

Upper Chattahoochee River Basin Profile



The Metro Water District represents 57 percent of the overall Upper Chattahoochee River Hydrologic Unit Code (HUC)-8 Basin, while that portion of this HUC-8 within the District represents 18 percent of the total District area. This area supplies drinking water and serves as the primary receiving water for treated wastewater effluent for over 3.5 million people in the Metro Water District (Atlanta Regional Commission [ARC], 2010). Lake Sidney Lanier, managed by the U.S. Army Corps of Engineers (USACE), and the Chattahoochee River National Recreation Area, managed by the National Park Service, are major recreational destinations within the region and Southeast U.S.

Physical and Natural Features

Geography

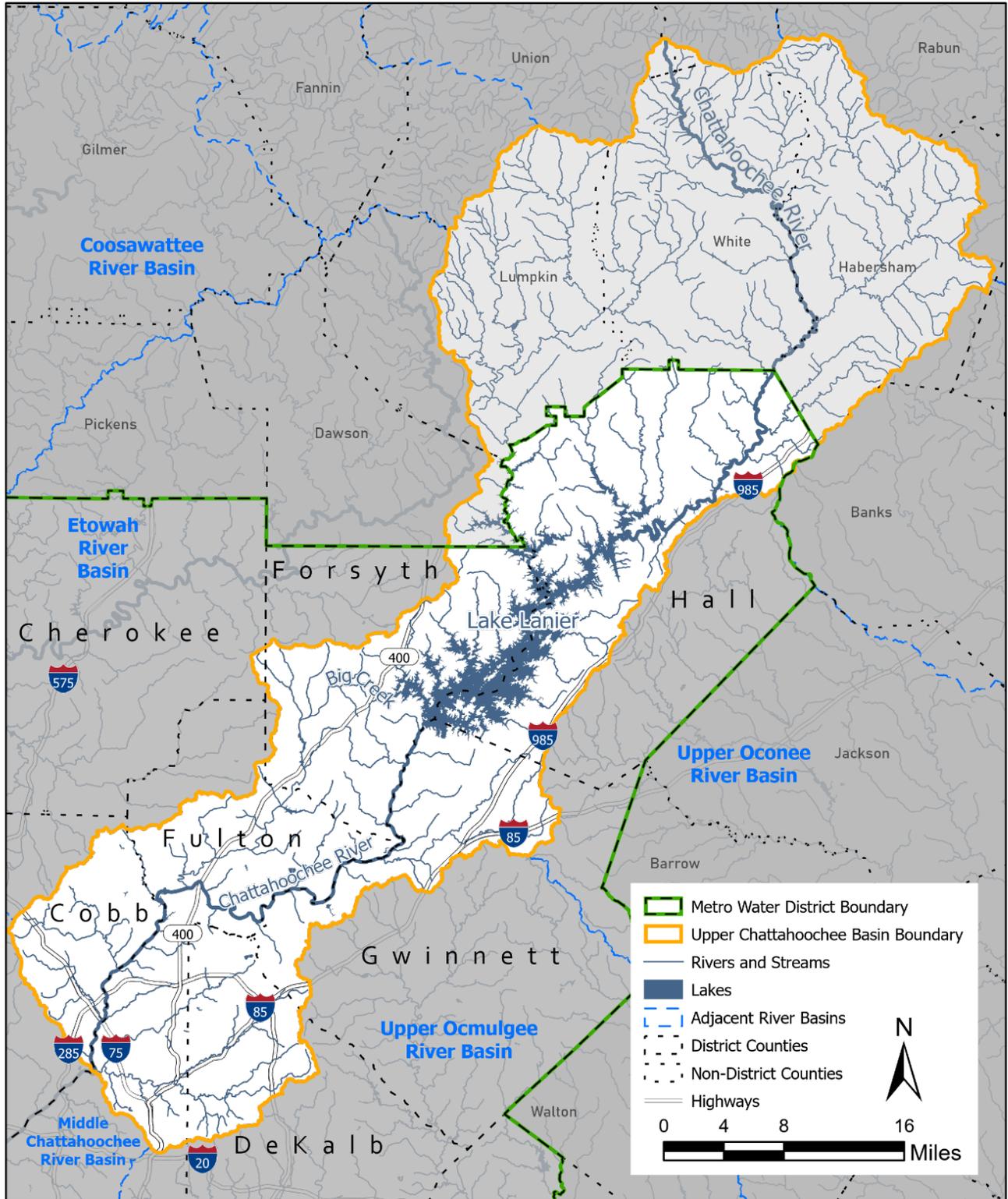
The Upper Chattahoochee River Basin has its headwaters in the Blue Ridge Mountains northeast of the Metro Water District, flowing southwest to the confluence of the Chattahoochee River with Peachtree Creek. Approximately 43 percent, or 680 square miles, of this HUC-8 Basin is located upstream of the Metro Water District before it occupies a relatively narrow corridor through the center of the Metro Water District, averaging about 40 miles wide, starting in the northeast corner and extending to the southwest corner (Figures A-1 and UC-1). The Chattahoochee River is entirely within the Piedmont province, which consists of a series of rolling hills and occasional isolated mountains. The Upper Chattahoochee River Basin includes portions of the Gainesville Ridge, Central Highlands and the Winder Slope physiographic districts (Metro Water District and CH2M HILL Engineers, Inc., 2002).

Portions of 29 cities and 7 counties are within the Metro Water District-portion of the Upper Chattahoochee River Basin, including Cherokee, Cobb, DeKalb, Forsyth, Fulton, Gwinnett and Hall. All of northern Fulton County is now incorporated within the Upper Chattahoochee River Basin, which also includes just over one-third, 35 percent, of the City of Atlanta as well as the newly incorporated City of Brookhaven in DeKalb County and the City of Peachtree Corners in Gwinnett County. The Upper Chattahoochee Basin covers 1,823 square miles and, when combined with the Middle Chattahoochee River - Lake Harding HUC-8, described in the next subsection, is the largest river basin within the Metro Water District. As new cities have been created, additional levels of coordination should be implemented to ensure proper watershed management across each basin.

Hydrology and Soils

The Chattahoochee River joins the Flint River in southern Georgia to form the Apalachicola River, which flows to the Gulf of Mexico. The main tributaries feeding the Upper Chattahoochee River Basin through the Metro Water District include the Chestatee River, Wahoo Creek, Suwanee Creek, Big Creek, Sope Creek, Rottenwood Creek and Peachtree Creek. In contrast to the mainstem Chattahoochee River, all of the natural tributaries remain free-flowing within this basin. Groundwater availability is limited due to geologic conditions, which restrict the potential yield for water supply.

Figure UC-1
Upper Chattahoochee Basin Within the Metro Water District



The flow of the Chattahoochee River through the Metro Water District is regulated primarily by Buford Dam, a federal impoundment forming Lake Lanier, which is operated by USACE. Lake Lanier has a drainage area of 1,040 square miles and extends from Buford Dam about 44 miles up the Chattahoochee River and about 19 miles up the Chestatee River. Constructed in the 1950s, Lake Lanier is a multi-purpose reservoir that provides flood protection, power production, water supply, navigation, recreation and fish and wildlife management. It is the largest reservoir in the Metro Water District (as well as Georgia) and provides the majority of the Metro Water District's water supply, either through direct withdrawals or downstream releases. Morgan Falls Dam, a second smaller downstream dam operated by Georgia Power, is a run-of-the-river project that provides minor regulation of the river. West Point Lake, also a USACE reservoir, is the second major reservoir on the Chattahoochee River system, located just south of the Metro Water District. Average monthly flows in the Chattahoochee River at Atlanta range from a low of 425.5 cubic feet per second (cfs) to a high of 8,959 cfs, with a mean flow of 2,470cfs based on 65 years of records (U.S. Geological Survey, 2020). Rainfall ranges from an average of 68 inches per year in the northeastern part of the basin to 49 inches in the southwestern part.

The Metro Water District lies almost completely within the Piedmont and the Blue Ridge (Ridge and Valley) geologic provinces. The aquifers in these provinces overlie crystalline rocks that crop out in the northern portion of the basin and extend to the Fall Line. The rock is overlain with deposits of weathered, unconsolidated rock debris (regolith) that make up the available aquifer spaces. These deposits are thickest in valleys, but generally provide insufficient yield for uses other than very low density residential and thus surface water is the primary source of potable water for the Metro Water District. The Georgia Geologic Survey Hydrologic Atlas 18 database identifies approximately 28 areas, representing about 4 percent of the Metro Water District, likely to contain unconfined aquifers and 79 areas, representing about 12 percent of the Metro Water District, likely to contain thick soils considered to be an indicator of significant groundwater recharge areas. The recharge areas were mapped based on outcrop area, lithology, soil type and thickness, slope, density of lithologic contacts, geologic structure, the presence of karst and potentiometric surfaces. There are approximately 131 square miles, 14 percent of the basin area within the Metro Water District, of potential recharge areas within the Upper Chattahoochee River Basin, as listed in Table UC-1.

Table UC-1. Groundwater Recharge Areas within the Upper Chattahoochee River Basin

Recharge Area Type	County	Square Miles of Recharge Area Type within County
Probable Areas of Thick Soil	Cobb ^a	31
	DeKalb	13
	Forsyth	38
	Fulton ^a	35
	Gwinnett	11
	Hall	3
Total Recharge Areas		131 ^b

^a Portions of Cobb and Fulton Counties overlap the basin boundary.

^b Minor differences in mapping methodologies may cause basin totals to vary slightly from county totals.

An assessment of the availability of groundwater resources in select prioritized aquifers of Georgia was completed as part of Georgia's Comprehensive State-wide Water Management Plan (Georgia EPD, 2010). None of the Chattahoochee River Basin within the Metro Water District was selected as a priority aquifer for assessment; however, a water budget approach was used to provide a planning level assessment of groundwater resource sustainability in the Chattahoochee River-Chickamauga Creek and Soque River Basins, which cover 315 square miles upstream of the Metro Water District in portions of Habersham, Towns, Union and White Counties. It found that there are small amounts of additional groundwater available from the

Paleozoic rock aquifer in the northwestern Georgia study basin and from the crystalline-rock aquifer in the Piedmont and Blue Ridge.

There are four soil associations that describe the soil types in the Upper Chattahoochee River Subbasin: Cecil-Madison-Pacolet, Madison-Davidson-Pacolet, Riverview-Chewacla-Cartecay and the "urban" soils that start in north Fulton County (Table UC-2). The Cecil-Madison-Pacolet and Madison-Davidson-Pacolet associations were the most abundant, with the former types associated with moderate rolling hills and the latter with steeper terrain. These soils are well drained and highly weathered, having a red to yellowish-red subsoil (Brock, 1977; Jordan et al., 1973; Murphy, 1979; Thomas and Tate, 1973; USDA, 1976; Thomas, 1982; Wells, 1961; Robertson et al., 1960; USDA, 1958; Tate, 1967; Thomas and Tate, 1964). The Riverview-Chewacla-Cartecay association was found along the banks of some of the major rivers, particularly the lower half of the Chattahoochee River. These soils are variable and less well drained than soils on higher elevations (Thomas and Tate, 1973; USDA, 1976; Thomas, 1982; Thomas, 1982 and USDA, 1958).

Table UC-2. Major Soil Associations within the Upper Chattahoochee River Basin

Soil Association	Significance to Watershed Management
Cecil-Madison-Pacolet	Characteristics: Associated with moderate rolling hills, well drained, highly weathered. Significance to Watershed Management: Sloping surfaces may be more susceptible to increased erosion due to stormwater runoff from impervious surfaces; well-drained soils may be more permeable, which increases infiltration capacity in areas without impervious cover, also may improve feasibility of infiltration practices.
Madison-Davidson-Pacolet	Characteristics: Associated with steep terrain, well drained, highly weathered. Significance to Watershed Management: Steep terrain may be more susceptible to increased erosion due to stormwater runoff from impervious surfaces; well-drained soils may be more feasible for infiltration practices.
Riverview-Chewacla-Cartecay	Characteristics: Found along the banks of some of the major rivers; less well drained. Significance to Watershed Management: Located near waterbodies, this soil type is characterized by flat terrain less susceptible to erosion due to stormwater runoff velocities from impervious surfaces; poor-drained soils are less feasible for infiltration.
Urban Soils	Characteristics: Highly disturbed and compacted soils. Significance to Watershed Management: Compacted soils; poor-drained, soils are less feasible for infiltration, restricted water drainage.
Areas of Bedrock	Infiltration practices may be limited in areas of contiguous bedrock.

Protected Species

Protected species include all species listed as threatened or endangered by the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service, and those listed as endangered, threatened, rare or unusual by the State of Georgia. The USFWS also may designate critical habitat for a federally listed species, which provides protection for the habitat as well as the species itself. The current listings of these endangered species, including their status, range and habitat, can be accessed via the USFWS's automated Information, Planning and Conservation System (IPaC, <http://ecos.fws.gov/ipac/>).

The Metro Water District is home to a number of species that are considered threatened or endangered. Protecting watershed health is more than protecting water quality; it also includes protection of biological resources. Within the Metro Water District, there are a number of protected animal species that spend all or part of their life cycle in rivers and streams or depend on streams for a significant portion of their life history. In addition, there are protected plants that are either aquatic or semi-aquatic and grow within or

along the margins of rivers and streams. Table UC-3 lists the 21 protected species potentially found within the counties of the Upper Chattahoochee River Basin of the Metro Water District.

Table UC-3. Aquatic and Semi-Aquatic Protected Species in the Upper Chattahoochee River Basin

Fauna Type	Common Name	Status [^]	Cherokee	Cobb	DeKalb	Forsyth	Fulton	Gwinnett	Hall
Fish	Amber Darter	<u>E</u>	X						
Fish	Cherokee Darter	<u>I</u>	X	X		X	X		
Fish	Etowah Darter	<u>E</u>	X			X			
Fish	Frecklebelly Madtom	<u>E</u>	X			X			
Invertebrate	Finelined Pocketbook	<u>I</u>	X						
Invertebrate	Gulf Moccasinshell	<u>E</u>		X			X		
Invertebrate	Shineyrayed Pocketbook	<u>E</u>					X		
Mammal	Gray Bat	<u>E</u>	X						
Mammal	Northern Long-eared Bat	<u>I</u>	X						X
Bird	Bald Eagle	T	X			X	X		X
Fish	Altamaha Shiner	T			X			X	X
Fish	Bluestripe Shiner	R		X			X		X
Fish	Highscale Shiner	R		X			X		
Fish	Lined Chub	R	X	X					
Fish	Rock Darter	R	X			X			
Invertebrate	Chattahoochee Crayfish	T		X	X	X	X	X	X
Invertebrate	Alabama Spike	E	X						
Invertebrate	Delicate Spike	E		X			X		
Invertebrate	Etowah Crayfish	T	X			X			

[^]Status that is not underlined is listed in Georgia. Underlined status is Federally listed.

R = Rare, E = Endangered, T = Threatened

Trout Streams

Trout streams are classified in accordance with the primary and secondary designations and criteria defined in Section 15 of Georgia's Water Use Classifications and Water Quality Standards (391-3-6-.03). Streams designated as Primary Trout Streams are waters supporting a self-sustaining population of Rainbow, Brown or Brook Trout. Streams designated as Secondary Trout Streams are those with no evidence of natural trout reproduction but are capable of supporting trout throughout the year. The Chattahoochee River upstream from Interstate 285 West Bridge is the only water designated as a secondary trout stream within the Metro Water District of the Upper Chattahoochee River Basin.

Land Use and Surface Water Quality

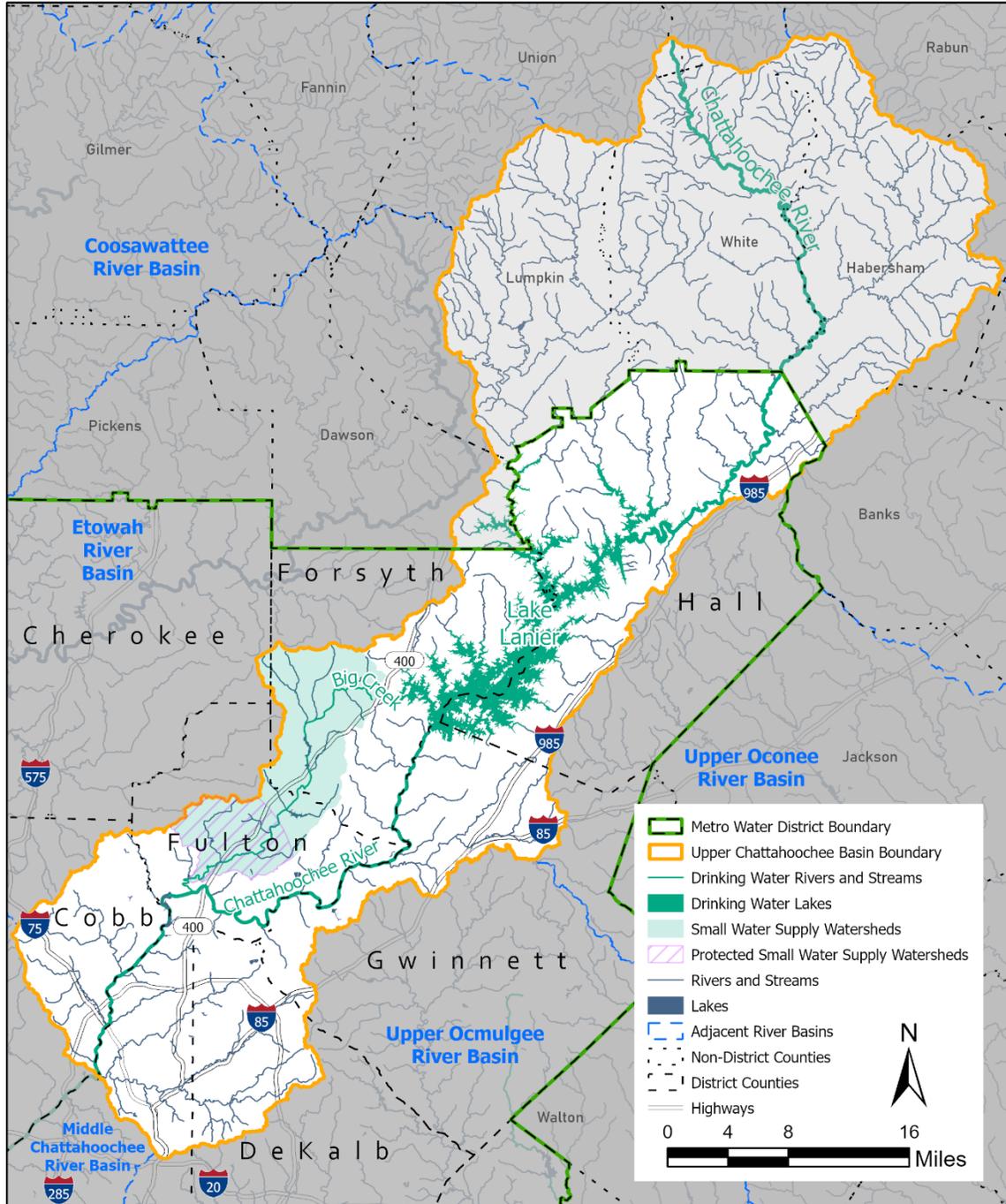
Drinking Water Supply

The Upper Chattahoochee River Basin is the primary drinking water supply source for the Metro Water District, providing water to all or parts of eight District counties, including the four most populous: Cobb, DeKalb, Fulton and Gwinnett. Withdrawals from this basin account for 72 percent of the District's total public water supplies. Recognizing the linkage between watershed management and water quality for water supply, the Georgia Department of Natural Resources (DNR) Rule 391-3-16-.01 includes environmental planning criteria (or Part V criteria) to protect natural resources, such as wetlands, stream buffers, water supply watershed areas, groundwater recharge areas, protected rivers and protected mountains. Table UC-4 lists the water supply sources and Figure UC-2 shows those waters that are designated to meet state drinking water criteria within the Upper Chattahoochee River Basin.

Table UC-4. Upper Chattahoochee River Basin Drinking Water Supply Sources

Water Supply Source	Owner/Operator Utilizing Source
Chattahoochee River	Cobb County-Marietta Water Authority
	DeKalb County Department of Watershed Management
	City of Atlanta Department of Watershed Management
	Atlanta - Fulton County Water Resources Commission
Lake Lanier	Cumming Utilities
	Forsyth County Water and Sewer Department
	Gwinnett County Department of Water Resources
	City of Buford
	City of Gainesville Department of Water Resources
Big Creek	City of Roswell Water Utility Department

Figure UC-2
Upper Chattahoochee Basin Drinking Water



Source water assessments were performed for all drinking water supplies within the Upper Chattahoochee River Basin as required by the U.S. Environmental Protection Agency (EPA). The source water assessments determined the potential for pollution based on individual source and non-point source pollution within drinking water supply watersheds and assigned a susceptibility ranking to each drinking water source. The susceptibility rankings throughout the basin were low for Lake Lanier, medium-high for the Chattahoochee River, and High for Big Creek. These susceptibility rankings indicate the urban and suburban nature of most of the watersheds within the Upper Chattahoochee River Basin.

Small Water Supply Watershed

A small water supply watershed is a watershed that has less than 100 square miles of land within the drainage basin upstream of a water supply reservoir. In this context, a water supply reservoir is a governmentally owned impoundment of water for the primary purpose of providing water to one or more governmentally owned public drinking water systems, which excludes the multipurpose reservoirs owned by the USACE.

Georgia Department of Natural Resources (DNR) Rule 391-3-16-.01(7) requires 100-ft undisturbed buffers and 150-ft impervious surface setbacks for streams in small water supply watersheds within seven miles upstream of water supply intakes and within seven miles upstream of water supply reservoirs, excluding federal reservoirs. That portion of a small water supply watershed that includes the corridors of streams within a seven-mile radius upstream of a governmentally owned public drinking water supply intake or a non-federal water supply reservoir is called the protected small water supply watershed.

To facilitate implementation of DNR Rule 391-3-16-.01(7) and Action Item Integrated-7, all areas of small water supply watersheds that are subject to protection through additional buffers and setbacks have been mapped for all local governments within the Metro Water District. The Upper Chattahoochee River Basin has 31 square miles of protected small water supply watersheds in Fulton County as shown in Figure UC-2. Additional information and guidance can be found on the Metro Water District Technical Assistance webpage in a memorandum titled, "District TAP Memo – Integrated-7 Additional Buffers in Small Water Supply Watersheds."

Land Cover/Land Use

The southern extent of the Upper Chattahoochee River Basin, downstream of Lake Lanier, transitions from a predominantly suburban character in Forsyth, Gwinnett and North Fulton to the more densely developed employment areas of Perimeter Center and Cobb Galleria. In addition to including stretches of all of the major transportation corridors, auto and rail, in the region, portions of Peachtree Creek drain some of the most densely developed areas in the Metro Water District, encompassing downtown and midtown Atlanta, Buckhead and Decatur. Overall, 54 percent of the Upper Chattahoochee River Basin within the Metro Water District is developed, 30 percent is forested area, and 16 percent of the area falls within the remaining land cover classes (Table UC-5, Figure UC-3).

Table UC-5. Upper Chattahoochee River Basin Land Cover / Land Use within the Metro Water District

Land Cover/Land Use	Area (Square Miles)	2019 Existing (%)
Barren Land (Rock/Sand/Clay)	2.38	0.26
Cultivated Crops	0.30	0.03
Deciduous Forest	183.61	20.23
Developed, High Intensity	50.70	5.59
Developed, Low Intensity	156.14	17.20
Developed, Medium Intensity	104.27	11.49

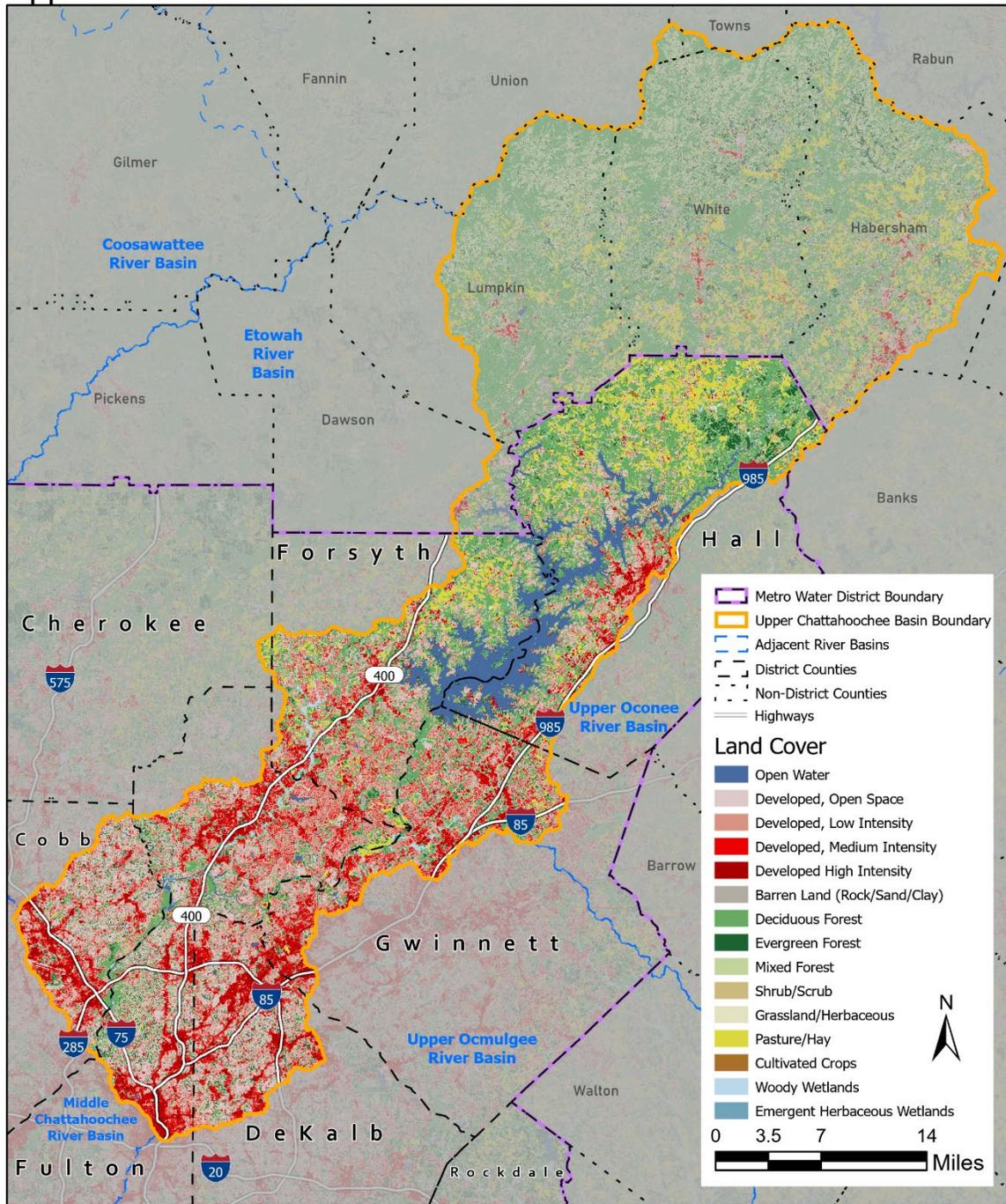
Table UC-5. Upper Chattahoochee River Basin Land Cover / Land Use within the Metro Water District

Land Cover/Land Use	Area (Square Miles)	2019 Existing (%)
Developed, Open Space	181.39	19.98
Emergent Herbaceous Wetlands	0.43	0.05
Evergreen Forest	45.87	5.05
Grassland/Herbaceous	8.83	0.97
Mixed Forest	46.42	5.11
Open Water	60.74	6.69
Pasture/Hay	55.91	6.16
Shrub/Scrub	3.78	0.42
Woody Wetlands	7.04	0.78
Undeveloped	415.31	46
Developed	492.50	54
Total	907.81	100

Notes: Developed = High Intensity, Low Intensity, Medium Intensity, and Open Space. Undeveloped = land cover classes not described as Developed.

Data Source: Aggregated Land Cover categories from USGS National Land Cover Database 2019.

Figure UC-3
Upper Chattahoochee Land Cover



Source: 2019 NLCD

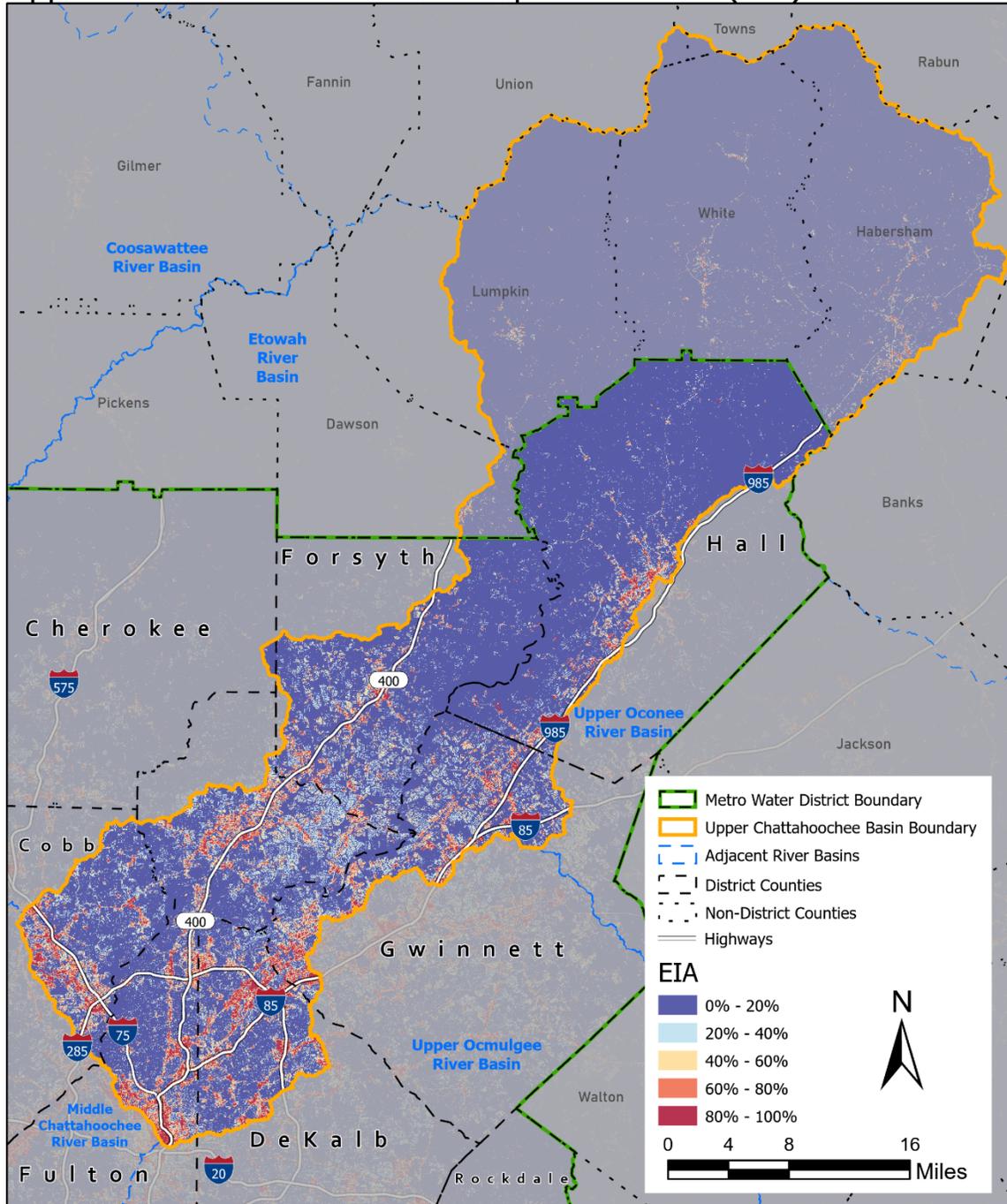
Effective Impervious Areas

The level of watershed imperviousness has long been linked to impacts on changes in hydrologic regimes that lead to increased intensity and frequency of peak stormwater flows, which affect stream stability, water quality and aquatic habitat and biotic community integrity. In general, the most sensitive aquatic organisms are affected at impervious levels greater than 10 percent. Between 11 and 25 percent of most stream communities become impacted, and over 25 percent of streams are generally no longer able to support viable biotic communities (Schueler, 2001).

Impervious surfaces (such as roofs, streets, parking lots) have a significantly different hydrologic response from pervious surfaces (lawns, forests); therefore, it is important to clearly define terms and assumptions related to the calculation of pervious and impervious areas for the purposes of watershed management. “Total impervious area” quantifies all of the land surfaces impervious to rainfall for the particular land cover category while “effective impervious area” (EIA) refers to the directly connected impervious area used for water quality and stormwater conveyance modeling. For the 2003 District-wide Plan, EIA values were initially defined based on previous studies, including the local watershed assessments, and then further refined based on calibration using available water quality data. For the 2022 District-wide Plan, the EIA of the HUC-12 subwatersheds within the Metro Water District was calculated using a mathematical model developed by Sutherland for EPA based on land cover data from the 2019 USGS National Land Cover Database.

Of the 41 HUC-12s within the Metro Water District portion of Upper Chattahoochee River Basin, 23 had an EIA greater than 10 percent, primarily those HUCs that either straddle a major transportation corridor such as Georgia 400 or Interstate 85 or the HUCs located within the more densely urbanized area of Interstate 285. Upstream of Buford Dam, the Lake Lanier drainage area had two HUC-12s greater than 10 percent EIA, including Flat Creek in Gainesville and the Bald Ridge Creek subwatershed just to the east of the City of Cumming. The effects of the region's transportation corridors are also apparent as most of the subwatersheds encompassing Interstate 85, Interstate 75 and Interstate 285 have EIAs greater than 20 percent (Figure UC-4).

Figure UC-4
Upper Chattahoochee Effective Impervious Area (EIA)



Wastewater Management

Permitted Wastewater Facility Service Areas

There are 15 municipal wastewater treatment facilities in the Upper Chattahoochee Basin with a permitted capacity of 116 Maximum Monthly Flow – Million Gallons per Day (MMF-MGD). Additionally, the Upper Chattahoochee Basin has XX non-municipal wastewater treatment facilities with a permitted capacity of XX MMF-MGD.

Combined-sewer Overflow Areas

Combined-sewer overflow (CSO) areas within the Upper Chattahoochee River Basin are limited to two small drainage areas within the Peachtree Creek (HUC-12 # 031300011204) subwatershed in the City of Atlanta. Major infrastructure improvement projects related to potential CSO overflows from the Tanyard Creek and Clear Creek areas during storm events as well as sanitary sewer overflows (SSOs) from the wastewater conveyance systems are ongoing and continue to reduce the bacteria contributions from these sources.

Impaired Waterbodies

The Georgia EPD establishes water quality standards for the state's surface waters. Section 303(d) of the federal Clean Water Act requires that all states list waterbodies that do not meet water quality standards. The Georgia EPD publishes a biennial list of streams that do not meet State water quality standards, referred to as the 303(d)/305(b) list. If a water body does not support its designated use (drinking, recreation, fishing, wild/scenic rivers or coastal fishing) because conditions violate water quality standards, it is considered an "impaired" stream or water body.

The Georgia EPD determines whether a waterbody is supporting its designated uses by collecting water quality data and comparing it against State water quality criteria. Georgia EPD describes their listing methodology and "preferred minimum dataset" at <http://epd.georgia.gov/georgia-305b303d-list-documents>. This methodology is important to understand the sample size, extent and timeframe of the dataset that was used to list a waterbody. Feedback can be given to Georgia EPD if additional data or information are known that may affect future sampling or listing evaluations.

The Metro Water District portion of the Upper Chattahoochee River Basin contains 1,721 stream miles, 385 of which were assessed for impairments. A total of 327 stream miles, 19 percent or 85 percent of total and assessed streams respectively, did not meet state water quality standards based on the 2020 303(d) list. The streams listed as not supporting are summarized in Table UC-6 by parameter and graphically shown in Figure UC-5. Several streams are listed for violations of more than one parameter, therefore the summation of impaired miles by parameter will not equal the miles of not supporting stream.

Streams in the Upper Chattahoochee River Basin that do not meet water quality standards for fecal coliform bacteria as a result of nonpoint source pollution account for 15 percent or 67 percent of total and assessed streams respectively. Fecal coliform is used for water quality purposes as a Fecal Indicator Bacteria (FIB). FIBs are used to provide an approximation of the potential risk a water body poses to human health. These bacteria enter the stream from both human and non-human sources, including SSOs, leaking sewer lines, failing septic systems and pet/ wildlife waste. Fecal coliform typically is found in both developed and undeveloped watersheds, and monitoring programs in Georgia have found levels that exceed state standards in urban, agricultural and forested areas (Georgia EPD, 2011). While fecal coliform is ubiquitous in streams across the country (Georgia EPD, 2011), concentrations of bacteria can increase as a result of the higher density of potential pollutant sources and decreased stormwater filtration and stormwater treatment from population growth and development. Biota listings typically indicate high sediment loads in streams, which decrease habitat quality for benthic macroinvertebrates and fish. Sediment sources include runoff from construction sites as well as from streambank erosion due to accelerated streamflow velocities from impervious cover associated with urbanization.

Woodall Creek, a three-mile long tributary to Peachtree Creek in Atlanta, is listed for fecal coliform, copper, zinc, lead and tetrachloroethylene (PCE) violations while a one-mile long tributary to Woodall Creek is also listed for copper, zinc and alpha-benzene hexachloride (BHC) and beta-BHC, byproducts of the production of the insecticide lindane (γ -HCH). PCE is the predominant chemical solvent used in dry cleaning.

Tributary #2 to Sope Creek in Cobb County is also listed for PCEs.

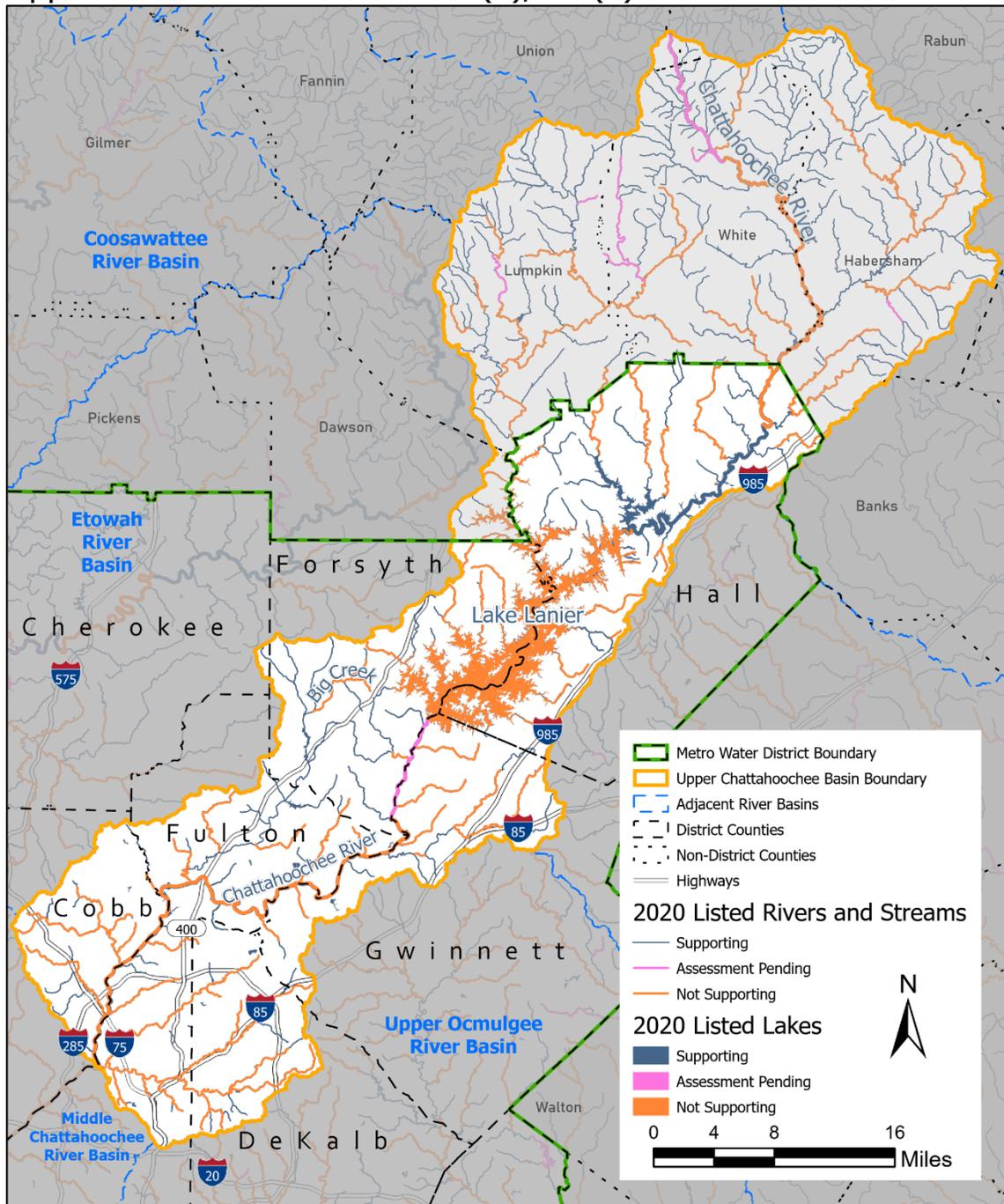
The Chattahoochee River from Morgan Falls Dam to West Point Lake, downstream of the Metro Water District, is listed for Fish Consumption Guidance as a result of legacy polychlorinated biphenyl (PCB) levels.

Table UC-6. Upper Chattahoochee River Basin Summary of Impaired Streams

Criterion Violated	Miles of Stream	% of 2020 Assessed Streams	% of Total Stream Mileage
Fecal Coliform Bacteria	256	67	15
Biota (Fish Community)	153	40	9
E Coli	47	12	3
Biota (Macroinvertebrate Community)	38	10	2
Fish Consumption Guidance (PCBs)	12	3	1
Tetrachloroethylene	7	2	<1
Copper	3	<1	<1
Lead	3	<1	<1
Zinc	3	<1	<1
Alpha-BHC and Beta-BHC	1	<1	<1
Total Impaired Stream Mileage ^a	327	85	19
Total Mileage Assessed for Possible Impairment	385		
Total Stream Mileage in the Basin	1,721		

^a Several streams are listed for violations of multiple parameters within the same stream segment; therefore, the total of impaired miles by parameter will not equal the total stream mileage of impaired streams.

Figure UC-5
Upper Chattahoochee Basin 305(b)/303(d) Listed Waters



Lake Lanier has a designated use of Recreation and Drinking Water with corresponding chlorophyll a and total nitrogen criteria. Sixteen percent of Lake Lanier at Browns Bridge Road (SR 369) is listed as not supporting its designated uses of Recreation and Drinking Water due to not meeting state water quality standards for chlorophyll a. An additional 13 percent of the lake (at Lanier Bridge Road) is pending assessment. A total of 68 percent of Lake Lanier is listed as supporting its designated use. Georgia EPD conducted modeling to establish Total Maximum Daily Loads (TMDLs) to address these exceedances and Georgia EPD found the growing season average chlorophyll a criteria at Browns Bridge and Flowery Branch needed to be revised based on modeling an all forested watershed. Georgia EPD has reevaluated and revised the chlorophyll a criteria at these locations (Georgia EPD, 2013).

TMDLs and TMDL Implementation Plans have been developed to help jurisdictions address impaired streams and lakes and specific parameters of concern. More information on specific TMDLs in the Upper Chattahoochee River Basin can be found on the Georgia EPD website <https://epd.georgia.gov/total-maximum-daily-loadings>.

Management Issues and Recommendations

BASIN-LEVEL SUMMARY

Land development affects the physical, chemical, and biological conditions of the District's watersheds, waterways, and water resources. Based on the Stormwater Forecast analysis, development patterns in the District over the past century have resulted in substantial changes to watershed characteristics. Developed area is projected to increase from over 314,850 acres in the current (2019) condition to over 401,800 acres in 2040, a 28 percent increase. If current land use policy and recent development patterns continue, future estimates of land use are expected to intensify, with the weighted average CN value potentially reaching approximately 84 and total imperviousness potentially reaching nearly 45 percent by 2040, based on the future developed area.

Precipitation rates are also expected to increase based on the future precipitation study results for the District. By 2040, the Basin-wide weighted average 85th percentile annual rainfall; 1-year, 24-hour rainfall; and 25-year, 24-hour rainfall events are estimated to potentially increase by 14 percent, 11 percent, and 16 percent, respectively. These changes to watershed characteristics and rainfall intensity will have a direct impact on the total potential runoff management volume generated from development that may require additional management from structural control measures.

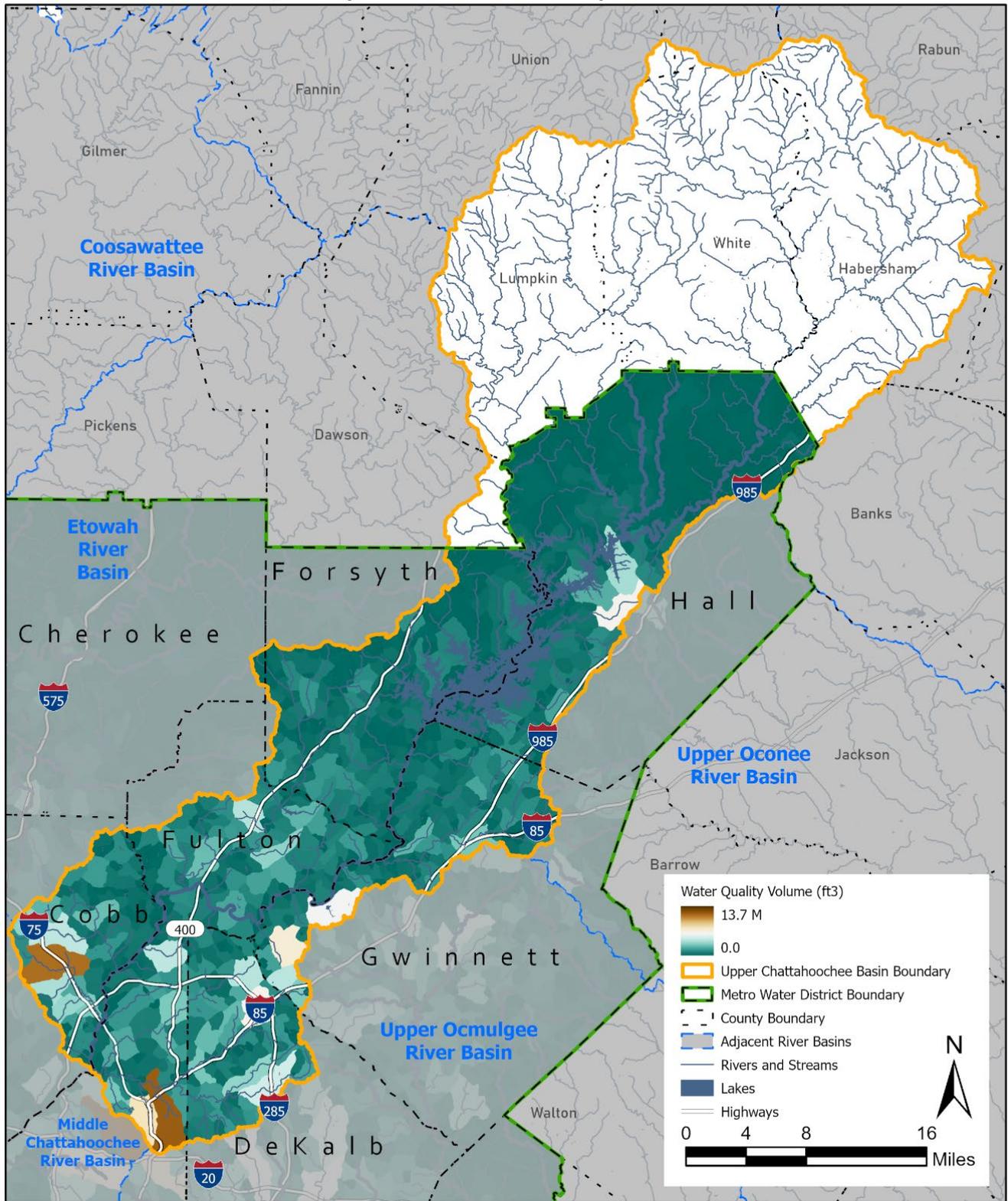
Runoff for the three post-construction volumes (WQv, CPv, and OFPv) were calculated for 1,232 individual subcatchments in the Basin. In 2019, a total of 517 million cubic feet of runoff was estimated in the Basin for the Water Quality (WQv), 1,188 million cubic feet for the Channel Protection Volume (CPv), and 6,891 million cubic feet for the Overbank Flood Protection Volume (OFPv), based on over 314,850 acres of development. See additional information in the following summary table and a figure of the 2019 WQv for the Basin.

Table UC-7. Upper Chattahoochee River Basin Watershed Characteristics at and Total Potential Runoff Management Volumes

	Predevelopment	2019	2030	2040
Subcatchments (count)	1,231	1,231	1,231	1,231
Total Area (acres)	580,776	580,776	580,776	580,776
Developed Area (acres)	314,850	314,850	375,187	401,835
Total Imperviousness (percent)	1.0	36.4	42.2	44.9
CN	62	82	83	84
Slope (percent)	9.8	9.8	9.8	9.8
85th Percentile Annual Rainfall (inches)	1.20	1.20	1.32	1.37
1-Year, 24-Hour Rainfall (inches)	3.34	3.34	3.58	3.70
25-Year, 24-Hour Rainfall (inches)	5.99	5.99	6.61	6.94
WQv (cubic feet)	80.92 M	517.32 M	772.21 M	907.85 M
CPv (cubic feet)	349.34 M	1,187.86 M	1,665.97 M	1,910.11 M
OFV (cubic feet)	-	6,890.77 M	10,232.41 M	12,014.55 M

M = Million

Figure UC-6
 Estimated Water Quality Runoff Volume per Subcatchment - 2019*



Management Issues and Recommended Strategies

Table UC-8 outlines management issues and strategies for the Upper Chattahoochee River Basin within the Metro Water District. The recommended strategies presented in Table UC-8 are based on data presented within this River Basin Profile. These strategies are provided to further describe the potential causes and potential solutions to the watershed issues. They provide a foundation for guidance but are not presented here as mandatory requirements.

Table UC-8. Upper Chattahoochee River Basin Management Issues and Recommended Strategies

Management Issue	Description	Recommended Strategies
Source water quality	Source water watershed protection of Lake Lanier, Chattahoochee River and small water supply watersheds.	<ul style="list-style-type: none"> Implement source water protection measures in all subwatersheds draining to Lake Lanier. Implement source water protection measures in all subwatersheds. Continue collaborative efforts in small drinking water supply watersheds, such as Big Creek, to protect the viability of these supplies.
Nutrient loading	<p>TMDL nutrient concentrations in Lake Lanier</p> <p>Portions of Lake Lanier have not met the chlorophyll a standards.</p> <p>Urban nutrient loading reductions will potentially be needed to restore Lake Lanier to its designated use.</p> <p>Agricultural nutrient loading reductions will potentially be needed to restore Lake Lanier to its designated use (Georgia EPD, 2013).</p>	<ul style="list-style-type: none"> Implement post-construction stormwater controls and infiltration practices to reduce NPS pollutants associated with multiple land uses, particularly suburban/urban and agricultural. Educate the public on NPS pollution reduction and proper fertilizer application and the impacts of excess nutrients on the lake and local economy. Coordinate with Georgia EPD NPS Program to develop nutrient management plans and strategies to reduce nutrient loading from animal feeding operations in concentrated production regions. Participate in efforts to educate agricultural stakeholders about the importance of implementing the <i>Best Management Practices for Georgia Agriculture Manual</i> for animal production facilities (poultry) and grazing operations. Coordinate with Georgia Department of Agriculture Livestock/Poultry Section on inspections, complaint investigations, nutrient management plan reviews, permit administrative support and enforcement assistance (Georgia EPD, 2014). Coordinate with counties upstream of Lake Lanier (Dawson, Habersham and White Counties) in nutrient management efforts.
Increases in impervious cover (new development)	Increases in impervious cover can lead to a change in the hydrologic regime of a watershed by causing more intense, high-velocity stormwater flows and increased erosion and sedimentation.	<ul style="list-style-type: none"> Nonpoint source pollution management Adopt and enforce the post-construction stormwater control ordinance and use of Georgia Stormwater Management Manual design standards. Watershed improvement projects, such as stream restoration and bank stabilization, are recommended in areas to reduce instream sediment load contributions.
Inadequate stormwater controls on existing impervious cover	<p>Much of the development in the basin occurred prior to current Georgia Stormwater Management Manual design standards.</p> <p>Limited resources and cost of maintaining and repairing stormwater infrastructure</p> <p>Varying local strategies of funding stormwater management</p>	<ul style="list-style-type: none"> Implement an asset management program to identify and prioritize maintenance and capital improvement projects to maximize benefit Consider updating stormwater controls during redevelopment Identify opportunities for watershed improvement projects to retrofit or install updated stormwater controls, green infrastructure, stormwater treatment or other controls. Consider dedicated funding sources, such as stormwater utilities, and seek out opportunities for grants, loans and partnerships.

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Management Issue	Description	Recommended Strategies
Aquatic resources	The Chattahoochee River upstream from I-285 West Bridge is a designated secondary trout stream.	<ul style="list-style-type: none"> Balance nonpoint source temperature inputs from its tributaries with cold water releases from Buford Dam to meet secondary trout stream criteria.
Biota TMDLs	<p>40% of assessed instream fish communities and 10% of the benthic macroinvertebrate communities are impaired.</p> <p>Biota impairment in this basin is the result of high sediment loads, primarily associated with existing development with inadequate stormwater controls, which is a concern for drinking water source supplies, biota and recreation.</p>	<ul style="list-style-type: none"> Enforce post-construction stormwater ordinance on new development and seek opportunities to retrofit stormwater controls to maximize water quality and channel protection. Recommend watershed improvement projects, such as stream restoration and streambank stabilization, in areas with failing stream banks to reduce instream sediment load contributions.
Bacteria TMDLs	67% of assessed stream segments in the Chattahoochee River Basin (within the Metro Water District) are listed for fecal coliform.	<ul style="list-style-type: none"> Identify bacteria sources through inspections, monitoring, source tracing and stream walks. Educate public on pollution prevention, proper septic system maintenance and reporting a potential illicit discharge. Address fecal coliform bacteria contributions from sanitary sewer overflows. Address bacteria loads from agricultural sources as they are identified. Perform regular maintenance to ensure proper functioning of decentralized systems (such as septic tanks). Ongoing infrastructure improvement projects related to reduction of potential CSO overflows.

NPS = nonpoint source pollution

Lake management	Lake Lanier is the largest lake within this basin, but there are other public and privately-held and managed lakes that play a significant role in meeting designated uses and downstream hydrologic regimes and water quality.	<ul style="list-style-type: none"> Develop a central inventory of lakes, ownership and management practices to facilitate pollutant source identification both up and downstream of the lake. Coordinate available water quality data and management activities for inventoried lakes. Implement shoreline protection and upstream sediment management to prevent excessive nutrients and sedimentation within the lake. Facilitate proper maintenance and management, particularly of small lakes by providing resources, links or other materials to assist with periodic activities such as inspections, water quality sampling or dredging. Conduct public education and involvement activities to promote watershed stewardship to protect lake quality.
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Identify Indicators and Monitoring to Measure Implementation Success

A critical component of any watershed management program is the ability to assess progress and determine if management strategies are effectively addressing issues. This Plan includes implementation actions related to watershed monitoring and conducting condition assessments to evaluate implementation success. These implementation actions include long-term ambient trend monitoring (Watershed-10), as well as resource-specific implementation actions for Watershed Improvement (Watershed-8). Communities may

choose to conduct project-specific monitoring associated with a watershed improvement project, such as biological or geomorphological monitoring to evaluate success.

As included in EPA (2008), a monitoring program should “...track progress in meeting load reduction goals and attaining water quality standards and other goals. Measurable progress is critical to ensuring continued support of watershed projects, and progress is best demonstrated with the use of monitoring data that accurately reflect water quality conditions relevant to the identified problems. Monitoring programs should include baseline (before), project-specific (during) and post-project (after) monitoring.”

Some potential indicators to measure implementation success for the Upper Chattahoochee River Basin are listed as follows, but this list is not exhaustive:

- Select representative monitoring stations within the watershed to monitor for pollutants of concern and other water quality or biological parameters.
- Use U.S. Geological Survey stream gage data or collect data to establish stream stage-discharge relationships and calculate or model water quality pollutant loads and potential reductions.
- Calculate or model improvements to hydrologic and hydraulic conditions based on structural project implementation.
- Estimate stream/lake bank stability and habitat improvement based on annual stream cross section surveys and bank erosion monitoring.
- Conduct stream/lake walks or structure inspections to inventory structure condition and performance, streambank stability and riparian condition over time.
- Conduct project monitoring to establish pre-, during- and post-project conditions, as well as upstream/downstream monitoring during the same time period to reduce the effects of environmental variability.
- To determine if water quality degradation is being prevented, conduct GIS analysis to identify high-activity areas of a watershed using aerial overlays, work orders, facility inspection, erosion and sedimentation control or new construction inspection data. Identify if monitoring data and GIS data follow similar patterns.
- Track number, location, size or features (that is, drainage area treated or linear feet of restored stream) of watershed improvement, green infrastructure or other nonpoint source reduction projects.
- Compare percentage of TMDL stream/lake segments over time.
- Track implementation actions by jurisdiction within the basin, and their measured effectiveness.
- Track enforcement actions by category and location.
- Track stream/lake buffer variances and local permits issued.
- Conduct public surveys for pollution prevention awareness or education effectiveness, particularly pre- and post-data associated with an education event.
- Compare existing water quality modeled loads against future water quality modeled loads.
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