GEORGIA
WATER PLANNING

Regional Water Plan

SAVANNAH-UPPER OGEECHEE

DRAFT – MARCH 2023

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Supplemental Documents

Supplemental data and technical memorandums may be found at the Council website at: www.altamahacouncil.org

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Acronyms

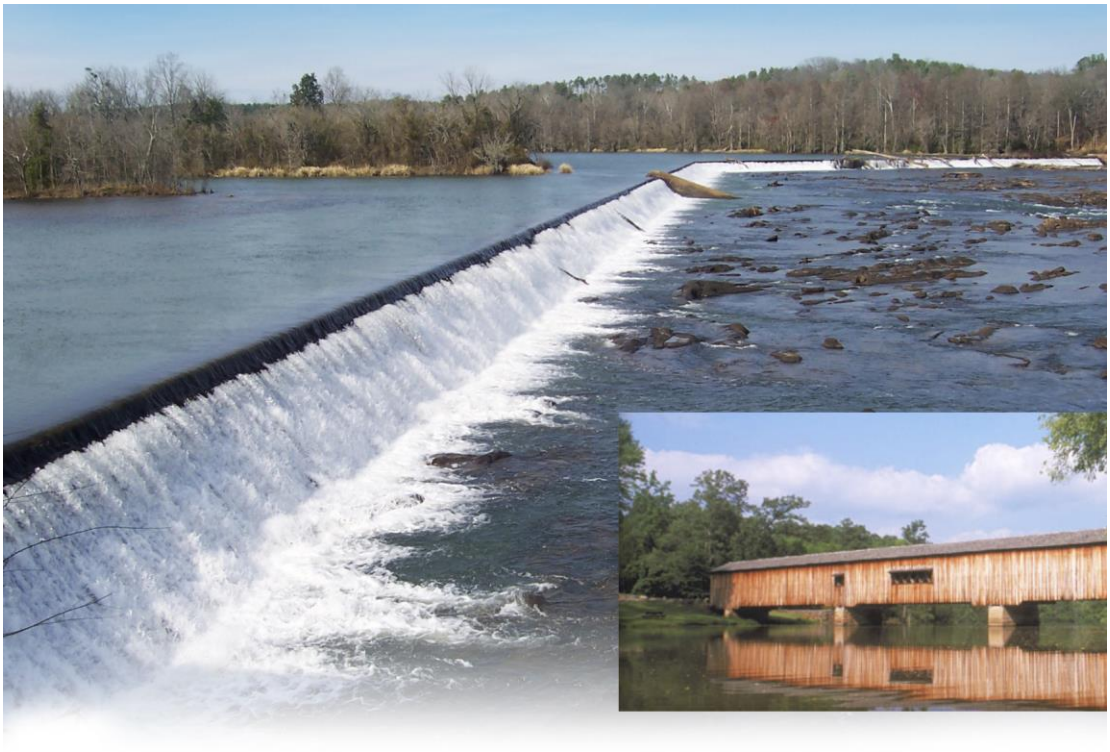
AAD-MGD	Annual Average Day in Million Gallons per Day
AADF	Annual Average Daily Flow
ACCG	Association of County Commissioners
af	acre-feet
Ag	Agriculture
AWWA	American Water Works Association
cfs	cubic feet per second
cfsd	cubic feet per second-day
CMOM	Capacity Management Operations and Management
DCA	Department of Community Affairs
DNR	Department of Natural Resources
DO	Dissolved Oxygen
ED	Education
El.	Elevation (in feet)
EPD	Environmental Protection Division
FERC	Federal Energy Regulatory Commission
GAWP	Georgia Association of Water Professionals
GEFA	Georgia Environmental Finance Authority
GIS	Geographic Information Systems
GLCP	Georgia Land Conservation Program
GLUT	Georgia Land Use Trends
GMA	Georgia Municipal Association
gpcd	gallons per capita per day
gpf	gallons per flush
gpm	gallons per minute

GMA	Georgia Municipal Association
GRWA	Georgia Rural Water Association
GSWCC	Georgia Soil and Water Conservation Commission
GWPPC	Georgia Water Planning & Policy Center
HEC DSS	Hydrological Engineering Center Data Storage System
I/I	inflow and infiltration
IWA	International Water Association
LAS	land application system
LDA	local drainage area
MPs	Management Practices
MGD	million gallons per day
mg/L	milligrams per litre
MMD	maximum monthly demand
MMF	maximum monthly flow
MLRA	major land resource area
MWh	megawatt-hour
NPDES	National Pollutant Discharge Elimination System
OCGA	Official Code of Georgia
OPB	Office of Planning and Budget
OSSMS	Onsite Sewage Management Systems
PS	point source
PSC	Public Service Commission
SB	Senate Bill
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
sq mi	square mile

SSO	Sanitary Sewer Overflow
TM	Technical Memorandum
TMDL	total maximum daily load
UGA	University of Georgia
USDA	U.D. Department of Agriculture
USACE	U.S Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WD	Water Demand
WQ	Water Quality
WRD	Wildlife Resources Division
WS	Water Supply

EXECUTIVE SUMMARY

Executive Summary

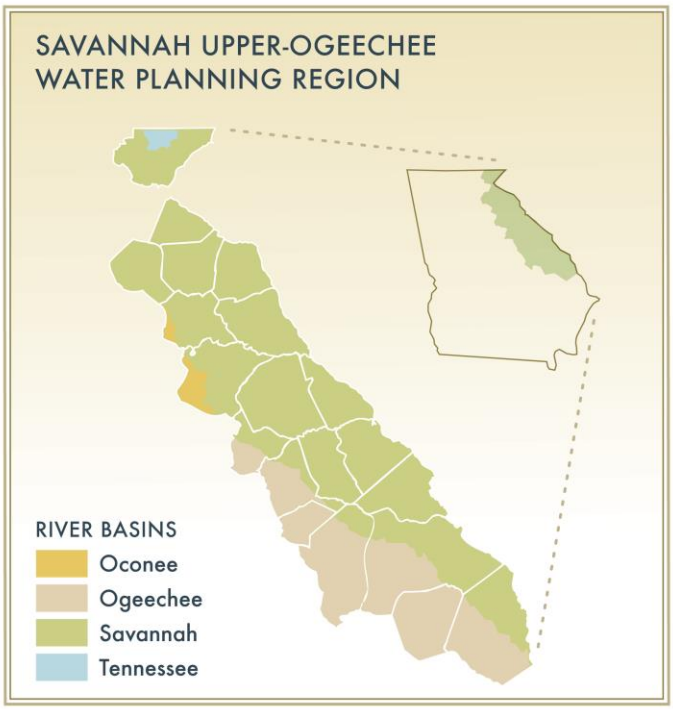


The Savannah-Upper Ogeechee Water Planning Region is one of ten such regions established by the Georgia General Assembly in 2008 as part of the State-wide Comprehensive Water Management Plan. The region's Water Planning Council (Council) consists of volunteer members who began working on the Regional Water Plan in March 2009 and completed those efforts in 2011. EPD adopted the initial Regional Water Plan in 2011. During the 5-year plan review and revision process (2017), the Council re-evaluated, and where appropriate, updated the Regional Water Plan. This current update builds upon the original 2011 Regional Water Plan and 2017 update. The plan describes water resources conditions, projected future demands, identified resource management issues, and recommended appropriate water management practices to be employed in the region through 2060.

Primary responsibility for implementing the Regional Water Plan is at the local level. Other state and regional agencies also have implementation roles. The Regional Water Plan includes benchmarks selected to measure the plan's progress and identifies entities responsible for monitoring those milestones. Continued funding at both state and local levels is crucial to successful implementation.

Regional Overview

The Savannah-Upper Ogeechee Region includes 20 counties and 67 incorporated municipalities, with a current population of about 640,000 (2020 Census). Slightly more than half of the region is covered by forest; only 8 percent of the region's land area is considered urban. The Savannah River Basin includes three major lakes owned and operated by the U. S. Army of Corps of Engineers (USACE): Lake Hartwell, Lake Richard B. Russell, and Lake Thurmond. In addition to water supply, power generation, flood prevention, and drought management, the streams and lakes in the region support significant recreational uses and important biological resources.

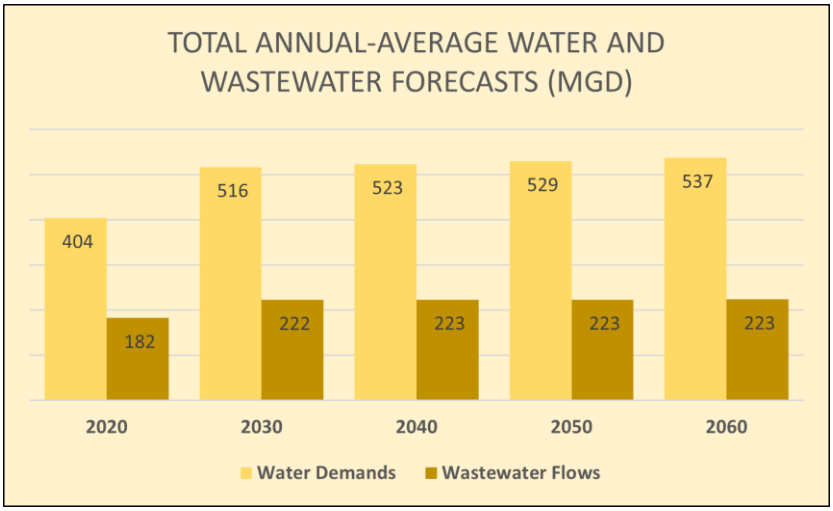


The region covers portions of the Savannah, Ogeechee, Oconee and Tennessee River basins; the lower portions of the Savannah, Ogeechee and Oconee basins lie within other regions, and the Savannah basin is shared with South Carolina. The region also includes various groundwater aquifer systems, particularly the Crystalline Rock aquifer, the Cretaceous aquifer and the Floridan aquifer systems. While much of the region's water comes from surface water and regulated reservoirs, portions of the region rely significantly on groundwater aquifers. In 2015, the Savannah-Upper Ogeechee Region withdrew approximately 303 million gallons per day (MGD) for water supply, with approximately 69 percent drawn from surface water. The region returned approximately 135 MGD of wastewater in 2015, with 51 percent from industrial and 49 percent from municipal sources. Currently, approximately 90 percent of the streams segments total mileage analyzed for dissolved oxygen levels have adequate capacity to assimilate pollutants.

Demand Forecasts and Water Resources Issues

With the region's population projected to grow to over 719,000 in 2060, the annual average water demand is projected to increase 33 percent from 2020 to 2060 (404 to 537 MGD). The region's wastewater generation will increase 23 percent from 2020 to 2060 (182 to 223 MGD) on an annual average daily basis. The Georgia Environmental Protection Division (EPD) conducted three Resource Assessments to analyze resource conditions based on these projections. Available information regarding permitted facilities and land use on the South Carolina side of the Savannah River Basin was also incorporated.

The Surface Water Availability Resource Assessment (2022) indicates that the water supply needs in the Savannah River Basin can be met, assuming the USACE continues to operate its reservoirs using the current operation protocol; however, peak season agricultural irrigation may result in potential instream flow shortages in the Ogeechee Basin. The stream flow may fall below the flow thresholds analyzed in the resource assessment during summer low flow periods after meeting upstream irrigation needs. The regulatory flow threshold is typically 7Q10 at the location of the discharge. 7Q10 is a commonly used regulatory flow statistic to help gage flow sufficiency in rivers. By definition, this is a seven-day average flow that is not exceeded 10 percent of the time and may be breached a small percentage of the time under natural conditions. The instream flow targets are in place to help protect ecological conditions.



The Groundwater Resource Assessment (2017) indicates that there will be adequate supplies to meet the region's future groundwater supply needs through 2060. The estimated sustainable yields from the Cretaceous aquifer and the portion of the Floridan aquifers that underlie the Savannah-Upper Ogeechee Region are significantly higher than the estimated demands from all planning regions relying on these aquifers.

EPD's Water Quality Resource Assessment (2017 and 2022) predicted that some stream segments, including the Savannah Harbor, will have limited capacity to accept future wastewater discharges because of limited ability to preserve dissolved oxygen levels above regulatory thresholds. Upgrade of existing wastewater treatment facilities or advanced treatment in new facilities will likely be required to improve the dissolved oxygen levels in the streams. Dischargers along the Savannah River in both South Carolina and Georgia participated in a robust stakeholder process to determine appropriate discharge loadings in the basin with the ultimate goal of restoring water quality in the Savannah River and Harbor. In lieu of developing a TMDL document, a Category 5R process was initiated and a 5R plan developed for the Savannah River and Harbor as authorized by the U.S. Environmental Protection Agency (USEPA) under the Clean Water Act. Stakeholders in the entire TMDL/5R process included USEPA, Georgia EPD, South Carolina Department of Health and Environmental Control (SCDHEC), and the Savannah River/Harbor Discharger Groups. The 5R plan was approved by USEPA and both Georgia EPD and SCDHEC are presently processing NPDES permit applications and reissuing permits for municipal and industrial facilities on the River/Harbor main stem and those facilities tributary to the main stem.

The Regional Water Plan's analysis shows that the rapidly-growing counties (especially Columbia County) will need additional water and wastewater infrastructure to meet growing demands in the next 40 years.

Recommended Management Practices

To help address the region's water resources issues and comply with the Georgia Water Stewardship Act (SB 370) and EPD's rules for drought management and water supply efficiency, the Council recommends 15 priority water management practices. These priority practices include water conservation measures to further manage and reduce municipal, industrial, energy and agricultural demands in the entire region and monitoring of agricultural water use in the Upper Ogeechee River Basin. The Council suggests short-term and long-term actions for the recommended priority management practices.

To prevent potential shortages in meeting instream flow needs, the Council calls for more aggressive water conservation practices and development of drought management practices for the agricultural users/permittees in the Upper Ogeechee River Basin. The Council also recommends instream flow studies (to determine what flow levels are appropriate for protecting aquatic life) and additional streamflow monitoring in the Ogeechee River Basin (to confirm the frequency and magnitude of predicted instream flow shortages). Also, the Council's priority practices include development of local water and wastewater plans to identify local infrastructure

needs and address watershed-related issues. The Council further supports State implementation of the 5R plan for NPDES permitting to restore water quality in the Savannah River Basin and Harbor.

The Council also recommends 14 additional management practices to be considered by local governments and other responsible entities based on specific needs to be included in detailed local planning studies. These management practices promote proactive infrastructure planning and resource management that, if implemented, will prevent or minimize local water resource shortages.

Interstate Water Planning

The ongoing discussion between the states of Georgia and South Carolina is a defining issue of the Savannah River Basin. The topics under discussion and their successful resolution not only are critical to the appropriate use and protection of the Savannah River, but also will serve to inform future iterations of the Regional Water Plan. Discussion topics between the two states include (1) the appropriate distribution of biochemical oxygen demand loads identified through the Savannah River Basin and Harbor Category 5R process; (2) the saltwater intrusion issue on Hilton Head Island; (3) the continuation of the USACE Savannah River Basin Comprehensive Study (a cost-shared plan with the states); and (4) the planning necessary to ensure responsible and appropriate sharing of interstate water resources.

The Council recommends that future updates of the USACE Comprehensive Study emphasize the need for maintaining maximum storage in the reservoirs when possible, in light of the economic benefits the lakes bring to the region. The Comp plan is a cost share with Georgia EPD, SCDHEC and The Nature Conservancy. With respect to water sharing, the Council has incorporated a preliminary assessment of South Carolina's projected water use into its planning efforts. The Council recognizes that this is a first step in mutual water planning that will become more robust as the interstate water planning process continues.

Conclusion

The Savannah-Upper Ogeechee Water Planning Council recognizes that the region's water resources are vitally important to the ecology of Georgia, the health and vitality of Georgia's citizens, and the state's economic well-being. The Council has worked diligently on the critical resource issues associated with the Savannah-Upper Ogeechee Planning Region and has developed a set of management practices and benchmarks to help ensure appropriate water use from now until 2060.

The Council recommends that EPD continue to update and refine its water resources database and use this data in subsequent updates to the resource assessments. This information will help guide more localized planning and decision making, as well as strengthen the appropriate and scientifically sound application of management practices.

The Council looks forward to future regional planning that will incorporate results from the ongoing studies detailed in this Regional Water Plan. It is critical that local water planning continue in this region so that future iterations of this plan adequately incorporate the outcomes of any additional environmental discussions and studies.

SECTION 1

Introduction

Section 1 Introduction

1.1 The Significance of Water Resources in Georgia

Of all Georgia's natural resources, none is more important to the future of our state than water. The wise use and management of water is critical to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens.

Georgia has abundant water resources, with fourteen major river systems (See Figure 1-1) and multiple groundwater aquifer systems. These waters are shared natural resources as streams and rivers run through many political jurisdictions. The Savannah River basin includes portions of South Carolina, and both the Savannah and Ogeechee basins flow downstream into the Coastal Georgia region. The rain that falls in one region of Georgia may replenish the aquifers used by communities many miles away. Although water in Georgia is abundant, it is not an unlimited resource. It must be carefully managed to meet long-term water needs.

Since water resources, their conditions, and their uses vary greatly across the state, selection and implementation of management strategies on a regional and local level is the most effective way to ensure that current and future needs for water supply and water quality are met.

Therefore, the State Water Plan calls for the preparation of ten regional water development and conservation plans (Regional Water Plans). This Regional Water Plan prepared for the Savannah-Upper Ogeechee Water Planning Region by the Savannah-Upper Ogeechee Regional Water Planning Council describes the regionally appropriate water management practices to be employed in Georgia's Savannah-Upper Ogeechee Water Planning Region through 2060. During the

Summary

The Savannah-Upper Ogeechee Water Planning Region is one of eleven such regions established by the Georgia General Assembly. The region's Water Planning Council consists of volunteer members who began working on the original regional water plan in March 2009, 2016, and the current update in 2022. The plan describes water resources conditions, projects future demands, identifies resource gaps and recommends appropriate water management practices to be employed in the region through 2060.

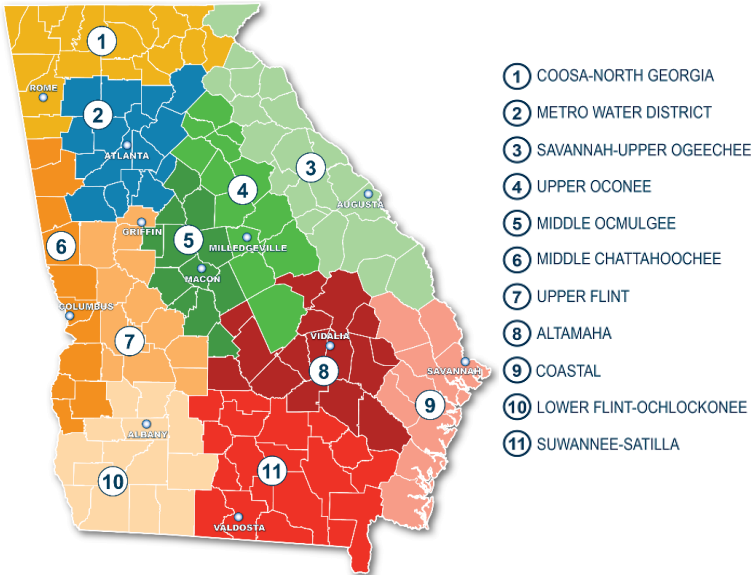


Figure 1-1 Regional Water Planning Councils

2017 plan update process, the original 2011 Regional Water Plan for the Savannah-Upper Ogeechee Region was reviewed and updated based on updated regional water demand forecasts, updated resource assessment modeling, evaluation of potential gaps in water availability and water quality, and revised management practices recommended by the Savannah-Upper Ogeechee Council to either address future water resource management needs or to refine or clarify management practices. This current update builds upon the original 2011 Regional Water Plan and 2017 update. A table is provided in Appendix A that identifies the portions of the plan that have been updated and provides a short explanation for why the update was made (for instance, a change in circumstance in the region, or an update to the technical work such as updated projections or forecasts).

1.2 State and Regional Water Planning Process

The State Water Plan calls for the preparation of Regional Water Plans designed to manage water resources in a sustainable manner through 2060. It establishes ten regional water planning councils and provides a framework for regional planning consistent with the policy statement that "Georgia manages water resources in a sustainable manner to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens."

The original (2011) Regional Water Plan was prepared following the consensus-based planning process illustrated in Figure 1-2. As detailed in the Savannah-Upper Ogeechee Water Planning Council's Memorandum of Understanding with the Georgia Environmental Protection Division (EPD) and Department of Community Affairs (DCA) as well as the Council's Public Involvement Plan, the process required and benefited from input of other regional water planning councils, local governments, and the public. For this plan update, a similar approach was followed including a review of the vision and goals, updates to the water and wastewater demands, updates to the resource assessments, and a re-evaluation of potential water resource challenges associated with comparing the water resource assessments versus the water resource demands. Public/local government input and coordination with other regional water planning councils also informed the plan update.

To develop the original (2011) Regional Water Plan, the Savannah-Upper Ogeechee Water Planning Council met regularly during the period of March 2009 to March 2011 to discuss water resource planning issues. The Council had three ongoing committees assisting with specific aspects of plan development. The Technical Committee consisted of five members with technical backgrounds in the water resource management. This committee was responsible for review of Resource Assessment data and had an advisory role in the selection of management practices. The Plan Review Committee consisted of four members who reviewed the draft plan sections in detail on behalf of the Council. The Interstate Coordination Committee consisted of one member who attended several meetings with Savannah River Basin Advisory Committee in South Carolina. Following each committee's initial review and feedback process, all major decisions and recommendations were brought to the full Council for discussion and approval. As part of this update, the Savannah-Upper Ogeechee Council met over a series of meetings from 2021 through early2023 to revise and update each of the sections of the plan, as appropriate.

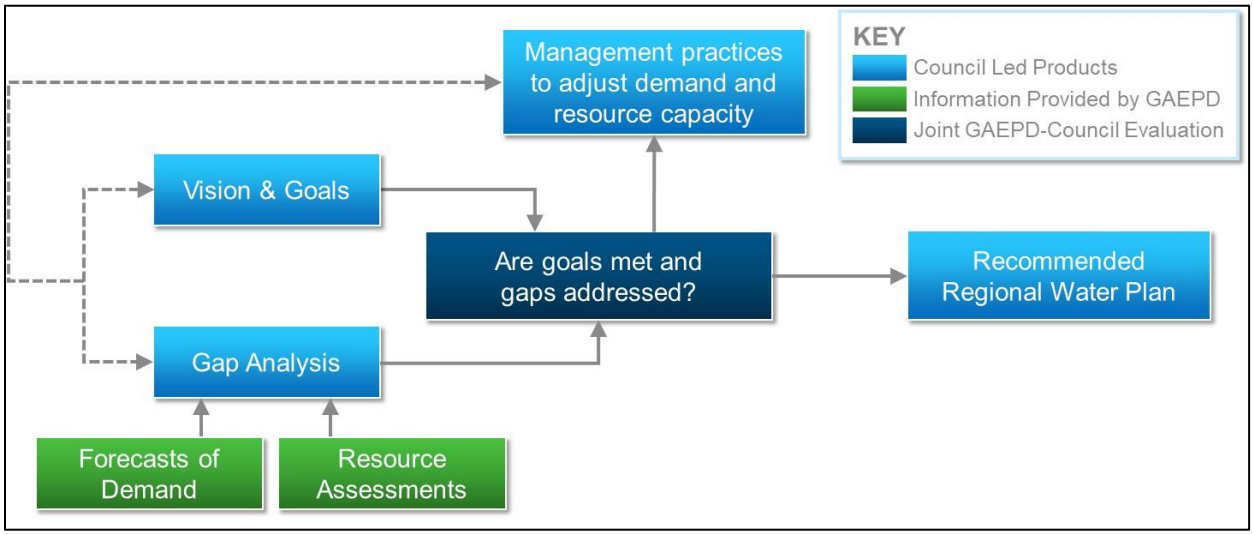


Figure 1-2 Planning Process

1.3 The Savannah-Upper Ogeechee Regional Vision and Goals

The guiding policy from the 2004 Water Planning Act requires that Georgia manage its water resources in a sustainable manner to: 1) support the State's economy; 2) protect public health and natural systems; and 3) enhance the quality of life for all citizens. Following this principle, the Savannah-Upper Ogeechee Regional Water Planning Council adopted the vision and goals presented in the following subsections.

1.3.1 Vision Statement

"The Savannah and Ogeechee Rivers along with the region's groundwater resources will provide high quality and quantity water supplies for balanced growth while protecting the natural and built environments. The Savannah-Upper Ogeechee Regional Water Planning Council, through collaboration with stakeholders, will formulate river basin policies based on current and developing technologies and conservation methods. Because of the results of our Council and other councils' efforts, Georgia will be recognized across the country as the leader in water resource management."

1.3.2 Goals

The Savannah-Upper Ogeechee Regional Water Planning Council adopted 7 goals reflecting the vision statement, which can be seen in Figure 1-3. It is important to note that the goals summarized below are not presented in order of priority, but rather were assigned a number to identify specific goals addressed as part of the water management practice selection process (Section 6).

GOALS

1. Plan for sufficient water supplies to support planned economic development while providing residential, industrial, agricultural, recreational, and utility services in a sustainable manner. Request that the State consider and encourage future economic development in areas with adequate water resources.

2. Provide support for state laws regulating interbasin transfers in Official Code of Georgia (OCGA) 12-5-584(f) and OCGA 12-5-31 and further described in EPD Rule 391-3-6-.07. Promote the development of a mandatory comprehensive evaluation process that protects donor basins from adverse impacts from proposed interbasin transfers between State Water Planning Districts.

3. Work with EPD to establish ongoing relationships with South Carolina stakeholders and other Water Planning Councils to equitably address water sharing issues.

4. Work to enhance the public's understanding of regional water issues and the need for support of new policies to protect future resources.

5. Identify opportunities for water reuse and conservation in the region.

6. Maintain and strive to improve the quality and quantity of the water of the region to protect species and habitat while balancing the needs of humans.

7. Form a permanent Savannah and Ogeechee water planning organization as the conduit for bringing together all stakeholders and assisting the State with implementation of water resource goals in the entire basin. Grandfather one- third of the current Water Planning Council on the permanent organization.

Figure 1-3 Goals for the Savannah-Upper Ogeechee Region

SECTION 2

The Savannah – Upper Ogeechee Water Planning Region

Section 2 The Savannah-Upper Ogeechee Water Planning Region

Summary

This region shares portions of four river basins - Savannah, Ogeechee, Oconee, and Tennessee Rivers - with 20 counties and three states. While much of the region's water comes from surface water and regulated reservoirs, portions of the region rely on groundwater aquifers.

The Savannah-Upper Ogeechee Water Planning Region (Figure 2-1) includes 20 counties and 67 incorporated municipalities. These local governments are responsible for land use and zoning decisions that may affect the management of water resources. Many local governments are also responsible for the planning, operations, and management of water and wastewater infrastructure.

2.1 History and Geography

The Savannah-Upper Ogeechee Water Planning Region is located in the eastern portion of the state and encompasses over 7,100 square miles. The region borders the Carolinas, as well as the Coosa-North Georgia, Metro North Georgia, Upper Oconee, Altamaha, and Coastal Georgia water planning regions. Spanning from Rabun County in the North Georgia Mountains down to Screven County near the Georgia coast, the region is diverse in geography and nature.

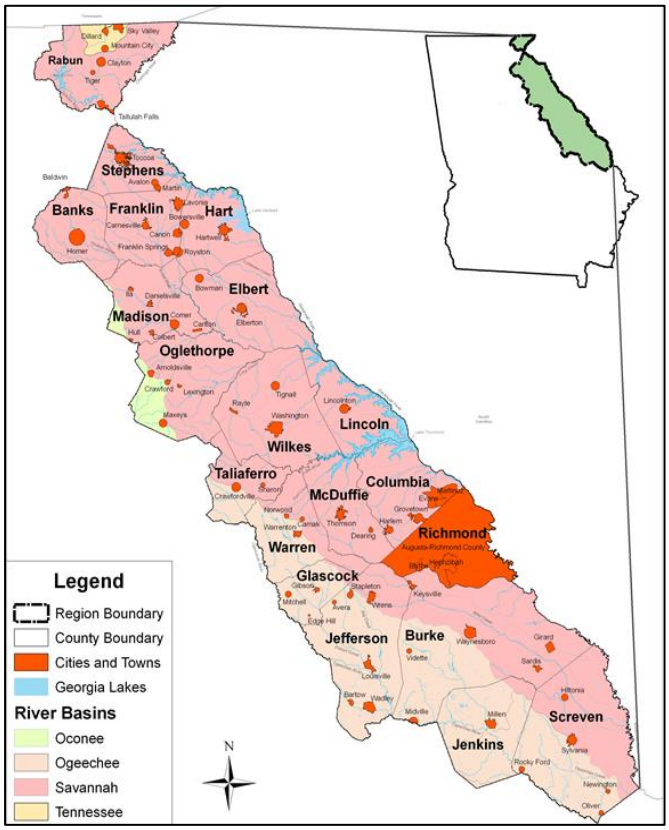


Figure 2-1 Savannah-Upper Ogeechee Water Planning Region

2.1.1 Watersheds and Water Bodies

Portions of four river basins are within the region: Savannah, Ogeechee, Oconee, and Tennessee (Figure 2-1). The Tennessee River Basin drains north (ultimately to the Gulf of Mexico), and the remaining three basins drain to the Atlantic Ocean. Most of the region is in the Savannah and Ogeechee River basins which are shared with the Coastal Georgia water planning region and South Carolina.

The Savannah River originates on the southeastern side of the Appalachian Mountains, just inside North Carolina, and forms most of the border between South Carolina and Georgia. The basin's northern portion is part of the Chattahoochee and Oconee National Forests. The Savannah River Basin also includes the Chattooga

National Wild and Scenic River, Tallulah Gorge, six lakes operated by the Georgia Power Company, and three lakes owned and operated by the U.S. Army Corps of Engineers (USACE) - Lake Hartwell, Lake Richard B. Russell, and Lake Thurmond (also called Clarks Hill Lake). The Ogeechee River is one of Georgia's few free flowing rivers, and its basin is located entirely within state. There are no municipal water supply storage reservoirs or hydroelectric plants in the Ogeechee River Basin. The coastal estuaries, sounds, and Atlantic Intracoastal Waterway that are located just south of the region are significant to the basin.

2.1.2 Physiography and Groundwater Resources

The Savannah-Upper Ogeechee Region is located in the Blue Ridge, Piedmont, and Coastal Plain physiographic provinces. The regional area north of the Fall Line is in the Blue Ridge and Piedmont provinces; the regional area south of the Fall Line is in the Coastal Plain province. Mountains with fast moving streams, rapids, and steep slopes – including the Appalachian and Blue Ridge mountains – dominate the Blue Ridge province. The Piedmont province is characterized by rolling hills, narrow valleys, and faster moving streams with occasional rapids and falls. The Coastal Plain province is characterized by slower, flatter streams with wide floodplain areas. The region receives between 40 to 80 inches of rain per year, typically with a wet spring and a dry season from mid-summer to late fall.

The Savannah-Upper Ogeechee Water Planning Region includes portions of four aquifers, as shown in Figure 2-2:

- **Crystalline-Rock Aquifers** – located in the northern portion of the basin and generally do not provide significant amounts of groundwater
- **Cretaceous Aquifer System** – forms a narrow band through the middle of the state and consists mainly of sand and gravels
- **Gordon Aquifer System** – located in the southern portion of the basin
- **Floridan Aquifer** – extremely productive and underlie most of south Georgia

Wells from the major Coastal Plain aquifers south of the Fall Line (Cretaceous & Floridan) are generally very productive, with yields on the order of 1,000 gallons per minute (gpm). Wells that draw from the Crystalline-Rock Aquifers are typically less productive (less than 100 gpm).

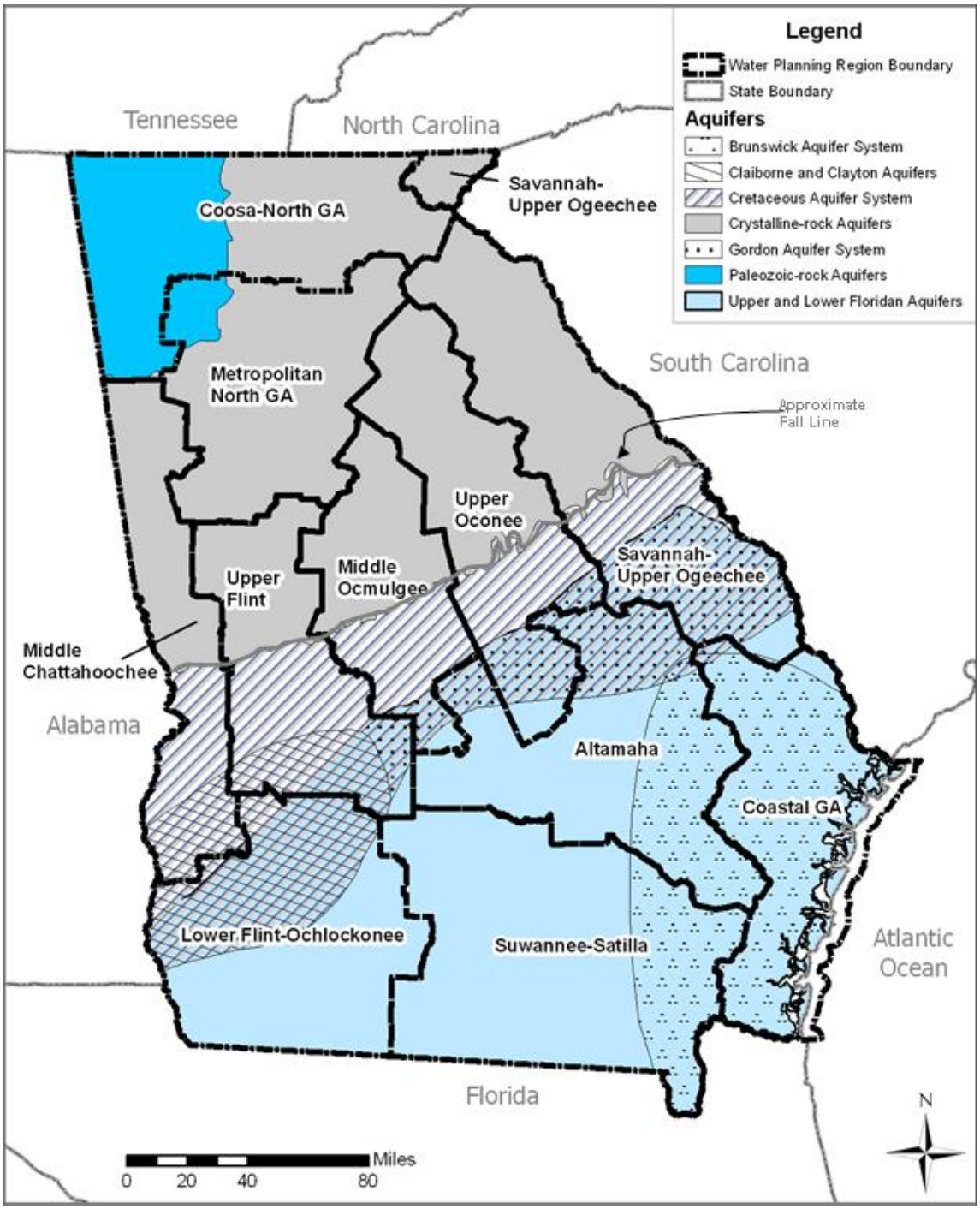


Figure 2-2 Water Planning Regions with Aquifers

2.2 Characteristics of the Region

2.2.1 Population

In 2020, total population for the 20-county Savannah-Upper Ogeechee Water Planning Region was 639,802 (U.S. Census, 2020). Table 2-1 shows the breakdown of the population per county, highest to lowest. Note that the 2020 Census population in Table 2-1 may differ from the projected 2020 population provided by the Office of Planning and Budget 2019 series population projections used as reported in Section 4. The two most populated counties, Richmond and Columbia, contain approximately 56 percent of the region's total population. Augusta-Richmond County is the largest population center in the region, with an estimated population of 206,328.

Table 2-1 Savannah-Upper Ogeechee Region 2020 Population by County

Richmond	206,328	Franklin	23,429	Rabun	16,894	Jenkins	8,662
Columbia	156,773	Burke	24,621	Jefferson	15,658	Lincoln	7,704
Madison	30,263	McDuffie	21,587	Oglethorpe	14,865	Warren	5,205
Stephens	26,800	Banks	18,069	Screven	14,060	Glascock	2,883
Hart	25,866	Elbert	19,627	Wilkes	9,556	Taliaferro	1,557

Source: U.S. Census, 2020.

2.2.2 Employment

Based on the Department of Labor and Census estimates, the region's employment is dominated by the government, health care services, manufacturing, retail, and construction sectors. U.S. Census data estimated the region's total employment has been growing from a low point in 2011 of 182,000 jobs to 284,463 jobs in 2019. Major government employers include Fort Gordon; the Savannah River Site; state universities and technical colleges; the Medical College of Georgia; local school systems; prison systems; and federal, state, and local governmental agencies.

Fort Gordon has over 23,000 employees, with an economic impact of approximately $1.4 billion. The region has 18 higher learning institutions located within ten counties. Within the metropolitan area of Augusta, approximately 28,400 residents are employed by area hospitals, clinics, nursing homes, social service agencies, and the offices of doctors, dentists and other practitioners. Leisure and hospitality establishments are also major employment generators that include many cultural facilities and special events, such as the Masters Golf Tournament in the Augusta area. Plant Vogtle, a nuclear facility jointly owned by four utilities, employs approximately 1,000 people. Currently under development are plans to double the number of reactors at the plant which will result in increased employment opportunities. The region's manufacturing sector includes textiles and apparel; paper and allied products; chemicals; transportation equipment; stone, clay and glass products; food products; and furniture, lumber and wood products.

2.2.3 Land Use

In 2015, approximately 51 percent of the land area of the Savannah-Upper Ogeechee Water Planning Region was covered by forested land (See Figure 2-3). Agriculture (22 percent land cover) is a significant land use activity, especially in the southern portion of the region, supporting a variety of animal operations and commodity production. In addition to forests (51%) and agriculture, wetlands consist of approximately 10 percent and urban area consists of approximately 10 percent of the land cover of the region. The majority of the urban area exists in Richmond and Columbia counties. There are a number of high priority streams, protected species, and significant recreational uses, which are described in Section 3 of the Plan.

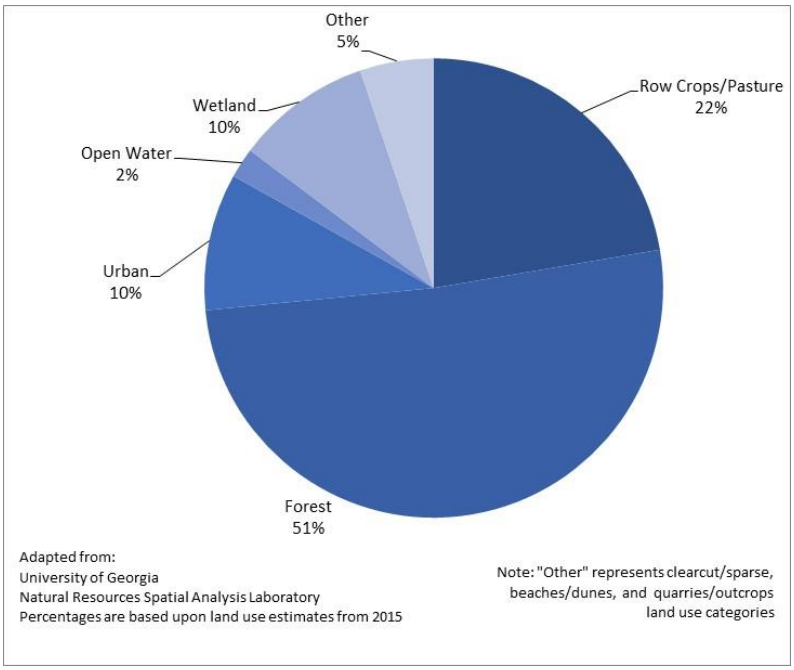


Figure 2-3 Land Cover in the Savannah-Upper Ogeechee Region

2.3 Local Policy Context

Four Regional Commissions – Georgia Mountains, Northeast Georgia, Central Savannah River Area, and Coastal – work with the DCA to assist communities in the Savannah-Upper Ogeechee Water Planning Region with a variety of planning issues. The commissions review local comprehensive land use plans and can help make connections between growth and water planning. They assist local governments in securing funds for the water and wastewater infrastructure necessary for economic development, as well as provide planning support for compliance with environmental regulations, some of which pertain to water quality, such as watershed protection plans.

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SECTION 3

Water Resources of the Savannah – Upper Ogeechee Region

Section 3 Water Resources of the Savannah-Upper Ogeechee Water Planning Region

A summary of current surface water and groundwater use, results from the current conditions Resource Assessments developed by EPD and discussion of instream uses are provided in this section. This section's references to current conditions reflect the most recent data available at the time of the statistical development.

Summary

In 2015, the Savannah-Upper Ogeechee Region withdrew over 303 MGD for water supply (69 percent from surface water and 31 percent from groundwater sources). The region returned nearly 135MGD to surface water in 2015; 51 percent from industry and 49 percent from municipal sources. The region has abundant water supplies and over 90 percent of the streams analyzed were found to have adequate capacity to handle pollutants. In addition to water supply, power generation, flood prevention and drought management, many streams and lakes in the region support significant recreational uses.

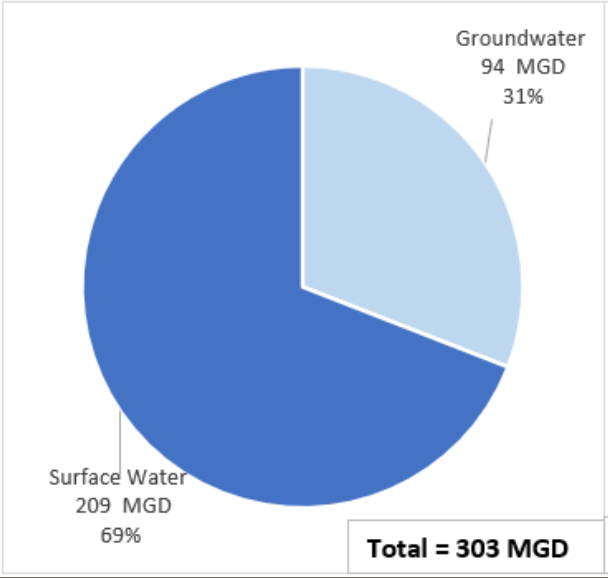
3.1 Major Water Use in the Region

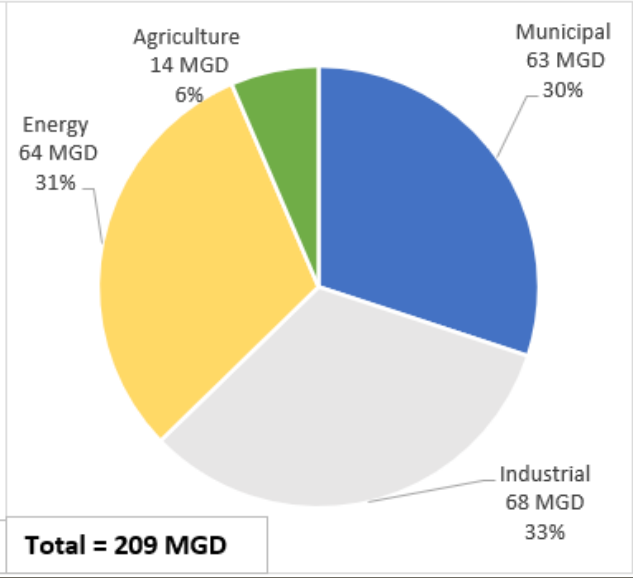
Major water use and water returns are summarized for the Savannah-Upper Ogeechee region based on data compiled by USGS in the report 'Water Use in Georgia by County for 2015 and Water-Use Trends, 1985-2015'. In 2015, the region's daily water withdrawals averaged over 303 million gallons per day (MGD) on an annual average daily basis for municipal, industrial, energy and agricultural use. Sixty-nine (69) percent was obtained from surface water supply sources and thirty-one (31) percent from groundwater supply sources (Figure 3-1). Municipal use included residential, commercial, and industrial usage supplied by publicly owned water providers and estimated usage from self-suppliers. Industrial use included only industries that have State water withdrawal permits. Energy use included only water withdrawn by thermoelectric facilities and excluded withdrawals from hydroelectric facilities because the water used is not considered consumptive.

3.1.1 Surface and Groundwater Water Use

In 2015, approximately 209 MGD were withdrawn on an annual average daily basis from the region's surface water supply sources. Approximately 94 MGD were withdrawn from groundwater aquifers, primarily the Floridan, Cretaceous Sand and Crystalline-Rock aquifers. Figure 3-2 and Figure 3-3 present a breakdown of total surface water and groundwater use by category.

In 2015, the region returned approximately 135 MGD to surface water on an annual average daily basis. Figure 3-4 shows the surface water return flows by category.

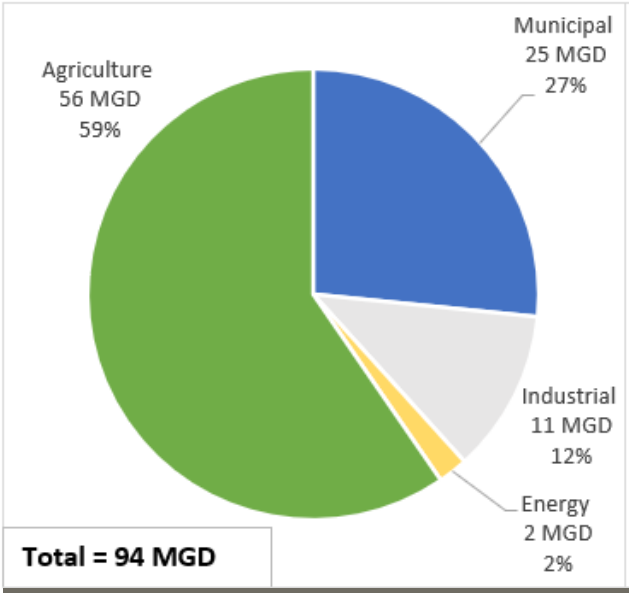


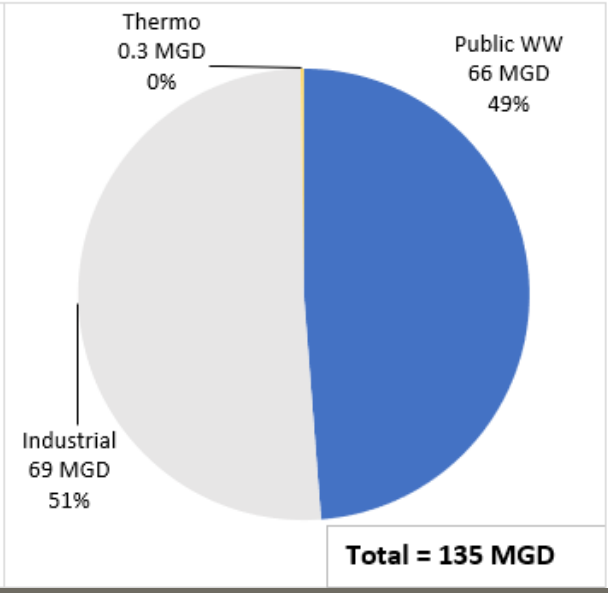


Data Source: USGS Water Use in Georgia 2015.
Note: Values shown in figures reflect current updated values.

Figure 3-1 2015 Water Supply by Source

Figure 3-2 2015 Surface Water Supply by Sector





Data Source: USGS Water Use in Georgia 2015.
Note: Values shown in figures reflect current updated values.

Figure 3-3 2015 Groundwater Supply by Sector

Figure 3-4 2015 Surface Water Returns by Sector

3.2 Current Conditions Resource Assessments

As a major component of the State Water Plan, EPD developed three Resource Assessments: (1) surface water quality; (2) surface water availability; and (3) groundwater availability. The Resource Assessments estimated the capacity of our water resources to support Georgia communities in a sustainable fashion while continuing to meet water management goals. The assessments were completed on a resource basis (river basins and aquifers). The results of the Baseline Resource Assessments evaluating current water use and discharge conditions are summarized here as they relate to the Savannah-Upper Ogeechee Water Planning Region. Future water supply and wastewater needs are discussed in Section 4; followed by Resource Assessments for future conditions in Section 5.

3.2.1 Surface Water Quality (Assimilative Capacity)

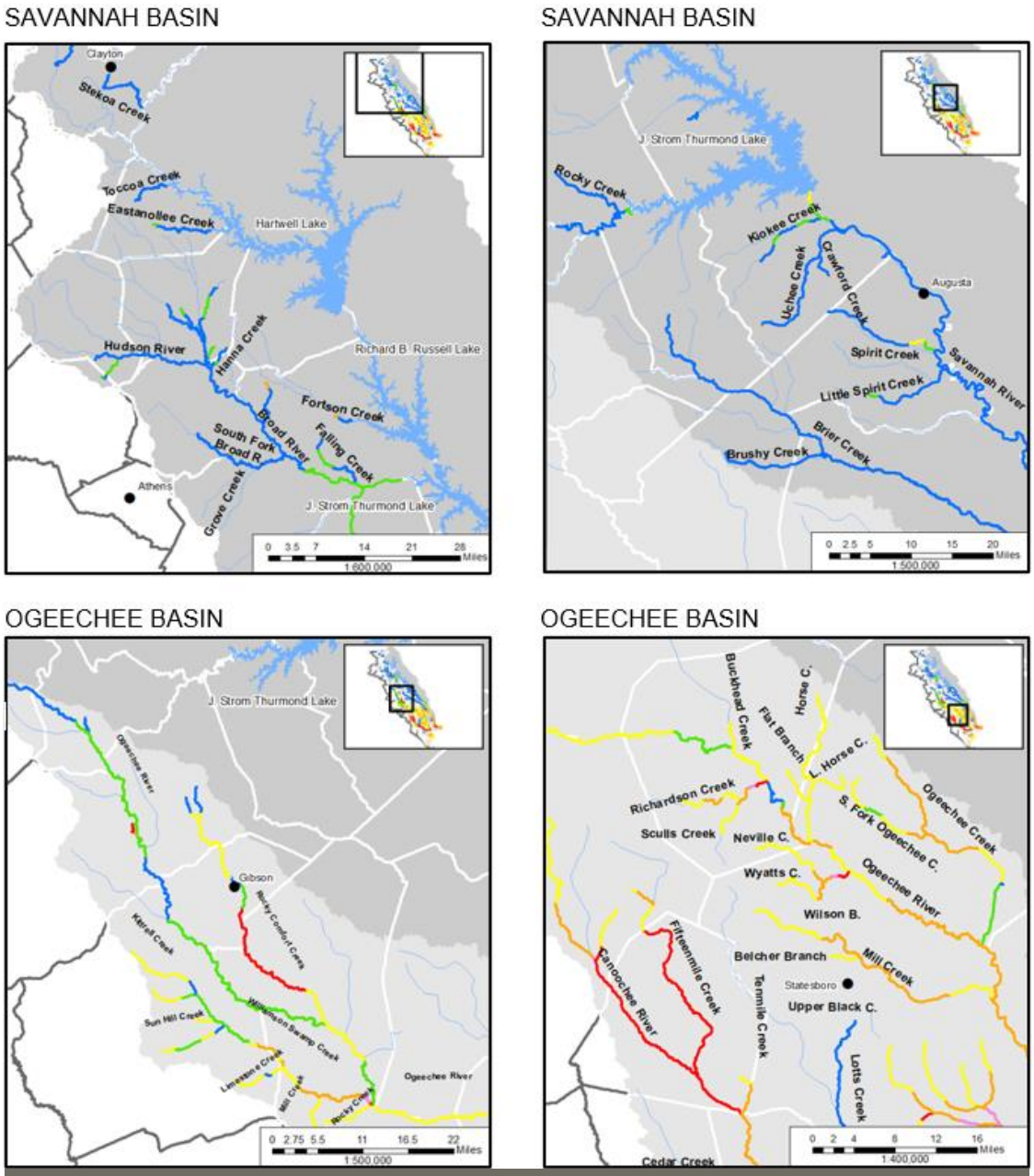
Assimilative capacity refers to the natural ability of a water body to respond to pollutants without harming aquatic life or humans who come in contact with the water. A water body can be overloaded with pollutants and violations of water quality standards may result. Water quality standards define the uses of a water body and set pollutant limits to protect those uses. The Assimilative Capacity Resource Assessment evaluated the capacity of surface waters to process pollutants without violating water quality standards. The Assimilative Capacity Resource Assessment results focus on dissolved oxygen (DO), nutrients (specifically nitrogen and phosphorus) and chlorophyll-a (a parameter that is closely tied to lake water quality). The current conditions assessment evaluated the impact of current wastewater and stormwater discharges with current withdrawals, land use, and meteorological conditions, with the Savannah River Basin assessment incorporating permitted facilities and land use for the South Carolina side of the basin. Limited or low assimilative capacity may indicate the need to upgrade treatment facilities, or to limit future wastewater discharge or stormwater pollutants to improve water quality in these streams.

Georgia's DO standards are based on stream-specific water use classifications. Most of the region's streams are designated as freshwater fishing, drinking water supplies or recreation. Assessment of the ability to assimilate oxygen-consuming wastes is important because aquatic life is dependent on the amount of residual DO available in the streams. The DO standards for these water use classifications require a daily average of 5 milligrams per litre (mg/L) and no less than 4 mg/L at all times.

Nutrients provide food for aquatic organisms. However, high nutrient concentrations can potentially encourage algal blooms, which may indirectly reduce fish population (and other aquatic life), cause unpleasant taste and odor in water supplies, and impact recreational use of water. The lakes in the region do not have specific standards for the nutrients nitrogen and phosphorus. EPD is currently evaluating Georgia's future nutrient standards.

Using planning level models, DO was modeled in the region's major river basins: the Savannah River (including the South Carolina portions of the basin), the Oconee (includes portions of Madison and Oglethorpe counties), the Ogeechee River, and the Little Tennessee River (includes portions of Rabun county).

Figure 3-5 and Table 3-1 show the results of the modeling. Additional site-specific monitoring and study may be required to determine the actual conditions of these streams and whether upgrade of treatment facilities is needed to improve existing water quality in these streams.



Source: Synopsis Report: Current Assimilative Capacity Assessment Report (GAEPD, 2022).

Figure 3-5 Results of Assimilative Capacity Assessment – DO under Current Permit Conditions

Table 3-1 Assimilative Capacity for DO in Savannah-Upper Ogeechee Planning Council (under current permit conditions)

Basin	Available Assimilative Capacity (Total Mileage)						Total River Miles Modeled in the Council Area
	Very Good (≥1.0 mg/L)	Good (0.5 to <1.0 mg/L)	Moderate (0.2 to <0.5 mg/L)	Limited (>0.0 to <0.2 mg/L)	None or Exceeded (<0.0 mg/L)	Un-modeled	
Oconee	14	2	0	0	0	0	16
Ogeechee	35	101	150	56	20	17	380
Savannah	387	59	6	7	6	0	464
Tennessee	2	1	0	0	0	1	3

Source: GIS Files from the Updated Water Quality Resource Assessment; EPD, 2022.
Notes: Since the 2017 update, additional stream segments were modeled for the Oconee Basin and Savannah River Basin.

A watershed model based on current conditions was developed for the Savannah River Basin to estimate nutrient loadings. Although there are no existing nutrient standards in the Savannah-Upper Ogeechee Region, the results of the watershed model could be used to determine locations of high nutrient loading where Management Practices (MPs) would provide the most benefit. It is anticipated that nutrient standards may be developed for the lakes within this region following a public stakeholder process.

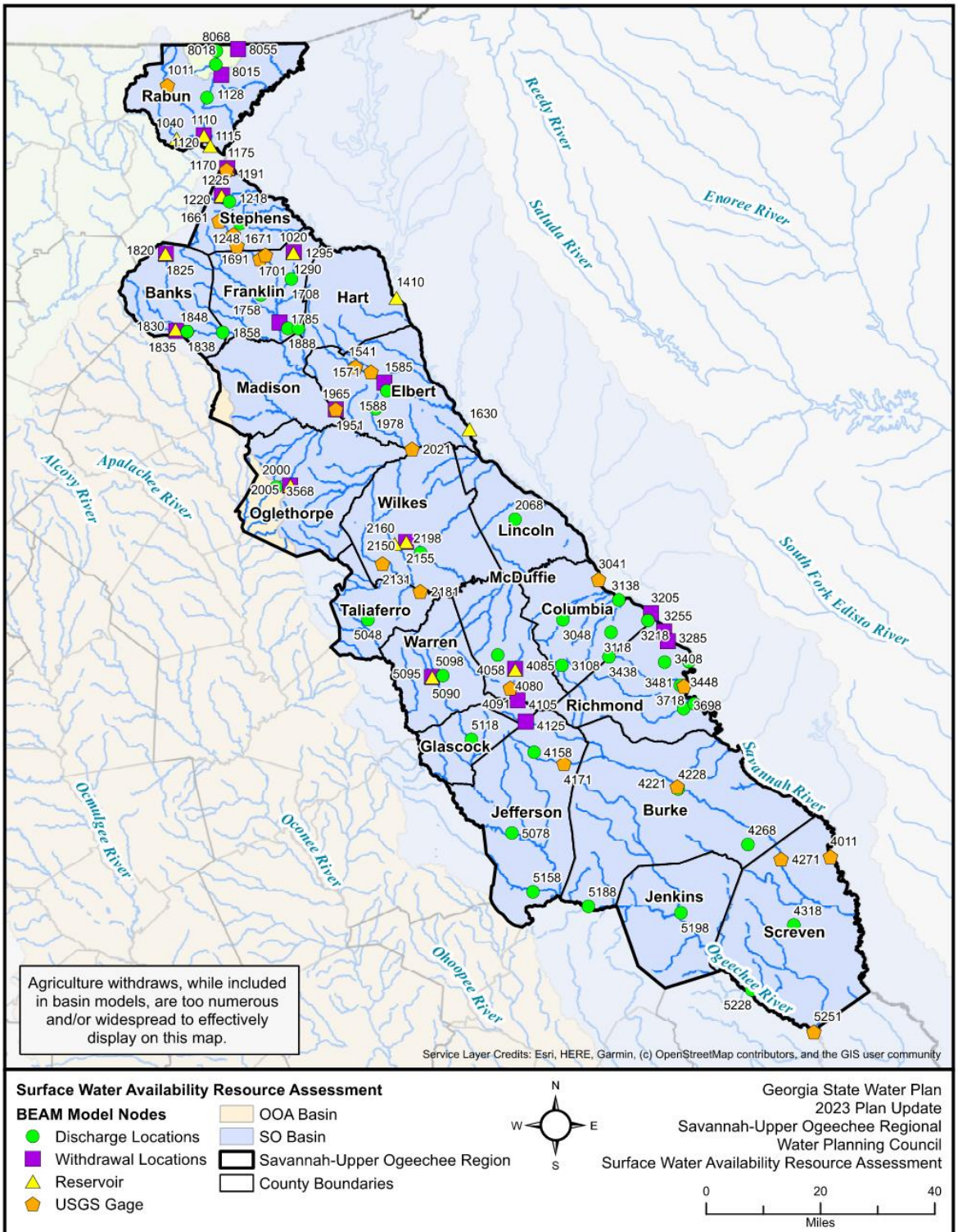
3.2.2 Surface Water Availability

The Surface Water Availability Resource Assessment estimates the ability of surface water resources to meet current municipal, industrial, agricultural, and thermoelectric generation needs, as well as the needs of instream and downstream users. The assessment evaluated the impact of water consumption (withdrawals from a water body that are not returned to that water body) on stream flows at certain locations in each river basin. Modeled stream flows were compared with a flow regime based on low flow thresholds selected as indicators of the potential for water consumption to impact instream uses such as fishing, boating, and aquatic life habitat. For streams where federal requirements for reservoir releases are in place, low flow thresholds have been established through site-specific analysis. In other streams, a low flow threshold from state policy was used. A permitted discharge facility may have its permit limitations determined by State water quality standards (i.e., water quality standards determined effluent limitations). In this situation, there is a regulatory flow threshold that is used in determining what effluent limitations are for various water quality constituents. This regulatory flow threshold is typically 7Q10 at the location of the discharge. By definition, this is a seven-day average flow that is not exceeded 10 percent of the time and may be breached a small percentage of the time under natural conditions. The modeled flow is compared with the flow regime; where the modeled stream flow was less than the flow regime, a potential “challenge” was identified. The potential challenges were analyzed in terms of both magnitude (i.e., the amount by which the modeled stream flow fell below the flow regime) and duration (i.e., the number of days the stream flow fell below the flow regime).

Since the 2017 update, there has been an evolving process in tools used by EPD to assess surface water availability. The model currently used to assess surface water availability is the Basin Environmental Assessment Model (BEAM). This model enables the assessment of river basin resources at spatial scales much finer than the previous models and explicitly represents permitted water withdrawal intakes, water supply reservoirs, refilling pump stations, federal reservoirs, private power generating reservoirs, National Pollution Discharge Elimination System (NPDES) permitted discharging facilities, and long-term USGS gages as nodes or junctions in BEAM. All permitted water withdrawal facilities are incorporated in the BEAM models as junctions where hydrologic information is available.

The Surface Water Availability Resource Assessment was conducted based on river basin boundaries rather than Water Planning Region boundaries. The model contains a more detailed node type representation that takes into account the various types of inputs and outputs throughout the system. (Figure 3-6). The USGS gage nodes are locations along a river where a USGS gauge has provided a long-term record of river flow measurements. Current water withdrawals and returns were calculated with the average 2010 – 2018 water supply needs (i.e., withdrawals and discharges) and authorized reservoir operations to stream flows from 1939 to 2018 at each of these nodes and for both Georgia and South Carolina. The South Carolina water withdrawal and return data was developed in coordination with the South Carolina Department of Health & Environmental Control (SCDHEC) and based on historic data. With information on sequences of inflow, water demand of current or future conditions, permit conditions on instream flow protection, permit limitations, and prescribed reservoir operations, the resulting surface water flows can be modeled and “potential challenges” revealed.

There are currently 13 municipal and 4 industrial withdrawal facilities in the region. There are also 25 municipal and 4 industrial discharge facilities in the region. Modeling of current conditions indicates that there are potential surface water availability challenges at some nodes located in the Region. The model estimates that current off-stream demands cannot be met without causing stream flows to fall below the flow regime during dry periods in the Ogeechee River Basin. Potential challenges are associated with both water supply and wastewater assimilation under current conditions at a number of model (facility) nodes within the region as shown in Table 3-2 and Table 3-3 Challenges to water supply can be caused by source stream inflows being lower than its instream flow protection threshold (IFPT), undetermined reservoir capacities or safe yields, and exhaustion of the water supply storage or inability to refill the water supply reservoirs. Challenges to wastewater assimilation result from the quantity of water withdrawal, quantity of return flow, and changes of such projected for the future. As stated earlier, the regulatory flow used to determine effluent limitations is typically 7Q10 at the point of such a discharge. More detailed information about the modeled potential challenges at these nodes under future conditions is included in Section 5.



Source: Georgia EPD, 2022.

Figure 3-6 Savannah-Ogeechee BEAM Model Schematic

Table 3-2 Summary of Modeled Current Conditions Surface Water Supply Challenges

BEAM Model Node	Length of Challenge (% of total days)	Total Volume Shortage (MG)
1225 (City of Toccoa)	27 (0.10%)	64.0
1785 (City of Royston)	14 (0.05%)	0.21
2005 (City of Crawford)	58 (0.21%)	6.9
4085 (Thomas-McDuffie County Water & Sewer Commission)	50 (0.18%)	24.1
4105 (KaMin, LLC)	154 (0.56%)	63.3
4125 (KaMin, LLC)	9,707 (35.5%)	12,764
Source: Surface Water Availability Resource Assessment (EPD, 2022).		

Table 3-3 Summary of Modeled Current Conditions Wastewater Assimilation Challenges

BEAM Model Node	Length of Challenge (% of total days)	Total Volume Shortage	Corresponding 7Q10 Flow
1128 (City of Clayton (Clayton WPCP))	422 (1.5%)	374 MG	7.8 cfs (4.2 MGD)
1248 (City of Toccoa (Eastanollee Creek WPCP))	473 (1.7%)	243 MG	1.7 cfs (0.91 MGD)
1708 (City of Lavonia (Lavonia WPCP))	693 (2.5%)	120 MG	0.8 cfs (0.43 MGD)
1858 (Banks County Board of Commissioners (Hudson River WPCP))	2,664 (9.7%)	8,599 MG	17 cfs (9.15 MGD)
1978 (City of Elberton (Falling Creek WPCP))	249 (1.1%)	44.7 MG	0.6 cfs (0.32 MGD)
3048 (Columbia County (Kiokee Creek WPCP))	1,312 (4.8%)	270 MG	0.3 cfs (0.16 MGD)
3478 (PCS Nitrogen Fertilizer, L.P. (Augusta))	3,949 (14.4%)	815,613 MG	3,600 cfs (1937 MGD)
3698 (City of Augusta (Spirit Creek WPCP))	649 (2.5%)	870 MG	2.4 cfs (1.29 MGD)
4058 (City of Thomson (Thomson WPCP))	183 (0.7%)	32.1 MG	0.3 cfs (0.16 MGD)
4158 (City of Wrens (Wrens WPCP))	1,378 (5.0%)	353 MG	1.2 cfs (0.65 MGD)
4228 (City of Waynesboro (Brier Creek WPCP))	1,109 (4.1%)	299 MG	1.2 cfs (0.65 MGD)
4268 (City of Sardis (Sardis WPCP))	157 (0.6%)	15.9 MG	0.1 cfs (0.05 MGD)
4318 (City of Sylvania (Sylvania WPCP))	168 (0.6%)	20.9 MG	0.2 cfs (0.11 MGD)
Source: Surface Water Availability Resource Assessment (EPD, 2022).			

It should be noted that due to the utilization of BEAM in resource assessment modeling, some of the previous approaches in expressing potential issues at the planning nodes become obsolete. The resource issues identified previously are now replaced by these new resource assessment results. For example, the exhaustion of storage within a reach or the breaching of instream minimum flow requirements as a way of showing a “potential resource gap” at the planning node representing that reach was previously used. With the new modeling platform, there are now specific facilities for that assessment in lieu of planning nodes. For example, where there is a shortage identified in meeting water demand at a specific surface water withdrawal facility, that is now referred to as a water supply challenge under the new modeling approach.

3.2.3 Current Groundwater Availability

The Groundwater Availability Resource Assessment (EPD, 2010 and 2017) estimates the sustainable yield for prioritized groundwater resources based on existing data. EPD prioritized the aquifers based on the characteristics of the aquifer, evidence of negative effects, aquifer availability and anticipated use, and other considerations. This assessment identified the sustainable yield, or a range of groundwater rates of withdrawal, without causing adverse impacts (such as 30-feet drawdown between pumping wells that limits use of neighboring wells, groundwater levels do not go below top of confining layer, reduction in aquifer storage does not go beyond a new base level, reducing groundwater stream baseflow, and continual declines in groundwater levels). If negative impacts occur or are expected to occur, then a groundwater “challenge” exists. The Savannah-Upper Ogeechee Region will coordinate usage with other water planning regions to meet the sustainable yield for each groundwater source.

The primary sources of groundwater in the Savannah-Upper Ogeechee Region are the Cretaceous aquifer, Crystalline Rock aquifer, and Floridan aquifer. In 2015, groundwater was relied upon to meet about 31% of the water use in the region (USGS, 2019). The current demand from the Cretaceous aquifer within the Savannah-Upper Ogeechee Region is 54 MGD in 2020 which is projected to increase by 2 MGD to 56 MGD in 2060. The 2060 projected demand is well within the low end of the sustainable yield (347 MGD) of the Cretaceous aquifer. The current demand from the Crystalline Rock aquifer within the Savannah-Upper Ogeechee Region is 2.8 MGD in 2020 which is projected to increase by 2.1 MGD to 4.9 MGD in 2060. The 2060 projected demand is well within the low end of the sustainable yield of the Crystalline Rock aquifer (20 MGD) in the Blue Ridge region. The current demand from the Floridan aquifer within the Savannah-Upper Ogeechee Region is 39 MGD in 2020 which is projected to increase by 9 MGD to 48 MGD in 2060. The 2060 projected demand is well within the low end of the sustainable yield (868 MGD) of the Floridan aquifer in South Central Georgia and Coastal Plain. Overall, the results from the Groundwater Availability Resource Assessment indicate that on a regional basis, for the prioritized aquifers, there is sufficient groundwater supply to meet current needs.

Burke, Jenkins, and Screven counties in the Savannah-Upper Ogeechee Region are subject to the Coastal Georgia Water and Wastewater Permitting Plan for Managing Salt Water Intrusion (Coastal Permitting Plan). These counties fall within the Green Zone. Per the Coastal Permitting Plan, there are no pumping restrictions from the Floridan aquifer in the Green Zone; however, there are water conservation requirements related to groundwater withdrawals.

3.3 Current Ecosystem Conditions and Instream Uses

The water resources of the region serve multiple purposes, including recreation and tourism, and support a great diversity of fish and wildlife. EPD has classified all of the streams in the region as fishing, except for the streams listed in Table 3-4.

Table 3-4 Special Stream Classifications[1]

Stream	Reach	Classification
Beaverdam Creek	Confluence with Little Beaverdam Creek to Carters Creek	Drinking Water
Beaverdam Creek (Lake Boline)	Headwaters to confluence with Little Beaverdam Creek (including Lake Boline)	Drinking Water
Black's Creek	Headwaters to confluence with Little Tennessee River	Drinking Water
Brier Creek	Walnut Branch to Fitz Creek	Drinking Water
Grove Creek	Headwaters to confluence with Hickory Level Creek	Drinking Water
Little Beaverdam Creek	Headwaters to confluence with Beaverdam Creek	Drinking Water
Mud Creek	Headwaters to confluence with Little Tennessee River	Drinking Water
North Fork Broad River	Confluence with Double Branch to confluence with Middle Fork Broad River	Drinking Water
Oconee River	Sinclair Dam to Fishing Creek	Drinking Water
Oconee River	Oochee Creek to Long Branch	Drinking Water
Ogeechee River	U.S. Hwy. 17 Bridge to Open Sea and littoral waters of Skidaway, Ossabaw, Sapelo, and St. Catherines Islands	Recreation
Rocky Comfort Creek	Headwaters to confluence with Whetstone Creek	Drinking Water
Sherrills Creek	Headwaters to confluence with South Fork Little River (including Sherrills Reservoir)	Drinking Water
Sweetwater Creek	Headwaters to confluence with Brier Creek (including Usry Lake)	Drinking Water

Source: EPD Rule 391-3-6-.03 Designated Uses and Water Quality Standards (2022).
Note:
[1] All streams in the region are classified as "Fishing" except for the streams listed above.

3.3.1 Monitored and Impaired Water

EPD assesses water bodies for compliance with water quality standards as required by the Clean Water Act and monitors streams throughout the state and publishes the results every other year. If an assessed water body is found not to meet standards, it is considered "not supporting" its designated use and is included on a list of impaired waters, also known as the 303(d) list. Impairments can be based on various parameters such as DO, fecal coliform, copper, biota aquatic species), fish consumption guidance, pH, and toxicity. Impairments must be addressed through the development of a Total Maximum Daily Load (TMDL), which sets a pollutant budget and outlines strategies for corrective action. A TMDL is defined by the U.S. Environmental Protection Agency (USEPA) as a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. Based on the assessment conducted in 2022, 687 miles of the streams

evaluated in the region are supporting their designated use (133 reaches), 1,135 miles are not supporting their designated use (163 reaches), and 111 miles are pending assessment (23 reaches). There are 4 lakes in the region that are supporting their designated use (70,156 acres), 6 lakes are not supporting their designated use (totaling 86,955 acres), and 1 lake pending assessment (240 acres).

Of the impaired reaches in the region (note that a reach may be impaired for more than one parameter):

- 45% are impaired for Biological (Fish Community)
- 39% are impaired for fecal coliform
- 12% are impaired for Biological (Macroinvertebrate Community)
- 10% are impaired for trophic-weighted residual mercury in fish tissue
- 4% are impaired for pH
- 2% are impaired for low dissolved oxygen
- 2% are impaired for Ammonia Toxicity
- 2% are impaired for copper
- 1% are impaired for trophic-weighted residual thallium in fish tissue
- <1% are impaired for trophic-weighted residual PCBs in fish tissue
- <1% are impaired for trophic-weighted residual selenium in fish tissue
- <1% are impaired for Tetrachloroethylene and Vinyl Chloride

The lakes in the region are impaired for trophic-weighted residual mercury, PCBs, thallium and selenium in fish tissue and pH. TMDLs have been completed for 124 of the impaired stream reaches and 1 of the impaired lakes. Figure 3-7 highlights the locations of the impaired stream segments and lakes in the region. A full list of impaired waters can be found on the EPD website (epd.georgia.gov/georgia-305b303d-list-documents). This list is updated every two years by EPD; the above information is based upon the 2022 list.

Stakeholders including Georgia EPD, SCDHEC, USEPA, and the Savannah River/Harbor Discharger Group collaboratively developed an implementation plan to meet applicable water quality standards for the Savannah River Basin, including the Savannah Harbor. Following development of the plan, and reclassification of the Savannah Harbor to Category 5R on the 2014 305(b)/303(d) list, the USEPA withdrew the TMDL for the Savannah Harbor in favor of the alternative restoration approach outlined in the plan.

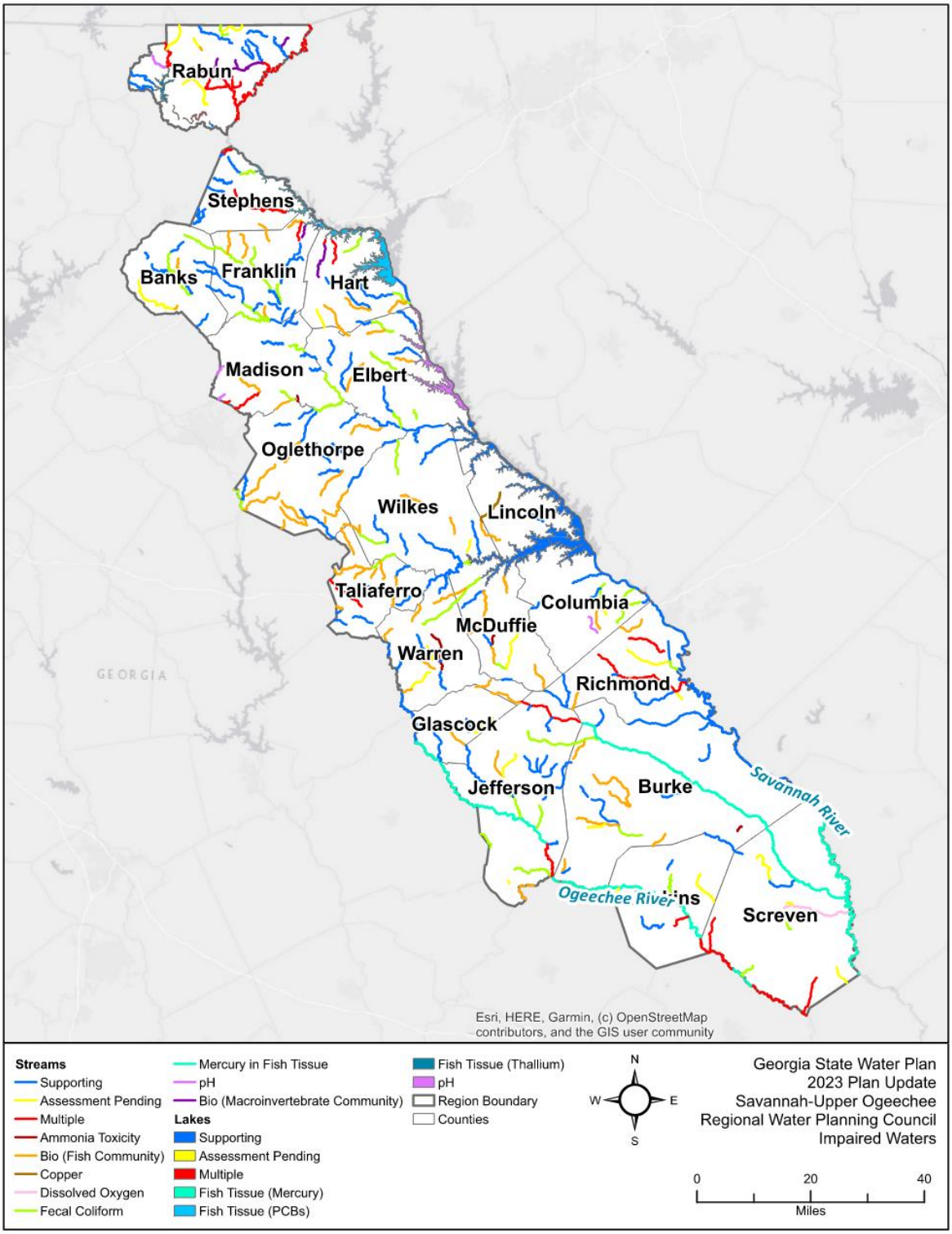


Figure 3-7 Savannah Upper Ogeechee Region Impaired Waters

3.3.2 Priority Conservation Areas

High priority waters for protecting aquatic biodiversity were identified as part of a larger effort by the Georgia Department of Natural Resources (DNR) to develop a comprehensive wildlife conservation strategy for Georgia. The streams included on the final priority list are those that have been identified as a high priority for restoration, preservation, or other conservation activity. Although the individual stream reaches were the basis for the selection process, a large portion of the region was identified as a high priority watershed. Protecting the entire watershed is the only way to protect these high priority waters. The high priority waters and watersheds for the Savannah-Upper Ogeechee Water Planning Region were identified in the Georgia DNR 2005 State Wildlife Action Plan and 2005 Comprehensive Wildlife Conservation Strategy. Table 3-5 demonstrates the high priority waters identified in 2005 Comprehensive Wildlife Conservation Strategy. The State Wildlife Action Plan was revised in 2015 and conservation efforts focused on high priority watersheds instead of high priority waters. The State Wildlife Action Plan (2015) identified 56 additional “significant” high priority watersheds in Georgia. There are 29 high priority watersheds located in the Savannah-Upper Ogeechee Region which are shown in Figure 3-8. Watersheds are classified as high priority due to important coastal habitats, critical habitat or a recent occurrence species listed under the federal Endangered Species Act, migratory corridor, or ecological drainage units that were poorly represented in the dataset. Further information may be found at georgiawildlife.com/WildlifeActionPlan.

Table 3-5 High-Priority Waters in the Savannah-Upper Ogeechee Region

Savannah River Basin		
Classification	Stream Name	County
High Priority Species/ Aquatic Community Stream	Long Creek	Oglethorpe/Wilkes
	Broad River	Franklin/Madison/Elbert/Oglethorpe/Wilkes
	Savannah River	Columbia/Richmond/Burke/Screven/Effingham/Chatham
	Brier Creek	Warren/McDuffie/Jefferson/Richmond/ Burke/Screven
	Brushy Creek	Jefferson/Burke
	Sandy Run Creek	Columbia/Richmond/Burke
	Reedy Creek	Jefferson/Glascock/Warren
	Boggy Gut Creek	McDuffie/Richmond/Jefferson
High Priority Aquatic Community Stream	McBean Creek	Burke
	Chattooga River	Rabun
	Moccasin Creek	Rabun
Ogeechee River Basin		
High Priority Species/ Aquatic Community Stream	Ogeechee River	Chatham/Bryan/Effingham/Bulloch/Screven
	Williamson Swamp	Washington/Jefferson
High Priority Aquatic Community Stream	Hannah Branch	Jefferson
Tennessee River Basin		
High Priority Species/ Aquatic Community Stream	Betty Creek	Rabun
Source: Georgia Comprehensive Wildlife Conservation Strategy (Georgia DNR, 2005).		

Figure 3-8 Savannah Upper Ogeechee Region Priority Watersheds

3.3.3 Wildlife and Fisheries Resources

Currently, there are 18 federally listed species in the Savannah River Basin: five federally threatened and 13 federally endangered. In addition, there are 55 species that are either state-listed or of special concern: 20 threatened or endangered, ten considered rare, and four listed as unusual and deserving of special consideration. In August 2017, NOAA finalized a rule that designated the Savannah River as critical habitat for Atlantic sturgeon. Water planning efforts must consider the protection of these species.

The DNR stocks trout in Rabun, Stephens, and Hart Counties and there are other stream segments in the basin designated as trout streams. Lake Burton, Hartwell, Richard B. Russell, and Thurmond also support popular sport fisheries. Some of the most sought-after sport fish in the region include largemouth, striped, and redeye bass, bluegill, sunfish, crappie, catfish, and pickerel. The Richmond Hill State Fish Hatchery is downstream in the Ogeechee River basin. The Burton Trout Hatchery and the McDuffie Public Fishing Area are in the Savannah River basin. Striped bass stocks were declining in the mid-1980s and are now stocked from the Richmond Hill Hatchery. The endangered robust redhorse fish, once thought extinct, was found in the Savannah River shoals in 1997 and a recovery program is underway. Below Augusta, the Savannah River has a strong sport fishery. The Ogeechee River, stocked with striped bass from the Richmond Hill Hatchery, also provides excellent fishing opportunities.

The Savannah and Ogeechee Rivers also support dense populations of diverse native freshwater mussels in Georgia. Two particularly rare mussels in the region are the Atlantic pigtoe and the Savannah lilliput.

SECTION 4

Forecasting Future Water Resource Needs

Section 4 Forecasting Future Water Resource Needs

Water demand and wastewater flow forecasts, along with Resource Assessments (Section 3), form the foundation for water planning in the Savannah-Upper Ogeechee Region and serve as the basis for the selection of water management practices (Section 6). This section presents the regional water and wastewater forecasts from 2020 through 2060 for four water use sectors: municipal, industrial, agricultural, and thermoelectric power generation.

Summary

From 2020 to 2060, community growth in the region will increase population by 11 percent. Water demands will increase by 33%, from 404 MGD to 537 MGD. Concurrently, regional wastewater needs will increase by 23%, from 183 MGD to 224 MGD.

The methodology to forecast water and wastewater demands is based primarily on the assumption that there will be a continuation of existing trends and practices. It does not make a determination regarding the efficiency or inefficiency of forecasted demands, only that they are expected to occur given current trends. Initial forecasting does not take into account management practices, including water conservation (other than passive conservation as described in more detail below) that may be adopted by Regional Water Planning Councils to reduce the expected magnitude of demand (see Sections 6-8 for additional details on water conservation and other management practices). Additionally, this forecasting effort does not change EPD requirements related to individual permitting decisions but represents a forecast for regional water planning that will help guide permitting and funding decisions.

During development of the Regional Water Plan, there was a concerted effort to strike a balance between broad coverage and local data by using consistent data collection on a regional basis modified as appropriate with local provider input. These data and resulting forecasts are not applicable between regions or between providers within the region.

4.1 Municipal Forecasts

Municipal water includes water supplied to residences, commercial businesses, and small industries (water use by higher water-using industries are forecasted separately and those major industrial sectors are identified in Section 4.2). Residential water uses include water for normal household purposes: cooking, bathing, and clothes washing, among others. Commercial water uses include water used by hotels, restaurants, retail stores, and office buildings, among others. Municipal water demands may be served by public water systems, private water systems, or self-supplied by the user (such as individual wells).

4.1.1 Population Projections

Municipal water and wastewater forecasts are closely tied to population projections for the counties within the Savannah-Upper Ogeechee Region. The population projections were developed by the Georgia Governor's Office of Planning and Budget, which is charged in State law (O.C.G.A. § 45-12-171) with the responsibility for preparing, maintaining, and furnishing

official demographic data for the State. The population projections by county for the planning period are shown in Table 4-1.

Table 4-1 Population Projections by County

County	2020	2030	2040	2050	2060	Difference (2020 - 2060)	% Increase (2020 - 2060)
Banks	19,982	24,827	28,650	32,701	37,420	17,438	87.3%
Burke	22,342	22,600	22,350	21,841	21,695	-647	-2.9%
Columbia	158,631	177,910	185,922	188,389	187,389	28,758	18.1%
Elbert	18,945	18,581	17,982	17,304	16,913	-2,032	-10.7%
Franklin	23,329	25,652	27,876	30,277	33,246	9,917	42.5%
Glascock	3,025	3,065	2,911	2,628	2,315	-710	-23.5%
Hart	26,107	26,772	27,170	27,657	28,635	2,528	9.7%
Jefferson	15,313	14,828	14,146	13,405	12,909	-2,404	-15.7%
Jenkins	8,576	8,044	7,419	6,838	6,371	-2,205	-25.7%
Lincoln	8,125	8,534	8,086	7,465	7,096	-1,029	-12.7%
McDuffie	30,177	33,121	36,518	40,691	46,076	15,899	52.7%
Madison	21,597	21,951	22,058	22,054	22,403	806	3.7%
Oglethorpe	15,240	16,237	17,242	18,353	19,824	4,584	30.1%
Rabun	16,986	17,641	18,198	19,221	20,867	3,881	22.8%
Richmond	202,240	204,904	202,735	198,965	197,404	-4,836	-2.4%
Screven	13,900	13,558	12,902	12,238	11,860	-2,040	-14.7%
Stephens	26,328	27,927	29,381	31,126	33,544	7,216	27.4%
Taliaferro	1,632	1,609	1,452	1,283	1,143	-489	-30.0%
Warren	5,210	5,002	4,816	4,639	4,601	-609	-11.7%
Wilkes	10,014	10,037	9,302	8,295	7,483	-2,531	-25.3%
Total	**647,699**	**682,800**	**697,116**	**705,370**	**719,194**	**71,495**	**11.0%**

Source: Governor's Office of Planning and Budget, 2019.

4.1.2 Municipal Water Demand Forecasts

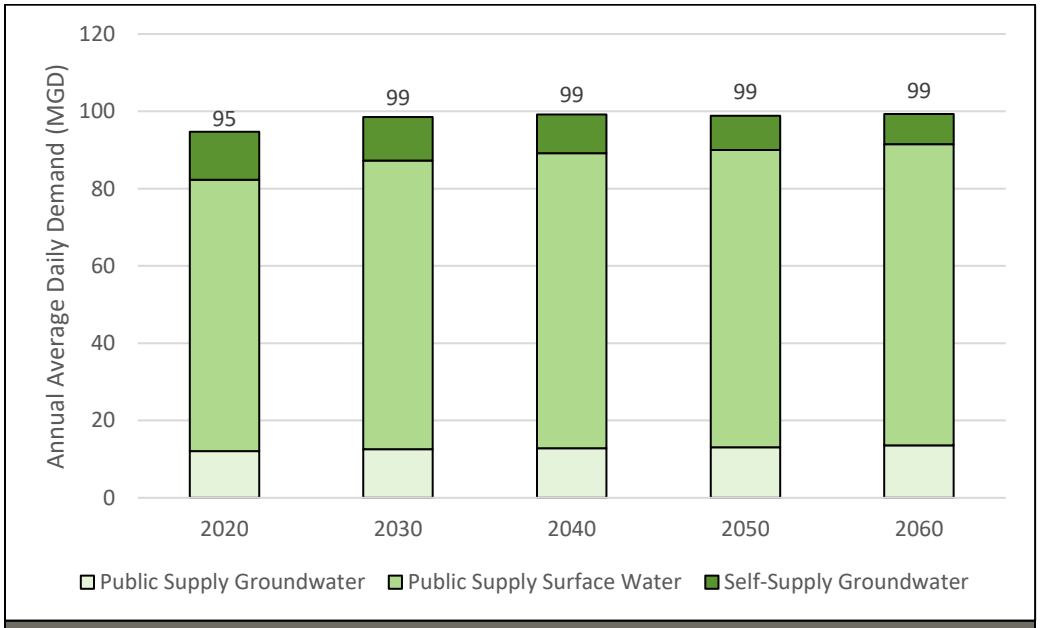
Municipal water demand forecasts were calculated by multiplying the per capita water use by the population served. Per capita water use rates are different for public water systems in comparison to self-supplied water use; therefore, the demands are calculated separately and then summed together. The publicly supplied water use rate was determined for each county within the region. The self-supply per capita demand is estimated at 75 gallons per capita per day (gpcd).

To support this Plan update, EPD reviewed water loss audit data, where it was available, as well as data on reported withdrawals and the estimated population served reported by permitted municipal water systems from the years 2015 through 2018. A weighted average was then

calculated for each county using those data for the public-supplied municipal demand within the county. The self-supplied per capita values remained unchanged.

The municipal water use rates for the Savannah-Upper Ogeechee Region were also adjusted based on two plumbing code changes that mandate new water saving lavatory fixtures. The National Energy Policy Act of 1992 reduced the maximum toilet flush volume from 3.5 to 1.6 gallons per flush (gpf) for all toilets available in the U.S. starting in 1994. The Georgia Water Stewardship Act of 2010 reduces the maximum flush volume to 1.28 gpf for all new toilets installed in Georgia after July 1, 2012. As new homes are constructed and less efficient toilets are replaced within existing housing stock, the water use rate is reduced over time. Additional information on plumbing code efficiency adjustments and rationale for per capita water use is available in the Savannah-Upper Ogeechee Water and Wastewater Forecasting Technical Memorandum (CDM Smith, 2022).

Although the assumed plumbing improvements lowered future per capita water use rates, the total municipal water need increases from 95 MGD in 2020 to 99 MGD in 2060 as a result of population growth and increased urbanization. Total regional municipal water demands are shown in Figure 4-1 for the Savannah-Upper Ogeechee Region. In addition, this figure shows the demands by public water systems and self-supply users. In the Savannah-Upper Ogeechee Region, municipal water demands are satisfied by utilizing groundwater and surface water as sources for withdrawals.



Source: Savannah-Upper Ogeechee Water and Wastewater Forecasting Technical Memorandum (2022).
Note: Values represent forecasted annual average demand (AAD) in million gallons per day (MGD).

Figure 4-1 Municipal Water Forecast (in AAD-MGD)

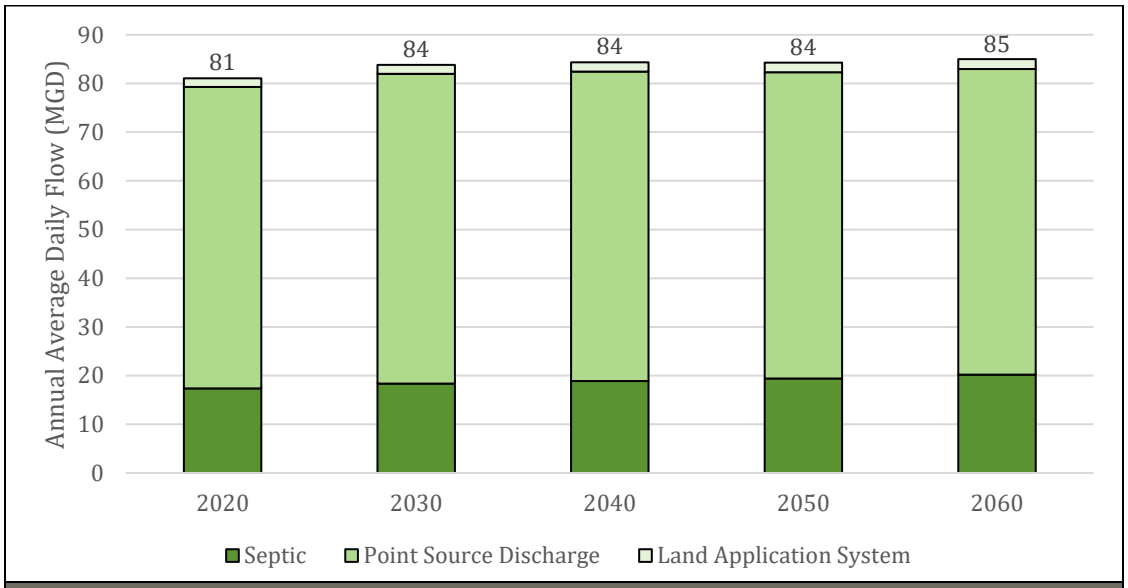
4.1.3 Municipal Wastewater Flow Forecasts

Municipal wastewater may be treated by centralized treatment plants or onsite sanitary sewage (septic) systems. Wastewater effluent flow from centralized treatment facilities is either discharged as a point source to a receiving water body or delivered to a land application system (LAS). EPD permit data as well as feedback from municipal suppliers were used to determine the volume of discharge from centralized treatment and the ratio of point discharge to land application system for each county.

U.S. Census data on the percent of households with septic systems were obtained by county. For planning purposes, it was assumed that households with septic systems use 75 gallons per capita per day and that 80 percent of this water use is disposed of via septic system. The estimated septic flow was based on the updated (2019) OPB county population projections for each planning year (2020, 2030, 2040, 2050, and 2060).

Reported centralized wastewater flows from 2019 EPD permits, including point discharges and LAS, were adjusted over time by the change in county population projections. The ratio of point discharge to LAS remained the same for the future years. Municipal wastewater forecasts are shown in Figure 4-2. Septic systems account for approximately 20 percent of the 2020 wastewater generation in the Savannah-Upper Ogeechee Water Planning Region. Despite efforts to extend sewer service in some counties, the presence of septic systems will remain relatively steady for counties with lower population densities.

The total municipal wastewater flows are estimated to increase from 81 MGD in 2020 to 85 MGD in 2060.



Source: Savannah-Upper Ogeechee Water and Wastewater Forecasting Technical Memorandum (2022).
Note: Values represent forecasted annual average demand (AAD) in million gallons per day (MGD).

Figure 4-2 Municipal Wastewater Forecast (in AAD-MGD)

4.2 Industrial Forecasts

Industrial water demand and wastewater flow forecasts anticipate the future needs for the major water using industries including paper and forestry products, food processing, manufacturing, and mining. Industries require water for their production processes, sanitation, cooling, and other purposes. The industrial forecasts were previously based on either production or employment, depending on the available information. The current industrial water need was determined through permit information and representative input from each industrial sub-sector (paper and forestry products, food processing, manufacturing, and mining).

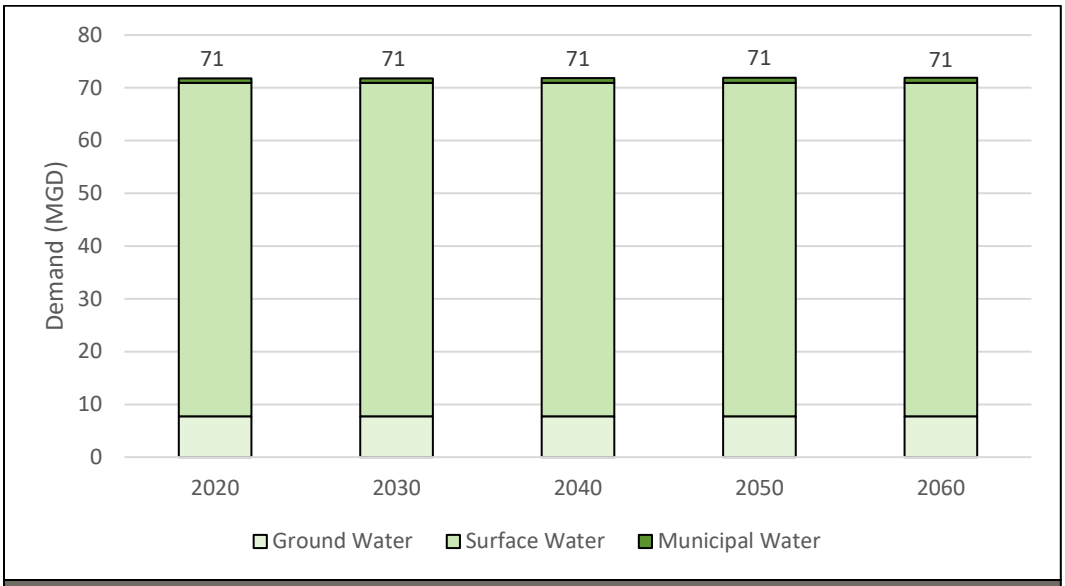
Industrial water demand and wastewater generation forecasts in this section include both publicly supplied and self-supplied industries. While many industries supply their own water and/or treat their own wastewater, some industries are supplied by public water systems and/or send their wastewater to a public treatment plant.

4.2.1 Advisory Group Review Process

EPD identified experts throughout the State of Georgia to form an industrial stakeholder advisory group representing the state's thirteen largest industrial sectors. Through the advisory group's review of the previous methodology, it was determined that employment projections were no longer a valid basis for estimating future industrial water requirements as increased automation has reduced the number of employees per unit of production, and water use per employee. The advisory group subsequently formed sub-sector advisory groups to review water trends and investigate a variety of considerations for paper and forestry products, food processing, manufacturing, and mining industries. Both common and sector-specific conclusions were determined.

4.2.2 Industrial Water Demand Forecasts

In addition to sub-sector advisory group feedback, confidential trade association surveys were collected for additional input. This information was used in conjunction with municipal water purchases and facility withdrawal permit information to develop the industrial water withdrawals forecast by county and sub-sector. The average water withdrawal from 2010 to 2019 for the majority of industrial facilities was used as the basis for projected water use. Figure 4-3 shows the industrial water forecast over the planning period. Water withdrawals are assumed to remain constant over time for all sub-sectors except for a slight increase in water demand for food processing.



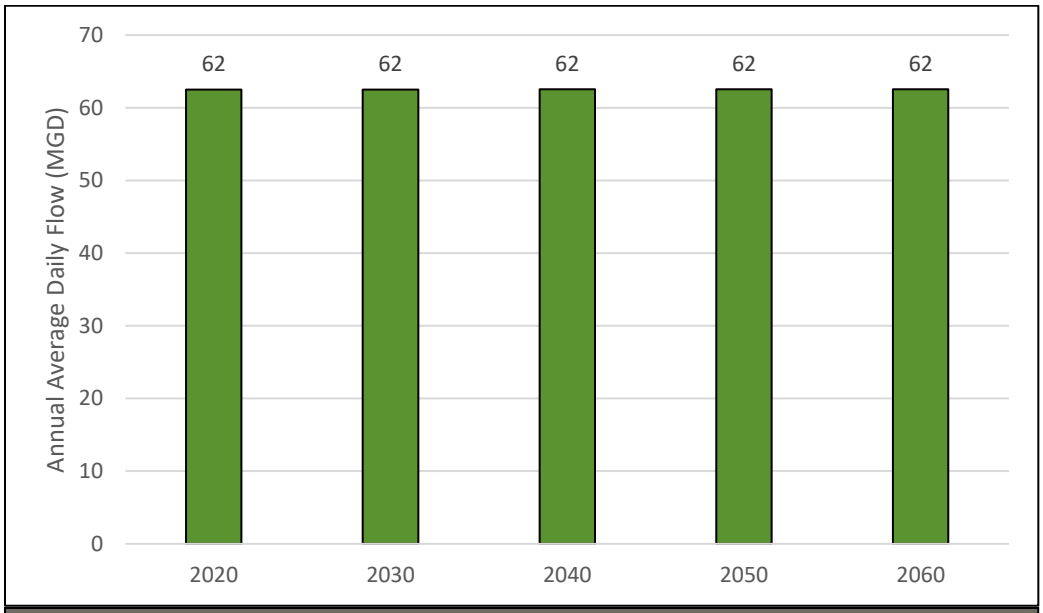
Source: Savannah-Upper Ogeechee Water and Wastewater Forecasting Technical Memorandum (2022).
Note: Values represent forecasted annual average demand (AAD) in million gallons per day (MGD).

Figure 4-3 Industrial Water Forecast (in AAD-MGD)

4.2.3 Industrial Wastewater Flow Forecasts

Similar to the industrial water forecast, the industrial wastewater forecast is estimated using facility discharge permit information from 2015 to 2019. Trade association surveys also reported industrial discharges, however, the information was limited to 2019 data in some cases. It should be noted that permitted stormwater discharges from mining operations have been excluded from the industrial wastewater data because stormwater is accounted for in the resource assessment from precipitation data. Note that some operations may recycle stormwater discharges resulting in a decrease in water withdrawal in wet months. Discharges are assumed to remain constant over time for all sub-sectors except for a slight increase for food processing.

Once the industrial wastewater flows were estimated, flows were separated between point discharges or land application based on EPD permit data, or discharges to municipal treatment facilities based on survey information. This allows the planning regions to account for flows discharging to surface water bodies. Figure 4-4 shows the industrial wastewater flow forecasts by the anticipated disposal system type: industrial wastewater treatment (point discharge), LAS, or discharge for municipal wastewater treatment. In the Savannah Upper Ogeechee, industrial wastewater discharges are more than 99 percent point discharges. Thus, the LAS and municipal discharges are not visibly displayed in Figure 4-4.



Source: Savannah-Upper Ogeechee Water and Wastewater Forecasting Technical Memorandum (2022)
Note: Values represent forecasted annual average demand (AAD) in million gallons per day (MGD)

Figure 4-4 Industrial Wastewater Forecast (in AAD-MGD)

4.3 Agricultural Forecasts

The agricultural water use forecasts include irrigation demands for both crop and non-crop uses (i.e., livestock, nurseries, and golf courses). The crop forecasts, developed by the Georgia Water Planning & Policy Center at Albany State University (GWPPC), with support from UGA's College of Agricultural and Environmental Sciences for 2020 through 2060, provide a range of irrigation water use from dry to wet climate conditions based on the acres irrigated for each crop. The projections cover row and orchard crops as well as most vegetable and specialty crops accounting for more than 95 percent of Georgia's irrigated land. Additionally, estimates of current use are made for animal agriculture, horticultural nurseries and greenhouses, as well as golf courses. Table 4-2 shows a drier-than-normal year crop irrigation water demand for each county.

The bulk of agricultural water needs are located in the southern part of the region, in Burke, Jefferson, Jenkins, and Screven counties. While agricultural water needs are known to fluctuate substantially throughout the year, the annual averages are presented so that suitable comparisons may be made with other demand sectors. A 19% increase in agricultural water demand is projected by 2060 for the Savannah-Upper Ogeechee Region. The largest increase in forecasted demand occurs in Screven County, with a 35% increase by 2060. Jenkins, Richmond, and Jefferson Counties have the next largest forecasted demand increases at 25%, 24% and 20%, respectively. All other counties in the region are forecasted to have increases of less than 20% through 2060.

Table 4-2 Agricultural Water Forecasts by County (in AAD-MGD)

County	2020	2030	2040	2050	2060	% Increase (2020 to 2060)
Banks	0.67	0.67	0.67	0.67	0.67	0%
Burke	39.89	41.04	42.52	44.17	45.95	15%
Columbia	1.27	1.27	1.27	1.27	1.27	0%
Elbert	0.88	0.88	0.88	0.91	0.90	2%
Franklin	1.43	1.43	1.43	1.45	1.44	1%
Glascock	0.24	0.26	0.26	0.29	0.28	15%
Hart	3.36	3.37	3.39	3.41	3.43	2%
Jefferson	24.30	25.15	26.32	27.55	29.14	20%
Jenkins	11.60	12.29	12.94	13.68	14.46	25%
Lincoln	0.12	0.12	0.12	0.12	0.12	0%
Madison	0.92	0.92	0.92	0.92	0.92	0%
McDuffie	6.20	6.21	6.22	6.26	6.24	1%
Oglethorpe	3.46	3.46	3.46	3.64	3.47	0%
Rabun	0.84	0.85	0.85	0.85	0.85	0%
Richmond	1.06	1.10	1.17	1.10	1.32	24%
Screven	29.58	31.70	34.10	36.98	40.01	35%
Stephens	0.45	0.45	0.45	0.45	0.45	0%
Taliaferro	0.06	0.06	0.06	0.13	0.06	0%
Warren	0.22	0.23	0.24	0.25	0.25	13%
Wilkes	1.77	1.77	1.77	1.77	1.77	0%
Total	**128.3**	**133.2**	**139.1**	**145.9**	**153.0**	**19%**

Source: Savannah-Upper Ogeechee Water and Wastewater Forecasting Technical Memorandum (2022).
Notes: Crop demands represent dry year conditions, in which 75% of years had more rainfall and 25% of years had less. Agricultural withdrawals (crop and non-crop) are supplied by groundwater and surface water. AAD-MGD: average annual demand represented as million gallons per day.

4.4 Water for Thermoelectric Power Forecasts

Thermoelectric power water withdrawal and consumption demands were developed for the State of Georgia based on forecasted power generation needs and assumptions regarding future energy generation processes.

The forecast analysis covers both water withdrawal requirements and water consumption associated with energy generation. Information related to water withdrawals is an important consideration in planning for the water needed for energy production. However, water consumption is also an important element when assessing future resources because a large volume of water is typically returned to the environment following the energy production process.

The energy sector represents a significant portion of surface water demand in the Savannah-Upper Ogeechee Region. Plant Vogtle, located in Waynesboro in Burke County, is one of Georgia Power Company's two nuclear facilities and is the only major water user for thermoelectric power

generation in the Savannah Upper-Ogeechee Water Planning Region. Its two existing units can generate 2,217 megawatts. Construction of two additional units (with additional capacity of 2,204 megawatts) is underway. In 2020, Plant Vogtle withdrew approximately 110 MGD (from the Savannah River) and returned 39.5 MGD on an annual average daily basis, effectively consuming 70.5 MGD of water. Based on the assumption that all four units will continue to be in operation through the year 2060, the region's total water withdrawal need for the energy sector is estimated to be 213.9 MGD in 2060; the respective consumptive water need is estimated to be 137.3 MGD (Table 4-3).

Table 4-3 Energy Sector Water Demand Forecast (in AAD-MGD)

Demand Type	Savannah Upper Ogeechee Region (MGD-AAD)				
	2020	2030	2040	2050	2060
Existing and Planned Facilities' Withdrawals	110.0	213.8	213.9	213.9	213.9
Existing and Planned Facilities' Consumption	70.5	137.2	137.2	137.2	137.3

Source: Savannah-Upper Ogeechee Water and Wastewater Forecasting Technical Memorandum (2022).
AAD-MGD: average annual demand represented as million gallons per day

Within the previous statewide analysis, the generating capacity of the existing and planned facilities was not able to meet the projected statewide power needs through 2050 and additional generating capacity was assumed to be developed beyond 2020. The Savannah Upper-Ogeechee Region had assumed a portion of this future generation could occur in their region. In the updated analysis, it was determined that planned generation levels will be sufficient enough to meet the expected need up to 2036. Because coal-fired generation is expected to decline and expire by 2040, renewable and natural gas-fired facilities will be increased to generate the additional energy required to meet the expected demand. Plant Vogtle is assumed to provide steady power generation throughout the planning horizon, therefore the anticipated water demand is expected to remain the same.

4.5 Total Water Demand Forecasts

In total, the water needs of the region increase steadily through the planning period from approximately 404 MGD in 2020 to an estimated 537 MGD in 2060. Water demand for the energy sector will be the largest when Plant Vogtle Units 3 and 4 are on-line, followed closely by agriculture and municipal water demands (Figure 4-5). Municipal and agricultural water demands are projected to increase moderately by 2060, while energy sector water demands are projected to increase more dramatically.

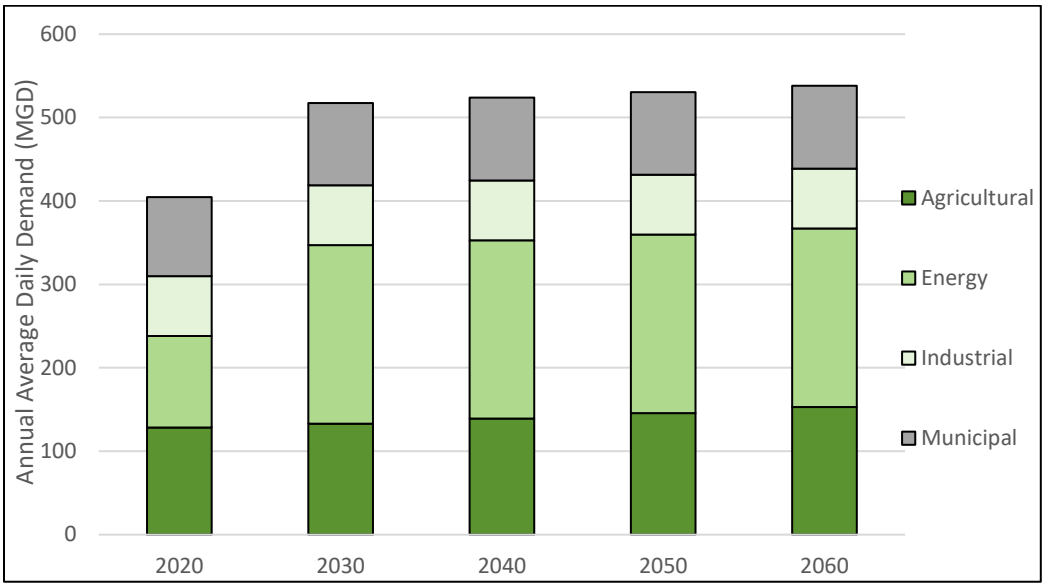
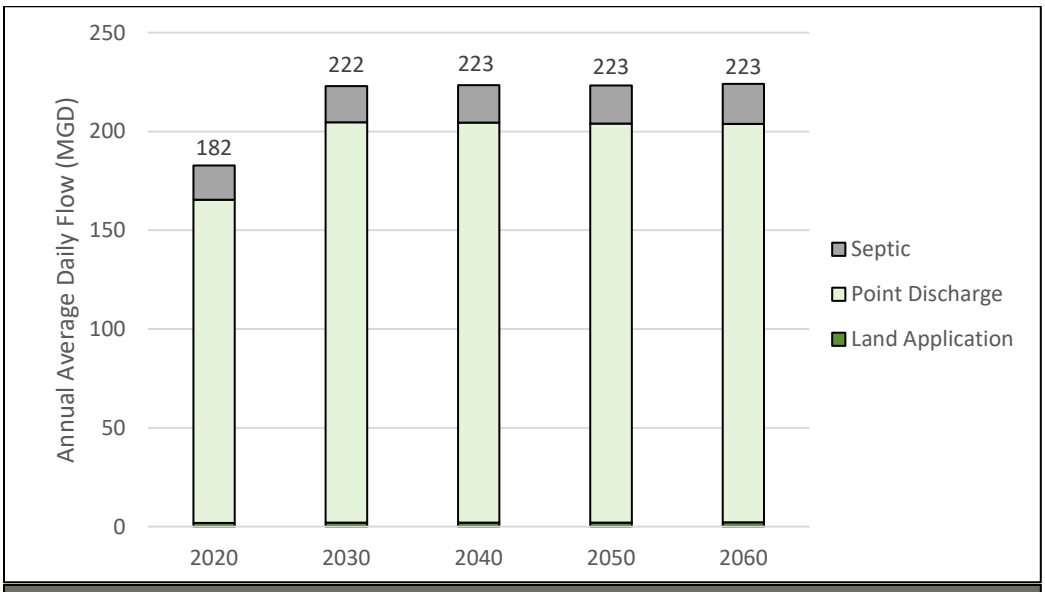


Figure 4-5 Water Demand per Sector (in AAD-MGD)

The region's wastewater returns increase from approximately 182 MGD to 223 MGD in the same 40-year planning period (Figure 4-6). The region's wastewater returns are much lower than its withdrawals because of the consumptive use for the energy production and negligible agricultural returns. Strategic planning for future wastewater management will be essential in protecting the region's surface water quality.



Source: Savannah-Upper Ogeechee Water and Wastewater Forecasting Technical Memorandum (2022).
Note: Values represent forecasted annual average demand (AAD) in million gallons per day (MGD).

Figure 4-6 Total Wastewater Forecasts (in AAD-MGD)

SECTION 5

Comparison of Available Resource Capacity and Future Needs

Section 5 Comparison of Available Resource Capacity and Future Needs

Summary

Over the planning period, potential surface water flow regime challenges (not meeting instream flow targets) are modeled to occur in the region.

For modeled aquifers, no groundwater resource shortfalls are expected to occur over the planning horizon.

Assimilative capacity assessments indicate the need for advanced treatment in several streams, including continued efforts to implement the alternative restoration plan for the Savannah Harbor.

This Section summarizes the potential water resources management issues for the Savannah-Upper Ogeechee Water Planning Region. The potential challenges – areas where future demands exceed the estimated capacity of the resources – have been determined by expanding the Baseline Resource Assessments (Section 3) with the water demand and wastewater flow forecasts (Section 4). These challenges will be addressed through the selected management practices (Section 6).

5.1 Groundwater Availability Comparisons

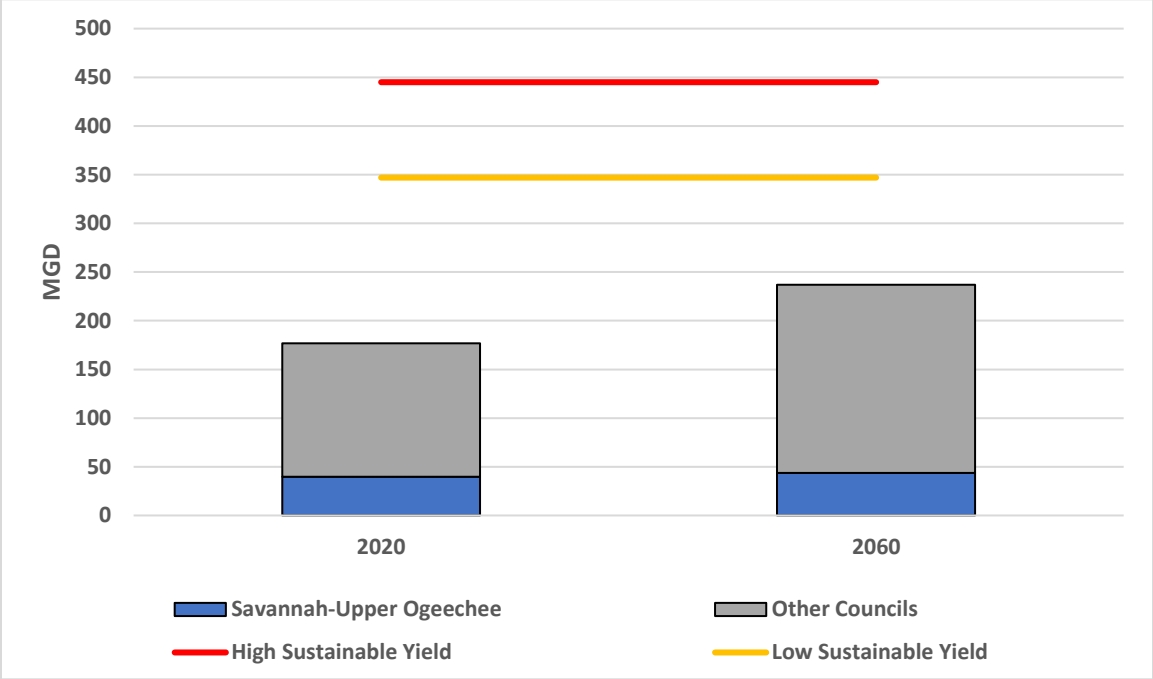
The Groundwater Availability Resource Assessment (EPD, 2010) estimated the potential range of sustainable yield for each of the three prioritized aquifers in the region based on the models developed for the respective aquifers. The assessment results have been used to evaluate the potential for groundwater use to meet the projected 2060 demands across water planning regions. The assessment concluded that supplies from the Crystalline-Rock, Floridan and Cretaceous aquifers are generally sufficient in meeting the forecasted groundwater demand from areas with access to these aquifers.

Crystalline-Rock Aquifer – Many communities in the upper portion of the region use groundwater from the Crystalline-Rock Aquifer to meet local needs or supplement their surface water supply sources including: Columbia, Franklin, Madison, Rabun, Stephens, and Taliaferro counties. In addition, groundwater is drawn from this aquifer for self-supply wells in the region. In most municipal cases, multiple wells are required to meet existing needs due to the relatively low yields from individual wells (less than 100 gallons per minute). Some of the existing water suppliers are likely to continue to use groundwater to meet water supply needs. Site-specific studies may be required to determine the availability and sustainable yield in a localized area for future supplies. However, areas with higher increases in projected population density will likely need a combination of surface water and groundwater from the Crystalline-Rock Aquifer to meet future demands.

Assuming that the Crystalline-Rock Aquifer in the region exhibits similar characteristics to the portion of the aquifer in the adjacent Middle Oconee study basin for which a water balance was generated, and using the low range of the area normalized sustainable yield (Piedmont - 0.01 MGD per square mile of area) for conservative planning, the sustainable yield available from the portion of the Crystalline-Rock Aquifer in the region is estimated to range from 20 MGD to 100 MGD on an annual average daily basis calculated based on results from the water budget model. Based on these estimates, supplies from the Crystalline-Rock Aquifer will be sufficient for users

in the region with total demands on the aquifer estimated as 2.8 MGD in 2020 increasing to 4.9 MGD in 2060.

Cretaceous Aquifer – The Cretaceous Aquifer is a significant water source in the Savannah Upper-Ogeechee Water Planning Region and in other water planning regions in Georgia. The sustainable yield for the prioritized aquifer units modeled is estimated to range from 347 to 445 MGD. Projections for water use from the multiple regions with access to this aquifer show that future demand within the modeled area is not projected to exceed the sustainable yield in future years (Figure 5-1). The demand estimates include 75th percentile agricultural demands representing dry year conditions. The 2060 projected demand of 56 MGD is well within the low end of the sustainable yield (347 MGD) of the Cretaceous aquifer. Because the Resource Assessment modeling is not specific to individual planning regions, site-specific studies would likely be required to determine the sustainable yield of this aquifer in any particular local area.



Sources: Groundwater Availability Assessment, 2022, EPD. Technical Memorandum: Savannah-Upper Ogeechee Water and Wastewater Forecasting, 2022

Figure 5-1 Cretaceous Aquifer Demand vs. Estimated Yield

Floridan Aquifer – The total estimated range of sustainable yield for the Floridan Aquifer in the South-Central Georgia and Eastern Coastal Plain modeled portions of the aquifer is higher than forecasted 2060 groundwater demands from regions with access to this aquifer. The projected water supply need from this aquifer for the Savannah-Upper Ogeechee Water Planning Region is approximately 48 MGD in 2060, mostly from the southern portion of the region (Burke, Glascock, Jefferson, Jenkins, Richmond, and Screven counties utilize this aquifer). The modeling results indicate that significant additional resources are available from the Floridan Aquifer.

5.2 Surface Water Availability Comparisons

The evaluation of surface water availability is based on the results of the Surface Water Availability Resource Assessment (2022) and the projected surface water demands in 2060, including estimated demands from South Carolina. Surface water model nodes located in the Savannah-Upper Ogeechee Region consist of more than 50 withdrawal, discharge, reservoir and gage station nodes. The locations of the model nodes within the Planning Region are summarized in Figure 5-2. The modeling tools currently used to assess surface water availability are described in greater detail in Section 3.

The surface water availability assessment model evaluated streamflows under future demand conditions and compared them to a low flow threshold. In the unregulated portions of the region (the Upper Ogeechee Basin), the low flow threshold is defined by the State's Interim Instream Flow Protection Policy, which calls for the protection of monthly 7Q10 or natural flow, whichever is lower. By definition, this is a seven-day average flow that is not exceeded 10 percent of the time and may be breached a small percentage of the time under natural conditions. The water supply and instream flow needs in the Savannah-Upper Ogeechee Water Planning Region are not met hydrologically at 7 withdrawal locations and 13 discharge locations. Potential surface water challenges exist at these model nodes.

Sufficient conservation storage is available in the federal reservoirs in northeastern Georgia. Certain counties and cities in this region may consider utilizing available storage in the federal reservoirs for developing their future water supply, but must do so in coordination with the USACE. Even during the worst drought periods, the vast storage within these reservoirs is not depleted. While sufficient conservation storage is available for future water supply, this analysis did not include an evaluation of potential economic impact to communities surrounding the lakes. The Savannah-Upper Ogeechee Planning Council recognizes that impacts on local economies, and the state of Georgia as a whole, is an important aspect of the statewide water planning process. Through the update of the Savannah River Basin Comprehensive Study, the Council recommended that the USACE evaluate adaptive management strategies that could minimize the use of the available conservation storage. In 2020, the USACE ended Phase II of the Comprehensive Study due to inadequate analysis, lack of full partnership concurrence and insufficient funding. The Comprehensive Study was a cost share with Georgia EPD, SDHEC and The Nature Conservancy. Future interim studies within the greater Comprehensive Study will be considered in coordination with cost share partners as funding allows.

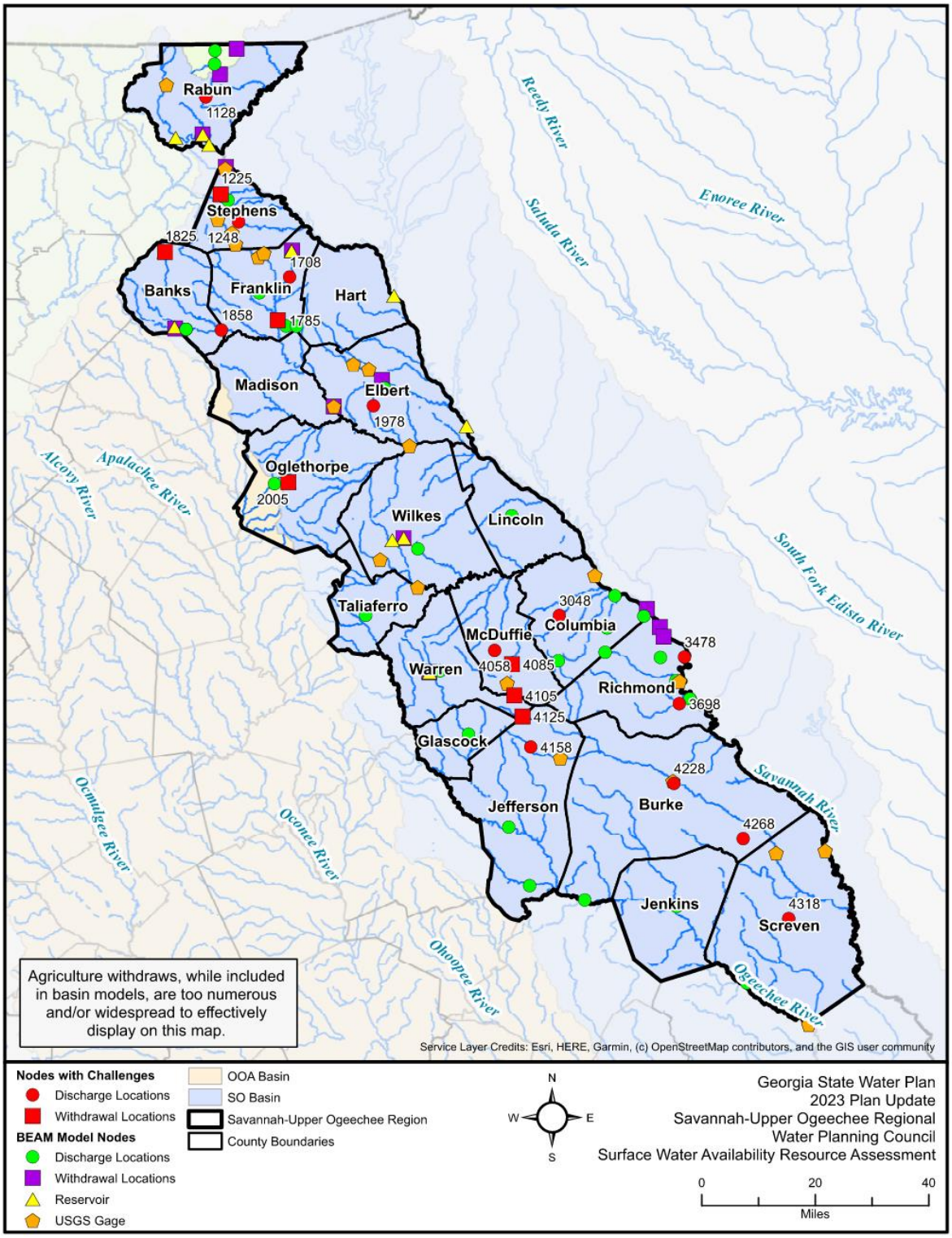


Figure 5-2 Surface Water BEAM Model for the Savannah-Upper Ogeechee Region

In order to better assess these specific potential challenges and better understand the types of management practices that may be required to address them, the anticipated duration (in days) when these challenges may occur is provided as well as the potential shortage (reported as million gallons (MG). It should be noted that due to the utilization of BEAM in resource assessment modeling, some of the previous approaches in expressing potential issues at the planning nodes have become obsolete. The resource issues identified previously are now replaced by these new resource assessment results (higher level of site-specific detail). For example, the exhaustion of storage within a reach or the breaching of instream minimum flow requirements as a way of showing a "potential resource challenge" at the planning node representing that reach was previously used. With the new modeling platform, there are now specific facilities for that assessment in lieu of the previously used planning nodes that summarized results without site specific detail. For example, where there is the exhaustion of a water supply storage, there is likely also a shortage in meeting water demand at the facility, which is now referred to as a water resource challenge. The Surface Water Availability Resource Assessment predicted that the low flow threshold cannot be maintained at all times while meeting the forecasted 2060 demands at the model nodes. Table 5-1 provides a summary of the modeled potential surface water supply challenges in the Savannah-Upper Ogeechee Region. Table 5-2 provides a summary of the modeled potential wastewater assimilation challenges in the Savannah-Upper Ogeechee Region.

Table 5-1 Summary of Modeled Potential Surface Water Supply Challenges

BEAM Model Node	Period	Length of Challenge (% of total days)	Total Volume Shortage (MG)
1225 (City of Toccoa)	2020	27 (0.10%)	64.0
	2060	216 (0.79%)	781
1785 (City of Royston)	2020	14 (0.05%)	0.21
	2060	23 (0.08%)	0.51
1825 (Banks County Board of Commissioners)	2020	0 (0.00%)	0.00
	2060	2,867 (10.5%)	5,918
2005 (City of Crawford)	2020	58 (0.21%)	6.9
	2060	27,384 (100%)	25,676
4085 (Thomas-McDuffie County Water & Sewer Commission)	2020	50 (0.18%)	24.1
	2060	37 (0.14%)	15.7
4105 (KaMin, LLC)	2020	154 (0.56%)	63.3
	2060	79 (0.29%)	31.4
4125 (KaMin, LLC)	2020	9,707 (35.5%)	12,764
	2060	9,650 (35.2%)	12.634

Source: Surface Water Availability Resource Assessment (EPD, 2022).

Table 5-2 Summary of Modeled Potential Wastewater Assimilation Challenges

BEAM Model Node	Period	Length of Challenge (% of total days)	Total Volume Shortage	Corresponding 7Q10 Flow
1128 (City of Clayton (Clayton WPCP))	2020	422 (1.5%)	374 MG	7.8 cfs (4.2 MGD)
	2060	422 (1.5%)	374 MG	
1248 (City of Toccoa (Eastanollee Creek WPCP))	2020	473 (1.7%)	243 MG	1.7 cfs (0.91 MGD)
	2060	473 (1.7%)	243 MG	
1708 (City of Lavonia (Lavonia WPCP))	2020	693 (2.5%)	120 MG	0.8 cfs (0.43 MGD)
	2060	693 (2.5%)	120 MG	
1858 (Banks County Board of Commissioners (Hudson River WPCP))	2020	2,664 (9.7%)	8,599 MG	17 cfs (9.15 MGD)
	2060	2,423 (8.9%)	7,532 MG	
1978 (City of Elberton (Falling Creek WPCP))	2020	249 (1.1%)	44.7 MG	0.6 cfs (0.32 MGD)
	2060	249 (1.1%)	44.7 MG	
3048 (Columbia County (Kiokee Creek WPCP))	2020	1,312 (4.8%)	270 MG	0.3 cfs (0.16 MGD)
	2060	1,324 (4.8%)	274 MG	
3478 (PCS Nitrogen Fertilizer, L.P. (Augusta))	2020	3,949 (14.4%)	815,613 MG	3,600 cfs (1937 MGD)
	2060	3,843 (14.0%)	769,934 MG	
3698 (City of Augusta (Spirit Creek WPCP))	2020	649 (2.5%)	870 MG	2.4 cfs (1.29 MGD)
	2060	701 (2.6%)	885 MG	
4058 (City of Thomson (Thomson WPCP))	2020	183 (0.7%)	32.1 MG	0.3 cfs (0.16 MGD)
	2060	183 (0.7%)	32.1 MG	
4158 (City of Wrens (Wrens WPCP))	2020	1,378 (5.0%)	353 MG	1.2 cfs (0.65 MGD)
	2060	1,426 (5.2%)	366 MG	
4228 (City of Waynesboro (Brier Creek WPCP))	2020	1,109 (4.1%)	299 MG	1.2 cfs (0.65 MGD)
	2060	1,231 (4.5%)	343 MG	
4268 (City of Sardis (Sardis WPCP))	2020	157 (0.6%)	15.9 MG	0.1 cfs (0.05 MGD)
	2060	98 (0.4%)	10.3 MG	
4318 (City of Sylvania (Sylvania WPCP))	2020	168 (0.6%)	20.9 MG	0.2 cfs (0.11 MGD)
	2060	168 (0.6%)	20.9 MG	

Source: Surface Water Availability Resource Assessment (EPD, 2022).

The projected use of surface water for the counties within the Savannah-Upper Ogeechee Region are shown in Table 5-3. Since there are potential challenges at several model nodes, any development of additional surface water to meet projected needs will need to be done in a manner that does not exacerbate potential challenges.

Table 5-3 2060 Increased Annual Average Surface Water Demand by County

County	Withdrawal Type	Change in Surface Water Demand by 2060[1] (MGD)	Change in Surface Water Demand by 2060[1] (cfs)
Banks	Municipal	2.43	4.52
Burke	Agriculture	0.73	1.36
	Energy	65.59	121.9
Columbia	Municipal	5.02	9.33
Elbert	Agriculture	0.01	0.02
	Municipal	0.01	0.02
Franklin	Municipal	0.47	0.87
Glascock	Agriculture	0.02	0.04
Hart	Agriculture	0.06	0.11
	Municipal	1.02	1.90
Jefferson	Agriculture	1.37	2.55
Jenkins	Agriculture	0.59	1.10
Lincoln	Municipal	-0.12	-0.22
McDuffie	Agriculture	0.01	0.02
	Municipal	0.06	0.11
Oglethorpe	Municipal	0.83	1.54
Rabun	Municipal	0.28	0.52
Richmond	Agriculture	0.06	0.11
	Industrial	0.00	0.00
Screven	Agriculture	1.51	2.81
Stephens	Municipal	0.68	1.26
Warren	Agriculture	0.01	0.02
	Industrial	0.00	0.00
Wilkes	Municipal	-0.10	-0.19

Note:
[1] All surface water demands within the planning region are agricultural or municipal except for the energy demand noted in Burke County and the industrial demands noted in Jefferson, Madison, and Warren County.

In addition to the surface water availability resource assessment modeling, current permitted municipal surface water and groundwater withdrawals have been compared to the forecasted future demands (Table 5-4). This comparison indicates that Banks, Glascock, Madison, Oglethorpe, and Taliaferro counties may require additional water supply infrastructure above what is currently permitted. However, a number of these counties show constant or even decreasing demand trends so the actual supply to meet demands may be coming from permits outside of the county boundaries.

Table 5-4 Municipal Permitted Water vs. 2060 Forecasted Demand (MGD)[1,2]

County	Current Permitted Water Withdrawals[3]	Projected 2020 Water Demand[3]	Projected 2060 Water Demand[3]	2060 Permitted Capacity Need[4]
Banks	1.0	3.5	6.2	5.20
Burke	3.9	2.1	1.8	-
Columbia	55.1	19.9	23.5	-
Elbert	3.7	2.5	2.2	-
Franklin	5.5	2.5	3.2	-
Glascock	0.0	0.2	0.15	0.15
Hart	3.8	2.9	3.4	-
Jefferson	4.0	2.6	2.1	-
Jenkins	1.0	0.8	0.6	-
Lincoln	0.9	0.8	0.6	-
Madison	0.6	2.5	4.0	3.50
McDuffie	4.6	2.3	2.3	-
Oglethorpe	0.25	1.2	1.3	1.10
Rabun	4.5	2.6	3.0	-
Richmond	79.9	40.7	37.4	-
Screven	1.3	1.6	1.2	-
Stephens	15.2	4.1	4.9	-
Taliaferro	0.0	0.1	0.07	0.07
Warren	0.8	0.6	0.5	-
Wilkes	3.8	1.2	0.8	-

Source: EPD Permit Data.
Notes:
1 Municipal Water Demand includes industries that obtain their water from a municipal source.
2 Includes both surface and groundwater.
3 Surface water withdrawals are permitted as monthly values while groundwater withdrawals are permitted as both monthly and annual values. The annual values were used for groundwater permitted in this table.
4 Analysis does not account for demands in one county that may be met by permits from another county.

5.3 Surface Water Quality Comparisons (Assimilative Capacity)

This section summarizes the results of the *Water Quality (Assimilative Capacity) Resource Assessment* (2022) and the water quality challenges that the Savannah-Upper Ogeechee Water Planning Region may face, based on projected 2060 wastewater flows and assumptions. Analysis of the Savannah River Basin incorporated permitted facilities and land use information for the South Carolina side of the basin.

5.3.1 Future Treatment Capacity Needs

Future treatment capacity needs were determined based on a comparison of forecasted 2060 wastewater flow and current permitted capacity in the region (Table 5-5). The permitted quantities are based on existing municipal, industrial, and energy facilities permitted under the National

Pollutant Discharge Elimination System (NPDES) or State land application systems (LAS) permits.

Based on the forecast wastewater flow, Jefferson, Lincoln, McDuffie, Rabun, Screven, and Warren counties may need additional permitted capacity for point source discharge. Rabun and Stephens show potential challenges for LAS permitted capacity. It should be noted that the comparison in Table 5-5 was completed at the county level; additional localized shortages in treatment capacity may exist, and challenges in some counties may be met by systems in neighboring counties. Future expansion or new treatment facilities will be included in the consideration of management practices (Section 6). Additionally, some water utilities are investing in source water protection as a multi-tier approach to hedge against increasing future treatment capacity and costs.

Table 5-5 2060 Wastewater Forecast versus Existing Permitted Capacity (MGD)

County	Point Source (PS)			Land Application Systems (LAS)		
	2060 Forecast[1]	Permitted Capacity	2060 Surplus or Gap (-)[2]	2060 Forecast[1]	Permitted Capacity	2060 Surplus or Gap (-)[2]
Banks	0.14	0.30	0.16	0.20	0.40	0.20
Burke	78.36	149.37	71.01	0.03	0.06	0.03
Columbia	11.36	15.65	4.29	0.40	0.58	0.18
Elbert	0.96	1.59	0.63	0	0	0
Franklin	1.23	1.65	0.42	0	0.08	0.08
Glascock	0.06	0.21	0.15	0	0	0
Hart	0	0	0	0.88	1.75	0.87
Jefferson	5.80	2.22	**-3.58**	0	0.05	0.05
Jenkins	0.42	0.95	0.53	0	0	0
Lincoln	0.53	0.52	**-0.01**	0	0	0
Madison	0.09	0.17	0.08	0.01	0.05	0.04
McDuffie	3.28	2.50	**-0.78**	0.11	0.26	0.15
Oglethorpe	0.09	0.18	0.09	0	0	0
Rabun	1.83	1.70	**-0.13**	0.42	0.10	**-0.32**
Richmond	88.35	143.33	54.98	0	0	0.0
Screven	3.27	1.58	**-1.69**	0.0002	0.05	0.05
Stephens	1.83	2.50	0.67	0.10	0	**-0.1**
Taliaferro	0.02	0.10	0.08	0	0	0.0
Warren	1.14	0.50	**-0.64**	0.02	0.05	0.03
Wilkes	0.41	4.08	3.67	0	0	0.0
Total	**192.91**	**329.10**	**136.19**	**2.18**	**3.42**	**1.24**

Notes:
[1] Includes industrial wastewater expected to be treated at municipal facilities.
[2] Analysis does not account for gaps in some counties that may be met by permitted systems in neighboring counties.

5.3.2 Assimilative Capacity Assessments

Full permit scenario. The Assimilative Capacity Resource Assessment drew upon water quality modeling tools to estimate the ability of streams and estuaries to assimilate pollutants under current and future conditions. Modeling focused on instream dissolved oxygen (DO) and incorporated all municipal and industrial wastewater facilities operating at their full permitted discharge levels (flow and effluent discharge limits as of 2019). The results of the DO modeling at current permitted conditions are presented in Figure 5-3 and Table 5-6 for the Savannah-Upper Ogeechee Region, which includes portions of the Oconee, Ogeechee, Savannah, and Tennessee River basins. The results show the modeled effects of oxygen-demanding compounds in wastewater and other factors on instream DO levels. A stream segment with “none or exceeded” available assimilative capacity (denoted as red lines in Figure 5-3) have estimated instream DO levels that are at or below the DO water quality criteria and therefore indicate conditions of no available assimilative capacity or exceeded assimilative capacity. It is important to note that an exceedance of DO assimilative capacity on a stream segment could be the result of a point source discharge, non-point source loading, or a naturally low instream DO condition. Reaches within the Savannah-Upper Ogeechee Planning Council that have exceeded their full assimilative capacity under the current conditions assessment include:

- Buck Creek in the Savannah River Basin; and
- Rocky Comfort Creek and Williamson Swamp Creek in the Ogeechee Basin.

Stakeholders including Georgia EPD, SCDHEC, USEPA, and the Savannah River/Harbor Discharger Group collaboratively developed an implementation plan to meet applicable water quality standards for the Savannah River Basin, including the Savannah Harbor. Following development of the plan, and reclassification of the Savannah Harbor to Category 5R on the 2014 305(b)/303(d) list, the USEPA withdrew the TMDL for the Savannah Harbor in favor of the alternative restoration approach outlined in the plan.

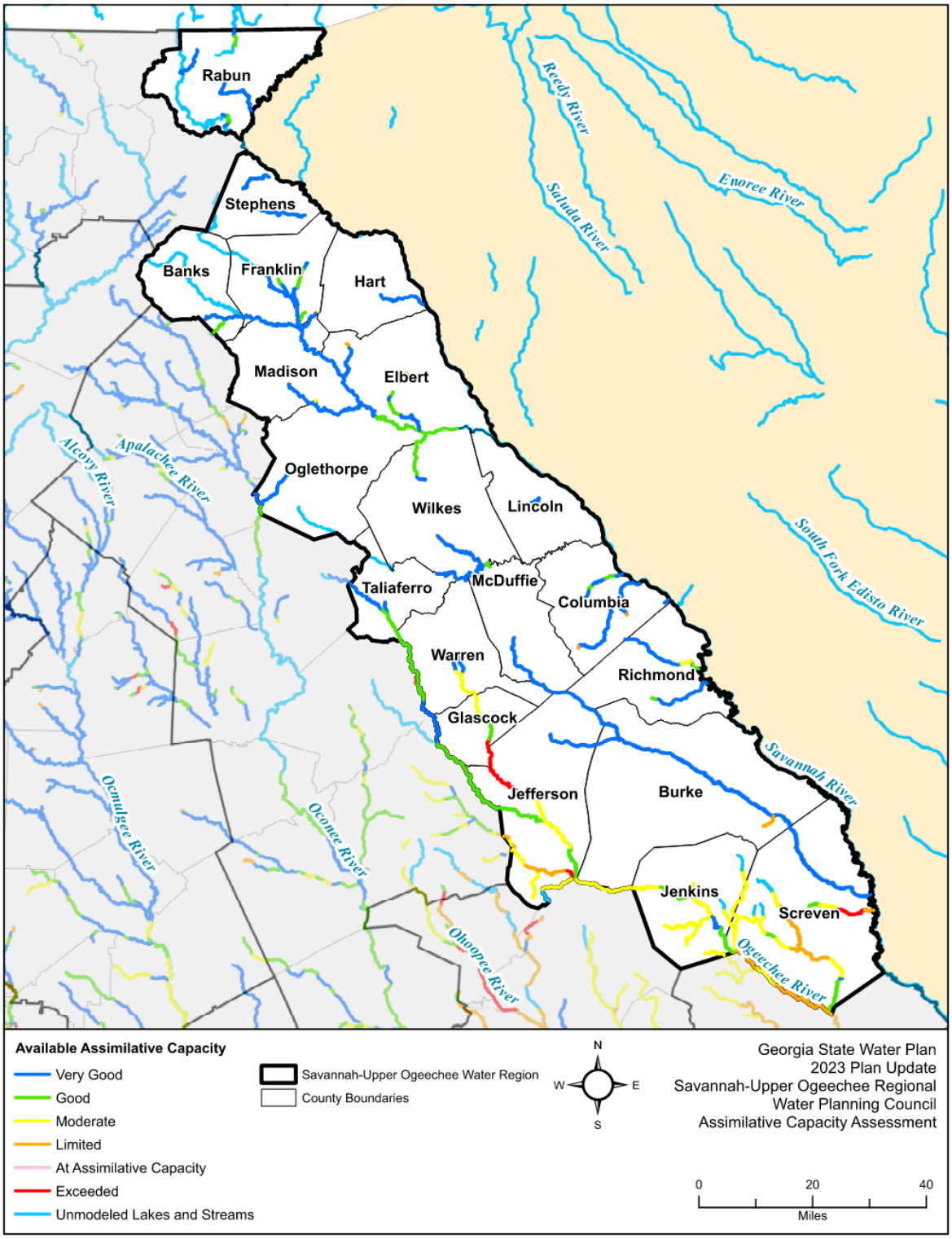


Figure 5-3 Results of Assimilative Capacity Assessment – DO at Current Permit Conditions

Table 5-6 Permitted Assimilative Capacity for DO in Savannah-Upper Ogeechee Planning Council

Basin	Available Assimilative Capacity (Total Mileage)						Total River Miles Modeled in the Council Area
	Very Good (≥1.0 mg/L)	Good (0.5 to <1.0 mg/L)	Moderate (0.2 to <0.5 mg/L)	Limited (>0.0 to <0.2 mg/L)	None or Exceeded (<0.0 mg/L)	Un-modeled	
Oconee	14	2	0	0	0	0	16
Ogeechee	35	101	150	56	20	17	380
Savannah	387	59	6	7	6	0	464
Tennessee	2	1	0	0	0	1	3

Source: GIS Files from the Updated Permitted Water Quality Resource Assessment (EPD, 2022).
Notes: Since the 2017 update, additional stream segments were modeled for the Oconee Basin and Savannah River Basin.

2060 Conditions Scenario. Based on the results shown in Figure 5-3, EPD also conducted modeling under future conditions. In order to address areas of limited or no assimilative capacity for DO, EPD incorporated some assumptions regarding future (2060) permitted flows and modifications to permit effluent limits. Since EPD cannot issue permits that will violate water quality standards, EPD will continue to evaluate and modify future permit requests and adjust permit limits to avoid potential DO violations. The resource assessment models developed for this planning process will continue to be used by EPD for future wasteload allocation and for assessing DO conditions in the streams. Assuming that 1) permit limits will be tightened in streams with potential DO violations, and 2) planned projects with alternative discharge locations will be constructed to handle future flows, EPD hopes to eliminate future DO violations in streams (red segments in Figure 5-3). Figure 5-4 shows the assimilative capacity at assumed future (2060) permitted flows and effluent limits.

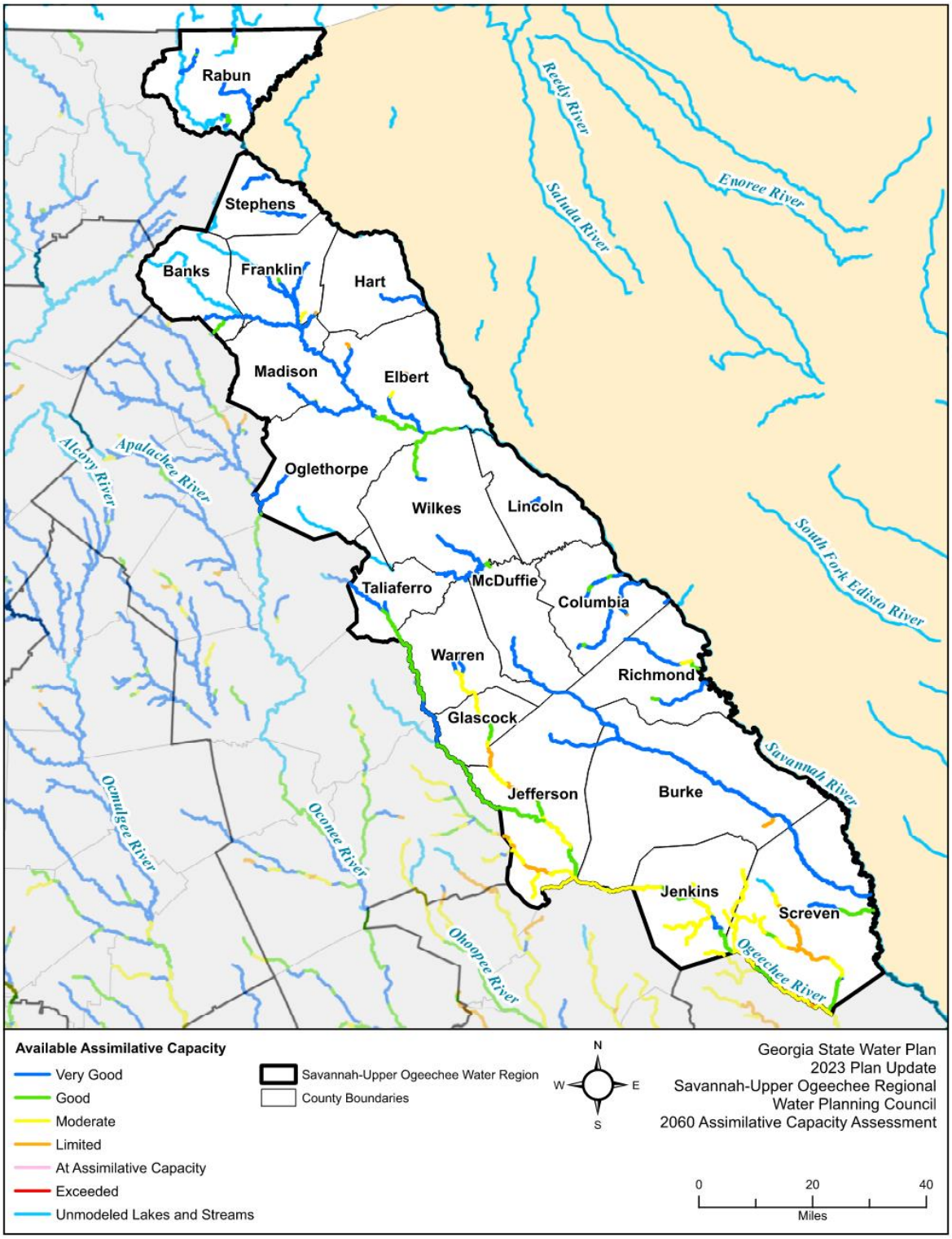


Figure 5-4 Results of Assimilative Capacity Assessment – DO at Assumed Future (2060) Permitted Conditions

5.3.3 Watershed Models & Nutrient Assessments

Future assessments of nutrients (nitrogen and phosphorus) levels have been completed. Moderate increase of nutrient loadings are predicted in limited areas along both sides of the Savannah River. However, there are no existing nutrient standards in this basin to compare to at the time of this study. It is anticipated that nutrient standards will be developed in the future. Strategies for nutrient management (including MPs and source water protection) should be evaluated based on these standards and updated watershed modeling results in future plan updates. More detail regarding the nutrient model results is available in the *Water Quality (Assimilative Capacity) Resource Assessment* (EPD, 2022). Nutrient and non-point source control management practices specific to land uses within the Savannah-Upper Ogeechee Region are discussed in Section 6.

5.3.4 Non-Point Source Pollution

Non-point source pollution accounts for the majority of surface water impairments in the region according to the 2022 303(d) list of Rivers, Streams, Lakes, and Reservoirs published by EPD (see discussion in Section 3). Non-point source pollution can occur as a result of human activities, including urban development, agriculture, and silviculture, failed septic tanks, and as a result of non-human influences such as wildlife and naturally-occurring nutrients. An important component of any non-point source management program is identifying those pollutant sources that are resulting from human activities in order to appropriately address them with management practices.

5.4 Summary of Potential Water Resources Issues

The region is fortunate to have abundant water supply sources. Future water availability issues include:

- The Surface Water Availability Resource Assessment predicted that there may be potential challenges where facility withdrawals and discharges are occurring within the region.
- At the regional level, for modeled aquifers, no groundwater resource shortfalls are expected to occur in the Savannah-Upper Ogeechee Region over the planning horizon.
- Additional permitted water withdrawals and treatment capacity may be needed in some counties to meet demands.

Major future water quality issues for the Savannah-Upper Ogeechee Region include:

- Additional wastewater treatment capacity is needed, especially in fast growing areas such as Columbia County.
- Additional wastewater planning and monitoring is needed to address limited assimilative capacity in several stream segments.

- Significant organic load reductions will be required for the Savannah River and Harbor for both Georgia and South Carolina discharges.

Table 5-7 summarizes the potential water resource challenges and permitted capacity needs in the Savannah-Upper Ogeechee Region by County. Section 6 discusses the management practices appropriate to address these potential water resources issues.

Table 5-7 Summary of Potential Challenges or Shortages by County

County	Surface Water Flow Regime Challenge	Municipal Water Permitted Capacity Need	Wastewater Permitted Capacity Need	Water Quality - Assimilative Capacity Challenge
Source	*Figure 5-2*	*Table 5-5*	*Table 5-6*	*Figure 5-3*
Banks	Yes	Yes		
Burke	Yes			
Columbia	Yes			
Elbert	Yes			
Franklin	Yes			
Glascock		Yes		Yes
Hart				
Jefferson	Yes		Yes	Yes
Jenkins				
Lincoln			Yes	
McDuffie	Yes		Yes	
Madison		Yes		
Oglethorpe	Yes	Yes		
Rabun	Yes		Yes	
Richmond	Yes			
Screven	Yes		Yes	Yes
Stephens	Yes		Yes	
Taliaferro		Yes		
Warren	Yes		Yes	
Wilkes				

Notes: "Yes" indicates a predicted challenge in the indicated county. Permitted capacity need is based on the comparison of permitted municipal capacity versus 2060 forecasted demand.

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SECTION 6

Addressing Water Needs and Regional Goals

Section 6 Addressing Water Needs and Regional Goals

This Section presents Savannah-Upper Ogeechee Water Planning Council's water management practices selected to address resource challenges identified and described in Section 5, and to meet the Council's Vision and Goals as described in Section 1.

Summary

The Savannah–Upper Ogeechee Water Planning Council selected 15 priority and 14 additional management practices that will assist with maintaining adequate supply, preventing surface water challenges, improving water quality, infrastructure planning, and proactive management of water resources in the region.

6.1 Identifying Water Management Practices

The comparison of Resource Assessments and forecasted needs presented in Section 5 identifies the region's likely resource challenges, and demonstrates the need for regional and resource specific water management practices. In the cases where challenges\ appear to be unlikely based on this comparison, the management practices described in this section have also been selected to meet those needs specified by the Council (e.g. facility or infrastructure needs and practices, programmatic practices, etc.) that are aligned with the Region's vision and goals. In selecting these practices, the Council considered the critical factors described below:

- Practices identified in existing plans, including the following two major regional studies:
  - An implementation plan to meet applicable water quality standards for the Savannah River Basin, including the Savannah Harbor developed by stakeholders including Georgia EPD, SCDHEC, USEPA, and the Savannah River/Harbor Discharger Group collaboratively. Following development of the Plan, and reclassification of the Savannah Harbor to Category 5R on the 2014 305(b)/303(d) list, the USEPA withdrew the TMDL for the Savannah Harbor in favor of the alternative restoration approach outlined in the plan.
  - Savannah River Basin Drought Contingency Plan (USACE, 2012).
- The Region's vision and goals; and
- Coordination with local governments and water providers as well as neighboring Councils who share these water resources.

Coordination with the USACE, SCDHEC, and the South Carolina Savannah River Basin Advisory Council remains ongoing with a positive interchange of information.

The Council conducted a comprehensive review of existing local and regional water management plans and relevant related documents to frame the selection of management practices. When possible, successful management practices already planned for and/or in use in the Region formed the basis for the water management practices selected by the Council. The supplemental

document Existing Plans for Savannah-Upper Ogeechee Water Planning Region (May 2011) includes detailed tables that list local water and wastewater related plans and comprehensive plans that were considered for this planning process. This document is available on the Council's website.

6.2 Selected Water Management Practices for the Savannah-Upper Ogeechee Region

This section briefly discusses the management practices selection process and presents the selected water management practices. The supplemental document Technical Memorandum - Management Practices Selection (May 2011) guided the original decision-making process for selecting management practices and can be found on the Council's website. For the 5-year update, the Council reviewed and updated the prior management practices based on the updated comparison of Resource Assessments and forecasted needs.

6.2.1 Management Practice Selection Process

The needs and interests of the stakeholders in the region are diverse. One of the Council's major concerns is that the recommended management practices do not dictate what each stakeholder group or entity should do. Rather, they are presented as a menu for selection by entities within the Savannah-Upper Ogeechee Region based on local needs and conditions. Each entity may conduct detailed planning or feasibility studies that evaluate its individual issues and resources to determine appropriate management practices.

The demand management (conservation) practices are based on the Water Stewardship Act, SB 370, and the 2015 EPD drought management and water efficiency rules. The Council reviewed the 2017 plan's list of water quantity and quality management practices as well as the added conservation practices. The Council also incorporated demand management (conservation) practices listed in Detailed Guidance for Evaluating Practices to Manage Demands (September 21, 2010, EPD). The Council's Technical Committee reviewed and revised management practices, and incorporated definitive actions to support management practices, for full Council approval. The management practices were then revised based on input received from the Technical Committee, other Council members and stakeholders.

The Council prioritized the recommended management practices so that stakeholders can focus their efforts on issues most important to their respective communities. The recommended management practices are divided into two groups:

- Priority Management Practices are selected to address water resource challenges and existing regulations (including demand management practices listed in the Water Stewardship Act, SB370) and the 2015 EPD drought management and water efficiency rules).
- Additional Management Practices can be selected by local entities to address specific concerns based on the results of detailed local planning.

The Council recognizes that although regions were established for planning purposes, plans and management practices must consider the entirety of the watershed, whether it is the Savannah River or the Ogeechee River. Although the resource assessment and forecasting analyses are generally conducted at the watershed level, some of the information contained in this plan has been filtered to reflect data specific to the Savannah-Upper Ogeechee Water Planning Region. However, in the Council's deliberations, the entirety of the watersheds concerned have been considered.

6.2.2 Priority Management Practices

Table 6-1 presents the recommended priority management practices for the Savannah-Upper Ogeechee Region. The table also identified regional goals and the type of challenge addressed by these selected practices. The fifteen (15) priority management practices are grouped by type of practices, as follows:

- Four demand management practices,
- Five supply management practices,
- Four water quality management practices, and
- Two education initiatives.

The State Water Plan (Section 7, Policy 3) states that "water conservation will be a priority water quantity management practice implemented to help meet water needs in all areas of the state and will be practiced by all water user sectors." In Detailed Guidance for Evaluating Practices to Manage Demands (September 21, 2010, EPD), demand management (or conservation) practices were divided into four tiers, as follows:

- **Tier One** includes basic water conservation activities and practices that are currently required by statute (SB370 – Water Stewardship Act) or under the water supply efficiency or drought management rules adopted by the DNR Board in 2015.
- **Tier Two** includes basic water conservation activities and practices that may be addressed in the water supply efficiency, drought management, or other rules, but are not required of all permit applicants.
- **Tier Three** includes basic water conservation activities and practices that will not be addressed in current or upcoming amended rules.
- **Tier Four** includes "beyond basic" water conservation practices to be considered to address future water supplies and demands challenges for the region.

Table 6-1 Priority Water Management Practices Selected for the Savannah-Upper Ogeechee Planning Region

Action(s) Needed	Applicable Area	Description/Definition of Action
Water Demand Management Practices		
Goals Addressed: 1 (economy and sustainability), 5 (water reuse/conservation), 6 (balance human needs v. habitat needs), 7 (regional planning) **Challenge Addressed: Potential Minimum Instream Flow Shortage in Ogeechee Basin (WD3 & WD4)**		
WD1 - Implement Tier 1 Water Conservation Practices Required by SB370 or the EPD rules for water efficiency and drought management	ALL	Tier 1 water conservation practices include those required by statute (SB370 – Water Stewardship Act) or under the drought management and water efficiency rules adopted by the DNR Board in 2015. Current State rules and regulations address the following water conservation practices: ▪ Water loss auditing requirements for public water systems (serving more than 3,300 individuals), according to IWA/AWWA Water Audit Method[1] (Ga. Comp. R. & Regs R. 391-3-33, OCGA §12-5-4.1) ▪ Demonstration of progress towards improving water supply efficiency by public water systems (Ga. Comp. R. & Regs R. 391-3-33) ▪ Submittal of drought contingency plans by water withdrawal permittees (Ga. Comp. R. & Regs R. 391-3-6-.07(4) and 391-3-2-.04(11)) ▪ Building code standards for high efficiency plumbing fixtures in new construction after July 1, 2012 (OCGA 8-2-3) ▪ Installation of submeters in multiunit residential buildings and certain retail and light industrial buildings granted a permit for construction after July 1, 2012 (OCGA 12-5-180.1) ▪ Even-odd watering restrictions for non-irrigation outdoor water uses during Drought Response Level 2 and 3 (Ga. Comp. R. & Regs R. 391-3-30) ▪ Agricultural withdrawal permittees to comply with SB370 requirements regarding classification of existing agricultural water permits by status (active, inactive and unused permits)
WD2 - Evaluate/ Encourage Tier 2 (Non-Farm) Water Conservation Practices	ALL	The Council supports and encourages the adoption of voluntary water conservation measures and recommends using existing incentive programs to support implementation of such management practices. Some recommended management practices for municipal and industrial permittees may include the following: ▪ Conservation-oriented rate structures for residential and/or commercial water customers ▪ Adoption of a beneficial meter calibration, repair and replacement program ▪ Studying feasibility of reuse ▪ Exploring use of grey water ▪ Exploring use of low impact development (LID) stormwater ▪ Adoption of replacement or retrofit programs for plumbing fixtures (e.g., toilet rebates) ▪ Offering facility-specific water use audits ▪ Considering rain or moisture sensor shut-off devices for irrigation systems

Action(s) Needed	Applicable Area	Description/Definition of Action
WD3 - Evaluate/ Encourage Tier 3 and Tier 4 Agricultural Water Conservation Practices	Ogeechee River Basin	Review and implement applicable agricultural water efficiency and demand management practices that are "beyond basic" to reduce surface water demand and in the Ogeechee River Basin. Some recommended management practices for agricultural permittees may include ▪ Using rain sensors on irrigation systems ▪ Irrigating during time of day with low evaporation rate *Note for WD1 to WD3: The full list of specific conservation goals and tiered conservation practices recommended by the Savannah-Upper Ogeechee Council can be found in Technical Memorandum – Demand Management Practices (August 2011), available on the Council's website.*
WD4 - Monitor Agricultural Use	ALL	▪ Complete installation of irrigation meters on all major agricultural withdrawal permittees ▪ Ensure appropriate procedures for reading and maintaining irrigation meters, including a meter calibration and replacement program and provisions for self-reporting ▪ Use monitored data during critical period to improve calibration of existing Resource Assessment model ▪ Review current agricultural withdrawal permits for potential modifications to protect minimum instream flows ▪ Monitor agricultural withdrawals from the Ogeechee River on a continuous basis to prevent development of a potential future supply challenge ▪ Evaluate future withdrawal permit request from the Ogeechee River against monitored usage before issuing future permits
Water Supply Management Practices		
Goals Addressed: 1 (economy and sustainability), 6 (balance human needs v. habitat needs), 7 (regional planning) Challenge Addressed: Potential Minimum Instream Flow Shortage in Ogeechee Basin (WS2, WS3, WS4, WS5), Water Infrastructure Need (WS1)		
WS1 - Evaluate/Update Local Water Master Plans	ALL	Local entities to re-evaluate every five years based on system demand or other growth factors, to ensure consistency with Regional Water Plan recommendations, as follows: ▪ Update population and water demand projections with local details; compare to Regional Water Plan forecast trend and assumptions ▪ Adequacy of water supply sources ▪ Need for additional water supply/ alternatives supply source analysis ▪ Water use efficiency ▪ Treatment and distribution system needs and options ▪ Review and update capital improvements ▪ Review and update funding requirements ▪ Recommended planning horizon: 20 years

Action(s) Needed	Applicable Area	Description/Definition of Action
WS2 - Monitor Streamflow to Confirm the Frequency and Magnitude of the Predicted Challenge	Ogeechee River Basin	Develop streamflow monitoring program to confirm the frequency, duration and magnitude of the predicted challenge at existing model nodes, plus new nodes located in the Savannah-Upper Ogeechee Region (Upper Ogeechee)
WS3 - Conduct Instream Flow Studies	Ogeechee River Basin	Conduct instream flow studies at various segments of the basin to determine required instream flow values to be compared to values used in the Resource Assessment Model
WS4 - Increase Groundwater Supplies	Ogeechee River Basin	▪ Use feasibility study[2] involving the Eden Node to evaluate replacement of surface water withdrawals with groundwater withdrawals. ▪ Encourage groundwater for agricultural use in the future.
WS5 - Decrease Surface Water Use during Low Flow Periods	Ogeechee River Basin	Develop drought management plan to decrease surface water withdrawals for agricultural use during low flow periods
Water Quality Management Practices		
Goals Addressed: 1 (economy and sustainability), 6 (balance human needs v. habitat needs), 7 (regional planning) Challenge Addressed: Wastewater Infrastructure Need (WQ1, WQ2, WQ3)		
WQ1 - Evaluate/ Update Local Wastewater Master Plans	ALL	Local entities to re-evaluate every five years based on wastewater treatment demand or other growth factors to ensure consistency with Regional Water Plan recommendations, as follows: ▪ Update population and wastewater flow projections with local details; compare to Regional Water Plan forecast trend and assumptions ▪ Evaluate future wastewater treatment, collection and disposal needs and options ▪ As needed, apply for new or updated existing waste load allocations to ensure compliance with water quality standards ▪ Evaluate septic disposal options for lower density areas without centralized treatment services ▪ Evaluate/update source water protection measures ▪ Review and update capital improvements ▪ Review and update funding requirements ▪ Recommended planning horizon: 20 years
WQ2 - Upgrade Existing Wastewater Treatment Facilities	ALL	As identified by local wastewater master plans or evaluations, increase treatment capacity or improve level of treatment as necessary to meet future capacity needs and/or water quality standards.

Action(s) Needed	Applicable Area	Description/Definition of Action
WQ3 - Construct New Advanced Wastewater Treatment Facilities	ALL	As identified by local wastewater master plans or evaluations, provide advanced treatment as necessary to meet future capacity needs and water quality standards.
WQ4 - Support Forestry Commission Water Quality Program	ALL	Support Georgia Forestry Commission's (GFC) water quality program consisting of MP development, education/ outreach, implementation/ compliance monitoring, and a complaint resolution process
Educational Initiatives		
Goals Addressed: 3 (stakeholder relationships), 4 (education), 5 (water reuse/conservation)		
ED1 - Develop Regional or Customize State or Other Available Educational Program and Materials for Localized Implementation	ALL	Modify existing state education materials to address regional and local issues and distribute to local governments, land managers, and water utilities for use or further customization. Materials can cover the following topics depending on local needs: ▪ Water conservation and efficiency for municipal /commercial / industrial / agricultural users ▪ Outdoor watering and gardening best management practices for residential users ▪ Water conservation/efficiency for landscape and irrigation professionals ▪ Water conservation/efficiency certification program for professional landscaping and irrigation ▪ Best management practices for agriculture, silvaculture, and other land management practices ▪ Pet waste impacts on water quality and proper disposal ▪ Stormwater management ▪ Current water issues awareness, including awareness of drought conditions ▪ Septic tank (OSSMS) installation/maintenance ▪ Protection of sensitive lands
ED2 - Promote Coordinated Environmental Planning	ALL	▪ Incorporate regional water planning goals and management practices into local comprehensive planning of land use, transportation, and water resources ▪ Explore and expand relationship with regional commissions and cities in order to aid in planning and assist with identifying funding alternatives. ▪ Support efforts to increase publicly available water supply and water quality data.

Source: Technical Memorandum - Management Practices Selection (May 2011).

Notes:

[1] American Water Works Association/International Water Association, IWA/AWWA Water Audit Method, Manual 36, 2009, http://www.awwa.org/resources-tools/water-knowledge/water-loss-control.aspx.

[2] J. Kennedy, Synopsis Report, Groundwater Availability Assessment Updates (EPD, March 2017).

Eden Node includes Burke, Glascock, Jenkins, Jefferson, Screven, Taliaferro, and Warren counties

Key: ED – Education Initiatives; WD – Water Demand Management; WS – Water Supply Management; WQ – Water Quality Management

One of the Council's goals is to identify opportunities for conservation in the region. The Council supports the implementation of the required Tier 1 demand management practices and encourages each water user or permittee to evaluate Tier 2 practices and implement practices as required by current or upcoming regulations or permit conditions. The recommended Tier 1 and Tier 2 conservation practices are applicable to the entire region. Water users in the Ogeechee watersheds are encouraged to evaluate and implement applicable Tier 3 and Tier 4 conservation practices to address the potential shortage in meeting instream uses. The Council encourages water users/permittees to evaluate the cost and operational implications of these practices, and to implement them when they are beneficial to their operation. The full list of specific Tier 1 and Tier 2 conservation goals and demand management practices recommended by the Savannah-Upper Ogeechee Council can be found in the supplemental document *Technical Memorandum – Demand Management Practices (August 2011)*, which can be found at the Council's website.

Development or update of local water and wastewater master plans is recommended to identify specific local needs and issues not examined in detail in this high-level regional plan. The regional plans evaluated information on a regional and county basis, and the number of entities providing water, wastewater and stormwater services to customers within a county varies greatly. The Council stressed the importance in providing flexibility for entities within the region to conduct their own planning activities to address specific community issues following Regional Water Plan recommendations.

To address the projected 2060 wastewater flows, new wastewater treatment facilities will need to be constructed and some of the existing facilities will need to be expanded and/or upgraded. The water quality management practices identified have been selected to prevent water quality (assimilative capacity) degradation, assuming that future facilities and/or facility expansions (as identified in local master plans) will be designed to meet existing and future water quality standards.

6.2.3 Additional Recommended Management Practices

Table 6-2 presents additional management practices that can be selected by local entities to address their specific concerns, based on the results of the detailed local master plans. The 14 management practices also are grouped by type of practices, including:

- Two demand management practices,
- Two supply management practices, and
- Ten water quality management practices: Five addresses wastewater management and infrastructure planning, and the other five focus on non-point source pollution reduction and stormwater management.

Table 6-2 Additional Recommended Management Practices For Water Resource Management

(Select based on needs identified in local master plans)

Action(s) Needed	Issues to be Addressed	Description/Definition of Action
Water Demand Management Practices		
Goals Addressed: 1 (economy and sustainability), 5 (water reuse/conservation)		
WD5 - Promote Full-Cost System Accounting/ Encourage Conservation-Oriented Rate Structure	Better planning and management Meeting water/ wastewater systems long-term needs for maintenance, repair, rehabilitation, as well as new or replacement assets	Utilities or local governments are encouraged to evaluate accounting and management practices to ensure that all costs of operating and maintaining the systems, as well as costs of rehabilitating and providing all needed capital assets, are understood and are reflected in accounting practices and in the schedule of rates and charges. Evaluation steps can include: ▪ Based on master planning, develop comprehensive lists of long-term system needs ▪ Evaluate internal accounting procedures and practices to reflect all direct and indirect costs ▪ Create a financial planning model and conduct a revenue analysis to determine the ability of the system to meet the full costs of providing services ▪ Investigate irrigation meter pricing, conservation- oriented pricing or other appropriate strategies for the locale ▪ Evaluate billing system functionality and determine the ability to implement alternative rate structures ▪ Conduct rate studies and update pricing and fee schedules as appropriate1 ▪ Implement procedures to verify revenue sufficiency and to support and track the expenditure of funds to meet the long-term needs of the systems
WD6 - Evaluate/ Encourage Tier 3 Water Conservation Practices	Additional Demand Management to extend life of existing water supply source and to delay capital expenditure for new supply sources (More applicable to counties in Table 5-5 with projected infrastructure needs)	▪ Local governments or utilities are encouraged to evaluate applicability of Tier 3 Practices for 1) Agricultural Water Use; 2) Electric Generation; 3) Golf Courses; 4) Water-Using Industries and Commercial Businesses; 5) Heavy Landscape Water Use; 6) Urban and Suburban Areas; and 7) State Agency Facilities. Implement where necessary based on local conditions. ▪ A trigger approach can be considered, such as reaching 85 to 90 percent of treatment capacity. Local utilities are encouraged to evaluate this approach based on local conditions and comfort level for operation.

Action(s) Needed	Issues to be Addressed	Description/Definition of Action
Water Supply Management Practices		
Goals Addressed: 1 (economy and sustainability), 5 (water reuse/conservation), 6 (balance human needs v. habitat needs)		
WS7 - Maximize or Increase Existing Surface Water Reservoir Storage	Local water supply needs as indicated in Table 5-5 (as an option for counties with projected infrastructure needs)	▪ As part of master planning process, evaluate expansion of existing reservoirs by increasing the height of existing dams or dredging to provide additional storage. This option can be used for all entities with existing reservoir storage to extend and maximize the life of the supply source. ▪ Evaluate potential for Natural Resources Conservation Service impoundments (if any within the service areas) to serve as water supply sources
WS8 - Promote and Evaluate Beneficial Reuse	Local water supply needs Decrease demand for groundwater and surface water sources	Evaluate the following to decrease overall system water demand: ▪ Indirect potable reuse: return highly treated wastewater to water supply reservoirs ▪ Non-potable reuse: irrigation with highly treated effluent in areas such as golf courses, parks and residences
Water Quality Management Practices		
Goals Addressed: 1 (economy and sustainability), 5 (water reuse/conservation), 6 (balance human needs v. habitat needs)		
WQ5 - Decrease Use of Land Application Systems (LAS) in Urban Areas	Reduction of consumptive loss and improved pollution control	▪ Increase returns to surface waters ▪ Counties with aging LAS may consider discontinuing the practice after 25-30 years of use of the facilities or when it is appropriate to switch to point discharge
WQ6 - Decrease Use of On-Site Sewage Management Systems (OSSMS)/ Septic in Urban Areas	Reduction of consumptive loss and improved pollution control	▪ Increase returns to surface water in urban areas ▪ Prevent long-term water quality problems caused by failing OSSMS ▪ As part of local wastewater master plans, evaluate providing centralized wastewater collection and treatment services where density requires ▪ Identify areas where centralized sewer would benefit water quality (e.g., areas around lakes or smaller lots that would not support septic systems)
WQ7 - Evaluate Restoration of Natural and/or Construction of Treatment Wetlands in Non-Urban/Low-Density Areas	Improved source water protection, discharge quality and enhanced pollution control	▪ Provide increased protection for source water ▪ Provide polishing treatment ▪ Promote beneficial reuse, wildlife habitat and public use benefits ▪ Promote re-establishing wetlands in forested areas

Action(s) Needed	Issues to be Addressed	Description/Definition of Action
WQ8 - Develop/ Implement Wastewater Collection System Asset Management Programs	Better planning and management of municipally owned facilities	▪ Develop/Update GIS database ▪ Develop/Implement Sanitary Sewer Overflow (SSO) Prevention and Response Plan ▪ Develop/Conduct system maintenance and update schedule ▪ Consider establishing Capacity Management, Operations and Maintenance (CMOM) programs
WQ9 - Customize State and Other Available Education Materials and Programs and Support Maintenance for Homeowners with OSSMSs (Septic)	▪ Reduction of non-point source pollution ▪ Prevention/reduction of septic tank failures	Customize and use state and other available educational materials and programs to emphasize ▪ Proper maintenance of on-site systems ▪ Regular inspection ▪ Pumping/disposal of waste
WQ10 - Update/ Implement Water Supply Watershed Protection Plan Measures	▪ Water quality protection of source water ▪ Reduction of non-point source pollution	Update/Implement watershed protection plan elements for water supply watersheds: ▪ Reservoir buffers ▪ Lot size requirements ▪ Septic setbacks ▪ Reservoir use restrictions
WQ11 - Customize State and Other Available Materials and Programs for Stormwater Public Education and Outreach	Reduction of non-point source pollution	Customize and use state and other available education and outreach materials and programs for reduction of non-point source pollution for the following audiences: ▪ Residential and commercial developments ▪ Industries ▪ Agricultural community ▪ Forestry professionals
WQ12 - Develop/ Update Local Stormwater Master Plan	Reduction of non-point source pollution Reduction of potential assimilative capacity challenges	▪ Prepare or update a local stormwater master plan to identify potential runoff/ water quality issues and develop long-term capital improvement programs to better manage drainage systems, floodplains and implement other water quality enhancement programs ▪ Recommended interval: every 5-10 years
WQ13 - Establish a Stormwater Utility	Reduction of non-point source pollution	Local governments (serving > 10,000 people) may consider establishing a stormwater utility (or other mechanism) to increase funding for stormwater management programs.

Action(s) Needed	Issues to be Addressed	Description/Definition of Action
WQ14 - Evaluate Water Quality Trading	Improved assimilative capacity	▪ Water quality trading is a market based approach that can complement water-quality regulation ▪ It allows facilities to buy pollutant reduction credits from other facilities in the same watershed (or non-point sources like agriculture) ▪ Non-point source pollutant reductions are frequently less expensive than treatment-plant upgrades. Trading programs can cost-effectively improve water quality

Source: Technical Memorandum - Management Practices Selection (May 2011).

Note:

[1] The University of North Carolina (UNC) Environmental Finance Center regularly reviews water and wastewater rate structures for utilities in Georgia. UNC's Environmental Finance Center has other tools available such as a rate analysis model to help utilities set rate structure based on expenses and revenue. (See http://www.efc.sog.unc.edu/project/georgia-water-and-wastewater-rates-and-rate-structures).

Key: WD – Water Demand Management; WS – Water Supply Management; WQ – Water Quality Management

6.2.4 Other Regional Efforts

In addition to the Management Practices identified above, another project with significant potential benefits to the region is the Phinizy Center for Water Sciences' efforts to restore oxbows along the Savannah River. Historically, these oxbows were cut off in order to straighten the channel for navigation. The work entails a feasibility study of approximately 22 oxbows in order to determine their restoration potential. If restored, these oxbows have the potential to enhance fish and wildlife habitat and improve water quality/assimilative capacity. The USACE has developed a draft project management plan to scope the work and estimate costs.

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SECTION 7

Implementing Water Management Practices

Section 7 Implementing Water Management Practices

This section presents the Savannah-Upper Ogeechee Council's roadmap for the implementation of the water management practices identified in Section 6. As the State Water Plan provides, this plan will be primarily implemented by the various water users in the region. This section describes the suggested roles and responsibilities of the implementing parties as well as the fiscal implications of the practices.

Summary

Primary responsibility for implementing the regional plan will be at the local level; however, State agencies are requested to assist with implementation. The Council suggested short-term and long-term actions for the recommended priority management practices. Implementation schedules for additional management practices are to be determined by local governments, utilities and permit holders based on needs identified in detailed local master plans.

7.1 Implementation Schedule and Roles of Responsible Parties

The implementation schedule and roles of responsible parties for priority management practices (management practices selected to address Resource Assessment challenges or existing regulations) are detailed in Table 7-1. The timeframe for implementation has only been identified for the priority management practices detailed in Table 6-1. Anticipated timeframes for implementation actions are defined as short-term (next 5 years) and long-term (5 years and beyond).

The Council recommends that timeframes for implementing other recommended management practices (Table 6-2) be determined by affected water users/entities, based on the type of projects selected to address specific needs and following detailed analysis conducted by local entities. Implementation of infrastructure projects, such as construction of a new reservoir or expansion of a wastewater treatment facility, often require much longer times and cannot be easily compared to implementation of ongoing programmatic measures, such as stormwater or water conservation education programs. The Council's recommended management practices, if implemented, will work toward preventing or addressing potential future challenges and meeting regional goals. The Council advocates that the recommended management practices be reviewed and updated as necessary in subsequent 5-year plan updates, based on newly available data, information, and implementation results.

Table 7-1 Implementation Schedule Priority Water Management Practices to Address Resource Assessment Challenges or Existing Regulations

Action(s) Needed	Permit Category of Responsible Parties	Short-term Actions (Next 5 Years)	Long-term Actions (5 years and beyond)	Responsible or Potentially Affected Parties
Water Demand Management Practices				
WD1 - Implement Tier 1 Water Conservation Practices Required by SB370 or the EPD rules for water efficiency and drought management	Municipal / Industrial Water Withdrawals Agricultural Surface Water Withdrawal	Municipal/ Industrial Withdrawal Permittees: ▪ Comply with SB370 (Water Stewardship Act) ▪ Based on water loss audits and water loss detection programs, target areas in need of improvement and implement water loss reduction measures ▪ Update and continue public education and awareness programs about outdoor watering restrictions Agricultural Withdrawal Permittees: Comply with SB370 (Water Stewardship Act) requirements regarding classification of existing agricultural water permits by status (active, inactive and unused permits)	Conduct surveys (based on annual progress reports) to gauge effectiveness Revise public education and awareness program if necessary to improve effectiveness	Short-term Actions: ▪ Municipal / Industrial Water Withdrawal Permittees ▪ Agricultural Withdrawal Permittees Long-term Actions: ▪ Municipal / Industrial Survey: EPD working with Council and Regional Commissions or DCA ▪ Agricultural Survey: EPD working with Georgia Soil and Water Conservation Commission (GSWCC), and County Extension Services ▪ Public Education: Local governments or utilities

Action(s) Needed	Permit Category of Responsible Parties	Short-term Actions (Next 5 Years)	Long-term Actions (5 years and beyond)	Responsible or Potentially Affected Parties
WD2 - Evaluate/ Encourage Tier 2 (Non-Farm) Water Conservation Practices	Municipal / Industrial Water Withdrawals	Draft/update water conservation plans to include additional, cost-effective water savings measures	▪ Conduct surveys to gauge effectiveness ▪ Continue implementation and revise program, if necessary.	DNR Board, EPD, and Municipal / Industrial Water Withdrawal Permittees (including thermoelectric power production)
WD3 - Evaluate/ Encourage Tier 3 & Tier 4 Agricultural Water Conservation Practices	Agricultural Withdrawal	▪ Evaluate and identify preferred conservation options based on irrigation conditions ▪ Evaluate potential inclusion of permit conditions (EPD) ▪ Update list of existing and potential incentive programs, with help from Georgia Soil and Water Conservation Commission and Farm Bureau ▪ Work with GSWCC and County Extension Services for outreach and education	▪ Continue implementation of selected practices ▪ Revise outreach and education based on results	▪ Agricultural permittees with help from GSWCC, County Extension Services, and Georgia Farm Bureau ▪ EPD
WD4 - Monitor Agricultural Use in the Ogeechee River	Agricultural Withdrawal	▪ Update list of current permittees with and without water use meters ▪ Install meters for major users that do not have metering systems ▪ Develop water use monitoring and reporting structure and database ▪ Develop meter calibration and replacement program	▪ Continue water use monitoring and meter calibration program ▪ Update demand forecasts and Resource Assessment models based on monitored use	▪ Agricultural permittees ▪ EPD, County Extension Services, and Georgia Farm Bureau

Action(s) Needed	Permit Category of Responsible Parties	Short-term Actions (Next 5 Years)	Long-term Actions (5 years and beyond)	Responsible or Potentially Affected Parties
Water Supply Management Practices				
WS1 - Develop/Update Local Water Master Plans	Municipal Water Withdrawals	▪ Update master plans with latest population and demand forecasts for local service areas; identify system needs and options ▪ Integrate Regional Water Plan recommendations into master plans ▪ Conduct alternatives analysis; identify and prioritize projects (including new, replacement repair and rehabilitation projects) to address long-term needs	Implement priority projects and update master plan every 5 years based on growth	Local governments / utilities
WS2 - Monitor Streamflow to Confirm the Frequency and Magnitude of the Predicted Challenge	EPD and USGS to coordinate	▪ Secure funding for additional flow monitoring ▪ Determine location(s) for monitoring in the Ogeechee Basin ▪ Install flow monitoring stations and begin monitoring daily flows and low flows; compare monitored flow conditions to model predictions	▪ Continue low flow monitoring and comparison of observed low flow conditions to model predictions ▪ Update Resource Assessment models based on observed low flows and revised water use and projections	▪ EPD (coordination and Resource Assessment) ▪ USGS (flow monitoring and record keeping) ▪ GEFA (funding)
WS3 - Conduct Instream Flow Studies	EPD, WRD and USGS to coordinate	▪ Secure funding for an initial “pilot-scale” study in the Ogeechee Basin ▪ Determine scope and locations to conduct instream flow study (suggest one location each in the Upper and Lower Ogeechee Basins). ▪ Begin and complete the “pilot” study in the basin.	Expand study locations as necessary; modify scope and content of studies from lessons learned from the pilot study	▪ EPD ▪ WRD ▪ USGS ▪ GEFA

Action(s) Needed	Permit Category of Responsible Parties	Short-term Actions (Next 5 Years)	Long-term Actions (5 years and beyond)	Responsible or Potentially Affected Parties
WS4 - Increase Groundwater Supplies	Agricultural Withdrawal	▪ Initiate strategic planning that includes identifying site-specific needs for groundwater wells over the next 40 years ▪ Identify a primary agency to lead outreach program and to develop an incentive program to reduce reliance on surface water for irrigation during summer low flow periods ▪ Begin permitting process for new wells ▪ Construct new wells as needed and as funding allows ▪ Develop outreach program to explain the need to increase groundwater use during summer low flow periods	▪ Continue permitting process for new wells ▪ Construct as needed and as funding allows ▪ Revise strategic plan every 5 years in conjunction with Regional Water Plan update	▪ EPD (planning) ▪ GSWCC, County Extension Services or Georgia Farm Bureau ▪ Agricultural permittee (Installation of wells)
WS5 - Decrease Surface Water Use during Low Flow Periods	Agricultural Withdrawal	▪ Identify funding sources and a lead agency (such as GSWCC or County Extension Services) to help develop drought management plans for agricultural permittees ▪ Review current agricultural withdrawal permits for potential modifications to protect minimum instream flows during low flow and drought conditions ▪ Develop drought management plan and implement instream flow protection measures ▪ Incorporate drought management into new agricultural withdrawal permits	▪ Continue to work with agricultural withdrawal permittees and EPD to develop permit modifications ▪ Update Resource Assessment models based on monitored use and instream flow protection measures	▪ EPD ▪ GSWCC, county Extension Services or Georgia Farm Bureau ▪ Agricultural permittees

Action(s) Needed	Permit Category of Responsible Parties	Short-term Actions (Next 5 Years)	Long-term Actions (5 years and beyond)	Responsible or Potentially Affected Parties
Water Quality Management Practices				
WQ1 - Develop/ Update Local Wastewater Master Plans	Municipal NPDES Permits	▪ Update master plans with latest population and demand forecasts for local service areas; identify system needs and options; evaluate future service area strategies ▪ Integrate Regional Water Plan recommendations into master plans ▪ Conduct alternatives analysis; identify and prioritize projects (including new, replacement, repair and rehabilitation projects) to address long-term needs ▪ Implement priority projects as appropriate	Implement priority projects and update master plan every 5 years based on growth	Local governments / utilities
WQ2 - Upgrade Existing Wastewater Treatment Facilities	Municipal & Industrial NPDES Permits	▪ Based on wastewater master planning and Regional Water Plan recommendations, evaluate options for upgrades ▪ Request new or revised waste load allocation for the selected local option ▪ Apply for revised permit based on selected option ▪ Begin preliminary design	▪ Facility Design and Construction ▪ Include results of implementation in 5-year Regional Water Plan update	Local governments; municipal/ industrial NPDES discharge permittees
WQ3 - Construct New Advanced Wastewater Treatment Facilities	Municipal & Industrial NPDES Permits	▪ Based on wastewater master planning and Regional Water Plan recommendations, evaluate treatment options ▪ Request new or revised waste load allocation for the selected option ▪ Apply for revised permit based on selected option ▪ Begin preliminary design	▪ Facility Design and Construction ▪ Include results of implementation in 5-year Regional Water Plan update	Local governments; municipal/ industrial NPDES discharge permittees

Action(s) Needed	Permit Category of Responsible Parties	Short-term Actions (Next 5 Years)	Long-term Actions (5 years and beyond)	Responsible or Potentially Affected Parties
WQ4 - Support Forestry Commission Water Quality Program	Stormwater (NPDES Discharges)	▪ Implementation of MPs identified in Georgia's Best Management Practices for Forestry handbook ▪ Annual monitoring of BMPs	▪ Conduct survey to gauge effectiveness ▪ Update BMPs as needed	Georgia Forestry Commission, UG
Educational Initiatives				
ED1 - Develop Regional or Customize State or Other Available Educational Program and Materials for Localized Implementation	All Water Withdrawal and NPDES Permits	▪ Coordinate with DCA, Regional Commissions and other Councils to establish and implement regional education programs. ▪ Update inventory of existing education materials from AWWA, GAWP and established water districts (in State or out of State) ▪ Develop educational materials and public awareness programs tailored to Region's needs and issues ▪ Develop additional outreach and promotional materials for economic development, focusing on the abundant water resources of the region ▪ Local entities to customize materials as needed and implement educational and outreach programs	▪ Conduct survey to gauge effectiveness ▪ Revise programs as needed	Short-term Actions: ▪ EPD and Council work with Regional Commissions, DCA with support from Association of County Commissioner of Georgia (ACCG), Georgia Municipal Association (GMA), Georgia Rural Water Association, Georgia Association of Water Professionals (GAWP), and local governments Long-term Actions: ▪ All of the above; survey lead - Regional Commissions or DCA

Action(s) Needed	Permit Category of Responsible Parties	Short-term Actions (Next 5 Years)	Long-term Actions (5 years and beyond)	Responsible or Potentially Affected Parties
ED2 - Promote Coordinated Environmental Planning	All Water Withdrawal and NPDES Permits	Coordinate with DCA regarding potential revisions to Chapter 110-12-1, Standards and Procedures for Local Comprehensive Planning and Part V Environmental Planning Criteria to facilitate incorporation of Regional Water Plan in the Comprehensive Planning process Implement revised Part V Environmental Planning Criteria (Chapter 391-3-16) of Georgia Planning Act of 1989 for the protection of ▪ Water supply watersheds ▪ Groundwater recharge areas ▪ Wetlands ▪ River corridors ▪ Mountains	▪ Continue integration of Regional Water Plan and Comprehensive Planning Process ▪ Implement recommendations as appropriate	Short-term Actions ▪ Council and EPD work with Regional Commissions, and DCA ▪ Local governments / Utilities Long-term Actions: ▪ Local governments / Utilities

Source: Technical Memorandum - Management Practices Selection (May 2011).
Key: ED – Education Initiatives; WD – Water Demand Management; WQ – Water Quality Management; WS – Water Supply Management

7.2 Fiscal Implications of Selected Water Management Practices

The following sub-sections discuss planning-level cost estimates and potential funding sources and options. Successful implementation of the Regional Water Plan hinges on the ability of the State and local governments to fund the needed implementation actions.

7.2.1 Planning Level Cost Estimates

Table 7-2 describes the fiscal implications of the priority management practices. Cost estimates for implementation are included to the extent possible, based on possible implementation unit (per capita, per study, per MGD of plant capacity, etc.). The table is designed so that local governments/jurisdictions or other permit holders and water users can estimate budget requirements for the implementation of the recommended management practices.

The planning level cost information shown in Table 7-2 is based upon cost guidance prepared by EPD in April 2011 ("EPD Supplemental Guidance"). Neither the guidance nor the cost estimates shown in the following tables have been updated. Accordingly, the values shown below should only be used as a general guide. Specific costs should be further evaluated and updated before being relied upon.

7.2.2 Funding Sources and Options

The ability of the responsible parties to successfully implement the management practices identified in this plan depends on the availability of funding. It is essential that a funding mechanism be identified, both at the State and local level to support the long-term implementation of the Regional Water Plan. Affected parties in the region will be responsible for determining the best combination of funding sources/options for implementing applicable management practices.

For local governments/utilities, water and sewer rates can be designed to provide a steady revenue stream to support implementation of certain actions. Other potential sources of funding for local governments and utilities can include general funds raised through property taxes or service fees, bonds, loans (such as loans from the Georgia Environmental Finance Authority), and grants. One existing program worth mentioning is DCA's "WaterFirst". WaterFirst communities receive discounts on interest rates for loans. The program is a voluntary partnership between local governments, State agencies, and other organizations working together to increase the quality of life in communities through the wise management and protection of water resources. It promotes a proactive approach to water resources that makes the connection between land use and water quality and quantity, which is consistent with the Council's goal. Details of this program can be found on the DCA website.[1]

For agricultural (farmers) or industrial (industries or businesses) permit holders, the sources of funding include investment by the individual or business, grants, and/or incentive programs.

[1] http://www.dca.state.ga.us/development/EnvironmentalManagement/programs/water_first.asp

Table 7-2 Cost Estimates for Implementation Responsibilities

(Associated with Priority Water Management Practices in Table 6-1 and Table 7-1)

Management Practice	Capital/ Programmatic Cost Range	Funding Sources and Options	Notes and Sources for Costs
WD1 - Implement Tier 1 Water Conservation Practices Required by SB370 or the EPD rules for water efficiency and drought management	Cost varies based on practices	Water/wastewater system revenues; State and local government incentive programs	EPD Supplemental Guidance[1] for various demand management practices
WD2 - Evaluate/ Encourage Tier 2 (Non-Farm) Water Conservation Practices	Cost varies based on practices	Water/wastewater system revenues; State and local government incentive programs	EPD Supplemental Guidance[1] for various demand management practices
WD3 -Evaluate/ Encourage Tier 3 and Tier 4 Agricultural Water Conservation Practices	Cost varies based on practices	State incentive programs	EPD Supplemental Guidance[1]
WD4 - Monitor Agricultural Use	$2,500 - $5,000 per user monitored $8,000 - $16,000 per year for data keeping and coordination	Local governments; State incentive programs (potential)	EPD Supplemental Guidance[1] page 6
WS1 - Evaluate/ Update Local Water Master Plans	$30,000 - $300,000 per plan, depending on size of the system and scope of study	Water/wastewater system revenues; State incentive programs (potential)	Water system modeling, if desired, may add to overall cost of master plan[2]
WS2 - Monitor Streamflow to Confirm the Frequency and Magnitude of the Predicted Challenge	$30,000 to $60,000 / new gage station installation; $15,000 annual maintenance	State and USGS	EPD Supplemental Guidance[1] page 6; Cost for Resource Assessment is not included
WS3 – Conduct Instream Flow Studies	$4,000 - $20,000 biological monitoring per site $70,000 - $200,000 per study - cost varies based on scope	State; State or Federal grant	EPD Supplemental Guidance[1] page 6 Colorado Water Supply Reserve Account Annual Report 2009
WS4 - Increase Groundwater Supplies	$30,000 - $300,000/MG; cost varies based on location	State incentive programs, private investment	EPD Supplemental Guidance[1]

Management Practice	Capital/ Programmatic Cost Range	Funding Sources and Options	Notes and Sources for Costs
WS5 – Decrease Surface Water Use during Low Flow Periods	$1,000 - $5,000/MG	State incentive programs	EPD Supplemental Guidance[1] Cost range is for conservation practices only
WQ1 – Evaluate/ Update Local Wastewater Master Plans	$30,000 - $250,000 per plan depending on size of the system and scope of study	Water/wastewater system revenues; State incentive programs (potential)	Sewer system modeling, if desired, may significantly increase overall cost of master plan[2]
WQ2 - Upgrade Existing Wastewater Treatment Facilities	$4 - $10 Million per MGD	Local governments / utilities, State (GEFA)	EPD Supplemental Guidance[1]
WQ3 - Construct Advanced Wastewater Treatment Facilities	$7 - $11 Million per MGD	Local governments / utilities, State (GEFA)	EPD Supplemental Guidance[1]
WQ4 – Support Forestry Commission Water Quality Program	Cost varies based on practices	State/federal funds	GA Forestry Commission's Water Quality Program
ED1 - Develop Regional or Customize State or Other Available Educational Program and Materials for Localized Implementation	$0.10 - $2.25 per capita	State, local governments/utilities	EPD Supplemental Guidance[1]
ED2 - Promote Coordinated Environmental Planning	$0.10 - $0.50 per capita	State, local governments/utility fees	EPD Supplemental Guidance[1]

Sources:

[1] Supplemental Guidance for Regional Planning Contractors: Water Management Practice Cost Comparison (EPD, 2010).

[2] Jacobs, various recent projects WD – Water Demand Management.

Key: ED – Education Initiatives; WQ – Water Quality Management; WS – Water Supply Management

7.3 Alignment with Other Plans

This update of the Regional Water Plan builds upon the knowledge base of previous planning efforts by the Council as well as State and local governments and utilities. Existing water- and wastewater-related plans and information sources are listed in the supplemental document *Existing Plans for Savannah-Upper Ogeechee Water Planning Region (May 2011)*, which can be found on the Council's website.

Where appropriate, locally planned projects and successful management practices were considered in the development of this plan. No known major conflicts between this regional plan and other plans have been identified. The Council encourages continuing alignment with all local and regional efforts (including those for adjacent watersheds and states) for future updates of regional plans. Coordinated environmental planning is recognized as a priority management practice, so that recommendations in the Regional Water Plan can be incorporated in other major regional or local planning, such as comprehensive land use plans, transportation plans, or local master plans.

Some differences exist in planning timing or cycle; for example, local comprehensive plans are typically prepared for a 20-year planning horizon; complete or partial update of the comprehensive plan can be prepared every 5 years. Water and wastewater master plans and capital improvement plans are typically conducted for a 20- to 30-year planning horizon. This Regional Water Plan has a 35-year planning horizon to allow major water supply needs and their long-term impacts on water resources to be evaluated. The differences in planning horizons indicate that the projects identified in local plans may not completely address the resource challenges identified in this Regional Water Plan. However, the potential trends and issues identified by this plan can be used to guide decision making by both local governments and state agencies to avert potential negative impacts on water resources in the region.

The Council also recognizes that specific funding needs to be set aside for continuation of regional water planning, implementation, and Council activities. Without available funding, the future role of the Council is unknown. The implementation of Regional Water Plans largely depends on the availability of funding.

7.4 Recommendations to the State

The Savannah-Upper Ogeechee Council recommends the following actions by the EPD to support implementation of the Regional Water Plan (Table 7-3). These recommendations include additional funding, data collection, policy, coordination and public education and outreach necessary for improving future regional water planning efforts.

Table 7-3 Recommendations to the State

Recommendations	
Funding	▪ Identify long-term funding options and a coordinating agency(s) to assist responsible parties with Regional Water Plan implementation. ▪ Coordinate with EPD and develop additional funding to further implement and improve the agricultural metering program. ▪ Recommend State and Federal funding to support further optimization studies for the USACE lakes to include: minimum release flows and pool elevation modifications (Savannah River Basin Comprehensive Study Phase II) ▪ Identify funding or support for developing Stormwater Utilities for small water utilities that lack necessary resources to implement on their own.
Additional Data (Surface Water)	▪ Engage USACE regarding a feasibility study to evaluate the costs/benefits of raising lake levels to preserve storage for water supply and provide flows for drought relief downstream. ▪ Further develop agricultural use metering program and monitor withdrawal from the nursery and agricultural industries in the region by reading meters, collecting and compiling that data on a regular basis, with consideration given to the implementing of a self-reporting practice. ▪ Evaluate instream flow and unimpaired flow assumptions in the Surface Water Availability Resource Assessment. Consider pilot site-specific instream flow studies in the Ogeechee Basin (at locations predicted to have instream flow shortage). In combination with a low flow monitoring program and an agricultural use metering program, confirm the magnitude and frequency of predicted challenges. ▪ Consider adding an additional model node(s) in the Upper Ogeechee Basin for further refinement of the Surface Water Availability Resource Assessment model. ▪ Update Surface Water Availability and Surface Water Quality Resource Assessment models based on the results of the studies for future Regional Water Plan update. ▪ Provide and present future updated information by watershed, rather than by Council boundaries.
Additional Data (Water Quality)	▪ Continue monitoring on segments of streams predicted to exceed DO assimilative capacity; monitor rate of DO depletion and evaluate possible causes before determining actions to correct the potential impairment.
Technical Support (Water Quality)	▪ Support and facilitate ongoing implementation of the Savannah Harbor 5R plan approved by USEPA. EPD's assistance in coordinating, facilitating, and providing technical support during implementation of the 5R Plan is needed to improve dissolved oxygen conditions in the lower Savannah River.
Policy	▪ Continue to study and evaluate current instream flow policy. ▪ Encourage State funding for minimum instream flow and unimpaired flow research. ▪ Request EPD assistance in streamlining the reservoir permitting process. ▪ Maintain the existing ban of interbasin transfers that was incorporated in the 2001 statue creating the Metropolitan North Georgia Water Planning District and expressly prohibiting the interbasin transfer of water into the 15 county metropolitan Atlanta area. Therefore, any transfer of Tennessee or Savannah River Basin water to the Metro region has been and is currently prohibited by law. ▪ Consider designating the Southeast Georgia Experiment Station at Midville as an irrigation research center similar to the Stripling Center in Camilla to provide modelling data that is more specific to the region.

Recommendations	
Coordination	▪ Continue to coordinate with SCDHEC and SCDNR on Savannah River water resources. ▪ Coordinate with USGS regarding its 5-year water use data collection efforts so these data can be aligned with other EPD data reporting efforts and used for future regional planning purposes. ▪ Use UGA Extension as the preferred channel to disseminate information to the Agricultural Community due to its reputation and capability.
Public Education and Outreach	▪ Develop regional education materials for use and customization by local entities that can be tailored for specific audiences (i.e., community vs. industrial vs. agricultural organizations).

The Council specifically requests that EPD, working in conjunction with the USACE and through the Savannah River Basin Comprehensive Study update process, evaluate adaptive management techniques and potential revisions to operating protocols that would minimize the use of the available conservation storage. Currently, the USACE is working with the States of Georgia and South Carolina to secure funding for the next phase of Comprehensive Study update. Topics to be investigated with the Comprehensive Study update are recommended to include:

1. Management of the Savannah River Basin in a more adaptive manner by releasing less water from the Thurmond dam if adequate river flows are occurring downstream. Generally speaking, it is in the best interest of all stakeholders within the Savannah River Basin to keep the lakes as full as practical and as long as practical, so that stored water is available to release in times of lower rainfall.

2. Evaluate potential revisions to the rule curves for Lakes Thurmond and Hartwell. Evaluate whether the winter pool elevations could be beneficially raised.

3. Manage the USACE lakes more closely to the existing rule curves. Evaluate the operational scenario where (a) downstream flow releases are reduced as soon as the lakes drop below the rule curves for Lakes Hartwell and Thurmond, and (b) reduce the range of lake level drop between trigger levels.

4. Consider further economic impact studies and protection of "the economic well being" of the communities that have developed both around the USACE projects and downstream in the basin as one of the goals of those projects.

5. Continue to evaluate the current minimum flow release below the Thurmond dam.

6. Continue to evaluate the ecological impacts of any modifications to the management operations strategy.

SECTION 8

Monitoring and Reporting Progress

Section 8 Monitoring and Reporting Progress

Summary

The Savannah-Upper Ogeechee Council selected benchmarks to assess the effectiveness of this Regional Water Plan. Progress toward implementation will be based on benchmarks designed for demand management, water supply, water quality management practices, and educational initiatives. Measurement tools include annual, biennial, and other surveys on a 5-year basis prior to each Regional Water Plan Update. EPD is assumed to be the lead party responsible to administer these surveys with help from partnering agencies and local governments.

This section presents benchmarks for evaluating the implementation of this Regional Water Plan and discusses future plan update requirements and amendment processes.

8.1 Benchmarks

The benchmarks prepared by the Savannah-Upper Ogeechee Council and listed in Table 8-1 below will be used to assess the effectiveness of this plan's implementation and identify periodic revisions. As detailed below, the Council selected both qualitative and quantitative benchmarks that will be used to assess whether the water management practices are addressing challenges over time and allowing the water planning region to meet its vision and goals.

The selected water management practices recommended by the Savannah-Upper Ogeechee Council will be primarily implemented by the various water users in the region, including local governments and others with the capacity to develop water infrastructure and apply for the required permits, grants and loans. The Council recommends specific benchmarks for all of the recommended priority management practices. Measurement of these benchmarks is primarily conducted by surveys at various frequencies, and some of the data can be gathered from reports already required by permit conditions. For additional voluntary management practices, the Council recommends a survey prior to the 5-year plan update process. EPD is assumed to be the lead responsible party to administer surveys with help from partnering agencies or local governments. These benchmarks should be revisited during the 5-year plan update process and revised as necessary, depending on implementation of management practices and other available information.

8.2 Plan Updates

Meeting current and future water needs will require periodic review and revision of Regional Water Plans. The State Water Plan and associated rules provide that each Regional Water Plan will be subject to review by the appropriate Regional Water Planning Council every five years and in accordance with guidance provided by the Director, unless otherwise required by the Director for earlier review. These reviews and updates will allow an opportunity to adapt the Regional Water Plan based on changed circumstances and new information arising in the five years since EPD's adoption of the most recently updated plan. The recommended benchmarks serve to guide EPD in the review of the Regional Water Plan.

Table 8-1 Benchmarks for Priority Management Practices

Management Practices	Benchmarks	Measurement Tools	Time Period
Water Demand Management Practices			
WD1 - Implement Tier 1 Water Conservation Practices Required by SB370 or the EPD rules for water efficiency and drought management	Maintenance or reduction of residential per capita water use Demonstrable progress toward improving water supply efficiency	Municipal water withdrawal permittee tools: ▪ Calculation of residential per capita demand (gpcd) via annual water conservation progress report with help from Regional Commissions and DCA ▪ Qualified annual water loss audits	Annual
WD2 - Evaluate/ Encourage Tier 2 (Non-Farm) Water Conservation Practices	Implementation of recommended water conservation practices for municipal and industrial permittees, including thermoelectric power generation	Survey based on annual water conservation progress report	Annual
WD3 - Evaluate/ Encourage Tier 3 & Tier 4 Agricultural Water Conservation Practices	Implementation of recommended water conservation practices	Survey with help from GSWCC, County Extension offices and Georgia Farm Bureau	Every 5 years[1]
WD4 – Monitor Agricultural Use	Establishment of water withdrawal monitoring network/database	▪ Number/location of new meters installed ▪ Total number of agricultural irrigation meters ▪ Number of meters calibrated or replaced ▪ Number of self-reported meter readings and if/how many of those readings were audited ▪ Revised Resource Assessment (model re-calibration based on newly available data)	Every 5 years[1]
Water Supply Management Practices			
WS1 - Evaluate/ Update Local Water Master Plans	Number of local water master plans initiated/ completed	Survey	Every 5 years[1]
WS2 - Monitor Streamflow to Confirm the Frequency and Magnitude of the Predicted Challenge	Establishment of flow monitoring network/database in the Ogeechee River Basin	▪ Number/location of new flow monitoring stations ▪ Comparison of monitored low flow to actual or estimated agricultural use ▪ Revised Resource Assessment (model re-calibration based on newly available data)	Every 5 years[1]
WS3 - Conduct Instream Flow Studies	Number of instream flow studies conducted	Streams with site-specific instream flow requirement based on the studies	Every 5 years[1]

Management Practices	Benchmarks	Measurement Tools	Time Period
WS4 - Increase Groundwater Supplies from Floridan Aquifer	Reduction of future water quantity challenge	▪ % of groundwater used for irrigation during low flow seasons ▪ Revised Resource Assessment (model re-calibration based on newly available data)	Every 5 years[1]
WS5 - Decrease Surface Water Use during Low Flow Periods	Reduction of future water quantity challenge	▪ % of surface water used for irrigation during droughts and low flow seasons ▪ Revised Resource Assessment (model re-calibration based on newly available data)	Every 5 years[1]
Water Quality Management Practices			
WQ1 - Evaluate/ Update Local Wastewater Master Plans	Number of local wastewater master plans initiated/ completed	Survey	Every 5 years[1]
WQ2 - Upgrade Existing Wastewater Treatment Facilities	Meeting treatment capacity needs and compliance with water quality standards	Quantities of additional permitted treatment capacities or upgrades	Every 5 years[1]
WQ3 - Construct New Advanced Wastewater Treatment Facilities			
WQ4 - Support Forestry Commission Water Quality Program	Ongoing improvement of data points	MP compliance surveys	Every 2 years
Educational Initiatives			
ED1 - Develop or Customize State or Other Available Educational Program and Materials for Localized Implementation	Number/type of local educational and outreach programs developed based on regional materials	Survey based on annual water conservation progress report; and surveys (for other educational programs) with help from Regional Commissions and DCA	Every 5 years[1]
ED2 - Promote Coordinated Environmental Planning	Incorporation of Regional Water Plan via Comprehensive Planning and Service Delivery Strategy processes	Survey with help from Regional Commissions and DCA	Every 5 years[1]

Source: Technical Memorandum - Management Practices Selection (May 2011).

Notes: For all measurement tools listed above, EPD is assumed to be the lead party responsible to administer survey with help from partnering agencies or local governments.

[1] Prior to next 5-year Regional Plan update.

Key: ED – Education Initiatives; WD – Water Demand Management; WQ – Water Quality Management; WS – Water Supply Management

8.3 Plan Amendments

The Council wishes to provide flexibility for plan amendments to adapt to changing circumstances. This Regional Water Plan will be amended, at a minimum, on a 5-year basis, or as required as additional needs arise. Examples of a major triggering event could include the following:

- Proposal (or expansion) of a major water-using industry or development, including energy generation or military facilities, that would be expected to significantly change the water demand or discharge conditions of the region;
- Closure of major existing water use facilities that would significantly change the water demand or discharge conditions of the region;
- Major change in regulatory requirements, such as nutrient loading or instream flow requirements based on site-specific studies;
- Major changes in operation protocols of USACE lakes;
- Any discussion regarding interbasin transfers into or out of the region; and
- New information that results in challenges in resource availability.

The Council intends to form a permanent Savannah and Ogeechee water planning organization as the conduit for bringing together all stakeholders and assisting the State with implementation of water resource goals in the entire basin. The Council recommends that one third of the current Council members be grandfathered into the permanent organization for continuity. The discussions on this new organization are in the very initial stage. The Council recommends that any plan amendments be reviewed and approved by EPD until a future organization is formed. Any meetings conducted to review and approve future plan amendments should invite stakeholders and allow for general public input.

APPENDIX A

Appendix A Summary of Edits and Updates 2022-2023 Review and Revisions

Section	Location	Change	Description
ES	Introduction	Minor text updates	▪ Text and dates were updated to reflect the 2023 Plan.
ES	Regional Overview	Minor text updates	▪ Updated current population values (2020 Census). ▪ Updated water use information to the most recent information compiled by USGS (2019 USGS Publication).
ES	Demand Forecasts and Water Resources Issues	Minor text updates	▪ Updated population projections (2019 OPB). ▪ Updated the revised water and wastewater forecasts. ▪ Added text to reflect the regulatory flow threshold, 7Q10. ▪ Updated dates and other minor wordsmithing.
ES	Conclusion	Minor text updates	▪ Updated word choice and dates.
1	Summary	Minor text updates	▪ Updated word choice and dates.
1	Section 1.1	Minor text updates	▪ Text was updated with minor wordsmithing.
1	Figure 1-1	Updated	▪ Replaced original graphic with one that provides better clarity on Region and County boundaries.
1	Section 1.2	Minor text updates	▪ Text was updated to reflect the 2023 Plan. ▪ Updated dates and word choice.
1	Figure 1-2	Updated	▪ Replaced with more recent graphic on the water planning process.
1	Section 1.3.2	Updated	▪ Replaced written text with Figure 1-4 that outlines the Council's goals. ▪ Added text to describe goals.
2	Section 2.2.1	Minor text updates	▪ Updated population values (U.S. Census, 2020). ▪ Added text reflecting the difference in population values and population projections.
2	Table 2-1	Updated	▪ Updated population values (U.S. Census, 2020).
2	Section 2.2.2	Updated	▪ The text was updated to reflect recent employment data.
2	Section 2.2.3	Updated	▪ Updated land use data.
2	Figure 2-3	Updated	▪ Replaced with more recent graphic on land cover.
3	Summary	Minor text updates	▪ Updated withdrawal and return data (2015).
3	Section 3.1	Updated water use information	▪ Updated water use information to the most recent information compiled by USGS (2019 USGS Publication).
3	Figures 3-1 to 3-4	Updated water use information and figures	▪ Updated water use information to the most recent information compiled by USGS (2019 USGS Publication).
3	Section 3.2.1	Minor text revisions	▪ Updated word choice.

Section	Location	Change	Description
3	Figure 3-5	Updated	▪ Figure updated with most recent results of the assimilative capacity assessment.
3	Table 3-1	Updated	▪ Values updated with most recent results of the assimilative capacity assessment.
3	Section 3.2.2	Updated	▪ Updated descriptions of the Surface Water Availability Resource Assessment to more accurately describe the nature of the analysis. ▪ Text was added to describe updated methodology utilized during the Plan update. ▪ Text was updated to reflect the most recent data and modeling results. ▪ Updated word choice and sentence structure. ▪ Removed text related to outdated references.
3	Figure 3-6	Updated	▪ Figure has been updated to show the new BEAM model nodes from the Surface Water Availability Resource Assessment.
3	Table 3-2 and Table 3-3	Updated	▪ Tables were updated to align with the new BEAM modeling approach. Values presented are based on the Surface Water Availability Assessment, 2022, EPD.
3	Section 3.2.3	Updated	▪ Updated descriptions of the Groundwater Availability Resource Assessment to more accurately describe the nature of the analysis. ▪ Updated water use information to the most recent information compiled by USGS (2016 USGS Publication).
3	Section 3.3.1	Updated	▪ Text was updated with the 2022 percentages of impaired reaches and lakes. ▪ Added text regarding the list of impaired waters. ▪ Removed text related to outdated references.
3	Figure 3-7	Updated	▪ Figure has been updated to show the types of impairments, the surrounding text has also been updated based on the 2022 303(d) list.
3	Section 3.3.2	Minor text updates	▪ The Comprehensive Wildlife Conservation Strategy was updated and replaced with State Wildlife Action Plan (SWAP). The number of high priority watersheds were updated.
4	Summary	Minor text updates/text additions	▪ Text was updated to reflect the revised forecasts and population projections.
4	Section 4	Minor text updates	▪ Text was updated to reflect the revised methodology in the Plan update,
4	Section 4.1	Text additions	▪ Text was added to describe municipal forecasts.
4	Section 4.1.1	Section addition	▪ Section was added to describe updated population projections utilized during the Plan update.
4	Table 4-1	Updated	▪ Population projections were updated based on the most recent statewide population projections (Governor's Office of Planning and Budget, 2019).
4	Section 4.1.2	Text additions	▪ Text was added to describe updated methodology utilized during the Plan update.
4	Figure 4-1	Updated	▪ Figure was updated to reflect the revised municipal water forecasts.

Section	Location	Change	Description
4	Section 4.1.3	Text revisions/updates Text additions	▪ Text was updated for the most recent information available. ▪ Text was updated to reflect revised methodology.
4	Figure 4-2	Updated	▪ Figure was updated to reflect the revised municipal wastewater forecasts.
4	Section 4.2	Updated	▪ Text was updated to reflect revised methodology.
4	Section 4.2.1	Updated	▪ Text was updated to reflect revised methodology.
4	Section 4.2.2	Updated	▪ Text was updated to reflect revised methodology.
4	Figure 4-3	Updated	▪ Figure was updated for industrial water forecasts (2022).
4	Section 4.2.3	Updated	▪ Text was updated to reflect revised methodology
4	Figure 4-4	Updated	▪ Figure was updated for industrial wastewater forecasts (2022).
4	Section 4.3	Text Updates	▪ Text was updated to reflect the revised methodology for forecasting agricultural demands. ▪ Text was updated based on the most recent data.
4	Table 4-2	Updated	▪ Table was updated with the revised agricultural forecasts. ▪ Values quoted in surrounding text was also updated based on current information.
4	Section 4.4	Text revisions/updates	▪ Text was updated to reflect the revised methodology for forecasting energy demands. ▪ Text was updated based on the most recent data.
4	Table 4-3	Updated	▪ Table was updated with the revised thermoelectric water forecasts.
4	Section 4.5	Minor text revisions/updates	▪ Text was updated based on the most recent data.
4	Figure 4-5	Updated	▪ Figure was updated with the revised water demand forecasts per sector.
4	Figure 4-6	Updated	▪ Figure was updated with the revised total wastewater forecasts per discharge method.
5	Summary	Minor text revisions/updates	▪ Text was updated based on the most recent analysis.
5	Section 5.1	Minor text revisions/updates	▪ Text was updated based on the results from the Groundwater Availability Resource Assessment
5	Figure 5-1	Updated	▪ Figure was updated with revised forecast.
5	Section 5.2	Minor text revisions/updates	▪ Text was updated to reflect the most recent data and modeling results. ▪ Updated dates and word choice. ▪ Removed text related to outdated references. ▪ Paragraph added to reflect the changes in the new modeling approach.
5	Figure 5-2	Updated	▪ Figure was updated with revised surface water challenges.
5	Table 5-1	Replaced	▪ Previous table, "Summary of Reservoir Storage Volumes" was removed due to outdated data. ▪ Table 5-1 was replaced with revised surface water supply challenges.

Section	Location	Change	Description
5	Table 5-2	Updated	▪ Table was updated with revised wastewater assimilation challenges.
5	Table 5-3	Updated	▪ Table was updated with revised increase in water demands.
5	Table 5-4	Updated	▪ Table was updated with revised municipal water demands and permitted withdrawals.
5	Section 5.3	Minor text revisions/updates	▪ Updated dates and word choice.
5	Section 5.3.1	Minor text revisions/updates	▪ Text was updated based on the most recent analysis.
5	Table 5-5	Updated	▪ Table was updated with revised point and LAS discharges.
5	Section 5.3.2	Minor text revisions/updates	▪ Text was updated based on the most recent analysis.
5	Figure 5-3	Updated	▪ Figure was updated with revised assimilative capacity assessment.
5	Table 5-4	Updated	▪ Table was updated with revised assimilative capacity assessment.
5	Figure 5-4	Updated	▪ Figure was updated with revised assimilative capacity assessment.
5	Section 5.3.4	Minor text revisions/updates	▪ Updated dates and word choice.
5	Section 5.4	Minor text revisions/updates	▪ Text was updated based on the most recent analysis.
5	Table 5-5	Updated	▪ Table was updated with revised assessment.
6	Summary	Minor text revisions/updates	▪ Text was updated based on the most recent analysis.
6	Section 6.1	Minor text revisions/updates	▪ Updated text for critical factors. ▪ Updated word choice.
6	Section 6.2.1	Minor text revisions/updates	▪ Updated dates and word choice.
6	Section 6.2.2	Minor text revisions/updates	▪ Updated dates and word choice.
6	Table 6-1	Updated	▪ Updated Description/Definition of Action for Action WD2 and ED2. ▪ Outdated text related to surface water availability gaps was revised.
6	Table 6-2	Updated	▪ Outdated text related to surface water availability gaps was revised.
7	Section 7.1	Minor text revisions/updates	▪ Updated word choice
7	Table 7-1	Updated	▪ Outdated text related to surface water availability gaps was revised.
7	Table 7-2	Updated	▪ Outdated text related to surface water availability gaps was revised.
7	Section 7.3	Minor text revisions/updates	▪ Updated word choice.
7	Table 7-3	Updated	▪ Outdated text related to surface water availability gaps was revised.
8	Section 8.1	Minor text revisions/updates	▪ Updated word choice.
8	Table 8-1	Updated	▪ Outdated text related to surface water availability gaps was revised.
8	Section 8.3	Minor text revisions/updates	▪ Updated word choice.