SUMMARY OF RESULTS

In support of the Georgia Comprehensive State-wide Water Management Plan (GA State Water Plan), the Surface Water Quality (or Assimilative Capacity) Resource Assessment was used to determine the capacity of Georgia's surface waters to absorb pollutants without unacceptable degradation of water quality. Assimilative Capacity is defined as the amount of contaminant load that can be discharged to a specific waterbody without exceeding water quality standards or criteria. In other words, the 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. The assimilative capacity resource assessment included developing water quality models of selected streams, rivers, lakes and estuaries throughout the State of Georgia. Results from these models were compared with applicable water quality standards.

The current assimilative capacity results focus on dissolved oxygen, nutrients, specifically nitrogen and phosphorus, and chlorophyll-a. The water quality models were used to evaluate the impacts of current wastewater and industrial discharges and withdrawals, land use, and meteorological conditions on the waterbody.

MODELS USED FOR ASSIMILATIVE CAPACITY RESOURCE ASSESSMENT

For the Assimilative Capacity Resource Assessment, four different models were developed.

GA Dosag

Georgia Dosag (GA Dosag) was used to predict dissolved oxygen (DO) concentrations in a stream or river during critical time periods which include low flow and high temperatures.

GaEst

Georgia Estuary (GaEst) was used to predict the dissolved oxygen sag curve in the vicinity of waste discharge points in Georgia estuaries.

LSPC

The Loading Simulation Program C++ (LSPC) was used to simulate both flow and water quality, from non-point and point sources in watersheds. LSPC was used to simulate various water quality parameters including temperature, dissolved oxygen, and nutrients.

EFDC

The Environmental Fluid Dynamics Code (EFDC) was used to simulate both flow and water quality in lakes and estuaries. EFDC was used to simulate various water quality parameters including temperature, dissolved oxygen, nutrients, and chlorophyll-a.

WATER QUALITY STANDARDS

For DO, the state cold water fishing standard that applies to Georgia's streams that have been designated as either primary or secondary trout streams is a daily average of 6.0 mg/L not less than 5.0 mg/L. The freshwater fishing standard, which applies in all areas of the state that support warm water fish species, is a daily average of 5.0 mg/L not less than 4.0 mg/L. The coastal fishing DO standard is a daily average of 5.0 mg/L not less than 4.0 mg/L unless the natural DO is less than these values and then the standard allows for a 0.1 mg/L deficit or up to a 10% deficit if the biological community is not adversely effected.

Below the fall line in the Coastal Plain, it is recognized that there can be streams with naturally low DO levels in the summertime. For these waters, EPD has allowed a 10% deficit down to 3.0 mg/L and below 3.0 mg/L, a 0.1 mg/L DO deficit.

There are six lakes in Georgia that have lake standards, Lanier, West Point, Walter F. George, Jackson, Allatoona and Carters. The 1992 Georgia Lake Law required that standards by set for growing season average chlorophyll *a* levels, major tributary annual total phosphorus loads, total lake phosphorus loading, and a total nitrogen limit for the lake. In addition, the law required standards be set for DO, temperature, pH, and fecal coliform, but only chlorophyll *a* and nutrient standards were examined. Results are currently only available for Lake Jackson and Lake Allatoona. The associated water quality standards for these lakes can be found in Georgia's Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03(17)(c) and Chapter 391-3-6-.03(17)(d), respectively.

DISSOLVED OXYGEN RESULTS

Dosag and GaEst models were developed for those waterbodies that currently have wastewater treatment plant discharges on them. For future discharges, these tools will be expanded to include additional stream segments if necessary. These models were calibrated to measured streamflow, instream DO levels, and chemical sampling data. Baseline critical, low flow (7Q10), high temperature condition models were run using 2007 discharge data. The results of these models were compared to the applicable Georgia DO standards. The following table provides a summary of the results for each river basin.

River Basin	Available Assimilative Capacity (River Miles)				
	Very Good	Good	Moderate	Limited	None or Exceeded
Altamaha	169	66	61	80	45
Chattahoochee	379	99	19	16	6
Coosa	477	87	43	12	23
Flint	572	275	75	29	9
Ochlockonee	47	61	12	8	7
Ocmulgee	560	249	92	41	43
Oconee	509	117	51	44	40
Ogeechee	96	218	307	103	211
St. Marys	0	0	15	29	32
Satilla	147	76	20	18	39
Savannah	449	33	9	3	56
Suwannee	375	85	29	0	48
Tallapoosa	81	27	5	2	6
Tennessee	82	9	0	2	0
Total	3943	1401	739	386	566

An EFDC model was developed for Brunswick Harbor. The model was setup and calibrated to temperature, salinity and DO data collected from 2001 through 2007. The model inputs included point sources that discharge directly to the harbor, meteorological data, marsh loadings, sediment oxygen demand, nutrient fluxes, tidal forcings, and watershed flows and loads developed from an LSPC watershed model. The results of the Brunswick Harbor model indicate that there is no more assimilative capacity in the harbor.

NUTRIENT RESULTS

LSPC watershed models were developed for the Coosa, Upper Ocmulgee, Upper Oconee, Lower Savannah, and Brunswick Harbor watersheds. The watershed models were simulated for the 10-year period from January 1, 1998 through December 31, 2007. This time period was selected as it captured two drought periods (1999-2001 and 2006-2007) and several wet years including 2003 and 2005. The models were calibrated to DO, temperature, sediment and nutrients.

EFDC models were developed for lakes Allatoona, Jackson, Oconee and Sinclair. The simulation period for the models was over a 7-year period – from January 1, 2001 through December 31, 2007. This period was chosen because it overlaps the data collection efforts by GAEPD, which occur monthly during the growing season (April through October). The models were calibrated to water level, DO, temperature, nutrients, and chlorophyll-a.

Coosa River

The LSPC model results show that the Coosa River exceeded its growing season median concentration for total phosphorus established in the Lake Weiss TMDL at the Georgia-Alabama State line each year from 2001 through 2007.

Lake Allatoona

The EFDC model results show that Lake Allatoona exceeded its growing season average concentration of chlorophyll *a* in 4 out of 5 stations (Allatoona Creek, Mid-Lake, Little River, and Etowah River). The primary years of violation are 2002 and 2007. Lake Allatoona exceeded its total nitrogen standard in Little River from 2001 through 2007. Lake Allatoona is meeting its annual total phosphorus loading standard of 1.3 lbs/acre-foot; however, it exceeded its annual total phosphorus tributary loading in Noonday Creek (2002 and 2003) and Shoal Creek (2002 through 2004).

Lake Jackson

Lake Jackson is meeting its growing season average concentration of chlorophyll *a* at the Mid-lake station every year. Lake Jackson exceeded its total nitrogen standard in 2002 and 2007. Lake Jackson is meeting its annual total phosphorus loading standard, and it is also meeting annual total phosphorus tributary loading for all years.

Lake Oconee

There are no lake specific standards for Lake Oconee. Therefore results for chlorophyll *a*, total nitrogen, and the total phosphorus loading were compared to the standards for Lake Jackson.

Lake Oconee has a range of growing season average concentration of chlorophyll *a* of 9.8 to 22.7 μg/L, with two values at or above 20 μg/L that occur at the Lake Oconee Highway 44 station. In addition, Lake Oconee exceeded a total nitrogen concentration of 4 mg/L during 2007 in the Oconee River embayment. The annual total phosphorus loading in Lake Oconee ranges from 0.9 to 1.2 lbs/acre-foot.

Lake Sinclair

There are no lake specific standards for Lake Sinclair. Therefore results for chlorophyll *a*, total nitrogen, and the total phosphorus loading were compared to the standards for Lake Jackson.

Lake Sinclair has a range of growing season average concentrations of chlorophyll *a* of 3.9 to 6.7 μg/L. Lake Sinclair exceeded a total nitrogen concentration of 4 mg/L during 2002 and 2005 through 2007. The annual total phosphorus loading in Lake Sinclair ranges from 1.0 to 1.3 lbs/acre-foot.

CONCLUSIONS

All of the results in this assessment are based on current wastewater discharges and water withdrawals. The draft results for the Assimilative Capacity Resource Assessment indicate that of the over 7,000 river miles evaluated for dissolved oxygen, 76% have Good to Very Good assimilative capacity for dissolved oxygen. This means many of these streams have greater than 0.5 mg/L of dissolved oxygen above the standard and/or natural dissolved oxygen levels and will likely to be able to assimilate additional wastewater discharges in the future; although, downstream effects will still need to be evaluated using the modeling tools developed. Of the 24% of streams miles that have Moderate to No assimilative capacity, which means these streams have 0.5 mg/L or less available dissolved oxygen, most of these streams are located in South Georgia, below the fall line, where the topography is flat and reaeration is low. This includes the Brunswick Harbor, whose model indicates there is no available dissolved oxygen assimilative capacity. Any new or expanded treatment facilities in these streams may require plant upgrades in the future. The Savannah Harbor and Coosa River at the Georgia-Alabama state line currently have exceed their available dissolved oxygen assimilative capacity. Total Maximum Daily Loads (TMDLs) are being revised for these both waterbodies.

The Coosa Watershed Model indicates that the Coosa River at the Georgia-Alabama state line exceeds its assimilative capacity for total phosphorus, which was developed in the Lake Weiss 2008 TMDL. Of the four lakes evaluated, only two, Lake Allatoona and Lake Jackson, have nutrient and chlorophyll a standards. There are four major tributaries of Lake Allatoona that have criteria for annual total phosphorus loads. The Lake Allatoona Watershed Model indicates two of these tributaries exceed their criteria. Lake Jackson also has four tributaries with annual total phosphorus load criteria; however, the Lake Jackson Watershed Models indicate none of these tributaries exceeded their criteria. The Lake Allatoona Model shows the lake exceeds its chlorophyll a standard at four out of five stations; whereas, the Lake Jackson Model did not show any chlorophyll a exceedences. The lake models also indicate that both Lake Allatoona and Lake Jackson did not exceed their total phosphorus loading for the lake; however, they did show exceedences of the total nitrogen standard in at least two years. The other two lakes in this assessment, Lake Oconee and Lake Sinclair were compared to the Lake Jackson water quality standards. The Lake Sinclair model indicate that the lake was in good condition; however the Lake Oconee draft results indicate that Lake Oconee may have a chlorophyll a issue that will need to be assessed further.