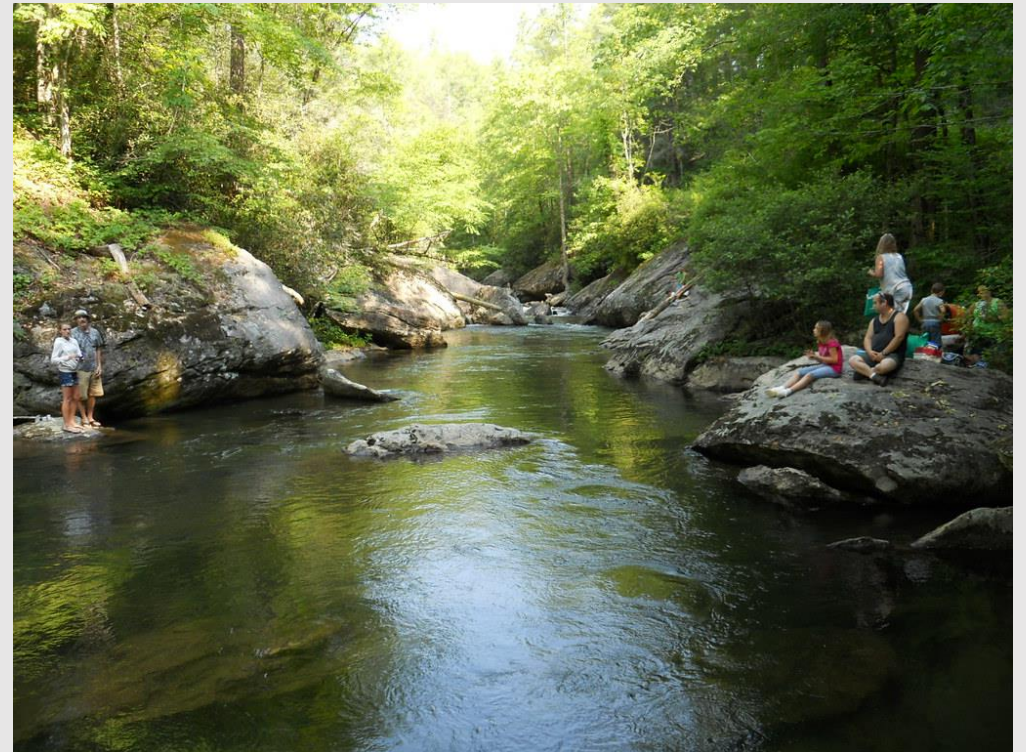


# Water Quality Resource Assessment

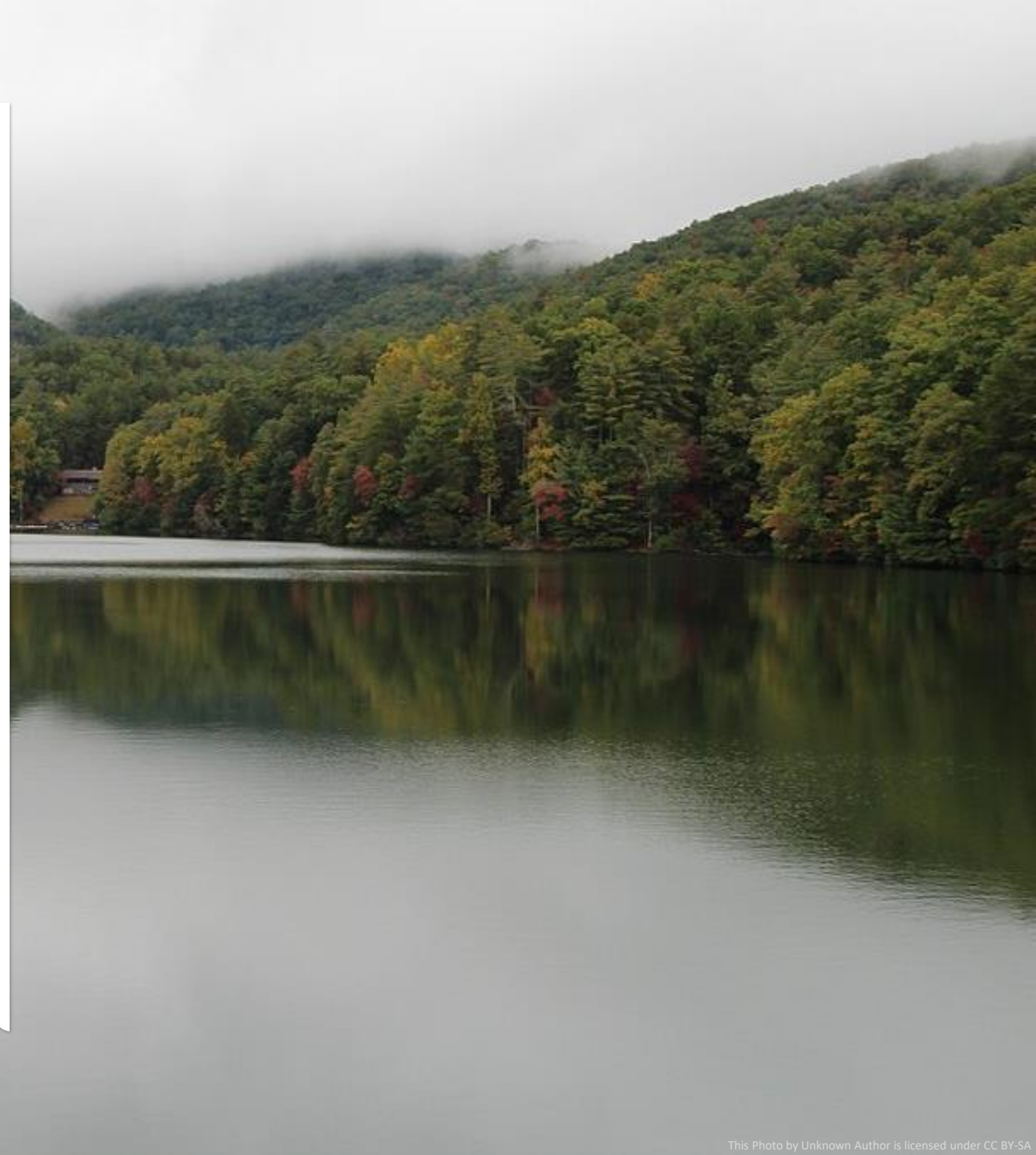
Elizabeth A. Booth, Ph.D., P.E.

Watershed Planning and Monitoring Program Manager



# Outline

- Water Quality Standards
  - Triennial Review
  - Related topic: Harmful Algal Blooms
- Assessment of State Waters
- Water Quality Resource Assessment
  - Modeling Approaches
  - Types of Results
- Questions







# Water Quality Standards

- All waterbodies have a designated use
  - Fishing
  - Drinking Water
  - Recreation
- General Criteria
  - Toxic substances
  - Metals
- Specific Criteria (based on designated use)
  - Bacteria
  - Dissolved Oxygen
  - Temperature
  - pH
  - Chlorophyll *a* (for specific lakes)



# 2019 Triennial Review

## EPA recommendations

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### 2009 EPA Acrolein Aquatic Life Criteria

- Acrolein (CAS RN1 107-02-8)

(a) Freshwater 3.0  $\mu\text{g/L}$

### 2012 EPA Carbaryl Aquatic Life Criteria

- Carbaryl (CAS RN1 63-25-2)

(a) Freshwater 2.1  $\mu\text{g/L}$

(b) Coastal and Estuarine Waters 1.6  $\mu\text{g/L}$





# 2019 Triennial Review

## GA EPD identified changes

- Replaced “Use Classifications” with “Designated Uses”
- Added Recreation Definitions
- Updated the Metal Criteria
  - Added Water Effect multiplier to the metal equations
  - Added paragraphs allowing site specific metal criteria based on a Biotic Ligand Model and/or Water Effects Ratio
- Proposed Drinking Water and Fishing Bacteria Criteria
- Proposed Lakes Oconee and Sinclair Criteria



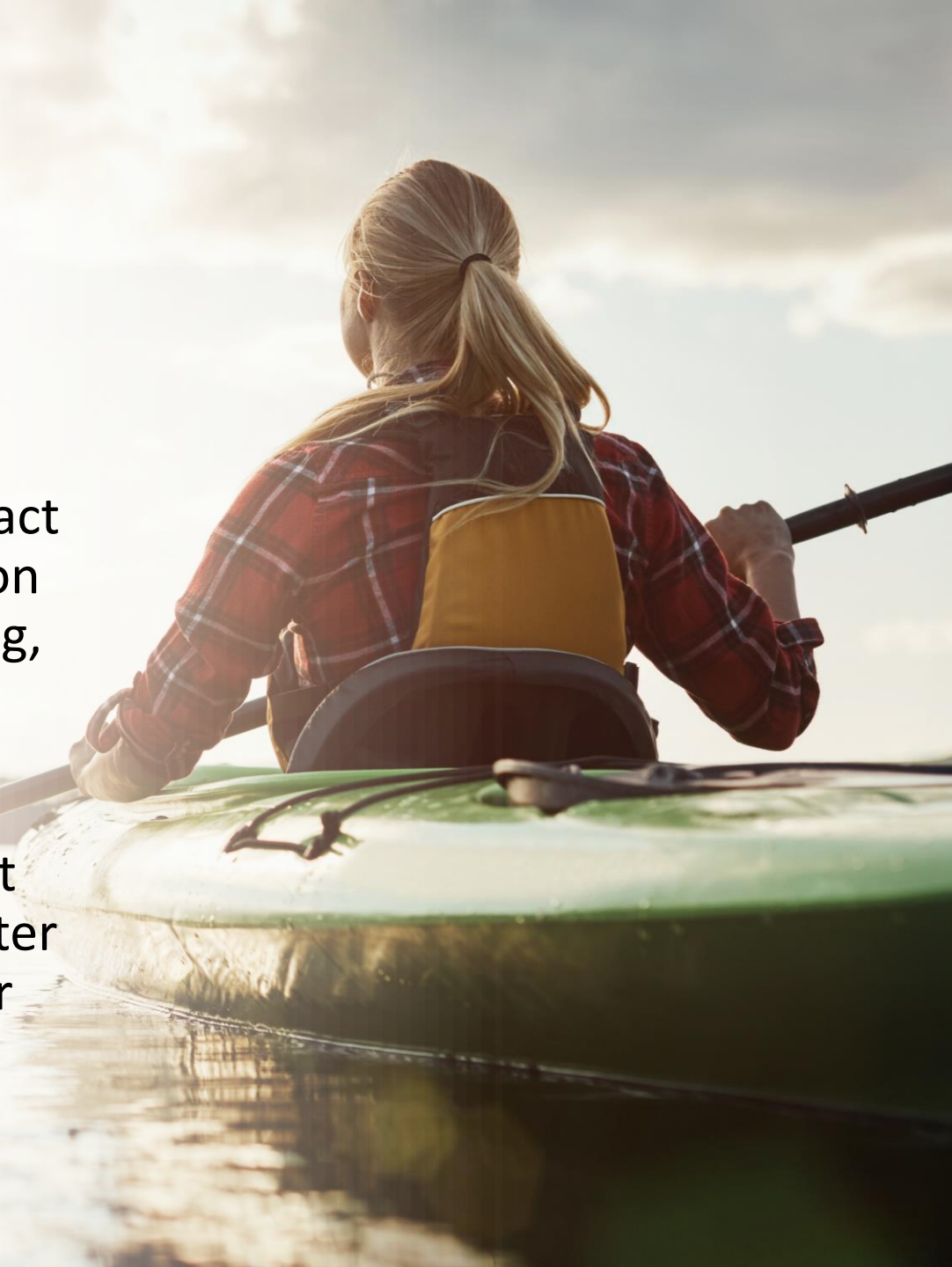


# Recreation definitions

## 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

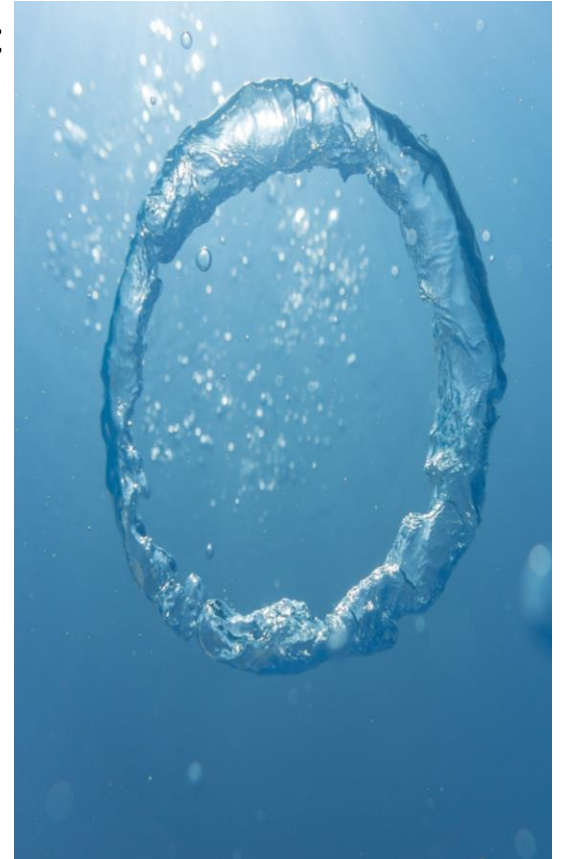
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- Added Water Effects Ratio multiplier WER to the freshwater metal's aquatic life criteria equations

## 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

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- Proposed E. coli and enterococci criteria for Drinking Water and Fishing designated uses
- Recreation designated use currently has 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 proposed bacteria criteria for Fishing and Drinking Water designated uses that replace the seasonal fecal coliform criteria currently in the rules.





# Bacteria Criteria for Drinking Water and Fishing Designated Uses:

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- 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 a 10% excursion frequency of the Statistical Threshold Value (STV) of 410 counts per 100 mL
  - Enterococci (coastal and estuarine waters): not to exceed 30-day geometric mean of 35 counts per 100 mL. No more than a 10% excursion frequency of the STV of 130 counts per 100 mL
- 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 a 10% excursion frequency of the STV of 861 counts per 100 mL.
  - Enterococci (coastal and estuarine waters): not to exceed 30-day geometric mean of 74 counts per 100 mL. No more than a 10% excursion frequency of the STV of 273 counts per 100 mL.
- Removed Non-human source Bacteria Criteria





# Public Comment Based Changes

## Changes in Designated Uses to Recreation

- Recognize current use is primary recreation.
- Broad community support with no significant stakeholder opposition
- Community has made or plans to make financial investments to promote the use current







# 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
- Once chlorophyll *a* criteria are adopted, nutrient limits will be implemented in NPDES permits where necessary to ensure chlorophyll *a* criteria is met.
- EPD plans to adopt numeric nutrient criteria for Total Phosphorus and Total Nitrogen in the future, once NPDES permit limits have been implemented.



# Designated Use Changes

- Public nominated 2662 river miles
- EPD prioritized waterbodies (804 river miles)
- EPD recommending 14 waterbody segments (407 miles) based on evaluation of nomination packages received
  - These waterbodies met all requirements for a designated use change to recreation:
    - Year-round primary contact recreation
    - Planned or current investments
    - Stakeholder and/or community support
  - No stakeholder opposition
- Consideration of eliminated waterbodies postponed due to conditions EPD anticipates may require more time for further stakeholder engagement.
  - These waterbodies can be considered for the upcoming 2022 Triennial Review.






# 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



# Triennial Review Timelines

- DNR Board Adopted the rule on January 28, 2022
- Secretary of State filed the revised rules on February 27, 2022
- Attorney General certifies the rule adoption
- EPA approves the rule package 
- 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





# 2022 Triennial Review

## Items Begin Considered

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- 2015 EPA Human Health Criteria
- 2016 EPA Aquatic Life Criteria for Selenium
- 2018 EPA Aquatic Life Criteria for Aluminum
- 2019 Human Health Recreational Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin



# Harmful Algal Bloom Swimming Advisories

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- 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 on April 16, 2021
- 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.





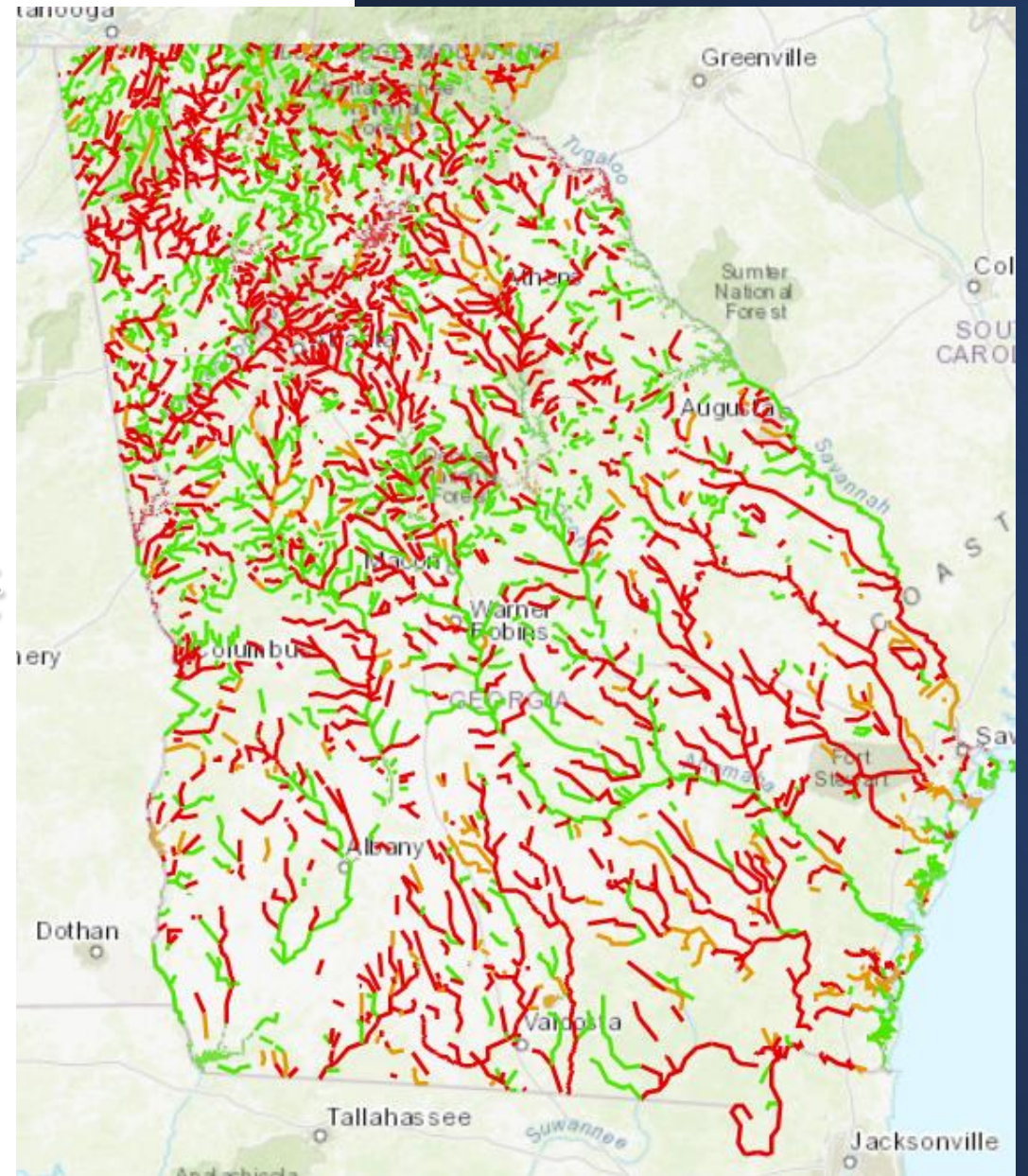
# Assessment of the State Waters

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

(included in the Plan in Section 3)

<u>Impairments</u>	<u>Extent</u>
None	5,686 miles
Assess Pending	1,412 miles
Impaired	10,092 miles

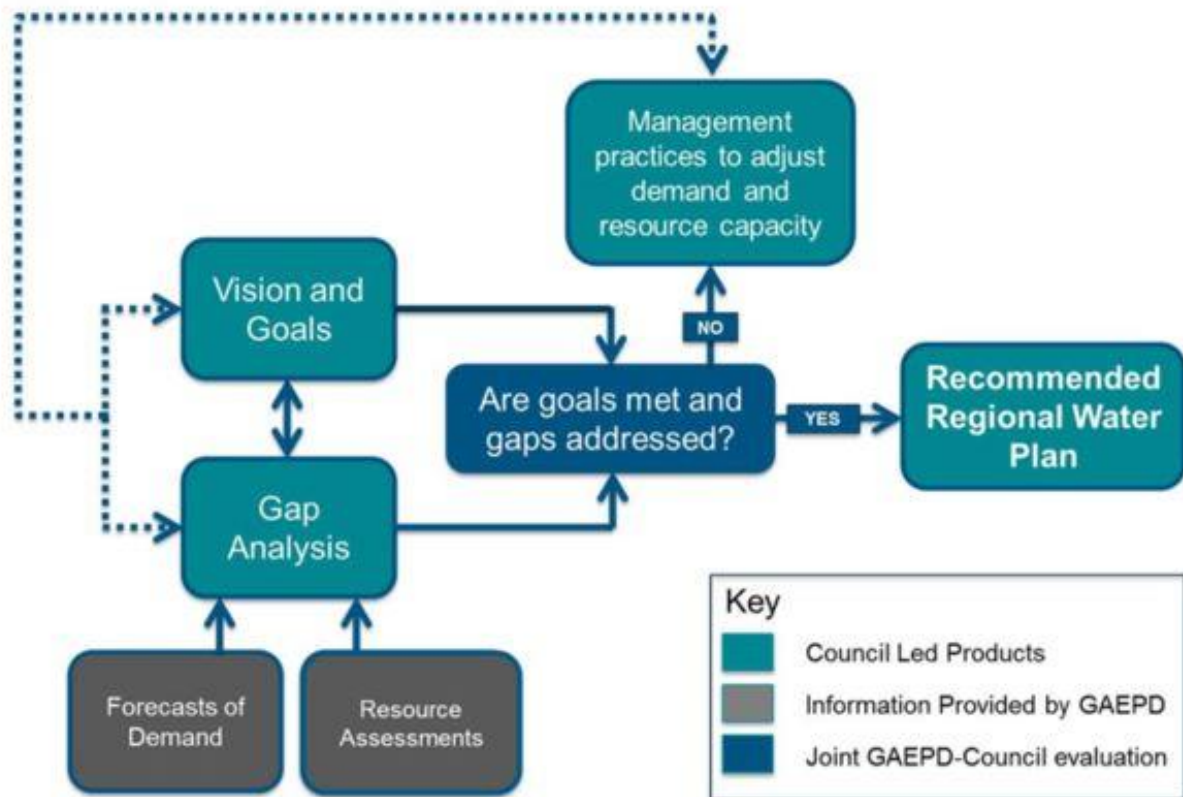
Pathogens	5,600 miles
Biologic Integrity	3,559 miles
Mercury	1,803 miles
Dissolved Oxygen	1,267 miles
PCBs	681 miles
Other	618 miles







# 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





# 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



# Water Quality Modeling

GA DOSAG

GA ESTUARY

GA RIV-1

Watershed Model

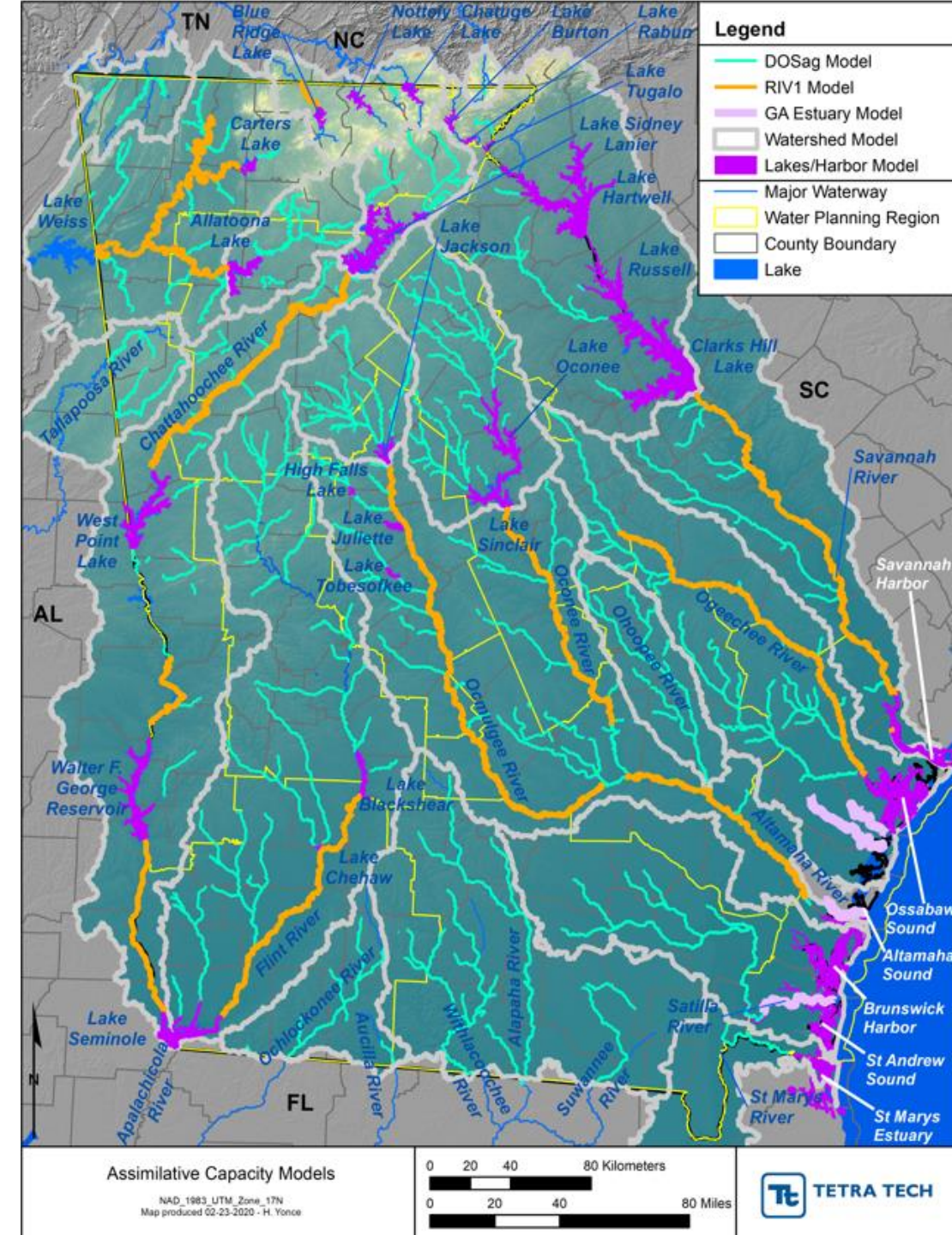
- Loading Simulation Program C++ (LSPC)

Hydrodynamic Model

- Environmental Fluid Dynamics Code (EFDC)

Water Quality Models

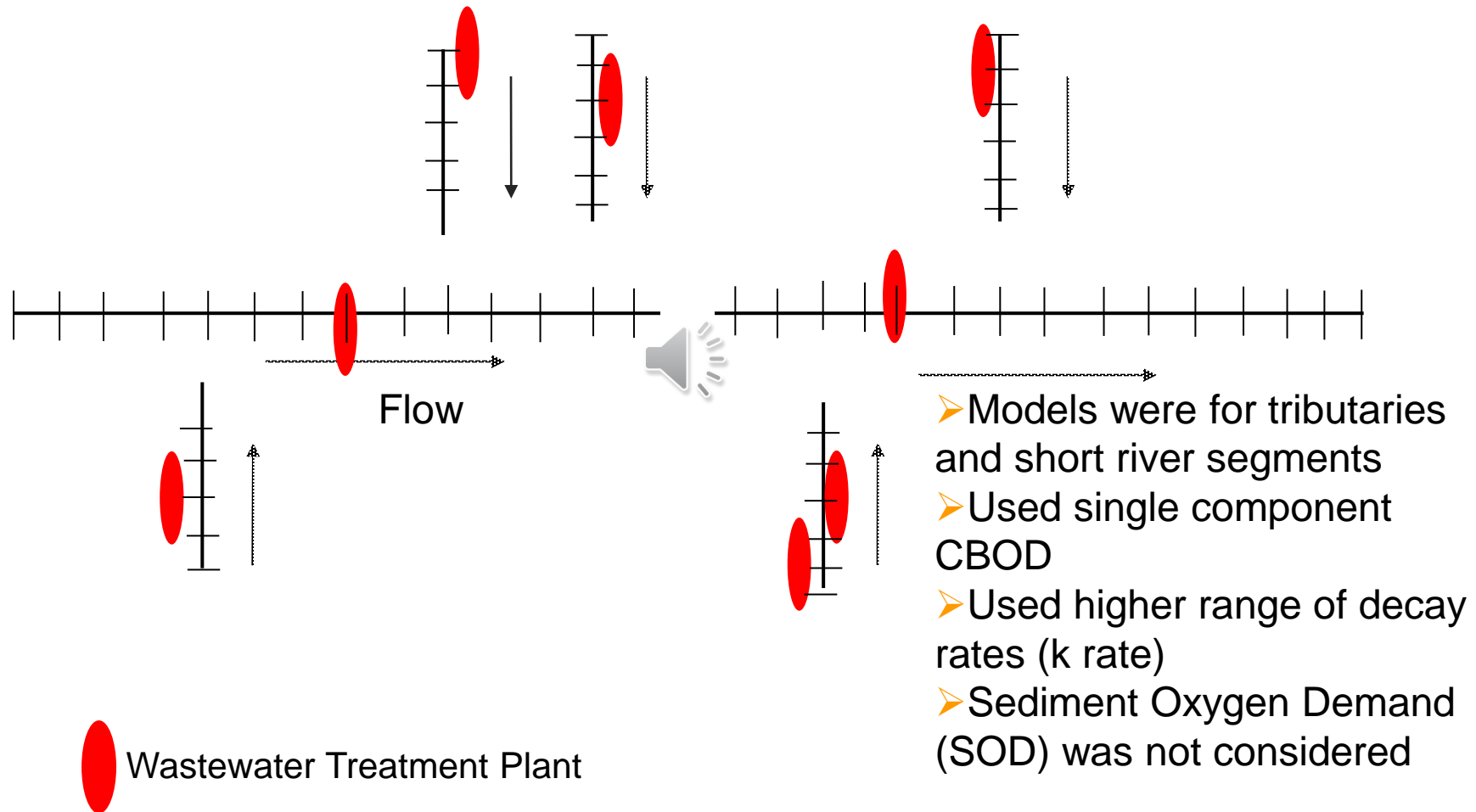
- Environmental Fluid Dynamics Code (EFDC)
- Water Quality Analysis Simulation Program (WASP 7.3)





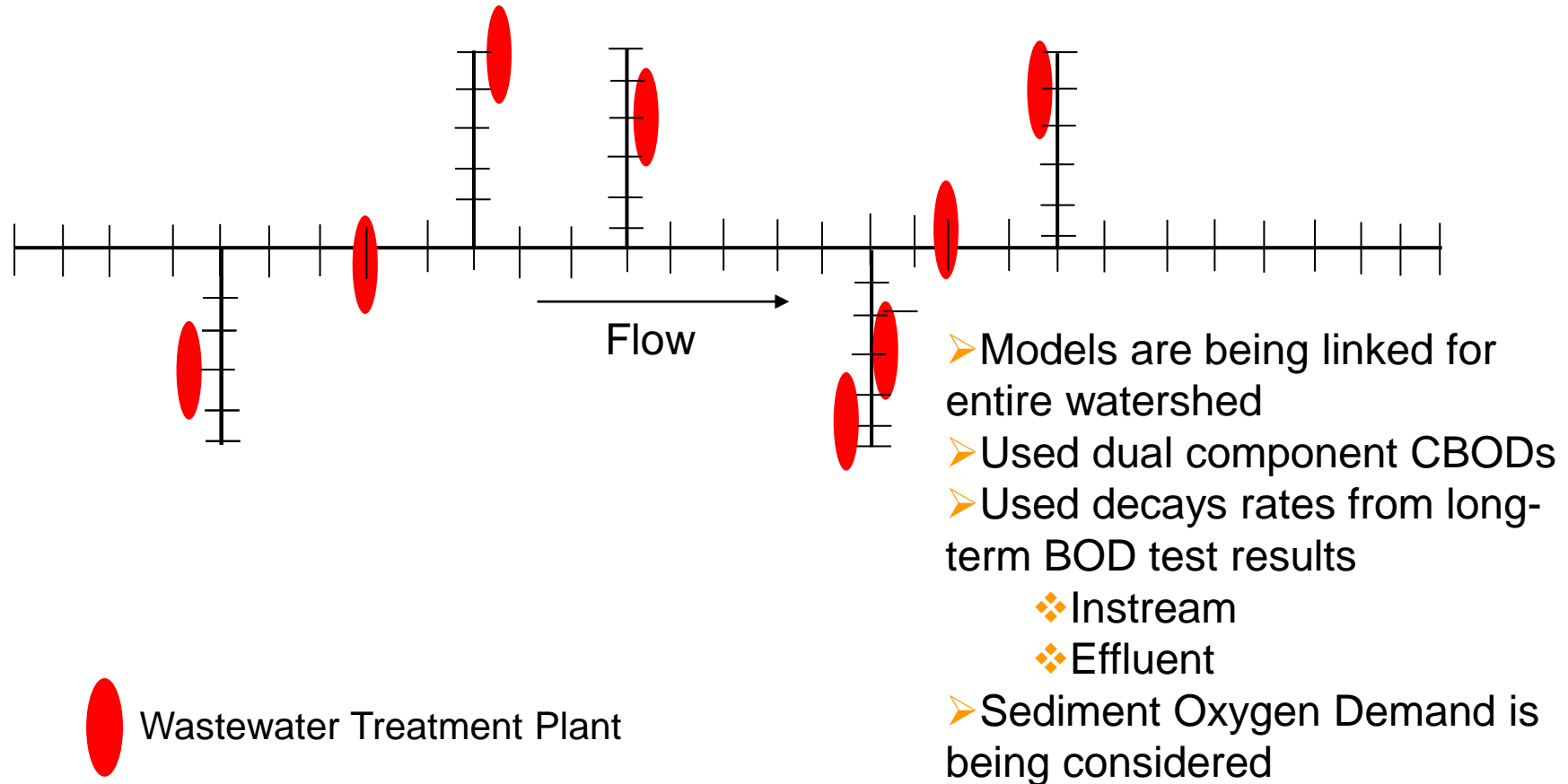
# Historic GA DOSAG Models

Determines impact of oxygen demanding substances on DO





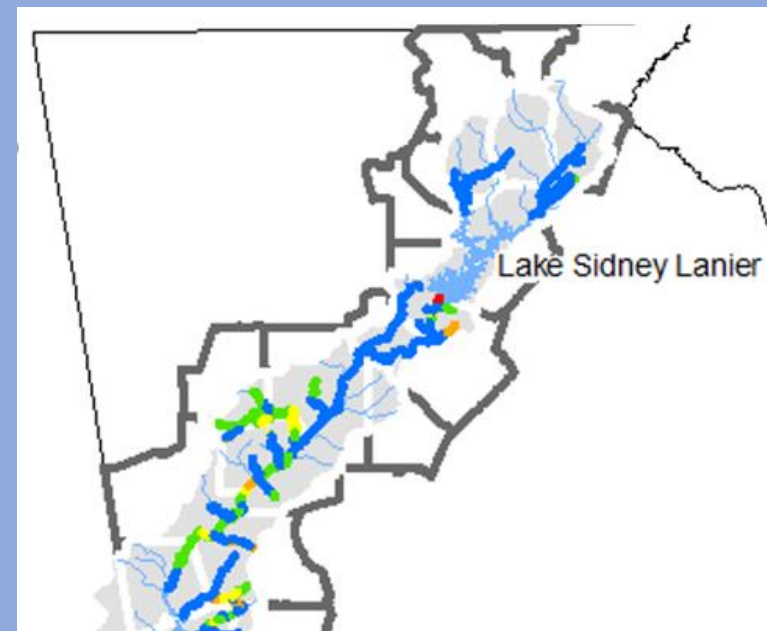
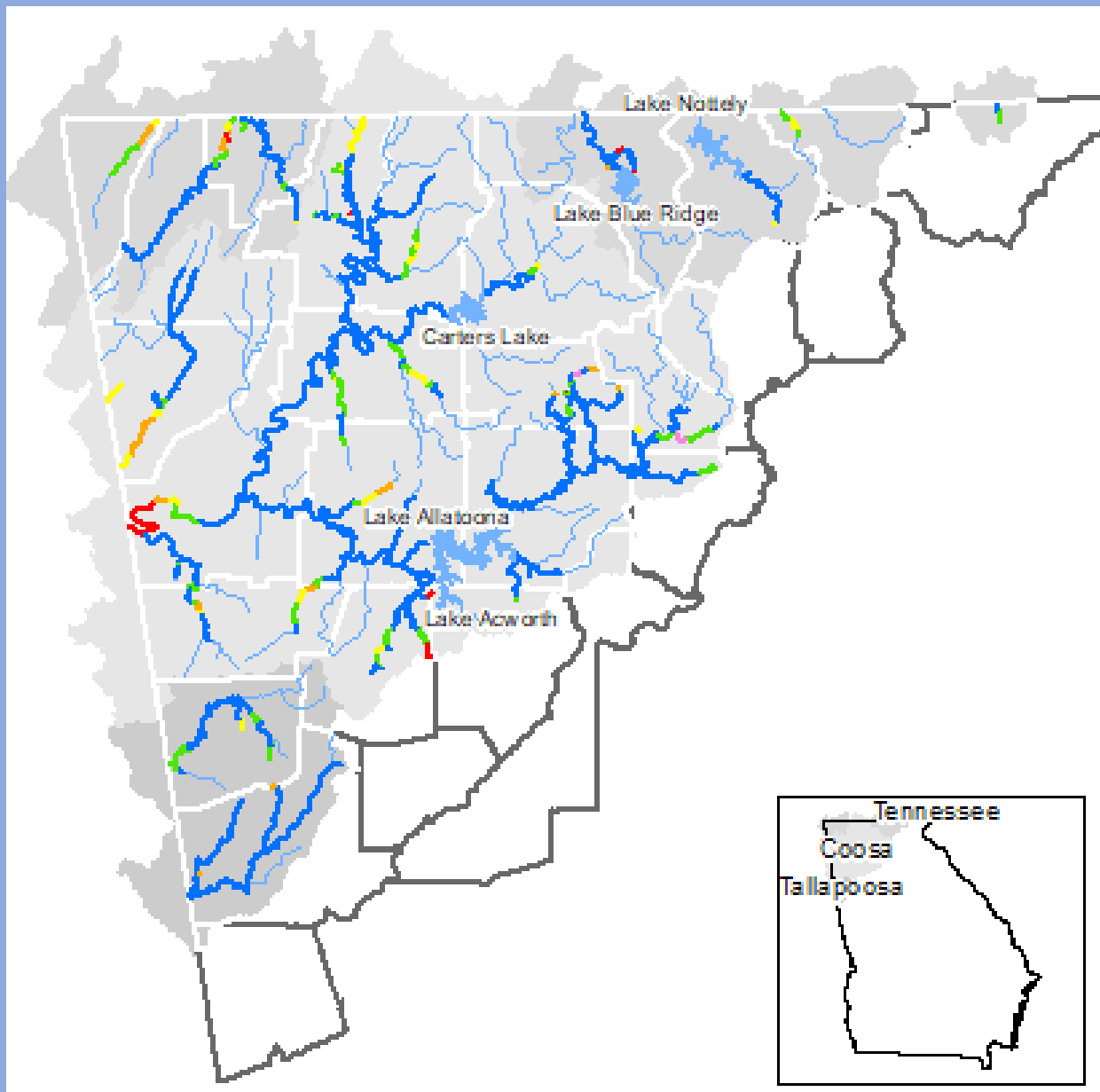
# State Water Plan GA DOSAG Models







# Dissolved Oxygen Results from GA DOSAG Models



## Legend

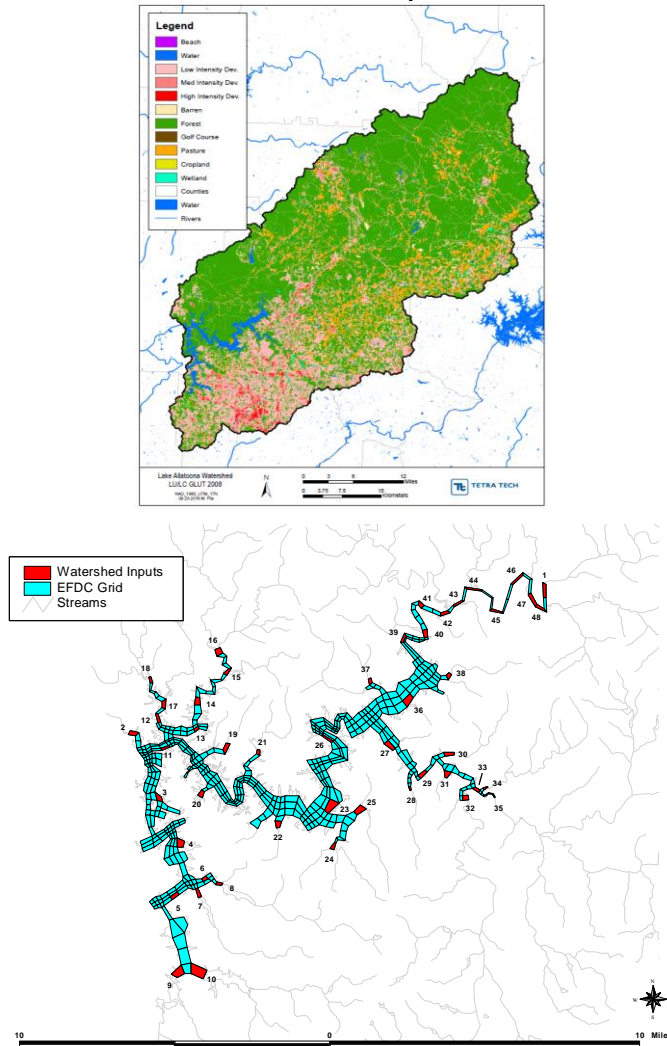
### Available Assimilative Capacity

- Very Good  $\geq 1$  mg/L DO available
- Good 0.5 mg/L to  $< 1$  mg/L DO available
- Moderate 0.2 mg/L to  $< 0.5$  mg/L DO available
- Limited  $> 0$  mg/L to  $< 0.2$  mg/L DO available
- At Assimilative Capacity 0 mg/L DO available
- None or Exceeded  $< 0.0$  mg/L DO available
- Unmodeled Lakes and Streams



# Watershed & Lake Models

Determine Impact of Nutrients on Lake Enrichment



**Watershed**

**Lake**

**Models**

**LSPC**

Flows

Temperatures

Concentrations

**EFDC**

**Outputs**

**Subwatershed Flows**

**Subwatershed Concentrations**  
(Chl-a, TN, NH<sub>3</sub>, NO<sub>x</sub>, OrgN, TP, PO<sub>4</sub>, OrgP, BOD<sub>5</sub>, DO, Temp, TSS)

**Water Surface Elevation**

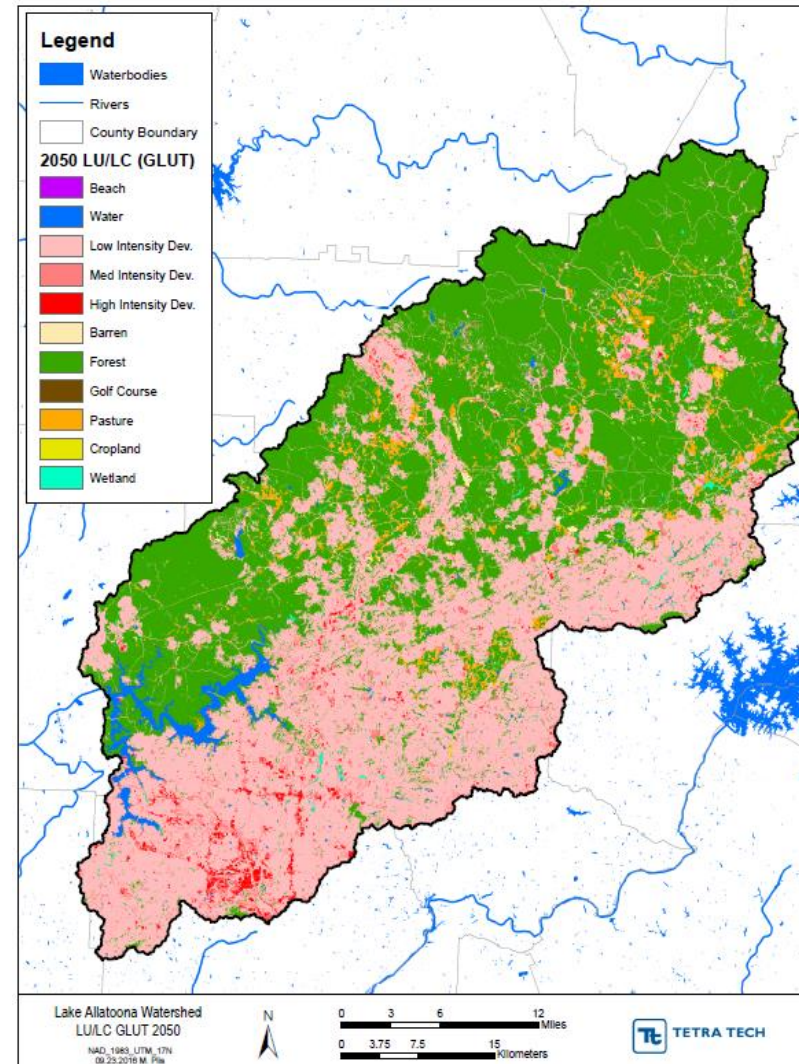
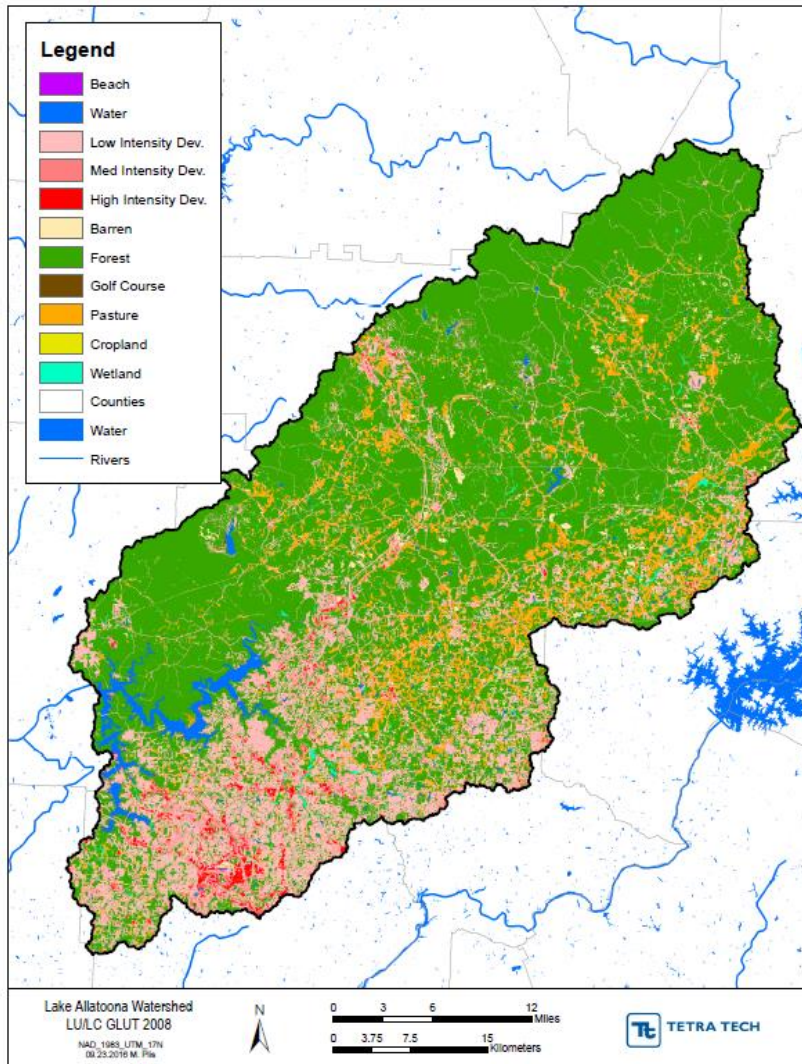
**Temperature and Dissolved Oxygen profiles**

**Lake Concentrations**  
(Chl-a, TN, NH<sub>3</sub>, NO<sub>x</sub>, OrgN, TP, PO<sub>4</sub>, OrgP, BOD<sub>5</sub>, DO, Temp)





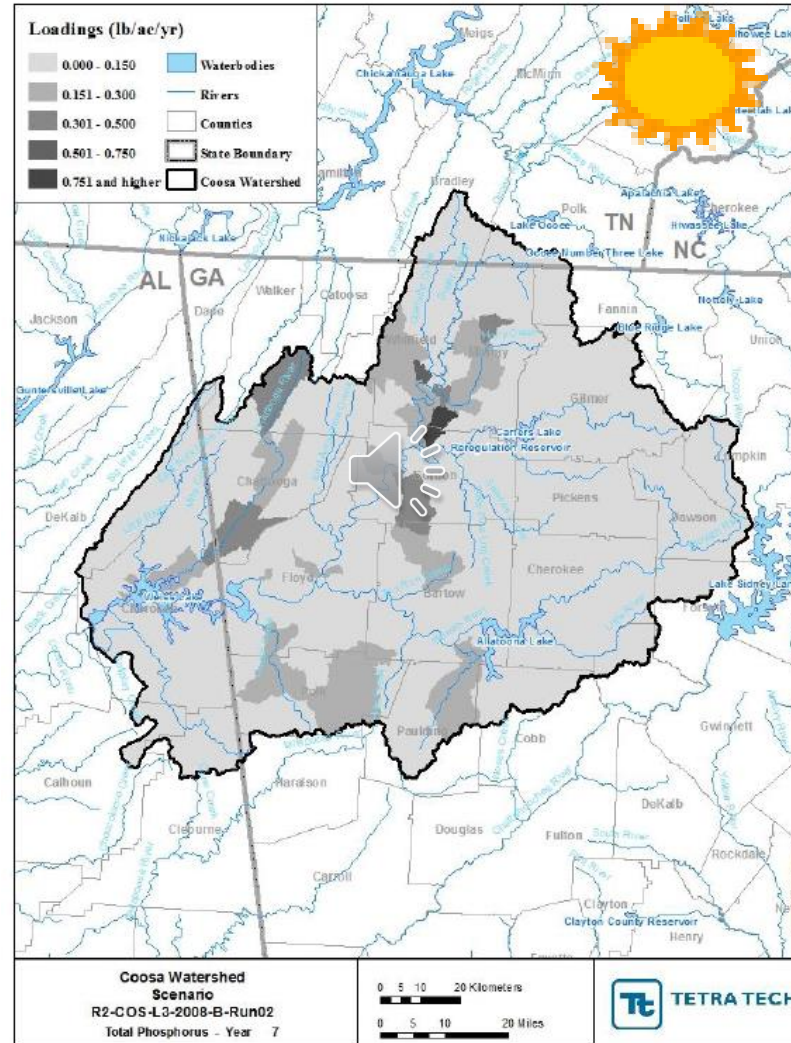
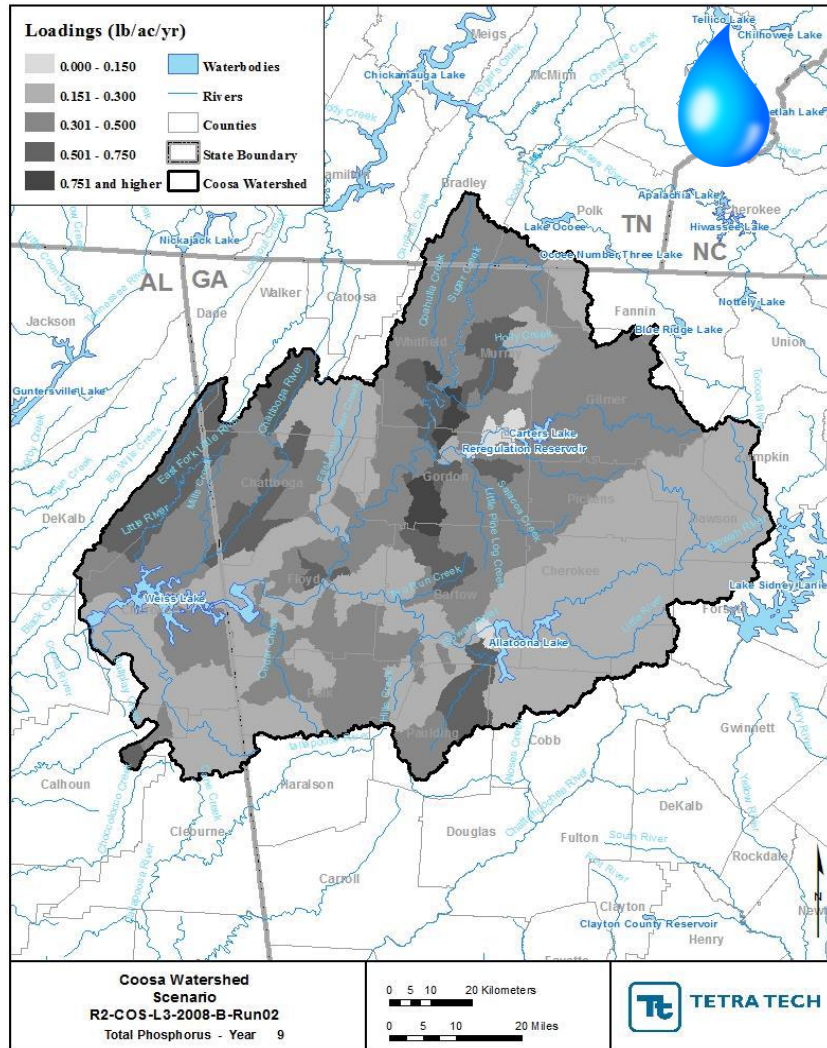
# Landuse Changes (2008-2050)

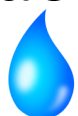







# Watershed Model Heat Loads



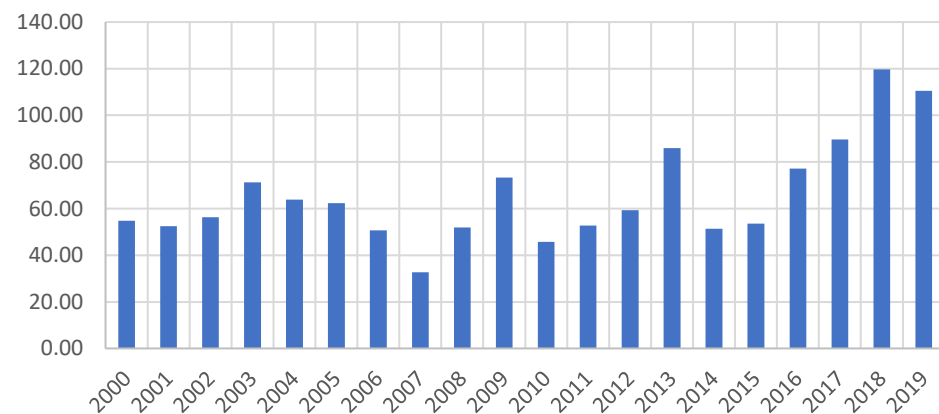
- Parameters analyzed
  - Biochemical Oxygen Demand
  - Total Nitrogen
  - Total Phosphorus
- “Heat Maps” show levels of loading (concentrations) under wet  and dry  years by sub-watersheds



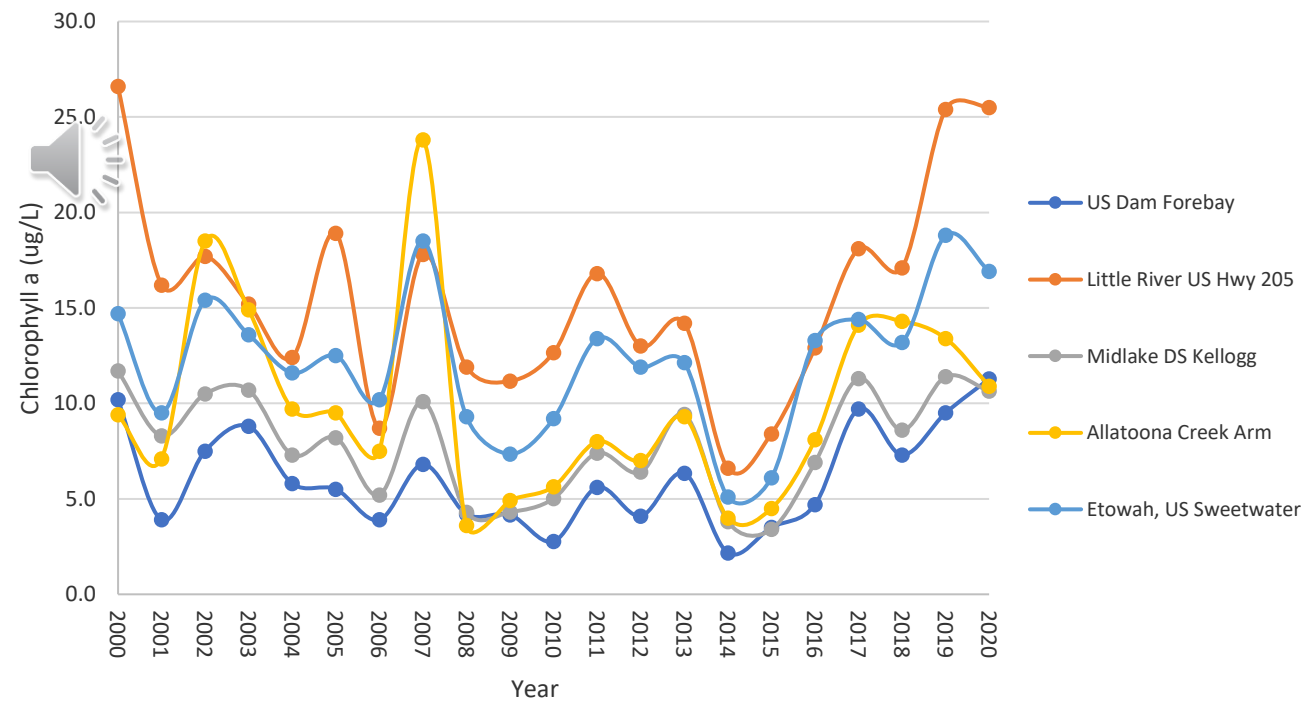


# Lake Modeling

Annual Rainfall (inches)



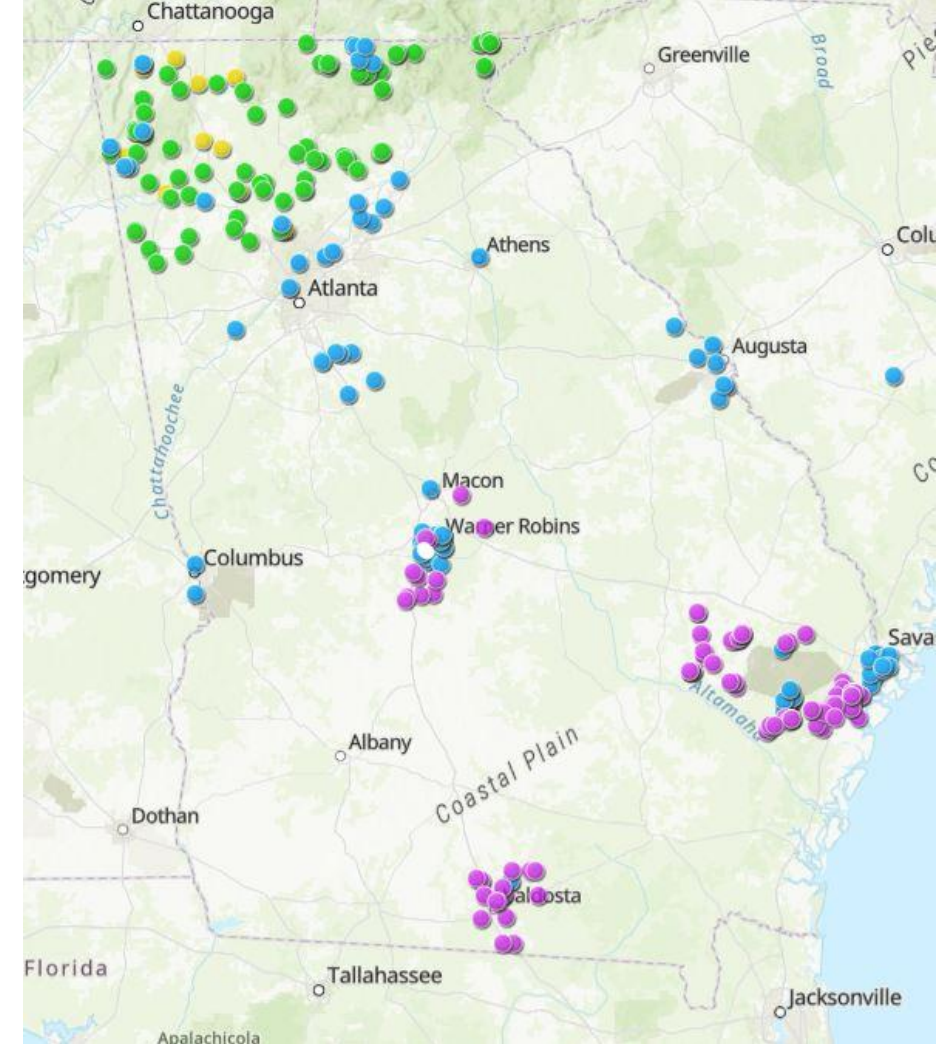
Measured Lake Allatoona Chlorophyll a Levels





# PFAS Monitoring of Drinking Water Source

- EPD initiated a targeted PFAS monitoring project in the winter of 2021
- Goal is to fulfill EPD's mission to protect human health and the environment
- PFAS have already been found near or above EPA's lifetime health advisory level in the Coosa basin, the Phase 1 focused on drinking water sources in the Coosa and Tennessee River Basins.
- Finished drinking water was sampled at all public surface water drinking water systems and all groundwater public drinking water system serving a population of 500 or greater.
- Phase II will focus on all large surface water systems serving a population of 100,000 or greater and all groundwater systems in and around military bases.
- If PFAS are detected in any groundwater systems around the military bases, Phase III will sample all neighboring small groundwater systems



PFOA\_PFOS\_Results\_\_ppt\_

- Not Sampled Yet Phase I and II
- Not Sampled Yet Phase III
- > 70 ng/L PFAS
- > BLR - 70 ng/L PFAS
- Below Report Limit (BRL)



# ANY QUESTIONS?

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Monitoring Program Manager

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