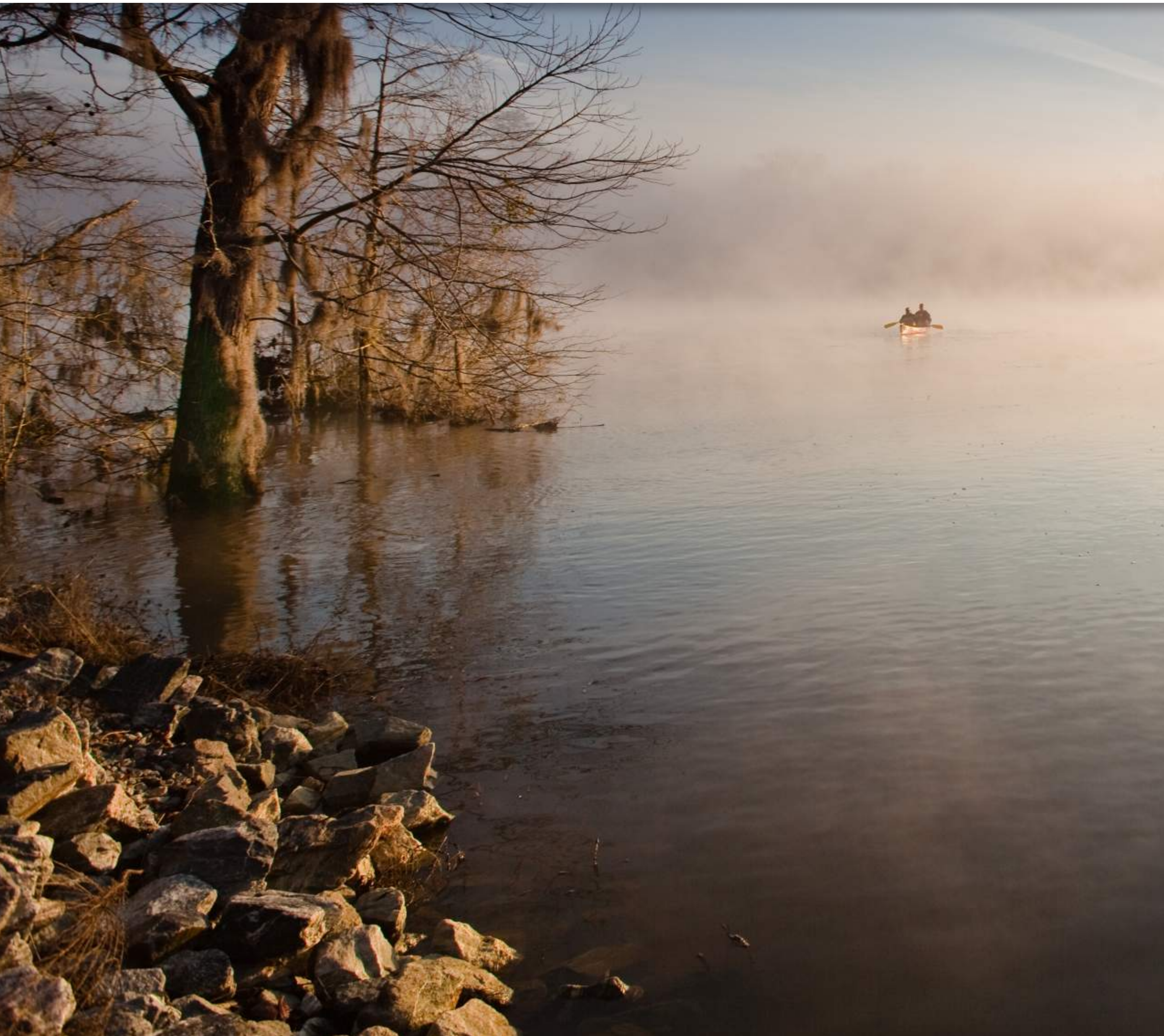
GEORGIA WATER PLANNING

Regional Water Plan

ALTAMAHA

JUNE 2023



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Supplemental Documents

The following supplemental materials have been developed and/or updated in support of the Altamaha Regional Water Plan and are available at https://waterplanning.georgia.gov/forecasting and https://waterplanning.georgia.gov/altamaha-region-technical-information:

- Energy Sector Demand Forecast Technical Memorandum
- Industrial Water Demand Forecasting Technical Memorandum
- Municipal Water Demand and Wastewater Flow Forecasting Methods Report
- Water and Wastewater Forecasting Technical Memorandum
- Gap Analysis Technical Memorandum

Acknowledgments

The Altamaha Council should be acknowledged for contributing significant amounts of time and talent toward the development of the Regional Water Plan. Since the inception of the 2011 Regional Water Plan, members have participated in council meetings, subcommittee meetings, conference calls, and report development and review. The members (current and previous) of the Altamaha Council include:

Name	City	County
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Randy Branch (Alternate)	Baxley	Appling
Guy R. Bullock	Pitts	Wilcox
James M. Burns	Tarrytown	Montgomery
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The Altamaha Council would like to thank Danielle Honour with CDM Smith and Jennifer Welte of Georgia EPD for providing the planning and technical guidance toward the development of this Plan.

Acronyms

AAD-MGD	Annual Average Day in million gallons per day
ASR	Aquifer Storage and Recovery
ASWS	Additional/Alternate Surface Water Supply
BEAM	Basin Environmental Assessment Model
BMP	best management practice
cfs	cubic feet per second
CRD	Coastal Resources Division
CWA	Clean Water Act
CWCS	Comprehensive Wildlife Conservation Strategy
CWSRF	Clean Water State Revolving Fund
DCA	Department of Community Affairs
DCAR	Data Collection/Additional Research
DNR	Department of Natural Resources
DO	dissolved oxygen
DWSRF	Drinking Water State Revolving Fund
EDU	Educational Needs
EPA	U.S. Environmental Protection Agency
EPD	Environmental Protection Division
ET	evapotranspiration
FERC	Federal Energy Regulatory Commission
GEFA	Georgia Environmental Finance Authority
Georgia DOA	Georgia Department of Agriculture
GFC	Georgia Forestry Commission
gpcd	gallons per capita per day
GSWCC	Georgia Soil and Water Conservation Commission
GW	groundwater
GWPPC	Georgia Water Planning & Policy Center

I/I	inflow and infiltration
IGWPC	Industrial Groundwater Permit Capacity
IWWPC	Industrial Wastewater Permit Capacity
LAS	land application system
LDA	local drainage area
M	million
MG	million gallons
MGD	million gallons per day
MGWPC	Municipal Groundwater Permit Capacity
MNGWPD	Metropolitan North Georgia Water Planning District
MOA	Memorandum of Agreement
MWWPC	Municipal Wastewater Permit Capacity
N/A	not applicable
NPDES	National Pollutant Discharge Elimination System
NPS	non-point source
NPSA	Agricultural Best Management Practices
NPSF	Forestry Best Management Practices
NPSR	Rural Best Management Practices
NPSU	Urban Best Management Practices
NRCS	Natural Resources Conservation Service
NUT	nutrients
O.C.G.A.	Official Code of Georgia Annotated
OCP	Ordinance and Code Policy
OPB	Office of State Planning and Budget
OSSMS	on-site sewage management systems
PIP	Public Involvement Plan
PS	point source
PSDO	Point Sources – Dissolved Oxygen

mi^2	square miles
SW	surface water
SWAP	State Wildlife Action Plan
TMDL	total maximum daily load
UGA	University of Georgia
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
WC	water conservation
WCIP	Water Conservation Implementation Plan
WPCP	Water Pollution Control Plant
WRD	Wildlife Resources Division
WTP	water treatment plant
WWTP	wastewater treatment plant

Conversion of Units (Water Flow and Volume) Used in Plan (values rounded)

1 cubic foot = 7.48 gallons

1 cubic foot per second = 0.646 million gallons per day or 646,272 gallons per day

1 million gallons per day = 1.55 cubic feet per second

1 million gallons = 3.069 acre-feet (1 acre-foot is enough water to cover a football field with about 9 inches of water)

1 cubic foot per second = 1.98 acre-feet per day

1 acre-foot = 325,851 gallons

1 acre-foot = 0.326 million gallons

EXECUTIVE SUMMARY

Executive Summary

Water Resource Trends and Key Findings for the Altamaha Region

The Altamaha Region includes 16 counties in the south-central portion of Georgia. Over the next 40 years, the population of the region is projected to increase from approximately 251,500 to 252,600 residents.

Key economic drivers in the region include agriculture, forestry, professional and business services, education, healthcare, manufacturing, public administration, fishing and hunting, and construction. Energy production is also significant to the region. Water supplies, wastewater treatment, and related infrastructure will need to be developed and maintained to support these economic drivers.

Groundwater (the majority from the Floridan aquifer) is forecasted to meet about 62% of the water supply needs in 2060, with agricultural and industrial uses being the dominant demand sectors. Surface water is expected to be utilized to meet about 38% of the 2060 water supply needs, with agriculture and energy as the dominant demand sectors. The energy sector is a major user of surface water from the Altamaha River.

Water resource challenges in the region include: surface water challenges during drier years/drought periods; and water quality challenges associated with low dissolved oxygen in some portions of the region.

Management practices are needed to address these challenges including: water conservation; refining planning information; alternate sources of supply in areas where surface water availability may be limited; improving/upgrading wastewater treatment; and addressing non-point sources of pollution.

Introduction and Overview of the Altamaha Region

Of all Georgia's natural resources, none is more important to the future of our State than water. Over the last several decades, Georgia continues to be one of the most populous states in the nation. According to the U.S. Census Bureau, between 2010 and 2020, Georgia ranked fifth in total population gain (1.02 million new residents) and 12th in percentage increase in population (10.6%). During a portion of this same period, our State also experienced critical areas of severe drought. Georgia's growth and economic prosperity are vitally linked to our water resources.

As our State has grown, the management and value of water resources have also changed. Ensuring a bright future for our State requires thoughtful planning and wise use of our water resources. The water planning process began in 2008, when the State of Georgia's leadership authorized a comprehensive state-wide water planning process to help address these challenges and take a forward look at how our State is expected to grow and use water through 2060. The Altamaha Regional Water Planning Council (Altamaha Council) was established in February 2009 as part of this state-wide process. The Altamaha Council completed the initial Regional Water Plan in 2011, and in 2017 the Altamaha Council updated the Regional Water Plan. This current update builds upon the original 2011 Regional Water Plan and 2017 update. The Altamaha Council is one of 11 planning regions charged with developing Regional Water Plans and encompasses 16 counties in the south-central portion of Georgia (shown in Figure ES-1). An overview of the updated findings and recommendations for the Altamaha Region are provided in this Executive Summary. The Altamaha Council's Regional Water Plan is available on the Council's website (Altamaha Regional Water Plan | Georgia Water Planning).

Georgia has ample water resources, with 14 major river systems and multiple groundwater aquifer systems. These waters are shared natural resources; streams and rivers run through many political jurisdictions. Rainfall that occurs in one region of Georgia may replenish the aquifers used by communities many miles away. And, while ample water in Georgia is available, it is not an unlimited resource. It must be carefully managed to meet long-term water needs. Since water resources vary greatly across the State, water supply planning on a regional and local level is the most effective way to ensure that current and future water resource needs are met.

Figure ES-1 Altamaha Regional Water Planning Council

The Altamaha River, formed by the confluence of the Ocmulgee and Oconee Rivers, is the major surface water feature in the region. The river originates in the Northern Piedmont province of north Georgia, traverses southeast through the Coastal Plain region, and discharges to the Atlantic Ocean near Darien, Georgia. It is the only major river in Georgia that is contained wholly within the boundaries of the State. The Altamaha River is known for its extremely rich biological diversity and supports 11 imperiled mussel species and at least 120 species of rare or endangered plants and animals (Nature Conservancy, 2007).

The Altamaha Region encompasses several major population centers, including Vidalia, Jesup, Swainsboro, Eastman, and Glennville. The Altamaha Region is projected to grow by approximately 1,100 residents, or 0.4%, from 2020 to 2060 (Georgia's Office of Planning and Budget, 2019). The region requires reliable water supplies and sufficient wastewater treatment to meet its current and future needs. In addition, the region has a vibrant agricultural base that requires water supply to continue supporting the economics of the region.

Key economic drivers in the Altamaha Region include agriculture, forestry, professional and business services, education, healthcare, manufacturing, public administration, fishing and hunting, and construction. The important industrial and manufacturing sectors in the region include mining, food, textile, paper, chemical, petroleum, rubber, stone and clay, primary metals, fabricated metals, and electrical equipment. Forested lands and agriculture are major land covers in the region, which are also important drivers for the region's economy.

Establishing a Water Resource Vision for the Altamaha Region

A foundational part of the water planning process was the development of a vision for the region that describes the economic, population, environmental, and water use conditions that are desired for the region. The Altamaha Council adopted the following vision for the region.

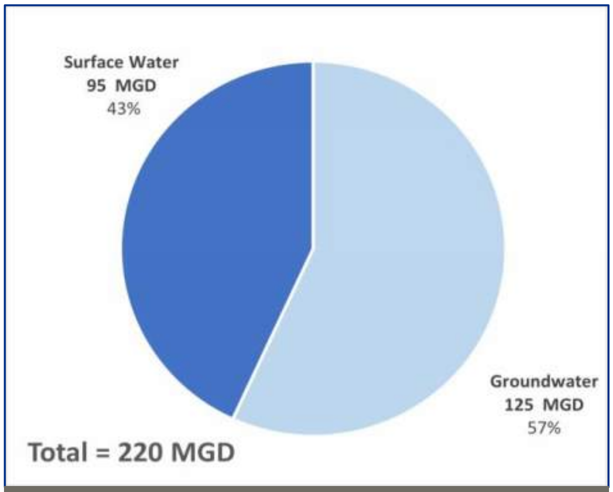
> *"The vision of the Altamaha Regional Water Planning Council is to wisely manage, develop, and protect the region's water resources for current and future generations by ensuring that the Altamaha basin's water resources are sustainably managed to enhance quality of life and public health, protect natural systems including fishing, wildlife and wildlife utilization activities, and support the basin's economy."*

The Altamaha Council identified 12 goals to complement the vision. These goals can be found in Section 1 of the Regional Water Plan. They are grouped into three categories: Water Systems/Supply Sustainability, Economic Sustainability and Development, and Quality of Life and Public Health Enhancement.

Overview of Water Resources and Use in the Altamaha Region

Surface Water

The Altamaha River is the major surface water feature in the region. The Altamaha River, formed by the confluence of the Ocmulgee and Oconee Rivers, is 127 miles long and has a drainage area of approximately 14,000 square miles (EPD, 2003). As shown in Figure ES-2, surface water is used to meet about 43% of the region's water supply needs in 2015. Through 2060, the sources of agricultural surface water in the region are projected to come from the Altamaha River Basin (27%), Ocmulgee River Basin (35%), Ogeechee River Basin (13%), Satilla River Basin (13%), Suwannee River Basin (7%), and Oconee River Basin (5%). This information is based on the assumption that future use will follow current practices and trends. However, as described in more detail below, there are some locations where current and/or future water needs exceed water availability, which causes the need to develop alternate sources of water supply.



Data Source: "Water Use in Georgia by County for 2015; and Water-Use Trends, 1980-2015" (USGS, 2019).

Figure ES-2 2015 Water Supply by Source Type

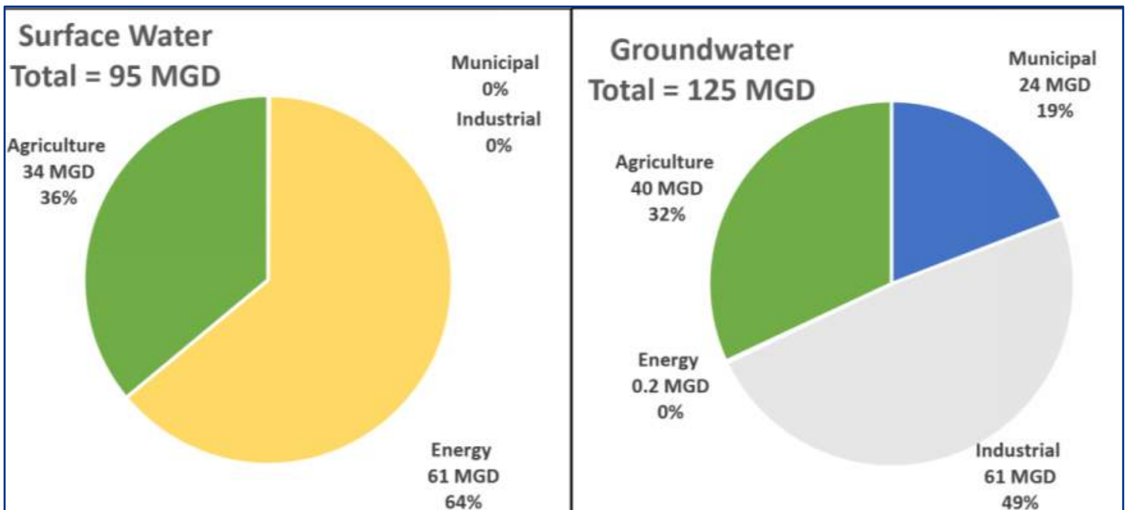
Groundwater

As shown in Figure ES-2, groundwater was used to meet about 57% of the region's water supply needs in 2015. Based on the updated water demand forecast, approximately 97% of groundwater in the region will be supplied from the Floridan aquifer, which is one of the most productive groundwater aquifers in the United

States. The remaining groundwater is supplied by the surficial, Claiborne, Gordon, Cretaceous, Dublin and Brunswick aquifers.

Water and Wastewater Needs in the Altamaha Region – A Closer Look

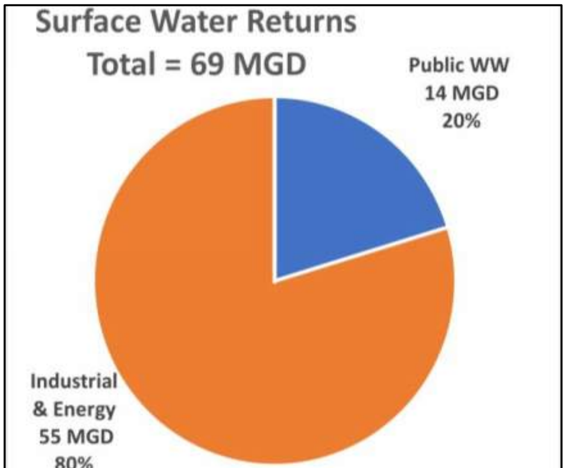
Figure ES-3 presents surface water and groundwater use by sector in the Altamaha Region. About 64% percent of 2015 surface water withdrawals in the region are for the energy sector. However, approximately 39 MGD of the total 61 MGD of energy water withdrawals in 2015 were consumed, while the remaining 22 MGD were returned to the surface water. The 125 MGD of groundwater withdrawals in 2015 were used to supply industrial (49%) and agricultural uses (32%), while municipal, self-supply (homes with groundwater wells), and energy made up the remaining uses.



Data Source: "Water Use in Georgia by County for 2015; and Water-Use Trends, 1985-2015" (USGS, 2019).
Note: Energy totals shown represent total thermoelectric water withdrawal; 39 MGD of the total 61 MGD (64%) is consumptive, the remainder (22 MGD) is discharged back to surface water as return flow.

Figure ES-3 2015 Water Use by Category

Wastewater treatment types/values representing past trends and forecasted use in the region are shown in Figure ES-4. According to the updated Altamaha Water and Wastewater Forecast developed for the Regional Water Plan (CDM Smith, 2022), 85% of treated wastewater in the region is disposed of as a municipal/industrial/energy point source discharge, and 6% by a land application system. The remaining wastewater is treated by on-site sewage treatment (septic) systems (9%).

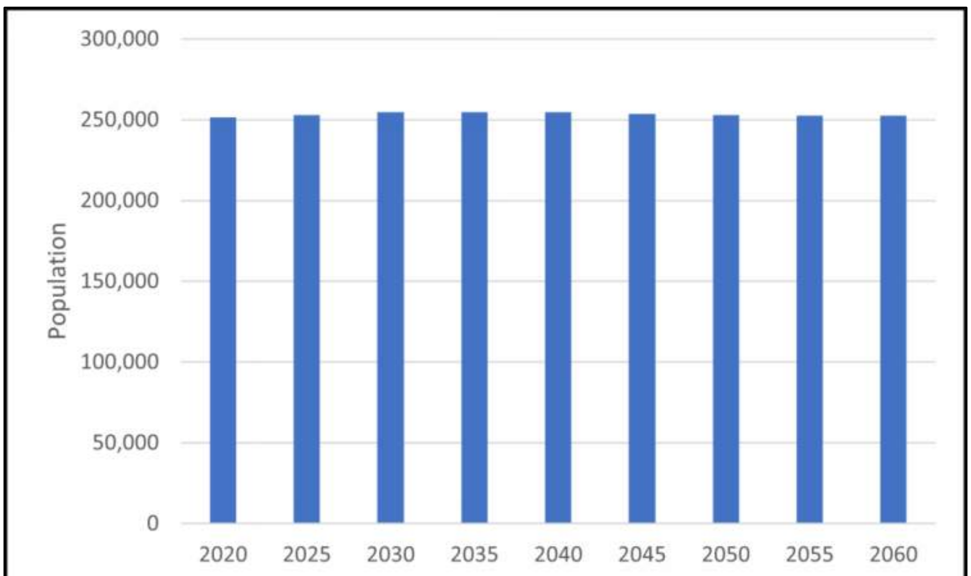


Data Source: "Water Use in Georgia by County for 2015; and Water-Use Trends, 1985-2015" (USGS, 2019).
USGS included thermoelectric returns with industrial return flow.

Figure ES-4 2015 Return Flows

Altamaha Forecasted Water Resource Needs from the Year 2020 to 2060

Municipal water and wastewater forecasts are tied to population projections for the counties within the Altamaha Region. The updated population projections were developed by the Georgia Governor's Office of Planning and Budget and are shown in Figure ES-5. Industrial, energy, and agricultural water demand were estimated separately. Overall, the region's water supply needs are expected to grow by 15% (47 MGD) from 2020 through 2060. Over the same period, total wastewater flows in the region are expected to grow by only 1.5% (1.7 MGD). The principal focus of this report is to identify where and when there may be "challenges" in meeting the anticipated water needs of instream and off-stream uses, and to recommend how these challenges can be managed.



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

Figure ES-5 Altamaha Region Population Projections (2020-2060)

Comparison of Available Resource Capacity to Future Water Resource Needs

Groundwater Availability

Groundwater from the Floridan aquifer is a vital resource for the Altamaha Region. Several groundwater modeling tools were developed as part of the water planning process to estimate the range of groundwater yield that can be pumped from select regional aquifers before specific impacts become evident, also referred to as sustainable yield. Overall, the results from the Groundwater Availability Resource Assessment (EPD, March 2010) indicate that the estimated range of sustainable yield for the modeled portions of the regional aquifer(s) is greater than the forecasted demands. Therefore, at this time no groundwater resource challenges are expected to occur in the Altamaha Region over the planning horizon. However, localized issues, such as excessive drawdown and reduced baseflow to streams, could arise in areas where there is a high well density and/or high volumes of groundwater withdrawal.

Summary of Resource Assessment Results

Management Practices should be developed and implemented to address water resource challenges as determined by the three Resource Assessments.

Groundwater: Overall, results indicate that the estimated range of sustainable yield for the modeled portions of the regional aquifer(s) is greater than the forecasted demands.

Surface Water Quantity: There are sufficient surface water supplies at some locations throughout the Altamaha Region, but there are also projected surface water challenges in every county except Candler, Evans, and Johnson Counties.

Surface Water Quality: There are five river reaches within the Altamaha River Basin, two river reaches in the Oconee, and one river reach in the Suwannee that may exceed assimilative capacity and exhibit dissolved oxygen below desirable thresholds.

Surface Water Availability

Surface water is also an important resource used to meet current and forecasted future needs of the Altamaha Region. In order to analyze whether there is sufficient surface water to meet both off-stream uses of water and instream flow needs while meeting flow thresholds, a Surface Water Availability Resource Assessment model was developed and used in the state water planning process.

A regulatory flow threshold is used to determine effluent limitations for various water quality constituents. 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. It refers to the lowest 7-day average flow that has occurred once every 10 years over the period of record.

The model currently used to assess surface water availability is the Basin Environmental Assessment Model (BEAM). The results of the future conditions modeling from the Surface Water Availability Resource Assessment (EPD, 2023b) show that in general, there are sufficient surface water supplies to meet current and forecasted surface water supply needs. However, in dry years, during some portions of the year, the modeled instream flow fell below the 7Q10 flow at the locations of wastewater discharges (referred to as a potential “challenge”). Table ES-1 summarizes the forecasted surface water challenges in 2060 near permitted municipal and industrial discharge facilities in Appling, Bleckley, Dodge, Emanuel, Jeff Davis, Montgomery, Tattnall, Telfair, Toombs, Treutlen, Wayne, Wheeler and Wilcox Counties. The projected increase of agricultural surface water use within the Altamaha Region is 15.3 MGD. As described below, management practices are recommended by the Altamaha Council to address potential surface water challenges.

Table ES-1 Summary of Modeled 2060 Potential Surface Water Challenges

BEAM Model Node	Duration of Challenge (% of total days)	Corresponding 7Q10 Flow	Change in Duration of Challenge from Current Condition
6178 (City of Cochran (Cochran WPCP))	970 (3.3%)	0.62 cfs (0.33 MGD)	601 (2.1%)
6298 (City of Abbeville (Abbeville WPCP))	53 (0.2%)	740 cfs (398 MGD)	-37 (-0.13%)
6338 (Lumber City (Lumber City WPCP))	225 (0.8%)	883 cfs (475 MGD)	-38 (-0.13%)
6368 (City of Scotland (Scotland WPCP))	3,907 (13.4%)	3.8 cfs (2.05 MGD)	957 (3.3%)
6398 (City of Alamo (Alamo WPCP))	3,454 (11.8%)	2.2 cfs (1.18 MGD)	829 (2.8%)
6438 (City of Eastman(Sugar Creek WPCP))	3,165 (10.8%)	0.13 cfs (0.07 MGD)	686 (2.4%)
6508 (City of Hazlehurst (Bully Creek WPCP))	177 (0.6%)	898 cfs (483 MGD)	-18 (-0.06%)
7048 (City of Soperton (Soperton WPCP))	234 (0.8%)	0.08 cfs (0.04 MGD)	116 (0.4%)
7108 (City of Ailey (Ailey WPCP))	9,895 (33.9%)	1.8 cfs (0.97 MGD)	139 (0.5%)
7128 (City of Glenwood (Glenwood WPCP))	11,225 (38.4%)	0.94 cfs (0.51 MGD)	0 (0.0%)
7168 (City of Mount Vernon (Mount Vernon WPCP))	6,651 (22.8%)	0.31 cfs (0.17 MGD)	0 (0.0%)
7318 (City of Swainsboro (Yam Grandy Creek WPCP))	1,648 (5.6%)	1.26 cfs (0.68 MGD)	62 (0.2%)
7358 (City of Vidalia (Swift Creek WPCP))	4,014 (13.7%)	1.32 cfs (0.71 MGD)	282 (1.0%)
7368 (City of Lyons (Lyons North WPCP))	2,863 (9.8%)	2.01 cfs (1.08 MGD)	1,226 (4.2%)
7378 (City of Lyons (Lyons East WPCP))	168 (0.6%)	0.06 cfs (0.03 MGD)	168 (0.6%)
7448 (Georgia Department of corrections (Rogers State Prison WPCP))	2,016 (6.9%)	49.9 cfs (26.9 MGD)	451 (1.5%)
7508 (City of Baxley (Baxley WPCP))	725 (2.5%)	1,788 cfs (962 MGD)	55 (0.2%)
7538 (City of Glennville (Glennville WPCP))	3,180 (10.9%)	0.03 cfs (0.02 MGD)	710 (2.4%)

BEAM Model Node	Duration of Challenge (% of total days)	Corresponding 7Q10 Flow	Change in Duration of Challenge from Current Condition
7588 (City of Jesup (Jesup WPCP))	743 (2.5%)	1,834 cfs (987 MGD)	44 (0.15%)
7598 (Rayonier Performance Fibers, LLC)	756 (2.6%)	1,834 cfs (987 MGD)	57 (0.2%)

Source: Surface Water Availability Resource Assessment, 2023b, EPD.
Note: Surface Water Availability modeling simulation period is from 1939 to 2018.

Assessment of Water Quality Conditions

One measure of the capacity of surface water to maintain its health and the health of the aquatic species living therein is the amount of residual dissolved oxygen in the water. As part of the Water Quality (Assimilative Capacity) Resource Assessment (EPD, 2017 and 2023a), modeling of dissolved oxygen concentrations was performed by EPD for each surface water reach in the region that has upstream wastewater discharges to the reach. The modeling estimates the ability of the surface water to assimilate the amount of pollutants being discharged without creating adverse conditions (also referred to as assimilative capacity). Each modeled river segment was classified as exceeding dissolved oxygen capacity, meeting dissolved oxygen capacity, or having available dissolved oxygen capacity. Table ES-2 summarizes the results of the assimilative capacity assessment for dissolved oxygen at permitted conditions. Assimilative capacity assessments indicate the potential need for improved wastewater treatment in some facilities within the Altamaha, Oconee and Suwanee River Basins.

Table ES-2 Permitted Assimilative Capacity for DO in Altamaha Planning Council

Basin	Available Assimilative Capacity (Total Mileage)							Modeled Miles in Council
	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)	At Capacity (0 mg/L)	None or Exceeded (<0.0 mg/L)	Un-modeled	
Altamaha	150	39	46	108	27	36	0	405
Ocmulgee	167	79	66	7	0	0	0	319
Oconee	12	46	7	8	1	6	0	80
Ogeechee	2	28	132	13	0	0	6	181
Suwannee	2	4	3	0	0	2	0	11

Source: GIS Files from the Dissolved Oxygen Assimilative Capacity Resource Assessment Report; EPD, 2023a.
Notes: Since the 2017 update, additional stream segments were modeled for the Altamaha and Ocmulgee Basins.

Under Section 303(d) of the federal Clean Water Act, a total maximum daily load must be developed for waters that do not meet their designated uses. A total maximum daily load represents the maximum pollutant loading that a water body can assimilate and continue meeting its designated use (i.e., not exceeding State water quality standards). A water body is deemed to be impaired if it does not meet the applicable criteria for a particular pollutant; consequently, total maximum daily loads are required to be established for these waters to reduce the concentrations of the exceeding parameters in order to comply with State water quality standards.

For the Altamaha Region, there are 108 impaired stream reaches (total impaired length of 1,266 miles) and 2 impaired lakes (total impaired area of 390 acres). Total maximum daily loads have been completed for 99 of the impaired stream reaches and for both of the impaired lakes. The majority of impairments are due to low dissolved oxygen and fecal coliform. Dissolved oxygen levels can be impacted by other pollutants. Low dissolved oxygen levels can originate from both identifiable point sources (such as wastewater treatment plants) or non-point sources (spatially distributed over land, such as stormwater or other runoff), and some water bodies may have naturally low dissolved oxygen levels.

Identifying Water Management Practices to Address Water Resource Challenges and Future Needs

The comparison of the Resource Assessments and the forecasted demands identified the region's likely resource challenges and demonstrated the necessity for region and resource-specific water management practices. In selecting the actions needed (i.e., water management practices), the Altamaha Council considered practices identified in existing plans, the Region's Vision and Goals, and coordinated with local governments and water providers as well as neighboring Councils that share these water resources.

The Altamaha Council developed a management practice strategy based on the best data and modeling results available. The Council recognizes that as data are refined and modeling results improve—including water and wastewater projections and Resource Assessments—the resulting future needs and potential challenges may change. Therefore, the Council has prioritized short-term management practices to address challenges with the understanding that more complex management practices may be required in the future. These short-term management practices are presented in Table ES-3 and Table ES-4.

The Altamaha Council believes the Regional Water Plan should continue to be reviewed in defined increments in the future, such as every 5 years, to evaluate how the implemented management practices are performing toward addressing challenges and meeting forecasted needs and what additional measures might be required. If the selected management practices have not sufficiently addressed the challenges identified by the Resource Assessments, then additional management practices should be selected and implemented. The selected management practices will over time address identified challenges and meet future uses when combined with practices for all shared resource regions.

Table ES-3 Short-Term Water Quantity Management Practices (0 – 10 Years)

Utilize surface water and groundwater sources within the available resource capacities
Water conservation
Data collection and research to confirm the frequency, duration, severity, and drivers of surface water challenges (forecast methodology assumptions and Resource Assessment modeling)
Evaluate and ensure that future surface water permit conditions do not contribute to low flow concerns
Encourage sustainable groundwater use as a preferred supply in regions with surface water low flow concerns
Identify incentives and a process to sustainably replace a portion of existing surface water use with groundwater use to address low flow concerns
Evaluate the potential to use existing storage to address low flow concerns
Education to reduce surficial aquifer groundwater use impacts to low flow

Table ES-4 Short-Term Water Quality Management Practices (0 – 10 Years)

Point Sources: ▪ Support and fund current permitting and waste load allocation process to improve treatment of wastewater and increase treatment capacity ▪ Data collection and research to confirm discharge volumes and waste concentrations as well as receiving stream flows and chemistry
Non-point Sources: ▪ Data collection to confirm source of pollutants and causes; encourage stormwater ordinances, septic system maintenance, and coordinated planning ▪ Ensure funding and support for Best Management Practices programs by local and state programs, including urban/suburban, rural, forestry and agricultural Best Management Practices
Non-point Source Existing Impairments - Total maximum daily load list streams: ▪ Improve data on source of pollutant and length of impairment ▪ Identify opportunities to leverage funds and implement non-point source Best Management Practices

Implementing Water Management Practices

The Altamaha Council supports the concept of regional water resource planning with a focus on planning Councils composed of local governments, water users, water providers, industry, business and affected stakeholders. Local representatives are typically most familiar with local water resource issues and needs. The State has a vital role providing technical support, guidance, and funding to support locally focused water resource planning. This plan should be viewed as a living, iterative document and the State should focus on the following principles: Education, Incentives, Collaboration, Cooperation, and Enabling. Supporting Implementation of the Altamaha Regional Water Plan will be primarily by various water users and wastewater utilities in the region. The most cost-effective and more readily implemented management practices will be prioritized for short-term implementation via an incremental and adaptive approach, as shown in Figure ES-6. If resource needs are not met and/or challenges are not addressed, then more complex management practices will be pursued. Future planning efforts should confirm current assumptions and make necessary revisions and/or improvements to the conclusions reached during this round of planning.

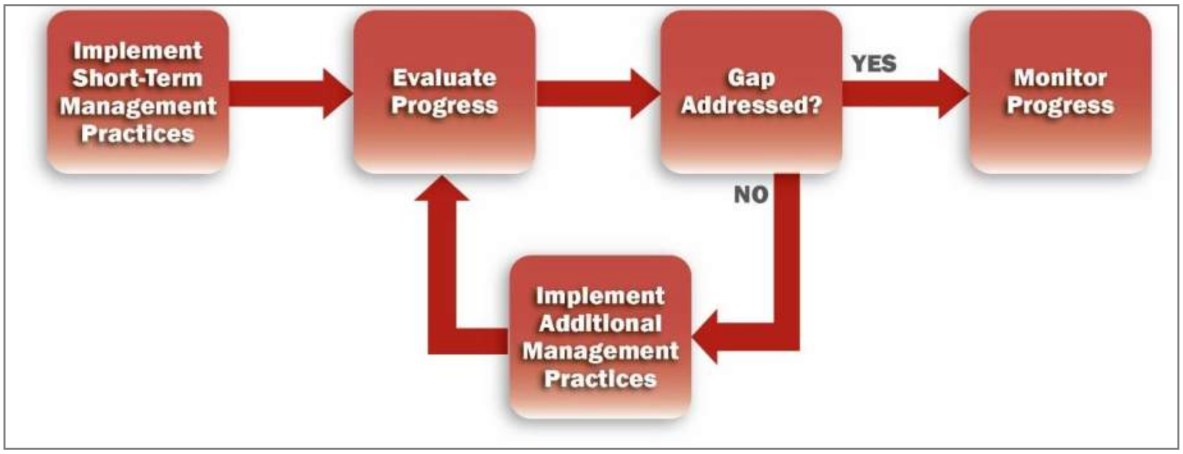


Figure ES-6 Implementation of Management Practices

Implementation Considerations and Benchmarks – Helping Ensure Progress toward Meeting Future Needs

Effective implementation of the Regional Water Plan will require the availability of sufficient funding in the form of loans, and in some cases, possibly grants. In addition, many of the proposed management practices require ongoing coordination with affected stakeholders/water users and collaboration to help ensure successful solutions are identified and implemented. Finally, in many cases, monitoring progress toward addressing future needs will require improved data and information on the current actions and management practices that are already in place.

To assess progress toward meeting regional needs, the Altamaha Council identified several benchmarks, which can be used to evaluate the effectiveness of the Regional Water Plan. The benchmarks are discussed in Section 8 and include both the activities that should be accomplished and the measurement tools that can be used to assess progress.

The Altamaha Council suggests that EPD consider “institutionalizing” planning. This would entail a long-term commitment of staff and funding to: monitor and support Regional Water Plan recommendations; coordinate improved data collection, management and analysis; continue to develop and improve Resource Assessment tools; and help provide funding, permitting, and technical support to address challenges and water resource needs. Institutionalized planning would provide the framework to monitor management practice progress against the benchmarks presented, assist in determining the success of implemented programs, and evaluate what additional practices might be necessary.

The Altamaha Council supports the concept of regional water planning led by local representatives. The Council members wish to express their gratitude to former Governor Sonny Perdue, Lieutenant Governor Casey Cagle, and former Speaker of the House Glenn Richardson for their nomination to the Altamaha Council. The Regional Water Plan provides a recommended path forward to help achieve social, economic, and environmental prosperity for the region. The Council members are grateful for the opportunity to serve the region and State. The Altamaha Council members wish to remain involved in facilitating attainment of the Regional Water Plan benchmarks and making necessary revisions to the Plan.

SECTION 1

Introduction

Section 1 Introduction

***The Altamaha Council intends for this Regional Water Plan to be a working document, and work on this document is part of the continual planning process*.**

Summary

The Altamaha Regional Water Planning Council, established in February 2009 under the State Water Plan, has adopted a Vision and Goals for prioritizing water resource use and management within the region.

These guiding principles were used to identify and select water management practices that best address the needs and resource conditions of the Altamaha Region.

Georgia continues to be one of the fastest growing states in the nation. According to the 2020 Census, Georgia is the eighth most populous state in the country. and ranks fifth in the nation for total population (numerical) growth. Couple that with recent unprecedented droughts, increased competition for water supplies, and changing perspectives on how the State of Georgia uses and values water. Based on these factors, Georgia recognizes the challenges of managing our valuable water resources. In response to these challenges, a State Water Council was formed to develop a state-wide water planning process.

The water planning processes began in 2008, when the State Water Council submitted the *Georgia Comprehensive State-wide Water Plan* (State Water Plan) to the Georgia General Assembly and the state-wide water planning process was approved. The purpose of the State Water Plan is to guide Georgia in managing water resources in a sustainable manner to support the State's economy, protect public health and natural systems, and enhance the quality of life for all our citizens. The State Water Plan identifies state-wide policies, provides planning guidance, and establishes a planning process for completion of Regional Water Development and Conservation Plans (Regional Water Plans). The Altamaha Regional Water Planning Council (Altamaha Council) was formed to help guide the completion of the original (2011) Regional Water Plan which addresses both water quantity and water quality in the region and updates are required every five years. The Altamaha Council is composed of membership based on a nomination and appointment process by the Governor, Lieutenant Governor, and Speaker of the House.

The Altamaha Regional Water Plan was first completed and adopted in 2011. During the 2017 plan update process, this document was updated from the original 2011 Regional Water Plan 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 Altamaha 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 forecast).

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. Georgia has abundant water resources, with 14 major river systems and multiple groundwater aquifer systems. These waters are shared natural resources as streams and rivers run through many political jurisdictions. Rainfall that occurs in one region of Georgia may replenish the aquifers used by communities many miles away. And, while 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 practices 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 10 Regional Water Plans. The eleventh regional water planning district, the Metropolitan North Georgia Water Planning District (MNGWPD, also known as "the District"), was created by State law in 2001 and had existing plans in place. Figure 1-1 illustrates the 11 council boundaries.

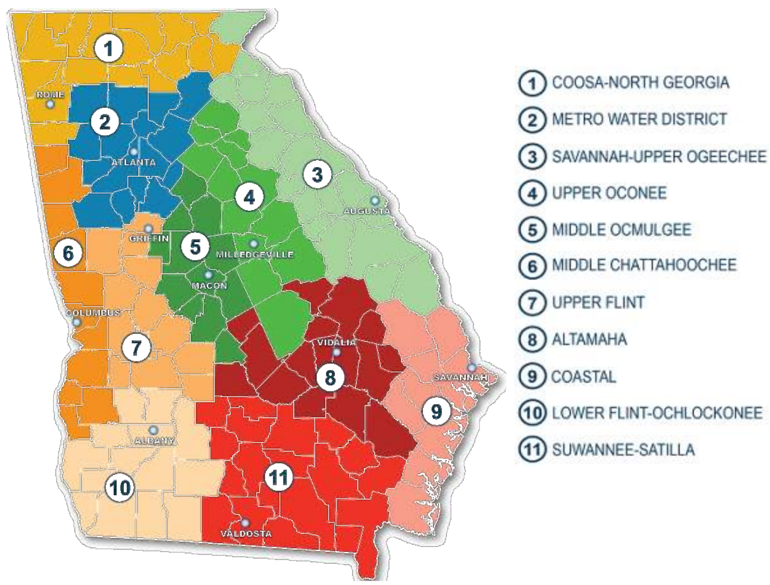


Figure 1-1 Regional Water Planning Councils

This Regional Water Plan prepared and updated by the Altamaha Council describes the current and projected water resource needs of the region and summarizes regionally appropriate management strategies (also referred to as water management practices) to be employed in Georgia's Altamaha Water Planning Region over the next 35 years to help meet these needs.

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 2050. The original (2011) Regional Water Plan was prepared following a consensus-based planning process illustrated in Figure 1-2. As detailed in the Altamaha Council's Memorandum of Agreement (MOA) with the Georgia Environmental Protection Division (EPD) and Department of Community Affairs (DCA) as well as the Council's Public Involvement Plan (PIP), 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 challenges associated with preserving water quality and water availability while water use patterns change over time. Public/local government input and coordination with other regional water planning councils also informed the plan update.

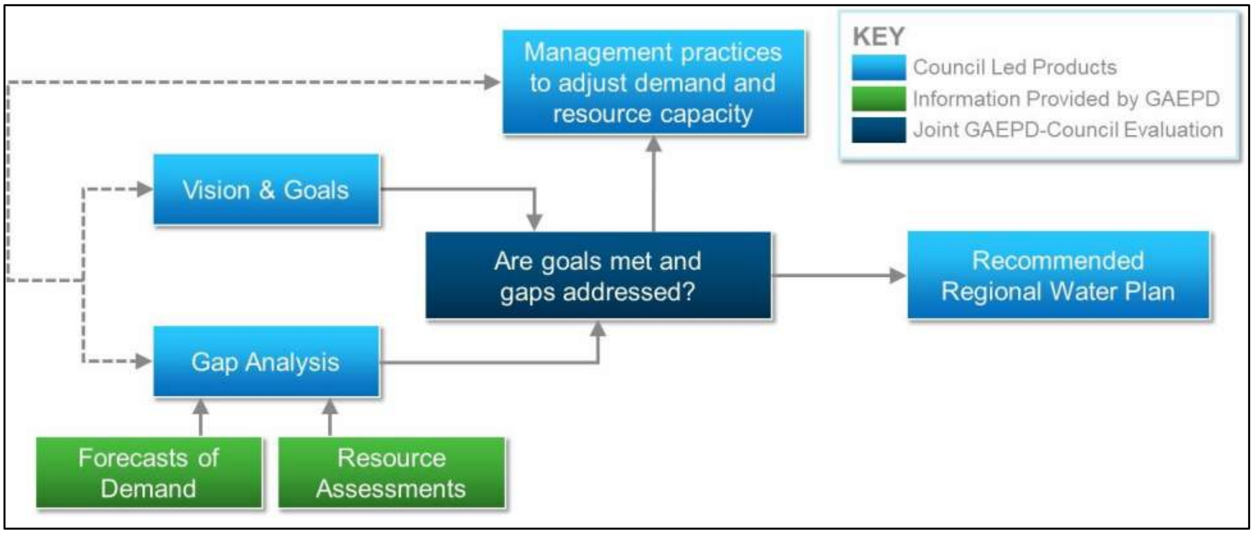


Figure 1-2 State Water Planning Process

1.3 The Altamaha Water Planning Region Vision and Goals

Following the process established in the State Water Plan, the Altamaha Council was established in February 2009. The Altamaha Council currently has 18 members, which includes 3 alternates and 2 Ex-Officio Members. Figure 1-3 provides an overview of the Altamaha Region and the residential locations of the Altamaha Council members.

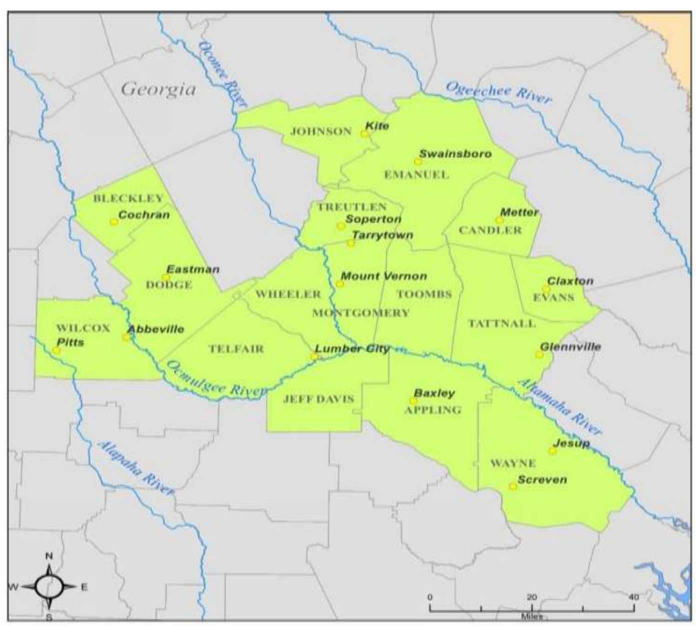


Figure 1-3 Location of Altamaha Council Members

To develop the original (2011) Regional Water Plan, the Altamaha Council met collectively for the first time on March 13, 2009 at a kickoff meeting for the 10 regional water planning councils. The meeting focused on: providing an orientation to the water planning process; a preliminary overview of Georgia's water resources; and establishing an understanding of the schedule for completing the Regional Water Plan, the Council's meeting schedule, and requirements. As part of this update, the Altamaha Council met over a series of meetings from 2020 through 2022 to revise and update each of the sections of the plan, as appropriate.

1.3.1 Developing the Region's Council Procedures

Initially, the planning process focused on establishing the Altamaha Council leadership along with operating procedures and rules for conducting meetings. The operating procedures and rules were appended to the Memorandum of Agreement that was executed between EPD, DCA, and the Altamaha Council. The Memorandum of Agreement was unanimously approved by the Altamaha Council and executed on June 18, 2009.

In support of the Memorandum of Agreement, the Altamaha Council formed six subcommittees to provide planning guidance during various development stages of the development of the original (2011) Regional Water Plan. The subcommittees consisted of the following: Vision and Goals, Public Involvement Plan, Water and Wastewater Forecasting, Plan Drafting (Table of Contents), Plan Drafting (Report), and Management Practices.

1.3.2 Developing Regional Vision and Goals

A major element of Georgia's state and regional water planning process is the identification of Vision and Goals that describe the economic, population, environmental, and water use conditions that are desired for the region. The Vision and Goals describe the Altamaha Council's priorities for water resource use and management. This information is used to help guide the identification and selection of water management practices for the Altamaha Region and to communicate these priorities and values to other regions of the State.

1.3.3 Vision Statement (as established September 17, 2009 and revised on October 28, 2010)

"The vision of the Altamaha Regional Water Planning Council is to wisely manage, develop, and protect the region's water resources for current and future generations by ensuring that the Altamaha basin's water resources are sustainably managed to enhance quality of life and public health, protect natural systems including fishing, wildlife and wildlife utilization activities, and support the basin's economy."

1.3.4 Goals (as established November 19, 2009)

The Altamaha Council identified 12 goals for the region. 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).

The Altamaha Council recognizes that we are generally not the primary implementation entity associated with water resource development, use, and management. Nevertheless, the Council wishes to express meaningful, action-oriented goals for the future use and management of water resources in our region. The following goals are identified with this principle in mind. Figure 1-4 includes the list of goals for the Altamaha Region.

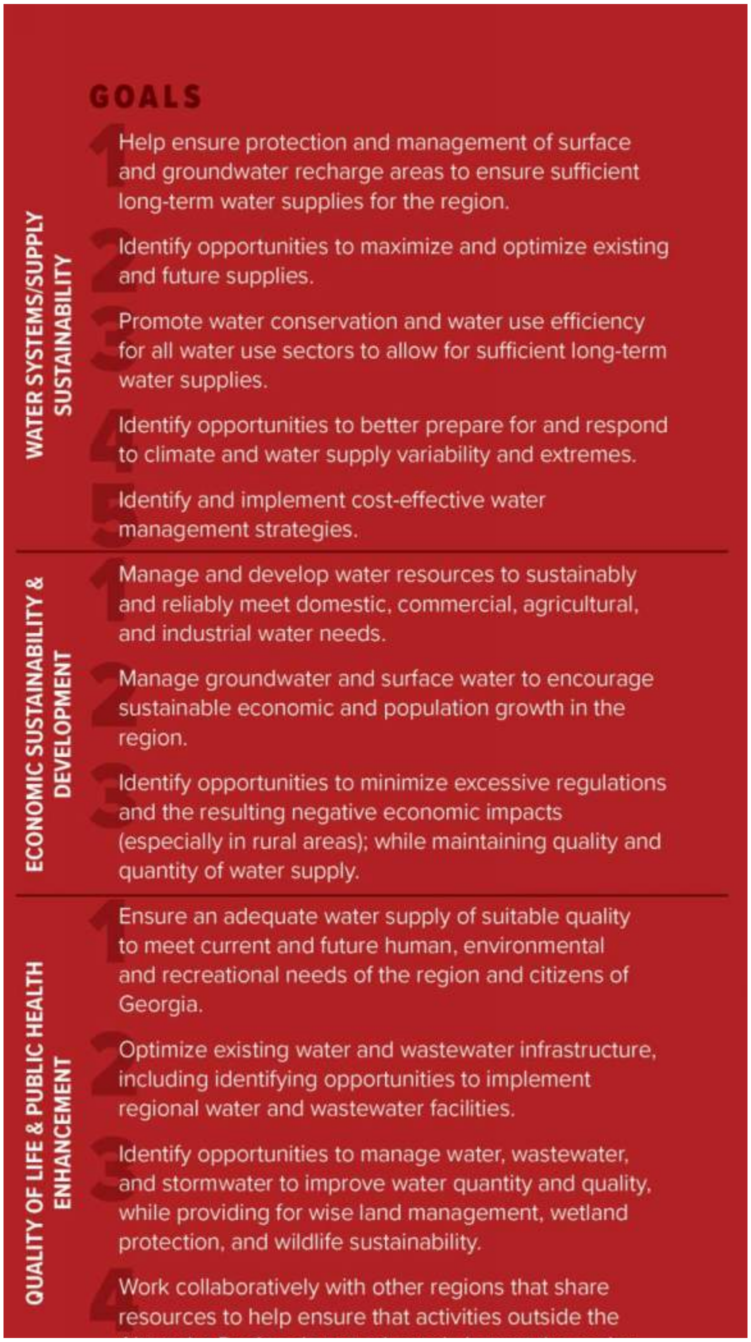


Figure 1-4 Goals for the Altamaha Region

More information regarding the region's Vision and Goals can be found at the Council's website.

1.4 The Altamaha Council's Public Involvement Plan

A foundational principle of the Georgia water planning process is public and stakeholder participation and coordination among multiple interests. The Altamaha Council developed a Public Involvement Plan to help guide and implement an inclusive planning process. The Public Involvement Plan was adopted by the Altamaha Council on November 19, 2009.

Outreach to the public, local governments, water providers, and users was accomplished by e-mail correspondence, direct communication, and updates provided by Council members at local government and other interest group meetings. Opportunity for public and local government comment was provided at each Council meeting. More information regarding public outreach can be found in the Altamaha Council Public Outreach Technical Memorandum.

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SECTION 2

The Altamaha Water Planning Region

Section 2 The Altamaha Water Planning Region

2.1 History and Geography

The Altamaha Region is located within the Coastal Plain Physiographic Province. The topography of the region is characterized by gentle slopes that reflect the geologic history of Tertiary and Quaternary marine incursions and regressions. Approximately 90% of the Coastal Plain sediments exposed in the area are sands and clays. The major land cover in the region is forested lands and agriculture, which are important drivers for the region's economy.

Summary

The Altamaha Region encompasses 16 counties in the south central portion of Georgia. Predominant land cover in the region includes agriculture, forest, and wetland areas.

The Altamaha River, formed by the confluence of the Ocmulgee and Oconee Rivers, is the major surface water resource in the region.

The Floridan aquifer, one of the most productive aquifers in the United States, is the primary source of groundwater in the region.

The regional domestic, commercial, industrial, agricultural, thermoelectric power, and recreational water uses are vital to the region's economy and quality of life.

2.1.1 Surface Water Resources

Figure 2-1 provides an overview of the surface water resources in the Altamaha Region. The Altamaha River is the major surface water feature in the region. The Altamaha River, formed by the confluence of the Ocmulgee and Oconee Rivers, is 127 miles long and has a drainage area of approximately 14,000 square miles (EPD, 2003). The river originates in the Northern Piedmont province of north Georgia, traverses southeast through the Coastal Plain region, and discharges to the Atlantic Ocean near Darien, Georgia. It is the only major river in Georgia that is contained wholly within the boundaries of the State. The Altamaha River is known for its extremely rich biological diversity and supports 11 imperiled mussel species and at least 120 species of rare or endangered plants and animals (Nature Conservancy, 2007). Much of the lower Altamaha River corridor has been put into conservation as close to 190,000 acres have been protected since 2005. These protections help preserve the floodplain and water quality. Due to its unique character, the Nature Conservancy has named the Altamaha River as one of the "75 Last Great Places".

Figure 2-1 Surface Water Resources, Counties, and Major Cities

2.1.2 Groundwater Resources

Groundwater is a very important resource for the Altamaha Region. Figure 2-2 depicts the major aquifers of Georgia. Based on 2020 groundwater withdrawal data, approximately 97% of groundwater supplied in the region is from the Floridan aquifer, which is one of the most productive groundwater aquifers in the United States. The remaining groundwater is supplied by the surficial, Claiborne, Gordon, Cretaceous, Dublin and Brunswick aquifers.

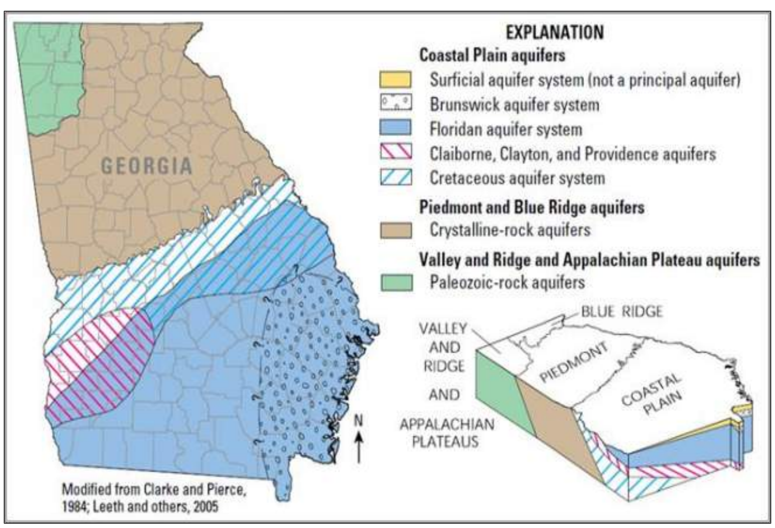


Figure 2-2 Major Georgia Aquifers

The Floridan aquifer is primarily comprised of limestone, dolostone, and calcareous sand. The aquifer is generally confined, but at its northern extent there are unconfined and semi-confined zones. The Floridan aquifer increases in thickness eastward across the State and is approximately 400 feet thick in Glynn County. The aquifer is very productive, with typical well yields of 1,000-5,000 gallons per minute.

The northern portion of the Altamaha Region is within the Cretaceous aquifer area, which consists of sands and gravels. The eastern portion of the Altamaha Region is within the Brunswick aquifer area, which consists of sands and limestones. Where these aquifers exist, they are used in addition to the Floridan aquifer for water supply. A surficial aquifer is present beneath most of the Coastal Plain area; however, it is usually not very thick and is not typically used as a primary source of water supply.

2.1.3 Climate

A review of available data for the region from the Southeast Regional Climate Center indicates that the climate is temperate with mild winter and hot summers. Average maximum temperatures are around 92°F in July and average minimum temperatures are around 35°F in January. The area receives abundant rainfall, averaging approximately 46 inches per year, with the greatest rainfall occurring during July and August and the least in October and November. Snowfall is rare and the historical average for the region is 0.1 inches near the coast to 0.3 inches further inland.

2.2 Characteristics of Region

The Altamaha Council encompasses 16 counties in the south central portion of Georgia, with a 2020 population of 242,935 (U.S. Census 2020). The major population centers in the region include Vidalia, Jesup, Swainsboro, Eastman, and Glennville.

Based on information obtained from Georgia Department of Labor Local Area Profiles, major employers in the region include Rayonier Performance Fibers, LLC in Wayne County and Edwin I. Hatch nuclear power plant in Appling County. The primary economic sectors in the region include agriculture, forestry, fishing and hunting, professional and business services, education, healthcare, manufacturing, public administration, and construction.

The region includes two colleges within the Technical College System of Georgia: Coastal Pines Technical College in Jesup and Southeastern Technical College (Vidalia and Swainsboro campuses). The region also includes East Georgia State College in Swainsboro, which is part of the University System of Georgia, as well as Middle Georgia State University in Eastman and Brewton-Parker College in Mount Vernon. In addition to county jails, there are 15 state and federal correctional facilities, which are important employers and water users in the Altamaha Region.

A summary of 2015 land cover distribution is shown in Figure 2-3, based on data obtained from the University of Georgia Natural Resources Spatial Analysis Laboratory. Forests cover 43% of the Altamaha Region, and agriculture and wetlands cover 25% and 19% of the region, respectively. The term wetland refers to land cover and does not infer a regulatory determination. Urban development accounts for only 6% of the land cover within the Altamaha Region. The remaining land cover (7%) consists of water and open spaces. Based on the inventory of Georgia's irrigated cropland developed as part of the agricultural demand assessment in 2020, cotton, peanut, and corn account for the majority of crops irrigated in the Altamaha Region. These crops cover 82% of the irrigated acreage within the region. Fresh vegetables and soybeans are also planted widely within the region.

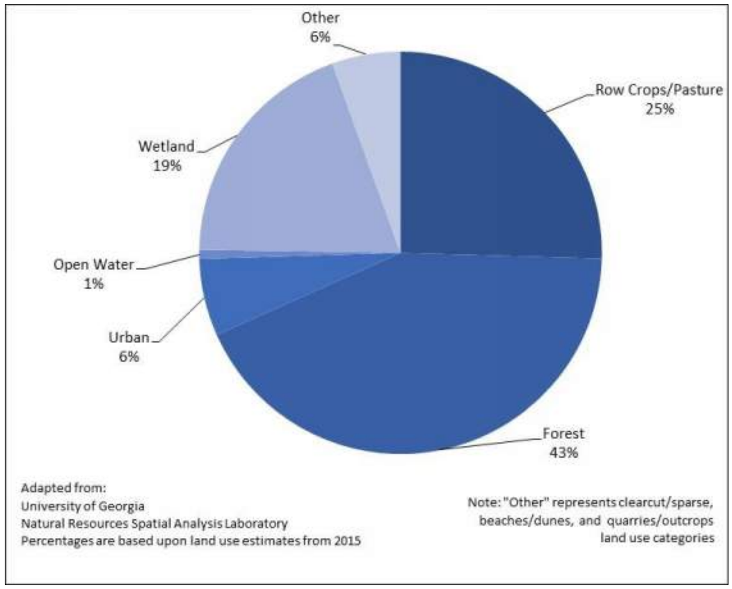


Figure 2-3 Land Cover Distribution

2.3 Local Policy Context

2.3.1 Regional Commissions

Regional Commissions are agencies of local governments and representatives from the private sector that facilitate coordinated and comprehensive planning at the local and regional levels. Regional Commissions often assist their membership with conformity to minimum standards and procedures and serve as liaisons with state and federal agencies. There are 12 Regional Commissions in Georgia. Except for Laurens County, the Heart of Georgia Altamaha Regional Commission covers the same counties as the Altamaha Council.

In July 2009, the Georgia Department of Community Affairs required the Regional Commissions to adopt, maintain, and implement a Regional Plan (DCA Rule 110-12-6). The Altamaha Regional Commission's Regional Plan provides guidance to regional and local business leaders, local governments, state and federal agencies, and citizens to promote quality growth in region. It is a vision of the future for the region and includes community-based objectives related to water resources such as water supply, wastewater, and stormwater management. A key component is the establishment of "performance standards," which are actions, activities, or programs a local government can implement or participate in that will advance their efforts to meet the vision of the Regional Plan. The Altamaha Regional Commission's Regional Plan defines two achievement thresholds (Minimum and Excellence), which are attained by implementing the performance standards. Local governments are required to achieve the Minimum Standard to maintain their Qualified Local Government status, which qualifies them for certain state funding. By achieving the Excellence Standard, a local government may be eligible for special incentives. The Heart of Georgia Altamaha Regional Commission completed their Regional Plan in 2012 and it was recently updated in 2019.

SECTION 3

Water Resources of the Altamaha Region

Section 3 Water Resources of the Altamaha Region

3.1 Current Major Water Use in Region

Based on data summarized from the 2019 USGS report "Water Use in Georgia by County for 2015; and Water-Use Trends, 1985-2015", water supply in the Altamaha Region for 2015 totaled approximately 220 million gallons per day (MGD) and was comprised of 57% groundwater and 43% surface water, as shown in Figure 3-1. Approximately 95 MGD were withdrawn from surface waters in the region to supply the energy and agricultural sectors, as shown in Figure 3-2. Figure 3-3 shows that 125 MGD of groundwater withdrawn were predominantly used to supply industrial (49%) and agricultural uses (32%) while municipal, self-supply, and energy made up the remaining uses. About 97 % of groundwater withdrawals are from the Floridan aquifer. Surface water returns in the region are shown in Figure 3-4. Approximately 69 MGD of surface water were returned; 80% from industries and 20% from municipal sources. Note that the USGS data did not separate thermoelectric generation discharges (e.g., Plant Hatch) from industrial discharges.

Summary

In 2015, surface water and groundwater withdrawal in the Altamaha Region totaled approximately 220 MGD to accommodate municipal, industrial, agricultural, and energy demands. Groundwater supplies are currently sufficient on a regional basis to meet uses across the region.

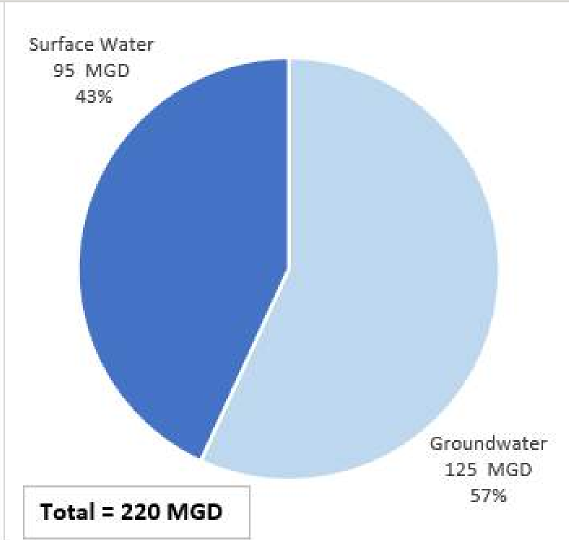
Potential surface water challenges were identified where the modeled flow fell below the 7Q10 flow used to establish effluent limits at the locations of wastewater discharges. River flows in the region may also be insufficient to meet both off-stream uses and instream needs during drier years or periods of drought.

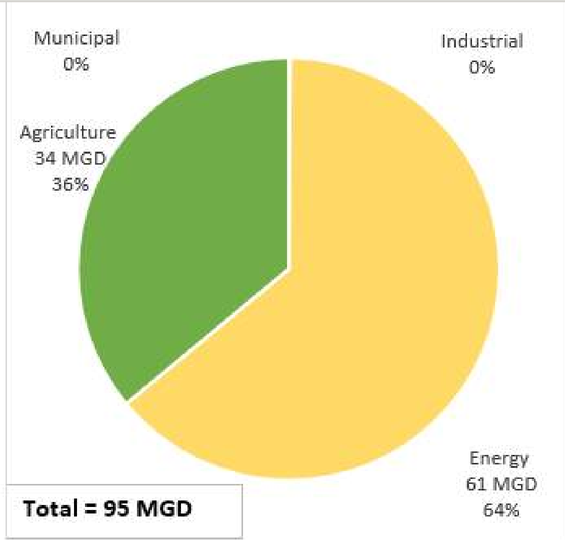
Under current conditions, there are several locations in the region where dissolved oxygen levels may be insufficient to assimilate wastewater discharges. The majority of wastewater in the region is disposed of as a point source discharge from municipal, industrial, and energy uses.

Water quality in several river reaches and water bodies does not meet the designated use for the resource. The majority of these occurrences are associated with low dissolved oxygen and fecal coliform.

3.2 Current Conditions Resource Assessments

EPD developed three Resource Assessments to evaluate surface water quality, surface water availability, and groundwater availability throughout the State. These assessments analyzed the capacity of water resources to meet demands for water supply and wastewater discharge without causing unacceptable local or regional impacts according to metrics established by EPD. These assessments were completed on a resource basis (river basins and aquifers). The results of the updated Resource Assessments (EPD) under current conditions are summarized herein as they relate to the Altamaha Region. As described in more detail below, the term "challenge" is used to indicate when the current or future use of water has been identified to potentially cause impacts.

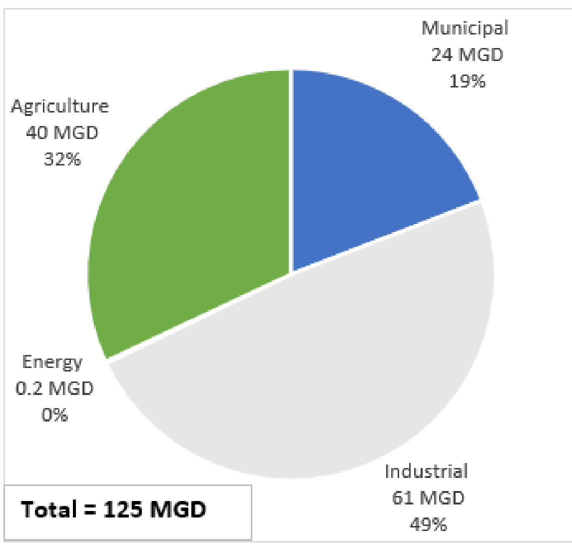


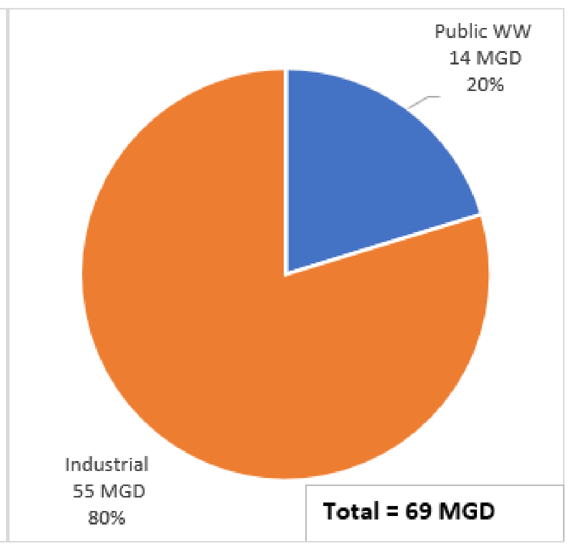


Data Source: USGS Water Use in Georgia 2015.
Note: Values shown in figures reflect current updated values.

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

3.2.1 Current Surface Water Quality (Assimilative Capacity)

The Water Quality (Assimilative Capacity) Resource Assessment (EPD, 2017 and 2023a) estimates the capacity of Georgia's surface waters to absorb pollutants without unacceptable degradation of water quality. The term assimilative capacity refers to the ability of a water body to naturally absorb pollutants via chemical and biological processes without harming aquatic life or humans who come in contact with the water. A water body can be overloaded 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 Water Quality (Assimilative Capacity) Resource Assessment evaluated the capacity of surface waters to process pollutants without violating water quality standards. The current (also referred to as a baseline) assimilative capacity results focus on dissolved oxygen (DO), and nutrients in some areas of the State (specifically nitrogen and phosphorus), and chlorophyll-a (a parameter that is closely tied to lake water quality). The assessments evaluate the impact of current wastewater and stormwater discharges with current withdrawals, land use, and meteorological conditions.

Assimilative Capacity Modeling (Dissolved Oxygen)

One measure of the capacity of a stream to maintain its health and the health of the aquatic species living therein is the amount of residual DO in the waters of the stream. As shown in Figure 3-5, DO modeling was performed by EPD for each reach that has upstream wastewater dischargers (light blue segments and orange segments). The current conditions assimilative capacity analysis incorporated municipal and industrial wastewater facilities operating at their full permitted discharge levels (flow and effluent discharge limits as of 2019).[1] Based on the results, each segment was classified as exceeding assimilative capacity, meeting assimilative capacity, or having available assimilative capacity. The results of the current permitted conditions DO modeling are presented in Table 3-1 and Figure 3-6 for the Altamaha Region, which includes portions of the Altamaha, Oconee, Ocmulgee, Ogeechee, and Suwannee river basins.

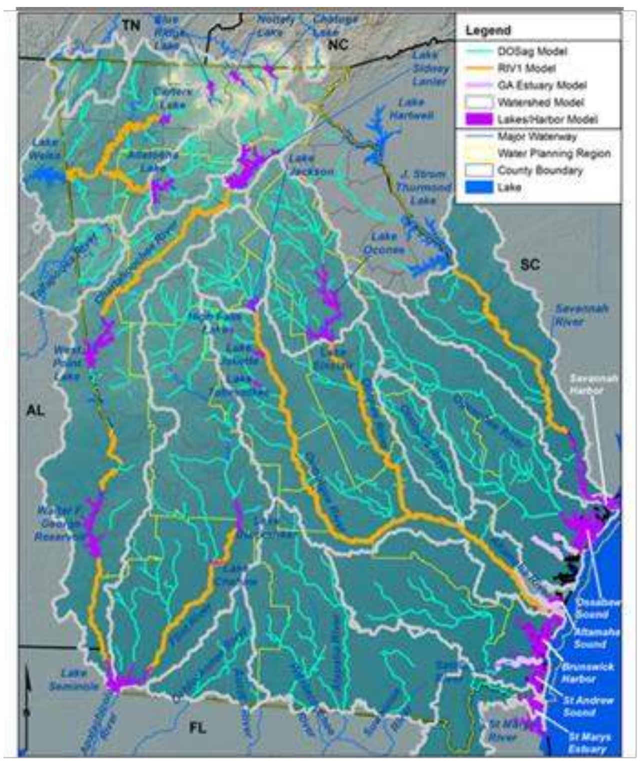


Figure 3-5 Assimilative Capacity Models

[1] Updated effluent discharge limits were issued to one of the major wastewater discharge facilities in the region (Rayonier Advanced Materials, Wayne County) in 2017. The updated effluent discharge limits are incorporated into the future conditions DO assimilative capacity analysis (see Section 5.3 and Figure 5-4).

Table 3-1 Current (Permitted) Conditions DO Assimilative Capacity in Altamaha Region

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)	At Assimilative Capacity (0 mg/L)	None or Exceeded (<0.0 mg/L)	Un-modeled	
Altamaha	150	39	46	108	27	36	0	405
Ocmulgee	167	79	66	7	0	0	0	319
Oconee	12	46	7	8	1	6	0	80
Ogeechee	2	28	132	13	0	0	6	181
Suwannee	2	4	3	0	0	2	0	11

Source: GIS Files from the Dissolved Oxygen Assimilative Capacity Resource Assessment Report; EPD, 2023a.
Notes: Since the 2017 update, additional stream segments were modeled for the Altamaha and Ocmulgee Basins.

Segments with exceeded assimilative capacity may result from a number of factors including: point and/or non-point sources of pollutants; modeling assumptions regarding wastewater discharge, stream flow and temperature; and naturally low DO conditions in the receiving stream. When model results show assimilative capacity as exceeded, a potential “challenge” exists between the amount of pollutants discharged and the ability of the receiving stream to assimilate the pollutants. These points were considered when developing recommended strategies to address water quality needs in the region.

The current permitted conditions DO assimilative capacity modeling incorporated municipal and industrial wastewater dischargers operating at their full permitted flow and effluent limits.

Nutrient Modeling

In addition to Assimilative Capacity modeling for DO, EPD completed nutrient (total nitrogen and total phosphorus) modeling. The location of the watershed model boundaries, and lakes, harbors and estuaries model locations are shown in Figure 3-5. There are currently no nutrient standards for total nitrogen and total phosphorus, but these standards may be developed within this region following a public stakeholder process. The Altamaha Council proactively identified several non-point source best management practices (BMPs) that can be used to help reduce nutrient loading as discussed in Section 6.

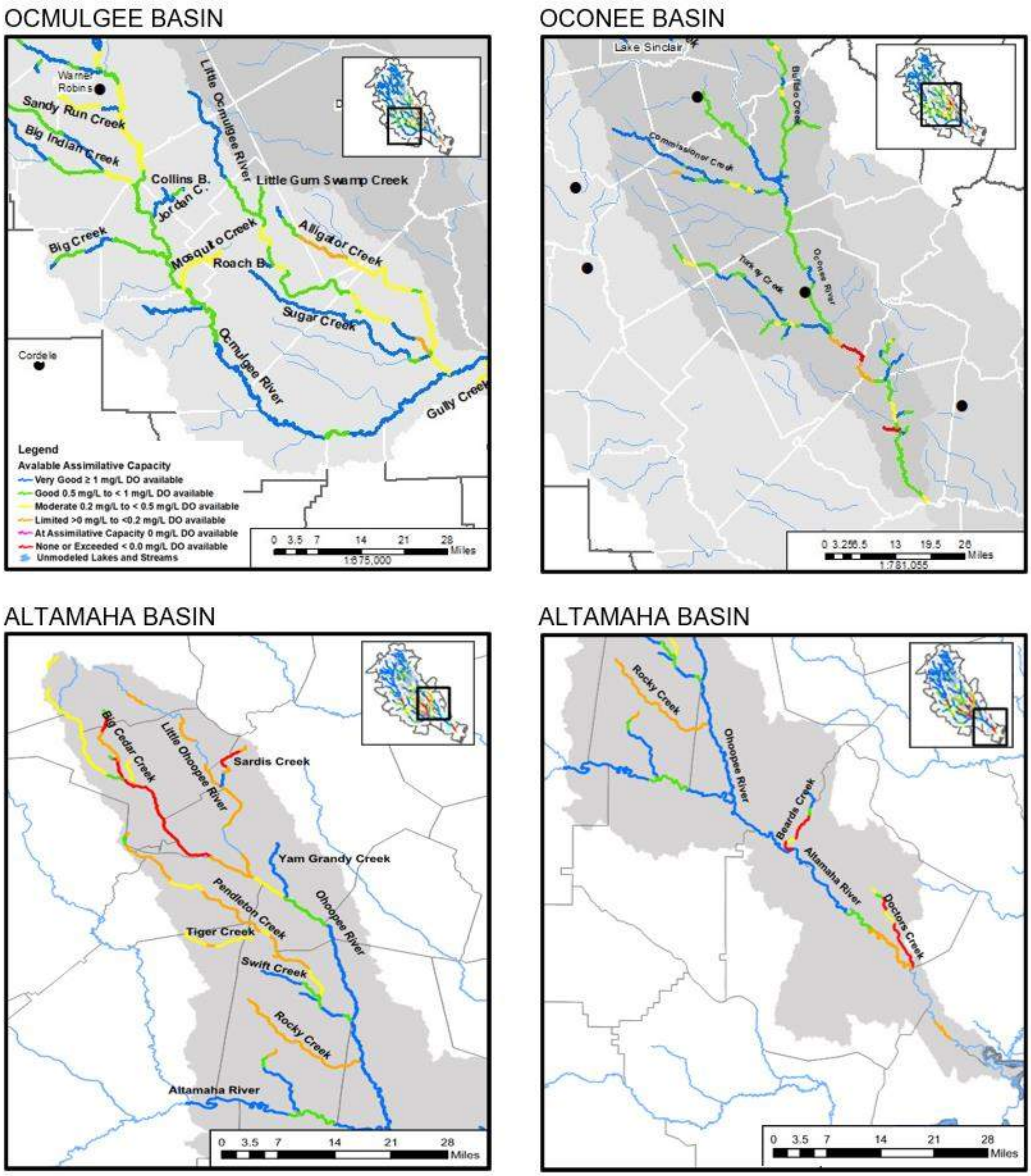


Figure 3-6 Results of Assimilative Capacity Assessment – DO at Current (Permitted) Conditions

3.2.2 Current Ecosystem Conditions and Instream Uses

The Altamaha Region encompasses parts of the Southern Coastal Plain and the Southeastern Plains ecoregions. The rivers in these ecoregions support a diversity of fish and wildlife and provide numerous recreational opportunities. There are two Public Fishing Areas (Dodge County and Evans County) and six Wildlife Management Areas managed by the Georgia Department of Natural Resources (DNR) in the Altamaha Region. These areas provide public access to rivers for fishing, hunting, and other recreational activities. Bowens Mill Fish Hatchery, also operated by DNR, produces a variety of fish that are stocked in both public and private waters around the State.

Around 1.29 million resident anglers fish Georgia's diverse freshwater resources that include more than 4,000 miles of trout streams, 12,000 miles of warm water streams wider than 10 feet, and 500,000 acres of impoundments (DNR, 2022). Annually, the Altamaha River is the destination for a significant number of recreational angling trips and provides a corresponding positive economic impact. The most sought-after species are largemouth bass, redbreast sunfish, bluegill, redear sunfish, channel catfish, flathead catfish, and mullet. DNR is currently involved in a restoration effort aimed at striped bass, another popular sport fish. Striped bass numbers in the Altamaha River are thought to be low partially due to the limited number of coolwater springs available in the river during summer.

The Altamaha River and its tributaries provide important riverine habitat for diadromous fish (fish that travel between rivers and the ocean to breed), including American eel, American shad, hickory shad, blueback herring, Atlantic sturgeon, and shortnose sturgeon. The Altamaha River also supports commercial fishing for American shad, eels, blue crab, and shrimp.

The State Wildlife Action Plan (formerly the Comprehensive Wildlife Conservation Strategy) identified 120 high priority animals that inhabit the Southern Coastal Plain ecoregion and 145 high priority animals in the Southeastern Plains ecoregion. Several of these species depend on rivers for part or all of their lifecycle including amphibians, fish, mammals, mollusks, and reptiles. Federally endangered species in the Altamaha Region that inhabit rivers and lakes include the shortnose sturgeon (Acipenser brevirostrum). There were 26 identified high priority habitats in the Southern Coastal Plain ecoregion and 27 high priority habitats in the Southeastern Plains (State Wildlife Action Plan (SWAP), 2015) (for more information on high priority waters and protected species go to georgiawildlife.com/WildlifeActionPlan). The Nongame Conservation Section (Department of Natural Resources, Wildlife Resources Division) can be contacted for additional information on rare aquatic species. Riverine systems and processes are important to many of these habitats, such as alluvial rivers and swamps, bottomland hardwood forests, blackwater streams, canebreaks, and open-water ponds and lakes. These high priority streams and watersheds are considered important for conservation of at least one high-priority habitat or species located in the Altamaha Region.

Several rivers and watersheds in this region have been identified as ecologically important, including the Altamaha, Ocmulgee, and Ogeechee rivers. In the Southern Coastal Plain ecoregion, conservation lands make up 17% of the land area (SWAP, 2015). The percentage of lands in conservation is lower in the Southeastern Plains ecoregion at 4.5% (SWAP, 2015).

The major rivers that flow through and from the Altamaha Region also pass through the Coastal Regional Council boundary and discharge to the Atlantic Ocean. The coastal area contains a unique combination of fresh, brackish and salt water environments. The area is defined by barrier islands, sand beaches, open Atlantic Ocean, and there are 9 major estuaries including 350,000 acres of salt marsh and 150,000 acres of open water. Shipping channels are maintained in three estuaries – the lower Savannah River, St. Simons, and Cumberland. Otherwise, the remainder are very similar in depth, size and other physical characteristics as they were at the time of European settlements of Georgia.

An estuary is a semi-enclosed body of water, which has a free connection with the sea and within which sea water is measurably diluted with fresh water. Without the freshwater input, such areas in Georgia would be saltwater lagoons or bays. A key characteristic of an estuary is salinity, which can be highly variable depending on the location within the estuary and the estuary itself. Sources of freshwater for estuaries include: freshwater river discharges, industrial and municipal discharges of groundwater after use and treatment and upwelling of groundwater through geologic features. Estuarine environments support a diversity of life, both aquatic and terrestrial, unparalleled in other portions of the State. Hundreds of species of animals and plants exist because of the unique mixing of salt water and fresh water. If the fresh water was removed, the diversity would change immensely from what is found today. Maintaining freshwater inputs to Georgia's estuaries is vital for maintaining a unique coastal environment, which provides a myriad of social and economic benefits, as well as invaluable ecological services to the citizens of Georgia. (Personal Communication: Spud Woodward, Coastal Resources Division, Georgia Department of Natural Resources).

Impaired Water Bodies

Under Section 303(d) of the federal Clean Water Act (CWA), a total maximum daily load (TMDL) must be developed for waters that do not meet their designated uses. A TMDL represents the maximum pollutant loading that a water body can assimilate and continue meeting its designated use (i.e., not exceeding State water quality standards). A water body is deemed to be impaired if it does not meet the applicable criteria for a particular pollutant; consequently, TMDLs are required to be established for these waters to reduce the concentrations of the exceeding parameters in order to comply with State water quality standards. For the Altamaha Region, there are 108 impaired stream reaches (total impaired length of 1,266 miles) and 2 impaired lakes (total impaired area of 390 acres).

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

- 49% are impaired for fecal coliform
- 37% are impaired for low dissolved oxygen

- 36% are impaired for Biological (Fish Community)
- 15% are impaired for trophic-weighted residual mercury in fish tissue
- 2% are impaired for lead
- 2% are impaired for pH

Both impaired lakes in the region are impaired for trophic-weighted residual mercury in fish tissue. TMDLs have been completed for 99 of the impaired stream reaches and 2 of the impaired lakes, as shown in Figure 3-7. A full list of impaired waters can be found on the EPD website, http://epd.georgia.gov/georgia-305b303d-list-documents. This list is updated every 2 years by EPD; the above information is based upon the 2022 list.

3.2.3 Surface Water Availability

The Surface Water Availability Resource Assessment (EPD, 2023b) estimates the availability of surface water to meet current and future municipal, industrial, agricultural, and thermal power water 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 (from state policy) selected as indicators of the potential for water consumption to impact instream uses such as fishing, boating, and aquatic life habitat.

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 occurs once every 10 years and may be breached a small percentage of the time under natural conditions.

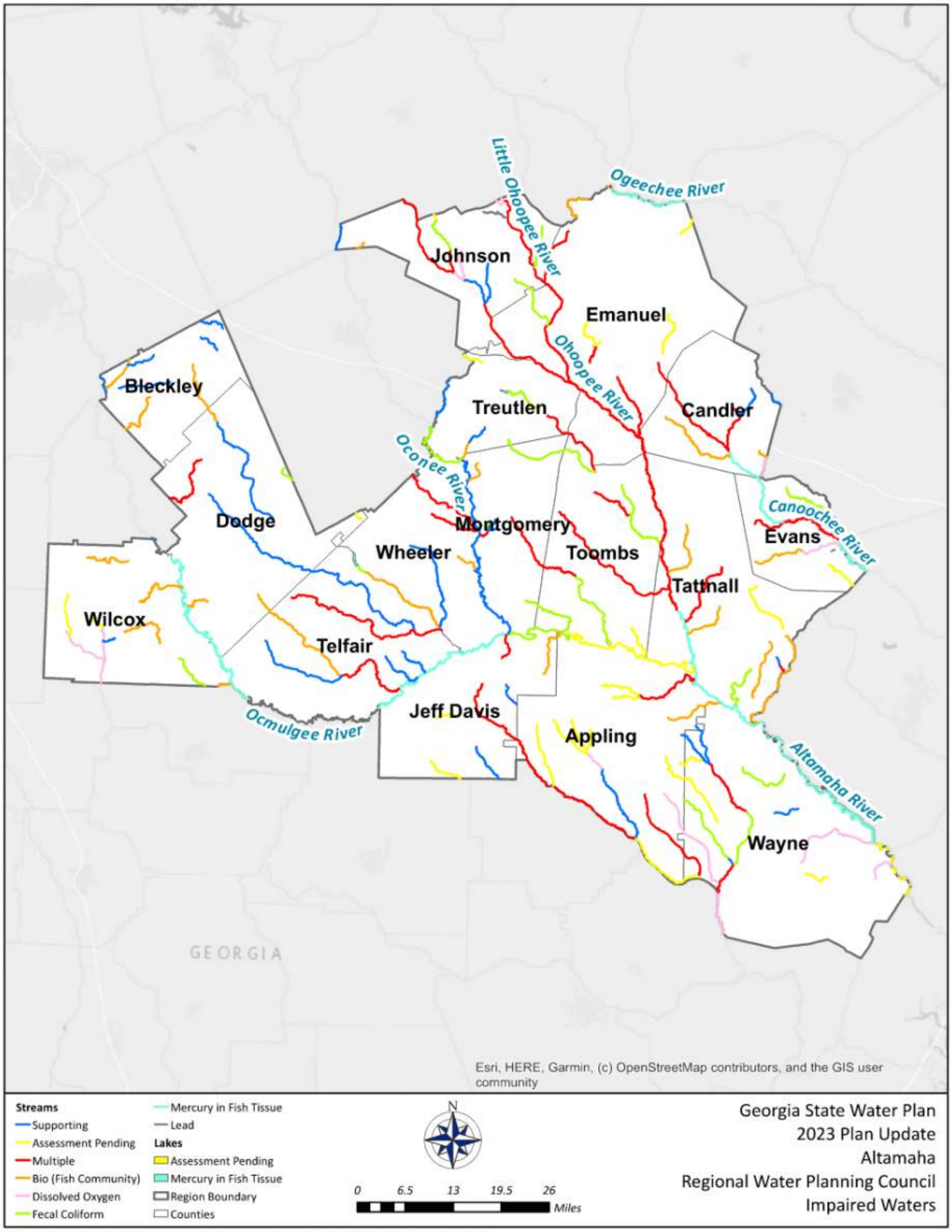


Figure 3-7 Impaired Water Bodies with Completed TMDLs

The modeled flow was compared with the desired 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. As shown in Figure 3-8, the model contains a more detailed node type representation that takes into account the various types of inputs and outputs throughout the system. The USGS gage nodes are locations along a river where there is a record of river flow measurements. At each node, the surface water availability models applied the average 2010 – 2018 water supply needs (i.e., withdrawals and discharges) and authorized reservoir operations to stream flows from 1939 to 2018. 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, resulting surface water flows can be simulated and “potential challenges” revealed.

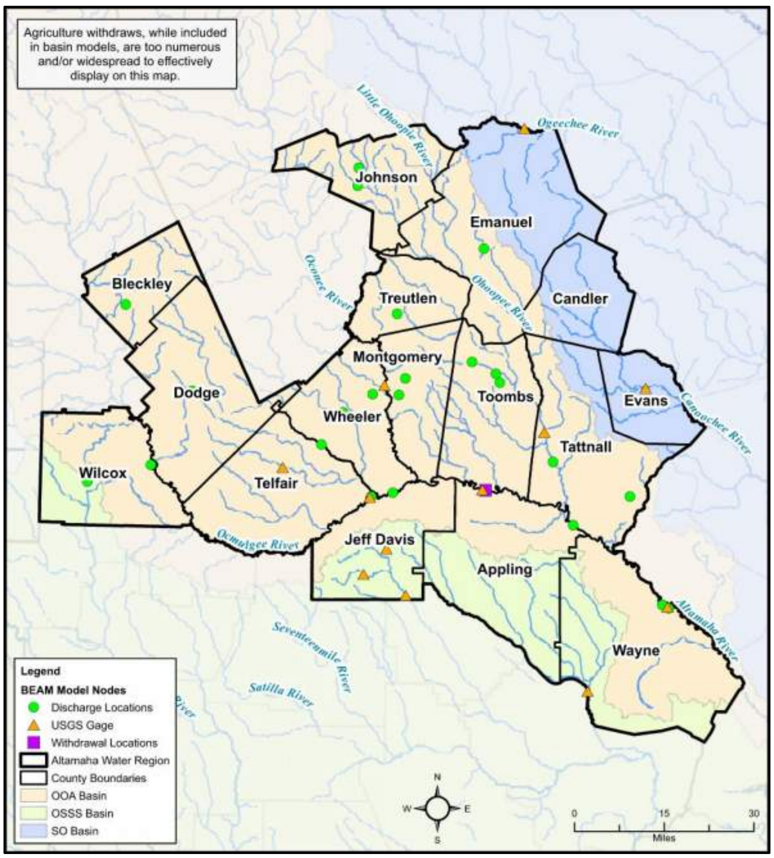


Figure 3-8 BEAM Nodes

Surface water is an important resource used to meet current and future needs in the region, especially for the agricultural and energy sectors. Between 2020 and 2060, the use of surface water for agricultural purposes is expected to increase by 15.3 MGD from 49.2 MGD to 64.5 MGD (Altamaha Water and Wastewater Forecasting Technical Memorandum; CDM Smith, 2022).

There are currently 21 permitted municipal facilities and 1 permitted industrial facility that discharge to surface waters in the Altamaha Region. There is also one energy surface water withdrawal/discharge facility in the region. There are currently no municipal or industrial surface water withdrawal facilities in the region. Potential surface water challenges are associated with wastewater assimilation under current conditions at a number of model (facility) nodes within the region as shown in Table 3-2. More detailed information about potential challenges at these nodes under future conditions is included in Section 5.

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

BEAM Node	Duration of Potential Challenge (% of total days)	7Q10 Flow at Node Location
6178 (City of Cochran (Cochran WPCP))	369 (1.3%)	0.62 cfs (0.33 MGD)
6298 (City of Abbeville (Abbeville WPCP))	90 (0.3%)	739.5 cfs (397.98 MGD)
6338 (Lumber City (Lumber City WPCP))	263 (0.9%)	883 cfs (475.20 MGD)
6368 (City of Scotland (Scotland WPCP))	2,950 (10.1%)	3.8 cfs (2.05 MGD)
6398 (City of Alamo (Alamo WPCP))	2,625 (9.0%)	2.2 cfs (1.18 MGD)
6438 (City of Eastman (Sugar Creek WPCP))	2,479 (8.5%)	0.13 cfs (0.07 MGD)
6508 (City of Hazlehurst (Bully Creek WPCP))	195 (0.7%)	898 cfs (483.28 MGD)
7048 (City of Soperton (Soperton WPCP))	118 (0.4%)	0.08 cfs (0.04 MGD)
7108 (City of Ailey (Ailey WPCP))	9,756 (33.4%)	1.8 cfs (0.97 MGD)
7128 (City of Glenwood (Glenwood WPCP))	11,225 (38.4%)	0.94 cfs (0.51 MGD)
7168 (City of Mount Vernon (Mount Vernon WPCP))	6,651 (22.8%)	0.31 cfs (0.17 MGD)
7318 (City of Swainsboro (Yam Grandy Creek WPCP))	1,586 (5.4%)	1.26 cfs (0.68 MGD)
7358 (City of Vidalia (Swift Creek WPCP))	3,732 (12.8%)	1.32 cfs (0.71 MGD)
7368 (City of Lyons (Lyons North WPCP))	1,637 (5.6%)	2.01 cfs (1.08 MGD)
7378 (City of Lyons (Lyons East WPCP))	0 (0.0%)	0.06 cfs (0.03 MGD)
7448 (Georgia Department of Corrections (Rogers State Prison WPCP))	1,565 (5.4%)	49.9 cfs (26.85 MGD)
7508 (City of Baxley (Baxley WPCP))	670 (2.3%)	1,787.6 cfs (962.03 MGD)

BEAM Node	Duration of Potential Challenge (% of total days)	7Q10 Flow at Node Location
7538 (City of Glennville (Glennville WPCP))	2,470 (8.5%)	0.03 cfs (0.02 MGD)
7588 (City of Jesup (Jesup WPCP))	699 (2.4%)	1,833.6 cfs (986.79 MGD)
7598 (Rayonier Performance Fibers, LLC)	699 (2.4%)	1,834.3 cfs (987.17 MGD)
Note: Surface Water Availability modeling simulation period is from 1939 to 2018. The simulation period totals to 29,220 days.		

In the Altamaha Region and surrounding area, critical low flow conditions occur on river systems that do not have any upstream storage reservoirs. It is important to note that when a potential surface water challenge exists, management practices can be used to address times when off-stream uses increase the severity and/or frequency of low flow conditions. Low flow conditions have been and will continue to occur; and the Altamaha Council's management practices are not utilized to address naturally occurring low flow or drought conditions.

3.2.4 Groundwater Availability

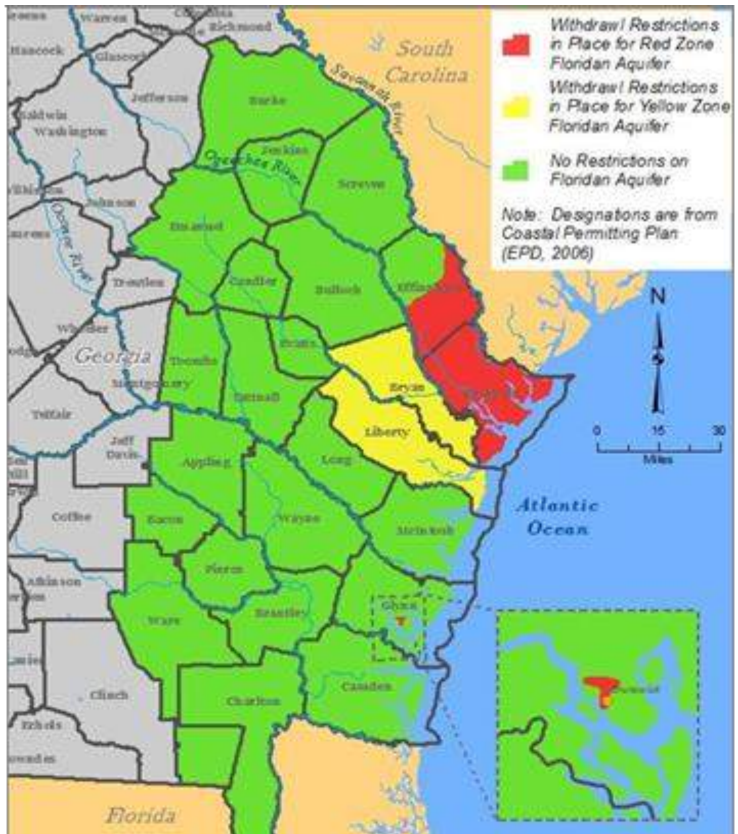
The Groundwater Availability Resource Assessment (EPD, 2010 and 2017) evaluates the amount of water that can be withdrawn from the modeled area of a prioritized aquifer without reaching specific thresholds of local or regional impacts. Indicators of impacts included declines in groundwater levels that may affect neighboring wells (drawdown) and reductions in the amount of groundwater that seeps into streams and thereby contributes to stream flows. The assessment estimates a range of yield that can be withdrawn from an aquifer before specific impacts become evident. The results reflect modeled aquifer responses to specific baseline conditions and specific pumping scenarios.

EPD prioritized the aquifers based on the characteristics of the aquifer, evidence of negative effects, aquifer availability, anticipated use, and other considerations. If negative impacts occur or are expected to occur, then a groundwater "challenge" exists.

Groundwater from the Floridan aquifer is a vital resource for the Altamaha Region. Some counties in Altamaha Region withdraw water from the Cretaceous aquifer as well. In 2015, groundwater was relied upon to meet about 57% of the water use in the region (USGS, 2019). The current demand from the Floridan aquifer within the Altamaha Region was 149 MGD in 2020 which is projected to increase by 49 MGD to 198 MGD in 2060. The 2060 projected demand is well below the low end of the sustainable yield (868 MGD) of the Floridan aquifer in South Central Georgia and Coastal Plain. Wells in Bleckley, Dodge, Johnson, and Wilcox counties withdraw water from the Cretaceous aquifer. The 2020 Cretaceous aquifer withdrawal rate from these counties was 3.0 MGD and it is projected to increase to 3.4 MGD in 2060 which is below the low end of the sustainable yield (347 MGD) of the Cretaceous aquifer.

Groundwater modeling results show that additional withdrawal of up to 10.5 MGD is possible from the Floridan aquifer without causing adverse impacts (such as: 30-feet drawdown between pumping wells that limits use of neighboring wells, reducing groundwater stream baseflow, and continual declines in groundwater levels), provided the wells are placed outside the low transmissivity area of the Gulf Trough. 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 demands. However, localized issues may occur if groundwater well densities or withdrawal rates are greater than the scenarios evaluated in the Groundwater Availability Resource Assessment or wells placed within the low transmissivity area of the Gulf Trough.

As shown in Figure 3-9, 24 counties in southeast Georgia are subject to the Coastal Georgia Water and Wastewater Permitting Plan for Managing Salt Water Intrusion, June 2006 (Coastal Permitting Plan). There are seven counties (Appling, Candler, Emanuel, Evans, Tattnall, Toombs, and Wayne Counties) in the Altamaha Region that are located within the "Green Zone". Per the Coastal Permitting Plan, there are no pumping restrictions from the Floridan aquifer in this area; however, there are several water conservation requirements related to groundwater withdrawals.



Source: Coastal Georgia Water and Wastewater Permitting Plan for Managing Salt Water Intrusion.

Figure 3-9 Sub-regions Associated with the Coastal Permitting Plan

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SECTION 4

Forecasting Future Water Resource Needs

Section 4 Forecasting Future Water Resource Needs

Water and wastewater demand forecasts, along with the Resource Assessments (Section 3), form the foundation for water planning in the Altamaha Region and serve as the basis for the selection of water management practices (Sections 6 and 7). The tables and graphics in this section present the regional water and wastewater forecasts for 2020 through 2060 for four water use sectors: municipal, industrial, agriculture, and thermoelectric generation.

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).

Population Projections

Municipal water and wastewater forecasts are closely tied to population projections for the counties within the Altamaha 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)
Appling	18,561	19,346	19,853	20,138	20,577	2,016	11%
Bleckley	12,838	13,243	13,576	13,789	14,084	1,246	10%
Candler	10,837	11,101	11,194	11,278	11,489	652	6%
Dodge	20,385	19,500	18,327	17,003	15,822	-4,563	-22%
Emanuel	22,664	23,564	24,037	24,228	24,591	1,927	9%
Evans	10,687	10,920	11,092	11,094	11,181	494	5%
Jeff Davis	15,148	15,681	15,943	16,040	16,096	948	6%
Johnson	9,661	9,499	9,280	9,085	9,045	-616	-6%
Montgomery	9,224	9,374	9,378	9,332	9,332	108	1%
Tattnall	25,411	25,591	25,460	25,001	24,641	-770	-3%
Telfair	15,644	14,736	13,742	12,735	12,020	-3,624	-23%
Toombs	26,983	27,477	27,507	27,171	26,821	-162	-1%
Treutlen	6,829	6,917	6,970	6,978	7,096	267	4%
Wayne	29,974	30,798	31,180	31,233	31,436	1,462	5%
Wheeler	7,909	8,097	8,304	8,464	8,675	766	10%
Wilcox	8,790	8,824	8,945	9,254	9,734	944	11%
Total Altamaha Region	**251,545**	**254,668**	**254,788**	**252,823**	**252,640**	**1,095**	**0.4%**
Source: Georgia Governor's Office of Planning and Budget, 2019.							

It should be noted that during the plan update process, the Council indicated that a new state prison is planned in Tattnall County. The Georgia Department of Corrections (GDC) is closing the Georgia State Prison in Reidsville which houses approximately 1,530 inmates. As outlined in the Governor's Budget Report for Amended Fiscal Year 2022 and Fiscal Year 2023, the state budget proposal includes construction of a new 3,000 bed facility to house prisoners in Tattnall County. The Regional Water Plan will be updated accordingly as more information becomes available on the State's plan and its impact to the local population in Tattnall County in future plan updates. In addition, anecdotal information suggests a recent migration to rural and unincorporated areas since the 2020 census. This may affect assumptions in the municipal water demand forecast in future updates of the Regional Water Plan.

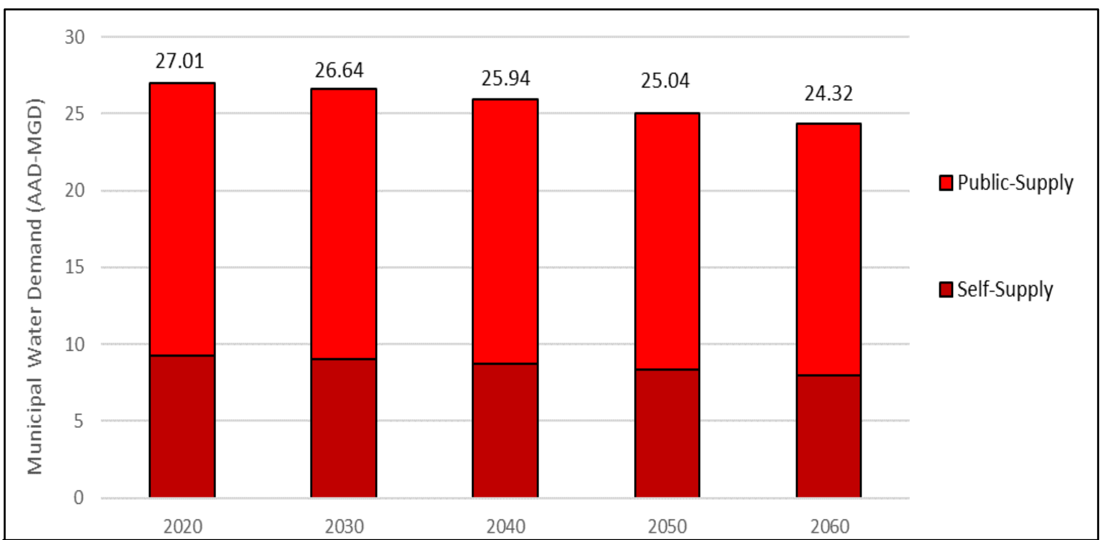
Municipal Water Forecasts

The municipal water forecasts were calculated by multiplying the baseline 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.

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 estimated gallons per capita per day values for public-supplied municipal demand. The self-supplied per capita values remained unchanged from prior the regional plan, and was estimated at 75 gallons per capita per day (gpcd).

The municipal water use rates for the Altamaha 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 Altamaha Water and Wastewater Forecasting Technical Memorandum (CDM Smith, 2022).

Total regional municipal water demands are shown in Figure 4-1 for the Altamaha Region. In addition, this figure shows the demands by public water systems and self-supply users. The gradual decline is the result of the reduced gpcd values. In the Altamaha Region, all municipal water demands are satisfied by utilizing groundwater as the sole source for withdrawals.



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

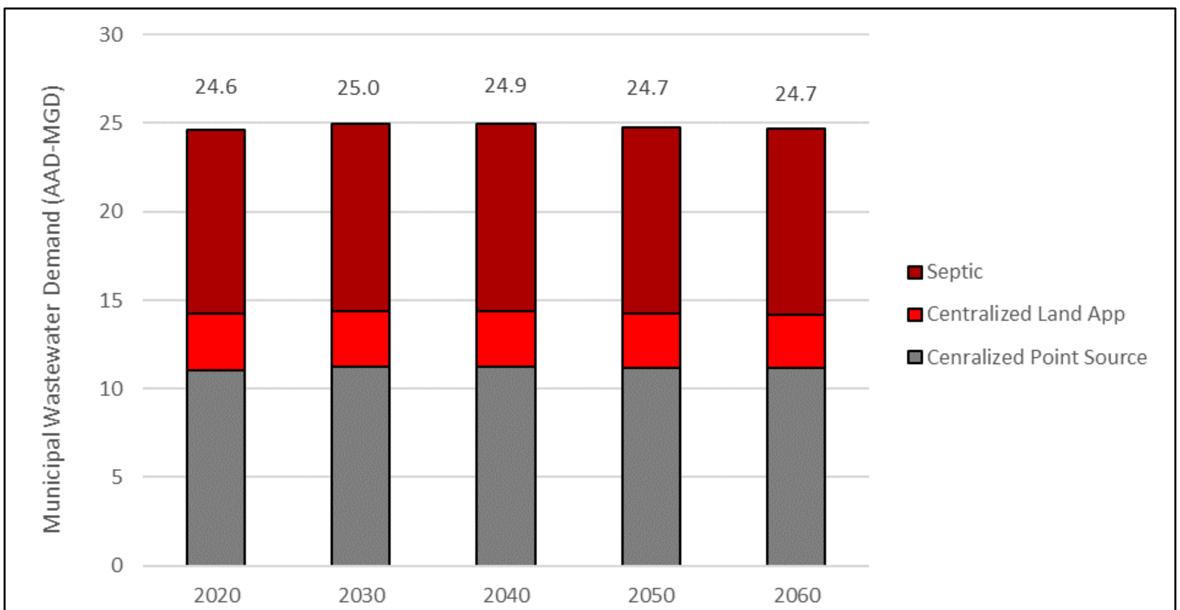
Figure 4-1 Total Municipal Water Use Forecast (in AAD-MGD)

Municipal Wastewater 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 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 gpcd and that 80 percent of this water use is disposed of via septic system. The estimated septic flow was based on the county population from the updated (2019) OPB 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.



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

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

4.2 Industrial Forecasts

Industrial forecasts show the future need from the major water using industries including: paper and forestry products, food processing, manufacturing, and mining. Industries require water for processes, sanitation, cooling, and other purposes. Some industries, such as poultry processors, operate under strict U.S. Department of Agriculture guidelines that require water use to maintain sanitary conditions within the facilities. Water need (i.e., the total water requirements of an industry, or the water withdrawals) was 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).

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. 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.

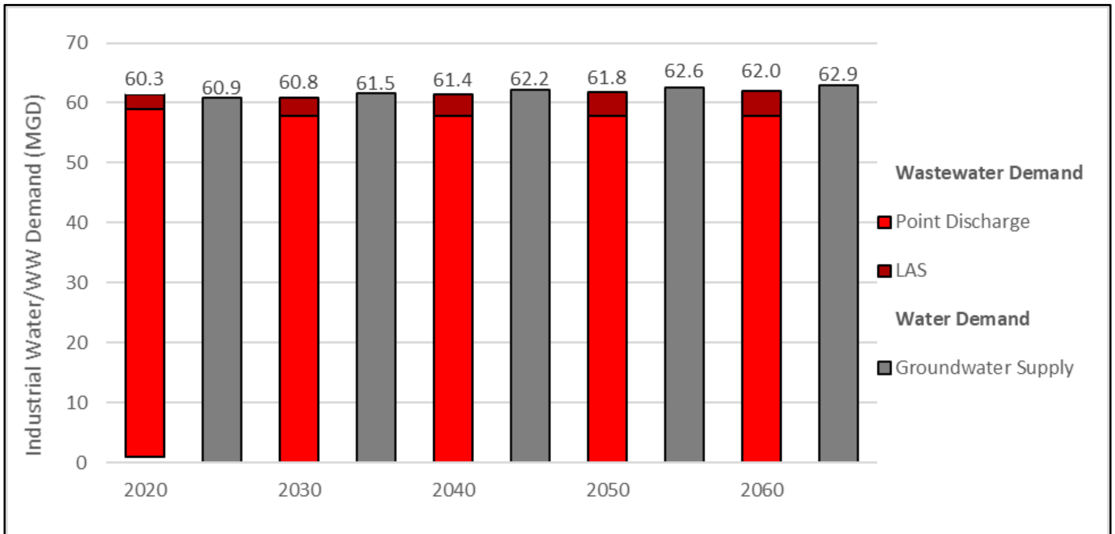
Industrial Water Forecasts

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 and wastewater forecast over the planning period. Water withdrawals are assumed to remain constant over time for all sub-sectors except for an expected increase in water demand for food processing.

Industrial Wastewater 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 some facility types (i.e., mining) may recycle stormwater discharges causing an increase in overall discharges but a decrease in water withdrawal. Discharges are assumed to remain constant over time for all sub-sectors except for an expected increase for food processing.

Once the industrial wastewater flows were estimated, flows were separated between point discharges and land application based on EPD permit data. This allows the planning regions to account for flows discharging to surface water bodies. The industrial wastewater forecasts are presented in Figure 4-3 by the anticipated disposal system type: industrial wastewater treatment (point discharge) or land application system (LAS).



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

Figure 4-3 Total Industrial Water and 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).[2] The crop forecasts, developed by the Georgia Water Planning & Policy Center at Albany State University (GWPPC), with support from the University of Georgia's (UGA) 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. Table 4-2 lists a drier-than-normal year crop irrigation forecast for each county.

Non-crop (including non-permitted) agricultural water demands were identified with the assistance of industry associations. Similar to crop irrigation, forecasts for nursery and greenhouse water use were also developed for a range of climate conditions over the planning period. For planning purposes, the drier-than-normal nursery/greenhouse forecasts are presented in Table 4-2. For golf courses, livestock production and nurseries, estimates of current water use were developed, but future forecasts were not developed due to lack of available data. Current water demands were held constant throughout the planning period for these water use sectors.

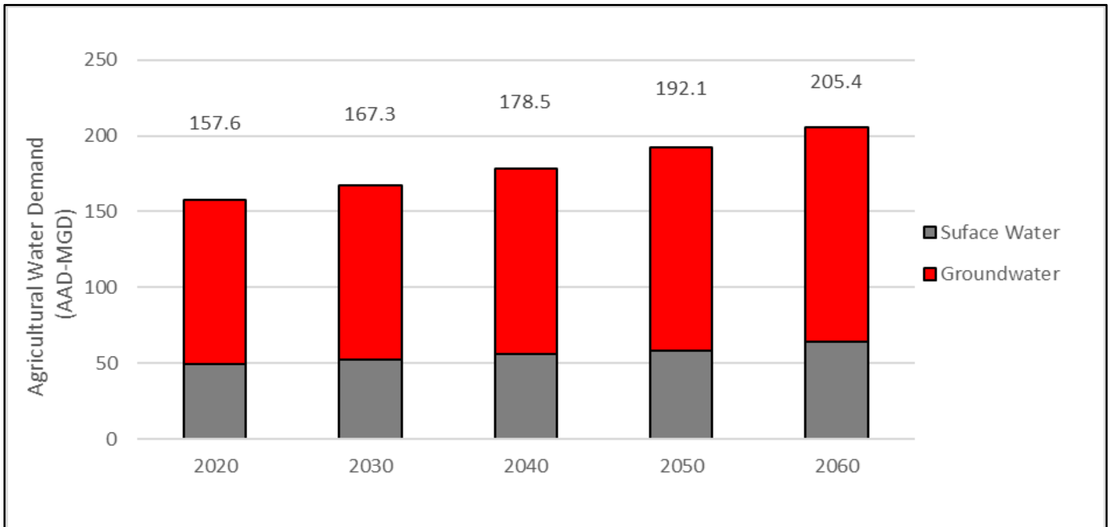
[2] Golf courses with withdrawal permits are included with crop water use although the acreage is small. Golf courses without permits may be included with nurseries.

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

County	2020	2030	2040	2050	2060	% Change
Appling	9.7	10.3	11.1	11.9	12.9	33%
Bleckley	16.8	17.7	19.0	20.3	21.9	30%
Candler	6.8	7.4	8.1	8.9	9.8	44%
Dodge	14.8	15.9	16.9	18.1	19.4	31%
Emanuel	6.0	6.2	6.5	6.7	7.0	17%
Evans	6.6	7.0	7.5	8.0	8.7	32%
Jeff Davis	8.2	8.6	9.0	9.5	9.8	19%
Johnson	3.8	3.9	4.0	4.2	4.3	13%
Montgomery	4.7	5.2	5.7	6.3	7.0	49%
Tattnall	20.4	21.8	23.6	25.6	28.2	38%
Telfair	11.9	12.7	13.6	14.7	15.7	32%
Toombs	13.8	14.4	15.0	15.7	16.6	20%
Treutlen	2.2	2.3	2.4	2.5	2.6	18%
Wayne	6.0	6.3	6.5	7.9	7.2	20%
Wheeler	4.3	4.5	4.8	5.0	5.3	23%
Wilcox	21.6	23.1	24.8	26.8	29.0	34%
Total	**157.6**	**167.3**	**178.5**	**192.1**	**205.4**	**30%**

Source: Altamaha 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

Figure 4-4 shows the regional agricultural demands by source of supply. A 30% increase in agricultural water demand is projected by 2060 for the Altamaha Region. The largest increase in forecasted demand occurs in Montgomery County, with a 49% increase by 2060. Candler, Tattnall, and Wilcox Counties have the next largest forecasted demand increases at 44%, 38% and 34%, respectively. All other counties in the region are forecasted to have increases of less than 33% through 2060, with Emanuel and Johnson Counties having the smallest increases at 17% and 13%, respectively. As shown in Figure 4-4, the majority of the agricultural withdrawals (over 65%) are supplied by groundwater and the remainder by surface water.



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

Figure 4-4 Total County Agricultural Water Use Forecast (in AAD-MGD)

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.

Thermoelectric water demands for the Altamaha Region are shown in Table 4-3. 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 the more important element when assessing future resources because a large volume of water is typically returned to the environment following the energy production process. The only current or planned facility that is in the Altamaha Region is the Edwin I. Hatch Nuclear Power Plant.

Table 4-3 Regional Thermoelectric Water Forecasts (in AAD-MGD)

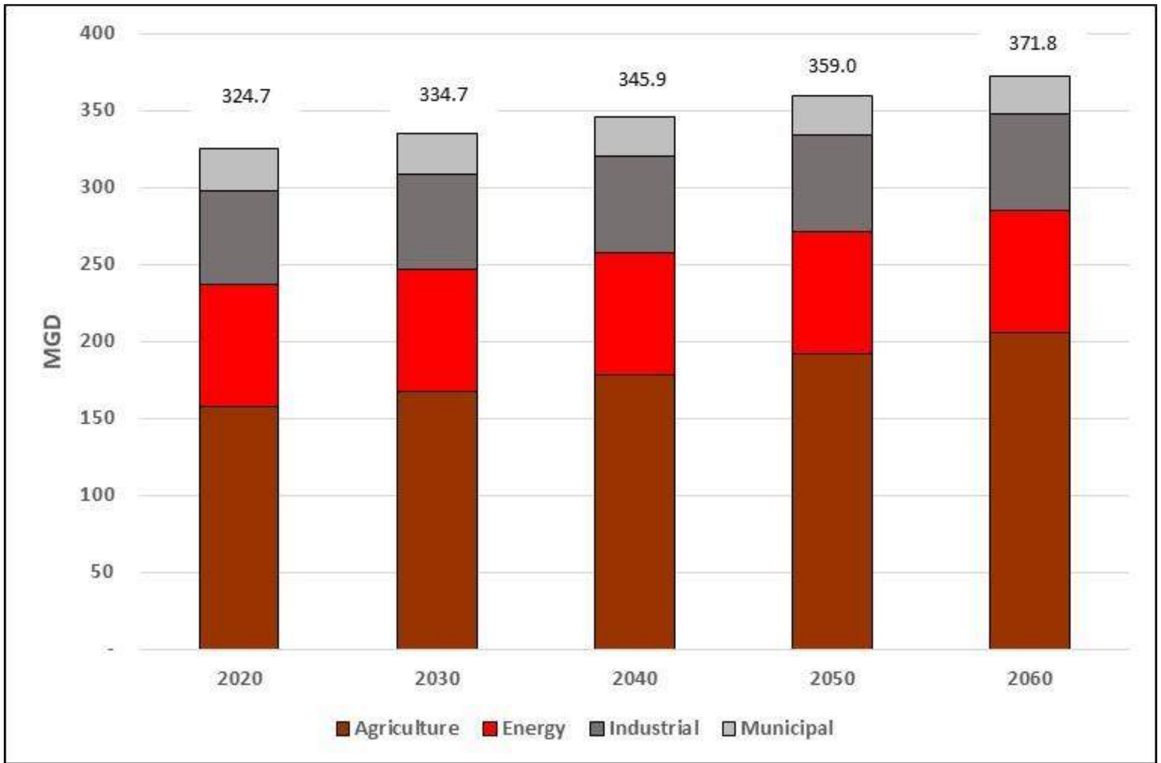
Category	2020	2030	2040	2050	2060
Existing and Planned Facilities' Withdrawals	79.2	79.2	79.2	79.2	79.2
Existing and Planned Facilities' Consumption	50.8	50.8	50.8	50.8	50.8

Source: Altamaha 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 Altamaha 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, increased generation from renewable and natural gas-fired facilities are expected to generate the additional energy required to meet the expected demand. Plant Hatch is assumed to provide steady power generation throughout the planning horizon.

4.5 Total Water Demand Forecasts

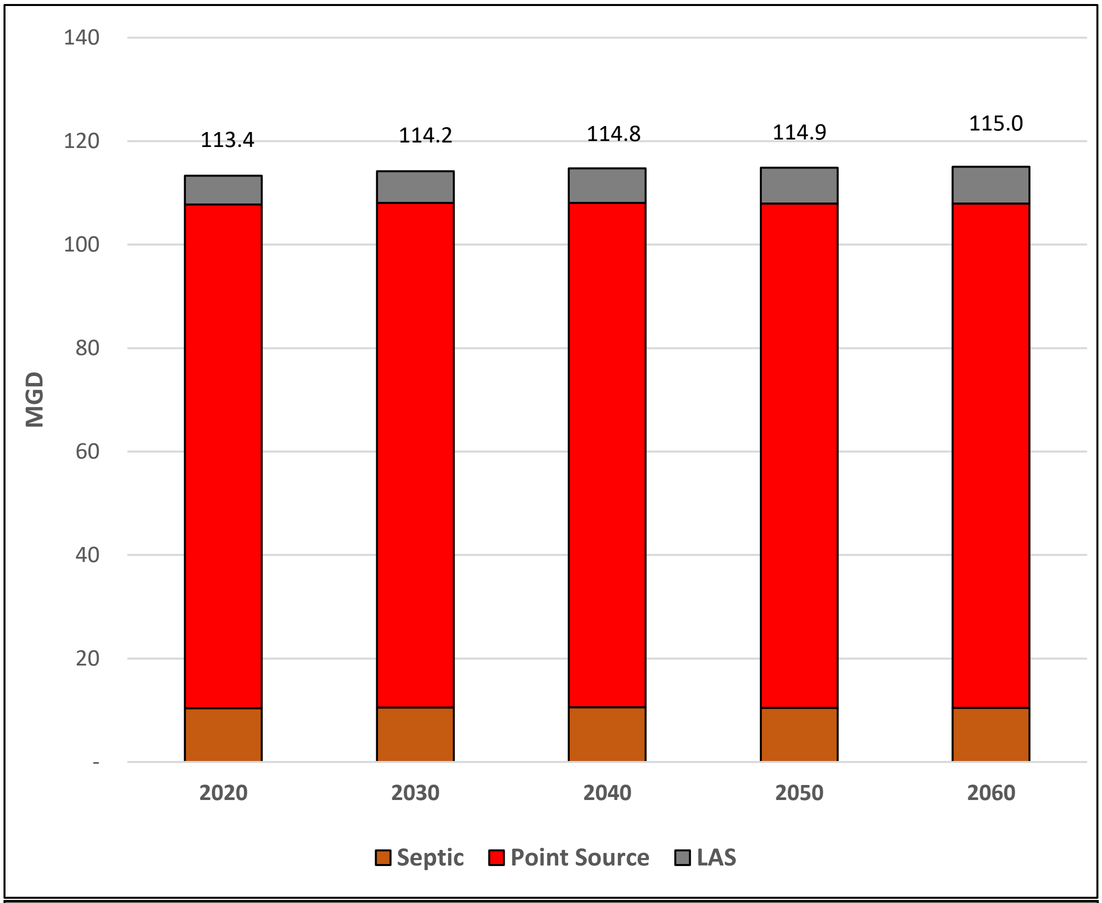
Total water demand forecasts for the years 2020 through 2060 for the Altamaha Region are summarized in Figure 4-5. This figure presents the forecasts for municipal, industrial, agricultural, and thermoelectric power for all counties in the region. Overall, the water demands in the region are expected to grow by 15% (47 MGD) from 2020 through 2060.



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

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

Figure 4-6 summarizes total wastewater forecasts from 2020 through 2060 for the Altamaha Region. This figure presents the forecasts by the anticipated disposal system type: point discharge, LAS, or discharge into a septic system. Overall, wastewater flows in the region are expected to grow by 1.5% (1.7 MGD) from 2020 through 2060.



Source: Altamaha 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 Forecast (in AAD-MGD)

SECTION 5

Comparison of Available Resource Capacity and Future Needs

Section 5 Comparison of Available Resource Capacity and Future Needs

This Section compares the water and wastewater demand forecasts (Section 4), along with the Resource Assessments (Section 3), providing the basis for selecting water management practices (Sections 6 and 7). Areas where future demands exceed the estimated capacity of the resource have a potential water resource challenge that will be addressed through water management practices. This Section summarizes the potential challenges and water supply needs for the Altamaha Region.

Summary

At the regional level, for modeled aquifers, no groundwater resource shortfalls are expected to occur in the Altamaha Region over the planning horizon.

Over the next 40 years, forecasted surface water demand within the Altamaha Region may increase the potential surface water challenges (flow below 7Q10) at the locations of wastewater discharges.

Assimilative capacity assessments indicate the potential need for improved wastewater treatment at some facilities within the Altamaha, Oconee, and Suwannee river basins.

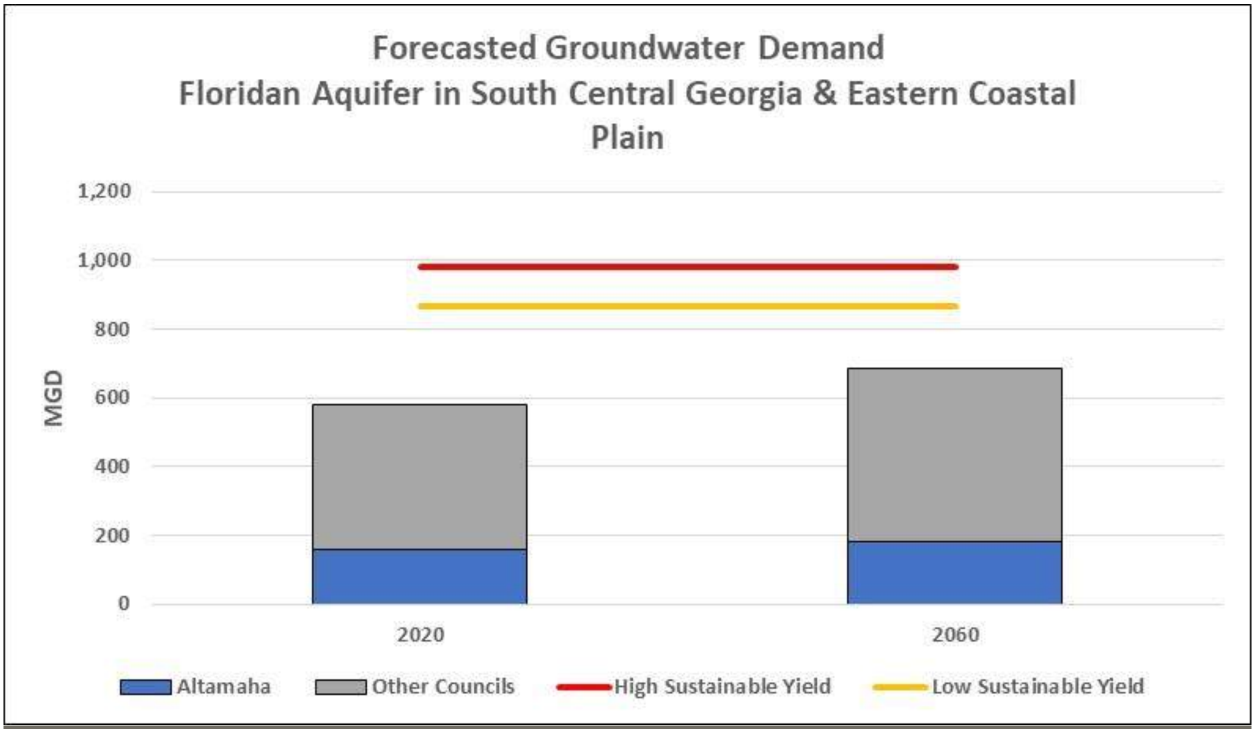
Addressing non-point sources of pollution and existing water quality impairments will be a part of addressing the region's future needs.

5.1 Groundwater Availability Comparisons

Groundwater from the Floridan aquifer is a vital resource for the Altamaha Region. Overall, the results from the Groundwater Availability Resource Assessment (EPD, 2010) indicate that the estimated range of sustainable yield for the modeled portions of the regional aquifer(s) is greater than the updated forecasted demands (see Figure 5-1).

At this time, no regional groundwater resource challenges are expected to occur in the Altamaha Region over the planning horizon. However, localized gaps could occur if well densities and/or withdrawal rates result in exceedance of sustainable yield metrics. In addition, some counties including Evans, Jeff Davis, and Wheeler Counties may need additional permitted capacity if future demand for groundwater exceeds permitted groundwater withdrawal limits. The comparison of existing groundwater permitted capacity to forecasted future demand in the Altamaha Region is shown in Table 5-1. Please note that sufficient capacity at the county level does not preclude localized municipal permit capacity shortages.

Local water providers in counties with large demand forecasts should review their permitting needs.



Sources: Groundwater Availability Assessment, January 2011, EPD. Altamaha Water and Wastewater Forecasting Technical Memorandum, 2022, CDM Smith. Other regions utilizing portions of the modeled Floridan aquifer to meet demand include: Coastal Georgia, Middle Ocmulgee, Suwannee-Satilla, Savannah-Upper Ogeechee, Upper Oconee, Lower Flint-Ochlockonee, and Upper Flint.

Figure 5-1 Floridan Aquifer Demand vs. Estimated Yield

Table 5-1 2060 Municipal Forecast versus Groundwater Permitted Capacity

County	2020 Public Demand Forecast (AAD – MGD)	2060 Public Demand Forecast (AAD – MGD)	Existing Permitted Capacity (AAD – MGD)	Additional Permitted Capacity Needed in 2060 (AAD – MGD)[1]
Appling	0.80	0.82	1.40	-
Bleckley	0.86	0.87	2.15	-
Candler	0.59	0.56	0.90	-
Dodge	1.33	0.95	3.40	-
Emanuel	1.74	1.72	2.03	-
Evans	0.80	0.77	0.50	0.27
Jeff Davis	1.03	1.02	0.85	0.17
Johnson	0.60	0.51	0.85	-
Montgomery	0.66	0.63	0.80	-
Tattnall	1.69	1.52	3.37	-
Telfair	1.57	1.13	2.03	-
Toombs	2.76	2.54	5.00	-
Treutlen	0.32	0.30	0.65	-
Wayne	1.68	1.62	2.63	-
Wheeler	0.50	0.49	0.40	0.09
Wilcox	0.84	0.86	0.91	-

Notes: Values provided are average annual demands in millions of gallons per day (AAD-MGD).
[1] Analysis does not account for demands in one county that may be met by permits from another county.

5.2 Surface Water Availability Comparisons

Surface water is an important resource used to meet current and future needs of the Altamaha Region, especially in the agricultural and energy sectors. With the recent development of the BEAM model by EPD, there are now many surface water modeling nodes located in and in close proximity to the Altamaha Region. The modeling tools currently used to assess surface water availability were described in Section 3. From the updated Surface Water Availability Resource Assessment (EPD, 2023b), the basic conclusions of the future conditions modeling show potential surface water challenges (i.e., times when there is insufficient water to meet off-stream demands and also meet the targets for support of instream uses based on the modeling analysis) may exist in the region. The location of these model nodes within the Altamaha Region are shown in Figure 5-2. A summary of the modeled potential surface water challenges in 2060 is provided in Table 5-2. The potential surface water challenges related to periods of time when the modeled stream flow falls below the 7Q10 flow used to determine the effluent limits for point source discharge facilities. EPD will use this information to guide communications with these facilities about future capacity and permit requirements, particularly for those facilities with larger durations of challenge (generally more than 10%) or with significant increases in the duration of challenge from current to future conditions.

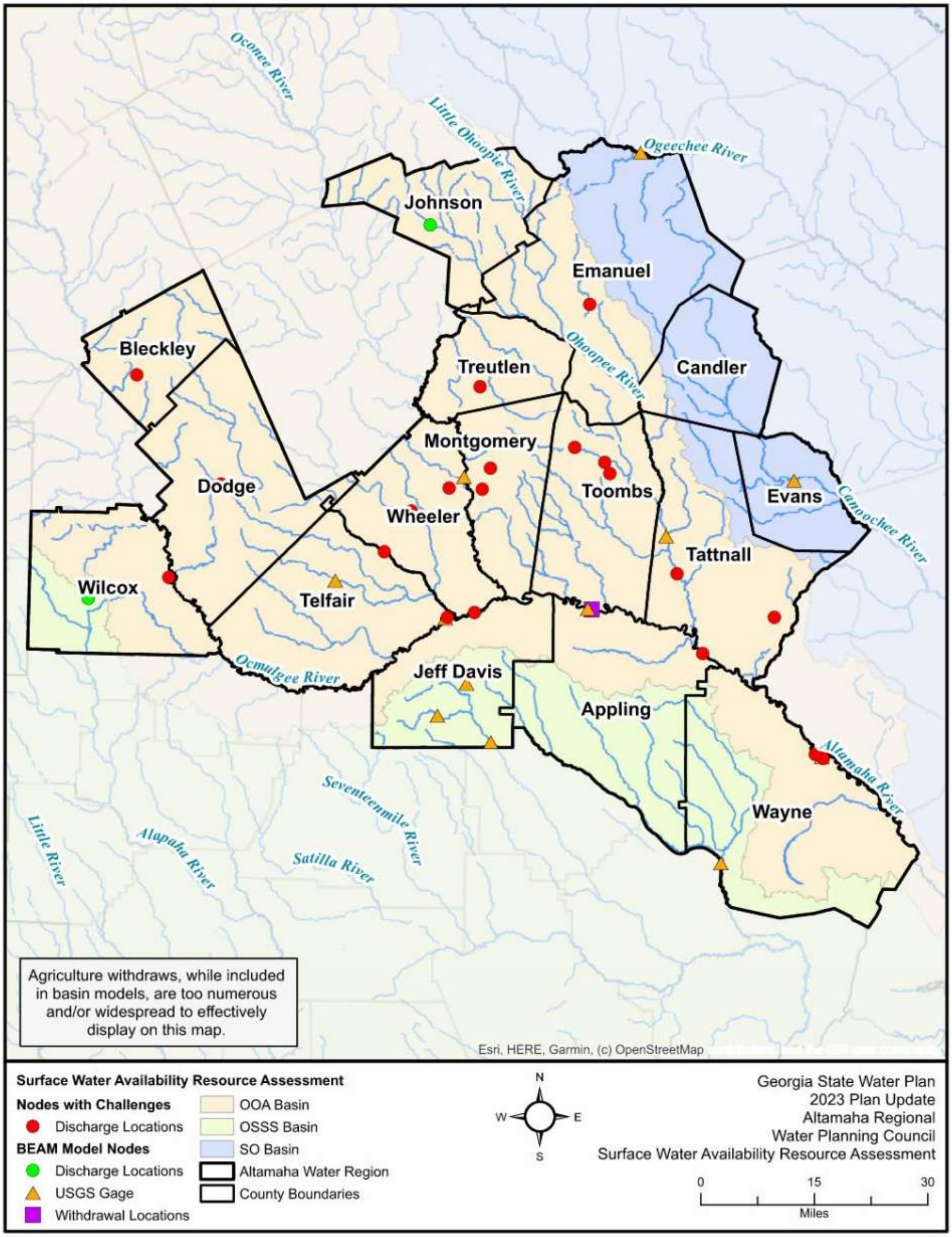


Figure 5-2 2060 Potential Surface Water Challenge Summary

Table 5-2 Summary of Modeled 2060 Potential Surface Water Challenges

BEAM Model Node	Duration of Challenge (% of total days)	Corresponding 7Q10 Flow	Change in Duration of Challenge from Current Condition
6178 (City of Cochran (Cochran WPCP))	970 (3.3%)	0.62 cfs (0.33 MGD)	601 (2.1%)
6298 (City of Abbeville (Abbeville WPCP))	53 (0.2%)	740 cfs (398 MGD)	-37 (-0.13%)
6338 (Lumber City (Lumber City WPCP))	225 (0.8%)	883 cfs (475 MGD)	-38 (-0.13%)
6368 (City of Scotland (Scotland WPCP))	3,907 (13.4%)	3.8 cfs (2.05 MGD)	957 (3.3%)
6398 (City of Alamo (Alamo WPCP))	3,454 (11.8%)	2.2 cfs (1.18 MGD)	829 (2.8%)
6438 (City of Eastman(Sugar Creek WPCP))	3,165 (10.8%)	0.13 cfs (0.07 MGD)	686 (2.4%)
6508 (City of Hazlehurst (Bully Creek WPCP))	177 (0.6%)	898 cfs (483 MGD)	-18 (-0.06%)
7048 (City of Soperton (Soperton WPCP))	234 (0.8%)	0.08 cfs (0.04 MGD)	116 (0.4%)
7108 (City of Ailey (Ailey WPCP))	9,895 (33.9%)	1.8 cfs (0.97 MGD)	139 (0.5%)
7128 (City of Glenwood (Glenwood WPCP))	11,225 (38.4%)	0.94 cfs (0.51 MGD)	0 (0.0%)
7168 (City of Mount Vernon (Mount Vernon WPCP))	6,651 (22.8%)	0.31 cfs (0.17 MGD)	0 (0.0%)
7318 (City of Swainsboro (Yam Grandy Creek WPCP))	1,648 (5.6%)	1.26 cfs (0.68 MGD)	62 (0.2%)
7358 (City of Vidalia (Swift Creek WPCP))	4,014 (13.7%)	1.32 cfs (0.71 MGD)	282 (1.0%)
7368 (City of Lyons (Lyons North WPCP))	2,863 (9.8%)	2.01 cfs (1.08 MGD)	1,226 (4.2%)
7378 (City of Lyons (Lyons East WPCP))	168 (0.6%)	0.06 cfs (0.03 MGD)	168 (0.6%)
7448 (Georgia Department of corrections (Rogers State Prison WPCP))	2,016 (6.9%)	49.9 cfs (26.9 MGD)	451 (1.5%)
7508 (City of Baxley (Baxley WPCP))	725 (2.5%)	1,788 cfs (962 MGD)	55 (0.2%)
7538 (City of Glennville (Glennville WPCP))	3,180 (10.9%)	0.03 cfs (0.02 MGD)	710 (2.4%)
7588 (City of Jesup (Jesup WPCP))	743 (2.5%)	1,834 cfs (987 MGD)	44 (0.15%)
7598 (Rayonier Performance Fibers, LLC)	756 (2.6%)	1,834 cfs (987 MGD)	57 (0.2%)

Source: Surface Water Availability Resource Assessment, 2023b, EPD.
Note: Surface Water Availability modeling simulation period is from 1939 to 2018.

In order to better assess these potential challenges and to better understand the types of management practices that may be required, the anticipated duration (in days) when these challenges may occur is provided. 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 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 the previously used planning nodes

The projected increased use of surface water for agriculture for the counties within the Altamaha Region is shown in Table 5-3.

Table 5-3 2060 Increased Annual Average Surface Water Demand

County	Withdrawal Type	Increase in Agricultural Demand by 2060 (MGD)	Increase in Agricultural Demand by 2060 (cfs)
Appling	Agriculture	0.51	0.79
Bleckley	Agriculture	1.97	3.05
Candler	Agriculture	1.68	2.61
Dodge	Agriculture	0.90	1.40
Emanuel	Agriculture	0.21	0.32
Evans	Agriculture	1.03	1.60
Jeff Davis	Agriculture	0.59	0.91
Johnson	Agriculture	0.07	0.11
Montgomery	Agriculture	0.28	0.44
Tattnall	Agriculture	4.19	6.48
Telfair	Agriculture	0.69	1.07
Toombs	Agriculture	1.13	1.75
Treutlen	Agriculture	0.12	0.18
Wayne	Agriculture	0.07	0.10
Wheeler	Agriculture	0.34	0.53
Wilcox	Agriculture	1.47	2.28

5.3 Surface Water Quality Comparisons (Assimilative Capacity)

This section summarizes the results of the Water Quality (Assimilative Capacity) Resource Assessment modeling when all municipal and industrial wastewater treatment facilities operate at permit conditions and provides a comparison of existing wastewater permitted capacity to the projected 2060 wastewater forecast flows. A discussion on non-point source pollution is also included.

5.3.1 Future Treatment Capacity Needs

Existing municipal and industrial wastewater permitted capacities were compared to projected 2060 wastewater flows to estimate future treatment capacity needs by county. This analysis was done for both point sources and land application systems (LASs) that are permitted under the National Pollutant Discharge Elimination System (NPDES) or state LAS permits. As shown in Table 5-4, Wheeler County is projected to have a minor exceedance of its permitted capacity by 2060. It should be noted that the comparison in Table 5-4 was completed at the county level and localized shortages in treatment capacity may exist.

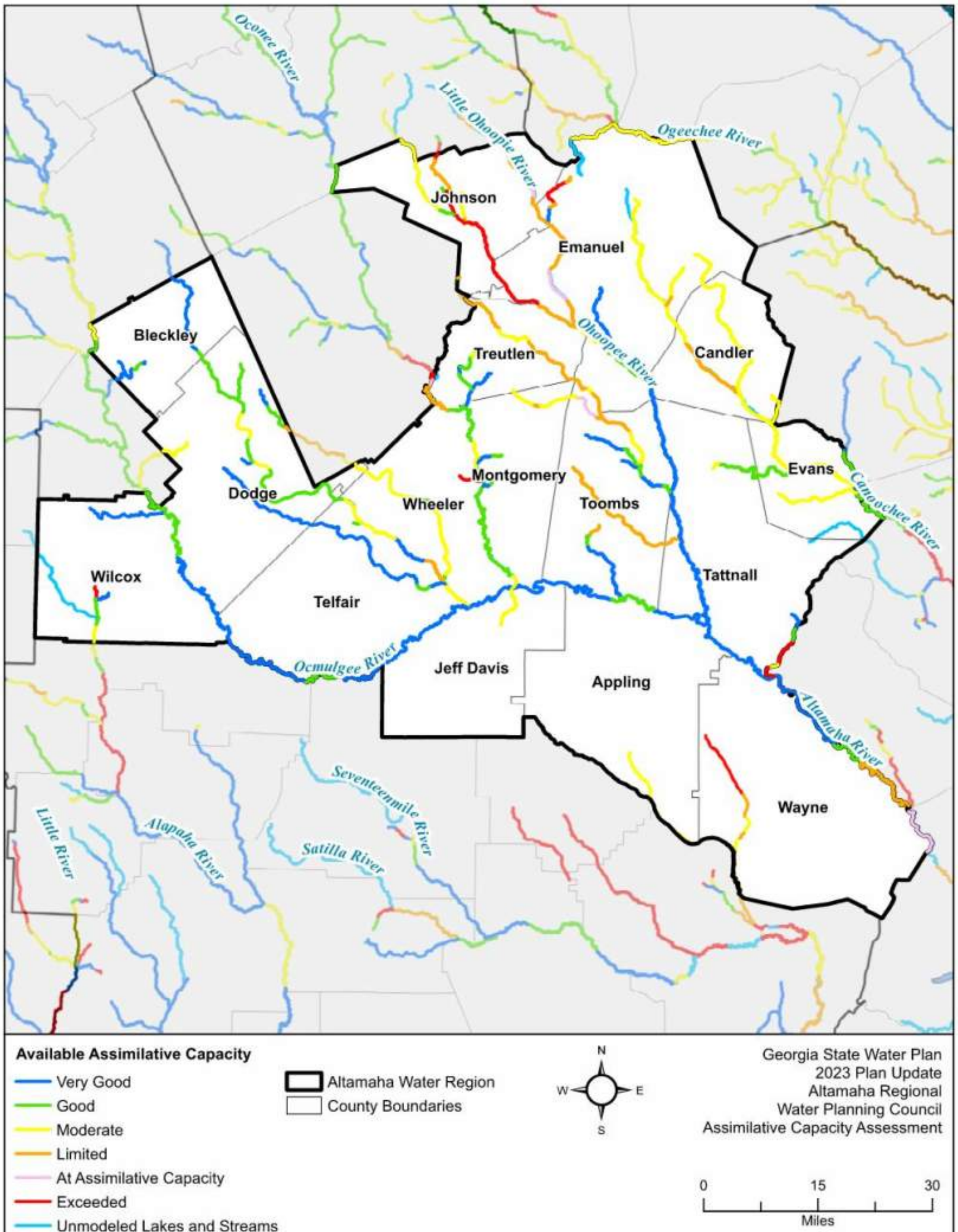
Table 5-4 2060 Wastewater Forecast versus Existing Permitted Capacity (MGD)

County	Point Source (PS)			Land Application Systems (LAS)		
	2060 Forecast[1]	Permitted Capacity	2060 Surplus or Gap (-)	2060 Forecast[1]	Permitted Capacity	2060 Surplus or Gap (-)
Appling	1.42	2.00	0.58	0.00	0.00	0.00
Bleckley	0.76	1.00	0.24	0.00	0.00	0.00
Candler	0.00	0.00	0.00	0.42	1.00	0.58
Dodge	0.55	1.80	1.25	0.23	0.50	0.27
Emanuel	1.10	3.00	1.90	0.11	0.25	0.14
Evans	0.02	0.02[2]	0.00	0.06	0.15	0.09
Jeff Davis	0.94	1.50	0.56	0.00	0.00	0.00
Johnson	0.00	1.01	1.01	0.00	0.00	0.00
Montgomery	0.23	0.35	0.12	0.03	0.15	0.12
Tattnall	1.66	2.85	1.19	0.31	0.74	0.43
Telfair	0.49	1.48	0.99	0.46	1.80	1.34
Toombs	1.22	3.22	2.00	1.19	1.80	0.61
Treutlen	0.37	0.60	0.23	0.00	0.00	0.00
Wayne	1.74	2.50	0.76	0.07	0.19	0.11
Wheeler	0.32	0.49	0.17	0.13	0.10	**(0.03)**
Wilcox	0.37	0.67	0.30	0.00	0.00	0.00
Total	**11.19**	**22.47**	**11.28**	**3.01**	**6.68**	**3.66**

Note:
1 Includes industrial wastewater expected to be treated at municipal facilities.
2 The Claxton WPCP does not have a flow limit specified in its permit, therefore the permitted capacity has been set equal to the forecasted flow.

5.3.2 Assimilative Capacity Assessments

The Water Quality (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. The 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 5-5 for the Altamaha Region, which includes portions of the Altamaha, Oconee, Ocmulgee, and Ogeechee River basins.



Source: Provided GIS Files from Dissolved Oxygen Assimilative Capacity Resource Assessment Report; EPD, 2023a.

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

Table 5-5 Permitted Assimilative Capacity for DO in Altamaha Planning Council

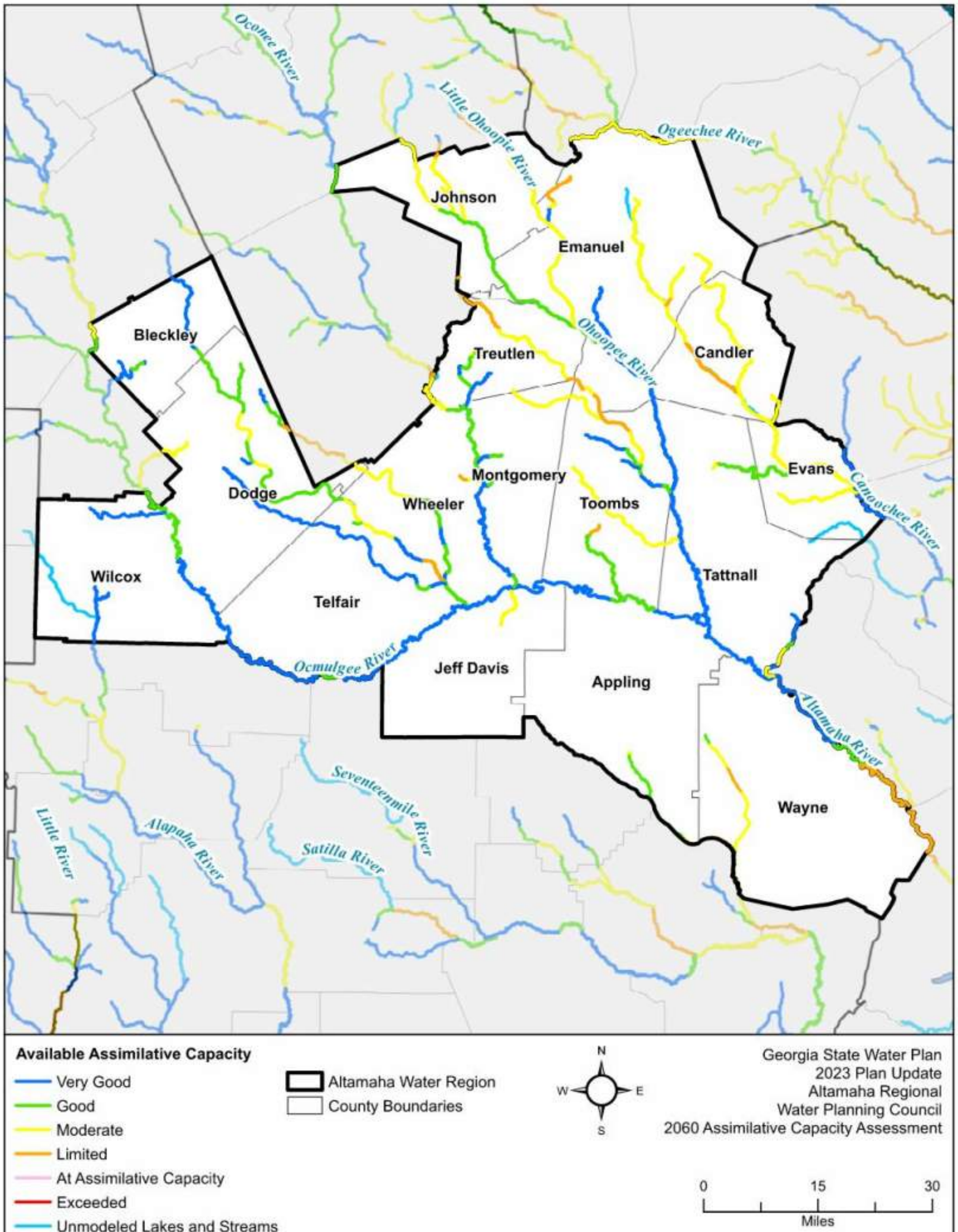
Basin	Available Assimilative Capacity (Total Mileage)							Modeled Miles in Council
	Very Good (≥1.0 mg/L)	Good (0.5 to <1.0 mg/L)	Moderate (0.2 to <0.5 mg/L)	Limited (>0.0 to <0.2 mg/L)	At Capacity (0 mg/L)	None or Exceeded (<0.0 mg/L)	Un-modeled	
Altamaha	150	39	46	108	27	36	0	405
Ocmulgee	167	79	66	7	0	0	0	319
Oconee	12	46	7	8	1	6	0	80
Ogeechee	2	28	132	13	0	0	6	181
Suwannee	2	4	3	0	0	2	0	11

Source: GIS Files from the Dissolved Oxygen Assimilative Capacity Resource Assessment Report; EPD, 2023.
Notes: Since the 2017 update, additional stream segments were modeled for the Altamaha and Ocmulgee 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) has 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 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 Altamaha Planning Council that have exceeded their full assimilative capacity under the current conditions assessment include:

- Beards Creek, Big Cedar Creek, Little Cedar Creek, Ohoopee River, and Sardis Creek in the Altamaha Basin;
- Peterson Creek and portions of the main stem of the Oconee River in the Oconee Basin; and
- Alapaha River in the Suwannee Basin.

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. Figure 5-4 shows the assimilative capacity at assumed future (2060) permitted flows and effluent limits. More information regarding the type of assumptions made under future conditions modeling is provided in the Dissolved Oxygen Assimilative Capacity Resource Assessment Report (EPD, 2023a).



Source: Provided GIS Files from Dissolved Oxygen Assimilative Capacity Resource Assessment Report; EPD, 2023a.

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

5.3.3 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, 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.

An analysis of nutrients (total nitrogen and total phosphorus) that may occur due to point sources and nonpoint sources in watersheds was conducted. The goal was to identify nutrient loading rates from different portions of the watersheds under various hydrologic conditions and evaluate them in relation to corresponding land uses and potential non-point source contributions. Results of watershed nutrient modeling identify portions of the watersheds where there are higher concentrations of nutrients (total nitrogen and total phosphorus) in stormwater runoff than other parts of the watershed.

There are currently no nutrient standards in place for the Altamaha Region, so there is no absolute threshold against which these nutrient loadings are compared. Rather, the nutrient model results are beneficial for relative comparisons to target areas where implementation of non-point source control management practices will have the greatest benefit. More detail regarding the nutrient model results is available in the Water Quality (Assimilative Capacity) Resource Assessment (EPD, 2017). Nutrient and non-point source control management practices specific to land uses within the Altamaha Region are discussed in Section 6.

5.4 Summary of Potential Water Resources Issues

This section summarizes the potential water resources issues in the Altamaha Region. These potential water resources issues are the basis for the recommended management practices in Section 6. Table 5-6 summarizes the potential water resource issues and permitted capacity needs in the Altamaha Region by County.

- Over the planning horizon, forecasted surface water demands within the Altamaha Region are projected to result in potential challenges at the locations of wastewater discharge facilities for all counties except Candler, Evans, and Johnson.

- At the regional level, for modeled aquifers, no groundwater resource shortfalls are expected to occur in the Altamaha Region over the planning horizon.

- Assimilative capacity assessments indicate the need for improved wastewater treatment in some facilities within the Altamaha, Oconee, and Suwannee River basins.

- Addressing non-point sources of pollution and existing water quality impairments will be a part of addressing the region’s future needs.

Table 5-6 Summary of Potential Water Resource Issues by County

County	Municipal Water Permitted Capacity Need	Counties with Modeled Surface Water Availability Challenges	Municipal Wastewater Permitted Capacity Need	Water Quality – DO Assimilative Capacity Issues
Source	*Table 5-1*	*Figure 5-2*	*Table 5-5*	*Figure 5-3*
Appling	-	Yes	-	-
Bleckley	-	Yes	-	-
Candler	-	-	-	-
Dodge	-	Yes	-	-
Emanuel	-	Yes	-	Yes
Evans	Yes	-	Yes	-
Jeff Davis	Yes	Yes	-	-
Johnson	-	-	-	Yes
Montgomery	-	Yes	-	
Tattnall	-	Yes	-	Yes
Telfair	-	Yes	-	-
Toombs	-	Yes	-	-
Treutlen	-	Yes	-	Yes
Wayne	-	Yes	-	Yes
Wheeler	Yes	Yes	Yes	Yes
Wilcox	-	Yes	-	Yes

Notes: "Yes" indicates a predicted challenge in the indicated county (for surface water, "yes" indicates part or all of the indicated county lies in the area contributing to a potential challenge). Permitted capacity need is based on the comparison of permitted municipal capacity versus 2060 forecasted demand.

SECTION 6

Addressing Water Needs and Regional Goals

Section 6 Addressing Water Needs and Regional Goals

This Section presents the Altamaha Council's water management practices selected to address resource shortfalls or challenges identified and described in Section 5, and/or to meet the Council's Vision and Goals described in Section 1. The management practices described here were fully updated in 2017. The Council recognizes that the management practices are generally robust and still applicable. However, due to the number of vacant seats during this round of revision, the Council was concerned that representation and knowledge of the region would not be sufficient to fully revise the management practices. Therefore, 2023 revisions of this section were limited to updates of outdated information.

Summary

The Altamaha Council selected management practices to help address surface water low flow conditions, and to provide for sustainable use and development of groundwater and surface water in other areas of the region.

Water quality management practices focus on addressing dissolved oxygen conditions at select locations and best management practices to address non-point sources of pollution and help reduce nutrient sources.

Additional water and wastewater permit capacity and new/upgraded infrastructure will be needed to address existing and/or future uses.

6.1 Identifying Water Management Practices

The comparison of Resource Assessments and forecasted demands presented in Section 5 identifies the Region's likely resource shortfalls or potential challenges and demonstrates the necessity for region and resource specific water management practices. In cases where shortfalls or challenges appear to be unlikely, the Council identified needs (e.g., facility/infrastructure needs and practices, programmatic practices, etc.) and corresponding management practices that are aligned with the Region's Vision and Goals. In selecting the actions needed (i.e., water management practices), the Council considered practices identified in existing plans, the Region's Vision and Goals, and coordinated with local governments and water providers as well as neighboring Councils that share these water resources.

6.1.1 Review of Existing Plans and Practices

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. The types of plans/studies that were reviewed to support identification and selection of management practices for the Altamaha Region consisted of the following:

- Comprehensive Work Plans (local and regional scale)
- EPD databases (permitted withdrawals, planned projects, and proposed reservoirs)
- State-wide guidance documents (conservation, cost, and water planning)
- Best Management Practices (agriculture, forestry, and stormwater management)

- Water quality studies (basin, watershed, and local scale)
- TMDL evaluations

When possible, successful management practices already planned for and/or in use in the Altamaha Region formed the basis for the water management practices selected by the Council.

6.2 Selected Water Management Practices for the Altamaha Region

Table 6-1 summarizes the Altamaha Council's selected management practices by source of supply for the relevant demand sector(s), including surface water supply for agricultural irrigation, permitted municipal and industrial water and wastewater capacity, water quality assimilative capacity (dissolved oxygen) challenges, current water quality impairments, and nutrient considerations for the associated watersheds. The table summarizes general information regarding management practices needed to meet forecasted needs, and more detailed information on management practices needed to address potential challenges between available resources and forecasted needs. The Altamaha Council reviewed a number of existing local and regional water management plans and related documents during the original development and selection of management practices. A detailed list of plans and documents that were considered can be found in the Altamaha Plans Reviewed in Selecting Management Practices Technical Memorandum (CDM, 2011). The Altamaha Council reviewed the management practices to ensure they were in alignment with the region's vision and goals.

Table 5-2 and Figure 5-3 previously both summarized the location and magnitude of potential challenges and should be referenced to provide the geographic focus of the management practices. Previously, the Altamaha Council considered a number of agricultural conservation practices to address surface water availability challenges. The Altamaha Council concluded that integrating practices, rather than using a single practice, would be more effective at addressing challenges and more economically feasible. Figure 6-1 illustrates the Altamaha Council's recommended suite of surface water availability management practices, which will be implemented via an incremental and adaptive approach. Those practices that are less costly and more readily implemented are prioritized for short-term implementation. If resource needs are not met and/or challenges are not addressed, then more costly and complex management practices will be pursued.

Table 6-1 Management Practices Selected for the Altamaha Region

Management Practice Number	Issue(s) to be Addressed by Action(s)	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
Action Needed - Address Current and Future Surface Water Use Data Collection/Additional Research (DCAR) to confirm frequency, duration, severity, and drivers of surface water challenges and identify significant causes (climate, timing, water use, land cover, etc.) of 7Q10 low flow conditions and advance research/feasibility of potential solutions			
DCAR-1 Agricultural Consumption Data	Improve understanding and quantification of agricultural water use as they relate to potential surface water challenges	▪ Acquire additional data/information on agricultural consumptive use to confirm or refine if agricultural consumption is less than 100% consumptive[1] ▪ Conduct "modeling scenario analysis to bracket a reasonable range of consumption" with Resource Assessment models with "new" information on consumptive use to assess effect on surface water challenge.[1]	2,6
DCAR-2 Source of Supply Data to Refine Forecasts		Refine surface water agricultural forecasts and Resource Assessment models to improve data on source of supply and timing/operation of farm ponds and dual source irrigation systems[1]	2,6
DCAR-3 Metering Data	Obtain additional data and improved understanding of actual versus forecasted water use	▪ Continue to fund, improve, and incorporate agricultural water use metering data; collect and use this information in Water Plan updates. ▪ Expand number of GSWCC continuously monitored real-time meter sites in potential surface water challenge areas.[1] ▪ Maintain and fund river gauging stations.	2,3,6
DCAR-4 Support Irrigation Efficiency Research	Improvement of surface water flows via reduced surface water use while maintaining/improving crop yields	Support research (University, State, and Corporate) on improved irrigation efficiency measures and development of lower water use crops and plant strains[1]	2,3,6
DCAR-5 Irrigation Education and Research		Improve education and research on when and how much water is needed to maximize crop yield with efficient irrigation[1]	2,3

Management Practice Number	Issue(s) to be Addressed by Action(s)	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
DCAR-6 Minimize Groundwater Use Impacts on Surface Water	Improvement of surface water flows where groundwater and surface water are hydrologically connected and groundwater use impacts surface water flows	Promote management practices and educate water users to minimize impacts to surface water associated with excessive pumping/use of shallow/surficial aquifers that may impact surface water flows.	2,3,6,9
DCAR-7 Address Low Flow with Wetland Restoration and Retention Structures	Examine potential role of wetlands restoration and water retention structures in addressing surface water low flow conditions. Evaluate implementation considerations for each option.	Develop plan of study and conduct research to evaluate the opportunities and limitations associated with improving river flow conditions via creation/restoration of wetlands systems and potential water retention structures including streams, and if deemed potentially feasible, identify potential location(s) and estimates of potential improvements to stream flow conditions. This effort should include the identification of the incentives that could be used to make this a viable water supply option and a cost-benefit analysis of these incentives.	2,6,9,11
DCAR-8 Analyze Addressing Extreme Conditions	Cost effectively address surface water low flow conditions while avoiding undue adverse impacts on water users and uses in the planning area	Conduct analysis of the socioeconomic benefits and cost in comparison to ecological benefits of addressing surface water challenges. Council discussion, and additional detail provided by EPD during the 2022 updates to the resource assessments, indicated the need to focus this Management Practice on the more frequent, smaller magnitude challenges, rather than the larger, longer duration challenges that would likely be addressed through drought management measures.	2,5,6,11

Management Practice Number	Issue(s) to be Addressed by Action(s)	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
Action Needed - Water Conservation (WC) - Address current and future challenges and meet water needs by efficient water use. The Altamaha Council supports the 25 water conservation goals contained in the March 2010 Water Conservation Implementation Plan (WCIP).			
WC-1 Tier 1 and Tier 2 Measures for Municipal and Industrial Users	Help meet current and forecasted municipal and industrial surface water and groundwater supply needs throughout the region	Municipal and Industrial water uses - encourage implementation and adherence to Tier 1 and Tier 2 water conservation measures established in existing and future rulemaking processes and plans [WCIP, Coastal Permitting Plan (including applicable Tier 3 and Tier 4 practices), Georgia Water Stewardship Act of 2010 and EPD rules for public water systems to improve water supply efficiency through water loss audit and water loss control programs (391-3-33)] by local governments/utilities	3
WC-2 Tier 1 and Tier 2 Measures for Agriculture	Help meet current and forecasted agricultural surface water and groundwater supply needs throughout the region	Encourage implementation of Tier 1 and Tier 2 conservation measures and adherence to WCIP by agricultural groundwater users	3
Action Needed - Water Conservation (WC) - Meet current and future challenge and needs by efficient agricultural water use - Tier 3 Conservation Practices[1]			
WC-3 Audits	▪ Help meet current and forecasted agricultural ground and surface water supply needs ▪ Help address potential surface water challenges	Conduct irrigation audits	3
WC-4 Metering		Meter irrigation systems	
WC-5 Inspections		Inspect pipes and plumbing to control water loss	
WC-6 Minimize High-Pressure Systems		Minimize or eliminate the use of high-pressure spray guns on fixed and traveler systems where feasible	
WC-7 Efficient Planting Methods		Utilize cropping and crop rotation methods that promote efficiency	

Management Practice Number	Issue(s) to be Addressed by Action(s)	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
Action Needed - Water Conservation (WC) Continued - Meet current and future challenges and needs by efficient water use - Tier 4 Conservation Practices[1]			
WC-8 Conservation Tillage	▪ Help meet current and forecasted agricultural ground and surface water supply needs ▪ Help address potential surface water challenges	Practice conservation tillage	3
WC-9 Control Loss		Control water loss	
WC-10 End-Gun Shutoffs		Install end-gun shutoff with pivots	
WC-11 Low Pressure Systems		Install low pressure irrigation systems where feasible (soil specific)	
WC-12 Application Efficiency Technologies		Encourage and improve use of soil moisture sensors, ET sensors, or crop water use model(s) to time cycles	
Additional/Alternate to Existing Surface Water Supply Sources (ASWS)[1] High Priority Management Practices			
ASWS-1 Incentives for Sustainable Groundwater Development	Help improve surface water flow during low flow conditions	Future and existing agricultural surface water uses - Using collaboration and incentive based program(s), encourage additional groundwater development as preferred source of supply for future demand where feasible and within the estimated sustainable yield of the resource. Identify the need for, and feasibility of, incentive-based seasonal surface water permit conditions to address 7Q10 low flow conditions.	2,4,6,9
ASWS-2 Land Management Incentives		Incentive-based land use practices to help promote infiltration and aquifer recharge	1,9,12
ASWS-3 Incentives for Greater Wastewater Returns		Identify incentive-based programs to increase wastewater returns; modify/manage land application systems, septic systems, and stormwater returns to address 7Q10 low flow conditions	2,6,10,11

Management Practice Number	Issue(s) to be Addressed by Action(s)	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
Additional/Alternate to Existing Surface Water Supply Sources (ASWS)[1] Medium Priority Management Practices			
ASWS-4 Address Challenges and Manage Adaptively	Help improve surface water flow during low flow conditions	Monitor progress of addressing potential challenge. If progress is not achieved, evaluate need and feasibility to conjunctively manage groundwater and surface water to address surface water flow shortages during 7Q10 low flow conditions	2,4,6,9
ASWS-5 Restoration Incentive Programs		Based on outcome of research (DCAR-7 above), consider incentive-based programs to restore wetlands and other areas if this practice can improve river flows during shortages to 7Q10 dry periods without impairing timber harvesting opportunities	2,6,7,9,11
Additional/Alternate to Existing Surface Water Supply Sources (ASWS)[1] Low Priority Management Practices			
ASWS-6 Consider Low Flow Conditions in Future Surface Water Permitting	Help ensure that future surface water use does not contribute to frequency and severity of low flow conditions	Future surface water uses - If surface water (ponds and withdrawals) is sought for future water supply, the Applicant and EPD should work collaboratively to promote surface water use patterns that will not significantly contribute to frequency or magnitude of 7Q10 low flow conditions	2,6,9
ASWS-7 Incentives for Dry-Year Releases from Ponds	Help improve surface water flow during low flow conditions	Future and existing surface water uses - Utilizing incentives and collaborative partnerships, examine opportunities to modify farm and other pond operations to obtain releases in dry/drought years	2,4,6
Action Needed - Address Water Quality (Dissolved Oxygen Levels)			
Point Sources – Dissolved Oxygen (PSDO)			
PSDO-1 Collect Water Quality Data	Verification of Water Quality Resource Assessment Data and Assumptions to determine dissolved oxygen conditions (see Figure 5-3 for more information)	Data collection to confirm loading and/or receiving stream chemistry	2,6,9
PSDO-2 Point Discharge Relocation	Improve dissolved oxygen levels in receiving streams (see Figure 5-3 for more information)	Modification of wastewater discharge location. In areas with shortages to 7Q10 low flow conditions, identify feasibility to move discharge location to higher flow streams with greater assimilative capacity.[1]	9-11

Management Practice Number	Issue(s) to be Addressed by Action(s)	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
PSDO-3 Enhance Point Source Treatment		Upgrade/improve treatment to address low dissolved oxygen conditions in receiving streams.[1]	2,6,9-11
Available Industrial Wastewater Permit Capacity (IWWPC)			
IWWPC-1 Collect Additional Industrial Permit Data	Collect additional data where needed on industrial flow volumes and permit conditions to verify permitted versus forecasted needs	Obtain additional permit data regarding flow volumes and permit conditions for industrial wastewater facilities forecasted needs[2]	9-11
Action Needed - Address Water Withdrawal Permit Capacity Needs			
Municipal Groundwater Permit Capacity (MGWPC)			
MGWPC-1 Increase Municipal Groundwater Permit Capacity	Additional municipal groundwater permit capacity may be needed in Evans, Jeff Davis and Wheeler Counties (Table 5-1)	Obtain groundwater permit capacity and construct new or expanded facilities to meet forecasted need	6,9,11
Industrial Groundwater Permit Capacity (IGWPC)[2]			
IGWPC-1 Increase Industrial Groundwater Permit Capacity	Additional industrial groundwater permit capacity may be needed in Evans and Wayne Counties	Obtain groundwater permit capacity and construct new or expanded facilities to meet forecasted need	6,9,11
The following Altamaha Council Management Practices are programmatic in nature and are therefore described in general terms.			
Action Needed - Address Current and Future Groundwater (GW) Needs			
GW-1 Sustainable Groundwater Use	Continue to sustainably drill wells and withdraw groundwater from the Floridan and other prioritized aquifers and use of other aquifer systems in the region to meet regional needs		2,6,9
GW-2 Research Groundwater Sustainability	Continue to refine sustainable yield metrics, monitor and improve understanding of historic, current, and future trends in groundwater levels Use best available science when evaluating potential value and/or impact associated with aquifer storage and/or recovery of surface water		2,4,6

Management Practice Number	Issue(s) to be Addressed by Action(s)	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
GW-3 Promote Aquifer-Friendly Land Use	Encourage land use practices that sustain and protect aquifer recharge areas (both inside and outside the region) for the aquifers that are present in the region		1
Management Practices to Address Current and Future Surface Water (SW) Needs			
SW-1 Maintain Current Permitted Capacity	Continue to apply for permits and use surface water within the available surface water resource capacity		2,6,9
SW-2 Monitor and Evaluate Estuaries	Monitor Atlantic slope river flow conditions to help determine flow conditions that sustain estuary conditions		9,11
Management Practices to Address Water Quality Non-Point Source (NPS) Needs			
(Dissolved oxygen, fecal coliform, nutrients, and other impairments)			
NPS-1 Study Human Impacts on Water Quality	Data collection/analysis to confirm if dissolved oxygen and/or fecal coliform is human induced		9-11
NPS-2 Research and Address Impairment Issues	Collect data to determine the sources of nutrient loading and other NPS impairments to waters of the State, and upon confirmation of source, develop specific management programs to address		9-11
The following practices are selected by the Altamaha Council to encourage implementation by the applicable local or state program(s).			
Urban Best Management Practices (NPSU)			
NPSU-1 Control Erosion	Use soil erosion and sediment control measures		9,11
NPSU-2 Manage Stormwater Runoff	Stormwater retention ponds, wetlands to manage runoff and help support river flows		9,11
NPSU-3 Increase Stormwater Infiltration	Promote measures to increase infiltration of stormwater to help reduce nutrient and other pollutant runoff (City of Baxley Watershed Protection Plan, 2007)		1,9,11

Management Practice Number	Issue(s) to be Addressed by Action(s)	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
NPSU-4 Riparian Buffers	Protect and maintain riparian buffers along urban streams		9,11
NPSU-5 Street Sweeping	Implement street sweeping program (City of Baxley Watershed Protection Plan, 2007)		9,11
Rural Best Management Practices (NPSR)			
NPSR-1 Advocate Implementing Road Runoff BMPs	Implement BMPs to control runoff from dirt roads by encouraging County implementation of the BMPs identified in Georgia Resource Conservation and Development Council, “Georgia Better Back Roads – Field Manual”		9,11
Forestry Best Management Practices (NPSF)			
NPSF-1 Support Forestry Commission Water Quality Program	Support Georgia Forestry Commission water quality program consisting of BMP development, education/outreach, implementation/compliance monitoring, and complaint resolution process		9,11
NPSF-2 Improve BMP Compliance	Improve BMP compliance through State-wide biennial BMP surveys and BMP assurance exams, Master Timber Harvester workshops, and continuing logger education		9,11
NPSF-3 Wetland and Forest Restoration Incentives	Incentives to restore wetlands and historically drained hardwood and other areas. Where applicable, support United States Department of Agriculture (USDA) incentive programs through the Farm Service Agency and NRCS to restore converted wetlands back to forested conditions.		9,11
Agricultural Best Management Practices for Crop and Pasture Lands (NPSA) - Support and encourage implementation of GSWCC BMP and Education Programs			
NPSA-1 Soil Erosion Reduction Measures	Conservation tillage and cover crop		3,9
NPSA-2 Utilize Buffers	Field buffers, riparian forested buffers, and strip cropping to control runoff and reduce erosion		3,9,11
NPSA-3 Livestock Management	Livestock stock exclusions from direct contact with streams and rivers and vegetation buffers		9,11

Management Practice Number	Issue(s) to be Addressed by Action(s)	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
NPSA-4 Manure Control	Responsible manure storage and handling		9,11
NPSA-5 Wetland and Forest Restoration Incentives	Incentives to restore wetlands and historically drained hardwood and other areas		9,11
Existing Impairments and Total Maximum Daily Load Listed Streams (TMDL)			
TMDL-1 Evaluate Impairment Sources	Data collection and confirmation of sources to remove streams listed due to "natural sources"		8,9
TMDL-2 Analyze Impaired Segments and Sources	Data collection to refine river/stream reach length for impaired waters; focus on longest reaches to refine location and potential sources of impairments		8,9
TMDL-3 Stormwater Management BMPs	Stormwater Management: ▪ Agricultural BMPs ▪ Forestry BMPs ▪ Rural BMPs ▪ Urban BMPs See Above Non-Point Source for Details		9,11
Nutrients – Regional Watershed Models (NUT)			
NUT-1 Link Nutrient Loading With Current Land Use	Align current land use with phosphorus and nitrogen loading data to help optimize effectiveness of management practice based on consideration of land uses and actual nutrient loading contribution to surface water resources (i.e., predominant land use is not necessarily the predominant source of nutrient) within all watersheds that affect the Altamaha Region ▪ Agricultural BMPs ▪ Forestry BMPs ▪ Rural BMPs ▪ Urban BMPs See Above Non-Point Source for Details		9,11

Management Practice Number	Issue(s) to be Addressed by Action(s)	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
Management Practices to Address Future Educational Needs (EDU)			
EDU-1 Promote Conservation Programs	Support Water Conservation Programs		2,3,5,6
EDU-2 Stormwater Education	Support Stormwater Educational Programs		9,11
EDU-3 Septic System Maintenance Education	Support Septic System Maintenance Programs		9,11
EDU-4 Forestry BMP Education	Support Georgia Forestry Commission Forestry BMP and UGA-SFI Logger Education Programs		9,11
EDU-5 Clean-Up Events	Conduct stream clean-up events (Examples include the Lumber City Watershed Protection Plan, 2007, City of Eastman, Wayne County)		9,11
Management Practices to Address Future Ordinance and Code Policy Needs (OCP)			
OCP-1 Engage Local Governments	Encourage local government to adopt tools and practices to implement and/or update stormwater and land development strategies to improve water quality/quantity. Possible resource documents include: Georgia Stormwater Management Manual, Coastal Stormwater Supplement, Metro North Georgia Water Planning District Model Ordinances, and Lumber City Watershed Protection Plan (2007)		9,11
OCP-2 Green Space Opportunities and Incentives	Identify opportunities for green space on incentive and voluntary basis		1,7,11
OCP-3 Promote Integrated Planning	Encourage coordinated environmental planning, land use, stormwater, and wastewater		1-3,5,6,9-12

Management Practice Number	Issue(s) to be Addressed by Action(s)	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
Shared Resources			
The Altamaha Region will continue to coordinate and collaborate with its neighboring Councils to address potential shared water resource challenges. The Altamaha Region will combine its management practices with Coastal Georgia, Savannah-Upper Ogeechee, Upper Oconee, Suwannee- Satilla and Upper Flint to address shared resource challenges related to surface water availability, groundwater availability, and surface water quality.			

Notes:

[1] Seek to reduce frequency and severity of human impacts to 7Q10 low flow conditions in the region, which are associated with surface water use in portions of the Altamaha Region. Focus on surface water permit holders and new surface water permit requests in Appling, Bleckley. Dodge, Emanuel, Jeff Davis, Montgomery, Tattnall, Telfair, Toombs, Treutlen, Wayne, Wheeler, Wilcox Counties.

[2] Additional industrial wastewater capacity may be needed. EPD to update and refine discharge limit databases.

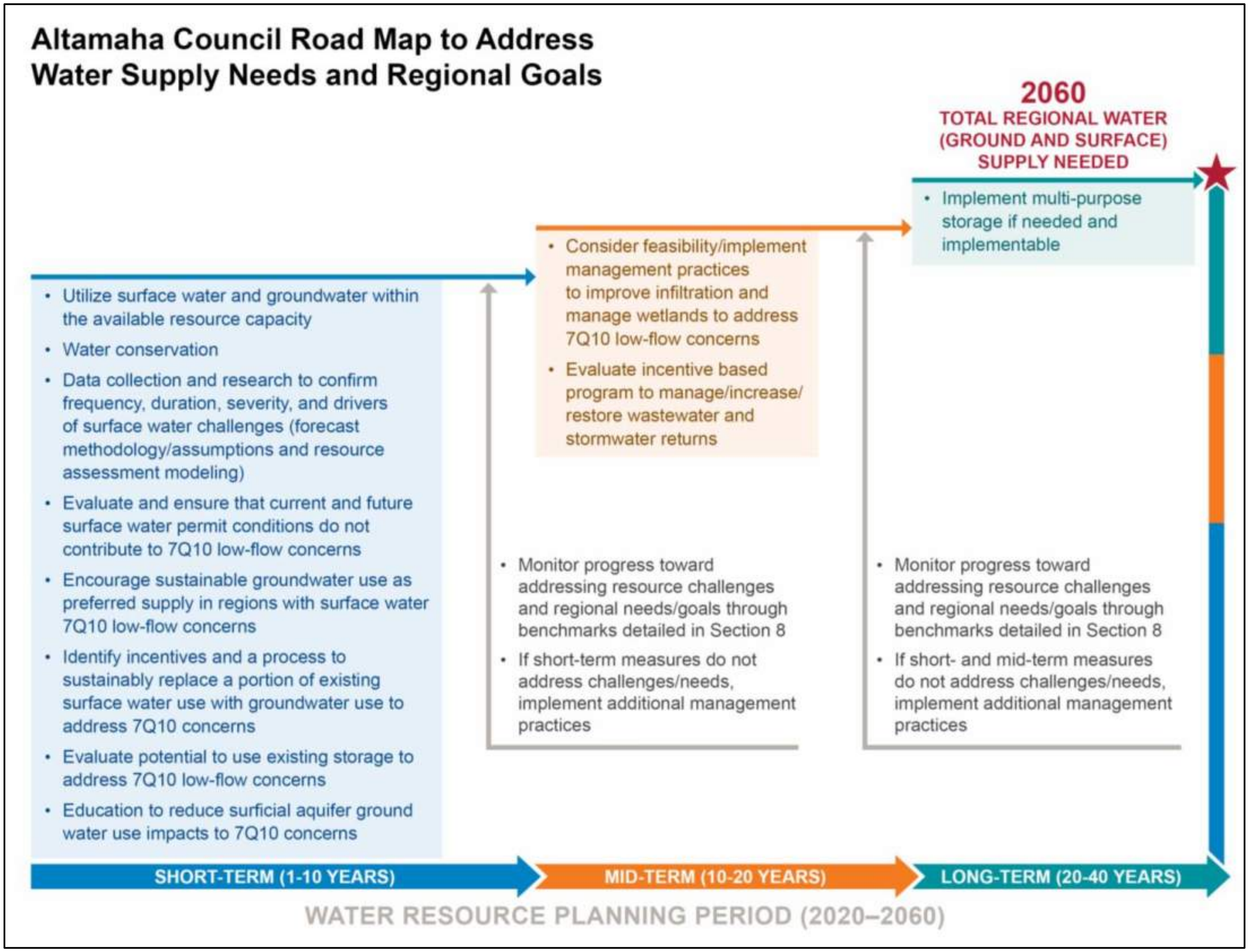


Figure 6-1 Recommended Surface Water Availability Management Practices in a Phased Approach

Potential surface water challenges in the region will be addressed by management practices that reduce net consumption, replace surface water use with groundwater use, and improve data on frequency and magnitude of challenges, among others. As described in Section 5.2 it is important to keep in mind that potential challenge conditions do not occur every year. In some cases, for years with potential challenges, the challenges do not occur for the entire year.

Figure 6-2 illustrates the Altamaha Council's recommended suite of surface water quality management practices in a phased approach. Table 6-1 also includes the Altamaha Council's recommended management practices to address water quality challenges, including stream segments with no dissolved oxygen assimilative capacity and insufficient wastewater permit capacity.

In addition to addressing challenges, the Altamaha Council identified several management practice recommendations in Table 6-1 to address forecasted future uses. These recommendations include practices such as the additional sustainable development of groundwater and surface water in areas with sufficient supply; management of other water quality issues such as non-point source runoff, nutrient loadings, TMDLs in the region; and additional educational and ordinance practices. The selected management practices will over time address identified challenges and meet future uses when combined with practices for all shared resource regions.

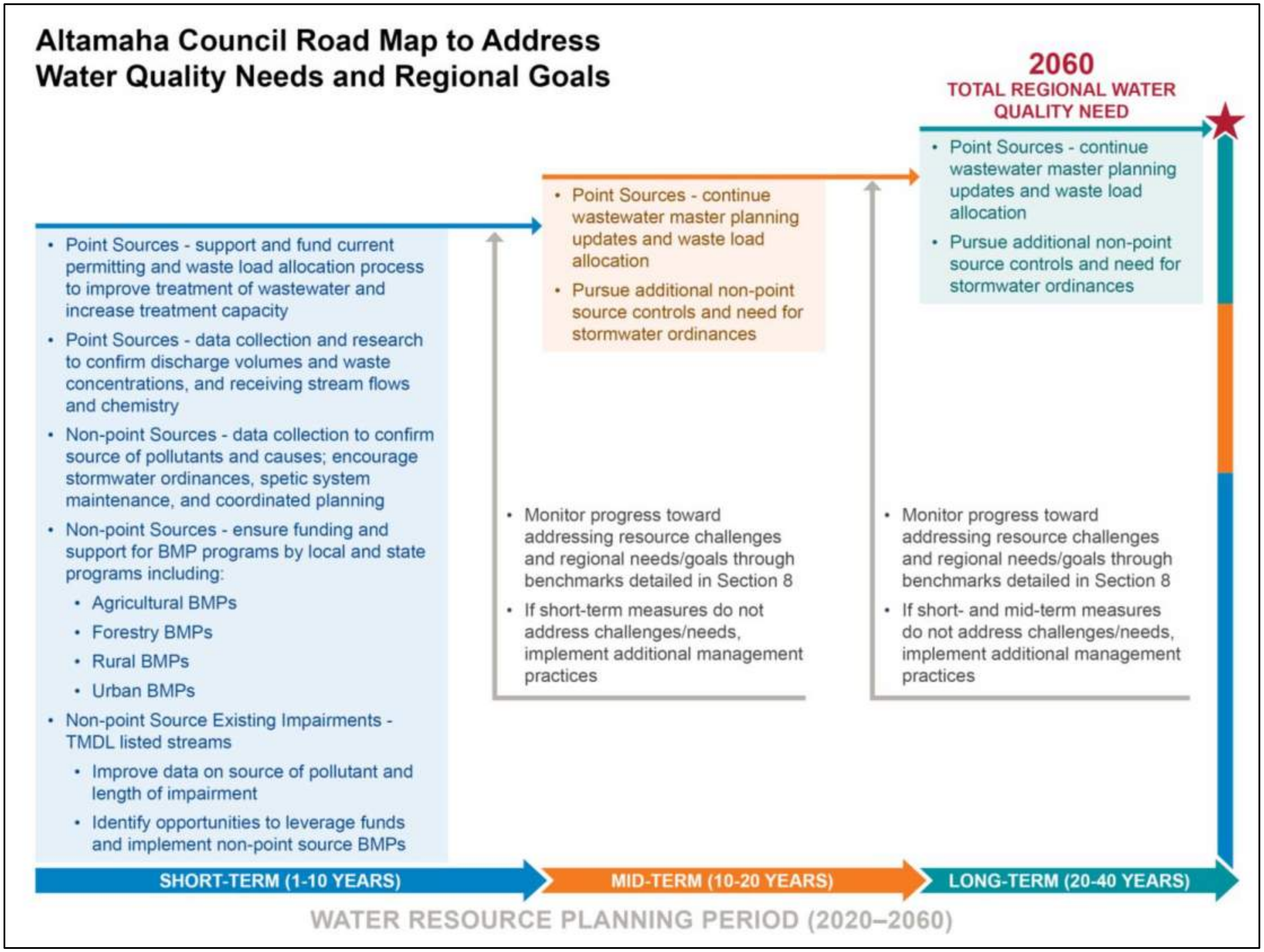


Figure 6-2 Recommended Surface Water Quality Management Practices in a Phased Approach

SECTION 7

Implementing Water Management Practices

Section 7 Implementing Water Management Practices

This section presents the Altamaha Council's estimated time frames for the implementation of the water management practices identified in Section 6. Schedules for implementation, in addition to the early step(s) required to initiate implementation of a given practice, are presented for both short- and long-term actions. The Altamaha Council has defined short-term as years 2025 to 2030 and long-term as 2030 to 2060. As the State Water Plan provides, this Plan will be primarily implemented by the various water users in the region; therefore, the Altamaha Council has described the roles and responsibilities of the implementing parties as well as the fiscal implications of the practices.

Summary

Implementation of the Altamaha Regional Water Plan will be primarily by various water users and wastewater utilities in the region. The most cost effective and more readily implemented management practices will be prioritized for short-term implementation via an incremental and adaptive approach. If resource needs are not met and/or challenges are not addressed, then more costly and complex management practices will be pursued.

As new information becomes available, it is important the Plan remain a living document and be updated to incorporate new findings.

The Altamaha Council also emphasizes that the implementation of recommended management practices are predicated on a number of planning assumptions and/or may be impacted by unanticipated or currently unknown factors including: projected growth of population, industry, agricultural and energy needs; shared resources with surrounding regions; future identification/proposal of a significant upstream water resource project; data sets and assumptions related to water use, water withdrawals and returns; data regarding water quality and watershed models; rules and regulations regarding water resource use and management; and Resource Assessment tools for surface water availability, surface water quality and groundwater availability. Consequently, significant changes or departures from these planning assumptions, forecasts, and Resource Assessment tools may require a modification of the recommended management practices, the implementation schedule, and/or the implementing entities/affected stakeholders. Future planning efforts should confirm current assumptions and make necessary revisions and/or improvements to the conclusions reached during this round of planning.

7.1 Implementation Schedule and Roles of Responsible Parties

Table 7-1 ties the resource shortfalls and the needs specified by the Council and the corresponding management practices detailed in Table 6-1 to the parties who will implement those practices. This table also describes the time frame for implementation and the specific steps required for implementation.

Table 7-1 Implementation Schedule

Management Practice Number (See Table 6-1)	Issues to be Addressed and Resource(s) Affected	Permittee Category of Responsible Parties (if applicable)	For All Actions: Initial Implementation Step(s)	For Short-term Actions (2025-2030):	For Long-term Actions (2030-2060):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
Data Collection/Additional Research (DCAR)						
DCAR-1 through DCAR-51 Agricultural Data Collection and Irrigation Research	Current and Future Surface Water Use Challenges	N/A	Develop scope of work and key partnering agencies	Complete data collection, research, and evaluation by 01/2025 Incorporate data/findings in next Regional Water Plan revision	N/A	EPD, Georgia Soil and Water Conservation Commission (GSWCC), Universities, Georgia Department of Agriculture (DOA)
DCAR-6 Minimize Groundwater Use Impacts on Surface Water						EPD, GSWCC, and Georgia DOA
DCAR-7 Address Low Flow with Wetland Restoration and Retention Structures DCAR-8 Analyze Addressing Extreme Conditions	Current and Future Surface Water Use Challenges	N/A	Develop scope of work and key partnering agencies	Complete data collection, research, and evaluation by 01/2025 Incorporate data/findings in next Regional Water Plan revision	N/A	EPD and other research agencies/entities USDA and other agencies for funding and incentives EPD

Management Practice Number (See Table 6-1)	Issues to be Addressed and Resource(s) Affected	Permittee Category of Responsible Parties (if applicable)	For All Actions: Initial Implementation Step(s)	For Short-term Actions (2025-2030):	For Long-term Actions (2030-2060):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
Water Conservation (WC)[1]						
WC-1 Tier 1 and Tier 2 Measures for Municipal and Industrial Users	Current and Future Surface and Groundwater Supply Needs	Agricultural Groundwater and Surface Withdrawal	Confirm and verify status of selected practices Conduct outreach/ education/incentives to encourage implementation of conservation measures	Continue to implement water conservation practices through 01/2030	Verify conservation savings estimates	EPD, Georgia Municipal Association, Georgia Association of County Commissioners, and Water Providers in the Altamaha Region
WC-2 through WC-12 Tier 1 through Tier 4 Measures for Agricultural Users	Current and Future Surface and Groundwater Use	Agricultural Groundwater and Surface Withdrawal	Confirm and verify status of selected practices Conduct outreach/ education/incentives to encourage implementation of conservation measures	Continue to implement water conservation practices through 01/2030	Verify conservation savings estimates	EPD, GSWCC, and Georgia DOA Agricultural surface water users in the Altamaha Region for implementation
Additional/Alternatives to Existing Surface Water Supply Sources (ASWS)[1] High Priority						
ASWS-1 Incentives for Sustainable Groundwater Development	Current and Future Surface Water Use Challenges	Agricultural Surface/ Groundwater Withdrawal	Develop strategy and work with potential participants/ impacted users to increase support for and implementation of strategy	Encourage groundwater development as preferred source of supply Identify the need for, and feasibility of, incentive based seasonal surface water permit conditions to address 7Q10 low flow conditions (by 01/2025)	N/A	EPD, GSWCC, Georgia DOA, and Agricultural surface water users in the Altamaha Region for implementation

Management Practice Number (See Table 6-1)	Issues to be Addressed and Resource(s) Affected	Permittee Category of Responsible Parties (if applicable)	For All Actions: Initial Implementation Step(s)	Further Action to Complete Implementation and Associated Dates: For Short-term Actions (2025-2030):	Further Action to Complete Implementation and Associated Dates: For Long-term Actions (2030-2060):	Responsible Parties
ASWS-2 Land Management Incentives	Current and Future Surface Water Use Challenges	City and County Land Use	Incentive-based practices to promote infiltration and aquifer recharge	Determine effectiveness and feasibility of implementing practice (by 01/2025)	If deemed effective and feasible, implement practice based on status of addressing challenge (by 01/2030)	EPD, Municipalities and Water/ Wastewater Utilities in the Altamaha Region
ASWS-3 Incentives for Greater Wastewater Returns	Wastewater/ Stormwater NPDES Discharge, Sanitary Sewer Extension	N/A		Continue to monitor land use and hydrologic relationships	Wastewater/ Stormwater NPDES Discharge, Sanitary Sewer Extension	
Additional/Alternatives to Existing Surface Water Supply Sources (ASWS)[1] Medium Priority						
ASWS-4 Address Challenge and Manage Adaptively	Current and Future Surface Water Use Challenges	Agricultural Surface/ Groundwater Withdrawal	Develop strategy and work with potential participants/ impacted users to increase support for and implementation of strategy	Evaluate need and feasibility to conjunctively manage groundwater and surface water to address 7Q10 low flow conditions (by 01/2025)	N/A	EPD and Agricultural surface water users in the Altamaha Region for implementation
ASWS-5 Restoration Incentive Programs	Current and Future Surface Water Use Challenges	Wetland Restoration	Encourage research to determine effectiveness and feasibility of restoring wetlands (see DCAR-7)	Determine effectiveness and feasibility of restoring wetlands (by 01/2025)	Restore wetland characteristics (by 01/2030), if deemed effective and feasible	EPD

Management Practice Number (See Table 6-1)	Issues to be Addressed and Resource(s) Affected	Permittee Category of Responsible Parties (if applicable)	For All Actions: Initial Implementation Step(s)	For Short-term Actions (2025-2030): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2030-2060): Further Action to Complete Implementation and Associated Dates	Responsible Parties
Additional/Alternatives to Existing Surface Water Supply Sources (ASWS)[1] Low Priority						
ASWS-6 Consider Low-Flow Conditions in Future Surface Water Permitting	Future Surface Water Use Challenges	Agricultural Surface Withdrawal	EPD to develop Data Needs and Guidance for Analysis Requirements Applicants to submit analysis from 2025-2030	N/A	GSWCC to collaborate with EPD, Georgia DOA, and current/future surface water users to develop application process and data needs to streamline application and review process (by 01/2030) Determine if expedited or revised permitting process is warranted to allow for use of the resource and protection of critical low flows	EPD, GSWCC, Georgia DOA, and Agricultural surface water users in the Altamaha Region for implementation

Management Practice Number (See Table 6-1)	Issues to be Addressed and Resource(s) Affected	Permittee Category of Responsible Parties (if applicable)	For All Actions: Initial Implementation Step(s)	For Short-term Actions (2025-2030): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2030-2060): Further Action to Complete Implementation and Associated Dates	Responsible Parties
ASWS-7 Incentives for Dry-Year Releases from Ponds	Current and Future Surface Water Use Challenges	Agricultural Surface Withdrawal	Develop strategy and work with potential participants/ impacted users to increase support for and implementation of strategy	N/A	Examine opportunities to modify farm and other pond operations to obtain releases in dry/challenge years Modify farm and other pond operations to obtain releases in dry/challenge years (by 01/2040), if deemed feasible	EPD, GSWCC, Georgia DOA, and Agricultural surface water users in the Altamaha Region for implementation
Point Sources – Dissolved Oxygen (PSDO)						
PSDO-1 Collect Water Quality Data	Water Quality Challenges	General Wastewater	EPD to work with potentially effected entities as part of permitting process	Collect data to confirm loading and/or receiving stream chemistry (by 01/2025)	N/A	EPD, Municipalities and/or wastewater utilities in the Altamaha Region
PSDO-2 Point Discharge Relocation				Identify feasibility to move discharge location to higher flow streams with greater assimilative capacity (by 01/2025)	If feasible and cost effective, relocate discharge location (by 01/2030)	

Management Practice Number (See Table 6-1)	Issues to be Addressed and Resource(s) Affected	Permittee Category of Responsible Parties (if applicable)	For All Actions: Initial Implementation Step(s)	For Short-term Actions (2025-2030):	For Long-term Actions (2030-2060):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
PSDO-3 Enhance Point Source Treatment	Water Quality Challenges	General Wastewater	Confirm wastewater facilities to upgrade/improve treatment to address low dissolved oxygen conditions in receiving streams	Upgrade/improve treatment of identified wastewater facilities	Continue to upgrade/improve treatment of identified wastewater facilities (by 01/2050)	Municipalities and/or wastewater utilities in the Altamaha Region
Available Industrial Wastewater Permit Capacity (IWWPC)[2]						
IWWPC-1 Collect Additional Industrial Permit Data	Wastewater Permit Capacity Challenges	Industrial Wastewater	Obtain additional permit data on flow volumes and permit conditions for industrial wastewater facilities forecasted needs	Expand or construct new facilities and/or obtain additional wastewater permit capacity to meet forecasted needs (by 01/2025)	N/A	EPD, Industrial wastewater facilities in the Altamaha Region
Available Municipal Groundwater Permit Capacity (MGWPC)						
MGWPC-1 Increase Municipal Groundwater Permit Capacity	Groundwater Permit Capacity Challenge (Evans, Jeff Davis and Wheeler Counties)	Municipal Groundwater Withdrawal	EPD and entities to confirm assumptions and needs	Evaluate short-term needs and, if needed, work with EPD to obtain additional permit capacity (by 01/2025)	Evaluate long-term needs and, if needed, work with EPD to obtain additional permit capacity (by 01/2060)	EPD, Municipal water utilities in the Altamaha Region

Management Practice Number (See Table 6-1)	Issues to be Addressed and Resource(s) Affected	Permittee Category of Responsible Parties (if applicable)	For All Actions: Initial Implementation Step(s)	For Short-term Actions (2025-2030):	For Long-term Actions (2030-2060):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
Available Industrial Groundwater Permit Capacity (IGWPC)						
IGWPC-1 Increase Industrial Groundwater Permit Capacity	Groundwater Permit Capacity Challenge (Evans and Wayne Counties)	Industrial Groundwater Withdrawal	EPD and entities to confirm assumptions and needs	Evaluate short-term needs and, if needed, work with EPD to obtain additional permit capacity (by 01/2025)	Evaluate long-term needs and, if needed, work with EPD to obtain additional permit capacity (by 01/2060)	EPD, Industrial water facilities in the Altamaha Region
Groundwater (GW)						
GW-1 Sustainable Groundwater Use GW-2 Research Groundwater Sustainability	Future Groundwater Needs (Evans, Jeff Davis and Wheeler Counties)	Groundwater Withdrawal (Municipal, Industrial, and Agricultural)	Continue to drill wells and withdraw groundwater to meet regional needs Verify sustainable yield metrics and consider relevant localized impacts	Provide guidance and implement sustainable groundwater withdrawal rates through 01/2025	Modify Resource Assessments and sustainable yield criteria, if necessary (by 01/2060)	Municipal, Industrial, Agricultural users in the Altamaha Region, EPD, GSWCC
GW-3 Promote Aquifer-Friendly Land Use		N/A	Monitor land use changes and further delineate aquifer recharge areas	Encourage land use practices that sustain and protect aquifer recharge areas (by 01/2025)	Continue to monitor land use and hydrologic relationships	EPD, Municipalities within the Altamaha Region
Surface Water (SW)						
SW-1 Maintain Current Permitted Capacity	Current and Future Surface Water Use Outside Challenge Areas	Surface water Withdrawal	Confirm non-challenge areas and available surface water resource capacity	Continue to apply for permits and use surface water in non-challenge areas within available resource capacity (by 01/2025)	Verify flow conditions and challenges	EPD, applicable federal agencies, and surface water users in Altamaha Region

Management Practice Number (See Table 6-1)	Issues to be Addressed and Resource(s) Affected	Permittee Category of Responsible Parties (if applicable)	For All Actions: Initial Implementation Step(s)	For Short-term Actions (2025-2030):	For Long-term Actions (2030-2060):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
SW-2 Monitor and Evaluate Estuaries		N/A	Monitor Atlantic slope river flow conditions	Determine flow conditions that sustain estuary health (by 01/2025)	N/A	EPD, Coastal Resources Division, Wildlife Resources Division
Non-Point Sources (NPS) – Urban, Rural, Agricultural and Forestry Uses						
NPS-1 Study Human Impacts on Water Quality	Water Quality Outside Challenge Areas	Stormwater (NPDES Discharges)	Collect data to determine dissolved oxygen, fecal coliform, and nutrient sources	Confirm sources of loading and develop programs to address (by 01/2030)	N/A	EPD, Municipalities and Utilities within the Altamaha Region
NPS-2 Research and Address Impairment Issues						
NPSU-1 through NPSU-5 Various Management Practices Related to Stormwater Uses			Select best management practices (BMPs) needed for treating stormwater from urban and rural uses	Implement a variety of stormwater BMPs related to urban uses and dirt road maintenance (by 01/2025)		
NPSR-1 Advocate Implementing Road Runoff BMPs						EPD, Counties (Public Works/Roads and Bridges Departments) within the Altamaha Region

Management Practice Number (See Table 6-1)	Issues to be Addressed and Resource(s) Affected	Permittee Category of Responsible Parties (if applicable)	For All Actions: Initial Implementation Step(s)	For Short-term Actions (2025-2030):	For Long-term Actions (2030-2060):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
NPSF-1 through NPSF-3 Various Management Practices Related to Forestry Uses	Water Quality Outside Challenge Areas	Stormwater (NPDES Discharges)	Continue to support BMP programs	Implement a variety of BMPs related to forestry and agricultural uses (by 01/2025)	N/A	Georgia Forestry Commission (GFC), and possibly county commissions
NPSA-1 through NPSA-5 Various Management Practices Related to Agricultural Uses						GSWCC, Agricultural users within the Altamaha Region
TMDL-1 through TMDL-3 Evaluate Impaired Segments and Sources	Water Quality Outside Challenge Areas	Stormwater (NPDES Discharges)	Collect data to confirm impairment and determine sources	Remove streams listed due to "natural sources" (by 01/2025) Refine river/stream reach length for impaired waters (by 01/2030)	Continue collecting data to monitor impairment sources and support reassessment of stream segment classifications (by 01/2060)	EPD, Municipalities and Utilities within the Altamaha Region
NUT-1 Link Nutrient Loading With Current Land Use	Water Quality Outside Challenge Areas	Stormwater (NPDES Discharges)	Align current land use with nutrient loading data to optimize management practice based on consideration of land uses and actual nutrient loading	Support research and development of tools such as the Southern Group of State Foresters and USFS Sediment Prediction modeling tool being developed by Auburn University (by 01/2030)	N/A	EPD, GSWCC, GFC, Municipalities and Utilities within the Altamaha Region, and county commissions

Management Practice Number (See Table 6-1)	Issues to be Addressed and Resource(s) Affected	Permittee Category of Responsible Parties (if applicable)	For All Actions: Initial Implementation Step(s)	For Short-term Actions (2025-2030): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2030-2060): Further Action to Complete Implementation and Associated Dates	Responsible Parties
Educational Practices (EDU)						
EDU-1 through EDU-4 Various Educational and Outreach Programs on Conservation / Water Quality	Education/ Outreach Support	Entities' Applicable Programs	Develop educational programs on water conservation, septic system maintenance, and stormwater management	Complete educational programs on water conservation, septic system maintenance, and stormwater management	Continue educational programs on water conservation, septic system maintenance, and stormwater management	EPD, State Agencies with WCIP responsibilities, GFC, Municipalities and Utilities within the Altamaha Region
EDU-5 Stream Clean-up Events	Education/ Resource Improvement	Entities' Applicable Programs	Encourage coordinating and arranging of clean-up events	Complete clean-up events	Continue clean-up events	EPD, Municipalities and Utilities within the Altamaha Region, Adopt-a-Stream organizations, Riverkeepers, and other applicable non-governmental entities

Management Practice Number (See Table 6-1)	Issues to be Addressed and Resource(s) Affected	Permittee Category of Responsible Parties (if applicable)	For All Actions: Initial Implementation Step(s)	For Short-term Actions (2025-2030): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2030-2060): Further Action to Complete Implementation and Associated Dates	Responsible Parties
Ordinance and Code Policy Practices (OCP)						
OCP-1 through OCP-3 Stormwater Management through Ordinance/Code Updates and Integrated Planning	Ordinances and Code Policies	N/A	Identify ordinances and standards to implement/update on stormwater and land development (including green space) Encourage coordinated environmental planning	Identify and implement strategies for stormwater management to help improve water quality (by 01/2030) Conduct regional environmental planning (e.g., land use, stormwater, wastewater)	N/A	EPD, Regional Commissions, Municipalities and Utilities within the Altamaha Region, and county commissions

Notes:

[1] Seek to reduce frequency and severity of human impacts to 7Q10 low flow conditions in the Altamaha Region, which are associated with surface water use in portions of the region. Focus on surface water permit holders and new surface water permit requests in Appling, Bleckley, Dodge, Emanuel, Jeff Davis, Montgomery, Tattnall, Telfair, Toombs, Treutlen, Wayne, Wheeler, Wilcox Counties.

[2] Additional industrial wastewater capacity may be needed. EPD to update and refine discharge limit databases to confirm flow and quality assumptions.

7.2 Fiscal Implications of Selected Water Management Practices

The following subsections discuss planning level cost estimates for the water management practices selected by the Altamaha Council and potential funding sources and options. Successful implementation of the Regional Water Plan is highly dependent on the ability of state and local governments, water providers, and utilities to fund the needed implementation actions.

7.2.1 Planning Level Cost Estimates

Planning level cost estimates were previously prepared for each management practice using planning guidance documents, the knowledge base of previous state and utility planning efforts, availability of quantifiable data, and other sources of information. However, the planning level cost information has been removed for this plan update as the cost details are out of date. Planning level cost estimates will be re-visited in the future plan updates.

7.2.2 Funding Sources and Options

Several different funding sources and options will be used to secure funding for the different management practices outlined in this Plan including:

- The State Revolving Fund Program
- Other State of Georgia Funding Programs
- State and Federal Grants
- Water/Wastewater System Revenues
- State and local government incentive programs

Below is a list of some of the larger organizations and agencies that provide funding for the types of management practices recommended in this Plan. It is important to note that funding sources and opportunities change on a yearly basis.

Environmental Protection Agency (EPA) Programs

The EPA provides grants to States, non-profits, and educational institutions to support high-quality research that will improve the scientific basis for decisions on national environmental issues and help the EPA to achieve its goals. The EPA provides research grants and graduate fellowships; supports environmental education projects that enhance the public's awareness, knowledge, and skills to make informed decisions that affect environmental quality; offers information for State and local governments and small businesses on financing environmental services and projects; and provides other financial assistance through programs such as the Drinking Water State Revolving Fund (DWSRF), the Clean Water State Revolving Fund (CWSRF), and the Brownfield Program. More information on the EPA can be accessed at: www.epa.gov.

The EPA offers the following grant programs:

- Continuing Program Grants
- Project Grants
- Clean Water State Revolving Fund Program
- Water Pollution Control Program
- Water Quality Cooperative Agreements Program
- Water Quality Management Planning Program
- Onsite Wastewater Management Planning Program
- Drinking Water State Revolving Fund Loan Program

Georgia Environmental Protection Division (EPD)

The mission of EPD is to help provide Georgia's citizens with clean air, clean water, healthy lives and productive land by assuring compliance with environmental laws and by assisting others to do their part for a better environment. As a result of the Clean Water Act, each year the State of Georgia receives funding from the U.S. Environmental Protection Agency to assist the State with addressing environmental issues. EPD offers the following grant programs:

- Section 319 (h) Grants
- Section 604 (b) Grants
- Regional Water Planning Seed Grants

U.S. Department of Agriculture – Natural Resource Conservation Service (USDA-NRCS) Conservation Programs

The USDA-NRCS offers a number of funding opportunities as a result of the Farm Security and Rural Investment Act of 2002. This Act is landmark legislation for conservation funding and for focusing on environmental issues. The conservation provisions will assist farmers and ranchers in meeting environmental challenges on their land. This legislation simplifies existing programs and creates new programs to address high priority environmental and production goals. The USDA-NRCS offers the following funding options:

- Agricultural Conservation Easement Program
- Conservation of Private Grazing Land Program
- Environmental Quality Incentives Program

- Resource Conservation and Development Program

7.3 Alignment with Other Plans

The Altamaha Council's Plan and management practices selection process was based on identifying and supporting existing policy, planning, and projects. Local comprehensive plans, planned and/or permitted projects were relied upon in developing the Regional Water Plan. This approach is tailored to maintain consistency with, and to maximize support for, locally driven water resource management decisions. The Altamaha Council did identify potential challenges associated with both the cost and technical issues that the region may face; especially regarding water and wastewater needs for both new and aging infrastructure. In addition, addressing existing surface water challenges must be accomplished in a manner that does not cause adverse impacts to local water users and local governments.

The challenges of funding Plan recommendations and addressing future technical and regulatory issues is especially difficult for smaller towns and utilities, agricultural water uses, and small businesses that rely on natural resources. The successful implementation of the Regional Water Plan will be dependent on the principles of support and leadership by state agencies, in a collaborative setting, utilizing incentives, and financial assistance to the extent possible.

7.4 Recommendations to the State

The Altamaha Council supports the concept of regional water resource planning with a focus on planning Councils composed of local governments, water users, water providers, industry, business, and affected stakeholders. Local representatives are typically most familiar with local water resource issues and needs. The State has a vital role providing technical support, guidance, and funding to support locally focused water resource planning. This Plan should be viewed as a living, iterative document and the State should focus on the following principles:

7.4.1 Education, Incentives, Collaboration, Cooperation, Enabling, Supporting

The Altamaha Council is sensitive to unintended consequences if Plan recommendations become mandates. The State must help balance Plan recommendations with assessing measurable progress toward Plan implementation. If additional rules or other administrative or regulatory actions are deemed necessary, the State should work with Councils to help ensure workable solutions.

The following specific recommendations to the State are provided to help aid in the successful implementation of the Plan.

Georgia Environmental Protection Division (EPD)

- Consider "institutionalizing" planning. This would entail a long-term commitment of staff and funding to: monitor and support Plan recommendations; coordinate improved data collection, management and analysis; continue to develop and improve Resource Assessment tools; and help provide funding, permitting and technical support to address challenges and water resource needs.

- Work with EPD's Agricultural Water Withdrawal Permitting and Water Metering Program, as well as other partners, including but not limited to, the University of Georgia and the Georgia Department of Agriculture to improve agricultural water use data collection and management. This effort would focus on refining source(s) of supply for multiple irrigation sources, continuing to assess data on crop water requirements, evaluating the effects of farm ponds on direct irrigation withdrawals and the hydrologic cycle, and further research on crop consumptive use. This data in turn should be coordinated with Resource Assessment tools to ensure accurate simulation of any challenges and assumptions.

- Support completion, maintenance and improvement of the Agricultural Water Use Measurement Program, which is aimed at cost effectively collecting agricultural water use data across the State, and integrating cooperative arrangements with the private sector and partnerships with other State agencies. This program is a vital component to helping the State and regions effectively manage and utilize water resources.

- Focus funding support and permitting assistance to projects and programs aimed at addressing challenge areas. Where possible, leverage federal funds to help support and expedite project implementation.

- Consider collaborative approaches to collecting more standardized water use data and improving data on water demands. This would include continued improvement and updating databases used in the planning process. It would also involve working with the Georgia Municipal Association, Georgia Association of County Commissioners, and other relevant stakeholders to improve water use information.

- Working with Georgia Environmental Finance Authority, examine opportunities to improve coordination among water providers and users and create incentives to maximize existing infrastructure and coordinated operations.

- Continue to engage in dialogue and data-sharing with the States of Florida and South Carolina regarding current and forecasted groundwater use. South Georgia, North Florida, and South Carolina rely on the Floridan aquifer to meet water supply needs and it is in EPD's best interest to include the most accurate available information on growth and groundwater use in both states in the Resource Assessment modeling.

Georgia Environmental Finance Authority (GEFA)

- Meeting forecasted water supply needs will require stable and flexible funding sources to assist water users and water and wastewater utilities in meeting forecasted needs. A stable GEFA financing source(s) should be provided for necessary water supply, water and wastewater plant construction and plant upgrades to address current and future needs.

Georgia Forestry Commission (GFC)

- Continue to support and fund the GFC Forestry Best Management Practices Program. Providing education and incentives to control erosion and segmentation will help the region prevent/address TMDL listed segments, reduce nutrient loadings, and support wetland areas. This will have the benefit of helping to sustain baseflow conditions of streams and water quality.

Georgia Soil and Water Conservation Commission (GSWCC)

GSWCC should continue to provide leadership and locally focused efforts in the following programs:

- Continue education and outreach associated with Urban Erosion and Sediment Control program including certification of individuals involved in land disturbing activities and on-site implementation of erosion, sedimentation, and pollution control plans. This will help address the water quality needs of the region.

- Continue education and outreach efforts to agricultural interests to inform farmers of available technologies and funding sources to make more efficient use of water resources without incurring hardship.

- Support Georgia Agricultural Conservation Incentive program, which provides funding support to help implement conservation practices that benefit water quantity and quality. Funding for this program is essential to help implement conservation measures, especially in the regional watersheds where there are surface water challenges.

Office of State Planning and Budget (OPB)

- Obtain population census data and compare to population forecasts to track trends in the accuracy of population projections

- Revise population forecasts and support ongoing state-wide planning

Department of Community Affairs (DCA)

- Identify and encourage local governments to integrate Regional Water Plan management practices with land use and water quality/quantity nexuses into their comprehensive planning efforts.

- Continue to promote coordinated environmental planning

Georgia Department of Agriculture (DOA)

- Provide technical information and participate in needed studies to better characterize agricultural water uses and quantification of shortages to low flow conditions.

- Assist with outreach and education of agricultural users to obtain greater understanding of surface water resource limitations, both quality and quantity, and to help improve the implementation rate of management practices. Assist EPD and other state agencies in coordinating accomplishment of the above goals with the Georgia Farm Bureau.

Georgia Department of Natural Resources [Coastal Resources Division (CRD) and Wildlife Resources Division (WRD)]

- Continue to monitor resources and help sustain, enhance, protect and conserve Georgia's natural, historic, and cultural resources.

- Provide technical and ecosystem information to help support state water planning needs

SECTION 8

Monitoring and Reporting Progress

Section 8 Monitoring and Reporting Progress

The selected water management practices identified in Section 6 will be primarily implemented (as described in Section 7) 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.

Summary

The Altamaha Council has identified several benchmarks and means to measure progress toward meeting regional needs and goals. In most cases, efforts will require significant coordination between affected water resource managers, and local and state government. Successful implementation will be dependent on adequate financing, leadership and support by state agencies, and collaboration by multiple stakeholders.

8.1 Benchmarks

The benchmarks prepared by the Altamaha Council and listed in Table 8-1 below will be used to assess the effectiveness of this Plan's implementation and identify any required revisions. As detailed below, the Altamaha 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. Effective implementation of the Plan will require the availability of sufficient funding in the form of loans, and in some cases, possibly grants. In addition, many of the proposed management practices require ongoing coordination with affected stakeholders/water users and collaboration to help ensure successful solutions are identified and implemented. Finally, in many cases monitoring progress toward addressing future needs will require improved data and information on the current actions and management practices that are already in place. The benchmarks will be used to evaluate the Regional Water Plan effectiveness at the next 5-year Plan review and will require collection of information in the intervening years to better quantify and document resource conditions and progress to meeting regional needs and goals. The successful implementation of the Regional Water Plan will require both leadership and supporting roles by EPD, other state agencies, local government and water and wastewater utilities, as well as individual water users.

Table 8-1 Benchmarks for Water Management Plans

Management Practice No. (See Table 6-1)	Benchmark	Measurement Tools	Time Period
Address Current and Future Surface Water Use Challenges Data Collection/Additional Research (DCAR) to confirm frequency, duration, and severity of agriculturally-driven shortages to 7Q10 low flow conditions			
DCAR-1 through DCAR-8 Various Data Collection and Additional Irrigation and Restoration Research Practices	▪ Develop Plan of Study, obtain funding and stakeholder participation as needed ▪ Completion of work plans and study implementation and documentation of results ▪ Incorporate data and findings into forecasts, Resource Assessments, and Water Plan updates	▪ Survey or self-reporting of agencies/entities involved in studies ▪ Verify inputs and revisions to water planning tools	5 years 5 years
Action Needed - Water Conservation (WC) - Meet current and future challenges and water needs by efficient water use			
WC-1 and WC-2 Tier 1 and Tier 2 Measures for Municipal, Industrial, and Agricultural Users	▪ Maintain or reduce gallons per capita consistent with Tiers 1 and 2 conservation practices ▪ Implementation of Tiers 1 and 2 agricultural conservation practices	Assess regional municipal, industrial, and agricultural water use rate trends and practices via periodic survey	2-5 years
WC-3 through WC-12 Tier 3 and Tier 4 Measures for Agriculture	Reduction in agricultural surface water withdrawals while maintaining agricultural production and reduction in surface water challenge areas	▪ Survey of agricultural conservation practices implementation rates and trends in water use by GSWCC ▪ Assess flow conditions using water use data and Resource Assessment tools (EPD)	2-5 years
Address Current and Future Surface Water Use Challenges - Additional/Alternate to Existing Surface Water Supply Sources (ASWS)			
ASWS-1 Incentives for Sustainable Groundwater Development	▪ Information and educational materials developed in conjunction with GSWCC and Georgia DOA to communicate issues and goals of improving surface water flows ▪ Methods and incentives identified to increase implementation/participation	▪ Verify information and educational outreach via survey or direct agency reporting ▪ Monitor and track surface water versus groundwater permit applications	1-3 years 1-5 years
ASWS-2 through ASWS-3 Various land management and wastewater incentive measures	▪ Feasibility studies completed (for short-term studies) ▪ Feasibility studies initiated (for long-term studies/actions)	Reevaluate need during next Regional Water Plan update	5 years

Management Practice No. (See Table 6-1)	Benchmark	Measurement Tools	Time Period
ASWS-4 Address Challenges and Manage Adaptively	▪ Develop information and educational materials in conjunction with GSWCC and Georgia DOA to communicate issue and goals of improving surface water flows ▪ Identify methods and incentives to increase implementation/participation	Identify and monitor participation and conversion rates from surface water to groundwater	1-3 years 1-5 years
ASWS-5 Restoration Incentive Programs	Pending feasibility study	Assess research results	5 years
ASWS-6 Consider Low-Flow Conditions in Future Surface Water Permitting	▪ Formation of stakeholder group and consensus reached on new surface water application process in challenge areas ▪ Application process and permit conditions developed	Status report from stakeholder group; Report on usage of process and the number of permits issued with conditions	1-2 years 2-4 years
ASWS-7 Incentives for Dry-Year Releases from Ponds	Incentives and operating conditions identified as part of ASWS-1	Document and maintain volumetric accounting of participating storage facilities	2-5 years
Address Water Quality (Dissolved Oxygen Levels) – Point Sources (PSDO)			
PSDO-1 Collect Water Quality Data	▪ Resource Assessment assumptions reviewed and, if necessary, new data collection efforts underway/completed ▪ New findings incorporated into updated Resource Assessment data sets	EPD/agency summary report complete verifying assumptions and documentation of new data	1-4 years
PSDO-2 Point Discharge Relocation PSDO-3 Enhance Point Source Treatment	▪ Outreach activities to dischargers completed and feasible options have implemented by dischargers ▪ EPD to conduct outreach and facilitate improved treatment in low dissolved oxygen reaches	Monitor permit applications and verify improved data collection for dischargers	1-5 years
Obtain Additional Municipal and Industrial Water and Wastewater Permit Capacity			
IWWPC-1, MGWPC-1, IGWPC-1 Expansion of Wastewater and Groundwater Permit Capacities to Address Challenges/Needs	▪ Outreach activities completed to water providers in high growth areas ▪ Need for additional permit capacity verified and improved data for discharges obtained	Monitor permit applications and verify improved data collection for dischargers	5 years

Management Practice No. (See Table 6-1)	Benchmark	Measurement Tools	Time Period
Addressing Current and Future Groundwater Needs			
GW-1 Sustainable Groundwater Use	Sufficient permit capacity to meet forecasted needs; through the timely submittal and processing of permit applications	Monitor permit applications and issuance	1-5 years
GW-2 Research Groundwater Sustainability	Sound science used to improve data and sustainably manage groundwater resources	Groundwater Resource Assessment updated	5 years
GW-3 Promote Aquifer-Friendly Land Use	Counties and local governments consider practices to promote infiltration and aquifer recharge	Evaluate trends in impervious land cover in areas of aquifer recharge	5 years
Addressing Current and Future Surface Water Needs			
SW-1 Maintain Current Permitted Capacity	Sufficient permit capacity exists to meet forecasted needs through timely submittal and processing of permit applications	Monitor permit applications and issuance	1-5 years
SW-2 Monitor and Evaluate Estuaries	▪ Major water resources diversion/storage projects identified ▪ Upstream actions that would significantly impact flow conditions assessed	Monitoring data collected in estuaries and river flow trend data collected and reviewed	5 years
Programmatic Practices for Water Quality – the following management practices are associated with the Vision and Goals of the Region and are described in general terms as they are either associated with existing state and local programs or are not yet at a point where implementation frameworks have been established by the State			
▪ Nutrient Non-point sources Regional Watershed Models ▪ Urban/Suburban, Rural, Forestry, and Agricultural Non-point source BMPs ▪ Total Maximum Daily Load Listed Streams BMPs	▪ Additional assessments to align sources of contaminants (point and non-point sources) to water quality impairments and land use types ▪ Continue implementation and assessment of the effectiveness of existing state program including GFC, GSWCC, 319 Water Quality initiatives, and local efforts to improve watershed protection and water quality improvements ▪ Background/natural levels of potential sources established	▪ Review and assessment of programs and information ▪ Complete summaries of watershed conditions using Resource Assessment tools, improved data collection, and synthesis of relevant state program data	1-5 years

Management Practice No. (See Table 6-1)	Benchmark	Measurement Tools	Time Period
Management Practices to Support Educational Needs			
Support education programs for: ▪ Water Conservation ▪ Stormwater Management ▪ Septic System Maintenance ▪ Logger Education ▪ Forestry BMPs	▪ Data used to identify where future program efforts will be most effective ▪ Funding for programs maintained or improved	Survey and summarize program effectiveness and success stories	1- 5 years
Management Practices to Address Ordinance and Code Policy Needs			
▪ Encourage implementation and/or compliance with Stormwater and land development ordinances and/or regulations ▪ Encourage improved coordinated environmental planning	▪ Select local governments surveyed to identify current knowledge base and recommended areas of improvement ▪ Improved education at state and local government conferences and workshops ▪ Enhanced awareness in Comprehensive Planning by local governments across region	Select follow-up survey of local governments to identify changes and success stories	1-5 years
Shared Resources			
Combined management practices for surface water challenges (Coastal Georgia, Suwannee-Satilla, Savannah-Upper Ogeechee, Upper Oconee, and Upper Flint Regions)	Regional Council-specific management practices implemented	Evaluate project improvement of surface water flows using gauge data and Resource Assessment tools	1-5 years

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 5 years and in accordance with this 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 5 years after EPD's adoption of these plans. These benchmarks will guide EPD in the review of the Regional Water Plan.

The Councils appointed to prepare future Regional Water Plan updates will have the opportunity to review the recommendations of past Plans against current available data to make a determination as to which management practices are still appropriate and which ones need to be revised or augmented to meet changing conditions. Future Councils will also have the ability to judge the effectiveness of practices recommended in previous Plans against available benchmark data. This analysis will reveal which practices are effective and what adjustments are necessary to compensate for less effective practices.

8.3 Plan Amendments

The Altamaha Council emphasizes that the recommendations in this Regional Water Plan are based on the best information available at the time the Plan was written. New information and issues that may impact the recommendations should be considered and incorporated into relevant implementation decisions and future Water Plan updates. Future planning efforts should confirm current assumptions and make necessary revisions and/or improvements to the conclusions reached during this round of planning.

SECTION 9

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Section 9 Bibliography

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APPENDIX A

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

Section	Location	Change	Description
ES	Introduction	Minor text updates	▪ The text was updated to reflect recent population trends, biological diversity and other minor wordsmithing.
ES	Sidebar	Minor text updates	▪ The text was updated to reflect recent population trends, 2020 water demand and wastewater forecasts, and resource challenges.
ES	Establishing a Vision	Minor text updates	▪ The text was updated to reflect how the goals were categorized.
ES	Water Resources	Minor text updates	▪ The text was updated to reflect USGS 2015 data and other minor wordsmithing.
ES	Water and Wastewater Needs	Minor text updates	▪ The text was updated to reflect USGS 2015 data and other minor wordsmithing.
ES	Figures ES-2 to ES-4	Updated	▪ Updated water use information to the most recent information compiled by USGS (2019 USGS Publication).
ES	Forecasted Water Needs	Minor text updates	▪ The text was updated to reflect recent population trends and 2020 water demand and wastewater forecasts.
ES	Figure ES-5	Updated	▪ Updated population projections (2019 OPB).
ES	Available Resource Capacity	Minor text updates	▪ The text was updated to reflect recent analysis.
ES	Table ES-1	Minor text updates	▪ Updated to reflect recent analysis.
ES	Table ES-2	Minor text updates	▪ Updated to reflect recent analysis.
ES	Management Practices	Minor text updates	▪ The text was updated to reflect minor wordsmithing.
ES	Cost Considerations	Removed	▪ The text was removed since the planning level cost information has been removed for this update.
1	Section 1	Minor text updates	▪ The text was updated to reflect recent population trends and other minor wordsmithing throughout Section 1.
1	Section 1.1	Minor text updates	▪ The 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	▪ Removed "Department of Community Affairs (DCA)" from the Council's Memorandum of Agreement (MOA). ▪ Text added to better define potential challenges.
1	Figure 1-2	Updated	▪ Replaced with more recent graphic on the water planning process.
1	Section 1.3	Minor text updates	▪ The text was updated to reflect changes in council members and other minor wordsmithing.

Section	Location	Change	Description
1	Section 1.3.4 Goals	Updated	▪ Replaced written text with Figure 1-4 that outlines the Council's goals
1	Section 1.4	Minor text revisions	▪ Removed text regarding the Suwannee-Satilla website.
2	Section 2.1.1	Minor text updates	▪ Added text regarding biological resources in the Altamaha Region
2	Section 2.1.2	Minor text updates	▪ Updated groundwater supply resources
2	Section 2.1.3	Minor text updates	▪ Updated average rainfall (in/year)
2	Section 2.2	Minor text updates	▪ Updated population values, land cover, and irrigated acre information.
2	Figure 2-3	Updated	▪ Replaced with more recent graphic on land cover distribution (2015)
2	Section 2.3	Minor text updates	▪ Updated date of most recent HOGARC Regional Plan
3	Summary	Minor text updates	▪ Updated withdrawal data (2015). ▪ The text was updated based on the most recent analysis.
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	Minor text revisions	▪ Updated word choice and sentence structure
3	Section 3.2.1	Minor text revisions/updates	▪ Updated dates and word choice
3	Table 3-1	Updated	▪ Values updated with most recent results of the assimilative capacity assessment.
3	Figure 3-6	Updated	▪ Updated with most recent results of the assimilative capacity assessment.
3	Section 3.2.2 -Current Ecosystem Conditions and Instream Uses	Minor text updates	▪ Wildlife statistics were updated. ▪ The Comprehensive Wildlife Conservation Strategy was updated and replaced with State Wildlife Action Plan (SWAP). The number of high priority animals and percentage of conservation lands were updated.
3	Section 3.2.2 -Impaired Water Bodies	Minor text revisions/updates	▪ The 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	▪ The figure has been updated to show the types of impairments, the surrounding text has also been updated based on the 2022 303(d) list.

Section	Location	Change	Description
3	Section 3.2.3	Text revisions/updates	▪ Updated descriptions of the Surface Water Availability Resource Assessment to more accurately describe the nature of the analysis. ▪ The 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 3-8	Updated	▪ The figure has been updated to show the new BEAM model nodes from the Surface Water Availability Resource Assessment.
3	Table 3-2	Revised	▪ Table was updated to align with the new BEAM modeling approach. Values presented are based on the Surface Water Availability Assessment, 2022, EPD.
3	Section 3.2.4	Text revisions/updates	▪ 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).
4	Summary	Minor text updates	▪ The text was updated to reflect the revised forecasts.
4	Section 4	Minor text updates	▪ The text was updated for 2022.
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 - Population Projections	Text additions	▪ Text was added to describe population changes due to a new state prison.
4	Section 4.1 - Municipal Water Forecasts Section	Text additions	▪ Text was added to describe updated methodology utilized during the Plan update.
4	Figure 4-1	Updated	▪ This figure was updated to reflect the revised municipal water forecasts. ▪ The text box was added to include the data source and notes.
4	Section 4.1 - Municipal Wastewater Forecasts Section	Text revisions/updates	▪ The text was updated for the most recent information available.
4	Figure 4-2	Updated	▪ This figure was updated to reflect the revised municipal wastewater forecasts. ▪ The text box was added to include the data source and notes.
4	Section 4.2 - Advisory Group Review Process (Previously Employment Projections Section)	Updated	▪ The text was updated to reflect revised methodology

Section	Location	Change	Description
4	Section 4.2 - Industrial Water Forecasts Section	Updated	▪ The text was updated to reflect revised methodology
4	Section 4.2 - Industrial Wastewater Forecasts Section	Updated	▪ The text was updated to reflect revised methodology
4	Figure 4-3	Updated	▪ This figure was updated for Industrial Water and Wastewater Forecasts (2022).
4	Section 4.3	Text Updates	▪ The text was updated to reflect the updated methodology for forecasting agricultural demands that were updated in 2022. ▪ The text was updated based on the most recent data.
4	Table 4-2	Updated	▪ This table was updated with the revised agricultural forecasts. ▪ Values quoted in surrounding text was also updated based on current information.
4	Figure 4-4	Updated	▪ This figure was updated to reflect the revised agricultural water use forecasts.
4	Section 4.4	Text revisions/updates	▪ The text was updated to reflect the updated energy forecast that was completed in 2020 and updates to the methodology.
4	Table 4-3	Updated	▪ The table was updated with the revised thermoelectric water forecasts.
4	Section 4.5	Minor text revisions/updates	▪ The text was updated based on the most recent data.
4	Figure 4-5	Updated	▪ This figure was updated with the revised water demand totals per sector.
4	Figure 4-6	Updated	▪ This figure was updated with the revised total wastewater flows.
5	Summary	Minor text revisions/updates	▪ The text was updated based on the most recent analysis.
5	Section 5.1	Minor text revisions/updates	▪ The text was updated based on the results from the Groundwater Availability Resource Assessment (EPD, 2021)
5	Figure 5-1	Updated	▪ Figure was updated with revised forecast.
5	Table 5-1	Updated	▪ Table was updated with revised forecast and capacities.
5	Section 5.2	Minor text revisions/updates	▪ New paragraph added regarding new level of spatial analysis.
5	Figure 5-2	Updated	▪ Figure was updated with revised surface water challenges.
5	Table 5-2	Updated	▪ Table was updated with revised surface water challenges.
5	Table 5-3	Updated	▪ Table was updated with revised agricultural water demands.

Section	Location	Change	Description
5	Section 5.3	Minor text revisions/updates	▪ The text was updated based on the most recent analysis.
5	Table 5-4	Updated	▪ Table was updated with revised point and LAS discharges.
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 5.4	Minor text revisions/updates	▪ The text was updated based on the most recent analysis.
5	Table 5-5	Updated	▪ Table was updated with revised assessment.
6	Section 6.1	Minor text revisions/updates	▪ Updated word choice.
6	Section 6.2	Minor text revisions/updates	▪ No updates on shared resource assessment, text was removed. ▪ Outdated text related to surface water availability gaps were removed. ▪ Updated word choice and sentence structure.
6	Table 6-1	Updated	▪ No updates on shared resource assessment. Shared resources were referenced generically. ▪ Outdated text related to surface water availability gaps were removed. ▪ Updated counties with potential challenges based on Section 5. ▪ Updated word choice and other minor wordsmithing.
6	Figure 6-1	Updated	▪ Updated timelines
6	Figure 6-2	Updated	▪ Updated timelines
7	Section 7.1	Updated	▪ Updated dates and word choice
7	Table 7-1	Updated	▪ Updated dates and word choice. ▪ Outdated text related to surface water availability gaps were updated. ▪ Updated counties with potential challenges based on Section 5.
7	Section 7.2	Updated	▪ Noted that planning level cost estimates are out of date and will be revised in future plan updates. ▪ Removed text related to planning level cost estimates.
7	Table 7-2	Removed	▪ Table removed since planning level cost estimates are out of date.
7	Section 7.3	Updated	▪ Updated word choice.

Section	Location	Change	Description
7	Section 7.4	Updated	▪ Updated word choice.
8	Section 8.1	Updated	▪ Updated word choice.
8	Table 8-1	Updated	▪ Outdated text related to surface water availability gaps were updated.
9	Section 9	Updated	▪ Updated references for recent studies and data sources.