amounts to the dredges and had to rely on smaller fuel totes and day tanks.

Due to the regional fish windows, all the work had to be conducted during late fall and winter months. Winter operations required keeping equipment from freezing as well as keeping work areas safe for employees. There were major concerns with snow and ice conditions for working surfaces as well as skin

exposure and frostbite. Due to cold water temperatures and swift currents, the potential of workers falling into the water was also a major concern.

A major issue that had to be overcome was the requirement to maintain the community usage of the town's very active boat ramp, park area, and beach. Due to the traffic on land in water additional precautions had to be taken to ensure the continued operation but also the safety of the community and the Brennan workforce.

Innovation

Brennan brought a number of innovations to bear on the Ninigret project.

- The RTK GPS used for dredge positioning with live updates ensured that we were meeting the required dredge cuts. Additionally, our state-of-art, high resolution single-beam bathymetric system (SBES) was utilized for the hydrographic survey, QA, and QC survey operations.
- Marsh layout included the use of an RTK-GPS rover pole to conduct land surveys and gather data points in shallow water.
- Additionally, drone technology was used to monitor the work but also employed volumetric capability to provide some preliminary information prior to the final survey.
- A marsh excavator was used to mover the pipelines and assist in the grading. This was selected because it would not cause any damage or compaction of the wetland. The Marsh excavator allowed us to control discharge, increase production and final grading by monitoring elevation increasing at discharge. According to *CRMC coastal policy analyst Caitlin Chaffee,* "J.F. Brennan's use of amphibious excavators minimizes the impact to vegetation in the marsh, and their impact on the marsh is next to nothing."

Economic benefits

- Each acre of wetland/marsh is valued at $6,471 per year for maintaining fisheries, supporting $75 million in commercial landings in Rhode Island and $150 million in recreational fishing. Based on the 22-acre project that equates to $142,362 generated by this project to help maintain Rhode Island fisheries.
- Each acre of wetlands is valued at $2,930 per year for coastal protection, helping to shield $5 billion in property in Rhode Island. This would equate to 64,460 dollars in coastal protection.
  Above is sourced from MNSA.info, R.I. CRMC and Save the Bay
- Economic growth from tourism, property value increase from the protection provided by material placed between the housing and rising seas.
- The use of the marsh excavator allowed the work on the sift marshes without the use of crane mats or the need to rework the construction to through the use of traditional low ground pressure equipment.
- The project contributes to strengthen tourism, recreational use for locals and visitors, commercial fishing
- It also contributes to making locals and visitors aware of the changing climate, rising water conditions and how it will affect them and their children. "we're all in this together, and thank goodness, because this is critical. We know that the sea levels are rising, all across the world, but in Rhode Island, it has a huge impact on us," said US Senator Jack Reed, (D-RI). "It has an impact

on our way of life, our economy, on maintaining our homes. We have to take positive action, and this is positive action." *Source www.restorationdredge.com/us-crmc-celebrates-ninigret-pond-sale-marsh-restoration-project*

Transferability

The use of the methods for the removal and placement of the sediment is highly transferable. In fact, the CRMC is using the Ninigret Pond project as a model for their pending projects. The ability to use sand and mud for beneficial reuse is a major component for the marsh restoration and beach nourishment program in RI. The use of nutrient-rich sediment is critical to protect or develop ecosystem nearby. In the past, these materials were thrown offshore in some open water disposal facility. By using the materials in this way, it also provides cost savings by not having to transport and dispose of the materials.

Outreach

There was some major outreach associated with this project. Brennan worked closely with the local community to provide them with updates and work schedule. Early on in the mobilization process the local constables, sheriff department, and state police were notified to ensure safe working conditions and deal with traffic issues. The team also worked with the local harbormaster to notify local mariners as to the potential issues boating near the dredges and their pipelines. And finally, they worked with the local state agencies and the US Fish & Wildlife Service (USFWS) to provide daily updates and reports.

One unique part of the project was the community outreach of the CRMC, University of Rhode Island (URI) and the USFWS to help complete the final construction of the Marsh. CRMC worked with a local company to grow and harvest marsh plant plugs. Brennan provided the final survey maps so they could be used to define the areas for specific plant habitats. These plugs and seeds were used to reseed the marsh. All of the survey and project data was shared with URI to help the university's wetland conservation program and students understand the construction of wetland and marsh projects better.

Additionally the CRMC, Save the Bay, Salt Ponds Coalition and the Town of Charlestown invited the local community to get involved in the planting of their newly restored marsh. They had a series of *Plant the Marsh Days* where the community would volunteer their time to plant, get muddy, cold, and afterwards enjoy provided refreshments. This level of community involvement is helping to push other projects along the coast of RI and Narraganset Bay.

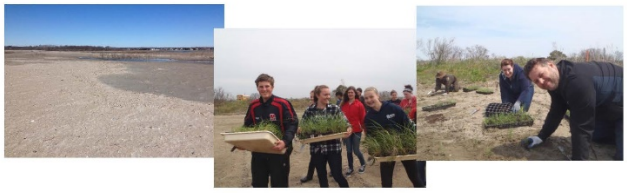
Figure 3 Winter working conditions

Figure 4 Discharge control in the designated marsh area

Join Save The Bay and our partners CRMC,

the Salt Ponds Coalition and the Town of Charlestown for the

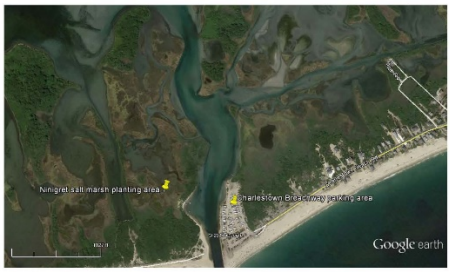
Ninigret salt marsh planting project



Volunteers will plant salt marsh grasses at the Ninigret salt marsh elevation enhancement site on the west of the Charlestown breachway to help protect the marsh from sea level rise.

When: 9 am to 12 pm or
1 pm to 4 pm

Friday May 19th
Saturday May 20th
Sunday May 21st
Monday, May 22nd
Tuesday, May 23rd



Where to meet: Meet at the Charlestown Breachway parking lot at the end of Charlestown Beach Road. A boat will ferry volunteers across the breachway to the Ninigret salt marsh restoration area.

What to wear/bring:

- Wear sturdy footwear (hiking boots are ideal) and clothes you don't mind getting dirty.
- Save The Bay will provide work gloves, but please feel free to bring your own.

To Sign Up: Please sign up online via our volunteer sign up form available at: www.savebay.org/volunteer.

NOTE: volunteers have to be 16 years or older and must be accompanied by an adult and have a parent/guardian sign their waiver.

Questions? Please contact July Lewis at jlewis@savebay.org

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NARRAGANSETT BAY

CRMC

Figure 5 Promotion for a plant the marsh day

Figure 6 Project Planting

Figure 7 Healthy Marsh

Figure 8 Project mobilization

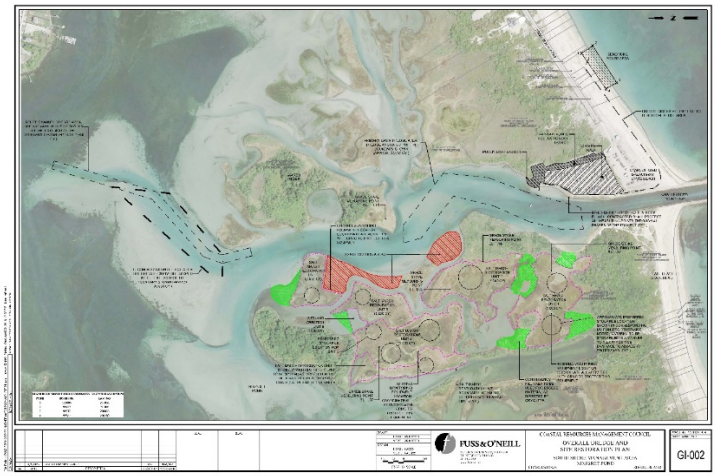

Figure 9 Project overview

Figure 10 Survey of the boundary between healthy and dead marsh