

LIVING SHORELINES

FROM BARRIERS TO OPPORTUNITIES

NOVEMBER 3, 2014



**RESTORE
AMERICA'S
ESTUARIES**

LIVING SHORELINES

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I. EXECUTIVE SUMMARY

Wise shoreline management is critical both to protecting property interests and protecting the ecosystems that shorelines impact. In the face of mounting evidence that hardened shoreline management techniques do not function well over time in many settings and that they do real and widespread harm to the affected ecosystems, why is there not broad use of living shorelines, which are not only protective of ecosystem services but also perform better over time in controlling erosion and preventing catastrophic flood damages?

At the request of the National Oceanic and Atmospheric Administration, Restore America's Estuaries empaneled a Committee to investigate what institutional obstacles are hindering the broader use of living shorelines. Recognizing the divergent views on what a living shoreline is, the Committee first agreed that, for the purposes of this Report, living shorelines are defined as:

A living shoreline is any erosion control management system that does not introduce a fixed interruption of a natural water/land continuum and that is designed to protect or restore natural shoreline ecosystem services; it includes natural elements and may incorporate manmade elements.

After consulting a variety of experts and practitioners experienced in shoreline management issues, the Committee concluded that there are four major Obstacles to broader use of living shorelines:

- Institutional Inertia
 - Familiarity with traditional methods and lack of information about both the shortcomings of those methods and the relative advantages of living shorelines has locked the major shoreline management decision-makers into a business-as-usual routine and impeded needed change in the regulatory system.
- Lack of a Broader Planning Context
 - Site-specific decision-making without consideration of system-wide impacts/benefits understates the negative cumulative effects of hardening, overlooks many of the greatest values of living shorelines (including mitigation of habitat loss), and imposes the entire shoreline management cost on the shoreline owner rather than spreading it across all of the constituencies benefited by a living shoreline installation.
- Shoreline Variability
 - Because of shoreline variability, implementing living shorelines that appropriately account for all the extant conditions and forces requires individualized analysis and planning rather than routinized solutions.
- Lack of an Advocate
 - The various constituencies benefited in different ways by living shorelines do not recognize their common interest and hence have not combined into an effective advocacy force.

To address these Obstacles, the Committee recommends four broad Strategies:

Strategy 1: Education and Outreach

The first step necessary to effecting all of the other Strategies recommended in this Report is the development of a broad and common understanding of the efficacy, impacts, and

benefits of living shorelines as well as hardened structures. Collecting reliable information, making it generally available, and providing education and training to the various constituencies affected by shoreline management decisions is necessary to overcoming each of the identified Obstacles and promoting the wider use of living shorelines. To accomplish these goals, the Committee recommends:

- Establishment of a centralized, reliable database regarding the science, design, construction, efficacy, and impact of shoreline management systems
- Development of a manual of living shoreline best practices and a directory of competent professionals knowledgeable in those practices
- Establishment of a coordinated vehicle for promulgating living shoreline education for the various affected constituencies

Strategy 2: Regulatory Reform

Regulatory reform, particularly at the federal level, is necessary to assure that all shoreline management permits are equally subject to application and review criteria consistent with the current scientific knowledge about the impacts of these systems. The new permitting program should coordinate federal, state, and local regulations, should evaluate project impacts beyond the project site (*i.e.*, system-wide), and should include living shoreline incentives reflective of the system-wide values created. To accomplish these goals, the Committee recommends:

- Establishment by regulation of living shorelines as the preferred alternative shoreline management system, absent a showing that it is impracticable or ineffective at a specific site
- Re-evaluation of NWP 13 at the appropriate time and incorporation of a more hierarchical approach to evaluation of all bank stabilization projects
- Establishment of a unified permitting system (federal, state, and local) for shoreline management systems
- Establishment of estuary-wide plans for permitting of shoreline management systems
- Evaluation by state and local agencies of the advisability of limiting the availability of NWP 13 based on local impacts
- Provision of regulatory incentives for living shorelines and dis-incentives for hardened structures as part of the permitting structure

Strategy 3: Increase Institutional Capacity

To successfully implement comprehensive regulatory reform and wider use of living shorelines, the capacity of the major constituencies must be improved and expanded. The current availability of designers, constructors, and regulators sufficiently knowledgeable of living

shoreline techniques is not adequate and must be increased, primarily through specialized training. To accomplish these goals, the Committee recommends:

- Providing specialized education to increase capacity for both private and public sector constituencies
- Development of certification requirements and training for Living Shoreline Professionals
- Targeting the use of NGO and other volunteer organizations in the installation of living shoreline projects
- Development of specialization plans for regulatory permitting staff
- Regulatory agencies providing encouragement for and cooperation with the promotion of living shoreline expertise in the private sector constituencies
- Giving high priority in public and private funding of living shoreline initiatives to proposals that increase institutional capacity

Strategy 4: Public Agencies as Role Models

Public lands at all level of government are ideal candidates for living shoreline demonstration projects which would raise awareness and acceptance of these techniques. Agency leadership would also be valuable in broadening planning perspectives and working across jurisdictions to collaboratively achieve meaningful regulatory reform. To accomplish these goals, the Committee recommends:

- Use of public lands for living shoreline demonstration projects
- Promotion of the use of living shoreline methods by government agencies through public education and support of regulatory reform

Successfully pursuing these Strategies will require a vigorous dedication to substantively reforming how we are managing our shorelines. Dedication alone will not be enough. Leadership and coordination of efforts will be necessary lest the energy necessary to effect change is dissipated. In the Committee's opinion, significant leadership can be provided at this stage by the NGO community working together in a focused way to advance these Strategies. RAE is well positioned to provide leadership on the education front through the inauguration of the Living Shorelines Academy. SERPPAS, GSAA, GOMA and others are well situated to advance the Strategy of public agencies acting as role models. All NGOs involved with shoreline issues can provide leadership in helping develop and seeking funding for targeted projects that increase capacity as well as broaden public knowledge of living shoreline benefits. All living shoreline constituencies must be involved in the effort to effect regulatory reform.

II. INTRODUCTION AND NOAA CHARGE

Erosion control, protection from storm/flood damage, and coastal climate change adaptation strategies are addressed differently on a regional basis due to the wide range of biogeophysical factors present. The use of living shorelines is one approach that can be executed very successfully at appropriate locations as a way to address erosion and flood threats, protect habitat and ecosystem services, and help adapt to the shifts brought about by climate change, especially sea level rise. The ability to actually implement this strategy locally, regionally, or nationally varies widely due a number of challenges. In particular, institutional impediments are slowing the use of living shorelines much more than science and engineering uncertainties. To date, much of the work on living shorelines has focused more on the science and evolving engineering practices, and less on what's required from a legal, policy, and administrative standpoint to get living shorelines into everyday practice.

Through funding from NOAA, Restore America's Estuaries was charged with overseeing an objective evaluation of institutional barriers to the use of living shorelines, and how they can best be overcome. This process will build upon previous efforts and recommendations, particularly those developed at the April 2013 Living Shorelines meeting at the Smithsonian Environmental Research Center, the federal Interagency Wetlands Working Group, and at the 2013 Mid-Atlantic Living Shorelines Summit.

III. COMMITTEE AND PROCESS

A. Members

RAE selected a Committee of experts in living shorelines policy and management to act as advisors and authors. A biography of each Committee member is attached as Appendix A.

Committee Members

- Todd Miller (Committee Chair)
 - Executive Director and founder, N.C. Coastal Federation
 - Chair, Albemarle-Pamlico Estuary Partnership Policy Committee
 - Board of Visitors, UNC Institute for the Environment
 - Recipient of the Environmental Law Institute's National Wetlands Community Leader
 - Recognized as a Distinguished Alumnus of UNC Chapel Hill
- Tim Dillingham
 - Executive Director, American Littoral Society
 - Advisory Committee, Barnegat Bay Partnership
 - Science and Technical Committee, Barnegat Bay Partnership
- Niki Pace
 - Senior Research Counsel for the Mississippi-Alabama Sea Grant Legal Program at The University of Mississippi School of Law
 - Instructor, Univ. of Miss. School of Law

- Tom Ries
 - Executive Vice President/Principal Scientist, Scheda Ecological Associates (Tampa Florida)
 - Over 30 years experience implementing ecological restoration projects
 - Recipient of 2013 National Wetlands Award for Conservation and Restoration (Environmental Law Institute)
- Bill Cary
 - Attorney with Brooks Pierce, Greensboro, N.C.
 - Former General Counsel of N.C. Dept. of Environ. & Nat. Res.

The Committee wishes to express its thanks for the invaluable support and assistance provided by Suzanne Giles Simon, Strategic Program Manager, and Jeff Benoit, President, Restore America's Estuaries. The Committee is also grateful for the time and wisdom contributed by Bill Ross (former Secretary, North Carolina Department of Environment and Natural Resources and Visiting Scholar, Duke University).

B. Process

The Committee exchanged their initial individual observations on the Obstacles and Opportunities for Living Shorelines in preparation for a day long retreat hosted at the NC Coastal Federation headquarters in Wrightsville Beach, NC on June 10, 2014. There, the team discussed the members' initial observations and began formulating the Obstacles and Strategies discussed in this Report. Through a series of conference calls, the Committee pursued fuller development of these Report elements, with each member taking a lead on an element and coordinating the development of input and conclusions. The team sought input from others at key stages in the process, especially by key agency representatives and other critical thinkers.

The first public draft will be presented for discussion at the RAE/TCS National Summit November 1-6, 2014. After input and comment at the Summit, the paper will be finalized and distributed electronically. In addition, RAE will produce a 1-page summary of the Report for electronic distribution and a Wikipedia page on living shorelines.

IV. BACKGROUND

A. Importance of Shoreline Ecosystems and Estuaries

Natural shorelines that surround our coastal rivers, creeks, bays and sounds are among the most productive places in the world for fish and wildlife. They are also high-priced real estate for land development. Many of these estuarine shorelines experience gradual long-term erosion as a result of everyday winds, waves, and sea level rise. These shores can also change dramatically in response to storm surges during hurricanes and other strong storms.

In addition to the economic value of waterfront property for private or commercial uses, shorelines provide a broad array of ecosystem services. Regardless of the shoreline type and setting, shoreline ecosystem services include: terrestrial and aquatic habitat for a wide variety of flora and fauna, nutrient uptake and carbon sequestration, sediment transport and stabilization,

wave attenuation, recreation, and the maintenance of biodiversity. For a detailed discussion of each of the services in each of the coastal types, see “NRC 2007 Report,” pp. 80–91.¹ To some degree, many or all of these services are impacted and potentially degraded by the introduction of a hardened shoreline stabilization technique.

One of the critical issues to consider when selecting shoreline management systems is the potential impact on the associated ecosystem services being provided in the affected area. Each time a shoreline is altered by the placement of an erosion control system, ecosystem services will be impacted, degraded, or lost. The trade-off of ecosystem services, such as marsh grass replacing a mudflat, should be considered and evaluated. In Tampa Bay, the Tampa Bay National Estuary Program has produced a number of planning studies over the years to assist in setting priorities for habitat protection and restoration that can be used in part to help evaluate ecosystem trade-offs. The most recent study is the Tampa Bay Estuary Program Habitat Master Plan Update, completed in 2010.

In addition to protecting an array of ecosystem services, natural shorelines are also significant carbon sinks, and their destruction releases significant amounts of carbon. “Recent estimates suggest that 0.15-1.02 Pg (billion tons) of carbon dioxide are being released annually due to destruction or degradation of coastal habitat (Pendleton et al.).”²

Living shorelines have the greatest potential for preventing ecosystem service degradation in estuaries and other sheltered shorelines. These ecosystems are particularly vulnerable to the effects of development and hardening. The management challenge for environmental agencies charged with protecting the health of our estuaries is to find ways to allow property owners to protect their valuable real estate while at the same time minimize long-term environmental damage to fish, wildlife, and the systems that support them.

B. Shoreline Type and Location

Selection of a shoreline management system is dependent on the type of shoreline that an owner may seek to manage. In the NRC 2007 Report, p.21, the authors grouped shoreline types into three geomorphic categories: beaches and dunes; bluffs; and mudflats and vegetated communities. In 2006, the N.C. Division of Coastal Management and a group of expert stakeholders identified eleven different types of estuarine shorelines,³ the first nine of which are for the most part subsets of the NRC Report’s third category (mudflats and vegetated communities): (1) Swamp Forest; (2) Marsh; (3) Marsh with Oysters; (4) Marsh with Mud Flats; (5) Low Sediment Bank with Marsh; (6) Low Sediment Bank with Swamp Forest; (7) Low Sediment Bank with Oysters /SAV; (8) Low Sediment Bank with Woody Debris; (9) Low

¹ National Research Council, Mitigating Shore Erosion Along Sheltered Coasts (2007) (“NRC 2007 Report”).

² Linwood Pendleton et al., Considering “Coastal Carbon” in Existing U.S. Federal Statutes and Policies. (Sept. 2013).

³ The North Carolina Estuarine Biological and Physical Processes Work Group, Recommendations for Appropriate Shoreline Stabilization Methods for the Different North Carolina Estuarine Shoreline Types (August 2006), available at http://portal.ncdenr.org/c/document_library/get_file?uuid=7a9230cb-ed99-4324-b9fe-3243a9b78c95&groupId=38319

Sediment Bank with Sand; (10) High Sediment Bank; and (11) Overwash Barrier/Inlet Areas. With the addition of (12) mangroves, the Committee believes this is a relatively complete list of the types of shorelines that are being managed for erosion throughout the country.

In addition to shoreline type, another significant factor in evaluating shoreline management options is the extent to which it is sheltered or exposed to significant wind and wave energy. Differences in orientation and fetch between otherwise similar shorelines can require significant differences in appropriate management techniques. Finally, an understanding of the off-shore bathymetry and the sediment transport forces at work at a particular site also have significant importance in selection and design of an appropriate management system.

C. Types of Shoreline Management Systems

Natural shorelines provide a variety of important ecosystem services, contributing to the health and aesthetics of the entire estuarine system. If those shorelines are considered degraded or threatened by erosion or recurring storm/flood events, the first reaction is often a desire to “manage” the shoreline, primarily for the purpose of protecting the adjacent upland property. One management option, and the preferred option for many shorelines, is to leave it in its natural state. However, if some other alternative is perceived as necessary or desirable, a variety of options are available. In this Report, the discussion of “shoreline management systems” refers to these other options for stabilizing or managing a shoreline, once a “no action” option is deemed not feasible.

Hundreds of miles of shoreline are stabilized each year throughout the U.S. by owners of estuarine waterfronts trying to prevent their valuable property from washing away. Historically, the preferred response to erosion has been to “harden” the shoreline for most types of estuarine shorelines, using bulkheads, revetments, and similar engineered structures that typically form a fixed delineation or barrier in the water/land continuum that would otherwise be the natural, shifting shoreline. These systems, to the layperson’s eye, appear to provide solid, enduring protection. Their impacts on the surrounding ecosystems—positive or negative—are not self-evident. Researchers from UNC-Chapel Hill and NOAA recently found that nearly 12,500 miles (or 14 percent) of U.S. shoreline have been hardened, 66 percent of which is along the south-Atlantic and Gulf coasts.⁴ These coasts contain most of the U.S. salt marshes and are also most vulnerable to sea level rise, storm events, and future development (based on the physical characteristics of the shoreline, storm frequency, and current population growth rates). This is the first analysis to quantify the total amount of hardened shoreline in the U.S. and to determine the vulnerability of salt marsh to future coastal development and sea level rise.

An alternative to hardened erosion control structures is the use of natural or “soft” systems, sometimes in combination with manmade, engineered elements designed to reintroduce natural systems that will provide land protection functions and reduce adverse impacts to terrestrial and aquatic ecosystems. These softer systems include, for example, a gamut of options

⁴ Rachel K. Gittman, et al., Presentation at the 99th ESA Annual Meeting, *Prevalence and impending ecological consequences of shoreline hardening along US coasts* (August 15, 2014), <http://eco.confex.com/eco/2014/webprogram/Paper50391.html>

running from replanting fringe marshes to refilling and planting a depleted marsh together with construction of a protective sill (typically made of rock, shell, or wood) to absorb wave energy. Many of these approaches leave intact the natural, shifting character of the natural water/land interface.

Collectively, these shoreline management measures are often referred to as “living shorelines.” The Committee recognizes that there is no uniform definition of a living shoreline. Some assert that introducing *any* engineered structure that includes manmade elements is not a true living shoreline. Others feel that any shoreline management that is not exclusively dependent on hardening and instead attempts to reintroduce otherwise lost ecosystem services is a living shoreline. The Committee has selected an approach that allows for the use of manmade elements that are designed to protect the natural functions of a living shoreline as well as the high ground real estate itself. A management measure that breaks the water/land continuum is not considered a living shoreline by the Committee. This choice is based on the belief that any manmade break in the water/land continuum will eventually become a *de facto* hardened structure functioning essentially like a bulkhead or revetment. Therefore, this Report’s definition of a living shoreline is:

LIVING SHORELINE DEFINITION: Any erosion control management system that does not introduce a fixed interruption of a natural water/land continuum and that is designed to protect or restore natural shoreline ecosystem services; it includes natural elements and may incorporate manmade elements.

There is a broad array of shoreline management strategies for estuaries. There are generally eight different types of shoreline stabilization methods that are used to manage these shorelines. The N.C. DCM report, p. 5-1,⁵ summarized these methods in the following table.⁶

⁵ See footnote 4, above.

⁶ This array is very similar to the NRC 2007 Report, which put erosion control systems into the following broad categories: (1) manage land use; (2) vegetate; (3) harden; (4) sills; (5) trap or add sand; (6) composite systems; (7) headland control; and (8) nontraditional and innovative methods. Pp. 45-67.

Structure Type	Aliases	Typical Construction Materials	Characteristics	Erosion Control Purpose
Land Planning			Live with/plan around existing conditions	Leave the land in its natural state.
Vegetation Control	Wetland or Upland Plantings	Wetland or upland vegetation	Planting, replanting, or conserving existing vegetation	Creates a buffer to dissipate wave energy.
Beach Fill	Beach Nourishment	Sediment/sand similar to the native beach	Placing sand on the shoreline	Acts as a sacrificial erosive barrier.
Sills	Marsh Sill, Wooden Breakwater, Wave Board	Timber, rock, concrete pieces, vinyl	Parallel and close to shore, low elevation, associated with wetland vegetation	Reduces wave energy on the shoreline. Traps sediment landward to rebuild/protect wetlands.
Groins	Jetties	Timber, rock, concrete, vinyl	Perpendicular to shore	Trap sand on the updrift side to build out the upland.
Breakwaters	Wave Attenuator	Timber, concrete, rock	Shore parallel, larger and further offshore than sills	Reduces wave energy on the shoreline. Trap sand between the shore and breakwater.
Sloped Structures	Riprap, Revetment Sloped seawall	Concrete, rock	Watertight or porous, sloped against a bank	Protect land from erosion and absorb wave energy without reflecting waves.
Vertical Structures	Bulkhead, Seawall, Gravity Wall	Timber, steel, vinyl, rock, concrete	Watertight, vertical, parallel to shore	Hold back land.

Selection of the most appropriate management system begins with a site analysis to evaluate the type of shoreline, the amount of energy that particular shoreline experiences, the sediment transport forces at work, and the nature of adjacent land uses. Selecting and designing the most appropriate stabilization methods and elements must consider these factors as well as how each possible management option will be impacted by them, and how each option will itself impact the site's ecosystem. Long term success requires monitoring and maintenance. This is true for all types of shoreline stabilization including traditional bulkheads as well as living shorelines.

D. Impact of Shoreline Management System on Estuarine System

Scientific and engineering research⁷ and monitoring comparing hardened structures with living shorelines over time demonstrates three important but not widely known consequences flowing from the choice of shoreline management systems:

⁷ C.A. Currin, et al., Developing Alternative Shoreline Armoring Strategies: The Living Shoreline Approach in North Carolina (2010), available at http://pubs.usgs.gov/sir/2010/5254/pdf/sir20105254_chap10.pdf

1. Living shorelines are often more effective over time in preventing erosion caused by everyday weather, boat waves, and long-term sea level rise than hardened structures.

2. Living shorelines are often more effective in preventing catastrophic storm damage than hardened structures.

3. Hardened structures usually have significant adverse effects on the adjacent aquatic and terrestrial ecosystems and the ecosystems services they supply. Living shorelines avoid many of these adverse effects.

Research supporting these conclusions has been presented at numerous scientific forums and in scientific papers as well as agency monitoring reports. In addition, many of the Committee's members have extensive hands-on experiences and knowledge regarding estuarine shoreline stabilization practices, including directly installing projects themselves. Over the past decade, they have reviewed a wide array of shoreline management projects and studies, participated in dozens of agency and scientific monitoring efforts, and attended numerous conferences, workshops, workgroups and agency briefings that have examined the effects of various shoreline management alternatives.

FINDING: The Committee has concluded that living shorelines are the best shoreline management alternative for both the environment and property owners when they are used in the right locations, designed correctly, constructed properly, and maintained appropriately.

The Committee believes that for the vast majority of shorelines, there is now a very strong and compelling scientific and engineering case for using living shorelines instead of bulkheads or other hardened methods of stabilization. Only the minimum necessary hardening should be permitted and should be considered the exception rather than the norm.

E. Potential Impact of Sea Level Rise

Sea level is rising and will continue to do so in the next century.⁸ As it does, the natural shoreline will be reconfigured and new erosion threats will emerge. The response to these threats will have a significant impact on the health of the evolving estuaries. Allowing marshes to migrate will not only protect the remaining land but will help ensure the health of the shifting estuarine ecosystem. Attempting to fix in place the existing shoreline configuration through hardening will only delay the inevitable and will also significantly degrade the aquatic and adjacent terrestrial habitats in the interim. The Corps has promulgated Regulation No. 1100-2-8162, Dec. 31, 2013, "Incorporating Sea Level Change In Civil Works Programs," to incorporate "the direct and indirect physical effects of projected sea level change across the project life cycle

⁸ *Climate Change 2013: The Physical Science Basis, Summary for Policymakers*, IPCC Working Group I, (Sept. 27, 2013), available at http://www.ipcc.ch/report/ar5/wg1/docs/WGIAR5_SPM_brochure_en.pdf

in managing, planning, engineering, designing, constructing, operating and maintaining USACE projects and systems of projects.”⁹

Recent research indicates that sea level rise threatens not only high value property but, in certain areas, particularly vulnerable populations (the poor and elderly).¹⁰ That research mapped areas of the US where natural coastal systems currently defend property and people and where simply maintaining existing natural systems can be effective in combating sea-level rise: “The number of people, poor families, elderly and total value of residential property that are most exposed to hazards can be reduced by half if existing coastal habitats remain fully intact.” *Id.*

The President’s Climate Action Plan (June 2013) calls for federal and local agencies to make “climate-resilient investments” (pp. 12-13) and “improve our natural defenses against extreme weather, protect biodiversity and conserve natural resources in the face of a changing climate, and manage our public lands and natural systems to store more carbon.” (p.15). Living shorelines address and advance realization of all of these goals.

F. **Economics of Shoreline Management Systems**

Hardened structures typically have well defined immediate cost parameters that are readily understood. The hidden cost to the landowner of gradual failure of the system over time, resulting in not just replacement expense but frequently the loss of significant land (when a bulkhead collapses) is less well recognized. The economic impact of ecosystem degradation is recognized in principle but, to the Committee’s knowledge, has not yet been quantified and documented. For example, while one bulkhead on one small lot may have a *de minimis* impact on the adjacent estuary, significant hardening of the entire estuary, as is now occurring in some locales, has a demonstrable impact on the health of that system such that commercial and recreational fisheries will be impacted. These economics are currently ignored.

Living shoreline costs and values are more complex. Because of the wide array of living shoreline types, it is not practical to attempt to calculate a “standard” linear foot cost of living shoreline techniques for comparison to bulkhead or revetment costs. Nevertheless, efforts to estimate these costs have been made:

Table 2. Cost Estimates for Shoreline Management Approaches (*average cost per linear foot*)¹¹

⁹ See <https://corpsclimate.us/ccaceslcurves.cfm> for a brief description of this and the previous rule.

¹⁰ Katie K. Arkema *et al.* *Coastal Habitats shield people and property from sea-level rise*, 3 Nature Climate Change 913 (2013).

¹¹ “Living Shoreline Implementation: Challenges and Solutions,” Rivers & Coast (newsletter of the Center for Coastal Resources Management), Vol. 9, No. 2 (Summer 2014). References for Table 2; http://www.seagrant.sunysb.edu/Images/Uploads/PDFs/LivingShorelines0513-Presentations/5_NYSG_Living_Shorelines_Maryland.pdf;

http://www.delawareestuary.org/pdf/Living%20Shorelines/LivingShorelinesBrochure_feb2012.pdf;

http://msucares.com/crec/envi/publications/living_shorelines_cost_estimates.pdf;

<http://www.cbf.org/Document.Doc?id=60>;

http://www.gulfalliancetraining.org/dbfiles/Cost%20and%20Maintenance%20of%20Living%20Shoreline_s.pdf

Nonstructural (planting grading/fill)	Hybrid (marsh + sill)	Breakwaters (offshore)	Structural (revetment)	Location	Date
\$100-200	\$250-400	\$450-600	\$500–1,200	Maryland	circa 2014
\$100-225	\$250-700	\$450-1,000	\$500-1,500	Delaware Estuary	circa 2012
\$45+	\$120-395	\$125-200	\$115-285 (low energy)	Northern Gulf of Mexico	circa 2008
\$50 - \$100	\$150-\$300	\$350-\$500	\$500-\$1000	Maryland	2007
\$45+	\$100+	\$150-\$250	\$115-\$1200	Florida	2008

Of greater long-term significance is the value of living shorelines. It is widely recognized (although difficult to quantify with precision) that aesthetics greatly affect property values and hence the tax base: just as a suburban lot with mature trees is more valuable than one without, so a waterfront lot with natural wetlands and shorelines is more aesthetically pleasing and hence potentially more valuable. This is a value of direct benefit to the property owner (and, indirectly, to the property taxing authority) as well as to nearby property owners and recreational users.

Other values generated by healthy estuaries do not directly benefit the owner but are nevertheless significant in making management decisions. The value of healthy fisheries is significant to recreational and commercial fishers and the consuming public. Habitat protection and restoration improves the recreational value of the system to the public. Trapping and preserving carbon in healthy wetlands benefits the public as well.

FINDING: Living shorelines contribute a variety of public values beyond those enjoyed exclusively by the landowner implementing such a project.

Another value to the broader public is the potential for protection of water quality. Erosion is a part of natural shoreline ecosystem processes, but it can also be one of the greatest sources of fine sediment and turbidity in a watershed. Living shorelines represent a water quality best management practice that reduces sediment and nutrient pollution loads while preserving and/or enhancing ecosystem services.¹²

The Chesapeake Bay Program's Expert Panel on Shoreline Management (Panel) has completed an extensive review of recent and relevant shoreline management practice research on the ability of wetlands to reduce sediment and nutrient pollution.¹³ In their effort to reduce the

¹² However, using living shoreline erosion control techniques can also result in ecosystem tradeoffs, so implementation should be undertaken responsibly and in a way that minimizes impacts.

¹³ Urban Stormwater Work Group, Chesapeake Bay Partnership, Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects (April 15, 2014).

total maximum daily load (TMDL) of sediments and nutrients into the Chesapeake Bay, the Panel looked at the role of wetlands in:

- Preventing erosion and associated near-shore sedimentation (nutrient and sediment reductions)
- Denitrification (vegetative removal of nitrogen)
- Removing sediment from the water column and trapping it through accretion (sediment and nutrient reductions)
- Vegetative uptake of nutrients utilizing above and below ground nutrient cycles (Marsh Redfield Ratio)

In the Chesapeake Bay watershed, the Panel has developed a series of protocols for calculating the nutrient and sediment reductions resulting from the use of living shorelines in shoreline erosion control strategies. Examples of the protocols' use are provided in the Panel's report.

Based on their work, the Panel found that using wetlands in a living shoreline erosion control design provided significant reductions of both sediment and nutrients and resulted in a cost-effective water quality enhancement.

FINDING: Use of living shorelines by public and private landowners offers a potential significant economic value to the regional agencies charged with protecting and restoring water quality.

G. Regulatory Overview

Installation of shoreline stabilization systems is subject to federal and state regulation and in some areas by local regulation as well (either as an additional regulatory program or as the delegated state regulatory element). This has resulted in regulation of these systems that varies significantly from jurisdiction to jurisdiction.

Federal. All activities in waters of the United States¹⁴ will require a permit from the US Army Corps of Engineers (USACE or the Corps), which is responsible for issuing permits pursuant to the Rivers and Harbors Act of 1899 and the Federal Water Pollution Control Act of 1972 ("Clean Water Act" or "CWA"). Although the Corps and EPA share certain administrative responsibilities under the CWA, the Corps is the permitting entity. In general,¹⁵ these acts regulate the deposition of "dredge or fill" material into jurisdictional waters and the excavation of material from the bottom of such waters by requiring a permit. There are two types of

¹⁴ The definition of "waters of the United States" has been the subject of much litigation and is currently the subject of proposed additional rulemaking by the US EPA. 79 Fed. Reg. 22188 (April 21, 2014). For the purposes of this Report, the Committee assumes that any application of living shorelines will occur in a jurisdictional water of the US.

¹⁵ A detailed explanation of the regulatory schemes described is beyond the purpose of this Report. For a more detailed explanation of these Acts, see 2007 NRC Report, pp. 104-08.

permits¹⁶: General Permits and Individual Permits. General Permits may be either Nationwide (NWP) or Regional, and generally allow a project which falls within certain definitions to proceed without an individualized assessment of the project, provided certain notifications and assurances are provided (and, in some cases, Corps confirmation that work may proceed). An Individual Permit, which is necessary if the applicant does not qualify for a General Permit, requires a lengthy and complex application process that includes a particularized assessment of the project and the opportunity for public notice and comment.

Of particular significance to shoreline management is NWP 13, for “Bank Stabilization” activities to prevent erosion. If the project is less than 500 linear feet and uses less than one cubic meter of fill per running foot, the applicant may proceed without notifying the Corps (unless the project is in a wetland or special aquatic site). This is the authorization for many bulkhead and other hardened projects. Another important General Permit for shoreline restoration is NWP 27, for Stream and Wetland Restoration Activities. Use of this NWP requires much more Corps notification and oversight, and it is frequently used as part of wetland mitigation projects.

Regional general permits (RGP) are similar to NWPs but are designed for a specific geographic area. The type of activity allowed and conditions required for RGPs will depend on the district. RGPs can be used to permit localized projects with minimal environmental impacts that are not already allowed under an existing NWP. To that end, RGPs for living shoreline activities have been adopted for the Alabama and Mississippi coasts by the Mobile District Office. In many instances, RGPs can ultimately become NWPs thus allowing these activities to be performed beyond the original specific geographic area.

In coastal states, NWPs are reviewed for consistency with state coastal programs through the Coastal Zone Management Act. During the review, states may object to the use of certain NWPs in their jurisdiction. For instance, the New England District has suspended use of all nationwide permits and instead uses state-specific general permits. States may also place regional conditions on the use of NWPs within the state. These conditions afford states the opportunity to tailor NWPs to meet the needs and objectives of the state’s coastal management policy.

State. State permitting provides another layer of oversight for shoreline stabilization projects. States regulate coastal activities through environmental permitting programs, which may include specific requirements for coastal activities and shoreline management. These programs may further condition reliance on Corps NWPs or RGPs, or may override their use altogether.

Shoreline stabilization activities usually trigger state environmental permitting because of concerns to water quality and wetlands. Each state program is its own animal and requires familiarity with the regulations of that state. State policies can be narrower than federal policies, meaning that a project may qualify for a federal permit from the Corps but not satisfy the state permitting requirements. This scenario can cause confusion among permit applicants that do not realize both state and federal permits are necessary.

State environmental permitting may be issued separate from or in conjunction with Corps permitting. In some states, the state permitting agency and the Corps designate a particular entity

¹⁶ 33 CFR 325.5.

to be the lead agency. Under this model, the applicant may submit one joint permit application to the designated lead agency. This joint permitting approach may alleviate some confusion among applicants mentioned previously. In other states however, Corps and state permitting operate independently of each other, requiring separate permit applications and review.

Along with state environmental permitting requirements, activities taking place on state-owned submerged lands may require additional permissions. States generally own title to coastal water bottoms where shoreline stabilization projects are sited. State property boundaries are usually tied to the water line, often either the mean high tide line or the mean low tide line. Activities that place materials on the water bottoms, like living shorelines, may require approval by the state agency in charge of managing state lands. Terminology varies by state and permission may be called a lease, easement, or license depending on the locale. Some states, like Connecticut, do not have separate regulatory programs for leasing submerged lands, but instead, incorporate this review into the state environmental permitting process.

Local. Local government land use authority provides a final level of review in many locales. Local jurisdictions may adopt land use restrictions designed to protect the public health and safety, including environmental protections.¹⁷ Coastal localities can use this authority to guide the type of shoreline erosion control structures installed within their communities.

Using this authority, Kent County, Maryland adopted a shoreline policy that requires property owners considering installation of hardened shoreline armor to demonstrate that a living shoreline would be inappropriate for that site.¹⁸ Similar measures have been adopted by Brevard County, Florida¹⁹ and Fairfax County, Va.²⁰ The Hawaiian counties of Honolulu and Kaua'i have also used local authority to protect natural shorelines.²¹

FINDING: The differing approaches to permitting of erosion control techniques has led to confusion, inconsistency, unpredictability, and a lack of regulatory credibility.

H. Trends in Shoreline Management

Separately, some states have developed tools to help landowners, designers, and constructors choose among the wide variety of shoreline management options in light of the known conditions at the project site even where living shorelines are not the regulatory preference. Many of the state agency websites²² include materials designed to educate the public

¹⁷ The 10th Amendment of the U.S. Constitution gives states authority to adopt laws for the betterment of the public health, safety, morals and general welfare (known as state police power). States delegate this authority to local governments through zoning enabling statutes. Local authority will vary based on the scope of the state enabling statutes.

¹⁸ Kent County, Md., Code § 6-3.10.

¹⁹ Brevard County, Fla., Code § 62-3661.

²⁰ Fairfax County, Va., Code Ch. 116.

²¹ Honolulu County, Haw., Code § 23-1.8; Kaua'i County, Haw., Code § 8-27.2.

²² <http://www.dnr.state.md.us/ccs/livingshorelines.asp>;

http://www.dep.state.fl.us/northwest/Ecosys/section/living_shorelines.htm;

<http://portal.ncdenr.org/web/cm/estuarine-shoreline-stabilization>

about shoreline management issues and living shorelines. An example of one such tool is the “Decision Tree for Undefended Shorelines and Those with Failed Structures” developed by the Center for Coastal Resources Management, Virginia Institute of Marine Science at William & Mary (April 22, 2010).²³ “This decision tree is driven by the principle of” integrated shoreline management, “based on the concept that all elements of the shoreline should be considered simultaneously when making a decision.” *Id.*, p. 2. Similarly, see the “Homeowners Guide to Permitting Living Shorelines in Mississippi and Alabama.”²⁴ NGOs are likewise contributing to these efforts.²⁵

As shoreline development has increased, the cumulative effect in some geographic areas reached proportions that resulted in a reassessment of the regulatory scheme enabling what many believed was a perilous course. Maryland is a prime example. In response to the artificial stabilization of 1,000 miles of the Chesapeake Bay’s 7,000 mile coastline, Maryland passed the Maryland Living Shoreline Act of 2008, which enacted a statutory presumption in favor of living shorelines and mandates their use, unless they cannot adequately address the owner’s legitimate needs.²⁶ In response, the design and contracting community has become knowledgeable in the elements and functions of living shoreline systems and can assist the owner in understanding different approaches to protecting property and the dependent ecosystems. Unfortunately, this regulatory change is being driven at the state level. Where the state has not mandated a living shoreline preference, living shorelines are much less prevalent.

V. OBSTACLES

A. Summary

Despite their advantages, the use of living shorelines is still relatively rare except where the local or state regulatory regime places a compelling preference on their use. One research team summarized the array of obstacles faced by living shoreline proponents as follows: “The greatest barrier...is the lack of understanding by the public and policy makers in regard to potential adverse effects of bulkheads, existing policy frameworks, and public sentiment.”²⁷

²³ Available at ccrm.vims.edu/decisiontree/decisiontree_manual.pdf. See also, Decision Tree for Currently Defended Shorelines, Virginia Wetlands Report, Vol. 26, Issue 1 (Spring 2011).

²⁴ masglp.olemiss.edu/living_shorelines.pdf; Chris Boyd and Niki Pace, Mississippi-Alabama Sea Grant Consortium and Mississippi-Alabama Sea Grant Legal Program.

²⁵ “Living Shorelines for the Chesapeake Bay Watershed,” Chesapeake Bay Foundation; “Living Shorelines: A Natural Approach to Erosion Control,” Galveston Bay Foundation; Living Shorelines webpage, N.C. Coastal Federation, <http://www.nccoast.org/Content.aspx?Key=76664726-1d0d-4f30-a6b0-c2702bf97ee3&title=Living+Shorelines>.

²⁶ U.S. Army Corps of Engineers, Baltimore District, Chesapeake Bay Shoreline Erosion in Maryland: A Management Guide (2010), available at http://dnr.maryland.gov/CoastSmart/pdfs/CBSE_mguide.pdf.

²⁷ Dr. J. Fear & Dr. C. Currin, Sustainable Estuarine Shoreline Stabilization: Research, Education and Public Policy in North Carolina, The NOAA/UNH Cooperative Institute for Coastal and Estuarine Environmental Technology, Final Report (31 Oct. 2008), “[P]otentially, the results of this work could be applied anywhere bulkheads are found.” *Id.*, p. 2

The Committee reviewed existing literature and reached out to a broad spectrum of individuals involved in shoreline management to identify the most significant obstacles to a broader use of living shorelines and strategies for addressing these obstacles. The Committee has grouped these observations into four major Institutional Obstacles, discussed separately below.

- Institutional Inertia
 - Familiarity with traditional methods and lack of information about both the shortcomings of those methods and the relative advantages of living shorelines has locked the major shoreline management decision-makers into a business-as-usual routine and impeded needed change in the regulatory system.
- Lack of a Broader Planning Context
 - Site-specific decision-making without consideration of system-wide impacts/benefits understates the negative cumulative effects of hardening, overlooks many of the greatest values of living shorelines (including mitigation of habitat loss), and imposes the entire shoreline management cost on the shoreline owner rather than spreading it across all of the constituencies benefited by a living shoreline installation .
- Shoreline Variability
 - Because of shoreline variability, implementing living shorelines that appropriately account for all the extant conditions and forces requires individualized analysis and planning rather than routinized solutions.
- Lack of an Advocate
 - The various constituencies benefited in different ways by living shorelines do not recognize their common interest and hence have not combined into an effective advocacy force.

In addition to these Institutional Obstacles, there are a number of “tactical” problems facing the design, permitting, and installation of a living shoreline, such as the current complex and variable permit regimes. The Committee does not minimize the significance of these problems by not identifying them as separate obstacles but instead believes that effectively addressing the broad Institutional Obstacles listed above will lead naturally to resolving many of these more tactical problems.

The Committee discussed how best to address each Obstacle with a specific recommended strategy and concluded that the Obstacles and their possible solutions are inter-related and best addressed by strategies that simultaneously consider all of the major identified Obstacles. Therefore, the Obstacles stated below do not have separately recommended strategies. Rather, the Recommended Strategies discussed later will address each of the Obstacles, where relevant.

B. Institutional Inertia

The major participants involved in choosing among shoreline management alternatives are the property owners, regulators, designers, and installers/contractors. Each of these groups has largely become accustomed to the traditional way of addressing erosion/storm protection

problems—hardening. “Bulkheads are well-liked by coastal property owners and their potential impacts are not well understood.”²⁸ In addition to not understanding the adverse ecological impacts of hardening the shoreline, most owners and contractors are not aware of the recent research showing the greater long-term benefits in preventing shoreline erosion as well as storm/flood damage offered by natural systems.²⁹ Lacking both information about the true efficacy of hardening (or, more accurately, the lack thereof) as well as the relative ecological advantages of softer alternatives, the major players have little perceived need to change course. Without a perceived need to change, there is an inherent bias against the adoption of new methods (*i.e.*, living shorelines).

The Virginia Institute of Marine Science hosted a wetland workshop in 2014 focused on living shorelines and asked participants to comment on challenges and solutions to living shoreline implementation. Many complained that shoreline hardening was preferred due to psychological inertia - neighbors had a bulkhead or rip rap, so they needed it too!

The dearth of design and construction contractors knowledgeable in living shoreline techniques further perpetuates the preference for the old hardening methods and can artificially inflate the cost of living shorelines: new contractors understandably build in larger contingency fees when trying new, unfamiliar methods.

FINDING: The major shoreline management decision-makers persist in preferring hardening because they are familiar with those methods and lack of information about both the shortcomings of those methods and the relative advantages of living shorelines.

In certain geographic regions, this institutional inertia has resulted in a regulatory inertia which, perhaps unintentionally, builds in a significant bias in favor of hardening and against living shorelines. For example, a recent study (“NC Sea Grant 2014”) shows that obtaining a Corps 404 permit for a marsh sill in the Wilmington, NC District takes 45-60 days, which compares favorably with the Norfolk, Baltimore, and Philadelphia Districts (all about 60 days).³⁰ However, in the Wilmington District, a bulkhead permit (state and federal) can be obtained in 1-2 days while the time required in those other, listed Districts (where state preferences for living shorelines have been imposed) is approximately 90 days, which is the same time needed for complete permitting of bulkheads in those Districts.

²⁸ “Sustainable Estuarine Shoreline Stabilization: Research, Education and Public Policy in North Carolina,” J. Fear, C. Currin, 31 Oct. 2008, p.2. “[P]otentially, the results of this work could be applied anywhere bulkheads are found.” *Id.*

²⁹ R. Gittman, A. Popowich, J. Bruno, C. Peterson, Marsches with and without sills protect estuarine shorelines from erosion better than bulkheads during a Category 1 hurricane (Sept. 2013), Ocean & Coastal Management. Available at <http://dx.doi.org/10.1016/j.ocecoaman.2014.09.016>.

³⁰ Lisa Schiavonato and J. Kalo, eds., Management Strategies for North Carolina Estuarine Shoreline (2014), North Carolina Sea Grant, and N.C. Coastal Resources Law, Policy, and Planning Center, Final Recommendations, p.40. Available at http://ncseagrant.ncsu.edu/ncseagrant_docs/products/2010s/estuarine_shoreline_report.pdf.

FINDING: Except where states have responded to excessive hardening by advocating changes in permitting systems, the federal regulatory regime has perpetuated the status quo bias in favor of hardening shorelines and has impeded needed change in the overall regulatory system.

C. Lack of a Broader Context for Shoreline Management Decisions

Historically, erosion/storm risks are addressed and shoreline management decisions are made piecemeal, looking only at the property owner's site. Stabilization projects are designed, permitted and constructed on an *ad hoc* basis without consideration of systemic influences and cumulative impacts of this and other erosion controls extant and likely to be installed in the same estuarine system. "Although loss of small parcels of shoreline habitat from hardening may not have a large impact on the ecosystem, the cumulative impact of the loss of many small parcels will at some point alter the properties, composition, and values of the ecosystem. In addition, the economic, recreational, and aesthetic properties of the shoreline will be altered, with potential loss of public use, access, and scenic value."³¹

FINDING: Site-specific decision-making without consideration of system-wide impacts understates the negative cumulative effects of hardening.

Decision-making without consideration of the broader context also fails to consider the multiple values created by living shorelines and overlooks the systemic advantages, both to the landowner and to other users of the estuary, of living shorelines. (see IV, F, above). System-wide planning is also a vehicle for living shorelines to provide mitigation for unavoidable habitat loss elsewhere in that system.

FINDING: Site-specific decision-making without consideration of system-wide benefits overlooks many of the greatest values of living shorelines both to the owner and to the other constituencies utilizing or affected by the estuary.

Because the broader system values contributed by living shorelines are not widely recognized by the decision-makers, the cost of shoreline management is not shared with those constituencies directly benefitting from the use of living shorelines. As long as there remains a disconnect between these values, the constituencies being benefited, and the cost being imposed on the individual landowner managing his/her small piece of the shoreline, a significant obstacle will remain to the broader use of living shorelines and the healthier ecosystems they support.

FINDING: Site-specific decision-making without consideration of system-wide values created by living shorelines impedes broader use of living shorelines by imposing the cost on the shoreline owner rather than spreading it across all of the constituencies benfited by a living shoreline installation.

³¹ NRC 2007 Report, Finding, p. 7.

The existing piece-meal approach to shoreline management is exacerbated by the regulatory system in place. “The current permitting system fosters a reactive response to the problem of erosion on sheltered coasts. Decision-making is usually parcel-by-parcel … with inadequate attention to the cumulative effect of individual decisions.”³²

FINDING: The existing regulatory schemes fail to adequately consider the system-wide impacts and benefits of shoreline management decisions, perpetuating a bias in favor of hardening.

The impact of climate change further highlights the importance of appreciating a broader context. One of the “key findings” of the 2012 National Climate Assessment’s Report was: “Although adaptation planning activities in the coastal zone are increasing, they generally occur in an *ad hoc* manner and at varied spatial scales dictated by on-the-ground needs and adaption drivers in the particular area. Efficiency of adaptation can be improved through integration into overall land use planning and ocean and coastal management.”³³ Unanswered by that Report is how to effectively integrate land use planning and ocean and coastal management.

New tools will be necessary to implement broader context planning. As mentioned earlier, many states are developing tools to help landowners, designers, and constructors make better decisions about what techniques are appropriate for a particular site’s characteristics. Similar tools that address not only that site’s immediate and nearby characteristics but also consider system-wide functions are necessary to further broaden the planning vision. For example, the Comprehensive Coastal Resource Management Portal³⁴ developed by the Virginia Institute of Marine Science provides links to guidance, data, and area planning tools at the local level for Tidewater localities.

FINDING: System-wide planning tools are necessary for the proper evaluation of individual site shoreline management decisions.

D. Shoreline Variability

Shorelines and the services they provide vary widely. Wise management of shorelines necessarily requires an understanding of the nature of the subject shoreline in the context of that locale, the services it is (or could be) providing, and the impact various management alternatives will have on that suite of potential services. Compared to hardened structures, the design and construction of living shorelines are more site-specific and must take into account the local ecosystems and how they will impact and be impacted by the specific proposed stabilization

³² NRC 2007 Report, Finding, p.8.

³³ V.R. Burkett and M.A. Davidson, eds. *Coastal Impacts, Adaptation, and Vulnerabilities* (2012), National Climate Assessment Technical Input Report, p.101. Available at http://downloads.usgcrp.gov/NCA/technicalinputreports/Burkett_Davidson_Coasts_Final_.pdf.

³⁴ <http://ccrm.vims.edu/ccrmp/index.html>

methods. A one-size fits all solution is not appropriate, making the task of overcoming the hardened structure inertia all the more difficult.

The NRC 2007 Report addresses in detail the many factors impacting a shoreline and the ecosystem services each shoreline type provides. In summary, design of a management system should take into account an understanding of the specific sediment characteristics and transport systems at the site as well as how those systems will impact and be impacted by the proposed management system. Recent research has demonstrated, for example, that “over-designing” a living shoreline system can actually damage the existing natural elements (such as by so limiting flow against the shore that temperature in the marsh is increased and dissolved oxygen is decreased).³⁵ Similarly, placing a living shoreline in a high energy environment without proper sheltering elements can lead to a complete failure of the system.³⁶

The NC DCM 2006 Report referenced earlier³⁷ recommends specific stabilization techniques for each shoreline type studied. The Committee reviewed these recommendations, and believes they provide a good framework for evaluating what type of shoreline stabilization is most appropriate for various shoreline types throughout the nation, and thus demonstrates the inherent complexity in utilizing living shorelines. The following two tables³⁸ from the N.C. report rank appropriate shoreline stabilization methods.

	Swamp Forest	Marsh	Marsh with Oysters	Marsh with Mudflats	Low Sediment Bank with Marsh	Low Sed. Bank with Swamp Forest
Land Planning	1	1	1	1	1	1
Vegetation Control	2	2	2	2	2	2
Beach Fill	3	3	NR	NR	NR	NR
Sills	4	4	3	3	3	3
Groins	5	5	4	4	4	4
Breakwaters	6	6	NR	NR	4	4
Sloped Structures	4-toe only NR-other	4-toe only NR-other	3-toe only NR-other	3-toe only NR-other	3-toe only 4-other	3-toe only 4-other
Vertical Structures	NR	NR	NR	NR	4	4

NR = Not Recommended

In the lower latitudes (below 32° north), mangrove trees are great plants to help stabilize the banks while still providing habitat for a diverse array of species (birds, mammals, crustaceans, and fish). In addition, they preserve water quality and reduce pollution by filtering suspended

³⁵ “Key Messages,” 2013 Mid-Atlantic Living Shorelines Summit, p. 2.

³⁶ Apollo Beach, Tampa Bay. Subsequent installation of breakwater protections led to a successful, sheltered living shoreline.

³⁷ The North Carolina Estuarine Biological and Physical Processes Work Group, Recommendations for Appropriate Shoreline Stabilization Methods for the Different North Carolina Estuarine Shoreline Types (August 2006), available at http://portal.ncdenr.org/c/document_library/get_file?uuid=7a9230cb-ed99-4324-b9fe-3243a9b78c95&groupId=38319

³⁸ *Id.*, p. 8-2.

	Low Sediment Bank with Sand	Low Sediment Bank with Woody Debris	Low Sediment Bank with Oysters/SAV	High Sediment Bank	Overwash Barrier/Inlet Areas
Land Planning	1	1	1	1	1
Vegetation Control	3	2	2	3	2
Beach Fill	2	NR	NR	2	2
Sills	5	3	3	5	4
Groins	4	NR	NR	4	3
Breakwaters	6	NR	NR	6	5
Sloped Structures	7	4	4	7	6
Vertical Structures	8	5	5	8	7

NR = Not Recommended

material and assimilating dissolved nutrients. Mangrove trees are the foundation of a complex marine food chain.

Another approach is the Virginia Decision tree tool mentioned earlier. The Committee likewise concluded that this approach is useful, especially for newcomers to living shorelines.

Developing the expertise to pair the best management system with the complex, on-site conditions has been one of the most significant obstacles to the broader application of living shoreline techniques.

FINDING: Because of shoreline variability, implementing living shorelines appropriate for all the extant conditions and forces requires individualized analysis and planning rather than routinized solutions.

E. Lack of an Advocate

Change does not occur because it should. Newton's first law of motion applies equally to complex social and economic systems: "Every body persists in its state of being...except insofar as it is compelled to change its state by force impressed."³⁹ The forces of change likewise do not coalesce spontaneously when the need arises. Individuals, whether motivated by self-interest or a sense of higher duty, rarely effect change individually. A community of effort bound together by common interests is usually necessary.

Currently, there is no well-defined living shoreline community. This is because, in large part, the community of interest that in fact exists is not recognized. The appropriate use of living shorelines will benefit not only the specific property owner installing the system (a fact many owners are not aware of) but also the entire estuary-dependent community in a variety of ways, many of which are likewise not widely recognized outside the scientific community. There has been little or no public recognition of these common interests and hence no coalescence of a living shoreline advocacy community.

³⁹ Newton, I., *Philosophiae Naturalis Principia Mathematica* (1687), translation by I.B. Cohen and A. Whitman, University of California press, Berkeley 1999.

FINDING: The various constituencies benefited in different ways by living shorelines do not recognize their common interest and hence have not combined into an effective advocacy force.

VI. RECOMMENDED STRATEGIES

A. Summary

The Institutional Obstacles to living shorelines are themselves inter-related, and so overcoming them naturally calls for strategies and tools that recognize and address these commonalities. The Committee concluded that the tools best suited for addressing the identified Obstacles are naturally organized into four broad categories, discussed in more detail in the following sections.

Strategy 1: Education and Outreach

The first step necessary to effecting all of the other Strategies recommended in this Report is the development of a broad and common understanding of the efficacy, impacts, and benefits of living shorelines as well as hardened structures. Collecting reliable information, making it generally available, and providing education and training to the various constituencies affected by shoreline management decisions is necessary to overcome each of the identified Obstacles and promoting the wider use of living shorelines.

Strategy 2: Regulatory Reform

Regulatory reform, particularly at the federal level, is necessary so that all shoreline management permitting is subject to the same, hierarchical evaluation criteria, and should include abandonment of traditional “cookie cutter” solutions (NWPs) that do not adequately consider the factors required by the CWA. The new permitting program should coordinate federal, state, and local regulations, should evaluate project impacts beyond the project site (*i.e.*, system-wide), and should include living shoreline incentives reflective of the system-wide values created. Such a permitting system would deliver consistent and predictable outcomes.

Strategy 3: Increase Institutional Capacity

To successfully implement comprehensive regulatory reform and wider use of living shorelines, the capacity of the major constituencies must be improved and expanded. The current availability of designers, constructors, and regulators sufficiently knowledgeable of living shoreline techniques is not adequate and must be increased, primarily through specialized training.

Strategy 4: Public Agencies as Role Models

Public lands at all level of government are ideal candidates for living shoreline demonstration projects which would raise awareness and acceptance of these techniques. Agency leadership would also be valuable in broadening planning perspectives and working across jurisdictions to collaboratively achieve meaningful regulatory reform.

B. Strategy 1: Education and Outreach

There is a significant gap between the established science of living shorelines and the public and regulatory perception of the efficacy and environmental impact of erosion control systems—both hardened systems and living shorelines. A better and broader understanding of living shorelines—their functions, benefits, and design elements—is key to overcoming each of the Obstacles identified above:

- Institutional Inertia is rooted in outdated and largely erroneous assumptions about the functionality and impact of hardened structures. Education is the first, necessary step in changing course.
- Myopic erosion control planning is likewise rooted in a lack of information about the true broader context and the impact of shoreline management on the entire estuary. The planners, designers, owners, constructors, and regulators need that broader Context.
- The Variability of shorelines dictates that a broader and deeper understanding of living shorelines is necessary for a successful project. One size does not fit all.
- Effective Advocacy for living shorelines requires informed constituencies.

An effective education campaign is also a critical element in each of the other Recommended Strategies discussed below:

- Regulatory Reform must start with a better understanding of the true environmental impact of hardened structures and the relative benefits of living shorelines.
- Increasing Institutional capacity requires educating each affected institution.
- Government leadership through example requires a comprehensive understanding of the issues and opportunities so that the use of limited public resources can be targeted to advance the overall planning goals.

Targets for Education and Outreach

The following constituencies could all benefit from a better understanding of the function and benefits of living shorelines and additional education about hardened shorelines (their lack of efficacy and adverse impact on ecosystem services):

- a. General public, especially shoreline owners and recreational users of estuarine systems (fishing, birding, etc.)
- b. Congressional leadership
- c. Regulatory agency leadership
- d. Regulatory agency permit staff
- e. State and Local water quality agencies
- f. Designers, landscape architects and consultants

- g. Marine contractors and suppliers (stone; wetland plants, constructed elements (domes; coir logs), slow-release fertilizers)
- h. Scientific community
- i. Commercial and recreational fishing interests
- j. Real estate interests (sales; developers)
- k. State and Federal wildlife agencies pursuing ecosystem-wide approaches to species protection
- l. Educational institutions (K-post-grad) that benefit from outdoor research and educational opportunities

Subject Matter

Each of these consistencies has particular educational needs. For example, the marine contractor industry needs to understand ways in which living shorelines can be installed profitably, consistent with the regulatory environment. Regulators need a better understanding of the adverse cumulative impacts of currently permitted hardened structures and their potential Clean Water Act compliance consequences. The scientific community needs to publicize more broadly the emerging findings supporting the broader use of living shorelines. The public needs a better understanding of the efficacy and impacts of all systems, hard and soft. The following subjects apply to some or many of the identified constituencies:

- a. Long term efficacy of hardened structures as erosion control systems, esp. with respect to severe storm events
- b. Long term changes to/degradation of aquatic systems caused by hardened structure
- c. Ecosystem services and benefits of living shorelines for landowners and the environment (wildlife, birds, fish, water quality, fiscal, flood protection)
- d. Erosion control and storm (flood) protection benefits of living shorelines
- e. Living shoreline types and appropriate selection
- f. Factors affecting living shoreline design
- g. Cost factors (design/construction savings; maintenance; replacement), esp. comparing hardened and living systems over time
- h. Cost incentives
- i. Values created by living shorelines (aesthetic, commercial, water quality)
- j. Environmental interdependency of wetlands and their adjacent riparian buffers (barriers to landward migration and role of riparian bank slope in storm resilience)
- k. Information on maintenance costs and requirements (including invasive species control/eradication) and expectations of wetland changes over time with maturation
- l. Effect of projected sea level rise on wetlands (esp. those with structures that would limit or slow landward migration)
- m. Directory of qualified contractors and design professional
- n. Directory of demonstration sites
- o. Other regulatory programs impacted by living shorelines (flood prevention, erosion control, water quality)

- p. Transitioning living shorelines to adjacent hardened structures
- q. Replacing dilapidated/failing structures with living shorelines

FINDING: A major impediment to effective education about living shorelines is the lack of an authoritative repository of information about the science and technology of shoreline management techniques.

RECOMMENDATION: The Committee supports the establishment of a centralized, reliable (*i.e.*, peer reviewed) database collecting scientific research on the design, construction, efficacy, and impact of various shoreline management systems as well as a directory of living shoreline sites and “qualified” designers and contractors [see Improving Institutional Capacity].

RECOMMENDATION: The Committee supports the development of a “manual” of living shoreline practices, including such elements as a decision guide for evaluating potential project sites, selecting and designing an appropriate management system, constructing the system, and monitoring and maintaining the system, as well as guidelines for where living shorelines are *not* appropriate.

Education/Outreach Methods

The Committee believes an education and outreach campaign should include these elements:

- Web presence for master database, directories, and manual referenced above.
- Web-based interactive training, modeled on the EPA Water Quality Standards Academy.
- Visual (*i.e.*, video) demonstrations to show what living shorelines are, how shoreline management systems (hard and soft) impact an estuary, and how hardened structures fail.
- Demonstration projects so all constituencies can see living shoreline projects in place.
- Professional outreach targeted to the particularized need of each constituency to customize the delivery of needed information.
- A general information campaign targeted to the estuary-using public, probably including social media elements.
- Targeted regional information campaigns, based on results of regional social marketing research of perceived local barriers (including rural and low income landowners).

- Identify existing entities delivering wetland or living shoreline outreach and re-message, using results of social marketing research.
- Encouraging local media to report on living shoreline projects, esp. those involving public projects or community/volunteer participation.
- Develop living shoreline “branding” logos/catch-phrases to build regional/national awareness.
- Develop materials demonstrating the value of living shorelines to each major stakeholder group.
- Coordination of outreach strategies for similarly interested NGOs (by region or specific subject).

Achieving these recommendations will require organizational leadership and program funding. Since beginning this report project, Restore America’s Estuaries, working in partnership with its member organizations and key federal agencies, has been awarded a major watershed grant by the U.S. Environmental Protection Agency to create the national capacity to transfer technology knowledge regarding good stewardship of estuarine shorelines across local, state and tribal governments, as well as other interested stakeholders including waterfront landowners. To implement this grant, RAE intends to establish beginning January 2015 an online ***Living Shorelines Academy***.

FINDING: Previously, no vehicle (*i.e.*, agency, NGO, etc.) existed that was tasked to implement the Recommendations made above (development of database, directories, and manual) or to construct and deliver a broad education program targeting shoreline management issues. The EPA grant to RAE is appropriately targeted at all of these needs.

RECOMMENDATION: The Committee supports the use of the RAE ***Living Shorelines Academy*** as the appropriate vehicle to implement the Committee’s education and outreach recommendations, either as the lead agency or in cooperation with any other entity undertaking similar tasks on a coordinated basis (*i.e.*, not duplicating work), specifically including:

- (1) Build a national repository of peer-reviewed scientific, engineering, and policy materials;
- (2) Provide online training and educational materials for the design and implementation of living shoreline projects; and
- (3) Conduct in-person training through regional workshops and national technology transfer meetings.
- (4) Coordinate the development of training materials and the conduct of information campaigns to assure consistency in message and goals.

Although numerous organizations work on various living shorelines activities, these activities are occurring mostly at the local or state levels. The Living Shorelines Academy should reach out to and engage the diversity of stakeholders that are already involved, or who should be involved, in managing and protecting the economic and environmental values of our nation’s

estuarine shorelines to bring these efforts together and integrate them at the national level. The Academy should be built upon these local and regional efforts, including a National Academies of Science study titled “*Sheltered Coasts*”, the Smithsonian Environmental Research Center workshop on living shorelines, results from the Mid-Atlantic Living Shorelines Summit, and numerous local initiatives in North Carolina, Virginia, Delaware, New Jersey, Alabama and elsewhere. Groups and agencies that have experience in living shorelines [e.g., VIMS, GOMA, GSAA, SELC] need to become part of the support network for this online site to provide the information it will need to function. Coordination of an overall education plan by the Academy would also assist federal, state and NGO grant sources in targeting their grants appropriately with a deliberate, coordinated plan to address the existing Obstacles to living shorelines.

The Academy should incorporate opportunities for voluntary restoration and protection of estuarine shorelines. It should address this need by:

- Providing targeted online and in-person outreach and training for key citizen or non-profit organizations on the benefits of voluntary wetland restoration, protection, and improvement activities to help overcome barriers in carrying out these types of activities.
- Developing work groups, processes, and mechanisms to enhance collaboration efforts with multiple parties (including land trust organizations, state wildlife agencies, local governments, tribes, agriculture agencies, etc.) to share knowledge and information.
- Improving approaches to reduce shoreline hardening and enhance coastal resiliency using nature-based solutions such as coastal marsh restoration or living shorelines.

In addition, the Academy should seek to enhance the regulatory programs that govern the use of estuarine shorelines throughout the nation by:

- Providing technical assistance and training to non-federal stakeholders on the CWA section 404 permitting process related to living shorelines.
- Developing a new mechanism for coordinating wetland protection and enhancement across regulatory agencies and levels of government focused on living shorelines.
- Developing educational tools and procedures to help state/tribal/local government programs to fill the gaps in federal protection on the basis of their own priorities.
- Developing tools and guides to incorporate the use of living shorelines into broader watershed planning and watershed management goals and to reflect on the contribution of living shorelines to the broader aquatic ecosystem.
- Supporting a sustained discussion forum on the use of living shorelines under state, tribal and local CWA section 401 authority.

Key steps to ensure the long-time success and usefulness of the Academy include:

1. Developing an on-going source of funding to run the Academy after the three year grant from EPA is over. User fees should be charged for some aspects of the services provided as a way to continue to operate the site in perpetuity.
2. Establishing a team of professionals to run the site.
3. Constantly updating the Academy web site.
4. Maintaining a Living Shorelines Academy portal with: (a) searchable databases of peer-reviewed and “gray” literature, and professional listings; (b) capacity for training modules that will include, at a minimum, key concepts, supplemental topics, “current news” and archived webcasts; and (c) a living shorelines project map organized by state with descriptions and images.
5. Planning and hosting regional in-person “classroom academies” with partner organizations or government agencies around the country on a periodic basis.
6. Organize and host national living shorelines technology transfer meetings as part of the RAE national summit.
7. Continue Living Shoreline Summits (on the model of the 2013 Mid-Atlantic Living Shorelines Summit) to promote the advancement and sharing of knowledge and innovation in the use of living shorelines.

The Academy addresses a major gap in existing environmental management efforts in many states where extremely valuable natural habitat is being degraded by ill-conceived shoreline management practices such as vertical bulkheads. In addition, it will help waterfront landowners appreciate that living shorelines enhance the economic value of their shorelines by providing a good management strategy that accommodates both their landowner activities and the natural values of waterfront habitat. Getting the Academy operational and working will represent a huge step forward in addressing the education and outreach needs identified by the Committee for living shorelines.

C. Strategy 2: Regulatory Reform

1. General. In many jurisdictions, property owners can readily obtain permits for installing bulkheads while permitting living shorelines remains an ongoing challenge. This permitting preference for hardened structures exists because of outdated assumptions about the long term efficacy and environmental effects of shoreline management systems—hard and soft. Scientific and engineering advances have outpaced our regulatory programs. Both state and federal systems need to reform shoreline permitting so that, at a minimum, “all estuarine shoreline stabilization structures are subject to comparable application and evaluation processes.”⁴⁰ Federal, state, and local regulation should be coordinated for consistency and predictability and should consider system-wide impacts beyond the parcel being permitted. Finally, incentives for living shorelines (and dis-incentives for hardened structures) should be developed that promote the goals of sound estuarine management and recognize the broader system values created by living shorelines.

⁴⁰ Lisa Schiavano and J. Kalo, eds., Management Strategies for North Carolina Estuarine Shoreline (2014), North Carolina Sea Grant, and N.C. Coastal Resources Law, Policy, and Planning Center, Final Recommendations, p.xi. Available at http://ncseagrant.ncsu.edu/ncseagrant_docs/products/2010s/estuarine_shoreline_report.pdf.

FINDING: Federal and state permitting of hardened shoreline stabilization structures generally and the Nationwide Permits (and in some states Regional General Permits) issued by the U.S. Army Corps of Engineers in particular do not adequately consider the state of current science about the cumulative, long-term negative impacts of these structures on aquatic systems and water quality and the relative benefits of softer structures.

RECOMMENDATION: The Committee supports the development of permitting regimes that reflect current science and engineering for estuarine systems, that coordinate federal, state, and local permitting schemes, that consider the broader impacts of shoreline management decisions beyond the single parcel being permitted, that provide appropriate incentives for better shoreline management, and that yield more consistent and predictable outcomes.

Reformation of the regulation of shoreline management is directly related to overcoming each of the Obstacles identified in this Report:

- Reliance on the existing regulatory systems in the face of contrary scientific evidence is the primary manifestation of Institutional Inertia impeding the broader use of living shorelines.
- The current regulatory scheme, by focusing on only the parcel at hand, is fatally flawed. Only by reforming how regulatory decisions are made can the appropriate consideration of a broader ecosystem context be brought to bear on shoreline management decisions.
- The Variability of shorelines dictates that blanket reliance on nationwide permits is no longer defensible and that a more site-specific, hierarchical regulatory inquiry be the basis for permitting.
- By reforming the regulatory system to one that is more comprehensible to the public and directly responsive to the goals of environmentally sound management of estuarine resources we can help assure the emergence and coalescence of Effective Advocacy for living shorelines.

Reformation of the regulatory system is also a critical element in accomplishing each of the other Recommended Strategies discussed in this Report:

- Regulatory reform will promote a better understanding of the true environmental impact of hardened structures and the relative benefits of living shorelines by focusing the permitting process on those issues. Providing incentives for living shorelines will likewise be a powerful education and outreach tool.
- Successful regulatory reform will be dependent on increasing the institutional capacity of both the regulatory entities and the professionals (designers, consultants, constructors) that directly interface with them.
- To achieve a permitting scheme that addresses the full array of shoreline management issues in a broader planning context and does so in a coordinated way at the federal,

state, and local levels will require government agencies at all levels to collaborate and lead by example.

With these broad parameters for regulatory reform in mind, the following are the Committee's specific Findings and Recommendations for elements of needed regulatory reform.

2. System Preference. The EPA developed CWA § 404(b)(1) guidelines, which establish the environmental criteria for evaluating a project under the federal wetlands permitting program.⁴¹ The § 404(b)(1) guidelines require the selection of a practical alternative that is the least damaging to the environment. Since it is now clear that living shorelines are generally the least damaging management alternative, hard stabilization should not be used if living shoreline methods are practical—provide equal or better erosion control and are cost-effective, considering the real total cost over time.

FINDING: Living shorelines are generally the least damaging to the environment alternative and are generally practicable in most estuarine settings.

RECOMMENDATION: In any permitting scheme, hardened structures should be a last resort, only available if softer methods are shown to be ineffective or impractical.

3. Rejection of blanket reliance on federal nationwide and regional general permits. The current over-reliance on federal nationwide and regional general permits, especially NWP 13 for bank stabilization (allowing the installation of bulkheads up to 500 linear feet), is no longer sound. The variability and site-specific nature of designing appropriate management measures weighs against the use of sweeping use of nationwide permits and suggests at least regional permits applicable to similarly constituted estuarine systems. The Corps previously concluded that the hardening activities authorized by NWP 13 (as well as in some states its Regional General Permits for bulkheads and riprap) have minimal environmental effects, both cumulatively and individually. However, current science shows that the cumulative effects of hardening our shorelines have documented detrimental effects to our estuarine systems and water quality, which the current broad use of NWP 13 fails to take into consideration. Based on this evidence, a challenge to NWP 13 was recently filed in federal court by three conservation NGOs. See Appendix B. This suit could materially affect the living shorelines community.

For these reasons, use of Nationwide Permit 13 for estuarine bank stabilization (as well as closely aligned regional permits in some Corps Districts) should be revisited. Nationwide permits are renewed every five years. Nationwide Permit 13 has been routinely reauthorized by the U.S. Army Corps of Engineers for the past couple of decades. The next renewal provides an opportunity to raise awareness of these issues through targeted outreach campaigns led by the non-profit conservation community. In addition, the review process provides the opportunity for public comment. The non-profit conservation community will be well poised to provide informed commentary and rationale for revising NWP 13 during the review process. As other constituencies become better informed about the impacts of hardened structures and the benefits of living shorelines, those constituencies should likewise make themselves heard in the review process. The Committee believes that review of NWP 13 should lead to a more hierarchical

⁴¹ 40 C.F.R. 230.

approach (such as an NWP that contains different levels of review tied to site conditions and design elements). In the interim, states should also consider using their coastal consistency review authority under the Coastal Zone Management Act to restrict or condition the use of federal nationwide permits for shoreline stabilization in bays and estuaries within their respective jurisdictions.

FINDING: The current broad application of NWP 13 and in some states regional general permits for bulkheads and riprap is not consistent with the mandates of the CWA and is not supported by current scientific data.

RECOMMENDATION: When NWP is next reviewed, the underlying assumptions about secondary and cumulative impacts of hardened structures should be re-examined, which, the Committee believes, will lead to substantial revisions and adoption of more hierarchical criteria for the evaluation of bank stabilization projects.

4. Coordinated Permitting. There is currently a hodgepodge of regulatory schemes that vary widely from jurisdiction to jurisdiction. This leads to confusion, misinformation, and mistrust.

In addition, the current regulatory schemes do not acknowledge or attempt to coordinate with other important and directly related executive and legislative priorities. For example:

- Executive Order 13508 (May 12, 2009): Chesapeake Bay Protection and Restoration. This initiative has many components directly related to living shorelines, including developing better shoreline management techniques and protecting the health of this unique estuarine system.
- Executive Order 13514 (October 8, 2009): Federal Leadership in Environmental, Energy, and Economic Performance. While this initiative is primarily focused on clean and sustainable energy, it also directs agencies to “promote pollution prevention and eliminate waste by...appropriate landscape management practices” and “advance regional and local integrated planning by...coordinating with regional programs for Federal, State, tribal, and local ecosystem, watershed, and environmental management”.
- Executive Order 13547 (July 22, 2010): Stewardship of the Ocean, Our Coasts, and the Great Lakes. This Order is directly focused on the health of coastal communities and endorses the use of ecosystem-wide planning tools.
- Executive Order 13554 (October 8, 2010): Establishing the Gulf Coast Ecosystem Restoration Task Force.
- The President’s Climate Action Plan (June 2013).
- Executive Order 13653 (November 1, 2013): Preparing the United States for the Impacts of Climate Change.

- Report of the Interagency Task Force on Carbon Capture and Storage (August 2010).
- Final Recommendations of the Interagency Ocean Policy Task Force (July 19, 2010).
- National Ocean Policy Implementation Plan (April 2013).

Each of these documents lends support to the principles that shoreline and estuarine health are linked and should be managed holistically. The current permitting of shoreline management systems ignores all of these mandates for change in the way we manage these resources.

To be successful, a coordinated federal/state regulatory permitting system that is based upon the latest and most up-to-date science is urgently needed. This means that a new system of permitting needs to be designed that will result in the routine and widespread use of living shoreline type stabilization measures in locations where such measures are found to be equally or more economical, practical and effective than traditional hard stabilization methods.

Coordinated permitting efforts can be accomplished in several ways. At the federal level, the possibility of an MOU between the many agencies affected by living shoreline issues (EPA, Corps, DOD, DOI, DOC, etc.) should be explored, especially in light of the other federal priorities listed above which are currently unaddressed in shoreline permitting. At the state/federal interface, many jurisdictions have already implemented a joint permitting process for shoreline projects as a means to coordinate project review. States may also work with federal regulators to develop regional general permits for living shorelines installations.

FINDING: The current mélange of permitting systems across jurisdictions is inefficient and in many cases counter-productive to the use of better shoreline management techniques. It retards the spread of a broader understanding of the principles of sound ecological management of shorelines.

RECOMMENDATION: Federal, state, and local regulatory agencies should work toward a unified permitting system for living shorelines that yields consistent and predictable outcomes.

5. Development of Regional or Estuary-Based Shoreline Management Plans.

A regional or estuary-based shoreline management plan is, in the Committee's opinion, the best overall strategy. It addresses the deficiencies discussed above (V. C.) inherent in the current myopic site-specific permitting approach (understating the broader negative impacts of hardening and the values created by living shorelines beyond the specific site). It provides greater planning flexibility where habitat loss is unavoidable by using living shorelines as a vehicle to deliver mitigation benefits. Consideration of a system-wide context will not always favor living shorelines. At certain sites, consideration of the natural site (orientation, fetch and shoreline type) and other existing shoreline management systems, especially on neighboring parcels, may lead to concluding that little habitat and erosion control improvement can be

realized with a living shoreline. In such a case, it is better to direct those resources to the area of the estuarine system that can best be benefitted by living shorelines.

Estuary-based planning would extend across jurisdictions, thereby encouraging cooperative management at the federal, state, and local level. This holistic approach would provide ample opportunity to coordinate permitting. It would provide a centralized information hub for shoreline management information within the region. All of the benefits, and all of the challenges, of watershed-based permitting for stormwater laid out in the 2008 National Research Council Report⁴² apply equally to regional shoreline permitting.

The Committee would like to see states and local governments develop regional or estuary-based shoreline management plans that help identify the preferred shoreline management option in advance of any permitting processes. The Committee realizes this approach is an ambitious undertaking. It is unrealistic to believe that a regional shoreline management planning system can be accomplished by a strictly top down federal mandate. However, other cooperative management programs (*e.g.*, the US Regional Fishery Management Council) may serve as models. Federal regulatory support for state and local initiatives will promote the implementation of a comprehensive estuarine shoreline management program. The goal of comprehensive planning must be pursued through building a constituency and educating the stakeholders about the long-term economic and ecological advantages of protecting an estuary through coordinated shoreline management.

Success of this management approach would be dependent on voluntary participation by the various jurisdictions. Smaller scale shoreline management plans like those undertaken in Washington and the VIMS Comprehensive Coastal Resource Management Portal⁴³ may provide a starting point to work towards larger regional plans.

FINDING: Protection of estuarine and aquatic resources requires decision-making that considers the environmental consequences of cumulative decisions and impacts beyond the boundaries of a permitted project. Approaching management of these resources from an ecosystem rather than political jurisdiction perspective is therefore necessary.

RECOMMENDATION: The Committee supports the development and adoption of estuary-based (or other natural system based criterion) plans for the regulation and permitting of shoreline management systems. Where necessary, inter-jurisdictional MOUs for this purpose should be adopted.

6. Encourage State Regulatory Leadership to Promote Living Shorelines.

The Committee encourages states to use their existing regulatory authority to promote the use of living shorelines over hardened structures where appropriate. Several states have already embraced this approach of discouraging hardened structures. For example, as increased amounts of shoreline became hardened in Maryland, and the negative impacts to fisheries and estuarine ecosystem services became apparent, Maryland rejected the ease of access to hardened structures

⁴² “Urban Stormwater Management in the United States,” A Report of the National Research Council, 2008, p. 387 *et seq.*

⁴³ <http://ccrm.vims.edu/ccrmp/index.html>

otherwise available under Nationwide Permit 13. In response, the Corps cooperated in developing regional or general permits that favored living shorelines and “leveled the playing field” by making living shorelines more attractive and hardened shorelines harder to obtain without sacrificing appropriate review of living shoreline projects.

In addition, local governments around the country have restricted the use of hardened structures within their communities by adopting local land use controls as part of their land use code. For example, Kent County, Maryland adopted a shoreline policy that requires property owners considering installation of hardened shoreline armor to demonstrate that a living shoreline would be inappropriate for that site.⁴⁴ Similar measures have been adopted by Brevard County, Florida⁴⁵ and Fairfax County, Va.⁴⁶ The Hawaiian counties of Honolulu and Kaua’i have also used local authority to protect natural shorelines.⁴⁷

FINDING: States are well situated to evaluate the cumulative impact of broad reliance on NWP 13 on their local estuarine systems and curtail the use of hardened structures where appropriate.

RECOMMENDATION: State and local regulatory agencies should review and re-evaluate the availability of NWP 13 in their state/local permitting schemes.

7. Living Shoreline Incentives

The Committee also encourages the development of positive incentives for the use of living shorelines. Some states have developed regional general permits for living shorelines (albeit without restricting the use of bulkheads). Although bulkheads are still permitted, property owners seeking living shorelines now have an easier permitting process, meaning that permitting living shorelines becomes less of a regulatory barrier.

Other more direct incentives are being developed. Maryland and Virginia have studied and are now on the verge of approving a system under which TMDL credits will be granted for the permitting of living shoreline projects, recognizing the water quality benefits of living shorelines.

Living shoreline permit applications could be given time preferences such as expedited treatment, longer permit terms, and phased development. As institutional capacity is increased at the regulatory agencies, application technical assistance (*e.g.*, project design) could be offered. Considering the growing body of data about the superior performance of living shoreline structures in storm and flood events, it is logical to develop incentives for landowners to use living shorelines, such as FEMA recognizing living shorelines and estuary-wide planning systems as a factor on its Community Rating System, which could result in lowering insurance rates.

⁴⁴ Kent County, Md., Code § 6-3.10.

⁴⁵ Brevard County, Fla., Code § 62-3661.

⁴⁶ Fairfax County, Va., Code Ch. 116.

⁴⁷ Honolulu County, Haw., Code § 23-1.8; Kaua’i County, Haw., Code § 8-27.2.

Conversely, disincentives for hardening should be used. Given the evidence of secondary impacts, increasing the mitigation ratios for hardened structure projects seems appropriate. Also, by giving priority to processing living shoreline permits, a disincentive for hardened structures necessarily results since those permit applications will go to the back of the line.

Financial incentives should suggest themselves based on identifying (and, where possible, quantifying) the values contributed by living shorelines, which leads naturally to shifting some of the cost of living shorelines (probably through regulatory schemes) to the constituencies benefited by those values. For example, protection of estuarine habitat directly benefits and supports sport and commercial fishing interests, and a portion of their license fees could be directed to monetary living shoreline incentives. Municipal water quality improvement projects should recognize the pollution abatement values provided (and hence the cost savings afforded the municipality) by living shorelines installations and subsidize those installations accordingly.

Living shorelines are not only necessary to protect our estuaries, they are a proven valuable tool in restoring systems that have been degraded. Without incentives—whether regulatory or financial—for broader use of living shorelines, it will be difficult to implement the number of living shoreline projects necessary in some locales to make meaningful progress toward ecosystem restoration.

FINDING: Because of institutional inertia, incentives—positive and negative—are necessary to promote the use of living shorelines. Assessing the value of living shorelines and finding ways to link those values to the constituencies benefited is one method to fund monetary incentives.

RECOMMENDATION: Regulatory agencies should adopt dis-incentives to the use of hardened structures and incentives for the use of living shorelines. Incentives may be administrative (preference in processing priority and technical support in design) as well as monetary (cost-sharing for design, construction, monitoring, or maintenance expenses).

D. Strategy 3: Improving Institutional Capacity

The variability of shorelines and the challenges presented by system-wide evaluation of the impacts and benefits of various management options requires a body of trained and knowledgeable professionals to design, construct, and permit shoreline management systems that are effective and that protect and maximize the values of that estuarine system. Increasing the capacity of the shoreline constituencies, primarily through education, will likewise support the changes necessary for meaningful regulatory reform and will promote broader advocacy for living shorelines.

The primary constituencies facing capacity challenges are the design/build private companies and the regulatory agencies--federal, state, and local.

FINDING: The design, construction, and regulatory constituencies involved in shoreline management do not currently have the institutional capacity to implement significantly broader use of living shoreline techniques.

1. Private Sector Capacity

RECOMMENDATION: Education about the techniques of living shorelines, their advantages and efficacy, and the economics of efficient design/implementation is the primary tool for increasing capacity in the private sector.

This carries the added benefit of promoting broader knowledge of living shorelines among waterfront landowners, who often turn first to the private sector professionals for shoreline management advice. All of the subjects listed in the earlier section on recommended Education and Outreach should be included. Targets for this education include design and landscape architect professionals, contractors, plant suppliers, and construction materials suppliers. In addition, a better understanding of the economics of living shorelines and the potential for jobs related to their design, construction, monitoring, and maintenance should promote a broader support in the private and public sectors.

As discussed earlier, the Committee believes that the Restore America's Estuaries Living Shoreline Academy is the best suited institution to take the lead in developing a comprehensive education program tailored to each of the affected private sector constituencies. In addition, the Committee supports encouraging higher education institutions to incorporate the growing body of scientific knowledge about living shorelines in undergraduate and graduate curricula related to environmental science, marine science, landscape design and architecture, water and wetlands science, and conservation.

In addition to basic, broader education, the Committee believes that the capacity of both private and public sector institutions can be increased by specialized training leading to professional certifications similar to those recognized in related fields (master gardener, wetlands delineation scientists, master naturalists). For example, completion of a basic (*e.g.*, 4 day workshop) course in design, construction, and monitoring for functional analysis could result in the designation of Living Shoreline Professional in Training, which would lead, with additional documented work experience, to Living Shoreline Professional Certification. Maintenance of a directory of such certified professionals could expand the use of living shoreline techniques.

Such professionals would maintain their currency through continuing education and re-certification programs. Continued education should focus on the full array of knowledge and skills that regulators and contractors will need to plan, design, permit, build and maintain shoreline projects. Included in this training should be guidance on business models private contractors can use that provide an on-going client relationship with shoreline property owners to help to ensure long-term maintenance of projects.

RECOMMENDATION: A course of study for the certification and continuing education of one or more levels of Living Shoreline Professionals should be developed by the Living Shoreline Academy.

Finally, the private sector capacities can be increased by partnering with NGOs and other volunteers. A demonstration living shoreline project was installed at Beaufort, SC Marine Air Station using (truly) volunteer, off-duty Marines to install oyster bags. The examples of NGOs providing volunteer labor and lowering construction costs for living shoreline projects are

myriad. By utilizing these resources, the economics of living shoreline projects are enhanced while providing significant public education and expansion of advocacy base opportunities.

RECOMMENDATION: Installation of living shoreline projects should deliberately target the use of volunteers both for economic benefits and to provide public education and expansion of the advocacy base.

2. Public Sector Capacity

Regulatory agencies face a number of capacity problems. Additional regulatory capacity with specialized skills will be needed for:

- Initial design approval, because living shorelines are necessarily site specific;
- Consideration of system-wide impacts and benefits; and
- Monitoring of completed living shorelines, which is recommended to assure proper maintenance and long-term efficacy of the structure as well as advancing the science of living shorelines.

Less reliance on standardized, nationwide permits will further increase the regulatory workload.

The Committee surveyed thirteen states⁴⁸ to try to better understand their regulatory structures, staffing, and permit loads related to all types of estuarine bank stabilization projects. Some states handle permits for estuarine shoreline stabilization in the same manner that they regulate all coastal development projects, while several have designated staff that specializes in estuarine shoreline management. All states surveyed have worked out a joint permit program that satisfied both federal (Clean Water Act) and state regulatory requirements. Every state surveyed except N.C. requires detailed permit applications for all types of estuarine shoreline bank stabilization projects (N.C. is the only state that does not have a permit application for hard stabilization general permits). Except for N.C. (which issues general permits for hard stabilization without a waiting period), the time it took to process complete permit applications ranged from a couple of weeks to over a year. While all states surveyed consider the number of permit applications they review for estuarine bank stabilization to be significant each year, the actual number of permits issued varies quite dramatically from about 75 permits a year to thousands. The number of regulatory staff in place to handle permit applications varies based upon the number of applications received each year.

Based upon this survey and its experiences with planning, designing, permitting and building living shoreline projects, the Committee recommends that regulatory agencies increase their capacity by two methods:

- Improve the capacity (*i.e.*, skill set) of the existing staff; and

⁴⁸ States surveyed included Maryland, Virginia, Delaware, South Carolina, North Carolina, Rhode Island, Georgia, Florida, Mississippi, Alabama, Texas, Massachusetts, and Washington.

- Improve the efficiency of the current staff by specialization and task standardization.
- Staff capacity:

RECOMMENDATION: Education about the techniques of living shorelines, their advantages and efficacy, and the economics of efficient design/implementation is the principal tool for increasing capacity of the existing regulatory staff. The Living Shorelines Academy could provide the basic education elements necessary for this training, and it could be provided by specialty.

- Staff efficiency:

RECOMMENDATION: Regulatory agencies should develop specialization plans for their permitting staffs.

- (1) Regulatory agencies should designate adequately trained staff to handle estuarine shoreline permit applications. At least some staff members should become certified professionals in estuarine shoreline management methods using the continuing education and certification courses that have been recommended as part of the Living Shoreline Academy.
- (2) Individual permit applications for *all* forms of estuarine shoreline stabilization are essential to provide the work sheet data necessary to determine the most appropriate type of stabilization method for a specific shoreline.
- (3) Web based permit application tools and permit databases need to be used to enable applicants to use a structured process to identify the best bank stabilization option for their site, and to help regulators evaluate permit applications and periodically check up on permitted sites to ensure proper maintenance.
- (4) Some fast track permit review times are recommended for projects that use conventional and proven living shoreline designs.
- (5) Site inspections (for monitoring) should occur when regulators are out in the field reviewing other new permit applications to the extent practical.
- (6) Permits for all estuarine shoreline stabilization should have a renewal date of at least ten years to ensure that sites are re-evaluated based upon current shoreline conditions.
- (7) As state agencies develop the needed expertise, they should affirmatively offer that expertise to local agencies also involved in permitting decisions, especially concerning their power to require landowners to justify hardened projects.

- Agency partners:

RECOMMENDATION: Regulatory agencies should encourage and cooperate with the development of expertise in the private sector living shoreline constituencies to leverage regulatory capacity.

Other regulatory programs are experimenting with partnering with the private sector, especially where specialized knowledge is important and the threat of loss of regulatory recognition of the private actor's eligibility acts to motivate compliance. For example, the North Carolina Inactive Hazardous Sites Branch allows the use of private Registered Environmental Consultants to implement and oversee voluntary remedial actions at low priority sites.⁴⁹ The state agency retains the right to spot audit individual projects.

The Committee considered and rejected recommending some level of similar partnering with private sector constituencies as a formal part of the permitting process. However, with the development and certification of Living Shoreline Professionals, the capacity of the regulatory agencies could be significantly expanded by reasonable and judicious reliance on the expertise already engaged by the landowner in the design and construction of the project. Accordingly, these agencies should actively promote all education efforts targeted at the private sector constituencies, especially programs that focus on the requirements of the permitting process. The Committee is not recommending outsourcing the permitting function to the private sector—just the judicious recognition of the value of their efforts in a necessarily more complex regime.

3. Targeted Capacity Funding

RECOMMENDATION: Public and private funding of living shoreline initiatives should give high priority to increasing institutional capacity.

Capacity demands, and their related education demands, are among the most immediate challenges to wider use of living shorelines. While funding demonstration living shoreline projects is beneficial on a number of fronts, there should also be a targeted effort to utilize funds to expand institutional capacities.

E. Strategy 4: Government Agencies as Role Models

FINDING: Government at all levels can benefit from the broader use of living shorelines and therefore will benefit by being an active advocate for their use.

As discussed earlier, current research demonstrates the many benefits to clean water and healthier estuarine ecosystems flowing from the use of living shorelines instead of continued hardening. The values generated for the public – clean water, healthy fisheries, superior recreational resources, improved property values (and tax base) – are all matters that should be of significant import to government at all levels. In addition, the use of living shorelines as a method of complying with TMDL mandates (as is about to happen in Maryland and Virginia) is an example of a direct benefit to the public agencies charged with achieving compliance with the Clean Water Act, and therefore of direct economic benefit to the taxpayers of that jurisdiction.

⁴⁹ <http://portal.ncdenr.org/web/wm/sf/ihc/recprogram>

RECOMMENDATION: The use of public lands as living shoreline sites should be actively promoted at all levels.

A living shoreline project on public lands offers an opportunity to be a role model in advancing awareness of and knowledge about living shorelines. Installation of living shoreline projects can frequently involve the use of volunteers, and local governments, military installations, and NGOs can work together to coordinate these efforts. Department of Defense facilities are already under mandates to assess and plan for the effects of climate change, and coastal facilities thus provide a natural vehicle for living shoreline demonstrations and innovation.

A good model for how government agencies can serve as a role model in advancing better environmental stewardship is how the federal government promotes the use of Low-Impact Development (LID) practices for federal construction projects. Beginning in the Bush Administration, the Department of Defense adopted a formal policy that required the use of LID measures when practical in all defense related construction projects. Congress then enacted the Energy Independence and Security Act of 2007 that expanded this LID mandate to any federal land development projects. Until passage of the Act, most federal construction projects relied on old fashioned stormwater measures that most stormwater experts agreed are not fully adequate to protect the nation's water resources.⁵⁰ Once the federal government became a role model in how to use LID, this method of stormwater management became a much more commonplace development practice for private developers, cities, and state government agencies as well.

RECOMMENDATION: The Committee recommends that federal, state and local government agencies adopt formal policies and guidance that promote and support the use of living shoreline management measures on all publicly owned estuarine shorelines.

This should include parks, refuges, military bases and training grounds, and any other publicly owned waterfront property. The policy should reflect how best to manage an estuarine shoreline based upon the types of shoreline in public ownership.

To help to advance this recommendation, the Committee further recommends that:

- (1) The Southeast Regional Partnership for Planning and Sustainability (SERPPAS) continue its leadership role in promoting the use of living shorelines on military installations in the Southeastern U.S. SERPPAS should work with its principals to devise recommended living shoreline management policies for its participating partners. In keeping with the leadership role that DOD played in promoting the use of LID, the goal should be to explore encouraging similar leadership by DOD on the use of living shorelines on all military installations when they are the best practical environmental alternative.

⁵⁰ "Urban Stormwater Management in the United States," A Report of the National Research Council, 2008, p. 102 *et seq.*

- (2) GOMA⁵¹ and GSAA⁵² should continue their advocacy of living shorelines. In particular, the GSAA proposal to develop and host a South Atlantic Living Shoreline Summit modeled on the Mid-Atlantic Summit should be pursued and supported.
- (3) Restore America's Estuaries and its member organizations should draft model policies that can be used by federal, state and local government agencies as well as not-for-profit organizations in managing shorelines they own.
- (4) The National Estuaries Programs (NEPs) should take a lead role implementing living shoreline example projects within their regions as demonstration sites for alternative shoreline stabilization options. In addition, they should also seek authorization for Regional General Permits for a suite of specific living shoreline designs which then would streamline the federal permitting process; these then could be adopted by the USACE as new Nationwide Permits.
- (5) Living shoreline projects undertaken by public agencies and non-profits should be viewed as excellent opportunities for experimentation and innovations. These shorelines sometimes provide the opportunity to test out new techniques. Innovation and testing should be encouraged on these types of shorelines.
- (6) Public sector agencies also are important data sources for developing comprehensive data repositories (maps, shoreline characterizations, planning tools). All shorelines managed by government agencies and not-for-profit organizations should be entered into the Living Shoreline Academy database, and where appropriate, made available for viewing by the public as a way to help spread awareness of living shoreline management practices.
- (7) Living shoreline projects undertaken on government and not-for-profit shorelines should be used for hands-on training opportunities for regulators and contractors whenever possible. The Academy should attempt to provide a list of upcoming projects that are going to be constructed so that interested stakeholders can ask to observe these ongoing projects if they are interested in doing so.
- (8) Local governments should set a goal of constructing a living shoreline demonstration project in each of its major watersheds.

VII. CONCLUSION

Promoting the broader use of living shorelines is critical for the preservation and restoration of the health of our estuaries. It is now also clear that living shorelines offer significant advantages to property owners and all users of the estuary that have not been widely recognized. The Institutional Obstacles that have slowed the use of living shorelines can be overcome by the Strategies recommended in this report – education, regulatory reform, building capacity, and government agencies acting as role models. The goals of each of these Strategies

⁵¹ Gulf of Mexico Alliance. <http://www.gulfmexicoalliance.org/>

⁵² Governors' South Atlantic Alliance. <http://southatlanticalliance.org/>

should also inform the public and private funding decisions supporting living shorelines so that funding systematically advances the overall goal of promoting wider use of living shorelines.

Successfully pursuing these Strategies will require a vigorous dedication to substantively reforming how we are managing our shorelines. Dedication alone will not be enough. Leadership and coordination of efforts will be necessary lest the energy necessary to effect change is dissipated. In the Committee's opinion, significant leadership can be provided at this stage by the NGO community working together in a focused way to advance these Strategies. RAE is well positioned to provide leadership on the education front through the inauguration of the Living Shorelines Academy. SERPPAS, GSAA, GOMA and others are well situated to advance the Strategy of public agencies acting as role models. All NGOs involved with shoreline issues can provide leadership in helping develop and seeking funding for targeted projects that increase capacity as well as broaden public knowledge of living shoreline benefits. All living shoreline constituencies must be involved in the effort to effect regulatory reform.

APPENDIX A

COMMITTEE MEMBERS

Todd Miller – Executive Director, NCCF (Chair)

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Todd founded the N.C. Coastal Federation in 1982 which now has 23 staff, three offices, a multi-million dollar budget, and more than 16,000 members and supporters. In 2013, he was selected as a distinguished alumnus of the University of North Carolina at Chapel Hill from which he holds an undergraduate and master's degree. Todd received The Old North State Award from the governor in 2007 and the National Wetlands Community Leader Award from the Environmental Law Institute in 2012. Todd currently serves on the Board of Visitors for the UNC Institute for the Environment as well as the chair of the Policy Committee for the Albemarle-Pamlico Estuary Partnership.

Tim Dillingham – Executive Director, American Littoral Society (NGO-Northeast Region rep)

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Tim has led the American Littoral Society since 2003. Long interested and involved in the management of estuaries, Tim started his career developing Special Area Management Plans in coastal Rhode Island, and served as a marine resources policy specialist for the state's Coastal Resources Management Council. Currently, he serves on the Advisory and Science and Technical Committees of the Barnegat Bay Partnership, and has served as gubernatorial appointee to the Highlands Water Protection and Planning Council, where he chaired the Council's Natural Resources subcommittee during the development of the Regional Master Plan required under New Jersey's Highlands Act.

Niki Pace – Senior Research Counsel, Mississippi-Alabama Sea Grant Legal Program (Policy/legal representative)

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Niki is Senior Research Counsel for the Mississippi-Alabama Sea Grant Legal Program at The University of Mississippi School of Law. She joined the Legal Program in 2009 and has over ten years of legal experience. At Mississippi-Alabama Sea Grant Legal Program, Ms. Pace works on a variety of legal education, research, and outreach activities, including providing legal research services to Sea Grant constituents on ocean and coastal law issues. In addition, she holds an adjunct position at The University of Mississippi School of Law where she teaches courses in Land Use Law, Energy Law, Oil & Gas Law, and Climate Change Law & Policy. Ms. Pace frequently presents research in these areas at interdisciplinary and legal conferences. Recent works include *Wetlands or Seawalls? Adapting Shoreline Regulation to Address Sea Level Rise and Wetland Preservation in the Gulf of Mexico* published in the Journal of Land Use and Environmental Law.

Tom Ries – Executive Vice President/Chief Scientist, Scheda Ecological Associates
(consulting representative)
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Tom has more than 28 years experience working with Florida ecosystems, specializing in habitat restoration, seagrass and vegetative mapping, as well as biotic sampling/analysis. He has designed or assisted in the implementation of over 80 habitat restoration projects in this region, including living shoreline protection alternatives. Many of these projects have won regional awards for environmental excellence. Tom received the 2013 National Wetlands Award for Conservation & Restoration from the Environmental Law Institute.

Bill Cary – Brooks Pierce (Lead writer)
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Bill has over 35 years experience representing businesses in a wide range of commercial and litigation issues, including environmental, general business litigation, and employment law. Most recently (during an extended leave from his law firm), he served as the General Counsel of the NC Department of Environment and Natural Resources (DENR). Bill currently supports the Living Shorelines workgroup of the Southeast Regional Partnership for Planning and Sustainability, a unique six-state partnership comprised of state and federal agencies that promotes collaboration in making resource-use decisions supporting conservation of natural resources, working lands, and national defense. He also works in support of the living shoreline initiatives being pursued by the Governors' South Atlantic Alliance.

APPENDIX B

NWP 13 LITIGATION

The National Wildlife Federation, the Ogeechee Riverkeeper, and the Savannah Riverkeeper filed suit October 10, 2014 in the U.S. District Court for the District of Columbia (1:14CV1701-JDB) challenging the reissuance in 2012 of NWP 13, primarily on the grounds that the permitted hardened structures “cause significant environmental damage” (Complaint ¶ 1) and the Corps “failed to adequately evaluate the environmental impact of the approximately 17,500 projects to be authorized under the permit in violation of the Clean Water Act (CWA), the Rivers and Harbors Appropriation Act (RHA), the National Environmental Policy Act (NEPA), and the Administrative Procedure Act (NPA).” (Complaint ¶ 2). In particular, focusing on impacts on the Georgia coast, the Complaint alleges that the Corps failed to evaluate the cumulative and continuing impacts of prior and future permitted hardened structures (as well as the effects of sea level rise) causing: erosion in front of and downstream of such structures; destruction of riparian vegetation; destruction of fish and wildlife habitat; and harm to endangered and threatened species.

The lawsuit seeks a declaration that the issuance of NWP 13 violated the CWA, the RHA, NEPA, and the APA, and should therefore be vacated. The suit also seeks to vacate the authorization of a specific, identified project (“Bull River Bulkhead”) and the award of costs and attorneys’ fees. The Corps’ answer is currently due in mid-December. Litigation could take 6-12 months or more.