



PROJECT OVERVIEW

March 2015

This overview describes project context and products completed over almost six years of funding from CICEET, the NERRS Science Collaborative, and other sources.

Vision: Decision makers possess and apply the best available information on shoreline management practices as they seek to protect for future generations the shore zone's wildlife habitat, ecological benefits, outdoor recreation, community quality of life, and water-dependent businesses.

I. INTRODUCTION

The Problem

Hudson River shorelines are being actively modified to support development, revitalize waterfronts, control erosion, and increase public access. These modifications can significantly affect how shorelines perform as habitats for fish and wildlife. However, regulators and other decision makers have lacked regionally specific information about ecological, economic, and engineering tradeoffs among shoreline treatments, and about options for enhancing shoreline habitat values.

Purpose

The purpose of the Hudson River Sustainable Shorelines Project is to provide science-based information about the best shoreline management options for preserving important natural functions of the Hudson River Estuary's shore zone, especially as sea level rise accelerates and storms increase in intensity. The project is generating new information about engineering performance, economic costs, projected river conditions, legal and regulatory opportunities, and the needs and priorities of key audiences.

Outcomes / Our Contribution

We seek to produce the best possible information to answer questions that decision-makers and advocates have about shorelines, from ecological, engineering, economic, social, legal, and other perspectives. We are collaborating with decision makers and advocates as we gather and produce answers to these questions, and engaging them in discussions about how best to encourage "ecologically enhanced" shorelines, where appropriate.



Hudson River Valley Greenway



Benefits

As a result, communities and regulators will be able to fully consider the benefits, trade-offs, and consequences of particular decisions as shorelines are modified to adapt to climate change, protect infrastructure, revitalize waterfronts, and support multiple human uses of the river. Project findings will be used to make decisions about private and community waterfronts, regulatory and land use policies, shoreline development, and long-term plans to allow vital near-shore natural areas to exist in the future.

Key User Groups

Regulators, policy makers, experts and consultants, advocates, and municipal officials

II. KEY QUESTIONS WE SEEK TO ANSWER

How do we produce the best possible information? The best information answers questions that decision-makers and advocates have about shorelines, from ecological, engineering, economic, social, legal, and other perspectives. Specifically, we need to answer:

- a) *What should I know about the condition of the Hudson River today and in the future that affects the use and treatment of the shorelines?*
 - 1) What are the current and projected future physical conditions in the estuary?
 - 2) What are the ecological conditions of Hudson River estuary shorelines? How do shoreline characteristics impact ecology?
 - 3) What are the benefits of shorelines to people? How might we value these services?
 - 4) What is the distribution of shoreline types? Where can we enhance ecology of the shore zones?

- b) *What are the shoreline options, and for each one:*
 - 1) How much does it cost?
 - 2) How long might it last? Under what conditions does it work best?
 - 3) Is there evidence it works in the Hudson River estuary?
 - 4) What ecological benefits does it provide?
 - 5) Is it likely to be approved by local and state regulators?
 - 6) Is there technical capacity to construct it?
 - 7) How does it perform during storms?

- c) *What are the best opportunities for advancing ecologically enhanced shorelines?*
 - 1) How do shoreline treatment decisions get made today, and by whom?
 - 2) What legal and regulatory opportunities exist for changing management practices?
 - 3) Which geographic areas should be targeted for ecological enhancement?
 - 4) Are there tools we can develop to support decision-making?
 - 5) How do we most effectively engage our intended users with the project?

III. ANSWERING THE QUESTIONS: CURRENT PROJECTS & PRODUCTS

<i>A. What should I know about the condition of the Hudson River today and in the future?</i>			
Question	Project Lead and Project Name	Final Product(s)	Deadline: Current Status
What are the current and projected future physical conditions in the Hudson River estuary?	Stevens Institute - Physical forces engineering research, NYHOPS model	Geospatial data; brief findings report on wind-driven waves, wakes, ice, & currents	2013: Geospatial data available on NYS GIS Clearinghouse; 2015: Summary report in development
	Jery Stedinger -Storm surge modeling	Model and presentation slides	Completed 2010
	ClimAID (NYSERDA; separate project)	Final report with sea level rise projections	Completed 2011 and updated in 2014
What are the ecological conditions of Hudson River estuary shorelines? How do shoreline characteristics impact ecology?	Cary Institute - Literature review of shoreline ecology	Peer reviewed article	Completed 2010
	Cary Institute - Comparison of shoreline ecology	Peer reviewed article; brochure; (overview of issues to consider in permitting may be done in the future)	Completed 2011
	Cary Institute - Engineered shoreline ecology	Rapid assessment protocol	Completed 2013
		Engineered shoreline characteristics research; guidance for experts & regulators	2014 and 2015: Journal articles in review or published; Ongoing work on guidance
What are the benefits of shorelines to people? How might we value these services?	David VanLuven - Ecosystem services scoping	Final scoping document	Completed 2011
What is the distribution of shoreline types?	Hudson River NERR - Shorelines Inventory	Geographic information system (GIS) layer	2006: Inventory Tappan Zee to Troy completed
		Geospatial analysis	2011-12: feasibility test

B. What are the shoreline options, and for each one:

Question	Project Lead and project name	Final Product(s)	Deadline/ Current Status
How much does it cost?	Stevens Institute: Construction and operating costs	Literature Review	Completed 2012
	David VanLuven: Scoping of ecosystem services analysis	White paper	Completed 2011 ¹
How long might it last? Under what conditions does it work best?	Stevens Institute: Engineering Research	Literature Review	Completed 2012
Is there evidence it works in the Hudson River estuary?	HRNERR: Demonstration Sites	Demonstration sites and data collection	2012: 1 site built; 2013: Case studies written; 2014-15: 3 sites in progress and monitoring plan protocol developed
What ecological benefits does it provide?	Cary Institute: Ecological studies	See previous page	Ongoing
Is it likely to be approved by local and state regulators?	Coordinating Team: Focus groups with regulators	Focus group summaries	Ongoing
Is there technical capacity to construct it? (Are there local engineers, consultants, and contractors comfortable with this approach in the area?)	Shawn Dalton (Thrive Consulting) interviews with experts and consultants; Advisory committee member input	Final Dalton report; lessons learned summaries	2012: Dalton work completed Advisory input is ongoing
How does it perform during storms? (Forensic Analysis)	Stevens Institute	Case studies, cumulative report, and methodology	2015: Available soon

¹ Decision in September 2011 not to pursue ecosystem service valuation further under this funding source.

C. What are the best opportunities for advancing ecologically enhanced shorelines?

Question	Project	Final Product(s)	Deadline: Current Status
How do shoreline treatment decisions get made today, and by whom?	Consensus Building Institute: Case Studies of municipal shoreline projects	Summary report	Completed 2011
	Thrive Consulting: Interviews with experts and consultants	Summary report	Completed 2011
	Coordinating Team: Focus groups & Advisory Team	Focus group and team meeting summaries	2015: Ongoing (CBI conducting interviews with regulators)
What legal and regulatory opportunities exist for changing management practices?	Pace University: Legal and Regulatory Framework	Report	Completed 2011
Which geographic areas should be targeted for ecological enhancement?	Cary Institute: Test of feasibility of spatial analysis.	Maps & recommendations for internal use	2012: Completed
Are there tools we can develop to support decision-making?	Zack Steele and Decision Support Tools (DST) work group: DST planning	Recommendations, table of DST alternatives	2013: completed
Decision support	Dave Strayer, Cary Institute	Expert systems key and supporting fact sheets on questions to ask when choosing shoreline infrastructure.	Funded by Hudson River Foundation, in progress
How do we most effectively engage our intended users with the project?	Coordinating Team: Focus groups & Advisory Committee, Forensic Panel	Focus group and team meeting summaries; formal evaluation techniques	2015: Ongoing (HRNERR conducting follow-up survey with 2014 workshop participants)

IV. PROJECT BACKGROUND & PARTICIPANTS

Local Conditions

The Hudson River Estuary flows 152 miles through open, rural landscapes and river towns to the urban boroughs of New York City. Connected to the Atlantic Ocean, the Estuary has tides that reach the Troy Dam. This project is currently focused on the 127 miles from the Troy Dam south to the Tappan Zee Bridge. Shorelines are regularly subjected to tidal and river currents, wind-driven waves, ice scour, and the wakes of recreational boats and large commercial vessels that navigate the river channel. Storms bring flooding and storm surge. To combat erosion and accommodate working waterfronts, roughly 41 percent of the water's edge in the project area has been reinforced with riprap revetment, bulkhead, or cribbing. Land use decisions about shoreline treatments are made within a complex legal and regulatory framework. About 1.3 million people live along this part of the Hudson in 79 municipalities, each with its own set of land use ordinances and a tradition of home rule.

Project History

Between 2005 and 2007, the Hudson River National Estuarine Research Reserve characterized the Hudson River Estuary's shorelines and developed guidance about shoreline management. The Reserve inventoried shoreline types on 85% of the estuary; underwrote a study of "soft" engineered shoreline stabilization alternatives; surveyed engineer, regulator, and manager needs and knowledge about shoreline management; and held a workshop on shoreline softening alternatives.

In 2008, the Reserve and partners, with funding from NOAA through the Cooperative Institute for Coastal and Estuarine Environmental Technologies (CICEET), launched the Sustainable Shorelines Project to identify the ecological, engineering, and economic tradeoffs among different shoreline treatments, and to communicate this work effectively to decision makers. In 2010, the Reserve and partners received additional NOAA funding from the NERRS Science Collaborative (NSC) to conduct an in-depth study of the ecology of engineered shorelines, characterize physical forces affecting Hudson River shorelines, construct a shoreline demonstration project, and develop tools and guidance for decision-makers. A third phase of the project began in 2013, with the objective of conducting a forensic assessment of shoreline protection techniques by characterizing the impacts of storms on different shoreline sites. Additional research and projects were funded by other sources.

Project phases:

1. Mitigating Shoreline Erosion along the Hudson River Estuary's Sheltered Coasts (Aug. 2008 - July 2012; CICEET)
2. Promoting Resilient Shorelines in an Era of Rapid Climate Change (Oct. 2010 - June 2015; NSC)
3. Assessing Resilient Shoreline Treatments along New York's Hudson River (Sept. 2013 - June 2015; NSC)

The need for this project has been recognized in two regional action plans² that call for New York State agencies to consider sea level rise in policies related to shoreline management and coastal land use, and to provide the technical guidance needed to implement these changes.

Coordinating Team: The coordinating team* includes natural and social scientists, engineers, natural resource managers, communication specialists, and consensus building experts. Additional experts were contracted to provide specific studies+ or provided early or concurrent essential studies.

NYS DEC Hudson River NERR *	Thrive Consulting +
NYS DEC Hudson River Estuary Program *	Pace University Land Use Law Center +
Cary Institute of Ecosystem Studies * +	New York Sea Grant +
Stevens Institute of Technology *	Cornell University +
Consensus Building Institute *	The Nature Conservancy +
Hudson River Valley Greenway + (fiscal agent)	VanLuven Environmental+
NYSERDA +	

Advisory Committee: To identify the highest priority information needs, most useful products, and best communication modes, we engage key shoreline decision-makers. State, federal and local government officials, shoreline engineers and consultants, shoreline land owners, policymakers, regulators, and others shape and guide the project by participating in advisory committees, focus groups, expert panels, surveys, and case studies. State agencies include NYS DOS Coastal Management Program, NYS Office of Climate Change, NYSERDA, NYS Parks, and NYS Department of Environmental Conservation.

V. PROJECTS & PRODUCTS

The Sustainable Shorelines Project has five overarching objectives:

- A. Characterize present and future estuary and shoreline conditions
- B. Determine ecological, engineering, and economic trade-offs of shoreline management options
- C. Characterize shoreline decision-making arenas and opportunities
- D. Demonstrate innovative shorelines and best management practices
- E. Create shoreline decision tools and communicate results

Under each major topic heading below is a list of projects supporting these objectives. A few of these are noted to be independent of this initiative but have been included because they have been essential to advancing the shorelines initiative. Also, some of the studies were supported in part or

² NYS Sea Level Rise Task Force Final Report (2010), http://www.dec.ny.gov/docs/administration_pdf/slrtrfinalrep.pdf, and Rising Waters: Helping Hudson River Communities Adapt to Climate Change, Final Report (2009), <http://www.largelandscapenetwork.org/wp-content/uploads/2014/02/rising-waters-helping-hudson-river-communities-adapt-to-climate-change1.pdf>

entirely by funding from other sources, and these are noted. Full citations and links, if available, can be found in the footnotes.

A. Characterize Present and Future Estuary and Shoreline Conditions

The Hudson River Estuary and its shorelines are affected by a complex array of tides, currents, waves, weather patterns, storm surges, and climate trends. In order to make good decisions about shorelines, we need to better understand these forces today and how they might change in the future. The following projects and studies were designed to characterize present and projected estuary and shoreline conditions.

1. Hudson River Estuary Shoreline Classification

Miller and Bowser completed an inventory of shoreline types along the Hudson River from the Tappan Zee Bridge to Troy. This inventory is a tool to calculate shoreline extent and distribution at three levels of classification: nature (hard, soft or natural), habitat structure, and substrate or material. It also provides a baseline of summer/fall 2005 shoreline conditions. These data are available through the NYS GIS Clearinghouse.³

2. Sea Level Rise and Other Climate Projections

This project originally included funding to advance our understanding of likely patterns of sea level rise and flooding along the estuary. Fortuitously, the New York State Energy Research Development Authority (NYSERDA) underwrote the development of a set of climate projections by Columbia University, Cornell University, and Hunter College⁴, which were adopted by the New York State Sea Level Rise Task Force⁵ and the New York State Climate Action Council. These projections are a fundamental underpinning of the project and provide information about future conditions that will influence the ecosystem and man-made shoreline structures.

3. Scenarios

Scenarios are constructions of plausible sets of future conditions that can guide thinking about both performance and possible consequences under future conditions, in this case of different shoreline treatments. A diverse group of stakeholders came together over many months from 2008 to 2009 in The Nature Conservancy-led *Rising Waters Project*, to identify four possible future scenarios.⁶ Although these scenarios are not being used in this project at present, *Rising Waters* advanced thinking and community awareness about climate-related challenges and adaptation needs in the Hudson Valley.

³ NYS GIS Clearinghouse. <http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1136>

⁴ ClimAID. Integrated Assessment for Effective Climate Change Strategies in New York State (2011), <http://nyserda.ny.gov/Publications/Research-and-Development/Environmental/EMEP-Publications/Response-to-Climate-Change-in-New-York.aspx>

⁵ NYS Sea Level Rise Task Force Final Report (2010), http://www.dec.ny.gov/docs/administration_pdf/slrtrfinalrep.pdf

⁶ Rising Waters: Helping Hudson River Communities Adapt to Climate Change, Final Report (2009). <http://www.largelandscapenetwork.org/wp-content/uploads/2014/02/rising-waters-helping-hudson-river-communities-adapt-to-climate-change1.pdf>

4. Storm Surge

The Hudson River experiences storm surges from the ocean; these low pressure-driven waves move 150 miles up the Hudson River to the head of tide at Troy. A Cornell University project, led by Jerry Stedinger and completed in 2010, created a one-dimensional model of storm surge in the estuary under present conditions. Model results confirmed that storm surge can move all the way to Troy.

5. Physical Forces on Shorelines

The Hudson's shorelines are subject to a wide variety of complex and interacting physical stresses including currents, wind-driven waves, ice, ship wakes, and storm surge. These had not previously been systematically measured or characterized throughout the Hudson. Stevens Institute has worked to advance our understanding of these forces through a combination of historic studies, direct measurements, and modeling of current and wind-wave energy by extending its NYHOPS model⁷ to Troy. This work expands our understanding of present conditions that shoreline stabilization techniques will need to withstand. Physical forces data and ice climatology have been available through the NYS GIS Clearinghouse since 2013.⁸ A report on the methodology is pending.

6. Forensic Analysis

For the third phase of the project, beginning in 2014, a team led by the Stevens Institute of Technology has conducted an assessment of shoreline stabilization techniques in the wake of three historic storms including superstorm Sandy. The team collaborated with a technical advisory panel to study why some stabilization treatments along the Hudson River Estuary were badly damaged during these storms, while others performed well. This forensic engineering analysis determines the critical factors that contributed to each treatment's performance in extreme weather events. Individual case studies and the methodology report are in review. A project summary is available here: <https://www.hrner.org/doc/?doc=240203442>

B. Determine Ecological, Engineering, and Economic Trade-offs of Shoreline Management Options

1. Ecological Trade-offs

Shore zones are vital habitat for multiple life stages of many fish, birds, reptiles, amphibians, and invertebrates. Different shore zones provide different kinds and levels of habitat, and when aggregated, can significantly influence life in the Hudson River ecosystem. This part of the project is generating information from the literature and from field studies to identify shoreline types and features that are best to support life in the Hudson River, as well as those that reduce near-shore life.

- **Literature Review:** Dave Strayer and Stuart Findlay produced a comprehensive summary of published literature on the ecology of shore zones. This work was funded by a NOAA grant for Hudson River NERR operations and completed in 2011.⁹

⁷ New York Harbor Observation and Prediction System (NYHOPS v3, Georgas et al. 2009, www.stevens.edu/maritimeforecast). Georgas, N., Blumberg, A.F., Bruno, M.S., and Runnels, D.S., 2009.

⁸ NYS Clearinghouse, <http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1136>

⁹ Strayer, D.L. and S.E.G. Findlay. 2010. The ecology of freshwater shore zones. *Aquatic Sciences* 72: 127-163. <http://springerlink.com/content/147526m7134jnt48/fulltext.pdf>

- ***Shore Zone Management Principles:*** An attractive brochure, developed in 2011, describes guidelines for managing the shore zone.¹⁰
- ***Comparison of ecology of natural and engineered shorelines:*** In work underwritten by the Hudson River Foundation, Cary IES scientists and the Hudson River Estuary Program restoration ecologist completed a field comparison of three natural and three engineered shorelines in 2012.¹¹
- ***Related Shorelines Research:*** Other investigators have conducted research on wrack and shore roughness through research fellowships and master's theses under project partners.¹²
- ***In-Depth Study of Ecology of Engineered Shorelines:*** Beginning in 2011, with NERRS Science Collaborative funding, Cary IES led an in-depth study of the ecology of engineered shorelines. Two manuscripts have recently been submitted for publication, describing results of research about a) the effects of shore type and physical complexity on fishes living along built shorelines in the Hudson River¹³ and b) vegetation of riprapped revetments along the freshwater tidal Hudson River.¹⁴ A third study on small-scale manipulations to improve ecological function of built shorelines was hampered by a lack of wrack during the study period due to a severe decline in submerged aquatic vegetation.

2. Engineering Trade-offs

A variety of shoreline stabilization techniques exists on the Hudson, from highly engineered to natural. Under this project, literature reviews and studies have advanced our understanding of the alternatives for shoreline management, given the physical conditions along the Hudson River.

- ***Soft Shoreline Alternative Analysis:*** In 2006, two consulting firms prepared an initial Hudson River Estuary-specific guidance document about alternatives for developing soft or vegetated shorelines. This work, commissioned by the Hudson River NERR and funded by a NOAA grant to NYS DEC, was the basis for a training workshop on soft shore alternatives.¹⁵

¹⁰ Managing Shore Zones for Ecological Benefits. 2011. Published by the Hudson River Sustainable Shorelines Project, Staatsburg, NY 12580. <http://www.largelandscapenetwork.org/wp-content/uploads/2014/02/rising-waters-helping-hudson-river-communities-adapt-to-climate-change1.pdf>

¹¹ Strayer, D.L., S.E.G. Findlay, D. Miller, H.M. Malcolm, D.T. Fischer, and T. Coote. 2012. Biodiversity in Hudson River shore zones: influence of shoreline type and physical structure. *Aquatic Sciences* 74: 597-610. <http://link.springer.com/article/10.1007%2Fs00027-012-0252-9>

¹² Harris, C., Strayer, D.L., and Findlay, S. 2014. The ecology of freshwater wrack along natural and engineered Hudson River shorelines. *Hydrobiologia*, 722(1), 233-246. <http://link.springer.com/article/10.1007/s10750-013-1706-3> and Villamagna, A., Strayer, D., and Findlay, S. 2009. Effects of surface roughness on ecological function: Implications for engineered structures in the Hudson River shore zone. Section III: 25pp. In Fernald, S.H., Yozzo, D., and Andreyko, H. (eds). Final Reports of the Tibor T. Polgar Fellowship Program, 2008. Hudson River Foundation. http://www.hudsonriver.org/ls/reports/Polgar_Villamagna_TP_08_08_final.pdf

¹³ Strayer, D.L., D. Miller, D., and S.E.G. Findlay. (Submitted for publication 2015). Effects of shore type and physical complexity on fishes living along built shorelines in the Hudson River, New York.

¹⁴ Strayer, D.L., E. Kiviat, S.E.G. Findlay, and N. Slowik. (Submitted for publication 2015). Vegetation of riprapped revetments along the freshwater tidal Hudson River, New York.

¹⁵ Allen, G., T. Cook, and J. Young. 2006. Hudson River Shoreline Restoration Alternatives Analysis. Report prepared for NYS DEC and NEIWPC by Alden Research Laboratories, Inc. and ASA Analysis and

- **Literature Review:** In 2012, Jon Miller and Andrew Rella of the Stevens Institute of Technology produced a comprehensive summary of published literature on engineering approaches for limiting erosion along any sheltered shoreline, like those found along the Hudson River Estuary. This work was funded by CICEET. The approaches are categorized by their degree of “softness,” their costs, and their adaptability to sea level rise.¹⁶

3. Economic Trade-offs Among Shoreline Options

The costs of managing shorelines can range in construction and long-term operation and maintenance. Different shoreline treatments are associated with different thresholds of risk, and some are more easily adapted over time to sea level rise and other changing physical conditions, with implications for long-term cost. The natural services associated with different shorelines also have values that are part of the equation. Both policymakers and individual shoreline owners and managers must weigh this complex set of factors in the context of other factors, such as regulations and incentives, to select shoreline treatments. This part of the project seeks to better understand the costs involved with different shoreline stabilization techniques and provide useful information for comparing options.

- **Alternative Approaches for Assessing Shoreline Ecosystem Services:** David VanLuven developed a white paper¹⁷ in 2011 with recommendations for valuing the ecosystem services of different shoreline treatments. We decided not to pursue these analyses further due to funding constraints and limited audience interest in this information.
- **Comparative Cost Analysis:** In 2012, Rella and Miller from the Stevens Institute conducted a cost analysis of ten shoreline protection techniques at three sites under two sea level rise scenarios. They incorporated construction, maintenance, and replacement costs and concluded that ecologically enhanced shoreline techniques can be cost competitive with harder approaches.¹⁸

C. Characterize Shoreline Decision-Making Arenas and Opportunities

Understanding the legal and decision-making arenas framing shoreline decisions is necessary to influence decision making. Under this objective, we seek to learn more about who is making shoreline decisions along the Hudson and how they are making them, and to identify opportunities for influencing these decisions.

Communications, Inc. <https://www.hrnerr.org/doc/?doc=240203596>

¹⁶ Rella, A., and Miller, J. 2012. Engineered Approaches for Limiting Erosion along Sheltered Shorelines. *In association with and published by Stevens Institute for the Hudson River Sustainable Shorelines Project, Staatsburg, NY 12580.* <https://www.hrnerr.org/doc/?doc=240189605>

¹⁷ VanLuven, D. 2011. Economic Tradeoffs between Shoreline Treatments: Phase 1 – Assessing Approaches. *In association with and published by the Hudson River Sustainable Shorelines Project, Staatsburg, NY 12580.* <https://www.hrnerr.org/doc/?doc=240189637>

¹⁸ Rella, A., and Miller, J. 2012. A Comparative Cost Analysis of Ten Shore Protection Approaches at Three Sites Under Two Sea Level Rise Scenarios. *In association with and published by the Hudson River Sustainable Shorelines Project.* <https://www.hrnerr.org/doc/?doc=240186100>

1. Legal and Regulatory Overview

The Land Use Law Center at Pace University Law School summarized the legal and regulatory framework within which shoreline decisions are made. Their 2011 report identifies local land use tools and local, state, and federal regulations that shape site-based decisions, as well as programmatic and legal opportunities for promoting ecologically enhanced shorelines.¹⁹

2. Analysis of Engineers and Other Experts

In 2010 and 2011, Shawn Dalton of Thrive Consulting surveyed technical experts and consultants who give shoreline management advice to determine how climate change and sea level rise are currently viewed and incorporated into shoreline planning along the Hudson. She documented barriers to the adoption of ecologically enhanced shoreline engineering techniques and identified training needs.²⁰ Dalton also wrote a summary of lessons learned and recommendations based on this work.²¹

3. Shoreline Case Studies

The Consensus Building Institute analyzed five case studies of recent Hudson River shoreline projects to understand why key decisions were made and what influenced decision makers to select particular shoreline types. The 2011 one-pager includes lessons learned and recommendations to be shared with the project team, others interested in Hudson River shoreline decision making, and similar groups around the country.²²

4. Focus Groups

A series of focus group meetings were held early in the project with regulators (two meetings) and municipal officials (one meeting) to explore their state of knowledge about shoreline management options and issues and to identify their needs and desires for additional information. These focus group results have shaped research directions, outreach products, and funding requests. In addition, interviews and surveys provided information from other stakeholders:

- In 2012, Thrive Consulting administered a survey of Hudson River shoreline users to better understand their perceptions and values of the shore zone. Participants included anglers and kayakers, and findings suggested a wide range of aesthetic preferences among shoreline users. This report is useful for getting a sense of this group's perceptions and preferences.²³

¹⁹ Pace University Law School, Land Use Law Center. 2011. Sustainable Shorelines Project Legal Framework: A Survey of Shoreline Governance and Legal Opportunities, Final Report prepared for NYS DEC and Hudson River Greenway. <https://www.hrnerr.org/doc/?doc=240189622>

²⁰ Dalton, S. 2011. Hudson River Sustainable Shorelines Project Report: Decision Making Regarding Shoreline Design and Management. In association with and published by the Hudson River Sustainable Shorelines Project. <https://www.hrnerr.org/doc/?doc=240186112>

²¹ Dalton, S. 2011. Lessons Learned: Decision Making Regarding Shoreline Design and Management. Published by the Hudson River Sustainable Shorelines Project. <https://www.hrnerr.org/doc/?doc=240189656>

²² Ferguson, O. 2011. Five Case Studies of Recent Shoreline Development Projects. Published by the Hudson River Sustainable Shorelines Project. <https://www.hrnerr.org/doc/?doc=240186108>

²³ Dalton, S. 2012. Shoreline Use and Perception Survey Report. In association with and published by the Hudson River Sustainable Shorelines Project. <https://www.hrnerr.org/doc/?doc=240189572>

- Pending work: 1) The Consensus Building Institute is currently conducting interviews with regulators, and 2) HRNERR is administering a follow-up survey of the July 2014 workshop participants to learn more about the longer-term impacts and effectiveness of the event.

D. Demonstrate Innovative Shorelines and Best Management Practices

The project received funding from the NERRS Science Collaborative to develop its first demonstration site at Cossackie for innovative shoreline practices. In order to expand the number of demonstration sites of sustainable shoreline techniques, the Hudson River Estuary Program funded designs at State Parks Dockside and Nyack, completed in 2014. A bulkhead enhancement project will be installed at Rhinecliff in spring 2015. We continue to seek out others' work that uses sustainable shorelines principles. The Hudson River NERR has developed case study reports for seven sites along the Hudson River with different stabilization techniques, site characteristics, intended uses, and physical forces acting on the site. The case studies provide information about planning, implementation, costs, and lessons learned.²⁴ Some of the demonstration sites have also been assessed in the forensic analysis study, which evaluates the performance of alternative shoreline stabilization methods during storms.²⁵

E. Create Shoreline Decision Tools and Communicate Results

1. Outreach & Engagement Plan

In winter 2009-2010, a small team of outreach specialists (from the Hudson River Estuary Program, New York Sea Grant, Thrive Consulting, Sustainable Hudson Valley, and the Hudson River NERR) developed an outreach and engagement plan for the project coordinating team. This document recommended steps for letting stakeholders know about the Sustainable Shorelines project, getting broad guidance and input during the project, and sharing results. The effort resulted in a working document, a one-page project flyer, and a project presentation.²⁶ The project website serves as a repository for project products (<https://www.hrnerr.org/hudson-river-sustainable-shorelines/>).

2. Project Findings Documents

Based on the stated preferences of our target audiences, project leaders are creating a series of products ranging from brief summaries to published papers, as noted in each sub-project description. These are helpful when making decisions on shoreline management.

3. Training Efforts

A workshop was held in July 2014 to bring together a variety of stakeholders (engineers, landscape architects, permit officials, and ecologists) to learn about the resources and tools produced by the project and how to apply them to shoreline management decisions. Participants learned about

²⁴ Information about the demonstration site network (including case studies) is available here: <https://www.hrnerr.org/hudson-river-sustainable-shorelines/demonstration-site-network/>

²⁵ Information about the forensic analysis study is available here: <https://www.hrnerr.org/hudson-river-sustainable-shorelines/shorelines-engineering/>

²⁶ Dalton, S, M. Everett, N. Holochuck, and E. Hauser. 2010. A Decision-Support Tool for Developing an Outreach and Communication Strategy for the Hudson River Sustainable Shorelines Project. Draft internal report prepared for NYS DEC and Hudson River Greenway.

useful resources and built relationships across sectors. A follow-up survey is underway to gather longer-term feedback about the effectiveness of this workshop. Presentations from the workshop are available here: <https://www.hrnerr.org/hudson-river-sustainable-shorelines/publications-resources/applying-findings-hudson-river-sustainable-shorelines-project/>. In addition to this workshop, we have given talks at a variety of venues and webinars. Some related resources include:

- Regional (NY-NJ-DE) Dialogue to Advance Sustainable Shorelines along Sheltered Coasts: This event included a workshop in New Jersey in October 2013 and a follow-up webinar with federal collaborators in February 2014. Workshop materials and presentations are available here: <https://www.hrnerr.org/estuary-training/trainingtopic/regional-dialogue-nynjde/>
- NOAA NERRS Living Shorelines Webinar Series from 2013 and 2014: Webinars are available at <https://www.hrnerr.org/estuary-training/trainingtopic/noaanerrslivingshorelineswebinarseries/>

VI. Conclusion

Since 2008 (and building on earlier work), the Hudson River Sustainable Shorelines Project has used a collaborative approach to develop useful scientific information and tools to inform decision-making about shoreline stabilization along the Hudson River. Through the collaborative approach, trainings, and other outreach efforts, the project aims to connect decision makers to the project resources and partners to promote more sustainable shoreline management decisions and maintain the many functions and values of Hudson River shore zones.

For more information contact Principal Investigator:

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