ATTACHMENT 8

Upper Oconee River Basin Profile

The Upper Oconee River Basin is located along the eastern edge of the Metropolitan North Georgia Water Planning District (Metro Water District) and encompasses about 208 square miles, or four percent, of the total District area (Figure A-1). The Upper Oconee River flows to the Altamaha River before draining to the Atlantic Ocean just north of Little St. Simons Island on the Georgia coast. The main tributaries draining the District portion of the Upper Oconee River are the North Oconee River, Middle Oconee River and Mulberry River in Hall County and Little Mulberry River and Apalachee River in Gwinnett County (Figure OC-1). The District represents seven percent of the overall Upper Oconee River Hydrologic Unit Code (HUC)-8 Basin and includes portions of Hall and Gwinnett Counties as well as portions of the following seven cities: Braselton (not a District member), Dacula, Flowery Branch, Gainesville, Gillsville, Lula and Oakwood. In spite of the small proportion it represents of the District, the City of Gainesville provides drinking water for much of eastern Hall County from Cedar Creek and the North Oconee River (ARC, 2010).

Physical and Natural Features

Geography

The Upper Oconee River is entirely within the Piedmont province, which consists of rolling hills and occasional isolated mountains; however, there are six physiographic districts, making the topography and hydrology highly variable. The Upper Oconee River Basin includes portions of the Gainesville Ridge and the Winder Slope physiographic districts (Metro Water District, 2002).

Hydrology and Soils

The Upper Oconee River Basin has its headwaters along a ridgeline generally following Interstate 985 and Braselton Highway (GA 124) in the northeast portion of the Metro Water District before flowing southeast to the confluence with the Middle Oconee River and Lake Oconee. Two headwater tributaries, the North Oconee River and the Middle Oconee River, originate at the northern end of the Upper Oconee River Basin, draining the eastern edges of Hall and Gwinnett Counties while the Apalachee River and its tributaries drain the eastern portion of Gwinnett County. Of the 143 miles of assessed streams within or straddling the Upper Oconee River Basin, 117 miles are designated for fishing and 26 miles, 18 percent, for drinking water. The Upper Oconee River Basin is part of one 8-digit HUC, four 10-digit HUCs and twelve 12-digit HUCs as listed in Attachment 10. None of the eight USGS flow stations selected for this overview is in the Upper Oconee River Basin. Since the portions of the Upper Oconee River Basin that are in the District are mainly tributaries, no USGS flow stations meeting the study criteria exist within the District in this portion of the basin. Accordingly, no flow data are presented for this basin. No significant impoundments currently exist within the portion of this basin within the District.

Groundwater availability is limited due to geologic conditions, which restrict the potential yield for water supply. 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 Upper Oconee River Basin within the Metro Water District was selected as a priority aquifer for assessment. Table OC-1 summarizes the limited groundwater recharge areas, only 10 square miles or five percent of the total Upper Oconee River Basin, as identified by the Georgia Geologic Survey Hydrologic Atlas 18 database.

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FIGURE OC-1
Upper Oconee Basin within the Metro Water District

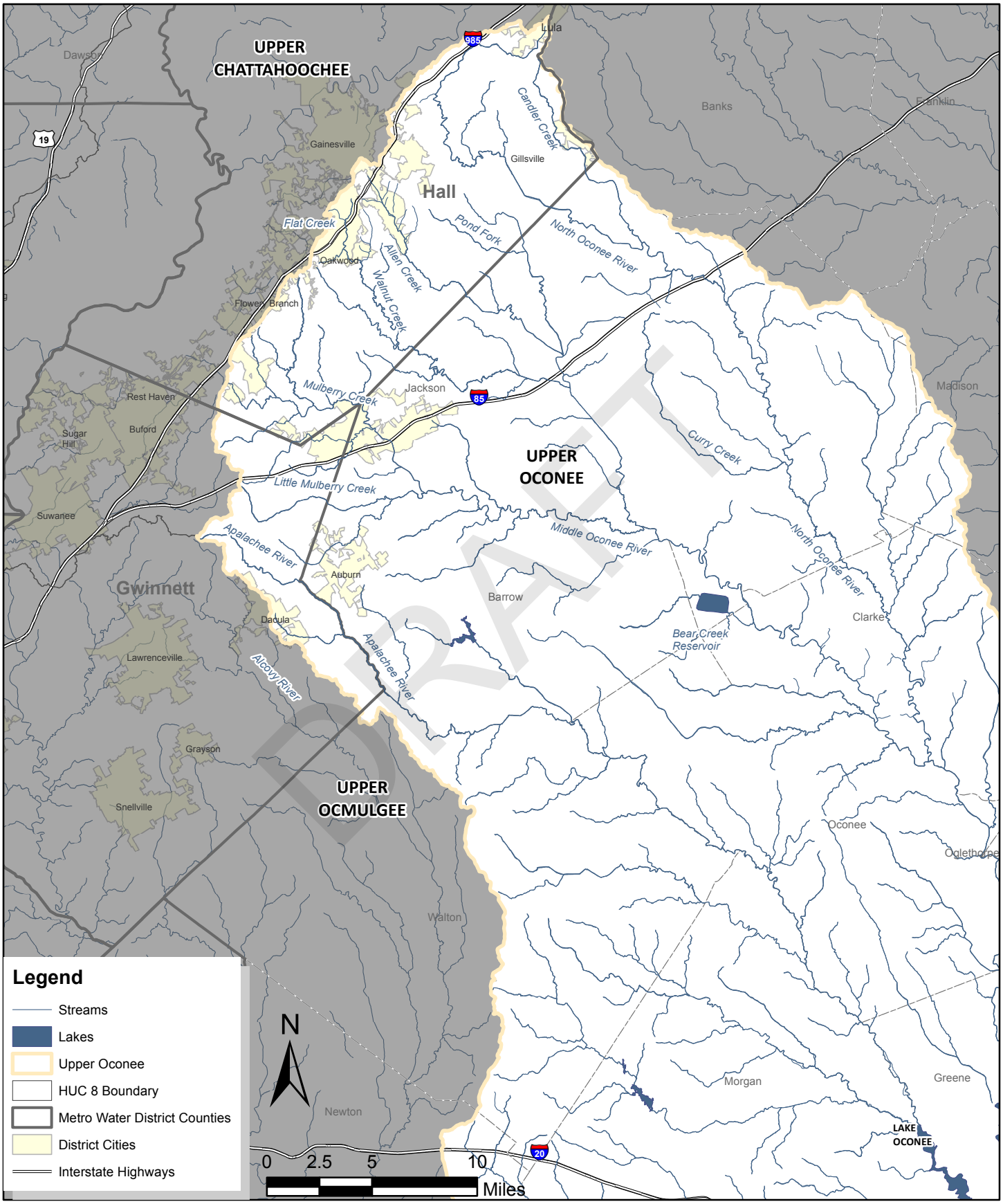

Table OC-1. Groundwater Recharge Areas within the Upper Oconee River Basin

Recharge Area Type	County	Square Miles of Recharge Area Type within County
Probable Areas of Thick Soil	Gwinnett	8
	Hall	2
Total Recharge Areas		10 [a]

[a] Minor differences in mapping methodologies may cause basin totals to vary slightly from county totals.

There are two soil associations that best characterize the overall soil types in the Upper Oconee River Basin: Cecil-Madison-Pacolet and Madison-Davidson-Pacolet (Table OC-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).

Table OC-2. Major Soil Associations within the Upper Oconee 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 velocities from impervious surfaces; well-drained soils may be more permeable, which increases infiltration capacity in areas without impervious cover, also may improve feasibility for 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 velocities from impervious surfaces; well-drained soils may be more feasible for infiltration practices.

Protected Species

Protected species include all species listed as threatened or endangered by the 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/).

Native Species

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 OC-3 lists the two protected species potentially found within the counties of the Upper Oconee River Basin.

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Table OC-3. Aquatic and Semi-Aquatic Protected Species in the Metro Water District

Fauna Type	Common Name	Status	Gwinnett	Hall
Fish	Bluestripe Shiner	GA		X
Invertebrates	Chattahoochee Crayfish	GA		X

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). There are no stream segments within the Metro Water District of the Upper Oconee River Basin that are classified as a primary trout stream or a secondary trout stream.

Land Use and Impaired Waterbodies Characteristics

Drinking Water Supply

As described in the Water Supply and Water Conservation Plan, the Upper Oconee River Basin provides a drinking water supply source for the City of Gainesville within the Metro Water District. Recognizing the linkage between watershed management and water quality for water supply, the Georgia Planning Act of 1989 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. The Act is further described in Section 3. Table OC-4 lists the water supply sources and Figure OC-2 shows those waters that are designated to meet state drinking water criteria within the Upper Oconee River Basin.

Table OC-4. Upper Oconee River Basin Drinking Water Supply Sources

Water Supply Source	Owner/Operator Using Source
North Oconee River / Cedar Creek	City of Gainesville Public Utilities

Land Cover/Land Use

Figure OC-3 illustrates the land cover characteristics of the Upper Oconee River Basin, which show the more densely developed lands clustered along the Interstate 985 and 85 corridors and the cities of Dacula and Gainesville. Overall, the Gwinnett County portion of the river basin had already transitioned to a more suburban-residential character in 2010 while the northern extent in Hall County retained much of its agricultural and rural residential acreage. Approximately 62 percent of the Upper Oconee River Basin remained undeveloped while 30 percent had been developed in to a residential use (Table OC-5).

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FIGURE OC-2
Upper Oconee Basin Drinking Water Stream Segments

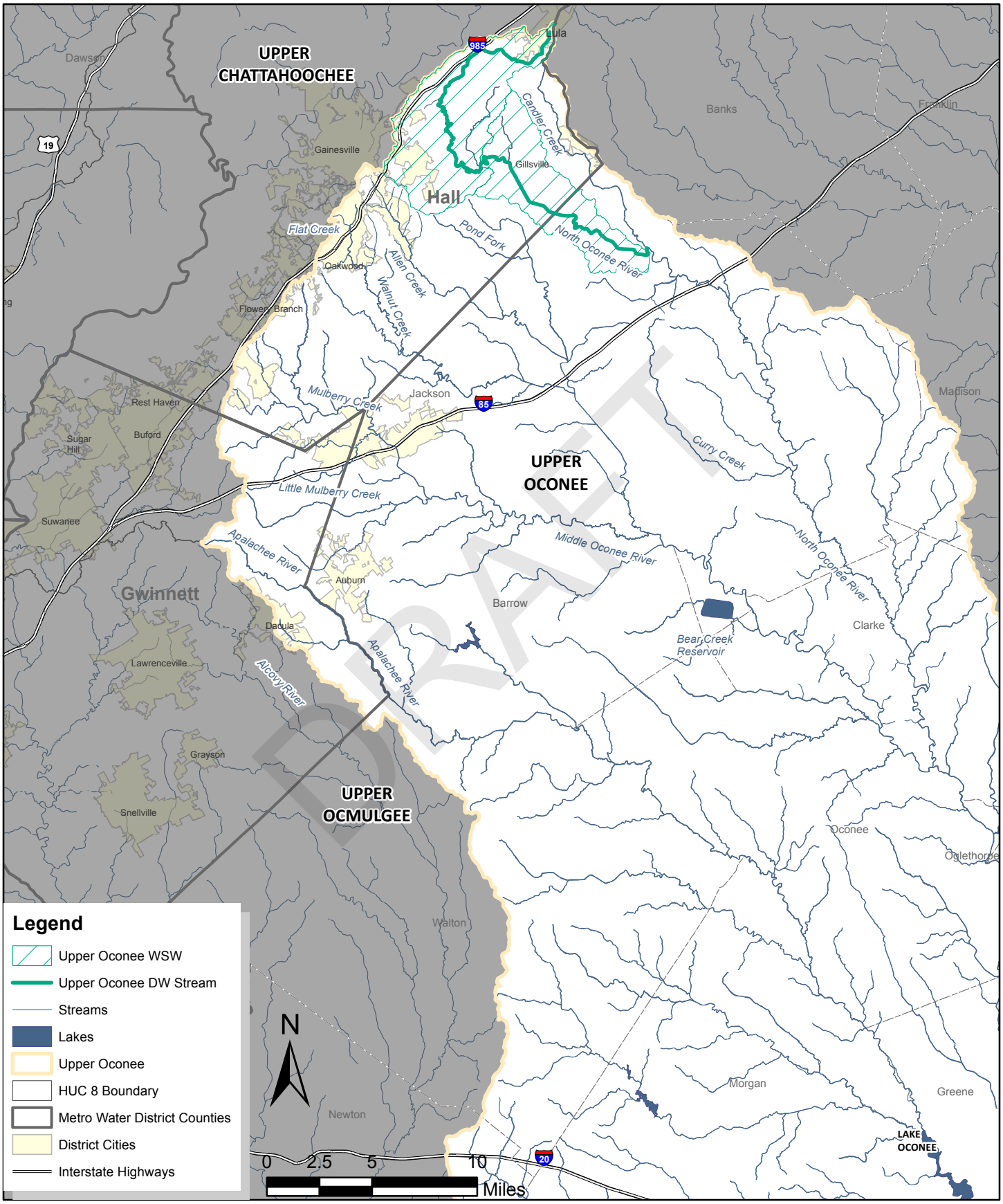

FIGURE OC-3
Upper Oconee Basin 2012 Land Cover

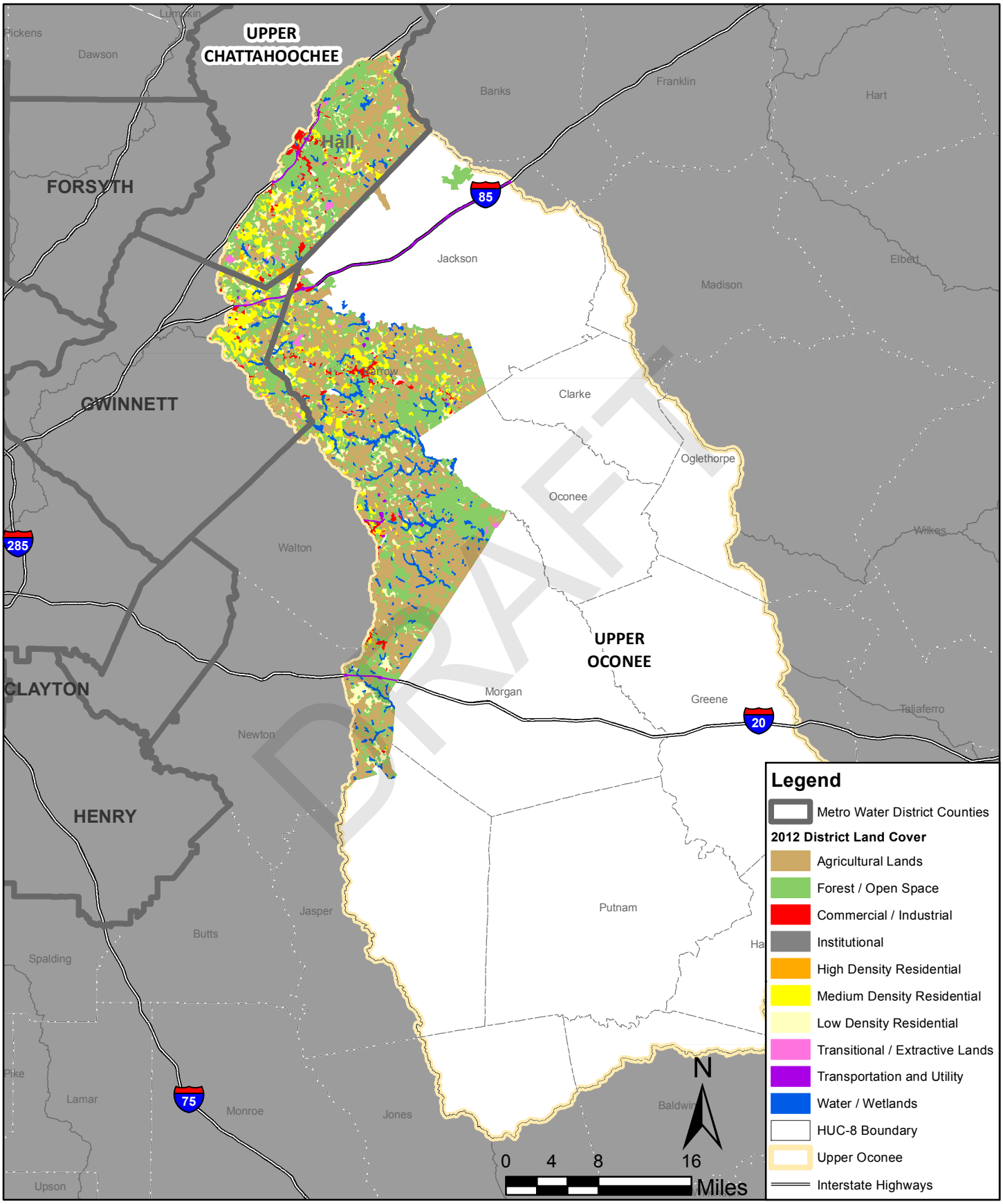

Table OC-5. Upper Oconee River Basin Land Cover / Land Use within the Metro Water District

	2010 Existing (%)	2040 Future (%)
Agricultural Lands	23	
Commercial	3	
Forest/Open Space	38	
High Density Residential	1	
Industrial/Institutional	1	
Low Density Residential	15	
Medium Density Residential	14	
Transitional/Extractive Lands	4	
Transportation and Utilities	1	
Water/Wetlands	1	
Undeveloped	62	60
Developed	38	40

Notes: Undeveloped = Agricultural, Forest / Open Space and Water / Wetlands

Data Source: Aggregated Land Cover categories from ARC's 2010 LandPro Geographic Information System (GIS) and 2040 Envision Data

The Plan 2040 Unified Policy Growth Map estimates that approximately two percent of the current forested and agricultural land will be developed in the next 25 years resulting in the Upper Oconee River Basin being 40 percent developed (ARC, 2012). The relative percent distribution and general character of these growth areas are illustrated in Figure OC-4. Much of this growth is anticipated to occur in the southwest portion of the basin in Gwinnett County with infill development and redevelopment resulting in increased density.

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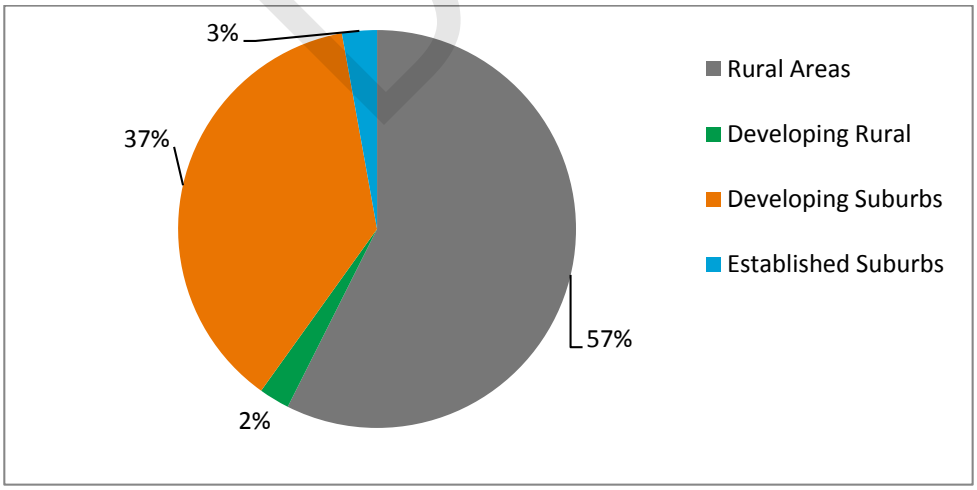

Figure OC-4. Upper Oconee River Basin Future Growth Area Distribution

Note: Categories are defined in
http://documents.atlantaregional.com/plan2040/docs/lu_plan2040_development_guide_0711.pdf

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, with the most sensitive aquatic organisms 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). Of the 12 HUC-12s within the Metro Water District portion of Upper Oconee River Basin, none had an effective impervious area (EIA) greater than 10 percent; however, seven had EIAs of five to 10 percent in 2010, indicating they are approaching the level of imperviousness that could potentially impact conditions in this river basin if adequate best management practices are not concurrently implemented (Figure OC-5).

Combined-sewer Overflow Areas

There are no combined-sewer overflow areas in the Upper Oconee River Basin.

Impaired Waterbodies

Georgia EPD determines whether a waterbody is supporting its designated uses by collecting water quality data and comparing these data against the water quality criteria. Georgia EPD describes their listing methodology and "preferred minimum dataset" at 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.

Of the 143 miles of streams assessed in the Metro Water District portion of the Upper Oconee River Basin, 96 miles, or 67 percent, did not meet state water quality standards based on the 2014 303(d) list. The streams listed as not supporting are graphically shown on Figure OC-6 and summarized in Table OC-6 by criterion violated.

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FIGURE OC-5
Upper Oconee Basin HUC-12 Effective Impervious Areas (EIAs)

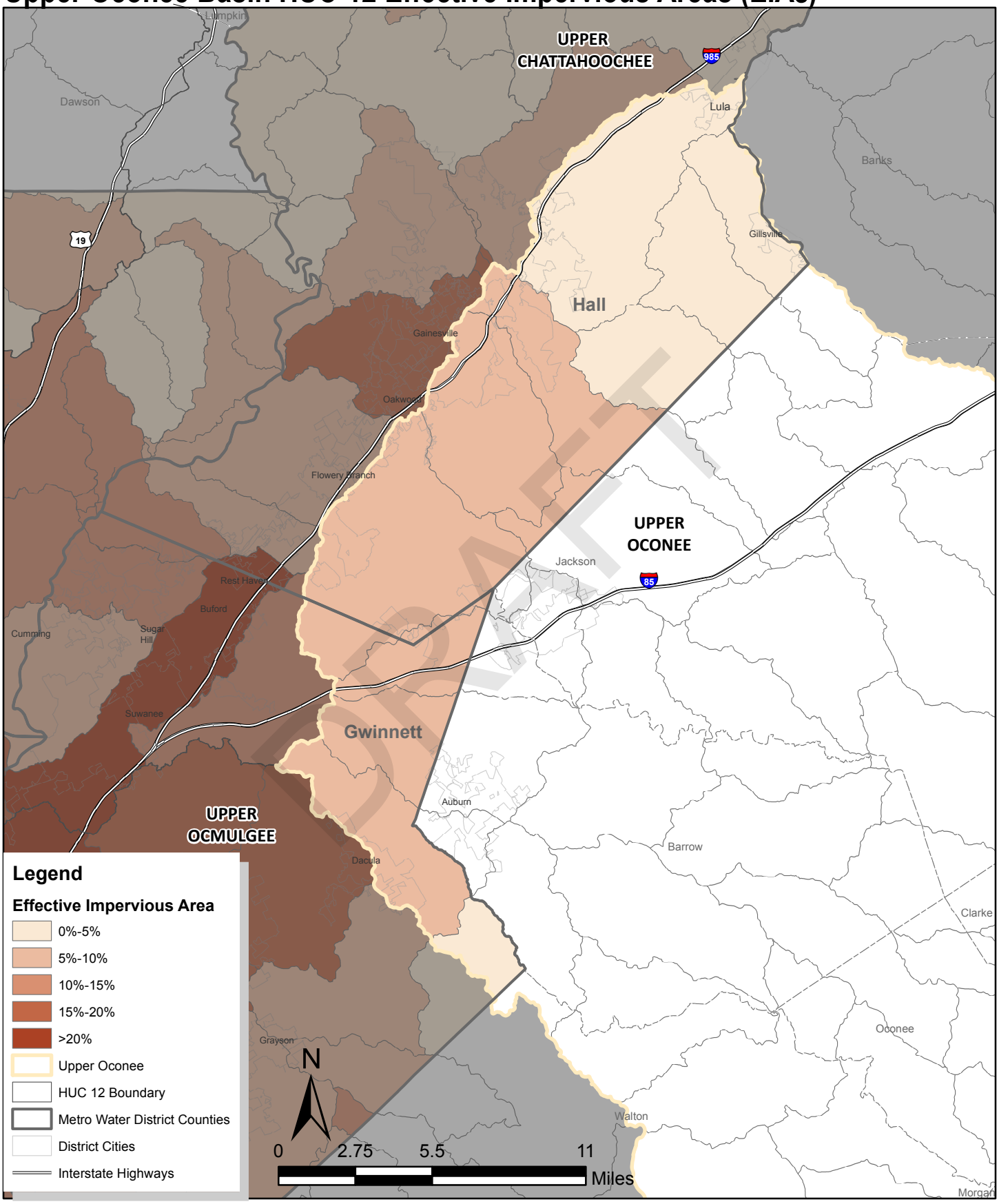

FIGURE OC-6
Upper Oconee Basin 305(b)/303(d) Listed Waters

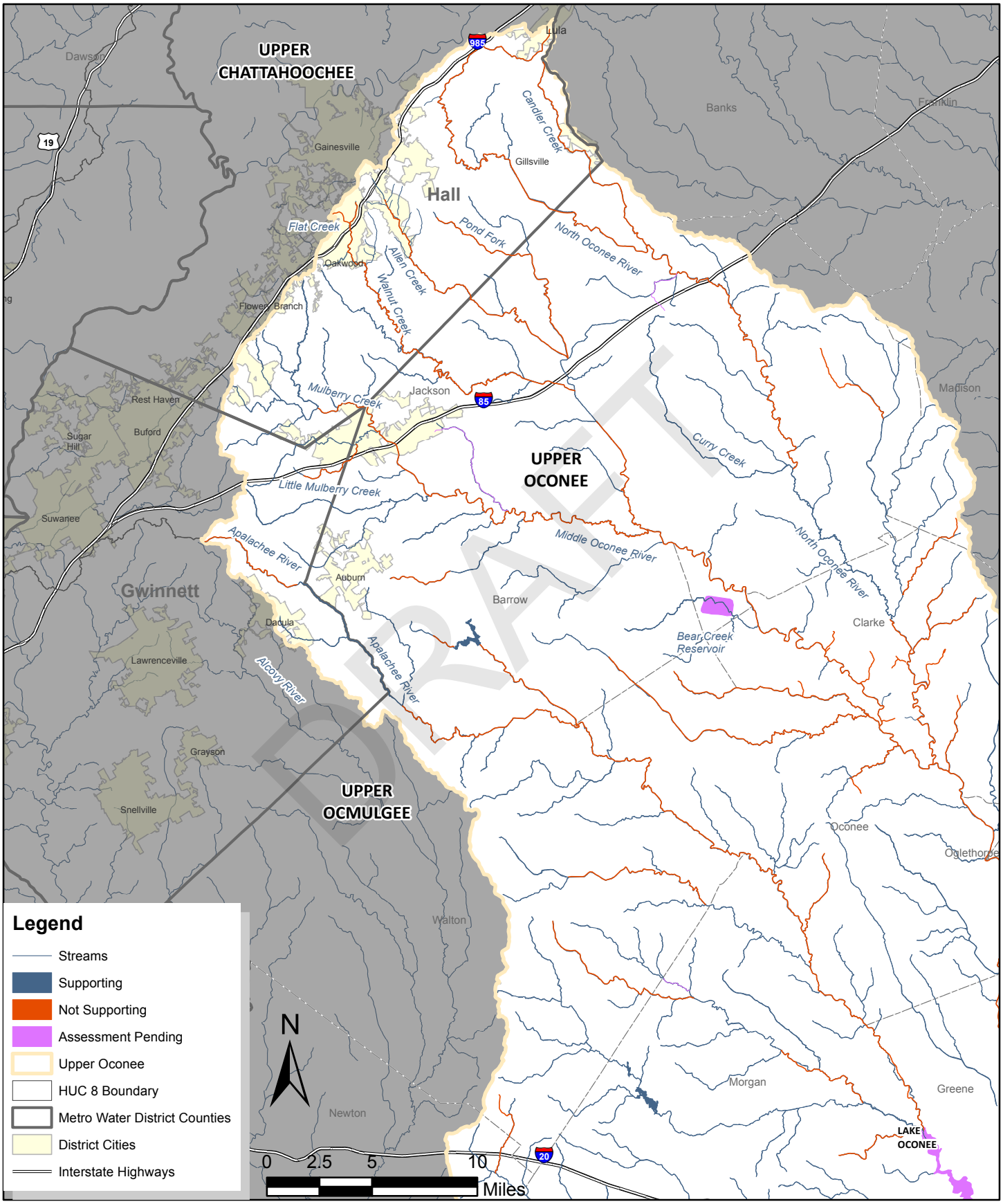

Table OC-6. Upper Oconee River Basin Summary of Impaired Streams

Criterion Violated	Miles of Stream	% of 2014 Assessed Streams
Fecal Coliform Bacteria	70	49
Biota (Macroinvertebrate Community)	59	41
Total Stream Mileage Listed	96 [a]	67
Total Stream Mileage Assessed for Possible Impairment	143	
Total Stream Mileage in Basin	157	

[a] Several streams are listed for violations of more than one parameter; therefore, the total of impaired miles by parameter will not equal the miles of not supporting stream.

Almost 50 percent of the assessed streams in the Upper Oconee River Basin do not meet water quality standards for fecal coliform bacteria as a result of nonpoint source pollution. These bacteria enter the stream from both anthropogenic and non-anthropogenic sources, including sanitary sewer overflows, 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. Just over 40 percent of the streams assessed were found to not be supporting of biota, specifically benthic macroinvertebrates, which typically indicate high sediment loads in streams, which decreases habitat quality. Sediment sources include runoff from construction sites as well as from streambank erosion due to accelerated streamflow velocities from impervious cover associated with urbanization.

Total maximum daily loads (TMDLs) and TMDL Implementation Plans have been developed to help jurisdictions address impaired streams and specific parameters of concern. More information on specific TMDLs in the Upper Oconee River Basin can be found on the Georgia EPD website.

Management Issues and Recommendations

Initial Screening of Priority Areas

Within the Metro Water District, the proposed implementation actions will vary between basins depending on the existing land uses, water quality, stream and waterbody condition and other watershed-specific management issues. The timeframe for implementation will also vary based on a variety of factors such as TMDL listings, presence of source water watersheds and potential for significant development in the future. Priority areas, also known as critical areas per U.S. Environmental Protection Agency guidance, were identified at the District-level by HUC-12 watershed as an initial screening to enable communities to perform more detailed prioritizations on a subwatershed basis. The priority areas were identified at the HUC-12 level in Table OC-7 and were included if it contained a 2014 303(d)-listed stream segment or waterbody, contained a water supply watershed or had an existing EIA greater than 10 percent.

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Table OC-7. Upper Oconee River Basin Initial Screening of Priority Areas Based on HUC-12 Watersheds

Total HUC-12 Watersheds (Upper Oconee River Basin)	Watersheds that include a 303(d)-listed stream (TMDLs)	Water Supply Watersheds [a]	Existing Effective Impervious Cover (EIA > 10%)
12	11	2	0
Percent of Total Watersheds	92%	17%	0%

[a] Water Supply Watersheds represent HUC-12 watersheds that drain to a water supply intake. Many of the HUC-12s do not actually contain any water supply intakes.

Management Issues and Recommended Strategies

Table OC-8 outlines management issues and strategies for the Upper Oconee River Basin within the Metro Water District. These issues and strategies were used to inform and guide the more specific management measures and requirements found in Sections 5, 6 and 7. The recommended strategies presented in Table OC-8 are based on data presented within this River Basin Profile. These strategies are provided to further describe the commonality of causes and potential solutions to the watershed issues. They provide a foundation for guidance, but are not presented here as mandatory requirements.

Table OC-8. Upper Oconee River Basin Management Issues and Recommended Strategies

Management Issue	Description	Recommended Strategies
Source water quality	Source water watershed protection of North Oconee River, Cedar Creek and small water supply watersheds.	• Implement source water protection measures in headwaters of North Oconee River and Cedar Creek. • Implement source water protection measures in headwaters of North Oconee River and Cedar Creek.
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. 0 (0%) HUC-12 watersheds with EIA of > 10 percent. 2% shift from undeveloped to developed land cover (2010 - 2040).	• Manage nonpoint source pollution. • Adopt and enforce the post-construction stormwater control ordinance and use of Georgia Stormwater Management Manual design standards. • Recommend watershed improvement projects, such as stream restoration and streambank stabilization, in areas with failing streambanks to reduce instream sediment load contributions.
Inadequate stormwater controls on existing impervious cover	Much of the development in the basin occurred prior to current Georgia Stormwater Management Manual design standards. Limited resources and cost of maintaining and repairing stormwater infrastructure. Varying local strategies of funding stormwater management.	• 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.
Biota TMDLs	41% of the assessed benthic macroinvertebrate communities are impaired. Biota impairment in this basin are the result of high sediment loads, primarily	• Enforce post-construction stormwater ordinance on new development and seek opportunities to retrofit stormwater controls to maximize water quality and channel protection.

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Table OC-8. Upper Oconee River Basin Management Issues and Recommended Strategies

Management Issue	Description	Recommended Strategies
	associated with existing development with inadequate stormwater controls, which is a concern for drinking water source supplies, biota and recreation.	• Watershed improvement projects, such as stream restoration and streambank stabilization are recommended in areas with failing streambanks to reduce instream sediment load contributions.
Bacteria TMDLs	49% of assessed stream segments in the Upper Oconee River Basin (within the Metro Water District) are listed for fecal coliform.	• 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 as outlined in the Wastewater Management Plan. • Regular maintenance to ensure proper functioning of decentralized systems (such as septic tanks). • Participate in efforts to educate agricultural stakeholders about the importance of implementing Best Management Practices for Georgia Agriculture Manual 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).
Lake Management	Lake Oconee is located downstream from the Metro Water District 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.	• 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.

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. The Plan includes implementation actions related to watershed monitoring and conducting conditions assessments to evaluate implementation success. These implementation actions include long-term ambient trend monitoring (5.F.1) and habitat and biological monitoring (5.F.2), as well as resource-specific implementation actions for TMDL Management (4.H.2). Communities may choose to conduct project-specific monitoring associated with a watershed improvement project, such as biological or geomorphological monitoring to evaluate success.

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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 Oconee 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 USGS 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 streambank stability and habitat improvement based on annual stream cross section surveys and bank erosion monitoring.
- Conduct stream 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 segments over time.
- Track implementation actions by jurisdiction within the basin.
- Track enforcement actions by category and location.
- Track stream 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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