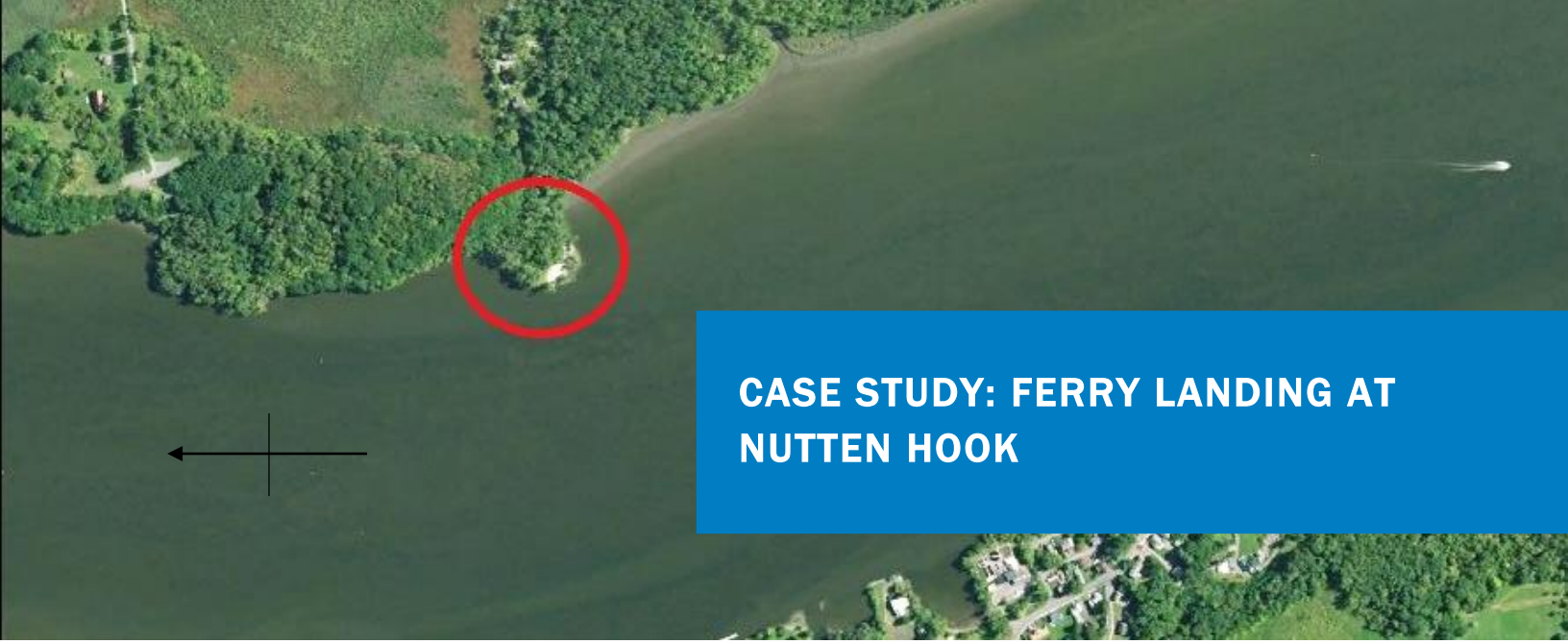

CASE STUDY: FERRY LANDING AT NUTTEN HOOK

HUDSON RIVER SUSTAINABLE SHORELINES

The Hudson River Sustainable Shorelines Project is a multi-year effort lead by the New York State Department of Environmental Conservation Hudson River National Estuarine Research Reserve. This case study builds on the work of the partners:

Cary Institute of Ecosystem Studies
Consensus Building Institute
Greenway Conservancy for the Hudson River Valley
NYSDEC Hudson River Estuary Program
Stevens Institute of Technology

The Project has been supported by NOAA through the National Estuarine Research Reserve System Science Collaborative.

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OVERVIEW

Shoreline protection, ecological enhancement, and access improvements are planned for 500 feet of shoreline at a popular property of the NYSDEC in the town of Stuyvesant, NY. The project will involve stabilizing eroded banks, planting native vegetation and providing a fishing platform for park users of all physical abilities to fish and view the river.

LOCATION & ACCESS

Ferry Landing at Nutten Hook is located on the east side of the Hudson River, in the town of Stuyvesant, a few miles north of the city of Hudson, NY, at river mile 124. It is in the Stockport Flats component site of the Hudson River National Estuarine Research Reserve and managed by the New York State Department of Environmental Conservation. The site is open to the public and can be accessed via Ferry Road off of US Route 9J (Figure 1).

PARTICIPANTS & COST

Owner: New York State Department of Environmental Conservation
Manager: NYS DEC, Hudson River National Estuarine Research Reserve
Design: BlueShore Engineering, Creative Habitat Corp., Contract managed by NEIPWCC
Design Cost: $50,000 **Construction Cost Estimate:** $500,000
Funding: Hudson R. Estuary Program and Environmental Protection Fund
Project Timeframe: Designs completed in September 2016, construction planned for spring 2019

BACKGROUND AND STORY

Stuyvesant has a rich history, at one time it was home to four ice houses on just 9 miles of shoreline. The remains of one ice house are at Nutten Hook, Figure 1. Ferry Landing is at the southern end of Nutten Hook and was the location of a ferry service between Nutten Hook and Coxsackie (until 1938). The landing appears to have been created in the 1920's by placing fill behind timber cribbing in an area that was previously Hudson river bottom. Ferry Landing is used for fishing and birdwatching and provides handheld boat access to the Hudson River.

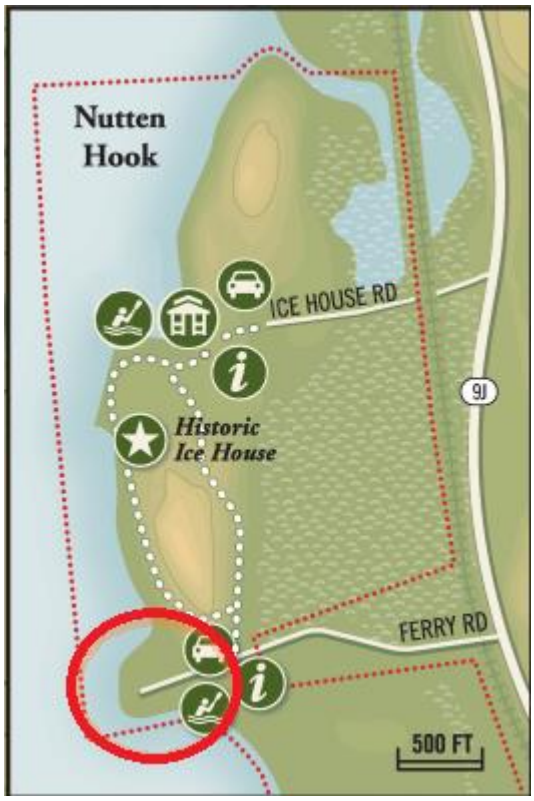

Figure 1. Nutten Hook, NY is part of the Hudson River National Estuarine Research Reserve Stockport Flats component site. Ferry Landing is at the southern end.

ASSESSMENT, PLANNING & DESIGN

Much of the site's shoreline has experienced significant scarping and erosion due to high-energy wave action. The goals of the project were to maintain or enhance current site uses for recreation, stabilize the shoreline, and improve or maintain the habitat value of the site for fish and wildlife.

Site designs were created by BlueShore Engineering in partnership with Creative Habitat Corp. The NYSDEC Hudson River Estuary Program provided funding as an incentive for Sustainable Shorelines Project demonstration sites. Hudson River Estuary Program staff were project manager. Town officials, state and federal permitting staff, and biologists were involved in the planning process.

Figure 2. Existing concrete and aging timber cribbing can be observed along the southern corner of the shoreline, looking north (left photo). Tree roots exposed by erosion at the northern corner of the shoreline (right photo, looking south).

Ferry Landing at Nutten Hook is a popular location for fishing, watching wildlife, canoeing and kayaking, and viewing the Hudson River. There was consensus among project planners that site designs should complement these uses. Another significant design consideration is

the low-lying nature of the property, which is prone to flooding and is particularly vulnerable to storm surge and rising sea levels. A balance was sought to preserve use of the site for the future, while utilizing the allotted funds in a reasonable fashion.

Figure 3. Visualization, created by BlueShore Engineering, of existing stone bulkhead to left, native plantings by plug and wattles in middle, and rock armoring along southern shoreline sandwiched parallel to Ferry Road (looking west). Trees along the stacked stone wall will be replaced with low growing vegetation to prevent destabilization of the road when trees topple over.

The shoreline exhibits significant erosion, particularly along the northwestern corner of the property, where tree roots have been exposed. The existing shoreline stabilization, a stacked rock bulkhead parallel to Ferry Road, and a timber cribbing bulkhead along the western shore, has provided some protection in those areas. In order to prevent further loss of shoreline, project managers agreed that maintenance and reinforcement of the shoreline was needed. Shoreline protection above mean high water (MHW) was identified as an important design component in order to protect the site from wave action at elevations above MHW given sea level rise, and thus also aid in preserving access to the site via Ferry Road. Staying true to the principles of the Sustainable Shorelines Project, engineers were encouraged to incorporate ecologically enhanced shoreline engineering techniques into the designs.

Project engineers presented project managers with several preliminary designs, considering various sea-level rise (SLR) scenarios. According to rapid ice melt SLR predictions, Ferry Road will be inundated in 50-60 years. Preliminary proposed engineering strategies ranged from doing nothing at the site to building up the entire site utilizing approximately 290 cubic yards of fill material, which includes areas above and below grade and below MHW. Project partners agreed to a plan that is a compromise between the two extreme scenarios.

PLAN DESIGN

The planning process began in 2016. Approximately 500 feet of shoreline will be protected. By using a combination of vegetation with stone armoring, the project engineers believe that this "softer" hard shoreline protection will greatly reduce erosion, stabilize the shoreline, and enhance the site's habitat for both wildlife and fish and recreationalists. Design components involve planting native vegetation (Table 1) and the use of rock to armor vulnerable areas. Due to the high-energy of the site, this combination approach was deemed necessary. Different sections of the site are treated according to existing conditions and the need to refurbish existing erosion protection and to protect or enhance habitat. At the stacked stone seawall/bulkhead along Ferry Road at the southern edge of the site, Figure 3, trees will be replaced with low growing vegetation, and by wattles and plug planting, to prevent destabilization of the road if existing trees were to topple. In other areas, existing trees

will be protected with rip-rap and understory established with live stakes, see Figure 4 and 5. The existing cribbing along the northern shore will remain. Sills will be placed in two locations to protect the existing wetland plants.

Planting methods to be used include live stakes, dormant wattles, and grass-plugs. Native species of live stakes will include Silky Dogwood, Red Osier Dogwood, and Arrowwood Viburnum (Table 1). Live stakes will measure between 3/8"- 1" in diameter and 3'- 4' in length, and they will be planted with 2'- 3' spacing. Dormant wattles include the same species as live stakes and will have a diameter of 4" and continuous installation. The wattles serve as a live soil retention device that will grow into a continuous hedge. Also, 450 grass plugs consisting of Switchgrass and Little Blue Stem will be planted by the seawall/bulkhead at the southeastern corner of the site with 1' spacing.

Table 1. List of small trees/shrubs and grasses for plantings.

Small trees/shrubs	Grasses
Silky Dogwood	Switchgrass
Red Osier Dogwood	Little Blue Stem
Arrowwood Viburnum	

The designs enhance popular site use by incorporating an over-land Americans with Disabilities Act (ADA) compliant fishing platform. The intent is that the platform will direct foot traffic away from sensitive shoreline plants and prevent shoreline vegetation from being trampled.

Figure 4. Visualization of rock armoring around poplars at the north of site. The rocks will be added to stabilize tree clusters and preserve habitat value generated by the trees. Created by BlueShore Engineering.

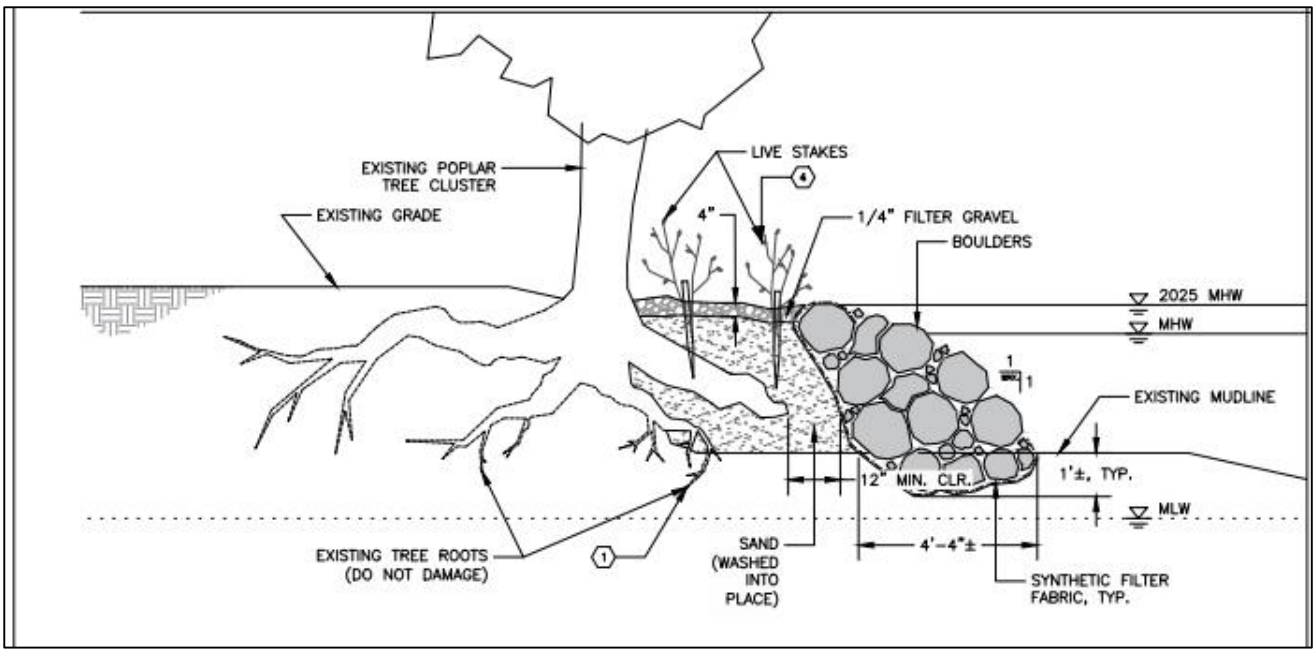

Figure 5. Design for stabilization of undermined poplar tree clusters at southwestern corner of site. The addition of fill and boulders up to the predicted 2025 MHW level will help mitigate erosion and protect existing poplars from further degradation for years to come. The planting of live stakes, using native species such as silky dogwood, red osier dogwood, and arrowwood viburnum, will help stabilize the soil and enhance the surrounding habitat. Credit: BlueShore Engineering.

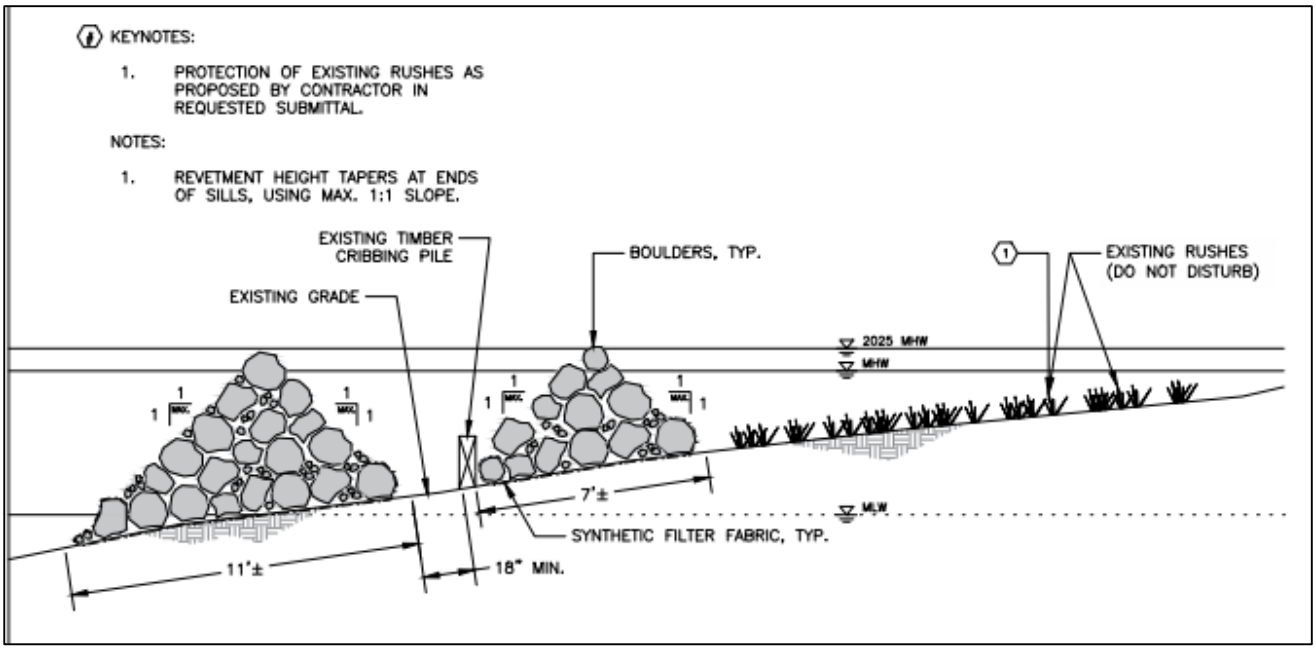

Figure 6. Design for the protection of existing rushes at the north of site. The addition of submerged stone sills up to the predicted 2025 MHW level will safeguard existing rushes from the full effects of wave action. Credit: BlueShore Engineering.

IMPLEMENTATION

Construction is planned to begin in the Spring of 2019. Park users will enjoy improved access for fishing, bird watching and other recreational activities. The habitat value of the site for fish and wildlife will be improved or maintained while stabilizing the riverbank.

LESSONS LEARNED

- Permits were required by both the NYSDEC and the Army Corps of Engineers
- Considering all the alternatives from doing nothing to planning for extreme sea-level rise was instructive in making the final design decision.

Photos, drawings, and information in this case study courtesy of New York State Department of Environmental Conservation, BlueShore Engineering & Creative Habitat Corp.