

LOWER CAPE FEAR

BUILDING COSTAL RESILIENCE IN THE LOWER CAPE FEAR REGION

CHALLENGE

Sea-level rise and more intense coastal storms are eroding habitats and threatening communities.



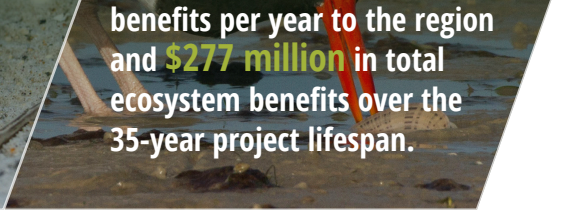
SOLUTION

Preserving barrier islands and rebuilding nesting islands and oysters reefs will improve habitat for birds and enhance flood resilience for nearby communities.



BENEFITS

Preserving and restoring important coastal habitats will deliver more than **\$12 million** in ecosystem benefits per year to the region and **\$277 million** in total ecosystem benefits over the 35-year project lifespan.



Photos: Piping Plover (Left), Least Tern Chick (Center), American Oystercatcher (Right), Lindsay Addison/Audubon North Carolina

BACKGROUND

The Cape Fear region, located in southern North Carolina near Wilmington, includes Brunswick, New Hanover, and Pender Counties. The region is characterized by a variety of coastal plain habitats from freshwater swamps and bottomland forests to coastal marshes and barrier islands. Two of the region's most prominent natural features are the Lower Cape Fear River estuary and its chain of barrier islands.

The Lower Cape Fear River is one of the state's largest estuarine ecosystems. Spanning 43 square miles from the Atlantic Ocean to the City of Wilmington, the estuary supports important coastal and riverine habitats that provide natural flood buffers and serve as a water source for nearby communities, like the City of Wilmington. The river is also a critical transportation corridor for the Port of Wilmington.

Audubon protects and manages an extensive network of islands in the Lower Cape Fear River that provide nesting, breeding, and feeding habitat for 25 percent of North Carolina's nesting coastal water birds. These habitats serve as nurseries for fisheries that are commercially important to the state, such as blue crab and southern flounder. Fishing, hunting, boating, and other recreational uses of the estuary are estimated to generate \$100 million to \$120 million in economic expenditures in the region annually.¹



American Oystercatchers
Photo: Lindsay Addison/Audubon North Carolina



Brown Pelicans
Photo: Lindsay Addison/Audubon North Carolina



Along the outer coast of the Cape Fear region, barrier islands front expansive saltmarshes. As primary nursery habitat, these marsh systems sustain commercial and recreational fisheries, as well as wildlife. The barrier islands provide recreational opportunities to residents and tourists and support an abundance of bird species year-round. In the spring and summer, the region's barrier islands support large proportions of the state's nesting Least Terns, Black Skimmers, American Oystercatchers, and other species. In the non-breeding season, thousands of migrating shorebirds rely on the region's inlets, marshes, and mudflats for foraging and resting.

In addition to protecting birds across the Lower Cape Fear region, Audubon is working with partners to ensure that they have the habitat needed to adapt to coastal threats. Climate change, rising sea levels, and coastal

storms are among the top threats to the region, which has seen 11 inches of sea-level rise since the 1950s.² More intense coastal storms have eroded habitats and caused loss of human life and damage to infrastructure. Since 2016, this region has experienced three major storms – hurricanes Matthew in 2016, Florence in 2018, and Dorian in 2019. These hurricanes caused heavy rainfall and storm surges that overflowed the Cape Fear River, damaging homes and businesses, making roads impassable, and causing widespread power outages from Bald Head Island to Wilmington and beyond. Marshes throughout the estuary enhance natural flood protections for low-lying communities along the banks of the Cape Fear River, and barrier islands along the Atlantic Coast protect communities on the mainland from damaging coastal storm surges.



Lea-Hutaff Island
Photo: Walker Golder/Audubon



American Oystercatcher
Photo: Greg Gard/Audubon Photography Awards

THE PROJECTS

Audubon North Carolina is advancing multiple resilience projects to protect, restore, and enhance critical ecosystems in the Cape Fear region. The following case study evaluates the economic benefits of three projects that are being pursued to improve habitat for coastal birds and enhance flood resilience for nearby communities:

- **Acquisition of the 415-acre Lea-Hutaff Island** – an undeveloped barrier island currently in a mix of public and private ownership – will prevent development on the island and ensure that it can be managed and maintained as a critical bird habitat and natural flood buffer for communities on the mainland.
- **Expansion of the footprints of Ferry Slip and South Pelican islands** by up to 16 acres using dredged sediments, which will create premium habitat for waterbirds and will provide wetland benefits as well.
- **Expansion and re-establishment of oyster reefs at Shellbed and Striking islands** will improve water quality, restore oyster populations, enhance nesting and foraging areas used by birds like the American Oystercatcher, and attenuate waves and reduce erosion to adjacent marsh.

THE PROJECTS WILL PRODUCE SIGNIFICANT RETURNS:

\$44 in benefits for every \$1 invested
into preserving Lea-Hutaff Island.

\$4 in benefits for every \$1 invested
into restoring nesting islands and
oyster reefs.

THE MANY BENEFITS OF MARSHES AND ISLANDS



RESILIENCE

Barrier islands, reefs, and marshes provide natural flood buffers, reducing impacts of flooding caused by storm surges and more intense rainfall, thus protecting homes, businesses, and critical infrastructure.



ENVIRONMENT

Barrier and dredged-material islands provide important nesting, breeding, and feeding habitats for coastal birds and nurseries for fisheries.

Islands protect and provide sediments needed to maintain healthy adjacent marshes.

Oysters reefs and marshes filter pollutants and improve water quality.

Marshes capture and store carbon from the atmosphere and reduce carbon pollution.



COMMUNITY

Coastal habitats provide local opportunities for birding, boating, fishing, and hunting.

They also provide aesthetic beauty, improve quality of life, and increase property values.

Restoration and management of these habitats provide opportunities for volunteer engagement, local jobs, and business revenues associated with recreation and tourism.

HEALTHY COASTAL ECOSYSTEMS SUPPORT COMMUNITY RESILIENCE

Beyond their important role in the ecosystem, healthy marshes, oyster reefs, and islands within the Cape Fear region provide substantial economic value to surrounding communities. This can be estimated by assigning monetary value to the many ecosystem services that natural places provide to people. Ultimately, *restoring nesting islands and oysters will generate approximately \$143,000 per year in economic value* to the Cape Fear River estuary, delivering more than \$3 million in economic value over a 35-year period (assuming a 3% discount rate).

Additionally, acquisition and protection of Lea-Hutaff Island will not only preserve important habitats for shorebirds like the Wilson's Plover and Least Terns, but it will also preserve the first line of defense for the mainland during coastal storms. *Preserving this valuable natural barrier will deliver more than \$12.3 million in annual economic benefits* to the region and over \$278 million in total economic benefits over a 35-year period (assuming a 3% discount rate).

Table 1. Annual benefits from the Projects.

BENEFIT	PRESERVED BARRIER ISLAND	NEW OYSTER REEFS	EXPANDED NESTING ISLAND
 RESILIENCE			
FLOOD PROTECTION (RAINFALL/RIVERINE)	--	--	\$2,140
STORM PROTECTION (HURRICANE/SURGE)	\$2,390,540	--	--
 ENVIRONMENT			
CARBON CAPTURE	\$18,499	--	\$320
FOOD & FISHERIES	\$21,462	\$1,228	\$11,674
HABITAT VALUE	\$1,749,929	\$832	\$5,212
WATER QUALITY & SUPPLY	\$6,783,606	\$4,229	\$76,067
 COMMUNITY			
AESTHETIC VALUE	\$1,352,401	\$408	\$4,028
RECREATION	\$61,500	\$4,100	\$8,200
VOLUNTEER ENGAGEMENT	\$10,199	\$12,095	\$12,095
ANNUAL TOTAL	\$12,338,136	\$22,896	\$119,735

In addition to the direct benefits of restoring oyster reefs, project planners anticipate that these actions will indirectly benefit adjacent marshes by contributing stabilizing sediments and buffering against erosion from storm surges, wave energy, and boat wakes. It is anticipated that adjacent marshes will improve in health by 30%, adding more than \$7,000 in annual benefits from improved marsh health alone. Table 1 summarizes the anticipated benefits expected per year. These are conservative estimates that do not capture the full range of ecosystem benefits anticipated and are described further in the final section of the case study. The true value of ecosystem services will likely be much larger.

RESTORATION PROVIDES SIGNIFICANT ECONOMIC VALUE

Restoration efforts in the region will produce benefits over many decades, similar to the value that would be provided by infrastructure like roads and bridges. The benefits of restored natural assets can be translated into a “benefit-cost ratio” that describes the economic value created by restoring natural amenities and improving ecosystem health. This information can be used by decision-makers and funders to compare different restoration options with other “gray” infrastructure investments, like hard shoreline armoring, which may be under consideration as strategies for enhancing community resilience in the region.

- **Asset Value:** The improvements to natural resources minus the costs to implement these three projects will be more than **\$277 million over a 35-year project lifespan**. This estimate accounts for projected sea-level rise and the resulting need to periodically nourish Ferry Slip and South Pelican islands as well as the conversion and loss of marsh.
- **Benefit-Cost Ratio:** Another way to estimate a project’s economic viability is by comparing the benefits delivered by the project to the cost to implement it. A benefit-cost ratio of great than 1.0 indicates that the project is cost effective and a worthwhile investment. ***The projects to restore nesting islands and oyster reefs together have a benefit-cost ratio of approximately 4:1***, meaning that each dollar invested will return about \$4 in benefits. And, using an even more conservative 7% discount rate, ***preservation of Lea-Hutaff island has a benefit-cost ratio of 44:1***, meaning that for every \$1 invested will return \$44 in benefits.

Clearly, investing in efforts to restore and preserve these important habitats will deliver significant economic value to the region. The projects are also expected to enhance community well-being by providing opportunities for residents to connect with nature through volunteer and coastal stewardship activities, birdwatching, kayaking, hunting, and fishing. This suite of projects demonstrates a cost-effective strategy for building ecological and community resilience to sea-level rise and other climate impacts.



Royal Tern and Sandwich Tern Colony
Photo: Lindsay Addison/Audubon North Carolina

IMPORTANT VALUES **NOT ESTIMATED**

There are many important benefits that we get from complex coastal ecosystems that can't be calculated or monetized, but they are nonetheless incredibly important to the health and resilience of birds and our communities. Lack of data and valuation methods makes it difficult to estimate some of the important benefits delivered by the Cape Fear River region. Those unmonetized benefits include:

- **Contiguous Natural Area:** The benefits of large, contiguous and connected ecosystems are often greater than the sum of any individual habitat. For example, a diversity of connected habitats present in the watershed is likely to provide greater resilience and wildlife benefits due to greater productivity compared to fragmented habitats. The benefits conveyed by connected habitats and restoration efforts are not estimated here.
- **Ecosystem Corridors:** Habitats spaced along flyways and wildlife migration routes provide feeding, nesting, and resting opportunities needed to maintain healthy populations. However, it is difficult to quantify and monetize the added value of preserving and restoring these important links in the chain of habitats used by migrating wildlife and birds as they make their way along important migration corridors, like the Atlantic Flyway.
- **Benefits to Marshes:** Restoring islands and oyster reefs improves the health of nearshore ecosystems like marshes by contributing sediments and reducing erosion from waves and storm surges. The indirect benefits of improving marsh health – i.e. improved water quality, nurseries for fish and other marine life, and sequestered carbon – are difficult to assess due to local complexity and variability. We relied on educated estimates from local experts to quantify indirect benefits to marsh health in this case study.
- **Losses Avoided:** Many of the birds that will benefit from the restoration and preservation efforts described in this case study are state or federally listed species that face many threats. Restoring their habitats can support the recovery of these species and help maintain healthy populations needed for them to survive in the face of climate change. Proactive conservation work, before these species' populations become critically low and require federal listing, can minimize administrative costs associated with developing and implementing species recovery plans.

As ecological and economic models advance, it will be easier to assess the multiple benefits that restoration and conservation projects deliver to communities. This information will help decision-makers and residents make more informed choices about how to protect and preserve important ecological resources. In the meantime, this case study provides insight into the significant value of Audubon North Carolina's efforts to restore and protect important coastal habitats, enhance community resilience to flooding, and improve community appreciation of these unique resources.

ACKNOWLEDGEMENT

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ENDNOTES

¹ North Carolina Coastal Federation. *Lower Cape Fear River Blueprint*. 2018

² SeaLevelRise.Org. *North Carolina's Sea Level Is Rising And It's Costing Over \$2 Billion*.

