

Suwannee-Satilla Regional Council

Water Quality Resource Assessment

Elizabeth A. Booth, Ph.D., P.E.

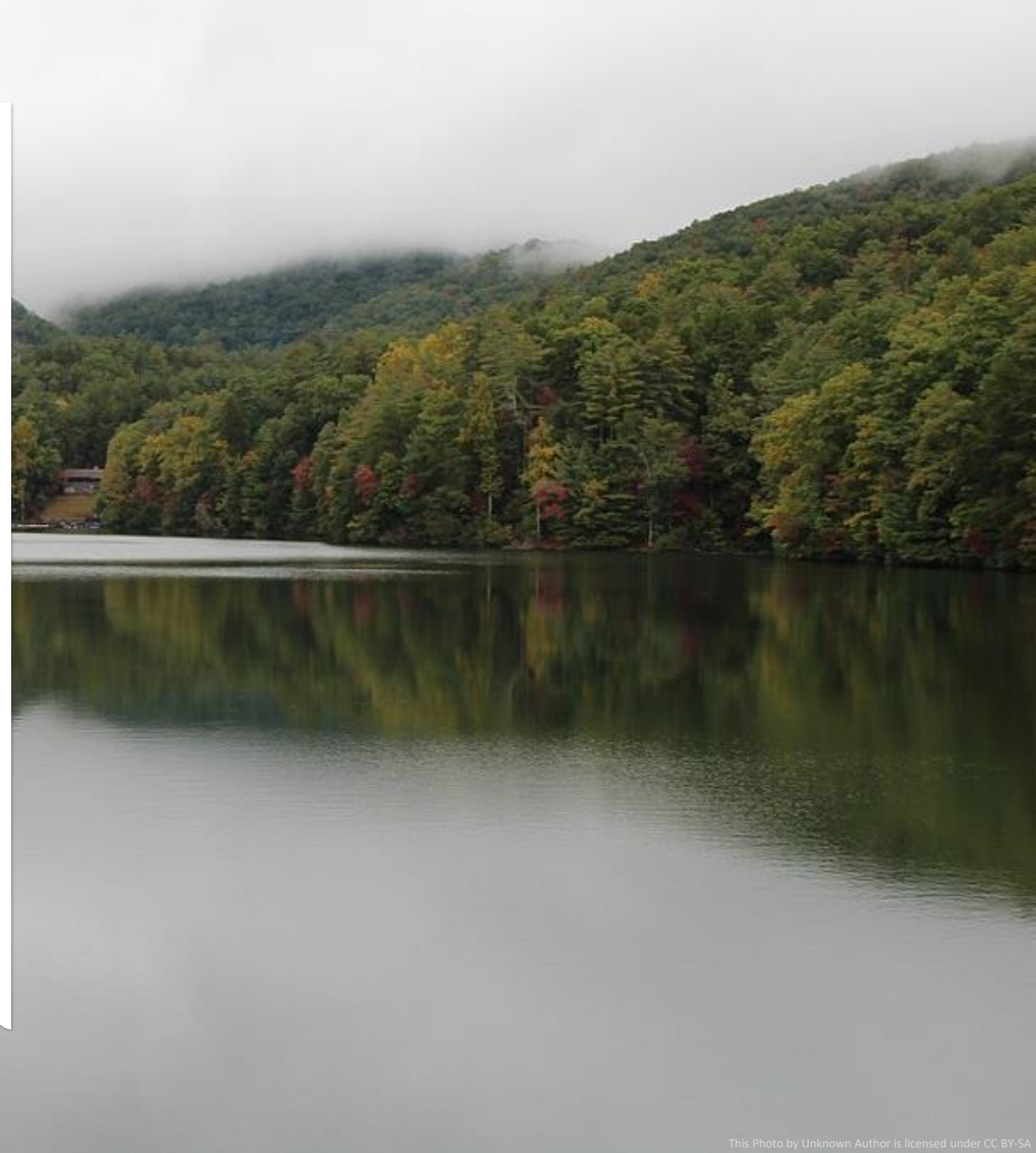
Watershed Planning and Monitoring Program Manager

November 2, 2022



Outline

- 2019 Triennial Review
 - EPA Recommendation
 - GAEPD Identified Changes
 - Public Comment Based Changes
- 2022 Triennial Review
- State Water Planning Process
- Water Quality Resource Assessment
- Water Quality Modeling
 - GA DOAG and GA Riv-1 Modeling
 - LSPC Watershed Model
 - EFDC Lake Modeling
- 2022 305(b)/303(d) Listed Segments
- Questions



2019 Triennial Review

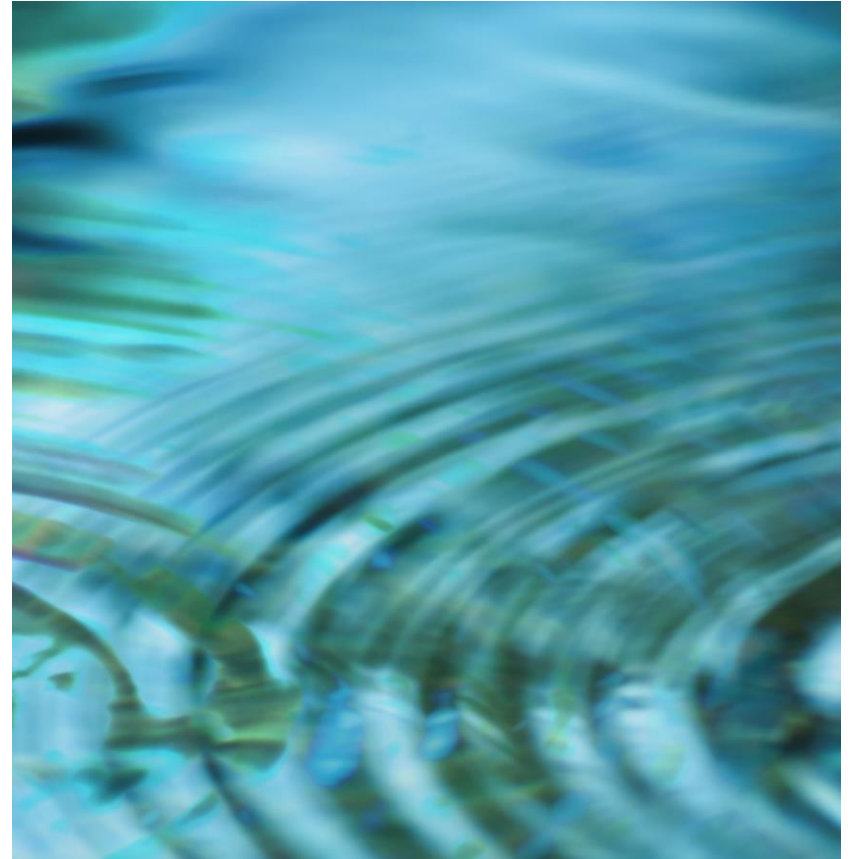
EPA recommendations

2009 EPA Acrolein Aquatic Life Criteria

- Acrolein (CAS RN1 107-02-8)
 - (a) Freshwater 3.0 µg/L

2012 EPA Carbaryl Aquatic Life Criteria

- Carbaryl (CAS RN1 63-25-2)
 - (a) Freshwater 2.1 µg /L
 - (b) Coastal and Estuarine Waters 1.6 µg /L



2019 Triennial Review

GA EPD identified changes

- Replaced “Use Classifications” with “Designated Uses”
- Added Recreation Definitions
- Added Water Effect Ratio to Metal Equations
- Added Site Specific Metal Criteria Based on BLM and WER
- Change Drinking Water and Fishing Bacteria Criteria
- Developed Lakes Oconee and Sinclair Criteria

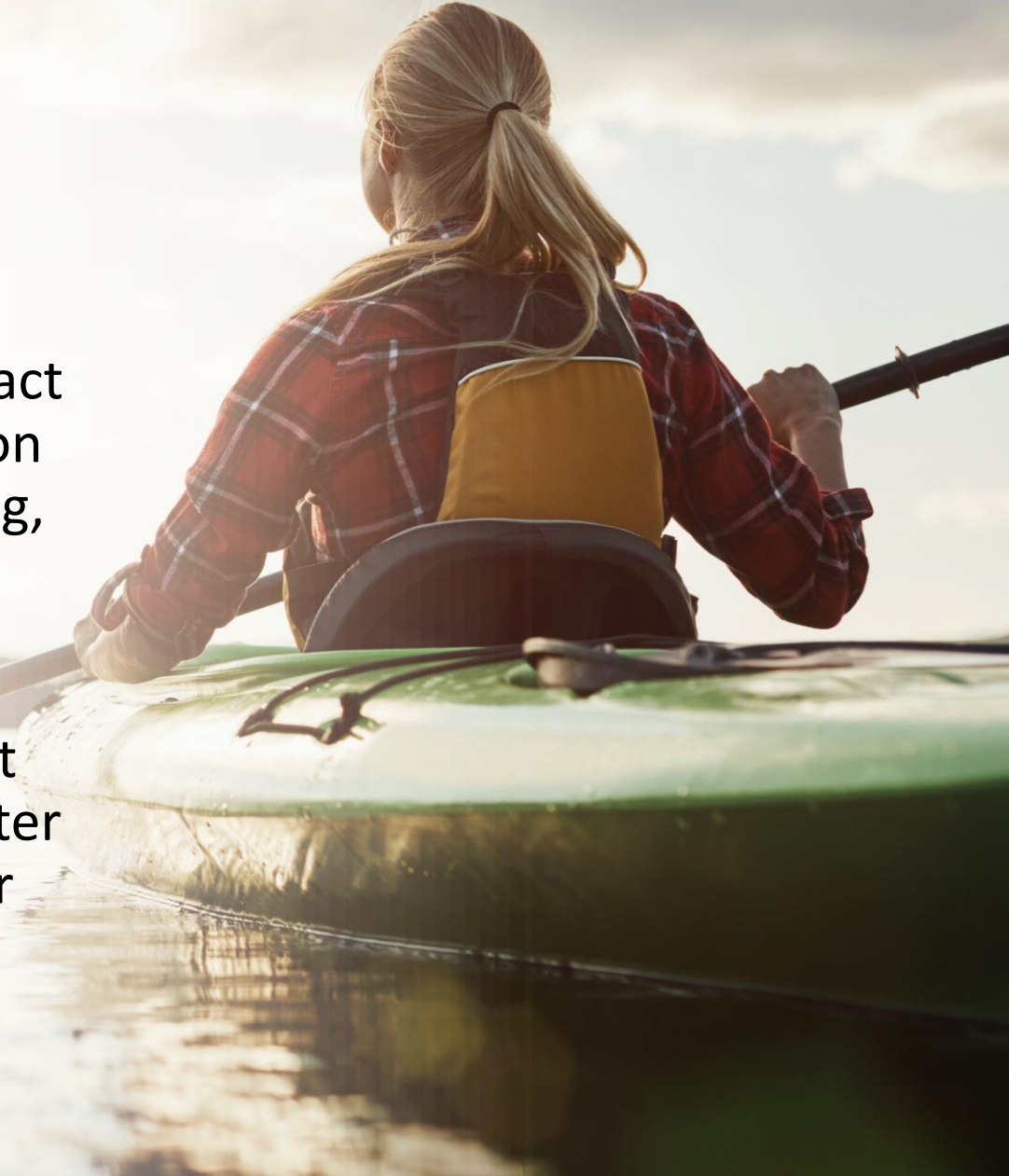


Recreation definitions

Primary and Secondary Recreation

"Primary contact recreation" is full immersion contact with water where there is significant risk of ingestion that includes, but is not limited to, swimming, diving, white water boating (class 3+), water skiing, and surfing.

"Secondary contact recreation" is incidental contact with the water not involving a significant risk of water ingestion such as canoeing, fishing, kayaking, motor boating, rowing, tubing, splashing, wading, and occasional swimming.



Water Effect Ratio additions

- Added Water Effects Ratio (WER) multiplier WER to the metal freshwater aquatic life criteria equations

Cadmium

Acute criteria = $WER * (e^{(0.9789[\ln(\text{hardness})] - 3.866)}) (1.136672 - [(\ln \text{hardness})(0.041838)]) \mu\text{g/L}$

Chronic criteria = $WER * (e^{(0.7977[\ln(\text{hardness})] - 3.909)}) (1.101672 - [(\ln \text{hardness})(0.041838)]) \mu\text{g/L}$





Bacteria Criteria

- Changed bacteria indicate from fecal coli to E. coli and enterococci for Drinking Water and Fishing designated uses
- Recreation designated use already used E. coli and enterococci criteria.
- Secondary recreational criteria were calculated based on the water ingestion rates from a study in EPA's [Exposure Factors Handbook, Chapter 3](#).
- Winter-time secondary contact recreation criteria are 2.1 times higher than bacteria criteria for primary contact recreation.
- The following slide lists the bacteria criteria for Fishing and Drinking Water designated uses that replaced the seasonal fecal coliform criteria.



Bacteria Criteria for Drinking Water and Fishing Designated Uses:

- Primary contact recreation bacteria criteria in May-October
 - *E. coli* (freshwaters): not to exceed 30-day geometric mean of 126 counts per 100 mL. No more than 10% excursion frequency of 410 STV
 - Enterococci (coastal and estuarine waters): not to exceed 30-day geometric mean of 35 counts per 100 mL. No more than 10% excursion frequency of 130 STV.
- Secondary contact recreation bacteria criteria in November-April:
 - *E. coli* (freshwaters): not to exceed 30-day geometric mean of 265 counts per 100 mL. No more than 10% excursion frequency of 861 STV.
 - Enterococci (coastal and estuarine waters): not to exceed 30-day geometric mean of 74 counts per 100 mL. No more than 10% excursion frequency of 273 STV.
- Removed Non-human source Bacteria Criteria

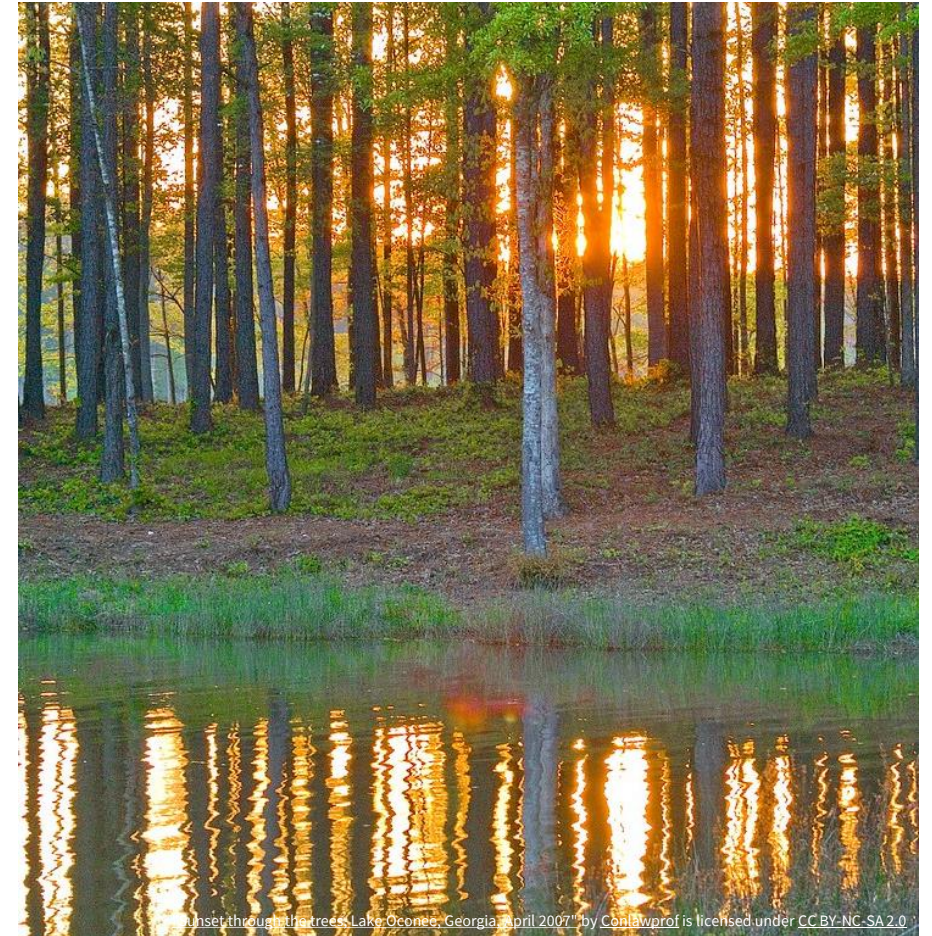
Lakes Oconee and Sinclair

- EPA did not approve the proposed criteria for these lakes during the 2016 Triennial Review
- Revised the pH criteria and removed the Total Phosphorus and Total Nitrogen
- Nutrient limits will be implemented in NPDES permits where necessary to ensure chlorophyll a criteria are met.
- EPD plans to adopt numeric nutrient criteria for Total Phosphorus and Total Nitrogen in the future, once NPDES permit limits have been implemented.

Lake Oconee

Lake Oconee: Those waters impounded by Wallace Dam and upstream on the Oconee River as well as other impounded tributaries to an elevation of 436 feet mean sea level corresponding to the normal pool elevation of Lake Oconee.

- (i) Chlorophyll a : For the months of April through October, the average of monthly mid-channel photic zone composite samples shall not exceed the chlorophyll a concentrations at the locations listed below more than once in a five-year period:
 - 1. Oconee Arm at Highway 44: 26 $\mu\text{g/L}$
 - 2. Richland Creek Arm: 15 $\mu\text{g/L}$
 - 3. Upstream from the Wallace Dam Forebay: 18 $\mu\text{g/L}$
- (ii) pH: within the range of 6.0 – 9.0 standard units.
- (iii) Bacteria: *E. coli* shall not exceed the Recreation criterion as presented in 391-3-6-.03(6)(b)(i).
- (iv) Dissolved Oxygen: A daily average of 5.0 mg/L and no less than 4.0 mg/L at all times at the depth specified in 391-3-6-.03(5)(g).
- (v) Temperature: Water temperature shall not exceed the Recreation criterion as presented in 391-3-6-.03(6)(b)(iv).



Lake Sinclair



Lake Sinclair: Those waters impounded by Sinclair Dam and upstream on the Oconee River as well as other impounded tributaries to an elevation of 340 feet mean sea level corresponding to the normal pool elevation of Lake Sinclair.

- (ii) Chlorophyll a : For the months of April through October, the average of monthly mid-channel photic zone composite samples shall not exceed the chlorophyll a concentrations at the locations listed below more than once in a five-year period:
 - 1. Oconee River Arm Midlake: 14 $\mu\text{g/L}$
 - 2. Little River and Murder Creek Arm upstream from Hwy 441: 14 $\mu\text{g/L}$
 - 3. Upstream from the Sinclair Dam Forebay: 10 $\mu\text{g/L}$
- (iii) pH: within the range of 6.0 – 9.0 standard units.
- (iv) Bacteria: *E. coli* shall not exceed the Recreation criterion as presented in 391-3-6-.03(6)(b)(i).
- (v) Dissolved Oxygen: A daily average of 5.0 mg/L and no less than 4.0 mg/L at all times at the depth specified in 391-3-6-.03(5)(g).
- (vi) Temperature: Water temperature shall not exceed the Recreation criterion as presented in 391-3-6-.03(6)(b)(iv).

Site Specific Criteria based on Biotic Ligand Model and Water Effect Ratio

- Added Site Specific Metal Criteria based on Biotic Ligand Models and Water Effect Ratio
 - The Biotic Ligand Model (BLM) is a metal bioavailability model that uses receiving water body characteristics and monitoring data to develop site-specific water quality criteria. A study plan and findings shall be submitted and approved that conforms to the requirements outlined in the *2007 Aquatic Life Ambient Freshwater Quality Criteria-Copper 2007 Revision EPA-822-R-07-001*.
 - A Water Effect Ratio (WER) is site specific and is the ratio of the toxicity of a metal in site water to the toxicity of the same metal in standard laboratory. A study plan and findings shall be submitted and approved that conforms to the requirements outlined in the *1994 Interim Guidance on Determination and Use of Water Effect Ratios for Metals EPA-823-B-94-001*. If the WER is for Copper, the *Interim Guidance* may be complemented with the *2001 Streamline Water Effect Ratio Procedure for Discharges of Copper EPA-822-R-01-005*.

Public Comment Based Changes

14 stream had their Designated Uses changed to Recreation

- Current use was primary recreation.
- Broad community support with no significant stakeholder opposition
- Community made or plans to make financial investments to promote the recreational use



Waterbodies Being Changed to Include Recreation

- Alapaha River - Cherry Creek to Stateline
- Alapaha River - Willacoochee River to Dampier Branch
- Altamaha River - Doctors Creek to Butler River
- Broad River - Comer-Carlton Rd (Athens Hwy) to Mill Branch
- Broad River - Wildcat Bridge Rd. to Scull Shoal Creek
- Chattooga River - confluence with West Fork Chattooga to Tugaloo Lake
- Little St. Simons Island - Littoral waters on the ocean and sound side of Little St. Simons Island
- Oconee River - Dead River to Flat Creek
- Satilla River - Alabaha River to Woodbine boat ramp at Hwy 17
- South River - Honey Creek (Henry County) to Lake Jackson at GA Hwy 36
- St. Marys River - Deep Creek to Boone Creek
- St. Marys River - Prospect Landing Rd. to Little St. Marys River
- Wassaw Sound - Open Sea and littoral waters of Wassaw and Little Tybee Islands
- Withlacoochee River - Tiger Creek to State Line



2022 Triennial Review

Items Begin Considered

- [Human Health Ambient Water Quality Criteria: 2015](#)
- [Aquatic Life Ambient Water Quality Criterion for Selenium - Freshwater 2016](#)
- [Final Aquatic Life Ambient Water Quality Criteria for Aluminum – Freshwater 2018](#)
- [Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin – 2019](#)



Harmful Algal Bloom Swimming Advisories

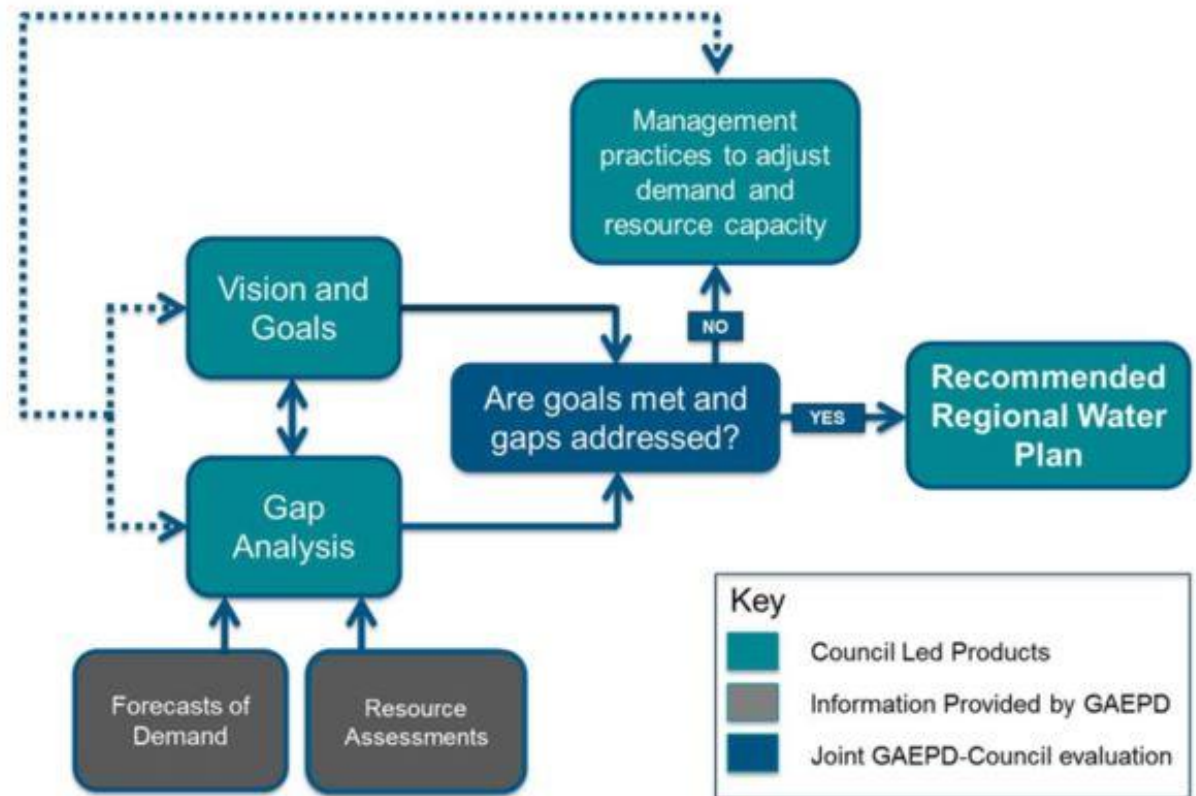
- EPD has developed a HABs Story map available on the GAEPD website: <https://gaepd.maps.arcgis.com/apps/MapSeries/index.html?appid=e8f2c6a51c1c41088002350f1eabe598>
- EPD held a virtual HABs meeting with lake managers and university researchers
- EPD developed an informational flyer that can be posted by lake managers
- EPD is working with lake managers on protocol for cyanotoxin sampling and a posting procedure for swim advisories.
- Swim advisories should be posted if visual observations and sampling indicate the presence of cyanotoxins above the advisory thresholds.



Triennial Review Timelines

- DNR Board adopted the rule on January 28, 2022
- EPA approved the rule package on August 31, 2022
- Public Meeting on revised *Draft Guidance for Changing a Designated Use* on March 7, 2022
- Kickoff Hearing for 2022 Triennial Review on March 22, 2022

State Water Planning Process



Resource Assessment

Surface Water Quality

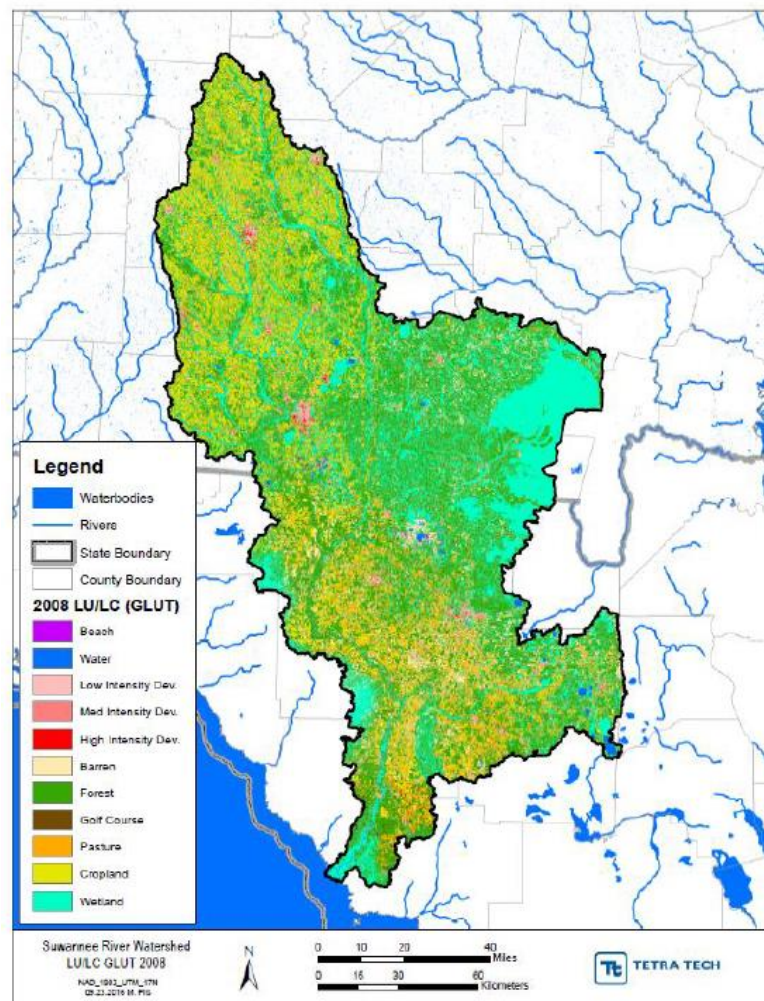
- Assimilative capacity is used to define the ability of a waterbody to naturally absorb and use a discharged substance without water quality becoming impaired or aquatic life being harmed
- Evaluating the amount of pollutants that can be discharged to a specific waterbody without exceeding water quality standards
 - Current Assessment
 - Future Assessment



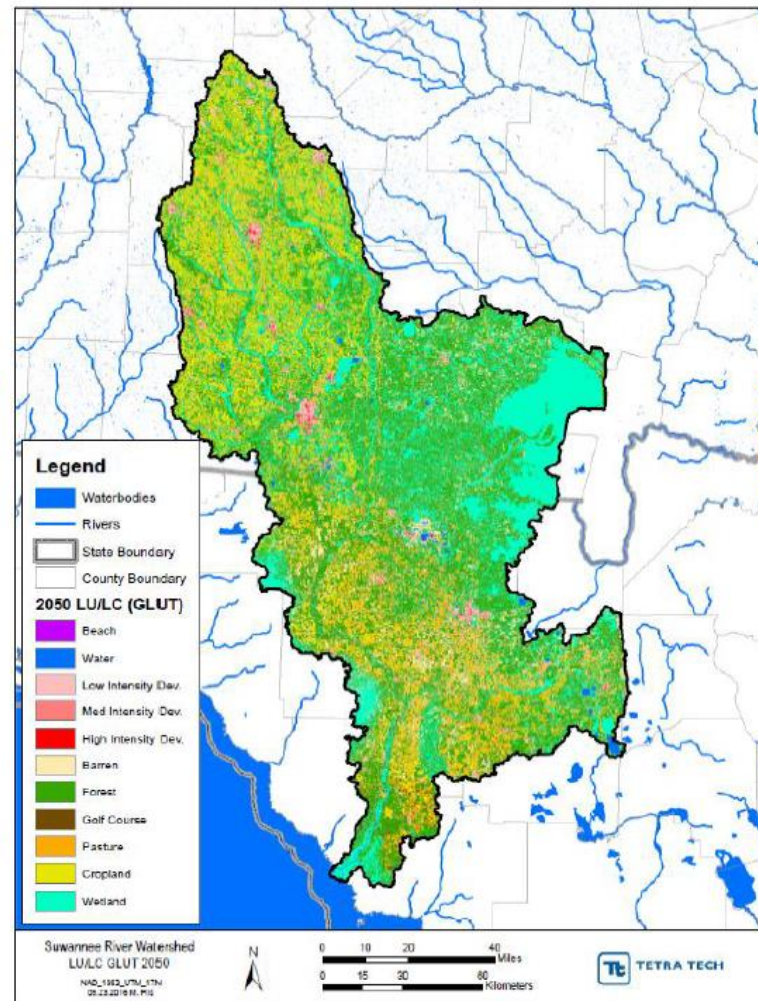


Landuse Changes (2008-2050)

Suwannee Basin Landuse (2008)



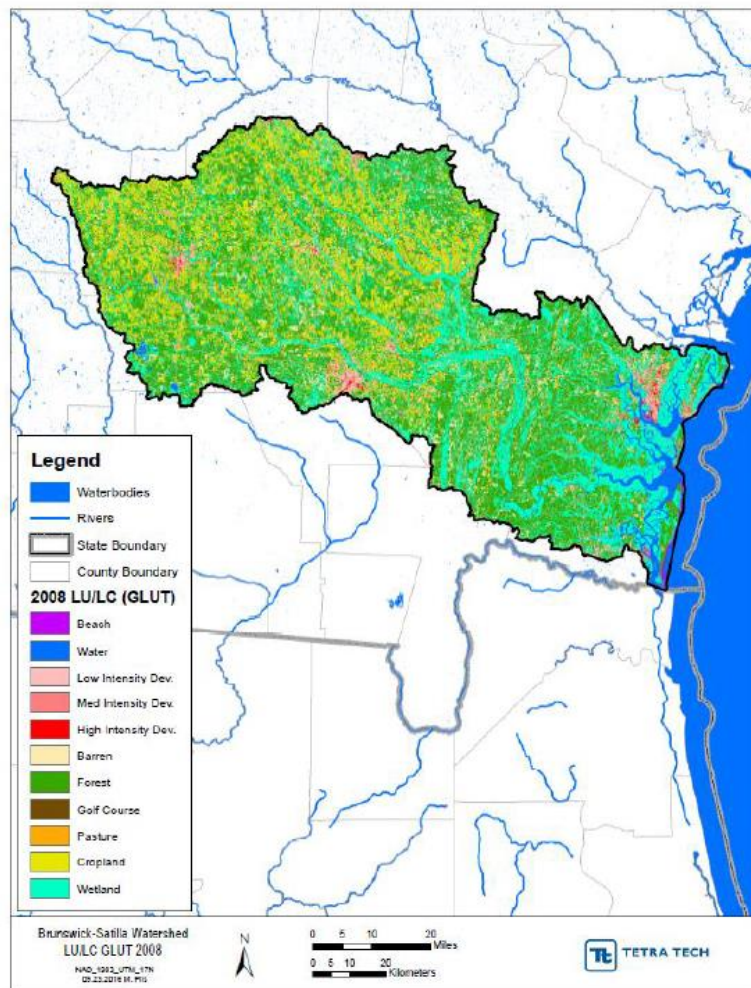
Suwannee Basin Landuse (2050)



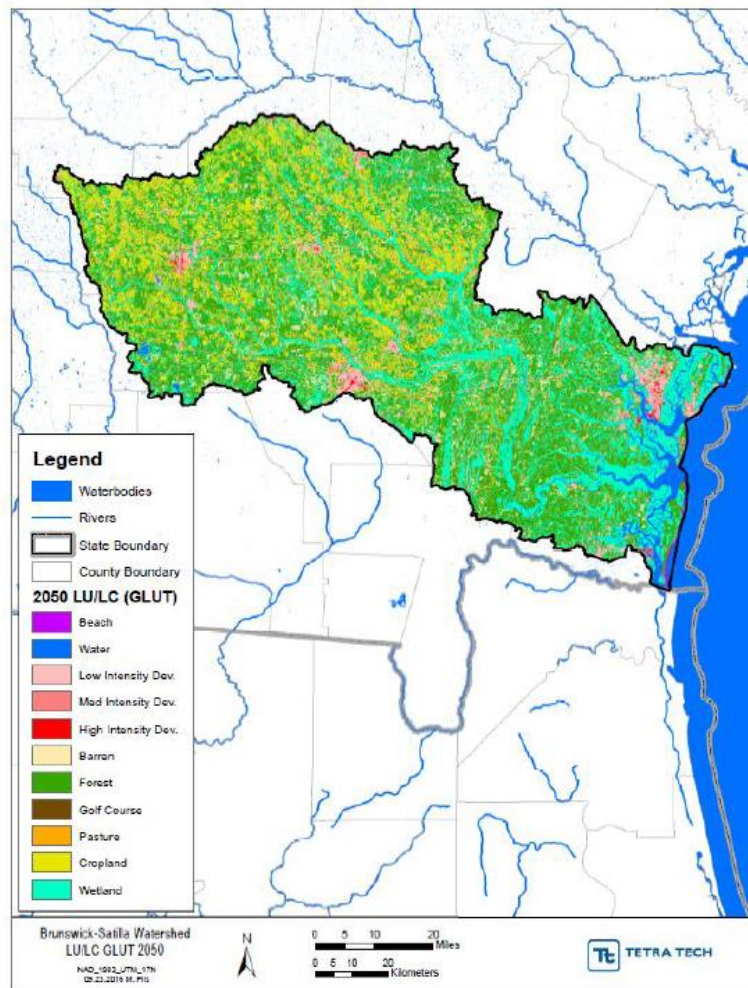


Landuse Changes (2008-2050)

Satilla Basin Landuse (2008)



Satilla Basin Landuse (2050)



Water Quality Modeling

GA DOSAG

GA ESTUARY

GA RIV-1

Watershed Model

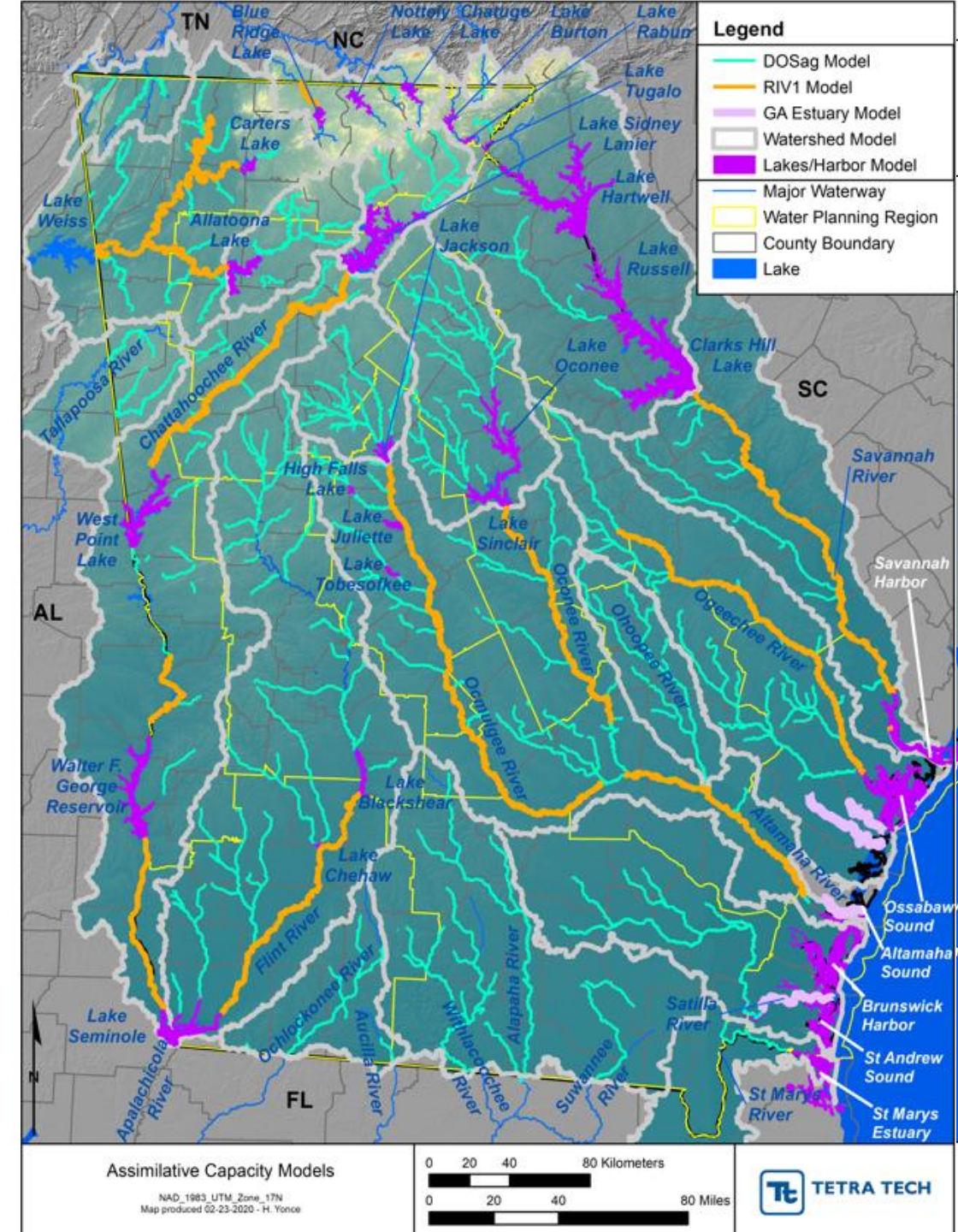
- Loading Simulation Program C++ (LSPC)

Hydrodynamic Model

- Environmental Fluid Dynamics Code (EFDC)

Water Quality Models

- Environmental Fluid Dynamics Code (EFDC)
- Water Quality Analysis Simulation Program (WASP 7.3)





Assimilative Capacity Assessment

- Develop models
- Use available data and conservative assumptions
- Calibrate models to existing conditions
- Evaluate current/future permits
- Determine available assimilative capacity
- Determine areas of concern

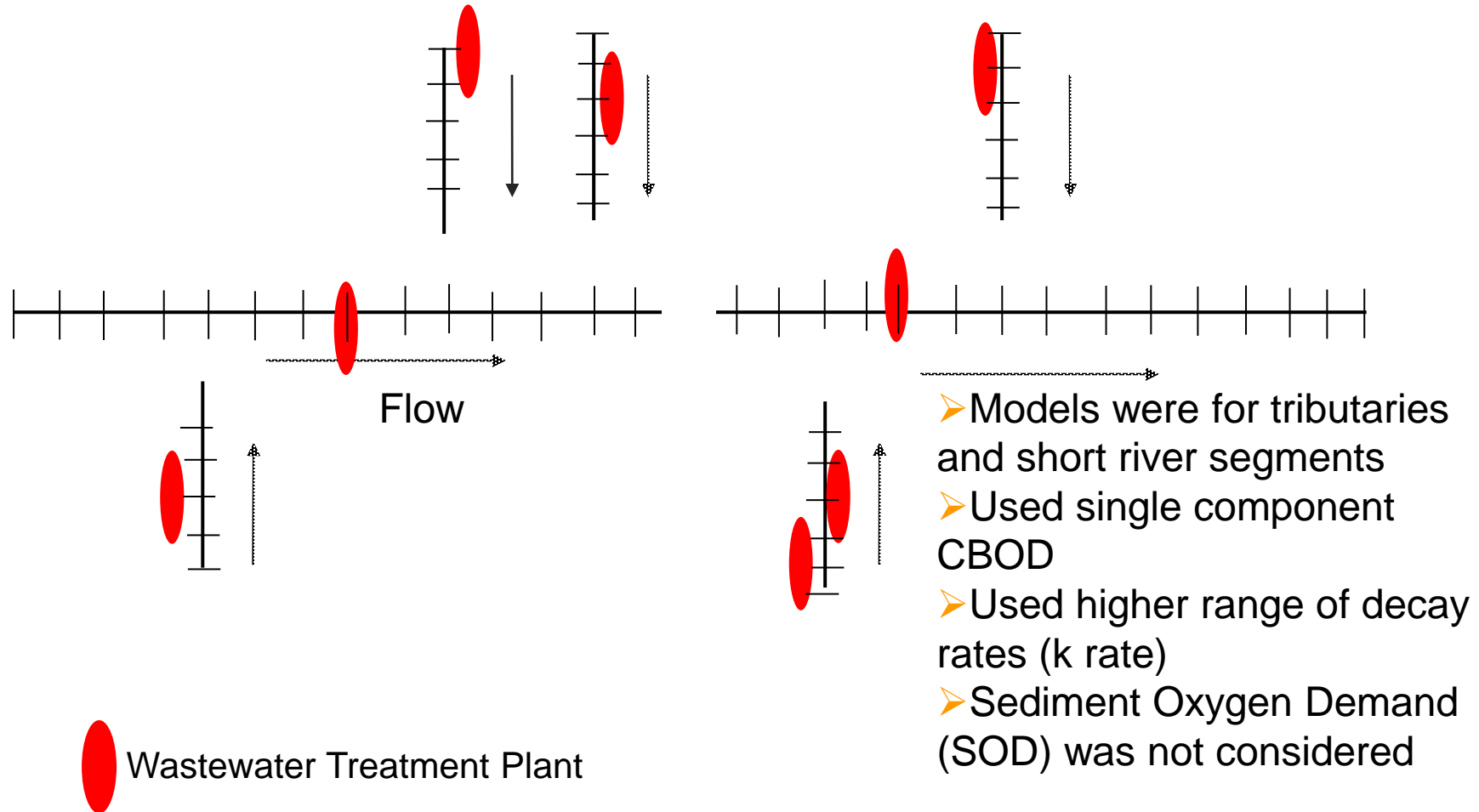


Assimilative Capacity Assessment

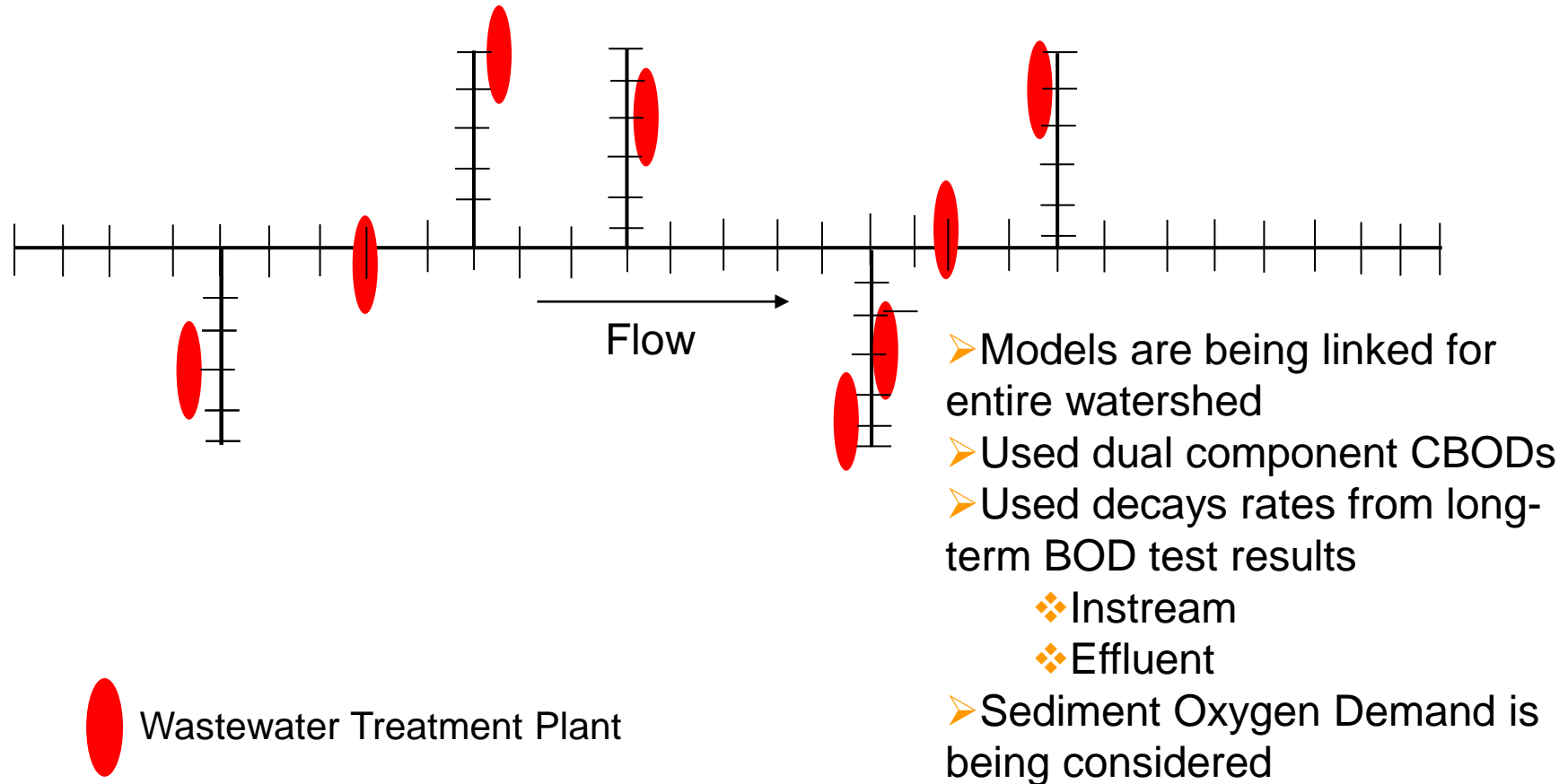
- Parameters of concern
 - Biochemical Oxygen Demand
 - Ammonia
 - Total Nitrogen
 - Total Phosphorus
- Water Quality Standards Effected
 - Dissolved Oxygen
 - Chlorophyll a (Algae)
 - Nutrients

Historic GA DOSAG Models

Determines impact of oxygen demanding substances on DO

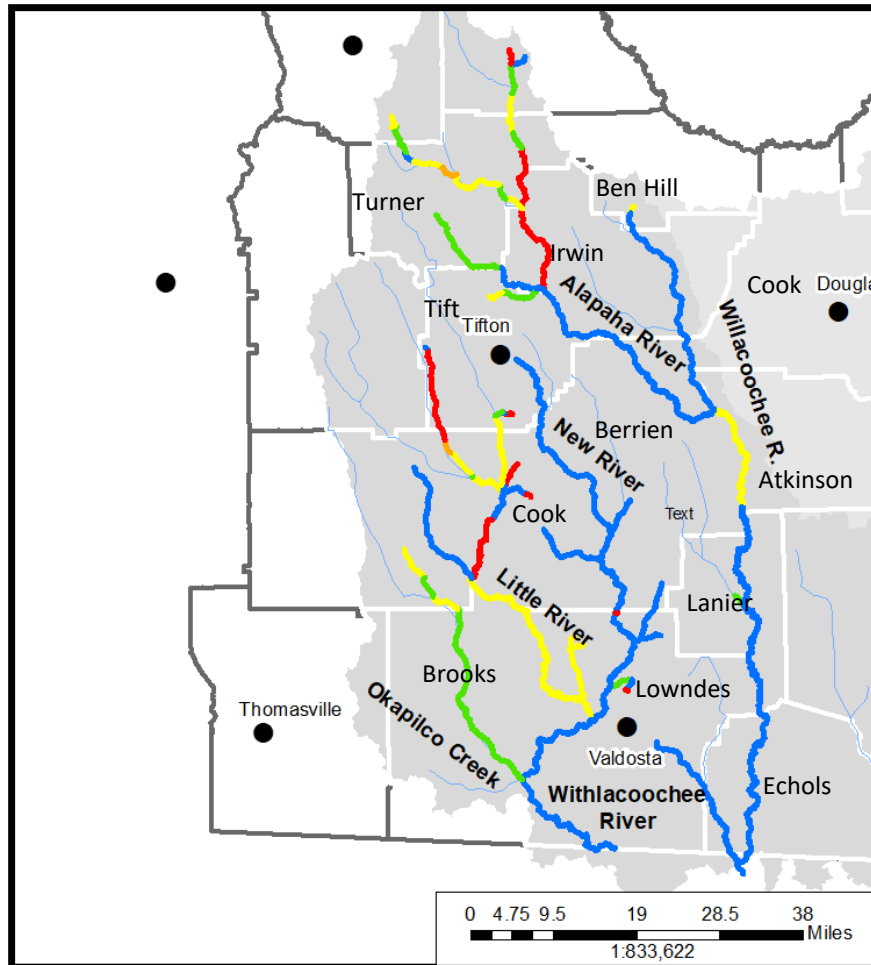


State Water Plan GA DOSAG Models

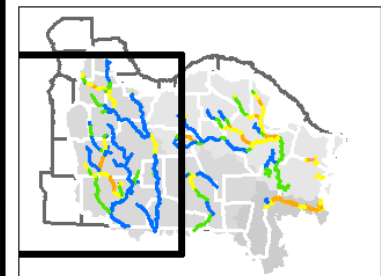
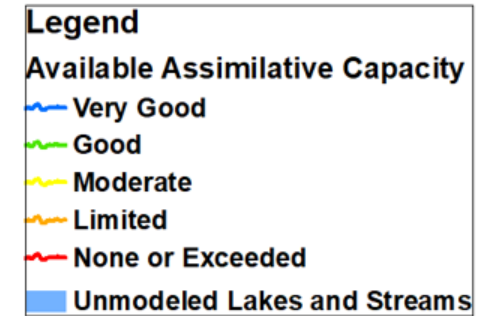
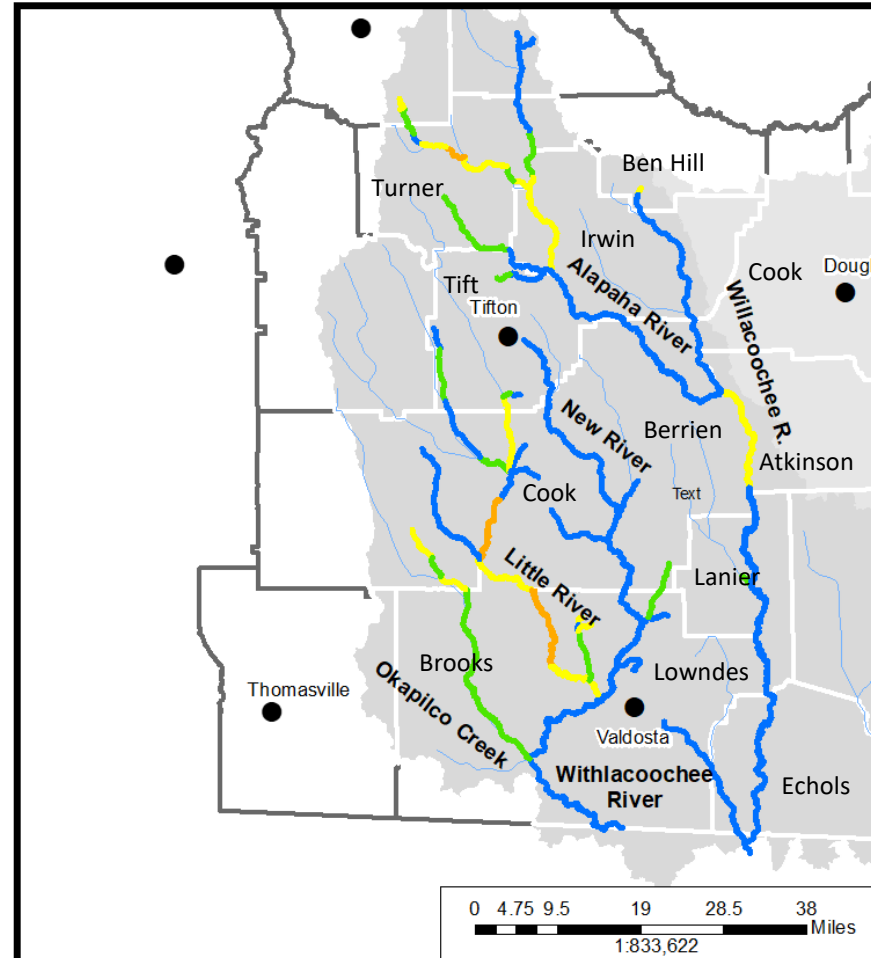


DO Conditions: Western Suwannee River Basin

Current Conditions

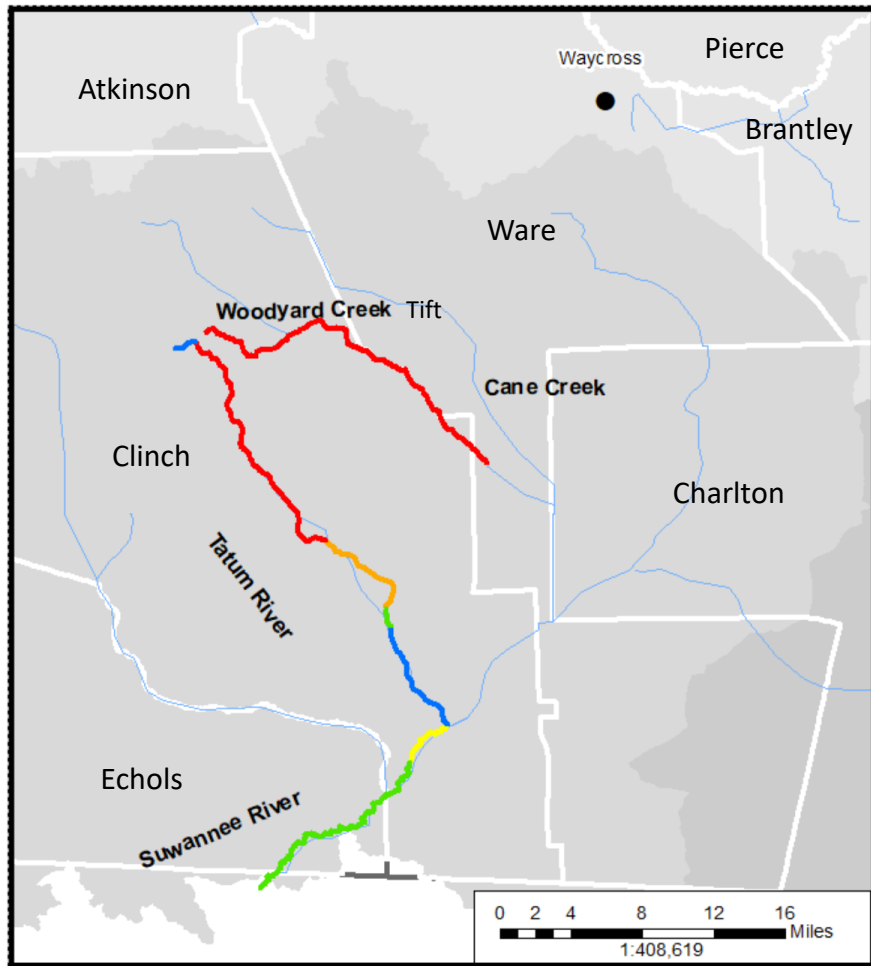


Future Conditions

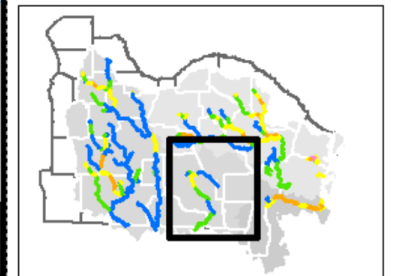
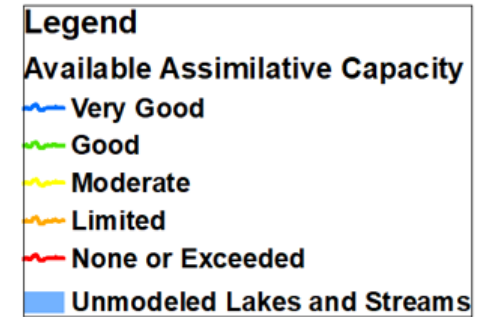
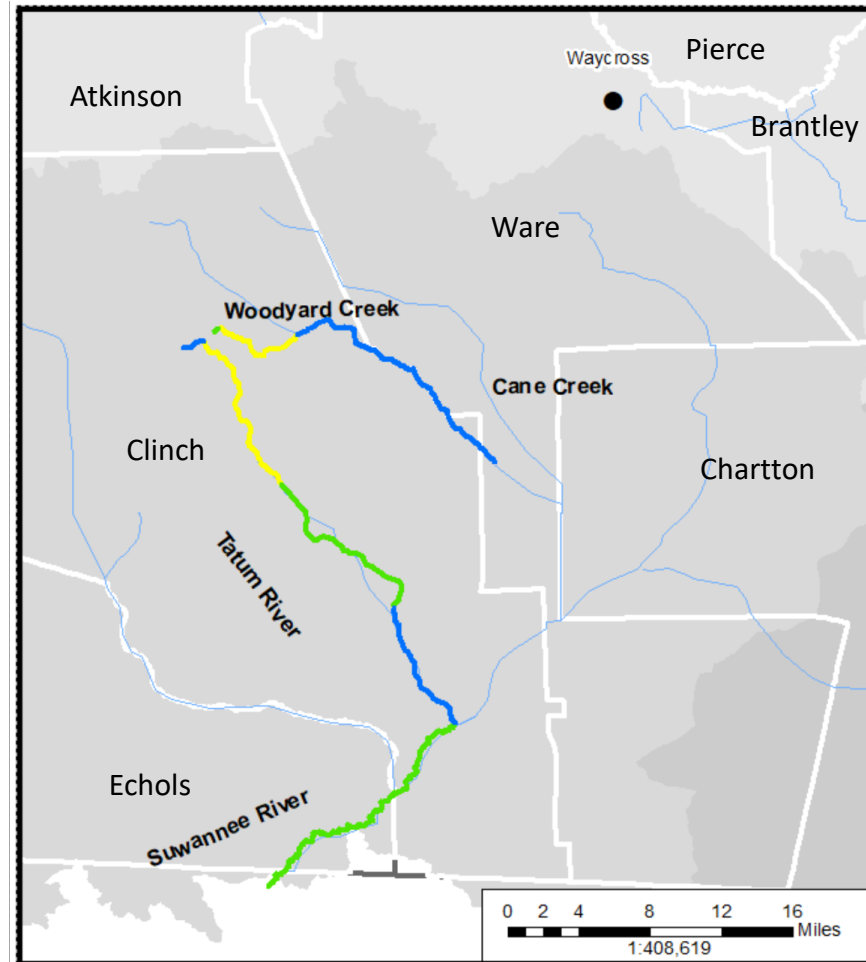


DO Conditions: Eastern Suwannee River Basin

Current Conditions

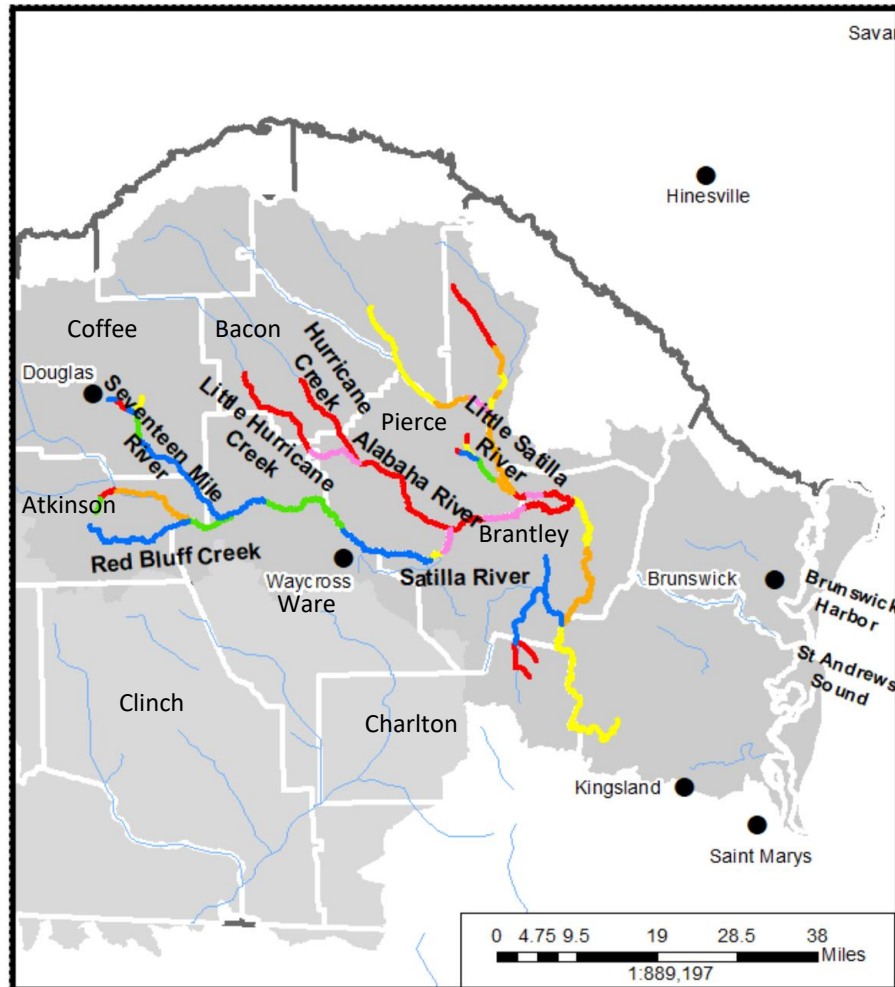


Future Conditions

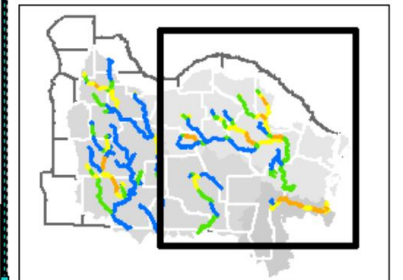
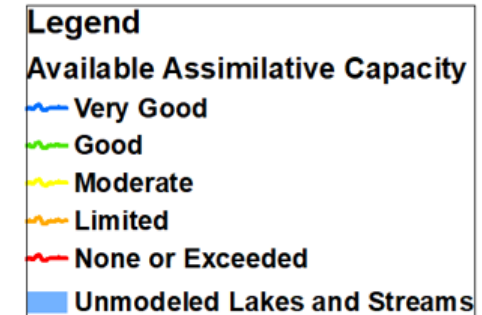
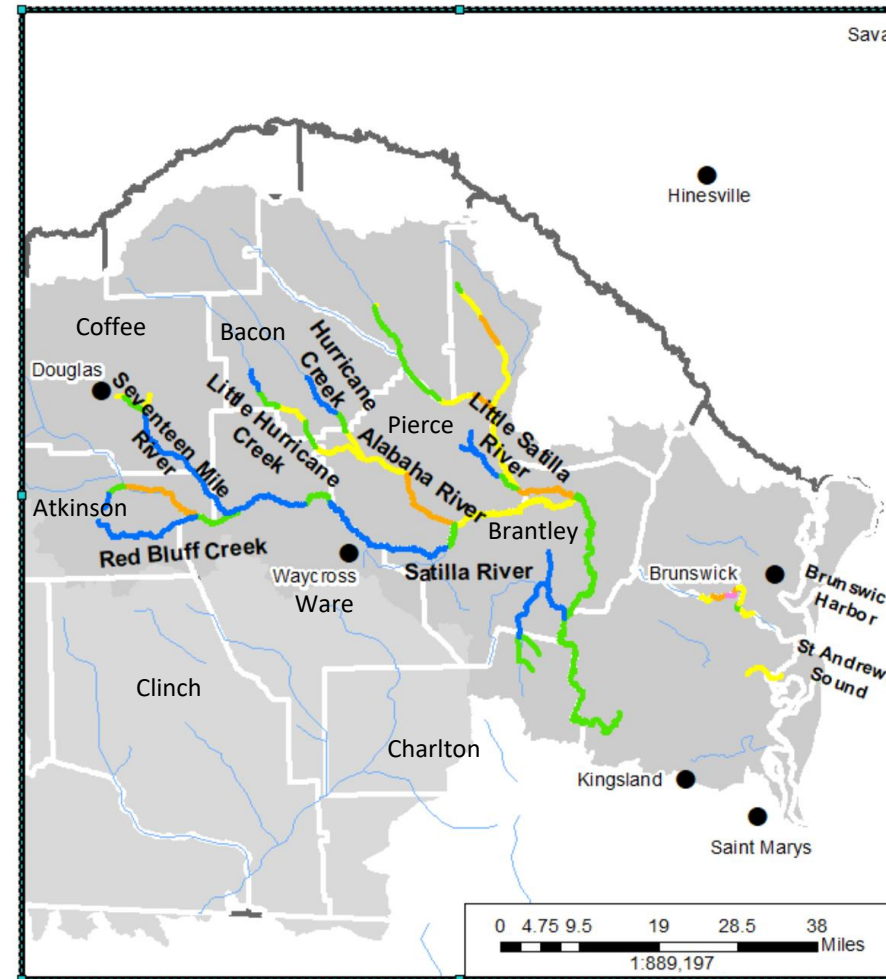


DO Conditions: Satilla River Basin

Current Conditions

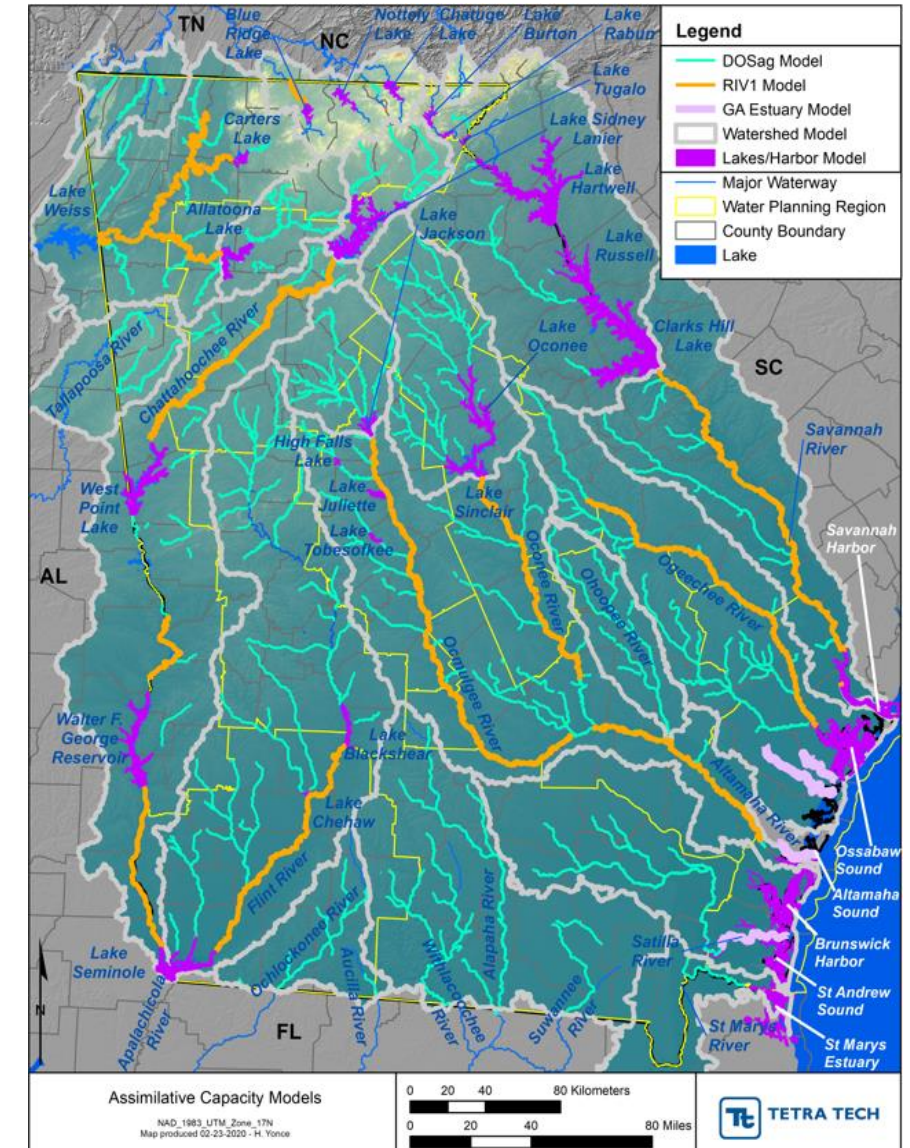


Future Conditions



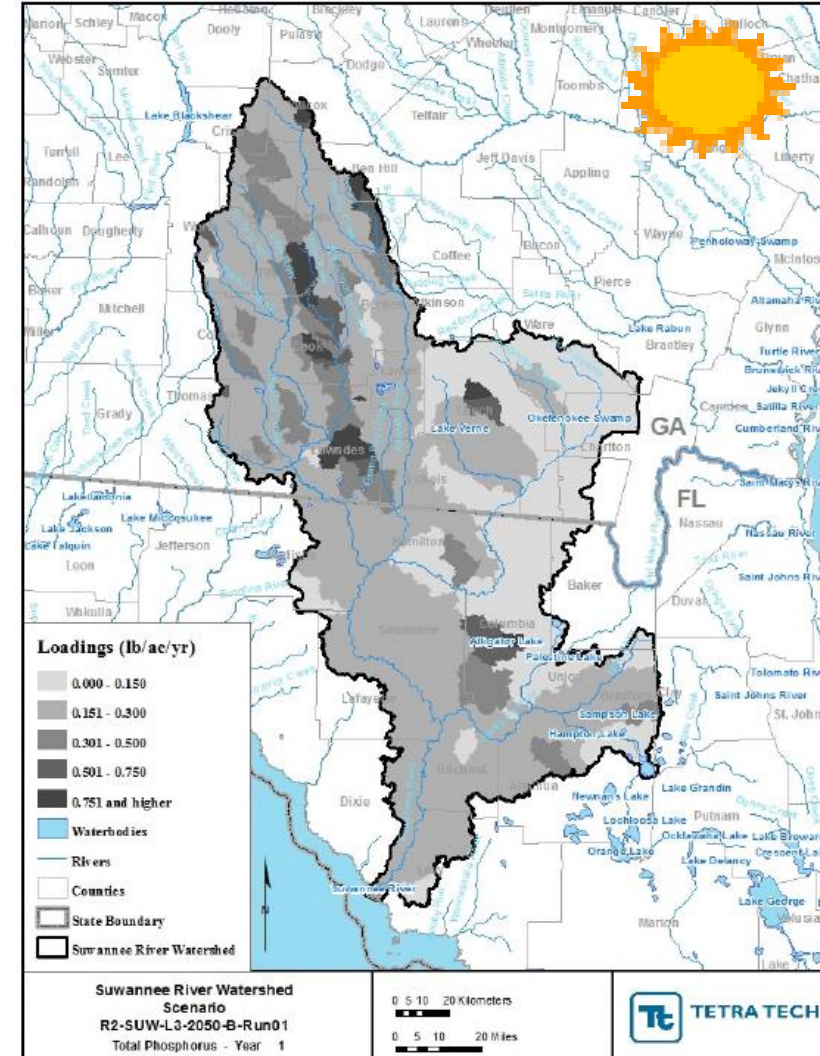
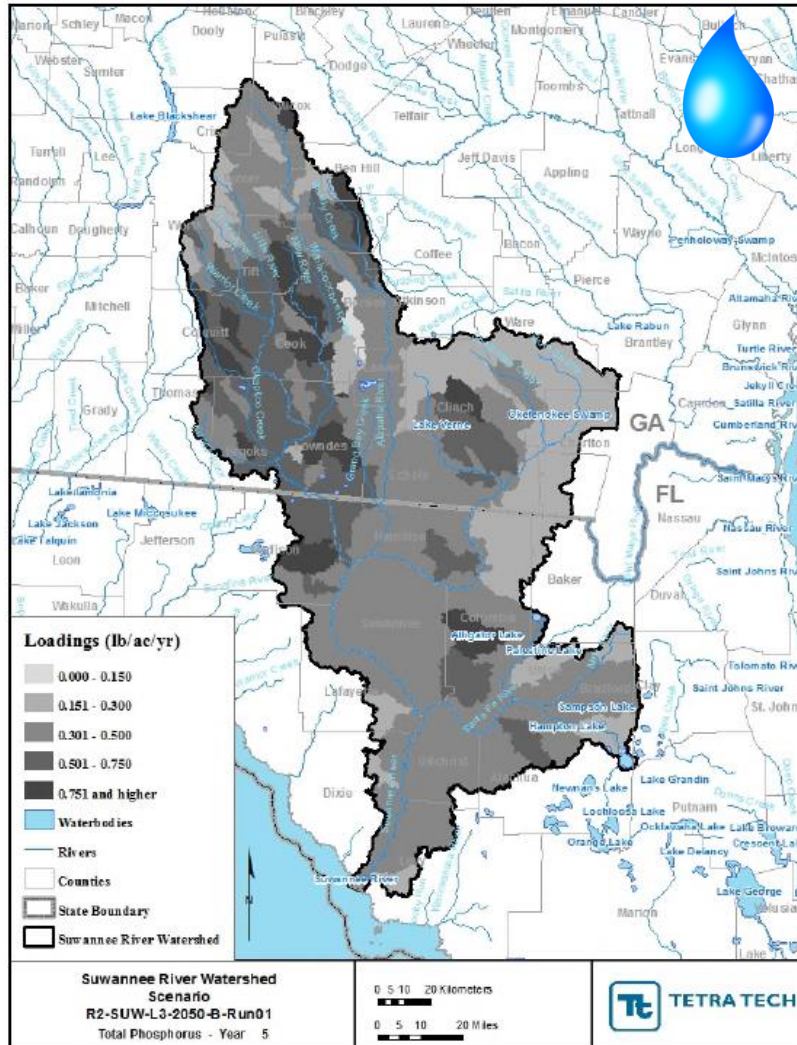
Watershed Modeling

- The LSPC models are not updated at this time, but updates are underway
 - Time-varying landuse inputs
 - Updated meteorological conditions using radar
- Current Conditions:
 - Dischargers at 2019 permit limits
- Future Conditions:
 - 2060 assumed permit limits based on previous forecasted flows
- Heat Maps
 - Loadings – by subbasin – under representative wet and dry years
 - Biochemical Oxygen Demand (BOD)
 - Total Nitrogen
 - Total Phosphorus



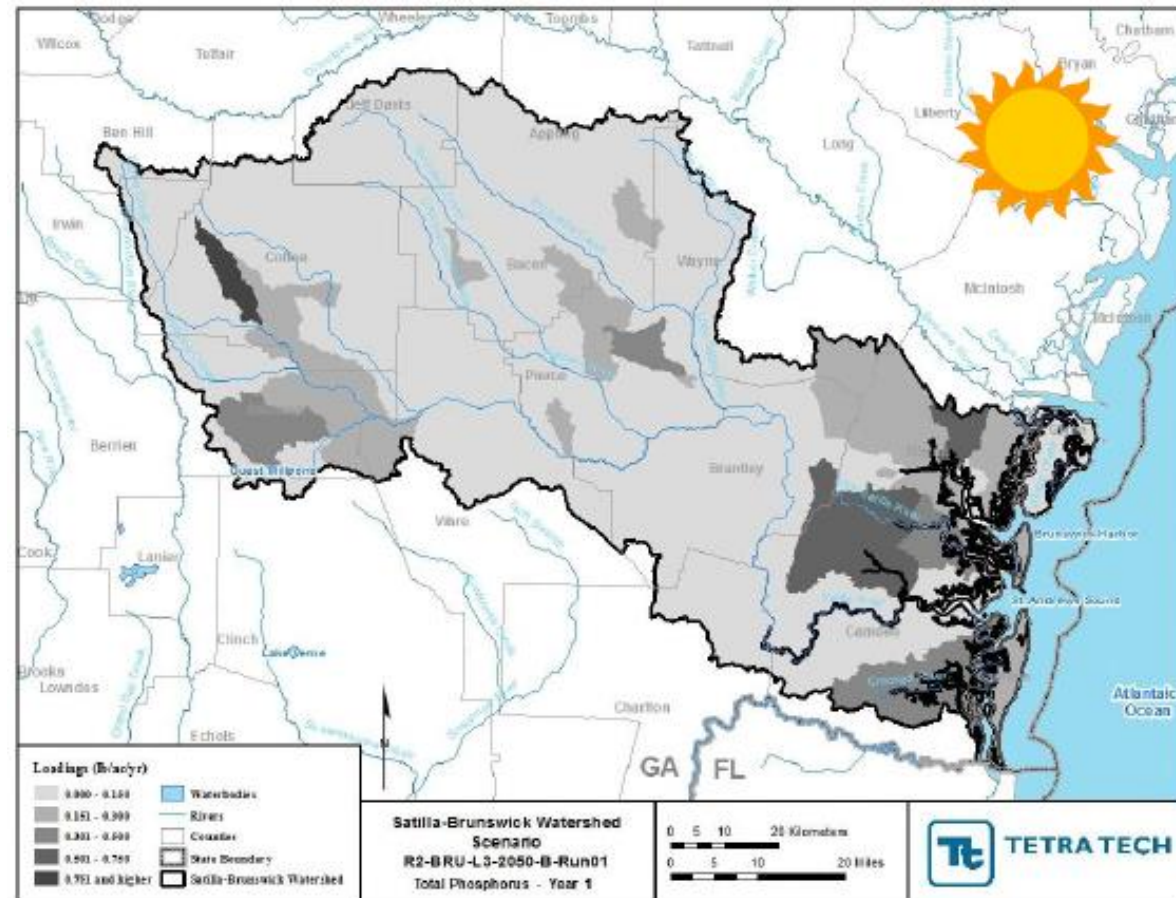
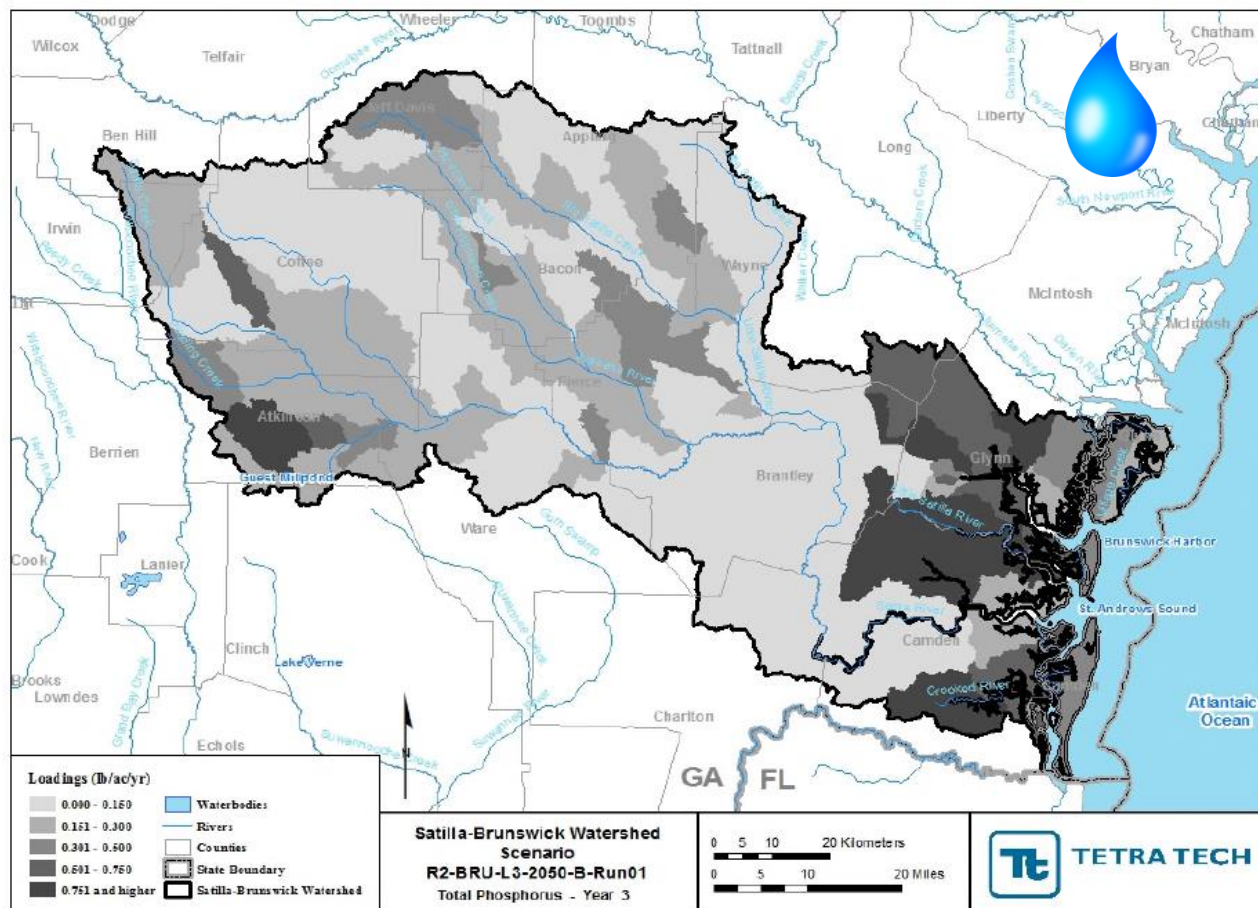


Watershed Model Heat Loads





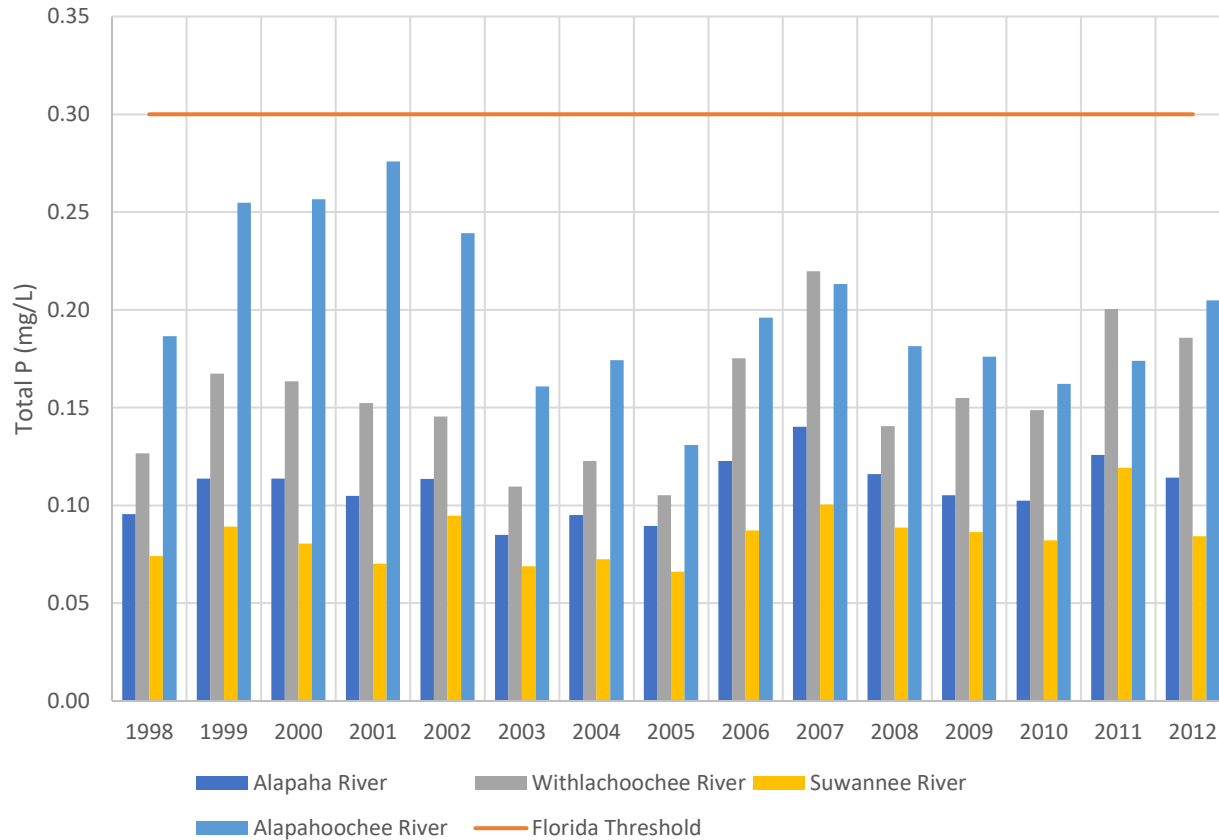
Watershed Model Heat Loads



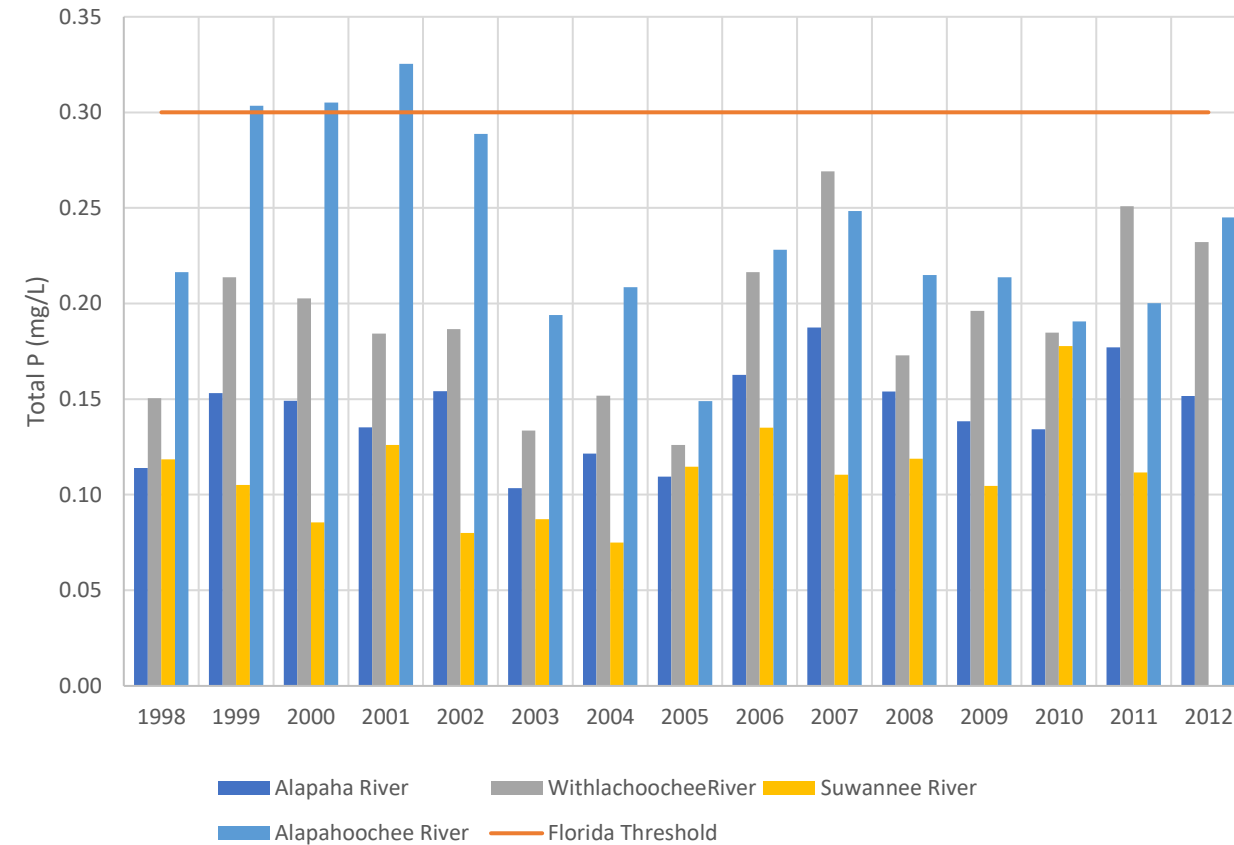


Watershed Model TP Delivery to Florida

Total Phosphorus at Florida State Line based on 2001 TMDL
Landuse



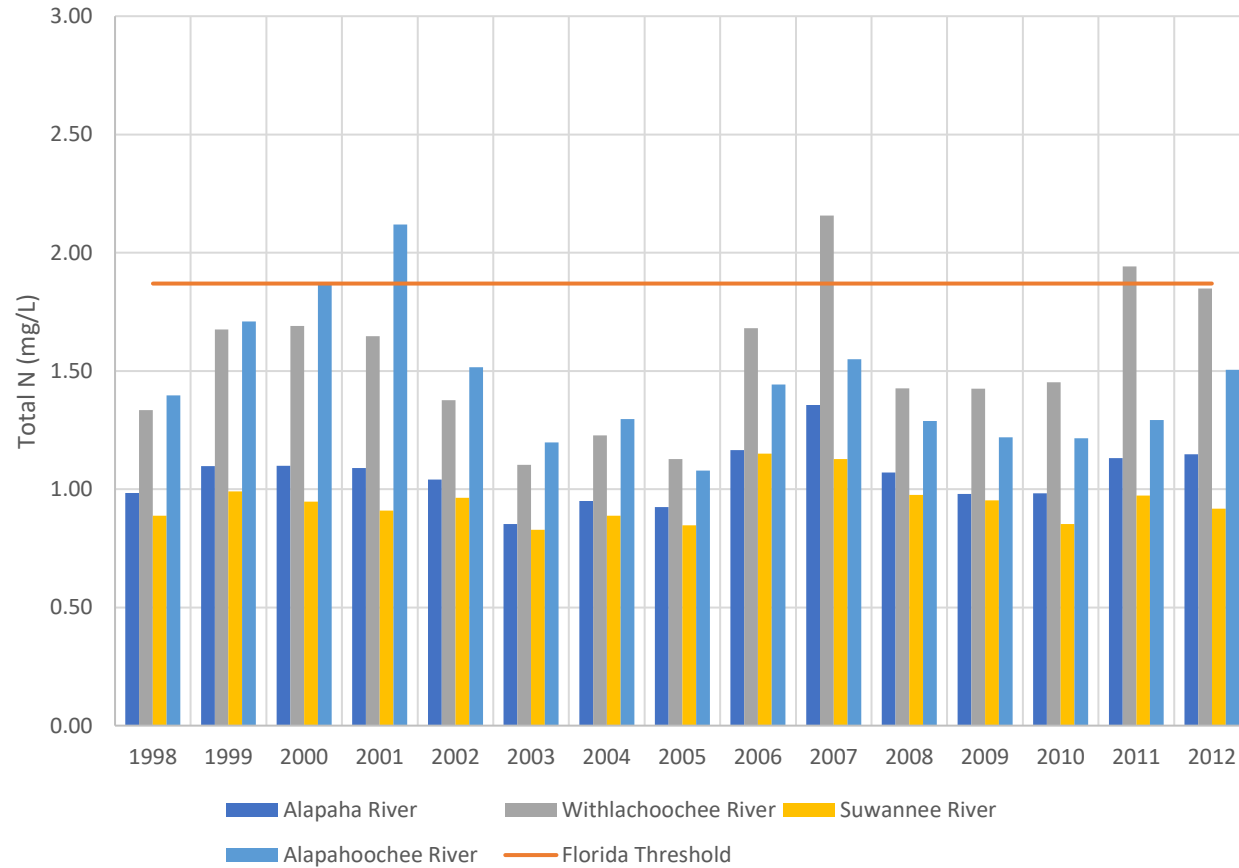
Total Phosphorus at Florida State Line based on 2015 landuse



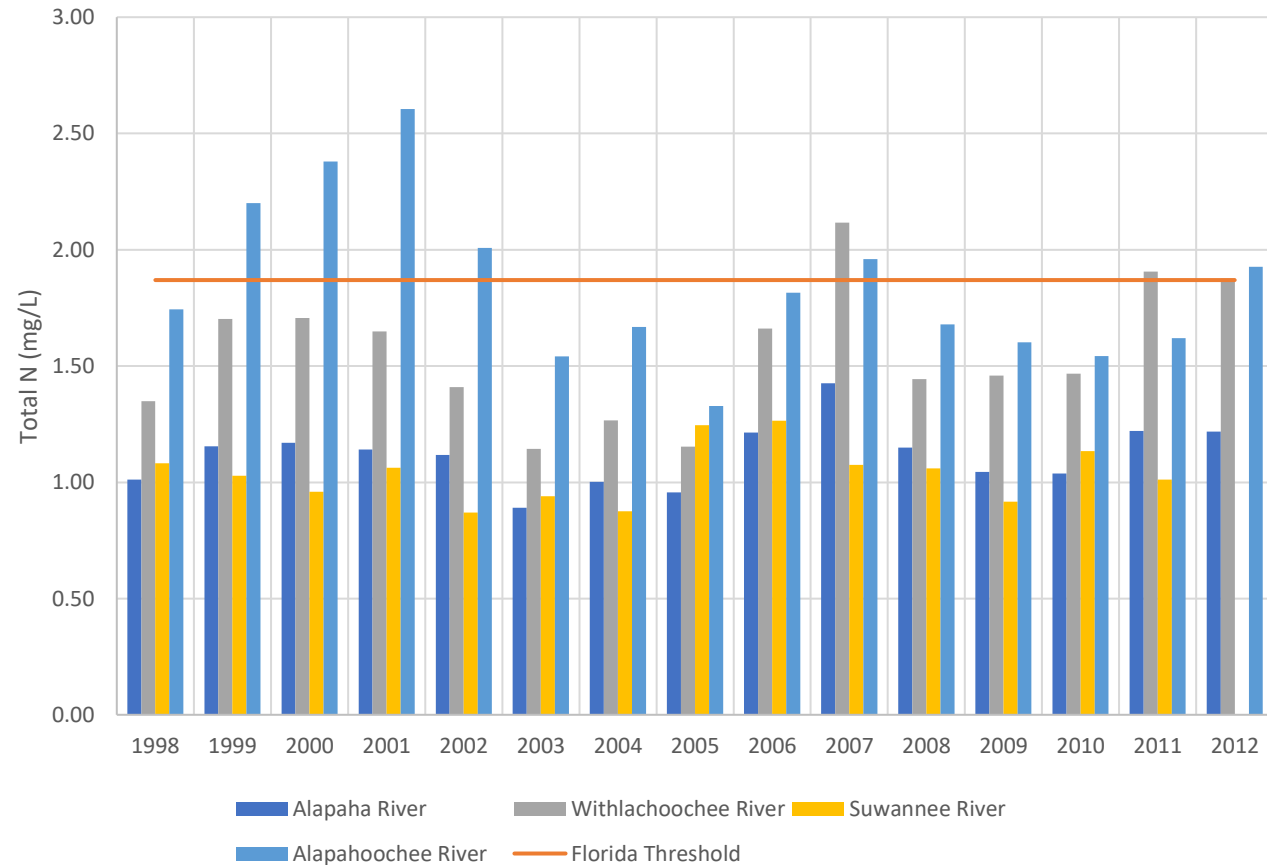


Watershed Model TN Delivery to Florida

Total Nitrogen at Florida State Line based on 2001 TMDL landuse



Total Nitrogen at Florida State Line based on 2015 landuse



2022 305(b)/303(d) Listed Segments

<u>Impairments</u>	<u>Extent</u>
None	5,572 miles
Assess Pending	1,412 miles
Impaired	10,205 miles

Pathogens	5,600 miles
Biologic Integrity	3,559 miles
Mercury	1,803 miles
Dissolved Oxygen	1,267 miles
PCBs	680 miles
Metals	328 miles
Other	477 miles

