REGIONAL WATER PLAN

June 2017

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Supplemental Documents

The following supplemental materials have been developed in support of the Suwannee-Satilla Regional Water Plan and are available electronically as attachments to the Regional Water Plan at www.suwanneesatilla.org.

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- 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 Suwannee-Satilla 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 Suwannee-Satilla Council include:

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The Suwannee-Satilla Council would like to thank Rick Brown and Shayne Wood with CDM Smith and Cliff Lewis of Georgia EPD for providing the planning and technical guidance toward the development of this Plan. In addition, the Suwannee-Satilla Council would like to recognize Tom Putnam for his contributions in serving as a proxy and contributing his input and perspective in updating the water 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
FERC	Federal Energy Regulatory Commission
GEFA	Georgia Environmental Finance Authority
Georgia DOA	Georgia Department of Agriculture
GFC	Georgia Forestry Commission
gpcd	gallons per capita per day
GSWCC	Georgia Soil and Water Conservation Commission
GW	groundwater

List of Acronyms (Continued)

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

List of Acronyms (Continued)

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

EXECUTIVE SUMMARY

Executive Summary

Introduction and Overview of the Suwannee-Satilla Region

Of all of Georgia's natural resources, none is more important to the future of our State than water. Over the last several decades, Georgia continues to be one of the fastest growing states in the nation. According to the U.S. Census Bureau, between 2010 and 2016, Georgia ranked 4th in total population gain (0.6 million new residents) and 12th in percentage increase in population (6%). During a portion of this same period, our State also experienced critical areas of severe drought. Georgia's growth and economic prosperity are vitally linked to our water resources.

As our State has grown, the management and value of water resources has also changed. Ensuring a bright future for our State requires thoughtful planning and wise use of our water resources. The water planning process began in 2008, when the State of Georgia's leadership authorized a comprehensive state-wide water planning process to help address these challenges and take a forward look at how our State is expected to grow and use water through 2050. The Suwannee-Satilla Regional Water Planning Council

Water Resource Trends and Key Findings for the Suwannee-Satilla Region

The Suwannee-Satilla Region includes 18 counties in the south central portion of Georgia. Over the next 35 years, the population of the region is projected to increase by 20% growing from approximately 416,000 to 499,000 residents.

Key economic drivers in the region include agriculture, forestry, professional and business services, education, healthcare, manufacturing, public administration, and construction. Recreation and fishing are also important to the area. Water supplies, wastewater treatment, and related infrastructure will need to be developed and maintained to support these economic drivers and maintain a high quality of life.

The rivers in the region are unique in comparison to most of Georgia Rivers in that the watersheds are much smaller in size. This results in more frequent surface water lower flow conditions and increases the importance of groundwater to the region.

Surface water is forecasted to meet about 18% of the region's water use and agriculture accounts for 98% of this use. Surface water use in the region is highest in the Suwannee River basin, followed by the Satilla, Ocmulgee, and Flint River basins.

Groundwater is predominately used from the Floridan aquifer and is needed to meet about 82% of the region's water needs. Agriculture, municipal, domestic, and industry are the major demand sectors for groundwater.

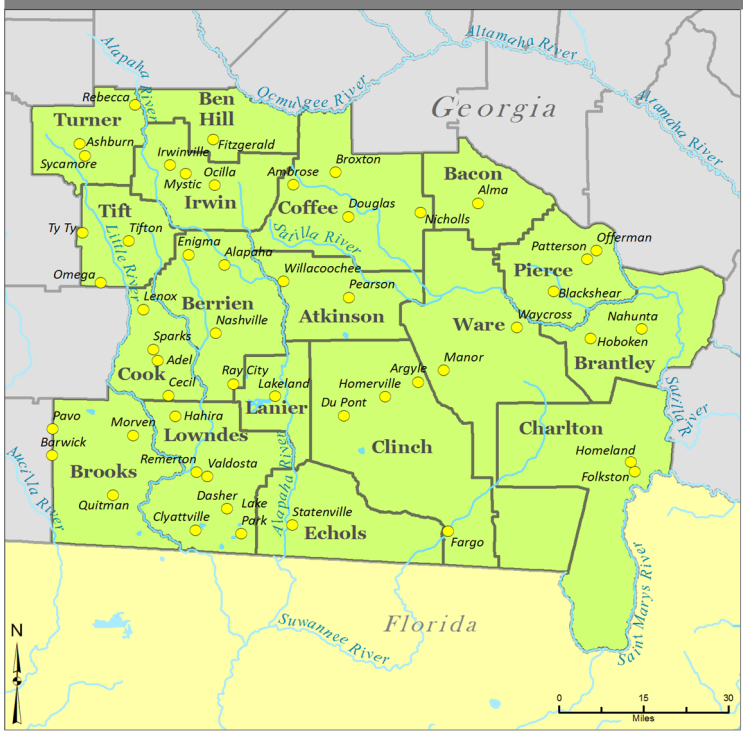
Water resource challenges in the region include surface water shortfalls during some periods of time on the Alapaha, Satilla, Suwannee, and Withlacoochee Rivers; and water quality challenges associated with trophic-weighted residual mercury in fish tissue and low dissolved oxygen in some portions of the region.

Management practices are needed to address these challenges including: water conservation; refining planning information; use of existing or new storage to help reduce the frequency/severity of critical low flow conditions; sustainable use of groundwater during times of limited surface water flows; improving/upgrading wastewater treatment; and addressing non-point sources of pollution.

(Suwannee-Satilla Council) was established in February 2009 as part of this state-wide process and in 2016-2017 the Suwannee-Satilla Council updated the Regional Water Plan. The Suwannee-Satilla Council is one of 11 planning regions charged with developing Regional Water Plans, and encompasses 18 counties in the southeastern portion of Georgia (shown in Figure ES-1). An overview of the updated findings and recommendations for the Suwannee-Satilla Region are provided in this Executive Summary. The Suwannee-Satilla Council's Regional Water Plan is available on the Council's website.

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

Figure ES-1: Suwannee-Satilla Regional Water Planning Council



The Suwannee, Satilla, and St. Marys Rivers are a popular fishing resource to the region. There are several species of fish found in the rivers, offering excellent fishing for chain pickerel, warmouth, largemouth bass, bluegill, topminnow, sunfish, crappie, and catfish. The coastal estuaries of the Satilla and St. Marys Rivers also provide recreationally and commercially important ecosystems for fish, crustaceans, and shellfish. Several parks along these rivers provide an important recreational resource for the region, offering opportunities for various outdoor activities. Perhaps the most well-known natural habitat and recreational resource in the region is the Okefenokee National Wildlife Refuge. The Okefenokee Swamp is home to 233 bird species, 49 mammal species, 64 reptile species, and 37 amphibian species. The swamp is also home to over 600 species of plants.

The Suwannee-Satilla Region encompasses several population centers, including the cities of Valdosta, Tifton, and Douglas. The Suwannee-Satilla Region is projected to grow by approximately 83,000 residents, or 20%, from 2015 to 2050 with the highest growth occurring in Lowndes and Coffee Counties (Georgia's Office of Planning and Budget, 2015). 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.

The primary economic sectors in the region include agriculture, forestry, professional and business services, education, healthcare, manufacturing, public administration, and construction. The rural economies of five counties in the region (Atkinson, Brantley, Charlton, Clinch, and Pierce Counties) are categorized as very or critically dependent on the forestry industry by the Georgia Forestry Commission in the 2008 report "Economic Impact of Forest Products Manufacturing in Georgia." 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 Suwannee-Satilla 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. On September 23, 2009, the Suwannee-Satilla Council adopted the following Vision for the region.

"The Vision of the Suwannee-Satilla Regional Council is to manage water resources in a sustainable manner under Georgia's regulated riparian and regulated reasonable use laws to support the state's and region's economy, to protect public health and natural resources, and to enhance the quality of life for all citizens; while preserving the private property rights of Georgia's landowners, and in consideration of the need to enhance resource augmentation and efficiency opportunities."

On November 11, 2009, the Suwannee-Satilla Council identified 13 goals to complement the Vision. These goals can be found in Section 1 of the Regional Water Plan.

In addition to providing these regional vision and goals, the Suwannee-Satilla Council believes it is critically important for the Council to have an ongoing role in regional water planning. The information in the Regional Water Plan is complex and will require ongoing education and an emphasis on cooperation to help obtain local support for, and maximize the effectiveness of the Plan's recommendations. The leadership, knowledge and experience of the Suwannee-Satilla Council establishes a uniquely qualified group to assist in facilitating implementation of the Plan, clarifying questions regarding the intent of the Regional Water Plan recommendations, and refining and updating existing information as well as executing future planning efforts. More information regarding the region and its water resource needs, challenges, and solutions is provided below.

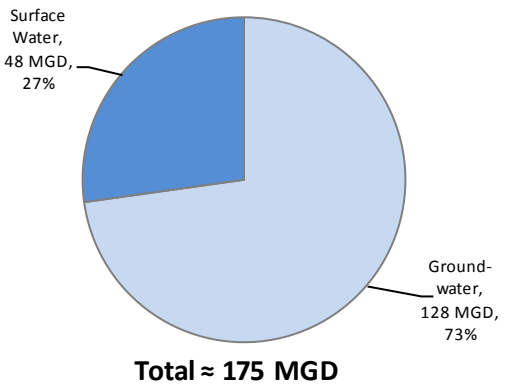
Overview of Water Resources and Use in the Suwannee-Satilla Region

Surface Water

Major surface water features in the region include the Alapaha, Satilla, St. Marys, Suwannee, and Withlacoochee Rivers. The Alapaha and Withlacoochee Rivers are major tributaries to the Suwannee River, which flows through Florida into the Gulf of Mexico downstream of these confluences. The headwaters of the Suwannee River are in the Okefenokee Swamp. The Satilla River flows to the southeast and discharges to the Atlantic Ocean between Cumberland and Jekyll Islands. This water body is a blackwater stream consisting of tannins and other natural leachates, which cause the river to have a darkly stained appearance and have unique physical and chemical characteristics and dissolved oxygen dynamics. Over half (59%) of the St. Marys River lies in Georgia and the remainder is in Florida. The St. Marys River is also a blackwater stream. However, the St. Marys River flows north and east, forming the border between southeast Georgia and northeast Florida and discharges into the Atlantic Ocean.

As shown in Figure ES-2, surface water is expected to provide 27% of the water supply within the region (USGS, 2009). Based on water use trends and forecast information through 2050, the majority of the agricultural and industrial surface water use in the region is projected to come from the Suwannee River basin (72%) and Satilla River basin (26%), with the Ocmulgee and Flint River basins each making up 1% or less of the regional surface water use. This information is based on the assumption that future use will follow current practices and trends.

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

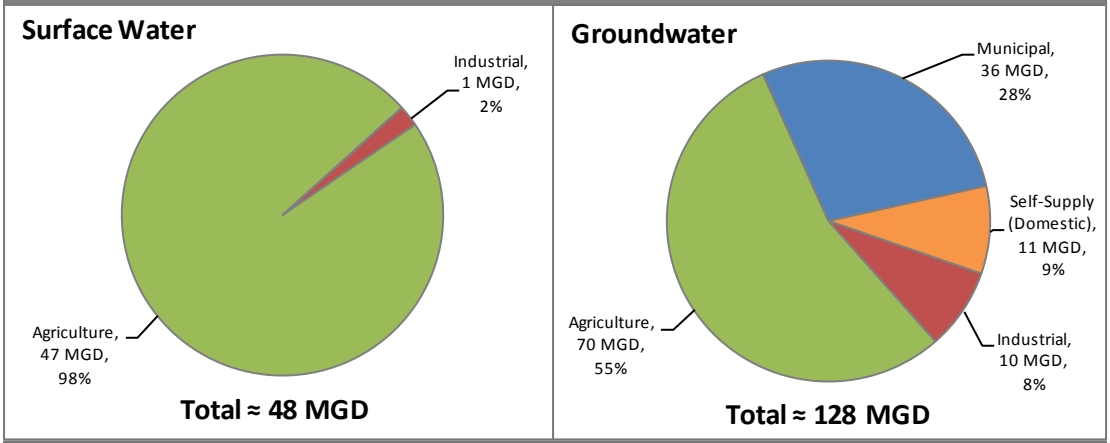
As shown in Figure ES-2, groundwater is projected to meet about 73% of the region's water supply needs. Based on 2015 forecasted groundwater withdrawal data, approximately 98% of groundwater in the region is supplied from the Floridan aquifer, which is one of the most productive groundwater aquifers in the United States.

Water and Wastewater Needs in the Suwannee-Satilla Region – A Closer Look

Figure ES-3 presents surface water and groundwater use by sector in the Suwannee-Satilla Region. Approximately 98% of surface water withdrawals in the region are for the agricultural sector, with the remaining 2% for industrial uses. About

128 MGD of groundwater withdrawn were predominantly used to supply agricultural (55%) and municipal users (28%) among others (self-supply and industrial).

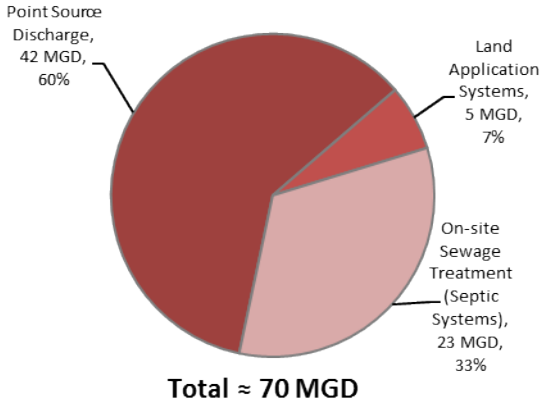
Figure ES-3: 2005 Water Use by Category



Data Sources: "Water Use in Georgia by County for 2005; and Water-Use Trends, 1980-2005" (USGS, 2009). Surface water withdrawals for municipal and industrial categories were adjusted based upon feedback from water providers.

Wastewater treatment types representing current conditions in the region are shown in Figure ES-4. According to the Suwannee-Satilla Wastewater Forecast developed for the Regional Water Plan (CDM Smith, 2017), 60% of treated wastewater in the region is disposed of as a municipal/industrial point source discharge or to a land application system (7%). The remaining wastewater is treated by on-site sewage treatment (septic) systems (33%).

Figure ES-4: Trends in Wastewater and Return Flows

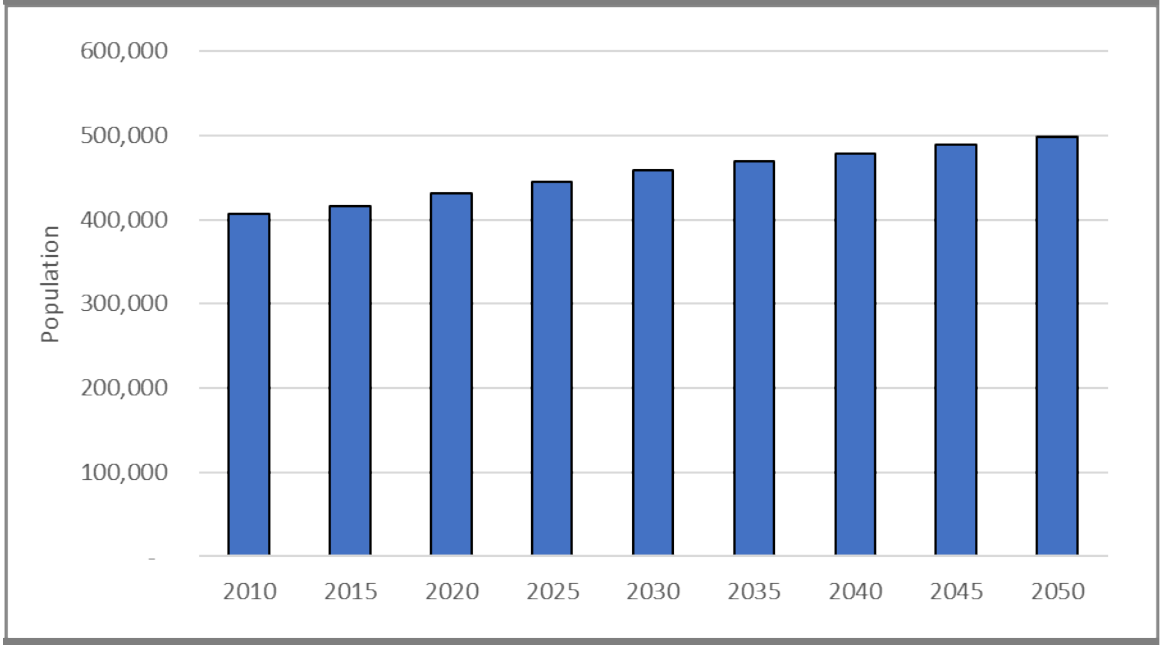


Data Source: Suwannee-Satilla Water and Wastewater Forecasting Technical Memorandum; CDM Smith, 2017.

Suwannee-Satilla Forecasted Water Resource Needs from the Year 2015 to 2050

Municipal water and wastewater forecasts are closely tied to population projections for the counties within the Suwannee-Satilla 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 16% (43 MGD) in demand from 2015 through 2050. Wastewater return flows are expected to grow by 19% (14 MGD) from 2015 through 2050.

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



Source: Georgia Governor's Office of Planning and Budget, 2015

Comparison of Available Resource Capacity to Future Water Resource Needs

Groundwater Availability

Groundwater is projected to meet about 82% of the region's water supply needs. Groundwater from the Floridan aquifer is a vital resource for the Suwannee-Satilla 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. Therefore, at this time no groundwater resource shortfalls are expected to occur in the Suwannee-Satilla Region over the planning horizon. However, localized issues could arise in areas where there is a high well density and/or high volumes of groundwater withdrawal.

Surface Water Availability

Surface water is also an important resource used to meet current and future needs of the Suwannee-Satilla 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 by EPD in the state water planning process.

The results of the future conditions modeling from the Surface Water Availability Resource Assessment (EPD, May 2017) show that in portions of the region, there are sufficient surface water supplies to meet 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").

Table ES-1 summarizes the locations in 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 the region: Atkinson (Satilla River), Jennings (Alapaha River), Pinetta (Withlacoochee River) and Statenville (Alapaha River). At each of these locations, the dominant water use type is agricultural. The projected increases of agricultural and industrial surface water use for the counties within the Suwannee-Satilla Region that contribute to current and/or future gaps are 3.5 MGD and 0.06 MGD, respectively. 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 Suwannee-Satilla Council to address surface water gaps.

Table ES-1: Summary of Modeled 2050 Potential Surface Water Gaps

Node	Duration of Gap (% of total days)	Average Flow Deficit	Long-term Average Flow
Atkinson	5	20 cfs / 13 MGD	2,236 cfs / 1,445 MGD
Jennings	8	36 cfs / 23 MGD	1,380 cfs / 892 MGD
Pinetta	9	46 cfs / 30 MGD	1,721 cfs / 1,112 MGD
Statenville	12	32 cfs / 21 MGD)	1,058 cfs / 684 MGD

Source: Surface Water Availability Resource Assessment, May 2017, EPD

Assessment of Water Quality Conditions

One measure of the capacity of surface water to maintain its health and the health of the aquatic species living therein is the amount of residual dissolved oxygen in the water. As part of the Water Quality (Assimilative Capacity) Resource Assessment (EPD, May 2017), modeling of dissolved oxygen concentrations was performed 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. The assimilative capacity assessment for dissolved oxygen at baseline and/or permitted conditions is presented in Section 3 and Section 5, and Section 6 (Management Practices) outlines the recommendations that have been made to address these impairments in the future. Assimilative capacity assessments indicate the potential need for improved wastewater treatment in some facilities within the Suwannee, Satilla, St. Marys, and Ochlockonee River Basins.

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 several locations throughout the Suwannee-Satilla Region, but there are also projected surface water shortfalls during some periods of time at the Atkinson, Jennings, Pinetta, and Statenville nodes.*

Surface Water Quality: *There are eight reaches within the Suwannee River Basin, five reaches within the Satilla River Basin, two reaches in the St. Marys River Basin, and one in the Ochlockonee Basin that exceed assimilative capacity.*

Under Section 303d of the federal Clean Water Act, 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 Suwannee-Satilla Region, there are 83 impaired stream reaches (total impaired length of 946 miles). TMDLs have been completed for 73 of the impaired stream reaches. Since the original water plan was published in 2011, the Suwannee-Satilla Region has improved water quality in terms of reducing fecal coliform impairments, and now the majority of stream impairments are due to trophic-weighted residual mercury in fish tissue and low dissolved oxygen.

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

The comparison of EPD's May 2017 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 Suwannee-Satilla 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 Suwannee-Satilla 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.

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 current and future surface water permit conditions do not contribute to 7Q10 low flow concerns
Encourage sustainable groundwater use as a preferred supply in regions with surface water 7Q10 low flow concerns and adequate groundwater supply
Identify incentives and a process to sustainably replace a portion of existing agricultural surface water use with groundwater use to address 7Q10 low flow concerns
Evaluate the potential to use existing storage to address 7Q10 low flow concerns
Education to reduce surficial aquifer groundwater use impacts to 7Q10 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 listed streams: Improve data on source of pollutant and length of impairment; Identify opportunities to leverage funds and implement non-point source Best Management Practices

Members of the Suwannee-Satilla Council have invested significant time and expertise into the planning process and wish to capitalize on the expertise gained by the Council prior to the end of their second term as Council members.

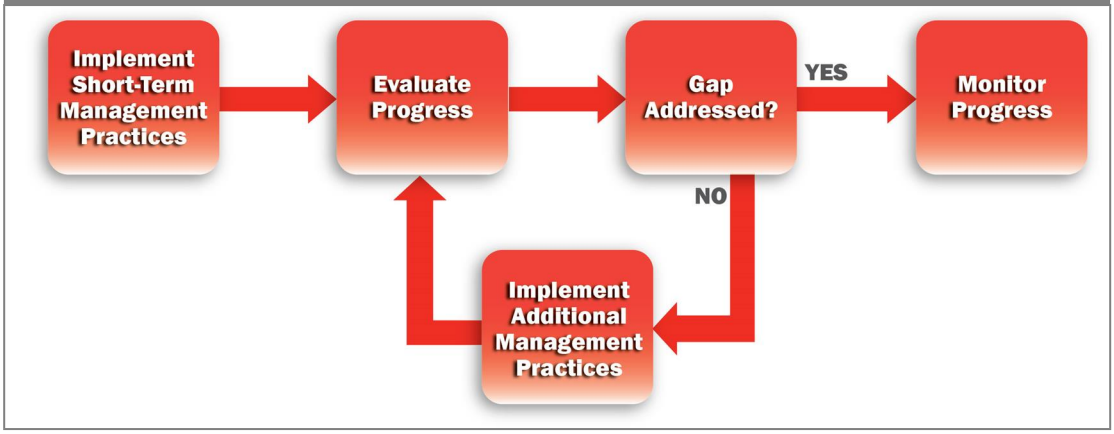
The Suwannee-Satilla Council believes the Regional Water Plan should be reviewed in defined increments in the future such as every 5 years to evaluate how the implemented management practices are performing toward addressing gaps and meeting forecasted needs and what additional measures might be required. This is the first of such updates. If the selected management practices have not sufficiently addressed the gaps identified by the Resource Assessments, then additional management practices should be selected and implemented. Over time, the selected management practices will address identified gaps and meet future uses. Addressing surface water gaps will require that management practices also be implemented by adjacent water planning councils that share resources with the Suwannee-Satilla Council.

Implementing Water Management Practices

The Suwannee-Satilla 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.

Implementation of the Suwannee-Satilla Regional Water Plan will be primarily by various water users and wastewater utilities in the region. The most cost-effective and more readily implemented management practices will be prioritized for short-term implementation via an incremental and adaptive approach as shown in Figure ES-6. If resource needs are not met and/or 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-6: 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 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 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-wide water planning effort.

Water conservation remains a cost-effective means to address future water supply needs and could be applied region-wide, especially in areas of limited future surface water withdrawals. Wastewater treatment will likely also require funding sources, both to upgrade plants and to address aging infrastructure.

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 Suwannee-Satilla Council identified several benchmarks, which can be used to evaluate the effectiveness of the Regional Water Plan. The benchmarks are shown in Section 8 of the Regional Water Plan and include both the activities to be accomplished and the measurement tools that can be used to assess progress.

The Suwannee-Satilla Council supports the concept of regional water planning led by local representatives. The Council members wish to express their gratitude to the Governor, Lieutenant Governor, and Speaker of the House for their nomination to the Suwannee-Satilla 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 Suwannee-Satilla Council members wish to remain involved in facilitating attainment of the Regional Water Plan benchmarks and making necessary revisions to the Plan.

1. INTRODUCTION

Section 1. Introduction

The Suwannee-Satilla Council intends this Regional Water Plan to be a working document, and work on this document is a continual planning process.

Georgia is one of the fastest growing states in the nation. Couple that with recent unprecedented drought, increased competition for water supplies, and changing perspectives on how we use and value water, we begin to see the challenges of managing our valuable water resources. In response to these challenges, a State Water Council was formed to develop a state-wide water planning process.

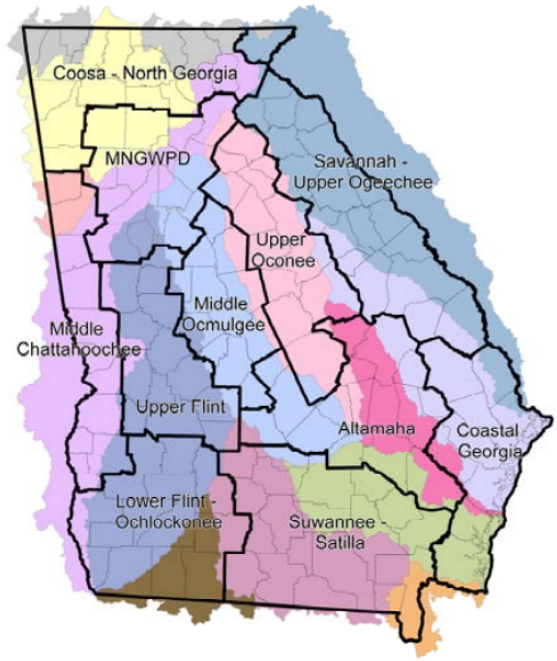
The water planning process began in 2008 when the State Water Council submitted the *Georgia Comprehensive State-wide Water Plan* (State Water Plan) to the Georgia General Assembly and the water planning process was approved. The purpose of the State Water Plan is to guide Georgia in managing water resources 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 Suwannee-Satilla Regional Water Planning Council (Suwannee-Satilla Council) was formed to help guide the completion of the 2011 Regional Water Plan and they have now produced this update. The Suwannee-Satilla Council is composed of membership based on a nomination and appointment process by the Governor, Lieutenant Governor, and Speaker of the House.

Summary

The Suwannee-Satilla 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 Suwannee-Satilla Region.

Figure 1-1: Regional Water Planning Councils



The Suannee-Satilla Regional Water Plan was first completed and adopted in 2011. During the 2016–2017 plan update process, this document was updated from the original 2011 Regional Water Plan for

the Suwannee-Satilla Region based on updated regional water demand forecasts, updated resource assessment modeling, and the evaluation of future gaps in water availability and water quality. This updated plan also includes the revised management practices recommended by the Suwannee-Satilla Council to either address future water resource management needs or to refine or clarify management practices. A table is provided in Appendix A that identifies the portions of the plan that have been updated and provides a short explanation for why the update was made (for instance, a change in circumstance in the region, or an update to the technical work such as updated projections or forecast).

1.1. The Significance of Water Resources in Georgia

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

Georgia has abundant water resources, with 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.

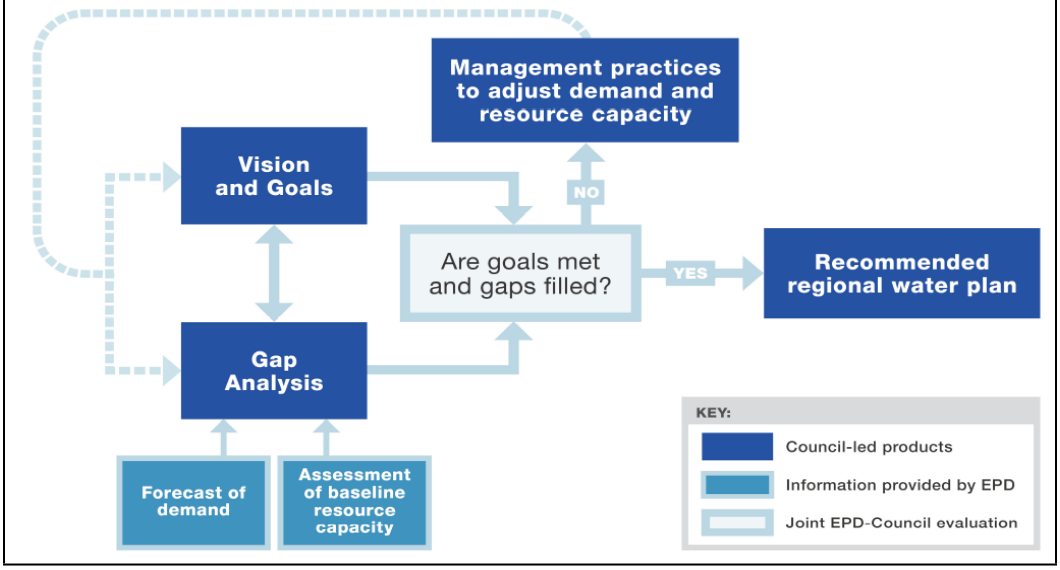
Since water resources, their conditions, and their uses vary greatly across the State, selection and implementation of management practices on a regional and local level is the most effective way to ensure that current and future needs for water supply and assimilative capacity are met. Therefore, the State Water Plan calls for the preparation of 10 Regional Water Plans. The eleventh regional water planning district, the Metropolitan North Georgia Water Planning District (MNGWPD, also known as "the District"), was created by State law in 2001 and had existing Plans in place. Figure 1-1 illustrates the 11 council boundaries and major surface watersheds, which are shown by the different background colors.

This Regional Water Plan prepared and updated by the Suwannee-Satilla 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 Suwannee-Satilla Water Planning Region over the next 35 years to help meet these needs.

1.2. State and Regional Water Planning Process

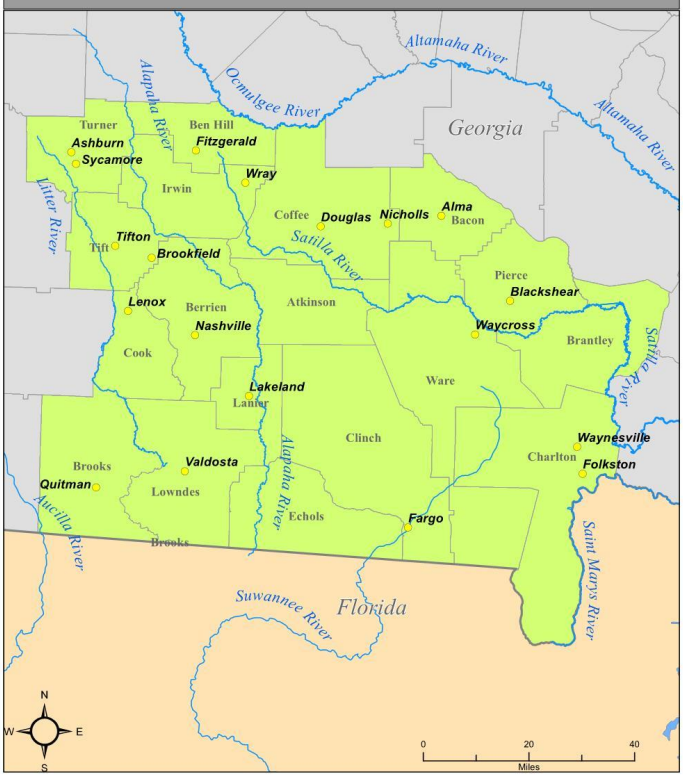
The State Water Plan calls for the preparation of Regional Water Plans designed to manage water resources in a sustainable manner through 2050. The original (2011) Regional Water Plan was prepared following a consensus-based planning process illustrated in Figure 1-2.

Figure 1-2: State Water Planning Process



As detailed in the Suwannee-Satilla Council's Memorandum of Agreement (MOA) with the Georgia Environmental Protection Division (EPD) and Department of Community Affairs (DCA) as well as the Suwannee-Satilla Council's Public Involvement Plan (PIP), the process required and benefited from input of other regional water planning councils, local governments, and the public. For this plan update, a similar approach was followed, including a review of the original vision and goals, updates to the water and wastewater demands, updates to the resource assessments, and a re-evaluation of future gaps. Public/local government input and coordination with other regional water planning councils also informed the plan update.

Figure 1-3: Location of Suwannee Satilla Council Members



1.3. The Suwannee-Satilla Water Planning Region Visions and Goals

Following the process established in the State Water Plan, the Suwannee-Satilla Council was established in February 2009. The Suwannee-Satilla Council has 26 members, which includes 2 alternates and 1 Ex-Officio Members. Figure 1-3 provides an

overview of the Suwannee-Satilla Region and the residential locations of the Suwannee-Satilla Council members.

To develop the 2011 Regional Water Plan, the Suwannee-Satilla Council met collectively for the first time on March 13, 2009 at a kickoff meeting for the 10 regional water planning councils. The meeting focused on: providing an orientation to the water planning process; a preliminary overview of Georgia's water resources; and establishing an understanding of the schedule for completing the Regional Water Plan, the Council's meeting schedule, and requirements. As part of this update, the Suwannee-Satilla Council met over a series of meetings in 2016 and 2017 to revise and update each of the sections of the plan, as appropriate.

Developing the Region's Council Procedures

Initially, the planning process focused on establishing the Suwannee-Satilla Council's 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 the Suwannee-Satilla Council, EPD, and DCA. The Memorandum of Agreement was unanimously approved by the Suwannee-Satilla Council and executed on June 24, 2009. A copy of this document can be accessed on the Council's website.

In support of the Memorandum of Agreement, the Suwannee-Satilla Council formed six subcommittees to provide planning guidance during various development stages of the development of the 2011 Regional Water Plan. The subcommittees consisted of the following: Vision and Goals, Municipal Water and Wastewater Forecasting, Public Involvement Plan, 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 the region's Vision and Goals that describe the economic, population, environmental and water use conditions desired for each region. The Vision and Goals described below summarize the Suwannee-Satilla 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 Suwannee-Satilla Region and to communicate these priorities and values to other regions of the State.

Vision Statement (as established September 23, 2009)

"The Vision of the Suwannee-Satilla Regional Council is to manage water resources in a sustainable manner under Georgia's regulated riparian and regulated reasonable use laws to support the state's and region's economy, to protect public health and natural resources, and to enhance the quality of life for all citizens; while preserving the private property rights of Georgia's landowners, and in consideration of the need to enhance resource augmentation and efficiency opportunities."

Goals (as established November 11, 2009)

The Suwannee-Satilla Council has identified 13 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).

1. Manage and develop water resources to sustainably and reliably meet domestic, commercial, industrial water needs, and agricultural water needs including all agricultural sectors (this includes the agro forestry economy of the region).

2. Manage groundwater and surface water to encourage sustainable economic and population growth in the region.

3. Manage the region's and state's water resources in a manner that preserves and protects private property rights.

4. Ensure an adequate water supply of suitable quality to meet current and future human needs, while protecting environmental resources.

5. Identify opportunities to optimize existing and future supplies, and water and wastewater infrastructure.

6. Promote efficient use and management of surface and groundwater resources to allow for sufficient supplies for current and future generations.

7. Protect and manage surface and groundwater recharge areas to ensure sufficient long-term water supplies for the region.

8. Protect, maintain, and where appropriate and practicable, identify opportunities to enhance water quality and river base flows.

9. Protect and maintain regional water-dependent recreational opportunities.

10. Identify opportunities to manage stormwater to improve water quantity and quality.

11. Identify and implement cost-effective water management strategies.

12. Seek to provide economically affordable power and water resource service to all citizens of the region.

13. Identify and implement actions to better measure and share water use data and information.

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

www.suwanneesatilla.org/documents/SSA_VisionAndGoals_Adopted.pdf.

The Suwannee-Satilla 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 Suwannee-Satilla Council developed a Public Involvement Plan to help guide and implement an inclusive planning process. The Public Involvement Plan was adopted by the Suwannee-Satilla Council on November 11, 2010 and can be accessed at the Council's website.

www.suwanneesatilla.org/documents/SSA_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 Suwannee-Satilla Public Outreach Technical Memorandum available at the Council's website.

2. THE SUWANNEE-SATILLA WATER PLANNING REGION

Section 2. The Suwannee-Satilla Water Planning Region

2.1. History and Geography

The Suwannee-Satilla 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 marine incursions and regressions. Approximately 90% of the Coastal Plain's sediments exposed in the area are sands and clays. The major land covers in the region are forested lands and agriculture, which are important drivers for the region's economy.

Surface Water Resources

Figure 2-1 provides an overview of the surface water resources in the Suwannee-Satilla Region. Major surface water features in the region include the Alapaha, Satilla, St. Marys, Suwannee, and Withlacoochee Rivers. Major lakes in the region include Banks Lake.

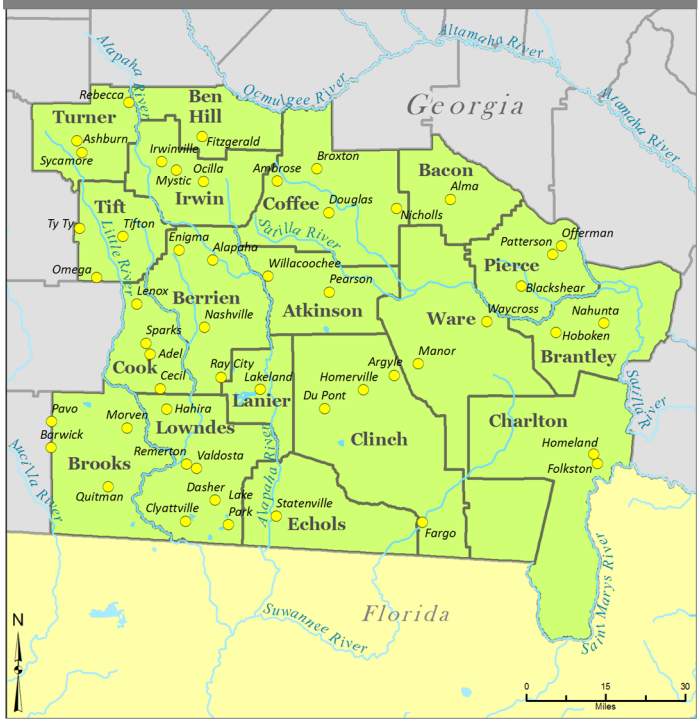
Summary

The Suwannee-Satilla Region encompasses 18 counties in the south central portion of Georgia. Predominant land cover in the region includes agriculture, forest, and wetland areas.

The major surface water resources in the region include the Alapaha, Satilla, St. Marys, Suwannee, and Withlacoochee Rivers.

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

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



The Alapaha and Withlacoochee Rivers are major tributaries to the Suwannee River, which flows into the Gulf of Mexico downstream of these confluences. The headwaters of the Suwannee River are in the Okefenokee Swamp. The Suwannee River is 266 miles long and has a drainage area of approximately 11,000 square miles (mi^2), 51% of which lies in Georgia (EPD, 2002) and the remainder in Florida. This water body is a blackwater stream consisting of tannins and other natural leachates, which cause the river to have a darkly stained appearance and unique physical and chemical characteristics, including dissolved oxygen dynamics.

The Satilla River flows to the southeast across the region from its headwaters in Ben Hill County and discharges to the Atlantic Ocean between Cumberland and Jekyll Islands (EPD, 2002). The Satilla River is 200 miles long and has a drainage area of approximately 3,940 mi^2, which is completely contained within Georgia. Like the Suwannee River, the Satilla River is a blackwater stream.

The St. Marys River is 90 miles long and has a drainage area of approximately 1,300 mi^2, 59% of which lies in Georgia (EPD, 2002) and the remainder in Florida. Like the Suwannee River, the St. Marys River is a blackwater stream. The St. Marys River flows north and east, forming the border between southeast Georgia and northeast Florida before discharging into the Atlantic Ocean.

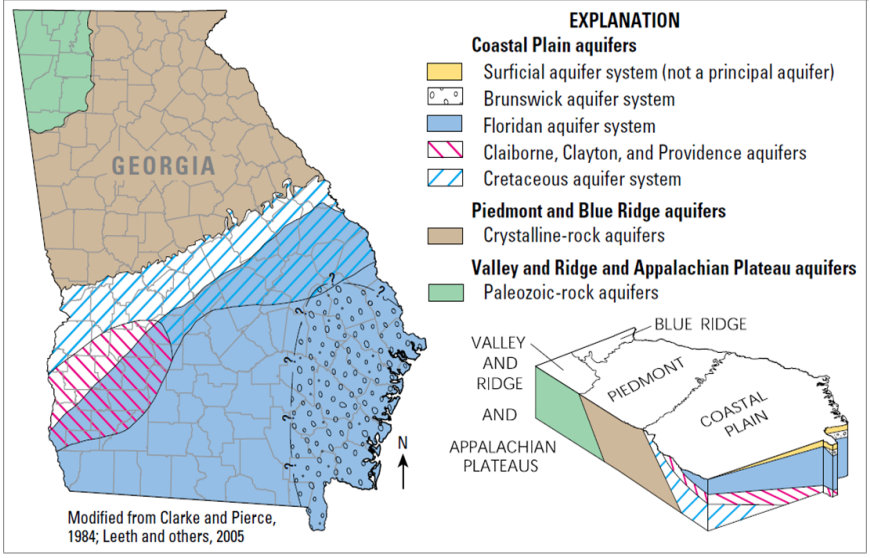
The Suwannee, Satilla, and St. Marys Rivers are popular fishing resources to the region. There are several species of fish found in the rivers, offering excellent fishing for chain pickerel, warmouth, largemouth bass, bluegill, topminnow, sunfish, crappie, and catfish. The coastal estuaries of the Satilla and St. Marys Rivers also provide recreationally and commercially important ecosystems for fish, crustaceans, and shellfish.

Several parks along these rivers provide an important recreational resource for the region, offering opportunities for various outdoor activities. Some of the more popular parks in the region include General Coffee State Park in Nichols, the Cumberland Island National Seashore, Reed Bingham State Park near Adel, and Crooked River State Park. Perhaps the most well-known natural habitat and recreational resource in the region is the Okefenokee National Wildlife Refuge. The Okefenokee Swamp is home to 233 bird species, 49 mammal species, 64 reptile species, and 37 amphibian species. The swamp is also home to over 600 species of plants.

Groundwater Resources

Groundwater is a very important resource for the Suwannee-Satilla Region. Figure 2-2 depicts the major aquifers of Georgia. Based on 2015 projected pumping data provided by Georgia EPD, approximately 98% 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 Floridan aquifer is primarily comprised of limestone, dolostone, and calcareous sand. The aquifer is generally confined, but at its northern

Figure 2-2: Major Georgia Aquifers



extent there are unconfined and semi-confined zones. The Floridan aquifer increases in thickness eastwardly across the State and is approximately 400 feet thick in Glynn County. The aquifer is very productive, with typical well yields of 1,000-5,000 gallons per minute.

The eastern portion of the Suwannee-Satilla Region is within the Brunswick aquifer area, which consists of sands and limestones. Where this aquifer exists, it is used in addition to the Floridan aquifer for water supply. The surficial aquifer, which is present beneath most of the Coastal Plain area, is usually not very thick and not typically used as a primary source of water supply.

The Suwannee-Satilla Region shares its groundwater resources with portions of North Florida. EPD coordinated with the Suwannee River Water Management District and St. Johns River Water Management District to obtain current Florida groundwater use data, which were incorporated into groundwater modeling efforts.

Climate

A review of data for the region from the Southeast Regional Climate Center indicates that the climate is temperate with mild winters and hot summers. Average maximum temperatures are around 92°F in July and average minimum temperatures are near 40°F in January. The area receives abundant rainfall, approximately 46-52 inches per year, with the greatest rainfall occurring during July and August. The driest month in the region is November. Snowfall is rare and the historical average for the region is 0.1 inch near the coast to 0.3 inch further inland.

2.2. Characteristics of Region

The Suwannee-Satilla Council encompasses 18 counties in the southeastern portion of Georgia, with a projected 2015 population of approximately 416,373 (Governor's Office of Planning and Budget, 2015). The counties and major towns and cities are shown in Figure 2-1. The major population centers in the region include the cities of Valdosta, Tifton, and Douglas.

Based on information obtained from Georgia Department of Labor Local Area Profiles, major employers in the regions include Bway Corporation, Inc. and Lee Container Corps in Clinch County, Shaw Industries Group Inc. in Tift and Ben Hill Counties, Heatcraft Refrigeration Products, LLC in Tift County, and the Moody Air Force Base in Lowndes and Lanier Counties. The rural economies of five counties in the region (Atkinson, Brantley, Charlton, Clinch, and Pierce Counties) are categorized as very or critically dependent on the forest community by the Georgia Forestry Commission in the 2008 report "Economic Impact of Forest Products Manufacturing in Georgia." There are five forestry products manufacturing facilities within the region. The raw materials to sustain these facilities are also supplied by the region. Two examples of industries that rely on the region's water resources for its operations are Pilgrim's Pride (chicken processing) and Premium Waters, Inc. (bottled water), which are both located in Coffee County. The primary economic

sectors in the region include agriculture, forestry, professional and business services, education, healthcare, manufacturing, public administration, and construction.

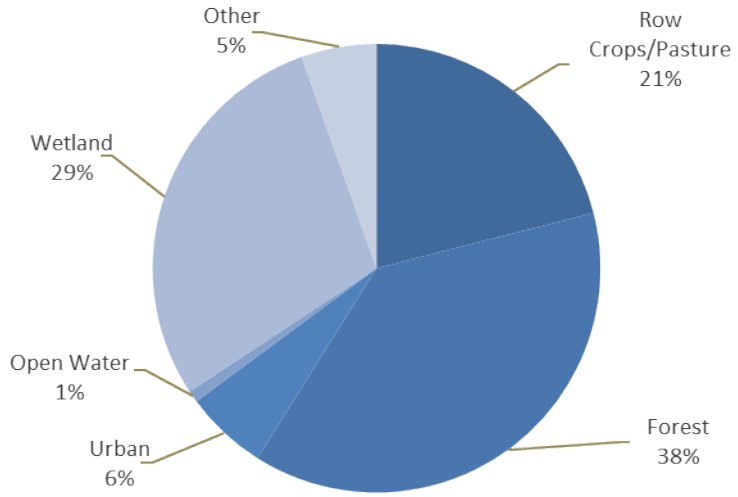
Agriculture has historically played a dominant role in the economy of the Suwannee-Satilla Region and the State. During 2012, Georgia agriculture generated more than $9.3 billion in cash receipts to the State's economy, with the Suwannee-Satilla Region contributing approximately $821 million in 2009 (2012 Census of Agriculture; U.S. Department of Agriculture, 2009). According to the USDA Economic Research Service, farming's contribution to state and national economies can be determined by calculating the *net value added*, which is the total value of the agricultural sector's production of goods and services less payments to other sectors of the economy. The farm production *net value added* for the Suwannee-Satilla Region represents 14% of the total state farm *net value added* in 2007. The Suwannee-Satilla farm production *net value added* represents 0.12% of the total State gross domestic product (GDP), which was $399 billion in 2007 (U.S. Department of Commerce Bureau of Economic Analysis). Turner, Irwin, Tift, Brooks, Berrien, and Cook Counties are expected to continue to be the higher agricultural water use areas of the region.

While forestry and agriculture have, and will continue to be major economic drivers in the region, a number of areas will experience increased urbanization and increases in commercial and industrial growth. These trends are especially likely to be seen in Coffee, Lowndes, and Tift Counties among others.

The region includes four colleges and universities within the University System of Georgia: Abraham Baldwin Agricultural College in Tifton, Valdosta State University, South Georgia College in Douglas, and Waycross College. The region also includes three colleges within the Technical College System of Georgia: Wiregrass Technical College in Valdosta, Douglas, and Fitzgerald, Okefenokee Technical College in Waycross, and Moultrie Technical College in Tifton. In addition to county jails, there are six correctional facilities that are important employers and water users in the Suwannee-Satilla Region.

A summary of 2008 land cover distribution is shown in Figure 2-3, based on data obtained from the University of Georgia

Figure 2-3: Land Cover Distribution



Adapted from:
University of Georgia
Natural Resources Spatial Analysis Laboratory
Percentages are based upon land use estimates from 2008

Note: "Other" represents clearcut/sparse, beaches/dunes, and quarries/outcrops land use categories

Natural Resources Spatial Analysis. Forests cover 38% of the Suwannee-Satilla Region, and wetlands and agriculture cover 29% and 21% of the region, respectively. It should be noted that 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 region. The remaining land cover (6%) consists of water and open spaces. Based on the inventory of Georgia's irrigated cropland developed as part of the agricultural demand assessment in 2016, peanut, corn and cotton account for the majority of crops irrigated in the Suwannee-Satilla Region. Fresh vegetables are also planted widely in 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. The Southern Georgia Regional Commission covers the same counties as the Suwannee-Satilla 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 Southern Georgia 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 Southern Georgia 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 Southern Georgia Regional Commission completed their Regional Plan in 2013.

3. WATER RESOURCES OF THE SUWANNEE-SATILLA REGION

Section 3. Water Resources of the Suwannee-Satilla Region

3.1. Current Major Water Use in Region

Based on data summarized from the 2009 U.S. Geological Survey (USGS) report "Water Use in Georgia by County for 2005; and Water-Use Trends, 1980-2005," water supply in the Suwannee-Satilla Region for 2005 totaled approximately 175 million gallons per day (MGD) and was comprised of 73% groundwater and 27% surface water, as shown in Figure 3-1. Figure 3-2 shows surface water in the region was used almost entirely for agriculture (98%) with the remaining 2% used by industry. A total of 128 MGD of groundwater withdrawn were predominantly used to supply agricultural (55%) and municipal users (28%) among others (self-supply and industrial), as shown in Figure 3-3. Wastewater treatment types in the region are shown in Figure 3-4. According to the Suwannee-Satilla Water and Wastewater Forecasting Technical Memorandum (CDM, 2011), 55% of treated wastewater in the region was disposed of as a municipal/industrial point source discharge or to a land application system (6%). The remaining wastewater was treated by on-site sewage treatment (septic) systems (38%).

3.2. Current Conditions Resource Assessments

EPD developed three Resource Assessments to evaluate surface water quality, surface water availability, and groundwater availability throughout the State. These assessments analyzed the capacity of water resources to meet demands for water supply and wastewater discharge without causing unreasonable impacts according to metrics established by EPD. The assessments were completed on a resource basis (river basins and aquifers), but are summarized herein as they relate to the Suwannee-Satilla

Summary

In 2005, surface water and groundwater withdrawal in the region totaled approximately 175 MGD to accommodate municipal, self-supply, industrial, and agricultural demands.

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

The availability of surface water to meet current uses varies across the region. Unlike many areas in Georgia the watersheds in the region are much smaller in size and therefore generally have lower flow conditions and are more vulnerable to drought. Consequently, on several of these smaller rivers (i.e., Alapaha, Satilla, and Withlacoochee Rivers) with higher water use, river flows are at times (during drier years) insufficient to meet both off-stream uses and instream needs.

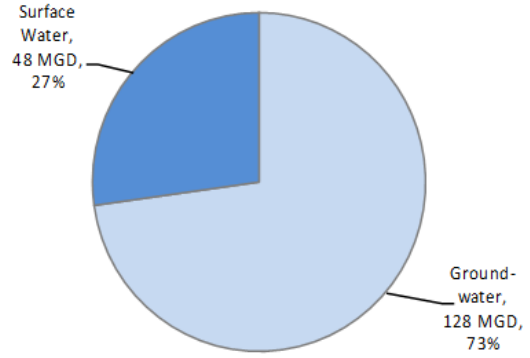
Groundwater supplies are currently sufficient on a regional basis to meet uses across the region.

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.

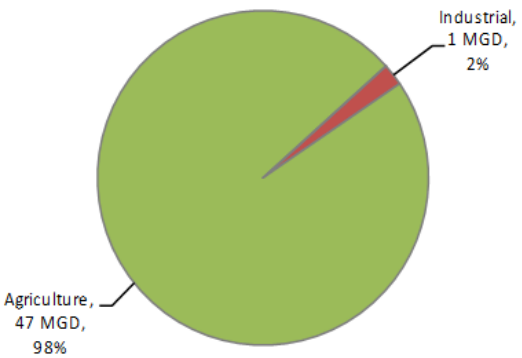
Region. As described in more detail below, the term “gap” is used to indicate when the current or future use of water has been identified as potentially causing unreasonable local or regional impacts.

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



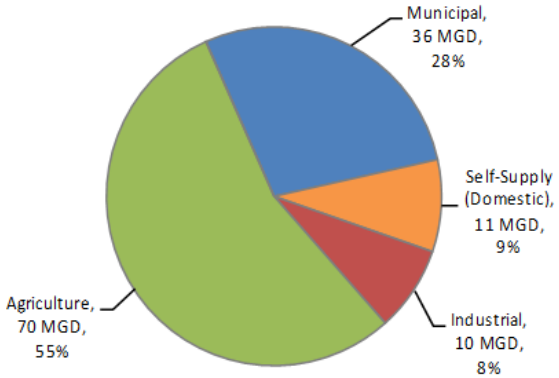
Total ≈ 175 MGD

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



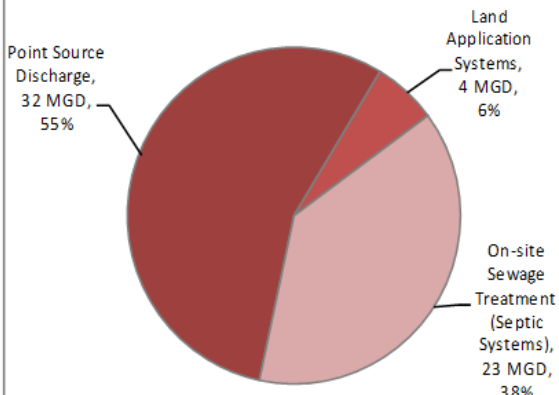
Total ≈ 48 MGD

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



Total ≈ 128 MGD

Figure 3-4: 2005 Wastewater Treatment by Category [1b]

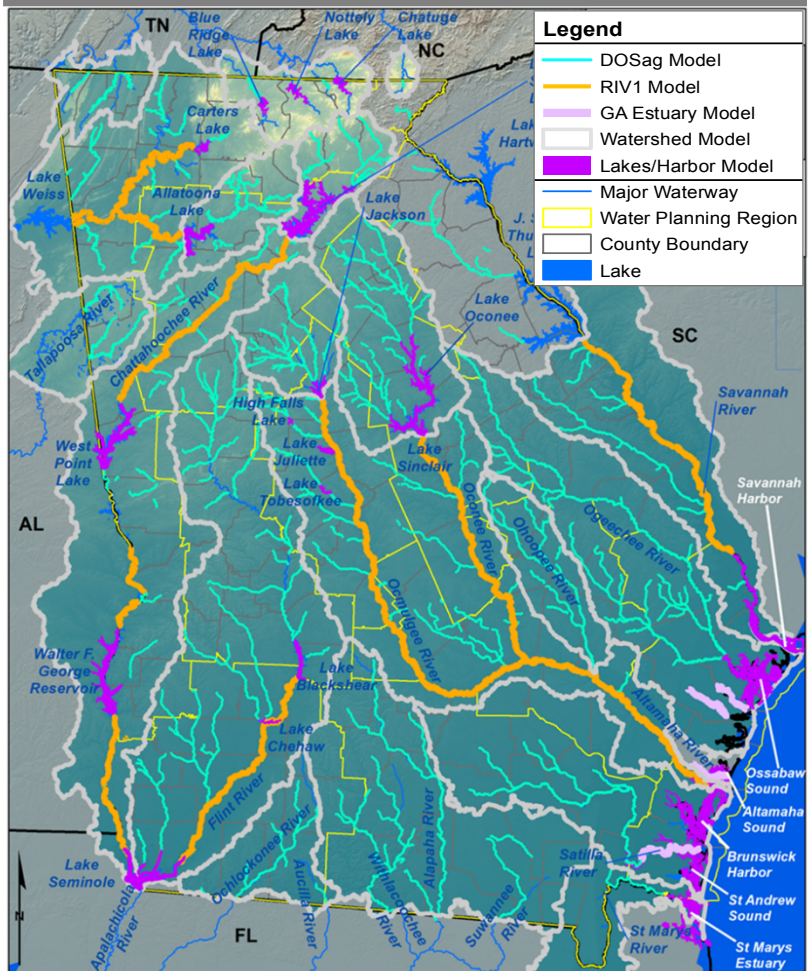


Total ≈ 59 MGD

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

3.2.1. Current Surface Water Quality (Assimilative Capacity)

Figure 3-5: Assimilative Capacity Models



The Water Quality (Assimilative Capacity) Resource Assessment (EPD, 2017) 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 assimilate pollutants via chemical and biological processes without exceeding State water quality standards or harming aquatic life. The Water Quality (Assimilative Capacity) Resource Assessment evaluated the capacity of surface waters to process pollutants without violating water quality standards. The current (also referred to as baseline) assimilative capacity results focus on dissolved oxygen (DO), and nutrients in some areas of the State (specifically nitrogen and phosphorus), and chlorophyll-a (a parameter that is closely tied to lake water quality). The assessments evaluate the impact of current wastewater and stormwater discharges with current withdrawals, land use, and meteorological conditions.

Assimilative Capacity Modeling (Dissolved Oxygen)

One measure of the capacity of a stream to maintain its health and the health of the aquatic species living therein is the amount of residual DO in the stream. As shown in Table 3-1 and 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 Figure 3-6 for the Suwannee-Satilla Region, which primarily includes portions of the Suwannee, Satilla, and St. Marys River basins as well as small portions of the Ochlockonee and Ocmulgee basins. The current assimilative capacity results represent municipal and industrial wastewater facilities operating at their full permitted discharge levels (flow

and effluent discharge limits as of 2014). It should be noted that most permit holders do not operate at their full permitted capacity, and therefore, these results should not necessarily be viewed as reflective of actual current conditions. When reviewing the figures, the following points should be kept in mind: segments shown 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.

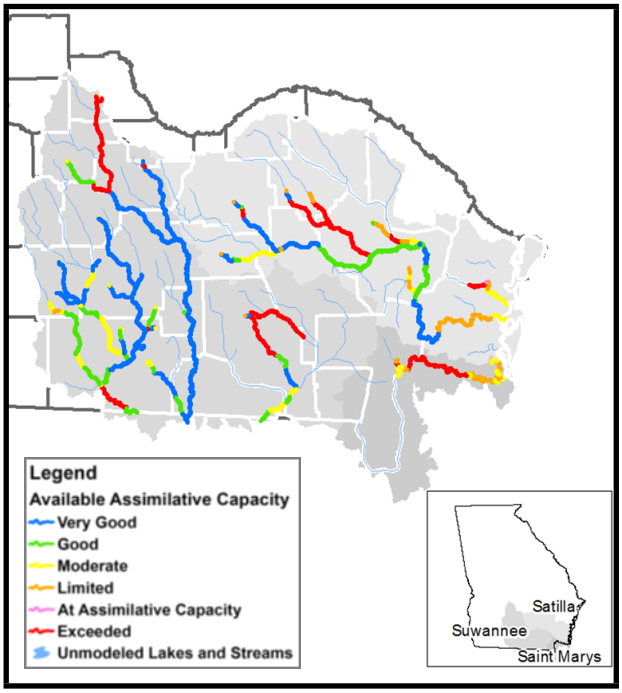
Table 3-1: Assimilative Capacity for DO in Suwannee-Satilla Planning Council (under current permit conditions)

Basin	Available Assimilative Capacity (Total Mileage)						Total River Miles in the Council Area
	Very Good (≥1.0 mg/L)	Good (0.5 to <1.0 mg/L)	Moderate (0.2 to <0.5 mg/L)	Limited (>0.0 to <0.2 mg/L)	None or Exceeded (<0.0 mg/L)	Unmodeled	
Ochlockonee	0	0	0	0	3	0	3
Ocmulgee	3	33	0	0	0	0	36
Satilla	73	91	31	14	60	0	269
St Marys	0	0	6	3	12	0	21
Suwannee	289	91	54	0	85	5	524

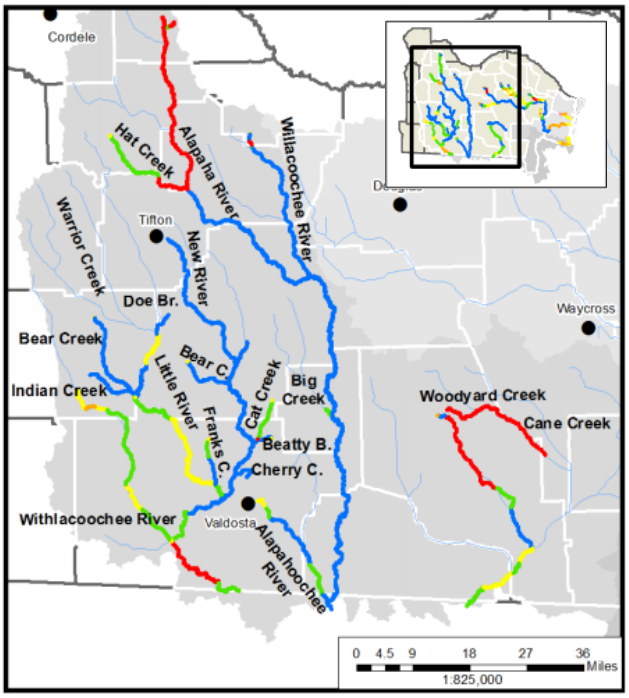
Source: GIS Files from the Updated Water Quality Resource Assessment; EPD, January 2017
Notes: Suwannee Basin includes many local creeks and rivers such as the, Willacoochee River, Alapaha River, New River, Withlacoochee River, Alapahoochee River, Woodyard Creek, Cane Creek and many other smaller tributaries. The Ocmulgee River makes up the northeastern boarder of Ben Hill County and the northern board of Coffee County. The Aucilla River is a tributary to the Ochlockonee but only 3 river miles are actually in the Suwannee – Satilla region near the southwest corner of Brooks County near Thomas County and the Florida State line. Approximately 34 of those river miles originate in Thomas County and then flow into Brooks County.

Figure 3-6: Results of Assimilative Capacity Assessment – DO under Current Permit Conditions

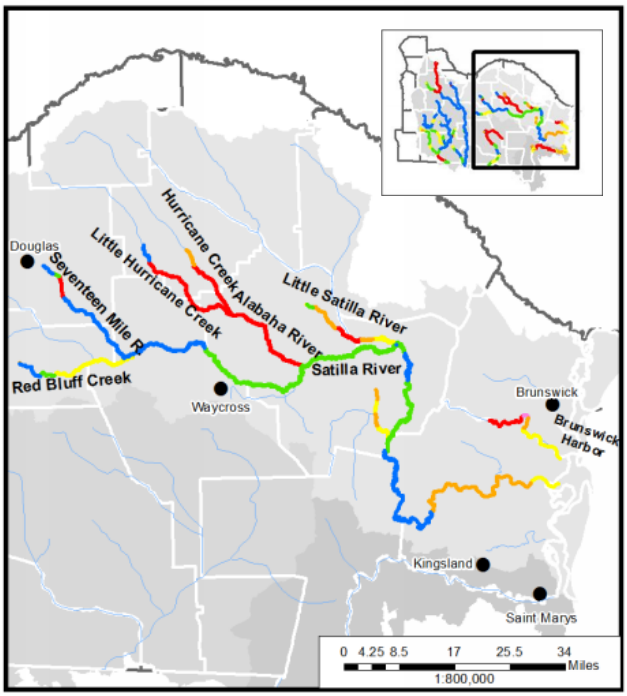
SUWANNEE-SATILLA BASIN



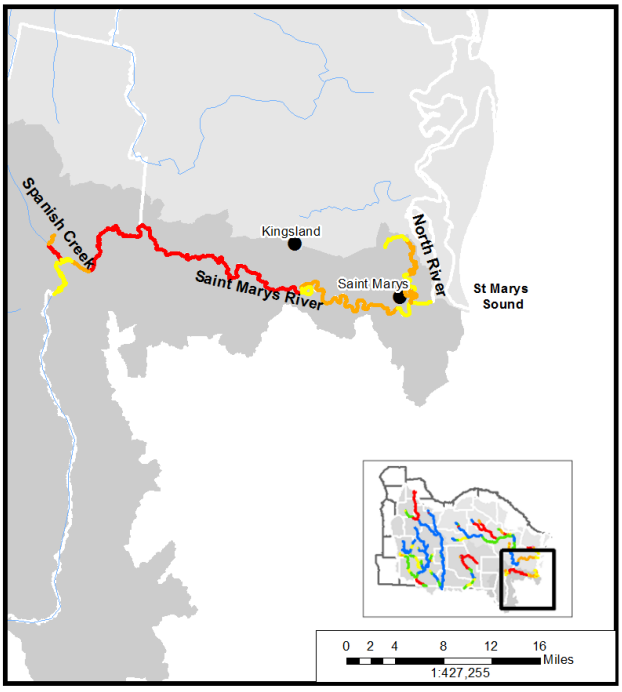
SUWANNEE BASIN



SATILLA BASIN



ST. MARYS BASIN



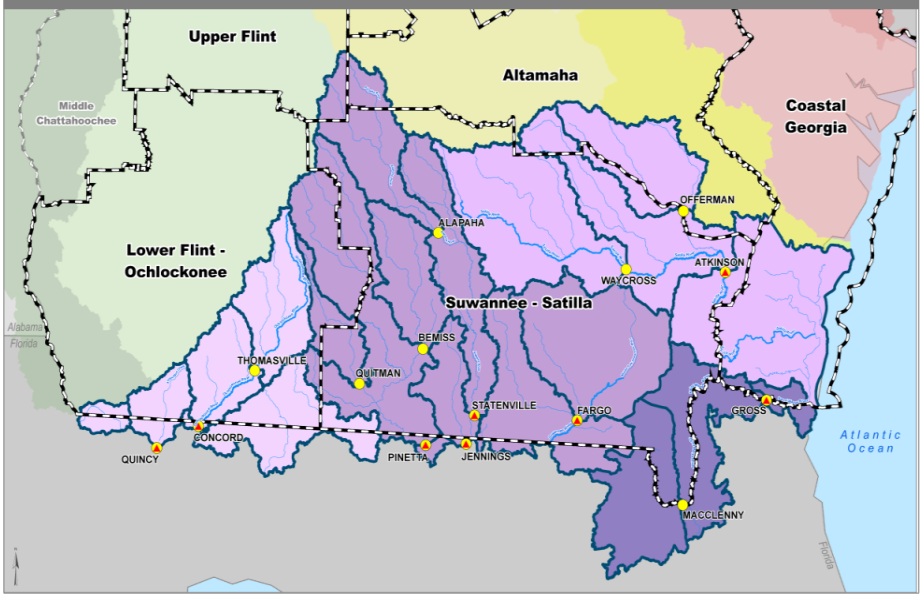
Nutrient Modeling

In addition to Assimilative Capacity modeling for DO, EPD completed nutrient (total nitrogen and total phosphorous) modeling for the watersheds in the Suwannee–Satilla region. The location of the watershed model boundaries, and harbors and estuaries model locations are shown in Figure 3-5. There are currently no nutrient standards for total nitrogen and total phosphorus, but these standards may be developed within this region following a public stakeholder process(es). The watershed models evaluate point and non-point source nutrient loadings of total phosphorus and total nitrogen to the Brunswick Harbor and to the state line. The Suwannee-Satilla 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.

3.2.2. Surface Water Availability

The Surface Water Availability Resource Assessment (EPD 2017) estimates the availability of surface water to meet current and future municipal, industrial, agricultural, and thermal power water needs as well as the needs of instream and downstream users. The assessment evaluated the impact of water consumption on stream flows at certain locations in each river basin. Modeled stream flows were compared with a flow regime based on low flow thresholds (7Q10 from state policy) selected as indicators of the potential for water consumption to impact instream uses such as fishing, boating, and aquatic life habitat. It should be noted that a stream's 7Q10 is a statistical figure that reflects the lowest 7-day running average of a stream's flow with a recurrence frequency of once in 10 years.

Figure 3-7: Model Nodes for the Suwannee-Satilla Region



As shown in Figure 3-7, there are several surface water planning nodes located in the Suwannee-Satilla Region (shown as yellow circles with red triangles). 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 2013. The modeled flow was compared with the flow regime; where the modeled stream flow was less than the

flow regime, a potential "gap" was identified. The potential gaps were analyzed in terms of both magnitude (i.e., the amount by which the modeled stream flow fell below the flow regime) and duration (i.e., the number of days the stream flow fell below the flow regime). Surface water potential gaps exist under current conditions at the following planning nodes: Atkinson (Satilla River), Jennings (Alapaha River), Pinetta (Withlacoochee River), and Statenville (Alapaha River). There are no potential gaps at Fargo. At the nodes with potential gaps, during certain low flow periods, there is not sufficient surface water to meet current off-stream demands and also meet the targets for support of instream uses. More detailed information about potential gaps at these nodes under future conditions is included in Section 5.

In the Suwannee-Satilla 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) as the low flow thresholds to determine the flow regime. It is important to note that when a potential surface water gap exists, management practices are needed to address times when off-stream uses increase the severity and/or frequency of low flow conditions. Low flow conditions have been and will continue to occur; and the Suwannee-Satilla Council's management practices are not utilized to address naturally occurring low flow conditions. The results of the current conditions potential gaps are shown in Table 3-2.

Table 3-2: Summary of Modeled Current Conditions Surface Water Gaps

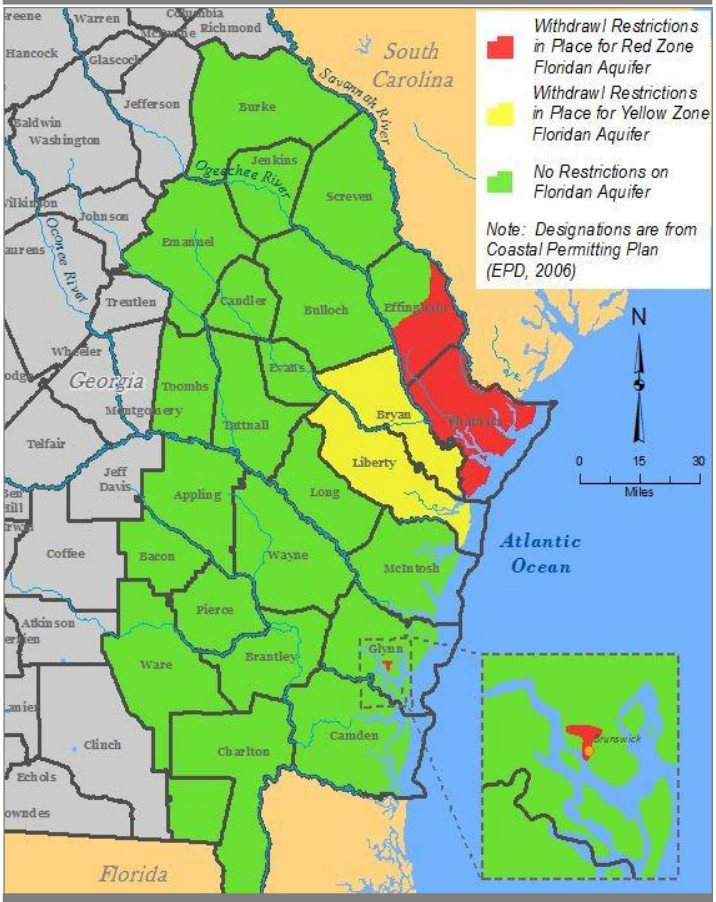
Node	Duration of Gap (% of total days)	Average Flow Deficit	Long-term Average Flow	Maximum 1-Day Gap	Corresponding Flow Regime
Atkinson	10	24 cfs (16 MGD)	2,208 cfs (1,427 MGD)	69 cfs (45 MGD)	188 cfs (76 MGD)
Jennings	11	33 cfs (21 MGD)	1,367 cfs (883 MGD)	103 cfs (67 MGD)	161 cfs (104 MGD)
Pinetta	12	45 cfs (29 MGD)	1,687 cfs (1,090 MGD)	118 cfs (76 MGD)	190 cfs (123 MGD)
Statenville	17	26 cfs (17 MGD)	1,047 cfs (677 MGD)	89 cfs (58 MGD)	100 cfs (65 MGD)

Source: Surface Water Availability Assessment, May 2017, EPD
Note: Surface Water Availability modeling simulation period is from 1939 to 2013

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 data. EPD prioritized the aquifers based on the characteristics of the aquifer, evidence of negative effects, anticipated negative impacts, and other considerations. This assessment identified the sustainable yield, or the volume of groundwater that can be used without negative impacts. Negative impacts include 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. The Suwannee-Satilla Region will coordinate usage with other water planning regions to meet the sustainable yield for each groundwater source.

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 Floridan aquifer is a vital resource for the Suwannee-Satilla Region. In 2005, groundwater was relied upon to meet about 73% of the water use in the region (USGS, 2009). The Suwannee-Satilla Region shares its groundwater resources with portions of North Florida. Coordination was conducted with the Suwannee River Water Management District and St. Johns River Water Management District to obtain current Florida groundwater use data, which were incorporated into the Groundwater Availability Resource Assessment. 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 needs. However, localized issues may occur if groundwater well densities or withdrawal rates are greater than the scenarios evaluated in the Resource Assessment. For the Suwannee-Satilla Region,

the Resource Assessment model boundary for the sustainable yield estimates did not include southern Ware, southern Brantley, and Charlton Counties, as these counties are included in an ongoing United States Geological Survey model of the Floridan aquifer and, therefore, were not included in the Eastern Coastal Plain model boundaries for the 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 (Coastal Permitting Plan) (www.gadnr.org/cws/). There are five counties (Bacon, Brantley, Charlton, Pierce, and Ware Counties) in the Suwannee-Satilla Region that are located within the Green Zone. Per the Coastal Permitting Plan, there are no pumping restrictions from the Floridan aquifer in this area; however, there are water conservation requirements related to groundwater withdrawals.

3.3. Current Ecosystem Conditions and Instream Uses

The Suwannee-Satilla Region encompasses parts of the Southern Coastal Plain and Southeastern Plains ecoregions. The rivers in these ecoregions support a diversity of fish and wildlife species and provide numerous recreational opportunities. The Department of Natural Resources manages one Public Fishing Area (Berrien County) and two Wildlife Management Areas (Coffee and Ware Counties) in the Suwannee-Satilla Region. The Okefenokee National Wildlife Refuge (Ware, Charlton, and Clinch Counties) contains one of the largest peat-based freshwater swamps in the world and is home to over 400 species of animals. All of these areas provide public access to rivers and lakes for fishing, hunting, and other recreational activities.

With over 1.29 million resident anglers, fishing is the most popular wildlife-related activity in Georgia (GADNR-WRD 2006). The Suwannee River, which begins in Georgia and discharges into the Gulf of Mexico, is well-known to anglers for its warmouth, flier, chain pickerel, and bullhead catfish. The Satilla and St. Marys rivers, which discharge into the Atlantic Ocean, are better known for their redbreast sunfish, bluegill, redear sunfish, black crappie, largemouth bass, and catfish. Because they are directly linked to Georgia's coastal ecosystem, the Satilla and St. Marys rivers also support commercial fisheries in Georgia for blue crabs, shrimp, and eels, and recreational fisheries for nearshore species such as red drum and sea trout.

The Satilla and St. Marys rivers provide important riverine habitat for small populations of shortnose sturgeon, Atlantic sturgeon, American shad, and American eel—all diadromous species that travel between the ocean and freshwater rivers to breed—as well as striped bass, a very popular sport fish. Because these populations are small and depend on varying mixtures of salt and fresh water at different life stages, they are susceptible to changes in water quality and flow.

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 amphibians, fish, mammals,

mollusks, and reptiles depend on rivers for part or all of their lifecycle. Federally endangered species in the Suwannee-Satilla Region that inhabit rivers include the shortnose sturgeon (Acipenser brevirostrum). There are 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). 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.

In the Southern Coastal Plain ecoregion, conservation lands make up 14% of the land area. The percentage of lands in conservation is lower in the Southeastern Plains ecoregion at 2.6% (CWCS, 2005). Several rivers and watersheds in this planning region have been identified as ecologically important, including the St. Marys, Ocmulgee, and Suwannee rivers. These high priority streams and watersheds are considered important for the conservation of at least one high priority habitat or species and were identified during the development of WRD's Comprehensive Wildlife Conservation Strategy (2005).

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

An estuary is a semi-enclosed body of water, which has a free connection with the sea and within which sea water is measurably diluted with fresh water. Without the 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 fresh water for an 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

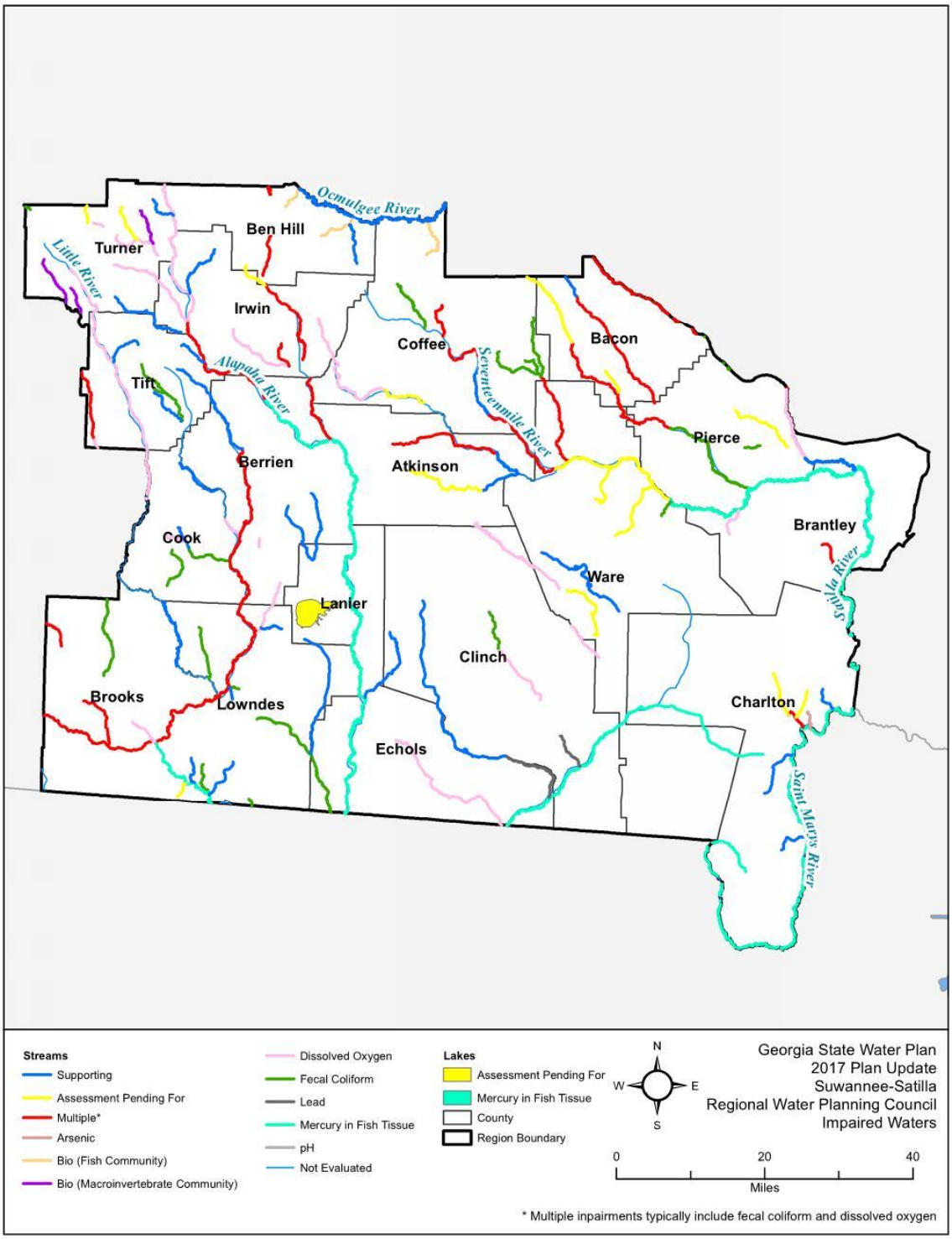
Under Section 303(d) of the federal Clean Water Act (CWA), a total maximum daily load (TMDL) must be developed for waters that do not meet their designated uses. A TMDL represents the maximum pollutant loading that a water body can assimilate and continue meeting its designated use (i.e., not exceeding 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 Suwannee-Satilla Region, there are 83 impaired stream reaches (total impaired length of 946 miles) as shown in Figure 3-9.

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

- 35% are impaired for trophic-weighted residual mercury in fish tissue
- 30% are impaired for low dissolved oxygen
- 28% are impaired for fecal coliform
- 3% are impaired for lead
- 1% are impaired for Biological (Fish Community)
- 1% are impaired for Biological (Macroinvertebrate Community)
- 1% are impaired for pH
- 1% are impaired for algae
- <1% are impaired for Arsenic

TMDLs have been completed for 73 of the impaired stream reaches.

Figure 3-9: Suwannee-Satilla Region Impaired Waters



4. FORECASTING FUTURE WATER RESOURE NEEDS

Section 4. Forecasting Future Water Resource Needs

Summary

Over planning horizon, the population in the Suwannee-Satilla Region is projected to grow by 20%, increasing the demands for surface water and groundwater and increasing the quantity of wastewater generated.

Total water withdrawals by municipal, industrial, and agricultural sectors are forecasted to increase by 16% (43 MGD) from 2015 to 2050.

Total wastewater flows are projected to increase by 19% (13 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 Suwannee-Satilla Region and serve as the basis for the selection of management practices (Sections 6 and 7). This section presents the regional water and wastewater forecasts from 2015 through 2050 for four water use sectors: municipal, industrial, agriculture, and thermoelectric generation.

During the regional planning process, the majority of Suwannee-Satilla Council members identified the following objectives for the forecast process. The two primary objectives were:

- Ensuring accurate data, and
- Ensuring that data are not used to establish regional or local mandates.

Central to these objectives is the overarching goal to develop consistent and comparable sets of data. This means that select data sets (common year for data inputs and comprehensive coverage of the State) in many cases have broader coverage of the State, but may not be as precise as local provider level data. During development of the Regional Water Plan, there was a concerted effort to strike a balance between broad coverage and local data. This was accomplished 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.

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.

4.1. Municipal Forecasts

Municipal water includes water supplied to residences, commercial businesses, and small industries (those not included in the 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 Suwannee-Satilla 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 are shown in Table 4-1.

Table 4-1: Population Projections by County

County	2015	2020	2030	2040	2050	Difference (2015 to 2050)	% Increase (2015–2050)
Atkinson	8,340	8,443	8,460	8,243	7,910	-430	-5%
Bacon	11,437	11,986	13,017	13,859	14,686	3,249	28%
Ben Hill	17,691	18,116	18,864	19,426	19,957	2,266	13%
Berrien	19,022	18,911	18,304	17,055	15,446	-3,576	-19%
Brantley	18,517	19,054	19,775	19,783	19,462	945	5%
Brooks	15,464	15,287	14,556	13,475	12,424	-3,040	-20%
Charlton	13,411	13,798	14,472	14,902	15,182	1,771	13%
Clinch	6,848	6,964	7,042	6,910	6,747	-101	-1%
Coffee	43,907	45,604	48,748	51,489	54,465	10,558	24%
Cook	17,268	17,764	18,635	19,188	19,604	2,336	14%
Echols	4,090	4,154	4,184	4,104	3,916	-174	-4%
Irwin	9,428	9,409	9,183	8,768	8,347	-1,081	-11%
Lanier	10,712	11,447	12,845	14,310	15,752	5,040	47%
Lowndes	116,023	123,740	138,246	152,066	166,258	50,235	43%
Pierce	19,384	20,528	22,997	25,452	28,211	8,827	46%
Tift	40,979	42,638	45,499	47,863	49,902	8,923	22%
Turner	7,940	7,470	6,579	5,626	4,736	-3,204	-40%
Ware	35,911	36,381	36,889	36,586	35,894	-17	0%
Total	**416,372**	**431,694**	**458,295**	**479,105**	**498,899**	**82,527**	**20%**

Source: Governor's Office of Planning and Budget (2015)

Municipal Water Forecasts

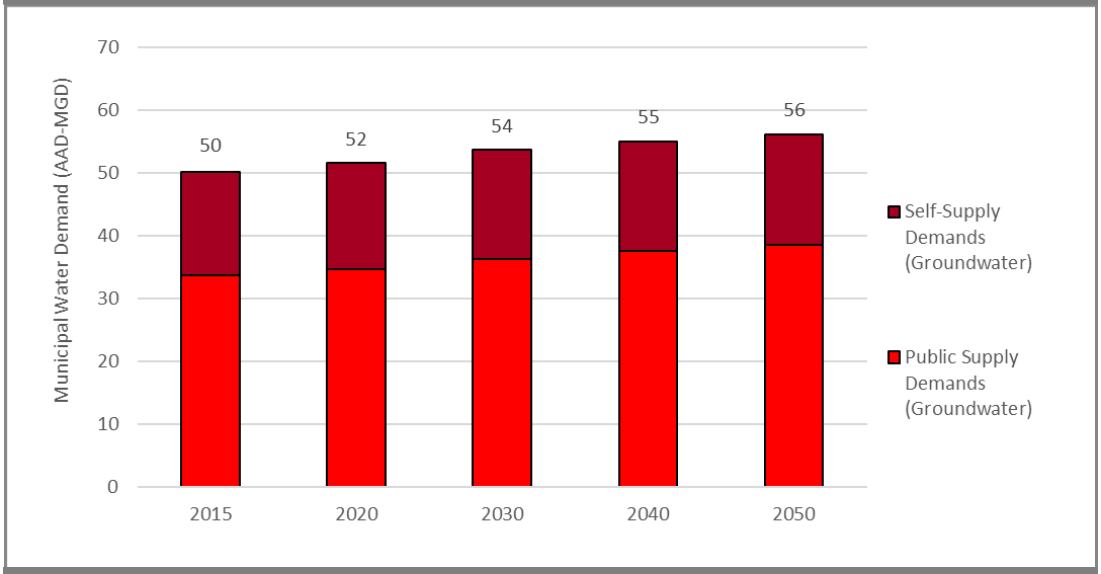
The municipal water forecasts were calculated by multiplying the baseline per capita water use rate by the population served. Per capita water use rates are different for public water systems in comparison to self-supplied water use; therefore, the demands are calculated separately and then summed together. The publicly-supplied water use rate was determined for each county within the region. The self-supply per capita demand is estimated at 100 gallons per capita per day (gpcd).

To support this Plan update, EPD reviewed withdrawal data and the estimated population served reported by permitted municipal water systems from the years 2010 through 2014. Based on the trends observed from that data, an adjustment factor for each County was developed and applied to the gallons per capita per day values used in 2010 for public-supplied municipal demand. The self-supplied per capita values remained unchanged.

The forecasted water use rates for the Suwannee-Satilla Region were further 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 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 gallons per flush 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 Suwannee-Satilla Water and Wastewater Forecasting Technical Memorandum (CDM Smith, 2017).

Total municipal water demands are shown in Figure 4-1 for the Suwannee-Satilla Region. In addition, this figure shows the distribution in demands resulting from public water systems and self-supply systems. In the Suwannee-Satilla 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: Suwannee-Satilla Water and Wastewater Forecasting Technical Memorandum (CDM Smith, 2017).

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).

In 2010, 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 100% 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.

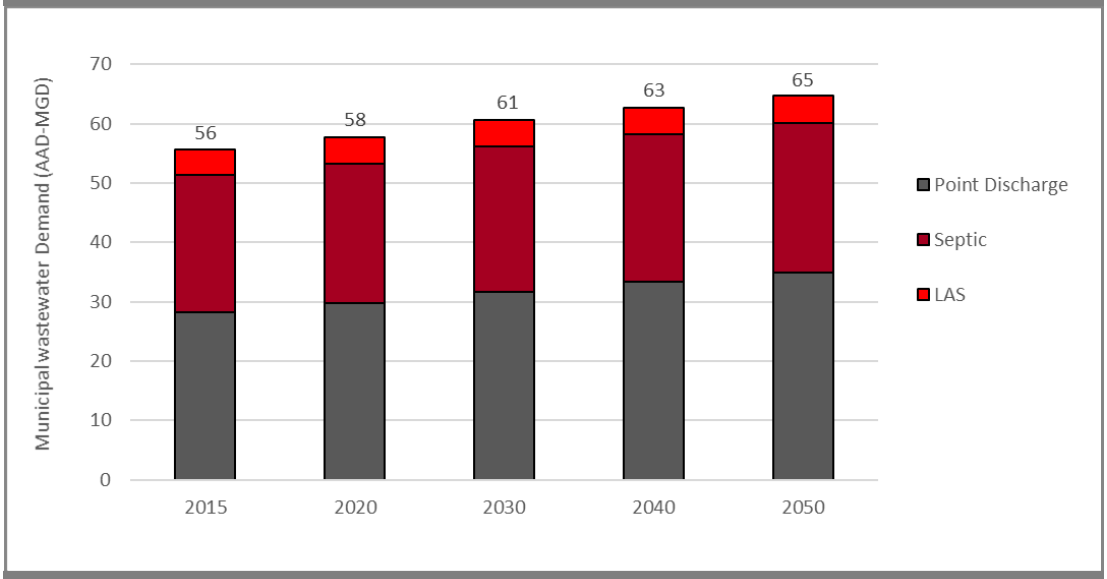
Wastewater effluent flow from centralized treatment facilities is either discharged as a point source to a receiving water body or to an LAS. Information obtained from existing EPD permit data as well as feedback from municipal suppliers was used to determine the ratio of point discharge to land application systems for each county.

For this Plan update, the percent of county total wastewater flow that is septic was retained, with the septic flow forecast adjusted based on the percent change in county

population between the prior (2010) and updated (2015) OPB population projections. Centralized wastewater flows from 2014, including point discharges and LAS, were analyzed. The sum of the 2014 point discharges per county was adjusted based on any adjustment in the ratio of septic/centralized treatment over time as well as the population projections. Similarly, the sum of 2014 land application system flows by county was adjusted based on the ratio of septic/centralized treatment over time and the population projections.

Municipal wastewater forecasts are shown in Figure 4-2.

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



Source: Municipal and Industrial Water and Wastewater Forecasts (CDM Smith, 2017)

4.2. Industrial Forecasts

Industrial water and wastewater forecasts anticipate the future needs from the following major water-using industries within the Suwannee-Satilla Region: mining, food, textile, apparel, paper, chemicals, fabricated metals, and electrical equipment. 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 (UGA) produced the industry-specific rates of growth in employment for EPD, which were then used to

calculate the future water needs for specific industries within the Suwannee-Satilla Region. General employment in heavy water-using industries such as mining, food, textile (carpet), paper, fabricated metal products, chemicals, and electrical equipment sectors shows an upward trend throughout the planning period, while employment projections in the apparel, and textile (fabric) sectors decreased. In situations where there was a decrease in employment for major water using industries, the water use forecast was held constant over the planning horizon.

Industrial Water Forecasts

Industrial water use was calculated based on available information including water need per unit of production, units of production per employee, and water need by employee. For industries where information was available on water use per unit of production, water forecasts were based on production. For industries where product based forecasting was not possible, industry-specific workforce projections were used to project the rate of future growth in water use within the industry. Industry employment data are readily available, and employment is linked to production, and thus indirectly linked to water requirements. By assuming that water use per production unit, and production per employee remain the same over the forecast period, future water needs can be estimated by future employment. Table 4-2 shows the baseline and alternate industrial water demands over the planning period.

Table 4-2: Baseline and Alternate Industrial Water Demands (in AAD-MGD)

Category	2015	2020	2030	2040	2050
Baseline Industrial	15.0	15.6	16.0	16.5	17.0
Alternate Industrial	15.5	16.7	18.3	20.1	22.0

Source: Suwannee-Satilla Water and Wastewater Technical Memorandum; CDM Smith (2017).

In addition to the baseline industrial water demand forecast, the Suwannee-Satilla Council elected to develop an alternate forecast that includes an additional (above the baseline forecast) 5 MGD of industrial demand by 2050 (starting in 2015 and added incrementally every 10 years). While the Suwannee-Satilla Council could not identify the specific industries or locations, the general consensus was that the region is attractive to industry from a cost of operations and abundant water resources perspective. The Suwannee-Satilla Council recommended alternate industrial water and wastewater forecast is shown graphically in Figure 4-3. Industrial water demands in the Suwannee-Satilla Region are satisfied mainly through groundwater withdrawals, although some minor surface water withdrawals also occur.

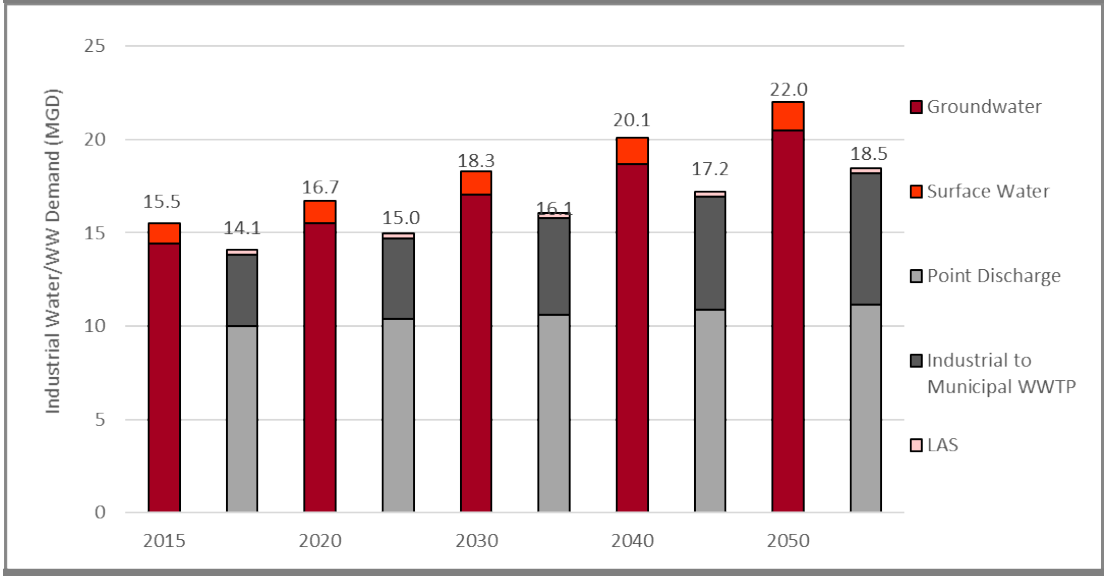
Industrial Wastewater Forecasts

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 gallon of wastewater produced. For the paper category, for every gallon of water used, there will be 1.0 gallon of wastewater produced. In some categories, this approach estimates that more wastewater will be produced than the gallons of water used. This

occurs when wastewater treatment tanks and ponds are located outside the industrial facility and collect precipitation. This rainwater adds to the total wastewater effluent discharged or land-applied. Stone and gravel quarries also have to discharge rainwater that accumulates in the operational pits, and this flow adds to the permitted discharge. Thus, some industries have a wastewater to water use ratio greater than 1.0.

Once the industrial wastewater flows were estimated, the 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. These are based upon the alternate industrial water forecasts presented in Table 4-2.

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



Source: Municipal and Industrial Water and Wastewater Forecasts (CDM Smith, 2017)

4.3. Agricultural Forecasts

The agricultural water use forecasts include irrigation demands for both crop and non-crop (including livestock, nurseries, and golf courses) uses. The crop forecasts, developed by the Georgia Water Planning & Policy Center at Albany State University (GWPPC), with support from the University of Georgia's (UGA) College of Agricultural and Environmental Sciences for 2015 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.

Non-crop (including non-permitted) agricultural water demands were identified with the assistance of industry associations. Similar to crop irrigation, forecasts for nursery and

greenhouse water use were also developed for a range of climate conditions over the planning period. For planning purposes, the drier-than-normal nurseries/greenhouse forecasts are presented in Table 4-3. For golf courses and livestock production, current 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.

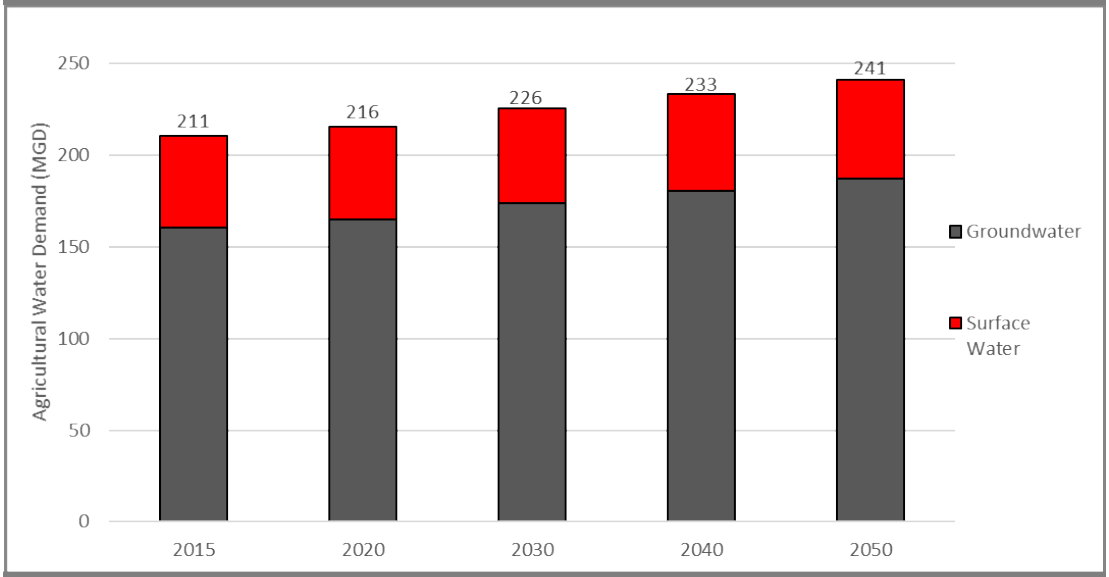
Table 4-3: Agricultural Water Forecast by County (in AAD-MGD)[1,2]

County	2015	2020	2030	2040	2050
Atkinson	8.5	8.6	8.9	9.1	9.2
Bacon	7.2	7.4	7.9	8.3	8.7
Ben Hill	8.1	8.2	8.4	8.5	8.6
Berrien	20.2	21.1	22.7	24.2	25.6
Brantley	0.65	0.66	0.69	0.71	0.73
Brooks	25.0	25.5	26.6	27.5	28.3
Charlton	0	0	0	0	0
Clinch	3.9	4.0	4.3	4.6	4.8
Coffee	14.5	14.6	15.0	15.2	15.3
Cook	15.4	15.6	16.2	16.6	17.1
Echols	2.9	3.0	3.1	3.1	3.2
Irwin	29.8	30.3	31.3	31.8	32.4
Lanier	5.4	5.7	6.3	6.8	7.4
Lowndes	10.0	10.5	11.7	12.8	14.0
Pierce	8.3	8.5	8.8	9.0	9.2
Tift	19.9	20.2	20.9	21.4	22.0
Turner	25.8	26.2	27.2	27.9	28.6
Ware	5.1	5.3	5.5	5.8	6.0
Total	**210.6**	**215.6**	**225.6**	**233.4**	**241.1**

[1]Source: Coastal Georgia Water and Wastewater Forecasting Technical Memorandum (2017).
[2]The agricultural demands represent dry year conditions, in which 75% of years had more rainfall and 25% of years had less

Figure 4-4 shows the regional agricultural demands by source of supply. Agriculture is a very important economic driver in the Suwannee-Satilla Region. Throughout the planning period, forecasted agricultural water demand for the region is approximately 3 times the combined municipal and industrial water demand. The Suwannee-Satilla Region as a whole is expected to see an increase of 14% in agricultural water demand by 2050. The largest increase in forecasted demand occurs in Lowndes County, with a 40% increase by 2050. Lanier, Berrien, and Clinch Counties have the next largest forecasted demand increases, at 37%, 26%, and 24% respectively. All other counties in the region are forecast to have increases of 20% or less through 2050. Charlton County has no forecasted increase in agricultural water demand through 2050. As shown in Figure 4-4, the majority of the agricultural withdrawals (approximately 75%) are supplied by groundwater and the remainder by surface water.

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



Source: Municipal and Industrial Water and Wastewater Forecasts (CDM Smith, 2017)

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. There is no existing or currently planned thermoelectric power generated in the Suwannee-Satilla Region, so the associated water demand is zero for 2015 through 2050 as shown in Table 4-4.

Within the previous statewide analysis, the generating capacity of the existing and planned facilities was not able to meet the projected statewide power needs through 2050 and additional generating capacity was assumed to be developed beyond 2020. Additional generating capacity may be needed to meet the statewide power need estimate. However, the water requirements associated with the potential new capacity are minimal; less than 20 MGD withdrawals and less than 10 MGD consumption, statewide. Thus, no future water demands for currently unassigned power generation facilities have been added to the estimates for the Suwannee-Satilla region within this update.

Suwannee-Satilla Council has elected to qualitatively assess the potential for energy development in the region by continuing to monitor renewable energy policy.

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

Category	2015	2020	2030	2040	2050
Existing and Planned Facilities' Withdrawals	0	0	0	0	0
Existing and Planned Facilities' Consumption	0	0	0	0	0

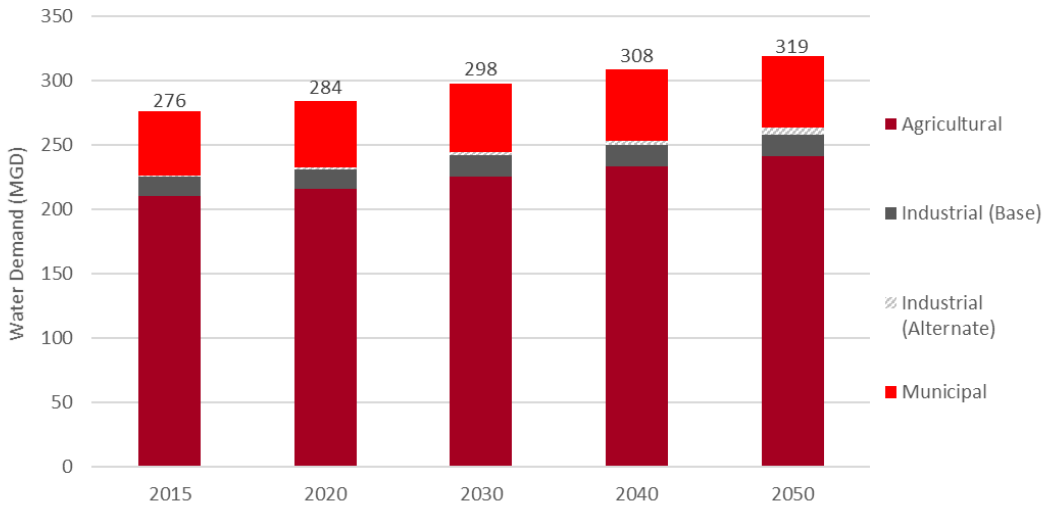
Source: Update of GA Energy Needs & Generating Facilities (2016)

4.5. Total Water Demand Forecasts

Total water demand forecasts in 2015 and 2050 for the Suwannee-Satilla Region are summarized in Figure 4-5. This figure presents the forecasts for municipal, industrial (baseline forecast), industrial (alternate forecast), and agricultural uses. Overall, the region is expected to grow by 16% (43 MGD) in water demand from 2015 through 2050.

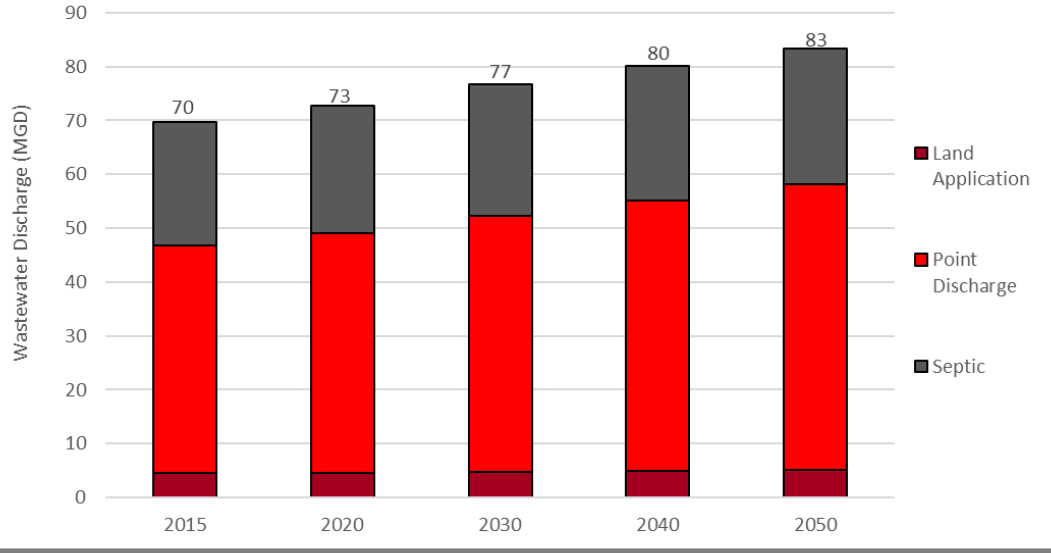
Total wastewater flow forecasts in 2015 and 2050 for the Suwannee-Satilla Region are summarized in Figure 4-6. This figure presents the forecasts for municipal and industrial flows divided by septic, LAS, and industrial to municipal WWTP discharges. Overall, the region is expected to grow by 19% (14 MGD) in wastewater flows from 2015 through 2050.

Figure 4-5: Water Demand per Sector



Source: Municipal and Industrial Water and Wastewater Forecasts (CDM Smith, 2017)

Figure 4-6: Total Wastewater Flow



Source: Municipal and Industrial Water and Wastewater Forecasts (CDM Smith, 2017)

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 projected future demands exceed the estimated capacity of the resource have a gap that will be addressed through water management practices. This Section summarizes the potential gaps and water supply needs for the Suwannee-Satilla Region.

Summary

Forecasted surface water demands within and outside the region are projected, at times, to exceed the available resources at some locations in the Region (Alapaha, Suwannee, Satilla, and Withlacoochee Rivers).

Regionally, there is sufficient groundwater to meet forecasted needs over the next 35 years.

Water quality conditions indicate the potential need for improved wastewater treatment within the Suwannee, Satilla, and St. Marys River basins.

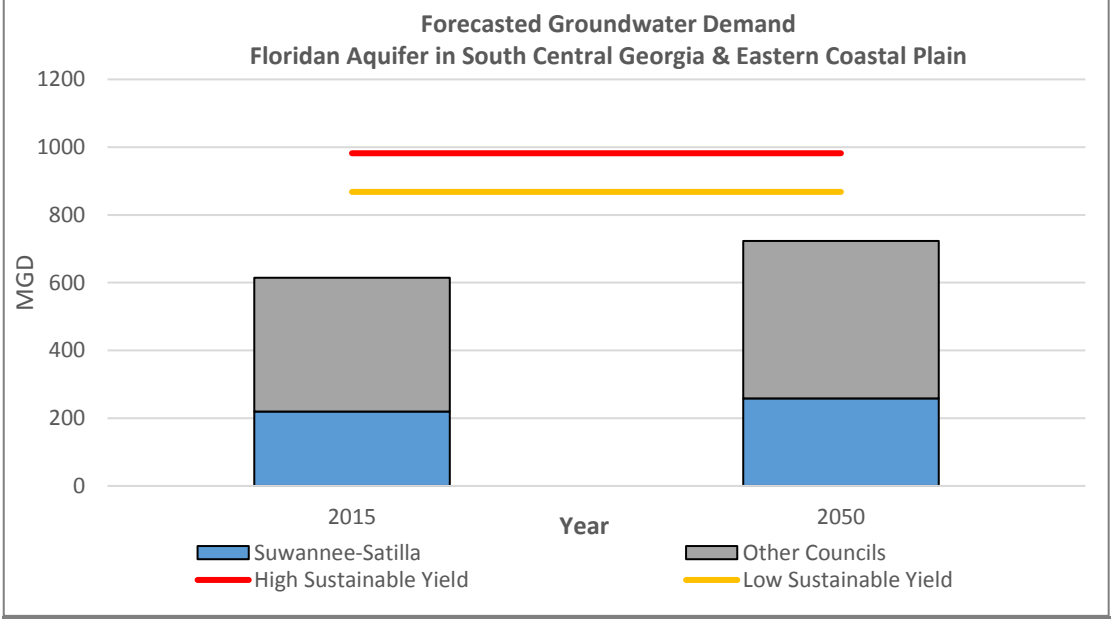
Addressing non-point sources of pollution and existing water quality impairments will be a part of addressing the region's future needs.

5.1. Groundwater Availability Comparisons

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

At this time, no regional groundwater resource gaps are expected to occur in the Suwannee-Satilla Region over the planning horizon. However, depending on the pattern of groundwater development, local groundwater availability may not be able to meet all needs. In addition, some counties including Brantley, Echols, Lanier, and Pierce Counties may need additional permitted capacity if future demand for groundwater exceeds permitted groundwater withdrawal limits. The comparison of existing municipal groundwater permitted capacity to forecasted future demand in the Suwannee-Satilla 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.

Figure 5-1: Floridan Aquifer Demand vs. Estimated Yield



Sources:
Groundwater Availability Assessment, January 2011, EPD
Technical Memorandum: Suwannee- Satilla Water and Wastewater Forecasting, 2017

Table 5-1: 2050 Municipal Forecast versus Groundwater Permitted Capacity

County	2015 Public Demand Forecast (AAD – MGD)	2050 Public Demand Forecast (AAD – MGD)	Existing Groundwater Permitted Capacity (AAD-MGD)	Additional Permitted Capacity Needed in 2050 (MGD)*
Atkinson	0.43	0.38	0.90	-
Bacon	0.66	0.80	1.50	-
Ben Hill	2.47	2.63	5.50	-
Berrien	1.10	0.83	1.73	-
Brantley	0.25	0.24	0.20	0.04
Brooks	0.97	0.73	3.55	-
Charlton	0.71	0.75	1.40	-
Clinch	0.45	0.42	0.75	-
Coffee	2.53	2.95	6.80	-

Table 5-1: 2050 Municipal Forecast versus Groundwater Permitted Capacity				
County	**2015 Public Demand Forecast (AAD – MGD)**	**2050 Public Demand Forecast (AAD – MGD)**	**Existing Groundwater Permitted Capacity (AAD-MGD)**	**Additional Permitted Capacity Needed in 2050 (MGD)***
Cook	1.29	1.36	4.00	-
Echols	0.08	0.07	0	0.07
Irwin	0.52	0.43	0.70	-
Lanier	0.60	0.83	0.70	0.13
Lowndes	12.35	16.60	19.04	-
Pierce	0.71	0.96	0.83	0.13
Tift	4.50	5.16	9.18	-
Turner	0.74	0.41	1.90	-
Ware	3.32	3.00	7.40	-
*Analysis does not account for demands in one County that may be met by permits from another County				

5.2. Surface Water Availability Comparisons

Surface water is an important resource used to meet current and future needs of the Suwannee-Satilla Region, especially in the agricultural sector. There are several surface water planning nodes located in and around the Suwannee-Satilla Region. From the updated Surface Water Availability Resource Assessment (EPD, 2017), the basic conclusions of the current and future conditions modeling show potential surface water gaps (i.e., times when there may be insufficient water to meet off-stream demands and also meet the targets for support of instream uses) at the following nodes:

- Atkinson (Satilla River) – potential surface water gaps under current and future conditions
- Fargo (Suwannee River) – no significant surface water gaps modeled under current and future conditions
- Gross (Saint Marys River) – no significant surface water gaps modeled under current and future conditions
- Jennings (Alapaha River) – potential surface water gaps under current and future conditions
- Lumber City (Ocmulgee River) – no significant surface water gaps modeled under current and future conditions.

- Pinetta (Withlacoochee River) – potential surface water gaps under current and future conditions
- Statenville (Alapaha River) – potential surface water gaps under current and future conditions

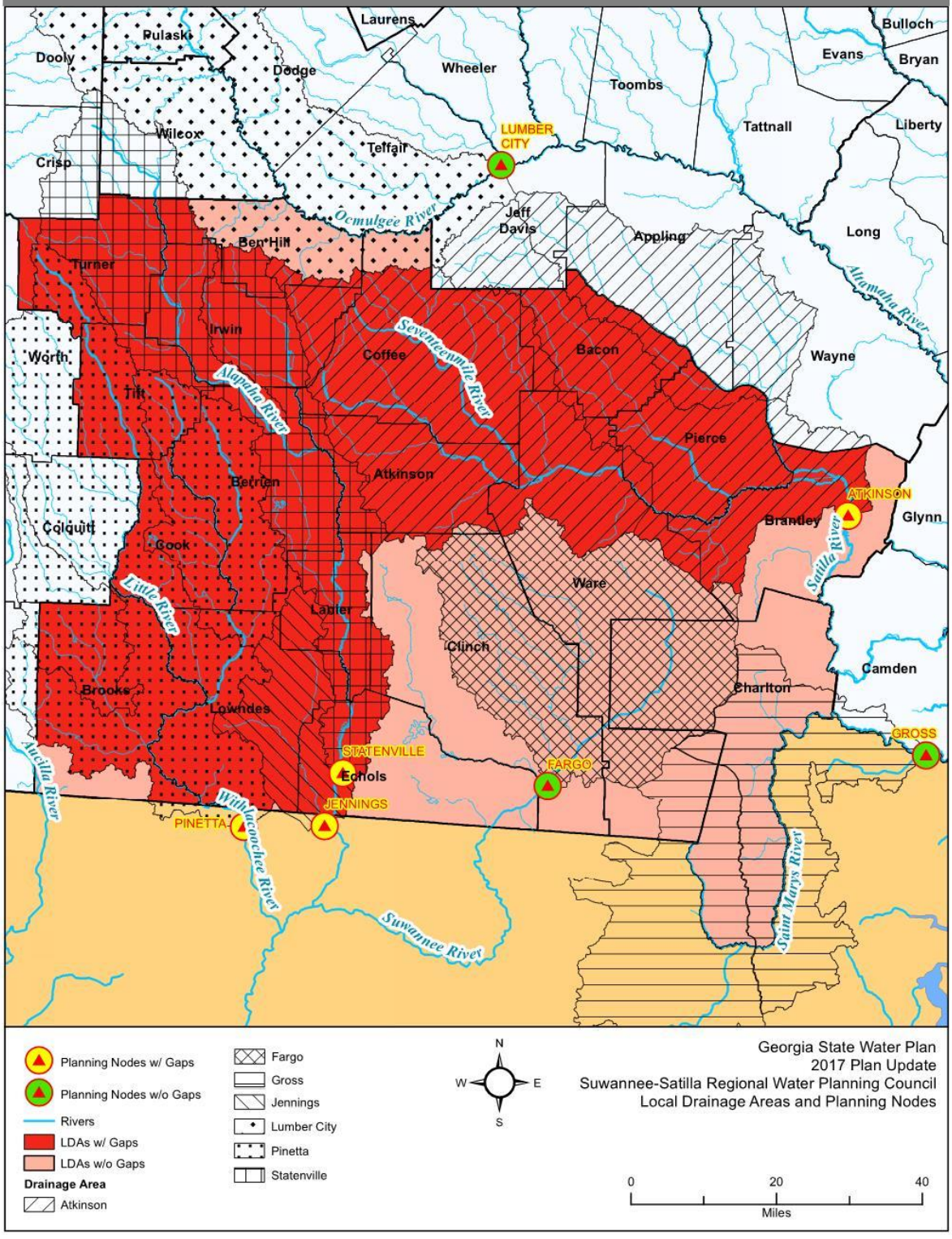
The location of these planning nodes and the portion of the Planning Region that is within the local drainage area (LDA) are shown in Figure 5-2. A summary of the modeled potential surface water gaps in 2050 is provided in Table 5-2. The darker shading within the Suwannee-Satilla region indicates the areas that drain to a planning node with potential surface water gaps.

Table 5-2: Summary of Modeled 2050 Potential Surface Water Gaps

Node	Duration of Gap (% of total days)	Average Flow Deficit	Long-term Average Flow	Maximum 1-Day Gap	Corresponding Flow Regime
Atkinson	5	20 cfs (13 MGD)	2,236 cfs (1,445 MGD)	42 cfs (27 MGD)	85 cfs (55 MGD)
Jennings	8	36 cfs (23 MGD)	1,380 cfs (892 MGD)	109 cfs (70 MGD)	135 cfs (87 MGD)
Pinetta	9	46 cfs (30 MGD)	1,721 cfs (1,112 MGD)	108 cfs (70 MGD)	155 cfs (100 MGD)
Statenville	12	32 cfs (21 MGD)	1,058 cfs (684 MGD)	77 cfs (50 MGD)	77 cfs (50 MGD)

Source: Surface Water Availability Resource Assessment, May 2017, EPD
Note: Surface Water Availability modeling simulation period is from 1939 to 2013

Figure 5-2: 2050 Potential Surface Water Gap Summary



When assessing this issue, the Suwannee-Satilla Council recognized that modeled 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 potential gaps to off-stream uses and instream needs. In dry years, the potential gaps are likely to be more severe. In order to better assess these potential gaps and to better understand the types of management practices that may be required, a more detailed quantification of the frequency and severity of modeled potential surface water gaps was completed.

The quantification and frequency of potential gaps 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 should 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 that may be needed because stream flow needs can then be addressed by controlling the rate of flow released from the reservoir. In addition, since the largest potential gaps occur less frequently, there are important cost-benefit considerations associated with addressing the largest and more infrequent potential gaps. The quantification and frequency of the projected gaps is provided in Table 5-3. It is important to note that the less severe and more frequent gaps (1- to 7-day and 8- to 14-day potential gaps events) are those that can most likely be addressed by management practices. The more infrequent and severe gaps are indicative of drought conditions and will most likely be addressed through drought management measures implemented by EPD and users in the region.

Table 5-3: Characteristics of Modeled 2050 Potential Surface Water Gaps						
Gap Event Duration	**Number of Gap Events (% of Total Gap Events)[1]**		**Total Gap Days (% of Total Days)[2]**		**Average Daily Flow Deficit per Event**	**Average Cumulative Flow Deficit per Event**
Atkinson Node						
1-7 days	43	(51.2%)	146	(0.5%)	9 cfs (6 MGD)	35 cfsd (23 MG)
8-14 days	11	(13.1%)	109	(0.4%)	16 cfs (10 MGD)	158 cfsd (103 MG)
15-30 days	17	(20.2%)	403	(1.5%)	21 cfs (14 MGD)	498 cfsd (324 MG)
>30 days	13	(15.5%)	608	(2.2%)	22 cfs (14 MGD)	1,031 cfsd (670 MG)
Totals	84	(100.0%)	1,266	(4.6%)		
Jennings Node						
1-7 days	88	(54.3%)	249	(0.9%)	11 cfs (7 MGD)	42 cfsd (27 MG)
8-14 days	30	(18.5%)	316	(1.2%)	28 cfs (18 MGD)	308 cfsd (200 MG)
15-30 days	22	(13.6%)	478	(1.7%)	36 cfs (23 MGD)	796 cfsd (517 MG)
>30 days	22	(13.6%)	1,208	(4.4%)	38 cfs (25 MGD)	2,255 cfsd (1,466 MG)
Totals	162	(100.0%)	2,251	(8.2%)		
Pinetta Node						
1-7 days	96	(51.3%)	313	(1.1%)	16 cfs (10 MGD)	63 cfsd (41 MG)
8-14 days	40	(21.4%)	417	(1.5%)	26 cfs (17 MGD)	274 cfsd (178 MG)
15-30 days	29	(15.5%)	563	(2.1%)	46 cfs (30 MGD)	920 cfsd (598 MG)
>30 days	22	(11.8%)	1,134	(4.1%)	59 cfs (38 MGD)	3,064 cfsd (1,992 MG)
Totals	187	(100.0%)	2,427	(8.9%)		
Statenville Node						
1-7 days	91	(48.4%)	298	(1.1%)	9 cfs (6 MGD)	37 cfsd (24 MG)
8-14 days	37	(19.7%)	405	(1.5%)	21 cfs (14 MGD)	229 cfsd (149 MG)
15-30 days	27	(14.4%)	554	(2.0%)	26 cfs (17 MGD)	536 cfsd (348 MG)
>30 days	33	(17.6%)	2,044	(7.5%)	38 cfs (25 MGD)	2,444 cfsd (1,589 MG)
Totals	188	(100.0%)	3,301	(12.1%)		

[1]The total number of modeled gap events in presented, as well as the percentage of that total to the total number of all modeled gap events.
[2]The total number of days within the modeling period (1939-2013) in which a potential gap occurred is presented, as well as the percentage of that total to the total number of days analyzed in the modeling period.

The projected increased use of surface water for the counties within the Suwannee-Satilla Region that have potential current and future modeled gaps is shown in Table 5-4. Since there are current modeled gaps at the referenced planning nodes, development of additional surface water to meet projected needs should be done in a manner that does not increase potential gaps.

Table 5-4: 2050 Increased Annual Average Surface Water Demand within Potential Gap Areas

County	Planning Node With Potential Gap	Increase in Agricultural Demand by 2050[1] (MGD)	Increase in Agricultural Demand by 2050[1] (cfs)
Atkinson	Atkinson	0.07	0.10
	Statenville	0.03	0.05
Bacon	Atkinson	0.23	0.36
Ben Hill	Atkinson	0.003	0.004
	Statenville	0.02	0.03
Berrien	Pinetta	0.40	0.62
	Statenville	0.18	0.28
Brantley	Atkinson - Ag	0.01	0.02
	Atkinson - Ind	0.06	0.09
Brooks	Pinetta	0.04	0.06
Coffee	Atkinson	0.37	0.57
	Statenville	0.002	0.003
Cook	Pinetta	0.11	0.16
Echols	Jennings	0.02	0.03
	Statenville	0.01	0.01
Irwin	Atkinson	0.19	0.30
	Statenville	0.38	0.59
Lanier	Jennings	0.08	0.13
	Pinetta	0.001	0.002
	Statenville	0.05	0.08
Lowndes	Jennings	0.02	0.04
	Pinetta	0.11	0.17
Pierce	Atkinson	0.07	0.11
Tift	Pinetta	0.47	0.73
	Statenville	0.05	0.08
Turner	Pinetta	0.15	0.22
	Statenville	0.31	0.48
Ware	Atkinson	0.08	0.12

[1]All surface water demands within the planning node drainage areas are agricultural except for the industrial demand noted in Brantley County.

5.3. Surface Water Quality Comparisons (Assimilative Capacity)

This Section summarizes the results of the Water Quality (Assimilative Capacity) Resource Assessment modeling when all municipal and industrial wastewater treatment facilities operate at permit conditions, and provides a comparison of existing wastewater permitted capacity to the projected 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 LAS that are permitted under the National Pollutant Discharge Elimination System (NPDES) or state LAS permits. As shown in Table 5-5, Bacon, Echols, and Pierce counties may exceed their current permitted capacity by 2050. It should be noted that the comparison in Table 5-5 was completed at the county level and localized shortages in treatment capacity may exist.

Table 5-5: 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 (-)
Atkinson	0.25	0.90	0.65	0.12	0.36	0.24
Bacon	0.80	0.75	**-0.05**	0	0.75	0.75
Ben Hill	3.17	6.00	2.83	0.18	0.30	0.12
Berrien	0.11	1.20	1.09	0	0	0
Brantley	0	0	0	0.11	0.12	0.01
Brooks	0	0	0	0.86	1.32	0.46
Charlton	0.65	1.08	0.43	0	0	0
Clinch	0.36	0.75	0.39	0	0	0
Coffee	4.14	6	1.86	0.56	0.66	0.10
Cook	2.55	3.19	0.64	0	0	0
Echols	0	0	0	0.003	0	**-0.003**
Irwin	0	0	0	0.50	0.85	0.35
Lanier	0.41	0.50	0.09	0	0	0
Lowndes	10.73	14.92	4.19	1.71	2.05	0.34
Pierce	0.34	0.21	**-0.13**	0.425	0.50	0.08
Tift	6.39	8.09	1.70	0.11	0.13	0.02
Turner	0.48	1.17	0.69	0.03	0.08	0.05
Ware	4.51	6.70	2.19	0	0	0
Total	**34.90**	**50.71**	**15.81**	**4.60**	**7.12**	**2.51**

[1]Includes industrial wastewater expected to be treated at municipal facilities.

Assimilative Capacity Assessments

The Water Quality (Assimilative Capacity) Resource Assessment drew upon water quality modeling tools to estimate the ability of streams and estuaries to assimilate pollutants under current and future conditions. Modeling focused on instream dissolved oxygen (DO) and incorporated all municipal and industrial wastewater facilities operating at their full permitted discharge levels (flow and effluent discharge limits as of 2014). The results of the DO modeling at current permitted conditions are presented in Figure 5-3 and Table 5-6 for the Suwannee-Satilla Region, which includes portions of the Ochlockonee, Ocmulgee, Satilla, St. Marys, and Suwannee River basins. The results show the modeled effects of oxygen-demanding compounds in wastewater and other factors on instream DO levels. A stream segment with “none or exceeded” available assimilative capacity (denoted as red lines in Figure 5-3) have estimated instream DO levels that are at or below the DO water quality criteria and

therefore indicate conditions of no available assimilative capacity or exceeded assimilative capacity. It is important to note that an exceedance of DO assimilative capacity on a stream segment could be the result of a point source discharge, non-point source loading, or a naturally low instream DO condition. Reaches within the Suwannee-Satilla Planning Council that have exceeded their full assimilative capacity under the current conditions assessment include:

- Alapaha River, Hat Creek, Withlacoochee River, Woodyard Creek, Tatum Creek, Cat Creek, Cane Creek, and a small portion of the Willacoochee River in the Suwannee Basin;
- Seventeen Mile River, Little Hurricane Creek, Hurricane Creek, Alabaha River, and Little Satilla River in the Satilla Basin;
- Spanish Creek and the main stem of the Saint Marys River in the St. Marys Basin; and
- Aucilla River in the Ochlockonee Basin

Table 5-6: Assimilative Capacity for DO under Current Permit Conditions in Suwannee-Satilla Planning Council

Basin	Available Assimilative Capacity (Total Mileage)						Modeled Miles in Council
	Very Good (≥1.0 mg/L)	Good (0.5 to <1.0 mg/L)	Moderate (0.2 to <0.5 mg/L)	Limited (>0.0 to <0.2 mg/L)	None or Exceeded (<0.0 mg/L)	Unmodeled	
Ochlockonee	0	0	0	0	3	0	3
Ocmulgee	3	33	0	0	0	0	36
Satilla	73	91	31	14	60	0	269
St Marys	0	0	6	3	12	0	21
Suwannee	289	91	54	0	85	5	524

Source: GIS Files from the Updated Permitted Water Quality Resource Assessment; EPD, January 2017
Notes: Suwannee Basin includes many local creeks and rivers such as the, Willacoochee River, Alapaha River, New River, Withlacoochee River, Alapahoochee River, Woodyard Creek, Cane Creek and many other smaller tributaries. The Ocmulgee River makes up the northeastern boarder of Ben Hill County and the northern board of Coffee County. The Aucilla River is a tributary to the Ochlockonee but only 3 river miles are actually in the Suwannee – Satilla region near the southwest corner of Brooks County near Thomas County and the Florida State line. Approximately 34 of those river miles originate in Thomas County and then flow into Brooks County.

Based on the results shown in Figure 5-3, EPD also conducted modeling under future conditions. In order to address areas of limited or no assimilative capacity for DO, EPD incorporated some assumptions regarding future (2050) permitted flows and modifications to permit effluent limits. Since EPD cannot issue permits that will violate water quality standards, EPD will continue to evaluate and modify future permit requests and adjust permit limits to avoid potential DO violations. Figure 5-4 shows the assimilative capacity at assumed future (2050) permitted flows and effluent limits.

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

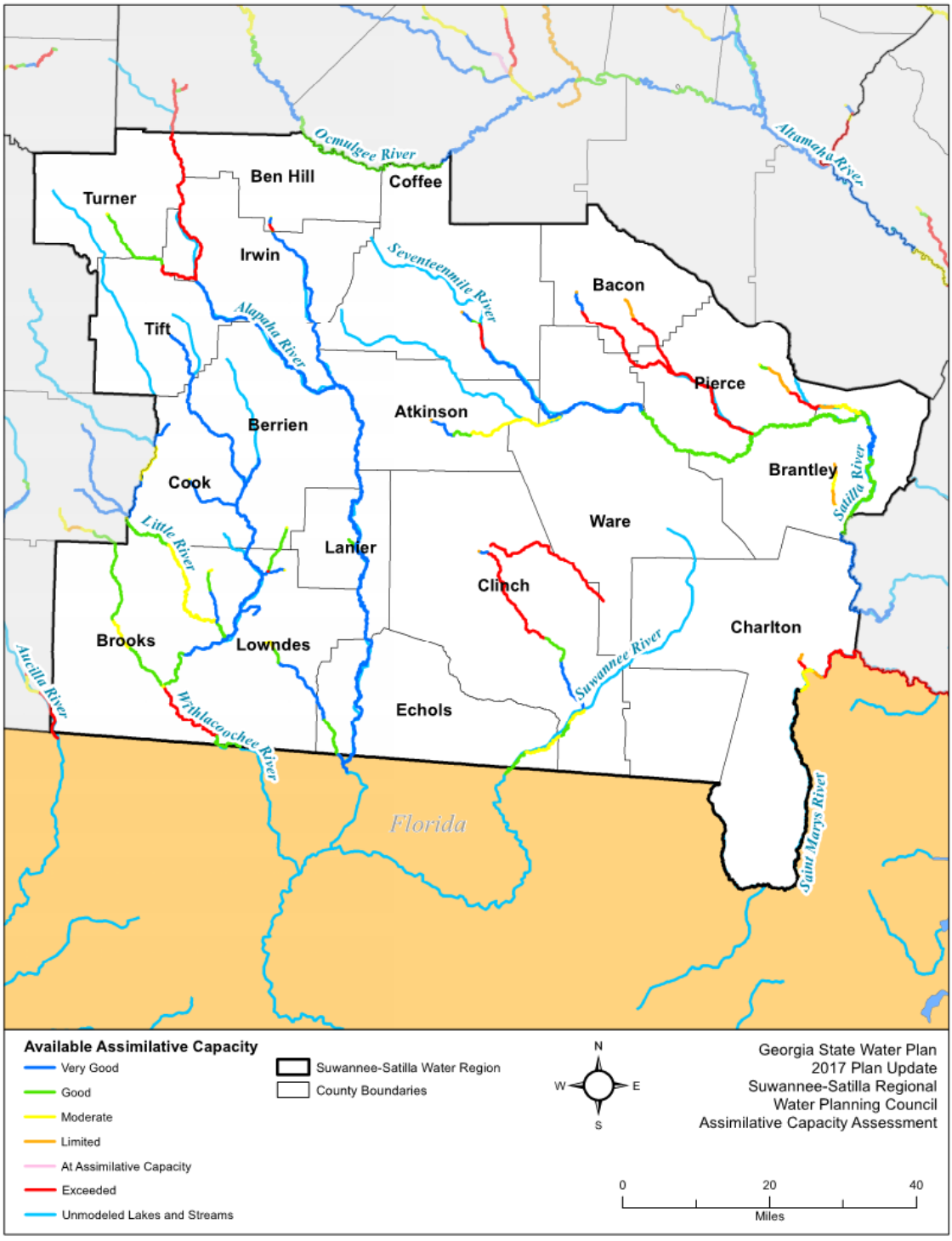
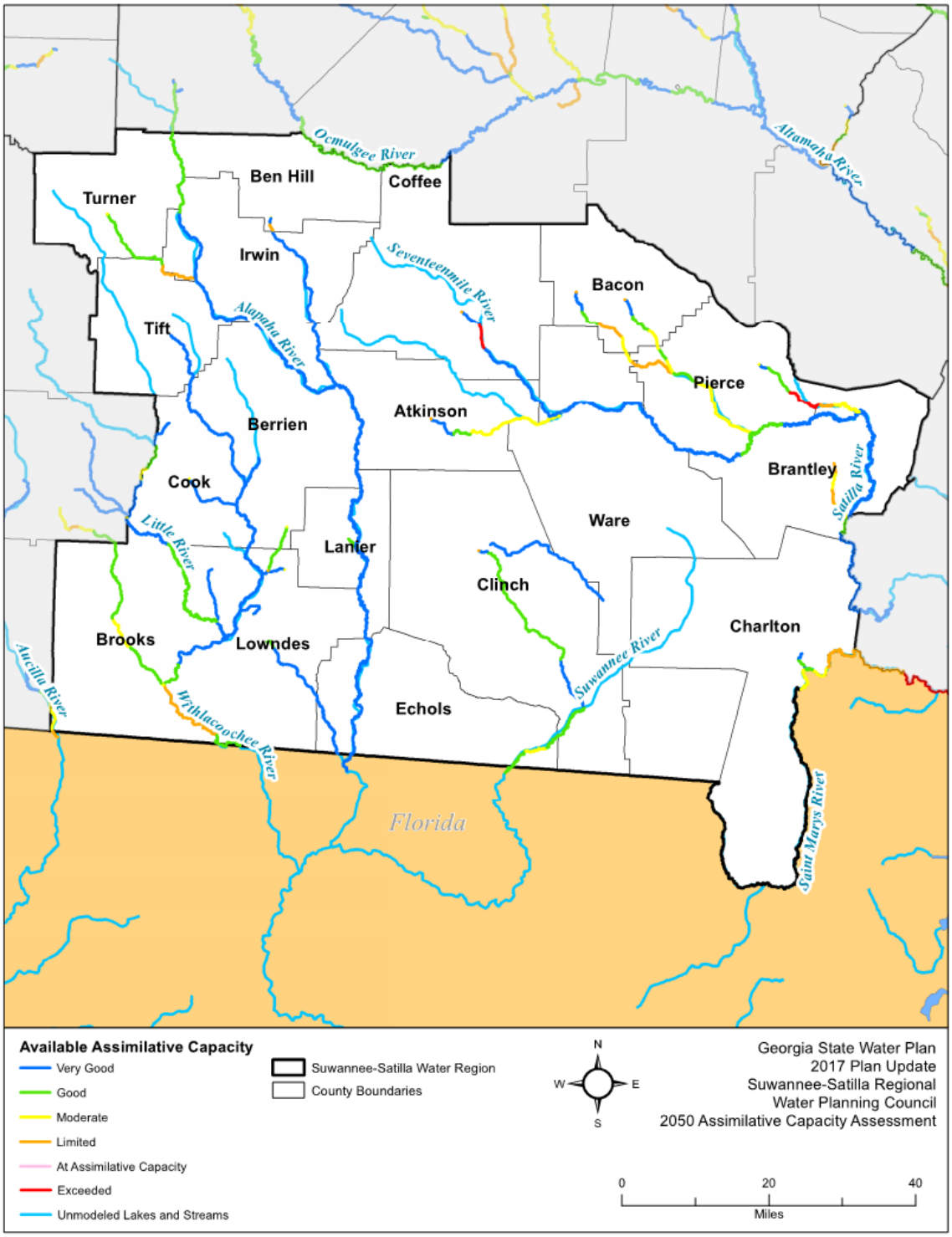


Figure 5-4: Results of Assimilative Capacity Assessment – DO at Assumed Future (2050) Permitted Conditions



Non-Point Source Pollution

Non-point source pollution accounts for the majority of surface water impairments in the region according to the 2014 303(d) list of Rivers, Streams, Lakes, and Reservoirs published by EPD (see Section 3 discussion). Non-point source pollution can occur as a result of human activities, including urban development, agriculture, and silviculture, and as a result of non-human influences such as wildlife and naturally-occurring nutrients. An important component of any non-point source management program is identifying those pollutant sources that are resulting from human activities.

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

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

5.4. Summary of Potential Water Resources Issues

This section summarizes the potential water resources issues in the Suwannee-Satilla Region. These potential water resources issues are the basis for the recommended management practices in Section 6. Table 5-7 summarizes the potential water resource issues and permitted capacity needs in the Suwannee-Satilla Region by County.

- Over the planning horizon, forecasted surface water demands within and outside the region are projected to result in potential gaps at locations in the Region (Alapaha, Suwannee, Satilla, and Withlacoochee Rivers).

- Regionally, there is sufficient groundwater to meet forecasted needs over the planning horizon.

- Water quality conditions indicate the potential need for improved wastewater treatment within the Suwannee, Satilla, and St. Marys River basins.

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

Table 5-7: Summary of Potential Water Resource Issues by County

County	Municipal Water Permitted Capacity Need	Part of Drainage Area with Modeled Surface Water Gaps	Municipal Wastewater Permitted Capacity Need	Water Quality – DO Assimilative Capacity Issues
Source	*Table 5-1*	*Figure 5-2*	*Table 5-5*	*Figure 5-3*
Atkinson	-	Yes	-	-
Bacon	-	Yes	Yes	Yes
Ben Hill	-	Yes	-	Yes
Berrien	-	Yes	-	-
Brantley	Yes	Yes	-	Yes
Brooks	-	Yes	-	Yes
Charlton	-	-	-	-
Clinch	-	Yes	-	Yes
Coffee	-	Yes	-	Yes
Cook	-	Yes	-	-
Echols	Yes	Yes	Yes	-
Irwin	-	Yes	-	Yes
Lanier	Yes	Yes	-	-
Lowndes	-	Yes	-	Yes
Pierce	Yes	Yes	Yes	Yes
Tift	-	Yes	-	Yes
Turner	-	Yes	-	Yes
Ware	-	Yes	-	Yes

Notes:
1) "Yes" indicates a predicted gap in the indicated county (for surface water "yes" indicates part or all of the indicated county lies in the area contributing to a potential gap)
2) Permitted capacity need is based on the comparison of permitted municipal capacity versus 2050 forecasted demand.

6. ADDRESSING WATER NEEDS AND REGIONAL GOALS

Section 6. Addressing Water Needs and Regional Goals

This Section presents the Suwannee-Satilla Council's water management practices selected to address resource shortfalls or gaps identified and described in Section 5, and/or meet the Council's Vision and Goals described in Section 1.

Summary

The Suwannee-Satilla Council selected management practices to help address surface water low flow conditions at the Atkinson, Statenville, Jennings, and Pinetta planning nodes.

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, data collection, 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 needs presented in Section 5 identifies the Region's likely resource shortfalls or gaps and demonstrates the need for region and resource specific water management practices. In the cases where shortfalls or gaps appear to be unlikely based on the comparison of the Region's Resource Assessments and forecasted needs, the management practices described in this section have been selected to also meet those needs specified by the Council (e.g., facility/infrastructure needs and practices, programmatic practices, etc.) 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 who 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 Suwannee-Satilla Region consisted of the following:

- Comprehensive Work Plans (local and regional scale)
- Regional infrastructure and permitting plans
- EPD databases (permitted withdrawals, planned projects, and proposed reservoirs)

- State-wide guidance documents (conservation, cost, and water planning)
- Best Management Practices (forestry, agriculture, and stormwater management)
- Water quality studies including Watershed Protection Plans (basin, watershed, and local scale)
- TMDL evaluations

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

6.2. Selected Water Management Practices for the Suwannee-Satilla Region

Table 6-1 summarizes the Suwannee-Satilla 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. Information on shared resources is provided to identify where management practices in other regional Councils are also needed to address identified gaps. 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. The Suwannee-Satilla 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 Suwannee-Satilla Plans Reviewed in Selecting Water Management Practices Technical Memorandum (CDM Smith, 2011).

Similar to when the original water plan was completed in 2011, the most significant gaps in the Suwannee-Satilla Region are potential 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. The Suwannee-Satilla Council considered a number of practices to address these potential 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 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 Suwannee-Satilla Council's recommended suite of surface water availability management practices in a phased 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.

Potential surface water gaps in the region exist at times under current and future conditions at Atkinson, Jennings, Pinetta, and Statenville planning nodes will be addressed by management practices including those that reduce net consumption, replace surface water use with groundwater use, improve data on frequency and magnitude of gaps, and assess the impact of infrequent surface water gaps and the associated costs associated with these gaps, among others. These potential gaps occur primarily as a result of net consumption associated with agricultural water use in the May–July timeframe. As described in Section 5.2, it is important to keep in mind that shortage to low flow conditions do not occur every year, and in some cases for years with shortages, the shortages do not occur for the entire year.

Figure 6-2 illustrates the Suwannee-Satilla Council's recommended suite of surface water quality management practices in a phased approach. Table 6-1 also includes the Suwannee-Satilla Council's recommended management practices to address water quality gaps, including stream segments with limited localized dissolved oxygen assimilative capacity and insufficient wastewater permit capacity. The Suwannee-Satilla Council addresses gaps by: identifying and recommending specific actions to add/improve infrastructure and improve flow and water quality conditions. Management practices that help improve river flows may also help improve water quality.

In addition to addressing gaps, the Suwannee-Satilla Council identified several management practice recommendations in Table 6-1 to address forecast future uses. These recommendations include such practices as the additional sustainable development of groundwater and surface water in areas with sufficient water supply; best management practices for water quality issues such as non-point source runoff, nutrient loadings, and 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

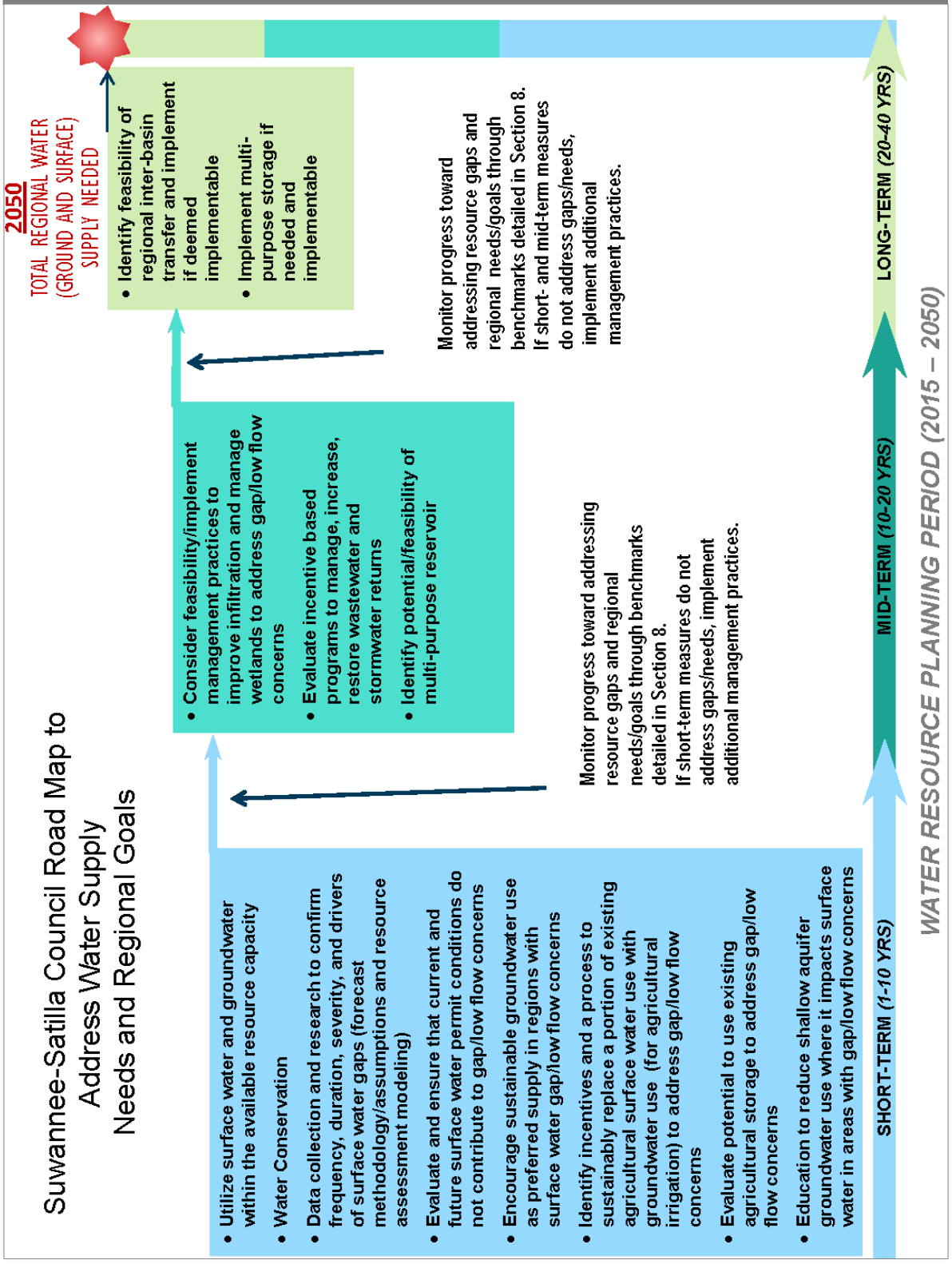


Figure 6-2: Recommended Surface Water Quality Management Practices in a Phased Approach

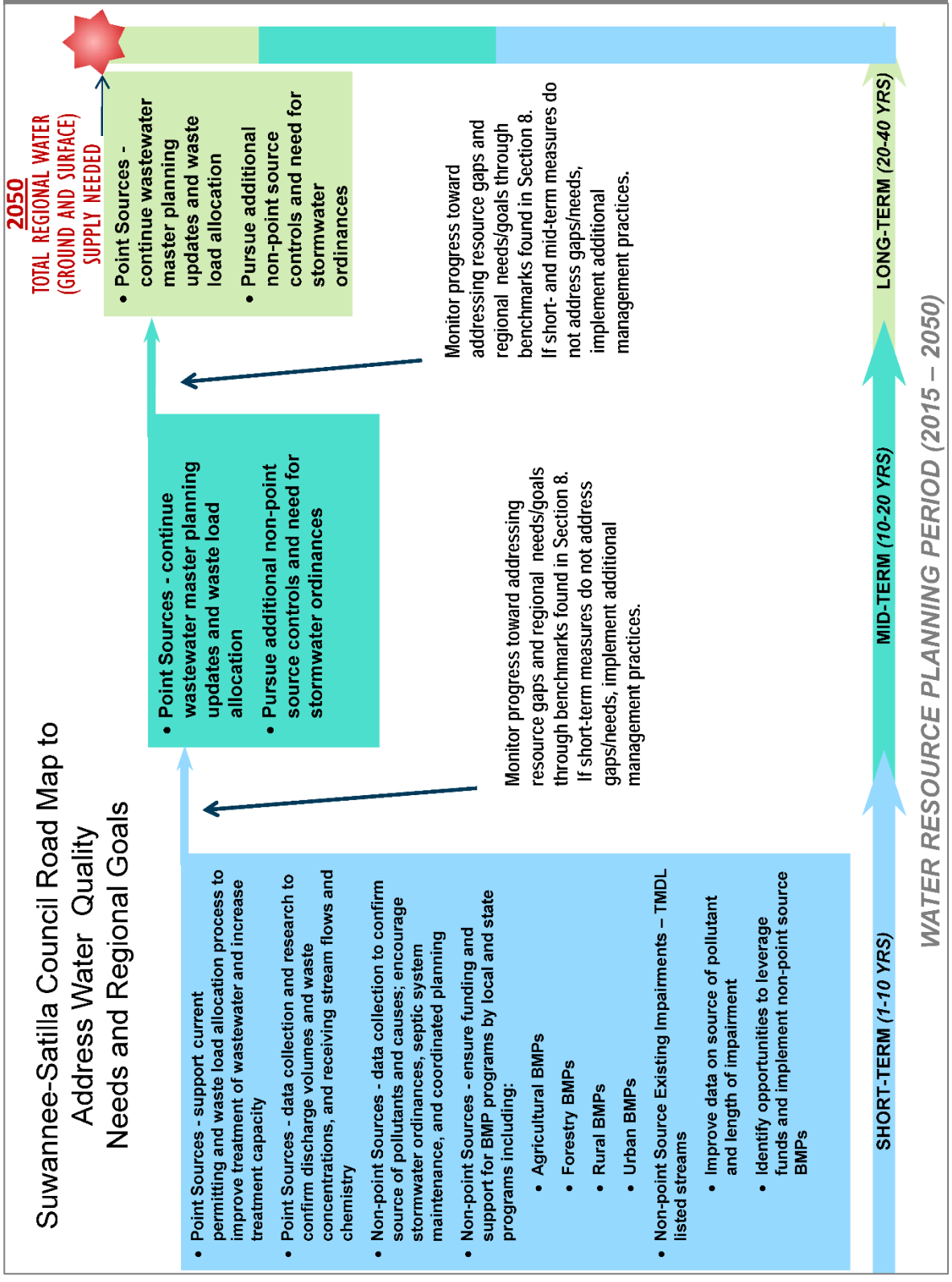


Table 6-1: Management Practices Selected for the Suwannee-Satilla Region

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 *__Note:__ 7Q10 refers to the 1 in 10 year 7 day monthly low flow condition			
DCAR-1[1] Collect Agricultural Consumption Data; Refine Resource Assessment	Improve understanding and quantification of agricultural water use and the projected surface water gaps on the Satilla River at Atkinson, the Alapaha River at Statenville and Jennings, and the Withlacoochee River at Pinetta (hereafter referred to as "surface water gaps")	Acquire additional data/information on agricultural consumptive use to confirm or refine if agricultural consumption is less than 100% consumptive 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	1,4,5,13
DCAR-2[1] 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	1,4,5,13
DCAR-3[1] Improve Forecast and Resource Data; Analyze Storage Impacts on Gaps		Refine and improve surface water Resource Assessment and agricultural forecasts to address spatial and temporal hydrologic variations (i.e., including but not limited to evapotranspiration, infiltration, runoff, and groundwater/surface water interconnections) in relationship to forecasts, climate conditions, and other non-water use variables. This includes developing a better understanding of agricultural and residential water storage systems (ponds) and their effect on low flow conditions.	1,4,5,13

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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)**
DCAR-4[1] Improve Data Quality and Analysis Capabilities	Obtain additional data and improved understanding of actual versus forecasted water use	Continue to fund, improve, and incorporate metering data regarding agricultural water use; Collect and use this information in Water Plan updates, including expanding the number of GSWCC continuously monitored real-time meter sites in surface water gap areas	5,6,13
DCAR-5[1] Irrigation Efficiency Education and Research	Improvement of surface water flows via reduced surface water use while maintaining/improving crop yields	Collaborate/support research (In-State University, State, and Corporate) on improved irrigation efficiency measures and development of lower water use crops and lower water use plant strains for existing and future crop types	5,6,13
DCAR-6[1] Understand Optimum Application Methods		Improve education and research on when and how much water is needed to maximize crop yield with efficient irrigation	5,6,13
DCAR-7 Minimize Groundwater Impacts to Surface Water	Improvement of surface water flows in areas where groundwater and surface water are hydraulically 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	1,5,6,13

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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)**
DCAR-8 Analyze Addressing Extreme Conditions	Evaluate the cost versus benefit of closing the largest, most infrequent surface water gaps	Conduct analysis of the socioeconomic benefits and cost in comparison to ecological benefits of addressing surface water gaps. Council discussion, and additional detail provided by EPD during the 2016 updates to the resource assessments, indicated the need to focus this Management Practice on the more frequent, smaller magnitude gaps, rather than the larger, longer duration gaps that would likely be managed through drought management measures. Additional analysis is also needed (similar to the examples shared during the surface water shared resources subcommittee meeting in January 2017) regarding the locations of demands contributing to the gaps within specific counties and portions of the local drainage areas (LDAs).	1,5,11
DCAR-9 Study Potential Use of Aquifers to Address Gaps	Improvement of surface water flows (in gaps 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	4,5,6,7
DCAR-10 Restoration Impact on Low Flow Conditions Analysis	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 research opportunities and limitations associated with improving river flow conditions via creation/restoration of wetlands and potential water retention structures including streams. If feasible, identify potential location(s) and estimate improvements to stream flow conditions. Identify incentives to make this a viable water supply option and develop a cost-benefit analysis of these incentives.	4,8

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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 - Water Conservation (WC) - Address current and future gaps and meet water needs by efficient water use. The Suwannee-Satilla Council supports the 25 water conservation goals contained in the March 2010 Water Conservation Implementation Plan (WCIP). Note: Water Conservation Tiers can be found here: http://www.georgiawaterplanning.org/documents/DetailedGuidanceforEvaluatingPracticestoManageDemand-WebDocument_000.pdf			
WC-1 Tier 3 and Tier 4 Measures for Municipal and Industrial Users	Help meet current and forecasted municipal and industrial surface water and groundwater supply needs throughout the region	Encourage Municipal and Industrial water users to continue implementation and adherence to Tier 3 and Tier 4 practices Water Stewardship Act of 2010 and 2015 rules for public water systems to improve water supply efficiency through water loss audit and water loss control programs (391-3-33) by local governments/utilities.	6
WC-2 Tier 1 and Tier 2 Measures for Agricultural Users	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 and surface water groundwater users	6
Action Needed - Water Conservation (WC) Continued - 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 gaps on the Satilla River at Atkinson, the Alapaha River at Statenville and Jennings, and the Withlacoochee River at Pinetta	Conduct irrigation audits	6,13
WC-4 Metering		Meter irrigation systems	
WC-5 Inspections		Inspect pipes and plumbing to control water loss	

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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)**
WC-6 Minimize High-Pressure Systems	- Help meet current and forecasted agricultural ground and surface water supply needs - Help address surface water gaps on the Satilla River at Atkinson, the Alapaha River at Statenville and Jennings, and the Withlacoochee River at Pinetta	Minimize or eliminate the use of high-pressure spray guns on fixed and traveler systems where feasible	6,13
WC-7 Efficient Planting Methods		Utilize cropping and crop rotation methods that promote efficiency	
Action Needed - Water Conservation (WC) Continued - Meet current and future gaps and needs by efficient agricultural water use - Tier 4 Conservation Practices[1]			
WC-8 Conservation Tillage	See issues addressed by WC-3 through WC-7	Practice conservation tillage	6,13
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, evapotranspiration 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 the Atkinson, Statenville, Jennings, or Pinetta gauges	Future surface water uses - If surface water (ponds and withdrawals) is sought for future water supply (new permits), Applicant, GSWCC, and EPD should work collaboratively to demonstrate that future surface water uses will not contribute to frequency or magnitude of gaps	1,4,5

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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)**
ASWS-2 Incentives for Dry-Year Releases from Ponds	Help improve surface water flow on the Satilla River at Atkinson, the Alapaha River at Statenville and Jennings, and the Withlacoochee River at Pinetta during low flow conditions	Future surface water uses - Utilizing incentives and collaborative partnerships, examine opportunities to optimize farm and other pond operations to obtain releases in dry/gap years	1,3,4,5
ASWS-3 Substitute Future Surface Water Use with Groundwater in Gap Areas		Future surface water uses - Encourage additional groundwater development as a preferred source of supply for future demand in surface water gap areas	1,2,5,11
ASWS-4 Substitute Existing Agricultural Surface Water Use with Groundwater in Dry Years		Existing surface water uses - Encourage replacement of a portion of existing agricultural surface water irrigation use with groundwater in times of shortage to 7Q10 dry periods; so long as use of the groundwater source does not impact surface water flow in other areas	1,4,5
ASWS-5 Opportunities and Incentives for Dry-Year Releases from Ponds		Existing surface water uses- Utilizing incentives and collaborative partnerships, identify opportunities that allow for use of agricultural pond storage to augment river flows in times of shortage to 7Q10 dry periods	1,3,4,5

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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)
ASWS-6 Consider Phased Seasonal Agricultural Permit Conditions		Existing surface water uses - Identify need for, and feasibility of, seasonal surface water permit conditions for existing agricultural uses to address times of shortage to 7Q10 dry periods; Phase implementation as follows: Phase 1 (Direct stream withdrawals); Phase 2 (Consider pond storage effects based on outcome of research from DCAR-2 and DCAR-3)	1,4,5
ASWS-7 Ecological Restoration Incentive Program	Help improve surface water flow on the Satilla River at Atkinson, the Alapaha River at Statenville and Jennings, and the Withlacoochee River at Pinetta during low flow conditions	Based on outcome of research (DCAR-10 above), consider incentive-based programs to restore wetlands and other areas if this practice can improve river flows during shortages to 7Q10 dry periods	1,4,5,8
ASWS-8 Land Management Incentives		Evaluate incentive-based land use practices to help promote infiltration and aquifer recharge	1,4,5,7
ASWS-9 Incentives for Greater Wastewater Return Flows; Coordinated Management		Evaluate incentive-based programs to increase wastewater returns; modify land application system, septic systems, and manage stormwater to improve return flows while maintaining water quality Evaluate feasibility, and encourage use of, regional storm water management, and if feasible, implement coordinated stormwater management to attenuate high flows and help augment low flows and improve water quality for the Withlacoochee River above the Pinetta Node	1,4,5,10

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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)**
ASWS-10 Multi-Region Reservoir		Possible joint non-main stem reservoir to serve multiple regions/regional council boundaries with Upper Flint and/or Lower Flint-Ochlockonee Councils	1,4,5,9
ASWS-11 Inter-Basin Transfers		Regional inter-basin transfers (i.e., Ocmulgee to Alapaha and Altamaha to Little Satilla); Collaborating between regions to meet regional water needs and benefit both the areas from which the transferred water is withdrawn and the area receiving the water	1,4,5
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	1,4,5,13
PSDO-2 Point Source Discharge Relocation	Improve dissolved oxygen levels in receiving streams (see Figure 5-2 for more information)	Modification of wastewater discharge location	4,5
PSDO-3 Improve Treatment Facilities		Upgrade or replacement of treatment facilities	4,5,8

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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 Wastewater Permit Capacity Needs/Gaps			
Available Municipal Wastewater Permit Capacity (MWWPC)			
MWWPC-1 Increase Wastewater Permit Capacity	Additional municipal wastewater treatment capacity may be needed in Bacon and Pierce Counties	Obtain additional wastewater permit capacity to meet forecasted needs	5
Available Industrial Wastewater Permit Capacity (IWWPC)			
IWWPC-1[2] 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	5
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 Brantley, Coffee, Echols, Lanier, Lowndes, Pierce, and Ware Counties	Obtain groundwater permit capacity	1,4,5
Industrial Groundwater Permit Capacity (IGWPC)			
IGWPC-1 Increase Industrial Groundwater Permit Capacity	Additional industrial groundwater permit capacity may be needed in Ben Hill, Cook, and Ware Counties	Obtain groundwater permit capacity	1,4,5

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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)**
The following Suwannee-Satilla 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 Development		Continue to sustainably drill wells, use, and develop water from the Floridan and other significant aquifers	1,4,5
GW-2 Promote Aquifer-Friendly Land Uses		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	4,5,7
GW-3 Research Groundwater Sustainability		Continue to refine sustainable yield metrics, monitor and improve understanding of historic, current, and future trends in groundwater levels; Continue to refine modeling and other tools	1,4,5,13
GW-4 Inter-State Resource Planning		Collaborate with Florida regarding shared resource issues and water planning	1,4,5,13
Management Practices to Address Current and Future Surface Water (SW) Needs			
SW-1 Surface Water Use Within Available Capacity		Continue to apply for permits and use surface water within the available surface water resource capacity	1,4,5
SW-2 Monitor and Evaluate Estuaries		Monitor St. Marys River flow conditions to help determine flow conditions that sustain estuary conditions	4,8,9,13

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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)**
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		4,8,13
NPS-2 Monitor and Address NPS Nutrient Loading	Support efforts to monitor and determine the sources of nutrient loading and other NPS impairments to rivers, lakes, and streams, and upon confirmation of source, develop specific management programs to address water quality needs		4,8,10,13
The following practices are selected by the Suwannee-Satilla 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		4,8,10
NPSU-2 Manage Stormwater Runoff	Stormwater retention ponds, wetlands, and bioretention areas to manage runoff quality and flow rate and help support river flows (as found in City of Valdosta Watershed Protection Plan, 2009)		4,8,10
NPSU-3 Increase Stormwater Infiltration	Consider measures to reduce directly-connected impervious area and promote increased infiltration of stormwater to help reduce nutrient and other pollutant runoff (as found in City of Baxley Watershed Protection Plan, 2007)		4,8,10
NPSU-4 Riparian Buffers	Protect and maintain riparian buffers along urban streams		4,8,10
NPSU-5 Street Sweeping	Implement street sweeping program (as found in City of Pearson Watershed Protection Plan, 2008)		4,8,10

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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)**
Rural Best Management Practices (NPSR)			
NPSR-1 Advocate Implementing Road Runoff BMPs	Implement BMPs to control runoff from dirt roads by encouraging County implementation of the BMPs identified in Georgia Resource Conservation and Development Council, "Georgia Better Back Roads – Field Manual"		4,8,10
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		4,8,10,13
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		4,8,10,13
NPSF-3 Conservation Land Use Planning	Seek long-term conservation easements or purchase development rights by willing landowners and conservation groups		4,8,10
NPSF-4 Forest Restoration Incentives and Support	Where applicable, support United States Department of Agriculture incentive programs through the Farm Service Agency and NRCS to restore converted wetlands back to forested conditions		4,8
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		4,6,8,10
NPSA-2 Utilize Buffers	Field buffers, riparian forested buffers, and strip cropping to control runoff and reduce erosion		4,6,8,10

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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)**
NPSA-3 Livestock Management	Livestock exclusions from direct contact with streams and rivers and vegetation buffers		4,8,10
NPSA-4 Manure Control	Responsible manure storage and handling		4,8,10
NPSA-5 Wetland and Forest Restoration Incentives	Incentives to restore wetlands and historically drained hardwood and other areas		4,8
Existing Impairments and Total Maximum Daily Load Listed Streams (TMDL)			
TMDL-1 Evaluate Impairment Sources	Data collection and confirmation of sources to support modify stream standards to reflect "natural sources" and/or to reflect naturally low dissolved oxygen streams		4,13
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		4,13
TMDL-3 Stormwater Management BMPs	Stormwater Management: -Agricultural BMPs -Forestry BMPs -Rural BMPs -Urban BMPs *See Above Non-Point Source for Details*		4,8,10,13
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 practices 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 load) - Agricultural, Forestry, Rural, and Urban BMPs *See Above Non-Point Source for Details*		4,8,10,13

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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)**
Management Practices to Address Future Educational Needs (EDU)			
EDU-1 Promote Conservation Programs		Support Water Conservation Programs	1,4,5,6,13
EDU-2 Stormwater Education		Support Stormwater Educational Programs	4,5,8,11
EDU-3 Septic System Maintenance Education		Support Septic System Maintenance Programs	4,5,8
EDU-4 Forestry BMP Education		Support Georgia Forestry Commission Forestry BMP and UGA-SFI Logger Education Programs	4,8,10
EDU-5 Funding and Support for BMP Education		Prioritize funding and support for existing and future education, awareness, and BMP programs on non-point source pollution, including but not limited to: Agricultural BMPs, Forestry BMPs, Rural BMPs, Urban BMPs, Georgia Adopt-a-Stream, UGA Extension Service, and Georgia Forestry Commission	4,5,8,10
Management Practices to Address Future Ordinance and Code Policy Needs (OCP)			
OCP-1 Engage Local Governments		Encourage local government to develop ordinances and standards to implement and/or update stormwater and land development regulations. Possible resource documents include: Georgia Stormwater Management Manual, Coastal Stormwater Supplement, and Metro North Georgia Water Planning District Model Ordinances	4,8,10
OCP-2 Green Space Opportunities and Incentives		Identify opportunities for green space on incentive and voluntary basis	1,4,5
OCP-3 Promote Integrated Planning		Encourage coordinated environmental planning, land use, stormwater, and wastewater	1,2,4,5,10,13

Table 6-1: Management Practices Selected for the Suwannee-Satilla 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)**
OCP-4 Local Government Erosion Control Measures	Encourage local governments to enforce Erosion and Sedimentation Control Ordinance (as found in Cities of Pearson and Valdosta Watershed Protection Plans, 2008 and 2009)		4,8,10
Summary of Management Practices for Shared Resources – The Suwannee-Satilla Region will implement management practices summarized in this table and collaborate with the following Councils to address shared resource gaps. Note: As summarized below, each Council has identified a series of management practices intended to address the contributing portion of the surface water flow gap within their boundaries.			
Surface Water Quantity – Satilla River (Atkinson), Alapaha River (Statenville and Jennings), and Withlacoochee River (Pinetta) Suwannee-Satilla – The Suwannee-Satilla Council has identified the management practices in the above table to address the majority of the cumulative gap at Atkinson, Statenville, and Jennings, and a portion of the cumulative gap at Pinetta. Altamaha – The Altamaha 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 among others to address a portion of the cumulative gap at Atkinson, and a small portion of the cumulative gaps at Statenville and Jennings. Lower Flint-Ochlockonee – The Lower Flint-Ochlockonee 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 (ASR) to address a portion of the cumulative gap at Pinetta. Upper Flint – The Upper Flint Council has identified conservation, investigation of replacement of surface water with groundwater, greater utilization of farm ponds, and consideration of new storage to address a portion of the cumulative gap at Statenville and Jennings. **Surface Water Quality:** Satilla River Watershed Model – The Altamaha Council has identified the same BMPs for nutrient loading as are summarized in the above table for the Suwannee-Satilla Council. Altamaha – There is one reach with exceeded assimilative capacity in the Suwannee River basin that is shared with the Altamaha Region. The Altamaha Council recommends improved level of wastewater treatment to improve in-stream dissolved oxygen, implementation of ammonia limits, and improvement of wastewater treatment for nutrients (nitrogen and phosphorus). Coastal Georgia – There is one reach with exceeded DO assimilative capacity in the St. Marys River basin that is shared with the Coastal Georgia Region. Both Councils recommend monitoring and data collection to assess whether impairment is caused by non-point source discharges or naturally low DO concentrations in the reach.			
[1]Seek to reduce frequency and severity of human impacts to 7Q10 low flow conditions in the region associated with agricultural water use. Focus on surface water permit holders and new surface water permit requests in Satilla Watershed [(Atkinson, Bacon, Brantley, Coffee, Irwin, Pierce, and Ware Counties (Atkinson Gap)], Alapaha Watershed [Atkinson, Ben Hill, Berrien, Echols, Irwin, Lanier, Lowndes, Tift, and Turner Counties (Statenville and Jennings Gaps)], and Withlacoochee Watershed [(Berrien, Brooks, Cook, Lowndes, Tift, and Turner Counties (Pinetta 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

Summary

Implementation of the Suwannee-Satilla 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.

This section presents the Suwannee-Satilla 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 Suwannee-Satilla Council has defined short-term as 2015 to 2025 and long-term as 2025 to 2050. As the State Water Plan provides, this Plan will be primarily implemented by the various water users in the region; therefore, the Suwannee-Satilla Council has described the roles and responsibilities of the implementing parties as well as the fiscal implications of the practices.

The 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; 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 (2015 - 2025): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2025-2050): Further Action to Complete Implementation and Associated Dates	Responsible Parties
Data Collection/Additional Research (DCAR)						
DCAR-1 through DCAR-7[1] Agricultural Data Collection and Irrigation Research	Current and Future Surface Water Use in Gap Areas (Satilla River at Atkinson, the Alapaha River at Statenville and Jennings, and the Withlacoo-chee River at Pinetta)	N/A	Develop scope of work (01/2012-06/2012) and key partnering agencies (06/2012-01/2015). Renew scope of work in 2017 to continue study.	Complete data collection, research, and evaluation by 01/2020 Incorporate data/findings in next Water Plan revision Georgia Department of Agriculture (Georgia DOA) identify funding sources and seek legislative authorization and funding through the legislative process (DCAR-1 through DCAR-6) Develop fact sheets, conduct landowner outreach, and work with applicable trade groups (DCAR-7 only)	N/A	EPD, Georgia Soil and Water Conservation Commission (GSWCC), In-State Universities, Georgia DOA, and agricultural stakeholders
DCAR-8 Analyze Addressing Extreme Conditions						EPD
DCAR-9 Study Aquifer Potential to Address Gaps						EPD, GSWCC, In-State Universities, Georgia DOA

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 (2015 - 2025):	For Long-term Actions (2025-2050):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
DCAR-10 Restoration Impact on Low Flow Analysis						EPD and other research agencies/ entities; USDA and other agencies for funding/incentives
Water Conservation (WC)						
WC-1[1] Tier 3 and Tier 4 Measures for Municipal and Industrial Users	Current and Future Surface and Groundwater Supply Needs	Agricultural Surface and Groundwater Withdrawal	Conduct outreach/ education incentives to encourage implementation of conservation measures	Implement water conservation practices thorough 01/2025	Verify conservation savings estimates	EPD, Georgia Municipal Association, Georgia Association of County Commissioners, and Water Providers in the Suwannee-Satilla Region

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 (2015 - 2025):	For Long-term Actions (2025-2050):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
WC-2 through WC-12[1] Tier 1 through Tier 4 Measures for Agricultural Users	Current and Future Surface and Groundwater Use in Gap/Non-gap Areas					EPD, GSWCC, and Georgia DOA and Natural Resources Conservation Service (NRCS)- Leverage funds and create incentives Agricultural surface water users in the Suwannee-Satilla Region 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 (2015 - 2025): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2025-2050): Further Action to Complete Implementation and Associated Dates	Responsible Parties
Additional/Alternatives to Existing Surface Water Supply Sources (ASWS)						
ASWS-1[2] 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 2015 - 2020	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 01/2020) Coordinate pond/irrigation permitting processes	Determine if expedited or revised permitting process is warranted to allow for use of the resource and protection of critical low flows	EPD, GSWCC, and Georgia DOA to develop strategy Agricultural surface water users in the Suwannee-Satilla Region for implementation
ASWS-2[2] Incentives for Dry-Year Releases from Ponds			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 01/2020)	Modify farm and other pond operations to obtain releases in dry/gap years (by 01/2030)	

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 (2015 - 2025): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2025-2050): Further Action to Complete Implementation and Associated Dates	Responsible Parties
ASWS-3[2] Substitute Future Surface Water Use with Groundwater in Gap Areas		Agricultural Groundwater Withdrawal		Identify the need for, and feasibility of, incentive based seasonal surface water permit conditions to address 7Q10 low flow conditions (by 01/2020) Replace surface water supply (by 01/2025)	N/A	
ASWS-4 Substitute Existing Agricultural Surface Water Use with Groundwater in Dry Years	Current Surface Water Use in Gap Areas	Agricultural Groundwater Withdrawal	Develop strategy and work with potential participants/ impacted users to increase support for and implementation of strategy	Replace surface water supply (by 01/2025) Confirm that use of groundwater source does not impact surface water flow in other areas	N/A	EPD, GSWCC, and Georgia DOA Agricultural surface water users in the Suwannee-Satilla Region for implementation
ASWS-5 Opportunities and Incentives for Dry-Year Releases from Ponds		Agricultural Surface Withdrawal		Examine opportunities to modify farm and other pond operations to obtain releases in dry/gap years (by 01/2020)	Modify farm and other pond operations to obtain releases in dry/gap years (by 01/2030)	

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 (2015 - 2025): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2025-2050): Further Action to Complete Implementation and Associated Dates	Responsible Parties
ASWS-6 Consider Phased Seasonal Agricultural Permit Conditions				Identify the need for, and feasibility of, incentive based seasonal surface water permit conditions to address 7Q10 low flow conditions Phase 1 implementation: Direct stream withdrawals (by 01/2015)	Phase 2 implementation: Consider pond storage effects based on outcome of research from DCAR-2 and DCAR-3 (by 01/2020)	
ASWS-7 Ecological Restoration Incentive Program	Current and Future Surface Water Use in Gap Areas	Wetland Restoration	Encourage research to determine effectiveness and feasibility of restoring wetlands (see DCAR-10)	Determine effectiveness and feasibility of restoring wetlands in relation to improving low flow conditions (by 01/2015)	Restore wetland characteristics (by 01/2030), if deemed effective and feasible	EPD
ASWS-8 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 Suwannee-Satilla Region

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 (2015 - 2025): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2025-2050):	Responsible Parties
ASWS-9 Incentives for Greater Wastewater Return Flows; Coordinated Management		Wastewater/ Stormwater NPDES Discharge, Sanitary Sewer Extension	N/A		Continue to monitor land use and hydrologic relationships	
ASWS-10 Multi-Region Reservoir	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 Suwannee-Satilla Region, other collaborating regions
ASWS-11 Inter-Basin Transfers	Future Surface Water Use in Gap Areas	Surface Water Withdrawal	Monitor gap closure	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)	EPD, Agricultural water users in the Suwannee-Satilla Region, other collaborating regions

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 (2015 - 2025): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2025-2050): Further Action to Complete Implementation and Associated Dates	Responsible Parties
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 01/2020)	Collect data to confirm loading and/or receiving stream chemistry (by 01/2025)	N/A	EPD, Municipalities and/or wastewater utilities in the Suwannee-Satilla Region
PSDO-2 Point Source Discharge Relocation				Identify feasibility to move discharge location to higher flow streams with greater assimilative capacity (by 01/2020)	If feasible and cost effective, relocate discharge location (by 01/2025)	
PSDO-3 Improve Treatment Facilities	Water Quality Gaps	General Wastewater	Confirm wastewater facilities to upgrade/improve treatment to address low dissolved oxygen conditions in receiving streams (by 01/2020)	Upgrade/improve treatment of identified wastewater facilities (by 01/2020)	Continue to upgrade/improve treatment of identified wastewater facilities (by 01/2040)	EPD, Municipalities and/or wastewater utilities in the Suwannee-Satilla Region

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 (2015 - 2025): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2025-2050):	Responsible Parties
Available Municipal Wastewater Permit Capacity (MWWPC)						
MWWPC-1 Increase Wastewater Permit Capacity	Wastewater Permit Capacity Gap (Bacon, and Pierce Counties)	Municipal Wastewater	EPD and entities to confirm assumptions and needs (by 01/2020)	Expand or construct new facilities and/or obtain additional wastewater permit capacity to meet forecasted needs (by 01/2025)	N/A	EPD, Municipal wastewater utilities in the Suwannee-Satilla Region
Available Industrial Wastewater Permit Capacity (IWWPC)						
IWWPC-1[3] 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 01/2020)	Expand or construct new facilities and/or obtain additional wastewater permit capacity to meet forecasted needs (by 01/2025)	N/A	EPD, Industrial wastewater facilities in the Suwannee-Satilla Region

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 (2015 - 2025): Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2025-2050): Further Action to Complete Implementation and Associated Dates	Responsible Parties
Municipal Groundwater Permit Capacity (MGWPC)						
MGWPC-1 Increase Municipal Groundwater Permit Capacity	Groundwater Permit Capacity Gap (Brantley, Echols, Lanier, and Pierce, Counties)	Municipal Groundwater Withdrawal	EPD and entities to confirm assumptions and needs (by 01/2020)	Evaluate short-term needs and, if needed, work with EPD to obtain additional permit capacity (by 01/2025)	Evaluate long-term needs and, if needed, work with EPD to obtain additional permit capacity (by 01/2050)	EPD, Municipal water utilities in the Suwannee-Satilla Region
Industrial Groundwater Permit Capacity (IGWPC)						
IGWPC-1 Increase Industrial Groundwater Permit Capacity	Groundwater Permit Capacity Gap (Ben Hill, Cook, and Ware Counties)	Industrial Groundwater Withdrawal	EPD and entities to confirm assumptions and needs (by 01/2020)	Evaluate short-term needs and, if needed, work with EPD to obtain additional permit capacity (by 01/2025)	Evaluate long-term needs and, if needed, work with EPD to obtain additional permit capacity (by 01/2050)	EPD, Industrial water facilities in the Suwannee-Satilla Region

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 (2015 - 2025): / Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2025-2050):	Responsible Parties
Groundwater (GW)						
GW-1 Sustainable Groundwater Development	Current and Future Groundwater Needs	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 01/2020)	Provide guidance and implement sustainable groundwater withdrawal rates through 01/2025	Modify Resource Assessments and sustainable yield criteria, if necessary (by 01/2050)	EPD, Cities, Counties, and Utilities in the Suwannee-Satilla Region
GW-2 Promote Aquifer-Friendly Land Uses	Current and Future Groundwater Needs	N/A	Monitor land use changes and further delineate aquifer recharge areas (by 01/2020)	Encourage land use practices that sustain and protect aquifer recharge areas (by 01/2025)	Continue to monitor land use and hydrologic relationships	Cities and Counties in aquifer recharge areas for implementation. State agencies for research and data transfer to local governments.

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 (2015 - 2025):	For Long-term Actions (2025-2050):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
GW-3 Research Groundwater Sustainability GW-4 Inter-State Resource Planning	Current and Future Groundwater Needs	Groundwater Withdrawal (Municipal, Industrial, and Agricultural)	Continue to drill wells and withdraw groundwater to meet regional needs Verify sustainable yields and consider relevant localized impacts (by 01/2020)	Provide guidance and implement sustainable groundwater withdrawal rates through 01/2025	Modify Resource Assessments and sustainable yield criteria, if necessary (by 01/2050)	EPD
Surface Water (SW)						
SW-1 Surface Water Uses Within Available Capacity	Current and Future Surface Water Use Outside Gap Areas	Surface water Withdrawal	Confirm non-gap areas and available surface water resource capacity (by 01/2020)	Continue to apply for permits and use surface water in non-gap areas within available resource capacity (by 01/2025)	Verify flow conditions and gaps	EPD, applicable federal agencies, and surface water users in Suwannee-Satilla Region
SW-2 Monitor and Evaluate Estuaries	Current and Future Surface Water Use Outside Gap Areas	N/A	Monitor St. Marys River flow conditions	Determine flow conditions that sustain estuary health (by 01/2025)	N/A	EPD, Coastal Resources Division, Wildlife Resources Division

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 (2015 - 2025): / Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2025-2050):	Responsible Parties
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 DO, fecal coliform, and nutrient sources	Confirm sources of loading and develop programs to address (by 01/2025)	N/A	EPD, Municipalities and Utilities within the Suwannee-Satilla Region
NPS-2 Monitor and Address NPS Nutrient Loading						
NPSU-1 through NPSU-5 Various Practices Related to Stormwater Management			Select best management practices (BMPs) needed for treating stormwater from urban and rural uses	Implement a variety of stormwater BMPs related to urban uses (by 01/2020)		

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 (2015 - 2025):	For Long-term Actions (2025-2050):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
NPSR-1 Advocate Implementing Road Runoff BMPs	Water Quality Outside Gap Areas	Stormwater (NPDES Discharges)	Continue to support existing best management practices programs	Implement a variety of stormwater BMPs related to dirt road maintenance (by 01/2015)	N/A	EPD, Counties (Public Works/Roads and Bridges Departments) within the Suwannee-Satilla Region
NPSF-1 through NPSF-4 Various Management Practices Related to Forestry BMPs	Water Quality Outside Gap Areas	Stormwater (NPDES Discharges)	Continue to support existing best management practices programs	Implement a variety of best management practices related to forestry uses (by 01/2020)	N/A	Georgia Forestry Commission (GFC), Georgia Forestry Association, Georgia State Forestry Registration Board, Georgia Sustainable Forest Initiative, In-State Universities, Southern Wood Producers Association, and possibly county commissions USDA, NRCS, Non-profits, Non-governmental organizations (NSPF-4 only)

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 (2015 - 2025):	For Long-term Actions (2025-2050):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
TMDL-1 through TMDL-3 Evaluate Impaired Segments and Sources			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 Suwannee-Satilla Region
NUT-1 Link Nutrient Loading with Current Land Use			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 Suwannee-Satilla Region, and county commissions

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 (2015 - 2025):	For Long-term Actions (2025-2050):	Responsible Parties
				Further Action to Complete Implementation and Associated Dates		
Educational Practices (EDU)						
EDU-1 through EDU-5 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 Suwannee-Satilla Region

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 (2015 - 2025): / Further Action to Complete Implementation and Associated Dates	For Long-term Actions (2025-2050):	Responsible Parties
Ordinance and Code Policy Practices (OCP)						
OCP-1 through OCP-4 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 and Erosion and Sedimentation Control Measures) Encourage coordinated environmental planning	Pass ordinances and develop standards on stormwater management and land development (by 01/2020) Conduct regional environmental planning (e.g., land use, stormwater, wastewater)	N/A	EPD, Regional Commissions, Municipalities and Utilities within the Suwannee-Satilla Region, and county commissions

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 Suwannee-Satilla Region. Focus on surface water permit holders and new surface water permit requests in Satilla Watershed [(Atkinson, Bacon, Brantley, Coffee, Irwin, Pierce, and Ware Counties (Atkinson Gap)], Alapaha Watershed [Atkinson, Ben Hill, Berrien, Echols, Irwin, Lanier, Lowndes, Tift, and Turner Counties (Statenville and Jennings Gaps)], and Withlacoochee Watershed [(Berrien, Brooks, Cook, Lowndes, Tift, and Turner Counties (Pinetta Gap)].

[2]Coordinate gap closure with the following regional councils: Altamaha (Wilcox County), Lower Flint-Ochlockonee (Colquitt, Worth Counties), Upper Flint (Crisp County).

[3]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 Suwannee-Satilla 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, and other sources of information, as listed below. The guidance documents and sources used to inform the planning level cost information in Table 7-2 have not been updated. Accordingly, the values shown below should only be used as a general guide. Specific costs should be further evaluated and updated before being relied upon.

- Georgia EPD 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 Smith 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.)
- Georgia Geologic Survey Project Report 32 titled Irrigation Conservation Practices Appropriate for the Southeastern United States. Prepared in cooperation with the Georgia DNR, EPD.

- 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.
- FY 2004 Sussex Conservation District Cover Crop Program Fact Sheet. Sussex Conservation District, Georgetown, Delaware dated 2003.
- North Carolina State University Department of Forestry presentation titled Costs of Forestry Best Management Practices in the South: A Review dated 2002.
- Recent bid tabulations (as of 2011) 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 was 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:

- Agricultural Conservation Easement Program
- Conservation of Private Grazing Land Program
- Environmental Quality Incentives Program
- Resource Conservation and Development 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 Collect Agricultural Consumption Data; Refine Resource Assessment	Current and Future Surface Water Use in Gap Areas	$25 to $0.5M		Various recent similar projects
DCAR-2 Source of Supply Data to Refine Forecasts		$0.5M to $1M		

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
DCAR-3 Improve Forecast and Resource Data; Analyze Storage Impacts on Gaps		$0.5M to $1M		
DCAR-4 Improve Data Quality and Analysis Capabilities		$0.2M to $0.4M		
DCAR-5 Irrigation Efficiency Education and Research		$0.1M to $0.2M		
DCAR-6 Understand Optimum Application Methods		$0.05M to $0.1M		
DCAR-7 Minimize Groundwater Impacts to Surface Water	Current and Future Surface Water Use in Gap Areas	$0.075M to $0.1M		Various recent similar projects
DCAR-8 Analyze Addressing Extreme Conditions		$0.1M to $0.2M		
DCAR-9 Study Aquifer Potential to Address Gaps		$0.15M to $0.2M		

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
DCAR-10 Restoration Impact on Low Flow Conditions Analysis		$0.2M to $0.5M		
Water Conservation (WC)				
WC-1 Tier 1 and Tier 2 Measures for Municipal and Industrial Users	Current and Future Surface Water and Groundwater Supply Needs Throughout the Region	$0.1M to $0.2M	Local governments; utilities	Supplemental Guidance
WC-2 Tier 1 and Tier 2 Measures for Agricultural Users		$0.1M to $0.2M		
WC-3 Audits	Current and Future Surface Water Use in Gap Areas	$1,300/system	State/federal loan or grant	Irrigation Conservation Practices Appropriate for the Southeastern United States
WC-4 Metering		$5.3M		(6,021 existing irrigation pumps) times 10% increase in pumps times $800/totalizer
WC-5 Inspections	Current and Future Surface Water Use in Gap Areas	$0 to $0.5M	State/federal loan or grant	$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 650,067
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

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
WC-8 Conservation Tillage		$0.1M to $0.2M		Educate farmers on benefits of conservation tillage
WC-9 Control 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		
Additional/Alternatives to Existing Surface Water Supply Sources (ASWS)				
ASWS-1 Consider Low Flow Conditions in Future Surface Water Permitting	Current and Future Surface Water Use in Gap Areas	$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 Substitute Future Surface Water Use with Groundwater in Gap Areas	Current Surface Water Use in Gap Areas	$0.01M to $0.1M per MGD	Georgia Reservoir and Water Supply Fund	Local well driller data and Supplemental Guidance

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
ASWS-4 Substitute Existing Agricultural Surface Water Use with Groundwater in Dry Years		$0.01M to $0.1M per MGD	Georgia Reservoir and Water Supply Fund	From local well driller data and Supplemental Guidance. Does not include pipeline costs and cost of treatment.
ASWS-5 Opportunities and Incentives for Dry-Year Releases from Ponds		$1M to $2M		Optimize farm and pond operations for existing use for 7Q10
ASWS-6 Consider Phased Seasonal Agricultural Permit Conditions		$0.15M to $0.2M per applicant		Various recent similar projects
ASWS-7 Ecological Restoration Incentive Program	Current and Future Surface Water Use in Gap Areas	$100,000/ac	Clean Water Act Section 319(h) Grants	Supplemental Guidance
ASWS-8 Land Management Incentives		$0 to $1/capita	Clean Water State Revolving Fund Loan Program	Supplemental Guidance. Total population in 2050: 650,067
ASWS-9 Incentives for Greater Wastewater Return Flows; Coordinated Management		$0.1M to $1M per MGD		Supplemental Guidance
ASWS-10 Multi-Region Reservoir	Current and Future Surface	$0.01M to $0.35M per MG	GEFA Georgia Reservoir and Water Supply Fund	Supplemental Guidance

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
ASWS-11 Inter-Basin Transfers	Water Use in Gap Areas	$12.7M per mile		Supplemental Guidance. Inter-basin transfer is a function of piping cost and flow. Assume 84-in pipe.
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 Source Discharge Relocation		$0.1M to $0.3M	GEFA Georgia Fund Loan; utilities	
PSDO-3 Improve Treatment Facilities		$7M to $10M per MGD	GEFA Georgia Fund Loan; utilities; CWSRF	Supplemental Guidance
Available Municipal Wastewater Permit Capacity (MWWPC)				
MWWPC-1 Increase Wastewater Permit 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	$0.025M to $0.05M	Drinking Water State Revolving Fund (DWSRF) Loan Program	Various recent similar projects

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
Industrial Groundwater Permit Capacity (IGWPC)				
IGWPC-1 Increase Industrial Groundwater Permit Capacity	Groundwater Permit Capacity Gap	$0.025M to $0.05M	DWSRF Loan Program	Various recent similar projects
Groundwater (GW)				
GW-1 Sustainable Groundwater Development	Current and Future Groundwater Needs	$0.01M to $0.1M per MGD	Georgia Reservoir and Water Supply Fund	Supplemental Guidance
GW-2 Promote Aquifer-Friendly Land Uses		$0 to $0.45M	GEFA Land Conservation Program	$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 650,067
GW-3 Research Groundwater Sustainability		$0.2M to $0.4M	Georgia Reservoir and Water Supply Fund	State of Georgia Groundwater Resource Assessment
GW-4 Inter-State Resource Planning		$0.2M to $0.4M		Various recent similar projects
Surface Water (SW)				
SW-1 Surface Water Use Within Available 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		$0.2M to $0.4M		Various recent similar projects

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
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	EPA Manual of Costs of Urban Stormwater Control (2002)
NPS-2 Monitor and Address NPS Nutrient Loading	Future Water Quality NPS Needs	$0.035M to $0.13M per impairment	Clean Water Act Section 319(h) Grants	Various recent similar projects
Urban Best Management Practices (NPSU)				
NPSU-1 Control Erosion	Future Water Quality NPS Needs	$0.65M to $1.3M	Clean Water Act Section 319(h) Grants; (Non-point Source Implementation Grant)	$1 to $2 per capita. Total population in 2050: 650,067
NPSU-2 Manage Stormwater Runoff		$6,000 to $65,000 per MG		EPA Manual of Costs of Urban Stormwater Control (2002)
NPSU-3 Increase Stormwater Infiltration		$0 to $0.5M	GEFA Land Conservation Program	$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 650,067
NPSU-4 Riparian Buffers		$0 to $0.5M		
NPSU-5 Street Sweeping		$0.65M to $1.3M	Clean Water Act Section 319(h) Grants; (Non-Point Source Implementation Grant)	$1 to $2 per capita per Supplemental Guidance. Total population in 2050: 650,067

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
Rural Best Management Practices (NPSR)				
NPSR-1 Advocate Implementing Road Runoff BMPs	Future Water Quality NPS Needs	$0.65M to $1.3M	Clean Water Act Section 319(h) Grants; (Non-point Source Implementation Grant)/One Georgia Authority Equity Fund	$1 to $2 per capita. Total population in 2050: 650,067
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		$0.1M to $0.25M		Costs of Forestry Best Management Practices in the South: A Review
NPSF-3 Conservation Land Use Planning		$0 to $0.5M	GEFA Land Conservation Program	$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 650,067
NPSF-4 Forest Restoration Incentives and Support		$0 to $0.5M		
Agricultural Best Management Practices for Crop and Pasture Lands (NPSA)				
NPSA-1 Soil Erosion Control Measures	Future Water Quality NPS Needs	$0.1M to $0.2M		Irrigation Conservation Practices Appropriate for the Southeastern United States

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
NPSA-2 Utilize Buffers		$0 to $0.5M		$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 650,067
NPSA-3 Livestock Management		$0 to $0.5M		
NPSA-4 Manure Control		$0.5M to $1M		Sussex (Delaware) Conservation District Cover Crop Program Fact Sheet
NPSA-5 Wetland and Forest Restoration Incentives		$0 to $0.5M		$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 650,067
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		$0.035M to $0.13M per impairment		
TMDL-3 Stormwater Management BMPs		$33M to $52M		$50 to $80 per capita. Total population in 2050: 650,067
Nutrients – Satilla and Savannah River Nutrient (Phosphorus and Nitrogen) Watershed Models (NUT)				
NUT-1 Link Nutrient Loading with Current Land Use	Future Water Quality NPS Needs	$10 to $150 per acre		Supplemental Guidance

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
Educational (EDU)				
EDU-1 Promote Conservation Programs	Future Educational Needs	$0 to $1.5M	State incentive programs; utilities; local governments	$0 to $2.25 per capita per Supplemental Guidance. Total population in 2050: 650,067
EDU-2 Stormwater Education		$0 to $1.5M		
EDU-3 Septic System Maintenance Education		$0 to $0.5M		$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 650,067
EDU-4 Forestry BMP Education		$0.05M to $0.1M	State incentive programs; local governments	Management Practices in the South: A Review
EDU-5 Funding and Support for BMP Education	Future Educational Needs	$0.05M to $0.1M	State incentive programs; utilities; local governments	
Ordinance and Code Policy (OCP)				
OCP-1 Engage Local Governments	Future Ordinance and Code Policy Needs	$0 to $0.5M	State incentive programs; utilities; local governments	$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 650,067
OCP-2 Green Space Opportunities and Incentives		$0.05M to $0.1M	State incentive programs; utilities, local governments; Georgia Land Conservation Program	Supplemental Guidance

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**
OCP-3 Promote Integrated Planning		$0 to $0.5M	State incentive programs; utilities, local governments	$0 to $0.7 per capita per Supplemental Guidance. Total population in 2050: 650,067
OCP-4 Local Government Erosion Control Measures		$0 to $0.5M	State incentive programs; local governments	
[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.				

7.3. Alignment with Other Plans

The Suwannee-Satilla Council's Plan and management practices selection process were 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 Suwannee-Satilla 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 Suwannee-Satilla 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 Suwannee-Satilla Council is sensitive to unintended consequences if Plan recommendations become mandates or infringe upon private property rights. 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 EPD's Agricultural Water Metering Program, as well as other partners, including but not limited to, the University of Georgia and the Georgia Department of Agriculture, to improve agricultural water use data collection and management. This effort would focus on refining source(s) of supply for multiple irrigation sources, continuing to assess data on crop water requirements, evaluating the effects of farm ponds on direct irrigation withdrawals and the hydrologic cycle, and further research on crop consumptive use. This data in turn should be coordinated with Resource Assessment tools to ensure accurate simulation of any gaps and assumptions.

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

- Work with the Southern Georgia Regional Commission to expand water quality monitoring of tributaries on the State's 303(d) list and tributaries identified as having little or no dissolved oxygen assimilative capacity. Develop a new

dissolved oxygen standard that reflects the naturally low concentrations in blackwater streams that are prevalent in this area.

- 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 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 sustaining baseflow conditions of streams and water quality.

Georgia Soil and Water Conservation Commission (GSWCC)

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

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

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

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

- Provide incentives to restore wetlands and historically drained hardwood swamps and other natural retention areas. Restoration of these features will replenish sources of headwaters by retaining surface runoff and releasing it over a longer period to offset loss of baseflows between rain events, while also providing additional recharge to surficial aquifers.

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.

In-State Universities and Colleges

- Research the percent loss and consumption of irrigation water applied to crops to estimate how much of the water that is applied to a crop is lost to evaporation, runs off into surface waters, and infiltrates to groundwater.

- Research varieties of crops that require less water and are more drought resistant.

- Research the impacts of development and various land uses on aquifer recharge areas.

- Research the effectiveness of management practices to control non-point source pollutants such as sediment, fecal coliform, and nutrients in stormwater runoff from different land uses including urban and rural development, agriculture, and silviculture.

- Research the role played by wetlands in abating runoff flows from storm events, providing source water for surface water features, and treating surface water quality. Evaluate the benefits of restoring previously drained and/or developed wetlands to their natural state.

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 Suwannee-Satilla 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. New and/or changing information will likely influence how the recommended practices are ultimately implemented.

8.1. Benchmarks

The benchmarks prepared by the Suwannee-Satilla Council and listed in Table 8-1 will be used to assess the effectiveness of this Plan's implementation and identify any required revisions. As detailed below, the Suwannee-Satilla 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. The benchmarks will be used to evaluate the Regional Water Plan effectiveness at the next 5-year Plan review.

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 toward meeting regional needs and goals. The successful implementation of the Regional Water Plan will require both leadership and supporting roles by Georgia 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-10 Research in Agricultural and Alternative Supply Management 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
Groundwater quantity and all water use throughout the region **Surface water quantity at Atkinson, Fargo, Statenville, Jennings, and Pinetta**			
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 Agricultural Users	Reduction in agricultural surface water withdrawals while maintaining agricultural production and reduction in surface water gaps	- 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

Table 8-1: Benchmarks for Water Management Plans			
Management Practice No. (See Table 6-1)	**Benchmark**	**Measurement Tools**	**Time Period**
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
ASWS-3 Substitute Future Surface Water Use with Groundwater in Gap Areas	- Information and educational materials developed in conjunction with GSWCC and Georgia DOA to communicate details 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 Substitute Existing Agricultural Surface Water Use with Groundwater in Dry Years	- Develop information and educational materials in conjunction with GSWCC and Georgia DOA to communicate details 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 Opportunities and Incentives for Dry-Year Releases from Ponds	- Completion of feasibility study - Working with potential participants, opportunities and incentives identified	- Identification of largest storage facilities for potential participation in gap areas - Report summarizing opportunities and implementation	1-3 years 1-5 years
ASWS-6 Consider Phased Seasonal Agricultural Permit Conditions	- Identify need for permit seasonality on a resource (drainage basin) basis and feasibility of permit alterations - Study magnitude of required permit alterations in identified basins through surface water availability modeling	- Inventory of basins that cannot support existing permitted uses in drought seasons - Report summarizing study results	1-3 years 3-5 years

Table 8-1: Benchmarks for Water Management Plans			
Management Practice No. (See Table 6-1)	**Benchmark**	**Measurement Tools**	**Time Period**
ASWS-7 Ecological Restoration Incentive Program	Pending feasibility study	Assess results of research	5 years
ASWS-8 through ASWS-11 Land Management Incentives and Alternative Supply Sources	- 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 (for ASWS 9: 1-3 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 Source Discharge Relocation PSDO-3 Improve Treatment Facilities	- 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	5 years
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

Table 8-1: Benchmarks for Water Management Plans			
Management Practice No. (See Table 6-1)	**Benchmark**	**Measurement Tools**	**Time Period**
Addressing Current and Future Groundwater Needs for Gap and Non-gap Areas			
GW-1 Sustainable Groundwater Development	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 Promote Aquifer-Friendly Land Uses	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
Management Practice No. (See Table 6-1)	**Benchmark**	**Measurement Tools**	**Time Period**
GW-3 Research Groundwater Sustainability	Sound science used to improve data and sustainably manage groundwater resources	Groundwater Resource Assessment updated	5 years
GW-4 Inter-State Resource Planning	Data sharing and cooperation with Florida; incorporation of Florida forecast uses into future modeling		
Addressing Current and Future Surface Water Needs for Gap and Non-gap Areas			
SW-1 Surface Water Use Within Available 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 Study Human Impacts on Water Quality	- 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

Table 8-1: Benchmarks for Water Management Plans			
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			
- Ammonia and Nutrients Point Sources - Nutrient Non-point sources Satilla 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 contaminates (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, and, 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

Table 8-1: Benchmarks for Water Management Plans			
Management Practice No. (See Table 6-1)	**Benchmark**	**Measurement Tools**	**Time Period**
Management Practices to Address Ordinance and Code Policy Needs			
- Encourage implementation and/or compliance with Stormwater ordinances and/or regulations - Encourage improved conformance with Environmental *Planning Criteria* developed pursuant to Part V of the Georgia Planning Act - Encourage local governments to improve conformance with erosion/sediment control measures	- Select local governments surveyed to identify current knowledge base and recommended areas of improvement - Improved education at state and local government conferences and workshops - Enhanced awareness in Comprehensive Planning by local governments across region	Select follow-up survey of local governments to identify changes and success stories	1-5 years
Shared Resources			
Combined management practices for the Atkinson, Statenville, Jennings, and Pinetta surface water gaps (Altamaha, Upper Flint, Lower Flint-Ochlockonee Planning Regions)	Regional Council-specific management practices implemented	Evaluate project improvement of surface water flows using gauge data and Resource Assessment tools	1-5 years
Ongoing Planning coordination with Florida	- Outreach and coordination with states completed and water planning data collected - Review Resource Assessment tools and make modifications if warranted	- Report summarizing planning data - Information needs and issues documentation	1-5 years 5 years

8.2. Plan Updates

Meeting current and future water needs will require periodic review and revision of Regional Water Plans. The State Water Plan and associated rules provide that each Regional Water Plan will be subject to review by the appropriate Regional Water Planning Council every 5 years and in accordance with the guidance provided by the Director, unless otherwise required by the Director for earlier review. These reviews and updates will allow an opportunity to adapt the Regional Water Plan based on changed circumstances and new information arising in the 5 years after EPD's adoption of these plans. These benchmarks will guide EPD in the review of the Regional Water Plan.

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

8.3. Plan Amendments

The Suwannee-Satilla 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 Regional Water Plan updates. Future planning efforts should confirm current assumptions and make necessary revisions and/or improvements to the conclusions reached during this phase of planning.

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APPENDIX A

Section	Location	Change	Description
ES	Trends and Key Findings	Updated summary box text with the most recent information.	- Population information was updated based on the most recent statewide population projections (Governor's Office of Planning and Budget, 2015). - Updated water use information from the Suwannee-SatillaWater and Wastewater Forecasting Technical Memorandum (CDM Smith, 2017). - Updated discussion and statistics of water quality impairments based on results from Surface Water Quality (Assimilative Capacity) Resource Assessment (EPD, March 2017).
ES	Introduction/ Overview	Updated state growth information	- Values for the state of Georgia were updated based on the most recent information from the U.S. Census Bureau.
ES	Introduction/ Overview	Minor text revisions/updates	- Text was revised/updated to reflect the purpose of this document as an update to the Plan completed in 2011. - Removal of Council website.
ES	Introduction/ Overview	Updated population projections	- Values were updated based on the most recent statewide population projections (Governor's Office of Planning and Budget, 2015).
ES	Water Resources and Use, Figure ES-4	Updated return flow information and figure	- Water and wastewater values updated based on the Suwannee-Satilla Water and Wastewater Forecasting Technical Memorandum (CDM Smith, 2017)
ES	Figure ES-5	Updated figure	- Population information was updated based on the most recent statewide population projections (Governor's Office of Planning and Budget, 2015).
ES	Groundwater Availability	Updated/modified text	- Groundwater use projection updated based on Suwannee-Satilla Water and Wastewater Forecasting Technical Memorandum (CDM Smith, 2017).
ES	Surface Water Availability	Updated/modified text	- Removed references to Figure ES-7 and added references to Table ES-1. - Removed reference to surface water gap at the Fargo planning node. - Updated contribution of agricultural and industrial surface water use to current and/or future surface water gaps from 9.54 MGD to 3.5 MGD. - Removed reference to the term "planning node" which referred to the removed Figure ES-7
ES	Table ES-1	Replaced Figure ES-7 with new Table ES-1	- Replaced Figure ES-7 with Table ES-1 to describe the forecasted surface water gaps.
ES	Summary of Resource Assessment Results	Updated summary box text with the most recent surface water quality information	- Updated summary of assimilative capacity based on results from Surface Water Quality (Assimilative Capacity) Resource Assessment (EPD, March 2017).
ES	Assessment of Water Quality Conditions	Updated/modified text	- Updated discussion and statistics of water quality impairments based on results from Surface Water Quality (Assimilative Capacity) Resource Assessment (EPD, March 2017).
ES	Former Table ES-1	Removed	- This table was removed and replaced with references to other portions of the document for the results of the assimilative capacity assessment for dissolved oxygen.
ES	Identifying Water Management Practices to Address Water Resources Shortfalls and Future Needs	Updated/modified text	- Updated EPD reference from 2010 to 2017. - Added additional wording to modify language about Regional Water Plan.
ES	Figure ES-7	Modified figure number	- Because Figure ES-7 was removed (see above), subsequent figure numbers were revised accordingly. 2011 Figure ES-8 is Figure ES-7 in 2017 update.
ES	Implementation Considerations and Benchmarks	Updated/modified text	- Updated Governor and Speaker of the House to current administration.
1	Section 1.0	Minor text revisions/updates in first three paragraphs of Introduction.	- Text was revised/updated to reflect the purpose of this document as an update to the Plan completed in 2011.

Section	Location	Change	Description
1	Section 1.0	Added fourth paragraph to Introduction.	- Added a brief description of the purpose of the Regional Water Plan update process and resulting changes to the revised management practices recommended by the Suwanee-Satilla Council.
1	Section 1.1	Minor text revisions/updates	- Text in fourth paragraph was revised/updated to reflect the purpose of this document as an update to the Plan completed in 2011.
1	Section 1.2	Minor text revisions/updates	- Text in this section was revised/updated to reflect the purpose of this document as an update to the Plan completed in 2011 and to describe the similar approach to process utilized for the Plan update.
1	Section 1.3	Updated to current Suwanee-Satilla Council member numbers.	- Updated Suwanee-Satilla Council member numbers, including positions of alternates and Ex-Officio members in first paragraph.
1	Figure 1-3	Updated to current Suwanee-Satilla Council member cities.	- Updated Suwanee-Satilla Council member location cities in the map showing each county in the council.
1	Section 1.3	Minor text revisions/updates	- Text in this section was revised/updated to reflect the purpose of this document as an update to the Plan completed in 2011 and to describe the similar approach to process utilized for the Plan update.
1	Section 1.3	Revised website references	- Website links for the Memorandum of Agreement, Vision and Goals, Public Involvement Plan, and Public Outreach Technical Memorandum were updated or removed because they were no longer valid. Please refer to the Council's website if link is not available in the document.
2	Section 2.1	Updated percentage of groundwater supplied from the Floridan aquifer system	- Updated percentage of groundwater supplied to the Suwannee-Satilla Planning Region from the Floridan aquifer system based on new 2015 forecasted groundwater withdrawal information.
2	Section 2.1	Refined climate description	- Refined description of snowfall historical average in climate section.
2	Section 2.2	Updated population projection	- Updated population value to the 2015 population projection based on updated reference (Governor's Office of Planning and Budget, 2015).
2	Section 2.2	Minor text revisions/updates	- Corrected misspelling in paragraph two.
2	Section 2.2	Updated cash receipts	- Updated cash receipt of State's economy value from 2007 to the 2012 projection based on updated reference (Census of Agriculture, 2012).
2	Section 2.2 and Figure 2-3	Updated land cover distribution	- Updated land cover distribution based on most recent available information from the University of Georgia Natural Resources Spatial Analysis Laboratory (2008)
2	Section 2.2	Updated description of irrigated crops	- Updated description based on the most recent information in the 2016 agricultural demand assessment.
2	Section 2.3	Minor text revisions/updates in second paragraph	- Updated text in second paragraph to reflect that the Regional Plan was completed.
3	Section 3.2	Minor text revisions/updates	- Updated word choice and sentence structure. - Removed text related to outdated references.
3	Section 3.2.1	Text revisions/updates	- Updated the reference to the year of the Resource Assessment. - Removed text related to outdated references. - Updated descriptions of the Surface Water Quality Resource Assessment to more accurately describe the nature of the analysis.
3	Figure 3-5	Updated	- Figure updated with most recent assimilative capacity model.
3	Table 3-1	Updated	- Values updated with most recent results of the assimilative capacity assessment.
3	Figure 3-6	Updated	- Values updated with most recent results of the assimilative capacity assessment.
3	Section 3.2.1 - Nutrient Modeling Section	Text revisions/updates	- Updated word choice and sentence structure.
3	Section 3.2.2	Text revisions/updates	- Updated the reference to the year of the Resource Assessment. - Updated descriptions of the Surface Water Availability Resource Assessment to more accurately describe the nature of the analysis. - Updated word choice and sentence structure. - Moved the reference to Table 3-2 prior to the table instead of after. Text following Table 3-2 was deleted.

Section	Location	Change	Description
3	Table 3-2	Revised/Updated	- Table was revised to align with the 2017 updates. Values presented are based on the Surface Water Availability Assessment, March 2017, EPD.
3	Section 3.2.3	Minor text revisions	- Removed text related to outdated references.
3	Figure 3-8	Updated	- This figure has been Updated to remove reference to the Upper Floridan Aquifer. See reason in "General updates completed throughout the plan".
3	Section 3.3 - Impaired Water Bodies Section	Minor text revisions/updates	- Percentages of impaired reaches was updated. - Removed text related to outdated references.
3	Figure 3-9	Updated	- Values updated with most recent results of the assimilative capacity assessment.
4	Summary	Updated projection values	- The text was updated to reflect the revised forecasts.
4	Section 4	Minor text updates	- Updated planning horizon in first paragraph.
4	Table 4-1	Updated	- Population projections were updated based on the 2015 population numbers from the Governor's Office of Planning and Budget.
4	Section 4.1 - Municipal Water Forecasts Section	Text revisions/updates	- The text was added to describe updated methodology utilized during the Plan update. - Updated the reference to the year of the Technical Memo and outdated text. - The text related to former Figure 4-2 was removed.
4	Former Table 4-2	Removed	- The table was removed as the revised methodology did not split out the specific contributions from each individual piece of legislation that reduced flush volumes of toilets for passive conservation. Because Table 4-2 was removed, subsequent table numbers were revised accordingly.
4	Figure 4-1	Updated	- This figure was updated to reflect the revised municipal water forecasts.
4	Section 4.1 - Municipal Wastewater Forecasts Section	Text revisions/updates	- Updated word choice and sentence structure. - A contribution for I/I was not explicitly added under the revised methodology but instead forecasts were based on the reported discharges. Thus the paragraph describing I/I flows was removed and text was added to describe the updated methodology.
4	Figure 4-2	Updated	- This figure was updated to reflect the revised municipal wastewater forecasts.
4	Section 4.2	Minor text revisions/updates	- The text related to the planning period was updated. - Mining industry shows an increasing trend throughout the planning period rather than a decreasing trend indicated in the 2011 Plan.
4	Table 4-2 and Figure 4-3	Updated	- The table and figure were updated to include 2015 data also other values remained the same.
4	Section 4.3	Text revisions/updates	- The text was updated to reflect the updated methodology for forecasting agricultural demands that was updated in 2016. - Removed text related to outdated references. - The text was updated based on the most recent data.
4	Table 4-3	Updated	- This table was updated with the revised agricultural forecasts. - Values quoted in surrounding text was also updated based on current information.
4	Figure 4-4	Updated	- This figure was updated to reflect the revised agricultural water use forecasts. - The forecast is no longer being split between crop and non-crop values.
4	Section 4.4	Text revisions/updates	- The text was updated to reflect the updated energy forecast that was completed in 2016 and included updates to the methodology.
4	Table 4-4	Updated	- There is no longer a regional portion of unassigned energy sector withdrawals as the Statewide unassigned withdrawals were significantly reduced since the previous round and this was no longer a factor.
4	Section 4.5	Minor text revisions/updates	- The text was updated based on the most recent data.
4	Figure 4-5	Updated	- This figure was updated with the revised water demand totals per sector. - The figure was converted from pie charts to a bar chart to better show the trend of increasing demands. - Values quoted in surrounding text was also updated based on current information.

Section	Location	Change	Description
4	Figure 4-6	Updated	- This figure was updated with the revised total wastewater flows. - The figure was converted from pie charts to a bar chart to better show the trend of increasing flows. - Values quoted in surrounding text was also updated based on current information.
5	Summary	Minor text revisions/updates	- Updated word choice and sentence structure.
5	Section 5 - Introduction	Minor text revisions	- Updated word choice and sentence structure.
5	Section 5.1	Text revisions/updates	- Updated word choice and sentence structure. - First paragraph, text was added for Figure 5-1. - Second paragraph, list of counties in the modeled aquifer area was cross checked with the county demands being included as part of the groundwater availability comparison.
5	Figure 5-1	Added	- This figure was previously included in the RWP of other councils. We also added it here to visually show the projected demands compared to the calculated sustainable yield as well as the portion of demand attributed to Suwannee-Satilla in the modeled aquifer area.
5	Table 5-1	Table revisions/updates	- Values in the table were updated based on revised permitted water withdrawal values and the updated demand forecasts. - All counties are now included in the table. - The focus of the table is solely municipal permits. - Both 2015 and 2050 demands are included so that projected growth patterns can be seen.
5	Section 5.2	Text revisions/updates	- Updated word choice and sentence structure. - Text was added regarding the Surface Water Availability Resource Assessment. - List of relevant planning nodes updated. There are now more relevant planning nodes being considered in the bulleted list at the beginning of Section 5.2. All nodes with any portion of their drainage area in Suwannee-Satilla are now being included in the list. - Text was added regarding the planning nodes and Table 5-2 and Figure 5-3. - Removed outdated text related to previous shortfall analysis. - Text was added related to current analysis.
5	Table 5-2, and Figure 5-2	Table 5-2 and Figure 5-2 added to replace former Figure 5-1	- Table 5-2 contains a summary of the potential gaps that was previously included as part of former Figure 5-1. - Figure 5-2 was added to highlight the portions of the region which drain to a planning node identified as having a potential gap.
5	Table 5-3	Added	- Table 5-3 (new) and related text was added to provide additional detail regarding the frequency and duration of the potential gaps. This information was utilized in determining the most relevant management practices for addressing the potential gaps.
5	Table 5-4	Updated	- Values in the table were updated based on the updated demands and the updated potential gaps.
5	Section 5.3	Text revisions/updates	- Updated word choice and sentence structure. - The text was updated to reflect the most recent data.
5	Table 5-5	Updated	- The table was updated with the latest permitted discharge flow values and the updated wastewater flow forecasts.
5	Section 5.3 - Assimilative Capacity Assessments Section	Text revisions/updates	- Updated word choice and sentence structure. - The text was updated to reflect the most recent data. - Text was added regarding the current modeling results.
5	Table 5-6	Updated	- This table was updated based on the results of the current assimilative capacity resource assessment.
5	Figure 5-3 and Figure 5-4	Revised to replace former Figure 5-2	- These figures were reworked to provide a single view of the whole region rather than the individual snapshots provided previously.
5	Former Figure 5-3	Removed	- This figure was removed as revised information was not available. The core components of the figure are still included within the text and new figures.

Section	Location	Change	Description
5	Section 5.3 - Non-Point Source Pollution Section	Minor text revisions/updates	- Updated word choice and sentence structure. - Text was added regarding the Resource Assessment.
5	Section 5.4	Added	- A summary section was added to recap major finding in the section.
5	Table 5-7	Added	- Table 5-7 was added to summarize the counties with specific identified issues.
6	Section 6.2	Minor text revisions/updates	- Text was added regarding the impact to the management practices since 2011. - Updated word choice and sentence structure. - Deleted references to 7Q10.
6	Table 6-1	Table updated with the most recent information.	- The Description/Definition of Action of various management practices were updated to align with 2017 updates and to capture the recommendations made by the council. - Additional updates: - A note was added regarding 7Q10. - WC-1: Text was added regarding the latest regulations. - MWWPC-1 currently only impacts Bacon and Pierce County. - SW-2: Revised Satilla to St. Mary's
7	Introduction	Minor text revisions/updates	- Years of the planning horizon were updated.
7	Table 7-1	Table updated with the most recent information.	- Updated the dates in the columns "For All Actions: Initial Implementation Step(s) and Associated Date(s)" and "Further Action to Complete Implementation and Associated Dates" to reflect the planning horizon. - MWWPC-1 currently only impacts Bacon and Pierce County. - MGWPC-1 currently only impacts Brantley, Echols, Lanier, and Pierce Counties. - SW-2: Revised Satilla to St. Mary's.
7	Section 7.2	Added verbiage regarding planning level cost estimate.	- Neither the cost guidance prepared by EPD in April 2011 (“GAEPD Cost Guidance”) nor the cost estimates have been updated therefore EPD recommended cautioning the public.
7	Section 7.2	Revised various USDA NRCS funding options.	- The Conservation Security Program (CSP) was not reauthorized in the 2008 Farm Bill and is no longer available. - The Agricultural Act of 2014 (Act) establishes the Agricultural Conservation Easement Program (ACEP) and repeals the Farm and Ranch Lands Protection Program (FRPP). F24ACEP combines the purposes of FRPP and the similarly repealed Grassland Reserve Program (GRP) into the new Agricultural Land Easements (ALE) that protect the agricultural use and conservation values of eligible farm and ranch land. - Wetland Reserve Program: The Agricultural Act of 2014 establishes the Agricultural Conservation Easement Program (ACEP). It repeals FRPP, GRP, and WRP but does not affect the validity or terms of any FRPP, GRP, or WRP contract, agreement or easement entered into prior to the date of enactment on February 7, 2014 or any associated payments required to be made in connection with an existing FRPP, GRP, or WRP contract, agreement or easement. - Wildlife Habitat Incentive Program: The Agricultural Act of 2014 (enacted on February 7, 2014) repealed the Wildlife Habitat Incentive Program (WHIP). NRCS will continue to support existing active WHIP contracts entered into prior to passage of the Agricultural Act of 2014, using the rules and policy in effect at the time of contract obligations. Portions of the WHIP Statute were rolled into the Environmental Quality Incentives Program (EQIP).
7	Section 7.4	Updated EPD & GSWCC subsections	- In 2016, the Ag metering program was moved out of GS&WCC and into EPD therefore the text was modified accordingly.

Section	Location	Change	Description
General updates completed throughout the plan		Updated references to "Upper Floridan" aquifer to read "Floridan" aquifer.	- References to the "Upper Floridan" aquifer were updated to read "Floridan," to ensure consistency with terminology used by EPD in the 2013 Announcement regarding Future Withdrawals from the Floridan Aquifer and in other documents.
		Removed references to the current State Water Plan or Council webpages (instead referring to availability on the Council's website of the Water Planning website).	- EPD is currently working to build a new Regional Water Planning website. Once the new site is up, the former site will be taken down. Web links in the Regional Water Plan document will be updated once the new website is completed.

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