

SUMMARY: The Council's vision and goals for the Upper Flint Water Planning Region guided the Council in the development of this Water Development and Conservation Plan.

Section 1. Introduction

1.1. The Significance of Water Resources in Georgia

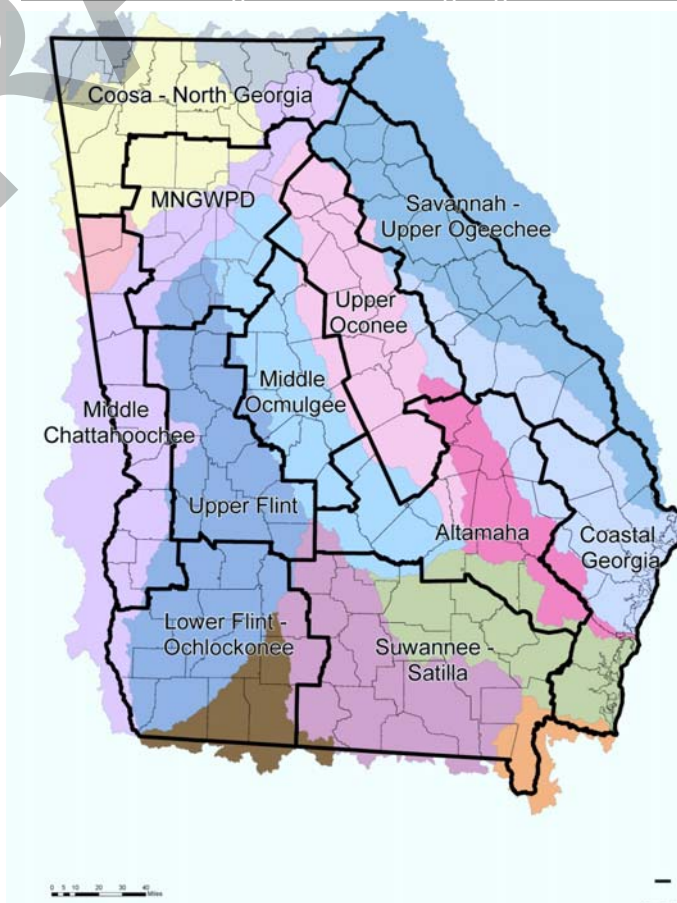
Of all Georgia's natural resources, none is more important to the future of our state than water. The wise use and management of water is critical to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens.

Georgia has abundant water resources, with fourteen major river systems and multiple groundwater aquifer systems. These waters are shared natural resources. Streams and rivers run through many political jurisdictions. The rain that falls in one region of Georgia may replenish the aquifers used by communities many miles away. While water in Georgia is abundant, it is not an unlimited resource. It must be carefully managed to meet long-term water needs.

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

Therefore, the State Water Plan calls for the preparation of ten regional water development and conservation plans (Regional Water Plans) for the water planning regions, outside of the Metropolitan Atlanta area, depicted in Figure 1-1. (The

FIGURE 1-1: Georgia Water Planning Regions



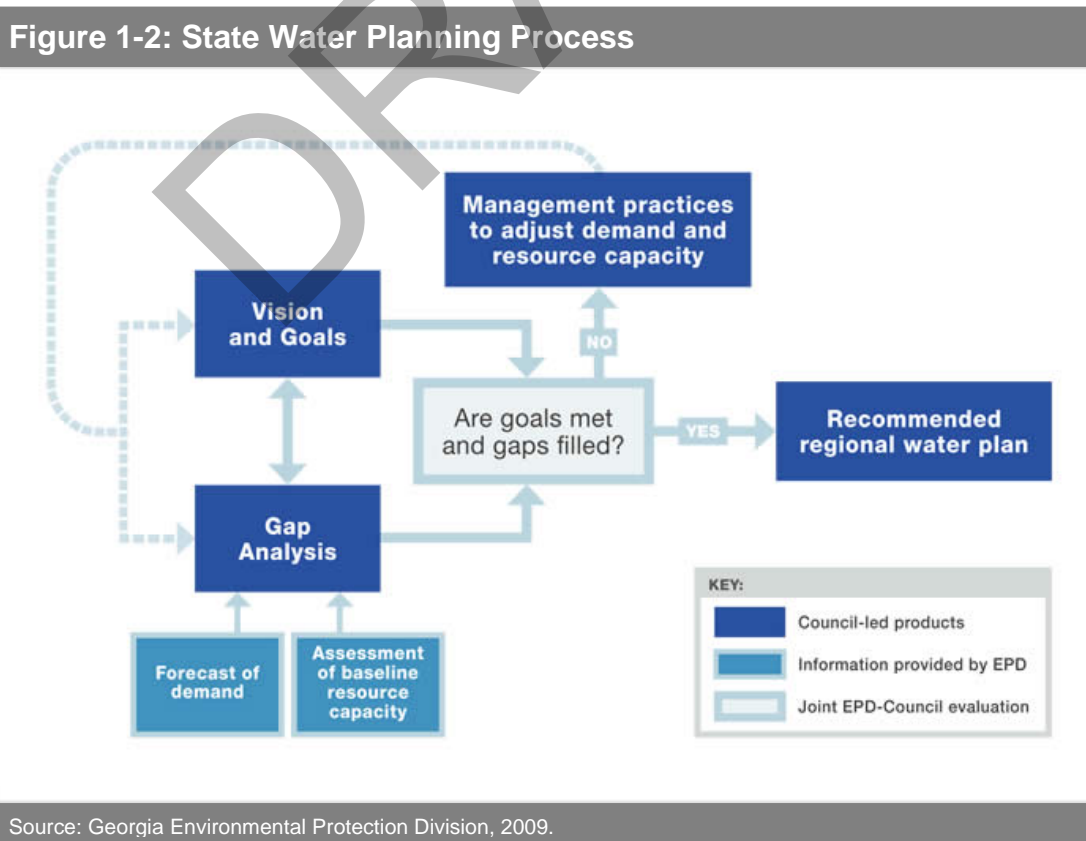
Metropolitan North Georgia Water Planning District (MNGWPD) has a separate water planning process created by the Metropolitan North Georgia Water Planning District Act of 2001.)

This Regional Water Plan prepared for the Upper Flint Water Planning Region by the Upper Flint Regional Water Planning Council describes the regionally appropriate water management practices to be employed in Georgia's Upper Flint Water Planning Region over the next 40 years.

1.2. State and Regional Water Planning Process

The State Water Plan calls for the preparation of regional water plans designed to manage water resources in a sustainable manner through 2050. It establishes ten regional water planning councils and provides a framework for regional planning consistent with the policy statement that "Georgia manages water resources in a sustainable manner to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens."

This regional water plan has been being prepared following the consensus-based planning process illustrated in Figure 1-2. As detailed in the Upper Flint Water





Planning Council's Memorandum of Understanding with the Georgia Environmental Protection Division and the Department of Community Affairs, as well as the Council's Public Involvement Plan, the process required and benefited from input of other regional water planning councils, local governments, and the public.¹

The development of this plan was supported by the work of several committees created by the Upper Flint Water Planning Council, including a Water Quantity Committee, a Water Quality Committee, and a Plan Review Committee. These committees met between Council meetings, reviewed materials, and developed recommendations regarding the plan for the full Council. Also, the Upper Flint Water Planning Council coordinated closely with its neighboring councils, especially the Lower Flint-Ochlockonee and Middle Chattahoochee Water Planning Councils, in developing this plan through multiple joint meetings to discuss shared resource concerns.

Statewide Priorities

[Initial text to be provided by EPD]

1.1—State and Regional Water Planning Process

[Initial text to be provided by EPD and figure 1-2 planning process]

1.1.1.3. The Upper Flint Regional Vision and Goals

The Upper Flint Regional Water Council adopted the following statement to describe its vision for the future of the planning region's water resources:

The Upper Flint Regional Water Council's purpose is to provide guidance, leadership and education on water resource utilization within the region. Through cooperation among stakeholders, this plan will assist the Council's efforts to manage the region's water resources in a sustainable manner, be supportive of public health and natural ecosystems, support the State's economy and enhance the quality of life for its citizens

The Council adopted the following goals to support its vision:

1. Lead the development and implementation of water resource policy in this region and work together with the state and federal government and with the other regional councils to ensure that the welfare and needs of our region are met.

¹ See the Memorandum of Agreement and the Public Participation Technical Memorandum available on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php



1. Introduction

2. Enhance the public's understanding of water resources and provide stakeholders with an opportunity for input into regional water policy.
3. Maintain and strive to improve the quality and quantity of our water resources in order to protect natural ecosystems and public health.
4. Manage water resources sustainably through the three "C's" – conserving, capturing and controlling water – in order to provide for the needs of all water users in the region (agriculture, utilities, residential, industry, forestry, and recreation).
5. Sustain the region's aquifers and surface waters in a way that will continue to support the economic activities of the Upper Flint Region and the economy of the State of Georgia.
6. Ensure that actions taken by this Council do not impede the agriculture and forestry based economy of this region.

The regional vision and goals were used by the Council to develop this plan and to guide the selection of water management practices, which are discussed in Section 6.

DRAFT



SUMMARY: The Upper Flint region is largely rural, and agriculture is the largest sector of the economy and water use in the region. Existing State policy concerning agricultural water use in the Flint River Basin is an important component of water resource management in the region.

Section 2. The Upper Flint Water Planning Region

2.1. History and Geography

The Upper Flint Water Planning Region encompasses over 4,355 square miles in west-central Georgia and includes 13 counties (Crisp, Dooly, Macon, Marion, Meriwether, Pike, Schley, Spalding, Sumter, Talbot, Taylor, Upson, and Webster) as well as 48 towns and cities partially or fully within these counties (Figure 2-1). Major regional river basins include the Flint, Chattahoochee and small areas within both the Ocmulgee and Altamaha River Basins.

The small cities and towns in the Upper Flint Region developed around train depots in the late 19th century. Those cities and towns developed into industrial centers which have experienced cyclical growth and decline in the past century. From 1985 to 2005, urban land use increased from 1.4% to 5.2% of the region. This trend signals a greater presence of industrial and commercial growth in the region and the spillover influence of growth in the Metro Atlanta area. Agriculture is the leading economic sector, water user, and land area cover in the region. Agricultural development in west Georgia expanded in the 19th century with the development of the cotton gin, and major crop diversification began in the 1930's due to farm mechanization advances, New Deal policies, and cotton yield reductions caused by the Boll Weevil. Widespread use of irrigation in the region began to develop in the 1970's.

2.2. Characteristics of the Region

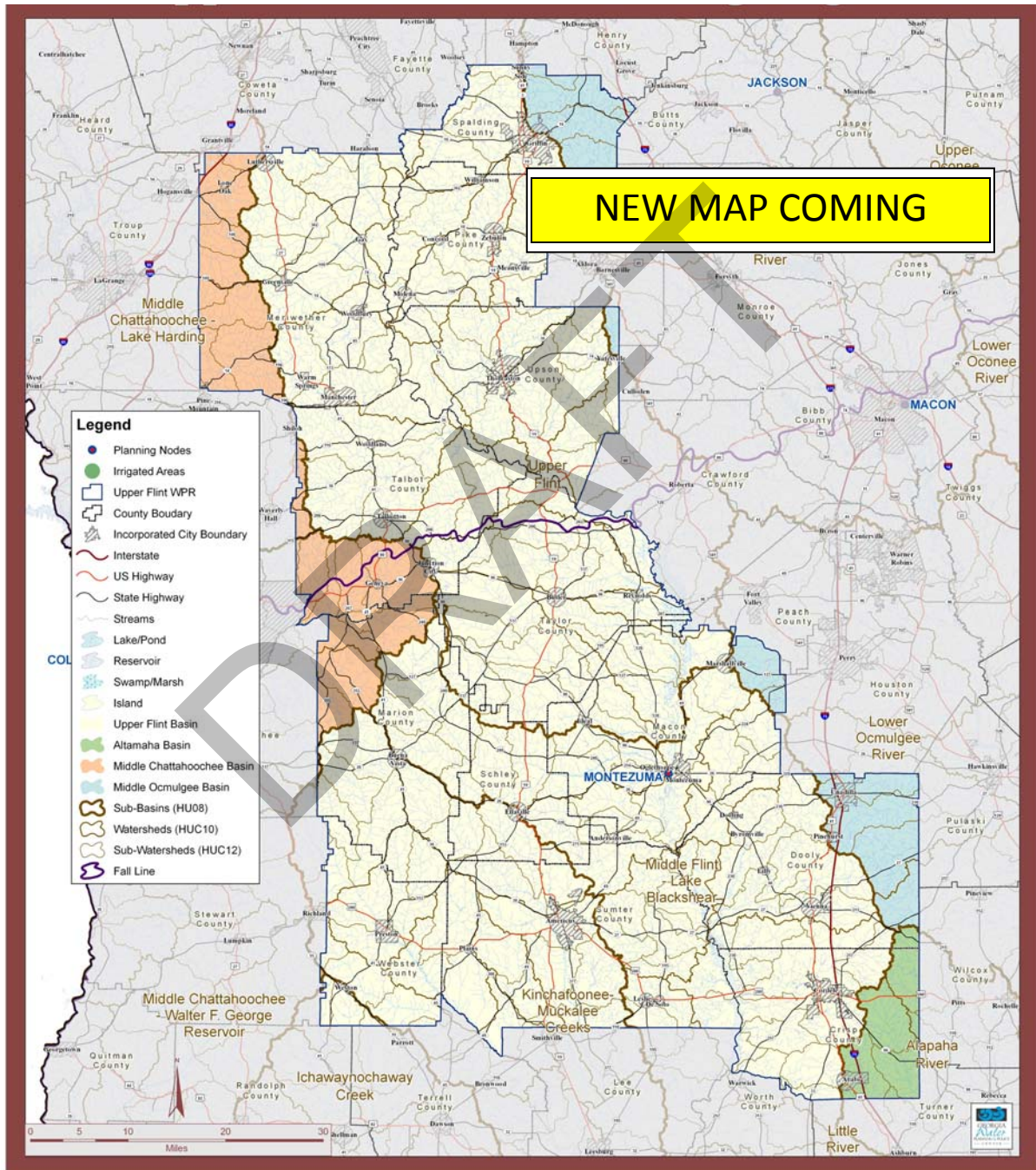
The Upper Flint Region is largely rural, with 29% of the total land area in row crops and pasture and an additional 47% in forest. As noted above, urban land area cover has increased in recent years, and it now accounts for 5% of the region. Land use in the region is illustrated in Figure 2-2.

Natural features in the region provide habitat for an abundance of flora and fauna as well as areas critical for recharging the region's aquifers. The region is bisected by the fall line splitting the piedmont and the coastal plain. At the fall line, metamorphic rock and clayey soils give way to sedimentary rock and sandy soils. The coastal plain physiographic region, south of the fall line "is underlain by relatively soft, weakly consolidated rocks and unconsolidated sediments deposited by the sea or streams when the shoreline was at or near the fall line between 80 and 100 million years ago" (Flint River Water Development and Conservation Plan, March 2006). Aquifers in the

2. The Upper Flint Water Planning Region

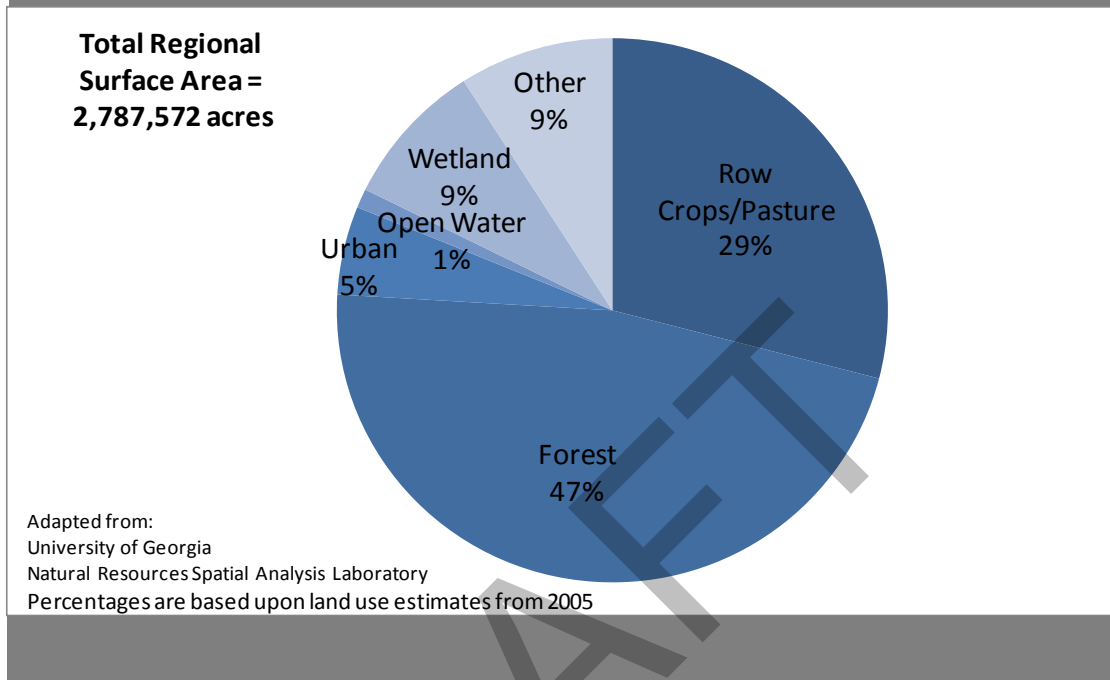
region include the Crystalline Rock aquifers in the piedmont and the Cretaceous, Clayton, Claiborne, and Floridan aquifer systems in the Coastal Plain.

Figure 2-1: Upper Flint Water Planning Region



2. The Upper Flint Water Planning Region

Figure 2-2: Upper Flint Region Land Use



2.3. Local Policy Context

The Upper Flint Region is subject to several overlapping layers of water resource management by state and federal agencies. State permitting programs for water withdrawals and wastewater dischargers affect all water users (including O.C.G.A. §§12-5-32, 12-5-30(a), 12-5-30(b), 12-5-96, 12-5-105; DNR Rules 391-3-6-.06, 391-3-6-.07, 391-3-2-.03). In this region, the following laws, regulations, and programs are also directly relevant to water management:

- The Flint River Water Development and Conservation Plan of 2006 serves as guidance for the Georgia Environmental Protection Division (EPD) ~~is the basis for agricultural water use permit issuance in the Flint River Basin by the Georgia Environmental Protection Division (EPD)~~ and for implementation of the Flint River Drought Protection Act.
- The Flint River Drought Protection Act (O.C.G.A. §12-5-540) and its implementing rules (DNR Rule 391-3-28) provide for demand management through agricultural irrigation suspension in times of drought.
- Federal Energy Regulatory Commission (FERC) licensing requirements for privately-owned hydroelectric impoundments apply to Lake Blackshear in the Upper Flint Region.

- Under the federal Endangered Species Act, four species of freshwater mussels have been listed as endangered or threatened in the Upper Flint Region:

Endangered: Shinyrayed pocketbook, Gulf moccasinshell, Oval pigtoe

Threatened: Purple bankclimber

The Endangered Species Act prohibits takings of these species and sets requirements for the protection of the species and their critical habitats.

- The U.S. Army Corps of Engineers (USACOE) operates five federal reservoir projects on the Chattahoochee River (Lake Sidney Lanier, West Point Lake, Walter F. George Lake, George W. Andrews Lake, and Lake Seminole). The operation of these projects affects the ~~Upper Flint in the~~ Upper Flint water planning region that are within the Chattahoochee Basin, ~~but and it also in that affects the region – the management of these reservoirs is as~~ a key component of water management in the Apalachicola-Chattahoochee-Flint (ACF) System as a whole. The Master Water Control Manual for the ACF is Revised Interim Operating Plan for the Chattahoochee Basin is currently being revised by the USACOE.

Additionally, the ACF system is the subject of protracted litigation over the management and allocation of water resources among Florida, Georgia, and Alabama and other interested parties. This litigation is currently subject to a 2009 ruling that gave the states until 2012 to resolve water sharing disputes or revert to 1970's allocations for water withdrawals from Lake Lanier. As the states have not resolved these issues, this plan is based on current conditions and will be revised as appropriate in the future to reflect any final agreements reached by the three states. The Council notes that plan revisions may also be necessary after the USACOE's revision of the Operating Plan for the ACF.

With regard to water quality regulation, the U.S. Environmental Protection Agency (EPA) recently promulgated ~~is currently developing~~ nutrient standards for free flowing streams and lakes in Florida as a result of a federal lawsuit under the Clean Water Act. ~~If promulgated as proposed, t~~ These criteria are currently subject to legal challenge, but they are expected to ~~–will~~ require increased control of nutrients in Georgia in order to meet downstream standards. These new nutrient standards could have substantial implications for water quality management in this region and other regions with river systems that cross into Florida.



*SUMMARY: This section assesses the **current** use, capacity, and condition of water resources in the Upper Flint region. Gaps that occur between resource capacities and current demands for water and wastewater assimilation are identified.*

Section 3. Current Assessment Water Resources of the Upper Flint Region

3.1. Major Water Uses in the Region

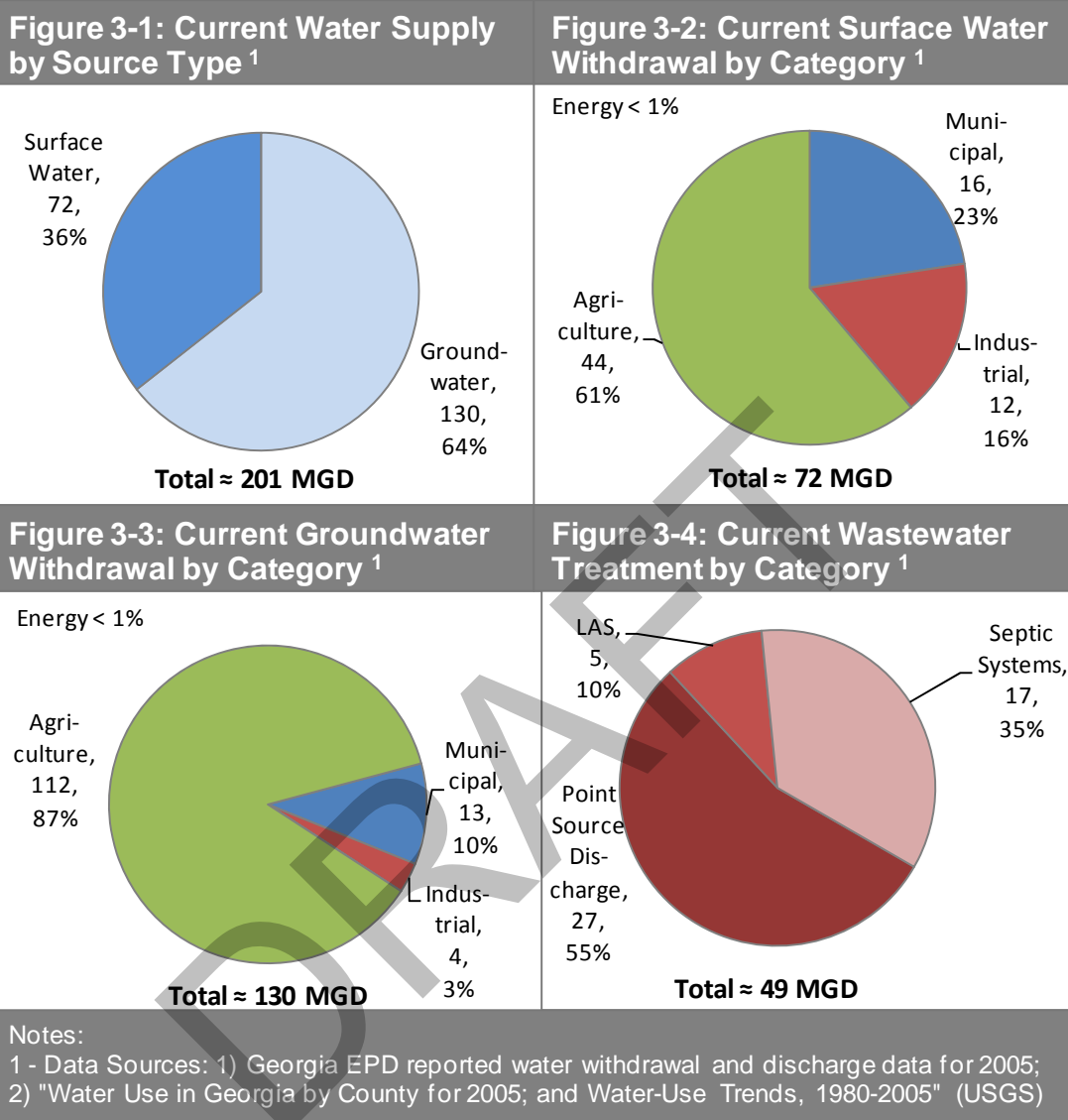
Current water use information for this region was compiled as a part of the development of water use forecasts for major categories of water use, including:

- **Municipal** water use is water withdrawn by public and private water supplier and delivered for a variety of uses. Water-using industries were compiled separately in the “industrial” category.
- **Industrial** water use includes fabrication, processing, washing, and cooling for facilities that manufacture products, including steel, chemical and allied products, paper, and mining.
- **Energy** production uses water to generate electricity, mainly for cooling purposes at thermoelectric plants. Hydroelectric energy uses water to produce energy, but because this use is nonconsumptive, hydroelectric water use is not included in the forecasts.
- **Agriculture** uses water to irrigate row and orchard crops as well as most vegetable and specialty crops that cover more than 95% of Georgia's irrigated land. Nursery water use estimates are also included. Animal operations and golf courses with agricultural water use permits are not included in the forecasts, but estimates of current use ~~are available and provided in Appendix X-~~were considered.¹

As shown in Figure 3-1, groundwater is the predominant source of water in the Upper Flint water planning region. The leading use of both surface water and groundwater is agriculture, as shown Figures 3-2 and 3-3. The leading method for treating wastewater is by point source discharge treatment facilities, as shown in Figure 3-4.

¹ Estimates of current water use for animal operations and golf course are included in the supplemental materials provided on the Upper Flint Water Planning Council website:
http://www.upperflint.org/pages/our_plan/index.php

3. Current Assessment Water Resources of the Upper Flint Region



For planning purposes, it is important to understand the amount of water that is not returned to the hydrologic system after it is used. Consumptive use is the difference between the total amount of water withdrawn from a defined hydrologic system and the total amount of the withdrawn water that is returned to the same hydrologic system. In this planning process, on-site sewage treatment and land application systems are treated as 100 percent consumptive. Similarly, agricultural water use is treated as 100 percent consumptive. While water may be returned to the hydrologic system from these treatment methods and from irrigated farm land, it is not returned within a timeframe that allows for it to offset the impacts of related withdrawals.



3.2. Resource Assessments

For this planning process, the Georgia Environmental Protection Division (GAEPD) developed three resource assessments for the state's water resources: **surface water availability, groundwater availability, and surface water quality**. These assessments estimated the capacity of streams and aquifers to meet water consumption demands and of streams to meet wastewater discharge demands, both within sustainability criteria described by GAEPD. The assessments were conducted on a resource basis (river basins and aquifers). The results of these assessments for **current** conditions are summarized in this section, as they relate to the Upper Flint water planning region. Section 5 describes the **future** conditions of these resources, as projected by the assessment models. Full details of each resource assessment can be found at the following website: http://www.georgiawaterplanning.org/pages/resource_assessments/index.php

3.2.1. Surface Water Availability

The surface water availability assessment determined the flow response of surface water streams to meeting current and forecasted future municipal, industrial, agricultural, and thermal power water consumptive uses. Flow responses were evaluated at selected points to determine the frequency and magnitude with which consumptive use caused the resulting stream flows to fall below sustainability criteria for flows established by GAEPD. The points of evaluation occurred at planning nodes, which are located at stream gages where the effect on stream flows of cumulative upstream consumptive uses of water (i.e., withdrawals minus returns) and authorized reservoir operations can be evaluated. Critical inputs for the model include: desired flow of the river system, expected return of treated wastewater to the system, water supply demands, and desired reliability of the water supply.

In unregulated portions of a basin, the **sustainability criteria** established by GAEPD for flows are monthly 7Q10 (lowest seven day average flow in a ten-year period) or natural inflow, whichever is lower. In regulated portions of a basin, the sustainability criteria for flows are set only where an explicit flow requirement is specified, such as by the U.S. Army Corps of Engineers. Otherwise, in regulated nodes, the ability to meet demands is evaluated relative to the availability of storage to meet demands and any downstream flow criteria.

Most of the Upper Flint water planning region occurs within the Flint River Basin, which has two unregulated nodes: Montezuma and Bainbridge. Montezuma is upstream of the lower boundary of the Upper Flint water planning region. Bainbridge is located in the Lower Flint-Ochlockonee water planning region, but in the Upper Flint water planning region, all of Webster and Sumter Counties and portions of Marion, Macon, Dooly, Schley, and Crisp Counties occur ~~within~~ in the region of the Bainbridge planning node.²

² Planning nodes are indicated on Figure 2-1. ~~A map of the planning nodes is provided in Appendix X.~~

The resource assessment evaluated how water use (and reservoir operation, where applicable) would impact water availability at the nodes if these use levels were held constant over the 1939 to 2007 period of record. It identifies the times at which a **shortfall** occurs between the resource capacity and demand. The period of record represents the longest and most complete range of historical stream flow data available in Georgia, and it was selected in order to provide a representation of the range of stream hydrology likely to be experienced throughout the planning horizon.

The results in this section concern current conditions. Current water use data used in the model was based on observed withdrawal data over the 2002 to 2007 time period. Reservoir operation data used in the model, where applicable, was that which is currently in effect for the major reservoirs.

Given **current** water use in the Flint River Basin, the model indicated that flows would only fall below the sustainability criteria on two days in the period of record (25,202 days) at Montezuma. At Bainbridge, however, the shortfall was much larger. Modeled flows fell below the sustainability criteria on 3,276 days in the period of record (13% of the time). The average shortfall on those days was 352 cfs (227 MGD). The maximum shortfall (which occurred on one day) was 1,376 cfs (889 MGD).

The shortfall at Bainbridge is created by consumptive water use in-measured at the Bainbridge node and by the effects of modeled diversion for storage upstream in the Montezuma node. A more complete discussion of these model assumptions is included in the supplemental materials provided on the Upper Flint Water Planning Council website.³ ~~For a more complete discussion of this model assumptions, see Appendix X.~~—The Bainbridge node results are affected by the use of both surface water and groundwater. Groundwater use with an impact on the Bainbridge node occurs in Subarea 4 of the Dougherty Plain of the Upper Floridan Aquifer, where interconnection with the surface water system is high. Subarea 4 includes the Flint River Basin south of Dooly County, part of the lower Chattahoochee River Basin, and a narrow strip on the eastern side of the Ochlockonee and Suwannee River Basins (see map in Appendix X).⁴

Part of the Upper Flint water planning region falls in the Chattahoochee watershed, and water management in the region occurs in the context of the larger Apalachicola-Chattahoochee-Flint (ACF) system, and therefore, Chattahoochee conditions are reported here. The Chattahoochee River Basin has several regulated nodes. In the Chattahoochee, the model results showed no shortfalls in meeting flow targets. Downstream needs for water use and flow could be met using available conservation storage in the system's reservoirs. The model results estimated that amount of conservation storage remaining when storage reached its lowest in the period of

³ See: http://www.upperflint.org/pages/our_plan/index.php

⁴ A map indicating Subarea 4 is available in the supplemental materials provided on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php



record. At that time, aggregate conservation storage in the system's major reservoirs was 40% of available conservation storage.⁵

Small portions of the Upper Flint water planning region also occur within the Ocmulgee and Suwannee River Basins. Results for these basins are not included in this report, but can be found in the plans for the Suwannee-Satilla and Middle Ocmulgee Water Councils. The Upper Flint Water Council coordinated with these councils in evaluating assessment results and in developing management practices for their respective plans.

3.2.2. Groundwater Availability

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

The groundwater availability assessment estimated the sustainable yield, or the volume of groundwater that can be used without causing adverse impacts, including: limiting use of neighboring wells (drawdown), reducing flow in nearby streams (base flow), and permanent reduction of aquifer levels. Sustainable yield estimates were determined by simulating withdrawals from existing wells and, where applicable, hypothetical new wells. Results of the assessment indicate a range for sustainable yield for each assessed aquifer, as shown in Table 3-1. Sustainable yield is defined as a range for each aquifer due to multiple model runs based on different assumptions about aquifer use. These assumptions varied for different aquifers.

~~A map of these aquifers is included in Appendix X.~~ The Upper Flint water planning region includes the Cretaceous, the South-Central Georgia Upper Floridan, and Piedmont crystalline rock aquifers and small portions of the Claiborne and Upper Floridan Dougherty Plain aquifers.⁶ The area of the Piedmont crystalline rock aquifers that was assessed did not fall within the Upper Flint water planning region. The results in Table 3-1 indicate that in several aquifers, current use is within or above the sustainable yield range: Claiborne,⁷ Cretaceous, and Upper Floridan Dougherty Plain. It is important to note that for the Cretaceous, in the Upper Flint

⁵ A more complete discussion of the surface water availability model results for the Flint and Chattahoochee can be found in the supplemental materials provided on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php ~~A more complete discussion of the surface water availability model results for the Flint and Chattahoochee can be found in Appendix X.~~

⁶ A map of the assessed aquifers is included in the supplemental materials provided on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php

⁷ In the Claiborne, the sustainable yield range results from two different assumptions about groundwater use. The lower end of the range is defined based on an assumption that groundwater use will increase uniformly across the aquifer from existing well locations. The upper end of the range is defined based on an assumption that groundwater use will increase in a nonuniform manner geographically.

3. Current Assessment Water Resources of the Upper Flint Region

Region, only the portion of the aquifer in Crisp, Dooly, and the eastern half of Macon County was included in the assessment ~~(see map in Appendix X)~~. The Claiborne aquifer includes only small portions of Webster, Sumter, and Crisp Counties within the Upper Flint water planning region.

In the Dougherty Plain, the sustainable yield results were defined by the impact of groundwater withdrawals on surface water flows, rather than on the condition of the aquifer itself, and therefore, these results relate closely to those observed in the surface water availability assessment at the Bainbridge node. The impact of withdrawals on aquifer levels in the Dougherty Plain predicted by the model is not substantial (less than five feet).⁸

Table 3-1: Groundwater Results for Assessed Aquifers in Upper Flint Region – Current Conditions

Aquifer	Estimated Current Groundwater Withdrawal (mgd) ¹	Sustainable Yield of Individual Aquifer (Min/Max, mgd)
Claiborne Aquifer	123-148 (190-229 cfs)	100-250 (155-387 cfs)
Cretaceous Aquifer	176-195 (272-302 cfs)	198 – 201 (306-311 cfs)
South-Central Georgia Upper Floridan	282-366 (436-566 cfs)	622 – 836 (962-1293 cfs)
South-Central Georgia & Eastern Coastal Plain Upper Floridan Aquifer	469-580 (726-897 cfs)	868 – 982 (1343-1519 cfs)
South-Central Georgia & Eastern Coastal Plain Upper Floridan, Claiborne, & Cretaceous Withdrawing Together	768-922 (1188-1427 cfs)	1066-1229 (1649-1902 cfs)
Upper Floridan Aquifer in the Dougherty Plain	450-587 (696-908 cfs)	237 – 328 (367-507 cfs)

Source: Georgia EPD, July-March 2010, Synopsis Report: Groundwater Availability Assessment (Review Draft)⁹ and subsequent results updates provided by GAEPD

¹ The lower end of the range for withdrawals includes agricultural withdrawals in a moderate year, while the upper end includes agricultural water use in a dry year.

⁸ The lower and upper ends of the sustainable yield range for the Dougherty Plain resulted from different assumptions about increases in pumping from one hydrologic unit (HUC 03130004), which crosses state lines into Florida and Alabama. For more information on the groundwater resource assessment results, see the Synopsis Report: Groundwater Availability Assessment (Review Draft, March 2010) available on the GAEPD water planning website at: <http://www.georgiawaterplanning.org/documents/LRG1403reviewdraft031810.pdf> [WILL THE FINAL BE POSTED?]

⁹ Available on the GAEPD water planning website at: <http://www.georgiawaterplanning.org/documents/LRG1403reviewdraft031810.pdf>



3.2.3. Surface Water Quality

The water quality assessment estimated the capacity of Georgia's surface waters to assimilate pollutants without unacceptable degradation of water quality. The term assimilative capacity refers to the ability of a water body to naturally absorb pollutants without exceeding state water quality standards or harming aquatic life.

The water quality assessment results focus on available assimilative capacity for oxygen consuming wastes (affecting dissolved oxygen), nutrients (specifically nitrogen and phosphorus) and chlorophyll-a (a green pigment found in algae; the concentration of chlorophyll a is used to assess lake water quality). Assessment of the ability to assimilate oxygen consuming wastes is important because aquatic life is dependent upon the amount of residual dissolved oxygen available in the stream.

Determining assimilative capacity is dependent on multiple parameters and requires information on the streamflow, in-stream water quality, wastewater discharges, water withdrawals, existence of land application systems, weather information, land use, stream hydrology, topography, and the state's water quality standards. Figure 3-5 shows the dissolved oxygen (DO) assessment results for current discharges given critical, low flow (7Q10), high temperature conditions. Stream segments that have no available assimilative capacity under these conditions are shown in red. Those with DO levels in excess of state water quality standards are blue. Naturally low DO waters that have DO below 5.0 mg/L in the summer will typically be in the yellow to red range.

[Placeholder for nutrient and chlorophyll a results from watershed model.]

3.3. Ecosystem Conditions and Instream Uses

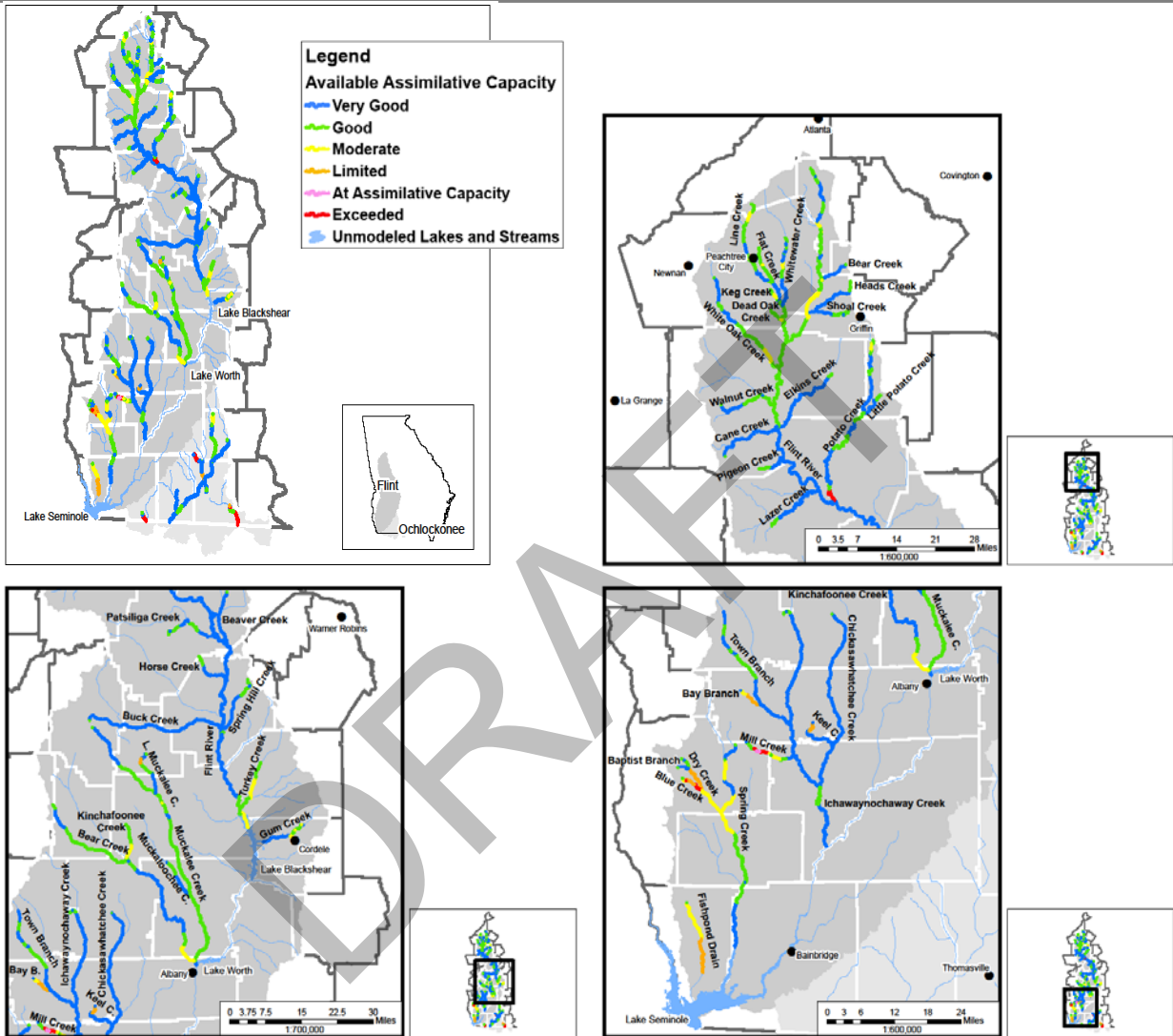
3.3.1. 303(d) list and TMDLs

The state of Georgia assesses its water bodies for compliance with water quality standards, as required by the federal Clean Water Act (CWA). Waters of the state are monitored by GAEPD, USGS, and other local authorities contracted by GAEPD. If an assessed water body is found not to meet standards, then it is considered "not supporting" its designated uses and it is included on a list of impaired waters. Impairments must be addressed through the development of a Total Maximum Daily Load (TMDL), which sets a pollutant budget and outlines a strategy for corrective action. Several stream reaches in the Upper Flint water planning region are on the state's list of impaired waters. A ~~list~~-summary of impaired waters in the region is provided in Table 3-2.¹⁰

¹⁰ A more complete list of impaired waters in the region is available in the supplemental materials provided on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php

3. Current Assessment Water Resources of the Upper Flint Region

Figure 3-5 Assimilative Capacity Results from Dissolved Oxygen Assessment: Flint River (Current Conditions)



Source: Georgia EPD, October 2010

**TABLE 3-2: Summary of Impaired Waters in Upper Flint Water Planning Region**

River Basin	Criterion Violated				Total
	DO	Fecal coliform	Metal	Other	
Chattahoochee	1	0	0	9	9
Flint	18	169	8	200	351
Ocmulgee	0	0	0	16	16
Suwannee	0	0	0	12	12
	Regional Total				388 miles

Note: Stream reaches may have more than one criterion violated, i.e. the sum of DO, Fecal coliform, Metals, and Other may be greater than the total number of stream miles listed as impaired. Metal includes mercury trophic-weighted residue value and fish consumptive guidance.

3.2.2. Wildlife and Fisheries Resources

In 2005, Georgia's Wildlife Resources Division (WRD) published *A Comprehensive Wildlife Conservation Strategy for Georgia*, which outlines a plan "to conserve Georgia's animals, plants, and natural habitats through proactive measures emphasizing voluntary and incentive-based programs on private lands, habitat restoration and management by public agencies and private conservation organizations, rare species survey and recovery efforts, and environmental education and public outreach activities." The strategy divides the state into several ecoregions, and the Upper Flint water planning region includes portions in both the southeastern plains and the piedmont ecoregions. In the southeastern plains, a total of 85 high priority animal species, 145 high priority plants species, and 27 high priority habitat types were identified; in the piedmont, a total of 55 high priority animal species, 71 high priority plants species, and 16 high priority habitat types were identified. Detailed listings of critical species and habitats are available through the Georgia Department of Natural Resources.

3.2.3. Recreational Resources

The Upper Flint water planning region provides boaters, fishermen, and other outdoor enthusiasts with a diverse and easily accessible river environment. Near the fall line, the river provides a scenic area for canoeists and kayakers. Lake Blackshear offers boating and fishing opportunities. Camping, hunting, and hiking trails are recreational options across the region. The Department of Natural Resources manages State Parks and Historic Sites, Public Fishing Areas, and Wildlife Management Areas throughout the Upper Flint water planning region.

4. Forecasting Future Water Resource Needs



*SUMMARY: This section forecasts **future** demands for water and wastewater treatment in the region. Between 2010 and 2050, water demands are forecasted to increase by 25% and wastewater treatment demands are forecasted to increase by 5% in the Upper Flint water planning region.*

Section 4. Forecasting Future Water Resource Needs

4.1. Municipal Forecasts

4.1.1. Municipal Water Forecasts

Municipal water and wastewater forecasts are based on population projections that were developed by Governor's Office of Planning and Budget (OPB). ~~The OPB population projection results by county are shown in Appendix X.~~ In summary, these forecasts project that population in the Upper Flint water planning region ~~is projected~~ is expected to increase by 63.1% from 245,827 in 2010 to 401,059 in 2050.¹

The municipal water forecasts were calculated by multiplying an estimate of per capita water use by the population to be served. ~~Estimates of per capita water use by county for the Upper Flint water planning region are included in Appendix X.~~ Per capita use rates are adjusted to reflect expected water savings over time from the transition to ultra low flow toilets (1.6 gallons per flush maximum), required by federal and state laws. Additional details regarding development of the municipal water forecasts, including the per capita rate and plumbing code savings, are provided in the *Municipal and Industrial Water and Wastewater Forecasting Memorandum* (Appendix X). ~~The resulting municipal water forecasts are shown in Appendix X. In summary, the~~ The resulting municipal water forecasts project that demand for municipal water ~~is forecasted to~~ is expected to increase from 31 MGD (48 cfs) in 2010 to 48 MGD (74 cfs) in 2050 in the region. Of this amount, 49% is forecasted to be sourced from surface water, 30% from groundwater withdrawals by municipal systems, and 21% from private wells (self-supply).²

4.1.2. Municipal Wastewater Forecasts

Municipal wastewater forecasts were calculated based on forecasted municipal water with adjustment for outdoor water use (not treated) and inflow and infiltration into municipal systems. Wastewater may be treated by one of three disposal systems: municipal wastewater treatment plant to point source discharge, municipal

¹ County-level population estimates for the region provided to GAEPD by OPB are included in the supplemental materials provided on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php

² Estimates of per capita water use by county for the Upper Flint water planning region, the *Municipal and Industrial Water and Wastewater Forecasting Memorandum*, and the resulting municipal water use forecasts are included in the supplemental materials provided on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php

wastewater treatment to land application system, or onsite sanitary sewage system (OSSMS), also called septic systems. For the forecasts, the current mix of discharge to point source facilities versus land application systems was held proportionate to current conditions. Additional details regarding development of the municipal wastewater forecasts can be found in the *Municipal and Industrial Water and Wastewater Forecasting Memorandum* ~~(Appendix X)~~.³

The resulting municipal wastewater forecasts for the region ~~are project that provided in Appendix X. In summary,~~ the demand for municipal wastewater treatment is ~~forecasted~~ expected to increase from 29 MGD in 2010 to 44 MGD in 2050 (45 to 68 cfs) in the region. Of this amount, 11% is forecasted to be treated by land application systems, 38% by systems with point source discharges, and 51% by septic systems.⁴

Wastewater generation forecasts allocated to central system disposal (i.e. land application and point discharges) include an inflow and infiltration (I/I) estimate of 20%, a typical value for municipal systems. (However, the increase in anticipated wastewater flows associated with I/I was not utilized in the surface water quality assessment since the model is being used as a tool to determine gaps during dry, low flow conditions.)

4.2. Industrial Forecasts

Industrial water and wastewater forecasts anticipate the future needs for industries in the region. Industries require water for use in their production processes, sanitation, cooling, as well as employee use and consumption. The forecasts presented in this section are based upon estimates of the rate of growth in employment for specific industrial sectors, estimates of the rate of growth in the units of production for specific industrial sectors, or other relevant information provided by specific industrial water users. The industrial demands forecasted in this section include major industrial water users and wastewater generators, many of which supply their own water and/or treat their own wastewater. Many other industrial users with lesser demands are serviced by municipal water and wastewater systems, and these demands are included in the municipal forecasts.

4.2.1. Industrial Water Forecasts

Industrial water forecasts were calculated using information and data specific to each of the major water using industries. For industries where information was available on water use per unit of production, water forecasts were based on production. For industries where product based forecasts were not possible, industry-specific workforce projections were assumed to reflect the anticipated growth in water use

³ This memorandum is included in the supplemental materials provided on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php

⁴ The municipal water and wastewater forecasts are included in the supplemental materials provided on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php

4. Forecasting Future Water Resource Needs



within the industry. ~~A summary of the employment projections is included in Appendix X.~~ The employment projections for the Upper Flint water planning region indicate that overall employment from major industrial water using industries is ~~forecasted~~ expected to increase by 19% over the 2010-2050 planning horizon.

~~The resulting forecasts of industrial water demands for the region are provided in Appendix X. In summary, i~~ Industrial demand for water is forecasted to increase from 20 MGD (31 cfs) in 2010 to 31 MGD (48 cfs) in 2050 in the region. Of this amount, 74% is forecasted to be sourced from surface water, while 26% is forecasted to be sourced from groundwater.⁵

4.2.2. Industrial Wastewater Forecasts

Industrial wastewater forecasts were calculated for each sector by multiplying the industrial water forecast by the ratio of wastewater generated to water used for that industrial sector. The primary mechanism for deriving the wastewater to water ratios was through a state-wide analysis of multiple years of actual annual average water return and withdrawal data for permitted users. Information provided by industrial stakeholder groups was also used to adjust ratios within a region or industry, as appropriate. Further detail regarding the industrial water and wastewater forecasts are included in the *Municipal and Industrial Water and Wastewater Forecasting Memorandum* (Appendix X).⁶ ~~The resulting forecasts for industrial wastewater in the region are provided in Appendix X. In summary, in~~ Industrial wastewater treatment is forecasted to increase from 18 MGD (28 cfs) in 2010 to 27 MGD (42 cfs) in 2050 in the region. Of this amount, 6% is forecasted to be treated by land application systems, while 94% is forecasted to be treated by systems with point source discharges.⁷

4.3. Agricultural Forecasts

Agricultural water use forecasts, developed by the University of Georgia, provide a range of irrigation water use under dry, medium and wet climate conditions. In collaboration with industry stakeholders, the University of Georgia also forecasted water use for the nursery industry and estimated water use by golf courses with agricultural withdrawal permits. Water use by animal operations is not included in the forecasts, but the estimates of current use are included in the current agricultural use estimates in Section 3. Water use by golf courses with agricultural withdrawal permits is included in the forecasts, but use by these operations is held constant at current levels throughout the planning horizon. ~~The agricultural water use forecast results are provided by county in Appendix X.~~

⁵ Employment projections and the industrial water and wastewater forecasts are included in the supplemental materials provided on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php

⁶ See note 3.

⁷ See note 5 for more information on industrial water and wastewater forecasts.

In summary, dry year agricultural water use is forecasted to increase by 16% from 2010 to 2050.⁸ Dry year use estimates for agriculture correspond to the 75th percentile of use estimates across a range from lowest to highest use levels. An abbreviated breakdown of agricultural use by source type over the planning horizon is as follows:

- 2010 Annual Average 75th Percentile Use = 165 MGD (255 cfs)
 - Groundwater Use = 118 MGD (183 cfs)
 - Surface Water Use = 47 MGD (73 cfs)
- 2050 Annual Average 75th Percentile Use = 192 MGD (297 cfs)
 - Groundwater Use = 137 MGD (212 cfs)
 - Surface Water Use = 55 MGD (85 cfs)

4.4. Thermoelectric Power Production Water Demand Forecasts

Forecasts of water use in thermoelectric power production were made for GAEPD by CDM, Inc., with the guidance of an advisory panel that included power industry representatives and the Georgia Environmental Facilities Authority.

Currently, the energy sector uses does not... 121 mgd from surface water in the Lower Flint-Ochlockonee water planning region. Existing power plants in the region use once-through cooling, and therefore, their water use is nonconsumptive. In 2020, it is expected that a new power plant in Mitchell County will begin production. This plant will use cooling towers, and it is projected to have consumptive use of approximately 11 mgd. Energy sector forecasts project that energy production in this region will use 146 mgd of water in 2050. Of this amount, approximately 11 mgd will be consumptive use because the new power plant in Mitchell County will use cooling towers.

Statewide, the forecasts for the energy sector indicate that additional power production needs will require 170 mgd statewide in 2050. At this time, it is unknown where that energy production capacity will be located in the state. It is possible that some of that capacity will be located in this region, and if so, it will increase water demand in the region. **COUNCIL NEEDS TO WEIGH IN ON ITS EXPECTATIONS HERE.**

~~Estimates of future amounts of water expected to be consumed in the production of thermoelectric energy are being generated by a consultant under contract to GAEPD. When available, these estimates will be factored into the appropriate resource assessments.~~

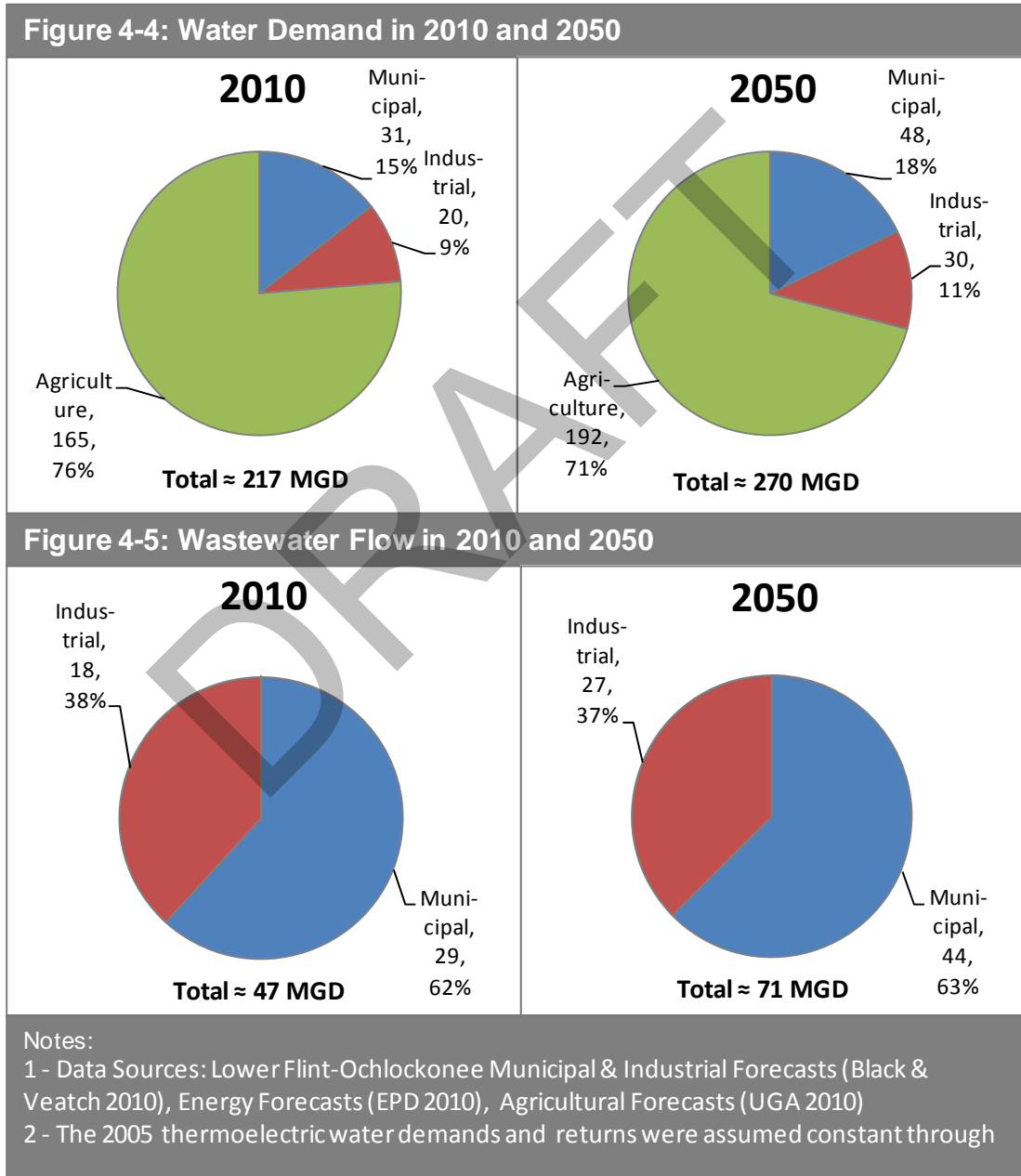
⁸ Agricultural water use forecasts are included in the supplemental materials provided on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php

4. Forecasting Future Water Resource Needs



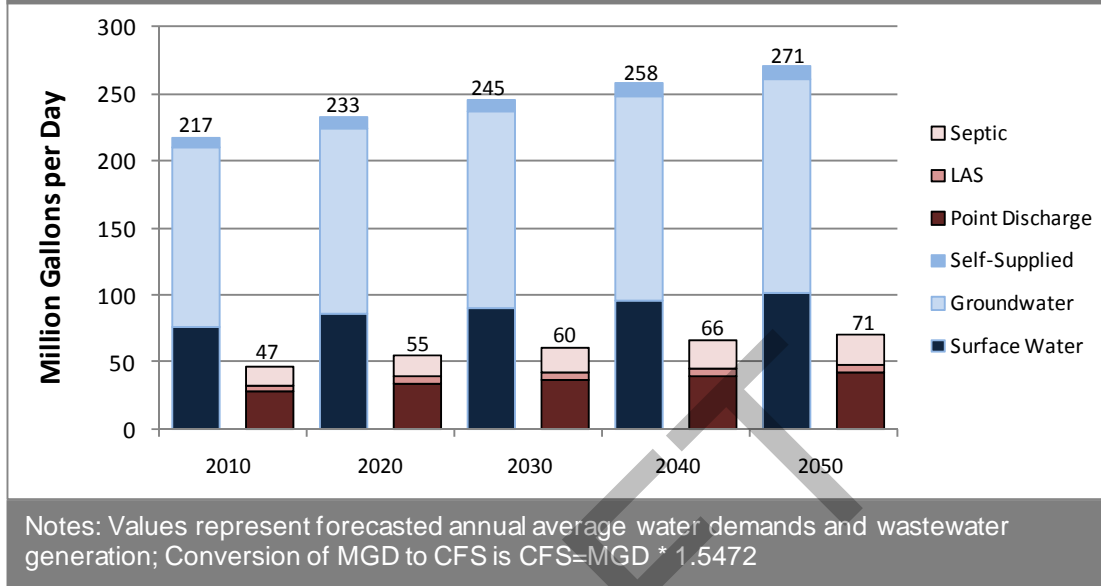
4.5. Total Water Demand Forecasts

In the Upper Flint water planning region, agricultural water use makes up the largest proportion of water use by a significant margin, and as shown in Figures 4-X through 4-X, agriculture is forecasted to be the largest water user in the region in 2050. However, municipal and industrial water uses are expected to increase slightly in their shares of total water use over the period.



4. Forecasting Future Water Resource Needs

Figure 4-6: Total Water & Wastewater Forecast



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5. Comparison of Water Resource Capacities and Future Needs



SUMMARY: This section compares water resource capacities and future demands for water and wastewater treatment in the region. It discusses how the Council considered gaps identified between needs and resource capacities.

Section 5. Comparison of Water Resource Capacities and Future Needs

This section compares forecasts of water and wastewater needs in the region (Section 4) with the capacities of the water resources. This comparison supported the Council in assessing where gaps exist between water resource needs and capacities. It provided the Council with a basis for selecting appropriate management practices (Section 6) that will help the region to meet its future water needs, protect water resources, and meet the Council's vision and goals for the region. Where gaps were identified, the Council considered the potential adverse impacts, both environmental and economic, of the gap and of closing that gap. Management practice selection was guided by the Council's understanding of such gaps in the region, as well as by the Council's vision and goals for the region (see Section 1).

5.1. Surface Water Availability Comparisons

The surface water availability assessment model described in Section 3.2.1 was run using 2050 forecasted water demands. The results for 2050 are similar to those under current demand conditions (discussed in Section 3.2.1). In the Flint, at Montezuma, GAEPD sustainability criteria¹ for in-stream flows were met almost 100% of the time during the period of record used in the model under 2050 demand conditions. A significant shortfall between resource capacity and demand persists at Bainbridge in 2050. The shortfall occurs 13% of the time in the period of record, and the average shortfall on those days was 355 cfs (229 MGD). The maximum shortfall was 1,295 cfs (837 MGD).

As noted in Section 3.2.1, part of the Upper Flint water planning region falls in the Chattahoochee watershed, and water management in the region occurs in the context of the larger Apalachicola-Chattahoochee-Flint (ACF) system, and therefore, Chattahoochee conditions are reported here.² In the Chattahoochee under 2050 demand conditions, in-stream flows do not fall short of the GAEPD sustainability criteria, but storage levels fall lower to meet in-stream needs and demands than under 2010 conditions. The model results estimated that amount of conservation storage remaining

¹ See page 3-3 for a description of the GAEPD sustainability criteria for the surface water availability assessment.

² As noted in Section 3, small portions of the Upper Flint water planning region occur within the Ocmulgee and Suwannee River Basins. Results for these basins are not included in this report, but can be found in the plans for the Suwannee-Satilla and Middle Ocmulgee Water Councils. The Upper Flint Water Council coordinated with these councils in evaluating assessment results and in developing management practices for their respective plans.

5. Comparison of Available Water Resource Capacities and Future Needs

WATER DEVELOPMENT & CONSERVATION PLAN

when storage reached its lowest in the period of record. At that time, aggregate conservation storage in the system's major reservoirs was 35% of available conservation storage (vs. 40% under 2010 demand conditions).³

Between 2010 and 2050, consumptive demand ~~in~~ measured at the Montezuma node is projected to increase by 5%. This change will be the net result of an increase of 10 MGD (15 cfs) in consumptive demand by municipal, industrial, and agricultural users in the region and a decrease in consumptive demand upstream of the region of 8 MGD (12 cfs). The upstream decrease is projected from expected conversions from septic systems to centralized treatment and greater use of centralized treatment associated with the wastewater management plan of the Metropolitan North Georgia Water Planning District ~~(described in the District's Wastewater Management Plan, May 2009).~~⁴

~~For~~ At the Bainbridge node, the shortfall is affected both by consumptive use of surface water and by withdrawals from the Floridan Aquifer in Subarea 4 of the Dougherty Plain, where interconnection with the surface water system is high. Subarea 4 includes the Flint River Basin south of Dooly County, part of the lower Chattahoochee River Basin, and a narrow strip on the eastern side of the Ochlockonee and Suwannee River Basins. The shortfall at Bainbridge also results from modeling assumptions used to project diversion of water to reservoirs upstream ~~(see Appendix X).~~⁵ Net consumptive water use in-measured at the Bainbridge node is forecasted to increase by 16% between 2010 and 2050.

5.2. Groundwater Availability Comparisons

Section 3.2.2 discussed the groundwater resource sustainable yields and current use of assessed aquifers. A comparison of sustainable yields and forecasted 2050 demands from those aquifers is included in Table 5-1 below. The results indicate that in the Claiborne, Cretaceous, and Upper Floridan Dougherty Plain, forecasted 2050 use will be within or above the sustainable yield range for these aquifers.⁶ It is important to note that for the Cretaceous, in the Upper Flint Region, only the portion of the aquifer in Crisp,

³ A more complete discussion of the surface water availability model results for the Flint and Chattahoochee can be found in the supplemental materials provided on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php ~~Appendix X.~~

⁴ The Metropolitan North Georgia Water Management Planning District's Wastewater Management Plan (May 2009) is available on the Internet: <http://www.northgeorgiawater.com/html/87.htm>

⁵ A more complete discussion of these model assumptions is included in the supplemental materials provided on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php

⁶ For a discussion of how the sustainable yield range was defined, see Section 3.2.2 of this plan and also see the Synopsis Report: Groundwater Availability Assessment (Review Draft, March 2010) available on the GAEPD water planning website at: <http://www.georgiawaterplanning.org/documents/LRG1403reviewdraft031810.pdf> **WILL THE FINAL BE POSTED?**

5. Comparison of Water Resource Capacities and Future Needs



Dooly, and the eastern half of Macon County was included in the assessment (~~see map in Appendix X~~); other parts of the Cretaceous in the Upper Flint water planning region were not assessed.⁷ In the Dougherty Plain, the sustainable yield results were defined based upon the impact of groundwater withdrawals on surface water flows, rather than on the condition of the aquifer itself, and therefore, these results relate closely to those observed in the surface water availability assessment at the Bainbridge node.

Table 5-1: Groundwater Results for Assessed Aquifers in Upper Flint Region – 2050 Conditions

Aquifer	Estimated 2050 Groundwater Withdrawal (mgd) ¹	Sustainable Yield of Individual Aquifer (Min/Max, mgd)
Claiborne Aquifer	146-174 (225-270 cfs)	100-250 (155-387 cfs)
Cretaceous Aquifer	226-247 (350-382 cfs)	198 – 201 (306-311 cfs)
South-Central Georgia Upper Floridan	371-471 (573-729 cfs)	622 – 836 (962-1293 cfs)
South-Central Georgia & Eastern Coastal Plain Upper Floridan Aquifer	608-739 (941-1143 cfs)	868 – 982 (1343-1519 cfs)
South-Central Georgia & Eastern Coastal Plain Upper Floridan, Claiborne, & Cretaceous Withdrawing Together	980-1160 (1517-1795 cfs)	1066-1229 (1649-1902 cfs)
Upper Floridan Aquifer in the Dougherty Plain	521-681 (806-1054 cfs)	237 – 328 (367-507 cfs)

Source: [Georgia EPD, March 2010, Synopsis Report: Groundwater Availability Assessment \(Review Draft\)⁸ and subsequent results updates provided by GAEPD](#), [GAEPD, July 2010](#)

¹ The lower end of the range includes agricultural withdrawals in a moderate year (50th percentile), while the upper end includes agricultural water use in a dry year (75th percentile).

5.3. Surface Water Quality Comparisons

In Section 3, Figure 3-5 shows the availability of assimilative capacity under **current** conditions for flow and oxygen consuming wastes that affect levels of dissolved oxygen. ~~Forecasted wastewater flows for 2050 were compared to and found to reasonably approximate existing permitted discharge capacity. Therefore, the model was run at permitted conditions as a reasonable approximation of future increased wastewater flows being directed to the existing treatment plant discharge locations.~~ Figure 5-1 shows the availability of assimilative capacity for these pollutants under **permitted projected future** conditions (~~i.e., current permit limits for flow and oxygen consuming~~

⁷ See the map of assessed aquifers included in the supplemental materials provided on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php

⁸ Available on the GAEPD water planning website at: <http://www.georgiawaterplanning.org/documents/LRG1403reviewdraft031810.pdf>

5. Comparison of Available Water Resource Capacities and Future Needs

WATER DEVELOPMENT & CONSERVATION PLAN

wastes). It is assumed that future flows will be distributed among existing discharge points. These results show where modeled conditions predict that water quality standards would be exceeded under critical conditions. It is important to note that treatment plants usually operate below their permit limits (not at their limits), and future permit limits are likely to be different than current permit limits. Figure 5-1 indicates that the number of stream miles where assimilative capacity is exceeded or unavailable will increase from ~~9 miles under current conditions to approximately 145 miles~~ in the Flint River basin by 2050, ~~assuming future flows and loads equal to current permit limits.~~ Water quality concerns also exist where water quality standards are violated. These impaired waters are discussed in Section 3 and ~~mapped in Appendix X; a list is provided in the supplemental materials provided on the Upper Flint Water Planning Council website.~~⁹

5.4. Summary of Potential Gaps between Resource Capacities and Future Needs

The results discussed in this section have identified the following as gaps between resource capacity and future needs from those resources:

- A substantial shortfall in meeting GAEPD's sustainability criteria for surface water flows at Bainbridge under both current and forecasted demands.
- Groundwater use within or above the sustainable yield range for the Cretaceous, Claiborne, and Upper Floridan Dougherty Plain aquifers (for the portions of those aquifers assessed; Cretaceous in Upper Flint Region was not fully assessed).
- Decreasing availability of assimilative capacity in streams as discharge flows increase.

The Council has considered these gaps and their potential adverse impacts on the region, both environmentally and economically. In order to meet the Council's vision and goals for the region, given the results considered in this section, the Council developed the rest of this plan to address these gaps as follows:

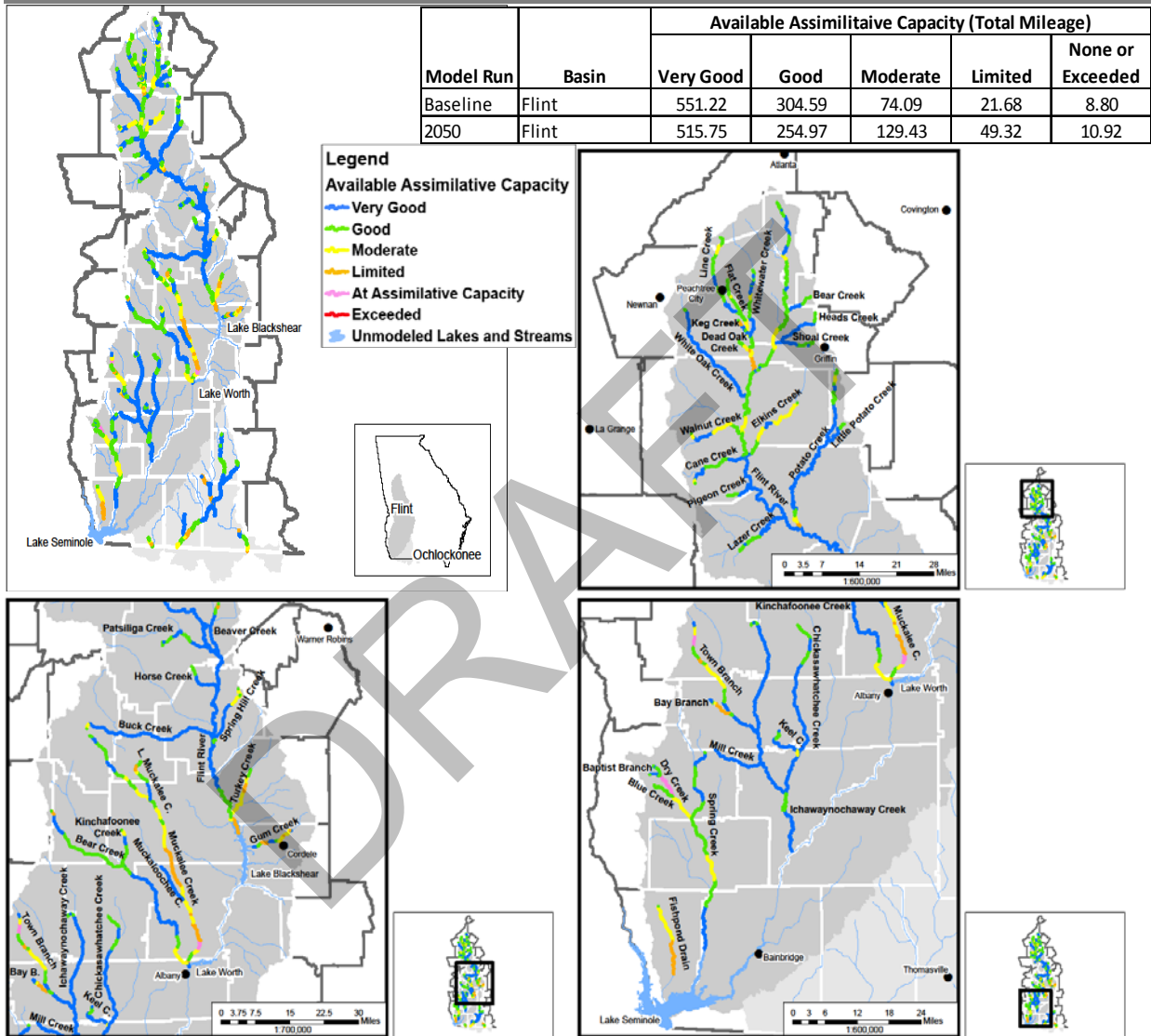
- *Surface water availability:* Close the gap with conservation and supply augmentation practices as much as possible, while also collecting better information to support more thorough evaluation of the resource capacity and impacts of potential gaps on instream and downstream uses.
- *Groundwater availability:* Limit reliance on groundwater resources that are currently or forecasted to be within or above sustainable yield ranges. Collect better and more geographically specific information on groundwater resource capacity, as needed to evaluate specific uses and management practices.
- *Surface water quality:* Implement practices targeted especially toward nonpoint source of pollutants to improve assimilative capacity in the region's streams and lakes. Also, it is expected that GAEPD will adjust point source permit limits over time as needed to address assimilative capacity constraints. Collect more complete information to support the targeting of management practices for water quality in the future.

⁹ See: http://www.upperflint.org/pages/our_plan/index.php

5. Comparison of Water Resource Capacities and Future Needs



Figure 5-1 Assimilative Capacity Results from Dissolved Oxygen Assessment: Flint River (2050)



Source: EPD, October 2010

6. Addressing Water Needs and Regional Goals



SUMMARY: This section presents the water management practices recommended by the Upper Flint Council in order to address gaps between resource needs and capacities and to fulfill the Council's vision and goals.

Section 6. Addressing Water Needs and Regional Goals

6.1. Identifying Water Management Practices

The Upper Flint Water Planning Council considered the following as it selected management practices for this plan:

- Existing plans and practices: The Council conducted a comprehensive review of existing local and regional water management plans and relevant related documents to frame the selection of management practices. When possible, successful management practices already planned for and/or in use in the region formed the basis for the water management practices selected by the Council.
- Gaps identified by the comparison of resource needs and resource capacities (see Section 5)
- Council's Vision and Goals (see Section 1)
- Results of a survey of Council members on management practices and criteria for evaluation¹
- Public input
- Coordination with local governments and neighboring councils
- ~~The survey asked council members to rate an extensive list of management practices and to rank criteria to guide management practice selection. See Appendix X and Table 6-1 for results of the survey.~~

~~Public Input: The Council implemented a Public Involvement Plan to inform stakeholders and local government officials about the planning process and to engage them in providing input to the Council as it developed its plan (see Appendix X).~~

- ~~Development of vision and goals~~
 - ~~Review of water and wastewater demand forecasts~~
 - ~~Review of resource assessment results on resource capacity~~
 - ~~Review of existing plans, practices, and pending regulations~~
 - ~~Development of a comprehensive list of management practices~~
- ~~In order to select management practices for this plan, the Council considered:~~

¹ Results of the survey and the process of selecting management practices is discussed in more detail in the Management Practice Selection Technical Memorandum available on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php

6. Addressing Water Needs and Regional Goals

~~The process of selecting management practices was preceded by the following steps that formed the foundation for later planning:~~

~~The comprehensive listing of management practices (See Appendix X) was developed using several documents:~~

- ~~• Georgia's Water Conservation and Implementation Plan, Georgia EPD, March 2010~~
- ~~• Georgia Water Stewardship Act of 2010~~
- ~~• Manual for Erosion and Sediment Control in Georgia, Georgia Soil and Water Conservation Commission, 2000~~
- ~~• Best Management Practices for Georgia Agriculture, Georgia Soil and Water Conservation Commission, 2007~~
- ~~• Georgia's Best Management Practices for Forestry, Georgia Forestry Commission, 2009~~
- ~~• Georgia Stormwater Management Manual (Blue Book)~~
- ~~• Mining Association Best Management Practices~~
- ~~• Nursery Best Management Practices~~

~~Management practice selection by the Council proceeded as follows:~~

- ~~1) Survey of council members on management practices and selection criteria~~
- ~~2) Creation of Water Quality and Water Quantity Committees to develop recommendations to the full council on management practices~~
- ~~3) Iterative development, review, and revision of Water Quality and Water Quantity "strawman" documents of management practice recommendations by the committees~~
- ~~4) Presentation of recommendations to the full council for consideration~~
- ~~5) Incorporation of Council comments~~
- ~~6) Incorporation of management practices into plan template~~

The Council's decision making process to adopt sets of recommendations was consensus-based, where possible, according to the Council's Operating Procedures and Rules for Meetings. In cases where consensus could not be reached, decisions were approved by voting. In order to coordinate beyond the region, Council members met with representatives of neighboring councils to discuss shared resource issues on multiple occasions. In these meetings, the Council worked with its neighbors toward adoption of coordinated or complementary management practices. Within the region, the Council sought to coordinate with local governments and build support for this plan regional plan through implementation of the Council's Public Involvement Plan.² ~~As a part of this plan, the Council provided opportunities for input from local government officials and the public at each meeting and announced and documented meetings on the Council website. Additionally, Council members worked individually to inform their own communities about the regional plan.~~

² The Council's public involvement plan is described in the Public Participation Technical Memorandum available on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php

6. Addressing Water Needs and Regional Goals



The Council identified several uncertainties that could impact plan implementation, including:

- ~~Revision—Update of the Master Control Manual for the Apalachicola-Chattahoochee-Flint (ACF) River Basin by the of the U.S. Army Corps of Engineers—water control manual for the Apalachicola-Chattahoochee-Flint (ACF) basin:~~ This process is due to be complete in June 2012. More information on the process can be found at the following website: <http://www.sam.usace.army.mil/pa/acf-wcm/index.htm>
- Consultation regarding the 2008 Biological Opinion provided to the U.S. Army Corps of Engineers by the U.S. Fish and Wildlife Service: This process has been reinitiated pursuant to provisions of the Endangered Species Act as of September 20, 2010. The consultation will continue ongoing depth distribution data collection and analysis to determine if the minimum flow of 5,000 cubic feet per second required under the Revised Interim Operating Plan for the ACF needs to be increased in order to protect listed species. More information on the process can be found at the following website: <http://www.sam.usace.army.mil/ACF.htm>
- Implementation of recently adopted federal nutrient criteria for Florida's lakes and flowing waters: These new water quality criteria have implications for water quality dischargers and other stakeholders in Georgia, because Georgia must meet the criteria at the state line. The effective date for the criteria is March 6, 2012. Implementation and compliance plans are in development, and the new criteria are currently subject to legal challenge. More information on the nutrient criteria is available on the following website: http://water.epa.gov/lawsregs/rulesregs/florida_index.cfm

• ~~(scheduled completion: June 2012)~~

~~Pending EPA promulgation of final nutrient criteria for Florida's lakes and flowing waters and resulting requirements for Georgia permittees~~

- Potential state regulatory changes: The Statewide Water Management Plan proposed several changes to water management regulations, including the dissolved oxygen water quality standard and rules for interbasin transfers. Proposed rule-making will be considered by the Board of Natural Resources and will be noticed on the following website: <http://www.gadnr.org/board>
- ~~(e.g., revisions to the state dissolved oxygen standard)~~
- Information needs to ~~address~~ support improved water quality and quantity management: Throughout the planning process, the limits of available information constrained planning decisions, and the Council identified numerous information needs to support improved future planning and management. For more detail on recommendations to address information needs, see Section 7.4.
- On-going litigation over ACF Basin water management and allocation with neighboring states: A 2009 ruling by a federal judge gave Alabama, Florida, and Georgia until July 2012 to resolve water-sharing disputes in the ACF or



6. Addressing Water Needs and Regional Goals

to revert to 1970's allocations for water withdrawals from Lake Lanier. The on-going litigation casts substantial uncertainty over future water resource management in the ACF and in this water planning region.

- ~~• data gaps for water bodies in the region~~
- ~~• Information needs regarding impacts of identified gaps between resource capacities and demands~~
- ~~• Information needs regarding baseline best management practices implementation in the region~~
- ~~• Coordination needs with other councils, particularly the Lower Flint-Ochlockonee, Middle Chattahoochee, and the Metropolitan North Georgia Water Planning District~~

Despite these uncertainties, the Council proceeded with plan development based on the best information currently available. The Council intends that future revisions of the plan will improve upon the current plan when possible, as conditions change and new information becomes available, in order to meeting the Council's vision and goals for the region.~~Despite these uncertainties, the Council proceeded with plan development based on the best information currently available. The Council intends that adaptive management will be employed in future revisions to the Upper Flint Water Development and Conservation Plan to improve upon the current plan when possible and to meet the Council's vision and goals for the region.~~

6.2. Selected Water Management Practices for the Upper Flint Region

The management practices selected by the Council are summarized in Table 6-21; the table ~~categories~~ is organized by the type of practice: Demand Management (DM), Supply Management and Flow Augmentation (SF), Water Returns Management (RM), and Water Quality (WQ). Additionally, the priority of management practices is indicated by color coding: highest priority practices are indicated by dark shading, medium priority practices are indicated by medium shading, and low priority practices are indicated by light shading. ~~practices into water quantity and water quality categories.~~ A discussion of the management practices follows the table.

6. Addressing Water Needs and Regional Goals



Table 6-1: Water Management Practices Selected for the Upper Flint Water Planning Region

Management Practice	Description/Definition of Action <i>PRIORITY: HIGH, MEDIUM, LOW</i>
DEMAND MANAGEMENT (DM)	
Issue Addressed	Surface water availability sustainability criteria; Groundwater sustainable yields
Gaps Addressed	Surface Water Availability at Bainbridge (Flint) and Alapaha (Suwannee); <u>Groundwater shortfalls in Dougherty Plain, Cretaceous, and Claiborne</u>
Council Goals Addressed	1,3,4,5,6
<u>DM1:</u> Implement Tier 1 and 2 non-farm water conservation practices in the region	<p>Tier 1 and 2 water Conservation practices include those required by existing law or anticipated in upcoming state rule-making:</p> <ul style="list-style-type: none"> • Submittal of water conservation plans by withdrawal permittees (391-3-6-.07 and 391-3-2-.04(11)) • Landscape irrigation limits (4pm to 10am), as required by Water Stewardship Act of 2010 (with exemptions) (12-5-7) • Even-odd watering restrictions for non-irrigation outdoor water uses (391-3-30) • Public car wash facility regulations, which require best management practices (391-31) • Demonstration by water withdrawal permittees of progress toward water conservation goals or water efficiency standards (State Water Plan, Section 8) • International Water Association standards and practices required for drinking water providers (Water Stewardship Act, Section 3). • Amendment of local building codes to require sub-metering in multi-tenant buildings, installation of high efficiency plumbing fixture in all new construction, and installation of high-efficiency cooling towers in new construction (Water Stewardship Act, Sections 7, 8, and 9)
<u>DM2:</u> Implement Tier 3 and 4 non-farm water conservation practices with the support of incentive programs	<ul style="list-style-type: none"> • Utilize existing incentive programs to support the use of these practices.
<u>DM3:</u> Implement Tier 1 and 2 agricultural water conservation practices in the region	<p>Tier 1 and 2 water Conservation practices required by existing law or anticipated in upcoming state rule-making:</p> <ul style="list-style-type: none"> • Implementation of conservation requirements under the Flint River Basin Plan (2006) • Compliance with forthcoming requirement (established by Water Stewardship Act of 2010) regarding active, inactive, and unused permits.
<u>DM4:</u> Implement Tier 3 and 4 agricultural water conservation practices in the region with the support of incentive programs	<ul style="list-style-type: none"> • Incentive funding is available from the Soil and Water Conservation Districts and the Georgia Soil and Water Conservation Commission. • The Council endorses the following benchmarks for this practice: By January 2012, all new, and by January 2020, all existing agricultural irrigation systems will have application efficiencies of 80% or greater.



6. Addressing Water Needs and Regional Goals

Table 6-1: Water Management Practices Selected for the Upper Flint Water Planning Region

Management Practice	Description/Definition of Action <i>PRIORITY: HIGH, MEDIUM, LOW</i>
	<p>By January 2050, all irrigation systems will have application efficiencies of 90% of greater.</p> <p>By January 2015, 25% of farmers using irrigation on their fields will adopt irrigation scheduling based on crop needs and available water supplies.</p> <p>By January 2020, 50% of farmers using irrigation on their fields will adopt irrigation scheduling based on crop needs and available water supplies.</p> <ul style="list-style-type: none"> • A focus on a desired performance outcome will support increased conservation while allowing farmers to select what practices and approach will work best for their own operations. • Practices that farmers can use to attain this benchmark include low-pressure/full-drop nozzle irrigation systems, Variable Rate Irrigation, conservation tillage, irrigation scheduling, drip irrigation, as well as other conservation measures not listed here that best suit an individual farmer's operation.
<p>DM5: <i>Use irrigation suspension only through implementation of the Flint River Drought Protection Act, only by voluntary means, with notification to farmers in January, and only as a last resort when other options are not available to address severe flow depletions</i></p>	<ul style="list-style-type: none"> • The Council supports voluntary implementation of the Flint River Drought Protection Act by GAEPD through an irrigation suspension auction, when absolutely necessary in abnormally dry periods and when other options are not available to address severe flow depletions. • GAEPD should provide notification of possible use of the Flint River Drought Protection Act before the March 1 deadline. Notification to farmers in January would inform planting decisions and help to reduce the cost to farmers and to the state for irrigation suspension. The Council acknowledges the need to improve drought prediction tools to support earlier notification and supports GAEPD efforts to develop better predictive tools. • The Flint River Drought Protection Act has not had adequate funding in recent years, and a reliable source of funding is needed to support voluntary suspension.
<p>DM6: <i>Restrict Manage new agricultural water withdrawal permits in the region according to the 2006 Flint River Basin Water Development and Conservation Plan</i></p>	<p>The 2006 Flint Plan limits new agricultural withdrawal permits based on expected impact on nearby wells and streams (summarized by map of Capacity Use, Restricted Use, and Conservation Use areas included in the 2006 plan). Under the 2006 plan, the following requirements apply to new agricultural water withdrawal permits in the Flint River Basin:</p> <ul style="list-style-type: none"> • New permits require mandatory conservation measures, such as end-gun shut off switches and leak prevention and repair, as a condition of the permit. • New surface water permits in Ichawaynochaway and Spring Creek sub-basins must suspend use when streamflow drops below 25% Average Annual Discharge instead of 7Q10. • New permits in the Flint River Basin have a \$250 application fee. <p>No new Capacity Use Area withdrawal permits in the Flint River Basin</p>

6. Addressing Water Needs and Regional Goals



Table 6-1: Water Management Practices Selected for the Upper Flint Water Planning Region

Management Practice	Description/Definition of Action <i>PRIORITY: HIGH, MEDIUM, LOW</i>
	<p>Make all new permits interruptible (surface and groundwater) New permits should have to demonstrate that they have no impact on minimum in-stream flows New permits should cause no net increase in consumptive use in the watershed during periods of low flow.</p>
DM7: <i>Improve agricultural water withdrawal metering program</i>	<ul style="list-style-type: none"> The Council recommends continued improvement in the implementation of the agricultural water metering program to ensure that the data collected is as comprehensive, accurate, and useful as possible. The Council recommends additional investment by the state in the metering program to ensure these outcomes. The Council also recommends that the program provide annual reporting to the public on collected data (while recognizing the confidentiality constraints on the use of the data).
SUPPLY <u>MANAGEMENT AND FLOW</u> AUGMENTATION <u>(SF)</u>	
Issue Addressed	Surface water availability sustainability criteria; Groundwater sustainable yields
Gaps Addressed	Surface Water Availability at Bainbridge (Flint) and Alapaha (Suwannee)
Council Goals Addressed	1, 2, 3, 4, 5
SF1: <i>Evaluate streamflow augmentation via direct pumping from aquifers in order to support in-stream flows in dry periods</i>	<ul style="list-style-type: none"> In dry periods, streamflow might be augmented through direct pumping of groundwater into surface water streams. Several factors could limit the potential use of this practice, including: groundwater yields, water quality, cost, aquifer impacts, and streamflow impacts of aquifer pumping.
SF2: <i>Replace surface water withdrawals with groundwater withdrawals, where feasible.</i>	<ul style="list-style-type: none"> This practice could support increased in-stream flows in some places in the region. The Council recommends that this practice be implemented with incentives. The Council recognizes that environmental and financial factors may limit the implementation of this practice. However, the Council supports reducing pressure on in-stream flows through an emphasis on increased use of groundwater in the region – for new and existing withdrawals. The practice should only be used where site specific evaluation indicates that it is practical and it will not adversely impact environmental resources, especially groundwater. The Council also recognizes the need for and calls for further evaluation of the feasibility of this practice and its potential impacts on groundwater aquifers in the region.
SF3: <i>Use Aquifer Storage and Recovery (ASR) as needed for future water supplies in the region, with thorough</i>	<ul style="list-style-type: none"> ASR could be used in the region to withdraw and store surface water during periods of high flow and provide augmentation for flows or supply in dry periods. The feasibility of an ASR projects can vary greatly depending

6. Addressing Water Needs and Regional Goals

Table 6-1: Water Management Practices Selected for the Upper Flint Water Planning Region

Management Practice	Description/Definition of Action <i>PRIORITY: HIGH, MEDIUM, LOW</i>
<i>evaluation of potential impacts</i>	<ul style="list-style-type: none"> on location, condition of the receiving aquifer and water quality considerations. ASR is probably best suited to provide water supply storage; its capability to provide for in-stream flow augmentation has not been directly evaluated. The Council recognizes that IBTs currently exist in the region and that IBTs will continue to be a valuable water management tool in the future. The Council urges policymakers not to preclude IBT as an option for future water management in the region, as needed and following thorough scientific evaluation. The Council recognizes the need for further evaluation of specific proposals for ASR in the region on a case-by-case basis.
<i>Do not preclude interbasin transfer as an option for future water management in the region, as needed.</i>	<ul style="list-style-type: none"> Interbasin transfer (IBT) of water can provide supply or flows to a receiving basin where water is needed. IBTs are used in many places in Georgia at this time. The Council does not endorse any specific proposals for future IBTs at this time. Any IBT proposal should receive thorough scientific evaluation.
SF4: Encourage continued development of farm ponds in the region through existing incentive programs	<ul style="list-style-type: none"> On-farm water storage that is filled in periods of high flow can replace direct pumping <u>for irrigation</u> from surface streams or wells during drought periods. Impacts on flows through intercepted drainage and evaporative loss should be considered to minimize adverse impacts on surface water availability. <u>Incentive funding is available from the Soil and Water Conservation Districts and the Georgia Soil and Water Conservation Commission.</u> <u>Future permits for farm pond withdrawals should include low flow protection requirements similar to those required in the Flint River Basin Water Development and Conservation Plan of 2006.</u>
SF5: Evaluate storage options in the Upper Flint Region that can provide for <u>supply and flow augmentation</u> in dry periods	<ul style="list-style-type: none"> Addressing the surface water availability gap at Bainbridge may require the addition of storage that can be used to augment <u>supply and flows</u> in the Flint River Basin. The Council recommends creation of a study commission to evaluate storage options within the Upper Flint Region. The Commission's evaluation should assess potential locations, viability, cost, and implementation.
WATER RETURNS MANAGEMENT (RM)	
Issue Addressed	Surface water availability sustainability criteria
Gaps Addressed	Surface Water Availability at Bainbridge (Flint) and Alapaha (Suwannee)
Council Goals Addressed	
RM1: <u>Restrict the development of new land</u>	<ul style="list-style-type: none"> <u>A preference for treatment systems that discharge to surface water over land application of wastewater supports increased</u>

6. Addressing Water Needs and Regional Goals



Table 6-1: Water Management Practices Selected for the Upper Flint Water Planning Region

Management Practice	Description/Definition of Action <i>PRIORITY: HIGH, MEDIUM, LOW</i>
<u>application systems for wastewater treatment</u>	<p><u>return flows to the surface water.</u></p> <ul style="list-style-type: none"> • <u>The Council recommends that new Land Application Systems be used only as an option of last resort.</u> • <u>Treatment by land application systems currently accounts for 11% of total wastewater volume in the region. In Section 4.1.2, this proportion held constant in the wastewater treatment forecast. This management practice would seek to reduce the proportion treated by land application systems in the future.</u>
WATER QUALITY (WQ)	
<u>Issue Addressed</u>	<u>Point and nonpoint source water pollution</u>
<u>Gaps Addressed</u>	<u>Water Quality Violations</u>
<u>Council Goals Addressed</u>	<u>1,2,3,5,6</u>
<u>WQ1: Improve enforcement of existing permits and regulations and implementation of existing plans and practices</u>	<ul style="list-style-type: none"> • Increase technical assistance from GA EPD to local communities for improved education and improved enforcement of erosion and sediment control.
<u>WQ2: Improve implementation of non-point source controls</u>	<p>The Council recommends the following:</p> <ul style="list-style-type: none"> • Encourage use of the Georgia Stormwater management manual or alternative equivalent stormwater management throughout the region. • Increase implementation of best management practices throughout the region for all industries • Investigate and promote best management practices for water quality for all industries • Encourage use of wastewater treatment systems with point source discharges where practicable and consider additional land application systems discharges only as a last resort. • Encourage local communities to increase stream buffer quality in the region • Create a conservation land program that targets voluntary acquisition of stream buffers for water quality to increase stream buffers
<u>WQ3: Increase education directed toward improving water quality</u>	<ul style="list-style-type: none"> • Improve education of local governments, industries, and individuals regarding the impact of activities on water quality in the region through multiple activities such as training courses for government staff and leaders focused on water quality and periodic water summits to highlight the water quality impacts challenges, and solutions shared by separate government agencies. • Establish a speakers' bureau to assist in educating local communities. • Encourage increased education on best management practices for dirt road maintenance. • Encourage local communities to increase stream buffer quality in the region

6. Addressing Water Needs and Regional Goals

Table 6-1: Water Management Practices Selected for the Upper Flint Water Planning Region

Management Practice	Description/Definition of Action <i>PRIORITY: HIGH, MEDIUM, LOW</i>
<i>WQ4: Improve water quality monitoring</i>	Provide data for water quality improvements in the future <ul style="list-style-type: none"> • Increase number of collection sites • Increased monitoring frequency • Increase parameters sampled
<i>WQ5: Continue coordination and cooperation with adjacent water councils</i>	Continue efforts initiative in the planning process to work across Council boundaries to address shared resource concerns.
<i>WQ6: Utilize technology to improve water resource management information</i>	Use tools such as computer mapping and database systems to: <ul style="list-style-type: none"> • Identify water quality “hot spots” • Document ongoing activities, such as existing monitoring programs.

The Council selected these management practices to apply to the whole Upper Flint Region. Although the region’s boundaries encompass multiple surface water and groundwater resources, the Council believes that the management practices will be beneficial to all of these resources and that within the region, issues across different water resources are similar enough that the selected practices are appropriate to be applied across the whole region.

The selected management practices were adopted by the Council because they address identified gaps between resource needs and resource capacities, discussed in Section 5. The practices were also selected in order to fulfill the Council’s vision and goals for the region (see Section 1). The Council has discussed the gaps identified for surface water availability and groundwater availability extensively. The model results indicate substantial gaps for these resources in the Bainbridge node of the Flint River Basin and in the Upper Floridan Dougherty Plain (the latter of which the region has only has a small amount of overlap with the Upper Flint water planning region). The identified gap in the Flint at Bainbridge relates to the depletion of surface water flows in drought periods, as a result of consumptive use of surface water and groundwater (from Subarea 4 of the Upper Floridan aquifer) in this region and neighboring regions. At many points in the period of record, the magnitude of the gap is sufficiently large that it cannot be addressed without drastic suspension of consumptive water use, or the construction of large-scale storage, or both.

The Council requested additional modeling from GAEPD to determine the scale of storage that would be needed to offset the gap at the Bainbridge node identified by the surface water availability assessment. The Council did not make this modeling request with the intention of proposing storage as the only management practice to address the gap, but rather, it made this request to aid Council members and others in understanding the magnitude of the gap and the potential management practices (storage or otherwise) needed to address it.

6. Addressing Water Needs and Regional Goals



The resource assessment model was run with this objective, and it was determined that the amount of storage needed to offset flow shortfalls at Bainbridge is 162,223 acre-feet. This amount accounts only for the volume needed to offset the flow shortfall. It does not include additional volume that would be necessary (e.g., to offset evaporation, seepage, and other loss factors) or that might be added to provide for additional purposes (e.g., recreation). According to the model results, in 2007, a reservoir of 162,223 acre-feet would have been emptied completely. Furthermore, it would not have completely offset the modeled flow shortfall because of evaporation and seepage losses. Therefore, this estimate is not a design estimate for a reservoir. It does, however, indicate that a reservoir of significant size would be needed to close the Bainbridge gap.³

Given the Council's vision and goals, it selected the management practices to address ~~these identified~~ gaps. However, the implications of these gaps for ~~downstream other users, and~~ instream needs, ~~and aquifer health are is~~ not fully understood; evaluation is needed to delineate and quantify the impacts of these gaps. and wWithout a more complete understanding of severity of these impacts, the Council would violate its own vision and goals if it were to recommend complete closing of the gaps at this time. The Council's vision and goals call for sustainable management of water resources that ensures that the welfare and needs of the region are met. They call for providing for the needs of all users, while protecting the economy, public health, and natural systems, and they specifically call for protection of the forestry and agricultural sectors of the regional economy. Complete closure of the gaps would require complete cessation of water withdrawals by agriculture in dry periods unless and until offsetting storage or augmentation are implemented. The complete cessation of through consumptive use ~~cessation~~ would have severe economic impacts for water users in the region, especially agriculture. It would be a major water policy shift with extraordinary implications for the region's economy and quality of life. Such drastic action is not justified without a better understanding of the implications of the gaps. A better understanding of the region's water resources is consistent with the Council's vision and goals. -and eConstruction of large-scale storage or augmentation can help to close identified gaps, but these are high-cost options that will requires further evaluation to ensure environmental protection and cost-effectiveness. Moreover, implementation of storage or augmentation will require several years for permitting and development.

As the planning process evolves, the Council recommends the development of more precise measures of the health of its water resources. This recommendation is explored further in Section 7.

³ The results of the storage estimate model run for the Bainbridge node are described in the GAEPD Technical Memorandum: Summary Future (2050) Resource Assessment in Apalachicola – Chattahoochee – Flint (ACF) River Basins Scenario MidChat-SWFA0001 available on the Upper Flint Water Planning Council website: http://www.upperflint.org/pages/our_plan/index.php

7. IMPLEMENTING WATER MANAGEMENT PRACTICES



7.3. Alignment with Other Plans

The development of this plan by the Upper Flint Water Planning Council builds upon the knowledge base of previous planning efforts by state and local governments and authorities. Existing water resources related plans and information sources that were consulted include:

- Flint River Basin Regional Water Development and Conservation Plan, Georgia EPD, March 20, 2006
- Watershed Assessments and Watershed Protection Plans (as required by NPDES permits)
- Water Quality in Georgia 2006- 2007 (305(b)/303(d) Report)
- TMDL Implementations Plans
- Nonpoint Source Implementation Plans
- Water and sewer master plans
- Stormwater master plans
- Georgia's Water Conservation and Implementation Plan, Georgia EPD, March 2010
- Georgia Water Stewardship Act of 2010
- Local comprehensive plans from Upper Flint water planning region

The council also ensured alignment with other regional Water Development and Conservation Plans was achieved by participating in a series of joint meetings, especially with the Lower Flint-Ochlockonee and Middle Chattahoochee Councils. In these meetings, council members discussed shared issues relating to resource availability and quality and policy, regulatory, and funding issues. As a result of this collaboration, where possible, the councils coordinated their plans. No conflicts between these regional plans have been identified.

Alignment with the existing Flint River Basin Regional Water Development and Conservation Plan (2006) was discussed by the Council throughout the planning process. While the Council recommendations will improve upon the 2006 plan, none of its recommendations conflict with that plan.

7.4. Recommendations to the State

The Upper Flint Water Planning Council has identified several recommended actions that would improve water resource management and planning in this region and the state as a whole. These include the following:

Information Needs:

Fulfillment of the following information needs would support improved water resources management and future water planning. Implementation of research and assessments to fill these needs will require funding (state, federal, other). Implementing agencies are not indicated here; if funding is identified, qualified researchers from state universities, institutions, and agencies, as well as private sector firms, can fulfill these information needs.



7. IMPLEMENTING WATER MANAGEMENT PRACTICES

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- Improve resource assessment modeling through increased use of observed water use and resource conditions data.
- Evaluate the environmental and other impacts of low flow conditions modeled at the Bainbridge planning node; determine a low flow criteria below which adverse ecosystem impacts are predicted.
- Increase the number of surface water availability model nodes in the Flint River Basin to support more detailed geographic understanding of water resource conditions.
- Improve assessment of groundwater use and recharge to support better understanding of impacts of use on aquifers and streamflow and to support protection for aquifer recharge areas.
- Assess baseline implementation of water conservation and water quality BMPs by agricultural producers. ~~The lack of information on current levels of implementation limits the ability of conduct effective regional water planning.~~
- Evaluate the full water cycle impacts of irrigation and evaporative losses from reservoirs to support better understanding of impact of these uses and losses.
- Encourage State and Federal agencies to reevaluate he scientific justification for the minimum flow ~~the required minimum flow~~ requirements for maintaining healthy aquatic ecosystems below Jim Woodruff Lock and Dam in the Apalachicola River. It is the opinion of this Council that the 5,000 cubic feet per second instantaneous flow target in the 1989 Water Control Manual (current operating plan when this plan was published) does not have sound scientific justification. Furthermore, the Council recommends the analysis of alternative structural hydraulic measures such as temporary weirs, gates, and/or steps to control river stage and sediment transport and scour at or below Woodruff Dam in order to protect critical habitat.
- Improve implementation of the agricultural water withdrawal metering program of the Georgia Soil and Water Conservation Commission by:
 - Completing comprehensive installation of meters
 - Ensuring the meters are functioning properly through regular maintenance inspection
 - Increasing data collection on parameters including monthly use, crops, inputs
 - Reporting aggregate results annually to permittees and policymakers
 - Preparing collected data in a manner that will facilitate use in future resource assessments
- Evaluate implementation and effectiveness of water conservation practices. Water conservation is a priority focus of the management practices in this plan, but there are currently several practical limitations to measuring progress and impact in conservation implementation, such as inconsistent

7. IMPLEMENTING WATER MANAGEMENT PRACTICES



terminology, lack of available data and the need to identify practical ways of collecting data. Periodically, it will be important to assess the progress and benefit of the water conservation program.

- Evaluate the impacts of farm ponds on stream flows through intercepted drainage and evaporative loss. Also improve how farm pond withdrawals are incorporated into the resource assessment models.

Water Policy Recommendations:

The following recommendations urge the General Assembly and other policymakers in Georgia (e.g., Board of Natural Resources) to pursue actions to improve water resource management in the state and in the Lower Flint-Ochlockonee water planning region.

- The Council recommends that the General Assembly provide funding for continued planning by the regional water councils in order to ensure continued progress toward state and regional water plan vision and goals. The Council also recommends that the General Assembly provide funding to support monitoring of plan implementation, data collection to support future planning, and continued refinement of water resource assessments used in the development of the regional water plans.
- The Council recommends that the Georgia General Assembly and implementing agencies, such as GAEPD, explore all possible funding sources to offset or pay for many of the management practices outlined in the Plan. Financial incentives and reimbursement for implementation of practices will expedite the progress needed to achieve the goals of the Plan.
- The Council urges the Georgia General Assembly and other state policymakers not to preclude interbasin transfer as an option for future water management in the region, as needed and following thorough scientific evaluation. Interbasin transfer (IBT) of water can provide supply or flows to a receiving basin where water is needed. IBTs are used in many places in Georgia at this time.
- The Council recommends that the General Assembly evaluate and consider the creation of regional water management institutions through which the authority for planning, management and oversight of water and watershed resources in the state is delegated to stakeholder-led councils. These institutions would have funding and staff for studies, assessments, measurement, monitoring and reporting on the progress toward goals, for future plan updates, and for the coordination of plan implementation. Revenue raising authority should be considered for these institutions. In the Apalachicola-Chattahoochee-Flint Basin, interstate needs also should be considered (see below).
- The General Assembly and other state policymakers should consider the development of an interstate compact for the ACF Basin. If any regional management institutions are created in the Basin, they would need the



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WATER DEVELOPMENT & CONSERVATION PLAN

capacity to operate as a part of that compact. The Council recognizes the examples of the Great Lakes Basin Compact, several of the Texas river basin compacts (i.e. Sabine River Compact Commission) and other successful stakeholder led water councils managing large river basins that cross geopolitical boundaries such as the Fraser River Basin Council (British Columbia, Canada). Collective legislative action involving Georgia, Alabama, and Florida would be needed to develop such a compact.

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