Coastal Ecology of North Carolina: From the River to the Sea

NCDEQ

Bill Russ, courtesy of VisitNC

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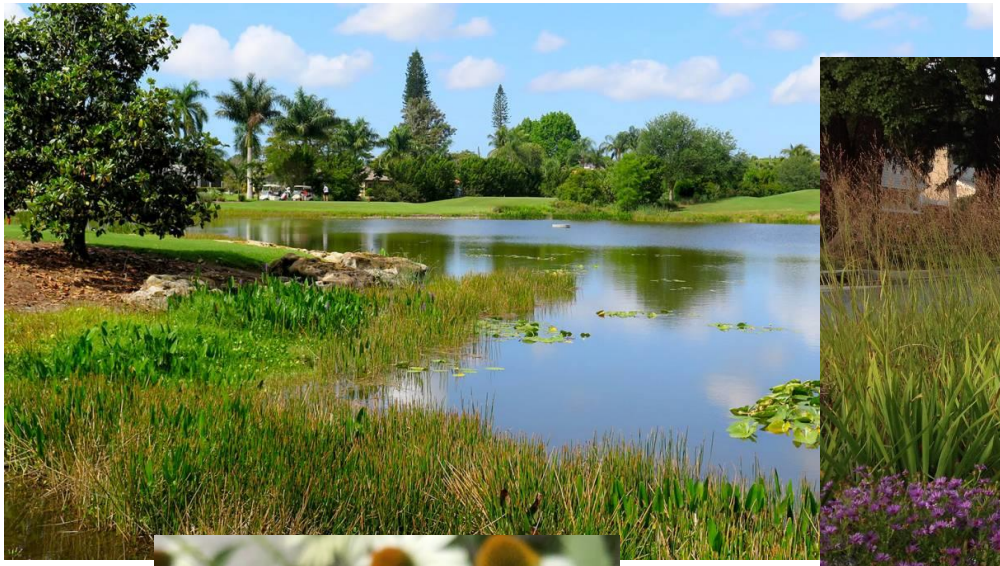
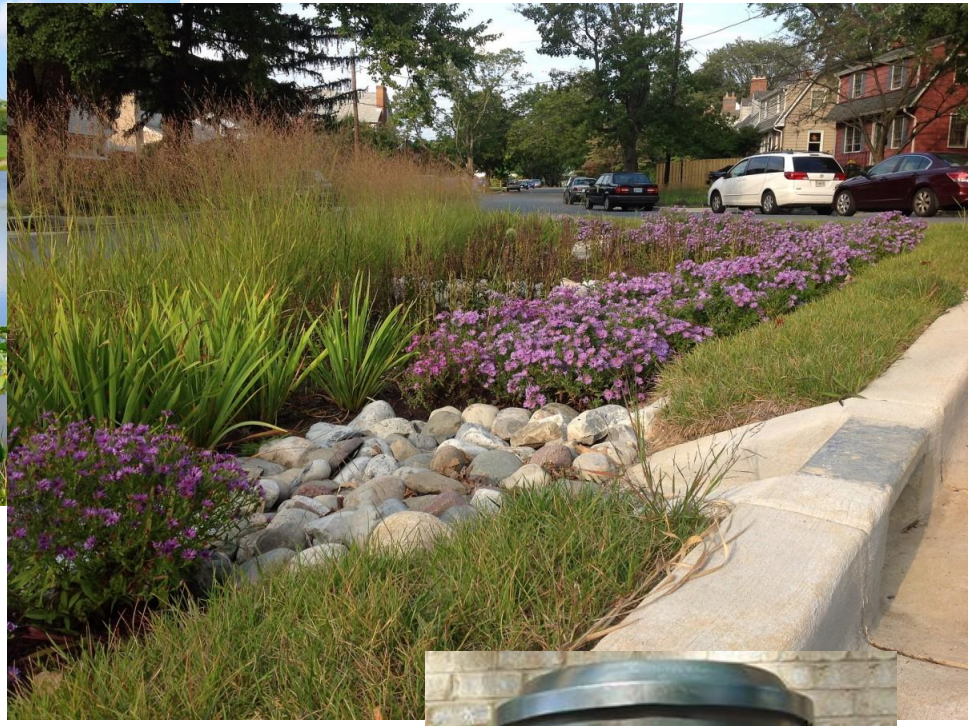
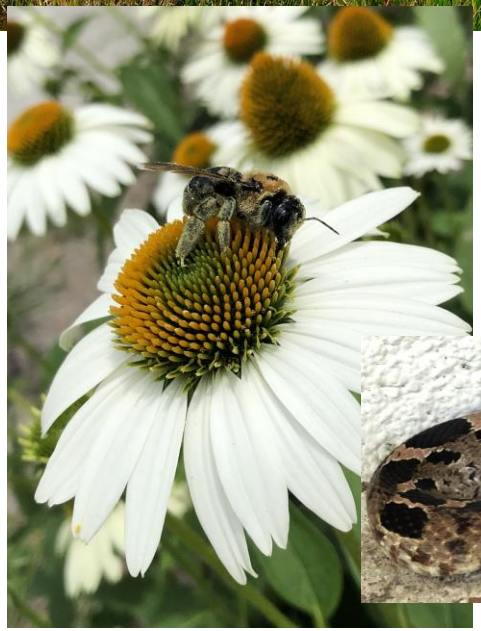
Natural Resources





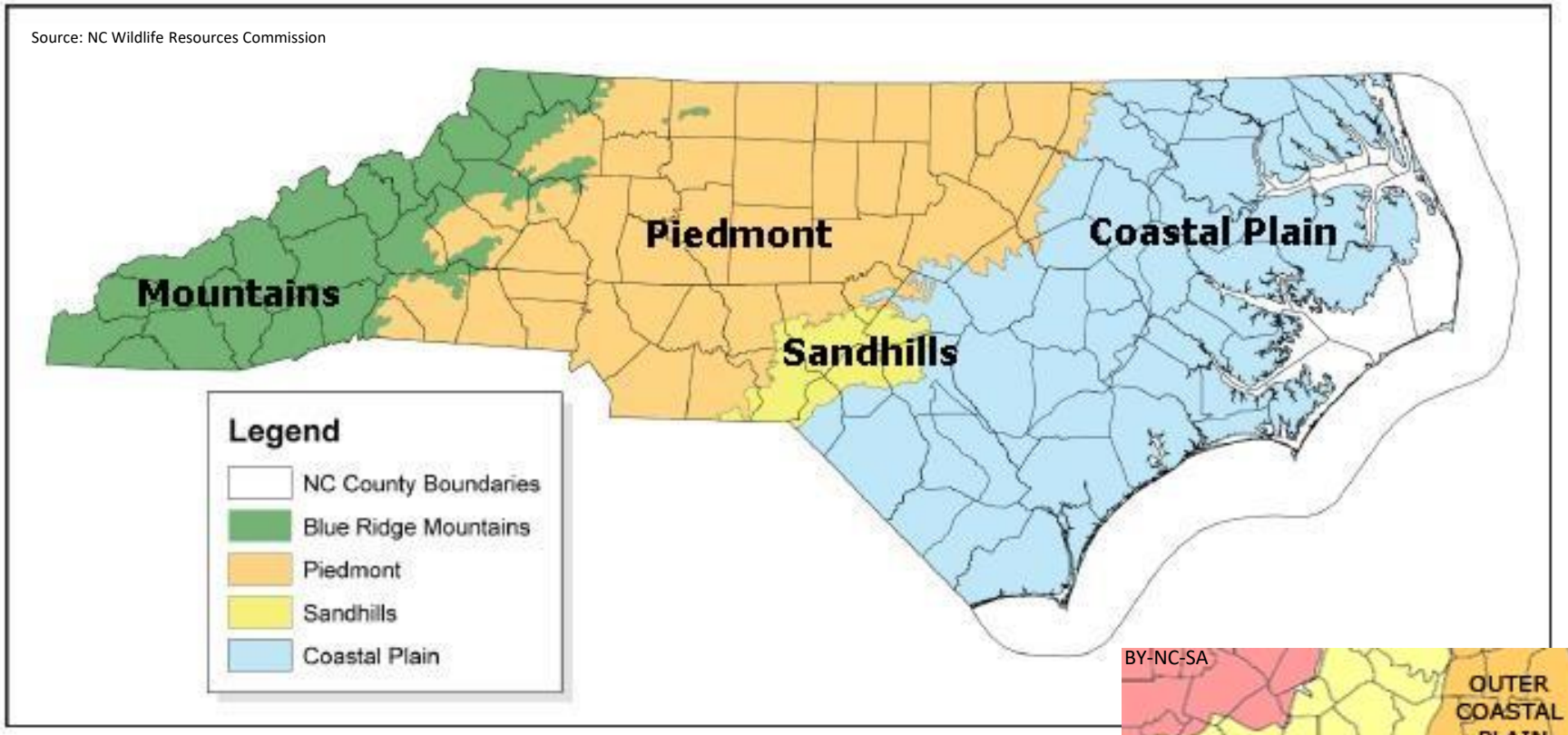



EW YORK

Coastal Ecology of North Carolina

- Geologic history of coastal North Carolina
- Processes that shape the formation of the coast
- Coastal habitats and plant communities
- Challenges of sea level rise

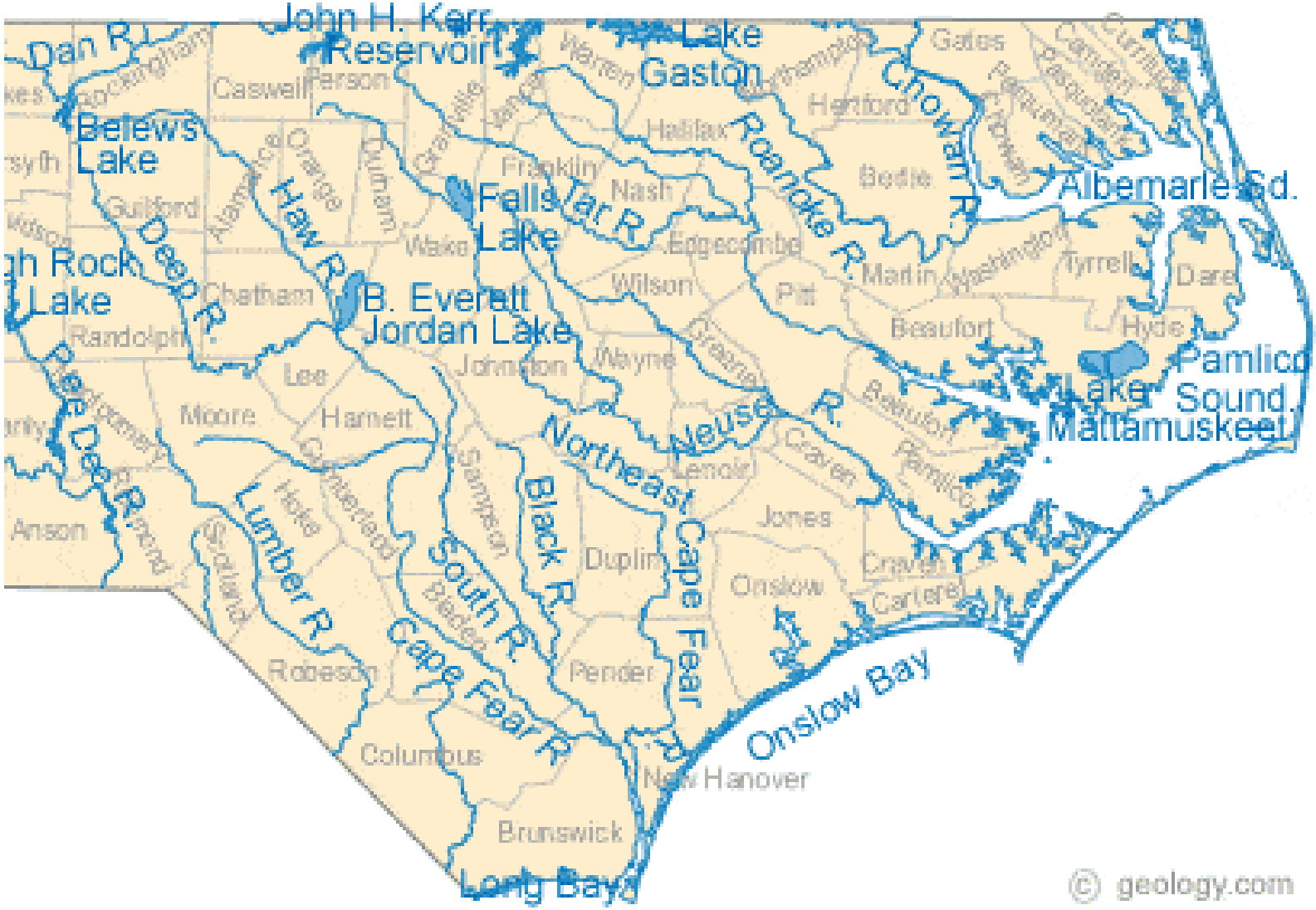
Physical Regions



"Tidewater"

Critical Ecosystems Partnership Fund
World's 36th biodiversity hotspot
-more than 1,500 endemic vascular plants and greater than 70 percent habitat loss

Rivers


John H. Kerr Reservoir
Lake Gaston
Dan R.
Belews Lake
Falls Lake
Tar R.
Roanoke R.
Chowan R.
Albemarle Sd.
Deep R.
Haw R.
B. Everett Jordan Lake
Pamlico Sound
Lake Mattamuskeet
Neuse R.
Northeast Cape Fear R.
Black R.
South R.
Cape Fear R.
Lumber R.
Pee Dee R.
Onslow Bay
Long Bay
Caswell
Person
Granville
Vance
Warren
Halifax
Northampton
Hertford
Gates
Camden
Currituck
Chowan
Perquimans
Pasquotank
Franklin
Nash
Bertie
Orange
Alamance
Durham
Wake
Guilford
Edgecombe
Martin
Tyrrell
Dare
Hyde
Wilson
Pitt
Beaufort
Washington
Chatham
Randolph
Johnston
Wayne
Greene
Lee
Moore
Harnett
Lenoir
Craven
Pamlico
Jones
Onslow
Carteret
Duplin
Sampson
Cumberland
Hoke
Scotland
Anson
Robeson
Bladen
Pender
Columbus
New Hanover
Brunswick
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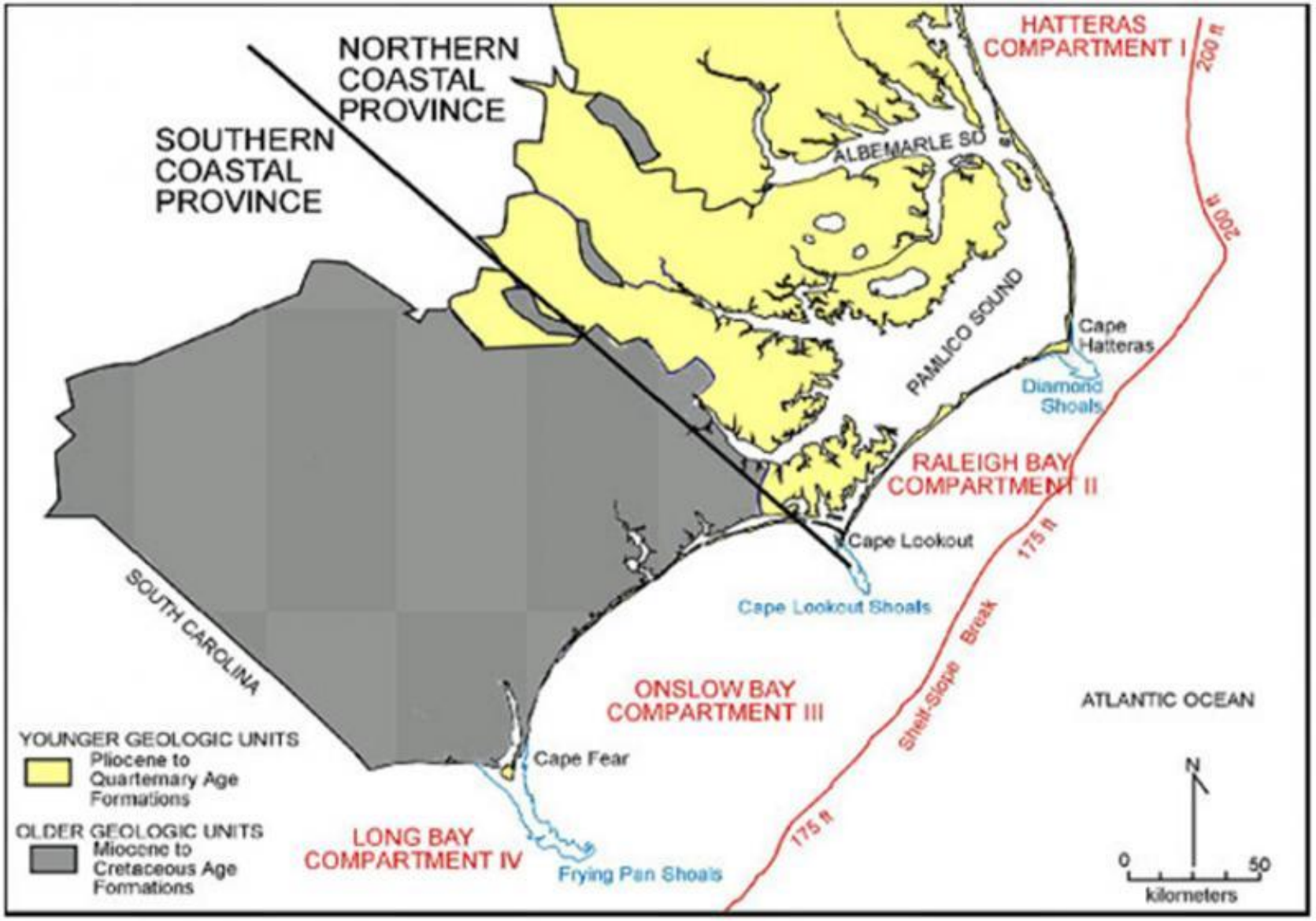
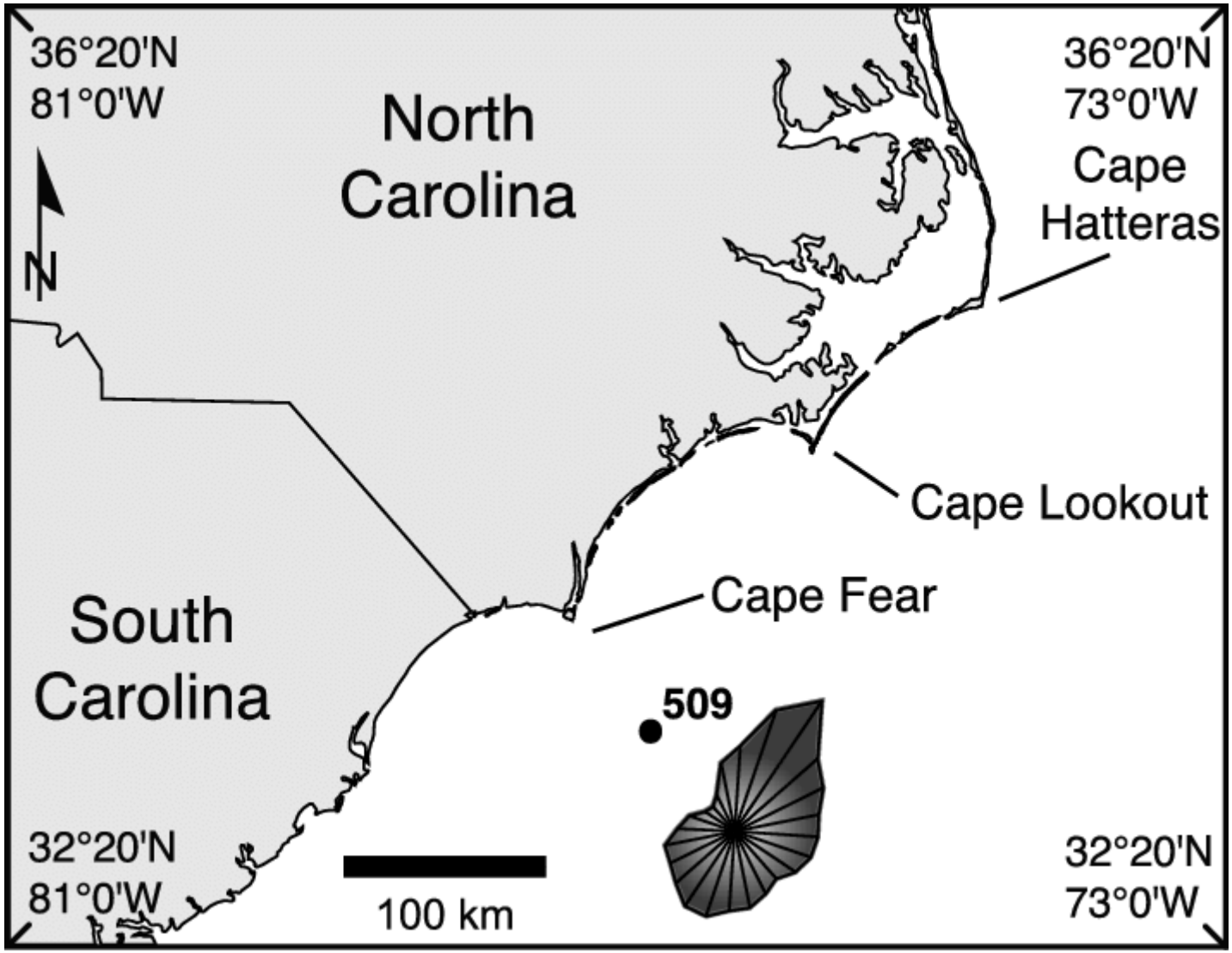


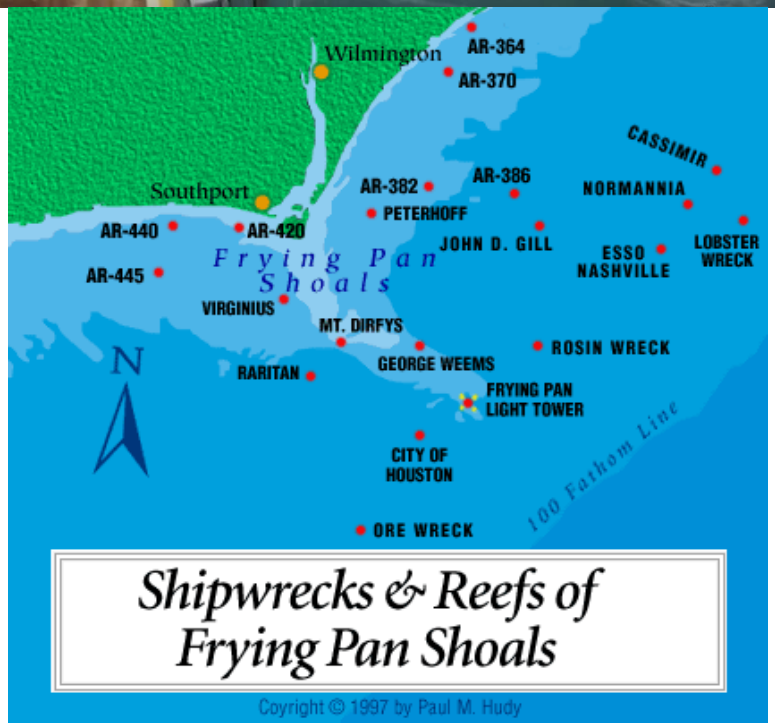
Riggs, S. et al., The Battle for North Carolina's Coast



The coastline of North Carolina and South Carolina, from Cape Hatteras, NC, to Cape Fear, SC, along the U.S. Atlantic coastline. From Ashton and Murray [2006b].

Lighthousefriends.com

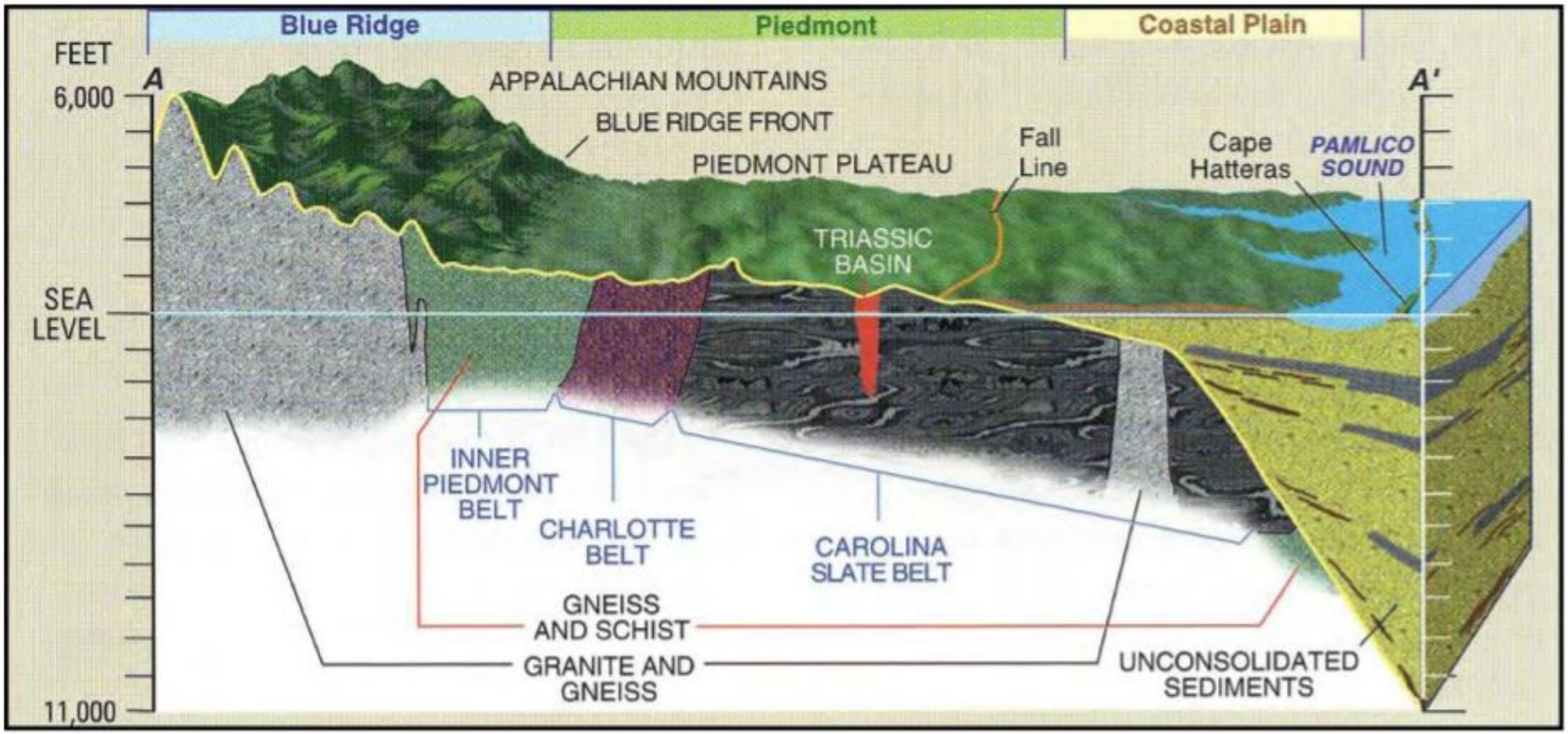
Gardenandgun.com



NC Coastline

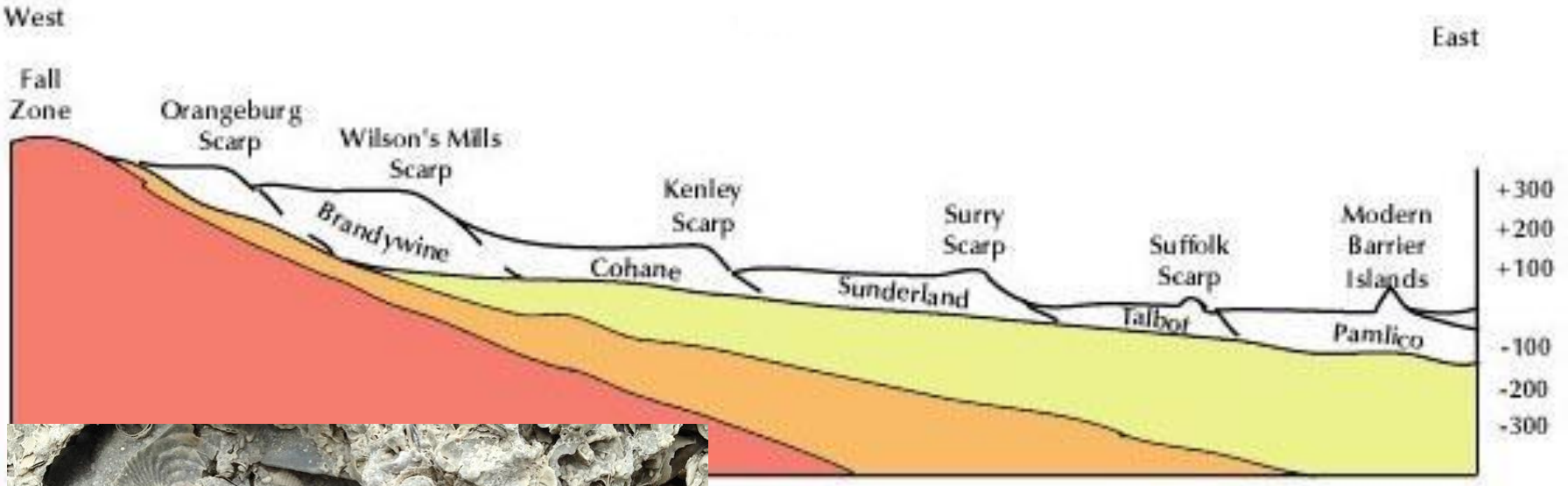
- 325 miles of ocean shoreline along barrier islands
- 21 enduring inlets, and some short-lived inlets
- Riverine drainage system flows through 300 square miles of brackish water estuaries
- Mainland has 10,000 miles of estuarine shoreline
- Coastal habitats are formed and sustained by environmental forces at the boundary between the land and the sea
  -tides, waves, and storms
  -sediments, freshwater, rocks

Riggs, S. et al., The North Carolina Outer Banks Barrier Islands: A Field Trip Guide to the Geology, Geomorphology, and Processes



Mountains and Piedmont: Metamorphosed sedimentary rock
Coastal Plain: Eroded sediments and associated marine fossils

Remnants of Former Shorelines



Fred Beyer, North Carolina: The years before Man

https://www.waketech.edu/about-wake-tech/divisions/mathematics-sciences-engineering/departments/natural-sciences/geology/olg/11

Castle Hayne Limestone Quarry

Geologic Terms

Cenozoic Era

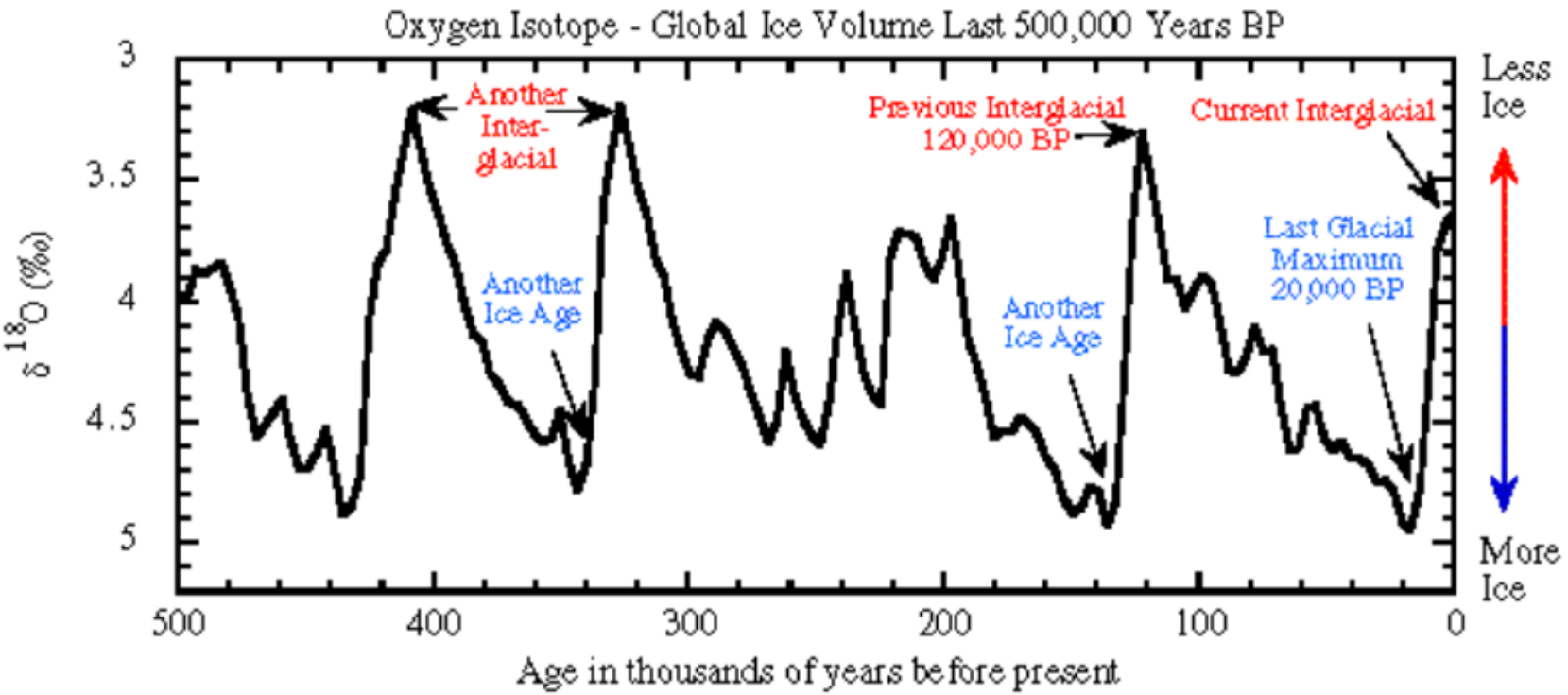
Quaternary Period-2.58 Million Years

-many cycles of glacial growth and retreat

Pleistocene Epoch-”Ice Age”

Holocene Epoch-Climactic warming and disappearance of continental glaciers; Extinction of megafauna

Anthropocene?

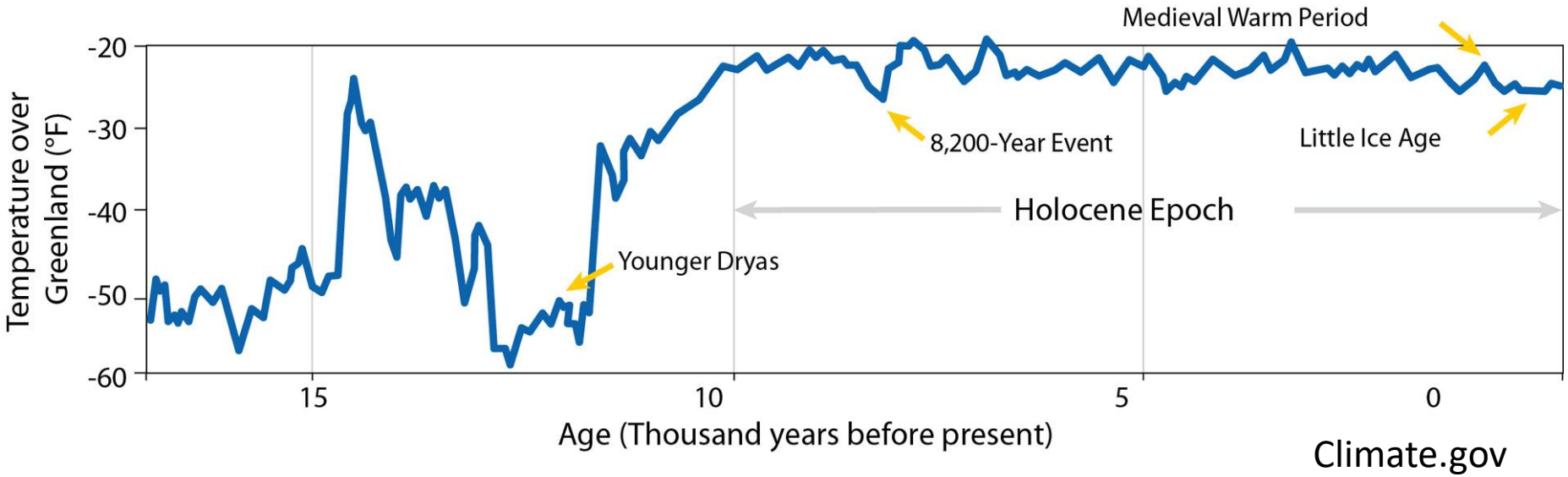


http://www.exo.net/~pauld/workshops/Paleoclimate/paleotemperature.html

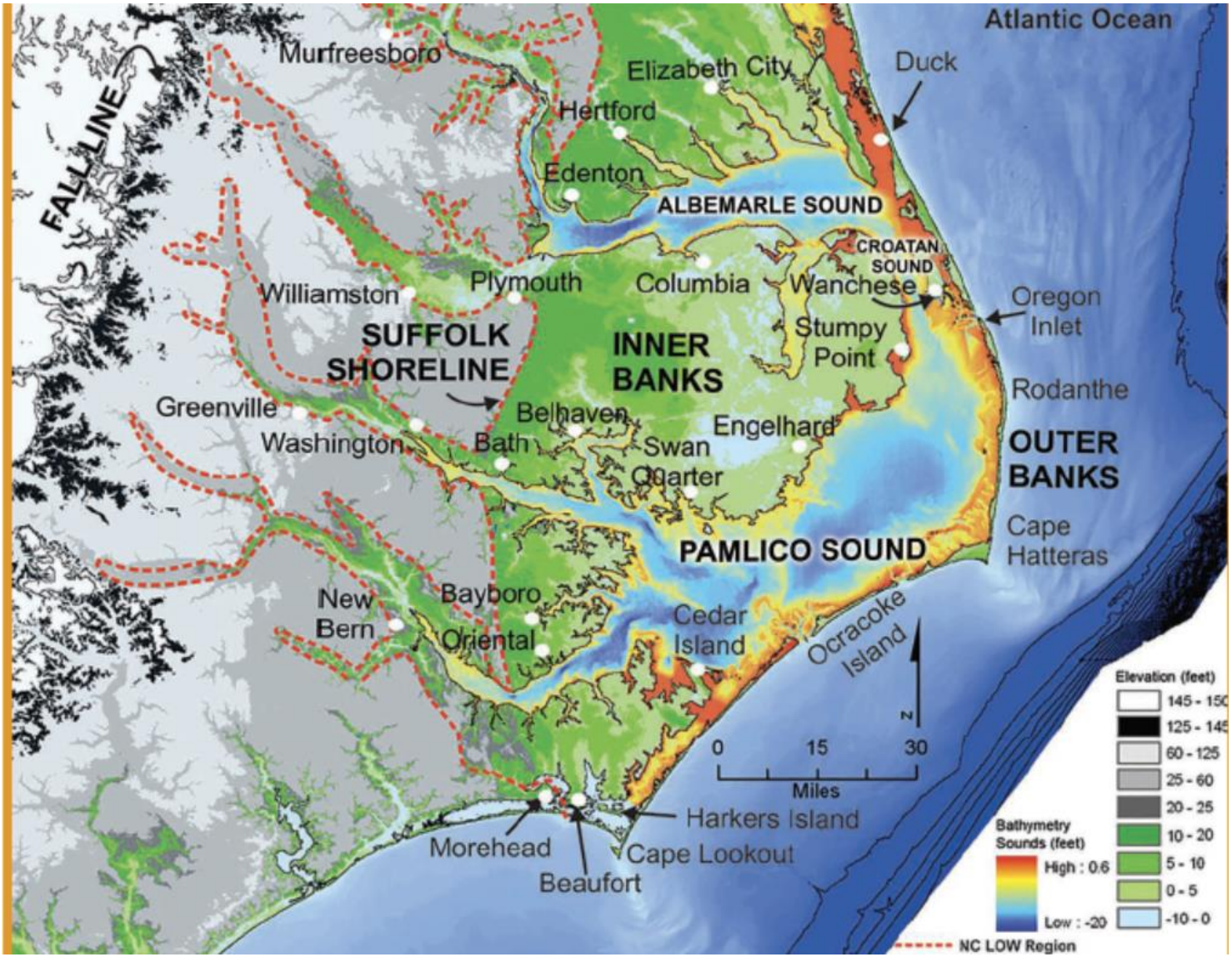
Last Glacial Maximum

- 25000 to 18000 years ago, the earth was experiencing the last glacial maximum
- Massive ice sheets covered N. America
- N. America's climate zones shifted downward
- Sea level was approximately 400 feet lower than it is today

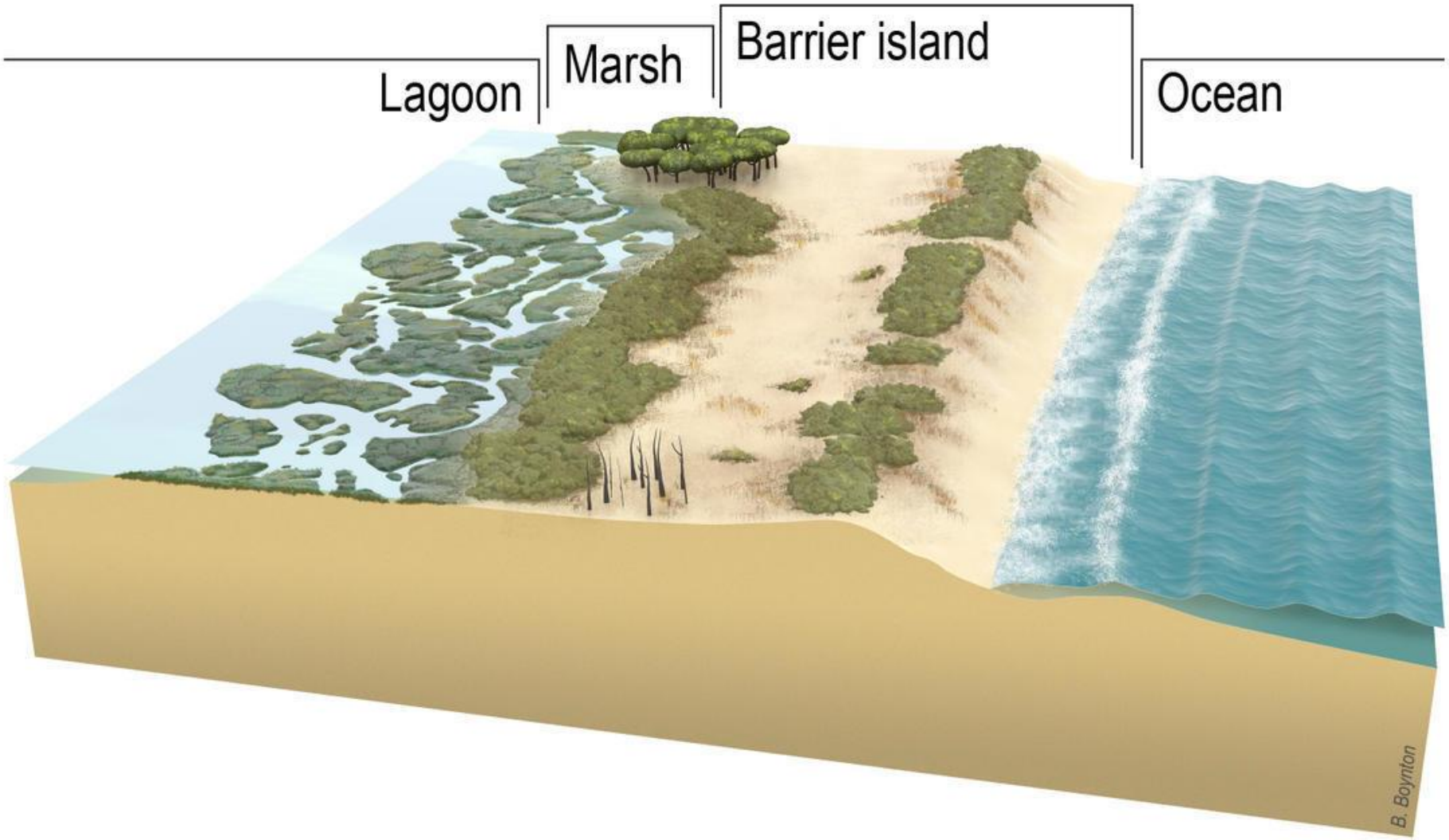
https://digitalatlas.cose.isu.edu/geog/native/text/history.htm



Ice core indicators show that the Holocene, our current interglacial epoch, began some 11,000 years ago and brought a time of stable temperatures, interrupted by a cool-down 8,200 years ago and later by the Medieval Warm Period and the Little Ice Age. Graph adapted from Richard B. Alley, The Two-Mile Time Machine.



https://ncseagrant.ncsu.edu/coastwatch/current-issue/winter-2019/a-brief-history-of-sea-level-rise-in-north-carolina/


Lagoon
Marsh
Barrier island
Ocean
B. Boynton

Barrier Island Formation

Form and persist due to:

- Presence of a gently sloping coastal plain shelf
- Availability of adequate sediment
- A rising sea level
- The occurrence of high-energy oceanic storms

Barrier islands are critical energy absorbing buffers at the land-sea interface!

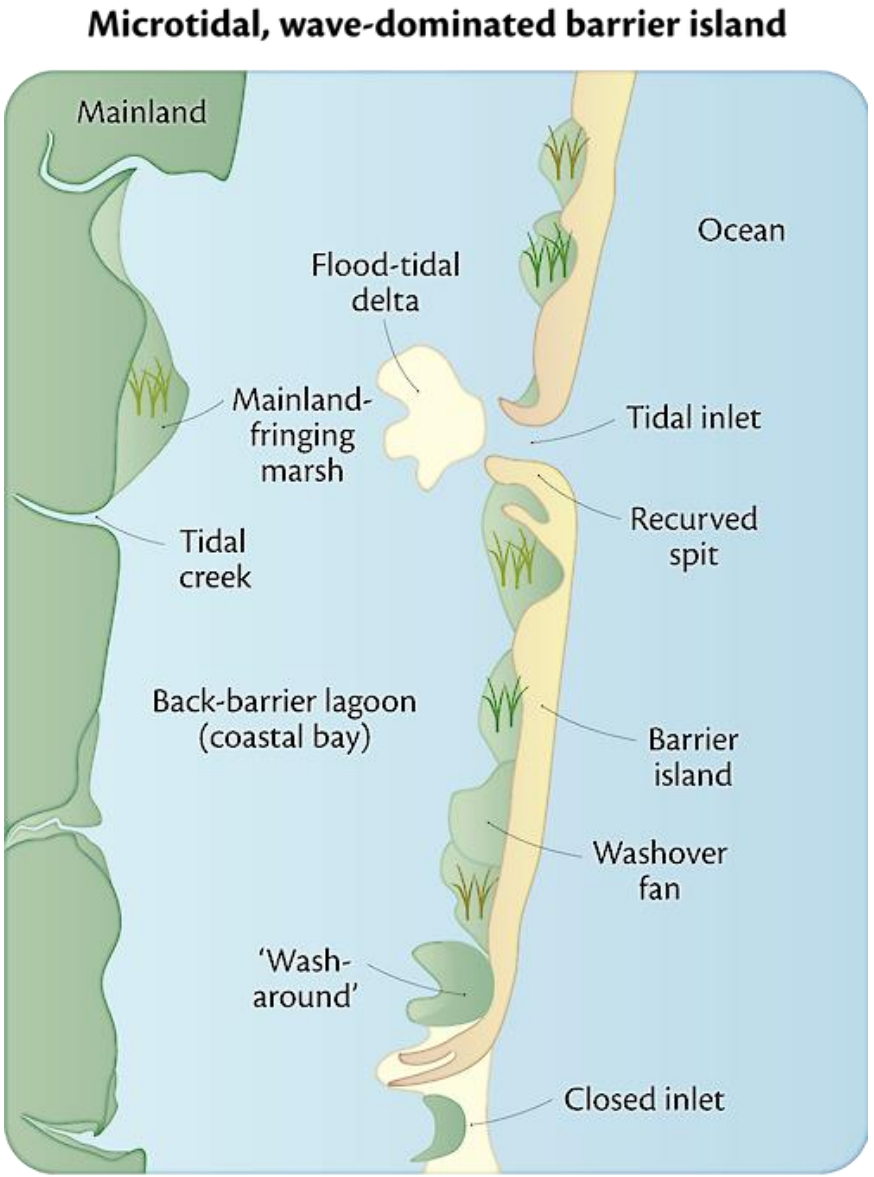
Satellite image of Cape Hatteras National Seashore on the Outer Banks of North Carolina. Credit: NASA's Earth Observatory.

Tides

- Tides are the rise and fall of sea levels caused by gravitational forces exerted by the Moon and Sun and the rotation of Earth

Microtidal Coasts:
<6.5 feet characterized by long, thin, frequently overwashed barrier islands

Mesotidal Coasts:
6.5-13 feet are characterized by barrier islands that are shorter, less frequently overwashed and backed by large areas of sand flats, salt marshes and tidal deltas.

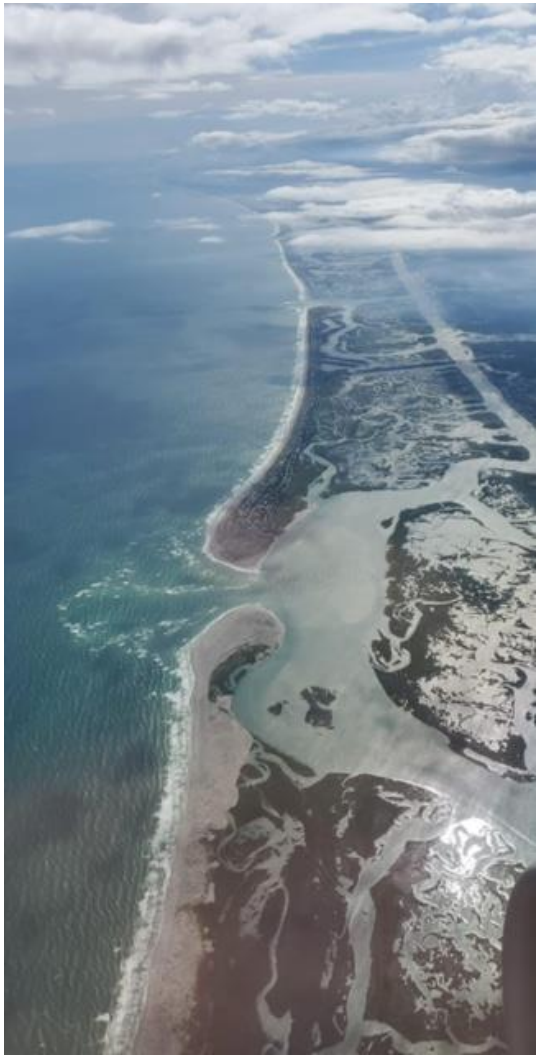


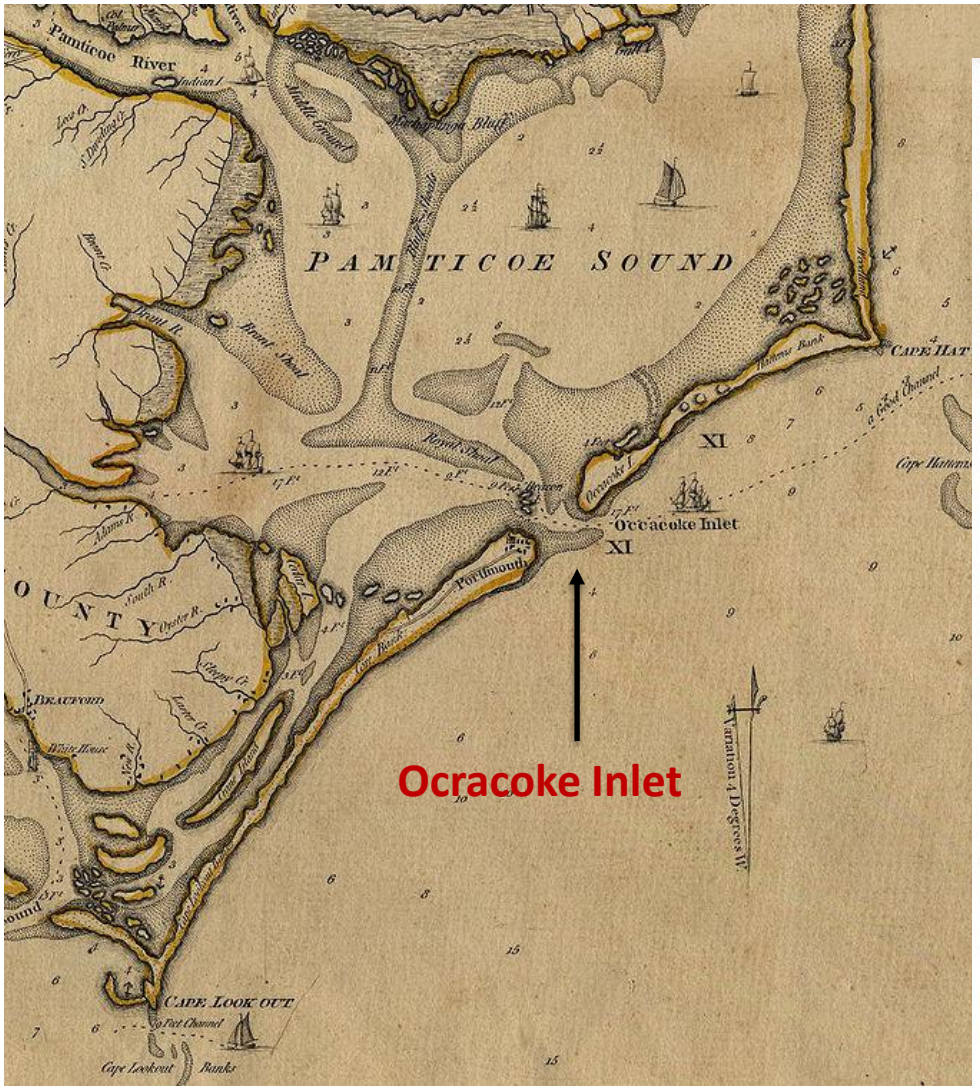
N.C. 12 on Ocracoke Island after September 2019's Hurricane Dorian: Photo: NCDOT

Masonboro Island Photo: Wrightsville-beachnc.com

Inlet Formation

- Serve as an “outlet” for freshwater
- Water drive by tidal forces must pass between or over coastal features
- Where tidal ranges are low, inlets occur less frequently (only 5 between Beaufort, NC and Virginia)
- Where tidal ranges are higher, inlets occur more frequently (14 between Beaufort and SC)
- Inlets are kept open by the flow of tidal water through them
- Inlets close when more sand enters than can be moved away by tidal currents



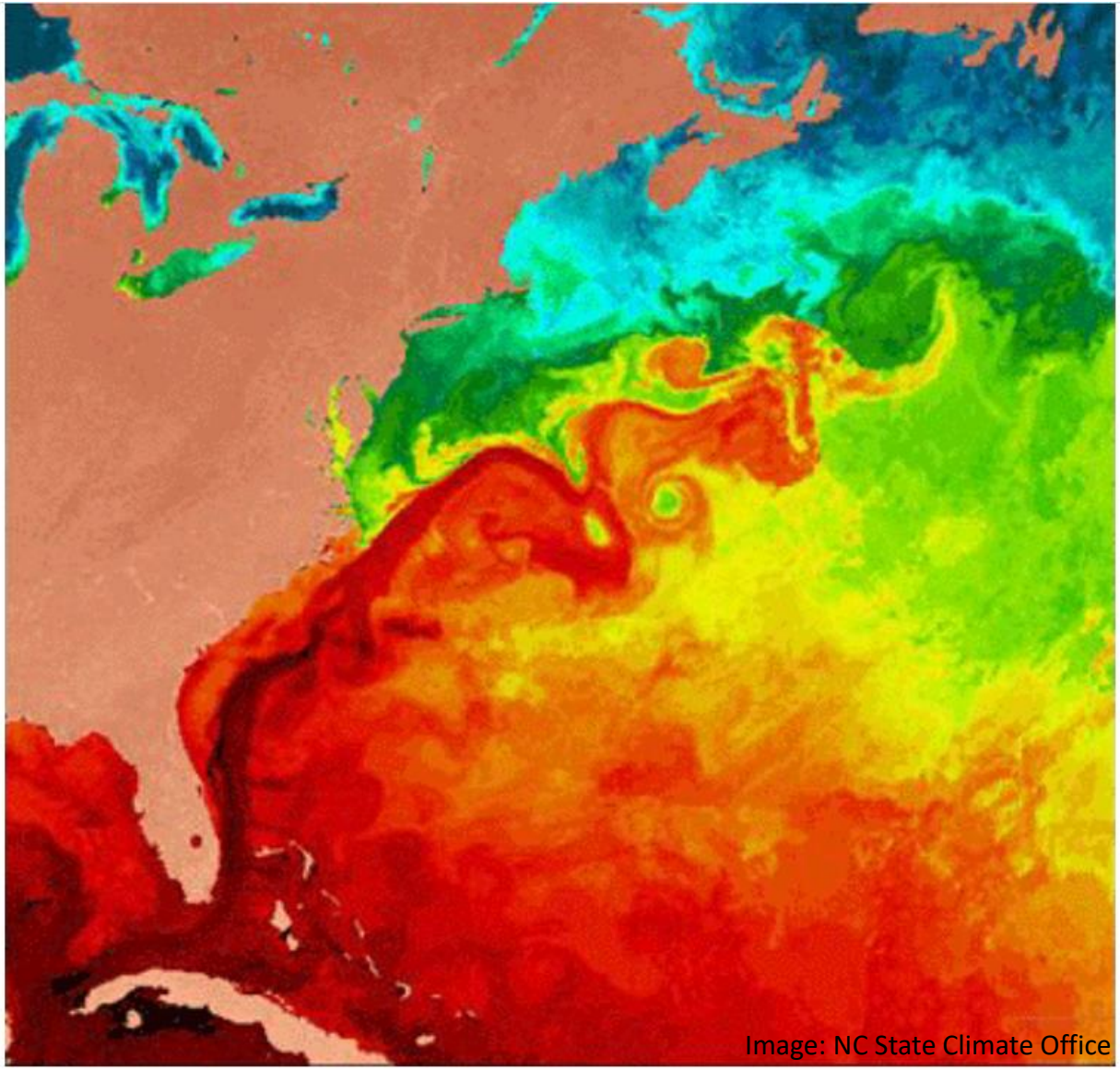


Map of Ocracoke and vicinity, ca 1775

Figure 1. MODIS satellite image showing the location of active inlets between the Virginia state line and Cape Lookout, NC. Satellite image courtesy of Institute for Marine Remote Sensing, College of Marine Science, University of South Florida.

For Informational Purposed Only/Do Not Use to Navigate

The Gulf Stream

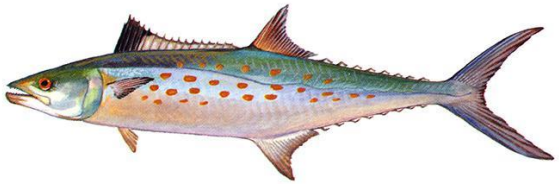


- Surface ocean currents are primarily affected by wind patterns
- Gulf Stream takes very warm water from the Gulf of Mexico and parts of the Caribbean Sea and transports it northward
- Warm water of the current contains an abundance of fish and wildlife
- Gulf Stream has a direct effect on hurricane patterns and how they hit the Eastern U.S. coast

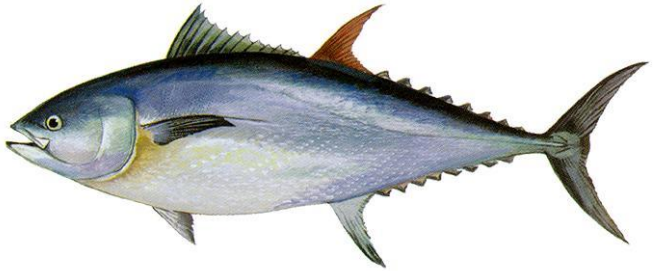
Inshore and Offshore Fish

Red Drum

Striped Bass

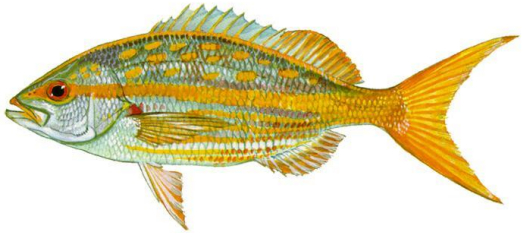


Spanish Mackerel



Bluefin Tuna

Dolphinfish

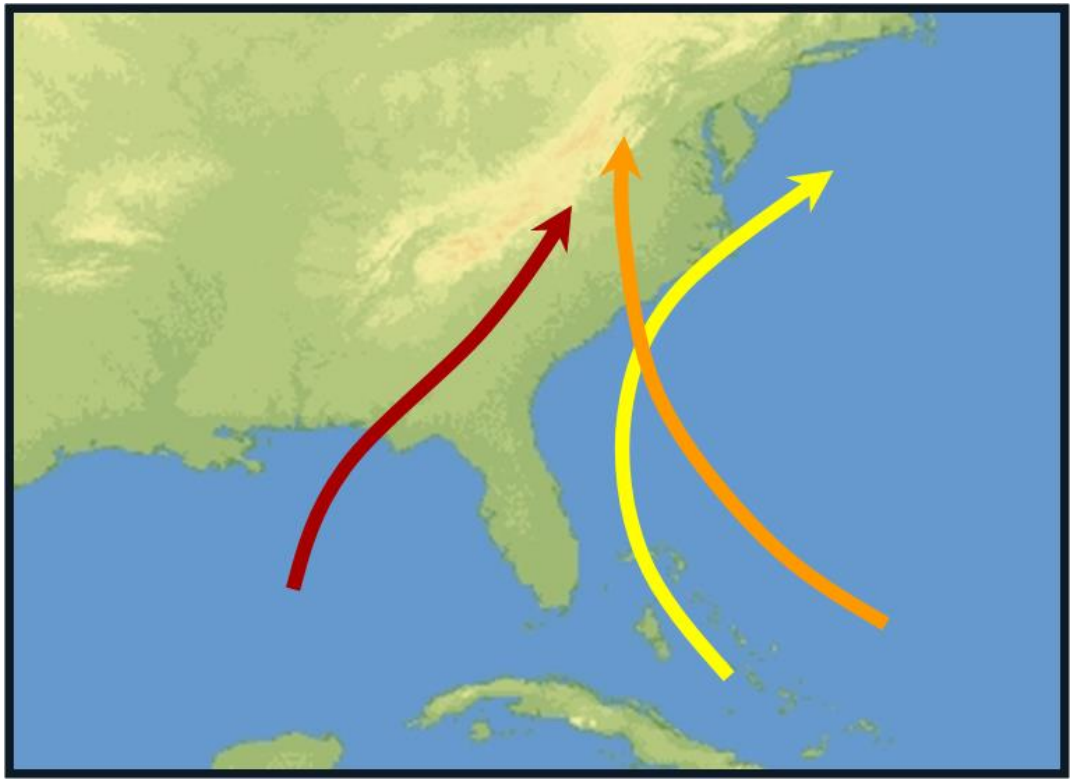


Yellowtail Snapper

Hurricanes and the NC Coast

Hurricane season lasts from June 1st to November 30th with the peak of hurricane season typically in early- to mid-September

Coastal Track: Largest threats are high winds and coastal flooding from storm surge
Inland Track: Usually causes nearly statewide damage from flooding and high winds
Gulf Track: Mostly likely to cause flooding in the mountains



Source: NC State Climate Office