REGIONAL WATER PLAN

September 2011

TABLE OF CONTENTS

Table of Contents

Tables

Figures

Supplemental Documents

The following supplemental materials have been developed in support of the Altamaha Regional Water Plan and are available electronically as attachments to the Regional Water Plan at www.altamahacouncil.org:

- Public Outreach Technical Memorandum
- Vision and Goals Technical Memorandum
- Water and Wastewater Forecasting Technical Memorandum
- Gap Analysis Technical Memorandum
- Management Practices Selection Process Technical Memorandum
- Plans Reviewed in Selecting Management Practices Technical Memorandum
- Water Conservation Technical Memorandum

Acknowledgments

The Atlamaha Council should be acknowledged for contributing significant amounts of time and talent toward the development of the Regional Water Plan. They participated in council meetings, subcommittee meetings, conference calls, and report development and review. The members of the Altamaha Council include:

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The Altamaha Council would like to thank Rick Brown and Katherine Zitsch with CDM and Kevin Farrell and Ted Hendrickx of Georgia EPD for providing the planning and technical guidance toward the development of this Plan.

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

List of Acronyms

AAD-MGD	Annual Average Day in million gallons per day
ASR	Aquifer Storage and Recovery
ASWS	Additional/Alternate Surface Water Supply
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

List of Acronyms

GW	groundwater
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

List of Acronyms

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
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
WRD	Wildlife Resources Division
WTP	water treatment plant
WWTP	wastewater treatment plant

EXECUTIVE SUMMARY

Executive Summary

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 has been one of the fastest growing states in the nation. According to the U.S. Census Bureau, between 2000 and 2010, Georgia ranked 4th in total population gain (1.5 million new residents) and 7th in percentage increase in population (18%). During a portion of this same period, our State also experienced unprecedented 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 has also changed. Ensuring a bright future for our State requires thoughtful planning and wise use of our water resources. In 2008, 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 over the next 40 years. The Altamaha Regional Water Planning Council (Altamaha Council) was established in February 2009 as part of this state-wide process. The Altamaha Council is one of 11 planning regions charged with developing Regional Water Plans, and encompasses sixteen counties in the south central portion of Georgia (shown in Figure ES-1). An overview of the initial findings and recommendations for the Altamaha Region are provided in this Executive Summary. The Altamaha Council's Regional Water Plan is available at: www.altamahacouncil.org.

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 250,000 to 375,000 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 from the Upper Floridan Aquifer is needed to meet about 55% of the water supply needs, with agricultural and industrial uses being the dominant demand sectors. Surface water is utilized to meet about 45% of the 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 shortfalls during some periods on the Canoochee, Ogeechee, Alapaha, and Satilla Rivers; 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.

Figure ES-1: Altamaha Regional Water Planning Council

Georgia has abundant 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. The rain that falls 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 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.

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 a popular fishing resource to the region and is home to 74 species of fish including sunfish, largemouth bass, bluegill, black crappie, and catfish.

The Altamaha Region encompasses several major population centers, including Vidalia, Jesup, Swainsboro, Eastman, and Glennville. The Altamaha Region is projected to grow by approximately 61,000 residents, or 24%, from 2010 to 2030 (Georgia's Office of Planning and Budget, 2010). Based on this trend, the population of the region in 2050 will increase by approximately 124,000 people, or 49%, for a total of about 375,000 residents. To accommodate this growth, the region requires reliable water supplies and sufficient wastewater treatment to meet its growing 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.”

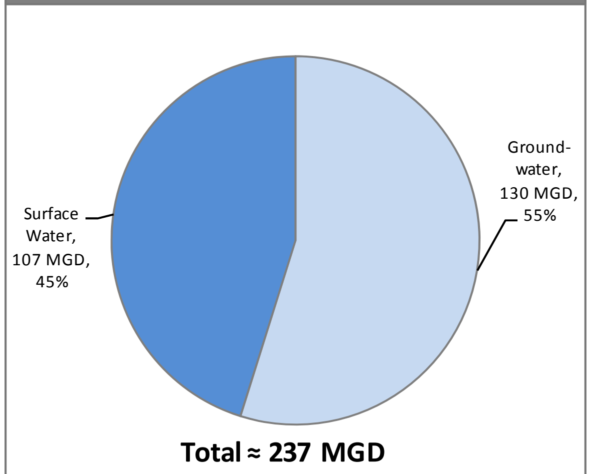
The Altamaha Council identified 12 goals to complement the vision. These goals can be found in Section 1 of the Regional Water Plan.

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 45% of the region’s water supply needs. Through 2050, the sources of agricultural surface water in the region are projected to come from the Altamaha River Basin (34-36%), Ocmulgee River Basin (28-29%), Ogeechee River Basin (21%), Satilla River Basin (7-8%), Suwannee River Basin (6%), and Oconee River Basin (2%). 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.

Figure ES-2: 2005 Water Supply by Source Type



Data Source: "Water Use in Georgia by County for 2005; and Water-Use Trends, 1980-2005" (USGS, 2009).

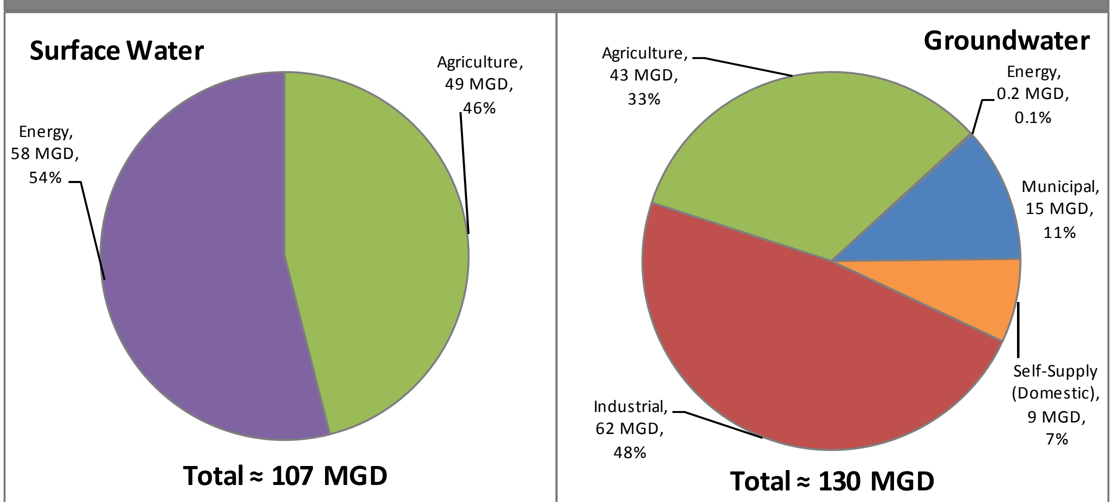
Groundwater

As shown in Figure ES-2, groundwater is used to meet about 55% of the region's water supply needs. Based on 2010 forecasted groundwater withdrawal data, approximately 94% 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, and Dublin 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 54% percent of surface water withdrawals in the region are for the energy sector. However, only approximately 36 MGD of the total 58 MGD of energy water withdrawals is consumed, while the remaining 22 MGD are returned to the surface water. About 105 MGD of groundwater withdrawals are used to supply industrial (48%) and agricultural uses (33%), while municipal, self-supply (homes with groundwater wells), and energy make up the remaining uses.

Figure ES-3: 2005 Water Use by Category



Data Source: "Water Use in Georgia by County for 2005; and Water-Use Trends, 1980-2005" (USGS, 2009).

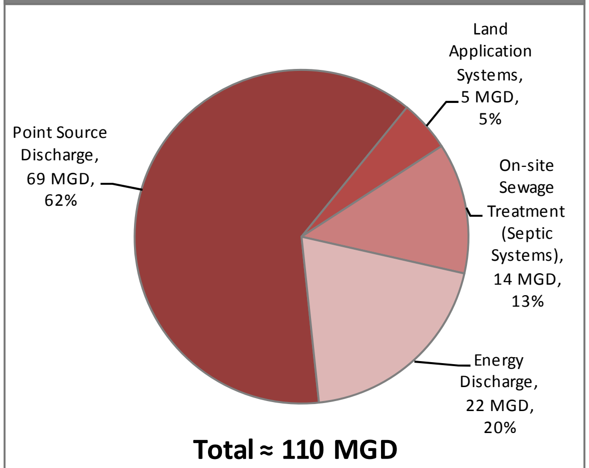
Energy totals shown represent total thermoelectric water withdrawal; 36 MGD of the total 58 MGD (62%) is consumptive, the remainder (22 MGD) is discharged back to surface waters as return flow.

Wastewater treatment types/values representing past trends and forecasted use in the region are shown in Figure ES-4. According to the Altamaha Water and Wastewater Forecast developed for the Regional Water Plan (CDM, 2011), 62% of treated wastewater in the region are disposed of as a municipal/industrial point source discharge, energy discharge (20%), or to a land application system (5%). The remaining wastewater is treated by on-site sewage treatment (septic) systems (13%).

Altamaha Forecasted Water Resource Needs from the Year 2010 to 2050

Municipal water and wastewater forecasts are 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 and are shown in Figure ES-5. Overall, the region's water supply needs are expected to grow by 34% (90 MGD) from 2010 through 2050. Over the same period, total wastewater flows in the region are expected to grow by 34% (36 MGD).

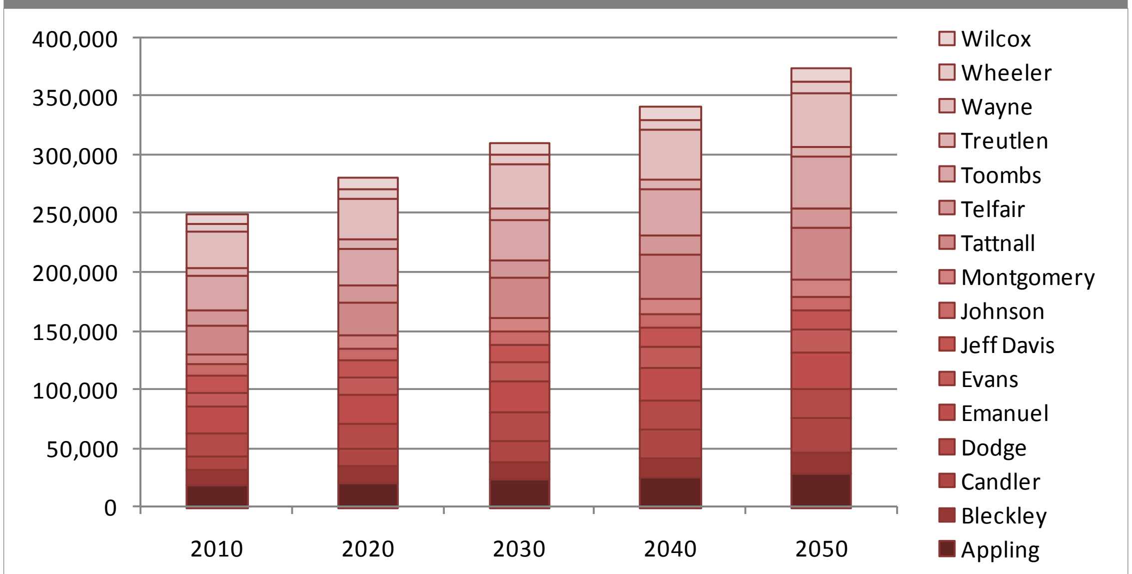
Figure ES-4: Trends in Wastewater and Return Flows



Data Source: Altamaha Water and Wastewater Forecasting Technical Memorandum; CDM, 2011.

Energy totals shown represent total thermoelectric water withdrawal; 36 MGD of the total 58 MGD (62%) is consumptive, the remainder (22 MGD) is discharged back to surface waters as return flow.

Figure ES-5: Altamaha Region Population Projections (2010-2050)



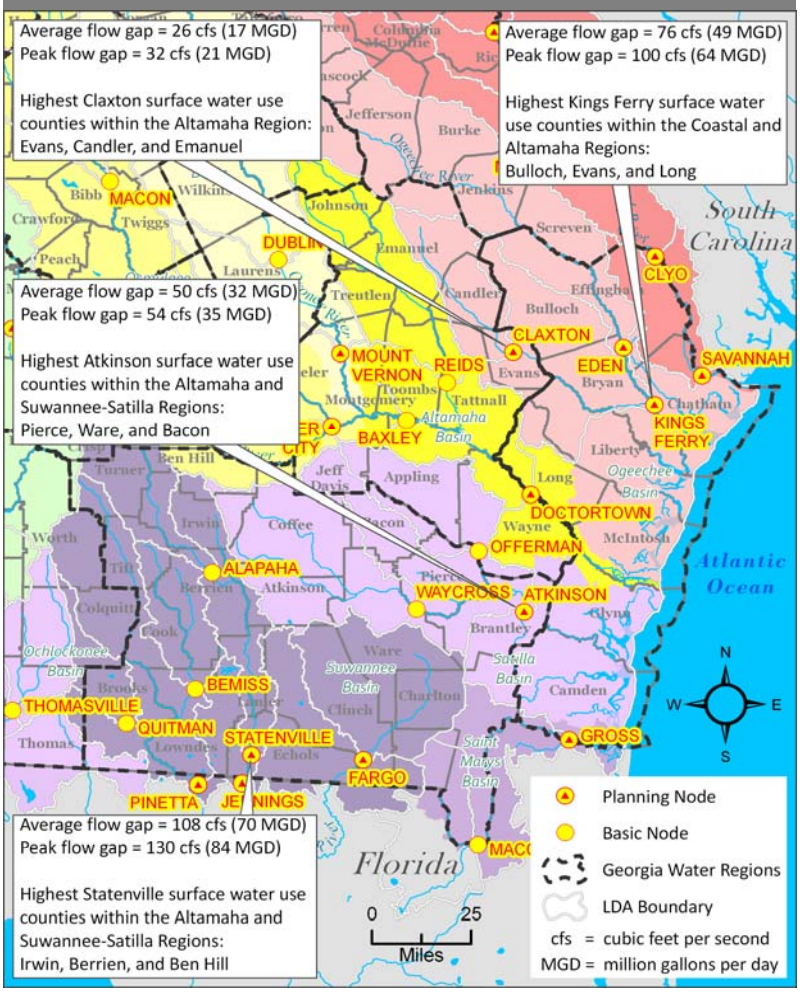
Data Source: Georgia 2030 Population Projections, Georgia Governor's Office of Planning and Budget, 2010. Data based on the 2010-2030 projections used for State Water Planning purposes and extrapolated to 2040 and 2050.

Comparison of Available Resource Capacity to Future Water Resource Needs

Groundwater Availability

Groundwater from the Upper 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 amount of water that can be sustainably pumped from select regional aquifers; also referred to as sustainable yield. Overall, the results from the Groundwater Availability Resource Assessment (EPD, March 2010) indicate that the sustainable yield for the modeled portions of the regional aquifer(s) is greater than the forecasted demands. Therefore, at this time no groundwater resource shortfalls are expected to occur in the Altamaha Region over the 40 year planning horizon. However, localized issues could arise in areas where there is a high well density and/or high volumes of groundwater withdrawal.

Figure ES-6: 2050 Surface Water Gaps



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 determine if there is sufficient surface water to meet both off-stream uses of water and instream flow needs, a Surface Water Availability Resource Assessment model was developed and used in the state water planning process.

The results of the future conditions modeling from the Surface Water Availability Resource Assessment (EPD, March 2010) show that in some portions of the region, there are sufficient surface water supplies to meet current and forecasted water supply needs. However, in dry years, during some portions of the year, the modeled demand for off-stream uses of water results in projected impacts to

instream flow needs (referred to as a "gap"). Figure ES-6 summarizes the locations in or near the region where there is a forecasted gap between available surface water resource and forecasted need. There are current and 2050 forecasted surface water gaps at the following locations in and near the region: Claxton (Canoochee River), Eden (Ogeechee River, outside of Altamaha Region), Kings Ferry (Ogeechee River, outside of Altamaha Region), Atkinson (Satilla River, outside of Altamaha Region) and Statenville (Alapaha River outside of the Altamaha Region). At each of these locations, the dominant water use type is agricultural. The projected increase of agricultural surface water use for the counties within the Altamaha Region that have current and/or future gaps is 5.32 MGD. Since there are current gaps at the referenced locations, it will be difficult to develop additional surface water to meet projected needs without increasing current gaps. As described below, management practices are recommended by the Altamaha Council to address surface water gaps. In Figure ES-6, the terms "planning node" and "basic node" refer to locations in the region with long-term river flow measurement data. In most instances, basic nodes are located at or near U.S. Geological Survey stream gages or at dams. Planning nodes are basic nodes where water availability assessments are performed.

Summary of Resource Assessment Results

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

Groundwater: *Overall, results indicate that the 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 shortfalls at the Claxton, Eden, Kings Ferry, Atkinson, and Statenville nodes.*

Surface Water Quality: *There are four river reaches within the Ogeechee River Basin, six river reaches within the Altamaha River Basin, and one river reach in the Ocmulgee River Basin that may exceed assimilative capacity.*

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 March 2010 Surface Water Quality (Assimilative Capacity) Resource Assessment, 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 waste being discharged (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-1 summarizes the results of the assimilative capacity assessment for dissolved oxygen at baseline and/or permitted conditions including recommendations to address potential future (2050) water quality needs. Assimilative capacity assessments indicate the potential need for improved wastewater treatment in some facilities within the Ogeechee, Altamaha, and Ocmulgee River Basins. Information is also included for portions of the river basin where additional treatment of nitrogen and/or phosphorus and/or ammonia may be needed.

Table ES-1: Surface Water Quality (Assimilative Capacity) Assessment Recommendations

River Basin	Recommendation	Number of Affected Stream Reaches
Altamaha	Monitoring and data collection	3
	Relocate discharge point to higher flow receiving stream	1
	Improve level of wastewater treatment to improve instream dissolved oxygen	3
	Improve wastewater treatment for nutrients (nitrogen and phosphorus)	2
Ogeechee	Monitoring and data collection	2
	Expand/construct new facility to meet future wastewater flows	1
	Improve level of wastewater treatment to improve instream dissolved oxygen	1
	Improve wastewater treatment for nutrients (nitrogen and phosphorus)	1
Ocmulgee	Improve level of wastewater treatment to improve instream dissolved oxygen	1
	Implement ammonia limits	1
	Improve wastewater treatment for nutrients (nitrogen and phosphorus)	1

Source: Altamaha Gap Analysis Technical Memorandum; CDM, 2011.

Under Section 303d 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 75 impaired stream reaches (total impaired length of 915 miles) and 2 impaired lakes (total impaired area of 390 acres). Total maximum daily loads have been completed for 71 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.

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

The comparison of EPD's March 2010 Resource Assessments and forecasted demands identified the region's likely resource shortfalls or gaps 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 has 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 gaps may change. Therefore, the Council has prioritized short-term management practices to address gaps with the understanding that more complex management practices may be required in the future. These short-term management practices are presented in Tables ES-2 and ES-3.

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

Table ES-2: 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 gaps (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 concerns

Table ES-3: 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, 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-7. If resource needs are not met and/or gaps 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-7: Implementation of Management Practices

Cost Considerations

Planning level cost estimates were prepared for the various categories of management practices. A detailed summary of costs can be found in Section 7 of the Regional Water Plan. In most cases, costs are presented on a unit cost basis or when applicable as a total estimated cost for certain management practices. Total overall costs for the entire Plan were not specifically developed because the recommended practices are not intended to be mandated or prescriptive to the water and wastewater users and providers. In general, addressing surface water needs in the region from both a water supply and a water quality perspective are expected to present the largest challenges and have the most fiscal impact. For the Regional Water Plan to be most effective, wastewater utilities and agricultural water users will need the planning and implementation support to help them meet current and future needs. It is anticipated that several different funding sources and options will be used to secure funding for the various management practices outlined in the Regional Water Plan, and adequate funding will be a critical component of the successful implementation of the State Water Plan.

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 of the Regional Water Plan 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 gaps 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 revision to the Plan.

1. INTRODUCTION

Section 1. Introduction

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.

Over the last decade, Georgia was one of the fastest growing states in the nation. During this same period the State experienced unprecedented drought. In addition, we have seen increased competition for water supplies, and our perspectives on how we use and value water have also changed. In response to these challenges, a State Water Council was formed to develop a state-wide water planning process.

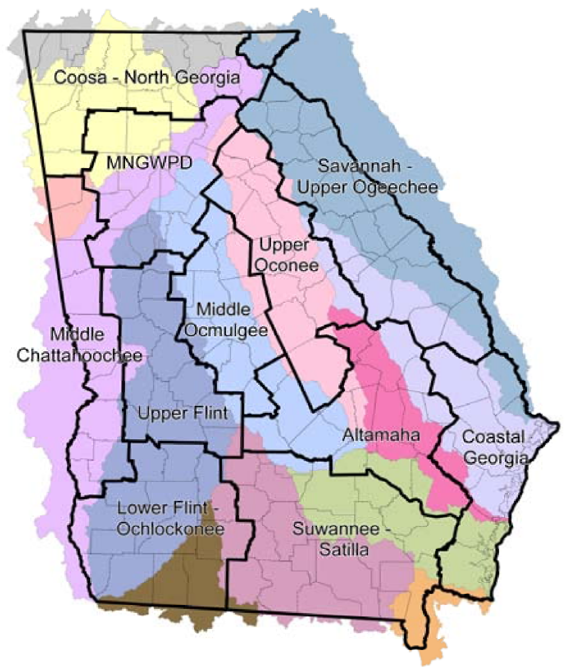
In 2008, the State Water Council submitted the *Georgia Comprehensive State-wide Water Plan* (State Water Plan) to the Georgia General Assembly and the state-wide water planning process was approved. The purpose of the State Water Plan is to guide Georgia in managing water resources in a sustainable manner to support the State's economy, protect public health and natural systems, and to 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 Regional Water Plan. The Altamaha Council is composed of membership based on a nomination and appointment process by the Governor, Lieutenant Governor, and Speaker.

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. Streams and rivers run through many political jurisdictions. The rain that falls 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 assimilative capacity are met. Therefore, the State Water Plan calls for the preparation of ten regional Water Development and Conservation Plans (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

Figure 1-1: Regional Water Planning Councils



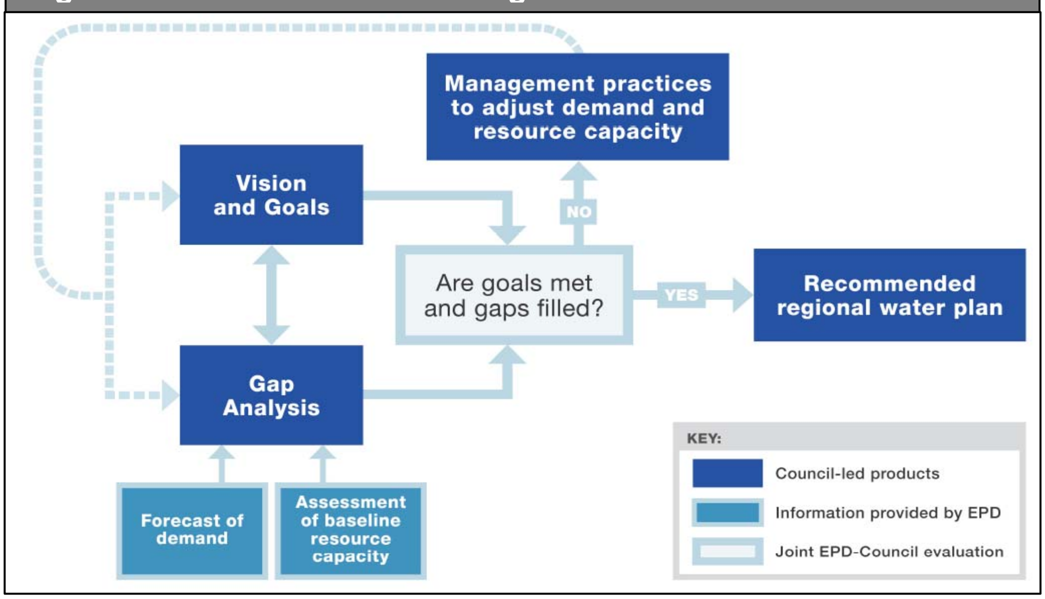
the 11 council boundaries and major surface watersheds, which are shown by the different background colors.

This Regional Water Plan prepared 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 40 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. This Regional Water Plan has been 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.

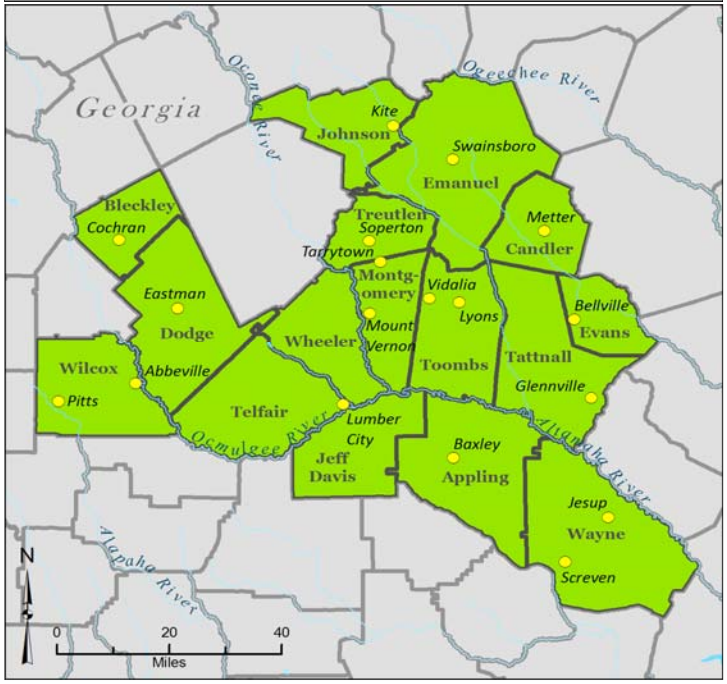
Figure 1-2: State Water Planning Process



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 has 29 members, which includes 2 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: Locations of Altamaha Region Council Members



The Altamaha Council met collectively for the first time on March 13, 2009 at a kickoff meeting for the ten 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.

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. A copy of this document can be accessed on the Internet at: www.altamahacouncil.org/documents/ALT_MOA_Signed-3.pdf.

In support of the Memorandum of Agreement, the Altamaha Council formed six subcommittees to provide planning guidance during various development stages of the 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.

Developing Regional Vision and Goals

A major element of Georgia's state and regional water planning process is the identification of a 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.

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."

Goals (As established November 19, 2009)

The Altamaha Council has 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.

Water Systems/Supply Sustainability

1. Help ensure protection and management of surface and ground water recharge areas to ensure sufficient long-term water supplies for the region.
2. Identify opportunities to maximize and optimize existing and future supplies.
3. Promote water conservation and water use efficiency for all water use sectors to allow for sufficient long-term water supplies.
4. Identify opportunities to better prepare for and respond to climate and water supply variability and extremes.
5. Identify and implement cost effective water management strategies.

Economic Sustainability and Development

6. Manage and develop water resources to sustainably and reliably meet domestic, commercial, agricultural, and industrial water needs.
7. Manage ground and surface water to encourage sustainable economic and population growth in the region.
8. Identify opportunities to minimize excessive regulations and the resulting negative economic impacts (especially in rural areas); while maintaining quality and quantity of water supply.

Quality of Life and Public Health Enhancement

9. Ensure an adequate water supply of suitable quality to meet current and future human, environmental and recreational needs of the region and citizens of Georgia.
10. Optimize existing water and wastewater infrastructure, including identifying opportunities to implement regional water and wastewater facilities.
11. Identify opportunities to manage water, wastewater, and stormwater to improve water quantity and quality, while providing for wise land management, wetland protection, and wildlife sustainability.
12. Work collaboratively with other regions that share resources to help ensure that activities outside the Altamaha Region do not adversely impact the region.

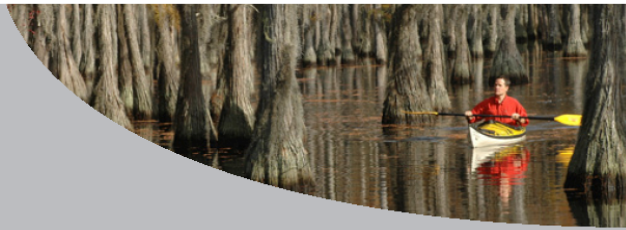
More information regarding the region's Vision and Goals can be found at:
www.altamahacouncil.org/documents/ALT_Vision_Goals_Adopted.pdf.

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/implement an inclusive planning process. The Public Involvement Plan was adopted by the Altamaha Council on November 19, 2009 and can be accessed at:
www.altamahacouncil.org/documents/ALT_Public_Involvement_Plan_Adopted.pdf.

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 available at: www.altamahacouncil.org/documents/ALT_Vision_Goals_Adopted.pdf.

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 Upper 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.

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

Surface Water Resources

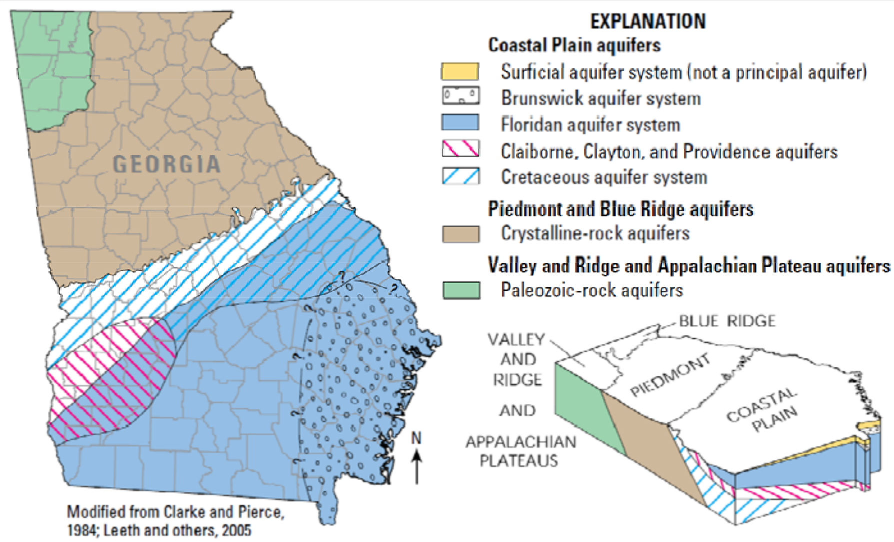
Figure 2-1 provides an overview of the surface water resources in the Altamaha Region. The Altamaha River is the major surface water feature in the region. The Altamaha River, formed by the confluence of the Ocmulgee and Oconee Rivers, is 127 miles long and has a drainage area of approximately 14,000 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 a popular fishing resource to the region and is home to 74 species of fish including sunfish, largemouth bass, bluegill, black crappie, and catfish.

Groundwater Resources

Groundwater is a very important resource for the Altamaha Region. Figure 2-2 depicts the major aquifers of Georgia. Based on 2010 forecasted groundwater withdrawal data, approximately 94% 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, and Dublin 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.

Figure 2-2: Major Georgia Aquifers



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.

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, approximately 42-48 inches per year, with the greatest rainfall occurring during July and August and the least in October and November. Snowfall is rare and typically averages around 0.2 inches in the northern portion of the region.

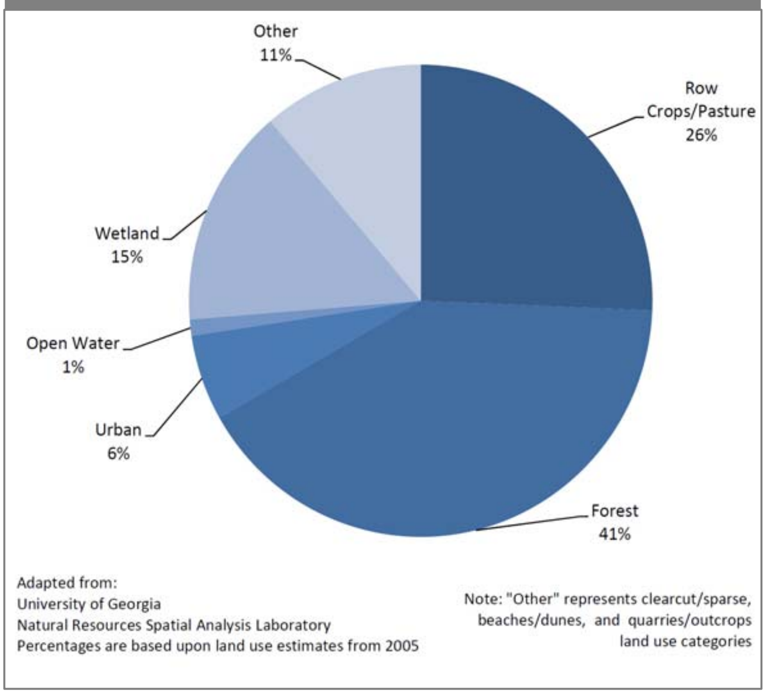
2.2. Characteristics of Region

The Altamaha Council encompasses 16 counties in the south central portion of Georgia, with a projected 2010 population of approximately 251,000 (Office of Planning and Budget, 2010). 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 four colleges within the Technical College System of Georgia: Altamaha Technical College in Jesup, Southeastern Technical College in Vidalia, Swainsboro Technical College, and Heart of Georgia Technical College in Dublin. The region also includes East Georgia College in Swainsboro, which is part of the University System of Georgia, as well as Middle Georgia College in Eastman, Brewton-Parker College in Mount Vernon, and Troy University in Vidalia. In addition to county jails, there are 15 state and federal correctional facilities, which are important employers and water users in the Altamaha Region.

Figure 2-3: Land Cover Distribution



A summary of 2005 land cover distribution is shown in Figure 2-3, based on data obtained from the University of Georgia Natural Resources Spatial Analysis. Forests cover 41% of the Altamaha Region, and agriculture and wetlands cover 26% and 15% 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 (12%) consists of water and open spaces. Based on the inventory developed of Georgia's irrigated croplands for the year 2008 (UGA Cooperative Extension Irrigation Survey and Dr. Jim Hook), the Altamaha Region is a major producer of cotton and fresh vegetables. These crops cover nearly 45% of the irrigated acreage within the region. Other crops such as peanuts, corn, and soybeans are also planted widely within the region.

2.3. Local Policy Context

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 quality 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 is expected to complete the Regional Plan by 2013.

3. WATER RESOURCES OF THE ALTAMAHA WATER REGION

Section 3. Water Resources of the Altamaha Region

3.1. Current Major Water Use in Region

Based on data summarized from the 2009 USGS report "Water Use in Georgia by County for 2005; and Water-Use Trends, 1980-2005", water supply in the Altamaha Region for 2005 totaled approximately 237 million gallons per day (MGD) and was comprised of 55% groundwater and 45% surface water, as shown in Figure 3-1. A total of 107 MGD was 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 about 130 MGD of groundwater withdrawn was predominantly used to supply industrial (48%) and agricultural uses (33%) while municipal, self-supply, and energy made up the remaining uses. Wastewater treatment types in the region are shown in Figure 3-4. According to the Altamaha Water and Wastewater Forecasting Technical Memorandum (CDM, 2011), 87% of wastewater in the region was disposed of as a municipal/ industrial point source discharge (62%), energy discharge/return flow (20%), or to a land application system (5%). The remaining wastewater was treated by on-site sewage treatment (septic) systems (13%).

3.2 Resource Assessments

EPD developed three Resource Assessments to evaluate surface water quality, surface water availability, and groundwater availability throughout the State. These assessments determined the capacity of water resources to meet demands for water supply and wastewater discharge without unreasonable impacts according to metrics established by EPD. These assessments were completed on a resource basis (river basins and aquifers), but are summarized herein as they relate to the Altamaha Region. As described in more detail below, the term "gap" is used to indicate when the current or future use of water has been identified as potentially exceeding the long-term sustainability of the water resource.

Summary

In 2005, surface water and groundwater withdrawal in the Altamaha Region totaled approximately 237 MGD to accommodate municipal, industrial, agricultural, and energy demands.

The majority of wastewater in the region is disposed of as a point source discharge from municipal, industrial, and energy uses.

The availability of surface water to meet current uses varies significantly across the region. In many areas of the region there are sufficient surface water supplies to meet current uses. On the smaller rivers (i.e., Alapaha, Canoochee, Ogeechee, and Satilla Rivers) with higher water use, river flows are at times (during drier years) insufficient to meet both off-stream uses and instream needs.

Groundwater supplies are currently sufficient on a regional basis to meet uses across the region.

Under current conditions, there are several locations in the region where dissolved oxygen levels may be insufficient to assimilate wastewater discharges.

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.

Full details of each Resource Assessment can be accessed on the EPD website at: www.georgiawaterplanning.org/pages/resource_assessments.

Figure 3-1: 2005 Water Supply by Source Type [1a]

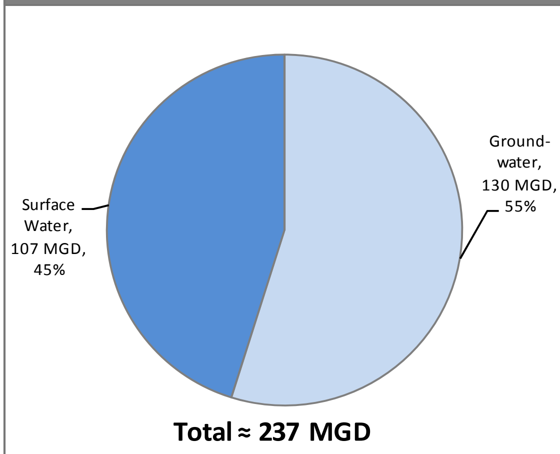


Figure 3-2: 2005 Surface Water Withdrawal by Category [1a, 2]

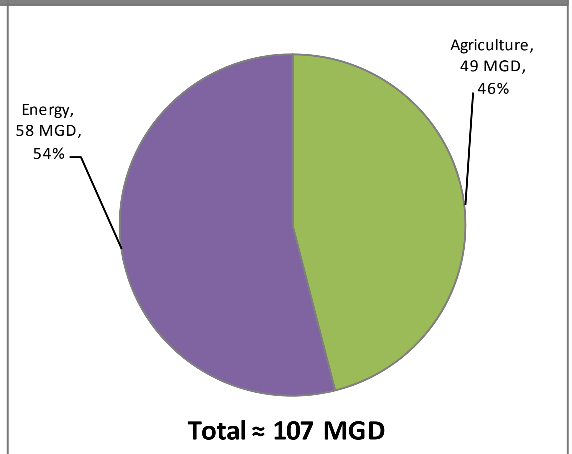


Figure 3-3: 2005 Groundwater Withdrawal by Category [1a, 2]

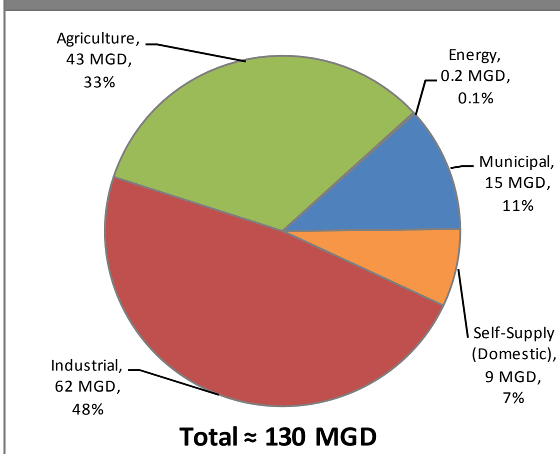
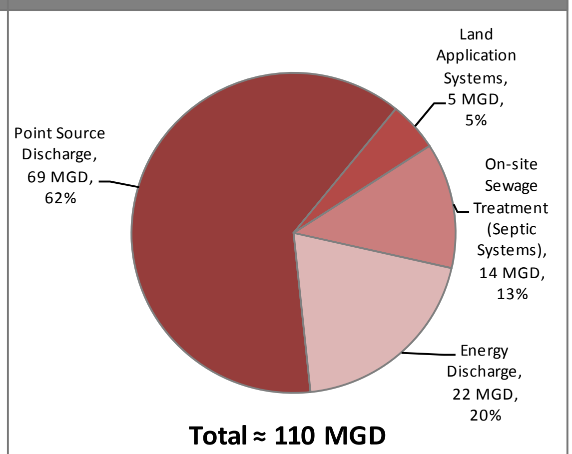


Figure 3-4: 2005 Wastewater/ Return Flow by Category [1b, 2]



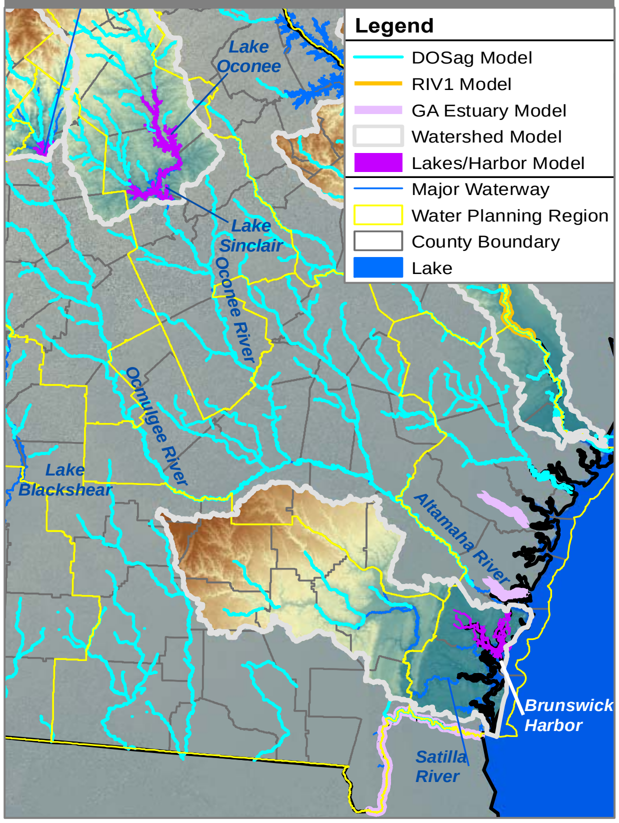
[1] Data Sources: a) "Water Use in Georgia by County for 2005; and Water-Use Trends, 1980-2005" (USGS, 2009); b) Altamaha Water and Wastewater Forecasting Technical Memorandum; CDM, 2011.

[2] Energy totals shown represent total thermoelectric water withdrawal; 36 MGD of the total 58 MGD (62%) is consumptive, the remainder (22 MGD) is discharged back to surface waters as return flow.

3.2.1. Current Surface Water Quality (Assimilative Capacity)

The Surface Water Quality (Assimilative Capacity) Resource Assessment (EPD, March 2010) 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 exceeding State water quality standards or harming aquatic life. 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 (2005) withdrawals, land use, and meteorological conditions. Additional details are provided in the Surface Water Quality Resource Assessment Synopsis (EPD, March 2010).

Figure 3-5: Assimilative Capacity Models



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). Each segment was classified as exceeding DO capacity, meeting DO capacity, or having available DO capacity. The results of the current DO modeling are presented in Table 3-1 and Figure 3-6 for the Altamaha Region, which includes portions of the Altamaha, Oconee, Ocmulgee, and Ogeechee river basins. The baseline assimilative capacity represents the model results based on discharge amounts as reported by wastewater treatment plants in 2007. 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 DO assimilative capacity as exceeded, a potential "gap" 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.

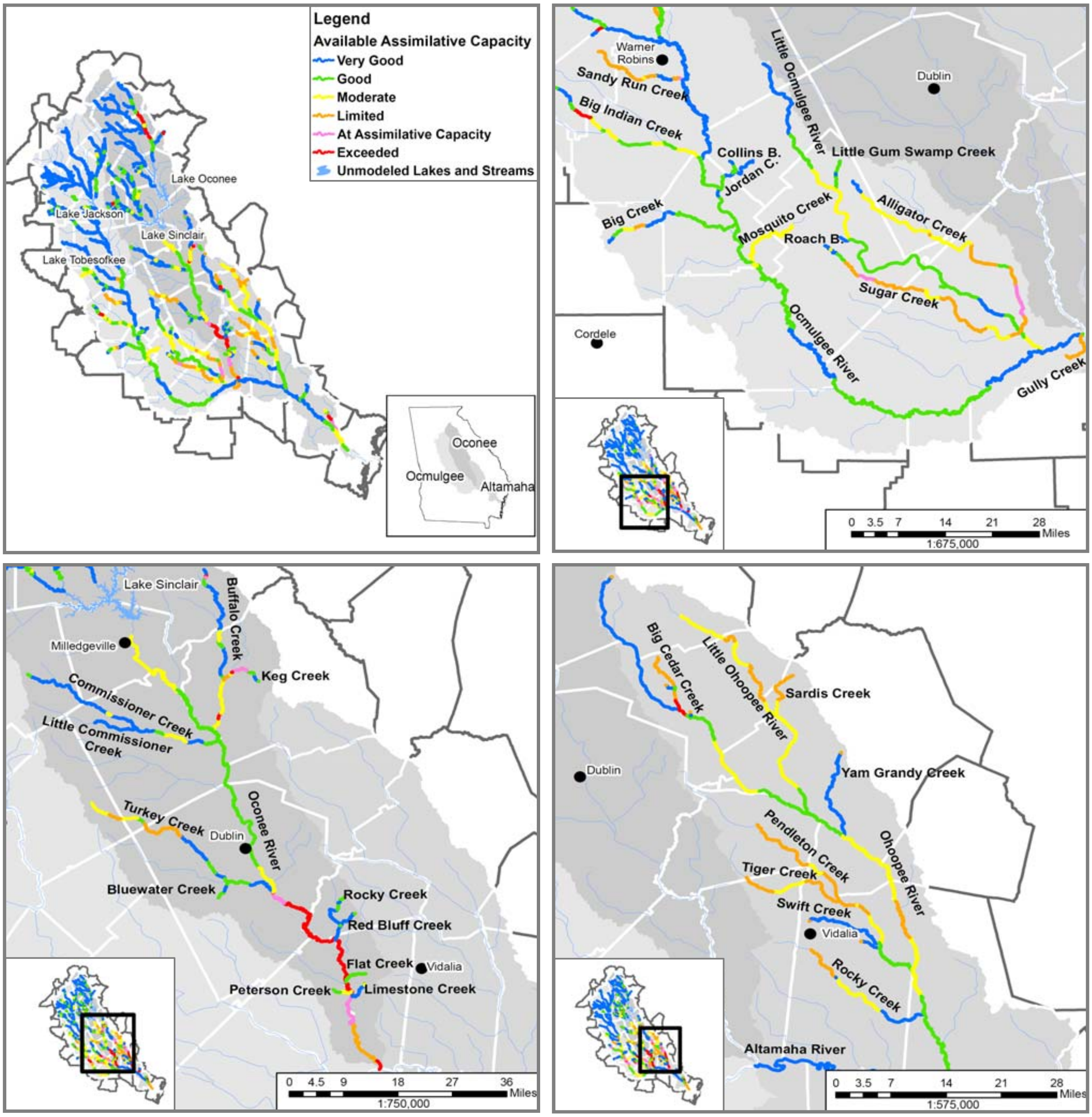
Table 3-1: Baseline DO Assimilative Capacity in Altamaha River Basins							
Model Run	Basin	Available Assimilative Capacity (Total Mileage)					Total Modeled River Basin Miles[1]
		Very Good (≥1.0 mg/L)	Good (0.5 to <1.0 mg/L)	Moderate (0.2 to <0.5 mg/L)	Limited (>0.0 to <0.2 mg/L)	None or Exceeded (<0.0 mg/L)	
Baseline	Oconee	509	117	51	44	40	761
	Ocmulgee	560	249	92	41	43	985
	Altamaha	169	66	61	80	45	421
	Ogeechee	96	218	307	103	211	935

Source: Surface Water Quality Resource Assessment; EPD, March 2010.
[1]Total miles include tributaries and main stem of the rivers within and outside of the Altamaha Council boundary.

Nutrient Modeling

In addition to Assimilative Capacity modeling for DO, EPD completed nutrient (nitrogen and phosphorus) modeling for the Satilla River watershed. The location of the watershed model boundaries, and lakes, harbors and estuaries model locations are shown in Figure 3-5. It should be noted that only current conditions nutrient modeling was performed. There are currently no nutrient standards for nitrogen and phosphorus, but these standards may be established in forthcoming years. The watershed models show non-point source nutrient loadings of phosphorus and nitrogen to the Brunswick Harbor. 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.

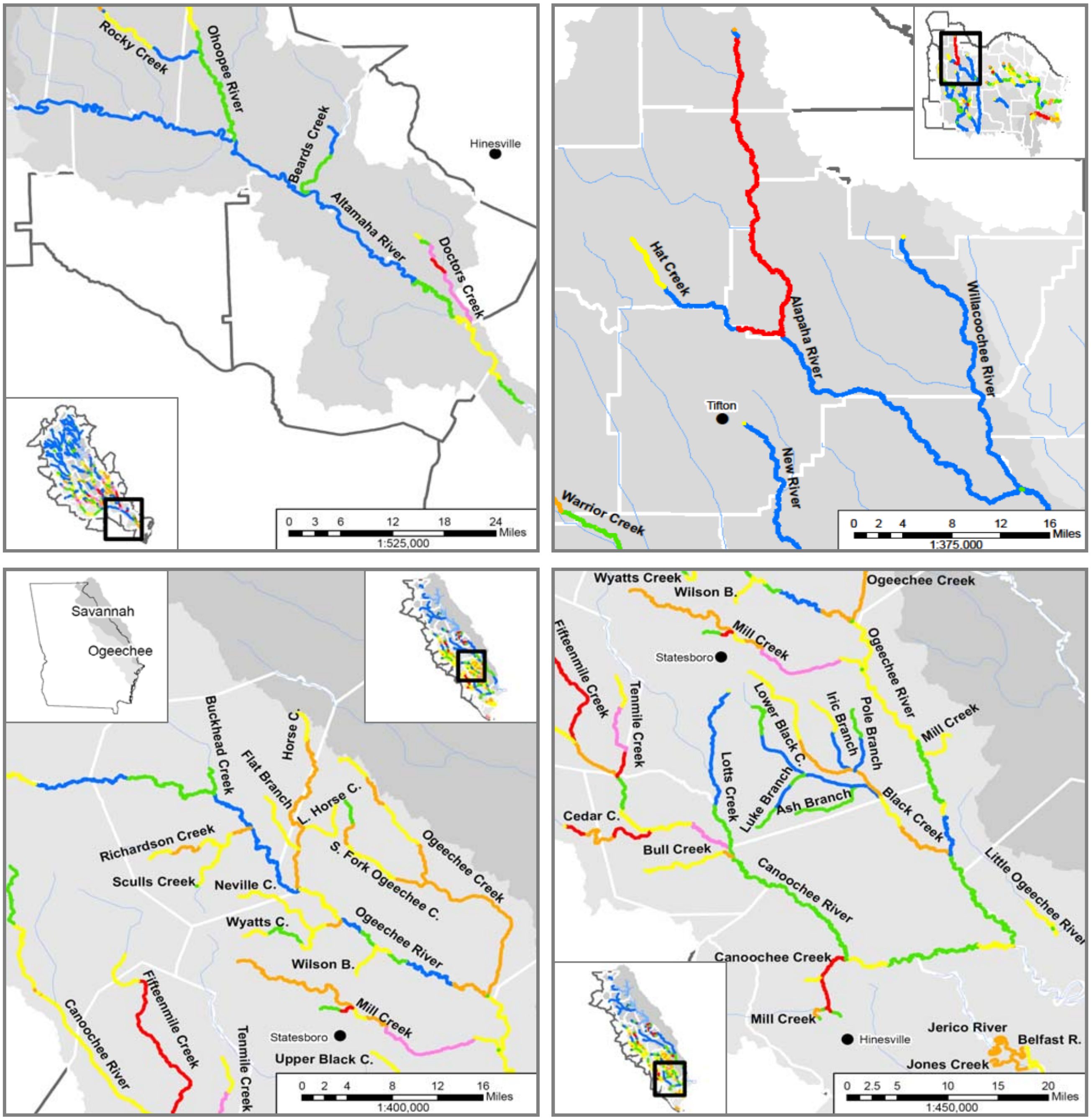
Figure 3-6: Results of Assimilative Capacity Assessment – DO at Baseline Conditions



Source: Additional Supporting Material for Baseline Water Quality Resource Assessment; EPD, October 2010.

Very Good: ≥ 1 mg/L of dissolved oxygen (DO) available (above the water quality standard of 5 mg/L)
Good: 0.5 mg/L to < 1.0 mg/L of DO available
Moderate: 0.2 mg/L to <0.5 mg/L of DO available
Limited: >0.0 mg/L to <0.2 mg/L of DO available
At assimilative capacity: 0.0 mg/L of DO available
None or Exceeded Capacity: <0.0 mg/L of DO available

Figure 3-6 (cont): Results of Assimilative Capacity Assessment – DO at Baseline Conditions



Source: Additional Supporting Material for Baseline Water Quality Resource Assessment; EPD, October 2010.

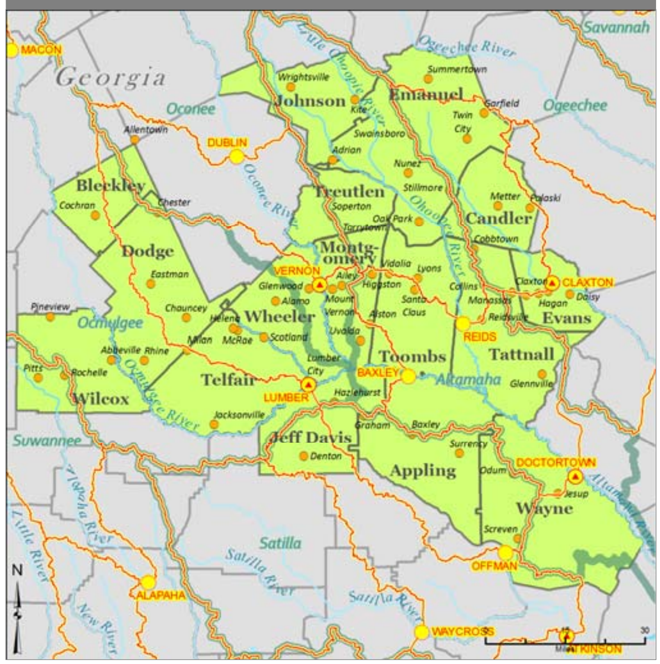
Very Good: ≥ 1 mg/L of dissolved oxygen (DO) available (above the water quality standard of 5 mg/L)
Good: 0.5 mg/L to < 1.0 mg/L of DO available
Moderate: 0.2 mg/L to <0.5 mg/L of DO available
Limited: >0.0 mg/L to <0.2 mg/L of DO available
At assimilative capacity: 0.0 mg/L of DO available
None or Exceeded Capacity: <0.0 mg/L of DO available

3.2.2 Current Surface Water Availability

The Surface Water Availability Resource Assessment (EPD, March 2010) 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. Instream uses include fish, wildlife habitat, recreation, and dilution of wastewater, among others. The Surface Water Resource Availability Assessment used specific minimum flow levels as indicators of the ability to support instream uses. Minimum instream flows were based on EPD policy, existing Federal Policy, or existing Federal Energy Regulatory Commission (FERC) license requirements. The assessment determines the reliability of the surface water to meet off-stream demands without impacting minimum instream flow requirements. The results of the assessment are provided in terms of both severity (i.e., the amount by which the stream would drop below minimum instream flow requirements) and frequency (i.e., number of days below minimum instream flow requirements).

As shown in Figure 3-7, there are several surface water planning nodes (shown as yellow circles with red triangles) located in the Altamaha Region. Planning nodes are locations along a river where there is a long-term record of river flow measurements. At each node, the surface water availability models applied the current cumulative upstream consumptive uses of water (i.e., withdrawals minus returns) and authorized reservoir operations to stream flows from 1939 to 2007. From the March 2010 Surface Water Availability Resource Assessment, the term “gap” is used to indicate when the mathematical computer modeling results indicate that forecasted off-stream uses of water increase the severity and/or frequency of critical low flow periods. At these nodes, during certain low flow periods, there is not sufficient water to meet current off-stream demands and also meet the targets for support of instream uses.

Figure 3-7: Surface Water Planning Nodes



Surface water is an important resource used to meet current and future needs in the region, especially for the agricultural sector. Between 2011 and 2050, the use of surface water for agricultural purposes is expected to increase by 9 MGD from 39.9 MGD to 48.9 MGD (Altamaha Water and Wastewater Forecasting Technical Memorandum; CDM, 2011). The only planning node within the region with a surface water gap is the Claxton node (Canoochee River). However, there are surface water gaps outside the region that may be associated with water use within the region.

There is a surface water gap at the Atkinson node on the Satilla River and there are surface water uses in three counties (Appling, Jeff Davis, and Wayne) that contribute surface water runoff to the Satilla River. There is also a surface water gap at the Kings Ferry (Ogeechee River) node, which is below the confluence of the Canoochee and Ogeechee Rivers. There is a very small portion of Tattnall County that contributes surface water runoff to the Kings Ferry node. Finally, there is a surface water gap at the Statenville node on the Alapaha River and there is surface water use in a portion of Wilcox County that contributes surface water runoff to the Alapaha River. There are no surface water gaps at the Doctortown (Altamaha River), Lumber City (Ocmulgee River), and Mount Vernon (Oconee River) nodes.

In the Altamaha Region and surrounding area, critical low flow conditions occur on river systems that do not have any upstream storage reservoirs. In these situations, the Surface Water Availability Resource Assessment uses the unimpaired (meaning estimated flows without off-stream uses) monthly 7 day low flow that occurred over a 10 year period or the daily unimpaired flow (whichever is the lowest value) to determine the critical low flow level/target. It is important to note that when a surface water gap exists, management practices are needed to address times when off-stream uses increase the severity and/or frequency of critical 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 conditions.

Table 3-2 shows modeled results with information on the size of projected current gaps, with current withdrawals, expressed as changes to natural flow conditions. The values are presented as an average annual flowrate and it is important to note that this summary does not take into account seasonal peaks in consumption and the effects on river flows on a monthly basis. Additional analysis was performed to assess monthly flow conditions. For example, impacts to stream flows are higher in the summer months and lower in the winter months. Additional details are provided in the Altamaha Gap Analysis Technical Memorandum (CDM, 2011).

Table 3-2: Magnitude of Current Surface Water Availability Gaps

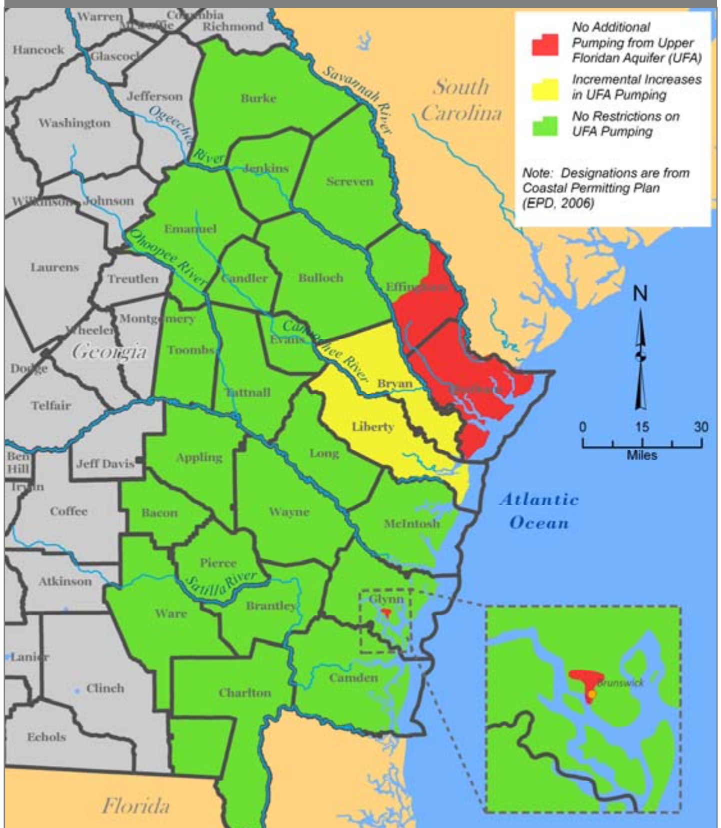
Node	Length of Shortfall (Percent of Time)	Average Shortfall	
		(MGD)	(CFS)
Claxton	18	3.2	5.0
Kings Ferry	6	22.6	35.0
Atkinson	11	16.8	26.0
Statenville	20	20.0	31.0

Source: Surface Water Availability Resource Assessment; EPD, March 2010.

3.2.3 Current Groundwater Availability

The Groundwater Availability Resource Assessment (EPD, March 2010) estimates the sustainable yield for prioritized groundwater resources based on existing water use data and aquifer characteristics. EPD prioritized the aquifers based on the characteristics of the aquifer, evidence of negative effects, anticipated negative impacts, and other considerations. These assessments identified the sustainable yield, or the volume of groundwater that can be used without negative impacts such as limiting use of neighboring wells (drawdown as a consequence of withdrawal), significantly reducing groundwater contributions to stream baseflows, and the permanent reduction of groundwater levels. If negative impacts occur or are expected to occur, then a groundwater "gap" exists.

Figure 3-8: Sub-regions Associated with the Coastal Permitting Plan



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

Groundwater from the Upper Floridan Aquifer is a vital resource for the Altamaha Region. In 2005, groundwater was relied upon to meet about 55% of the water use in the region (USGS, 2009). Overall, the results from the March 2010 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 March 2010 Groundwater Availability Resource Assessment.

As shown in Figure 3-8, 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) (www.gadnr.org/cws/). 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 Upper Floridan

Aquifer in this area; however, there are several water conservation requirements related to groundwater withdrawals.

3.3. 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.

With over 1.29 million resident anglers, fishing is the most popular wildlife-related activity in Georgia (DNR-WRD, 2006). 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 2005 Comprehensive Wildlife Conservation Strategy identified 71 high priority animals that inhabit the Southern Coastal Plain ecoregion and 85 high priority animals in the Southeastern Plains ecoregion (more information is available at (www.georgiawildlife.com/node/1370). 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 25 identified high priority habitats in the Southern Coastal Plain ecoregion and 27 high priority habitats in the Southeastern Plains (CWCS, 2005) (for more information on high priority waters and protected species go to www.georgiawildlife.com/node/1377 and www.georgiawildlife.com/node/1366). 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 14% of the land area (CWCS, 2005). The percentage of lands in conservation is lower in the Southeastern Plains ecoregion at 2.6% (CWCS, 2005).

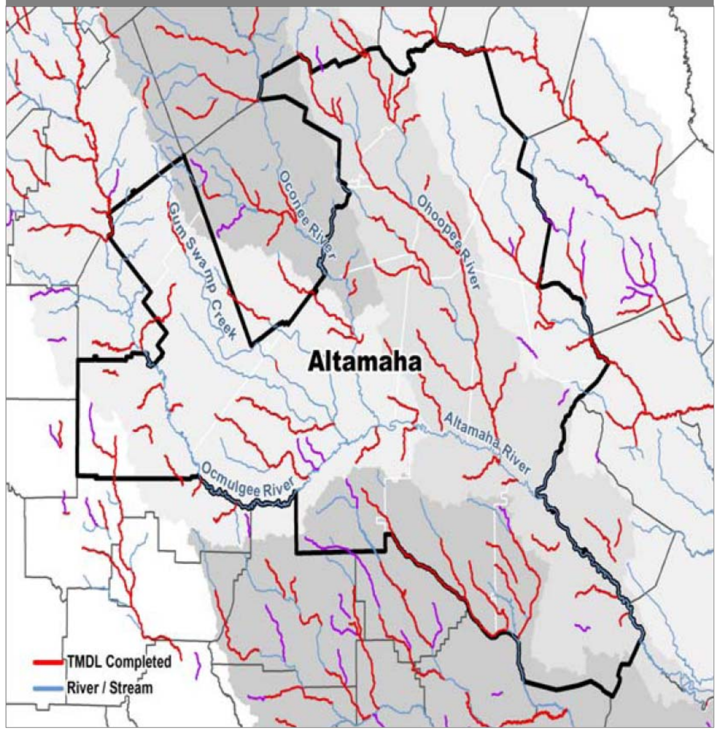
The major rivers that flow through and from the Altamaha Region also pass through the Coastal Regional Council boundary and discharge to the Atlantic Ocean. The coastal area contains a unique combination of fresh, brackish and salt water environments. The area is defined by barrier islands, sand beaches, 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 is 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 fresh water input, such areas in Georgia would be salt water 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 estuaries itself. Sources of freshwater for estuary include: fresh water 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 were 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 75 impaired stream reaches (total impaired length of 915 miles) and 2 impaired lakes (total impaired area of 390 acres).

Figure 3-9: Impaired Water Bodies with Completed TMDLs



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

- 53% are impaired for low dissolved oxygen
- 52% are impaired for fecal coliform
- 21% are impaired for fish community impacts
- 15% are impaired for trophic-weighted residual mercury in fish tissue
- 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 71 of the impaired stream reaches and 2 of the impaired lakes, as shown in Figure 3-9. The Altamaha Council categorized these TMDL listed segments and more information on the listed segments can be found in the Altamaha Gap Analysis Technical Memorandum (CDM, 2011).

4. FORECASTING FUTURE WATER RESOURCE NEEDS

Section 4. Forecasting Future Water Resource Needs

Summary

Over the next 40 years, the population in the Altamaha Region is projected to grow by 49%, increasing the demands for surface water and groundwater and increasing the quantity of wastewater generated.

Total water withdrawals by municipal, industrial, agricultural, and energy sectors are projected to increase by 34% (90 MGD) from 2010 to 2050.

Total wastewater flows are projected to increase by 34% (36 MGD) over the same period.

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 10-year intervals from 2010 through 2050 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 projection results by county for the planning period are shown in Table 4-1.

Table 4-1: Population Projections by County

County	2010[1]	2020[1]	2030[1]	2040[2]	2050[2]	Difference[2] (2010-2050)	% Increase[2] (2010 – 2050)
Appling	18,437	20,766	23,043	25,335	27,782	9,345	51%
Bleckley	13,001	14,501	15,820	17,104	18,322	5,321	41%
Candler	11,074	14,216	18,241	23,201	29,306	18,232	165%
Dodge	20,458	22,367	24,218	25,048	25,775	5,317	26%
Emanuel	23,141	24,623	26,424	28,315	30,401	7,260	31%
Evans	12,004	14,052	16,103	18,128	20,146	8,142	68%
Jeff Davis	13,676	14,422	15,079	15,592	16,041	2,365	17%
Johnson	9,698	10,272	10,849	11,431	11,948	2,250	23%
Montgomery	9,172	10,611	11,961	12,866	13,737	4,565	50%
Tattnall	24,230	28,706	33,706	39,135	45,100	20,870	86%
Telfair	13,529	14,360	15,241	15,984	16,734	3,205	24%
Toombs	28,858	32,189	35,059	38,619	43,195	14,337	50%
Treutlen	7,189	7,973	8,811	9,195	9,255	2,066	29%
Wayne	30,275	34,061	37,861	41,637	45,387	15,112	50%
Wheeler	7,039	7,869	8,652	9,361	10,011	2,972	42%
Wilcox	8,878	9,655	10,350	10,921	11,425	2,547	29%
Total	**250,659**	**280,643**	**311,418**	**341,872**	**374,565**	**123,906**	**49%**

[1]Source: Georgia 2030 Population Projections, Georgia Governor's Office of Planning and Budget, 2010.
[2]Data based on the 2010-2030 projections used for State Water Planning purposes and extrapolated to 2040 and 2050.

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. The publicly-supplied water use rate was determined for each county within the region. The self-supply per capita demand is estimated at 75 gallons per capita per day (gpcd).

The forecasted water use rates for the Altamaha Region were adjusted based on two plumbing code changes which 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, 2011). Table 4-2 summarizes the estimated water savings for both acts. On a regional basis, municipal water demands are expected to be about 11% lower as a result of water demand reduction (4 MGD in 2050) that can be attributed to passive conservation.

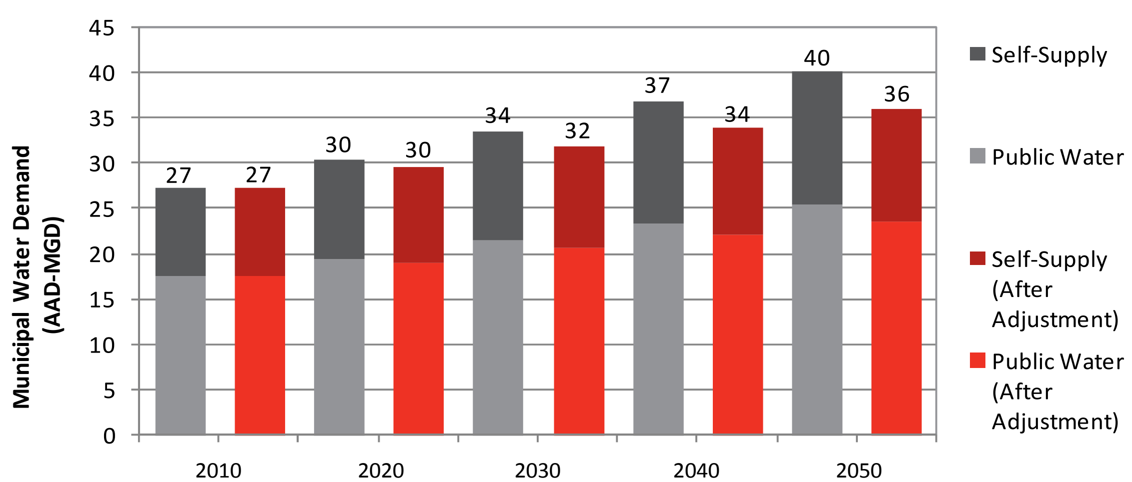
Table 4-2: Estimated Municipal Water Demand Reductions from Lower Flush Volume Toilets (AAD - MGD)

Category	2010	2020	2030	2040	2050
Passive Conservation Reduction from 1992 National Energy Policy Act	0.0	0.5	1.0	1.6	2.1
Additional Passive Conservation Reduction from 2010 Water Stewardship Act	0.0	0.2	0.6	1.1	1.8
Total Passive Conservation Savings	**0.0**	**0.7**	**1.6**	**2.7**	**3.9**

Source: Altamaha Water and Wastewater Forecasting Technical Memorandum; CDM, 2011.
These estimates are based upon reduced flush volume toilets, but do not include the 2010 Water Stewardship Act provisions for more efficient showers, urinals, and faucets in newly constructed or renovated homes.

Total regional municipal water demands are shown in Figure 4-1 for the Altamaha Region. In addition, this figure shows the distribution in demands resulting from public water systems and self-supply systems. In the Altamaha Region, all municipal water demands are satisfied by utilizing groundwater as the sole source for withdrawals.

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



Source: Altamaha Water and Wastewater Forecasting Technical Memorandum; CDM, 2011.

Municipal Wastewater Forecasts

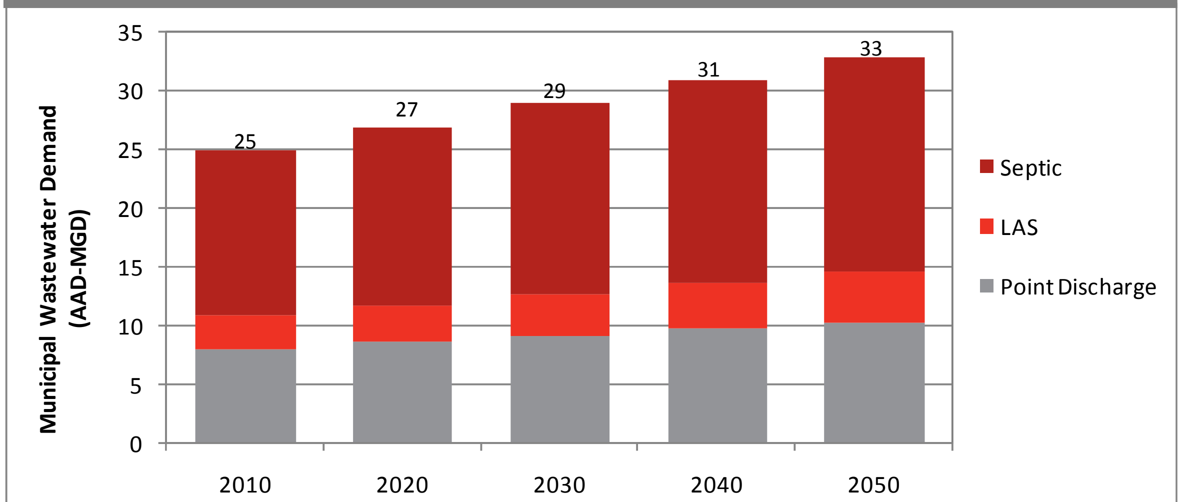
Municipal wastewater forecasts are based on estimates of indoor municipal (public and self supplied) water use. Indoor water use may be treated by centralized treatment plants or onsite sanitary sewage (septic) systems. Centralized treatment plants may discharge to a water body or to a land application system (LAS).

Estimates of wastewater generated from publicly-supplied and self-supplied water use (from the passive conservation scenario above) were calculated and then assigned to septic and centralized wastewater flows. U.S. Census data on the percent of households with septic systems were obtained by county. For planning purposes, it was estimated that all of the wastewater generated from self-supplied water use is disposed of via septic system. Dividing the number of municipally supplied households on septic by the U.S. Census estimate of the number of households by county provided an estimate of the percent of municipally supplied households that discharged to septic systems in 2005.

Estimates of flows treated at centralized wastewater treatment plants are derived from the portion of wastewater flow that is not septic. In addition, a percent of flow is added to account for infiltration and inflow (I/I) that occurs in the wastewater collection system before reaching the treatment facility. I/I is a term used to describe groundwater and stormwater that enters into the dedicated wastewater system. An initial I/I estimate of 20% was used to calculate return flows. This estimate was adjusted when there was county-specific data to support an alternate value.

Finally, 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. EPD permit data as well as feedback from municipal suppliers were used to determine the ratio of point discharge to land application system for each county. Municipal wastewater forecasts are shown in Figure 4-2.

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



Source: Altamaha Water and Wastewater Forecasting Technical Memorandum; CDM, 2011.

4.2. Industrial Forecasts

Industrial forecasts show the future need from the major water using industries including: food, textile, and paper. Industries require water for processes, sanitation, cooling, and other purposes, in addition to domestic (employee) water use. 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) is based on either production or employment, depending on the available information.

Employment Projections

The employment projections provided information on the anticipated employment growth rate for each industrial sector. The University of Georgia produced the industry-specific rates of growth for employment for EPD, which were then used to calculate the future water needs for specific industries within the Altamaha Region. General employment in heavy water-using industries such as textile and paper sectors shows an upward trend throughout the 40 year planning period, while employment projections in the food manufacturing sector are maintained relatively constant.

Industrial Water Forecasts

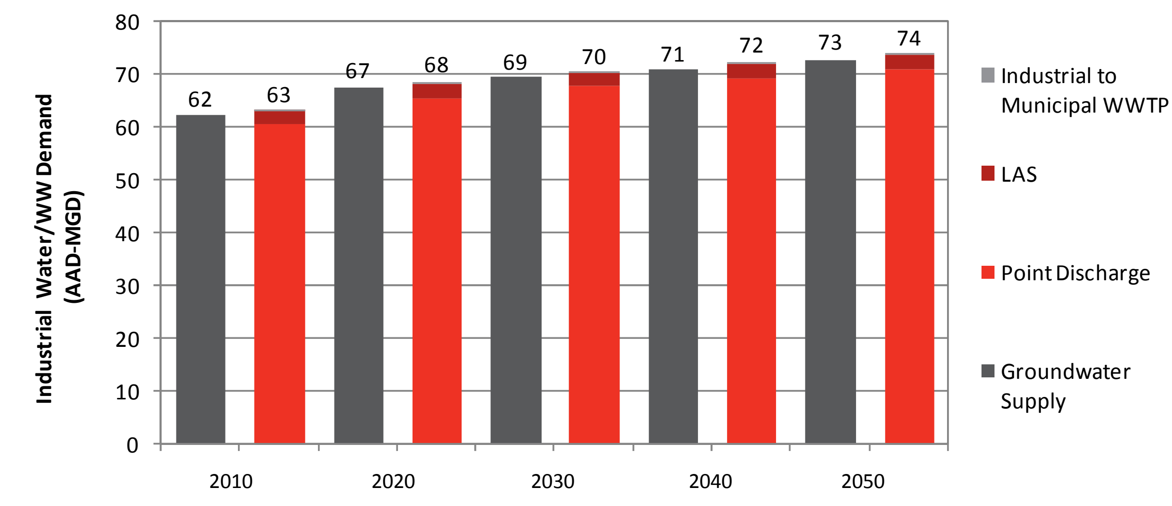
Industrial water forecasts were calculated using information and data specific to each of the major water using industries. For industries where information was available on water use per unit of production, water forecasts were based on production. For industries where product based forecasts were not possible, industry-specific workforce projections were assumed to reflect the anticipated growth in water use within the industry. Figure 4-3 shows the industrial water and wastewater forecast over the planning period. Similar to the municipal water demands, industrial demands in the Altamaha Region are fully satisfied by utilizing groundwater as the sole source for withdrawals.

Industrial Wastewater Forecasts

Industrial wastewater forecasts were calculated for each sector by multiplying the industrial water use by the ratio of wastewater to water for that industrial sector. For example in the apparel category, for every gallon of water used, there will be 0.6 gallons of wastewater produced. For the paper category, for every gallon of water used, there will be 1.0 gallon of wastewater produced.

Once the industrial wastewater flows were estimated, flows were separated between point discharges and land application. The industrial wastewater forecasts are presented in Figure 4-3 by the anticipated disposal system type: industrial wastewater treatment (point discharge), LAS, or discharge for municipal wastewater treatment.

Figure 4-3: Total Industrial Water and Wastewater Forecast (in AAD-MGD)



Source: Altamaha Water and Wastewater Forecasting Technical Memorandum; CDM, 2011.

4.3. Agricultural Forecasts

The agricultural water use forecasts include irrigation demands for both crop and non-crop uses (i.e., livestock, nurseries, and golf courses). The crop forecasts, developed by the University of Georgia for 2011 through 2050, provide a range of irrigation water use from dry to wet climate conditions based on the acres irrigated for each crop. Table 4-3 lists a drier-than-normal year crop irrigation forecast for each county.

The University of Georgia also compiled non-crop (including non-permitted) agricultural water demand 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 4-3. For golf courses and livestock production, current (2011) water forecasts were developed, but future forecasts were not developed for this first round of regional water planning due to lack of available data. Current water demands were held constant throughout the planning period for these water use sectors. Full documentation of the methodology and results of the agricultural forecasts developed by the University of Georgia are available at:

www.nespal.org/sirp/waterinfo/State/awd/agwaterdemand.htm.

Figure 4-4 shows the regional agricultural demands by source of supply. An 18% increase in agricultural water demand is projected by 2050 for the Altamaha Region. The largest increase in forecasted demand occurs in Toombs County, with a 36% increase by 2050. Tattnall and Evans Counties have the next largest forecasted demand increases at 26% and 22%, respectively. All other counties in the region are

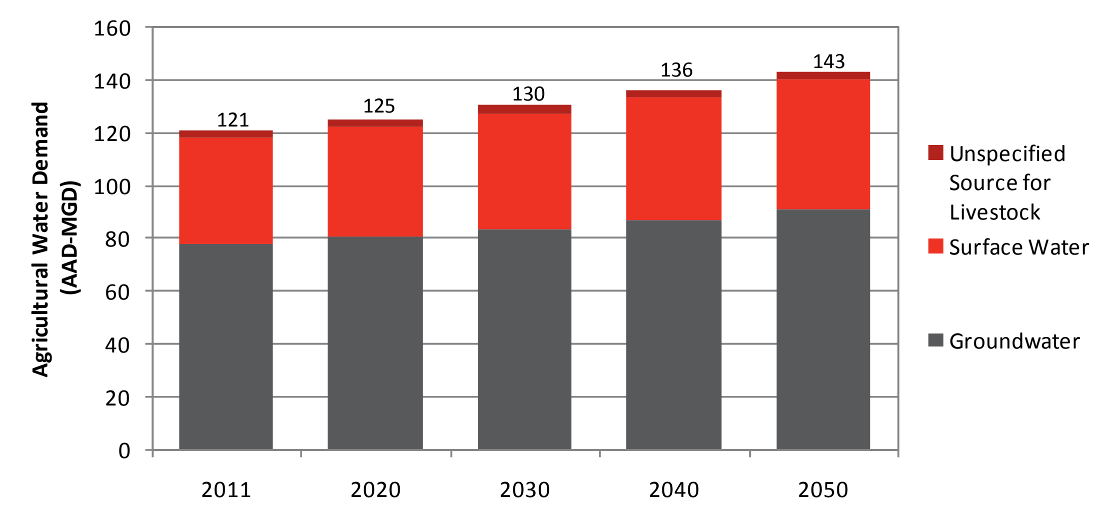
forecasted to have increases of less than 20% through 2050, with Montgomery and Johnson Counties having the smallest increases at 8% and 2%, respectively. As shown in Figure 4-4, the majority of the agricultural withdrawals (over 60%) are supplied by groundwater and the remainder by surface water.

Table 4-3: Agricultural Water Forecast by County (in AAD-MGD)[1-3]

County	2011		2020		2030		2040		2050	
	Crop	Non-Crop	Crop	Non-Crop	Crop	Non-Crop	Crop	Non-Crop	Crop	Non-Crop
Appling	5.59	0.71	5.71	0.71	5.87	0.72	6.05	0.72	6.24	0.73
Bleckley	10.46	0.78	10.64	0.78	10.88	0.78	11.15	0.78	11.45	0.78
Candler	4.94	0.34	5.04	0.34	5.17	0.34	5.31	0.34	5.46	0.34
Dodge	12.33	0.46	12.76	0.46	13.29	0.46	13.87	0.46	14.51	0.46
Emanuel	4.38	0.32	4.52	0.33	4.69	0.33	4.88	0.34	5.08	0.34
Evans	5.82	1.33	6.09	1.36	6.44	1.40	6.83	1.44	7.26	1.49
Jeff Davis	5.73	0.18	5.91	0.18	6.13	0.18	6.37	0.18	6.62	0.18
Johnson	1.76	0.14	1.76	0.14	1.77	0.14	1.78	0.14	1.79	0.14
Montgomery	2.55	0.46	2.60	0.46	2.66	0.46	2.73	0.46	2.80	0.46
Tattnall	15.59	0.84	16.40	0.84	17.43	0.84	18.58	0.84	19.86	0.84
Telfair	8.57	0.08	8.87	0.08	9.26	0.08	9.69	0.08	10.17	0.08
Toombs	10.42	0.87	11.18	0.89	12.14	0.91	13.22	0.93	14.43	0.96
Treutlen	1.37	0.25	1.41	0.26	1.45	0.27	1.51	0.27	1.56	0.28
Wayne	3.34	0.49	3.41	0.50	3.51	0.51	3.62	0.52	3.74	0.53
Wheeler	3.02	1.00	3.09	1.02	3.18	1.03	3.29	1.05	3.40	1.08
Wilcox	16.14	0.28	16.75	0.28	17.53	0.28	18.40	0.28	19.37	0.28
Sub-Total	**112.0**	**8.5**	**116.1**	**8.6**	**121.4**	**8.7**	**127.3**	**8.8**	**133.8**	**9.0**
Total	**120.5**		**124.8**		**130.1**		**136.1**		**142.7**	

[1]Source: University of Georgia, 2010.
[2]Crop demands represent dry year conditions, in which 75% of years had more rainfall and 25% of years had less based on rainfall records from 1950 to 2007. Non-crop demands consist of livestock, nurseries, and golf course uses.
[3]Agricultural withdrawals (crop and non-crop) are supplied by groundwater and surface water.

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



Source: Altamaha Water and Wastewater Forecasting Technical Memorandum; CDM, 2011.
Livestock demands do not have information on source of supply and are not included in forecasts that are reported by source of supply.

4.4. Water for Thermoelectric Power Forecasts

Thermoelectric 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. Full details of the state-wide energy sector water demand forecast can be accessed on the EPD website at:
www.georgiawaterplanning.org/pages/forecasting/energy_water_use.php.

Thermoelectric water demands for the Altamaha Region are shown in Table 4-4. The first two rows show the regional forecast of water demand for existing facilities and facilities planned to become operational by 2020. Beyond 2020, the location of generating facilities that may be built is not known. Therefore, water demands beyond 2020 associated with this unplanned power capacity need were developed on a state-wide basis and not disaggregated regionally. The state-wide forecasts show that in 2030, an additional 58 MGD of water consumption (106 MGD of withdrawal) is needed to meet projected state-wide energy production requirements, with 170 MGD of consumption (313 MGD of withdrawal) needed state-wide in 2050.

The Altamaha Council acknowledges that some portion of the future additional generating capacity may be constructed in the Altamaha Region in future years. Council discussed “economy of scale” considerations for siting, designing, and constructing new generating capacity and identified that about a 2,000 megawatt facility would be the likely capacity to warrant new capital investment. For the purposes of water planning, the Altamaha Council developed the water demand scenario shown in Table 4-4 for 2030-2050, with the acknowledgement that actual

demand may vary considerably. This approach results in 28% of the unassigned state-wide consumptive use being projected to occur in the Altamaha Region in 2030 and 20% in 2050. The Altamaha Council also identified several principles to consider when developing additional energy needs including: locating facilities in areas of sufficient supply, encouraging reuse where possible and feasible, and encouraging close cooperation with local government to promote “fairness” in water supply and accommodating other possible growth sectors. For more information please see the Altamaha Water and Wastewater Technical Memorandum (CDM, 2011).

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

Category	2010	2020	2030[1]	2040[1]	2050[1]
Existing and Planned Facilities’ Withdrawals	51.0	50.5	50.5	50.5	50.5
Existing and Planned Facilities’ Consumption	32.7	32.4	32.4	32.4	32.4
Regional Portion of Unassigned Withdrawals	-	-	25.0	25.0	50.0
Regional Portion of Unassigned Consumption	-	-	16.5	16.5	33.3
Total Regional Withdrawals	51.0	50.5	75.5	75.5	100.5
Total Regional Consumption	32.7	32.4	48.9	48.9	65.4

Source: Statewide Energy Sector Water Demand Forecast Technical Memorandum; CDM, 2010.
[1]Water Demand Forecasts from 2030 to 2050 were decided by the Council based on the minimum threshold for power plant expansion.

4.5. Total Water Demand Forecasts

Total water demand forecasts in 2010 and 2050 for the Altamaha Region are summarized in Figure 4-5. This figure presents the forecasts for municipal, industrial, agricultural, and thermoelectric power. Overall, the region is expected to grow by 34% (90 MGD) in water demand from 2010 through 2050.

Figure 4-6 summarizes total wastewater and return flow forecasts in 2010 and 2050 for the Altamaha Region. This figure presents the forecasts for municipal, industrial, and thermoelectric power discharges. Overall, the region is expected to grow by 34% (36 MGD) in wastewater flows from 2010 through 2050.

Figure 4-5: Water Demand in 2010[1] and 2050[2]

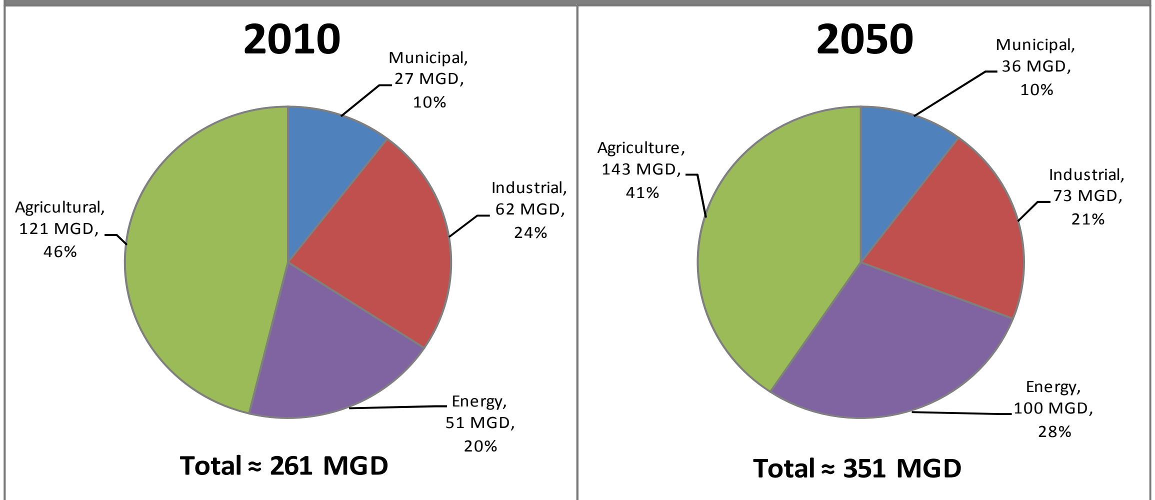
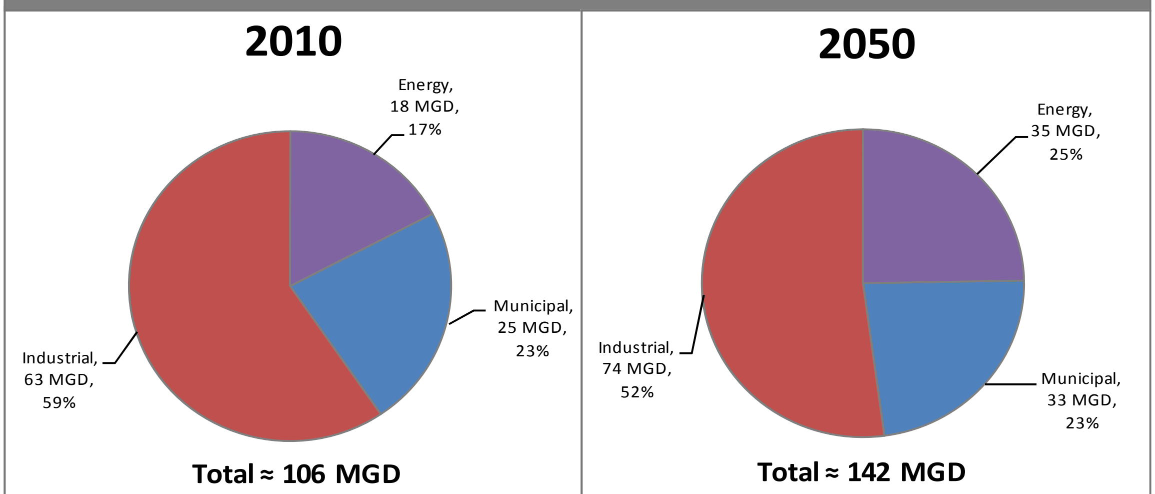


Figure 4-6: Wastewater/Return Flow in 2010[1] and 2050[2]

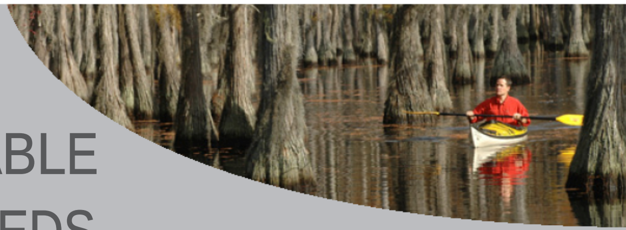


Source: Altamaha Water and Wastewater Forecasting Technical Memorandum; CDM, 2011.

[1] 2010 Energy totals shown represent total thermoelectric withdrawal; 33 MGD of the total 51 MGD (64%) is consumptive, the remainder is discharged back to surface waters as return flow. For 2050, 65 MGD of the total 100 MGD (65%) is consumptive, the remainder is discharged back to surface waters as return flow.

[2] The portion of thermoelectric withdrawal (50.0 MGD) and return flow (16.7 MGD) associated with future unplanned generating capacity is not assigned to specific resources and, therefore, is not included in resource assessments.

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 capacity of the resource have a gap that will be addressed through water management practices. This Section summarizes the gaps and water supply needs for the Altamaha Region.

Summary

Over the next 40 years, forecasted surface water demand within the Altamaha Region will exceed the available resource in the Canoochee River. Increased demand in the region may also add to surface water gaps downstream of the region on the Ogeechee River at the Kings Ferry planning node, the Satilla River at Atkinson node, and the Alapaha River at the Statenville node.

At the regional level, for modeled aquifers, no groundwater resource shortfalls are expected to occur in the Altamaha Region over the 40 year planning horizon.

Assimilative capacity assessments indicate the need for improved wastewater treatment in some facilities within the Altamaha, Ocmulgee, Ogeechee, 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 Upper Floridan Aquifer is a vital resource for the Altamaha Region. Overall, the results from the Groundwater Availability Resource Assessment (EPD, March 2010) indicate that the sustainable yield for the modeled portions of the regional aquifer(s) is greater than the forecasted demands.

At this time, no regional groundwater resource gaps are expected to occur in the Altamaha Region over the 40 year 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 Candler, Emanuel, Evans, Jeff Davis, Montgomery, Wayne, Wheeler, and Wilcox 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.

Table 5-1: 2050 Forecast versus Groundwater Permitted Capacity						
County	Municipal			Industrial		
	2050 Public Demand Forecast (AAD – MGD)	Existing Municipal Groundwater Permitted Yearly Average (MGD)	Municipal Permitted Capacity Need in 2050 (MGD)	2050 Industrial Demand Forecast (AAD – MGD)	Existing Industrial Groundwater Permitted Yearly Average (MGD)	Industrial Permitted Capacity Need in 2050 (MGD)
Candler	1.2	0.9	0.3	0.0	0.0	None
Emanuel	2.6	2.0	0.6	1.1	1.7	None
Evans	0.9	0.5	0.4	1.8	1.7	0.1
Jeff Davis	1.4	0.9	0.5	0.4	1.0	None
Montgomery	0.9	0.8	0.1	0.0	0.0	None
Wayne	3.1	2.6	0.5	69.2	68.0	1.2
Wheeler	0.4	0.4	0.03	0.0	0.0	None
Wilcox	0.8	0.0	0.8	0.0	0.1	None

Source: Altamaha Gap Analysis Technical Memorandum; CDM, 2011.

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. There are several surface water planning nodes located in and in close proximity to the Altamaha Region. From the Surface Water Availability Resource Assessment (EPD, March 2010), the basic conclusions of the future conditions modeling show surface water gaps (i.e., there are times when there is insufficient water to meet off-stream demands and also meet the targets for support of instream uses) at the following nodes: Claxton (Canoochee River), Kings Ferry (Ogeechee River, outside of Altamaha Region), Atkinson (Satilla River, outside of Altamaha Region) and Statenville (Alapaha River outside of the Altamaha Region). When assessing this issue, the Altamaha Council recognized that surface water gaps are driven by both net consumption (withdrawal minus returns) and year to year variations in river flows. In wet years, the region is likely to not experience any shortfalls to off-stream uses and instream needs. In dry years, the shortfalls are likely to be more severe. In order to better assess these shortfalls and to better understand the types of management practices that may be required, a more detailed quantification of the frequency and severity of shortage was completed.

First, a quantification of the largest flow shortfall was completed. This quantification estimated the average flow of water that would be needed to increase stream flows to their minimum target levels, and it quantified the number of days that the flow would be needed. The flow needed and the number of days that it is needed results in an estimate of the total volume of water that would be needed to address the largest flow shortfall.

Using the same approach outlined above, quantification of shortfalls was completed for the average flow needed to address 90% of the shortages and 50% of the shortages. It is important to note that in some cases, the largest flow shortage did not always correspond to the largest volume shortage because some shortfalls are lower in flow rate but longer in duration.

The quantification of shortfalls is especially relevant when selecting water management practices. For example, if the preferred management practice is to replace surface water diversions with groundwater withdrawals, it is important to know how much flow needs to be generated and for what length of time. This process will in turn dictate the number and size of wells needed to generate the flow. If a reservoir is the preferred practice, then one needs to know the largest volume of storage needed because stream flow needs can then be addressed by controlling the rate of flow released from the reservoir. In addition, since the largest shortages occur less frequently, there are important cost-benefit considerations associated with addressing the largest and more infrequent shortfalls.

The geographic location of the modeled regional surface water gaps are shown in Figure 5-1. The gaps are quantified in terms of flow. The flow values depicted in the charts represent the average additional flow at that node that would be needed to close the specified gap occurrence. These flows are presented on a percent capture basis. The term “capture” refers to the percent of all gap occurrences at a node that are less than or equal to this flow value. For example, the 50% capture value indicates the flow that would be needed to close half the gap occurrences at a particular node, and the 100% capture value indicates the flow that would be needed to close all gap occurrences at a particular node. In addition to flow, values are given for gap duration (number of days the flow is below 7Q10) and volume (total volumetric shortfall to 7Q10 expressed in acre-feet) at each node. The years and months listed in the figure are tied to the hydrologic data set used in the modeling. The specific years and months are the periods of time when the referenced gap occurred. For example, at the Claxton node the largest flow gap (100% capture) occurred between June and August 1952.

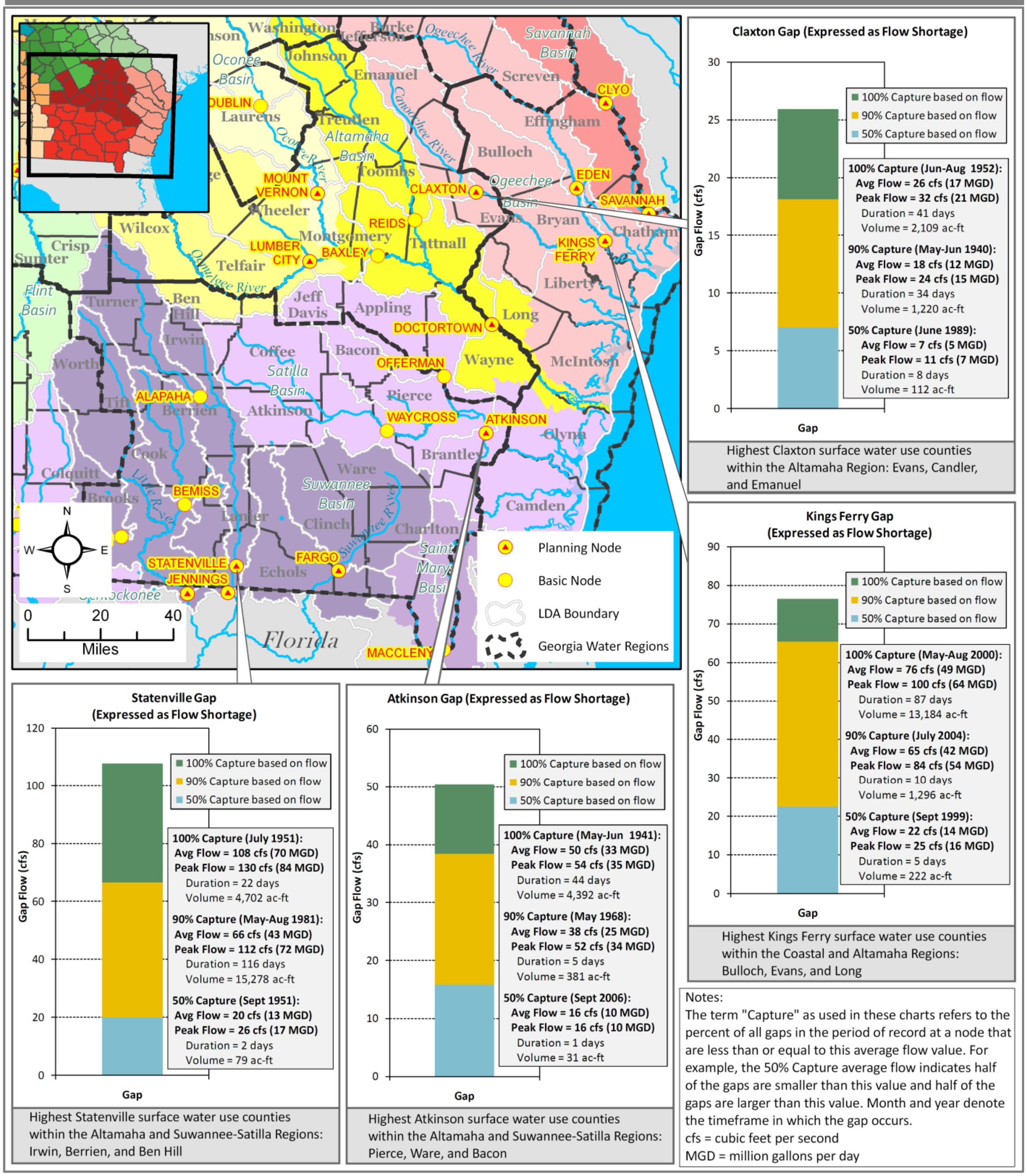
The projected increased use of surface water for the counties within the Altamaha Region that have current and future gaps are shown in Table 5-2. Since there are current gaps at the referenced planning nodes, development of additional surface water to meet projected needs will need to done in a manner that does not increase current gaps.

Table 5-2: 2050 Surface Water Gap Forecast (in AAD-MGD)

County	Planning Node with Gap	Total County Increase in Agriculture Demand by 2050[1]
Appling	Atkinson	0.16
Candler	Claxton	0.30
Emanuel	Eden and Claxton	0.12
Evans	Kings Ferry and Claxton	0.95
Jeff Davis	Atkinson	0.29
Tattnall	Claxton and Kings Ferry	2.68
Wayne	Atkinson	0.04
Wilcox	Statenville	0.78

Source: Altamaha Gap Analysis Technical Memorandum; CDM, 2011.
[1]A portion of this increased demand falls within the local drainage area of the planning node with gap.

Figure 5-1: 2050 Surface Water Gap Summary



5.3. Surface Water Quality Comparisons (Assimilative Capacity)

This Section summarizes the results of 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 2050 wastewater forecast flows. A discussion on non-point source pollution is also included.

Future Treatment Capacity Needs

Existing municipal wastewater permitted capacities were compared to projected 2050 wastewater flows to estimate future treatment capacity needs by county. This analysis was done for both point sources and land application systems, both of which are permitted under the National Pollutant Discharge Elimination System (NPDES). As shown in Table 5-3, Candler and Evans Counties may have small infrastructure needs by 2050. It should be noted that the comparison in Table 5-3 was completed at the county level and localized shortages in treatment capacity may exist.

Assimilative Capacity Assessments

The Assimilative Capacity Assessment at permit conditions (EPD, March 2011) was developed to estimate the ability of streams, estuaries, and harbors to assimilate pollutants under future conditions. The modeling was focused on dissolved oxygen (DO) and based upon municipal and industrial wastewater facilities operating at their full permitted levels in terms of flow and effluent discharge limits. The results of the DO modeling are presented in Table 5-4 and Figure 5-2 for the Altamaha Region, which includes portions of the Altamaha, Oconee, Ocmulgee, and Ogeechee River basins.

Figure 5-3 illustrates the number of reaches within each river basin in the region that have exceeded their DO assimilative capacity in either the baseline or permitted model runs or both. It is important to note that exceedance of assimilative capacity on a reach could be the result of a point source discharge, non-point source loading, or a naturally low DO condition. The river basin tables in the figure summarize recommendations that arose out of coordination with EPD's Watershed Protection Branch and the number of reaches within the basin for which these recommendations apply. In addition to improving low DO conditions in surface waters, these recommendations are aimed at providing sufficient future wastewater permit capacity and preparing for future nutrient standards in receiving waters.

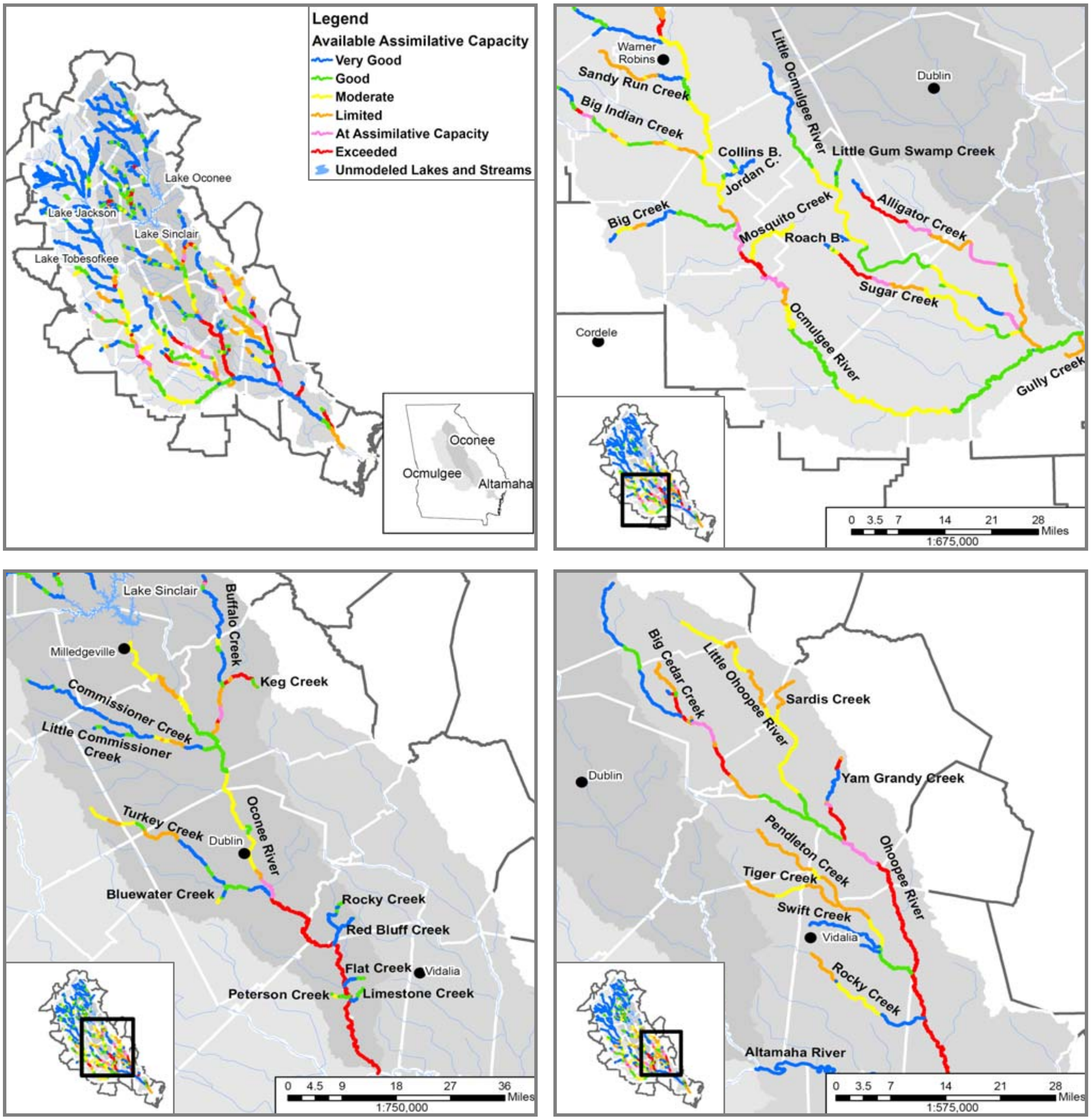
Table 5-3: 2050 Municipal Wastewater Forecast versus Existing Permitted Capacity (MGD)						
County	Point Source (PS)			Land Application Systems (LAS)		
	2050 Forecast[1]	Permitted Capacity	2050 Surplus or Gap (-)	2050 Forecast[1]	Permitted Capacity	2050 Surplus or Gap (-)
Appling	0.7	1.4	0.8	0.2	1.4	1.2
Bleckley	0.6	1.0	0.4	0.0	0.0	0.0
Candler	0.0	0.0	0.0	1.2	1.0	**-0.2**
Dodge	0.8	1.8	1.0	0.2	0.4	0.2
Emanuel	1.0	3.0	2.0	0.3	2.1	1.8
Evans	0.53	0.52	**-0.01**	0.0	0.2	0.2
Jeff Davis	0.8	1.5	0.7	0.0	0.0	0.0
Johnson	0.2	0.8	0.6	0.0	0.0	0.0
Montgomery	0.4	0.4	0.1	0.0	0.2	0.1
Tattnall	1.1	3.8	2.7	0.5	0.7	0.2
Telfair	0.5	0.7	0.2	0.5	1.8	1.3
Toombs	1.4	3.2	1.9	1.4	1.8	0.4
Treutlen	0.3	0.6	0.3	0.0	0.0	0.0
Wayne	1.4	2.5	1.1	0.1	0.2	0.1
Wheeler	0.2	0.5	0.3	0.0	0.0	0.0
Wilcox	0.5	0.7	0.2	0.0	0.0	0.0
Total	**10.4**	**22.5**	**12.1**	**4.3**	**9.6**	**5.3**

Source: Altamaha Gap Analysis Technical Memorandum; CDM, 2011.
[1] Includes industrial wastewater expected to be treated at municipal facilities.

Table 5-4: Permitted Assimilative Capacity for DO in Altamaha River Basins							
Model Run	Basin	Available Assimilative Capacity (Total Mileage)					Total Modeled River Basin Miles[1]
		Very Good (≥1.0 mg/L)	Good (0.5 to <1.0 mg/L)	Moderate (0.2 to <0.5 mg/L)	Limited (>0.0 to <0.2 mg/L)	None or Exceeded (<0.0 mg/L)	
Permitted	Oconee	458	163	39	6	80	746
	Ocmulgee	473	192	185	73	82	1,005
	Altamaha	119	34	48	96	123	420
	Ogeechee	127	211	442	27	127	944

Source: Additional Supporting Material for Permitted Water Quality Resource Assessment; EPD, August 2010.
[1]Total miles include tributaries and main stem of the rivers within and outside of the Altamaha Council boundary.

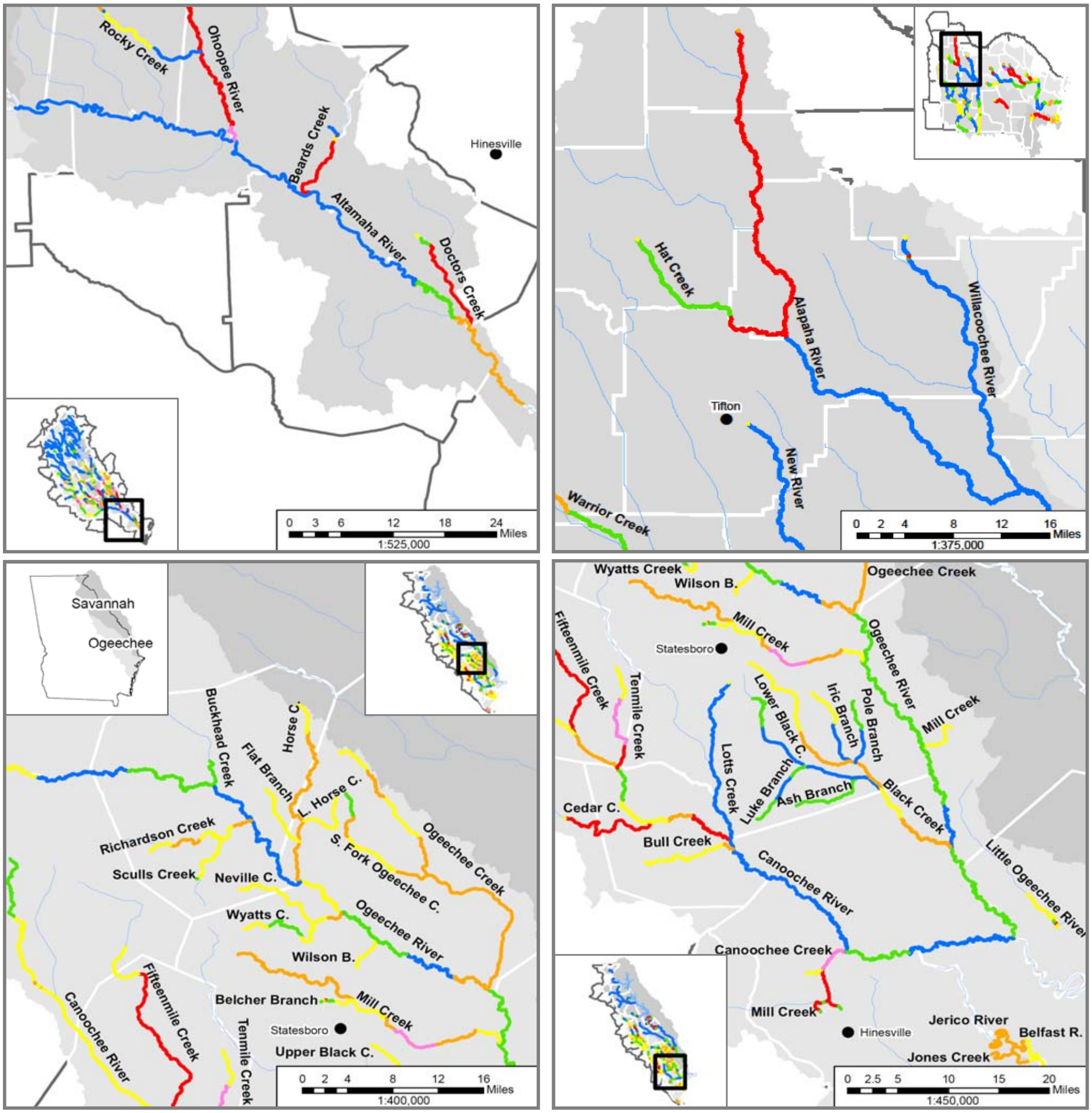
Figure 5-2: Results of Assimilative Capacity Assessment – DO at Permitted Conditions



Source: Additional Supporting Material for Permitted Water Quality Resource Assessment; EPD, October 2010.

Very Good: ≥ 1 mg/L of dissolved oxygen (DO) available (above the water quality standard of 5 mg/L)
Good: 0.5 mg/L to < 1.0 mg/L of DO available
Moderate: 0.2 mg/L to <0.5 mg/L of DO available
Limited: >0.0 mg/L to <0.2 mg/L of DO available
At assimilative capacity: 0.0 mg/L of DO available
None or Exceeded Capacity: <0.0 mg/L of DO available

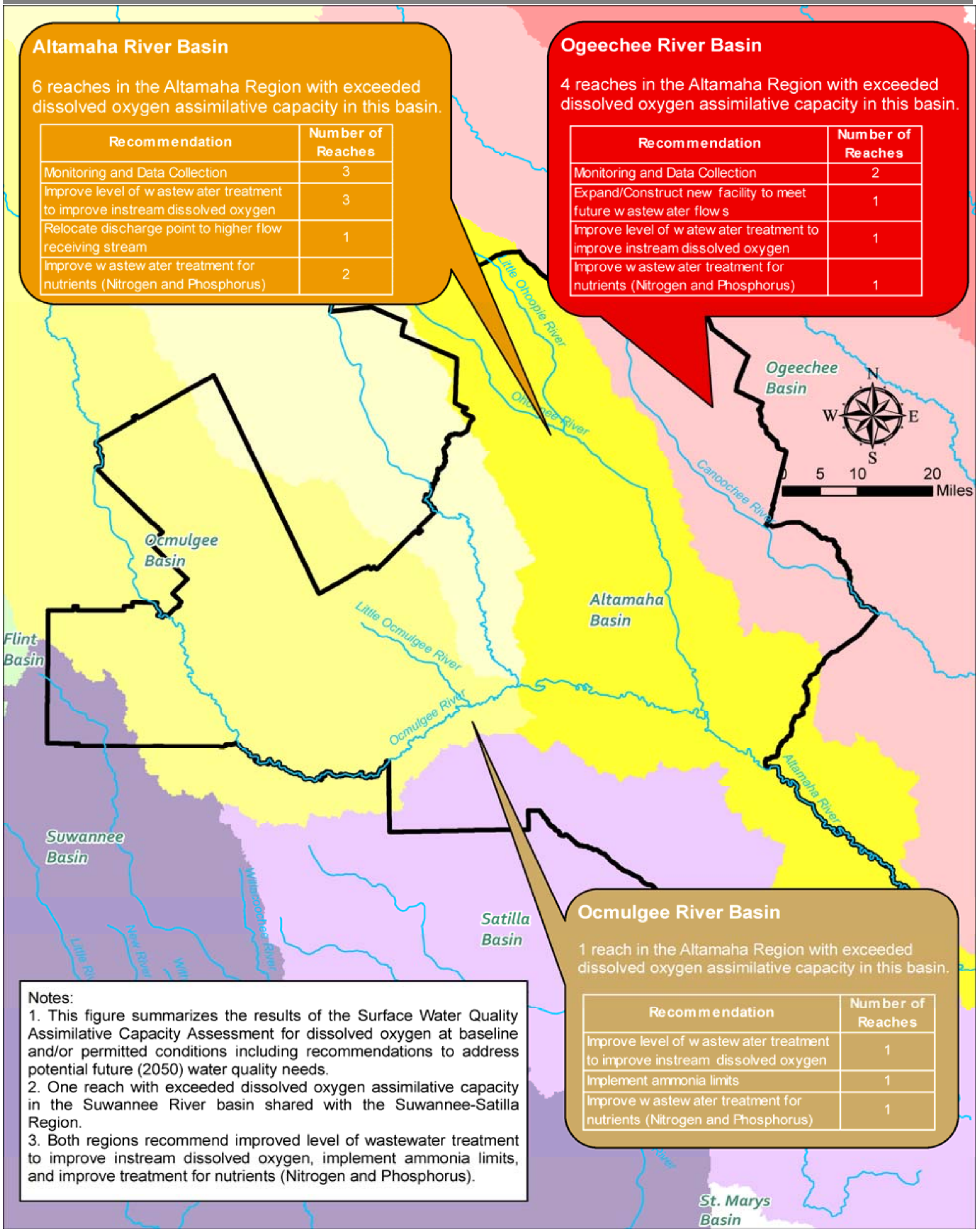
Figure 5-2 (cont.): Results of Assimilative Capacity Assessment – DO at Permitted Conditions



Source: Additional Supporting Material for Permitted Water Quality Resource Assessment; EPD, October 2010.

Very Good: ≥ 1 mg/L of dissolved oxygen (DO) available (above the water quality standard of 5 mg/L)
Good: 0.5 mg/L to < 1.0 mg/L of DO available
Moderate: 0.2 mg/L to <0.5 mg/L of DO available
Limited: >0.0 mg/L to <0.2 mg/L of DO available
At assimilative capacity: 0.0 mg/L of DO available
None or Exceeded Capacity: <0.0 mg/L of DO available

Figure 5-3: Surface Water Quality Gap Summary



Non-Point Source Pollution

Non-point source pollution accounts for the majority of surface water impairments in the region according to the 2008 303(d) list of Rivers, Streams, Lakes, and Reservoirs published by EPD. 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.

Watershed nutrient (nitrogen and phosphorus) modeling was conducted for the Brunswick Harbor/Satilla River watersheds. The goal was to identify nutrient loading rates from different portions of the watershed 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 watershed where there are higher concentration of nutrients (nitrogen and 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. Nutrient and non-point source control management practices specific to land uses within the Altamaha Region are discussed in Section 6.

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 gaps identified and described in Section 5, and/or to meet the Council's Vision and Goals described in Section 1.

Summary

The Altamaha Council selected management practices to help address surface water low flow conditions at the Claxton and shared resource planning nodes, 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 gaps and demonstrates the necessity for region and resource specific water management practices. In cases where shortfalls or gaps 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.

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 Satilla River watershed. The table summarizes general information regarding management practices needed to meet forecasted needs, and more detailed information on management practices needed to address gaps between available resources and forecasted needs. Information on shared resources is provided at the end of the table to identify where management practices in other regional Councils are also needed to address identified gaps. The Altamaha Council reviewed a number of existing local and regional water management plans and related documents during the 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 most significant gaps in the Altamaha Region are surface water availability gaps driven by agricultural irrigation usage. As such, the majority of water supply management practices in Table 6-1 are intended to address agricultural surface water use (in the table the term 7Q10 refers to the 1 in 10 year 7 day low flow condition). Figure 5-1 shows the location and magnitude of regional surface water gaps and should be referenced to provide the geographic focus of the management practices. The Altamaha Council considered a number of practices to close these surface water availability gaps, ranging from agricultural conservation to one or more regional reservoirs. While reservoirs would provide multiple potential benefits, the flat topography of the region makes siting of regional reservoirs difficult, expensive, and may have associated impacts. The Altamaha Council concluded that integrating practices, rather than using a single practice would be more effective at addressing gaps 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 gaps are not addressed, then more costly and complex management practices will be pursued.

Surface water gaps (increased frequency or severity of 7Q10 low flow conditions) in the region exist under current and future conditions at the Claxton planning node and 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 gaps among others. The gap at Claxton occurs primarily as a result of net consumption associated with agricultural water use in the February-November timeframe. The Altamaha Council's management practices will address a significant portion of the net consumption at Claxton and when combined with management practices from the Coastal Georgia and Savannah-Upper Ogeechee water planning regions will close surface water gaps over time. Finally, as described in Section 5.2 it is important to keep in mind that shortage to low flow conditions do not occur every year. In some cases, for years with shortages the shortages 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 gaps, including stream segments with no dissolved oxygen assimilative capacity and insufficient wastewater permit capacity.

In addition to addressing gaps, the Altamaha Council identified several management practice recommendations in Table 6-1 to address forecasted future uses. These recommendations include such practices 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 gaps and meet future uses when combined with practices for all shared resource regions.

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

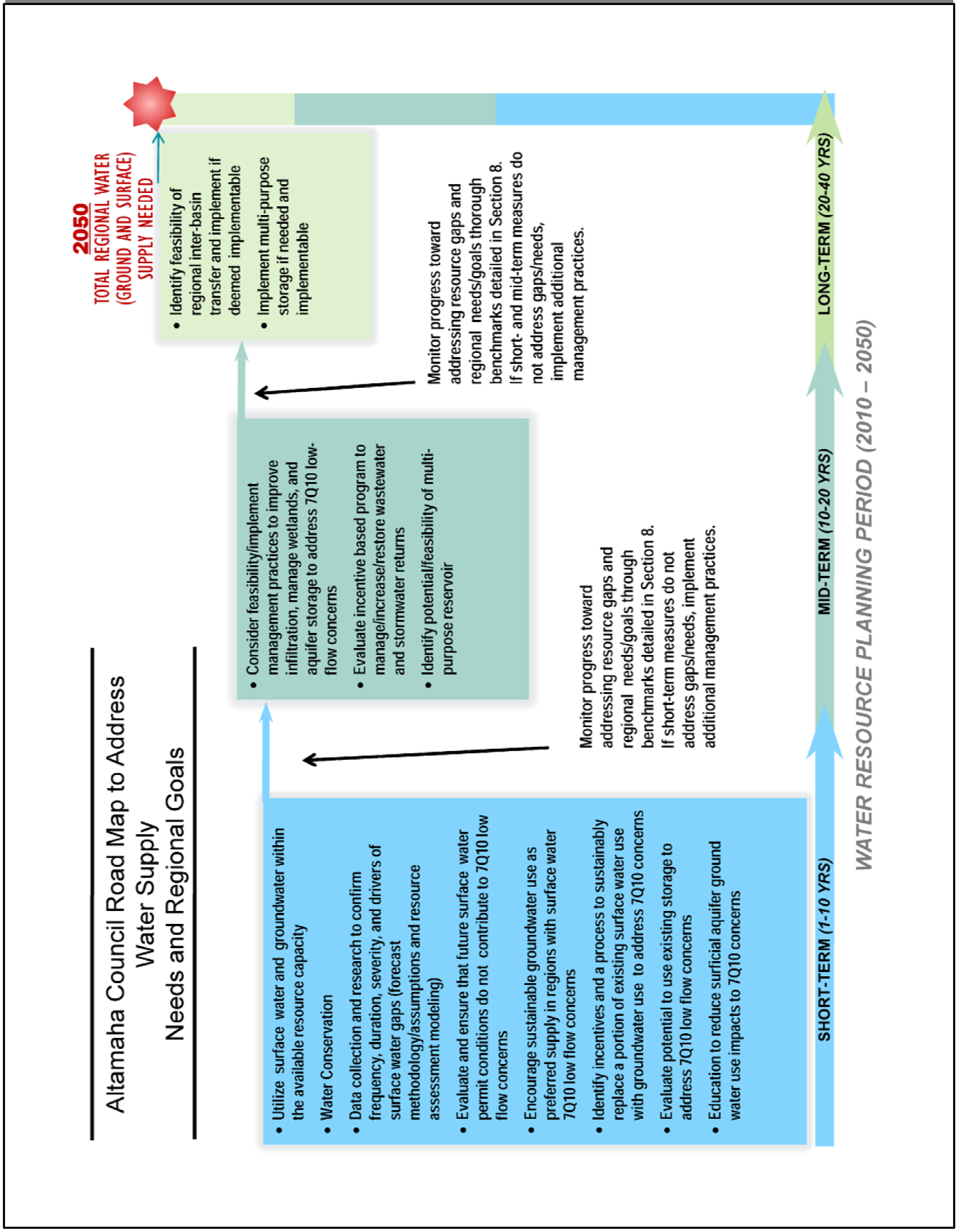


Figure 6-2: Recommended Surface Water Quality Management Practices in a Phased Approach

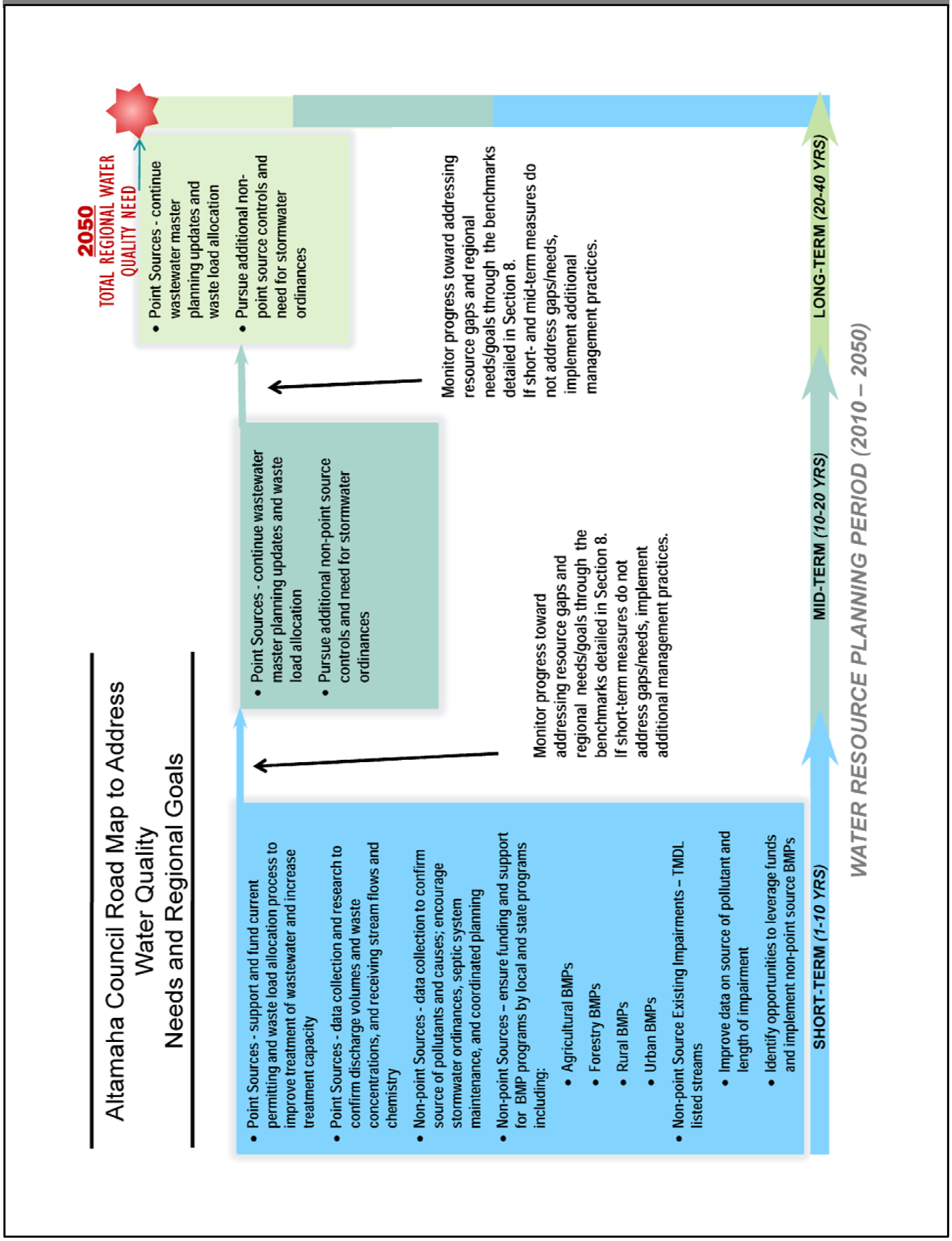


Table 6-1: Management Practices Selected for the Altamaha Region

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 in Gap Areas **Data Collection/Additional Research (DCAR)** to confirm frequency, duration, severity, and drivers of surface water gaps 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 and the projected surface water gaps on the Canoochee River at Claxton, Ogeechee River at Kings Ferry, Alapaha River at Statenville, Satilla River at Atkinson (hereafter referred to as "gap areas")	-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 gap[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 surface water gap areas.[1] -Maintain and fund river gauging stations.	2,3,6
DCAR-4 Support Irrigation Efficiency Research	Improvement of surface water flows (in gap areas) 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 (in gap areas) 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 Study Potential Use of Aquifers to Address Gaps	Improvement of surface water flows (in gap areas).	Conduct research to determine the feasibility and potential benefits and limitations of aquifer storage and recovery for confined aquifers; and determine the feasibility and potential benefits to recharge surficial aquifers to increase stream baseflow to address gaps	1,2,4,11
DCAR-8 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-9 Analyze Addressing Extreme Conditions	Cost effectively address surface water low flow conditions (in gap areas) 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 gaps that are larger in magnitude, but occur infrequently.	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 gaps 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), and Water Stewardship Act of 2010] 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 gaps 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 surface water gap areas	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 gaps 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 surface water gap areas	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]			
ASWS-1 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 within the Local Drainage Areas that contribute flow to gap areas	Future surface water uses - If surface water (ponds and withdrawals) is sought for future water supply in gap areas (new permits), the Applicant, GSWCC, 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-2 Incentives for Dry-Year Releases from Ponds	Help improve surface water flow in gap areas 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/gap years	2,4,6
ASWS-3 Incentives for Sustainable Groundwater Development		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 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

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)
ASWS-4 Monitor Gap Closure and Manage Adaptively	Help improve surface water flow in gap areas during low flow conditions	Monitor gap closure. If progress toward gap closure 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-8 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
ASWS-6 Land Management Incentives		Incentive-based land use practices to help promote infiltration and aquifer recharge	1,9,12
ASWS-7 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
ASWS-8 Address Gaps Periods with Aquifer Storage		If deemed fiscally and technically effective (based on outcome of research in DCAR-7), implement aquifer storage and recovery and/or recharge of surficial and other aquifers to help retime flows to gap periods	1,2,4,11
ASWS-9 Study Multi-Region Reservoir Feasibility		Evaluate feasibility and need for regional joint reservoir with Savannah-Upper Ogeechee and Upper Oconee Councils, and/or use of existing reservoirs and/or multiple new smaller reservoirs	2,6,10-12
ASWS-10 Inter-Basin Transfers		Inter-basin transfers from within the region or collaborating regions that can address regional water needs and benefit both the areas from which the transferred water is withdrawn and the area receiving the water	2,6,9-12

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)
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 5-2 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 5-2 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.	9-11
PSDO-3 Enhance Point Source Treatment		Upgrade/improve treatment to address low dissolved oxygen conditions in receiving streams	2,6,9-11
Action Needed - Address Wastewater Permit Capacity Needs/Gaps			
Available Municipal Wastewater Permit Capacity (MWWPC)			
MWWPC-1 Increase Wastewater Capacity	Additional municipal wastewater treatment capacity may be needed in Candler and Evans Counties	Expand or construct new facilities and/or obtain additional wastewater permit capacity to meet forecasted needs Planned municipal projects in Candler and Evans Counties	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

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 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 Candler, Emanuel, Evans, Jeff Davis, Montgomery, Wayne, Wheeler, and Wilcox Counties	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 Upper 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
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 Practice Number	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
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
NPSU-4 Riparian Buffers	Protect and maintain riparian buffers along urban streams	9,11

Management Practice Number	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
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 indentified 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
NPSA-4 Manure Control	Responsible manure storage and handling	9,11

Management Practice Number	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
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 – Satilla River Watershed Model (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) - Agricultural BMPs - Forestry BMPs - Rural BMPs - Urban BMPs See Above Non-Point Source for Details	9,11
Management Practices to Address Future Educational Needs (EDU)		
EDU-1 Promote Conservation Programs	Support Water Conservation Programs	2,3,5,6

Management Practice Number	Description/Definition of Action	Relationship of Action or Issue to Vision and Goals (Section 1.4)
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 (Lumber City Watershed Protection Plan, 2007)	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

Summary of Management Practices for Shared Resources – The Altamaha Region will combine its management practices with the following Councils to address shared resource gaps.

Surface Water Quantity – Canoochee River (Claxton), Ogeechee River (Kings Ferry), Satilla River (Atkinson), and Alapaha River (Statenville)

Altamaha – The Altamaha Regional Council has identified the management practices in the above table to address the majority of the gap at Claxton, a portion of the cumulative gap at Kings Ferry, a small portion of the cumulative gap at Statenville, and a portion of the cumulative gap at Atkinson.

Coastal Georgia – The Coastal Georgia Regional Council has identified water conservation, replacement of surface water use with groundwater, refinement of forecasting and modeling data, and potential use of incentives and new permit conditions to address a small portion of the cumulative gap at Kings Ferry. The management practices that close gaps at Kings Ferry will also close the gaps at Claxton and Eden.

Savannah-Upper Ogeechee – The Savannah-Upper Ogeechee Regional Council has identified water conservation, replacement of surface water use with groundwater use, and agricultural water use monitoring program to address a portion of the cumulative gap at Kings Ferry.

Upper Oconee – The Upper Oconee Regional Council has identified the use of variable rate irrigation, development of new groundwater wells, and encouraging centralized sewer in developing areas to address a small portion of the gap at Eden and a small portion of the cumulative gap at Kings Ferry.

Suwannee-Satilla– The Suwannee-Satilla Regional Council has identified water conservation, replacement of surface water use with groundwater use, refinement of forecasting and modeling data, and potential use of incentives and new permit conditions to address the majority of the cumulative gap at Statenville and at Atkinson.

Upper Flint – The Upper Flint Regional Council has identified conservation, investigation of replacement of surface water with groundwater, greater utilization of farm ponds, and consideration of new storage and Aquifer Storage and Recovery to address a portion of the cumulative gap at Statenville.

Surface Water Quality:

Satilla River Watershed Model – The Suwannee-Satilla Regional Council has identified the same Best Management Practices for reducing nutrient loading as are summarized in the above table for the Altamaha Council.

Suwannee-Satilla – One reach with exceeded dissolved oxygen assimilative capacity in the Suwannee River basin is shared with the Suwannee-Satilla Region. Both regions recommend improved level of wastewater treatment to improve instream dissolved oxygen, implementation of ammonia limits, and improved treatment for nutrients (Nitrogen and Phosphorus).

Notes:

[1]Seek to reduce frequency and severity of human impacts to 7Q10 low flow conditions in the region, which are associated with agricultural water use in portions of the Altamaha Region. Focus on surface water permit holders and new surface water permit requests in Canoochee Watershed [Candler, Evans, Emanuel, Tattnall, and Bulloch Counties (Claxton Gap)], Ogeechee Watershed [Candler, Emmanuel, and Evans Counties (Eden and Kings Ferry Gap)], Alapaha Watershed [Wilcox County (Statenville Gap)], and Satilla Watershed [Appling, Jeff Davis, and Wayne Counties (Atkinson Gap)].

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

7. IMPLEMENTING WATER MANAGEMENT PRACTICES

Section 7. Implementing Water Management Practices

This section presents the Altamaha Council's estimated timeframes 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 2010 to 2020 and long-term as 2020 to 2050. 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 gaps are not closed, 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 timeframe 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) and Associated Date(s)	For Short-term Actions (2010-2020): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2020-2050): Further Action to Complete Implementation and Associated Dates	Responsible Parties
Data Collection/Additional Research (DCAR)						
DCAR-1 through DCAR-5[1] Agricultural Data Collection and Irrigation Research	Current and Future Surface Water Use in Gap Areas (Canoochee, Ogeechee, Satilla, and Alapaha Rivers)	N/A	Develop scope of work (01/2012-06/2012) and key partnering agencies (06/2012-01/2015)	Complete data collection, research, and evaluation by 01/2015 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 Study Aquifer Potential to Address Gaps						EPD, Universities, Corporations, Water Utilities and Agricultural water users

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) and Associated Date(s)	For Short-term Actions (2010-2020): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2020-2050): Further Action to Complete Implementation and Associated Dates	Responsible Parties
DCAR-8 Address Low Flow with Wetland Restoration and Retention Structures	Current and Future Surface Water Use in Gap Areas (Canoochee, Ogeechee, Satilla, and Alapaha Rivers)	N/A	Develop scope of work (01/2012-06/2012) and key partnering agencies (06/2012-01/2015)	Complete data collection, research, and evaluation by 01/2015 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
DCAR-9 Analyze Addressing Extreme Conditions						EPD
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 (06/2011-12/2011) Conduct outreach/ education/incentives to encourage implementation of conservation measures	Implement water conservation practices through 01/2020	Verify conservation savings estimates	EPD, Georgia Municipal Association, Georgia Association of County Commissioners, and Water Providers 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) and Associated Date(s)	For Short-term Actions (2010-2020): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2020-2050): Further Action to Complete Implementation and Associated Dates	Responsible Parties
WC-2 through WC-12 Tier 1 through Tier 4 Measures for Agricultural Users	Current and Future Surface and Groundwater Use in Gap/Non-gap Areas	Agricultural Groundwater and Surface Withdrawal	Confirm and verify status of selected practices (06/2011-12/2011) Conduct outreach/ education/incentives to encourage implementation of conservation measures	Implement water conservation practices through 01/2020	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]						
ASWS-1 Consider Low-Flow Conditions in Future Surface Water Permitting	Future Surface Water Use in Gap Areas	Agricultural Surface Withdrawal	EPD to develop Data Needs and Guidance for Analysis Requirements Applicants to submit analysis from 2010-2015	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 01/2015)	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) and Associated Date(s)	For Short-term Actions (2010-2020): Further Action to Complete Implementation and Associated Dates		For Long-term Actions (2020-2050):
ASWS-2 Incentives for Dry-Year Releases from Ponds	Current and Future Surface Water Use in Gap Areas	Agricultural Surface Withdrawal	Develop strategy and work with potential participants/ impacted users to increase support for and implementation of strategy	Examine opportunities to modify farm and other pond operations to obtain releases in dry/gap years (by 01/2015)	Modify farm and other pond operations to obtain releases in dry/gap years (by 01/2030), if deemed feasible	EPD, GSWCC, Georgia DOA , and Agricultural surface water users in the Altamaha Region for implementation
ASWS-3 Incentives for Sustainable Groundwater Development		Agricultural Surface/ Groundwater Withdrawal		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 01/2015)	N/A	
ASWS-4 Monitor Gap Closure and Manage Adaptively		Agricultural Surface/ Groundwater Withdrawal		Evaluate need and feasibility to conjunctively manage groundwater and surface water to address 7Q10 low flow conditions (by 01/2015)		EPD 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) and Associated Date(s)	For Short-term Actions (2010-2020): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2020-2050): Further Action to Complete Implementation and Associated Dates	Responsible Parties
ASWS-5 Restoration Incentive Programs	Current and Future Surface Water Use in Gap Areas	Wetland Restoration	Encourage research to determine effectiveness and feasibility of restoring wetlands (see DCAR-8)	Determine effectiveness and feasibility of restoring wetlands (by 01/2015)	Restore wetland characteristics (by 01/2030), if deemed effective and feasible	EPD
ASWS-6 Land Management Incentives		City and County Land Use	Incentive-based practices to promote infiltration and aquifer recharge	Determine effectiveness and feasibility of implementing practice (by 01/2015)	If deemed effective and feasible, implement practice based on status of gap closure (by 01/2025)	EPD, Municipalities and Water/ Wastewater Utilities in the Altamaha Region
ASWS-7 Incentives for Greater Wastewater Returns		Wastewater/ Stormwater NPDES Discharge, Sanitary Sewer Extension	N/A		Continue to monitor land use and hydrologic relationships	
ASWS-8 Address Gaps Periods with Aquifer Storage		Underground Injection Public Water System	Evaluate effectiveness and feasibility of aquifer storage and recovery/aquifer recharge (see DCAR-7)	Implement if outcome of evaluation determines practice is feasible and effective (by 01/2020) and if necessary legislative changes are approved	N/A	EPD, Universities, Corporations, Georgia Legislature, Water Utilities and Agricultural water users 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) and Associated Date(s)	For Short-term Actions (2010-2020):	For Long-term Actions (2020-2050):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
ASWS-9 Study Multi-Region Reservoir Feasibility	Future Surface Water Use in Gap Areas	Surface Water Withdrawal	Monitor gap closure	Based on rate of gap closure, consider reservoir reconnaissance/feasibility study (by 01/2015)	Construct joint regional reservoir and/or multiple new smaller reservoirs (and/or utilize existing reservoirs) (by 01/2030)	EPD, Agricultural water users in the Altamaha Region, other collaborating regions
ASWS-10 Inter-Basin Transfers				Based on rate of gap closure, consider inter-basin transfer reconnaissance/feasibility study (by 01/2020)	Construct infrastructure for inter-basin transfers, if feasible and needed (by 01/2050)	
Point Sources – Dissolved Oxygen (PSDO)						
PSDO-1 Collect Water Quality Data	Water Quality Gaps	General Wastewater	EPD to work with potentially effected entities as part of permitting process (by 01/2015)	Collect data to confirm loading and/or receiving stream chemistry (by 01/2020)	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 01/2015)	If feasible and cost effective, relocate discharge location (by 01/2020)	

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) and Associated Date(s)	For Short-term Actions (2010-2020):	For Long-term Actions (2020-2050):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
PSDO-3 Enhance Point Source Treatment	Water Quality Gaps	General Wastewater	Confirm wastewater facilities to upgrade/improve treatment to address low dissolved oxygen conditions in receiving streams (by 01/2015)	Upgrade/improve treatment of identified wastewater facilities (by 01/2015)	Continue to upgrade/improve treatment of identified wastewater facilities (by 01/2040)	Municipalities and/or wastewater utilities in the Altamaha Region
Available Municipal Wastewater Permit Capacity (MWWPC)						
MWWPC-1 Increase Wastewater Capacity	Wastewater Permit Capacity Gap (Candler and Evans Counties)	Municipal Wastewater	EPD and entities to confirm assumptions and needs (by 01/2015)	Expand or construct new facilities and/or obtain additional wastewater permit capacity to meet forecasted needs (by 01/2020)	N/A	EPD, Municipal wastewater utilities in the Altamaha Region
Available Industrial Wastewater Permit Capacity (IWWPC)[2]						
IWWPC-1 Collect Additional Industrial Permit Data	Wastewater Permit Capacity Gap	Industrial Wastewater	Obtain additional permit data on flow volumes and permit conditions for industrial wastewater facilities forecasted needs (by 01/2015)	Expand or construct new facilities and/or obtain additional wastewater permit capacity to meet forecasted needs (by 01/2020)	N/A	EPD, Industrial wastewater facilities 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) and Associated Date(s)	For Short-term Actions (2010-2020):	For Long-term Actions (2020-2050):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
Available Municipal Groundwater Permit Capacity (MGWPC)						
MGWPC-1 Increase Municipal Groundwater Permit Capacity	Groundwater Permit Capacity Gap (Candler, Emanuel, Evans, Jeff Davis, Montgomery, Wayne, Wheeler, and Wilcox Counties)	Municipal Groundwater Withdrawal	EPD and entities to confirm assumptions and needs (by 01/2015)	Evaluate short-term needs and, if needed, work with EPD to obtain additional permit capacity (by 01/2020)	Evaluate long-term needs and, if needed, work with EPD to obtain additional permit capacity (by 01/2050)	EPD, Municipal water utilities in the Altamaha Region
Available Industrial Groundwater Permit Capacity (IGWPC)						
IGWPC-1 Increase Industrial Groundwater Permit Capacity	Groundwater Permit Capacity Gap (Evans and Wayne Counties)	Industrial Groundwater Withdrawal	EPD and entities to confirm assumptions and needs (by 01/2015)	Evaluate short-term needs and, if needed, work with EPD to obtain additional permit capacity (by 01/2020)	Evaluate long-term needs and, if needed, work with EPD to obtain additional permit capacity (by 01/2050)	EPD, Industrial water facilities 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) and Associated Date(s)	For Short-term Actions (2010-2020):	For Long-term Actions (2020-2050):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
Groundwater (GW)						
GW-1 Sustainable Groundwater Use	Future Groundwater Needs (Candler, Emanuel, Evans, Jeff Davis, Montgomery, Wayne, Wheeler, and Wilcox 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 (by 01/2015)	Provide guidance and implement sustainable groundwater withdrawal rates through 01/2020	Modify Resource Assessments and sustainable yield criteria, if necessary (by 01/2050)	Municipal, Industrial, Agricultural users in the Altamaha Region, EPD, GSWCC
GW-2 Research Groundwater Sustainability						
GW-3 Promote Aquifer-Friendly Land Use		N/A	Monitor land use changes and further delineate aquifer recharge areas (by 01/2015)	Encourage land use practices that sustain and protect aquifer recharge areas (by 01/2020)	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 Gap Areas	Surface water Withdrawal	Confirm non-gap areas and available surface water resource capacity (by 01/2015)	Continue to apply for permits and use surface water in non-gap areas within available resource capacity (by 01/2020)	Verify flow conditions and gaps	EPD, applicable federal agencies, and surface water users in Altamaha Region
SW-2 Monitor and Evaluate Estuaries		N/A	Monitor Atlantic slope river flow conditions	Determine flow conditions that sustain estuary health (by 01/2020)	N/A	EPD, Coastal Resources Division, Wildlife Resources Division

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) and Associated Date(s)	For Short-term Actions (2010-2020):	For Long-term Actions (2020-2050):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
Non-Point Sources (NPS) – Urban, Rural, Agricultural and Forestry Uses						
NPS-1 Study Human Impacts on Water Quality	Water Quality Outside Gap 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 01/2020)	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 01/2015)		
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) and Associated Date(s)	For Short-term Actions (2010-2020):	For Long-term Actions (2020-2050):	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 Gap Areas	Stormwater (NPDES Discharges)	Continue to support BMP programs	Implement a variety of BMPs related to forestry and agricultural uses (by 01/2015)	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 Gap Areas	Stormwater (NPDES Discharges)	Collect data to confirm impairment and determine sources	Remove streams listed due to “natural sources” (by 01/2020) Refine river/stream reach length for impaired waters (by 01/2020)	Continue collecting data to monitor impairment sources and support reassessment of stream segment classifications (by 01/2050)	EPD, Municipalities and Utilities 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) and Associated Date(s)	For Short-term Actions (2010-2020):	For Long-term Actions (2020-2050):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
NUT-1 Link Nutrient Loading With Current Land Use	Water Quality Outside Gap 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 01/2020)	N/A	EPD, GSWCC, GFC, Municipalities and Utilities within the Altamaha Region, and county commissions
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

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) and Associated Date(s)	For Short-term Actions (2010-2020):	For Long-term Actions (2020-2050):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
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
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 01/2020) 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 agricultural water use in portions of the region. Focus on surface water permit holders and new surface water permit requests in Canoochee Watershed [(Candler, Evans, Emanuel, Tattnall, and Bulloch Counties (Claxton Gap)], Alapaha Watershed [Wilcox County (Statenville Gap)], Ogeechee Watershed [Candler, Evans, Emanuel Counties (Eden and Kings Ferry Gap)], and Satilla Watershed [Appling, Jeff Davis, and Wayne Counties (Atkinson Gap)].

[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.

Planning Level Cost Estimates

Planning level cost estimates were prepared for each management practice as shown in Table 7-2 using planning guidance documents, the knowledge base of previous state and utility planning efforts, availability of quantifiable data, and other sources of information, as listed below:

- Georgia Environmental Protection Division Supplemental Guidance for Planning Contractors: Water Management Practice Cost Comparison dated March 2010 (Revised March 2011).
- Water Conservation Analysis Technical Memorandum to Supplement Council's Plan prepared by CDM for Georgia EPD draft dated July 2011.
- CDM Water Supply Cost Estimation Study prepared for the South Florida Water Management District dated February 2007.
- EPA Report titled Costs of Urban Stormwater Control Practices – Preliminary Report dated February 5, 2006.
- EPA Report titled Costs of Urban Stormwater Control dated January 2002.
- St. Johns River Water Management District Report titled Water Supply Needs and Sources Assessment Alternative Water Supply Strategies Investigation, Water Supply and Wastewater Systems Component Cost Information dated 1997 (Publication Number SJ97-SP3).
- Preliminary estimates of production well yields and costs from local licensed well drillers in Georgia (Bishop Well and Pump Service and Grosch Irrigation Company.)
- Irrigation Conservation Practices Appropriate for the Southeastern United States. Project Report 32. Prepared in cooperation with the Georgia DNR, EPD under Proposal No. ES61135FC1.
- Groundwater Flow Modeling of the Coastal Plain Aquifer System of Georgia. Draft Report completed for EPD as part of State of Georgia Groundwater Resource Assessment (December 2009).

- FY 2004 Sussex Conservation District Cover Crop Program Fact Sheet. Sussex Conservation District, Georgetown, Delaware. Dated 2003.
- North Carolina State University Department of Forestry Costs of Forestry Best Management Practices in the South: A Review.
- Recent bid tabulations for wastewater treatment facilities.

The cost estimates are unit cost estimates where there is a lack of detail or specificity about the management practice. For example, for an inter-basin transfer of water, the cost is driven by the length and size of the pipeline and the quantity to be transferred. If the connection locations and or the transfer quantity are not known, a unit cost per mile of pipeline is given. Where there is detail about the management practice, unit cost data were used to develop an approximate capital/programmatic cost. The capital costs were adjusted to 2010 dollars using the Engineering News Record Cost Index. In summary, some cost estimates are unit costs with different unit basis and some costs are approximate capital costs. Therefore, each management practice is assigned a cost (where applicable) rather than rolling up the costs into general categories since they may not be additive. The cost information provided in this document will be used to pursue loans, grants, and other funding options that can be prioritized throughout the region.

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

More details on potential loan and grant programs are provided for the management practices in Table 7-2. 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

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:

- Conservation of Private Grazing Land Program
- Conservation Security Program
- Environmental Quality Incentives Program
- Farmland Protection Program
- Resource Conservation and Development Program
- Wetlands Reserve Program
- Wildlife Habitat Incentives Program

Table 7-2: Cost Estimates for the Implementation Responsibilities

Management Practice No. (See Table 6-1)	Issues to be Addressed	Capital/ Programmatic Cost	Funding Sources and Options[1]	Notes and Sources for Costs
Data Collection/Additional Research (DCAR)				
DCAR-1 Agricultural Consumption Data	Surface Water Gaps	$0.25M	State incentive programs	Various recent similar projects
DCAR-2 Source of Supply Data to Refine Forecasts		$0.5M	Local governments; State incentive programs	
DCAR-3 Metering Data		$0.5M		
DCAR-4 Support Irrigation Efficiency Research		$0.2M		
DCAR-5 Irrigation Education and Research		$0.1M		
DCAR-6 Minimize Groundwater Use Impacts on Surface Water		$0.05M		
DCAR-7 Study Aquifer Potential to Address Gaps		$0.075M		
DCAR-8 Address Low Flow with Wetland Restoration and Retention Structures		$0.125M		
DCAR-9 Analyze Addressing Extreme Conditions		$0.15M		

Management Practice No. (See Table 6-1)	Issues to be Addressed	Capital/ Programmatic Cost	Funding Sources and Options[1]	Notes and Sources for Costs
Water Conservation (WC)				
WC-1 Tier 1 and Tier 2 Measures for Municipal and Industrial Users	Surface Water Gaps	$0.1M to $0.2M	Local governments; utilities	Supplemental Guidance
WC-2 Tier 1 and Tier 2 Measures for Agriculture		$0.1M to $0.2M		
WC-3 Audits		$1,300/system	State/federal loan or grant	Irrigation Conservation Practices Appropriate for the Southeastern United States
WC-4 Metering		$2.7M		(3,026 existing irrigation pumps) times 10% increase in pumps times $800/totalizer
WC-5 Inspections		$0 to $0.25M		$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 374,565
WC-6 Minimize High-Pressure Systems		$4,700/system		Irrigation Conservation Practices Appropriate for the Southeastern United States
WC-7 Efficient Planting Methods		$0.1M to $0.2M		Educate farmers on benefits of cropping and crop rotation
WC-8 Conservation Tillage		$0.1M to $0.2M		Educate farmers on benefits of conservation tillage
WC-9 Control Water Loss		$0.1M to $0.2M		Educate farmers on practices to prevent water loss through more efficient detention of rainfall
WC-10 End-Gun Shutoffs		$700/system		Irrigation Conservation Practices Appropriate for the Southeastern United States
WC-11 Low Pressure Systems		$3,400/system		
WC-12 Application Efficiency Technologies		$2,000/system		

Management Practice No. (See Table 6-1)	Issues to be Addressed	Capital/ Programmatic Cost	Funding Sources and Options[1]	Notes and Sources for Costs
Additional/Alternatives to Existing Surface Water Supply Sources (ASWS)				
ASWS-1 Consider Low-Flow Conditions in Future Surface Water Permitting	Surface Water Gaps	$0.15M to $0.2M per applicant	State incentive programs; utilities	Various recent similar projects. Includes modeling, permit application and monitoring.
ASWS-2 Incentives for Dry-Year Releases from Ponds		$1M to $2M	State incentive programs	Various recent similar projects
ASWS-3 Incentives for Sustainable Groundwater Development		$0.01M to $0.1M per MGD		From local well driller data and Supplemental Guidance. Includes only cost of supply.
ASWS-4 Monitor Gap Closure and Manage Adaptively		$1M to $2M		Various recent similar projects
ASWS-5 Restoration Incentive Programs		$5,000 to $9,000 per credit		Supplemental Guidance. The costs are based on the cost to purchase credits from a restoration bank.
ASWS-6 Land Management Incentives		$0 to $1 per capita	State incentive programs	Supplemental Guidance. Total population in 2050: 374,565
ASWS-7 Incentives for Greater Wastewater Returns		$0.1M to $1M per MGD	State incentive programs; utilities	Supplemental Guidance
ASWS-8 Address Gaps Periods with Aquifer Storage		$0.025M to $1M per MGD	Georgia Reservoir and Water Supply Fund	From Supplemental Guidance and CDM Water Supply Cost Estimation Study
ASWS-9 Study Multi-Region Reservoir Feasibility		$0.01M to $0.35M per MG		Supplemental Guidance for new surface reservoirs

Management Practice No. (See Table 6-1)	Issues to be Addressed	Capital/ Programmatic Cost	Funding Sources and Options[1]	Notes and Sources for Costs
ASWS-10 Inter-Basin Transfers	Surface Water Gaps	$6.7M per mile	Local governments; utilities	Inter-basin transfer is a function of piping cost. Assume 48-in pipe. Pipe costs from Supplemental Guidance. Does not include easement acquisition, storage, or treatment costs.
Point Sources – Dissolved Oxygen (PSDO)				
PSDO-1 Collect Water Quality Data	Water Quality Gaps	$0.25M to $0.5M	Local governments; utilities	Various recent similar projects
PSDO-2 Point Discharge Relocation		$0.1M to $0.3M	GEFA Georgia Fund Loan; utilities	
PSDO-3 Enhance Point Source Treatment		$7M to $10M per MGD		Supplemental Guidance
Available Municipal Wastewater Permit Capacity (MWWPC)				
MWWPC-1 Increase Wastewater Capacity	Wastewater Permit Capacity Gap	$4M to $10M per MGD	GEFA Georgia Fund Loan	Supplemental guidance
Available Industrial Wastewater Permit Capacity (IWWPC)				
IWWPC-1 Collect Additional Industrial Permit Data	Wastewater Permit Capacity Gap	$0.1M to $0.2M		Various recent similar projects
Municipal Groundwater Permit Capacity (MGWPC)				
MGWPC-1 Increase Municipal Groundwater Permit Capacity	Groundwater Permit Capacity Gap	$0.25M to $0.5M	Drinking Water State Revolving Fund (DWSRF) Loan Program	Various recent similar projects
Industrial Groundwater Permit Capacity (IGWPC)				
IGWPC-1 Increase Industrial Groundwater Permit Capacity	Groundwater Permit Capacity Gap	$0.25M to $0.5M	DWSRF Loan Program	Various recent similar projects

Management Practice No. (See Table 6-1)	Issues to be Addressed	Capital/ Programmatic Cost	Funding Sources and Options[1]	Notes and Sources for Costs
Groundwater (GW)				
GW-1 Sustainable Groundwater Use	Future Groundwater Needs	$0.01M to $0.1M per MGD	Georgia Reservoir and Water Supply Fund	Supplemental Guidance
GW-2 Research Groundwater Sustainability		$0.2M to $0.4M		State of Georgia Groundwater Resource Assessment
GW-3 Promote Aquifer-Friendly Land Use		$750 to $8,500 per MGD	State incentive programs	Supplemental Guidance
Surface Water (SW)				
SW-1 Maintain Current Permitted Capacity	Current and Future Surface Water Uses Outside Gap Areas	$0.05M to $0.1M per applicant	Local governments; utilities	Includes cost of permitting and impact evaluation
SW-2 Monitor and Evaluate Estuaries		$0.1M to $0.15M		Various recent similar projects
Dissolved Oxygen, Fecal Coliform, Nutrients, and Other Impairments				
NPS-1 Study Human Impacts on Water Quality	Future Water Quality Non-Point Source (NPS) Needs	$0.2M to $0.4M	Clean Water Act Section 319(h) Grants (NPS Implementation Grant)	EPA Manual of Costs of Urban Stormwater Control (2002)
NPS-2 Research and Address Impairment Issues		$0.5M to $1.5M		Various recent similar projects
Urban Best Management Practices (NPSU)				
NPSU-1 Control Erosion	Future Water Quality NPS Needs	$0 to $ $0.37M	Clean Water Act Section 319(h) Grants; (NPS Implementation Grant)	$0 to $1 per capita. Total population in 2050: 374,565
NPSU-2 Manage Stormwater Runoff		$6,000 to $65,000 per MG		EPA Manual of Costs of Urban Stormwater Control (2002)

Management Practice No. (See Table 6-1)	Issues to be Addressed	Capital/ Programmatic Cost	Funding Sources and Options[1]	Notes and Sources for Costs
NPSU-3 Increase Stormwater Infiltration	Future Water Quality NPS Needs	$0 to $0.25M	Clean Water Act Section 319(h) Grants; (NPS Implementation Grant)	$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 374,565
NPSU-4 Riparian Buffers		$0 to $0.25M	GEFA Land Conservation Program	
NPSU-5 Street Sweeping		$0.4M to $0.8M	Clean Water Act Section 319(h) Grants; (NPS Implementation Grant)	$1 to $2 per capita per Supplemental Guidance. Total population in 2050: 374,565
Rural Best Management Practices (NPSR)				
NPSR-1 Advocate Implementing Road Runoff BMPs	Future Water Quality NPS Needs	$2,500 to $75,000 per mile of swale	319(h) Grants; (NPS Implementation Grant)	EPA Manual of Costs of Urban Stormwater Control (2002)
Forestry Best Management Practices (NPSF)				
NPSF-1 Support Forestry Commission Water Quality Program	Future Water Quality NPS Needs	Continue to fund existing programs		
NPSF-2 Improve BMP Compliance		Continue to fund existing programs		Costs of Forestry Best Management Practices in the South: A Review
NPSF-3 Wetland and Forest Restoration Incentives		$5,000 to $9,000 per credit	Federal grants	Supplemental Guidance. The costs are based on purchasing credits from a restoration bank.
Agricultural Best Management Practices for Crop and Pasture Lands (NPSA)				
NPSA-1 Soil Erosion Reduction Measures	Future Water Quality NPS Needs	$0.1M to $0.2M		Conservation tillage and cover crop
NPSA-2 Utilize Buffers		$0 to $0.25M		$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 374,565

Management Practice No. (See Table 6-1)	Issues to be Addressed	Capital/ Programmatic Cost	Funding Sources and Options[1]	Notes and Sources for Costs
NPSA-3 Livestock Management	Future Water Quality NPS Needs	$0 to $0.25M		$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 374,565
NPSA-4 Manure Control		$0.5M to $1M		Sussex (Delaware) Conservation District Cover Crop Program Fact Sheet
NPSA-5 Wetland and Forest Restoration Incentives		$5,000 to $9,000 per credit		Supplemental Guidance. The costs are based on the cost to purchase credits from a restoration bank.
Total Maximum Daily Load Listed Streams (TMDL)				
TMDL-1 Evaluate Impairment Sources	Future Water Quality NPS Needs	$0.5M to $1M		Various recent similar projects
TMDL-2 Analyze Impaired Segments and Sources		$35,000 to $130,000 per impairment		Various recent similar projects
TMDL-3 Stormwater Management BMPs		$19M to $30M		$50 to $80 per capita. Total population in 2050: 374,565
Nutrients – Satilla River Watershed Model (NUT)				
NUT-1 Link Nutrient Loading With Current Land Use	Future Water Quality NPS Needs	$10 to $150 per acre		Supplemental Guidance
Educational (EDU)				
EDU-1 Promote Conservation Programs	Future Educational Needs	$0 to $0.85M	State incentive programs; utilities; local governments	$0 to $2.25 per capita per Supplemental Guidance. Total population in 2050: 374,565
EDU-2 Stormwater Education		$0 to $0.85M		$0 to $2.25 per capita per Supplemental Guidance. Total population in 2050: 374,565

Management Practice No. (See Table 6-1)	Issues to be Addressed	Capital/ Programmatic Cost	Funding Sources and Options[1]	Notes and Sources for Costs
EDU-3 Septic System Maintenance Education	Future Educational Needs	$0 to $0.25M	State incentive programs; utilities; local governments	$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 374,565
EDU-4 Forestry BMP Education		$0.05M to $0.15M		Support Georgia Forestry BMPs
EDU-5 Clean-Up Events		$0.05M to $0.1M		Various recent similar projects
Ordinance and Code Policy (OCP)				
OCP-1 Engage Local Governments	Future Ordinance and Code Policy Needs	$0 to $0.25M	State incentive programs; local governments; utilities	$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 374,565
OCP-2 Green Space Opportunities and Incentives		$0 to $0.25M	State incentive programs; utilities, local governments; Georgia Land Conservation Program	Green space incentives $0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 374,565
OCP-3 Promote Integrated Planning		$0 to $0.25M	State incentive programs; utilities; local governments	$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 374,565

[1] Where referenced, GEFA-administered loan programs (e.g., CSWRF, DWSRF) are intended to finance eligible activities related to construction of water infrastructure projects, including site-specific engineering and planning efforts.

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 gaps 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:

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 gaps and water resource needs.

- Work with Georgia Soil and Water Conservation Commission, Georgia Department of Agriculture, University of Georgia, and other relevant institutions 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 gaps and assumptions.

- Focus funding support and permitting assistance to projects and programs aimed at addressing gap 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 Upper 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 gaps.

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 through annual Irrigation Meetings and other avenues to inform farmers of available technologies and funding sources to make more efficient use of water resources without incurring hardship.

- 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.

- 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 gaps.

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.

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 closing gaps 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 in Gap Areas **Data Collection/Additional Research (DCAR)** to confirm frequency, duration, and severity of agriculturally-driven shortages to 7Q10 low flow conditions			
DCAR-1 through DCAR-9 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	2-4 years 5 years
Action Needed - Water Conservation (WC) - Meet current and future gaps 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 gap 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 in Gap Areas **Additional/Alternate to Existing Surface Water Supply Sources (ASWS)**			
ASWS-1 Consider Low-Flow Conditions in Future Surface Water Permitting	- Formation of stakeholder group and consensus reached on new surface water application process in gap 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-2 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

Management Practice No. (See Table 6-1)	Benchmark	Measurement Tools	Time Period
ASWS-3 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-4 Monitor Gap Closure 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 through ASWS-10 Various land management, disposal, and water storage/transfer 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
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

Management Practice No. (See Table 6-1)	Benchmark	Measurement Tools	Time Period
Obtain Additional Municipal and Industrial Water and Wastewater Permit Capacity			
MWWPC-1, IWWPC-1, MGWPC-1, IGWPC-1 Expansion of Wastewater and Groundwater Permit Capacities to Address Gaps/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
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 for Gap and Non-gap Areas			
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

Management Practice No. (See Table 6-1)	Benchmark	Measurement Tools	Time Period
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 Satilla and Watershed Model - 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 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

Management Practice No. (See Table 6-1)	Benchmark	Measurement Tools	Time Period
Shared Resources			
Combined management practices for the Claxton, Kings Ferry, Atkinson, and Statenville gaps (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 five 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 five 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.

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