The Ever-Changing NC Coast

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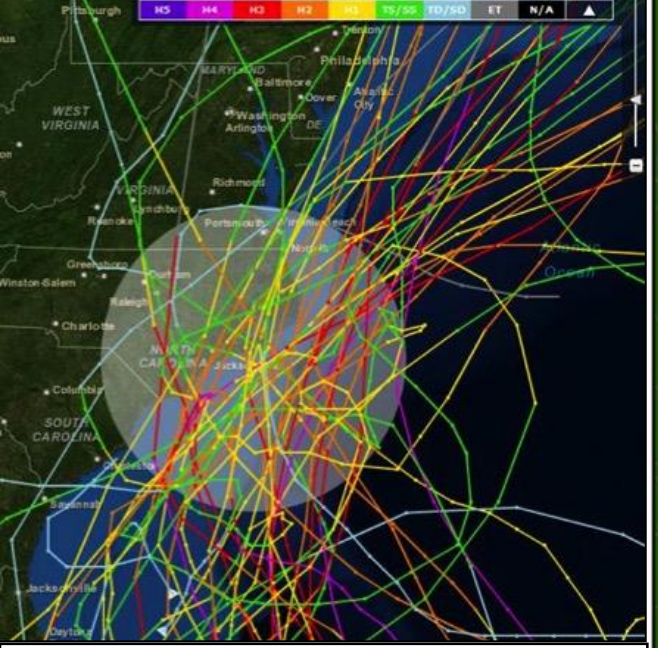
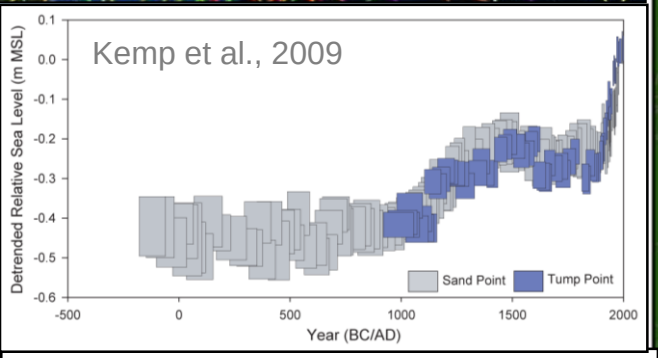
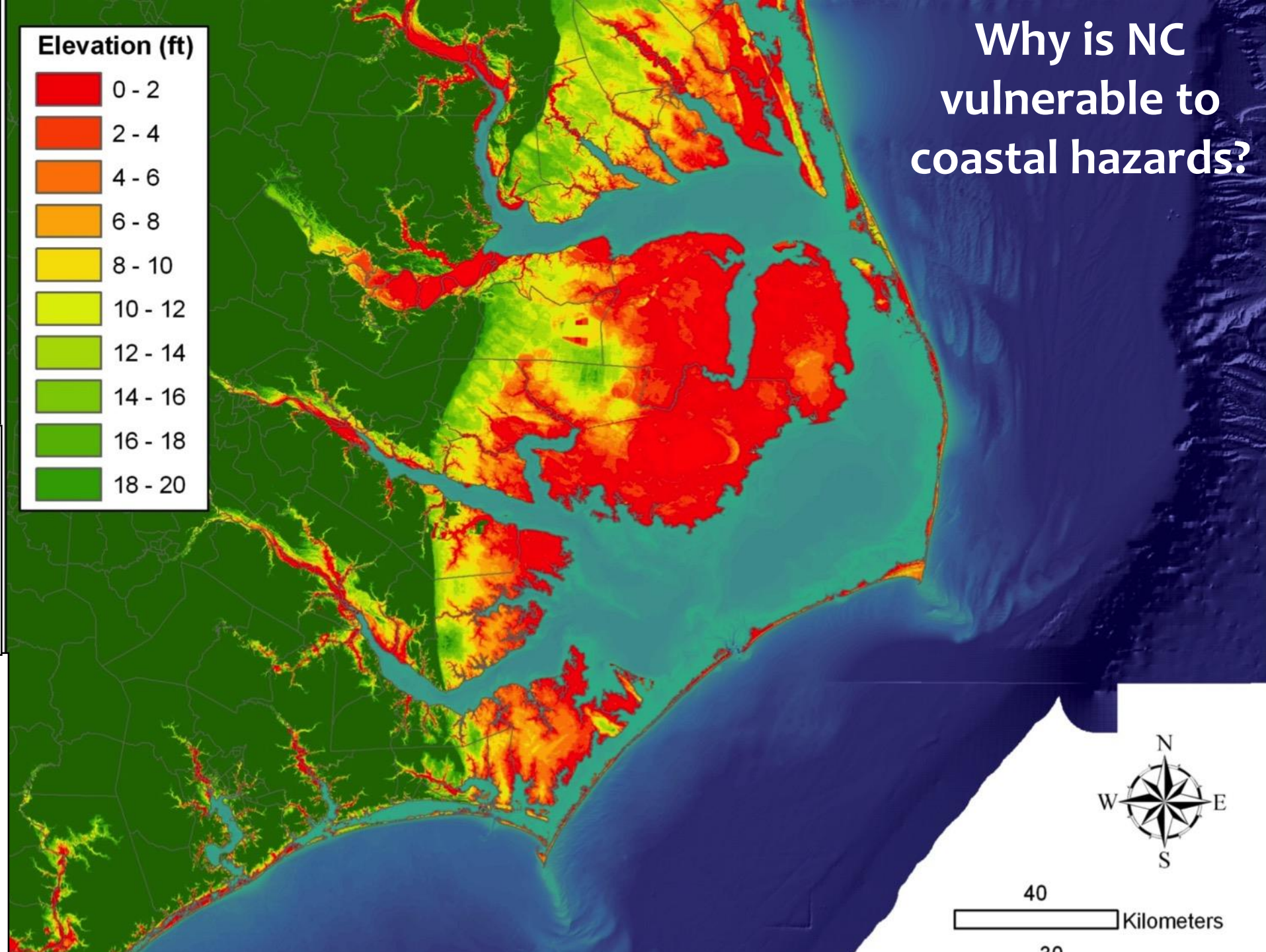
East Carolina University
Coastal Studies Institute

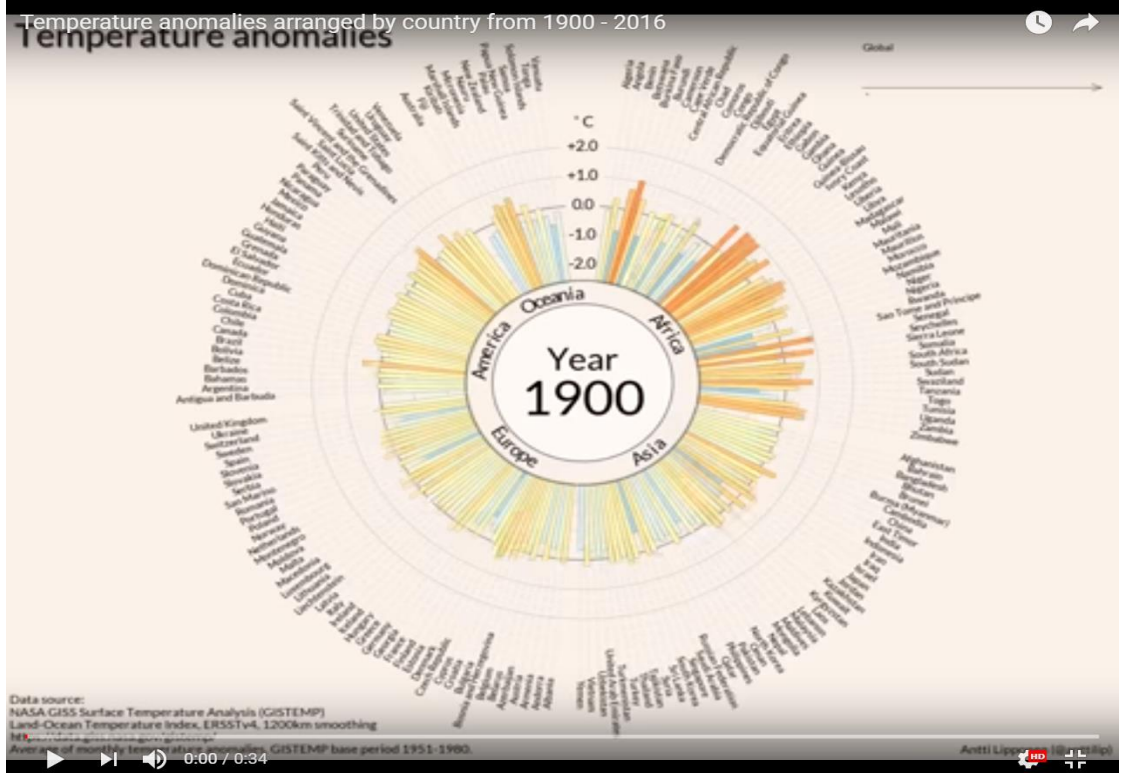
Why is NC vulnerable to coastal hazards?

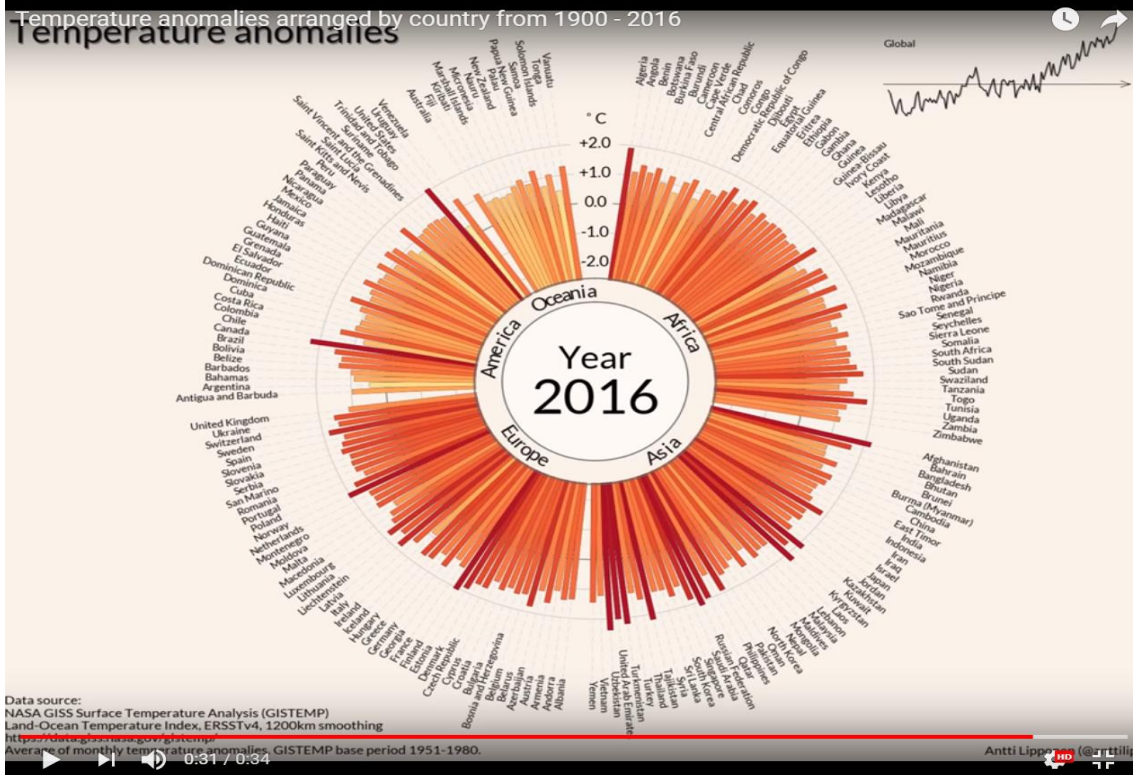




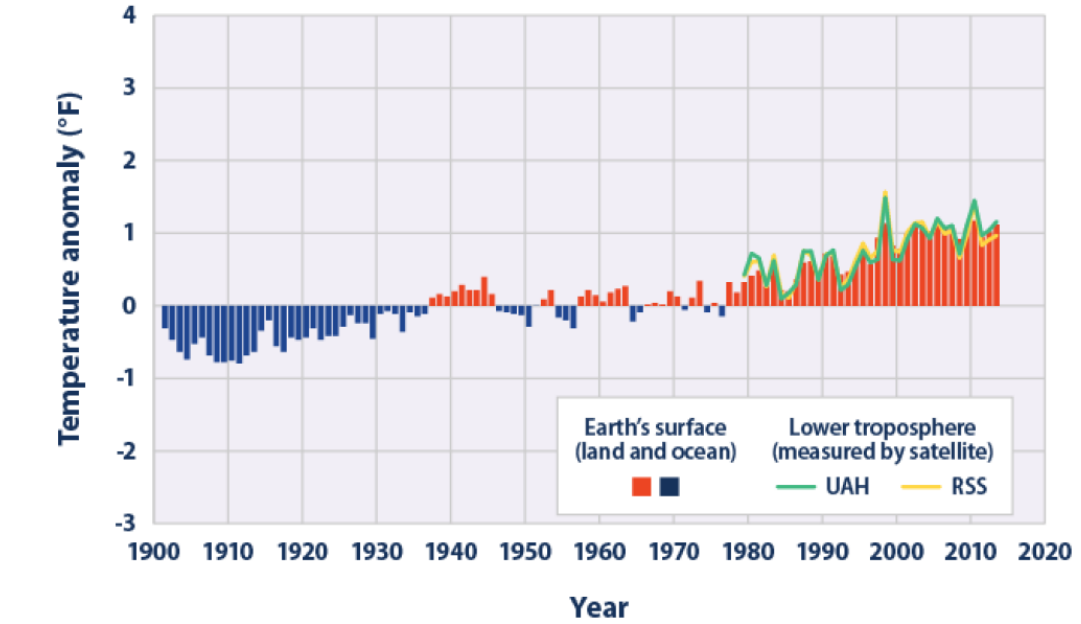
- Low, extensive
- Geology
- Dynamic setting
- Storms
- Sea Level
- Humans





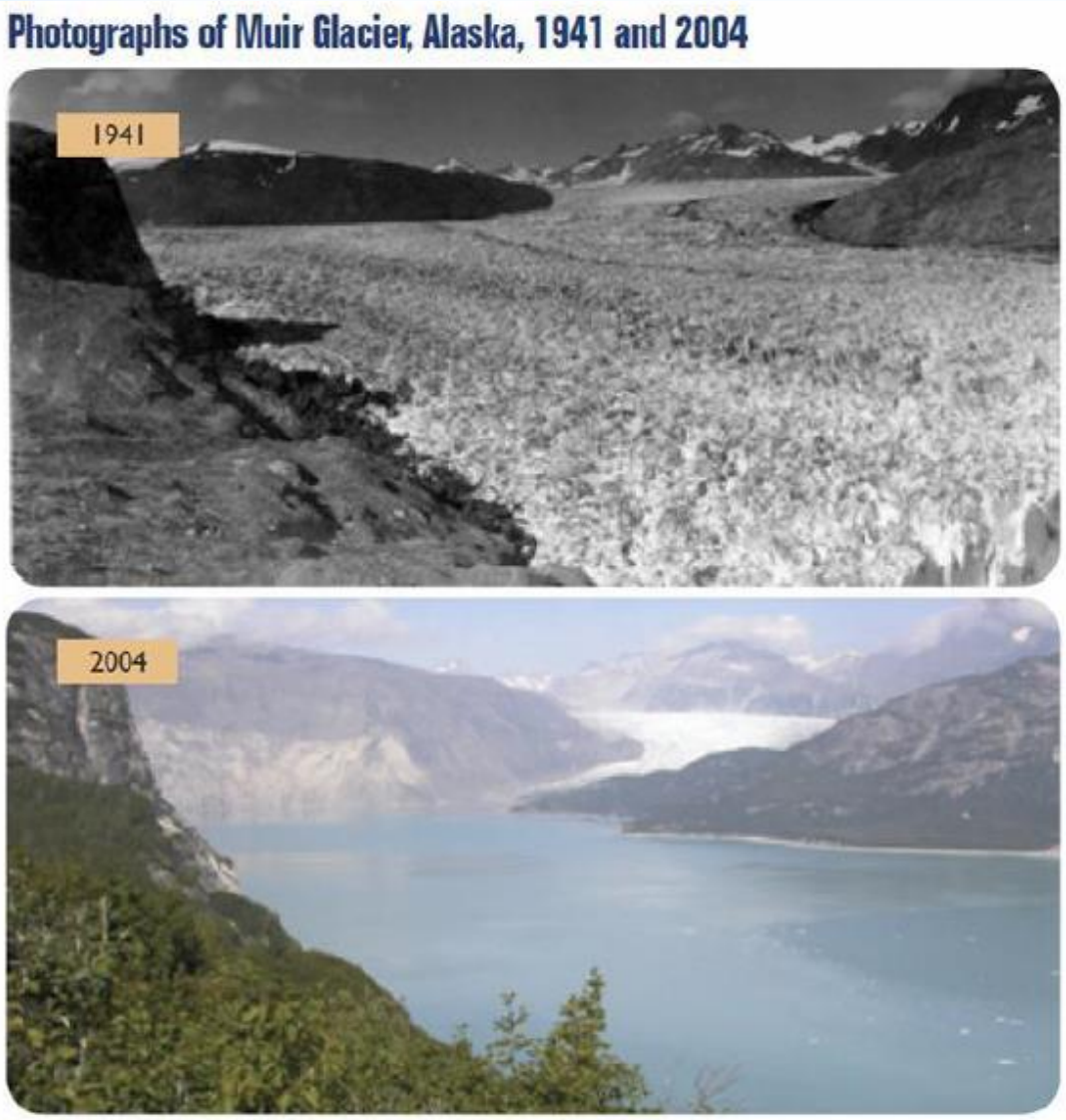


https://youtu.be/-ylHxOui9nQ

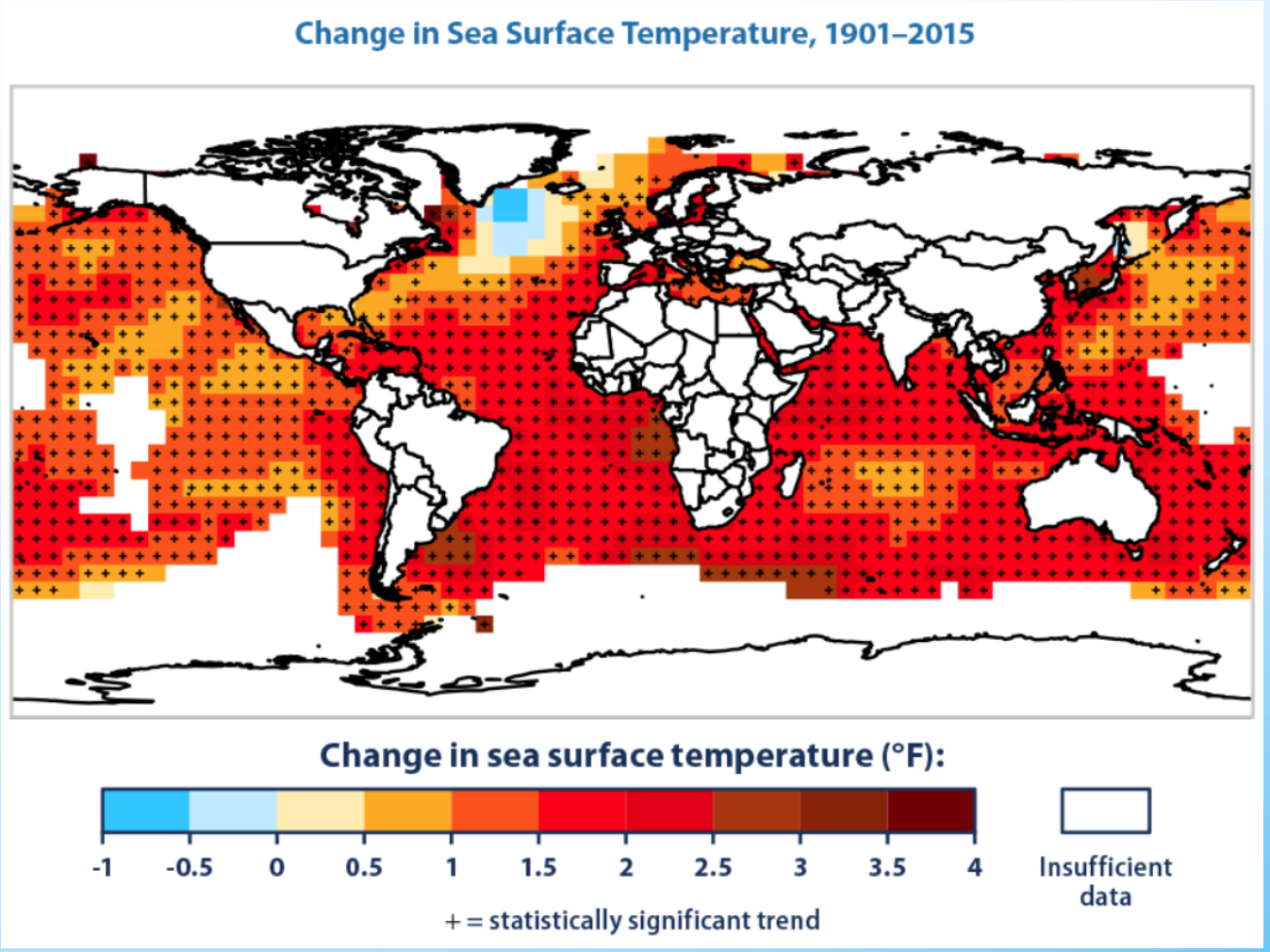


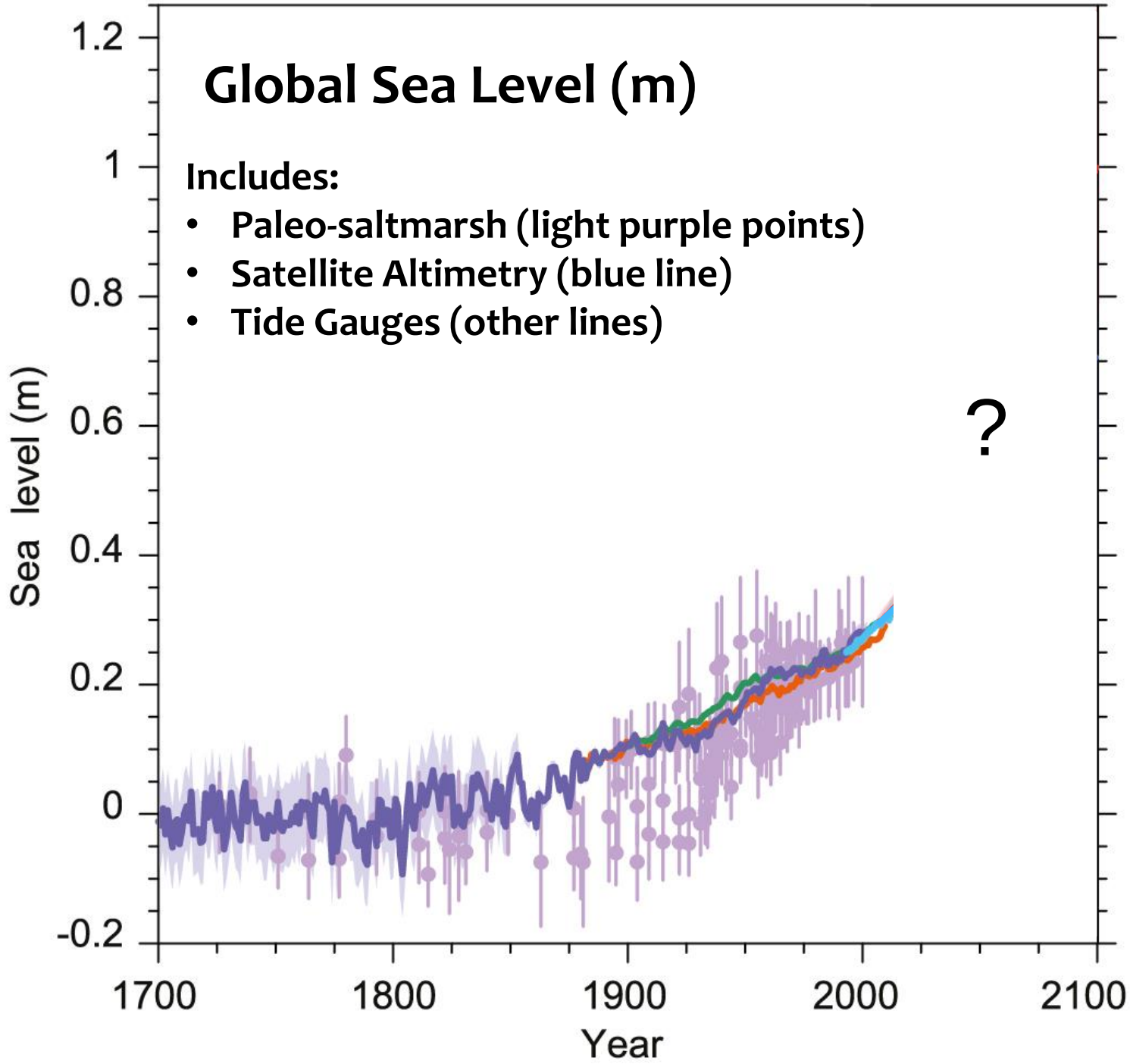
Current change can't be argued!

Melting Glaciers

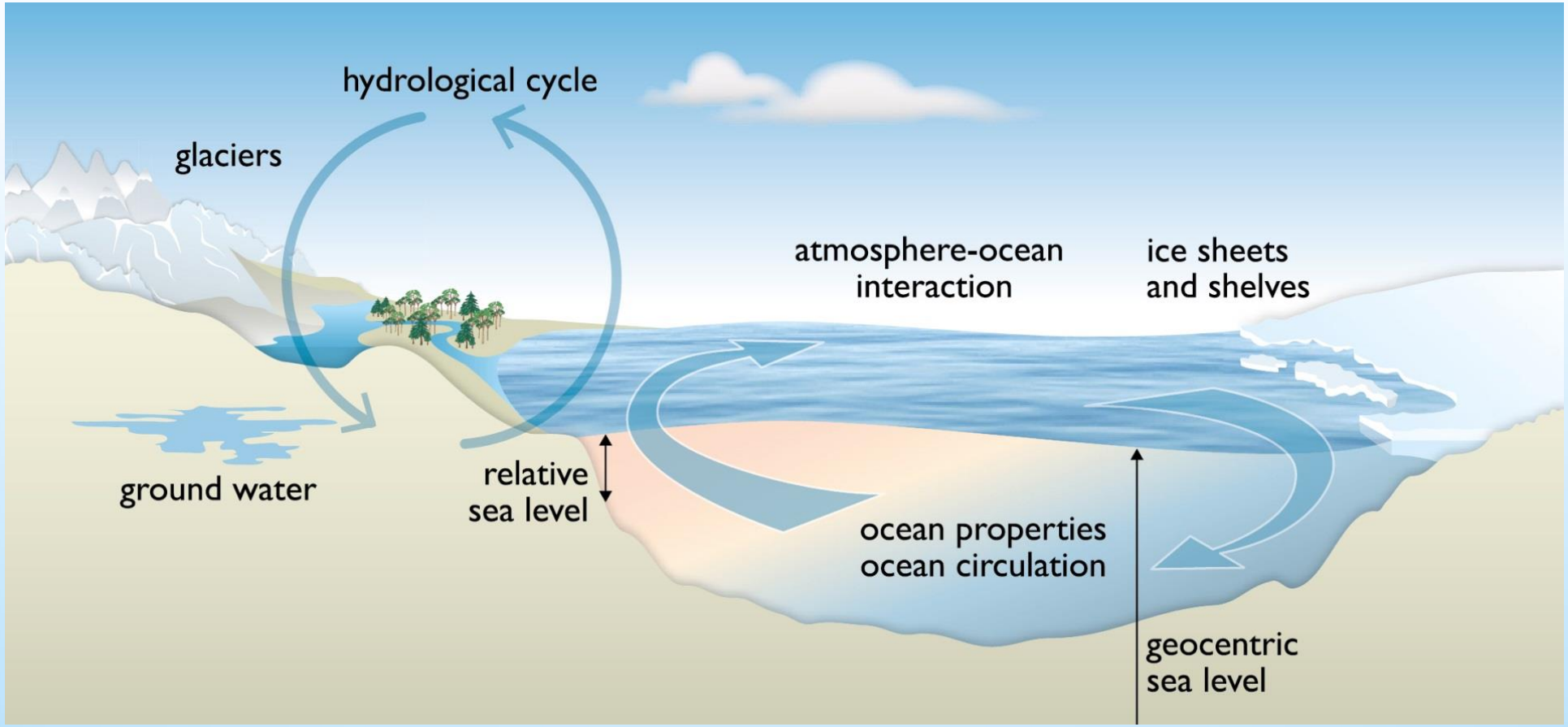


Rising Ocean Temperatures




Global Sea Level (m)
Includes:
• Paleo-saltmarsh (light purple points)
• Satellite Altimetry (blue line)
• Tide Gauges (other lines)
?
Sea level (m)
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
1700
1800
1900
2000
2100
Year

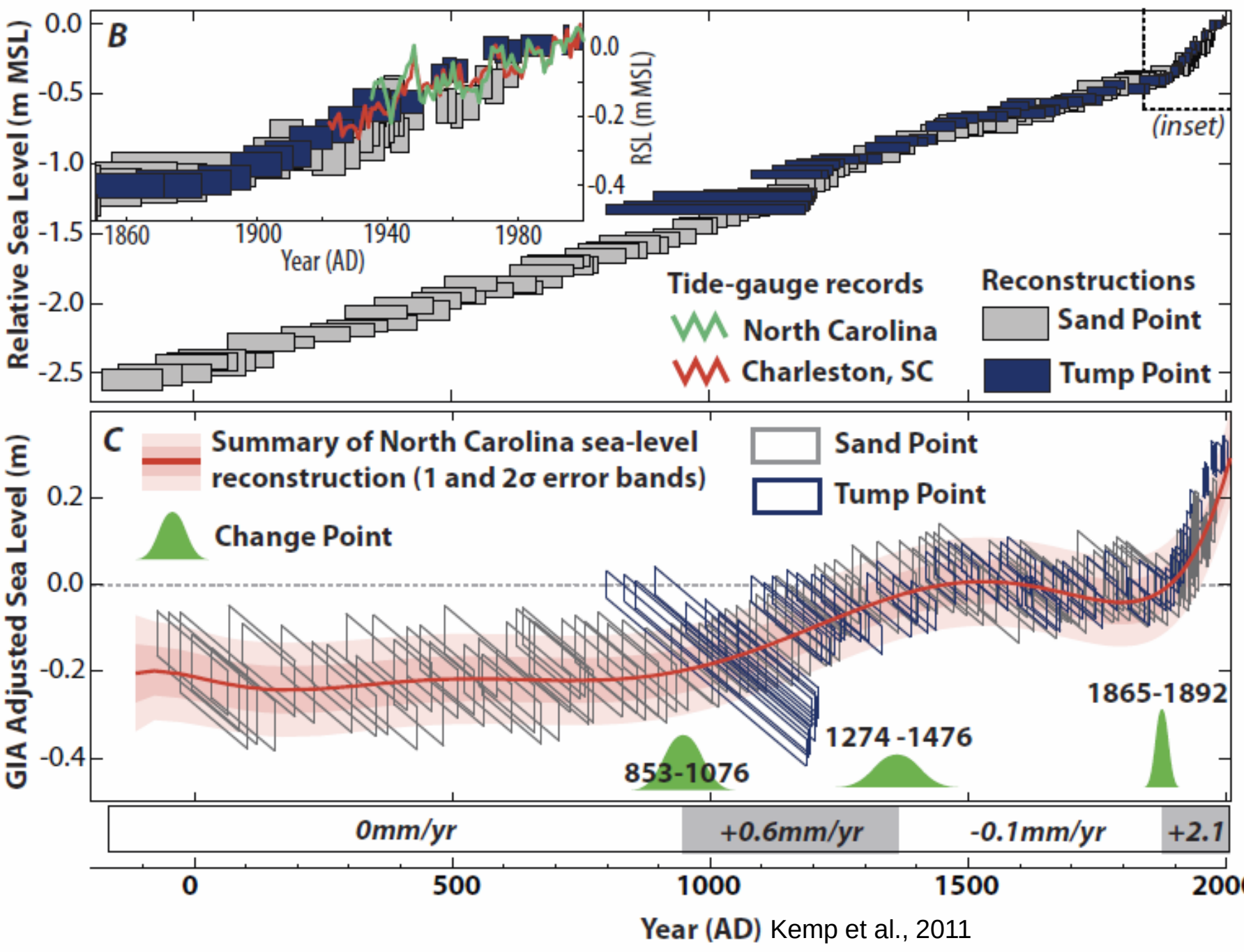
Complex causes of sea level change



Need to consider the Global and Local influences:

- Land-ice volume
- Steric effects (salinity, temp)
- Seafloor spreading
- Groundwater storage
- Glacial rebound (i.e. subsidence)
- Winds, tides
- Tectonics
- Ocean currents

Core collected from saltmarsh near Coastal Studies Institute



Kemp et al., 2011

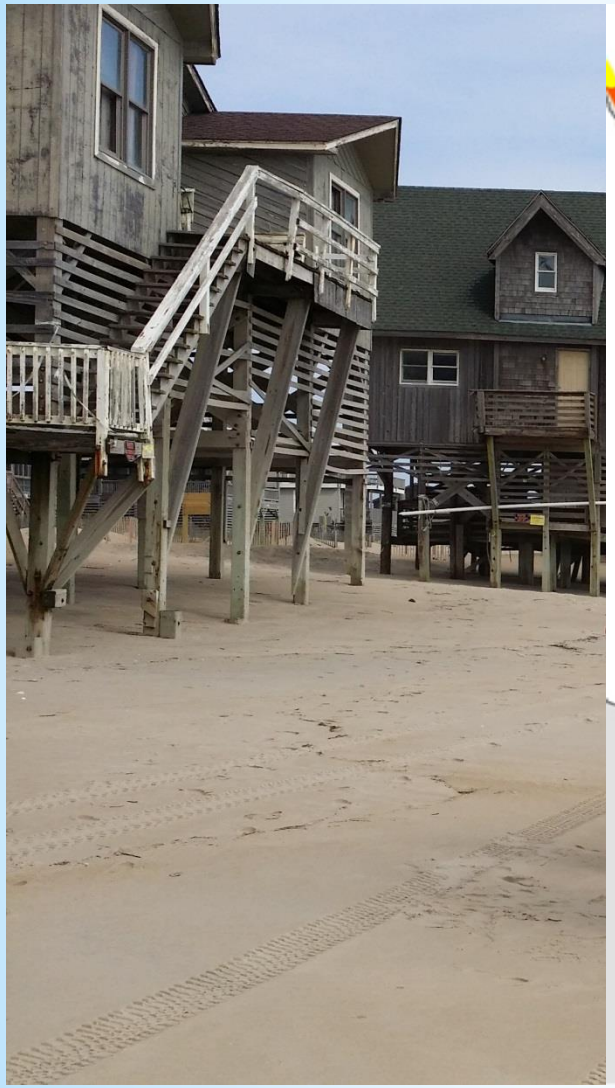
Salt marsh proxy data correlate with local tide gauge records

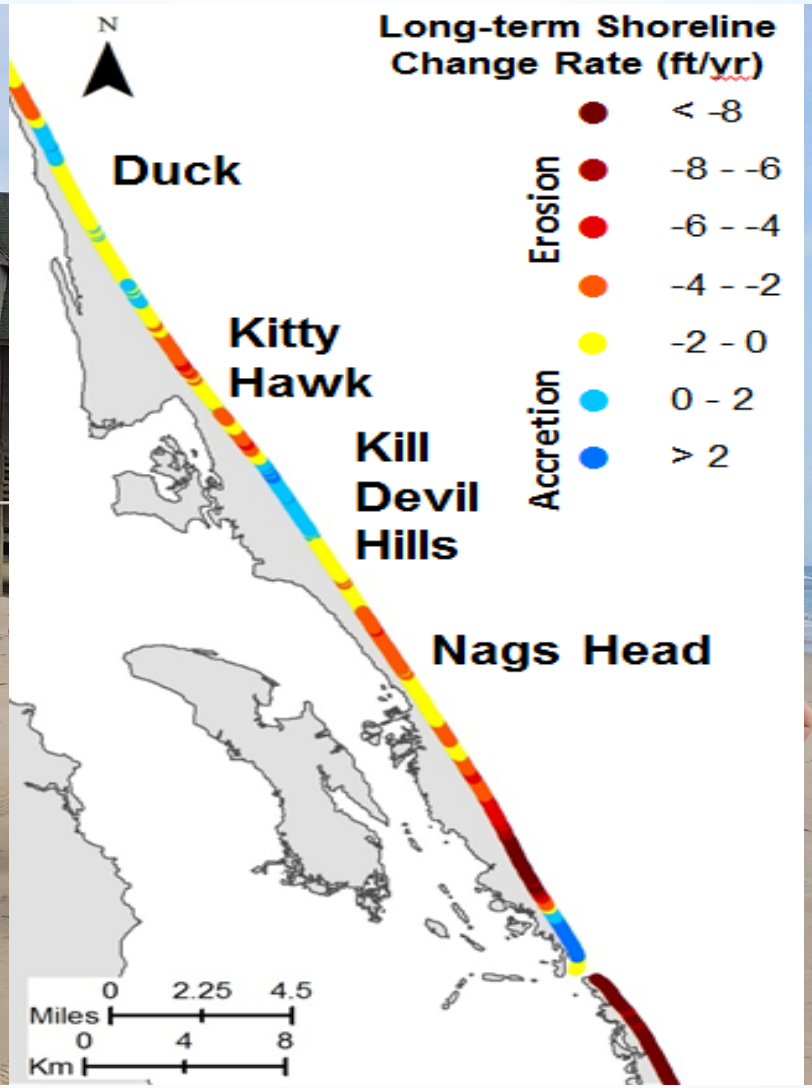
Understanding the Coast

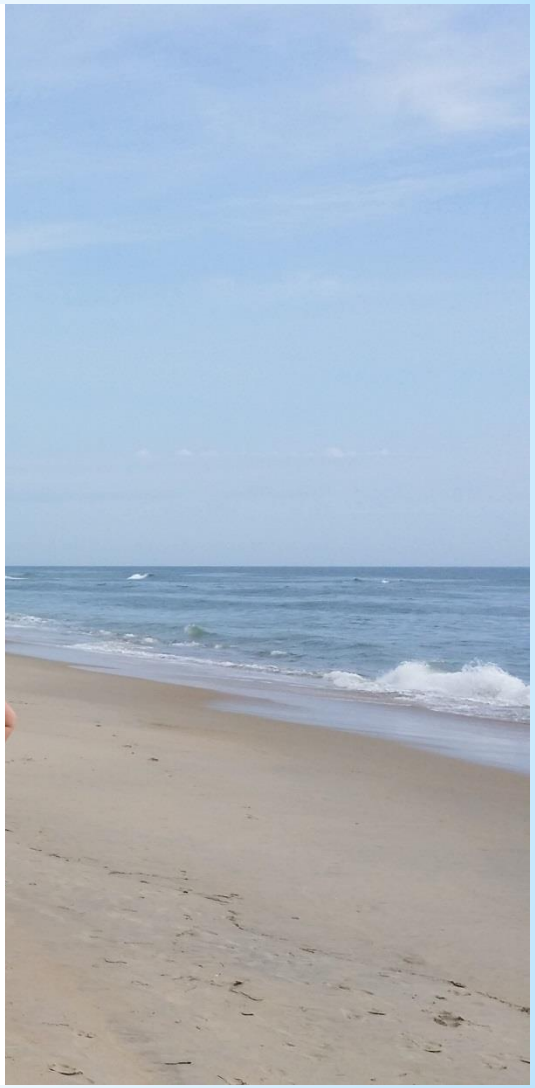
Sea-level rise influences more than the ocean height…

- **Shoreline Erosion**
- **Inundation (tide, storm)**
- **Groundwater System**
- **Water Quality**

Shoreline Change in NC

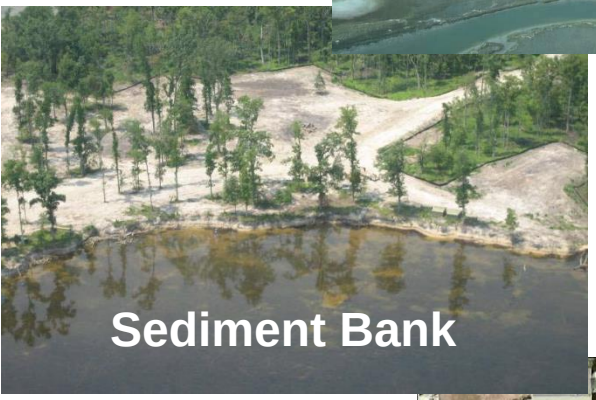






When considering SLR, must think about other processes being influenced and creating change.

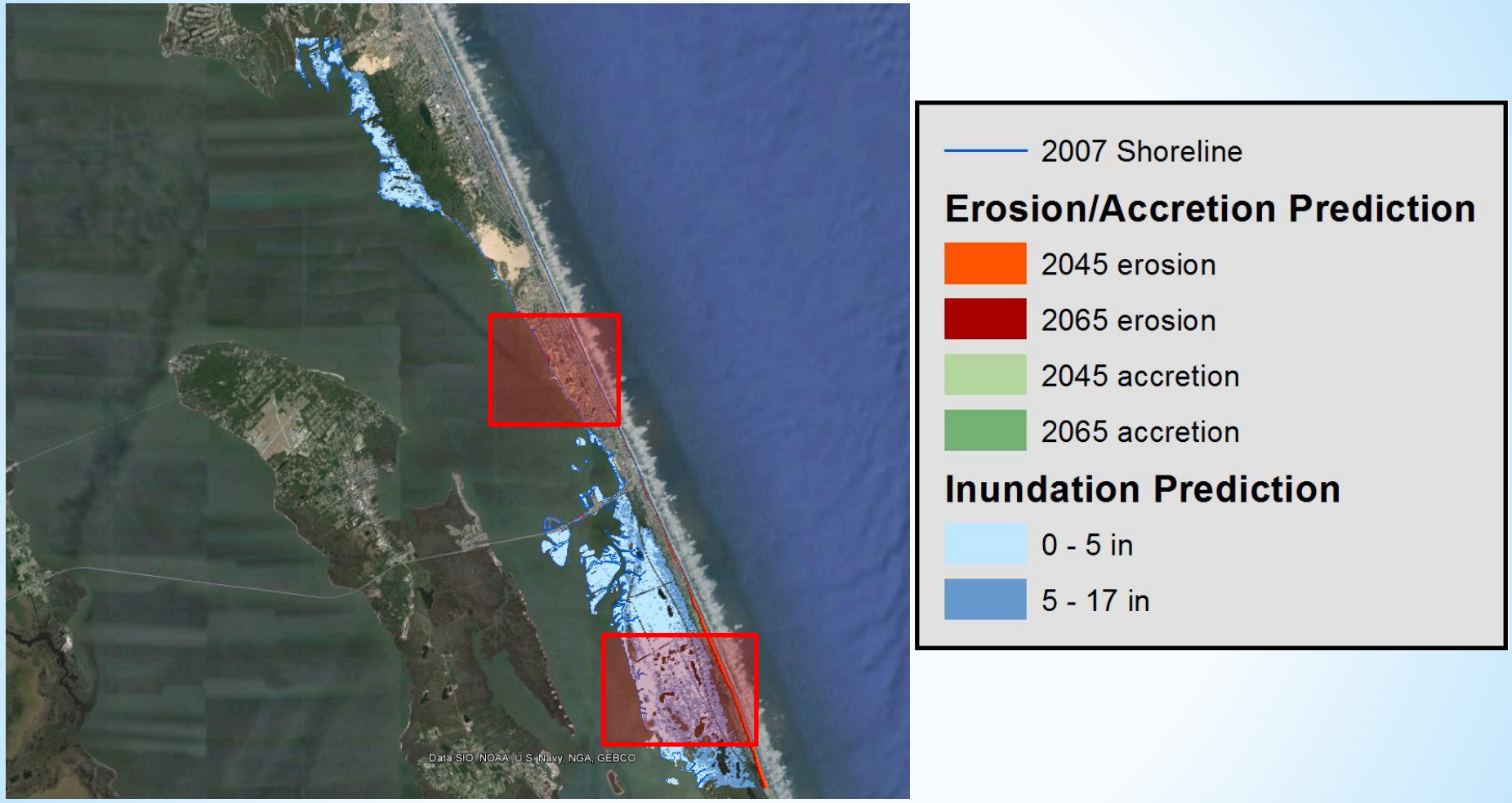
Defining Our Coast



>12,000 miles of estuarine shoreline

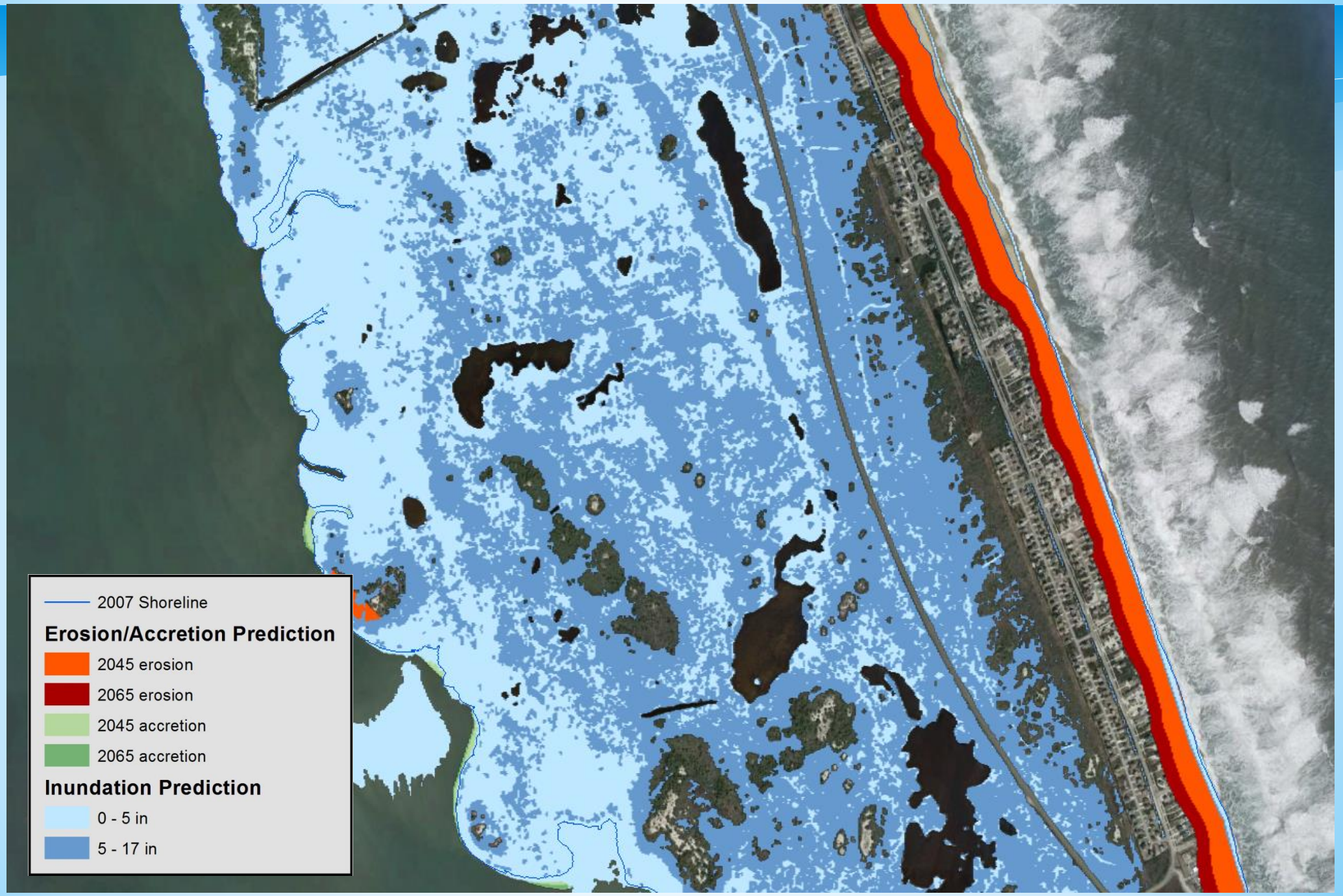
~300 miles of Ocean Shoreline

SLR & Shoreline Change

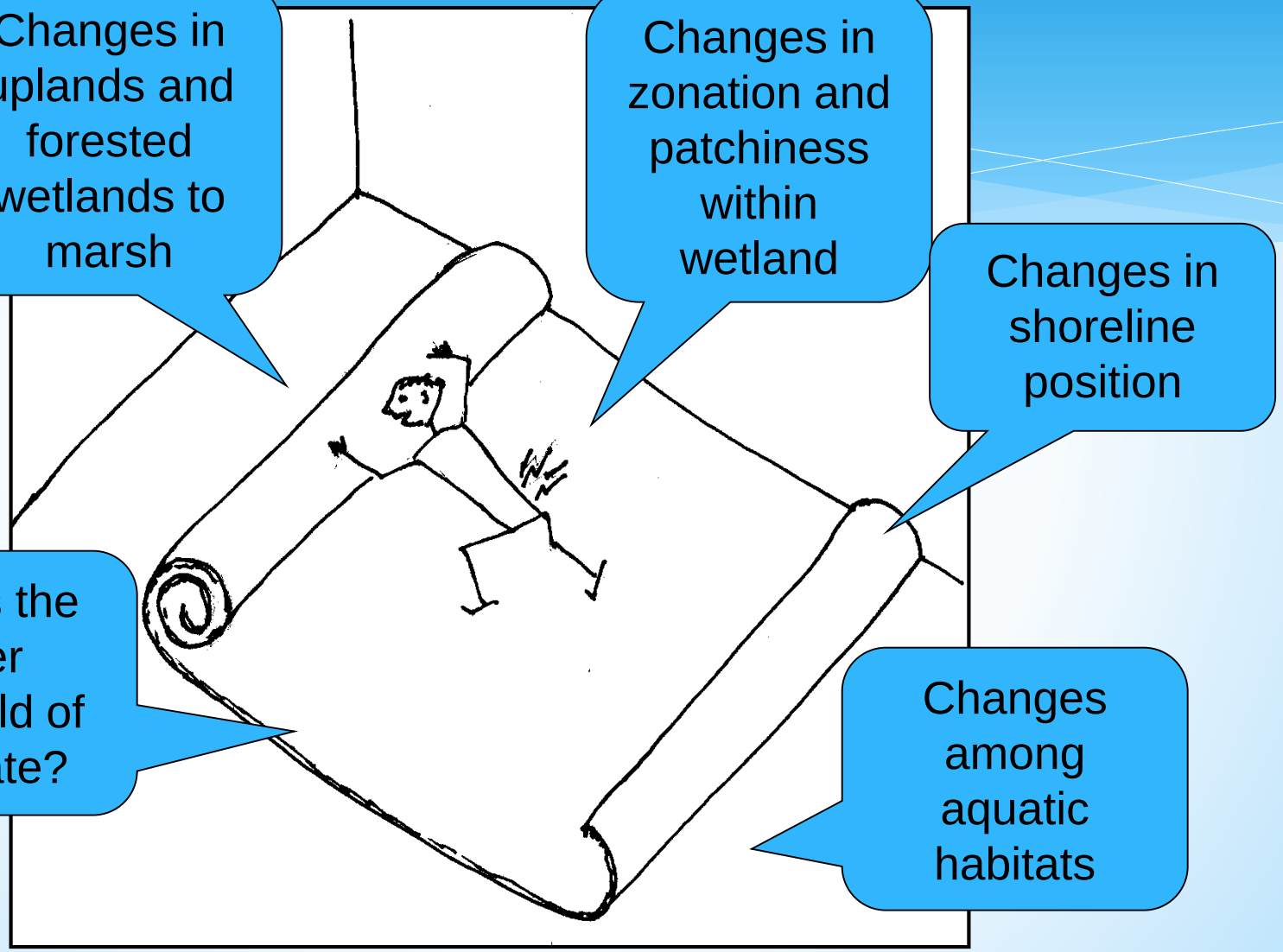


When considering SLR, must think about other processes being influenced and creating change.


2007 Shoreline
Erosion/Accretion Prediction
2045 erosion
2065 erosion
2045 accretion
2065 accretion
Inundation Prediction
0 - 5 in
5 - 17 in

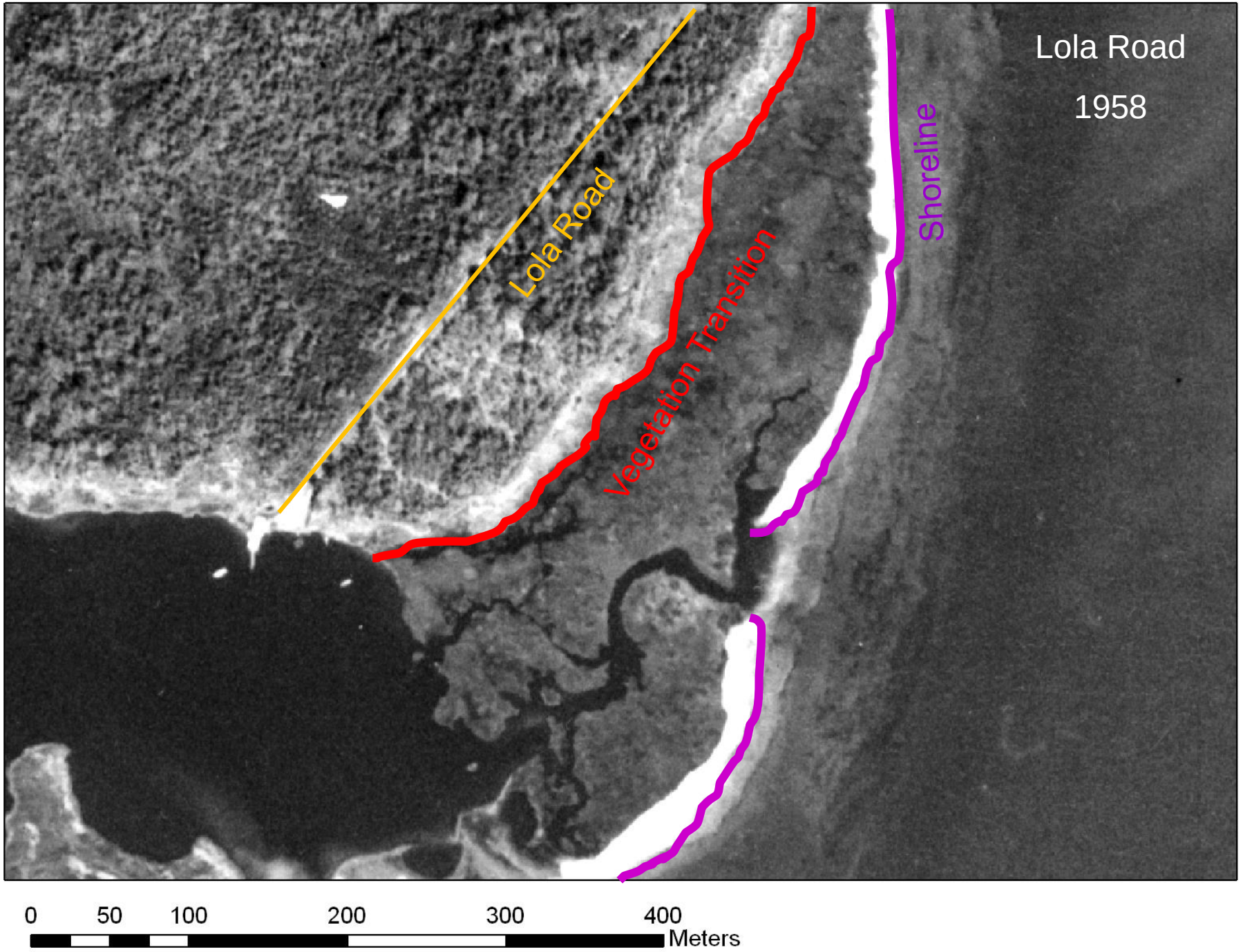

2007 Shoreline
Erosion/Accretion Prediction
2045 erosion
2065 erosion
2045 accretion
2065 accretion
Inundation Prediction
0 - 5 in
5 - 17 in

Coastal Landscape Transition



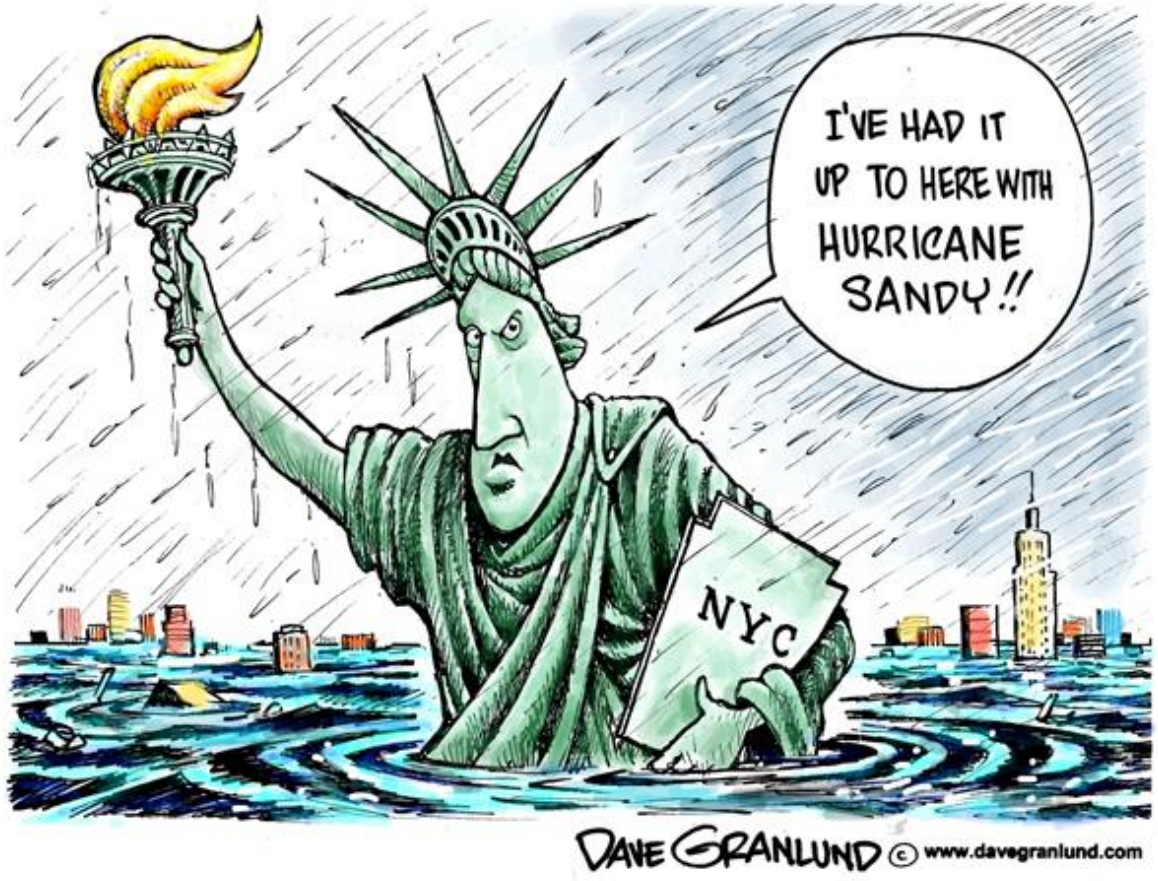
Mark Brinson, ECU

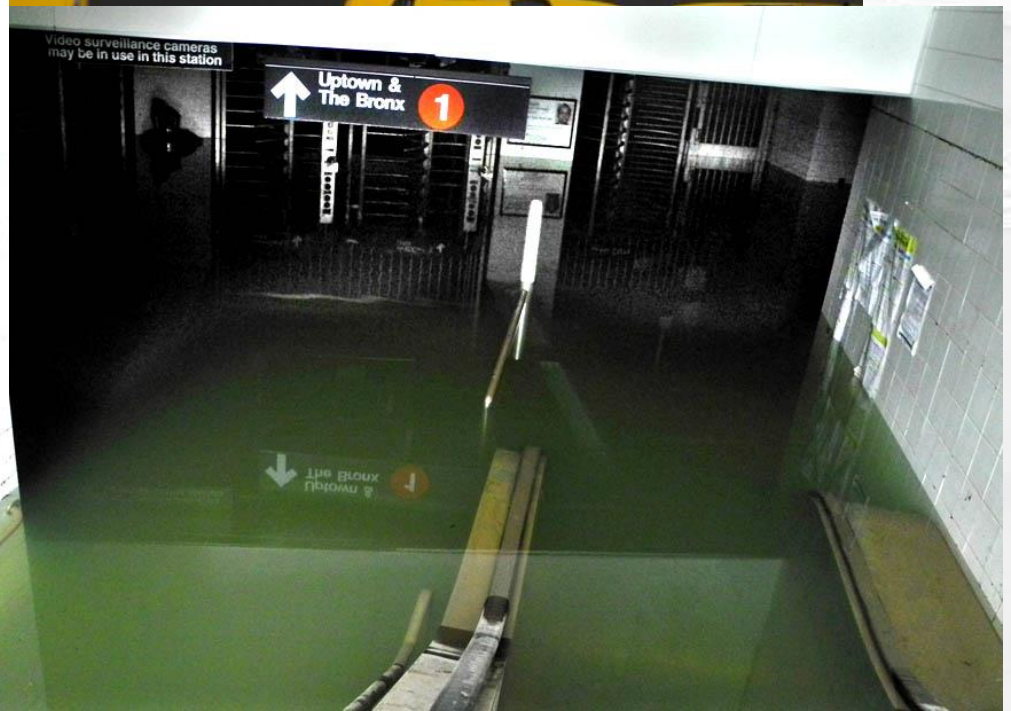

Lola Road, Cedar Island
2008


Lola Road
1958
Lola Road
Vegetation Transition
Shoreline
0
50
100
200
300
400
Meters


Lola Road
1998
What if there is no room for transition?
0
50
100
200
300
400
Meters

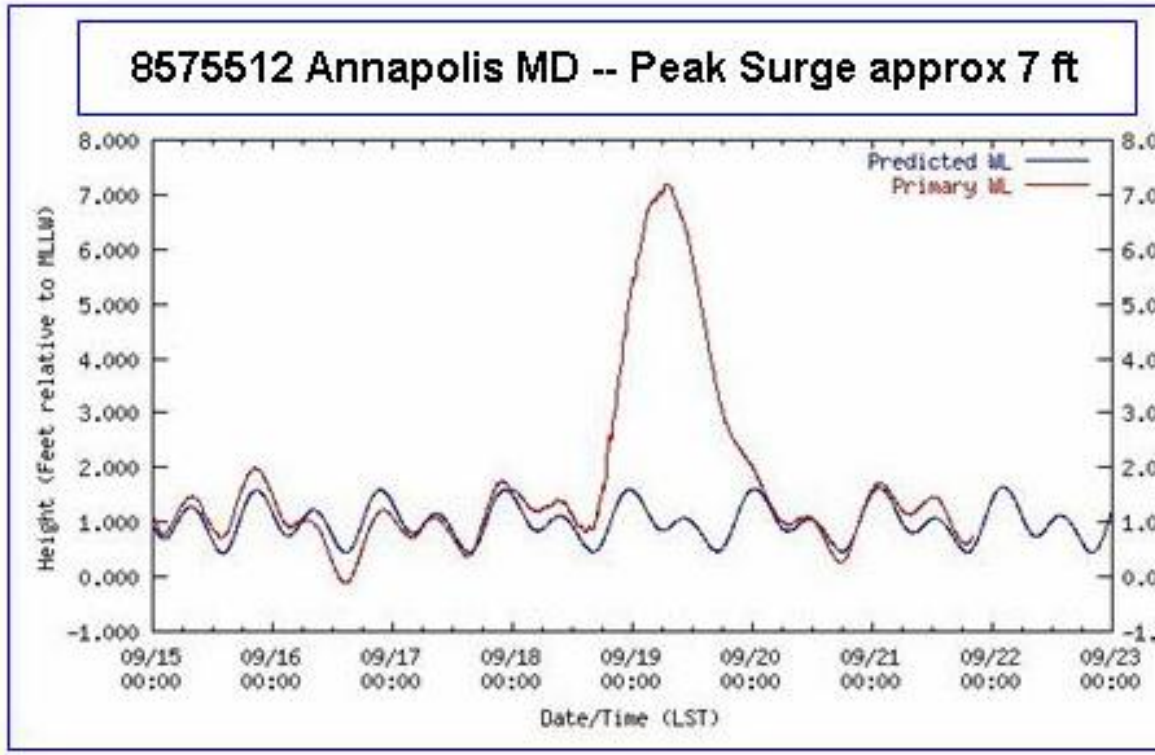
What is storm surge?



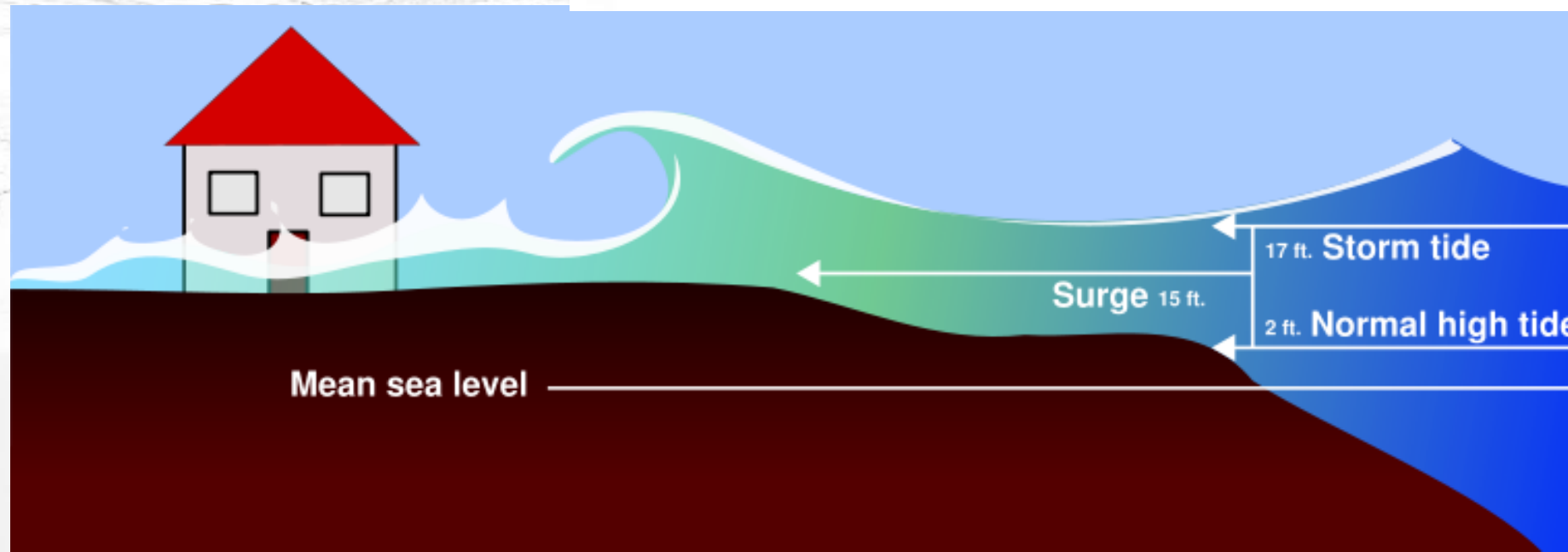


At least we don't have this problem…

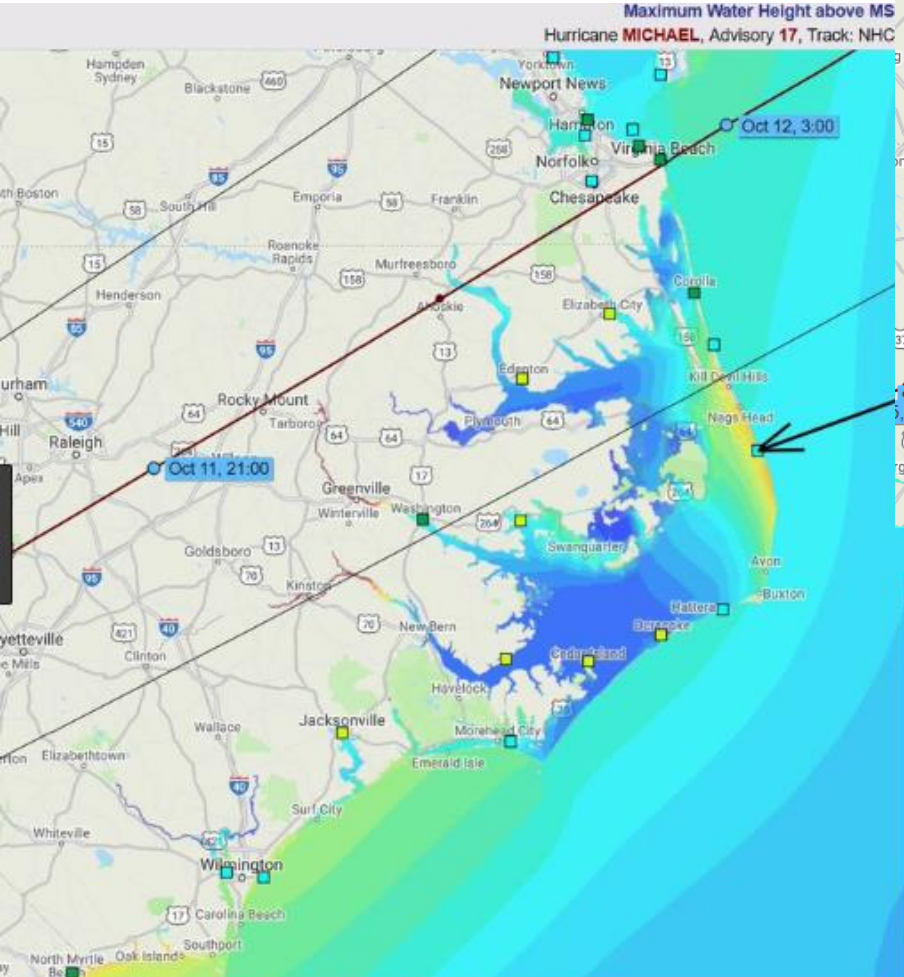
- **Storm surge** is the high water created by:
  - the accumulation of wind-blown water against the shore
  - the mound of water generated by the low atmospheric pressure of the storm

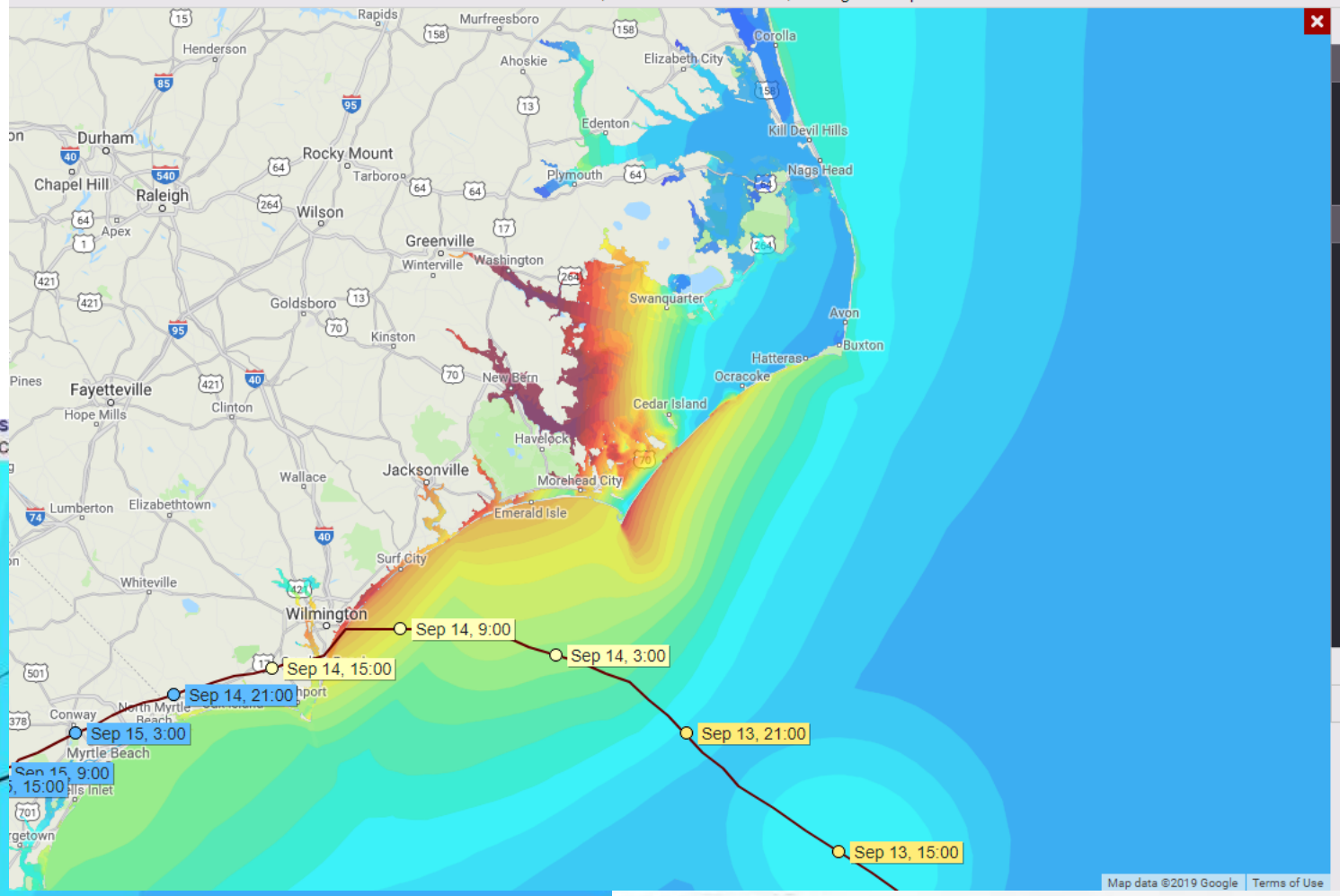


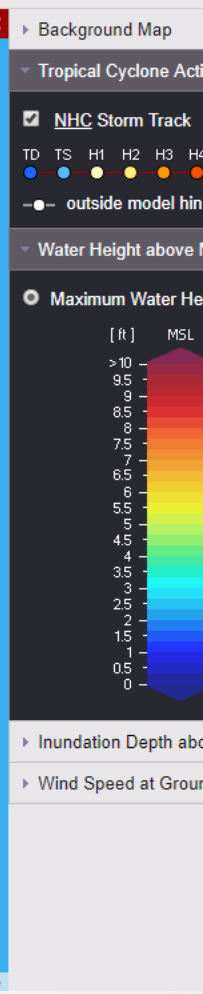
The elevated water level allows waves to reach much farther inland than usual.



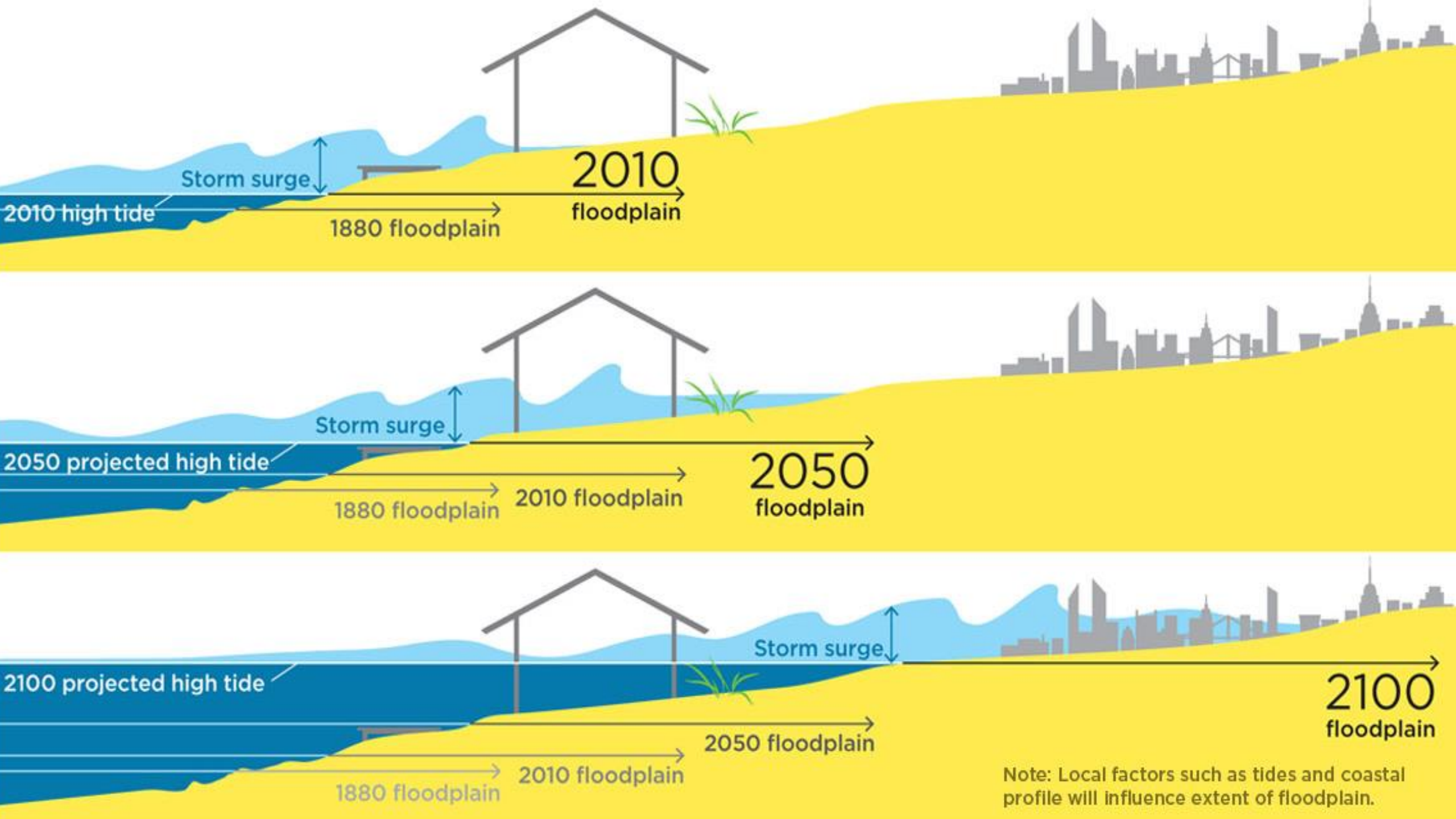
Storm Surge in Coastal NC is not simple…



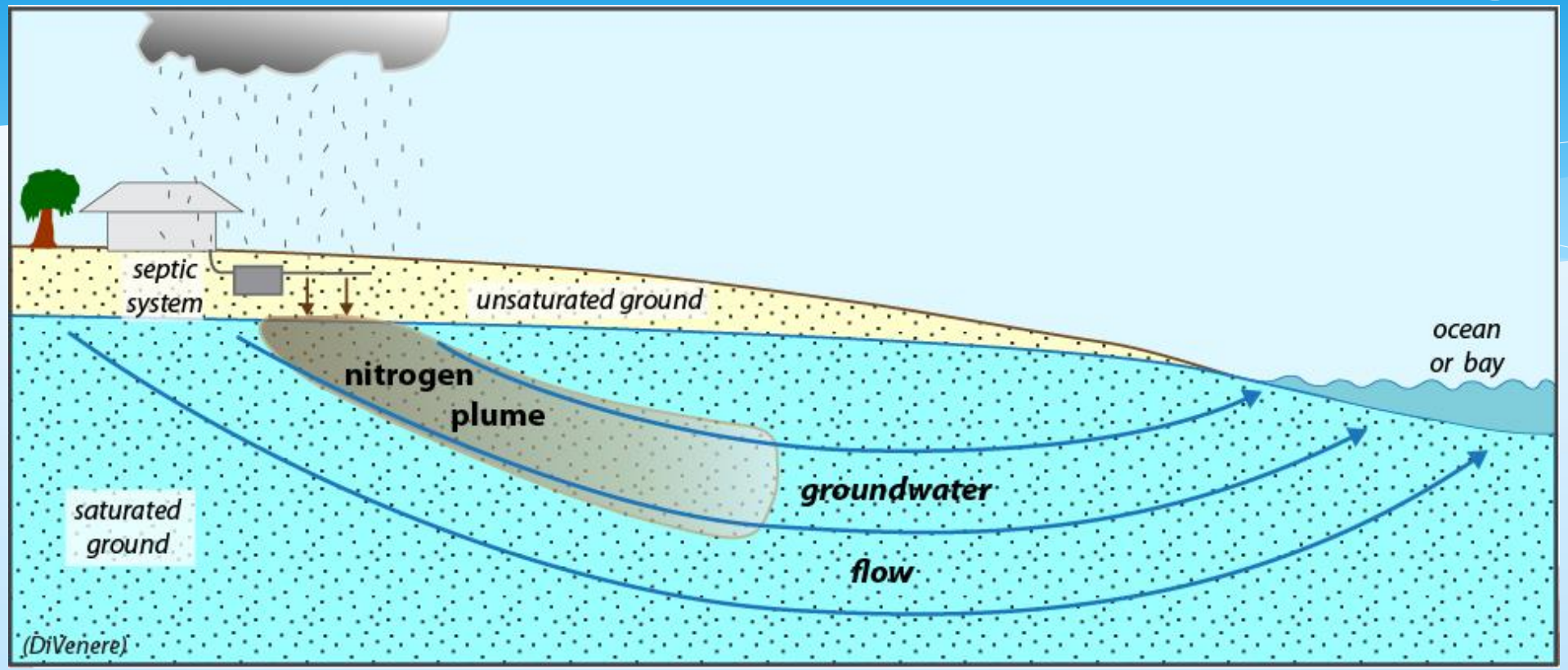




…must be mindful of each storm


Storm surge
2010 high tide
1880 floodplain
2010
floodplain
Storm surge
2050 projected high tide
1880 floodplain
2010 floodplain
2050
floodplain
2100 projected high tide
Storm surge
2050 floodplain
2010 floodplain
1880 floodplain
2100
floodplain
Note: Local factors such as tides and coastal profile will influence extent of floodplain.

Groundwater & Water Quality Challenges



A rise in sea-level will:

(1) increase the elevation of the water table (dashed–blue line)

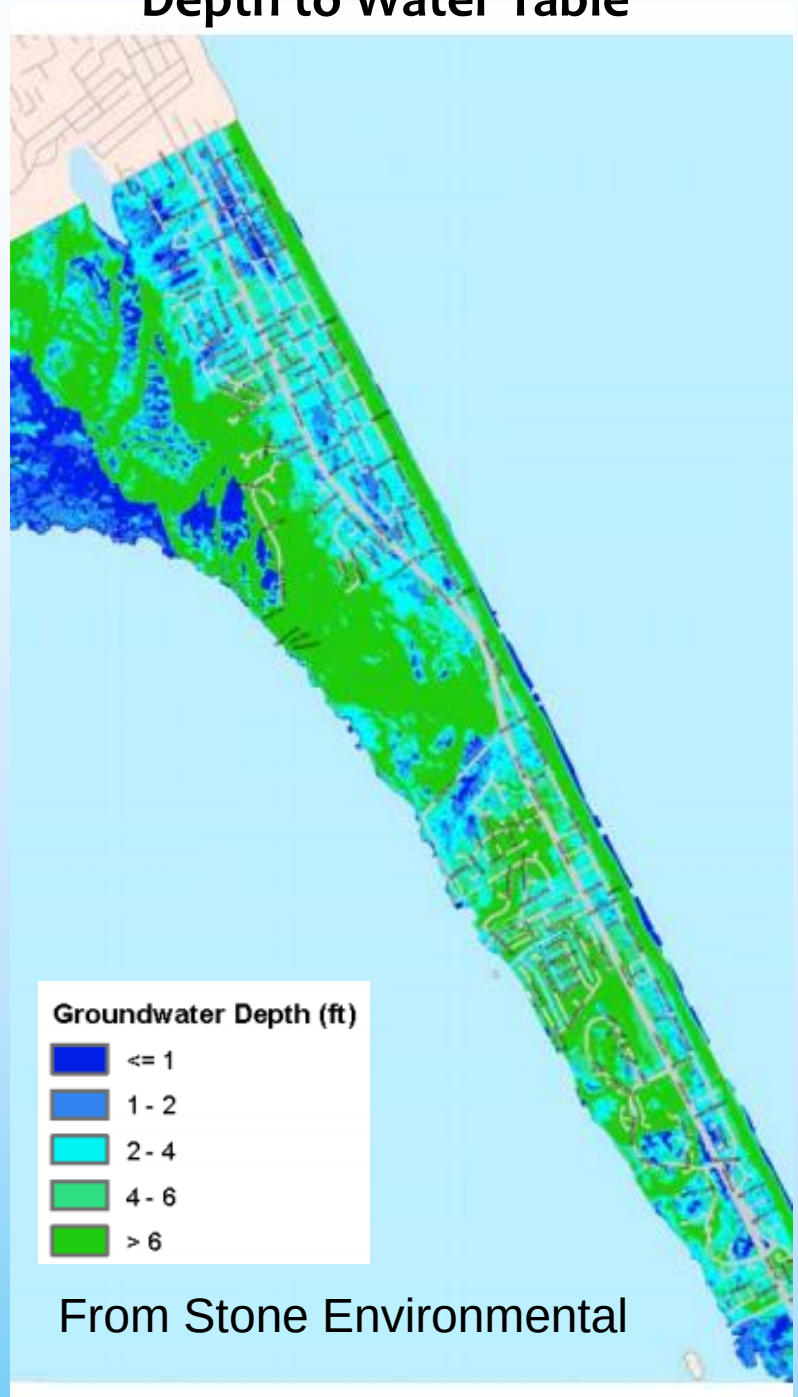
(2) compromise septic systems

(3) result in an upward and landward shift in the freshwater-saltwater interface

(4) influence the level and salinity of surface water bodies.

USGS; http://woodshole.er.usgs.gov/project-pages/sea-level-rise_hazards/index.html

Depth to Water Table



From Stone Environmental

Ocean Outfall

http://jockeysridge.blogspot.com/

Ponding Water during Rain Events

Photo: Island Free Press

The Washington Post

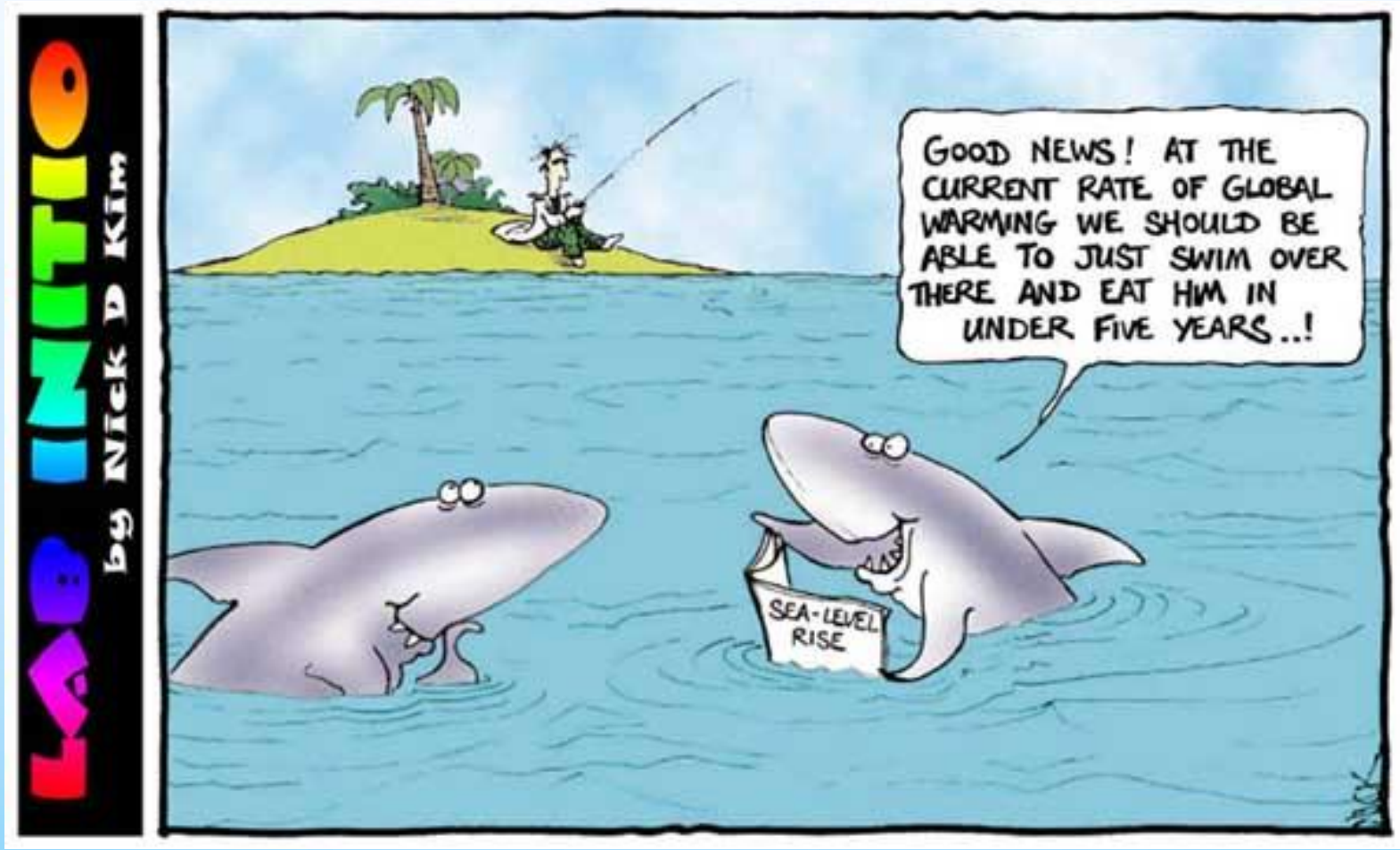
National

Ruined crops, salty soil: How rising seas are poisoning North Carolina's farmland

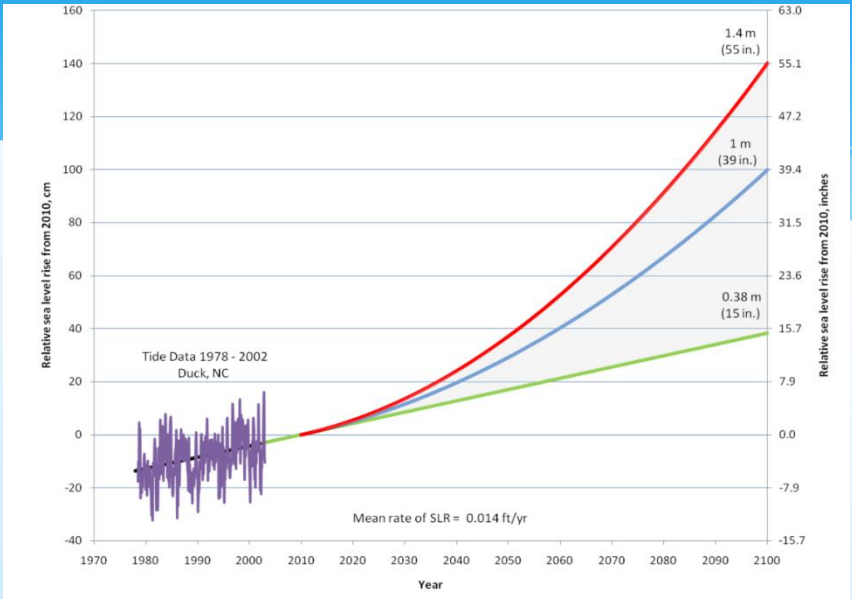
East Carolina University graduate students Trevor Burns, left, and Tyler Palochak check groundwater monitoring equipment on a farm near Engelhard, N.C., in January. (Eamon Queeney/for The Washington Post)

Summary

- Sea-level rise is ongoing and impacts other processes.
- NC has many coastal hazards to consider.
- Adaptive planning is needed.



Science & Policy… how are we responding?



North Carolina Sea-Level Rise Assessment Report, 2010

http://www.climatecentral.org/blogs/colbert-sink-or-swim

2010 Report and Backlash led to a change in charge to the Science Panel in 2015

Charge: This report has been written by the members of the Science Panel as a public service in response to a charge from the Coastal Resources Commission (CRC) and the N.C. General Assembly Session Law 2012-202. The CRC charge specified that sea level rise projections be developed for a 30- year timeframe.