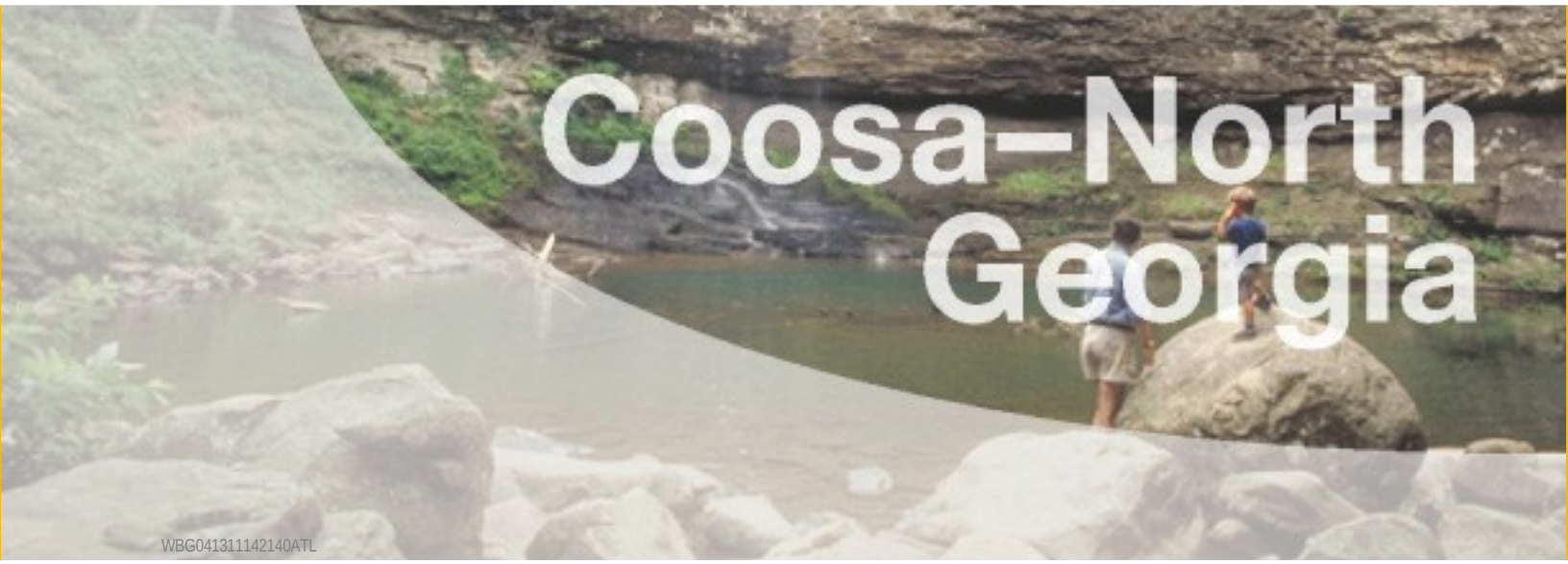


Regional Water Plan

June 2017

Printed on Recycled Paper

Table of Contents

Table of Contents

Tables

Figures

Table of Contents

(This page intentionally left blank)

Acronyms and Abbreviations

AAD-MGD	annual average demand in million gallons per day
AAF-MGD	annual average flow in million gallons per day
ACCG	Association of County Commissioners of Georgia
ACF	Apalachicola-Chattahoochee-Flint
ACT	Alabama-Coosa-Tallapoosa
AE	Adverse Effects
ASR	aquifer storage and recovery
AT	Alternative Technologies
BMP	best management practice
cfs	cubic feet per second
CNG	Coosa-North Georgia
°F	degrees Fahrenheit
DCA	Department of Community Affairs
DCH	Department of Community Health
DO	dissolved oxygen
ED	Economic Development
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ES	Educate Stakeholders
FERC	Federal Energy Regulatory Commission
FOG	fats, oils, and grease
GADNR	Georgia Department of Natural Resources
GAEPD	Georgia Environmental Protection Division
GAP	Gap Analysis Program
GAWP	Georgia Association of Water Professionals
GEFA	Georgia Environmental Finance Authority
GEMA	Georgia Emergency Management Agency
GGCSA	Georgia Golf Course Superintendents Association
GGIA	Georgia Green Industry Association
GMA	Georgia Municipal Association
gpcd	gallons per capita per day
gpf	gallons per flush
gpm	gallons per minute
GRWA	Georgia Rural Water Association
GSWCC	Georgia Soil and Water Conservation Commission
GWh	gigawatts per hour
HCP	Habitat Conservation Plan
HUC	hydrologic unit code
I/I	inflow and infiltration

ITP	Incidental Take Permits
LAS	land application system
lbs	pounds
lb/yr	pounds per year
LDA	Local Drainage Area
MGD	million gallons per day
mg/L	milligrams per liter
MS4	Municipal Separate Storm Sewer System
MSL	mean sea level
NESPAL	National Environmentally Sound Production Agriculture Laboratory
NLCD	National Land Cover Database
NNC	Numerical Nutrient Criteria
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWGRC	Northwest Georgia Regional Water Planning Council
O&M	operation and maintenance
O.C.G.A.	Official Code of Georgia Annotated
OPB	Governor's Office of Planning and Budget
Partnership	North Georgia Regional Watershed Partnership
PCB	polychlorinated biphenyl
PVEPC	Part V Environmental Planning Criteria
RC	Regional Commission
SB	Senate Bill
SOP	standard operating procedure
SPLCP	Standards and Procedures for Local Comprehensive Planning
SSO	sanitary sewer system overflow
SWMP	Stormwater Management Program
TMDL	total maximum daily load
TVA	Tennessee Valley Authority
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey

WC	water conservation
WCIP	Water Conservation Implementation Plan
WQ	water quality
WRD	Wildlife Resources Division
WS	water supply
WTP	water treatment plant
WW	wastewater

(This page intentionally left blank)

Acknowledgements

The authors gratefully acknowledge the cooperation, courtesy, and contributions of the following members of the Coosa-North Georgia Regional Water Planning Council.

Name	City	County
Brooke Anderson	Dawsonville	Dawson
Donald Anderson, Jr.	Cornelia	Habersham
David Ashburn	LaFayette	Walker
Irwin Bagwell	Cave Springs	Floyd
Jerry Barnes	Jasper	Pickens
Wayne Bennett	Dawsonville	Dawson
John Bennett	Rome	Floyd
Mike Berg	Dawsonville	Dawson
Greg Bowman	Calhoun	Gordon
Jim Conley	Blairsville	Union
Keith Coffey	Ringgold	Catoosa
James Donald Cope	Dalton	Whitfield
Jerry Crawford	Calhoun	Gordon
Jamie Doss	Rome	Floyd
W. David Gattis	Ringgold	Catoosa
James Irby, Jr.	Cornelia	Habersham
Haynes Johnson	Jasper	Pickens
Anne Kaiser	Rome	Floyd
Ronnie Kilgo	Rome	Floyd
Larry Lykins	Ellijay	Gilmer
Edwin Nix	Cleveland	White
Tom O'Bryant	Cleveland	White
Lamar Paris	Blairsville	Union
Jimmy Petty	Crandall	Murray
Frank Riley, Jr.	Hiawassee	Towns
Sandie Sparks	Ellijay	Gilmer
Alvin Worley	Ringgold	Catoosa
Representative Katie Dempsey	(Ex-Officio)	Floyd
Senator Charlie Bethel	(Ex-Officio)	Whitfield

(This page intentionally left blank)

Executive Summary

This Regional Water Plan lays out a roadmap for implementing specific measures designed to ensure wise use and management of the Coosa-North Georgia (CNG) Region's water over the next 50 years. It focuses on four areas:

- Water Conservation—Responsible use of a public resource
- Water Supply—Optimal management of water supplies and systems
- Wastewater—Reliable means for wastewater treatment and reuse
- Water Quality—Environmental improvements through reduced pollution

This Plan assesses the Region's current and future water and wastewater needs, and describes 41 management practices that can be implemented through collaboration between local, regional, and state entities. It also presents realistic and measurable benchmarks to track short-term and long-term progress toward implementing these management practices.

Introduction

The Georgia Environmental Protection Division (GAEPD), with oversight from the Georgia Water Council, developed the first Comprehensive State-wide Water Management Plan (State Water Plan), which was adopted by the Georgia General Assembly in January 2008. The State Water Plan included a provision to create 10 water planning regions across the state, each guided by a regional water planning council. (An eleventh region and council, covering the Atlanta metro area, already existed). Part of the mission of each council was to create a Regional Water Plan, and the original plan was adopted by GAEPD in September 2011.

The Coosa-North Georgia Regional Water Planning Council (the Council) prepared this Regional Water Plan for the CNG Region, which includes 18 counties and 52 municipalities. See Figure ES-1. The Region contains portions of the Coosa, Conasauga, Coosawattee, Etowah, and Oostanaula River Basins, and includes various groundwater aquifer systems, particularly the Crystalline rock and Paleozoic rock aquifer systems.

Figure ES-1: Location Map of Coosa-North Georgia Water Planning Region

Process

The Council is comprised of 29 individuals who represent a cross-section of public and private stakeholders within the Region's 18 counties: Catoosa, Chattooga, Dade, Dawson, Fannin, Floyd, Gilmer, Gordon, Habersham, Lumpkin, Murray, Pickens, Polk, Towns, Union, Walker, White, and Whitfield. The Council adopted the following vision and goals (Table ES-1) to guide the development of this Regional Water Plan:

Vision: Enhance the potential and quality of life for all communities through sustainable use of water resources in the region and state with partnerships among a broad spectrum of stakeholders.

Table ES-1: Goals for the Regional Water Plan

Number	Goal
1	Plan for appropriate levels of water storage, water sources, and long-term supply to meet anticipated need for local communities.
2	Minimize adverse effects to local communities and adjacent regions, and, when possible, enhance natural systems.
3	Ensure that management practices support economic development and optimize existing water and wastewater infrastructure.
4	Promote alternative technologies that conserve, return, and recycle water; protect water quality; and ensure adequate capacity for water storage within the Region.
5	Promote properly managed wastewater discharges.
6	Educate stakeholders in the Region on the importance of water resources, including water conservation, efficiency, and pollution prevention.
7	Identify practices that reduce nonpoint source pollution and control stormwater to protect and enhance water quality and ecosystems in lakes and streams, particularly those in priority watersheds and listed streams.
8	Develop an ongoing adaptive management approach to measure, share, and evaluate water use data and information.

A series of nine full council meetings were held to develop the original (2011) Regional Water Plan over a 24-month period. The meetings included representation from state agency staff, local government and utility staff, and interested stakeholders. Additional subcommittee meetings were held to address specific topics including the water and wastewater per capita demands and the selection of management practices. Results and recommendations from subcommittee meetings were discussed and approved during full council meetings.

Five-Year Plan Update

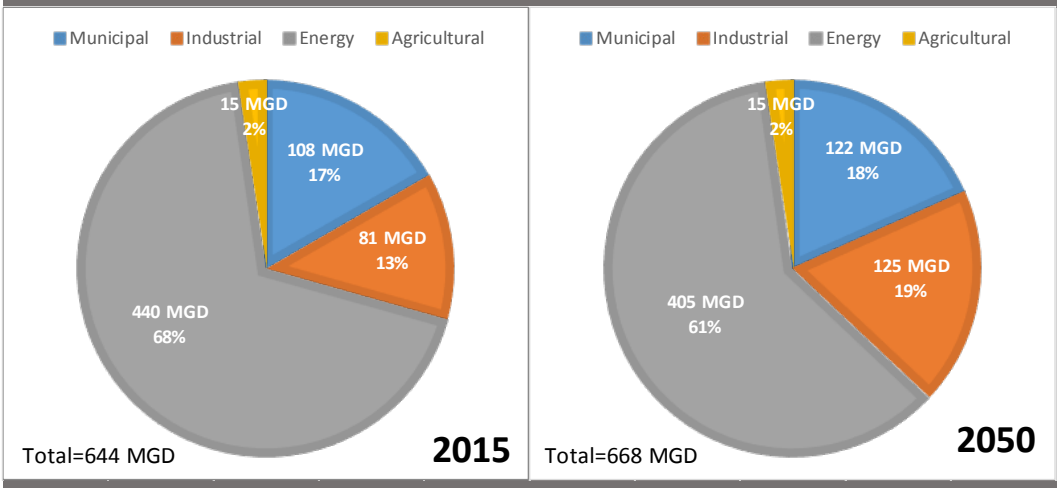
As defined in the water planning act approved by the Georgia General Assembly in 2008, the Regional Water Plans are required to be updated on a 5-year cycle. This document is the product of the first update to the original 2011 plan for the CNG water planning region. In general, the plan update process followed essentially the same overall planning process outlined in Figure 1-2, with some variances in specific steps to accommodate the schedule or available funding. Variances in the planning steps are outlined in the respective sections of the document, including water and wastewater demand forecasts (Section 4) and resource assessment modeling (Sections 3 and 5).

Water and Wastewater Demands

As shown in Figure ES-2, major water uses, based on 2015 water withdrawal totals, are for energy generation (68 percent), municipal water supply (17 percent), industrial use (13 percent), and agricultural use (2 percent). Virtually all of the water withdrawn for energy generation is used for cooling and then returned to its original source. Thus, consumptive water use for this purpose is negligible.

Energy water demands are expected to decrease throughout the planning horizon (i.e., through 2050); however, energy use will remain the largest demand in the Region in 2050, comprising 61 percent of the total. Other uses forecast for 2050 include municipal water supply (18 percent), industrial use (19 percent), and agricultural use (2 percent). Agricultural water demands are expected to remain relatively constant between 2015 and 2050. Municipal and industrial water demands are projected to increase steadily from approximately 189 million gallons per day (MGD) in 2015 to 247 MGD in 2050. The updated 2050 water forecasts are lower than the original plan estimates (247 versus 334 MGD) primarily due to the updated population projections, which indicate a lower overall population in 2050 for the Region than estimated for the original plan.

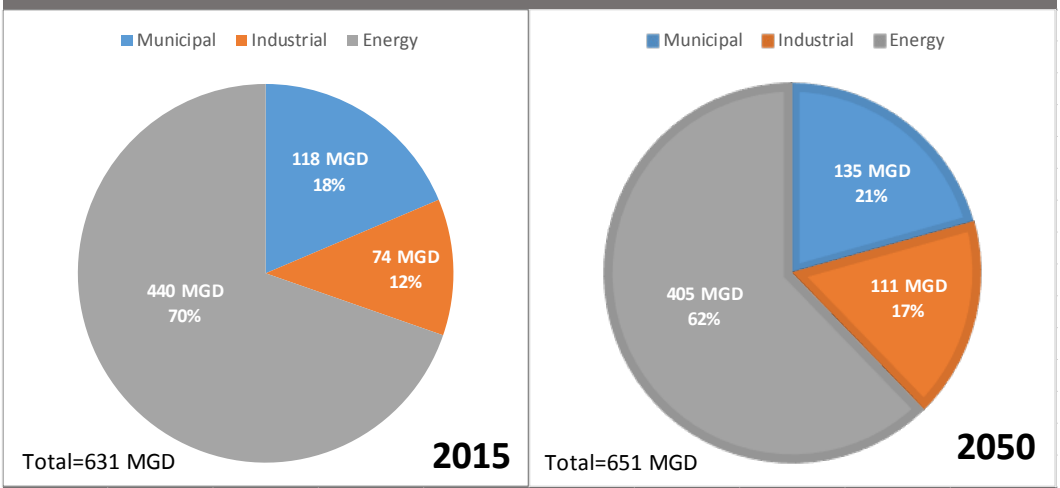
Figure ES-2: Water Demand Forecast for 2015 and 2050 (AAD-MGD)



Notes:
Includes Municipal, Industrial, Energy, and Agriculture (Irrigation, Nursery, Golf, and Livestock).
Source: Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum (2017).

Figure ES-3 shows the results of the wastewater flow forecast for 2015 and 2050 by sector. Water returns from thermoelectric energy production make up 70 and 62 percent of the total in 2015 and 2050, respectively. However, these flows are generally for permitted cooling water returns and do not represent future needs for wastewater treatment. The total wastewater flow for municipal and industrial uses is projected to be 246 MGD in 2050.

Figure ES-3: Wastewater Flow Forecast for 2015 and 2050 (AAF-MGD)



Notes:
Source: Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum (2017).

Major Findings

The GAEPD developed Resource Assessments of the State's river basins and aquifers that examine three resource conditions:

Surface Water Quality (Assimilative Capacity)—The capacity of Georgia's surface waters to accommodate pollutants without unacceptable degradation of water quality, i.e., without exceeding State water quality standards or harming aquatic life.

Surface Water Quantity—The ability of surface water resources to meet current municipal, industrial, agricultural, and thermoelectric power water needs, as well as the needs of in-stream and downstream users.

Groundwater Quantity—The sustainable yield or volume of water that can be withdrawn without causing adverse effects in prioritized groundwater resources.

The Resource Assessments also identify potential shortcomings in these resources and classify them as "gaps." A potential gap means that the existing or future conditions (2050) exceed the Resource Assessment metric, e.g., if the estimated sustainable yield of a specific groundwater aquifer is exceeded, then a potential "gap" exists in groundwater availability in that area.

In addition, an analysis of existing permitted capacity (for water and wastewater facilities) versus future demands was conducted to identify potential water infrastructure "needs" and any potential wastewater infrastructure "shortages." A need or shortage means that the current permitted capacity of water or wastewater treatment facilities, respectively, is less than the future forecast demands, e.g., a potential "need" would occur if the permitted capacity of a water treatment plant in 2050 is less than the forecast demand for that year.

Table ES-2 summarizes the potential gaps, needs, and/or shortages identified for each county within the Region. The water quality gap analysis includes a summary of the miles of stream segments in each county that are not meeting water quality standards and are on the 303(d) list of impaired waterbodies. Based on the Resource Assessments, there were limited gaps in meeting future water availability in Catoosa, Chattooga, Dade, and Walker Counties in 2050. There were estimated gaps in meeting assimilative capacity in the future that will require improvements in wastewater treatment and nonpoint source controls, primarily for nutrient removal. Needs and shortages in permitted water and wastewater capacity, respectively, also occur by 2050 and will require development of additional treatment facilities. However, these needs are now limited to improvements in municipal facilities in Dawson and Towns Counties and wastewater facilities in Habersham County.

Table ES-2: Summary of Potential Gaps, Needs, or Shortages by CNG County

County	Surface Water Availability Gaps	Municipal Water Needs	Municipal Wastewater Shortages	Agricultural Water Shortages	Water Quality – Assimilative Capacity Gaps[a]	Miles and (Segments) of 303(d) Reaches[b]
Source	*Table 5-1*	*Table 5-2*	*Table 5-4*	*Table 5-5*	*Figure 5-2*	*Section 3.3.2 and 5.3*
Catoosa	Yes					69 (14)
Chattooga	Yes				Yes	56 (10)
Dade	Yes			Yes	Yes	21 (3)
Dawson		Yes				51 (7)
Fannin						49 (10)
Floyd					Yes	175 (24)
Gilmer						74 (18)
Gordon					Yes	94 (17)
Habersham			Yes			42 (5)
Lumpkin						61 (10)
Murray					Yes	65 (10)
Pickens						54 (12)
Polk					Yes	18 (2)
Towns		Yes				42 (11)
Union						89 (23)
Walker	Yes					50 (9)
White						25 (5)
Whitfield					Yes	37 (10)
Total	**4**	**2**	**1**	**1**	**3**	**1072 (200)**

Notes:

"Yes" indicates that there is a potential gap or need/shortage in the indicated county.

"Gap" is defined as a condition where the existing or future water withdrawal or return conditions exceed the Resource Assessment metric within a portion of the county.

"Need" and "Shortage" are defined as a condition where the current permitted capacity of water and wastewater treatment facilities, respectively, is less than the future forecast demands.

[a] Gaps in assimilative capacity are for streams modeled to have "Limited," "At Capacity," or "No Capacity Remaining" status.

[b] Includes only 303(d) reaches that are fully within each respective county. An additional 397 miles over 41 stream reaches are shared between two or more CNG counties.

Recommended Management Practices

The State Water Plan defines Management Practices as reasonable methods, considering available technology and economic factors, for managing water demand, water supply, return of water to water sources, and prevention and control of pollution of the waters of the State. The Council ultimately selected 41 management practices within the following categories: Water Conservation (11 management practices), Water Supply (8 management practices), Wastewater (8 management practices), and Water Quality (14 management practices). In counties with no identified potential gaps/needs/shortages within a particular category, the management practices were selected to align with the Region's visions and goals.

Due to the diversity of land use and anticipated growth across the basin, the Council recognized that a "one size fits all" approach to management practices was not appropriate. Therefore, the Council developed a diverse set of management practices that may be applied to address more localized sub-regional water supply, wastewater, or water quality issues. For this plan update, the Council recommended more specific language on several management practices to emphasize the need to move forward with implementation. The language changed from "consider" implementation of a practice to "implement" the practice.

For this plan update, the Council reviewed the original management practices and provided recommendations on modifications based on feedback from stakeholders (Council members, local governments, and utilities) during a series of meetings facilitated by the Northwest Georgia Regional Commission in 2015. These recommendations were revisited during the update process after the resource assessments were completed to ensure that the final recommendations addressed any new potential "gaps" in water availability or water quality. Based on the new resource assessment information, the potential "gaps" that were identified in the original planning process remained essentially the same. Therefore, the primary changes to the management practices were identified to clarify or enhance existing management practices based on local government implementation experience or to add management practices to address specific Council recommendations.

The Council also re-evaluated the short-term and long-term actions for implementing all management practices and identified the parties responsible for implementation. The bulk of implementation actions will continue to be the responsibility of local governments and utilities, and their respective Regional Commissions; however, extensive support for short-term activities, in particular, will be needed from State entities, such as the GAEPD. Cost estimates are presented that specify the capital or programmatic costs and funding sources and options for each management practice. These cost estimates were not revised during this plan update but the cost estimates for the new management practices were provided based on the same cost guidance used in the original study. In addition, the Council compiled a list of recommendations to the State for actions that will support implementation of the Plan. The Council also established measurable, achievable, realistic, and time-phased benchmarks for implementing this Regional Water Plan. For example, the Council still recommends that progress in implementation of the short-term actions be measured using an annual

survey, and improvements in water quality monitoring results be measured using the GAEPD water quality database.

Overview of Plan Sections

Table ES-3 presents an overview of the Sections of this Regional Water Plan.

Table ES-3: Overview of the Regional Water Plan

Section	Title	Overview
1	Introduction	Introduction of Regional Water Planning process and the Council
2	Coosa-North Georgia Water Planning Region	Characteristics of the Region, including geography and watersheds, aquifers, population, and land cover
3	Water Resources of the Coosa-North Georgia Region	Major water uses and baseline water resource capacities
4	Forecasting Future Water Resource Needs	Municipal, industrial, agricultural, and energy water use forecasts through 2050
5	Comparison of Water Resource Capacities and Future Needs	Groundwater and surface water (quantity and quality) comparisons and identification of potential future gaps, needs, or shortages
6	Addressing Water Needs and Regional Goals	Identified Management Practices to address future goals, shortfalls, needs, and potential gaps
7	Implementing Water Management Practices	Management Practice implementation schedules, roles of responsible parties, cost estimates, and Recommendations to the State
8	Monitoring and Reporting Progress	Benchmarks and measurement tools to track progress toward meeting goals and addressing shortfalls
9	Bibliography	Supporting and referenced materials list

Section 1. Introduction

Section Summary

Georgia is developing Regional Water Plans for 10 planning regions across the state to define sustainable practices to meet regional water resource needs through 2050.

*The Coosa-North Georgia Council developed a vision to "**enhance the potential and quality of life for all communities through sustain-able use of water resources in the region and state with partnerships among a broad spectrum of stakeholders**" and adopted the eight goals listed in Section 1.3.*

The 2004 Comprehensive State-wide Water Management Planning Act mandated the development of a state-wide water plan that supports a far-reaching vision for water resource management: "Georgia manages water resources in a sustainable manner to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens" (Official Code of Georgia Annotated [O.C.G.A.] §12-5-522(a)).

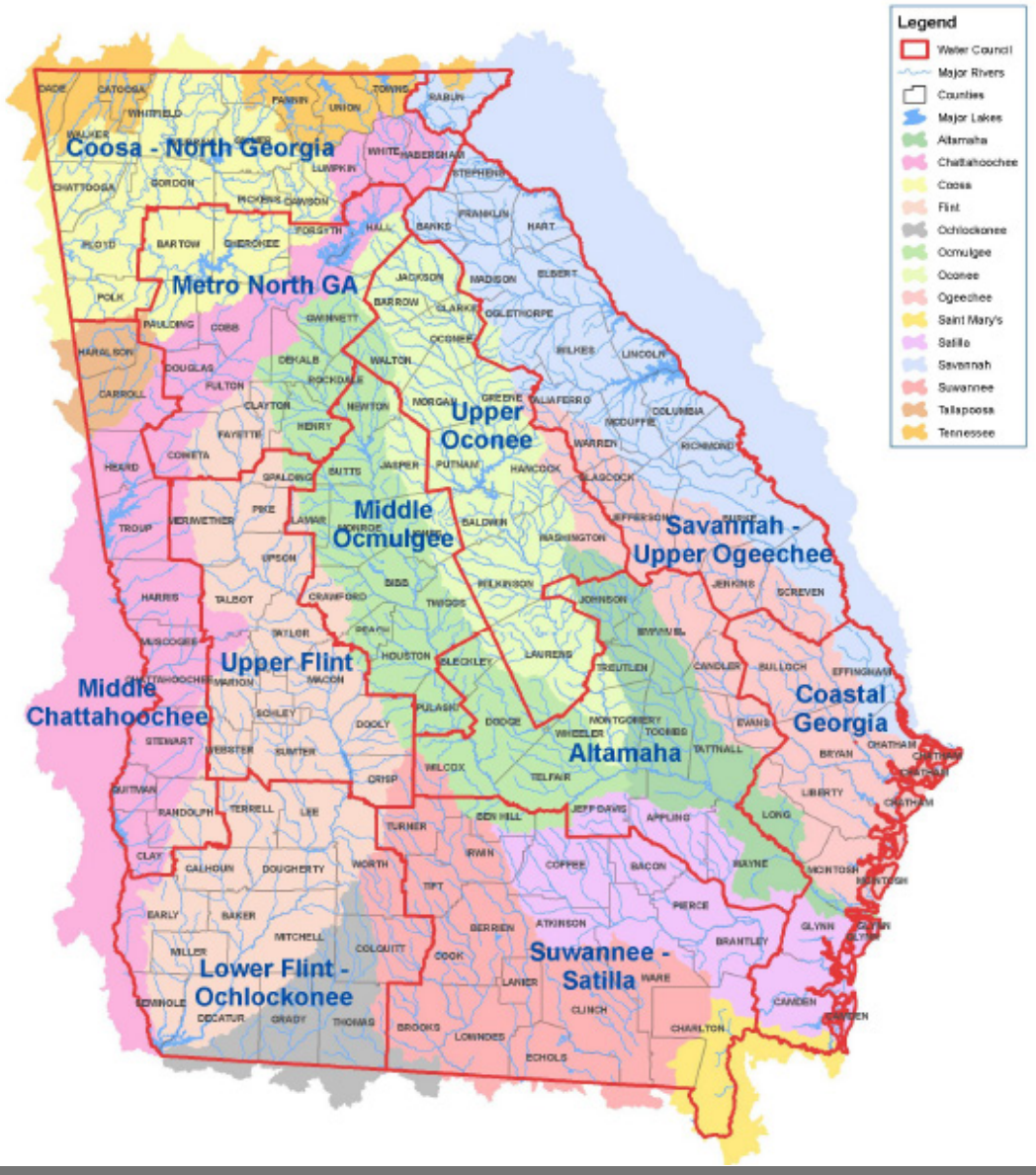
The Georgia Environmental Protection Division (GAEPD), with oversight from the Georgia Water Council, was charged with developing the first Comprehensive State-wide Water Management Plan (State Water Plan), which was adopted by the Georgia General Assembly in January 2008.

The State Water Plan included a provision to create 10 water planning regions across the state, each guided by a regional water planning council. The Governor, Lieutenant Governor, and Speaker of the House appoint members of the regional water planning councils. Figure 1-1 illustrates the location of these regions relative to Georgia's river basins and counties. The preexisting Metropolitan North Georgia Water Planning District (Metro District) was established in May 2001.

The original 10 regional water development and conservation plans (Regional Water Plans) were developed and adopted by GAEPD in 2011. This Regional Water Plan prepared for the Coosa-North Georgia Water Planning Region (the Region) by the Coosa-North Georgia (CNG) Regional Water Planning Council (the Council) defined the regionally appropriate water management practices to be employed in the CNG Region.

This document is an update to the 2011 Regional Water Plan for the CNG Region and is based on updated regional water demand forecasts, updated resource assessment modeling, and the evaluation of potential future gaps in surface water availability and water quality. This updated plan also includes the revised management practices recommended by the CNG Council to either address future water resource management needs or to refine or clarify management practices for the local governments and utilities in the CNG Region.

Figure 1-1: Georgia Regional Water Planning Councils



Source: Georgia Environmental Protection Division, 2009.

Each regional water plan recommends sustainable management practices designed to meet each region's needs through the year 2050, while coordinating with the regional water plans of adjoining regional water planning councils for consistency across the state. As such, this CNG Regional Water Plan contains the following sections:

- Section 2 provides in an overview of the Region's population, municipalities and land use.
- Section 3 describes the Region's existing water resources and unique characteristics.
- Section 4 forecasts the Region's future water resources needs.
- Section 5 compares the Region's future needs with existing capacities to identify potential water resource issues, particularly any potential water gaps or shortages.
- Section 6 reviews existing local and regional plans as part of an effort to select management practices to address potential gaps and shortages, while still meeting goals for the Region.
- Section 7 establishes a roadmap for implementing the selected management practices.
- Section 8 establishes benchmarks for measuring and reporting progress toward implementation.

1.1 The Significance of Water Resources in Georgia

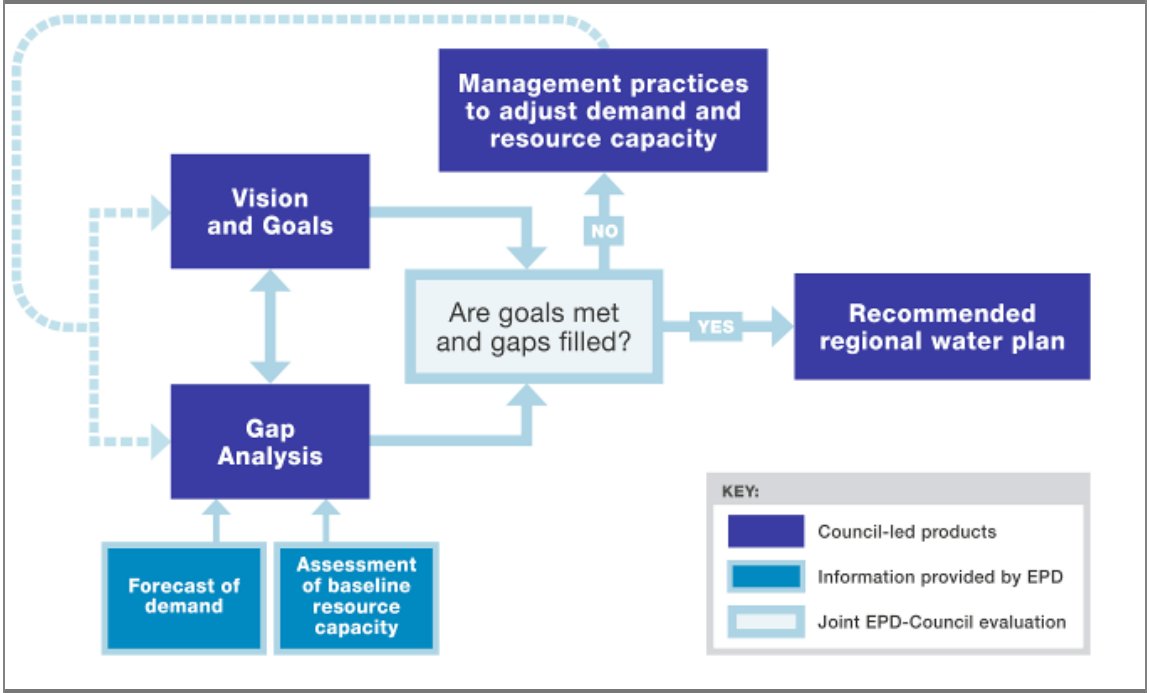
Of all Georgia's natural resources, none is more important to the future of the state than water. The wise use and management of water is critical to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens. Georgia has abundant water resources, with 14 major river systems and multiple groundwater aquifer systems. But, while water in Georgia is abundant, it is not an unlimited resource and must be carefully and sustainably managed to meet long-term water needs. This CNG Regional Water Plan moves the Region toward managing its water resources in a proactive, sustainable manner.

1.2 State and Regional Water Planning Process

The State Water Plan established the 10 regional water planning councils illustrated in Figure 1-1, including the CNG Council, and provided a framework for regional planning. The original regional water plans were prepared following the consensus-based planning process outlined in Figure 1-2, which requires the input of regional water planning councils, local governments, and the public. For this plan update, a similar approach was followed including a review of the original vision and goals, updates to the water and wastewater demands, updates to the resource assessments, and a re-evaluation of potential future gaps. Similar to the original plan development, GAEPD is overseeing the planning process and, along with partner agencies,

providing support to the councils. The primary role of each council is to develop an updated Regional Water Plan and submit it to GAEPD for approval. The CNG Council has coordinated its efforts with councils adjacent to the CNG Region, including the Lower Flint-Ochlockonee, Middle Chattahoochee, Metropolitan North Georgia, Savannah-Upper Ogeechee, and Upper Flint councils. Specific roles and responsibilities for regional water planning councils are outlined in a Memorandum of Agreement between each council, GAEPD, and the Georgia Department of Community Affairs (DCA).

Figure 1-2: State Water Planning Process



Source: Georgia Environmental Protection Division, 2009.

1.3 CNG Regional Water Planning Council Vision and Goals

The Council created a vision and a set of goals to guide water management in the Region. The vision and goals guided the evaluation and selection of management practices that will best meet the Region's needs, as illustrated in Figure 1-2.

The Council adopted the following vision:

Enhance the potential and quality of life for all communities through sustainable use of water resources in the region and state with partnerships among a broad spectrum of stakeholders.

The Council adopted the following goals, which include both water quantity and quality management objectives:

- Plan for appropriate levels of water storage, water sources, and long-term supply to meet anticipated need for local communities.
- Minimize adverse effects to local communities and adjacent regions, and, when possible, enhance natural systems.
- Ensure that management practices support economic development and optimize existing water and wastewater infrastructure.
- Promote alternative technologies that conserve, return, and recycle water; protect water quality; and ensure adequate capacity for water storage within the Region.
- Promote properly managed wastewater discharges.
- Educate stakeholders in the Region on the importance of water resources, including water conservation, efficiency, and pollution prevention.
- Identify practices that reduce nonpoint source pollution and control stormwater to protect and enhance water quality and ecosystems in lakes and streams, particularly those in priority watersheds and listed streams.
- Develop an ongoing adaptive management approach to measure, share, and evaluate water use data and information.

These goals will lead the CNG Region toward sustainable growth in the future while maintaining its existing excellent quality of life. The CNG Council recognizes that the fish, wildlife, streams, rivers, and lakes in the Coosa, Chattahoochee, and Tennessee watersheds are vitally important to the people living in this Region and the entire state. These resources provide numerous people with the opportunity to fish, hunt, and otherwise enjoy areas of unspoiled green space. This public use and the existing natural resources provide significant economic benefits to the Region with minimal outlay of public funds or services. The high quality of the water resources within the Region allows, in many cases, water utilities to operate at lower costs than in areas with more heavily impacted water quality. As a result, the Council places a very high priority on the protection, maintenance, enhancement, and restoration of the natural resources located within the Region.

(This page intentionally left blank)

Section 2. Coosa-North Georgia Water Planning Region

Section Summary

The 5,500-square-mile Region includes 18 counties and contains portions of the Savannah, Chattahoochee, Tennessee, and Coosa River Basins. Local governments in the Region are supported by two regional planning entities: the Northwest Georgia Regional Commission and the Georgia Mountains Regional Commission.

The total population of the Region was estimated at 759,880 in 2015 and is projected to grow to nearly 900,000 in 2050. Approximately 68 percent of the total region was forested based on 2011 data, 11 percent was developed/urban, 13 percent was being used for pasture or row crops, and the remaining area was a mixture of wetlands, grasslands, and barren land.

The CNG Region encompasses the northern extent of the State of Georgia, with portions bordering South Carolina, North Carolina, Tennessee, and Alabama. The Region covers 5,500 square miles and includes 18 counties and 52 municipalities (see Figure 2-1). Its population was an estimated 759,880 in 2015 and is projected to reach 892,207 in 2050 (Georgia Office of Planning and Budget, 2015). Figure 2-1 illustrates that the Region has a large amount of land dedicated for conservation purposes; approximately 20 percent is conserved as part of the National Forest or as part of a State Forest, Wildlife Management Area, or Historic Area.

2.1 History, Climate and Physiography

The CNG Region has an extensive history of Native American habitation.

The Region is characterized by a moist and temperate climate with mean annual precipitation ranging from 52 to 64 inches. Rainfall is fairly evenly distributed throughout the year, but a distinct dry season usually occurs from mid-summer to late fall. Winter is the wettest season and March the wettest month, on average (Robinson et al., 1996).

The Coosa River Basin Management Plan describes in detail the physiography, geology, and soils in the Region (GAEPD, 1998). The Region encompasses parts of four distinct physiographic provinces: the Cumberland Plateau, the Valley and Ridge, the Blue Ridge, and the Piedmont. Only a small segment of the Appalachian Plateau physiographic province lies in Georgia, encompassing Cloudland Canyon State Park in Dade County (Chowns, 2006). As a result, the Region's geography is diverse.

The Cumberland Plateau province is dominated by relatively flat plateaus, ranging in altitude from 1,500 to 1,800 feet above mean sea level (MSL), that are bounded by narrow, northeast-southwest-trending linear valleys. In contrast, the Valley and Ridge and the Piedmont provinces range from approximately 600 to 1,600 feet above MSL, while the Blue Ridge province is dominated by mountains as high as about 4,100 feet above MSL. The Valley and Ridge province extends northeast to southwest through the western portion of the region, connecting portions of Georgia and Tennessee with

eastern Alabama. This province consists of numerous northeast-to-southwest-trending ridges with associated valleys; it historically has been the source of mining activity with some farming in the valley floors. The Blue Ridge province includes most of the eastern portion of the Region and is dominated by mountains with fast-flowing streams, rapids, and steep slopes in the foothills of the Appalachian Mountains. Additionally, the southeastern borders of Habersham and Polk Counties straddle the Piedmont province, which is characterized by low hills and narrow valleys.

2.1.1 Local Governments

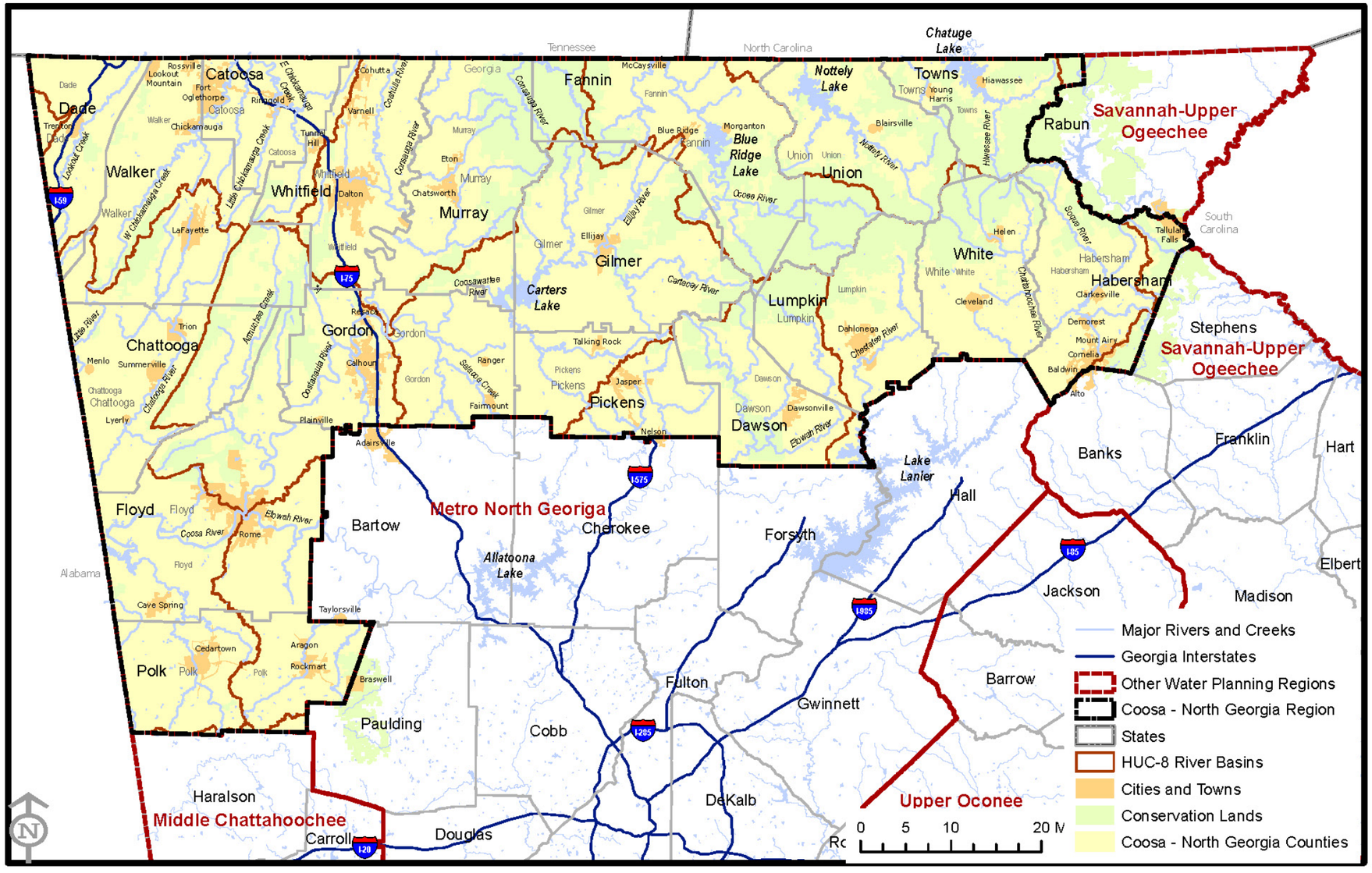
The Region includes 18 counties and 52 municipalities, as illustrated in Figure 2-1 and listed in Table 2-1; these local governments are responsible for land use and zoning decisions that affect water resources management. While many local governments are also responsible for planning, operating, and managing water and wastewater infrastructure, in some cases local or regional water authorities, or private companies, manage local infrastructure separately from local governments, as described in Section 4.

Table 2-1: CNG Counties and Municipalities

County	Municipalities
Catoosa County	Ringgold[a], Fort Oglethorpe
Chattooga County	Lyerly, Menlo, Summerville[a], Trion
Dade County	Trenton[a]
Dawson County	Dawsonville[a]
Fannin County	Blue Ridge[a], McCaysville, Morganton
Floyd County	Cave Spring, Rome[a]
Gilmer County	Ellijay[a], East Ellijay
Gordon County	Calhoun[a], Fairmount, Plainville, Ranger, Resaca
Habersham County	Alto, Baldwin, Clarkesville[a], Cornelia, Demorest, Mount Airy, Tallulah Falls
Lumpkin County	Dahlonega[a]
Murray County	Chatsworth[a], Eton
Pickens County	Jasper[a], Nelson, Talking Rock
Polk County	Aragon, Braswell, Cedartown[a], Rockmart, Taylorsville
Towns County	Hiawassee[a], Young Harris
Union County	Blairsville[a]
Walker County	LaFayette[a], Chickamauga, Fort Oglethorpe, Lookout Mountain, Rossville
White County	Cleveland[a], Helen
Whitfield County	Cohutta, Dalton[a], Tunnel Hill, Varnell

[a] Indicates County Seat

Figure 2-1: Counties and Cities in the CNG Region



Source: Conservation Lands, Natural Resource Spatial Analysis Laboratory (NARSAL), Institute of Ecology, University of Georgia (UGA), 2015. River Basins, GAEPD, Watershed Protection Branch, Drinking Water Compliance Program, 2003.

(This page intentionally left blank)

2.1.2 Watersheds and Water Bodies

The U.S. Geological Survey (USGS) has divided and sub-divided the U.S. into successively smaller hydrologic units, which are classified into four levels: regions, sub-regions, accounting units, and cataloging units. Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to eight digits based on the four levels of classification in the hydrologic unit system (USGS, 2011). Within the Region, there are portions of five river basins: Savannah, Chattahoochee, Coosa, Tallapoosa, and Tennessee, as shown in Figure 2-1 and summarized in Table 2-2. Table 2-2 provides the 8-digit HUCs for the river basins, and the area and proportion of the Region each HUC represents. The vast majority, almost 99 percent, of the Region drains to the Chattahoochee, Coosa, or Tennessee River Basins. Section 3 describes the Region's water use classifications and impaired waters.

The headwaters of the Chattahoochee River originate in the southeastern corner of the Region and drain approximately 12 percent of the total Region, including portions of Dawson, Lumpkin, White, and Habersham Counties. Major tributaries of the upper Chattahoochee River include the Chestatee River and Soque River. These waterways drain southwest to Lake Lanier, a multi-purpose reservoir constructed and operated by the U.S. Army Corps of Engineers (USACE), located primarily within the Metro District.

As shown in Table 2-2, the Coosa River Basin encompasses 60 percent of the Region and includes the following major rivers: Conasauga, Coosawattee, Etowah, and Oostanaula. The largest water body is 3,200-acre Carters Lake on the Coosawattee River in Gilmer, Gordon, and Murray Counties. Major tributaries to Carters Lake include Talking Rock Creek, Cartecay River, Ellijay River, and Mountaintown Creek. Carters Lake is operated by the USACE and, unlike many reservoirs, has no private docks or development along its 62 miles of shoreline (USACE, 2011a). The Coosa River at the Alabama/Georgia state line in Floyd County also starts to form the upper impoundment of Lake Weiss, an Alabama Power reservoir.

Approximately 26 percent of the Region drains north to tributaries of the Tennessee River. In the northeastern portion of the Region, these tributaries include the Hiwassee River (Chatuge Lake), Nottely River (Nottely Lake), and the Ocoee River (Blue Ridge Lake). In the northwestern corner of the state and Region, Lookout Creek, West Chickamauga Creek, Peavine Creek, Little Chickamauga Creek, East Chickamauga Creek, and Tiger Creek drain portions of Dade, Walker, Catoosa, and Whitfield Counties to the north into Tennessee and ultimately to the Tennessee River (see Figure 2-1).

Table 2-2: River Basin Characteristics within Region				
River Basin	Watershed Name	HUC-8 Code	Square Miles in Region	Percent of Region
Savannah	Tugaloo	03060102	46	1%
Savannah	Broad	03060104	18	Less than 1%
Chattahoochee	Upper Chattahoochee	03130001	676	12%
Coosa	Conasauga	03150101	600	11%
Coosa	Coosawattee	03150102	758	14%
Coosa	Oostanaula	03150103	523	10%
Coosa	Etowah	03150104	677	12%
Coosa	Upper Coosa	03150105	742	13%
Tallapoosa	Upper Tallapoosa	03150108	9	Less than 1%
Tennessee	Middle Tennessee – Chickamauga	06020001	598	11%
Tennessee	Hiwassee	06020002	425	8%
Tennessee	Ocoee	06020003	418	8%
Tennessee	Guntersville Lake	06030001	12	Less than 1%
	Total Region		**5,502**	

Source: Georgia Department of Natural Resources (GADNR) Basins at 1:24,000 scale, http://www.gaepd.org/Documents/dnr_basins_metadata.html.

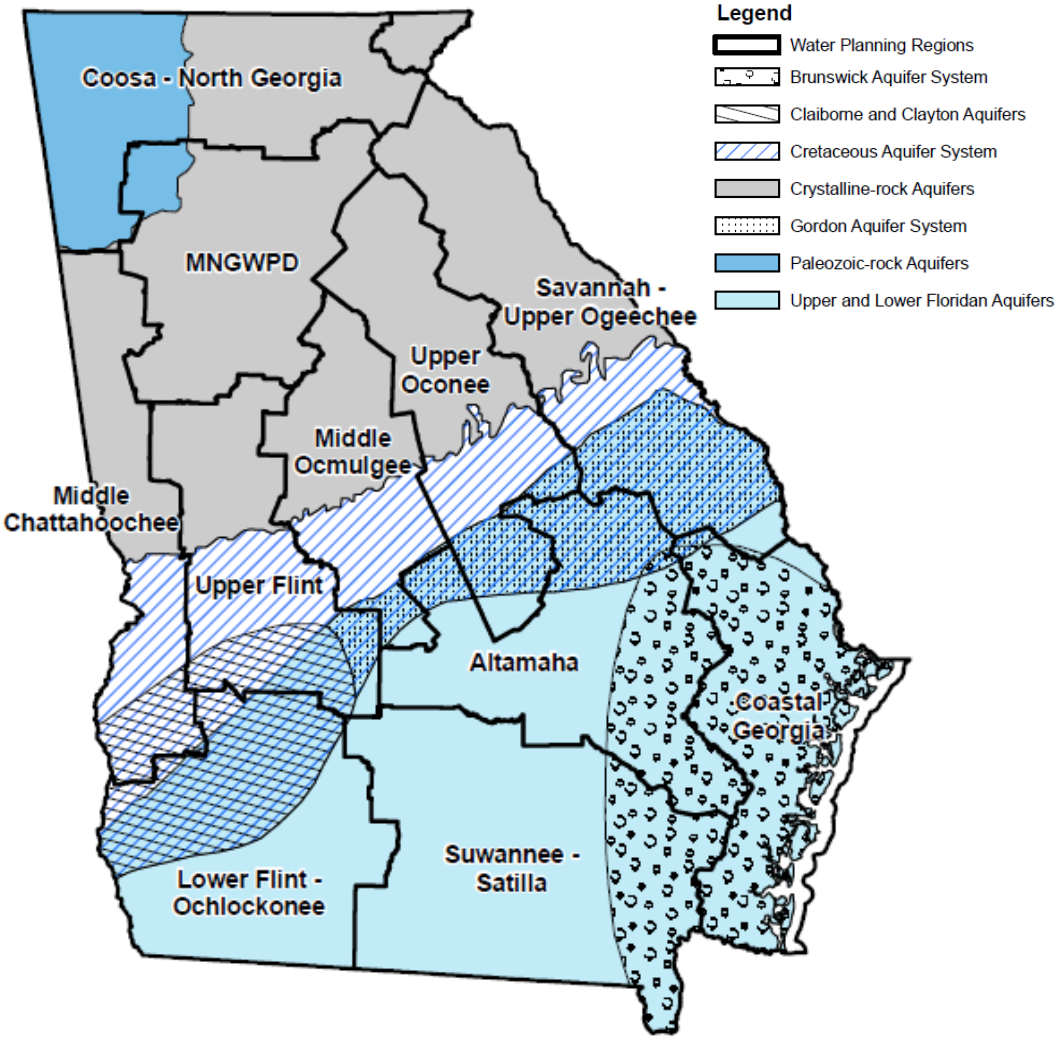
2.1.3 Groundwater Aquifers

The Region includes portions of two principal aquifer systems: the Crystalline rock and Paleozoic rock. See Figure 2-2. The eastern half of the Region includes Crystalline rock aquifer systems of the Piedmont and Blue Ridge physiographic provinces. The aquifer systems in the Crystalline rock aquifer occur in metamorphic and igneous rocks where secondary porosity and permeability has developed as a function of differential weathering along discontinuities. Enlargement of discontinuities, such as joints, faults, compositional layering/bedding, and foliation/cleavage, provides discreet pathways for groundwater storage and flow. The intersection and interconnection of these features creates localized aquifer systems within the bedrock that are dependent on many variables of each rock unit. Although these aquifer systems do not typically provide significant quantities of groundwater over the Region, local topographic and geologic conditions are conducive to development of discreet aquifer systems with sufficient sustainable yield to supplement water supply. These aquifer systems are typically local in extent, and the yield and groundwater chemistry can be affected by localized water use and climate. However, these aquifer systems, if properly managed, provide drought resistant sources of water to supplement surface water supplies.

The western half of the Region includes Paleozoic rock aquifers within the Valley and Ridge physiographic province. The principal aquifer systems in the Valley and Ridge occur in the carbonate sedimentary rocks where chemical weathering via solutioning has enlarged discontinuities (such as joints, faults, compositional layering and/or bedding planes) within the rock mass. Groundwater in these aquifer systems generally occurs under confined and semi-confined conditions, with recharge principally generated from precipitation and surface water percolating downward through the overburden into the underlying carbonate rocks and leakage from other aquifer systems. Karst topography commonly develops in valley floors underlain by carbonate rocks in this physiographic province, especially where the cover of residuum and/or alluvium is thin. Fluctuation of the groundwater table resulting from natural (e.g., drought) or anthropogenic (e.g., pumping) processes can accelerate the development of karstic features such as sinkholes, swallets, and sinking streams. While solution-enlarged discontinuities form conduits that can yield several thousand gallons of water per minute (gpm), the water may have high levels of calcium and bicarbonate; in addition, well yields outside these conduits are low (10 gpm or less). Within the Coosa River Basin, wells in these karst aquifers yield an average of 350 to 700 gpm (GAEPD, 1998), with some well yields in Gordon County exceeding 2,000 gpm (GAEPD, 2005).

The water system is dynamic, with groundwater and surface water interacting with each other differently depending on geologic and climatic conditions; for example, groundwater may provide a large percentage of stream baseflow during extended dry periods. The USGS has estimated that approximately 60 percent of the average annual flow in the Coosa River is supplied by groundwater (Robinson et al, 1996). However, in the Crystalline rock aquifers, well yields are typically less than 1 cubic feet per second (cfs) and have minor, if any, impact on measured baseflow (Williams, 2004; Williams et al., 2005).

Figure 2-2: Groundwater Aquifers



Source: GAEPD, 2009.

2.2 Characteristics of the Region

The characteristics of the region are briefly discussed in the following subsections.

2.2.1 Population

The total population of the 18-county Region was estimated at 759,880 in 2015 (Georgia Office of Planning and Budget, 2015). Floyd and Whitfield Counties are the two most populated counties in the Region, with 96,639 and 104,496 residents, respectively. Walker, Catoosa, and Gordon Counties have populations between 50,000 and 70,000; however, the remaining 13 counties have populations below 50,000. The five most populous counties represent just over half, 52 percent, of the total population in the region.

2.2.2 Employment

Employment data from the U.S. Bureau of Labor Statistics estimate that the Region is largely dominated by the textile manufacturing sector, mainly the carpet industry, followed by the food sector. The estimated total employment for the Region was 314,956 in 2015, a 23 percent increase from the 255,238 jobs estimated in 2005 (BLS, 2015).

The principal components of the manufacturing sector are textiles and apparel; paper and allied products; chemicals; transportation equipment; stone, clay, and glass products; food products; furniture; and lumber and wood products. Most of the manufacturing facilities are located in modern industrial parks and/or in proximity to water and the surface transportation network. The CNG Region has 10 of Georgia's higher learning institutions that contribute significantly to the economy of the communities where they are located.

2.2.3 Land Cover

Table 2-3 and Figure 2-3 illustrate land cover distribution across the major river basins in the Region in 2011. Table 2-3 summarizes acres by major river basin, including upstream and downstream areas outside of the Region, e.g., in Tennessee.

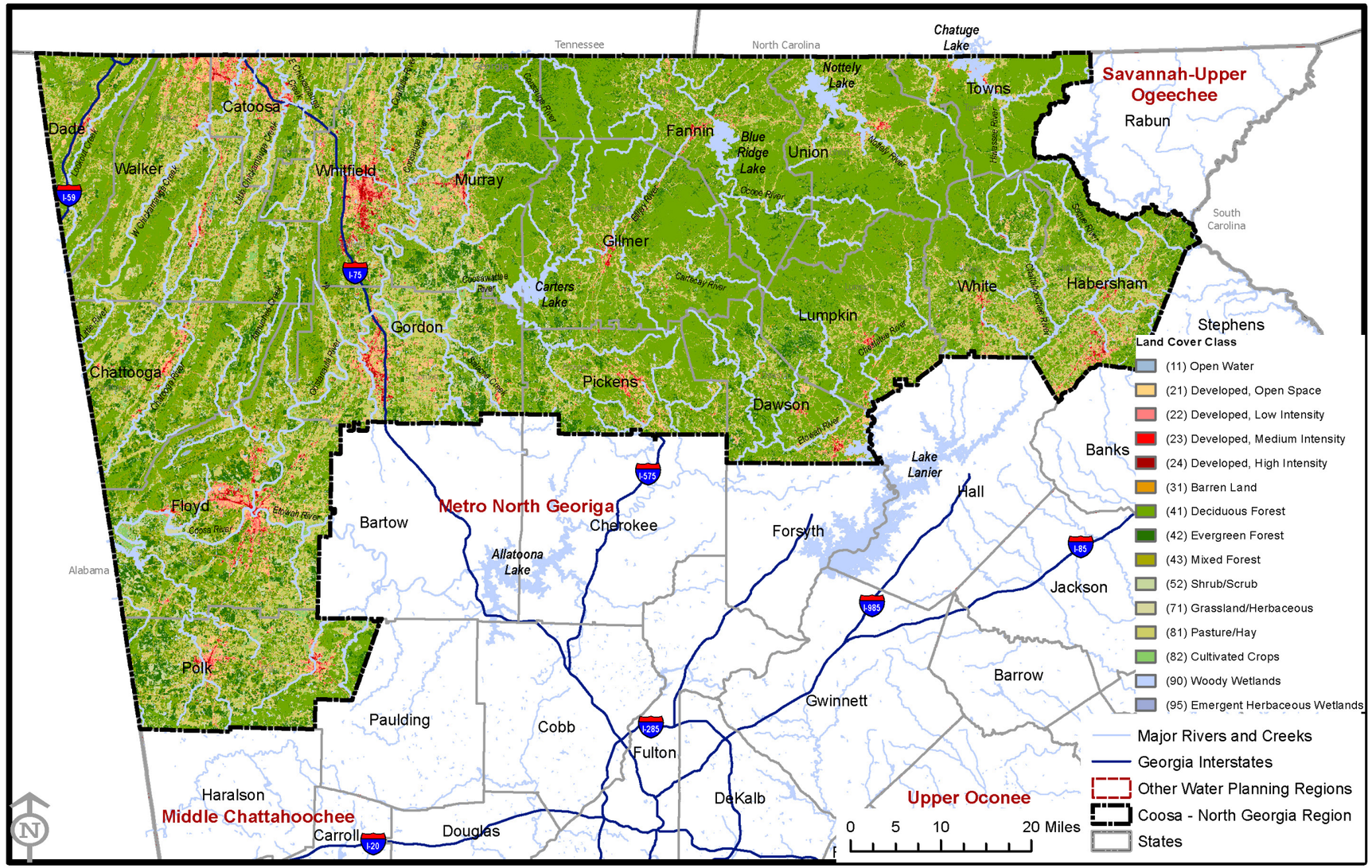
According to the 2011 USGS National Land Cover Database (NLCD), approximately 68 percent of the total Region was forested in 2011, with almost half, 49 percent, as deciduous forests. Eleven percent of the land was considered developed (open, low, medium, and high intensity), while another 13 percent was being used for pasture or row crops. This land cover information provides a relatively complete and consistent source for characterizing land cover conditions, and therefore potential nonpoint pollutant sources across the Region. The data show that the majority of the low and high intensity urban lands are clustered around the incorporated areas in the western third of the Region, while agricultural corridors are found in the western valleys. With the exception of limited pockets of urban land around Blairsville and Dahlonega, most of the lands to the northeast of the Region are forested.

Table 2-3: 2011 Land Cover Distribution

Land Cover Category	Coosa Basin (Acres)	Upper Chattahoochee Basin (Acres)	Tennessee Basin (Acres)	Total Acres	Percent of Total
Open Water	15,366	3,462	9,553	28,381	0.82%
Developed, Open Space	157,760	36,782	71,632	266,174	7.68%
Developed, Low Intensity	46,564	8,890	17,806	73,260	2.11%
Developed, Medium Intensity	15,631	2,945	4,701	23,277	0.67%
Developed, High Intensity	8,062	1,069	1,496	10,627	0.31%
Barren Land	3,372	1,392	1,420	6,184	0.18%
Deciduous Forest	902,262	256,457	536,948	1,695,667	48.93%
Evergreen Forest	292,486	32,803	69,372	394,661	11.39%
Mixed Forest	193,826	12,798	64,114	270,738	7.81%
Shrub/Scrub	99,230	3,935	19,236	122,401	3.53%
Grassland/Herbaceous	65,192	19,927	15,919	101,038	2.92%
Pasture/Hay	263,249	52,559	99,603	415,411	11.99%
Cultivated Crops	35,977	28	4,983	40,988	1.18%
Woody Wetlands	12,063	520	2,425	15,008	0.43%
Emergent Herbaceous Wetlands	1,701	12	243	1,956	0.06%
Total	**2,112,742**	**433,579**	**919,450**	**3,465,771**	**100%**

Source: USGS National Land Cover Database (NLCD), 2011.

Figure 2-3: 2011 Land Cover in the CNG Region



Source: Coosa-North Georgia Land Use Trends, 2011 Land Cover, USGS National Land Cover Database (NLCD).

(This page intentionally left blank)

2.2.4 Local Policy Context

The CNG Region includes portions of two regional planning entities: the Northwest Georgia Regional Commission (RC) and the Georgia Mountains RC (Table 2-4). Table 2-4 indicates the other counties that fall within these two RCs as well as those counties' corresponding Water Planning Region. Georgia's 12 RCs are quasi-governmental regional planning organizations, created and managed under Georgia law by their member local governments to serve regions that share similar economic, physical, and social characteristics. The RCs, working with the DCA, assist communities with a variety of planning issues, including local government planning, economic development, sustainable growth planning, and grant preparation and administration. The RCs also review local comprehensive land use plans and can help coordinate the connections between growth and water planning.

Table 2-4: CNG Counties by RC

RC	CNG Counties	Other Counties in this RC / Water Planning Region
Northwest Georgia	Dade, Walker, Catoosa, Chattooga, Gordon, Floyd, Polk, Whitfield, Murray, Gilmer, Pickens, Fannin	Haralson / Middle Chattahoochee Paulding and Bartow/Metro District
Georgia Mountains	Dawson, Lumpkin, Union, Towns, White, Habersham	Forsyth and Hall / Metro District, Hart, Franklin, Banks, Stephens, Rabun/Savannah – Upper Ogeechee

Source: DCA, 2009.

Local governments develop ordinances, policies, and plans to meet the requirements of State regulations. For example, communities with existing stormwater permits within the Region have developed local requirements for erosion and sediment control, post-construction runoff, and other programs required by the Federal and State stormwater programs. Local government and utility plans considered during the development of this Regional Water Plan are summarized in the Summary of Local Plans supplemental document available on the CNG website. There are also multiple regional water resource planning efforts ongoing within the Region, such as the Lake Allatoona Upper Etowah Partnership and the Northwest Georgia Regional Water Resources Partnership.

Section 7.3 provides a summary of the other water resource planning efforts in the Region.

(This page intentionally left blank)

Section 3. Water Resources of the Coosa-North Georgia Region

Water uses in the CNG Region are summarized in this section based on data developed by the USGS regarding water use in 2010 by county (USGS, 2016). The USGS examined both primary water users and water sources. 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).

Section Summary

Approximately 94 percent of the CNG Region's water is supplied by surface waters, with the other 6 percent coming from groundwater.

Resource Assessments for current conditions indicated that 31 miles of the Region's waterways have limited assimilative capacity remaining, i.e., the ability to receive wastewater discharges and still meet water quality standards for dissolved oxygen.

Resource Assessments for current conditions also indicated that under current conditions two of the six modeled nodes in the Tennessee Study Basin are predicted to have potential water availability gaps 5 to 6 percent of the time. The Alabama-Coosa-Tallapoosa Basin included five nodes, and only one node had a potential gap in water availability 2 percent of the time. Flows at each of the nodes with gaps are unregulated (i.e., no reservoirs are located upstream).

3.1 Major Water Use in Region

For planning purposes, water "withdrawal" is defined as the removal of water from a water source for a specific use. Depending on the kind of use, a portion of the withdrawn water is not returned to a water source as a measurable discharge. Water consumption (or consumptive use) is the difference between the amount of water withdrawn from a water source and the amount returned.

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

- **Municipal**—water withdrawn by public and private water suppliers and delivered for a variety of uses (such as residential, commercial, and light industrial).
- **Industrial**—water withdrawn 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**—water withdrawn to generate electricity, mainly for cooling purposes at thermoelectric plants. Water returns after use may vary depending on the cooling technology used by each plant.

- **Agriculture**—water withdrawn for crop irrigation, accounted for more than 95 percent of Georgia's irrigated land. Estimates of water use for animal agriculture, horticultural nurseries and greenhouses, as well as golf courses, are also included in this category.

As shown in Figure 3-1, in 2010 surface water continues to be the predominant source of water in the Region. Surface water and groundwater withdrawals that supplied the four major water use categories totaled approximately 605 million gallons per day (MGD) on an annual average.

Figure 3-2 shows the surface water withdrawals by major water withdrawal category. Thermoelectric energy production was, by far, the largest water withdrawal category (76 percent), followed by municipal use (13 percent). Although the majority of the water withdrawn in this region is used for energy production, nearly 100 percent return is expected for this use, because the cooling technology used by the only thermoelectric facility permitted within the Region (Plant Hammond, Floyd County) has a negligible water consumption rate.

Figure 3-3 shows groundwater withdrawals by major water withdrawal category. The leading use for groundwater withdrawal is municipal (81 percent), followed by industrial (12 percent). The two groundwater supply sources for the Region are the Crystalline rock and Paleozoic rock aquifers; however, Crystalline rock aquifers are a minor source due to geologic limitations.

Figure 3-4 summarizes wastewater treatment categories for the Region, and shows that the leading method for treating wastewater in 2010 was treatment facilities with point source discharges[1]. In addition, a significant amount of the municipal wastewater generated in the Region was treated by private onsite treatment systems (58 MGD), such as septic tanks, in areas where public collection systems are unavailable. In 2015, the GAEPD listed 138 municipal and industrial discharge permits in the Region comprised of 123 point source facilities, 1 subsurface systems, and 14 land application systems (LASs).

Throughout the planning process, existing agricultural water use, onsite sewage treatment, subsurface systems, and LASs were considered to be consumptive. Although water returns to its source from these applications, it was assumed in the Resource Assessments to not be returned within a time frame that allows for it to offset the impact of related withdrawals. Additional study of this issue in future updates of this Regional Water Plan and related resource assessments will more accurately represent the percent of this water that should be considered as a return flow.

[1] Note that the point discharge flows include returns from Plant Hammond.

Figure 3-1: 2010 Water Supply by Source Type [a]

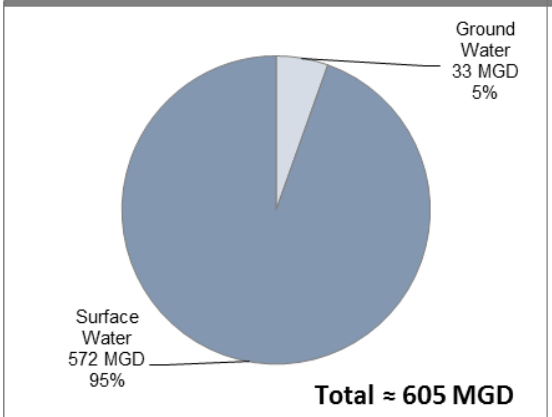


Figure 3-2: 2010 Surface Water Withdrawal by Category [a,b,d]

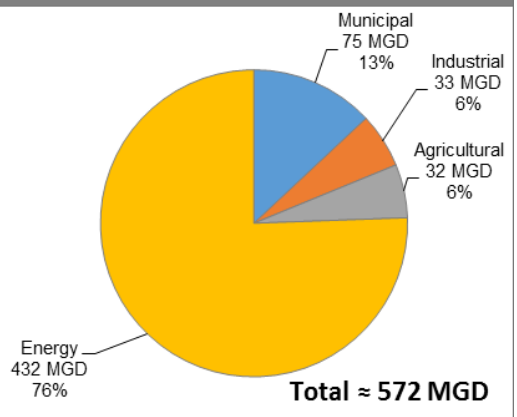


Figure 3-3: 2010 Groundwater Withdrawal by Category [a,d]

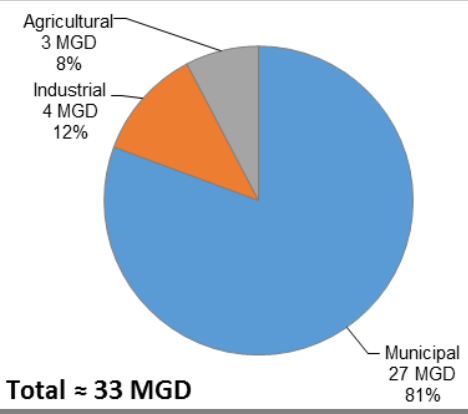
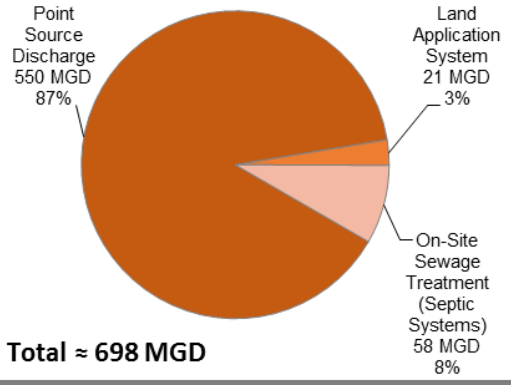


Figure 3-4: 2010 Wastewater Treatment by Category [c,e]



Notes:

a - Surface water value includes water withdrawals associated with thermoelectric power production from Plant Hammond.

b - Point Source Discharge includes 535 MGD total returns from Plant Hammond (thermoelectric energy production facility).

c - Some industrial categories are treated by municipal facilities and are included in the municipal category.

d - Data Sources: "Water Use in Georgia by County for 2010; and Water-Use Trends, 1980-2010" (Lawrence, 2016)

e - Data Source: Georgia EPD approved permit database. Septic system data was obtained using a regression analysis of the forcasted wastewater. 2010 LAS flows were not available; hence, 2014 modeling data is shown.

3.2 Resource Assessments

GAEPD developed three Resource Assessments: (1) surface water quality, also known as assimilative capacity, (2) surface water availability, also known as surface water quantity, and (3) groundwater availability. These Resource Assessments analyzed the capacity of streams and aquifers to meet demands for water supply and wastewater discharge without causing unacceptable local or regional impacts according to metrics established by GAEPD. The Resource Assessments were completed on a resource basis (river basins and aquifers), but are summarized here as they relate to the CNG Region. Full details of each Resource Assessment are presented on the GAEPD Water Planning website. Section 5 of this Regional Water Plan compares the Resource Assessments to water demand and wastewater flow forecasts.

In the context of the Resource Assessments, a potential "gap" is defined as a condition where the current or future use of water has been identified as potentially causing unacceptable impacts based on an exceedance of the Resource Assessment metric. For example, if the estimated sustainable yield of a specific groundwater aquifer is exceeded, then there would be a potential "gap" in groundwater availablity in that area. Similarly, if an existing water quality standard for nutrient loadings to a lake is projected to be exceeded, then there would be a water quality "gap" for that location. By contrast, a potential "need" or a potential "shortage" (discussed in Section 5) is defined as a condition where the current permitted capacity of water or wastewater treatment facilities, respectively, is less than the future forecast demands. For example, a potential "shortage" would occur if the permitted capacity of a water treatment plant in 2020 is 10 MGD and the forecast demand is 20 MGD. These potential gaps, needs, or shortages are addressed through water quantity and water quality management practices in Section 7.

3.2.1 Surface Water Quality (Assimilative Capacity)

The assimilative capacity Resource Assessment estimated the capacity of Georgia's surface waters to accommodate pollutants without unacceptable degradation of water quality. The term assimilative capacity refers to the ability of a water body to naturally absorb pollutants via chemical and biological processes without harming aquatic life or humans who come in contact with the water. A water body can be overloaded and violations of water quality standards may result. Water quality standards define the uses of a water body and set pollutant limits to protect those uses. The Assimilative Capacity Resource Assessment evaluated the capacity of surface waters to process pollutants without violating water quality standards.

The assimilative capacity results focus on dissolved oxygen (DO), nutrients (specifically total nitrogen and total phosphorus), and chlorophyll-a (the green pigment found in algae that serves as an indicator of lake water quality). Fish and other aquatic organisms need oxygen to survive, and the DO standards have been established to protect aquatic life. Although nutrients support food production for aquatic organisms, high concentrations of nutrients can result in algal blooms, negatively affecting DO concentrations that may result in fish kills and potentially impacting taste and odor in water supplies. The Assimilative Capacity Resource Assessment included an

evaluation of the impact of current wastewater and stormwater (including nonpoint source pollutants from all land uses) discharges, combined with current withdrawals, land use, and meteorological conditions, on DO, nutrients, and chlorophyll-a.

The Region includes both trout streams and warm water fishery streams that have daily average DO standards of ≥6 milligrams per liter (mg/L) and ≥5 mg/L, respectively. DO was modeled for each of the Region's major rivers. For this update, DO was modeled for 465 miles of streams in the Region.The results indicated 392 river miles with "Very Good" assimilative capacity (≥1.0 mg/L of available DO), 42 river miles with "Good" or "Moderate" capacity (>0.2 to 1.0 mg/L of available DO), and 31 river miles rated "Limited" or "None/Exceeded" (≤0.2 mg/L of available DO) capacity.

Lake Allatoona must meet the State standards outlined in Chapter 391-3-6-.03(17)(d) including chlorophyll-a, pH, total nitrogen, total phosphorus, fecal coliform, DO, and temperature. The standards for chlorophyll-a and total phosphorus vary by lake location. GAEPD has developed a total maximum daily load (TMDL) for Lake Allatoona in response to water quality problems caused by high nutrient levels (GAEPD, 2013). Based on direction from GAEPD, for the Etowah River Arm to Lake Allatoona, a 14 percent reduction in total nitrogen loads (in pounds per day [lbs/day]) and a 20 percent reduction in total phosphorus loads (lbs/day) are required to meet the TMDL. For the Allatoona Creek Arm to Lake Allatoona, a 40 percent reduction in total nitrogen loads (lbs/day) and a 41 percent reduction in total phosphorus loads (lbs/day) are required to meet the TMDL. The TMDL recommends compliance with National Pollutant Discharge Elimination System (NPDES) permit limits and requirements, adoption of Natural Resource Conservation Service (NRCS) conservation practices for agriculture, and application of stormwater best management practices (BMPs) appropriate to reduce nonpoint sources.

The U.S. Environmental Protection Agency (EPA) has established a TMDL for total phosphorus for Lake Weiss in Alabama that allocates a 30 percent aggregate pollutant load reduction to upstream Georgia sources from the Coosa River and Chattooga River at the Georgia/Alabama state line (EPA, 2008). Chapter 391-3-6-.03(14) of Georgia's Rules and Regulations for Water Quality Control specify that the Coosa River support recreational water uses at the state line, while the Chattooga River is targeted to support fishing. Updated modeling of the Coosa River indicated that the aggregate pollutant load reductions in total phosphorus would not be met under current loading conditions in both wet and dry years. However, recent (2016) data showed that total phosphorus levels have been consistently at or below 0.06 mg/L at the state line. In 2011, GAEPD began implementing a total phosphorus strategy in permits in the Coosa basin and since that time, there has been a reduction in the total phosphorus levels at the state line.

GAEPD has developed a final TMDL for two portions of Carters Lake (Coosawattee River Embayment and Woodring Branch) in response to water quality issues caused by high nutrient loadings, which have resulted in exceedances of the chlorophyll-a and total phosphorus standards (GAEPD, 2016). The combined loading reductions for both portions of Carters Lake called for a 7 percent reduction in total nitrogen loads (lbs/day) and a 58 percent reduction in total phosphorus loads (lbs/day) to meet the

TMDL. The TMDL recommends compliance with NPDES permit limits and requirements, adoption of NRCS conservation practices, and appliction of stormwater BMPs appropriate to reduce nonpoint sources.

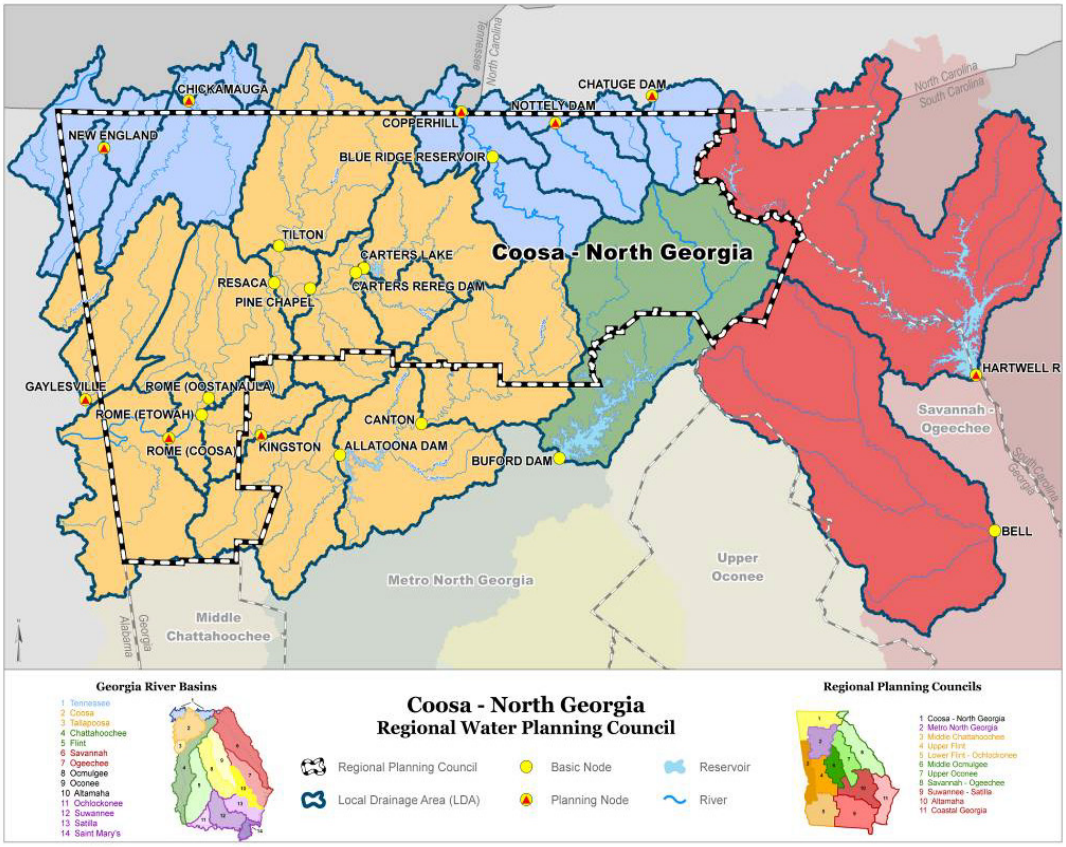
GAEPD is developing a TMDL for Lake Lanier due to exceedances of the chlorophyll-a critera. Currently, GAEPD has modeled preliminary nutrient reductions to meet the TMDL; however, the TMDL has not been completed. GAEPD has indicated that nonpoint source reductions for urban and agricultural land uses will be required, as well as future reductions in point source loadings to meet the required overall nutrient load reductions to achieve the chlorophyll-a standard.

3.2.2 Surface Water Availability

The surface water availability Resource Assessment estimated the flow response at various planning nodes within the Region based on current municipal, industrial, agricultural, and thermal power water consumptive uses within the basins above the planning nodes. The flow responses at the planning nodes were evaluated to determine the frequency with which the resulting stream flows fell below the flow regime established by stream flow metrics based on a policy developed by the Board of Natural Resources, and the magnitude of those deviations. The stream flow metrics are based on state policy, existing Federal policy, or existing Federal Energy Regulatory Commission (FERC) license requirements. The modeled flow was compared with the flow regime; where the modeled stream flow was less than the flow regime, a potential “gap” was identified. The potential gaps were analyzed in terms of both magnitude (i.e., the amount by which the modeled stream flow fell below the flow regime) and duration (i.e., the number of days the stream flow fell below the flow regime).

Figure 3-5 illustrates the local drainage areas and planning nodes used in developing the surface water availability Resource Assessments. Planning nodes are stream gages at selected points along streams in a watershed. These gaging stations are used to evaluate the impact of cumulative upstream consumptive uses of water (i.e., withdrawals minus returns) and authorized reservoir operations on stream flows.

Figure 3-5: Local Drainage Areas and Planning Nodes in the CNG Region



Source: GAEPD, 2009

The Region is part of three hydrologic modeling areas: the Tennessee Study Basin, the Alabama-Coosa-Tallapoosa (ACT) Study Basin, and the Apalachicola-Chattahoochee-Flint (ACF) Study Basin. The Tennessee Study Basin included six modeling nodes, or points where in-stream flow was estimated (see Figure 3-5). Two of these nodes were predicted to have potential gaps 5 percent (Chickamauga) and 6 percent (New England) of the time (2 to 6 cfs under current conditions; flows at both nodes are unregulated, i.e., no reservoirs are located upstream). The ACT Basin included five nodes, and only one that is unregulated (Gaylesville) was predicted to have a potential gap 2 percent of the time (average of 3 cfs) under current conditions. Although potential gaps were predicted in the ACF Basin, no gaps were predicted in the Chattahoochee portion of the CNG Region. The potential gaps indicate that the modeled natural streamflow is insufficient to meet the in-stream and off-stream uses at all times.

3.2.3 Groundwater Quantity

The groundwater availability Resource Assessment estimates the sustainable yield for prioritized groundwater resources based on existing data. GAEPD prioritized the aquifers based on the aquifer characteristics, evidence of negative effects, anticipated negative impacts, and other considerations.

No new analysis of groundwater availability was conducted as part of the Regional Water Plan update process. Two prioritized aquifer systems were evaluated in the Region in 2010 during the original Regional Water Plan process: the Crystalline rock and the Paleozoic rock. The Crystalline rock aquifer system lies within the Chattahoochee and Tennessee River watersheds; the Paleozoic rock aquifer system lies within the Etowah and Oostanaula River watersheds.

As part of the 2010 analysis, GAEPD developed a numerical groundwater model to estimate sustainable yield for a study basin selected within the Paleozoic rock aquifer system; a water budget approach developed for a basin within the Crystalline rock aquifer system was used to estimate sustainable yield in this part of the CNG Region. No groundwater sustainable yield issues were identified within the Region based on current demands and conditions. Although most wells produce less than 200 gpm in the Crystalline rock aquifers, in local geologically unique settings, several wells exist with production rates between 200 and 500 gpm (Georgia Geologic Survey, 2006). Furthermore, within the Paleozoic rock aquifers, carbonate aquifers can produce over 2,000 gpm with little or no impact to the local water table.

Typical water quality issues known to be associated with the Crystalline rock aquifer systems include elevated iron/manganese levels and local concentration of radionuclides. Water quality issues known to be associated with the Paleozoic rock aquifers include turbidity, pH, hardness, and iron.

3.3 Ecosystem Conditions and In-Stream Use

This section includes information on stream classifications, impaired waters, priority watersheds, and fish and wildlife.

3.3.1 Water Use Classifications (Designated Uses)

In accordance with the Federal Clean Water Act, GAEPD classifies each of the State's surface waters according to its uses. At a minimum, all waters are classified as fishable and swimmable. Water quality standards or criteria have been developed for each water use classification to assist GAEPD with making water use regulatory decisions; Table 3-1 summarizes the streams in the Region that are classified by the State for uses other than fishing and swimming as referenced in Chapter 391-3-6-.03(14) of Georgia's Rules and Regulations for Water Quality Control.

Jacks River and the headwaters of the Conasauga River are designated as Wild and Scenic for which no alteration of natural water quality from any source is allowed. Portions of 54 other waterways in the Region are designated as Recreation or Drinking Water, which also have additional water quality criteria. In addition to a water's

designated use, standards apply to two levels of trout stream designations: "Primary," which support self-sustaining populations of wild trout, and "Secondary," which provide habitat suitable for stocking trout. Eleven of the Region's 18 counties contain a primary or secondary trout steam. There is to be no elevation of natural stream temperatures for a primary trout stream. A secondary trout stream must have no temperature elevation exceeding 2 degrees Fahrenheit (°F) of natural stream temperatures.

Table 3-1: Special Stream Classifications

Basin	Stream	Reach	Classification
Chattahoochee	Bear Creek	Headwaters to confluence with Chattahoochee River	Drinking Water
Chattahoochee	Blue Creek	Headwaters to Yellowjacket Creek	Drinking Water
Chattahoochee	Camp Creek	Headwaters to confluence with Hazel Creek	Drinking Water
Chattahoochee	Chattahoochee River	Headwaters to confluence with Soque River	Recreation
Chattahoochee	Chattahoochee River	Soque River to White Creek	Recreation and Drinking Water
Chattahoochee	Chattahoochee River	White Creek to Mud Creek	Recreation
Chattahoochee	Chattahoochee River/Lake Lanier	Mud Creek to Buford Dam	Recreation and Drinking Water
Chattahoochee	Hazel Creek	Law Creek to Camp Creek	Drinking Water
Chattahoochee	Smith Creek	Unicoi Lake, Unicoi State Park Beach	Recreation
Chattahoochee	Soque River	Deep Creek to Sutton Mill Creek	Drinking Water
Chattahoochee	Turner Creek	Headwaters to confluence with Tesnatee Creek	Drinking Water
Chattahoochee	Yahoola Creek	Bryant Creek to confluence with Chestatee River	Drinking Water
Coosa	Beech Creek	Headwaters to Dry Creek (including Possum Trot Reservoir)	Drinking Water
Coosa	Blackwell Creek	Headwaters to Cox Lake Dam	Drinking Water
Coosa	Cartecay River	Clear Creek to confluence with Ellijay River	Drinking Water
Coosa	Chestnut Cove Creek	Headwaters to and including Lake Tamarack	Drinking Water
Coosa	Coahulla Creek	Bates Branch to Mill Creek	Drinking Water
Coosa	Conasauga River	Waters within the Cohutta Wilderness Area	Wild and Scenic
Coosa	Conasauga River	Headwaters to Forest Service Road 17	Outstanding Natural Resource Water
Coosa	Coosa River	At the Alabama State Line	Recreation

Table 3-1: Special Stream Classifications			
Basin	**Stream**	**Reach**	**Classification**
(Continued)			
Coosa	Coosawattee River	Mineral Springs Branch to confluence with Conasauga River	Drinking Water
Coosa	Coosawattee River/Carters Lake	Confluence with Mountaintown Creek to Carters Dam	Recreation and Drinking Water
Coosa	Dry Creek	Headwaters to confluence with Duck Creek	Drinking Water
Coosa	Duck Creek	Confluence with Dry Creek to Dickson Creek	Drinking Water
Coosa	Ellijay River	Briar Creek to confluence with Cartecay River	Drinking Water
Coosa	Etowah River	Headwaters to Montgomery Creek	Drinking Water
Coosa	Etowah River	Lily Creek to Mill Creek	Drinking Water
Coosa	Etowah River	Long Swamp Creek to Canton Creek	Drinking Water
Coosa	Etowah River	Allatoona Dam to Ward Creek	Drinking Water
Coosa	Etowah River	Dykes Creek to Silver Creek	Drinking Water
Coosa	Etowah River/Lake Allatoona	Georgia Highway 20 to Allatoona Dam	Recreation and Drinking Water
Coosa	Euharlee Creek	Parham Springs Creek to Fish Creek	Drinking Water
Coosa	Headwaters of Gold Mine Branch	Fort Mountain Lake, Fort Mountain State Park Beach	Recreation
Coosa	Holly Creek	Dill Creek to Chicken Creek	Drinking Water
Coosa	Jacks Creek	Waters within the Cohutta Wilderness Area	Wild and Scenic
Coosa	Long Swamp Creek	Lake Tamarack Dam to Cox Creek	Drinking Water
Coosa	Mill Creek	Hurricane Creek to confluence with Conasauga River	Drinking Water
Coosa	Oostanaula River	Confluence of Conasauga and Coosawattee Rivers to Oothkalooga Creek	Drinking Water
Coosa	Oostanaula River	Confluence with Woodward Creek to Coosa River	Drinking Water
Coosa	Pettit Creek	Headwaters to confluence with Disharoon Creek (including Lake Pettit)	Drinking Water
Coosa	Raccoon Creek	Headwaters to confluence with Chattooga River	Drinking Water
Coosa	Tributaries to Heath Creek	Rocky Mountain Public Fishing Lakes, Rocky Mountain Public Fishing Area	Recreation

Table 3-1: Special Stream Classifications			
Basin	**Stream**	**Reach**	**Classification**
(Continued)			
Coosa	Tributary of Dakwa Lake	Headwaters to confluence with Turniptown Creek (including Dakwa Lake)	Drinking Water
Coosa	Woodward Creek	Headwaters to confluence with Oostanaula River	Drinking Water
Tennessee	Black's Creek	Headwaters to confluence with Little Tennessee River	Drinking Water
Tennessee	Hiawassee River	Headwaters to Lake Chatuge	Recreation
Tennessee	Hiawassee River/Lake Chatuge	Lake Chatuge to Georgia - North Carolina State Line	Recreation and Drinking Water
Tennessee	Lookout Creek	Confluence with Turner Branch to confluence with Sitton Gulch Creek	Drinking Water
Tennessee	Mud Creek	Headwaters to confluence with Little Tennessee River	Drinking Water
Tennessee	Nottely River	Headwaters to confluence with Fortenberry Creek	Recreation
Tennessee	Nottely River	Lake Nottely Dam to Georgia - North Carolina State Line	Recreation
Tennessee	Nottely River/Lake Nottely	Confluence with Fortenberry Creek to Lake Nottely Dam	Recreation and Drinking Water
Tennessee	South Chickamauga Creek	Confluence of Tiger Creek with East Chickamauga Creek to confluence with Little Chickamauga Creek	Drinking Water
Tennessee	Toccoa River	Lake Blue Ridge Dam to Georgia - Tennessee State Line	Recreation and Drinking Water
Tennessee	Toccoa River/Lake Blue Ridge	Headwaters to Lake Blue Ridge Dam	Recreation
Tennessee	Tributary to Crawfish Spring Lake	Headwaters to confluence with Coke Oven Branch (including Crawfish Spring Lake) to West Chickamauga Creek	Drinking Water
Tennessee	Wolf Creek	Lake Trahlyta, Vogel State Park Beach	Recreation

Source: GAEPD Rule 391-3-6-.03 Water Use Classifications and Water Quality Standards, August 2016.

[a]All waters classified to support recreational contact; these waters are used for activities such as water skiing, boating, swimming where risk of contact is greater than in most waters.

[b]No alteration of natural water quality allowed; no wastewater and stormwater discharges permitted.

3.3.2 Monitored and Impaired Waters

GAEPD publishes a list of streams that do not meet the water quality standards associated with each designated use category. GAEPD monitors streams throughout the State and publishes the list, known as the 303(d) list, every other year. Of the 2,624 stream miles assessed in the CNG Region, 56 percent were not supporting their designated use, or 1,469 miles representing 241 individual stream segments. Most of these waters were rated as impaired based on biological monitoring (i.e., fish or macroinvertebrate data indicated reduced organism numbers or diversity) and/or high levels of fecal coliform. Fecal coliform bacteria are an indicator of the presence of human waste; high levels indicate potential health risks in waters used for swimming and other recreational activities. Figure 3-6 shows the locations of the impaired stream segments within the Region based on the 2014 listings, the most recent year for which mapping data were available.

Lakes also are monitored as part of the 303(d) process and are listed as "not supporting" their uses if sampling results indicate they do not meet State water quality standards. Carters Lake, designated for Recreation, in Gilmer County, was not supporting recreational use due to a violation of the chlorophyll-a standard caused by nonpoint source pollution.

The EPA accepted as final the GAEPD's 2014 303(d) list, which includes the following general changes from the 2010 list for waterbodies within the Region (GAEPD, 2014):

- Six stream reaches were changed from "Not Supporting" to "Supporting" their designated use (or "de-listed") between the 2010 List and 2014 List. The most common impairments that were resolved were fecal coliform (4) followed by Bio (Fish) (2).
- Twelve stream reaches were changed from "Supporting" to "Not Supporting" their designated use (or "listed") between the 2010 List and 2014 List. The most common impairments that were responsible were Bio (Fish) (8) followed by fecal coliform (4).
- Additional water quality impairments were added to six stream that were already listed as Not Supporting their designated use between 2010 and 2014, including impairments for DO (3) and fecal coliform (3).
- Water quality impairments also were removed from eight stream reaches; however, these streams continue to Not Support their designate use due to other water quality factors.

3.3.3 Conservation Areas

Georgia Department of Natural Resources' (GADNR's) Wildlife Resources Division (WRD) identifies waters and watersheds it believes should be given high conservation priority to protect important populations of high priority species and to protect or restore representative aquatic systems throughout Georgia (GADNR, 2015). The entire list of

high priority waters is available at the WRD website.[2] Figure 3-7 shows the high priority waters within the CNG Region.

The streams included on the final priority list are those that are a high priority for restoration, preservation, or other conservation activity; streams that were too degraded were not included in the final list. The streams on the list contain anadromous fish (fish that return to the river where they were born to breed), include rare natural systems, or represent the least disturbed aquatic systems within the Region. Although the individual stream reaches were the basis for the selection process, Figure 3-7 identifies the entire watershed as a high priority watershed since protecting the entire watershed is the only way to protect these high priority waters.

The Georgia Conservation Lands Database, a product of the Georgia Gap Analysis Program (GAP), was compiled to aid a state-wide evaluation of how the distribution of lands managed to protect biodiversity compares with potential natural vertebrate systems in the State. The Region contains more than 948,000 acres of protected land managed for conservation purposes, representing 27 percent of the Region's total area. Of the total, 576,000 acres are located in the Chattahoochee National Forest.

The rivers within the CNG Region include some of the most pristine streams and unique aquatic habitats in Georgia, and as a result, this area includes several rare, threatened, and endangered aquatic species. These include 2 State threatened amphibians, 1 State and Federally listed turtle, 7 federally listed fish, 38 State rare or State threatened or endangered fish species, 8 State threatened or endangered crayfish species, 7 federally listed mussels, and 12 State threatened or endangered mussel species and 1 State and Federally listed aquatic snail. The Georgia Nongame Conservation Section maintains an active list of these imperiled species and can be contacted for more information.[3]

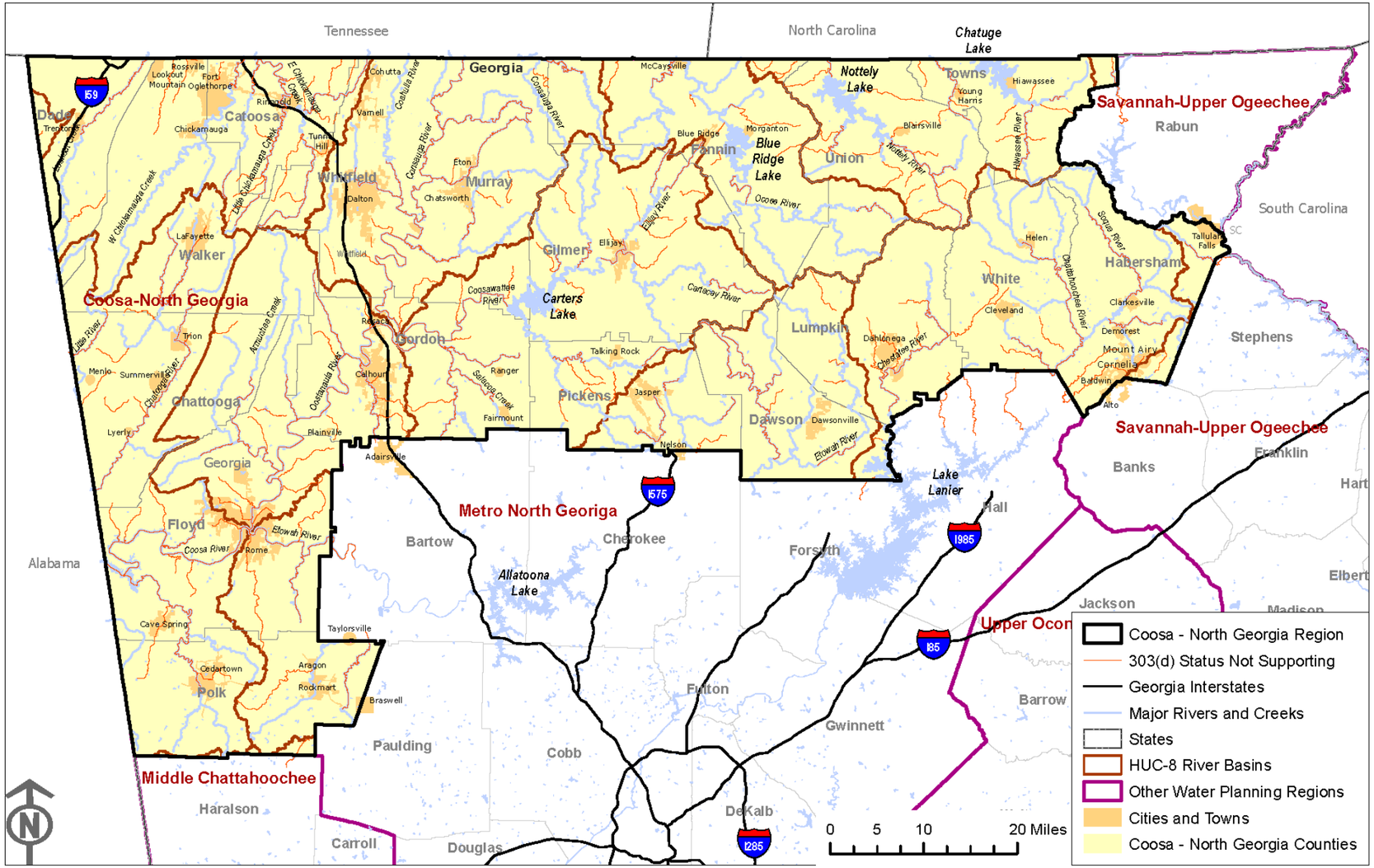
3.3.4 Fisheries Resources

The Coosa and Tennessee River Basins are nationally recognized for its aquatic biological diversity (fish, mussel, and crayfish). In 2016, the Southeastern Aquatic Biodiversity Conservation Strategy (Elkins, et al., 2016) was published, which summarizes the most threatened HUC 8 watersheds within the southeast region. Figure 3-8 shows that multiple watersheds within the CNG Region are among the highest priority in the study, including the Etowah River and the Conasauga River Basins, which were listed in the top 10 for the Study. More specifically for Georgia, the study identified six HUC 8 watersheds within the Top 10 priority watersheds for the entire State (Figure 3-9), including, in descending order: Conasauga, Etowah, Middle Tennessee-Chickamauga, Coosawattee, Upper Coosa, and Oostanaula.

[2] http://www.georgiawildlife.com/node/1377
[3] http://www.georgiawildlife.org/conservation/species-of-concern?cat=6

(This page intentionally left blank)

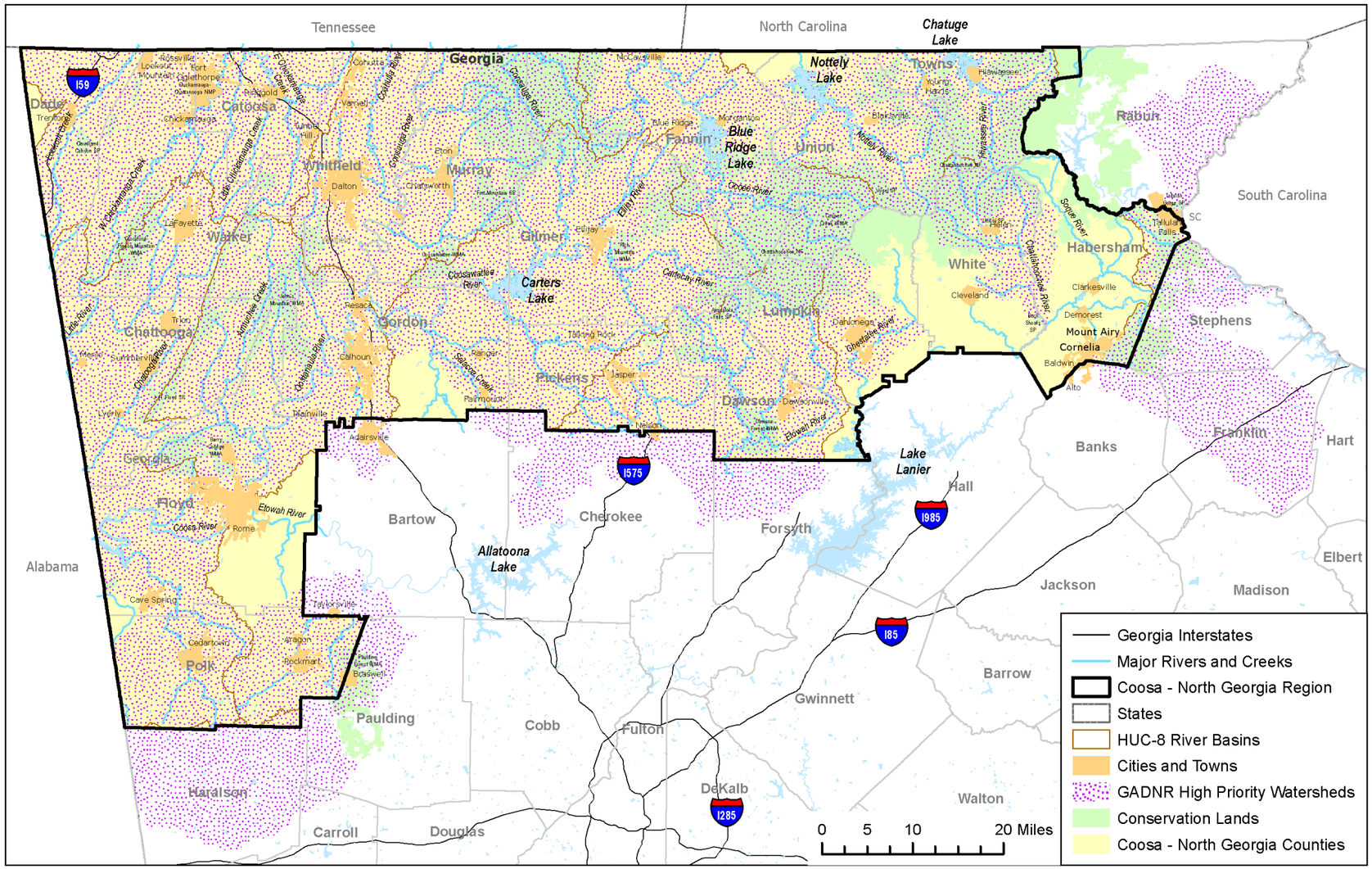
Figure 3-6: Impaired Waters in the CNG Region



Source: GAEPD, Watershed Protection Branch, 305(b)/303(d) List, 2014.

(This page intentionally left blank)

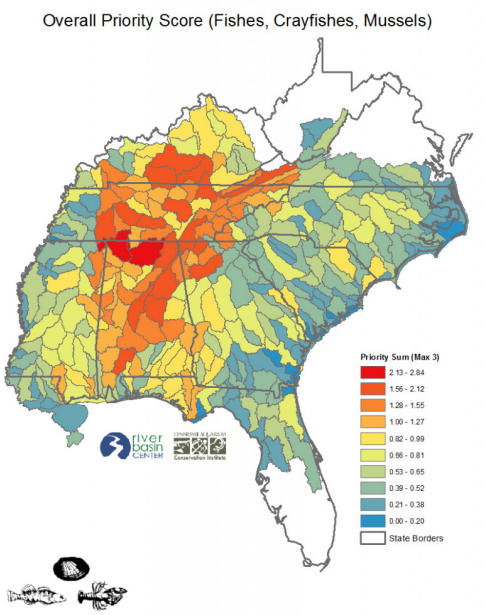
Figure 3-7: Conservation Areas and GADNR High Priority Waters (As Delineated in the State Wildlife Plan) in the CNG Region



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

(This page intentionally left blank)

Figure 3-8: Southeastern Imperiled Priority Watersheds



Source: Southeastern Aquatic Biodiversity Conservation Strategy

Figure 3-9: Georgia Imperiled Priority Watersheds

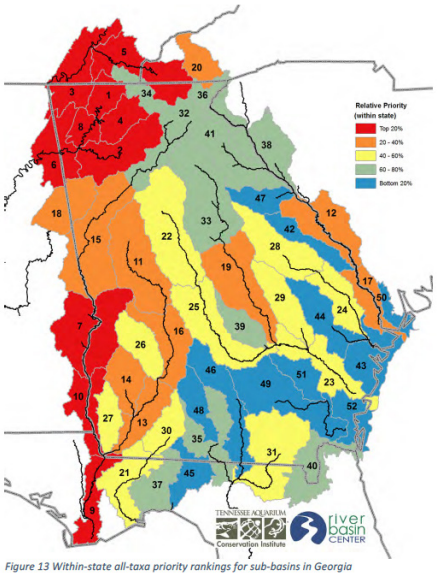


Figure 13 Within-state all-taxa priority rankings for sub-basins in Georgia

Source: Southeastern Aquatic Biodiversity Conservation Strategy

Sport fishing is very popular in the CNG Region's rivers, lakes, and streams. Important recreational gamefish include striped bass, hybrid bass, and smallmouth bass. In addition, hybrid bass from the Region are used to stock rivers, lakes, and streams throughout Georgia. Other important game species include spotted bass, largemouth bass, smallmouth bass, redeye bass, black crappie, blue catfish, channel catfish, walleye, bluegill, and red ear sunfish. Future changes in water use or water quality could affect all of these fisheries and the economic benefits provided by these resources.

Each year, trout fishing is enjoyed in Georgia by over 100,000 anglers on approximately 4,000 miles of trout streams (almost entirely in the CNG Region), and generates more than $172,000,000 in economic benefits. Due partially to naturally low productivity in some of these streams, GADNR WRD and the U.S. Fish and Wildlife Service (USFWS) stock over 1.1 million trout annually in Georgia streams and impose special regulations on some streams to help meet demands for trout fishing.

(This page intentionally left blank)

Section 4. Forecasting Future Water Resource Needs

Water demand and wastewater flow forecasts and the Resource Assessments described in Section 3 form the foundation for water planning in the CNG Region and serve as the basis for the selection of the management practices discussed in Section 7.

This section presents the regional water demand and wastewater flow forecasts for 2015 and for 10-year intervals from 2020 through 2050 for the four major water use categories: municipal, industrial, agricultural, and energy. Forecasting for each sector is explained in this section as well as some of the differences between forecasting done for the 2011 plan and updated forecasting done for this Plan. These forecasts will continue to be refined and updated as part of the continuing regional water planning process.

Section Summary

Total water demand in the CNG Region for municipal, industrial, agriculture, and energy use is expected to increase from 644 MGD in 2015 to 668 MGD in 2050. Similarly, wastewater flows are expected to increase from 631 MGD in 2015 to 651 MGD in 2050.

Energy generation is forecast to continue to make up the largest portion of future water withdrawals; however, the majority of this water is not consumptive, i.e., it is returned to its source. Agricultural water demands also are expected to remain relatively constant, while municipal and industrial water demands are projected to increase from 189 MGD in 2015 to 247 MGD in 2050.

The supplemental document available on the CNG website details the agricultural, municipal, industrial, and energy sector forecasts: Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum. The document titled Update of the GA Energy Needs & Generating Facilities also is available on the GAEPD Water Planning website.

4.1 Municipal Forecasts

Municipal water demand and wastewater flow forecasts include water supplied to residences, commercial businesses, small industries, institutions, and military bases. The municipal forecasts are based on county population projections developed by the Governor's Office of Planning and Budget (OPB) in accordance with State law (O.C.G.A. 45-12-171) and are summarized in Table 4-1.

The population in the Region is projected to increase from 759,880 in 2015 to 892,207 in 2050, a growth rate of 17 percent over this 35-year period.

Table 4-1: Population Projections by County provided by Office of Planning and Budget[a]

County	2015	2020	2030	2040	2050	Difference (2015 - 2050)	% Increase (2015 – 2050)
Catoosa	66,522	69,484	74,878	79,250	83,210	16,688	25%
Chattooga	25,171	25,224	24,926	24,017	22,941	-2,230	-9%
Dade	16,542	16,575	16,353	15,892	15,393	-1,149	-7%
Dawson	23,551	25,736	30,251	34,934	40,003	16,452	70%
Fannin	23,926	24,272	24,349	23,656	22,952	-975	-4%
Floyd	96,639	98,546	101,509	103,214	104,392	7,753	8%
Gilmer	28,925	29,754	31,094	32,172	33,749	4,824	17%
Gordon	56,865	59,527	63,966	67,045	69,290	12,425	22%
Habersham	44,193	46,535	51,898	57,837	64,860	20,667	47%
Lumpkin	31,701	33,655	37,267	40,577	44,201	12,501	39%
Murray	39,554	40,152	40,353	39,019	36,739	-2,815	-7%
Pickens	30,218	31,781	34,610	37,109	40,028	9,810	32%
Polk	41,781	43,176	45,166	46,136	46,579	4,799	11%
Towns	10,968	11,496	12,931	14,917	17,747	6,779	62%
Union	21,854	22,575	23,724	24,361	25,377	3,524	16%
Walker	68,730	69,933	71,200	70,777	69,562	833	1%
White	28,246	29,390	31,593	33,515	35,839	7,593	27%
Whitfield	104,496	108,222	114,277	117,828	119,343	14,847	14%
Total	**759,880**	**786,034**	**830,343**	**862,256**	**892,207**	**132,327**	**17%**

Notes:
[a] Population projections provided by the Governor's Office of Planning and Budget (2015) include 2010 census results.
Source: *Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum (2017*

4.1.1 Municipal Water Demand Forecasts

Regional municipal water demand forecasts are calculated by multiplying the estimated per person (capita) water use for each county by its population. Typically, per capita water use rates differ for public water systems and self-supplied private wells; therefore, the demands are calculated separately and then added together for each county. A plumbing code adjustment also was applied to account for water conservation legislation that was adopted in 2010 as well as existing plumbing codes. The publicly-supplied and self-supplied water demands were calculated separately for each Water Planning Region.

The original per capita numbers used in the 2011 Plan were based on data published in the 2005 USGS publication, and then adjusted to account for wholesale and large industrial sales. The references and assumptions used to develop the prior per capita

projections for each county are summarized in the Municipal and Industrial Water and Wastewater Forecasting Technical Memorandum (July 1, 2010). The prior per capita numbers were used as the basis for the updated forecasting efforts. GAEPD developed an adjustment factor to be applied to the prior per capita numbers before the forecasting was performed. Adjustments made to the per capita water demand for the current projections are described below.

To obtain the per capita water demand by county for the updated forecasts, GAEPD reviewed actual withdrawal data and calculated adjustment factors for each county's per capita water demand as follows:

1. A per capita value for each year, 2010 through 2014, was developed using actual withdrawal data and reported population-served data for each county.
2. The percent rate of change was calculated for each year interval (2010 to 2011, 2011 to 2012, 2012 to 2013, 2013 to 2014), and the average of those four values was calculated as the per capita adjustment factor.
3. The adjustment factor for each county was then applied to the prior per capita water demand value. This updated per capita value was used to obtain water demand forecasts through 2050.
4. The ratio of public-supplied to self-supplied water use in each county as well as the self-supplied value of 75 gallons per capita per day (gpcd) were maintained from the prior planning effort.

Table 4-2 summarizes municipal water demand forecasts by county for the Region over the planning period.

Table 4-2: Municipal Water Demand Forecasts by County (AAD-MGD)[a]

County	2015	2020	2030	2040	2050
Catoosa	7.2	7.4	7.8	8.1	8.3
Chattooga	3.8	3.8	3.7	3.5	3.3
Dade	2.0	2.0	2.0	1.9	1.8
Dawson	3.1	3.5	4.3	5.1	5.9
Fannin	2.8	2.8	2.7	2.6	2.5
Floyd	12.9	13.0	13.1	13.0	12.9
Gilmer	3.0	3.1	3.2	3.2	3.3
Gordon	7.8	8.1	8.6	8.9	9.0
Habersham	5.9	6.4	7.5	8.7	10.0
Lumpkin	3.2	3.5	4.0	4.5	5.0
Murray	4.2	4.2	4.2	3.9	3.5

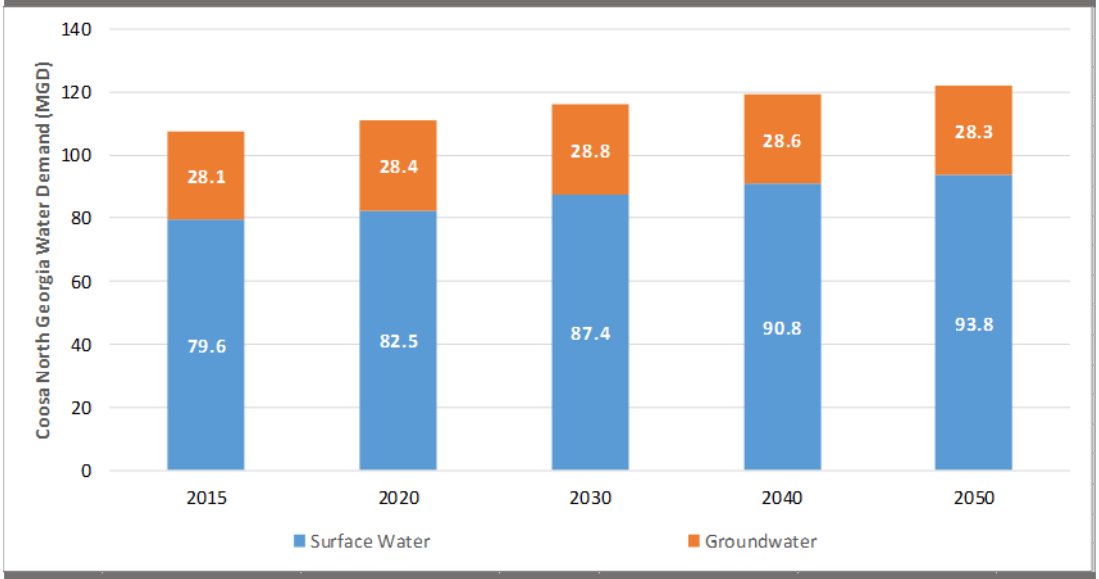
Table 4-2: Municipal Water Demand Forecasts by County (AAD-MGD)[a]					
County	2015	2020	2030	2040	2050
(CONTINUED)					
Pickens	3.9	4.1	4.4	4.7	5.0
Polk	6.6	6.8	7.0	7.0	6.9
Towns	1.5	1.5	1.7	1.9	2.3
Union	2.6	2.6	2.7	2.8	2.8
Walker	10.0	10.0	10.0	9.8	9.4
White	3.2	3.3	3.5	3.7	3.9
Whitfield	23.9	24.6	25.7	26.2	26.2
Total	**107.7**	**110.9**	**116.2**	**119.4**	**122.1**

Notes:
[a]Municipal water demand forecasts include publicly-supplied and self-supplied demands from surface water and groundwater sources. Major publicly supplied industries are not included.
Source: *Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum* (2017).

Additional details regarding development of the municipal water demand forecasts, including the per capita rate and plumbing code adjustment for each county, are provided in the supplemental document titled the Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum, which is available on the CNG website.

The demand for municipal water is forecasted to increase from 108 MGD in 2015 to 122 MGD in 2050 in the CNG Region. Based on existing uses, approximately 77 percent of forecasted future water demand will be obtained from surface water sources and 23 percent from groundwater sources; the latter includes private wells (self-supply). Figure 4-1 shows the municipal demand forecasts for the Region; the demands do not include major publicly supplied industries, which are included in the industrial forecast.

Figure 4-1: Municipal Water Demand Forecast (AAD-MGD)



Notes:
Municipal water demands include residential, commercial, and small industry.
Values represent forecasted annual average.
Source: Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum (2017).

4.1.2 Municipal Wastewater Flow Forecasts

Municipal wastewater flow forecasts were developed to determine the amount of treated wastewater generated and returned to the watershed. For the prior municipal wastewater forecast prepared for the 2011 plan, the municipal water demand served as the basis for estimating the municipal wastewater flows for each county with a portion of the water demand assumed to be indoor use that entered the wastewater system. While self-supplied water demand was assumed to go to a septic system, public-supplied water in each county had a portion going to septic and a portion to centralized treatment.

Inflow and infiltration (I&I) is a term used to describe the entrance of groundwater and stormwater 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. In the prior forecast, a percentage based on literature review was added to the wastewater generation forecast. Finally, centralized flow estimates were allocated between point discharge (NPDES) and LASs.

For the updated forecast, GAEPD used currently permitted wastewater treatment plant reported discharge flow data and OPB population projections to estimate future wastewater generation, allocations, and expansions. GAEPD utilized 2014 historical (annual average) discharge data to forecast future wastewater flows by county.

The percent change between the base year (2015) population projections and the population projections for each planning year (2020, 2030, 2040, and 2050) was applied to the historical wastewater discharge totals for each county from 2014 to estimate total county discharge flows for each planning year. In addition, the following approach was used for the municipal wastewater forecast update:

1. The percent of county total wastewater flow that was septic during the prior forecast was retained. For some counties, this percentage changes over time as more of the county joins the centralized sewer systems. The change over time was estimated and approved by the Georgia Water Council members during the prior planning process.
2. For the update, the percent change between the prior (2001) and updated (2015) population projections for each planning year through 2050 was applied to the prior septic flow forecasts to obtain an updated septic flow projection by county.
3. Wastewater forecasts were proportionally allocated per facility for each county using the historical discharge data. Forecasts were then manually adjusted based on knowledge of new facilities and the decommissioning of old facilities. Facility type for centralized discharge was broken down into three categories: point discharge, LAS, and general subsurface permits.
4. It was assumed that there will be no expanded capacity in LAS facilities during the planning period.
5. Because the updated wastewater forecasts were generated using historical discharge information, it was assumed I&I was inherently accounted for in the projections.
6. Historical data also was used to allocate wastewater quantities by Local Drainage Area (LDA) so that quantity, disposal type, and LDA location could be forecasted. Forecasts for centralized wastewater discharge projections were aggregated based on 2014 flow percentages. Septic system flows were aggregated by node based on watershed/land area percentages within each county.

Table 4-3 summarizes municipal wastewater flows forecasts for the CNG Region over the planning period.

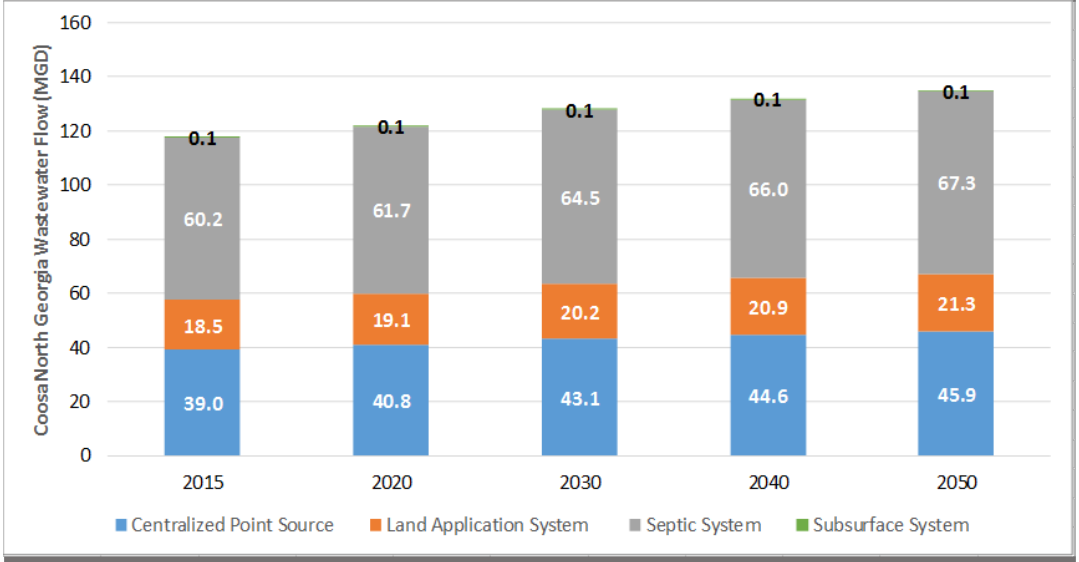
Table 4-3: Municipal Wastewater Flow Forecasts by County (AAF-MGD)[a]					
County	2015	2020	2030	2040	2050
Catoosa	5.9	6.1	6.4	6.6	6.8
Chattooga	7.8	7.8	7.7	7.4	7.0
Dade	1.9	1.9	1.8	1.7	1.6
Dawson	1.4	1.5	1.7	1.9	2.1
Fannin	2.2	2.2	2.2	2.1	2.1
Floyd	15.2	15.5	15.9	16.1	16.2
Gilmer	4.1	4.2	4.4	4.5	4.7
Gordon	11.4	12.0	12.8	13.3	13.6
Habersham	7.4	8.0	9.3	10.6	12.1
Lumpkin	2.7	3.0	3.5	4.0	4.4
Murray	4.2	4.4	4.5	4.4	4.2
Pickens	2.6	2.7	3.0	3.2	3.4
Polk	6.0	6.2	6.4	6.5	6.5
Towns	1.2	1.3	1.4	1.7	1.9
Union	2.0	2.1	2.2	2.2	2.2
Walker	8.8	8.9	8.9	8.7	8.5
White	2.8	2.9	3.1	3.2	3.4
Whitfield	30.0	31.1	32.7	33.5	33.8
Total	**117.7**	**121.7**	**127.8**	**131.6**	**134.6**

Notes:
[a]Municipal wastewater flows do not include major industrial sources that treat their water in municipal facilities.
Source: *Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum* (2017).

Treated wastewater may undergo one of four disposal methods: point source discharge, LAS, subsurface, or septic systems. For forecasting purposes, the current mix of discharge to point source facilities versus LASs was held proportionate to current conditions, and adjustments were made based on feedback provided by local water systems or utilities.

Further details regarding development of the municipal wastewater forecasts and county-specific results are presented in the supplemental document titled Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum, which is available on the CNG website. Figure 4-2 shows the municipal wastewater flow forecasts by disposal type.

Figure 4-2: Municipal Wastewater Flow Forecast (AAF-MGD)



Notes:
Values represent forecasted annual average.
Source: Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum (2017).

The demand for municipal wastewater treatment is forecasted to increase from 118 MGD in 2015 to 135 MGD in 2050 in the Region. Of either amount, 16 percent will be treated by LASs, 34 percent by systems with point source discharges and less than 1 percent by subsurface systems. Septic systems currently treat approximately 50 percent of the municipal wastewater generated in the Region. The percentage of wastewater treated via septic systems is expected to remain relatively steady in the future for counties with lower population density.

4.2 Industrial Forecasts

Industrial water demand and wastewater flow forecasts anticipate future needs among industries that were identified as major water users through 2050. Industries require water for use in their production processes, sanitation, and cooling, as well as for employee use and consumption. The industrial forecasts presented in this section are based upon the rate of growth in employment for specific industrial sectors, the rate of growth in units of production for specific industrial sectors, or other relevant information and data provided by specific industrial water users. The industrial demands forecasted in this section include major industrial water users and wastewater generators, many of which supply their own water and/or treat their own wastewater. Many industrial users with very small demands are serviced by municipal water and wastewater systems; those demands are included in the municipal forecast.

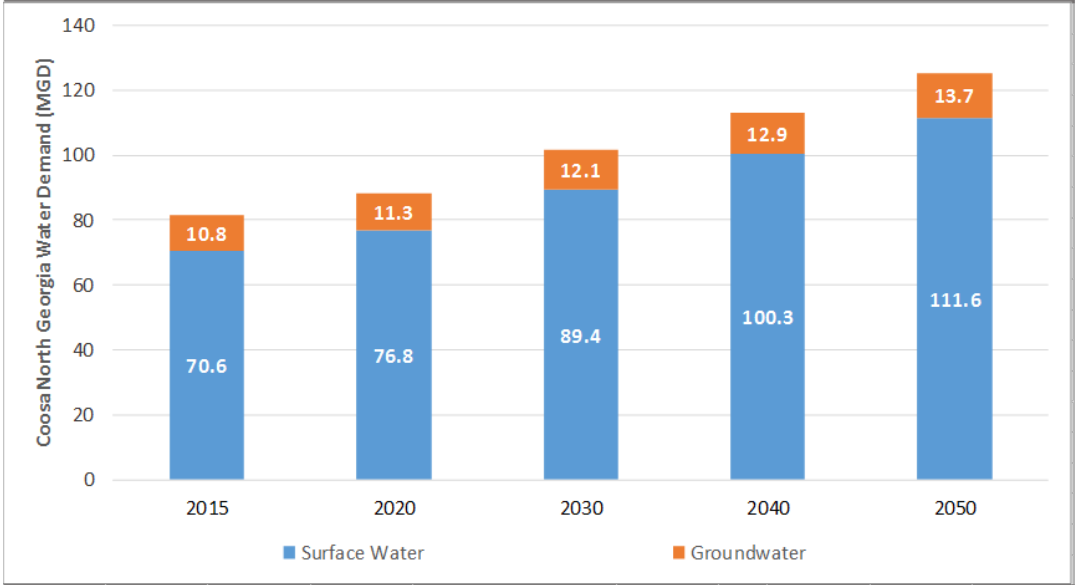
4.2.1 Industrial Water Demand Forecasts

Industrial water and wastewater forecasts were not updated since 2011 because the employment projections that formed a basis for these forecasts were not updated. Industrial water demand forecasts were previously calculated using information and data specific to each major water-using industry. For industries where information was available on water use per unit of production, water forecasts were based on production. For industries where product-based forecasts were not available, industry-specific workforce projections were assumed to reflect the anticipated growth in water use within the industry. The University of Georgia (UGA) produced industry-specific workforce projections, which were used to calculate future water needs for the major water-using industries within the Region. A summary of the employment projections is included in the supplemental document titled Coosa-North Georgia Region–Water and Wastewater Forecasting Technical Memorandum (2017), which is available at the CNG website. The employment projections for the Region indicate that overall employment among major industrial water-using industries is forecasted to increase over the 2015-2050 planning horizon.

For the Region, a decrease in employment is forecasted for the textile and apparel industries, in keeping with trends over the past several decades. For the carpet industry; however, this does not appear to be the case, and employment is not a good indicator of water use. Therefore, in calculating the forecasts, water demands for these industries were not reduced to reflect the decrease in employment because their water use has shown to be independent of employment projections and still provide conservative results. The carpet and paper industries will continue to be the most significant water-using industries for this region. Both industries use surface water; typically the textile industry, particularly the carpet industry, obtains its supply primarily from municipal suppliers, whereas the paper industry has its own permits for withdrawals.

Industrial demand for water is forecasted to increase from 81 MGD in 2015 to 125 MGD in 2050 in the Region. Based on current proportions, in the future approximately 89 percent will come from surface water and 11 percent from groundwater sources. The results of the industrial water demand forecast for the Region are provided in the supplemental document titled Coosa-North Georgia Region–Water and Wastewater Forecasting Technical Memorandum (2017), which is available at the CNG website. Figure 4-3 shows the steady increase of industrial water demand through the planning period.

Figure 4-3: Industrial Water Demand Forecast (AAD-MGD)



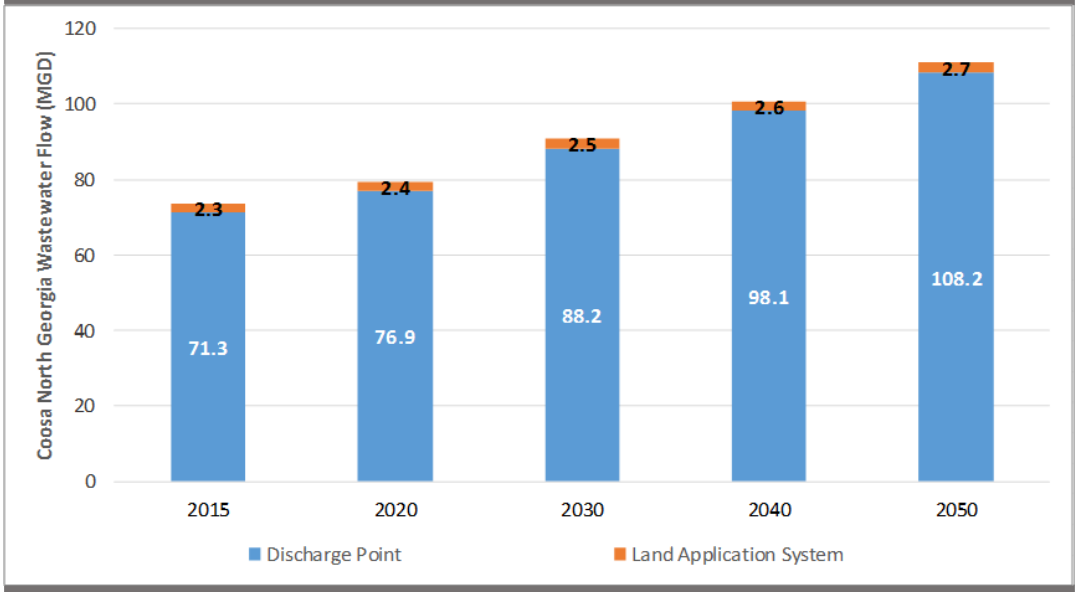
Notes:
Values represent forecasted annual average.
Source: Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum (2017).

4.2.2 Industrial Wastewater Flow Forecasts

Industrial wastewater flow forecasts were calculated for each sector by multiplying the industrial water demand forecast by the ratio of wastewater generated to water used for that particular industrial sector. Wastewater to water ratios per industry were derived through a state-wide analysis of multiple years of actual annual average water return and withdrawal data for permitted users and information provided by industrial stakeholder groups within a region or industry, as appropriate.

Figure 4-4 shows the industrial wastewater flow forecast, which is projected to increase from 74 MGD in 2015 to 111 MGD in 2050 in the Region. According to current proportions, in the future approximately 2 percent will be treated by LASs and 98 percent will be treated by systems with point source discharges. The results of the forecasting exercise for industrial wastewater flows are provided in the supplemental document titled Municipal and Industrial Coosa-North Georgia Region–Water and Wastewater Forecasting Technical Memorandum (2017), which is available at the CNG website.

Figure 4-4: Industrial Wastewater Flow Forecast (AAF-MGD)



Notes:
Values represent forecasted annual average.
Source: Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum (2017).

4.3 Agricultural Forecasts

Agricultural water use includes irrigation for both crop production and non-crop agricultural water users. The future irrigation needs for crop production were developed by UGA's National Environmentally Sound Production Agriculture Laboratory (NESPAL). Based on the acres irrigated for each crop, these forecasts provide a range of irrigation water use under dry, medium, and wet climate conditions. Current non-crop (including non-permitted) agricultural water uses, such as water use for nurseries/greenhouses, golf courses, and livestock production, have been compiled by respective industry associations; however, water forecasts for future non-crop agricultural use were not developed for this first round of regional water planning because of the lack of available 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 Floyd and Gordon Counties. Table 4-4 summarizes agricultural water demands for the Region over the planning period. A more detailed description of the agricultural forecasts is provided in the supplemental document titled Coosa-North Georgia Region–Water and Wastewater Forecasting Technical Memorandum (2017), which is provided at the CNG website. The agricultural forecast also considered a study conducted on agricultural water demands prepared by TetraTech for the Northwest Georgia Regional Watershed Partnership (TetraTech, 2015).

Table 4-4: Agricultural Water Demand Forecasts by County (AAD-MGD) for the 75th Percentile Scenario

County	Crop Demand		Non-Crop Demand		
	Irrigation 2015	Irrigation 2050	Nursery 2015-2050	Golf 2015-2050	Livestock 2015-2050
Catoosa	0.156	0.18	0.126	0.558	0.187
Chattooga	-----	-----	0.06	-----	0.24
Dade	-----	-----	0.03	-----	0.16
Dawson	0.09	0.1	0.03	0.27	0.22
Fannin	0.15	0.19	0.03	-----	0.09
Floyd	0.9	0.86	0.13	0.3	0.68
Gilmer	-----	-----	0.11	0.45	0.81
Gordon	1.26	1.28	0.06	0.2	0.99
Habersham	0.3	0.33	0.31	0.4	0.57
Lumpkin	0.08	0.1	0.13	-----	0.15
Murray	0.13	0.12	0.32	-----	0.32
Pickens	-----	-----	0.01	0.13	0.25
Polk	-----	-----	0.08	-----	0.26
Towns	-----	-----	0.01	0.2	0.09
Union	0.03	0.03	0.23	0.41	0.06
Walker	-----	-----	0.11	-----	0.52
White	-----	-----	0.01	-----	0.33
Whitfield	-----	-----	0.1	0.71	0.43
Total	**3.10**	**3.19**	**1.89**	**3.63**	**6.36**

Notes:
Forecasted Agricultural Water Demand based on the 75th percentile scenario (in MGD). This demand is comprised of crop irrigation, golf courses, livestock watering, and nurseries. The crop irrigation is the only demand with a forecasted value.
It should be noted that the water demand for chicken processing facilities is included in the industrial forecast.
----- indicates information not available.

4.4 Water for Thermoelectric Power Forecasts

Forecasts for future water needs for thermoelectric power production were developed by GAEPD and an ad-hoc group representing Georgia's power industry. Future energy needs are based on projected population. For this plan update, energy water demands were estimated based on updated population projections and the relationship between population and energy demand that was previously calculated. The prior population projections were released in 2008. These projections were developed prior to the recession and prior to the 2010 Census. Statewide, the 2010 Census showed that the

2010 population was generally less than had been projected in the 2008 projections. The updated 2015 population projections, developed after the recession, show a more modest future growth rate.

A baseline and high demand scenario were estimated using the updated population projections. The same regression relationship between historical power generation and population was used to generate the updated estimates of power need. The CNG Region has one coal-fired power plant, Plant Hammond, with a once-through cooling tower system. Water withdrawals at this plant are expected to decrease from 440 MGD in 2015 to 405 MGD in 2050.

Once-through cooling systems use water to cool the condenser water. River or lake water is passed through a heat exchanger to condense steam, exiting condenser water is pumped back through the cycle, and the cooling water is returned to its source. Water consumption at the power plant is minimal, if not zero, because the cooling water does not directly contact the air. Although the consumptive water use is minimal, the amount of water withdrawn from the river or lake is significant because the water is only used for a short time before being returned to the source.

The process of generating the forecasted water demands and wastewater returns for thermoelectric power generation is documented in the supplemental document titled, Update of GA Energy Needs & Generating Facilities (2016).

Two other facilities in the Region generate power, but do not have the same impact on water resources as do thermoelectric generating facilities. First, there is a 1,240-megawatt combined cycle electrical generating plant that utilizes natural gas and steam, currently owned by KGEN. This plant uses 100 percent treated wastewater from Dalton Utilities. The other facility is Oglethorpe Power's Rocky Mountain pumped-storage hydroelectric generation facility with a capacity of 1,046 megawatts. Neither of these facilities was included in the energy sector water demand forecast.

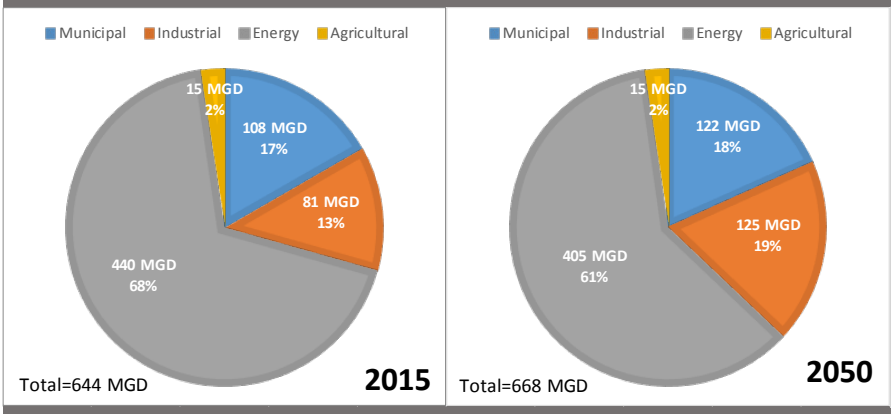
4.5 Total Water Demand Forecasts

As a general rule, the total water demands and wastewater flows for the Region are expected to have a modest increase. Compared to the forecast reflected in the 2011 Plan, total water demands forecasted for 2050 decreased approximately 300 MGD. The majority of the decrease occurred in the energy sector followed by the municipal sector. As stated above, the industrial sector forecast was not updated because employment projections were not available at this time; therefore, the industrial projections have not changed from those presented in the 2011 Plan. Wastewater flows show a similar trend as the water demands.

In the Region, energy generation makes up the largest portion (70 percent in 2015) of water withdrawals, as shown in Figure 4-5. Although energy water demands are expected to decrease throughout the planning horizon but remain the largest demands in the Region in 2050, consumptive use is expected to have minimum impact on the Region's water resources. Agricultural water demands also are expected to remain relatively constant, while municipal and industrial water demands are projected to

increase steadily from approximately 189 MGD in 2015 to 247 MGD in 2050 (Figure 4-5).

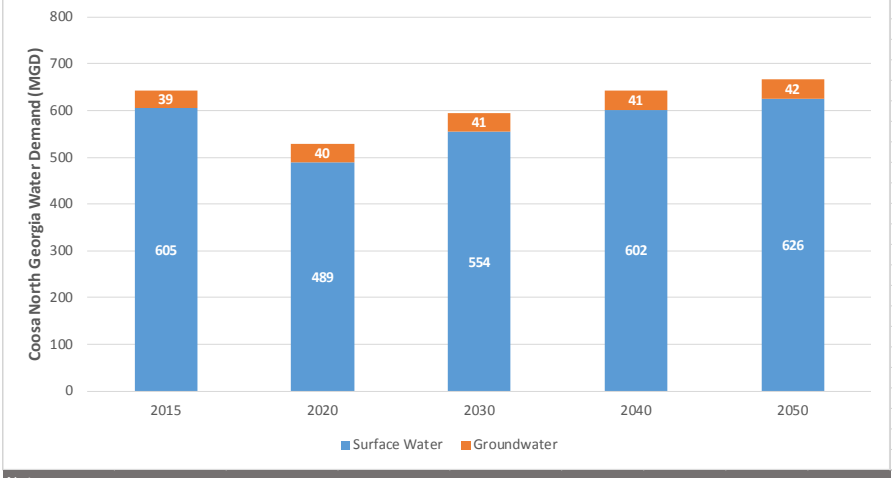
Figure 4-5: Water Demand Forecast for 2015 and 2050 (AAD-MGD)



Notes:
Includes Municipal, Industrial, Energy, and Agriculture (Irrigation, Nursery, Golf, and Livestock).
Source: Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum (2017).

Figure 4-6 shows the total water demand forecast by source. The main water source for this region is surface water, a large portion of which is used as cooling water for thermoelectric power generation.

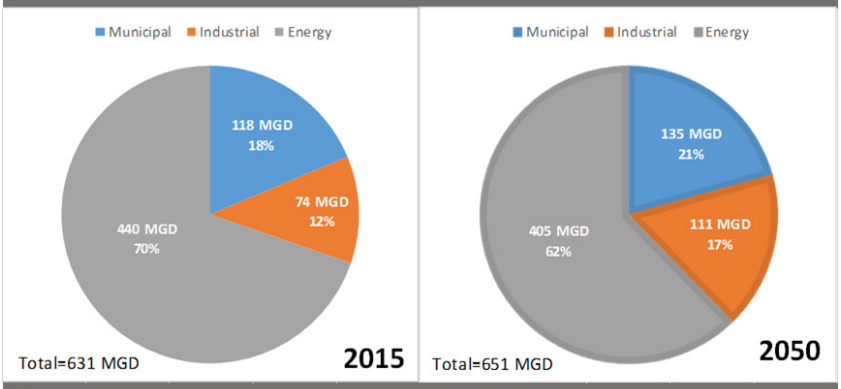
Figure 4-6: Total Water Demand Forecast (AAD-MGD)



Notes:
Includes Municipal, Industrial, Energy, and Agriculture (Irrigation, Nursery, Golf, and Livestock).
Source: Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum (2017).

Figure 4-7 shows the total wastewater flow forecast by sector (energy, municipal, and industrial) for the Region in 2015 and 2050. Energy demands make up 70 percent of the total in 2015; however, these demands are generally for permitted cooling water returns and do not represent future needs for wastewater treatment.

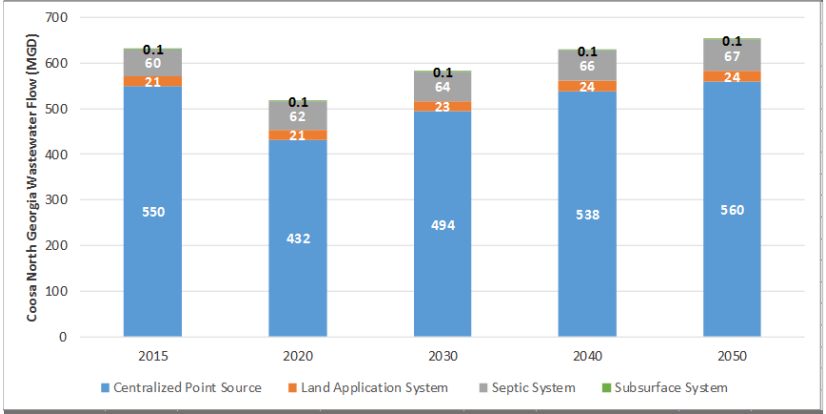
Figure 4-7: Wastewater Flow Forecast for 2015 and 2050 (AAF-MGD)



Notes:
Source: Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum (2017).

The total wastewater flow forecast for municipal and industrial uses are projected to be 246 MGD in 2050. Wastewater demands by treatment and disposal type (point discharge, LAS, or onsite septic) are illustrated for 2015 through 2050 in Figure 4-8. Removing the thermal power (energy) discharges from the total, direct discharges of municipal and industrial wastewater will make up 63 percent, LAS 10 percent, subsurface systems 0.03 percent, and septic systems 27 percent of the future wastewater flow forecast.

Figure 4-8: Total Wastewater Flow Forecast (AAF-MGD)



Notes:
Values represent forecasted annual average.
Source: Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum (2017).

(This page intentionally left blank)

Section 5. Comparison of Water Resource Capacities and Future Needs

Section Summary

Future assessment results for the groundwater aquifers indicate there is adequate yield to meet future demands from the modeled portion of the Paleozoic rock aquifers.

A potential gap in water supply, in both duration and volume, is observed at nodes such as Gaylesville (3 percent of the time under 2050 conditions over the period of record; average gap is 5.8 MGD), New England (6 percent and 1.3 MGD), and Chickamauga (5 percent and 4 MGD).

Available assimilative capacity is good, but future nutrient loadings will need to be reduced from point and nonpoint sources to meet existing standards at the Georgia border on the Coosa River, and in Carters Lake, Lake Lanier and Lake Allatoona.

Potential water or wastewater infrastructure needs were met in all counties except Dawson, Habersham, and Towns Counties.

This section compares the water demand and wastewater flow forecasts (Section 4), along with the Resource Assessments (Section 3), providing the basis for selecting management practices (Section 6) in the CNG Region. Areas where future demands are predicted to exceed the capacity of the resource for groundwater, surface water availability, or surface water quality (assimilative capacity) have a potential gap, need, or shortage that will be addressed through the management practices described in Section 6. This section summarizes the potential gaps, needs, or shortages, also referred to as water resource management issues, for the Region.

5.1 Groundwater Availability Comparisons

Groundwater sources within the Region include (1) the Crystalline rock aquifer systems in the eastern half of the basin, including Towns, Habersham, Lumpkin, Dawson, Union, Fannin, Gilmer, White, and Pickens Counties, and portions of Murray, Polk, and Gordon Counties; and (2) the Paleozoic rock aquifer systems in the western half of the basin, including Floyd, Chattooga, Walker, Catoosa, and Whitfield Counties, and portions of Polk, Murray, Gordon, and Dade Counties.

The Resource Assessment for groundwater sustainability in the Crystalline rock aquifers, based on a water budget approach and described further in Section 3.2, was developed for the Chattahoochee River-Chickamauga Creek and Soque River Basins, which cover 315 square miles in portions of Habersham, Towns, Union, and White Counties of the Blue Ridge physiographic province. The Resource Assessment for sustainable yield in the Paleozoic rock aquifers covered an area in the Valley and Ridge physiographic province that included portions of Floyd, Polk, Bartow, and Paulding Counties. This area was selected based on the large spatial extent of carbonate rocks of the Knox Group, a geologic formation known to contain prolific

karstic aquifer systems. For information on the groundwater Resource Assessment, see the Water Planning website.

An initial assessment of future groundwater availability was conducted for the original planning process (2010) that included the Paleozoic rock aquifers, but not the Crystalline rock aquifers, by comparing forecast groundwater demands with currently modeled ranges of aquifer sustainable yields for the years 2010, 2020, 2030, 2040, and 2050. This analysis was not updated for the current plan update process; therefore, the following analysis is based on the original groundwater evaluation. Each comparison included:

- Range of sustainable yield in MGD
- Forecasted agricultural groundwater demands for normal and dry years (defined as the 50th and 75th percentile irrigation requirements in MGD)
- Forecasted municipal, industrial, and self-supplied groundwater demands

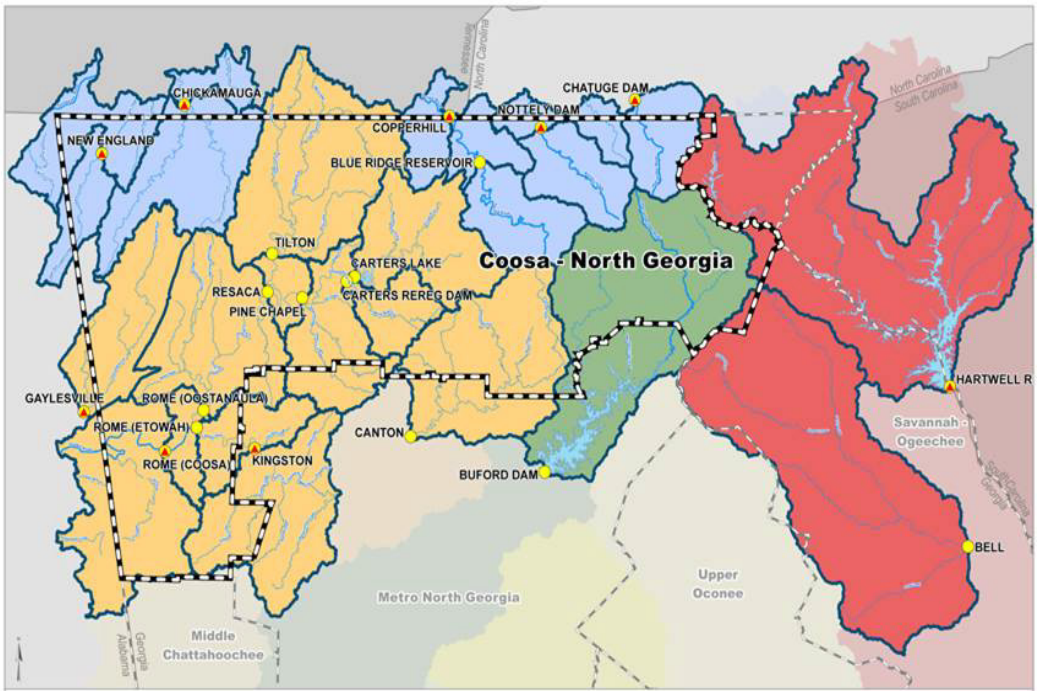
The results indicated that there is an estimated 28 to 70 MGD sustainable yield to meet future demands (based on the original projections) from the modeled portion of the Paleozoic rock aquifers. The existing groundwater Resource Assessment (see Section 3.2) for the Crystalline rock aquifers indicates that there is additional groundwater available within this system. It is more difficult, however, to find sufficient water-bearing fractures in the Crystalline rock aquifers to develop the entire estimated sustainable yield. To take advantage of these resources, additional analysis, careful geologic mapping, and well siting by experienced geologists will be necessary.

5.2 Surface Water Availability Comparisons

The comparisons of surface water availability are based on the results of the surface water availability Resource Assessment described in Section 3.2 and the projected surface water demands in 2050. For modeling purposes, the CNG Region was divided into the following local drainage areas, which drain to the planning nodes illustrated in Figure 5-1:

- “New England” and “Chickamauga” planning nodes in the northwest portion of the region draining the Tennessee River Basin
- “Copperhill,” “Nottely Dam,” and “Chatuge Dam” planning nodes in the northeast portion of the region draining the Tennessee River Basin
- “Kingston,” “Rome,” and “Gaylesville” planning nodes in the southwest portion of the region draining the Coosa River Basin

Figure 5-1: Surface Water Modeling Nodes



Source: GAEPD, 2009.

The surface water quantity Resource Assessment described in Section 3.2 is based on the ability to meet and sustain a flow regime according to stream flow metrics selected as an indicator of potential impacts on instream uses such as assimilative capacity of pollution and habitat for aquatic life. In unregulated portions of the basin, the flow regime is defined by the State's Interim Instream Flow Protection Policy, which calls for the protection of monthly 7Q10 or natural inflow, whichever is lower. (The 7Q10 flow is the 7-day, consecutive low flow with a 10-year return frequency; the lowest stream flow for 7 consecutive days that would be expected to occur once in 10 years.) In the ACT Basin, this applies to the Gaylesville Node. In the regulated portion of the basins, the flow regime is limited to locations where an explicit flow requirement is specified by the USACE, Tennessee Valley Authority (TVA), or FERC. In the ACT Basin, this applies to the Kingston and Rome (Coosa) Nodes. The Resource Assessment results provide an estimate of whether a potential gap in stream flow or storage exists with future demands to indicate potential future shortages by planning node.

Table 5-1 provides a summary of the future (2050) demands by regulated or unregulated planning node and indicates whether there is a potential gap in flow or storage in the future based on the updated modeling.

Table 5-1: Future Surface Water Potential Gaps in 2050 by Node

Unregulated Nodes	Counties	Length of Potential Gap (% of Time Target Flow not Met)	Average Potential Gap (MGD)	Long-term Average Flow (MGD)	Maximum Potential Gap (MGD)	Corres-ponding Flow Regime (MGD)
Gaylesville	Chattooga, Walker	3	5.8	424	14.2	51.7
New England	Dade	6	1.3	162	1.9	7.8
Chickamauga	Catoosa, Walker	5	4	450	6	83
Regulated Nodes	**Counties**	**Demand Gap (MGD)**	**At-site Flow Require-ment Shortage (MGD)**	**Minimum Reservoir Conservation Storage Remaining (acre-feet)**	**Minimum Percentage Conservation Storage Remaining (%)**	**Basin-Wide Flow Require-ment Potential Gap (MGD)**
Copperhill	Fannin	0	0	15,453 at Blue Ridge	11% at Blue Ridge	N/A
Chatuge Dam	Towns	0	0	21,180 at Chatuge	17% at Chatuge	N/A
Nottely Dam	Union	0	0	10,790 at Nottely	9% at Nottely	N/A
Kingston	Dawson, Pickens	0	0	96,530 at Allatoona	34% at Allatoona	N/A[1]
Rome	Catoosa, Fannin, Floyd, Gilmer, Gordon, Murray, Pickens, Polk	0	0	91,668 at Carters 96,530 at Allatoona	65% at Carters 34% at Allatoona	N/A[a]

Source: GAEPD, 2017.

[a]Rule-based flow regime; i.e., seasonal and conditional requirements prescribed by system operating rules.

A potential gap, in both duration and volume, is observed at nodes such as Gaylesville (3 percent of the time under 2050 conditions over the period of record; average gap is 5.8 MGD), New England (6 percent and 1.3 MGD), and Chickamauga (5 percent and 4 MGD). These potential gaps may result from water consumption during dry periods

of the year and increased demand in the future, but the potential gaps also incorporate periods of drought. The quantification and frequency of the modeled potential gaps are provided in Table 5-2. It is important to note that the majority of the modeled potential gaps at the Gaylesville, New England, and Chickamauga nodes were shorter in duration (1- to 7-day and 8- to 14-day potential gaps events). The more infrequent and severe potential gaps are indicative of drought conditions and will most likely be addressed through drought management measures implemented by GAEPD and users in the Region.

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

Gap Event Duration	Number of Potential Gap Events (% of Total Gap Events)[a]		Total Potential Gap Days (% of Total Days)[b]		Average Daily Flow Deficit per Event (cfs)	Average Cumulative Flow Deficit per Event (cfsd)
Gaylesville Node						
1-7 days	111	(78.7%)	268	(1.0%)	7 (4.5 MGD)	18 (12 MG)
8-14 days	15	(10.6%)	153	(0.6%)	6 (3.9 MGD)	64 (41 MG)
15-30 days	10	(7.1%)	193	(0.7%)	11 (7.1 MGD)	216 (140 MG)
>30 days	5	(3.5%)	223	(0.8%)	8 (5.2 MGD)	421 (272 MG)
Totals	141	(100.0%)	837	(3.1%)		
New England Node						
1-7 days	158	(71.5%)	447	(1.6%)	2 (1.3 MGD)	5 (3 MG)
8-14 days	28	(12.7%)	275	(1.0%)	2 (1.3 MGD)	24 (16 MG)
15-30 days	23	(10.4%)	466	(1.7%)	2 (1.3 MGD)	49 (32 MG)
>30 days	12	(5.4%)	502	(1.8%)	3 (1.9 MGD)	113 (73 MG)
Totals	221	(100.0%)	1,690	(6.2%)		
Chickamauga Node						
1-7 days	175	(77.1%)	509	(1.9%)	4.8 (3.1 MGD)	15.6 (10 MG)
8-14 days	26	(11.5%)	280	(1.0%)	5.9 (3.8 MGD)	64.1 (42 MG)
15-30 days	19	(8.4%)	375	(1.4%)	6.8 (4.4 MGD)	132.2 (86 MG)
>30 days	7	(3.1%)	328	(1.2%)	6.8 (4.4 MGD)	333.8 (216 MG)
Totals	227	(100.0%)	1,492	(5.4%)		

[a]The total number of modeled gap events is presented for each duration range, as well as the percentage in that duration range to the total number of all modeled gap events.

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

Reservoir storage modeled in the Tennessee Basin shows substantially reduced available capacity. These reduced capacities were primarily based on updated storage information from the TVA and model improvements rather than additional consumptive use. For the Coosa River Basin, the updated future Resource Assessment modeling

indicates there are no longer potential gaps in the downstream flow regime based on the future 2050 demands at the Kingston and Rome nodes (Table 5-1). Additionally, the minimum conservation storage remaining in Lake Allatoona and Carters Lake changed because of updated USACE reservoir operations as well as changes in future demands.

During the development of the original plan in 2011, Georgia was engaged in challenges from the adjacent states of Alabama and Florida regarding the use of water in the ACF and ACT River Basins. Over the last 5 years, the USACE has completed the required water control manuals for Lakes Allatoona and Lanier, which detail the operational approach that will be followed to meet all of the original purposes of the two federal reservoirs. The resource assessment incorporates the operational approaches detailed in the updated water control manuals.

In addition to the re-evaluation of the potential gaps in water availability in 2050 in the CNG Region, the existing permitted water withdrawals (surface and groundwater) and future demands were compared to identify potential needs, shortages, or surpluses in available facilities or infrastructure. Needs in permitted water availability were met in all counties except Dawson and Towns (Table 5-3). It should be noted that need estimates were calculated by comparing the permitted monthly average withdrawal limit with the forecast annual average demands. Therefore, these estimates are only an indicator of potential future needs in permitted capacity and indicate areas where continued localized facility planning will be needed.

Table 5-3: Permitted Municipal Water Withdrawal Limits versus Forecasted Municipal Water Demands (MGD)

County	Permitted Municipal Water Withdrawal Limits[a,b,e]	2015 Forecasted Municipal Water Demand[a,c]	2050 Forecasted Municipal Water Demand[a,c]	Potential 2050 Need[a,d]	Additional Capacity Available in 2050[a,d]
Catoosa [f]	9.80	6.43	7.47	None	2.33
Chattooga	4.87	3.56	3.04	None	1.83
Dade	4.23	2.05	1.77	None	2.47
Dawson [g]	4.12	2.60	5.76	(1.65)	None
Fannin	2.53	1.93	1.77	None	0.76
Floyd [h]	23.15	12.83	12.83	None	10.32
Gilmer [i]	4.45	1.84	2.06	None	2.39
Gordon [j]	30.80	6.79	7.87	None	22.93
Habersham	10.25	4.61	9.39	None	0.86
Lumpkin	6.80	1.47	3.43	None	3.37
Murray [k]	9.56	2.81	2.30	None	7.27
Pickens [l]	7.24	3.36	4.56	None	2.68
Polk	9.79	6.23	6.56	None	3.23

Table 5-3: Permitted Municipal Water Withdrawal Limits versus Forecasted Municipal Water Demands (MGD)

County	Permitted Municipal Water Withdrawal Limits[a,b,e]	2015 Forecasted Municipal Water Demand[a,c]	2050 Forecasted Municipal Water Demand[a,c]	Potential 2050 Need[a,d]	Additional Capacity Available in 2050[a,d]
(CONTINUED)					
Towns	2.00	1.42	2.18	(0.18)	None
Union	3.43	2.00	2.22	None	1.21
Walker [m]	18.74	9.93	9.38	None	9.37
White	3.04	2.22	2.70	None	0.34
Whitfield [n]	56.30	23.81	26.16	None	30.14

[a]Water withdrawal values include surface water and groundwater withdrawals and purchases from outside the County. The purchases from outside each county are detailed below, as applicable. The purchases from outside each county were discussed with each water provider during Round 1(2005), and remained unchanged for Round 2.

[b]Surface water and groundwater permitted withdrawal limits are based on the current Monthly Average Limit (in MGD) of each permit. Purchases from outside the county reflect the Average Annual Demand for 2005 (in MGD).

[c]Forecasted Municipal Water Demands include water demands from major industrial sectors when supplied by municipal sources, but they do not include self-supplied water demands. Forecasted Municipal Water Demands were calculated applying the new plumbing code (1.28 gallons per flush [gpf] toilets) mandated by the Water Stewardship Act passed in 2010. Values are based on Annual Average Demand (in MGD).

[d]Based on differences between Permitted Withdrawal Limit and 2050 Forecasted Demand (in MGD). Values are estimates for future needs or additional capacity available.

[e]Includes the municipal withdrawal permit holders listed in the GAEPD database for each county.

[f]In 2005, Catoosa County purchased approximately 1.80 MGD from Tennessee and municipal sources supplied approximately 0.23 MGD to major industries.

[g]In 2005, Dawson County purchased 0.24 MGD from Pickens County, 0.30 MGD from Forsyth County, and 0.08 MGD from Cherokee County.

[h]In 2005, Floyd County purchased 0.65 MGD from Bartow County and municipal sources supplied approximately 2.15 MGD to major industries.

[i]In 2005, municipal sources supplied approximately 1.50 MGD to major industries.

[j]In 2005, Municipal sources supplied approximately 4.54 MGD to major industries.

[k]In 2005, Murray County purchased 0.50 MGD from Gordon County.

[l]In 2005, Pickens County purchased 0.50 MGD from Gordon County and 0.21 MGD from Cherokee County.

[m]In 2005, Walker County purchased 0.08 MGD from Catoosa County.

[n]In 2005, Whitfield County purchased 2.00 MGD from Tennessee and municipal sources supplied approximately 17.2 MGD to major industries.

Sources: Forecasted water demands and GAEPD approved permit database.

5.3 Surface Water Quality Comparisons (Assimilative Capacity)

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 both DO conditions and nutrient loadings, as described in Section 3.2. Instream DO conditions were modeled in the

original 2011 Plan and in this update for streams and tributaries currently receiving major NPDES treated wastewater discharges with 0.1 MGD or greater permitted flows at critical instream low flow conditions. For purposes of this modeling effort and the identification of potential gaps, wastewater flows for municipal and industrial facilities were assumed to be the current permitted treatment capacity and limits unless planned facility expansions were identified in existing permits.

Overall, the current permitted assimilative capacity in the major tributaries in the Region remains moderate to very good (Figure 5-2). There are specific stream segments that would exceed or be at their assimilative capacity for pollutants that deplete oxygen based on permitted conditions and the predicted DO levels. These waterbodies include segments in the Chattooga River (in Chattooga County), Alpine Creek, Coahulla Creek, Kenyon Creek, Ketchum Branch, Salacoa Creek, Holly Creek, Brasstown Creek, Polecat Branch, and Lookout Creek.

Figure 5-2: Permitted Surface Water Quality (Assimilative Capacity)

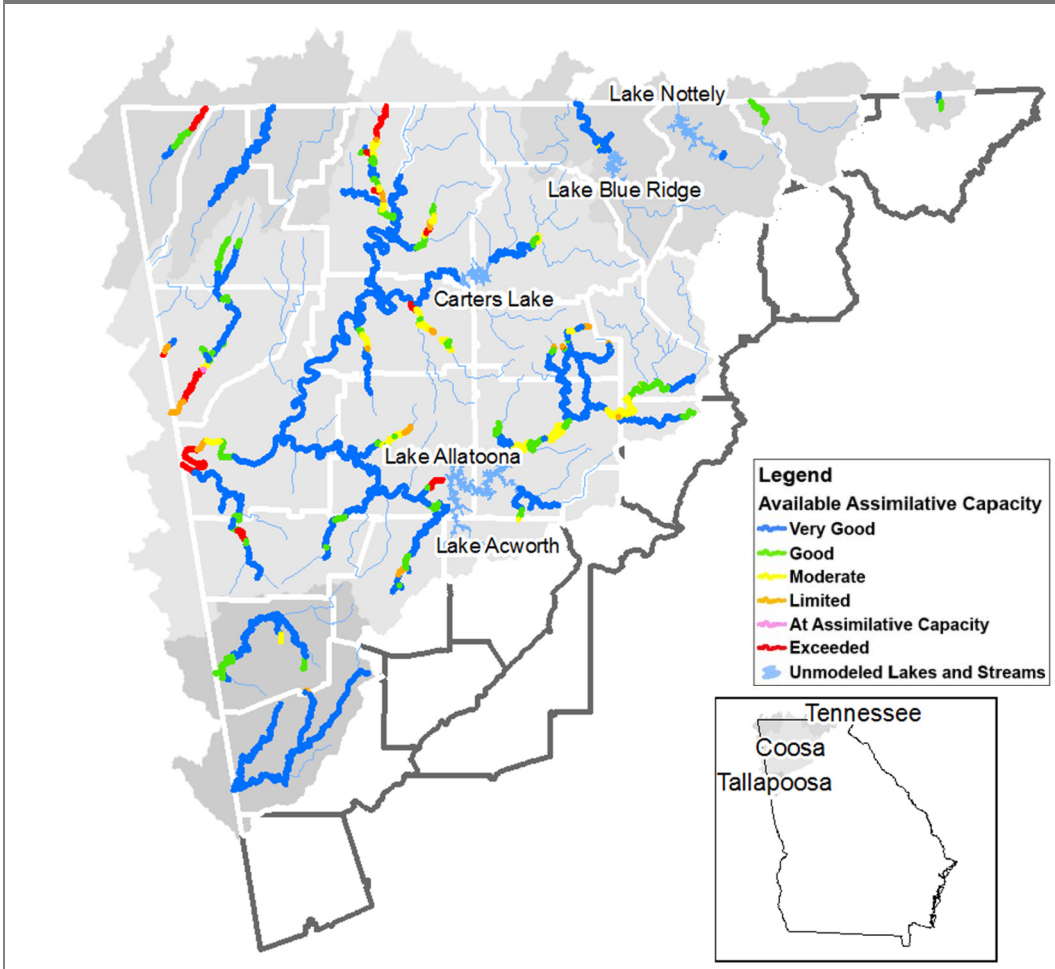
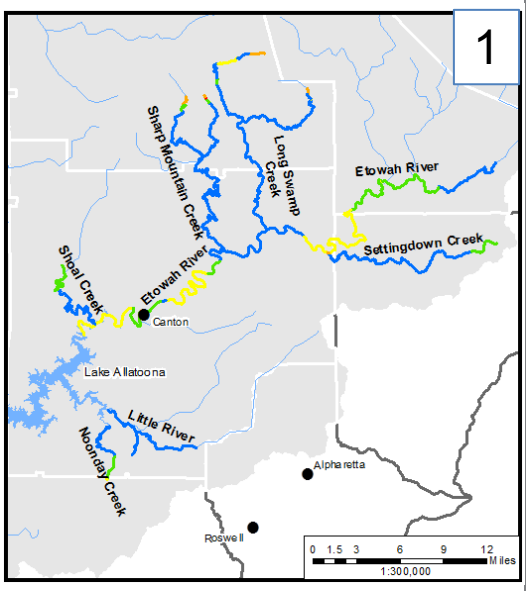
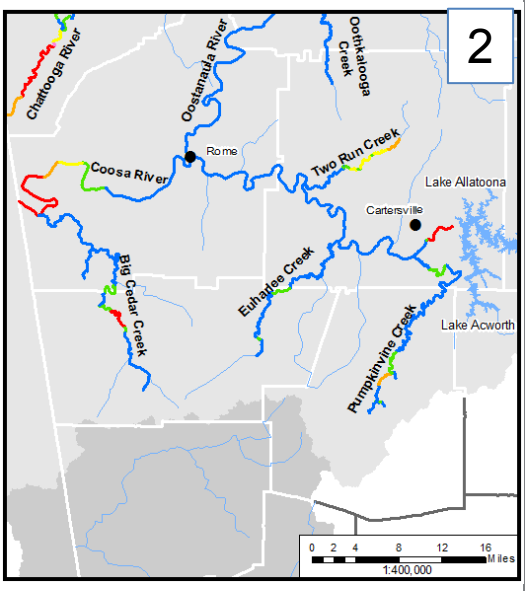
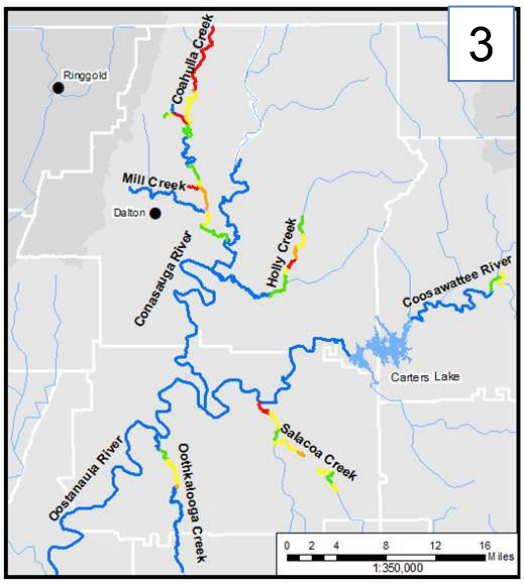


Figure 5-2: Permitted Surface Water Quality (Assimilative Capacity)

(CONTINUED)







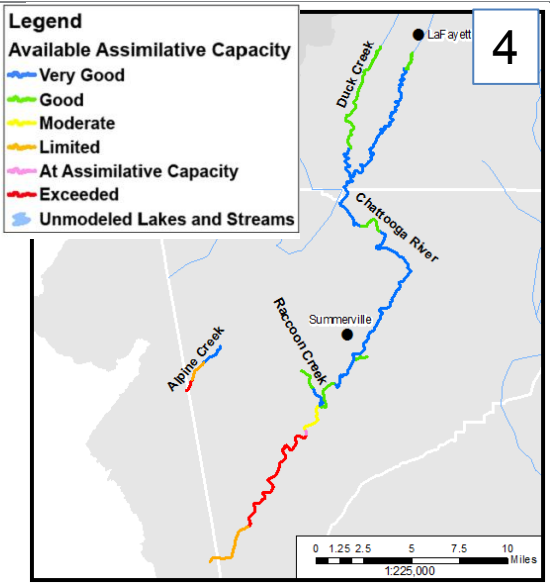
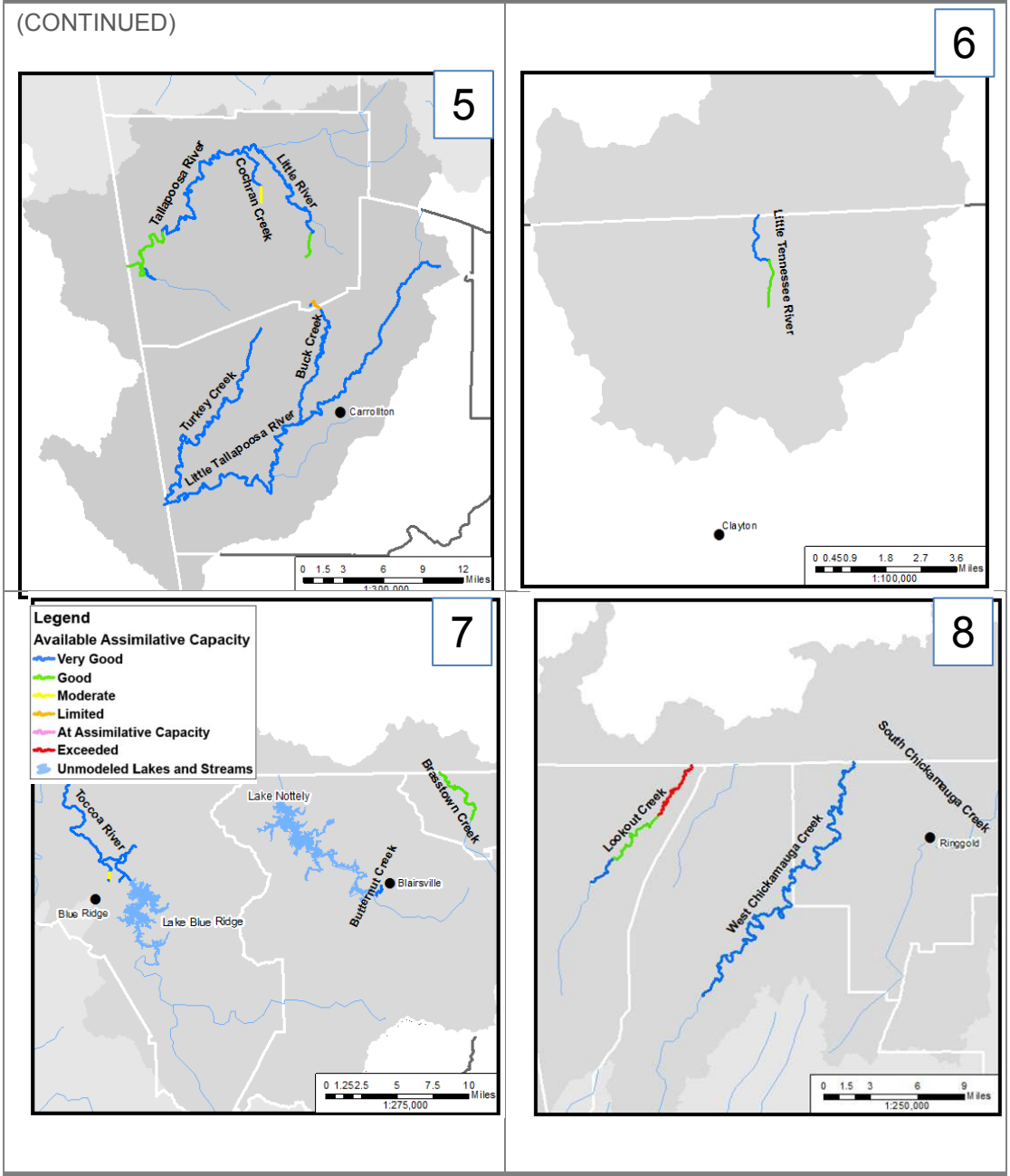


Figure 5-2: Permitted Surface Water Quality (Assimilative Capacity)

(CONTINUED)



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
No assimilative capacity: < 0 mg/L available DO
Source: Georgia Environmental Protection Division, 2017.

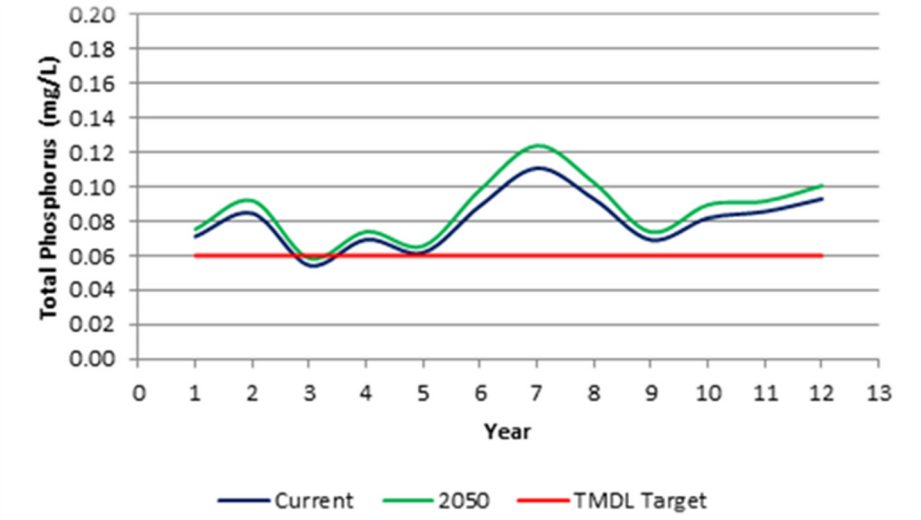
Additional data need to be collected to verify the modeling results before making any permitting decisions. GAEPD could modify the permits for facilities in the stream segments that are predicted to exceed or be at their assimilative capacity for DO to protect water quality. Additional or higher levels of wastewater treatment may be required in these reaches to improve DO levels and accommodate additional wastewater inputs, except for Coahulla Creek. There are no NPDES facilities discharging to the “exceeded“ segment of Coahulla Creek.

Watershed-based modeling to evaluate nutrient loadings under 2050 conditions also was completed for those watersheds contributing to the Coosa River at the Georgia-Alabama state line and Lake Allatoona on the Etowah River. There is a total phosphorus TMDL target of 0.06 mg/L for the Coosa River at the Georgia-Alabama state line. Figure 5-3 illustrates the modeling results for an 11-year period (including the rainfall conditions for 2001-2012) for total phosphorus concentrations at the state line based on current and future point and nonpoint source loadings. These results show that under current and future conditions, the total phosphorus TMDL target of 0.06 mg/L would not be met during most years (Figure 5-3). This suggests that there is a potential gap in meeting the nutrient (total phosphorus) target at the state line, even with the proposed total phosphorus limitations in place. However, recent monitoring data from 2016 indicates that total phosphorus levels at the state line have consistently been at or below the 0.06 mg/L target.

Under the modeled future conditions in the Coosa watershed, the nutrient contributions in pounds per year (lb/yr) during dry years are approximately 60 percent point sources and 40 percent nonpoint sources (Figure 5-4 and Figure 5-5). In a wet year, on the other hand, nonpoint sources contribute roughly 70 percent of the total loadings.

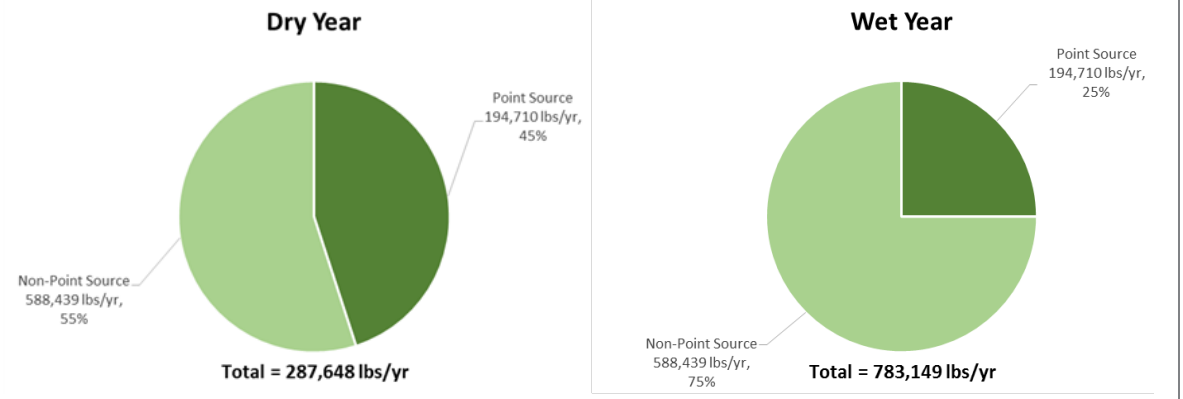
In addition, GAEPD is considering new water quality numerical nutrient criteria (NNC) for streams that likely will require additional reductions in nutrient loadings to maintain or meet the new standards.

Figure 5-3: Growing Season Median Phosphorus Concentration – Coosa River at Georgia-Alabama State Line



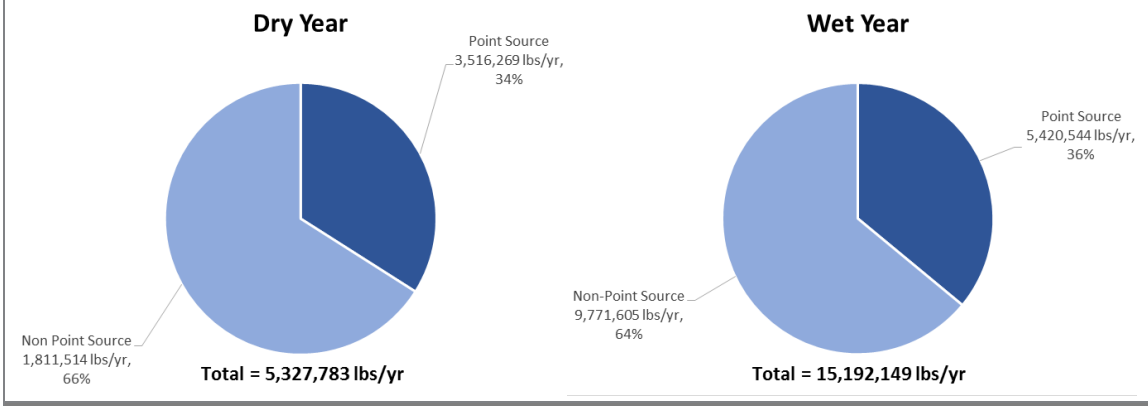
Note: 2050 model results assume future permit limits of 1.0 mg/L total phosphorus for major point sources (1.0 MGD and above) and 8.34 lbs/day total phosphorus for minor point sources.

Figure 5-4: Coosa Watershed – Tributary Phosphorus Loading (lb/yr)



Note: Based on 2050 demands.

Figure 5-5: Coosa Watershed – Tributary Nitrogen Loading (lb/yr)



Note: Based on 2050 demands.

As described in Section 3.2.1, Lake Allatoona has different chlorophyll-a standards depending on the location within the lake. The TMDL includes significant nonpoint source reductions: an 85 percent reduction in urban nutrient loads, a 40 percent reduction in agricultural nutrient loads, and a 50 percent reduction in failing septic tanks (GAEPD, 2013). As part of the Plan update, additional modeling was completed over an 11-year period (2001 through 2011) to capture a range of annual rainfall conditions. The results of this modeling indicate that the proposed TMDL reductions will result in compliance with the chlorophyll-a standards in the Little River Arm, Etowah River Arm, Mid Lake, and Dam Pool modeling locations. The model indicates that the Allatoona Creek location of the lake would not meet the chlorophyll-a standard with the TMDL reduction in place. However, the Allatoona Creek tributary is located outside of the CNG Region and would not be influenced by management practices implemented by local governments within the CNG Region.

5.4 Future Treatment Capacity Comparison

Based on a comparison of the future wastewater capacity needs with existing permitted capacity, municipal facilities in Habersham County would not meet 2050 demands with their currently permitted facilities, with a 0.61 MGD shortage (see Table 5-4). This suggests that additional wastewater facility expansions or development of new facilities will be required to meet the projected future wastewater demands in that County.

It should be noted that the shortage or surplus estimates were calculated by comparing the current permitted maximum monthly average discharge with the forecasted annual average wastewater flow. Therefore, these estimates are only an indicator of potential future shortages/surpluses in permitted treatment capacity and indicate areas where continued localized facility planning will be needed.

Table 5-4: Permitted Municipal Wastewater Discharge Limits versus Forecasted Municipal Wastewater Flows (MGD)

County	Permitted Municipal Wastewater Discharge Limit[a,b]	2015 Forecasted Municipal Wastewater Flows[a,c]	2050 Forecasted Municipal Wastewater Flows[a,c]	Potential 2050 Need[a,d]	Additional Capacity Available in 2050[a,d]
Catoosa[e]	-	-	-	None	-
Chattooga	7.17	6.33	5.8	None	1.37
Dade	0.95	0.37	0.34	None	0.61
Dawson	2.36	0.47	0.89	None	1.46
Fannin	1.26	0.68	0.66	None	0.60
Floyd[f]	20.22	11.54	12.52	None	7.70
Gilmer[g]	4.00	1.73	2.06	None	1.94
Gordon[h]	16.32	5.36	6.64	None	9.68
Habersham	5.08	3.3	5.69	(-0.61)	None
Lumpkin	1.73	0.66	1.55	None	0.18
Murray	3.01	1.24	1.39	None	1.62
Pickens	1.24	0.63	0.92	None	0.33
Polk	6.67	3.34	3.77	None	2.90
Towns	1.13	0.36	0.59	None	0.10
Union	0.66	0.31	0.37	None	0.29
Walker[j]	7.03	3.02	3.07	None	3.97
White	1.4	0.65	0.84	None	0.56
Whitfield[j]	40.52	17.54	20.18	None	20.34
Total	**120.31**	**57.53**	**67.28**	**NA[k]**	**NA[k]**

[a]Includes centralized systems such as point source discharges, LASs and subsurface systems, but not septic systems.

[b]Permitted Discharge Limits based on the Maximum Monthly Average Permit Limit (in MGD) of each permit.

[c]Forecasted Municipal Wastewater Flows include flow from industries that are served by municipal facilities. Values based on Annual Average Flow (in MGD).

[d]Based on difference between Permitted Treatment Limit and 2050 Forecasted Flows (in MGD). Red values in parentheses are shortages and values in black are surpluses.

[e]Catoosa County is estimated to provide 0.21 MGD of treatment capacity to textile industries (2010). Wastewater from Catoosa County is treated at the Moccasin Bend Plant in Chattanooga, TN.

[f]Floyd County is estimated to provide 2.28 MGD of treatment capacity to textile and automotive industries (2010).

[g]Gilmer County is estimated to provide 1.36 MGD of treatment capacity to food and textile industries (2010).

[h]Gordon County is estimated to provide 4.14 MGD of treatment capacity to textile industries (2010).

[i]Walker County is estimated to provide 0.48 MGD of treatment capacity to textile industries (2010). The Moccasin Bend Plant in Chattanooga, TN, serves portions of Walker County.

[j]Whitfield County is estimated to provide 16.13 MGD of treatment capacity to textile industries (2010).

[k]NA means Not Applicable

Sources: Forecasted wastewater flows and GAEPD approved permit database.

Table 5-5 lists the number of agricultural permits, the permitted agricultural acreage per crop, and the 2050 forecasted agricultural water demand. The 2050 agricultural water demands will be refined in the future when more information regarding usage becomes available.

Table 5-5: Number of Permits, Permitted Agricultural Acreage and 2050 Forecasted Agricultural Water Demand (MGD)

County	Number of Permits[a]	Permitted Agricultural Acreage[a]	2050 Forecasted Agricultural Water Demand[b,c]
Catoosa	10	945	1.05
Chattooga	5	285	0.30
Dade	0	0	0.19
Dawson	8	343	0.62
Fannin	21	559	0.31
Floyd	43	4,487	1.97
Gilmer	9	816	1.37
Gordon	18	2,602	2.52
Habersham	20	1,497	1.61
Lumpkin	19	1,033	0.38
Murray	16	1,760	0.76
Pickens	4	185	0.39
Polk	8	395	0.34
Towns	1	90	0.31
Union	18	548	0.74
Walker	5	200	0.63
White	7	234	0.33
Whitfield	15	1,611	1.24
Total	**227**	**17,590**	**15.06**

Notes: The first two columns (number of permits and permitted acreage) have not been verified.

[a]Includes surface and ground water permits greater than 100,000 gallons/day. Permits listed include crop irrigation, golf courses, livestock watering, and nurseries. Note that permits issued before the early 1990s do not list acreage.

[b]2050 Forecasted Agricultural Water Demand based on P75 scenario (in MGD). This demand is comprised of crop irrigation, golf courses, livestock watering, and nurseries. Note that the crop irrigation is the only demand that has a forecasted value. The other demands were not forecasted, so the current values for those demands are used for 2050 forecast.

[c]Peak demand could exceed 19.14 MGD during the growing season and under critical drought conditions.

Sources: *Coosa-North Georgia Region – Water and Wastewater Forecasting Technical Memorandum* (2017) and TetraTech, 2015.

5.5 Summary of Potential Water Resource Gaps or Shortages

Table 5-6 summarizes the potential water resource gaps or infrastructure needs/shortages. The basis for each potential gap or need/shortage is noted and further explanation is provided in the source of the gap or need/shortage. In addition to the watershed-based nutrient modeling for those watersheds contributing to the Coosa River at the Georgia-Alabama boundary and Lake Allatoona on the Etowah River, the water quality 303(d) issues column also integrates the widespread 303(d) stream listings in the CNG Region (see Section 3.3.2). The most common water quality violations within the Region, in descending order, were due to impaired fish communities, high fecal coliform concentrations, polychlorinated biphenyls (PCBs) and impaired benthic macroinvertebrate communities.

Infrastructure shortages may have multiple solutions such as municipal facility expansions and/or the construction of new local or regional facilities. The intent of this document is to provide a global overview of the Region, but not to replace or undermine local capital improvement planning.

Table 5-6: Summary of Potential Gaps, Needs, or Shortages by CNG County

County	Surface Water Availability Potential Gaps	Municipal Water Potential Needs	Municipal Wastewater Potential Shortages	Agricultural Water Potential Shortages	Water Quality – Assimilative Capacity Potential Gaps[a]	Miles and (Segments) of 303(d) Reaches[b]
Source	*Table 5-1*	*Table 5-3*	*Table 5-4*	*Table 5-5*	*Figure 5-2*	*Section 3.3.2 and 5.3*
Catoosa	Yes					69 (14)
Chattooga	Yes				Yes	56 (10)
Dade	Yes			Yes	Yes	21 (3)
Dawson		Yes				51 (7)
Fannin						49 (10)
Floyd					Yes	175 (24)
Gilmer						74 (18)
Gordon					Yes	94 (17)
Habersham			Yes			42 (5)
Lumpkin						61 (10)
Murray					Yes	65 (10)
Pickens						54 (12)
Polk					Yes	18 (2)
Towns		Yes				42 (11)
Union						89 (23)
Walker	Yes					50 (9)
White						25 (5)
Whitfield					Yes	37 (10)
Total	**4**	**2**	**1**	**1**	**3**	**1072 (200)**

Notes:

"Yes" indicates that there is a potential gap or need/shortage in the indicated county.

A potential "gap" is defined as a condition where the existing or future water withdrawal or return conditions are predicted to exceed the Resource Assessment metric within a portion of the county.

A potential "need" and "shortage" are defined as a condition where the current permitted capacity of water and wastewater treatment facilities, respectively, is less than the future forecast demands.

[a] Potential gaps in assimilative capacity are for streams modeled to have "Limited", "At Capacity", or "No Capacity Remaining"

[b] Includes only 303(d) reaches that are fully within each respective county. An additional 397 miles, or over 41 stream reaches, are shared between two or more CNG counties.

(This page intentionally left blank)

Section 6. Addressing Water Needs and Regional Goals

Section Summary

Management Practices were selected to meet the Council's vision and goals and to address the potential resource gaps and shortages identified and described in Section 5.

In 2011, a prioritization and ranking process was used by the Regional Water Planning Council that resulted in the selection of 14 Water Conservation, 8 Water Supply, 8 Wastewater, and 12 Water Quality Management Practices. In 2017, the Council revised the management practices to combine several of the Water Conservation measures (11 total) and to add 2 Water Quality measures (14 total).

This section presents the management practices selected by the CNG Water Planning Council to address the potential resource gaps, needs, or shortages identified and described in Section 5, and/or to meet the Council's vision (Enhance the potential and quality of life for all communities through sustainable use of water resources in the Region and State with partnerships among a broad spectrum of stakeholders) and the goals for the Region described in Section 1.3.

6.1 Identifying Water Management Practices

Section 5 identifies the CNG Region's likely resource gaps, needs, and shortages, based on a comparison of the Resource Assessments and forecasted demands, and demonstrates the need for Region- and resource-specific management practices. In cases where potential gaps, needs, and shortages appear unlikely, the management practices were selected to meet the needs specified by the Council (facility and infrastructure needs and practices, programmatic practices, etc.) that are aligned with the Region's vision and goals. In selecting the management practices, the Council considered its vision and goals, and the practices identified in existing plans and coordinated management practice selection with local governments, water providers, and neighboring councils that share the water resources.

6.1.1 Review of Existing Plans and Practices

For the initial Regional Water Plan adopted in 2011, the Council conducted a comprehensive review of existing local and regional water management plans and relevant related documents to frame management practice selection. Where possible, management practices already planned for use or successfully in use in the Region formed the basis for the management practices selected by the Council. A summary of the local and regional plans reviewed is provided as a supplemental document on the CNG website.

6.2 Selected Water Management Practices for the Region

Management practices are grouped by primary water resource area addressed, such as Water Quality or Water Conservation. They are generally listed in order of the total benefit ranking assigned by the Council. The prioritization and ranking process performed for the initial Regional Water Plan in 2011 is described in the supplemental document titled Summary of Management Practice Process, which is available at the CNG website.

For this current update to the Regional Water Plan, the Council conducted a review and assessment of the existing management practices that were adopted in 2011. Management practices were revised to provide clarity or in an effort to improve effectiveness based on the Council's experience in the Region. Additionally, new management practices were incorporated and adopted in this updated Plan.

6.2.1 Water Conservation Management Practices

The State will need to practice water conservation in order to meet its long-term water needs. Conservation also helps ensure responsible use of a public resource.

Water conservation is a priority management practice in Section 7, Policy 3 of the State Water Plan and the State Water Conservation Implementation Plan (WCIP). The latter, published in March 2010, identified water conservation goals, bench marks, and BMPs for the State's diverse water users (GAEPD, 2010b). The WCIP framed the following conservation tiers for each Council to use during management practice selection:

- Tier 1: Basic water conservation activities and practices that are currently required by statute or will soon be required in GAEPD's upcoming amended rules.
- Tier 2: Basic water conservation activities and practices that will be addressed in upcoming amended rules but not required of all permit applicants.
- Tier 3: Basic water conservation practices (for all water use sectors) that will not be addressed in current or upcoming amended rules.
- Tier 4: "Beyond basic" water conservation practices to be considered if a gap exists between current or future water supplies and demands for the region.

Figure 6-1 illustrates the process used to consider the tiers during selection of the CNG Water Conservation Management Practices, listed in Table 6-1(a). Three of the Council's goals specifically address water conservation or the optimization of water infrastructure:

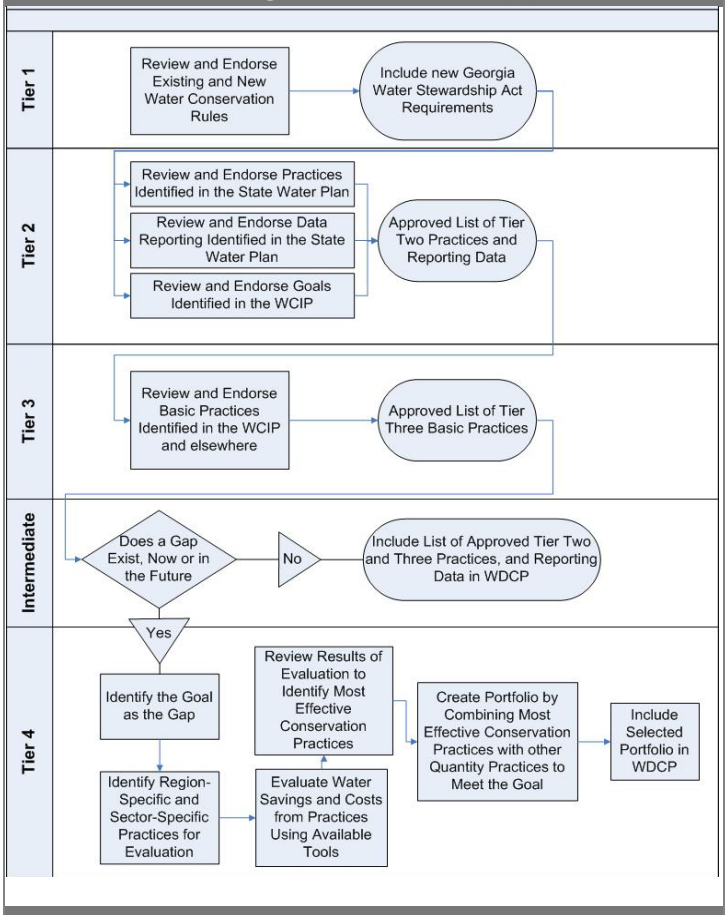
Goal #3: Ensure that management practices support economic development and optimize existing water and wastewater infrastructure.

Goal #4: Promote alternative technologies that conserve, return, and recycle water; protect water quality; and ensure adequate capacity for water storage within the CNG Region.

Goal #6: Educate stakeholders in the Region on the importance of water resources, including water conservation, efficiency, and pollution prevention.

The 11 water conservation management practices listed in Table 6-1(a) meet the goals noted above and address potential gaps at the Gaylesville, New England, and Chickamauga nodes, and in localized areas in the Tennessee Basin headwater communities; these potential gaps are discussed further in Section 5 and summarized in Table 5-6.

Figure 6-1: Water Conservation Guidance Process Flow Diagram



Source: Georgia Environmental Protection Division, 2009.

Table 6-1(a): Water Conservation Management Practices Selected for the CNG Water Planning Region

Action Needed (Management Practice)	Description of Activities	Relationship of Action or Issue to Goals (Section 1.3)
WC-1. Implement education and public awareness programs	• Develop and implement local public education programs. • Perform public education and outreach activities. • Perform public participation and involvement activities. • Develop a residential water audit program. • Distribute residential water audit guidelines. • Encourage voluntary residential water audits. • Consider purchasing and distributing high-efficiency retrofit kits to residential users. • Encourage the use of landscaping practices that minimize water usage and prevent runoff, such as native vegetation that requires less water than nonnative vegetation. • Encourage use of trained irrigation specialists who understand irrigation application timing, levels of water needed by vegetation, as well as technologies and installation practices that increase water use efficiency of irrigation systems.	Supports ES, ED, WQ, and WS goals[a]
WC-2. Develop water conservation goals	Set region-wide goals to encourage reductions in water usage by consumers.	Supports ES, WQ, and WS goals[a]
WC-3. Stewardship Act Practices	• Assess and reduce water system leakage • Adopt Stewardship Act outdoor watering restrictions • Install high-efficiency cooling towers in new construction • Adopt new agricultural permit requirements	Supports AT, ES, ED, WQ, and WS goals[a]
WC-4. Consider retrofitting to 1.28-gpf (high-efficiency) toilets and high-efficiency urinals in government buildings	• Develop a list of eligible government buildings. • Develop a retrofit schedule and program. • Retrofit fixtures according to the schedule and program developed. • Promote use of tax incentives to encourage retrofits.	Supports ES, AT, and WS goals[a]

Table 6-1(a): Water Conservation Management Practices Selected for the CNG Water Planning Region		
Action Needed (Management Practice)	**Description of Activities**	**Relationship of Action or Issue to Goals (Section 1.3)**
(CONTINUED)		
WC-5. Encourage non-potable reuse	• Identify areas with potential for reuse applications. • Promote irrigation with high quality treated effluent in areas such as golf courses, parks, and residences. Encourage industries to use reclaimed water for processes such as cooling when feasible.	Supports ES, ED, WQ, and WS goals[a]
WC-6. Encourage conservation pricing for residential and irrigation sprinkler systems	Implement conservation pricing for residential customers to provide economic incentive for people to use less water in the region. Activities to implement include: • Eliminate declining block rate structures. • Perform a rate and revenue analysis. • Use irrigation meter pricing (non-punitive). • Ensure adequate billing system functionality. • Review and update pricing. This does not apply to agricultural uses.	Supports ES, WQ, and WS goals[a]
WC-7. Encourage installation of rain sensor shut-off switches on new irrigation systems	• Encourage installation or retrofitting of irrigation systems that automatically shut off during rain events or moist soil conditions. • Update building inspection checklists.	Supports ES, WQ, and WS goals[a].
WC-8. Encourage agricultural irrigation efficiency improvements	• Continue implementation of the Mobile Irrigation Lab Program to provide free irrigation system performance audits. • Encourage agricultural irrigation users to improve water efficiency of the irrigation systems.	Supports ES, ED, AT, WQ, and WS goals[a]
WC-9. Encourage development of golf course-specific water conservation plans	• Implement the GAEPD standard water conservation plan template for self-supplied golf courses. • Consider adoption of provisions from the Georgia Water Conservation Implementation Plan (WCIP).	Supports ES, ED, WQ, and WS goals[a]

Table 6-1(a): Water Conservation Management Practices Selected for the CNG Water Planning Region

Action Needed (Management Practice)	Description of Activities	Relationship of Action or Issue to Goals (Section 1.3)
(CONTINUED)		
WC-10. Encourage metering of permitted and non-permitted agricultural irrigation water use	• Inventory all permitted and non-permitted agricultural irrigation water users. • Install flow meters on agricultural irrigation systems. • Report metered water usage from agricultural irrigation on at least an annual basis, or as prescribed by GAEPD.	Supports ES, ED, AT, WQ, and WS goals[a]
WC-11. Encourage the energy production industry to conserve water at facilities	• Reduce withdrawals at energy production facilities, and maximize returns to the water supply.	Supports ES, ED, AT, WQ, and WS goals[a]

[a]Goals were given the following acronyms during the management practice ranking and selection process:

WS: Water Supply/Quantity – Plan for appropriate levels of water storage, water sources, and long-term supply to meet anticipated needs of local communities.

WQ: Water Quality – Protect and enhance water quality and ecosystems in lakes and streams, particularly those in priority listed watersheds.

AT: Alternative Technologies – Promote alternative technologies that conserve, return, and recycle water; protect water quality; and ensure adequate capacity for water storage within the CNG Region.

ED: Economic Development – Ensure that management practices support economic development and optimize existing water and wastewater infrastructure.

AE: Adverse Effects – Minimize adverse effects to local communities and adjacent regions, and when possible, enhance natural systems.

ES: Educate Stakeholders – Educate stakeholders in the Region on the importance of water resources, including water conservation, efficiency, and pollution prevention.

6.2.2 Water Supply Management Practices

Management practices that supplement water supply are an important part of addressing the potential water resource gaps for the Region, as summarized in Table 5-6. Of the 18 counties in the Region, 2 are to projected to have future needs in their water supply infrastructure, as described in Section 5.2. Potential gaps due to increased future demands, in both duration and volume, also were observed at the Gaylesville, New England, and Chickamauga nodes in 2050, primarily affecting Catoosa, Chattooga, Dade and Walker Counties. Table 6-1(b) outlines the 8 Water Supply Management Practices targeted for implementation in the Region to address these potential gaps and needs. Three of the Council's goals specifically address water supplies or the optimization of water infrastructure:

Goal #1: Plan for appropriate levels of water storage, water sources, and long-term supply to meet anticipated need for local communities.

Goal #3: Ensure that management practices support economic development and optimize existing water and wastewater infrastructure.

Goal #4: Promote alternative technologies that conserve, return, and recycle water; protect water quality; and ensure adequate capacity for water storage within the Region.

Table 6-1(b): Water Supply Management Practices Selected for the CNG Water Planning Region

Action Needed (Management Practice)	Description of Activities	Relationship of Action or Issue to Goals (Section 1.3)
WS-1. Encourage development of water master plans	Create and utilize a local water master plan with a 30-year planning horizon that includes, as appropriate: • Evaluate potential for partnerships in meeting future water supply needs, including sources such as the Tennessee River, which receives a significant flow originating in Georgia. • Evaluate cost-benefits of various water resources options and use Integrated Natural Resource Management Plan approach to assess relationships between water, wastewater, stormwater, and energy. • Adopt a written emergency water supply plan and assess the need for interconnections to meet reliability targets. • Support and participate in continued updates of the Redundancy and Emergency Interconnectivity study. • Evaluate potential to purchase from other water systems for the short term. • Update local water master plan as needed. • Identify new North Georgia Water Resources Partnership members to increase regional participation in plan development and implementation.	Supports ED, WQ, and WS goals[a]
WS-2. Identify and map planned, existing, or offline reservoirs, and consider expansion of existing reservoirs, as needed	• Evaluate potential expansion of existing facilities. • Evaluate potential for Natural Resources Conservation Service (NRCS) impoundments to serve as water supply sources, as applicable.	Supports ES, ED, WQ, and WS goals[a].

Table 6-1(b): Water Supply Management Practices Selected for the CNG Water Planning Region

Action Needed (Management Practice)	Description of Activities	Relationship of Action or Issue to Goals (Section 1.3)
(CONTINUED)		
WS-3. Consider construction of new reservoirs to meet multiple purposes	• Regional water planning councils or local entities and GAEPD identify the safe yield of current sources. • Identify where gap(s) between available supply and demand will occur. • Begin process to permit new water supplies for both off-stream (water supply) and in-stream (water quality protection) purposes.	Supports ES, ED, WS goals[a]
WS-4. Consider development of new groundwater wells	• Evaluate potential for groundwater (often as supplemental supply). • Permit/implement as needed and practicable. • Evaluate feasibility of aquifer storage and recovery (ASR).	Supports WQ and WS goals[a]
WS-5. Encourage indirect potable reuse	• Return highly treated wastewater to water supply reservoirs and/or streams.	Supports WQ and WS goals[a].
WS-6. Consider construction of new water treatment plants (WTPs) or expansion of existing WTPs	• Evaluate when and where new WTPs are needed to meet demands. • Begin process to permit new WTPs. • Continue to assess existing and proposed interconnections for redundancy and regional water supply potential to supply increased demand in the future, by supporting the continued Redundancy and Emergency Interconnectivity study	Supports AT, WQ, and WS goals[a]
WS-7. Encourage water system asset management	• Create water system maps of all infrastructure in electronic format. • Link water system maps with asset inventory and characteristic data for maintenance and management. • Develop a water system rehabilitation and replacement program (asset management program). • Coordinate asset management and leak detection programs. • Implement based on local government and utility needs. • Establish and implement inspection and maintenance program. • Review existing staff certifications and secure additional training as needed. • Prioritize rehabilitation projects and develop schedules and budgets.	Supports ED, WQ, and WS goals[a]

Table 6-1(b): Water Supply Management Practices Selected for the CNG Water Planning Region

Action Needed (Management Practice)	Description of Activities	Relationship of Action or Issue to Goals (Section 1.3)
(CONTINUED)		
	• Implement rehabilitation program and document rehabilitation projects. • Conduct annual planning and budgeting.	
WS-8. Encourage source water protection	• Identify water supply watersheds. • Recommend adoption of Environmental Planning Criteria. • Coordinate with local governments on watershed protection. • Emphasize "non-intrusive" environmental criteria and alternative ways to protect watersheds.	Supports ES, ED, WQ and WS goals[a]

[a]Goals were given the following acronyms during the management practice ranking and selection process:
WS: Water Supply/Quantity – Plan for appropriate levels of water storage, water sources, and long-term supply to meet anticipated needs of local communities.
WQ: Water Quality – Protect and enhance water quality and ecosystems in lakes and streams, particularly those in priority listed watersheds.
AT: Alternative Technologies – Use alternative technologies that conserve, return, and recycle water; protect water quality; and ensure adequate capacity for water storage within the CNG Region.
ED: Economic Development – Ensure that management practices support economic development and optimize existing water and wastewater infrastructure.
AE: Adverse Effects – Minimize adverse effects to local communities and adjacent regions, and when possible, enhance natural systems.
ES: Educate Stakeholders – Educate stakeholders in the Region on the importance of water resources, including water conservation, efficiency, and pollution prevention.

6.2.3 Wastewater Management Practices

The surface water quality Resource Assessments described in Section 5.3 were performed to measure the assimilative capacity, or the ability of Georgia's surface waters to absorb pollutants from treated wastewater and stormwater without unacceptable degradation of water quality. The Resource Assessments also highlighted the need for nutrient load reductions to Lake Allatoona, Carters Lake, and Lake Weiss to address expected future water quality issues. Table 5-4 and Table 5-6 summarize the Resource Assessment results and potential wastewater infrastructure shortages. One of the 18 counties in the Region has a projected wastewater infrastructure capacity shortage (Table 5-4). Table 5-6 also notes the two counties (which do not necessarily correspond with the WW infrastructure shortage county) with potential gaps in wastewater demand and in the assimilative capacity of surface waters. Table 5-6 also lists that all counties in the Region contain 303(d) listed impaired stream segments. These counties should consider implementation of the Wastewater Management Practices listed in Table 6-1(c) and a more rigorous

implementation of the Water Quality Management Practices described in Section 6.2.4 to improve the quality of surface waters.

Two of the Council's goals specifically address wastewater infrastructure:

Goal #3: Ensure that management practices support economic development and optimize existing water and wastewater infrastructure.

Goal #5: Promote properly managed wastewater discharges.

Table 6-1(c): Wastewater Management Practices Selected for the CNG Water Planning Region

Action Needed (Management Practice)	Description of Activities	Relationship of Action or Issue to Goals (Section 1.3)
WW-1. Consider development of local wastewater treatment master plans to evaluate wastewater treatment and disposal options to meet future demands	• Evaluate future wastewater capacity needs. • Identify and evaluate options to treat and dispose of wastewater. • Consider opportunities for reuse (indirect potable, non-potable, etc.).	Supports ES, ED, WQ, and WS goals[a]
WW-2. Consider development and implementation of a local wastewater education and public awareness program	• Develop and implement local public education programs. • Perform public education and outreach activities. • Perform public participation and involvement activities.	Supports ES, ED, WQ, and WS goals[a]
WW-3. Promote septic system management	• Conduct an analysis of existing septic systems, including identifying systems on plats and implementing a tracking system. • When upgrading or designing a wastewater treatment facility, develop a plan and acceptable parameters for septage disposal to include future septic system areas, local requirements, critical areas, and overall septage disposal needs. • Develop short- and long-term policies for transitioning unsewered areas to sewered areas. • Conduct additional management of septic systems in those critical areas.	Supports ES and WQ goals[a]

Table 6-1(c): Wastewater Management Practices Selected for the CNG Water Planning Region		
Action Needed (Management Practice)	**Description of Activities**	**Relationship of Action or Issue to Goals (Section 1.3)**
(CONTINUED)		
	• Implement a septic system homeowner education program and provide information, including pumping history, at closings. • Enforce actions for failed septic systems to encourage upgrades.	
WW-4. Provide sewer system inventory and mapping	• Create wastewater system maps in electronic format of all infrastructure. • Consider linking wastewater system maps with asset inventory and characteristic data for maintenance and management. • Use mapping to prioritize capital improvements and operation and maintenance (O&M), as well as during emergency response. • Upon completion of mapping, keep current via ongoing updates as conditions change.	Supports ES, ED, and WQ goals[a]
WW-5. Consider implementation of sewer system inspection, maintenance, and rehabilitation program	• Implement based on local government and utility needs. • Establish and implement inspection and maintenance program. • Review existing staff certifications and secure additional training as needed. • Prioritize rehabilitation projects and develop schedules and budgets. • Implement rehabilitation program. • Conduct annual planning and budgeting. • Document rehabilitation projects.	Supports ES, ED, and WQ goals[a]
WW-6. Develop a capacity certification program	• Implement based on local entity needs. • Maintain a flow and rainfall monitoring program. • Maintain a hydraulic model or use manual calculation approach. • Determine system capacity and maintain procedures for certifying available capacity. • Certify availability of capacity for proposed developments.	Supports ES, ED, and WQ goals[a]

Table 6-1(c): Wastewater Management Practices Selected for the CNG Water Planning Region		
Action Needed (Management Practice)	**Description of Activities**	**Relationship of Action or Issue to Goals (Section 1.3)**
(CONTINUED)		
WW-7. Implement a grease management program	• Implement based on local entity needs. • Develop procedures for grease control and enforcement. • Implement fats, oils, and grease (FOG) and disposable wipes education efforts.	Supports ES, ED, and WQ goals[a]
WW-8. Develop a sanitary sewer overflow (SSO) emergency response program	• Implement based on local entity needs. • Review overflow response program. • Add Standard Operating Procedures (SOPs) to ensure proper response to overflows.	Supports ES, ED, and WQ goals[a]

[a]Goals were given the following acronyms during the management practice ranking and selection process:

WS: Water Supply/Quantity – Plan for appropriate levels of water storage, water sources, and long-term supply to meet anticipated needs of local communities.

WQ: Water Quality – Protect and enhance water quality and ecosystems in lakes and streams, particularly those in priority listed watersheds.

AT: Alternative Technologies – Use alternative technologies that conserve, return, and recycle water; protect water quality; and ensure adequate capacity for water storage within the CNG Region.

ED: Economic Development – Ensure that management practices support economic development and optimize existing water and wastewater infrastructure.

AE: Adverse Effects – Minimize adverse effects to local communities and adjacent regions, and when possible, enhance natural systems.

ES: Educate Stakeholders – Educate stakeholders in the Region on the importance of water resources, including water conservation, efficiency, and pollution prevention.

6.2.4 Water Quality Management Practices

While significant progress has been made in managing pollution from point sources, Georgia's future growth will continue to be accompanied by conversion of land cover, more intensive land uses, and significant increases in the volume of pollutants discharged to waters from both point and nonpoint sources. Table 5-6 notes the CNG counties with assimilative capacity water quality issues and illustrates that the entire Region needs to focus on implementing Water Quality Management Practices to address the 303(d) listings in each county and the nutrient load reductions needed for those watersheds contributing to the Coosa River, Lake Allatoona, Weiss Lake, and Carters Lake. Implementation of the Water Quality Management Practices noted in Table 6-1(d) builds on the existing TMDL and stormwater management activities already being performed by the Municipal Separate Stormwater Sewer System (MS4) or NPDES permittees within the Region. As of 2017, the current MS4 counties are Catoosa, Dawson, Floyd, Murray, Walker, and Whitfield Counties.

Two of the Council's goals specifically address water quality:

Goal #4: Promote alternative technologies that conserve, return, and recycle water; protect water quality; and ensure adequate capacity for water storage within the CNG Region.

Goal #6: Educate stakeholders in the Region on the importance of water resources, including water conservation, efficiency, and pollution prevention.

Table 6-1(d): Water Quality Management Practices Selected for the CNG Water Planning Region

Action Needed (Management Practice)	Description of Activities	Relationship of Action or Issue to Goals (Section 1.3)
WQ-1. Encourage implementation of nutrient management programs	• Apply fertilizer at rates that are used by plants to avoid excessive nutrient runoff. • Use cropland management practices such as conservation tillage, cover crops, field buffers, riparian forested buffers, land conversion (crop to forest), strip cropping, and nutrient management. • Use practices to reduce runoff carrying pollutants from animal waste; include practices to store/cover and compost manure. • Recommend developing a pollutant tracking mechanism.	Supports ES, WQ, and WS goals[a]
WQ-2. Promote use of forestry best management practices	• Use BMPs to minimize runoff from silviculture operations such as streamside management zones, mechanical site preparation, and main haul roads (as adopted and enforced by the Georgia Forestry Commission). • Investigate mechanisms for tracking erosion from forestry practices such as a notification program for land clearing/harvesting activities.	Supports ES, AT, and WQ goals[a]
WQ-3. Encourage local government participation in erosion and sediment control	• Continue to implement existing construction NPDES Program. • Revisit practices to reduce runoff from construction sites when a given threshold of land is disturbed, if needed. • Consider the implementation of guidelines in the Georgia Backroads Program. • Draft sample erosion and sediment control ordinances to be made publicly available by the CNG Council and Regional Commissions.	Supports ES, ED, AT, and WQ goals[a]

Table 6-1(d): Water Quality Management Practices Selected for the CNG Water Planning Region

Action Needed (Management Practice)	Description of Activities	Relationship of Action or Issue to Goals (Section 1.3)
(CONTINUED)		
WQ-4. Consider development of post-development stormwater management and site design practices	• Manage runoff from new development and redevelopment areas so that post-development runoff volume is no greater than pre-development runoff volume. • Encourage site design practices that minimize environmental impacts, such as conservation subdivisions. • Draft sample conservation subdivision ordinances to be made publicly available by the CNG Council and Regional Commissions.	Supports ES, AT, WQ, and WS goals[a]
WQ-5. Encourage pollution prevention/good housekeeping practices for local operations and implementation of an illicit discharge detection and elimination program	• Local governments develop practices to prevent pollutant runoff from their land. • Identify illicit discharges to stormwater system and develop a program to eliminate them. • Stencil manhole covers and sewer grates with words to the effect, "Drains to stream. Do not dump contaminants."	Supports ES, WQ, and WS goals[a]
WQ-6. Encourage implementation of local stormwater education and public awareness program	• Develop a program to educate public about measures they can take to minimize their impacts (nonpoint source) on water resources. • Develop and implement local public education programs. • Perform public education and outreach activities. • Perform public participation and involvement activities.	Supports ES, ED, WQ, and WS goals[a]
WQ-7. Encourage consideration of regional BMPs such as regional ponds and natural protection systems	• Encourage local governments to work together to develop regional BMP plans. • Construct regional BMP facilities such as stormwater ponds and greenway networks for buffer restoration and protection. • Existing stormwater BMPs will be made publicly available to the region by the Regional Commissions and the Council.	Supports ED, AT, WQ, and WS goals[a]

Table 6-1(d): Water Quality Management Practices Selected for the CNG Water Planning Region		
Action Needed (Management Practice)	**Description of Activities**	**Relationship of Action or Issue to Goals (Section 1.3)**
(CONTINUED)		
WQ-8. Encourage stream buffer protection measures and stream restoration	• Preserve and develop vegetated (often forested) corridors along streams to filter pollutants. • Existing BMPs will be made publicly available to the region by the Regional Commissions and the Council.	Supports ES, ED, WQ and WS goals[a]
WQ-9. Encourage floodplain management/flood damage prevention practices	• Adopt site plan review practices to prohibit or minimize development in the floodplain. • Develop updated flood maps based on land use and refer to maps during the development review process. • Draft Model flood plain ordinances and make available through the Regional Commissions and the Council.	Supports ES, AT, WQ, and WS goals[a]
WQ-10. Continue implementation of comprehensive land use planning and environmental planning criteria	• Develop plans to recommend development in certain areas and discourage development in environmentally sensitive areas, including protecting open space along riparian corridors, wetlands, and groundwater recharge areas to protect water resources. • Include protection of endangered species, wetlands, aquifer recharge areas, and drinking water supplies.	Supports ED, WQ, and WS goals[a]
WQ-11. Support TMDL implementation	• Evaluate existing impaired waters, investigate potential pollutant sources, and participate in the TMDL development and implementation planning process. • Choose waterways to monitor, and seek funding for impairment mitigation.	Supports ES, WQ, and WS goals[a]
WQ-12. Consider water quality credit trading	• Evaluate the feasibility of point-to-point trading and nonpoint–to-point trading.	Supports ES, ED, and WQ goals[1].
WQ-13. Sampling and Testing of 303(d) Listed Streams	• Perform regular sampling and laboratory testing in the Region's 303(d) impaired waters in an effort to remove them from the list.	Supports ES, AT, WQ, and WS goals[a]

Table 6-1(d): Water Quality Management Practices Selected for the CNG Water Planning Region

Action Needed (Management Practice)	Description of Activities	Relationship of Action or Issue to Goals (Section 1.3)
(CONTINUED)		
WQ-14. Support Non-Traditional NPDES Permitting	• Evaluate the potential for non-traditional NPDES permitting to support nutrient reduction. • Identify and support opportunities for new non-traditional NPDES permitting.	Supports ES, AT, WQ, and WS goals[a]

[a]Goals were given the following acronyms during the management practice ranking and selection process:

WS: Water Supply/Quantity – Plan for appropriate levels of water storage, water sources, and long-term supply to meet anticipated needs of local communities.

WQ: Water Quality – Protect and enhance water quality and ecosystems in lakes and streams, particularly those in priority listed watersheds.

AT: Alternative Technologies – Use alternative technologies that conserve, return, and recycle water; protect water quality; and ensure adequate capacity for water storage within the CNG Region.

ED: Economic Development – Ensure that management practices support economic development and optimize existing water and wastewater infrastructure.

AE: Adverse Effects – Minimize adverse effects to local communities and adjacent regions, and when possible, enhance natural systems.

ES: Educate Stakeholders – Educate stakeholders in the Region on the importance of water resources, including water conservation, efficiency, and pollution prevention.

Section 7. Implementing Water Management Practices

Section Summary

The Council has developed a roadmap for implementing the Management Practices identified in Section 6.

This section identifies the short-term (2013-2016) and long-term (beyond 2017) actions and the applicable corresponding responsible parties. The responsibility for most of the implementation actions falls to local governments and utilities, and their corresponding Regional Commissions; however, extensive support for short-term activities, in particular, will be needed from various State entities.

This section presents the CNG Regional Water Planning Council's roadmap for implementing the water management practices identified in Section 6. Updates to the implementation schedule reflect the changes in the recommended management practices and feedback from the Council on the original schedule of activities. The Regional Water Plan will be primarily implemented by the various water users in the CNG Region along with the other responsible parties described below.

The Regional Water Plan is used to:

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

7.1 Implementation Status

In 2015, the Northwest Georgia Regional Commission (NWGRC) assisted the CNG Regional Water Planning Council in development of a progress report to document the status of implementation activities across the Region and to evaluate potential changes to the management practices (Section 6) and the implementation schedule (Section 7) (NWGRC, 2015). Over the first 5 years of plan implementation, members of the CNG Council participated in monthly meetings with the North Georgia Water Resources Partnership (Partnership) to discuss implementation status of the ongoing technical studies funded by the Partnership and grants from GAEPD. Although not "official" Council meetings, these meetings served as opportunities to coordinate between local governments within the Region on key technical issues related to plan implementation.

The primary studies that have been either funded by the Partnership or GAEPD grants since 2011 include the following:

- **Nutrient Trading** – *Nutrient Trading in the Coosa Basin: A Feasibility Study* was completed by Brown and Caldwell in August 2013 and was funded by an EPA 319 (h) grant. The study evaluated the issues associated with setting up a point to nonpoint source nutrient trading framework. The study was conducted in an effort

to reduce total phosphorus loads by 30 percent in the Coosa River, measured at the Georgia/Alabama state line, as required by the EPA's Lake Weiss TMDL for Nutrient Impairment (2008).

- **Redundancy and Emergency Interconnectivity Study** – The *Redundancy and Emergency Interconnectivity Study* was completed by Jacobs and Amec Foster Wheeler in April 2015 and was funded by a Regional Water Plan Seed Grant from GAEPD. The study evaluated the feasibility for using municipal water system interconnections for emergency water supply.
- **Water Transmission Grid Study** – The *Water Transmission Grid Study* was completed by Jacobs and Amec Foster Wheeler in April 2015 and was funded by a Regional Water Plan Seed Grant from GAEPD. This is a long-term planning study that evaluates the potential for developing a regional water transmission grid across multiple municipalities to meet future water demand beyond the year 2050. The document's high level plan for meeting water supply needs is intended to encourage water systems and stakeholders to consider regional implications when making local decisions.
- **North Georgia Agricultural Water Use Study** – The *North Georgia Agricultural Water Use Study* was completed by TetraTech in June 2015 and was funded by a Regional Water Plan Seed Grant from GAEPD. The study determines the amounts of agricultural water use in the CNG Region. Agricultural acreage and irrigation withdrawal data were used to estimate water use. These data came from a variety of sources, including the UGA Center for Agribusiness and Economic Development, the Natural Resources Spatial Analyst Laboratory, and GAEPD, among others. Water use was estimated for commercial crops, poultry, and livestock.
- **Soque River Nutrient Management Study** – The Partnership, NWGRC, Cities of Cornelia and Clarksville, and the Soque River Watershed Association are collaborating on a nutrient study to identify nutrient sources in the watershed and potential strategies for nutrient loading reductions in the future. Findings from this study will be used to improve water quality management practices around the Region in the future.

In 2014, the Partnership entered into a Memorandum of Understanding (MOU) with the Georgia Association of Water Professionals (GAWP) to allow for collaboration and development of educational and resource materials to facilitate implementation of the Regional Water Plan. Through this partnership, the following resource documents were identified, and can be accessed through the GAWP website, www.gawp.org.

- Best Practice Master Planning Guidance and Resource Document
- A Guide to Asset Management for Small Water Systems
- Stormwater Program Guidance Manual for Small Local Governments

Between April and September 2015, the NWGRC held a series of three council meetings to review implementation status of the original plan and to evaluate potential changes to the recommended management practices.

7.2 Implementation Schedule and Roles of Responsible Parties

Tables 7-1(a) through 7-1(d) identify the short- and long-term actions needed to implement the management practices detailed in Tables 6-1(a) through 6-1(d) and the corresponding responsible parties for each series of actions. The Council has defined short-term as occurring between 2018 and 2022 and long-term as year 2022 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. Based on Council feedback, the RCs will take the lead role in coordinating and assisting local governments and utilities in implementing the management practices.

While the bulk of implementation actions noted in this section fall to local governments and utilities and their corresponding RCs, support for implementation will be needed from State entities such as GAEPD, DCA, Georgia Department of Community Health (DCH), Division of Public Health, Environmental Health Section, and Georgia Environmental Finance Authority (GEFA). This Regional Water Plan also assumes continued support from the Council in some capacity beyond its current 3-year appointment. Support from other organizations, such as the Association of County Commissioners of Georgia (ACCG), Georgia Green Industry (GGIA), Georgia Municipal Association (GMA), Georgia Rural Water Association (GRWA), and Georgia Association of Water Professionals (GAWP) also will be needed to implement the management practices in an efficient, cost-effective manner. In the CNG region, the Partnership has been a key partner in providing technical support for implementation of the regional water plan and will continue to serve in this role in the future.

Tables 7-1(a) through 7-1(d) indicate the permit category of the responsible parties for each management practice including the following mechanisms for tracking implementation, with GAEPD responsible for enforcement:

- Energy, Municipal, Golf Course and Agricultural Water Withdrawal and Drinking Water
- Municipal Wastewater Discharge
- Municipal and Construction Stormwater
- Safe Dams Program

7.2.1 Implementation of Water Conservation Management Practices

Table 7-1(a) lists implementation details for the 11 Water Conservation Management Practices selected by the Council. The list includes a wide variety of practices, such as: (1) practices that are required by state law (WC-3, Stewardship Act practices),

(2) practices that are beneficial for all communities (WC-1, Implement education and public awareness programs), and (3) practices that may be appropriate for some communities but not others (WC-5, Encourage non-potable reuse). Each community will need to continue to evaluate the practices to determine which are appropriate for implementation in their community, and are encouraged to adopt all management practices or other equally effective measures. Communities with Resource Assessment gaps or infrastructure needs or shortages will continue to be encouraged to implement these management practices to address their gaps, needs, or shortages. All communities will continue to be required to report on their implementation activities to the Council and to the GAEPD to help determine the effectiveness of the Regional Water Plan. Finally, it is important to seek out opportunities for implementation across state lines with partners to address impairments and improvements to inter-state waters.

The industrial sector continually strides to implement water conservation practices that increase productivity while decreasing water use. Particularly in the CNG Region, the carpet industry has significantly reduced water usage per unit of carpet manufactured due to industry process improvements, increased efficiencies, and conservations efforts (GTMA, 2009).

Table 7-1(a): Implementation Schedule for Water Conservation Management Practices

Management Practice	Permit Category of Responsible Parties	Short-term Implementation Actions: 2018 to 2022	Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update	Responsible Parties[a]
WC-1. Implement education and public awareness programs	Municipal Water Withdrawal, Drinking Water and Municipal Stormwater	• Review existing education programs and build on readily available examples from within Georgia to develop either a region-wide public education program or template for local implementation. • Implement the Education and Public Awareness Program including retrofit kits, residential water audits, and efficient landscaping and irrigation practices.	• Administer survey to gauge effectiveness of program after implementation of short-term actions. • Revise Education and Public Awareness Program during 5-year Regional Water Plan update, if necessary, to improve effectiveness.	Short-term Actions: GAEPD and councils working with the RCs noted in Section 2.2 with support from organizations such as the ACCG, GMA, GRWA, and GAWP. Local governments noted in Section 2.1.1. Long-term Actions: WC-2. Develop water conservation goals GAEPD and councils working with the RCs.

Table 7-1(a): Implementation Schedule for Water Conservation Management Practices

Management Practice	Permit Category of Responsible Parties	Short-term Implementation Actions: 2018 to 2022	Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update	Responsible Parties[a]
(CONTINUED)				
WC-2. Develop water conservation goals	Municipal Water Withdrawal and Drinking Water	• Identify achievable, measurable goals (and benchmarks) based on those in the WCIP to help local governments evaluate progress and success in reducing water supply gaps through conservation. • Develop ways to track progress in meeting conservation goals and reporting progress.	• Administer survey to gauge effectiveness of program after implementation of short-term actions. • Revise program during 5-year Regional Water Plan update, if necessary, to improve effectiveness.	GAEPD and councils working with the RCs noted in Section 2.2 with support from organizations such as the ACCG, GMA, GRWA, and GAWP.
WC-3. Stewardship Act Practices	Municipal Water Withdrawal and Agricultural Water Withdrawal	Assess and reduce water system leakage: • Follow the Water Supply Efficiency Rule (391-3-33) for submitting water loss audits. Adopt outdoor watering restrictions in compliance with the Drought Rule (391-3-30).	Assess and reduce water system leakage: • Administer survey to identify water saved by identifying and repairing leaks. • Continue annual assessments. • Implement outdoor watering restrictions and drought rule requirements. • Continue to implement ordinance and educate public.	Assess and reduce water system leakage: <u>Short-term Actions:</u> Local governments and utilities coordinated by the RCs noted in Section 2.3 with support from organizations such as GRWA and GAWP. <u>Long-term Actions:</u> Local governments and utilities, GAEPD, and councils working with the RCs. Adopt outdoor watering restrictions: Local governments and utilities.

Table 7-1(a): Implementation Schedule for Water Conservation Management Practices

Management Practice	Permit Category of Responsible Parties	Short-term Implementation Actions: 2018 to 2022	Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update	Responsible Parties[a]
(CONTINUED)				
WC-4. Consider retrofitting to 1.28-gpf (high efficiency) toilets and high efficiency urinals in government buildings	Municipal Water Withdrawal	• Develop a list of eligible government buildings, including the number and age of current fixtures. • Identify potential funding sources for government retrofits. • Develop preliminary cost estimates, prioritize buildings for retrofit, and develop schedule. • Retrofit fixtures according to schedule as funding allows.	• Administer survey to track number of fixtures installed and replaced.	<u>Short-term Actions:</u> Georgia Building Authority and GEFA, which, pursuant to Senate Bill 194, have responsibility for overseeing State Energy Performance Contracts that include water conservation measures. <u>Long-term Actions:</u> GAEPD and councils working with the RCs.
WC-5. Encourage non-potable reuse	Municipal Wastewater and Municipal Water Withdrawal	• Identify areas with potential for reuse application such as golf courses and parks. Identify industries that may use reclaimed water. • Consider applying for State Revolving Fund low-interest loans from GEFA, which can fund priority green projects, including water reuse and recycling programs. • Develop implementation costs and assess feasibility of providing non-potable reuse water.	• Encourage industries to use reclaimed water for processes, such as cooling, when technically and economically feasible.	Industry, local governments, and utilities.

Table 7-1(a): Implementation Schedule for Water Conservation Management Practices

Management Practice	Permit Category of Responsible Parties	Short-term Implementation Actions: 2018 to 2022	Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update	Responsible Parties[a]
(CONTINUED)				
WC-6. Encourage conservation pricing for residential and irrigation sprinkler systems	Municipal Water Withdrawal	• Review existing rate structure and perform a rate study, if needed, to eliminate declining block rate structure. • Implement conservation-oriented rate structure.	• Revise rate study and rate structure, as needed.	Local governments and utilities.
WC-7. Encourage installation of rain sensor shut-off switches on new irrigation systems	Municipal Water Withdrawal	• Develop regional guidelines / educational materials for local implementation. • Encourage voluntary installation or retrofitting to utilize irrigation systems that automatically shut off during rain events or moist soil conditions.	• Evaluate requiring switches in water-limited areas and revise guidelines during 5-year Regional Water Plan update, if necessary, to improve effectiveness. • Develop maintenance program to ensure long-term effectiveness of sensors.	<u>Short-term Actions:</u> GAEPD and councils working with DCA and the RCs with support from organizations such as the ACCG, GMA, and GAWP. Local governments and utilities. <u>Long-term Actions:</u> GAEPD and councils working with the RCs.

Table 7-1(a): Implementation Schedule for Water Conservation Management Practices				
Management Practice	**Permit Category of Responsible Parties**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WC-8. Encourage agricultural irrigation efficiency improvements	Agricultural Water Withdrawal	• Continue implementation of the Georgia Soil and Water Conservation Commission (GSWCC) Mobile Irrigation Laboratory Program to provide free irrigation system performance audits and then offer financial incentives to install water-saving technologies, based on audit efficiency results. • Implement with the support of the GSWCC. • Integrate message into Public Education and Awareness Program (see WC-1).	• Evaluate requiring irrigation efficiency improvements in water-limited areas. • Revise guidelines during 5-year Regional Water Plan update, if necessary, to improve effectiveness.	UGA College of Agriculture and Environmental Sciences and the Cooperative Extension Service. Short-term Actions: GAEPD Agriculture Water Permitting Unit and councils working with GSWCC. Long-term Actions: GAEPD, councils, and GSWCC.

Table 7-1(a): Implementation Schedule for Water Conservation Management Practices

Management Practice	Permit Category of Responsible Parties	Short-term Implementation Actions: 2018 to 2022	Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update	Responsible Parties[a]
(CONTINUED)				
WC-9. Encourage development of golf course-specific water conservation plans	Golf Course Water Withdrawal	• Educate Golf Course Superintendents about availability of GAEPD standard water conservation plan template for self-supplied golf courses (WC-1). • Identify incentives or recognition program to encourage development of golf course-specific water conservation plans. • Implement recognition program.	• Administer survey to gauge effectiveness of program after implementation of short-term actions. • Revise guidelines during 5-year Regional Water Plan update, if necessary, to improve effectiveness.	Short-term Actions: Georgia Golf Course Superintendents Association (GGCSA) and GAEPD. Long-term Actions: GGCSA with GAEPD and councils.
WC-10. Encourage metering of permitted and non-permitted agricultural irrigation water use	Agricultural Water Withdrawal	• Inventory existing permitted and non-permitted agricultural irrigation water users. • Prioritize meter installation. • Report water usage annually, or as prescribed by GAEPD.	• Evaluate effectiveness of metering program. • Revise program during 5-year updates.	Short-term Actions: Agricultural Water Users and GAEPD. Long-term Actions: Agricultural Water Users with GAEPD and councils.
WC-11. Encourage energy production industry to conserve water at facilities	Energy Water Withdrawal	• Evaluate and prioritize opportunities for water conservation at energy production facilities.	• Implement prioritized opportunities for water savings.	Short-term Actions: Energy Companies and GAEPD. Long-term Actions: Energy Companies with GAEPD and councils.

[a]Assumes continued support from the CNG Council in some capacity beyond its current 3-year appointment.

7.2.2 Implementation of Water Supply Management Practices

Table 7-1(b) lists implementation details for the eight Water Supply Management Practices selected by the Council. The list includes a wide variety of practices, such as practices that are beneficial for all communities (WS-1, Encourage development of water master plans) and practices that may be appropriate for some communities but not others (WS-2, Consider expansion of existing reservoirs). Each community will need to continue to evaluate the management practices to determine which are appropriate for implementation in their community. Communities with Resource Assessment gaps or infrastructure needs or shortages are strongly encouraged to implement these management practices to address their gaps, needs, or shortages. All communities will need to report on their implementation activities to the Council and to the GAEPD to help determine the effectiveness of the plan.

Table 7-1(b): Implementation Schedule for Water Supply Management Practices

Management Practice	Permit Category of Responsible Parties	Short-term Implementation Actions: 2018 to 2022	Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update	Responsible Parties[a]
WS-1. Encourage development of water master plans	Municipal Water Withdrawal	Develop or revise local water master plan to: • Include a 40-year planning horizon. • Include an emergency water plan. • Assess need for interconnections and their reliability targets. • Implement local water master plan. • Identify new North Georgia Water Resources Partnership members to increase regional participation in plan development and implementation.	• Revise local water master plan based on 5-year Regional Water Plan update.	Local governments and utilities with support from GAEPD.

Table 7-1(b): Implementation Schedule for Water Supply Management Practices				
Management Practice	**Permit Category of Responsible Parties**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WS-2. Identify and map planned, existing, or offline reservoirs, and consider expansion of existing reservoirs, as needed.	Municipal Water Withdrawal and Safe Dams Program	• In areas with potential future gaps, identify map and evaluate potential for cost-effectively retrofitting existing reservoirs to provide additional storage, and interconnection including retrofit of NRCS impoundments for water supply use, as applicable. • Identify potential funding sources and cost-share partners for retrofits and potential expansion of existing reservoirs; include in interconnectivity studies. • In areas with potential future gaps, identify and map planned, existing, or offline reservoirs; evaluate potential for bringing offline or planned reservoirs online to provide additional storage and interconnection.	• Begin process of expanding existing reservoirs. • Integrate plans for reservoir startup and expansions in 5-year Regional Water Plan update, if necessary, and interconnectivity studies.	Short-term Actions: GAEPD and councils working with DCA and the RCs with support from the NRCS. GEFA, local governments and utilities. Long-term Actions: Local governments and utilities with support from GAEPD and the CNG council.

Table 7-1(b): Implementation Schedule for Water Supply Management Practices				
Management Practice	**Permit Category of Responsible Parties**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WS-3. Consider construction of new reservoirs to meet multiple purposes	Municipal Water Withdrawal	• Identify site-specific needs for new water supply reservoirs over next 40 years via local water master planning process and Regional Water Plan. • Begin permitting process for new water supplies.	• Continue permitting process for new water supplies and construct as needed and as funding allows. • Revise local water master plan based on 5-year Regional Water Plan update, if necessary.	Local governments and utilities with support from GAEPD.
WS-4. Consider development of new groundwater wells	Industrial Water Withdrawal and Municipal Water Withdrawal	• As part of local water master planning process, identify site-specific needs for new groundwater wells over next 40 years. • Begin permitting process for new wells and construct as needed and as funding allows.	• Continue permitting process for new wells and construct as needed and as funding allows. • Revise local water master plan based on 5-year Regional Water Plan update, if necessary.	Industry, local governments and utilities with support from GAEPD.

Table 7-1(b): Implementation Schedule for Water Supply Management Practices				
Management Practice	**Permit Category of Responsible Parties**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WS-5. Encourage indirect potable reuse	Municipal Wastewater and Municipal Water Withdrawal	• Encourage indirect potable reuse by identifying opportunities to augment water supplies with highly treated wastewater via local water master planning process. • Identify incentives to encourage indirect potable reuse. • Implement via local water master plan.	• Revise local water master plan based on 5-year Regional Water Plan update, if necessary.	Local governments and utilities with support from GAEPD and GEFA.
WS-6. Consider construction of new WTPs or expansion of existing WTPs	Industrial Water Withdrawal and Municipal Water Withdrawal	• Evaluate need for new/expanded WTPs as part of local water supply planning process. • If needed, begin permitting process for the WTPs. • Continue to assess the existing and proposed interconnection for redundancy and regional water supply potential to supply increased demand.	• Complete permitting process, obtain funding and construct WTPs, as necessary. • Revise local water master plan and Regional Water Plan to reflect infrastructure changes.	Industry, local governments and utilities with support from GAEPD and GEFA.

Table 7-1(b): Implementation Schedule for Water Supply Management Practices				
Management Practice	Permit Category of Responsible Parties	Short-term Implementation Actions: 2018 to 2022	Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update	Responsible Parties[a]
(CONTINUED)				
WS-7. Encourage water system asset management	Municipal Water Withdrawal	• Develop a water system asset management program, if one does not already exist. • Begin or continue mapping of water system assets in electronic format. • Develop targeted asset replacement/ rehabilitation program to prevent catastrophic failures. • Continue mapping of water system assets. • Coordinate asset management and leak detection programs. • Incorporate data from utility surveys.	• Continue asset management and leak detection programs. • Revise programs based on 5-year Regional Water Plan update, if necessary.	Local governments and utilities with support from GAEPD.

Table 7-1(b): Implementation Schedule for Water Supply Management Practices				
Management Practice	Permit Category of Responsible Parties	Short-term Implementation Actions: 2018 to 2022	Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update	Responsible Parties[a]
(CONTINUED)				
WS-8. Encourage source water protection	Municipal Water Withdrawal	• Continue implementation of Chapter 391-3-16, Rules for Environmental Planning Criteria, which provide criteria for water supply watersheds and for protection of groundwater recharge areas. • Update water supply reservoir protection plans or source water protection plans, as needed.	• Implement source water protection plans.	Local governments and utilities with support from GAEPD and DCA.

[a]Assumes continued support from the CNG Council in some capacity beyond its current 3-year appointment.

7.2.3 Implementation of Wastewater Management Practices

Table 7-1(c) lists implementation details for the 8 Wastewater Management Practices selected by the Council. The list includes a wide variety of practices, such as practices that are beneficial for all communities (WW-1, Consider development of local wastewater master plans to evaluate wastewater treatment and disposal options to meet future demands) and practices that may be appropriate for some communities but not others (WW-6, Consider developing a capacity certification program). Each community will need to continue to evaluate the practices to determine which are appropriate for implementation in their community. Communities with Resource Assessment gaps or infrastructure needs or shortages are strongly encouraged to implement these management practices to address their gaps, needs, or shortages. All communities will need to report on their implementation activities to the Council and to the GAEPD to help determine the effectiveness of the plan.

Table 7-1(c): Implementation Schedule for Wastewater Management Practices				
Management Practice	**Permit Category of Responsible Parties**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
WW-1. Consider development of local wastewater master plans to evaluate wastewater treatment and disposal options to meet future demands.	Municipal Wastewater	• Consider developing (or revising) local wastewater master plan that: evaluates local, future wastewater capacity needs; identifies and evaluates options to treat and dispose of wastewater; and considers opportunities for reuse (indirect potable, non-potable, etc.). • If needed, implement local wastewater master plan.	• Revise local wastewater master plan based on 5-year Regional Water Plan update.	Local governments and utilities with support from GAEPD.
WW-2. Consider development and implementation of a local wastewater education and public awareness program	Municipal Wastewater	• Develop template materials for local wastewater education from readily available sources. • Adapt template materials for local use and distribute with water bills and septic tank applications as funding allows.	• Administer survey to gauge effectiveness of program after implementation of short-term actions. • Revise guidelines during 5-year Regional Water Plan update, if necessary, to improve effectiveness.	Short-term Actions: RCs with support from DCH. Local governments and utilities and local public health departments. Long-term Actions: RCs with support from GAEPD and CNG Council.

Table 7-1(c): Implementation Schedule for Wastewater Management Practices				
Management Practice	**Permit Category of Responsible Parties**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WW-3. Promote septic system management	Municipal Wastewater	As part of local wastewater planning efforts: • Develop policies for transitioning to sewer in areas where feasible. • Identify grant funds or other sources to develop and implement Septic System Homeowner Education program. • Implement policies for transitioning to sewer in areas where feasible. • Integrate Septic System Homeowner Education component into Public Education and Awareness Program (see WC-1). • Enforce actions for failed septic systems to encourage upgrades.	• Administer survey to gauge effectiveness of program after implementation of short-term actions. • Revise guidelines during 5-year Regional Water Plan update, if necessary, to improve effectiveness.	<u>Short-term Actions:</u> Local governments and utilities with support from DCA and the RCs and GEFA. <u>Long-term Actions:</u> GAEPD and councils working with State and Local Public Health Department.

Table 7-1(c): Implementation Schedule for Wastewater Management Practices				
Management Practice	**Permit Category of Responsible Parties**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WW-4. Provide sewer system inventory and mapping	Municipal Wastewater	• Develop electronic sewer system mapping strategy and identify potential funding sources. • As funding allows: – Generate sewer inventory and perform condition assessment. – Create sewer system map for emergency response and planning purposes. – Consider linking sewer system maps with asset inventory.	• Update sewer system inventory map as needed.	Short-term Actions: Local governments and utilities with support from GEFA, GRWA, and GAWP. Long-term Actions: Local governments and utilities with GAEPD.
WW-5. Consider implementation of sewer system inspection, maintenance, and rehabilitation program	Municipal Wastewater	• Develop local inspection, maintenance, and rehabilitation program. • Review existing staff certifications and identify needed training. • Prioritize rehabilitation projects and develop schedule and budget for implementation. • Secure funding for training and implement training program.	• Implement rehabilitation program. • Conduct annual planning and budgeting. • Document rehabilitation projects.	Short-term Actions: Local governments and utilities with support from GRWA, GAWP, and GEFA. Long-term Actions: Local governments and utilities.

Table 7-1(c): Implementation Schedule for Wastewater Management Practices

Management Practice	Permit Category of Responsible Parties	Short-term Implementation Actions: 2018 to 2022	Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update	Responsible Parties[a]
(CONTINUED)				
WW-6. Develop a capacity certification program	Municipal Wastewater	• Develop a capacity certification program as part of local wastewater master planning efforts. • Implement capacity certification program by monitoring flow and rainfall and use resulting data to develop a local hydraulic model.	• Determine system capacity and maintain procedures for certifying available capacity. • Certify availability of capacity for proposed developments.	Short-term Actions: Local governments and utilities with support from GAWP and GRWA. Long-term Actions: Local governments and utilities.
WW-7. Implement a grease management program	Municipal Wastewater	• Develop regional Grease Management Program guidelines or templates for local government and utility implementation. • Implement local Grease Management Program. • Integrate fats, oils, and greases (FOG) and disposable wipes reduction message into Public Education and Awareness Program (see WC-1).	• Revise guidelines during 5-year Regional Water Plan update, if necessary, to improve effectiveness.	Short-term Actions: RCs with support from GRWA and GAWP. Local governments and utilities. Long-term Actions: GAEPD and councils.

Table 7-1(c): Implementation Schedule for Wastewater Management Practices				
Management Practice	**Permit Category of Responsible Parties**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WW-8. Develop a sanitary sewer overflow (SSO) emergency response program	Municipal Wastewater	• Develop regional SSO emergency response guidelines or templates for local government and utility implementation. • Provide local staff with appropriate SSO emergency response training. • Implement SSO emergency response guidelines.	• Review SOPs as part of 5-year wastewater master plan update.	Short-term Actions: RCs with support from GAEPD, GRWA. and GAWP. Local governments and utilities with support from GRWA and GAWP. Long-term Actions: Local governments and utilities.
[a]Assumes continued support from the CNG Council in some capacity beyond its current 3-year appointment.				

7.2.4 Implementation of Water Quality Management Practices

Table 7-1(d) lists implementation details for the 14 Water Quality Management Practices selected by the Council. The list includes a wide variety of practices, such as: (1) practices that are required by state law (WQ-3, Encourage local government participation in erosion and sediment control), (2) practices that are beneficial for all communities (WQ-6, Encourage implementation of local stormwater education and public awareness program) and (3) practices that may be appropriate for some communities but not others (WQ-12, Consider water quality credit trading). Each community will need to evaluate the management practices to determine which are appropriate for implementation in their community. Communities with Resource Assessment gaps or infrastructure needs or shortages are strongly encouraged to implement these management practices to address their gaps, needs, or shortages. All communities will need to report on their implementation activities to the Council and to the GAEPD to help determine the effectiveness of the plan.

Table 7-1(d): Implementation Schedule for Water Quality Management Practices				
Management Practice	**Permit Category of Responsible Parties and Other States**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
WQ-1. Encourage imple-mentation of nutrient management programs	Agricultural Water Withdrawal	• Identify incentives to encourage local implementation of nutrient management guidelines. • Implement program based on nutrient management guidelines with support of GSWCC. • Integrate message into Public Education and Awareness Program (see WC-1). • Consider developing pollutant tracking mechanisms.	• Review implementation progress results during 5-year Regional Water Plan update to evaluate whether changes to guidelines are needed.	Short-term Actions: GAEPD working with GSWCC and NRCS Resource Conservation and Development. Agricultural Water Users and Council. Long-term Actions: GAEPD, councils, GSWCC, and NRCS.
WQ-2 Promote use of forestry best management practices	None	• Continue to implement measures and practices outlined in Georgia Forestry Commission BMP manual. • Identify potential measures for tracking major forestry/land clearing operations and erosion.	• Review implementation and compliance during 5-year Regional Water Plan update to evaluate whether changes to Georgia Forestry Commission BMP manual are needed.	Short-term Actions: Private foresters and the Georgia Forestry Commission. Long-term Actions: GAEPD, RCs, and the Georgia Forestry Commission.

Table 7-1(d): Implementation Schedule for Water Quality Management Practices				
Management Practice	**Permit Category of Responsible Parties and Other States**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WQ-3. Encourage local government participation in erosion and sediment control	Construction Stormwater	• Continue to implement existing Construction NPDES Program. • Encourage local government participation in erosion and sediment control as Local Issuing Authority. • Encourage implementation of sedimentation and erosion control ordinances. • Integrate construction erosion and sedimentation component into Public Education and Awareness Program (see WC-1).	• Assess erosion and sedimentation compliance and enforcement in conjunction with Resource Assessment results during 5-year Regional Water Plan update to evaluate whether changes to existing Construction NPDES Program are needed.	Short-term Actions: GAEPD, NRCS, GSWCC and local governments, utilities and RCs. Long-term Actions: GAEPD and councils.

Table 7-1(d): Implementation Schedule for Water Quality Management Practices				
Management Practice	**Permit Category of Responsible Parties and Other States**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WQ-4. Consider development of post-development stormwater management and site design practices	Municipal Stormwater	• Consider implementation of guidelines and model ordinance, building on existing examples from within Georgia, to maintain pre- and post-development runoff volume consistently across CNG Region. • Identify site design practices which minimize environmental impacts while still being cost-effective. • Utilize existing educational materials and training program for local government staff and developers to assist with post-development stormwater control review process. • Integrate message into Public Education and Awareness Program (see WC-1).	• Consider adopting model ordinance and establishing development review process. • If adopted, implement educational materials and a training program for local developers. • Revise guidelines during 5-year Regional Water Plan update, if necessary, to improve effectiveness.	Short-term Actions: DCA and RCs with support from organizations such as the ACCG, GMA, GRWA, Metro District, and GAWP. Local governments with support from their corresponding RC. Long-term Actions: GAEPD and councils working with the RCs.

Table 7-1(d): Implementation Schedule for Water Quality Management Practices				
Management Practice	**Permit Category of Responsible Parties and Other States**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WQ-5. Encourage pollution prevention/ good housekeeping practices for local operations and implementation of an illicit discharge detection and elimination program	Municipal Stormwater	• Continue to implement current components of Stormwater Management Program (SWMP) if already an MS4 community. • Develop regional, minimum guidelines for pollution prevention/good housekeeping for local operations and illicit discharge detection and elimination programs for local governments not operating under MS4 NPDES permit. • Develop educational materials and training program for non-MS4 local government staff based on existing materials. • Initiate storm drain stenciling. • Identify incentives and potential funding sources to encourage local implementation.	• Implement pollution prevention/ good housekeeping for local operations and illicit discharge detection and elimination programs for local governments not operating under MS4 NPDES permit.	Short-term Actions: Local governments and RCs with support from GAWP. RCs with support from GAWP and GEFA. Long-term Actions: Local governments.

Table 7-1(d): Implementation Schedule for Water Quality Management Practices				
Management Practice	**Permit Category of Responsible Parties and Other States**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WQ-6. Encourage implementation of local stormwater education and public awareness program	Municipal Stormwater	• Continue to implement current components of SWMP if already an MS4 community. • Develop regional, minimum guidelines for local education and public awareness programs building on existing programs from within Georgia, for local governments not operating under MS4 NPDES permit. • Provide example materials on the RC websites. • Identify incentives and potential funding sources to encourage local implementation. • Continue to implement current components of SWMP if already an MS4 community. • Implement stormwater component as part of Public Education and Awareness Program (see WC-1) for local governments not operating under MS4 NPDES permit.	• Administer survey to gauge effectiveness of program after implementation of short-term actions. • Revise Education and Public Awareness Program during 5-year Regional Water Plan update, if necessary, to improve effectiveness.	<u>Short-term Actions:</u> Local Governments, DCA and RCs with support from GEFA and GADNR Sustainability Division. <u>Long-term Actions:</u> GAEPD and councils working with RCs.

Table 7-1(d): Implementation Schedule for Water Quality Management Practices				
Management Practice	**Permit Category of Responsible Parties and Other States**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WQ-7. Encourage consideration of regional BMPs such as regional ponds and natural protection systems	Municipal Stormwater	• Establish mechanism to evaluate and consider implementation of regional BMPs such as stormwater ponds, stream buffer protection and restoration. • Identify incentives and potential funding sources to encourage local participation in regional planning. • Develop regional BMP plans including construction, and O&M plan(s). • Identify potential BMP retrofits projects as examples.	• Permit and construct regional BMP facilities. • Implement regional BMP plan(s).	Short-term Actions: Local governments and RCs. GEFA and GADNR Sustainability Division. Long-term Action: Local governments and RCs.

Table 7-1(d): Implementation Schedule for Water Quality Management Practices				
Management Practice	**Permit Category of Responsible Parties and Other States**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WQ-8. Encourage stream buffer protection measures and stream restoration	MS4	• Develop regional recommendations and consider adoption of a stream buffer ordinance that goes beyond current minimum State standards. • Consider stream restoration as funding allows. • Identify incentives and potential funding sources to encourage local implementation. • Integrate messages about the importance of stream buffer protection into Public Education and Awareness Program (see WC-1).	• Revise guidelines during 5-year Regional Water Plan update, if necessary, to improve effectiveness.	Short-term Actions: Local governments and RCs. Long-term Actions: GAEPD and councils working with the RCs.

Table 7-1(d): Implementation Schedule for Water Quality Management Practices				
Management Practice	**Permit Category of Responsible Parties and Other States**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WQ-9. Encourage floodplain management/ flood damage prevention practices	MS4	• Evaluate use of Metro District model flood damage prevention ordinance. • Develop educational materials emphasizing the importance of preventing flood damage. • Identify incentives and potential funding sources to encourage local implementation.	• Integrate message into Public Education and Awareness Program (see WC-1). • Consider adoption of flood damage prevention ordinance. • Revise development review process, if needed. • Revise guidelines during 5-year Regional Water Plan update, if necessary, to improve effectiveness.	Short-term Actions: GAEPD and GEMA. RCs with support from GEFA. Long-term Actions: RCs and local governments.

Table 7-1(d): Implementation Schedule for Water Quality Management Practices				
Management Practice	Permit Category of Responsible Parties and Other States	Short-term Implementation Actions: 2018 to 2022	Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update	Responsible Parties[a]
(CONTINUED)				
WQ-10. Continue implementation of comprehensive land use planning and environmental planning criteria	MS4	• Continue implementation of Comprehensive Plan and Part V Environmental Planning Criteria (PVEPC). • Assess need for revisions to Chapter 110-12-1, Standards and Procedures for Local Comprehensive Planning (SPLCP), and the PVEPC to facilitate implementation of the State Water Plan water management practices. • Integrate any needed revisions into local comprehensive plans during the next, regular 10-year update or 5-year updates to the Short-Term Work Program portion of the Community Agenda.	• Continue implementation of current [State Water Plan and PVEPC.	Short-term Actions: Local governments, DCA, and local governments. Long-term Actions: Local governments.
WQ-11. Support TMDL Implementation	Municipal Wastewater and Municipal Stormwater	• Continue to follow TMDL implementation plans and to participate in GAEPD updates. • Identify impaired streams and initiate monitoring.	• Update TMDL implementation plans, as needed, based on water quality and biological monitoring data as well as Resource Assessment results.	Short-term Actions: GAEPD, industry, local governments and utilities. Long-term Actions: GAEPD and councils working with the RCs.

Table 7-1(d): Implementation Schedule for Water Quality Management Practices				
Management Practice	**Permit Category of Responsible Parties and Other States**	**Short-term Implementation Actions: 2018 to 2022**	**Long-term Actions: 2022+, i.e., after 5-year Regional Water Plan Update**	**Responsible Parties[a]**
(CONTINUED)				
WQ-12. Consider water quality credit trading	Municipal Wastewater, Industrial Wastewater, Municipal Stormwater, and Industrial Stormwater	• Perform feasibility study to assess the development of a regulatory framework, including the need for legislation, and guidelines for water quality credit trading in Georgia. • Propose legislative changes to allow for water quality credit trading, if needed. • Consider implementation framework and initiate pilot study. • Utilize results of pilot study to implement broader water quality trading program state-wide.	• Pending the results of the feasibility and pilot studies, implement water quality credit trading program state-wide.	Short-term Actions: State legislature, GAEPD, industry, local governments and utilities. Long-term Actions: GAEPD.
WQ-13. Sampling and Testing of 303(d) Listed Streams	Municipal Wastewater, Municipal Stormwater, and Industrial Stormwater	• Develop sampling plans for 303(d) listed streams. • Initiative sampling to remove streams from list of impaired waters.	• Re-evaluate needs for continued sampling and/or watershed improve-ments.	Short-term Actions: GAEPD, local governments and utilities. Long-term Actions: GAEPD
WQ-14. Support Non-Traditional NPDES Permitting	Municipal Wastewater, Municipal Stormwater, and Industrial Stormwater	• Evaluate non-traditional approaches for nutrient reductions in NDPES permits. • Develop guidance for NPDES permitting.	• Review effective-ness of alternative permitting approaches .	Short-term Actions: GAEPD, local governments and utilities. Long-term Actions: GAEPD.

[a]Assumes continued support from the CNG Council in some capacity beyond its current 3-year appointment.

7.3 Fiscal Implications of Selected Water Management Practices

This section outlines the general planning level costs and potential funding sources and options for implementation of the management practices selected by the CNG Council. The planning level cost information shown in the following tables are based upon cost guidance prepared by EPD in April 2011 ("GAEPD Cost Guidance"). Neither the guidance nor the cost estimates shown in the following tables have been updated. Accordingly, the values shown below should only be used as a general guide. Specific costs should be further evaluated and updated before being relied upon.

Table 7-2: Cost Estimates for the Water Conservation Management Practices Implementation Responsibilities

Management Practice	Capital / Programmatic Costs	Funding Sources and Options	Notes and Sources
WC-1. Implement education and public awareness programs	$0.10-2.25/capita	State, Local, Utilities	GAEPD Cost Guidance E-2
WC-2. Develop water conservation goals	$0-0.50/capita	State, Local, Utilities	GAEPD Cost Guidance – various Ordinance and Policy management practices
WC-3. Stewardship Act Practices	See WC-STEW below	See WC-STEW below	See WC-STEW below
WC-3 (STEW). Assess and reduce water system leakage	$0-0.50/capita	Local, Utilities	GAEPD Cost Guidance – various Ordinance and Policy Management Practices
WC-3 (STEW). Adopt Stewardship outdoor watering restrictions	$0-0.50 /capita	Local, Utilities	GAEPD Cost Guidance – various Ordinance and Policy Management Practices
WC-3 (STEW). Adopt new agricultural permit requirements	$0-0.50/capita	Local, Utilities	GAEPD Cost Guidance – various Ordinance and Policy Management Practices
WC-3 (STEW). Install high-efficiency cooling towers in new construction	$0-0.50/capita	Local, Utilities	GAEPD Cost Guidance – various Ordinance and Policy Management Practices

Table 7-2: Cost Estimates for the Water Conservation Management Practices Implementation Responsibilities

Management Practice	Capital / Programmatic Costs	Funding Sources and Options	Notes and Sources
(CONTINUED)			
WC-4. Consider retrofitting 1.28-gpf (high-efficiency) toilets and high-efficiency urinals in government buildings	$150-$450/fixture	State, Local, Utilities	Does not include cost to install
WC-5. Encourage non-potable reuse	$0-0.50/capita	State, Local, Utilities	GAEPD Cost Guidance OP-9
WC-6. Encourage conservation pricing for residential and irrigation sprinkler systems)	$0-500/MG	Utilities	GAEPD Cost Guidance WD-5
WC-7. Encourage installation of rain sensor shut-off switches on new irrigation systems	$25-1,000/MG	State, Local, Utilities	GAEPD Cost Guidance WD-2
WC-8. Encourage agricultural irrigation efficiency improvements	$2,000-4,000/MG	State	GAEPD Cost Guidance WD-3
WC-9. Encourage development of golf course-specific water conservation plans	$500-2,000/MG	Local, Utilities	GAEPD Cost Guidance WD-7
WC-10. Encourage metering of permitted and non-permitted agricultural irrigation water use	$600-2,500/well plus $200 annual maintenance	State	GAEPD Cost Guidance Table 4
WC-11. Encourage the energy production industry to conserve water at facilities		Energy companies	Costs will be facility specific

Source: *Supplemental Guidance for Planning Contractors: Water Management Practice Cost Comparison* (EPD, April 2011).

Table 7-3: Cost Estimates for the Water Supply Management Practice Implementation Responsibilities

Management Practice	Capital / Programmatic Costs	Funding Sources and Options	Notes and Sources
WS-1. Encourage development of water master plans.	$1,000-2,000/MG	Utilities	GAEPD Cost Guidance – various Ordinance and Policy Management Practices
WS-2. Identify and map planned, existing, or offline reservoirs; and consider expansion of existing reservoirs, as needed	$300,000-700,000/ MG	State, Local, Utilities	GAEPD Cost Guidance WS-2
WS-3. Consider construction of new reservoirs to meet multiple purposes	*$300,000-800,000/ MG*	State, Local, Utilities	GAEPD Cost Guidance WS-1
WS-4. Consider development of new groundwater wells	*$40,000-300,000/MG*	State, Local, Utilities	GAEPD Cost Guidance WS-3
WS-5. Encourage indirect potable reuse	*$0-0.50/capita*	State, Local, Utilities	GAEPD Cost Guidance OP-9
WS-6. Consider construction of new WTPs or expansion of existing WTPs	*$1.5 million-8 million/ MG*	State, Local, Utilities	GAEPD Cost Guidance WT-1 and WT-2
WS-7. Encourage water system asset management	*$1,000-3,000/MG*	Utilities	GAEPD Cost Guidance WD-4
WS-8. Encourage source water protection	*$0-0.50/capita*	State, Local, Utilities	GAEPD Cost Guidance OP-2

Source: *Supplemental Guidance for Planning Contractors: Water Management Practice Cost Comparison* (GAEPD, April 2011).

Table 7-4: Cost Estimates for the Wastewater Management Practice Implementation Responsibilities

Management Practice	Capital / Programmatic Costs	Funding Sources and Options	Notes and Sources
WW-1. Consider development of local wastewater master plans to evaluate wastewater treatment and disposal options to meet future demands	$1,000-2,000/MG	Utilities	GAEPD Cost Guidance – various Ordinance and Policy Management Practices
WW-2. Consider development and implementation of a local wastewater education and public awareness program	$0-0.50/capita	State, Local, Utilities	GAEPD Cost Guidance OP-10
WW-3. Promote septic system management	$0-0.50 /capita	State, Local, Utilities	GAEPD Cost Guidance OP-9
WW-4. Provide sewer system inventory and mapping	$0.50 per linear foot	Utilities	Rough order of magnitude supplied by local GIS/GPS contractor.
WW-5. Consider implementation of sewer system inspection, maintenance, and rehabilitation program	$0-1 million/MGD	State, Local, Utilities	GAEPD Cost Guidance WW-6
WW-6. Develop a capacity certification program	$0-1 million/MGD	State, Local, Utilities	GAEPD Cost Guidance WW-6
WW-7. Implement a grease management program	$0.10-2.25/capita	State, Local, Utilities	GAEPD Cost Guidance E-2
WW-8. Develop a sanitary sewer system overflow (SSO) emergency response program	$0-1 million/MGD	State, Local, Utilities	GAEPD Cost Guidance WW-6

Source: *Supplemental Guidance for Planning Contractors: Water Management Practice Cost Comparison* (GAEPD, April 2011).

Table 7-5: Cost Estimates for the Water Quality Management Practice Implementation Responsibilities

Management Practice	Capital / Programmatic Costs	Funding Sources and Options	Notes and Sources
WQ-1. Encourage implementation of nutrient management programs	$5,000-7,000/farm	State	NRCS, 2003
WQ-2 Promote use of forestry management practices	$5-100/acre	State	Costs vary by region, slope, and practice
WQ-3. Encourage local government participation in erosion and sediment control	$1-3/capita	State, Local	GAEPD Cost Guidance E-1
WQ-4. Consider development of post-development stormwater management and site design practices	$0-0.50/capita	State, Local	GAEPD Cost Guidance OP-1; cost to develop ordinance which would probably be similar to developing educational materials; costs do not include staff to review stormwater plans or any increased development costs
WQ-5. Encourage pollution prevention/good housekeeping practices for local operations and implementation of a illicit discharge detection and elimination program	$1.50-3.00/capita	State, Local	GAEPD Cost Guidance OP-8
WQ-6. Encourage implementation of local stormwater education and public awareness program	$0.10-2.50/capita	State, Local	GAEPD Cost Guidance E-1
WQ-7. Encourage consideration of regional BMPs such as regional ponds and natural protection systems	$35,000-$75,000/ acre of pond	State, Local	(Cubbage et al., Undated)

Table 7-5: Cost Estimates for the Water Quality Management Practice Implementation Responsibilities (Continued)

Management Practice	Capital / Programmatic Costs	Funding Sources and Options	Notes and Sources
(CONTINUED)			
WQ-8. Encourage stream buffer protection measures and stream restoration	$0-0.50/capita	Local	GAEPD Cost Guidance OP-7
WQ-9. Encourage floodplain management/ flood damage prevention practices	$0-0.50/capita	Local	GAEPD Cost Guidance OP-7
WQ-10. Continue implementation of comprehensive land use planning and environmental planning criteria	$0-0.50/capita	State, Local	GAEPD Cost Guidance OP-7 and OP-9
WQ-11. Support TMDL Implementation	$0-2/capita	Federal, State, Local, Utilities	GAEPD Cost Guidance for Education; assume would be similar level of effort and would vary depending on the complexity and cost of TMDL implementation
WQ-12. Consider water quality credit trading	$0-0.50 /capita	Federal, State	GAEPD Cost Guidance for Ordinance and Policy; includes only feasibility and not actual trading program
WQ-13. Sampling and Testing of 303(d) Listed Streams	$4,000-8,000/station	State, Local	GAEPD Cost Guidance Table 4
WQ-14. Support Non-Traditional NPDES Permitting		State, Local	GAEPD costs linked to NPDES permit review process

Source: *Supplemental Guidance for Planning Contractors: Water Management Practice Cost Comparison* (GAEPD, April 2011).

7.4 Alignment with Other Plans

As discussed in Section 6, during the original plan development a review of regional and local plans served as the basis for the development of the Region's selected management practices. As a result, this Regional Water Plan is generally aligned and consistent with these efforts; however, the following sections describe ongoing efforts and/or differences that are worth noting and revisiting during future Regional Water Plan updates.

7.4.1 Alabama-Coosa-Tallapoosa (ACT) Basin Master Water Control Manual

The ACT Basin Master Water Control Manual is composed of a series of documents, a Master Water Control Manual and 9 individual reservoir manuals. Water control manuals describe the specific operations of the federal reservoir including storage and release schedules to meet the authorized uses of the project. The USACE approved the environmental impact statement (EIS) and the water control manuals for the ACT basin on May 4, 2015. The updated water control manuals detail adjustments to reservoir operations to meet the authorized purposes based on various factors and conditions.[4]

In development of the updated resource assessments for the CNG Region, the modeling team updated the hydrologic model used for the surface water availability resource assessment analysis in the basin to incorporate the new water control manuals and the updated operational protocols. However, no major changes in the surface water availability resource assessment results were identified based on the updated modeling.

7.4.2 Etowah Aquatic Habitat Conservation Plan (HCP)

In response to the number of imperiled aquatic species found in the Etowah watershed, the USFWS initiated development of the Etowah Aquatic Habitat Conservation Plan (HCP)[5]. The draft Etowah Aquatic HCP is currently working its way through the USFWS review process. Once that is complete, each local government that submitted an application for an Incidental Take Permit (ITP) will determine whether it wants to move forward with acceptance of the ITP, which includes formal adoption of the HCP. Many of the recommendations in the draft HCP were focused on improving water quality through reduction of point and nonpoint source loadings, reductions in sedimentation and erosion, and restoration or maintenance of hydrology. The recommendations in the 2011 and in this updated regional plan related to water quality and stormwater management will address many of the original HCP recommendations.

[4] http://www.sam.usace.army.mil/Missions/Planning-Environmental/ACT-Master-Water-Control-Manual-Update/

[5] http://www.etowahhcp.org/

7.4.3 Metropolitan North Georgia Water Planning District Plans

The Metro District was created by the Georgia General Assembly in 2001 to establish policy, create plans, and promote intergovernmental coordination within the 15-county metro Atlanta region, which includes more than 90 cities. While the Metro District is governed by separate authorizing legislation than the CNG Water Planning Region, the two are similar in some respects and the provisions of the 2008 State Water Plan apply to planning activities by both entities. There are, however, differences. For example, the Metro District is funded by State appropriations and per capita local government dues; it is governed by an elected/appointed Governing Board, which sets policy and direction. Metro District staffing is provided by the Atlanta Regional Commission Environmental Planning Division, while plans and policies are guided by the Board Executive and Finance Committees, the Technical Coordinating Committee, and the Basin Advisory Councils (Metro District, 2011).

Similar to the CNG Regional Water Plan, local governments and utilities are responsible for implementing the plans at the local level, but compliance with the Metro District Plan is directly enforced through the GAEPD's permitting process. While the CNG Regional Water Plan will guide GAEPD's future permitting decisions, local governments must be in compliance with the District plans to receive a permit for an increased water withdrawal, a new or increased discharge, or for an MS4 permit, with GAEPD being responsible for auditing local governments to determine compliance with the plans, including audit checklists and site visits.

The original Metro District Plan was approved in 2003 and was updated in 2009, and is currently going through an update that will be completed in 2017 in conjunction with the other 10 regional water plans. This update will result in an integrated water resources management plan that integrates water supply and conservation, wastewater and stormwater management components. A joint council meeting was held with the Metro District to discuss the potential needs for future collaboration or coordination on management practice implementation in January 2017. The points for potential collaboration were primarily related to water supply and water quality management practices in the Chattahoochee River Basin and Lake Allatoona watersheds. Specifically, measures related to nonpoint source management are emphasized in this plan to address the existing TMDL for nutrients in Lake Allatoona and the pending TMDL for nutrients on Lake Lanier. Updates to the water quality management practices focusing on post development stormwater controls and forestry BMPs for sedimentation and erosion will address feedback from the Metro District members regarding nonpoint source pollutant loading reductions to Lake Lanier.

7.4.4 Other Regional Planning Considerations

7.4.4.1 Water Supply Planning Considerations

Future development of water supplies in the CNG Region should continue to take into consideration the availability of water from the Tennessee River Basin. A significant portion of the Region is included in the Tennessee River watershed, and local entities should have access to water contributed to the river from watersheds within north Georgia. The CNG Council recognizes there are potential legal issues that would have to be addressed between Georgia and Tennessee to facilitate usage of the Tennessee

River; however, the Council would like future planning efforts to address this alternative water source in more detail as needs arise.

Additionally, regional reservoir projects should continue to be evaluated to meet both in-stream and off-stream needs within the CNG region. Portions of the CNG Region, specifically in the Coosa basin, have the potential for development of new water supply reservoirs that may provide sufficient yield to supply water to areas outside of the CNG planning area. The CNG Council is not opposed to considering these options for meeting future water supply needs in Georgia; however, the Council would like to ensure that a complete and thorough evaluation is completed to verify that the CNG basin water resource needs (both in-stream and off-stream) are met. This plan update includes a recommendation to identify and map potential new reservoirs and reservoirs that may be candidates for future expansion.

7.4.4.2 Total Maximum Daily Load (TMDL) Implementation

The State's TMDL process establishes the allowable pollutant loadings or other quantifiable parameters for a water body based on the relationship between pollutant sources and in-stream water quality conditions. This allows water quality-based controls to be developed to reduce pollution and restore and maintain water quality. Integration of the CNG Region's existing TMDL Implementation Plans was an important component considered during the development and selection of the management practices.

There are a number of streams segments in the CNG Region, including streams in every county, that are on the 303(d) list of impaired waterbodies and/or have existing TMDLs to address the identified impairments. As noted in Sections 3 and 5, the streams are primarily listed for fecal coliform, impaired biota, or fish consumption guidelines/commercial fishing ban due to legacy pollutants such as PCBs or metals. The updated water quality management practices include recommendations with greater emphasis on post-development stormwater controls, improved forestry BMP practice implementation, and increased monitoring of listed stream segments.

Since the original plan was developed in 2011, TMDLs have been finalized to address chlorophyll-a issues in Lake Allatoona (GAEPD, 2013) and Carter's Lake (GAEPD, 2016). Studies also are currently under way to finalize the chlorophyll-a TMDL for Lake Lanier. In each case, the local governments and utilities in the watersheds leading to these three lakes will need to implement measures to further reduce nutrient loadings in these watersheds. The CNG Council, with support from the Partnership, has been studying options for cost effective nutrient reductions (see below) including water quality nutrient trading. Most recently, the Partnership has initiated a nutrient management study on the Soque River in the Chattahoochee River watershed that will provide additional insight on specific measures for nutrient management. The updated CNG plan provides the additional emphasis on stormwater management to begin to address the needed nutrient reductions to comply with the TMDL implementation plans for Lakes Allatoona and Carters, and in anticipation of a TMDL implementation plan for Lake Lanier.

7.4.4.3 Northwest Georgia Regional Water Resources Partnership

The Northwest Georgia Regional Water Resources Partnership was formed and endorsed by the Board of Directors of both the Coosa Valley and North Georgia Regional Commissions (known as RDCs at the time) in 2001 in recognition of the importance of watershed planning. Water withdrawal and discharge permit holders (government, water authority, industrial and private communities) and interested entities not holding water permits (governments, quasigovernmental agencies, environmental organizations, advocacy groups, and other interested entities) were invited to participate, and an executive committee of 12 members was elected from the membership. Many of the local governments, utilities and industries in the CNG region are full participating members of the Partnership. The goals of the Partnership include:

- Goal 1: Organize and increase our collective political influence on local, state and national levels.
- Goal 2: Combine our resources to develop and implement watershed assessments, water supply studies, and storm water management initiatives within the region including the Coosa, Tallapoosa, and Tennessee River Basins.
- Goal 3: Educate legislators, citizens, and ourselves on surface and ground water resources in the region.
- Goal 4: Obtain funding from a variety of sources for water related activities.
- Goal 5: Monitor, assess, and shape local, state, and national legislation on water related issues.
- Goal 6: Monitor the proposed ACT and ACF water compact agreement.
- Goal 7: Serve as a coordinating mechanism for all regional water related activities including development of the proposed State Comprehensive Water Resources Management Plan.

The Partnership was endorsed by the CNG Council as the technical support group for the Council in 2011, and has served as the primary entity supporting implementation of the regional water plan. As noted in Section 7.1, over the last 5 years the Partnership has received grants or used member funding to implement the following studies:

- Nutrient Trading in the Coosa Basin: A Feasibility Study
- Redundancy and Emergency Interconnectivity Study
- Water Transmission Grid Study
- North Georgia Agricultural Water Use Study
- Soque River Nutrient Management Study

The following are guidance documents produced by GAWP that the Partnership has identified as tools for implementation of the regional water plan:

- Best Practice Master Planning Guidance and Resource Document
- A Guide to Asset Management for Small Water Systems
- Stormwater Program Guidance Manual for Small Local Governments

These documents and studies are available on the Partnership website.[6] The Partnership will continue to provide technical and implementation support for the CNG Council over the next 5-year period.

7.4.4.4 Lake Allatoona/Upper Etowah River Comprehensive Watershed Study

The Etowah River watershed above Allatoona Dam includes portions of eight counties: Bartow, Cherokee, Cobb, Dawson, Forsyth, Fulton, Lumpkin, and Pickens. Dawson, Lumpkin and Pickens counties in the CNG region are participating in the Study. In response to the previously defined problems, Congress authorized the USACE to address the water resource problems within the study area. The Lake Allatoona/Upper Etowah River Watershed Study was authorized by Section 422 of the Water Resources Development Act of 2000 (Public Law 106-541) to address streambank and shoreline erosion, sedimentation, water quality, fish and wildlife habitat degradation, and other problems relating to ecosystem restoration and resource protection in the Lake Allatoona Watershed.

The Watershed Assessment and Watershed Protection Plan planning effort are designed to provide the data needed to make targeted improvement in the quality and quantity of water and ecological conditions of Lake Allatoona and the Upper Etowah River Watershed. This information will help county governments as they strive to protect environmental quality and meet or exceed regulatory requirements, while managing rapid growth in North Georgia (USACE, 2011b). Many of the recommendations in the Watershed Protection Plan are reflected in the management practices included in this plan.

7.5 Recommendations to the State

This section provides recommendations for actions by the State (Table 7-6) that support implementation of this Regional Water Plan.

[6] http://www.ngawater.org/

Table 7-6: Recommendations to the State	
	Recommendation
Funding	Identify long-term funding mechanism, beyond grants, to assist responsible parties with implementation of water supply projects.
Coordination	The RCs should continue to serve as the clearinghouse and coordinator for ongoing CNG Council planning activities.
	Enhance the opportunity for ongoing CNG Council input during implementation of Regional Water Plan Management Practices and establish a process for involvement in the 5-year Regional Water Plan update.
	Improve coordination with organizations, such as the ACCG, GMA, GRWA, and GAWP to develop templates and materials that each council, with the assistance of DCA or the RCs noted in Section 2.3, can adapt for regional/local implementation.
	Support local monitoring and allow volunteer sampling data to be used to assess watershed conditions.
	Coordinate CNG planning efforts and ACT Basin negotiations.
Policy / Programmatic	Develop a program to consistently meter and report agricultural water withdrawals.
	Provide support to study the effects of septic systems on water quality.
	Develop regulatory framework/guidelines for water quality credit trading and alternative permitting strategies.
	Develop guidelines for appropriate use of interbasin transfers of water.
	Explore opportunities for Georgia to expand use of the Tennessee River as a water supply source.
	Support efforts to develop regional reservoir projects to meet both in-stream and off-stream needs.
	Develop regulatory framework/guidelines for aquifer storage recovery.
	Support efforts to give authority to enforce Regional Plans.
	Support and expand water quality monitoring programs.
Implementation	Develop or support BMP demonstration projects to evaluate their effectiveness in the CNG Region.
	Support and coordinate additional commercial water audits.
Next 5-Year Update	Refine Resource Assessment models to report results at a finer resolution.
	Review the technical assumption that LAS is considered to be a consumptive use so that this can be correctly accounted for in the future.
	Partner with the counties to obtain better information on future forecasts of non-crop (and less than 100,000 gallons per day) uses through planning period.

Section 8. Monitoring and Reporting Progress

Section Summary

Monitoring of the progress toward implementation of the recommendations will be based on key benchmarks identified for water conservation, water supply, wastewater, and water quality practices. Progress will be evaluated annually, biennially, or at each of the 5-year plan updates, depending on the management practice.

The selected management practices identified in Section 6 will be primarily implemented (as described in Section 7) by the various water users in the region, including local governments and others with the capacity to develop water infrastructure and apply for the required permits, grants and loans.

The benchmarks prepared for the original plan (2011) by the CNG Council were reviewed as part of this plan update and the recommended benchmarks are listed in Table 8-1. These benchmarks will be used to assess the effectiveness of implementation and to identify changes that need to be addressed during the 5-year Regional Water Plan update. As detailed below, the Council selected both qualitative and quantitative benchmarks that will be used to assess whether the management practices are closing gaps and eliminating shortages over time and allowing the Region to meet its vision and goals.

8.1 Benchmarks

The State Water Plan guided the Council's selection of benchmarks that are specific, measurable, achievable, realistic, and time-phased. Table 8-1 outlines the benchmarks for implementation of this Regional Water Plan; the short-term actions outlined in Tables 7-1(a) through (d) will serve as overall benchmarks, and it is recommended that progress be measured via an annual survey.

The GAEPD and DCA will continue to coordinate the annual survey with the support of the RCs. GAEPD and DCA will track the results of these surveys for needed adaptation and adjustments to the CNG Regional Water Plan during the 5-year updates.

Table 8-1 also provides resource-specific benchmarks that allow a mechanism for tracking realistic and measureable progress over the long-term in addressing the water resource gaps, or issues, described in Section 5. For example, because of the time it takes to develop or expand water and wastewater infrastructure, it is appropriate to measure overall progress during the 5-year Regional Water Plan update cycle by revisiting the infrastructure gaps summarized by County in the tables in Section 5. The resource benchmarks also build on existing measurement tools, such as the biennial update of the Clean Water Act 305(b)/303(d) list of waters not meeting their designated uses.

Table 8-1: Resource Benchmarks for Management Practices			
Category of Management Practice	**Benchmark**	**Measurement Tools**	**Time Period**
All Practices	Implement short-term actions	Annual Survey	Annual
Water Conservation (WC)			
	Maintain or Reduce Residential Per Capita Water Use	Update of Regional Water Plan Per Capita Water Use Estimates	Every 5 years
	Implementation of Recommended Water Conservation Management Practices	Survey via Annual Water Conservation Plan Progress Report	Annual
Water Supply Practices (WS)			
	Reduction in future facility / infrastructure gaps between existing permitted water withdrawals (surface and groundwater) and future demands	Update of Regional Water Plan Forecasts	Every 5 years
Wastewater Practices (WW)			
	Availability of permitted assimilative capacity in the major tributaries of the CNG Region	Resource Assessments	Every 5 years
	Reduction of the future wastewater facility shortages via expansions or development of new facilities to meet projected future wastewater demands	Update of Regional Water Plan Forecasts	Every 5 years
Water Quality Practices (WQ)			
	Support of Designated Use	305(b)/303(d) List of Waters	Biennial
	Reduction in pollutant loads observed in the watershed modeling	Resource Assessments	Every 5 years
	Observed improvements in water quality monitoring results	GAEPD Online Water Quality Database[7]	Annual

[7] http://www.gaepd.org/Documents/EPDOnlineWaterQualityData.html

8.2 Regional Water Plan Updates

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

8.3 Plan Amendments

This Regional Water Plan has been drafted to provide flexibility to adapt to changing circumstances. This Regional Water Plan will be amended on a 5-year basis as required unless additional needs (triggering events) are identified in the interim period.

(This page intentionally left blank)

Section 9. Bibliography

Agricultural Water Use Forecast for the Coosa-North Georgia Region. http://www.georgiawaterplanning.org/pages/forecasting/agricultural_water_use.php

Brown and Caldwell. 2013 (August). *Draft Nutrient Trading in the Coosa Basin: A Feasibility Study*. Prepared for North Georgia Water Resources Partnership. http://www.ngawater.org/docs/DraftCoosaBasinNutrientTradingStudy-August2013.pdf

Bureau of Labor Statistics. 2015. Local Area Unemployment Statistics, Labor Force Data by County, 2015 Annual Averages. https://www.bls.gov/lau/tables.htm. (accessed February 27, 2017).

Carl Vinson Institute of Government at the University of Georgia. May 2015. *Georgia Office of Planning and Budget (OPB) Population Projections Methodology Report.*

CH2M HILL. August 2010. *Municipal and Industrial Water and Wastewater Forecasting for the Coosa-North Georgia Region*. http://www.coosanorthgeorgia.org/documents/3-CNG_MI_ForecastTM_20100824.pdf

Chowns, T. 2006 (October 6). "Appalachian Plateau Geologic Province," in *New Georgia Encyclopedia*. Georgia Humanities Council and the University of Georgia Press. http://www.georgiaencyclopedia.org/nge/Article.jsp?id=h-3561 (accessed January 31, 2017).

CNG website. 2017. Coosa-North Georgia Region –Water and Wastewater Forecasting Technical Memorandum.

Cubbage, Frederick, Jonathon Scott, Threesa Pressley, and Susan Moore. Undated. *"Costs of Forestry Best Management Practices in the South: A Review"*. Department of Forestry. North Carolina State University. http://www.trout.forprod.vt.edu/meetings/presentations/cubbage.pdf (accessed January 31, 2017).

Elkins, D.C., S.C. Sweat, K.S. Hill, B.R. Kuhajda, A.L. George, and S.J. Wenger. 2016 (December). *The Southeastern Aquatic Biodiversity Conservation Strategy*. Final Report. Athens (GA): University of Georgia River Basin Center. 237p.

EPA, see U.S Environmental Protection Agency.

Etowah Aquatic Habitat Conservation Plan (HCP). 2009. *Welcome to the Etowah Aquatic HCP Archives*! http://www.etowahhcp.org/ (accessed January 31, 2017)

Fanning, J.L. and V.P. Trent. 2009. *Water Use in Georgia by County for 2005; and Water-Use Trends, 1980-2005*. USGS Scientific Investigations Report 2009-5002.

GADNR. 2013. (April). Total Maximum Daily Load Evaluation for Lake Allatoona in the Coosa River Basin for Chlorophyll a.

GADNR. 2015. *State Wildlife Action Plan*. http://www.georgiawildlife.com/conservation/wildlife-action-plan

GADNR. 2016. (February). Total Maximum Daily Load Evaluation for Carters Lake in the Coosa River Basin for Chlorophyll a.

GAEPD, 2003. Watershed Protection Branch, Drinking Water Compliance Program, River Basins.

GAEPD. 1998. *Coosa River Water Management Plan 1998*. http://www.georgiaepd.org/Documents/coosa_plan.html (accessed January 31, 2017).

GAEPD. 2005. (February). Drinking Water Source List.

GAEPD. 2008 (January). Georgia Comprehensive State-wide Water Management Plan.

GAEPD. 2009 (March). Draft Total Maximum Daily Load Evaluation for Two Segments of Lake Allatoona in the Coosa River Basin for Chlorophyll a.

GAEPD. 2010a (November). *Changes between the 2008 and Draft 2010 305(b)/303(d) List of Waters*. http://www.gaepd.org/Files_PDF/305b/Y2010_303d/List_ofChanges_Table_Y2010.pdf (accessed February 17, 2017).

GAEPD. 2010b (March). *Water Conservation Implementation Plan*. http://www.conservewatergeorgia.net/documents/wcip.html (accessed January 31, 2017).

GAEPD. 2011. Supplemental Guidance for Planning Contractors: Water Management Practice Cost Comparison. April.

Georgia Department of Natural Resources (GADNR), Wildlife Resources Division. 2011. "High Priority Waters," in *Georgia Rare Species and Natural Community Information*. http://www.georgiawildlife.com/node/1377 (accessed February 3, 2017).

Georgia Environmental Protection Division. (GAEPD). 2011 (April). Total Maximum Daily Loadings (TMDLs). http://www.georgiaepd.org/Documents/TMDL_page.html (accessed January 31, 2017).

Georgia Geologic Survey. 2006. Digital Environmental Atlas of Georgia, 2006. CD-1.

Georgia Traditional Manufacturers Association (GTMA). 2009. Industrial Water and Wastewater Forecasting Carpet Sector Input.

Jacobs and AMEC Foster Wheeler. 2015 (April). *The Redundancy and Emergency Interconnectivity Study*. Prepared for the North Georgia Water Resources Partnership and the Coosa North Georgia Regional Planning Council\l. Submitted to the Northwest Georgia Regional Commission. http://www.nwgrc.org/ngawater/Coosa%20Interconnection%20Report%20Completed.FINAL%20042015.pdf

Jacobs and AMEC Foster Wheeler. 2015 (April). Water Transmission Grid Study. Prepared for the North Georgia Water Resources Partnership and the Coosa North Georgia Regional Planning Council. Submitted to the Northwest Georgia Regional Commission. http://www.nwgrc.org/ngawater/Coosa%20Grid%20Completed%20Report%20042120 15.REALLY%20FINAL.pdf

Marlowe, Mark. 2010 (August 26). *A Summary of the Partnership—The Utility Perspective*. Georgia Environmental Conference.

Metropolitan North Georgia Water Planning District (Metro District). 2011. *About Us*. http://www.northgeorgiawater.org/html/aboutus.htm (accessed January 31, 2017)

Natural Resource Spatial Analysis Laboratory (NARSAL), Institute of Ecology, University of Georgia (UGA), 2015. *Conservation Lands*.

North West Georgia Regional Council. 2015. Progress Report on Identifying Items to Update in the 5-year Review and Revision Cycle. 59 pgs.

Robinson, J.L., C.A. Journey, and J.B. Atkins. 1996. Ground-Water Resources of the Coosa River Basin in Georgia and Alabama—Subarea 6 of the Apalachicola-Chattahoochee-Flint and Alabama- Coosa-Tallapoosa River Basins. USGS Open-File Report 96-177.

TetraTech. 2015. *North Georgia Agricultural Water Use Study*. Prepared for the North Georgia Water Resources Partnership and the Coosa North Georgia Regional Planning Council. www.nwgrc.org/wp-content/uploads/AgWaterUsev2.pptx

U.S. Army Corps of Engineers (USACE). 2011a. *Carters Lake*. http://carters.sam.usace.army.mil/ (accessed January 31, 2017)

U.S. Geological Survey (USGS). 2011. *Hydrologic Unit Maps*. http://water.usgs.gov/GIS/huc.html (accessed January 31, 2017)

USACE. 2011b. *Lake Allatoona/Upper Etowah River Comprehensive Watershed Study*. http://www.allatoona.sam.usace.army.mil/Watershed%20Documents/Documents.htm (accessed April 1, 2017)

Williams, L. 2004. Methods and Hydrogeologic Data from Test Drilling and Geophysical Logging Surveys in the Lawrenceville, Georgia Area. USGS Open-File Report 2004-1366.

Williams, L., R. Kath, T. Crawford, and M. Chapman. 2005. Influence of Geologic Setting on Ground-Water Availability in the Lawrenceville Area, Gwinnett County, Georgia. USGS Scientific Investigations Report 2005-5136.

(This page intentionally left blank)

Appendix A
Summary of 2017 Coosa-North Georgia Regional Water Plan Revisions

Summary of 2017 Coosa-North Georgia Regional Water Plan Revisions			
Section	**Location**	**Change**	**Reason**
	Table of Contents and Acronyms and Abbreviations	Content revised.	Updated to reflect changes in the plan.
	Acknowledge-ments	Table revised.	Updated to reflect current council members.
Executive Summary	Figures ES-2 and ES-3	Date updated.	Updated to address the updated water and wastewater forecasts.
Executive Summary	Table ES-2	Table revised.	Table updated to provide a summary of potential gaps, needs, or shortages by CNG county.
1	All pages	Text revised.	Updated to reflect this document is an update to the 2011 Regional Water Plan.
2	Page 1, first paragraph, Section Summary and Section 2.2.1	Text revised.	Updated to reflect most recent population information.
2	Section 2.2.2	Text revised.	Deleted 2011 employment information.
2	Section 2.2.3, Table 2-3, and Figure 2-3	Text, table, and figure revised.	Updated to reflect most recent land cover information.
3	Section Summary	Text revised.	Updated to reflect the updated water use and Resource Assessment information.
3	Section 3.1 and Figures 3-1 to 3-4	Text and figures revised.	Updated to reflect most recent water use information.
3	Section 3.2	Text revised.	Updated to reflect the updated Resource Assessments information, and to more accurately describe the nature of the analyses.
3	Section 3.3, Table 3-1 and Figures 3-6 through 3-9	Text, table, and figures revised.	Updated to reflect most recent ecosystem conditions, in-stream use information, and the 2014 303(d) list.
4	Page 1, first paragraph and Section Summary	Text revised.	Updated to reflect the updated regional water demand and wastewater flow forecasts 2015, and for 10-year intervals from 2020 through 2050.

Summary of 2017 Coosa-North Georgia Regional Water Plan Revisions			
Section	**Location**	**Change**	**Reason**
(Continued)			
4	Section 4.1; Tables 4-1, 4-2, and 4-3; and Figures 4-1 and 4-2	Text and tables revised, and figures replaced.	Updated to reflect the most recent population projections and the updated regional municipal water demand and wastewater flow forecasts.
4	Section 4.2 and Figures 4-3 and 4-4	Text revised and figures updated.	No updates were made to the industrial water demand and wastewater flow forecasts, but the text and figures were updated to include 2015 values.
4	Section 4.3 and Table 4-4	Text and table revised.	Updated to reflect most recent regional agricultural water demand and wastewater flow forecasts.
4	Section 4.4	Text revised.	Updated to reflect most recent forecasts for future water needs for thermoelectric power production.
4	Section 4.5 and Figures 4-5, 4-6, 4-7, and 4-8	Text revised and figures replaced.	Updated to reflect most recent total water demand forecasts.
5	Section Summary	Text revised.	Updated to reflect the updated Resource Assessment information and the most recent permit information.
5	Section 5.2 and Table 5-1	Text and tables revised.	Updated to reflect most recent information from the surface water availability resource assessment.
5	Section 5.3	Text revised.	Updated to reflect the updated resource assessment information.
5	Figure 5-2	Figure replaced.	Updated to reflect the updated surface water quality resource assessment analysis under current permitted conditions.
5	Tables 5-2 and 5-3	Tables renumbered after adding Table 5-2.	Table 5-2 added to provide detail on the frequency and duration of potential gaps. The subsequent tables were renumbered. Original Table 5-3 on Lake Allatoona water quality was deleted.
5	Figures 5-2 to 5-5	Figures updated.	Figures updated to reflect the updated water quality resource assessment.
5	Table 5-6	Table updated.	Table updated to reflect the updated gap analysis by county.

Appendix A
Summary of 2017 Coosa-North Georgia Regional Water Plan Revisions

Summary of 2017 Coosa-North Georgia Regional Water Plan Revisions			
Section	**Location**	**Change**	**Reason**
(Continued)			
6	All sections and Table 6-1(a)	Text and tables revised.	Updated to reflect updates to the water management practices. Primary changes included: Combining all the education related water conservation measures in WC-1 and deleting original WC-7, 8, 10, 12, and 14. Clarification on original WC-11 (now WC-8) on agricultural irrigation efficiency. Addition of new WC-10 on the inventory of agricultural withdrawals, installation of flow meters, and monitoring. Addition of new WC-11 encouraging energy production facilities to reduce withdrawals where possible and maximize returns.
6	Table 6-1(b)	Table revised.	Updated to reflect updates to the water management practices, including: Clarifications on WS-1, 2, 3, 6, 7.
6	Table 6-1(c)	Table revised.	Updated to reflect updates to the water management practices, including: Clarifications on WW-3, 4, 6, 7, and 8.
6	Table 6-1(d)	Table revised.	Updated to reflect updates to the water management practices, including: Clarifications on WQ-1 to 5, 7 to 9, and 11. Addition of WQ-13 regarding sampling in impaired waters to help remove them from the 303(d) list and WQ-14 to support non-traditional water permitting (water quality trading).
7	Section 7.1	Added section and renumbered subsequent sections.	Added Section 7.1 Implementation Update to provide information included in 2015 progress report developed by CNG Regional Water Planning Council and NWGRC.
7	Section 7.2 and Tables 7-1(a) through 7-1 (d)	Revised text and updated tables.	Updated to reflect updates to implementation schedule and roles of responsible parties.
7	Section 7-3 and Tables 7-2, 7-3, 7-4, and 7-5	Revised text and tables.	Updated to reflect updates to the water management practices.

Summary of 2017 Coosa-North Georgia Regional Water Plan Revisions			
Section	**Location**	**Change**	**Reason**
(Continued)			
7	Section 7-4	Revised text.	Updated to reflect updated discussion about how the CNG plan aligns with regional and local plans.
7	Table 7-6	Revised table.	Updated to reflect updated recommendations for actions by the State.
8	All pages	Text revised.	Updated to reflect that this is an update to the original (2011) plan.
9	All pages	Text revised.	Updated to reflect references cited in the plan.

Printed on Recycled Paper