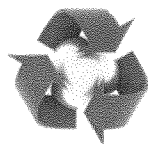


**U.S. Army Corps
of Engineers
WILMINGTON DISTRICT**

**Finding of No Significant Impact
For
Restoring Coastal Estuarine Habitat in Four North
Carolina Estuaries**

January 2013



**Finding of No Significant Impact
Restoring Coastal Estuarine Habitat in Four North Carolina
Estuaries**

January 2013

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1.0 Introduction

The National Environmental Policy Act of 1969, as amended, (NEPA), requires consideration of the environmental impacts for major federal actions. The proposed action and the environmental impacts of the proposed action were addressed in the Restoring Coastal Estuarine Habitat in Four North Carolina Estuaries Environmental Assessment (EA), dated November 2012.

During the agency and public review of the EA, comment letters were submitted by various regulatory agencies and members of the public. These comments are included with this Finding of No Significant Impact (FONSI). The purpose of this FONSI is to ensure the environmental consequences of the proposed plan are considered and that environmental and project information are available to the public.

This FONSI has been prepared pursuant to NEPA in accordance with the Council on Environmental Quality (CEQ) regulations as contained in 40 CFR Parts 1500 to 1508, which directs federal agencies on how to implement the provisions of NEPA.

2.0 Background

The project purpose is to restore intertidal and shallow subtidal patch eastern oyster (*Crassostrea virginica*) reef habitat and fringing salt marsh habitats. Additional objectives are to increase public awareness and support for habitat restoration efforts, provide opportunities for the public to engage in these activities, and develop and enhance scientific understanding of habitat restoration techniques through monitoring and evaluation.

3.0 Alternatives

The proposed action includes the creation of patch oyster reefs and living shorelines consisting of oyster reef sills with landward salt marsh plantings. Project actions include:

- Create patch oyster reefs (Figures 1 and 2);
- Restore salt marsh habitat along an eroding shorelines (Figures 3 and 4);
- Develop and refine patch oyster reef and living shoreline restoration methods; and
- Increase public awareness, support and involvement in estuary habitat restoration.

The EA identified one action alternative, the proposed patch oyster reefs and living shorelines, which is the Selected Action. The EA also analyzed a No Action Alternative.

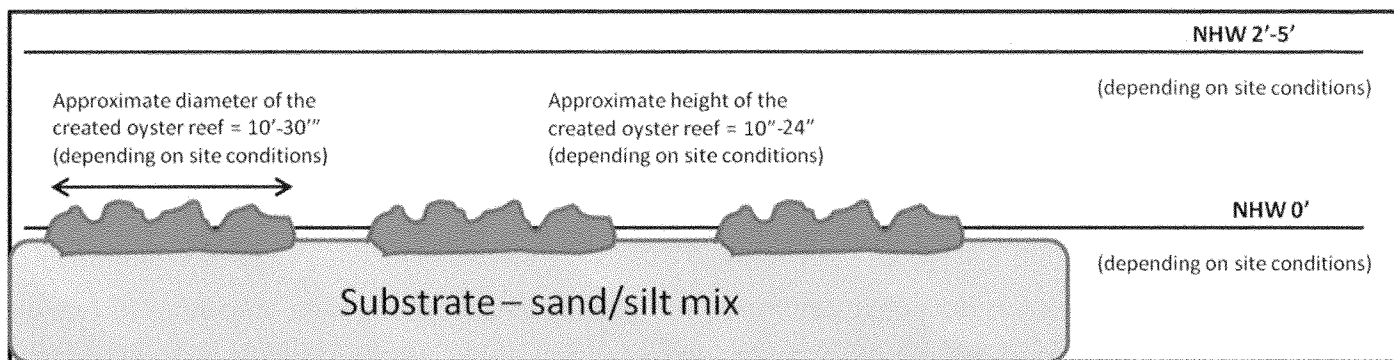


Figure 1. Cross Section of Patch Oyster Reef Project.

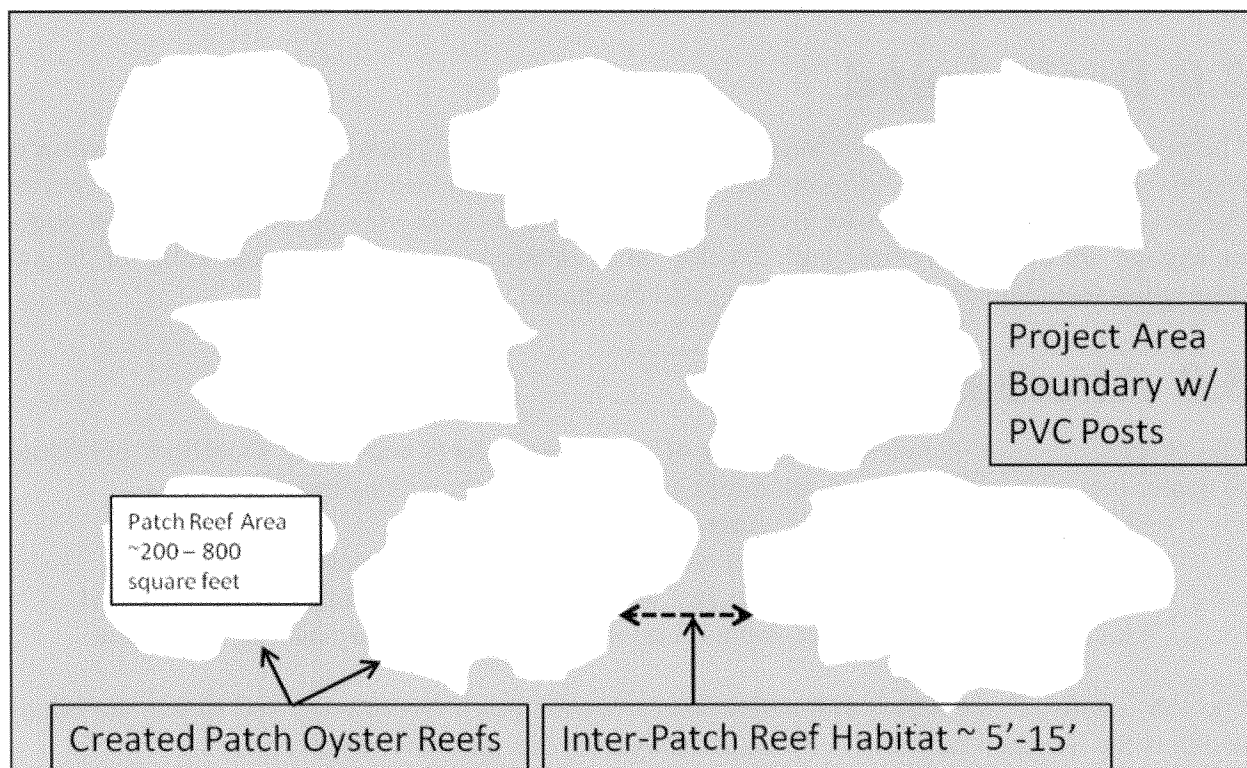


Figure 2. Overview of Patch Oyster Reef Project.

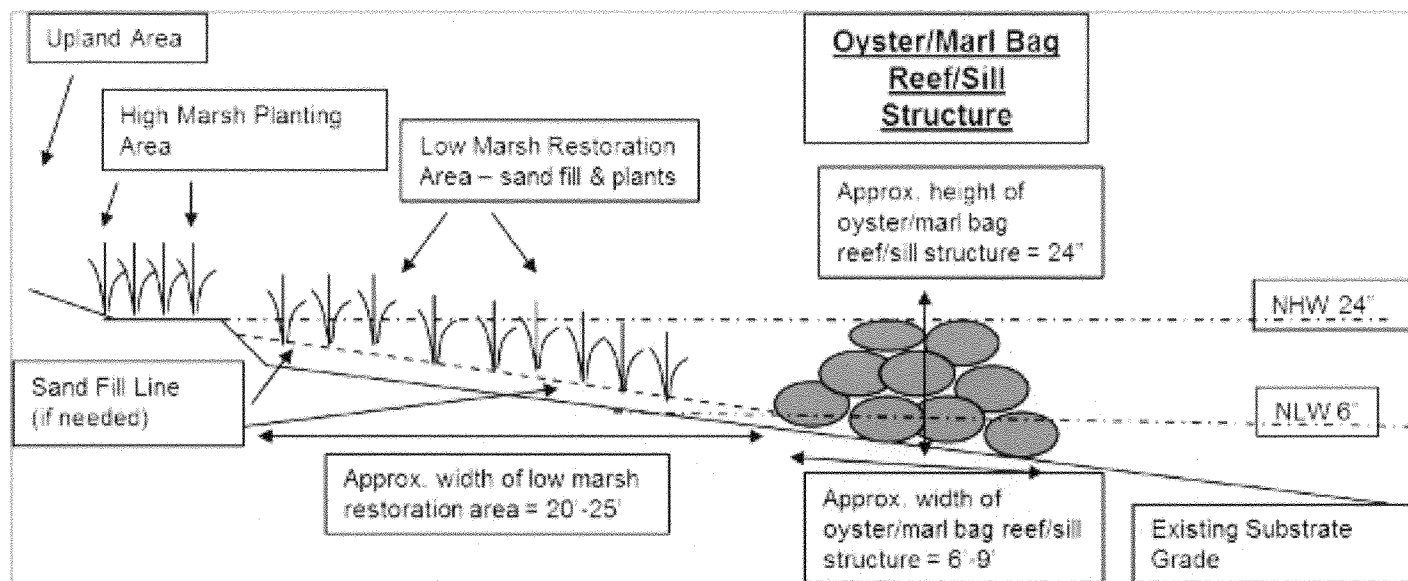


Figure 3. Cross Section of a Typical Living Shoreline Project.

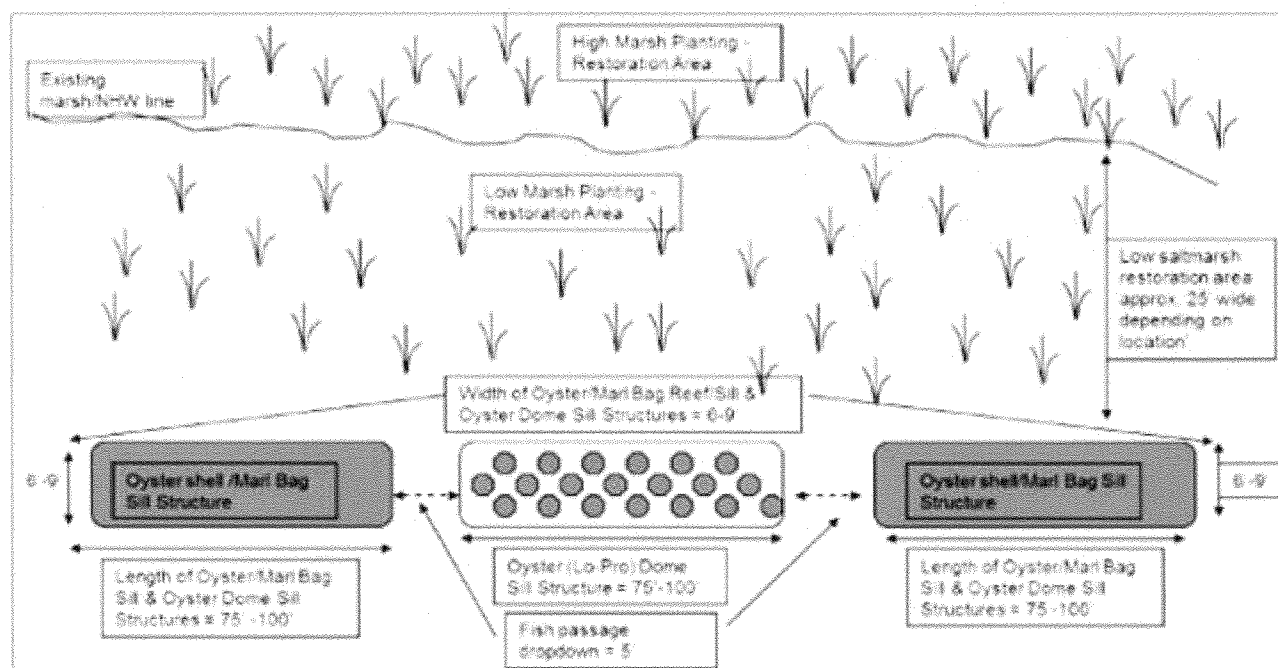


Figure 4. Overview of Typical Living Shoreline Project.

3.1 Proposed Action

The preferred alternative will create and restore 10.5 acres of fringing, intertidal and shallow subtidal patch oyster reefs and fringing salt marsh habitats in four targeted estuarine systems. Project sites are in the Lockwood Folly River, Masonboro-Myrtle Grove Sound, Stump Sound and White Oak River. The N.C. Coastal Federation will coordinate with the N.C. Division of Marine Fisheries, Hammocks Beach State Park, the Town of Oak Island, University of North Carolina at Wilmington, community volunteers and students to implement this alternative. The locations of the four project areas are illustrated in Figure 5.

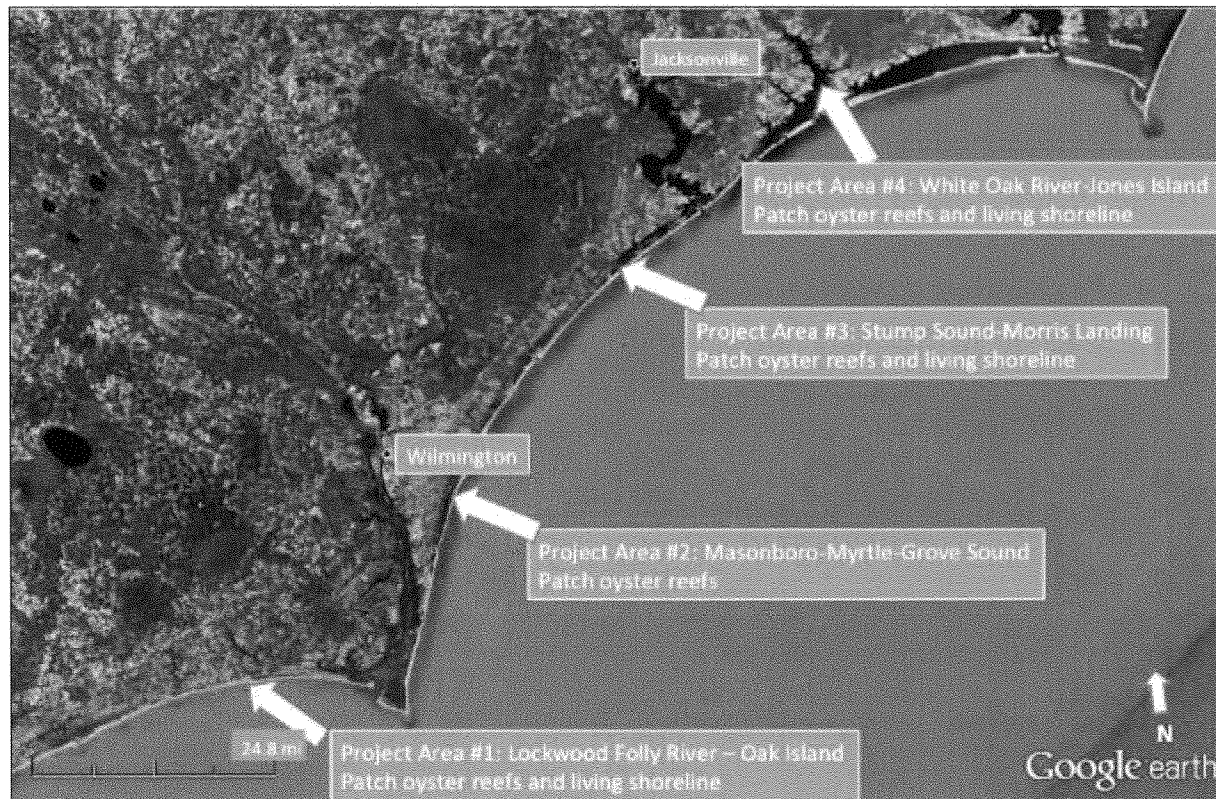


Figure 5. Locations of Project Sites.

The Lockwood Folly and White Oak Rivers as well as Masonboro-Myrtle Grove Sound and Stump Sounds contain significant areas of oyster beds and maintain high levels of annual oyster spatfall. However, due to continuing harvest pressure, sedimentation, disease, and water quality degradation, a significant amount of viable oyster reef habitat has been lost or has deteriorated. Providing adequate reef and settlement substrate will enhance the oyster population and oyster reef habitat in the lower river estuaries.

A total of 9.3 acres of fringing, intertidal and shallow patch oyster reef habitat will be created along with 1.24 acres of fringing shoreline saltmarsh habitat. This combination of restoration practices will be designed to restore and enhance intertidal and shallow subtidal patch oyster reef habitat and reduce shoreline erosion caused by storm activity and rising sea levels, providing an innovative approach to managing the declining habitats in these estuaries.

The proposed action will demonstrate the effectiveness of “Living Shorelines” which include two components: a sill made up of bags of oyster shell and marl (marine limestone) and concrete oyster domes; and a restored coastal salt marsh. Living shoreline projects are used in medium to high energy open-water environments for the purpose of dissipating wave energy and enhancing, restoring and protecting existing habitats.

The project will be monitored for five years by university researchers and the federation staff working with volunteers to document their success. The project will use loose shell and small limestone marl for the patch reefs, and oyster shell bags, limestone marl bags and oyster domes for the shoreline sills. Approximately 900 linear feet of shoreline/fringing salt marsh habitat will be restored by planting over 45,000 marsh plants. Public awareness and support for the restoration of these habitats will be expanded through educational and outreach activities and public participation in the project by teachers, students, community members and volunteers. All of the reef habitat constructed through this project will be placed in permanently closed shellfish waters and/or will be designated as research sanctuaries, and therefore will not be subject to commercial or recreational harvest.

Project Area #1 is within the watershed of the Lockwood Folly River in Brunswick County. A patch oyster reef and living shoreline will be constructed in the project area. The river’s headwaters are in the Green Swamp and flow into the Atlantic Ocean through the Lockwood Folly Inlet. The estuary maintains polyhaline to euhaline conditions ranging from 18 to 36 ppt salinity. Due to the proximity of the inlet and strong tidal flow the estuary experiences a high rate of water exchange and flushing. This allows the lower river to maintain good water quality despite increasing non-point source pollution from a developing watershed. Salt marshes, dominated by smooth cordgrass (*Spartina alterniflora*), saltmeadow hay (*Spartina patens*) and saltgrass (*Distichlis spicata*), occur along the estuarine shorelines and make up small islands in the lower river. The lower river contains extensive intertidal flats with areas of shell hash and mud. The Lockwood Folly River contains significant areas of intact wetland areas along its length which provide valuable buffering and water quality benefits. The existing estuarine habitats, water quality status, and direct connection with the ocean makes the Lockwood Folly a vital area for estuarine and marine organisms foraging, migrating, breeding, spawning and seeking refuge as juveniles.

Project components at Project Area #1 will include the creation of intertidal patch eastern oyster (*Crassostrea virginica*) reef habitat in a three acre project area, and the construction of 200’ of living shoreline along an eroding estuarine shoreline to create 0.2 acres of saltmarsh habitat and 0.1 acres of oyster habitat (See Figure 6). The patch oyster reef habitat will be constructed in the public trust waters on an intertidal flat in the lower estuary of the Lockwood Folly River (See Figure 7). The project site is located just off the main stem of the lower river, in a section of the river called Eastern Bend, below the town of Varnamtown, and opposite of the Lockwood Folly Golf and Country Club community. The site is between the Cross Rock Shellfish Management Area and the oyster reef known as the “S Rock”. The approximate geographic coordinates for the site are 33°56.099’ N x 78°13.113’ W.



Figure 6. Project Area #1, Lockwood Folly River.

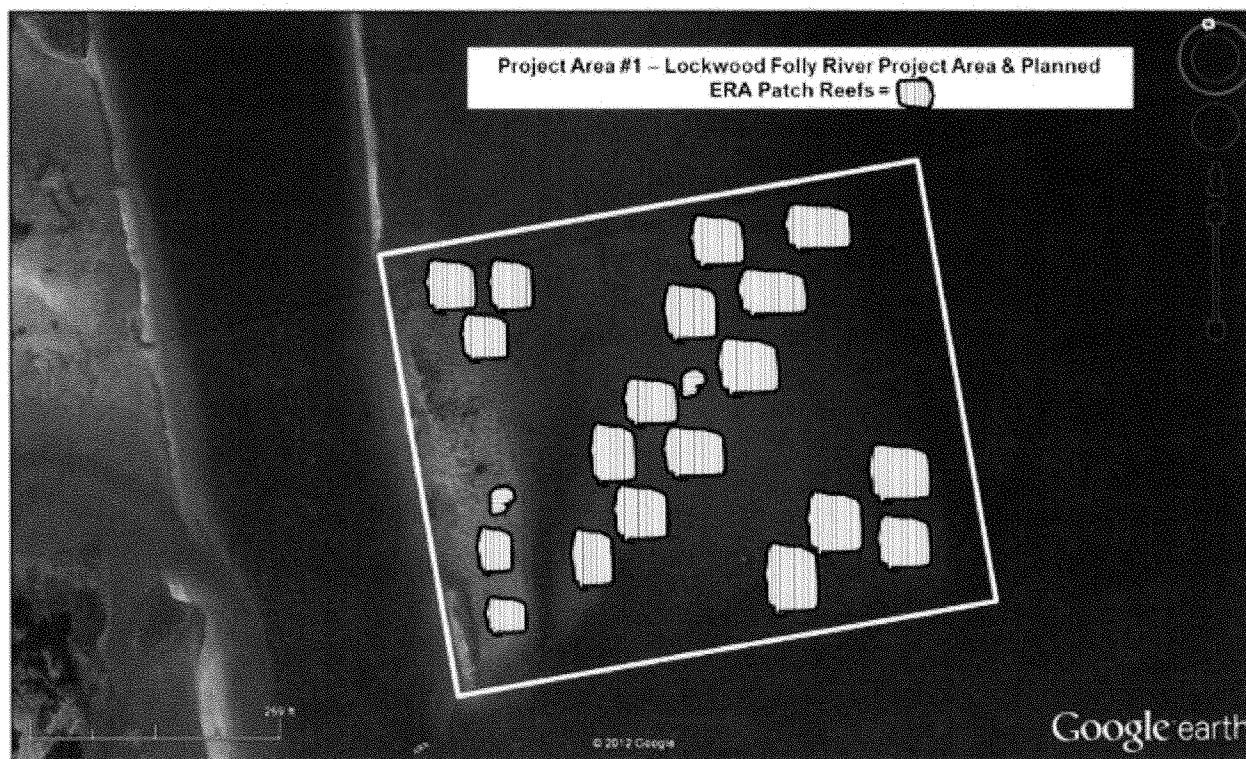


Figure 7. Project Area #1, Lockwood Folly River Patch Oyster Reef.

The living shoreline component will be located within the Lockwood Folly River watershed at a site within the jurisdiction of the Town of Oak Island. A total of 200 feet of living shoreline which will include oyster reef and salt marsh habitat will be constructed along the Town's Waterway Municipal Park at the end of NE 15th St on Oak Island. The approximate geographic coordinates for the site are 33°55'48" N x 78°09'8.64" W. The project activities will occur at and below the mean high water mark in public trust waters.

Oyster reef restoration activities at Project Area #1 will include purchasing and transporting 15,000 bushels of oyster shell and reef material to a stockpile location near the project site. The oyster shell stockpile for Project Area #1 is on a parcel of land owned by the Town of Varnamtown next to the Lockwood Folly River. The federation will coordinate the use of the stockpile with the Town and contractors working from the site. No permits are required to use this existing stockpile. The oyster reef material will be loaded onto barges for transport to the project site. The oyster reef material will be spread onto the restoration site from private contractor barges to create the patch oyster reef habitat in the three acre project site.



Figure 8. Project Area #1, Living Shoreline Location at Town of Oak Island.

The living shoreline project includes two components: an oyster shell and marl bag sill (functions both as erosion control and as an oyster reef), and a restored coastal salt marsh. The federation will work with volunteers and contractors to install the living shoreline project totaling 200 feet along the estuarine shoreline of the Town's Waterway Park. Volunteers, aided by the Town's donated Bobcat/skid loader, will use about 2,000 bushels of oyster shell and marine limestone #4 (marl) to create 5,000 oyster shell/marl bags. The bags will be placed by volunteers as two 100 foot long low profile oyster reef sills along the intertidal estuarine shoreline and shallow subtidal areas. The oyster reef sills will have a minimum six feet width and a maximum nine feet width. Once the oyster reef sills have been constructed, salt marsh

restoration between the sill and eroding shoreline will be implemented through planting of saltmarsh cordgrass seedlings. The living shoreline will create 0.2 acres of salt marsh habitat and 0.1 acres of oyster habitat (See Figure 8).

Project Area #2 is in Masonboro-Myrtle Grove Sound in New Hanover County. The project area is within the Cape Fear River Sub-basin 03-06-24 and includes the shallow estuarine waters of Greenville, Masonboro, Myrtle Grove and Middle Sounds as well as Hewletts and Bradley Creeks. The project area also includes the Masonboro Island component of the N.C. National Estuarine Research Reserve (NERR). Within the project area Masonboro Sound is classified by the N.C. Division of Water Quality as Shellfishing and Outstanding Resource Waters. Habitat areas within these waters have also been classified as Primary Nursery Areas by the N.C. Division of Marine Fisheries. The location of the project site is shown in Figure 10.

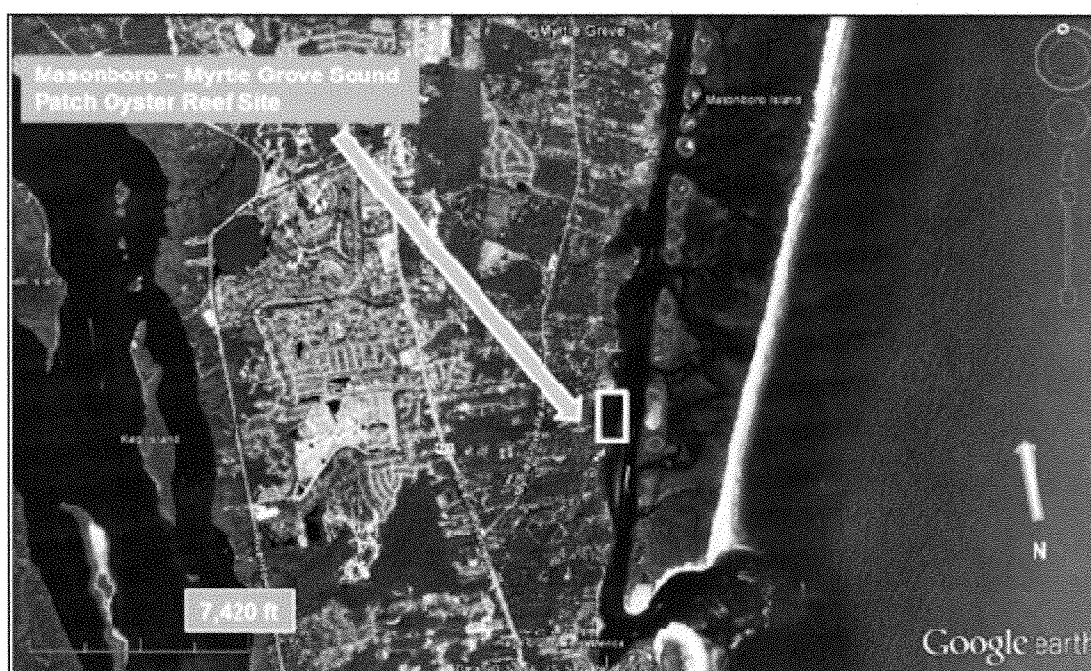


Figure 9. Project Area #2, Masonboro-Myrtle Grove Sound.

Project Area #2 will include the creation of intertidal patch eastern oyster (*Crassostrea virginica*) reef habitats in a two acre project area in Masonboro-Myrtle Grove Sound. The intertidal patch reef will be constructed in the public trust waters on an intertidal mud flat near the mouth of Johns Creek which empties into Masonboro Sound. The approximate geographic coordinates for the site are 34°5'52.28" N x 77°52'46.87" W (See Figure 9).

Oyster reef restoration implementation activities at Project Area #2 will include purchasing and transporting a maximum of 5,000 bushels of oyster shell and reef material to a stockpile location owned by the USACE on Snows Cut near the project site in Carolina Beach. The federation will coordinate the use of the stockpile with the USACE and contractor working from the site. The oyster reef material will be loaded onto barges for transport to the project site within the project

area. The oyster reef material will be deployed from the barges into project site per project design for two acres of patch oyster reef habitat creation (See Figure 10).

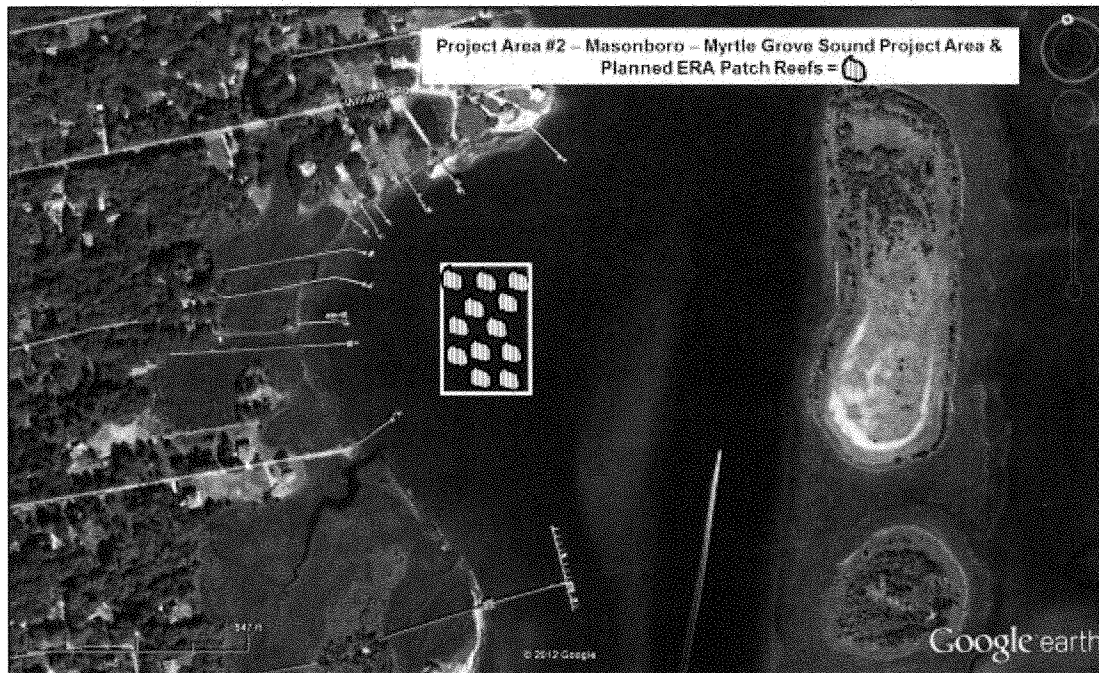


Figure 10. Project Area #2, Patch Oyster Reef, Masonboro-Myrtle Grove Sound.

Project Area #3 is located in Stump Sound which is located in Onslow County. The sound is primarily a shallow estuary with a tidal range of approximately 18 inches containing polyhaline to euhaline conditions ranging from 18 to 36 parts per thousand salinity. Due to the exceptional water quality and extremely high fisheries value, the shallow subtidal waters of Stump Sound are classified as Shellfishing, Outstanding Resource Waters and are designated as Primary Nursery Areas. The location of the project site is in Figure 11.



Figure 11. Project Area #3, Stump Sound - Patch Oyster Reefs and Living Shoreline.

Restoration activities at Project Area #3 will include the creation of one acre of shallow subtidal patch eastern oyster (*Crassostrea virginica*) reef habitat. In addition 200 feet of living shoreline will be constructed along the eroding shoreline at property owned by the federation known as the Morris Landing Clean Water Preserve. This will create 0.2 acres of saltmarsh habitat and 0.1 acres of oyster habitat. The locations of the patch oyster reef are shown in Figure 12.

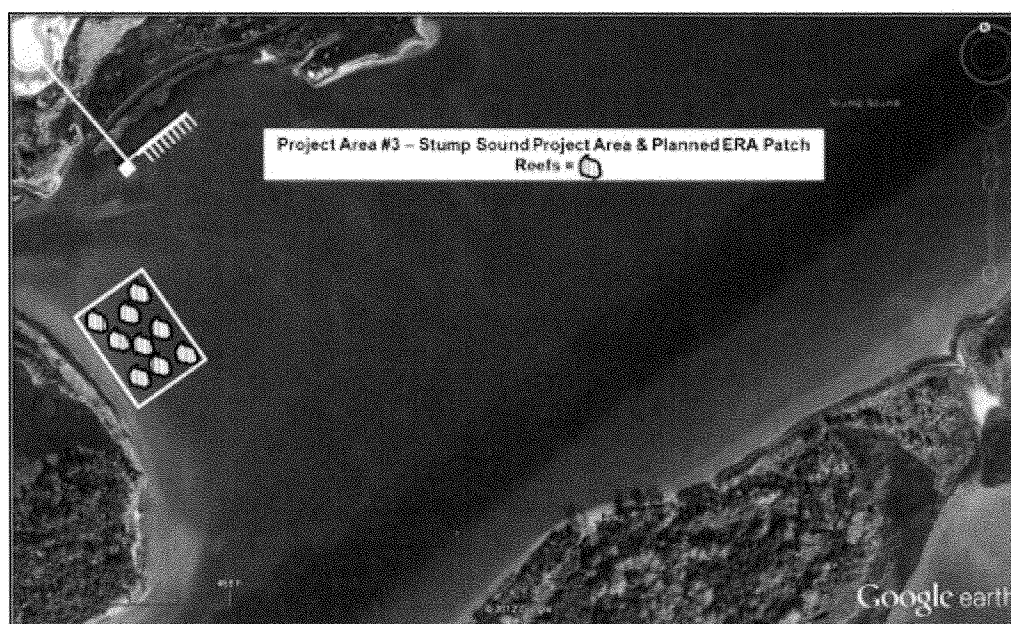


Figure 12. Project Area #3, Locations of Patch Oyster Reef in Stump Sound.

The shallow subtidal patch oyster reef habitat will be constructed in the public trust waters on mud flats near the opening of Kings Creek and Spicer Bay in Stump Sound. The approximate geographic coordinates for the site are 34°28'37.92" N x 77°29'24" W.

Oyster reef restoration implementation activities at Project Area #3 will include purchasing and transporting of 7,000 bushels of oyster shell and reef material to an existing stockpile location near the project site. The oyster shell stockpile location for Project Area #3 will be located at the federation's Morris Landing Clean Water Preserve which has an existing oyster shell stockpile area and barge loading pier. The oyster reef material will be loaded onto barges for transport to the project site within the project area. The oyster reef material will be deployed from the barges into project site per project design for one acre of patch oyster reef creation.

The living shoreline will be constructed along the eroding shoreline of the Morris Landing Clean Water Preserve on Stump Sound (See Figure 13). The Morris Landing site has 3,300 feet of estuarine shoreline. The federation constructed a 600' living shoreline with a granite sill and salt marsh restoration in 2005; a 150' oyster shell bag and marl sill with salt marsh restoration in 2008; and a 225' living shoreline with salt marsh restoration and three sills made up of oyster shell and marl bags and oyster domes in 2011 along the shoreline of Morris Landing.

The approximate geographic coordinates for the project area are 34°28'12" N x 77°30'41.76" W. The project will include two components: an oyster shell and marl bag and oyster dome sill (functions for both erosion control and as an oyster reef), and a restored/protected coastal salt marsh. The federation will work with volunteers and contractors to install the living shoreline project along 200 feet along the estuarine shoreline of Stump Sound. Volunteers, aided by a rented Bobcat/skid loader will use 2,000 bushels of oyster shell and marine limestone #4 (marl) to create 5,000 oyster shell/marl bags. The bags will be emplaced along with the concrete oyster domes to make two 100 foot sections of long low profile oyster reefs to create an oyster reef sill along the intertidal shoreline. The oyster reef sills will have minimum six feet width and a maximum nine feet width. Once the oyster reef sills have been constructed, saltmarsh restoration between the sill and eroding shoreline will be implemented by means of fill (if necessary) and revegetation. The living shoreline will create 0.2 acres of saltmarsh habitat and 0.1 acres of oyster habitat.

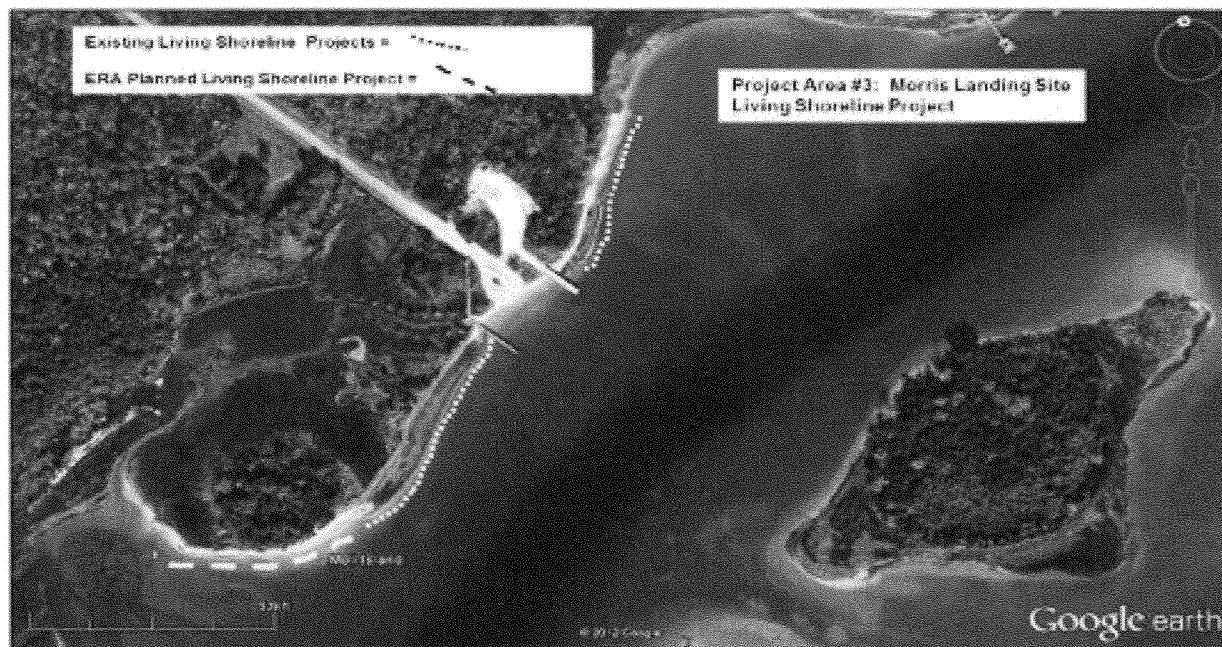


Figure 13. Project Area #3, Living Shoreline Location at Morris Landing.

The Project Area #4 is located at Jones Island, a 23-acre island located in the White Oak River in Onslow County. The project area is located on part of the island was purchased by the federation through a grant from the N.C. Clean Water Management Trust Fund. In 2007, the federation's portion of the island, along with a tract owned by Audubon North Carolina, was donated to the N.C. Division of Parks and Recreation and became part of Hammocks Beach State Park. The White Oak River that surrounds Jones Island is classified for shellfishing by the N.C. Division of Water Quality. This part of the river is also considered Essential Fish Habitat for spot, croaker and brown shrimp, and two nearby tributaries are identified as Primary Nursery Areas by the N.C. Division of Marine Fisheries. For these reasons, the N.C. Oyster Management Plan Central Regional Oyster Workgroup identified the project area as a high priority area for oyster restoration projects. The island's shoreline is comprised of coastal fringing marsh that is dominated by smooth cordgrass (*Spartina alterniflora*). However, these areas have eroded significantly in recent years. The federation has been working to restore the shoreline of Jones Island since 2007. To date, these restoration activities have included creating 1,350 linear feet of oyster shell bag sills with landward marsh grass plantings and three acres of oyster reef habitat. The location of the project site is shown in Figure 14.

Restoration activities at Project Area #4 will consist of creation of 0.84 acres of salt marsh habitat and approximately 0.1 acres of intertidal and shallow subtidal eastern oyster (*Crassostrea virginica*) reef habitat at Jones Island.



Figure 14. Project Area #4, Jones Island.

This will be accomplished by: (1) planting marsh grass landward of previously constructed oyster shell bag sills, (2) creating 500 linear feet of new living shoreline consisting of oyster shell bag sills and landward marsh grass plantings; and (3) creating new patch oyster reef habitat. Additionally three acres of shallow subtidal and intertidal patch oyster reef habitat will be created. The living shoreline and shoreline plantings will occur in the intertidal zone along the eroding shoreline of Jones Island. The approximate geographic coordinates for the site are 34°41.904' N x 77°6.46' W.

A total of 20,000 plugs of smooth cordgrass (*Spartina alterniflora*) will be planted in the intertidal zone, landward of previously constructed oyster shell bag sills during spring 2013. Planting dibblers will be used to create six-inch V-shaped holes in the sediment. Individual plugs of *S. alterniflora* will be inserted into each hole. Marsh plants will be randomly planted about one foot apart within the planting area. This component of the project will restore 0.5 acres of coastal marsh habitat. Living shorelines, consisting of oyster shell bag sills and landward marsh grass plantings will be constructed along 500 linear feet of eroding shoreline at Jones Island in spring-summer 2013. The oyster sills will have a minimum six feet width and a maximum nine feet width. The sill design consists of three layers high of oyster shell bags. At least six feet of open area will be left for every 100 linear feet of sill to allow for fish passage and inter-reef fisheries habitat. A total of 20,000 plugs of *Spartina alterniflora* will be planted in the intertidal zone, landward of the oyster shell bag sills in Spring 2013. This component of the project will create 0.1 acres of oyster reef and 0.34 acres of coastal marsh habitat. The shallow subtidal and

intertidal patch oyster reef habitat will be constructed in public trust waters on mud flats adjacent to Jones Island. The approximate geographic coordinates for the reef site are 34° 41.930' N x 77°6.360' W (See Figure 15).



Figure 15. Project Area #4, Location of Patch Oyster Reefs and Living Shorelines on Jones Island.

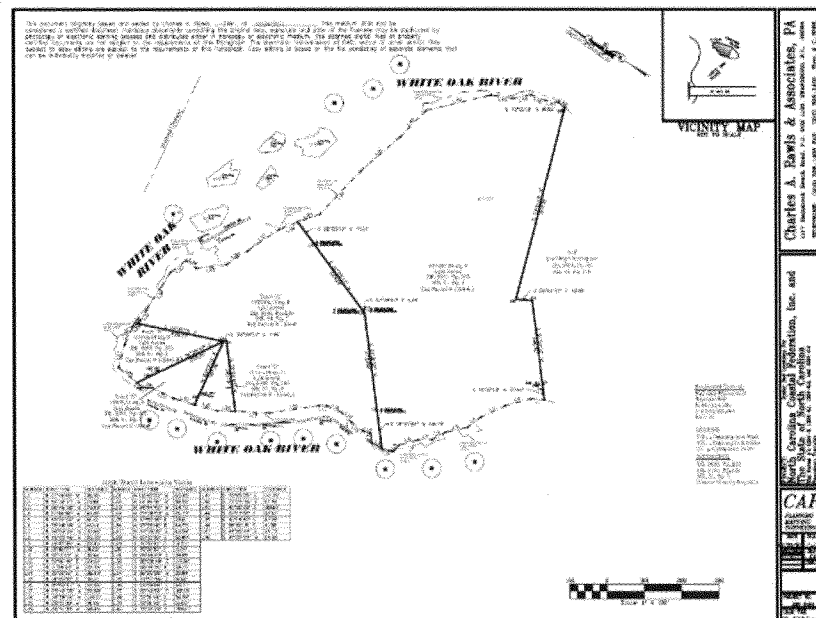


Figure 16. Project Area #4, Circles Represent Locations of Patch Oyster Reefs at Jones Island.

The reefs are being constructed close to an eroded shoreline that because of sedimentation does not have any existing oyster reefs suitable for commercial or recreational harvest (See Figure 16).

All four of the project areas where intertidal and shallow subtidal eastern oyster (*Crassostrea virginica*) patch reef habitat will be constructed have adequate levels of oyster larval recruitment and settlement as well as nekton and epifauna utilization. Within the southern region project areas (Lockwood Folly, Masonboro-Myrtle Grove Sound and Stump Sound) the reef sites will be located just inside of the line marking the permanent closure of waters to shellfish harvest due to bacteriological contamination. This bacteria is not harmful to reef development and will prevent any harvest of restored oysters. Placement of the reefs just inside the closed area eliminates user conflicts that would be caused by closing open shellfish waters to build and protect the habitat restoration sites. Placing the reefs in the closed areas will also allow for more research and comparison of oysters further upstream and closer to the pollution sources in the closed areas. Within the White Oak River, the reef sites will be adjacent to Jones Island which is a component of Hammocks Beach State Park. The Park and the federation have maintained research sanctuary or shellfish management area designations for all their oyster reef habitat projects in these waters that are subject to shellfish harvest.

The reefs will be designed with suitable elevations, patch size, inter-reef habitat, surface and edge complexity and shell layer thickness to allow for maximum potential for oyster larvae recruitment and settlement, water flow and transport of oxygen and food for the oysters, habitat provision and other ecosystem services. The federation will mark the project site and reef locations with PVC poles according to the designated project design prior to reef construction.

The project will use oyster shells to create the intertidal and shallow subtidal oyster reefs. At some of the sites, a limited amount of #4 marine limestone marl may be used in conjunction with the oyster shells. Marl is a suitable reef material and is utilized by N.C. Division of Marine Fisheries for oyster reef enhancement activities. Using marl in conjunction with oyster shells supplements the amount of reef material and enables further evaluation of marl as reef material in estuaries along the coast.

The oyster reef material will be purchased from oyster shucking houses and quarries (marl) and transported by truck to a stockpile location near each project site. Project contractors (either N.C. Division of Marine Fisheries or private contractors) will load the reef material onto small, shallow draft barges. The barges will travel to the project site where the contractor will spread the shell into the reef locations as indicated by the PVC poles placed earlier. Using its flat bottom boats, the federation will be monitoring the reef construction activities and will check the placement of the shells to ensure that it meets the project design specifications. Upon the satisfactory completion of the reef material deployment, the federation will place signage on the project area indicating their designation by the N.C. Division of Marine Fisheries as shellfish research sanctuaries. Post project monitoring will then begin and occur according to the monitoring schedule.

Previous monitoring of federation restored oyster reefs in North Carolina indicates that they provide oyster habitat during the first spatfall season, and that recruitment may be heavy,

depending upon larval availability and seasonal fluctuations . Oysters generally reach maturity in two to three years, and the reef will provide oyster habitat for as long as the reef exists, since new oysters will continue to attach onto previous oyster shell layers, even in a scenario of rising sea level. Lifecycle estimates of the individual oysters are highly variable, and are not impacted by the project, but by natural predation, oyster diseases, and pollution.

Monitoring of oyster reefs previously created by the federation also shows that they provide habitat and are used by a variety of finfish during the first year. Again, the reefs will provide habitat for finfish for as long as the reefs exist. Since the reefs are formed from oyster shells, there is no known limit to the structure lifetime. Sea level rise predictions are expected to increase significantly over the next century, and it is currently unknown whether oyster recruitment patterns will be able to be sustained during periods of rapid sea level rise.

The federation will work with volunteers and contractors to install the innovative living shoreline projects. Each living shoreline project will create saltmarsh and oyster habitat along a section of eroding shoreline. The projects will include the restoration of coastal salt marsh and the implementation of an oyster reef sill made up of oyster shell and marl bags and in some cases concrete oyster domes. The project employs the innovative technique of using a combination of “softer” approaches to reducing shoreline erosion instead of relying on a vertical wall bulkhead, rip-rap revetment or other hardened structure. The oyster reef sills serve as the wave dampening mechanism or sill. This use of oyster shell and marl bags and oyster domes is an innovative approach to erosion control along estuarine shorelines.

This approach also allows for the potential for adaptation to rising sea levels. The living shoreline allows the project components to adapt and migrate to changing levels of water. The oyster sills made up of oyster shell and marl bags and oyster domes will recruit oyster larvae that will attach to the oyster shell and marl in the bags and the marine friendly concrete oyster domes. As these oyster spat develop and mature they will transform the shell and marl bags and oyster domes into a developing reef. The oysters will continue to grow and more larvae will settle onto the reef. The oysters will tolerate a certain vertical range in this growing reef. As water levels change, the oysters will settle and grow in this range using the reef base as a foundation for continual buildup of the newer, taller reaches of the reef. The created and restored salt marsh habitat behind the oyster shell bag sill will also be able to migrate to maintain its preferred elevation in relation to the water level and tidal amplitude.

Each of the project areas along with nearby reference sites will be surveyed to determine the exact location, elevation and grade needed to establish the oyster reef sill and the marsh plantings. If necessary, clean sandy fill of compatible grain size and color will be installed in the project area to create a suitable grade and elevation for successful marsh restoration. The fill would come from a commercial sand mine that has provided sand for previous marsh restoration projects.

The project contractor will use a Bobcat/skid loader to haul the sand from the stockpile area to the project site. The contractor will place the sand in the designated restoration area and will work on the sand fill to avoid travel on existing marsh. The fill will be placed from the top of the marsh scarp at normal high water and extend towards the base of the oyster shell bag, marl bag

or oyster dome sills. Once all the sand is in place the contractor will use the blade of the Bobcat/skid loader to shape and grade the sand to the approved elevations. The fill will be graded to match the natural grade suitable for *Spartina patens* and *Spartina alterniflora*. The fill will be stabilized with the installation of *Spartina alterniflora* planted on 12 inch centers to enhance the restoration of the salt marsh. Some high marsh plant seedlings, *Spartina patens* will be installed as needed in any high marsh zones.

The ground will be protected through the use of logging/marsh mats for the equipment and people to pass over. Once the project is complete, all the mats and any project debris will be removed and the path area will be allowed to return to its natural state. No fill will be used at the Jones Island living shoreline restoration site because the grade is acceptable and the logistical difficulties in moving it to the site.

Oyster shell bags, marl bags and concrete oyster domes will be placed by volunteers and project contractors along the shoreline to form long low profile oyster reefs to create the oyster sills. Depending upon the project area, the oyster sills will have a minimum 6 feet in width and a maximum 9 feet in width, and each sill will range from 200 to 500 feet in length. The reefs will be made up of oyster shell and marine limestone marl placed in aquaculture mesh bags and in some cases marine friendly concrete oyster domes. Marl is an approved oyster reef cultch material, but is more readily available and is less expensive than oyster shells. The marl, while successful for oyster larvae recruitment and attachment, is best used as a base for the sill. The base of the sill is often covered in sediment fairly early on in the development of the shell bag blanket reef so it is best to use the marl in this area. The marl will be placed, either in bags or loose depending on the site conditions, in the footprint of the sill. Then mesh bags filled with recycled oyster shells will be placed on top of the marl so that the shell is in the optimum elevation range for oyster larvae recruitment. In areas with strong wave and wake action, primarily the Morris Landing site in Project Area #3, concrete oyster domes will be used in conjunction with the oyster shell and marl bags. The domes, placed in staggered rows, would occupy the same reef footprint as designed for the marl and shell bags. Approximately 5 feet of open area will be left between each of the oyster reef sills to allow for fish passage and inter-reef fisheries habitat. These reefs will protect existing oyster and salt marsh habitat and will enhance and restore lost oyster reef and salt marsh habitats.

Once the oyster reef sills have been constructed, the salt marsh restoration between the sill and eroding shoreline will take place. The pre-project survey will determine if clean sandy fill of compatible grain size and color will need to be installed in the project area (except no fill will be used at Jones Island). Once the fill is in place and settled, *Spartina alterniflora* (smooth cordgrass) and saltmeadow hay (*Spartina patens*) seedlings will be planted along the intertidal zone, landward of the restored oyster reef area in each project area. In all the salt marsh restoration areas the plants will be planted by volunteers on 1 foot centers, in an offset grid pattern in the zone between the created oyster habitat and the existing eroding salt marsh at each project site.

Flat bottom boats will be used to scout the project sites, haul oyster shell and marl bags, and volunteer work crews. *Spartina alterniflora* seedlings will be acquired and planted by volunteer work crews in the construction of the living shoreline. Monitoring activities will consist of the

use of flat bottom boats to transport volunteers and staff to the project site, and the acquisition and installation of *Spartina alterniflora* seedlings for use in annual maintenance activities.

For the oyster reef sills, previous project monitoring indicates that the sills provide oyster reef habitat within weeks of construction through colonization by reef epifauna, followed by nekton utilization. Oyster recruitment occurs during the first spatfall season, and recruitment may range from light to heavy, depending upon larval availability and seasonal fluctuations. Oysters generally reach maturity in two to three years, and the reef will provide oyster habitat for as long as the reef exists, since new oysters will continue to attach onto previous oyster shell layers, even in a scenario of rising sea level. Lifecycle estimates of the individual oysters are highly variable, and are not impacted by the project, but by natural predation, oyster diseases, pollution, etc. Monitoring of previously created oyster reef sills also show that these reefs provide habitat and are used by a variety of finfish during the first year. Again, the reefs will provide habitat for finfish for as long as the reefs exist. Since the reefs are formed from oyster shells, there is no known limit to the structure lifetime, although it is possible that these structures may be damaged or destroyed during a strong hurricane.

The restored marsh shoreline provides certain habitat functions during the first season (erosion control, fisheries habitat), but restored marshes in North Carolina usually require two to three years to provide aerial plant coverage similar to natural marshes, and may take seven to ten years to provide most of the functions of a natural marsh, including production of peat layer, nutrient cycling, etc. Monitoring of similar sill/marsh projects indicate that restored low/high marshes landward of sills has remained stable for 20 to 30 years. Since sills function to retain sediment and provide stability of the marshes landward of the sill, some sill projects can result in accretion of sediment landward of the sill, and resultant evolution from low to high marsh. Although research data is fairly limited, current findings show that some marshes may accrete landward of the sills, while others reach a stable elevation and location of low to high marshes. Given the recent estimates for significantly increased rates of sea level rise and storms, it is possible that the marshes landward of sills may be more successful in keeping pace with sea level rise, although no data yet exists to support this possibility.

3.2 Alternatives Considered

The EA also considered a No Action Alternative. The No Action alternative involves no construction of intertidal and shallow subtidal patch oyster reefs and fringing salt marsh habitats in four project sites in southeastern North Carolina using Estuary Restoration Act (ERA) grant funding. The No Action alternative would not provide for restoration of salt marsh and oyster reef estuarine habitat. The no action alternative does not increase public awareness and support for habitat restoration efforts, and provides no opportunity for the public to engage in these activities. Scientific understanding of the best way to conduct these projects will not be enhanced by the No Action alternative since monitoring and evaluation of these restoration techniques will not occur.

4.0 Impacts of the Selected Alternative

Table 1 provides a brief summary and comparison of impacts to the physical and natural environment for the Selected Alternative and the No Action Alternative.

Table 1. Summary of Environmental Impacts.

Resource	No Action	Proposed Action
Tides and Currents	No impact	No impact
Water Quality	No impact	Positive impact
Sediment Quality	No impact	Positive impact in areas of shoreline erosion
Shoreline Processes	Negative impact from continued loss of habitat and lost education and involvement opportunity	Positive impact on shoreline erosion and in demonstrating living shoreline methods
Threatened and Endangered Species	No affect	Minor positive direct impact by providing more habitat, long-term benefits by promoting habitat restoration and living shorelines. Either no affect or may affect not likely to adversely affect.
Aquatic Resources	Negative impact because of lost opportunity to provide more habitat as well as greater education and involvement in restoration efforts.	Positive impacts by providing more habitat for shellfish and fish
Essential Fish Habitat	No impact	Positive impact by providing more reefs and salt marsh habitat that is designated as EFH
Fish and Wildlife Resources	No impact	Positive impact by providing more habitat and food for fish and wildlife
Recreation, Navigation, and Aesthetic Resources	No impact	Positive impact by providing more habitat for shellfish, fish and birds
Archaeological/Historical Resources	Negative impact since archaeological resources will not be protected at Jones Island	Positive impact by providing for traditional uses of estuaries and protection of archaeological resources at Jones Island
Coastal Barrier Resources Act	No impact	No impact
Wetlands	No impact	Positive impact by protecting and restoring salt marsh
Prime and Unique Agricultural Land	No impact	No impact
Hazardous and Toxic Waste Sites	No impact	No impact
Air Quality	No impact	No impact

5.0 Environmental Commitments

The project will be monitored for five years by university researchers and the federation staff working with volunteers to document their success.

The ground will be protected through the use of logging/marsh mats for the equipment and people to pass over. Once the project is complete, all the mats and any project debris will be removed and the path area will be allowed to return to its natural state.

The Federal action for USACE is the providing of a grant to the federation for construction of the proposed estuarine restoration projects as part of the Estuary Restoration Act of 2000, Title I of Public Law 106-457. The North Carolina Coastal Federation, the non-federal sponsor, will be responsible for complying with securing any necessary regulatory permits for the project activities, including all USACE regulatory permits. The federation has complied with the Programmatic Environmental Assessment of NOAA Fisheries' Implementation Plan for the Community-Based Restoration Program.

For project activities at Project Area #4 White Oak River – Jones Island, a Coastal Area Management Act (CAMA) Modification to an existing Major Development Permit (Permit No. 47-09) will be necessary for the installation of the 500 linear ft. of oyster shell bag sills. The federation will request and apply for this modification in fall and winter of 2012 and 2013, with approval expected in winter or spring of 2013. Once constructed, the reefs will be designated as Shellfish Management Areas through proclamation by the N.C. Division of Marine Fisheries. Due to the archaeological sites on the island, the project was previously subject to review by the N.C. Department of Cultural Resources State Historic Preservation Office (NCDCCR SHPO). It was determined on February 10, 2009, that the proposed project would not involve any ground-disturbing activities and did not appear to represent a significant threat to any existing cultural resources within the project area (Figure 14). The N.C. Division of Water Quality Wilmington Regional Office also reviewed the project proposal and decided that any impacts of the project are covered by General Water Quality Certification Number 3642. This allowed for use of a 404 permit when issued by the US Army Corps of Engineers and a CAMA Major Permit when issued by the N.C. Division of Coastal Management. Erosion and sediment control measures were designed according to the North Carolina Sediment and Erosion Control Planning and Design Manual.

Construction of the proposed patch oyster reefs at Jones Island is already permitted through a previous Major Modification (received on October 10, 2011) of CAMA Major Development Permit No. 47-09.

For project activities at Project Area #3 Stump Sound – Morris Landing, a Coastal Area Management Act (CAMA) Modification to an existing Major Development Permit (Permit No. 28-05) will be necessary for the installation of the 200 linear ft. of oyster shell bag, marl bag and oyster dome sills. The federation will request and apply for this modification in fall and winter of 2012 and 2013, with approval expected in winter or spring of 2013.

The remaining environmental permits will be obtained for all project activities at project areas 1, 2, and 3. These will primarily include: Coastal Area Management Act permit issued by the N.C. Division of Coastal Management; 401 Water Quality Certification issued by the N.C. Division of Water Quality; and General Permits and Consistency Determination issued by the USACE.

All of the project components will require coordination with state and federal regulatory agencies for permitting and environmental compliance. The federation will work with the project partners to prepare and submit the necessary state and federal permit applications.

6.0 Public and Agency Coordination

On November 16, 2012, the EA was mailed to federal, state, and local agencies and other interested parties for a 30-day review and comment period. Responses to comments are included in Appendix A. Correspondence on the EA was received from the following:

Federal Agencies

- U.S. Environmental Protection Agency

State Agencies

- North Carolina Department of Environment and Natural Resources Division of Coastal Management
- North Carolina Department of Environment and Natural Resources Division of Marine Fisheries
- North Carolina Department of Historic Resources
- North Carolina Division of Water Resources- Public Water Supply Section

Local Communities

- No comments received

Elected Officials

- No comments received

Federally-Recognized Tribes

- No comments received

Conservation Groups

- No comments received

Interested Groups and Individuals

- No comments received

None of the comments received identified any reasonable alternatives or major substantive issues that are not already addressed in the EA. In addition, none of the comments required substantive changes to the Selected Alternative or impact determinations in the EA.

7.0 Finding of No Significant Impact

I have reviewed the Environmental Assessment for the Restoring Coastal Estuarine Habitat in Four North Carolina Estuaries, the information provided by interested parties, and the information contained in this Finding of No Significant Impact, and I find that the project will not significantly affect the quality of the human environment. Therefore, preparation of an Environmental Impact Statement, pursuant to Section 102(2) (c) of the National Environmental Policy Act of 1969, as amended, is not required.

Date: 4 FEB 2013

A handwritten signature in black ink, appearing to read 'SAB', followed by the printed text 'COL, EN'.

Steven A. Baker
Colonel, U.S. Army
District Commander

**Appendix A
Response to Public Comments**

1. U.S. Environmental Protection Agency, Dated December 11, 2012

Comment: Is there any methodology for the placement pattern of the Patch Oyster Reefs depicted in Figure 8 (and other figures)?

Response: The patch reef design and placement are based on recommendations from benthic ecology researchers at UNCW and others developed from their work on intertidal and shallow subtidal patch reefs in central and southeastern North Carolina. Multiple, smaller patch reefs are recommended versus fewer and larger reefs. The current flow disturbance on smaller patch reefs enables improved larvae settlement and recruitment and food (plankton) availability and distribution across the whole patch reef. Larger patch reefs have more uniform current flow which can lead to reduced larvae recruitment and food availability. The smaller patch reefs also lead to more habitat fringes/edges and complexity which is attractive to a variety of species resulting in enhanced species diversity and utilization. The height (thickness of shell layers) and square footage of the proposed reefs are based on the height and approximate square footage of existing nearby reference reefs, allowing for some subsidence post construction. The space between the reefs is recommended to enable nekton to have access to multiple patch reefs, move between the patches, and enter and exit the patch reef complex as the tide rises and falls.

Comment: Recommend providing more detail of the typical oyster species (shells) that are being used for material to build the reefs. It is stated in the EA that the material will be acquired locally.

Response: All the proposed oyster reefs (patch and shoreline/sill) will utilize *Crassostrea Virginica* shell obtained from shucking houses. The shell is allowed to "cure" for a minimum of three months to allow any bacteria or pathogens to dissipate. This is based on the same procedure utilized by the NC Division of Marine Fisheries (DMF) and recommended by researchers and practitioners.

Comment: Recommend providing additional details on the type of typical BMPs that will be used to minimize WQ impacts during construction of these projects.

Response: For the patch oyster reef construction the reef material (shell and marl) to be used will be free of debris and sediment to the extent possible. The material will be stored in stockpile areas that have extensive buffer areas between the material and water bodies. As the reef material is deployed from the shallow draft barges into the project area there may be some very temporary and localized increases in turbidity. Using as clean as possible reef material will limit the turbidity increase. This method of reef creation is utilized by the NCDMF and they follow these same practices.

For the living shoreline project components the ground in the project area will be protected through the temporary use of logging/marsh mats for any equipment and people to pass over. Once the project is complete, the mats will be removed, vegetation will be installed if needed and the project area will be allowed to return to its natural state. On a project site specific basis silt fences and turbidity booms will be installed and maintained in the project area prior to construction if needed. The silt fences and boom will be temporarily anchored in place during

the construction and until the project is deemed stable. The project area will be stabilized with the installation of approximately 2,500 *Spartina alterniflora* (Smooth Cordgrass) planted on 12" centers to enhance the restoration of the saltmarsh.

2. North Carolina Department of Environment and Natural Resources Division of Coastal Management, Dated December 21, 2012

Comment: Would the newly restored reefs be able to overcome the adverse trends mentioned on page 12 of the EA?

Response: The newly created reefs will provide needed substrate for oyster larvae to attach. The central and southern coastal region of North Carolina is considered substrate limited for larval recruitment and oyster population growth. The design height of the reefs will allow the reefs to remain emergent when facing sedimentation, and the oysters that settle on the reef will be able to grow higher in the water column due to the reef elevation. The higher in the water column the oysters are provides for increased food availability and access to dissolved oxygen. This reduces the stress on the oyster increasing its resilience to disease and temporary periods of harsh environmental conditions. The oysters on the reef will face natural mortality from predation, environmental conditions and disease, but the reefs will be designed to lessen the degree that these factors can influence them.

Comment: Are there any management proposals to lessen sedimentation, reduce disease, and/or to improve water quality to enhance the viability of the restoration effort?

Response: As mentioned the reefs will be in closed waters which eliminates the allowed harvest pressure. The description above provides information on how the reef design is intended to help the reefs combat sedimentation and increase the oysters' resiliency against disease. Also, the reefs are being constructed in project areas that are a focus of numerous water quality initiatives including watershed TMDL and restoration plans (Lockwood Folly, Hewletts & Bradley Creek, and the White Oak River). Along with the plans a number of management practices are being put into place to address stormwater run-off which is the primary source of water quality degradation in the project areas. Many of these measures are in place or being put into place near or adjacent to the project areas. In addition, the living shoreline projects include salt marsh habitat restoration which will provides opportunity for water quality protection in the project areas. As the oyster reefs become established the reef structure and the oysters on the reefs will have a beneficial effect on the overlying water column.

Comment: Project Area #2 (page 16, figure 10 & 11) appears close to existing development that could adversely affect the proposed reefs viability. EA states the oyster reef would be located in Public Trust Areas.

Response: The Coastal Federation will work with DCM and DMF to closely review the proposed reefs in this project area to address these issues through an interagency meeting and CAMA permit preparation and review. The reefs in this project area will be located on an intertidal sand flat adjacent to the AIWW, and out of any of the deeper areas, natural drains and

secondary channels used by the adjacent riparian landowners. The intertidal flat is not used as a navigation channel. The low profile reefs and patch reef complex should not disrupt the natural flow in the area, and the reefs' location on the tidal flat should not result in any increase in sedimentation in the deeper areas of the cove.

Comment: At the time a CAMA Major Development permit is applied for, would Project Area #2 be marked with PVC pipes, flagging, etc. to allow the properties owners adjacent to the proposed reef to get an idea of the area to be occupied by the reef?

Response: After the interagency meeting and discussion, the project area will be posted and outlined with PVC pipes and flagging for field inspections by agencies and riparian landowners. Comments and concerns from the agencies and landowners will be considered and incorporated into the final project design.

Comment: Since the proposed reef is near an existing development that will provide boat traffic, an assessment should be made on concerning the impact of the nearby development on the viability of the proposed reef.

Response: The comments above describe how the proposed oyster reefs will be designed and located with input from agencies and landowners. Designing the project to ensure its viability and least amount of impact to users of the area will be a critical consideration. The Coastal Federation has also worked with DMF to tentatively identify an alternative project site nearby with similar environmental conditions if the proposed project site proves untenable. If this alternative is pursued, the Coastal Federation will work with all the appropriate agencies to review the site and potential impacts.

3. North Carolina Division of Water Resources- Public Water Supply Section, Dated December 21, 2012

Comment: If existing water lines will be relocated during the construction, plans for the water line relocation must be submitted to the DWR-PWS, Technical Services Branch.

Response: No existing water lines have been identified in any of the project areas. If any are located the Coastal Federation will work with DWR to prepare and submit plans for relocation.

4. North Carolina Department of Environment and Natural Resources Division of Marine Fisheries, Dated December 18, 2012

Comment: The North Carolina Division of Marine Fisheries (DMF) has been involved with the planning of several of these proposed sites. DMF is currently working with NCCF to consider potential revisions to the Masonboro area site as described in this EA. All sites are in areas permanently closed to shellfish harvest or will be protected as Shellfish Management Areas. Many sites are adjacent to and extensions of previous clutch planting efforts that were collaborations between DMF and NCCF.

DMF will take the opportunity to comment during the permitting phase of these projects when more details are provided.

Response: Noted.

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