



State of the South Atlantic 2015

Understanding our living landscapes

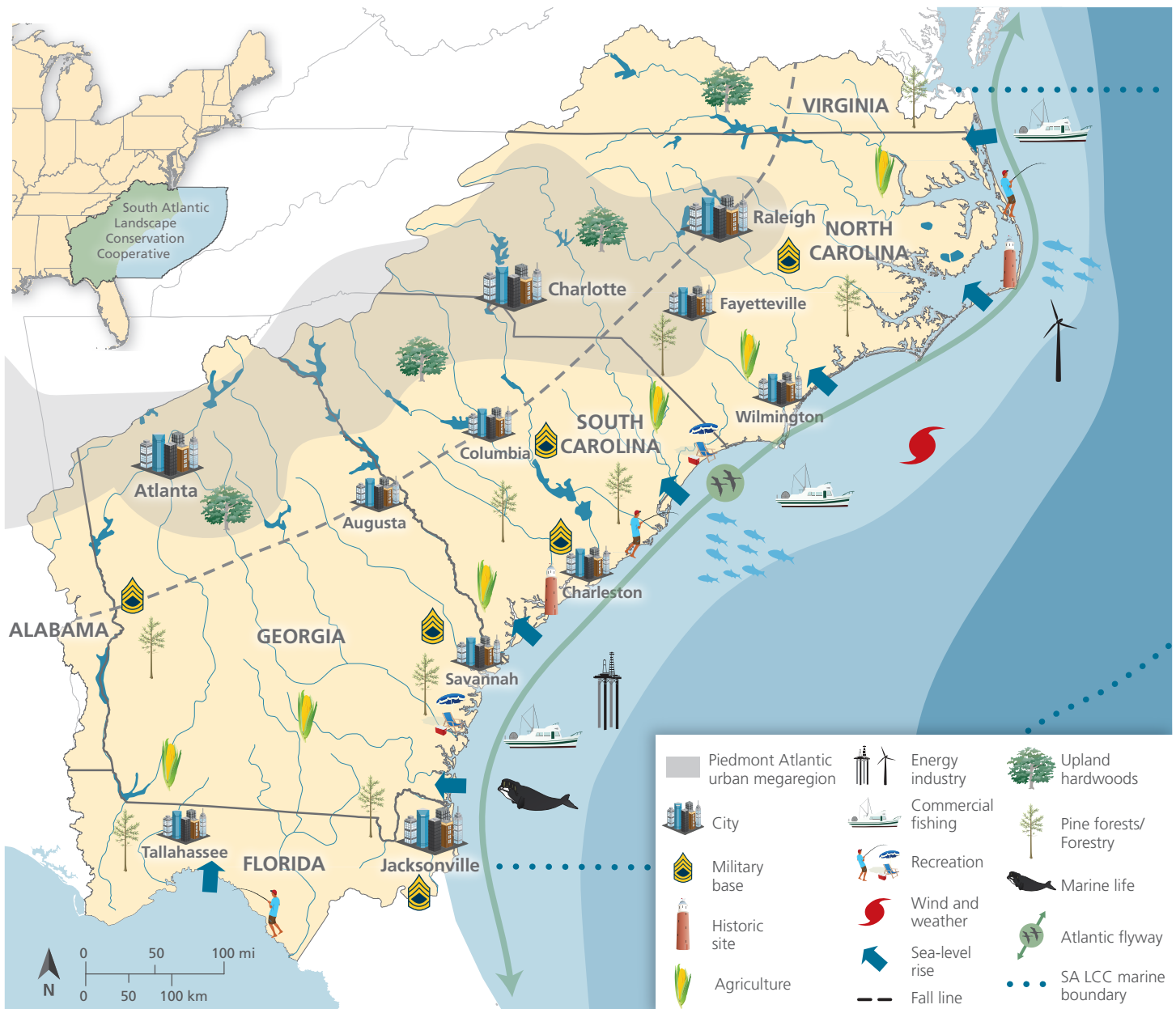


Introducing the South Atlantic

The South Atlantic region

The South Atlantic Landscape Conservation Cooperative (LCC) is a partnership of federal, state, nonprofit, and private organizations dedicated to conserving a landscape capable of sustaining natural and cultural resources for current and future generations. Its geography spans parts of six states, from Virginia to Florida, including U.S. waters to 200 miles offshore.

The South Atlantic region supports a complex mix of biological richness and human activity—since over 90% of the land is privately owned, balancing the two poses a challenge. Above the fall line, a geological boundary separating the uplands and Coastal Plain, the Piedmont harbors hardwood forests and amazing aquatic diversity, both threatened by rapid urban growth. Below, agriculture and pine forestry thrive. Many military installations balance mission readiness with rare species habitat. Along the shore, ships unload freight in ports near historic lighthouses and beach-nesting birds—all while sea level rises and storms intensify. Offshore, energy exploration is underway. Recreational and commercial fishermen harvest their catch while whales migrate up the coast.



State of the South Atlantic



South Atlantic ecosystem health scores

Overall, the South Atlantic scored a C. Piedmont areas scored the lowest, likely due to impacts from their major urban megaregions. The Marine region scored the highest; however, it did not include fishing impacts. The Coastal Plain scores were in the middle. These scores show that, while the South Atlantic is not completely healthy, there's hope for making future improvements.

North Piedmont: **D** Home to Charlotte, Raleigh, and large areas of upland hardwood forest. People who live and work in urban areas will help decide the future of this region.

South Piedmont: **D** Home to Atlanta and diverse watersheds draining into the Atlantic and Gulf. Balancing water needs for people and species continues to be a challenge.

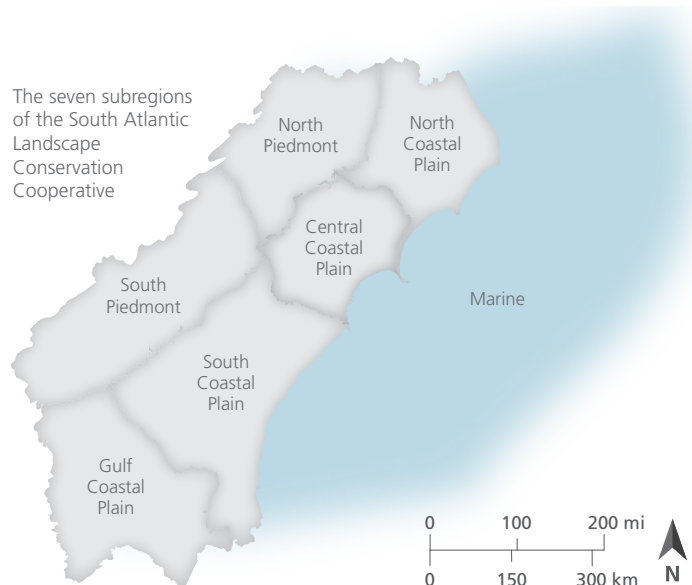
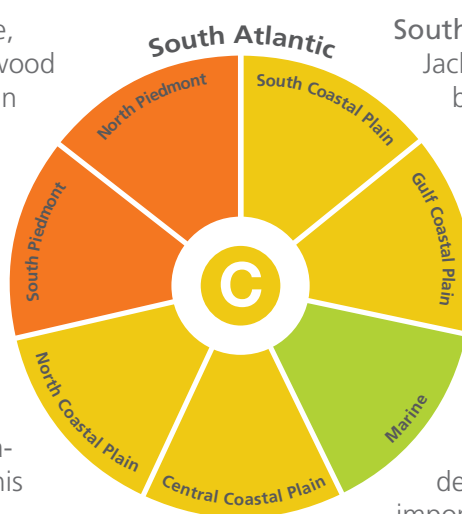
North Coastal Plain: **C** Home to the Outer Banks and extensive estuaries. Sea-level rise is predicted to heavily impact this particularly flat region.

Central Coastal Plain: **C** Home to Wilmington, Myrtle Beach, and large protected wetland areas. Sea-level rise, tourism, and changing agricultural practices continue to influence ecosystem health.

South Coastal Plain: **C** Home to Savannah, Jacksonville, and a network of protected barrier islands. Partnerships are working to conserve this region's largest river floodplains.

Gulf Coastal Plain: **C** Home to rural Southwest Georgia and extensive conservation lands in the Big Bend of Florida. Sea-level rise and upstream agriculture continue to impact coastal protected areas.

Marine: **B+** Home to rich fisheries, deepwater coral, diverse seabirds, and important migratory fish, whales, and turtles. Ocean acidification and increased energy development are major emerging threats.



A snapshot in time

This assessment evaluates the ecological integrity of the South Atlantic using natural and cultural resource indicators. The indicators are scored across the entire region, for individual ecosystems, and within subregions following watershed and ecoregional boundaries. All indicators are regularly tested and revised, and this first report uses the best metrics available today.

Toward conservation action

Measuring these indicators communicates the status of the region's land and waters, helping develop a more unified vision for thriving ecosystems that support communities and economies. People and organizations are working together on cross-boundary conservation actions through the South Atlantic LCC to improve ecosystem health in the face of unprecedented changes to the natural world.

Scoring & level of confidence

Each data-driven indicator score is based on the percent of an area in good condition, according to the best available science. Though all indicators were measured, some scores were omitted to provide a baseline for future comparison. Confidence values are qualitative estimates of uncertainty based on known issues with indicators and data sources.

- A** 100-80% in good condition
- B** 79-60% in good condition
- C** 59-40% in good condition
- D** 39-20% in good condition
- F** 19-0% in good condition
- Not scored; baseline for future



Ecosystem indicators

Indicators provide a simple way to measure the overall condition of the South Atlantic's complex ecosystems. More than 200 people from at least 50 organizations actively participated in selecting, testing, and revising the current indicators. This first report establishes a baseline for evaluating future trends using the best science and region-wide spatial data available today.



Upland hardwood

- **Upland hardwood birds:** index of habitat suitability for seven upland hardwood bird species.
- **Urban open space:** index based on distance of urban areas from open space.



Pine & prairie

- **Longleaf pine extent:** overall acres of longleaf pine.
- **Pine & prairie birds:** index of habitat suitability for three pine and prairie bird species.
- **Pine & prairie amphibians:** Priority Amphibian and Reptile Conservation Areas within pine and prairie.
- **Regularly burned habitat:** acres of fire-maintained, open canopy habitat.



Forested wetland

- **Forested wetland extent:** overall acres of forested wetlands.
- **Forested wetland birds:** index of habitat suitability for six forested wetland bird species.
- **Forested wetland amphibians:** Priority Amphibian and Reptile Conservation Areas within forested wetlands.



Freshwater aquatic

- **Riparian buffers:** index of natural habitat near rivers, streams, and large waterbodies.
- **Impervious surface:** index of impervious surface within each watershed.



Freshwater marsh

- **Freshwater marsh extent:** overall acres of freshwater marsh.
- **Freshwater marsh birds:** index of habitat suitability for five freshwater marsh bird species.



Estuarine

- **Wetland patch size:** index based on the size of wetland patches.
- **Water-vegetation edge:** index of length of edge between open water and vegetation.
- **Coastal condition:** index of water quality, sediment quality, and benthic condition.



Maritime forest

- **Maritime forest extent:** overall acres of maritime forest.



Beach & dune

- **Beach birds:** index of habitat suitability for four shorebird species.
- **Beach alteration:** index of impacts from hardened structures like jetties, groins, and infrastructure.



Marine

- **Marine turtles & mammals:** index of highly productive areas for sea turtles, dolphins, and whales.
- **Potential hardbottom condition:** index of potential condition of deepwater corals and other hardbottom habitats.
- **Primary productivity:** index of ocean ecosystem productivity based on chlorophyll measurements.



Landscapes

- **Structural connectivity:** important hubs and corridors for ecological connectivity.
- **Low road density:** index of areas with few roads.
- **Resilient biodiversity hotspots:** index of mostly natural high-diversity areas potentially resilient to climate change.
- **Low-urban historic landscapes:** index of National Historic Register Sites surrounded by limited urban development.



Waterscapes

- **Fresh & saltwater connectivity:** index of dams preventing fish migration between rivers and the ocean.
- **Resident fish connectivity:** index of local barriers to fish and other aquatic species.

Combining indicators

Every ecosystem has at least one unique indicator. Freshwater aquatic, Landscapes, and Waterscapes indicators (shown in green) also apply to multiple ecosystems. These indicator scores appear on the following pages where relevant to ecosystem condition. All indicators are weighted equally to produce final scores.

For more information

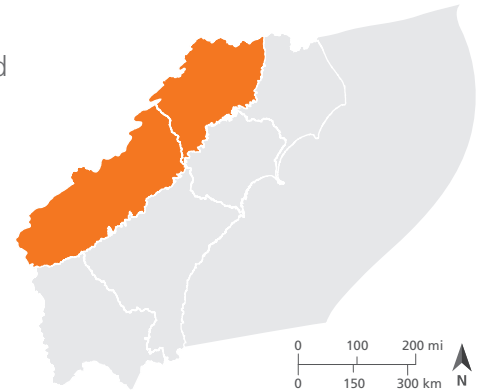
The conservation community, working through the South Atlantic Landscape Conservation Cooperative, regularly tests and improves the indicators. To explore geospatial indicator data and to stay up-to-date on future progress, please visit: <http://StateOf.SouthAtlanticLCC.org>.

Forests in the foothills

This ecosystem includes Piedmont wooded communities ranging from dry upland forests to moist forests next to floodplains. Deciduous hardwood trees adapted to less frequent fire typically dominate, mixed with pine. Most major urban centers occur in upland hardwood forests, which causes habitat fragmentation but also provides many people opportunities to appreciate nature.

Interpreting the score

Overall, this ecosystem scored a **D+**. While the scores for the Piedmont regions were similar, the North Piedmont scored better on the bird index and poorly on low road density. Coastal Plain regions were not scored due to their small amount of upland hardwood. The Piedmont includes the major urban centers of the South Atlantic, providing challenges and opportunities for improving ecosystem condition and offering access to nature.



- | | |
|------------------------------------|-----------------------------------|
| A 100-80% in good condition | D 39-20% in good condition |
| B 79-60% in good condition | F 19-0% in good condition |
| C 59-40% in good condition | ○ Not scored; baseline for future |

- | | |
|---------------------------------|---|
| C- Upland hardwood birds | B- Low-urban historic landscapes |
| ○ Urban open space | D Structural connectivity |
| F Low road density | ○ Resilient biodiversity hotspots |



- Mature growth forests
- Rare plants
- Forest birds
- Forest mammals
- Urban and suburban areas
- Habitat fragmentation
- Recreation

Bright lights, big city

If growth trends continue, recent research predicts that Southeast urban areas will double in size by 2060, creating a megalopolis connecting Raleigh to Atlanta. Sprawl will likely concentrate in the upland hardwood ecosystem where urban centers already prosper. This forecast emphasizes the importance of smart growth planning to ensure wildlife habitat and recreation opportunities persist into the future.

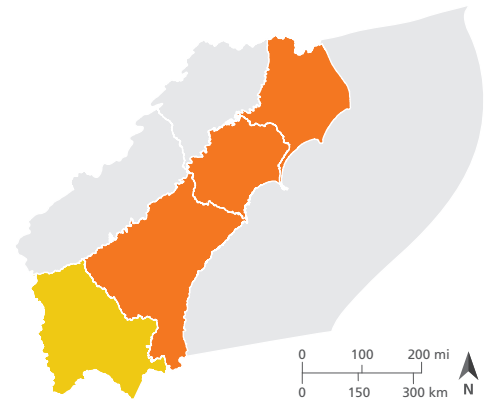


Pine woodlands, savannas, & prairies

Distributed across the Coastal Plain and occasional Piedmont areas, this fire-adapted ecosystem encompasses longleaf, loblolly, and slash forests, as well as open pine savannas and prairies. It is integral to the region's economy, culture, and natural heritage, driving timber production, harboring rare species, and supporting quail hunting and native tribal traditions.

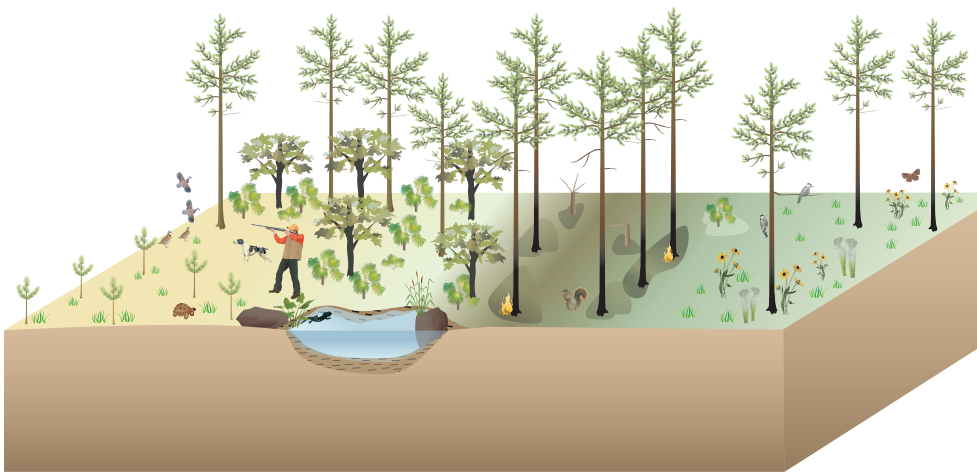
Interpreting the score

Overall, this ecosystem scored a **D+**. The Gulf Coastal Plain scored the highest, mostly driven by better scores on low road density, regularly burned habitat, and connectivity. Piedmont regions were not scored due to their small amount of this ecosystem. Despite years of heavy impacts from incompatible management and urban growth, efforts to restore iconic species like bobwhite quail and longleaf pine are making progress toward improving ecosystem condition.



A 100-80% in good condition	D 39-20% in good condition
B 79-60% in good condition	F 19-0% in good condition
C 59-40% in good condition	○ Not scored; baseline for future

- Longleaf pine extent
- C+** Pine & prairie birds
- Pine & prairie amphibians
- D-** Regularly burned habitat
- F** Low road density
- B-** Low-urban historic landscapes
- D** Structural connectivity
- Resilient biodiversity hotspots



- Pine forests
- Seasonal ponds
- Healthy understory
- Overgrown understory
- Prescribed forest burn
- Reptiles and amphibians
- Pine birds
- Recreational hunting

Longleaf makes a comeback

Longleaf pine forests with towering trees and open, grassy understories once spanned 90 million acres from Virginia to Texas. Fire suppression and land use change reduced it to only 3% of its former range by the late 1990s. In response, a coalition of public and private partners began restoring longleaf, and started to reverse the decline during the last decade!



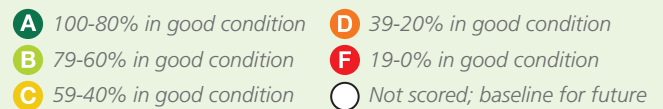
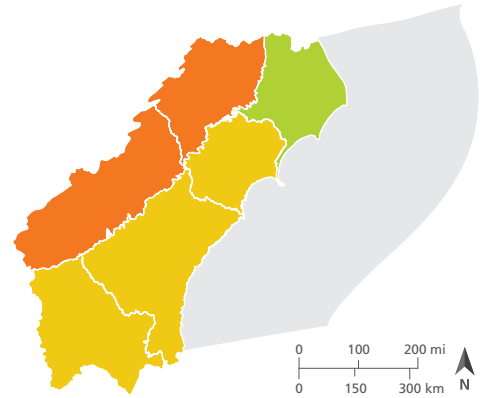
Lark Hayes

Floodplain forests, pocosins, & bays

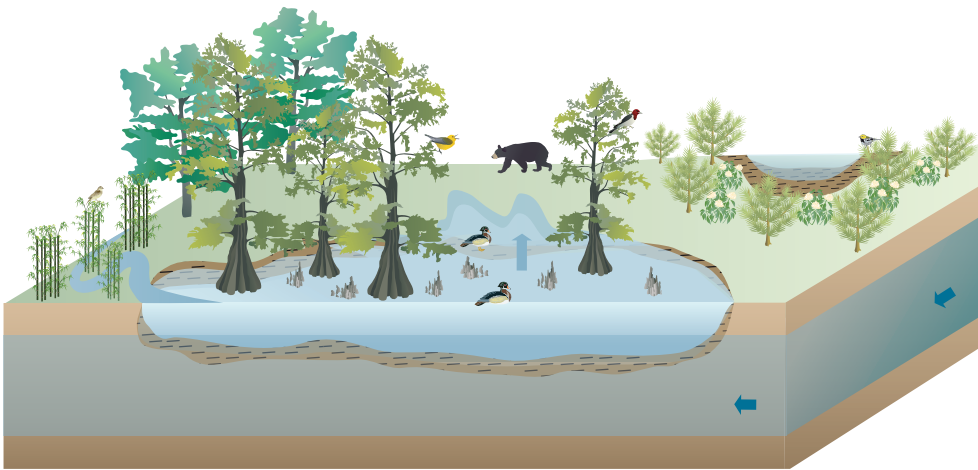
These frequently flooded swamp forests occur across the region on both organic soils, like peatland pocosins and Carolina Bays, and mineral soils, like bottomland hardwood and floodplain forests. Though historically drained for timber production and agriculture, intact forested wetlands support ecological diversity and enhance water quality by filtering polluted runoff.

Interpreting the score

Overall, this ecosystem scored a **C**. Piedmont areas scored the lowest, mostly driven by poor scores on low road density, the bird index, and aquatic connectivity. The North Coastal Plain scored the highest, mostly driven by better scores on low road density and aquatic connectivity. These results underscore the importance of efforts to restore the altered hydrology of forested wetlands in the South Atlantic.



- | | | |
|----------------------------------|--|---|
| ○ Forested wetland extent | D Low road density | ○ Resilient biodiversity hotspots |
| B- Forested wetland birds | A Low-urban historic landscapes | D Fresh & saltwater connectivity |
| ○ Forested wetland amphibians | C Structural connectivity | D Resident fish connectivity |



- Floodplain forests
- Pocosin wetlands
- Forest birds and waterfowl
- Large mammals
- Native cane
- Temporal flooding
- Saltwater intrusion

Restoring ancient soils

Thirty years ago, the Eastern North Carolina wetlands that now comprise Pocosin Lakes National Wildlife Refuge were drained for peat mining and agriculture. Catastrophic wildfires burned away feet of the resulting dry organic soil. The Refuge has since restored natural hydrology on nearly 30,000 acres, improving habitat quality, protecting against future fires, and sequestering carbon by rebuilding the soil.



ECOSYSTEM freshwater aquatic

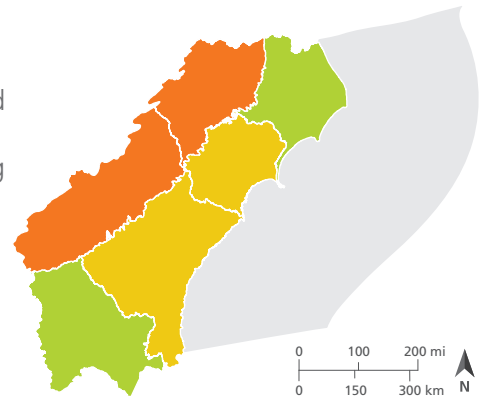


Lakes, rivers, & streams

This ecosystem includes the lakes, rivers, and streams throughout the region that drain to the Atlantic Ocean and Gulf of Mexico. Water quality, quantity, and timing define a healthy freshwater environment, which provides clean drinking water and fishable and swimmable streams for human use while also supporting mussel and fish populations.

Interpreting the score

Overall, this ecosystem scored a **C**. Piedmont areas scored the lowest, driven by poor scores on all indicators. The North Coastal Plain scored the highest, driven by better scores on aquatic connectivity and despite lower scores on riparian buffers. The Piedmont includes the major urban centers of the South Atlantic and many aquatic species found nowhere else. This provides opportunities for proactive conservation measures to sustain both people and biodiversity.



A 100-80% in good condition	D 39-20% in good condition
B 79-60% in good condition	F 19-0% in good condition
C 59-40% in good condition	O Not scored; baseline for future

C- Riparian buffers

D Fresh & saltwater connectivity

A Impervious surface

D Resident fish connectivity



- Riparian buffers
- Benthic species
- Native fish
- Urban areas
- Impervious surface
- Dams and culverts
- Nutrient and sediment runoff
- Recreation

A horse worth betting on

The South Atlantic harbors unparalleled aquatic diversity, including 120 endemic fish, mussel, and crayfish species—all increasingly threatened by human activity. Fortunately, there's still time to make a difference! Scientists rediscovered the robust redhorse, once thought extinct, in the Oconee River in 1991. Now federal and state agencies, utilities, and nonprofits are partnering to recover this native fish.



Valerie Renee/Flickr

ECOSYSTEM freshwater marsh

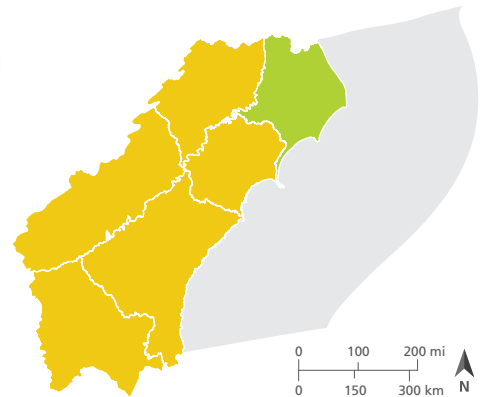


Tidal & nontidal freshwater marshes

Nontidal freshwater marshes occur throughout the geography in poorly-drained depressions, including waterfowl impoundments. Tidal freshwater marshes occur along the upper tidal reaches of coastal rivers. Characterized by regular flooding and low-growing vegetation, freshwater marshes harbor diverse reptile and amphibian populations. They also support recreational hunting and traditional Gullah sweetgrass harvest.

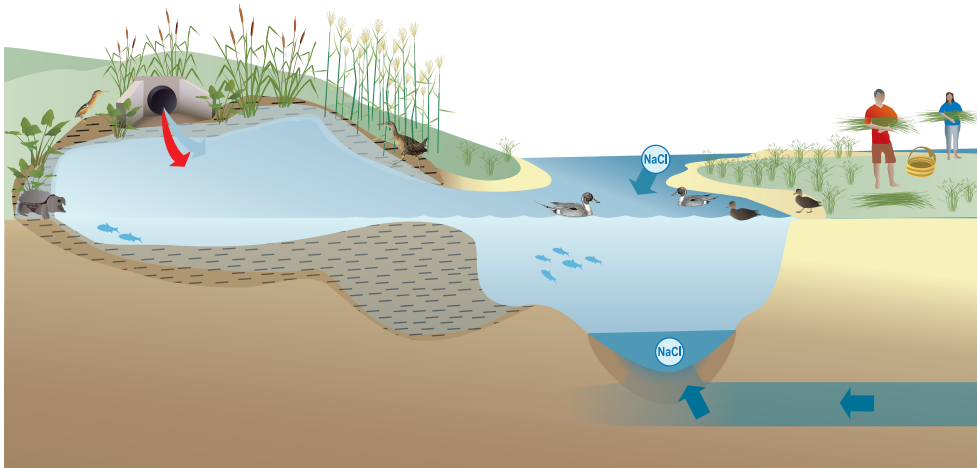
Interpreting the score

Overall, this ecosystem scored a **C**. Piedmont areas scored the lowest, mostly driven by poor scores on riparian buffers, low road density, and aquatic connectivity. The North Coastal Plain scored the highest, mostly driven by better scores on the bird index, low road density, and aquatic connectivity. Much of this ecosystem is threatened by sea-level rise, requiring restoration and protection to keep up with future marsh loss.



A 100-80% in good condition	D 39-20% in good condition
B 79-60% in good condition	F 19-0% in good condition
C 59-40% in good condition	○ Not scored; baseline for future

- Freshwater marsh extent
- C** Freshwater marsh birds
- D** Fresh & saltwater connectivity
- D** Resident fish connectivity
- C-** Riparian buffers
- A** Impervious surface
- D-** Low road density
- A** Low-urban historic landscapes
- D+** Structural connectivity
- Resilient biodiversity hotspots



- Freshwater marshes
- Reptiles and amphibians
- Migratory waterfowl
- Marsh birds
- Invasive Phragmites
- Saltwater intrusion
- Culverts
- Stormwater runoff
- Sweetgrass harvest

Saltwater threatens managed marshes

A network of impoundments dots the Atlantic flyway, providing overwintering habitat for migratory waterfowl up and down the East Coast. The influx of saltwater from intrusion and sea-level rise threatens these intensively-managed freshwater marshes, forcing coastal land managers to consider difficult tradeoffs—to repeatedly rebuild damaged dikes or seek new marsh habitat inland through restoration or protection.



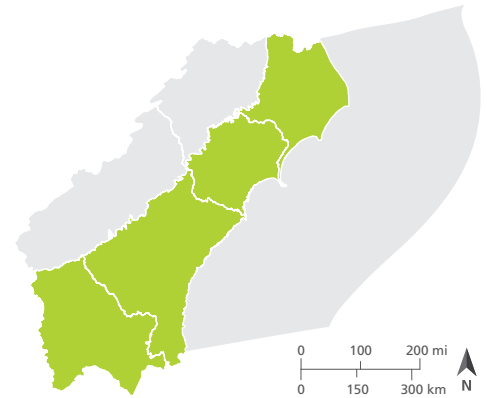
KG Schneider/Flickr

A slightly salty sanctuary

Estuaries are partially enclosed coastal water bodies where freshwater rivers meet the ocean. This system extends upstream into tidal flats and salt marshes, and seaward to the estuary mouth. Nutrient-rich sediment and brackish water make estuaries extremely productive fish and crab nurseries, while salt marshes filter water and buffer coastal storms.

Interpreting the score

Overall, this ecosystem scored a **B**. The Gulf Coastal Plain scored the highest, mostly driven by better scores on riparian buffers and impervious surface. The Central Coastal Plain scored the lowest, mostly driven by poor scores on riparian buffers, coastal condition, and fresh and saltwater connectivity. This ecosystem has one of the higher scores in this assessment, yet still highlights major opportunities for improving ecosystem health.



A 100-80% in good condition	D 39-20% in good condition
B 79-60% in good condition	F 19-0% in good condition
C 59-40% in good condition	○ Not scored; baseline for future

- Wetland patch size
- Water-vegetation edge
- A** Coastal condition
- C+** Riparian buffers
- A** Impervious surface
- D** Fresh & saltwater connectivity



- ➡ Fresh and saltwater flow
- ➡ Sea-level rise
- 🐟 Fish, crustaceans, and mollusks
- 🐢 Reptiles and amphibians
- 🐦 Estuarine birds
- 🌿 Invasive Phragmites
- 🏠 Impervious surface
- 🔴 Nutrient and sediment runoff
- 🌱 Living shoreline
- 🚣 Recreation

Building living shorelines

Coastal developers often stabilize retreating shorelines using seawalls and bulkheads. However, hard structures worsen coastal erosion and degrade estuarine habitat. Instead of concrete, living shorelines use wetland and aquatic plants, oyster reefs, wood, sand, and stone to protect the intertidal environment. This technique restores beautiful, functional estuaries benefitting people and wildlife. Plus, installation can be fun!



ECOSYSTEM maritime forest

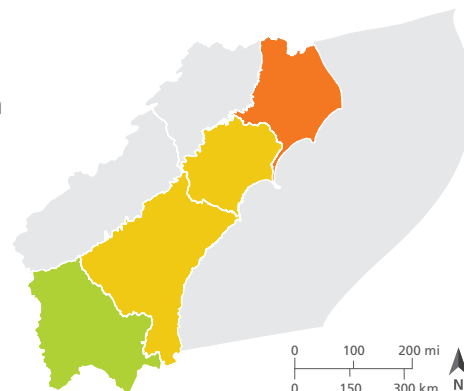


Shelter from the storm

Maritime forests are scattered throughout the South Atlantic coast, found on barrier islands and behind estuaries and dunes where migratory songbirds often refuel. Harsh salt spray and wind exposure shape these unique scrub-shrub and wooded communities. They naturally stabilize the coastline and provide critical storm protection, preventing excessive erosion.

Interpreting the score

Overall, this ecosystem scored a **C**. The North Coastal Plain scored the lowest, mostly driven by poor scores on low road density, low-urban historic landscapes, and connectivity. The Gulf Coastal Plain scored the highest, mostly driven by far more low road density and high connectivity. These results underscore the continued impact of human development on this rare coastal ecosystem.



- A** 100-80% in good condition
- B** 79-60% in good condition
- C** 59-40% in good condition
- D** 39-20% in good condition
- F** 19-0% in good condition
- Not scored; baseline for future

○ Maritime forest extent

A Low-urban historic landscapes

F Low road density

C Structural connectivity



- Live oak forests
- Seasonal ponds
- Migratory birds
- Coastal storms
- Development
- Recreation

A vanishing forest

Maritime forest is one of the South Atlantic's most endangered ecosystems, limited to a tiny fraction of its former range. European settlers once harvested the sprawling live oaks for shipbuilding and fuel. Now, urban development and climate change pose the greatest threats. The remaining isolated protected lands provide a haven for migratory songbirds and buffer against coastal storms.



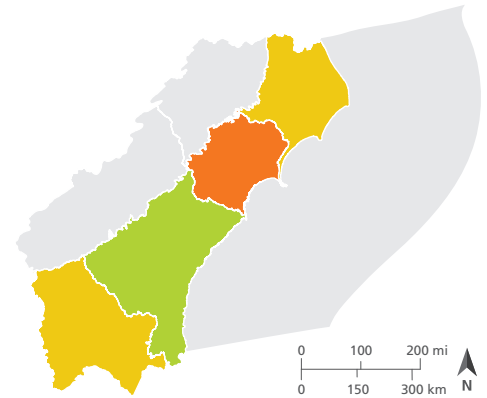
Derek A Young/Flickr

Where the ocean meets the land

Beaches and dunes occur along the Atlantic and Gulf shorelines. The system extends from the nearshore ocean across sand, gravel, or shell intertidal beaches, and into more stable and vegetated dunes. Waves, wind, and currents constantly shape these dynamic coastal features, which provide wildlife habitat, storm protection, and recreational opportunities.

Interpreting the score

Overall, this ecosystem scored a **C**. The Central Coastal Plain scored the lowest, mostly driven by problems with beach alteration and connectivity. The Southern Coastal Plain scored the highest, mostly driven by better scores for beach alteration and connectivity. The popularity of South Atlantic beaches and creation of hardened structures to respond to sea-level rise continue to stress the coastal environment.



A 100-80% in good condition	D 39-20% in good condition
B 79-60% in good condition	F 19-0% in good condition
C 59-40% in good condition	○ Not scored; baseline for future



Beach birds



Low-urban historic landscapes



Beach alteration



Structural connectivity



Low road density



- Beach grasses
- Migratory shorebirds
- Sea turtle nesting
- Coastal storms and overwash
- Shoreline erosion
- Shoreline alteration
- Artificial sand dunes
- Historic sites
- Development
- Recreation

Living with the rising sea

The South Atlantic shoreline draws numerous people eager to enjoy ocean views from beachfront homes and resorts. Yet, coastal development occurs in a constantly changing environment, as erosion naturally transports sand deeper offshore and further alongshore. Temporary measures like beach renourishment and hardened structures stress the ecosystem and still cannot keep pace with rising sea levels and stronger storms.



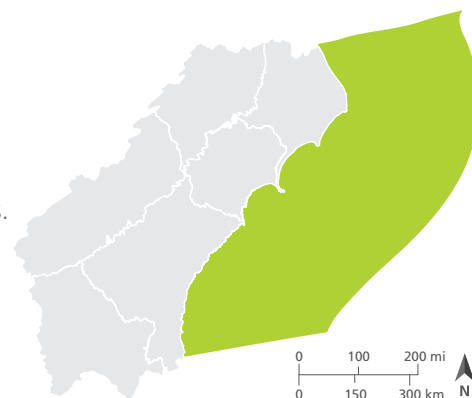
David McSpadden/Flickr

An ocean of possibilities

The marine environment starts at either the estuary mouth or the shoreline and stretches 200 miles into the ocean, covering the extent of U.S. waters. The marine ecosystem comprises about half of the South Atlantic geography! From deepwater coral formations to right whale calving grounds, this vast expanse of open water and benthic habitat sustains coastal tourism, commerce, and fisheries.

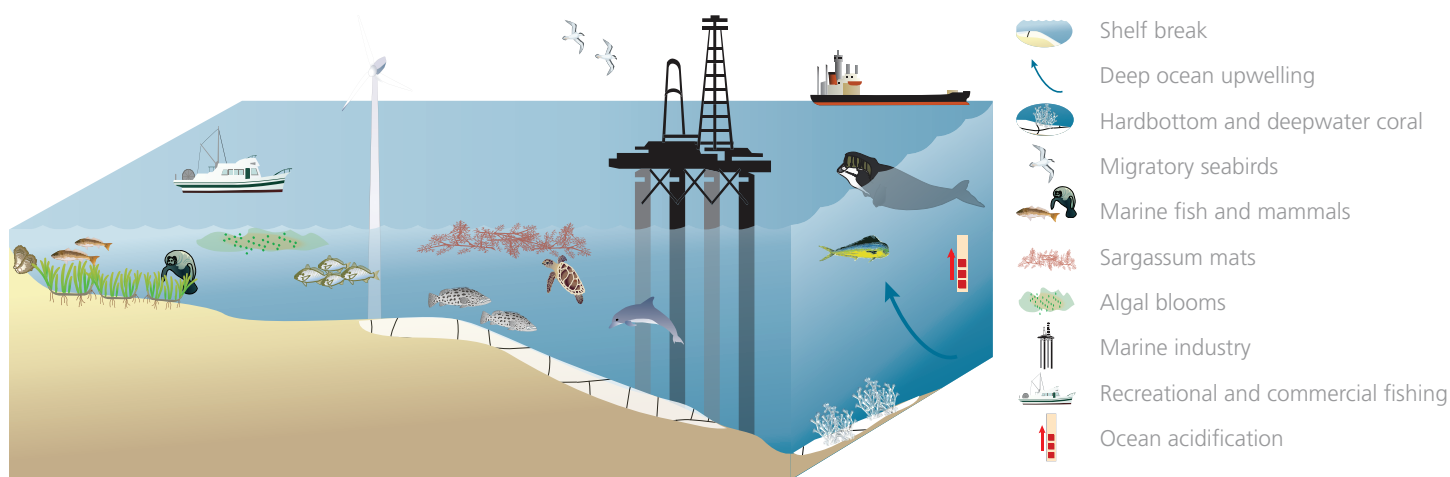
Interpreting the score

Overall, this ecosystem scored a **B+**. This is the highest ecosystem score in this assessment, however, it does not include fishing impacts. If included, those would likely lower the score. Productivity and hardbottom indicators were in good condition, but poor connectivity with freshwater brought down the overall score. While this system is relatively healthy, future threats from offshore energy and ocean acidification could significantly impact ecosystem integrity.



A 100-80% in good condition	D 39-20% in good condition
B 79-60% in good condition	F 19-0% in good condition
C 59-40% in good condition	○ Not scored; baseline for future

- Marine turtles & mammals
- A** Primary productivity
- A** Potential hardbottom condition
- D** Fresh & saltwater connectivity

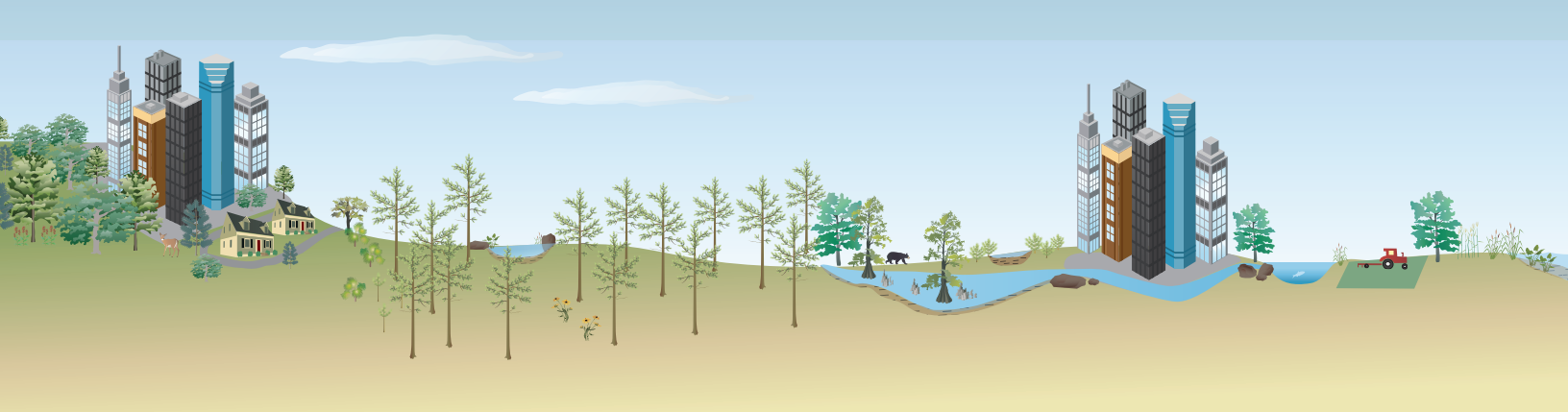


Small turtles, big adventures

Sea turtles are iconic marine animals perhaps best-known for nesting on the beach. Not only do adult females famously migrate back to their birthplaces to lay their own eggs, but recent tracking data shows that young green sea turtles, born as far away as Costa Rica, swim thousands of miles to grow up off the South Atlantic coast.



Andy Bruckner/NOAA

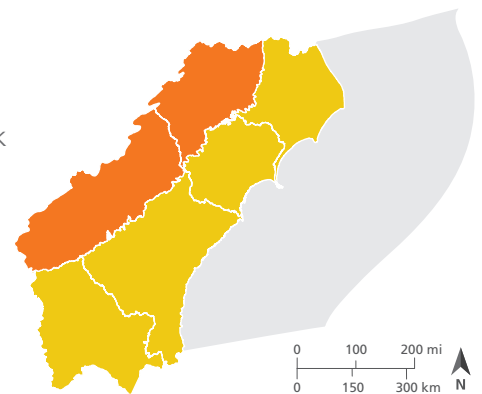


Connecting all terrestrial ecosystems

This system focuses on connections across all terrestrial habitats, from uplands to the shoreline. A functional landscape knits together biodiversity hotspots, large habitat patches, and cultural features. This ecologically connected network creates a healthy environment for wildlife and people alike that is resilient to threats like climate change and urbanization.

Interpreting the score

Overall, connections across terrestrial ecosystems scored a C-. The North Piedmont scored the lowest, driven by low scores on all indicators. The South Coastal Plain scored the highest, mostly driven by better scores on low-urban historic landscapes and connectivity. These results show that, while the landscapes of the South Atlantic are fragmented, there is still hope for restoring and protecting an ecologically connected network of natural areas and working forests.



- A** 100-80% in good condition
- B** 79-60% in good condition
- C** 59-40% in good condition
- D** 39-20% in good condition
- F** 19-0% in good condition
- Not scored; baseline for future

F Low road density

C- Structural connectivity

B Low-urban historic landscapes

○ Resilient biodiversity hotspots

Conserving the Florida wildlife corridor

Florida conservation organizations are working to connect protected lands and waters from the Everglades to Georgia and Alabama. This statewide corridor would sustain working lands, wildlife populations, and healthy watersheds. Sixty percent of 15.8 million available acres have already been secured. To raise awareness, a 2012 expedition trekked over 1,000 miles of the corridor in 100 days.



Nathan McMillan

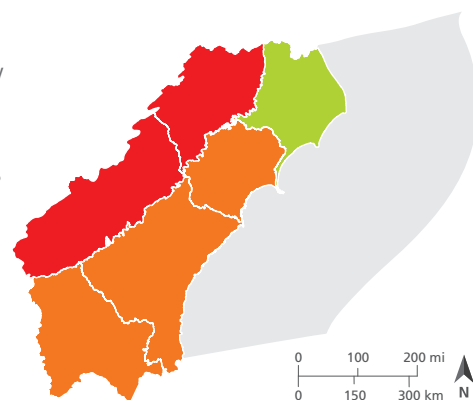


Connecting fresh, brackish, & saltwater ecosystems

This system focuses on connections between freshwater and saltwater—the flow of water from lakes and rivers, through marshes and estuaries, eventually to the ocean. Energy, agriculture, cities, shipping, and fisheries all depend on water. These competing uses limit water availability and interfere with natural processes like fish passage and natural seasonal flooding.

Interpreting the score

Overall, connections across aquatic systems scored a **D**. Piedmont areas scored the lowest, driven by poor scores on all indicators. The North Coastal Plain scored the highest, driven by better scores on all indicators. Despite this low overall score, ongoing efforts to remove small dams that are old, unsafe, or no longer serving their original purpose provide hope for improving conditions in the future.



A 100-80% in good condition	D 39-20% in good condition
B 79-60% in good condition	F 19-0% in good condition
C 59-40% in good condition	○ Not scored; baseline for future

D Fresh & saltwater connectivity

D Resident fish connectivity

Let it flow

Many fish species alternate spending parts of their life cycle in saltwater and freshwater. The thousands of dams in the South Atlantic prevent these diadromous fish from migrating and degrade spawning and foraging habitat. Many small dams are outdated, unsafe, and no longer useful. Conservation partners are now removing these barriers to restore connectivity and enhance habitat quality.



Markemak4/ Flickr



ian.umces.edu

Learn more about the South Atlantic LCC

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Web: <http://www.SouthAtlanticLCC.org>

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For more information, visit
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Acknowledgements

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Photos

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