Sesachacha Pond Ecological Enhancement and Resilience Strategies on Nantucket, MA

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INTRODUCTION

- The Island of Nantucket is located ~30 miles off of Cape Cod in the Atlantic Ocean (Figure 1.)
- The Island experiences high wind, wave energy, flooding and erosion which will be exacerbated by climate change and sea level rise
- This project is focused in one of Nantucket's brackish great ponds, Sesachacha (Figure 1.). This pond is facing water quality degradation due to increased nutrient loading. The decline in water quality has led to a reduction in habitat for benthic species including the pond's natural population of oysters.
- In 2018 a winter storm event led to severe episodic erosion that caused Polpis Road, the roadway that runs along the southwest side of the Pond, to fail (Figure 2.). As a result, the road was unpassable for several weeks.

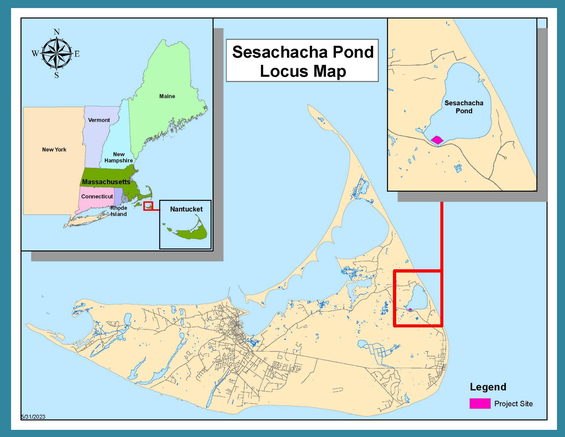

Figure 1. Locus map of Nantucket, MA showing the project site in Sesachacha Pond.

Figure 2. Polpis Road failure from a winter storm in 2018.

PROJECT GOALS

1. To protect Polpis Road using the best environmentally friendly solution while providing adequate protection to maintain the integrity of the roadway.
2. Address the problem of wind and water driven erosion occurring at the interface of Sesachacha Pond and Polpis Road by attenuating wave energy with a constructed oyster reef.
3. Increase the natural oyster population within Sesachacha Pond by providing suitable habitat (i.e., reef balls).
4. Improve water quality within the eutrophic pond and increase biodiversity in the pond and surrounding coastal habitats.
5. Serve as an educational experience for locals and visitors to learn about adaptable nature-based solutions to help mitigate hazards from climate change.
6. Serve as a transferable model around New England for an adaptable, nature-based solution to address problems exacerbated by climate change.

PROJECT DESCRIPTION

PHASE 1 (SNEP FUNDED):

- Conduct topographic survey, bathymetric survey, wetland delineation, and sediment sampling and analysis.
- Design, permit, and install a nearshore oyster reef using reef balls and oyster shell bags to protect the shoreline along Polpis Road (Figure 3.). The reef will attenuate waves, reduce erosion, increase sedimentation on the landward side, while enhancing oyster habitat.
- Outreach efforts through tours, presentations, local forums, signage, and project website.

PHASE 2 (FUNDING NEEDED):

- Work off phase 1
- Design, permit, and install a living shoreline between Polpis Road and Sesachacha Pond to permanently stabilize the shoreline while enhancing habitat with natural vegetation (Figure 3.).

January '23
- Town hired Woods Hole Group to help facilitate project

February '23
- Signed grant agreement
- Project kick-off meeting

March '23
- Standard Operating Procedures (SOPs) draft developed

April '23
- SOPs approved
- QAPP draft developed
- Gathered historic wind and water level data

May '23
- QAPP sent for review
- Bathymetric and topographic surveys completed
- Wetland delineation completed
- Sediment sampling completed

June '23
- Model wave conditions
- Prepare existing conditions plan

July '23
- Prepare nearshore reef alternatives
- Assess and choose nearshore reef alternative

August-December '23
- Geotechnical subsurface investigation
- 90% Engineered reef plans
- Hold public hearing
- Start local, state, and federal permitting

January-March '24
- Complete permitting
- Design project website
- Order reef balls
- Develop implementation plan
- Develop project lesson plans for students

April-August '24
- Develop project sign
- Deploy reef
- Conduct outreach tours

September-December '24
- Implement project lesson plan
- Conduct field trips with school students to site
- SNEP grant complete

Figure 3. Conceptual design produced by Horsley Witten Group of nearshore reef and living shoreline for Sesachacha Pond.

WHAT ARE REEF BALLS?

- Created by Reef Innovations and used world-wide to create habitat for many species including fish, corals, and oysters (Figure 4.)
- Secondary benefits include living breakwater, promote sediment accretion on the landward side, and promote marsh growth (Figure 5.)
- Made from marine friendly concrete with micro silica and crushed oyster shell that has a similar pH to sea water
- Designed to create miniature vortexes to reduce lifting forces during storm events while bringing nutrient rich water to reef
- Available in different sizes ranging from 0.3m-2m in height

Figure 4. Reef balls serve as excellent habitat for oysters.

Figure 5. Reef balls promoting marsh growth at Stratford Point, CT.