

Living Shoreline Wagon Hill Farm, Durham

BE A GOOD STEWARD:

- Shoreline access is restricted to the water entry point outside of the fence barrier. To view the living shoreline please stay on the trail, or use the observation platform (perfect for photos!)
- Do not walk on the restored marsh surface; the success of the living shoreline at Wagon Hill depends upon thriving salt marsh vegetation.

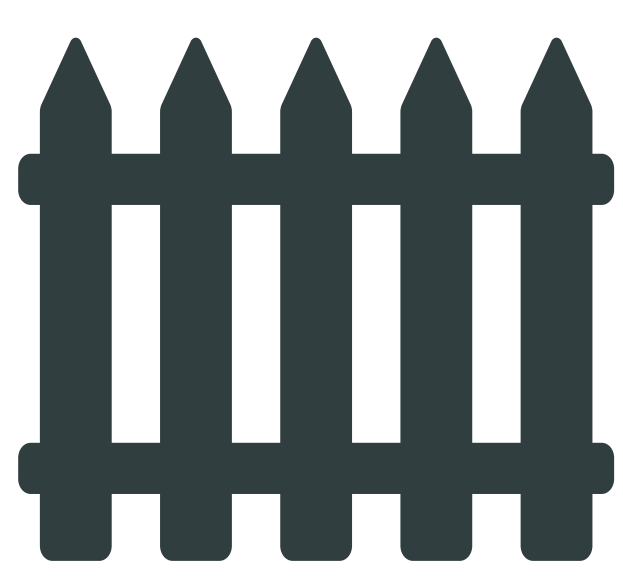
FAST FACTS

30k



the number of new saltmarsh plants restored along the shoreline

750



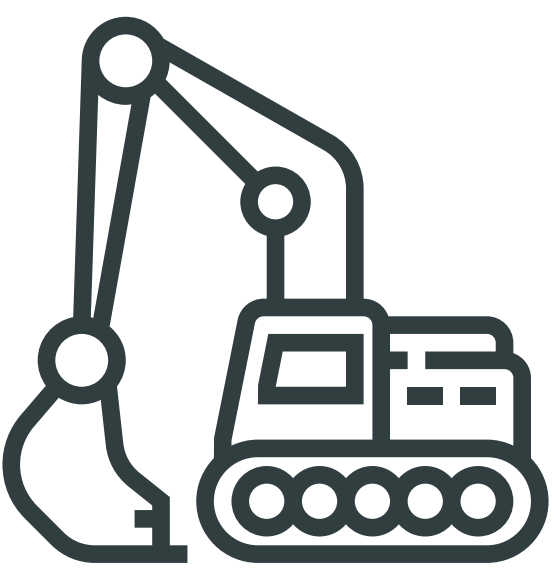
the length in feet of fence installed at the shoreline

\$678k



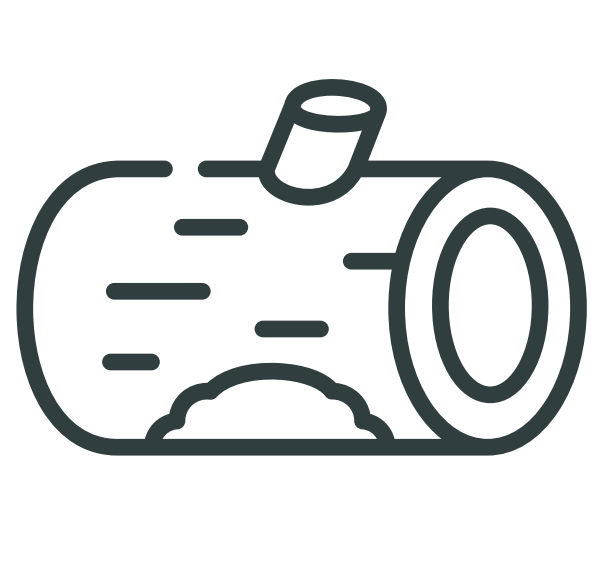
the total amount of funding allocated for the project

1,042



the total in cubic yards of dirt used for the new slope/shoreline

6



the number of trees cut down & converted to root wads

THE CHALLENGE

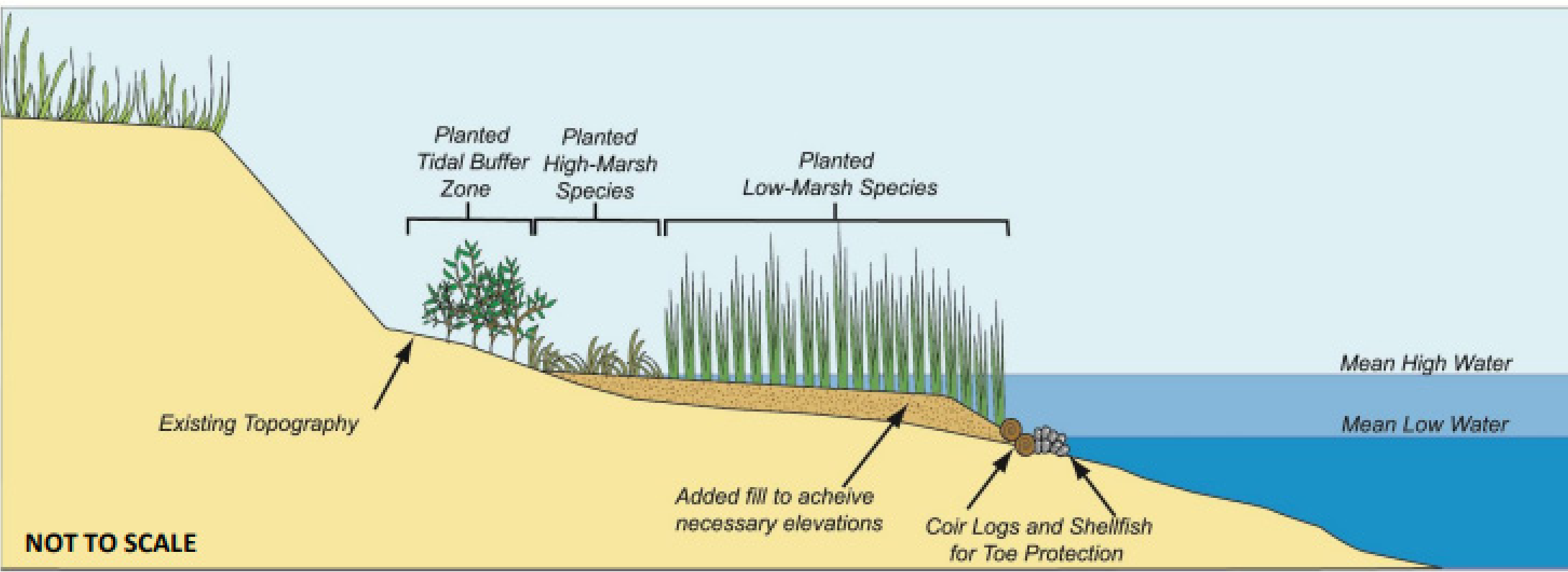
Over the 27 years that The Town of Durham has maintained public access to the Oyster River shoreline at Wagon Hill Farm, erosion has resulted in shoreline retreat at a rate of 1 foot/year. This erosion is caused by a variety of factors including waves, boat wakes, people and dogs walking over salt marsh vegetation, shade from trees and other stressors. These stressors have affected almost 2,000 feet of shoreline along the property adjacent to the River, and have led to loss of salt marsh vegetation and erosion of marsh sediments.

WHAT IS A LIVING SHORELINE?

LIVING SHORELINE: "A management practice that provides erosion control benefits, protects, restores, or enhances natural shoreline habitat, and maintains coastal processes through the strategic placement of plants, stone, sand fill, and other structural organic materials, maintaining the continuity of the natural land-water interface while providing habitat value and protecting against coastal hazards."

¹ NHDES Wetlands Rules

LIVING SHORELINE DESIGN USED



MARSH CREATION/ENHANCEMENT W/ TOE PROTECTION

A toe protection structure holds the toe of an existing, enhanced or created marsh platform in place, and provides additional protection against shoreline erosion. A gapped approach to the toe protection structure allows habitat connectivity, and greater tidal exchange. Toe protection is particularly important where there is higher wave activity or threat of boatwakes.¹

¹ The Nature Conservancy's *Living Shorelines in New England: State of Practice*, July 2017

PLANT SPECIES USED

Upper Buffer



Shadbush
Amelanchier spp.



Sweet Fern
Comptonia perigrina



Bayberry
Myrica pensylvanica



Sweet Pepperbush
Ostrya albidula

Lower Buffer



Slough Grass
Spartina pectinata



Switchgrass
Panicum virgatum

High Marsh



Black Grass
Juncus gerardi



Spikegrass
Distichlis spicata



Salt Hay
Spartina patens

Low Marsh



Smooth Cordgrass
Spartina alterniflora

THE STRATEGY

The Town worked with the University of New Hampshire and the New Hampshire Department of Environmental Services Coastal Program to design, pilot, build, and monitor a living shoreline in order to minimize erosion and adapt to expected increases in water levels. The project includes shoreline stabilization, habitat enhancement, and flood damage protection by incorporating natural, green, "soft" infrastructure. The marsh was restored along 300 linear feet of eroding Wagon Hill Farm shoreline along with stormwater drainage management and new site access amenities. It was implemented in spring 2019 after much research and planning.

1



VISUALIZING CHANGES

Strafford Regional Planning Commission (SRPC) provided design assistance to develop an artistic rendering of a living shoreline at Wagon Hill. SRPC staff used Photoshop to convert an existing conditions photo of the site and re-imagined the space using initial living shoreline design concepts that were being developed by the project team. This approach allowed the Town to provide additional education on what the living shoreline could look like. The final design and installation improved upon the strategies rendered in the mock-up.



2



RESTORING THE SALT MARSH VEGETATION

In May and July 2019, Durham staff and local volunteers helped plant all the salt marsh vegetation. Most of the plant species were grown in a greenhouse prior to being transported to the site and planted at the shoreline. Starting young plants in a controlled environment before being planted at Wagon Hill increased the likelihood of their survival. Coir logs were used to separate the two sections of vegetation, higher marsh and lower marsh plants, for additional stabilization. Coir logs are often made from coconut husks fibers and are 1 ft or larger in diameter.

3



STONE TOE

A barrier of rocks, often referred to as a stone toe, was installed to help hold the new tidal marsh in place and protect the shoreline by reducing the energy of wave action. During construction, 'live' rocks (rocks in the mudflats that had algae on them) were stockpiled and added to the face of the stone toe. Besides providing protection for the living shoreline, the stone toe also provides a place for intertidal plants and animals to grow. As part of this pilot project, monitoring is currently being conducted to see if seaweed planted on the rocks survives.

4



TREE REMOVAL AND GRADING

Several eroding, large trees were cut down to allow for the shoreline to be properly graded back to help stabilize the bank and promote grass and shrub growth as part of the salt marsh restoration. The bottom halves of the trees were reused as root wads. The root wads, in conjunction with the coir logs and stone toe, were cabled down and placed approximately 20 feet apart from each other. Acting as natural barriers, the root wads will help protect the living shoreline by absorbing energy from waves, storm surge, and future sea level rise.

5



STORMWATER

A green stormwater management system was designed and constructed to the east of the sandy access area. This bioretention system captures and treats all the uphill water draining from fields. Due to the expected nitrogen loads in this runoff from animals using the property, the bioretention system was specifically designed to remove nitrogen.

6



FINAL PRODUCT

The living shoreline at Wagon Hill Farm is one of the first of its kind in Strafford County. The Town's meticulous planning process led to a final design which improved the site's resilience by protecting its shoreline against future sea level rise and extreme coastal storms. In order to ensure the long-term health of salt marsh vegetation, a fence was installed to guide visitors away from this sensitive area. We hope you appreciate and respect all the work the Town has put into protecting this special resource at Wagon Hill Farm. Enjoy!

TIMELINE

Durham acquires the land at what would be later named Wagon Hill Farm for \$3.1 million dollars in bond funds.

1995

The Public Works Department begins implementing several management activities identified in the 1995 Plan, including maintenance of trails, installation of animal restriction signs and a picnic pavilion area, upkeep of trash cans and portable toilets, enhancing parking and access, coordination of special events, and shoreline stabilization.

2009

The Town of Durham receives \$20,000 in funding from the NH Department of Environmental Services (NHDES) Coastal Program to assess the erosion issue at the Wagon Hill Farm shoreline in Durham. The Town partners with NHDES and the University of New Hampshire (UNH) to monitor, assess and design alternatives for erosion control and shoreline protection using a living shoreline approach. This later becomes referred to as Phase I of the Wagon Hill Living Shoreline project.

2017

The Town of Durham receives a second round of funding from the NH Department of Environmental Services Coastal Program to implement Phase II of the Wagon Hill Living Shoreline project. Phase II includes designing a plan to stabilize Wagon Hill Farm's eroding shoreline.

2018

Durham receives a grant from the NH Department of Environmental Services Aquatic Resources Mitigation Fund totaling \$250,000 to fully design, pilot, build, and monitor a living shoreline in order to restore lost and degraded salt marsh, address erosion issues, prepare for sea-level rise, and provide public education opportunities.

2019

The Town, with support from the University of New Hampshire and the New Hampshire Department of Environmental Services Coastal Program, installs the living shoreline along the Oyster River. This management technique will sustain and allow the marsh to migrate due to sea-level rise by halting the erosion cycle and removing stressors, such as foot and dog traffic, tree shade, and stormwater runoff.

Funding for this educational display was provided by the New Hampshire Department of Environmental Services Aquatic Resource Mitigation Fund Program and by NOAA's Office for Coastal Management under the Coastal Zone Management Act in conjunction with the NH Department of Environmental Services Coastal Program. This poster was prepared by Strafford Regional Planning Commission for the Town of Durham.

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PROJECT PARTNERS

