2019 11th National Monitoring Conference

Advancing Continuous Streamflow and Water Quality Monitoring Networks in the Coastal Plain, Waccamaw River Watershed, South Carolina.

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Charleston Field Office, SC

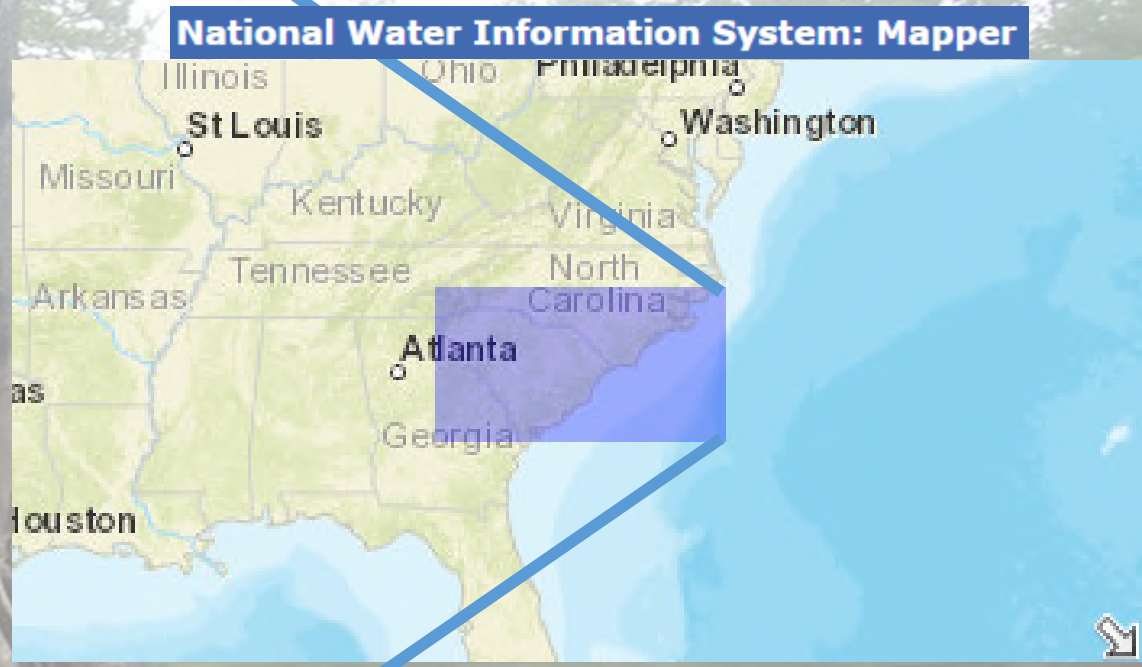
Outline

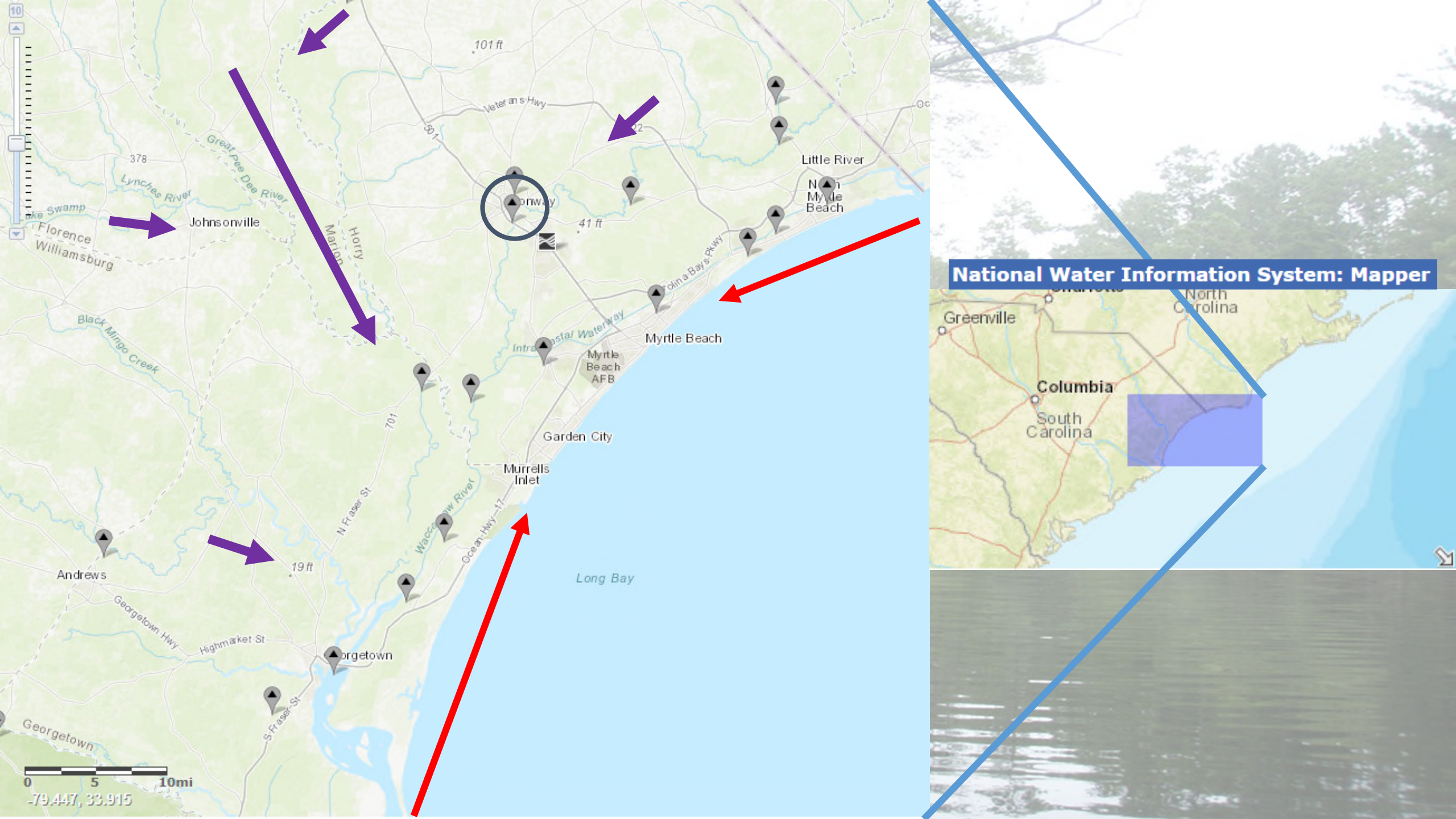
- Pee Dee and Waccamaw QW and Streamflow Network
- Blackwater Ecosystems
- Coastal Plain Hydrology
- Continuous Nitrate Monitoring
- Discussion/Questions

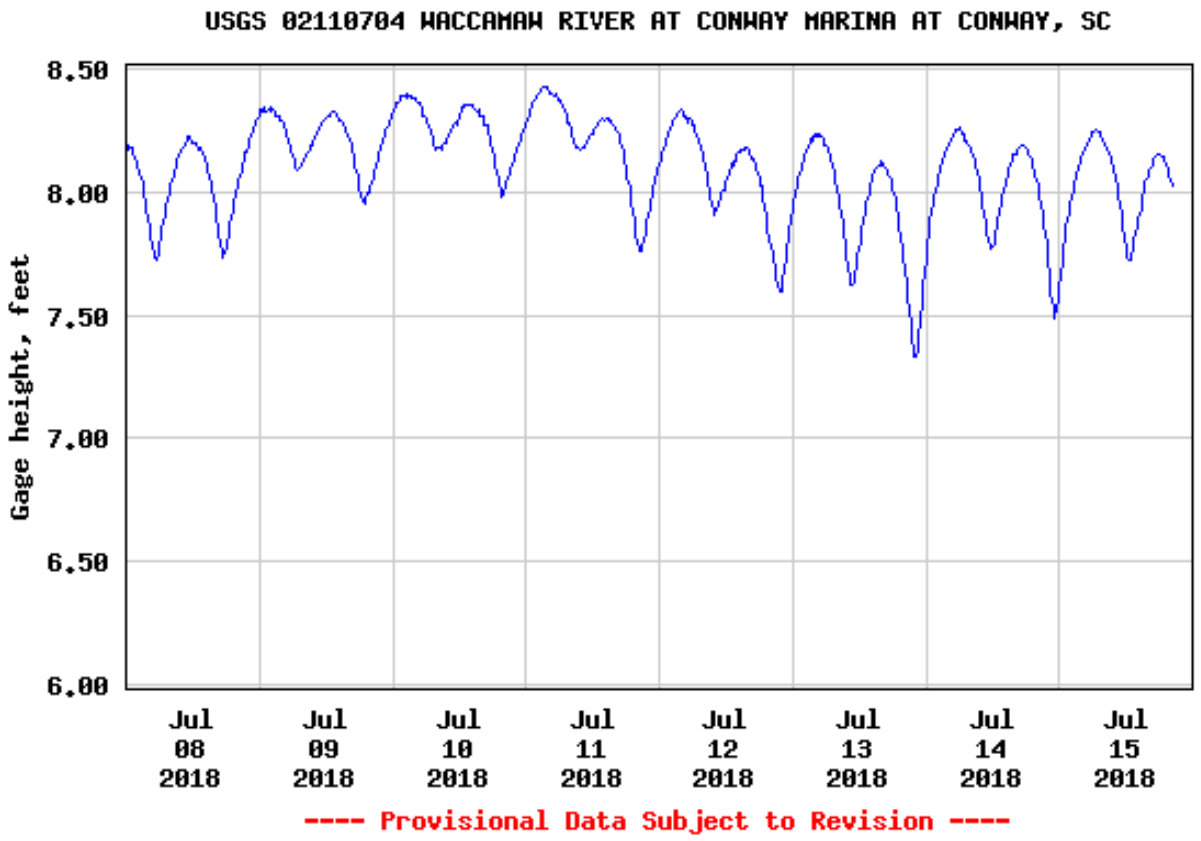
USGS

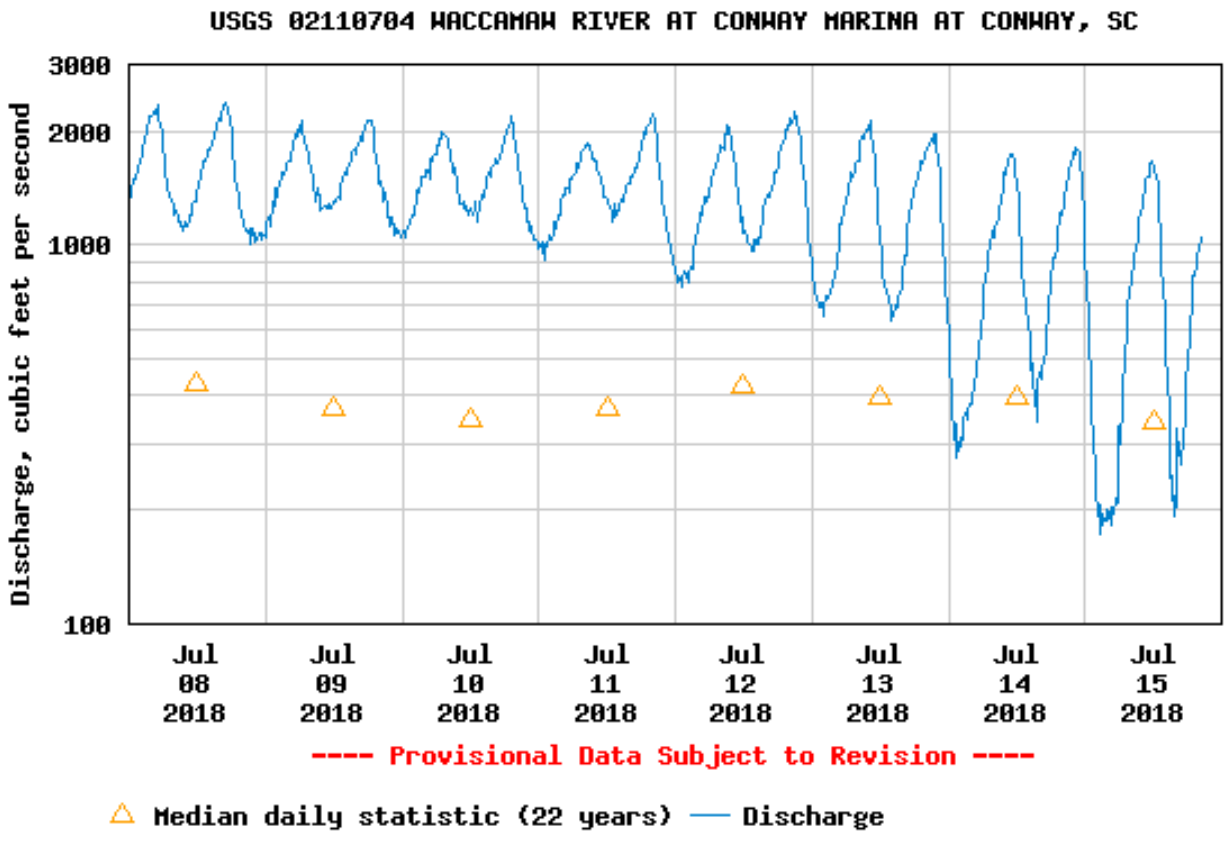
South Atlantic Water Science Center

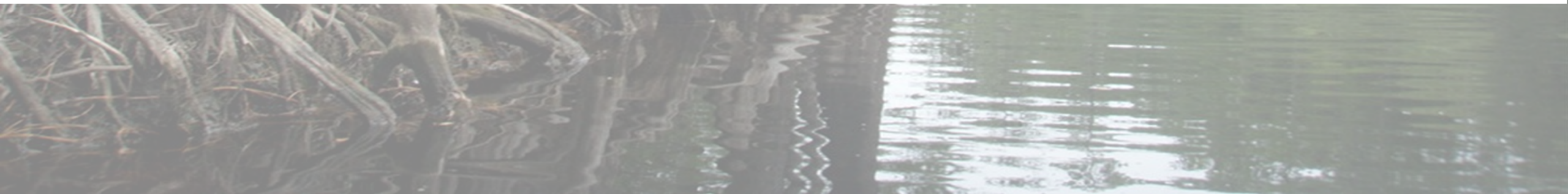
Virginia
Winyah Bay Watershed
Yadkin River
South Yadkin River
Raleigh
North Carolina
Rocky River
Charlotte
Lumber River
Pee Dee River
Little Pee Dee River
Lynches River
Florence
Columbia
Sumter
Black River
Waccamaw River
Intracoastal Waterway
South Carolina
Myrtle Beach
Sampit River
Winyah Bay
Charleston
Atlantic Ocean
North Inlet - Winyah Bay National Estuarine Research Reserve


National Water Information System: Mapper
Illinois
Ohio
Philadelphia
St Louis
Washington
Missouri
Kentucky
Virginia
Tennessee
North Carolina
Arkansas
Atlanta
Georgia


National Water Information System: Mapper
Johnsonville
Florence
Williamsburg
Lynches River
Great Pee Dee River
Black Mingo Creek
Marion
Horry
Veterans Hwy
101 ft
41 ft
19 ft
Little River
North Myrtle Beach
Myrtle Beach
Myrtle Beach AFB
Garden City
Murrells Inlet
Intracoastal Waterway
Waccamaw River
Ocean Hwy
N Fraser St
S Fraser St
Georgetown Hwy
Highmarket St
Andrews
Georgetown
Long Bay
Greenville
Columbia
South Carolina
North Carolina
0 5 10mi
-79.447, 33.915

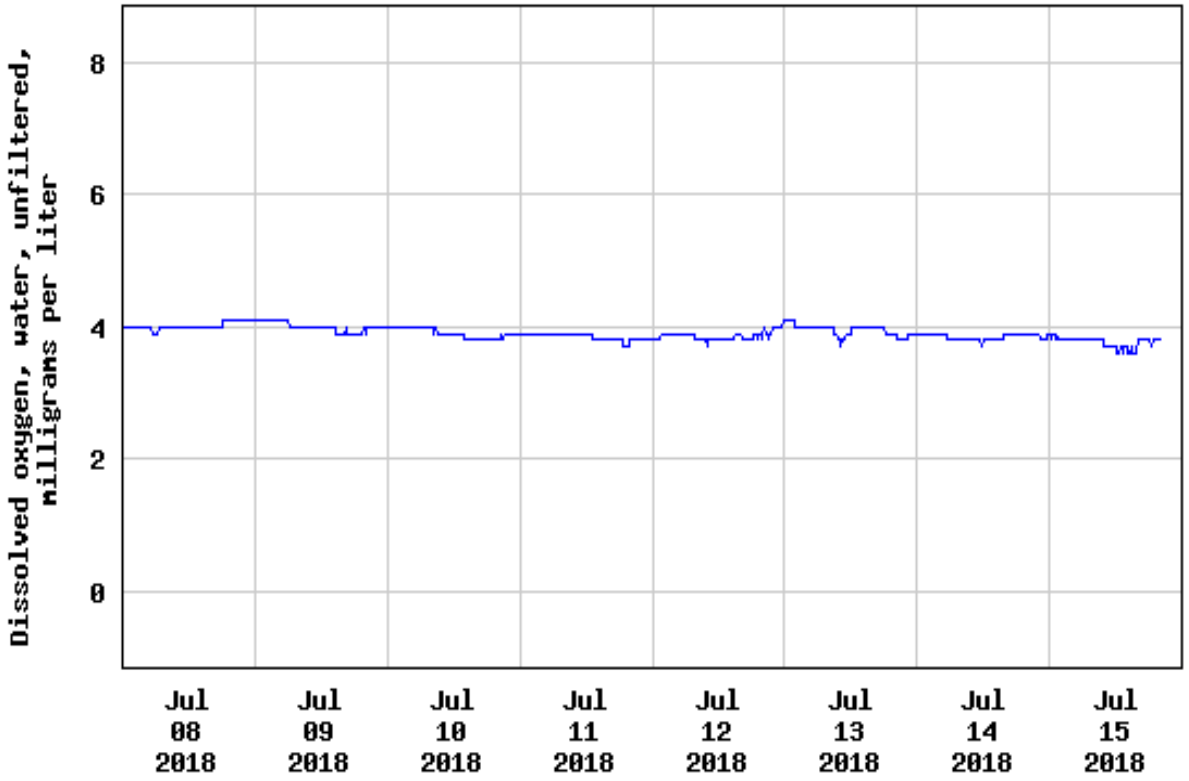

USGS 02110704 WACCAMAW RIVER AT CONWAY MARINA AT CONWAY, SC
Gage height, feet
8.50
8.00
7.50
7.00
6.50
6.00
Jul 08 2018
Jul 09 2018
Jul 10 2018
Jul 11 2018
Jul 12 2018
Jul 13 2018
Jul 14 2018
Jul 15 2018
---- Provisional Data Subject to Revision ----


USGS 02110704 WACCAMAW RIVER AT CONWAY MARINA AT CONWAY, SC
Discharge, cubic feet per second
3000
2000
1000
100
Jul 08 2018
Jul 09 2018
Jul 10 2018
Jul 11 2018
Jul 12 2018
Jul 13 2018
Jul 14 2018
Jul 15 2018
---- Provisional Data Subject to Revision ----
Median daily statistic (22 years)
Discharge



Blackwater Ecosystem

USGS 02110704 WACCAMAW RIVER AT CONWAY MARINA AT CONWAY, SC



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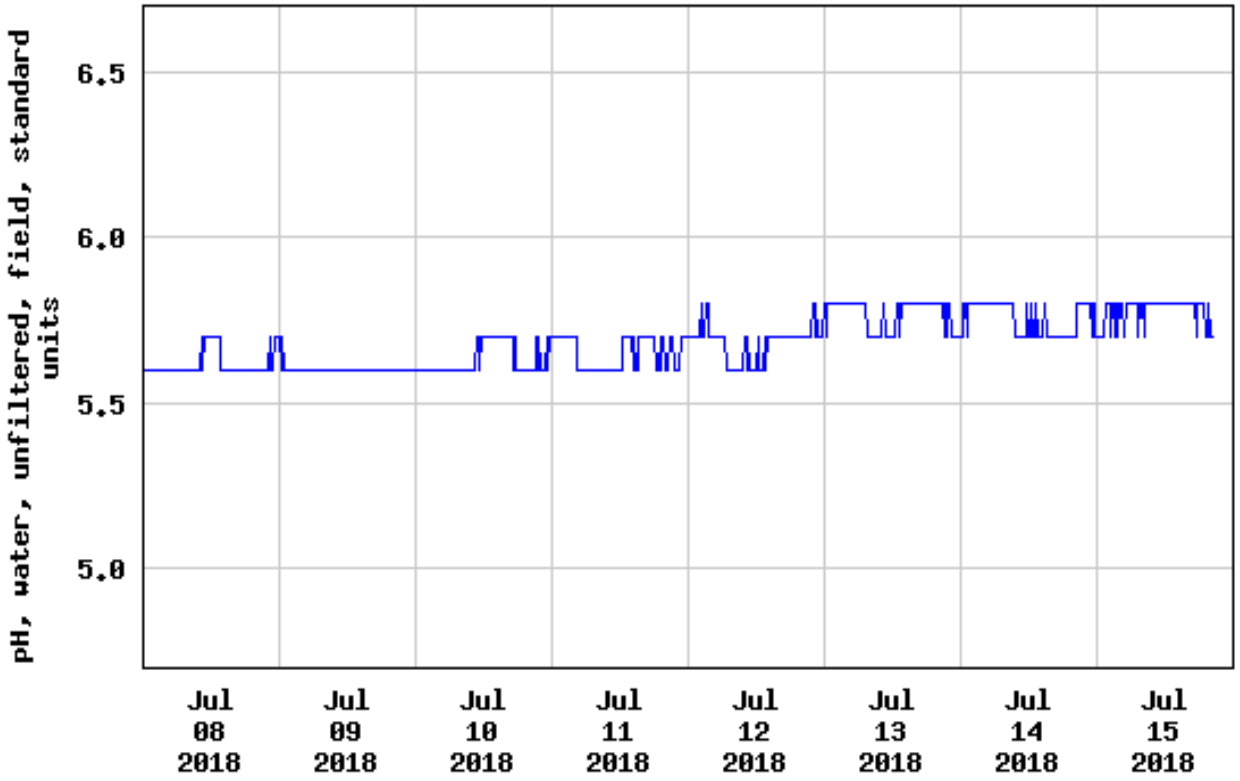
USGS 02110704 WACCAMAW RIVER AT CONWAY MARINA AT CONWAY, SC

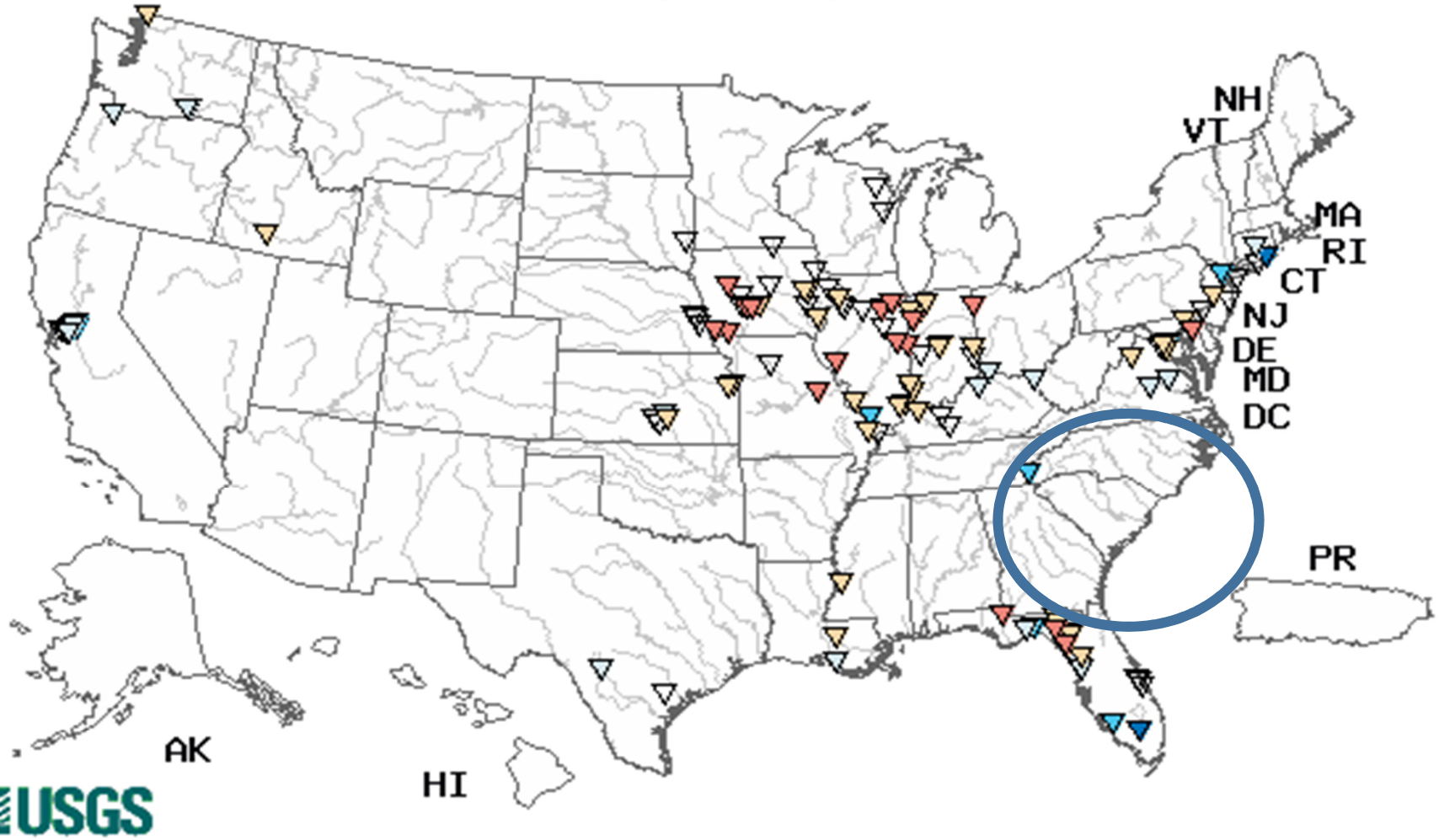


---- Provisional Data Subject to Revision ----

WaterQualityWatch -- Continuous Real-Time Water Quality of Surface Water in the United States

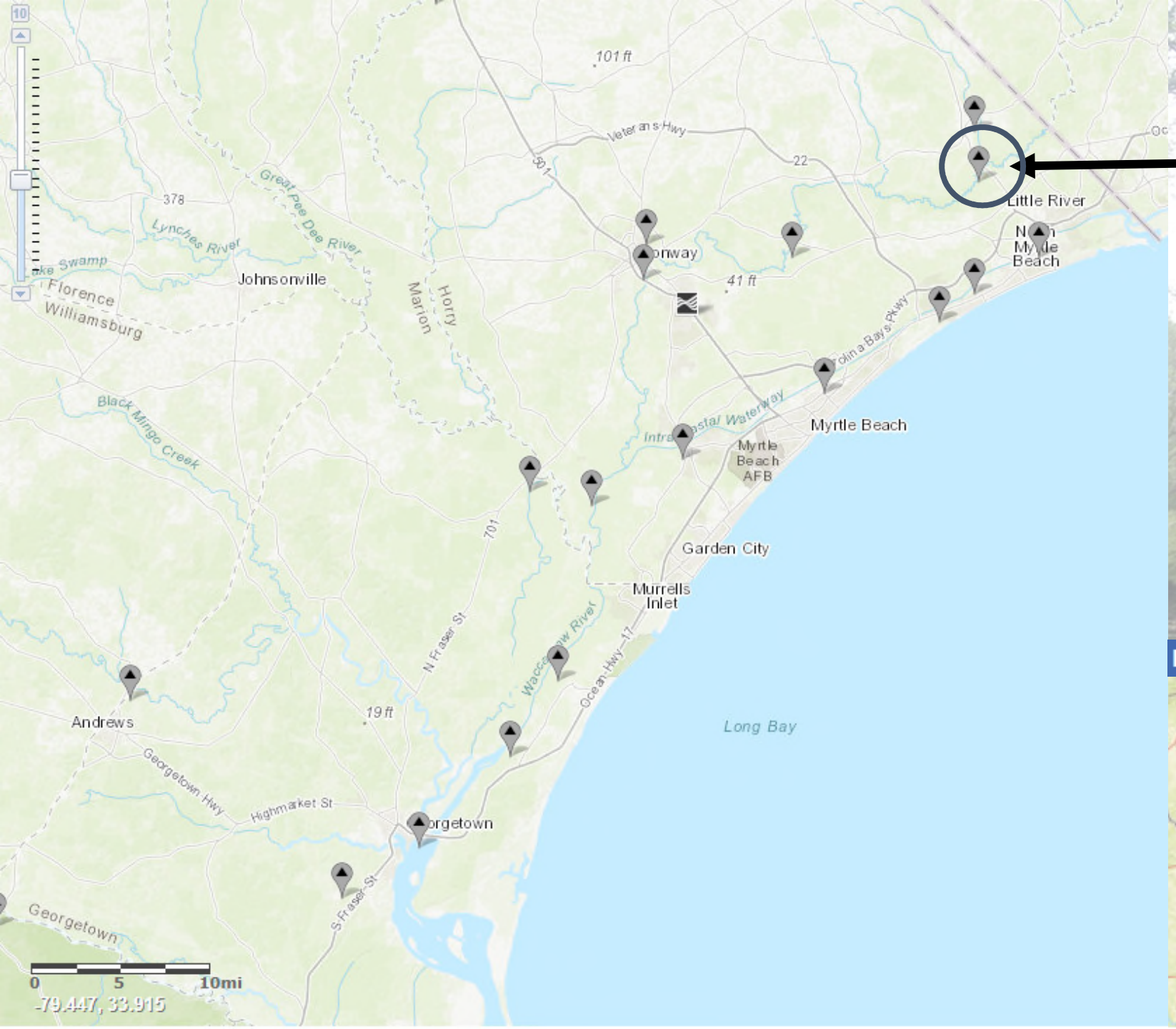
Real-Time Nitrate, in mg/L as N

March 26, 2019 20:30ET

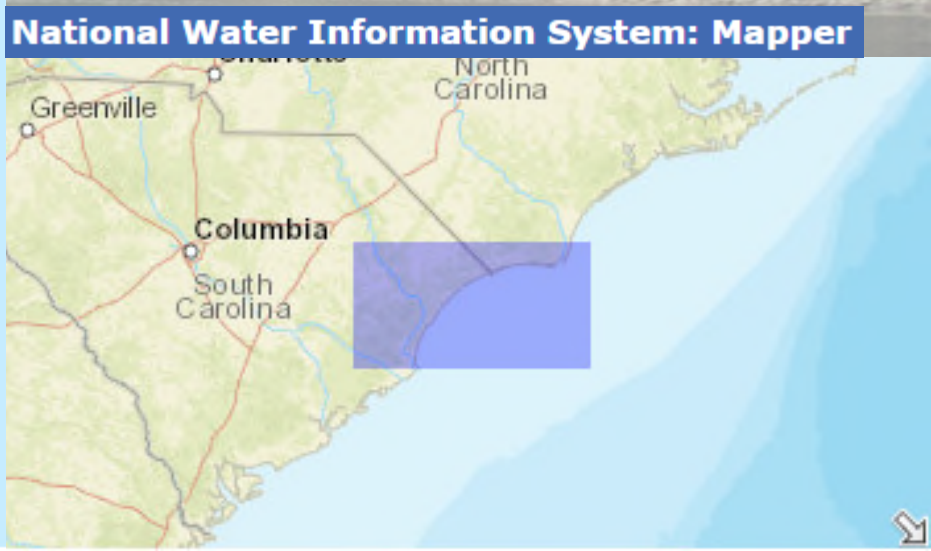


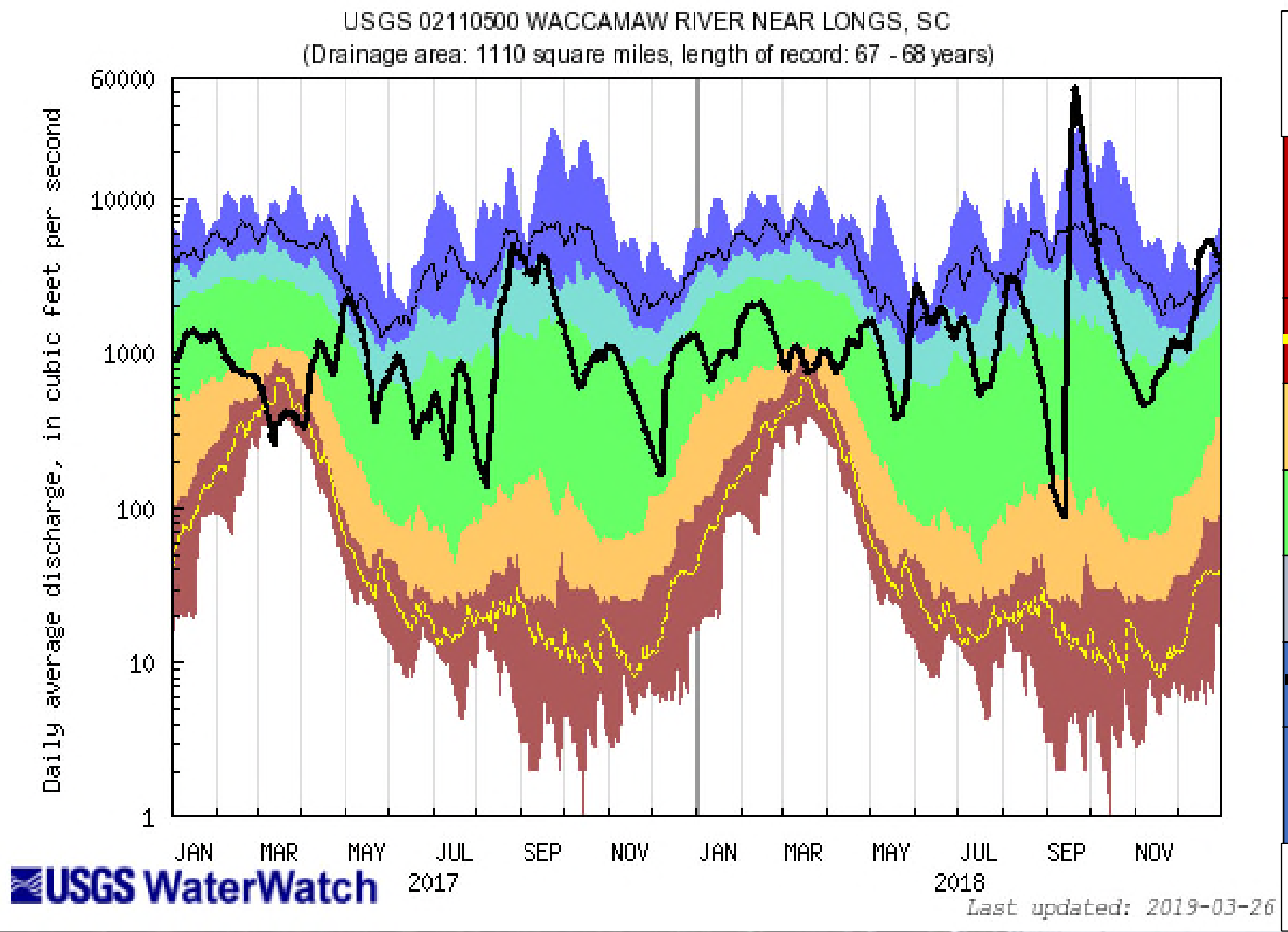
USGS

Explanation							
▼	▼	▽	▽	▽	▽	▽	▽*
<.1	.1-.29	.3-.99	1-2.99	3-9.99	10-29.9	>30	No Data



02110500 Waccamaw River near Longs, SC





EXPLANATION-PERCENTILE CLASSES

	LOWEST-10th PERCENTILE	MUCH BELOW NORMAL
	5	
	10-24	BELOW NORMAL
	25-75	NORMAL
	76-90	ABOVE NORMAL
	95	
	90th PERCENTILE - HIGHEST	MUCH ABOVE NORMAL

FLOW

Continuous Nitrate Monitoring

Setting

Waccamaw River near Longs

Watershed has 303-D listings; Eutrophication
SCDHEC (Site ID: MD-124) Turbidity, pH rising
SCDHEC developing statewide Nutrient (N,P) Criteria for streams and estuaries

Continuous Nitrate Monitoring

Methods

- **<u>Hach Nitratax</u>**

(2mm, 2 beam UV absorb.)

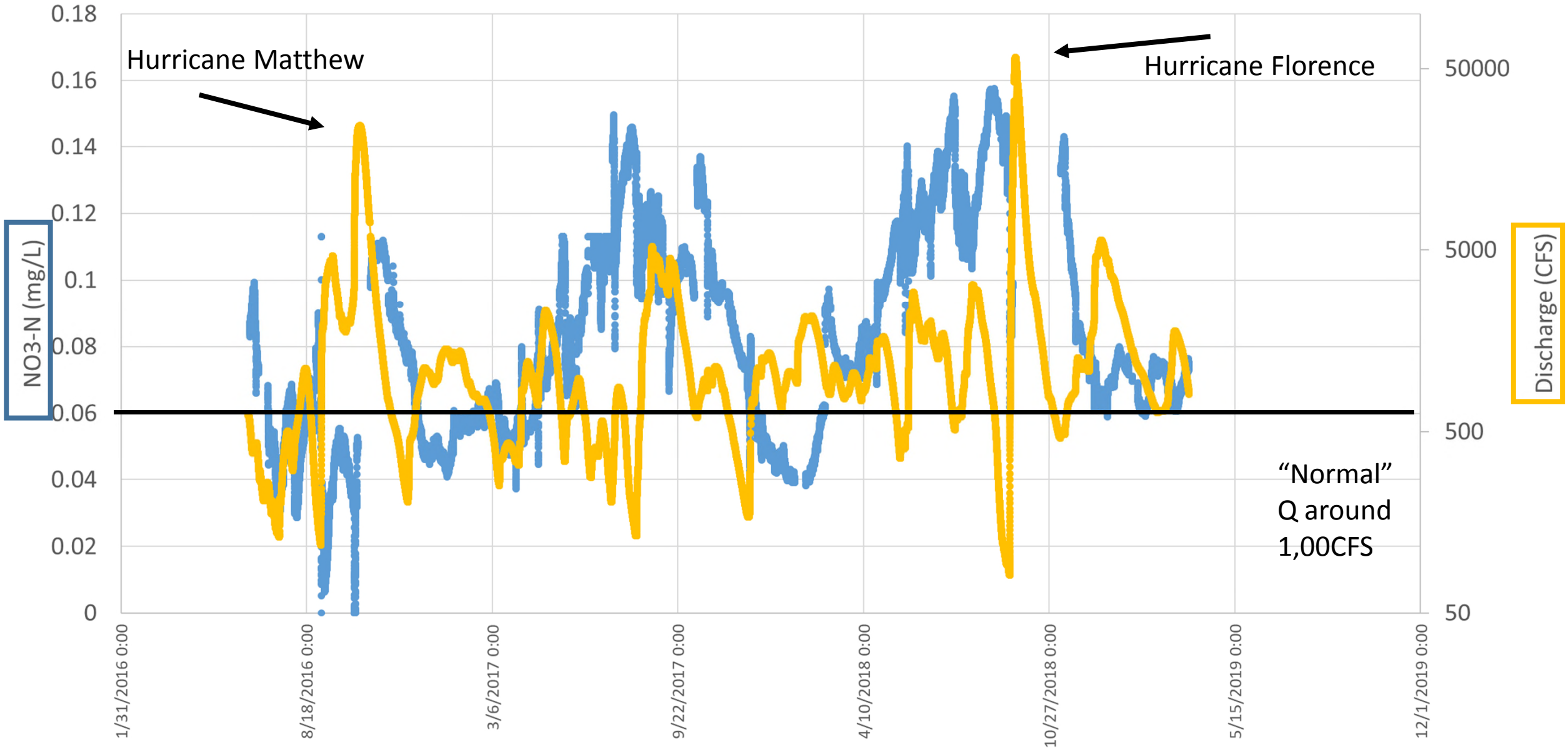
24V, In Series- 2 Solar Panels

- ➢ **Cleaning, Calibration**
- ➢ **Swapping, Sampling**

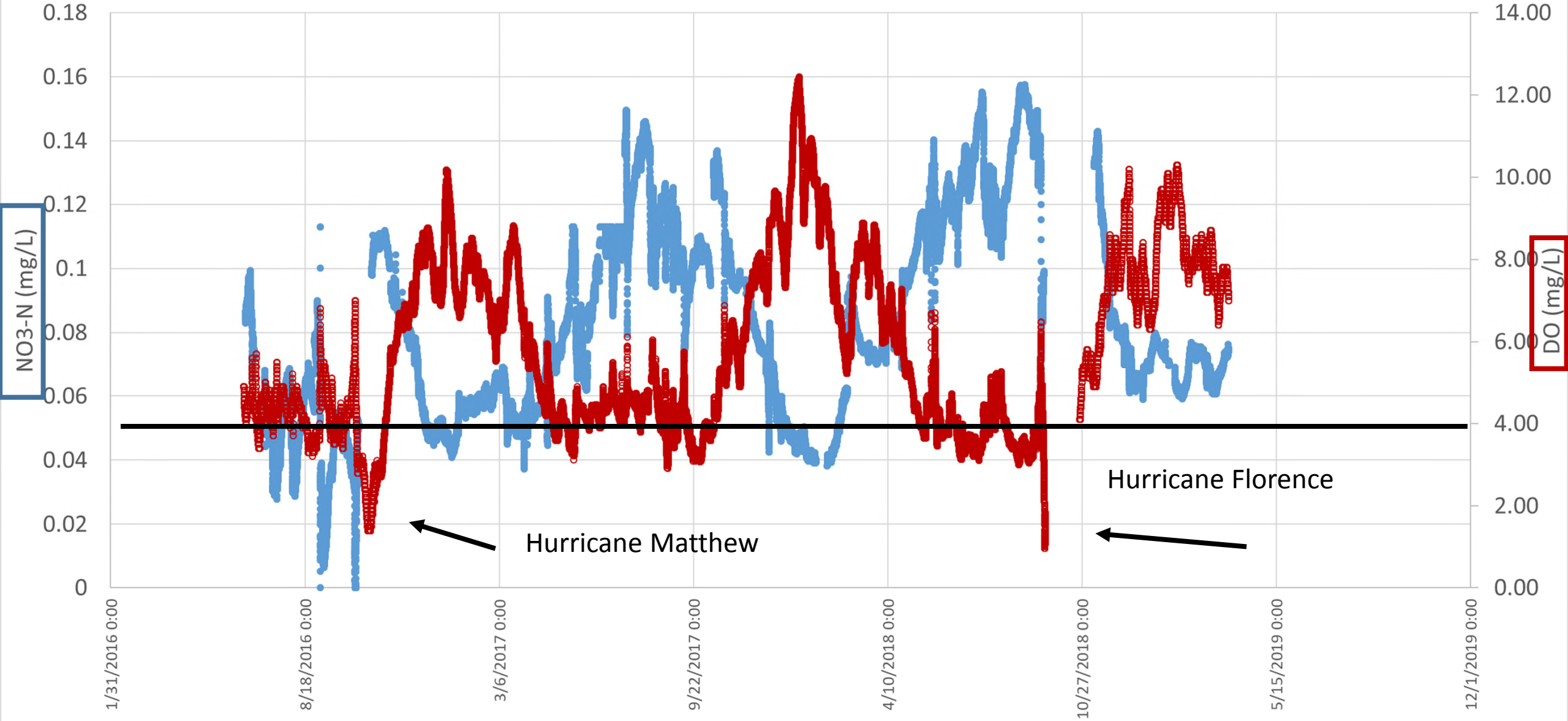
Post-Process

- ✓ NO3 to NO3-N (/4.46)
- ✓ FC + DC
- ✓ Sample – Matrix effect

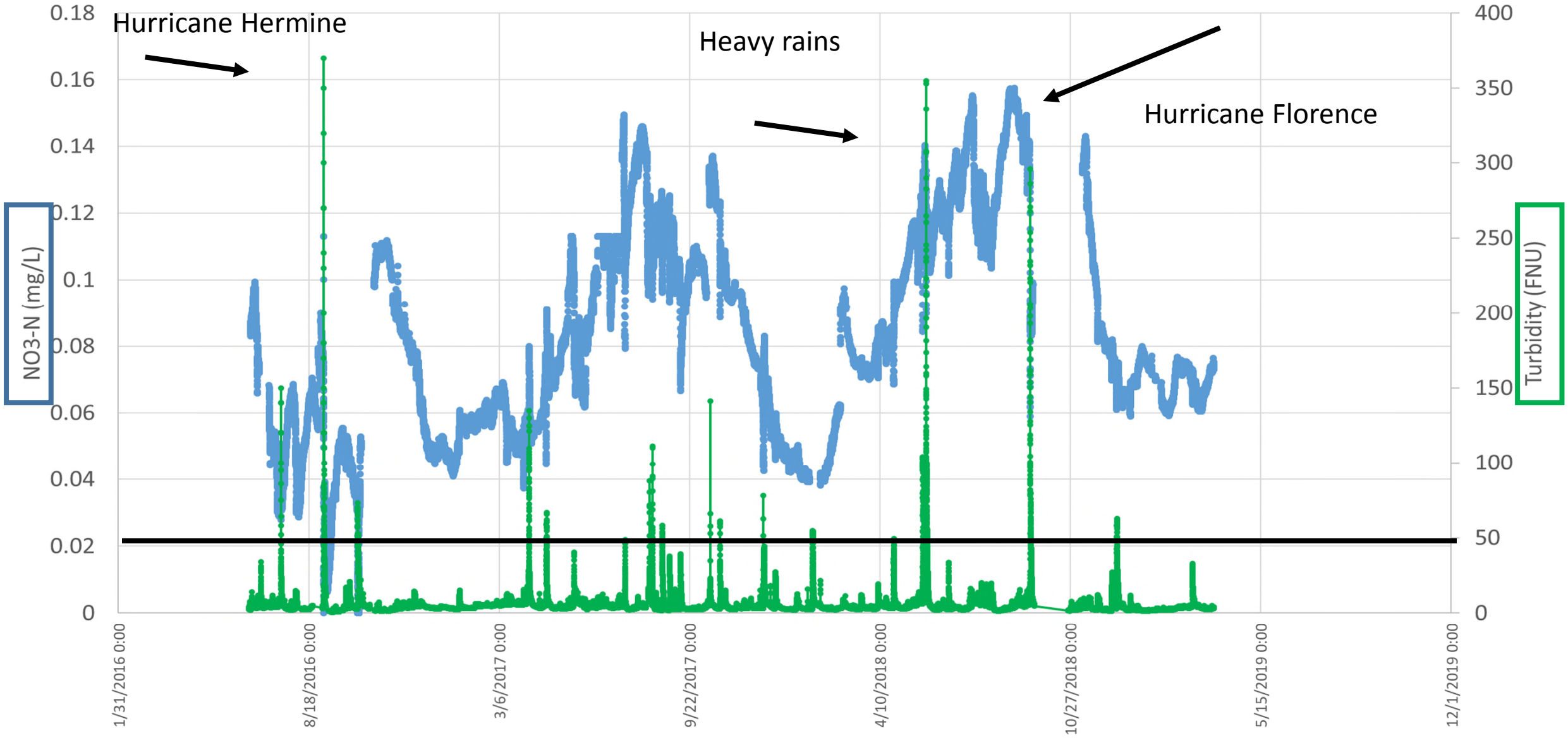
Continuous Nitrate Monitoring- Results



Continuous Nitrate Monitoring- Results

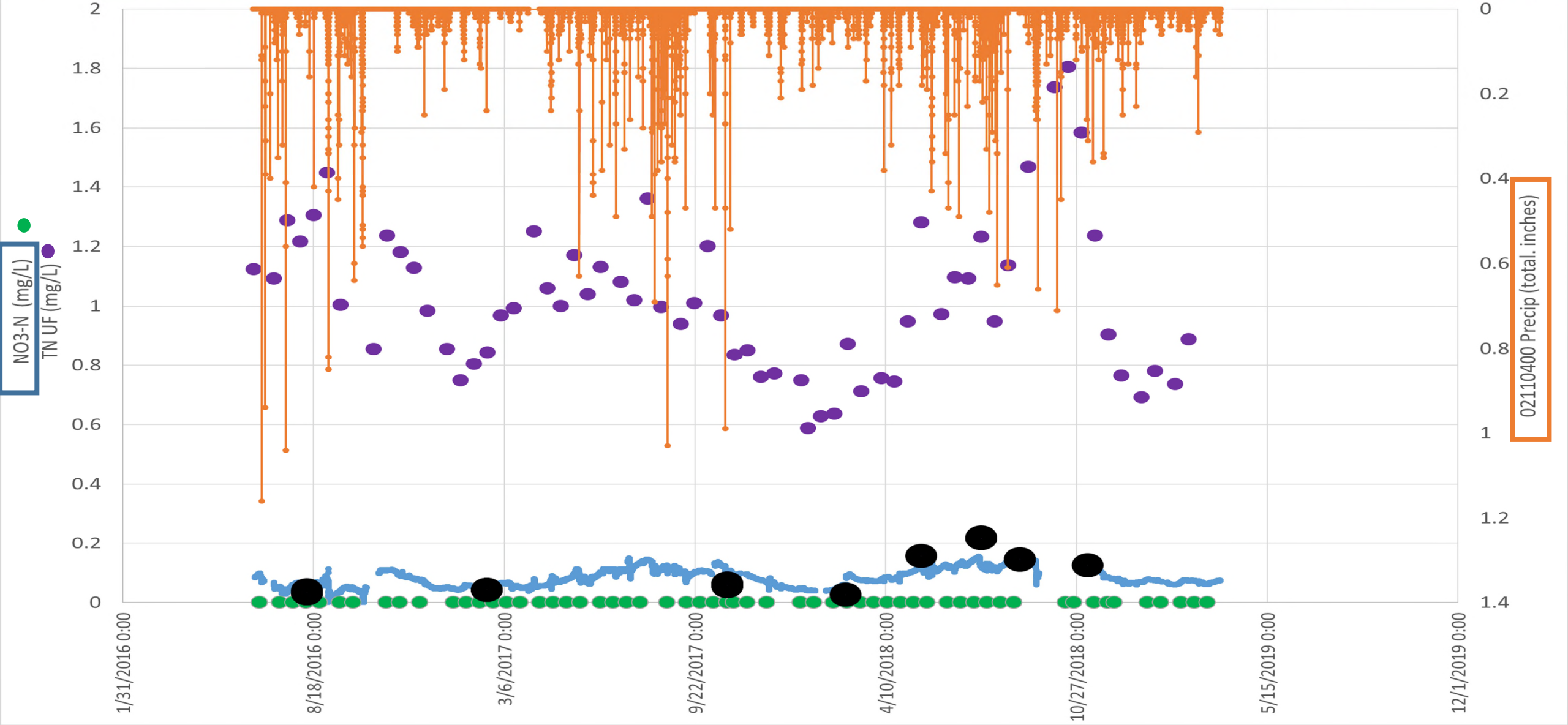


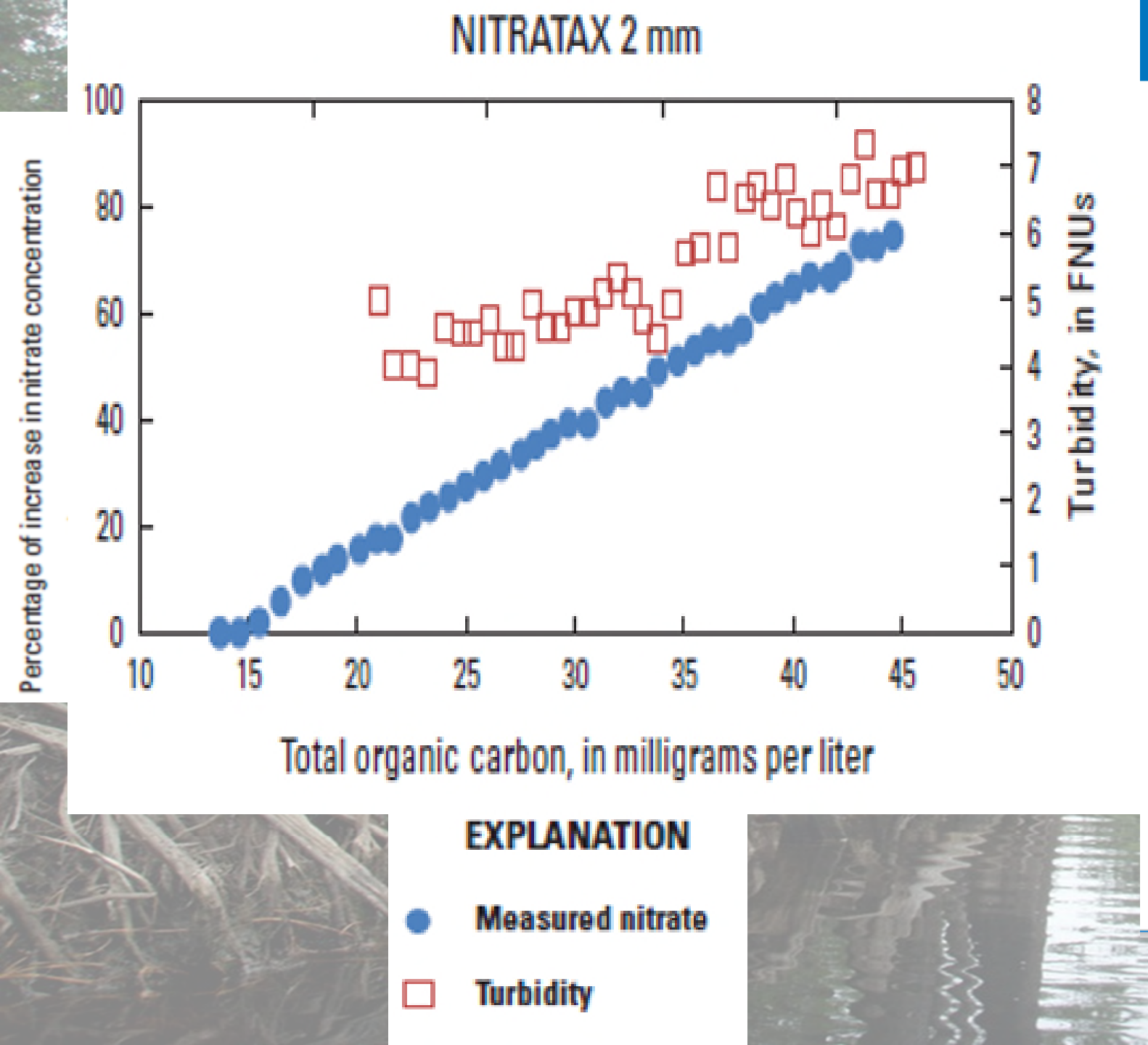
Continuous Nitrate Monitoring- Results



Continuous Nitrate Monitoring

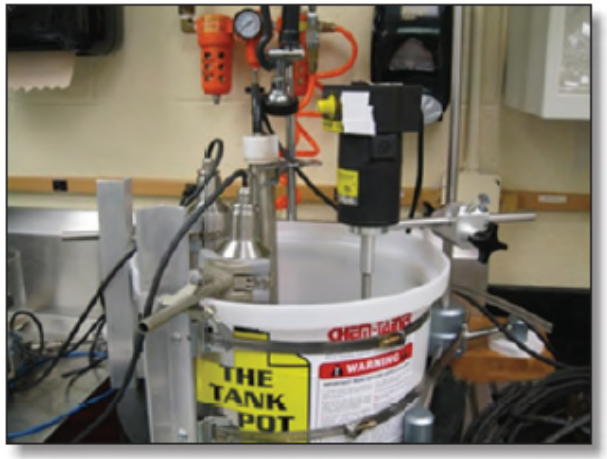
Results: Environmental Quality Lab, Waccamaw Riverkeeper





USGS
science for a changing world

The Effect of Suspended Sediment and Color on Ultraviolet Spectrophotometric Nitrate Sensors



Open-File Report 2016–1014

U.S. Department of the Interior
U.S. Geological Survey

Conclusions
Need sampling, longer dataset

Table 3. Examples of challenges related to matrix effects, data quality, and logistics that can help determine the appropriate sensor selection.

[**Abbreviations**: DOC, dissolved organic carbon; mg N/L, milligrams N per liter; mg/L, milligrams per liter; mm, millimeter; n/a, not applicable; NTU, nephelometric turbidity units; NO_3, nitrate; UV, ultraviolet; <, less than; >, greater than]

Type	Typical values	Approach
		Matrix effects
High suspended sediment concentration/turbidity	>500 NTU	Use instruments with a shorter path length (that is, <10 mm) or deploy with a filtered flow path.
High DOC concentrations	>5–10 mg/L	Use instruments that measure the full UV spectrum.
	>30 mg/L	Use instruments that measure the full UV spectrum and use a shorter path length (that is, <10 mm).
High bromide concentrations	n/a	Use instruments that measure the full UV spectrum and include bromide compensation in algorithm.
High potential for biofouling	n/a	Use instruments with integrated or third party wipers.
		Data quality
High NO_3- concentrations	>20 mg N/L	Use instruments with a shorter path length (that is, <10 mm).
Low NO_3- detection limit needed	<0.5 mg N/L	Use instruments with a longer path length (that is, 10 mm or longer).
High NO_3- accuracy needed	<±0.5 mg N/L	Longer path length (that is, > 10 mm), full spectrum.
		Logistics
Buoy access only	n/a	Use instruments with integrated or third party wipers and can easily be integrated into existing data-collection platforms.
Infrequent site visits	<3–4 weeks	Use instruments with integrated or third party wipers.
Ease of use	n/a	Use instruments with integrated or third party wipers and "plug and play" controllers.

Discussion

Contact

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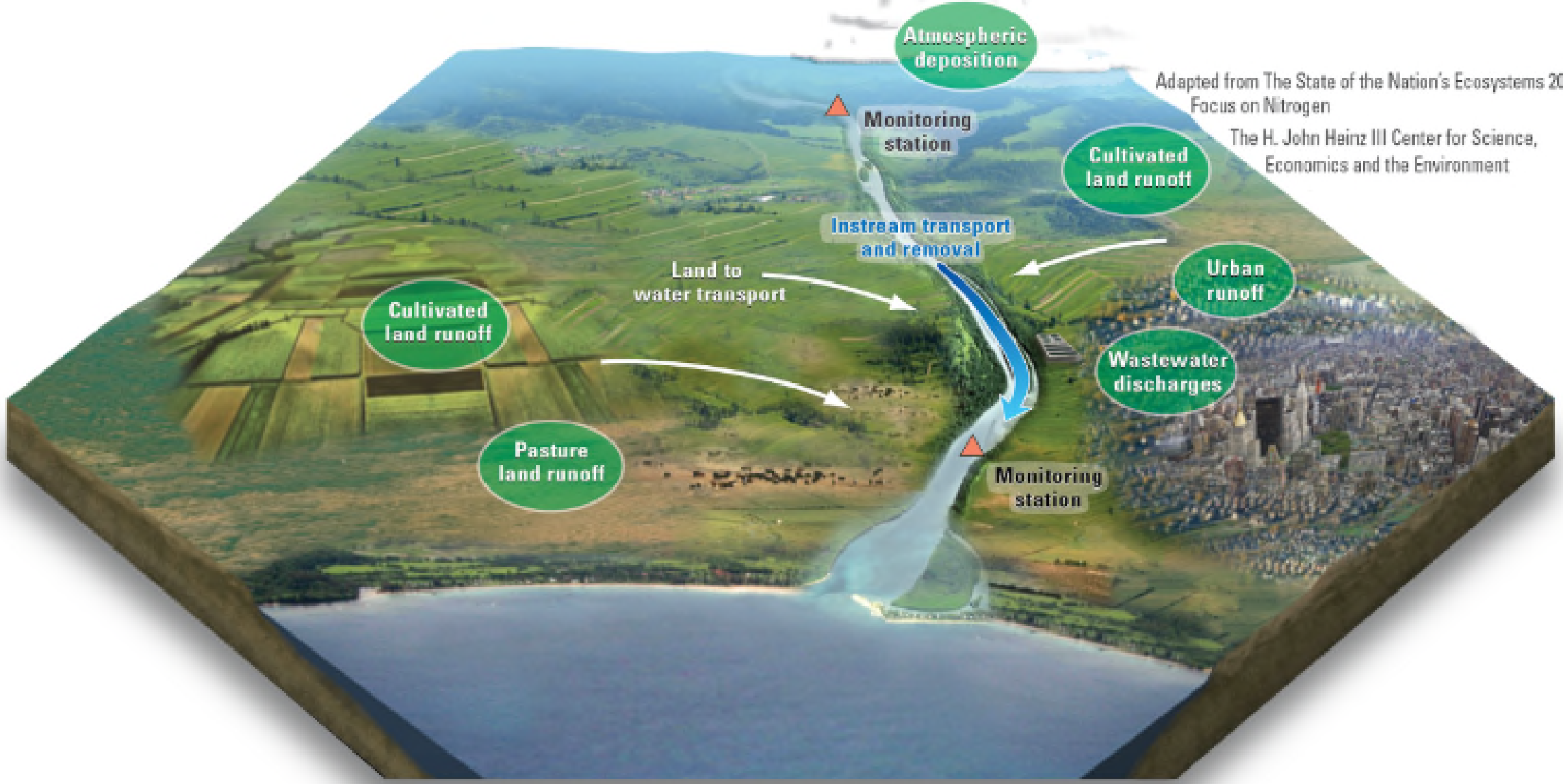
Thank you to our cooperators

Horry County
SOUTH CAROLINA
Committed to Excellence

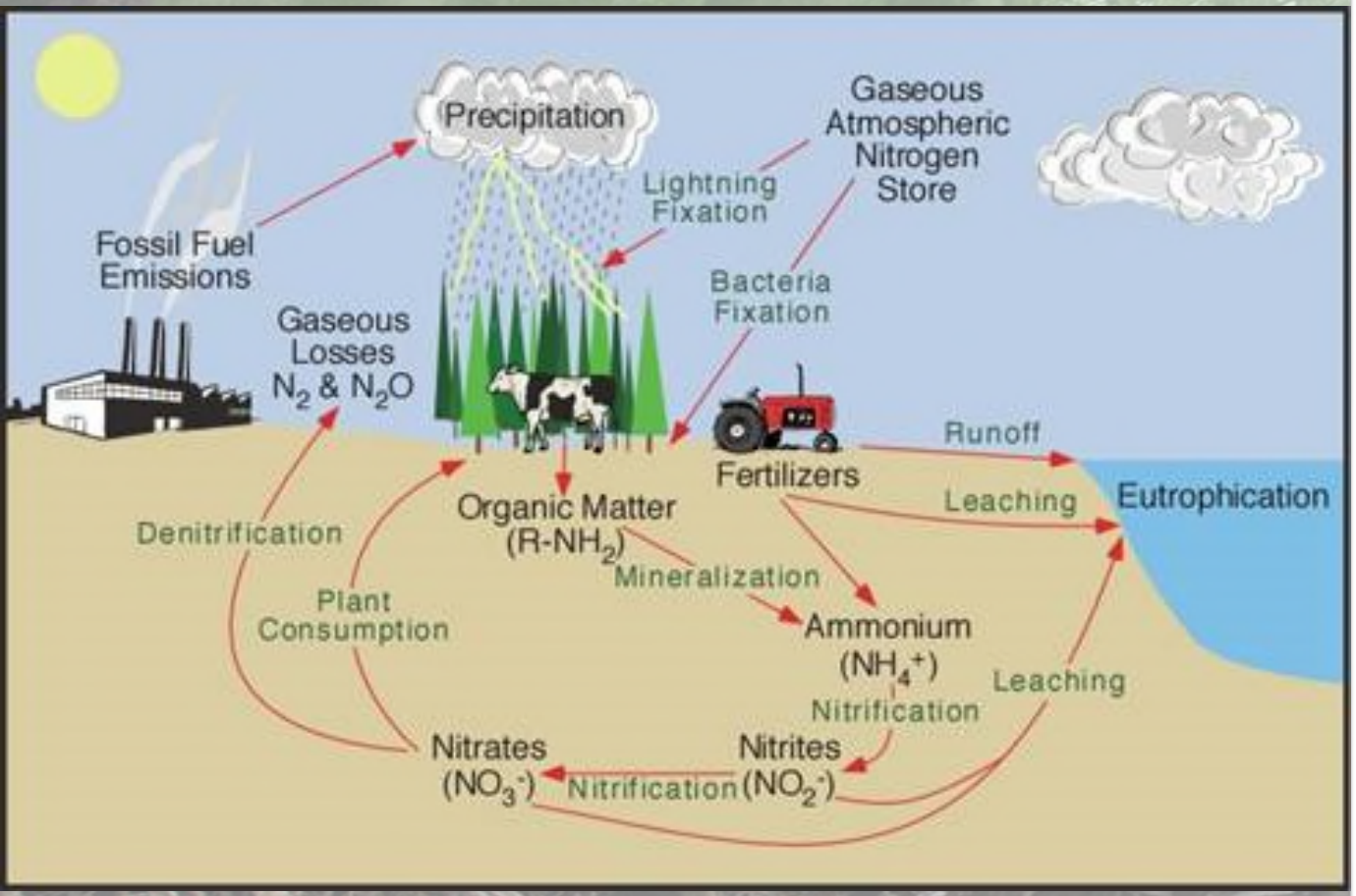
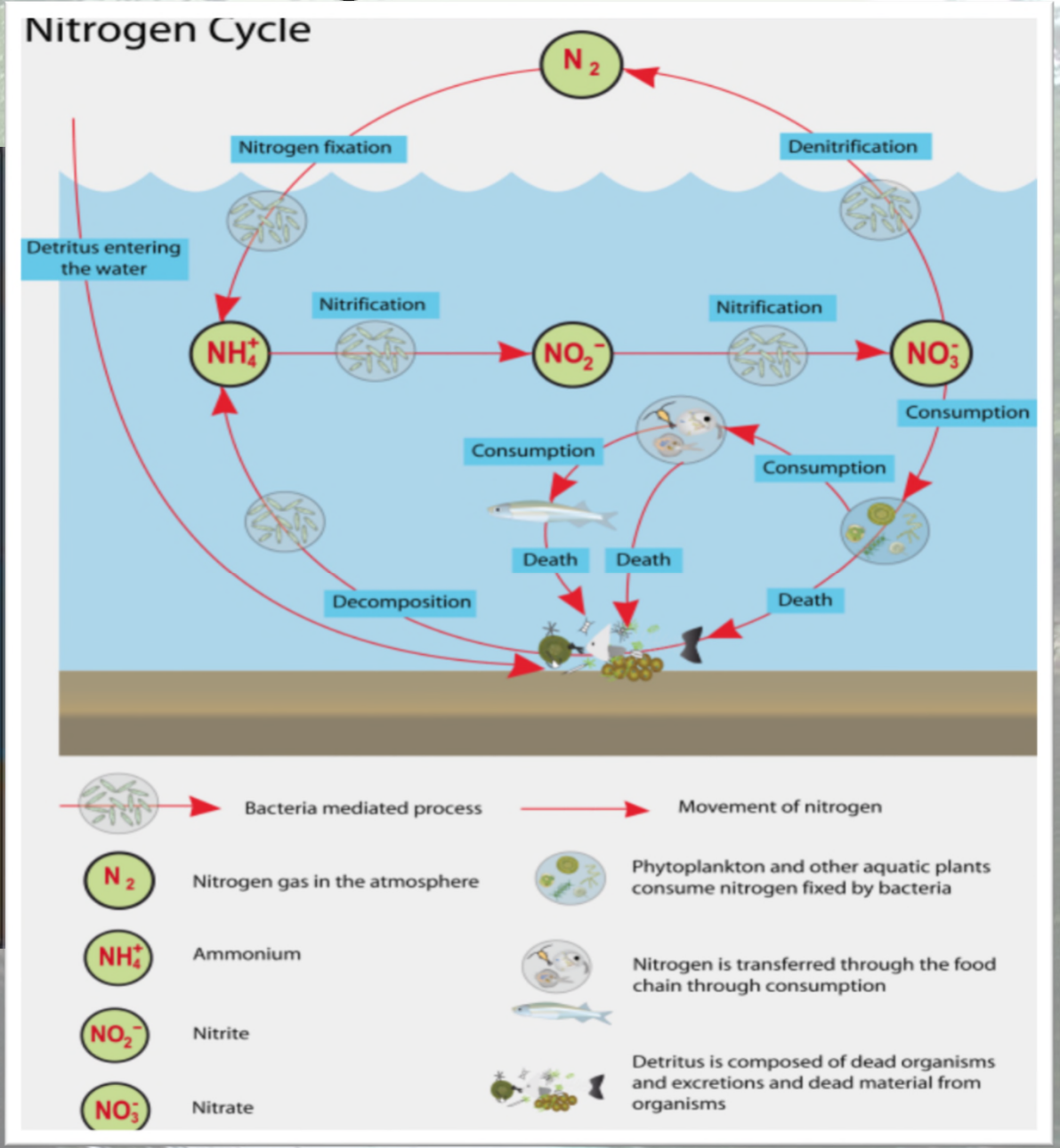
Questions?

Sparrow Model- calibration and validation



Adapted from The State of the Nation's Ecosystems 2008: Focus on Nitrogen

The H. John Heinz III Center for Science, Economics and the Environment

Continuous Nitrate Monitoring

Discussion