

**Coosa River Modeling Project**

**Study Plan Outline**

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Watershed Protection Branch  
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## **Study Plan Outline Coosa River Modeling Project**

### **Background**

The purpose of this study is to collect data to calibrate and validate the existing water quality model of the Coosa River Basin to be used in refining the Total Maximum Daily Load (TMDL) for DO prepared by the Georgia Environmental Protection Division (GAEPD). The GAEPD and the U.S. Environmental Protection Agency (USEPA) will conduct the Coosa River fieldwork in 2005 and 2006. The Coosa River Modeling work will be done by the GAEPD in 2006 and 2007.

In concert with the work on the Coosa River, the Alabama Department of Environmental Management (ADEM) will be collecting data and information for use in developing a water quality model for Lake Weiss to be used in refining a nutrient TMDL prepared by the USEPA for the Lake. The Lake Weiss fieldwork will be conducted by the ADEM and USEPA in 2005 and 2006. The modeling work for Lake Weiss will be done by the USEPA and ADEM in 2006 and 2007.

The work will provide the basis for an integrated basin modeling approach, with linkages between the Coosa River model and the Lake Weiss model. The linked models will be used to evaluate oxygen demanding loads, nutrient loads, and temperature effects with respect to heat loads, on instream DO (DO) concentrations.

### **Detailed Study Plan Development**

This study plan outline provides a starting point for planning the work needed to successfully model the lower portion of the Coosa River. The GAEPD, USEPA, and ADEM will work together to develop additional detail as necessary to outline the data collection needs for the river study. ADEM and the USEPA with input from the GAEPD will be responsible for developing the conceptual and detailed plans for work on Lake Weiss.

The data collection for the river and river-reservoir transition zone will extend from Allatoona Dam on the Etowah River, Carters Lake on the Coosawattee River, and the USGS Eton gage on the Conasauga River to the George/Alabama State Line and will include:

- Watershed flow and temperature data
- Continuous water quality monitoring
- Water quality sampling
- Chlorophyll *a* sampling
- Wastewater treatment facility sampling and data collection
- DO and temperature depth profiles

- Basin-wide phosphorus data
- Specialized studies
  - Reaeration measurements
  - Sediment Oxygen Demand measurements
  - Long-Term Biochemical Oxygen Demand (BODs)
  - Dye studies

Each module is discussed in further detail in the paragraphs below. Quality Assurance and Quality Control Plans and Procedures will be considered and integrated in each module specific study plan.

**Module 1: Watershed Flow and Temperature Data.** This module includes the installation and annual operation and maintenance of watershed streamflow gages with temperature recorders, for two years. The data from these gages will be used either directly as model input or to estimate tributary input data for ungaged streams.

The Coosa River Basin has ten mainstem USGS flow gages and three tributary USGS flow gages and/or stage recorders relevant to this project. These are long-term USGS gages that will be operated by the USGS during the study period. An additional stage recorder will be installed at the State Line to collect hydraulic boundary condition information for the EPD RIV-1 model. Nine additional flow gages will be installed and maintained by the USGS to collect hydraulic tributary information that will be used in the EPD RIV-1 model.

In addition, periodic flow measurements will be taken in ungaged tributaries in order to determine a relationship between gaged and ungaged streams.

**Module 2: Continuous Water Quality Monitoring.** This module includes the installation and maintenance of continuous water quality monitors at several locations on the Coosa River mainstem and tributaries.

Continuous water quality monitors will be installed and maintained for the study period at a number of tributary and mainstem locations. Continuous water quality monitors will be installed on the Conasauga River at the USGS gaging stations at Eton and downstream from Carters and Allatoona Dams to collect upstream boundary condition data necessary for EPD RIV-1. The monitors will record DO, temperature, conductivity, pH, and depth at hour intervals.

**Module 3: Water Quality Sampling.** This module includes the collection and analysis of discrete water quality samples at locations on the Coosa River mainstem and tributaries.

The data collection for the Coosa River Modeling Project will extend from Allatoona Dam on the Etowah River, Carters Lake on the Coosawattee River, and the USGS Eton gage on the Conasauga River to the George/Alabama State

Line. The data collection will include discrete mainstem and tributary water quality sampling. The samples will be analyzed for carbonaceous and total BOD<sub>5</sub> (inhibited and uninhibited), DO, temperature, TKN, NH<sub>3</sub>, NO<sub>2</sub>-NO<sub>3</sub>, total phosphorus, ortho-phosphate, TOC, conductivity, and pH. Flow measurements will be made at the time of sample collection.

**Module 4: Chlorophyll a Sampling.** This module includes the installation, operation, and maintenance of three continuous chlorophyll monitors and the periodical collection chlorophyll data on the mainstem and tributaries of the Coosa River Basin. These data will be used to calibrate the river and lake models being developed.

**Module 5: Wastewater Treatment Facility Sampling and Data Collection.** This module includes the compilation of data from wastewater treatment plants and sampling of mainstem and tributary dischargers during the study period.

The discharge monitoring reports (DMRs) and/or operating monitoring reports (OMRs) for the wastewater treatment facilities in the study area will be reviewed and data compiled as needed. In addition, the mainstem facilities and selected tributary facilities will be sampled to provide data that is not available in the discharge monitoring reports. This sampling work will also provide a quality assurance check for sampling and analytical work done by each discharger.

**Module 6: DO and Temperature Depth Profiles.** This module includes centerline runs on portions of the Coosa River to collect temperature and DO depth profiles.

Regular temperature and DO depth profiles will be collected at selected river stations to document the extent of vertical mixing in the system. This project will include centerline runs, made of the river, from Rome to the Georgia/Alabama State Line, with depth profiles taken every five miles.

**Module 7: Basin-Wide Phosphorus Data.** This module involves collecting available phosphorus data within the Coosa River Basin.

A thorough understanding of the magnitude and location of basin-wide phosphorus loads will be needed. Available phosphorus data from the various dischargers into the Coosa River Basin will be obtained. A review of all instream phosphorus data will be conducted. A special phosphorus study will be conducted to quantify the major point and nonpoint sources of phosphorus in the watershed. This information will provide an understanding of the magnitude and location of basin-wide phosphorus loads.

Meteorological data will be obtained from available meteorological stations. These data will include barometric pressure, air temperature, relative humidity, dew point, rainfall evaporations, wind speed, solar radiation, and cloud cover. All

available data will be managed in the GAEPD Water Resources Database (WRDB). This will include stream flow and gage information, discrete water quality data, continuous water quality data, NPDES permit limits, discharge monitoring reports, water intake reports, and meteorological data.

**Module 8: Special Studies.** This module includes several specialized studies including reaeration, sediment oxygen demand (SOD), long-term BOD tests, and dye studies.

Reaeration studies will be conducted at several locations in the Coosa River Basin. For comparative purposes both krypton reaeration and diffusion dome reaeration studies will be conducted on one reach of the Coosawattee River below Carter's Dam. Diffusion dome reaeration studies will be conducted on the lower portion of the Conasauga River and on the entire length of the Coosa River.

SOD measurements will be taken in the Coosa River downstream from Rome at four locations. These locations include one station above and one station below Mayo's Bar, and two stations between SR 100 and the State Line.

River, tributary and selected wastewater treatment plant effluent samples will be collected for long-term BOD analysis during the field surveys. Long-term BOD analyses will include periodic testing of nitrogen components to determine possible nitrification reactions. Aged river water will be used as dilution water, when necessary. Samples will be collected and analyzed from each location for both monitoring years.

Dye studies will be performed on the Conasauga, Coosawattee, Oostanaula, and Etowah Rivers during the study period July through September. Single-slug Rhodamine WT dye injections will be made in the center of the river and the dye concentrations downstream from the injection point will be measured using a fluorometer. Information from the dye studies will be used to help characterize river velocity, travel time, and dispersion.

### **Water Quality Modeling**

This task includes the calibration and validation of the existing water quality model of the Coosa River to refine the Total Maximum Daily Load (TMDL) for DO prepared by the Georgia Environmental Protection Division (GAEPD).

The GAEPD will use the EPD RIV-1 model. EPA and ADEM will prepare a water quality model of Lake Weiss including the river/lake transition zone at the Georgia/Alabama State Line. The hydrologic output from the Coosa River EPD RIV-1 at Mayo's Bar will be used as the upstream boundary for the ADEM/USEPA model of Lake Weiss. There will be an overlap in the two models for the section of the Coosa River from Mayo's Bar to the Georgia/Alabama State

Line. Watershed models will be developed for some of the larger Coosa River tributaries using The Loading Simulation Program in C++ (LSPC). These watershed models will be used to predict nonpoint source loads. LSPC will be used to calculate runoff and hydrologic transport of pollutants based on precipitation data. The Coosa River watersheds will be configured into a series of the hydrologically connected subwatersheds. Potential pollutant loadings will be determined from mass-balance predictions of available pollutants on the land surface for the land cover distribution in each watershed. The output from the LSPC models will be used as tributary inputs to the Coosa River EPD RIV-1.

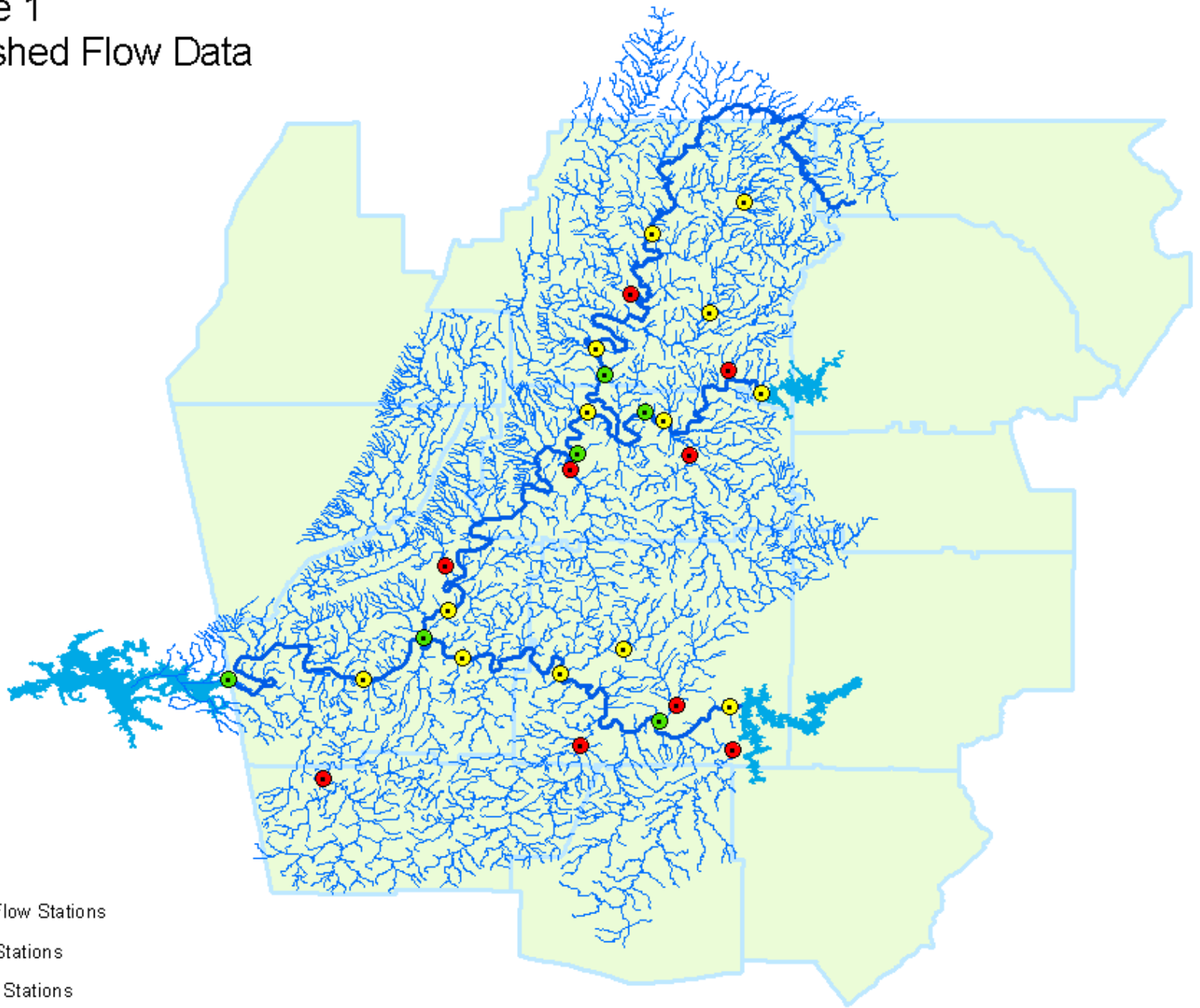
The integrated models will be used to confirm, and, if necessary, refine both the Coosa River DO and Lake Weiss nutrient TMDLs. The models will be used to examine load reductions in oxygen demanding substances and nutrients from both point and non-point sources; temperature effects with respect to heat loads; and operations of Carters Lake and Allatoona Dams with respect to future interstate source water allocation proposals.

### **Project Schedule**

The GAEPD and USEPA will conduct fieldwork to collect data needed for the Coosa River Model during the summers (critical period) of 2005 and 2006 and the EPD RIV-1 model will be set up in 2006. The ADEM and USEPA will conduct fieldwork to collect data needed for the Lake Weiss model during the same period and the river/lake transition zone and the lake model will be built in 2005. The databases for each model will be developed in 2006 following the initial field season. All models will be calibrated and linked in 2007. The Coosa River DO TMDL will be refined in 2008.

# Module 1

## Watershed Flow Data

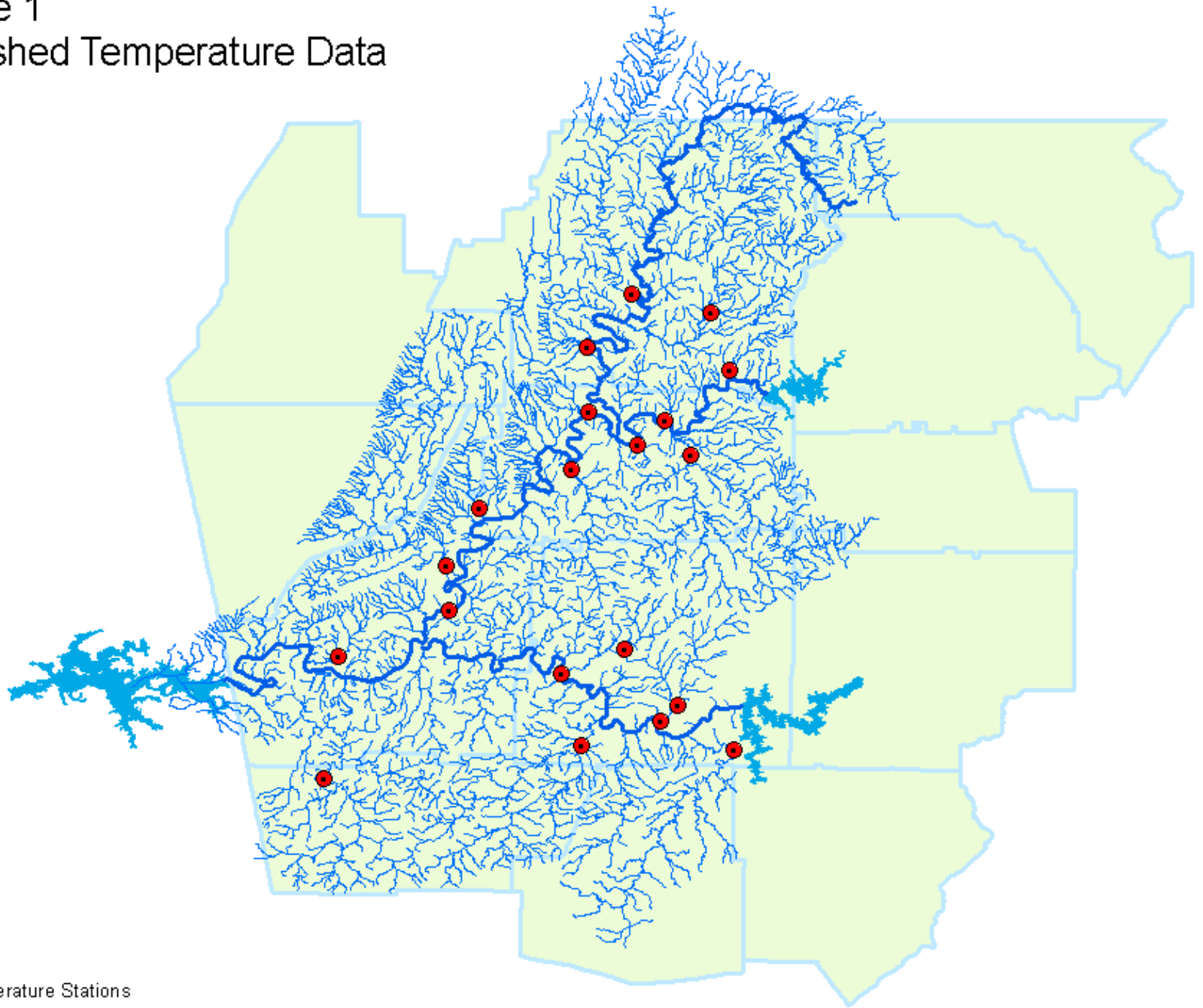


### Legend

- New Flow Stations
- Flow Stations
- Stage Stations

# Module 1

## Watershed Temperature Data

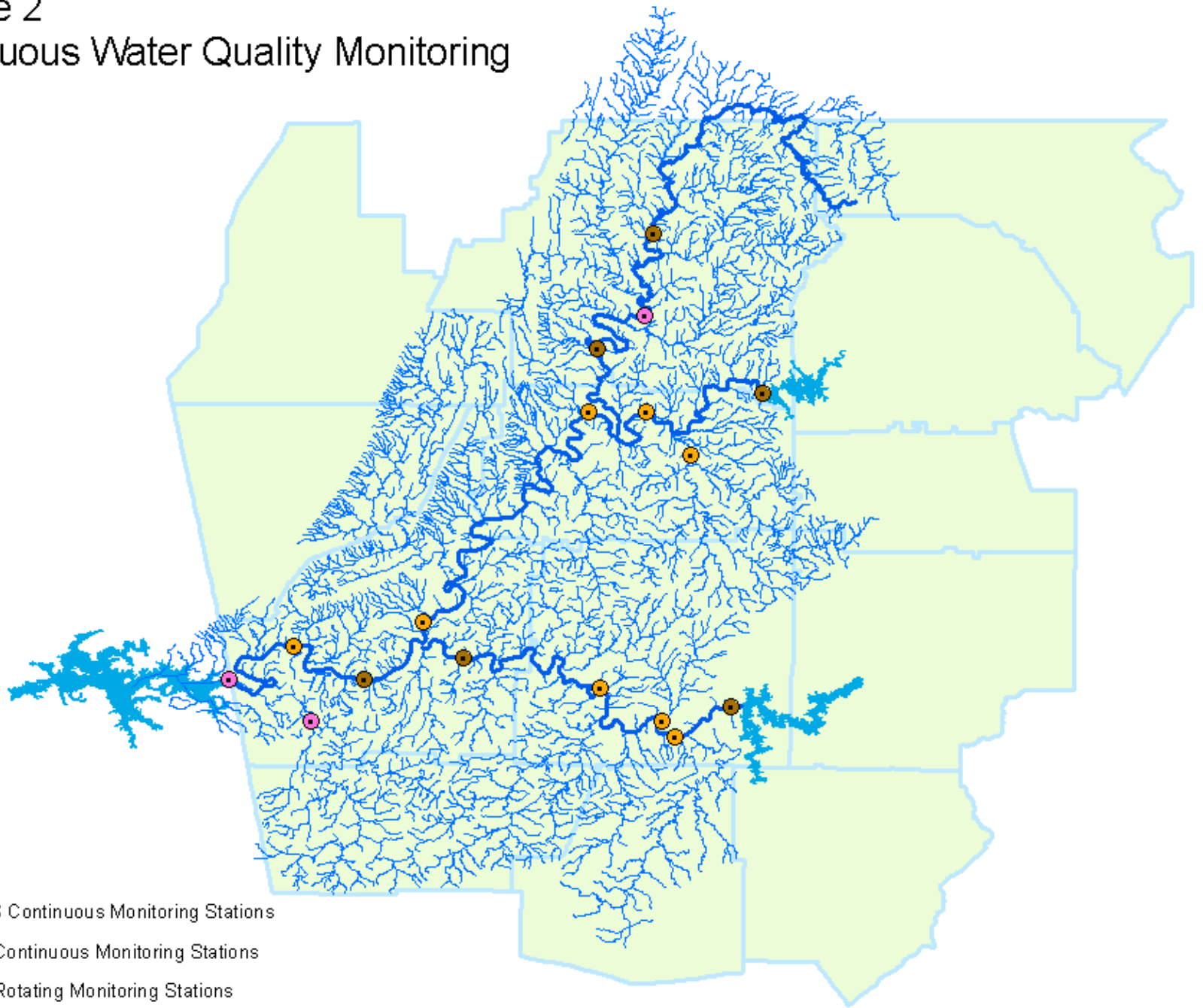


### Legend

- Temperature Stations

# Module 2

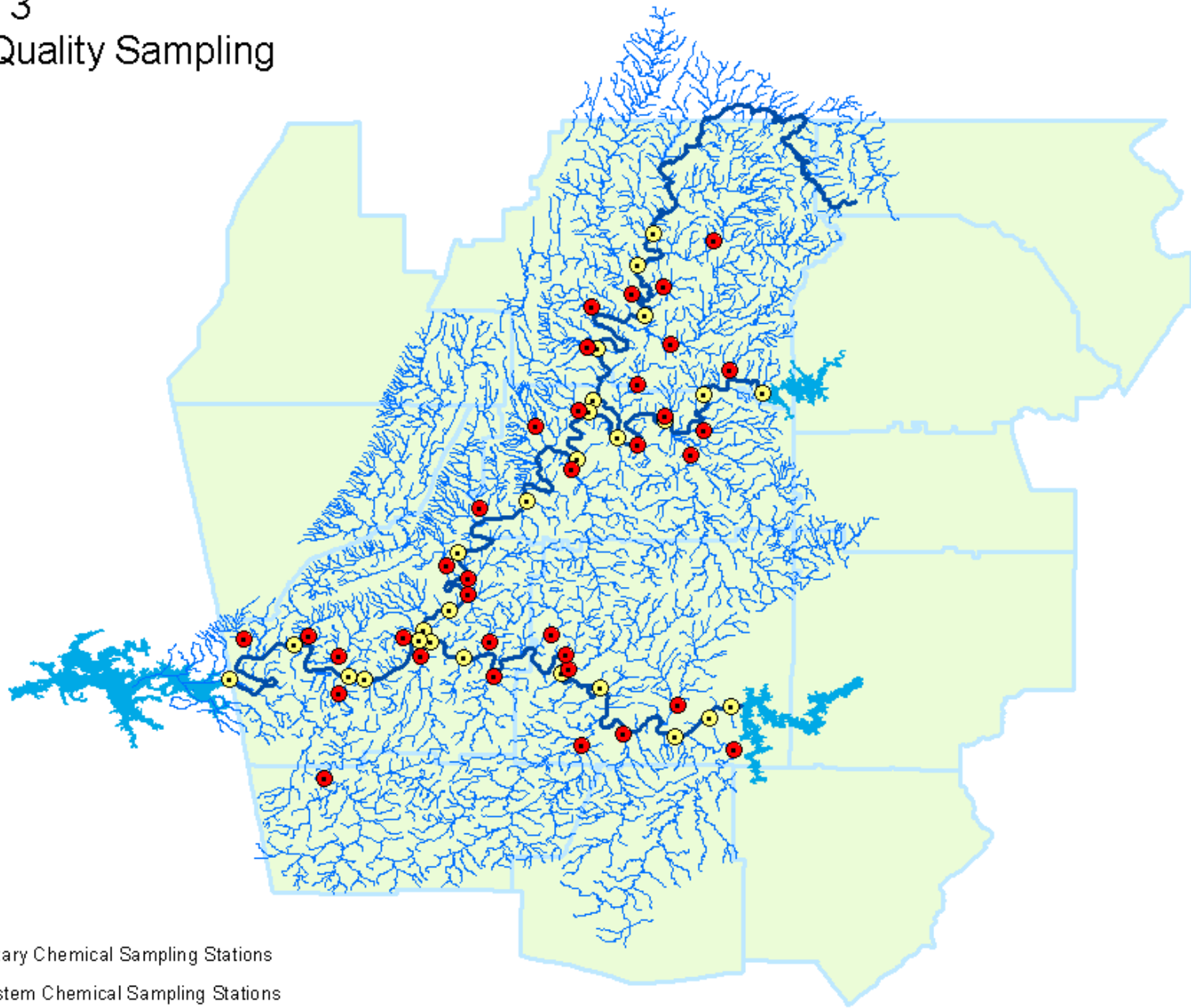
## Continuous Water Quality Monitoring



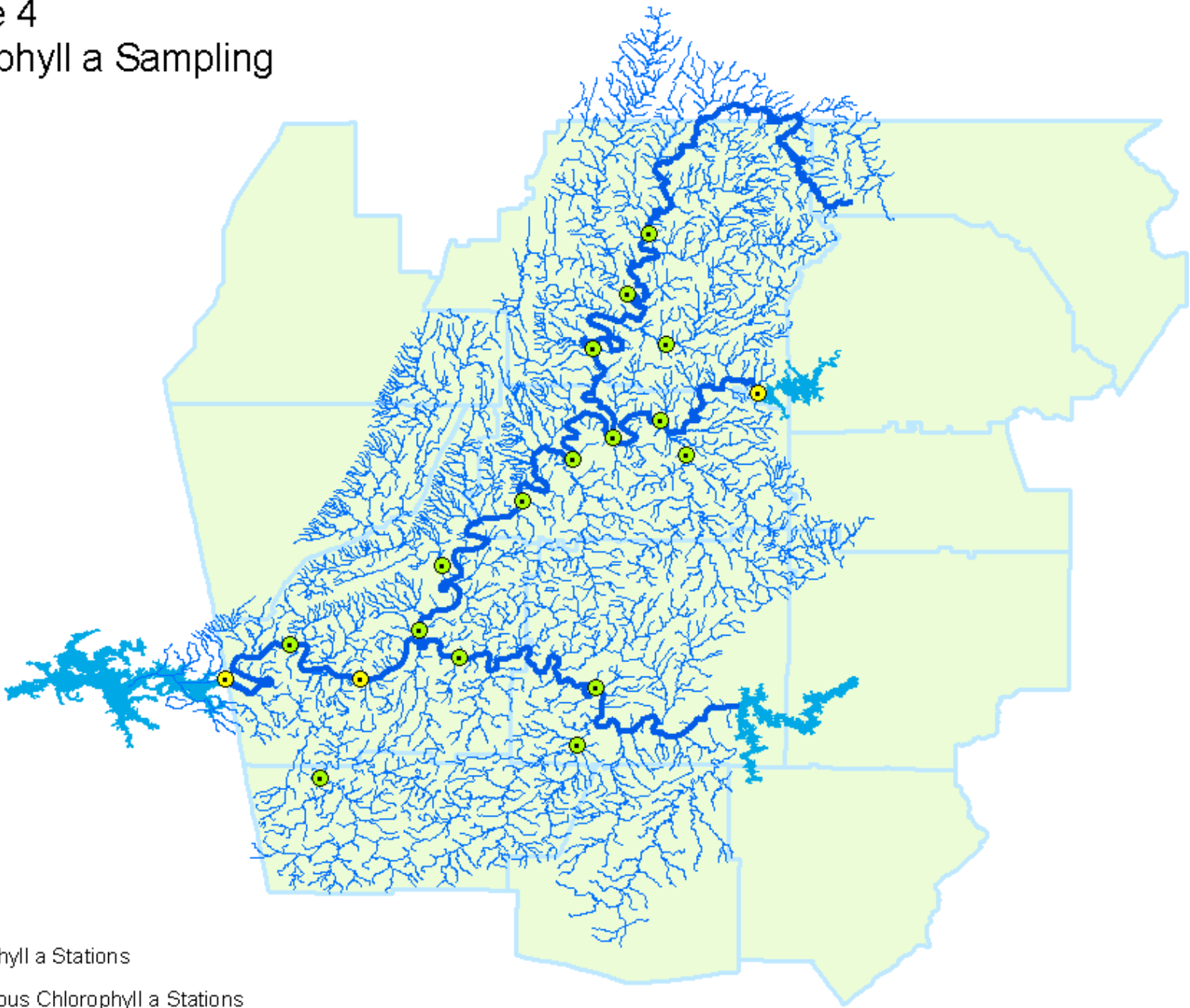
### Legend

- USGS Continuous Monitoring Stations
- EPD Continuous Monitoring Stations
- EPD Rotating Monitoring Stations

# Module 3 Water Quality Sampling



# Module 4 Chlorophyll a Sampling

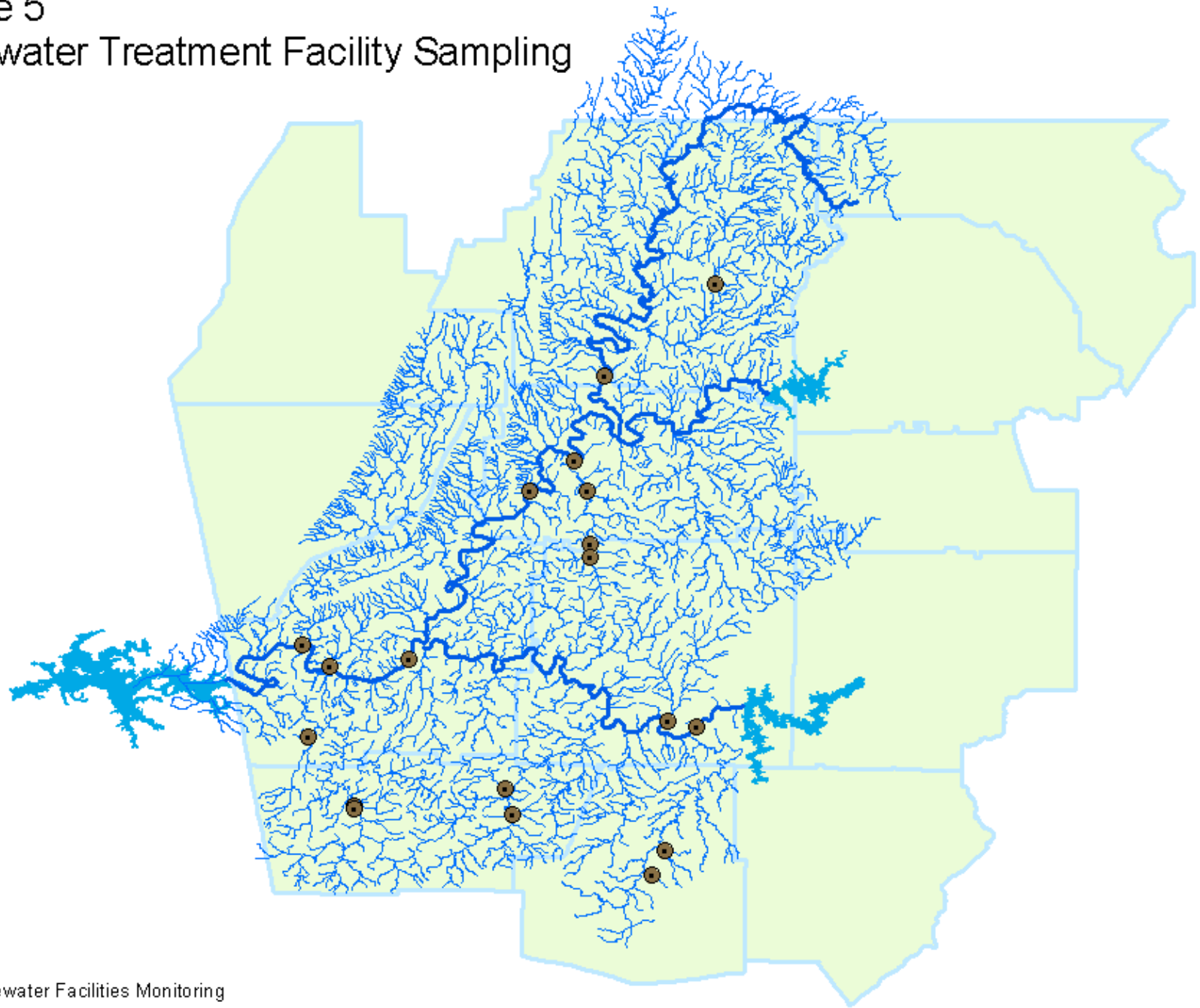


## Legend

- Chlorophyll a Stations
- Continuous Chlorophyll a Stations

# Module 5

## Wastewater Treatment Facility Sampling

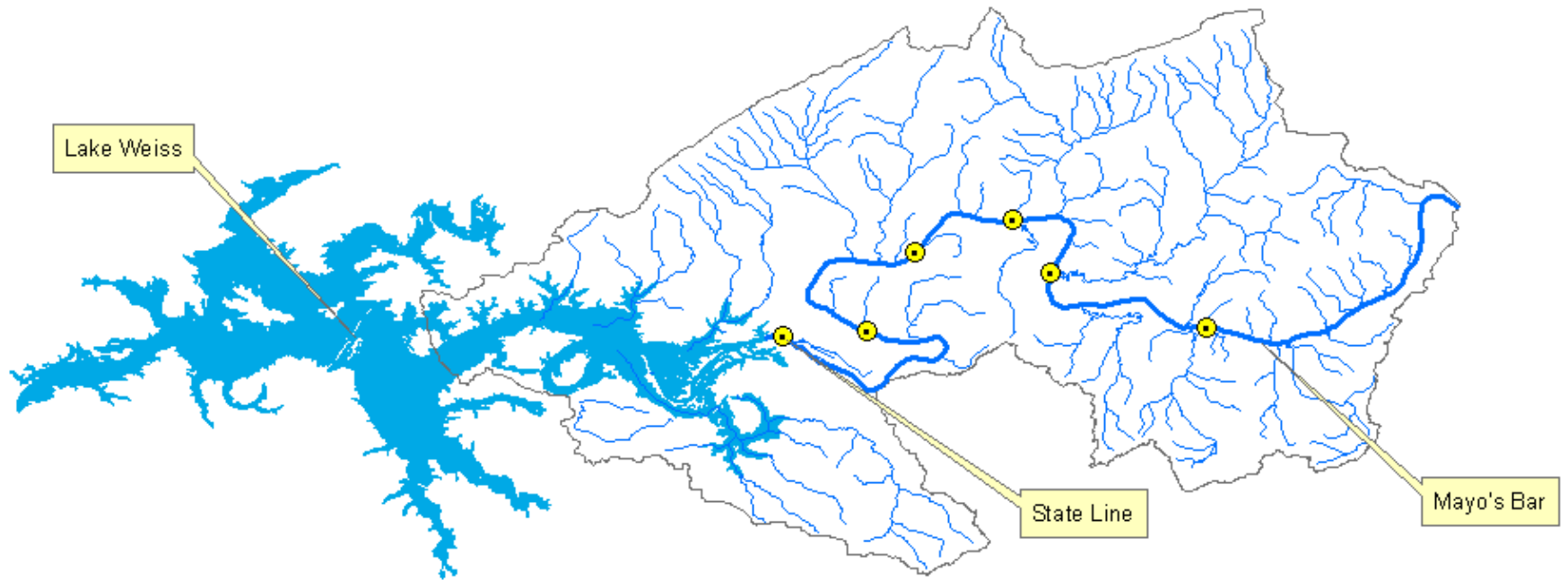


### Legend

- Wastewater Facilities Monitoring

# Module 6

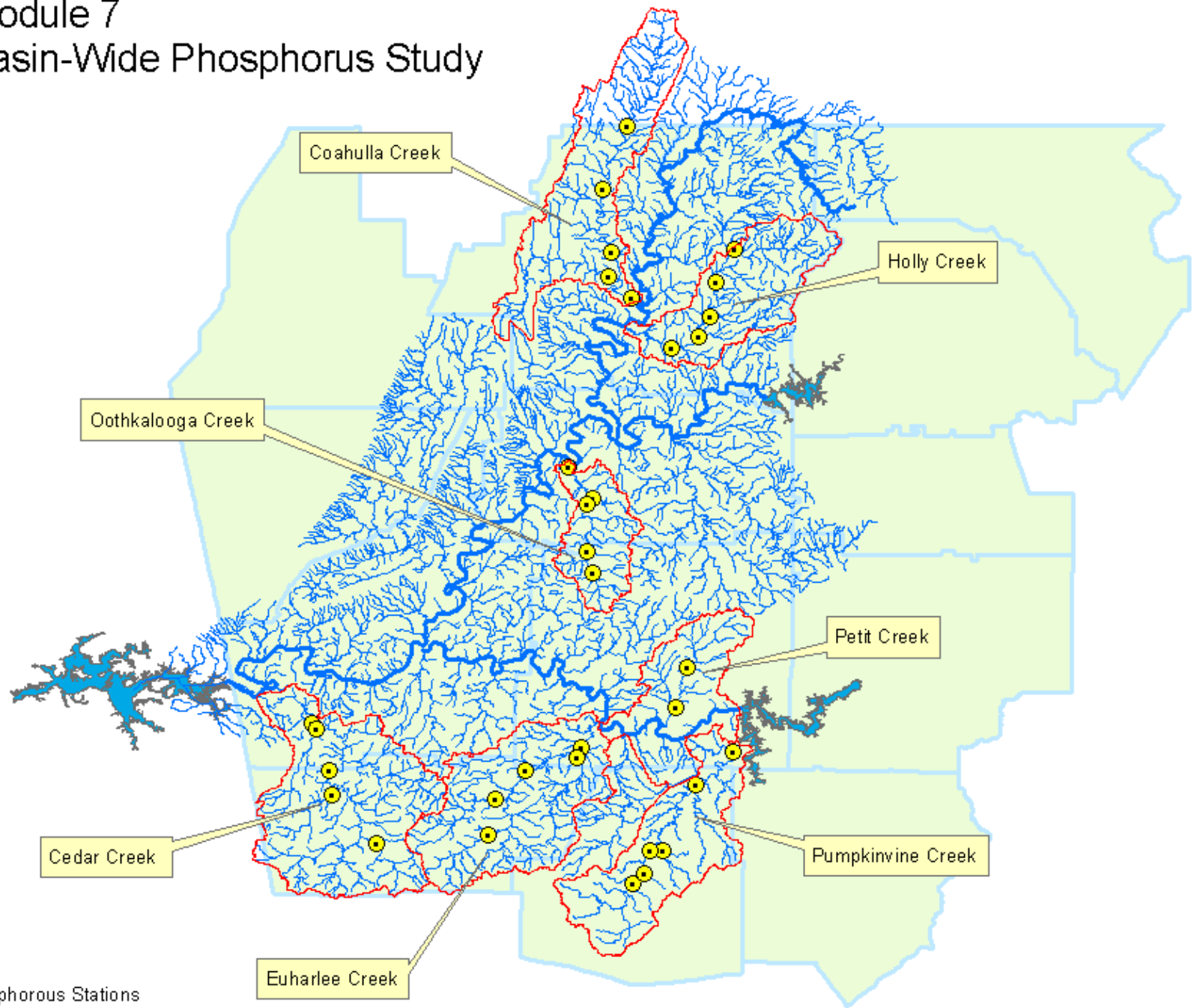
## DO and Temperature Depth Profiles



### Legend

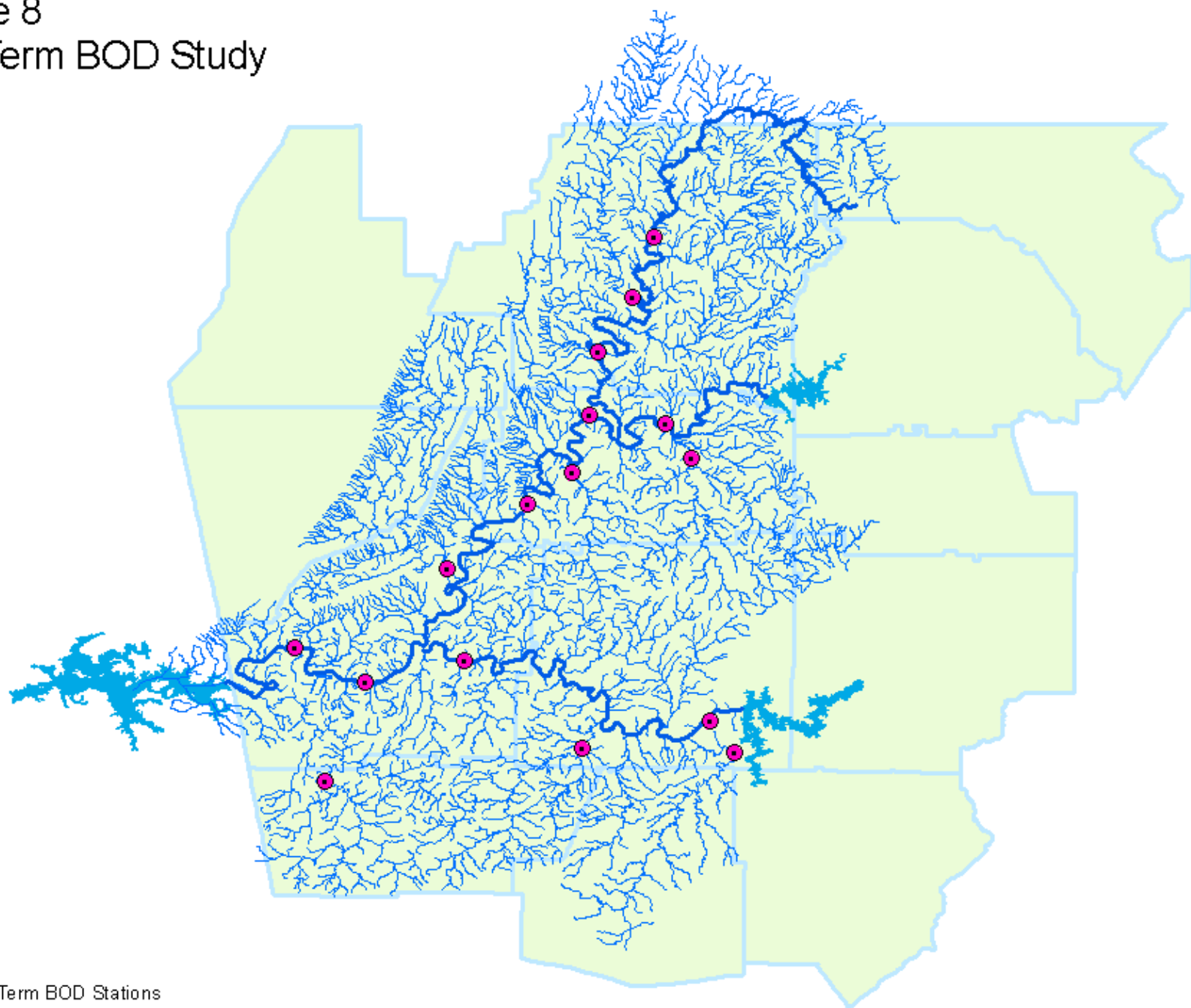
- Dissolved Oxygen & Temperature Profile Stations

# Module 7 Basin-Wide Phosphorus Study



# Module 8

## Long Term BOD Study



### Legend

- Long Term BOD Stations