Gap Analysis Technical Memorandum

Savannah – Upper Ogeechee Regional Water Planning Council

Ogeechee River, Georgia

Supplemental Material

Savannah – Upper Ogeechee Regional Water Plan

October 2019

CDM Smith

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Section 1
Introduction

In February 2008, the Georgia General Assembly adopted the Georgia Comprehensive State-wide Water Plan (Plan) dated January 8, 2008. The Plan established the Regional Planning process that was officially kicked off in March 2009. The Savannah-Upper Ogeechee Regional Water Planning Council (Savannah-Upper Ogeechee Council) is one of the 11 planning regions established throughout the state. The Savannah-Upper Ogeechee Council is charged with several tasks including 1) review and consideration of water and wastewater forecasts for the region through the year 2050; 2) review and consideration of resource assessments prepared by EPD; and 3) identification of management practices to help meet forecasted demands and address regional needs. The Savannah-Upper Ogeechee Council boundaries are shown in **Figure 1-1**.

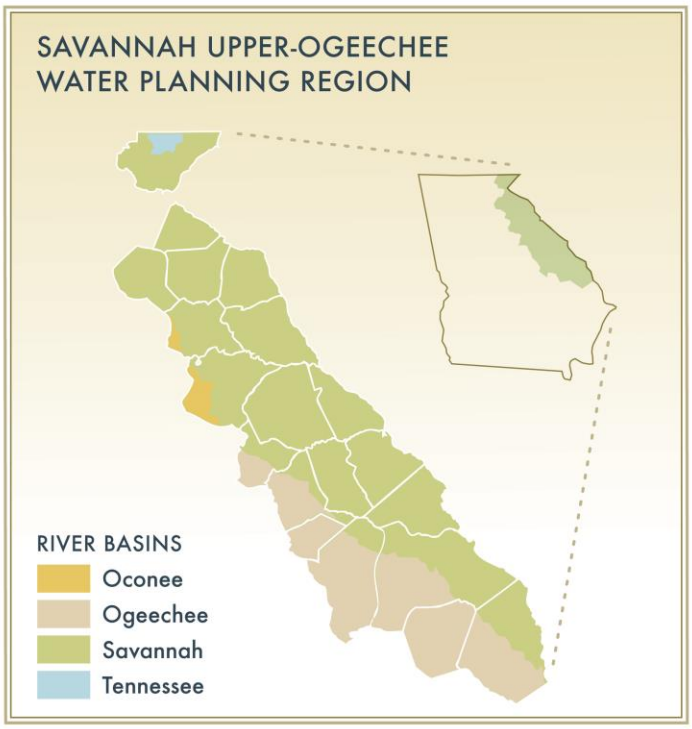

Figure 1-1: Savannah-Upper Ogeechee

The purpose of this technical memorandum is to compare the water and wastewater demand forecasts to the available resources. Areas where future demands exceed the estimated capacity of the resource have a gap that may be addressed through water management practices as part of the larger regional water planning effort. This technical memorandum summarizes:

- Water and wastewater forecasts for regional surface and groundwater resources;
- Identification of known existing permit capacity in relationship to forecasts;

- Estimated sustainable yield of the prioritized aquifers used in the Savannah-Upper Ogeechee Region in relationship to forecasts;
- Estimated surface water availability in relationship to the forecasts while maintaining the instream flow regime; and
- Water quality considerations.

Section 2

Water and Wastewater Forecast Overview

Water and wastewater forecasts have been developed beginning in 2015 and extending to 2050 for the 20 counties within the region. The major water and wastewater sectors include municipal (domestic and commercial), industrial, agricultural, and energy (thermoelectric power production).

A brief summary is provided in this document, but for more details concerning the forecast methodology and development please see the Water and Wastewater Forecasting Technical Memorandum for the Savannah-Upper Ogeechee Council.

2.1 Water Demand Summary

Figure 2-1 shows the aggregated county water forecasts for the Savannah-Upper Ogeechee Council region (the Savannah-Upper Ogeechee Region) in 2015 and 2050. Overall, the regional forecasted water need is expected to increase by 109.2 MGD. The forecasts are associated with a water source, either surface water (SW) shown in blue or groundwater (GW) shown in brown as well as the sector associated with the demand. The consumptive demand rather than total withdrawals from the energy sector are included. The agricultural demands represent dry year conditions (75th percentile demands).

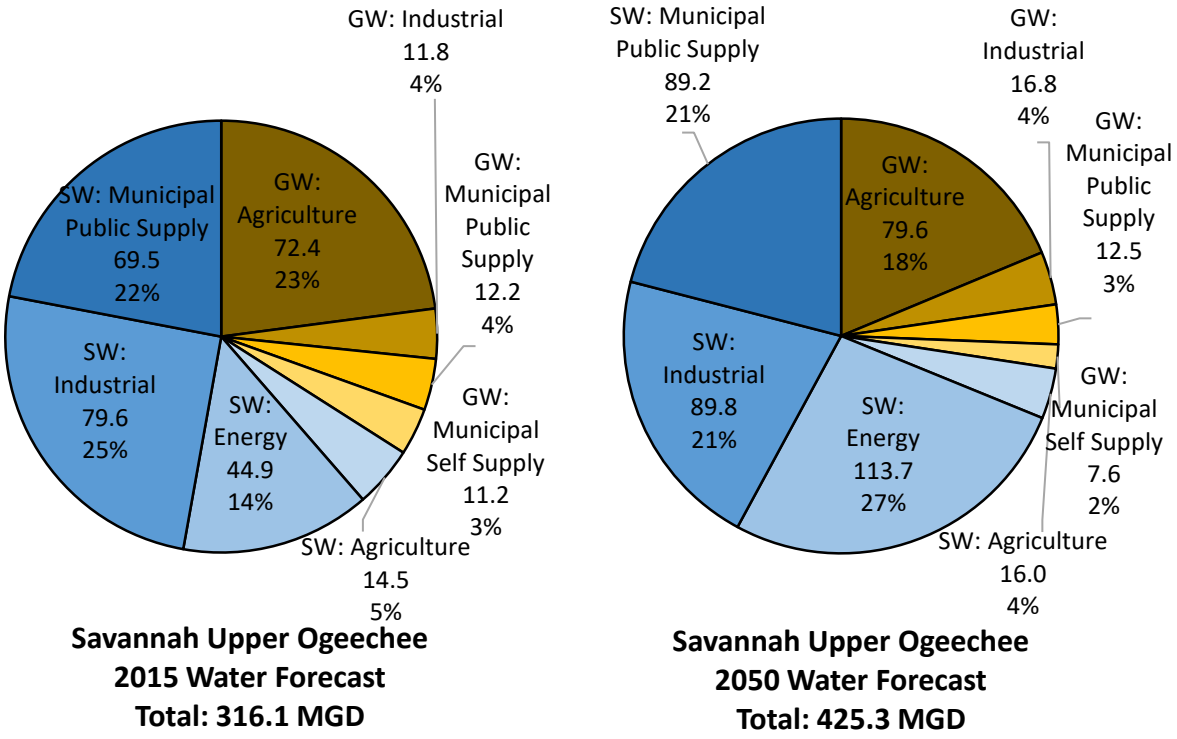

Figure 2-1: Savannah-Upper Ogeechee Regional Water Forecast by Sector and Supply Source

2.1.1 Groundwater Forecasts

Out of the 109.2 MGD increase in total water need by 2050, 9.0 MGD is projected to come from groundwater sources. **Table 2-1** shows the breakdown of this groundwater forecast by aquifer. Groundwater demand has been assigned to prioritized aquifers with Gordon aquifer demands reclassified as Floridan and Dublin aquifer demands reclassified as Cretaceous.

Table 2-1: Regional Groundwater Forecast by Aquifer (MGD)

Aquifer	2015	2050	Difference
Brunswick	0.3	0.3	0.0
Cretaceous	44.1	46.4	2.3
Crystalline-Rock	9.6	10.8	1.3
Floridan	53.7	59.0	5.4
Total	**107.7**	**116.5**	**9.0**

2.1.2 Surface Water Forecasts

For the Savannah-Upper Ogeechee Region, surface water is used to meet municipal, industrial, and agricultural demands as well as cooling system needs at the Plant Vogtle Nuclear Power Plant. Total surface water demands are expected to increase by 100.2 MGD by 2050 (19.7 MGD from municipal demands, 10.2 MGD from industrial demands, 1.5 MGD from agricultural demands, and 68.8 MGD from the energy sector). Counties with the largest projected growth in surface water usage include Burke and Columbia counties.

2.1.3 Municipal Demand Forecast Compared to Permitted Supply

Table 2-2 shows the 2015 and 2050 forecasts for publicly-supplied municipal use covering both groundwater and surface water. The existing permitted capacity by county is shown as well as any gap between the permitted capacity and the 2050 forecast. Glascock, Madison, Oglethorpe, and Taliaferro counties may require additional water supply infrastructure above what is currently permitted. However, these counties show constant or even decreasing demand trends, so the actual supply to meet demands may be coming from permits outside of the county boundaries. In the attached Appendix, municipal demands and permitted capacity are further subdivided, by county, into surface water and groundwater supplies.

Table 2-2: Municipal Forecast versus Permitted Capacity

County	2015 Public Demand Forecast (AAD – MGD)	2050 Public Demand Forecast (AAD – MGD)	Existing Permitted Capacity (AAD – MGD)	Additional Permitted Capacity Needed in 2050 (AAD – MGD)*
Banks	0.8	0.8	1.0	-
Burke	1.1	0.9	4.9	-
Columbia	16.8	37.0	55.1	-
Elbert	1.0	0.9	5.4	-
Franklin	1.9	3.0	7.4	-
Glascock	0.09	0.09	-	0.09
Hart	1.6	2.9	3.8	-
Jefferson	1.4	1.2	3.1	-
Jenkins	0.8	0.7	1.0	-
Lincoln	0.4	0.2	0.9	-
Madison	2.5	2.6	0.6	2.0
McDuffie	1.5	2.5	4.6	-
Oglethorpe	1.3	1.13	0.25	0.88
Rabun	2.0	1.8	8.2	-
Richmond	43.3	41.2	85.6	-
Screven	0.9	0.8	1.3	-
Stephens	3.4	3.3	15	-
Taliaferro	0.05	0.03	-	0.03
Warren	0.2	0.2	0.8	-
Wilkes	0.8	0.6	3.8	-

Values provided are average annual demands in millions of gallons per day (AAD-MGD)

*Analysis does not account for demands in one county that may be met by permits from another county.

2.2 Wastewater Forecast Summary

Figure 2-2 shows the aggregated county wastewater forecasts for the Savannah-Upper Ogeechee Region in 2015 and 2050. Overall, the regional forecasted wastewater flows are expected to increase by approximately 26.2 MGD.

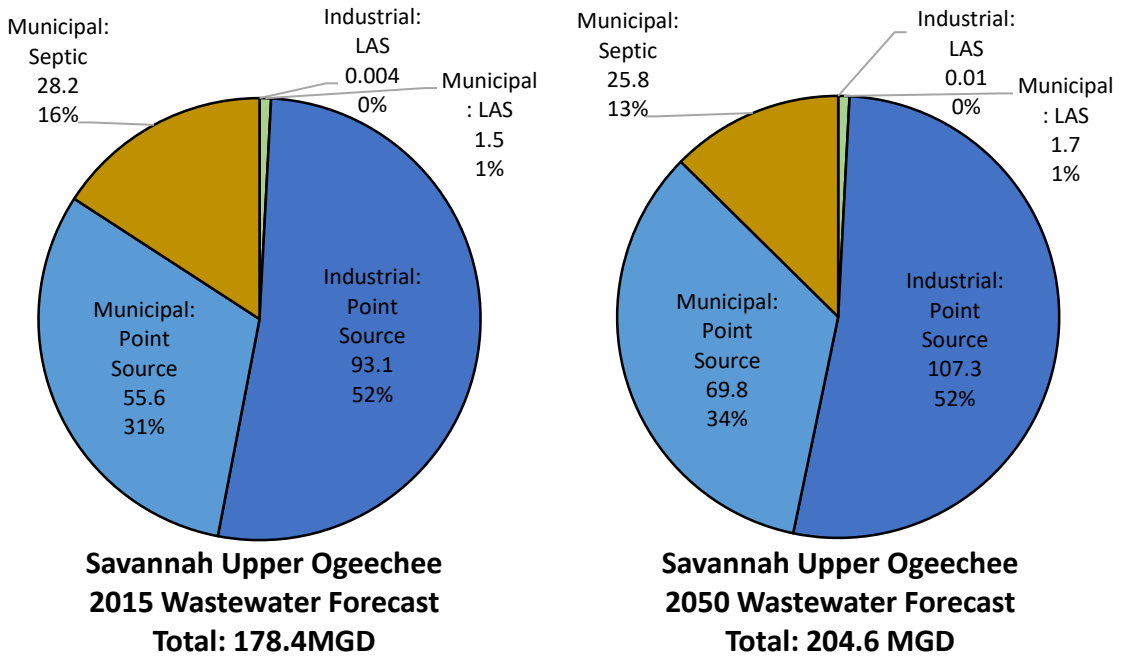

Figure 2-2: Savannah-Upper Ogeechee Regional Wastewater Forecast by Discharge Method and Sector

2.2.1 Comparing Wastewater Forecasts to Permitted Capacity

About 32% of the total regional wastewater flow is directed to municipal centralized treatment with ultimate discharge either directly to streams (point source) or through land application systems (LAS). This includes municipal wastewater as well as industrial wastewater that is treated and discharged through municipal centralized treatment facilities. **Table 2-3** shows the wastewater forecasts and permitted capacity for these municipal facilities summarized by county. The difference between the existing permitted capacity and the 2050 forecast is also listed for each county in terms of either surplus or gap. Based on the forecast wastewater flow, Madison and Oglethorpe counties may need additional permitted capacity for point source discharge. Burke and Stephens show minor potential gaps for LAS Permitted capacity. The attached Appendix has a detailed listing of existing permitted wastewater facilities per county.

Table 2-3: 2050 Municipal Wastewater Forecast versus Existing Permitted Capacity (MGD)

County	Point Source (PS)			Land Application Systems (LAS)		
	2050 Forecast[1]	Permitted Capacity	2050 Surplus or Gap (-)	2050 Forecast[1]	Permitted Capacity	2050 Surplus or Gap (-)[2]
Banks	0.04	1.11	1.06	0.11	0.32	0.21
Burke	0.64	2.37	1.73	0.15	0	**-0.15**
Columbia	19.50	21.65	2.15	0.49	0.58	0.09
Elbert	0.66	1.59	0.93	0	0	0
Franklin	0.62	1.50	0.87	0.06	0.08	0.02
Glascock	0.02	0.21	0.19	0	0	0
Hart	0.20	0.50	0.30	0.72	1.75	1.03
Jefferson	1.77	3.85	2.07	0	0.05	0.05
Jenkins	0.33	0.95	0.62	0	0	0
Lincoln	0.09	0.52	0.43	0	0	0
Madison	0.93	0.17	**-0.76**	0.01	0.1	0.09
McDuffie	1.77	2.50	0.73	0.10	0.29	0.19
Oglethorpe	0.53	0.25	**-0.28**	0	0	0
Rabun	1.24	4.20	2.96	0.01	0.1	0.09
Richmond	38.10	48.43	10.32	0	0	0
Screven	0.60	1.57	0.97	0.001	0.044	0.043
Stephens	1.81	2.50	0.70	0.003	0	**-0.003**
Taliaferro	0.03	0.10	0.07	0	0	0
Warren	0.37	0.84	0.47	0.02	0.05	0.03
Wilkes	0.55	4.08	3.53	0	0	0
Total	**69.80**	**98.89**	**29.09**	**1.67**	**3.36**	**1.69**

[1] Includes industrial wastewater expected to be treated at municipal facilities.

[2] Analysis does not account for gaps in some counties that may be met by permitted systems in neighboring counties.

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Section 3

Groundwater Availability

A Groundwater Availability Resource Assessment was performed by CDM Smith in March 2010 with updated information on the Cretaceous aquifer provided in September 2012. This resource assessment evaluated the estimated sustainable yield of a group of prioritized aquifers. Sustainable yield is the estimated amount of water that can be withdrawn from the modeled area of an aquifer without reaching specific thresholds of local or regional impacts. A separate analysis was performed in 2016 to investigate the capacity of the Floridan aquifer to replace agricultural surface water withdrawals in the Canoochee River Basin.

3.1 Crystalline-Rock Aquifer

The Crystalline-Rock aquifer is located beneath Columbia, Franklin, Madison, Rabun, Stephens, and Taliaferro counties.

Within the groundwater resource assessment, a small portion of the Crystalline-Rock aquifer was modeled. This estimated provided a low range normalized sustainable yield of 0.01 MGD per square mile of area, giving an estimated sustainable yield of approximately 40 MGD (on an annual average basis) for the modeled portion of the Crystalline-Rock aquifer. The portion of the forecasted demand coming from the Savannah-Upper Ogeechee Region accounts for 9.6 MGD currently and 10.8 MGD in 2050. The 2050 demands are projected to remain under the estimated range of sustainable yield for this aquifer.

3.2 Floridan Aquifer

Currently, the Savannah-Upper Ogeechee Region's use of the Floridan Aquifer accounts for slightly more than 8.7% of the total modeled aquifer use.

Within the groundwater resource assessment, an estimated range of sustainable yield of 868 to 982 MGD was determined for the modeled portion of the Floridan Aquifer. This modeled area encompasses Burke, Glascock, Jefferson, Jenkins, Richmond, and Screven counties for the Savannah-Upper Ogeechee Region. Other regions modeled as using portions of the Floridan Aquifer include Altamaha, Coastal Georgia, Middle Ocmulgee, Suwannee-Satilla, Upper Oconee, Lower Flint-Ochlockonee, and Upper Flint. **Figure 3-1** shows the current and forecasted demands for all regions using the modeled portion of the Floridan Aquifer. The portion of the demand coming from the Savannah-Upper Ogeechee Region is highlighted and accounts for 53.7 MGD currently and 59 MGD in 2050. 2050 demands are projected to remain under the estimated range of sustainable yield for this aquifer.

The analysis of whether groundwater from the Floridan aquifer could be utilized to replace agricultural surface water withdrawals in the Canoochee River Basin showed that groundwater withdrawals from the Floridan aquifer at existing surface water irrigation locations outside of the Gulf Trough area could be increased up to a total withdrawal of 10.5 mgd without impacting the estimated sustainable yield of the aquifer. Within the Gulf Trough area, the properties of the Floridan aquifer are not as conductive to groundwater development. But based on this study,

additional groundwater withdrawals are possible within the Canoochee River Basin and can contribute to reduction of current or future potential surface water gaps in the Canoochee River at the Claxton node (see Section 4.2.1 for more details).

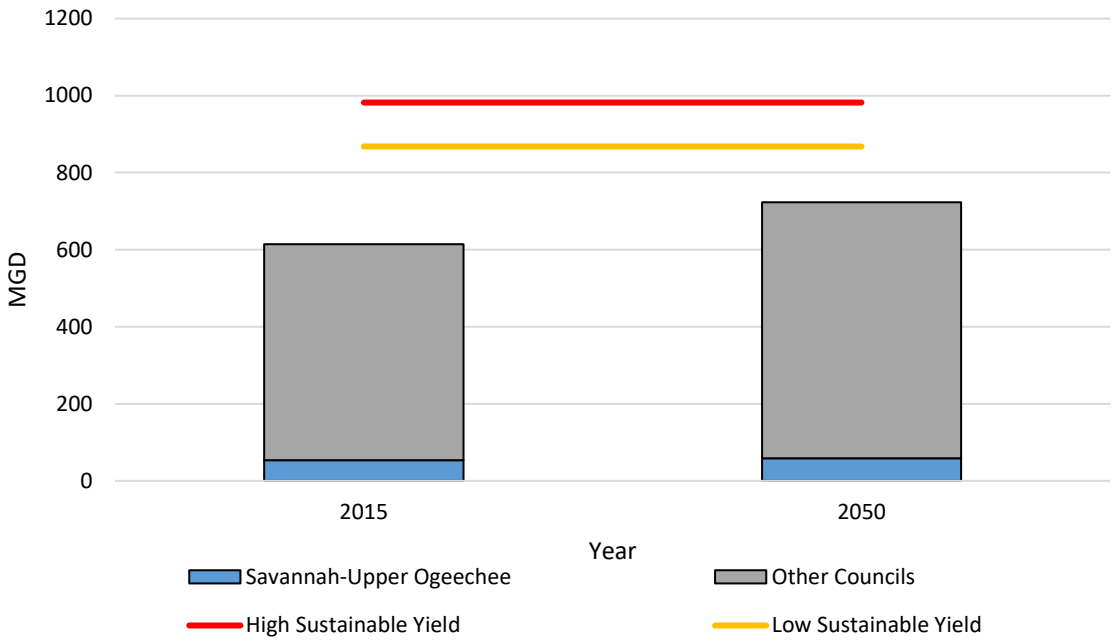

Figure 3-1: Floridan Aquifer (South Central Georgia & Eastern Coastal Plain) Forecasted Groundwater Demand Compared to Estimated Sustainable Yield

3.3 Cretaceous Aquifer

Currently, the Savannah-Upper Ogeechee Region's use of the Cretaceous Aquifer accounts for slightly more than 15% of the total modeled aquifer use.

Within the groundwater resource assessment, an estimated range of sustainable yield of 347 to 445 MGD was determined for the modeled portion of the Cretaceous aquifer. This modeled area encompasses Burke, Columbia, Glascock, Jefferson, Jenkins, McDuffie, Richmond, Screven, and Warren counties for the Savannah-Upper Ogeechee Region. Other regions modeled as using portions of the Cretaceous Aquifer include Altamaha, Middle Ocmulgee, Suwannee-Satilla, Upper Oconee, and Upper Flint. **Figure 3-2** shows the current and forecasted demands for all regions using the modeled portion of the Cretaceous aquifer. The portion of the demand coming from the Savannah-Upper Ogeechee Region is highlighted and accounts for about 34 MGD currently. 2050 demands are projected to remain constant and under the estimated range of sustainable yield for this aquifer.

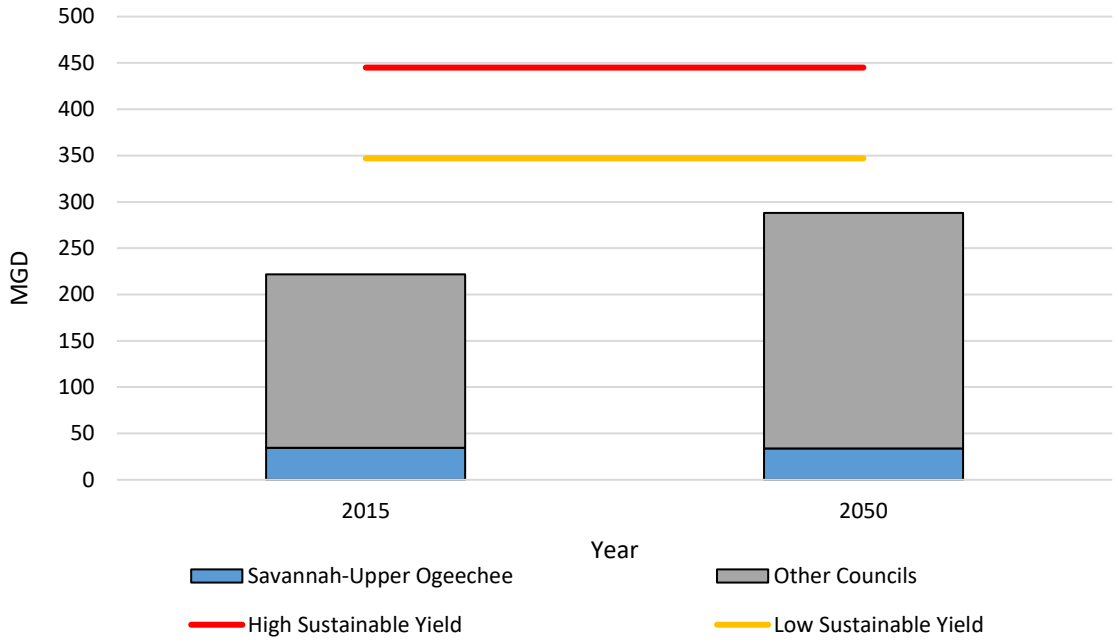

Figure 3-2: Cretaceous Aquifer Forecasted Groundwater Demand Compared to Estimated Sustainable Yield

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Section 4

Surface Water Availability

The Surface Water Availability Resource Assessment estimates the availability of surface water to meet current and future water needs as well as the needs of instream and downstream users.

4.1 Surface Water Planning Node Summary

There are several surface water planning nodes located within and near the Savannah-Upper Ogeechee Region. The modeling analysis conducted at these nodes under the Surface Water Availability Resource Assessment indicated the following under current and future conditions modeling (bolded nodes are located within the Savannah-Upper Ogeechee Region planning boundaries):

- **Augusta (Savannah River) – No potential surface water gaps under current and future conditions, based on existing U.S. Army Corps of Engineers (USACE) operations**
- Claxton (Canoochee River) – Potential surface water gaps under current and future conditions. However, only a small portion of Jenkins County is within the drainage are for this node.
- Clyo (Savannah River) – No potential surface water gaps
- Eden (Ogeechee River) – Potential surface water gaps under current and future conditions
- **Hartwell Reservoir (Savannah River) - No potential surface water gaps under current and future conditions, based on existing USACE operations**
- Kings Ferry (Ogeechee River) – Potential surface water gaps under current and future conditions.
- Milledgeville (Oconee River) – No potential surface water gaps
- Penfield (Oconee River) – No potential surface water gaps
- Savannah (Savannah River) – No potential surface water gaps

The location of the planning nodes and the portion of the Savannah-Upper Ogeechee Region that is within the local drainage area (LDA) of a node with a potential surface water gap are shown in **Figure 4-1**.

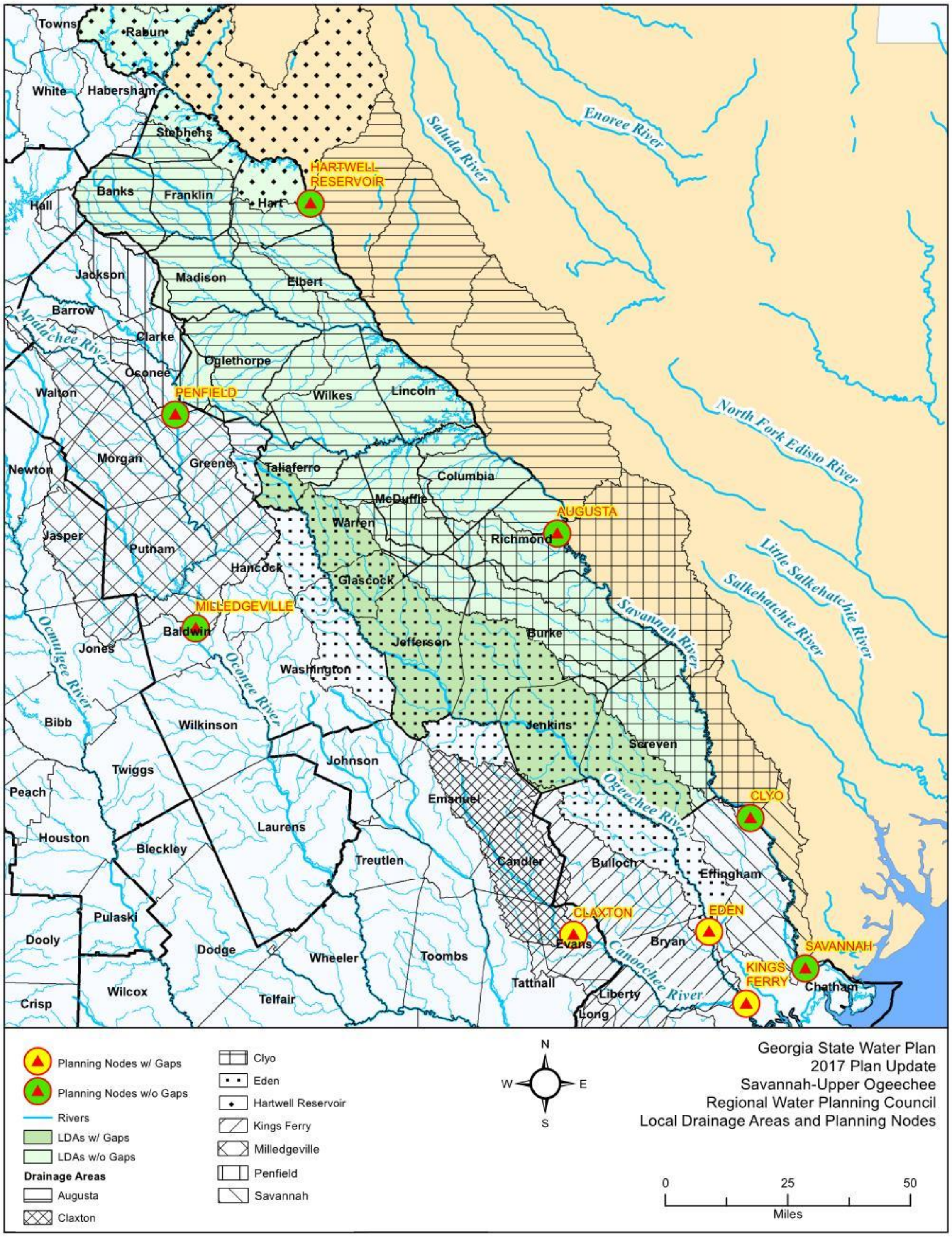


Figure 4-1: 2050 Potential Surface Water Gap Summary

4.2 Detailed Potential Gap Analysis

Modeled surface water gaps are driven by both net consumption (withdrawal minus returns) and year to year variation in river flows. In wet years, the region is less likely to experience any potential gaps to instream needs. In dry years, the potential gaps are likely to be more frequent, larger, and for longer duration. **Table 4-1** provides a quantification and frequency of modeled potential surface water gaps. The majority of the modeled potential gaps were shorter in duration (1-7 days and 8 -14 days potential gap events).

Table 4-1: Characteristics of Modeled 2050 Potential Surface Water Gaps

Gap Event Duration	Number of Gap Events (% of Total Gap Events)[1]		Total Gap Days (% of Total Days)[2]		Average Daily Flow Deficit per Event	Average Cumulative Flow Deficit per Event
Claxton Node						
1-7 days	139	(51.7%)	482	(1.8%)	3 cfs (2 MGD)	13 cfsd (8 MG)
8-14 days	55	(20.4%)	598	(2.2%)	5 cfs (3 MGD)	56 cfsd (36 MG)
15-30 days	39	(14.5%)	851	(3.1%)	6 cfs (4 MGD)	123 cfsd (80 MG)
>30 days	36	(13.4%)	2181	(8.0%)	6 cfs (4 MGD)	335 cfsd (218 MG)
Totals	269	(100.0%)	4112	(15.0%)		
Eden Node						
1-7 days	44	(61.1%)	178	(0.6%)	11 cfs (7 MGD)	52 cfsd (34 MG)
8-14 days	12	(16.7%)	114	(0.4%)	15 cfs (10 MGD)	150 cfsd (98 MG)
15-30 days	10	(13.9%)	222	(0.8%)	29 cfs (19 MGD)	633 cfsd (411 MG)
>30 days	6	(8.3%)	388	(1.4%)	28 cfs (18 MGD)	1,795 cfsd (1,167 MG)
Totals	72	(100.0%)	902	(3.3%)		
Kings Ferry Node						
1-7 days	40	(58.0%)	137	(0.5%)	20 cfs (13 MGD)	82 cfsd (530MG)
8-14 days	9	(13.0%)	98	(0.4%)	41 cfs (27 MGD)	468 cfsd (302 MG)
15-30 days	13	(18.8%)	291	(1.1%)	57 cfs (37 MGD)	1,264 cfsd (817 MG)
>30 days	7	(10.1%)	413	(1.5%)	75 cfs (49 MGD)	4,363 cfsd (2,820 MG)
Totals	69	(100.0%)	939	(3.4%)		

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

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

The following subsections provide a more detailed look at the potential gaps at each planning node. Each subsection provides a comparison of the potential gaps under current demands and projected 2050 future demands. The potentials gaps are then compared against the forecasted surface water demands for the Councils and counties within the local drainage area of each node.

4.2.1 Potential Gaps at the Claxton Node

The Claxton Node is located on the Canoochee River near Claxton, Georgia. Surface water withdrawals and discharges in the local drainage area for this node include municipal returns and agricultural use. **Table 4-2** provides an overview of the potential gaps at the Claxton node under current conditions and future conditions. **Table 4-3** shows the Regional Water Planning Councils

and counties within the local drainage area of the node, the forecasted surface water demand and the potential gaps for comparison.

As mentioned in Section 3.2, there is an opportunity to replace agricultural surface water withdrawals within the local drainage area of the Claxton node with Floridan aquifer groundwater withdrawals to help reduce the estimated potential gaps. Analysis showed that groundwater withdrawals from the Floridan aquifer at existing surface water irrigation locations outside of the Gulf Trough area could be increased up to a total withdrawal of 10.5 mgd without impacting the estimated sustainable yield of the aquifer.

Table 4-2: Potential Surface Water Gaps at Claxton Node

Scenario	Duration of Gap (% of total days)	Average Flow Deficit	Long-term Average Flow	Maximum 1-Day Gap	Corresponding Flow Regime
Current Demands	21	6 cfs / 4 MGD	448 cfs / 290 MGD	16 cfs / 10 MGD	16 cfs / 10 MGD
Future (2050) Demands	15	5 cfs / 3 MGD	452 cfs / 292 MGD	15 cfs / 10 MGD	15 cfs / 10 MGD

Table 4-3: Claxton Planning Node Surface Water Forecast and Summary of Potential Gaps by Region

Councils and Associated Counties That Are Within in the Local Drainage Area with Potential Gaps	Total 2050 Forecasted Surface Water Demand at Planning Node Summarized by Sector (MGD)	2050 Potential Gap Information: Average Daily Flow Deficit per Gap Event Summarized by Planning Node		2050 Forecasted Surface Water Withdrawals Summarized by Planning Council (MGD)
		1-7 Day Duration	8 - 14 Day Duration	
Canoochee River				
Altamaha – Candler, Emanuel, Evans, Tattnall	Agriculture: 4.98	2 MGD (3 cfs)	3 MGD (5 cfs)	4.98
Coastal Georgia - Bulloch	Agriculture: 0.27	51.7% of all potential gap events	20.4% of all potential gap events	0.27
Savannah Upper Ogeechee - Jenkins	Agriculture: 0.02			0.02
			Total:	**5.26**

4.2.2 Potential Gaps at Eden Node

The Eden node is located on the Ogeechee River near Eden, Georgia. Surface water withdrawals and discharges in the local drainage area for this node include municipal demands and returns, industrial returns, and agricultural use. **Table 4-4** provides an overview of the potential gaps at the Eden node under current conditions and future conditions. **Table 4-5** shows the councils and counties within the local drainage area of the node, the forecasted surface water demand and the potential gaps for comparison.

Table 4-4: Potential Surface Water Gaps at Eden Node

Scenario	Duration of Gap (% of total days)	Average Flow Deficit	Long-term Average Flow	Maximum 1-Day Gap	Corresponding Flow Regime
Current Demands	6	16 cfs / 10 MGD	2,207 cfs / 1,426 MGD	35 cfs / 23 MGD	139 cfs / 90 MGD
Future (2050) Demands	3	24 cfs / 16 MGD	2,213 cfs / 1,430 MGD	47 cfs / 30 MGD	102 cfs / 66 MGD

Table 4-5: Eden Planning Node Surface Water Forecast and Summary of Potential Gaps by Region

Councils and Associated Counties That Are Within in the Local Drainage Area with Potential Gaps	Total 2050 Forecasted Surface Water Demand at Planning Node Summarized by Sector (MGD)	2050 Potential Gap Information: Average Daily Flow Deficit per Gap Event Summarized by Planning Node		2050 Forecasted Surface Water Withdrawals Summarized by Planning Council (MGD)
		1-7 Day Duration	8-14 Day Duration	
Ogeechee River				
Altamaha - Emanuel	Agriculture: 0.05	7 MGD (11 cfs) 61.1% of all potential gap events	10 MGD (15 cfs) 16.7% of all potential gap events	0.05
Coastal Georgia – Bryan, Bulloch, Effingham	Agriculture: 1.29			1.29
Savannah-Upper Ogeechee – Burke, Glascock, Jefferson, Jenkins, Screven, Taliaferro, Warren	Agriculture: 7.7			7.87
	Municipal Water: 0.17			
Upper Oconee – Greene, Hancock, Washington	Agriculture: 1.42			1.42
			Total:	**10.64**

4.2.3 Potential Gaps at Kings Ferry Node

The Kings Ferry node is located on the Ogeechee River at U.S. 17 in Georgia. Surface water withdrawals and discharges in the local drainage area for this node include municipal returns and agricultural use. **Table 4-6** provides an overview of the potential gaps at the Kings Ferry node under current conditions and future conditions. **Table 4-7** shows the councils and counties within the local drainage area of the node, the forecasted surface water demand and the potential gaps for comparison.

Table 4-6: Potential Surface Water Gaps at Kings Ferry Node

Scenario	Duration of Gap (% of total days)	Average Flow Deficit	Long-term Average Flow	Maximum 1-Day Gap	Corresponding Flow Regime
Current Demands	6	35 cfs / 23 MGD	3,634 cfs / 2,349 MGD	81 cfs / 52 MGD	422 cfs / 273 MGD
Future (2050) Demands	3	37 cfs / 24 MGD	3,658 cfs / 2,364 MGD	80 cfs / 52 MGD	247 cfs / 160 MGD

Table 4-7: Kings Ferry Planning Node Surface Water Forecast and Summary of Potential Gaps by Region

Councils and Associated Counties That Are Within in the Local Drainage Area with Potential Gaps	Total 2050 Forecasted Surface Water Demand at Planning Node Summarized by Sector (MGD)	2050 Potential Gap Information: Average Daily Flow Deficit per Gap Event Summarized by Planning Node		2050 Forecasted Surface Water Withdrawals Summarized by Planning Council (MGD)
		1-7 Day Duration	8-14 Day Duration	
Ogeechee River				
Altamaha – Candler, Emanuel, Evans, Tattnall	Agriculture: 8.12	13 MGD (20 cfs) 58.0% of all potential gap events	27 MGD (41 cfs) 13.0% of all potential gap events	8.12
Coastal Georgia – Bryan, Bulloch, Chatham, Effingham, Liberty, Long	Agriculture: 4.42			4.42
Savannah-Upper Ogeechee – Burke, Glascock, Jefferson, Jenkins, Screven, Taliaferro, Warren	Agriculture: 7.83 Municipal: 0.17			8.00
Upper Oconee – Greene, Hancock, Washington	Agriculture: 1.42			1.42
			Total:	**21.96**

Section 5
Surface Water Quality

The Surface Water Quality (Assimilative Capacity) Resource Assessment estimated the capacity of Georgia's surface waters to assimilate pollutants without unacceptable degradation of water quality. This section describes the relevant finding of the assessment for the Savannah-Upper Ogeechee Region.

5.1 Dissolved Oxygen Assimilative Capacity

One measure of the capacity of a stream to maintain its health and the health of the aquatic species living therein is the amount of residual dissolved oxygen (DO) in the waters of the stream. The Assimilative Capacity Resource Assessment drew upon water quality modeling tools to estimate the ability of streams and estuaries to assimilate pollutants under current and future conditions. The current conditions modeling incorporated all municipal and industrial wastewater facilities operating at their full permitted discharge levels (flow and effluent discharge limits as of 2014). The results for the Savannah-Upper Ogeechee Region at current permitted conditions are presented in **Table 5-1** and **Figure 5-1**.

Table 5-1: Permitted Assimilative Capacity for DO in the Savannah-Upper Ogeechee Region

Basin	Available Assimilative Capacity (Total Mileage)						Modeled Miles in Council Region
	Very Good (≥1.0 mg/L)	Good (0.5 to <1.0 mg/L)	Moderate (0.2 to <0.5 mg/L)	Limited (>0.0 to <0.2 mg/L)	None or Exceeded (<0.0 mg/L)	Unmodeled	
Oconee	13	2	0	0	0	0	15
Ogeechee	108	112	126	27	2	6	381
Savannah	338	26	13	2	48	0	427
Tennessee	2	1	0	0	0	1	4

Source: GIS Files from the Updated Permitted Water Quality Resource Assessment; EPD, January 2017

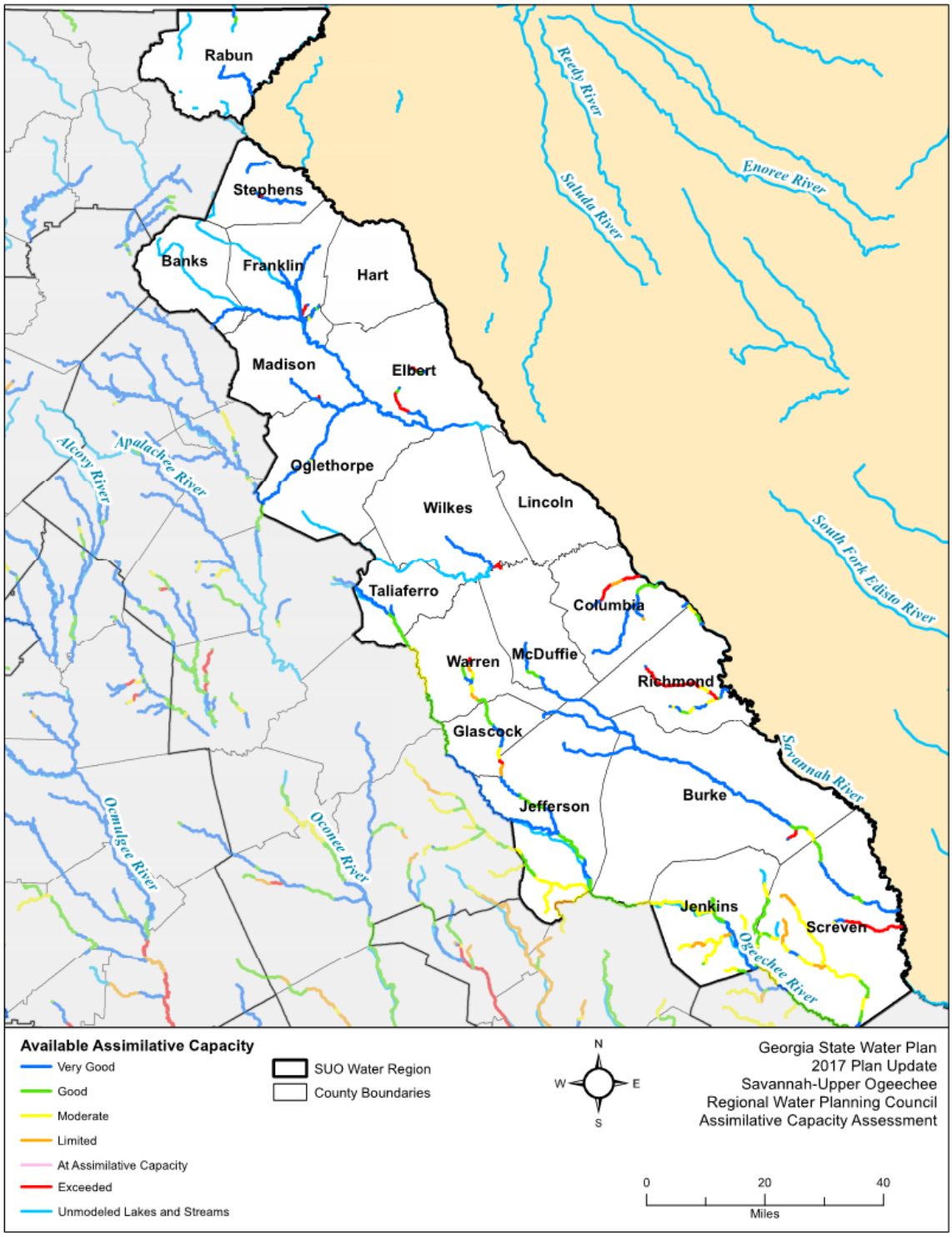


Figure 5-1: Results of DO Assimilative Capacity Assessment at Permitted Conditions

The stream segments at or exceeding their assimilative capacity within the Savannah-Upper Ogeechee Region are listed in **Table 5-2**.

Table 5-2: Stream Segments with No or Exceeded Assimilative Capacity Under Current Permitted Conditions

Basin	Stream Segment	Length (miles)
Ogeechee	Goldens Creek - 0.3 miles DS Northside WPCP to Warrenton New WPCP	0.7
	Goldens Creek - Warrenton Northside WPCP to 0.3 miles DS of Northside WPCP	0.3
	Rocky Comfort Creek - Joes Creek to Clear Creek	1.2
Savannah	Buck Creek - Unnamed Tributary to Savannah River	11.5
	Chandlers Branch - Sardis WPCP to Brier Creek	2.8
	Eastanollee Creek - Toccoa - Eastonollee Creek WPCP to Unnamed Tributary	0.7
	Falling Creek - Contour 480 to Unnamed Tributary	4.7
	Fortson Creek - Elberton - Fortson Creek WPCP to Unnamed Tributary	1.5
	Franklin Springs - Franklin Springs Pond WPCP to Broad River	2.6
	Kiokee Creek - Contour 200 to Savannah River	3.6
	Kiokee Creek - Contour 230 to Contour 210	2.4
	Kiokee Creek - Contour 240 to Contour 230	1.2
	Little River - Rocky Creek to Lake Hartwell	2.3
	Spirit Creek - 130 Contour to Little Spirit Creek	2.3
	Spirit Creek - U.S. Army - Fort Gordon WPCP to 140 Contour	12.3
	Unnamed Tributary to South Fork Broad River - Comer WPCP to Hill Street	0.2

5.2 Non-Point Source Pollution

Under Section 303(d) of the federal Clean Water Act, total maximum daily loads (TMDLs) are developed for waters that do not meet their designated uses. A TMDL represents the maximum pollutant loading that a water body can assimilate and continue meeting its designated use (i.e., not exceeding State water quality standards).

For the Savannah-Upper Ogeechee Region, there are 89 stream reaches (total impaired length of 617 miles) and 2 sounds (total impaired area of 56,548 acres) that are listed as impaired based on the 2014 list of impaired waters developed by EPD.

Of the impaired reaches in the region (note that a reach may be impaired for more than one parameter):

- 36% are impaired for Biological (Fish Community)
- 34% are impaired for Fecal Coliform
- 12% are impaired for trophic-weighted residual mercury in fish tissue
- 10% are impaired for Biological (Macroinvertebrate Community)
- 4% are impaired for low dissolved oxygen
- 1% are impaired for Zinc
- 1% are impaired for Cadmium
- <1% are impaired for Copper

A map of the impaired waters is provided in **Figure 5-2**. Both impaired lakes in the region are impaired for trophic-weighted residual mercury in fish tissue. TMDLs have been completed for 61 of the impaired stream reaches and one of the impaired sounds.

Figure 5-2: Impaired Water Bodies

5.3 Nutrient Loading

In addition to assimilative capacity modeling for DO, EPD completed nutrient (total nitrogen and total phosphorus) modeling for the watersheds in the Savannah-Upper Ogeechee Region. The watershed models evaluate point source and non-point source nutrient loadings. Results are provided within the resource assessments for wet, dry, and normal years. Example figures of nutrient loading for the Savannah-Upper Ogeechee watershed under 2050 future conditions for a wet year (2003) are provided in **Figure 5-3** for total nitrogen and **Figure 5-4** for total phosphorus. There are currently no nutrient standards for total nitrogen and total phosphorus in the region.

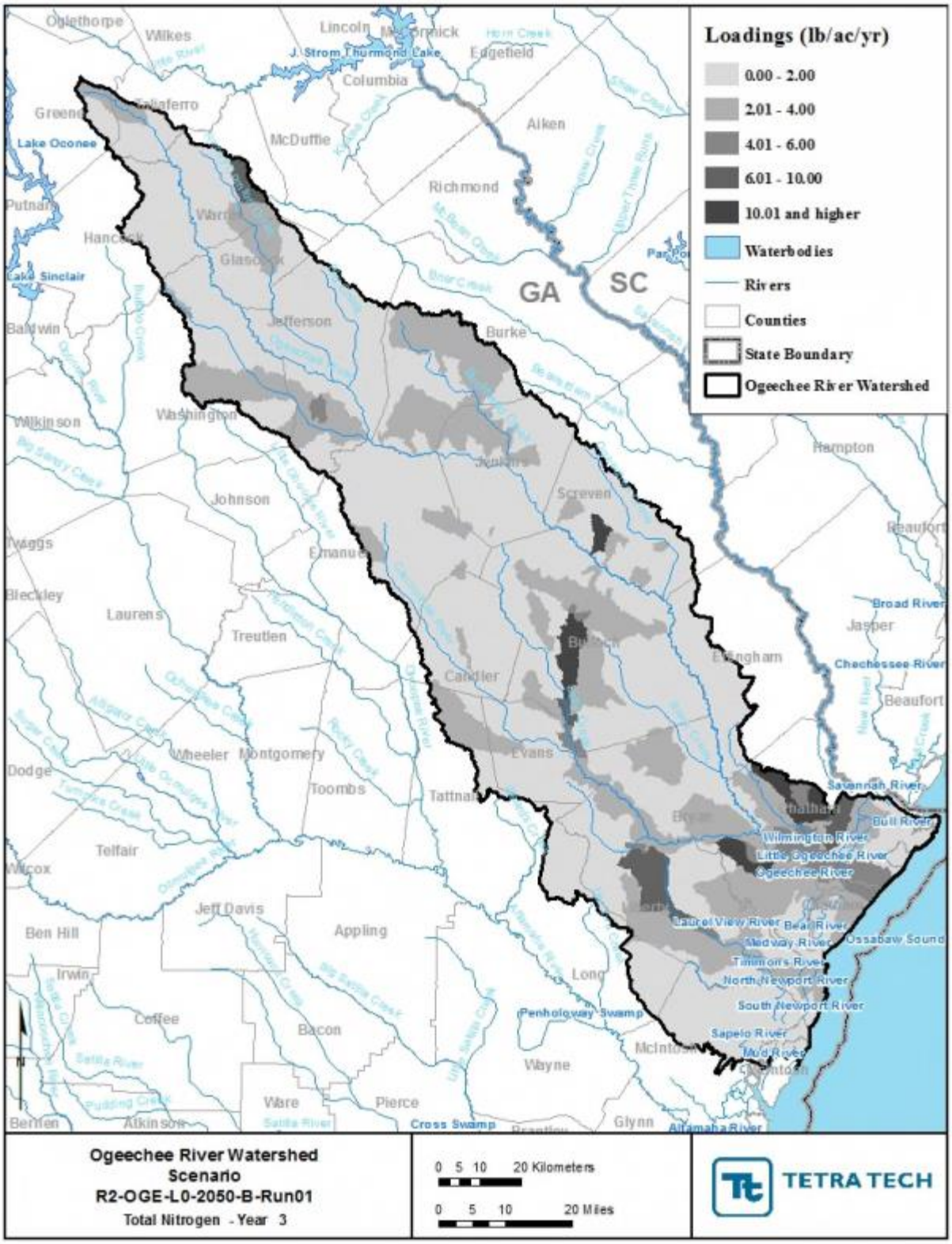


Figure 5-3 Savannah-Upper Ogeechee Watershed Wet Year Nutrient Loadings; Total Nitrogen Future (2050) Conditions

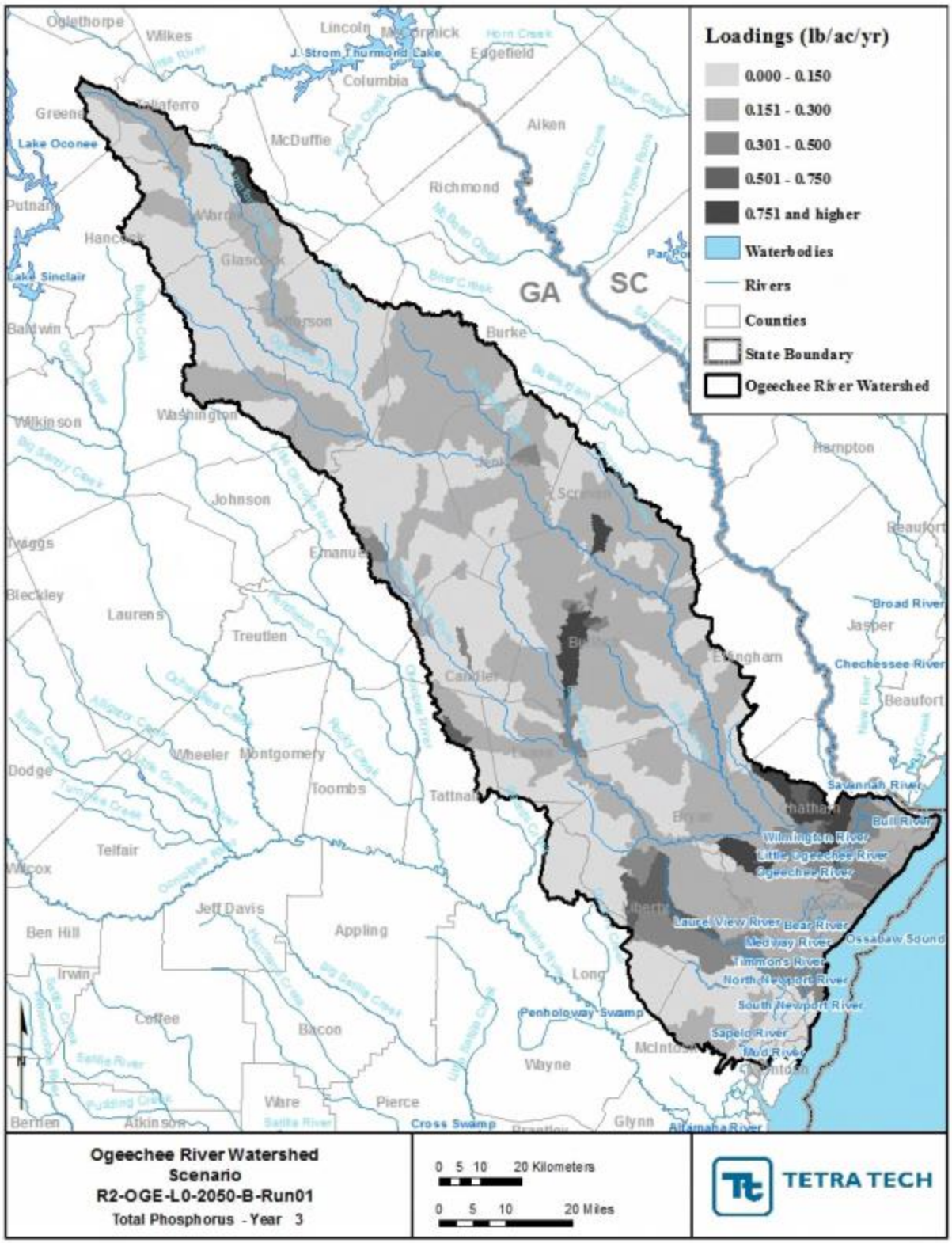


Figure 5-4 Savannah-Upper Ogeechee Watershed Wet Year Nutrient Loadings; Total Phosphorus Future (2050) Conditions

Section 6
Gap Analysis Summary

The Savannah-Upper Ogeechee Region is fortunate to have abundant water supply sources. Future water availability issues and needs for the Region include:

- There is a potential inability to maintain the low flow threshold at all times while meeting the forecasted 2050 demands at the Eden planning node in the Ogeechee River. Increased demand in the region may also add to potential surface water gaps downstream of the region on the Ogeechee River at the Kings Ferry planning node and on the Canoochee River at the Claxton planning node.
- With respect to those aquifers modeled, no groundwater resource shortfalls are expected to occur over the planning horizon.
- Additional permitted water withdrawals and treatment capacity may be needed in some counties to meet demands.

Future water quality issues and needs for the Region include:

- For fast growing counties, additional wastewater treatment capacity may be needed.
- To address limited assimilative capacity in several stream segments, additional wastewater planning and monitoring is needed.
- Significant organic load reductions will be required for the Savannah River and Harbor to address both Georgia and South Carolina discharges.

Table 6-1 summarizes the potential water resource issues and permitted capacity needs in the Savannah-Upper Ogeechee Region by County.

Table 6-1: Summary of Potential Water Resource Issues by County[1]

County	Municipal Water Permitted Capacity Need[2]	Part of Drainage Area with Modeled Surface Water Gaps	Municipal Wastewater Permitted Capacity Need[2]	Water Quality – DO Assimilative Capacity Issues
Source	*Table 2-2*	*Figure 4-1*	*Table 2-3*	*Figure 5-1*
Banks	-	-	-	-
Burke	-	Yes	Yes	Yes
Columbia	-	-	-	Yes
Elbert	-	-	-	Yes
Franklin	-	-	-	Yes
Glascock	Yes	Yes	-	Yes
Hart	-	-	-	-
Jefferson	-	Yes	-	Yes
Jenkins	--	Yes	-	-
Lincoln	-	-	-	-
McDuffie	-	-	-	Yes
Madison	Yes	-	Yes	Yes
Oglethorpe	Yes	-	Yes	-
Rabun	-	-	-	-
Richmond	-	-	-	Yes
Screven	-	Yes	-	Yes
Stephens	-	-	Yes	Yes
Taliaferro	Yes	Yes	-	-
Warren	-	Yes	-	Yes
Wilkes	-	-	-	Yes

Notes:
1) "Yes" indicates a potential gap in the indicated county (for surface water, “yes” indicates part or all of the indicated county lies in the area contributing to a potential gap)

2) Permitted capacity need is based on the comparison of permitted municipal capacity versus 2050 forecasted demand.

Appendix

Municipal Forecasts versus Permitted Capacity by County

Within this appendix, the water and wastewater forecasts at the County level are compared to existing permitted capacities for facilities located within the County. These county level results should not be interpreted at the facility/municipality level, as they do not account for demands in one county that may be met by permits from another county. Water and wastewater providers should review the information presented here and incorporate the general trends into their actual planning and permit needs.

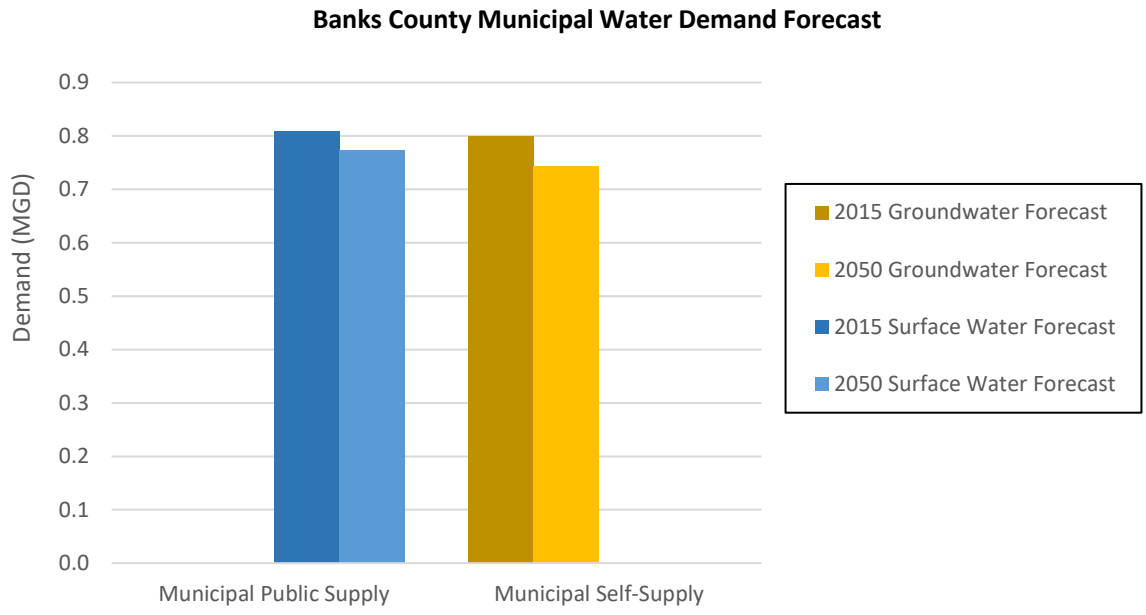
Banks County

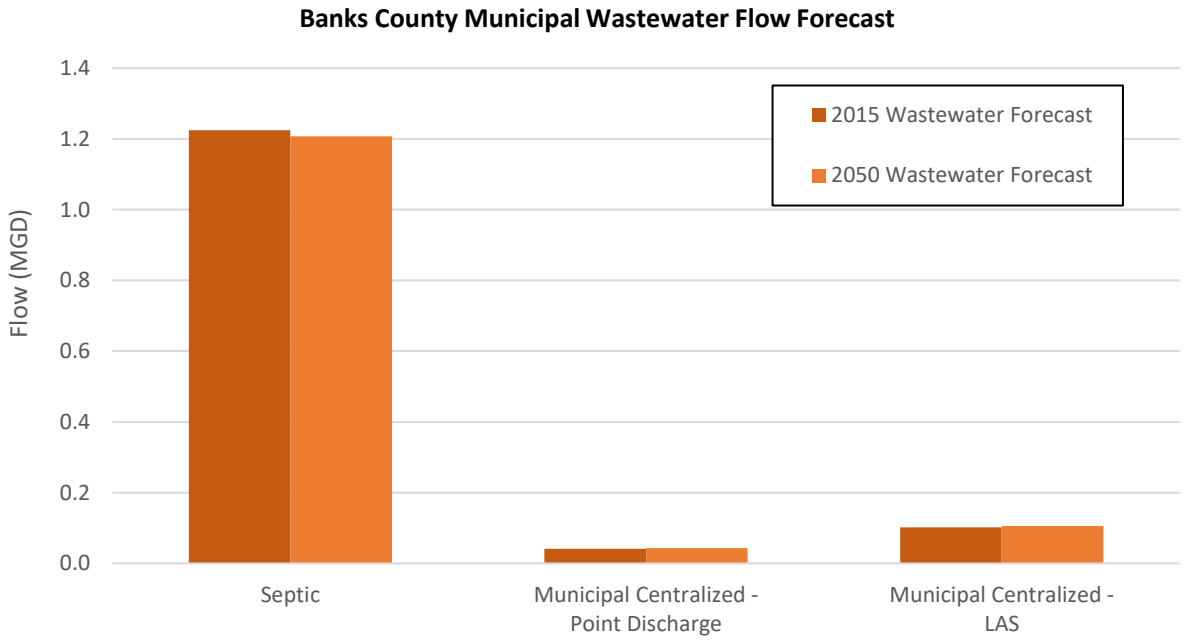
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	0	0	0
Surface Water	1.00	0.77	0.23
Municipal Wastewater (MGD)			
NPDES (Point Source)	1.11	0.04	1.07
LAS (Land Application)	0.32	0.11	0.21

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Banks County Board of Commissioners	006-0106-05	1.00	Mtn. Cr. Res. Strctr 11
Existing Permitted Wastewater Facilities			
Banks County - Southeast	GA0050215	1.00	Hudson River
Commerce- Davis House	GA0032646	0.067	Grove Creek tributary to the Hudson River tributary to the Broad River
Commerce- Holiday Inn WPCP	GA0032638	0.041	Crooked Creek tributary to the Grove Creek tributary to the Hudson River tributary to the Broad River
Banks County BOC - Atlanta International Dragway WPCP	GAJ020023	0.27	LAS
Banks County BOC- Industrial Park WPCP	GA02-181	0.045	LAS


Banks County Municipal Water Demand Forecast
Demand (MGD)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Municipal Public Supply
Municipal Self-Supply
2015 Groundwater Forecast
2050 Groundwater Forecast
2015 Surface Water Forecast
2050 Surface Water Forecast


Banks County Municipal Wastewater Flow Forecast
Flow (MGD)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Septic
Municipal Centralized - Point Discharge
Municipal Centralized - LAS
2015 Wastewater Forecast
2050 Wastewater Forecast

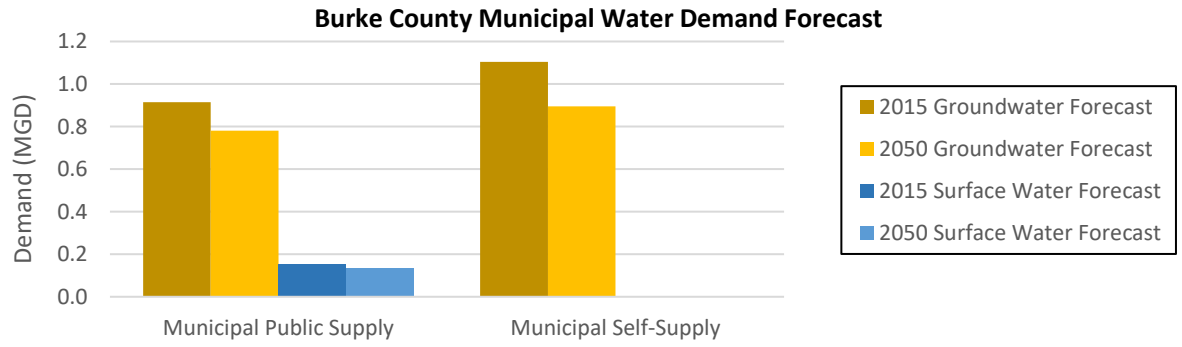
Burke County

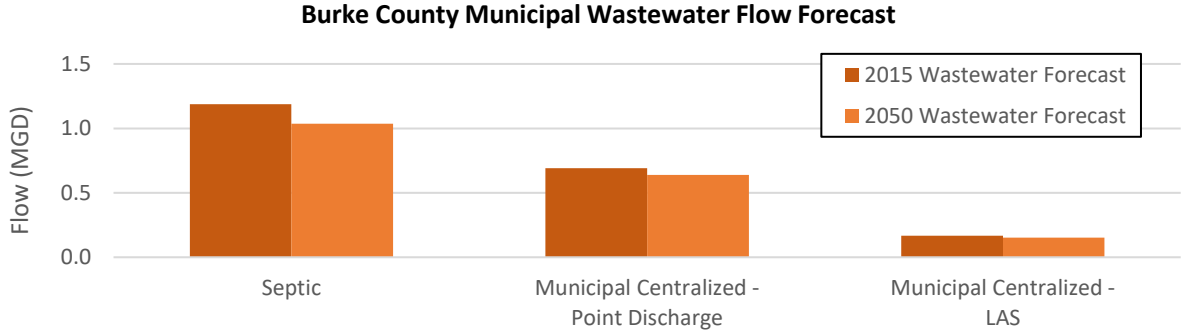
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	3.90	0.78	3.12
Surface Water	1.00	0.13	0.87
Municipal Wastewater (MGD)			
NPDES (Point Source)	2.37	0.64	1.73
LAS (Land Application)	0	0.15	-0.15

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Sardis, City of	017-0005	0.4	Cretaceous Aquifer
Waynesboro, City of	017-0002	3.5	Cretaceous Aquifer
Waynesboro, City Of	017-0113-01	1.0	Brier Creek
Existing Permitted Wastewater Facilities			
Midville WPCP	GA0020028	0.167	Ogeechee River
Sardis	GA0020893	0.2	Chandlers Creek Tributary
Waynesboro	GA0038466	2.0	Mcintosh Creek (tributary To Brier Creek)





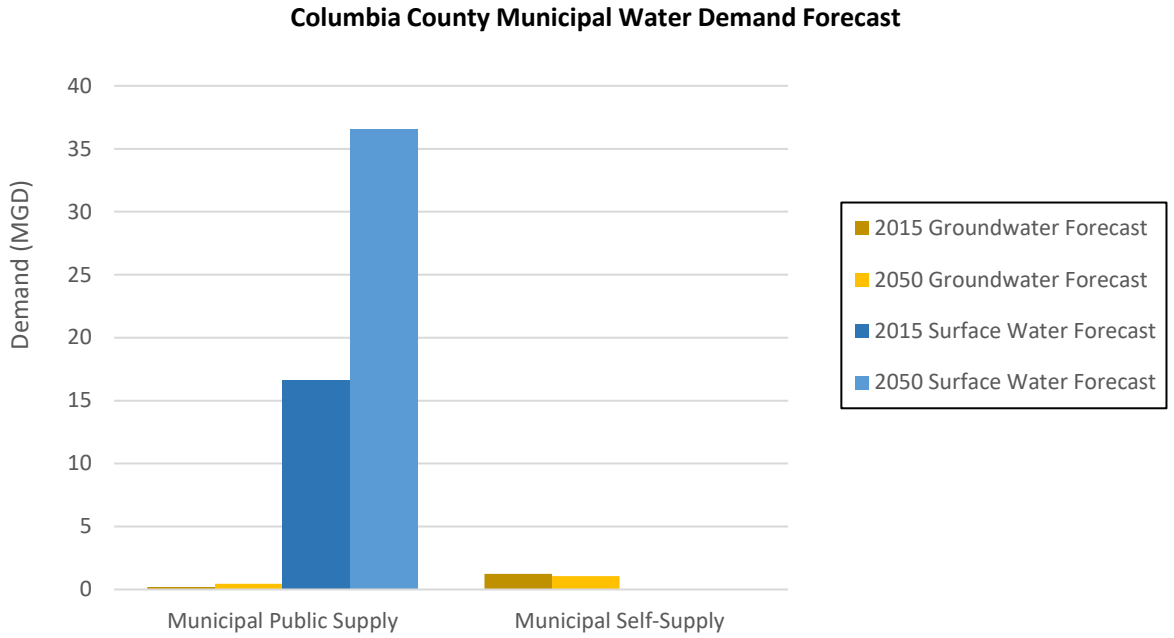
Columbia County

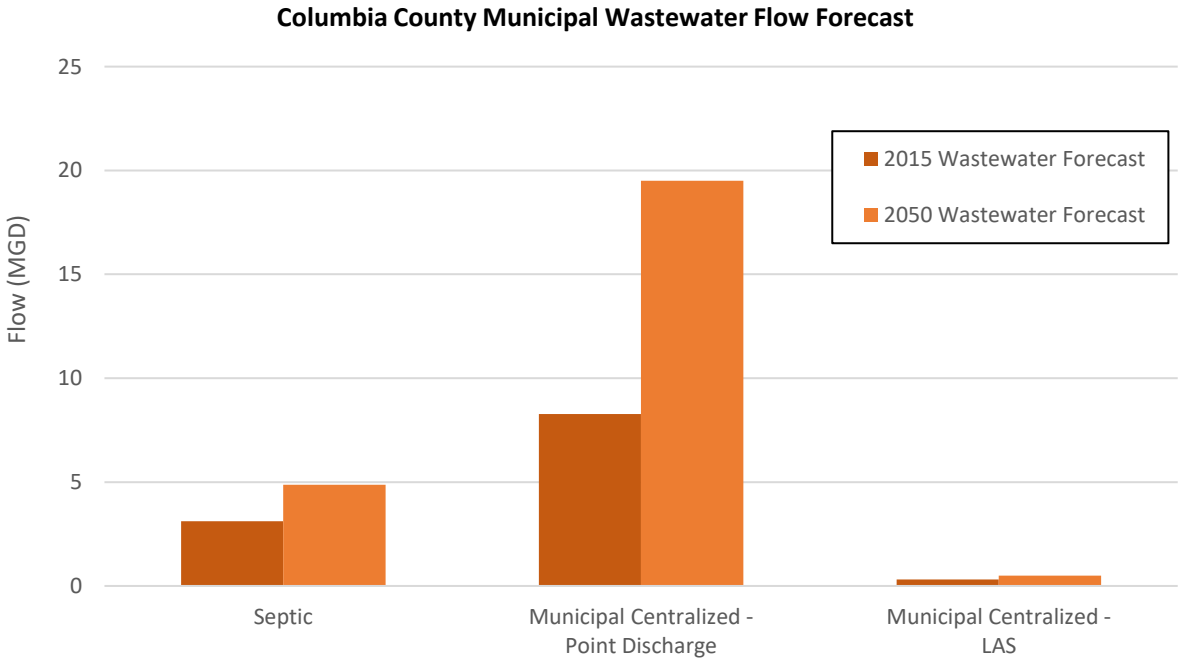
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	1.15	0.44	0.71
Surface Water	53.90	36.56	17.34
Municipal Wastewater (MGD)			
NPDES (Point Source)	21.65	19.50	2.15
LAS (Land Application)	0.58	0.49	0.09

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Grovetown, City of	036-0002	0.9	Crystalline Rock Aquifer
Harlem, City of	036-0001	0.25	Crystalline Rock Aquifer
Columbia County Water System	036-0109-04	8.0	Clarks Hill Reservoir
Columbia County Water System	036-0110-01	45.9	Stevens Creek Reservoir (Savannah River)
Existing Permitted Wastewater Facilities			
Harlem	GA0020389	0.25	Uchee Creek Tributary
Columbia County - Crawford Creek	GA0031984	1.5	Crawford Creek
Columbia County - Reed Creek	GA0031992	4.6	Reed Creek
Columbia County - Little River	GA0047775	12.0	Savannah River
Columbia County - Kiokee Creek	GA0038342	0.3	Kiokee Creek
Grovetown (City of)	GA0050246	3.0	Butler Creek
Grovetown (City of)	GA02-222	0.58	LAS


Columbia County Municipal Water Demand Forecast
Demand (MGD)
40
35
30
25
20
15
10
5
0
Municipal Public Supply
Municipal Self-Supply
2015 Groundwater Forecast
2050 Groundwater Forecast
2015 Surface Water Forecast
2050 Surface Water Forecast


Columbia County Municipal Wastewater Flow Forecast
Flow (MGD)
25
20
15
10
5
0
Septic
Municipal Centralized - Point Discharge
Municipal Centralized - LAS
2015 Wastewater Forecast
2050 Wastewater Forecast

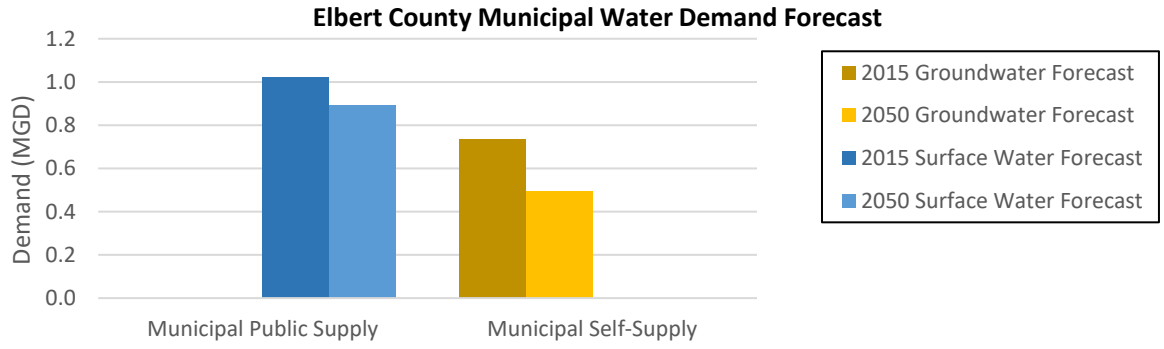
Elbert County

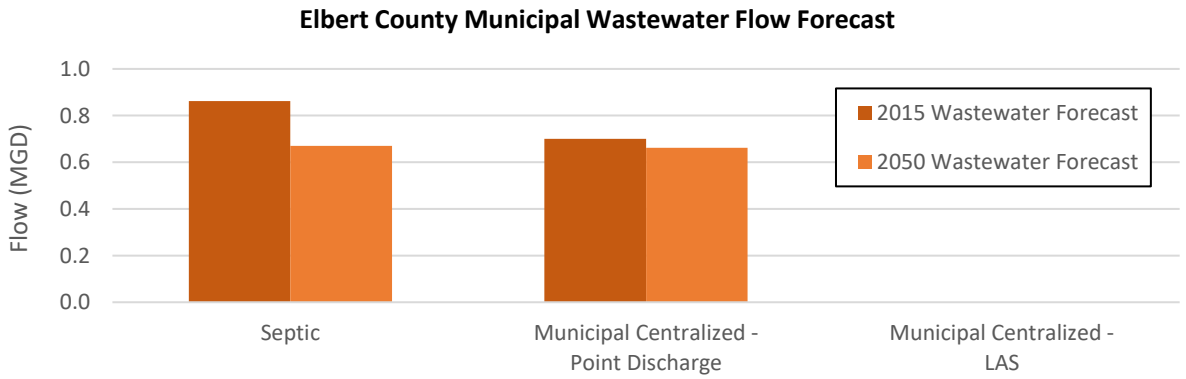
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	0	0	0
Surface Water	5.40	0.89	4.51
Municipal Wastewater (MGD)			
NPDES (Point Source)	1.59	0.66	1.59
LAS (Land Application)	0	0	0

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Elberton, City of	052-0104-01	1.7	Beaverdam Creek
Elberton, City Of	052-0104-04	3.7	Lake Russell
Existing Permitted Wastewater Facilities			
Bowman WPCP	GA0021067	0.09	Fork Creek to Deep Creek tributary to Broad River
Elberton - Fortson Creek	GA0025631	0.6	Fortson Creek
Elberton - Falling Creek	GA0025682	0.9	Falling Creek





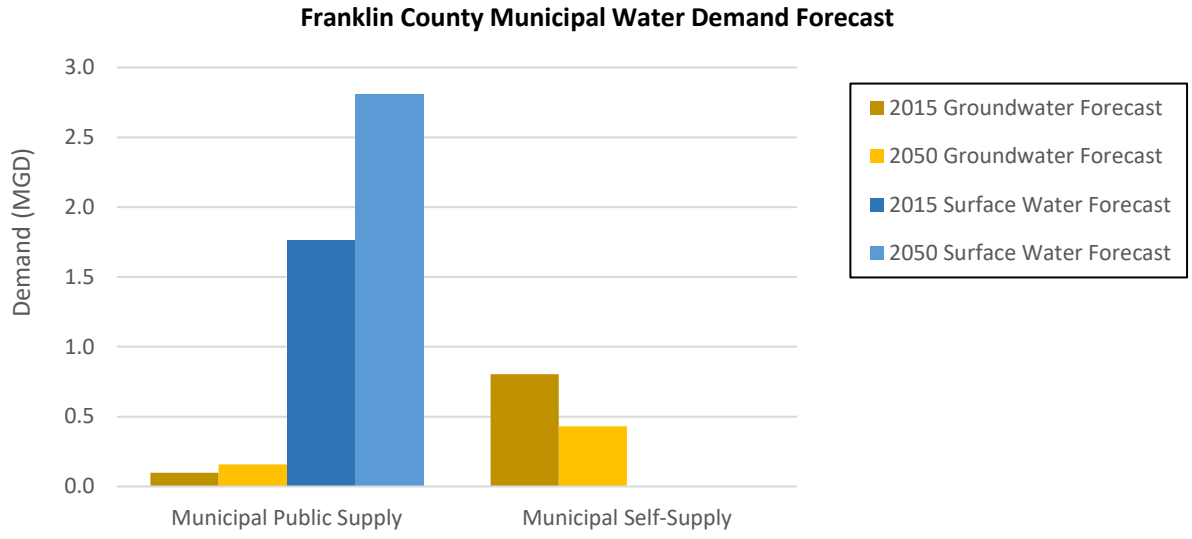
Franklin County

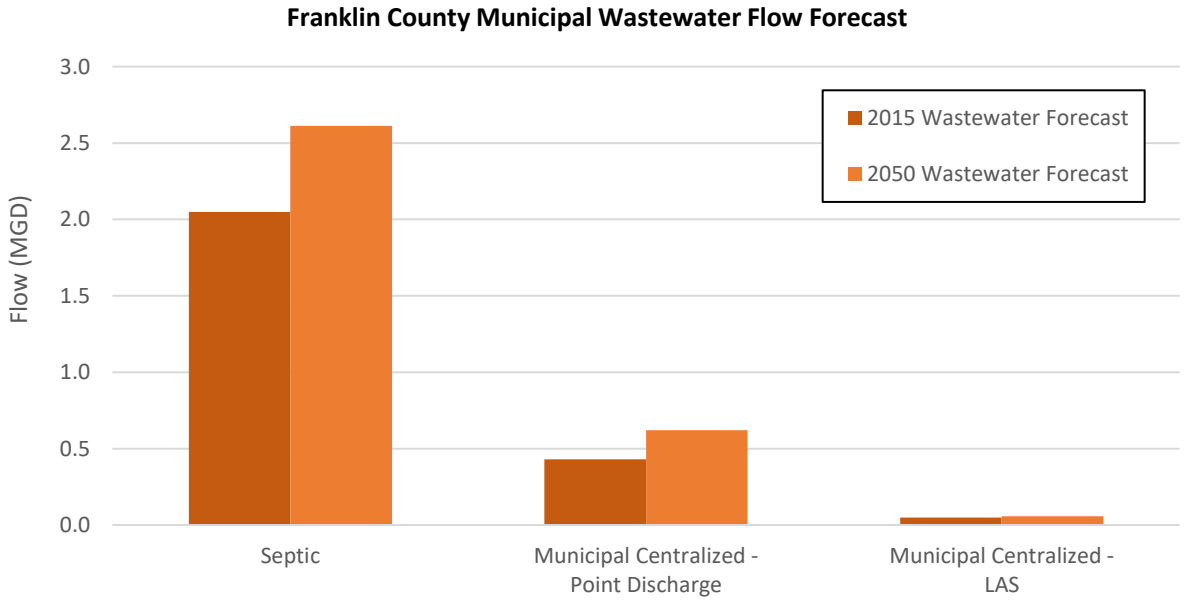
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	1.90	0.16	1.74
Surface Water	5.50	2.81	2.69
Municipal Wastewater (MGD)			
NPDES (Point Source)	1.50	0.62	0.88
LAS (Land Application)	0.08	0.06	0.02

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Canon, City of	059-0002	0.1	Crystalline Rock Aquifer
Franklin County	059-0003	1.545	Crystalline Rock Aquifer
Franklin Springs, City of	059-0001	0.25	Crystalline Rock Aquifer
Lavonia, City Of	059-0102-01	1.5	Crawford Creek
Lavonia, City Of	059-0102-04	3.0	Lake Hartwell
Royston, City of	059-0103-01	1.0	North Fork Broad River
Existing Permitted Wastewater Facilities			
Lavonia - Unawatti Creek	GA0038661	1.32	Unawatti Creek Tributary to Broad River Tributary to Savannah River
Franklin - Springs Pond	GA0050172	0.1	Broad River Tributary
Carnesville WPCP	GA0035734	0.075	Stephens Creek tributary to the Middle Fork Broad River tributary to the Broad River tributary
Franklin County LAS	GA02-065	0.075	LAS


Franklin County Municipal Water Demand Forecast
Demand (MGD)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Municipal Public Supply
Municipal Self-Supply
2015 Groundwater Forecast
2050 Groundwater Forecast
2015 Surface Water Forecast
2050 Surface Water Forecast


Franklin County Municipal Wastewater Flow Forecast
Flow (MGD)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Septic
Municipal Centralized - Point Discharge
Municipal Centralized - LAS
2015 Wastewater Forecast
2050 Wastewater Forecast

Glascock County

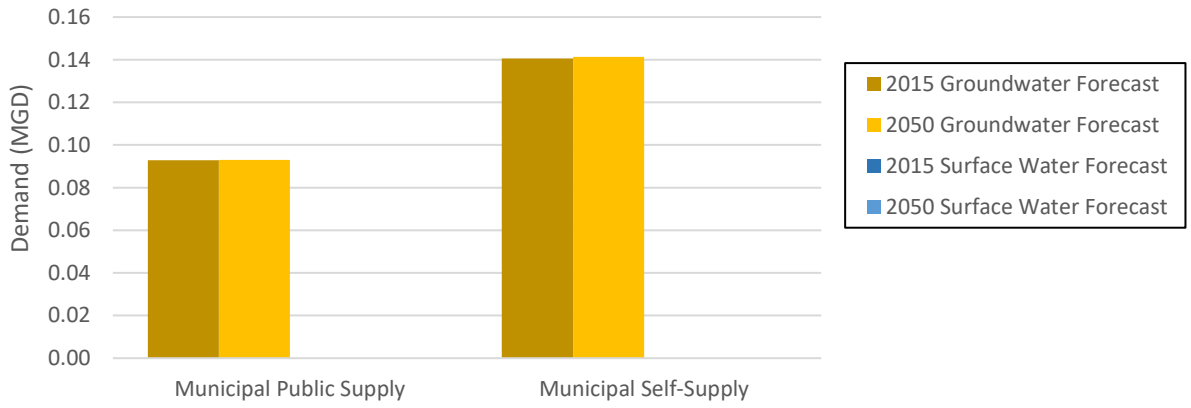
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	0	0.09	-0.09
Surface Water	0	0	0
Municipal Wastewater (MGD)			
NPDES (Point Source)	0.21	0.02	0.19
LAS (Land Application)	0	0	0

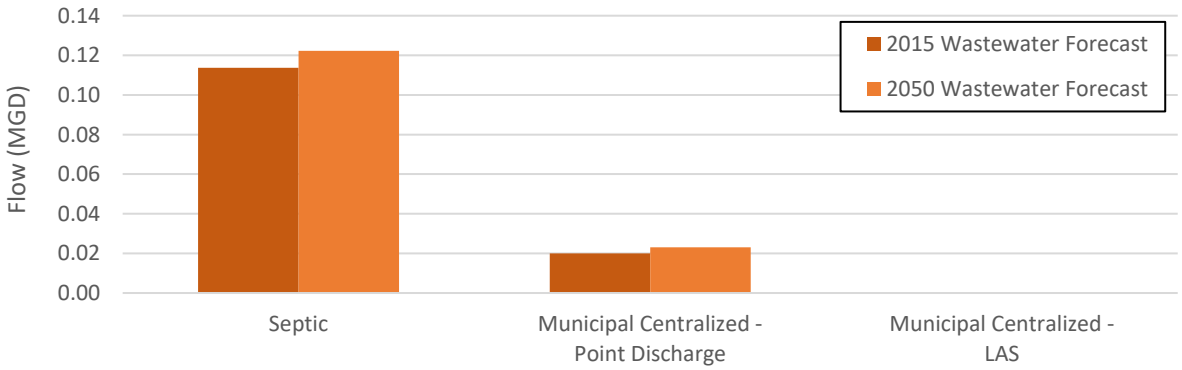
List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Existing Permitted Wastewater Facilities			
Gibson WPCP Pond	GA0021849	0.21	Rocky Comfort Creek Tributary

Glascock County Municipal Water Demand Forecast



Glascock County Municipal Wastewater Flow Forecast



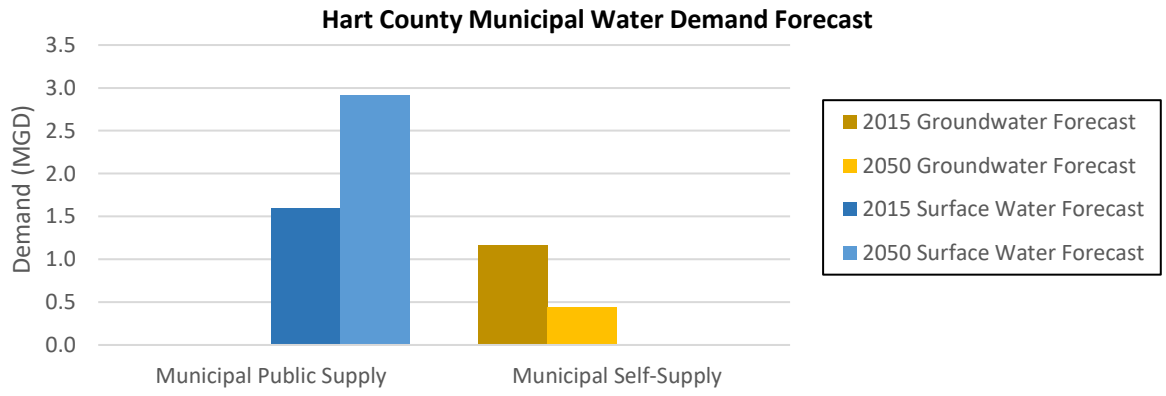
Hart County

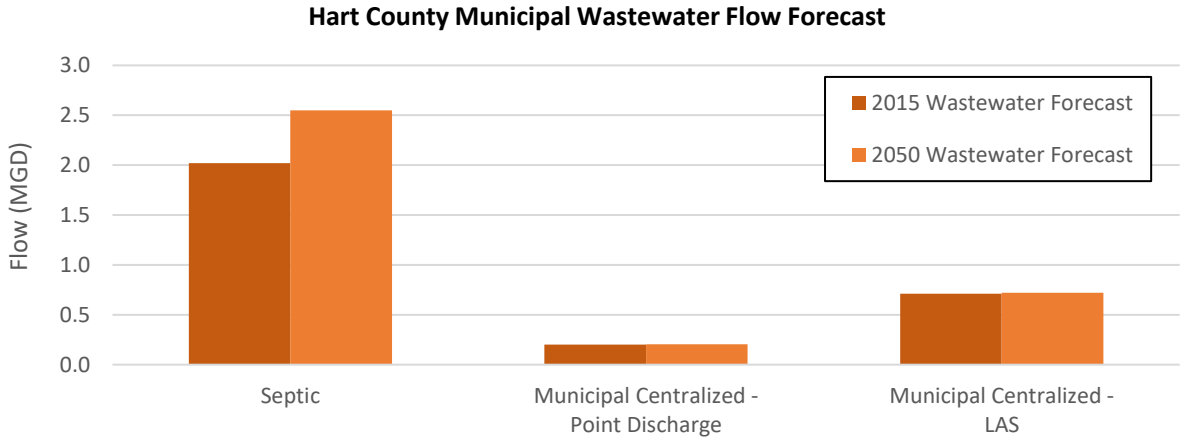
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	0.34	0	0.34
Surface Water	3.50	2.92	0.58
Municipal Wastewater (MGD)			
NPDES (Point Source)	0.50	0.20	0.30
LAS (Land Application)	1.75	0.72	1.03

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Royston, City of	073-0003	0.341	Crystalline Rock Aquifer
Hartwell, City Of	073-0190-01	3.5	Lake Hartwell
Existing Permitted Wastewater Facilities			
Royston	GA0021491	0.5	Hannah Creek
Hartwell LAS	GA02-114	1.75	LAS





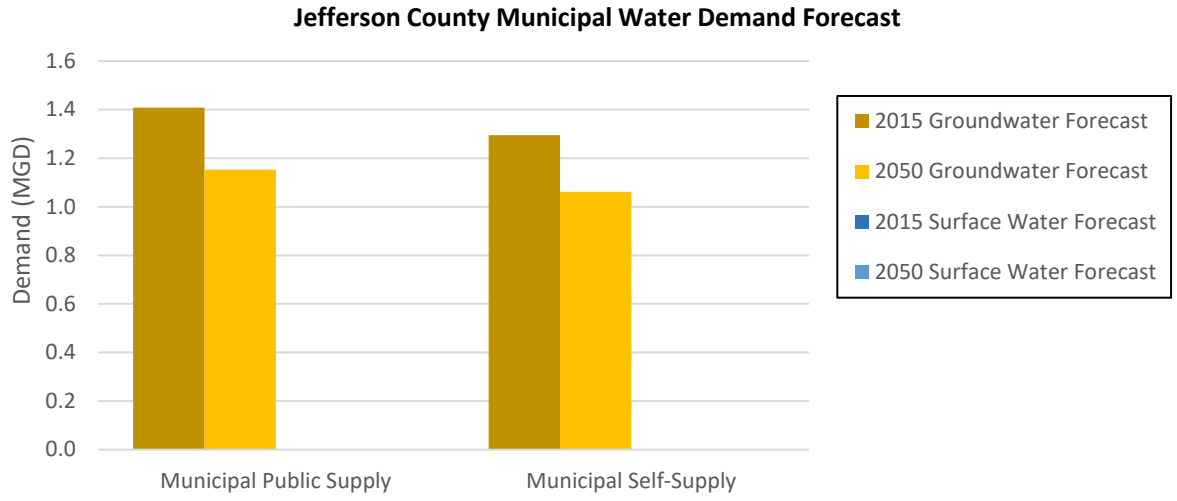
Jefferson County

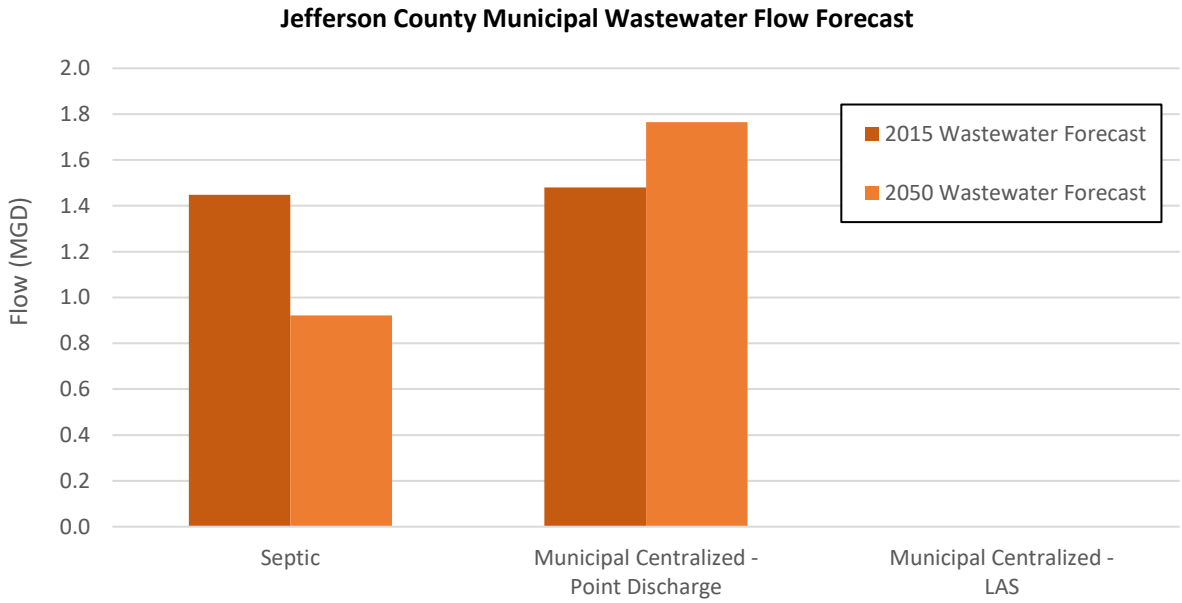
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	3.10	1.15	1.95
Surface Water	0	0	0
Municipal Wastewater (MGD)			
NPDES (Point Source)	3.84	1.77	2.07
LAS (Land Application)	0.05	0	0.05

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Louisville, City of	081-0003	2.0	Cretaceous Aquifer
Wadley, City of	081-0002	0.45	Cretaceous Aquifer
Wrens, City of	081-0004	0.65	Cretaceous Aquifer
Existing Permitted Wastewater Facilities			
Louisville (City of) Forstmann WPCP	GA0050243	2.0	Ogeechee River
Louisville WPCP - Pond #2 (replaced by Forstmann Plant)	GA0032301	0.062	Rocky Comfort Creek
Louisville WPCP - Pond #21(replaced by Forstmann Plant)	GA0021580	0.56	Rocky Comfort Creek Tributary
Wadley Pond WPCP	GA0021024	0.215	Williamson Swamp Creek
Wrens	GA0021857	1.0	Brushy Creek
Bartow (Town of) WPCP	GAJ020215	0.05	LAS


Jefferson County Municipal Water Demand Forecast
Demand (MGD)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Municipal Public Supply
Municipal Self-Supply
2015 Groundwater Forecast
2050 Groundwater Forecast
2015 Surface Water Forecast
2050 Surface Water Forecast


Jefferson County Municipal Wastewater Flow Forecast
Flow (MGD)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Septic
Municipal Centralized - Point Discharge
Municipal Centralized - LAS
2015 Wastewater Forecast
2050 Wastewater Forecast

Jenkins County

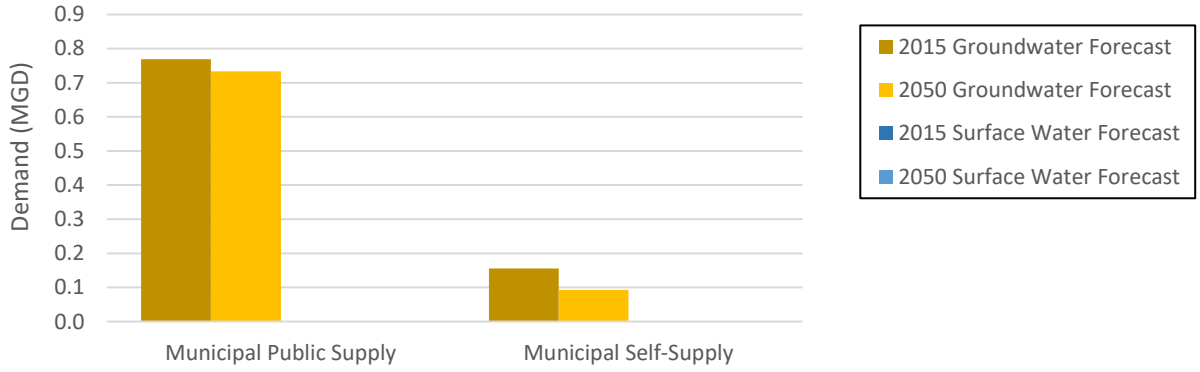
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	1.00	0.73	0.27
Surface Water	0	0	0
Municipal Wastewater (MGD)			
NPDES (Point Source)	0.95	0.33	0.62
LAS (Land Application)	0	0	0

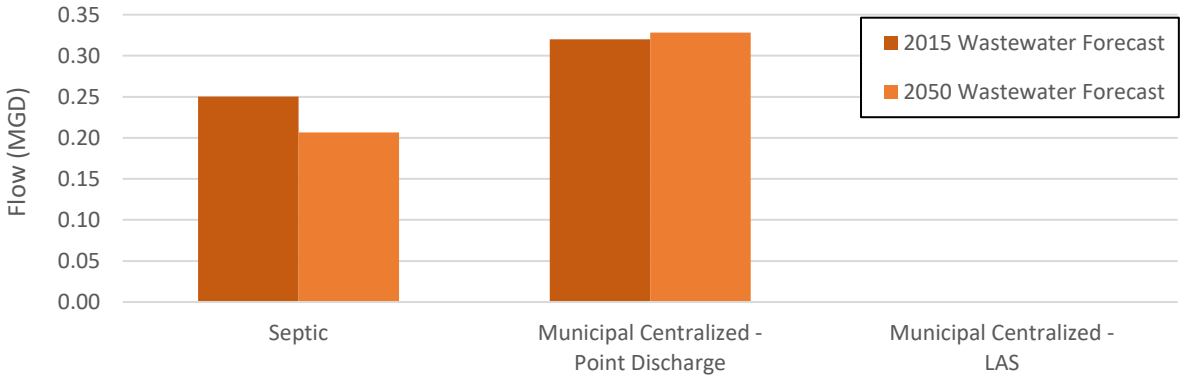
List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Millen, City of	082-0002	1.00	Floridan Aquifer
Existing Permitted Wastewater Facilities			
City of Millen Discharge	GA0038750	0.95	Ogeechee River

Jenkins County Municipal Water Demand Forecast



Jenkins County Municipal Wastewater Flow Forecast



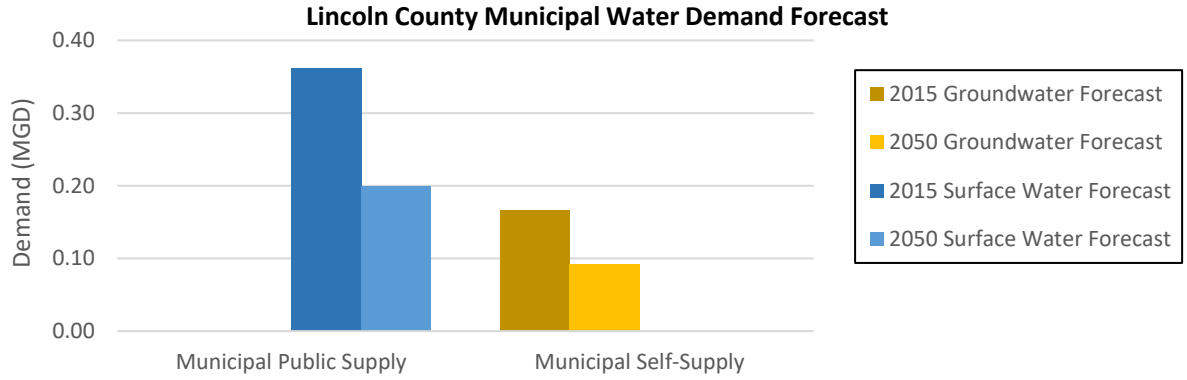
Lincoln County

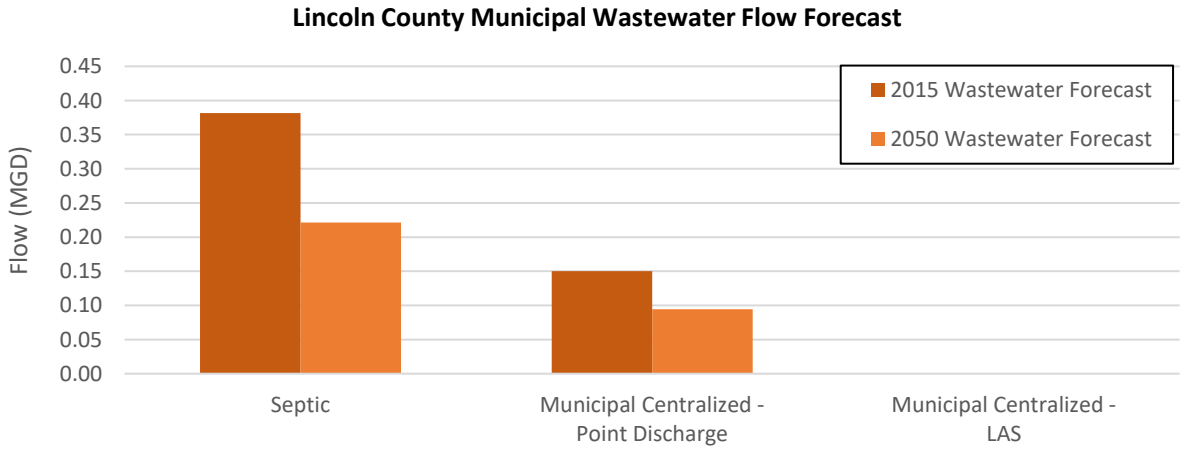
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	0.30	0	0.30
Surface Water	0.63	0.20	0.43
Municipal Wastewater (MGD)			
NPDES (Point Source)	0.52	0.09	0.43
LAS (Land Application)	0	0	0

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Lincoln County Water System	090-0002	0.30	Crystalline Rock Aquifer
Lincolnton, City Of	090-0108-01	0.63	Clarks Hill Reservoir
Existing Permitted Wastewater Facilities			
Lincolnton WPCP	GA0049450	0.52	Reedy Creek Tributary





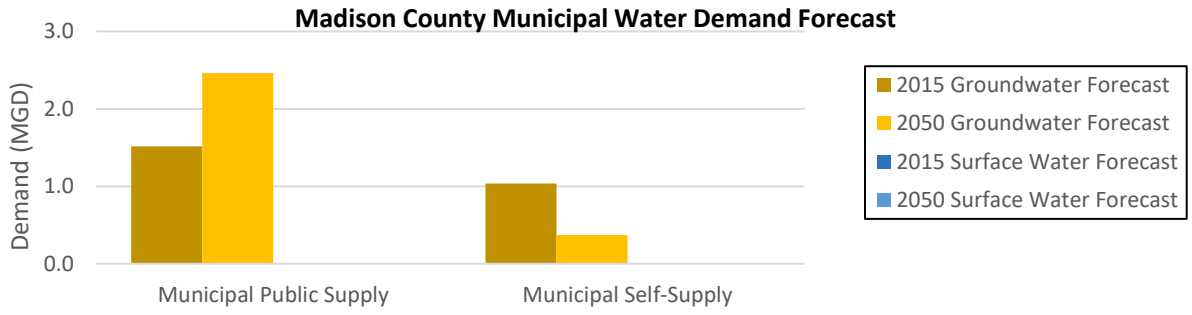
Madison County

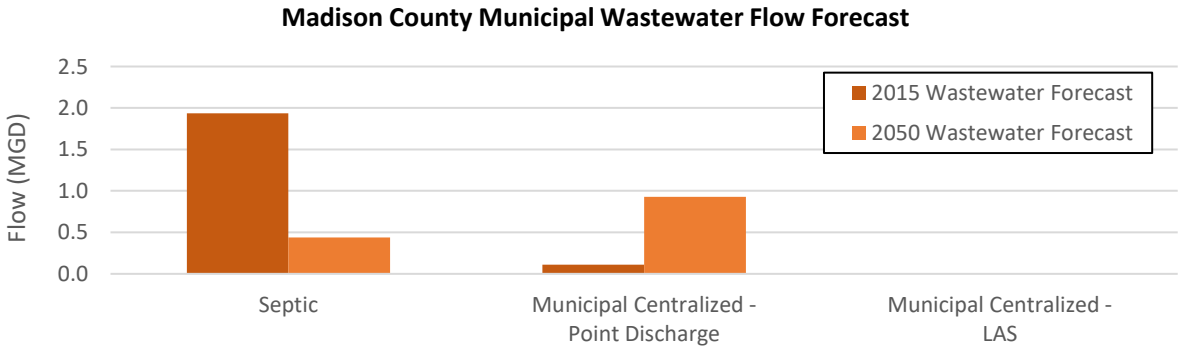
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	0.60	2.46	-1.86
Surface Water	0	0	0
Municipal Wastewater (MGD)			
NPDES (Point Source)	0.17	0.93	-0.76
LAS (Land Application)	0.10	0.01	0.09

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Comer, City of	095-0002	0.25	Crystalline Rock Aquifer
Danielsville, City of	095-0001	0.25	Crystalline Rock Aquifer
Madison County Industrial Development & Building Authority	095-0004	0.10	Crystalline Rock Aquifer
Existing Permitted Wastewater Facilities			
Comer WPCP	GA0021598	0.09	South Fork Broad River tributary to the Broad River
Danielsville WPCP	GA0048224	0.075	South Fork broad River
Madison County IDBA	GAJ020039	0.10	LAS





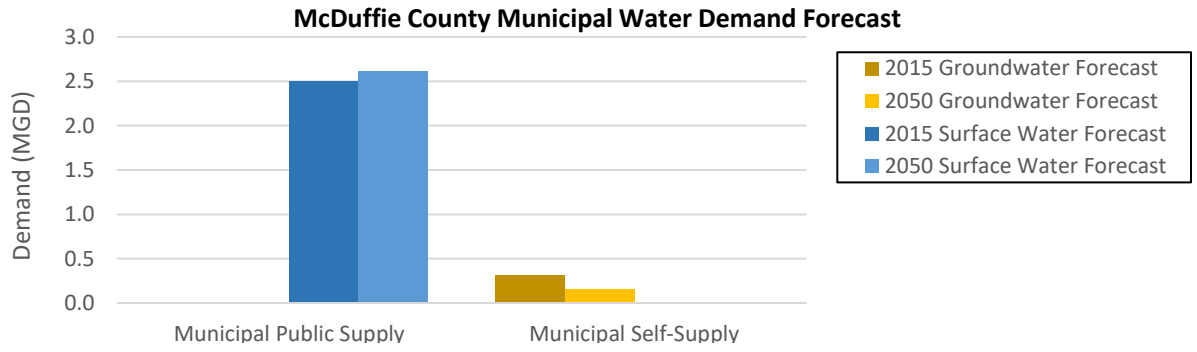
McDuffie County

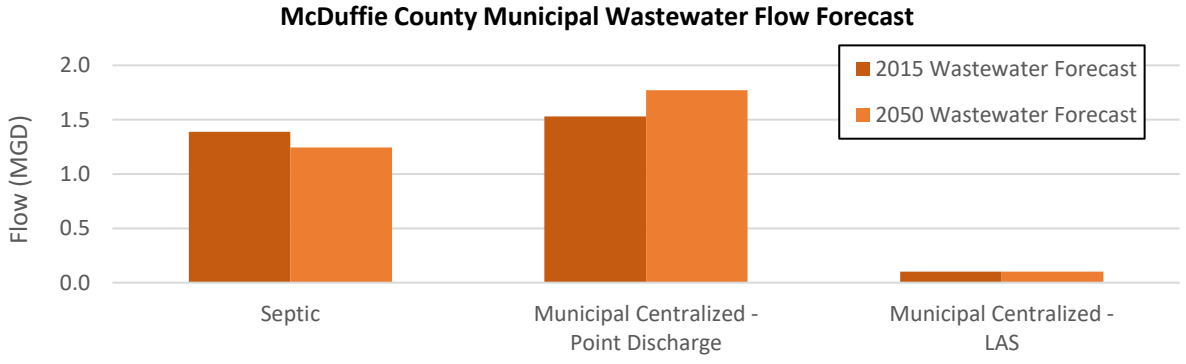
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	0	0	0
Surface Water	4.60	2.61	1.99
Municipal Wastewater (MGD)			
NPDES (Point Source)	2.50	1.77	0.73
LAS (Land Application)	0.29	0.10	0.19

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Thomson/ McDuffie Water & Sewer Commission	097-0109-05	3.1	Clarks Hill Reservoir
Thomson/ McDuffie Water & Sewer Commission	097-0111-03	1.5	Usry's Lake on Sweetwater Creek
Existing Permitted Wastewater Facilities			
Thomson	GA0020974	2.5	Whites Creek
Dearing LAS	GA02-007	0.12	LAS
Thomson (City of) LAS	GA02-252	0.171	LAS





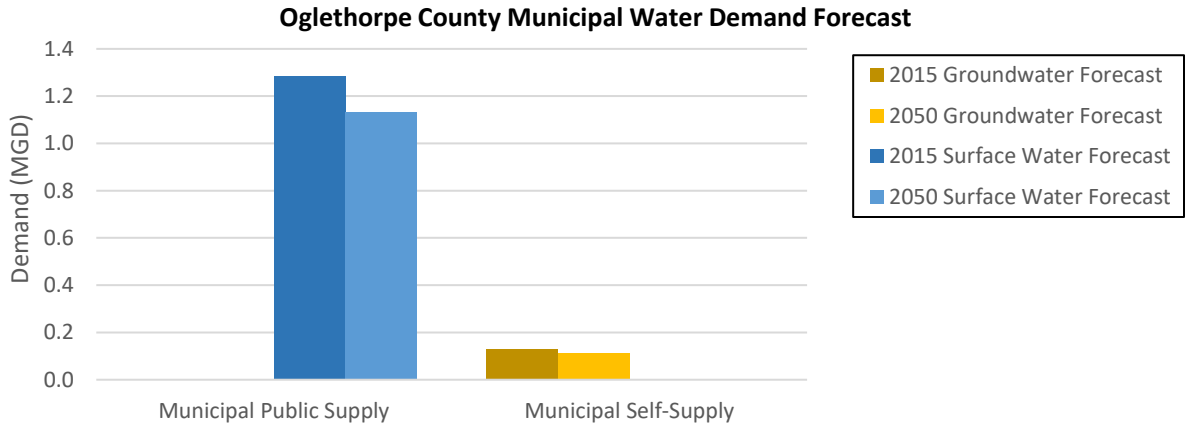
Oglethorpe County

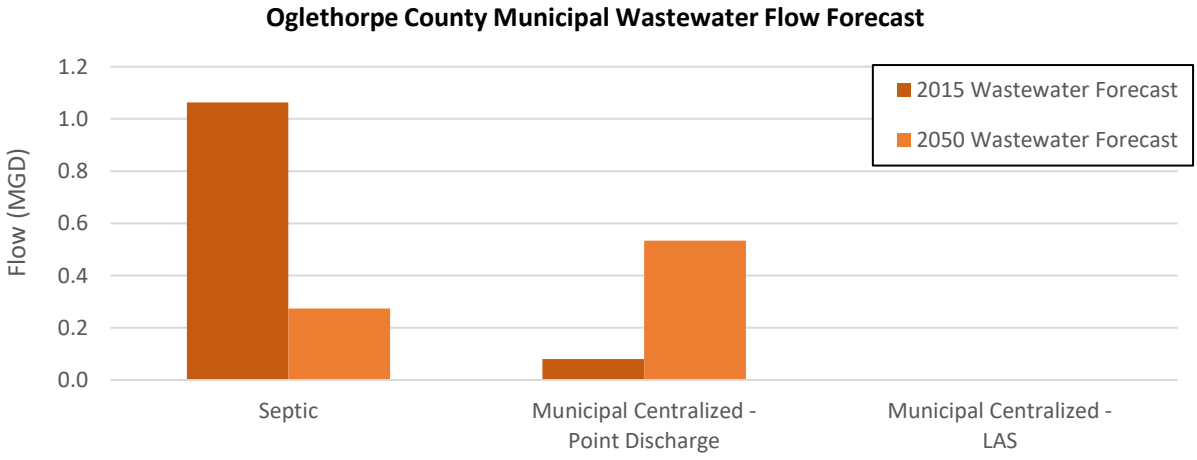
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	0	0	0
Surface Water	0.25	1.13	-0.88
Municipal Wastewater (MGD)			
NPDES (Point Source)	0.25	0.53	-0.28
LAS (Land Application)	0	0	0

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Crawford, City Of	109-0105-01	0.25	Tributary to Long Creek
Existing Permitted Wastewater Facilities			
Crawford	GA0039144	0.25	Barrow Creek





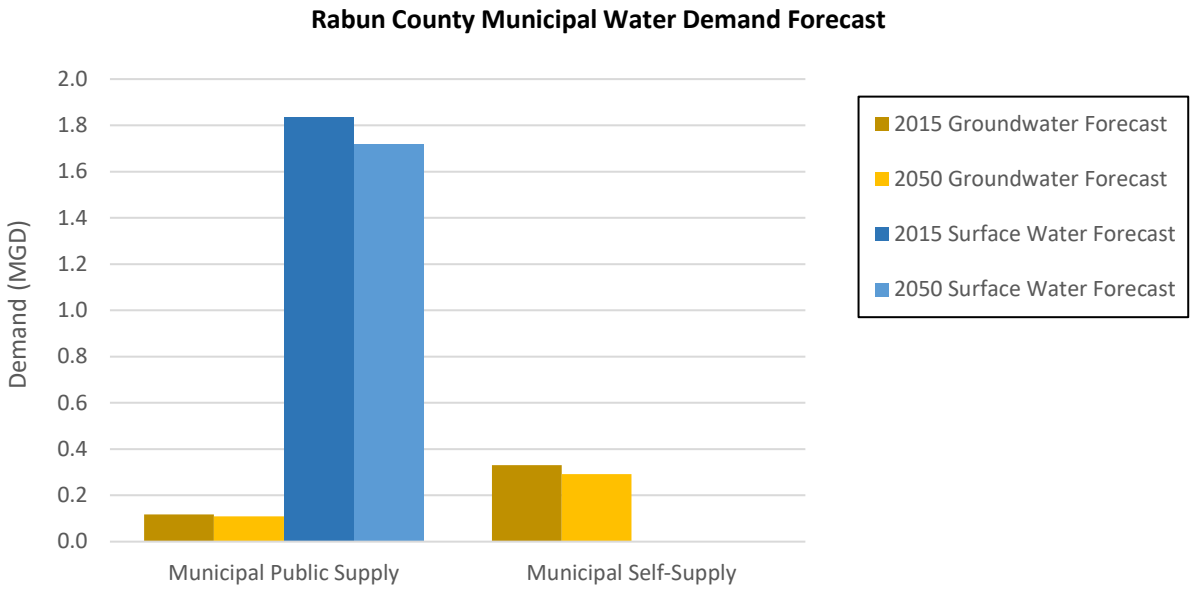
Rabun County

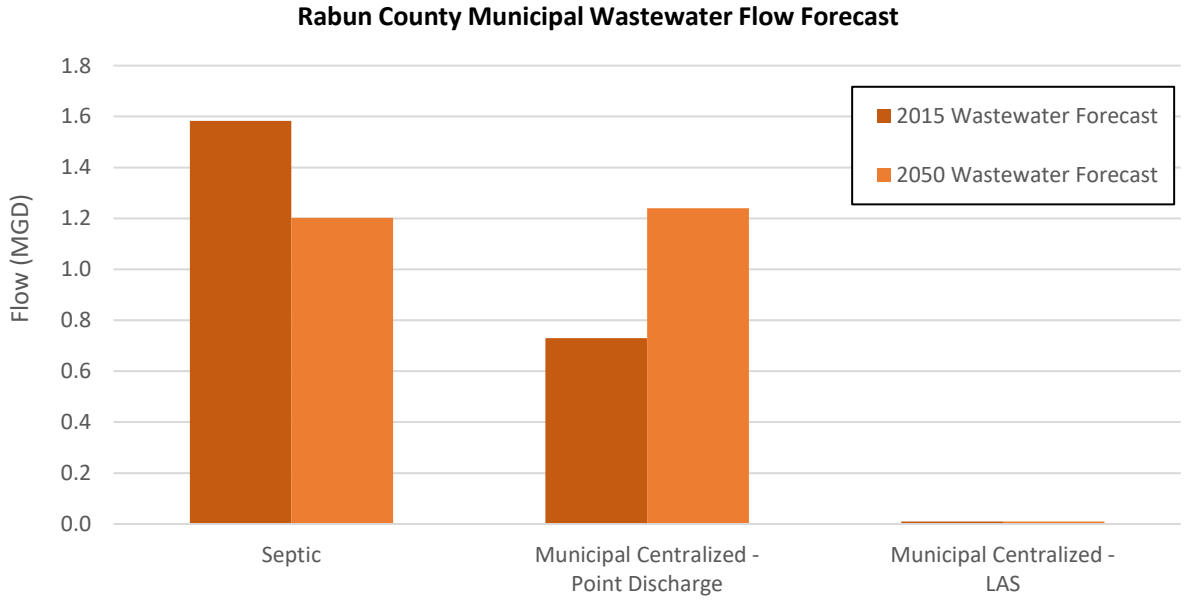
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	0.30	0.11	0.19
Surface Water	7.85	1.72	6.13
Municipal Wastewater (MGD)			
NPDES (Point Source)	4.20	1.24	2.96
LAS (Land Application)	0.10	0.01	0.09

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Sky Valley, City of	119-0002	0.3	Crystalline Rock Aquifer
Clayton, City Of	119-1501-02	0.7	Black's Creek
Clayton-Rabun Co. Water & Sewer Authority	119-0101-03	3.5	Lake Rabun
Rabun County	119-1501-01	3.1	Little Tennessee River
Sky Valley Resort	119-1501-04	0.3	Mud Creek
Sky Valley, City Of	119-1501-03	0.25	Mud Creek
Existing Permitted Wastewater Facilities			
Clayton WPCP	GA0020923	2.0	Stekoa Creek
Dillard	GA0047139	0.2	Little Tennessee River
Rabun County WRF	GA0039152	2.0	Little Tennessee River
Camp Ramah Darom	GAJ030753	0.025	LAS
Waterfall at Lake Burton WRF	GAJ030794	0.075	LAS


Rabun County Municipal Water Demand Forecast
Demand (MGD)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Municipal Public Supply
Municipal Self-Supply
2015 Groundwater Forecast
2050 Groundwater Forecast
2015 Surface Water Forecast
2050 Surface Water Forecast


Rabun County Municipal Wastewater Flow Forecast
Flow (MGD)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Septic
Municipal Centralized - Point Discharge
Municipal Centralized - LAS
2015 Wastewater Forecast
2050 Wastewater Forecast

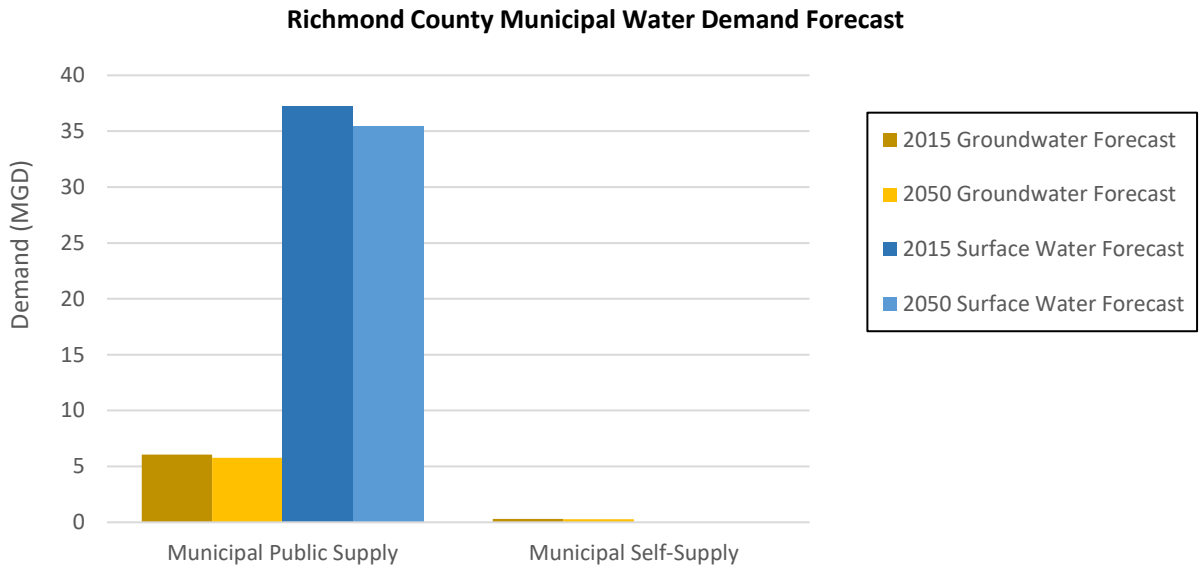
Richmond County

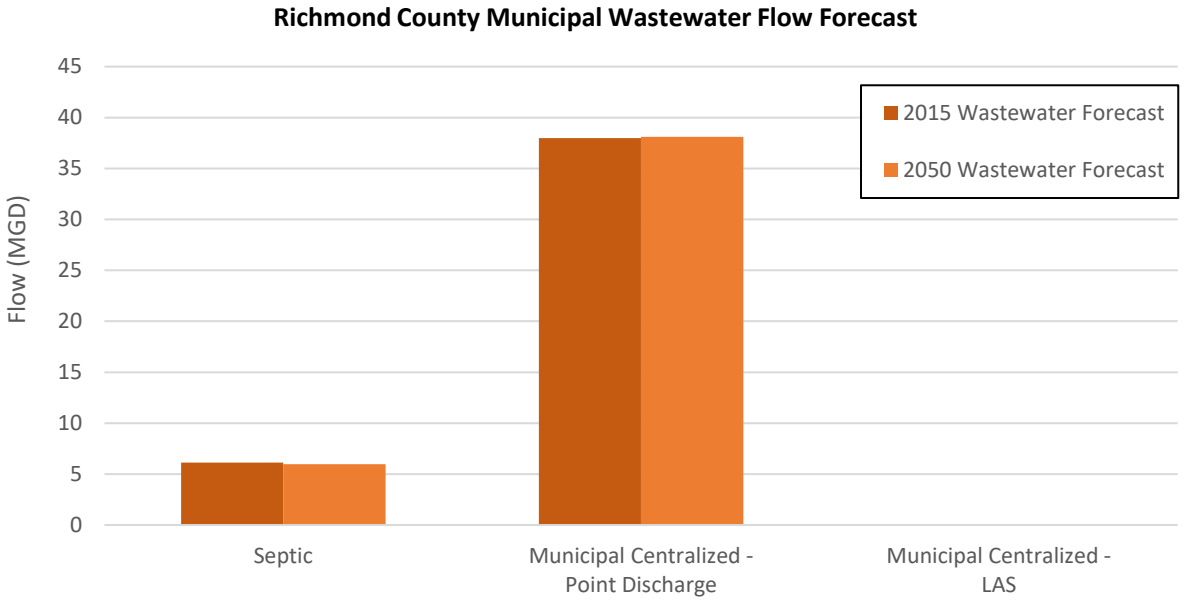
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	19.40	5.77	13.62
Surface Water	66.20	35.47	30.73
Municipal Wastewater (MGD)			
NPDES (Point Source)	48.43	38.10	10.33
LAS (Land Application)	0	0	0

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Augusta Utilities Department	121-0007	17.4	Cretaceous Aquifer
Blythe, City of	121-0019	0.25	Cretaceous Aquifer
Hephzibah, City of	121-0003	1.2	Cretaceous Aquifer
Augusta-Richmond County	121-0191-06	45.0	Augusta Canal
Augusta-Richmond County	121-0191-09	15.0	Savannah River
Fort Gordon - Cow Branch	121-0110-02	0.6	Cow Branch
Fort Gordon - Butler Creek	121-0110-03	5.0	Butler Creek
Fort Gordon - Union Mill Pond	121-0110-06	0.2	Union Mill Pond
Fort Gordon - Lietner Lake	121-0110-05	0.4	Lietner Lake
East Central Regional Hospital - Gracewood Campus	121-0008	0.4	Cretaceous Aquifer
Fort Gordon Environmental Division, Directorate of Public Works	121-0018	0.145	Crystalline Rock, Cretaceous Aquifer
Existing Permitted Wastewater Facilities			
Augusta - Spirit Creek	GA0047147	2.24	Spirit Creek
Hephziba	GA0049433	0.085	Little Spirit Creek Tributary
Augusta Butler Creek - Messerly	GA0037621	46.1	Butler Creek


Richmond County Municipal Water Demand Forecast
Demand (MGD)
40
35
30
25
20
15
10
5
0
Municipal Public Supply
Municipal Self-Supply
2015 Groundwater Forecast
2050 Groundwater Forecast
2015 Surface Water Forecast
2050 Surface Water Forecast


Richmond County Municipal Wastewater Flow Forecast
Flow (MGD)
45
40
35
30
25
20
15
10
5
0
Septic
Municipal Centralized - Point Discharge
Municipal Centralized - LAS
2015 Wastewater Forecast
2050 Wastewater Forecast

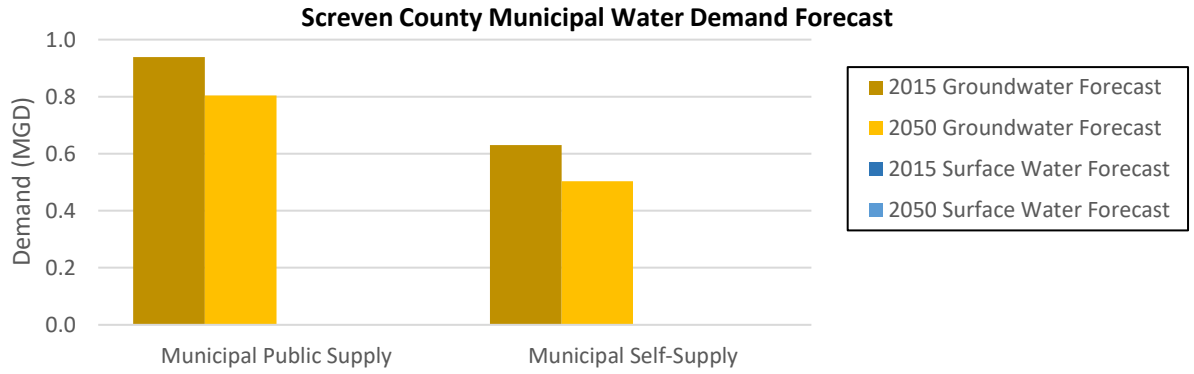
Screven County

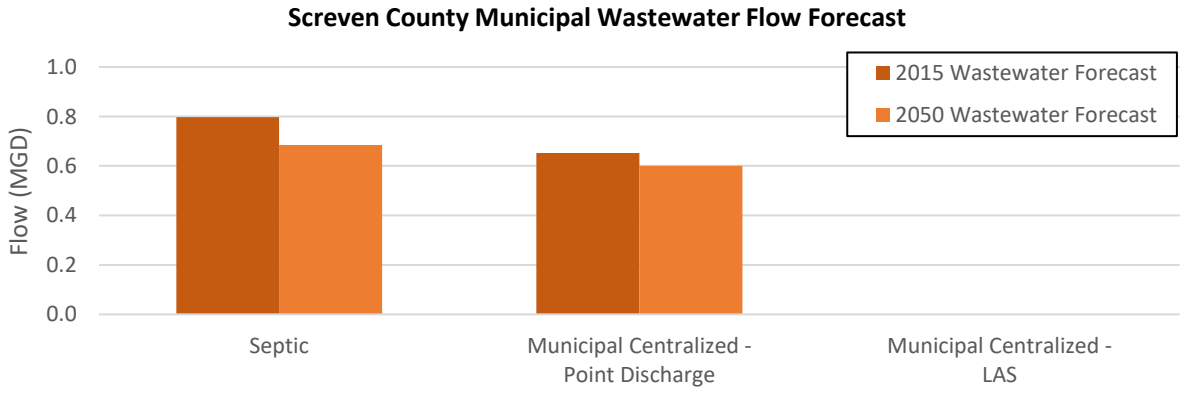
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	1.30	0.80	0.50
Surface Water	0	0	0
Municipal Wastewater (MGD)			
NPDES (Point Source)	1.57	0.60	0.97
LAS (Land Application)	0.044	0	0.04

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Sylvania, City of	124-0002	1.3	Floridan Aquifer
Existing Permitted Wastewater Facilities			
Sylvania	GA0021385	1.51	Buck Creek
GA Visitor Center- Sylvania	GA0030287	0.015	unnamed tributary to the Savannah River
Newington Pond	GA0050202	0.045	Ogeechee Creek Tributary
Hiltonia (Town of) LAS	GAJ020033	0.044	LAS





Stephens County

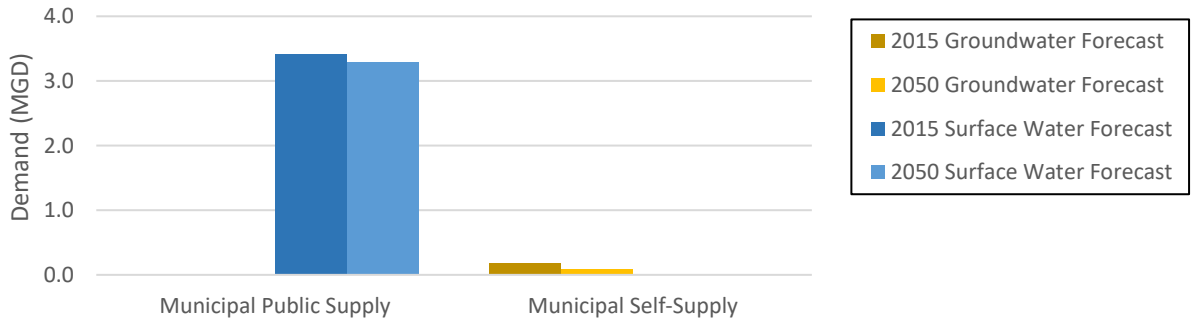
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	0	0	0
Surface Water	15.00	3.29	11.71
Municipal Wastewater (MGD)			
NPDES (Point Source)	2.50	1.81	0.69
LAS (Land Application)	0	0	0

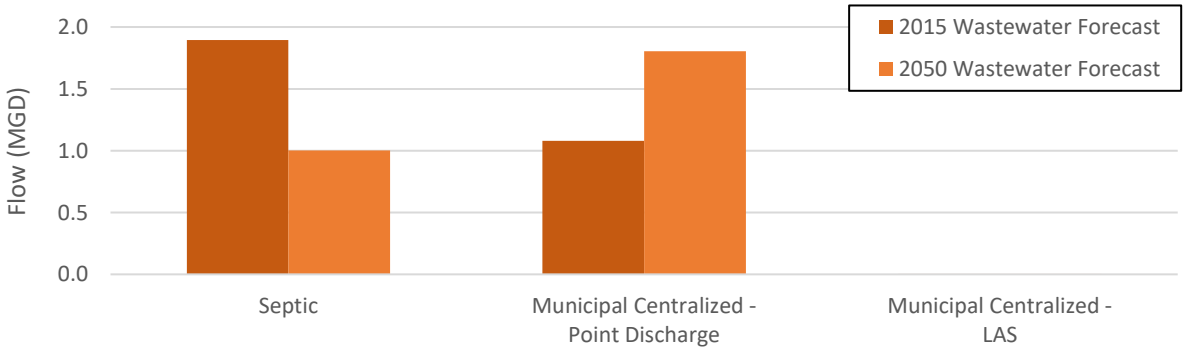
List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Toccoa, City Of	127-0102-05	6.0	Lake Yonah
Toccoa, City Of - Davidson Creek	127-0102-02	9.0	Lake Toccoa
Existing Permitted Wastewater Facilities			
Toccoa Falls College	GA0025798	0.093	Toccoa Creek
Toccoa - Toccoa Creek	GA0021806	0.41	Toccoa Creek
Toccoa - Eastanollee Creek	GA0021814	2.0	Eastonollee Creek

Stephens County Municipal Water Demand Forecast



Stephens County Municipal Wastewater Flow Forecast



Taliaferro County

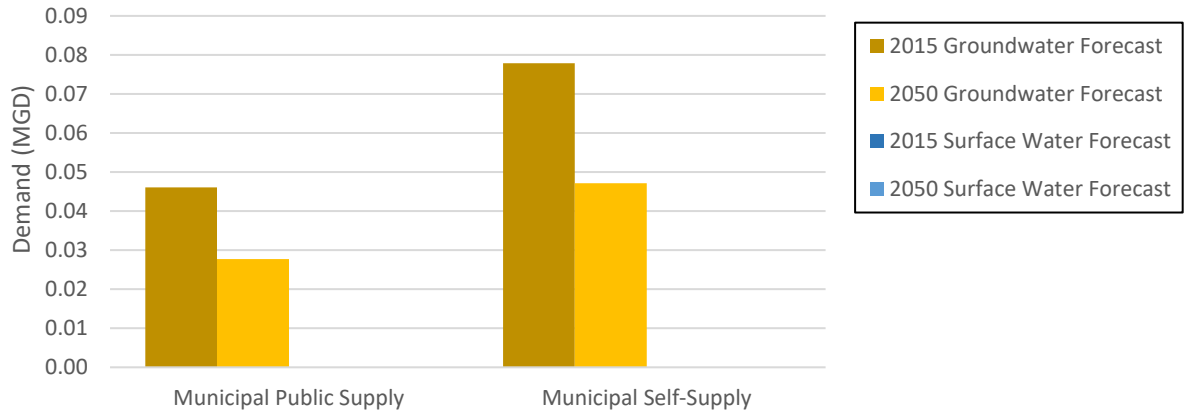
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	0	0.03	-0.03
Surface Water	0	0	0
Municipal Wastewater (MGD)			
NPDES (Point Source)	0.10	0.03	0.07
LAS (Land Application)	0	0	0

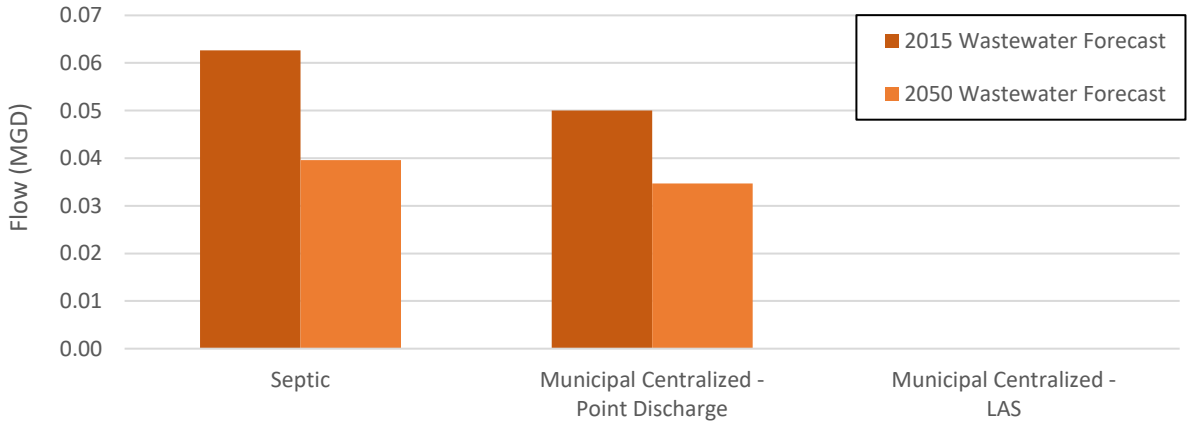
List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Existing Permitted Wastewater Facilities			
City of Crawfordville WPCP	GA0020915	0.10	Mile Branch

Taliaferro County Municipal Water Demand Forecast



Taliaferro County Municipal Wastewater Flow Forecast



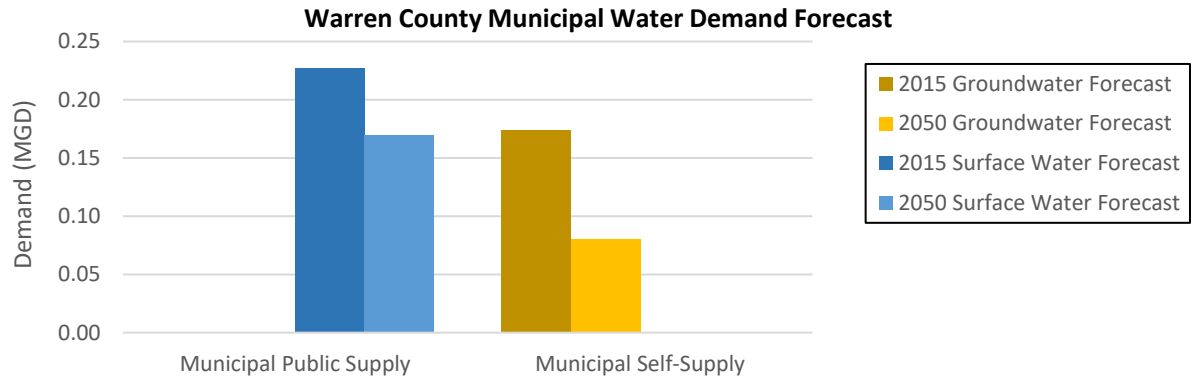
Warren County

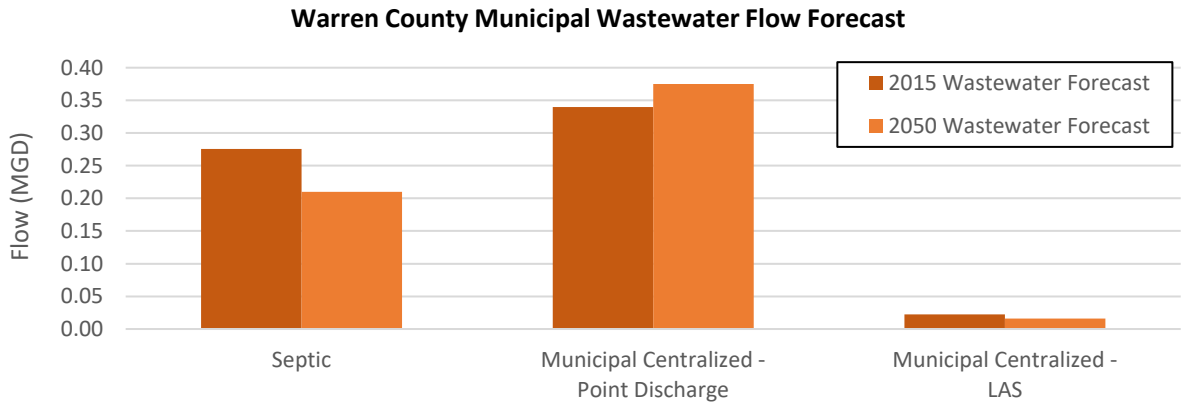
Municipal Water and Wastewater Permits Compared to Forecasts

Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	0	0	0
Surface Water	0.75	0.17	0.58
Municipal Wastewater (MGD)			
NPDES (Point Source)	0.84	0.37	0.47
LAS (Land Application)	0.05	0.02	0.03

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Warrenton, City Of	149-0202-01	0.75	Rocky Comfort Creek Reservoir
Existing Permitted Wastewater Facilities			
Warrenton Northside WPCP	GA0032778	0.045	Golden Creek
Warrenton Southside WPCP	GA0032786	0.295	Golden Creek
Warrenton WPCP	GA0050233	0.5	Golden Creek
Norwood LAS	GAJ020258	0.05	LAS





Wilkes County

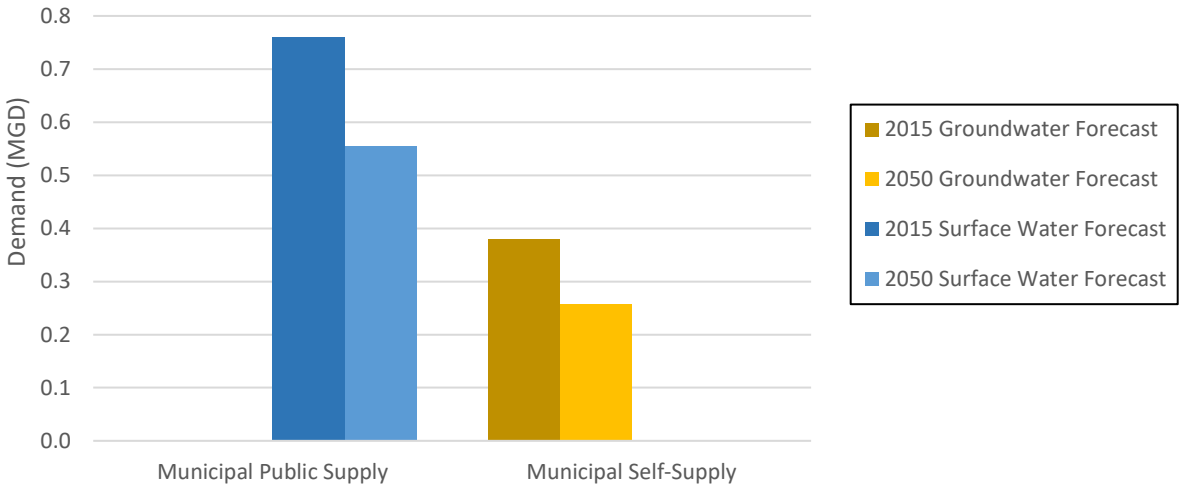
Municipal Water and Wastewater Permits Compared to Forecasts

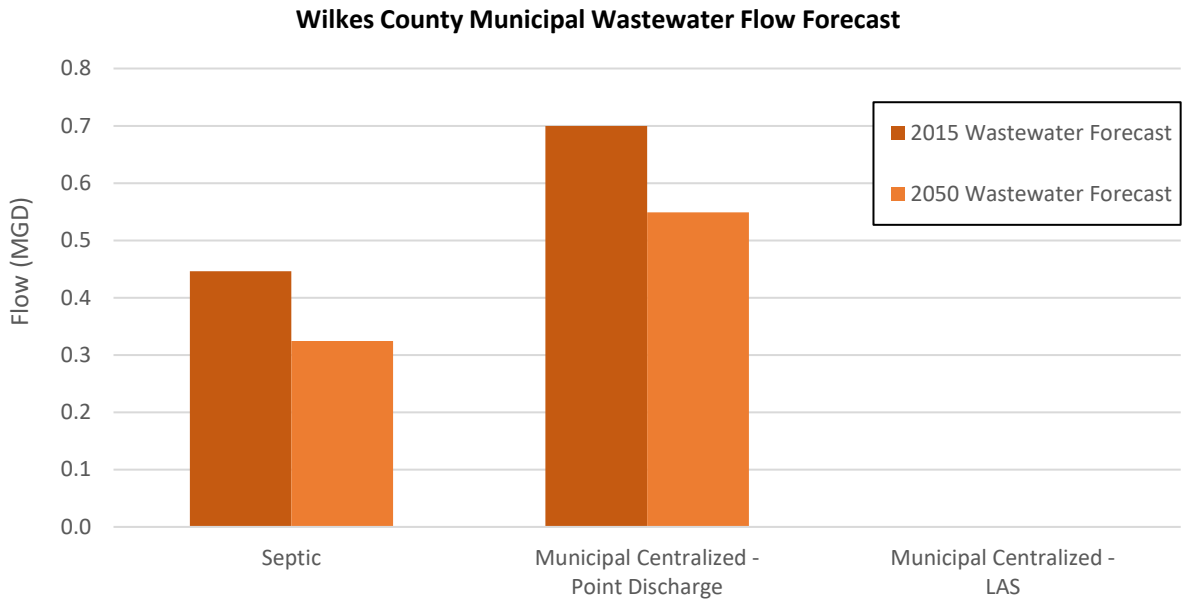
Permit Type	Permit Limit (MGD)	2050 Forecast	Surplus (+) Shortage (-)
Municipal Water Demands (MGD)			
Groundwater	0	0	0
Surface Water	3.80	0.76	3.04
Municipal Wastewater (MGD)			
NPDES (Point Source)	4.08	0.55	3.53
LAS (Land Application)	0	0	0

List of Individual Municipal Permits

Permit Holder	Permit Number	Permit Limit (MGD)	Source / Receiving Stream
Existing Withdrawal Permits			
Washington, City of	157-0109-01	2.0	Clarks Hill Reservoir
Washington, City of	157-0109-03	1.8	Little Beaverdam Creek and Beaverdam Creek
Existing Permitted Wastewater Facilities			
Town of Tignall	GA0046141	0.078	Unnamed Creek tributary to Tanyard branch tributary to Greensboro Creek
Washington	GA0031101	4.0	Rocky Creek

Wilkes County Municipal Water Demand Forecast




Wilkes County Municipal Wastewater Flow Forecast
Flow (MGD)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2015 Wastewater Forecast
2050 Wastewater Forecast
Septic
Municipal Centralized - Point Discharge
Municipal Centralized - LAS

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