

South Atlantic Living Shoreline Summit

Summary Report



2016 South Atlantic Living Shoreline Summit

April 12–13, 2016
Jacksonville, Florida

Hosted by
Governors' South Atlantic Alliance

In partnership with
Moffat & Nichol
North Carolina Coastal Federation

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The opinions stated within this document represent those of the presenters and the participants only. They do not necessarily reflect the views of the organizers, steering committee, or financial supporters.

Cover Photo by Vance Miller

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Preface

In September 2013 at the Annual Meeting of the Governors' South Atlantic Alliance (GSAA), discussions surfaced of the mutual interests of the states and EPA in learning more about the potential for living shorelines in the South Atlantic region. While there was recognition that the application of living shorelines is very site specific, the Mid-Atlantic Living Shorelines Summit that was hosted by Restore America's Estuaries the same year was an inspiration and highlighted the opportunity that a regional approach could provide. Working with GSAA partners and other interested representatives from academia, government, and non-profits, a Living Shorelines Workgroup identified the path forward for a larger regional discussion on the research, policy, and outreach activities needed to promote the use of living shorelines. The Workgroup agreed that the first step was to better understand the scope of living shorelines work going on in the region and, with a Wetlands Program Development Grant from EPA Region 4, planning for a South Atlantic Living Shorelines Summit was underway.

This report summarizes the proceedings that occurred on April 12 and 13 at the 2016 South Atlantic Living Shoreline Summit in Jacksonville, Florida. This was the first regional summit on living shorelines in the South Atlantic region, comprised of the states: North Carolina, South Carolina, Georgia, and Florida. The purpose of the summit was:

To share information on the management, research, regulation, and implementation of living shorelines in the South Atlantic region, by building knowledge and relationships that expand the use of appropriate stabilization alternatives to traditional shoreline hardening.

Researchers, regulators and policymakers, property owners and managers, planners, contractors, and non-profit organizations were all invited to attend the Summit and to benefit from the expertise and networking opportunities it provided. Approximately 150 people attended the Summit.

Speaker presentations and programming have been made available on the [Governors' South Atlantic Alliance website](#).

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Purpose

Kevin Claridge *Florida Department of Environmental Protection*

The purpose of the 2016 South Atlantic Living Shoreline Summit is to share information on management, research, and education advancements made in North Carolina, South Carolina, Georgia, and Florida. The summit hopes to foster discussion on these topics within the region and encourage learning from fellow practitioners and subject matter experts.

Keynote Speaker

Dr. Charles ‘Pete’ Peterson *University of North Carolina Chapel Hill*

Estuarine habitats provide vital ecosystem services, particularly as they are highly productive and provide habitat for many species. Living shorelines are one option for protecting and promoting these services and the restoration of estuarine habitats. Living shorelines can be described as shorelines that are engineered to harbor biology with their transformable, yet resilient qualities that help to provide benefits to ecosystems. Often there is difficulty in explicitly defining living shorelines because government agencies have varying definitions. For example, some agencies may use the expectation of colonization as enough to consider a structure a living shoreline. Thus, when defining living shorelines, the following should be considered:

- Whether the structure restores the natural habitat of “ecosystem engineers,” such as: replanted coastal marshes, mangroves, oyster reefs, and seagrass. In particular, research on the structural function of seagrass should be expanded.
- If the structure is non-natural, whether its associated biota stabilize shorelines and create ecosystem services.

In addition, there is a need to reconsider the management and design strategies of living shoreline projects. However, this can be difficult due to the limited research available. The technical basis of designing the structure of a living shoreline includes:

- Engineering performance of living shorelines
- Sedimentary geology in response to living shorelines
- Biology, ecology, and economic valuation of living shorelines

The science of living shorelines is incomplete and needs to be expanded, specifically regarding ecosystem services and structural durability of living shorelines to wave energy and water levels. The following research gaps exist:

- Economic costs associated with different erosion protection structures, as well as costs of maintenance and costs of reversibility if the project must be removed
- Performance during storms of different magnitude and duration
- Recreationally and commercially important nekton usage
- Nekton behavior changes
- Structural complexity and marsh sill configuration affecting fish usage

More information on the ecosystem services of coastal marshes is available in the *2005 Millennium Ecosystem Assessment Report: [Ecosystems and Human Well-being: Wetlands and Water](#)*, which includes material on food web support, water quality improvement, hydrologic services, shoreline stabilization, carbon sequestration, and storm buffers. Oyster reefs provide a number of ecosystem services and it may be possible to incorporate oyster reefs in nitrogen mitigation banks similar to wetland mitigation banks. Sea level and climate change are currently impacting shorelines across the Southeast; thus, the Governors' South Atlantic Alliance serves an important purpose.

Status of Management and Implementation of Living Shorelines in the South Atlantic Region

Moderator: Melody Ray-Culp

Panel: Daniel Govoni, Dr. Denise Sanger, Jan MacKinnon, Kent Smith

Currently, each state has varying degrees of implementation strategies and design methods for developing living shoreline projects. At the summit, there was an overall consensus by panelists that focus should be placed on improving and simplifying the permitting process. The permitting process for living shorelines is slower and more difficult than the permitting of conventional hardened structure projects, which can be an inhibiting factor. However, revising or developing new regulations and standards will likely be a complex process as living shoreline project designs can vary greatly.

In order to develop regulations and standards, further research on the ecological and economic impacts will be critical. More research regarding how designs perform under different wave energy regimes will be an important component to monitoring and data reporting. Monitoring is an important component to living shorelines, and thus, long term funding for monitoring programs should be included in funding proposals. Additionally, developing relationships with



coastal scientists and universities has become a significant resource for many states. There is hope that, with more outreach and interest from contractors and private property owners, living shorelines will become a common alternative for shoreline management.

Daniel Govoni *North Carolina Department of Environmental Quality*

North Carolina emphasizes the use of a suite of options for shoreline erosion control that maintain existing connections between upland, intertidal, estuarine, and aquatic areas. These alternatives are necessary for maintaining good water quality, ecosystem services, and habitat values. In North Carolina, wetland plantings do not require a permit if no fill is needed.

North Carolina Permits fall into two categories:

- *Major permits:* reviewed by 9 state & 4 federal agencies, including US Army Corps of Engineers (USACE) (permit issuance averages 75 days)
 - Living shorelines
- *General permits:* streamlined major permits for routine projects (permit issuance averages 5 days)
 - Marsh Sill
 - Rip-rap Revetment for wetland protection
 - Bulkhead
 - Rip-rap

Suggestions for the future:

- Continue hosting workshops designed for professional audiences, e.g. real estate professionals, marine contractors, and engineers
- Emphasize outreach, regulatory enhancement, monitoring, financial incentives and public education
- Continue to develop [*Weighing Your Options: How to Protect Your Property from Shoreline Erosion*](#)

Dr. Denise Sanger *South Carolina Department of Natural Resources*

An idea of projects going on in South Carolina:

- 150 reef projects by S.C. Department of Natural Resources
- 6 reef projects by the U.S. Fish and Wildlife Service
- Reef projects by The Nature Conservancy
- 33 derelict crab pot reefs by S.C. Department of Natural Resources
- 8 oyster castle reefs by S.C. Department of Natural Resources

South Carolina State Permitting (S.C. Department of Health and Environmental Control's Office of Ocean and Coastal Resource Management):

- No regulations or guidance specific to living shoreline projects exist currently
- Lack of streamlined regulations results in longer review times and uncertainties about project performance (reviewed under erosion control structure regulations)
- Bulkhead and revetment permits can be obtained relatively easily because design criteria are well-known

South Carolina Federal Permitting through Army Corps of Engineers:

- General Permit from S.C. Department of Natural Resources to plant oyster shell
- Nationwide Permit 27: Restoration
- Nationwide Permit 13: Erosion Control
- Often require signs and coordination with the Coast Guard

Suggestions for the future:

- Research efforts to collaborate with science to review existing data and test new options
- Develop science-based information to make better policy decisions
- Extend successful living shoreline results through workshops and guidance documents

Jan MacKinnon *Georgia Department of Natural Resources*

Georgia experiences a unique system of extreme diurnal tides, having a tidal range between 6 and 9 feet. This is a major limitation to project time frames.

Case Studies:

- *Ashantilly, Sapelo Island, GA: 8,000 oyster bags with *Spartina* planting. Approximate cost* of \$332/linear foot.*
- *Long Tabby, Sapelo Island, GA: Extreme sloping. University of Georgia conducting monitoring of the site for ecosystem valuation study. Three treatments: (1) oyster bags with granite, (2) loose shell with granite, and (3) granite only. Approximate cost of \$346/linear foot.*
- *Little St Simons Island, GA: 2,000 oyster bags, 1,500 plants of 25 species. Private property with failing bulkhead. Approximate cost of \$367/linear foot.*
- *Skidaway Island State Park, GA: 2,000 oyster bags: bags were placed higher than mean tidal line. Current plan to modify design. Approximate cost of \$70/linear foot.*

**Costs include materials; costs do not include labor or transportation*

Permitting:

- Slow permitting process – in one instance it took 2 years to permit a living shoreline project
- USACE Nationwide 13 Permit requires a State issued Revocable License (RL), which includes a buffer variance
- USACE Nationwide 27 Permit requires a Coastal Marshlands Protection Act (CMPA) permit and a State issued Revocable License (RL), which includes a buffer variance

Suggestions for the future:

- Develop the [*Living Shorelines Along the Georgia Coast*](#)
- Report project summaries
- Conduct workshops in May 2016

Kent Smith *Florida Fish and Wildlife Conservation Commission*

In Florida, oyster sills are being used to protect mangroves and native limerock.

Case Studies:

- *McDill Airforce Base Project*: Living shoreline “muck capping” project with oyster bags. Sediment accretion and plant expansion observed.
- *Mosquito Bay Oyster Reef*: Boat wake action issues. Use of oyster mats that interlock and stabilize underlying substrate.
- *Ecocenter*: Primary focus is developing a fisheries habitat. Shoreline demonstration examples along public access walkways include: bulkhead with planting, bulkhead, terraced system, natural slope system, and bags only.

Permitting:

- State exemption for homeowners to install oyster/rock material and native plantings for small scale projects:
 - Living shorelines along private property shorelines < 500 feet
 - Plantings extending no farther than ten feet waterward of Mean High Water
 - Clean oyster shell, reef balls, concrete rubble, etc.
 - Breakwaters three feet from any seagrass beds with three-foot channel breaks every 20 feet
- Joint Statewide Environmental Resource Permitting (SWERP)
- U.S. Army Corps of Engineers Nationwide 27 Permit: Restoration



- U.S. Army Corps of Engineers Nationwide 13 Permit: Stabilization

Suggestions for the future:

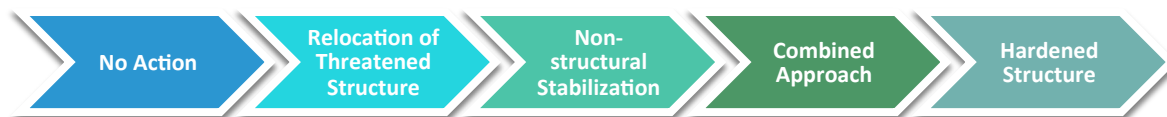
- Consider incentives to use living shoreline projects for future shoreline stabilization through permitting or property tax mechanisms
- Consider incorporating living shorelines into long term regional planning for sea level rise
- Research economic and ecological benefits and design strategies
- Reach out to private land owners and contractors through [Florida Living Shorelines](#) website

Triaging Estuarine Shorelines

**How to Identify and Use the Best Practical Alternatives
That Protect the Coastal Environment and Economy**

Tracy Skrabal *North Carolina Coastal Federation*

When considering projects that alter the shoreline, practitioners should consider maximizing the benefits to the environment and ecosystem, while still providing stabilization. Additionally, stabilization may not always be the primary priority of a site; instead, fish habitat or oyster habitat may be the priority. Practitioners should consider the *Hierarchy of Erosion Control Options*, a ranking structure of shorelines and shoreline stabilization methods developed by the [North Carolina Estuarine Biological and Physical Processes Work Group 2006 Report](#), when designing shoreline stabilization for a site:



North Carolina has a variety of living shoreline designs that can serve as examples of the many possible strategy and design combinations. Practitioners should consider the function of the shoreline and aim to preserve or restore what was originally there, while also considering field observation of adjacent natural shorelines. Land planning and vegetative control methods are important factors to consider in the development of living shoreline projects.

Living Shoreline Research: Recent Research and Development

Moderator: Eric Hughes

Panel: Dr. Rachel Gittman, Dr. Peter Kingsley-Smith, Tom Bliss, Andrea Noel

Researchers and agencies are focusing on addressing the performance and functionality of living shoreline designs, alternative materials, and the related benefits to ecosystems.

Some states are experiencing difficulty with accessing oyster shells for projects and are exploring alternative substrate materials that can promote oyster spat recruitment. Interim solutions to limited shell sources include the development of shell recycling programs or sourcing shells from other states.

With regard to effectiveness of living shoreline projects, it can be difficult to determine when to consider a project a success. As part of many living shoreline management plans, maintenance and removal procedures are incorporated to uphold accountability; however, accountability is difficult to track especially on private properties. Thus, future research should consider how to define success and the additional human benefits of living shorelines, such as harvesting energy or allowing land owners to harvest shellfish (currently harvesting from living shorelines is dependent on individual state regulations), as well as how to handle the removal of unsuccessful projects.

Dr. Rachel Gittman *Northeastern University*

Shoreline hardening: how much of the shoreline is hardened?

- Difficult to answer because the shoreline is always in flux
- Approximately 14% of shoreline in the continental US is hardened
- From North Carolina to Florida, approximately 10% is hardened

Currently, a literature review of shoreline structure effectiveness is being conducted. Preliminary findings show that there is a negative correlation between seawalls and effectiveness, that the effectiveness of riprap is undetermined, and that breakwaters possibly have positive effects.

Other findings:

- A comparison of marshes with and without sills reveals an increase in Nekton in marshes without sills (published January 2016).
- A Hurricane Irene, Before and After qualitative study shows the positive effects of living shorelines for erosion control.

Peter Kingsley-Smith *South Carolina Department of Natural Resources*

Current research includes:

- Utilizing alternative materials to create new oyster reefs, such as repurposed crab traps and oyster castles
- Evaluating reef success through oyster size and density
- Quantifying habitat valuation

Image analysis post-processing in the lab is used to determine percent coverage. Nekton use is monitored with drop net sampling. Nekton abundance, taxa richness, the Simpson index, and the Shannon index are used to analyze nekton use.

Research to be conducted between 2015 and 2018:

- Develop a comprehensive, science-based regulatory process to address the design and permitting of living shorelines (SCDHEC = end users)
- Understand the full suite of living shoreline options for South Carolina (i.e. evaluate more than just oyster-based approaches)
- Implement a comprehensive monitoring plan – identify the critical drivers of success or failure for each approach in particular environments

Tom Bliss *Georgia Sea Grant*

- Installation of living shorelines is labor intensive. Significant erosion at many sites in Georgia has required engineering and site planning, which can include the use of construction equipment and site grading.
- The tidal regime in Georgia limits the window of opportunity to install living shoreline projects at some sites.
- The Georgia Sea Grant is monitoring oyster density and vegetation coverage at Ashantilly, Long Tabby, and Little St. Simons sites. They are also experimenting with “flex cement” as a substrate.
- Observations of differences in recruitment between sites of different shoreline slope are being collected and the grant is trying to determine if slope affects recruitment and whether projects are being over- or under-designed.

Andrea Noel *Florida Department of Environmental Protection*

The Guana Tolomato Matanzas National Estuarine Research Reserve is testing the effectiveness and comparing the costs of substrates for living shorelines.

Cost comparison:*

- Conventional Naltex plastic mesh oysters bags (approximately \$0.26 per bag):

- Inexpensive, long lasting
 - Issue: 10% loss due to tearing of bags during transportation
- Coconut fiber bags (\$6.32 per bag):
 - Lasted only a year
 - Issues: monofilament lining with the bag, which was not known at the time of purchase; fibers stretch when wet
- Gabions (metal cages; \$5.50 per cage):
 - Inexpensive for the amount of coverage and surface area
 - Issues: heavy, difficult to transport
- Biolog (\$100 per log or \$10 per foot):
 - Renewable, good surface area
 - Issues: only lasted 6 months, had to clean up once burst fibers were everywhere; with securing them as they are positively buoyant
- Coconut fiber mats (\$2 per linear foot):
 - Effective base layer that helps prevent bags from sinking; plants able to grow through it
 - Issues: added to cost of project

**Costs include shipping to Jacksonville, FL; costs do not include labor or costs to access site*

Best Practices for Designing and Constructing Living Shorelines and Lessons Learned in the GSAA Region

Moderator: Jason Doll

Panel: Dr. Lexia Weaver, Tom Havens, Dough Baughman, Zachary Schang

As more living shoreline projects are being implemented, more observational knowledge and “lessons learned” are being gained on best practices in design and construction of living shorelines. Some best practices to consider in the design of any living shoreline project are site plans based on field observations of the characteristics of the site. This includes understanding the tidal cycle, vegetation characteristics, soil characteristics, and structure of adjacent shorelines, especially unaltered adjacent shorelines.

Understanding characteristics of the site will aid in determining the structural and nonstructural design components. Additionally, maintenance should be considered during project development to ensure long-term success, as living shorelines do have some level of maintenance that must be incorporated into the project schedule.

Dr. Lexia Weaver *North Carolina Coastal Federation*

Some of the techniques used in North Carolina include, but are not limited to: sills, loose shells, oyster reefs, marsh toe revetments, vegetation plantings, or some combination of these.

Projects conducted by N.C. Coastal Federation (a non-profit organization) have utilized manpower through reaching out to the local community. Volunteers come from local schools (K-12 and college), non-governmental organizations, government agencies, and even military service members.

Case Study: Jones Island

- Site Description: 1-2 foot tidal range, river delta, Hammocks Beach State Park
- Issues of scarps and bluffs;
- Installed: sills, revetments, bags
- Material source: Bought from seafood restaurants, oyster roasts and trucking companies; cost of shell has increased over time due to transportation costs; problems with using marl: bags rip and are heavy and need a trailer to transport them
- Design: use marl as base (three rows) with two layers of oyster bags (three rows)
- Results and lessons learned:
 - Saw full coverage recruitment of oyster by third year
 - Mixed vegetation plantings helped
 - Trimming blades helped with success
 - Planted 116,000 plugs; used large dibbler tool to plant 6-inch deep with plants placed six inches to one foot apart
 - The closer the plugs, the higher the success rate
 - 18 patch reefs 23,000 bushels after 1 to 2 years they were covered in oysters
 - Stagger patch yields more habitat
 - Using oyster bags as marsh toe revetments
 - Limits to the revetments: could not go outward more than 5 feet and could not be higher than 6 inches, per regulations

Dough Baughman *CH2MHill*

Understanding coastal processes is critical to the success of living shorelines and when emphasizing success, it is important to include ecological *and* economic values.

Design considerations will vary based on location, scale, and project objectives. Thus, important factors to consider when planning a living shoreline are:

- Elevation and slope
- Extreme storm event considerations



- Existing erosion rate
- Existing shore morphology
- Depth offshore
- Nearshore morphology & substrate stability
- Wave climate
- Presence of submerged aquatic vegetation (SAV)
- Tide range
- Storm surge
- Vegetation
- Sediment transport

Case Study: *Eastern Neck National Wildlife Refuge, Maryland*

- Built a living shoreline project that sunk and was not successful
- To reevaluate project design, geotechnical data was collected in order to analyze the sinking into the sediment
- Development of Storm Induced Beach Change Model (SBEACH by USACE) looks at various aspects affecting shoreline and focused on a 25-year storm event

When evaluating project benefits, consider:

- Proprietary modeling: (1) Hydrodynamic modeling, (2) water depth flood, (3) demographics economics, and (4) cost benefit analysis
- Natural and grey infrastructure needs to meet flood reduction goal
- Cost-benefit analysis with The Nature Conservancy: [How Nature-based and Gray Infrastructure Work Together to Protect Communities](#)

Tom Havens/Ed Hoffman *Coastal Civil Engineering*

Observations have been noted from installing in high impact areas with extreme tidal regimes.

In Georgia, living shoreline projects have been installed in tidal creeks, outside bank erosion, in sandy-clay soils, and on near-vertical slope. These types of shorelines typically require engineering design.

Case Studies:

- *St. Catherine's Island*: Contains archaeological site that needs to be protected
- *Burton 4H*: A lot of erosion, impacting nearby building structures. Two-layer system: oyster bags wrapped in geogrid with toe protection and then second layer of oysters, top has *spartina* planting, deadman pole at the top

- *Cannons Point*: active erosion on the curve of stream, toe protection in the water; structural base and biota at the top; geotextile did not have a problem growing and it was determined that geotextile was essential in keeping the natural soil stable

It is important to *emphasize partnerships and build relationships with landowners*.

Zachary Schang *Florida Department of Environmental Protection*

- Ecological aspects need to be addressed appropriately for a successful living shoreline project. For example, we need to plant the appropriate vegetation at the appropriate tidal level.
- Field observations are important. It is not always necessary to design a wave model to understand a site, as field observations can provide substantial information.
- Only apply living shorelines where needed and when appropriate.
- Minimize over-engineering, and keep track of the shoreline through monitoring.
- Things to consider during the site assessment:
 - Adjacent property
 - Existing vegetation
 - Fetch
 - Hidden structures
 - Invasive species
 - Marine/terrestrial wildlife
 - Orientation
 - Presence of oysters
 - Presence of submerged aquatic vegetation (SAV)
 - Salinity
 - Scarping
 - Sediment quality
 - Sediment transport
 - Shoreline access
 - Shoreline history
 - Shoreline length
 - Slope of intertidal/upland
 - Stormwater outfalls
 - Sunlight/tree shade (roots) (affects vegetation plantings)
 - Upland erosion influences
- Techniques for planting and oyster reefs:
 - Vegetation:
 - Planting depth, season, and tidal regime is important
 - Consider zonation, grading, spacing, and replanting
 - Fiber Logs: tie down logs, was successful
 - Oyster reefs:

- Move towards consolidation and alternative materials, as shell stock becomes costlier and difficult to access
- Florida does not put oyster reefs unless there is going to be settlement
- Oyster reef designed with a curve; shallow slope on water side to aid in dispersing wave energy
 - Focus on upland buffer; make sure to consider all ecosystem zones, the water to the upland, not just the immediate shoreline
- Consider networking with neighbors of homeowners, as oftentimes neighbors see what homeowner is doing and become interested.
- Previous projects have installed living shoreline projects in front of bulkheads at sites where some beach still exists. These projects have observed sedimentation occurring and have successfully been able to conduct plantings.
- Proper maintenance is important; the homeowners should understand how to take care of vegetation. Specifically, they should be educated on what vegetation is appropriate to mow, weed or remove.

Comparing the Costs Among Living Shorelines and to More Traditional Stabilization Methods

Moderator: Dr. Amber Whittle

Panel: Ed Hoffman, Tom Ries

Developing an accurate cost comparison between living shorelines and conventional hardening methods is complicated, particularly since living shoreline projects can vary greatly based on the materials and level of engineering design required. When conducting a cost comparison between the two methods for a site, the project life span and marsh valuation should be taken into consideration. Overall, living shoreline projects tend to be cheaper, add to marsh valuation, and have a comparable lifespan to conventional hardened methods.

Ed Hoffman *Greenworks, LLC.*

Cost comparisons were generated by North American Sheet Piling Association based on materials. Cost comparisons were verified from a case study of St. Simons Island, GA site installation cost.

- Wood bulkhead – \$686/linear foot
- Concreate bulkhead – \$1,022/linear foot
- Granite Rip Rap Design Option 1 – \$469/linear foot
- Granite Rip Rap Design Option 2 – \$443/linear foot
- Granite Rip Rap Design Option 3 – \$440/linear foot



- Oyster bags with recycled concrete living shoreline – \$361/linear foot

**Cost disparities based on location of the material.*

**Estimates considered cost of materials in relation to St. Simons Island. For example, granite costs more along the coast.*

Findings from the cost comparison study:

- External cost-benefit analysis finds that all methods experience loss *except* for living shorelines, which have positive gains to external cost-benefit analysis
- Living shorelines are the cheapest to install and life span costs are cheaper, as well.
- Bulkheads have high upfront costs, are expensive to maintain, and the replacement cost is nearly double due to having to remove the original structure: timber after 25 years, concrete after 30 years.
- Marsh Benefits:
 - Provision of nursery habitat for commercially and recreationally important species of shellfish and other wildlife
 - Control and dissemination of pollutants
 - Detention of surface waters and coastal storm surges
 - Maintenance of moderated stream flow
 - Transformation of nutrients
 - Sequestration of carbon
 - Retention of sediment and other particulates
 - Provision of essential fisheries and aquatic invertebrate habitat
 - Provision of waterfowl and water-bird and other wildlife habitat
 - National Wetlands Inventory and Landscape Level Functional Assessment
 - Provision of aesthetic and recreational value

Tom Ries *Scheda Ecological Associates, Inc.*

Cost-benefit analysis of living shorelines and conventional hardened structures is incredibly important to government agencies and homeowners. One size does not fit all. Every shoreline is unique and living shorelines should be engineered based on those specific features.

Case Study: *Stewart Middle School, Tampa*: Installation at school was \$95 per linear foot. Total cost of \$5,000.

Maintenance:

- *Quarterly vegetation maintenance:*
 - Consider nonnative plant removal
 - Watering of upland plants temporarily until they take hold
 - Plan to replace up to 10% of vegetation that is planted



- *Long term:*
 - Annual assessment of vegetation and removal of invasive species
 - Some vegetation only lasts 5 years and then needs to be replaced, though it should eventually become self-sustaining
 - Structure maintenance of sills, revetment, and breakwater structure
- The goal is for the structure to become self-sustaining as habitat and oyster recruitment.

Tips:

- In Florida, mangroves are a great option as they create habitat and stabilize the shoreline.
- When developing permits, be sure to include vegetation trimming and maintenance. Consider whether there are state or local regulations; for example, Florida has regulations regarding mangrove tree management.
- Use different layers of tree and scrub heights.

Promoting Living Shoreline Projects: A Recent Report on Overcoming Institutional Barriers

Bill Cary *Brooks Pierce*

The report from Restore America's Estuaries highlighted the major impediments to expanding the use of living shorelines. Familiarity with traditional shoreline hardening methods, a lack of knowledge of natural approaches, and a lack of flexibility in state and federal regulations impede movement away from hardened structures and are obstacles to the expansion of living shorelines. Regulators struggle to plan within a broader context. The overall ecosystem and economic values of living shorelines are overlooked and consideration is not given to the cumulative impacts of armoring the shoreline. There is often a lack of advocates within communities to share and promote the benefits behind living shorelines. Consideration should be given to the fact that private land owners are asked to bear all the costs of choosing between traditional shoreline hardening methods or living shorelines, when benefits from living shoreline projects are experienced at the communal level. Strategies to address the barriers to living shoreline opportunities include:

- Education and Outreach:
 - Messages should be designed based on the target audience (home owners, regulators, general public, etc.)
 - Subjects that need to be addressed: Efficacy, impacts, lower costs, values, sea level rise, directory of professionals, demonstration sites
 - Recommendations:
 - Strong web-based presence
 - Development of a centralized, reliable database



- Manual of best practices
 - Emphasis on [Living Shoreline Academy](#)
- Regulatory Reform:
 - Permitting of hardened structures does not address current science
 - State-Federal regulations are often too confusing for general public and homeowners to understand
 - Recommendations:
 - Develop coordinated permitting system that accounts for science and the site and that ranks hardened structures as last resort
 - Reevaluate the NWP 13; State should consider limiting availability of NWP 13,
 - Provide incentives
- Improving Institutional Capacity:
 - Increase education on available techniques, certifications for professionals, using volunteers on projects to reduce cost and expand public knowledge of living shorelines
 - Have living shorelines be a specialization within permitting staff
 - Use public lands for living shoreline demonstrations
 - Adopt policies and guidance that promote and support living shorelines
- Recommended Next Steps:
 - Non-governmental organizations:
 - Support and encourage innovative state regulatory programs
 - Provide leadership in moving other states away from business-as-usual
 - Provide leadership in focusing funding, education, and reform efforts on the Strategies
 - Provide leadership in identifying incentive systems and cost-shifting mechanisms
 - USACE:
 - Re-examine Nationwide Permit 13
 - Work with constituencies to develop coordinated permitting system
 - State agencies:
 - Continue living shoreline initiatives
 - Act as role model with demonstration projects, education, and policies promoting living shorelines
 - Reassess impacts of business-as-usual
 - Cooperate with other jurisdictions in developing system-wide planning/permitting methods
 - See more recommendations at [Restore America's Estuaries](#)



Living Shorelines: Federal Agency Initiatives

Moderator: Mary Conley

Panel: Dave Evans, Janine Harris, Henry Wicker, Jason Engle

Positive advancements have been made particularly in the last five years on living shoreline techniques and their regulation. Developing and implementing regulation is a complex process, especially since there are a wide variety of opinions and perspectives involved in the regulation development process. Due to this, regulatory advances occur significantly slower than scientific and technical advances. Access to studies on the ecological and economic productivity of living shorelines will aid in the advancement of regulation that benefits living shoreline projects. Presently, the USACE now considers sea level rise in the cost benefit analysis of new projects. Furthermore, legislative action such as the Climate Change Executive Order enables living shorelines to have a competitive advantage over conventional solutions. Efforts to improve inter-agency relationships and streamline procedures and regulations are currently taking place and the following programs are now available for funding, education and support of living shorelines:

- EPA State Revolving Fund: up to 20 percent can be used for estuaries and green projects.
- CWA NPDS program
- EPA Wetlands Program Development Grants are given out to regional offices for each region. There is \$500,000 for NGOs that help with wetlands restoration works.
- CWA 320 National Estuaries Program for habitat restoration and water quality
- Pre-application meetings are very important and should include as many partners as possible.
- RSM program, CAT program, Engineering and Nature Program RND
- North Atlantic Coast System Regional Study: 700 pg appendix on natural features, should be replicated for the Southeast
- Coastal Resiliency Funding RTF, regulatory rules - The earlier they are involved the better.
- Digital Coast for tools and resources
- Atlantic Sturgeon widening
 - Endangered Species Act trying to streamline with USACE in FL
 - Essential fish habitat
- Coastal Barriers Resources Act (COBRA)
 - Gives restrictions on where federal funding can be and exemptions on some projects
 - Seeks to Minimize damage to fish and wildlife resources
- Potential Nationwide Permit for Living Shorelines (comment period currently underway)

Dave Evans *U.S. Environmental Protection Agency*

- Successful interagency collaboration has highlighted the following gaps:
 - Need a better scientific understanding of coastal wetland loss
 - Need for new or revised policy to garner better coastal wetland protection and living shoreline use on the national scale
 - Need for better tools to disseminate information and to educate the general public on living shorelines
 - Need research on what methods are most successful in garnering public interest and education of living shorelines
- Limited number of programs that specifically target restoration:
 - State revolving fund (for drinking water)
 - Up to 20% can be used for estuary programs
 - Non-point source programs (319 funds)
 - Grants for demonstration projects to build capacity
 - Support via Section 320 National Estuaries Program – habitat restoration, water quality, etc.
 - Living shoreline projects are becoming increasingly successful at accessing funding
- States have the ability to establish additional requirements on Nationwide Permits and Regional General Permits in order to modify regulatory scrutiny as appropriate on a state level.
- Floodplain Management Executive Order gives preference to natural structures over hardened structures and therefore provides regulatory rationale for living shorelines.
- There is planning for all federal investments to consider climate changes and its effects and therefore provides regulatory rationale for living shorelines.
- Federal policy improvements are beginning to even the playing field between green and grey projects and thereby are promoting living shoreline projects.

Henry Wicker *U.S. Army Corps of Engineers*

- Living shorelines always require a 404 permit through the U.S. Army Corps of Engineers and may also require a Section 10 permit.
- Main concerns are project impacts to fishing habitat, submerged aquatic vegetation, endangered species, critical habitat moratoriums, etc.
- Reissuing Nationwide permits:
 - 60-day comment period
 - Districts have 45-day comment on regional conditions

- New [Nationwide Permit B](#): There is a new nationwide permit being developed just for living shorelines and the best time for comment is now as comment periods only occur every 5 years.

Janine Harris *NOAA Fisheries*

- NOAA and the [Interagency Coastal Wetlands Workgroup](#) are working to determine what actions are necessary to develop a more unified national approach for the appropriate use of living shorelines.
- NOAA encourages the use of living shorelines on a site-specific basis.
- NOAA is encouraging advancements in living shoreline knowledge through scientific research conducted by its scientists.
 - [Caroline Currin et al.](#) has found an association between blue carbon and living shorelines.
- NOAA encourages the sharing of and dissemination of studies conducted by or in partnership with NOAA.
- Serving as both a form of stewardship and demonstration are NOAA's many living shoreline sites. There are over 45 sites including Pivers Island in North Carolina, Oxford Laboratory and the Maryland Office.

Jason Engle *U.S. Army Corps of Engineers*

Creating Habitat:

- Usage of dredging and placement material to create shorebird habitat
- Design and construction of beach projects
- USACE moves 2 million tons of sediment each year – not all of which is beach quality
- Regional Sediment Management Program:
- May be valuable for marsh restoration
- Regulation requires them to go with least cost option for disposal
- Cost share of design and construction recommended

Issues:

- USACE is required to continue maintaining channels
- USACE is required to go with least cost options

There is a need to quantify the benefits of living shorelines in order for it to gain traction as a viable solution.

Education Tools and Practices

Moderator: Suzanne Simon

Panel: Suzanne Simon, Whitney Jenkins, Joy Brown, Ana Zivanovic-Nenadovic

Living shorelines have been around for a number of years, but remain a relatively unknown strategy to the general public, marine industries, and even to some involved in conservation. Education and outreach for living shorelines should be tailored to the appropriate audience. Some audiences are difficult to reach and, thus, it may be necessary to think outside the box for unique engagement strategies. Restore America's Estuaries has a [short video](#) describing living shorelines that can easily be used as an education medium for homeowners.

Whitney Jenkins *North Carolina Department of Environmental Quality*

Strategy:

- North Carolina Coastal Training Program: guided by the N.C. Division of Coastal Management Living Shoreline Strategy
 - Conducted 11 workshops since 2011 reaching 530 coastal decision makers
 - Marine Contractors: not as many attended as was hoped
 - Realtors: giving credit for attendance was well-received
 - Workshop content:
 - In person discussion with various speakers and field trips
 - Adult Learning Style: design a living shoreline assignment utilizes “share your knowledge,” which is a successful form of adult learning
 - Why realtors?
 - They are the first people new homeowners talk to.
 - It is exciting and new for realtors, most of whom seem interested and committed.
 - Workshop Recordings: available Online from N.C. Coastal Resources
- Involving Marine Contractors
 - Difficult to reach audience and workshops often require contracts to utilize personal time to attend
- “Outside the box” Thinking – dinner and a living shoreline movie
- Additional Outreach:
 - Signage at project locations is an easy means of education and outreach for the community
 - [Resources for Homeowners and Professionals](#) on N.C. Division of Coastal Management website
 - [Weighing Your Options Handbook](#)
 - Social Media: Twitter and Facebook
 - Seeds to Shoreline (similar to Grasses to Classes) selected 10 teachers in North Carolina to learn about it



Joy Brown *The Nature Conservancy*

- Coastalresilience.org:
 - Use this tool to create workshops through interactive partnerships with communities
 - Develop relationship with planning staff and local residences
 - Assist homeowners with developing appropriate solutions for their shorelines
 - Integrate the use of GIS to educate community
- [Nature-Based Coastal Defense in Southeast Florida](#):
 - Outreach material that the staff of Southeast Florida The Nature Conservancy offices are using
 - Managing coastal erosion and the benefits of living shoreline program:
 - South Carolina had a 1-day event for everyone with an easement to come and learn about living shorelines
 - Ability to connect with landowners for easement consideration
 - Connecting with easement owners as they often are already aware of conservation and would likely be most interested in a living shoreline project
- See more at projects.tnc.org/coastal

Ana Zivanovic-Nenadovic *North Carolina Coastal Federation*

- [Living Shoreline Academy](#)
 - Concept:
 - A resource for promoting the exchange of information, research, training modules, policies, and practices to advance the use of living shorelines
 - Advancing the use of living shorelines with a national focus
 - Goals:
 - Increase overall abundance of wetlands
 - Build a comprehensive national tool
 - Unique components:
 - Training modules
 - Database of research
 - Information exchange
 - Contains databases of living shorelines including research on living shorelines
 - Project map
 - Goal is to have several projects from each state ***We welcome the submission of projects to add to the map.*



Summary of Needs

Living shorelines offer a suite of solutions to address issues like erosion and habitat loss. More long term research and monitoring must be conducted to better understand the appropriate uses of living shorelines when compared to conventional structures. Further research and stronger education and outreach can aid in shifting public awareness.

- *To achieve a better understanding of the solutions living shorelines offer, we need:*
 - More multidisciplinary research
 - Long-term monitoring on efficacy and longevity of living shorelines
 - Economic assessments of ecological benefits and erosion control benefits
- *To promote living shoreline solutions, we need to:*
 - Build awareness by expanding creative outreach approaches
 - Think about incentives as we move from public projects to projects with private homeowners:
 - Overcome permitting disincentives
 - Communicate costs and benefits
 - Engage contractors on alternatives to shoreline hardening
 - Support more collaboration among Southeastern states to share lessons learned, for example:
 - Tracking and sharing information on substrates
 - Challenges of scaling up to broad public use of living shorelines
- *To successfully implement living shorelines, we need to:*
 - Understand the varied local conditions of each site – including coastal processes and context from engineering analysis and plans
 - Clarify how we define “success” and how we manage and respond to risks or “failures”
 - Coordinate early with federal agencies so they can provide assistance and guidance
 - Consider the needs and behaviors of homeowners