



Georgia's Amazing Coast

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The Georgia Coast

The Georgia Coast is composed of barrier islands, oceanic and estuarine systems



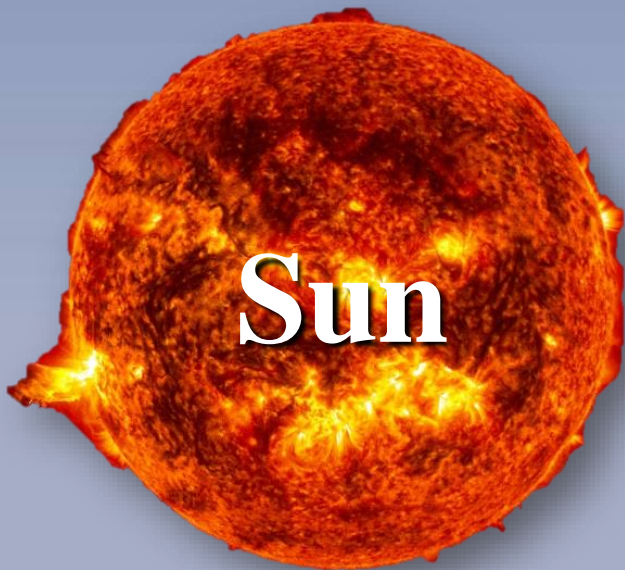
South Atlantic Bight



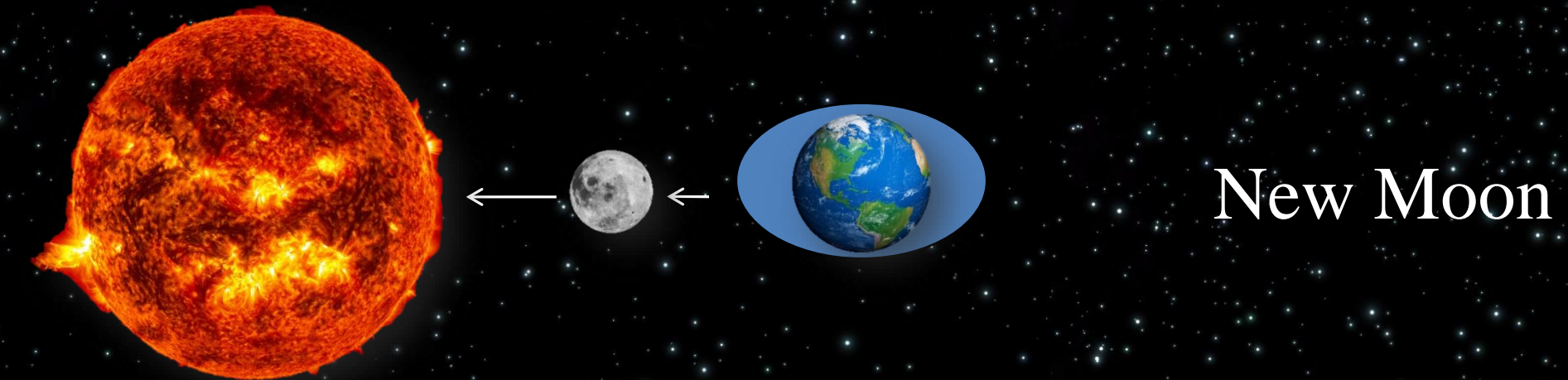
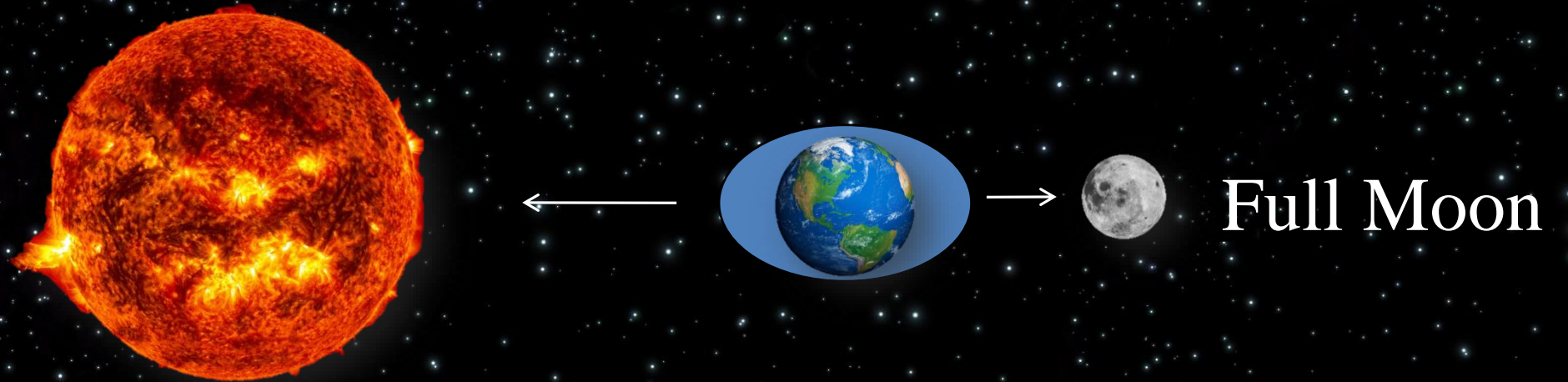
- Georgia has the most western coastline on the east coast
- The geologic formation and shallow slope yield some of the highest tides south of the Bay of Fundy

Georgia's Tides

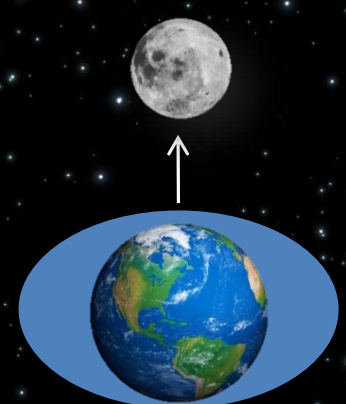
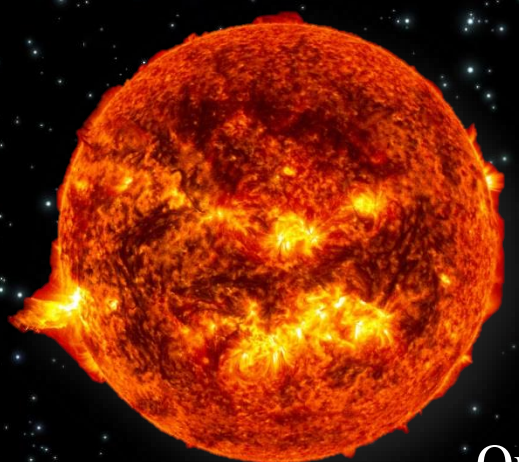
- Georgia has semi-diurnal tidal amplitudes of 6-9 feet.



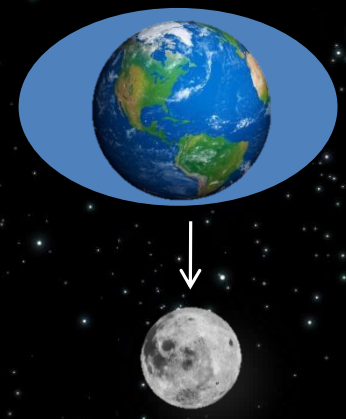
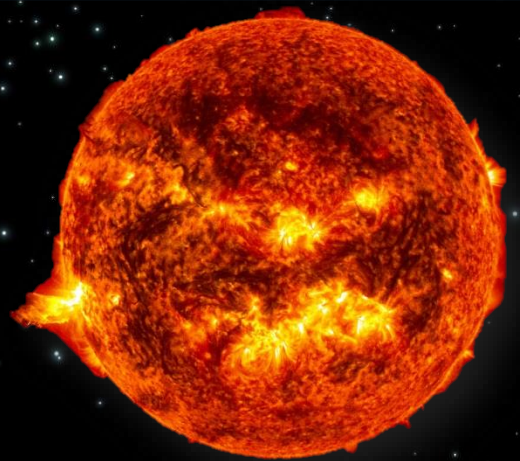
Spring Tides



Neap Tides



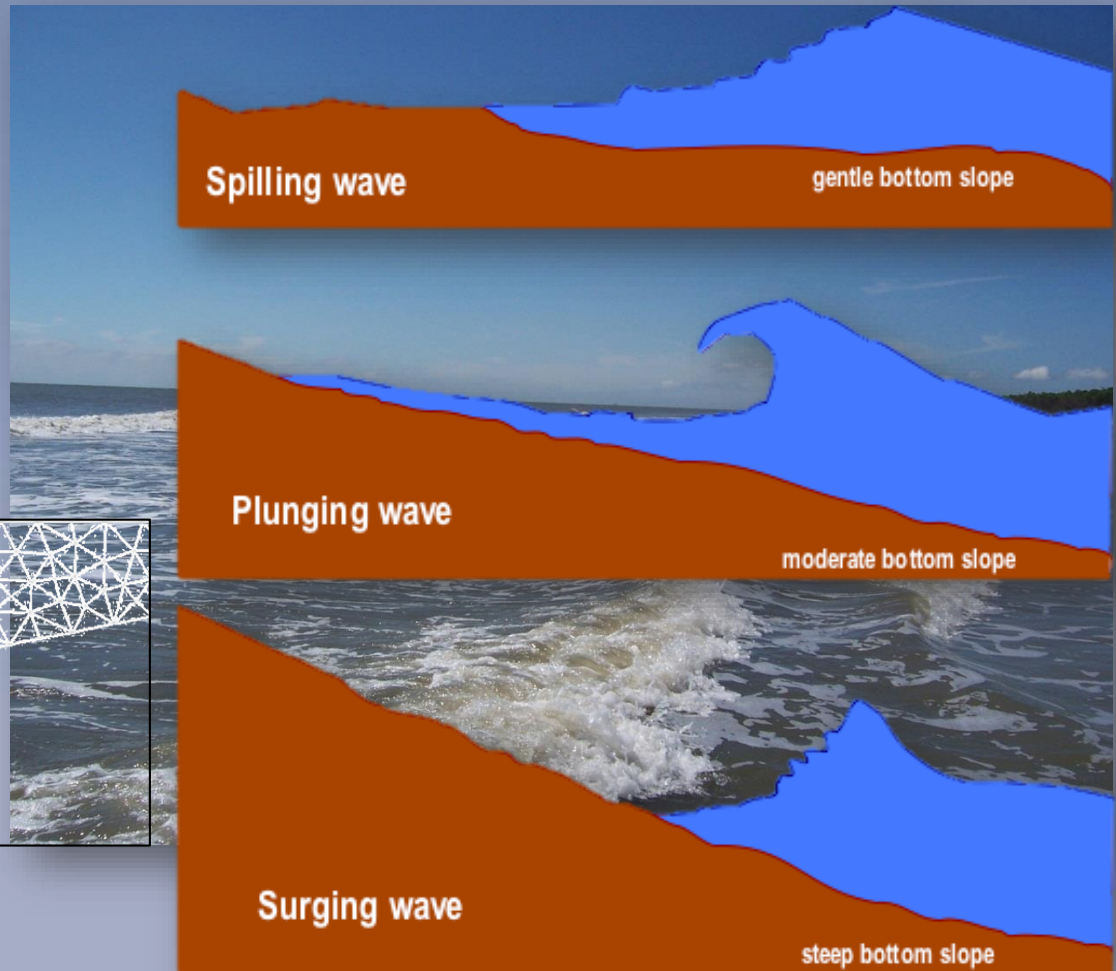
Quarter phases of the Moon



Waves

- Due to Georgia's shallow continental slope, the wave energy is very low
- This allows for fine grain sands to form

Spilling Wave



Surging wave

Plunging wave

Spilling wave

Waves

- Georgia's beaches are made up of fine quartz sands



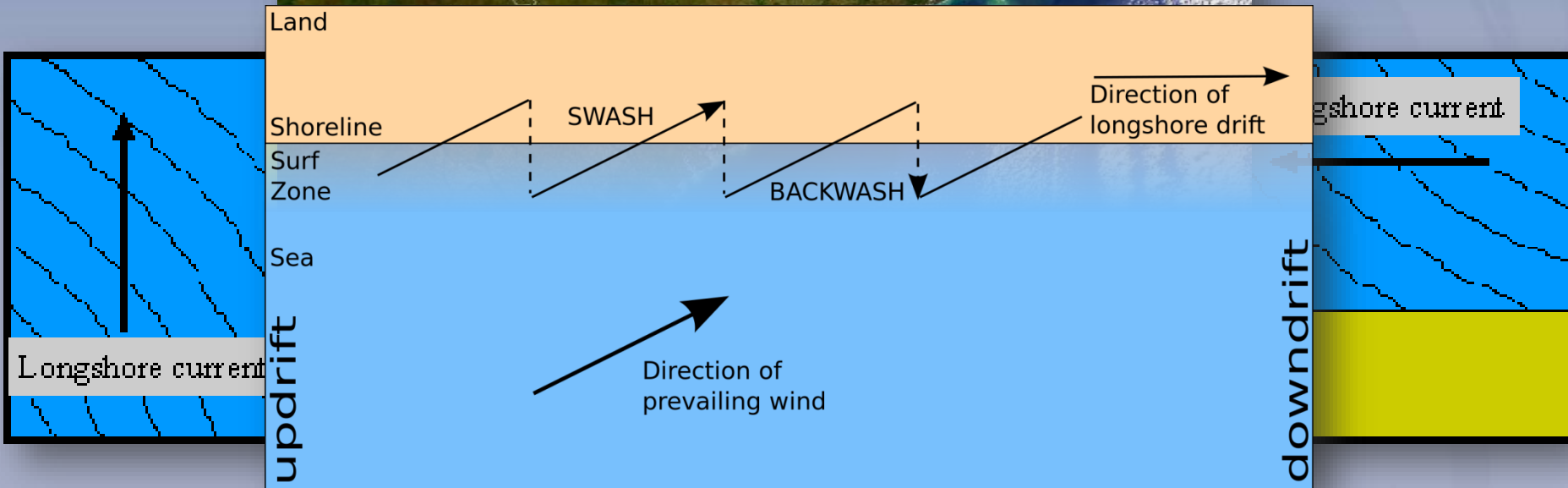
Currents

- Longshore currents shape our coastline

- Longshore currents flow parallel to the shoreline, striking

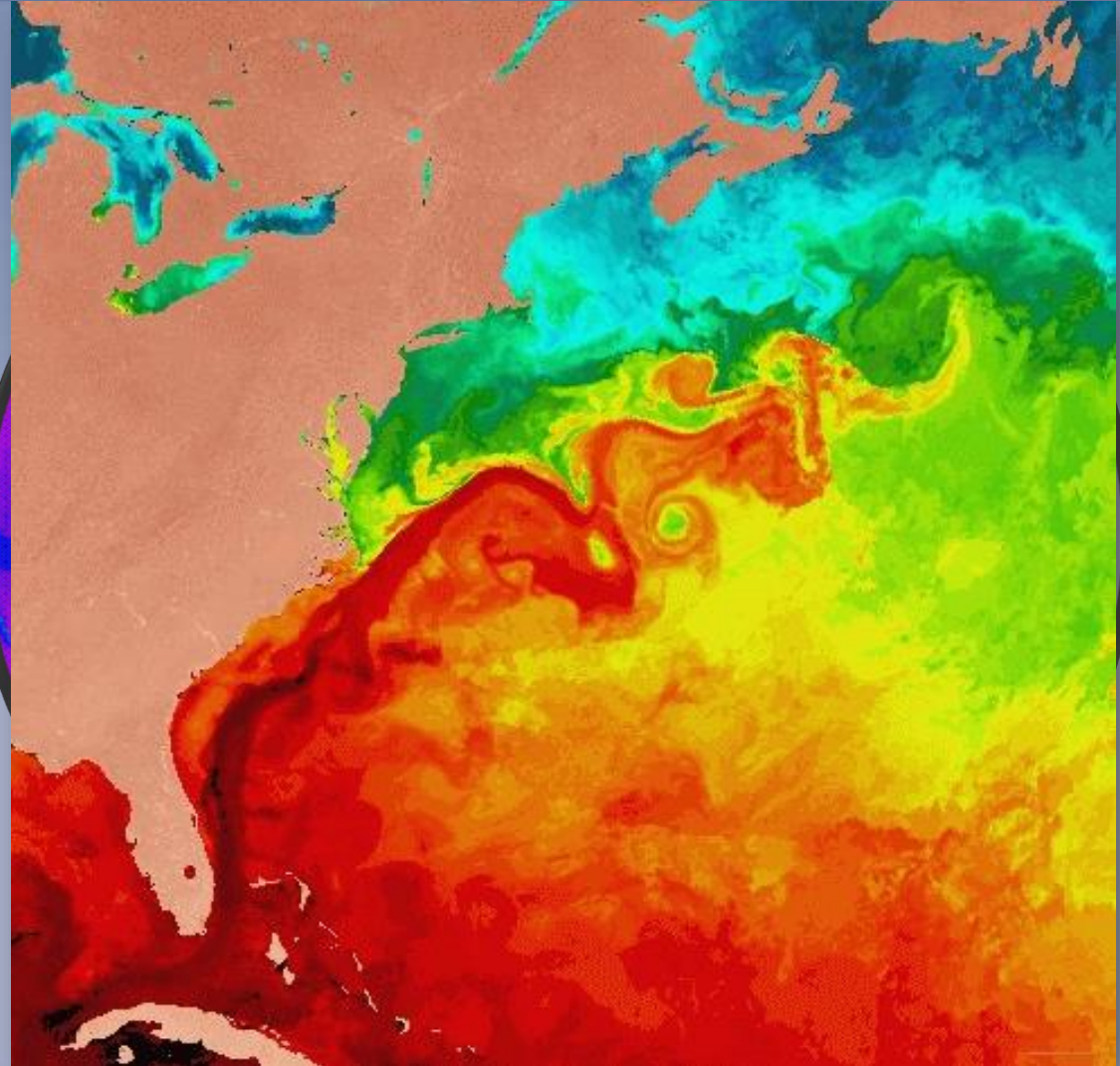


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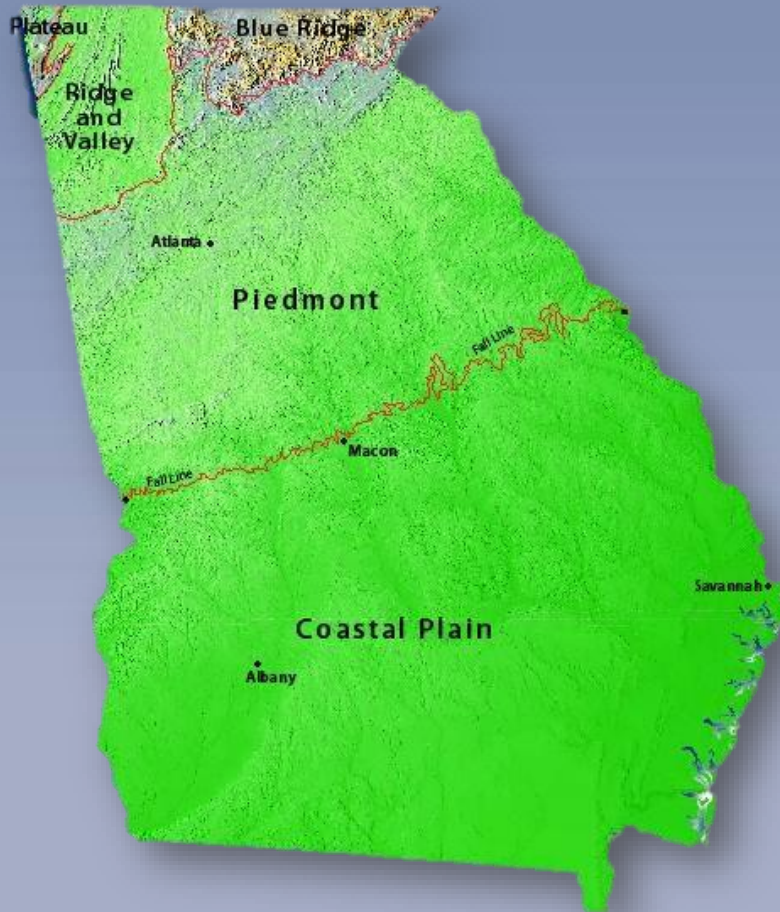


Currents

- The North Atlantic Gyre
- The western component is known as the Gulf Stream.

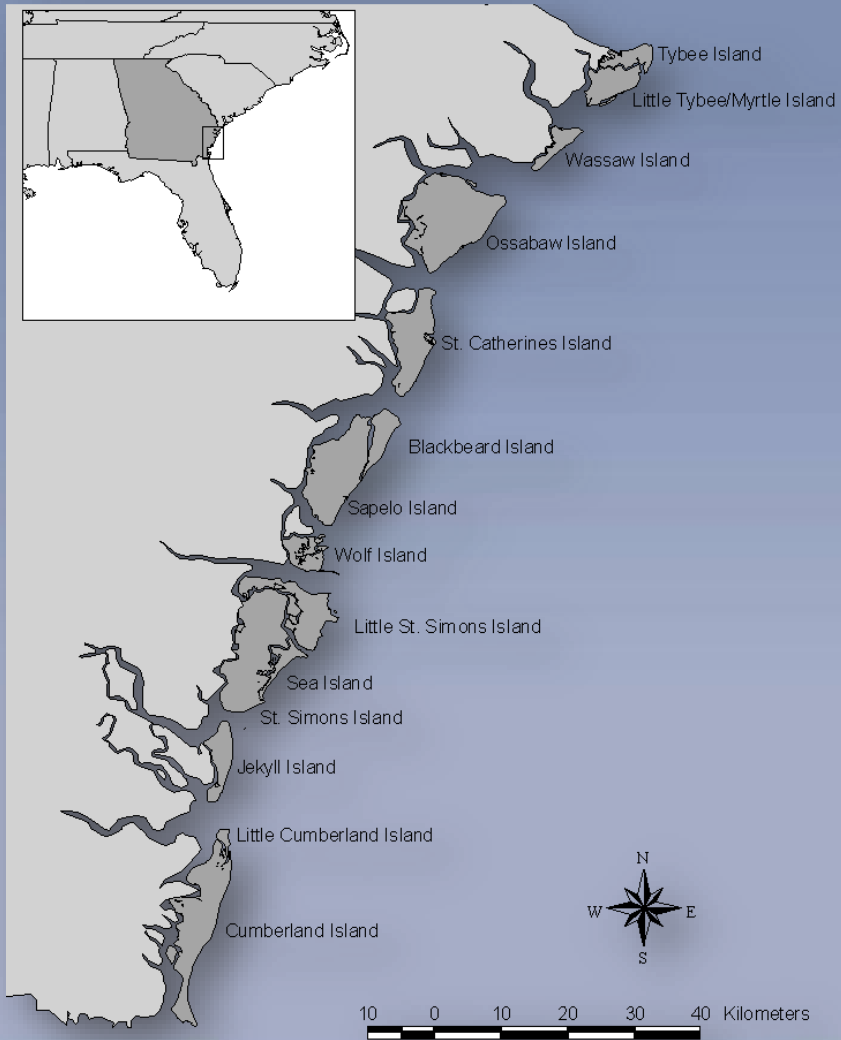


Georgia's Barrier Islands



- The fall line represents the inland edge of the oldest Coastal Plain sediments that were deposited in the sea of the Cretaceous period more than 100 million years ago.
- Tens of millions of years of Piedmont surface erosion provided sediment to the Cretaceous shoreline until the Coastal Plain built out and up to its present extent.

Georgia's Barrier Islands



The NOAA logo is partially visible in the top left corner, featuring a circular emblem with a fish and the text "NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION" and "NOAA".

Estuaries

**Georgia's coast is dominated by
estuarine systems**

- Savannah River
- Ogeechee River
- Altamaha River
- Satilla River
- St. Mary's River

Estuaries

What is an Estuary?

It is where the river

Meets the sea



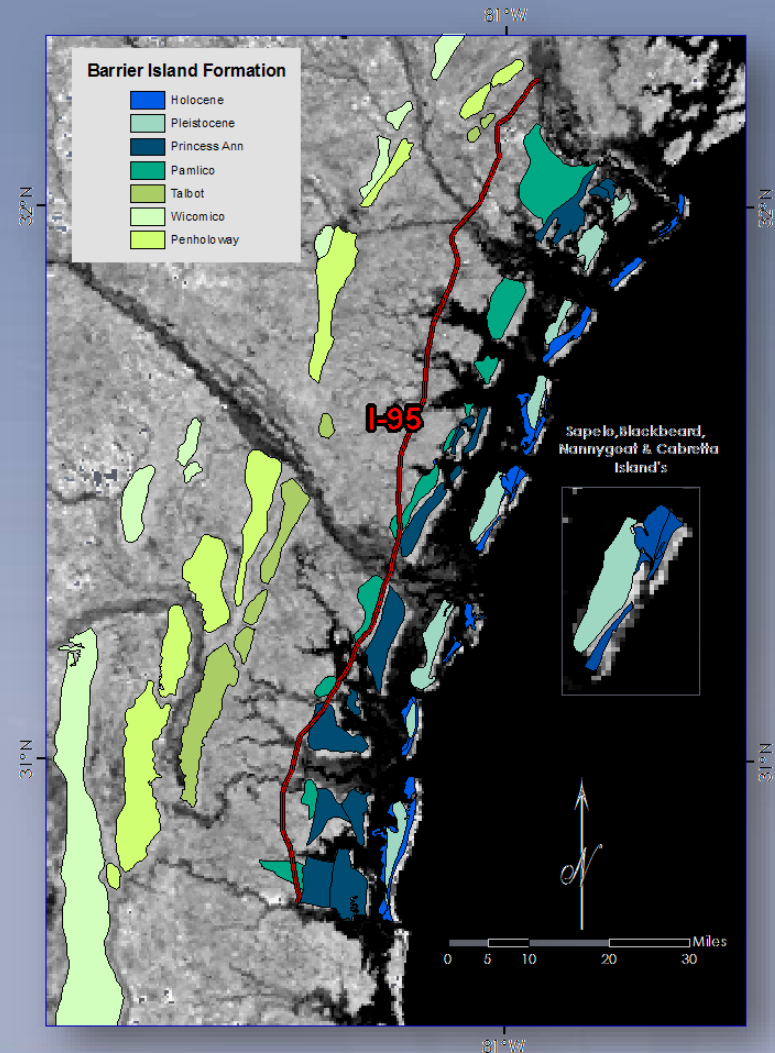
Altamaha River



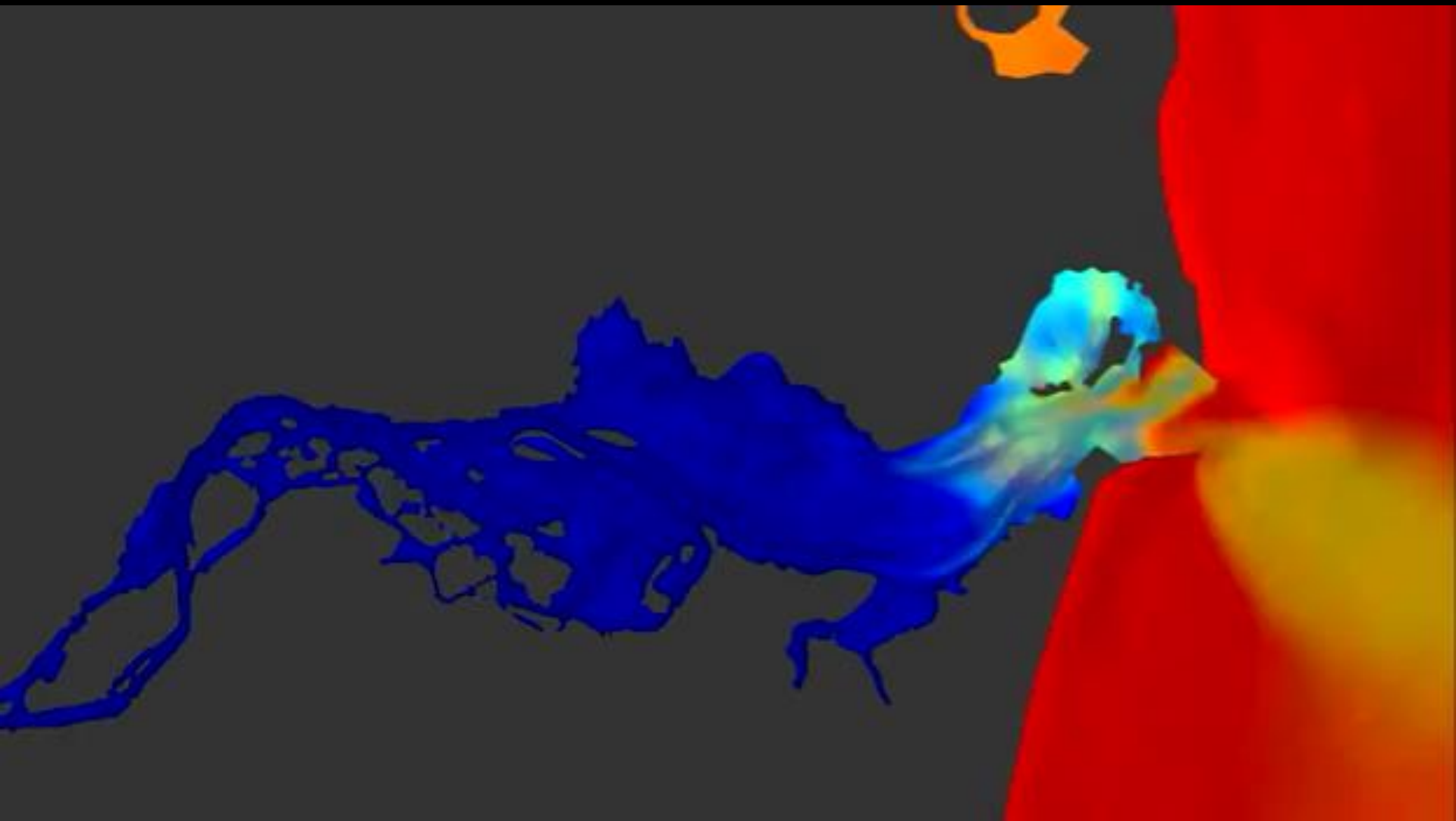
100,000 gal/second

Estuary Formation

- Most existing estuaries were formed during the Holocene epoch by the flooding of river-eroded or glacially scoured valleys .
- This occurred when sea level began to rise about 10,000-12,000 years ago.



Salinity in the Estuary



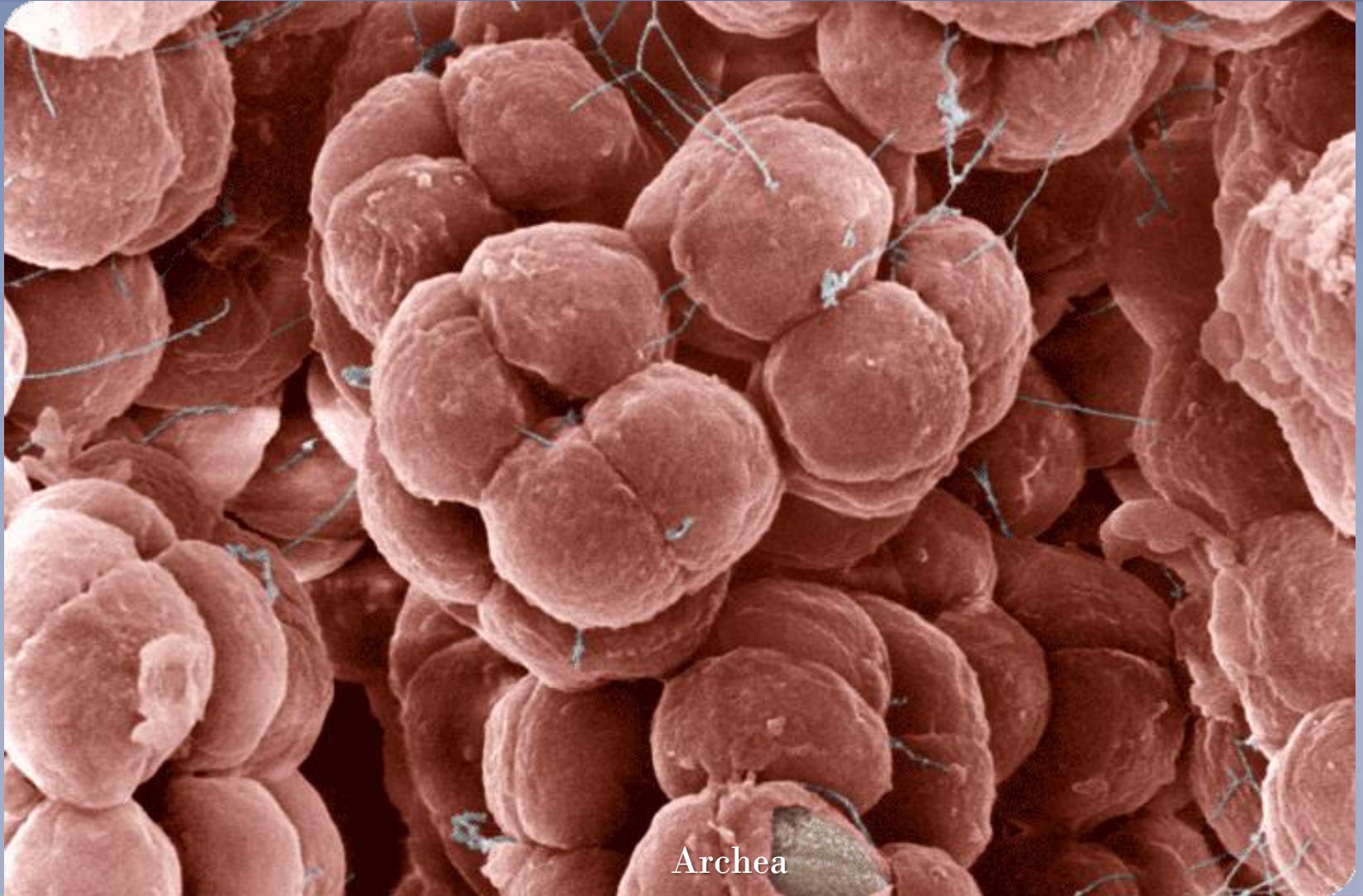


Life in an Estuary



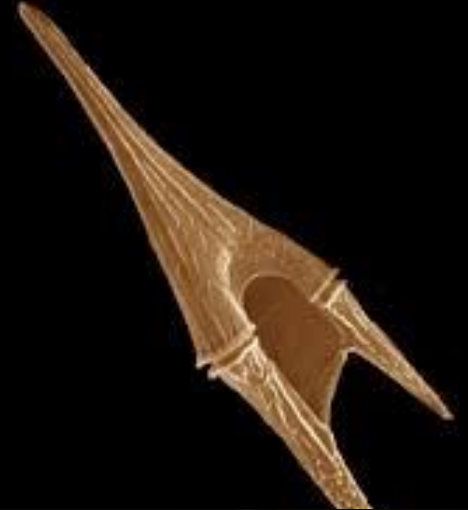
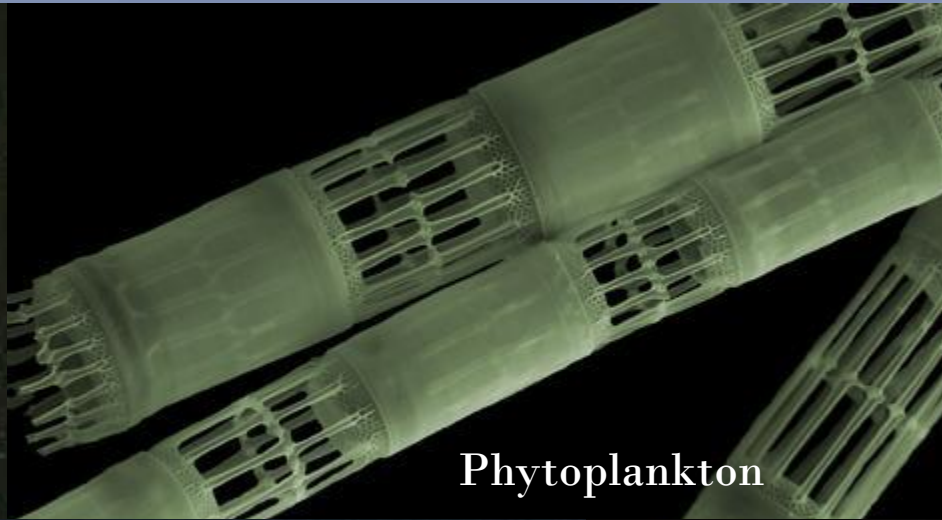
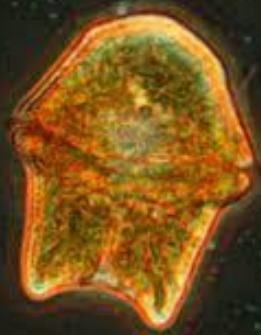
Bacteria

Life in an Estuary



Archea

Life in an Estuary



Phytoplankton



Zooplankton

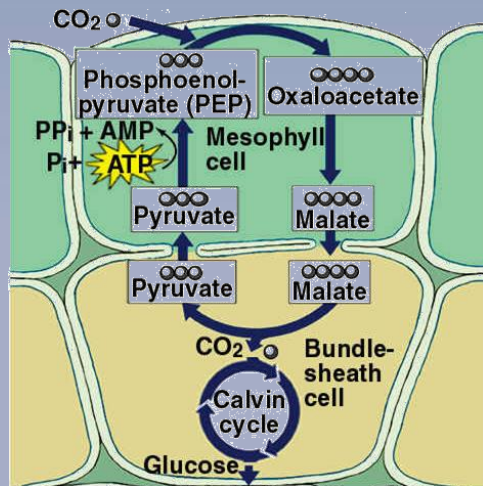


Life in an Estuary



Life in an Estuary

- Many types of plants grow in estuaries. Our estuaries are dominated by smooth cordgrass (*Spartina alterniflora*).



Carbon Fixation in C₄ Plants



Life in an Estuary

- Many bivalves, such as oysters and mussels inhabit estuaries.



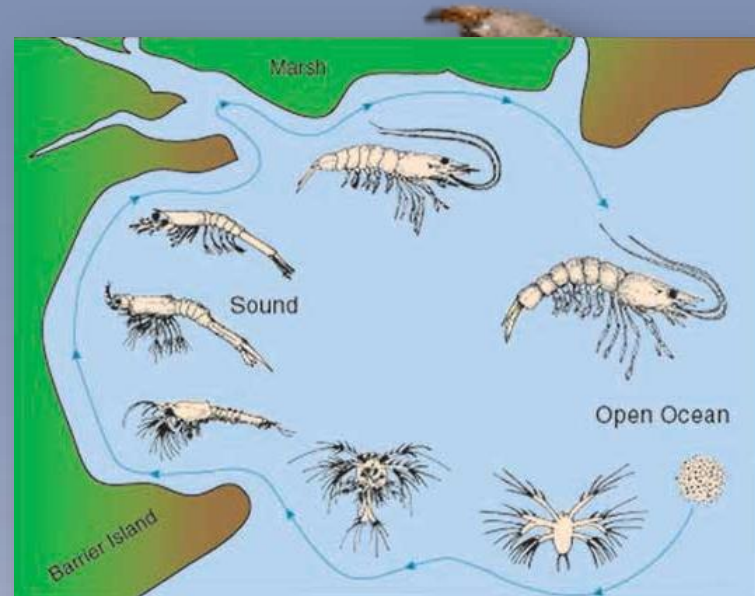
Eastern Oyster



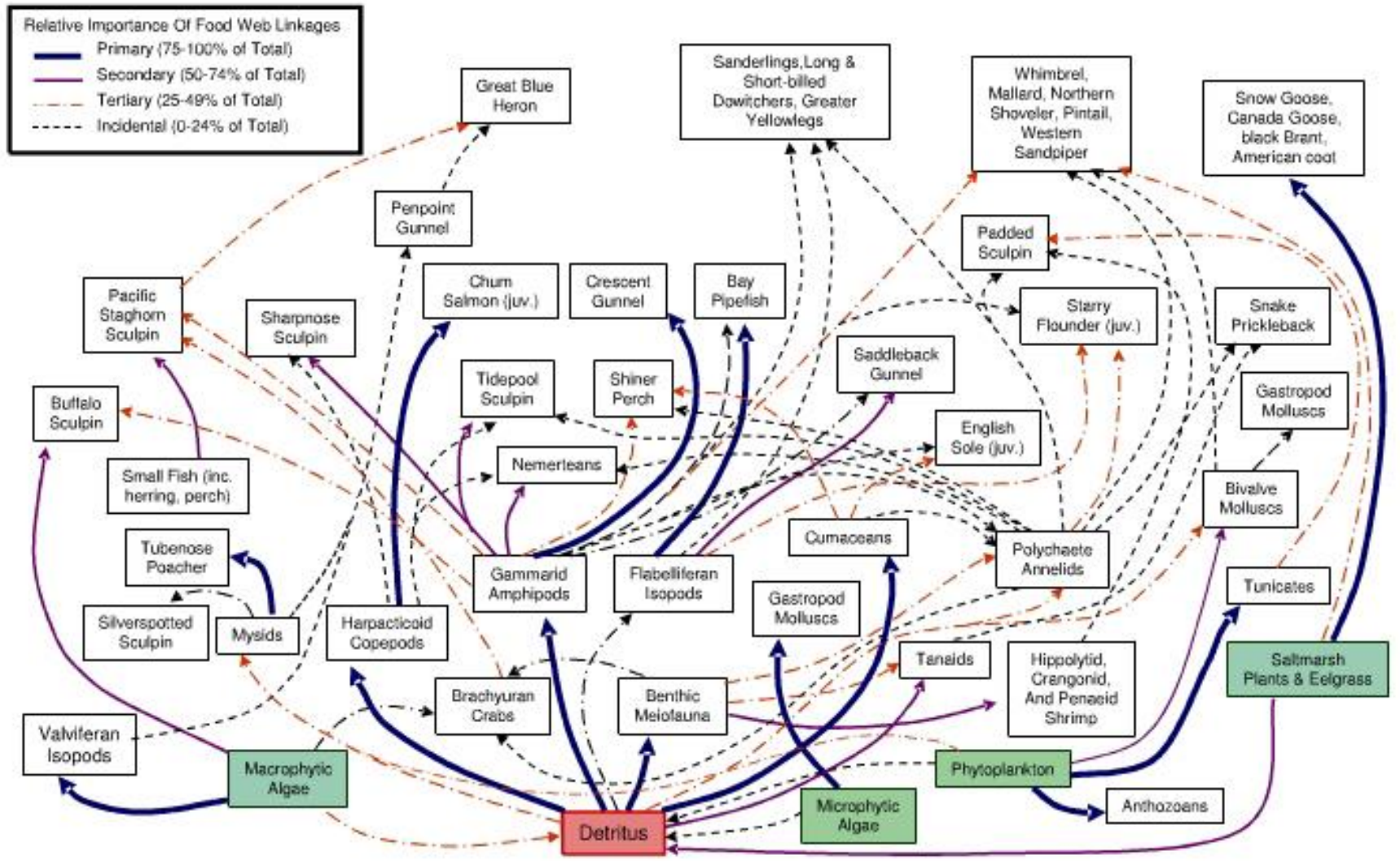
Ribbed Mussel

Life in an Estuary

- Blue crabs and shrimp spend part of their life cycle in the estuary



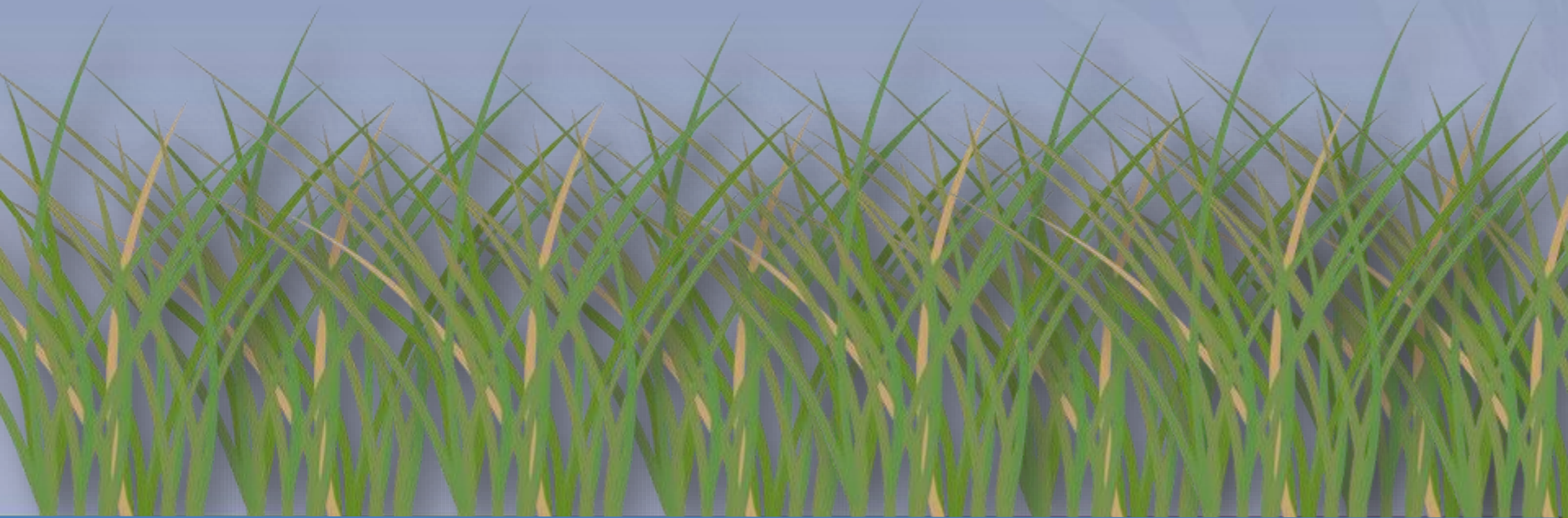
Estuary Food Web



The NOAA logo is located in the top left corner of the slide. It features a circular emblem with a stylized fish and the text "NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION" around the perimeter. The acronym "NOAA" is prominently displayed in the center of the emblem.

Estuaries

Benefits of an Estuary



Benefits of an Estuary

- **Tourism**
 - Tourism is Georgia's 5th largest employer
 - Coastal ecotourism is a rapidly expanding sector of this market

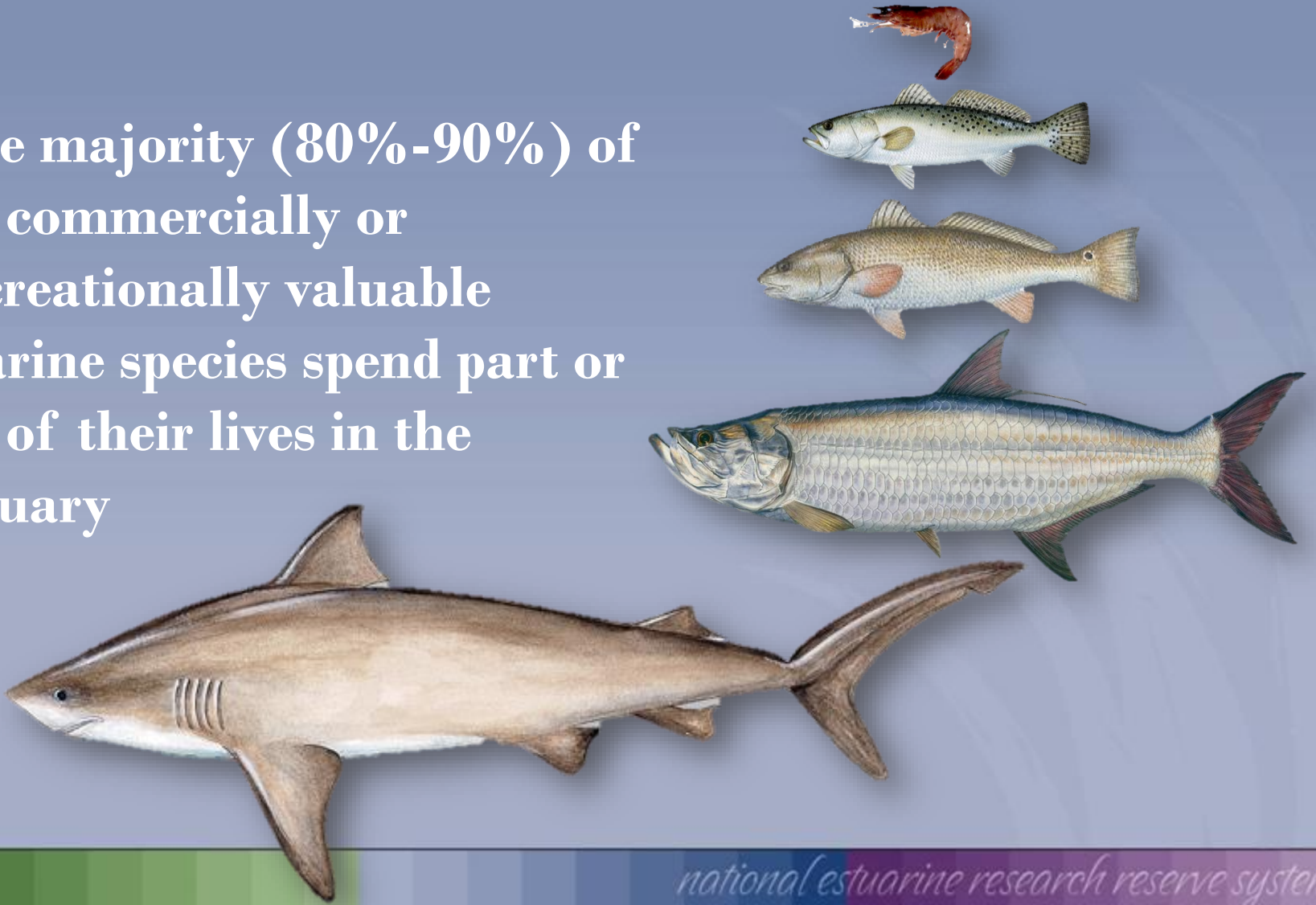


"Look around you. Take courage from the land which God has given you, which has always nourished you, and which is still there, and be comforted."

-Marshes of Glynn by Sydney Lanier

Benefits of an Estuary

- The majority (80%-90%) of all commercially or recreationally valuable marine species spend part or all of their lives in the estuary



Benefits of an Estuary

- Stabilize sediment



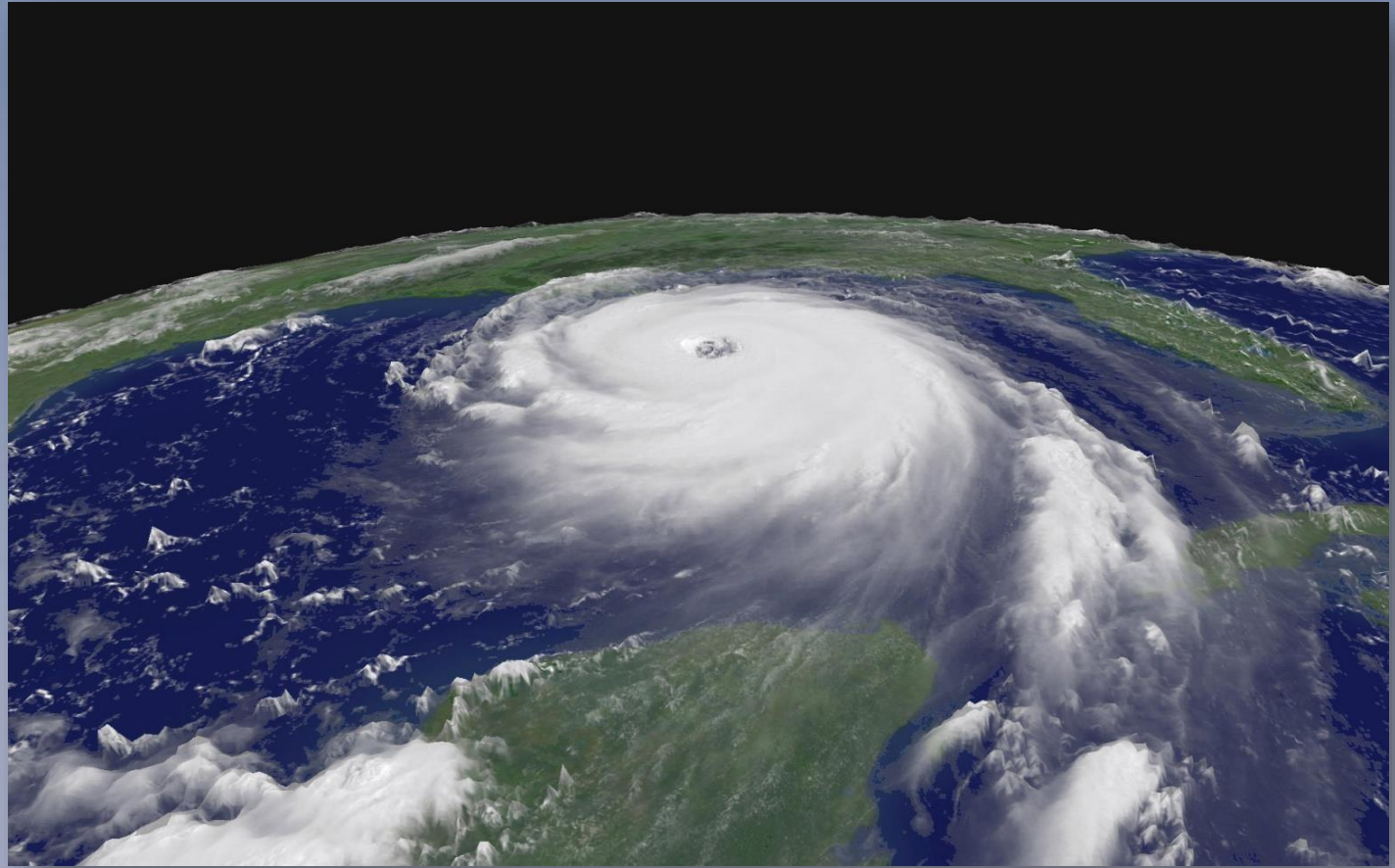
Benefits of an Estuary

- **Filter** contaminants from the upland as well as ocean sources.



Benefits of an Estuary

- Act as protective barriers from storms.





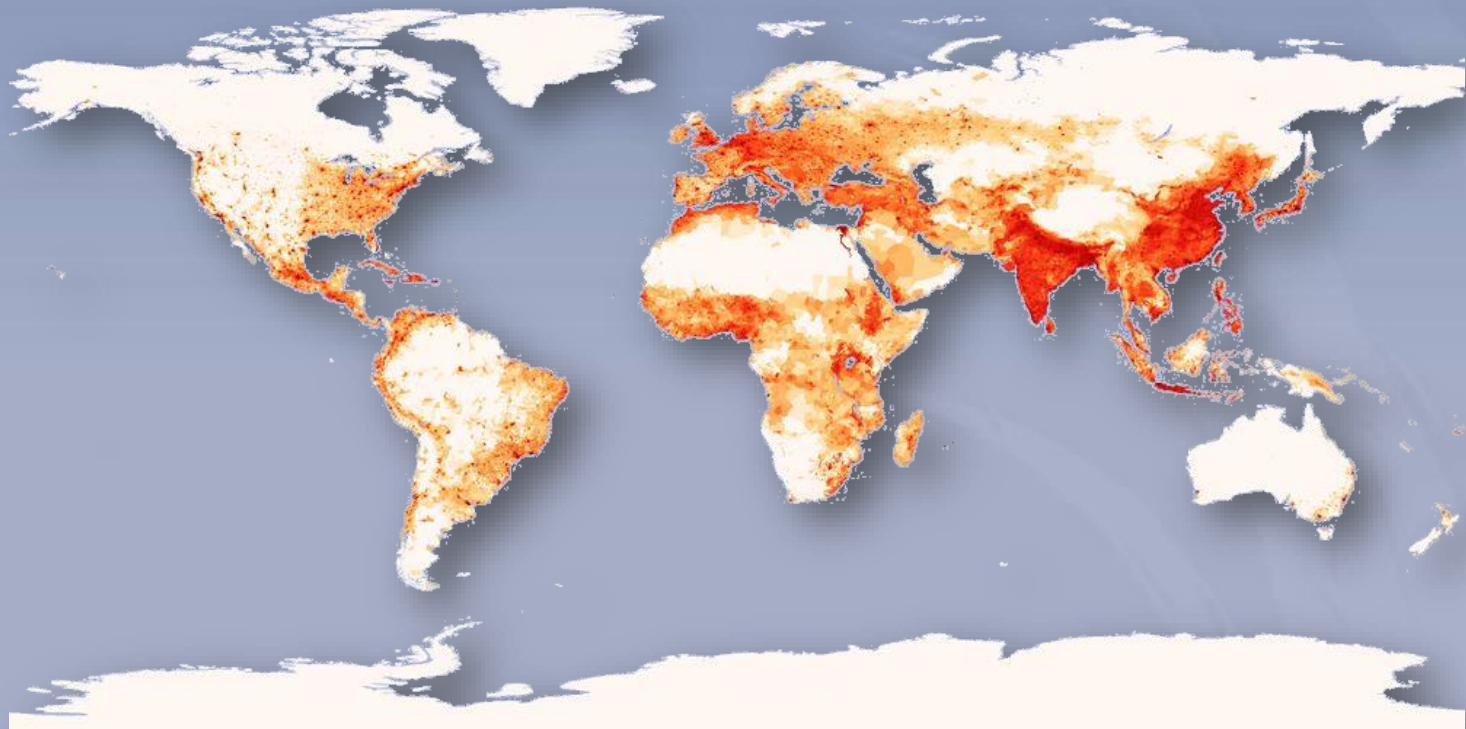
Estuaries

Threats to the Estuary



Threats to the Estuary

- Sixty percent (60%) of the world's population live on the coasts or near estuaries.



Threats to the Estuary

Many estuaries are suffering degradation by many factors:

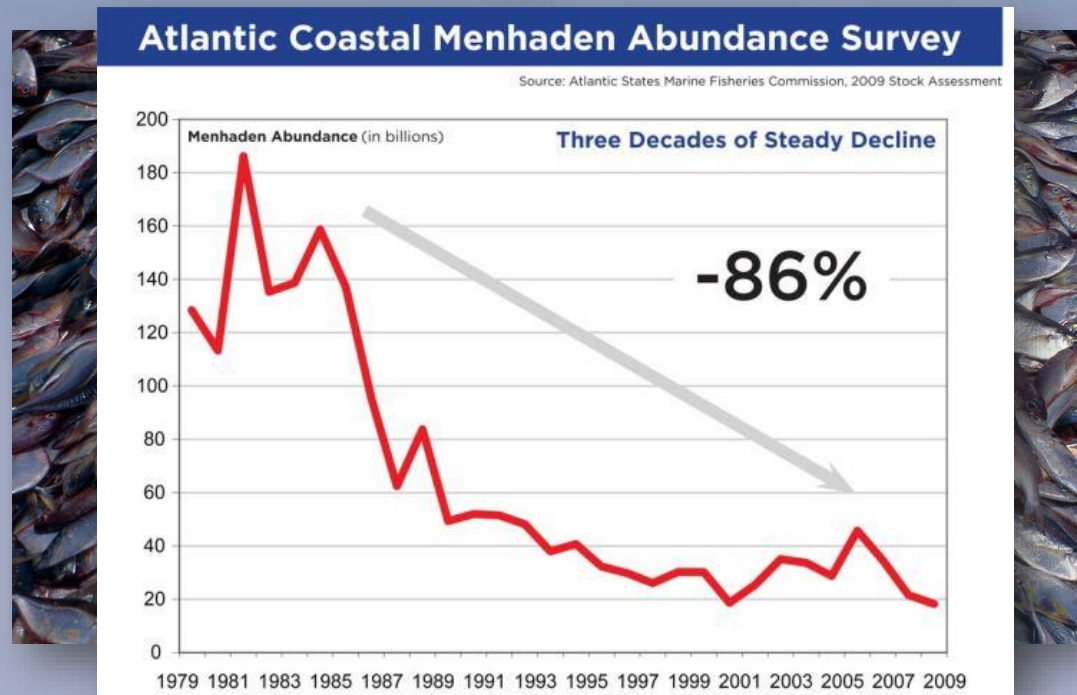
- Sedimentation from soil erosion from deforestation, overgrazing, and other poor farming practices



Threats to the Estuary

Many estuaries are suffering degradation by many factors:

- **Overfishing**



Threats to the Estuary

- Drainage and filling of wetlands



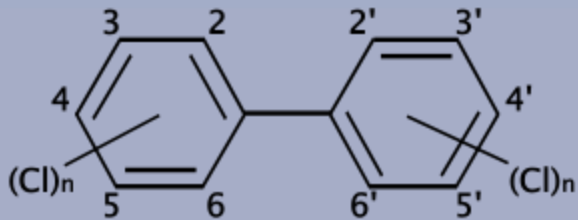
Threats to the Estuary

- Eutrophication due to excessive nutrients from sewage and animal wastes



Threats to the Estuary

- **Pollutants including heavy metals, polychlorinated biphenyls (PCB's), radionuclides and hydrocarbons from sewage inputs**



Threats to the Estuary

- Development



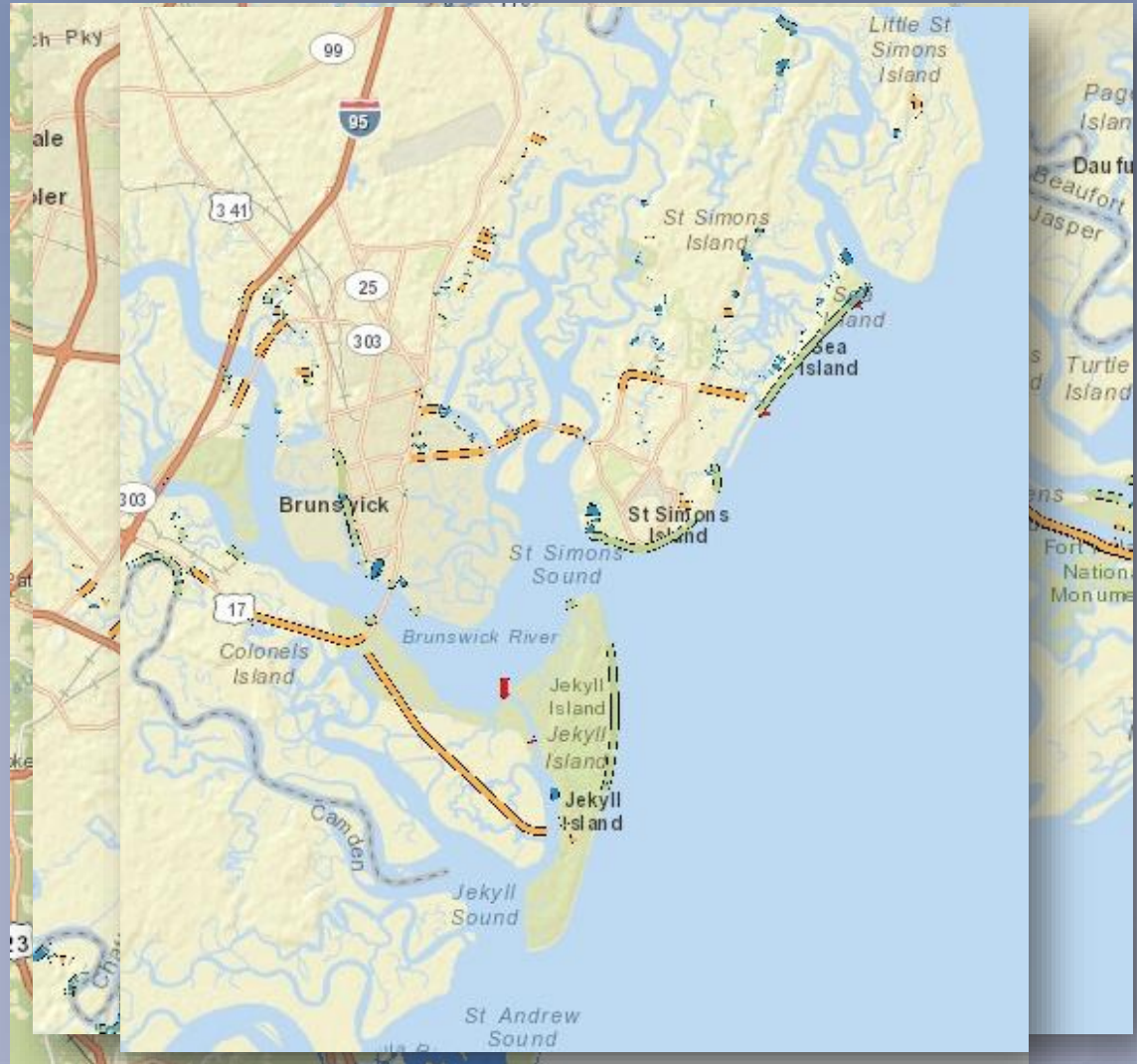
Threats to the Estuary

- Diking or damming for flood control or water diversion.

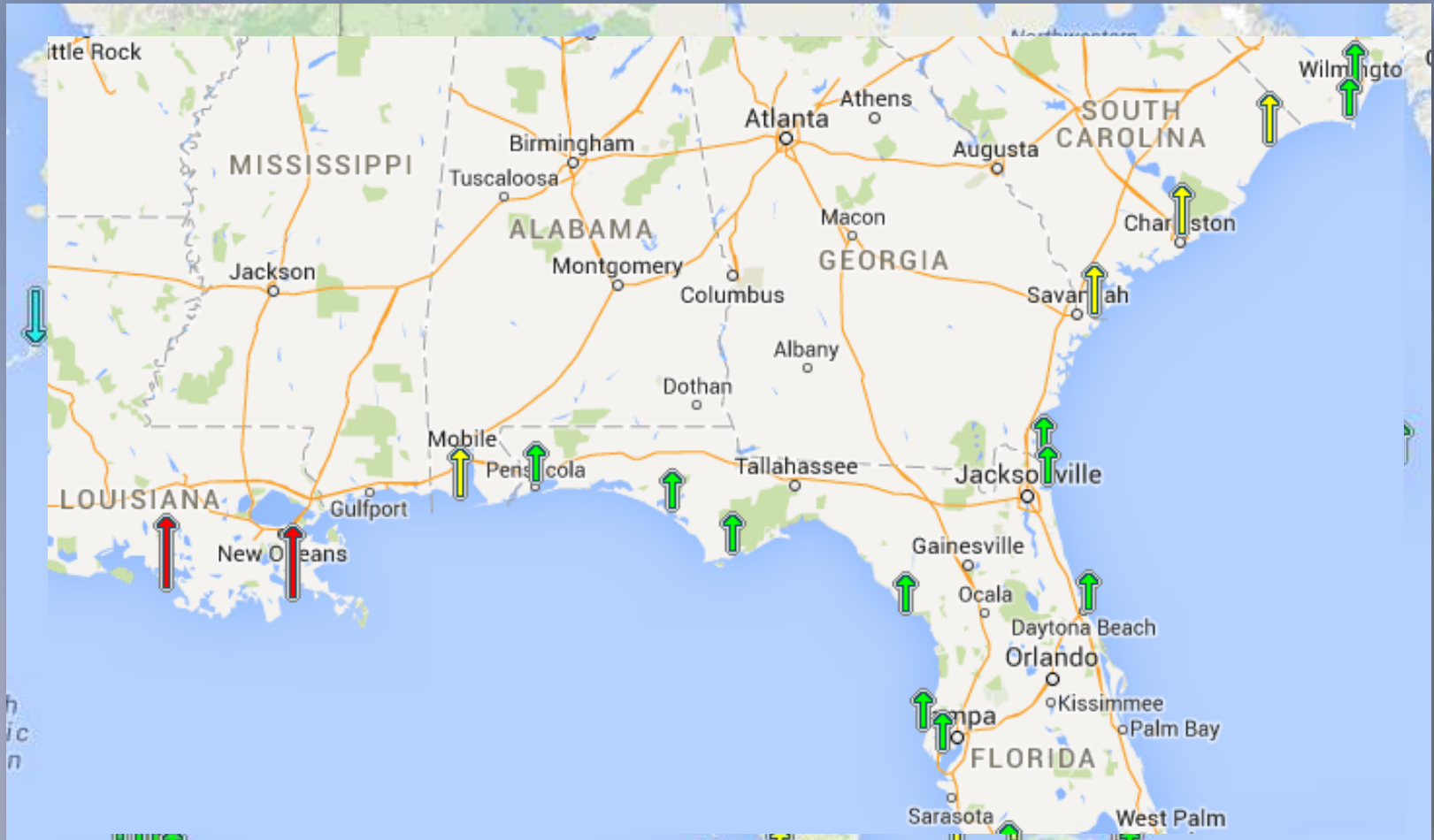


Threats to the Estuary

- Sea Level Rise
1 meter rise in
sea level



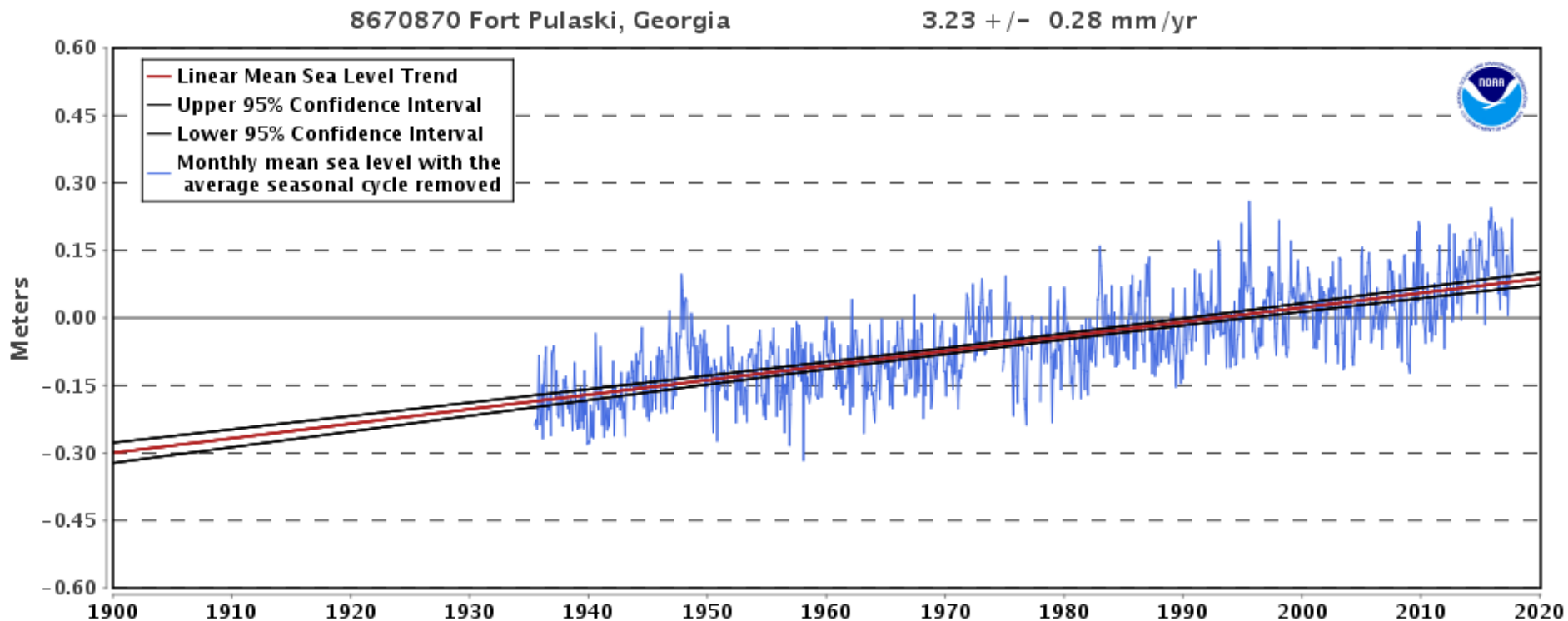
Threats to the Estuary



Sea level trends

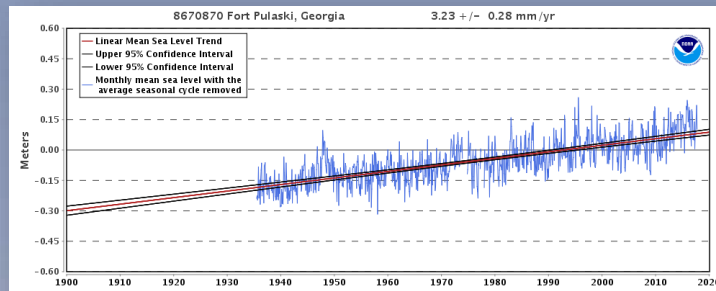
Threats to the Estuary

- Current sea level rise in Georgia is around 1 ft. per 100 years.

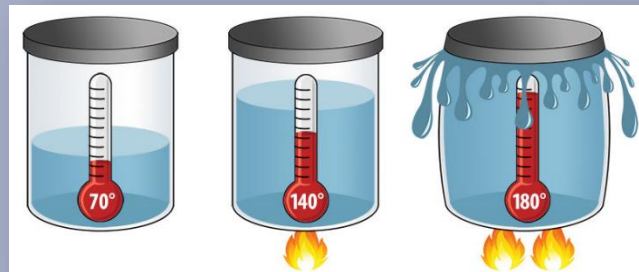


Sea Level Rise

- Current sea level rise in Georgia is around 1 ft. per 100 years.

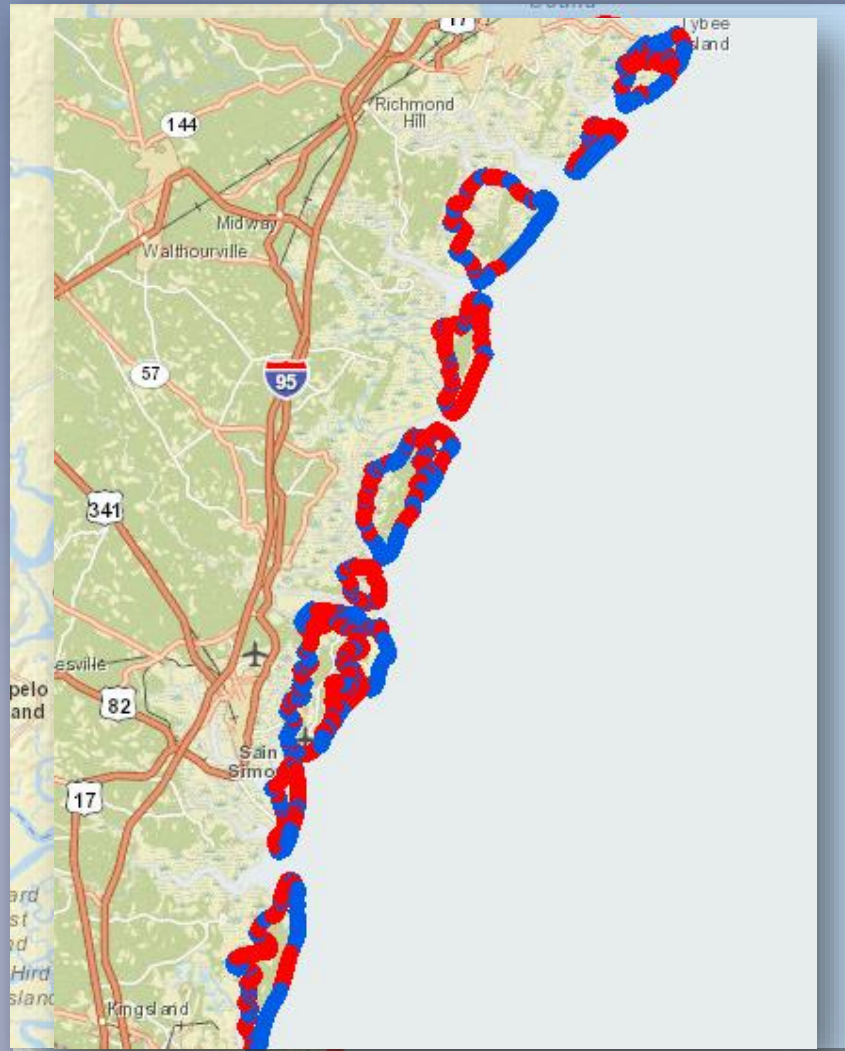


- Most of this sea level rise is due to thermal expansion.



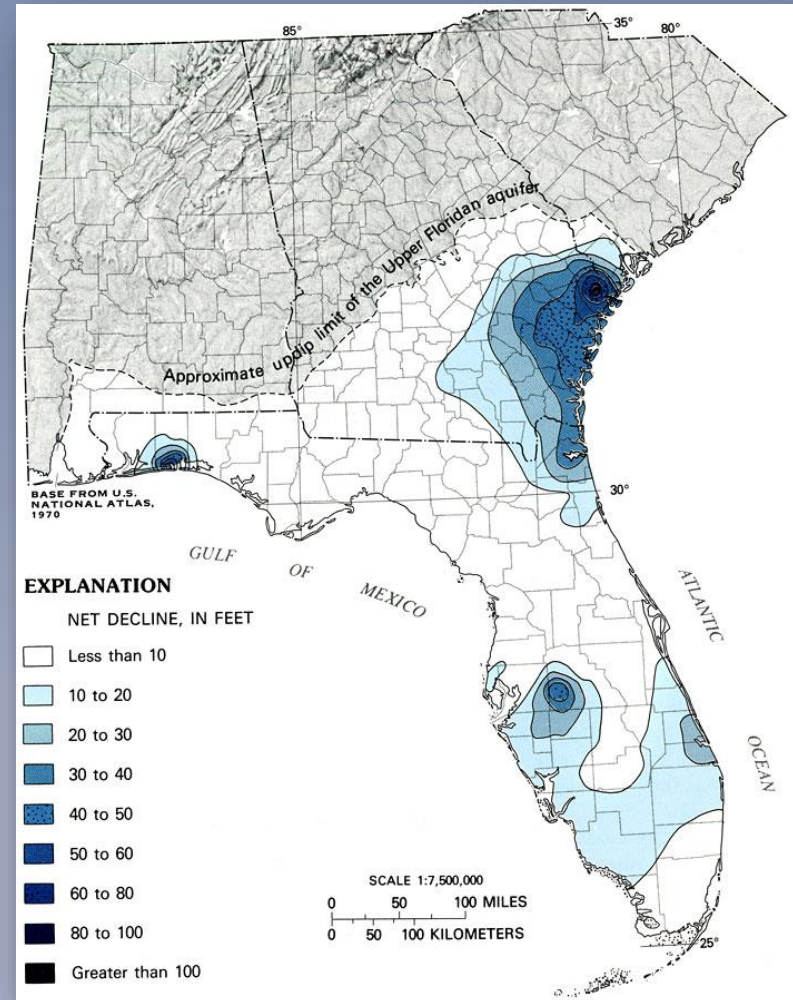
Threats to the Estuary

- Erosion



Threats to the Estuary

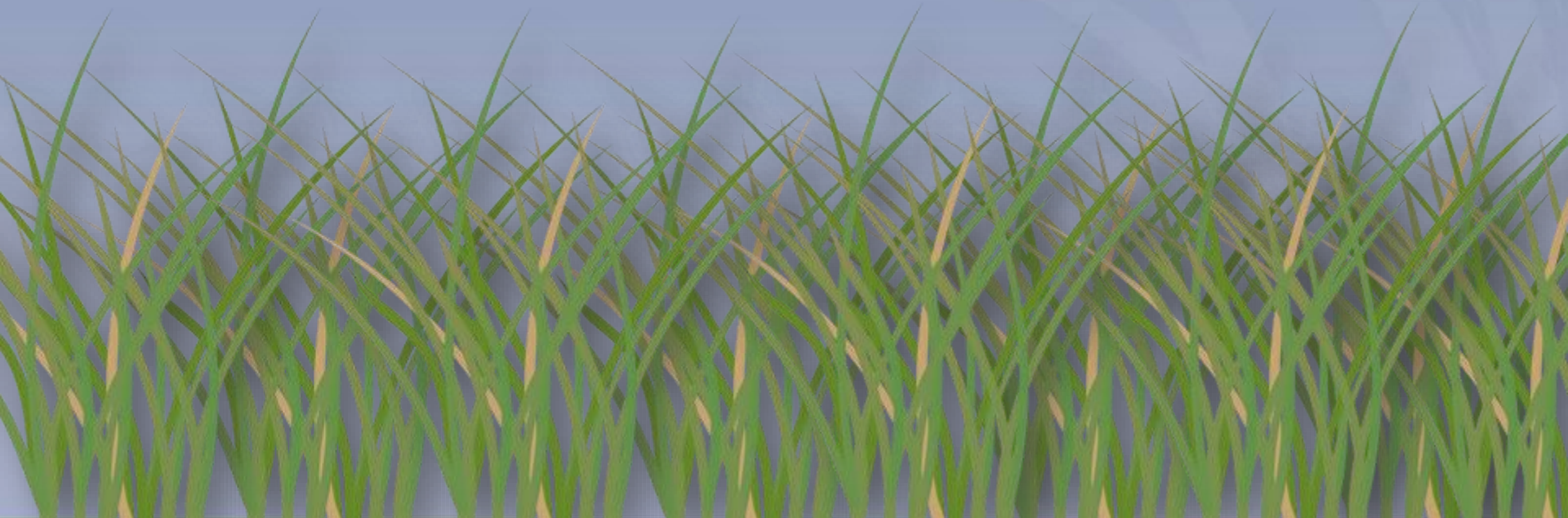
- Depletion of Floridan Aquifer recharge
 - Pumping between 50-76 million gallons day
 - This is down from a peak of 88 million gallons per day
 - Pre-development pumping pressure was at 35 ft. above sea level
 - Now it is 100 ft. below sea level.



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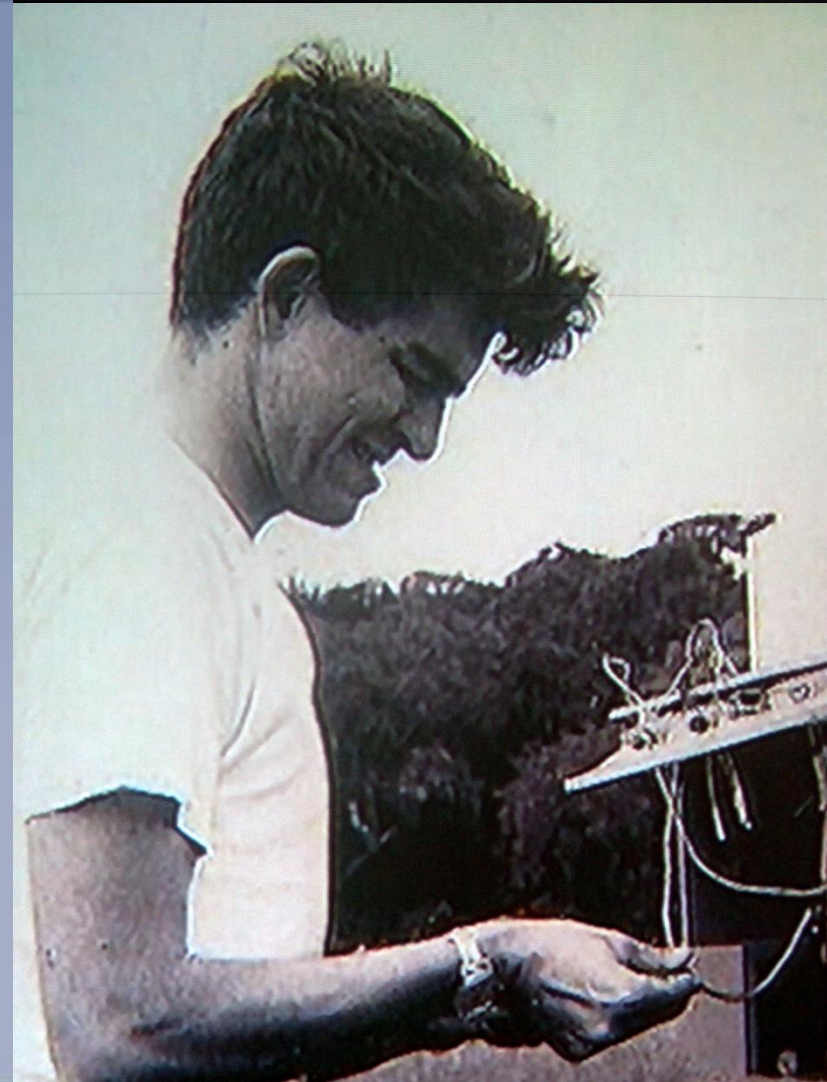
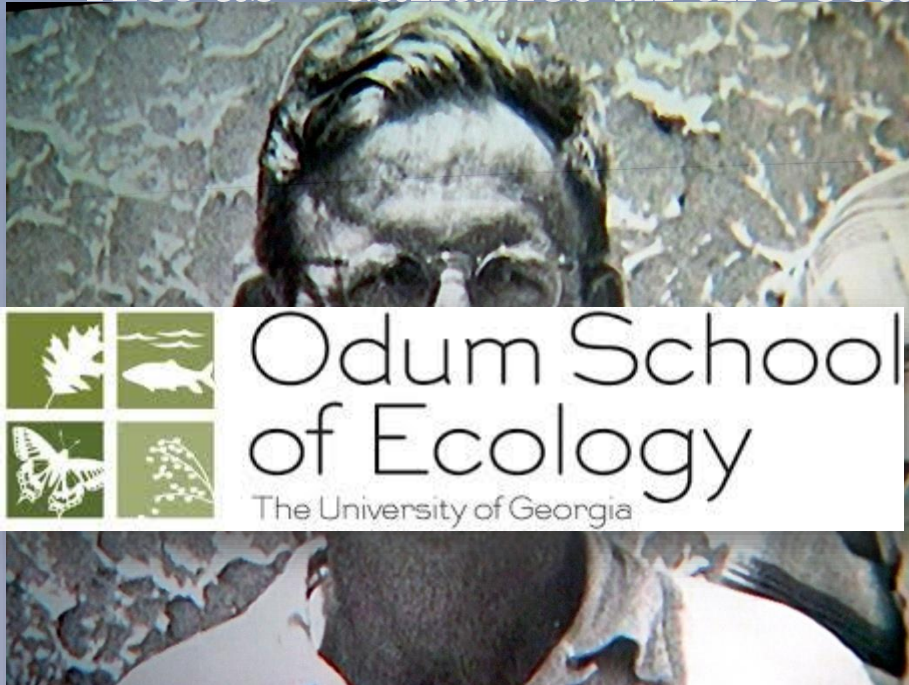
Estuaries

Research



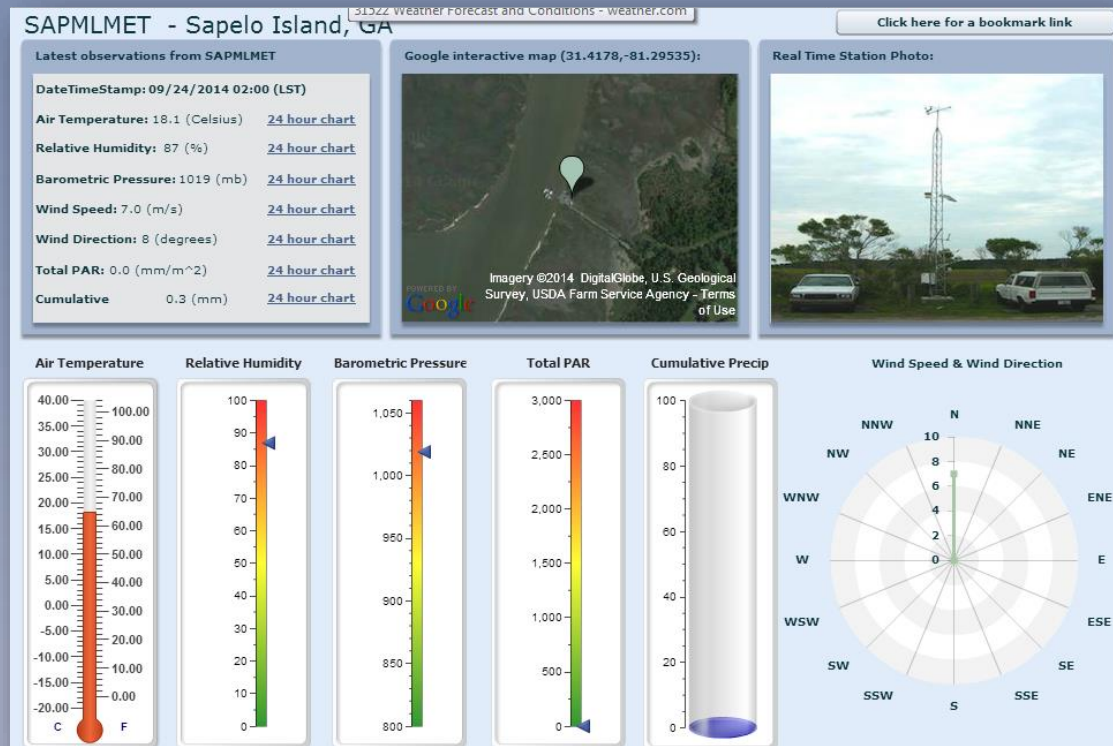
Research

- Estuary serves as an important area for research
- Act as “Canaries in the coal



Research

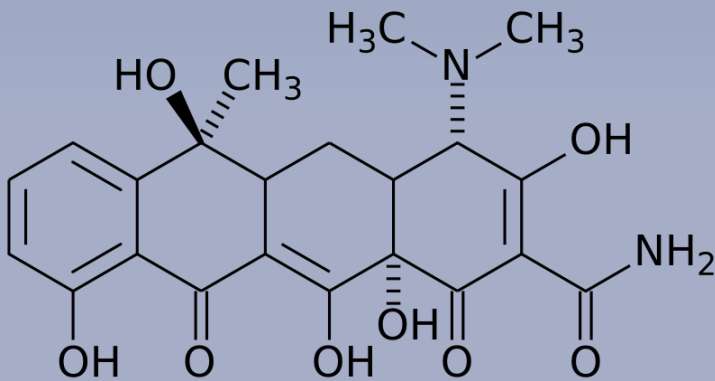
- System Wide Monitoring Program (SWMP)



<http://cdmo.baruch.sc.edu/get/realTime.cfm>

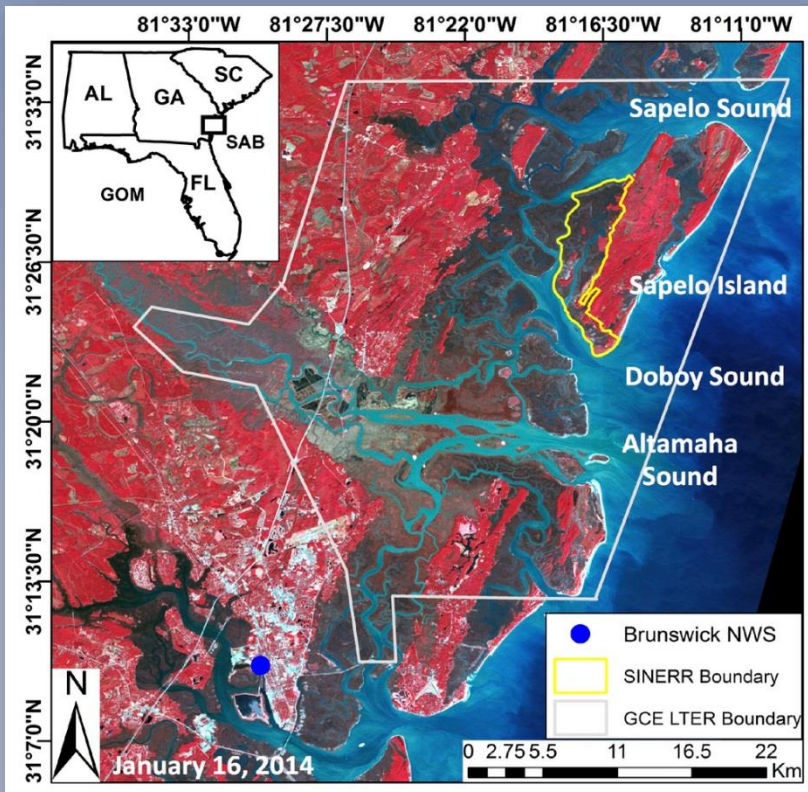
Research

- Tetracycline resistant bacteria monitoring
- Antibiotic produced by the *Streptomyces* genus of Actinobacteria



Salt Marsh Research

- 30 year decline in salt marsh biomass

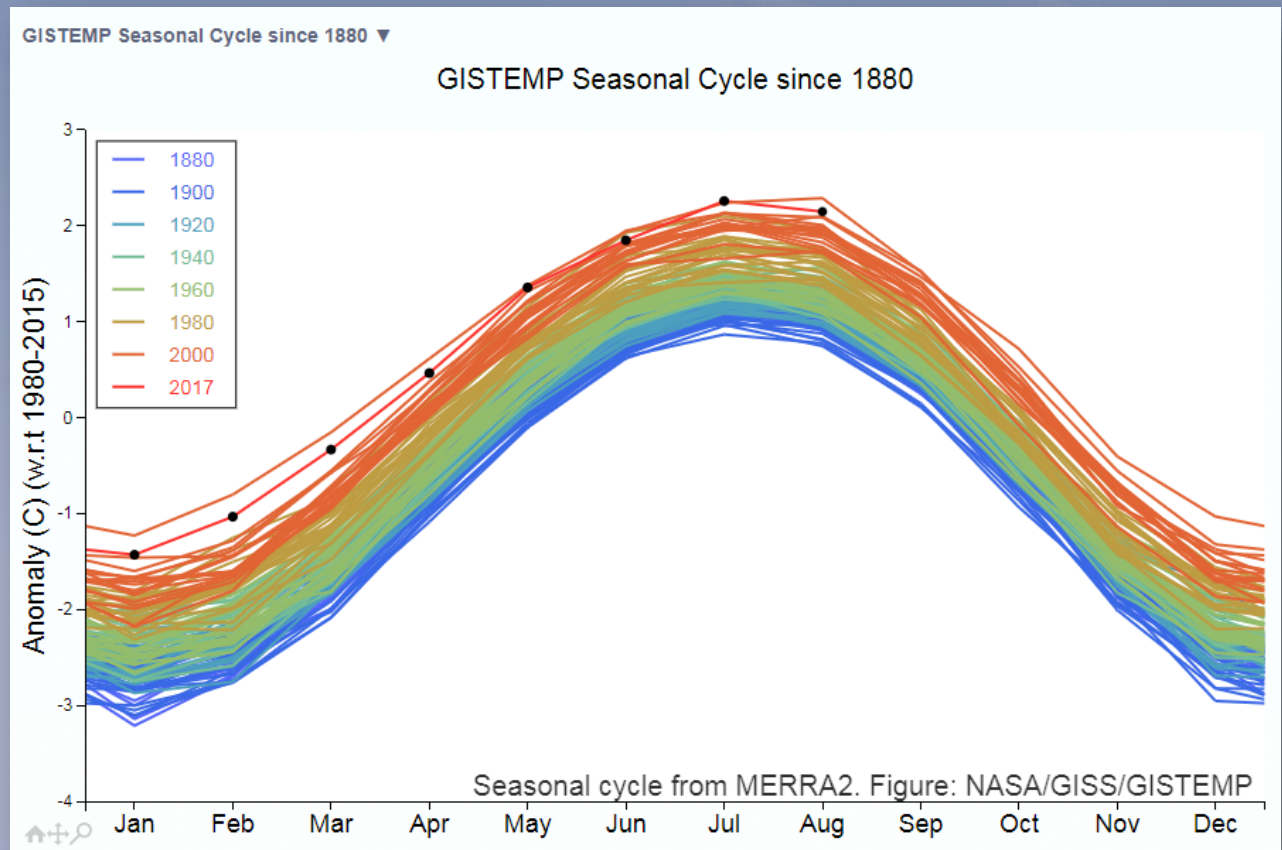


John O'Donnell

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UNIVERSITY

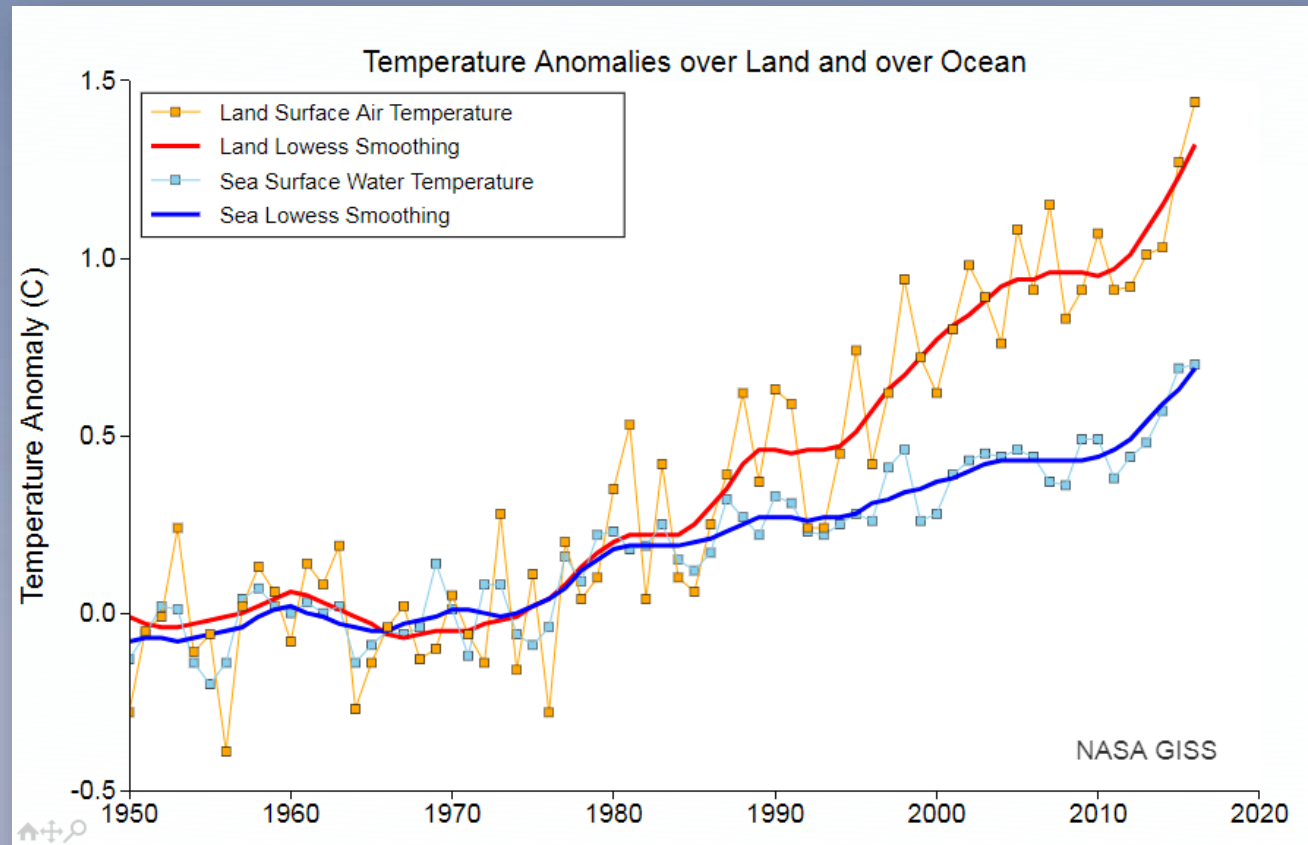
Climate Change Research

- Global temperatures are increasing



Climate Change Research

- Global temperatures are increasing



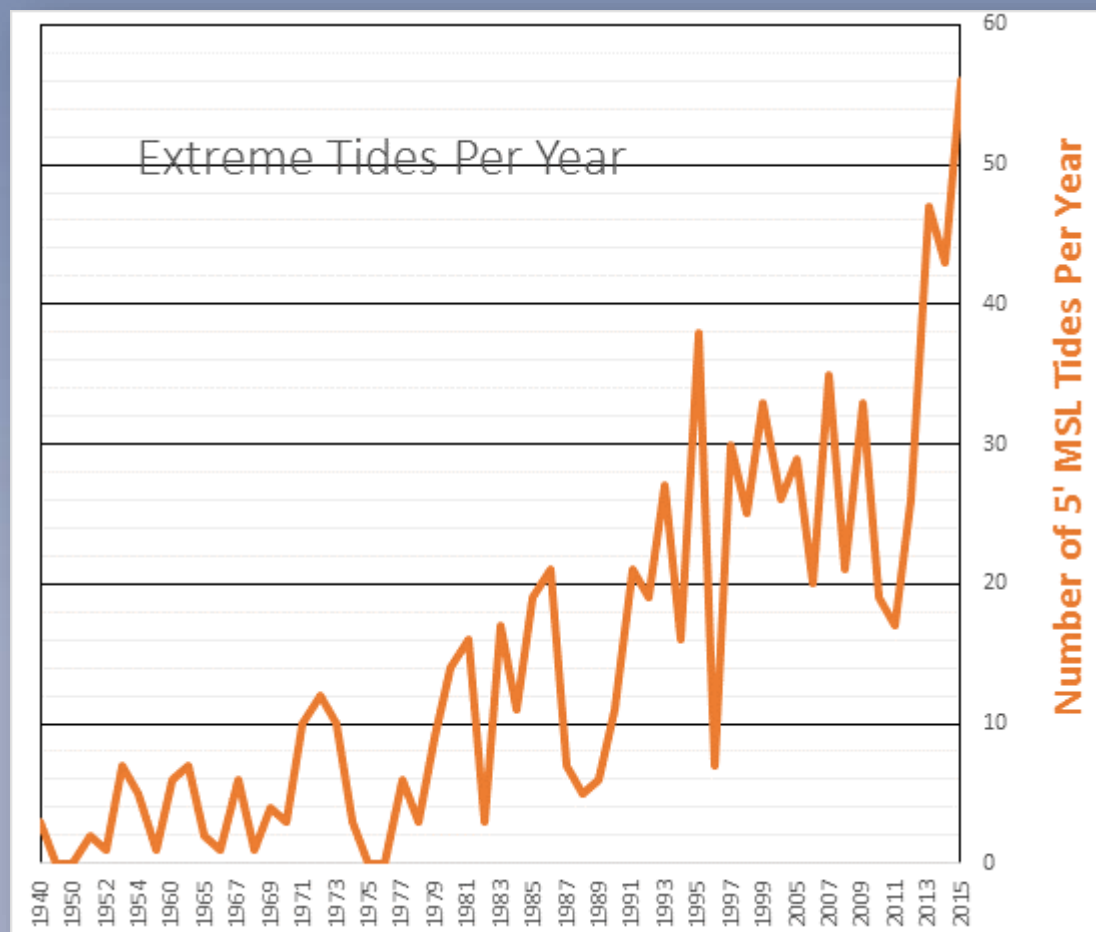
Climate Change Research

- Greenhouse gas emissions



Sea Level Rise

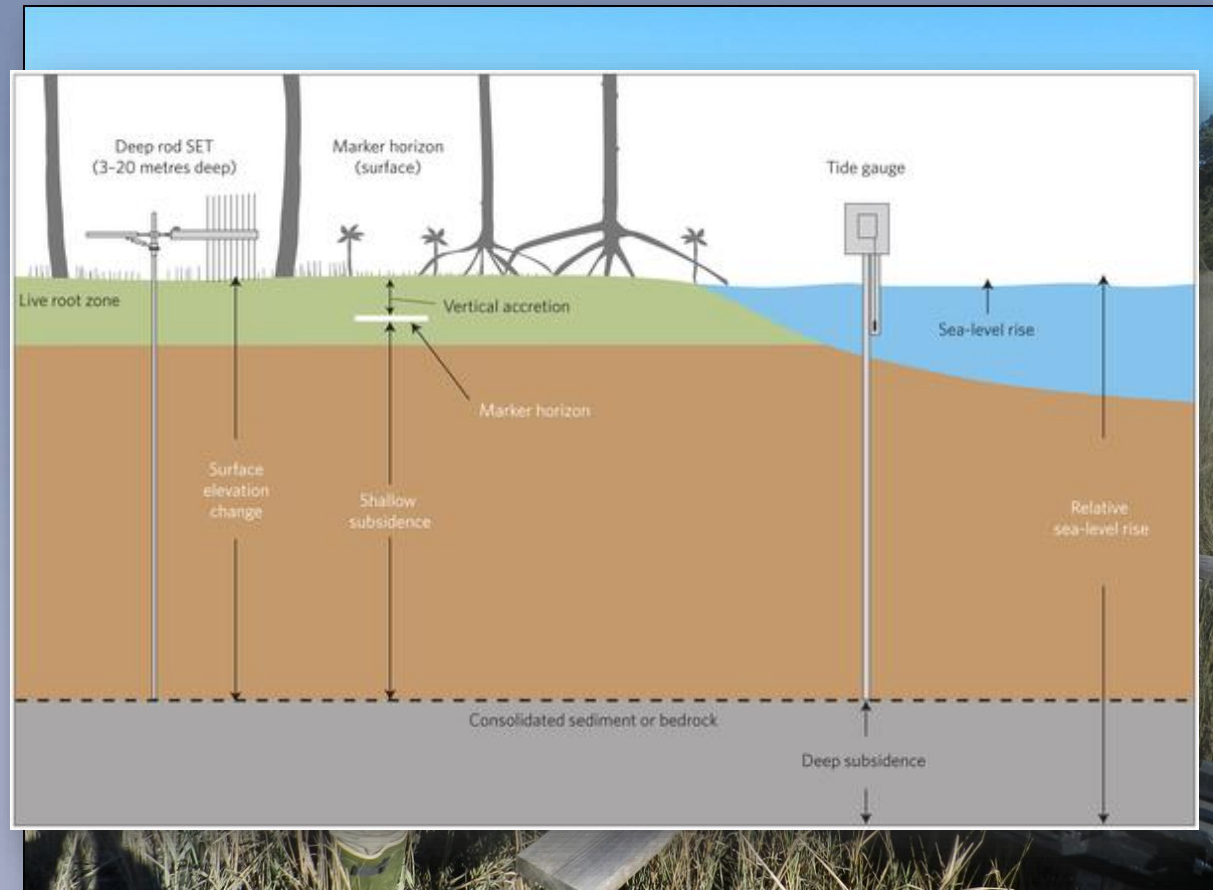
- Increasing “Extreme” Tides



Jason Lee (2015)

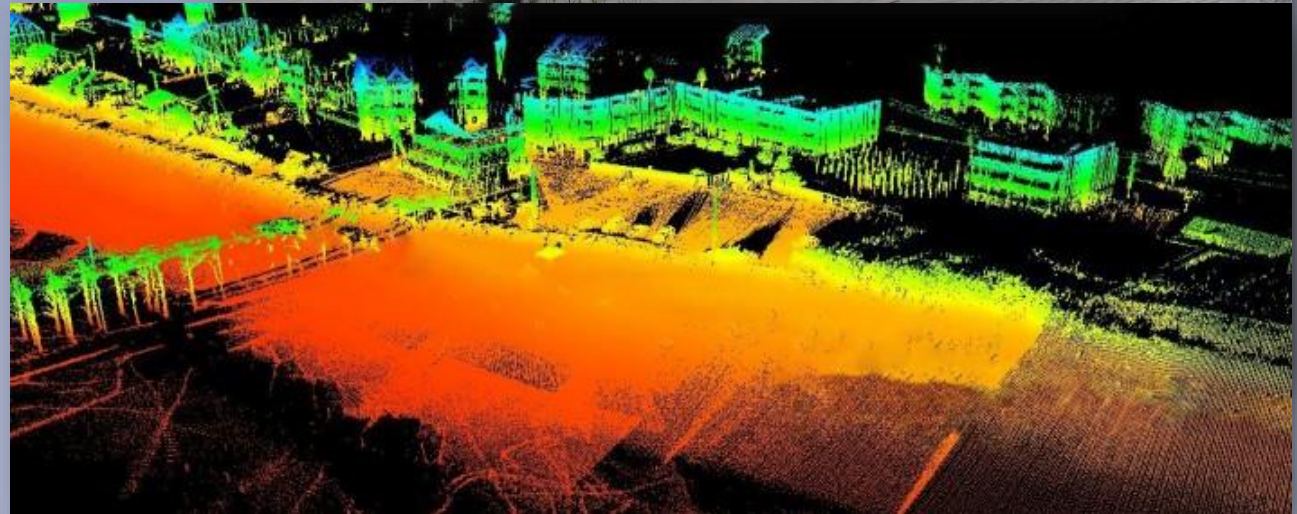
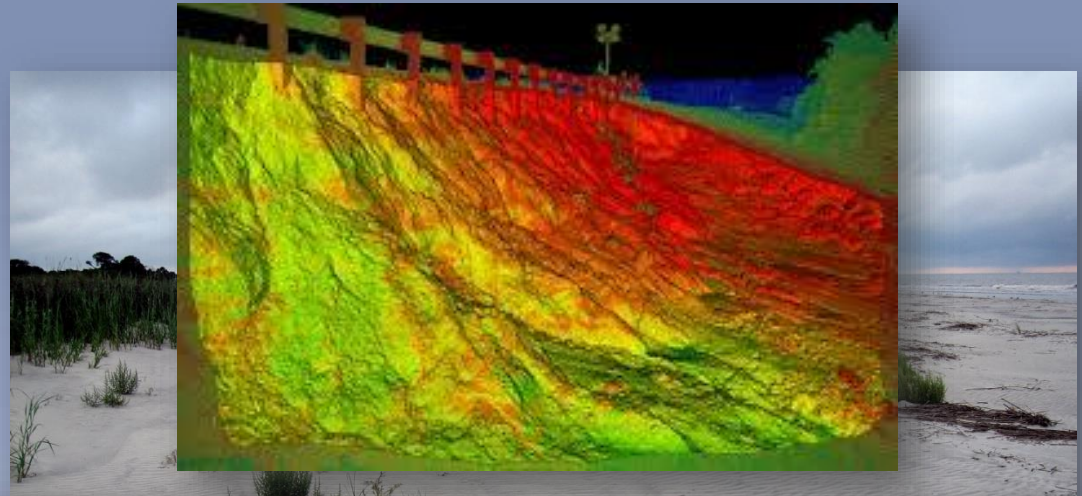
Sea Level Rise

- Deep rod SET and vegetative monitoring



Sea Level Rise

- Beach Slope Monitoring





Research



The Bottlenose Dolphin

Research

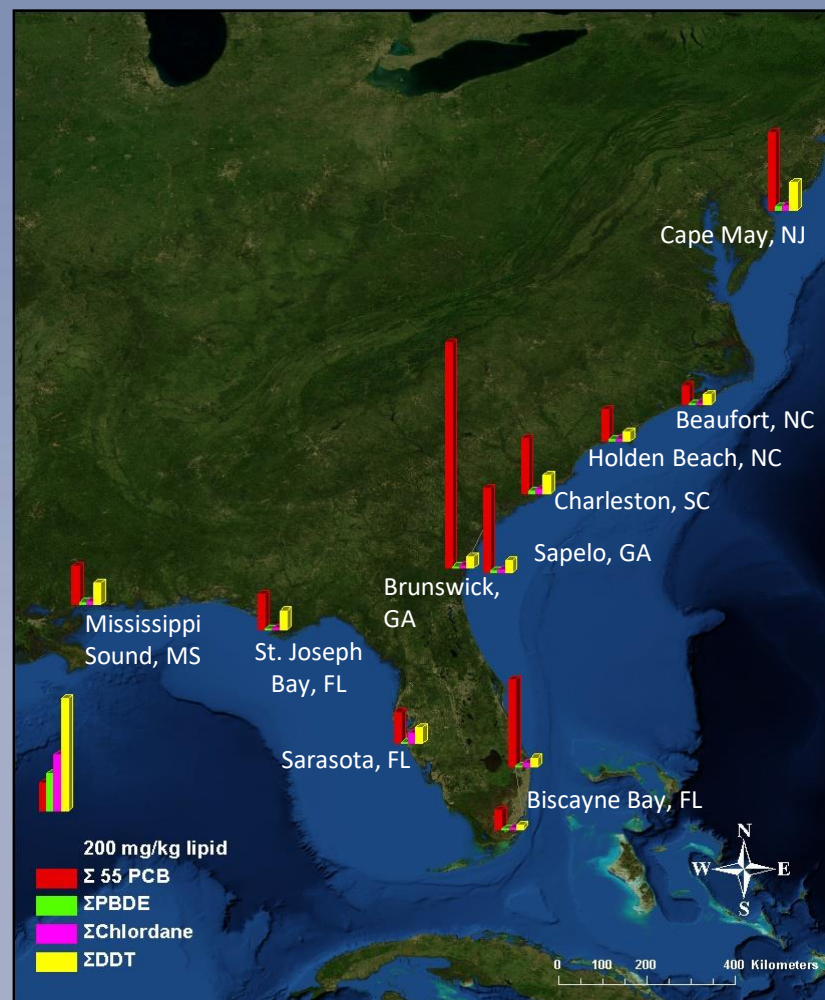
- **Toxins**



Research

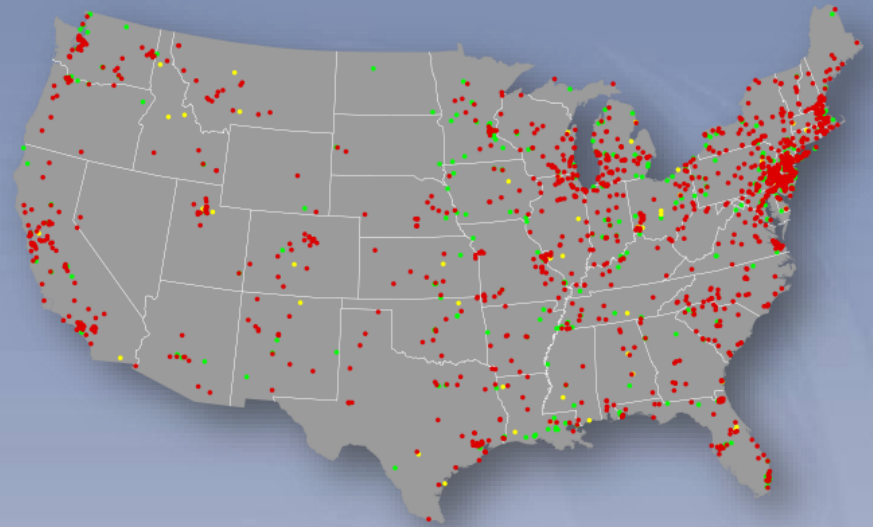
Persistent Environmental Contaminants

- High concentrations of PCBs in Georgia dolphins
- Aroclor 1268 from LCP site in Brunswick
- One male dolphin in Brunswick had highest concentration documented worldwide (2822 $\mu\text{g/g}$ lipid)
- Female dolphins had significantly lower levels of PCB's.
- Incredibly high neonatal mortality



Research

- **Toxins** (PCB, Toxaphene, Methylated Mercury, PBDE's, etc.)



Research

Whole Body Aroclor 1268 Concentration (ppm) – LCP Site by fish species

	2004	2005
<i>Silver perch</i>	3.61	2.84
<i>Red drum</i>	0.92	0.71
<i>Black drum</i>	3.06	7.82
<i>Spotted seatrout</i>	3.68	6.49
<i>Striped mullet</i>	10.08	12.00

What's considered a safe maximum in humans? About 0.01ppm

Research

- Human implications?



CENTERS FOR DISEASE
CONTROL AND PREVENTION





**A society grows great when old men plant trees whose shade
they know they shall never sit in.**

-Greek Proverb

Questions?

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