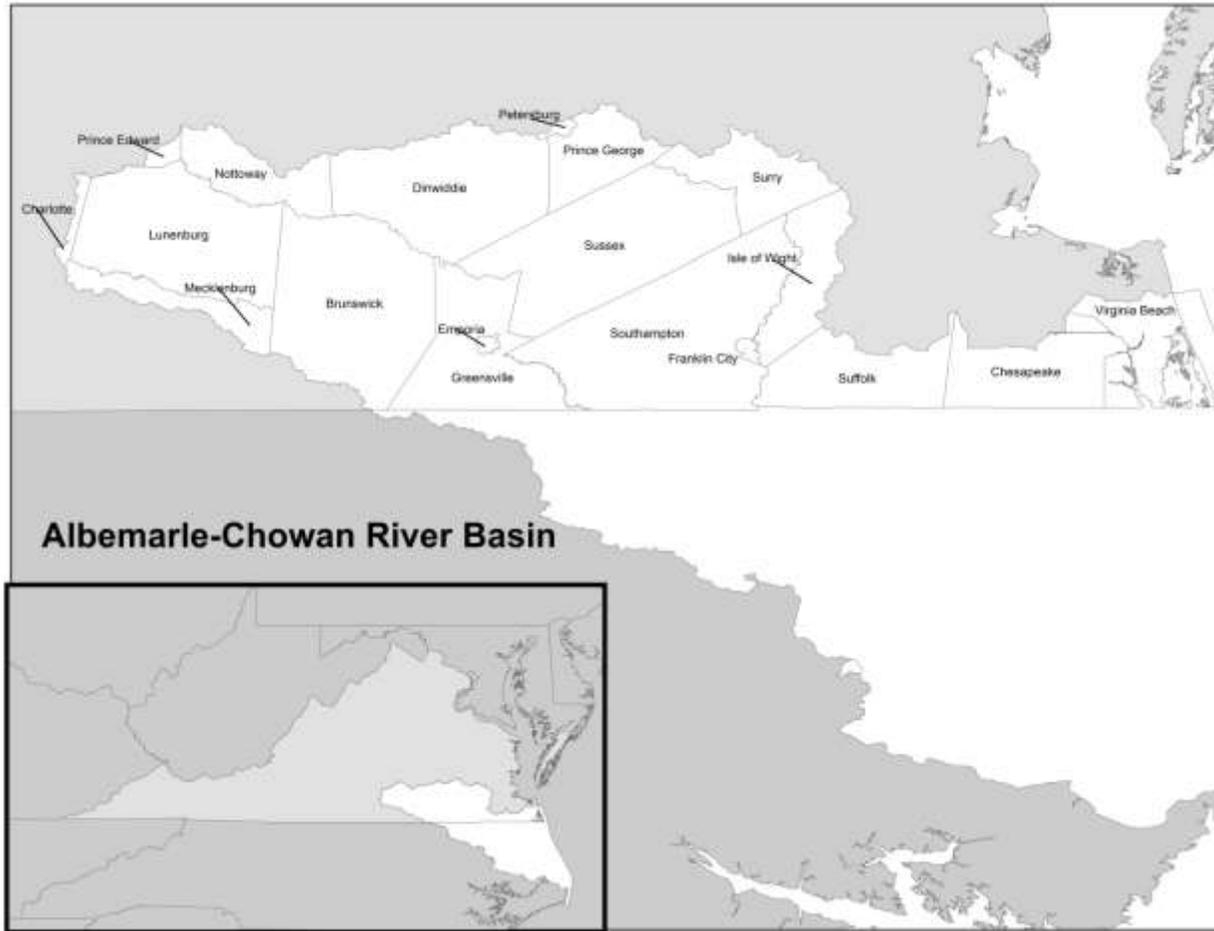


## Albemarle-Chowan River Basin Summary

For a full description of localities included in the water supply plans, as well as explanations of various terms and concepts used throughout this summary, please review the Introduction to SWRP Plan Appendices.

The Albemarle-Chowan River Basin is located in the southeastern portion of Virginia and covers 4,220 square miles, or approximately 10% of the Commonwealth's land area. The Basin is approximately 145 miles in length and varies from 10 to 50 miles in width. Virginia's portion of the Basin extends eastward from Charlotte County to the Chesapeake Bay. The Basin is bordered by the James River and the Chesapeake Bay-Small Coastal River Basins to the north, the Roanoke River Basin to the west and the Virginia/North Carolina State line to the south.

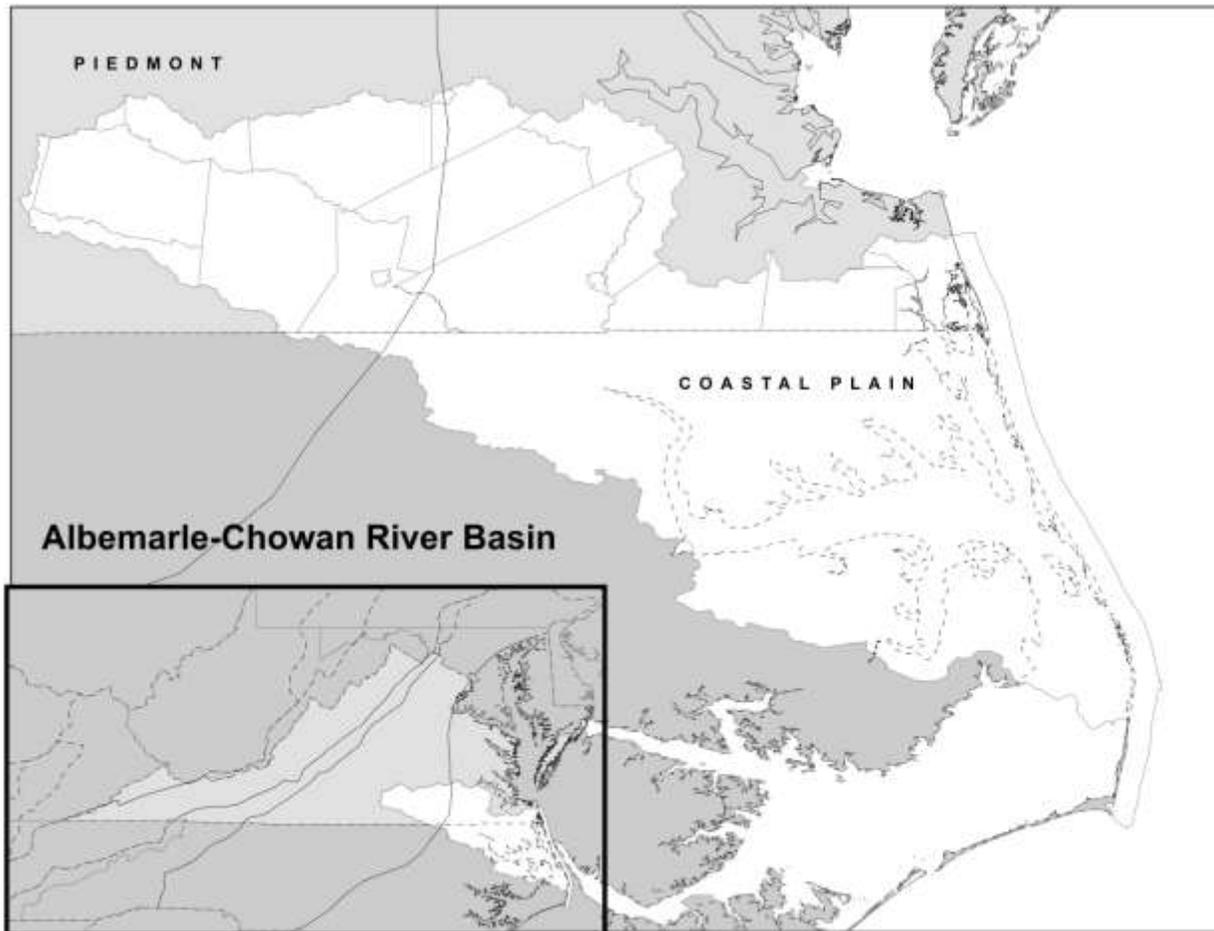
All or portions of the following 13 counties and six cities lie within the Basin: counties of Brunswick, Charlotte, Dinwiddie, Greensville, Isle of Wight, Lunenburg, Mecklenburg, Nottoway, Prince Edward, Prince George, Southampton, Surry, and Sussex; cities of Chesapeake, Emporia, Franklin, Petersburg, Suffolk, and Virginia Beach. These jurisdictions are represented within eight regional water supply plans: Greensville/Sussex/Emporia, Lunenburg County/Towns, Nottoway County/Towns, Hampton Roads, Lake Country, Charlotte/Town, Appomattox River Water Authority, and Prince Edward/Town.



Albemarle-Chowan River Basin Localities

Major tributaries of the Chowan River are the Meherrin, Nottoway and Blackwater Rivers. Approximately nine miles south of the City of Franklin, along the Southampton County and City of Suffolk border, the Nottoway and Blackwater Rivers combine to form the Chowan River. Virginia's portion of the Meherrin River crosses into North Carolina to join the Chowan as it travels south to the Albemarle Sound on North Carolina's coast. The far eastern section of the Basin encompasses the southern portions of the Cities of Suffolk, Chesapeake and Virginia Beach. The land here is mostly flat with many swamp and marshland areas and drains directly to the Albemarle Sound.

The Basin flows through the Piedmont and Coastal Plain Physiological Provinces. The Chowan portion flows 130 miles from west to east, crossing both the Piedmont and Coastal Plain, while the eastern portion of the Basin lies entirely within the Coastal Plain. The Piedmont is characterized by rolling hills, steeper slopes, and somewhat more pronounced stream valleys. The Coastal Plain, in contrast, is nearly flat with a descending series of terraces.



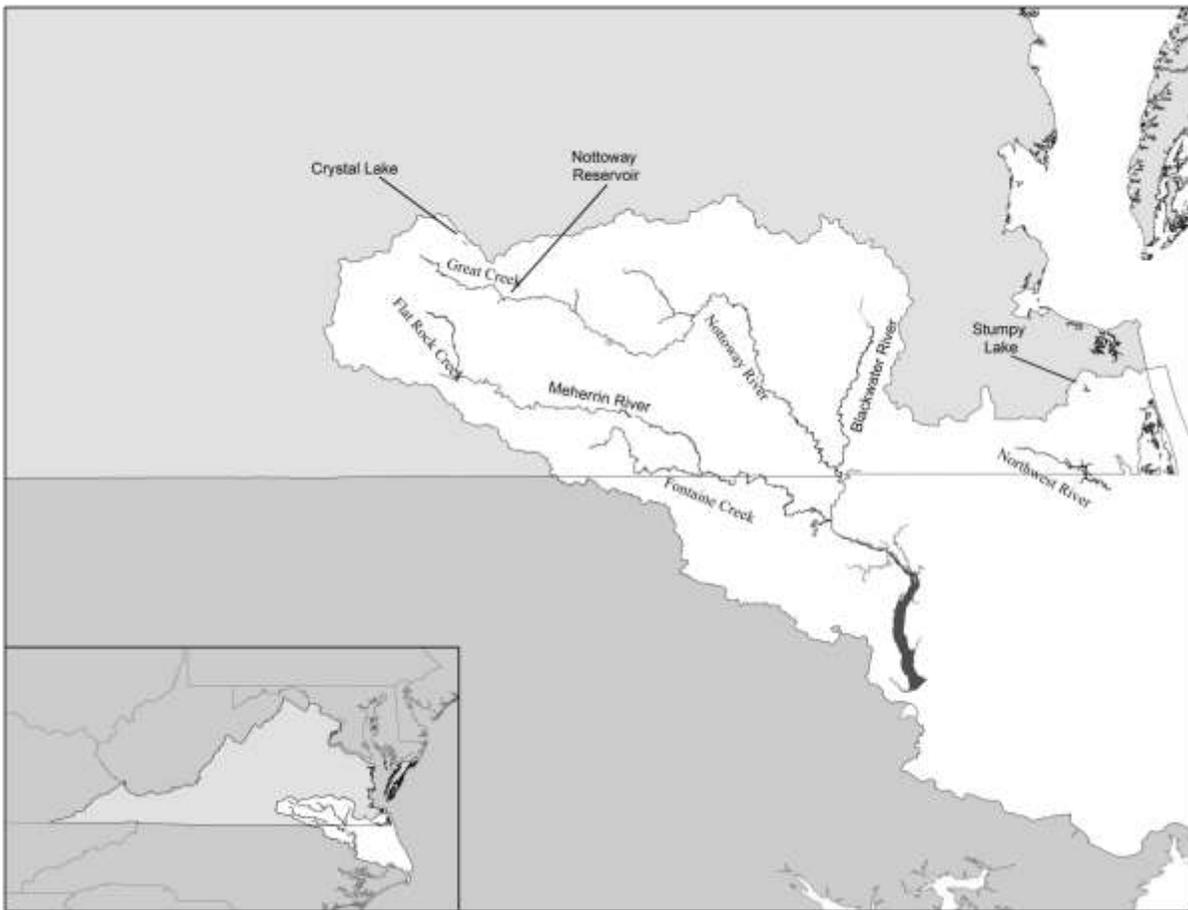
Albemarle-Chowan River Basin Physiographic Provinces

The Albemarle-Chowan River Basin is mostly rural with approximately 64% of its land covered by forest. Crop and pasture land make up another 28%, while only about 6% is classified as urban. The Basin is divided into five USGS hydrologic units as follows: HUC 03010201 Nottoway; HUC 03010202 Blackwater; HUC 03010203 Chowan; HUC 03010204 Meherrin; and HUC 03010205 Albemarle Sound. The five hydrologic units are further divided into 42 waterbodies or watersheds and 127 6th order sub-watersheds.

#### Existing Water Sources

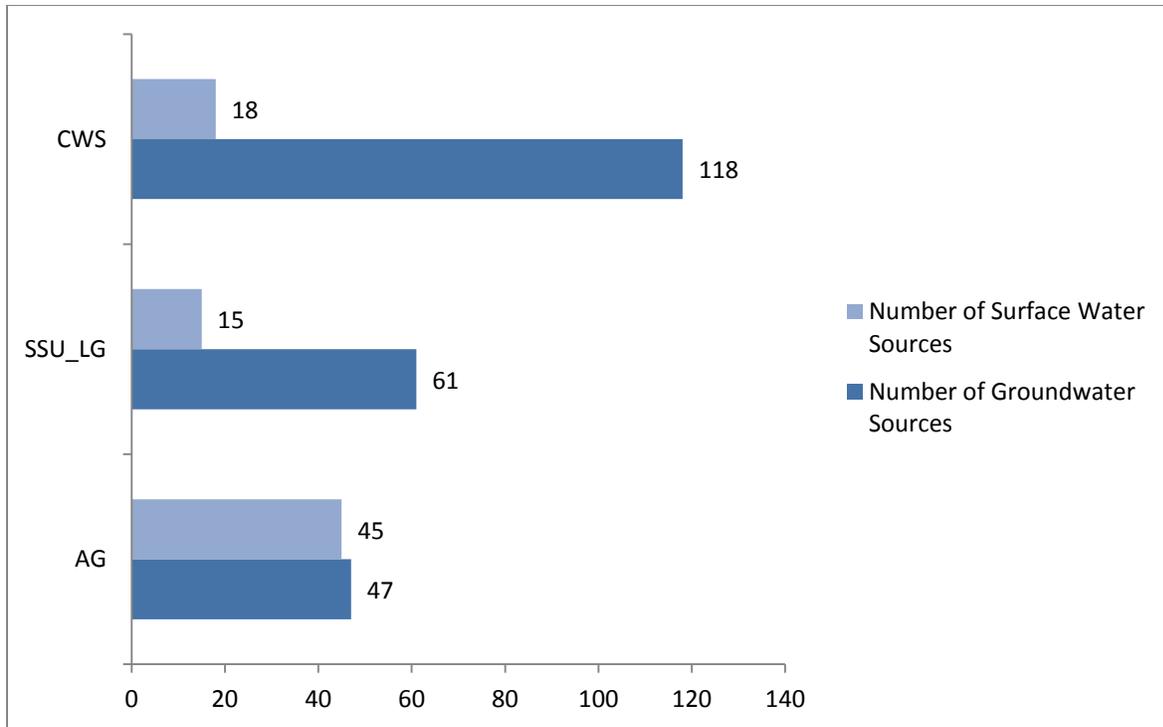
Water sources utilized in the Basin include stream intakes, reservoirs, private ponds, and groundwater wells. Surface water sources (reservoirs and streams) account for 78 withdrawals; additionally there are 226 groundwater withdrawals currently identified in the Albemarle-Chowan River Basin. Source water reservoirs used in the Basin include Lunenburg Lake, Nottoway Falls Reservoir, Emporia Reservoir, Crystal Lake, Fort Pickett Reservoir, and Stumpy Lake. Stream intakes used in the Basin include the Blackwater River, Great Creek, Meherrin River, Northwest River, Nottoway River, Flat Rock Creek, and

Fontaine Creek. Ponds and lakes on private property are used for irrigation on farms and golf courses in the Basin.



Albemarle-Chowan River Basin Major Reservoir and Stream Sources

Reported groundwater sources outnumber reported surface water sources in all use types. The number of residential groundwater sources (SSU\_SM) is unknown and, therefore, is not included in the figure below. As estimated for the year 2010, approximately 224,335 people in the Basin use private groundwater wells for residential water supply.



Albemarle-Chowan River Basin Source Type by User Type

Nontraditional water sources, such as water reclamation and reuse, desalination, and interconnection are not commonly utilized by localities in the Commonwealth. However, there are a few localities in the Basin taking advantage of these options. The City of Chesapeake treats brackish surface water at the Northwest River Reverse Osmosis Water Treatment Plant and uses an aquifer storage and recovery well for storage of treated water during peak demands. The City of Suffolk uses electro-dialysis reversal desalination at their water treatment plant to treat high fluoride groundwater.

### Transfers

Water withdrawn in the Basin may be used by the withdrawing user, or it may be transferred to another user. The transfer of water within and between river basins is a demand management practice that can address water supply and/or water quality needs by moving water from a basin or sub-basin with surplus supply to a basin or sub-basin with a supply deficit. Most often this practice of transferring water across sub-basin boundaries within a river basin - intrabasin transfers - occurs within a single county, but they can occur across county lines. Water movement that occurs when water is withdrawn from one major basin and transferred to a user in another major basin is called an interbasin transfer. Interbasin transfers of water are less common in Virginia.

The following table lists the two reported Albemarle-Chowan intrabasin transfers between water providers and the Community Water System (CWS) to which they sell water (water purchaser).

User Type	Water Purchaser and System(s)	Water Provider
CWS	Town of Alberta	Town of Lawrenceville
CWS	Greenville County WSA - Jarratt system	Georgia Pacific Jarratt Plant

Albemarle-Chowan River Basin Intrabasin Transfers

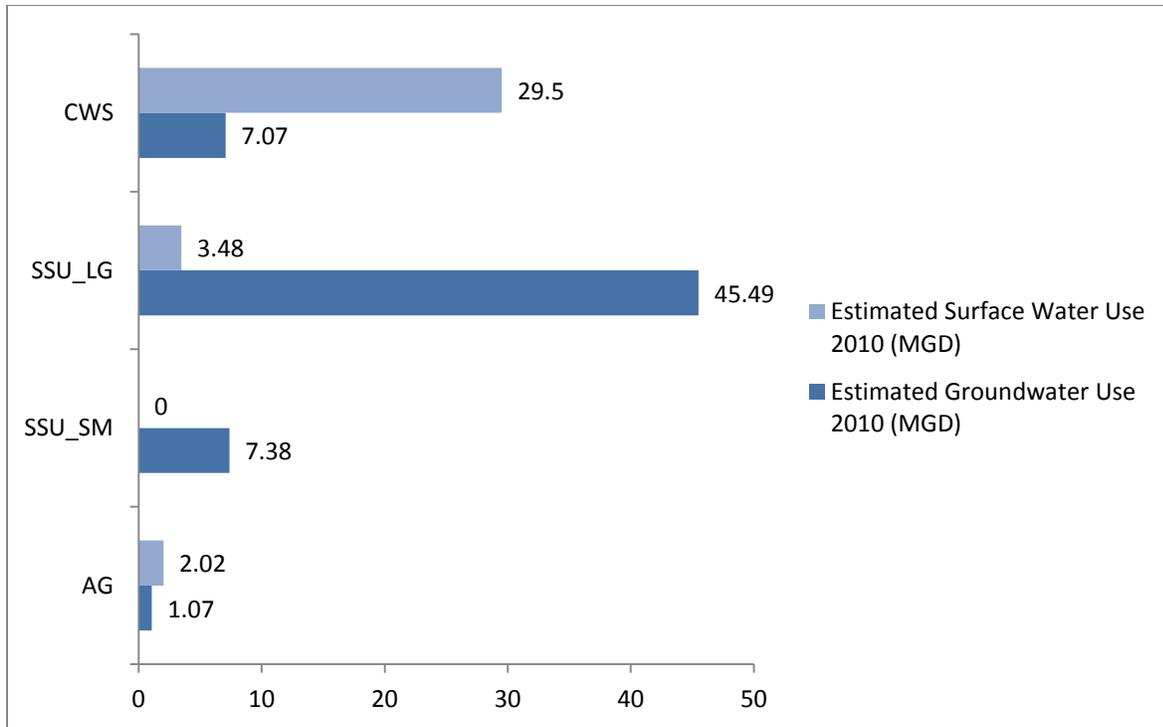
Interbasin transfers reported in the Albemarle-Chowan River Basin are found below.

User Type	Water Purchaser and System(s)	Water Provider
CWS	Chesapeake - Northwest River System	City of Norfolk
CWS	U. S. Navy - Dam Neck	City of Norfolk
CWS	U. S. Navy - Oceana	City of Norfolk
CWS	City of Virginia Beach	U. S. Army Corps of Engineers
CWS	Town of South Hill	Roanoke River Service Authority
CWS	Town of Brodnax	Roanoke River Service Authority
SSU_LG	Georgia Pacific Skippers Plant	Roanoke Rapids Sanitary District
SSU_LG	Interstate 95 Rest Area located in Greenville County	Roanoke Rapids Sanitary District

Albemarle-Chowan River Basin Interbasin Transfers

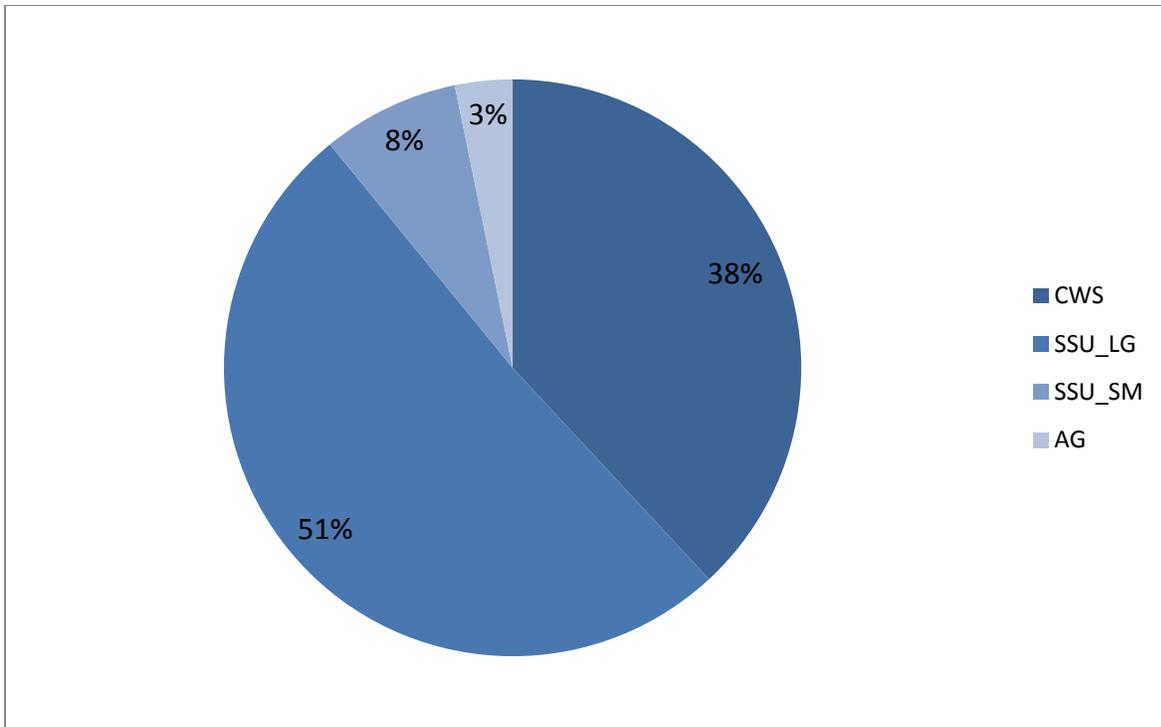
### Existing Water Use

The estimated water use provided by the regional water supply plans is summarized below. The total estimated water use is approximately 96 MGD with 35 MGD of surface water use and 61 MGD of groundwater use.



Albemarle-Chowan River Basin Estimated Use by Source and Type

Large Self-Supplied Users (SSU\_LG) use an estimated 51% of the total water used in the Basin followed by CWS (38 percent), Small Self-Supplied Users (SSU\_SM) (8%) and Agriculture (AG) (3%).

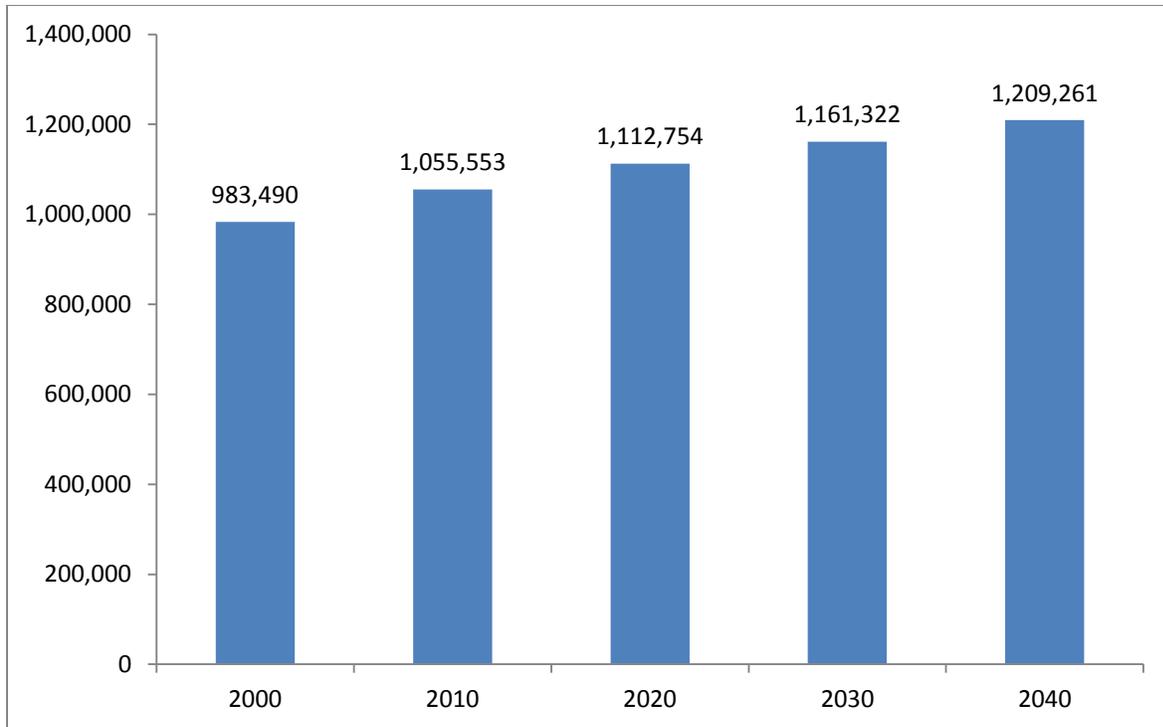


Albemarle-Chowan River Basin Percentage of 2010 Estimated Use by User Type

CWS reported their water use disaggregated into categories of use appropriate for the system. Categories commonly used included Residential, Commercial/Institutional/Light Industry (CIL), Heavy Industrial, Military, Unaccounted for Water Losses, Production Processes, and Sales to other CWS. In addition, some CWS chose to include a category for “Other” use. Many smaller CWS did not report disaggregated use as required. No assumption of disaggregated use was made for these systems; they are not included in this chart. The majority of water used by CWS is for residential supply.

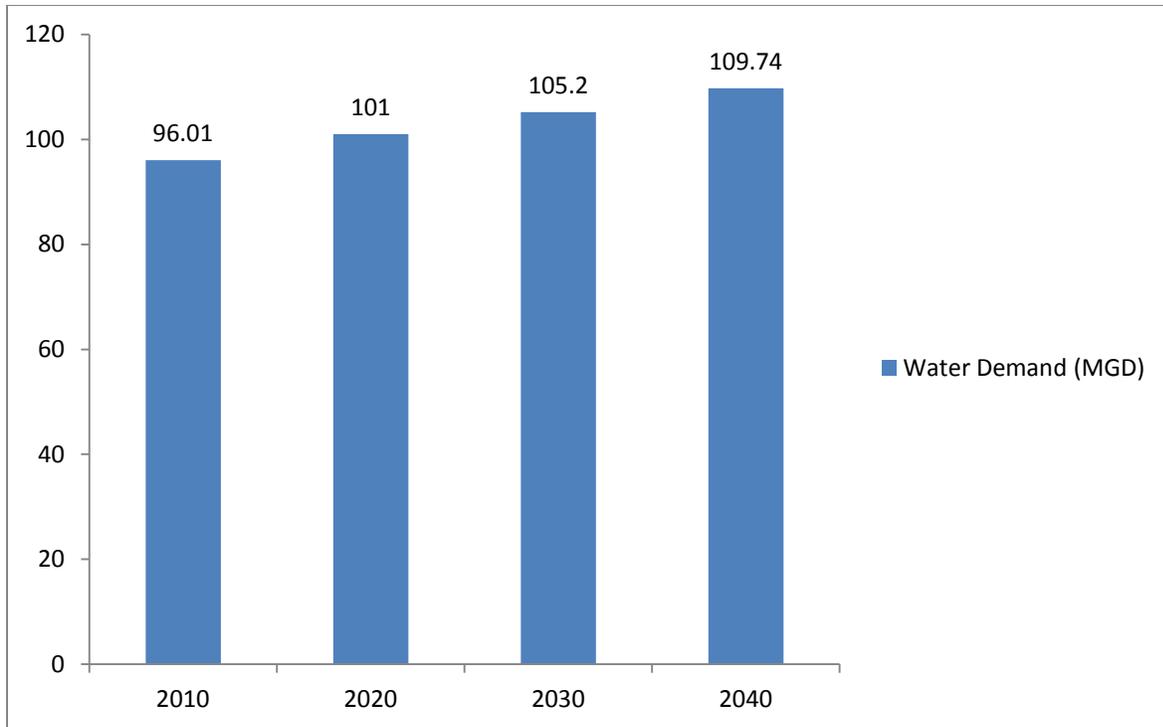
#### Projected Water Demand

The projected population of the localities with at least a portion of their land area in the Albemarle-Chowan River Basin is displayed in the figure below. Population data is obtained from the Virginia Employment Commission’s population estimates, which rely on data produced by the United States Census Bureau. The overall population of the Basin is projected to increase through the year 2040. By the year 2040 the estimated basin-wide population is projected at 1,209,261. The percent change in population from the years 2010 through 2040 is estimated at 14.6%.



Albemarle-Chowan River Basin Projected Population

A 30- to 50-year projection of future water demand is required by the WSP Regulation. Thirty years is the period of time common to all plans, so data is analyzed here for the timeframe of 2010 through 2040. The total projected water demand in the Albemarle-Chowan River Basin, as reported in the regional water supply plans, is estimated to increase from approximately 96 MGD to 110 MGD in 2040. The percent change in water use during the 30-year timeframe is estimated at 20.8%.



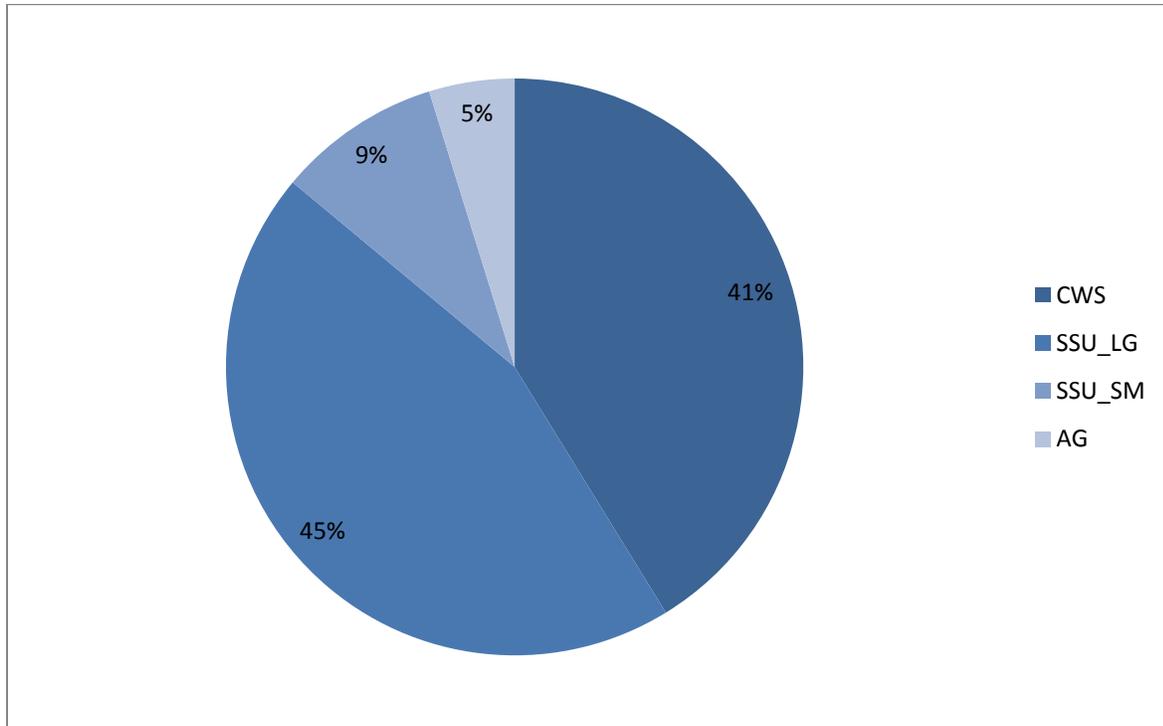
Albemarle-Chowan River Basin Projected Water Demand

As depicted in the following table, agricultural users show the largest increase (70%) in water demand over the 30-year period, followed by SSU\_SM (36.2%), CWS (30.4%) and SSU\_LG (0.5%).

User Type	Reported Use 2010 MGD	Projected Use 2020 MGD	Projected Use 2030 MGD	Projected Use 2040 MGD	Percent Change (2010-2040)
CWS	36.57	39.46	42.3	45.24	30.4%
SSU_LG	48.97	49.04	49.1	49.20	0.5%
SSU_SM	7.38	8.28	9.2	10.06	36.2%
AG	3.09	3.81	4.5	5.25	70.0%

Albemarle-Chowan River Basin Projected Water Demand by User Type (2010-2040)

The percentage of total projected 2040 demand by user type is shown in the figure below. In the year 2040 SSU\_LG demand is estimated at 45% of the total demand in the Basin followed by CWS with 41%, SSU\_SM with 9% and AG at 5%.



Albemarle-Chowan River Basin Percentage of 2040 Projected Demand by User Type

#### Statement of Need and Alternative Water Sources

The following review of future water needs and alternative water sources is obtained from the eight regional water supply plans represented in the Albemarle-Chowan River Basin. The information is presented for all those localities with at least a portion of land area located within the Albemarle-Chowan River Basin. The following lists the projected deficits in the Basin.

#### **Appomattox River Water Authority Regional Water Supply Plan**

##### Dinwiddie County and the Town of McKenney, Prince George County and the City of Petersburg

By the year 2040, the Appomattox River Water Authority (ARWA) is expected to have an average day supply deficit of 9.4 MGD. Regional peak day supply deficit of 14.6 MGD is anticipated by 2050. Peak day deficits anticipated by locality are anticipated as follows:

Dinwiddie County anticipates a peak day deficit of 0.16 MGD by 2050

Prince George County anticipates a peak day deficit of 0.9 MGD by 2020

The City of Petersburg shows a decline in future water demand.

Several alternatives are recommended for meeting this additional demand in the future: increases in current water supply allocations, new sales/purchase agreements, development of water reuse capacity, increases in water demand management and conservation efforts, and development of additional supply through new groundwater sources, raising the water level of Lake Chesdin, building a river intake on the Appomattox River, and development of a new surface water reservoir.

The Virginia Water Protection (VWP) permit reissued to the ARWA on November 1, 2013 for operation and management of Chesdin Lake and the municipal water withdrawal requires the permittee to continue investigating options and to report on progress towards procurement of future storage augmentation.

Funding was appropriated by the 2013 General Assembly for expanding capacity at Lake Chesdin. The ARWA is currently investigating increasing raw water supply through a seasonal increase of 18 inches in the water level of Lake Chesdin.

### **Charlotte County Regional Water Supply Plan**

Charlotte County the Towns of Charlotte Court House, Drakes Branch, Keysville and Phenix

The regional plan provided 'upper level' and 'lower level' population and water demand projections. Using the upper level demand projections for community water systems found in the water supply plan, future deficits in water supply are anticipated in the four towns as follows:

Town of Drakes Branch: deficit of 0.153 MGD by 2020

Town of Phenix: deficit of 0.0002 MGD by 2010

Town of Charlotte Court House: deficit of 0.008 MGD by 2020

Town of Keysville: deficit of 0.207 MGD by 2050

Several alternatives are recommended for meeting this additional demand in the future: clarification of the safe yield for Keysville Reservoir; development of additional groundwater supply in the towns of Drakes Branch, Charlotte Court House, and Phenix; development of a water treatment plan at the Drakes Branch Lake; and system interconnection of Charlotte Court House with either Drakes Branch or Keysville, and system interconnection of Drakes Branch with Keysville.

### **Greensville-Sussex-Emporia Regional Water Supply Plan**

Greensville County and the Town of Jarratt, Sussex County and the Towns of Stony Creek, Wakefield and Waverly; City of Emporia

The communities of Skippers, Jackson-field Home, Stony Creek, Northeast, and Wakefield have ample water supply for projected demands. The communities of Waverly, Birch Island, Greensville/Jarratt and Emporia may not meet peak demands in the planning period. Greensville County has concerns of the water source for the Greensville/Jarratt area, which is obtained from a Georgia-Pacific (G-P) owned intake, due to physical limitations of the existing withdrawal canal. The County proposes improvements to Greensville County Water Service Authority's (GCWSA) raw water supply system to create a stable and reliable system that will allow them to safely add customers to their water system to support growth in

the County. The County informed DEQ during a meeting on October 22, 2013, that they are continuing negotiations with G-P regarding the intake in spite of receiving notification that G-P is closing the Jarratt Plant. It is still their intention that the water needs currently being met by the existing G-P intake, for both public water supply and potentially a new industrial user, be met through the new, County-owned, intake on the Nottoway River and construction of a pumped storage reservoir system. The GCWSA is seeking a VWP permit for this project (JPA No. 13-0957). The GCWSA also plans to deepen/refurbish groundwater wells and dredge/refurbish the Emporia Reservoir if the storage capacity is reduced to 500 acre feet.

#### **Hampton Roads Regional Water Supply Plan**

Isle of Wight County and the Towns of Smithfield and Windsor; Southampton County and the Towns of Boykins, Branchville, Capron, Courtland, Ivor, and Newsoms; Surry County and the Towns of Claremont, Dendron, and Surry; Cities of Chesapeake, Franklin, Suffolk, and Virginia Beach

Demand is expected to increase as population in the region continues to grow; however, projected supply is anticipated to meet projected demand for the region through 2050.

#### **Lake Country Regional Water Supply Plan**

Brunswick County and the Towns of Alberta, Brodnax and Lawrenceville; Mecklenburg County and the Towns of Boydton, Chase City, Clarksville, La Crosse, and South Hill

Total population for the planning area is projected to increase only slightly during the planning period. Regional water supply is plentiful, and it is estimated that there are adequate water sources to provide for the needs of the planning area now and in the foreseeable future; however, competition for water from fast growing metropolitan areas in neighboring North Carolina and Tidewater Virginia was cited in the Plan as a potential threat to water quantity.

#### **Lunenburg County and the Towns of Kenbridge and Victoria Regional Water Supply Plan**

A slight increase in regional population is anticipated from 13,146 in 2000 to 13,551 in 2040. Land use within the region is not predicted to change substantially. The water supply plan indicates that existing water sources are adequate to meet current and projected demand.

#### **Nottoway Water Supply Plan**

Nottoway County and the Towns of Blackstone, Burkeville and Crewe, and the Fort Pickett Military Reservation

The planning region expects current sources will meet projected demands through 2050.

### Prince Edward County and the Town of Farmville Regional Water Supply Plan

Prince Edward County anticipates future growth in their northern sector and the Farmville CWS service area. 2060 high-range projected average daily demands (2.7 MGD) in Farmville are not anticipated to exceed the safe yield at the Appomattox River intake (3.04 MGD) or the VDH permitted capacity (3.0 MGD). However, the plan notes that during low-flow or drought conditions, additional source water may be needed. Plans to address the projected shortfall of municipal supply include developing a water intake structure and water treatment facility near the Sandy River Reservoir, extending existing waterlines, and expansion of groundwater wells, along with new and continuing water conservation efforts.

Locality	Estimated Year of Deficit	Estimated Deficit Amount (MGD)
Town of Drakes Branch	2020	0.153
Town of Phenix	2010	0.0002
Town of Charlotte Court House	2020	0.008
Town of Keysville	2050	0.207
Dinwiddie County	2050	0.16
Prince George County	2020	0.9

Albemarle-Chowan River Basin Projected Water Deficits