Review of Sea Level Rise and Storm Surge Adaptation Projects in Rhode Island
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Barrington

1. Mixed-use Climate Response Demonstration Site Land Use Workshop (2017 – 2019)

- **What**: The aim of this initiative was to explore adaptation strategies that will promote resilience of coastal municipalities and enhance ecosystem sustainability. The demonstration site drew from adaptation practices currently being implemented in RI and other coastal regions and aimed to test, monitor, and "demonstrate" the resiliency response to adaptation actions.
- **When**: 2017 – 2019
- **Who**: URI Coastal Institute, URI Coastal Resources Center and RI Sea Grant, Town of Barrington, Town of Warren
- **Funding**: URI Coastal Institute and The Sounds Conservancy with in-kind support and collaboration from the towns of Barrington and Warren, Save The Bay, the RI Coastal Resources Management Council, and the URI Coastal Resources Center
- **Process**: Topic-focused workshops, student engagement projects, and public outreach panels and presentations have been the primary means of gathering, sharing and synthesizing information, and facilitating a wide collaborative network.
- **Outcomes**: URI Coastal Institute is committed to collaborating with Barrington as they explore adaptation actions that are necessary to enhance community resilience and sustain natural ecosystems. Led to Barrington starting the Municipal Resilience Program certification process.

2. Municipal Community Resilience Building Workshop

- **What**: As a step towards the Municipal Resilience Program certification, Rhode Island Infrastructure Bank (RIIB), and The Nature Conservancy (TNC) provided the town with a community-focused process to assess current hazard and climate change impacts and to surface projects, plans, and policies for improved resilience.
- **When**: 2019
- **Who**: Town of Barrington, RIIB, TNC
- **Funding**: Technical assistance in providing space and workshop facilitation by RIIB and TNC, in-kind man-hours from the town of Barrington officials.
- **Process**: In 2019 the town of Barrington began certification with RI's Municipal Resilience Program in order to be able to apply to RI Infrastructure Bank (RIIB) grants.
- **Outcome**: Detailed list of projects needed were organized by priority level, and the creation of a schedule of events for each fiscal year.

3. Barrington Beach

- **Problem**: The beach suffered from erosion from wave energy and high velocity stormwater runoff. Water comes in from both directions: ocean and stormwater from the streets that pours down the beach.
- **Project Description**: As part of a larger water quality improvement project, the parking lot at Barrington Beach was moved 10 feet inland and dune grass was planted in the

former parking area to create a natural buffer. The western end of the parking lot was also removed.

- **Completed**: 2014
- **Who**: Town of Barrington and Save the Bay
- **Funding**: The town was loaned $219,000 from the state revolving loan fund that was administered by the RI Clean Water Finance Agency. The American Recovery and Reinvestment Act provided $51,000 because of the green infrastructure implemented in the project.
- **Process**: In 2013, as part of a larger stormwater management project, the Town of Barrington's contractor, William Anthony Excavating (North Kingstown) removed the western section of the beach parking lot and moved the rest of the lot 10 feet inland. In 2014, a dune was created in the area where the lot had been and Save The Bay volunteers and staff planted beach grass in the now unpaved area. They did not use coconut coir envelopes/burritos, they only planted the beach grass. The design consultant was Gifford Design Group of Cumberland, RI.
- **Lessons Learned**: The project needs regular ongoing maintenance due to stormwater from the streets pouring onto the beach, which is in a high velocity zone, and carves out small trenches in the sand. Sediment builds up on the sides of the trenches and needs to be shoveled back in place.
- **Moving Forward**: The town would love to have volunteers to consistently fill in trenches.
- **Contacts:**
    - Kim Jacobs, Barrington's Resilience Coordinator
    - Phil Hervey, Director of Planning, Building & Resiliency
    - Wenley Ferguson, Save the Bay Restoration Coordinator

4. Latham Park

- **Problem**: Flooding in the parking area due to stormwater and nuisance tides.
- **Project Description**: The parking lot was moved inland and an infiltration area was created in the middle of the parking lot. A natural buffer area was planted in the area of the former parking area and a stone dust path with benches was also added near the water.
- **Completed**: 2015
- **Who**: Town of Barrington, technical assistance from Save the Bay
- **Funding**: DEM's Historic and Passive Recreation grants and the Town of Barrington with technical assistance from Save the Bay.
- **Lessons Learn**: According to Phil Hervey, the town's Director of Planning, Building & Resiliency, the maintenance for the park is ongoing and needs a touch up about once a year, but overall is a great improvement. Another issue that will be addressed in the next phase of the project is that sand is building up around the lip of the infiltration area. Also, the stone dust path was placed too close to shoreline and is currently beaten up by wave action and will need to be moved.
- **Moving Forward**: In the next phase of the project they are planning on fixing the infiltration area so sediment does not pile up around the lip, installing rain gardens around where they are adding more parking spaces farther inshore, and moving back stone dust path.
- **Contacts:**
    - Kim Jacobs, Barrington's Resilience Coordinator
    - Phil Hervey, Director of Planning, Building & Resiliency

    - Wenley Ferguson, Save the Bay Restoration Coordinator

5. Allins Cove

- **Problem**: Erosion along Byway road, which not only threatens the road, but also the utility infrastructure underneath.
- **Project Description**: The entrance of the cove was moved by the Army Corps of Engineers and Save the Bay installed coconut coir envelopes and planted grasses to help hold them and the overlying sediment in place.
- **Completed**: 2005
- **Who**: Army Corps of Engineers, CRMC, Save the Bay, the Barrington Land Trust, the Town of Barrington
- **Funding**: Save the Bay applied for a NOAA grant administered by CRMC
- **Process**:
    - In the 1990's a local resident complained that the banks along the Byway Road were eroding. This threatened the road and the utilities infrastructure (water, sewer, and gas mains). She discovered the Army Corps of Engineers had deposited silty sediment there as part of a dredging project, and brought up the issue to the town and Army Corps of Engineers.
    - In 2005 the Army Corps of Engineers moved the entrance of the cove. Save the Bay installed coconut coir envelopes filled with sand along the bank in two tiers. They covered the envelopes with sand and planted with beach grass to combat erosion and provide better support for the road.
- **Lessons Learned**: The coir envelopes are holding up well since their installment in 2005, and only one currently needs maintenance. They would have liked to regrade the slope of the bank along Byway Road to make it more dissipative, but there was no room to do so. The beach grass plugs they planted helped hold the sand and envelopes in place.
- **Moving Forward**: One of the coconut coir envelopes needs maintenance.
- **Contact:**
    - Kim Jacobs, Barrington's Resilience Coordinator
    - Phil Hervey, Director of Planning, Building & Resiliency
    - Wenley Ferguson, Save the Bay Restoration Coordinator

<u>Newport</u>

1. King Park

- **Problem**: Storms such as superstorm Sandy and Hurricane Irene caused erosion to the upland edge of the beach and grassy park area along Newport Harbor.
- **Project Description**: 210 feet of coconut fiber envelopes were filled with sand and installed along the eroding bank.
- **Completed**: 2014
- **Who**: Save the Bay, City of Newport
- **Funding**: $17,000 NOAA grant, administered by CRMC
- **Process**:
    - Save the Bay applied for and received the NOAA grant through CRMC, and is coordinating the project with the city of Newport

    - Netco Inc. of Lexington MA developed the technique and worked with Save the Bay to put in the envelopes or “burritos”
    - July 2014, the envelopes were installed
    - As of June 2018, several envelopes have failed and coconut fiber coir was found torn up on the beach. This was due to one of the winter 2018 Nor’easters that followed a direct north path.
- **Lessons Learned**: Some of the envelopes at King Park have failed, despite King Park being in a low wave energy area. Coastal geologist Janet Freedman of the CRMC didn’t have an answer for why they failed, but she listed some possible reasons:
    - The sediment used to fill the envelopes was finer than the sediment that was typically used, i.e. the sediment had more clay in it than sand.
    - Ground water seepage could have undermined the envelopes, causing them to break down faster.
    - Temporary, short-term fix.
- **Moving Forward**: They have not come up with a solution yet.
- **Contacts**:
    - Scott Wheeler, Newport Park’s Director
    - Wenley Ferguson, Save the Bay Restoration Coordinator
    - Janet Freedman, CRMC

2. Tide Gate:

- **Problem**: A king tide can surge through the storm-drain opening at Storer Park and push harbor water up through the stormwater system along Bridge Street, causing the area to flood, specifically the historic Point Neighborhood. Flooding is exacerbated when extreme precipitation events coincide with king tides.
- **Project Description**: Implementation of a tide gate that allows water to only flow one direction, thus preventing tidal waters from flowing into the stormwater system. The tide gate was placed at the opening of the Bridge Street storm drain and has a 4 ft diameter.
- **Completed**: 2019
- **Who**: Newport’s Department of Utilities
- **Funding**: City of Newport received a reimbursement-based Bay and Watershed Restoration Grant from the state DEM for $425K, and the city’s Water Pollution fund, which is funded by people’s sewer bills, will cover the remaining cost
    - Estimated cost: $760k
- **Process**:
    - Tide gate is a recommendation found in a report to the city by CH2M Hill of Boston (engineering firm) that conducted a drainage investigation and flood analysis of two areas in the city prone to flooding in 2015
    - The consultation included the area along city’s shoreline at Wellington Avenue under a $126k contract with the city
    - The report was commissioned in response to the ~70 flooding events per year that take place in the area of Marchant and Clintons streets, just south of Wellington Ave, and also in the Bridge and Marsh streets area of the Point Neighborhood.
    - Contract was awarded to D’Alessandro Corp. of Avon MA, the engineering firm is Wright-Pierce (Providence office) and construction began April 15, 2019
    - Project was completed and the tide gate was operational as of July 17, 2019
- **Lessons Learned:** Haven’t had the right conditions yet for the tide gate to be effective, i.e. king high tide and extreme precipitation event.

- **Moving Forward**: City is seeking funding for the construction of two other tide gates to be put in at Wellington Avenue. These tide gates will be engineered differently and are more like culverts. The cost of implementing two tide gates at Wellington Ave is estimated at $1.6 million.
- **Contact**: Julia Forgue, the Director of the City of Newport's Utilities Department

3. Gateway Center

- **Problem**: Superstorm Sandy damaged the Gateway Center. The major concerns with rebuilding were the Center's ability to withstand storm surge and flooding from Newport Harbor.
- **Project Description**: The goal of this project was to restore the overhead passenger protection, reduce surface runoff from the site in order to minimize the impact on Newport's sewer system, and mitigate flooding in future storms by implementing green infrastructure.
- **Who**: Rhode Island Public Transit Authority (RIPTA), City of Newport
- **Funding**:
    - Federal Transit Administration's Hurricane Sandy Resilience Program for public transportation directed through RIPTA ($5.9 million)
    - City of Newport ($660,000)
    - Discover Newport - the region's visitors and convention bureau ($20,000)
- **Process**:
    - RIPTA was awarded funding to restore iconic 'sails' of Gateway Center and to make it more resilient to future storms.
    - RIPTA worked with the city, community residents and its consultants to incorporate new soil and structural testing into the plans as well as feedback from the City Council's Architectural Review Committee.
    - The leading architecture team was Northeast Collaborative Architects (Newport, RI office), who has expertise in design specifics such as drainage, green infrastructure, sustainability, architectural detail and signage for passengers and visitors.
    - Completed in 2017 the final project implemented green stormwater system using five bioretention areas (rain gardens) and permeable pavers. The structure is built to withstand a standard category 4 hurricane.
- **Lessons Learned**: Permeable pavement requires maintenance, sand cannot be used on permeable pavers because it reduces its permeability. Also, a special salt is used in the winter as deicer that won't decrease the pavements permeability.
- **Contacts**: Greg Nordin, RIPTA

4. The Point Neighborhood

- **Problem**: Constant flooding in the Point Neighborhood due to outdated stormwater system and nuisance high tides/extreme precipitation events.
- **Project Description:** Newport Restoration Foundation's (NRF) response to the threat of climate change is through its Keeping History Above Water initiative, which brings interdisciplinary conferences and workshops, related to climate and cultural heritage to vulnerable regions across the country. It was one of the first national conversations to focus on the increasing and varied risks posed by sea level rise to historic coastal communities and their built environments. The 74 Bridge Street, the Christopher

Townsend House, serves as NRF's case-study in resiliency measures for historic homes.

- **Who**: Collaborative effort between the Newport Restoration Foundation and architects around the region: Union Studio Architecture and Community Design from Providence, RI and Building Conservation Associates (Newton, MA), and Mohamad Farzan, RIBA, AIA
- **Funding**: Hurricane Sandy Disaster Relief Grant through the Historic Preservation Fund of the National Park Service awarded by the R.I. Historical Preservation and Heritage Commission. Additional funding has been awarded by the City of Newport under their Impacts of Sea Level Change: PILOTING Toward Solutions, and a grant from the van Beuren Charitable Foundation.
- **Process**: The team spent two days in a design charrette in Newport in January 2016.
- **Outcomes**:
    - A published document and an exhibit of resiliency strategies, each of which explored a different level of intervention for mitigating the impact of more frequent and more severe flooding
    - Elevated boiler in basement of 74 Bridge Street
    - Sump pumps – 2 have been installed and are constantly running, if they're turned off 9-10" of standing water accumulate
- **Lessons Learned**: Need for someone in-state to spearhead historic preservation, Keeping History Above Water is now a national organization
- **Moving Forward**: 1/23/20 Press Release: Historic District Commission members voted unanimously to adopt a series of design guidelines for elevating historic buildings that seek to strike a balance between the preservation of historic neighborhoods and the need to face the present-day realities posed by climate change.
- **Contacts**: Helen Johnson, City of Newport

South Kingstown:

1. Matunuck Seawall

- **Problem**: Flooding on Matunuck Beach Road and associated town infrastructure is causing shoreline erosion. The road is only access to 240 homes and several businesses (Ocean Mist) and overlies the only water main line that supplies drinking water to those houses.
- **Project Description:** Installment of a 200-ft seawall to protect Matunuck Beach Road and its underlying infrastructure. An additional 150-ft of seawall (phase two) was proposed after the installment of the first 200-ft in 2017.
- **Completed**: Phase one – 2017, phase two – ongoing
- **Who**: Town of South Kingstown, CRMC
- **Funding**: Phase One: $1.2 million, phase two: $3 million
- **Process**:
    - Town officials concluded that it would be too expensive to create an alternative road through the salt marsh and instead submitted a proposal for a seawall which was approved in 2012.
    - Ocean Mist owner, Kevin Finnegan, was not initially supportive, he was against the first 200-ft, and stalled phase one of the project for five years. However, he came to an agreement with the town in 2016 and is now on board with another 150ft of wall. In their agreement, CRMC approved the rebuilding of a 530-foot-long stone revetment that runs along Mary Carpenter Beach to the edge of the

property that houses the Ocean Mist. Finnegan will pay $2.5 million for the wall's repairs.
    - The first phase of the project, a 200 ft seawall, was completed in 2017.
    - Second Phase: Extend the 200 ft seawall an additional 150 ft to the west, making it a total of 350 ft.
        - CRMC sought public input of the plans, the proposed work requires both a special exception and setback variance, which the town applied to receive.
    - CRMC approved the 150 ft extension of the seawall in 2019, even though many oppose the project.
- **Lessons Learned**:
    - Complications with sheet pile insertion: Project Matunuck, a group of business owners and community members, posted on Facebook describing that the phase 1 work caused the ocean to breach Matunuck Beach Road for the first time since Hurricane Sandy due to cement block walls and sand dunes having been removed for the town's construction, leaving the road exposed.
    - Construction vibrations: Ocean Mist experienced vibrations due to construction of sea wall and had issues finishing the sea wall because vibrations could not exceed a certain amount

<u>Wickford</u>

1. GRIP (Coastal Green and Resilient Infrastructure Project) Design Project for Brown Street Parking lot

- **Problem**: The parking lot in Wickford Village supports the local economy and recreation. It is vulnerable to flooding during extreme high tides, rain events and coastal storms. Untreated stormwater drains from the parking lot to the harbor. These issues will intensify with sea level rise and increased storm intensity.
- **Project Description**: GRIP was conceived shortly after superstorm Sandy and used a learn-by-doing approach to identify opportunities to implement green infrastructure as a tool for building coastal resilience in three municipalities: Newport, North Kingstown, and Warwick. For North Kingstown, the GRIP team partnered with Wickford to develop a conceptual plan that features green infrastructure for the Brown Street parking lot. The team also partnered with the URI Landscape Architecture class who came up with conceptual designs for the parking lot and presented them to the municipality.
- **When**: 2016
- **Who**: GRIP team: URI Coastal Resource Center and Rhode Island Sea Grant, others included the City of Newport, Town of North Kingstown, City of Warwick; the Coastal Resources Management Council, the Department of Environmental Management, the RI Nursery and Landscape Association, the Narragansett Bay Research Reserve, Save The Bay, URI's Landscape Architecture Program and Cooperative Extension Program, and the University of New Hampshire Stormwater Center, URI Students from landscape architecture class
- **Funding:** US Department of the Interior and US Fish and Wildlife Foundation's Hurricane Sandy Coastal Resiliency Competitive Grant Program
- **Moving Forward**: Wickford has funding for the design phase of Brown Street Parking Lot and is looking for funding for the implementation.

- **Contact:** Becky Lamod, Wickford's Planning Department