2021 Coastal Habitat Protection Plan: Priority Habitat Issue – Habitat Monitoring to Assess Status, Trends, and Regulatory Effectiveness

DEPARTMENT OF ENVIRONMENTAL QUALITY

CHPP Steering Committee | Casey Knight | January 21, 2021

Coastal Habitat Protection Plan

Legislative Goal

"…the long-term enhancement of coastal fisheries associated with coastal habitats."

Water Column

Submerged Aquatic Vegetation

Shell Bottom

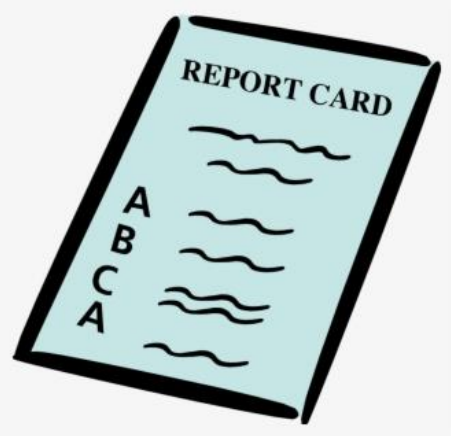
Wetlands

Hard Bottom

Soft Bottom

Habitat Monitoring to Assess Status, Trends, and Regulatory Effectiveness

Habitat Monitoring ➡ repeated recording of the condition of habitats to detect or measure deviations from a predetermined standard, target state or previous status (Hellawell 1991)



Status ➡ a state of affairs; condition; position; importance; standing; rank

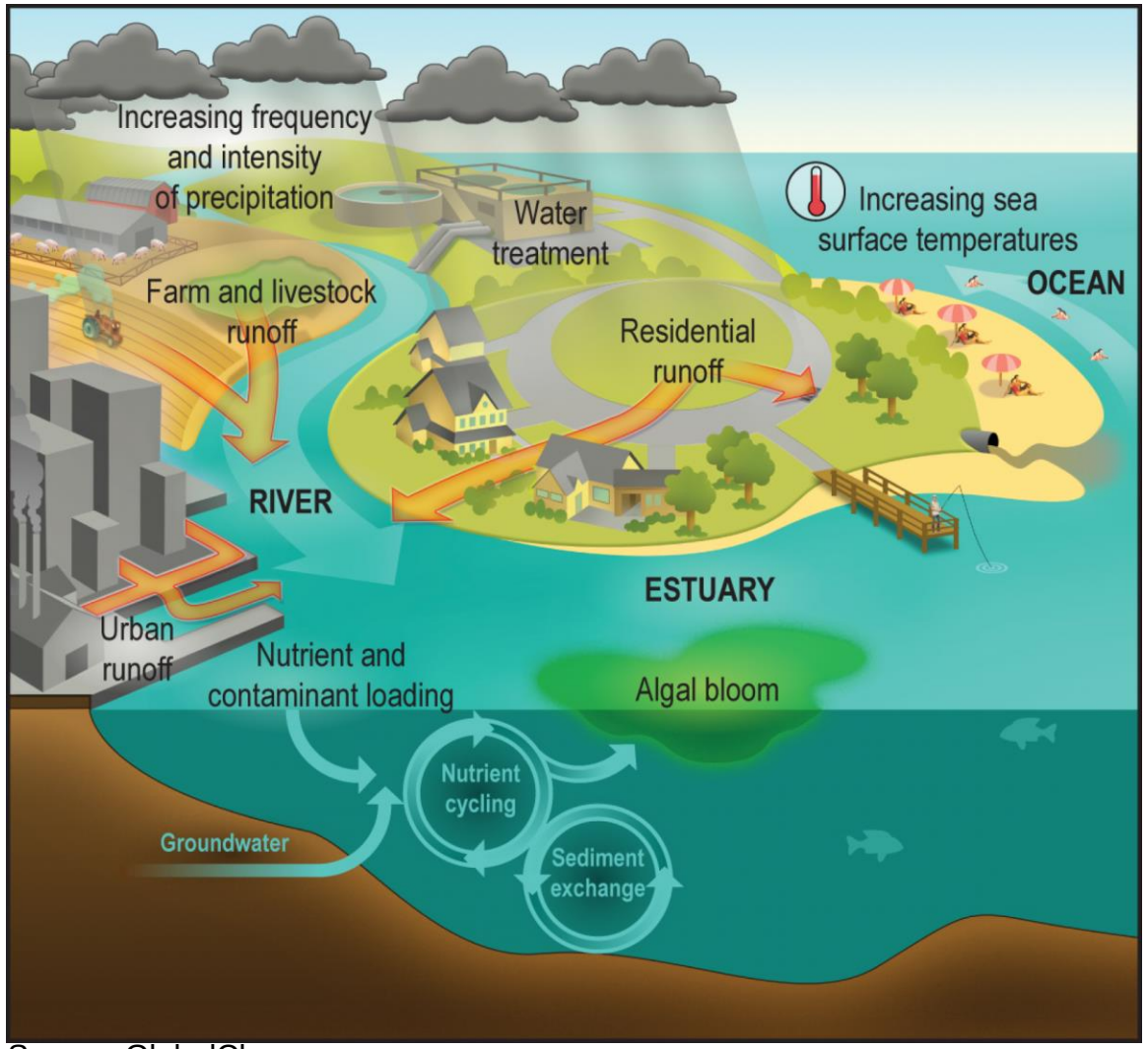
Trends ➡ general tendencies, a prevailing direction

Water Column – Water Quality

Dissolved Oxygen

Temperature

pH



Source: GlobalChange.org

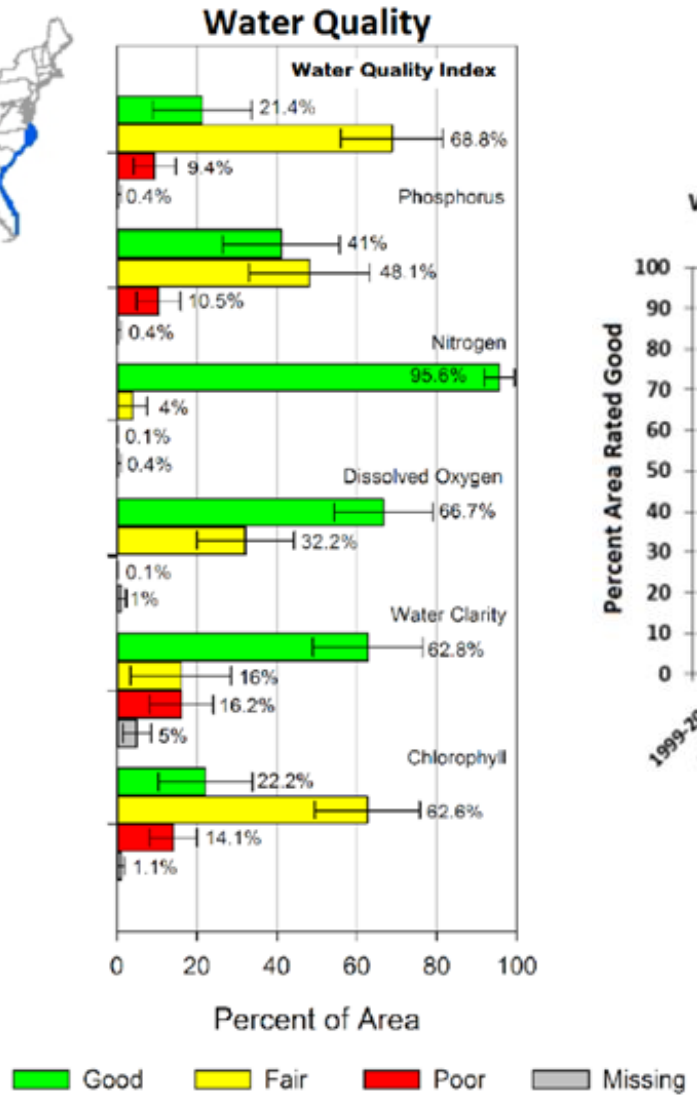
Turbidity

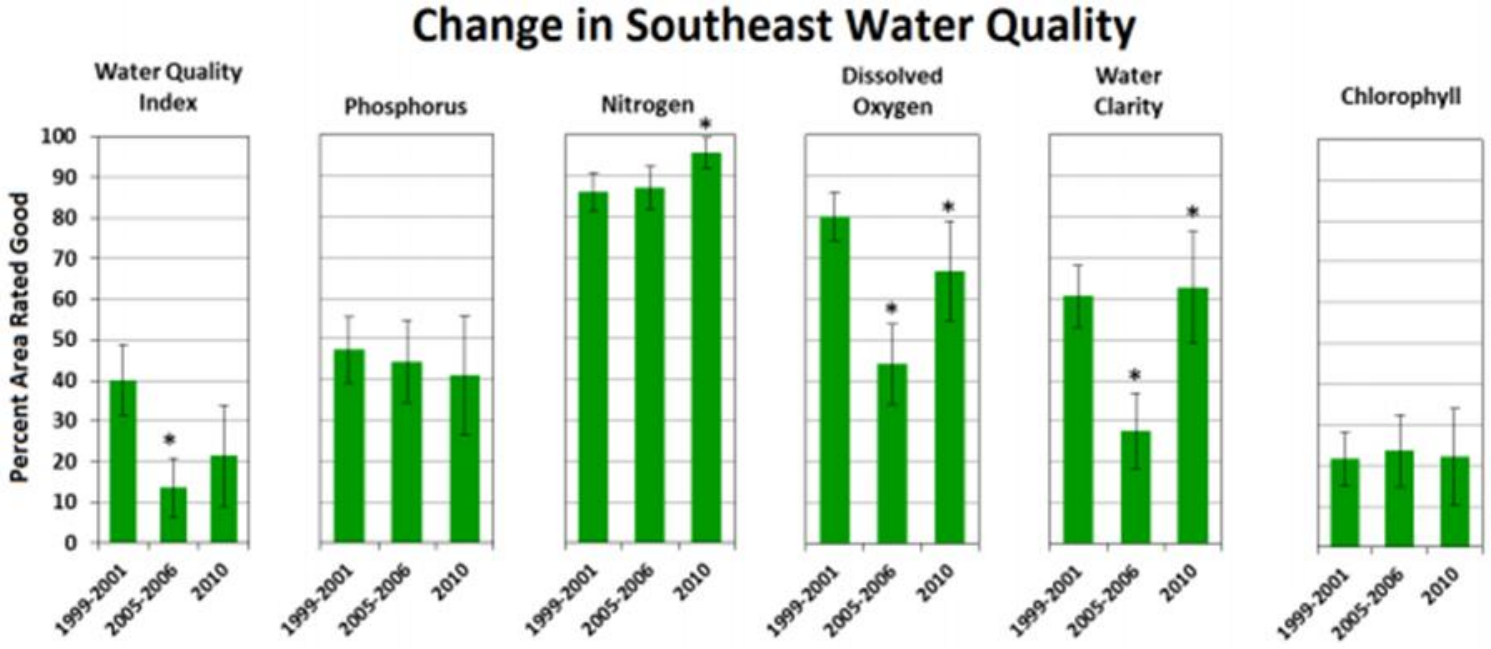
Nutrients (N, P, Chl *a*)

Bacteria

NORTH CAROLINA Department of Environmental Quality

Water Quality – National Coastal Condition Assessment 2010



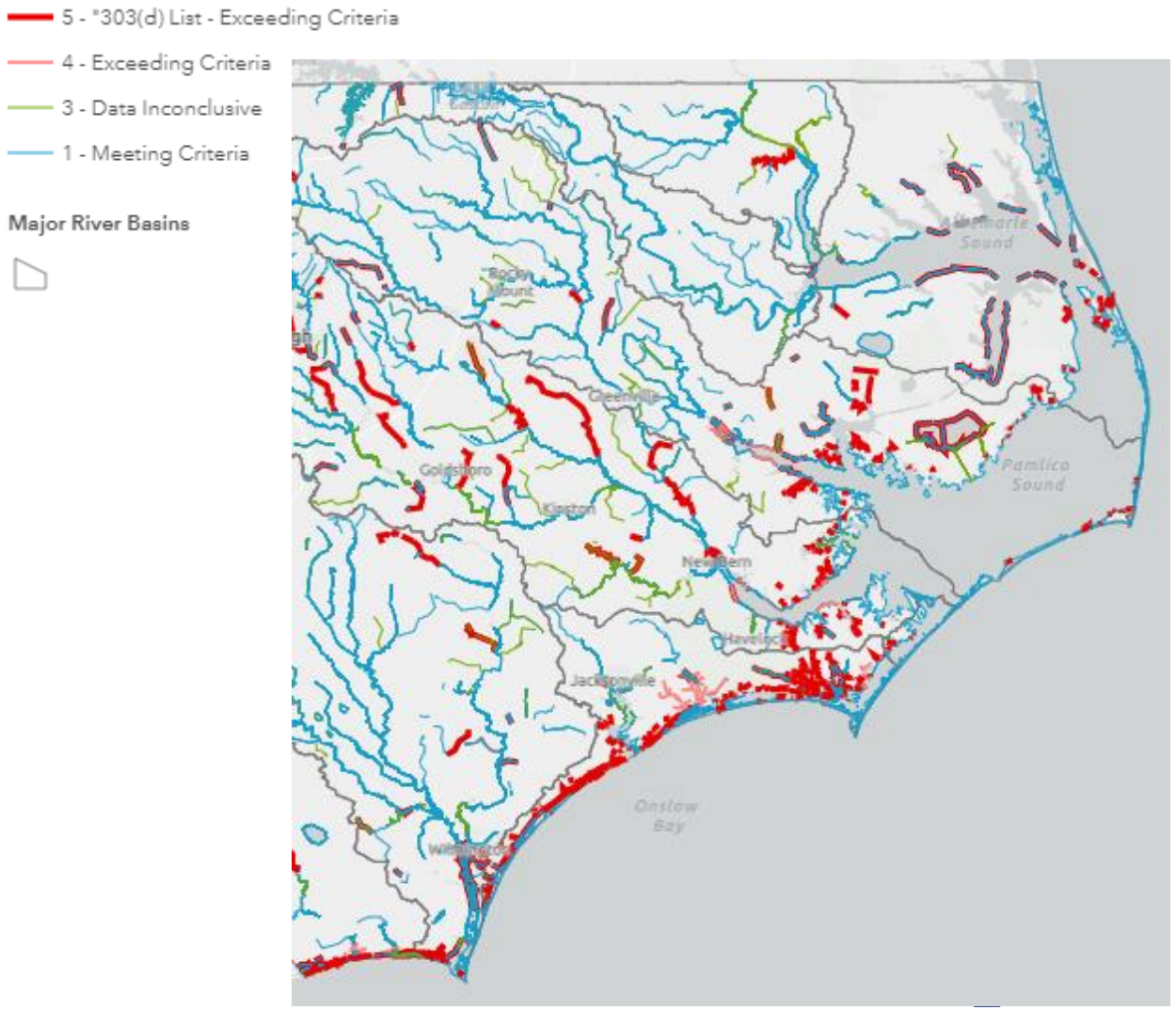


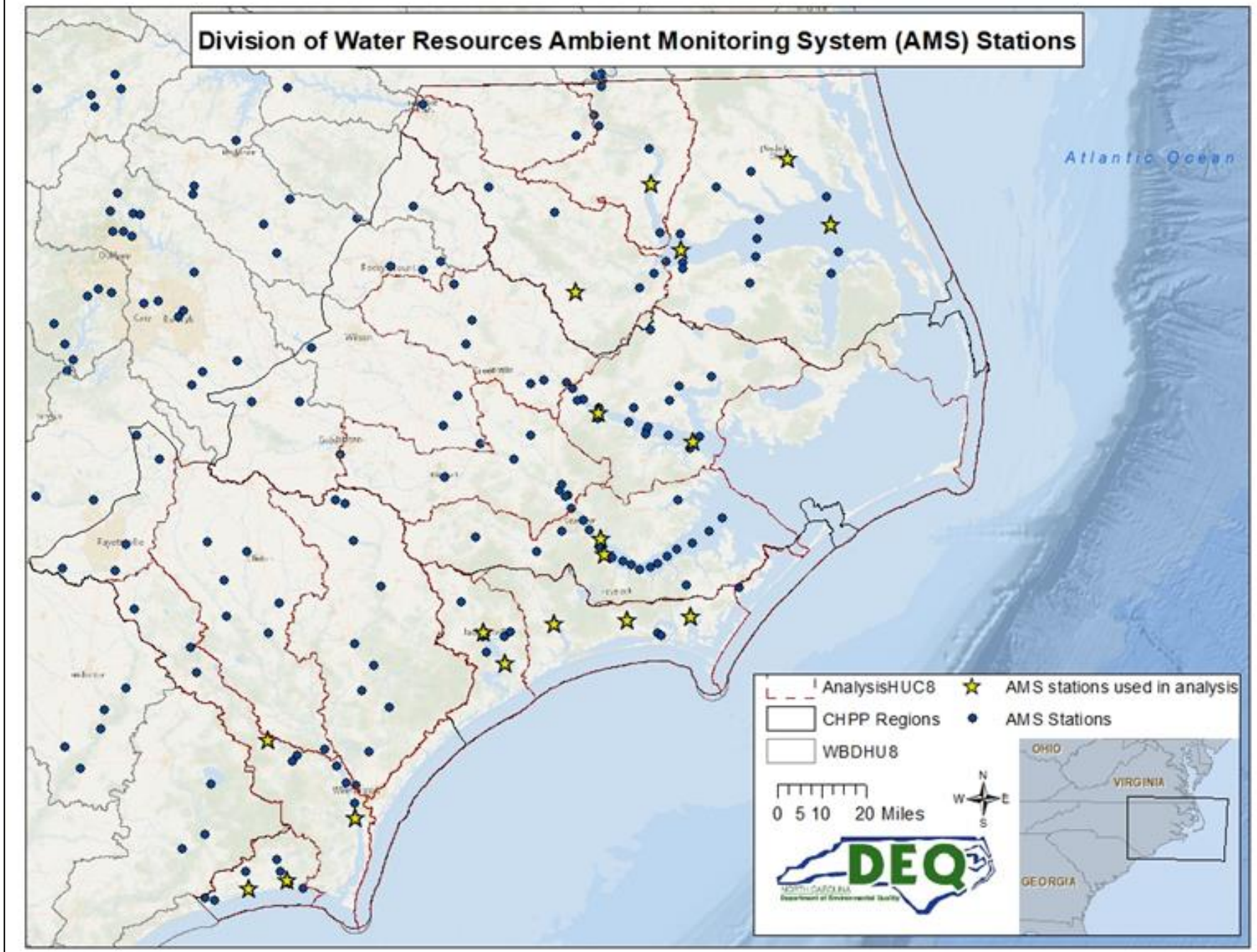
Source: USEPA 2015

Division of Water Resources
Draft 2020 Integrated Report

Impaired Waters within the CHPP regions:

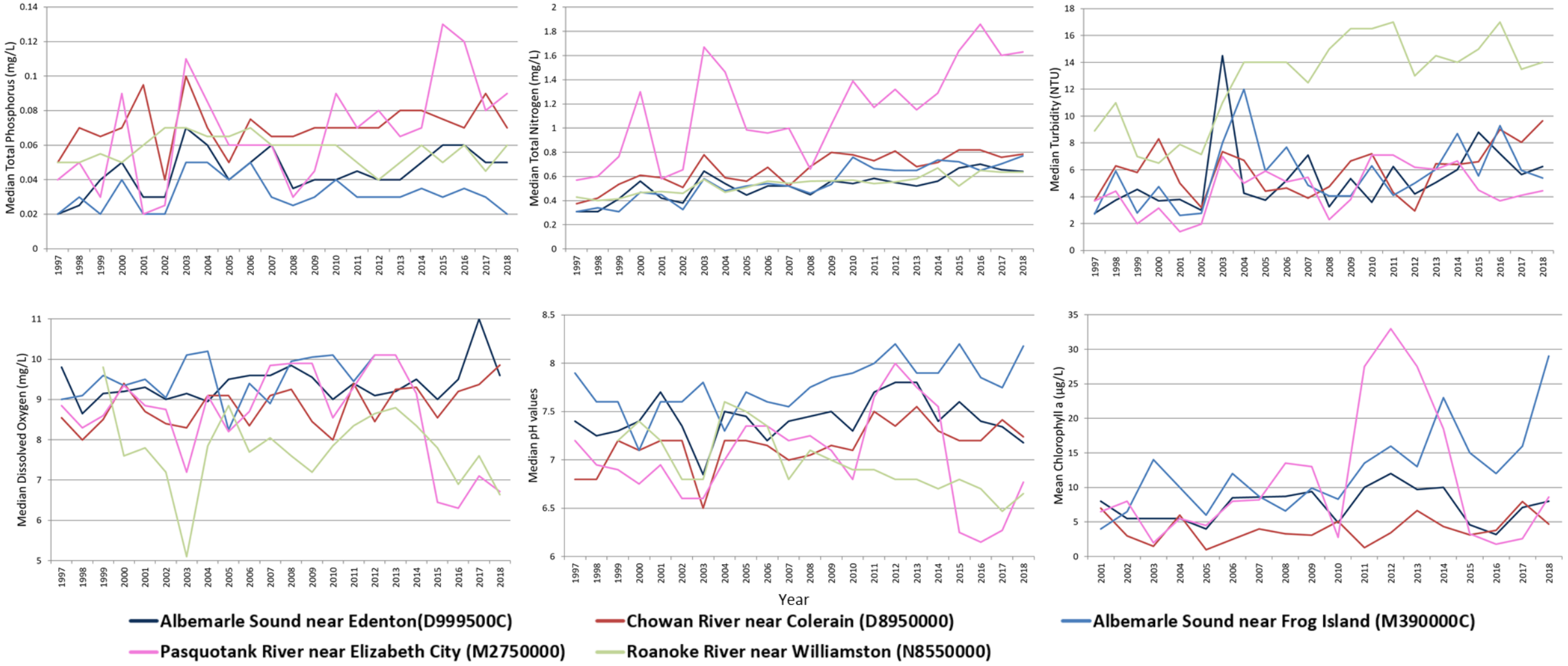
- 18,455 freshwater acres (39%)
- 493 freshwater miles (13%)
- 630,001 saltwater acres (20%)
- 16 Atlantic coast (4%)




Division of Water Resources Ambient Monitoring System (AMS) Stations
Atlantic Ocean
AnalysisHUC8
CHPP Regions
WBDHU8
AMS stations used in analysis
AMS Stations
0 5 10 20 Miles
N
W
E
S
DEQ
OHIO
VIRGINIA
GEORGIA

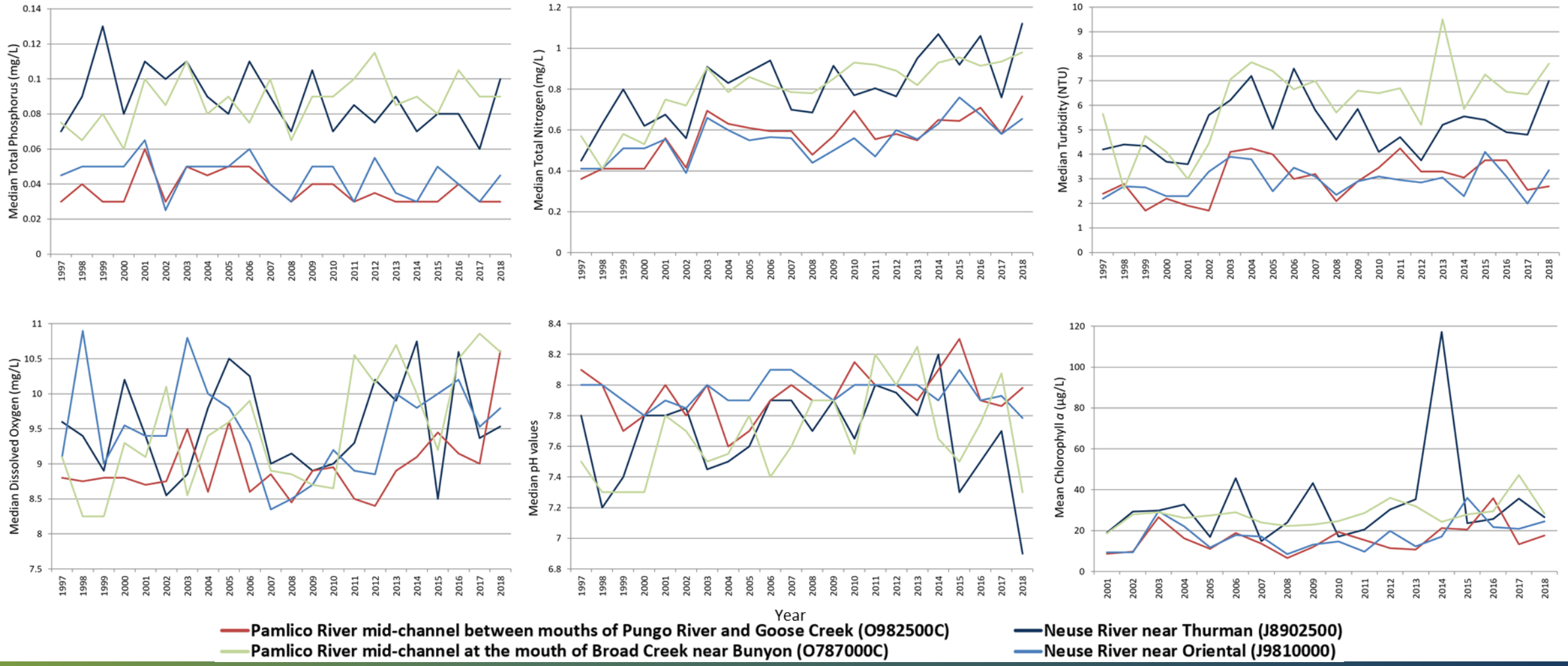
Division of Water Resources – Ambient Monitoring System Trends

CHPP Region 1 Water Quality Parameters



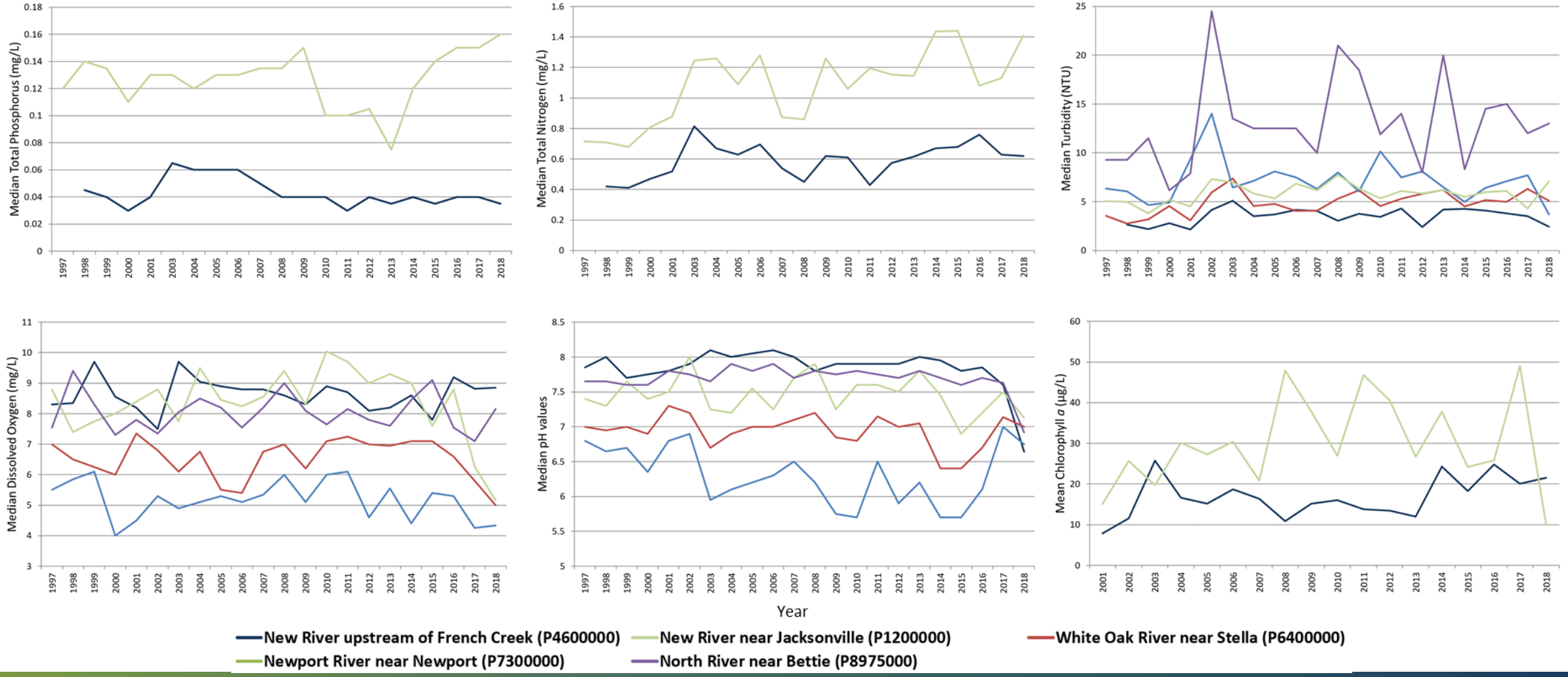
Division of Water Resources – Ambient Monitoring System Trends

CHPP Region 2 Water Quality Parameters



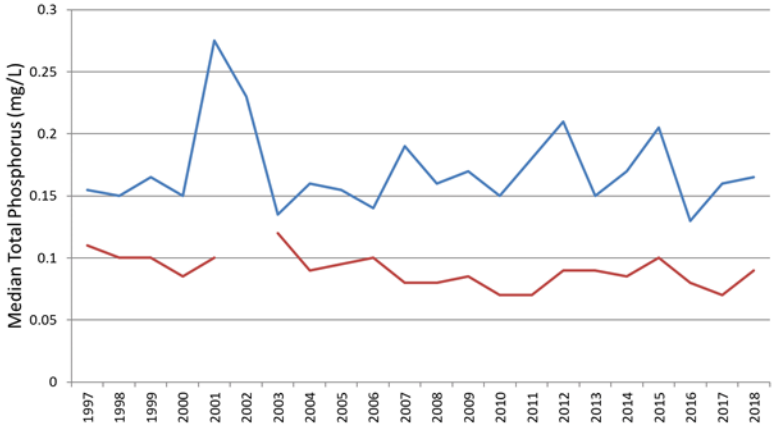
Division of Water Resources – Ambient Monitoring System Trends

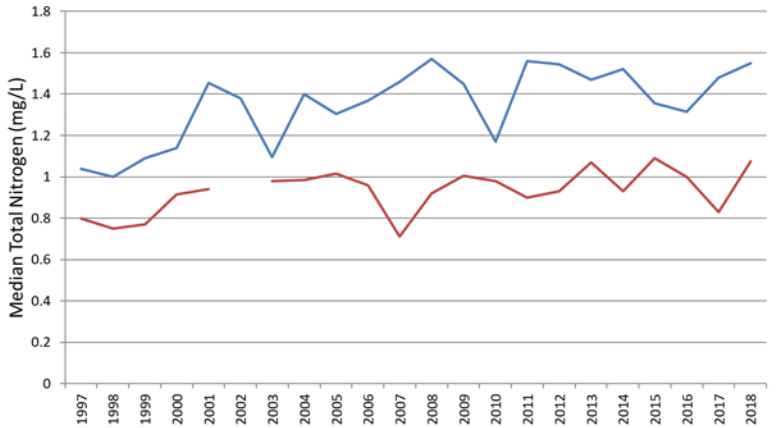
CHPP Region 3 Water Quality Parameters

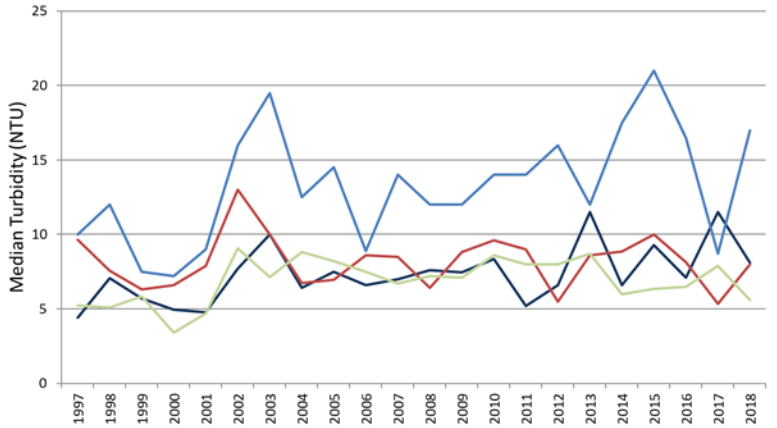


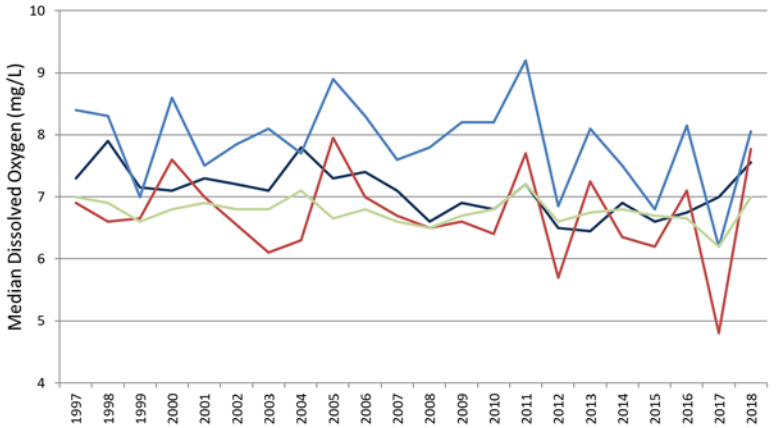
Division of Water Resources – Ambient Monitoring System Trends

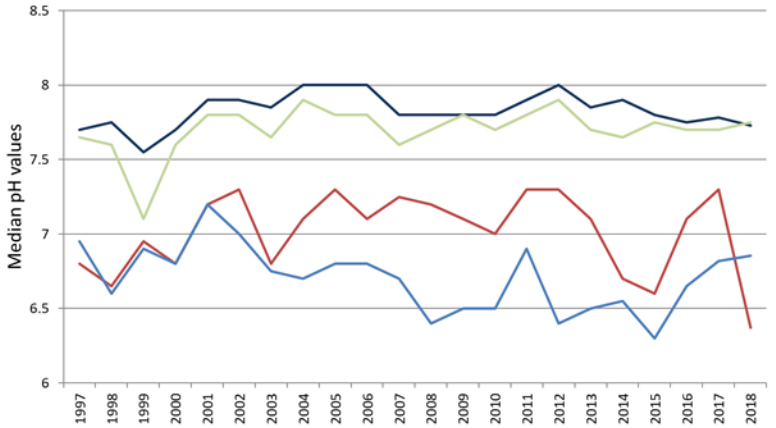
CHPP Region 4 Water Quality Parameters







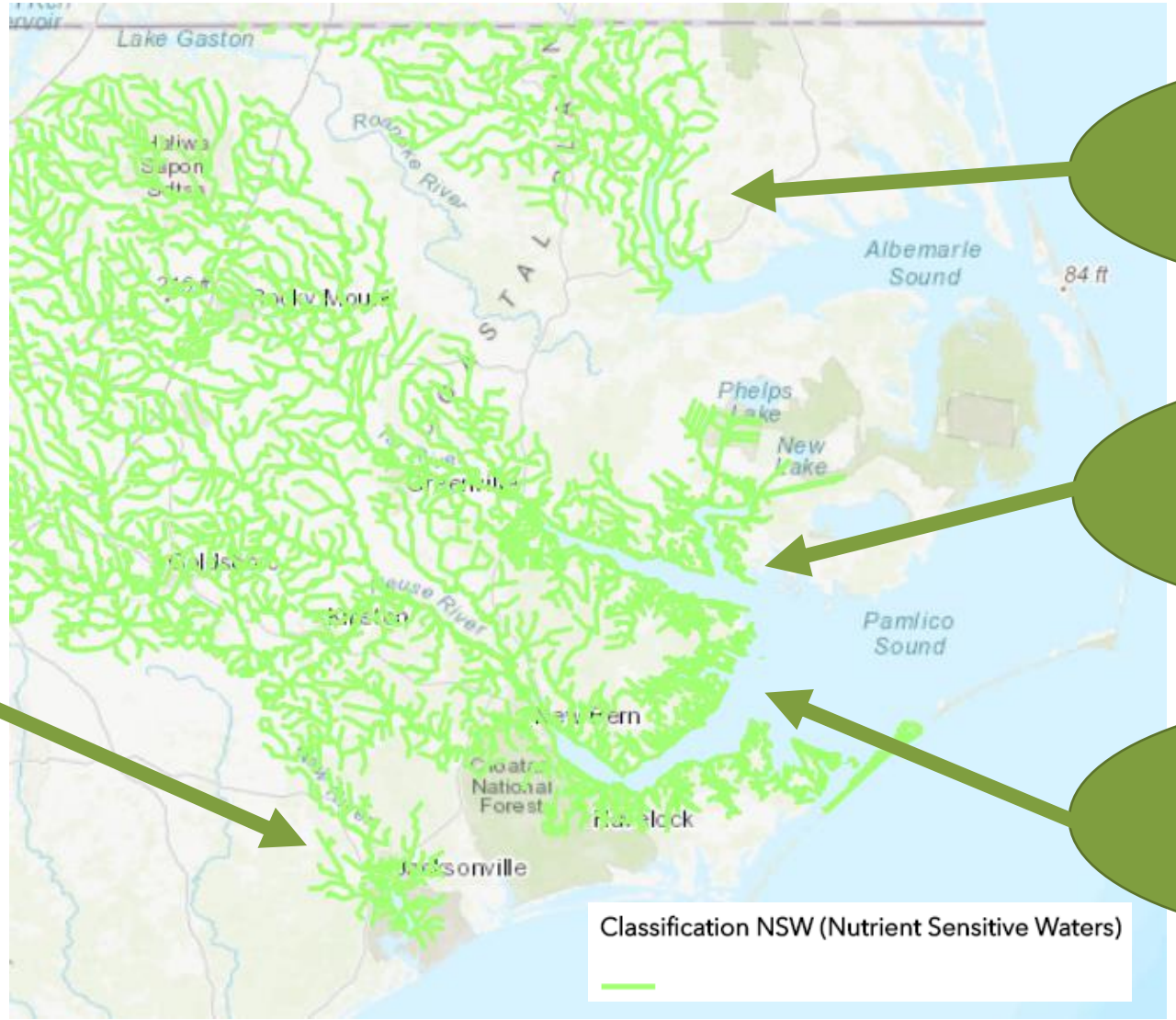




Year

Shallotte River near Shallotte (I9820000)
Cape Fear River near Wilmington (B9820000)
Cape Fear River near Kelly (B8350000, below lock and dam #1)
Lockwood Folly near Varnum (I9440000)

Division of Water Resources – Nutrient Sensitive Waters



Chowan River Basin

Tar-Pamlico River Basin

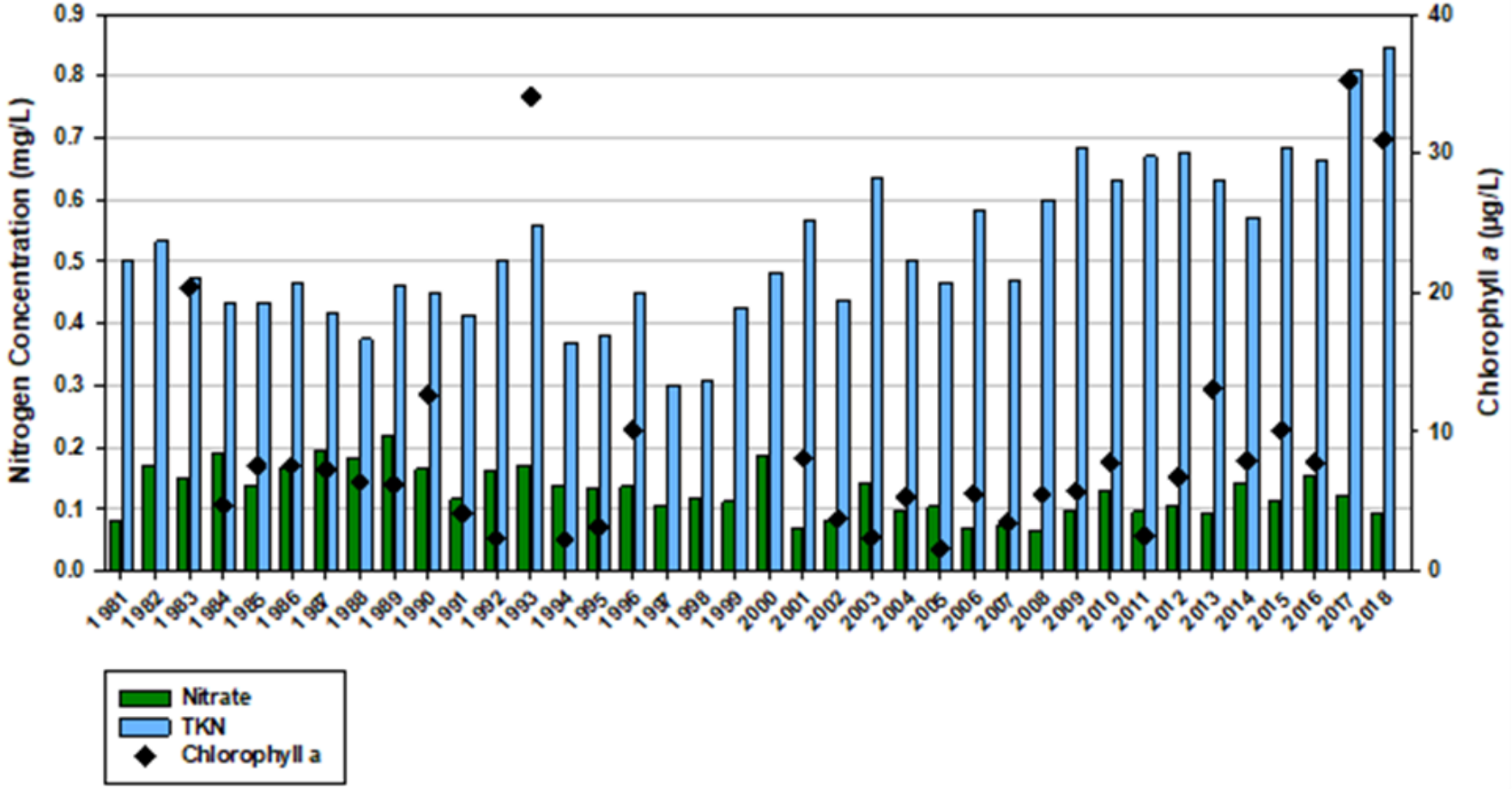
New River

Neuse River Basin

Division of Water Resources – Nutrient Sensitive Waters

Chowan River Basin

Chowan River near Colerain

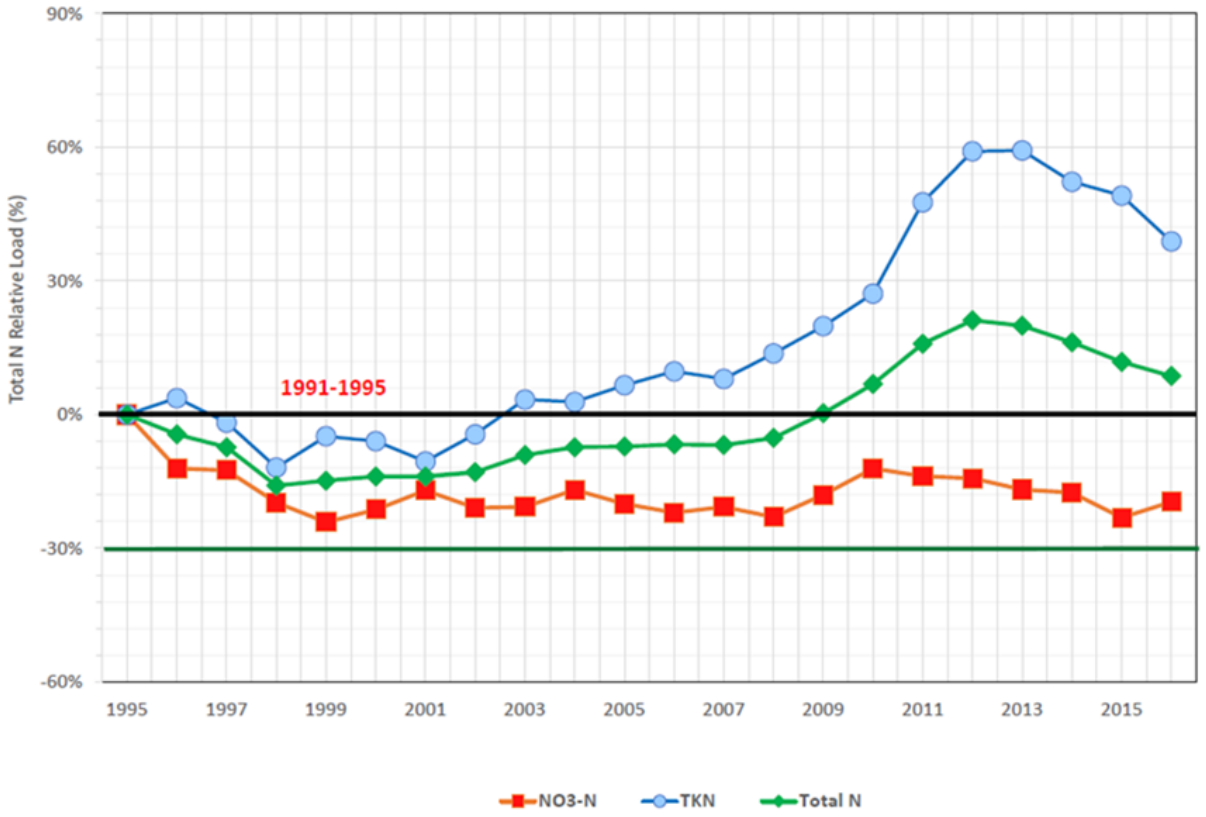


Annual mean total Kjeldahl Nitrogen, Nitrate, and Chlorophyll *a* concentrations

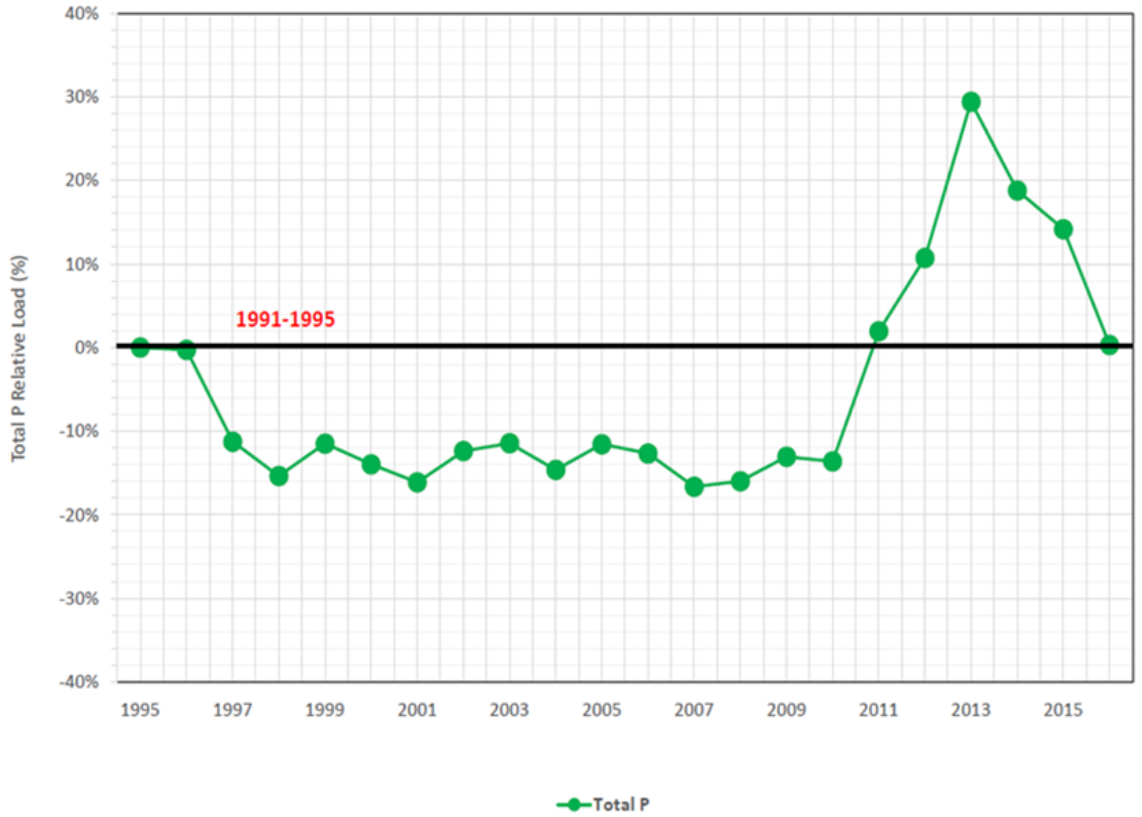
Division of Water Resources – Nutrient Sensitive Waters

Tar-Pamlico River Basin

Tar River at Grimesland
(% Change vs. 1991-1995)



Flow-Normalized Nitrogen Loads

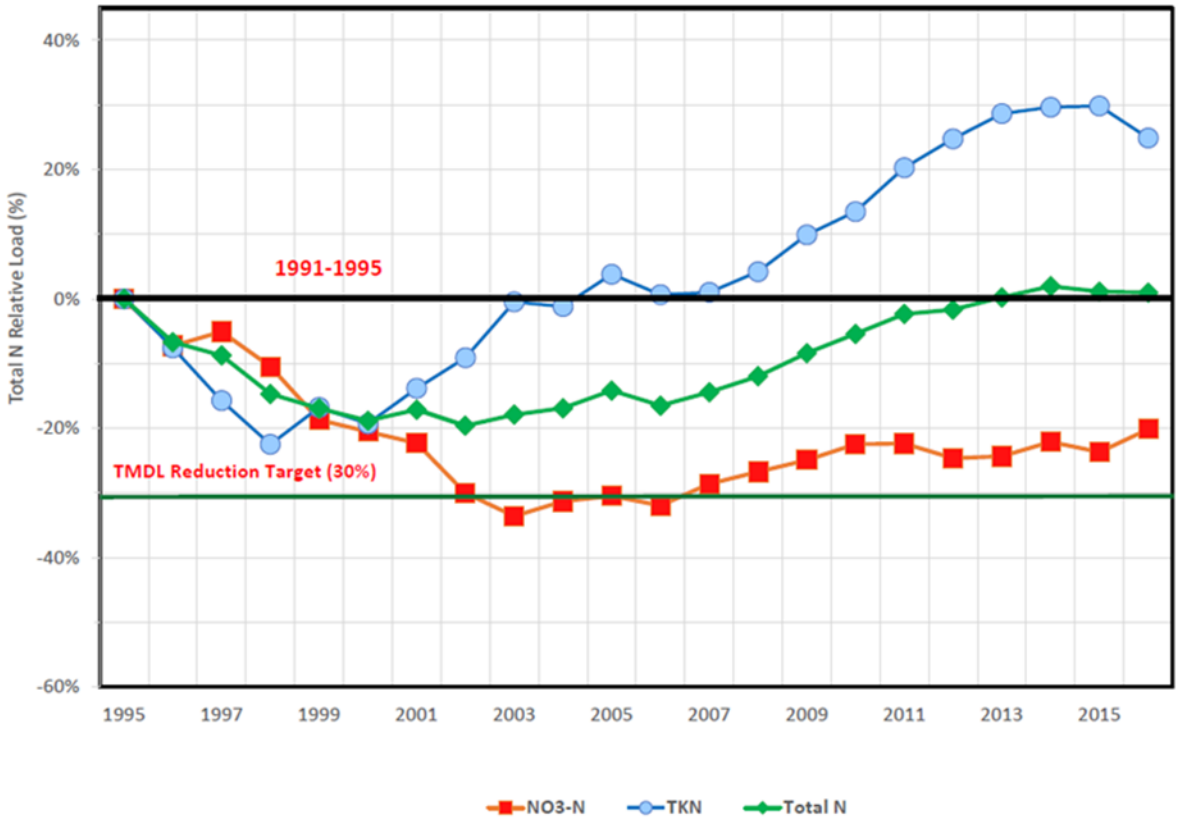


Flow-Normalized Total Phosphorus Loads

Division of Water Resources – Nutrient Sensitive Waters

Neuse River Basin

Neuse River at Fort Barnwell
(% Change vs. 1991-1995)

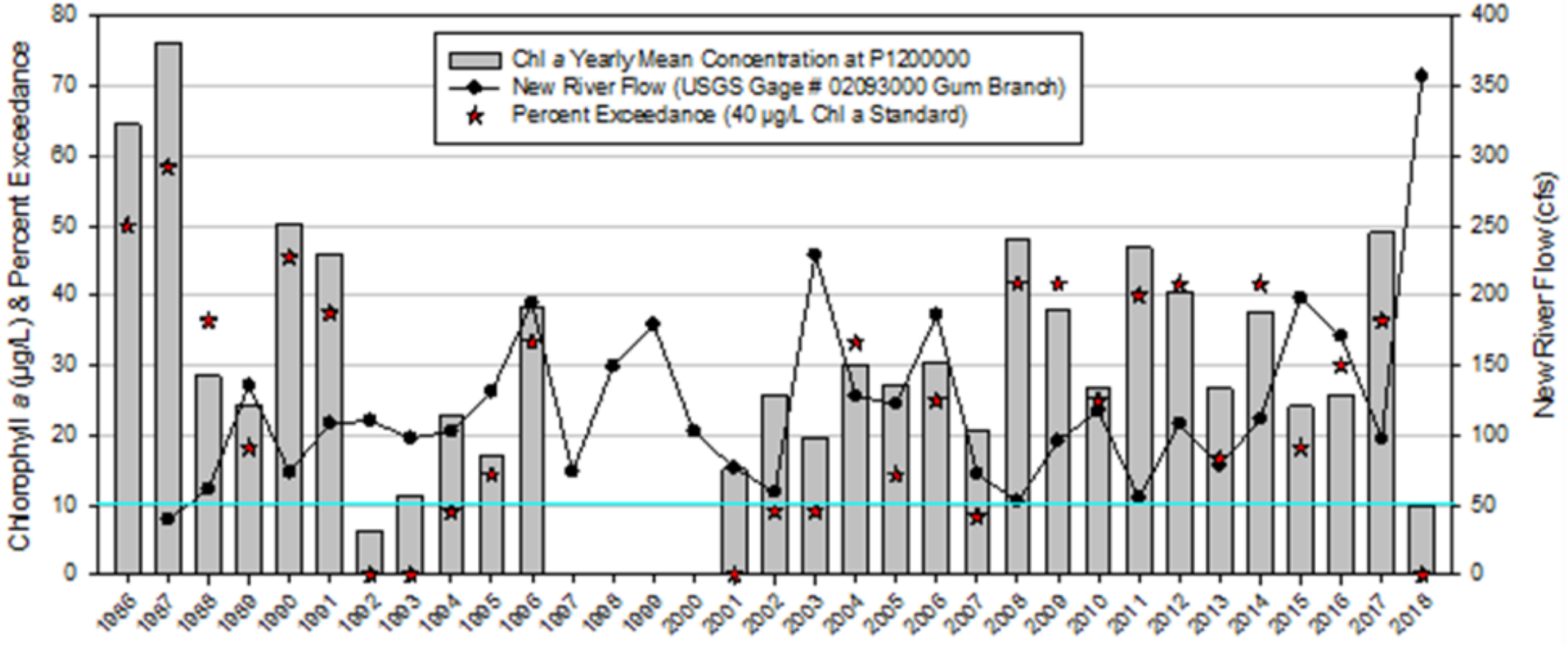


Flow-Normalized Nitrogen Loads

Division of Water Resources – Nutrient Sensitive Waters

New River in the White Oak River Basin

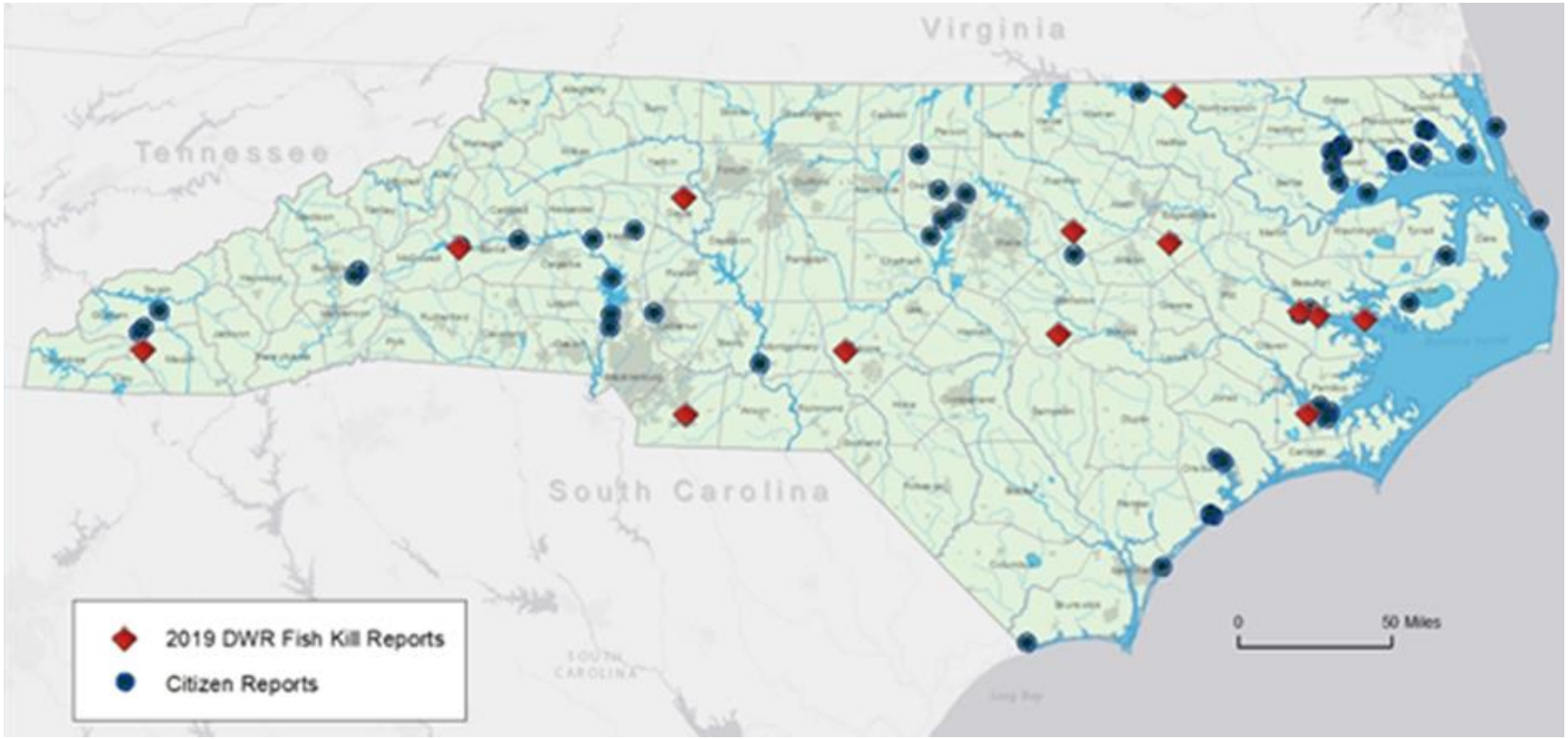
New River at Jacksonville US 17 Bridge



Annual mean Chlorophyll *a* concentrations with percent exceedance of the 40 µg/L Chlorophyll *a* standard and annual mean flow

Division of Water Resources – Fish Kill and Algal Bloom Reports

2019 Reported Fish Kill Activity



To report fish kill or algal bloom activity:
https://survey123.arcgis.com/share/c23ba14c74bb47f3a8aa895f1d976f0d?portalUrl=https://ncdenr.maps.arcgis.com

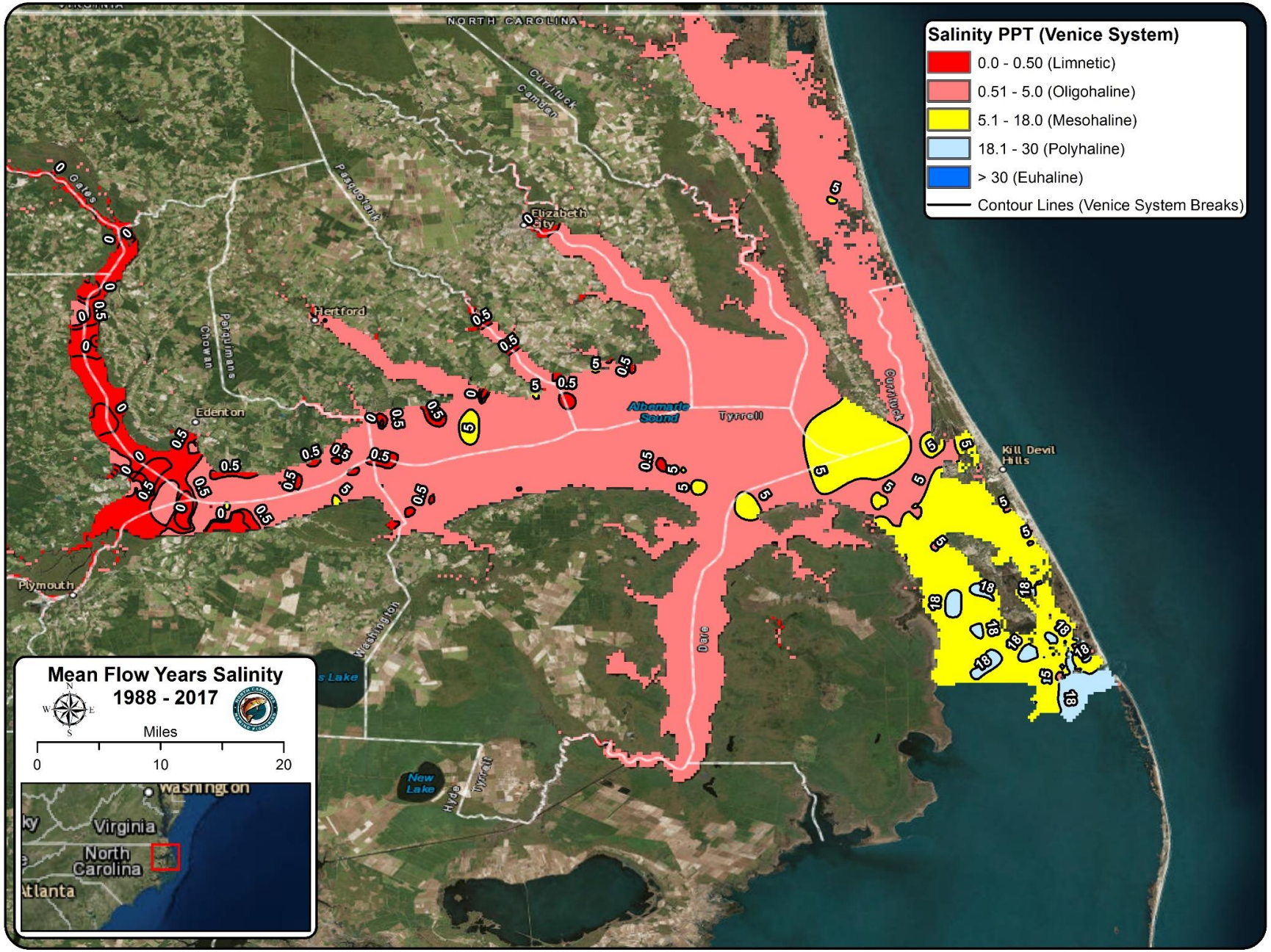
Division of Marine Fisheries – Shellfish Sanitation and Recreational Water Quality

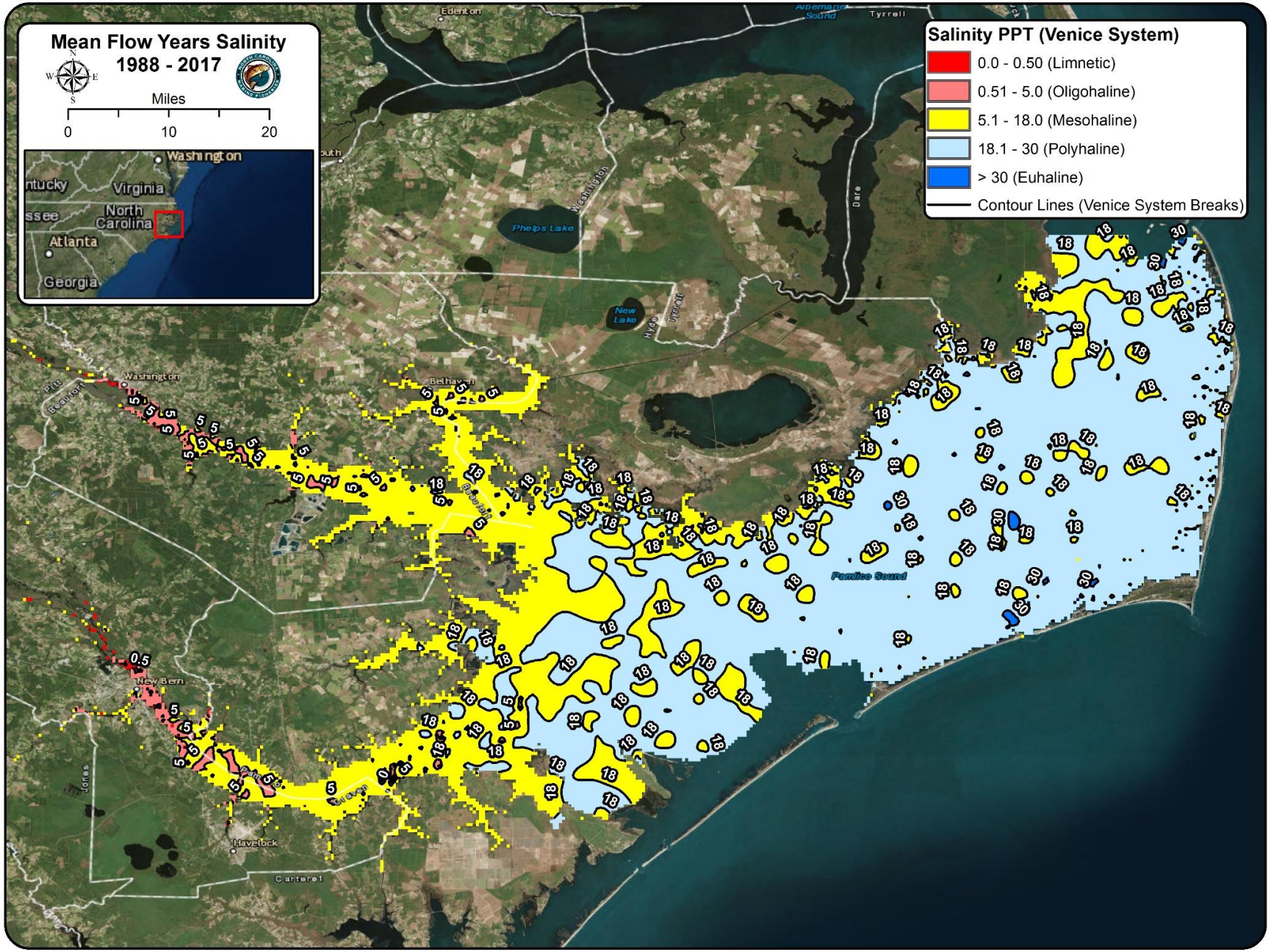
Shellfish Growing Area Classifications

	Open Area		Closed Area		
Year	Approved	Conditionally Approved Open	Conditionally Approved Closed	Prohibited	Restricted
2007	1,732,069	45,699	11,775	429,475	NA
2008	1,734,339	43,184	12,793	428,685	NA
2009	1,734,192	43,281	12,788	428,739	NA
2010	1,734,938	43,054	12,552	428,414	NA
2011	1,734,938	43,054	12,552	428,414	NA
2012	1,732,888	44,599	12,708	428,835	NA
2013	1,733,069	44,649	11,834	429,531	NA
2014	1,733,155	44,261	11,827	429,796	NA
2015*	1,418,373	43,849	11,739	745,169	NA
2016	1,416,960	44,785	12,008	745,597	NA
2017	1,414,709	44,425	12,209	747,759	NA
2018**	1,414,525	44,122	11,859	729,761	18,933
2019	1,414,877	43,217	12,721	730,550	20,260
2020	1,416,179	42,857	10,138	735,791	18,658

*314,710 acres administratively closed on 2/4/15 due to budget cuts and office closures.
**First year of use for Restricted classification. Previously these waters were included in our Prohibited classification.

For the most up to date closures, refer to the Shellfish Sanitation Temporary Closure Public Viewer:
https://ncdenr.maps.arcgis.com/apps/webappviewer/index.html?id=5759aa19d7484a3b82a8e440fba643aa


Salinity PPT (Venice System)
0.0 - 0.50 (Limnetic)
0.51 - 5.0 (Oligohaline)
5.1 - 18.0 (Mesohaline)
18.1 - 30 (Polyhaline)
> 30 (Euhaline)
Contour Lines (Venice System Breaks)
Mean Flow Years Salinity
1988 - 2017
Miles
0
10
20
NORTH CAROLINA
Elizabeth City
Hertford
Edenton
Albemarle Sound
Tyrrell
Kill Devil Hills
Plymouth
Washington
Dare
New Lake
Hyde
Virginia
North Carolina


Mean Flow Years Salinity
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10
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Virginia
North Carolina
Atlanta
Georgia
Salinity PPT (Venice System)
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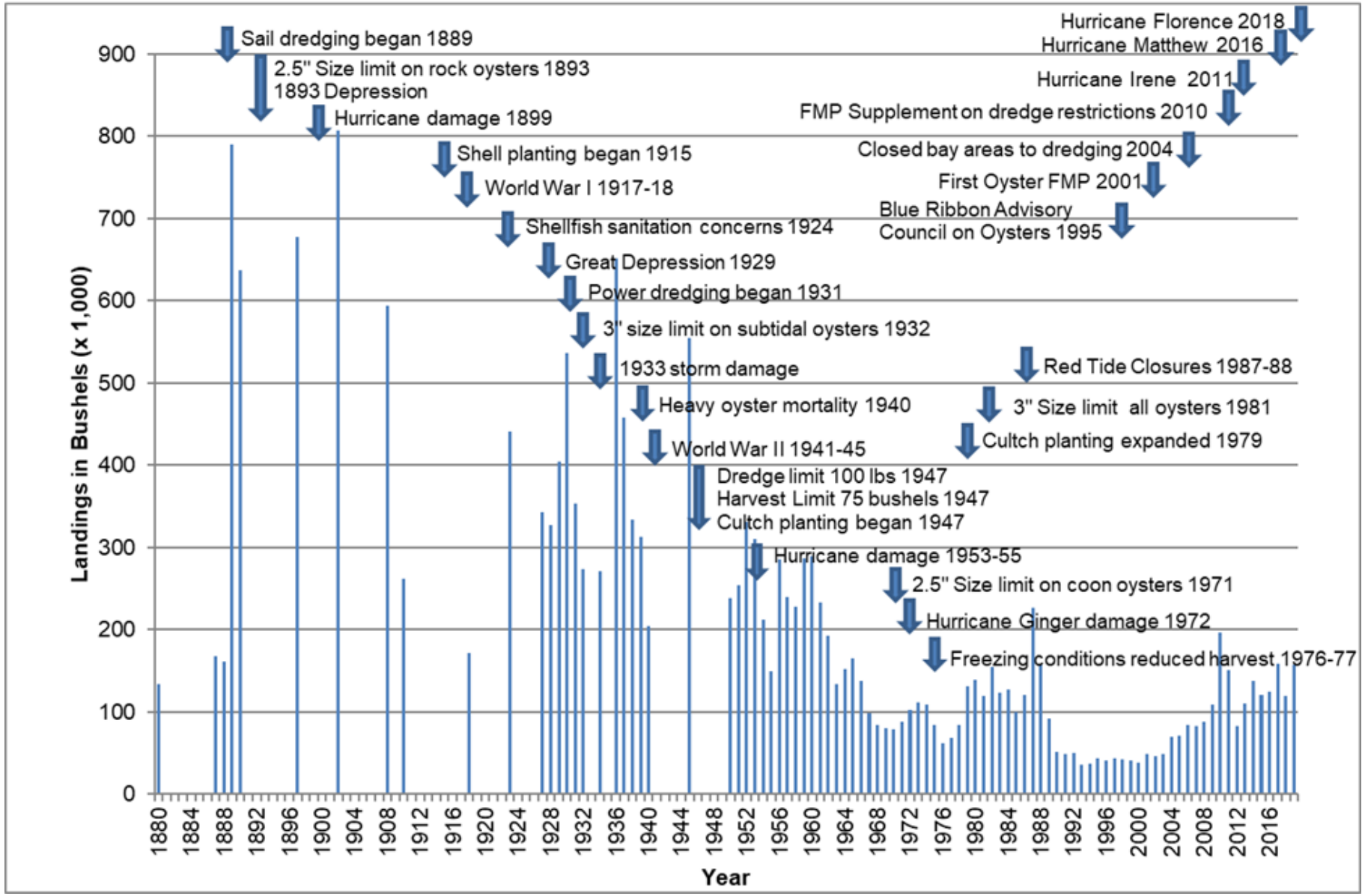
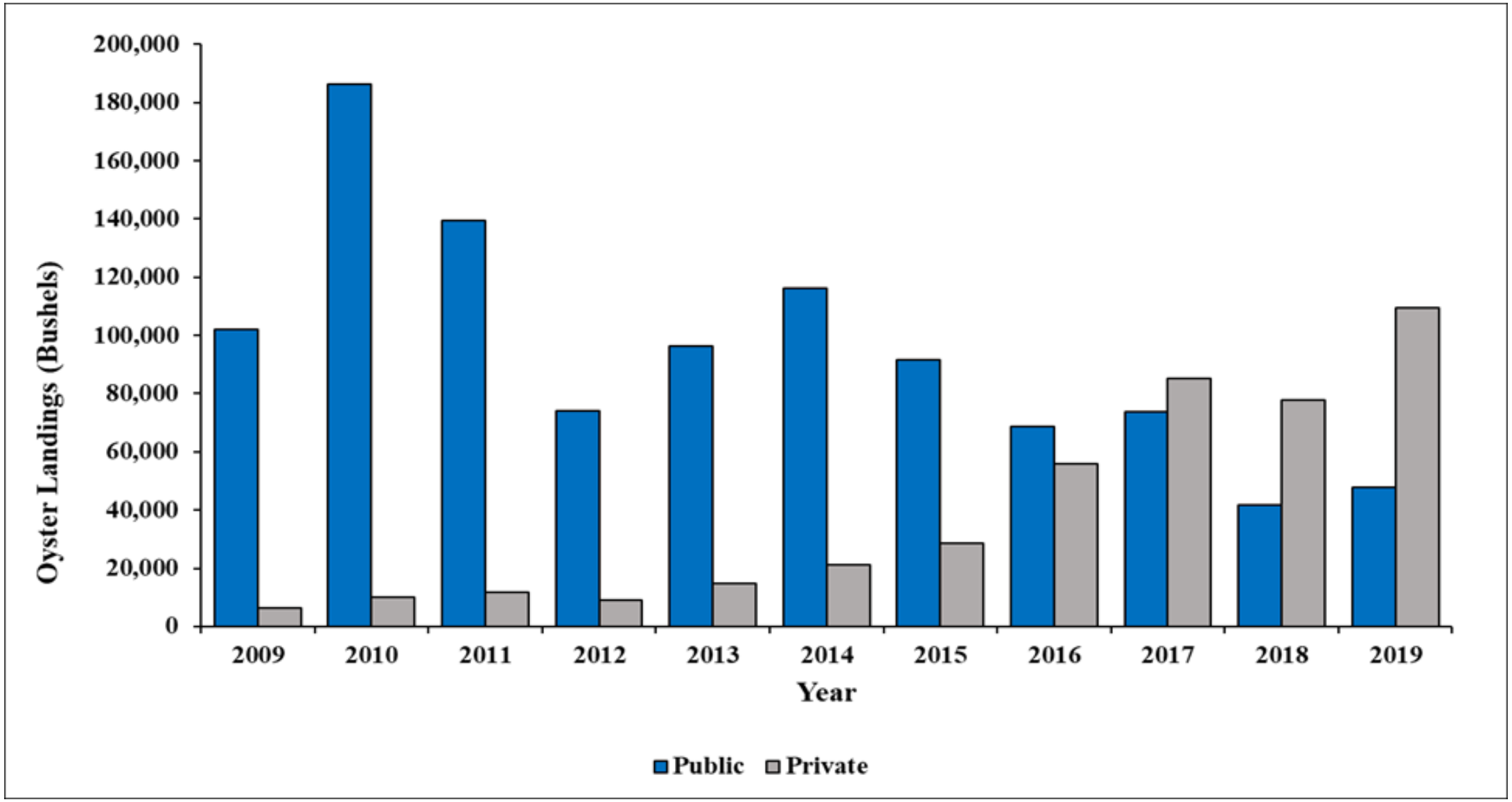
5.1 - 18.0 (Mesohaline)
18.1 - 30 (Polyhaline)
> 30 (Euhaline)
Contour Lines (Venice System Breaks)
Edenton
Albemarle Sound
Tyrrell
Dare
Phelps Lake
New Lake
Washington
Pamlico Sound
New Bern
Havelock
Carteret
Jones

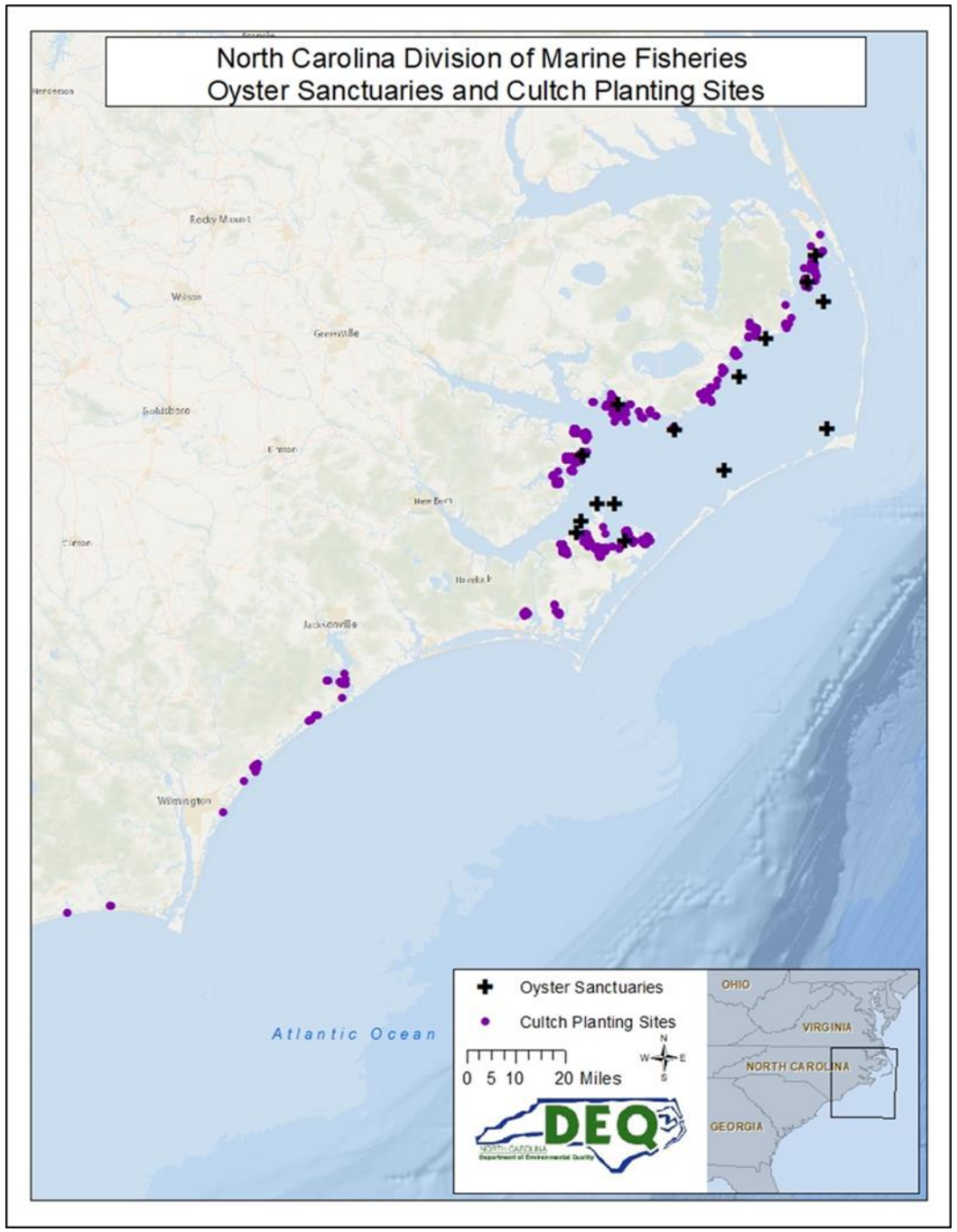
Shell Bottom – History

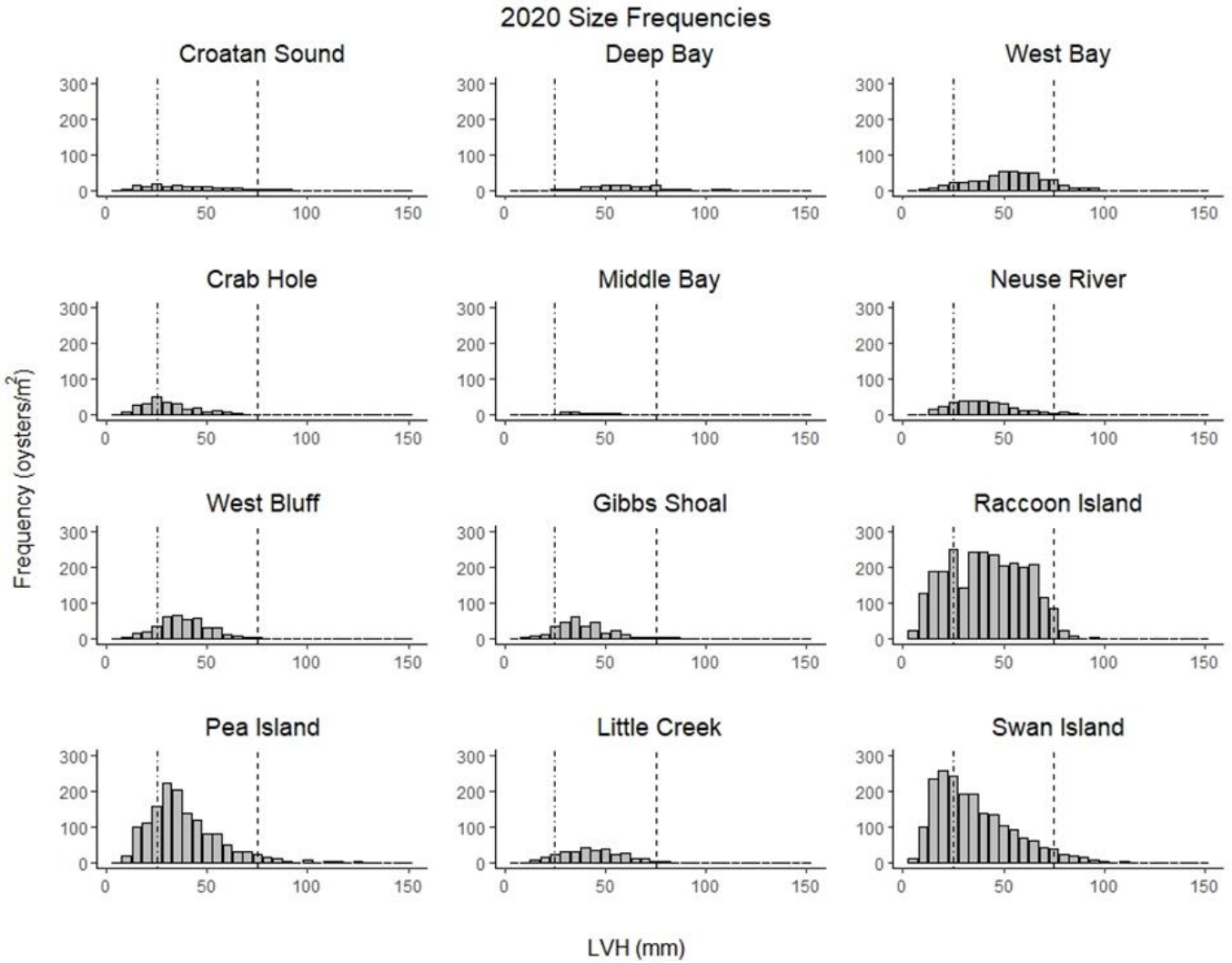


Shell Bottom – Commercial Harvest

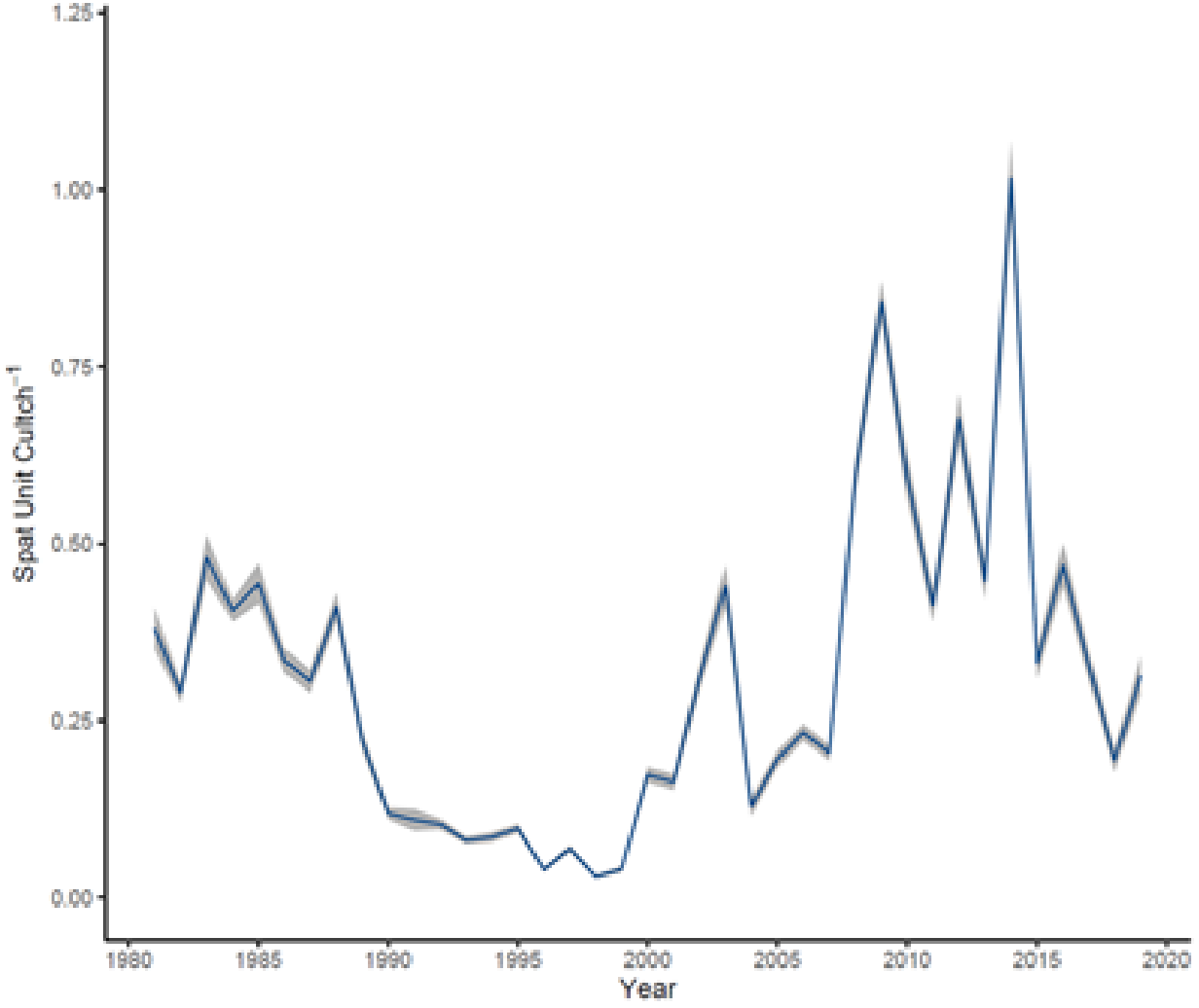


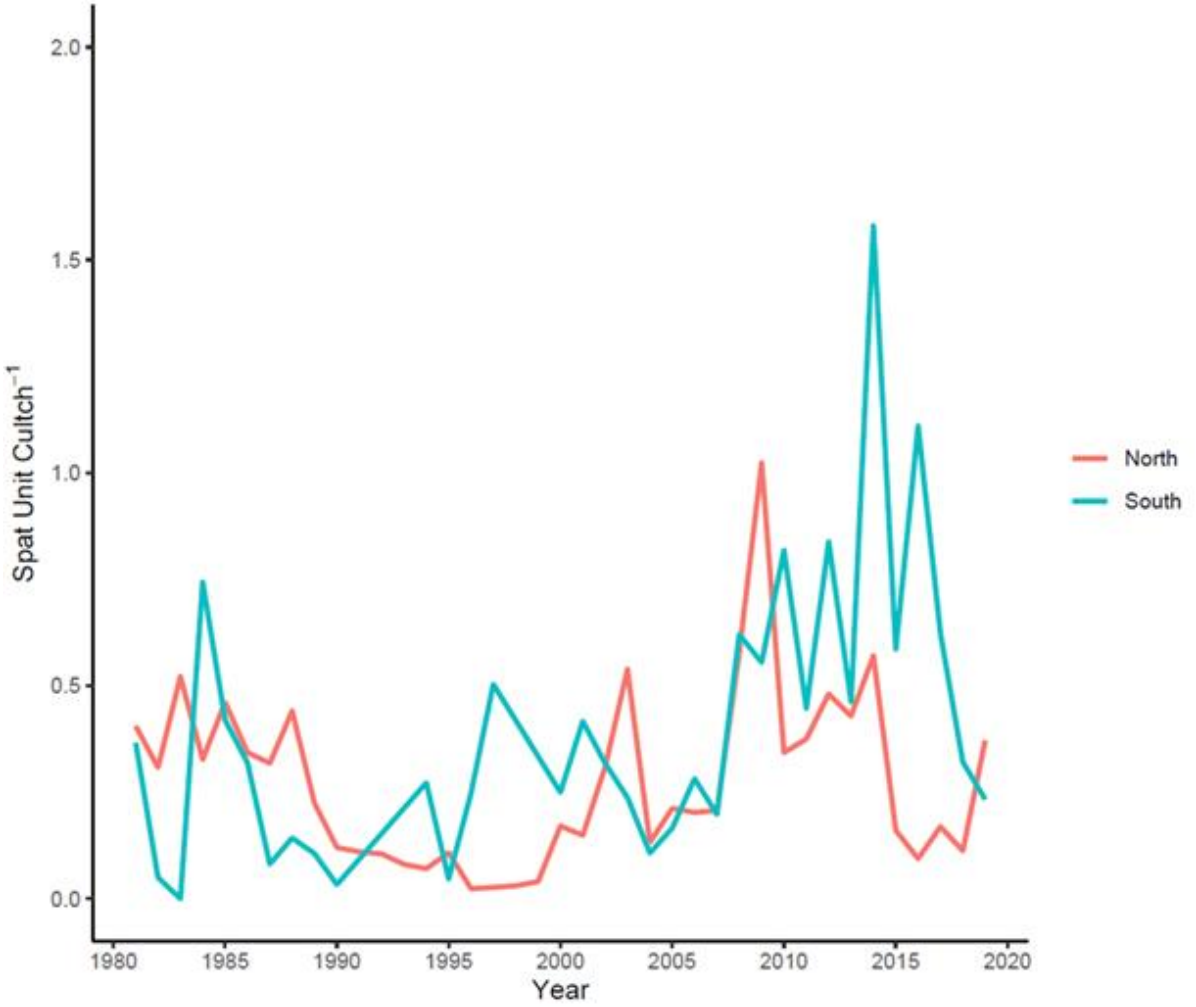
Shell Bottom – Oyster Sanctuaries





Shell Bottom – Cultch Planting





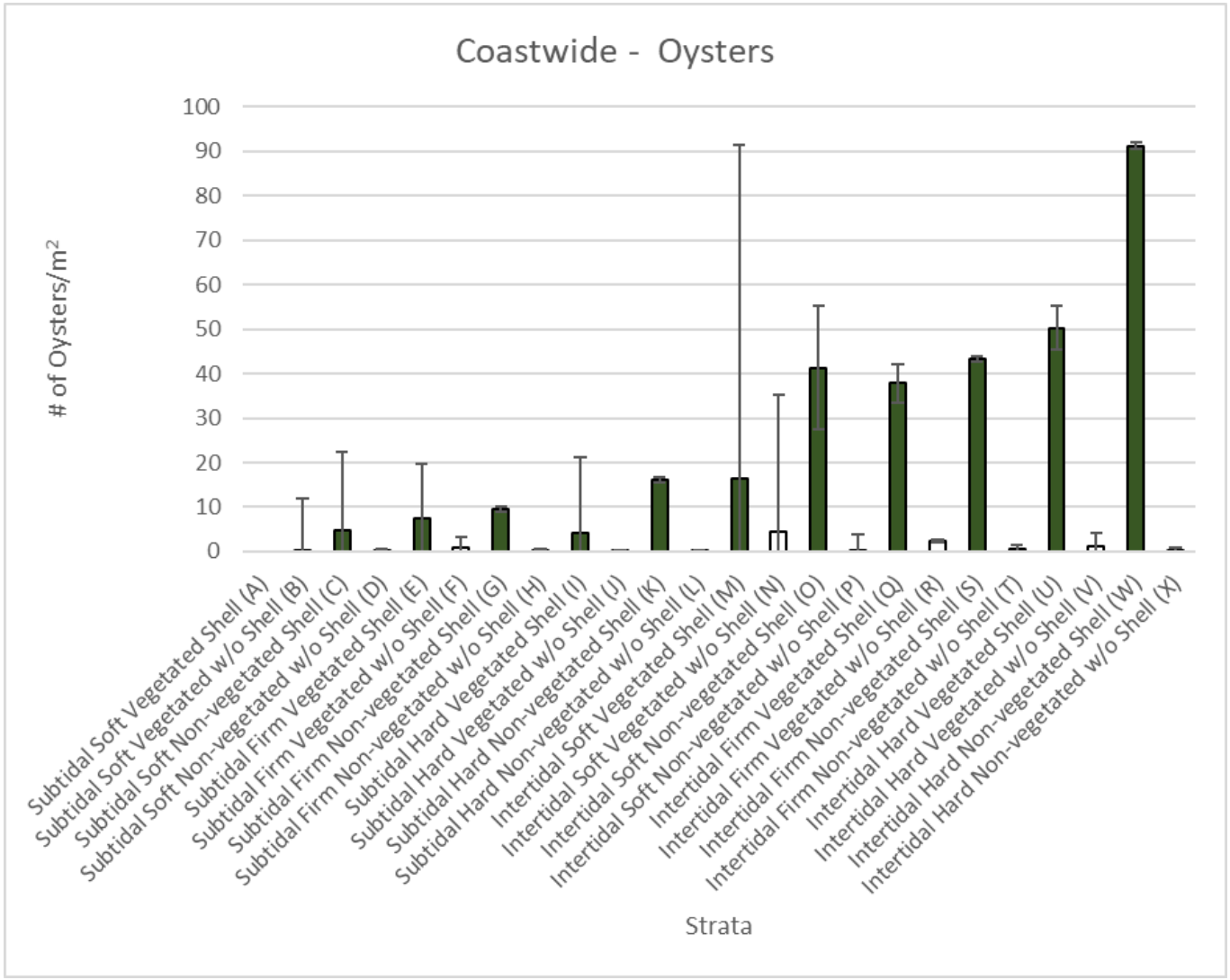
Shell Bottom – Estuarine Bottom Mapping

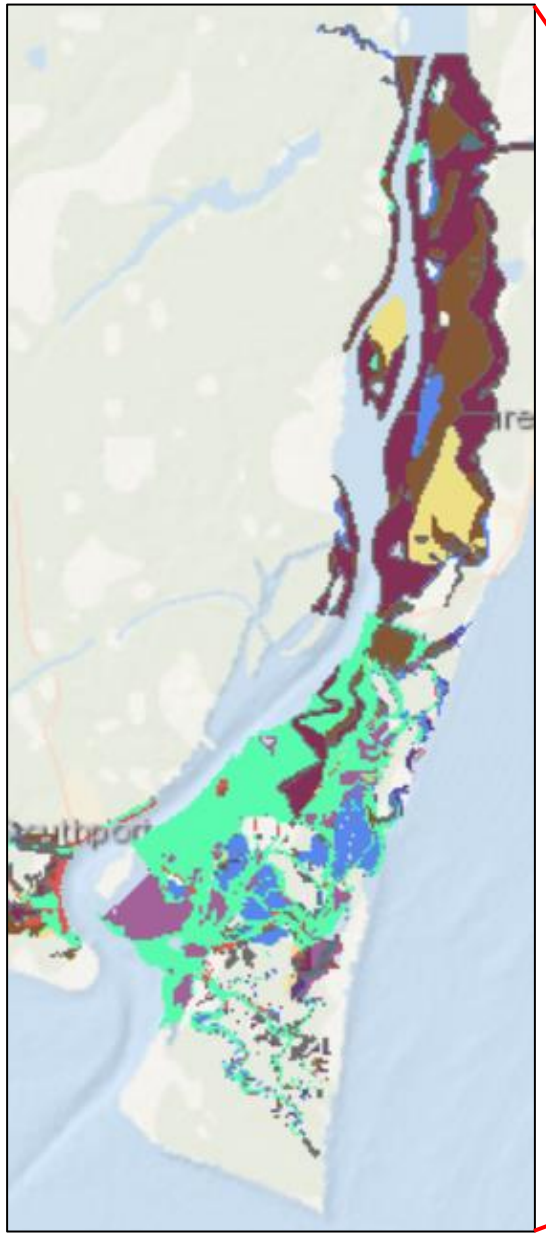
	Total Mapped Shell Bottom		Mapped Subtidal Shell bottom		Mapped Intertidal Shell Bottom	
CHPP Regions*	Acres	Percent	Acres	Percent	Acres	Percent
Albemarle Sound to Northeastern Coastal Ocean (1)	615	2.79%	571	3.42%	44	0.82%
Pamlico Sound System (2)	4,290	19.45%	4,213	25.21%	77	1.44%
White Oak River Basin (3)	10,543	47.79%	9,123	54.60%	1,420	26.53%
Cape Fear River Basin (4)	6,612	29.97%	2,801	16.76%	3811	71.21%
Total	22,060		16,709	75.74%	5,351	24.26%

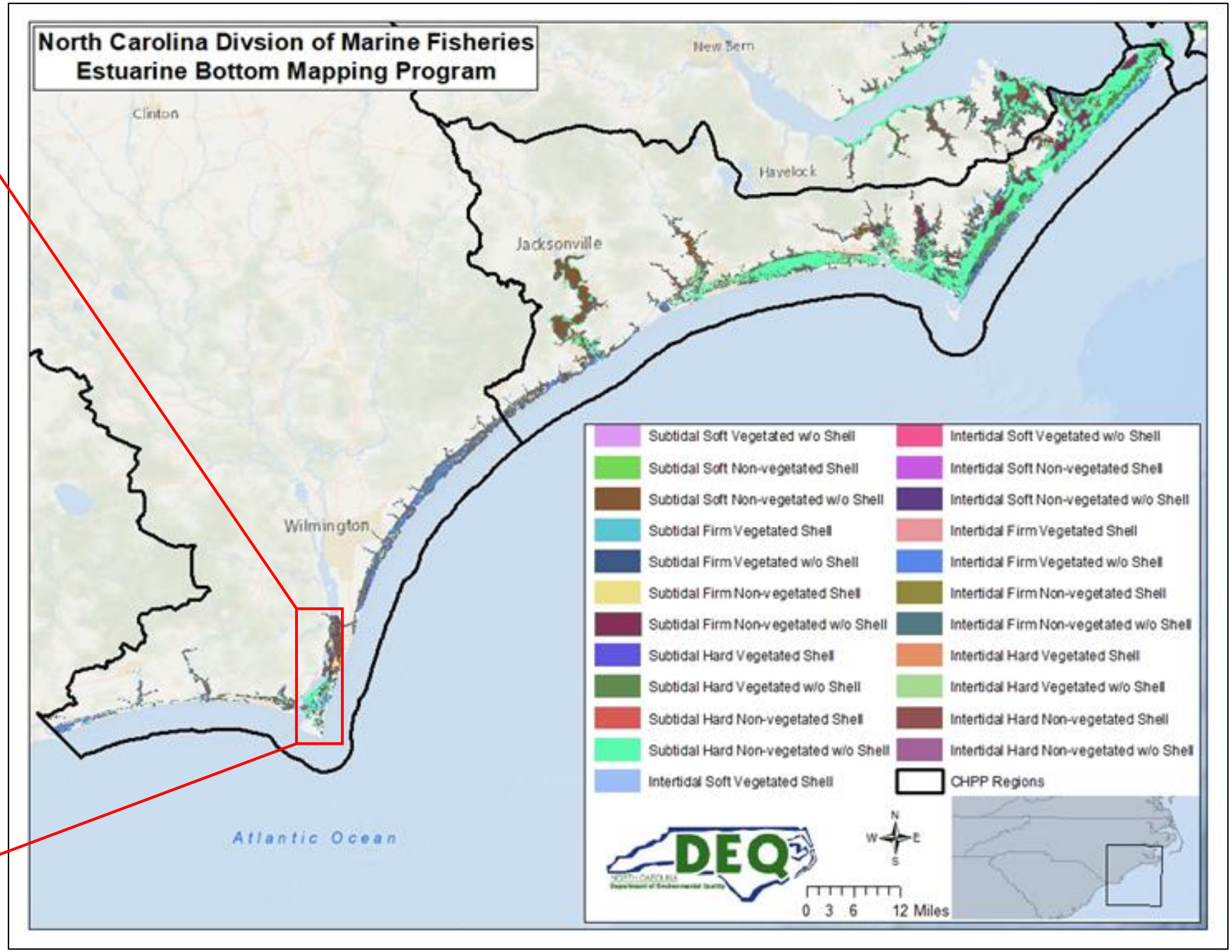
*Oregon Inlet acres included in Albemarle Region; Ocracoke Inlet acres included in White Oak River Basin Region.

**Excludes areas that cannot be mapped due to military prohibitions, leases, bridge restrictions, depths, hazards.

Shell Bottom – Estuarine Bottom Mapping






North Carolina Divsion of Marine Fisheries
Estuarine Bottom Mapping Program
New Bern
Clinton
Havelock
Jacksonville
Wilmington
Atlantic Ocean
Subtidal Soft Vegetated w/o Shell
Subtidal Soft Non-vegetated Shell
Subtidal Soft Non-vegetated w/o Shell
Subtidal Firm Vegetated Shell
Subtidal Firm Vegetated w/o Shell
Subtidal Firm Non-vegetated Shell
Subtidal Firm Non-vegetated w/o Shell
Subtidal Hard Vegetated Shell
Subtidal Hard Vegetated w/o Shell
Subtidal Hard Non-vegetated Shell
Subtidal Hard Non-vegetated w/o Shell
Intertidal Soft Vegetated Shell
Intertidal Soft Vegetated w/o Shell
Intertidal Soft Non-vegetated Shell
Intertidal Soft Non-vegetated w/o Shell
Intertidal Firm Vegetated Shell
Intertidal Firm Vegetated w/o Shell
Intertidal Firm Non-vegetated Shell
Intertidal Firm Non-vegetated w/o Shell
Intertidal Hard Vegetated Shell
Intertidal Hard Vegetated w/o Shell
Intertidal Hard Non-vegetated Shell
Intertidal Hard Non-vegetated w/o Shell
CHPP Regions
DEQ
N
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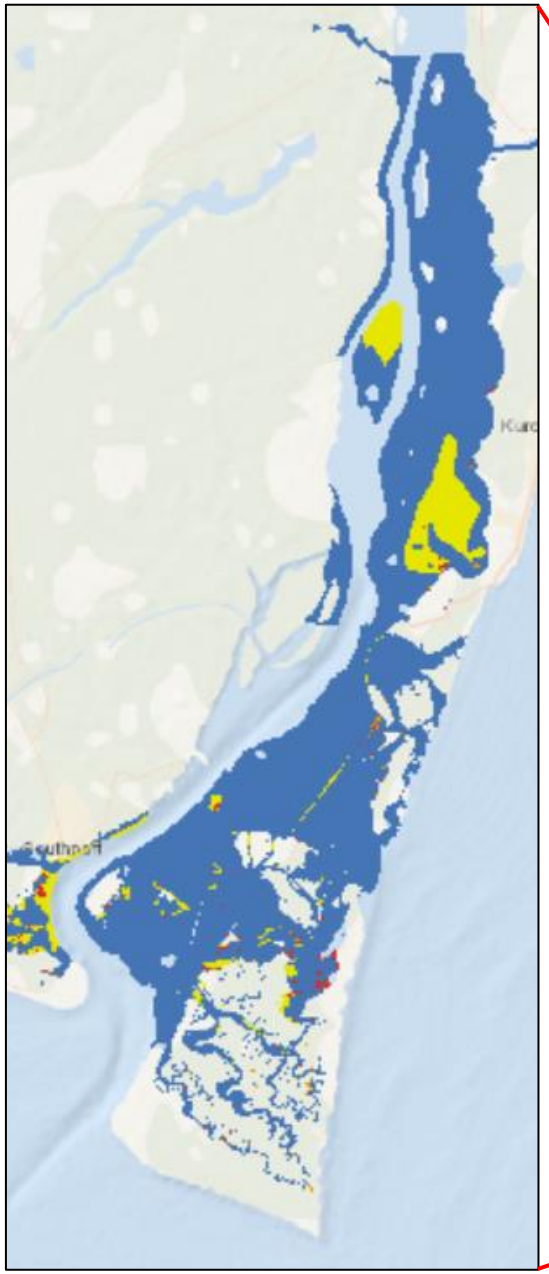
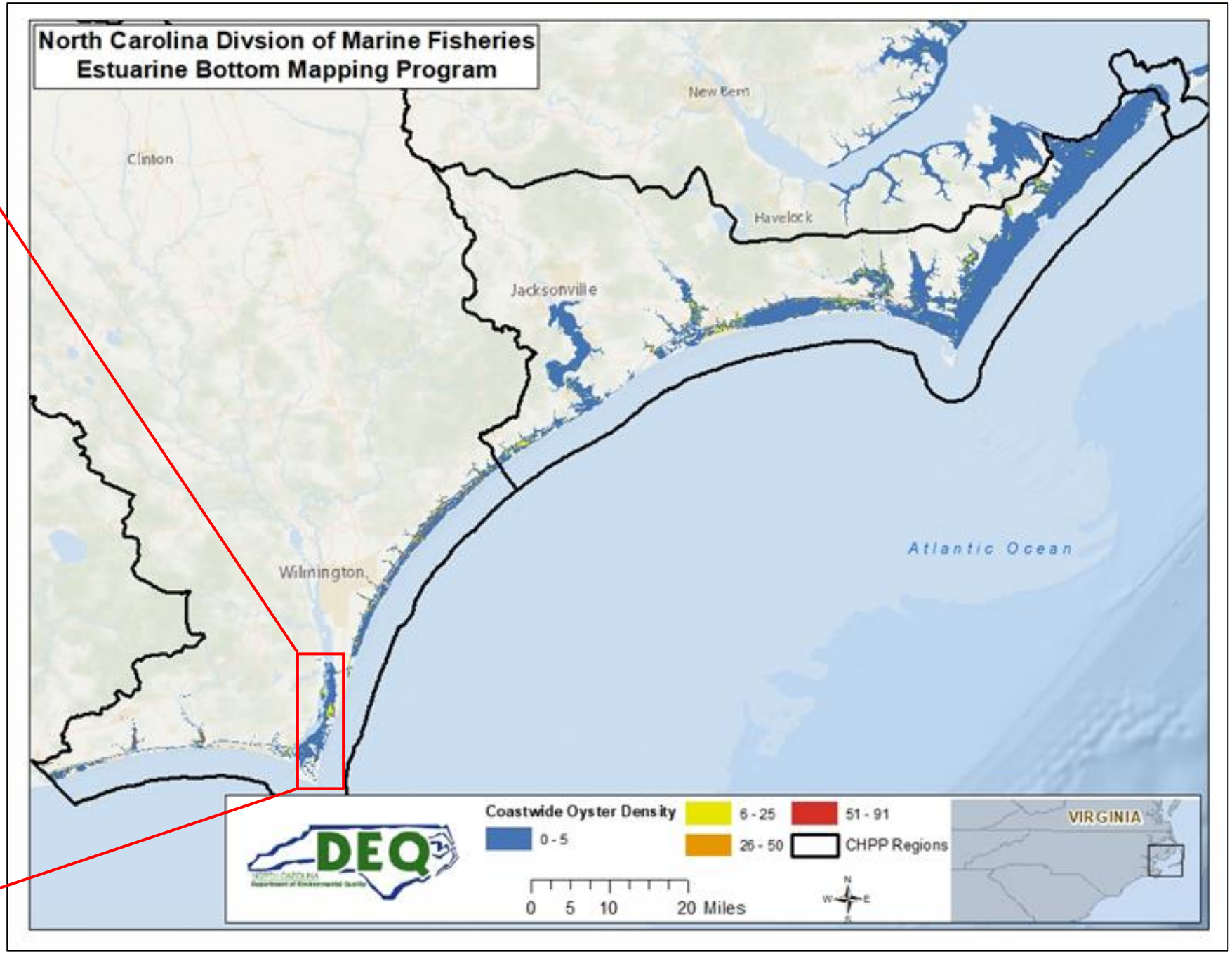
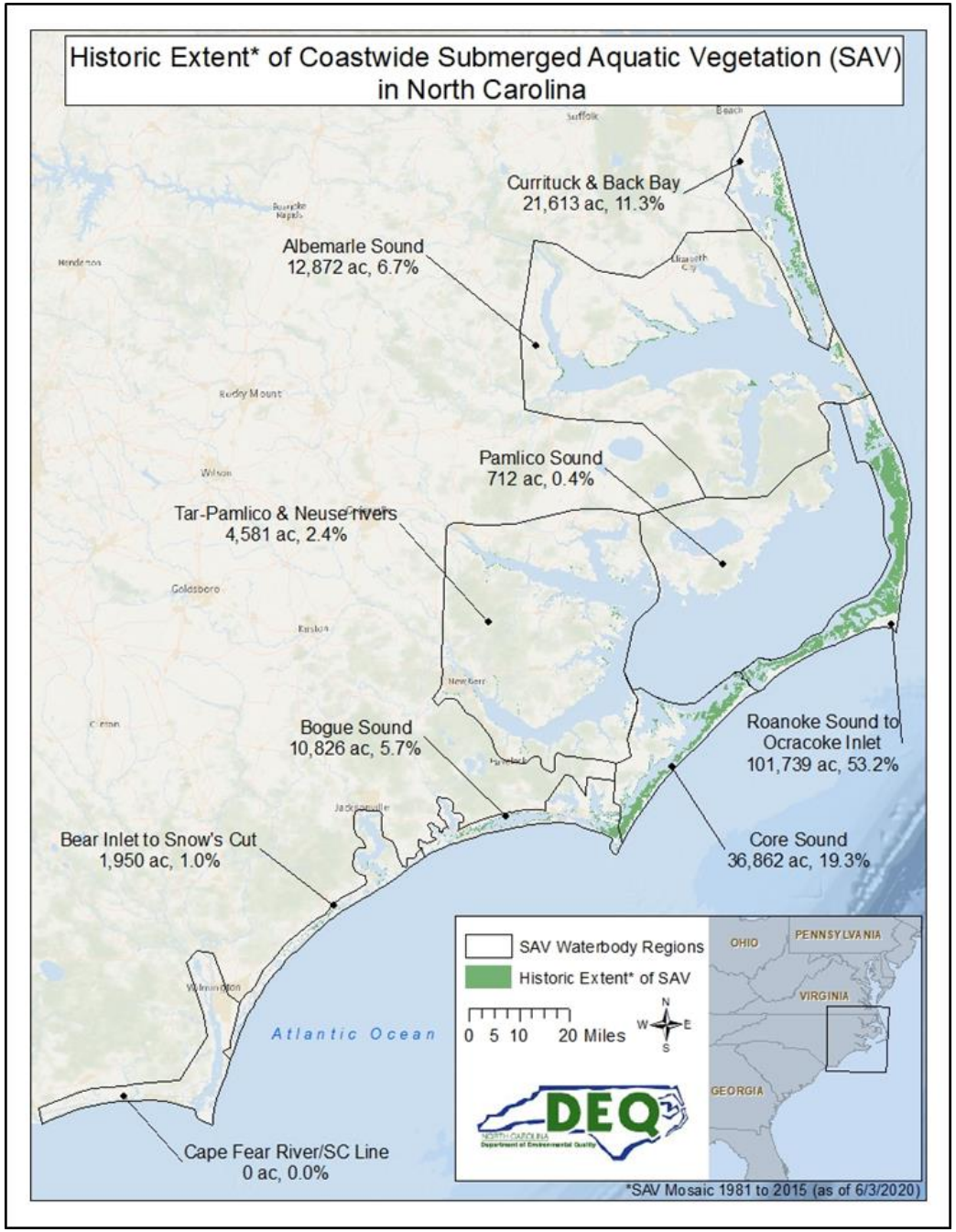
0 3 6 12 Miles




North Carolina Divsion of Marine Fisheries
Estuarine Bottom Mapping Program
New Bern
Clinton
Havelock
Jacksonville
Wilmington
Atlantic Ocean
Coastwide Oyster Density
0 - 5
6 - 25
26 - 50
51 - 91
CHPP Regions
0 5 10 20 Miles
VIRGINIA
DEQ



Submerged Aquatic Vegetation

Salinity Zone	SAV Region Name	Historic Extent* (ac)	Percent of Historical Extent* (%)
Low	Currituck Sound and Back Bay	21,613	11.3
Low	Albemarle Sound	12,872	6.7
Low	Tar-Pamlico & Neuse rivers	4,581	2.4
High	Pamlico Sound	712	0.4
High	Roanoke Sound to Ocracoke Inlet	101,739	53.2
High	Core Sound	36,862	19.3
High	Bogue Sound	10,826	5.7
High	Bear Inlet to Snow's Cut	1,950	1.0
High/Low	Cape Fear River to SC line	0	0.0
Total		191,155	100.0

***SAV Mosaic 1981 to 2015 (as of 6/3/2020)**

APNEP Indicator Report: Extent of Submerged Aquatic Vegetation: High-Salinity Waters, 2006-2013

North Zone = 5.98% Loss

Central Zone = 2.67% Loss

South Zone = 10.38% Loss

Wetlands

Thankfully, already covered

NORTH CAROLINA
Department of Environmental Quality

Hard Bottom

- Limited to areas of continental shelf with ~90% occurring South of Cape Hatteras
- ~504,095 acres between Cape Hatteras and Cape Fear
- Many nearshore sites have been sanded over
- From 2016-2019, the commercial snapper-grouper fishery harvested an annual average of 1,294,409 lbs and recreational fisherman harvested an average of 1,219,797 lbs of fish in the snapper-grouper complex/year

Photo Credit: Emily Pickering

North Carolina Artificial Reefs

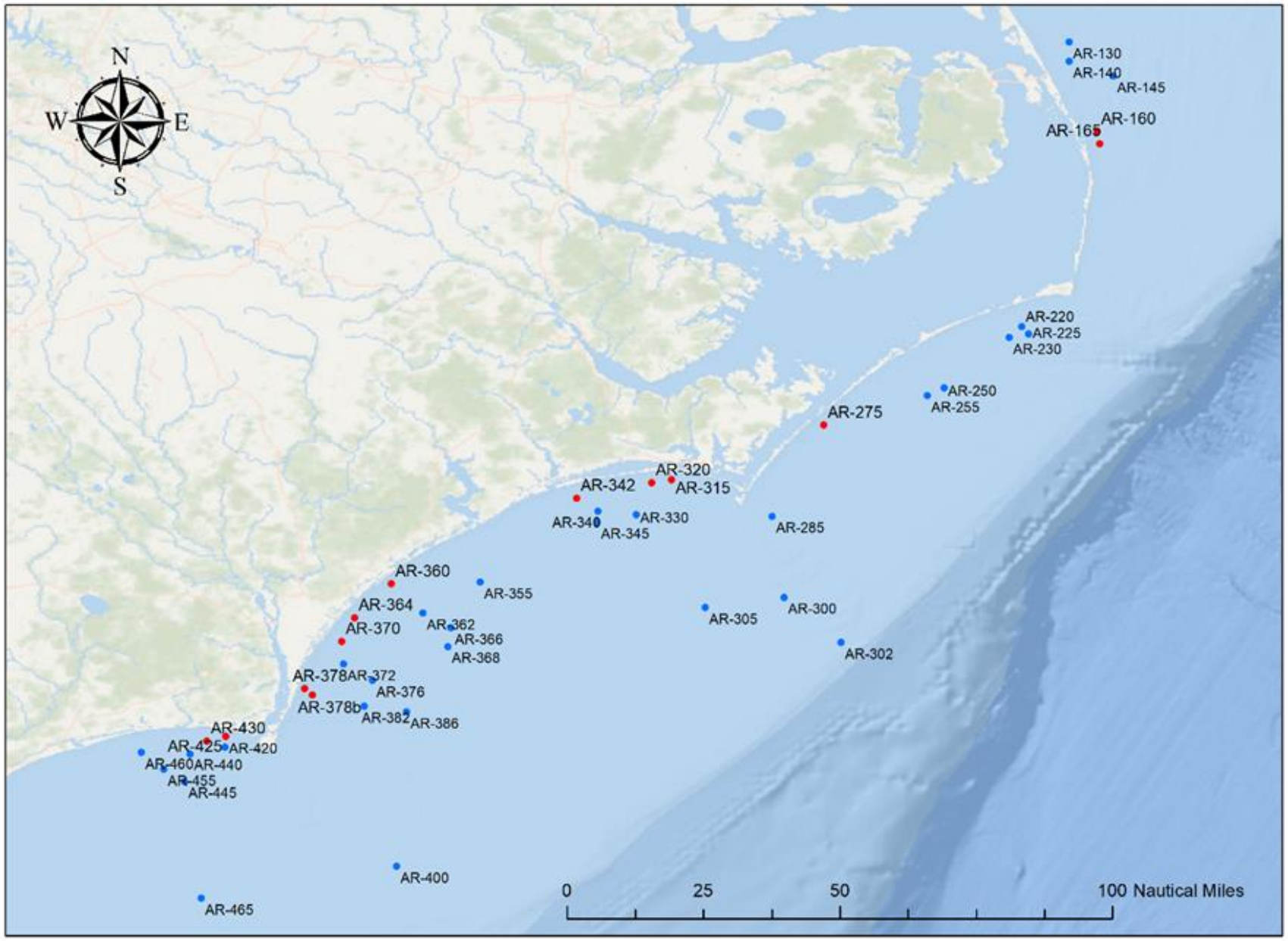


Photo Credit: Sam Blount

Soft Bottom

- Globally, ~16% of tidal flats were lost from 1984-2016 due to coastal development, lack of sediment transport, increased erosion, and sea level rise
- In NC, ~90% of the 2.9 million acres of estuaries and coastal rivers

CHPP Regions	Shallow Soft Bottom (≤6 ft)	Deep Soft Bottom (>6 ft)	Soft Bottom (Unknown)	Total Soft Bottom
	Acres	Acres	Acres	Acres
Albemarle Sound to Northeastern Coastal Ocean (1)	232,608	610,733	64,908	908,248
Pamlico Sound System (2)	193,417	1,172,449	63,887	1,429,753
White Oak River Basin (3)	128,282	242,402	10,996	381,680
Cape Fear River Basin (4)	31,951	184,556	13,978	230,485

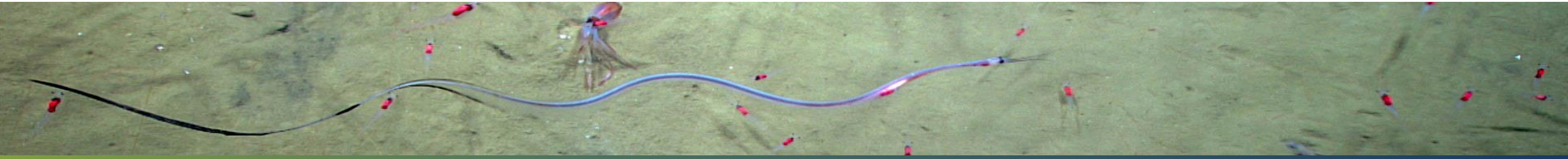
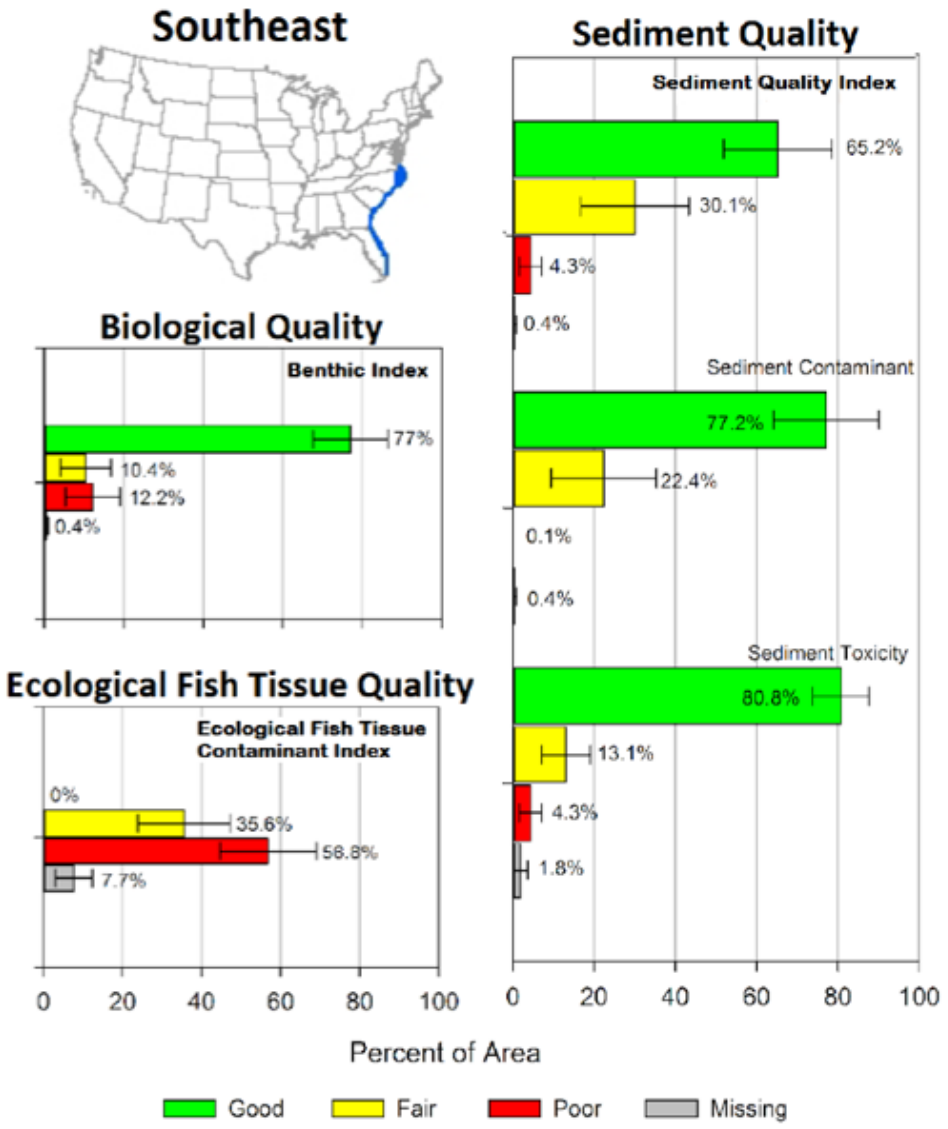
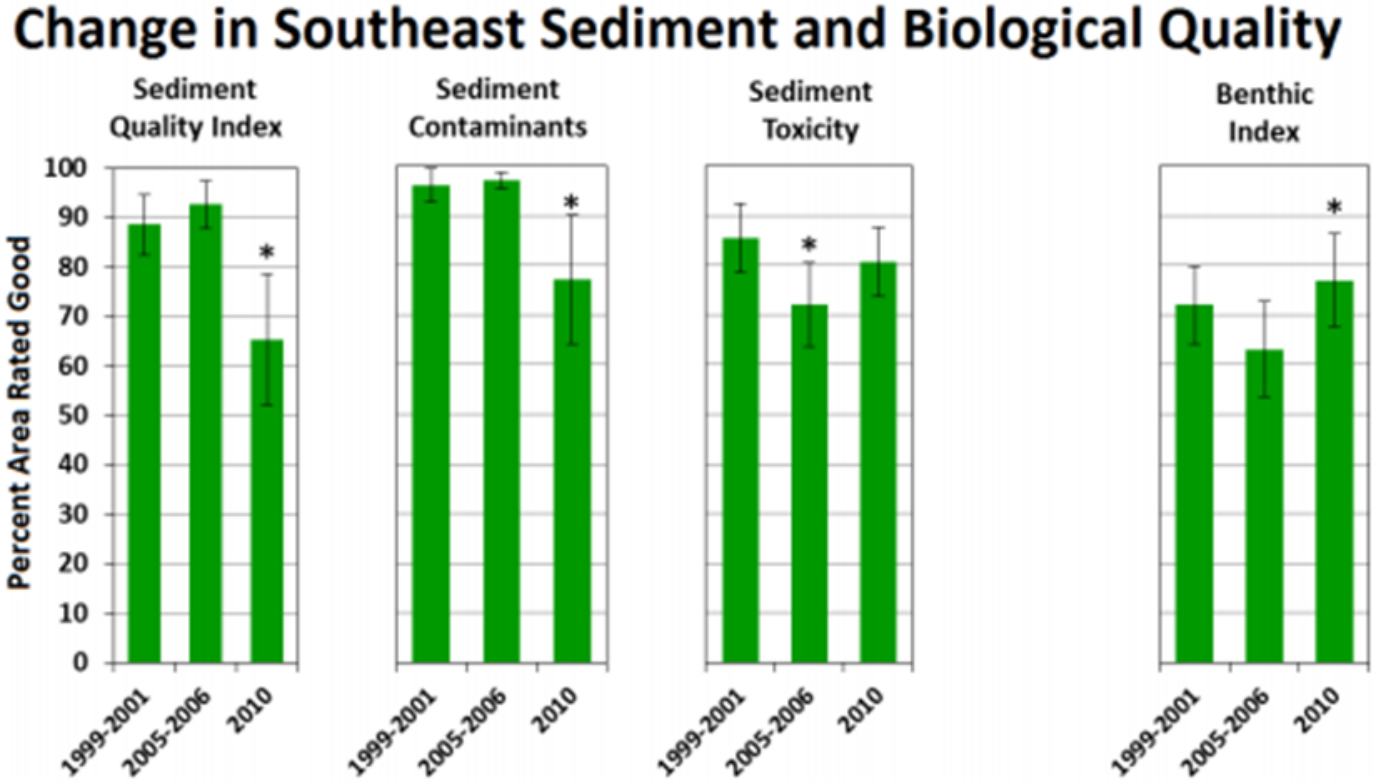


Photo Credit: NOAA *Office of Ocean Exploration and Research*

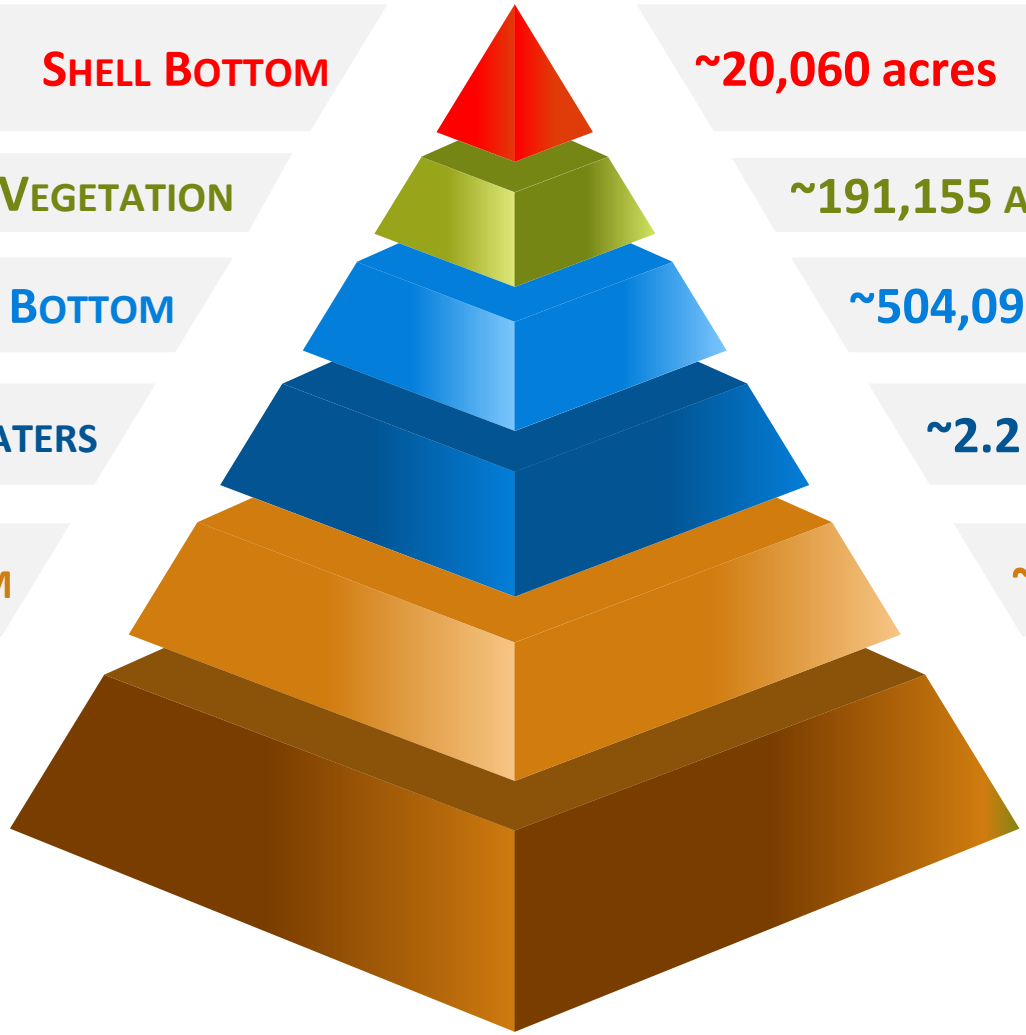
Soft Bottom – National Coastal Condition Assessment 2010





Source: USEPA 2015

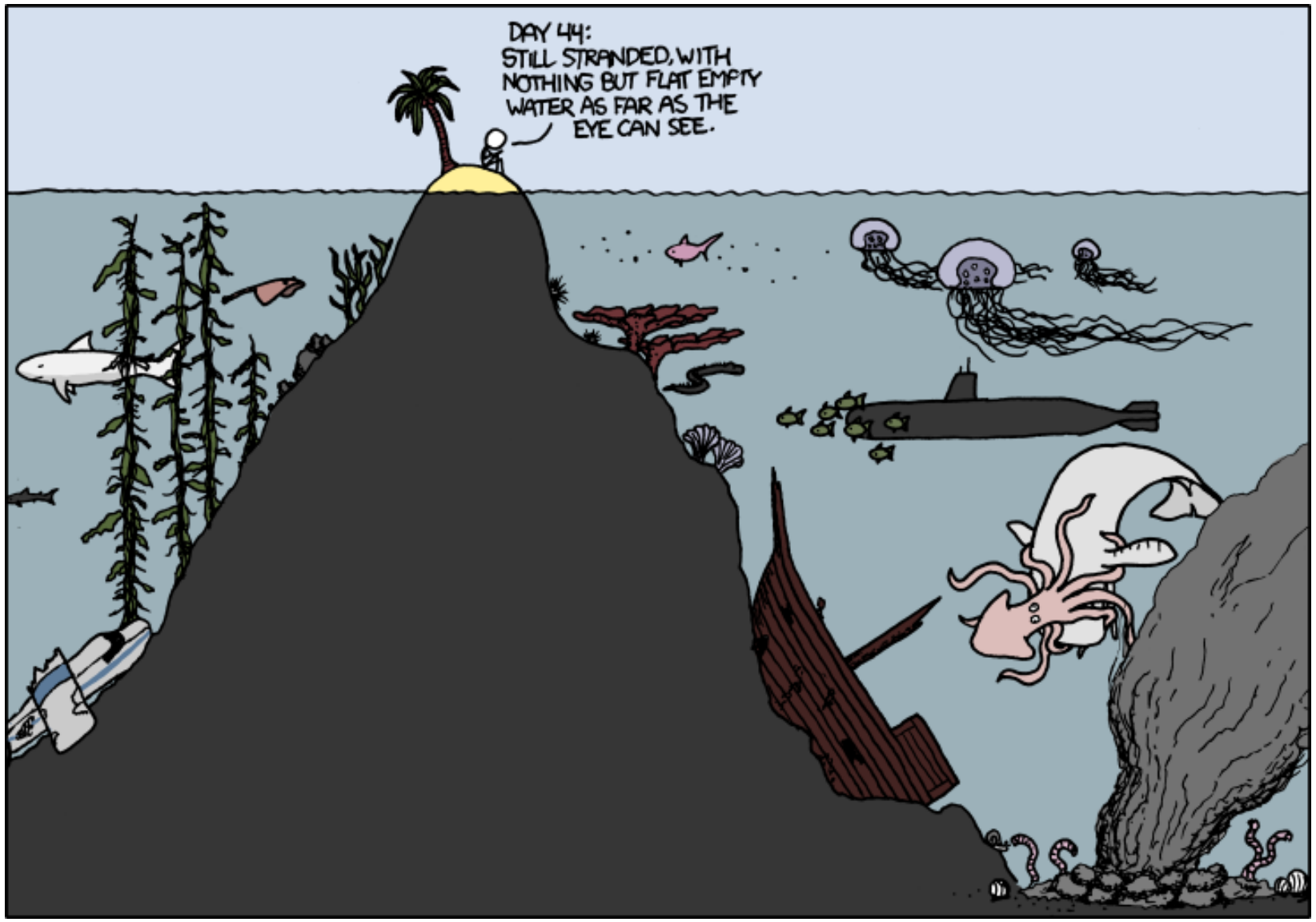
The Foundation for Healthy Fisheries in North Carolina



SHELL BOTTOM	~20,060 acres
SUBMERGED AQUATIC VEGETATION	~191,155 ACRES HISTORIC EXTENT
HARD BOTTOM	~504,095 ACRES
COASTAL WATERS	~2.2 MILLION ACRES
SOFT BOTTOM	~2.9 MILLION ACRES
WETLANDS	~3.0 MILLION ACRES

NORTH CAROLINA
Department of Environmental Quality

Questions?


DAY 44:
STILL STRANDED, WITH NOTHING BUT FLAT EMPTY WATER AS FAR AS THE EYE CAN SEE.