

# NERR or Far:

## The Reserves Are Where You Are

### Episode 5: A Glimpse Inside the Reserve Toolbelt

**National Estuarine Research Reserves (NERRs)** utilize a wide variety of techniques and tools to manage their lands and help foster healthy ecosystems on our coastline. One of these techniques is installing **living shorelines**. So what are living shorelines? **NOAA**, the National Oceanic and Atmospheric Administration, says that living shorelines "connect the land and water to stabilize shorelines, reduce erosion, and provide valuable habitat that enhances coastal resilience". Living shorelines utilize natural elements like plants, rocks and sand to stabilize estuarine coasts, sometimes in combination with existing harder shoreline structures, like **bulkheads** or **seawalls**. These shorelines are a creative and cost-effective way to add **resilience** to communities on the water as well as provide valuable habitat for wildlife. They are also beautiful green space! Living shorelines can replace aging structures like old boat launches or docks. Another benefit is that they will grow over time, unlike hard structures, which may end up hindering the growth of aquatic life.

Shoreline treatments lie on the spectrum from green to gray. **Green shorelines** are designed using more natural, softer techniques, whereas **gray shorelines** are less natural, using what's considered harder techniques. An example of a more green shoreline is a **vegetation-only shoreline**. This type of shoreline would be useful in low wave energy environments to provide a buffer to upland areas. This type is considered a non-structural method and a type of living shoreline. An example of a gray shoreline technique would be installing a bulkhead: a vertical wall parallel to the shoreline. Areas highly



vulnerable to storm surge and powerful waves use bulkheads to hold soil in place. This is considered a coastal structure, not a living shoreline. A technique in the middle of the spectrum is **sills**. Sills are a hybrid type of living shoreline where a structure made of rock, concrete or oyster shell lies parallel against an existing vegetated shoreline. This technique reduces wave energy and prevents erosion in areas that don't commonly receive high wave energy. NOAA encourages using the softest, or greenest, approaches to shoreline stabilization that are feasible based on site conditions. Studies have found that during major storms, living natural shorelines perform better than a hardened shoreline and are less costly. The NERRs are doing a lot of neat work with living shorelines.

The ACE Basin NERR in South Carolina has been working on living shorelines for years. The reserve's researchers have investigated different materials and methods that are the most effective to build living shorelines, experimenting with combinations of **oyster reefs** and marsh grass planting, as

well as other natural materials based upon what the specific site looks like. They've done extensive testing and monitoring of living shorelines to determine the best methods for different areas along the coast. Other ACE Basin staff have worked with community members who live on the marsh to help inform them on how to go about installing a living shoreline instead of a seawall to help prevent erosion, and how that mechanism would work. Reserve partners and permitting agencies are also involved, helping determine where it would be possible to build more living shorelines on the SC coast. The reserve's education section has even gotten involved through a school-based program, "From Seeds to Shoreline", where kids can grow marsh grass at school and then plant it in the community as living shorelines. The reserve stewardship sector leads a similar program with adult groups and different community organizations!

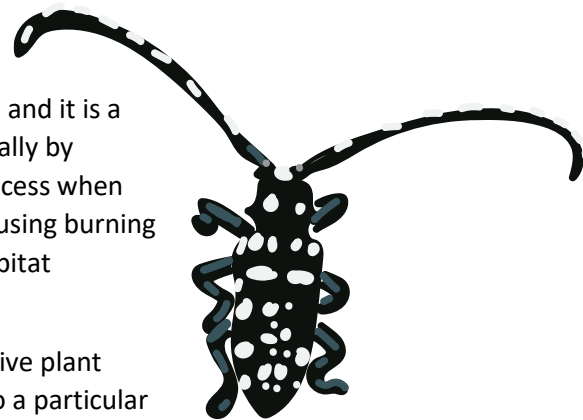
Another living shoreline project is in the works at the Apalachicola NERR in Florida. There is an important highway between Apalachicola and Carabelle, two towns in the county that are right against the water, and during hurricanes and winter storms the water is now consistently reaching the edge of the highway due to nearby shoreline erosion. Because of this, every time there is a large storm, it takes out little chunks of the road, forcing drivers to take a detour. So what the reserve is planning to do is plant *Spartina* and other plants in the water and recreate a marsh in front of the highway, hoping to create an effective wave **buffer** that prevents further erosion of the pavement. The Federal Highway Administration and the Florida Highway Department of Transportation have even given a grant to support the project. The route out of town for Apalachicola residents will hopefully be preserved by the area's new living shoreline!



The **stewardship** staff at the NERRs oversee land management at the reserves, which is an important role considering what we do on land can impact the health of our waters. Reserve land managers work on public access, developing kiosks and maps that people can use to hike reserve lands, maintain trails and places where you can get out and leave your car safely, perform prescribed / controlled burning, and manage invasive species. **Controlled burns**, as ironic as it sounds, help prevent destructive wildfires by ridding the forest floor of flammable debris like dead leaves in a more controlled, monitored setting. Additional benefits include returning nutrients to the soil through the ashes of vegetation, clearing space to give young trees more sunlight for growth and reducing insect populations. Some species of pine even have cones that need fire to **germinate**, or to begin growing the seeds within them. These burns can also destroy invasive plant species.

We have a long history of controlled burning in this part of the country. Pine forests in the southeast have become adapted to fire, and it is a very natural occurrence for these trees. Fires are typically caused naturally by lightning; reserve staff use controlled burning to mimic that natural process when needed. We also have evidence of some of our Native American tribes using burning to flush game, to clear the landscape, and to perform other types of habitat management a lot in the way that biologists do now.

One important benefit of controlled burning is destroying invasive plant species. An **invasive species** is any type of organism that is not native to a particular environment, and can cause harm to this area. Some invasive species are brought to a new area on purpose to serve as a method of pest control or as pets, but in many cases, their introduction is actually



accidental. Maybe they traveled in the **ballast water** of ships, or they were transported cross country with a crop harvest, or they were even just a bug that hitched a ride in a car. Since these species are not native to their new environment, there are often no predators to hunt them, and they can even outcompete many native species for food. Unchecked, these organisms can cause a lot of harm to the environment, as well as to the economy, damaging property and hurting **yields** from a variety of industries.

Another management technique is **beach renourishment**. In beach renourishment, sand is moved from areas offshore to resupply eroded beach areas. But where does the sand move over time? Where does it go after a storm? These are questions that the North Carolina NERR and partners at the University of North Carolina at Wilmington are investigating. Andrea Hawks and Joe Long have been investigating long-term effects from Hurricane Florence on Masonboro Island, as well as the impacts of beach renourishment in this area. Sand was deposited along portions of the southern end of the island, and since then, they have been tracking changes to the beach profile and sediment composition. The goal is to develop long-term predictive models to help folks understand how the sand will move and what the island might look like in the future. The NERRs do an incredible job of managing reserve lands through a variety of management techniques, from living shorelines to controlled burns. Through careful stewardship of our estuaries and coasts, reserves of the southeast are helping to improve coastal resiliency and preserve biodiversity. What a nifty toolbelt!

## QUESTION TIME

1. Name some benefits of living shorelines.

Living shorelines connect the land and water to stabilize shorelines, reduce erosion, and provide valuable habitat that enhances coastal resilience. They are also beautiful green space, low-cost, can replace aging structures like old boat launches or docks, and will grow over time, unlike hard structures, which may end up hindering the growth of aquatic life.

2. If you lived in an area that doesn't **typically** receive high wave energy, what type of shoreline technique would you use? Why?

The best type to use in this case would be a sill, a hybrid type of living shoreline where a structure made of rock, concrete or oyster shell lies parallel against an existing vegetated shoreline. This technique reduces wave energy and prevents erosion in areas that don't commonly receive high wave energy. A vegetation-only shoreline could also work, but considering it is most effective in low wave energy environments, a sill could ensure better protection in case there is a storm event in this area.

3. What are some ways that reserve land managers help foster sustainable natural ecosystems in the southeast?

Reserve land managers work on public access, developing kiosks and maps that people can use to hike reserve lands, maintain trails and places where you can get out and leave your car safely, perform prescribed / controlled burning, manage invasive species, and occasionally do beach renourishment.

4. Why are invasive species harmful? Do you know any invasive species in your state?

Since these species are not native to their new environment, there are often no predators to hunt them, and they can even outcompete many native species for food. Unchecked, these organisms can cause a lot of harm to the environment, as well as to the economy, damaging property and hurting yields from a variety of industries. Some examples of invasive species in the southeast include:

NC: spotted lanternfly, emerald ash borer, red sorrel, freshwater golden clam, spongy moth

SC: Chinese wisteria, kudzu bug, sugarcane aphid, spotted-wing drosophila

GA: tropical soda apple, Japanese stiltgrass, feral pigs

FL: torpedograss, old world climbing fern, Cuban treefrog, green iguana, veiled chameleon

Great site to find lists of invasive species: <https://www.eddmaps.org/tools/choosedistrict.cfm>

(From UGA Center for Invasive Species and Ecosystem Health)

5. Why do reserves perform controlled burning? What might happen if they didn't do this?

Controlled burns help prevent destructive wildfires by ridding the forest floor of flammable debris like dead leaves in a more controlled, monitored setting. Additional benefits include returning nutrients to the soil through the ashes of vegetation, clearing space to give young trees more sunlight for growth and reducing insect populations. Some species of pine even have cones that need fire to germinate, or to begin growing the seeds within them. These burns can also destroy invasive plant species. If they didn't do this, destructive wildfires could catch and spread uncontrollably in coastal communities. Relying upon natural fires via lightning strike could also mean less control over insect and invasive species populations and limited ability for new trees to spring up in dense areas.

6. What is the importance of creating long-term predictive models for beach renourishment?

Predictive models help scientists and the public understand how the sand will move and what the island might look like in the future. It helps ensure that reserves and their communities are making the best-informed decisions.

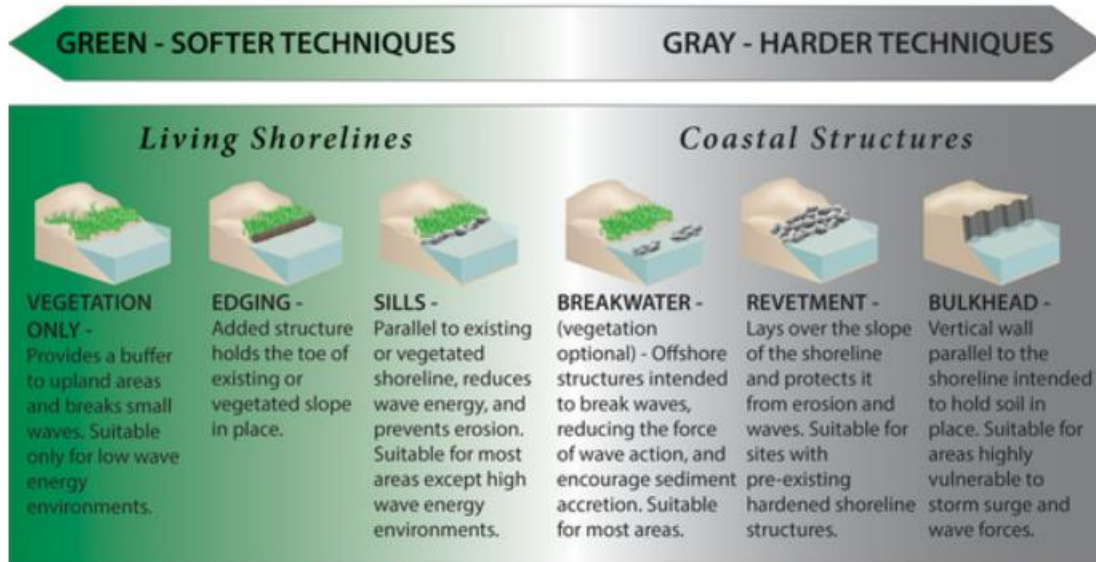
7. Put these shorelines in order from green to gray (1 is the greenest, 6 is the grayest)



# ACTIVITIES

- Take part in the seeds to shoreline program! More info here: <https://www.scseagrant.org/from-seeds-to-shoreline/>
- Have a class discussion on question 7, what are the advantages and disadvantages of these different options, and where they might be used?

HOW GREEN OR GRAY SHOULD YOUR SHORELINE SOLUTION BE?



NOAA Fisheries (2023). Coastal Shoreline Continuum and Typical Living Shorelines Treatments [Photograph]. <https://www.fisheries.noaa.gov/insight/understanding-living-shorelines#:~:text=A%20living%20shoreline%20is%20a%20protected%2C%20stabilized%20coastal,plants%20and%20animals%2C%20living%20shorelines%20grow%20over%20time.>

- Students in groups create short presentations on different management tools, what they're used for, and how they are used in other areas of the country as well.
- Students create presentations on a southeastern invasive species and how they got here! *The beetle illustrated in this article is an Asian Longhorned Beetle, an invasive species that threatens hardwood trees in Massachusetts, New York, and Ohio. It was first detected in eastern U.S. ports in 1992.*