



North Carolina's Barrier Islands

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Outline:



Overview of North Carolina's Coast



Barrier Island Evolution



Living on a Barrier Island



Benefits of a Healthy Barrier Island

There's No Place Like North Carolina's Barrier Islands:

...where change is guaranteed



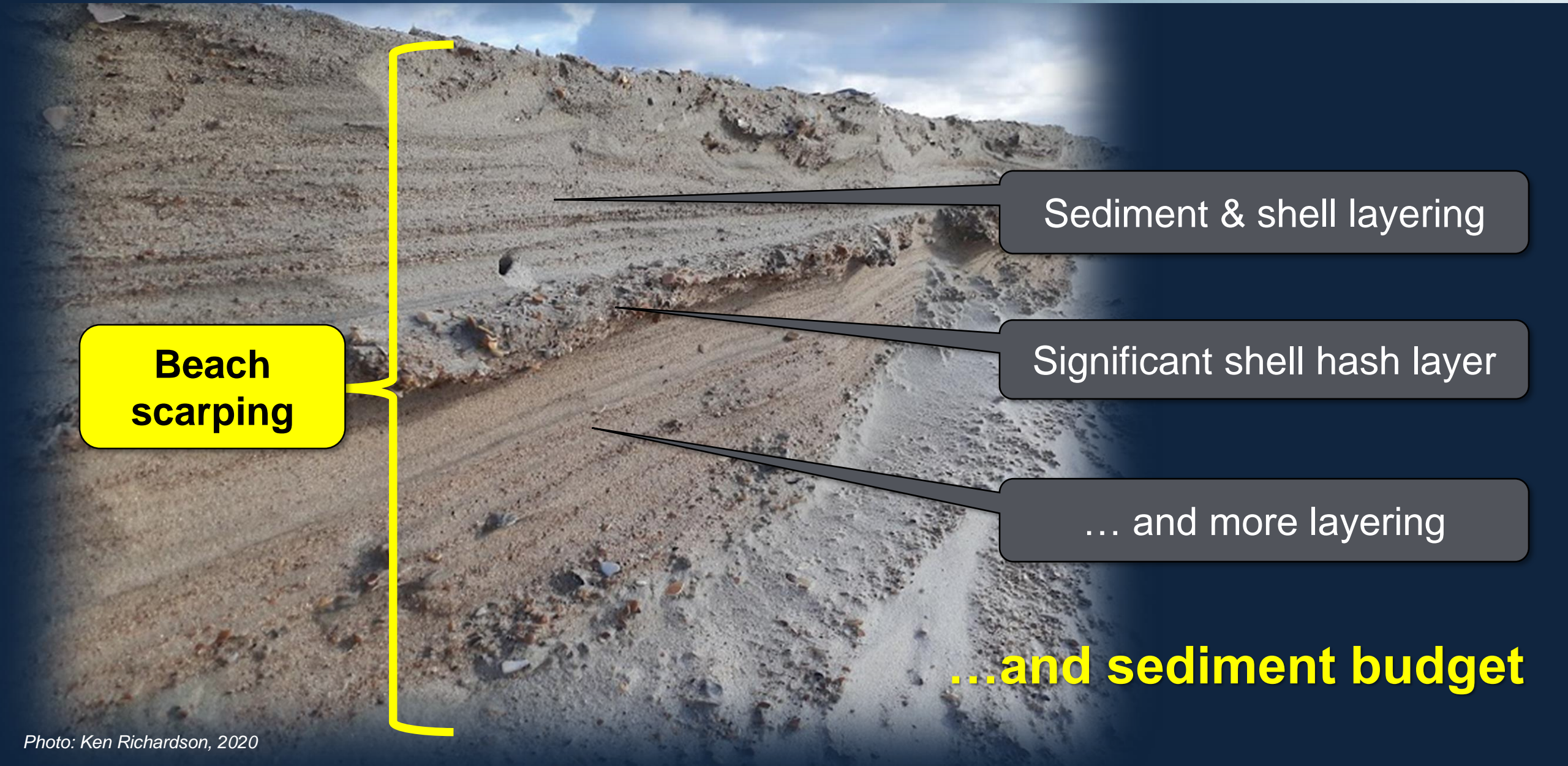
7:44 AM



7:54 AM
(10 minutes later)

Photo: Ken Richardson, 2020

... and change is relative to **Time & Scale**



Sediment & shell layering

Significant shell hash layer

... and more layering

...and sediment budget

**Beach
scarping**

Overview of North Carolina's Coast Today

- **23 Barrier Islands**

- Oceanfront Shoreline (~320 miles)
- Estuarine Shoreline (~10,657 miles)

- **3 Capes**

- Cape Fear
- Cape Lookout
- Cape Hatteras

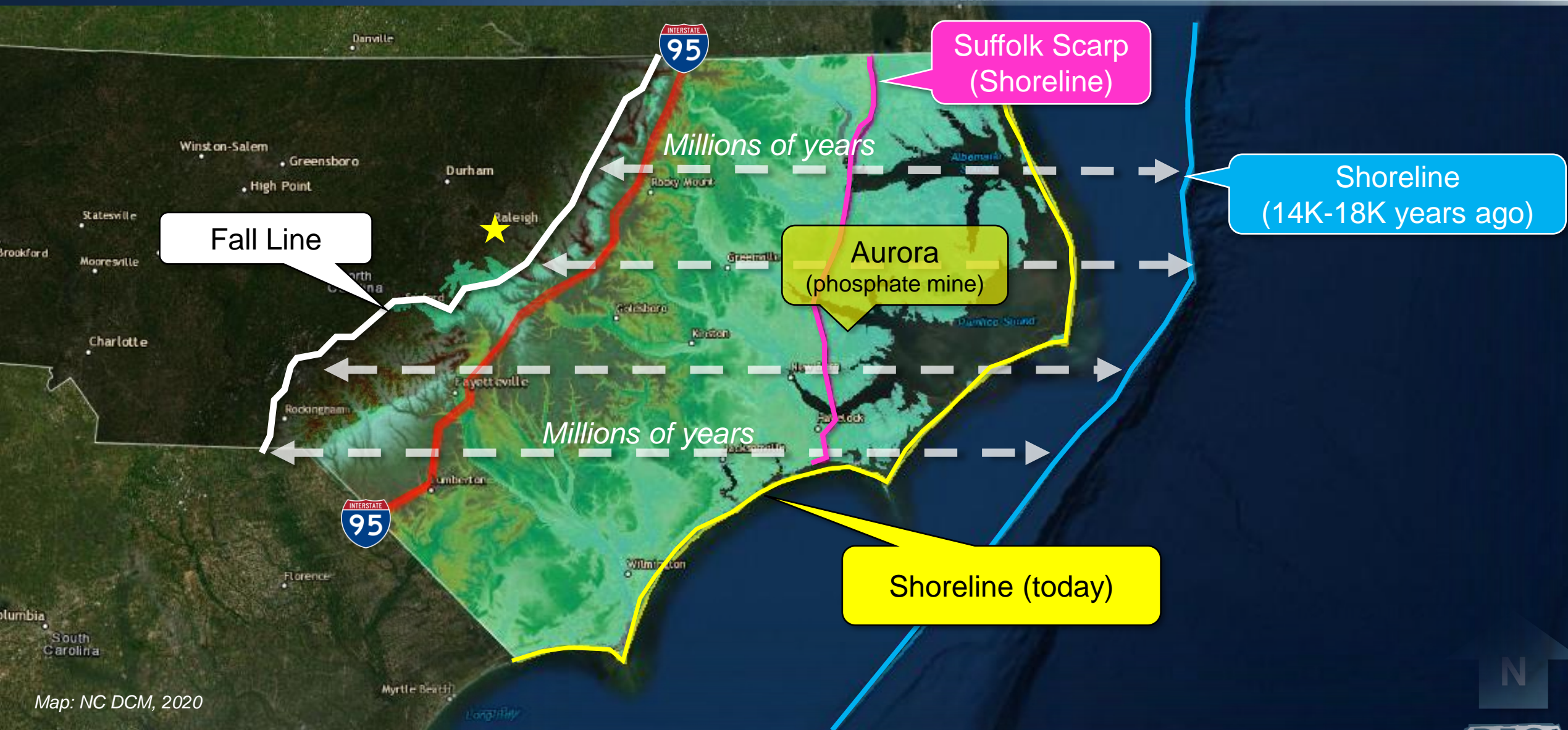
- **19 Active Ocean Inlets** •



How Did We Get Here?



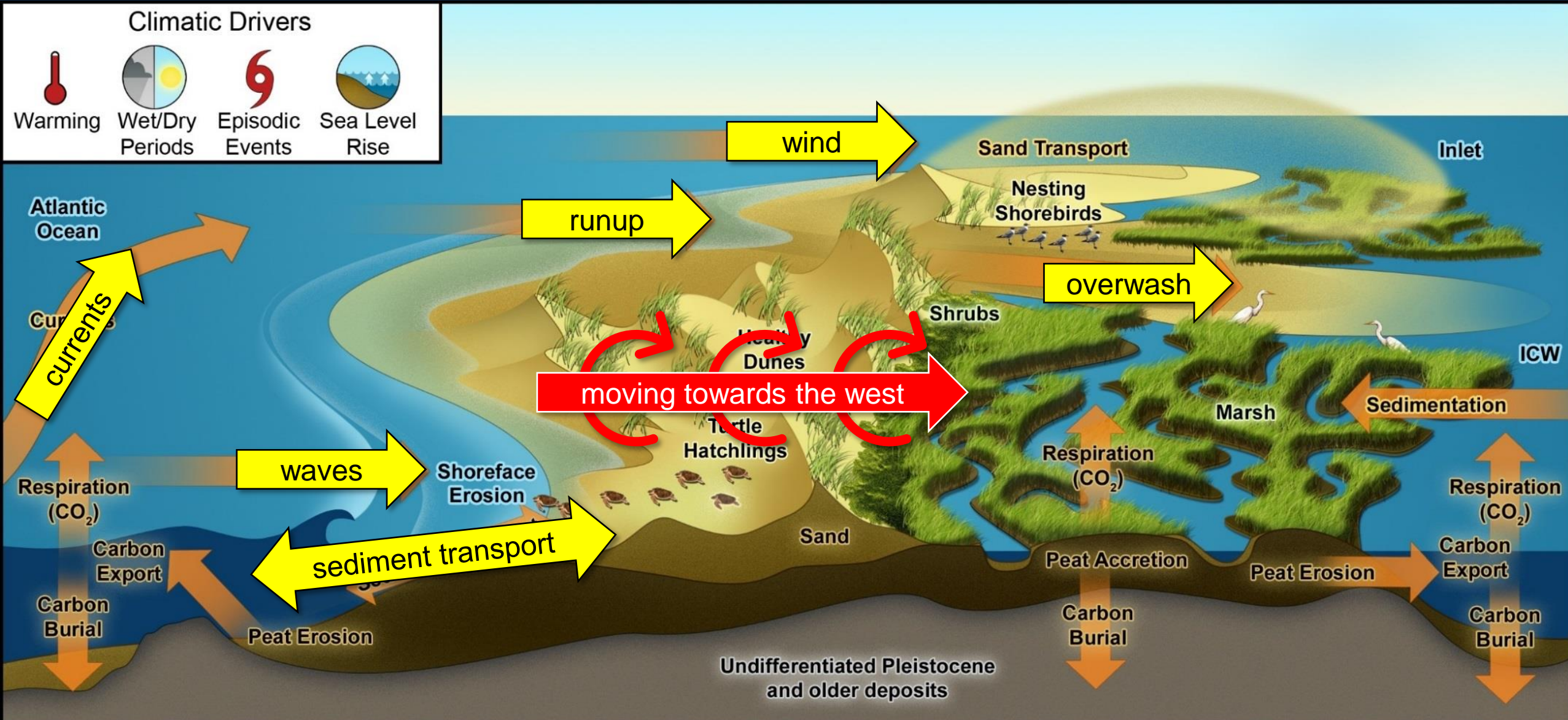
Barrier Island Evolution: Time & Scale



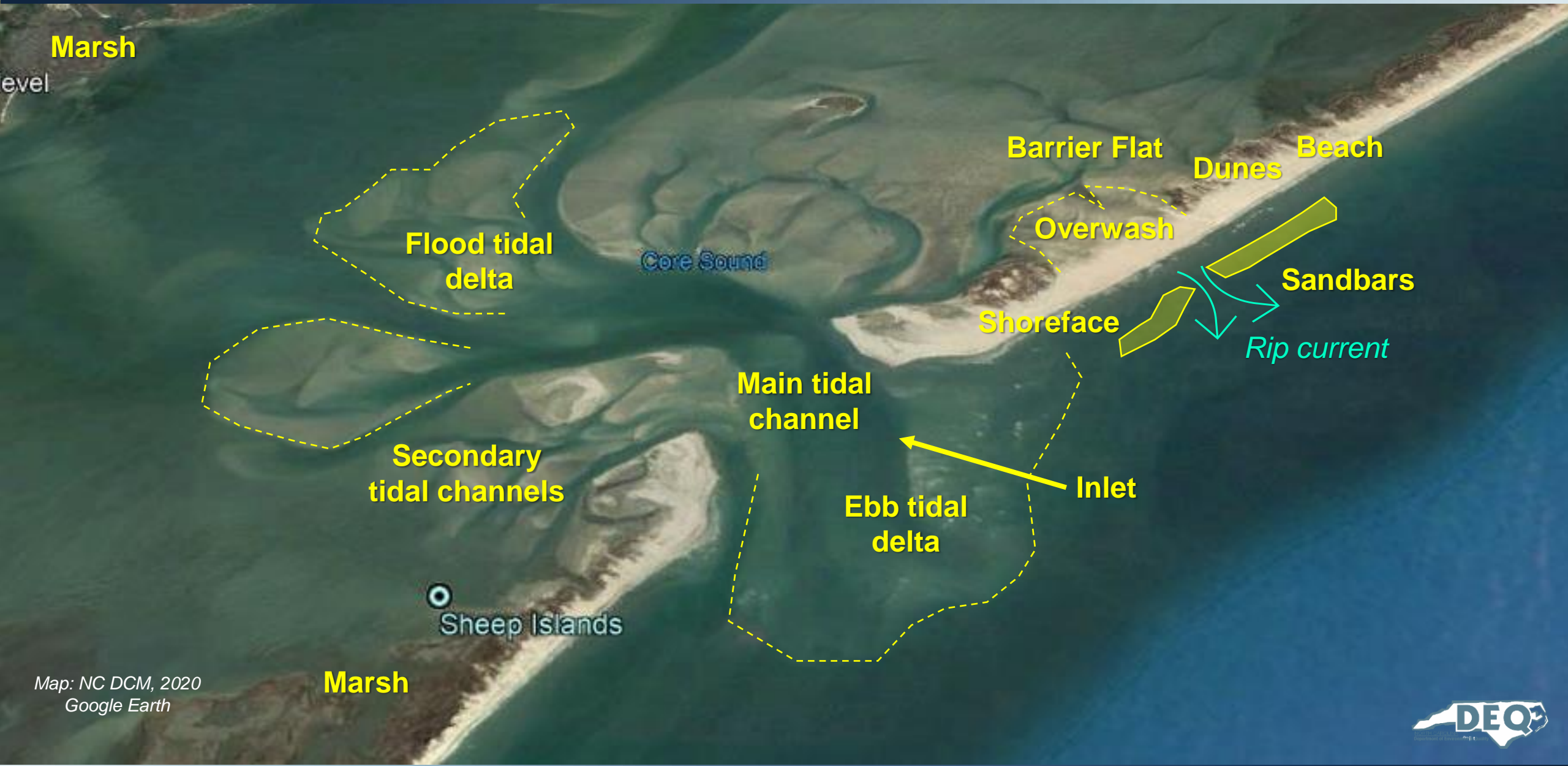
Barrier Island Evolution: Forces At Work



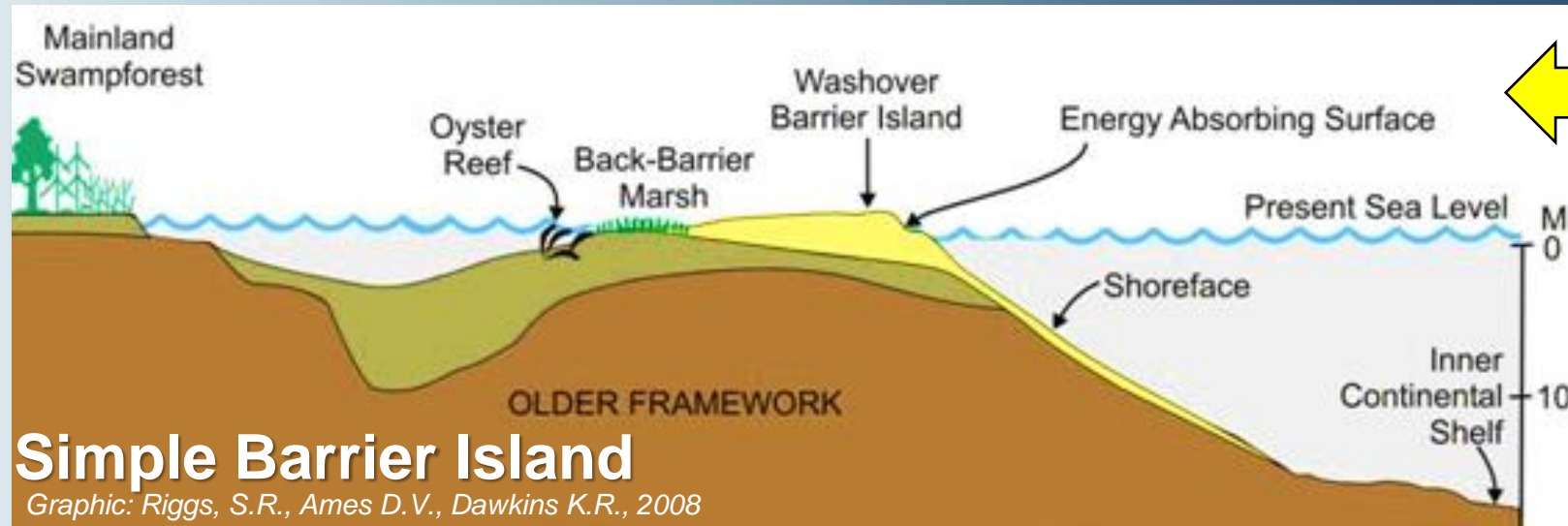
Barrier Island Evolution: Response to Sea Level Rise



Barrier Islands: Components of a Complex System

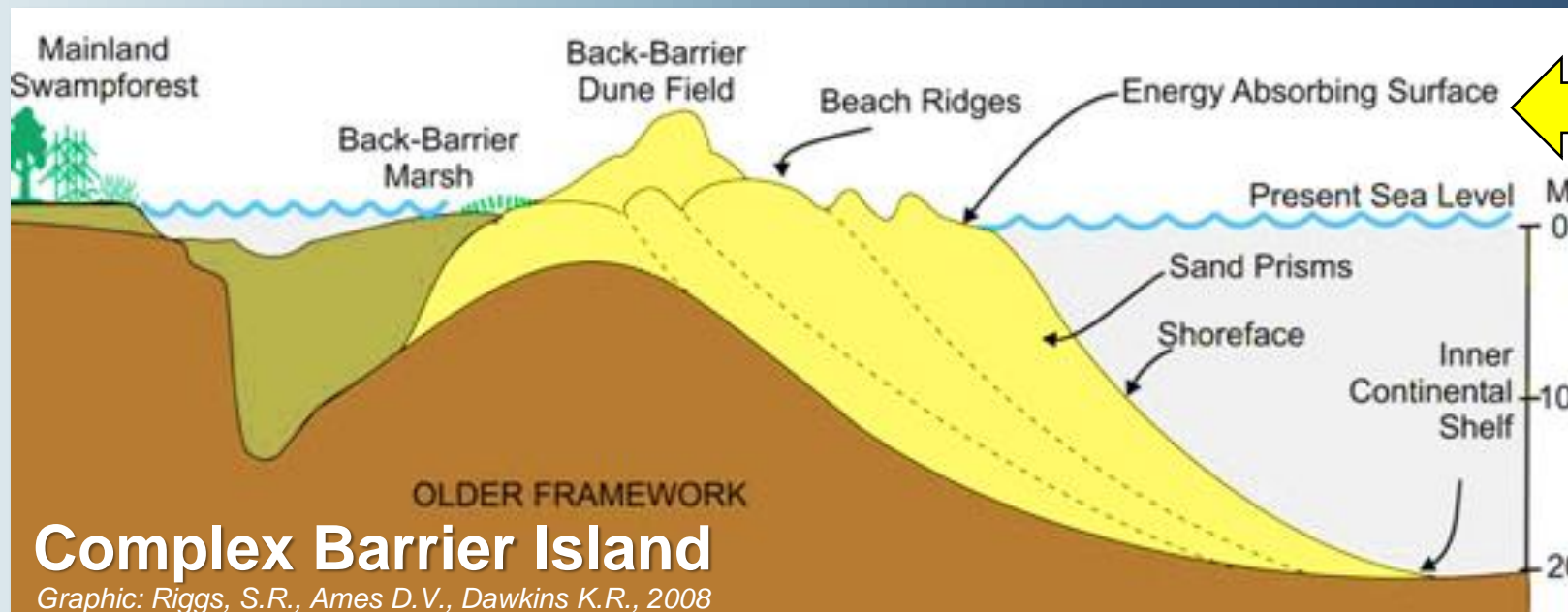


Barrier Islands: “Simple” vs. “Complex”



Simple:

- Sediment poor
 - Narrow
 - Low elevation
 - Minimal dune system
 - Less storm protection
 - Less diverse landcover

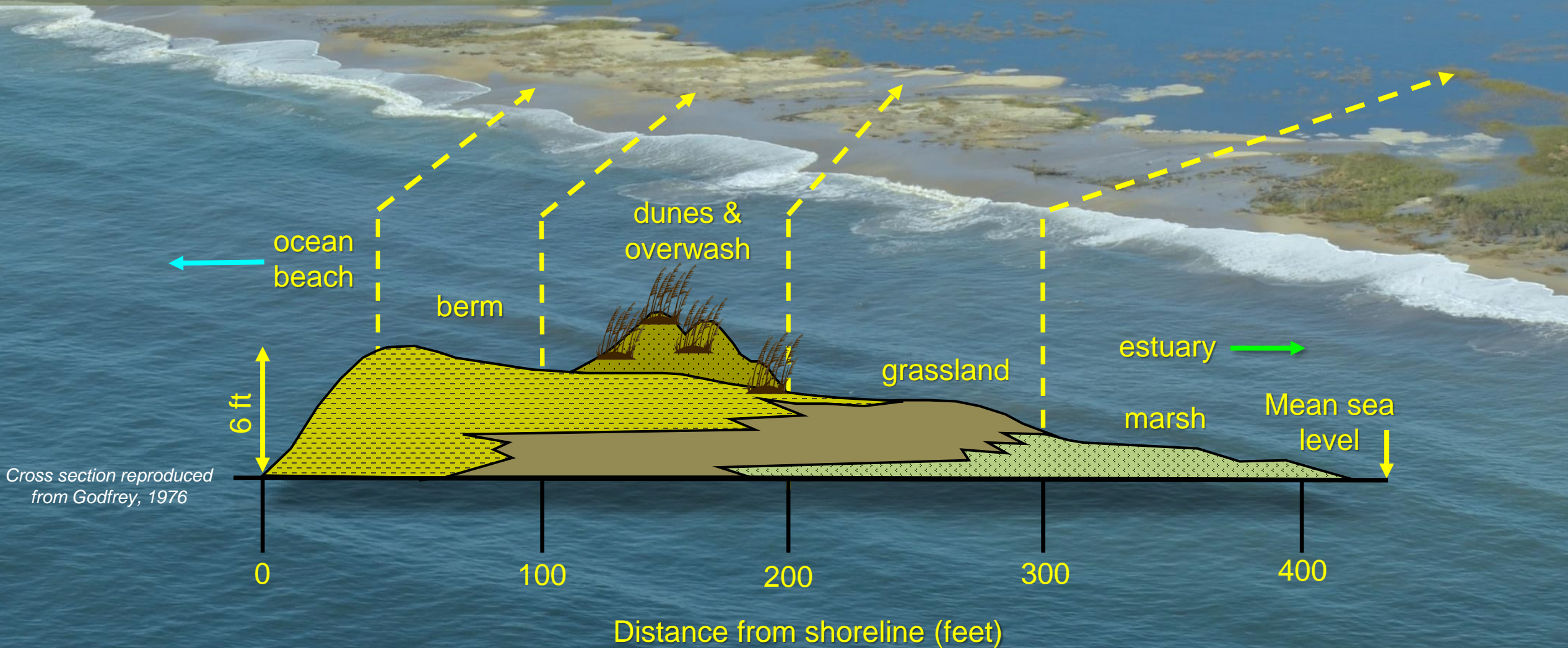


Complex:

- Sediment Rich
 - Wider
 - Higher elevations
 - Greater storm protection
 - Healthy dune system
 - Diverse landcover

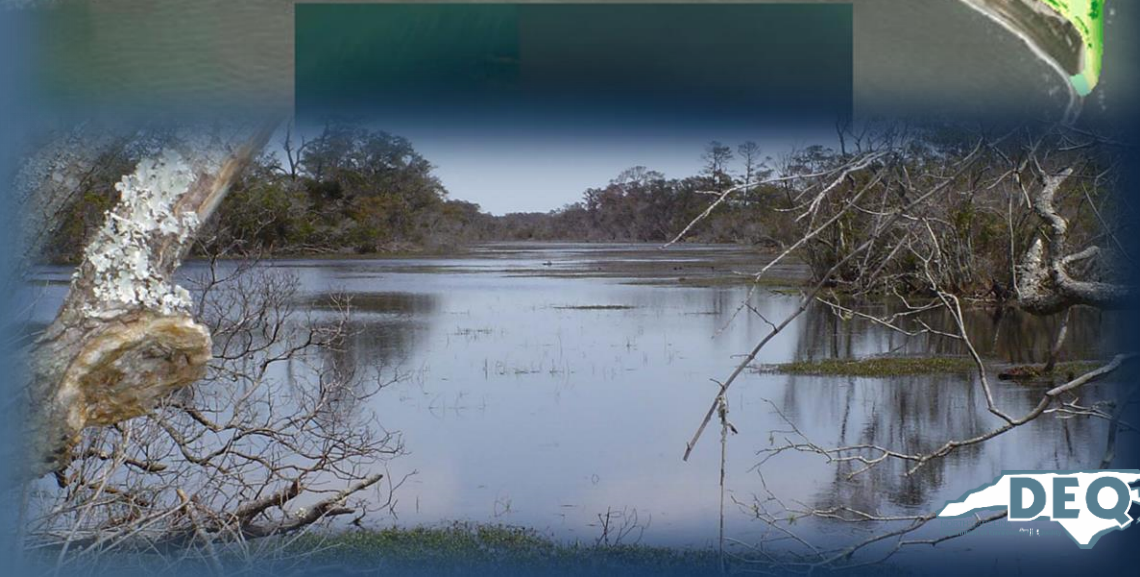
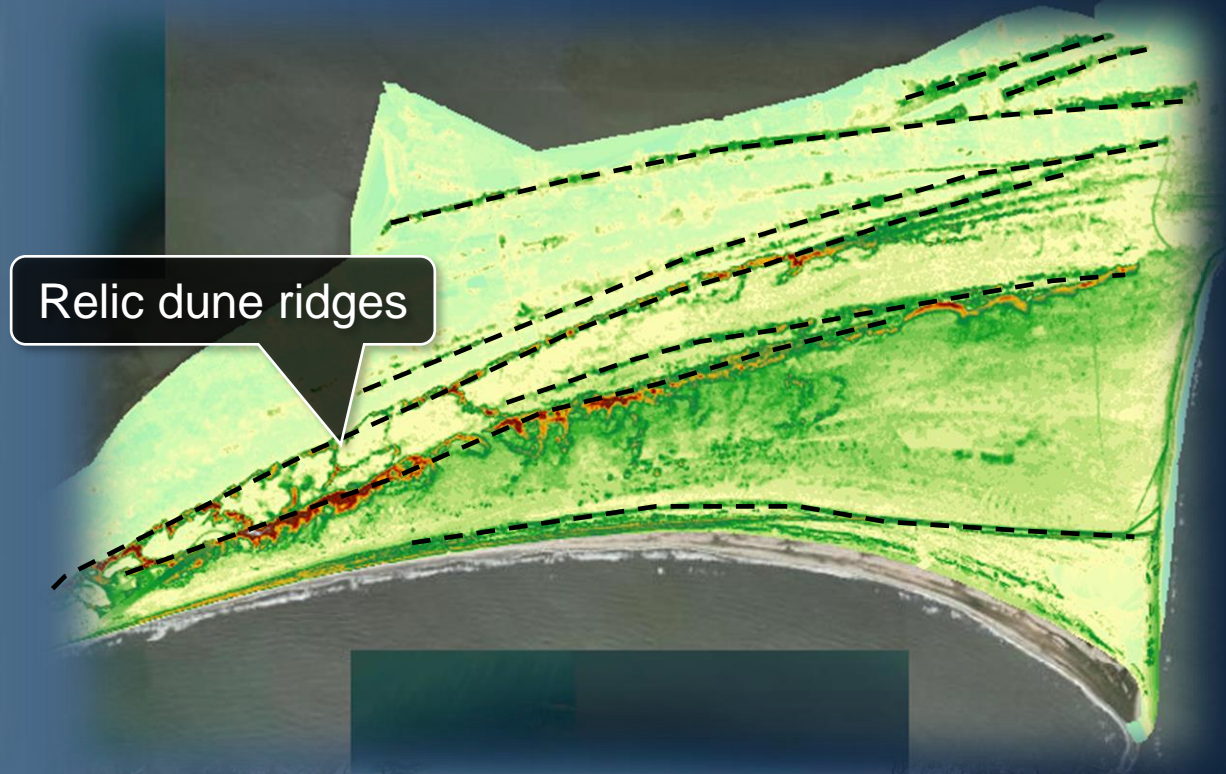
Barrier Islands: Example at Masonboro Island

Simple Barrier Island:



Barrier Islands: Example at Cape Hatteras

Complex Barrier Island:



Barrier Islands: Inlets

Inlets:

1. Oscillating

Back & forth

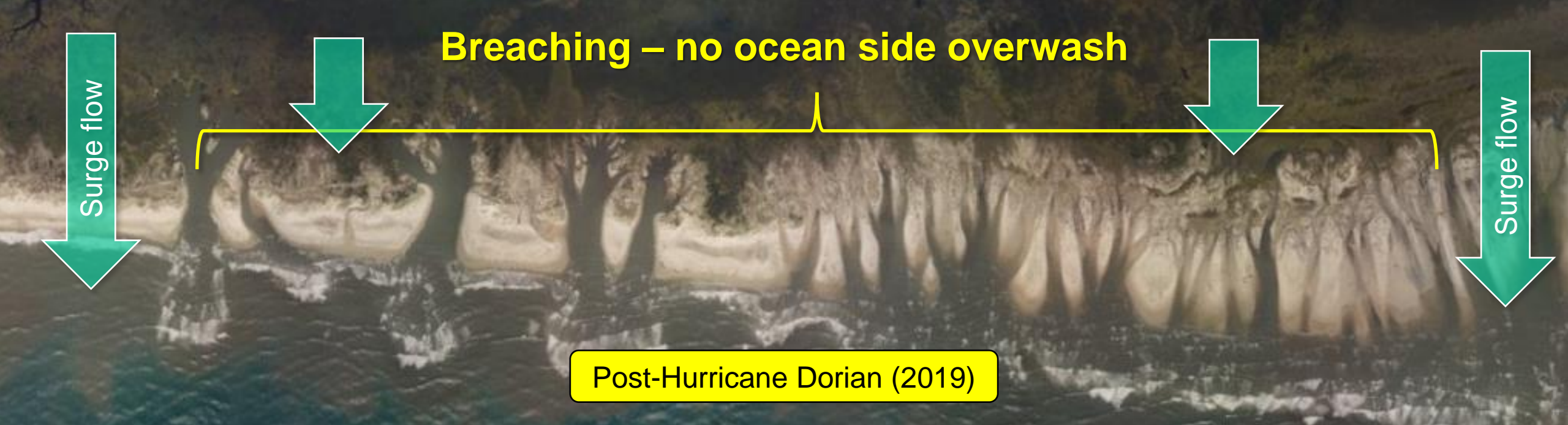
2. Migrating

One direction

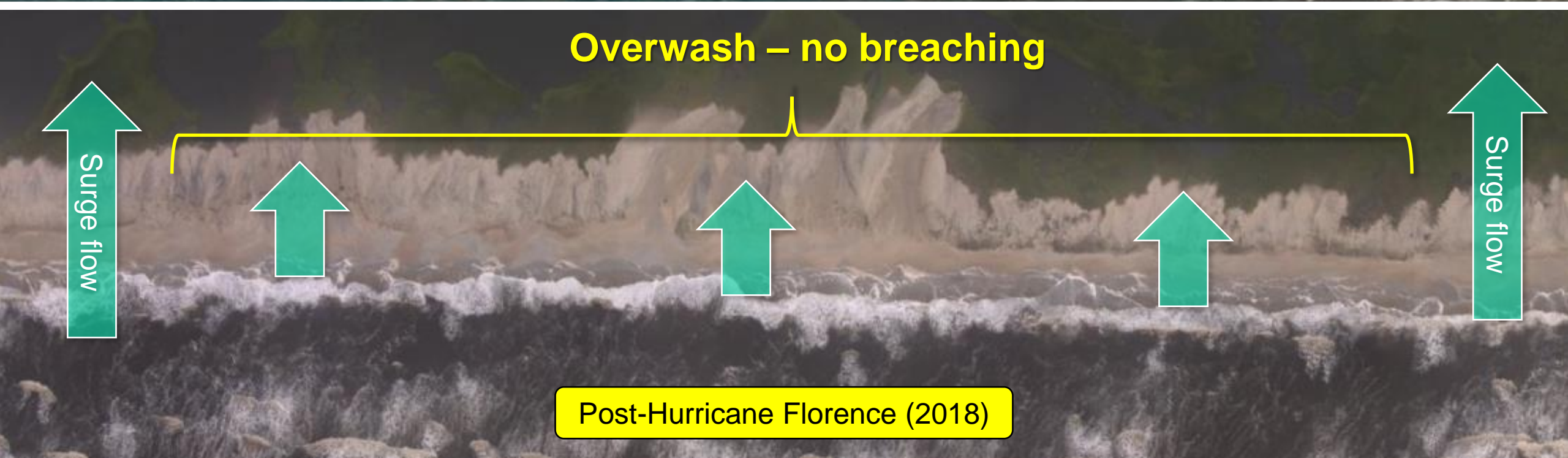
- Deep & Shallow Draft
- Open & Close
- Engineered
 - Dredged
 - Channel alignment
 - Erosion control structure

shorelines

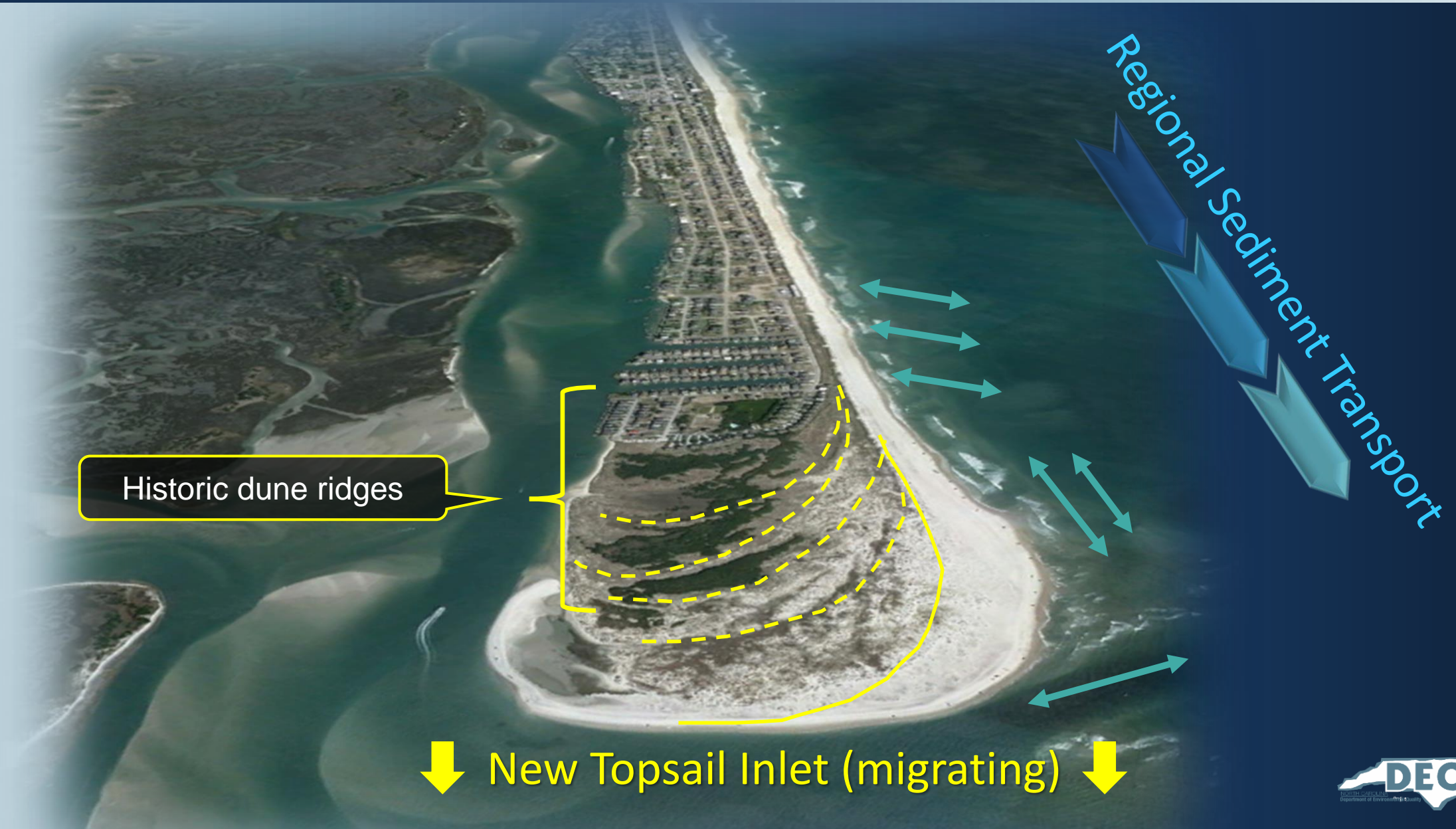
Breaching – no ocean side overwash



Overwash – no breaching



Barrier Islands: Sediment Transport



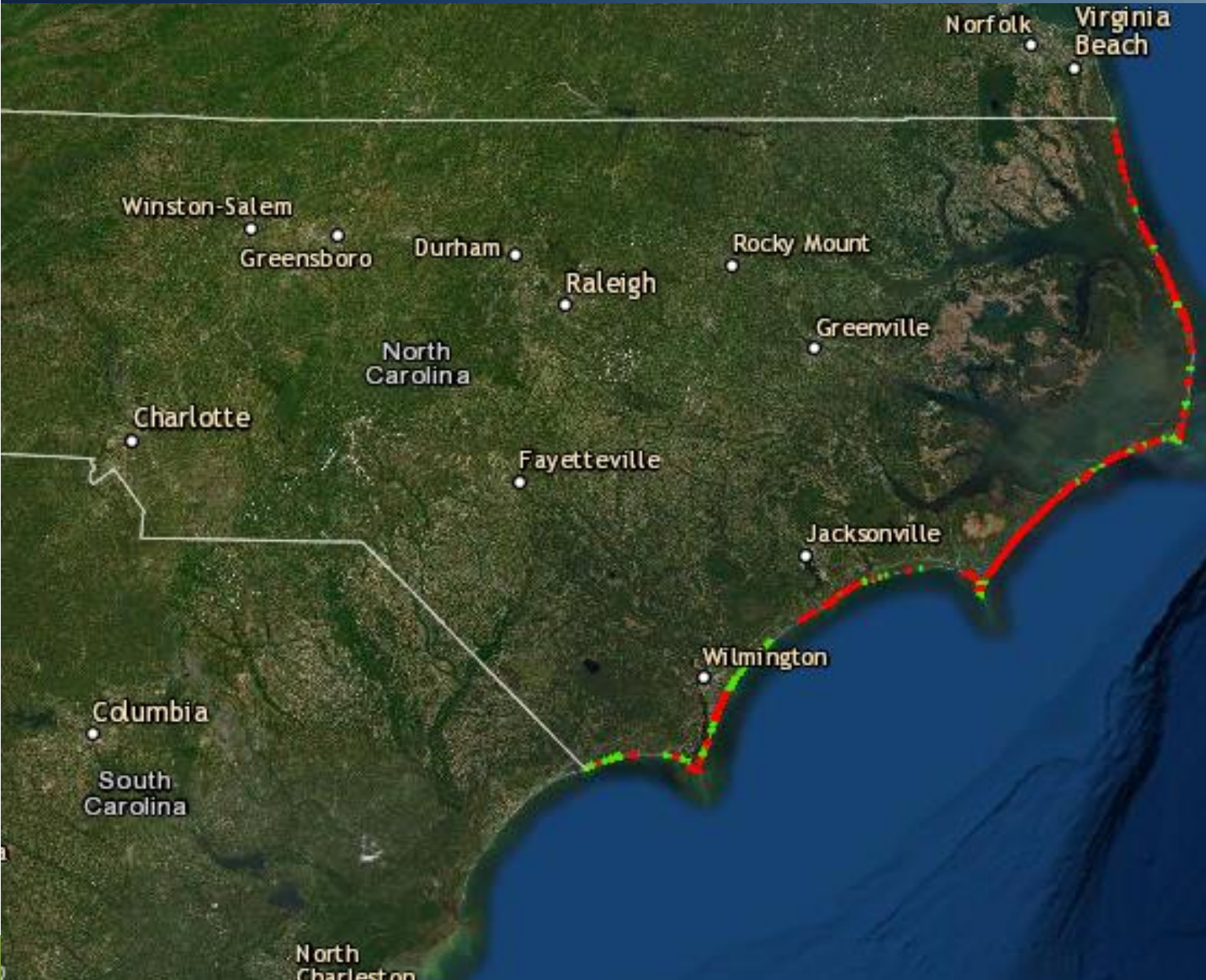
Barrier Islands: Sediment Transport (wind)



Wind driven sediment transport



Living on a Barrier Island: Nature vs. Human



Oceanfront Erosion Rates

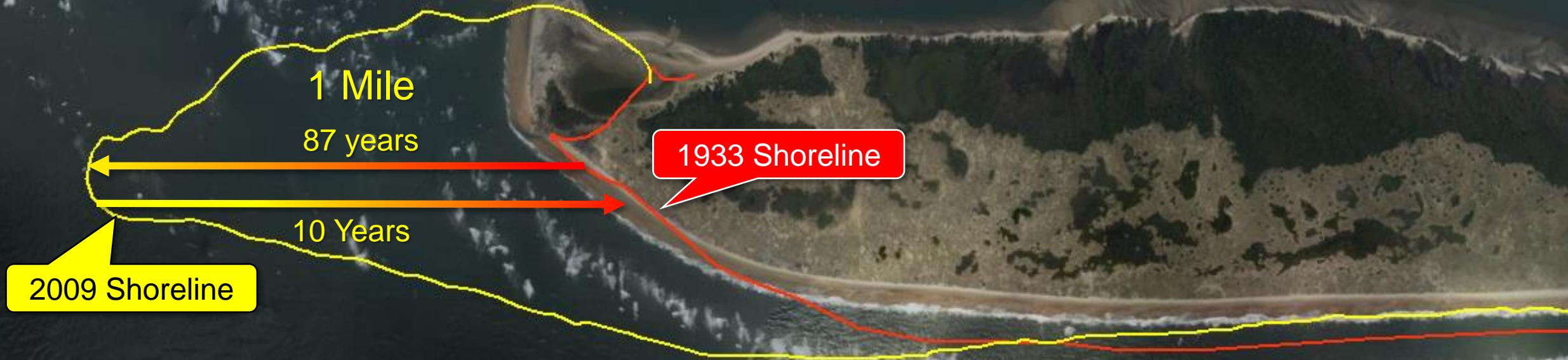
- Calculated ~ 5 years
- Ocean Erodible Area
- Oceanfront Construction Setbacks
 - Average erosion rate ~ 2 feet/year
 - Higher rates at inlets & Capes

— Erosion
— Accretion

Living on a Barrier Island: Extreme Changes

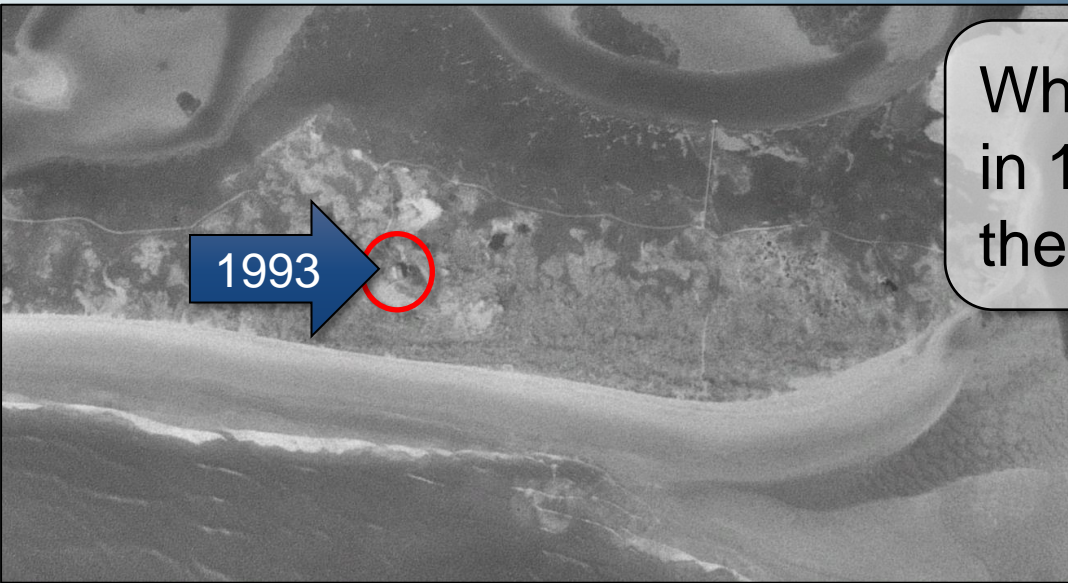
Beaufort Inlet – Shackleford Banks

- Accretion: 87 Years (1933 to 2009)
- Erosion: 10 Years (back to 1933 location)



2020 Photo

Living on a Barrier Island:



When constructed on Lea-Hutaff Island in 1990, this house sat 500 feet from the ocean shoreline



25 years later...destroyed





1,500 Feet

1870 Shoreline

Cape Hatteras Lighthouse

Photo: circa 1970 U.S. Park Service



Morris Island Lighthouse (SC)

- Built in 1876 (south of Charleston Harbor)
- 1,200 feet from water's edge

maritime forest

marsh grass

Photo: U.S. Coast Guard, 1893

Morris Island Lighthouse (SC)

- Built in 1876 (south of Charleston Harbor)
- 1,200 feet from water's edge

Jetty

Sediment Transport

1,300 feet

1,200 feet

Lighthouse
(current location)

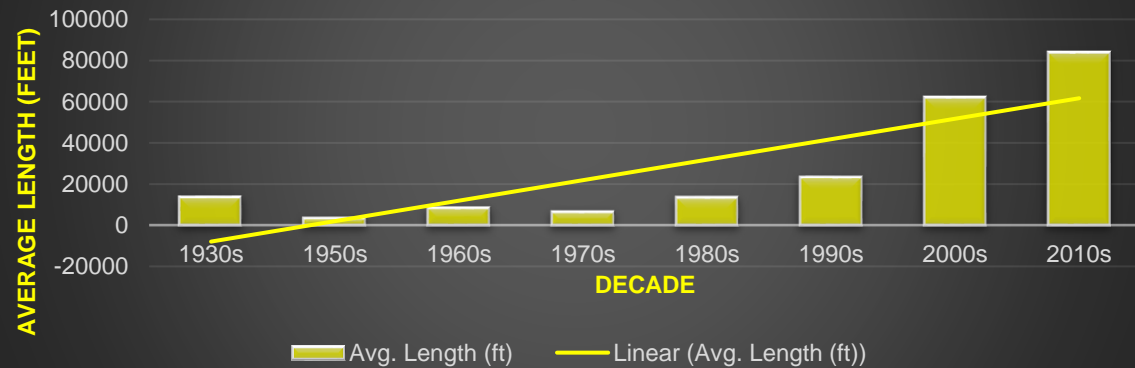
1876 Shoreline

Living on a Barrier Island: Erosion Management

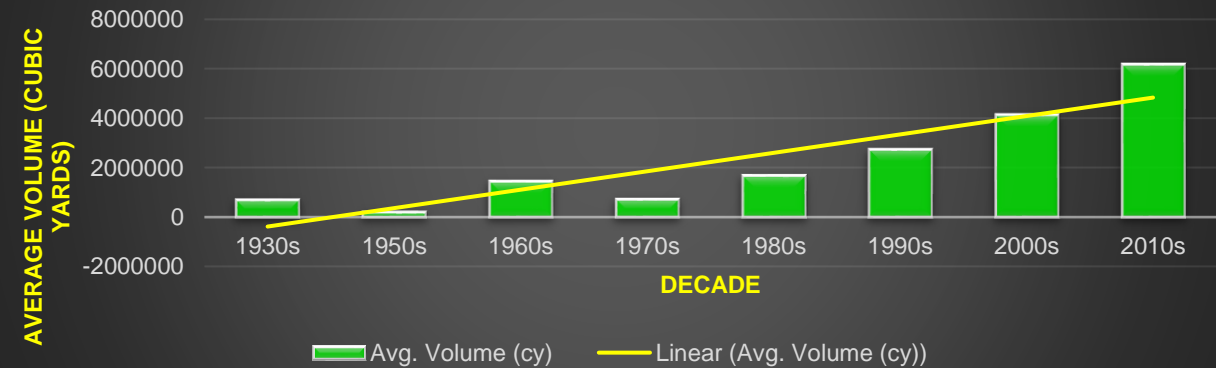
- ✓ **None**
- ✓ **Soft** (*beach nourishment, sandbags, dredging*)
- ✓ **Hard** (*groin, breakwater, jetty, seawall*)
- ✓ **Retreat**
- ✓ **Combination** (*all the above*)



Average **Length** (ft) per Decade
(all projects)



Average **Volume** (cy) per Decade
(all projects)



Living on a Barrier Island: Erosion Management

Bulkheads



Revetments



Living Shorelines





- **Tropical storm events**
- **Coastal erosion**
- **Erosion control & mitigation**
- **Population** (nationwide)
- **Recovery cost** (nationwide)

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Benefits of a Healthy Beach

Tourism

Recreation

Employment

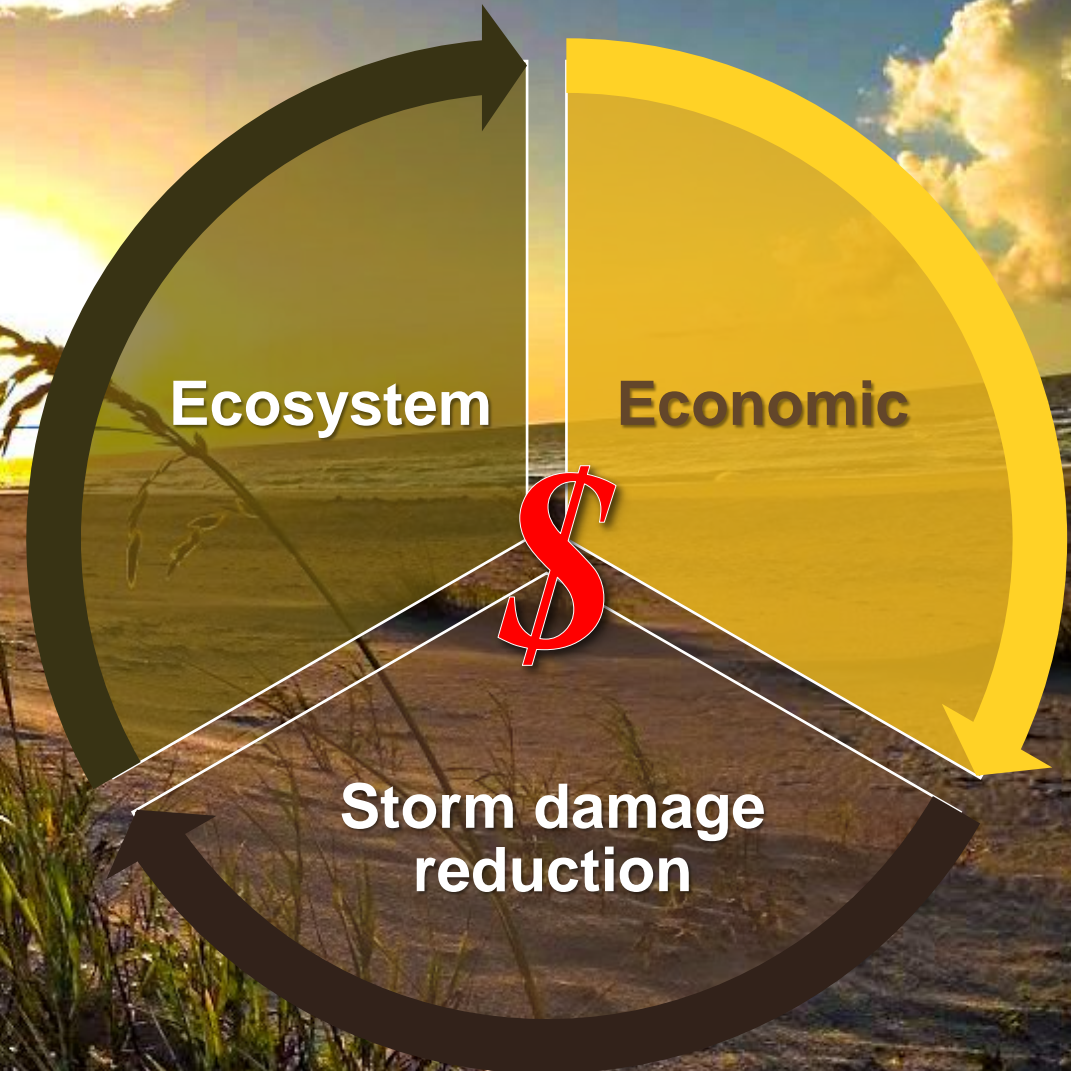
Critical habitat

Less storm damage

Property value

Commercial

Tax revenue





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