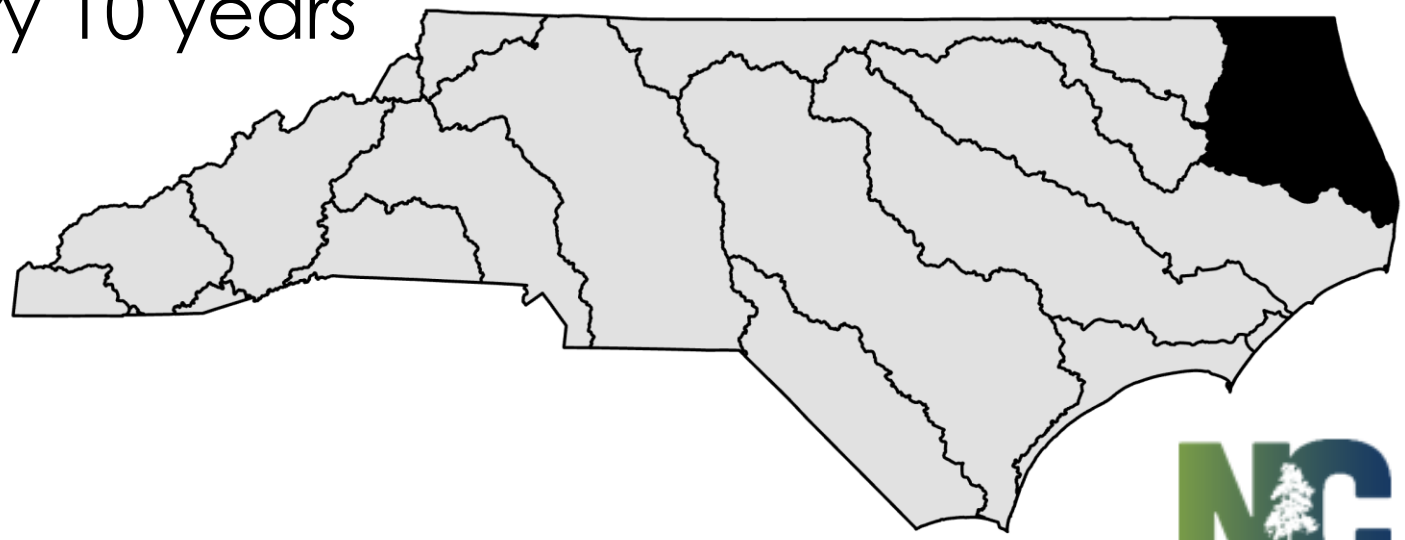
Environmental Management Commission (EMC) Request Approval of the 2021 Pasquotank River Basin Water Resources Plan September 2021

Department of Environmental Quality
Division of Water Resources
Planning Section

Basin Planning (§143-215.8B)

- Watershed-based approach to managing water resources
- Considers cumulative impacts of all activities across a river basin (point and nonpoint sources)
- Basin plan required every 10 years
- **<u>Basin plan is not a rule</u>**



Department of Environmental Quality

Pasquotank Stakeholder Concerns

Stakeholder Engagement:

- Future Development/Population Growth
- Water Quality and Quantity Protection and Monitoring especially in Low Lands
- Conserve Riparian Buffers
- Deforestation/Biomass Harvesting
- Best Management Practices
- Incentives
- Flooding and Environmental Contamination
- Sea Level Rise and Extreme Rainfall
- Climate Change
- Salt-water Intrusion in Agriculture Lands close to the Sound (Southern Shore)
- Groundwater Rise
- Identify areas with better drainage, drainage committees
- Public Engagement

Internal Review (Multiple NCDEQ Divisions, Sections, Branches)

Public Comments (Soil and Water Conservation Districts, North Carolina Farm Bureau, Citizens)

Pasquotank River Basin Water Resources Plan - Overview

Chapter 1: Basin Characteristics

- Geography
- Population and land cover
- Point and Nonpoint source pollution
- Climate Change

Chapter 2: Monitoring Data and Water Quality

Chapter 3, 4, and 5: Northern, Southern, and Outer Banks Watershed Chapters

Chapter 6: Albemarle Sound

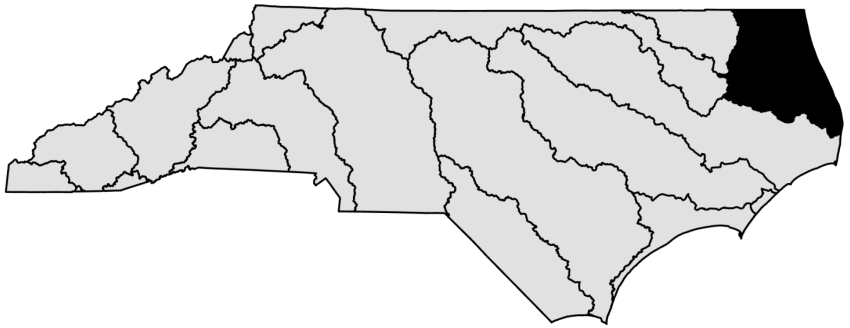
Chapter 7: Permitted and Registered Activities

Chapter 8: Water Quality Initiatives

Chapter 9: Water Use

Basin Characteristics

- Located in the northeastern corner of the Coastal Plain Province



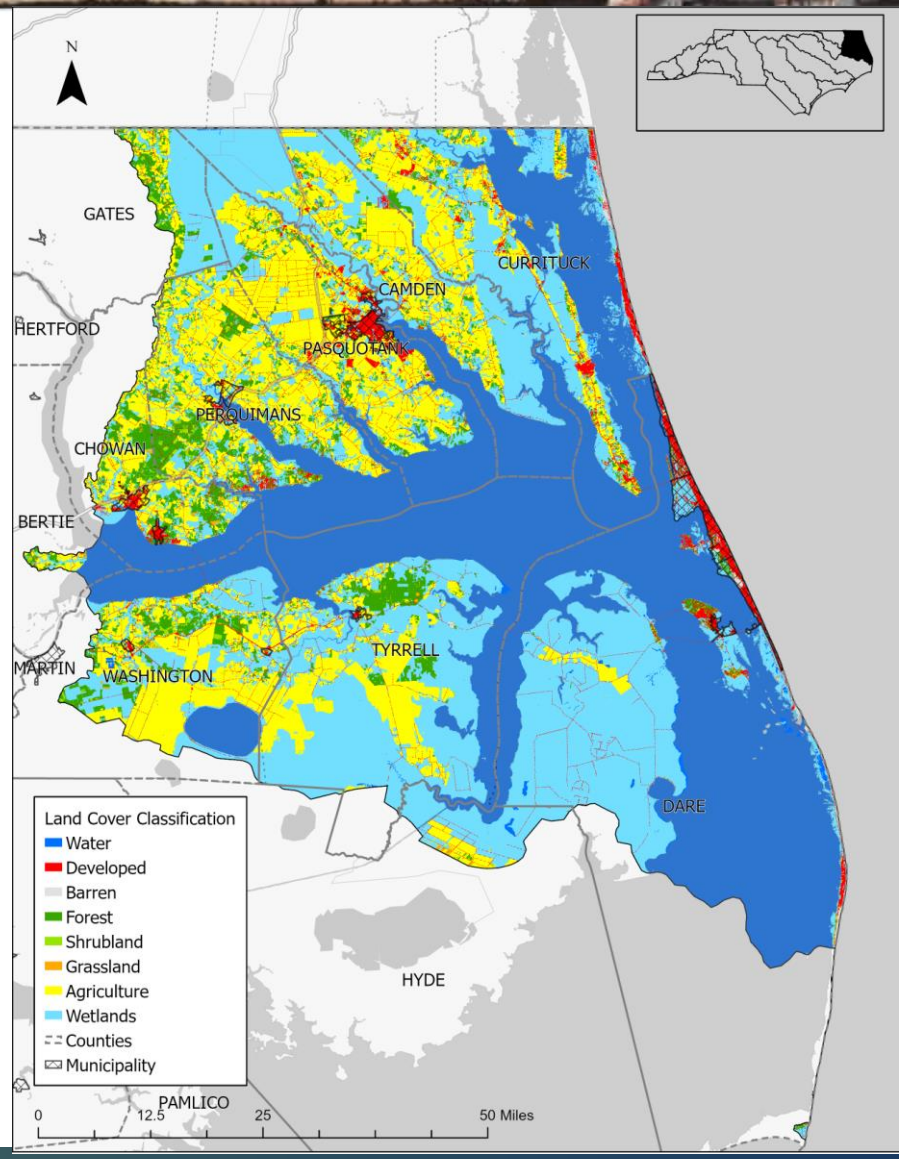
- There are 11 counties and 13 municipalities located in wholly or partially in the Pasquotank River basin.
- As of 2016 the predominant land cover is:
  - 38% Open Water
  - 33% Wetlands
  - 20% Agriculture
  - 5% Forest
  - 3% Developed
  - 1% Shrub/Barren/Grassland/Herbaceous
- Nutrients, algal blooms, altered hydrology, and flooding continue to be water related issues throughout the basin

Basin Characteristics

- Located in the northeastern corner of the Coastal Plain Province
- There are 11 counties and 13 municipalities located in wholly or partially in the Pasquotank River basin.
- As of 2016 the predominant land cover is:
  - 38% Open Water
  - 33% Wetlands
  - 20% Agriculture
  - 5% Forest
  - 3% Developed
  - 1% Shrub/Barren/Grassland/Herbaceous
- Nutrients, algal blooms, altered hydrology, and flooding continue to be water related issues throughout the basin

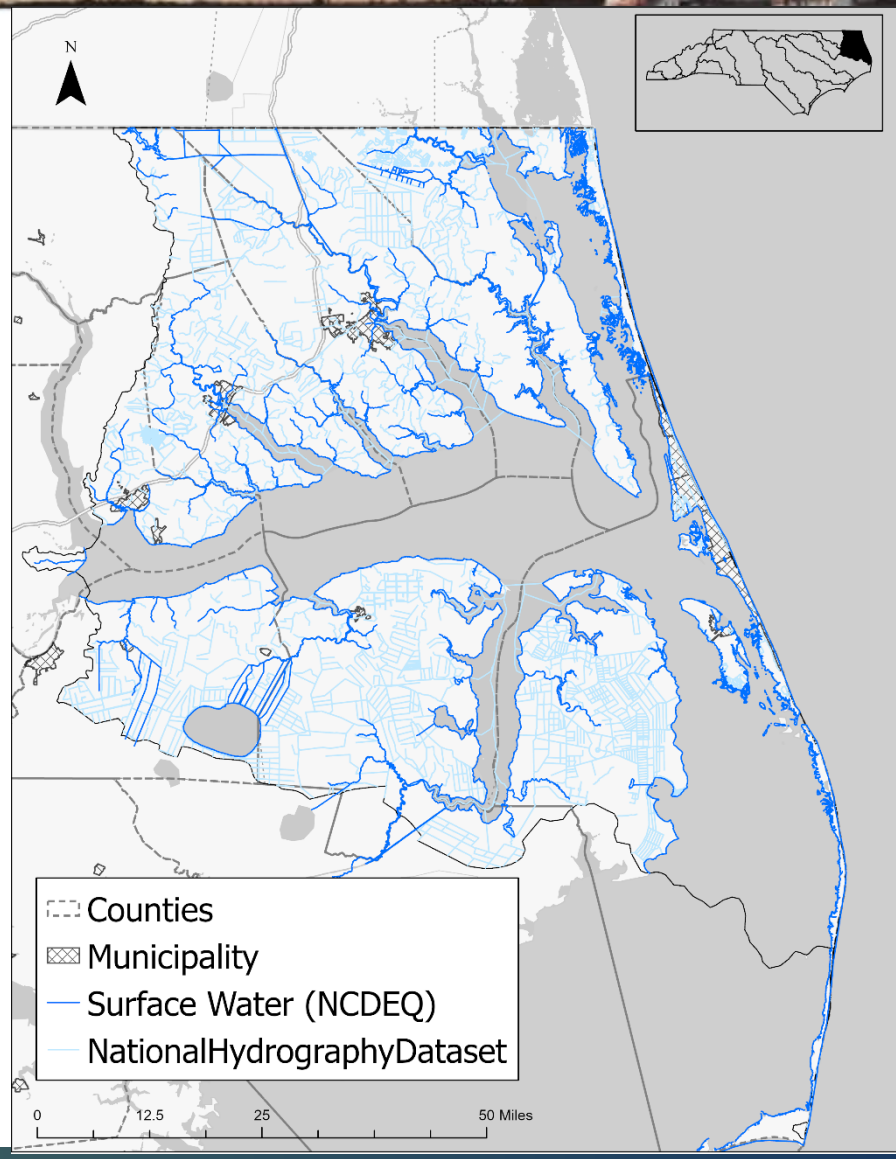
Basin Characteristics

- Located in the northeastern corner of the Coastal Plain Province
- There are 11 counties and 13 municipalities located in wholly or partially in the Pasquotank River basin.
- As of 2016 the predominant land cover is:
  - 38% Open Water
  - 33% Wetlands
  - 20% Agriculture
  - 5% Forest
  - 3% Developed
  - 1% Shrub/Barren/Grassland/Herbaceous
- Nutrients, algal blooms, altered hydrology, and flooding continue to be water related issues throughout the basin



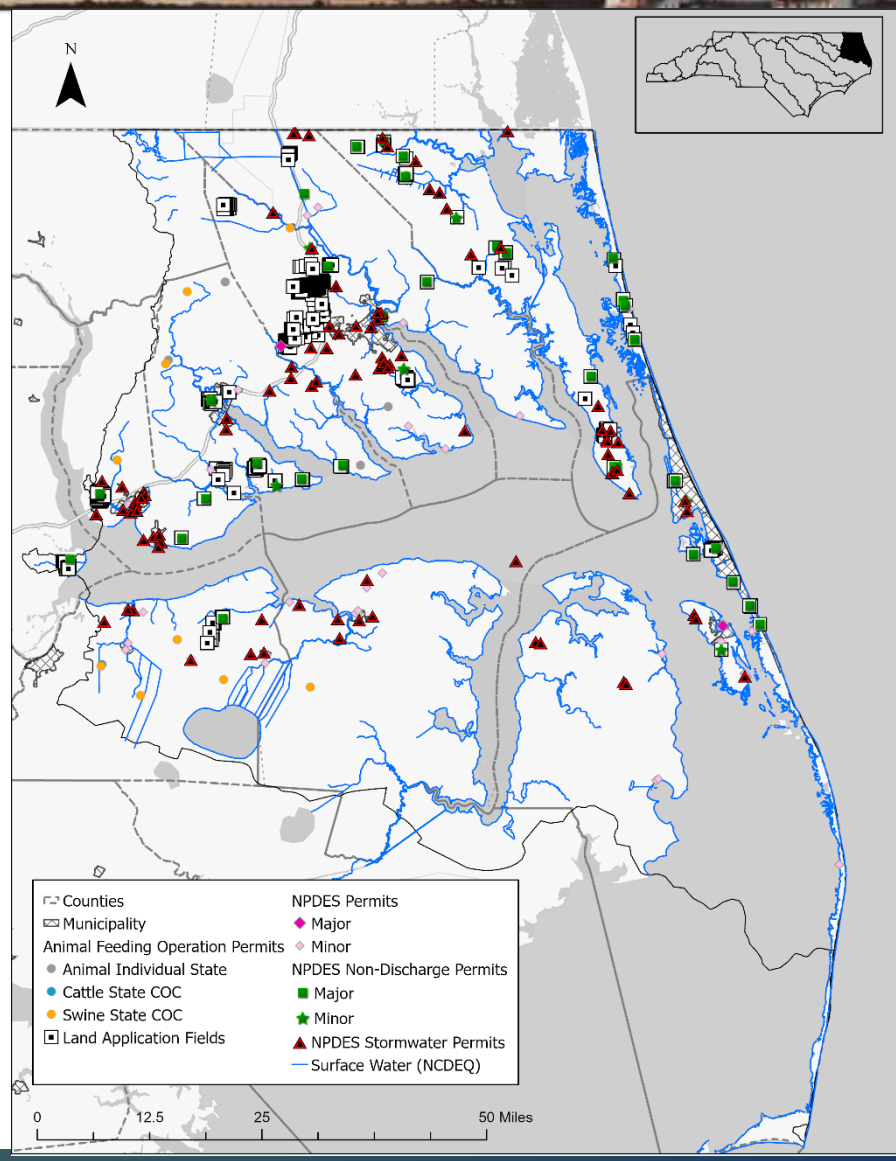
Basin Characteristics

- Located in the northeastern corner of the Coastal Plain Province
- There are 11 counties and 13 municipalities located in wholly or partially in the Pasquotank River basin.
- As of 2016 the predominant land cover is:
  - 38% Open Water
  - 33% Wetlands
  - 20% Agriculture
  - 5% Forest
  - 3% Developed
  - 1% Shrub/Barren/Grassland/Herbaceous
- Nutrients, algal blooms, altered hydrology, and flooding continue to be water related issues throughout the rivers in this basin



Basin Characteristics

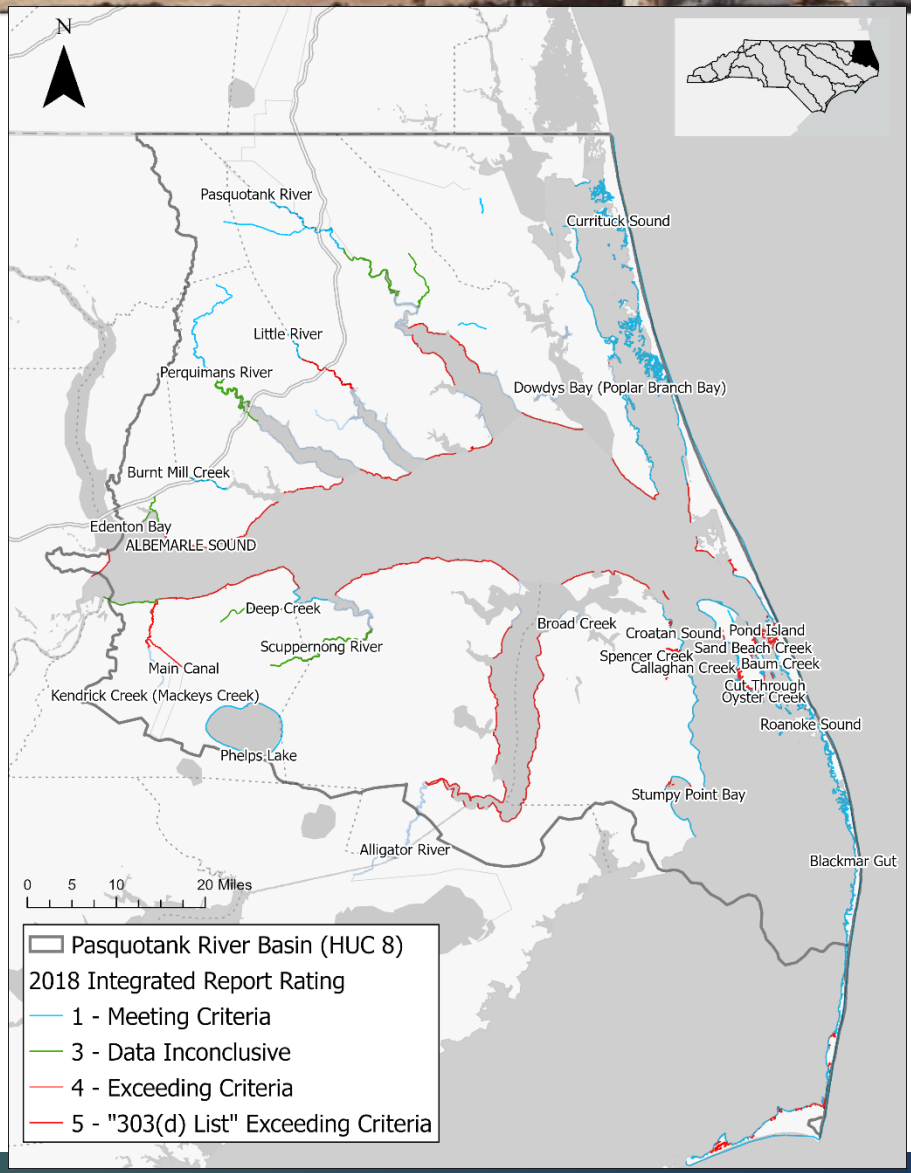
- NPDES Wastewater permits: 47
- NPDES Stormwater permits: 106
- NPDES Non-discharge permits: 39
- Animal Feeding Operation permits: 15
- Public Water Supply (PWS) systems: 21
  Required to submit LWSP: 21
- Registered in WWATR: 22
- CCPCUA (Washington County)
  Registered: 2 Permitted: 6



Monitoring Data and Water Quality

2018 Impaired Waters in the Pasquotank River Basin:

- Albemarle Sound (Copper, pH, Dioxin)
- Little River (Chlorophyll *a*)
- Pasquotank River (Copper, Dissolved Oxygen, pH)
- Kendrick Creek (Nickel)
- Main Canal (Benthos)
- Alligator River (Copper)
- Dowdys Bay (Enterococcus)
- Currituck Sound (Enterococcus)
- Collington Creek (Enterococcus)
- Shellfish Growing Area Status (Prohibited):
  - Baum Creek, Blackmar Gut, Broad Creek, Callaghan Creek, Croatan Sound, Currituck Sound, Cut Through, Johns Creek, Oyster Creek, Pond Island, Roanoke Sound, Rockhall Creek, Sand Beach Creek, Spencer Creek, Stumpy Point Bay



Monitoring Data and Water Quality – North Shore

2018 Impaired Waters in the Pasquotank River Basin:

- Little River (Chlorophyll *a*)
- Pasquotank River (Copper, Dissolved Oxygen, pH)

2016 Land Cover

- 55% Agriculture
- 18% Wetlands
- 14% Open Water
- 11% Forest/Developed/Grassland/Shrub

4,800’ in-stream wetland on a farm canal

2,000’ in-stream wetland on a farm canal

2,000’ in-stream wetland on privately-owned canal

Monitoring Data and Water Quality – North Shore

2018 Impaired Waters in the Pasquotank River Basin:

- Little River (Chlorophyll *a*)
- Pasquotank River (Copper, Dissolved Oxygen, pH)

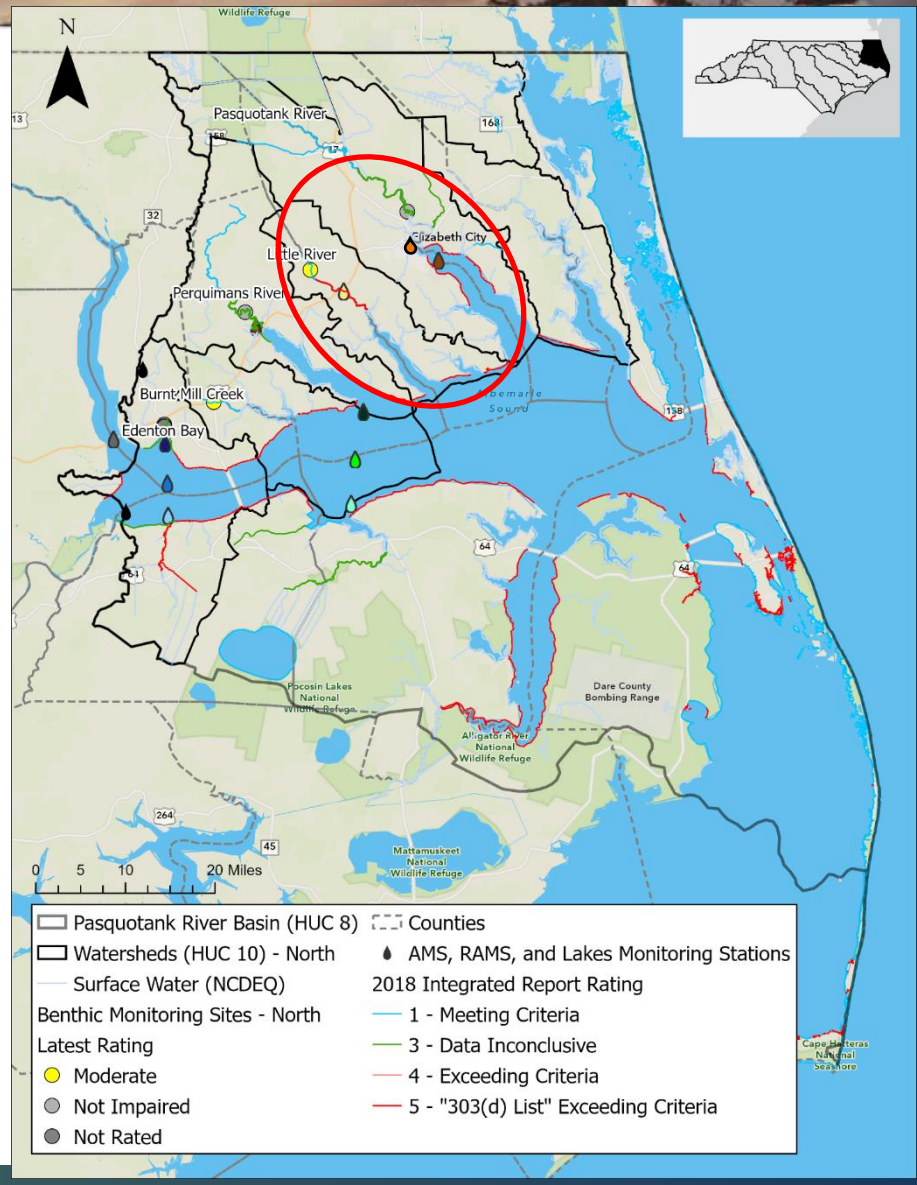
2016 Land Cover

- 55% Agriculture
- 18% Wetlands
- 14% Open Water
- 11% Forest/Developed/Grassland/Shrub

4,800’ in-stream wetland on a farm canal

2,000’ in-stream wetland on a farm canal

2,000’ in-stream wetland on privately-owned canal



Monitoring Data and Water Quality – North Shore

2018 Integrated Report:

- Little River (Chlorophyll *a*)
- Pasquotank River (Copper, Dissolved Oxygen, pH)

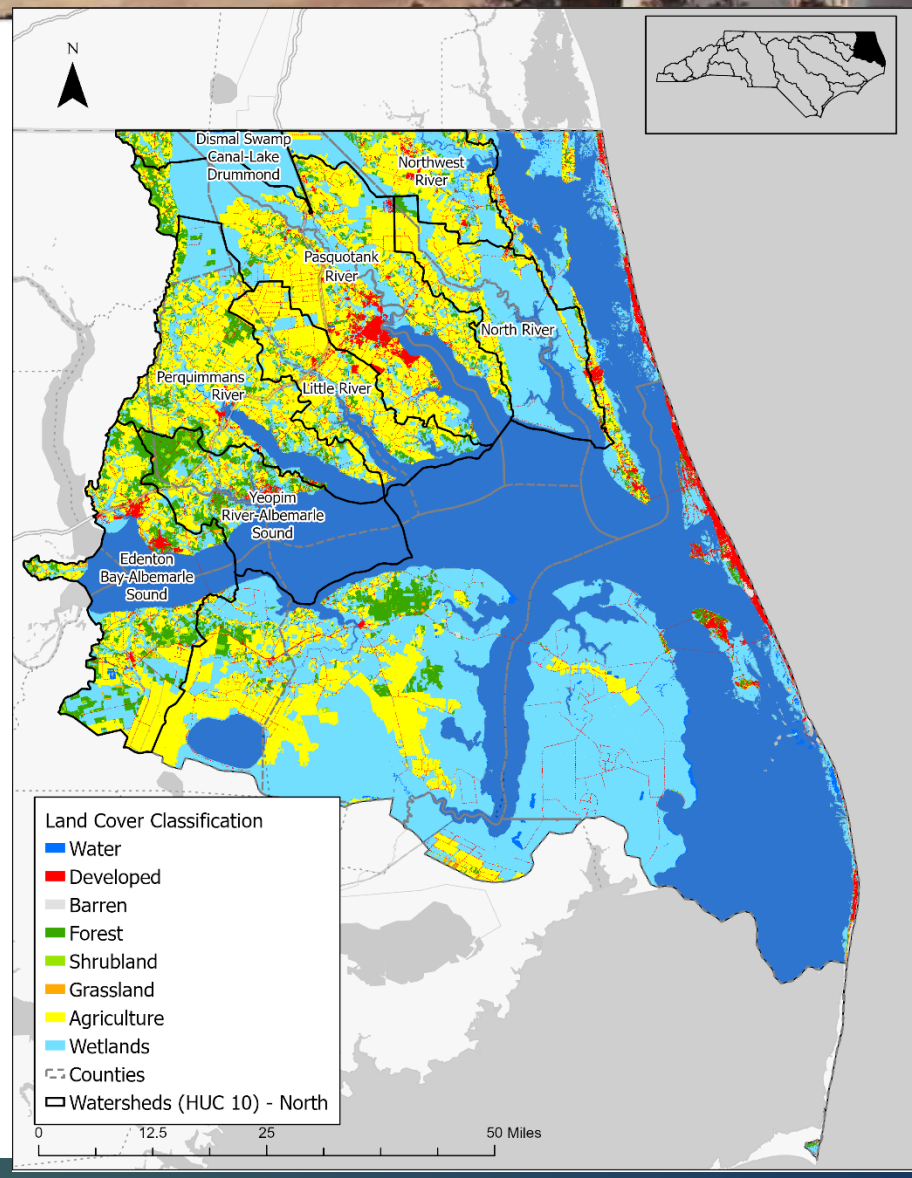
2016 Land Cover

- 55% Agriculture
- 18% Wetlands
- 14% Open Water
- 11% Forest/Developed/Grassland/Shrub

4,800’ in-stream wetland on a farm canal

2,000’ in-stream wetland on a farm canal

2,000’ in-stream wetland on privately-owned canal



Monitoring Data and Water Quality – North Shore

2018 Integrated Report:

- Little River (Chlorophyll *a*)
- Pasquotank River (Copper, Dissolved Oxygen, pH)

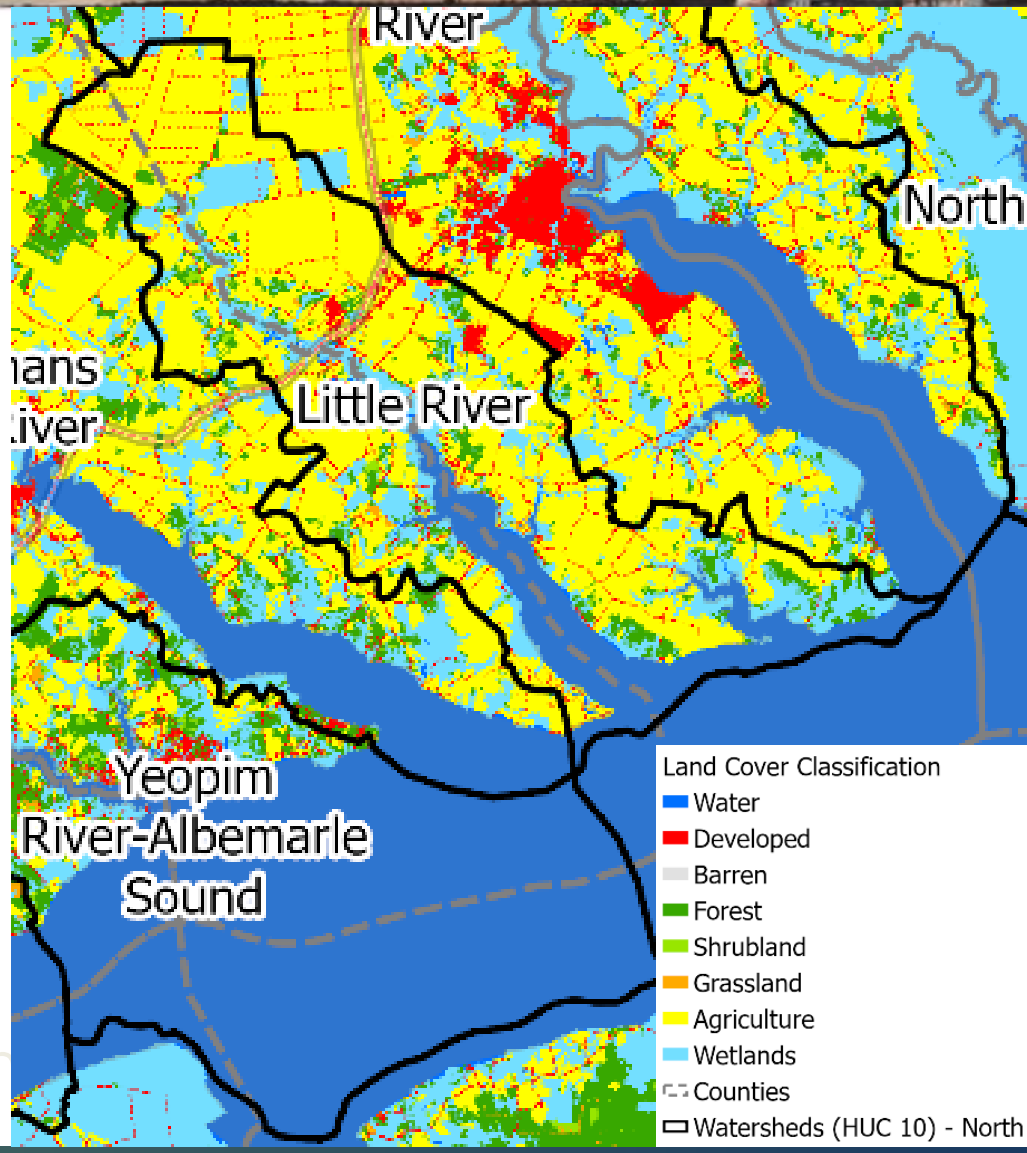
2016 Land Cover

- 55% Agriculture
- 18% Wetlands
- 14% Open Water
- 11% Forest/Developed/Grassland/Shrub

4,800’ in-stream wetland on a farm canal

2,000’ in-stream wetland on a farm canal

2,000’ in-stream wetland on privately-owned can



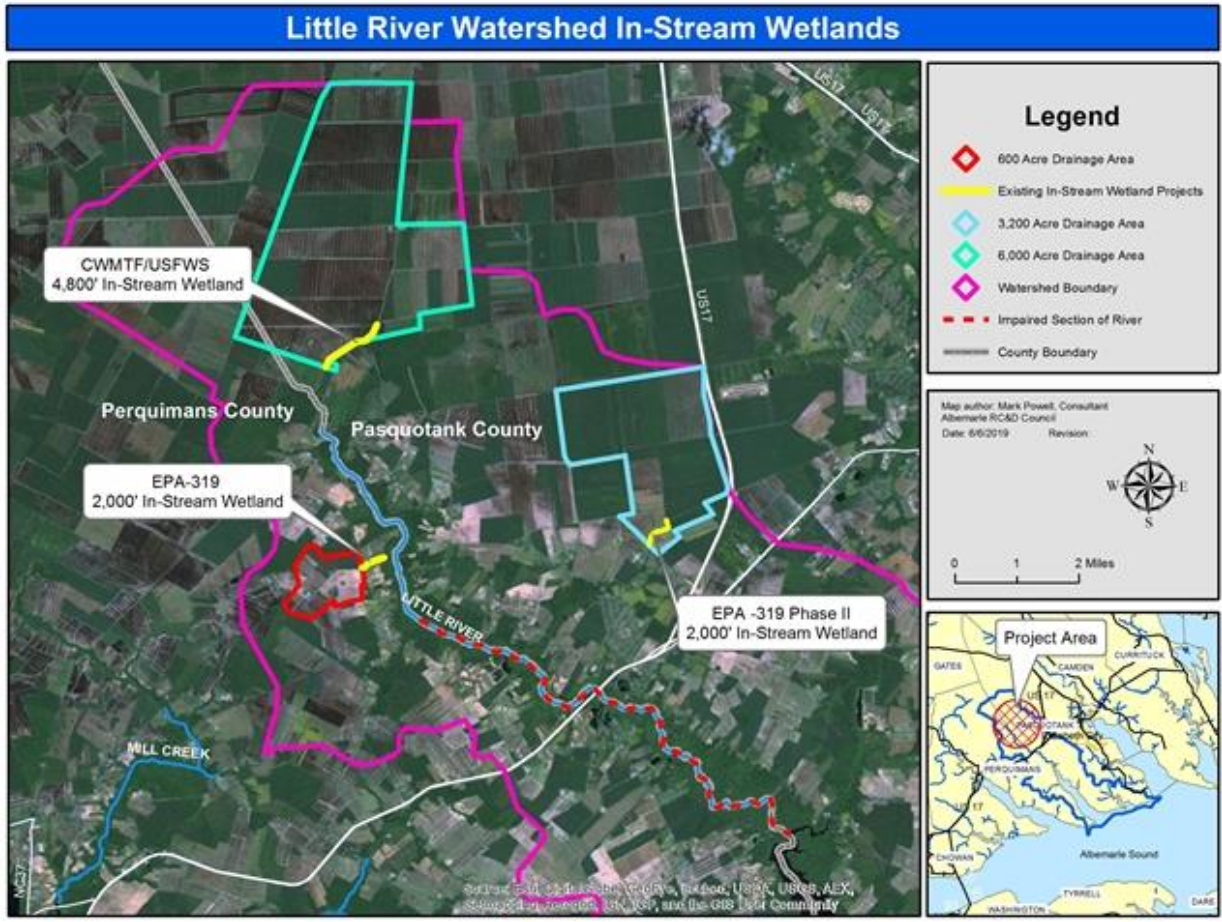
Monitoring Data and Water Quality – North Shore

2018 Integrated Report:

- Little River (Chlorophyll *a*)
- Pasquotank River (Copper, Dissolved Oxygen, p

2016 Land Cover

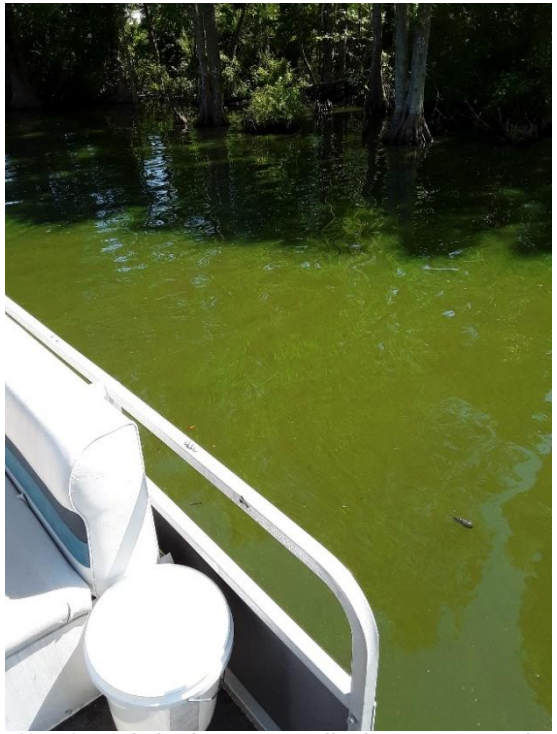
- 55% Agriculture
- 18% Wetlands
- 14% Open Water
- 11% Forest/Developed/Grassland/Shrub



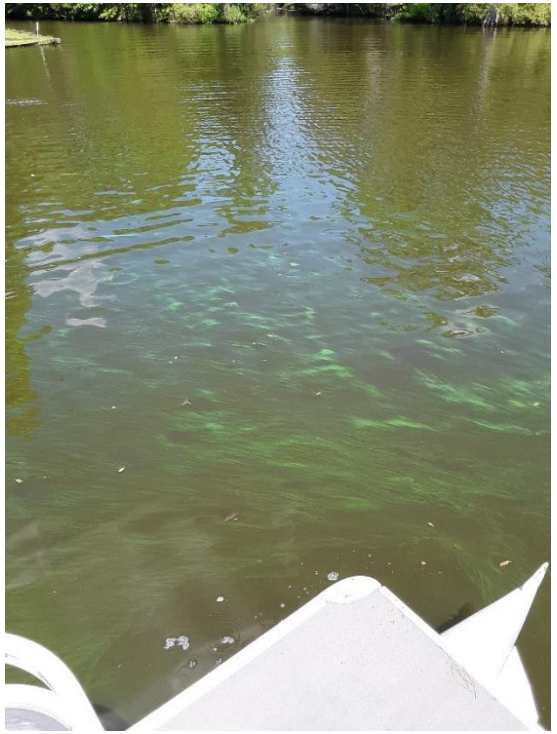
4,800' in-stream wetland on a farm canal

2,000' in-stream wetland on a farm canal

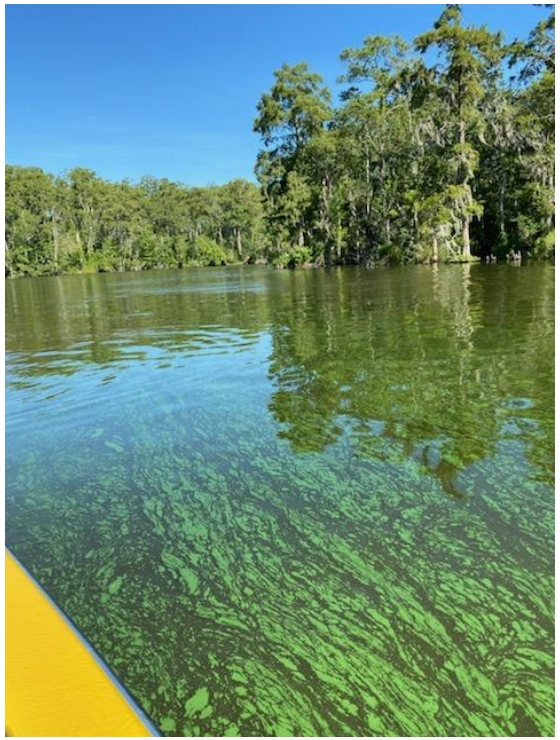
2,000' in-stream wetland on privately-owned canal



Little River (7/20) EMT; Cylindrospermopsis: may produce cyanotoxins



Hall's Creek on Little River (7/20) Rodney Johnson



Symonds Creek Bridge flows to the Little River (7/20) Scott Cumberland

7/18/2017 - Rodney Johnson

7/16/2017 - Rodney Johnson

7/19/2017 - Rodney Johnson

Figure 2. Algae bloom on the Pasquotank River at the Elizabeth City on October 12, 2019.

7/18/2017 - Rodney Johnson

Monitoring Data and Water Quality – South Shore

2018 Impaired Waters in the Pasquotank River Basin:

- Kendrick Creek (Nickel)
- Main Canal (Benthos)
- Alligator River (Copper)

- Scuppernong Coastal System Regional Water Management Study

- This study and regional water management strategy.

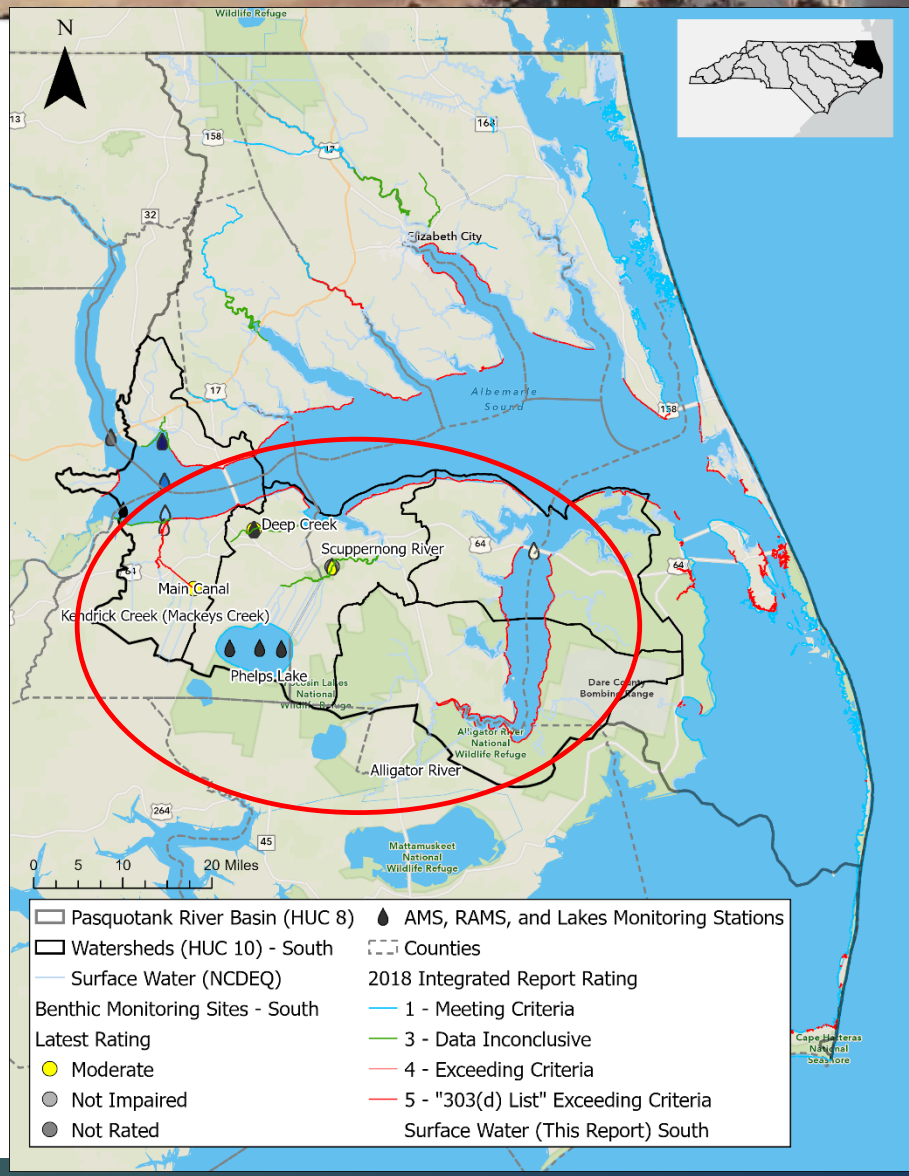
Monitoring Data and Water Quality – South Shore

2018 Impaired Waters in the Pasquotank River Basin:

- Kendrick Creek (Nickel)
- Main Canal (Benthos)
- Alligator River (Copper)

- Scuppernong Coastal System Regional Water Management Study

- This study and regional water management strategy.



Monitoring Data and Water Quality – South Shore

2018 Integrated Report:

- Kendrick Creek (Nickel)
- Main Canal (Benthos)
- Alligator River (Copper)

- Scuppernong Coastal System Regional Water Management Study

- This study and regional water management strategy.

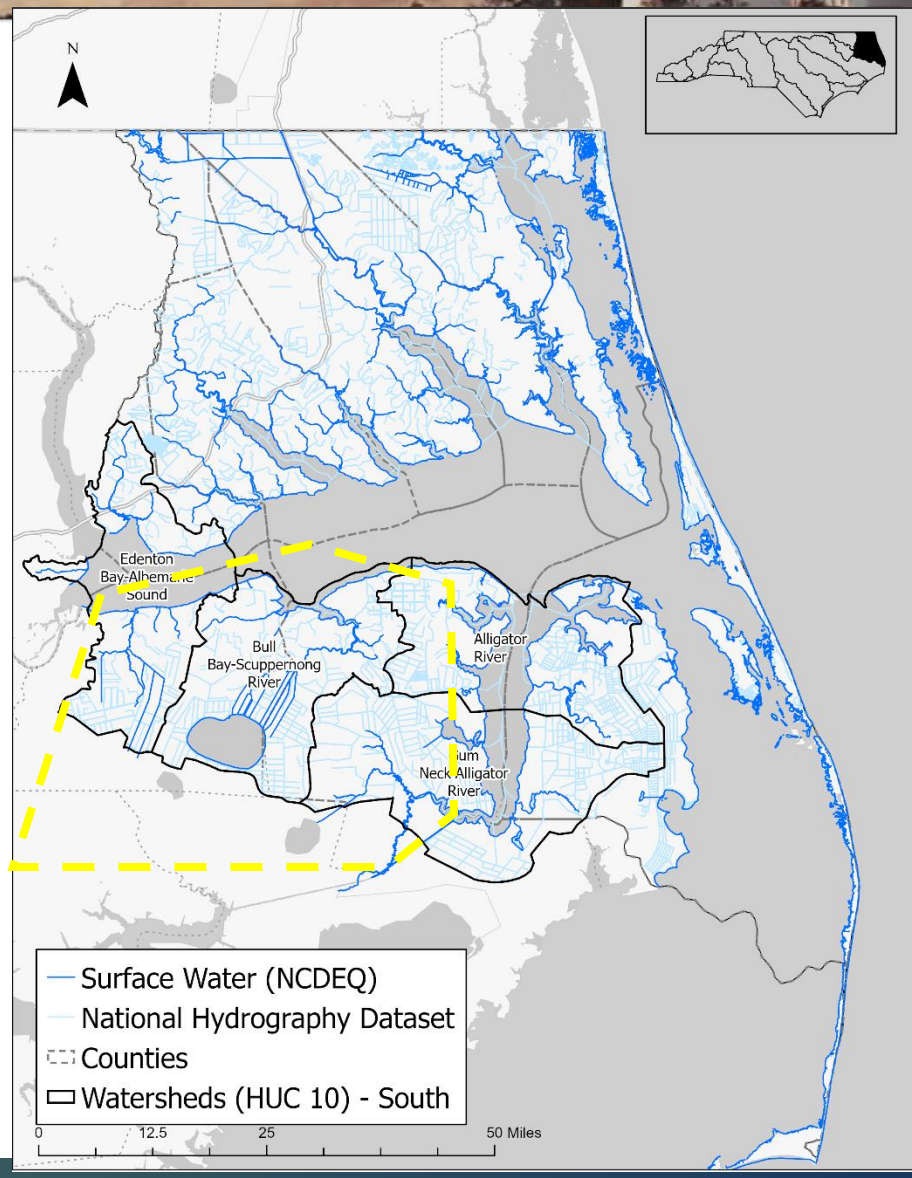
Monitoring Data and Water Quality – South Shore

2018 Integrated Report:

- Kendrick Creek (Nickel)
- Main Canal (Benthos)
- Alligator River (Copper)

- Scuppernong Coastal System Regional Water Management Study

- This study and regional water management strategy.

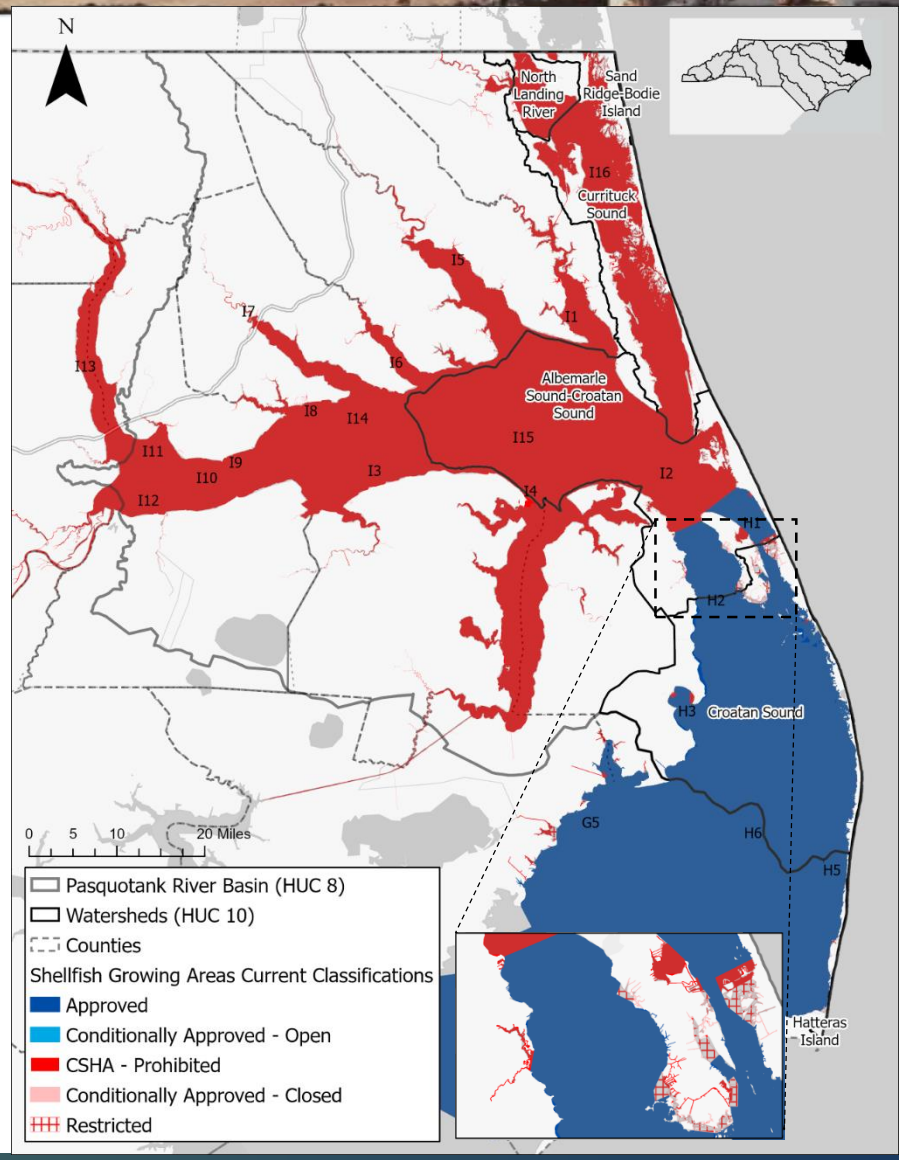


Monitoring Data and Water Quality – Outer Banks

2018 Impaired Waters in the Pasquotank River Basin:

- Dowdys Bay (Enterococcus)
- Currituck Sound (Enterococcus)
- Collington Creek (Enterococcus)

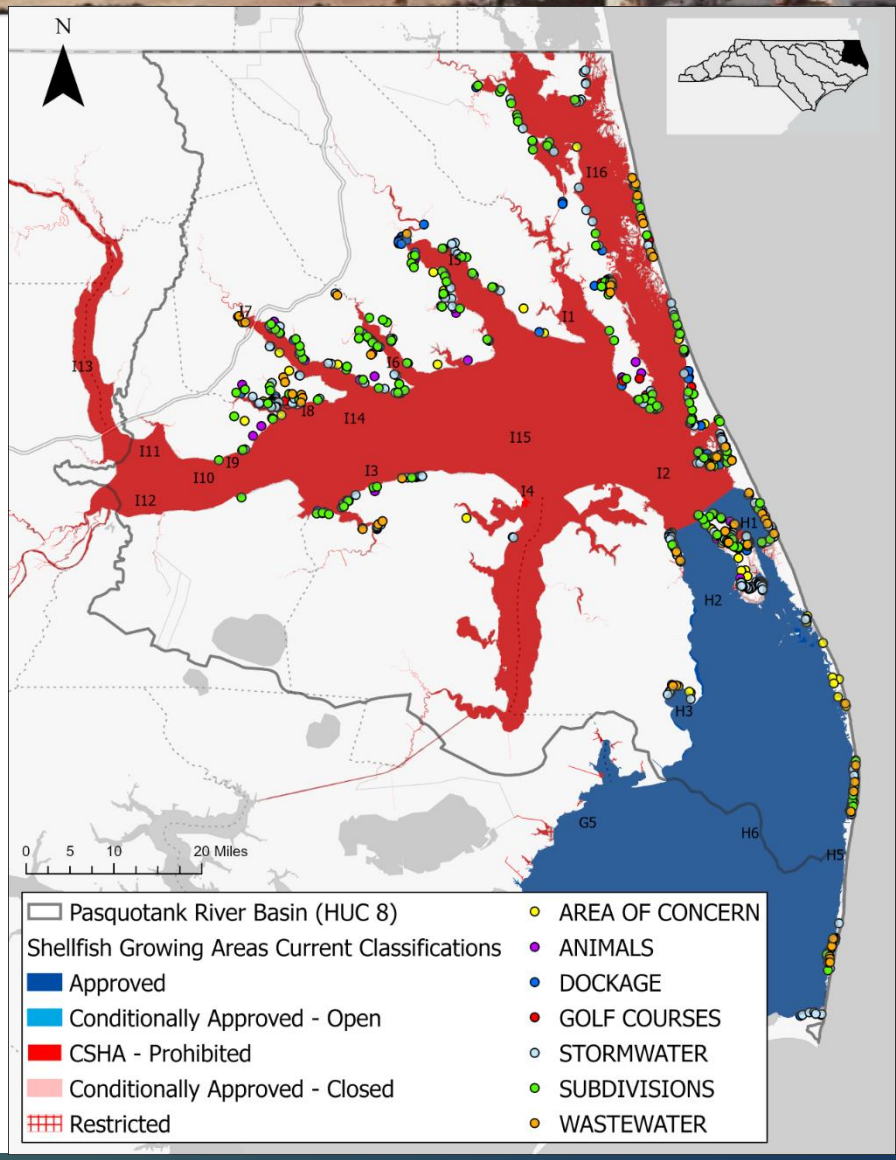
- Shellfish Growing Area (Prohibited):
  - Baum Creek, Blackmar Gut, Broad Creek, Callaghan Creek, Croatan Sound, Currituck Sound, Cut Through, Johns Creek, Oyster Creek, Pond Island, Roanoke Sound, Rockhall Creek, Sand Beach Creek, Spencer Creek, Stumpy Point Bay



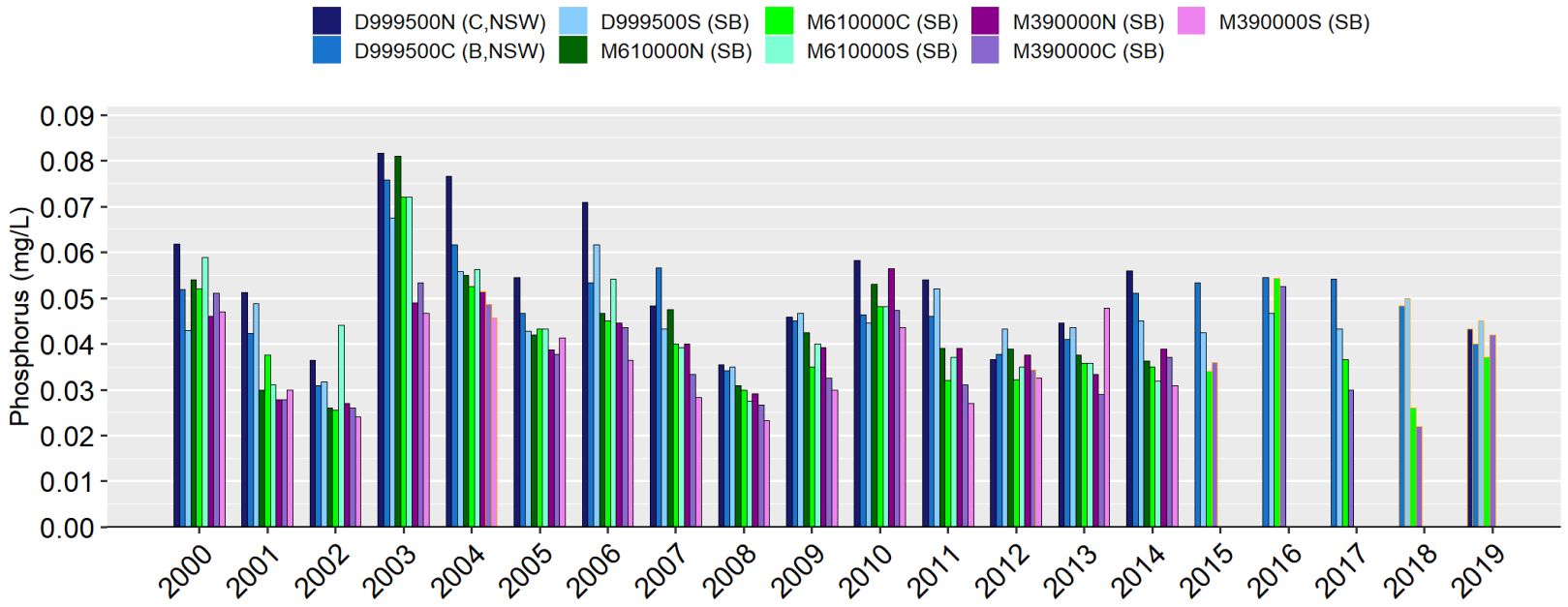
Monitoring Data and Water Quality – Outer Banks

Shoreline surveys assessed:

- Areas of Concern
- Wildlife and Domestic Animals
- Marinas and Multi-slip Docks
- Golf Courses
- Stormwater
- Subdivisions
- Wastewater Treatment

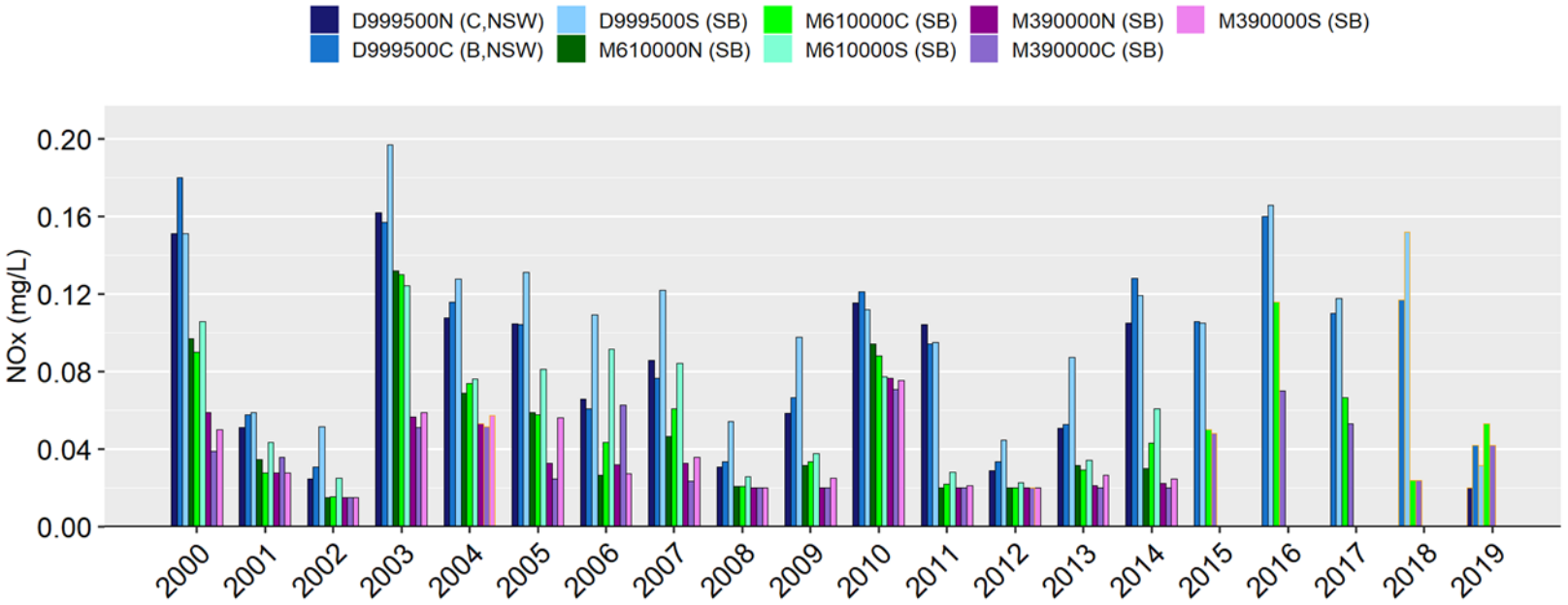


Monitoring Data and Water Quality – Albemarle Sound



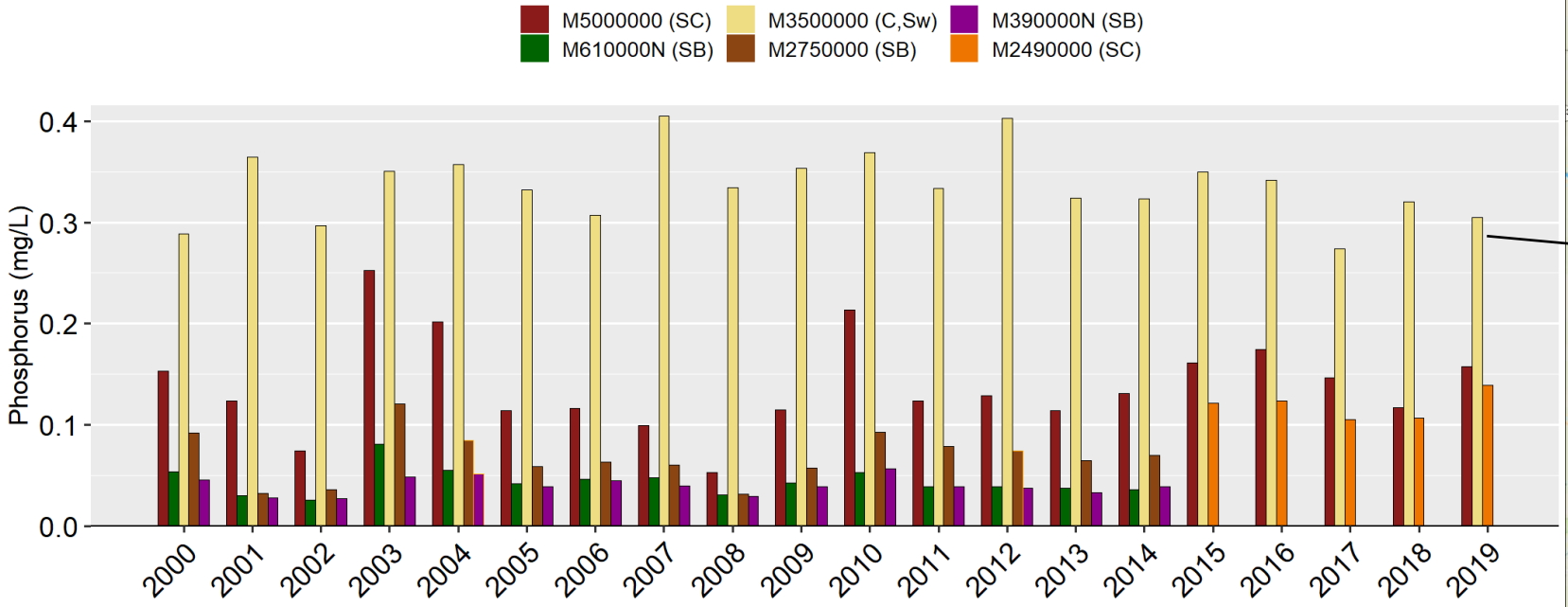
- Annual average distribution of Total Phosphorus concentrations in the Albemarle Sound generally decline as observed from west to east

Monitoring Data and Water Quality – Albemarle Sound



- The Nitrate-Nitrite Nitrogen (NOx) concentrations generally decline as observed from west to east

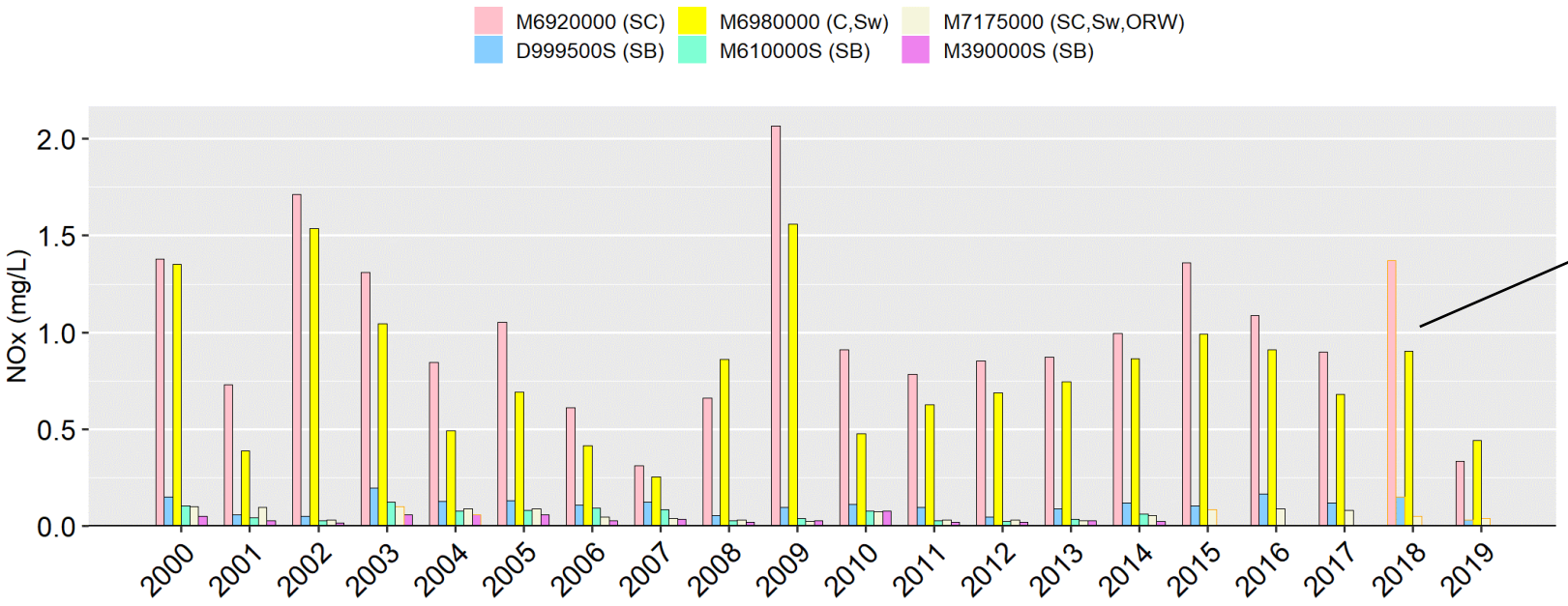
Monitoring Data and Water Quality – Albemarle Sound



- Notably, the Little River on the northern side of the basin had the highest Total Phosphorus concentrations

Monitoring Data and Water Quality – Albemarle Sound

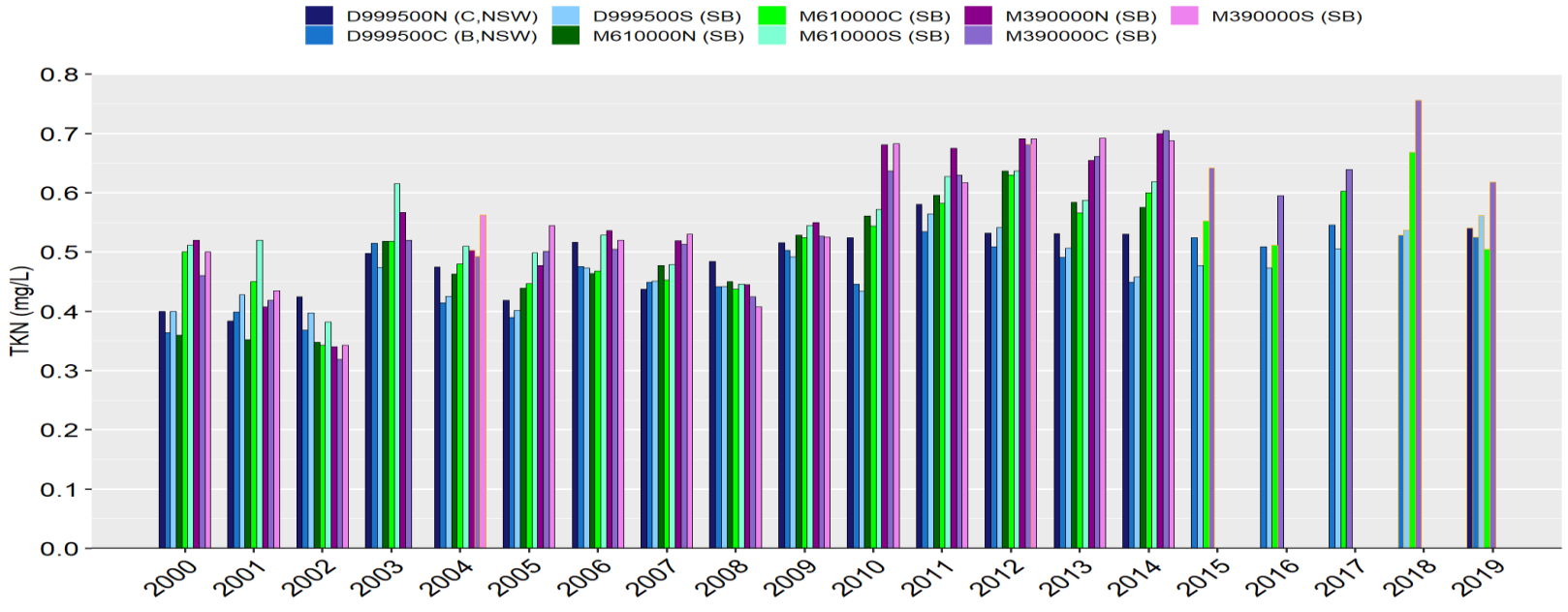
- Kendrick Creek and Scuppernong River on the Southern Shore had the highest Nitrate-Nitrite Nitrogen (NOx) concentrations



Monitoring Data and Water Quality – Albemarle Sound

- Instream Organic Nitrogen concentrations in the Albemarle Sound appear to be increasing over time and as observed from west to east; notably, during the most recent 10 years on record (2010 – 2019)

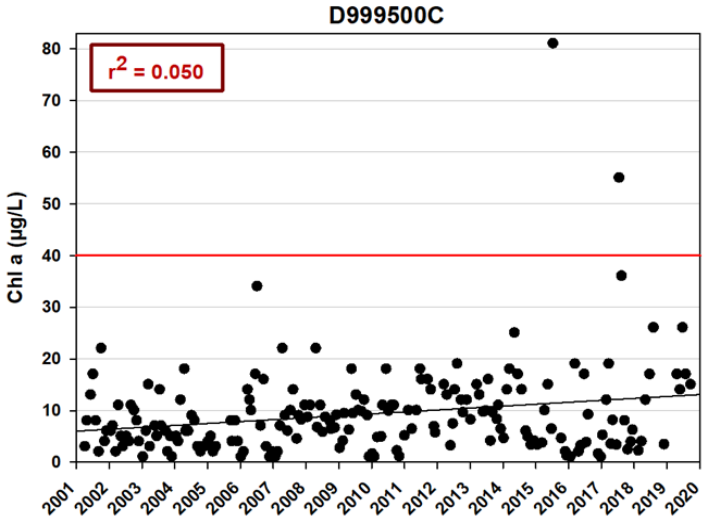
- Increases in Organic Nitrogen concentrations often coincide with increases in biological productivity

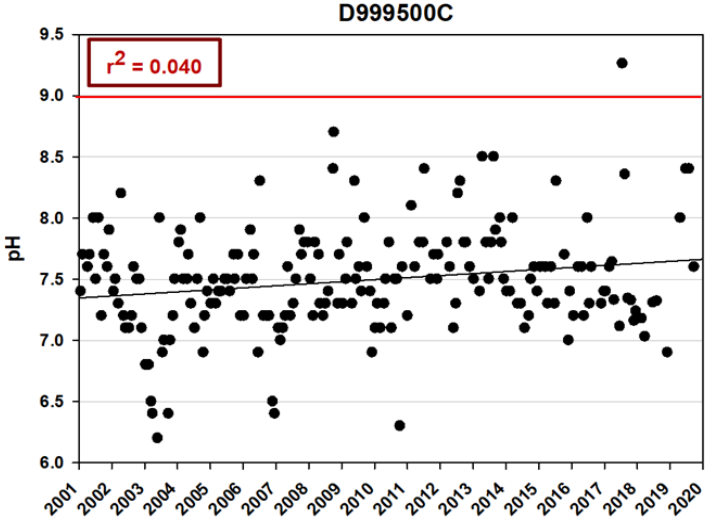


Monitoring Data and Water Quality

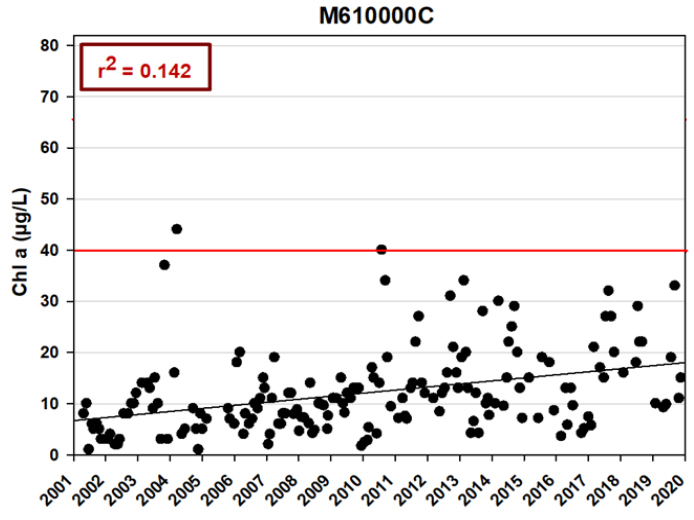
Another signal of biological productivity can be found concerning Chlorophyll a and pH concentrations in the eastern Albemarle Sound (AS)

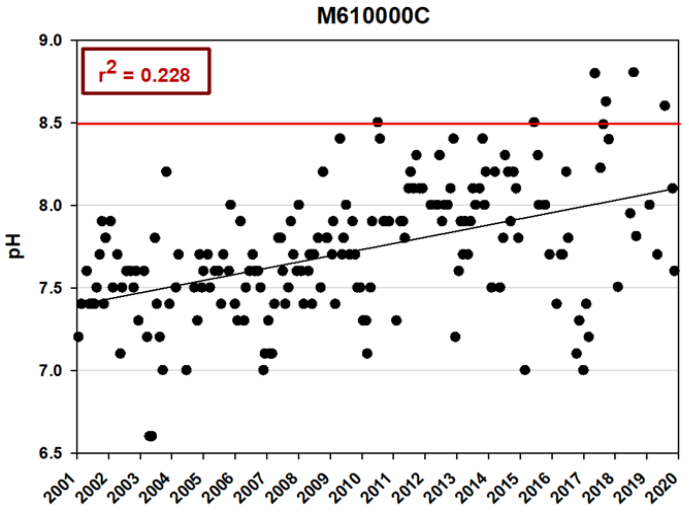
Western AS



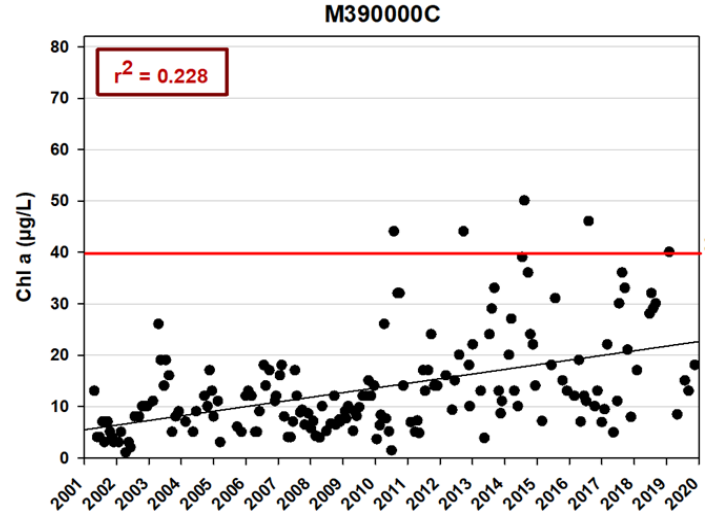


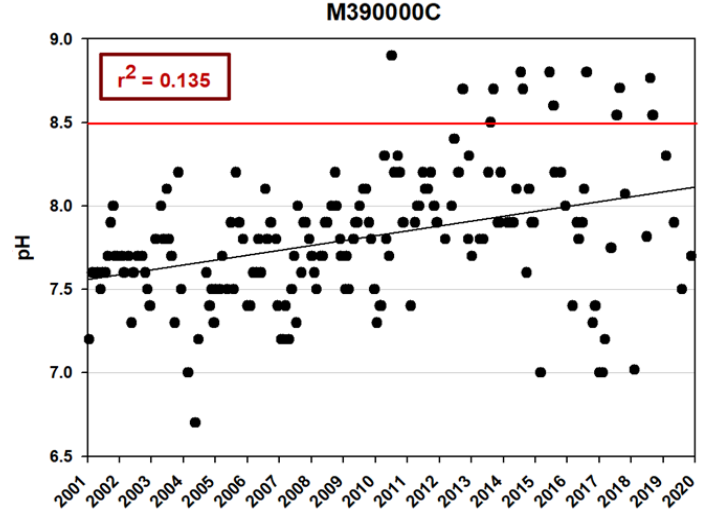
Middle AS





Eastern AS



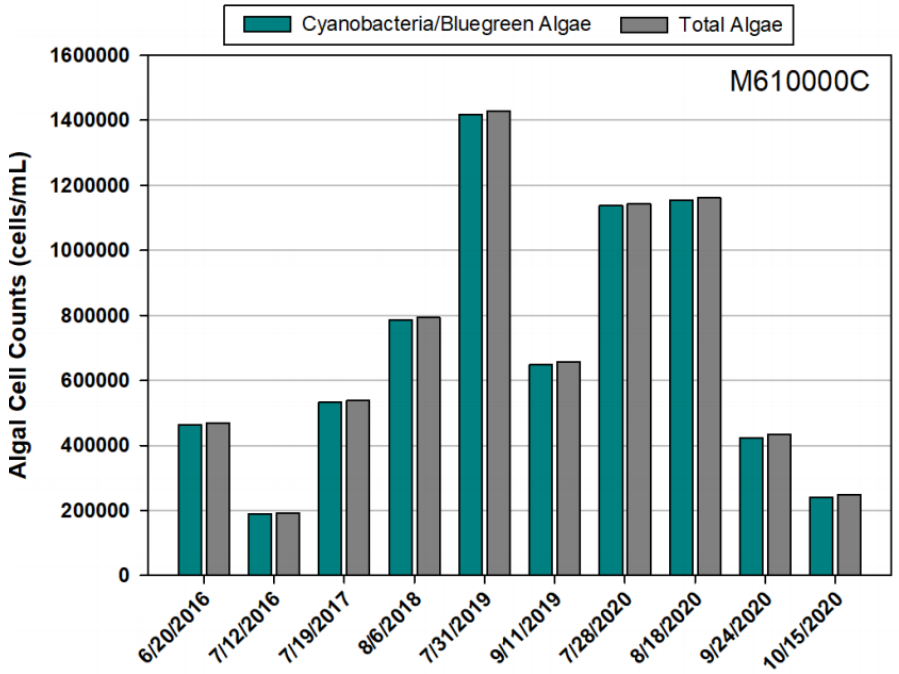


Monitoring Data and Water Quality

Location	Date	Micro-cystin µg/L	Chl a µg/L	Cell Density+ cells/mL	Cell Density+ units/mL	Biovolume mm^3/m^3	Algal Group/ Dominant Taxa	County
Albemarle Sound M390000C	6/28/2018	ND	28	T-865,000 C-860,000	T-85,000	T-5,500	CYA Dolichospermum	Tyrrell
Albemarle Sound M390000C	8/6/2018	0.4U	29	T-1,624,000 C-1,620,000	T-140,000	T-8,300	CYA Dolichospermum, Pseudanabaena	Tyrrell
Albemarle Sound M610000C	8/6/2018	0.4	22	T-793,000 C-787,000	T-79,000	T-5,300	CYA Dolichospermum	Tyrrell
Perquimans River	6/5/2019	0.4	131		T-14,000	T-15,000	CYA Dolichospermum	Perquimans
Sutton Creek (to Perquimans R)	6/12/2019	0.44	86		T-139,000	T-19,000	CYA, BAC Choococcus, centric diatoms	Hertford
Little River	7/2/2019	0.4U	ND		T-125,000	T-45,000	CYA Dolichospermum, Cylindrospermopsis	Pasquotank
Albemarle Sound M610000C	7/31/2019	ND	19	T-1,429,000 C-1,418,000	T-108,000	T-7,100	CYA Chroococcus, Pseudanabaena	Tyrrell
Manns Harbor	8/29/2019	ND	9.4		T-53,000	T-3,000	CYA Planktolyngbya	Dare
Albemarle Sound M610000C	9/11/2019	ND	33	T-657,000 C-648,200	T-66,000	T-5,000	CYA Chroococcus, Pseudanabaena	Tyrrell
Pasquotank River M2750000	10/8/2019	ND	ND	T-421,000 C-406,000	T-26,000		CYA Pseudanabaena, Dolichospermum	Pasquotank

WHO (World Health Organization): Recreational guideline of 10 ug/L indicating moderate probability of acute health effects from recreational exposure;
+ T=Total Algae & C=Cyanobacteria/Bluegreen Algae;
ND = No data available (data sheet found, but no analytical data this specific parameter found;
CYA = Cyanobacteria Algal Group (Cyanobacteria is also known as bluegreen algae)

- Algal blooms which result in elevated Chlorophyll *a* concentrations also occur throughout the Albemarle Sound
- Many of these algal blooms contain dominant cyanobacterial or blue green algae



Water Use

Data Sources:

- Water Withdrawal and Transfer Registration (WWATR) Program
- Local Water Supply Planning (LWSP) Program
- Central Coastal Plain Capacity Use Area (CCPCUA)
- North Carolina Department of Agriculture & Consumer Services (NCDA&CS)

Summary:

- Currently, groundwater is the primary source of water supply for communities and private wells throughout the basin.
- Collectively, public water supply systems in the Pasquotank River basin are expected to have adequate water supplies to meet current and future demands.

Recommendations

- Continue to work on technology that can distinguish a specific nitrogen signature in order to identify a specific source such as animal types, domestic waste or a background forest/sediment signature.

- Continue to work with the Nutrient Criteria Development Plan (NCDP) Scientific Advisory Council (SAC) to develop appropriate protective criteria (which could be response and/or causal variables) for the Chowan River and Albemarle Sound.

- Broad partnerships should include local nonprofits, county governments, Soil and Water Conservation Districts, state agencies (North Carolina and Virginia), and universities that are working together to monitor water quality and quantity in Northeastern North Carolina.

Photo: NCDEQ

DWR requests approval of the 2021 Pasquotank River Basin Water Resources Plan

Forest Shepherd
Forest.shepherd@ncdenr.gov
919.707.9042

Pasquotank River Basin StoryMap Link:
Pasquotank River Basin Water Resources Plan (2021) (arcgis.com)