# 2019 Living Shoreline Accomplishments

Prepared by: Living Shoreline Steering Committee Members

## Introduction

The Living Shoreline Steering Committee (Committee) was formed during the summer of 2018 to bring together federal and state agencies, non-governmental organizations and universities to communicate and collaborate on education and outreach, research, and implementation of living shorelines as a means to support sustainable management of estuarine shorelines. This Committee also acts as the Albemarle-Pamlico National Estuary Partnership (APNEP) Living Shoreline Implementation Team and is co-led by APNEP and the North Carolina Coastal Federation (federation).

The Committee meets twice a year to discuss ongoing education and outreach, research, and implementation of living shorelines in North Carolina. Work by these members in 2019 includes research and monitoring of natural marshes and living shorelines, wave attenuation and transformation and the use of alternative living shoreline construction materials. Education and outreach efforts by members have increased the awareness and shown the benefits of living shoreline techniques to the public as well as to real estate agents, contractors, and engineers. In addition, nearly 2,400 feet of living shorelines were constructed in 2019 throughout the state.

The Committee is guided by a Working Strategy that provides the roles and responsibilities of the members. Members offer guidance and recommendations on any needed actions regarding the promotion of the use of living shorelines, best practices for design, location and maintenance of living shorelines, and set priorities for collaboration and partnering within the Committee.

The purpose of this document is to showcase the progress made in 2019 by the partner members of the Committee on the advancement of living shoreline knowledge and benefits and their promotion and use coastwide.

## 2019 Living Shoreline Major Accomplishments

- The Living Shoreline Steering Committee met in January and May of 2019 and finalized the Working Strategy Document.
- The Education and Outreach, Research, and Implementation/Incentives subcommittees worked throughout the year to demonstrate the benefits of living shorelines and increase their use in the state.
- The North Carolina Coastal Federation was the local host of Restore America's Estuaries' (RAE) Third National Living Shorelines Tech Transfer Workshop that was held in October 2019 in Beaufort.
    - The workshop was attended by approximately 250 professionals from the U.S. and Canada.
    - Committee members played a major role in the development of the workshop agenda and coordinated and led field trips for all attendees.
    - Field trips showcased local living shoreline work at Pivers Island (National Oceanographic and Atmospheric Administration (NOAA) and Duke University Marine Lab), Carrot Island (NC National Estuarine Research Reserve), Sandbar Oyster Company's shellfish lease, Trinity Center, the N.C.

Aquarium at Pine Knoll Shores and Hammocks Beach State Park's Jones Island and the mainland area.
    - Committee members moderated, presented and led several breakout sessions during the workshop. All aspects of living shoreline work in our state were discussed with the participants.
    - Trained living shoreline contractors from Carolina Silvics, Inc. and one waterfront property owner also presented at the workshop.
- The Wilmington District of the U.S. Army Corps of Engineers (USACE) issued their new Regional General Permit for living shorelines in March 2019.
- The Coastal Resources Commission adopted 15A NCAC 7H .2700 General Permit for Construction of Marsh Sills for Wetland Enhancement in Estuarine and Public Trust Waters in July 2019.
- These new federal and state general permit does not require any coordination with state and federal agencies as long as the permit conditions are met; therefore, creating a streamlined general permit process that is consistent with other CAMA general permits.
- The federation's Pelican Award was presented to the N.C. Division of Coastal Management for their efforts in making the living shoreline permitting process consistent with other CAMA general permits for shoreline stabilization, such as bulkheads.

## 2018 Living Shoreline Major Accomplishment

There is one additional major accomplishment from 2018 that should be noted.

- The Nature Conservancy and scientists, Jenny Davis and Carolyn Currin from NOAA's Beaufort Lab have developed a Living Shoreline Explorer app for Carteret and Onslow Counties to assist users with determining where it is suitable to use a living shoreline. It can be found on The Nature Conservancy's North Carolina Coastal Resilience online mapping tool: https://maps.coastalresilience.org/northcarolina/ [maps.coastalresilience.org]
- The Nature Conservancy's Restoration Explorer application [coastalresilience.org] (app) on the Coastal Resilience Tool helps users identify where they can use oyster reefs to stabilize their shoreline. Using this online this tool you can identify sites for subtidal shoreline oyster reef restoration within the Pamlico Sound.

## 2019 Living Shoreline Education and Outreach Accomplishments

**North Carolina Coastal Reserve (NCCR) & NC National Estuarine Research Reserve (NCNERR):**

Hosted four workshops:

- Promoting Living Shorelines for Erosion Control on February 19, 2019 in Wanchese, NC for real estate agents and homeowners associations. Forty-three real estate agents, homeowner associations representatives, and property owners attended.
- Living Shorelines for Erosion Control on Estuarine Shorelines on February 20, 2019 in Wanchese for marine contractors, engineers, land use planners, landscape architects, other coastal decision-makers. Forty-three professionals attended.
- Promoting Living Shorelines for Erosion Control – A Workshop for Real Estate Professionals on March 25, 2019 for the Brunswick County Association of Realtors' members. Twenty-three real estate agents attended.

- Promoting Living Shorelines for Erosion Control – A Workshop for Real Estate Professionals on March 26, 2019 for the Brunswick County Association of Realtors' members. Thirty-four real estate agents attended.

**North Carolina Coastal Federation:**

- Living shoreline consultations were provided to 55 waterfront property owners throughout the coast through property site visits. There were also email and phone conversation consultations.
- The federation presented best practices for living shoreline construction at the workshops mentioned above. Attendees from the workshops toured the living shoreline demonstration site at the federation's Northeast office in Wanchese.
- Presentations and guidance on living shoreline implementation were provided to the Bluewater Cove Homeowners Association, the Sandy Point Homeowners Association, and to the Emerald Isle Town Planner.
- The federation gave a tour of completed living shoreline projects to Bridget Lussier, the NOAA technical monitor for previously funded resiliency projects.
- A presentation on the success of living shorelines after Hurricane Florence was given to approximately 20 people during a Morehead City town meeting.
- Information on living shorelines was provided to Smart Home America to include in a Gulf Coast Mitigation Guidebook and to the NC Coastal Reserve to include in another revision to the "Weighing Your Options" handbook for waterfront property owners.
- Community volunteers as well as volunteers from First Flight Middle School, the Town of Kitty Hawk, N.C. Aquarium on Roanoke Island and Pine Knoll Shores, Dare County Soil and Water Conservation, Youth Build, Dare 4-H, Croatan High School, Leadership Carteret, East Carolina University, Keene State University, St. John's Episcopal Church in Lynchburg, VA, the National Charity League, Big Rock Sports, Dude Solutions, Camp Albemarle Leaders in Training, Duke University Marine Laboratory, Tensar International Corporation, JLS Contracting Services, LLC, University of North Carolina at Chapel Hill's Institute for the Environment's Morehead City Field Site, Croatan High School, Coastal Carolina Community College, Sunset Vision, Bird Island Stewards, Old Bridge Preservation Society, Sunset Beach Turtle Watch Program, the Town of Sunset Beach, Ashley High School's Marine Science Academy, Old Bridge Historical Society, Bird Island Preservation Society, Cisco, SE Coastal Ambassadors, Church of Latter Day Saints and GE assisted with the construction of living shorelines. Educational introductions to living shorelines and oysters were given at each volunteer workday with student groups and community volunteers. This provided background information before volunteers began building the living shorelines.
- Presentations, field trips and lessons on living shorelines were given to teachers, Kitty Hawk Rotary Club, First Flight Middle School, N.C. Aquarium at Roanoke Island, Jennette's Pier, Dare County and Camden County 4-H groups, international college students (China, Thailand, Turkey and Dominican Republic) from the Alliance Abroad Group, Bogue Sound Elementary School students, Camp Albemarle's STEM Club and Girls Exploring Science and Technology.
- Students from Bogue Sound Elementary School created living shoreline displays, for the federation's office and for various festivals. Teachers at the school incorporated living shoreline and estuary lessons into their 4th grade curriculum, including the STEAM

(science, technology, engineering, art, and mathematics) and incorporated by the language arts teacher, helping to make this an interdisciplinary learning process.
- The federation's living shoreline work was featured in the May 2019 issue of Erosion Control magazine.
- Numerous print and television outlets covered the Sunset Beach living shoreline project with extensive coverage.

**University of North Carolina--Wilmington (UNC-W):**
- Two living shoreline construction events were conducted in June and July 2019 at the Town of St. James in Brunswick County. Each project involved the construction of bagged oyster shell with *Spartina* plantings behind the newly established reefs. Over 100 volunteers plus ~15 UNC-W students and researchers (Alphin and Posey lead UNCW contacts) were involved with various phases of the construction. These events included educational activities for students and volunteers (presentations and educational displays from UNCW researchers and students).

## 2019 Living Shoreline Research and Monitoring Accomplishments

**NOAA:**
- RAE Tech Transfer Workshop presentations (Davis, Currin).
- Presentations on living shoreline function and response to climate drivers; CERF 2019; NC Coastal Resilience Summit, UNC Clean Tech summit, NOAA Climate Team Webinar (Currin, Davis).
- Manuscript preparation on 2004-2019 salt marsh SET results (Currin and Davis).
- Manuscript preparation on 2006-2019 Living Shoreline Vegetation Monitoring results, Carteret County (Currin and Puckett). Demonstrates different response of natural and sill-stabilized fringing marshes to sea level rise.
- Annual vegetation monitoring of paired natural and stabilized fringing marshes at three sites (Currin and Puckett).
- Monitoring data to support USS NC battleship Living with Water Living Shoreline, Wilmington (Davis and Currin).
- Post-Dorian vegetation and elevation data collection, including drone imagery, showed little impact of hurricane on natural and stabilized living shorelines on Pivers Island.

**University of North Carolina at Chapel Hill Institute of Marine Sciences:**
- Manuscript submitted: Coastal Engineering Wave attenuation natural marshes (Haddad, Rosman).
- NC Sea Grant funded study on wave transformation across living shorelines (Rosman, Haddad).
- RAE Tech Transfer Workshop (Rosman, Haddad).

**North Carolina Coastal Federation:**
- Previously constructed living shorelines were maintained and monitored for success at Springer's Point, Jones Island, Morris Landing, Sunset Beach Town Park and Carolina Beach State Park with the help of our summer interns and volunteers from The Peak Church youth group, VCU Alternative Spring Break, Meredith College, MMS Holdings, Wood Environment & Infrastructure and the N.C. Clean Water Management Trust Fund.

- Visually, it appears living shorelines were not affected by Hurricane Dorian.

**UNC-W:**

- Ongoing monitoring of living shorelines at the Town of St. James, constructed in stages over the past 1 ½ decades, is being conducted by UNCW (Alphin and Posey lead researchers). This monitoring includes assessment of oyster growth, size, and abundance on the constructed reefs; aspects of sediment composition and erosion near the reefs; and assessment of associated fauna within and adjacent to reef and reference areas.

**Multiple Partners:**

- Duke University Marine Lab, NCCR & NCNERR, NOAA: Manuscript submitted demonstrating significantly greater loss of marsh area associated with bulkheaded shorelines (S. Burdick, Puckett, Currin, Davis)
- U.S. Coastal Research Program. 2019-2021. "Multidisciplinary quantification of biogeomorphical impacts of living shorelines" (Polk, Eulie, Posey and Gittman)
- NSF Humans, Disasters, and the Built Environment Rapid Grant. 2018-2020. "Evaluation of the Resilience of Shoreline Protection Methods to Hurricane Florence." Eulie, Hao, Polk (UNCW) Gittman (ECU, Smith (Duke)
- NOAA Ecological Effects of Sea Level Rise Event Response Program. 2019-2020. "Evaluation of the Resilience of Living Shorelines and Coastal Residents to Hurricane Dorian." Gittman (ECU)
- Continued monitoring of living shorelines and surveys of coastal residents under NC Sea Grant. 2018-2020 "Quantifying the geomorphic, ecological, and socioeconomic impacts of shoreline management strategies: a multi-disciplinary approach." Eulie (UNCW), Gittman (ECU), Smith (Duke)
- Continued monitoring of Oyster Catcher and oyster shellbag reefs along Carrot Island constructed under NOAA SARP and USFWS grants. 2017-2020. "Oyster Restoration in Back Sound, NC" Gittman (ECU), Puckett (NC Coastal Reserve), Lindquist (UNC IMS)

## 2019 Living Shoreline Implementation and Incentives Accomplishments

**North Carolina Coastal Federation:**

Construction:

- A total of 2,379 feet of living shorelines were constructed coast wide at 16 public and private properties.
- A total of 21,987 plugs of salt marsh grasses were planted coast wide.
- Above construction and planting was partially funded by U.S. Fish and Wildlife Service Southeast Aquatic Resources Partnership Funding (Grant amount: $43,998. Matching funds: $61,600. Total: $105,598).
- Engineered designs were developed for 2,200 linear ft. of living shoreline at Whittaker Pointe in Oriental and for 1,650 ft. of living shoreline at White's Point in Atlantic. Work on the Coastal Area Management Act Major Development Permits for these two project locations was also performed. These living shorelines are being funded by the National Fish and Wildlife Foundation (Grant amount: $1,038,537.71. Matching funds: $997,464. Total: $2,036,001.71) and will be permitted and constructed in 2020.
- The contractors that received hands on training on the design permitting and construction of living shorelines, Carolina Silvics, Inc. built multiple living shorelines on their own.

Testing Alternative Living Shoreline Construction Materials:

- A 185 ft. living shoreline was constructed in Bogue Sound at the NC Aquarium at Pine Knoll Shores using Sandbar Oyster Company's Oyster Catcher™ material.
- Oyster shell and rock gabions developed by the Tensar International Corporation and JLS Contracting Services, LLC, were tested at Jones Island and at a shoreline along the Intracoastal Waterway in Swansboro.
- The federation worked with Green Recycling Solutions to develop a degradable alternative to the traditional plastic mesh bags. They developed a jute mesh bag filled with oyster shells that can be tested. The use of their degradable erosion control sock was also explored.
- The federation led a breakout session on living shoreline materials at the Third National Living Shorelines Technology Transfer workshop to discuss possible alternatives to the traditional plastic mesh bags that are used nationally for living shoreline and oyster restoration.

Qualifying Living Shorelines for Mitigation Credits:

- The federation explored the possibility of establishing living shoreline projects along the coast for the distinct purpose of qualifying for mitigation credits with RES, an environmental consulting firm and Restoration Systems, LLC, an environmental restoration and mitigation banking firm.

**The Nature Conservancy:**

Construction

- TNC has permits in hand but need funding and/or match to pursue grant funding to construct:
    - over 1,200 linear feet at Pea Island NWR Shoreline Back-barrier Reef sites
    - The living shoreline oyster reef restoration site at Coastal Studies Institute in Wanchese is functioning as a conveniently located living laboratory for researchers and students at CSI. This will provide new insight into the viability and effectiveness of oyster sills for shoreline stabilization while serving as an educational tool for students and the community.

## Looking Toward 2020

The members and the partners of the Committee continue to work to advance the goal of supporting sustainable management of estuarine shorelines in North Carolina through their continued collaboration on expanding education, research and implementation of living shorelines in North Carolina. This includes planning for marine contractor trainings, providing a congressional briefing on nature-based solutions, continued research and monitoring, continued education through volunteer workdays, presentations to HOAs, educational workshops, continued site consultations for private property owners and continued small and large-scale living shoreline construction on private and public properties.

What the partners hope to accomplish in 2020 include:

**Education and Outreach**

- The federation, NCCR & NCNERR, and NC Sea Grant are working to adapt the Florida marine contractor training for North Carolina. A pilot workshop is being planned for early 2021 (needs funding support).

North Carolina Coastal Federation:

- The federation was invited to participate on a panel on the Environmental and Energy Study Institute's (EESI) Congressional briefing on "Coastal Resilience in the Southeast: Science, Policies, and Programs Furthering Local Resilience Goals." EESI is a nonpartisan, non-profit organization dedicated to promoting sustainable societies. They hold a few dozen Congressional briefings a year on a variety of environmental and clean energy topics. The briefing was scheduled to occur in March in Washington, D.C., however, it was held via webinar instead due to the coronavirus. During the briefing, the federation presented on "Implementing Living Shorelines through Community Engagement, Partnerships, Science, Policies and Funding".
- Continue to conduct one on one living shoreline training with marine contractors.
- Continue to conduct one on one living shoreline consultations with waterfront property owners.
- Continue to educate waterfront property owners, realtors, homeowners associations, local governments, underserved communities and other members of the general public on the value and benefits of living shorelines to create and promote consumer demand for these projects.

**Research and Monitoring**

- Annual monitoring of vegetation and plot elevation at 3 paired natural and living shoreline sites (NOAA and NCCR & NCNERR).
- Battleship USS North Carolina Living with Water Living Shoreline. Data collection and survey to support project design (NOAA).
- NOAA Ecological Effects of SLR 2020 Funding
    - Keep it in the System: a decision tool for managers considering beneficial use of dredged sediment to increase resilience of coastal marshes and built infrastructure. UNC-IMS, NOAA National Centers for Coastal Ocean Science, EA, USACE will assess opportunities to incorporate living shorelines into beneficial use and thin layer application of dredged sediment projects.
- Continue monitoring shorelines pre- and post-hurricanes (ECU, UNCW, NCNERR)
- Continue to test and monitor performance of alternative materials for living shorelines (ECU, NCNERR)

**Implementation and Incentives**

**NOAA/National Fish & Wildlife Foundation (NFWF) Funding Awarded in 2020:**

- Overcoming Local Barriers to Implementation and Getting to Shovel Readiness. Grant amount: $1,141,050. Matching funds: $830,000. Total: $1,971,050. Grantee: NC Department of Environmental Quality. Establish an incentive-based state framework which will support comprehensive local community resilience planning and build upon an existing vulnerability assessment and knowledge base that will help strengthen ecosystems at the Rachel Carson Reserve. Project will protect the Town of Beaufort and

result in several shovel-ready projects that increase the resilience of natural resources and coastal communities in North Carolina.

- Shoreline Restoration and Tidal Wetland Creation at the Battleship North Carolina. Grant amount $1,250,000. Matching funds: $1,583,931. Total $2,833,931. Grantee: USS Battleship North Carolina Commission. Restore 800 linear feet of estuarine intertidal shoreline and create approximately 2 acres of intertidal estuarine marsh habitat within a North Carolina Significant Natural Heritage Area. Project will remove and reconnect 2 acres of existing parking lot to the Cape Fear River, resulting in 2 acres of tidal wetland creation to build resilience.
- Building Adaptive Shorelines for Resilient Coastal Communities (NC). Grant amount: $1,513,500. Matching funds: $1,514,941. Total $3,028,441. Grantee: Carteret County Shore Protection Office. Construct living shorelines to naturally stabilize and protect 3,800 linear feet of eroding estuarine shorelines at two important project sites within Carteret County. Project will enable the communities of Beaufort and Down East to enhance existing resilient infrastructure, and protect important fish, shellfish, submerged aquatic vegetation habitat and nesting bird habitat.
- Brunswick Town Fort Anderson Shoreline Restoration (NC). Grant amount: $2,002,500. Matching funds: $1,516,669. Total: $3,519,169. Grantee: N.C. Department of Natural and Cultural Resources. Install a living shoreline to protect 1,000 linear feet along the Brunswick Town/Ft. Anderson State Historic Site by attenuating wave action and mitigating erosion. Project will protect and provide salt marsh and oyster habitat, and safeguard the site's historical resources.
- North Duck Village Living Shoreline (NC). Grant amount: $384,011. Matching funds: $384,011. Total: $768,022. Grantee: Town of Duck. Construct 1,100 linear feet of sheetpile sill and restore eroded wetlands along the shoreline of Currituck Sound. Project will create a more resilient coastal edge, improve coastal habitat, and protect the adjacent sidewalk, bike lane and road that serve as the primary transportation artery.

**North Carolina Coastal Federation:**

- NOAA/NFWF 2019 Funding. Grant amount: $1,038,537.71. Matching funds: $997,464. Total: $2,036,001.71. Construction of 2,200 linear ft. of living shoreline at Whittaker Pointe in Oriental and 1,650 ft. of living shoreline at White's Point in Atlantic.
- NOAA/NFWF 2020 Funding. Grant amount: $2,719,349. Matching Funds: $2,894,489. Total: $5,613,838. Protecting Education Infrastructure, Critical State Roadways and Estuarine Habitats with Living Shorelines (NC) Grantee: Coastal Federation. Install three large living shorelines that will protect important community infrastructure as well as restore and protect vital salt marsh and oyster habitat in Bogue Sound and the White Oak River. Project will result in a total of 3,518 linear feet of saltwater marsh living shorelines, protecting and restoring a total of over 23 acres of salt marsh, oyster and upland habitat.
- Clean Water Management Trust Fund 2020 Funding. Grant amount: $400,000. Matching funds: $328,586, Total: $728,586. Coastwide living shoreline cost-share program.
- N.C. Division of Soil and Water Conservation Community Conservation Assistance Program 2019 Funding ($36,999): Install 6 living shorelines at private waterfront properties in Carteret and Onslow County and plant an existing 250 ft. living shoreline in Swansboro.

- Honda grant. This project will create three demonstration sills totaling 300 ft. at the federation's Wanchese office, a wooden, vertical wall sill, granite sill, and oyster castle sill. Previously, two sills (oyster dome and oyster shell bag sill) were constructed on site.

**Albemarle Pamlico National Estuary Partnership (APNEP)**

- APNEP is collaborating as a project partner on a NOAA Coastal Resilience Grant awarded to the Virginia Institute of Marine Science (VIMS), Wetlands Watch, and the Virginia Coastal Policy Center in 2017. The project includes development of tools for local governments in coastal Virginia to determine suitable areas to implement natural infrastructure to increase resilience to storm driven flooding. GIS analysis is used to quantify the co-benefits associated with NNBFs to allow coastal localities to take advantage of incentive based credits through FEMA's Community Rating System and areas regulated for water quality improvement. Staff are assessing transferability of the tool to coastal localities in North Carolina and information was presented to the Living Shorelines team.