GEORGIA WATER PLANNING

Regional Water Plan

MIDDLE OCMULGEE GEORGIA

JUNE 2023

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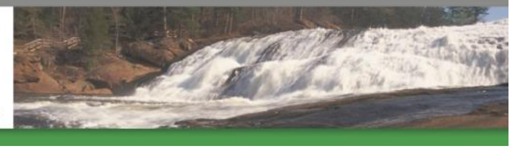

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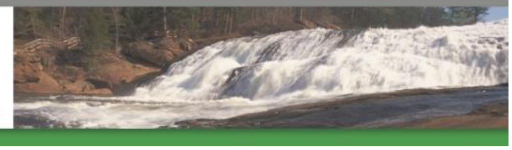

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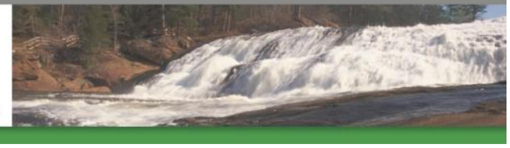
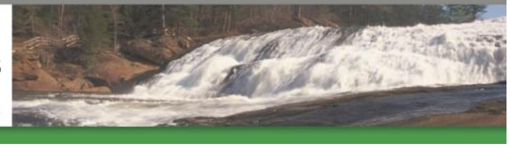


Acronyms and Abbreviations

AAD	Annual Average Day
ACCG	Association County Commissioners of Georgia
ACF	Apalachicola-Chattahoochee-Flint
BEAM	Basin Environmental Assessment Model
BMP	Best Management Practice
DCA	Department of Community Affairs
DO	Dissolved Oxygen
EPD	Environmental Protection Division of DNR
FERC	Federal Energy Regulatory Commission
GEFA	Georgia Environmental Finance Authority
GAWP	Georgia Association of Water Professionals
GMA	Georgia Municipal Association
gpcd	gallons per capita per day
gpm	gallons per minute
GRWA	Georgia Rural Water Association
GWPPC	Georgia Water Planning & Policy Center
I&I	Inflow and Infiltration
LAS	Land Application System
LID	Low Impact Development
MEAG Power	Municipal Electric Authority of Georgia
Metro District	Metropolitan North Georgia Water Planning District
MGD	Million Gallons per Day
mg/L	Milligrams per Liter
MLRA	Major Land Resource Area
MWh	Megawatt-hour
N	Nitrogen
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
OOA	Oconee-Ocmulgee-Altamaha
OPB	Georgia Governor’s Office of Planning and Budget
OSSMS	Onsite Sewage Management Systems
P	Phosphorus
PSC	Public Service Commission
PFA	Public Fishing Area

RAFB	Robins Air Force Base
State Water Plan	Comprehensive Statewide Water Management Plan
TMDL	total maximum daily load
μg/L	micrograms per liter
USGS	U.S. Geological Survey
WRD	Wildlife Resources Division of DNR
WCIP	State Water Conservation Implementation Plan



We would like to acknowledge the contributions of the following members of the Middle Ocmulgee Water Planning Council. The council members volunteered their time and talents during the development of this Regional Water Plan.

Middle Ocmulgee Regional Water Planning Council Members

Name	County
Active Members (2023 Update)	
John W. Bembry	Pulaski County
Mike Bilderback	Monroe County
Ben Copeland, Jr., Vice Chair	Peach County
Don Cook	Butts County
Cassandra Cox	Bibb County
Robert L. Dickey	Crawford County
Lawrence E. McSwain	Newton County
Barry Peters,	Monroe County
Elmo A. Richardson, Chair	Bibb County
Tony Rojas,	Bibb County
Marcie Seleb	Butts County
David Knight	Ex-officio
Previous or Inactive Members	
Peter Banks	Lamar County
Jason E. Briley	Jones County
Blair Cleveland	Bibb County
Keith Dalton	Newton County
Jerry D. Davis	Pulaski County
Keith Ellis	Newton County
Richard Haddock	Bibb County
Jim Ham	Monroe County (Deceased)
Charles F. Harris	Crawford County
Sam Hart	Bibb County
Paul Leath	Bibb County
Tom McMichael	Houston County
Robert F. Ray	Peach County
Terry M. Scarborough	Houston County
William Whitten	Jasper County
Thomas Wicker	Bibb County

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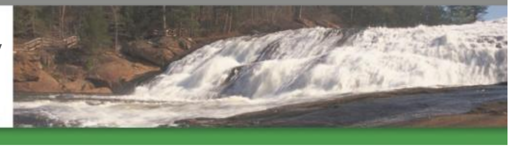
EXECUTIVE SUMMARY



Executive Summary

This Regional Water Plan provides a roadmap for implementing specific measures designed to promote sustainable water usage and management of the Middle Ocmulgee Region's water resources over the next 50 years.

Introduction

The Comprehensive Statewide Water Management Plan calls for the preparation of regional plans designed to manage water resources in a sustainable manner through 2060. The Middle Ocmulgee Water Planning Region is one of ten such regions established by the Georgia General Assembly. The region's Water Planning Council consists of volunteer members who began working on the development of an initial Middle Ocmulgee Regional Water Plan (Plan) in March 2009. The initial Plan was completed in 2011 and the second Plan was adopted in 2017. The Council began a review and update process in 2022, which is reflected in this Plan. The Plan describes current water resources conditions, projects future demands, identifies resource issues, and recommends appropriate water management practices to be implemented in the region through 2060.

Local governments/utilities and other permitted water users will be primarily responsible for implementing the Plan. Other agencies, also discussed in the Plan, will have implementation roles. The Plan includes benchmarks to measure progress and identifies entities responsible for monitoring and reporting those benchmarks. Continued funding at both state and local levels is key to successful Plan implementation.

Middle Ocmulgee Water Planning Region Vision Statement

The Middle Ocmulgee Water Council will work so that our water resource, both surface and subsurface, is of exceptional quality and quantity for the well being and prosperity of all that will follow. Our plan will consider the resource's natural integrity, wise conservation, and prudent management for continuing economic development and enhanced quality of life for all.

Goals

1. Maximize water supply sources to the extent practicable to provide sufficient water supply for the region.
2. Support the protection of natural stream integrity to enhance ecosystem benefits such as water quality, fish and wildlife, floodplain protection, and recreation.
3. Promote conservation of and efficient use of water.
4. Promote properly managed wastewater discharges and beneficial reuse.
5. Support the reduction of non-point source pollution by advocating for enhanced stormwater management and better land management practices.
6. Support the comprehensive planning and management of water resources to maintain a healthy economy, ensure a high quality of life, and protect our natural resources.

The Middle Ocmulgee Water Planning Region

Figure ES-1: Middle Ocmulgee Water Planning

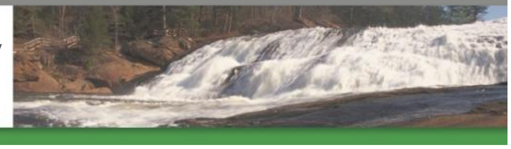
The Middle Ocmulgee Water Planning Region includes 12 counties and 36 cities and towns. In 2020, the total population for the region was estimated at 607,242. Approximately 71 percent of the total population resides in Macon-Bibb, Houston, and Newton counties. Major population centers include the cities of Macon, Warner Robins, and Covington. Approximately 54 percent of the region's land area is covered by forested land and 11 percent by urban development. Land use generally transitions from suburban in the north to rural in the south. The region's leading economic sectors include government, health care, service industries, and agriculture.

The Middle Ocmulgee Region receives between 40 and 52 inches of rain per year and is fortunate to have an abundant water supply to support long-term growth. Approximately 76 percent of the region lies in the Ocmulgee River Basin. Above the Fall Line, larger water suppliers generally rely on surface water sources; smaller suppliers typically access groundwater from the Crystalline-Rock Aquifer. The Cretaceous and Floridan Aquifer systems provide significant amounts of groundwater supply below the Fall Line.

Water Resources of the Region

Based on 2015 USGS data, the Middle Ocmulgee Region withdrew approximately 186 million gallons per day (MGD) of water to supply municipal, industrial, energy, and agriculture uses. Of that water supply, approximately 60 percent (112 MGD) was withdrawn from surface water, while the remaining 40 percent (74 MGD) was obtained from groundwater supply sources. The region generated approximately 71 MGD of wastewater returns in 2015, with the majority (84 percent) returned from the municipal uses, 15 percent returned from industrial sources, and the remaining 1 percent returned from the energy sector.

As a major component of the Regional Water Planning process, EPD developed three Resource Assessments: (1) surface water quality (assimilative capacity); (2) surface water availability; and (3) groundwater availability. The Resource Assessments



analyzed the capacity of water resources to support Georgia communities without causing unacceptable local or regional impacts according to metrics established by EPD.

The baseline Water Quality Resource Assessment indicated that 98.7 percent of the streams evaluated have sufficient assimilative capacity for dissolved oxygen. Existing nutrient standards are being met in Lake Jackson and its tributary watersheds for phosphorus and chlorophyll-a, but not nitrogen during dry years.

The Surface Water Availability Resource Assessment was conducted using a new tool called the Basin Environmental Assessment Model (BEAM). BEAM enables assessment of river basin resources at a much finer scale than previous models. The model demonstrated water supply availability challenges for two facilities. To assess wastewater assimilation challenges, breaches of facility regulatory flow thresholds (7Q10 values) were used. The model indicated wastewater assimilation challenges for 19 facilities in the 80-year model simulation.

No new modeling was conducted for the Crystalline Rock and Floridan aquifers as part of the Groundwater Resource Assessment. Additional modeling was conducted for the Cretaceous Sand aquifer. Generally, the estimated available groundwater exceeds existing withdrawals. Additional analysis may be needed to assess pumping under drought conditions or refine sustainable yield estimates near the Fall Line where the aquifer is unconfined and streamflow could be reduced.

The water resources of the region serve multiple purposes, including drinking water, recreation, and tourism. Fish and wildlife are abundant and diverse in the region, and include the red-cockaded woodpecker, a federally listed endangered species, and nine species found on Georgia’s list of protected animals. The region also provides important aquatic habitat for several anadromous (migrating from oceans or estuaries into rivers to spawn) species and supports significant sport fisheries. The Middle Ocmulgee River is also very popular for recreational canoeists and kayakers. Streams not supporting their designated use due to impairments, such as fecal coliform or dissolved oxygen, are listed on the 303(d) database, which is updated every two years. The Middle Ocmulgee Region has 95 impaired stream reaches and 4 impaired lakes. Efforts to improve impaired streams will need to continue.

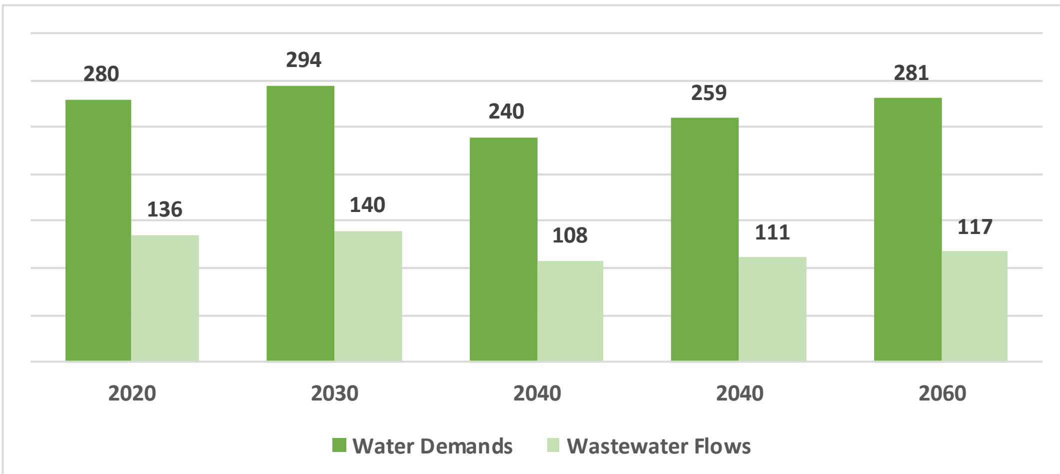
Forecasting Future Water Resource Needs

Although the region’s population is projected to increase by 24 percent between 2020 and 2060 to 736,998, the Middle Ocmulgee Region’s annual average daily water demand is only projected to increase less than 1 percent, from 280 MGD in 2020 to 281 MGD in 2060. The small increase is due to the retirement of the power generating facility, Plant Scherer, which decreases demands in 2040.

Municipal water demand forecasts are projected to increase 20% from 85 MGD in 2020 to 102 MGD in 2060. Industrial water forecasts are projected to increase 14% from 28 MGD in 2020 to 32 MGD in 2060. The sector with the largest projected growth in the water forecast is agriculture, increasing 54% from 95 MGD in 2020 to 146 MGD in 2060. The sector with the largest projected decline in the water forecast is energy withdrawal, decreasing 99% from 72 MGD in 2020 to 0.55 MGD in 2060.

Plant Scherer's retirement will also impact the region's wastewater as wastewater generation will decrease 14%, from 136 MGD in 2020 to 117 MGD in 2060 on an annual average daily basis. Municipal wastewater is projected to increase 18% from 78 MGD in 2020 to 92 MGD in 2060. Industrial wastewater is projected to increase 14% from 22 MGD in 2020 to 25 MGD in 2060.

Figure ES-2 Total Annual Average Water & Wastewater Forecasts in Million Gallons Per Day (MGD)



Comparison of Water Resource Capacities and Future Needs

The water demand and wastewater flow forecasts (Section 4) were compared to the Resource Assessments to identify future needs. The surface water assessment results, shown in Table ES-1, indicate four potential challenges in surface water supply in the region, in both duration and volume, but supply is generally adequate to meet future water demands. Additional permitted water withdrawal capacity will also be needed in Crawford, Jasper, and Lamar Counties. Wastewater facilities with challenges were identified in Newton County, City of Barnesville, and City of Monticello.

The future conditions Resource Assessment evaluated the potential for groundwater capacity to meet the projected 2060 demands. Cretaceous aquifers are generally sufficient to meet future demands for the 6 counties with access to these aquifers including Bibb, Crawford, Houston, Peach, Twiggs, and Pulaski counties. For the 3 counties with access to the Floridan aquifer including Pulaski, Houston and Twiggs counties, it is forecasted that aquifer-wide water demands are within the estimated sustainable yield range but above the low yield, indicating a potential for future challenges. Localized studies are recommended to further assess capacity challenges.

Overall, the region's future water quality challenges include the following:

- Substantial wastewater assimilation challenges predicted for 2 facilities (Cities of Perry and Monticello). A wastewater assimilation challenge is defined as substantial when more than 10% of the simulated flow was less than the 7Q10 value under the 2060 scenario.
- Additional wastewater treatment capacity is projected to be needed in Lamar and Newton County by 2060.
- High nutrient loadings are also predicted in Lake Jackson and its tributary watersheds, including contribution from point source discharges.
- Based on the 303(d)-list published by EPD, 47% of the region's streams and 3 of the region's lakes are not supporting their designated uses in 2022 and are listed as impaired.
- Potential wastewater assimilation challenges in all counties except Crawford and Peach Counties, with substantial challenges for the City of Perry in Houston County and the City of Monticello in Jasper County.
- Need for additional wastewater planning and monitoring to address potential limited assimilative capacity in several stream segments.
- Need for additional watershed protection and management of non-point and point discharge sources to further improve existing impaired stream status.

Although the Middle Ocmulgee Region is fortunate to have abundant water supply sources, there are facilities that are projected to face water supply challenges. Potential water resource challenges in the future in include the following:

- Need for localized groundwater monitoring for counties withdrawing from the Floridan aquifer.
- Need for additional permitted municipal withdrawal capacity in Crawford, Jasper, and Lamar Counties.
- Potential surface water supply challenges for four facilities in Jasper, Lamar, Monroe, and Newton Counties.

Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected in the table due to differences in water supply and permitted withdrawal limits at the utility level.

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Table ES-1: Summary of 2060 Potential Water Resources Challenges by County

County	Groundwater Supply Challenges (Aquifer) [a]	Surface Water Supply Challenges (# Facilities) [a]	Wastewater Assimilation Challenges (# Facilities) [a]	Municipal Water Withdrawal Needs (MGD) [b]	Municipal Wastewater Discharge Needs (MGD) [b]	Assimilative Capacity Challenges for Dissolved Oxygen (# Segments) [c]	Miles of 303(d) Not Supporting Reaches (# Segments) [d]
	Groundwater Availability Section 5.1	BEAM Results: Surface Water Availability Section 5.2	BEAM Results: Surface Water Availability Section 5.2	Future Capacity Comparisons Table 5-2	Future Capacity Comparisons Table 5-3	Water Quality Section 5.3	Water Quality Section 3.3.2
Macon-Bibb			Yes (3)				22.5 (3)
Butts			Yes (2)				31.0 (5)
Crawford				Yes (0.3)			51.1 (7)
Houston	Yes (Floridan)		Yes (3) 1 Substantial				36.2 (7)
Jasper		Yes (1)	Yes (1) 1 Substantial	Yes (0.6)			52.9 (11)
Jones			Yes (1)				31.8 (7)
Lamar		Yes (1)	Yes (2)	Yes (0.2)	Yes (3.1)		7.0 (2)
Monroe		Yes (1)	Yes (2)				62.4 (11)
Newton		Yes (1)	Yes (1)		Yes (0.2)		55.1 (10)
Peach							
Pulaski	Yes (Floridan)		Yes (2)				16.0 (2)
Twiggs	Yes (Floridan)		Yes (2)				6.0 (1)

Notes:
a) "Yes" indicates at least one day of a water supply or wastewater assimilation challenge.
b) A municipal "need" is where the current permitted water withdrawals or wastewater discharges, respectively, is less than the future forecast demands.
c) Potential challenges in assimilative capacity due to dissolved oxygen are for streams modeled to be "At Assimilative Capacity", or "Exceeded" in Figures 5-3 through 5-8.
d) Includes only 303(d) reaches with not supporting status that are fully within each respective county. An additional 191.4miles are shared between two or more counties. 121.8 additional miles are shared with counties outside of the Middle Ocmulgee region. Impaired streams based on 2022 305(b)/303(d) list published by EPA.

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Addressing Water Needs and Regional Goals

The State Water Plan defines Management Practices as reasonable methods, considering available technology and economic factors, for managing water demand, water supply, return of wastewater to water sources, and prevention and control of pollution of the waters of the State. For this 2023 update to the Regional Water Plan, the Council conducted a review and assessment of the existing management practices that were adopted in 2017. Management practices were revised to provide clarity, remove redundancy with existing rules or regulations, and incorporate the Council's experience in the Region. The revised management practices include the following categories:

- Administrative (4 practices)
- Water Demand Management (1 practice)
- Water Supply (6 practices)
- Wastewater (3 practices)
- Water Quality (7 practices)

The management practices seek to address potential resource challenges, needs, or shortages within a particular category and support the Region's vision and goals. Short-term and long-term actions and parties responsible for implementation were identified.

Plan Collaboration and Alignment

The update of the Regional Water Plan builds upon the knowledge base of previous planning efforts by the Council as well as state and local governments and utilities. Where possible, local planned projects and/or successful management practices are considered in the development of this plan. The Council encourages continuing alignment with all local and regional efforts for future updates of the Plan.

The ability of the responsible parties to successfully implement management practices identified in this Plan depends on the availability of funding. Affected parties in the region will be responsible for determining the best combination of funding sources/options for implementing applicable management practices. The Plan discusses several potential funding sources and options, but planning level cost estimates for implementation actions were not included in this plan update.

Guidance is provided to benchmark and monitor implementation progress. The Middle Ocmulgee Water Planning Council selected benchmarks to measure the effectiveness of this regional plan. Measurement tools for the benchmarks include annual surveys based on water withdrawal permittees' water conservation progress reports, or other surveys conducted on a 5-year basis prior to each Regional Water Plan update. Future amendments will need to be reviewed and approved by the Council. This Regional Water Plan will be amended, at a minimum, on a 5-year basis, or as required as additional needs arise.

Conclusions

Water resources in the Middle Ocmulgee Water Planning Region are generally abundant, from surface water in the Ocmulgee River Basin to groundwater from the Crystalline-Rock, Cretaceous and Floridan Aquifer systems. The Council recognizes that the wise use and management of water is critical to support the region's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens. Based on future forecasted demand and Resource Assessments conducted by EPD, the Council evaluated critical resource issues in the Region and has recommended a set of management practices and benchmarks to help ensure appropriate water management from now until 2060. This information will help guide more localized planning and decision-making.

The Council also recognizes that the Resource Assessment tools can be further improved for use in subsequent plan updates. The Council developed a set of recommendations to the State to further improve future water planning activities. Highlights of these recommendations include:

- Development of an outreach program to feature the Middle Ocmulgee Region's abundant water resources and promote future economic growth.

- Additional data collection and model improvements to aid in future regional water planning efforts.

- Evaluation of the alternative instream flow policy and initiation of pilot instream flow studies in each Water Planning Region.

- Further evaluation of EPD's nutrient policy, particularly nitrogen loading, for Lake Jackson and its watershed; and additional research on the impact of emerging contaminants in discharges from the Metro District.

- Identification of long-term funding mechanism for implementation of this Plan.

SECTION 1

Introduction

Section 1. Introduction

The Comprehensive Statewide Water Management Plan (State Water Plan) calls for the preparation of regional plans designed to manage water resources in a sustainable manner through 2060. It establishes ten regional water planning councils and provides a framework consistent with Georgia's water resource management goals.

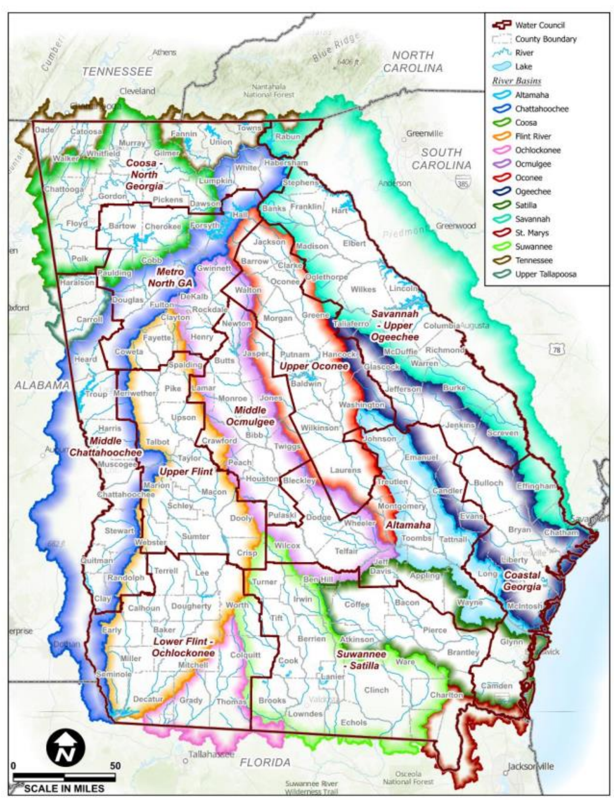
The Middle Ocmulgee Water Planning Region is one of 10 such regions established by the Georgia General Assembly. The region's Water Planning Council consists of volunteer members, some of whom worked on the original regional Water Plan in March 2009 or 2016 update in addition this update in 2023. The plan describes water resources conditions, projects future demands, identifies resource gaps and recommends appropriate water management practices to be employed in the region through 2060.

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 (See Figure 1-1) 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. Although water in Georgia is generally abundant, it is not an unlimited resource. It must be carefully managed to meet long-term water needs.

Figure 1-1: Georgia Regional Water Planning Councils



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

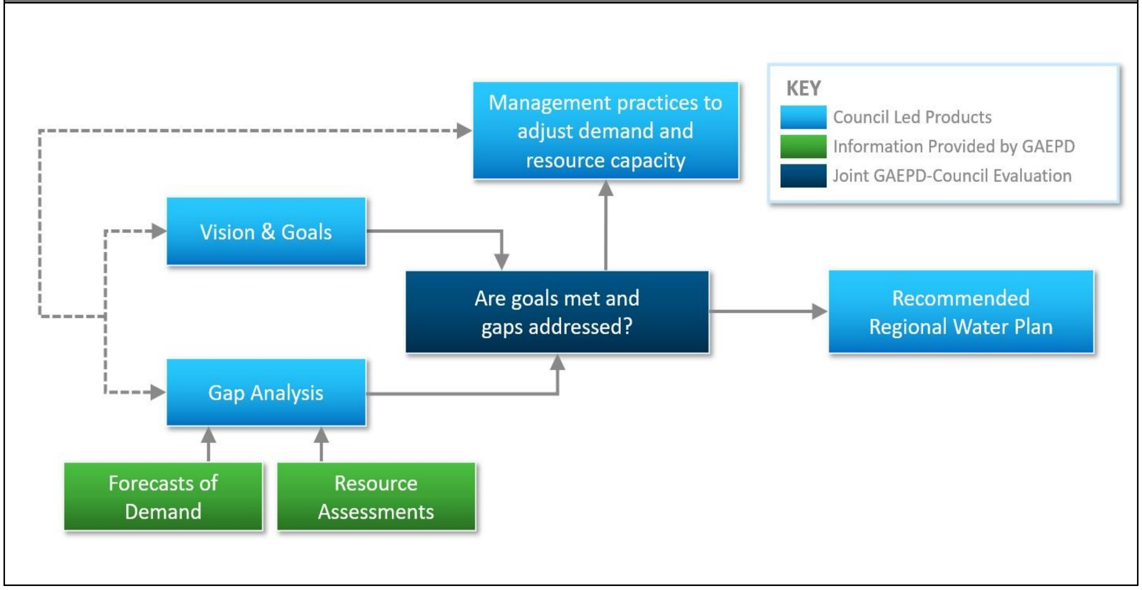
Therefore, the State Water Plan calls for the preparation of ten regional water development and conservation plans (Regional Water Plans). This Middle Ocmulgee Regional Water Plan, prepared by the Middle Ocmulgee Regional Water Planning Council, was developed to identify the appropriate water management practices to be employed in the region through 2060. The Middle Ocmulgee Regional Water Council recognizes that this Plan is to be revised, as per the Georgia Comprehensive Statewide Water Management Plan, at a minimum every 5 years.

During the 2023 plan update process, the previous 2017 Regional Water Plan for the Middle Ocmulgee Region was updated 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 revised management practices recommended by the Council to either address future water resource management needs or to refine or clarify management practices.

1.2. State and Regional Water Planning Process

The previous (2011 and 2017) Regional Water Plans were prepared following a consensus-based planning process. The process required and benefited from input of other regional water planning councils, local governments, and the public, as detailed in Middle Ocmulgee Water Planning Council's Memorandum of Understanding with the Georgia Environmental Protection Division (EPD) and the Department of Community Affairs (DCA), as well as the Council's Public Involvement Plan. 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. The planning process is illustrated in Figure 1-2.

Figure 1-1: Planning Process



To update the 2017 Regional Water Plan, the Middle Ocmulgee Regional Water Planning Council met quarterly during the period of August 2020 to May 2023 to discuss water resource issues. The Council members reviewed and discussed technical work on population projections, forecasting, and resource assessments, as provided by EPD and guest speakers. The Council reviewed and approved revisions to each section of the plan, as appropriate.

1.3. The Middle Ocmulgee Regional Vision and Goals

The Middle Ocmulgee Regional Water Planning Council reviewed the original 2009 vision statement and adopted the following revised vision statement in January 2022:

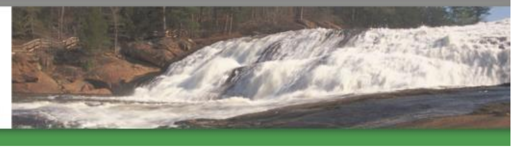
The Middle Ocmulgee Water Council will work so that our water resources, both surface and subsurface, is of exceptional quality and quantity for the well being and prosperity of all that will follow. Our plan will consider the resource's natural integrity, wise conservation, and prudent management for continuing economic development and enhanced quality of life for all.

The Middle Ocmulgee Regional Water Planning Council adopted an original set of goals in September 2010. The goals were revisited and modified during the 2023 plan update process after understanding potential future water resource issues in the region, based on resource assessments performed by EPD. In January 2022, the following revised goals were affirmed to guide the Council with selection of management practices:

1. Maximize water supply sources to the extent practicable to provide sufficient water supply for the region.
2. Support the protection of natural stream integrity to enhance ecosystem benefits such as water quality, fish and wildlife, floodplain protection and recreation.
3. Promote conservation of and efficient use of water.
4. Promote properly managed wastewater discharges and beneficial reuse.
5. Support the reduction of non-point source pollution by advocating for enhanced stormwater management and better land management practices.
6. Support the comprehensive planning and management of water resources to maintain a healthy economy, ensure a high quality of life, and protect our natural resources.

SECTION 2

Middle Ocmulgee Georgia Water Planning Region



Section 2. The Middle Ocmulgee Water Planning Region

The Middle Ocmulgee Region's population and economy are supported equally by surface water and groundwater. The Ocmulgee River Basin covers 76 percent of the region. The Cretaceous and Floridan aquifers provide significant amounts of groundwater supply. Land use spans from suburban north to rural south. Forested land covers about 54 percent of the region. The leading economic sectors include governments, health care, service industry, and agriculture.

The Middle Ocmulgee Water Planning Region (Figure 2-1) is 3,548 square miles in size and includes 12 counties and 36 cities and towns. Macon is the largest city in the region. The local governments are responsible for land use and zoning decisions that affect the management of water resources. Many local governments are also responsible for the planning, operation, and management of water, wastewater, and stormwater infrastructure.

2.1 History and Geography

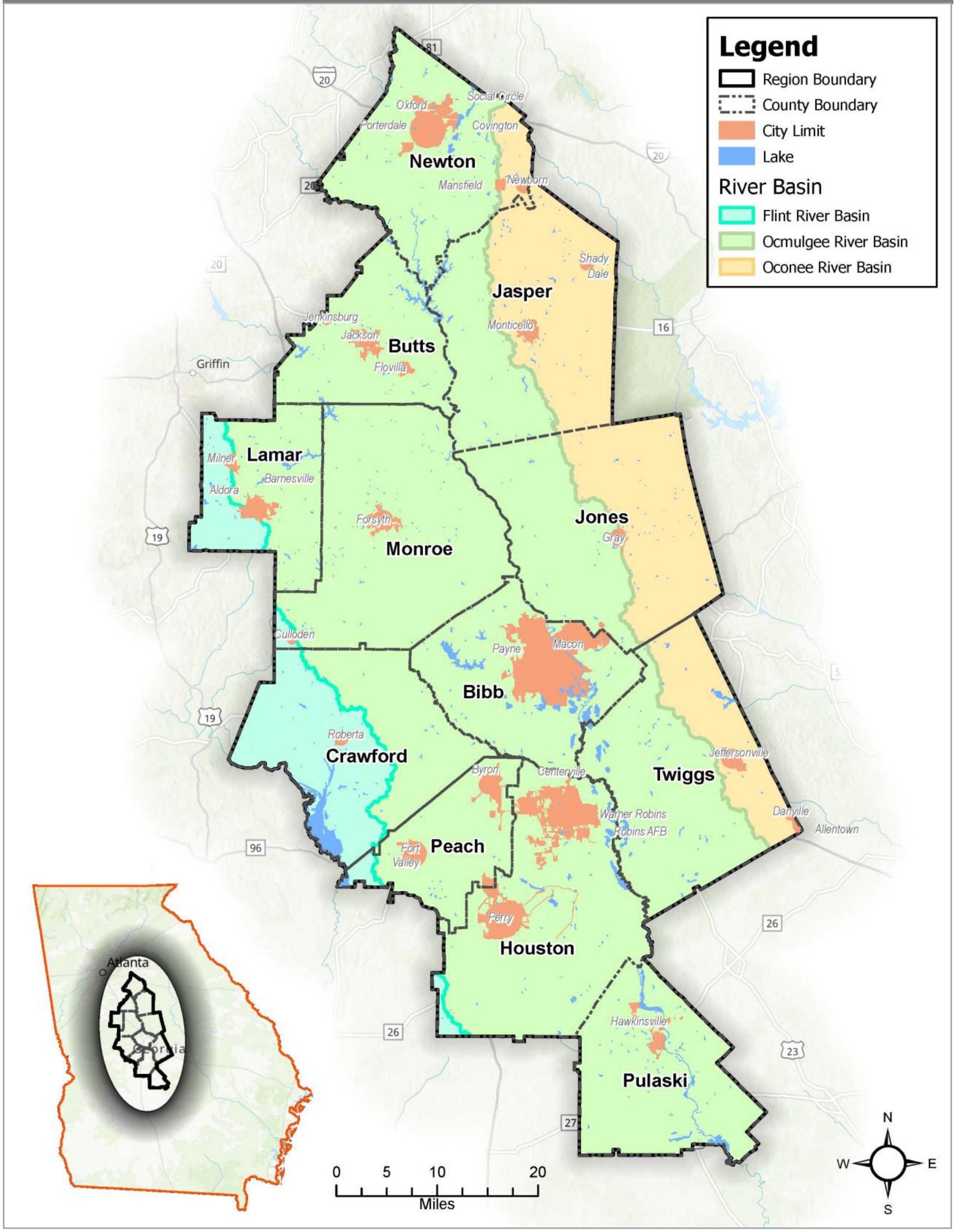
The Middle Ocmulgee Water Planning Region, located in the central portion of the state, spans from suburban Newton County in the north to rural Pulaski County in the south. It borders the Metro North Georgia Water Planning District to the northwest, Upper Oconee Water Planning Region to the east, Altamaha Water Planning Region to the southeast, and Upper Flint Water Planning Region to the west.

2.1.1 Watersheds and Water Bodies

Portions of three river basins are within the region: Flint, Ocmulgee, and Oconee (Figure 2-1). The Ocmulgee River Basin covers 76 percent of the region. The Oconee River Basin, covering about 17 percent of the region, drains toward the Upper Oconee Water Planning Region. The Ocmulgee and Oconee Rivers are major tributaries that flow south to form the Altamaha River, and constitute shared resources with the Altamaha Water Planning Region. The Flint River Basin comprises approximately seven percent of the region and drains into the Upper Flint Water Planning Region.

The Ocmulgee River Basin, located entirely in Georgia, is flanked by the Flint River Basin to the west, the Suwannee and Satilla River basins to the south, and the Oconee River Basin to the east. The Ocmulgee River's headwaters are located in Fulton, DeKalb, and Gwinnett counties and consist of the Alcovy, Yellow, and South Rivers. These rivers travel through the eastern and southeastern metropolitan Atlanta area, join at Lake Jackson west of Monticello, and form the Ocmulgee River. Tussahaw Creek, which originates in Henry County, is also a significant tributary of Lake Jackson. South of Lake Jackson, the Towaliga River and several large creeks (including Tobesofkee, Echeconnee, and Big Indian Creeks) join the Ocmulgee River. The Ocmulgee River continues in a generally southern direction until it swings eastward north of Ben Hill County, converges with the Little Ocmulgee River at Lumber City in Telfair County, and downstream joins the Oconee River to form the Altamaha River.

Figure 2-1: Middle Ocmulgee Water Planning Region



Major lakes in the area include Georgia Power's Lake Jackson, bordering Butts, Jasper and Newton Counties on the Ocmulgee River, and Lake Juliette on Rum Creek in Monroe County. Discharges below the Lloyd Shoals dam (Lake Jackson) are regulated by the Federal Energy Regulatory Commission (FERC) and influence the flow regime of the Ocmulgee River through the Macon area. Lake Juliette is bordered by the Rum Creek Wildlife Management Area.

2.1.2. Physiography and Groundwater Resources

The Middle Ocmulgee Water Planning Region is divided by the Fall Line (Figure 2-2). The northern part of the region is located in the Piedmont physiographic province, and the southern part of the region is located in the Coastal Plain physiographic province of central Georgia. The Piedmont province is characterized by rolling hills, narrow valleys, and faster moving streams with occasional rapids and falls. The Coastal Plain is characterized by slower, flatter streams with wide floodplain areas. The region receives between 40 and 52 inches of rain per year, typically with a wet spring and a dry season from mid-summer to late fall.

Aquifers in the Middle Ocmulgee Water Planning Region include (Figure 2-2):

- **Crystalline-Rock Aquifer –** located in the northern portion of the region; generally provides amounts of groundwater adequate for rural single-family residential use
- **Cretaceous Aquifer –** forms a narrow band through the middle of the state and consists mainly of sands and gravels; generally very productive
- **Floridan Aquifer –** limestone aquifer that underlies most of south Georgia (only Pulaski County and portions of Houston and Twiggs counties in the region have access to this aquifer); extremely productive

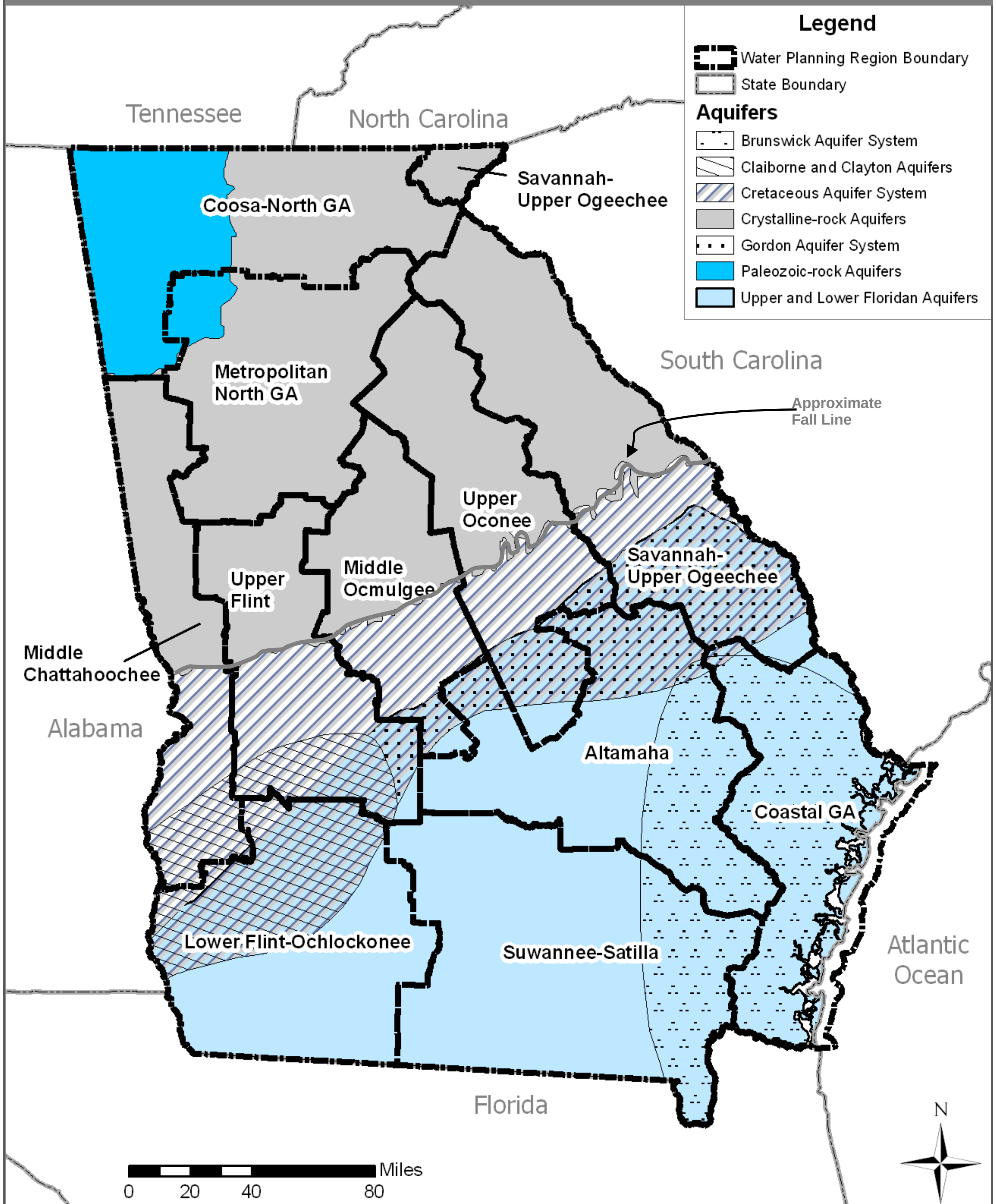
Wells from the major Coastal Plain aquifers south of the Fall Line (Cretaceous and Floridan) are generally very productive, with yields on the order of 1,000 gallons per minute (gpm). Wells that draw from the Crystalline-Rock Aquifers are generally much less productive (less than 100 gpm).

2.1.3. Unique Physical Features

The geology is very different between the Piedmont and the Coastal Plain provinces. The Piedmont province is composed of crystalline igneous rocks (formed by the cooling of magma) and metamorphic rocks (caused by extremely high temperature and pressure). The Coastal Plain province is composed of sands and clays, including valuable deposits of kaolin. The Middle Ocmulgee Region has several kaolin processing industries (mostly in Twiggs County) with significant groundwater needs.

According to the United States Department of Agriculture land use categories, the region crosses four Major Land Resource Areas (MLRAs): Southern Piedmont, Carolina and Georgia Sand Hills, Southern Coastal Plain, and Black Lands (a small MLRA that comprises less than one percent of the Ocmulgee River Watershed).

Figure 2-2: Water Planning Regions with Aquifers



Source: EPD, 2009

Traversing the watershed from northwest to southeast, general landscape and soil property trends include a decrease in soil's clay content and an increase in sand content; a decrease of slope gradient; a decrease of water table depth (soils become wetter); and an increase in the prominence of flood plains.

2.2 Characteristics of the Region

2.2.1. Population

In 2020, the region's total population was 607,242.

In 2020, the total population for the 12-county Middle Ocmulgee Water Planning Region was estimated at 607,242. Table 2-1 shows the population per county, highest to lowest. Approximately 71 percent of the total 2020 population resides in Houston, Macon-Bibb and Newton counties. Major population centers include the cities of Macon, Warner Robins, Perry, and Covington.

Table 2-1: Middle Ocmulgee Region 2020 Population by County

Houston	164,242	**Jones**	28,356	**Butts**	25,542	**Crawford**	12,100
Macon-Bibb	157,104	**Monroe**	28,046	**Lamar**	18,550	**Pulaski**	9,863
Newton	112,780	**Peach**	28,035	**Jasper**	14,638	**Twiggs**	7,986

Source: United States Census Bureau (2020)

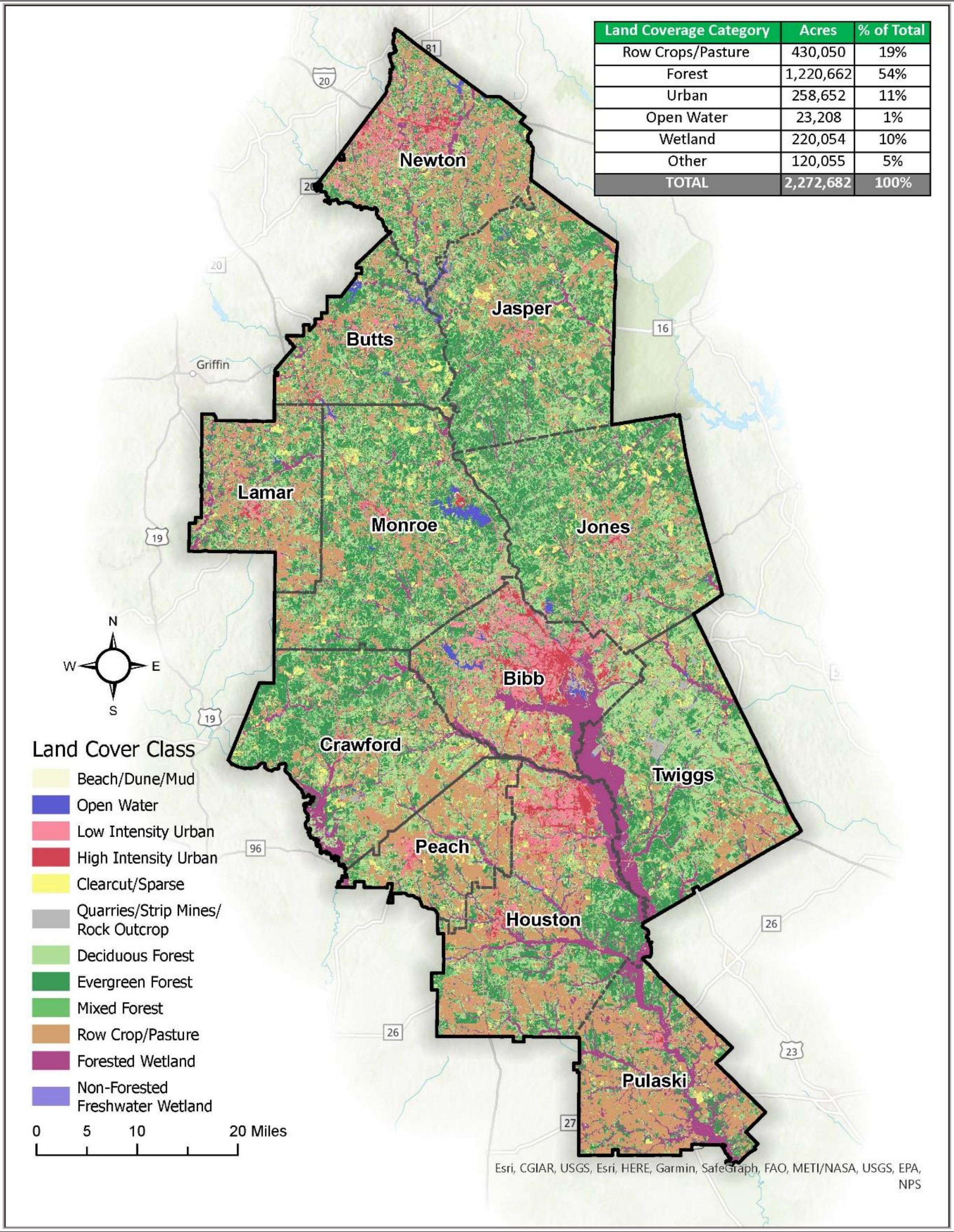
2.2.2. Employment

Based on United States Census Bureau data, the region's total employment decreased from an estimated 189,700 jobs in 2016 to an estimated 166, 571 jobs in 2020. The leading employment sectors include government, health care, service industries (retail and food), manufacturing, and agriculture. Employment in the agricultural sector has remained strong because of the peach, pecan, and strawberry facilities within the region's southern counties. Major employers include Robins Air Force Base (RAFB), Atrium Health Navicent, the Blue Bird Corporation, Frito-Lay, Inc., the Kroger Company, Walmart, and higher learning institutions.

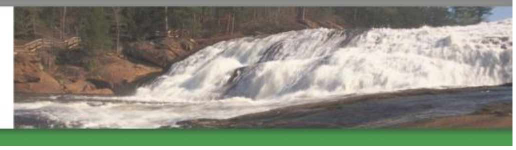
2.2.3 Land Use

In 2019, approximately 54 percent of the land area of the Middle Ocmulgee Water Planning Region was covered by forested land (See Figure 2-3). Agriculture (row crops and pasture) is a significant land use activity (19 percent land cover), supporting a variety of animal operations and commodity production. In addition to forests and agriculture, wetlands comprise 10 percent and urban areas comprise 11 percent of the land cover of the region. The majority of the urban areas exist in Bibb, Houston, and Newton counties. There are a number of high priority streams, protected species, and significant recreational uses, which are described in Section 3 of the Plan.

Figure 2-3: 2019 Land Cover in the Middle Ocmulgee Region



Land Coverage Category	Acres	% of Total
Row Crops/Pasture	430,050	19%
Forest	1,220,662	54%
Urban	258,652	11%
Open Water	23,208	1%
Wetland	220,054	10%
Other	120,055	5%
TOTAL	2,272,682	100%



2.3 Local Policy Context

The Northeast Georgia, Three Rivers, and Middle Georgia regional commissions work with the Department of Community Affairs to assist the region's local governments with a variety of planning issues.

Three regional commissions - Northeast Georgia, Three Rivers, and Middle Georgia – work with the DCA to assist communities in the Middle Ocmulgee Water Planning Region with a variety of planning issues. The commissions review local comprehensive land use plans and can help make connections between growth and water planning. They assist local governments in securing funds for the water and wastewater infrastructure necessary for economic development. The commissions also provide planning support for compliance with environmental regulations, some of which pertain to water quality (e.g. watershed assessment/protection plans).

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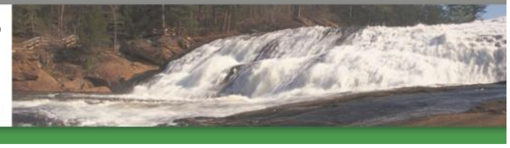
SECTION 3

Water Resources of the Middle Ocmulgee Georgia Region



Section 3. Water Resources of the Middle Ocmulgee Water Planning Region

This section discusses current major water uses in the region, based on 2015 data developed by USGS and GAEPD of reported water withdrawals and wastewater returns. This section incorporates this information and provides an overview of the Resource Assessments of current conditions for surface water and groundwater availability, and surface water assimilative capacity (water quality). In addition, a summary of current ecosystem conditions and instream uses are provided in this section.

The Middle Ocmulgee Water Planning Region used 186 million gallons per day of surface and groundwater for water supply in 2015. There is generally abundant water supply for long-term growth of the region. Baseline Resource Assessments indicated that 98.7 percent of the streams evaluated have sufficient assimilative capacity for dissolved oxygen, and existing nutrient standards are being met in Lake Jackson and its tributary watersheds for phosphorus and chlorophyll-a, but not nitrogen during dry years. Efforts to improve impaired streams will need to continue.

3.1 Major Water Uses in the Region

Major water use and water returns are summarized for the Middle Ocmulgee Region based on data compiled by USGS in the report *Water Use in Georgia by County for 2015 and Water-Use Trends, 1985-2015*. These estimates provide a snapshot that describes water use in that year by multiple sectors in the region.

In 2015, the Middle Ocmulgee Water Planning Region's daily water withdrawals totaled approximately 186 million gallons per day (MGD) on an annual average daily basis for municipal, industrial, energy, and agricultural use. Of the 186 MGD withdrawn, approximately 60 percent (112 MGD) was obtained from surface water supply sources and 40 percent (74 MGD) was obtained from groundwater supply sources (Figure 3-1). The analysis of withdrawal data and locations indicated that the portion of the region north of the Fall Line generally relies on surface water sources for water supply, and the southern portion of the region is supplied mainly by groundwater sources. Figure 3-2 and Figure 3-3 illustrate the estimated groundwater and surface water use by category, respectively, in 2015.

Current water withdrawal information for this Region was compiled for the development of the water use forecasts for four major categories:

- **Municipal** includes water withdrawn by public and private water suppliers and delivered for a variety of uses (such as residential, commercial, and light industrial), as well as estimates for self-supplied residential water use (private groundwater wells).
- **Industrial** includes water used for fabrication, processing, washing, and cooling at facilities that manufacture products, including steel, chemical and allied products, paper, and mining. These industries utilize the largest amount of water among industrial classifications in Georgia.
- **Energy** includes water withdrawn for thermoelectric power generation. In the Middle Ocmulgee Region, water for energy is typically used for cooling purposes at thermoelectric plants, including Plant Scherer, the largest coal-

fired facility in Georgia. Water returns after use may vary depending on the cooling technology used by each plant.

- **Agriculture** includes permitted water withdrawal for farm use. The vast majority of permitted agricultural withdrawals are from ground water in the Middle Ocmulgee Region. Estimates of water use for animal agriculture, horticultural nurseries, greenhouses, and golf courses are also included in this category.

In 2015, municipal use was the largest water withdrawal by category (40 percent) for surface water, followed by energy (39 percent). Most surface water withdrawal is from the Ocmulgee River Basin and a small percentage is from the Oconee River Basin, portions of which are located within the Middle Ocmulgee Water Planning Region (see Figure 2-1). For groundwater withdrawals, municipal (53 percent) is the largest water use category, followed by agriculture (32 percent) and industrial (15 percent).

In 2015, the region returned approximately 71 MGD of wastewater on an annual average daily basis. The majority (84 percent) was returned from the municipal sector, with 15 percent returned from industrial sources; the remaining 1 percent was returned from the energy sector. Figure 3-4 shows surface water returns by category.

Figure 3-1: 2015 Water Supply by Source Type

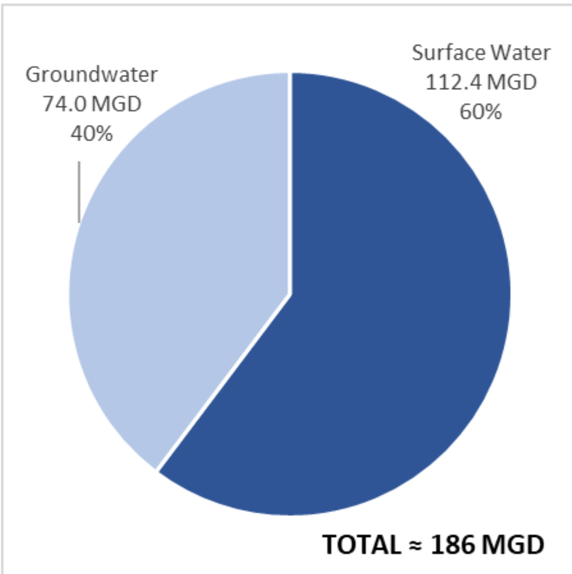


Figure 3-2: 2015 Groundwater Withdrawal by Category

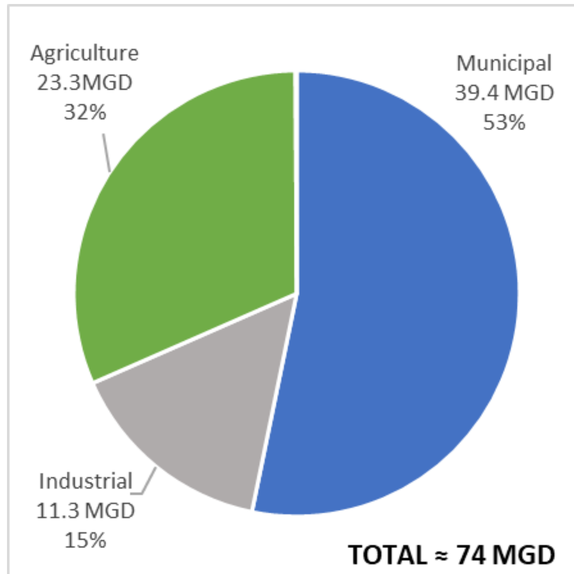


Figure 3-3: 2015 Surface Water Withdrawal by Category

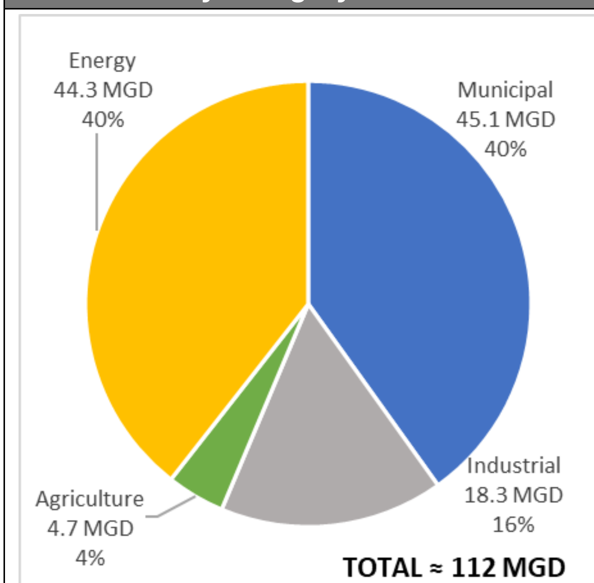
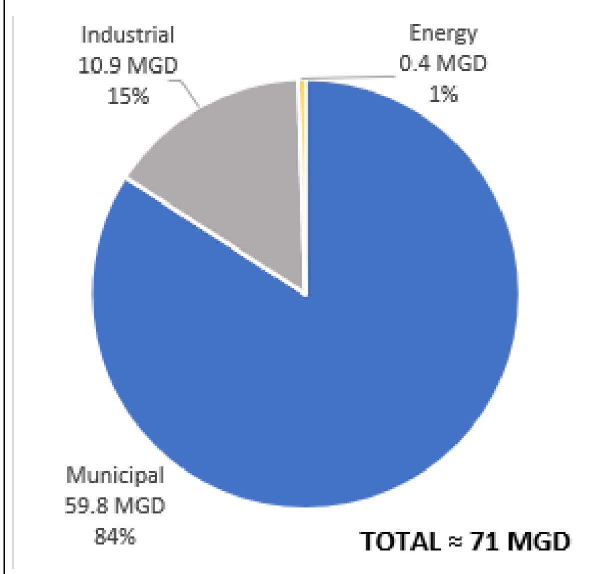


Figure 3-4: 2015 Surface Water Return Flow by Category



Data Source: Estimated Use of Water in Georgia for 2015 and Water-Use Trends, 1985–2015 (USGS, 2019)

3.2 Current Conditions Resource Assessments

As a major component of the State Water Plan, EPD developed three Resource Assessments: (1) surface water quality (assimilative capacity); (2) surface water availability; and (3) groundwater availability. The Resource Assessments analyzed the capacity of water resources to support Georgia communities without causing unacceptable local or regional impacts according to metrics established by EPD. The resource assessments are based on river basins and aquifers shared by multiple regions. The results of the baseline Resource Assessments evaluating current water use and discharge conditions are summarized here as they relate to the Middle Ocmulgee Water Planning Region. Future water supply and wastewater needs are discussed in Section 4, followed by Resource Assessments for future conditions in Section 5. The Council recognizes that the Regional Water Plan will need to be updated based on revised Resource Assessments as a result of changed conditions and updated information in the future.

3.2.1 Surface Water Quality (Assimilative Capacity)

Assimilative capacity is the amount of contaminant load that can be discharged to a specific waterbody without exceeding water quality standards or criteria. A water body can be overloaded, and violations of water quality standards may result. Water quality standards define the uses of a water body and set pollutant limits to protect those uses. The Assimilative Capacity Resource Assessment evaluated the capacity of surface waters to process pollutants without violating water quality standards. Assimilative capacity is used to define the ability of a waterbody to naturally absorb and use a discharged substance without water quality becoming impaired or aquatic life being harmed. The Assimilative Capacity Resource Assessment results focus on available assimilative capacity for dissolved oxygen (DO), nutrients (specifically nitrogen and phosphorus), and chlorophyll-a (a green pigment found in algae and a parameter commonly used to assess lake water quality).

3.2.1.1 Dissolved Oxygen

Georgia's DO standards are based on stream-specific water use classifications. The Middle Ocmulgee Water Planning Region contains mostly "freshwater fishing" streams. Assessment of the ability to assimilate oxygen-consuming substances is important because aquatic life is dependent on the amount of residual DO available in the streams. The DO standards for freshwater fishing, drinking water supply and recreation water use classifications require a daily average of 5 milligrams per liter (mg/L) and no less than 4 mg/L at all times.

Using planning level models, DO was modeled in the Middle Ocmulgee region's major river basins: Flint River (includes western portion of Lamar and Crawford counties), Ocmulgee River, and the Oconee River (includes eastern portion of Jasper, Jones and Twiggs counties). Table 3-1 and Figure 3-5 show the results of the modeling.

Additional monitoring and studies will be required to assess actual conditions and to help determine whether or not upgrades of treatment facilities are needed to improve existing water quality in these streams.

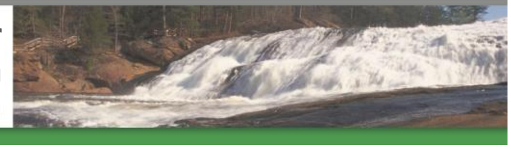
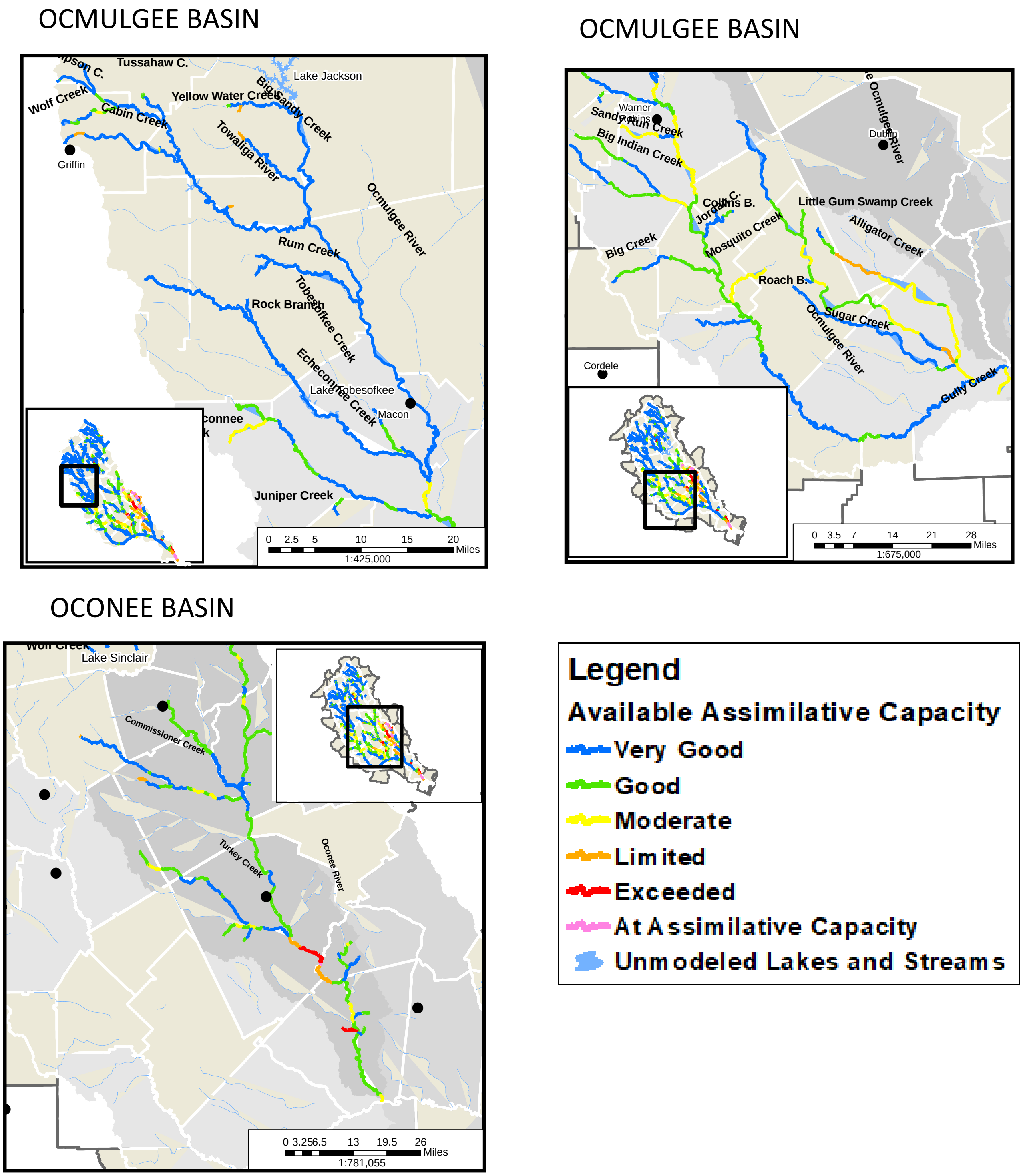


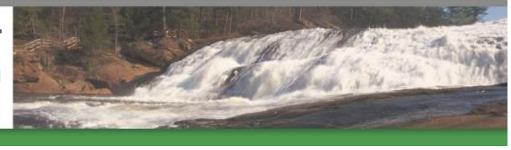
Table 3-1: Assimilative Capacity for DO in Middle Ocmulgee Region (under current permit conditions)

Basin	Available Assimilative Capacity (Total River Miles)					Total River Miles in the Region
	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)	
Flint	49.6	1.9	9.6	1.9	0	63.0
Ocmulgee	337.8	107.5	66.5	2.7	0	514.5
Oconee	58.8	8.8	3.9	0.4	3.4	75.3
Total	446.2	118.2	80.0	5.0	3.4	652.8

Source: GIS Files from the Updated Water Quality Resource Assessment; EPD, November 2022

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





3.2.1.2 Nutrient Modeling

Nutrients provide food for aquatic organisms. However, high nutrient concentrations can potentially encourage algal blooms, which may indirectly reduce fish population (and other aquatic life), cause unpleasant taste and odor in water supplies, and impact recreational use of water. A watershed model for the Upper Ocmulgee Watershed and a lake model for Lake Jackson were previously developed to evaluate the impacts on nutrient levels of current wastewater discharges, stormwater runoff, and land application systems (assuming current water withdrawals, land use, and meteorological conditions). The baseline watershed model simulated conditions for a 15-year period (1998 to 2012) capturing several wet years and three drought periods. The baseline lake model simulated conditions for a 12-year period (2001 to 2012).

Lake Jackson has existing standards for chlorophyll-a (growing season average concentration), total phosphorus loadings for the lake and four tributaries, and a total nitrogen limit (for the photic zone). The results of the watershed and lake modeling conducted as part of the 2017 Plan update confirmed that the lake met its chlorophyll-a standard at the mid-lake station every year for the period of record analyzed. The watershed model also confirms that, at current water use and return conditions, Lake Jackson and its major tributaries generally meet their total annual phosphorus loading standards. However, the modeling results showed that in dry years (with weather conditions similar to the 2007 drought), the total nitrogen limit was exceeded.

3.2.2 Surface Water Availability

The Surface Water Availability Resource Assessment estimates the availability of surface water to meet current municipal, industrial, agricultural, and thermoelectric generation needs, as well as the needs of instream and downstream users.

For the current plan, a new tool developed to assess surface water availability, named the Basin Environmental Assessment Model (BEAM) enables assessment of river basin resources at a much finer scale than previous models. As a result, more nodes are included in the BEAM results. BEAM includes nodes (or junctions) for the following elements:

- Permitted water withdrawal intakes,
- Water supply reservoirs,
- Refilling pump stations for off-stream pump-storage facilities,
- Federal reservoirs,
- Private power generating reservoirs,
- NPDES permitted discharging facilities, and
- Long-term USGS gages as model nodes.

Model simulations tested water demand and supply operational conditions against about 80 years of daily flow data from 1939 to 2018, including all known drought years, normal years, and wet years.

BEAM identifies days when the simulated available water withdrawal is less than the water demand at a node, whether under baseline or future projections. When this situation occurs in the model to a permitted water withdrawal facility, it is noted as a potential water supply challenge and is quantified in terms of days of shortage. Minimum instream flow protection thresholds were modeled as the water demand at permitted water withdrawal facilities, based on permit conditions. Reservoir physical and operational data was simulated where it was available.

Similarly, the potential for wastewater assimilation challenges were modeled using BEAM. A challenge was identified when the simulated stream flow was less than the regulatory minimum in-stream flow that is used to establish effluent limitations at NPDES discharge facilities. The regulatory minimum in-stream flow is based on the 7Q10 at the point of discharge, a statistic that indicates the lowest streamflow for 7 consecutive days that occurs on average once every 10 years. The NPDES discharge facilities are included as nodes in the BEAM model to assess assimilative capacity thresholds for the streams, and when modeled stream flows drop below the 7Q10 minimum threshold, a potential challenge is indicated and quantified in a total number of days.

BEAM scenarios assessed for current conditions include a baseline scenario covering the marginally dry conditions of 2010 to 2018 and current withdrawals and discharges. The BEAM assessment identified water supply challenges and wastewater assimilation challenges for the Middle Ocmulgee Region:

- A water supply challenge was defined as a period where a facility's withdrawal needs exceeded the available water supply.
- A wastewater assimilation challenge results when the modeled stream levels dropped below the 7Q10 minimum in-stream flows and thus water quality standards may be exceeded by the cumulative water withdrawn and returned. The wastewater assimilation challenge was not considered to be a substantial challenge if the percent of time was less than 10%, as the 7Q10 flow may statistically be exceeded 10% of the time.
- Both metrics are quantified in terms of days of challenges and total volume of water shortage for each modeled facility.

Figure 3-6 illustrates the facility nodes used in developing the surface water availability Resource Assessments.

The major hydrologic modeling river basin group for the Middle Ocmulgee Region was the OOA (Oconee-Ocmulgee-Altamaha).

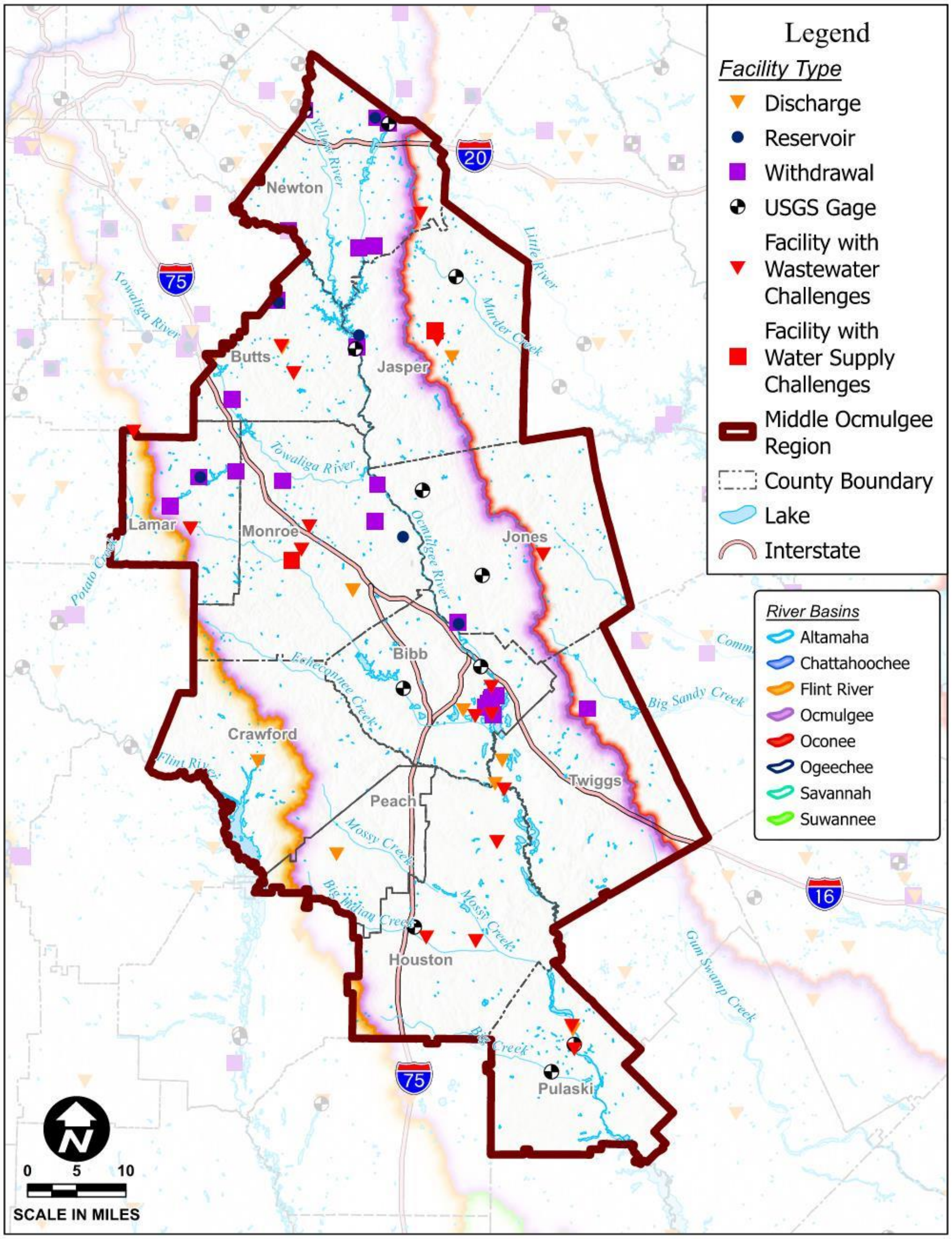
- The OOA Study Basin included:
    - 47 municipal withdrawals, 98 municipal discharges, 13 industrial withdrawals, 18 industrial discharges, and 3 energy withdrawal expressed as consumptive use.
    - Two facilities demonstrated at least one modeled water supply challenge day in the 80-year simulation with baseline water demands. These facilities included:

    - City of Monticello, which had the largest percent of challenge days at 69.50% (substantial challenge)
    - City of Forsyth
  - 18 facilities demonstrated wastewater assimilation challenges in the 80-year baseline scenario. These facilities included:
    - City of Mansfield
    - City of Monticello, which had the largest percentage of challenge days at 83.39% (substantial challenge)
    - City of Jackson (two facilities)
    - City of Forsyth
    - Macon Water Authority (two facilities)
    - Graphic Packaging International
    - City of Barnesville
    - City of Forsyth
    - City of Warner Robins (two facilities)
    - Robins Air Force Base
    - City of Perry (substantial challenge)
    - Perdue Foods (substantial challenge)
    - City of Hawkinsville (two facilities)
    - City of Gray

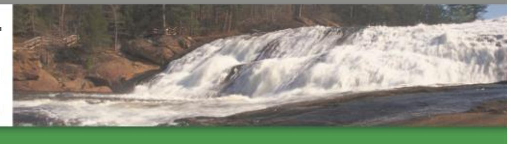
The Middle Ocmulgee Region has two wastewater discharge facilities in the Apalachicola-Chattahoochee-Flint (ACF) Study Basin. One of these facilities, the City of Griffin, demonstrated wastewater assimilation challenges in the 80-year baseline scenario at 0.19%.

Figure 3-6 illustrates the facility nodes with existing water supply or wastewater assimilation challenges according to the BEAM model results. Additional details are provided in the memorandum, “Development of Basin Environmental Assessment Models (BEAMs) for Georgia Surface Water Basins” (May 2023).

Figure 3-6: MOC Facilities with Challenges in the Baseline Scenario



Source: GAEPD, 2023



3.2.3 Groundwater Availability

The Groundwater Availability Resource Assessment estimates the amount of water that can be withdrawn from modeled areas of an aquifer without reaching specific thresholds of local or regional impacts. Indicators of adverse impacts included:

- Declines in groundwater levels of neighboring wells (drawdown) by more than 30 feet
- Reduction in groundwater storage beyond a new base level
- Difficulty recovering between periods of higher pumping
- Reductions in the amount of groundwater that seeps into streams, resulting in more than a 40% reduction in groundwater contribution to base stream flows
- Groundwater levels dropping below the top of the confining layer.

EPD prioritized the aquifers for modeling efforts based on the aquifer characteristics, evidence of negative effects, expected future demands, anticipated negative impacts, and other considerations. The Middle Ocmulgee Water Planning Region has access to three aquifer systems that were prioritized for the Resource Assessment: the Crystalline Rock, the Cretaceous, and the Floridan.

The Crystalline Rock Aquifer supplies mostly private wells in the northern portion of the region. The Cretaceous Aquifer underlies counties in the lower reach of the planning region south of the Fall Line and is the primary groundwater supply source for the Middle Ocmulgee Region. The Cretaceous Aquifer is shared by the Upper Oconee and Savannah-Upper Ogeechee planning regions, as well as a small portion of the Upper Flint region. Only Pulaski County and portions of Houston and Twiggs counties within the region have access to the Floridan Aquifer.

No new analysis of groundwater availability was conducted for the Crystalline Rock aquifer system or Floridan Aquifer. The Resource Assessment indicated that the range of sustainable yields from the 2010 Resource Assessment are generally higher than the current baseline withdrawals from the Middle Ocmulgee Water Planning Region and other regions that also obtain groundwater from these two aquifers. Data analysis using a water budget approach for the Crystalline Rock Aquifer in the Piedmont study basin indicates that there is additional groundwater available above its current use, assuming that conditions in the Middle Ocmulgee Region are similar to those in the study basin.

The Floridan Aquifer baseline modeling results indicate that between 150 MGD and 275 MGD of water is available above existing use in the eastern Coastal Plain before estimated sustainable yields are reached. However, the portion of the Floridan located within the region is at its updip edge, where yields are much lower than in other areas of the aquifer.

An additional assessment for the Cretaceous Sand aquifer was conducted in 2012 due to concerns about the impacts of increased local groundwater withdrawals. The aquifer is utilized for water supply in Bibb, Crawford, Houston, Peach, Twiggs, and Pulaski Counties. The 2010 groundwater flow simulations were reviewed with increased withdrawals applied, potential locations that may be adversely impacted by the increased groundwater withdrawals were identified, and monitoring recommendations were developed.

The updated baseline modeling results for the Cretaceous Sand aquifer indicate that between 150 MGD and 275 MGD of water is available above existing withdrawals before estimated sustainable yields are reached. Locally, the increased withdrawals did not exceed the 30 feet drawdown metric or the groundwater contribution to stream baseflow minimums. The greatest simulated drawdown occurred in Peach and Houston Counties, which have a large concentration of wells. Additional analysis may be needed to assess pumping under drought conditions or refine sustainable yield estimates near the Fall Line where the aquifer is unconfined and streamflow could be reduced.

EPD also reviewed water level declines in two USGS wells within the Cretaceous Sand aquifer region to understand climate and pumping impacts on groundwater wells. Well levels have historically declined since 1995 but recently stabilized. A tight correlation was identified between historical well levels and droughts.

3.3 Ecosystem Conditions and Instream Uses

The water resources of the region serve multiple purposes, including drinking water, recreation, and tourism. Fish and wildlife are abundant and diverse in the region, and include the red-cockaded woodpecker, a federally listed endangered species, and nine species found on Georgia’s list of protected animals. The region also provides important aquatic habitat for several anadromous (migrating from oceans or estuaries into rivers to spawn) species and supports significant sport fisheries. The Middle Ocmulgee River also is very popular for recreational canoeist and kayakers.

3.3.1 Monitored and Impaired Waters

EPD assesses water bodies for compliance with water quality standards as required by the Clean Water Act, monitoring streams throughout the state and publishing the results every other year. If an assessed water body is found not to meet standards, it is considered “not supporting” its designated use and is included on a list of impaired waters, also known as the 303(d) list. Impairments can be based on various parameters such as DO, fecal coliform, copper, biota (aquatic species), fish consumption guidance, pH, and toxicity.

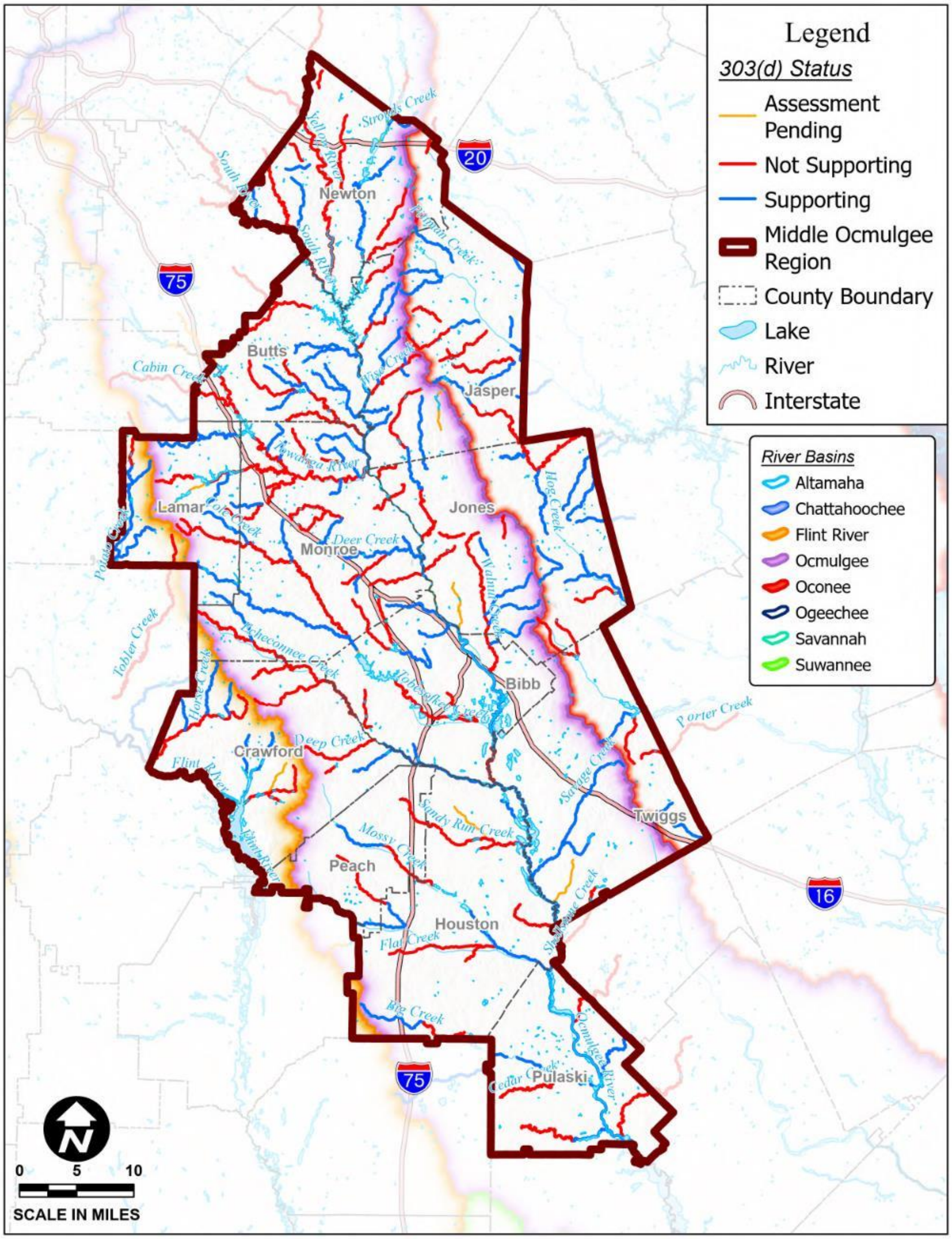
Impairments must be addressed through the development of a Total Maximum Daily Load (TMDL), which sets a pollutant budget and outlines strategies for corrective action. A TMDL is defined by the U.S. Environmental Protection Agency as a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards and an allocation of that amount to the pollutant’s sources. In addition to TMDLs, impairments are addressed through watershed assessments and watershed protection plans that are required for treatment facility upgrades or permit increases.

For the Middle Ocmulgee Region in 2022, there are 95 impaired stream reaches (total impaired length of 685.2 miles) and 4 impaired lakes (total impaired area of 1,464 acres). Figure 3-7 highlights the locations of the impaired stream segments in the region. A full list of Georgia's impaired waters can be found on the EPD website:

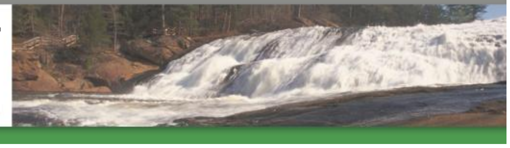
https://epd.georgia.gov/watershed-protection-branch/watershed-planning-and-monitoring-program/water-quality-georgia

TMDLs have been completed for 74 impaired stream reaches and 2 impaired lakes.

Figure 3-7: Impaired Waters in the Middle Ocmulgee Region



Source: GAEPD, Watershed Protection Branch, 305(b)/303(d) List, 2022.



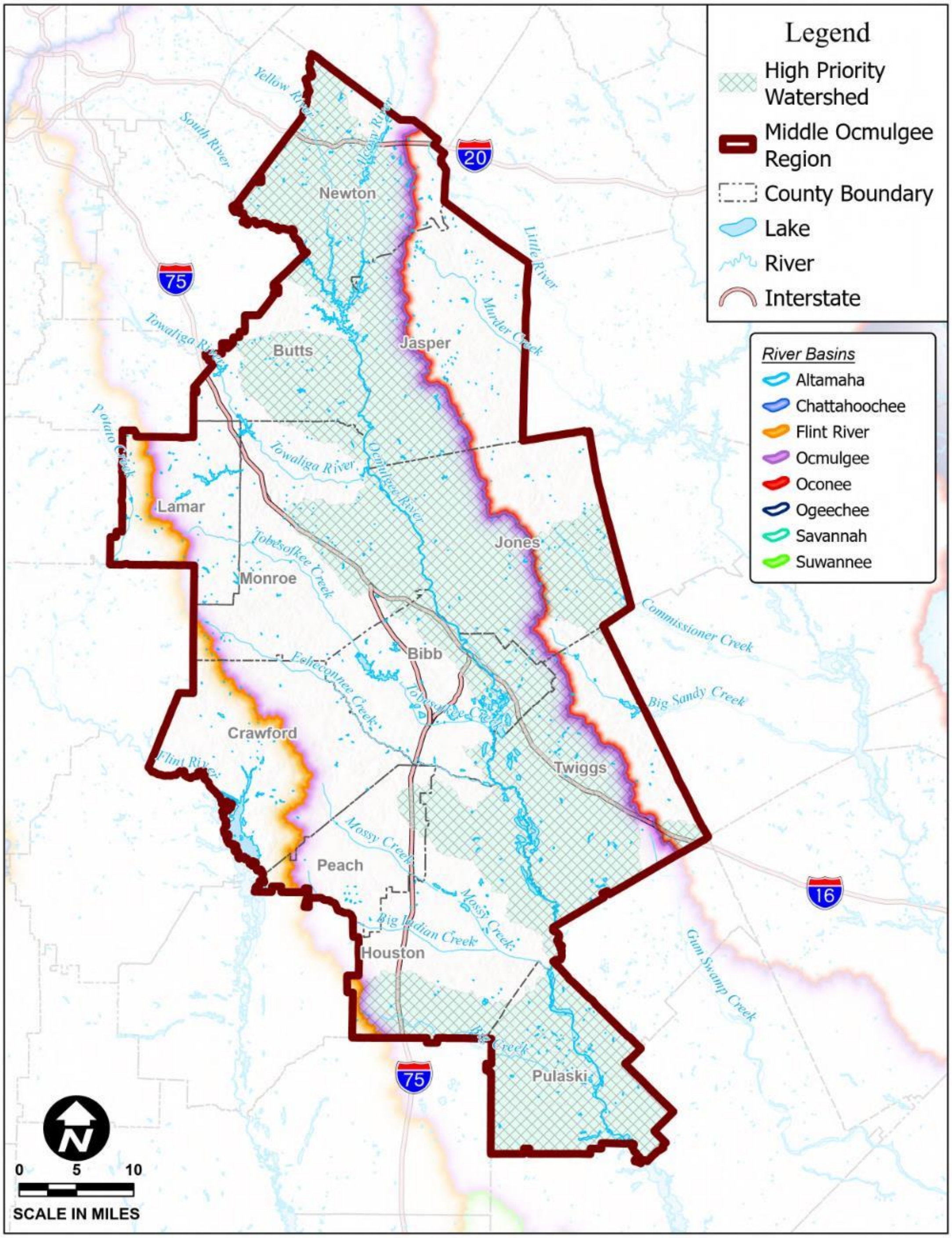
3.3.2 Priority Conservation Areas

High priority waters for protecting aquatic biodiversity were identified as part of a larger effort (the 2005 State Wildlife Action Plan) by the DNR's Wildlife Resources Division (WRD) to develop a comprehensive wildlife conservation strategy for Georgia. The streams included on the final priority list are those that are a high priority for restoration, preservation, or other conservation activity. Although the individual stream reaches were the basis for the selection process, nearly the entire Ocmulgee Watershed was identified as a high priority watershed. The prioritization was updated in 2015 and approved by the U.S. Fish and Wildlife Service in September 2016 as part of the State Wildlife Action Plan revision (Figure 3-8) due to important coastal habitats, critical habitat or a recent occurrence of a listed species, migratory corridor, or ecological drainage units that were poorly represented in the dataset. Further information may be found at https://georgiawildlife.com/WildlifeActionPlan.

The Council and local governments within the region may consider land conservation as a management practice to increase protection of environmentally sensitive lands (such as stream buffers, flood plains, wetlands, springs, and other critical habitats), to minimize the impacts of development on water quality, and to reduce non-point source pollution. The Georgia Outdoor Stewardship Program is a grant program that provides funding for protecting and acquiring lands critical to wildlife. Coordination with WRD and the Georgia Outdoor Stewardship Program can be an effective way to obtain funding and to achieve multiple conservation purposes. The Georgia Outdoor Stewardship Program offers grants, low-interest loans, and tax incentives which augment 40% of existing State sales and use taxes on outdoor sporting goods to fund stewardship projects for existing parks, acquire and develop new parks, and acquire new lands and conservation easements which are critical to protecting wildlife and clean water supply. More information on the Georgia Outdoor Stewardship Program can be found at the following links:

- https://gadnr.org/gosp
- https://gadnr.org/sites/default/files/dnr/pdf/2022_2023_GOSP_Manual.pdf

Figure 3-8: Conservation Areas and GADNR High Priority Waters (As Delineated in the State Wildlife Plan) in the Middle Ocmulgee Region



Source: High Priority Streams and Watersheds, GADNR Nongame Conservation Section, http://www.georgiawildlife.come/node/1377

3.3.3 Wildlife and Fisheries Resources

Wildlife and fisheries are natural resources found throughout the Middle Ocmulgee Region. These natural resources create opportunities for outdoor recreation for Georgians including fishing, hunting, and wildlife watching. Some of the opportunities are found on the many reservoirs and lakes with public access including Lake Varner, Javors Lucas Lake (formerly Town Creek Reservoir), Lake Jackson, Lake Juliette, and Lake Tobesofkee. Georgia WRD manages several properties within the planning region and Ocmulgee River basin, including:

- Marben PFA (Jasper and Newton Counties)
- Clybell WMA (Jasper and Newton Counties)
- Flat Creek PFA (Houston and Pulaski Counties)
- Perry Dove Field (Houston and Pulaski Counties)
- Go Fish Education Center (Houston County)
- Oaky Woods WMA (Houston and Pulaski Counties)
- Echeconnee Creek WMA (Bibb and Houston Counties)
- Gaither WMA (Newton County)
- Cedar Creek WMA (Jasper, Jones, and Putnam Counties)

Other notable WRD properties in the Ocmulgee River basin include:

- Ocmulgee PFA/WMA (Bleckley and Pulaski Counties)
- Dodge County PFA
- Bowens Mill Fish Hatchery (Ben Hill and Wilcox Counties)

Georgia DNR State Parks Division manages the following properties in the region:

- Dames Ferry
- High Falls Lake
- Jarrell Plantation

Federal properties within the region include:

- Piedmont National Wildlife Refuge (Jones and Jasper Counties)
- Bonds Swamp National Wildlife Refuge (Bibb and Twiggs Counties)
- Ocmulgee Mounds National Historic Park (Bibb County).

The Ocmulgee River basin is home to nine aquatic species found on Georgia's list of protected animals: Altamaha shiner (state Threatened), Goldstripe darter (state Rare), Atlantic Sturgeon (state Endangered), Altamaha arcmussel (state Threatened), Chattahoochee crayfish (state Threatened), Savannah Lilliput (state Threatened), Shortnose sturgeon (state Endangered), Altamaha Spinymussel (state Endangered), and Robust redhorse (state Endangered, see below). More information about these species can be found through the Georgia DNR Biodiversity Portal (georgiabiodiversity.org). Federally listed species can be found through the U.S. Fish and Wildlife Service Information for Planning and Consultation (IPAC) system (https://ipac.ecosphere.fws.gov/).

The Robust redhorse, an imperiled fish species native to Georgia and the Carolinas, was reintroduced into the Ocmulgee River between Lake Jackson (Lloyd Shoals Dam) and Lake Juliette in 2002 as part of a range-wide recovery program facilitated by several partners, including state and federal natural resource agencies, power generation companies, and conservation groups.

WRD monitors and manages the sportfish populations in the Ocmulgee River and its tributaries. Popular fisheries include largemouth bass, shoal bass, Altamaha (Redeye) bass, redbreast, bluegill, redear, and channel catfish. The world record largemouth bass was caught in an oxbow of the Ocmulgee River. American shad and striped bass are both anadromous species that are experiencing population declines. There are collaborative programs and research aiming to restore these fisheries to sustainable levels. Habitat restoration and natural flow regimes are two focus areas for researchers due to their likelihood to significantly improve fish stocks.

SECTION 4

Forecasting Future Water Resource Needs

Section 4. Forecasting Future Water Resource Needs

This section presents the regional water and wastewater forecasts from 2020 through 2060 for four water use sectors: municipal, industrial, agriculture, and thermoelectric energy generation. The supplemental documents available on the Middle Ocmulgee website detail the municipal, industrial, agricultural and energy sector water and wastewater forecasts.

The Middle Ocmulgee Region's annual average daily (AAD) water demand is generally projected to grow through the planning period in most areas, but the projected closure of Plant Scherer creates a drop in demand in year 2040. As a result, the overall demand is relatively steady at 280 MGD in 2020 and 281 MGD in 2060. The region's wastewater generation will have a slight reduction, with 136 MGD in 2020 to 117 MGD in 2060 on an AAD basis for the same reasons.

4.1 Municipal Forecasts

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

4.1.1 Population Projections

Municipal water and wastewater forecasts are closely tied to population projections within the Middle Ocmulgee Region. The population projections were developed by the Georgia Governor's Office of Planning and Budget (OPB), 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 projection data published in October 2019 by OPB was adopted by the Georgia EPD for this planning process.

The population projections by county for the planning period are shown in Table 4-1. These projections provide the basis for municipal water and wastewater forecasts and also provide indirect impact on forecasts for other categories of water and wastewater projections, as described in the sections which follow.

Table 4-1: Population Projections by County

County	2020	2030	2040	2050	2060	Difference (2020 - 2060)	% Change (2020 – 2060)
Bibb	152,150	151,845	148,802	144,734	142,159	-9,991	-7%
Butts	25,174	29,426	31,968	33,957	35,674	10,500	42%
Crawford	12,228	12,052	11,689	11,243	11,160	-1,068	-9%
Houston	157,039	169,507	180,954	190,663	201,754	44,715	28%
Jasper	14,199	15,147	16,096	16,945	18,033	3,834	27%
Jones	28,591	28,729	28,701	28,521	28,857	266	1%
Lamar	19,347	21,228	23,110	25,219	27,856	8,509	44%
Monroe	27,727	28,871	29,702	30,296	31,391	3,664	13%
Newton	112,354	128,770	148,303	170,860	197,976	85,622	76%
Peach	27,375	27,802	27,796	27,506	27,598	223	1%
Pulaski	10,893	10,121	9,332	8,548	7,924	-2,969	-27%
Twiggs	8,086	7,604	7,111	6,719	6,616	-1,470	-18%
TOTAL	**595,163**	**631,102**	**663,564**	**695,211**	**736,998**	**141,835**	**24%**

Source: Governor's Office of Planning and Budget (2019)

4.1.2 Additional Data Sources

Population projections must be paired with other important metrics to forecast future municipal water and wastewater needs, such as the percentage of people using on-site septic management systems (OSSMS, or simply "septic systems"), existing per capita water usage rates, and future efficiencies which may be planned through fixture replacements. To develop these metrics, several additional data sources were included in the forecasts. These are summarized in the bullets below.

- **Georgia Water Loss Audit Data** – Used to develop per-capita water use rates for systems with over 3,300 customers.
- **"Estimated Use of Water in Georgia for 2015 and Water-Use Trends, 1985-2015"** (USGS 2015 Report) – Provided percentages of self-supply by county.
- **EPD Surface Water and Groundwater Withdrawal Data** – Summarized trends from 2015 to 2019 and established baseline water demands for permitted users using 2019 historical data.
- **Georgia Dept of Public Health Data and 1990 U.S. Census Data** – Provided percentages of population on septic systems by county, with corrections for older data made as-needed.

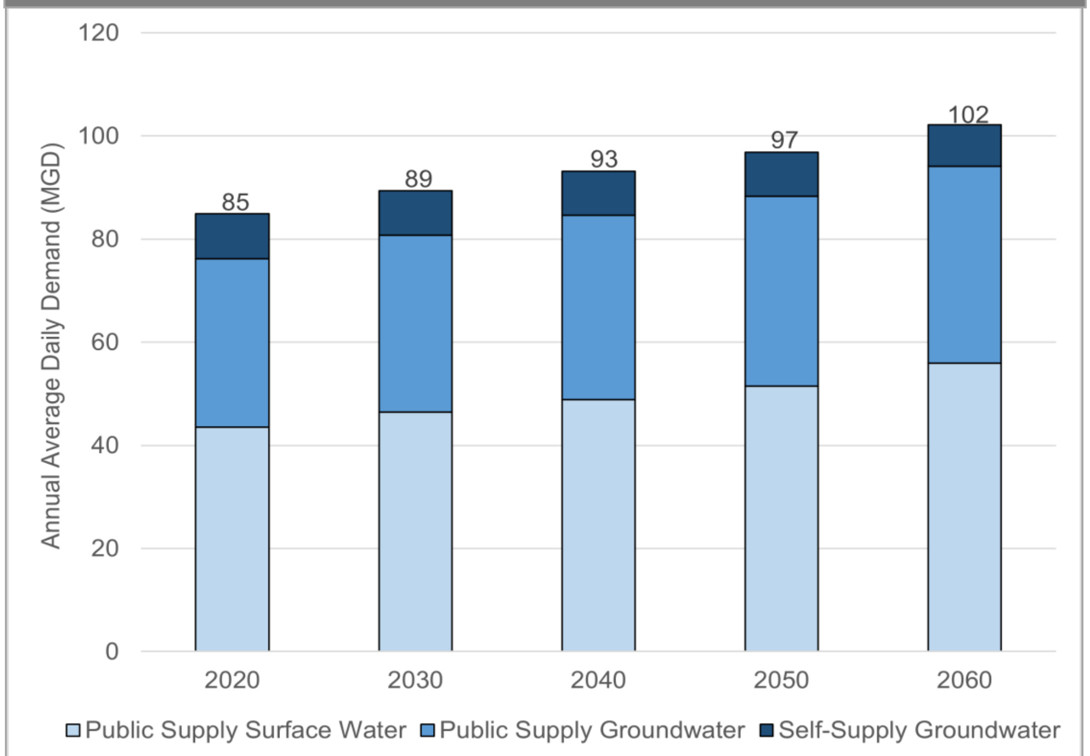
- **NPDES and Land Application System (LAS) Permit Data** – Provided historical discharge data which was used to develop baseline flows for the forecast.

- **Additional Sources** included 2020 U.S. Census data, the 2017 Regional Water Plans, and EPA databases.

4.1.3 Municipal Water Demand Forecasts

Municipal water demand forecasts (Figure 4-1) include demands for population that will be served by public water systems and by private wells (self-supply). The projected demand for public water systems is further divided by the type of water supply source (groundwater or surface water). The total municipal water demand for the Middle Ocmulgee Region is projected to increase, from 85 MGD in 2020 to 102 MGD in 2060, as a result of population growth. These demand figures do not include any large publicly supplied industries, as those demands are included in the industrial forecast (See Section 4.2).

Figure 4-1: Municipal Water Forecast



Source: Middle Ocmulgee Water and Wastewater Forecasting Technical Memorandum (2022)
Note: Municipal water and wastewater includes residential, commercial, small industry and military institutions.

Municipal water demand forecasts were estimated by multiplying the per capita water use by the population served for each planning horizon. Per capita water use differs for public water systems and self-supplied users. Self-supplied water users were assumed to use a standard 75 gallons per capita per day (gpcd) unless feedback dictated otherwise. Baseline per-capita water use rates for publicly supplied water were calculated in separate ways as enabled by available data. For most counties, water loss audit data directly provided per-capita water use rates. This audit data was averaged across all utilities in a county to develop a county-specific rate of per capita water use. For other counties with small utilities or a combination including small utilities who do not submit audits, withdrawal and population data reported to EPD were used to develop baseline per capita rates.

Future rates of per capita water use were developed by making adjustments to account for water savings resulting from plumbing codes requiring high efficiency plumbing fixtures. These water savings were calculated based on U.S. Census housing information and an assumption of a two percent annual replacement rate of older fixtures to new high efficiency plumbing fixtures throughout the planning period. This methodology was developed for the initial Regional Water Plans and has been updated for this forecast. The assumed plumbing improvements lowered the future per capita water use rates which were applied to future population forecasts.

The municipal water demand forecasts were further refined through a stakeholder review and input process which included appointed representatives from each Regional Water Planning Council. This process highlighted several adjustments to be applied to the per capita water use rates, including ensuring that wholesale transactions were applied to the county in which the demand was taking place, moving municipally supplied industrial demands to the industrial water forecasts, and adjusting both baseline and future percentages of public supply by county to reflect feedback provided by stakeholders and utility representatives. In the Middle Ocmulgee Region, additional key feedback from this process consisted of a new industrial demand of 1.5 MGD in Bibb County which is expected to double to 3 MGD by 2022 and was accounted for in the industrial forecasts in Section 4.2.

4.1.4 Municipal Wastewater Flow Forecasts

The goal of the municipal wastewater flow forecasts is to estimate how much treated wastewater will be returned by users to waterways. Municipal wastewater may be treated either at a centralized wastewater treatment facility or in septic systems. As there are two types of discharge for centralized treatment facilities, either point source discharges or to LAS, this results in three total disposal methods for wastewater flows: (1) centralized point source; (2) LAS; and (3) septic systems. The municipal wastewater forecasts were developed using baseline flow data from 2019 and future population changes by county. Baseline percentages of wastewater sent to the three disposal methods by county were maintained throughout the planning period.

Reported centralized wastewater flows from 2019 EPD permits, including point discharges and LAS, were adjusted over time by the change in county population projections. In cases where LAS systems were forecasted to exceed their existing permits, the excess future flows were assigned to point source discharges.

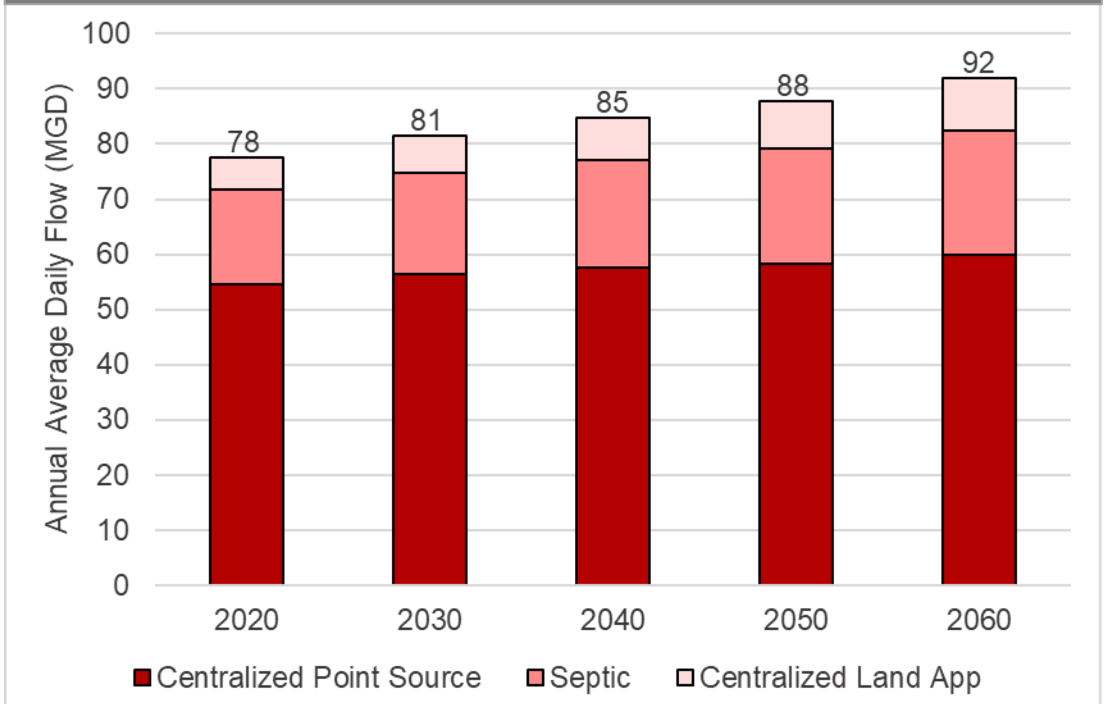
OSSMS, or septic systems, account for approximately 22 percent of the 2020 wastewater generation in the Middle Ocmulgee Water Planning Region based on US Census Data. These flows were estimated by assuming an 80% return ratio (i.e., indoor water use) and a per capita water demand rate of 75 gpcd. The estimated septic flow was based on the county population from the updated OPB population projections for each planning year (2020, 2030, 2040, 2050, and 2060). Despite efforts to extend sewer service in some counties, the presence of septic systems will remain relatively steady for counties with lower population densities. The percentages of future wastewater flow that will be treated by centralized facilities (such as municipal treatment plant or LAS) versus septic systems are based on current ratios for each county. Adjustments to future ratios were made based on feedback provided by local governments and utilities.

A key component of wastewater flows is Inflow and Infiltration, or “I&I”, which is groundwater and stormwater that enters into centralized sanitary sewer systems. Inflow is stormwater that enters the sanitary sewer systems at points of direct connection to the system while infiltration is groundwater that enters sanitary sewer systems through cracks and/or leaks in the sanitary sewer lines. I&I typically increases as systems age, particularly for centralized wastewater collection networks. Because the municipal wastewater forecasts were developed using baseline discharge information instead of assumed ratios of return for indoor municipal water use, I&I is included in the baseline discharge data and the future forecasts. Importantly, the prevalence of per capita volumes of I&I in the future municipal wastewater flows was assumed to remain constant through the planning period. This assumption effectively “cancels out” the expected increase in I&I as systems continue to age against installation of newer pipes and on-going I&I reduction programs.

As with the water demand forecasts, the stakeholder input and review process identified several improvements to be made to the wastewater flow forecasts. Key feedback from this process for the Middle Ocmulgee Region included a new industrial wastewater flow (being sent to a municipal wastewater treatment plant) of 0.9 MGD in Bibb County, expected to increase to 1.8 MGD by 2022. This flow was accounted for in the industrial forecasts in Section 4.2.

Figure 4-2 shows the municipal wastewater flow forecasts by category.

Figure 4-2: Municipal Wastewater Forecast



Source: Middle Ocmulgee Water and Wastewater Forecasting Technical Memorandum (2022)
Note: Municipal water and wastewater includes residential, commercial, small industry and military institutions

4.2 Industrial Forecasts

Industrial water demand and wastewater flow forecasts anticipate the future needs for major water-using industries in the region through 2060. Industries require water for their production processes, sanitation, and cooling, as well as employee use and consumption. Previous planning efforts forecasted industrial needs using future employment data. The current industrial water demand and wastewater flow forecasts are based on permit information and representative input from four industrial sub-sectors (paper and forestry products, food processing, manufacturing, and mining). While many industries supply their own water and/or treat their own wastewater, some industries are supplied by public water systems and/or send their wastewater to a public treatment plant. Industrial water demand and wastewater generation forecasts in this section include both publicly supplied and self-supplied industries.

4.2.1 Advisory Group Review Process

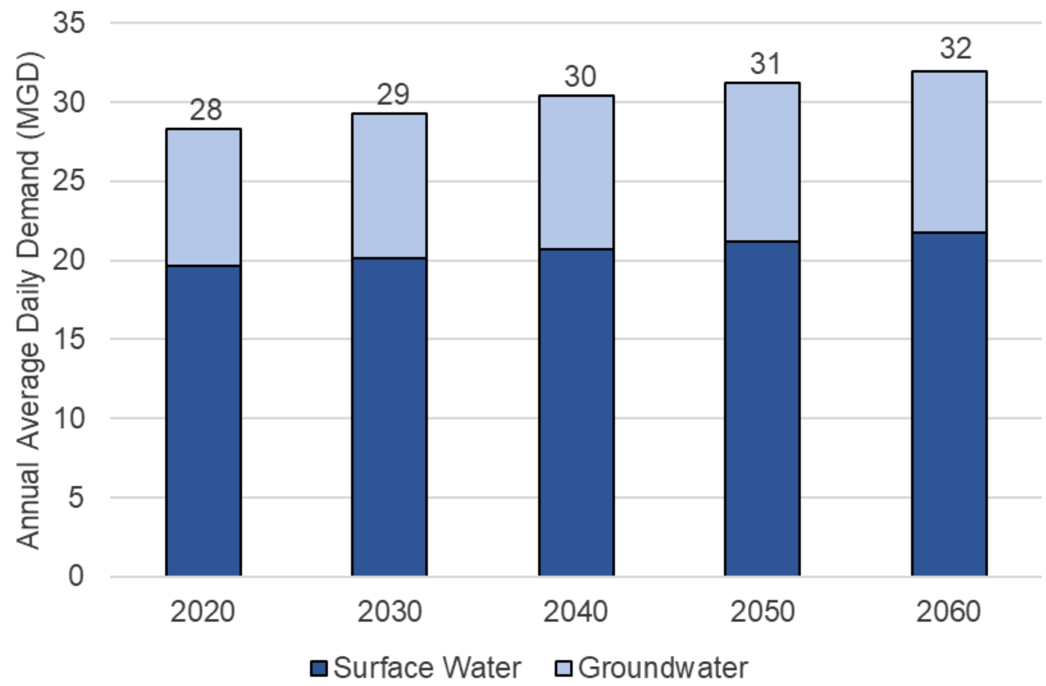
EPD identified experts throughout the State of Georgia to form an industrial stakeholder advisory group representing the state's thirteen largest industrial sectors. Through the advisory group's review of the previous methodology, it was determined that employment projections were no longer a valid basis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

4.2.2 Industrial Water Demand Forecasts

Through independent discussions, each sub-sector advisory group reached a series of recommendations to forecast their relevant industrial water and wastewater needs in Georgia. In addition to sub-sector advisory group feedback, confidential trade association surveys were collected for additional input. This information was used in conjunction with municipal water purchases and facility withdrawal permit information to develop the water withdrawal forecasts by county and sub-sector. The average water withdrawal from 2010 to 2019 for the majority of industrial facilities was used as the basis for projected water use. Figure 4-3 shows the industrial water and wastewater forecast over the planning period. Water withdrawals are assumed to remain constant over time for all sub-sectors except for an expected increase in water demand for food processing and a modest increase in the mining and paper and forestry products in Bibb County.

Figure 4-3 indicates a continual and gradual increase in industrial water demands through the planning period, from 28 MGD in 2020 to 32 MGD in 2060. The stone and clay industry and the paper industry will continue to be the two most significant water-using industries for the Middle Ocmulgee region. While the stone and clay industry obtains most of its supply from groundwater, the paper industry relies heavily on surface water.

Figure 4-3: Industrial Water Forecast



Source: Middle Ocmulgee Water and Wastewater Forecasting Technical Memorandum (2022)
Note: Includes public-and-self-supplied industries.

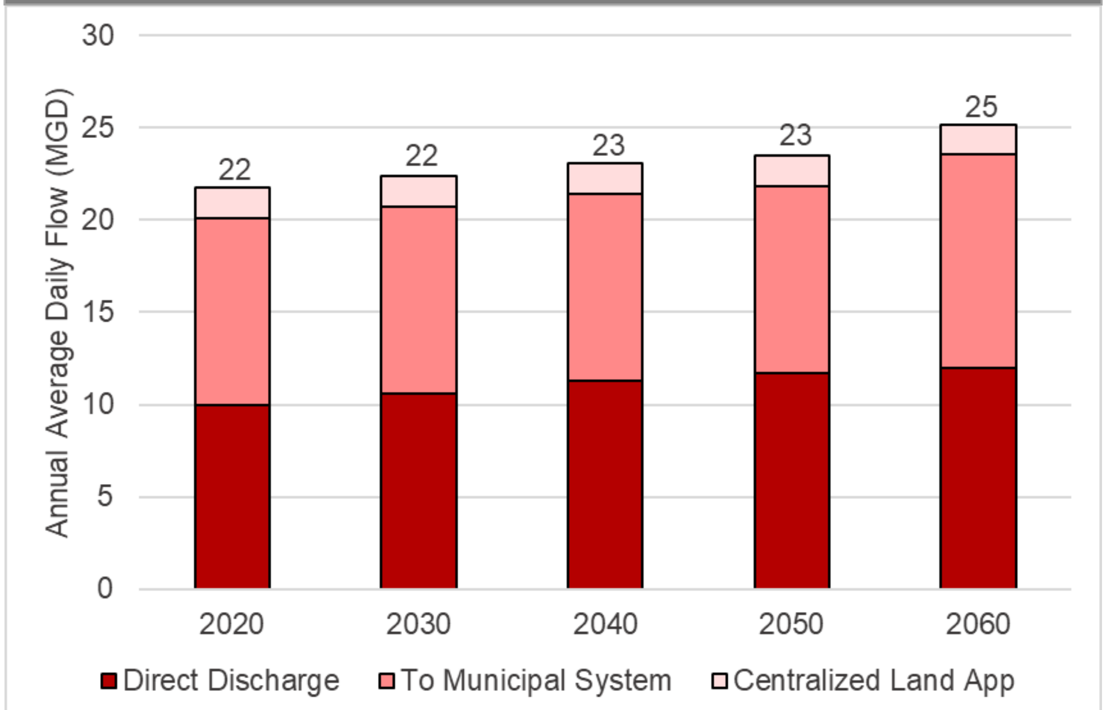
4.2.3 Industrial Wastewater Flow Forecasts

Industrial wastewater flow forecasts were estimated based on facilities' wastewater permit data for the years 2015 through 2019, as available. Although some facilities may include stormwater runoff in their discharges (primarily in the mining sector), that runoff has been otherwise accounted for in the Resource Assessment modeling process. Accordingly, in these forecasts, wastewater discharges are assumed not to exceed water withdrawals to exclude industrial discharges of captured stormwater.

The wastewater flow forecasts are broken down into types: direct discharge to surface waters, discharge to a municipal sewer system, and land application. To be conservative in the resource assessment modeling, wastewater flows sent to land application are not included as a return to surface water bodies. Proportions of wastewater sent to each type of discharge are held constant by county throughout the forecasts.

Wastewater flow forecasts for each sub-sector follow the same growth patterns as water flow forecasts. For the Middle Ocmulgee region, this means that expected growth in the paper and mining sub-sectors in Bibb County and projected increases in the food processing sub-sector translate into increases in the associated wastewater flow forecasts. Figure 4-4 shows the industrial wastewater flow forecasts.

Figure 4-4: Industrial Wastewater Forecast



Source: Middle Ocmulgee Water and Wastewater Forecasting Technical Memorandum (2022)
Note: Includes public-and-self-supplied industries. Industrial discharges of captured stormwater are excluded.

4.3 Agricultural Forecasts

Agricultural water demand forecasts include both crop and non-crop uses. Crop forecasts were 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. These forecasts provide a range of irrigation water use under dry, medium, and wet climate conditions based on the acres irrigated for each crop type for the years 2020 through 2060.

With help from respective industry associations, the current non-crop (including non-permitted) agricultural water uses were compiled, such as water use for nurseries/greenhouses, golf courses and livestock production. Water forecasts for future non-crop agricultural use were not developed because of the lack of available historical data. For this planning effort, the non-crop water uses are assumed to remain at current levels throughout the planning period.

The bulk of agricultural water needs are located in the southern part of the region, in Crawford, Houston, Peach, and Pulaski counties. Groundwater is the primary source for irrigation in these areas. Total agricultural demand for the planning period is shown in Table 4-2.

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

County	2020	2030	2040	2050	2060	% Increase (2020 to 2060)
Macon-Bibb	0.21	0.21	0.21	0.21	0.22	2%
Butts	0.66	0.66	0.66	0.74	0.66	0%
Crawford	8.70	9.62	10.86	12.47	14.08	62%
Houston	21.06	23.45	26.38	30.14	33.89	61%
Jasper	2.75	2.75	2.75	2.75	2.75	0%
Jones	0.25	0.25	0.25	0.25	0.25	0%
Lamar	1.10	1.10	1.10	1.06	1.11	1%
Monroe	0.32	0.32	0.32	0.34	0.32	1%
Newton	0.20	0.20	0.20	0.22	0.20	0%
Peach	28.74	32.77	38.22	45.32	52.42	82%
Pulaski	27.43	29.13	31.11	33.51	35.90	31%
Twiggs	3.17	3.45	3.63	3.85	4.06	28%
TOTAL	**94.59**	**103.91**	**115.70**	**130.85**	**145.86**	**54%**

Source: Middle Ocmulgee Water and Wastewater Forecasting Technical Memorandum (2022)

4.4 Energy Forecasts

EPD and an energy sector advisory group developed statewide water demand forecasts for future thermoelectric energy production through 2060. Full details of the state-wide energy section water demand forecast can be found in the memorandum, Update of Georgia Energy Sector Water Demand forecast (2020). The energy sector ad hoc group is composed of representatives from Georgia Power, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia (MEAG Power), the Georgia Environmental Finance Authority (GEFA), the Georgia Public Service Commission, and Dalton Utilities. The group provided guidance related to assumptions used in the statewide and regionally distributed water demand forecasts. Water requirements for thermoelectric energy generation facilities are estimated based on future energy demands along with the water requirements and consumption rates in gallons per megawatt-hour (MWh) for different power generating configurations. Future energy demands were based on population growth and a fixed per capita energy need based on recent historical data.

The forecast analysis covers both water withdrawal requirements and water consumption associated with thermoelectric energy generation. Information related to water withdrawals is an important consideration in planning for the water needed for thermoelectric energy production; however, water consumption is the more important element when assessing future resources because it represents the volume of water which is not returned to the environment following the thermoelectric energy production process.

Thermoelectric power generation represents a significant portion of surface water demand in the Middle Ocmulgee Region. The only major thermoelectric generation facility in the Middle Ocmulgee Water Planning Region is Plant Scherer, located near Forsyth in Monroe County. Plant Scherer, one of the largest single generating stations in the United States, is currently the largest coal-fired facility in Georgia. The facility is a joint venture of Oglethorpe Power Corporation, Georgia Power Company, Florida Power & Light, Municipal Electric Authority of Georgia, Gulf Power, Jacksonville Electric Authority, and Dalton Utilities. The plant primarily withdraws from Lake Juliette, which receives water transferred by a pumping station from the nearby Ocmulgee River. The plant also has permits to withdraw from the Ocmulgee River and Crystalline Rock Aquifer.

This water forecast assumes Plant Scherer will be retired by 2040, along with all other coal-fired generating facilities in Georgia. Potential gaps in future energy needs driven by these closures are assumed to be met by growth in natural gas-fired facilities and renewable energy production. The current forecast assumes that Plant Scherer is retired and not replaced, which reduces the energy-driven water withdrawal and consumption in 2040 for the Middle Ocmulgee Region.

The Middle Ocmulgee region also has three natural gas-fired power facilities that consume much less water than Plant Scherer. These facilities include the Mid-Georgia Cogeneration Facility and GA Power Plant Robins in Houston County, and the Oglethorpe Power Smart Energy Center in Monroe County. Municipalities provide the water supply for the Mid-Georgia Cogeneration Facility and Oglethorpe Power Smart Energy Center.

Table 4-3 shows the energy sector’s expected water withdrawal and consumptive needs through 2060.

Table 4-3: Energy Sector Water Demand Forecasts

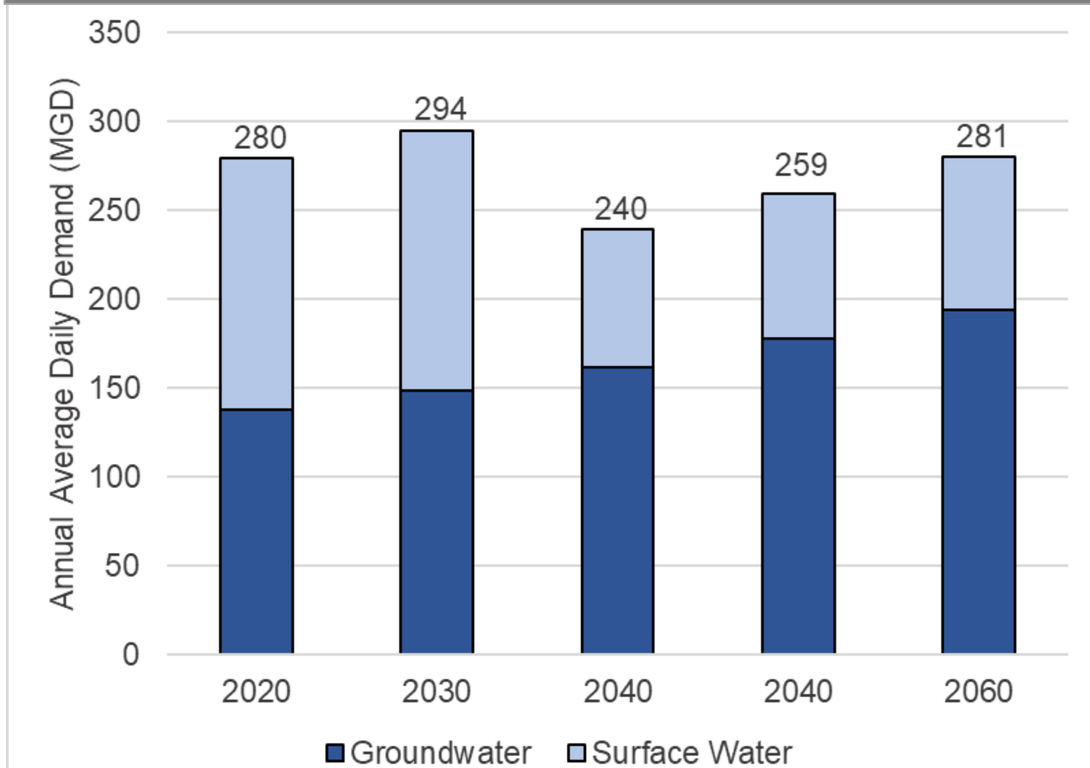
	Middle Ocmulgee Region (MGD-AAD)				
	2020	2030	2040	2050	2060
Withdrawal	71.88	71.88	0.45	0.50	0.55
Consumption	35.48	35.48	0.40	0.44	0.48

Source: *Memorandum: Update of Georgia Energy Sector Water Demand Forecast (2020)*

4.5 Total Water Demand and Wastewater Flow Forecasts

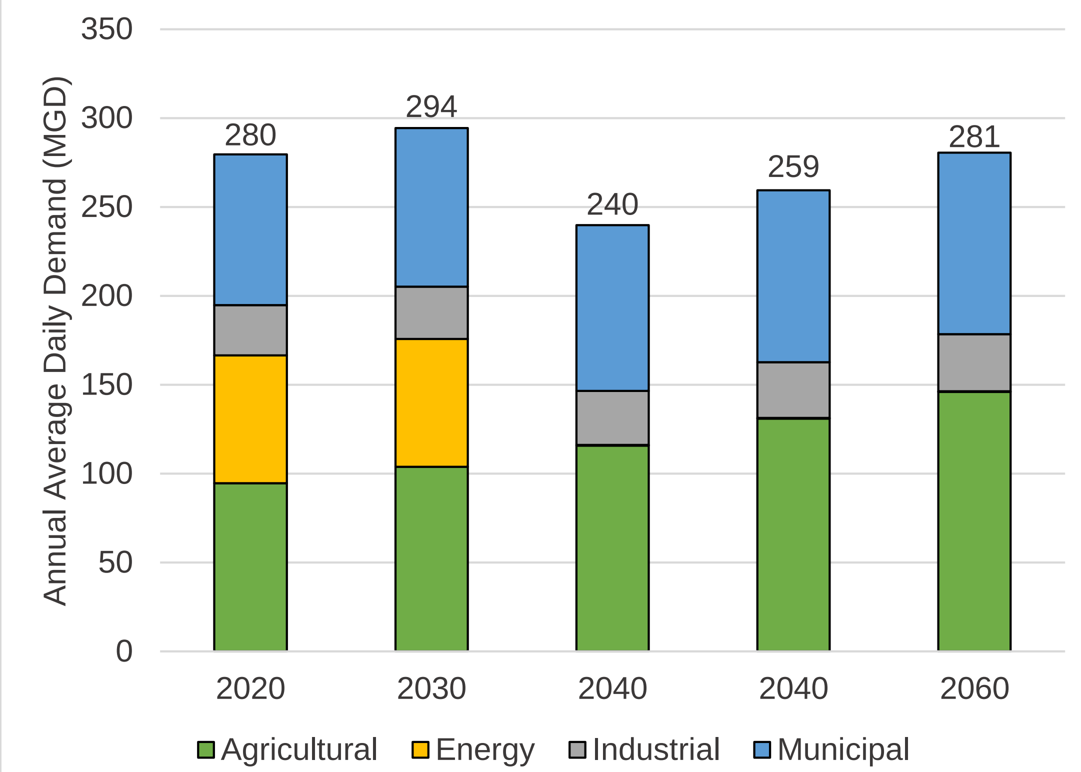
The total projected water needs of the Middle Ocmulgee Water Planning Region are summarized in Figures 4-5 and 4-6. Water demands are projected to increase slightly from 280 MGD in 2020 to an estimated 294 MGD in 2030. The projected water demand for 2040 drops substantially after the Plant Scherer thermoelectric generation facility is retired. Water demand steadily increases from 240 MGD in 2040 to an estimated 281 MGD in 2060 on an annual average daily basis. Agricultural and municipal water use account for the largest portion of the projected 2060 total water demand (approximately 52 and 36 percent, respectively), followed by industrial and energy water use.

Figure 4-5: Total Water Forecasts



Source: Middle Ocmulgee Water and Wastewater Forecasting Technical Memorandum (2022)
Note: The total shown above includes estimated consumptive needs for thermoelectric energy generation.

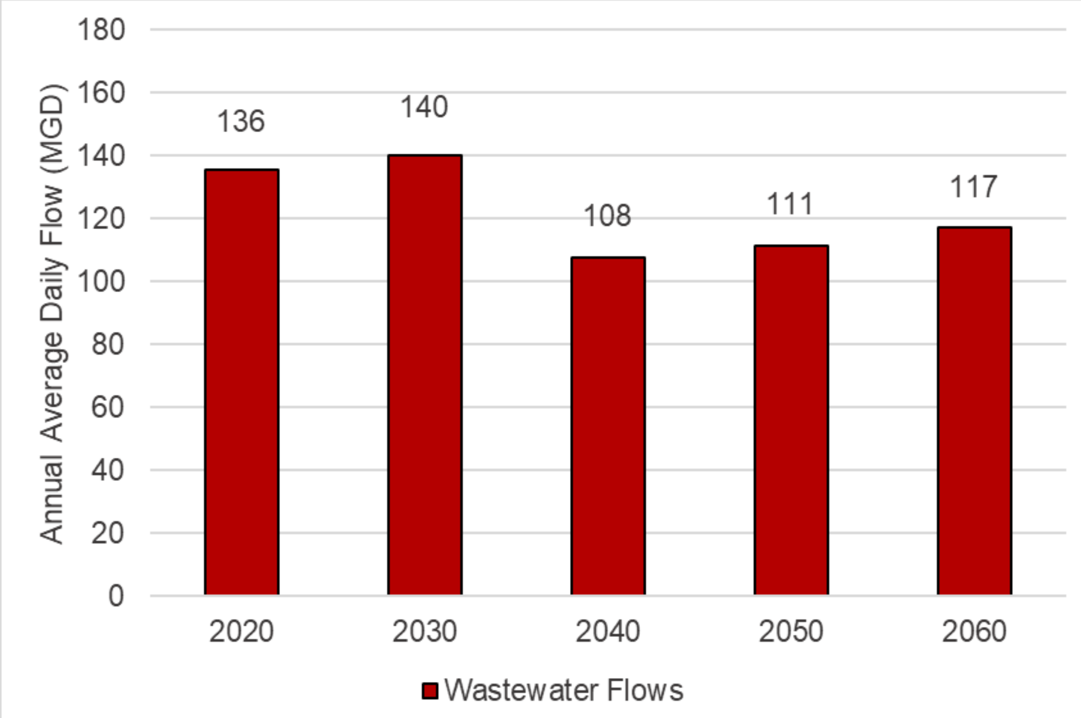
Figure 4-6: Total Water Forecasts by Sector



Source: Middle Ocmulgee Water and Wastewater Forecasting Technical Memorandum (2022)
Note: The total shown above includes estimated consumptive needs for thermoelectric energy generation

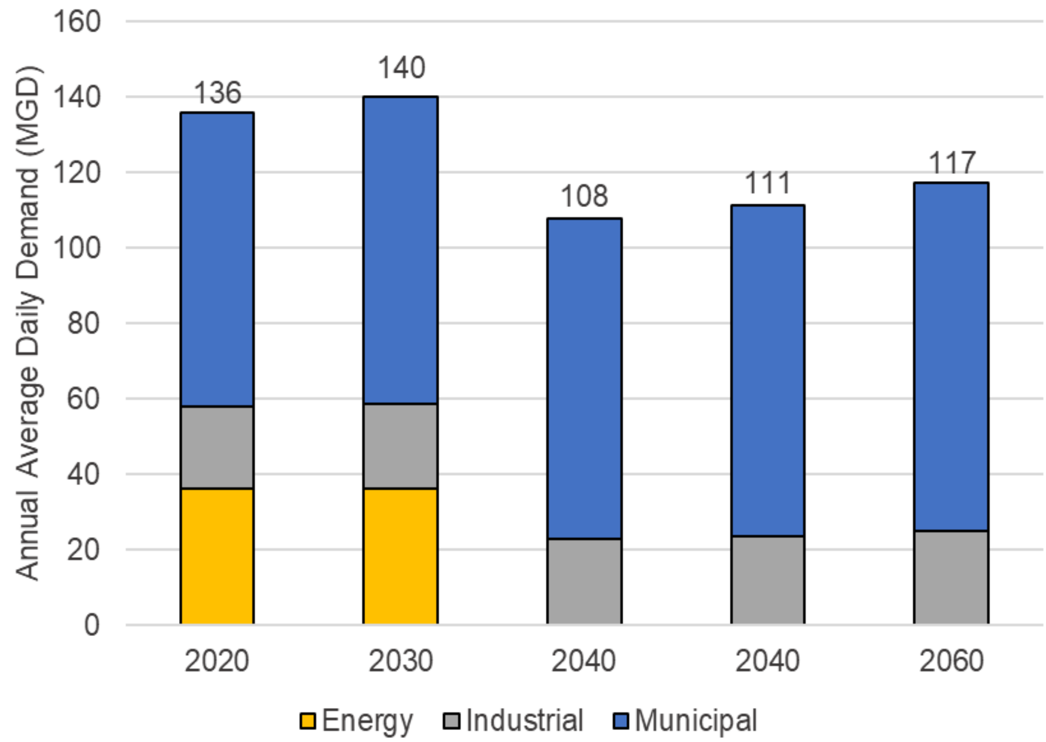
The region's municipal and industrial wastewater flows are projected to increase from approximately 136 MGD in 2020 to an estimated 140 MGD in 2030 (Figure 4-7). After the retirement of the Plant Scherer, estimated flows decrease before rebounding to approximately 117 MGD in 2060. Figure 4-8 shows the breakout of wastewater generation by sector, with industrial flow accounting for 21.5% and municipal flow accounting for 78.5% of the total by year 2060. Figure 4-9 shows the breakout of wastewater generation by disposal method. Direct discharge from industrial and energy use is forecasted to account for 10% of wastewater generation by year 2060, with centralized municipal systems at 61%, municipal land application systems at 10%, and septic systems accounting for 19%.

Figure 4-7: Total Wastewater Forecasts



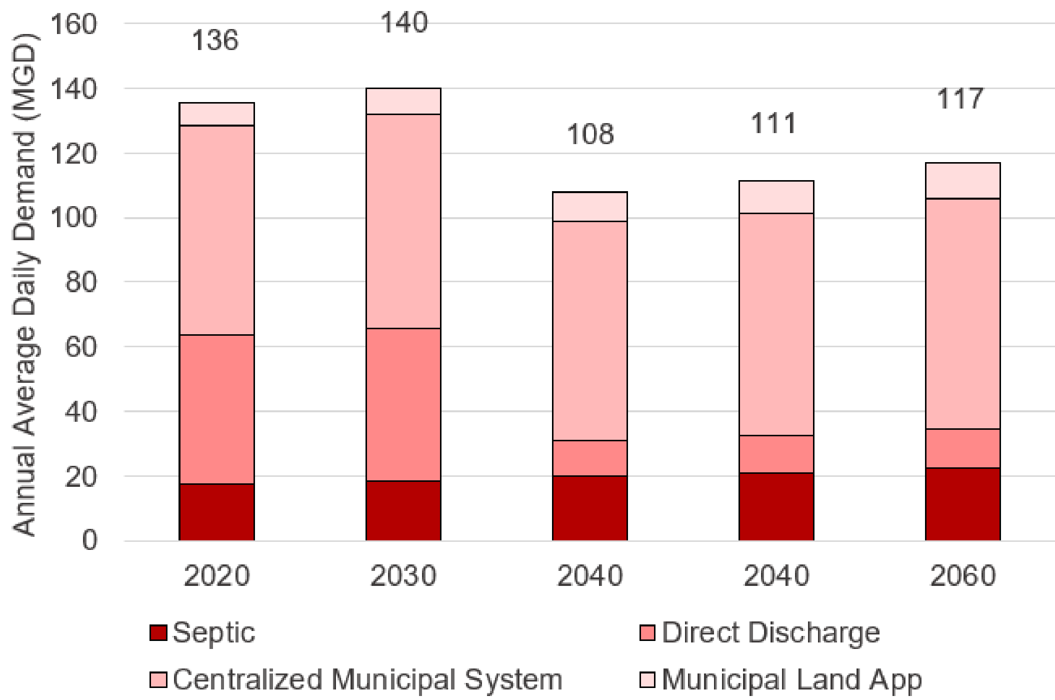
Source: Middle Ocmulgee Water and Wastewater Forecasting Technical Memorandum (2022)
Note: The total shown above includes municipal, energy, and industrial wastewater flows.

Figure 4-8: Total Wastewater Forecasts by Sector



Source: Middle Ocmulgee Water and Wastewater Forecasting Technical Memorandum (2022)

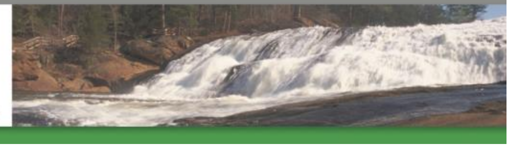
Figure 4-9: Total Wastewater Forecasts by Disposal Method



Source: Middle Ocmulgee Water and Wastewater Forecasting Technical Memorandum (2022)
Note: The total shown above includes municipal, energy, and industrial wastewater flows.

SECTION 5

Comparison of Water Resources Capacities and Future Needs



Section 5. Comparison of Water Resource Capacities and Future Needs

This section summarizes the potential water resource management issues for the Middle Ocmulgee Water Planning Region. The potential gaps – areas where future demands exceed the estimated capacity of the resources – were determined by comparing the Resource Assessments with the water demand and wastewater flow forecasts (Section 4). These potential gaps in specific counties will be addressed through the water management practices identified in Section 6.

Future Assessment Results

Groundwater Supplies:

- *Cretaceous aquifers are generally sufficient to meet future demands for the 6 counties with access to these aquifers.*
- *For the 3 counties with access to the Floridan aquifer, forecasted aquifer-wide water demands are within the estimated sustainable yield range but above the low yield, indicating a potential for future challenges.*

Surface Water Supplies:

- *A potential gap in surface water supply, in both duration and volume, is predicted at 4 facilities in 4 different counties.*
- *Additional permitted water withdrawal capacity will be needed in Crawford, Jasper, and Lamar Counties.*

Water Quality:

- *Substantial wastewater assimilation challenges predicted for 2 facilities (Cities of Perry and Monticello).*
- *Additional wastewater treatment capacity is needed in Lamar and Newton County by 2060.*
- *High nutrient loadings predicted in Lake Jackson and its tributary watersheds, including contribution from point source discharges.*
- *Existing stream impairment (47 percent of streams in the region not supporting their designated uses)*
- *Management of septic systems in rural areas*

5.1. Groundwater Availability Comparisons

The *Groundwater Availability Assessment* (EPD, 2010) estimated the potential range of sustainable yield for three prioritized aquifers in the Middle Ocmulgee Water Planning Region: the Crystalline Rock, Floridan, and Cretaceous aquifers. The model results for the Cretaceous aquifer were updated in 2012 and documented in the *Groundwater Availability Assessment Updates* (EPD, 2017).

The future conditions Resource Assessment evaluated the potential for groundwater capacity to meet the projected 2060 demands. Agricultural use comprised most of the forecasted increase in demand for groundwater in the Middle Ocmulgee Region. The assessment concluded that groundwater supplies from the Crystalline Rock and Cretaceous aquifers are generally sufficient to meet the 2060 forecasted groundwater demand from areas with access to these aquifers. The forecasted 2060 aquifer-wide demands for the Floridan aquifer are within the estimated sustainable yield range but above the low yield estimation, indicating a potential for future challenges. The results reflect modeled aquifer responses to specific baseline conditions and specific pumping scenarios. Aquifer responses in the future will depend on how pumping is ultimately configured – where wells are located and how much pumping is applied at each location. A resource assessment summary for each aquifer is provided in the following paragraphs.

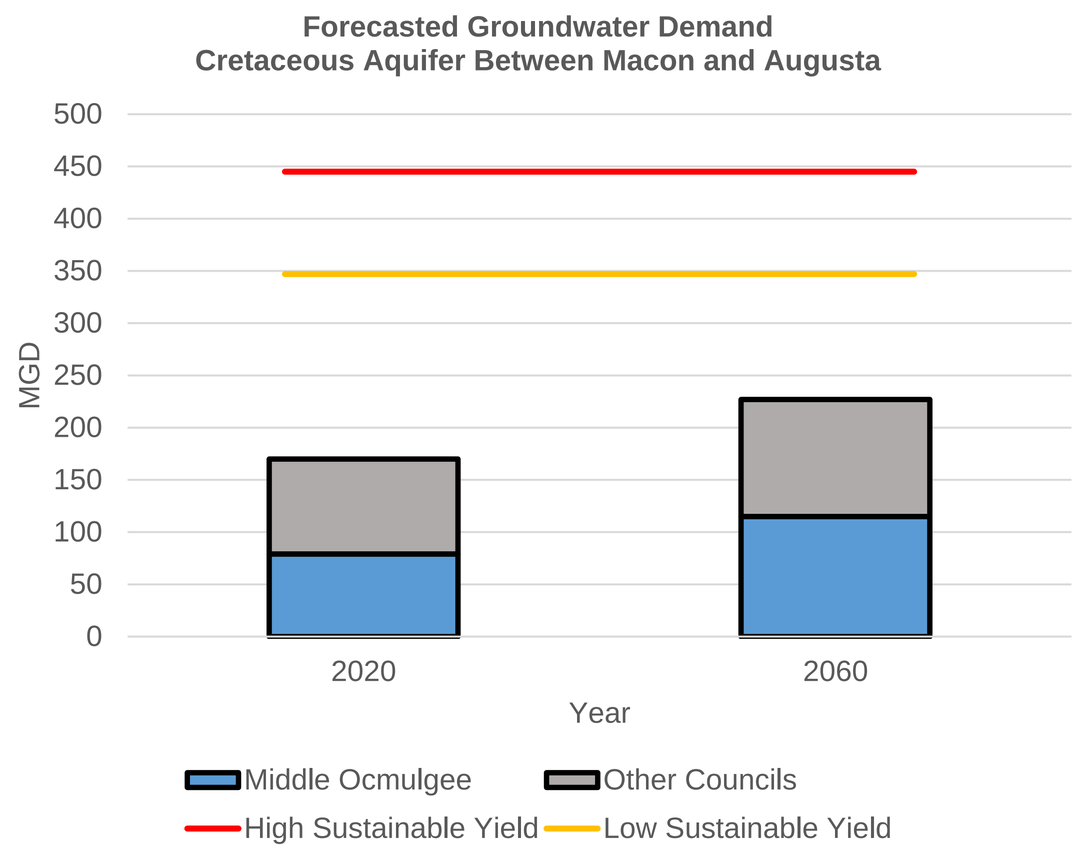
Crystalline Rock Aquifer – The Crystalline Rock aquifer is located north of the Fall Line, and includes Butts, Jasper, Jones, and Newton Counties. Due to the variability of groundwater yields in this aquifer, most use is limited to self-supplied residential users who rely on private wells. In the Middle Ocmulgee Region, only seven non-farm entities have active groundwater withdrawal permits from this aquifer. The current usage pattern – the aquifer primarily supplying small users on private wells – is likely to continue. The demand for the aquifer from the Middle Ocmulgee Region was estimated to be approximately 2.1 MGD in 2060.

The sustainable yield available from the portion of the Crystalline Rock Aquifer in the Middle Ocmulgee Region is estimated to be approximately 21 MGD on an annual average basis, assuming that the aquifer in the Middle Ocmulgee Region exhibits similar characteristics to the same aquifer in the adjacent Middle Oconee study basin for which a water balance was generated, and using the low range of the area normalized sustainable yield of 0.01 MGD per square mile of area for conservative planning. Based on this estimate, supplies from the Crystalline Rock Aquifer appear to be sufficient for future private well users in the region; however, locating sufficient water-bearing rock fractures is challenging. To take advantage of these groundwater resources, additional analysis, careful geologic surveying, mapping, and well siting by experienced geologists will be necessary at a local level.

Cretaceous Aquifer – The Cretaceous Aquifer is a significant water supply source in the Middle Ocmulgee Region, supplying major municipal, agricultural, and industrial users in the portion of the area south of the Fall Line. This aquifer is used for water supply in Bibb, Crawford, Houston, Peach, Twiggs, and Pulaski Counties. The sustainable yield for the prioritized aquifer units modeled was estimated to range from 347 to 445 MGD in 2010. The sustainable yield was reassessed in 2016 using increased local withdrawals in the model. The resulting drawdown and stream baseflow reduction satisfied the impact criteria, so no changes were made to the yield. Projections for water use from the multiple regions with access to this aquifer show that future demand is not expected to exceed the sustainable yield in 2060 (Figure 5-1).

Because the Resource Assessment modeling is not specific to individual planning regions, it is uncertain how the aquifer yield applies specifically to the Middle Ocmulgee Region. Site-specific studies would likely be needed to determine the sustainable yield of this aquifer in any particular local area. As discussed in **Section 3.2.3**, an additional assessment for the Cretaceous Sand aquifer was conducted in 2012 due to concerns about the impacts of increased local groundwater withdrawals. The analysis applied increased withdrawals to the 2010 groundwater flow simulations and concluded that the increased withdrawals did not exceed the 30 feet drawdown metric or stream flow minimums. The greatest simulated drawdown occurred in Peach and Houston Counties, which have a large concentration of wells. The study provided detailed monitoring recommendations which could be a valuable tool in identifying any potential localized gaps.

Figure 5-1: Cretaceous Aquifer Demand vs. Estimated Yield[1]



Sources:
Groundwater Availability Assessment, March 2010, EPD
Groundwater Availability Assessment Updates, May 2017, EPD
[1]The range of sustainable yield was determined using numerical model simulations with various combinations of withdrawals from existing wells, and, where applicable, from hypothetical new wells.

Floridan Aquifer – The total estimated range of sustainable yield is 868 MGD to 982 MGD for the South-Central Georgia and Eastern Coastal Plain modeled portions of the Floridan Aquifer. The combined forecasted 2060 groundwater needs from regions with access to this aquifer is 913 MGD, which is within the estimated range of sustainable yield and indicates a potential future challenge. The projected water supply need from this aquifer for the Middle Ocmulgee Water Planning Region is approximately 139 MGD in 2060, mostly from the very southern tip of the region. Pulaski County and portions of Houston and Twiggs counties have access to this aquifer. Site-specific studies would likely be beneficial to determine the potential response of this aquifer to localized demands.

5.2. Surface Water Availability Comparisons

The comparisons of surface water availability are based on the results of the surface water availability Resource Assessment using the BEAM model described in Section 3.2, and the projected surface water demands in 2060. All permitted water withdrawal facilities are included in the BEAM model as nodes. For modeling purposes, the river basins in the Middle Ocmulgee Region were modeled as the OOA group (Oconee-Ocmulgee-Altamaha). A future scenario was also developed using projected water demands for the 2060 planning horizon. Figure 5-2 illustrates the facility nodes used in the model.

In addition, the BEAM modeling platform was used to quantify the number of days when the simulated stream flow was less than the 2060 water demand at each facility (as indicated by the minimum instream flow requirement in the water withdrawal permit), indicating a potential water supply challenge. The 2060 water demands and water facility operations were tested with 80 years of daily flow data, including all known drought years, normal years, and wet years.

Specific NPDES discharging facilities were also modeled as nodes. Breaches of each facility's regulatory flow thresholds (7Q10 values) under the 2060 future scenario were used to determine wastewater assimilation challenges.

In the OOA Study Basin, three facilities demonstrated at least one modeled water supply challenge day under the 80-year simulation under 2060 water demands, including:

- Newton County
- City of Barnesville
- City of Monticello, which had the highest percentage of challenge days (82.66% for the 2060 future scenario).

18 facilities in the OOA Study Basin demonstrated wastewater assimilation challenges in the 80-year simulation, with 2 facilities facing substantial challenges (more than 10% of the simulated flow was less than the 7Q10 value under the 2060 future scenario):

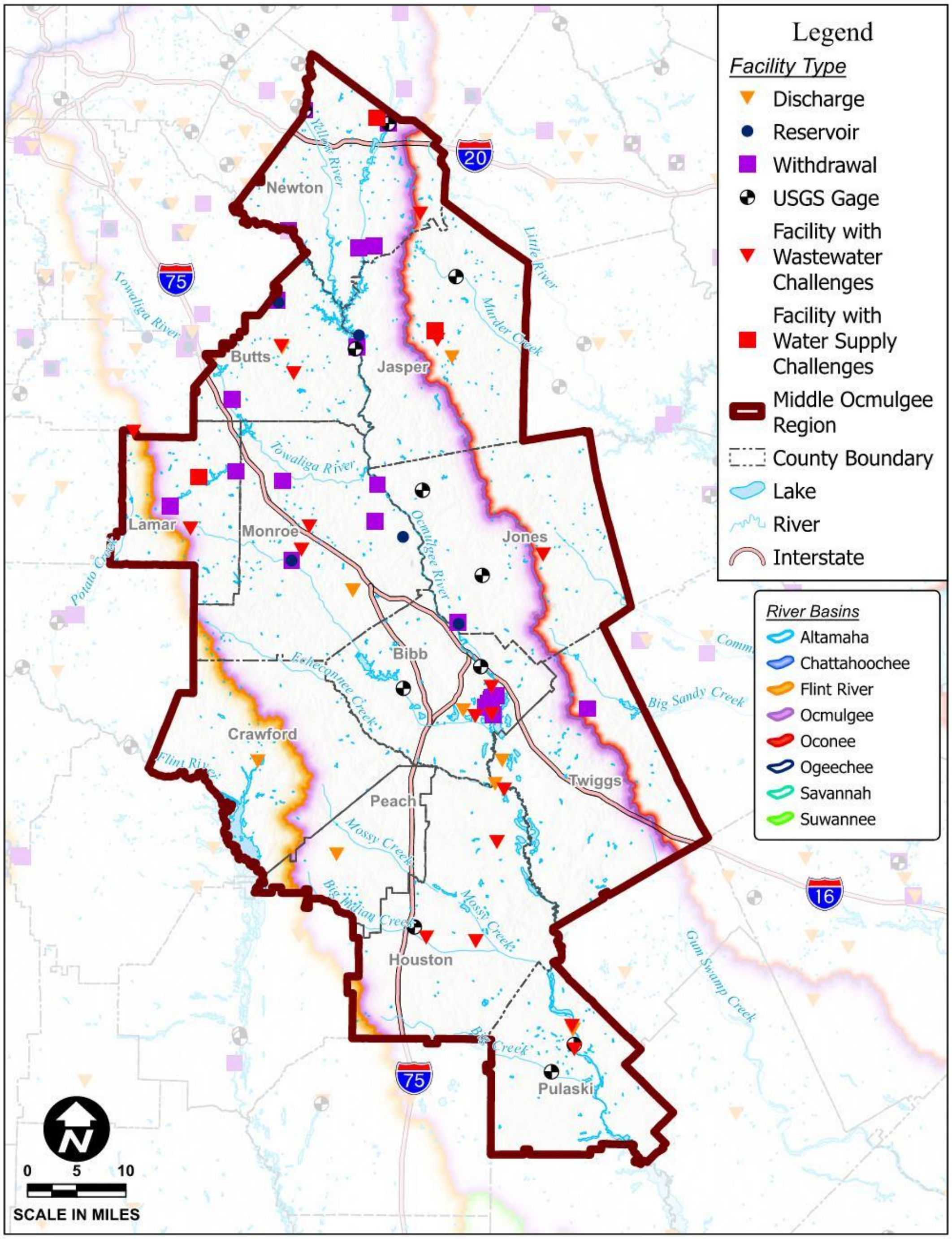
- City of Mansfield
- City of Monticello, which had the largest percentage of challenge days at 89.15% (substantial challenge)
- City of Jackson (two facilities)
- City of Forsyth (two facilities)
- Macon Water Authority (two facilities)
- Graphic Packaging International
- City of Barnesville
- City of Warner Robins (two facilities)
- Robins Air Force Base

- City of Perry (substantial challenge)
- Purdue Foods
- City of Hawkinsville (two facilities)
- City of Gray

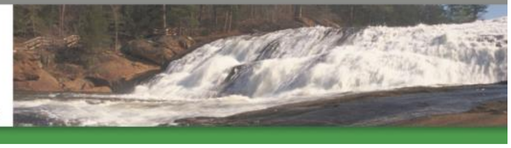
The Middle Ocmulgee Region has two wastewater discharge facilities in the Apalachicola-Chattahoochee-Flint (ACF) Study Basin. One of these facilities, the City of Griffin discharge in Lamar County, demonstrated wastewater assimilation challenges in the 80-year simulation under 2060 water demands at 0.19%.

Additional details are provided in the memorandum, "Development of Basin Environmental Assessment Models (BEAMs) for Georgia Surface Water Basins" (May 2023).

Figure 5-2: Surface Water BEAM Assessment Results for 2060 Conditions



Source: GAEPD, 2023.



5.3. Surface Water Quality Comparisons (Assimilative Capacity)

This section summarizes the results of the “Dissolved Oxygen Assimilative Capacity Resource Assessment Report (2023) and the water quality challenges that the Middle Ocmulgee Water Planning Region may face based on projected 2060 wastewater flows and assumptions.

5.3.1 Assimilative Capacity Assessments

The assimilative capacity of a watershed is the amount of a given pollutant that can be discharged to the watershed while maintaining water quality standards. The evaluation of water quality was based on modeling DO conditions and nutrient loadings, as described in Section 3.2.

Instream DO conditions were modeled under critical instream low flow conditions. The instream DO modeling was conducted on streams and tributaries currently receiving major NPDES treated wastewater discharges with permitted flows of at least 0.1 MGD. The DO results are based on a comparison of modeled DO levels to the water quality standard of 5.0 mg/L or natural conditions, whichever is lower. For purposes of this modeling effort and the identification of potential challenges, wastewater flows for municipal and industrial facilities were assumed to be at the full permitted treatment capacity and limits.

The results of the DO modeling at current (2019) permitted conditions and future 2060 forecasted conditions are presented in Figures 5-3 through 5-8 for the Middle Ocmulgee Region, which includes portions of the Flint, Ocmulgee, and Oconee 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 and pink lines in Figures 5-3 through 5-8) has estimated instream DO levels that are at or below the DO water quality criteria, which 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.

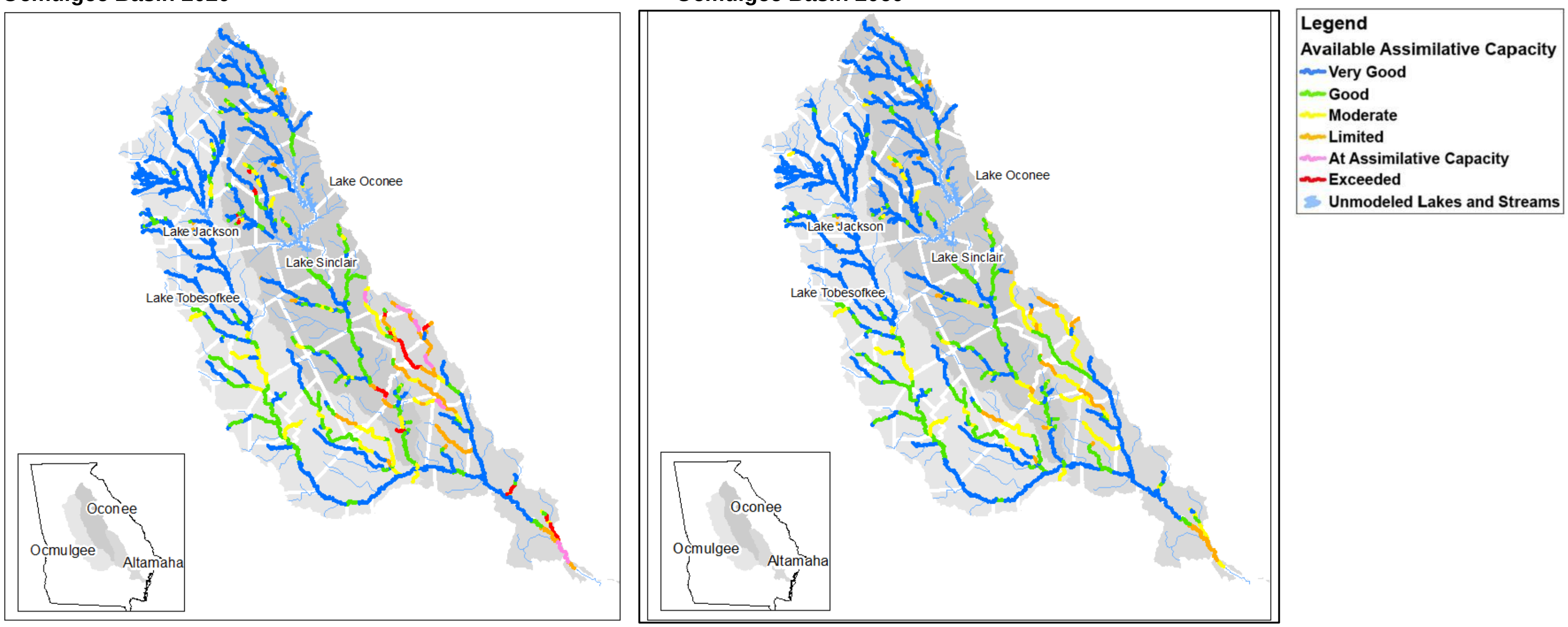
Reaches within the Middle Ocmulgee Region that have exceeded their full assimilative capacity under the 2019 conditions assessment include portions of White Oak Creek and Shoal Creek in the Oconee Basin. For these segments, actions may not be required immediately because of the high permit limits modeled; further monitoring and evaluation are required to verify modeling results.

The results shown in Figures 5-3 through 5-8 also present the DO modeling under 2060 conditions, conducted by EPD. The model results show that under 2060 conditions, all stream reaches in the Middle Ocmulgee Region have sufficient assimilative capacity for DO. In order to address areas of no or exceeded assimilative capacity for DO, EPD incorporated some assumptions regarding future (2060) permitted flows and modifications to permit effluent limits. Since EPD cannot issue permits that will violate water quality standards, EPD will continue to evaluate and modify future permit requests and adjust permit limits to avoid potential DO violations.

The resource assessment models developed for this planning process will continue to be used by EPD for future wasteload allocation and for assessing DO conditions in the streams. Assuming that 1) permit limits will be tightened in streams with potential DO violations, and 2) planned projects with alternative discharge locations will be constructed to handle future flows, EPD's goal is to prevent future DO violations in streams (red segments in Figures 5-3 through 5-8).

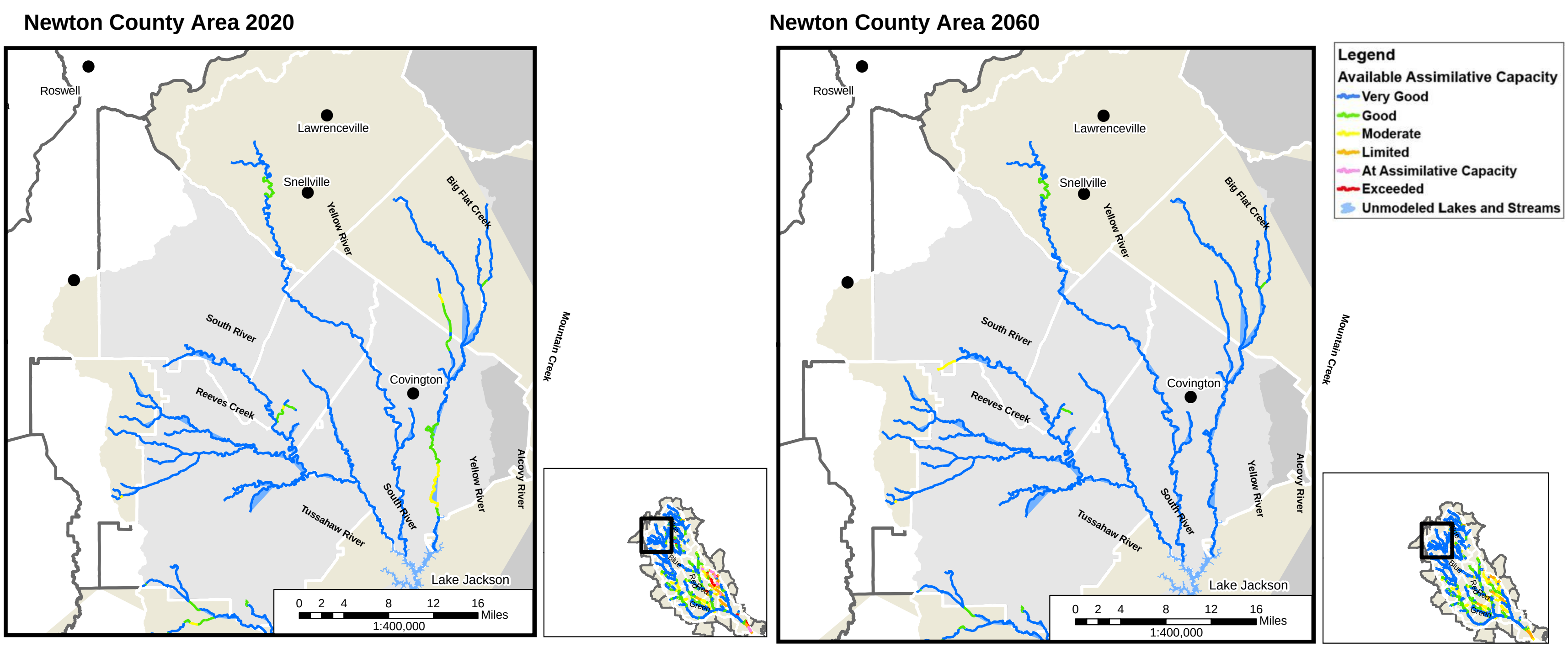
Figure 5-3: DO Assimilative Capacity Results for Ocmulgee Basin

Ocmulgee Basin 2020 **Ocmulgee Basin 2060**



Note: The results shown are based on municipal and industrial facilities at their full permitted levels.
Very good: ≥ 1 mg/L available DO (that is, above DO standards)
Good: < 1.0 and ≥ 0.5 mg/L available DO
Moderate: < 0.5 and ≥ 0.2 mg/L available DO
Limited: < 0.2 and > 0 mg/L available DO
At Assimilative Capacity: 0 mg/L available DO
No assimilative capacity: < 0 mg/L available DO
Source: "Dissolved Oxygen Assimilative Capacity Resource Assessment Report" (2023)

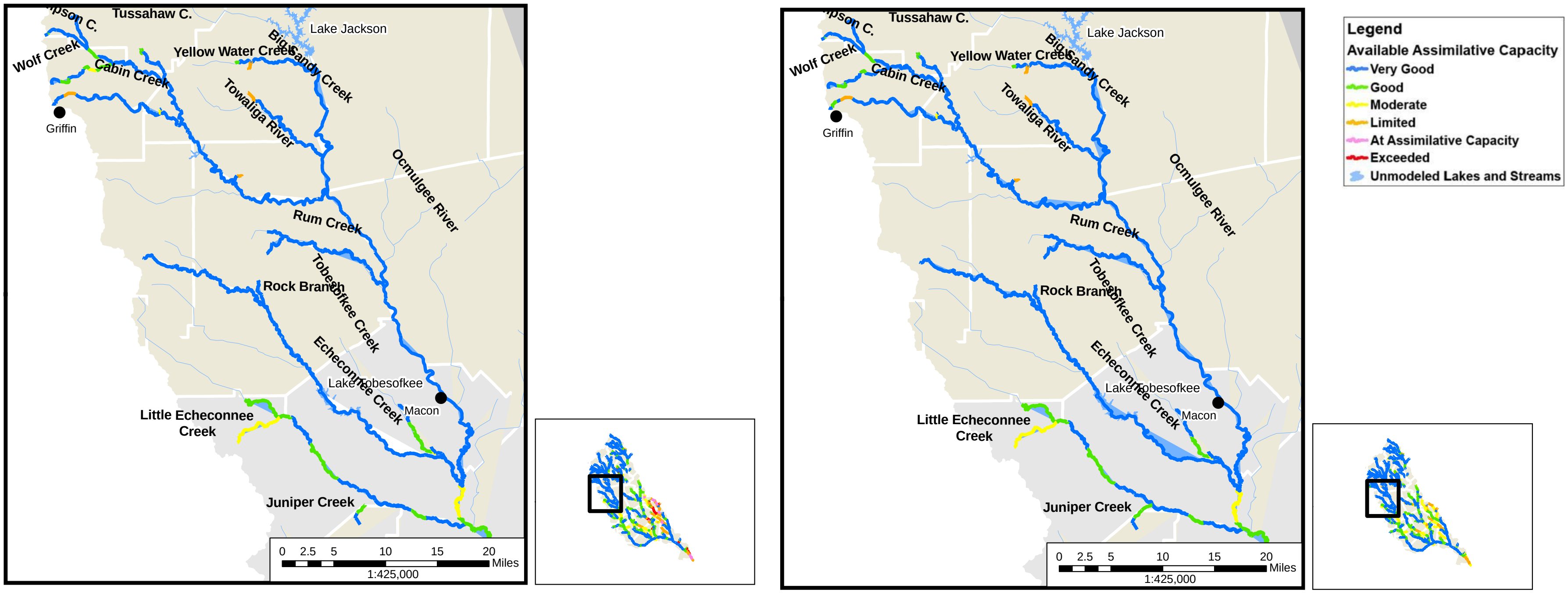
Figure 5-4: DO Assimilative Capacity Results for Newton County Area



Note: The results shown are based on municipal and industrial facilities at their full permitted levels.
Very good: ≥ 1 mg/L available DO (that is, above DO standards)
Good: < 1.0 and ≥ 0.5 mg/L available DO
Moderate: < 0.5 and ≥ 0.2 mg/L available DO
Limited: < 0.2 and > 0 mg/L available DO
At Assimilative Capacity: 0 mg/L available DO
No assimilative capacity: < 0 mg/L available DO
Source: "Dissolved Oxygen Assimilative Capacity Resource Assessment Report" (2023)

Figure 5-5: DO Assimilative Capacity Results for Bibb, Butts, Jasper, Jones, Lamar and Monroe County Area Located In the Ocmulgee River Basin

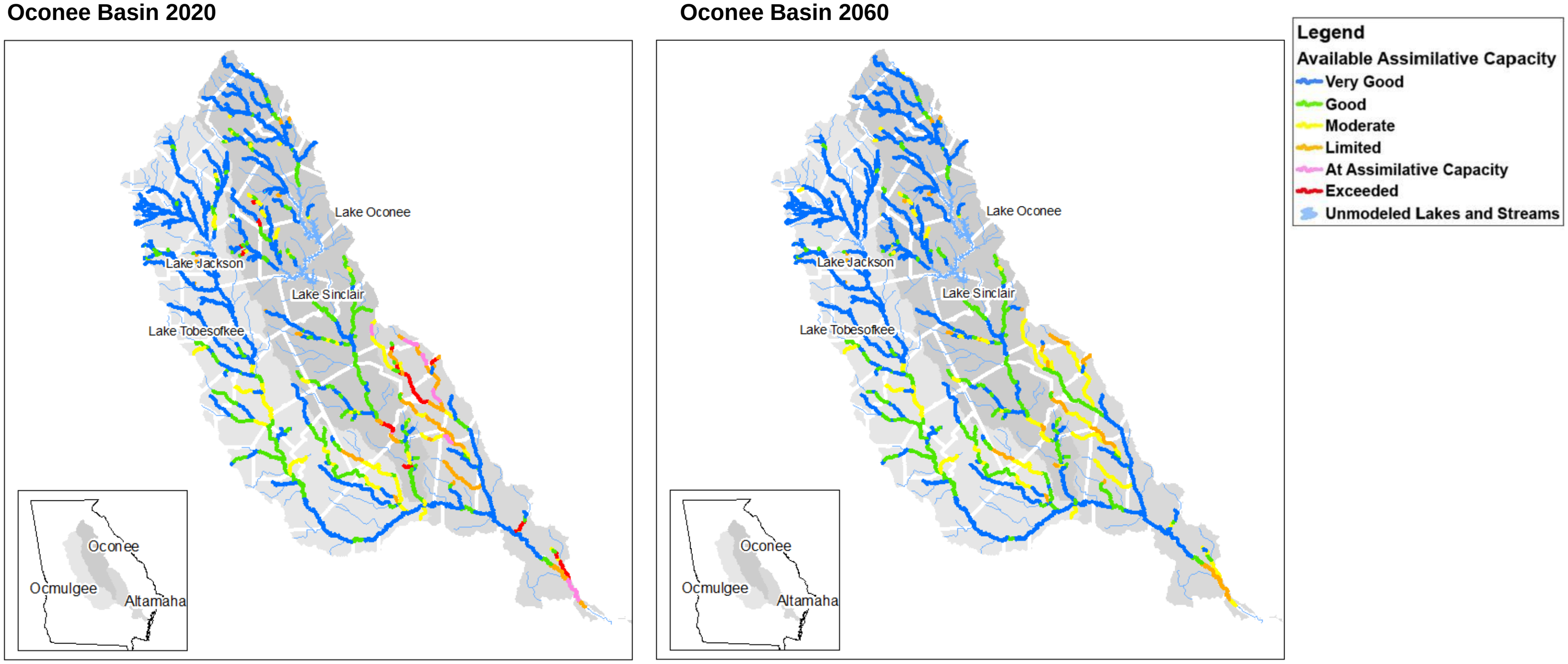
Bibb, Butts, Jasper, Jones, Lamar, and Monroe Counties 2020 | **Bibb, Butts, Jasper, Jones, Lamar, and Monroe Counties 2060**



Note: The results shown are based on municipal and industrial facilities at their full permitted levels.
Very good: ≥ 1 mg/L available DO (that is, above DO standards)
Good: < 1.0 and ≥ 0.5 mg/L available DO
Moderate: < 0.5 and ≥ 0.2 mg/L available DO
Limited: < 0.2 and > 0 mg/L available DO
At Assimilative Capacity: 0 mg/L available DO
No assimilative capacity: < 0 mg/L available DO
Source: "Dissolved Oxygen Assimilative Capacity Resource Assessment Report" (2023)

Figure 5-6: DO Assimilative Capacity Results for Oconee Basin

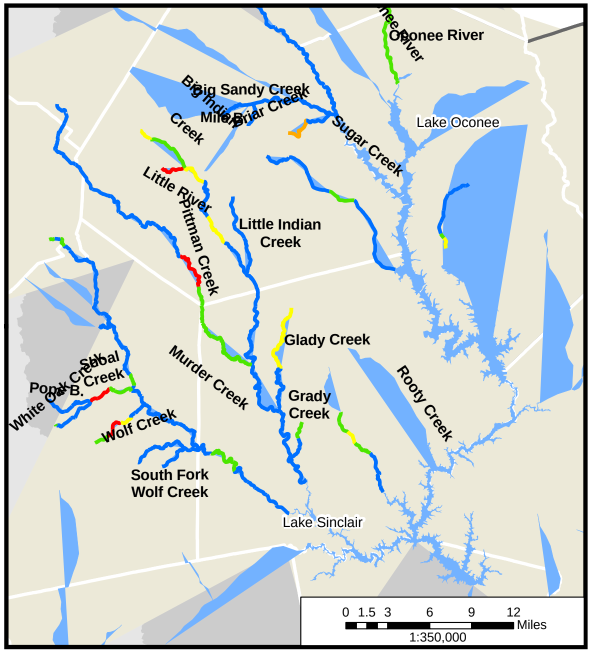
Oconee Basin 2020 **Oconee Basin 2060**

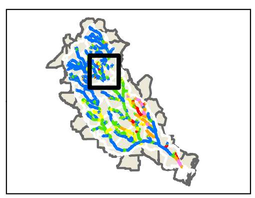


Note: The results shown are based on municipal and industrial facilities at their full permitted levels.
Very good: ≥ 1 mg/L available DO (that is, above DO standards)
Good: < 1.0 and ≥ 0.5 mg/L available DO
Moderate: < 0.5 and ≥ 0.2 mg/L available DO
Limited: < 0.2 and > 0 mg/L available DO
At Assimilative Capacity: 0 mg/L available DO
No assimilative capacity: < 0 mg/L available DO
Source: "Dissolved Oxygen Assimilative Capacity Resource Assessment Report" (2023)

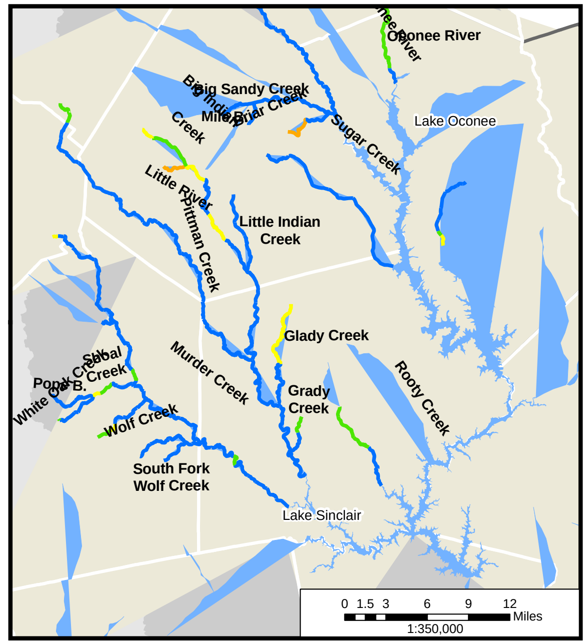
Figure 5-7: DO Assimilative Capacity Results for Jasper County Area

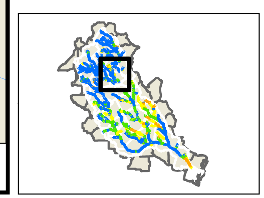
Jasper County Area 2020





Jasper County Area 2060

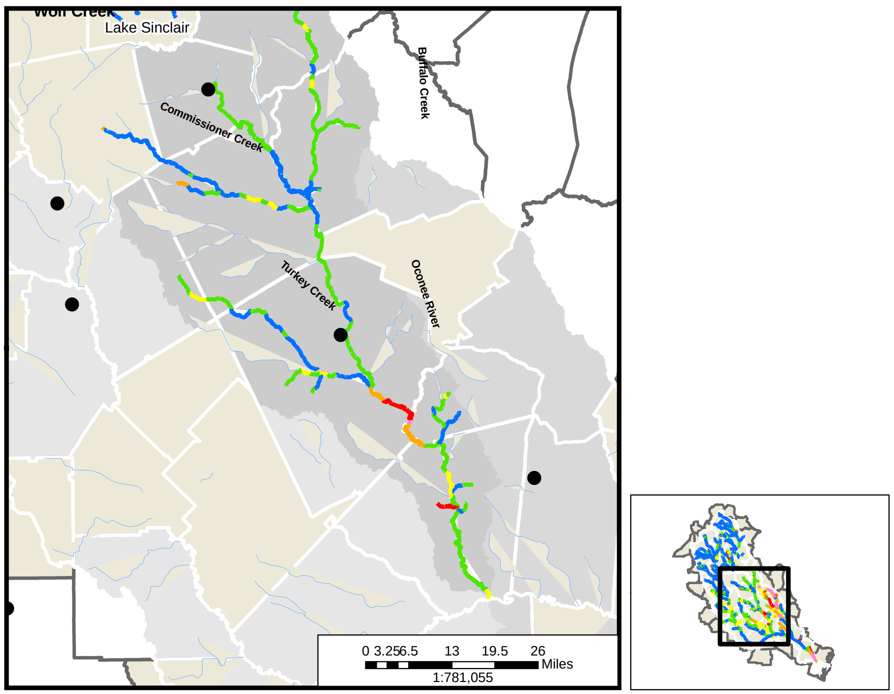




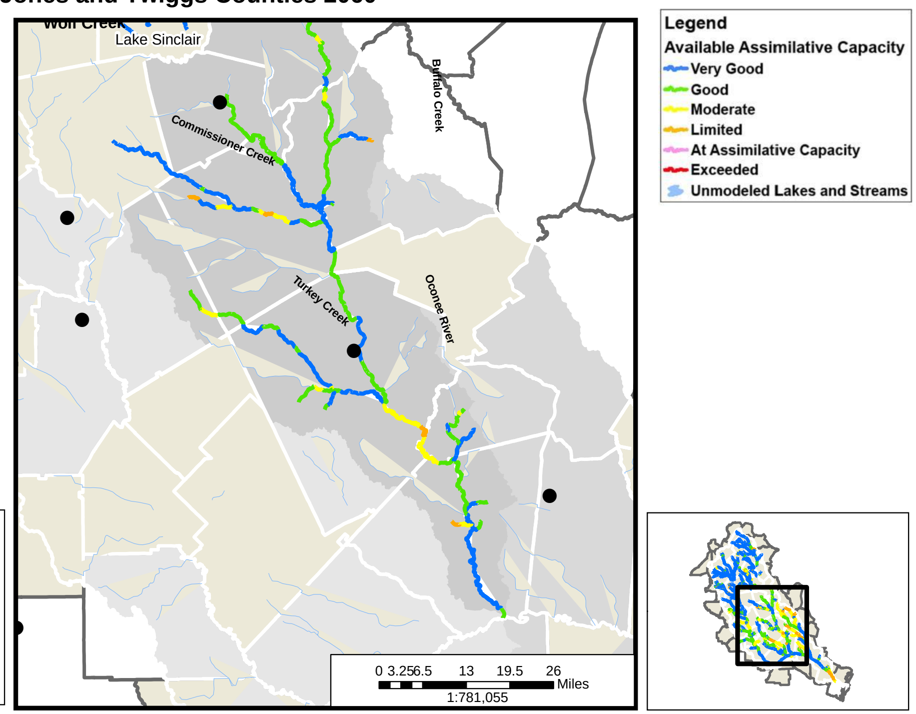
Note: The results shown are based on municipal and industrial facilities at their full permitted levels.
Very good: ≥ 1 mg/L available DO (that is, above DO standards)
Good: < 1.0 and ≥ 0.5 mg/L available DO
Moderate: < 0.5 and ≥ 0.2 mg/L available DO
Limited: < 0.2 and > 0 mg/L available DO
At Assimilative Capacity: 0 mg/L available DO
No assimilative capacity: < 0 mg/L available DO
Source: "Dissolved Oxygen Assimilative Capacity Resource Assessment Report" (2023)

Figure 5-8: DO Assimilative Capacity Results for Jones and Twiggs Counties

Jones and Twiggs Counties 2020



Jones and Twiggs Counties 2060



Note: The results shown are based on municipal and industrial facilities at their full permitted levels.
Very good: ≥ 1 mg/L available DO (that is, above DO standards)
Good: < 1.0 and ≥ 0.5 mg/L available DO
Moderate: < 0.5 and ≥ 0.2 mg/L available DO
Limited: < 0.2 and > 0 mg/L available DO
At Assimilative Capacity: 0 mg/L available DO
No assimilative capacity: < 0 mg/L available DO
Source: "Dissolved Oxygen Assimilative Capacity Resource Assessment Report" (2023)

5.3.2 Modeled Nutrient Results

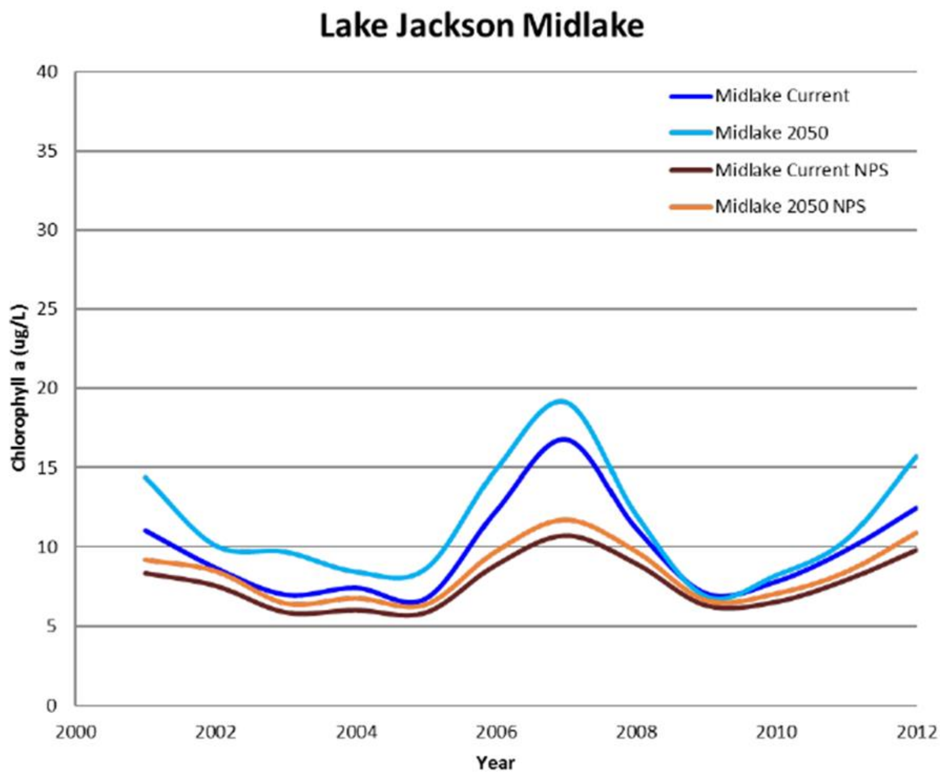
During the 2017 Plan Update, a watershed-based model for the Upper Ocmulgee Watershed and a lake model for Lake Jackson were also completed to evaluate nutrient loadings under 2050 conditions. For the 2023 Plan Update, no watershed or lake model updates were conducted for the Middle Ocmulgee Region.

Watershed models account for water withdrawal, wastewater discharges and stormwater runoff from various projected land uses. The lake model is primarily used to evaluate the impacts of nutrients. The 2050 scenario assumed full permit limits for permitted discharges and when the projected 2050 flow exceeds permitted flow, assumptions were made for point source discharges to meet the projected 2050 need. The models simulated a 12-year period which captured several drought periods (2001-2002, 2006-2008 and 2011-2012) and several dry years (2003 and 2005). Unacceptable impacts (i.e., not meeting state water quality standards for dissolved oxygen and/or nutrients) are identified by the watershed and lake models. The lake model simulated mid-lake chlorophyll *a* concentrations during various wet and dry year conditions.

Lake Jackson currently has a growing season average chlorophyll *a* limit at mid-lake of 20 micrograms per liter (μg/L). Recent warmer temperatures have led to higher chlorophyll *a* levels in Lake Jackson. There was a 1-year exceedance of the chlorophyll *a* criterion in 2020, however, Lake Jackson remains in compliance because the criterion is evaluated over a multi-year period. In 2020, all reservoirs in Georgia had higher measured chlorophyll *a* levels than usual.

Figure 5-9 shows that in the future chlorophyll *a* levels in Lake Jackson are predicted to increase at mid-lake due to both non-point sources and point sources. However, the chlorophyll *a* water quality standard for the lake is predicted to be met.

Figure 5-9: Comparison of Current and Future Lake Chlorophyll *a* Levels



Note: The blue lines above show the chlorophyll *a* levels that result from modeling combined loads from wastewater discharge permits and nonpoint source pollution; the darker blue line shows current levels and the lighter blue line shows levels projected for 2050. The brown lines show the levels attributed just to nonpoint source pollution (NPS); the darker brown line shows the current levels and the lighter brown line shows levels projected for 2050.

The maximum annual growing season average total nitrogen (N) and total phosphorus (P) levels predicted for modeled scenarios are shown in Table 5-1. Lake Jackson has a total N criteria not to exceed 4.0 mg/L in the photic zone. The model predicts a maximum total N level of 6.7 mg/L based on the current permits. A change to the criteria to include duration and frequency such as a growing season average standard may be needed in the future and careful management of the lake watershed to ensure this criterion is met.

Table 5-1: Comparison of Current and Future Lake Jackson Growing Season Average Nutrient Levels

Scenario	Total N (mg/L)	Total P (mg/L)
Current (Nonpoint Sources only)	0.6	0.07
Current (Point + Nonpoint Sources)	4.0	0.12
2050 (Nonpoint Sources only)	0.7	0.08
2050 (Point + Nonpoint Sources)	6.7	0.33
Source: EPD, 2017		

The Upper Ocmulgee Watershed model includes counties from Metro North Georgia Water Planning District (DeKalb, Gwinnett, Rockdale, Henry), Middle Ocmulgee Region (Newton and portions of Jasper and Butts), and Upper Oconee Region (part of Walton). No new modeling was conducted as part of this Plan update. Analysis conducted in 2017 of total phosphorus loadings in the four sub-watersheds upstream of Lake Jackson indicated that point source discharge is the main source of nutrient (total phosphorus and total nitrogen) loadings for the South River, Yellow River, and Tussahaw Creek Watersheds, while non-point sources contribute slightly more in the Alcovy River Watershed.

Figures 5-10a and 5-10c show the predicted total phosphorus and nitrogen loadings in a typical wet year (2020) using 2015 land use, with the assumption that all facilities above Lake Jackson will have Metro North Georgia Water Planning District phosphorus loading limits. Total nitrogen loadings are projected to increase significantly from the baseline conditions, but there are currently no loading limits for total nitrogen. Figures 5-10b and 5-10d show the predicted total phosphorus and nitrogen loadings in a typical wet year under 2050 conditions. The predicted nutrient loadings during wet years are generally higher than during dry years. Further studies conducted by the State will be required to examine policies regarding total nitrogen loadings.

Figure 5-10: Upper Ocmulgee Watershed Wet Year Nutrient Loadings; Total Phosphorus Current (2020) Conditions

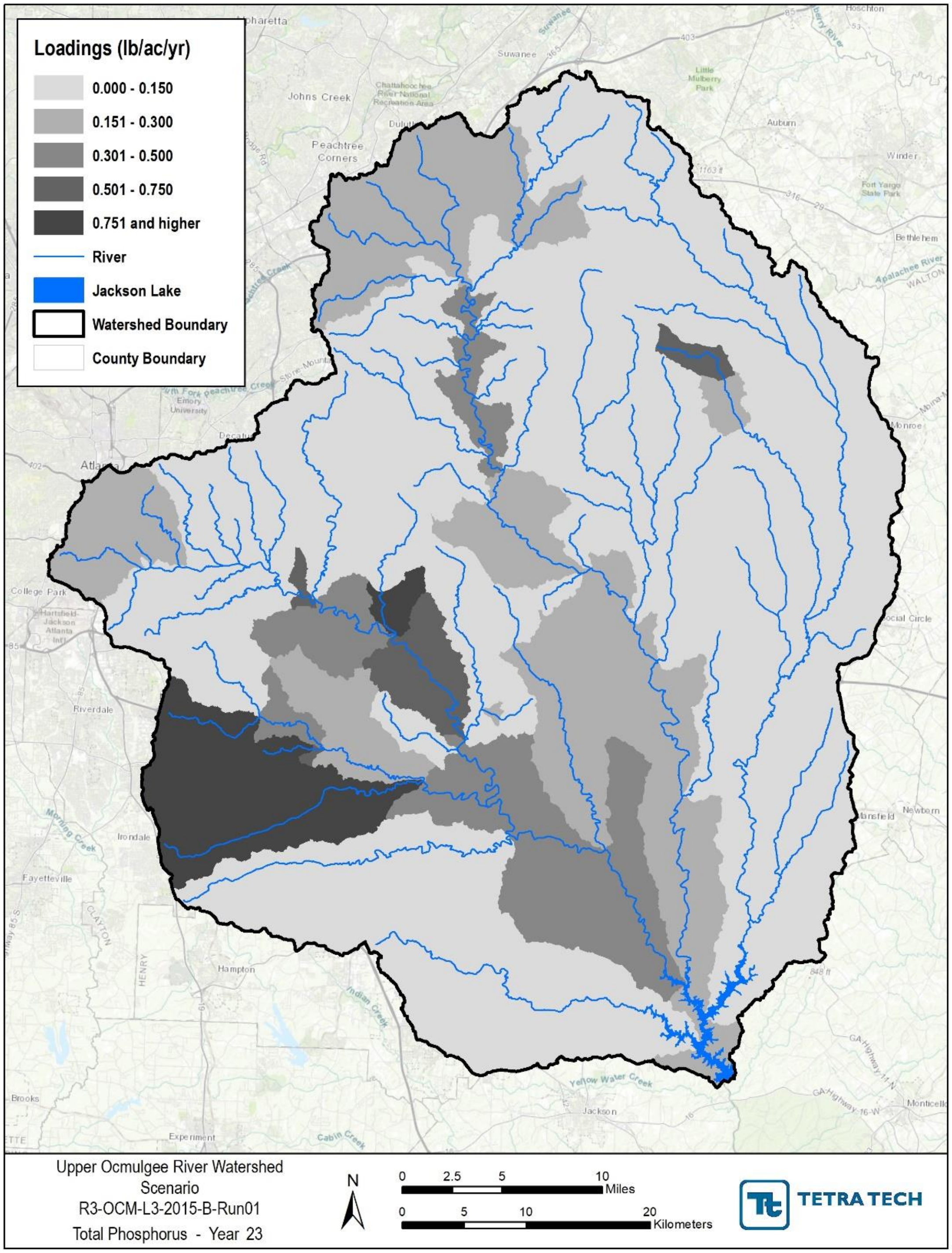


Figure 5-11: Upper Ocmulgee Watershed Wet Year Nutrient Loadings; Total Phosphorus Future (2050) Conditions

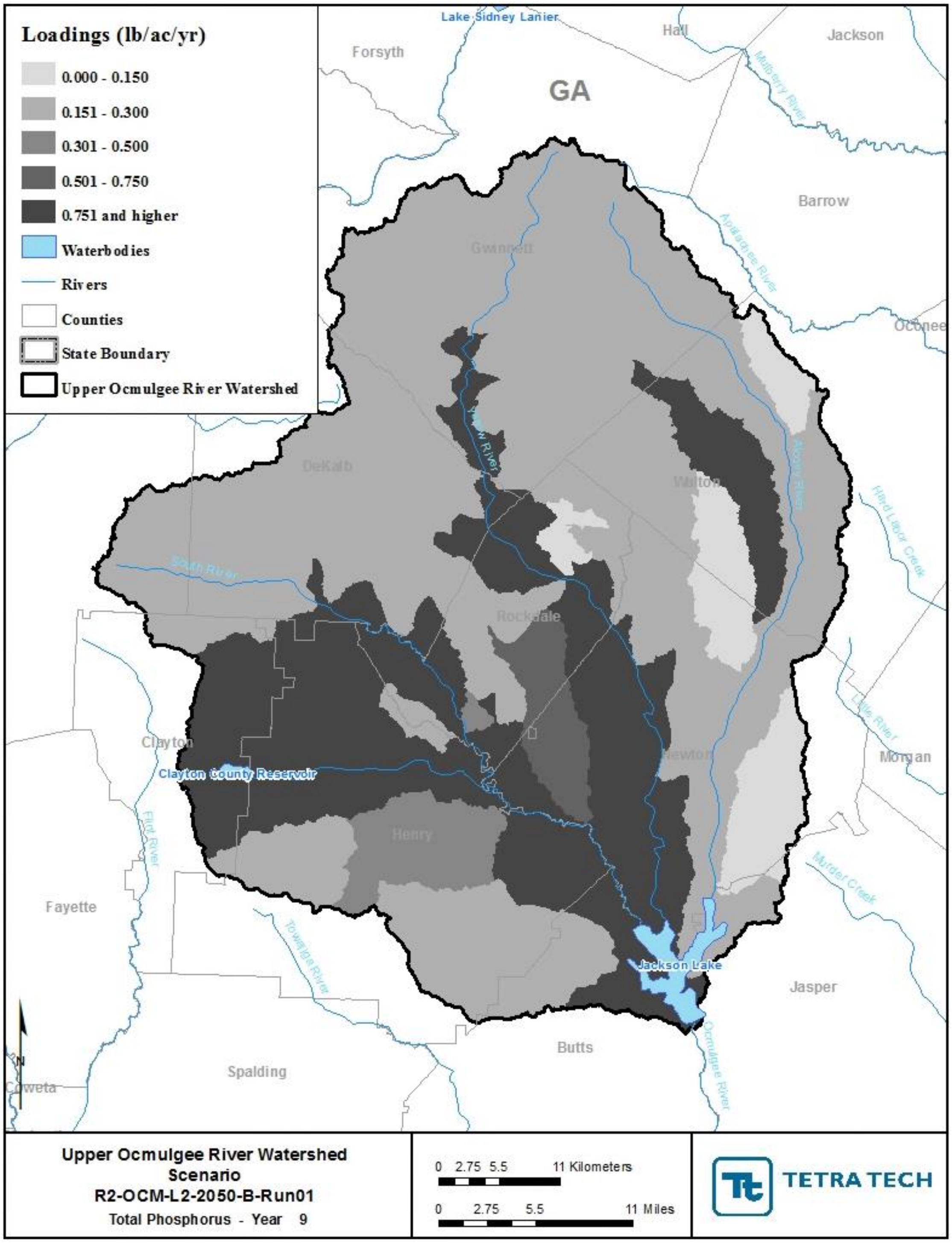


Figure 5-12: Upper Ocmulgee Watershed Wet Year Nutrient Loadings; Total Nitrogen Current (2020) Conditions

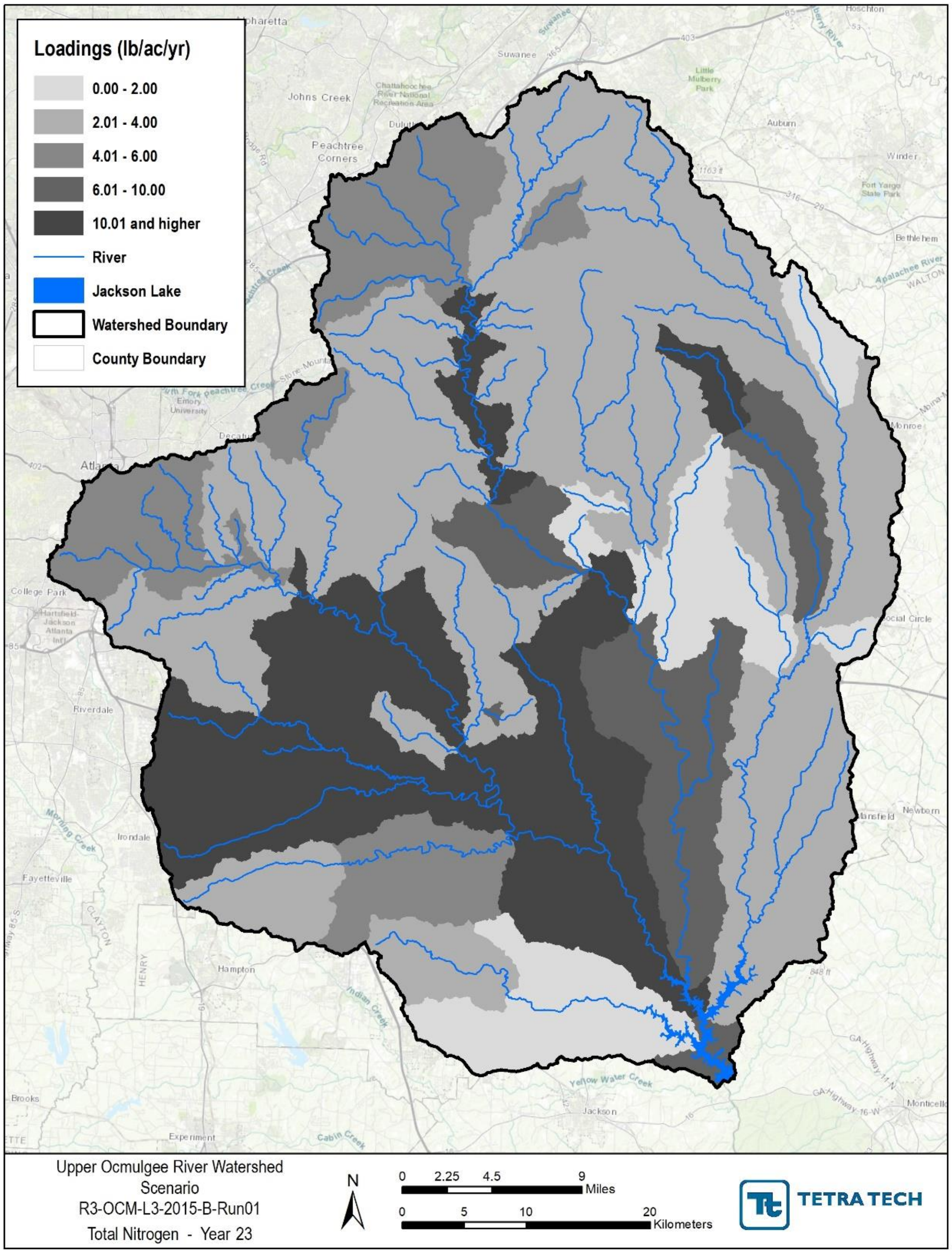
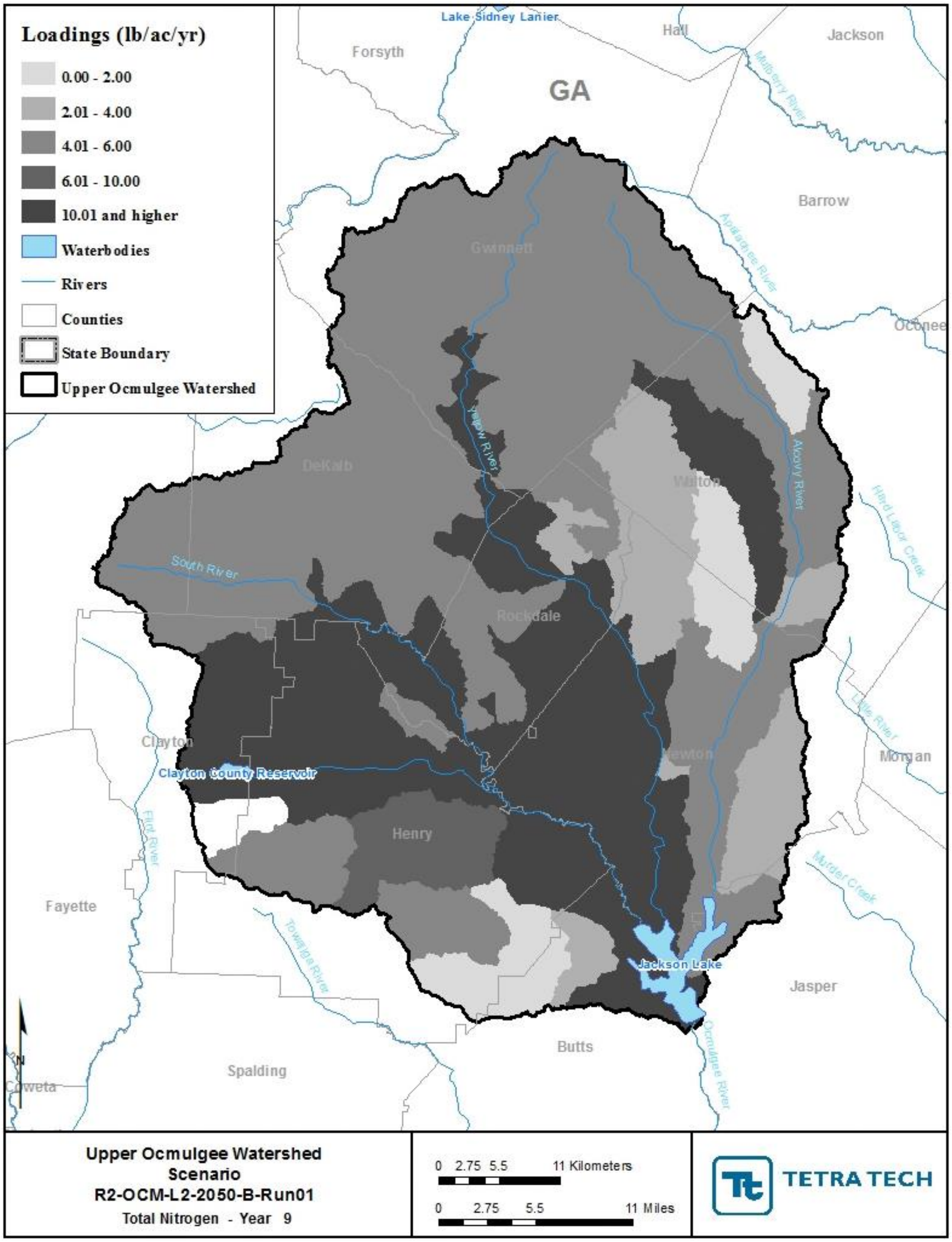
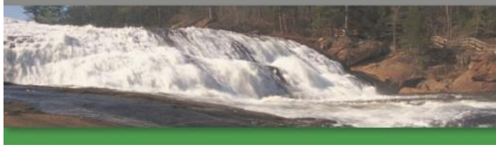


Figure 5-13: Upper Ocmulgee Watershed Wet Year Nutrient Loadings; Total Nitrogen Future (2050) Conditions





5.4. Future Capacity Comparisons

This section compares the Middle Ocmulgee Region's existing municipal permitted water withdrawals (surface and groundwater) and existing municipal permitted wastewater discharges to the 2060 future forecasts to identify potential needs, shortages, or surpluses at the county level. Individual entities within counties may have varying needs or surpluses.

Comparing the existing municipal permitted monthly average withdrawal limit with the forecast annual average demands indicates that future municipal water supply needs in the Middle Ocmulgee Region are met in all counties except Crawford, Jasper, and Lamar Counties. These three counties each exhibit a forecasted shortage of less than 1.0 MGD, as shown in Table 5-2.

These estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed. Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected in the table due to differences in water supply and permitted withdrawal limits at the utility level.

Table 5-2: Permitted Municipal Water Withdrawal Limits vs. 2060 Forecasted Demands (MGD) [1,2]

County	Current Permitted Water Withdrawals	Current 2020 Water Demand	Projected 2060 Water Demand	Potential 2060 Capacity Needs[3]	Potential 2060 Surplus Capacity Available
Macon-Bibb[4]	63.0[4]	23.8	23.8	-	39.2
Butts	11.0	2.3	3.0	-	8.0
Crawford	0.5	1.0	0.8	0.3	None
Houston	39.9	26.9	32.9	-	7.0
Jasper	1.1	1.4	1.7	0.6	None
Jones	3.2	2.8	2.6	-	0.6
Lamar	4.0	3.1	4.2	0.2	None
Monroe	4.0	3.4	3.6	-	0.4
Newton	37.5	15.3	25.7	-	11.8
Peach	3.7	2.5	2.2	-	1.5
Pulaski	1.6	1.4	1.1	-	0.5
Twiggs	0.8	1.0	0.7	-	0.1

Source: EPD Permit Data, Municipal Water Demand and Wastewater Flow Forecasting Methods Report (2022).

[1] Municipal Water Demand includes industries that obtain their water from a municipal source.

[2] Current permitted water withdrawal values include all permitted municipal groundwater withdrawals (annual average withdrawal limits) and all permitted municipal surface water withdrawals (monthly average withdrawal limits) in each County.

[3] Analysis does not account for demands in one county that may be met by permits from another County.

[4] Surface water withdrawal for Macon Water Authority is located in Jones County.

Future treatment capacity needs were determined based on a comparison of forecasted 2060 wastewater flow and current permitted capacity in the region (Table 5-3). The permitted quantities are based on existing municipal facilities permitted under the National Pollutant Discharge Elimination System (NPDES) or state land application system (LAS) permits. It should be noted that the comparison in Table 5-3 was completed at the county level and additional localized shortages in wastewater treatment capacity may exist.

Based on the forecasted wastewater flows, Lamar and Newton counties may need additional permitted capacity for point source discharge in the future.

Table 5-3: Permitted Municipal Wastewater Discharge Limits vs. 2060 Forecasted Municipal Wastewater Flows (AAD-MGD) [1]

County	Point Source (PS)			Land Application Systems (LAS)		
	Current Permitted Quantity	Projected 2060 Flow	2060 Permitted Capacity Need	Current Permitted Quantity	Projected 2060 Flow	2060 Permitted Capacity Need
Macon-Bibb	48.00	33.51	None	0.00	0.00	None
Butts	1.62	0.88	None	0.96	0.77	None
Crawford	0.44	0.13	None	0.00	0.00	None
Houston[2]	>18.01	15.40	None	2.018	0.01	None
Jasper	0.29	0.19	None	0.00	0.00	None
Jones	0.40	0.38	None	0.00	0.00	None
Lamar	2.40	5.50	3.10	0.00	0.00	None
Monroe	2.03	1.61	None	0.12	0.09	None
Newton	0.06	0.28	0.22	8.86	8.56	None
Peach	2.20	0.99	None	0.00	0.00	None
Pulaski	2.30	1.05	None	0.00	0.00	None
Twiggs	0.00	0.00	None	0.70	0.10	None

Source: EPD Permit Data, Middle Ocmulgee Water and Wastewater Forecasting Technical Memorandum (2022)
[1] Municipal treatment capacity includes industries that send their water to municipal plants for treatment.
[2] Houston County permitted totals include a permitted discharge from Robins Air Force Base that does not specify the permitted monthly average flow limit.

5.5. Summary of Potential Water Resources Challenges

This section summarizes the potential water resources issues in the Middle Ocmulgee Region. These potential water resources issues are the basis for the recommended management practices in Section 6.

The Middle Ocmulgee Region is fortunate to have abundant water supply sources; however, the 2060 surface water availability assessment indicated that there are four facilities with at least one day of a predicted water supply challenge and two facilities with substantial wastewater assimilation challenges. There are projected needs for additional permitted water withdrawal or wastewater discharge capacity as well.

In summary, major future water resource challenges for the Middle Ocmulgee Region include:

- Need for localized groundwater monitoring for counties withdrawing from the Floridan aquifer.
- Need for additional permitted municipal withdrawal capacity in Crawford, Jasper, and Lamar Counties.
- Need for additional wastewater planning and treatment capacity in Newton and Lamar counties.
- Potential surface water supply challenges for four facilities in Jasper, Lamar, Monroe, and Newton Counties.
- Potential wastewater assimilation challenges for surface water in all counties except Crawford and Peach Counties, with substantial challenges for the City of Perry in Houston County and the City of Monticello in Jasper County.
- Need for additional wastewater planning and monitoring to address potential limited assimilative capacity in several stream segments.
- Potential high nutrient loadings into Lake Jackson (particularly total nitrogen) and in the watersheds above Lake Jackson because of significant point source discharge contribution.
- Need for additional watershed protection and management of non-point and point discharge sources to further improve existing impaired stream status.
- Need for OSSMS (septic system) management in rural counties.

Table 5-4 summarizes the potential water resource issues and permitted capacity needs in the Middle Ocmulgee Region by County. Section 6 discusses the management practices appropriate to address these potential water resources issues.

County	Groundwater Supply Challenges (Aquifer) [a]	Surface Water Supply Challenges (# Facilities) [a]	Wastewater Assimilation Challenges (# Facilities) [a]	Municipal Water Withdrawal Needs (MGD) [b]	Municipal Wastewater Discharge Needs (MGD) [b]	Assimilative Capacity Challenges for Dissolved Oxygen (# Segments) [c]	Miles of 303(d) Not Supporting Reaches (# Segments) [d]
	Groundwater Availability Section 5.1	BEAM Results: Surface Water Availability Section 5.2	BEAM Results: Surface Water Availability Section 5.2	Future Capacity Comparisons Table 5-2	Future Capacity Comparisons Table 5-3	Water Quality Section 5.3	Water Quality Section 3.3.2
Macon-Bibb			Yes (3)				22.5 (3)
Butts			Yes (2)				31.0 (5)
Crawford				Yes (0.3)			51.1 (7)
Houston	Yes (Floridan)		Yes (3) 1 Substantial				36.2 (7)
Jasper		Yes (1)	Yes (1) 1 Substantial	Yes (0.6)			52.9 (11)
Jones			Yes (1)				31.8 (7)
Lamar		Yes (1)	Yes (2)	Yes (0.2)	Yes (3.1)		7.0 (2)
Monroe		Yes (1)	Yes (2)				62.4 (11)
Newton		Yes (1)	Yes (1)		Yes (0.2)		55.1 (10)
Peach							
Pulaski	Yes (Floridan)		Yes (2)				16.0 (2)
Twiggs	Yes (Floridan)		Yes (2)				6.0 (1)

Table 5-4: Summary of 2060 Potential Water Resources Challenges by County

Notes:
a) "Yes" indicates at least one day of a water supply or wastewater assimilation challenge.
b) A municipal “need” is where the current permitted water withdrawals or wastewater discharges, respectively, is less than the future forecast demands.
c) Potential challenges in assimilative capacity due to dissolved oxygen are for streams modeled to be “At Assimilative Capacity”, or “Exceeded” in Figures 5-3 through 5-8.
d) Includes only 303(d) reaches with not supporting status that are fully within each respective county. An additional 191.4miles are shared between two or more counties. 121.8 additional miles are shared with counties outside of the Middle Ocmulgee region. Impaired streams based on 2022 305(b)/303(d) list published by EPD.

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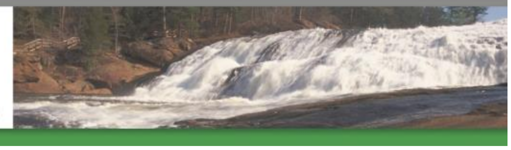
SECTION 6

Addressing Water Needs and Regional Goals



Section 6. Addressing Water Needs and Regional Goals

This section presents the water management practices recommended by the Middle Ocmulgee Regional Water Planning Council. These practices have been selected to meet the Council's vision and goals stated in Section 1 and to address resource shortfalls or challenges identified and described in Section 5. This section identifies short-term and long-term actions and parties responsible to implement each management practice and recommendations to the State.

<u>*Section Summary*</u>

In 2023, the Council updated its 2017 Management Practices to align with its vision and goals, as presented in Section 1, and to address the potential resource challenges identified in Section 5.

The Council's updates include reorganizing the management practices into five categories, eliminating practices required by state law, regulations or rules, consolidating repetitive or similar practices, and reflecting current regional needs. The revised management practices include the following categories:

- *5 - Administrative*
- *1 - Water Demand Management*
- *6 - Water Supply*
- *3 - Wastewater*
- *7 - Water Quality*

Implementation actions and parties responsible are provided for each management practices. Local governments and utilities are responsible for most of the implementation actions; however, support will be needed from various State entities.

6.1 Identifying Water Management Practices

Management practices seek to address the Middle Ocmulgee Region's likely resource challenges, needs, and shortages (as documented in Section 5), or other goals specific by the Council. The Council considered the following as it selected management practices for this Regional Water Plan:

- Existing plans and practices
- Council's vision and goals (see Section 1)
- Public input
- Coordination with stakeholders, including local governments, water providers, and major industrial water users or their respective industry associations.

For the initial Regional Water Plan adopted in 2011, the Council conducted a review of existing local and regional water and wastewater master plans, TMDL implementation plans, watershed assessment and management plans, and comprehensive plans to frame the selection of management practices. Where possible, management practices already planned for or successfully in use in the Region formed the basis for the water management practices selected by the Council.

The needs and interests of the stakeholders in the region are diverse. One of the Council's major concerns during the original water plan development in 2011 was that the recommended management practices not dictate what each stakeholder group or entity should do. Rather, they are presented as a menu for selection by entities within the Middle Ocmulgee Region, based on local needs and conditions. In subsequent updates, the existing plans and practices were revisited and considered in the context of forecasting updates, resource assessments summarized in Section 5, existing rules and regulations, changing conditions in the region, and neighboring council plans.

For the 2023 update to the Regional Water Plan, the Council conducted a review and assessment of the existing management practices that were adopted in 2017. Management practices were revised to provide clarity, remove redundancy with existing rules or regulations, and incorporate the Council's experience in the Region. The management practices were reorganized into five categories: Administrative, Water Demand Management, Water Supply, Wastewater, and Water Quality. The Administrative and Wastewater categories are new additions since the 2017 plan, while one 2017 category, "Education Initiatives" was consolidated into the Administrative category and removed as its own category. New management practices under these categories were drafted and adopted in this updated Plan.

6.2 Selected Water Management Practices for the Region

After multiple discussions and considering feedback from stakeholders and EPD, the Council selected 22 recommended management practices that focus on the most important and pressing water resource issues and address the goals identified by the Council. The recommended management practices are divided into five categories:

- Administrative
- Water Demand Management
- Water Supply
- Wastewater
- Water Quality

Tables 6-1 through 6-5 also identify the short- and long-term actions needed to implement the management practices and the corresponding responsible parties for each practice. The Council has defined short-term as occurring between 2023 and 2027 and long-term as year 2027 and beyond. It is assumed that all long-term activities would occur after the next 5-year Regional Water Plan update, allowing the Council to revisit these actions using an adaptive management approach.

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

6.2.1 Administrative Management Practices

The Council identified a need for an "Administrative" category that involves utility management topics that impact multiple categories of water resource management, such as financial measures, planning, and asset management. The administrative practices seek to promote and facilitate "prudent management" of water resources, as stated in the Council's vision, through responsible utility management and intentional administrative structures.

Table 6-1 presents the five Administrative Management Practices developed by the Council and the short-term and long-term implementation actions. The Administrative Management Practices include:

1. Develop and Update Asset Management Plans and Promote Full-Cost System Accounting

2. Develop and Update Local Utility Master Plans

3. Promote Coordinated Environmental Planning

4. Develop Regional Educational Materials for Localized Implementation and Outreach

5. Develop and Update Biosolids Management Plans

The administrative management practices support all six of the Council's goals and seek to reduce the water resource challenges documented in Table 5-4. While local utilities and governments are encouraged to implement all the administrative management practices, each is encouraged to routinely review the practices to determine which are appropriate for implementation in their community. Utilities will be required to report on their implementation activities to EPD as part of the permit renewal process.

<table>
<tr><th colspan="2">Table 6-1: Administrative Management Practices</th></tr>
<tr><td>Council Goals Addressed</td><td>1, 2, 3, 4, 5, 6,</td></tr>
<tr><td>Potential Challenges Addressed</td><td>Surface water availability, future withdrawal capacity, future treatment capacity, water quality (point and non-point source)</td></tr>
<tr><td colspan="2">AM-1: Develop and Update Asset Management Plans and Promote Full-Cost System Accounting</td></tr>
<tr><td colspan="2">Short-Term Implementation Actions</td></tr>
<tr><td colspan="2">• Develop a water system asset management program utilizing EPD guidelines
• Create water, wastewater, and stormwater maps in electronic format
• Coordinate water asset management and leak detection program
• Review existing staff certification and secure additional training as needed</td></tr>
<tr><td colspan="2">Long-Term Implementation Actions</td></tr>
<tr><td colspan="2">• Consider linking water, wastewater, and stormwater system maps with an asset inventory including operations and maintenance data
• Consider developing a wastewater and/or stormwater asset management program
• Prioritize rehabilitation projects and develop schedules and budgets.
• Consider reviewing and updating asset management plans every 5 years
• Promote full-cost accounting, including:
o Conduct revenue analysis
o Conduct rate studies
o Investigate pricing structures
o Evaluate accounting procedures
o Evaluate billing system functionality</td></tr>
<tr><td colspan="2">Responsible Parties</td></tr>
<tr><td colspan="2">• Local governments and utilities
• Support from EPD</td></tr>
</table>

AM-2: Develop and Update Local Utility Master Plans
Short-Term Implementation Actions
• Prepare or update local master plans based on growth or other system changes for with a 20-year minimum planning horizon: • Water System ○ Update water demand forecasts with local details; compare to Regional Water Plan forecast trend ○ Compare to locally available water supply (permitted or contractual amounts) ○ Assess need for additional water supply / alternatives analysis ○ Evaluate water treatment capacity and distribution system needs ○ Develop long-term capital improvements plan • Wastewater System ○ Update wastewater flow forecasts with local details; compare to Regional Water Plan forecast trend; consider service area changes with shifts in population density ○ Evaluate wastewater collection, treatment and effluent management needs and options ○ As needed, apply for wasteload allocations ○ Include planning and treatment of septage ○ Develop short- and long-term policies for transitioning unsewered areas to sewered areas ○ Develop long-term capital improvements plan • Stormwater System ○ Prepare or update a local stormwater master plan to identify potential runoff / water quality issues ○ Develop long-term capital improvement programs to better manage drainage systems and floodplains and to implement other water quality enhancement programs
Long-Term Implementation Actions
• Update master plans at least every 5 years, in coordination with the Regional Water Plan update schedule • Consider resiliency and adaptive management strategies
Responsible Parties
• Local governments and utilities • Support from EPD, regional commissions, GEFA, DCA

AM-3: Promote Coordinated Environmental Planning

Short-Term/Long-Term Implementation Actions

- Incorporate Regional Water Planning goals and management practices
    - Land use planning
    - Transportation
    - Water resources

Responsible Parties

- Council and EPD in collaboration with Regional Commissions and DCA
- Local governments and utilities
- Environmental advocacy groups

AM-4: Develop Regional Educational Materials for Localized Implementation and Outreach

Short-Term/Long-Term Implementation Actions

- Develop or distribute general educational materials for outreach by local governments or utilities; topics may include the following, depending on local needs:
    - Water conservation and efficiency
        - Homeowners or businesses
        - Industries
        - Landscape professionals, including drought tolerant landscaping or water efficiency certification programs
    - Protection of sensitive lands
    - Current water issues/awareness
    - Septic system maintenance
    - Reduction of non-point source pollution with the follow target audiences:
        - Residential / Commercial
        - Industries
        - Agricultural Community

Responsible Parties

- Local governments and utilities
- Support from EPD, Regional Commissions, DCA, the Association of County Commissioners of Georgia (ACCG), Georgia Municipal Association (GMA), Georgia Rural Water Association (GRWA), Georgia Association of Water Professionals (GAWP), and environmental advocacy groups

AM-5: Develop and Update Biosolids Management Plans
Short-Term/Long-Term Implementation Actions
• Evaluate residuals/biosolids management options for water and wastewater systems • Consider technologies available and compare costs for different alternatives
Responsible Parties
• Local governments and utilities • Support from EPD

6.2.2 Water Demand Management Practices

Table 6-2 includes one water demand management practice (applicable to the entire Region) aligned with the Region's vision and the goal to promote conservation of and efficient use of water. The State Water Plan and the State Water Conservation Implementation Plan (WCIP) states "*water conservation will be a priority water quantity management practice implemented to help meet water needs in all areas of the state and will be practiced by all water user sectors.*" Demand management practices were divided into four tiers, as follows:

- Tier 1: includes basic water conservation activities and practices that are currently required by statute or rules (regarding the State Water Plan and SB370 – Water Stewardship Act).
- Tier 2 includes basic water conservation activities and practices that may be addressed in EPD amended rules, but are not currently required of all permit applicants.
- Tier 3: includes basic water conservation activities and practices that were not intended to be addressed in current or upcoming amended rules.
- Tier 4: includes "beyond basic" water conservation practices to be considered if a gap exists between current or future water supplies and demands for the region.

The Council identified one, overarching Water Demand Management Practice:

1. Implement and Encourage Water Conservation Practices

This management practice supports three of the Council's goals:

- Goal #1: Maximize water supply sources to the extent practicable to provide sufficient water supply for the Region.
- Goal #3: Promote conservation of and efficient use of water.

- Goal #6: Support the comprehensive planning and management of water resources to maintain a healthy economy, ensure a high quality of life, and protect our natural resources.

The Water Demand Management Practice addresses potential water supply challenges at three facilities across the Region. These challenges are discussed in Section 5 and summarized in Table 5-4.

Table 6-2 presents the Water Demand Management Practice selected by the Council and the short-term and long-term implementation actions to support the Council's goals.

The Council supports the implementation of the demand management practice and encourages each water user or permittee to implement this practice where practicable, or as required by permit conditions. The Council encourages water users/permittees to evaluate the cost and operational implications of this practice and its associated implementation actions, and to implement them when they are beneficial to their operation. Utilities will be required to report on their implementation activities to EPD as part of the permit renewal process.

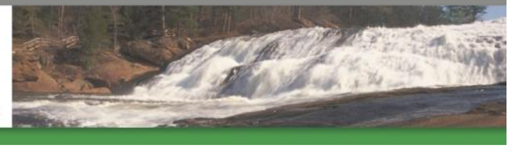
Table 6-2: Water Demand Management Practices	
Council Goals Addressed	1, 3, 6
Potential Challenges Addressed	Surface water availability challenges for 3 facilities in the region
WD-1: Implement and Encourage Water Conservation Practices	
Short-Term Implementation Actions	

• Consider implementing water conservation rate structures:
  • Residential
  • Non-residential (golf courses, industries, etc.)	

Long-Term Implementation Actions	

• Consider water billing options:
  • AMI and billing systems that communicate usage with customers
  • Provide historical and current data on bills when customers pay online
  • Provide gallon-based usage to customers	

Responsible Parties	
• Local governments and utilities • EPD	



6.2.3 Water Supply Management Practices

Management practices that supplement water supply are an important part of addressing the potential water resource challenges for the Region. The Council identified six Water Supply Management Practices:

1. Investigate Impacts of Metro Atlanta Area Discharges
2. Evaluate New and Existing Surface Water Reservoir Storage
3. Investigate New Groundwater Sources
4. Evaluate System Interconnections for Water Supply
5. Expand Water Treatment Capacity
6. Promote and Evaluate Beneficial Reuse

The Water Supply Management Practices support four of the Council's goals:

- Goal #1: Maximize water supply source to the extent practicable to provide sufficient water supply for the region.
- Goal #2: Support the protection of natural stream integrity to enhance ecosystem benefits such as water quality, fish and wildlife, floodplain protection and the recreation it provides.
- Goal #3: Promote conservation of and efficient use of water.
- Goal #6: Support the comprehensive planning and management of water resources to maintain a healthy economy, ensure a high quality of life, and protect our natural resources.

These Water Supply Management Practices seek to address potential water supply challenges documented in Table 5-4. Of the 12 counties in the Region, three are projected to have future needs in their permitted water withdrawal capacity. Three facilities were identified to have potential surface water availability challenges in 2060. Local utilities and governments will need to assess which management practices are appropriate for implementation in their community. Communities with resource assessment challenge, infrastructure needs, or shortages are encouraged to implement management practices to alleviate the challenge. Utilities will be required to report on their implementation activities to the EPD as part of the permit renewal process.

Table 6-3 presents the Water Supply Management Practices and short-term and long-term implementation actions to address the water supply challenges.

Table 6-3: Water Supply Management Practices	
Council Goals Addressed	1, 2, 3, 6
Potential Challenges Addressed	Surface water availability challenges for 3 facilities in the region, permitted water withdrawal capacity challenges in Crawford, Jasper, and Lamar counties
WS-1: Investigate Impacts of Metro Atlanta Area Discharges	
Short-Term/Long-Term Implementation Actions	
• Investigate impacts to pollutant loads in Lake Jackson and Ocmulgee River downstream of the Lake if the effluent discharges from Gwinnett, Dekalb, Clayton, Henry, Rockdale, and Spalding counties are proposed to be discontinued (that is, if all interbasin transfers discharges are returned to the basin of withdrawn). • Investigate impacts of pollutant loadings (especially nutrient) and emerging contaminants from various discharge scenarios in the Metro District • Investigate effects on local assimilative capacity in Lake Jackson and Ocmulgee River downstream of the Lake	
Responsible Parties	
• Local governments and utilities • EPD	
WS-2: Evaluate New and Existing Surface Water Reservoir Storage	
Short-Term/Long-Term Implementation Actions	
• Consider evaluating sediment and impact on existing reservoir capacity • Consider assessing abandoned quarries for local water supply needs • Conduct potential new source feasibility study (generally north of fall line) • Expand existing reservoirs (including those built by NRCS)	
Responsible Parties	
• Local governments and utilities • Regional Commissions • EPD	
WS-3: Investigate New Groundwater Sources	
Short-Term/Long-Term Implementation Actions	
• Conduct feasibility study of new groundwater sources, based on local need (generally south of the fall line)	
Responsible Parties	
• Local governments and utilities • EPD	

WS-4: Evaluate System Interconnections for Water Supply
Short-Term/Long-Term Implementation Actions
• Evaluate obtaining water from neighboring utility for regular or emergency water supply • Consider system interconnections during water master planning process
Responsible Parties
• Local governments and utilities • EPD
WS-5: Expand Water Treatment Capacity
Short-Term/Long-Term Implementation Actions
• Maximize or upgrade existing capacity, as needed • Monitor emerging contaminants and consider future treatment technologies • Evaluate new treatment of surface and groundwater based on local needs
Responsible Parties
• Local government and utilities • EPD
WS-6: Promote and Evaluate Beneficial Reuse
Short-Term/Long-Term Implementation Actions

• Evaluate the following to decrease overall system water demand:
  ◦ Indirect potable reuse: return highly treated wastewater to water supply reservoirs
  ◦ Non-potable reuse: irrigation with highly treated effluent in areas such as golf courses, parks, and residences

Responsible Parties
• Local government and utilities • EPD

6.2.4 Wastewater Management Practices

Wastewater management is essential to enhance the quality of life for all communities and protect the water quality of natural systems. The Council identified three Wastewater Management Practices:

1. Upgrade and Construct Wastewater Treatment Facilities

2. Mitigate Impact of On-Site Septic System Management (OSSMS)

3. Evaluate Constructed Wetlands (Beneficial Reuse)

These Wastewater Management Practices support three of the Council's goals:

- Goal #2: Support the protection of natural stream integrity to enhance ecosystem benefits such as water quality, fish and wildlife, floodplain protection, and recreation.

- Goal #4: Promote properly managed wastewater discharges and beneficial reuse.

- Goal #6: Support the comprehensive planning and management of water resources to maintain a healthy economy, ensure a high quality of life, and protect our natural resources.

The Wastewater Management Practices address potential assimilative capacity, wastewater treatment capacity, and water quality challenges described in Table 5-4. The Resource Assessments identified potential challenges with assimilative capacity, or the ability of Georgia's surface waters to absorb pollutants from treated wastewater and stormwater without degradation of water quality, for 19 facilities in the Region in 2060. Two counties, Lamar and Newton, have projected wastewater infrastructure capacity shortages. Therefore, new wastewater treatment facilities will likely need to be constructed and some of the existing facilities will need to be expanded and/or upgraded. The Resource Assessments also highlight the likely need for nutrient load reductions in Lake Jackson; however, further studies conducted by the State will be required to examine policies regarding total nitrogen loading limits. Additionally, eleven counties in the Region contain 303(d) listed impaired stream segments. These counties should consider implementation of the Wastewater Management Practices listed in Table 6-4 as well as implementation of the Water Quality Management Practices described in Section 6.2.6 to improve stream quality.

Table 6-4 present the Wastewater Management Practices and short-term and long-term implementation actions. Local utilities and governments will need to assess which management practices are appropriate for implementation in their community. Communities with resource assessment challenges, infrastructure needs, or shortages are encouraged to implement management practices to alleviate the challenge. Utilities will be required to report on their implementation activities to the EPD as part of the permit renewal process.

Table 6-4: Wastewater Management Practices	
Council Goals Addressed	2, 4, 6
Potential Challenges Addressed	Wastewater assimilation challenges (19 facilities in the region), wastewater treatment capacity challenges (2 counties), and 303d not supporting stream reaches (11 counties)
WW-1: Upgrade and Construct Wastewater Treatment Facilities	
Short-Term/Long-Term Implementation Actions	
• As identified by local wastewater master plans: ◦ Increase treatment capacity or improve level of treatment to meet future capacity needs and/or water quality standards ◦ Consider advanced treatment in planning process to meet future water quality standards and discharge limits ◦ Include septage treatment capacity at existing and planned wastewater treatment plant expansions, if appropriate for the community	
Responsible Parties	
• Local governments and utilities • EPD	
WW-2: Mitigate Impact of On-Site Septic Management System (OSSMS)	
Short-Term/Long-Term Implementation Actions	
• Consider future service areas of centralized wastewater collection and treatment services based on future population or land use density as part of local master planning: ◦ Increase returns to surface water in densely populated areas ◦ Prevent long-term water quality problems caused by failing OSSMS (septic systems) ◦ Identify areas where centralized sewer would benefit water quality (e.g., areas around lakes, streams, or small lots (<0.5 acre) that would not support OSSMS) ◦ Consider enacting local ordinance to require pumping out and inspection of septic tank as part of real estate transactions.	
Responsible Parties	
• Local governments and utilities • EPD • DCA • DPH	

WW-3: Evaluate Constructed Wetlands (Beneficial Reuse)
Short-Term/Long-Term Implementation Actions
• Consider wetlands for polishing treatment, which also promote beneficial reuse, wildlife habitat, and public use benefits
Responsible Parties
• Local governments and utilities • EPD

6.2.5 Water Quality Management Practices

While most of the selected Water Quality Management practices address point source discharges for improving assimilative capacity, the Council also recommends management practices that address the equally important non-point source pollution reduction. Both types of pollution sources are important to manage, as future growth in Georgia will likely decrease land cover, increase intensive land uses, and increase the volume of pollutants from both point and nonpoint sources.

The Council identified seven Water Quality Management Practices to address current and future water quality challenges:

1. Adopt Ordinances and/or Incentive Programs to Protect Sensitive Land
2. Establish a Stormwater Utility to Ensure Funding
3. Implement Watershed Improvement Projects
4. Implement Stormwater Standards for Rural Areas and Forest and Dirt Roads
5. Develop/Implement Watershed Assessment/Protection Plan Measures
6. Consider Water Quality Trading
7. Develop Commercial/Industrial Pollution Prevention Programs

The Water Quality Management Practices support three of the Council's goals:

- Goal #2: Support the protection of natural stream integrity to enhance ecosystem benefits such as water quality, fish and wildlife, floodplain protection, and recreation.
- Goal #5: Support the reduction of non-point source pollution by advocating for enhanced stormwater management and better land management practices.

- Goal #6: Support the comprehensive planning and management of water resources to maintain a healthy economy, ensure a high quality of life, and protect our natural resources.

The Water Quality Management Practices address potential challenges with assimilative capacity and water quality described in Table 5-4. The Resource Assessments identified potential challenges with assimilative capacity for 19 facilities in the Region in 2060. Eleven counties in the Region contain 303(d) listed impaired stream segments, which illustrates the need for a focused effort on implementing the Water Quality Management Practices. The Resource Assessments also highlight the likely need for nutrient load reductions in Lake Jackson; however, further studies conducted by the State will be required to examine policies regarding total nitrogen loading limits.

Table 6-5 presents the seven Water Quality Management Practices and short-term and long-term implementation actions. Local utilities and governments need to assess which management practices are appropriate for implementation in their community. Communities with resource assessment challenges, infrastructure needs, or shortages are encouraged to implement management practices to alleviate the challenge. Utilities will be required to report on their implementation activities to the EPD as part of the permit renewal process.

Table 6-5: Water Quality Management Practices	
Council Goals Addressed	2, 5, 6
Potential Challenges Addressed	Assimilative capacity for stream dissolved oxygen and 303d not supporting stream reaches
WQ-1: Adopt Ordinances and/or Incentive Programs to Protect Sensitive Land	
Short-Term/Long-Term Implementation Actions	

• Consider adopting ordinances or incentive programs for developers to protect or conserve environmentally sensitive lands and to minimize impacts of development. The programs may include any combination of the following based on local needs or issues (such as impaired streams):
  • Stream buffer protection (wider buffer requirement to filter pollutants, various buffer widths for different slopes)
  • High priority watersheds (based on Wildlife Resource Division's published list)
  • Floodplain protection (wider buffer along larger streams or in lower part of watersheds)
  • Wetlands protection
  • Protection of areas with steep slopes (minimize development in these areas or mitigate the effects of sediment and erosion)
  • Site plan review to prohibit or minimize development in floodplain or other sensitive areas	

Responsible Parties	
• Local governments and utilities in collaboration with environmental protection groups	
WQ-2: Establish a Stormwater Utility to Ensure Funding	
Short-Term/Long-Term Implementation Actions	
• Consider establishing a stormwater utility (or other mechanism) to ensure funding for stormwater management programs	
Responsible Parties	
• Local governments and utilities • EPD	

WQ-3: Implement Watershed Improvement Projects
Short-Term/Long-Term Implementation Actions
• Implement watershed improvement projects to help restore streams to attain designated uses, as well as impacted habitats and flow regimes. Projects can include physical improvements, such as: • Retrofit existing stormwater infrastructure • Restore ecosystem (stream/wetlands restoration)
Responsible Parties
• Local governments and utilities
WQ-4: Implement Stormwater Standards for Rural Areas and Forest and Dirt Roads
Short-Term/Long-Term Implementation Actions
• Implement ordinances/policies requiring stormwater management for new developments • Adopt Georgia Stormwater Management Manual (Blue Book) or equivalent local design manual • Implement Georgia Forestry Commission Best Management Practices (BMPs) manual • Expand education and compliance with the Measures outlined in Georgia Forestry Commission BMP manual • Implement dirt road BMPs
Responsible Parties
• Local governments and utilities with support from the Georgia Forestry Commission
WQ-5: Develop/Implement Watershed Assessment/Protection Plan Measures
Short-Term Implementation Actions
• Work with EPD to (1) develop watershed assessment and protection plans as part of wastewater treatment/discharge upgrade and/or expansion process, and (2) implement watershed monitoring and protection measures identified in these plans • Implement the following watershed protection plan elements if a water supply watershed is located within the jurisdiction: • Reservoir buffers • Lot size requirements • Septic setbacks • Reservoir use restrictions

Long-Term Implementation Actions

• Consider the following programs to address non-point source pollution and stormwater management issues:
  • Low Impact Development (LID)
  • Reduction of impervious surfaces in development and building design
  • Land (green space) conservation
  • Transfer of development rights to encourage utilization of conservation easements with limitation of developer rights
  • Local governments may adopt incentive programs

Responsible Parties
• Local governments and utilities • EPD
WQ-6: Consider Water Quality Trading
Short-Term/Long-Term Implementation Actions
• Consider watershed-based water quality trading program that can complement water quality regulation • Consider wetlands/stream banks mitigation projects, if beneficial to water quality
Responsible Parties
• Local governments and utilities with support from EPD
WQ-7: Develop Commercial/Industrial Pollution Prevention Programs
Short-Term/Long-Term Implementation Actions
• Adopt pollution prevention and good house-keeping programs that will eliminate or prevent pollutants from entering stormwater systems and reaching water bodies • Encourage industrial facilities to monitor for PFAS
Responsible Parties
• Local governments and utilities with support from EPD

6.3 Recommendations to the State

The Council recommends the following actions by the State that support implementation of the Regional Water Plan (Table 6-6). The recommendations include additional data collection and modeling needs for improving future regional water planning efforts.

Table 6-6: Recommendations to the State

Public Education and Outreach	Develop an outreach program to feature the Middle Ocmulgee Region's abundant water resources to promote future economic growth.
	Develop regional education materials for use and customization by local entities.
Policy	Continue to study and evaluate current instream flow policy. Consider an alternative minimum instream flow policy such as stream-specific instream flow values instead of the current monthly 7Q10 requirement (especially for ecologically sensitive streams). Encourage state or federal funding for minimum instream flow research that includes a pilot stream-specific study in each of the river basin or planning region, beginning with streams designated as DNR high priority streams, other ecologically sensitive streams, or streams predicted to fall short of instream flow target in other water planning regions. These studies should be used to establish an updated DNR instream flow policy for all similar streams in that basin or region. These studies should be completed before the next regional water planning cycle.
	Continue the current adaptive management and instream flow strategy for permitting additional water supply reservoirs in the state (all regions).
	Evaluate future nutrient policy based on analysis of additional monitoring and data for nitrogen levels in Lake Jackson and its watersheds and the impacts of elevated nutrient loadings.
Additional Data (Surface Water)	Evaluate and better integrate "critical (minimum instream flow) conditions" in Surface Water Quality Resource Assessment models for the future Regional Water Plan Update. Coordinate and ensure consistency for period of records used for all Resource Assessments.
	Continue to monitor interbasin transfers and provide the Council with a summary of interbasin transfers for the region to be included in the future Regional Water Plan Update.

Table 6-6: Recommendations to the State

Additional Data (Water Quality)	Conduct additional monitoring on segments of streams predicted to have exceeded DO assimilative capacity in the future Resource Assessment (full permit limits assumptions) and evaluate possible causes before determining actions to correct the potential impairment.
	Encourage further research on emerging contaminants.
	Conduct additional monitoring on nutrient loadings in Lake Jackson and its watersheds and evaluate the impacts of elevated nutrient loadings, especially nitrogen.
Funding	Identify long-term funding mechanism, beyond grants, to assist responsible parties with implementation.
	Identify a mechanism to allow for ongoing Middle Ocmulgee Council input between the 5-year updates and during implementation of this plan.
	Continue to promote use of the Regional Water Plan Seed Grant Funds and provide technical support to potential applicants.
	Fund innovative research strategies to address state-wide water resource challenges, such as detailed mapping and modeling of groundwater resources.
Coordination	Coordinate with USGS regarding its 5-year water use data collection efforts so these data can be aligned with other EPD data reporting efforts and used for future regional planning purposes.
	Coordinate local watershed monitoring efforts with regional or state monitoring efforts.

SECTION 7

Plan Collaboration and Alignment

Section 7. Plan Collaboration and Alignment

This section discusses Plan alignment with other plans and potential funding sources to support the implementation of the management practices. In addition, the Council developed benchmarks, outlined in this section, to assess the progress of the management practice implementation.

The Regional Water Plan should be updated every five years, but can be amended sooner if additional needs are identified in the interim period.

This section presents the Middle Ocmulgee Council's alignment with state and local governments, utilities, and other plans in the development of this Plan. Funding options for implementation actions are discussed but planning level cost estimates for implementation actions are not included in this plan update. Guidance is provided to benchmark and monitor implementation progress.

Every five years, the Regional Water Plan should be reassessed and updated. The Regional Water Plan will be used to:

- Guide permitting decisions by EPD.
- Guide the awarding of Section 319(h) Nonpoint Source Implementation Grant funds from EPD.
- Guide the awarding of State grants and loans for water-related projects.

7.1 Fiscal Implications of Selected Water Management Practices

Additional funding guidance has not been included, as development of cost estimates for management practices are variable and dependent on several factors including scope of work, market conditions, technological improvements and availability of supplies, equipment, and labor. Georgia EPD developed a "Supplemental Guidance for Planning Contractors: Water Management Practice Cost Comparison," last revised in April 2011, that provides guidance about the relative costs of various water management practices.

7.1.1 Funding Sources and Options

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

For local governments/utilities, water and sewer rates can be designed to provide a steady revenue stream to support implementation of actions. Other potential sources of funding for local governments can include general funds raised through property taxes or service fees and grants. Utilities can leverage bonds or other loan options (such as loans from GEFA) can provide up-front funding for required one-time infrastructure investments but must be repaid through user charges or other recurring revenues.

It is not likely that the costs of implementation can be supported by non-rate revenues in many communities. Grants are only available in limited quantities and under certain conditions, and sources of ongoing revenues such as general government tax receipts and sales tax proceeds are often already over committed. As a result, most communities may need to reflect most implementation costs in their operating budgets and recover these costs through water and sewer or stormwater user charges. Limited implementation funding may be obtained through GA EPD's Seed Grant program, which specifically seeks to support and incentivize local governments and other water users as they undertake their Regional Water Plan implementation responsibilities.

WaterFirst designated communities receive discounts on interest rates for loans. The program is a voluntary partnership between local governments, state agencies, and other organizations working together to increase the quality of life in communities through the wise management and protection of water resources. It promotes a proactive approach to water resources that makes the connection between land use and water quality and quantity, which is consistent with the Council's goal. Details of this program can be found on the GEFA website: https://gefa.georgia.gov/waterfirst

For agricultural (farmers) or industrial permittees (industries or businesses), the sources of funding include investment by the individual or business, grants, and/or incentive programs. The Council and stakeholders in the Middle Ocmulgee Region have identified that creation of new or expansion of existing incentive programs can encourage implementation of demand management practices.

7.2 Alignment with Other Plans

The update of the Regional Water Plan builds upon the knowledge base of previous planning efforts by the Council as well as state and local governments and utilities. Where possible, local planned projects and/or successful management practices are considered in the development of this plan. No known major conflicts between this Regional Water Plan and other plans have been identified. The Council encourages continuing alignment with all local and regional efforts for future updates of the Regional Water Plan. Coordinated environmental planning is recognized as a management practice, so that recommendations in the Regional Water Plan can be incorporated in other major regional or local planning, such as comprehensive land use plans, transportation plans, or local master plans.

Some differences exist in planning timing or cycles for various local planning efforts:

- Local comprehensive plans: typically prepared for a 20-year planning horizon and a complete or partial update of the comprehensive plan can be prepared every 5 years.

- Water and wastewater master plans and capital improvement plans: typically prepared for a 20- to 30-year planning horizon and updated every 5 years.

- Georgia's investor-owned utilities (Georgia Power, Atlanta Gas Light Company and Liberty Utilities) forecast future demand and develop comprehensive plans for a 10-year planning horizon for supply and demand management for their service territories under the Guidance of the Georgia Public Service Commission (PSC).

- This Regional Water Plan has a 35-year planning horizon to allow evaluation of major water supply needs and their long-term impacts on water resources.

The differences in planning horizons indicate that the projects identified in local plans may not completely address the resource challenges identified in this Regional Water Plan. However, the potential trends and challenges identified by this Plan can be used to guide decision-making by both local governments and state agencies to avert potential negative impacts on water resources in the region.

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

7.3 Benchmarks

The benchmarks prepared by the Middle Ocmulgee Council (listed in Table 7-1 below) are used to assess the effectiveness of this Regional Water Plan's implementation and identify where revisions are needed. As detailed below, the Council selected both qualitative and quantitative benchmarks to assess whether the Plan's water management practices address potential challenges overtime and facilitate progress towards attaining the region's vision and goals.

The Council recommends specific benchmarks for each of the recommended management practices. Measurement of these benchmarks is primarily conducted by surveys at various frequencies and some of the data can be gathered from reports already required by permit conditions. For additional voluntary management practices, the Council recommends a survey prior to the 5-year plan update process. EPD and DCA will continue to serve as the responsible party to administer surveys, with appropriate assistance from partnering agencies or local governments. These benchmarks should be revisited during the 5-year plan update process and revised as necessary depending on implementation of management practices and other available information.

Table 7-1: Benchmarks for Management Practices

Management Practices	Benchmark	Measurement Tools	Time Period
Demand Management Practices	Implementation of Recommended Water Conservation Practices	Survey based on annual water conservation progress report, with help from Regional Commissions, GSWCC, Farm Bureau, County Extension Service, and DCA	Annual
	Reduction of Residential Per Capita Water Use	Calculation of residential per capita demand (gpcd) for municipal water withdrawal permittees via annual water conservation progress report	Annual
	Reduction of Industrial Water Use Intensity	Calculation of water use intensity for industrial water withdrawal permittees via annual water conservation progress report; examples include 1) gallons consumed per square foot of production space, 2) gallons of water consumed per kilowatt produced for energy generation facilities, or 3) other appropriate water consumption per production unit	Annual
Water Supply Practices	Investigate Impacts of Metro Atlanta Area Discharges: Initiation or completion of regional interbasin study	Completion of study	Every 10 years
Wastewater Practices	Meeting treatment capacity needs and compliance with water quality standards	Quantities of additional permitted treatment capacities or upgrades	Every 5 years
Water Quality	Support Designated Uses	305(b)/303(d) List of Impaired Waters	Every 2 years
	Adoption of ordinances for stream buffer, floodplain, or other sensitive lands protection beyond minimum requirement Number of acres of lands identified as environmentally sensitive lands Number of acres placed as "conservation land" for protection of sensitive lands	Survey with help from DCA, GSWCC, Regional Commissions and WRD of DNR	Every 5 years
	Number and list of watershed protection plans completed	305(b)/303(d) List of Impaired Waters	Every 2 years
	Number and list of watershed improvement/restoration projects completed	Survey with help from Regional Commissions, Farm Bureau, and DCA	Every 2 years

Table 7-1: Benchmarks for Management Practices

Management Practices	Benchmark	Measurement Tools	Time Period
Additional Management Practices	Number of local master plans initiated or completed	Survey	Every 5 years
	Number/type of local educational and outreach programs developed based on regional materials	Survey based on annual water conservation progress report; and surveys (for other educational programs) with help from Regional Commissions and DCA	Every 5 years
	Implementation of selected practices based on local needs and conditions	Survey with help from Regional Commissions and DCA	Every 5 years

* For these measurement tools, EPD is assumed to be the lead responsible party to administer surveys with help from partnering agencies or local governments.

7.4 Plan Updates

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

7.5 Plan Amendments

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

- Proposal (or expansion) of a major water-using industry or development, including energy generation, military or agricultural facilities, that would be expected to significantly change the water demand or discharge conditions of the region;
- Closure of major existing water use facilities that would significantly change the water demand or discharge conditions of the region;
- Major change in regulatory requirements, such as nutrient loading or instream flow requirements based on in-depth studies;
- Major political or judicial decisions that may impact the region;
- Major interbasin transfer into or out of the region;
- New information that results in resource availability challenges.

The Middle Ocmulgee Water Planning Council recommends that the current Council members continue to operate in a similar capacity, even after expiration of 3-year terms. The Council also recommends that some portion of the existing members be re-appointed to the Council prior to the initiation of future Regional Planning processes to ensure continuity, and that EPD continue to lead the coordination of future regional water planning activities. Any future plan amendments need to be considered and approved by the Council. If the Council considers making changes to the Regional Water Plan, the Council will call a meeting for such consideration between plan updates. Council meetings conducted to review and approve future plan amendments should invite stakeholder and general public input.

SECTION 8

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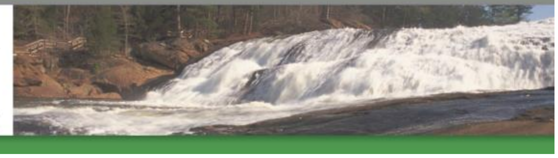
APPENDIX A

Summary of 2023 Middle Ocmulgee Regional Water Plan Revisions

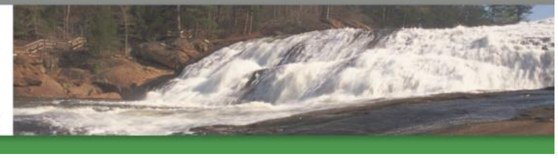


Section	Location	Change	Description
All	Throughout	Minor updates	• Revised text to improve clarity and grammar
ES	All	Changed section headings	• Changed the ES section headings and content to align with the report section headings
ES	Overview	Significant updates to text	• Added a summary box with the updated vision statement and goals of the Council • Briefly established the purpose of the Plan • Moved all other text into the Introduction section to align with the Plan's structure
ES	Introduction	Minor updates to text	• Created section to align with Section 1 of the Plan • Moved and updated text from 2017 overview section regarding the planning process • Updated years of past plans
ES	The Middle Ocmulgee Water Planning Region	Minor updates to text	• Retitled section to align with Section 2 of the Plan • Provided the number of cities and towns instead of the number of municipalities • Updated population information based on the most recent data (2020 U.S. Census Bureau) • Revised the percentage of land area covered by urban development • Relocated data of water withdrawn and wastewater treated to the next section to align with the Plan
ES	Water Resources of the Region	Significant updates to text	• Created section to align with Section 3 of the Plan • Updated water use and wastewater return information to reflect the most recent information compiled by USGS (2015) • Added more detailed information regarding the baseline Resource Assessments and summarized results • Added details about water resources in the region and impaired streams
ES	Forecasting Future Water Resource Needs	Significant updates to text	• Retitled section to align with Section 4 of the Plan • Updated population, water, and wastewater forecast data and discussion
ES	Figure ES-2	Updates to figure	• Updated water demand and wastewater flow forecast data and years
ES	Comparison of Water Resource Capacities and Future Needs	Significant updates to text	• Retitled section to align with Section 5 of the Plan • Updated assessment year to be 2060 • Updated future resource assessments' results and discussion • Relocated council vision and goal summary box to the Overview section

Section	Location	Change	Description
ES	Table ES-1	Addition of Table ES-1	• Added table with 2060 potential challenges, needs, or shortages by county
ES	Addressing Water Needs and Regional Goals	Significant additions to text	• Retitled section to align with Section 6 of the Plan • Consolidated and updated management practice discussion • Added mention of implementation actions
ES	Plan Collaboration and Alignment	Significant revisions/updates to text	• Added section to align with Section 7 of the Plan • Added details about plan alignment with governments and other plans, a discussion of funding and parties responsible for implementing the Plan, benchmarking, and the Plan update cycle
ES	Conclusions	Minor text revisions/updates	• Updated planning year to 2060 • Added Floridian aquifer systems to discussion • Removed the reference to Section 7
1	Section 1	Minor text revisions/updates	• Updated planning year to 2060 • Added that volunteer members may have been a part of previous plan updates
1	Section 1.1	Minor text revisions/updates	• Updated span of current and previous plan update process in years
1	Section 1.2	Significant text revisions/updates	• Added 2017 as prior year of Regional Water Plan • Revised the process utilized for the Plan update • Removed previous reference to technical memorandum
1	Figure 1-2	Updates to Figure 1-2	• Updated planning process based on public/local government input and coordination with other regional water planning councils
1	Section 1.3	Minor text revisions/updates	• Revised the Council goals and vision statement
2	Section 2.0	Minor text updates	• Updated the number of cities and towns • Updated percentage of forested land cover in the summary box
2	Figure 2-1	Updates to Figure 2-1	• Updated the Middle Ocmulgee Planning Region map
2	Section 2.2.1	Minor updates to text	• Updated with 2020 population data
2	Table 2-1	Updates to Table 2-1	• Updated population by county with 2020 data from the U.S. Census Bureau
2	Section 2.2.2	Significant updates to text	• Updated the employment data and discussion to reflect more recent data from the Census Bureau and the Georgia Department of Labor
2	Section 2.2.3	Minor text revisions/updates	• Updated the land use information with more recent data from USGS and EPA.
2	Figure 2-3	Updates to Figure 2-3	• Updated land coverage based on USGS data

Section	Location	Change	Description
3	Section 3.0	Significant revisions/updates to text	• Revised water usage data, resource assessments' results, and references
3	Section 3.1	Significant revisions/updates to text	• Updated to reflect the most recent water usage data (2015) • Added detail to the water usage category descriptions
3	Figures 3-1 to 3-4	Updates to Figures 3-1 to 3-4	• Updated water usage data (2015)
3	Section 3.2	Minor text revisions	• Added clarification that assimilative capacity is part of the surface water quality resource assessment
3	Section 3.2.1	Organizational changes	• Divided Section 3.2.1 into two subsections: Dissolved Oxygen and Nutrient Modeling
3	Section 3.2.1.1	Minor text revisions	• Added as subsection of 3.2.1
3	Table 3-1	Updates to Table 3-1	• Updated the dissolved oxygen results and number of modeled miles of streams • Added a row displaying the total river miles for each assimilative capacity category • Updated data reference
3	Figure 3-5	Revisions to Figure 3-5	• Updated region graphs with the 2022 assimilative capacity assessment results for current permit conditions
3	Section 3.2.1.2	Minor text revisions	• Added as subsection of 3.2.1 • Clarified that nutrient modeling was conducted in 2017
3	Section 3.2.2	Significant text revisions	• Replaced 2017 surface water availability discussion with new BEAM model methodology and results • Revised Surface Water Resource Assessment process • Edited description of Figure 3-6 • Replaced "gap" with "challenge" to align with the BEAM terminology
3	Figure 3-6	Updates to Figure 3-6	• Updated results and facilities modeled in 2023 for the region
3	Section 3.2.3	Minor text revisions	• Clarified the thresholds for adverse impacts • Added detail regarding the results from the 2010 groundwater availability modeling • Added text discussing the additional 2012 modeling conducted on the Cretaceous Sand aquifer
3	Section 3.3	Minor text revisions	• Updated the number of species found on Georgia's list of protected animals
3	Section 3.3.1	Minor text revisions/updates	• Updated the number of impaired stream segments and total stream length
3	Figure 3-7	Revisions to Figure 3-7	• Updated the impaired waters from the 2022 303d list

Section	Location	Change	Description
3	Section 3.3.2	Significant text revisions/updates	• Included recent Wildlife Action plan revision events • Described the new Outdoor Stewardship Program instead of the Land Conservation Program • Updated website references
3	Figure 3-8	Revisions to Figure 3-8	• Updated with current high priority watersheds using prioritization from 2015 which was approved in 2016
3	Section 3.3.3	Updated text	• Updated the aquatic species currently in Georgia's list of protected animals • Removed old in-text website reference • Removed the Atlantic sturgeon from the referenced fish habitat in the Middle Ocmulgee region • Changed the number of anadromous fish with declines in riverine habitat from three to two
4	Section 4.0	Updated text	• Updated to 2020 and 2060 for water and wastewater forecasts • Updated the location of supplemental forecast documents • Revised section summary box to reflect 2020 and 2060 forecasts
4	Section 4.1	Significant text addition	• Added descriptions of municipal, commercial, and residential water uses • Clarified the industries forecasted separately
4	Section 4.4.1	Significant text addition/update	• Added details about the development of population projection data
4	Table 4.1	Updates to table	• Updated 2019 population forecasts from OPB for 2020 through 2060
4	Section 4.1.2	Significant text addition	• Described additional data sources used in the development of the water and wastewater forecasts
4	Section 4.1.3	Significant text revisions/updates	• Updated to 2020 and 2060 and associated total municipal water demand forecasts for the region • Provided detailed and updated explanations of the methodology for the municipal water demand forecast, including use of water loss audit data when available
4	Figure 4-1	Revisions to Figure 4-1	• Updated with 2022 municipal water forecast data
4	Section 4.1.4	Significant text revisions/updates	• Provided detailed and updated explanations of the methodology for the municipal wastewater flow forecasts • Included details of stakeholder input • Updated years and forecasted flows • Added details about I&I
4	Figure 4-2	Revisions to Figure 4-2	• Updated using 2022 wastewater forecasting data



Section	Location	Change	Description
4	Section 4.2	Significant text revisions/updates	• Updated and revised the basis of planning efforts revolving around permit information and representative input as opposed to employment data
4	Section 4.2.1	Significant text addition	• Added introductory information about EPD's industrial stakeholder advisory group and conclusions
4	Section 4.2.2	Significant text revisions/updates	• Documented assumptions and the process to develop industrial water withdrawal forecasts • Updated the regional totals for industrial water demands
4	Figure 4-3	Revised Figure 4-3	• Updated with 2022 industrial water forecast data
4	Section 4.2.3	Significant text revisions/updates	• Updated industrial wastewater flow forecasting assumptions, methodology, and results
4	Figure 4-4	Revisions to Figure 4-4	• Updated to 2022 industrial wastewater forecast data
4	Section 4.3	Minor text revisions/updates	• Updated agricultural forecast years and water demands • Revised word choice
4	Table 4-2	Revisions to Table 4-2	• Updated using 2022 agricultural water forecast data
4	Section 4.4	Significant text revisions/update	• Changed section title from "Thermoelectric Generation Forecasts" to "Energy Forecasts" • Updated years • Revised reference to the forecasting memorandum • Clarified abbreviations of the organizations in the energy sector advisory group • Changed terminology to "thermoelectric energy" and "thermoelectric energy generation" instead of "thermoelectric power" • Revised details about the forecast assumptions, process, and relevant facilities, including the anticipated retirement of Plant Scherer and three natural gas-fired power facilities • Updated the energy sector forecast
4	Table 4-3	Revisions to Table 4-3	• Updated the energy sector water demand forecast from the 2020 memorandum
4	Section 4.5	Significant text updates	• Updated trend discussion and regional totals for the water demand and wastewater flow forecasts
4	Figures 4-5 to 4-9	Revisions to Figures 4-5 – 4.9	• Updated using 2022 data from the Middle Ocmulgee Water and Wastewater Forecasting Technical Memorandum • Added Figures 4-8 and 4-9
5	Section 5	Minor text revisions	• Updated summary box of future water resource needs with resource assessments' results

Section	Location	Change	Description
5	Section 5.1	Significant text updates	• Updated to show the most current sources • Clarified the cause of the forecasted increase in demand for groundwater • Added a discussion of the geological challenges to quantifying a sustainable yield for the Crystalline Rock aquifer and need for local assessments • Compared the 2010 estimates of groundwater availability to the 2060 forecasted demands for the Floridan and Crystalline Rock aquifers • Compared the updated 2012 estimate of groundwater availability to the 2060 forecasted demands for the Cretaceous aquifer
5	Figure 5-1	Revisions to Figure 5-1	• Updated the comparison of forecasted water demand to the estimated groundwater availability
5	Section 5.2	Significant text revisions/updates	• Replaced 2017 surface water availability discussion with new BEAM model methodology and results
5	Figure 5-2	Revisions to Figure 5-2	• Updated figure to display forecasted 2060 surface water availability challenges
5	Section 5.3	Minor text revisions/updates	• Replaced “gaps” with “challenges” • Updated years
5	Section 5.3.1	Significant text revisions/updates	• Relocated the “Future Treatment Capacity Comparison” subsection to Section 5.4 and adjusted subsection numbering accordingly • Revised description of assimilative capacity and added reference to Section 3.2 • Clarified the modeled instream dissolved oxygen conditions and assessed water body segments • Revised descriptions of the 2019 and 2060 scenarios • Revised list of streams with assimilative capacity challenges
5	Figures 5-3 to 5-8	Revisions to Figures 5-3 to 5-8	• Updated assimilative capacity results with 2022 GAEPD data for current and 2060 conditions • Restructured figures to have two maps per figure • Added Figures 5-4 to 5-8 to focus on smaller areas • Added a new category, “at assimilative capacity”
5	Section 5.3.2	Significant text revisions/updates	• Clarified that no new lake or watershed nutrient modeling was conducted for the region • Added historical details about chlorophyll a levels at Lake Jackson • Revised section organization to improve flow • Removed subsequent section from the 2017 Plan, 5.3.3 “Existing Stream Impairment” due to redundance with Section 3

Section	Location	Change	Description
5	Section 5.4	Significant text revisions/updates	• Modified the introduction of section content • Moved the discussion and table of permitted water withdrawal limits compared to forecasted municipal demands from another location in the 2017 plan and updated data • Added that local/utility-level challenges can be present even if the county does not show 2060 water supply challenges Revised existing municipal wastewater discharge capacities and comparison to forecasted
5	Table 5-2	Revisions to Table 5-2	• Moved table and updated the existing permitted water withdrawal limits and forecasted demands for 2020 and 2060
5	Table 5-3	Added Table 5-3	• Added existing permitted discharge limits versus 2020 and 2060 forecasted flows
5	Section 5.5	Significant text revisions/updates	• Replaced “issues” with water resource challenges • Updated discussion of challenges to 2060 data
5	Table 5-4	Revisions to Table 5-4	• Updated with 2060 potential challenges, needs or shortages summary data by county • Added surface water modeling results for wastewater assimilation challenges • Included the applicable quantity of impacted facilities, MGD, or stream segments in parenthesis after a “Yes” for a challenge
6	Section 6.0	Significant text revisions/updates	• Replaced “gaps” with “challenges” • Added a brief discussion of implementation, which was moved from Section 7 in the 2017 plan to Section 6 • Updated and refined summary box
6	Section 6.1	Significant text revisions/updates	• Consolidated language previously in Sections 6.1 and 6.2 about identifying and selecting water management practices • Documented changes to the organization of management practices

Section	Location	Change	Description
6	Section 6.2	Significant text revisions/updates	• Relocated the tables of management practices to subsections separated by management practice category • Removed language about the management practice selection process to Section 6.1 • Updated the overview of the Council's recommended management practices • Removed classification of "priority" and "additional" management practices • Integrated language about implementation of management practices, which was previously in Section 7 of the 2017 Plan
6	Section 6.2.1	Significant text additions	• Introduced a new administrative category for management practices • Detailed the applicable council goals • Presented the administrative management practices, challenges that the practices seek to address, implementation actions, and responsible parties
6	Tables 6-1 to 6-5	Revision of presentation of management practices	• Modified management practice tables to integrate elements that were previously split between tables in Sections 6 and 7 of the 2017 Plan, including council goals addressed, challenges addressed, management practices
6	Section 6.2.2	Significant text additions/revisions	• Clarified that utilities may be required to report on their implementation activities • Detailed the applicable council goals • Presented the updated water demand management practice, challenges that the practice seeks to address, implementation actions, and responsible parties • Added reference to the WCIP
6	Section 6.2.3	Significant text additions	• Detailed the applicable council goals • Presented the updated water supply management practices, challenges that the practices seek to address, implementation actions, and responsible parties
6	Section 6.2.4	Significant text additions/revisions	• Introduced a new wastewater category for management practices • Detailed the applicable council goals • Presented the wastewater management practices, challenges that the practices seek to address, implementation actions, and responsible parties
6	Section 6.2.5	Significant text revisions/updates	• Detailed the applicable council goals • Presented the updated water quality management practices, challenges that the practices seek to address, implementation actions, and responsible parties

Section	Location	Change	Description
6	Section 6.3	Significant text revisions/updates	• Relocated text from Section 7
6	Table 6-6	Revisions to Table 6-6	• Relocated table from Section 7 • Updated with current recommendations to the state of implementation actions • Remove the previous additional data
7	Section 7	Significant text revisions/updates	• Changed section title • Removed discussion of management practice implementation actions • Clarified that planning level cost estimates were not included • Revised summary box to reflect new section structure
7	Section 7.1	Minor text revisions/updates	• Removed cost estimation tables and related text • Added explanation for why current funding guidance has not been included
7	Section 7.1.1	Minor text revisions/updates	• Added topics from previous Section 8 • Updated website references and footnotes
7	Section 7.2	Significant text updates	• Added topics from previous Section 8 • Removed previous references to Section 6 • Replaced “Atmos Energy” with “Liberty Utilities” • Replaced “gaps” and “issues” with “challenges”
7	Section 7.3	Significant text revisions/updates	• Added topics from previous Section 8 • Added details describing benchmark selection
7	Table 7-1	Relocation, restructuring of and updates to Table 7-1	• Relocated table from Section 8 • Updated with current benchmarks • Restructured by management practice category instead of individual management practice to be more concise
7	Section 7.4	Significant text revisions/updates	• Added topics from previous Section 8 • Added detail specifying that the Director refers to the EPD Director and clarifying details that the Plan is by the Council and EPD
7	Section 7.5	Significant text revisions/updates	• Added topics from previous Section 8 • Replaced “gaps in resource availability” with “resource availability challenges”
8	Section 8	Text relocation and updates	• Changed Section 8 from monitoring topics such as benchmarking, plan updates, and amendments to the bibliography, which was previously Section 9 • Included the 2017 Section 8 material in the current Section 7

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APPENDIX B

Summary of Forecasts and Challenges by County

Forecasts

The tables summarize the total county forecasts. Water withdrawals are separated by sector and source type: groundwater (GW) or surface water (SW). Industrial facilities that receive water from municipal sources are included in the municipal public supply forecasts. Sectors without water demands within the county are excluded.

Summary of Total County Water Demand by Source Type (AAD-MGD)

County	Sector	2020	2030	2040	2050	2060
Macon-Bibb	GW Agricultural	0.21	0.21	0.21	0.21	0.22
	GW Municipal Self Supply	1.63	1.42	1.30	1.19	0.54
	GW Industrial	1.79	1.79	1.79	1.79	1.79
	Groundwater Total	3.63	3.42	3.30	3.19	2.55
	SW Municipal Public Supply	22.19	22.60	22.46	22.21	23.27
	SW Industrial	15.26	15.79	16.33	16.86	17.40
	Surface Water Total	37.45	38.39	38.79	39.07	40.66
	Total	**41.07**	**41.81**	**42.09**	**42.26**	**43.21**

2020 Per Capita Water Demand Applied (gpcd)[1,2]: 136

[1]Weighted average per capita calculated using the available 2015-2018 Water Loss Audits. Per capita demand for forecast years beyond 2020 is reduced over time to reflect conservation.

[2]Adjusted to reflect municipally-supplied industrial demand.

Summary of Total County Wastewater Flow Forecasts by Discharge Type (AAF-MGD)

County	Source	2020	2030	2040	2050	2060
Macon-Bibb	Centralized Municipal System	43.73	44.07	43.96	43.69	45.11
	Septic	1.82	1.82	1.78	1.73	1.70
	Direct Discharge	4.93	4.93	4.93	4.93	4.93
	Total	**50.48**	**50.82**	**50.67**	**50.35**	**51.74**

*For more information, refer to the “2023 Water and Wastewater Forecasting Technical Memorandum.”

Potential 2060 Challenges

These estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed. Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected due to difference in water supply and permitted withdrawal limits at the utility level.

Groundwater Supply Challenges
- No anticipated challenges

Surface Water Supply Challenges
- No anticipated challenges

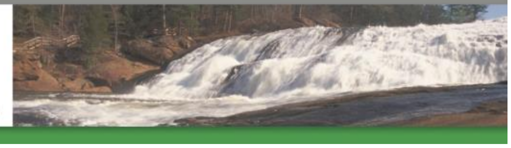
Wastewater Assimilation Challenges
- Graphic Packaging International Inc. (Macon Mill)
- Macon Water Authority (Lower Poplar WRF)
- Macon Water Authority (Rocky Creek WPCP)

Municipal Water Withdrawal Needs
- No anticipated challenges

Municipal Wastewater Discharge Needs
- No anticipated challenges

Assimilative Capacity Challenges for Dissolved Oxygen
- No anticipated challenges

303(d) Not Supporting Reaches
- 1 mi. u/s Rocky Creek Rd to Tobesofkee Creek (Rocky Creek)
- Lake Tobesofkee to Rocky Creek (Tobesofkee Creek)
- Headwaters to Gum Branch (Tributary to Gum Branch)



Forecasts

The tables summarize the total county forecasts. Water withdrawals are separated by sector and source type: groundwater (GW) or surface water (SW). Industrial facilities that receive water from municipal sources are included in the municipal public supply forecasts. Sectors without water demands within the county are excluded.

Summary of Total County Water Demand by Source Type (AAD-MGD)

County	Sector	2020	2030	2040	2050	2060
Butts	GW Agricultural	0.66	0.66	0.66	0.66	0.66
	GW Municipal Public Supply	0.07	0.09	0.09	0.09	0.10
	GW Municipal Self Supply	0.01	0.01	0.01	0.01	0.01
	Groundwater Total	0.74	0.76	0.76	0.76	0.77
	SW Agricultural	0.00	0.00	0.00	0.08	0.00
	SW Municipal Public Supply	2.25	2.57	2.73	2.84	2.91
	Surface Water Total	2.25	2.57	2.73	2.92	2.91
	Total	**3.00**	**3.33**	**3.49**	**3.68**	**3.67**

2020 Per Capita Water Demand Applied (gpcd)[1]: 90

[1]Weighted average per capita calculated using the available 2015-2018 Water Loss Audits. Per capita demand for forecast years beyond 2020 is reduced over time to reflect conservation.

Summary of Total County Wastewater Flow Forecasts by Discharge Type (AAF-MGD)

County	Source	2020	2030	2040	2050	2060
Butts	Centralized Municipal System	0.62	0.72	0.79	0.84	0.88
	Land Application	0.54	0.63	0.69	0.73	0.77
	Septic	1.06	1.24	1.35	1.43	1.50
	Total	**2.22**	**2.60**	**2.82**	**3.00**	**3.15**

*For more information, refer to the “2023 Water and Wastewater Forecasting Technical Memorandum.”

Potential 2060 Challenges

These estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed. Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected due to difference in water supply and permitted withdrawal limits at the utility level.

Groundwater Supply Challenges
- No anticipated challenges

Surface Water Supply Challenges
- No anticipated challenges

Wastewater Assimilation Challenges
- City of Jackson (Southside WPCP)
- City of Jackson (Yellow Water Creek WPCP)

Municipal Water Withdrawal Needs
- No anticipated challenges

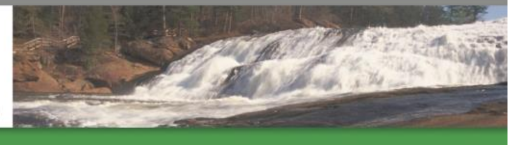
Municipal Wastewater Discharge Needs
- No anticipated challenges

Assimilative Capacity Challenges for Dissolved Oxygen

- No anticipated challenges

303(d) Not Supporting Reaches

- Headwaters to Chief McIntosh Lake (Big Sandy Creek)
- Headwaters (Jenkinsburg) to Tussahaw Creek (Malholms Creek)
- Indian Creek to High Falls Lake (Towaliga River)
- Headwaters (Jackson) to Aboothlacoosta Creek (Town Branch)
- Wolf Creek to Lake Jackson (Tussahaw Creek)



Forecasts

The tables summarize the total county forecasts. Water withdrawals are separated by sector and source type: groundwater (GW) or surface water (SW). Industrial facilities that receive water from municipal sources are included in the municipal public supply forecasts. Sectors without water demands within the county are excluded.

Summary of Total County Water Demand by Source Type (AAD-MGD)

County	Sector	2020	2030	2040	2050	2060
Crawford	GW Agricultural	8.32	9.22	10.44	12.03	13.63
	GW Municipal Public Supply	0.34	0.33	0.31	0.29	0.28
	GW Municipal Self Supply	0.65	0.63	0.59	0.55	0.54
	Groundwater Total	9.31	10.18	11.35	12.88	14.44
	SW Agricultural	0.38	0.39	0.41	0.43	0.46
	SW Industrial	4.01	4.01	4.01	4.01	4.01
	Surface Water Total	4.39	4.40	4.42	4.44	4.47
	Total	**13.70**	**14.58**	**15.77**	**17.32**	**18.91**

2020 Per Capita Water Demand Applied (gpcd)[1,2]: 96

[1]Weighted average per capita calculated using the available 2015-2018 Water Loss Audits. Per capita demand for forecast years beyond 2020 is reduced over time to reflect conservation.

[2]Per capita was calculated using the population stated in SDWIS and the reported water withdrawals.

Summary of Total County Wastewater Flow Forecasts by Discharge Type (AAF-MGD)

County	Source	2020	2030	2040	2050	2060
Crawford	Centralized Municipal System	0.14	0.14	0.13	0.13	0.13
	Septic	0.64	0.63	0.61	0.59	0.58
	Total	**0.78**	**0.77**	**0.74**	**0.71**	**0.71**

*For more information, refer to the "2023 Water and Wastewater Forecasting Technical Memorandum."

Potential 2060 Challenges

These estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed. Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected due to difference in water supply and permitted withdrawal limits at the utility level.

Groundwater Supply Challenges
- No anticipated challenges

Surface Water Supply Challenges
- No anticipated challenges

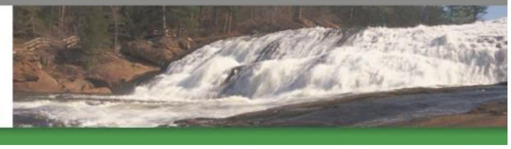
Wastewater Assimilation Challenges
- No anticipated challenges

Municipal Water Withdrawal Needs
- Potential 2060 capacity need of 0.3 MGD

Municipal Wastewater Discharge Needs
- No anticipated challenges

Assimilative Capacity Challenges for Dissolved Oxygen
- No anticipated challenges

303(d) Not Supporting Reaches
- Headwaters to Spring Creek (Beaver Creek)
- Headwaters to Echeconnee Creek (Deep Creek)
- Tributary to Deep Creek (Hartley Branch)
- Downstream Lake Henry to Beaver Creek (Lee Creek)
- Headwaters to Echeconnee Creek (Little Echeconnee Creek)
- Headwaters to Auchumpkee Creek (Ulcohatchee Creek)
- Downstream Hwy 42 (Walnut Creek)



Forecasts

The tables summarize the total county forecasts. Water withdrawals are separated by sector and source type: groundwater (GW) or surface water (SW). Industrial facilities that receive water from municipal sources are included in the municipal public supply forecasts. Sectors without water demands within the county are excluded.

Summary of Total County Water Demand by Source Type (AAD-MGD)

County	Sector	2020	2030	2040	2050	2060
Houston	GW Agricultural	19.89	22.19	25.02	28.65	32.28
	GW Municipal Public Supply	26.29	28.04	29.58	30.78	32.17
	GW Municipal Self Supply	0.64	0.67	0.69	0.71	0.73
	GW Industrial	2.37	2.85	3.40	3.72	3.90
	Groundwater Total	49.18	53.74	58.69	63.86	69.08
	SW Agricultural	1.17	1.26	1.36	1.49	1.61
	SW Energy	0.23	0.23	0.31	0.34	0.37
	Surface Water Total	1.40	1.50	1.67	1.83	1.98
	Total	**50.59**	**55.24**	**60.36**	**65.68**	**71.06**

2020 Per Capita Water Demand Applied (gpcd)[1,2]: 177

[1]Weighted average per capita calculated using the available 2015-2018 Water Loss Audits. Per capita demand for forecast years beyond 2020 is reduced over time to reflect conservation.
[2]Per capita was calculated using water withdrawals from large and small systems and population served data provided by EPD.

Summary of Total County Wastewater Flow Forecasts by Discharge Type (AAF-MGD)

County	Source	2020	2030	2040	2050	2060
Houston	Centralized Municipal System	11.99	12.94	13.82	14.56	15.40
	Land Application	1.63	1.63	1.63	1.63	1.63
	Septic	3.18	3.43	3.66	3.86	4.08
	Direct Discharge	3.01	3.62	4.34	4.75	4.99
	Total	**19.80**	**21.62**	**23.44**	**24.79**	**26.10**

*For more information, refer to the “2023 Water and Wastewater Forecasting Technical Memorandum.”

Potential 2060 Challenges

These estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed. Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected due to difference in water supply and permitted withdrawal limits at the utility level.

Groundwater Supply Challenges

- Forecasted aquifer-wide water demand exceeds the low sustainable yield estimate, indicating a potential future challenge

Surface Water Supply Challenges

- No anticipated challenges

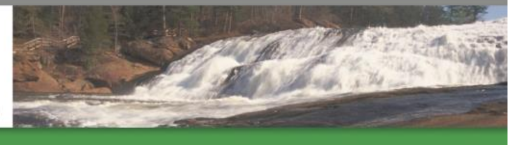
Wastewater Assimilation Challenges
- Perdue Foods LLC (Perry, GA)
- City of Perry (Frank Satterfield Road WWTF)
- City of Warner Robins (Sandy Run Creek WPCP)

Municipal Water Withdrawal Needs
- No anticipated challenges

Municipal Wastewater Discharge Needs
- No anticipated challenges

- **Assimilative Capacity Challenges for Dissolved Oxygen**
- No anticipated challenges

303(d) Not Supporting Reaches
- Elko Creek to Burnham Creek (Big Creek)
- Headwaters to Ocmulgee River (Big Grocery Creek)
- Flat Creek to Mossy Creek (Big Indian Creek)
- Lake Placid to Sandy Run Creek (Cainey Branch)
- ~0.4 mi u/s of US Hwy 41 to Big Indian Creek (Flat Creek)
- Okeetuck Creek to Big Indian Creek (Limestone Creek)
- Bay Gall Creek to Ocmulgee River (Sandy Run Creek)



Forecasts

The tables summarize the total county forecasts. Water withdrawals are separated by sector and source type: groundwater (GW) or surface water (SW). Industrial facilities that receive water from municipal sources are included in the municipal public supply forecasts. Sectors without water demands within the county are excluded.

Summary of Total County Water Demand by Source Type (AAD-MGD)

County	Sector	2020	2030	2040	2050	2060
Jasper	GW Agricultural	2.75	2.75	2.75	2.75	2.75
	GW Municipal Public Supply	0.44	0.46	0.48	0.49	0.52
	GW Municipal Self Supply	0.47	0.49	0.50	0.51	0.53
	Groundwater Total	3.66	3.69	3.73	3.76	3.80
	SW Municipal Public Supply	0.55	0.57	0.60	0.62	0.65
	SW Industrial	0.34	0.34	0.34	0.34	0.34
	Surface Water Total	0.88	0.91	0.94	0.96	0.98
	Total	**4.54**	**4.60**	**4.67**	**4.71**	**4.78**

2020 Per Capita Water Demand Applied (gpcd)[1]: 121

[1]Weighted average per capita calculated using the available 2015-2018 Water Loss Audits. Per capita demand for forecast years beyond 2020 is reduced over time to reflect conservation.

Summary of Total County Wastewater Flow Forecasts by Discharge Type (AAF-MGD)

County	Source	2020	2030	2040	2050	2060
Jasper	Centralized Municipal System	0.15	0.16	0.17	0.18	0.19
	Septic	0.63	0.67	0.71	0.75	0.80
	Total	**0.78**	**0.83**	**0.88**	**0.93**	**0.99**

*For more information, refer to the “2023 Water and Wastewater Forecasting Technical Memorandum.”

Potential 2060 Challenges

These estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed. Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected due to difference in water supply and permitted withdrawal limits at the utility level.

Groundwater Supply Challenges
- No anticipated challenges

Surface Water Supply Challenges
- City of Monticello

Wastewater Assimilation Challenges
- City of Monticello (Pearson Creek WPCP)

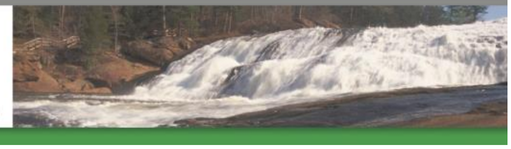
Municipal Water Withdrawal Needs
- Potential 2060 capacity need of 0.6 MGD

Municipal Wastewater Discharge Needs
- No anticipated challenges

Assimilative Capacity Challenges for Dissolved Oxygen
- No anticipated challenges

303(d) Not Supporting Reaches

- Headwaters to Little Falling Creek (Gladesville Creek)
- GA Hwy 212 to Ocmulgee River (Herds Creek)
- Lowry Branch
- Headwaters to South Fork Wolf Creek
- Headwaters to Tributary 0.3 miles upstream Post Road/College Street (Pearson Creek)
- Tributary 0.3 miles upstream Post Road/College Street to Popes Branch (Pearson Creek)
- Headwaters to Lake Jackson (Rocky Creek)
- Headwaters to Monticello White Oak WPCP (Tributary to White Oak Creek)
- Monticello White Oak WPCP to White Oak Creek
- Headwaters to Murder Creek (White Oak Creek)
- Headwaters to Ocmulgee River (Wise Creek)



Forecasts

The tables summarize the total county forecasts. Water withdrawals are separated by sector and source type: groundwater (GW) or surface water (SW). Industrial facilities that receive water from municipal sources are included in the municipal public supply forecasts. Sectors without water demands within the county are excluded.

Summary of Total County Water Demand by Source Type (AAD-MGD)

County	Sector	2020	2030	2040	2050	2060
Jones	GW Agricultural	0.25	0.25	0.25	0.25	0.25
	GW Municipal Public Supply	2.15	2.12	2.07	2.01	1.99
	GW Municipal Self Supply	0.62	0.61	0.59	0.57	0.56
	Groundwater Total	3.02	2.97	2.91	2.83	2.80
	Surface Water Total	0.00	0.00	0.00	0.00	0.00
	Total	**3.02**	**2.97**	**2.91**	**2.83**	**2.80**

2020 Per Capita Water Demand Applied (gpcd)[1]: 106

[1]Weighted average per capita calculated using the available 2015-2018 Water Loss Audits. Per capita demand for forecast years beyond 2020 is reduced over time to reflect conservation.

Summary of Total County Wastewater Flow Forecasts by Discharge Type (AAF-MGD)

County	Source	2020	2030	2040	2050	2060
Jones	Centralized Municipal System	0.38	0.38	0.38	0.38	0.38
	Septic	1.32	1.33	1.32	1.32	1.33
	Direct Discharge	0.18	0.18	0.18	0.18	0.18
	Total	**1.88**	**1.89**	**1.89**	**1.88**	**1.89**

*For more information, refer to the “2023 Water and Wastewater Forecasting Technical Memorandum.”

Potential 2060 Challenges

These estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed. Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected due to difference in water supply and permitted withdrawal limits at the utility level.

Groundwater Supply Challenges
- No anticipated challenges

Surface Water Supply Challenges
- No anticipated challenges

Wastewater Assimilation Challenges
- City of Gray (Wolf Creek WPCP)

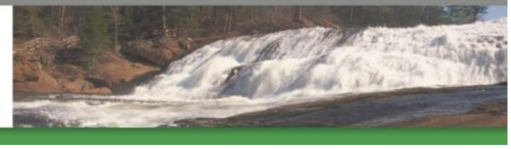
Municipal Water Withdrawal Needs
- No anticipated challenges

Municipal Wastewater Discharge Needs
- No anticipated challenges

Assimilative Capacity Challenges for Dissolved Oxygen
- No anticipated challenges

303(d) Not Supporting Reaches

- Tributary to Ocmulgee River (Butlers Creek)
- Headwaters to Commissioner Creek (Crooked Creek)
- Little Falling Creek to Ocmulgee River (Falling Creek)
- Headwaters to Walnut Creek (Little Chehaw Creek)
- Headwaters to Ocmulgee River (Scoggins Creek)
- Tributary to Ocmulgee River (Third Branch)
- Headwaters to Hurricane Creek (Tributary to Hurricane Creek)



Forecasts

The tables summarize the total county forecasts. Water withdrawals are separated by sector and source type: groundwater (GW) or surface water (SW). Industrial facilities that receive water from municipal sources are included in the municipal public supply forecasts. Sectors without water demands within the county are excluded.

Summary of Total County Water Demand by Source Type (AAD-MGD)

County	Sector	2020	2030	2040	2050	2060
Lamar	GW Agricultural	1.07	1.07	1.07	0.85	1.08
	GW Municipal Self Supply	0.83	0.88	0.93	0.98	1.04
	Groundwater Total	1.90	1.95	2.00	1.83	2.12
	SW Agricultural	0.03	0.03	0.03	0.21	0.03
	SW Municipal Public Supply	2.24	2.44	2.63	2.84	3.11
	Surface Water Total	2.27	2.47	2.66	3.05	3.14
	Total	**4.17**	**4.42**	**4.66**	**4.88**	**5.26**

2020 Per Capita Water Demand Applied (gpcd)[1,2]: 263

[1]Weighted average per capita calculated using the available 2015-2018 Water Loss Audits. Per capita demand for forecast years beyond 2020 is reduced over time to reflect conservation.
[2]This per capita value is above the typical range of values and more information is being sought from the water systems in Lamar County.

Summary of Total County Wastewater Flow Forecasts by Discharge Type (AAF-MGD)

County	Source	2020	2030	2040	2050	2060
Lamar	Centralized Municipal System	3.82	4.19	4.56	4.98	5.50
	Septic	0.98	1.07	1.17	1.28	1.41
	Total	**4.80**	**5.27**	**5.73**	**6.26**	**6.91**

*For more information, refer to the “2023 Water and Wastewater Forecasting Technical Memorandum.”

Potential 2060 Challenges

These estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed. Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected due to difference in water supply and permitted withdrawal limits at the utility level.

Groundwater Supply Challenges
- No anticipated challenges

Surface Water Supply Challenges
- City of Barnesville

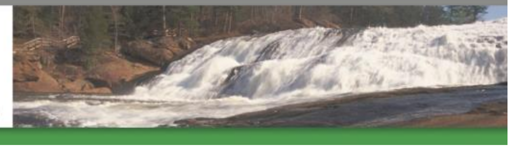
Wastewater Assimilation Challenges
- City of Barnesville (James A. King WWTF)

Municipal Water Withdrawal Needs
- Potential 2060 capacity need of 0.2 MGD

Municipal Wastewater Discharge Needs
- Potential 2060 capacity need of 3.1 MGD

Assimilative Capacity Challenges for Dissolved Oxygen
- No anticipated challenges

303(d) Not Supporting Reaches
- Headwaters to Turner Creek (Prairie Creek)
- Headwaters to Tobesofkee Creek (Barnesville)



Forecasts

The tables summarize the total county forecasts. Water withdrawals are separated by sector and source type: groundwater (GW) or surface water (SW). Industrial facilities that receive water from municipal sources are included in the municipal public supply forecasts. Sectors without water demands within the county are excluded.

Summary of Total County Water Demand by Source Type (AAD-MGD)

County	Sector	2020	2030	2040	2050	2060
Monroe	GW Agricultural	0.30	0.31	0.31	0.27	0.31
	GW Municipal Self Supply	0.98	0.99	0.99	0.98	0.98
	GW Energy	0.10	0.10	0.00	0.00	0.00
	Groundwater Total	1.39	1.40	1.29	1.25	1.29
	SW Agricultural	0.01	0.01	0.01	0.07	0.01
	SW Energy	71.55	71.55	0.15	0.16	0.18
	SW Municipal Public Supply	2.42	2.48	2.52	2.53	2.59
	Surface Water Total	73.97	74.04	2.68	2.76	2.78
	Total	**75.36**	**75.44**	**3.97**	**4.01**	**4.07**

2020 Per Capita Water Demand Applied (gpcd)[1]: 160

[1]Weighted average per capita calculated using the available 2015-2018 Water Loss Audits. Per capita demand for forecast years beyond 2020 is reduced over time to reflect conservation.

Summary of Total County Wastewater Flow Forecasts by Discharge Type (AAF-MGD)

County	Source	2020	2030	2040	2050	2060
Monroe	Centralized Municipal System	1.42	1.48	1.52	1.55	1.61
	Land Application	0.08	0.09	0.09	0.09	0.09
	Septic	1.16	1.21	1.24	1.27	1.31
	Direct Discharge	36.44	36.44	0.09	0.09	0.09
	Total	**39.11**	**39.22**	**2.94**	**3.00**	**3.11**

*For more information, refer to the “2023 Water and Wastewater Forecasting Technical Memorandum.”

Potential 2060 Challenges

These estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed. Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected due to difference in water supply and permitted withdrawal limits at the utility level.

Groundwater Supply Challenges

- No anticipated challenges

Surface Water Supply Challenges

- City of Forsyth

Wastewater Assimilation Challenges

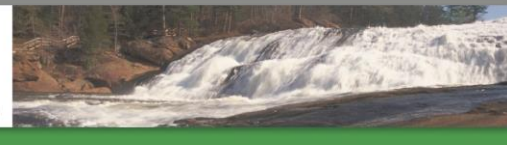
- City of Forsyth (Northeast WPCP)
- City of Forsyth (South WPCP)

Municipal Water Withdrawal Needs
- No anticipated challenges

Municipal Wastewater Discharge Needs
- No anticipated challenges

Assimilative Capacity Challenges for Dissolved Oxygen
- No anticipated challenges

303(d) Not Supporting Reaches
- Pond at the headwaters to Ocmulgee River (Berry Creek)
- Tributary to Towaliga River (Eightmile Creek)
- Headwaters to Mill Dam Creek (Hansford Branch)
- Headwaters to Deer Creek (Little Deer Creek)
- White Creek to Rocky Creek (Red Creek)
- Downstream English Rd (CR 152) to Towaliga River (Rocky Creek)
- Headwaters to Lake Juliette (Rum Creek)
- Cole Creek to Todd Creek (Tobesofkee Creek)
- Todd Creek to Little Tobesofkee Creek (Tobesofkee Creek)
- Tributary to Ocmulgee River (Tobler Creek)
- Headwaters to Rum Creek (Town Creek)



Forecasts

The tables summarize the total county forecasts. Water withdrawals are separated by sector and source type: groundwater (GW) or surface water (SW). Industrial facilities that receive water from municipal sources are included in the municipal public supply forecasts. Sectors without water demands within the county are excluded.

Summary of Total County Water Demand by Source Type (AAD-MGD)

County	Sector	2020	2030	2040	2050	2060
Newton	GW Agricultural	0.15	0.15	0.15	0.16	0.15
	GW Municipal Self Supply	1.39	1.55	1.75	1.97	2.23
	Groundwater Total	1.53	1.70	1.90	2.13	2.38
	SW Agricultural	0.05	0.05	0.05	0.06	0.05
	SW Municipal Public Supply	13.91	15.77	17.95	20.45	23.42
	Surface Water Total	13.97	15.82	18.01	20.51	23.47
	Total	**15.50**	**17.52**	**19.90**	**22.64**	**25.85**

2020 Per Capita Water Demand Applied (gpcd)[1]: 144

[1]Weighted average per capita calculated using the available 2015-2018 Water Loss Audits. Per capita demand for forecast years beyond 2020 is reduced over time to reflect conservation.

Summary of Total County Wastewater Flow Forecasts by Discharge Type (AAF-MGD)

County	Source	2020	2030	2040	2050	2060
Newton	Centralized Municipal System	0.04	0.05	0.05	0.06	0.28
	Land Application	4.98	5.71	6.57	7.57	8.56
	Septic	4.52	5.18	5.97	6.88	7.97
	Total	**9.54**	**10.94**	**12.60**	**14.51**	**16.82**

*For more information, refer to the “2023 Water and Wastewater Forecasting Technical Memorandum.”

Potential 2060 Challenges

These estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed. Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected due to difference in water supply and permitted withdrawal limits at the utility level.

Groundwater Supply Challenges
- No anticipated challenges

Surface Water Supply Challenges
- Newton County Board of Commissioners

Wastewater Assimilation Challenges
- City of Mansfield (Mansfield WPCP)

Municipal Water Withdrawal Needs
- No anticipated challenges

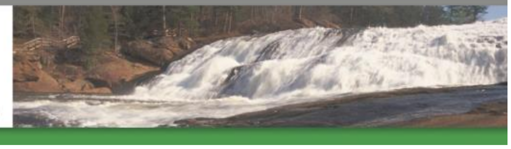
Municipal Wastewater Discharge Needs
- Potential 2060 capacity need of 0.22 MGD

Assimilative Capacity Challenges for Dissolved Oxygen

- No anticipated challenges

303(d) Not Supporting Reaches

- Newton Factory Bridge Road to Lake Jackson (Alcovy River)
- Gaithers Branch to Lake Jackson (Bear Creek)
- Headwaters to Beaverdam Creek (Caney Fork Creek)
- Headwaters to Yellow River (Dried Indian Creek)
- Pond 0.7 miles upstream Marks Road to West Bear Creek (East Bear Creek)
- Headwaters to Bear Creek (Gaithers Branch)
- Tributary 0.25 miles upstream Hightower Trail to tributary 0.16 miles upstream Dial Mill Road (Gum Creek)
- I-20 to Nelson Creek (Little River)
- Headwaters to Pittman Branch
- Big Haynes Creek to Jackson Lake (Yellow River)



Forecasts

The tables summarize the total county forecasts. Water withdrawals are separated by sector and source type: groundwater (GW) or surface water (SW). Industrial facilities that receive water from municipal sources are included in the municipal public supply forecasts. Sectors without water demands within the county are excluded.

Summary of Total County Water Demand by Source Type (AAD-MGD)

County	Sector	2020	2030	2040	2050	2060
Peach	GW Agricultural	28.42	32.44	37.87	44.95	52.03
	GW Municipal Public Supply	2.01	1.99	1.94	1.87	1.82
	GW Municipal Self Supply	0.45	0.44	0.43	0.41	0.40
	GW Industrial	0.34	0.34	0.34	0.34	0.34
	Groundwater Total	31.22	35.22	40.58	47.57	54.59
	SW Agricultural	0.32	0.33	0.35	0.37	0.40
	Surface Water Total	0.32	0.33	0.35	0.37	0.40
	Total	**31.55**	**35.55**	**40.93**	**47.94**	**54.99**

2020 Per Capita Water Demand Applied (gpcd)[1,2]: 94

[1]Weighted average per capita calculated using the available 2015-2018 Water Loss Audits. Per capita demand for forecast years beyond 2020 is reduced over time to reflect conservation.

[2]Per capita was calculated using water withdrawals from large and small systems and population served data provided by EPD.

Summary of Total County Wastewater Flow Forecasts by Discharge Type (AAF-MGD)

County	Source	2020	2030	2040	2050	2060
Peach	Centralized Municipal System	0.98	1.00	1.00	0.98	0.99
	Septic	1.09	1.11	1.11	1.10	1.10
	Total	**2.07**	**2.10**	**2.10**	**2.08**	**2.09**

*For more information, refer to the “2023 Water and Wastewater Forecasting Technical Memorandum.”

Potential 2060 Challenges

These estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed. Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected due to difference in water supply and permitted withdrawal limits at the utility level.

Groundwater Supply Challenges
- No anticipated challenges

Surface Water Supply Challenges
- No anticipated challenges

Wastewater Assimilation Challenges
- No anticipated challenges

Municipal Water Withdrawal Needs
- No anticipated challenges

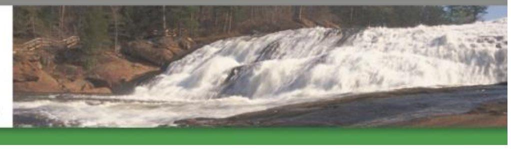
Municipal Wastewater Discharge Needs
- No anticipated challenges

Assimilative Capacity Challenges for Dissolved Oxygen

- No anticipated challenges

303(d) Not Supporting Reaches

- No anticipated challenges



Forecasts

The tables summarize the total county forecasts. Water withdrawals are separated by sector and source type: groundwater (GW) or surface water (SW). Industrial facilities that receive water from municipal sources are included in the municipal public supply forecasts. Sectors without water demands within the county are excluded.

Summary of Total County Water Demand by Source Type (AAD-MGD)

County	Sector	2020	2030	2040	2050	2060
Pulaski	GW Agricultural	22.66	24.15	25.88	28.00	30.11
	GW Municipal Public Supply	0.84	0.84	0.83	0.83	0.85
	GW Industrial	0.58	0.48	0.39	0.30	0.21
	GW Municipal Self Supply	0.53	0.53	0.53	0.53	0.53
	Groundwater Total	24.61	25.99	27.63	29.65	31.70
	SW Agricultural	4.77	4.98	5.23	5.51	5.79
	Surface Water Total	4.77	4.98	5.23	5.51	5.79
	Total	**29.38**	**30.97**	**32.86**	**35.16**	**37.49**

2020 Per Capita Water Demand Applied (gpcd)[1]: 164

[1]Weighted average per capita calculated using the available 2015-2018 Water Loss Audits. Per capita demand for forecast years beyond 2020 is reduced over time to reflect conservation.

Summary of Total County Wastewater Flow Forecasts by Discharge Type (AAF-MGD)

County	Source	2020	2030	2040	2050	2060
Pulaski	Centralized Municipal System	1.45	1.35	1.24	1.14	1.05
	Septic	0.45	0.42	0.38	0.35	0.33
	Direct Discharge	0.53	0.53	0.53	0.53	0.53
	Total	**2.43**	**2.29**	**2.15**	**2.02**	**1.91**

*For more information, refer to the “2023 Water and Wastewater Forecasting Technical Memorandum.”

Potential 2060 Challenges

These estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed. Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected due to difference in water supply and permitted withdrawal limits at the utility level.

Groundwater Supply Challenges

- Forecasted aquifer-wide water demand exceeds the low sustainable yield estimate, indicating a potential future challenge

Surface Water Supply Challenges

- No anticipated challenges

Wastewater Assimilation Challenges

- City of Hawkinsville (North WPCP)
- City of Hawkinsville (South WPCP)

Municipal Water Withdrawal Needs

- No anticipated challenges

Municipal Wastewater Discharge Needs

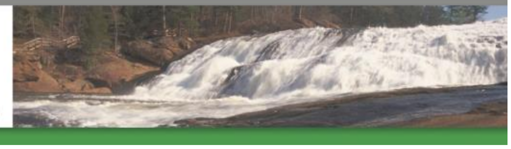
- No anticipated challenges

Assimilative Capacity Challenges

- No anticipated challenges

303(d) Not Supporting Reaches

- Double Branch Creek to Big Creek (Cedar Creek)
- ~0.7 miles upstream GA Hwy 257 to Bluff Creek (Ten Mile Creek)



Forecasts

The tables summarize the total county forecasts. Water withdrawals are separated by sector and source type: groundwater (GW) or surface water (SW). Industrial facilities that receive water from municipal sources are included in the municipal public supply forecasts. Sectors without water demands within the county are excluded.

Summary of Total County Water Demand by Source Type (AAD-MGD)

County	Sector	2020	2030	2040	2050	2060
Twiggs	GW Agricultural	2.97	3.23	3.41	3.61	3.81
	GW Municipal Public Supply	0.52	0.48	0.45	0.42	0.41
	GW Municipal Self Supply	0.44	0.40	0.36	0.33	0.31
	GW Industrial	3.67	3.67	3.67	3.67	3.67
	Groundwater Total	7.59	7.77	7.88	8.02	8.19
	SW Agricultural	0.20	0.21	0.23	0.24	0.25
	Surface Water Total	0.20	0.21	0.23	0.24	0.25
	Total	**7.79**	**7.99**	**8.10**	**8.26**	**8.44**

2020 Per Capita Water Demand Applied (gpcd)[1,2,3]: 227

[1]Weighted average per capita calculated using the available 2015-2018 Water Loss Audits. Per capita demand for forecast years beyond 2020 is reduced over time to reflect conservation.
[2]Per capita was calculated using the population stated in SDWIS and the reported water withdrawals.
[3]This per capita value is above the typical range of values and more information is being sought from the water systems in Twiggs County.

Summary of Total County Wastewater Flow Forecasts by Discharge Type (AAF-MGD)

County	Source	2020	2030	2040	2050	2060
Twiggs	Land Application	0.12	0.11	0.10	0.10	0.10
	Septic	0.42	0.39	0.37	0.35	0.34
	Direct Discharge	1.30	1.30	1.30	1.30	1.30
	Total	**1.83**	**1.80**	**1.77**	**1.74**	**1.73**

*For more information, refer to the “2023 Water and Wastewater Forecasting Technical Memorandum.”

Potential 2060 Challenges

These estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed. Counties that do not have a potential 2060 water supply need identified may have water supply challenges not reflected due to difference in water supply and permitted withdrawal limits at the utility level.

Groundwater Supply Challenges

- Forecasted aquifer-wide water demand exceeds the low sustainable yield estimate, indicating a potential future challenge

Surface Water Supply Challenges

- No anticipated challenges

Wastewater Assimilation Challenges

- Robins Air Force Base
- City of Warner Robins (Ocmulgee River WPCP)

Municipal Water Withdrawal Needs

- No anticipated challenges

Municipal Wastewater Discharge Needs

- No anticipated challenges

Assimilative Capacity Challenges for Dissolved Oxygen

- No anticipated challenges

303(d) Not Supporting Reaches

- Headwaters to Ugly Creek (Alligator Creek)