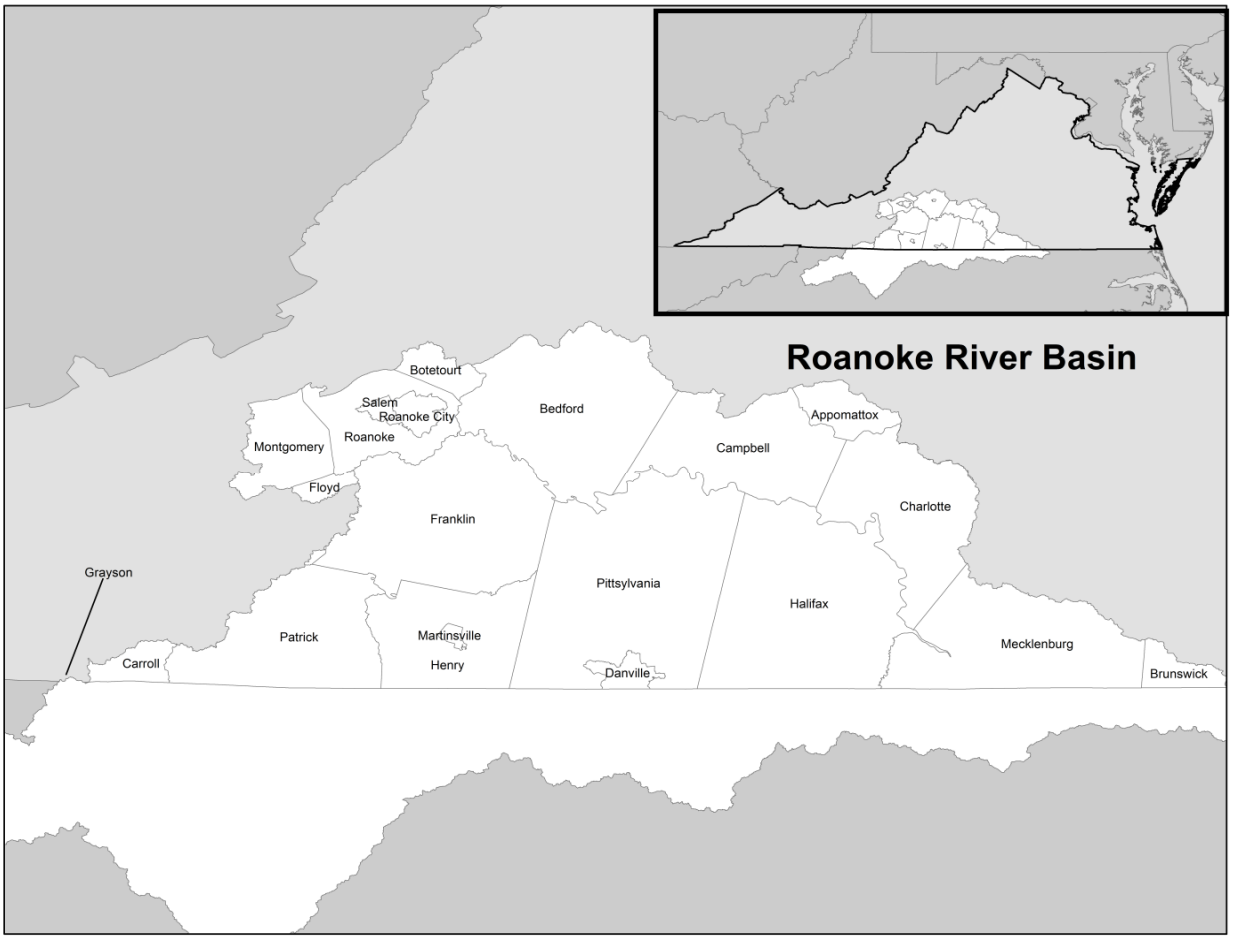
Roanoke River Basin Summary

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 the State Plan Appendices.

The Roanoke River Basin covers 6,393 square miles, or approximately 15% of the Commonwealth's total area. The basin is bordered by the James River Basin on the north, the Albemarle-Chowan River Basin to the east, and the New River Basin to the west. The southern boundary of the Basin is the Virginia/North Carolina state line. The Roanoke River headwaters begin in the Blue Ridge Mountains in eastern Montgomery County. Once through the City of Roanoke, the river generally flows east-southeast to the Virginia state line, exiting the Commonwealth near the Mecklenburg-Brunswick County line. The river travels southeast across North Carolina and enters the Albemarle Sound. In Virginia, the Roanoke River is often referred to as the Staunton River, particularly below Leesville Lake.

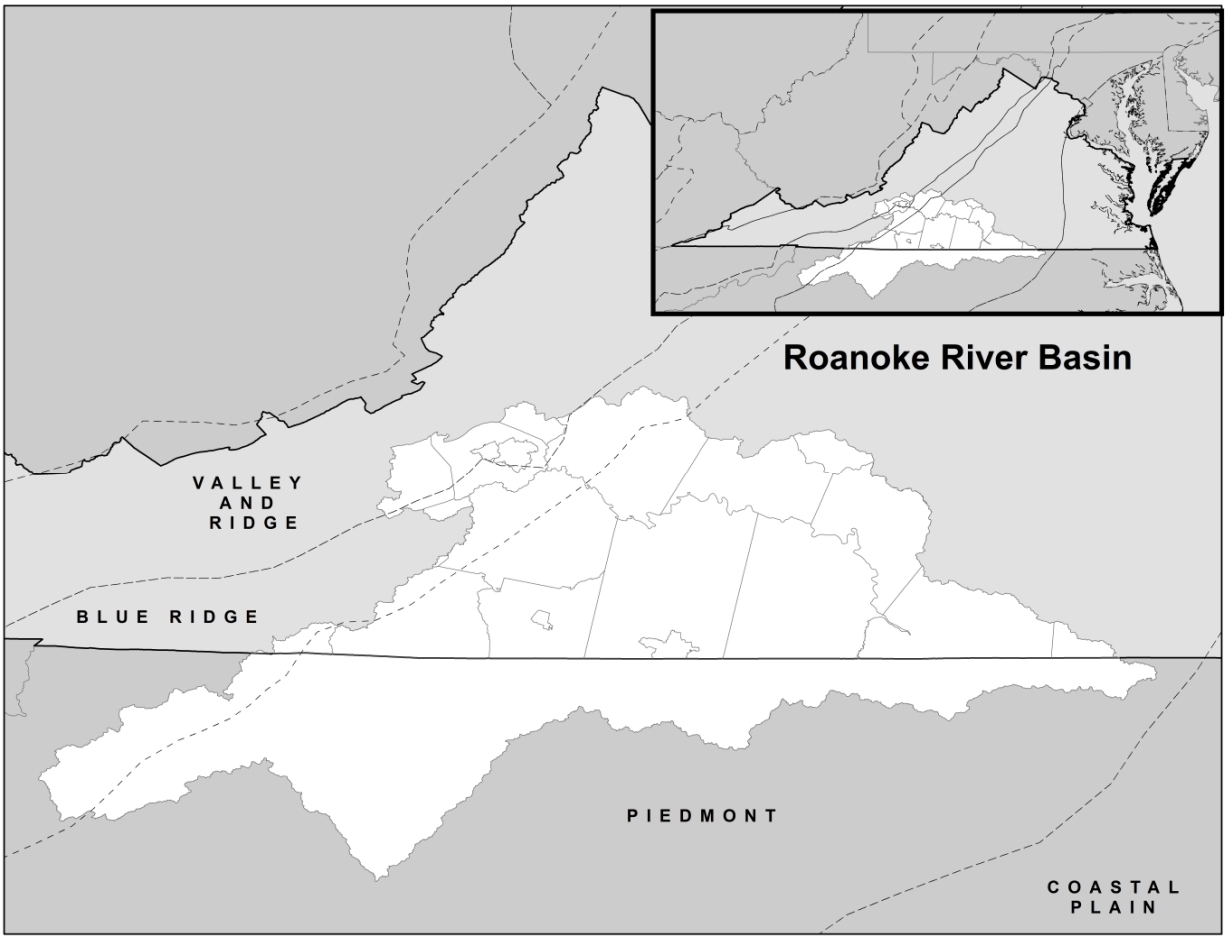
In addition to the Roanoke itself, the Basin also contains the Yadkin River sub-basin. The Yadkin River forms in North Carolina and is the northernmost part of the Pee Dee River drainage. The Pee Dee River flows south entering the Atlantic Ocean near Georgetown, South Carolina.

The following seventeen counties and four cities are entirely or partially located within the Basin: Counties of Appomattox, Bedford, Botetourt, Brunswick, Campbell, Carroll, Charlotte, Floyd, Franklin, Grayson, Halifax, Henry, Mecklenburg, Montgomery, Patrick, Pittsylvania, and Roanoke; Cities of Danville, Martinsville, Roanoke, and Salem. These jurisdictions are represented within eight regional water supply plans: Lake Country, Charlotte/Town, Halifax/Towns, Region 2000, Roanoke Valley, New River Valley, West Piedmont, and Southwest Virginia.



Roanoke River Basin Localities

Three physiographic provinces are represented in the Basin, the Valley and Ridge Province to the northwest and the Blue Ridge and Piedmont Provinces to the southeast. The topography of the Basin ranges from broad valleys and linear ridges in the Valley and Ridge Province followed by the moderate to steep slopes in the Blue Ridge and ending in the gently sloping terrain east of the mountains in the Piedmont Province.



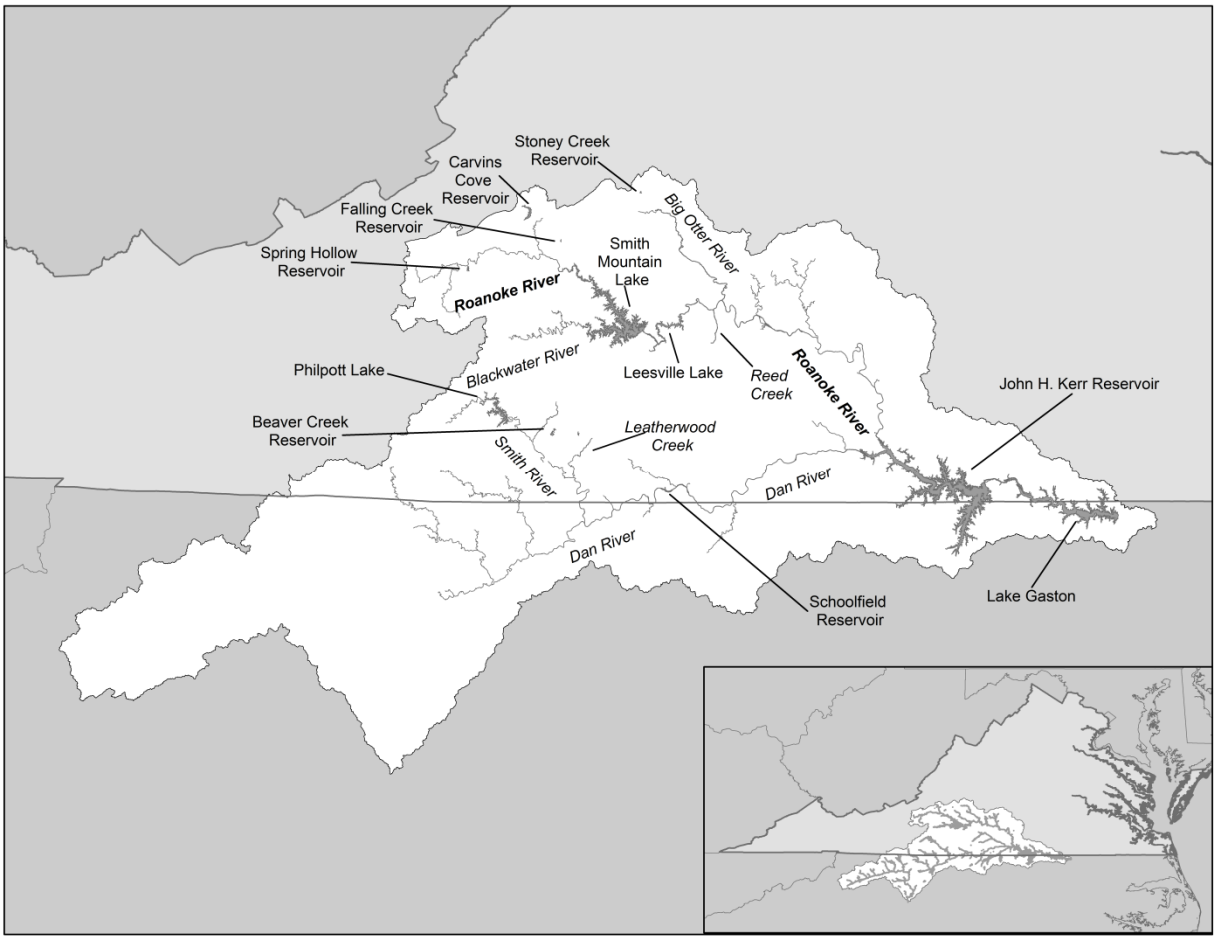
Roanoke River Basin Physiographic Provinces

Over 62% of the Roanoke River Basin is forested, while nearly 25% is in cropland and pasture. Approximately 10% is considered urban. The remainder is streams, lakes, ponds, wetlands, small barren/mixed uses, or quarries. The Roanoke River Basin is divided into seven USGS hydrologic unit codes (HUC) as follows: HUC 03010101 Upper Roanoke; HUC 03010102 Middle Roanoke; HUC 03010103 Upper Dan; HUC 03010104 Lower Dan; HUC 03010105 Banister; HUC 03010106 Roanoke Rapids and HUC 03040101 Upper Yadkin. The seven hydrologic units are further divided into 87 waterbodies or watersheds and 202 sixth order sub-watersheds.

Existing Water Sources

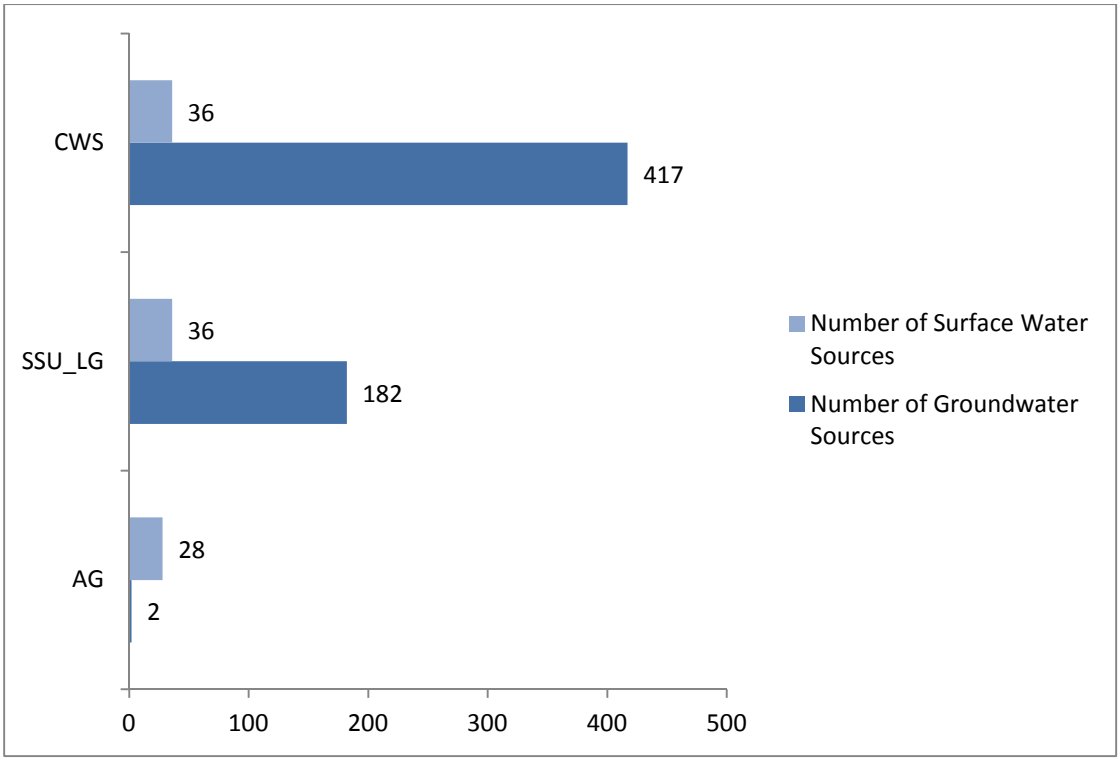
Water sources utilized in the Basin include stream intakes, reservoirs, springs, and groundwater wells. Surface water sources (reservoirs, streams, and springs) account for 100 withdrawals; additionally there are 601 groundwater withdrawals currently identified in the Roanoke River Basin. Large source water reservoirs used include Smith Mountain Lake and Leesville Lake to the north and John H. Kerr Reservoir (known locally in Virginia as Buggs Island Lake), and Lake Gaston located along the North Carolina state

line. These reservoirs range in size from the 33,300 acre Kerr Reservoir to the 2,600-acre Leesville Lake. Smaller reservoir sources used include Falling Creek Reservoir, Beaverdam Reservoir, Beaver Creek Reservoir, Carvins Cove Reservoir, Spring Hollow Reservoir, Keysville Reservoir, Georges Creek Reservoir, Stoney Creek Reservoir, Phelps Creek Reservoir, Schoolfield Reservoir, Hale Creek Reservoir, and Philpott Reservoir. Stream intakes and spring sources used in the Basin include the Dan River, Roanoke River, Big Otter River, Blackwater River, South Mayo River, Smith River; Reed Creek, Cherrystone Creek, Rutledge Creek, Sycamore Creek, Leatherwood Creek, Little Beaver Creek; Boones Mill Spring, and Crystal Springs.



Roanoke River Basin Major Reservoir and Stream Sources

Groundwater wells provide source water for most of the community water systems in the Basin. Groundwater sources outnumber surface water withdrawals in all use types except agriculture. 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 345,880 people in the Basin use private groundwater wells for residential water supply.



Roanoke River Basin Source Type by User Type

Nontraditional water sources, such as water reclamation and reuse, desalination, and interconnection are used by two localities in the basin. The Bedford Regional Water Authority is permitted to generate and distribute up to 2.0 MGD of reclaimed water and Halifax County Service Authority is permitted to generate and distribute up to 4.0 MGD of reclaimed water. The water is currently provided to non-municipal facilities for use in cooling and boiler feed.

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.

In the Roanoke River Basin, intrabasin transfers primarily exist between municipal CWS. The following lists the reported intrabasin transfers between water providers and the entities to which they sell water (water purchaser).

User Type	Water Purchaser and System(s)	Water Provider
CWS	Botetourt County: Cloverdale/Vista Park	Town of Troutville
CWS	Bedford County RWA: Stewartsville Consecutive	Western Virginia Water Authority
CWS	Town of Boydton	Roanoke River Service Authority
CWS	Franklin County: Forest Hills	Blackwater River (Town of Rocky Mount)
CWS	Henry County PSA: Edgewood Village, Woodland Avenue	City of Martinsville
CWS	Henry County PSA: Sandy Level	City of Eden, North Carolina
CWS	Town of Hurt	Town of Altavista
CWS	Town of La Crosse	Roanoke River Service Authority
CWS	Pittsylvania County SA: Greenwood Drive, Route 58 West	Henry County PSA
CWS	Pittsylvania County SA: Grit	Town of Hurt
CWS	Pittsylvania County SA: Mount Cross Road, Mount Hermon, Ringgold Industrial Park, Route 29 North, Route 360	City of Danville
CWS	Pittsylvania County SA: Route 40 West Gretna Road	Town of Gretna
CWS	Pittsylvania County SA: Tightsqueeze	Town of Chatham
CWS	Western Virginia Water Authority: Andrew Lewis Place	City of Salem
SSU_LG	Goodyear-Danville Plant	City of Danville

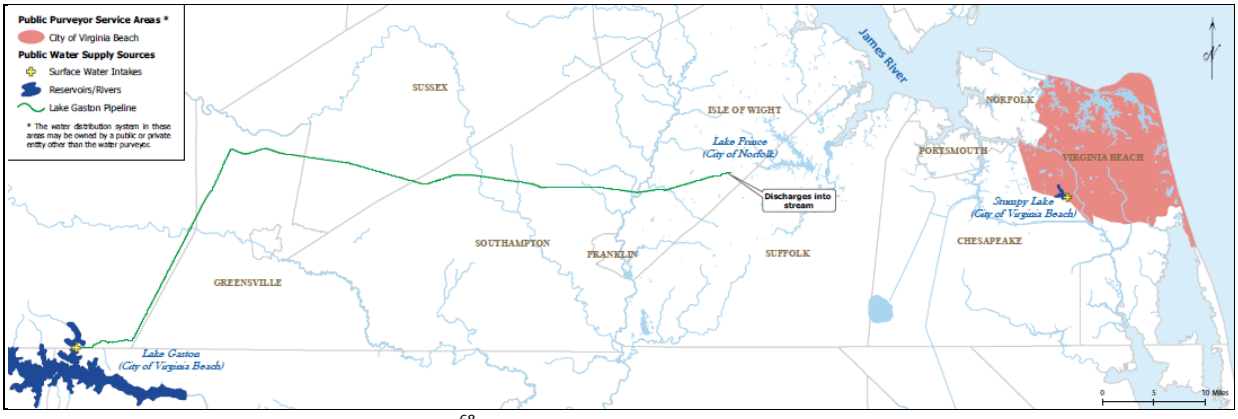
Roanoke River Basin Intrabasin Transfers

Interbasin transfers exist in the Roanoke River Basin with Roanoke water being sold to supply CWS and SSU_LG in other basins.

User Type	Water Purchaser and System(s)	Water Provider
CWS	City of Virginia Beach	U. S. Army Corps of Engineers
CWS	City of Chesapeake - Northwest River System	City of Norfolk
CWS	US Navy-Dam Neck	City of Norfolk
CWS	US Navy-Oceana	City of Norfolk
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 Greensville County	Roanoke Rapids Sanitary District

Roanoke River Basin Interbasin Transfers

Since 1998, the City of Virginia Beach has pumped fresh water from an intake on Lake Gaston in Brunswick County to Lake Prince located in Isle of Wight County's portion of the James River Basin. Lake Prince is owned by the City of Norfolk and Lake Gaston is owned by the U.S. Army Corps of Engineers (USACE). Water is purchased by Virginia Beach from the USACE.

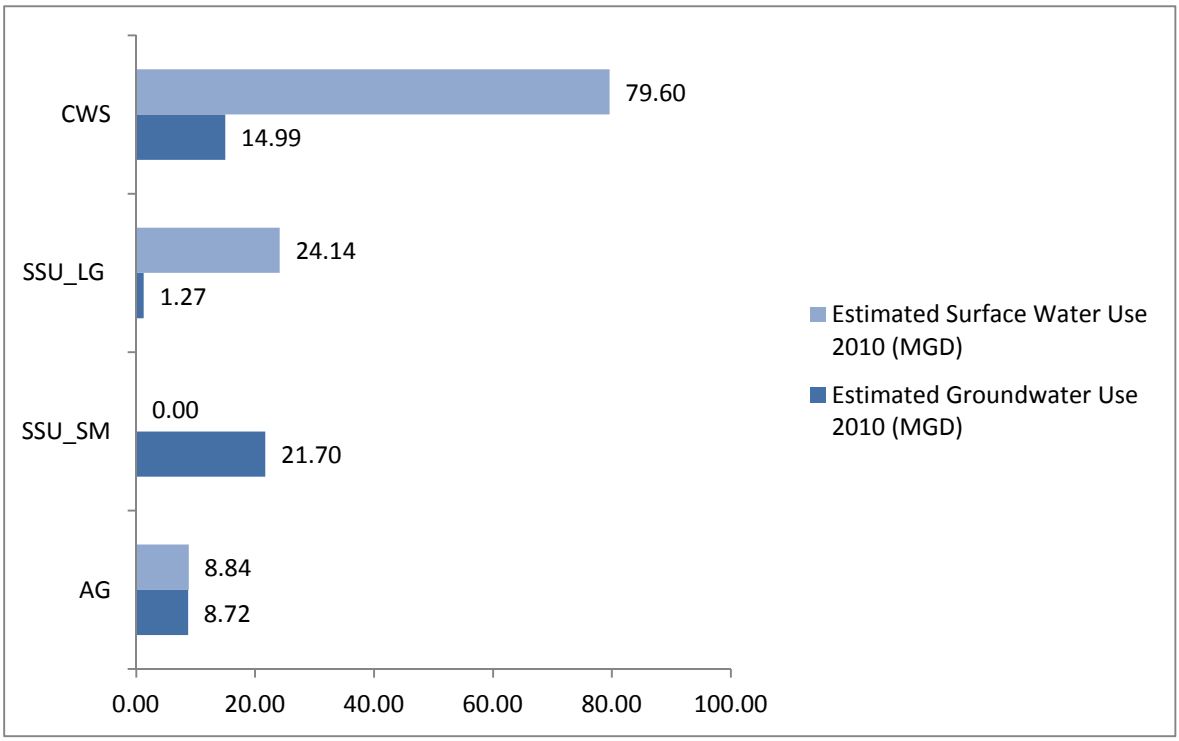


City of Virginia Beach Sources and Service Area[68]

[68] Hampton Roads Planning District Commission: Hampton Roads Regional Water Supply Plan

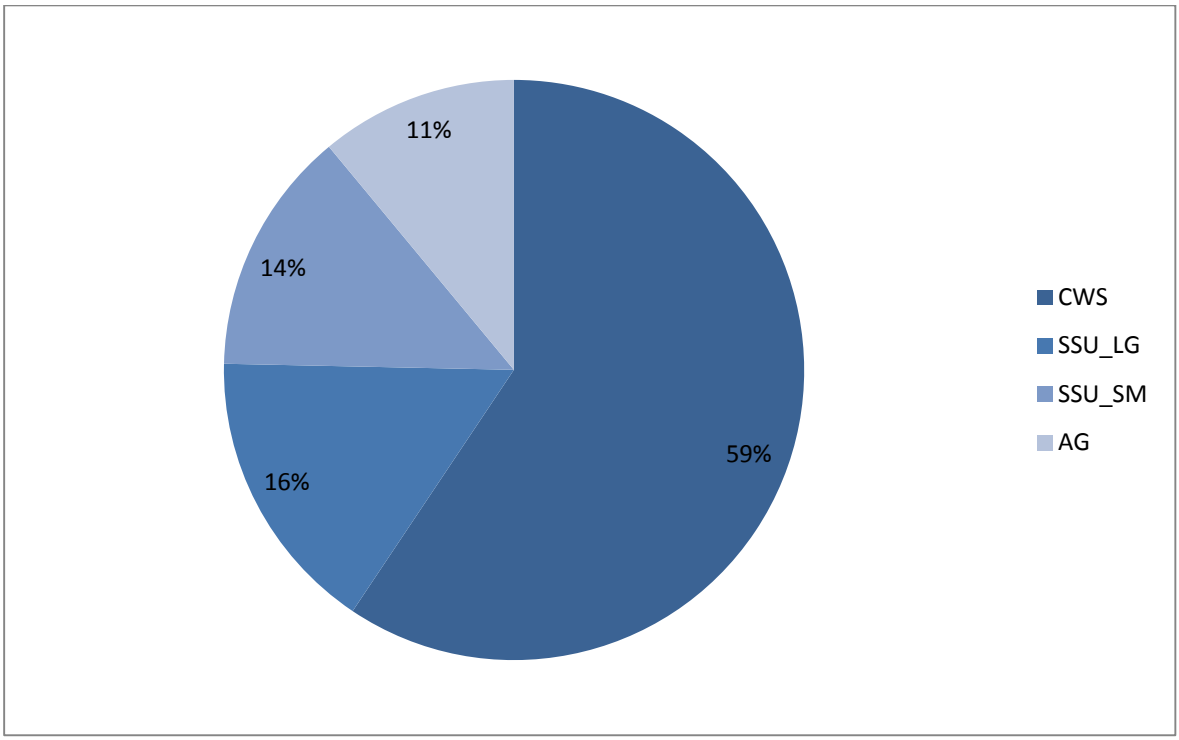
Existing Water Use

The total estimated water use provided in the regional water supply plans is summarized in the figure below. The total estimated water use is approximately 159 MGD, with 112 MGD of surface water use and 47 MGD of groundwater use. Although the number of groundwater withdrawals far exceeds the number of surface water withdrawals in the Roanoke River Basin, the estimated amount of use from surface water exceeds that from groundwater.



Roanoke River Basin Estimated Use by Source and Type

CWS use an estimated 59% of the total water in the Basin followed by SSU_LG (16%), SSU_SM (14%) and AG (11%).

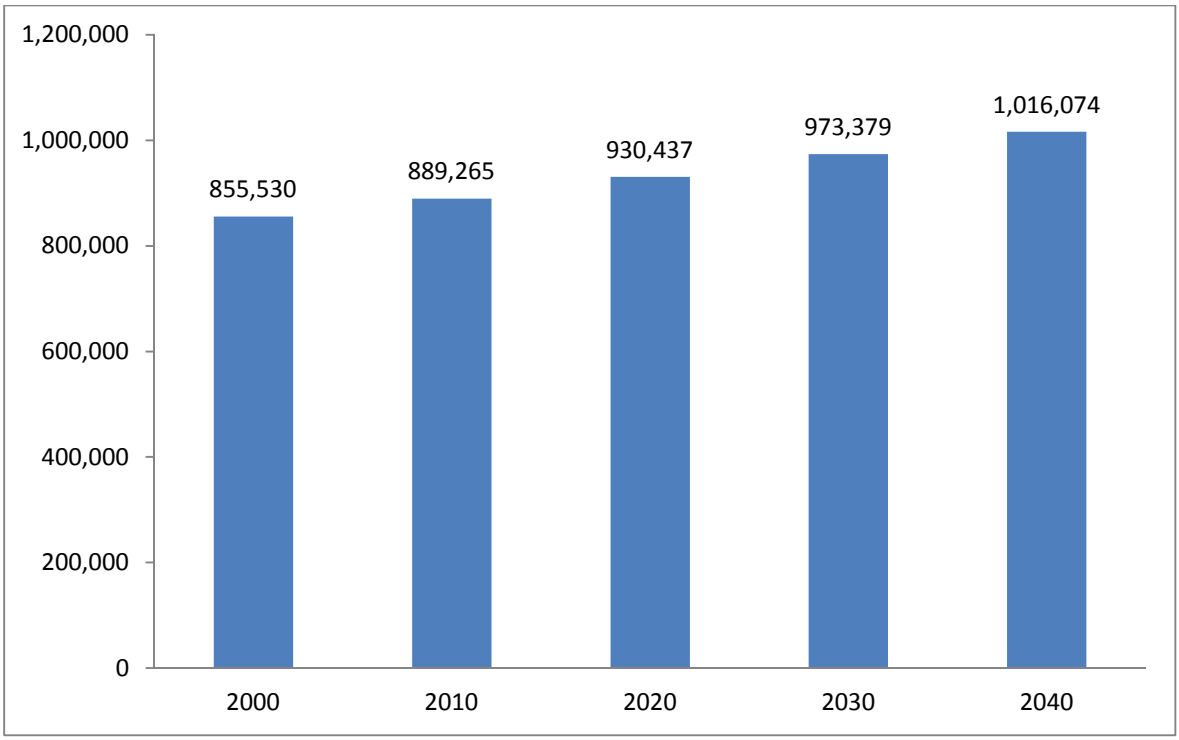


Roanoke River Basin Percentage of 2010 Estimated Use by User Type

CWS reported their water use disaggregated into categories of use appropriate for the system. Categories commonly used included Residential, Commercial, Institutional, and Light Industrial (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 on 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.

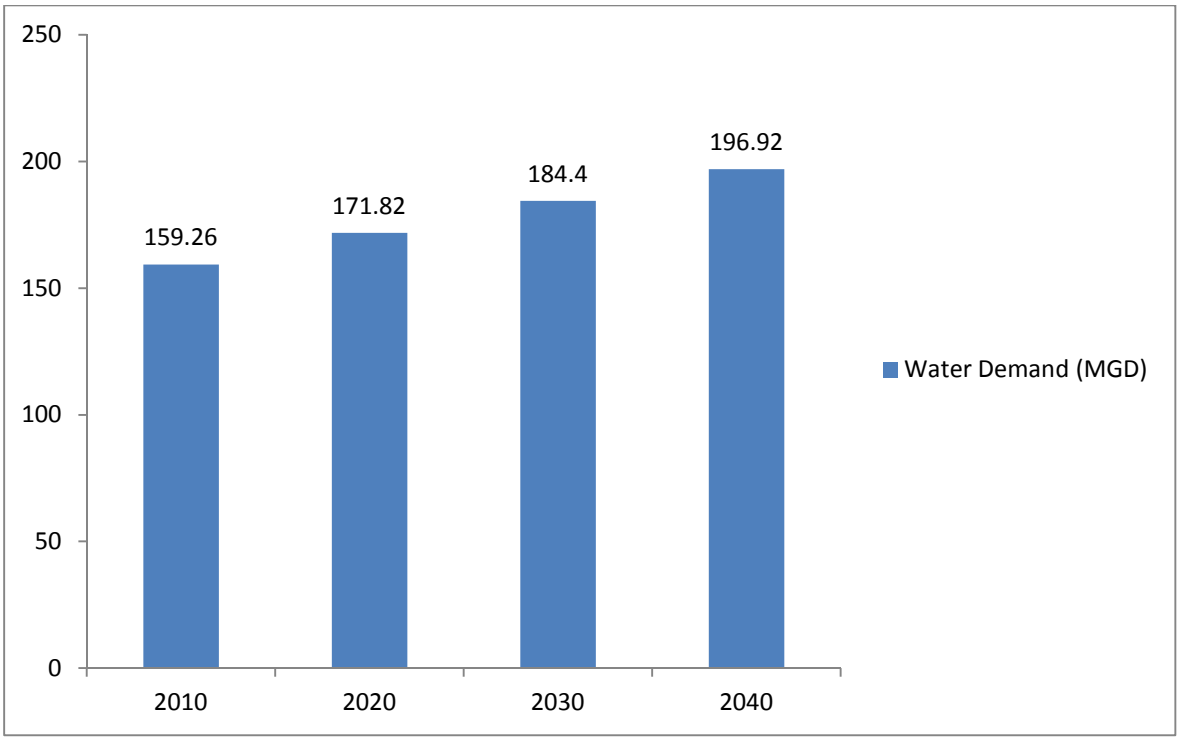
Projected Water Demand

The projected population of the localities with at least a portion of their area in the Roanoke 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 is projected to increase through the year 2040. By the year 2040 the estimated basin-wide population is projected at 1,016,074. The percent change in population from the years 2000 through 2040 is estimated at 14.3%.



Roanoke 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 Roanoke River Basin, as reported in the regional water supply plans, is estimated to increase from approximately 159 MGD in 2010 to 197 MGD in 2040. The percent change in water use during the 30-year timeframe is estimated at 23.5%.



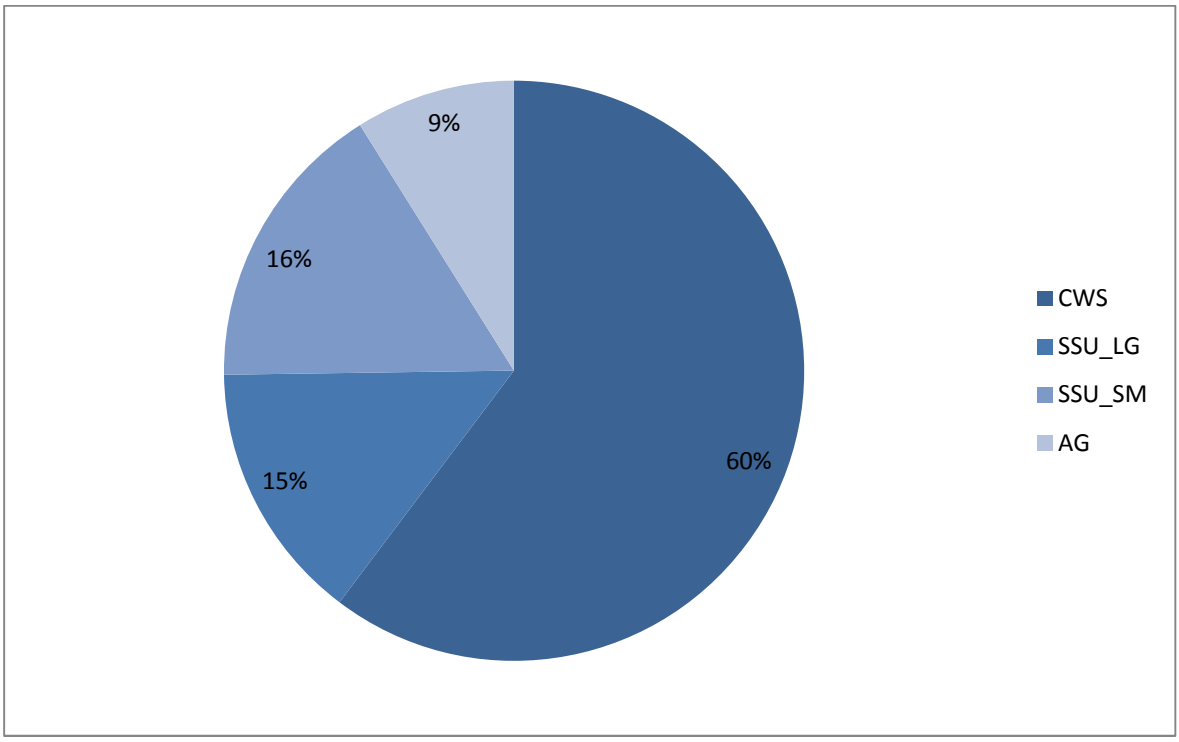
Roanoke River Basin Projected Water Demand

As depicted in the table below, SSU_SM show the largest percent change (47.9%) in water demand over the 30 year period. From this data, it appears the majority of population growth in the Basin may occur outside the CWS service areas. Projected water demand for CWS has the next highest percentage growth (25.3%) followed by SSU_LG (12.3%). The AG use in the Roanoke River Basin remains unchanged over the planning period as detailed in the regional water supply plans. The steady state of AG use is a best guess on the part of the planning entities, as the withdrawal data is limited and water use on an annual basis, in particular for crop irrigation, may change depending on precipitation.

User Type	Reported Use 2010 MGD	Projected Use 2020 MGD	Projected Use 2030 MGD	Projected Use 2040 MGD	Percent Change (2010-2040)
CWS	94.58	102.63	110.7	118.72	25.3%
SSU_LG	25.41	26.46	27.5	28.55	12.3%
SSU_SM	21.70	25.17	28.6	32.10	47.9%
AG	17.56	17.56	17.56	17.56	-0.0%

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

The percentage by user type of total projected 2040 demand is shown in the following figure. In 2040 CWS demand is estimated at 60% of the total demand in the Roanoke River Basin followed by SSU_SM (16%), SSU_LG (15%), and AG (9%).



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

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.

Halifax County Regional Water Supply Plan

Halifax County and the Towns of Halifax, South Boston, Scottsburg, and Virgilina

The Halifax County Service Authority CWS anticipates reaching 80% of its VDH permitted capacity (2.4 MGD) for a three-month period at the Leigh Street Water Treatment Plant on the Dan River around 2035. A deficit of 0.035 MGD may occur by the year 2050 based on the VDH permitted capacity. The Halifax County Service Authority plans to address the 2035 capacity issue by requesting an increase in the permitted withdrawal amount on the Dan River.

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.

New River Valley Regional Water Supply Plan

Floyd County and Montgomery County

As a region, there is generally no deficit during the planning period. Some systems are already exploring options to increase system capacity. Alternatives considered include the installation of pressure reducing valves and the interconnection of systems with the City of Radford across the planning area. Floyd County desires to increase educational efforts and develop additional well(s). Montgomery County mentions joining the Blacksburg-Christiansburg-VPI Water Authority as a possible alternative in the future.

Region 2000 Regional Water Supply Plan

Appomattox County and the Towns of Appomattox and Pamplin City; Campbell County and the Towns of Altavista and Brookneal; Bedford County and the Town of Bedford (Bedford County participated in two regional water supply plans, Region 2000 and the Roanoke Valley-Alleghany Regional Commission).

As stated in the plan, in a planning area as diverse as Region 2000, the ability to meet water demands may vary from one municipality to another. This may be due to population centers or system limitations. Because of these complexities, water supply is adequate for a portion of the planning area through the planning period of 2060. However, deficits are anticipated in the following community water system supplies.

- Bedford Regional Water Authority: deficit of 0.004 MGD by 2015, based on the VDH permitted capacity of 0.79 MGD plus the 1.4 MGD purchase from the City of Lynchburg.
- Campbell County Utility and Service Authority: deficit of 0.03 MGD by 2057, based on the VDH permitted capacity of 4.4 MGD, if future water sales are factored into the projections.
- Town of Altavista: deficit of 0.003 MGD by 2052, based on the VDH permitted capacity of 3.0 MGD.
- Town of Appomattox: deficit of 0.0004 MGD by 2051, based on the VDH permitted capacity of 0.33 MGD.

Alternatives described for Bedford County include the Lakes Regional Water Treatment Plant on Smith Mountain Lake and increased purchase from the City of Lynchburg. Campbell County and Town of Altavista alternatives listed in the regional plan include storage at Boxley Rock Quarry with a pump-over to Harvey Branch, a Campbell County Utility and Service Authority-Altavista intake on the Roanoke River and water purchase agreements with Lynchburg City or Bedford County. The Town of Appomattox is considering development of new groundwater wells or an intake on the James River as future alternatives. In addition to the alternatives listed above, the region considers the following as water supply alternatives: additional groundwater sources, reservoirs, intakes, inter-connections, reuse and recycling, and demand management.

Roanoke Valley-Alleghany Regional Commission Water Supply Plan

Bedford County and the Town of Bedford (Bedford County participated in two regional water supply plans, Roanoke Valley-Alleghany Regional Commission and Region 2000); Botetourt County and the Towns of Buchanan, Fincastle, Rocky Mount, and Troutville; Franklin County and the Towns of Boones Mill and Rocky Mount; Roanoke County; Cities of Roanoke and Salem; Town of Vinton

Current water sources are adequate to meet current and projected demand except for those supplying the following localities:

- Bedford County: deficit of 0.004 MGD by 2015
- Botetourt County: deficit of 0.09 MGD by 2020
- Franklin County: deficit of 0.03 MGD by 2020
- City of Salem: deficit of 0.11 MGD by 2046
- Town of Boones Mill: deficit of 0.002 MGD by 2018
- Town of Troutville: deficit of 0.009 MGD by 2027

Two water supply alternatives are listed as the most economical for the region: the expansion of the Smith Mountain Lake Regional Water Treatment Plan in Bedford County and a new intake on Smith Mountain Lake to supplement Western Virginia Water Authority's (WVWA) Carvins Cove reservoir system. Development of new groundwater sources is also mentioned by some of the localities with predicted water supply deficits.

Southwest Virginia Regional Water Supply Plan

Carroll County and the Town of Hillsville; Grayson County and the Towns of Fries, Independence, and Troutdale

Existing water sources are adequate to meet current and projected demands through the planning period.

West Piedmont Planning District Commission Regional Water Supply Plan

Henry County and the Town of Ridgeway; Patrick County and the Town of Stuart; Pittsylvania County and the Towns of Chatham, Gretna, and Hurt; Cities of Danville and Martinsville

Regional water supply is adequate to provide for the needs of the planning area through the planning period of 2060 except for Henry County and the Town of Gretna, as follows:

- Henry County: deficit of 0.01 MGD by 2049 based on the VDH permitted capacity
- Town of Gretna: demands may exceed reservoir safe yield by 2020

To address the deficit, Henry County Public Service Authority submitted a VWP permit application for an increased withdrawal from the Upper Smith River, under review by DEQ at the development of the plan. The Town of Gretna will likely pursue a new raw water intake on Whitethorn Creek and a pipeline to Georges Creek Reservoir.

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
Halifax County	2050	0.035
Bedford County	2015	0.004
Campbell County	2057	0.03
Town of Altavista	2052	0.003
Town of Appomattox	2051	0.0004
Henry County	2049	0.01
Town of Gretna	2020	Demands may exceed reservoir safe yield
Botetourt County	2020	0.09
Franklin County	2020	0.03
City of Salem	0.11	2046
Town of Boones Mill	2018	0.002
Town of Troutville	2027	0.009

Roanoke River Basin Projected Water Deficits