# Water and Wastewater Forecasting Technical Memorandum

## Savannah – Upper Ogeechee
## Regional Water Planning Council

**Lake Strom Thurmond, Lincoln County**

**Supplemental Material**

**Savannah – Upper Ogeechee Regional Water Plan**

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# Section 1

# Introduction

Municipal and Industrial Water and Wastewater Forecasts were originally developed for the Savannah-Upper Ogeechee Regional Water Planning Council as part of the Georgia Comprehensive Statewide Water Management Plan (CSWMP) in 2011. Agricultural and Energy water needs were also identified and forecasted during the 2011 planning process. As part of the 5-year review and revision of that plan, all of these forecasts, except Industrial water and wastewater forecasts, have been updated. This Technical Memorandum describes how the original forecasts have been updated to account for changes in population and water use that have occurred since the original forecasts were produced.

Throughout this report, the prior Regional Planning process that occurred in 2009 – 2011 is referred to as "Round 1." Thus, the current (2016) update is referred to as "Round 2".

The basic approach to updating the forecasts starts with the same methodology used in developing the original forecasts, which are described in various Technical Memoranda, which were included as supplemental materials to the 2011 Savannah-Upper Ogeechee Regional Water Plan.[1] The purpose of this Technical Memorandum is to describe where modifications to the original forecast methodology were made and to provide the revised forecast values.

## 1.1 General Methodology

The basic methodology for forecasting water demand is to estimate demand separately for each major water use sector. For each sector, water demand is estimated using a 'driver' multiplied by the 'rate of use'. The driver is defined as a countable unit that can be projected in future years, such as number of people, number of employees in a business, acres irrigated or megawatts of power. The rate of use is defined as the quantity of water used by the driving unit per unit of time, such as gallons per person per day, gallons per day per acre, or gallons per megawatt produced.

The planning process examines and forecasts water demand for four major sectors:

- **Municipal** – this sector includes domestic, commercial, and low water use industries

- **Industrial** – this sector includes higher water use industries

- **Agricultural** – this sector includes major crops such as cotton, corn, peanuts, soybean, pecans, specialty crops, and nursery and horticulture; a snapshot of major livestock water use and golf course water use

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[1] See "Water and Wastewater Forecasting Technical Memorandum," dated May 2011 (available at http://www.savannahupperogeechee.org/pages/our_plan/documents/SupSec4_Forecast_TM_SUO_May2011_FINAL.pdf);

"Statewide Energy Sector Water Demand Forecast" Technical Memorandum, dated October 29, 2010 (available at http://www.georgiawaterplanning.org/pages/forecasting/energy_water_use.php);

and Agricultural Water Use forecast prepared by Dr. Jim Hook et al. (available at http://www.georgiawaterplanning.org/pages/forecasting/agricultural_water_use.php).

- **Energy** – this sector includes thermoelectric power generation

## 1.2 Population Update

State and County population projections are provided by the Governor's Office of Planning and Budget (OPB). These projections are used consistently throughout the state for multiple purposes such as transportation planning and allocation of education funds. The Georgia Environmental Protection Division (EPD) is required to use these population projections in statewide water planning. The 2010 Census statewide population count was lower than had been projected for 2010 in the Round 1 projections, although this trend of lower population than projected does not hold true for all counties. The prior forecast had the State's population growing at an annual rate of 1.69% while the new forecast grows at an annual rate of only 1.05% as shown in **Figure 1-1**.
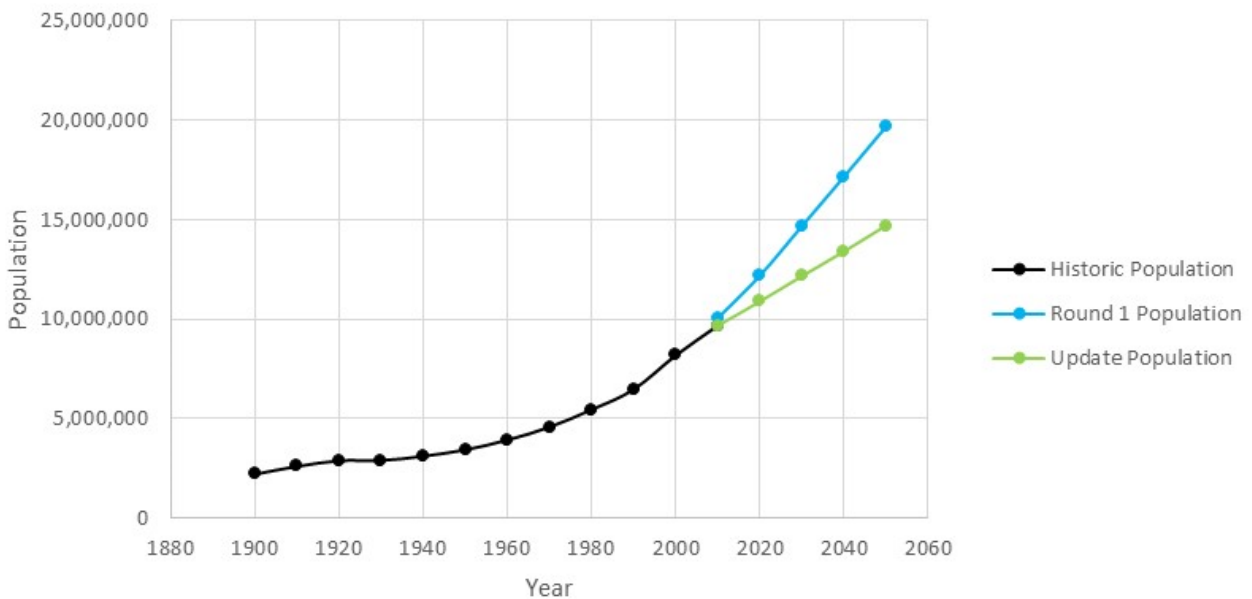


**Figure 1-1**
**Georgia's Historic Population and Growth Projections**

While the trend of a lower population in 2010 than projected was seen statewide, each county had its own individual trend. For the region as a whole, the population obtained from the 2010 Census data was 0.5 percent higher than previously projected. However, lower growth rates moving forward are predicted leading to a projected population in 2050 that is 20.4 percent less than the previous estimates as shown in **Figure 1-2**. The new population projections (OPB, 2015) by county are shown in **Table 1-1**.
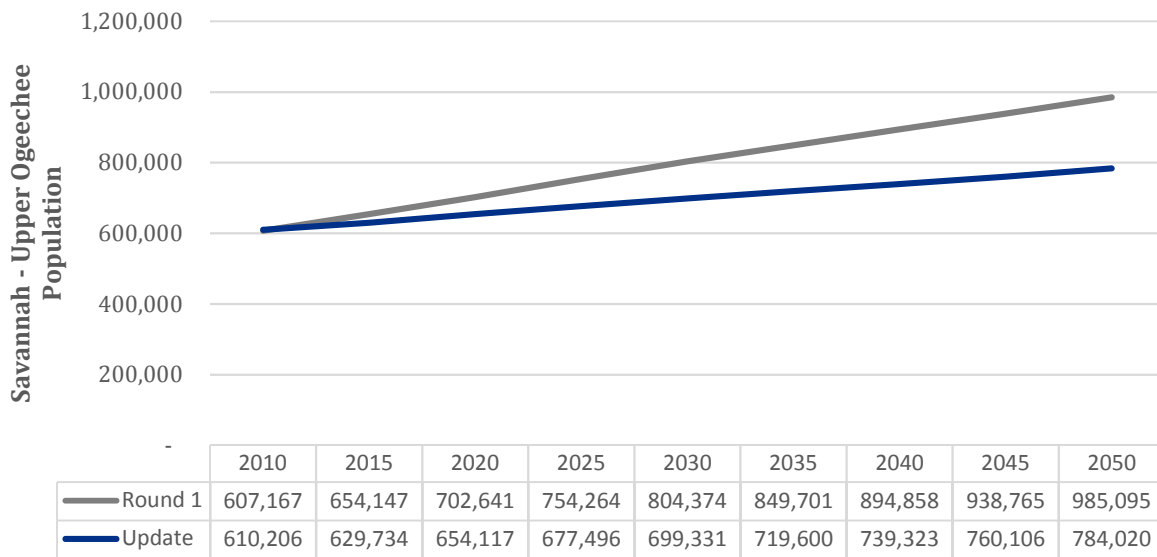
**Figure 1-2**
**Savannah-Upper Ogeechee Population Projections**

**Table 1-1 Population Projections per County**

| County | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--------|------|------|------|------|------|------|------|------|
| Banks | 18,586 | 18,983 | 19,279 | 19,427 | 19,442 | 19,383 | 19,268 | 19,129 |
| Burke | 23,006 | 23,175 | 23,215 | 23,059 | 22,701 | 22,193 | 21,608 | 21,032 |
| Columbia | 142,402 | 160,541 | 180,369 | 201,807 | 224,710 | 249,263 | 276,027 | 305,680 |
| Elbert | 19,537 | 19,343 | 19,066 | 18,718 | 18,299 | 17,838 | 17,373 | 16,947 |
| Franklin | 22,282 | 22,952 | 23,568 | 24,089 | 24,531 | 24,959 | 25,410 | 25,946 |
| Glascock | 3,139 | 3,239 | 3,349 | 3,442 | 3,503 | 3,541 | 3,570 | 3,605 |
| Hart | 25,628 | 26,034 | 26,310 | 26,417 | 26,368 | 26,238 | 26,088 | 25,969 |
| Jefferson | 16,286 | 16,190 | 16,040 | 15,785 | 15,411 | 14,964 | 14,529 | 14,139 |
| Jenkins | 9,292 | 9,346 | 9,382 | 9,370 | 9,303 | 9,201 | 9,084 | 8,980 |
| Lincoln | 7,659 | 7,401 | 7,070 | 6,672 | 6,219 | 5,739 | 5,274 | 4,857 |
| McDuffie | 21,781 | 22,267 | 22,596 | 22,716 | 22,620 | 22,376 | 22,046 | 21,703 |
| Madison | 28,467 | 29,441 | 30,269 | 30,884 | 31,254 | 31,448 | 31,550 | 31,648 |
| Oglethorpe | 14,612 | 14,750 | 14,817 | 14,791 | 14,679 | 14,494 | 14,240 | 13,947 |
| Rabun | 16,320 | 16,482 | 16,528 | 16,454 | 16,292 | 16,145 | 16,038 | 15,992 |
| Richmond | 203,625 | 207,182 | 209,457 | 210,404 | 210,056 | 208,482 | 206,035 | 203,352 |
| Screven | 14,267 | 14,285 | 14,179 | 13,964 | 13,686 | 13,400 | 13,138 | 12,933 |
| Stephens | 25,794 | 26,010 | 26,087 | 26,046 | 25,901 | 25,702 | 25,501 | 25,355 |
| Taliaferro | 1,683 | 1,632 | 1,572 | 1,501 | 1,422 | 1,339 | 1,255 | 1,174 |
| Warren | 5,462 | 5,230 | 5,010 | 4,784 | 4,556 | 4,329 | 4,112 | 3,925 |
| Wilkes | 9,906 | 9,635 | 9,333 | 9,000 | 8,646 | 8,288 | 7,958 | 7,705 |
| **Total** | **629,734** | **654,117** | **677,496** | **699,331** | **719,600** | **739,323** | **760,106** | **784,020** |

# Section 2

# Municipal Water Forecasting

This section describes the methodology and results of municipal water demand forecasts for the Savannah-Upper Ogeechee Planning Region.

## 2.1 Methodology

The county level municipal water demand includes both public-supplied (i.e., utility) water demand and self-supplied (i.e., private well) water demand. The self-supplied water is associated with groundwater use, while the public-supply water is associated with either surface water or groundwater use as indicated by permit data. Each county has an average weighted per capita water use value that was derived from an analysis of all reporting utilities within each county, and then vetted through the regional councils in Round 1. The following sections describe updates to the previous methodology used to produce the revised forecasts.

### 2.1.1 Percent Change in Gallons per Capita per Day

The Georgia EPD reviewed withdrawal data and estimated population served data reported by permitted municipal water systems from the years 2010 through 2014. GA EPD then calculated adjustment factors for each County's public-supplied municipal per capita water use rate. For each county, a per capita value for each year 2010-2014 was calculated based on actual withdrawal and estimated population served data for that county. The percent rate of change was calculated for each year interval (2010 to 2011, 2011 to 2012, 2012 to 2013, 2013 to 2014), and the average of those four values was calculated as the per capita water use adjustment factor.

These adjustment factors were applied to the gpcd values used in Round 1 to derive the 2015 gpcd values for each county. If no data were available to EPD, the prior gpcd value was used as the 2015 value. Of the counties with available data, roughly two-thirds had a decrease in gpcd while about one third showed an increase in gpcd. Note that a decrease in gpcd could be due to conservation and water loss control efforts during this time period, or other factors such as an increase in population with less increase in water use, or a drop in water use (e.g., loss of industrial customer) with the same population. **Table 2-1** shows the gpcd adjustment factor applied to the Round 1 gpcd for each county in the region.

The self-supplied value of 75 gpcd for each county (with 169 gpcd for Jefferson County) remains unchanged from Round 1.

**Table 2-1. Per Capita Demand Values by County, gpcd**

| County | Round 1 Per Capita | 2015 Adjustment Factor | Round 2 Adjusted Per Capita |
|---|---|---|---|
| Banks | 101 | 1.3% | 102 |
| Burke | 132 | -2.4% | 129 |
| Columbia | 153 | -12.6% | 134 |
| Elbert | 102 | 2.9% | 105 |
| Franklin | 164 | -1.7% | 161 |
| Glascock | 73 | 0% | 73 |
| Hart | 154 | 2.6% | 158 |
| Jefferson | 169 | -3.1% | 163 |
| Jenkins | 101 | 5.3% | 107 |
| Lincoln | 67 | -0.7% | 66 |
| McDuffie | 139 | 1.8% | 141 |
| Madison | 107 | -3.3% | 104 |
| Oglethorpe | 94 | 6.1% | 100 |
| Rabun | 168 | -2.3% | 164 |
| Richmond | 221 | -2.1% | 217 |
| Screven | 161 | -0.5% | 160 |
| Stephens | 144 | 1.4% | 146 |
| Taliaferro | 71 | 0% | 71 |
| Warren | 73 | -1.3% | 72 |
| Wilkes | 156 | 0.3% | 156 |

## 2.1.2 Plumbing Code Adjustment Factor

In Round 1, the gpcd for each county was reduced over time due to the effects of plumbing codes based upon the age of housing stock in each county. Over time, as new houses are built with more efficiency fixtures, the county average gpcd will decrease. Previously a reduction (adjustment) was calculated for each county starting with zero in 2010 (the base year in Round 1) and increasing over time. For the update, these plumbing code adjustments were reset to zero in 2015 with the difference in the adjustment factor between 2010 and 2014 subtracted from the adjustment factor for all remaining years. The revised plumbing code adjustment was then applied to both public-supplied and self-supplied water demand. **Table 2-2** shows the municipal public-supplied gpcd value over time for each county.

**Table 2-2. Adjusted Public-Supplied GPCD**

| County | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--------|------|------|------|------|------|------|------|------|
| Banks | 102.0 | 101.0 | 99.9 | 98.9 | 97.8 | 96.8 | 95.8 | 94.7 |
| Burke | 129.1 | 127.9 | 126.7 | 125.4 | 124.2 | 123.0 | 121.8 | 120.6 |
| Columbia | 133.7 | 132.8 | 131.9 | 131.0 | 130.1 | 129.2 | 128.3 | 127.4 |
| Elbert | 105.0 | 103.6 | 102.2 | 100.8 | 99.4 | 98.0 | 96.7 | 95.3 |
| Franklin | 161.0 | 159.8 | 158.6 | 157.4 | 156.2 | 154.9 | 153.7 | 152.5 |
| Glascock | 73.4 | 72.1 | 70.7 | 69.4 | 68.1 | 66.7 | 65.4 | 64.1 |
| Hart | 157.9 | 156.8 | 155.6 | 154.4 | 153.2 | 152.1 | 150.9 | 149.7 |
| Jefferson | 163.5 | 162.1 | 160.8 | 159.5 | 158.2 | 156.8 | 155.5 | 154.2 |
| Jenkins | 106.5 | 105.2 | 103.8 | 102.4 | 101.0 | 99.7 | 98.3 | 96.9 |
| Lincoln | 66.3 | 65.1 | 63.8 | 62.5 | 61.3 | 60.0 | 58.7 | 57.4 |
| McDuffie | 141.5 | 140.3 | 139.2 | 138.0 | 136.8 | 135.7 | 134.5 | 133.4 |
| Madison | 103.6 | 102.3 | 101.0 | 99.7 | 98.5 | 97.2 | 95.9 | 94.6 |
| Oglethorpe | 99.7 | 98.6 | 97.5 | 96.4 | 95.3 | 94.1 | 93.0 | 91.9 |
| Rabun | 163.9 | 162.8 | 161.8 | 160.7 | 159.7 | 158.6 | 157.6 | 156.5 |
| Richmond | 216.8 | 215.4 | 214.0 | 212.6 | 211.2 | 209.8 | 208.4 | 207.0 |
| Screven | 160.1 | 158.9 | 157.6 | 156.3 | 155.1 | 153.8 | 152.5 | 151.3 |
| Stephens | 145.8 | 144.5 | 143.2 | 141.9 | 140.5 | 139.2 | 137.9 | 136.6 |
| Taliaferro | 71.4 | 70.0 | 68.6 | 67.2 | 65.8 | 64.4 | 63.0 | 61.6 |
| Warren | 72.1 | 70.8 | 69.5 | 68.1 | 66.8 | 65.5 | 64.2 | 62.8 |
| Wilkes | 156.4 | 155.0 | 153.6 | 152.2 | 150.8 | 149.4 | 148.1 | 146.7 |

## 2.2 Municipal Water Forecasting Results

**Table 2-3** shows the forecasted municipal water demand in millions of gallons per day (MGD) (public-supplied and self-supplied) by county in the Savannah-Upper Ogeechee region. The total regional demand is shown graphically in **Figure 2-1** along with a comparison of the Round 1 estimates. Region-wide the municipal forecast is lower than in Round 1 due to the combination of lower population projections and generally lower per capita water use values.

**Table 2-3 Average Annual Municipal Water Demand Forecast by County (MGD)**

| County | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | % Change |
|---|---|---|---|---|---|---|---|---|---|
| Banks | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.5 | 1.5 | -6% |
| Burke | 2.2 | 2.2 | 2.1 | 2.1 | 2.0 | 2.0 | 1.9 | 1.8 | -17% |
| Columbia | 18.1 | 20.3 | 22.8 | 25.4 | 28.2 | 31.2 | 34.5 | 38.0 | 111% |
| Elbert | 1.8 | 1.7 | 1.7 | 1.6 | 1.6 | 1.5 | 1.4 | 1.4 | -21% |
| Franklin | 2.7 | 2.8 | 2.9 | 3.0 | 3.1 | 3.2 | 3.3 | 3.4 | 27% |
| Glascock | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0% |
| Hart | 2.8 | 2.9 | 3.0 | 3.1 | 3.2 | 3.2 | 3.3 | 3.4 | 21% |
| Jefferson | 2.7 | 2.7 | 2.6 | 2.6 | 2.5 | 2.4 | 2.3 | 2.2 | -18% |
| Jenkins | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.8 | 0.8 | -11% |
| Lincoln | 0.5 | 0.5 | 0.5 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | -45% |
| McDuffie | 2.8 | 2.9 | 2.9 | 2.9 | 2.9 | 2.8 | 2.8 | 2.8 | -2% |
| Madison | 2.6 | 2.6 | 2.7 | 2.8 | 2.8 | 2.8 | 2.8 | 2.8 | 11% |
| Oglethorpe | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.3 | 1.3 | 1.2 | -12% |
| Rabun | 2.3 | 2.3 | 2.3 | 2.2 | 2.2 | 2.2 | 2.1 | 2.1 | -7% |
| Richmond | 43.6 | 44.0 | 44.2 | 44.1 | 43.8 | 43.1 | 42.3 | 41.5 | -5% |
| Screven | 1.6 | 1.6 | 1.5 | 1.5 | 1.4 | 1.4 | 1.3 | 1.3 | -17% |
| Stephens | 3.6 | 3.6 | 3.6 | 3.6 | 3.5 | 3.5 | 3.4 | 3.4 | -6% |
| Taliaferro | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | -40% |
| Warren | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | -38% |
| Wilkes | 1.1 | 1.1 | 1.0 | 1.0 | 0.9 | 0.9 | 0.8 | 0.8 | -29% |
| **Total** | **92.9** | **95.8** | **98.5** | **100.9** | **103.0** | **104.9** | **107.0** | **109.3** | **18%** |



| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Round 1 | 98.4 | 104.5 | 110.9 | 117.2 | 122.7 | 128.2 | 133.6 | 139.0 |
| Update | 92.9 | 95.8 | 98.5 | 100.9 | 103.0 | 104.9 | 107.0 | 109.3 |
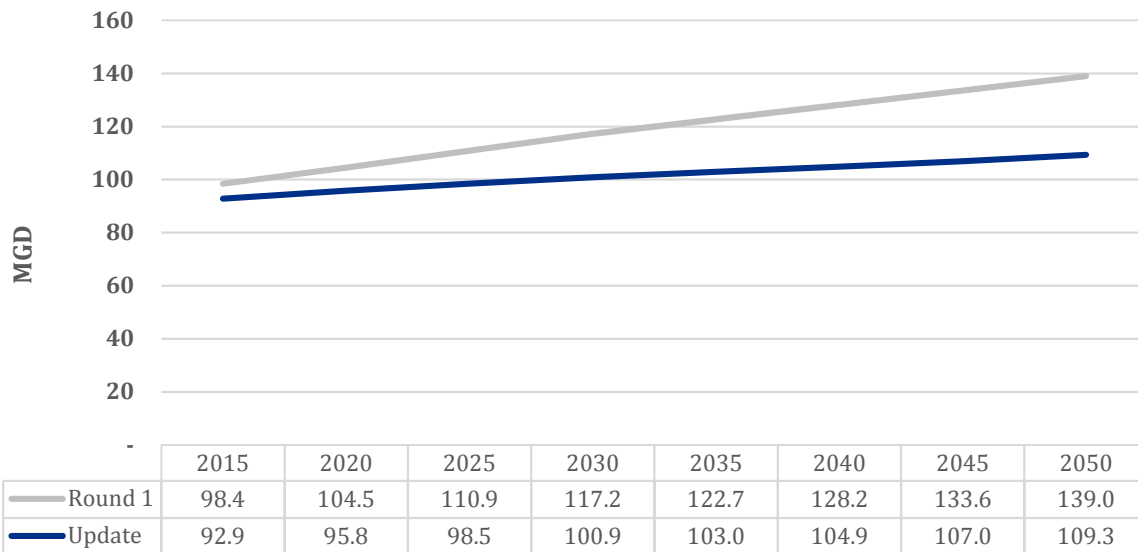
**Figure 2-1**
**Forecasted Municipal Water Demand for Savannah-Upper Ogeechee Planning Council**

## 2.3 Municipal Water Forecast Allocations

As noted above, the municipal water demand for each county is the summation of the public-supplied and self-supplied water demand estimates for each county. The percent of county population that is public-supplied and self-supplied remains the same from Round 1. This split of county population was derived from USGS estimates, and were vetted through the regional council review process. **Figure 2-2** shows the split between self-supply versus public-supply for the region.

As in Round 1, it is assumed that all self-supplied (i.e., domestic residential) water use is from groundwater. The allocation of public-supplied municipal water among surface water and groundwater sources was determined in Round 1 by an analysis of surface water and groundwater permitted water withdrawals for municipal use by county. The percent of county public-supply municipal water by surface water and groundwater are retained from Round 1 and used to allocate the updated county municipal water demand by sources. Furthermore, the allocation of surface water by stream node (for the surface water models) and groundwater by aquifer (for the groundwater models) maintains the same proportions as in Round 1.

Thus the updated county municipal water demand forecasts are allocated among surface water nodes and groundwater aquifers for analysis with other components of the state water plan update. For the Savannah-Upper Ogeechee region, the majority (75 percent) of municipal water currently comes from surface water and this percentage is projected to rise in the future, as shown in **Figure 2-3**.

| | 2015 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|
| Public Supply | 81.7 | 85.0 | 90.9 | 96.1 | 101.8 |
| Self-Supply | 11.2 | 10.8 | 9.9 | 8.8 | 7.6 |
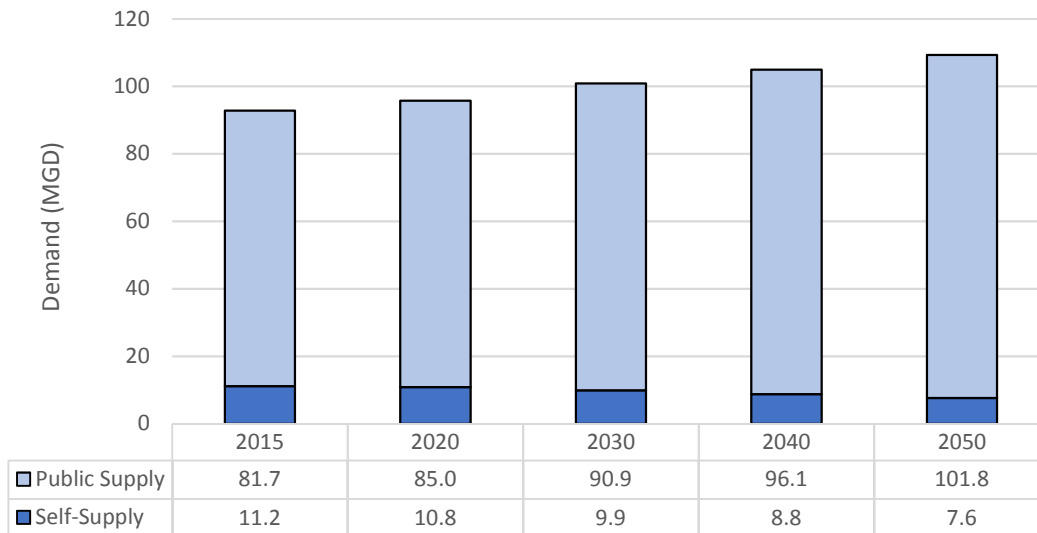
**Figure 2-2**
**Self-Supply Versus Public-Supply of Municipal Water Demand**
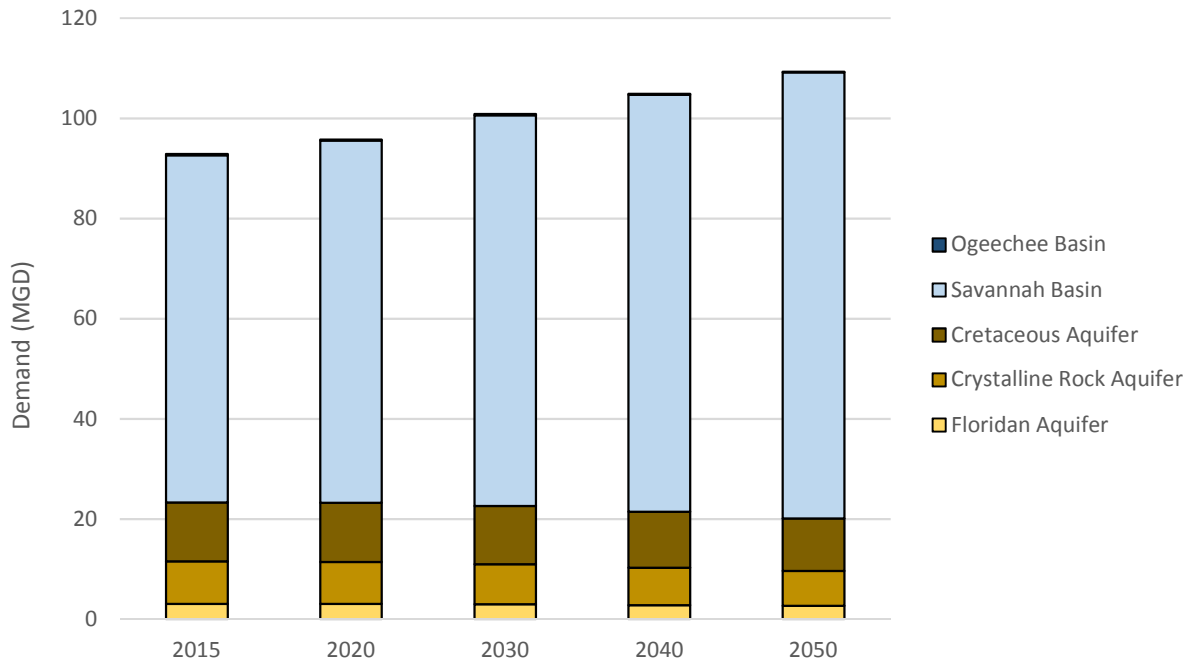
**Figure 2-3**
**Municipal Water Demand for Savannah-Upper Ogeechee Planning Council by Aquifer and Basin**

# Section 3
# Municipal Wastewater Forecasting

This section describes the methodology and results of the update of the municipal wastewater demand forecasts for the Savannah-Upper Ogeechee Planning Region.

## 3.1 Methodology

Within the previous analysis (i.e., Round 1), the municipal water demand served as the basis for estimating the municipal wastewater flows for each county with a portion of the water demand assumed to be indoor use that entered the centralized wastewater treatment system. While self-supplied water demand was assumed to go to a septic system, public-supplied water in each county had a proportion going to septic and a portion to centralized treatment. A percentage was then added to centralized flows for inflow and infiltration (I/I) that occurs on the way to the treatment facility. The centralized flow estimate was then allocated between point discharge (NPDES) and land application systems (LAS).

For the update, the Georgia EPD provided an analysis of 2014 NPDES permitted discharges by county and a recommended methodology for the municipal wastewater forecast update.

- The percent of county total wastewater flow that is septic is retained from Round 1. Any percentage change over time is from council member input in Round 1.

- Future septic flow by county is estimated from the Round 1 septic flow forecast times the percent change in county population between the Round 1 and Round 2 population projections for the county.

- Future septic flows are allocated to watersheds and stream nodes based on the same percent of county area in watersheds as in Round 1.

- The sum of annual average 2014 NPDES point discharges by county are adjusted by the change in percent of county that is septic/centralized over time (if applicable), and increased/decreased over time with the rate of change in the new county population projections to derive the new point discharge forecast for the county.

- The updated point discharge for the county is allocated to watersheds and stream nodes based on the permit locations of the 2014 NPDES flows in the county.

- The sum of annual average 2014 land application system (LAS) flows by county are adjusted by the change in percent of county that is septic/centralized over time (if applicable), combined with any 2014 subsurface flows (if any), and increased/decreased over time with the rate of change in the new county population projections to derive the new LAS + subsurface forecast for the county.

- The updated LAS + subsurface flow forecast for the county is allocated to watersheds and stream nodes based on the permit locations of the 2014 LAS (and subsurface) flows in the county.

- County centralized flow is the sum of the point source discharges and LAS + subsurface discharges.

- County total wastewater flow is the sum of the centralized and septic flows.

## 3.2 Results

**Table 3-1** shows the forecasted municipal wastewater generated per County in the Savannah-Upper Ogeechee region. The total regional wastewater generated is then shown graphically in **Figure 3-1** broken down between septic treatment and centralized treatment that is discharged via a point source or land application. **Figure 3-2** gives a snapshot of the how the generated wastewater is discharged per watershed for 2015.

**Table 3-1 Total Wastewater Generated in Savannah-Upper Ogeechee Planning Region per County (MGD)**

| County | 2015 | 2020 | 2030 | 2040 | 2050 | % Change 2015 to 2050 |
|---|---|---|---|---|---|---|
| Banks | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | -1% |
| Burke | 2.0 | 2.1 | 2.0 | 1.9 | 1.8 | -11% |
| Columbia | 11.7 | 13.4 | 16.7 | 20.4 | 24.9 | 112% |
| Elbert | 1.6 | 1.5 | 1.5 | 1.4 | 1.3 | -15% |
| Franklin | 2.5 | 2.6 | 2.9 | 3.1 | 3.3 | 30% |
| Glascock | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 9% |
| Hart | 2.9 | 3.0 | 3.2 | 3.3 | 3.5 | 19% |
| Jefferson | 2.9 | 2.9 | 2.9 | 2.8 | 2.7 | -8% |
| Jenkins | 0.6 | 0.6 | 0.6 | 0.6 | 0.5 | -6% |
| Lincoln | 0.5 | 0.5 | 0.4 | 0.4 | 0.3 | -41% |
| Madison | 2.1 | 2.1 | 1.7 | 1.5 | 1.4 | -33% |
| McDuffie | 3.0 | 3.1 | 3.2 | 3.2 | 3.1 | 3% |
| Oglethorpe | 1.1 | 1.1 | 1.0 | 0.9 | 0.8 | -29% |
| Rabun | 2.3 | 2.4 | 2.4 | 2.4 | 2.5 | 6% |
| Richmond | 44.1 | 45.0 | 45.7 | 45.2 | 44.1 | 0% |
| Screven | 1.5 | 1.4 | 1.4 | 1.3 | 1.3 | -11% |
| Stephens | 3.0 | 3.0 | 3.0 | 2.9 | 2.8 | -6% |
| Taliaferro | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | -34% |
| Warren | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | -6% |
| Wilkes | 1.1 | 1.1 | 1.0 | 0.9 | 0.9 | -24% |
| **Total** | **85.3** | **88.2** | **91.9** | **94.6** | **97.3** | 14% |
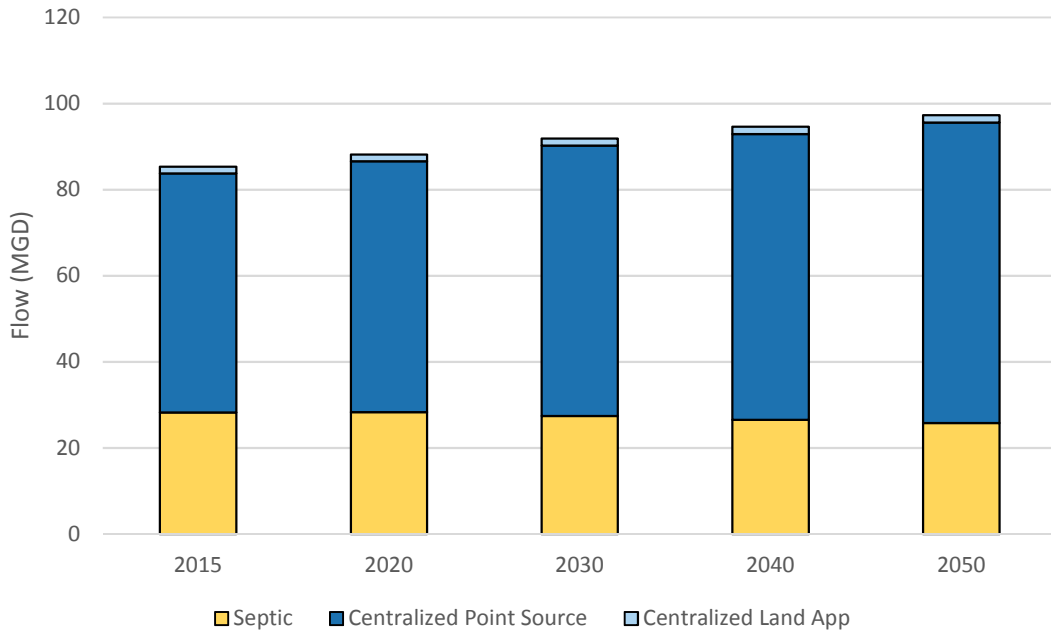
**Figure 3-1**
**Total Wastewater Generated Savannah-Upper Ogeechee Planning Region by Type**
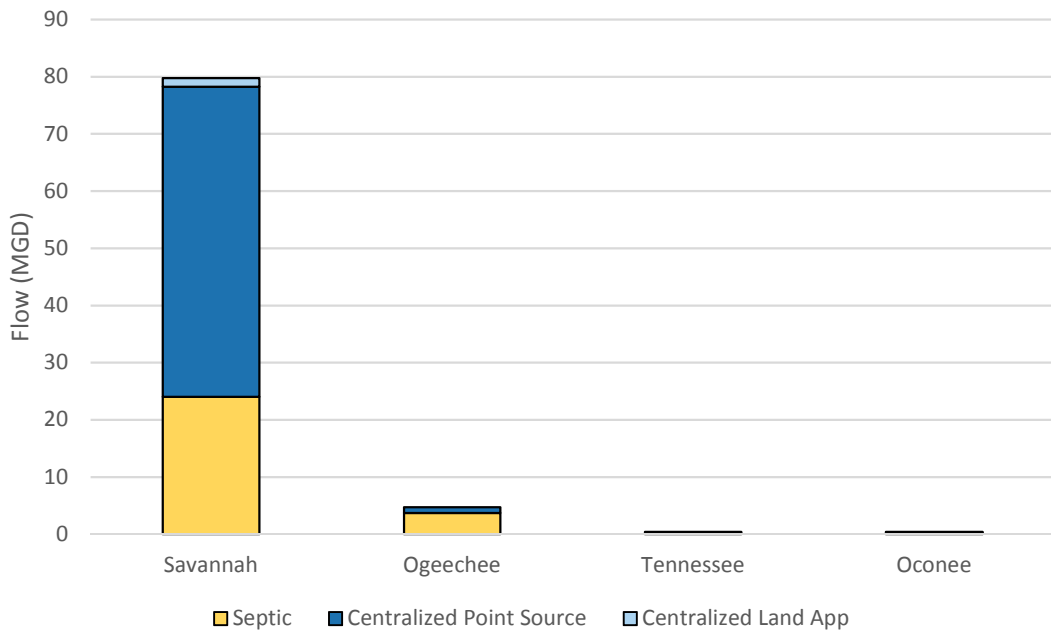


**Figure 3-2**
**2015 Snapshot of Wastewater Discharge Type per Watershed**

# Section 4

# Industrial Forecasting

This section describes the methodology and results of industrial water and wastewater demand forecasts for the Savannah-Upper Ogeechee Planning Region.

## 4.1 Methodology

The industrial water and wastewater forecasts were not updated from those produced in Round 1 other than any significant issues or changes that individual Planning Councils believed should be incorporated. For the Savannah-Upper Ogeechee Planning Council, no changes were decided to be incorporated at this time.

The original methodology forecasted industrial water demand based on employment projections per industry with the 2010 water use multiplied by the expected employment growth rate into the future for that type of industry. The industrial wastewater flow was then estimated from a wastewater to water ratio developed for each industrial category.

## 4.2 Results

**Table 4-1** shows the (Round 1) industrial water demand by industry. The majority of industrial water demand in the Savannah-Upper Ogeechee region is from the paper, chemicals, stone and clay industrial classification categories. Currently, 87 percent of the industrial water demand in the region comes from surface water. The percentage is projected to decrease slightly in the future as a greater ratio of future demand comes from groundwater as shown in **Figure 4-1**.

**Table 4-2** provides the forecast of industrial wastewater generated per industry. The forecasted wastewater is higher than the forecasted water demand for the stone and clay industry as it includes stormwater drainage from the facility site. The vast majority (greater than 99.9 percent) of the industrial wastewater in the Planning Region is discharged via permitted point sources for the industrial facilities. A very small percentage is discharged via land application.

**Table 4-1 Industrial Water Demand Forecast per Industry (MGD)**

| Industry | 2015 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|
| Mining | 0.55 | 0.74 | 1.12 | 1.50 | 1.50 |
| Food | 2.30 | 2.32 | 2.37 | 2.43 | 2.49 |
| Textiles | 2.76 | 2.76 | 2.76 | 2.76 | 2.76 |
| Apparel | - | - | - | - | - |
| Paper | 55.99 | 56.61 | 57.72 | 58.95 | 60.42 |
| Chemicals | 12.98 | 13.08 | 13.33 | 13.63 | 13.99 |
| Petroleum and Coal | - | - | - | - | - |
| Plastic and Rubber | - | - | - | - | - |
| Stone and Clay | 14.69 | 15.52 | 17.15 | 18.78 | 18.83 |
| Primary Metals | 0.12 | 0.13 | 0.13 | 0.13 | 0.14 |
| Fabricated Metal Products | - | - | - | - | - |
| Electrical Machinery | - | - | - | - | - |
| Automotive Manufacturing | - | - | - | - | - |
| Other | 2.41 | 3.16 | 4.34 | 5.57 | 7.17 |
| **TOTAL** | **91.8** | **94.3** | **98.9** | **103.7** | **107.3** |
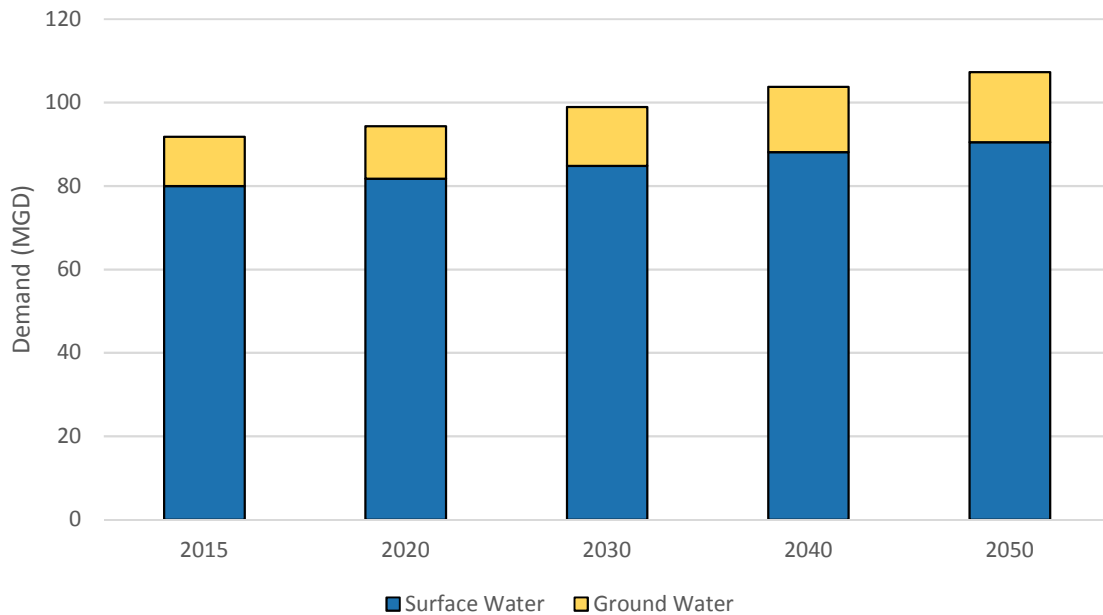


**Figure 4-1
Industrial Water Demand by Source Water Type**

**Table 4-2 Industrial Wastewater Generation Forecast per Industry (MGD)**

| Industry | 2015 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|
| Mining | 0.34 | 0.45 | 0.68 | 0.92 | 0.92 |
| Food | 2.04 | 2.06 | 2.10 | 2.15 | 2.20 |
| Textiles | 2.38 | 2.38 | 2.38 | 2.38 | 2.38 |
| Apparel | - | - | - | - | - |
| Paper | 55.99 | 56.61 | 57.72 | 58.95 | 60.42 |
| Chemicals | 12.07 | 12.17 | 12.40 | 12.67 | 13.01 |
| Petroleum and Coal | - | - | - | - | - |
| Plastic and Rubber | - | - | - | - | - |
| Stone and Clay | 18.95 | 20.02 | 22.12 | 24.22 | 24.29 |
| Primary Metals | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| Fabricated Metal Products | - | - | - | - | - |
| Electrical Machinery | - | - | - | - | - |
| Automotive Manufacturing | - | - | - | - | - |
| Other | 1.27 | 1.70 | 2.38 | 3.08 | 4.02 |
| **TOTAL** | **93.1** | **95.5** | **99.9** | **104.4** | **107.3** |

# Section 5

# Agricultural Water Forecasting

This section describes the methodology and results of agricultural water demand forecasting for the Savannah-Upper Ogeechee Planning Region.

## 5.1 Methodology

Agricultural water demand forecasts were originally developed, and recently updated, by the Georgia Water Planning & Policy Center at Albany State University (GWPPC), with support from the University of Georgia's (UGA) College of Agricultural and Environmental Sciences. GWPPC was contracted by Georgia Environmental Protection Division (GAEPD) to prepare estimates of current and future use of water by the agricultural sector in Georgia. The basic methodology involved estimating the projected irrigated area for each crop type and multiplying that area by the predicted monthly irrigation need in inches per each crop type. The proportion of irrigation water derived from different water source types was also considered. The projections cover row and orchard crops as well as most vegetable and specialty crops accounting for more than 95 percent of Georgia's irrigated land. Additionally, estimates of current use are made for animal agriculture, horticultural nurseries and greenhouses, as well as golf courses.

Metered observations were utilized from the 2010-2013 growing seasons and then projected into the future demand years using methods consistent with Round 1. To address potential climate extremes, a range of agricultural demand scenarios were considered. The 75th percentile of water demand was selected to represent dry year conditions when higher irrigation demands are expected. For planning purposes, GWPPC used the 75th percentile values for each region to represent a more conservative scenario than the median value. It is the 75th percentile demands that are presented in this report.

## 5.2 Results

**Table 5-1** shows the forecasted agricultural water needs by county in the Savannah-Upper Ogeechee region. The region as a whole is expected to see an increase of 10 percent in agricultural water demand by 2050. **Figure 5-1** shows the agricultural demands split by basin for surface water and aquifer for groundwater with the same data also provided in **Table 5-2**. Currently 83 percent of the agricultural demand in the Savannah-Upper Ogeechee region is met from groundwater.

**Table 5-1 Savannah-Upper Ogeechee Agricultural Demand Forecast per County (MGD)**

| County | 2015 | 2020 | 2030 | 2040 | 2050 | Percent Increase 2015 to 2050 |
|--------|------|------|------|------|------|-------------------------------|
| Banks | 0.003 | 0.003 | 0.004 | 0.005 | 0.005 | 77% |
| Burke | 31.3 | 31.9 | 32.6 | 32.9 | 33.2 | 6% |
| Columbia | 0.17 | 0.17 | 0.18 | 0.19 | 0.19 | 16% |
| Elbert | 0.18 | 0.18 | 0.18 | 0.17 | 0.17 | -7% |
| Franklin | 0.09 | 0.09 | 0.08 | 0.08 | 0.08 | -5% |
| Glascock | 0.14 | 0.14 | 0.14 | 0.14 | 0.13 | -6% |
| Hart | 0.82 | 0.84 | 0.85 | 0.85 | 0.85 | 4% |
| Jefferson | 19.5 | 19.9 | 20.5 | 20.8 | 21.1 | 8% |
| Jenkins | 9.3 | 9.6 | 10.0 | 10.3 | 10.6 | 14% |
| Lincoln | 0 | 0 | 0 | 0 | 0 | 0% |
| Madison | 0 | 0 | 0 | 0 | 0 | 0% |
| McDuffie | 0.61 | 0.61 | 0.60 | 0.59 | 0.58 | -5% |
| Oglethorpe | 0.31 | 0.32 | 0.32 | 0.32 | 0.33 | 4% |
| Rabun | 0 | 0 | 0 | 0 | 0 | 0% |
| Richmond | 0.75 | 0.78 | 0.80 | 0.82 | 0.84 | 12% |
| Screven | 23.6 | 24.3 | 25.5 | 26.5 | 27.4 | 16% |
| Stephens | 0 | 0 | 0 | 0 | 0 | 0% |
| Taliaferro | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0% |
| Warren | 0.06 | 0.06 | 0.06 | 0.06 | 0.05 | -7% |
| Wilkes | 0 | 0 | 0 | 0 | 0 | 0% |
| Total | **86.9** | **88.9** | **91.8** | **93.7** | **95.6** | **10%** |
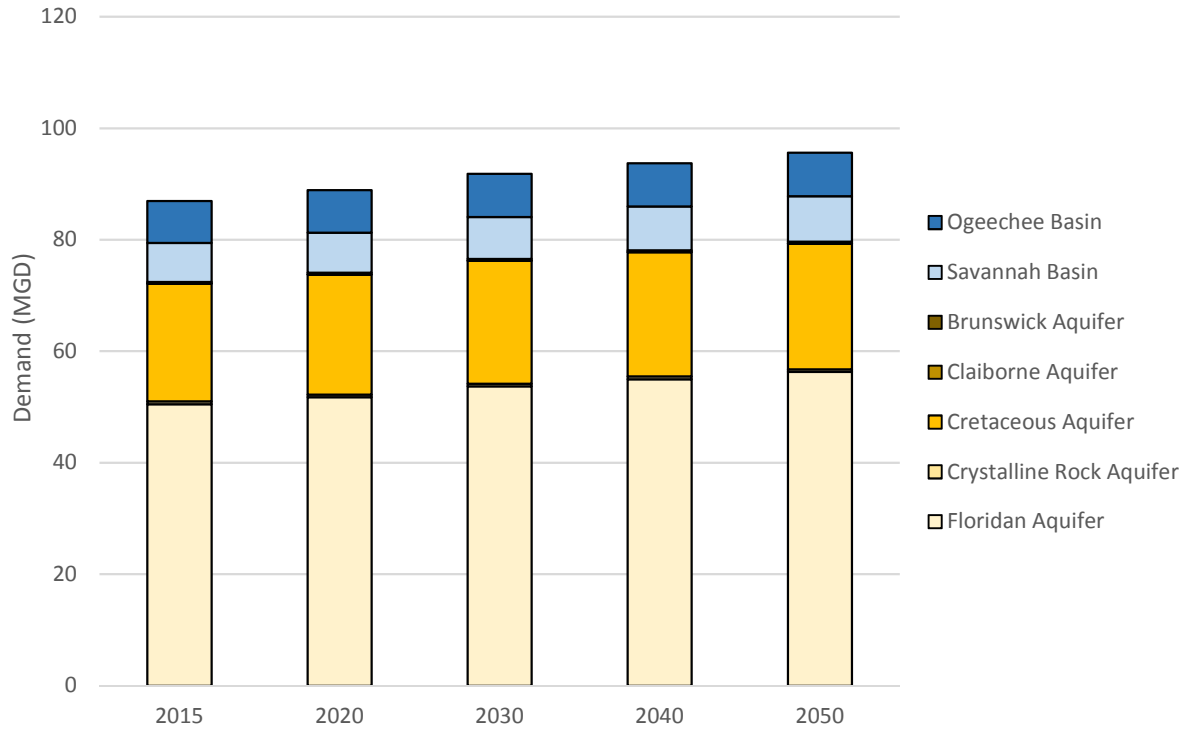
**Figure 5-1**
**Agricultural Water Demand by Source Water Type**

**Table 5-2 Savannah-Upper Ogeechee Agricultural Demand Forecast per Source (MGD)**

| Source Water Type | Basin/Aquifer | 2015 | 2020 | 2030 | 2040 | 2050 | Percent Increase 2015 to 2050 |
|---|---|---|---|---|---|---|---|
| Surface Water | Ogeechee | 7.5 | 7.6 | 7.8 | 7.8 | 7.8 | 4% |
| | Savannah | 7.0 | 7.2 | 7.6 | 7.9 | 8.2 | 17% |
| | **Sub Total** | **14.5** | **14.8** | **15.3** | **15.7** | **16.0** | **10%** |
| Groundwater | Brunswick | 0.28 | 0.28 | 0.29 | 0.29 | 0.30 | 7% |
| | Claiborne | 0.043 | 0.043 | 0.042 | 0.041 | 0.040 | -6% |
| | Cretaceous | 21.1 | 21.5 | 22.0 | 22.3 | 22.5 | 7% |
| | Crystalline Rock | 0.48 | 0.48 | 0.48 | 0.47 | 0.46 | -5% |
| | Floridan | 50.5 | 51.7 | 53.7 | 55.0 | 56.3 | 11% |
| | **Sub Total** | **72.4** | **74.1** | **76.5** | **78.1** | **79.6** | **10%** |
| | **Total** | **86.9** | **88.9** | **91.8** | **93.7** | **95.6** | **10%** |

# Section 6
# Energy Water Forecasting

This section describes the methodology and results of energy sector water demand for the Savannah-Upper Ogeechee Planning Region.

## 6.1 Methodology

Demands forecasted in this section are associated with future energy sector utilities (NAICS 22) power generation. Water demands associated with power generation by facilities with other industry codes are captured as part of the municipal and industrial water demand forecasts discussed in previous sections.

The analysis covers both water withdrawal requirements and water consumption associated with energy generation. Information related to water withdrawals is an important consideration in planning for the water needed for energy production. However, water consumption is the more important element when assessing future resources because a large volume of water is typically returned to the environment following the energy production process.

Water requirements for thermoelectric power generation facilities are estimated based on future energy demands along with the water requirements and consumption rates in gallons per megawatt-hour (MWh) for different power generating configurations. For a full discussion of the original forecast methodology see the 2010 technical memorandum "Statewide Energy Sector Water Demand Forecast" or the "Update of GA Energy Needs & Generating Facilities" memorandum. The following updates to the original methodology were incorporated into the current estimates:

- Projections of the statewide energy demand were updated using the new population projections with the relationship between population and energy demand the same as previously estimated.

- The list of existing facilities, facilities under construction, and planned and permitted new facilities was updated. In addition, some prior facilities were retired from service or converted from one generating configuration to another configuration.

- The same water withdrawal and consumptive use factors (gallons per MWh) by generating configuration were maintained as previously developed.

- To meet the future energy demand, the energy generation of existing facilities is increased over time to a predetermined maximum sustainable generating capacity based on the generation configuration. As additional capacity is needed in the future, "new" capacity is added to the most likely to be developed generating configurations, but the "new" generating capacity is not assigned geographically to any specific region within the state.

- The estimated future generating capacity of existing facilities, and associated water requirements, is allocated to regions based on the location of the existing facilities.

## 6.2 Results

The only current or planned facility part of the analysis in the Savannah-Upper Ogeechee Planning Council is Plant Vogtle. **Table 6-1** shows the projected expected scenario average annual daily withdrawal and consumption at this facility over the planning horizon which is met via surface water.

**Table 6-1 Savannah-Upper Ogeechee Forecasted Energy Sector Demands (MGD)**

| Demand Type | 2015 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|
| Withdrawals | 70 | 138 | 140 | 155 | 175 |
| Consumption | 45 | 89 | 91 | 100 | 114 |

Within the previous statewide analysis, the generating capacity of the existing and planned facilities was not able to meet the projected statewide power needs through 2050 and additional generating capacity was assumed to be developed beyond 2020.  Additional generating capacity may be needed to meet the statewide power need estimate. However, the water requirements associated with the potential new capacity are minimal; less than 20 MGD withdrawals and less than 10 MGD consumption, statewide. Thus, no future water demands for currently unassigned power generation facilities have been added to the estimates for the Savannah-Upper Ogeechee region within this update. Projections for the need of new energy capacity are less than estimated previously because: (a) population projections are lower, (b) high water-using facilities have been retired, and (c) the types of generating facilities likely to be constructed in the future to meet the additional need have lower water use requirements.

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# Section 7

# Regional Summary

This section summarizes the water and wastewater forecasts within the region for all the sectors combined.

## 7.1 Water Demand Summary

The full regional water demand including municipal, industrial, agricultural and energy uses are summarized in the figures and tables of this section. **Figure 7-1** shows the regional water demand per basin for surface water withdrawals and per aquifer for groundwater withdrawals, while **Figure 7-2** shows the regional water demand per sector. **Table 7-1** provides a breakdown of the demand types and withdrawal locations per County.
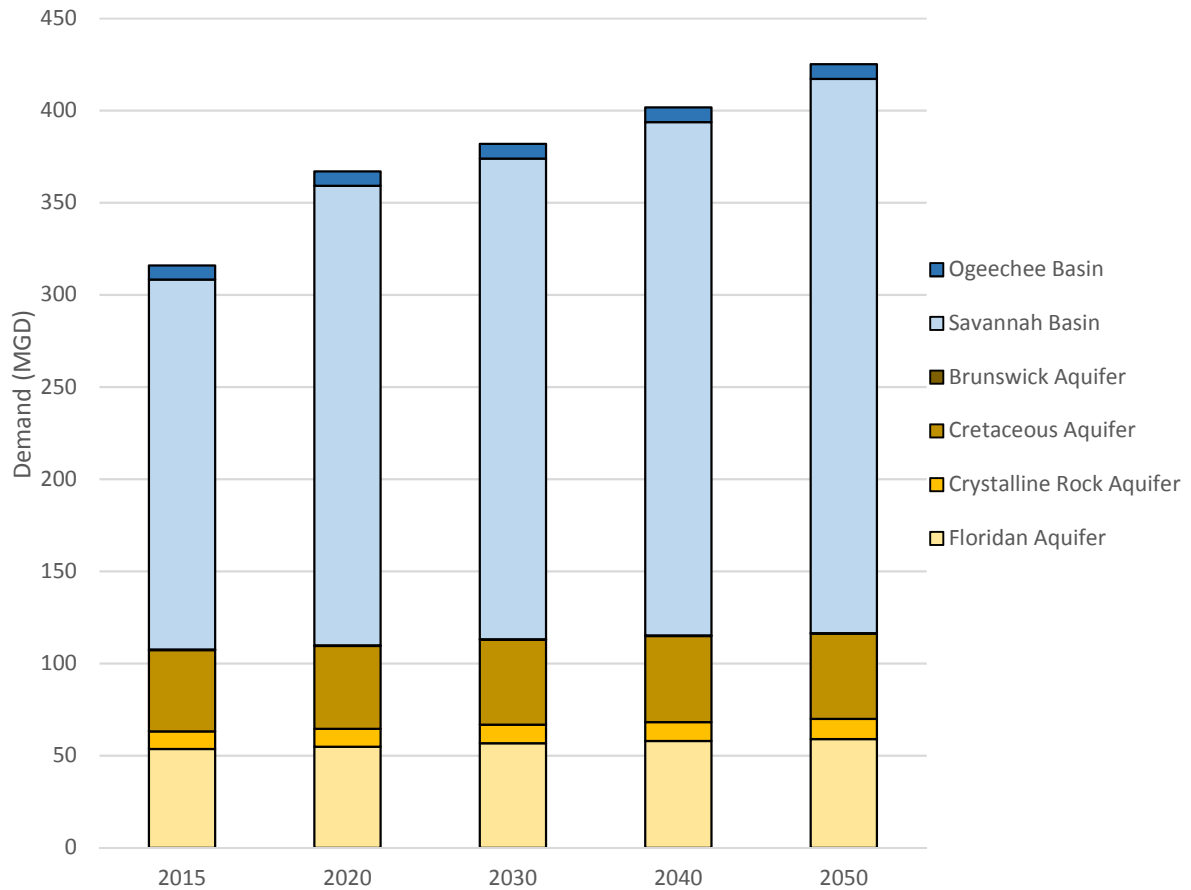


Note: Consumptive demand rather than total withdrawals from the energy sector included

**Figure 7-1**
**Regional Water Demand by Basin and Aquifer**
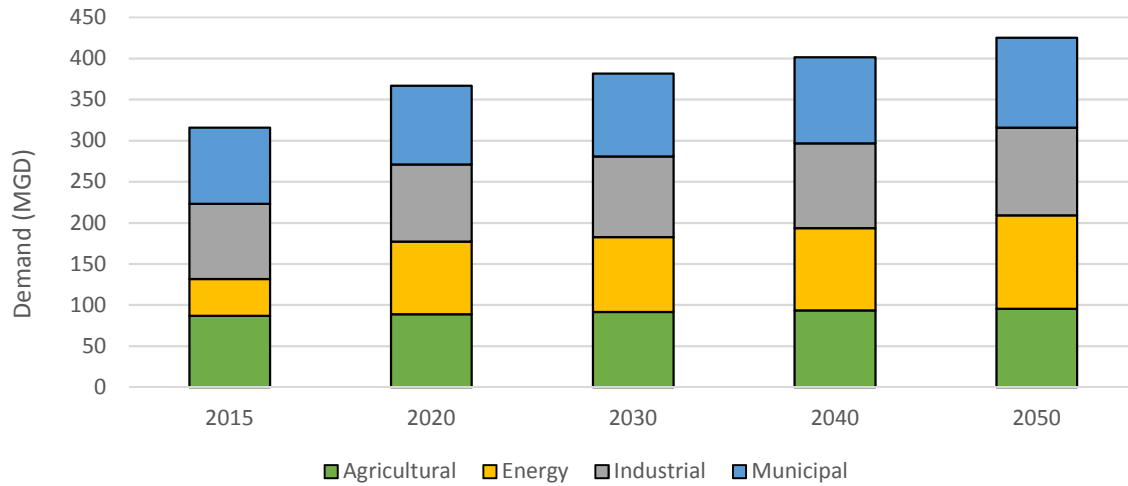
**Figure 7-2**
**Regional Water Demand by Sector**



**Figure 7-3**
**County Water Demand by Sector for 2015**

**Table 7-1 Summary of Water Demand per County (MGD)**

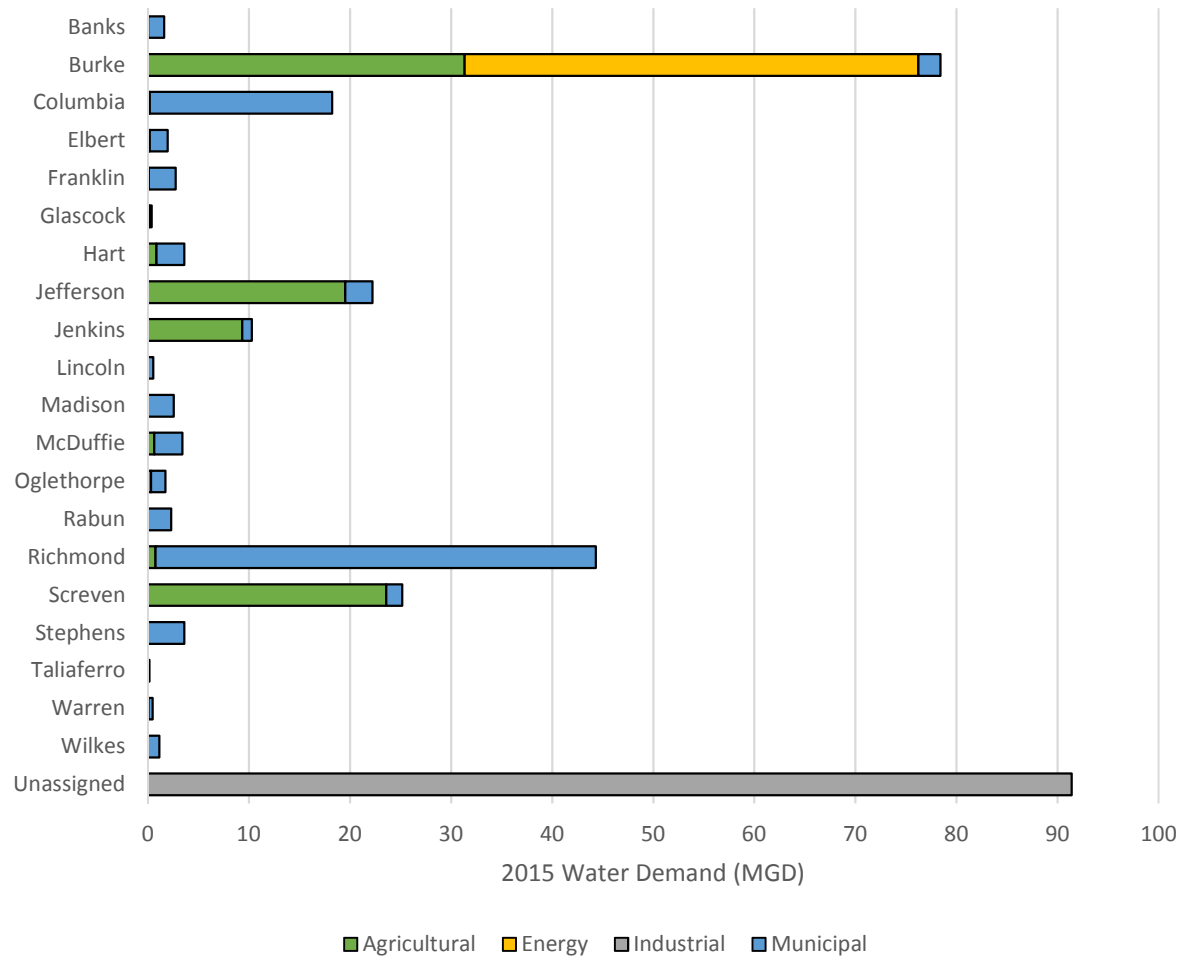| County | Sector | Aquifer/Node | 2015 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|---|
| Banks | GW Agricultural | Crystalline Rock | 0.003 | 0.003 | 0.004 | 0.005 | 0.005 |
| | GW Municipal Self Supply | Crystalline Rock | 0.80 | 0.80 | 0.80 | 0.78 | 0.74 |
| | Groundwater Total | | 0.80 | 0.81 | 0.80 | 0.78 | 0.75 |
| | SW Municipal Public Supply | Bell | 0.81 | 0.82 | 0.82 | 0.80 | 0.77 |
| | Total | | 1.61 | 1.63 | 1.62 | 1.58 | 1.52 |
| Burke | GW Agricultural | Floridan, Cretaceous | 27.20 | 27.70 | 28.37 | 28.70 | 29.03 |
| | GW Municipal Public Supply | Cretaceous | 0.92 | 0.91 | 0.89 | 0.84 | 0.78 |
| | GW Municipal Self Supply | Cretaceous | 0.49 | 0.49 | 0.47 | 0.44 | 0.40 |
| | GW Municipal Self Supply | Floridan | 0.61 | 0.61 | 0.58 | 0.54 | 0.50 |
| | Groundwater Total | | 29.22 | 29.70 | 30.31 | 30.52 | 30.71 |
| | SW Agricultural | Eden, Millhaven, Burtons Ferry | 4.14 | 4.18 | 4.22 | 4.19 | 4.17 |
| | SW Energy | Burtons Ferry | 44.9 | 88.6 | 90.8 | 100.1 | 113.7 |
| | SW Municipal Public Supply | Millhaven | 0.15 | 0.15 | 0.15 | 0.14 | 0.13 |
| | Surface Water Total | | 49.20 | 92.92 | 95.21 | 104.4 | 118.0 |
| | Total | | 78.4 | 122.6 | 125.5 | 134.9 | 148.7 |
| Columbia | GW Agricultural | Cretaceous | 0.10 | 0.10 | 0.10 | 0.11 | 0.11 |
| | GW Municipal Public Supply | Crystalline Rock | 0.20 | 0.23 | 0.29 | 0.36 | 0.44 |
| | GW Municipal Self Supply | Cretaceous | 0.94 | 0.96 | 0.97 | 0.92 | 0.79 |
| | GW Municipal Self Supply | Crystalline Rock | 0.31 | 0.31 | 0.32 | 0.30 | 0.26 |
| | Groundwater Total | | 1.54 | 1.60 | 1.68 | 1.68 | 1.60 |
| | SW Agricultural | Augusta | 0.07 | 0.07 | 0.08 | 0.08 | 0.08 |
| | SW Municipal Public Supply | Augusta | 14.21 | 16.09 | 20.37 | 25.33 | 31.26 |
| | SW Municipal Public Supply | Thurmond Reservoir | 2.41 | 2.73 | 3.45 | 4.29 | 5.30 |
| | Surface Water Total | | 16.69 | 18.89 | 23.90 | 29.71 | 36.64 |
| | Total | | 18.24 | 20.49 | 25.58 | 31.38 | 38.24 |
| Elbert | GW Municipal Self Supply | Crystalline Rock | 0.74 | 0.70 | 0.63 | 0.56 | 0.49 |
| | SW Agricultural | Russell Reservoir | 0.18 | 0.18 | 0.18 | 0.17 | 0.17 |
| | SW Municipal Public Supply | Russell Reservoir | 1.02 | 1.01 | 0.99 | 0.94 | 0.89 |
| | Surface Water Total | | 1.20 | 1.20 | 1.16 | 1.11 | 1.06 |
| | Total | | 1.94 | 1.90 | 1.80 | 1.67 | 1.56 |

**Table 7-1 Summary of Water Demand per County (MGD)**

| County | Sector | Aquifer/Node | 2015 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|---|
| Franklin | GW Municipal Public Supply | Crystalline Rock | 0.10 | 0.11 | 0.12 | 0.14 | 0.16 |
| | GW Municipal Self Supply | Crystalline Rock | 0.80 | 0.76 | 0.66 | 0.54 | 0.43 |
| | Groundwater Total | | 0.90 | 0.87 | 0.78 | 0.68 | 0.59 |
| | SW Agricultural | Bell | 0.09 | 0.09 | 0.08 | 0.08 | 0.08 |
| | SW Municipal Public Supply | Bell | 0.32 | 0.35 | 0.40 | 0.45 | 0.51 |
| | SW Municipal Public Supply | Hartwell Reservoir | 1.44 | 1.57 | 1.82 | 2.05 | 2.30 |
| | Surface Water Total | | 1.85 | 2.00 | 2.30 | 2.59 | 2.89 |
| | Total | | 2.75 | 2.87 | 3.08 | 3.27 | 3.48 |
| Glascock | GW Agricultural | Cretaceous, Floridan | 0.08 | 0.09 | 0.08 | 0.08 | 0.08 |
| | GW Municipal Public Supply | Cretaceous | 0.09 | 0.09 | 0.10 | 0.10 | 0.09 |
| | GW Municipal Self Supply | Cretaceous | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| | GW Municipal Self Supply | Floridan | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| | Groundwater Total | | 0.32 | 0.32 | 0.33 | 0.32 | 0.31 |
| | SW Agricultural | Eden | 0.06 | 0.06 | 0.06 | 0.05 | 0.05 |
| | Total | | 0.37 | 0.38 | 0.38 | 0.38 | 0.37 |
| Hart | GW Municipal Self Supply | Crystalline Rock | 1.16 | 1.07 | 0.86 | 0.64 | 0.43 |
| | SW Agricultural | Russell Reservoir, Hartwell Reservoir, Bell | 0.82 | 0.84 | 0.85 | 0.85 | 0.85 |
| | SW Municipal Public Supply | Hartwell Reservoir | 1.59 | 1.82 | 2.23 | 2.59 | 2.92 |
| | Surface Water Total | | 2.42 | 2.65 | 3.08 | 3.44 | 3.77 |
| | Total | | 3.58 | 3.72 | 3.93 | 4.08 | 4.20 |
| Jefferson | GW Agricultural | Floridan, Cretaceous | 15.42 | 15.71 | 16.09 | 16.28 | 16.46 |
| | GW Municipal Public Supply | Cretaceous | 1.41 | 1.39 | 1.33 | 1.24 | 1.15 |
| | GW Municipal Self Supply | Cretaceous | 1.01 | 1.00 | 0.96 | 0.89 | 0.83 |
| | GW Municipal Self Supply | Floridan | 0.28 | 0.28 | 0.27 | 0.25 | 0.23 |
| | Groundwater Total | | 18.13 | 18.38 | 18.64 | 18.66 | 18.68 |
| | SW Agricultural | Millhaven, Eden | 4.10 | 4.21 | 4.39 | 4.54 | 4.68 |
| | Total | | 22.22 | 22.58 | 23.03 | 23.20 | 23.36 |
| Jenkins | GW Agricultural | Floridan, Cretaceous | 7.46 | 7.66 | 8.04 | 8.30 | 8.56 |
| | GW Municipal Public Supply | Floridan | 0.77 | 0.77 | 0.77 | 0.76 | 0.73 |
| | GW Municipal Self Supply | Cretaceous | 0.08 | 0.07 | 0.06 | 0.05 | 0.05 |
| | GW Municipal Self Supply | Floridan | 0.08 | 0.07 | 0.07 | 0.06 | 0.05 |
| | Groundwater Total | | 8.38 | 8.58 | 8.94 | 9.16 | 9.38 |
| | SW Agricultural | Eden, Kings Ferry, Clyo, Claxton | 1.88 | 1.92 | 2.00 | 2.04 | 2.08 |
| | Total | | 10.26 | 10.51 | 10.94 | 11.20 | 11.46 |

**Table 7-1 Summary of Water Demand per County (MGD)**

| County | Sector | Aquifer/Node | 2015 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|---|
| Lincoln | GW Municipal Self Supply | Crystalline Rock | 0.17 | 0.16 | 0.14 | 0.11 | 0.09 |
| | SW Municipal Public Supply | Thurmond Reservoir | 0.36 | 0.34 | 0.30 | 0.24 | 0.20 |
| | Total | | 0.53 | 0.50 | 0.43 | 0.36 | 0.29 |
| Madison | GW Municipal Public Supply | Crystalline Rock | 1.52 | 1.68 | 1.99 | 2.24 | 2.46 |
| | GW Municipal Self Supply | Crystalline Rock | 1.04 | 0.96 | 0.78 | 0.57 | 0.37 |
| | Total | | 2.55 | 2.64 | 2.77 | 2.82 | 2.83 |
| McDuffie | GW Agricultural | Crystalline Rock, Cretaceous | 0.52 | 0.52 | 0.52 | 0.50 | 0.49 |
| | GW Municipal Self Supply | Crystalline Rock | 0.31 | 0.29 | 0.25 | 0.19 | 0.15 |
| | Groundwater Total | | 0.83 | 0.82 | 0.76 | 0.70 | 0.64 |
| | SW Agricultural | Millhaven, Augusta | 0.09 | 0.09 | 0.09 | 0.09 | 0.08 |
| | SW Municipal Public Supply | Millhaven | 0.88 | 0.91 | 0.94 | 0.94 | 0.92 |
| | SW Municipal Public Supply | Thurmond Reservoir | 1.61 | 1.66 | 1.72 | 1.72 | 1.68 |
| | Surface Water Total | | 2.58 | 2.66 | 2.75 | 2.74 | 2.69 |
| | Total | | 3.41 | 3.48 | 3.51 | 3.44 | 3.33 |
| Oglethorpe | GW Municipal Self Supply | Crystalline Rock | 0.13 | 0.13 | 0.12 | 0.12 | 0.11 |
| | SW Agricultural | Thurmond Reservoir, Bell | 0.31 | 0.32 | 0.32 | 0.32 | 0.33 |
| | SW Municipal Public Supply | Bell | 1.29 | 1.28 | 1.26 | 1.20 | 1.13 |
| | Surface Water Total | | 1.60 | 1.60 | 1.58 | 1.53 | 1.46 |
| | Total | | 1.73 | 1.73 | 1.70 | 1.65 | 1.57 |
| Rabun | GW Municipal Public Supply | Crystalline Rock | 0.12 | 0.12 | 0.12 | 0.11 | 0.11 |
| | GW Municipal Self Supply | Crystalline Rock | 0.33 | 0.33 | 0.32 | 0.30 | 0.29 |
| | Groundwater Total | | 0.45 | 0.45 | 0.44 | 0.42 | 0.40 |
| | SW Municipal Public Supply | Hartwell Reservoir | 1.83 | 1.84 | 1.81 | 1.76 | 1.72 |
| | Total | | 2.28 | 2.29 | 2.25 | 2.17 | 2.12 |
| Richmond | GW Agricultural | Cretaceous, Floridan | 0.70 | 0.72 | 0.74 | 0.76 | 0.77 |
| | GW Municipal Public Supply | Cretaceous | 6.06 | 6.12 | 6.14 | 6.00 | 5.77 |
| | GW Municipal Self Supply | Cretaceous | 0.30 | 0.30 | 0.30 | 0.28 | 0.26 |
| | Groundwater Total | | 7.06 | 7.15 | 7.18 | 7.04 | 6.81 |
| | SW Agricultural | Burtons Ferry, Millhaven | 0.05 | 0.05 | 0.06 | 0.06 | 0.07 |
| | SW Municipal Public Supply | Augusta | 37.20 | 37.61 | 37.70 | 36.86 | 35.47 |
| | Surface Water Total | | 37.25 | 37.66 | 37.75 | 36.92 | 35.54 |
| | Total | | 44.32 | 44.81 | 44.93 | 43.96 | 42.35 |

**Table 7-1 Summary of Water Demand per County (MGD)**

| County | Sector | Aquifer/Node | 2015 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|---|
| Screven | GW Agricultural | Floridan, Cretaceous, Brunswick | 20.95 | 21.55 | 22.58 | 23.35 | 24.12 |
| | GW Municipal Public Supply | Floridan | 0.94 | 0.93 | 0.90 | 0.85 | 0.80 |
| | GW Municipal Self Supply | Cretaceous | 0.31 | 0.30 | 0.29 | 0.27 | 0.25 |
| | GW Municipal Self Supply | Floridan | 0.32 | 0.32 | 0.30 | 0.28 | 0.26 |
| | Groundwater Total | | 22.52 | 23.10 | 24.06 | 24.74 | 25.42 |
| | SW Agricultural | Eden, Burtons Ferry, Clyo, Millhaven, Savannah | 2.63 | 2.74 | 2.94 | 3.11 | 3.28 |
| | Total | | 25.15 | 25.84 | 27.00 | 27.85 | 28.71 |
| Stephens | GW Municipal Self Supply | Crystalline Rock | 0.18 | 0.17 | 0.14 | 0.11 | 0.08 |
| | SW Municipal Public Supply | Hartwell Reservoir | 3.41 | 3.43 | 3.42 | 3.35 | 3.29 |
| | Total | | 3.59 | 3.60 | 3.56 | 3.46 | 3.37 |
| Taliaferro | GW Municipal Public Supply | Crystalline Rock | 0.05 | 0.04 | 0.04 | 0.03 | 0.03 |
| | GW Municipal Self Supply | Crystalline Rock | 0.08 | 0.07 | 0.07 | 0.06 | 0.05 |
| | Groundwater Total | | 0.12 | 0.12 | 0.10 | 0.09 | 0.07 |
| | SW Agricultural | Eden | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 |
| | Total | | 0.13 | 0.12 | 0.11 | 0.10 | 0.08 |
| Warren | GW Municipal Self Supply | Cretaceous | 0.12 | 0.11 | 0.09 | 0.07 | 0.06 |
| | GW Municipal Self Supply | Crystalline Rock | 0.05 | 0.05 | 0.04 | 0.03 | 0.02 |
| | Groundwater Total | | 0.17 | 0.16 | 0.13 | 0.10 | 0.08 |
| | SW Agricultural | Eden, Millhaven | 0.06 | 0.06 | 0.06 | 0.06 | 0.05 |
| | SW Municipal Public Supply | Eden | 0.23 | 0.22 | 0.20 | 0.19 | 0.17 |
| | Surface Water Total | | 0.29 | 0.28 | 0.26 | 0.24 | 0.22 |
| | Total | | 0.46 | 0.44 | 0.39 | 0.34 | 0.30 |
| Wilkes | GW Municipal Self Supply | Crystalline Rock | 0.38 | 0.36 | 0.32 | 0.29 | 0.26 |
| | SW Municipal Public Supply | Thurmond Reservoir | 0.76 | 0.73 | 0.67 | 0.61 | 0.55 |
| | Total | | 1.14 | 1.09 | 1.00 | 0.90 | 0.81 |
| Unassigned | GW Industrial | | 11.80 | 12.54 | 14.07 | 15.65 | 16.79 |
| | SW Industrial | | 79.58 | 81.31 | 84.29 | 87.44 | 89.78 |
| Planning Region Total Groundwater Demand | | | 107.5 | 109.8 | 113.2 | 115.2 | 116.5 |
| Planning Region Total Surface Water Demand | | | 208.5 | 257.3 | 268.7 | 286.6 | 308.7 |
| Planning Region Total Demand | | | 316.1 | 367.1 | 381.9 | 401.8 | 425.3 |

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# 7.2 Wastewater Summary

The full regional wastewater forecasts including municipal and industrial discharges are summarized in the figures and tables of this section. **Figure 7-4** shows the wastewater discharges per basin while **Figure 7-5** shows the forecasted discharge per method. **Table 7-2** provides a summary of the discharge type per watershed model node.
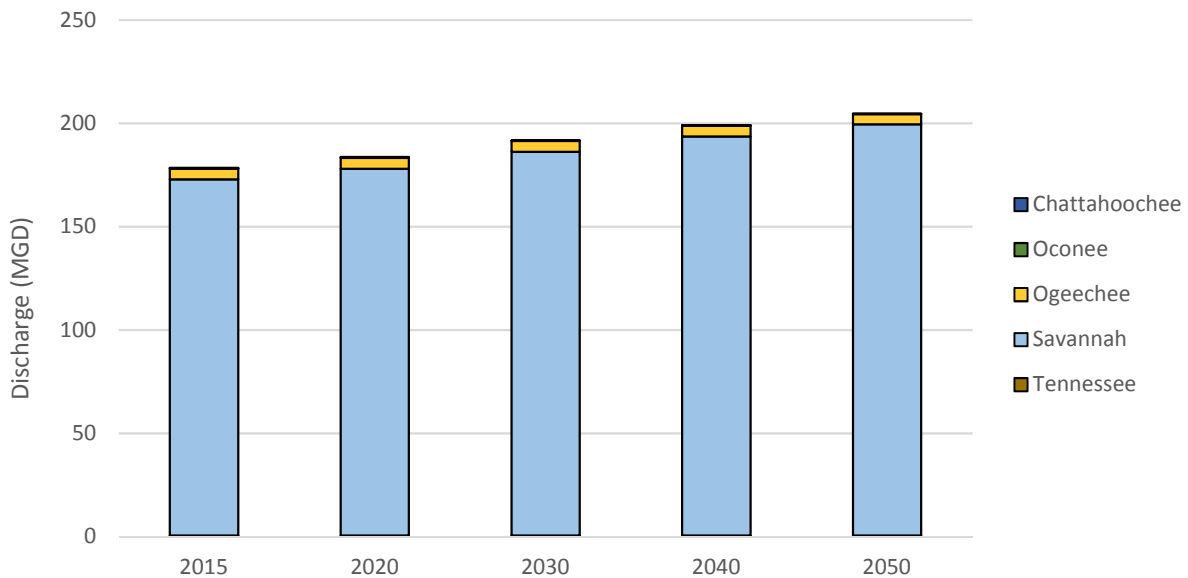


**Figure 7-4**
**Regional Wastewater Discharge per Basin**
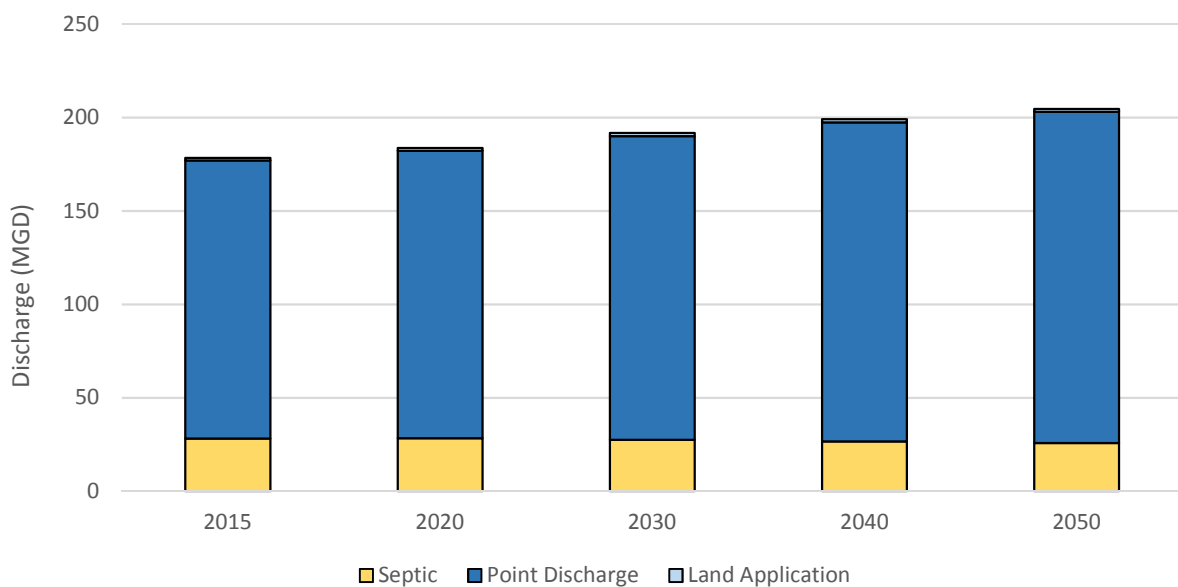


**Figure 7-5**
**Regional Wastewater Discharge per Method**

**Table 7-2 Summary of Regional Wastewater Flows at Applicable Nodes (MGD)**

| Node | Discharge Type | 2015 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|
| Augusta | Land Application | 0.32 | 0.37 | 0.46 | 0.50 | 0.50 |
| | Point Discharge | 60.94 | 63.41 | 67.34 | 70.93 | 74.31 |
| | Septic | 4.49 | 4.71 | 5.12 | 5.47 | 5.77 |
| | Total | 65.75 | 68.48 | 72.92 | 76.89 | 80.57 |
| Bell | Land Application | 0.16 | 0.16 | 0.17 | 0.17 | 0.17 |
| | Point Discharge | 3.44 | 4.11 | 5.52 | 6.65 | 7.83 |
| | Septic | 6.85 | 6.77 | 5.87 | 5.33 | 4.91 |
| | Total | 10.44 | 11.04 | 11.57 | 12.15 | 12.91 |
| Burtons Ferry | Land Application | 0.17 | 0.17 | 0.17 | 0.16 | 0.15 |
| | Point Discharge | 57.96 | 58.62 | 59.76 | 60.98 | 62.41 |
| | Septic | 3.63 | 3.67 | 3.69 | 3.62 | 3.50 |
| | Total | 61.76 | 62.46 | 63.61 | 64.75 | 66.06 |
| Clyo | Land Application | - | - | - | - | - |
| | Point Discharge | 0.65 | 0.65 | 0.64 | 0.62 | 0.60 |
| | Septic | 0.44 | 0.43 | 0.42 | 0.39 | 0.37 |
| | Total | 1.09 | 1.09 | 1.06 | 1.01 | 0.97 |
| Eden | Land Application | - | - | - | - | - |
| | Point Discharge | 2.69 | 2.78 | 2.94 | 3.06 | 3.06 |
| | Septic | 2.47 | 2.41 | 2.25 | 2.05 | 1.86 |
| | Total | 5.17 | 5.19 | 5.19 | 5.12 | 4.93 |
| Hartwell Reservoir | Land Application | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | Point Discharge | 2.03 | 2.16 | 2.50 | 2.79 | 3.09 |
| | Septic | 3.75 | 3.69 | 3.55 | 3.36 | 3.21 |
| | Total | 5.79 | 5.87 | 6.06 | 6.17 | 6.31 |
| Little Tennessee | Land Application | - | - | - | - | - |
| | Point Discharge | 0.27 | 0.30 | 0.35 | 0.40 | 0.45 |
| | Septic | 0.20 | 0.20 | 0.18 | 0.17 | 0.15 |
| | Total | 0.47 | 0.49 | 0.53 | 0.57 | 0.60 |
| Milledgeville | Land Application | - | - | - | - | - |
| | Point Discharge | - | - | - | - | - |
| | Septic | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 |
| | Total | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 |
| Millhaven | Land Application | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| | Point Discharge | 18.43 | 19.46 | 21.40 | 23.22 | 23.31 |
| | Septic | 2.35 | 2.36 | 2.35 | 2.28 | 2.18 |
| | Total | 20.81 | 21.86 | 23.78 | 25.53 | 25.52 |

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**Table 7-2 Summary of Regional Wastewater Flows at Applicable Nodes (MGD)**

| Node | Discharge Type | 2015 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|
| Penfield | Land Application | - | - | - | - | - |
| | Point Discharge | - | - | - | - | - |
| | Septic | 0.31 | 0.29 | 0.19 | 0.13 | 0.08 |
| | Total | 0.31 | 0.29 | 0.19 | 0.13 | 0.08 |
| Russell Reservoir | Land Application | 0.71 | 0.72 | 0.73 | 0.73 | 0.72 |
| | Point Discharge | 0.98 | 1.00 | 1.01 | 1.01 | 1.02 |
| | Septic | 1.36 | 1.39 | 1.44 | 1.48 | 1.53 |
| | Total | 3.05 | 3.11 | 3.18 | 3.22 | 3.27 |
| Savannah | Land Application | - | - | - | - | - |
| | Point Discharge | - | - | - | - | - |
| | Septic | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | Total | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Thurmond Reservoir | Land Application | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 |
| | Point Discharge | 1.28 | 1.22 | 1.17 | 1.10 | 1.05 |
| | Septic | 2.37 | 2.38 | 2.35 | 2.28 | 2.22 |
| | Total | 3.74 | 3.70 | 3.61 | 3.47 | 3.36 |
| **Grand Total** | | **178.4** | **183.6** | **191.7** | **199.0** | **204.6** |

# Section 8

# References

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