

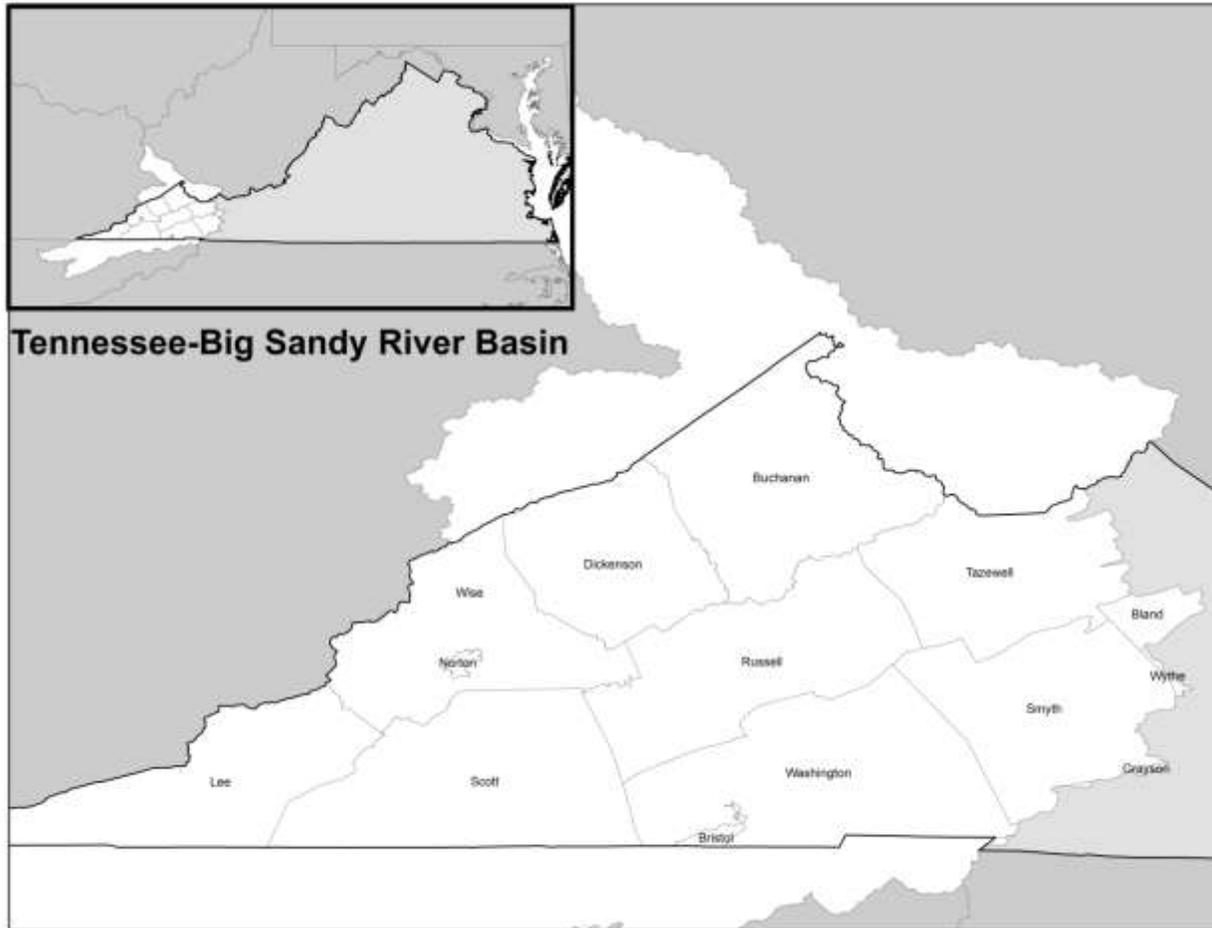
## Tennessee-Big Sandy River Basin Summary

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 Virginia portion of the Tennessee-Big Sandy River Basin is comprised of the Holston, Clinch-Powell, and Big Sandy sub-basins. These sub-basins are located in the extreme southwest portion of Virginia and cover 4,132 square miles, or approximately 10% of the Commonwealth's land area. The Basin is bordered by the West Virginia state line to the north, Kentucky to the west, and Tennessee to the south. The New River Basin makes up the eastern boundary.

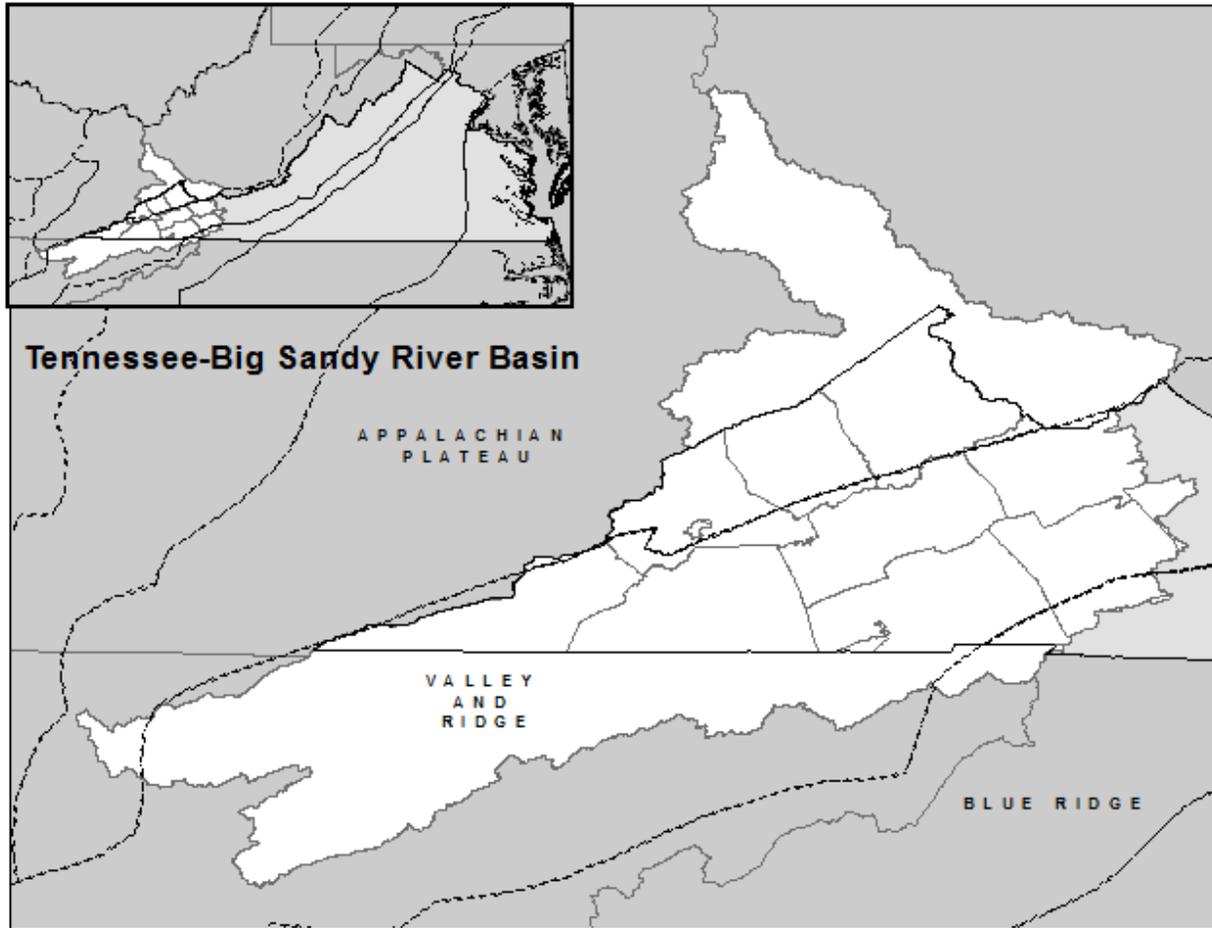
While numerous southwestern Virginia streams feed the Tennessee and Big Sandy Rivers, neither river has headwaters within the Commonwealth itself. In Virginia, the Russell, Levisa, and Tug Forks flow northward into Kentucky and combine to form the Big Sandy River. The Holston (North, Middle, and South Forks), Clinch, and Powell Rivers flow southwestward through Virginia and merge in Tennessee to form the Tennessee River. The Big Sandy and Tennessee Rivers eventually empty into the Gulf of Mexico via the Ohio and Mississippi Rivers.

The entire Virginia portion of the Tennessee-Big Sandy River Basin is contained within one water supply plan, the Southwest Virginia Regional Water Supply Plan. The following 12 counties and two cities are entirely or partially located within the Basin: Counties of Bland, Buchanan, Dickenson, Grayson, Lee, Russell, Scott, Smyth, Tazewell, Washington, Wise, and Wythe; Cities of Bristol and Norton.



Tennessee-Big Sandy River Basin Localities

Three physiographic provinces are included in the Basin: the Appalachian Plateau, Valley and Ridge, and the Blue Ridge. The Big Sandy portion of the Basin lies within the Appalachian Plateau. This province is characterized as rugged, with mountainous terrain and steep valleys. Parallel valleys and ridges running in a northeast to southwest direction characterize the Tennessee portion, lying in the Valley and Ridge Province. A small portion of the Basin, located in the Blue Ridge Province, is more like a plateau with no single, prominent ridge that characterizes the province to the southeast.



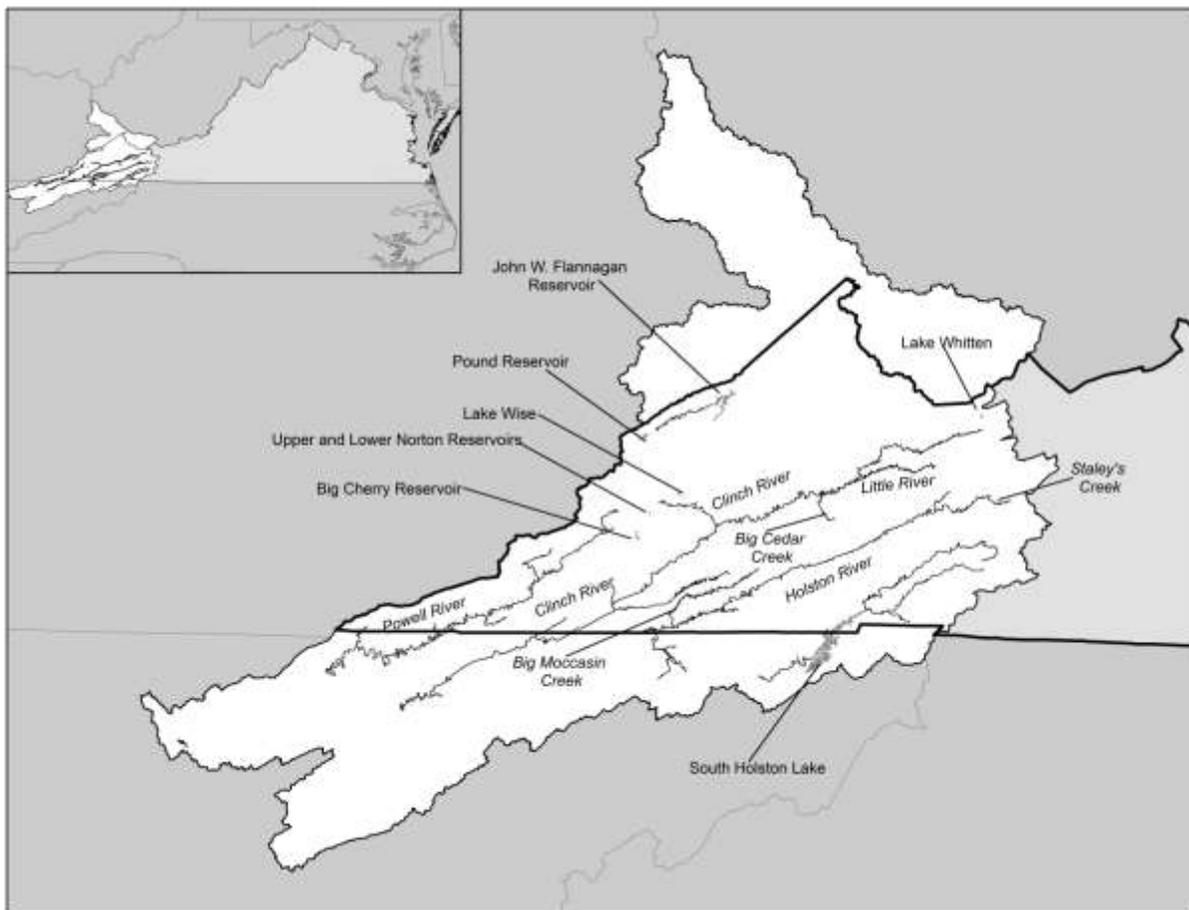
Tennessee-Big Sandy River Basin Physiographic Provinces

Within Virginia, approximately 48% of the Tennessee River sub-basin is forested, while cropland and pasture make up another 39.7%. The Big Sandy portion of the Basin is approximately 86% forest, with only about 5% in cropland and pasture. Urban areas make up only a small percentage of the total land area of the combined Tennessee-Big Sandy Basin. The Basin is divided into six USGS hydrologic units: HUC 05070201 Tug Fork; HUC 05070202 Upper Levisa; HUC 06010101 North Fork Holston; HUC 06010102 South and Middle Fork Holston; HUC 06010205 Upper Clinch; and HUC 06010206 Powell River. The six hydrologic units are further divided into 56 waterbodies or watersheds and 135 6th 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 56 withdrawals. Additionally, there are 53 groundwater withdrawals currently identified in the Tennessee-Big Sandy River Basin. Source water reservoirs used in the Basin include the John Flannagan Reservoir, Lower Banner Seam

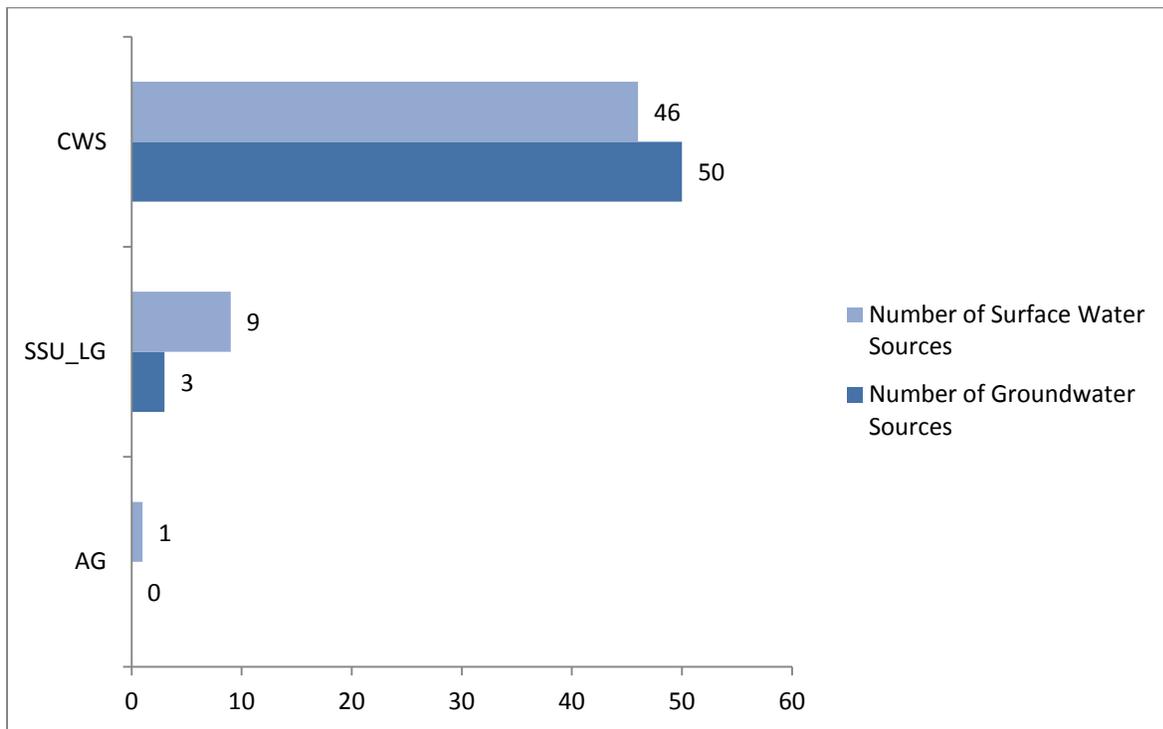
(abandoned mine), Cox Reservoir, Lake Whitten, Ben's Branch Reservoir, Big Cherry Reservoir, KVS Quarry, Pound Reservoir, Upper and Lower Reservoirs in Norton, South Holston Lake, Tom's Creek Reservoir, and Wise Reservoir. Stream intakes and spring sources used in the Basin include the Clinch River, Little River, Big Cedar Creek, Big Moccasin Creek, Staley's Creek, Powell River, Spurlock Branch, Benges Branch, Robinette Branch, Chaney Creek, Holston River, Seven Springs, White Spring, Sargent Spring, Taylor Spring, Coles Spring, Reservation Spring, Millcreek Spring, Jones Spring, Widener Spring, and Wynn Spring.



Tennessee-Big Sandy River Basin Major Reservoir and Stream Sources

The number of reported surface water withdrawals narrowly outnumbers groundwater sources. Only one individual AG user is reported in the regional plan. Agricultural water withdrawal data collected by DEQ is limited for this area of the Commonwealth. It is possible agricultural users of greater than 300,000 gallons per month are limited in the Basin, or those that exist may not currently report their water withdrawals to DEQ as required by law through the VVWR. The number of groundwater sources for the SSU\_SM use type is unknown and, therefore, is not included in the figure below. As estimated for the

year 2010, approximately 88,598 people in the Basin were reported as using private groundwater wells for residential water supply.



Tennessee-Big Sandy 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 is one non-municipal entity in the region generating reclaimed water. Primland Resort in Patrick County is permitted through DEQ to generate and distribute up to 0.087 MGD of reclaimed water. The water is currently provided to a golf course for irrigation reuse.

### Water 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 Tennessee-Big Sandy River Basin, all intrabasin transfers reported occur between municipal and private CWS. The following table lists Tennessee-Big Sandy River Basin intrabasin transfers between water providers and the CWS to which they sell water (water purchaser). Interbasin transfers were not reported in the Southwest Virginia regional water supply plan.

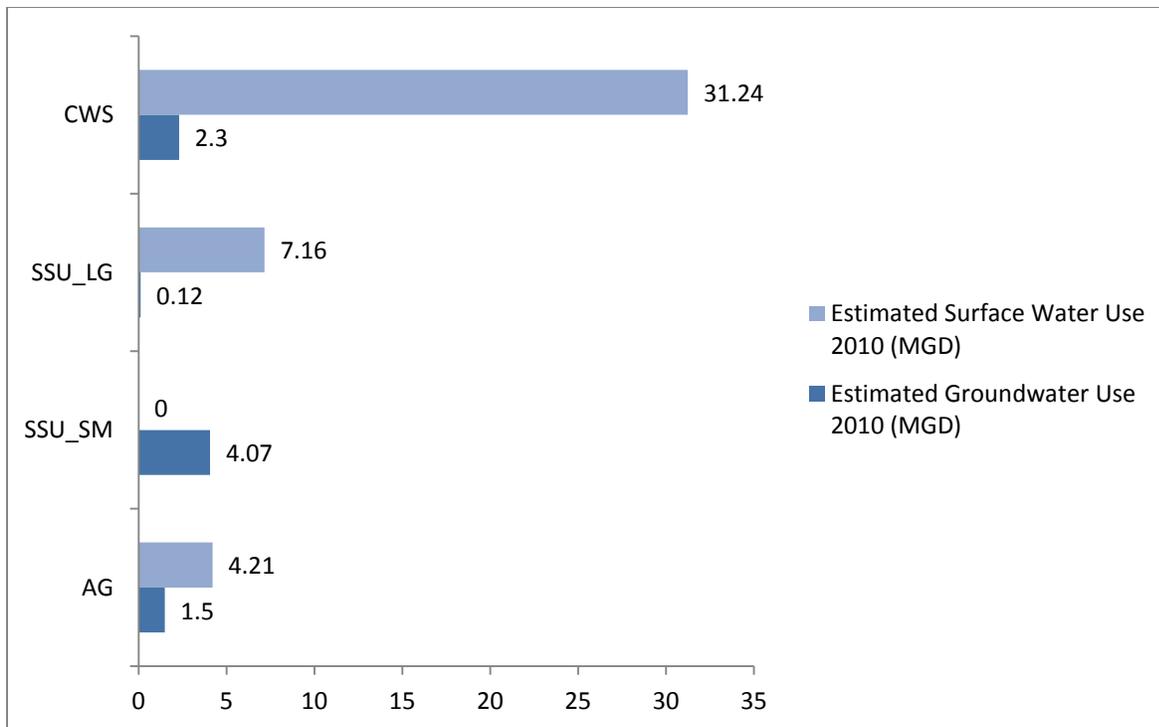
User Type	Water Purchaser and System(s)	Water Provider
CWS	Buchanan County PSA: Grassy Creek	Dickenson County PSA (Bartlick/Breaks CWS)
CWS	Town of Cedar Bluff	Town of Richlands
CWS	Town of Clintwood	John Flanagan Water Authority
CWS	Dickenson County PSA: Bartlick/Breaks, Crooked Branch, Fearls Branch, Honey Camp, Osborns Gap, Rakes Ridge, Route 80, Skeetrock, Wolf Pen Branch	No details in regional plan
CWS	Dickenson County PSA: Dickenson County Regional, Sandy Ridge	Wise County Public Service Authority
CWS	Dickenson County PSA: Doe Branch	Buchanan County PSA
CWS	Dickenson County PSA: Rush Creek	Town of Clintwood
CWS	Dryden Water Authority	Town of Pennington Gap
CWS	Lee County PSA: Eastern Lee, Jasper, Old Woodway Road	Town of Big Stone Gap
CWS	Lee County PSA: Keokee	Town of Appalachia
CWS	Lee County PSA: Lee County System	Arthur Shawanee Utility District (located in TN)
CWS	Lee County PSA: Big Hill, Miller/Smyth Chapel, Puckett and Ely Creek, Robbins Chapel	Town of Pennington Gap
CWS	Russell County PSA: Belfast/Rosedale, Swords Creek	Tazewell County PSA
CWS	Russell County WSA	Town of St. Paul
CWS	Scott County PSA: Boozy Creek, East Carters Valley	Bloomington Utility District (located in TN)
CWS	Scott County PSA: Cove Creek	Washington County SA
CWS	Scott County PSA: Daniel Boone	Town of Gate City

CWS	Smyth County SA: Atkins Extension, East Hungry Mother	Town of Marion
CWS	Smyth County SA: Poor Valley	Town of Saltville
CWS	Smyth County SA: South Fork	Thomas Bridge Water Company
CWS	Smyth County SA: St. Claires Creek, St. John's Crossing, Walker Creek	Town of Chilhowie
CWS	Smyth County SA: Walker Creek	Thomas Bridge Water Company
CWS	Spring Valley Subdivision	Bloomington Utility District (located in TN)
CWS	St. Charles Water Authority	Town of Pennington Gap
CWS	Tazewell County PSA: Baptist Valley, Eastern Tazewell, Fort Whitten, Gratton	Town of Tazewell
CWS	Tazewell County PSA: Jewell Ridge	Buchanan County PSA
CWS	Tazewell County PSA: Raven-Doran	Town of Richlands
CWS	Washington County SA: Hayter's Gap	Town of Saltville
CWS	Washington County SA: Clear Creek, Hayter's Gap, WCSA WTP	Bristol Virginia Utilities Board
CWS	Wise County PSA: Appalachia #1, Blackwood, Flatwoods, Mill Branch, Nortion #1, South Mountain, Wise #2	Towns of Pound and Wise
CWS	Woodway Water Authority	Towns of Pennington Gap and Jonesville

Tennessee-Big Sandy River Basin Intrabasin Transfers

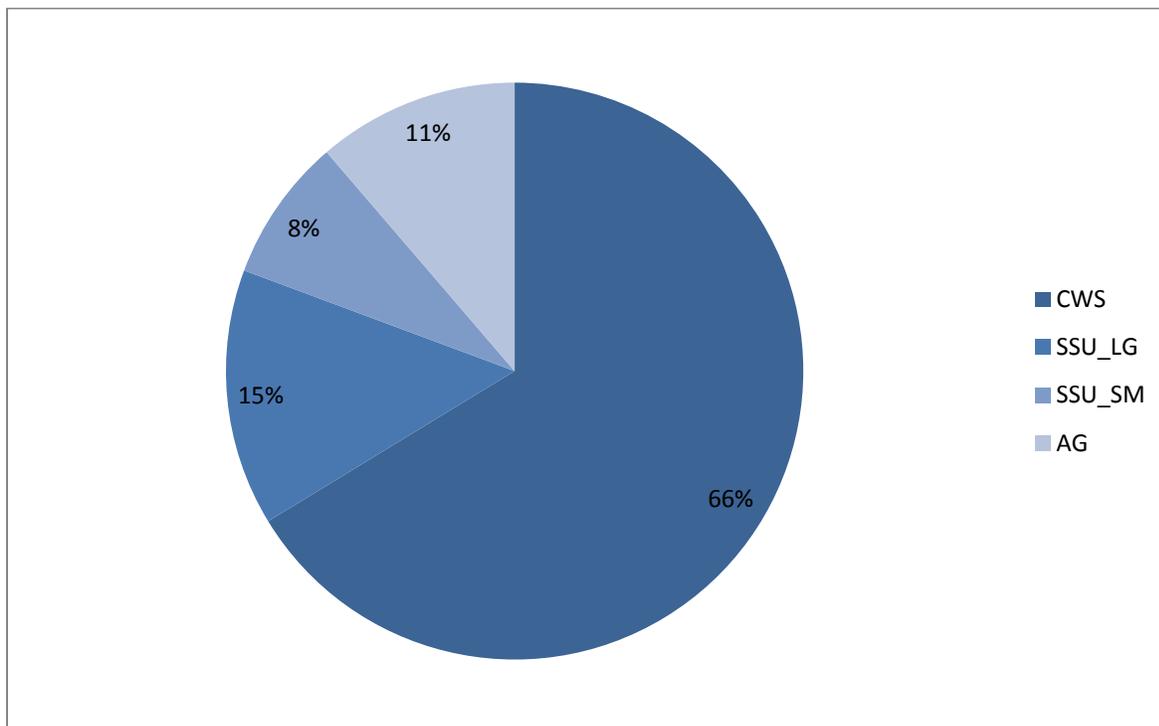
#### Existing Water Use

The estimated water use provided in the Southwest Virginia Regional Water Supply Plan is summarized in the following figure. The total estimated water use is approximately 51 million gallons per day (MGD). The estimated amount of use from surface water (43 MGD) exceeds that from groundwater (8 MGD) by a significant margin.



Tennessee-Big Sandy River Basin Estimated Use by Source and Type

CWS use an estimated 66% of the total water used in the Basin followed by SSU\_LG (15%), AG (11%), and SSU\_SM (8%).

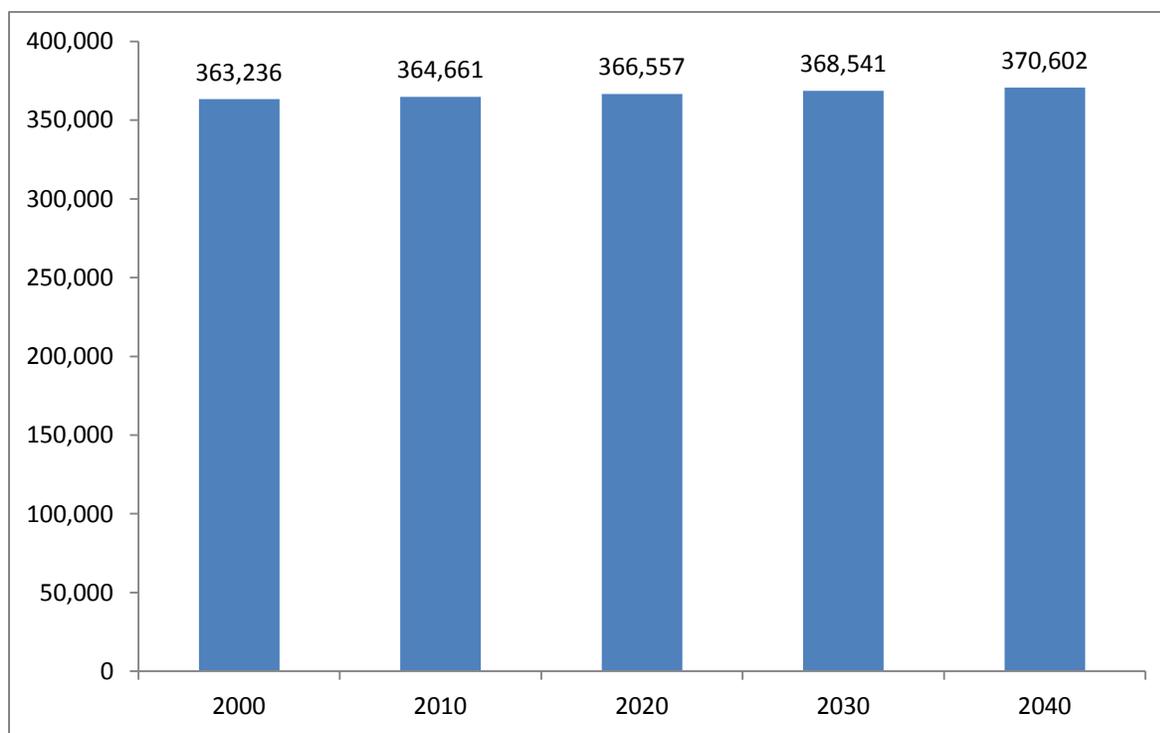


Tennessee-Big Sandy River Basin Percentage of 2010 Estimated Use by User Type

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

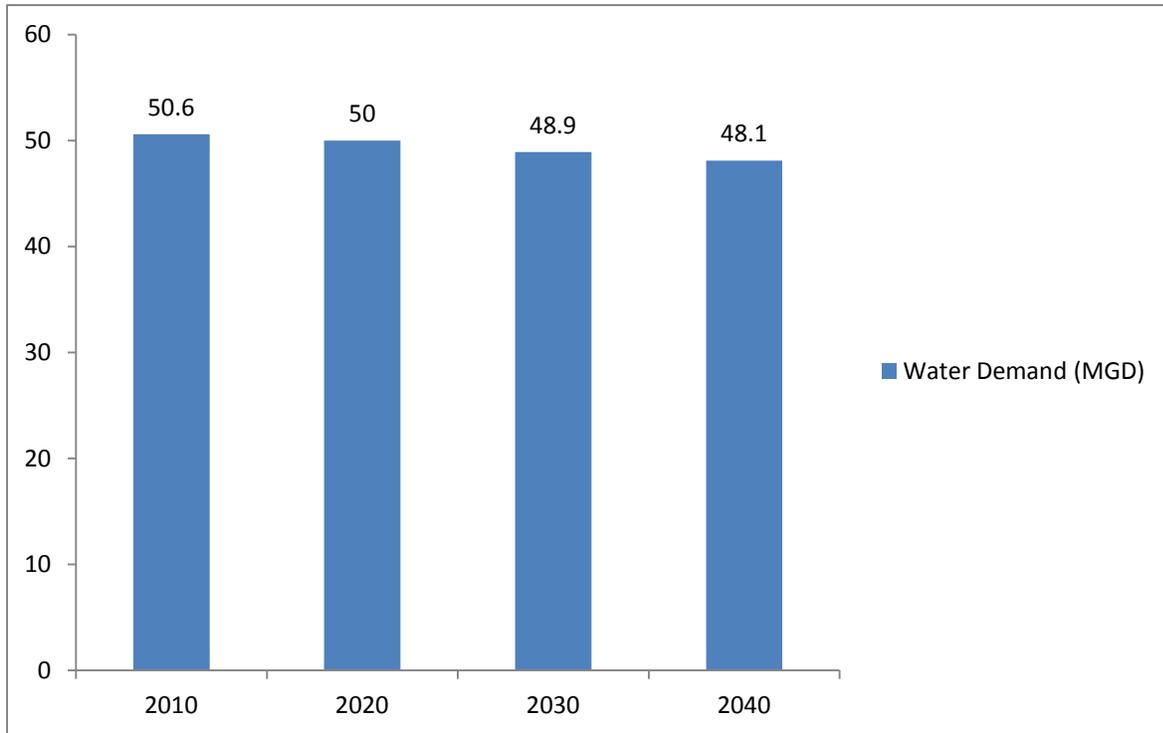
The projected population of the localities with at least a portion of their land area in the Tennessee-Big Sandy River Basin is displayed in the following figure. Population data is obtained from the Virginia Employment Commission’s population estimates which rely on data produced by the United States Census Bureau. The overall population of the Basin is projected to increase only slightly through the year 2040. By the year 2040 the estimated basin-wide population is projected at 370,602. The percent change in population from the years 2000 through 2040 is estimated at 1.6%.



Tennessee-Big Sandy River Basin Projected Population

A 30- to 50-year projection of future water demand is required by 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 for the Basin is estimated to decrease from approximately 51 MGD to

approximately 48 MGD in 2040. The percent change in water use during the 30-year timeframe is estimated at -4.9%.



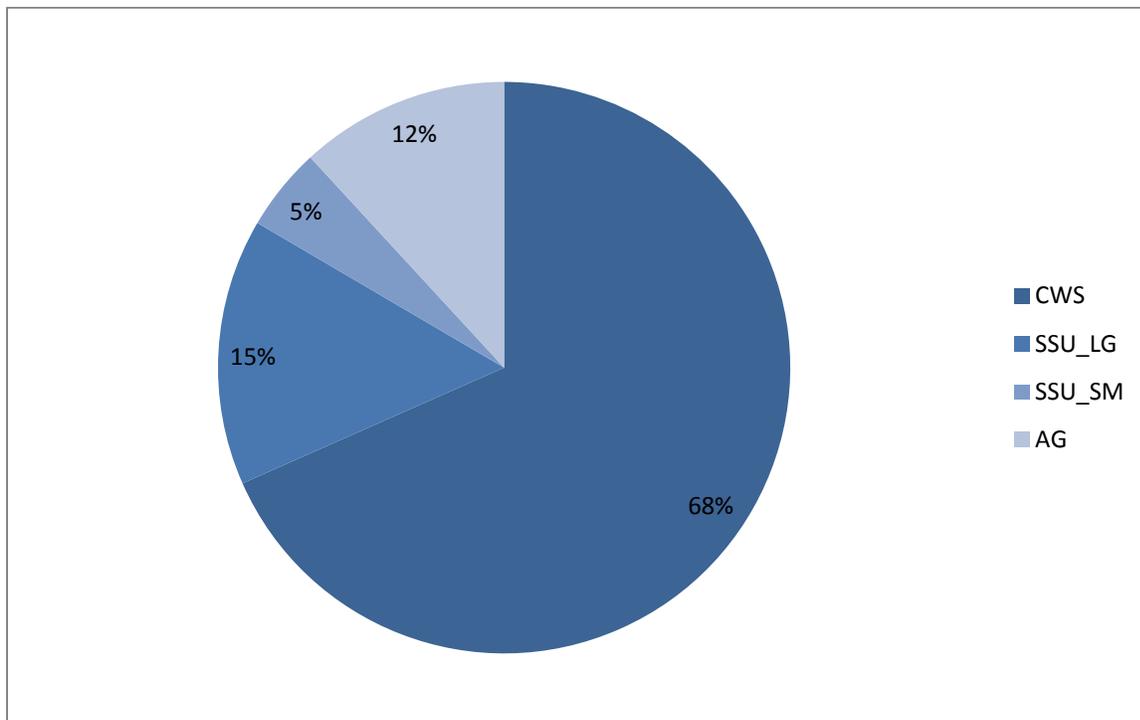
Tennessee-Big Sandy River Basin Projected Water Demand

As depicted in the following table, small self-supplied users of private groundwater wells show the largest decrease (-44.2%) in water demand over the 30 year period. Projected water demands also decrease (-2%) for CWS. The reported LG\_SSU and AG use remains unchanged over the planning period as detailed in the regional plan. The steady state of agricultural 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	33.54	33.31	33.6	32.85	-2.00%
SSU_LG	7.27	7.27	7.27	7.27	0.0%
SSU_SM	4.07	3.47	2.9	2.27	- 44.2%
AG	5.71	5.71	5.71	5.71	0.0%

Tennessee-Big Sandy River Basin Projected Water Demand by User Type (2010-2040)

The 2040 projected water demand in the Tennessee-Big Sandy River Basin by user type is similar to the estimated 2010 use by user type in that CWS are projected to use the greatest percentage of water, followed by SSU\_LG, AG, and SSU\_SM. While three user types increase in percentage over the 30-year time frame, the percentage of water use by SSU\_SM users is estimated to decrease by 3%.



Tennessee-Big Sandy 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 regional water supply plan. The information is presented for all those localities with at least a portion of land area located within the Tennessee-Big Sandy River Basin. The following lists the projected deficits in the Basin.

#### **Southwest Virginia Regional Water Supply Plan**

Lee County and the Towns of Jonesville, Pennington Gap, and St. Charles; Scott County and the Towns of Clinchport, Duffield, Dungannon, Gate City, Nickelsville, and Weber City; Wise County and the Towns of Appalachia, Big Stone Gap, Coeburn, Pound, St. Paul, and Wise; City of Norton; Dickenson County and the Towns of Clinchco, Clintwood, and Haysi; Russell County and the Towns of Cleveland, Honaker, and Lebanon; Washington County and the Towns of Abingdon, Damascus, and Glade Spring; City of Bristol; Buchanan County and the Town of Grundy; Tazewell County and the Towns of Bluefield, Cedar Bluff, Pocahontas, Richlands, and Tazewell; Smyth County and the Towns of Chilhowie, Marion, and Saltville; Bland County; Wythe County and the Towns of Rural Retreat and Wytheville; Grayson County and the Towns of Fries, Independence, and Troutdale

Current sources are adequate for the needs of all localities in the planning region except for those localities listed below.

Russell County may experience deficits in two community water systems during the planning period. The Castlewood Water and Sewage Authority community water system is projected to experience a water deficit in 2010, based on the current VDH permitted capacity. The deficit is projected to increase to approximately 0.12 MGD in 2040. Russell County's Belfast/Rosedale CWS is also projected to experience a deficit in 2040 (amount unknown) based on future waterline extensions and the current capacity of the Tazewell County Water Treatment Plant that provides water to the system.

The Town of Saltville may experience a water deficit as early as 2006 based on the current VDH permitted capacity. The deficit is projected to increase to approximately 0.68 MGD in 2060.

Washington County may experience a water deficit as early as 2006 based on the current VDH permitted capacity. The deficit is projected to increase to approximately 4.75 MGD in 2060.

The Town of Wytheville may experience a water deficit as early as 2041, based on the current VDH permitted capacity. The deficit may increase to approximately 0.85 MGD in 2060.

To address the projected shortfall of municipal supply the regional plan includes the following alternatives: maintaining, increasing, or initiating supply interconnections with neighboring localities, infrastructure upgrades, groundwater source development, increasing permitted surface water withdrawals, upgrading current VDH permitted capacities, and continuing existing water conservation policies or developing new ones.

Locality	Estimated Year of Deficit	Estimated Deficit Amount (MGD)
Russell County	2040	0.12
Town of Saltville	2060	0.68
Washington County	2060	4.75
Town of Wytheville	2060	0.85

Tennessee-Big Sandy River Basin Projected Water Deficits