

**Lake Lanier**  
**Nutrient Study Plan Outline**

**Georgia Department of Natural Resources  
Environmental Protection Division  
Watershed Protection Branch  
Watershed Planning & Monitoring Program  
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## **Lake Lanier Nutrient Study Plan Outline**

### **Background**

Three segments of Lake Lanier have been listed as impaired for chlorophyll *a* on Georgia's draft 2006 303(d) list. These include Lanier Bridge Road (SR 53), Browns Bridge Road (SR 369), and Flowery Branch. The purpose of this study is to collect data to develop, calibrate, and validate three water quality models of the Lake Lanier watershed in the Upper Chattahoochee River Basin to be used in developing a Total Maximum Daily Load (TMDL) for chlorophyll *a*. The three models to be used in the TMDL development process are:

- Loading Simulation Program in C++ (LSPC)
- Environmental Fluid Dynamics Code (EFDC)
- Water Quality Analysis Simulation Program (WASP)

The Georgia Environmental Protection Division (GAEPD) and the U.S. Environmental Protection Agency (USEPA) will conduct the fieldwork in 2007. The Lake Lanier modeling work will be done by the GAEPD's contractor in 2008.

### **Detailed Study Plan Development**

This study plan outline provides a starting point for planning the work needed to successfully model the Lake Lanier watershed. The GAEPD and USEPA will work together to develop additional details, as necessary, to outline the data collection needs for this study.

The data collection for the Lake Lanier Watershed will extend from the headwaters to Buford Dam on the Chattahoochee River and will include:

- Watershed flow data
- Water quality sampling
- Continuous water quality monitoring
- Wastewater treatment facility sampling and data collection
- Basin-wide phosphorus data
- Specialized studies
  - Sediment Oxygen Demand measurements with nutrient flux
  - Photosynthesis and Respiration Studies
  - Algal Growth Potential Test
  - HPLC analysis to determine algal species

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.** This module includes the operation and maintenance of four or more continuous USGS flow gages in the watershed. These include one on the Chattahoochee River near Helen, on the Chattahoochee River near Cornelia, on the Soque River near Clarksville, and on the Chestatee River near Dahlonaga. The data from these gages will be used either directly as model input to the lake model or to calibrate the watershed model. EPD will also continue to monitor flow and develop rating curves at six additional locations in the watershed. The data from these sites will be used to determine a relationship between gaged and ungaged streams. These data will also be used in calibration of the LSPC watershed model.

**Module 2: Water Quality Sampling.** This module includes the collection and analysis of discrete water quality samples at locations throughout the Lake Lanier Watershed. EPD will collect water samples twice a month from 27 locations in the watershed. These data will be used to calibrate the LSPC watershed model and will provide valuable information for assessing the water quality in the areas. The samples will be analyzed for BOD<sub>5</sub>, TKN, NH<sub>3</sub>, NO<sub>2</sub>-NO<sub>3</sub>, total phosphorus, ortho-phosphate, and TOC. The following field measurements will also be taken: pH, DO, temperature, and conductivity and tape-downs will be made at the time of sample collection.

In addition, EPD will also collect in-lake data at the five lake and five embayment monitoring sites. Vertical pH, DO, temperature, and conductivity profiles will be measured. A depth composite water samples from the photic zone will be collected and analyzed for chlorophyll a, nutrients, fecal coliform. In addition, the light penetration will be determined using a Li-Cor and a sechi depth will be measured. These data will be used for water quality assessment and to calibrate the WASP model.

USGS will also collect monthly water quality samples at the three major lake tributaries, which include the Chattahoochee River at Belton Bridge Road, the Chestatee River at GA 400, and Flat Creek at McEver Road. These samples will be analyzed for BOD<sub>5</sub>, TOC, TKN, NH<sub>3</sub>, NO<sub>2</sub>-NO<sub>3</sub>, total phosphorus, ortho-phosphate, TSS, fecal coliform, pH, DO, temperature and conductivity.

**Module 3: Continuous Water Quality Monitoring.** This module includes the installation and maintenance of continuous water quality monitors at four locations in Lake Lanier. The location of these monitors is as follows: upstream from the Buford Dam forebay, Browns Bride Road (SR 369), Bolling Bridge Road (SR 53) on the Chestatee, and Lanier Bridge Road (SR 53) on the Chattahoochee. The continuous water quality monitors will be installed and maintained for the duration of the growing season (April-October). The monitors

will record DO, temperature, conductivity, pH, and depth at one hour intervals. These data will be used in the calibration of the WASP Model for the lake.

**Module 4: Wastewater Treatment Facility Sampling and Data Collection.**

This module includes the compilation of data from wastewater treatment plants and sampling of major and minor 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, all dischargers will be sampled to provide data that may not be 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. EPD will sample the major dischargers twice and the minor dischargers once during the study period.

**Module 5: Basin-Wide Phosphorus Data.** This module involves collecting available phosphorus data within the Lake Lanier Watershed. 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 watershed will be obtained. A review of all instream phosphorus data will be conducted. If necessary, 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.

**Module 6: Special Studies.** This module includes specialized studies that will be conducted by the USEPA. These include light and dark nutrient bottles that are used to determine photosynthesis and respiration rates, studies to determine the sediment oxygen demand (SOD) and the nutrient fluxes off the bottom sediments. Algal growth potential tests to determine the limiting factor. Finally, HPLC test will be performed that will be used to determine the algal species typically found in the lake. This information is required for the WASP model.

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.

## **Water Quality Modeling**

This task includes the development, calibration, and validation of three water quality models. These models will be used to develop the Total Maximum Daily Load (TMDL) for nutrients in Lake Lanier.

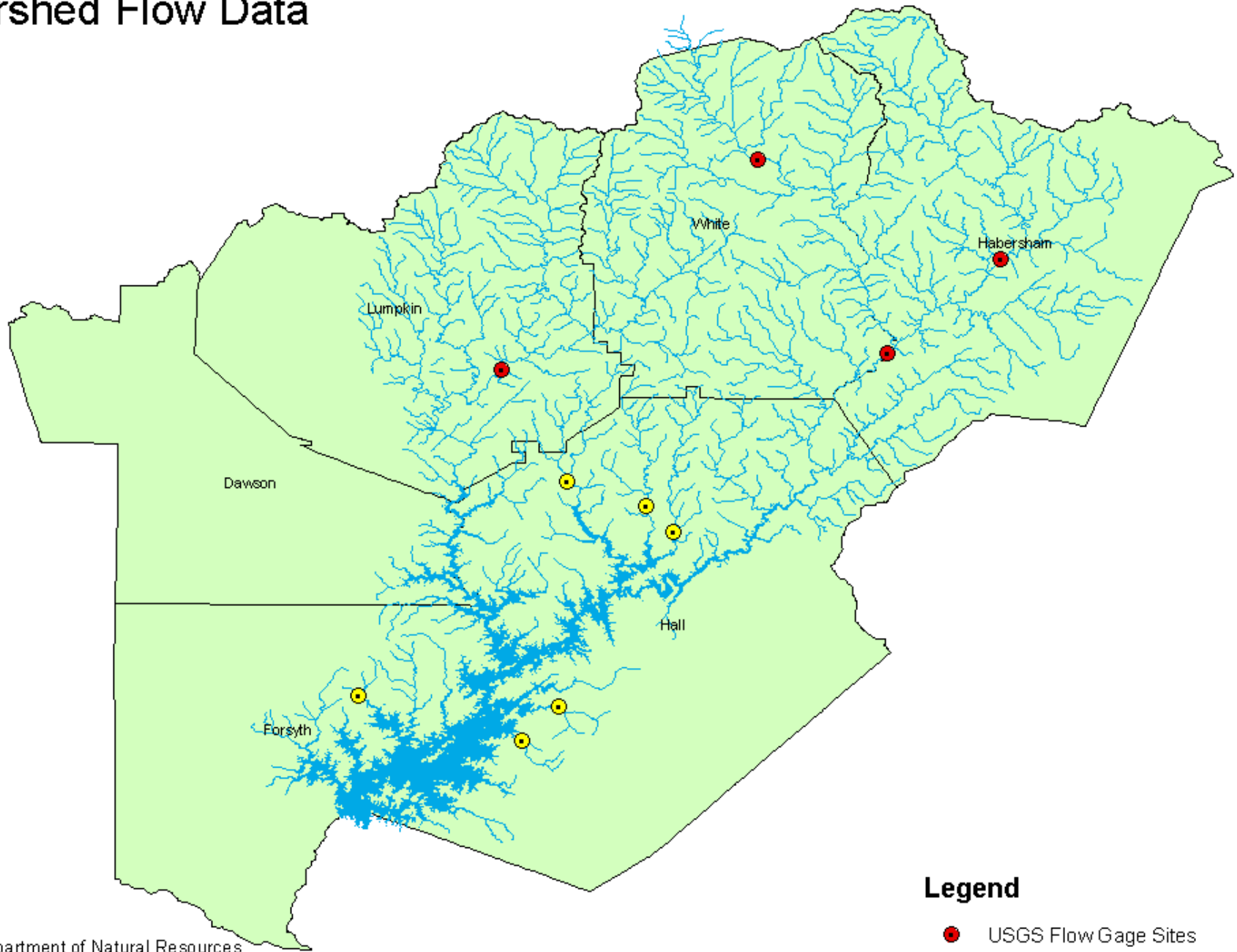
A watershed model for Lake Lanier will be developed using the Loading Simulation Program in C++ (LSPC). This model will include point and nonpoint sources of nutrients. The watershed model will simulate the effects of surface runoff on both water quality and flow and will be calibrated to available data. The results of this model will be used as tributary flow inputs to the hydrodynamic model, Environmental Fluid Dynamics Code (EFDC), which will be used to simulate the transport of water into and out of the lake. The third model is the EPA Water Quality Analysis Simulation Program (WASP). It will be used to simulate the fate and transport of nutrients into and out of the lake and nutrient uptake by phytoplankton. The growth and death of phytoplankton is measured through the surrogate parameter chlorophyll a. The data collections outlined in this Study Plan are intended to provide the basis for developing, calibrating, and validating these three models.

## **Project Schedule**

The GAEPD and USEPA will conduct fieldwork to collect data needed for the Lake Lanier Nutrient Study during 2007. All models will be calibrated and linked in 2008. The Lake Lanier nutrient TMDL will be drafted in 2009.

# Module 1

## Watershed Flow Data



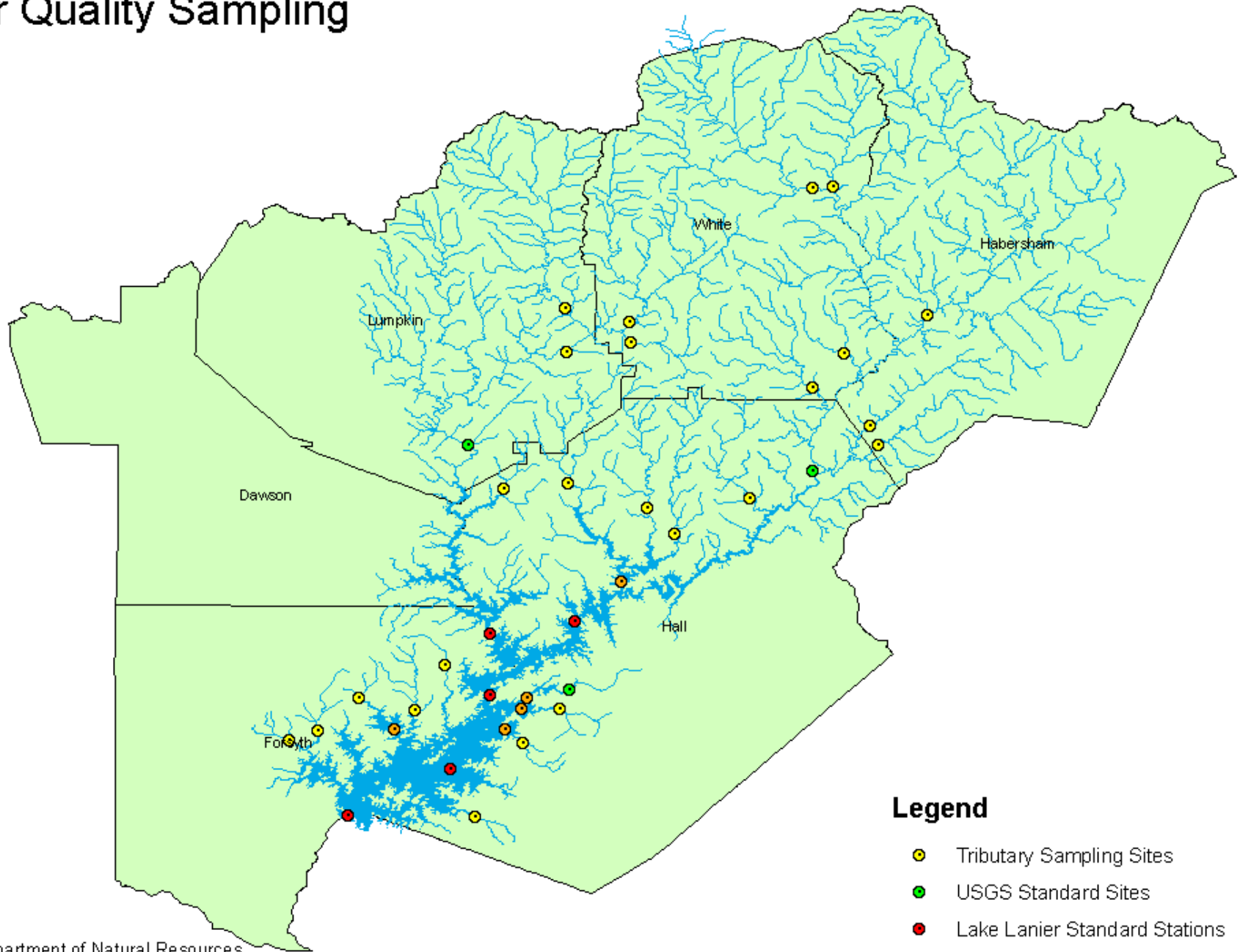
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### Legend

- USGS Flow Gage Sites
- Lanier Tributary Gaging Sites

# Module 2

## Water Quality Sampling

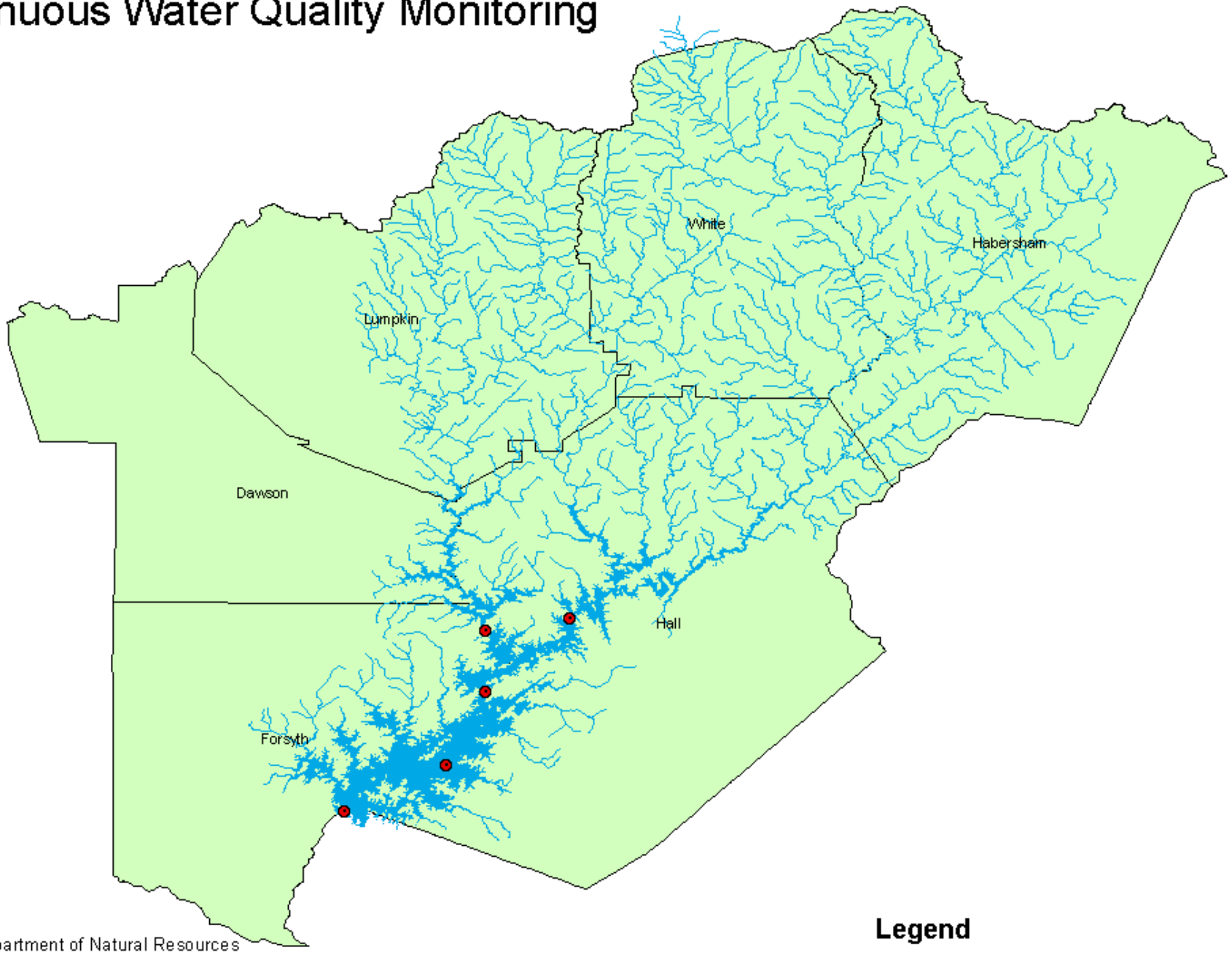


### Legend

- Tributary Sampling Sites
- USGS Standard Sites
- Lake Lanier Standard Stations
- Lake Lanier Embayment Stations

# Module 3

## Continuous Water Quality Monitoring



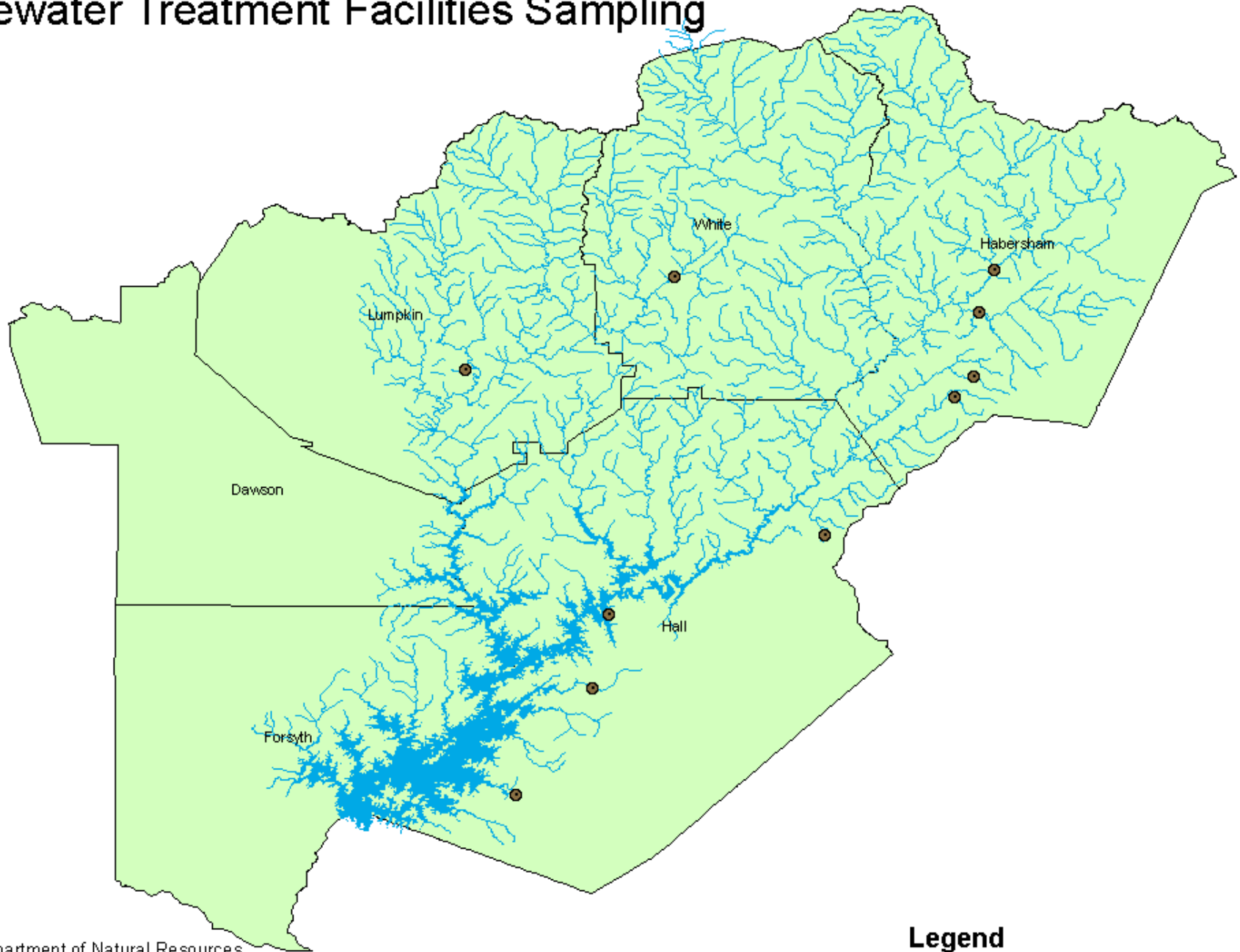
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### Legend

- Lake Continuous Monitor Locations

# Module 4

## Wastewater Treatment Facilities Sampling

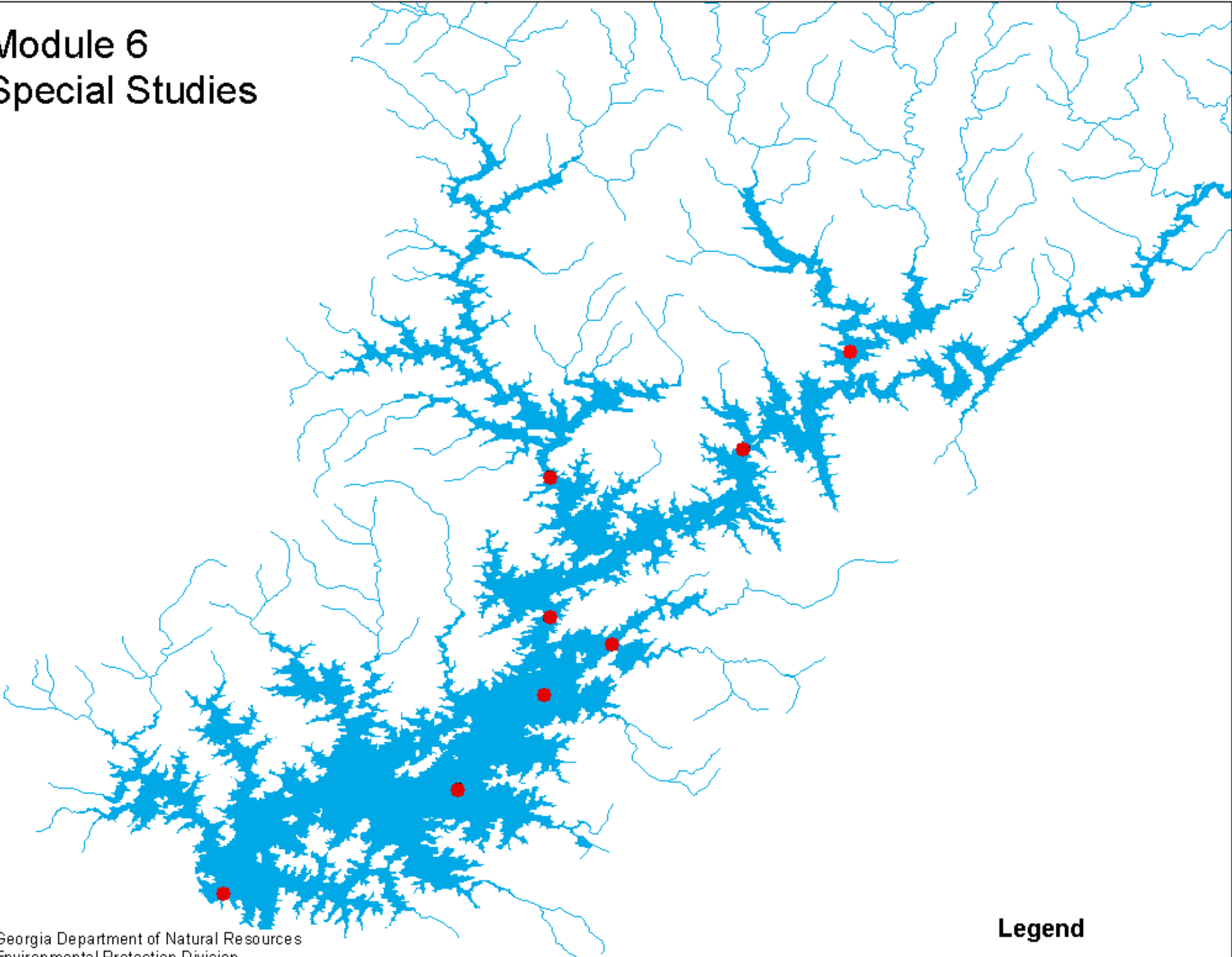


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### Legend

● Wastewater Facilities Monitoring

# Module 6 Special Studies



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● Monitoring Locations