# Implications of Changing Climate and Rising Seas for Coastal North Carolina

**Testimony to the Legislative Commission on Global Climate Change**

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ENVIRONMENTAL DEFENSE

finding the ways that work

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# Special “Thanks” to:

- Dr. Sam Pearsall (Chief Scientist, NC Nature Conservancy)
- Dr. Stan Riggs (East Carolina University)
- Dr. Pat Halpin (Duke University)
- Dr. Jennifer Phelan (NC State University)
- Dr. Pete Peterson (Univ. of North Carolina)

# Overview

- Primer on North Carolina coastal ecosystems vulnerable to global warming and rising seas
- Predicted impacts of warming and rising seas
- Recommendations

# World-Class Treasures at Risk

Fisheries

Photo: WRC

Forests

Fauna

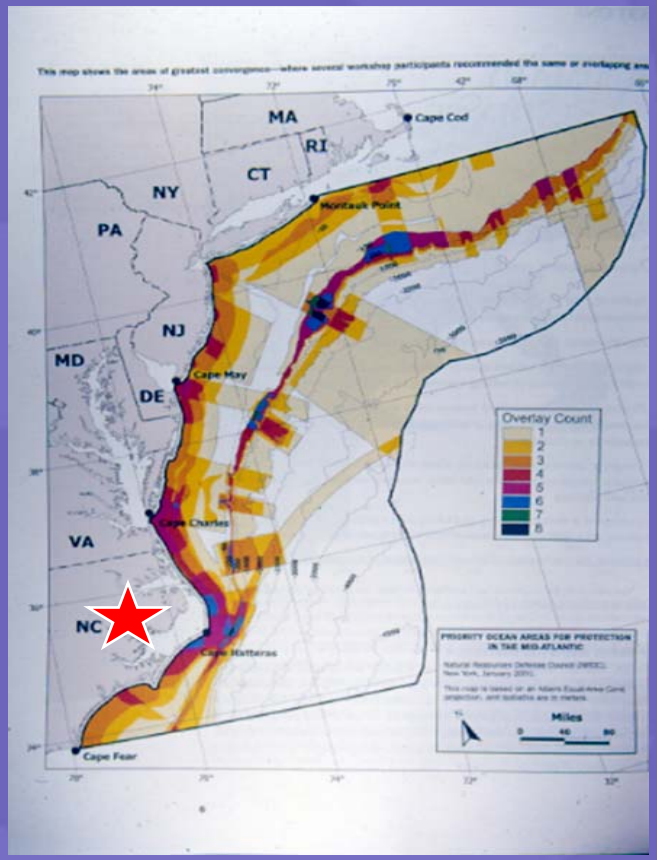
Photos: Rader

# World-Class People

Photo: Rader

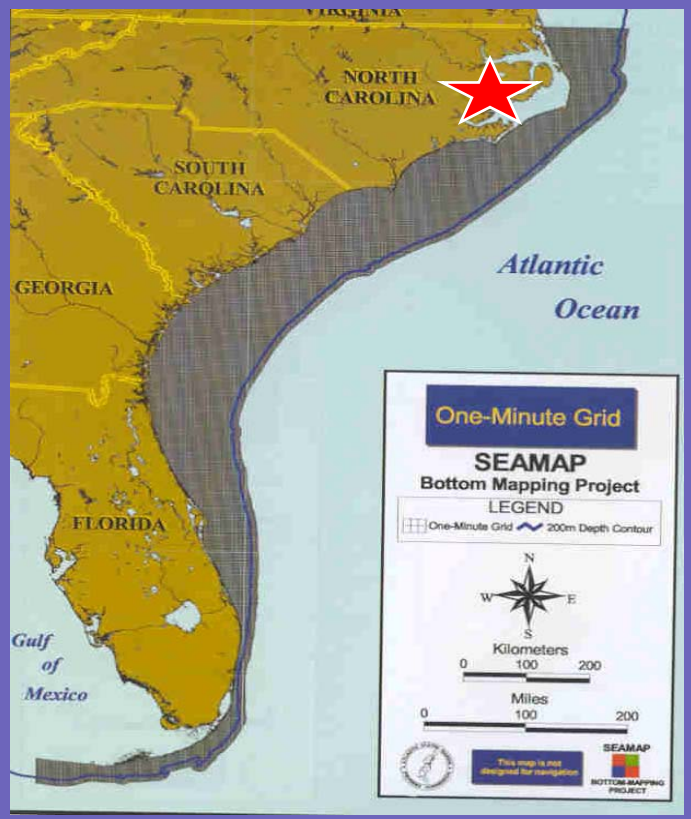
Rader Copy of
Photo in Possession of Frances Inglis

# Essential Habitats for the Entire Atlantic Region




Cool Waters

Source: NRDC




Warm Waters

Source: SAFMC

# The Lowest and the Greatest: Albemarle and Pamlico Sounds

Photo: WRC

Photo: USFWS

Photo: NCDMF

Source:

# Heritage Fisheries: Freshwater Spawners

Striped Bass

Photo: WRC

Shads and Herrings

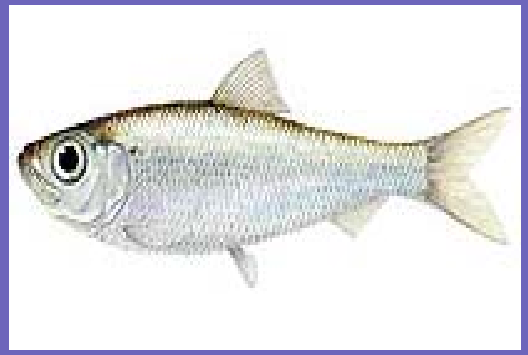


Photo: J.F. Scarola


Photo: Rader

# Brackish Marshes

Primary Nursery Areas

Photo: Nurnberg

Photo: T. R. Lake

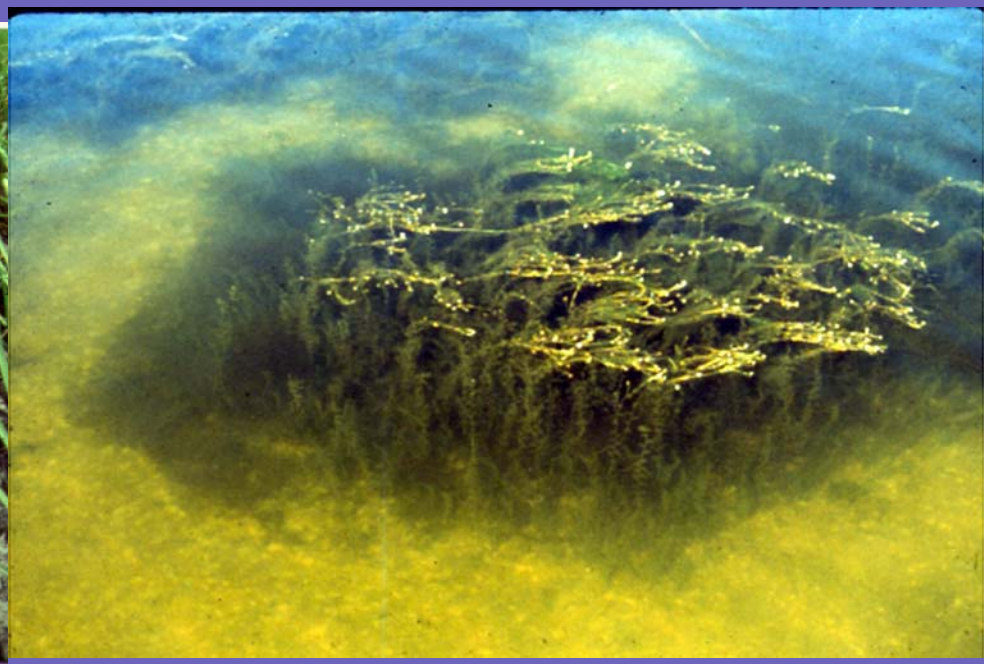
Photo: SCDNR

Photo: SRI

# Saltwater Habitats

Saltmarsh w/Oysters

Photo: Rader



Submersed Plant Bed

Photo: DWQ

# Globally-Important Bottomland Hardwood Swamps

Photo: WRC

Photo: Rader

Photo: Cornell

# Pocosin Peatlands

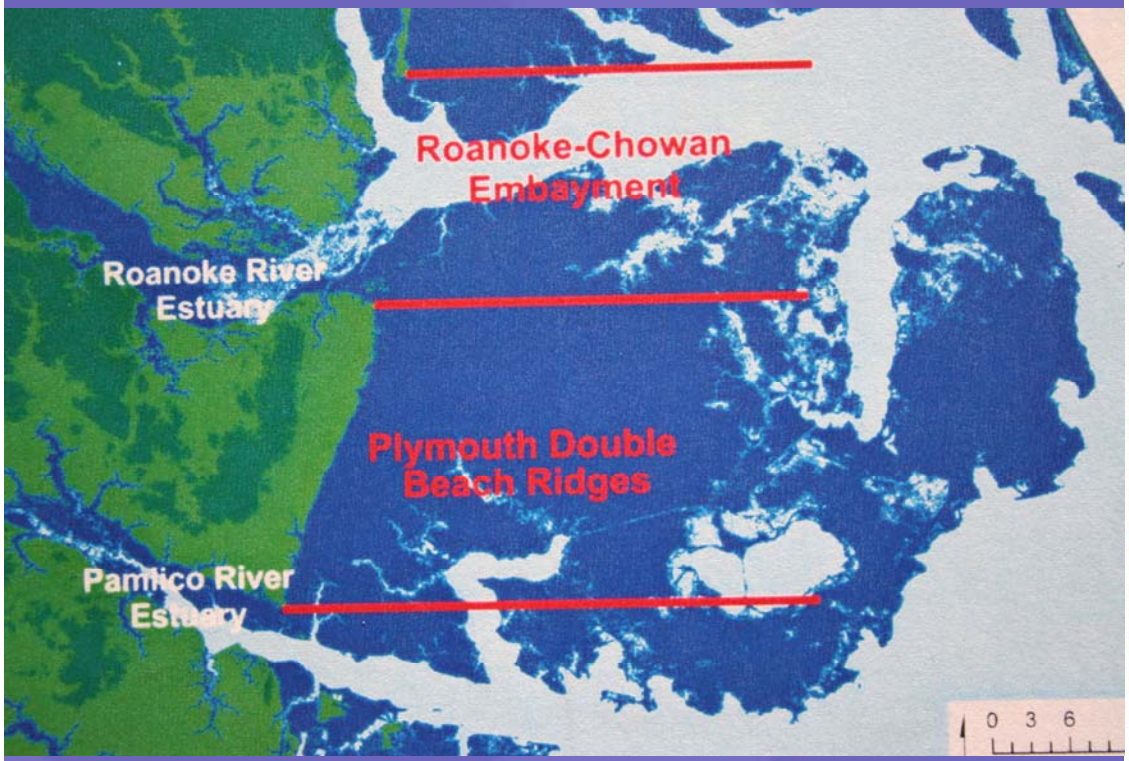

Source: Heath (1975)

Photo: Cabelas

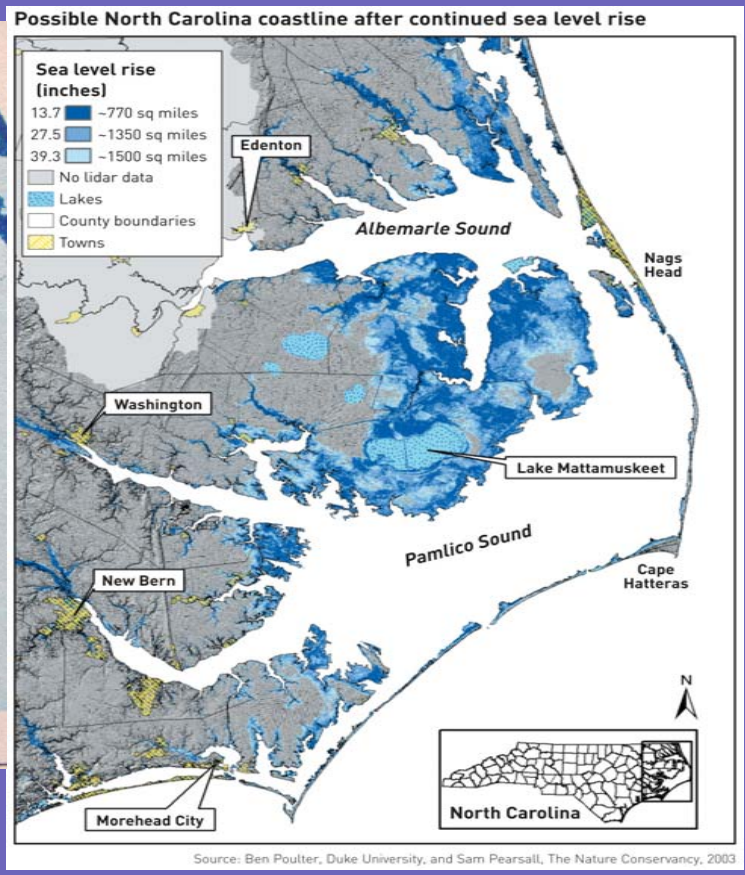
Photo: USFWS

Photo: Northeastern

# Threats: Direct Flooding



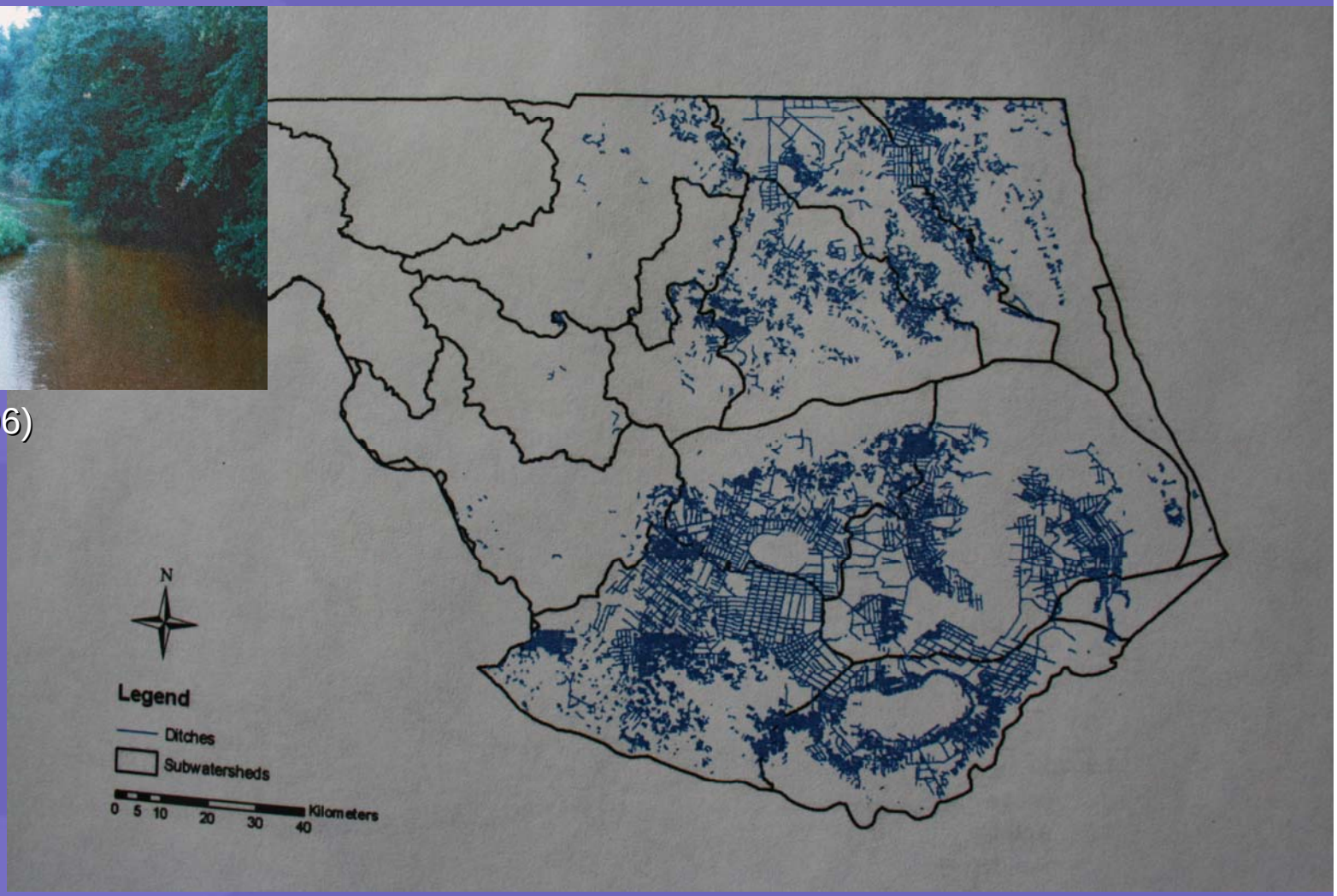

Source: Riggs (2006)




Source: Duke University

# Threat: Dense Drainage

Photo: Riggs (2006)




Source: Lurie (2006)

# Drainage Networks

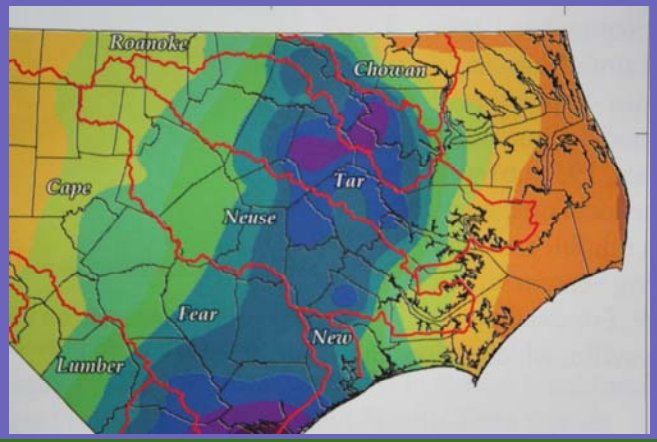
- Oxidation of peats and subsidence
- Alteration of flows
- Salt waters “intrusion”
- Alteration of vegetation and habitat
- Alteration of human uses

# Threat: Hurricanes and Extra-tropical Cyclones

Hurricane Isabel

Photo: NASA

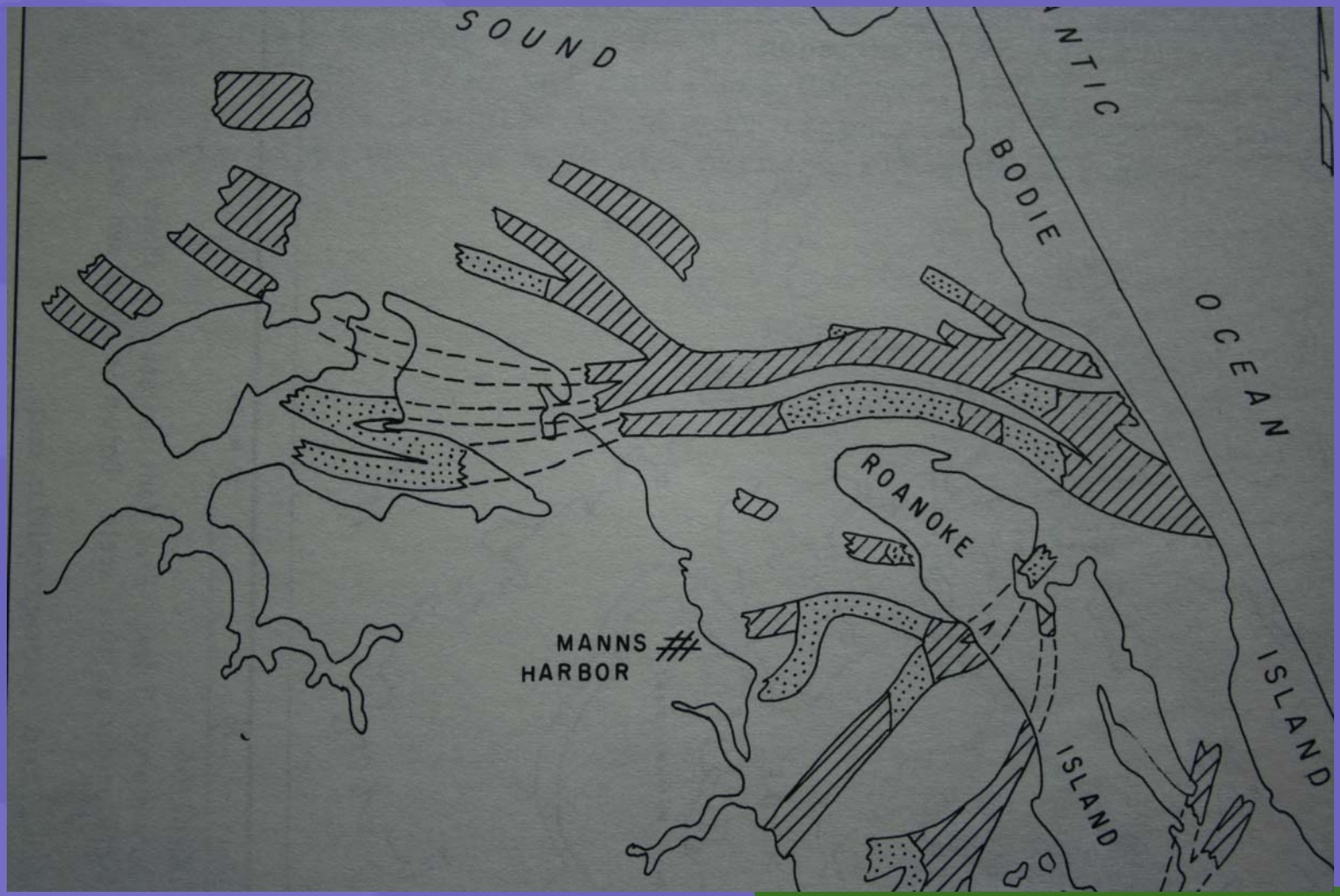

Floyd/Dennis Source: USGS



# Storm Central!

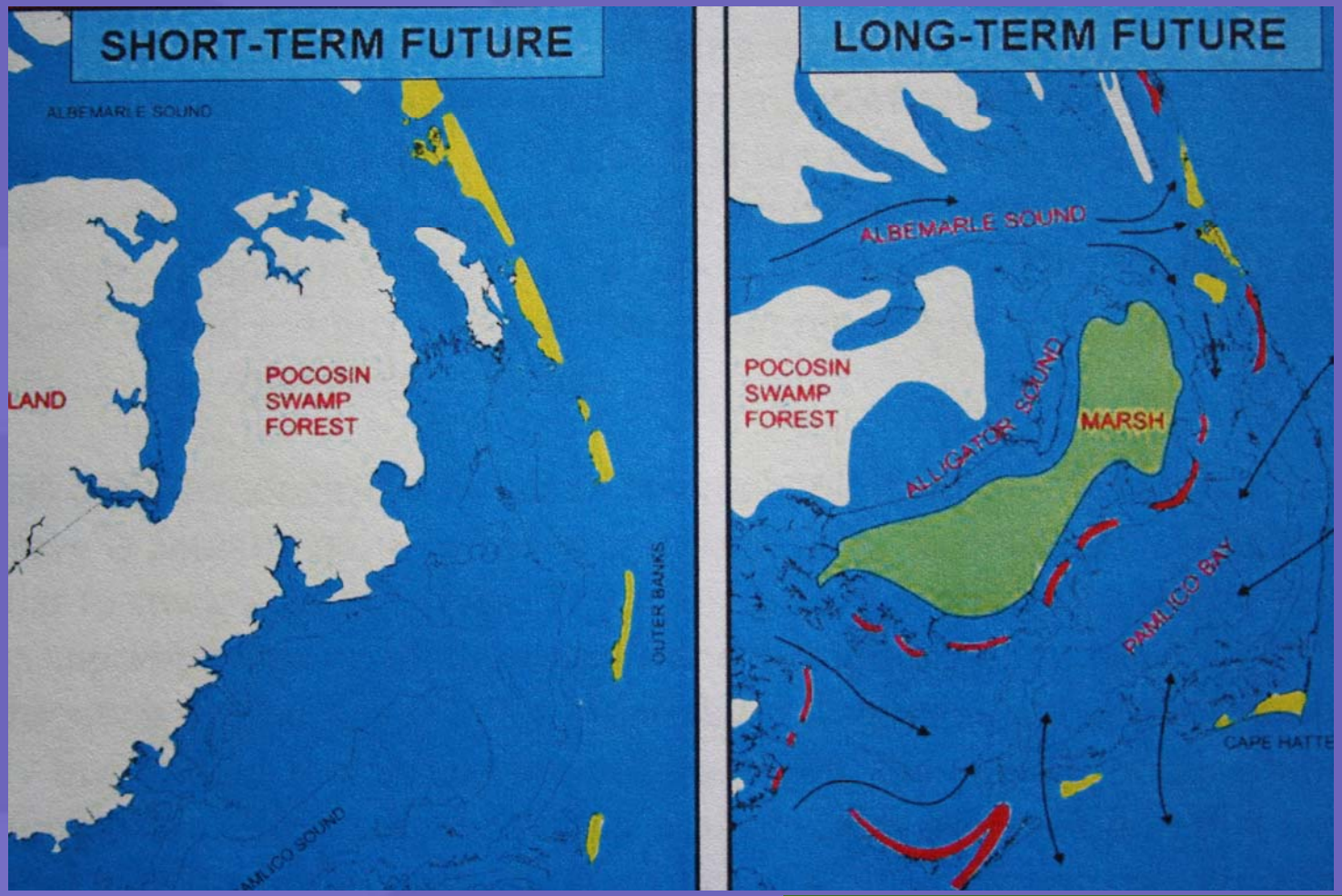

Source: Riggs (2006)

# Old and New Inlets?




Source: Riggs and O'Conner (1974)

# Collapsing Barrier Islands




Source: Riggs (2006)

# Threat: Disruption of Biogeochemical Cycles

Nitrogen

Water

Carbon

Photo: DWQ

## Albemarle Sound?

# Ecological Cascades

- New Inlets
- Altered salinities
- Altered swamps and marshes
- Altered habitat values (e.g. migratory birds, fishes)
- Altered human usage (hunting, fishing, farming, forestry, etc.)

# Threat: Altered Rainfall

- Altered flows (higher peaks, lower averages)
- Altered water availability (human and ecosystem needs)
- Altered assimilative capacity (wastes)
- Competition for water and waste assimilation!!!!

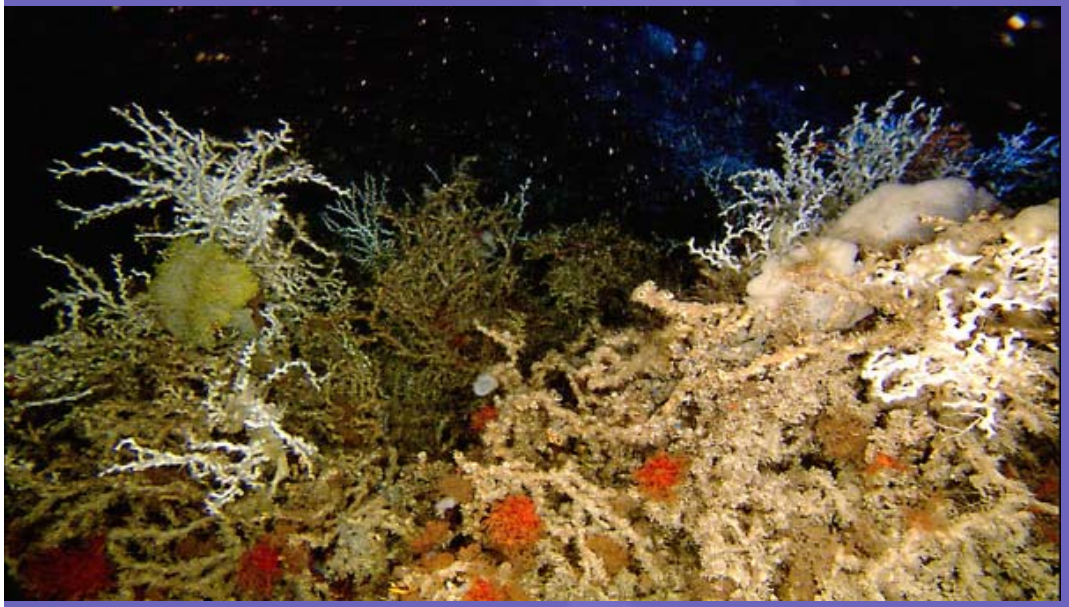
# Threat: Changing Temperatures

- Altered vegetation (forests, crops and natural communities)
- Altered fisheries
- Human health???

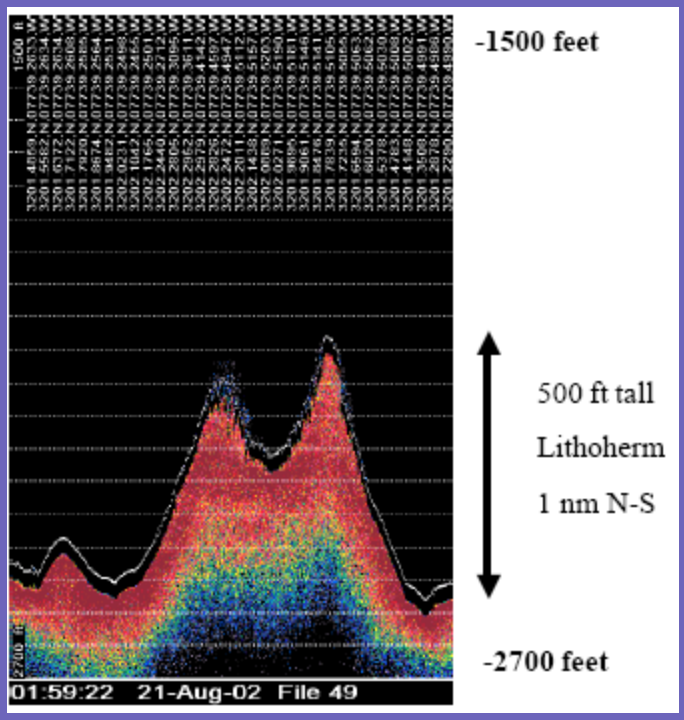

Gray triggerfish

Photo: Florida NH Museum

# Deepwater Coral Reefs!?



Images: NOAA Ocean Exploration, UNCW



# Threat: Invasive Species??

*photo by Paula Whitfield (NOAA Beaufort Laboratory)*

Pacific Red Lionfish

# Recommendations

- NC Climate Action Plan
- Leverage ALL existing environmental plans:
  - Coastal Habitat Protection Plan
  - A/P Comprehensive Conservation and Management Plan
  - State Wildlife Action
  - South Atlantic Fishery Ecosystem Plan
  - Basinwide Management Plans
  - State Beach and Inlet Management Plan
  - State Water Plan
  - State Ocean Plan?

# Recommendations (2)

- Flow targets for all rivers (remove or “reoperate” dams)
- Map and remediate drainage systems and drainage districts
- Prohibit new public and publicly licensed or permitted infrastructure in flood-prone and storm-surge-prone areas

# Recommendations (3)

- Remediate existing vulnerable or damaging infrastructure as storms occur ("strategic opportunism")
- "Balance" biogeochemical cycles
- Utilize existing and develop new markets for carbon, nitrogen, water and habitat
- Leverage current state investments (e.g. CWMTF)

# Recommendations (4)

- Protect and restore oyster reefs and SAVs as energy absorbing structures
- Facilitate shoreline retreat and upslope wetland migration (sand, bulkheads, etc.)
- Invest in research and monitoring (e.g. water levels monitors, invasive species)
- Address inevitable “publicization” of newly submerged lands; ease that transition (e.g. rolling easements?)

ENVIRONMENTAL DEFENSE

Photo: ED

Photo: Rader

CLIMATE CHANGE COMMISSION