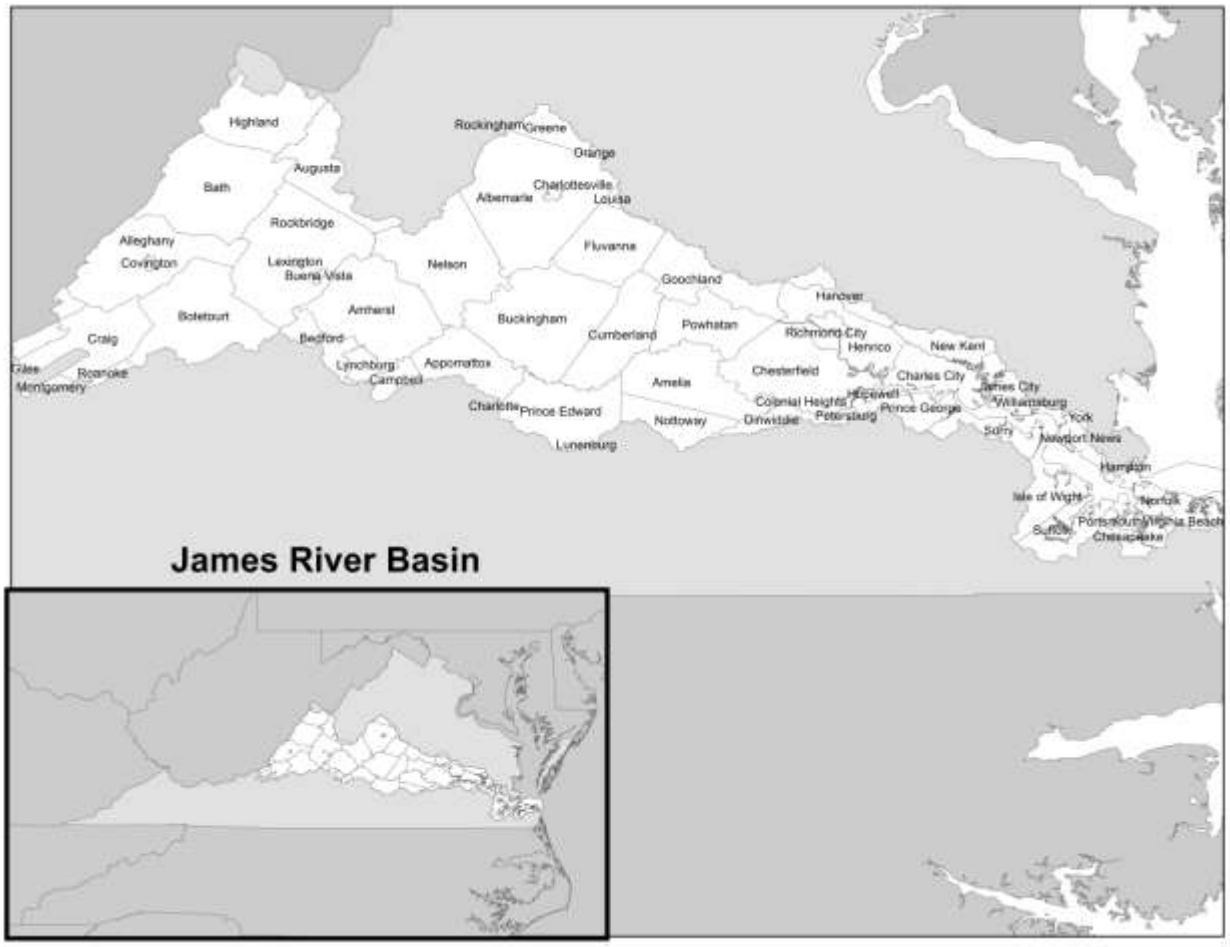
James River Basin Summary

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 James River Basin occupies the central portion of Virginia and covers 10,265 square miles, or approximately 24% of the Commonwealth's total land area. It is Virginia's largest river basin and is made up of the Upper, Middle, and Lower James River sub-basins as well as the Appomattox River sub-basin.

All or portions of the following 38 counties and 17 cities lie within the Basin: Counties: Albemarle, Alleghany, Amelia, Amherst, Appomattox, Augusta, Bath, Bedford, Botetourt, Buckingham, Campbell, Charles City, Chesterfield, Craig, Cumberland, Dinwiddie, Fluvanna, Giles, Goochland, Greene, Hanover, Henrico, Highland, Isle of Wight, James City, Louisa, Montgomery, Nelson, New Kent, Nottoway, Orange, Powhatan, Prince Edward, Prince George, Roanoke, Rockbridge, Surry, and York; Cities: Buena Vista, Charlottesville, Chesapeake, Colonial Heights, Covington, Hampton, Hopewell, Lexington, Lynchburg, Newport News, Norfolk, Petersburg, Portsmouth, Richmond, Suffolk, Williamsburg, and Virginia Beach. These jurisdictions are represented within eighteen regional water supply plans (Appomattox River Water Authority, Albemarle County/City of Charlottesville/Town of Scottsville, Craig County and Town, Fluvanna County and Town, Greene County and Town, Hampton Roads Planning District Commission, Upper James, Region 2000, Roanoke Valley-Alleghany Regional, New River Valley, Upper Shenandoah, Prince Edward County and Town, Buckingham County and Town, Louisa County and Town, Henrico/Goochland/Powhatan/Cumberland, Hanover County and Town, Nottoway County and Towns, and Orange County and Towns) and four local water supply plans (Amelia County, Charles City County, New Kent County, and the City of Richmond).

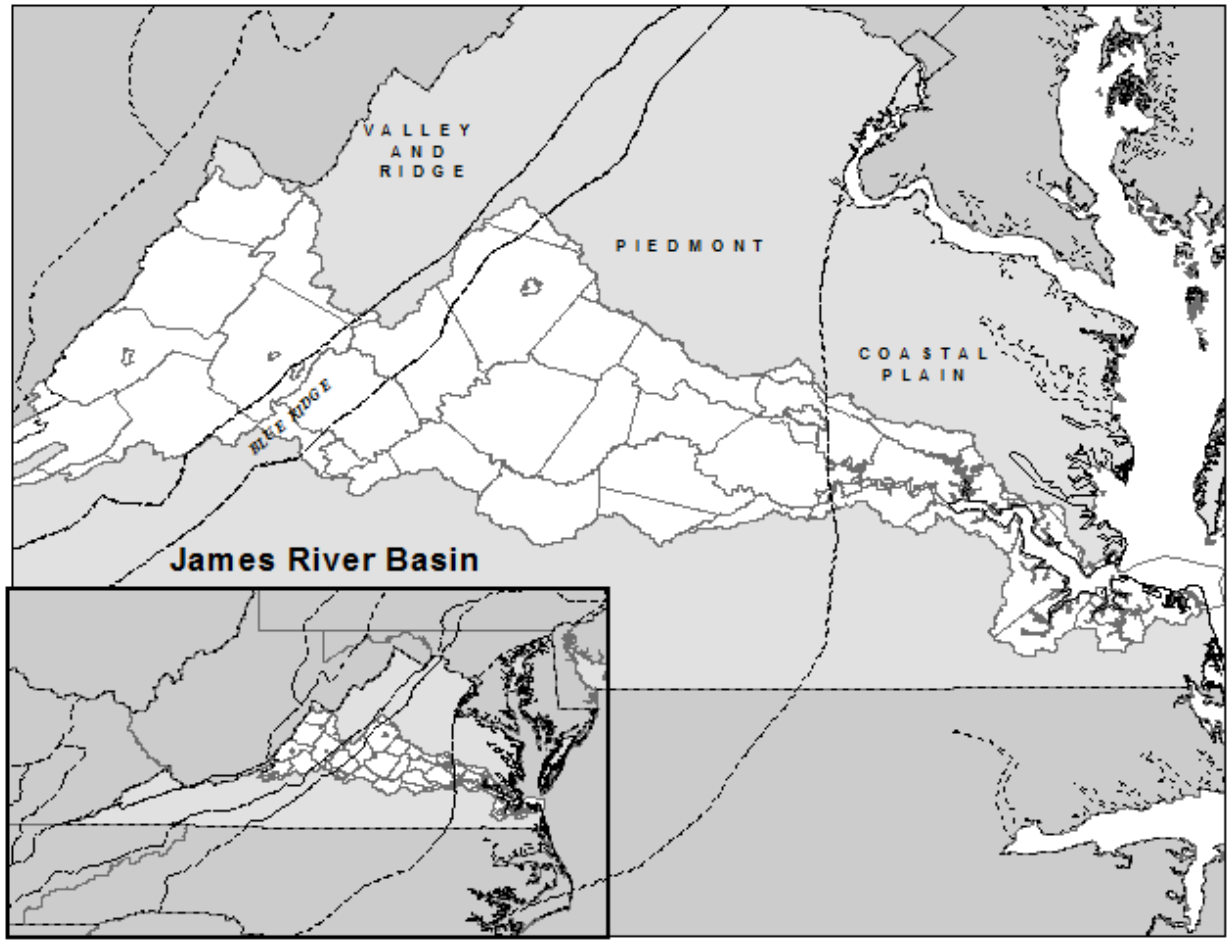


James River Basin Localities

The James River Basin is defined by both hydrologic and political boundaries. The Potomac-Shenandoah River Basin, the Rappahannock River Basin, and the York River Basin bound the Basin to the north. The southern boundary is made up of the New River Basin, the Roanoke River Basin, and the Albemarle-Chowan River Basin. Its headwaters originate along the Virginia/West Virginia state line. The James is formed by the confluence of the Jackson and Cowpasture Rivers in the Alleghany Mountains and flows 242 miles to the Fall Line at Richmond and another 106 miles where it enters the Chesapeake Bay.

The topography of the James River Basin varies throughout the four physiographic provinces that it spans. The Valley and Ridge Province extends from the Appalachian Plateau in West Virginia to the Blue Ridge Province. The Blue Ridge Province, a remnant of a former highland, differs from the Valley and Ridge Province. It is a province of rugged terrain with steep slopes and narrow ridges in the north and broad moderate slopes in the south. The Piedmont Province extends to the Fall Line and has scattered hills and small mountains, gradually turning into gently rolling slopes and lower elevation in the eastern

portion of the province. The Fall Zone separates the Coastal Plain Province from the Piedmont. The Fall Zone is a three-mile stretch of river running through Richmond where the river descends 84 feet as it flows from the resistant rocks of the Piedmont to the softer sediments of the Coastal Plain.



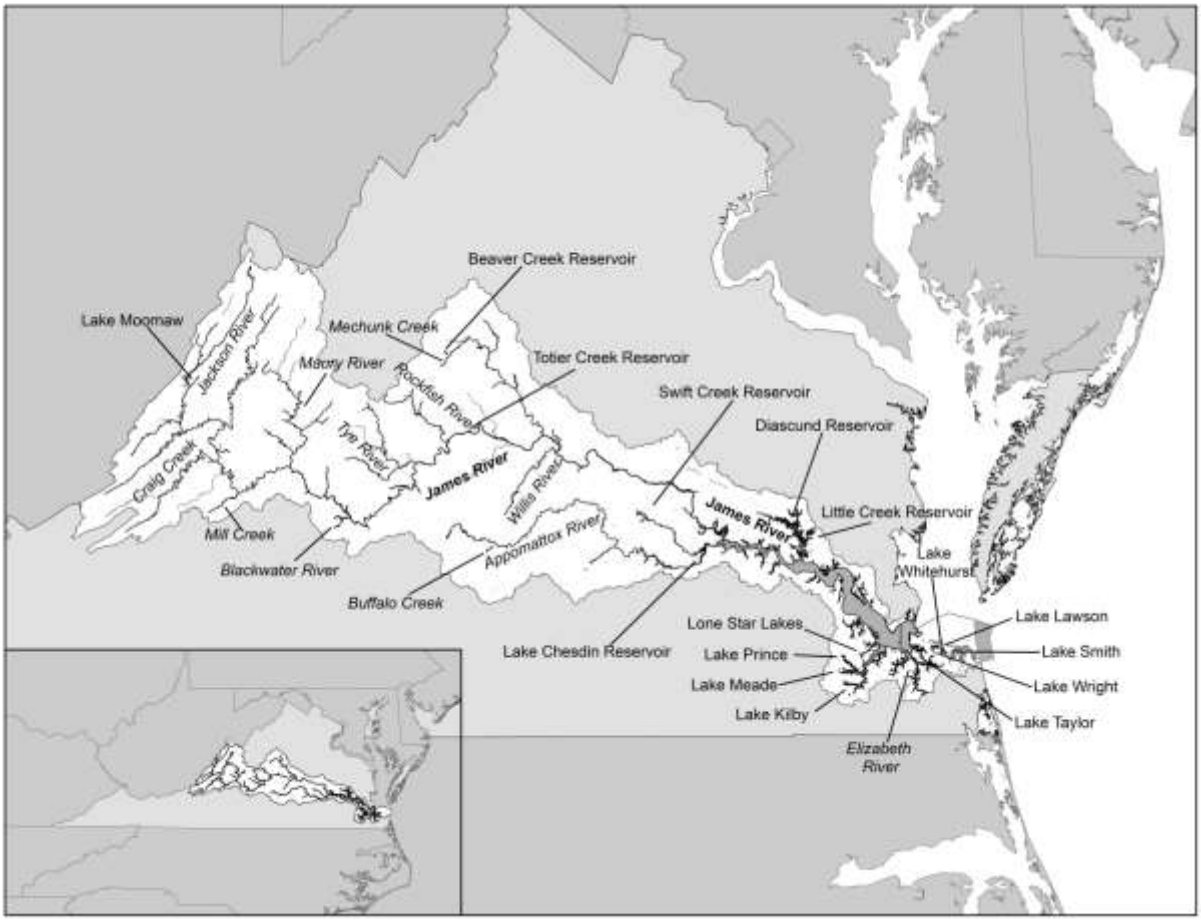
James River Basin Physiographic Provinces

Over 65% of the James River Basin is forested, with 19% in cropland and pasture. Approximately 12% is considered urban. Major tributaries to the James River are Jackson River, Cowpasture River, Craig Creek, Maury River, Tye River, Rockfish River, Slate River, Rivanna River, Willis River, Appomattox River, Chickahominy River, Pagan River, Nansemond River, and the Elizabeth River.

The James River Basin is divided into eight USGS hydrologic units as follows: HUC 02080201 –Upper James, HUC 02080202 – Maury, HUC 02080203 – Upper Middle James, HUC 02080204 – Rivanna, HUC 02080205 – Lower Middle James, HUC 02080206 – Lower James, HUC 02080207 – Appomattox, and HUC 02080208 – the Elizabeth. The eight hydrologic units are further divided into 109 waterbodies or watersheds and 298 6th order sub-watersheds.

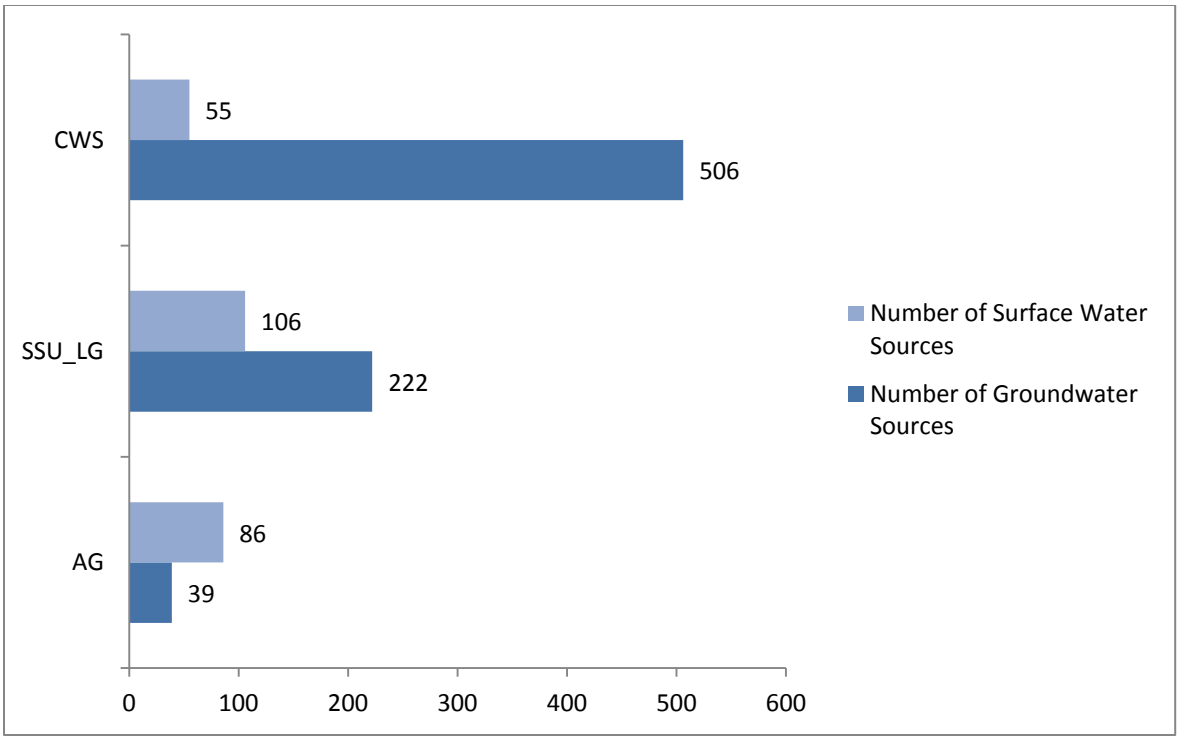
Existing Water Sources

Water sources utilized in the Basin include stream intakes, reservoirs, springs, and groundwater wells. Surface water sources (reservoirs, streams, and springs) account for 247 withdrawals. Additionally, there are 767 groundwater withdrawals currently identified in the James River Basin. Source water reservoirs used in the Basin include Beaver Creek Reservoir, Black Creek Reservoir, Diascund Reservoir, Graham Creek Reservoir, Harwood's Mill Reservoir, Judith Creek Reservoir, Lake Burnt Mills, Lake Chesdin Reservoir, Lake Cohoon, Lake Kilby, Lake Lawson, Lake Meade, Lake Monocan, Lake Prince, Lake Smith, Lake Taylor, Lake Whitehurst, Lake Wright, Lee Hall Reservoir, Little Creek Reservoir, Lone Star Lakes, Ragged Mountain Reservoir, Smith Creek Reservoir, Skiff's Creek Reservoir, South Fork Rivanna Reservoir, Sugar Hollow Reservoir, Swift Creek Reservoir, Totier Creek Reservoir, and Western Branch Reservoir. Stream intakes and spring sources used in the Basin include Allen Creek, Appomattox River, Buck Creek, Buffalo Creek, Collins Run of Chickahominy River, Craig Creek, Dillard Creek, Fighting Creek, Hat Creek, Jackson River, James River, Mill Creek, Newfound River, North Anna River, North Buckskin Creek, Paint Bank Branch, Pamunkey River, Reeds Creek, South Anna River, South Fork Rockfish River, Blackwater River, Montbello Springs, Tye River, Speights Run, Alvey Spring, Augusta Springs, Big Spring, Buffalo River, Cascades Spring, Chaplin Spring, Chickahominy River, Gladstone Springs, Hall Spring, Harris Creek, Jackson River, Johnson's Branch, Keyser-Jackson Springs, Klondike Spring, Maury River, McAllister Spring, Mechunk Creek, North Fork Rivanna River, Pounding Mill Spring, Queen Spring, Rivanna River, Smith Creek, and Stoney Creek. Ponds and lakes on private property are used for irrigation on farms and golf courses in the Basin.



James River Basin Major Reservoir and Stream Source Sources

Reported groundwater sources outnumber surface water withdrawals in all use types except agriculture. 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 591,811people in the Basin use private groundwater wells for residential water supply.



James 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 taking advantage of these options.

The City of Chesapeake treats brackish surface water at the Northwest River Reverse Osmosis Water Treatment Plant, and they use an Aquifer Storage and Recovery well for storage of treated water during peak demands. The City of Suffolk uses electrodialysis reversal desalination at their water treatment plant to treat high fluoride groundwater. New Kent County's Parham Landing Waste Water Treatment Plant is permitted to generate and distribute up to 2 MGD of reclaimed water to non-municipal facilities for bulk irrigation reuse and dust suppression and irrigation (bulk and non-bulk) use. Powhatan County's Dutoy Creek Waste Water Treatment Plant is permitted to generate and distribute up to 0.04 MGD of reclaimed water to a non-municipal facility for non-bulk irrigation reuse. Chesterfield County's Proctors Creek Waste Water Treatment Facility is permitted to discharge up to 27 MGD of reclaimed water into the James River. Additionally, they provide up to 7 MGD of effluent to a non-municipal facility for stack scrubbing.

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 James 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	Alleghany County Public Works (ACPW) - Selma/Low Moore/Valley Ridge Subdivision; Westgate; Cliftondale Park/Wilson Creek/Sharon	Town of Clifton Forge
CWS	ACPW - Pounding Mill; Intervale/Clearwater Park; Rosedale/Callaghan; Cherokee/Indian Valley/Oneida Trail	City of Covington
CWS	Albemarle County SA - Urban Area, Crozet, Scottsville, Red Hill	Rivanna Water and Sewer Authority
CWS	Amherst County SA - Henry L. Lanum, Jr. Water Filtration Plant	City of Lynchburg
CWS	Bath County Service Authority (BCSA) - Thomaston/Crowdertown/Switchback	Homestead Water
CWS	BCSA - Bath County Regional Water; Millboro Industrial Park	Millboro Water Association
CWS	Bedford County RWA - Forest & New London	City of Lynchburg
CWS	City of Charlottesville	Rivanna Water and Sewer Authority
CWS	City of Chesapeake - South Norfolk System	City of Norfolk
CWS	City of Chesapeake - Western Branch System	City of Portsmouth
CWS	Chesterfield County	Appomattox River Water Authority
CWS	Chesterfield County	City of Richmond
CWS	City of Colonial Heights	Appomattox River Water Authority
CWS	Eastern Goochland Water System	Henrico County
CWS	Goochland Courthouse	James River Correctional Center
CWS	Hanover Utilities - Overhill Estates-Holly Farms	Henrico County
CWS	Henrico County Water System	City of Richmond
CWS	Town of Iron Gate	Town of Clifton Forge

CWS	City of Lexington	Maury Service Authority
CWS	Norfolk Naval Base	City of Norfolk
CWS	Norfolk Naval Shipyard	City of Portsmouth
CWS	City of Petersburg	Appomattox River Water Authority
CWS	City of Portsmouth	City of Norfolk
CWS	Powhatan Correctional Facilities	James River Correctional Center
CWS	Powhatan County Flat Rock Water System	Chesterfield County
CWS	Founders Bridge (Powhatan)	Chesterfield County
CWS	Prince George County Department of Utilities	Appomattox River Water Authority
CWS	Prince George County Department of Utilities	City of Petersburg
CWS	Rockbridge County PSA (RCPSA) - Rt. 251 System	City of Lexington
CWS	RCPSA - Long Hollow Water Development Company	City of Buena Vista
CWS	RCPSA - North Lexington/Fairfield/Raphine	Maury Service Authority
CWS	RCPSA - Rivermont Heights	City of Buena Vista
CWS	York County Utilities - Hubbards Lane	Newport News Waterworks, Williamsburg/York County
CWS	Western Tidewater Water Authority - Suffolk Main System	City of Portsmouth
CWS	Galting Pointe Subdivision	Town of Smithfield
CWS	Newport Development Service District	Western Tidewater Water Authority/City of Suffolk, City of Portsmouth
CWS	Isle of Wight County	Western Tidewater Water Authority
CWS	Windsor Development Service District	Town of Windsor
CWS	Western Tidewater Water Authority	City of Suffolk
CWS	City of Virginia Beach	U. S. Army Corps of Engineers
CWS	Isle of Wight County	City of Franklin
SSU_LG	MeadWestVACO Corporation	City of Covington
SSU_LG	Applied Extrusion Technologies	City of Covington
SSU_LG	Lee's Carpets - Mohawk Industries	Town of Glasgow
SSU_LG	Fort Eustis, Fort Monroe	Newport News Waterworks
SSU_LG	Luck Stone - Route 6 Goochland	Manakin Farms

James River Basin Intrabasin Transfers

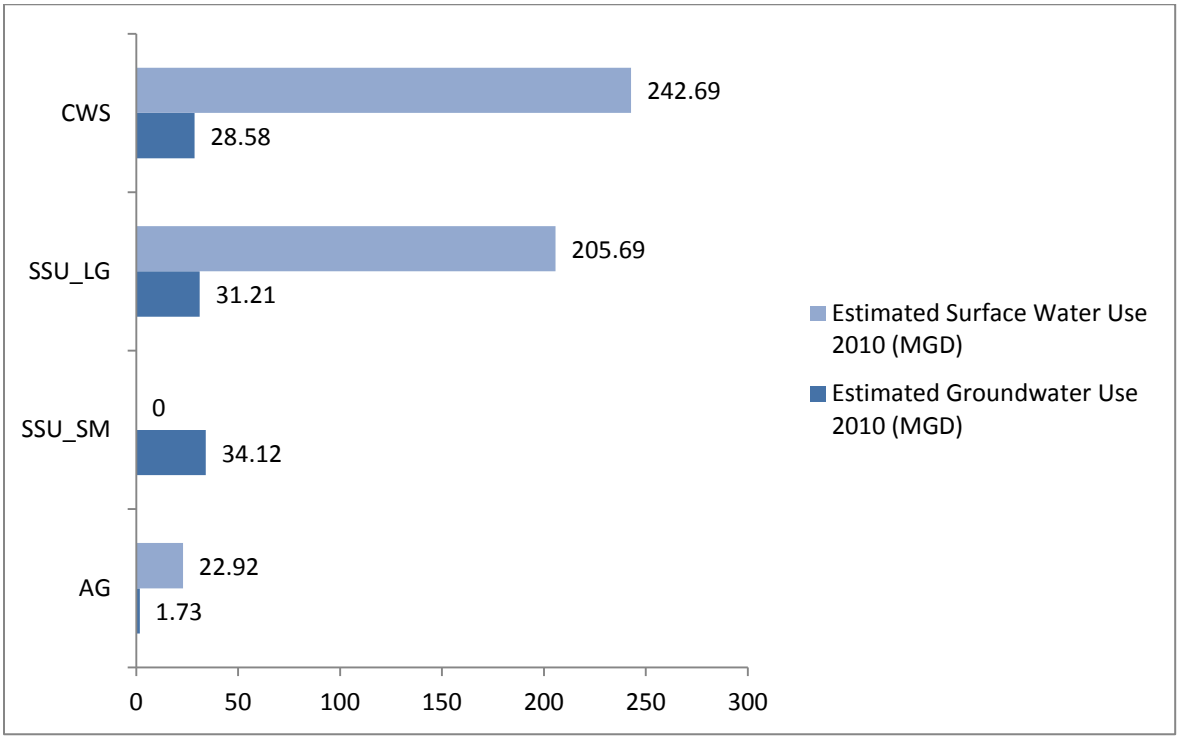
Interbasin transfer(s) reported in the James River Basin are listed in the following table.

User Type	Water Purchaser and System(s)	Water Provider
CWS	U.S. Navy (Little Creek Amphibious Base and Oceana Naval Air Station) and the U.S. Army (Fort Story)	City of Norfolk

James River Basin Interbasin Transfers

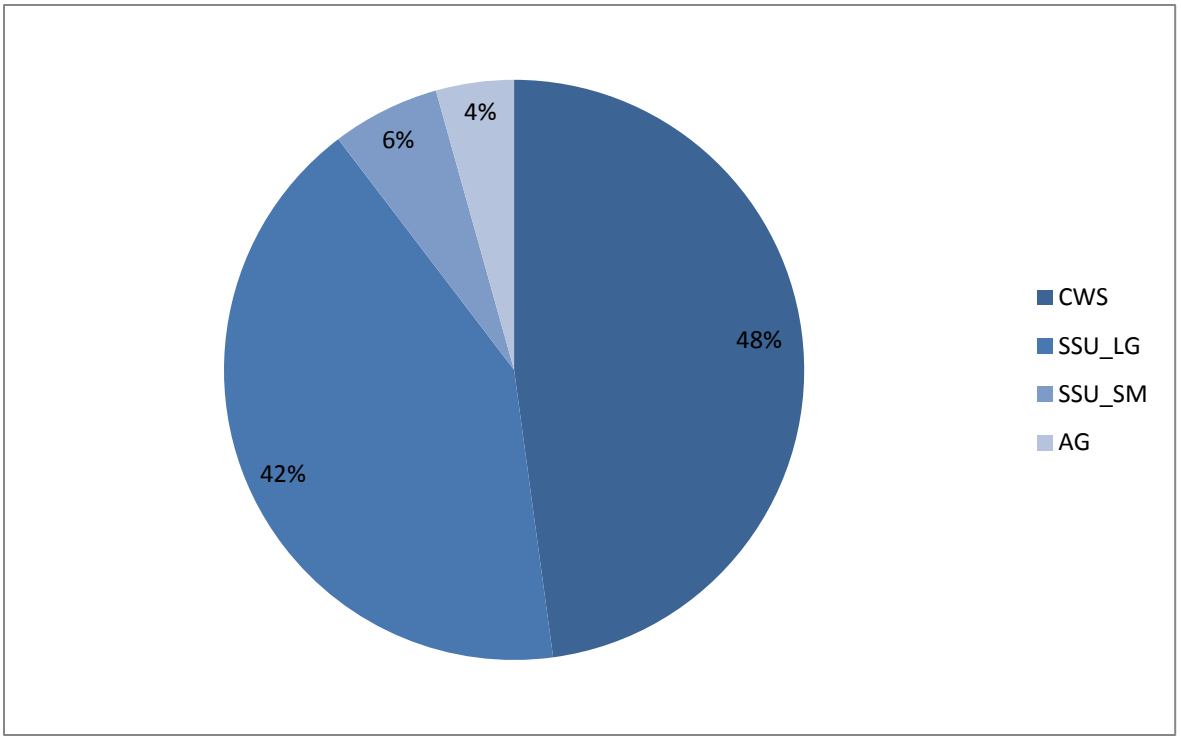
Existing Water Use

The total estimated water use provided in the twenty-two water supply plans is summarized in the following figure. The total estimated water use is 567 MGD, with approximately 475 MGD of surface water use and 92 MGD of groundwater use.



James River Basin Estimated Use by Source and Type

CWS use an estimated 48% of the total water used in the Basin followed by SSU_LG (42%), SSU_SM (6%), and AG (4%).

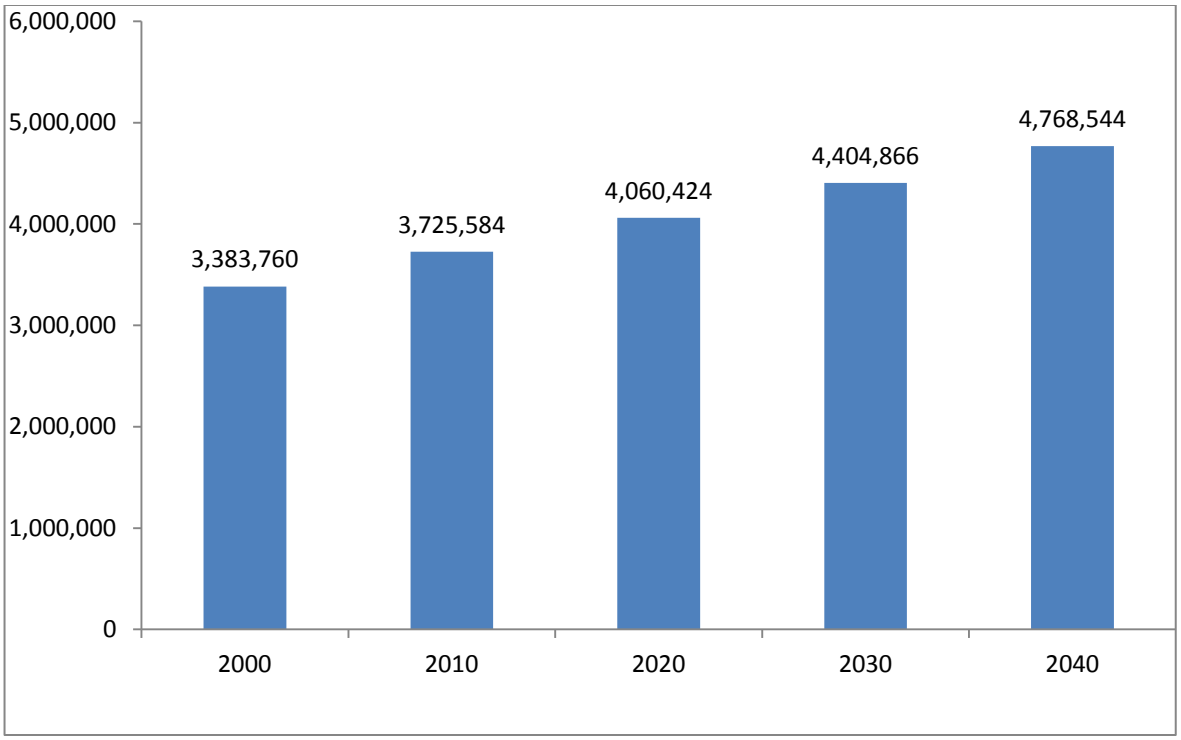


James River Basin Percentage of 2010 Estimated Use by User Type

CWS reported their water use disaggregated into categories of use appropriate for the system. Categories commonly used included Residential, Commercial/Institutional/Light 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 Demand

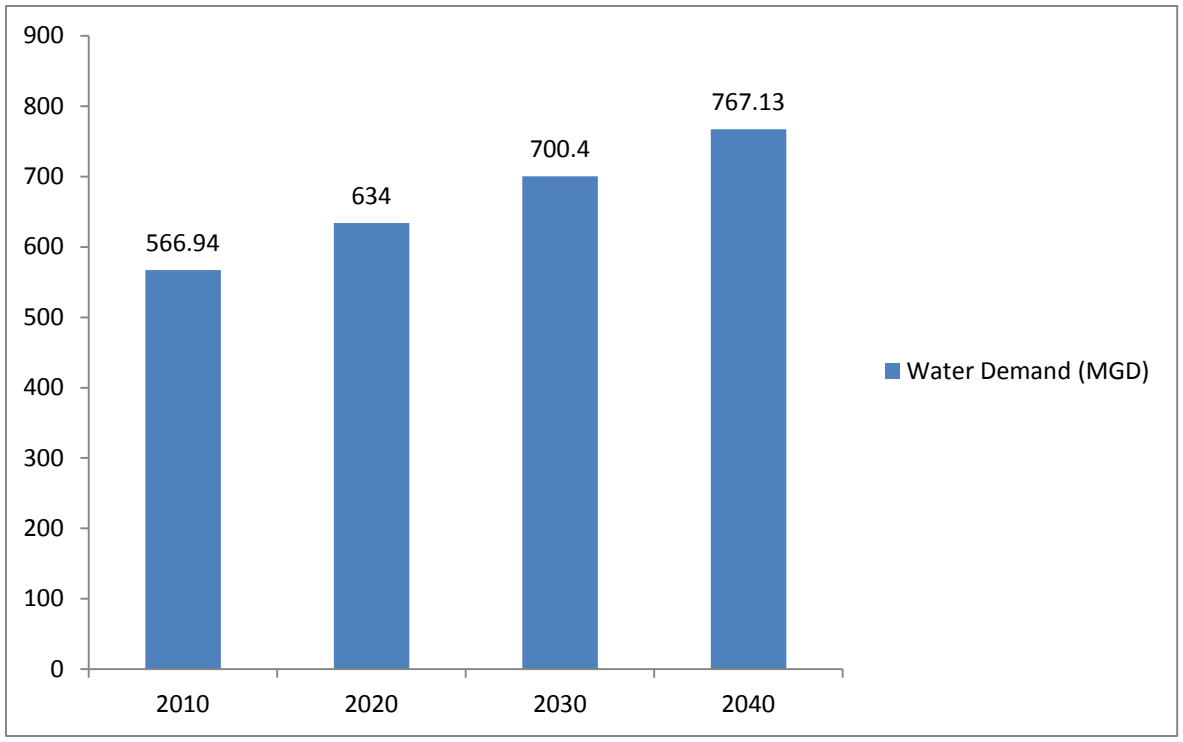
The projected population of the localities with at least a portion of their area in the James River Basin is displayed in the following figure. Population data is obtained from the Virginia Employment Commission's population estimates which rely on data produced by the United States Census Bureau. The overall population of the localities is projected to increase through the year 2040. By the year 2040, the estimated basin-wide population is projected at 4,768,544. The percent change in population from the years 2000 through 2040 is estimated at 28%.



James 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 James River Basin, as reported in the regional water supply plans, is estimated to increase from 567 MGD to approximately 767 MGD in 2040. The percentage change in

water use during the 30-year timeframe is estimated at 37.3%.



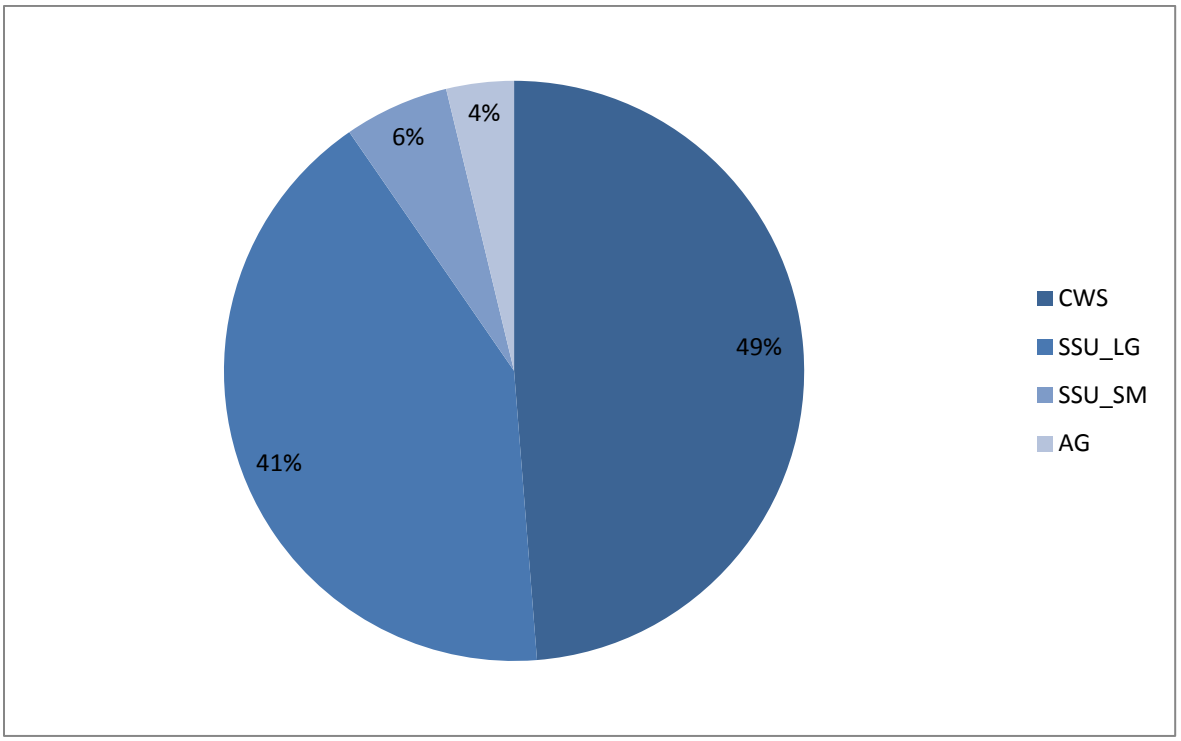
James River Basin Projected Water Demand

As depicted in the following table, CWS show the largest percent change (41%) in water demand over the 30-year period, followed by SSU_LG (34.8%), SSU_SM (31.5%), and AG (17.2%).

User Type	Reported 2010 Use MGD	Projected Use 2020 MGD	Projected Use 2030 MGD	Projected Use 2040 MGD	Percent Change (2010-2040)
CWS	271.27	305.48	339.7	373.89	41.0%
SSU_LG	236.9	264.43	292	319.48	34.8%
SSU_SM	34.12	37.7	41.3	44.87	31.5%
AG	24.64	26.06	27.5	28.89	17.2%

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

In the year 2040 the projected water demand by user type in the James River Basin is similar to the 2010 use in that CWS are projected to use the greatest percentage of water followed by SSU_LG, SSU_SM, and AG.



James River Basin Percentage of 2040 Projected Demand by User Type

Statement of Need and Alternative Water Sources

The following review of future water needs is obtained from the eighteen regional and four local water supply plans represented in the James River Basin. The information is presented for all those localities with at least a portion of land area located within the James River Basin. The following lists the projected deficits in the Basin.

Albemarle County, the City of Charlottesville, and the Town of Scottsville Regional Water Supply Plan

A deficit of water supply of 0.41 MGD is anticipated by 2035 in the urban areas of the planning region due to future demands. The region's plan to address the projected shortfall of municipal supply includes the expansion of the existing Ragged Mountain Reservoir in two phases. The first phase, known as the intermediate expanded height phase, is scheduled to be operational in March 2014. The region also includes continuing water conservation as an alternative.

Amelia County, Virginia Water Supply Plan

Based on projections of future water demand and aquifer recharge and recovery assumptions, existing water sources are expected to meet projected 2060 water demands. Although current sources are deemed adequate, development of additional groundwater sources and the use of surface water (Appomattox River) were given as alternative sources.

Appomattox River Water Authority Regional Water Supply Plan

Chesterfield County; Dinwiddie County and the Town of McKenney; Prince George County; the Cities of Colonial Heights, Petersburg, and Hopewell

The City of Hopewell is not expected to require additional supply or treatment capacity to meet demand projections. Of the Appomattox River Water Authority member localities, Chesterfield County is the largest customer, and fluctuations in the Appomattox River Water Authority (ARWA) demand and supply result from demand peaks by Chesterfield customers. Chesterfield's demand has shown significant increases since the mid-1980's, while the remaining jurisdictions have seen demand remain flat, or even decline in the case of the City of Petersburg. By the year 2040, the ARWA is expected to have an average day supply deficit of 9.4 MGD. A regional peak day supply deficit of 14.6 MGD is anticipated by 2050. Peak day deficits anticipated by locality are anticipated as follows:

Chesterfield County anticipates a peak day deficit of 1.0 MGD by 2040
City of Colonial Heights anticipates a peak day deficit of 0.1 MGD by 2020
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

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, 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 permit reissued to 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 their 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.

Buckingham County and the Town of Dillwyn Regional Water Supply Plan

The Buckingham County water system's source water is adequate to meet future demands. Privately-owned community water systems and self-supplied user supplies are presumed adequate with no increase in demand projected.

Charles City County 2013 Water Supply Management Plan

Charles City County's demand is expected to exceed well capacity in 2040 at the Hideaway/Mt. Zion Rustic, the Schools Complex, Ruthville, and the Adkins Store neighborhood service areas. Additional groundwater sources are expected to meet demands in neighborhood service areas. Deficits in planned industrial areas (with no current source) may be met with interconnection to adjacent localities. Development in these areas has slowed due to the economy.

Craig County -Town of New Castle Regional Water Supply Plan

Based on projections of future water demand and the VDH permitted capacity of the Craig-New Castle Public Service Authority community water system, existing water sources are deemed adequate to meet projected 2040 community water system demands.

Cumberland, Goochland, Henrico, and Powhatan Regional Water Supply Plan

The Counties of Henrico, Goochland, Powhatan, and Cumberland conclude the greatest growth is anticipated by Goochland County (229%) and Powhatan County (123%). Cumberland and Goochland counties project that existing sources will meet future demand. Powhatan County anticipates a deficit of 0.56 MGD by 2030; Henrico County anticipates a deficit of 3.75 MGD by 2045. Several alternatives are recommended for meeting this additional demand in the future: the regional Cobbs Creek Reservoir project; continuing the existing water conservation policies or developing new ones; initiating discussions with Prince Edward County concerning the availability of water from the Sandy River Reservoir; regional coordination between the Department of Corrections and Goochland and Powhatan Counties to increase the withdrawal of water from an existing James River water withdrawal; developing and implementing groundwater management policies to manage the groundwater resources; and expanding existing water purchase contracts or developing new ones.

Fluvanna County and the Town of Columbia Regional Water Supply Plan

Water demands are projected through 2030 with a deficit anticipated in the Palmyra Community Water System. The other community water systems' sources are expected to be adequate for the next twenty years. The James River Water Authority is listed as one option to meet future demand. A reservoir site associated with the Rivanna River and the James River is also included. A specific site for a reservoir is not given.

Greene County and the Town of Stanardsville Regional Water Supply Plan

The planning area is transitioning from rural farming to a residential community due to growth pressures from Albemarle County, the City of Charlottesville, and the Washington D.C. metro area. The Greene County municipal CWS anticipates an average day deficit of 0.54 MGD by 2030 and a peak day deficit of

0.07 MGD by 2010; Mountain Lakes CWS anticipates that, although average day demands are met through 2050, a peak day deficit of 0.031 MGD is anticipated by 2010. Short-term alternatives for additional supply include implementation of water conservation measures and development of new groundwater sources. Reservoir development is anticipated to satisfy long-term supply needs.

Hampton Roads Regional Water Supply Plan

Isle of Wight County and the Towns of Smithfield and Windsor; James City County; Surry County and the Towns of Claremont, Dendron, and Surry; York County; the Cities of Chesapeake, Hampton, Newport news, Norfolk, Portsmouth, Suffolk, Williamsburg, 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. There is potential for demand to exceed supply by 2040 in the York-James Peninsula sub-region as the projections are within a 10% margin of error and alteration of the assumptions could result in revised projections. Alternatives considered to meet the potential need in the Peninsula sub-region include additional surface water storage, additional groundwater withdrawals, desalination, aquifer storage and recovery, interconnection, reuse, and system optimization.

Hanover County and Town of Ashland Long Range Water Resources Plan

Hanover County CWS may experience a deficit of 0.34 MGD by the year 2032 based on total projected demands as compared to the current VDH permitted capacity for all CWS in the planning region. A single alternative is mentioned in the plan, the Verdon Quarry side storage reservoir project which includes: river intakes and raw water pumping stations on North Anna and Little Rivers, and a reservoir intake and raw water pumping station on Verdon Quarry. If completed in 2037 as scheduled, water resources will be adequate to meet the CWS needs through the planning period to 2042.

Louisa County Long Range Water Supply Plan

Louisa County and the Towns of Louisa and Mineral

Louisa County's Northeast Creek Reservoir Service Area's average day demands can be met through 2050; peak day water demand surpasses the permitted capacity in 2039. Water demand within the Zion Crossroads Service Area is expected to outpace the permitted supply by 2025. The small groundwater-based CWS and Blue Ridge Shores do not predict a deficit in the planning period. The Northeast Creek Reservoir Service Area will need improvements in the Town of Mineral well, and the Northeast Creek Water Treatment Plant would be required to meet this peak demand for the Northeast Creek Reservoir Service Area. If Northeast Creek Reservoir Service Area and Zion Crossroads Service Area were interconnected and all source capacity was developed, this deficit would be eliminated in the planning period (2050).

The County has partnered with Fluvanna County to create the James River Water Authority, which is authorized to withdrawal water from the James River under Virginia Water Protection Permit No. 04-0805. Louisa County Water Authority also has a pending application for an intake on Lake Anna to supply that area.

Six designated growth areas (Gum Spring, Ferncliff, Shannon Hill, Lake Anna, Boswells Tavern, and Gordonsville) do not currently have sources, but the Louisa County Water Authority is considering groundwater wells, surface water withdrawals, off-line reservoir, extension of water transmission lines from other growth areas, upgrades to the existing Northeast Creek Water Treatment Plant, a partnership with Fluvanna County, and an upgrade to Bowlers Mill Reservoir.

New Kent County Water Supply Plan

Portions of New Kent County may experience a water supply deficit as early as 2017, based on the current permitted withdrawal amount. Factoring in all available water sources and demand reduction goals, the projected 2060 water deficit for county-operated CWS is approximately 1.5 MGD. In the short term, a waterline extension is being designed to connect two county-operated CWS to alleviate the anticipated 2017 deficit. The two top ranked alternatives for future water supply listed in the plan are an intake on the Pamunkey River (reverse osmosis water treatment) and the purchase of water from the City of Richmond.

New River Valley Regional Water Supply Plan

Giles County and the Towns of Glen Lyn, Narrows, Pearisburg, Pembroke, and Rich Creek; Montgomery County

As a region, there is generally no deficit in the planning period. Some systems are already exploring options to increase system capacity. Alternatives considered include the installation of pressure reducing valves; interconnection of systems with the City of Radford across the planning area; increased educational efforts; water capacity expansion for the Giles County PSA and a pilot study on potential to withdraw from the New River; joining the Blacksburg-Christiansburg-VPI Water Authority for Montgomery County.

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.

Orange County Water Supply Plan

Orange County and the Towns of Orange and Gordonsville

The existing sources for each of the service areas may not be adequate to meet the projected maximum day demands. Depending on the source of the system (surface water impoundments, run-of-river intakes, groundwater) the deficit will be between 0.45 MGD and 4.61 MGD with a range of years from 2010 to 2050. Rapidan River/Orange Water Treatment Plant serving the Town of Gordonsville, Rapidan Service Area Rt. 15, and the Town of Orange will experience a deficit of 2.61 MGD in 2050. Rapidan River/Wilderness Water Treatment Plant and the wells serving the Rapidan Service Area Rt. 20 will experience a deficit of 2 MGD in 2050. The region's plan to address the projected shortfall of municipal supply includes increasing the existing, permitted surface water withdrawal, developing new raw water storage, and developing new groundwater supplies, as well as continuing the existing water conservation policies or developing new ones.

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. Regional 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.

Region 2000 Regional Water Supply Plan

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

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 CWS supplies:

- Amherst County Service Authority/ACSA (deficit of 0.019 MGD by 2019, based on the current VDH permitted capacity of 2.0 MGD)
- Town of Amherst (deficit of 0.14 MGD by 2060 if future water sales to other communities are factored into the projections, based on the VDH permitted capacity of 1.0 MGD)

Bedford County 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/CCUSA (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)

Nelson County (deficit of 0.005 MGD by 2059, based on the VDH permitted capacity of 0.79 MGD)

Town of Appomattox (deficit of 0.0004 MGD by 2051, based on the VDH permitted capacity of 0.33 MGD).

Alternatives as presented: Amherst County plans an expansion of the Lanum Water Filtration Plant from 2.0 mgd to 4.0 mgd capacity to meet the projected 2019 deficit. In addition, in 2050 a replacement of ACSA's interconnecting mains with the City of Lynchburg is planned. The Town of Amherst is considering a recommendation to pursue an interconnection upgrade with ACSA. 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 plan include storage at Boxley Rock Quarry with a pump-over to Harvey Branch and a CCUSA-Altavista intake on the Roanoke River. Water purchase agreements with Lynchburg City or Bedford County may also be feasible alternatives. The Town of Appomattox is considering development of new groundwater wells or an intake on the James River as future alternatives. Nelson County's highest rated alternative is a Tye River withdrawal. Besides the alternatives listed above, the region considers the following as water supply alternatives: additional groundwater sources, reservoirs, intakes, interconnections, reuse and recycling, and demand management.

City of Richmond Water Supply Plan

The City of Richmond has sufficient water treatment and supply capacity to meet the city and its wholesale customers' water demand in the planning period, through 2060.

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, Troutville; Roanoke County and the Town of Vinton; the cities of Roanoke and Salem

Future deficits are anticipated in CWS for Bedford County (deficit of 0.004 MGD by 2015), and Botetourt County (deficit of 0.09 MGD by 2020). 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 future water supply deficits.

Upper James River Basin Water Supply Plan

Alleghany County and the Towns of Clifton Forge and Iron Gate; Bath County; Highland County and the Town of Monterey; Rockbridge County and the Towns of Glasgow and Goshen; the Cities of Buena Vista, Covington, and Lexington

Population and demand will remain constant through 2040; therefore, existing water sources are anticipated to be adequate.

Upper Shenandoah River Basin Regional Water Supply Plan

Augusta County and the Town of Craigsville

Water demand is anticipated to increase during the planning period (from 2010 to 2040) as is population. The plan concludes the County of Augusta may experience a deficit by the year 2040 compared to existing VDH permitted capacities. Augusta County Service Authority (ACSA) predicts a deficit of 0.83 MGD by 2027. Several alternatives are recommended for meeting this additional demand in the future: development of new wells and treatment facilities; plant upgrades to provide additional supply and treatment capacity; development of new stream intakes, pump stations, and pipelines; development of purchase water agreements with neighboring jurisdictions; and inter-jurisdictional collaboration on new infrastructure projects.

Locality	Estimated Year of Deficit	Estimated Deficit Amount (MGD)
Albemarle County – Charlottesville - Scottsville	2035	0.41
Appomattox River Water Authority	2040	9.4
Charles City County	2040	1.0
Palmyra CWS (Aqua VA)	2030	0.067
Greene County	2030	0.54
Powhatan County	2030	0.56
Henrico County	2045	3.75

New Kent County	2060	1.5
Amherst County	2019	0.019
Town of Amherst	2060	0.14
Bedford County	2015	0.004
Campbell County	2057	0.03
Town of Altavista	2052	0.003
Nelson County	2059	0.005
Town of Appomattox	2051	0.0004
Botetourt County	2020	0.09
Orange County	2050	4.61
*Augusta County	2027	0.83
Louisa County Water Authority - Zion Crossroads Service Area	2050	0.841
Hanover County	2032	0.34

James River Basin Projected Water Deficits