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COASTAL OCEAN RESEARCH AND MONITORING PROGRAM



Physics to Fish: Using Coastal Observations to Identify Ecosystem Conditions, Responses and Linkages

Coastal Ocean Research and Monitoring Program

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Funded by the National Oceanic and
Atmospheric Administration



NC STATE UNIVERSITY

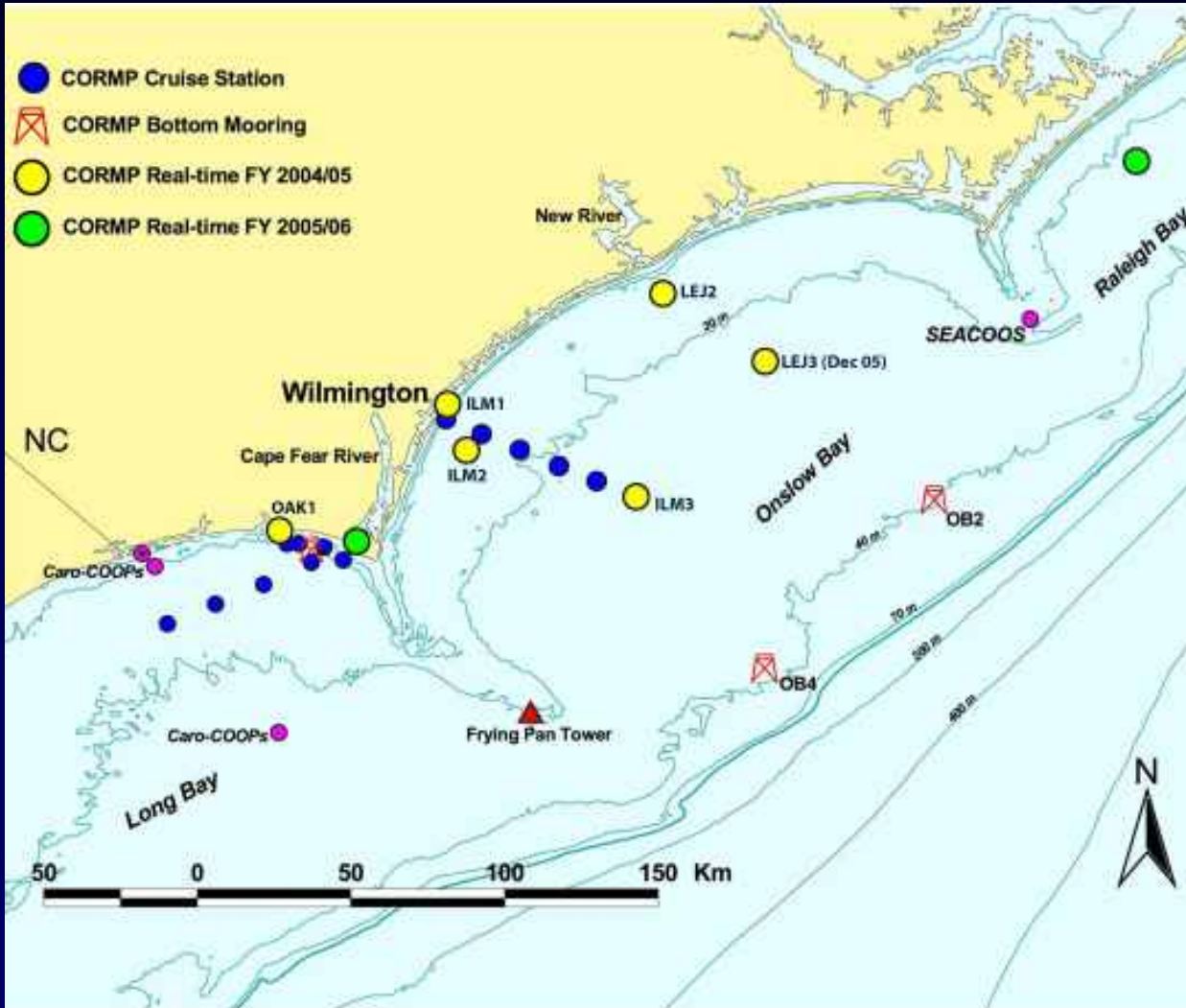


- Since 2000, UNCW has conducted a sustained, long-term program of coastal ocean observations and research off North Carolina.
- Initiated as an interdisciplinary marine science research program. Evolved into a comprehensive coastal ocean observing system in support of the national IOOS initiative
- Partnership with USC, NCSU and NOAA-NWS





OBSERVING NETWORK



- Fixed moorings:
 - Real time
 - Non-real time
- Cruise stations:
 - Bi-monthly sampling
- AUV surveys
- Trawls
 - Monthly in key seasons



Offshore Fixed Moorings



2 - NDBC Design

- Weather Observations
- Current speed & direction
- Turbidity
- Water temperature
- Salinity
- Fluorescence
- NDBC buoys also transmit standard wave data



- Buoy transmit data via satellite
- 2 - NC State Design

WWW.CORMP.ORG



Pier-Based Observing Network

- Instruments deployed and hard-wired to local fishing piers.
- Transmit real-time marine weather and oceanographic data.
 - waves (height, direction, frequency)
 - currents
 - bottom temperature
 - salinity
 - water level (tide)
 - Slots still available for additional sensors!



Wave data used by NWS for rip current forecasts and models



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CORMP Station - ILM2
Last update: 2005/09/12 11:00 AM EDT
Wind from NE(45 deg) at 23.7 kts
Wind Gust: 24.9 kts
Air Temperature: 77.0 F
Air Pressure: 1012.7 mb
Relative Humidity: 86%
Bottom Temperature: 78.4 F





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Bi-monthly, Monthly, and other Sampling Cruises

Water Quality

(Turbidity, Nutrients, etc.)

Physical parameters

(Temp, Salinity & Currents)

Sea floor characteristics

Bioptical measurements

Primary productivity

Secondary productivity and

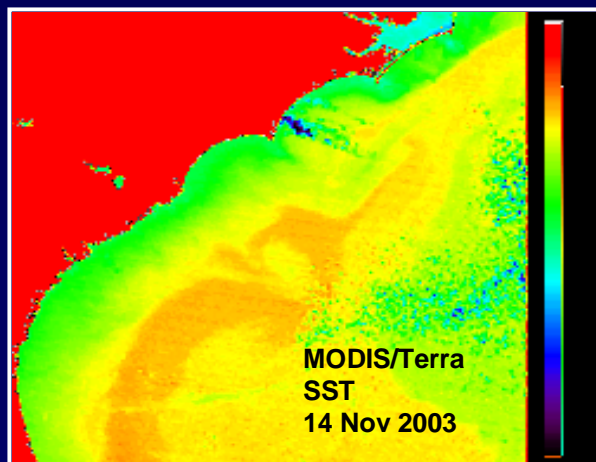
Fisheries





Other Observing Efforts

Diver
Ops



Satellite
Imagery

Pelagia Autonomous Glider



1st deployment Sept 2005

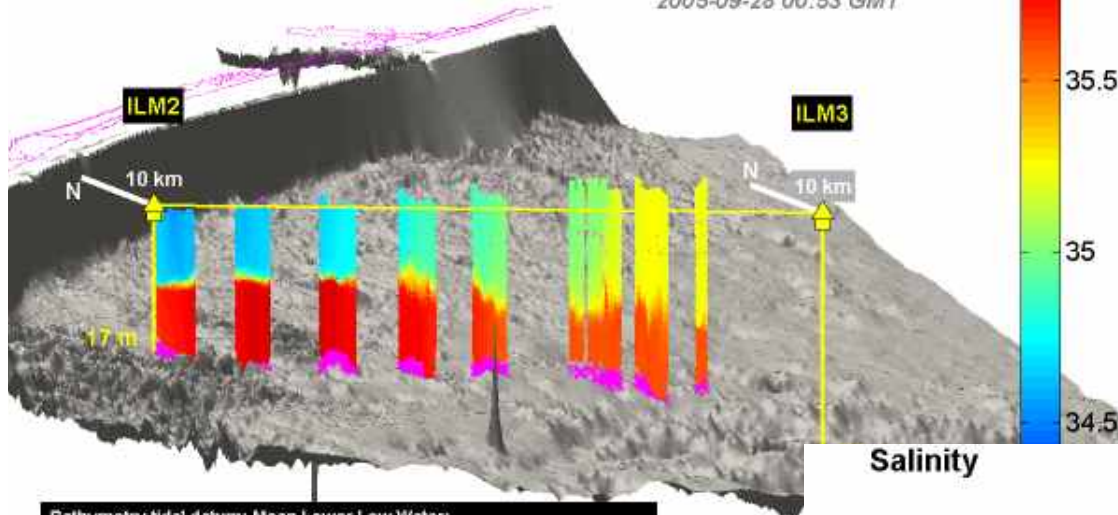
Preparing to dive

The glider is pre-programmed with a course to follow and can be deployed for up to 30 days. Transmits data to the lab by satellite every 4 hours

Salinity

(PSU)

2005-09-26 15:32 -
2005-09-28 00:53 GMT



Bathymetry tidal datum: Mean Lower Low Water;
bathymetric surface shifted down 2 m for clarity
X = glider-measured water depth (not downshifted,
measured throughout ~1.5 m tidal cycles)

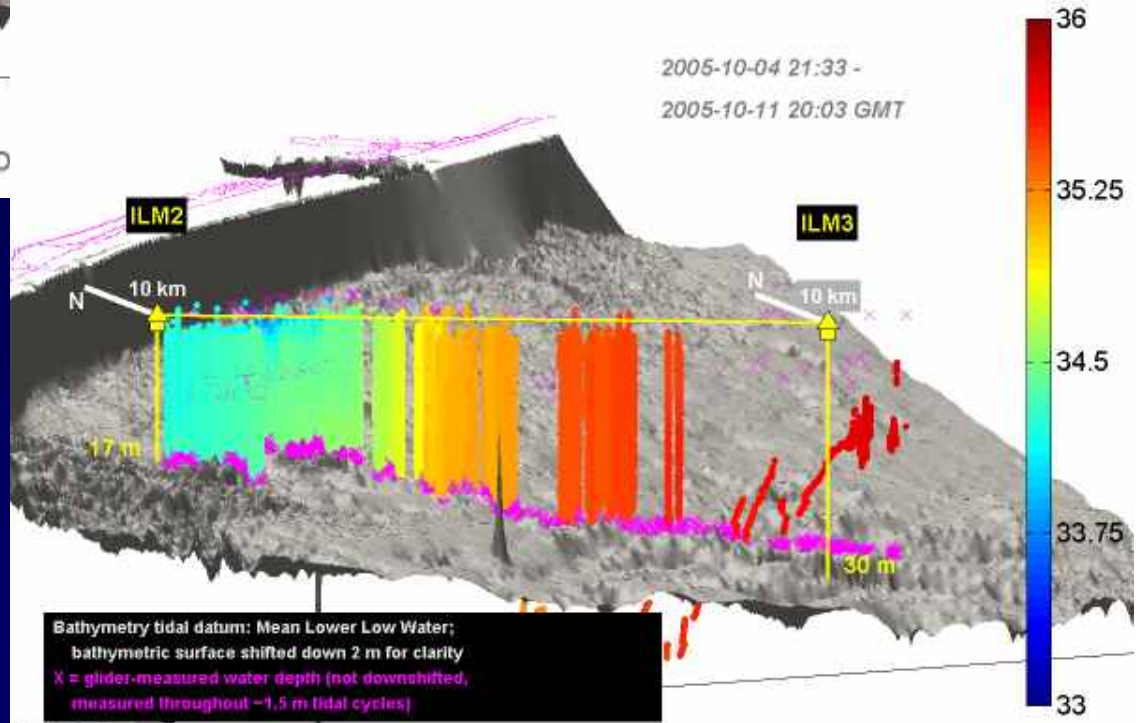
<http://CORMP.org>

UNCW-CMS & NO

Salinity

(PSU)

2005-10-04 21:33 -
2005-10-11 20:03 GMT



Bathymetry tidal datum: Mean Lower Low Water;
bathymetric surface shifted down 2 m for clarity
X = glider-measured water depth (not downshifted,
measured throughout ~1.5 m tidal cycles)

<http://CORMP.org>

UNCW-CMS & NOAA-NURC



COASTAL OCEAN RESEARCH AND MONITORING PROGRAM

Research Initiatives Supported by Observing Network

- Identify key ecosystem components supporting fisheries and identify key fisheries habitats
- Identify how water quality of the Cape Fear River plume impacts fisheries ecosystems
- Improve our understanding of storm impacts from the coastline to the continental shelf
- Develop numerical and ecological models for predicting storm surge and supporting fisheries management in the Cape Fear Region, respectively



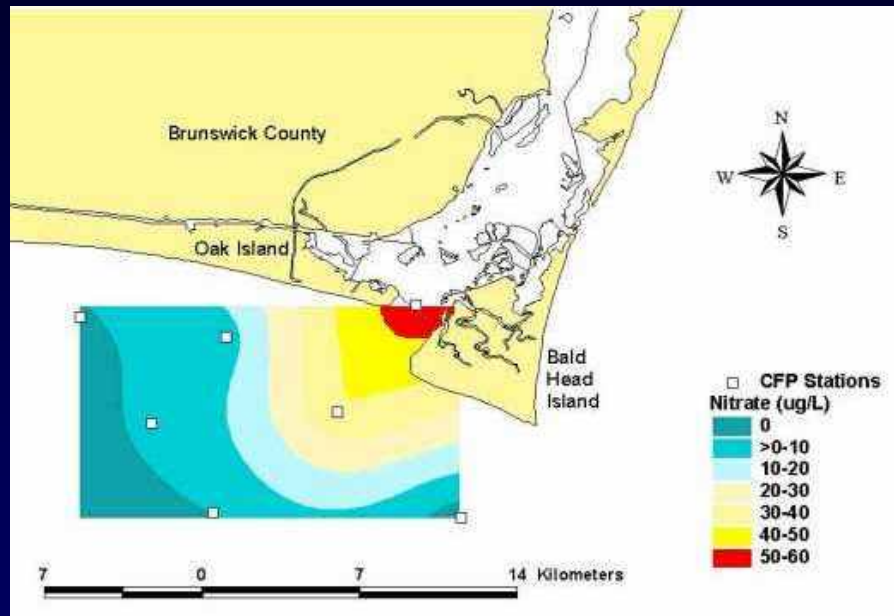
Role of the CFR Plume on Ecosystem Dynamics and Selected Fisheries



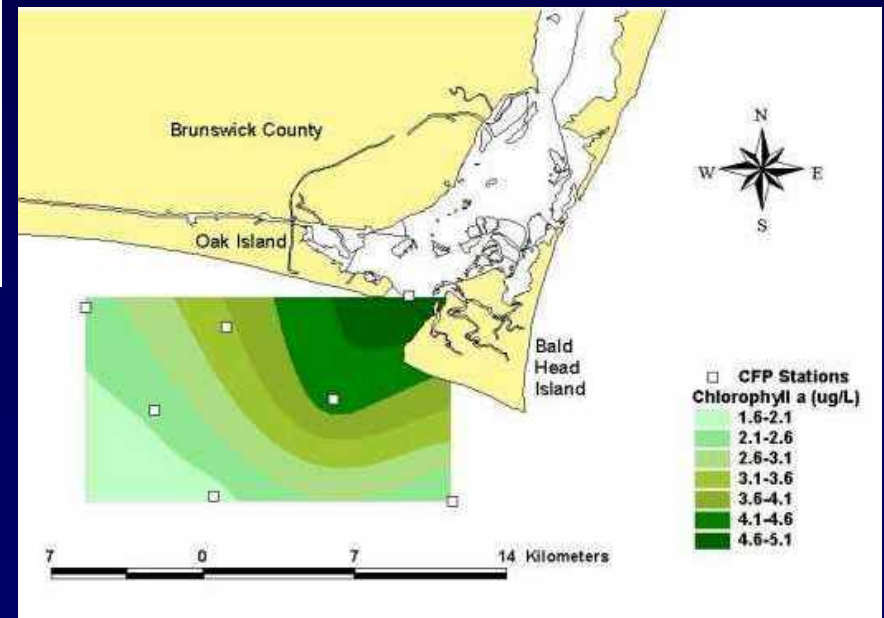
CFR provides:

- Exemplary location for examining estuary/coastal connections
- May provide unique habitat with detrital and nutrient inputs (thereby enhancing both detrital based and planktonic food chains)
- May serve as estuary extension and spawning/nursery area

Linkages: WQ & 1° Productivity



Nutrient and chlorophyll concentrations in the plume > stations outside the plume



Plume & non-plume stations in Long Bay have 4-8x the chlorophyll as Onslow Bay stations



Plume vs Non-Plume 1^o Production

- Nutrients are more abundant in plume, but less light reaches the bottom than in Onslow Bay
- In Onslow Bay, sufficient light for photosynthesis reaches the bottom up to 40 km offshore
- So, primary producers are more abundant in the water column in the plume and on the bottom in Onslow Bay.
- We hypothesize that this distribution of food resources affects ecosystem dynamics



Benthic fauna

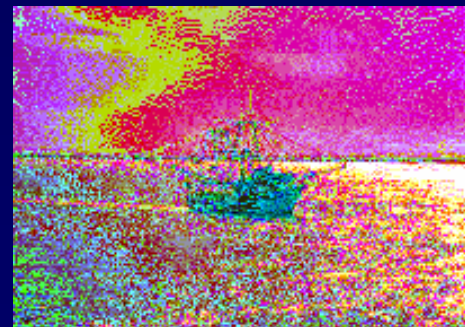
- Benthic Resources

- Higher diversity than estuary or coastal ocean
- Dominated by a mix of offshore and estuary species
- Larger size/individual than coastal ocean
- Higher biomass than estuary or coastal ocean



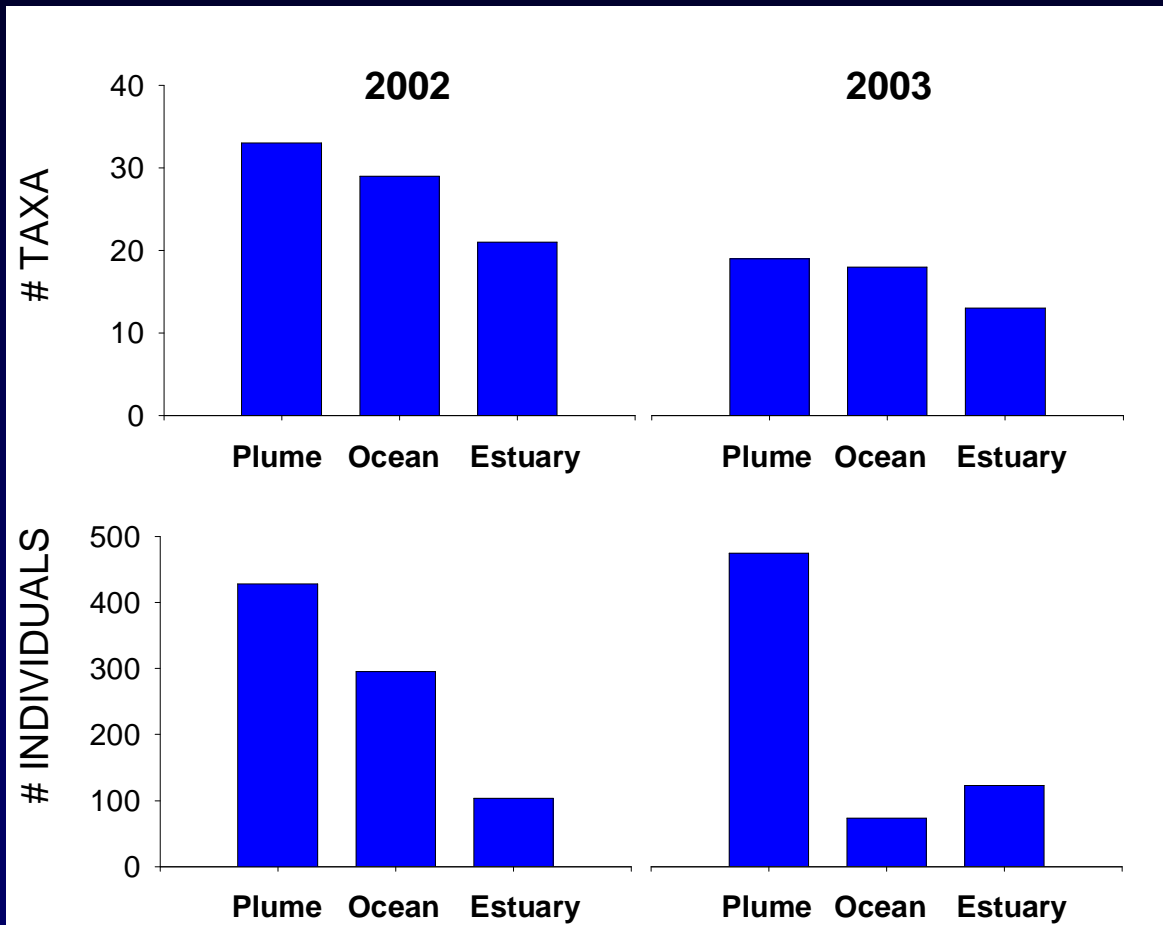
- Plume directly used by benthic fisheries species:

- Juvenile blue crab habitat
- Blue crab spawning area
- Shrimp abundances





Fish Species Diversity & Abundance vs. Habitat



Diversity of larval/juvenile fish species is greater in plume than in ocean or estuary

Larval /juvenile fish abundance also greater in the plume than in ocean or estuary

Size/individual is greater in the plume (not shown here)



Data Applications

- NC Div. of Marine Fisheries (NCDMF):
 - Uses plume abundance data to open and close the shrimp fishery
 - Utilizes abundance data in revisions of the NC blue crab management plan
- CORMP data are used to refine SE Atlantic bluefish stock assessments

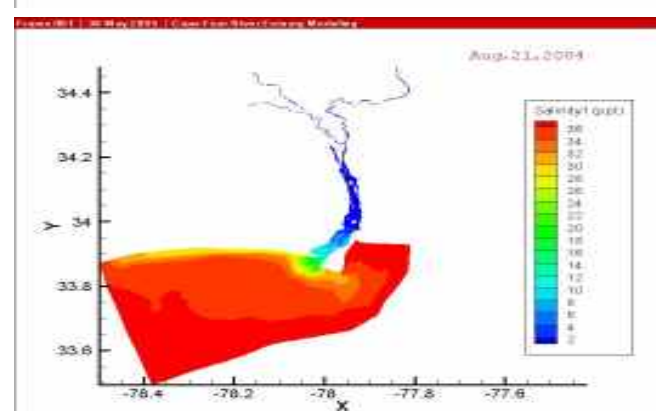
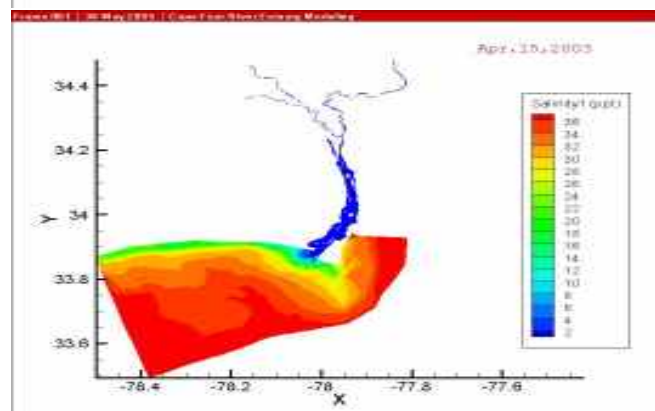
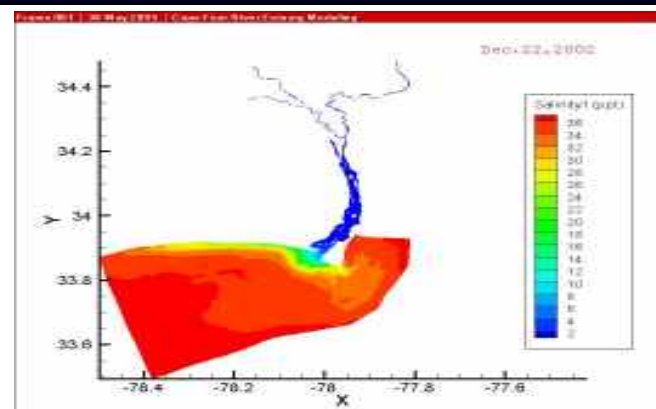
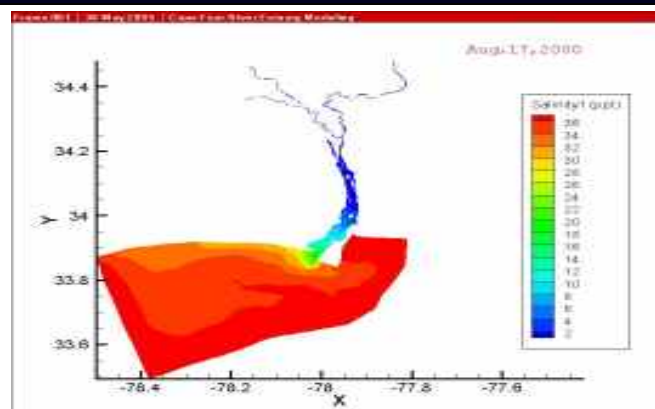
<u>Top Commercial Fisheries</u>	<u>2001 Landings (million dollars)</u>	<u>Plume-impacted</u>
Blue crab	32.0	***
Shrimps	11.9	***
Southern flounder	5.6	***
Atlantic menhaden	4.6	***
Summer flounder	4.4	***
Atlantic croaker	3.1	***
King mackerel	1.3	
Swordfish	1.3	
Spot	1.3	***
Mullets	1.2	***
Vermillion snapper	1.2	
Bluefish	1.1	***
Oysters	1.1	
Seabasses	1.1	
Weakfish	1.0	***
		(\$72,000,000)



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NCSU Cape Fear River Estuary Ecological Model
Built on numerical hydrodynamic model
CORMP Data available for other modeling partnerships!



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Thank-you!



NC STATE UNIVERSITY



US Army Corps
of Engineers
Wilmington District



North Carolina
Department of Environment
and Natural Resources



MARINES
THE FEW. THE PROUD.

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