ATTACHMENT 4

Upper Flint River Basin Profile

The Upper Flint River Basin is located in the southern section of the Metro Water District and encompasses about 556 square miles of the Metro Water District, or 11 percent of its total area. This also represents 21 percent of the overall Upper Flint River (Hydrologic Unit Code) HUC-8 Basin, which extends downstream to Macon County in southern Georgia. Portions of 25 cities and 5 counties are within the District portion of the Upper Flint River Basin including Fulton, Clayton, Fayette, Coweta and Henry Counties (Figure UF-1). Larger cities include College Park, Fairburn, Fayetteville, Newnan, Peachtree City, Riverdale, Tyrone and Union City.

Physical and Natural Features

Geography

The Upper Flint River Basin lies entirely within the Piedmont province and includes only the Greenville Slope district. It is characterized by rolling topography that decreases gradually in elevation from about 1,000 feet in the northeast to 600 feet in the southwest. Those flowing to the southwest occupy shallow, open valleys with broad, rounded divides while those flowing to the southeast occupy narrower, deeper valleys with narrow, rounded divides (Clark and Zisa, 1976). The Flint River is entirely within the Piedmont province, which consists of a series of rolling hills and occasional isolated mountains. The Upper Flint River Basin includes portions of the Gainesville Ridge, Greenville Slope, Washington Slope and Winder Slope physiographic districts (Metro Water District, 2002).

Hydrology and Soils

The Upper Flint River Basin originates in Atlanta and drains to all of Fayette County and portions of Clayton, Coweta, Douglas and Henry Counties. It eventually drains to the Gulf of Mexico at Apalachicola Bay in Florida. It is comprised of one 8-digit HUC, three 10-digit HUCs and nineteen 12-digit HUCs, and its main tributaries are Line, Morning, White Oak and Whitewater Creeks. Of the approximately 240 miles of assessed waters in the Upper Flint River Basin, 17 percent are designated solely for drinking water, 18 percent for drinking water and fishing with the remaining 64 percent designated for fishing (Figure UF-2). Stream discharges for the Flint River and its tributaries are recorded by the USGS station 02344500, the Flint River near Griffin. Annual flows range from a low of 9.2 cubic feet per second (cfs) to a high of 3,150 cfs, with a mean of 290 cfs (USGS, 2015). The existing reservoirs in the Upper Flint River Basin are primarily smaller impoundments on tributaries to the Flint River that were developed for drinking 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). While none of the Upper Flint River Basin within the Metro Water District was selected as a priority aquifer for assessment, the Cretaceous Aquifer in Georgia's Coastal Plain includes the southern tip of the Upper Flint River HUC-8 watershed below the fall line. The aquifers in the Piedmont province are in 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 District.

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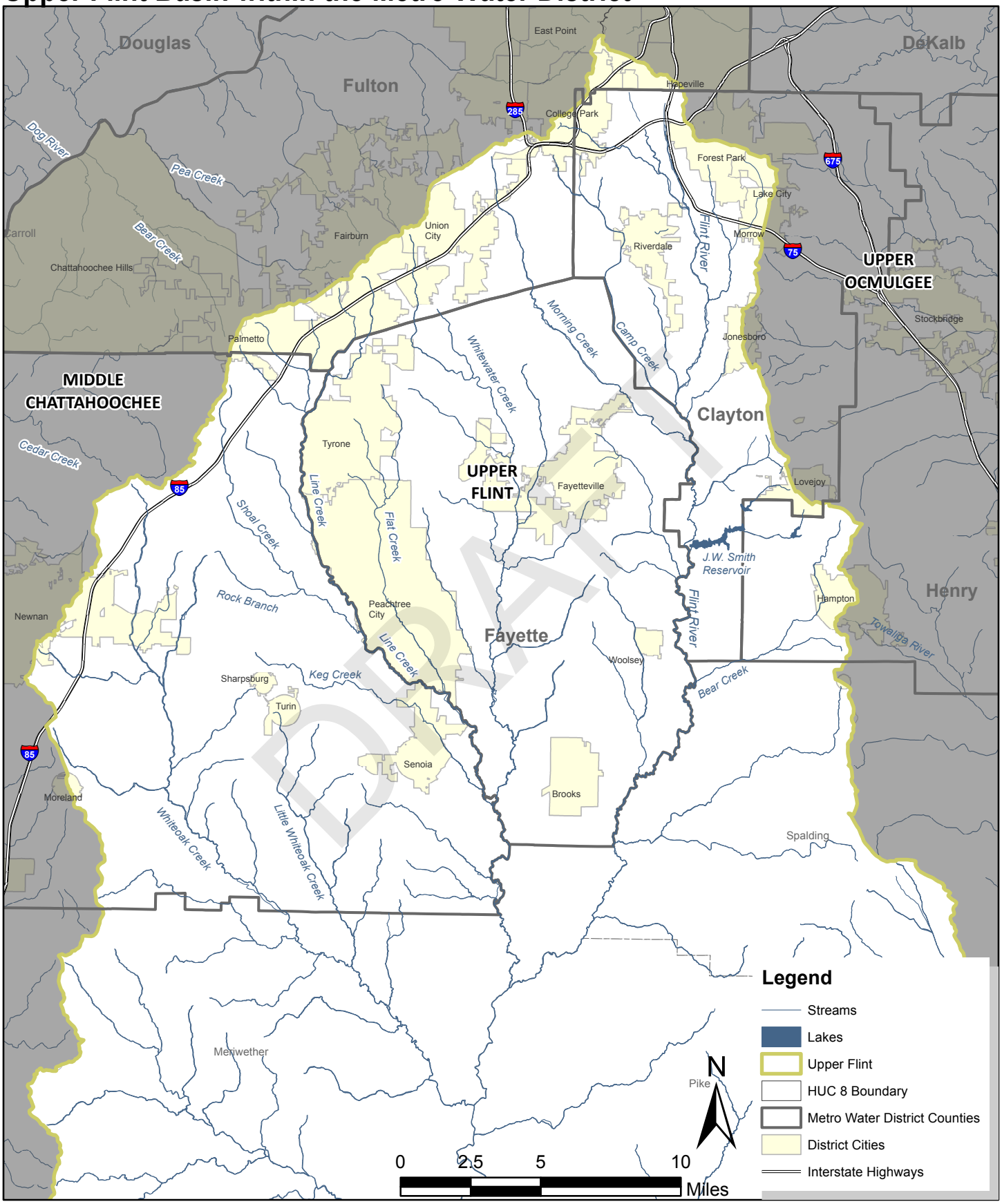
FIGURE UF-1
Upper Flint Basin within the Metro Water District



The Georgia Geologic Survey Hydrologic Atlas 18 database identifies approximately 84 areas, representing about 15 percent of the Metro Water District, likely to contain thick soils considered to be an indicator of significant groundwater recharge areas. Of these, there are approximately 77 square miles, or 14 percent of the total river basin area, within the Upper Flint River Basin (see Table UF-1).

Table UF-1. Groundwater Recharge Areas within the Upper Flint River Basin

Recharge Area Type	County	Square Miles of Recharge Area Type within County
Probable Areas of Thick Soil	Clayton [a]	3
	Coweta [a]	20
	Fayette	45
	Fulton [a]	10
	Henry [a]	0
Total Recharge Area		77 [b]

[a] Portions of Fulton, Clayton, Henry and Coweta Counties overlap the basin boundary.

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

There are three soil associations that describe the soil types in the Upper Flint River Basin: Ashlar-Pacolet-Cecil, Cecil-Madison-Pacolet and the "urban" soils that start in south Fulton County (Table UF-2). The Ashlar-Pacolet-Cecil association was found along the banks of some of the major rivers, particularly Peachtree City and Fayetteville. These soils are variable and less well drained than soils on higher elevations (Thomas and Tate, 1973; USDA, 1976; Thomas, 1982; USDA, 1958). The Cecil-Madison-Pacolet associations were the most abundant associated with moderate rolling hills. 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 UF-2. Major Soil Associations within the Upper Flint River Basin

Soil Association	Significance to Watershed Management
Ashlar-Pacolet-Cecil	Characteristics: Moderately deep and excessively drained. Significance to Watershed Management: Runoff is slow to rapid with moderately rapid permeability.
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.
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.

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,

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watersheds as well as those waters that are designated to meet state drinking water criteria within the Upper Flint River Basin.

Source water assessments were performed for all drinking water supplies within the Upper Flint River Basin as required by the EPA. The source water assessments determined the potential for pollution based on a number of watershed characteristics and assigned a susceptibility ranking to each source. The susceptibility rankings throughout the basin were low for Hortons Creek and Pates Creek and high for Flint River. All other source waters were assigned a susceptibility ranking of medium. These susceptibility rankings indicate the urban and suburban nature of most of the watersheds within the Upper Flint River Basin.

Table UF-4. Upper Flint River Basin Drinking Water Supply Sources

Water Supply Source	Owner/Operator Using Source
Flint River	Clayton County Water Authority Fayette County Water System
Shoal Creek Reservoir	Clayton County Water Authority
J.W. Smith Reservoir	Clayton County Water Authority
Whitewater Creek	City of Fayetteville Fayette County Water System
Lake Kedron (Flat Creek)	Fayette County Water System
Lake Peachtree (Flat Creek)	Fayette County Water System
Lake Horton (Horton Creek)	Fayette County Water System
Lake McIntosh (Line Creek)	Fayette County Water System
Line Creek	Newnan Utilities
White Oak Creek	Newnan Utilities
Hutchin's Lake (Keg Creek)	City of Senoia
Still Branch Creek	City of Griffin (To Coweta County)

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Land Cover/Land Use

The northern extent of the Upper Flint River Basin is traversed by over 46 miles of major transportation corridors such as Interstates 85, 75 and 285, as well as Hartsfield Atlanta International Airport and its supporting businesses (Figure UF-3). The Flint River, Camp Creek and Morning Creek watersheds in southeastern Fulton County and northwestern Clayton County also include a relatively large amount, 15 percent, of high or medium density residential lands. With the exception of some limited pockets of denser development around Fayetteville, Newnan and Peachtree City, the southern two-thirds of the Upper Flint River Basin are dominated by low density residential and undeveloped lands. Overall, the river basin was almost equally split between developed and undeveloped lands in 2010 with forested/open space representing 28 percent of the total acreage (Table UF-5, Figure UF-3).

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 UF-3 lists the 16 protected aquatic or semi-aquatic species potentially found within the counties of the Upper Flint River Basin of the District.

Table UF-3. Aquatic and Semi-Aquatic Protected Species in the Upper Flint River Basin

Fauna Type	Common Name	Status	Clayton	Coweta	Fayette	Fulton	Henry
Bird	Bald Eagle	US					X
Bird	Bachman's Sparrow	GA				X	
Bird	Peregrine Falcon	GA				X	
Fish	Bluestripe Shiner	GA				X	
Fish	Highscale Shiner	GA	X	X	X	X	
Fish	Cherokee Darter	US				X	
Invertebrates	Chattahoochee Crayfish	GA				X	
Invertebrates	Delicate Spike	GA		X		X	
Invertebrates	Inflated Spike	GA		X			
Invertebrates	Rayed Creekshell	GA		X			
Invertebrates	Southern Creekmussel	GA		X	X		
Invertebrates	Gulf Moccasinshell	US		X	X	X	
Invertebrates	Oval Pigtoe	US		X			
Invertebrates	Purple Bankclimber	US		X			
Invertebrates	Shinyrayed Pocketbook	US		X	X	X	
Invertebrates	Southern Elktoe	GA		X			

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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 primary trout streams or secondary trout streams located within the Metro Water District of the Upper Flint River Basin.

Land Use and Impaired Waterbodies Characteristics

Drinking Water Supply

As described in the Water Supply and Water Conservation Plan, there are 12 individual water supply sources operated by six separate entities (Table UF-4). Figure UF-2 illustrates the corresponding water supply

FIGURE UF-2
Upper Flint Basin Drinking Water Stream Segments

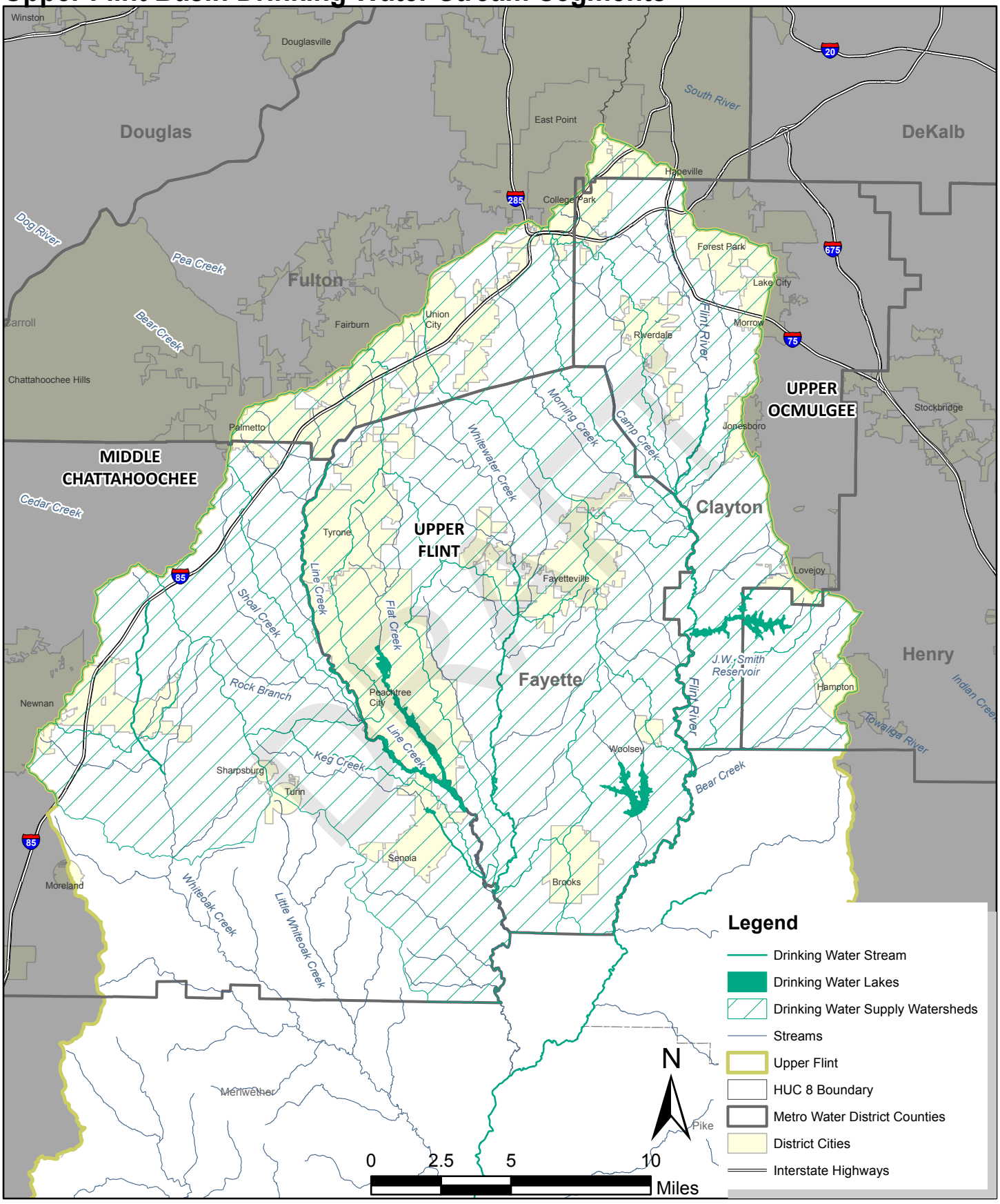

FIGURE UF-3
Upper Flint River Basin 2012 Land Cover

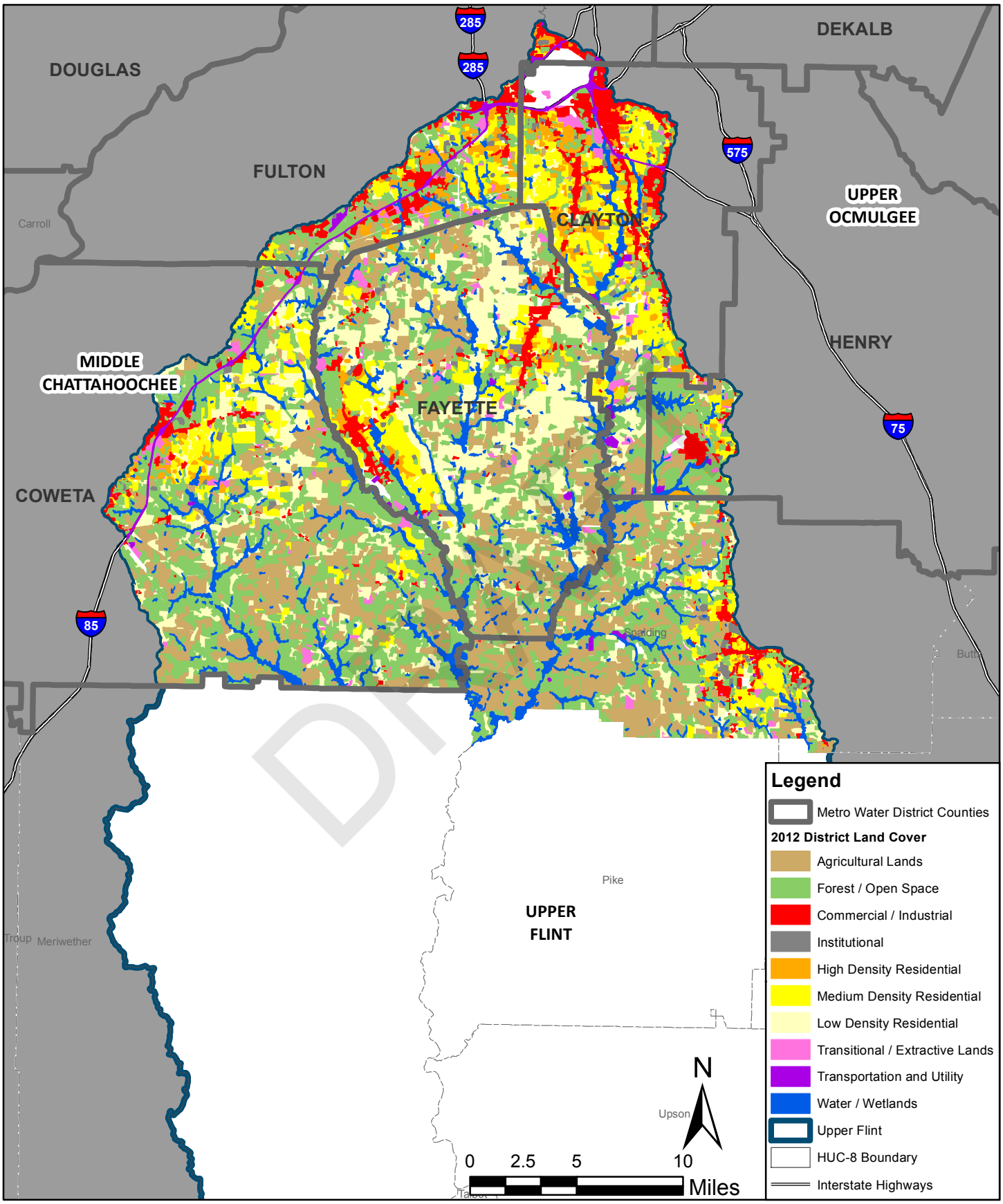

Table UF-5. Upper Flint River Basin Land Cover / Land Use within the Metro Water District

Land Cover/Land Use	2010 Existing (%)	2040 Future (%)
Agricultural Lands	16	
Commercial	6	
Forest/Open Space	28	
High Density Residential	4	
Industrial/Institutional	1	
Low Density Residential	21	
Medium Density Residential	11	
Transitional/Extractive Lands	3	
Transportation and Utilities	2	
Water/Wetlands	7	
Undeveloped	51	48
Developed	49	52

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 3 percent of the current forested and agricultural land will be developed in the next 25 years resulting in the Upper Flint River Basin being 52 percent developed (ARC, 2012). The relative percent distribution and general character of these growth areas are illustrated in Figure UF-4. Much of this growth is anticipated to occur in the northern portion of the basin in south Fulton and North Clayton Counties while infill development and redevelopment resulting in increased density is expected to continue in Peachtree City, Newnan and north Fayette County.

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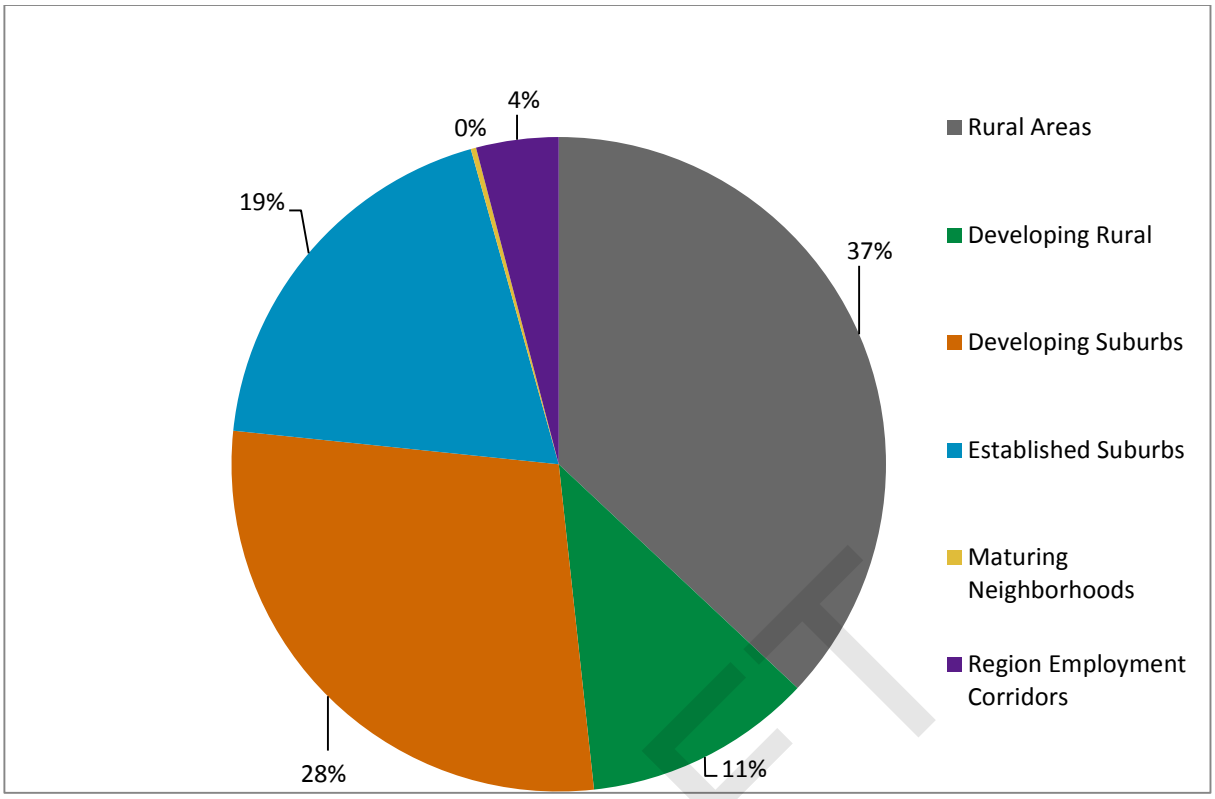

Figure UF-4. Upper Flint River Basin Future Growth Area Distribution

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

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Effective Impervious Areas

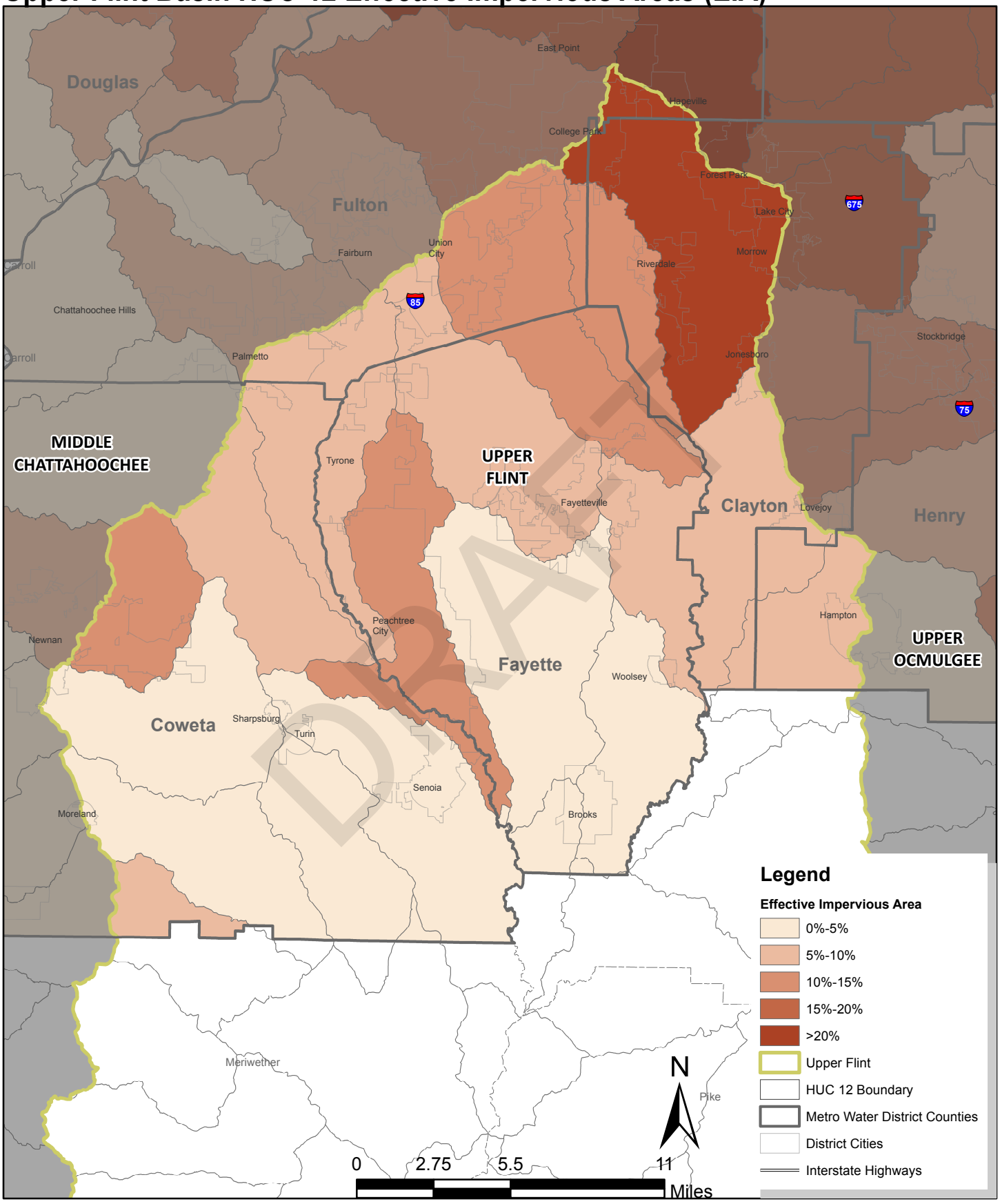
The level of watershed imperviousness has long been linked to impacts on changes in hydrologic regimes that lead to increased intensity and frequency of peak stormwater flows, which affect stream stability, water quality and aquatic habitat and biotic community integrity. In general, the most sensitive 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).

Of the 19 HUC-12s within the Metro Water District portion of Upper Flint River Basin, six had an effective impervious area (EIA) greater than 10 percent, primarily those HUCs that included the Hartsfield Atlanta International Airport and surrounding area or that straddle a major transportation corridor such as Interstates 85 or 285 or the HUC is located within the more densely urbanized area of local cities like Newnan and Peachtree City. Figure UF-5 illustrates that the HUC-12 with the headwaters (Mud Creek and Jester Creek) of the Upper Flint River is the only watershed to have an EIA greater than 20 percent. Attachment 10 lists HUC-12 watershed numbers and descriptions.

Combined-sewer Overflow Areas

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

FIGURE UF-5
Upper Flint Basin HUC-12 Effective Impervious Areas (EIA)



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 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.

Of the 240 miles of streams assessed in the Metro Water District portion of the Upper Flint River Basin, 124 miles, or 52 percent, did not meet state water quality standards based on the 2014 303(d) list. The streams listed as not supporting are summarized in Table UF-6 by parameter and graphically shown in Figure UF-6. This includes new fecal coliform bacteria listings in Fayette County based on 2012 data and new biota (fish) listings in Clayton, Fulton and Fayette Counties based on 2008 Georgia Department of Natural Resources Water Resources Division River Basin Monitoring Data. The dissolved oxygen listing is for Flat Creek from Lake Peachtree to Line Creek in Peachtree City, which can have low levels of dissolved oxygen during drought conditions and periods of low flow. Several streams are listed for violations of more than one parameter; therefore, the total impaired miles by parameter will not equal the total miles of not supporting streams.

Table UF-6. Upper Flint River Basin Summary of Impaired Streams

Criterion Violated	Miles of Stream	% of 2014 Assessed Streams
Fecal Coliform Bacteria	104	43
Biota (Fish Community)	29	12
Biota (Macroinvertebrate Community)	8	3
Dissolved Oxygen	4	2
Total Stream Mileage Listed	124	52
Total Stream Mileage Assessed for Possible Impairment	240	
Total Stream Mileage in Basin	397	

The majority of assessed streams (43 percent) in the Upper Flint River Basin does 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. Biota listings typically indicate high sediment loads in streams, which decreases 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.

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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 Flint River Basin can be found on the Georgia EPD website.

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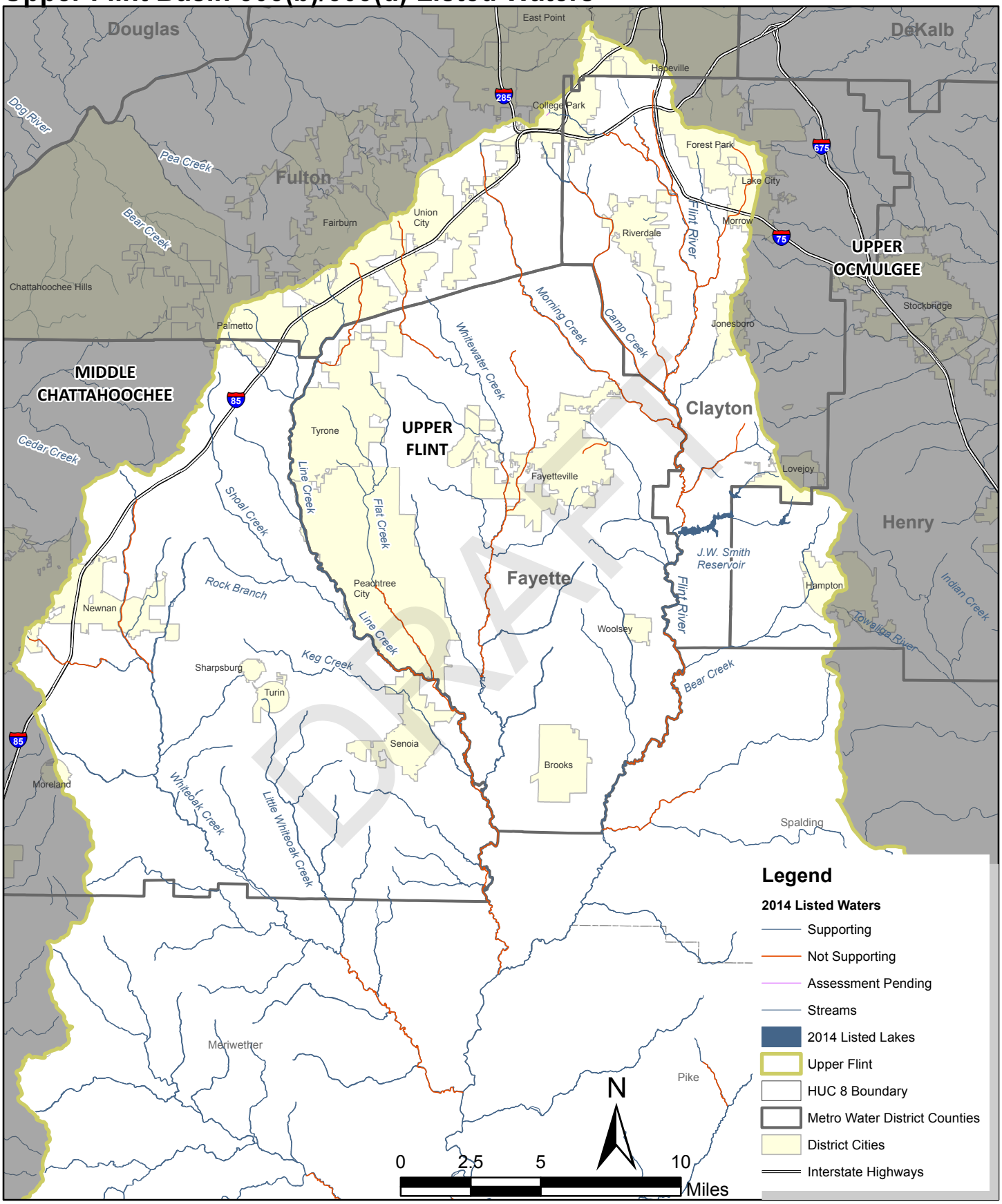
FIGURE UF-6
Upper Flint Basin 305(b)/303(d) Listed Waters



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 EPA 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 UF-7, if they include a stream or waterbody with a TMDL, water supply watersheds or existing EIA greater than 10 percent.

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

Total HUC-12 Watersheds (Upper Flint River Basin)	Watersheds that Include a 303(d)-listed Segment (TMDL)	Water Supply Watersheds [a]	Existing Effective Impervious Cover (EIA > 10%)
19	13	16	6
Percent of Total Watersheds	68%	84%	32%

[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 UF-8 outlines management issues and strategies for the Upper Flint 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 UF-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 UF-8. Upper Flint River Basin Management Issues and Recommended Strategies

Management Issue	Description	Recommended Strategies
Source water quality	Source water watershed protection of small water supply watersheds.	• Implement source water protection measures in all water supply subwatersheds. • Continue collaborative efforts in small drinking water supply watersheds, such as Shoal Creek, Line Creek, Flat Creek and White Oak Creek, to protect the viability of these supplies.
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. 6 (32%) HUC-12 watersheds with EIA of > 10%. 3% 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. • Watershed improvement projects, such as stream restoration and streambank stabilization, are recommended in areas with failing stream banks to reduce instream sediment load contributions.

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Table UF-8. Upper Flint River Basin Management Issues and Recommended Strategies

Management Issue	Description	Recommended Strategies
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	12% of the assessed streams have impaired fish communities and 3% have impaired benthic macroinvertebrate communities. Biota impairment in this basin are 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.	• 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	43% of assessed stream segments in the Flint River Basin (within the Metro Water District) are listed for fecal coliform bacteria.	• 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. • Perform regular maintenance to ensure proper functioning of decentralized systems (such as septic tanks).
Lake management	Within the basin, there are 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.

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Table UF-8. Upper Flint River Basin Management Issues and Recommended Strategies

Management Issue	Description	Recommended Strategies
Flint River Flows	Due to upstream impacts, the Flint River has significantly reduced or no flow during times of less rainfall. This has an impact not only on stream and ecological health, but also water availability, recreation opportunities, and other beneficial downstream uses.	• Partner with local jurisdictions and other stakeholders to develop projects and specific strategies for addressing • Look to green infrastructure and other multiple benefit solutions • Apply an integrated water management approach to address issues in the Upper Flint while also increasing resiliency in the system.

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 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.

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 Flint 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

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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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