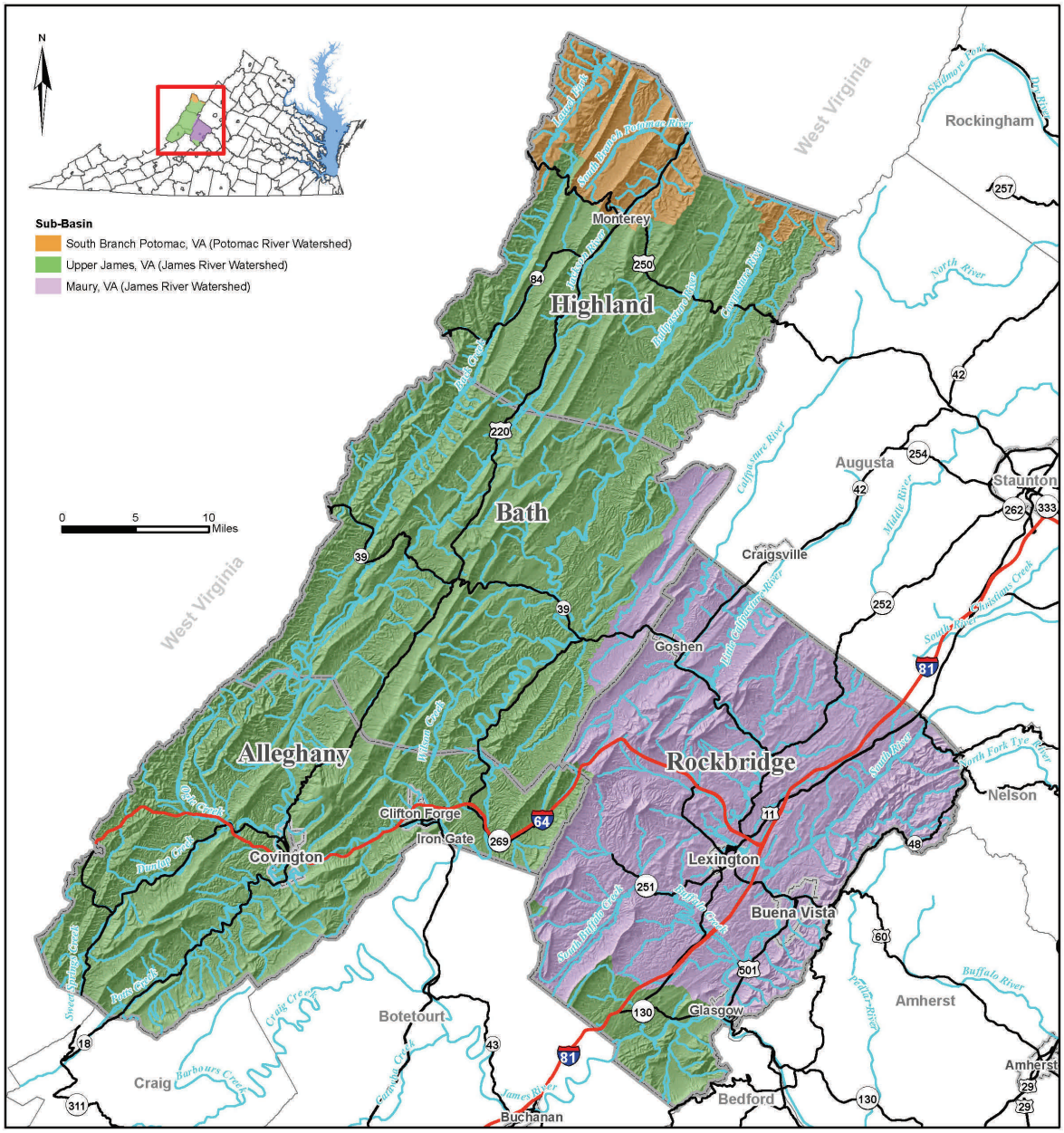
Upper James River Basin
Water Supply Plan



Prepared and Submitted By:

Central Shenandoah Planning District Commission
and
Roanoke Valley Alleghany Regional Commission
September 2011

Upper James River Basin Water Supply Plan

and

Drought **P**reparedness and **R**esponse **P**lan

Covering:

Counties of Alleghany, Bath, Highland, Rockbridge
Cities of Buena Vista, Covington, and Lexington

and

Towns of Clifton Forge, Glasgow,
Goshen, Iron Gate, and Monterey

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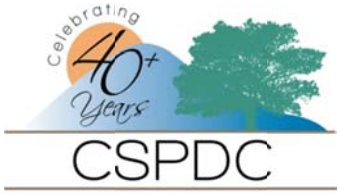

September 2011

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a grant from the Virginia Department of Environmental Quality and complies with
Virginia State Regulations 9 VAC 25 780, Local and Regional Water Supply Planning.

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1.0 INTRODUCTION

In 2007, communities in the Upper James River Basin began exploring options to begin working regionally in order to complete the requirements in conjunction with 9 VAC 25-780, Local and Regional Water Supply Planning. This requirement provides guidance to localities in developing a Water Supply Plan – a regulation that became mandated to all localities by the General Assembly. The final regulations became effective November 2, 2005, and made provisions for all localities electing to participate in a regional water supply planning effort to submit plans to the Department of Environmental Quality (DEQ) no later than November 2, 2011.

In early 2007, regional groups began forming in the Upper James River Basin communities. During the summer of 2007, grants were announced by DEQ to assist with the cost of localities to do water supply planning work. The Central Shenandoah Planning District Commission (CSPDC) received a grant to perform water supply work for the Upper James communities within its planning region. The Roanoke Valley-Alleghany Regional Commission (RVARC) was also awarded funding to support water supply work for its communities within the Upper James.

In FY 2009, the CSPDC and the Roanoke Valley – Alleghany Regional Commission (RVARC) began working together to combine the James River water supply plans for all localities within both planning districts. Incorporated communities within the Upper James Basin Planning Area are:

- Alleghany County
- Bath County
- City of Buena Vista
- Town of Clifton Forge
- City of Covington
- Town of Glasgow
- Town of Goshen
- Highland County
- Town of Iron Gate
- City of Lexington
- Town of Monterey
- Rockbridge County

The staffs of the CSPDC, RVARC, DEQ, and the localities within the planning area worked closely together to provide the necessary data and analysis to comply with the regulation. This Plan represents the compilation of these efforts.

The regulations establish a planning process and criteria to be used in the development of the Upper James River Basin Water Supply Plan. This Plan is required to include information on existing water source information, existing water use information, existing resource information, projected water demand information, and water demand management information. This Plan will be reviewed, revised and resubmitted every ten years after the last approval. This Plan represents the compilation of these efforts.

2.0 EXISTING WATER SOURCES (9 VAC 25-780-70)

Section 70 requests localities within the planning area to submit information regarding their existing water sources, including groundwater, surface water reservoirs and stream intakes. Please note that all associated excel spreadsheets for Section 70 are attached as Appendix A and included on a CD at the back of this report.

Many data sources were consulted in documenting existing water resource information for community water systems, and include, but are not limited to

- Countywide Water/Sewer/Drainage Study, Alleghany County, Virginia (Anderson and Associates, 2006)
- VA Department of Environmental Quality (DEQ) water withdrawal records
- VA Department of Health records
- Local Government records
- Maury River study
- Preliminary Engineering Report Water Filtration Phase II Improvements, Town of Clifton Forge (Draper Aden Associates, 2010)
- U.S. Environmental Protection Agency, Safe Drinking Water Information System (SDWIS)

2.1 Municipal Community Water Systems

For purposes of this plan, a municipal community water system is one that is owned, operated, and/or maintained by a local government. Each community water system is described separately in the following sections. A summary table of municipally-owned water systems in the planning region is provided in Table 2-1. Additional detailed water source information is included in Appendix A.

Table 2-1
Municipal Community Water Systems

Owner	Water System	Source
Alleghany County	Cliftondale Park /Wilson Creek / Sharon	Purchased - Clifton Forge (Smith Creek)
Alleghany County	Selma / Low Moor/ Valley Ridge Subdivision	Purchased - Clifton Forge (Smith Creek)
Alleghany County	Cherokee / Indian Valley / Oneida Trail	Purchased - City of Covington (Jackson River)
Alleghany County	Rosedale / Callaghan	Purchased - City of Covington (Jackson River)
Alleghany County	Wesgate	Purchased - Clifton Forge (Smith Creek)
Alleghany County	Pounding Mill	Purchased – City of Covington (Jackson River)
Alleghany County	Intervale / Clearwater Park	Purchased - City of Covington (Jackson River)

Bath County	Bath County Service Authority (Regional)	Smith Spring, High School Well & Queen Spring
Bath County	Bath County Service Authority – Ashwood	Groundwater Well - Ashwood Well
Bath County	Bath County Service Authority – Clifton Forge	Groundwater Well – Clifton Forge Mountain Well
Bath County	Bath County Service Authority – Cedar Creek Well	Groundwater Well – Cedar Creek Well
Bath County	Bath County Service Authority – Millboro Industrial Park	Via Homestead Water
Bath County	Bath County Service Authority – Thomaston/Crowdertown/Switchback	Via Homestead Water
City of Buena Vista	Buena Vista	Groundwater - 5 wells, Halls Spring
Town of Clifton Forge	Clifton Forge Water Plant	Smith Creek
City of Covington	City of Covington Water Filtration Plant	Jackson River
Town of Glasgow	Town of Glasgow	Groundwater - 3 wells
Town of Goshen	Town of Goshen	Goshen Spring
Highland County	McDowell System	Groundwater - 3 wells
Town of Iron Gate	Town of Iron Gate	Purchased - Clifton Forge via Alleghany County
City of Lexington	City of Lexington	Purchased-Maury River Service Authority
Town of Monterey	Town of Monterey	Groundwater - 3 wells
Rockbridge County	Rockbridge County PSA - Natural Bridge Station/Arnolds Valley combined system	Groundwater – Natural Bridge Station Well and Arnold's Valley Well
Rockbridge County	Rockbridge County PSA - North Lexington/Fairfield/Raphine	Via MSA
Rockbridge County	Rockbridge County PSA – Rivermont Heights	Via City of Buena Vista
Rockbridge County	Rockbridge County PSA – Route 251 System	Via City of Lexington

2.1.1 Alleghany County (2010 Population: 16,202; without Towns of Clifton Forge and Iron Gate 11,978)

Alleghany County owns, operates, and maintains seven municipal community water systems. All Alleghany County municipal community water systems are supplied with purchased treated water from the City of Covington Water Filtration Plant or the Town of Clifton Forge Water Treatment Plant. By governmental agreement, Alleghany County is allocated a reserved capacity of 1.0 MGD from the City of Covington municipal community water system and 0.6 MGD from the Clifton Forge municipal community water system (additional surplus water can be purchased on a "non-reserved," short term basis.) Also, by governmental agreement, Alleghany County sells purchased treated water to the Town of Iron Gate, which in turn supplies the Wesgate municipal community water system.

The City of Covington supplies treated water to the following Alleghany County municipal community water systems:

- Cherokee / Indian Valley / Oneida Trail
- Intervale/Clearwater Park
- Pounding Mill
- Rosedale/Callaghan

Information on the City of Covington water source is included in Section 2.1.5.

The Town of Clifton Forge supplies water to the following Alleghany County municipal community water systems:

- Clifton Dale Park/Wilson Creek/Sharon
- Selma/Low Moor/Valley Ridge
- Wesgate (via the Town of Iron Gate municipal community system)

Information on the Town of Clifton Forge water source is included in Section 2.1.4.

Cherokee/Indian Valley/Oneida Trail

System Overview

The Cherokee/Indian Valley/Oneida Trail municipal community water system service area is located in Alleghany County adjacent to the southern corporate limits of the City of Covington along Route 18. The water system operates off of the 2.0 million gallon Horse Mountain tank in the City of Covington. System distribution includes 7,000 Linear Feet (LF) 6"; 4,900 LF 4"; 1,500 LF less than 4" mains (*Countywide Water/Sewer/Drainage Study, Alleghany County, Virginia*).

Water Source

The source water for the Cherokee/Indian Valley/Oneida Trail municipal community water system is purchased treated water from the City of Covington municipal water system (Jackson

River). A master meter located on Route 18 at the Alleghany County/City of Covington corporate limits meters all water received by the Cherokee/Indian Valley/Oneida Trail municipal community water system from the City of Covington.

Cliftondale Park/Wilson Creek/Sharon

System Overview

The Cliftondale Park/Wilson Creek/Sharon municipal community water system service area includes portion of Alleghany County east of the Town of Clifton Forge along Route 60, US 220, and Route 42. The water system also provides treated water (from Clifton Forge) to the Town of Iron Gate, which in turn supplies water to the Wesgate municipal community water system owned and operated by Alleghany County. Additionally, the Cliftondale Park/Wilson Creek/Sharon municipal community water system supplies water to Douthat State Park, which is operated by the Virginia Department of Conservation and Recreation.

Cliftondale Park/Wilson Creek/Sharon municipal community water system storage includes a 0.3 MG tank. Additionally, a 0.25 MG tank owned by the Town of Iron Gate constructed in 2010 serves the town as well as the Wesgate subdivision municipal community water system in Alleghany County. System distribution includes 1 booster station located in Alleghany County and 2,700 LF 4"; 56,800 LF 6"; 11,800 LF 8"; 700 LF 10" mains (Countywide Water/Sewer/Drainage Study, Alleghany County, Virginia). A booster station and an additional 1500 LF of 8" line were installed as part of the 0.25 MG Iron Gate storage tank project. Additionally, extension of service from the Cliftondale Park/Wilson Creek/Sharon municipal community water system to Douthat State Park included the addition of 6,850 LF of 6" line to the system.

Water Source

The source water for the Cliftondale Park/Wilson Creek/Sharon municipal community water system is purchased treated water from the Town of Clifton Forge (Smith Creek). A master meter located on Route 60 near the Alleghany County/Clifton Forge corporate limits records the amount of water delivered to the system from Clifton Forge. A master meter located along US 220 at the Alleghany County/Town of Iron Gate corporate limits meters water sent from the Cliftondale Park/Wilson Creek/Sharon municipal community water system to the Town of Iron Gate. Additionally, another master meter, located adjacent to the Iron Gate water tank and booster station, records total water sent from the Town of Iron Gate municipal community water system to the Wesgate subdivision municipal community water system.

Intervale/Clearwater Park

System Overview

The Intervale/Clearwater Park municipal water system service area is located north of the City of Covington along US 220 and Route 687 in Alleghany County. System storage consists of a 0.06 MG tank. System distribution includes 1 booster station; and 5,300 LF 4" or smaller; 7,500 LF 6"; 1,600 LF 8" mains (*Countywide Water/Sewer/Drainage Study, Alleghany County, Virginia).*

Water Source

The source water for the Intervale/Clearwater Park municipal water system is purchased treated water from the City of Covington (Jackson River). The main water line from City of Covington Water Filtration Plant is metered and records the amount of water is delivered to the system.

Pounding Mill Spring

The Pounding Mill Spring municipal community water system is located adjacent to the east corporate limits of the City of Covington and serves the Pounding Mill, Mallow, and Dolly Ann areas of Alleghany County. As of March 2009, Pounding Mill Spring was discontinued as the source of water for the Pounding Mill municipal community water system, which is now supplied with treated water from the City of Covington. Prior to discontinuing use of Pounding Mill Spring as the water source, the water system was permitted for 2,439 equivalent residential connections. Storage capacity includes a 0.3 MG tank located in the Mallow area and a 0.2 MG tank located in the Dolly Ann area. System distribution includes 1 booster station and 5,400 LF 4" or smaller; 13,900 LF 6"; 1,500 LF 8" mains (*Countywide Water/Sewer/Drainage Study, Alleghany County, Virginia*). The main line serving the system will be replaced as part of upcoming system improvements.

Rosedale/Callaghan

System Overview

The Rosedale/Callaghan municipal water system serves areas of Alleghany County, west of the City of Covington, along Interstate 64, US 60, and Routes 600 and 601. System distribution includes a 0.1 MG tank and a 0.175 MG tank. The distribution system includes 2 booster stations; and 3,600 LF 4" or smaller; 23,000 LF 6"; 36,100 LF 8" water mains (*Countywide Water/Sewer/Drainage Study, Alleghany County, Virginia).*

Water Source

The source water for the Rosedale/Callaghan municipal water system is purchased treated water from the City of Covington municipal water system (Jackson River). A master meter located at the end of Court Street in the City of Covington records the amount of water is delivered to the system.

Valley Ridge Subdivision

The Valley Ridge municipal community water system serves the Valley Ridge subdivision in Alleghany County. Prior to 2004, the subdivision was served by a private system (well and spring) with the spring being surface water influenced. In 2004, Alleghany County purchased the Valley Ridge subdivision community water system from a private owner and extended water service from the Alleghany Commerce Center (served by the Selma/Low Moor municipal water system). System storage includes a 0.04 MG tank and a 0.05 MG tank. System distribution consists of an unknown amount of 6" or smaller water mains (*Countywide Water/Sewer/Drainage Study, Alleghany County, Virginia*).

Water Source
The Valley Ridge municipal community water system receives water from the Selma/Low Moor municipal water system, which purchases water from the Town of Clifton Forge WTP (Smith Creek).

Wesgate Subdivision

System Overview
The Wesgate municipal water system serves the Wesgate subdivision in Alleghany, located adjacent to the Town of Iron Gate with water being supplied by the Town of Iron Gate municipal community water system. The system is owned and operated by Alleghany County. System storage includes the Town of Iron Gate water tank (0.25 MG). System distribution consists of 1 booster station; 7,400 LF 4" or smaller; 500 LF 8" mains (Countywide Water/Sewer/Drainage Study, Alleghany County, Virginia). Recent systems improvements (2009) included an additional 1,500 LF of 8" and a new booster station. A master meter located adjacent to the Wesgate booster station records all water received from the Town of Iron Gate.

Water Source
The source water for the Wesgate municipal community water system is the Town of Clifton Forge WTP (Smith Creek). Alleghany County purchases treated water from the Town of Clifton Forge, sells purchased water to the Town of Iron Gate (via Cliftondale Park/Wilson Creek/Sharon municipal community water system), which in turn, by governmental agreement, sells water to the Wesgate municipal community water system.

2.1.2 Bath County (2006 Population: 4,635)

The Bath County Service Authority owns several community water systems in Bath County. These include:

- Bath County Regional Water System
- Clifton Forge Mountain System
- Ashwood System
- Cedar Creek System
- Thomastown/Crowdertown/Switchback System
- Millboro System

Bath County Service Authority purchases water from The Homestead Water Company to serve its Thomastown/Crowdertown/Switchback service area. In addition, water is purchased from the Millboro Water Association to serve the Millboro service area.

Bath County Regional Water System

System Overview
Bath County Regional Water system has had four major sources of water: Smith Spring, High School Well, Queen Spring, and Old Dairy Well. As of 2008, Smith and Queen Springs had been removed as water sources for this system. Currently, the High School well and the Old

Dairy well are in operation. Water from the High School Well supplements water production from the Old Dairy Well. (Virginia Department of Health, Engineering Description Sheet, December 12, 2000.)

Source Water

Smith Spring: The Smith Spring is contained in a stone structure with a corrugated tin roof and a wooden access door. This spring is located east of Mitchelltown on a service road which intersects State Route 649. Water gravity feeds the Smith Spring Booster Station through a 4-inch pipe at an estimated 16 gpm.

High School Well: The well is drilled to a depth of 480 feet and is cased with 6-inch diameter casing to a depth of 203 feet. A 48-hour pump test was conducted and indicates a sustained yield of 25 gpm. A sample tap, water meter, and valving are located in a block building adjacent to the High School Storage Tank.

Queen Spring: The Queen Spring is contained in a stone structure with a corrugated tin roof and a wooden access door. The spring house is located on the west side of State Route 687, approximately three miles southwest of State Route 39. Water gravity feeds the Queen Spring Booster Station through a 6-inch ductile iron pipe at a low flow estimate of 90 gpm**.**

Homestead Preserve – Old Dairy Well: This project consists of a well and well house, a storage tank and connection to the Bath County Regional distribution system. The well is 17.5 inches in diameter from the surface to 40 feet, 12 inches from 40 feet to 103 feet, and 8 inches from 103 feet to 450 feet. The well capacity is estimated to be 160,000 gpd.

Clifton Forge Mountain Community System

System Overview

This waterworks consists of a well and well house, a water storage tank and distribution piping.

Source Water

The well is 6 inches in diameter and 525 feet deep. A 48-hour pump test indicated a yield of 130 gpm at a draw down on 413 feet and bacteriological analyses indicated disinfection is not required. The well is protected by a 6-foot square pad and is equipped with a pitless adapter.

Due to electrical power constraints, the installed well pump is a single phase, 7½ hp submersible rated at 65 gpm at 370 feet TDH. Its operation is controlled by water level in the storage tank. The well house is situated about 10 feet from the well (Virginia Department of Health, Engineering Description Sheet, December 16, 2003.)

Ashwood Community System

System Overview

This waterworks consists of a well and well house, a water storage tank, distribution piping, and connection to the nearby Homestead Water Company for emergency use as needed.

Source Water
This system consists of a well that is 770 feet deep. It is cased and grouted with 6-inch diameter casing to a depth of 165 feet. A 48-hour pump test indicated a sustained safe yield of 59 gpm. The well head is located in a 10-foot by 11-foot well house with appropriate 2-inch diameter piping (Virginia Department of Health, Engineering Description Sheet, February 17, 2000).

Cedar Creek Community System

System Overview
This system consists of a storage tank, a well and a distribution system to serve the Cedar Creek area including the Bath County Trailer Park.

Source Water
This well was drilled 12 inches in diameter to a depth of 725 feet with 250 feet of 6 inch casing. Static water level during development was at 277 feet and a drawdown of 162 feet was observed during a 48-hour pump test that yielded 91 gpm (Virginia Department of Health, Engineering Description Sheet, December 6, 1990).

Millboro Industrial Park System

This system's source is a purchase from the Millboro Water Association. It is supplied by Big Spring which includes a distribution system and water storage tank (Virginia Department of Health, Engineering Description Sheet, November 7, 1977). It serves Millboro Industrial Park.

Thomastown/Crowdertown/Switchback System

This system's source is a purchase directly from the Homestead Water Company. The Bath County Service Authority has a contractual agreement with Homestead Water Company for a maximum of 70,000 gpd to serve Bacova Junction.

2.1.3 City of Buena Vista (2006 Population: 6,482)

System Overview
This waterworks consists of five drilled wells, one spring, seven finished water storage reservoirs, four booster pumping stations, and the distribution system serving the City.

Source Water
French Post Well (Well No. 1): This well is located near the intersection of Pine Avenue and 12th Street adjacent to the City's firing range and is accessed by a gravel drive south from this intersection. The well is drilled to a depth of 207 feet and is cased with 10-inch diameter casing to a depth of 155 feet. A 16-inch diameter casing extends to a depth of 35 feet, 7 inches. The well house is of brick construction with concrete floor and portable electric heater. The well has had recent electrical upgrades and operates as one of the City's sources of water.

Laurel Park Well (Well No. 2): This well is located adjacent to the Laurel Park Recreation Area and is accessed by a gravel drive from the eastern end of 21st Street. Construction of the well is

unknown, as a well log is not available. A new pump was recently installed and the well is in use. The well house is of brick construction with concrete floor and portable electric heater.

Pedlar Gap Well (Well No. 3): This well is inoperable due to a broken pump shaft, which has fallen into the drill hole and cannot be retrieved. The City has no expectations to bring Pedlar Gap back into service. The well is located adjacent to Pedlar Gap Run just off State Route 607. The well is drilled to a depth of 545 feet and is cased with 7-inch diameter casing to a depth of 104 feet. The well house is of brick construction with concrete floor and portable electric heater.

Dickinson Well (Well No. 4): This well is currently not in service and was taken off line in November, 2009, because it was determined to be UDISW. The City is working to bring this well online. This well is located on the west side of U.S. Route 501 south near the Des Champs plant. This well is drilled to a depth of 172 feet and cased with 12-inch steel casing and grouted to a depth of 108 feet, 4 inches. The well head is housed in an 18-foot by 20-foot brick building with concrete floor. The building is divided into two separate rooms, with one room set aside for chlorine and fluoride feed equipment. A 48-hour pumping test of the well indicated a sustained yield of 1,040 gpm. A pumping rate of approximately 720 gpm is maintained.

Park Avenue Well (Well No. 5): This well is located off U.S. Route 501 near the entrance of Southern Virginia University. The well is drilled to a depth of 417 feet and is cased with 10-inch diameter casing to a depth of 183 feet. The well was pump tested several times for 48 hours to determine a yield that would not result in unacceptably high turbidity observed at higher pumping rates. The final 48-hour yield and drawdown test established the sustained well yield of 700 gpm with a 62-foot drawdown. Pumping is limited to approximately 450 gpm due to undesirable turbidity at higher pumping rates.

Hall's Spring: This source is not in service as it has been determined to be under the direct influence of surface water. This source is located just south of the Dickinson Well on the west side of U. S. Route 501. The City is working to bring this well online. The spring outcrop area is enclosed by a concrete wall and covered by a floating 40 mil thick membrane cover. The cover is equipped with a storm drainage collection system with pumping for removal of rain water. Water flows by gravity from the spring collection basin to an underground pump sump approximately 50 feet to the south. The reliable yield of the spring is unknown. Historically, during extremely dry conditions, the source has been able to deliver approximately 330,000 GPD.

The Dickinson Well and Hall's Spring are the only sources protected by chain link fences with locked access gates (Virginia Department of Health, Engineering Description Sheet, March 4, 2005).

2.1.4 Town Clifton Forge (2007 Population: 3,982)

System Overview

The Town of Clifton Forge owns, operates, and maintains one municipal community water system (see Table 2-1). The Clifton Forge WTP is located north of the Town Clifton Forge off of Route 606 in Alleghany County. By governmental agreement, the Town of Clifton Forge sells treated water to Alleghany County to serve three municipal community water systems owned and operated by Alleghany County (Selma/Low Moor/Valley Ridge; Cliftondale Park/Wilson Creek/Sharon; and Wesgate). Additionally, the Town of Iron Gate purchases treated water from Alleghany County (via the Cliftondale Park/Wilson Creek/Sharon municipal community water system) which in turn was purchased, by Alleghany County, from the Clifton Forge WTP.

The Clifton Forge Water system has a design capacity of 3.0 MGD, permitted withdrawal of 3.0 MGD, and reservoir safe yield of 2.2 MGD. Treated water storage capacity includes a 0.148 MG clearwell; 0.375 MG tank; 0.25 MG tank; 0.5 MG tank; and 0.125 MG tank. Treated water storage capacity, although sufficient to meet short term demands, could pose a problem if water production is compromised for more than 24 hours. The water system distribution includes 2 booster stations and water mains ranging from 16", 12", 8" and smaller.

Water Source

The water source for the Town of Clifton Forge water treatment plant is series three interconnected reservoirs (one coffer dam and two surface reservoirs) on Smith Creek, a tributary of the Jackson River. Much of the Smith Creek watershed upstream from, as well as adjacent to, the Town of Clifton Forge WTP reservoirs is National Forest.

The Smith Creek reservoirs have and continue to experience significant sedimentation and resulting decreases in storage capacity in the reservoirs. Currently, there is one water intake on the Smith Creek upper reservoir and three intakes on the lower (larger) reservoir. However, due to sedimentation issues, two of the intakes are inoperable, leaving only two operable system intakes (one on the upper reservoir and one on the lower reservoir). A preliminary engineering report (PER Water Filtration Phase II Improvements, Town of Clifton Forge) produced by Draper Aden Associates in February 2010, provides cost estimates and related information for needed water treatment plant improvements.

2.1.5 City of Covington (2010 Population: 5,961)

System Overview

The City of Covington owns and operates one community water system - City of Covington Water Filtration Plant on the Jackson River. The system consists of 2 covered concrete reservoirs, and 2 storage tanks. Treatment includes chemical addition, flash mixing, flocculation, sedimentation, filtration, chlorination, and fluoridation. Finished water storage capacity includes a 3.0 MG reservoir and 2.0 MG tank. Water system distribution includes 3 booster stations and water mains of 12", 8", 6" and smaller.

As previously noted, in addition to City of Covington residents and customers, the City of Covington provides treated water to the Rosedale/Callaghan; Intervale/Clearwater Park; Cherokee/Indian Valley/Oneida Trail; and Pounding Mill (as of March 2009) municipal community water systems in Alleghany County. By agreement, Alleghany County is allotted 1.0 MGD from the City of Covington WTP.

Water Source
The Jackson River is the water source for the water treatment plant with the intake located north of the City of Covington.

2.1.6 Town of Glasgow (2006 Population: 1,015)

System Overview
This waterworks consists of three drilled wells, a 500,000-gallon metal ground storage reservoir, disinfection by chlorine gas (Well 4), disinfection by sodium hypochlorite (Wells 2 & 3), fluoridation, and ion exchange softening (Well 4).

Source Water
Well No. 2: This well is located on the west side of State Route 684, approximately 1.1 miles north of its intersection with State Route 130. The well is approximately 65 feet from the road. The well is housed in a 6-foot by 8-foot brick enclosure with a concrete floor. The 10-inch steel casing extends approximately 5 inches above the concrete floor. The well is drilled to a depth of 320 feet. The 10-inch casing is set to a depth of 73 feet. The reported well yield is 125 gpm.

Well No. 3: This well is located opposite the storage reservoir approximately $^1/_4$ mile east of State Route 684 on a gravel road. The well is housed within a 5-foot by 5-foot brick enclosure with a concrete floor. The 10-inch well casing extends approximately 8 inches above grade. The reported well yield is 125 gpm.

Well No. 4: This well is located at the corner of 7th and Gordon Streets on State Route T-1102 approximately 200 feet south and is housed in an "L" shaped concrete block enclosure. The pump room is 13 feet by 10.5 feet with the casing located approximately at the center. The enclosure's floor extends approximately 5 feet above grade. The well is reported to be 317 feet deep, cased with 16-inch casing to 122 feet, 12-inch casing to 170.5 feet, and 10-inch black pipe to an unknown depth. The pumping capacity is reported to be 1,200 gpm; however, the well pump is throttled to 640 gpm.

2.1.7 Town of Goshen (2006 Population: 397)

System Overview
This system consists of a spring, chlorination and booster pumping system, a 125,000 gallon standpipe and distribution system of eight inch and smaller water lines.

Source Water

The spring (estimated dry weather yield greater than 310,000 gpd) outcrops in a low isolated area northwest of town along Mill Creek but segregated from it by the railroad tracks. A heavy concrete impoundment traps the flow. A screened overflow and an eight inch distribution main leave the structure. The outcrop is at the base of a hollow with a drainage area wooded. The Town of Goshen leases the spring from the Tutwiler Estate which is being managed by the Union Planters Bank and Trust Company of Memphis, Tennessee.

2.1.8 Highland County (2006 Population: 2,446)

System Overview

The Highland System (McDowell) is composed of two distinct segments. The new portion is served by two wells and eight inch PVC distribution lines. The old system is served by a spring and three inch cast iron and galvanized steel distribution lines. The systems are interconnected at several locations.

Source Water

Well System: Well number 1 is 6 inches in diameter, 275 feet deep and cased with 100 feet of six inch diameter casing. A 48 hour pump test yielded a flow of 15 gpm at a drawdown level of 250 feet. Static levels of both wells indicate artesian characteristics.

Well number 2 is 8 inches in diameter, 506 feet deep, and cased with 100 feet of 8 inch diameter casing. A 48 hour pump test yielded a flow rate of 15 gpm at a stabilized drawdown level of 355 feet.

Spring System: The old system has a spring source (elev. 2272) obtained from the discharge at the mouth of a cavern approximately 3 miles north of McDowell off State Route 654. The screened intake delivers water through a three inch cast iron pipe to the treatment facility located approximately 1/3 mile below the source and directly behind Stonewall Recreation Park. The spring is not owned by the Highland County Board of Supervisors. An existing agreement between the owner and the Board of Supervisors states that there will be no limit placed on the amount consumed but limits access to a maximum four inch conveyance. The spring feeds directly into the nine foot by 19 foot pre-cast treatment building.

2.1.9 Town of Iron Gate (2010 Population: 388)

System Overview

Water for the Town of Iron Gate is supplied by the Town of Clifton Forge via Alleghany County. The Town of Iron Gate does not operate a water treatment plant but is responsible for billing and administration of its system. Water supply agreements between the Town of Iron Gate, Clifton Forge, and Alleghany County are in place outlining water supply and distribution. All water connections are metered in the Town of Iron Gate. The Town of Iron Gate supplies water to the Wesgate water system in Alleghany County, as well as to one private community in Botetourt County. Recent upgrades to the Town of Iron Gate municipal community water system storage consists of a 0.25 MG tank. Distribution includes booster station located adjacent to the storage tank. An 8-inch master meter located on US 220 records all water purchased by the Town of Iron Gate from Alleghany County.

Water Source

Water for the Town of Iron Gate is supplied by the Town of Clifton Forge (Smith Creek) via Alleghany County from an extension of the Cliftondale Park/Wilson Creek/Sharon system. The Town of Iron Gate municipal community water system in turn sells bulk treated water to the Wesgate subdivision municipal community water system, which is owned and operated by Alleghany County (Countywide Water/Sewer/Drainage Study, Alleghany County, Virginia).

2.1.10 City of Lexington (2006 Population: 7,206)

The City of Lexington purchases water from the Maury Service Authority (MSA) community water system.

Maury Service Authority Overview

This facility is a high rate water treatment plant utilizing raw water from the Maury River with the intake located approximately 1.3 miles upstream of the City of Lexington. This facility supplies water to two consecutive systems, the City of Lexington and the Rockbridge County Public Service Authority's North Lexington system.

Maury Service Authority Source Water

The intake structure, which draws water from a small check dam, is equipped with a bar screen and a wire mesh screen series, both manually cleaned, with the raw water conveyed by gravity from the intake structure at the river's southern bank to the pumping station through a 16-inch cast iron water line. The primary raw water pumping station is of the wet well type and is equipped with two vertical turbine pumps powered by 75 hp electric motors with one pump capable of delivering 1400 gpm [2.0 MGD]. The secondary (older) raw water pumping station is equipped with two raw water pumps each capable of delivering 970 gpm [1.4 MGD]. Raw water is pumped through approximately 1,800 feet of 16-inch cast iron water line to the water treatment plant. The design basis of the treatment facility is 4.0 mgd (Virginia Department of Health, Engineering Description Sheet, May 4, 2004).

2.1.11 Town of Monterey (2010 Population: 147*)

***** The Town of Monterey conducts an annual count of its residents. In 2011, the town counted 215 residents rather than 147 residents counted in the 2010 Census.

System Overview

The system consists of three drilled wells, chlorination facilities, and distribution pipes to the Town of Monterey.

Source Water

Well No. 1 is located approximately ¼ mile south of the intersection of U.S. Route 220 and U.S. Route 250. This well is drilled to a depth of 360 feet. The well is 10 inches in diameter from 0 to 100 feet and 6 inches in diameter from 100 feet to 360 feet. The well is cased with 6¾-inch diameter steel casing to a depth of 100 feet, and a 6-inch diameter steel inner casing extends to a depth of 100 feet. The well was pump tested at 70 gpm for a period of 48 hours. The well head is located in a 15-foot x 20-foot brick building that is provided with a concrete floor and a floor drain.

Well No. 2 is located just off U.S. Route 250 approximately ½ mile west of Monterey. The well is located approximately 50 feet from the Town's 74,262-gallon water storage tank. The well is drilled to a depth of 840 feet and is cased with 12-inch diameter steel casing to a depth of 61.5 feet, and an inner 8-inch diameter steel casing extends from the top of the well to a depth of 141 feet. This well has a natural artesian flow of approximately 5 gpm, and the well head is equipped with a screened drain. The well was pump tested at 19 gpm for a period of 48 hours. The well is manually controlled.

Well No. 3 is located on the west side of U.S. Route 220 approximately 1,000 feet south of the intersection of U.S. Route 220 and U.S. Route 250 next to the new medical facility. The well was drilled in August 2002 and is 10 inches in diameter to a depth of 105 feet and 6 inches in diameter from 105 feet to a total depth of 805 feet. The well is cased with 6¼-inch steel casing to a depth of 105 feet and is pressure grouted with cement grout to a depth of 100 feet. The well yield, following a 48-hour yield test in February 2003, was 53 gpm with a drawdown of 581 feet. The pumps are controlled manually and a control valve is provided on the well discharge line to throttle the flow from the submersible pump to match the booster pump output.

2.1.12 Rockbridge County (2006 Population: 21,498)

System Overview

The Rockbridge County Public Service Authority owns the Natural Bridge Station/Arnolds Valley water system, Long Hollow Water Development, Route 251 System and Rivermont Heights. In addition, water is purchased from the Maury Service Authority. A description of the Maury Service Authority system and source is included in Section 2.1.10.

Source Water

Natural Bridge/Arnolds Station: The well is drilled to a depth of 870 feet. The well is cased with 10-inch diameter steel casing to a depth of 286 feet 5 inches. The pump is rated at 100 gpm at 520 feet TDH. The well discharge is provided with a water meter. A sustained yield of 103.1 GPM for the well was determined by a 72-hour pump test. This water system is connected to the Natural Bridge Station water supply system that is also owned by Rockbridge County Public Service Authority. A valve in the line connecting these two systems is normally closed but can be opened when necessary. The Natural Bridge Station water system provides the necessary backup source of water for Arnolds Valley.

Rivermont Heights: This is a consecutive waterworks that receives all of its water from the City of Buena Vista. A concrete meter vault is located at the entrance to Rivermont Heights just off U.S. Route 60.

Route 251 System: The source of water for this system is a metered connection with the City of Lexington located near the booster pumping station. The City purchases water from the Maury Service Authority, which is a wholesale provider of potable water to the City of Lexington and the Rockbridge County Public Service Authority.

Longhollow Development: Consists of two drilled wells. The waterworks has a contract with the City of Buena Vista to receive 60,000 gpd.

Well 1: This well, drilled in 1974, is housed in an block building located on Hevener Drive. The well is 13 inches in diameter to a depth of 100 feet, 8 inches in diameter from 100 to 245 feet, and 6 inches in diameter from 245 to 325 feet. Water is pumped from the well by a 7.5 hp submersible pump rated at 50 gpm. A 48-hour yield test performed in 1995 indicated a well yield of 20gpm with a stabilized water level of 233 feet.

Well 2: This well, drilled in 1995, is located adjacent to Well No. 1. The well is 10 inches in diameter to a depth of 230 feet. And 6 inches in diameter from 230 to 850 feet. Water is pumped from the well by a 10hp submersible pump rated at 25gpm at 1,050 feet TDH into a systems high pressure zone.

2.2 Private Community Water Systems on Groundwater

2.2.1 Brownsburg (Rockbridge County)

System Overview

This system is owned by the Brownsburg Water Company. It consists of three wells, a pump house and a ground storage tank.

Source Water

Well 1: This 6-inch well is 400 feet deep with 6-inch casing and a sanitary cap and is grouted to a depth of 50 feet. Well yield is reported to be 15 gpm.

Well 2: This well is located in an 18 inch high block structure adjacent to Well 1. It is 250 feet deep and is said to produce 25 gpm. The depth of the grout and casing is unknown; however, the casing extends 12 inches above grade and is capped and vented.

Well 3: This well is located northwest of the well house. It is 10 inches wide to a depth of 103 feet and 6 inches wide from 103 feet to 500 feet. It is grouted and cased with 6 inch casing to 103 feet.

2.2.2 Johnson's Mobile Home Park (Rockbridge County)

System Overview

The water system consists of one drilled well, treatment processes and storage tanks.

Source Water

The well has two casings, the inner casing is 6-inches in diameter an the other casing is 10-inches in diameter. The well is grouted between the two casings. The casing extends approximately 12 inches above grade. The well has a sanitary seal and screened vent. It is housed within a concrete block structure.

2.2.3 Long Hollow Water Development Company (Rockbridge County)

System Overview
This system is owned and operated by the Rockbridge County Public Service Authority. It has two distinct but contiguous zones. Zone A has as its principal source a well and as an alternate source the City of Buena Vista. Zone B has as its only source the City of Buena Vista.

The well is housed in an 8 foot by 8 foot block building. The well is drilled to a total depth of 325 feet. The well width is 13 inches to a depth of 100 feet, 8 inches from 100 to 245 feet and 6 inches from 245 to 325 feet. The top 100 feet is grouted to an 8-inch well casing. This source has a demonstrated yield of 45 gpm.

Water from Buena Vista is supplied in accordance with a contract between the City and the Long Hollow Road Water Company which contains no restrictions on usage (Virginia Department of Health, Engineering Description Sheet, October 12, 1992).

2.2.4 Natural Bridge Juvenile Correctional Center (Rockbridge County)

System Overview
The waterworks consists of one drilled well, a storage tank, booster pumps, and treatment.

Source Water
The well casing is 8-inches in diameter and extends approximately 12 inches above grade. No other construction details or reliable well yield is known.

2.2.5 Shady Grove Mobile Home Park (Rockbridge County)

System Overview
This water system consists of one drilled well and two pressure tanks. It is owned by F& W Investments.

Source Water
This well is housed in an approximate 2-foot pit of a 2-foot diameter concrete pipe section with a gravel floor. The well casing extends approximately 4 inches above the gravel floor and is approximately 2 feet below grade. The well is provided with a sanitary seal, screened casing vent, check valve, and sample tap (Virginia Department of Health, Engineering Description Sheet, August 6, 2005).

2.2.6 Warm Springs Water Association (Bath County)

System Overview
The water system consists of two springs, one well, and a water storage tank.

Source Water
Klondike and Alvey Springs: Klondike is the primary source of supply. Both springs are located in stone and concrete buildings with wood roofs. Water from each spring flows by gravity to

separate storage basins. From there it is distributed to the system (Virginia Department of Health, Engineering Description Sheet, June 1, 1978, May 29, 1987).

Well: The well is located near Klondike Spring. It is cased with 6-inch diameter steel casing and grouted to a depth of 100 feet. The well casing extends approximately 3 feet above the ground surface and is equipped with a sanitary seal and a 6-foot square concrete pad. This well pumps to the storage tank for Klondike spring (Virginia Department of Health, Engineering Description Sheet, June 1, 1978, May 29, 1987.)

2.2.7 Mountain Lake (Alleghany County)

System Overview
The Mountain Subdivision community water system is a privately owned and operated facility that serves approximately 15 residences.

Source Water
The water source is a well with a 3,000 gallon storage tank. Water is chlorinated prior to distribution. (*Countywide Water/Sewer/Drainage Study, Alleghany County, Virginia*).

2.3 Private Community Water Systems Using Streams, Rivers or Springs

2.3.1 Longdale Furnace (Alleghany County)

System Overview
The Longdale Furnace system is a privately owned and operated facility located in eastern Alleghany County.

Source Water
The water source is a spring permitted to serve approximately 92 residents on the original 49 parcels of Longdale Furnace. The system has no finished water storage capacity.

2.3.2 Millboro Community Water System (Bath County)

System Overview
This system is owned by the Millboro Water Association, Inc. The spring is located on the left side of State Route 633 leaving the community of Millboro. The spring is enclosed with a concrete foundation and cinderblock superstructure. The water flows by gravity through an 8-inch water main from the tank to the distribution system.

2.3.3 Homestead Water Company (Bath County)

System Overview
This system is owned by The Homestead Water Company. It consists of the Cascade Spring, Chaplin spring system (18 springs), and the McAllister spring system (18 springs) and includes treatment by membrane filtration and chlorination, four gravity storage tanks, three booster pump stations and distribution piping.

Source Water

Cascade Spring: This spring is located at elevation 2,160 feet above msl, on the west side of U.S. Route 220 near the Cascades Club. Water from the unprotected spring flows into a catchment basin. Two pumps are in place to transfer water to the Rubinot Reservoir. The estimated safe yield is 864,000 gpm.

Chapin Reservoir and Spring System: This system includes 18 springs. Seventeen (17) of the springs are known collectively as the G.W. Smith springs and one additional spring is the W. H. Smith spring. The springs are enclosed with stone and mortar construction with metal roofs. The water is collected through a network of piping that discharges into the Chaplin Reservoir. This is a concrete construction raw water reservoir. The estimated safe yield of the spring system is 30,000 gpd. Water from this system flows by gravity to the Rubinot Reservoir.

McAllister Reservoir and Spring System: This system includes 18 separate springs. Eleven (11) of the springs are known collectively as the McAllister springs and 7 are known as the C.L. Smith springs. The springs are enclosed with stone and mortar construction with metal roofs. The water is collected through a network of piping which discharges into the McAllister concrete raw water reservoir. The estimated safe yield of the spring system is 100,000 gpd. Water flows from the reservoir by gravity into Rubinot Reservoir.

Rubinot Reservoir: The Rubinot Reservoir serves a raw water collection tank prior to water treatment (Virginia Department of Health, Engineering Description Sheet, October 10, 2007).

2.3.4 Piney Ridge (Bath County)

System Overview

This system is owned by The Homestead Water Company, L.C. It includes two spring sources, a concrete reservoir.

Source Water

Keyser and Jackson Springs are located within approximately 100 yards of each other in a hollow at the 3,000-foot elevation on Warm Springs Mountain between Cascades and Ashwood. Both springs are enclosed in stone and concrete spring houses with roofs. They discharge collectively into a combined metered line that flows to the Piney Ridge chlorination and reservoir building (Virginia Department of Health, Engineering Description Sheet, January 19, 1993).

2.4 Large Self-Supplied Users of More Than 300,000 Gallons Per Month

As required by the DEQ regulations, this section describes information for Large Self-Supplied Users of more than 300,000 gallons per month. The following information was obtained from the Virginia Department of Environmental Quality's Water Use Database.

There are three agricultural self-supplied users of more than 300,000 gallons per month of surface water. The water withdrawn comes from four different sources. Three of the four sources are used for fish hatchery operations. In these cases, most water is being returned to the source.

The remaining users listed are those who use more than 300,000 gallons per month of surface or groundwater for non-agricultural purposes.

2.4.1 David J. Tardy, Buffalo Farms (Agricultural User) (Rockbridge County)

Buffalo Farm withdraws water from Buffalo Creek. In 2002, 1,068,492 gallons per month were used for irrigation purposes. Data for this user was only available for 2002. No data was reported for 2003 or 2006. (Virginia Department of Environmental Quality, Water Withdrawal Database.)

2.4.2 Commonwealth of Virginia, Coursey Spring Fisheries (Agricultural User) (Bath County)

The Coursey Springs Fish Hatchery is owned and operated by the Commonwealth of Virginia. The facility withdraws water from Coursey Spring. 357,444,190 gallons per month were withdrawn in 2006. Because of the nature of this facility, not all water withdrawn is consumptive. A majority of water is returned. (Virginia Department of Environmental Quality, Water Withdrawal Database.)

2.4.3 Virginia Trout Company, Terry Place Plant and Monterey Plant (Agricultural User) (Highland County)

Terry Place Plant and Monterey Plant are owned by the Virginia Trout Company as fish hatcheries. The Terry Place facility withdraws water from Blue Spring. In 2006, 111,673,971 gallons per month were withdrawn from the Blue Spring. The Monterey facility withdraws water from Vandevender Spring. In 2006, 61,734,246 gallons per month were withdrawn from Vandevender Spring. Because of the nature of these facilities, not all water withdrawn is consumptive. A majority of water is returned. (Virginia Department of Environmental Quality, Water Withdrawal.)

2.4.4 The Homestead, L.C., Cascades Golf Course (Non-Agricultural User) (Bath County)

The Homestead, L.C., is a surface-water user of more than 300,000 gallons per month. The facility is located in Bath County and is owned and operated by the Homestead. There are three sources that contribute to the facility. They include, Cascades Creek, the Lower Cascades and Hot Springs Run. The following table reflects the withdrawal data for all sources in 2006 (Virginia Department of Environmental Quality, Water Withdrawal).

Source	2006 Withdrawal Data
Cascades Creek (SW)	568,767 gallons per month
Lower Cascades (SW)	882,408 gallons per month
Hot Springs Run (SW)	1,187,178 gallons per month

2.4.5 Modine Manufacturing Company, Buena Vista Plant (Non-Agricultural User) (City of Buena Vista)

Modine Manufacturing Company is a surface-water user of more than 300,000 gallons per month. The Buena Vista Plant is owned and operated by Modine Manufacturing Company. The facility withdraws water from an unnamed spring. In 2006, 1,916,370 gallons per month were withdrawn. (Virginia Department of Environmental Quality, Water Withdrawal Database.)

2.4.6 Stillwater, Inc., Goshen Plant (Non-Agricultural User) (Town of Goshen)

Stillwater, Inc. is a surface-water user of more than 300,000 gallons per month. The Goshen Plant is owned and operated by Stillwater, Inc. The facility withdraws water from the Calfpasture River. 9,009,945 gallons per month were withdrawn in 2002. There is no data available for 2003 or 2006. The facility is no longer in operation. (Virginia Department of Environmental Quality, Water Withdrawal Database.)

2.4.7 Lexington Golf and Country Club (Non-Agricultural User) (City of Lexington)

The Lexington Golf and Country Club is a surface-water user of more than 300,000 gallons per month. The Lexington Golf Course is owned and operated by the Lexington Golf and Country Club. The facility withdraws water from a Coe Spring. In 2006, 757,479 gallons per month were withdrawn. (Virginia Department of Environmental Quality, Water Withdrawal Database.)

2.4.8 Bontex, Inc., Buena Vista Plant (Non-Agricultural User) (City of Buena Vista)

Bontex, Inc. is a surface-water user of more than 300,000 gallons per month. The Buena Vista Plant is owned and operated by Bontex, Inc. The facility withdraws water from the Maury River. In 2006, 5,000,547 gallons per month were withdrawn. (Virginia Department of Environmental Quality, Water Withdrawal Database.)

2.4.9 Dominion Virginia Power, Bath County Pumped Storage (Non-Agricultural User) (Bath County)

Dominion Virginia Power is a surface and groundwater user of more than 300,000 gallons per month. It is important to note that although this user withdraws over 300,000 gallons per month not all is consumed.

The Bath County Pumped Storage facility is owned and operated by Dominion Virginia Power. VWP Permit No. 01-964, which expires in November of 2016, does not define a withdrawal amount from the streams. Instead, a minimum release is established from two storage reservoirs back into the streams on which the reservoirs sit. The instantaneous release from the upper reservoir will be equal to or greater than 1.29 mgd and the daily average release from the lower reservoir will be greater than or equal to the difference between 9.69 million gallons and the daily average release from the upper reservoir. At no time will the lower reservoir release be less than 10 cfs (Virginia Water Protection Permit 01-964).

There are three sources that contribute to the facility. They include, Back Creek, the Beaver Run Well #1 and Beaver Run Well #2. The following table reflects the withdrawal data for all sources in 2006 (Virginia Department of Environmental Quality, Water Withdrawal Database). Wells 1 and 2 are consumptive but Back Creek is non-consumptive. The non-consumptive flow from Back Creek is used to supply flow through the recreation ponds. Water is pumped from Back Creek into the northern pond and flows by gravity to the southern pond and passes back into Back Creek nearly a mile downstream from the withdraw point. The largest flow reported is the 6 pump-generator turbines that produce electricity. The facility consists of two large reservoir impoundments. The upper reservoir is 100 feet above the lower reservoir. The inflow for the entire project is solely dependent on the flow from Back Creek. Water is pumped through the power tunnels during off-peak times from the lower to the upper reservoir. Water is continuously being cycled up and down between the two reservoirs but is not consumed or used in the process. The reservoir discharges are regulated by FERC and VWPP (Bath County Power Station).

Source	Water Withdrawal Data
Back Creek (SW)	34,250,958 gallons per month
Beaver Run Well # 1 (GW)	257,400 gallons per month
Beaver Run Well # 3 (GW)	205,428 gallons per month

2.4.10 Natural Bridge of Virginia (Rockbridge County)

No information available at this time.

2.4.11 Buena Vista Golf Course

No information available at this time.

2.4.12 Mohawk-Lee's Carpet, Glasgow Plant of Lee's Carpet (Non-Agricultural User) (Town of Glasgow)

The Glasgow Plant of Mohawk-Lee's Carpet is a groundwater user of more than 300,000 gallons per month. There are three sources that contribute to the facility. They include, purchase from the Town of Glasgow, Well #2 and Well #3. The following table reflects the withdrawal data for all sources in 2006. (Virginia Department of Environmental Quality, Water Withdrawal Database.)

Source	Water Withdrawal Data
From Town of Glasgow (GW)	470,940 gallons per month
Well #2 (GW)	8,498,728 gallons per month
Well #3 (GW)	12,271,230 gallons per month

2.4.13 Commonwealth of Virginia, Douthat State Park (Non-Agricultural User) (Alleghany County)

The Douthat State Park system is a groundwater user of more than 300,000 gallons per month. There are two sources that contribute to the facility. They include Well A and Well B. The

following table reflects the withdrawal data for all sources in 2006 (Virginia Department of Environmental Quality, Water Withdrawal Database.)

Source	Water Withdrawal Data
Well A (GW)	281,259 gallons per month
Well B (GW)	203,178 gallons per month

Note: Douthat is now served by Alleghany County's Cliftondale Park/Wilson Creek/ Sharon System.

2.5 Water Purchased Outside of the Geographic Planning Area

As required by the DEQ regulations this section provides an overview all source water purchased and water available to be purchased outside of the geographic Planning Area.

2.5.1 Water Purchased Outside the Geographic Planning Area

There is no groundwater or surface water purchased from water supply systems outside the geographic boundaries of the Upper James Planning Area.

2.5.2 Water Available to be Purchased Outside of the Geographic Planning Area

There are no existing contracts or known current planning efforts to purchase water from outside of the Upper James Planning Area.

2.6 Self-Supplied Users of Groundwater on Individual Wells Withdrawing Less Than 300,000 Gallons Per Month

As required by DEQ regulations, this section provides an estimate of the number of residences and businesses supplied by individual wells and an estimate of the population served by individual wells. Information on self-supplied users on individual wells is presented in Appendix A, Section 70J.

2.6.1 Alleghany County

To capture the number of self-supplied users for Alleghany County, including the Towns of Clifton Forge and Iron Gate, 2000 Census population estimates were compared with 2007 all community water systems data for the population and households served. In 2007, the estimated population for Alleghany County was 16,334 (11,976 without towns of Clifton Forge and Iron Gate). Of the total population, 8,034 were served by Community Water Systems.

To determine the number of self-supplied users on individual wells less than 300,000, the population served by community water systems is subtracted from the total population. A population per household factor (2.32 persons per household) is then applied to determine the number of residences.

Alleghany County - 2007	
Estimated Population Served by Individual Wells	8,300
Estimated Number of Residences served by Wells	3,578
Estimated Number of Businesses served by Wells	5

2.6.2 Bath County

To capture the number of self-supplied users for Bath County, 2006 Census population estimates were compared with 2006 CWS data for the population and households served. In 2006, the estimated population for Bath County was 5,048. Of the total population, 4,600 were served by community water systems.

To determine the number of self-supplied users on individual wells less than 300,000, the population served by community water systems is subtracted from the total population. A population per household factor (2.34 persons per household) is then applied to determine the number of residences.

Bath County - 2006	
Estimated Population Served by Individual Wells	448
Estimated Number of Residences served by Wells	191
Estimated Number of Businesses served by Wells	8

2.6.3 Rockbridge County (Including Towns)

To capture the number of self-supplied users for Rockbridge County, including the Towns of Goshen and Glasgow, 2006 Census population estimates were compared with 2006 community water systems data for the population and households served. In 2006, the estimated population for Rockbridge County was 22,379. Of the total population, 4,400 were served by Community Water Systems.

To determine the number of self-supplied users on individual wells less than 300,000, the population served by community water systems is subtracted from the total population. A population per household factor (2.43 persons per household) is then applied to determine the number of residences.

Rockbridge County - 2006	
Estimated Population Served by Individual Wells	17,979
Estimated Number of Residences served by Wells	7,399
Estimated Number of Businesses served by Wells	25

2.6.4 Highland County (Including Monterey)

To capture the number of self-supplied users for Highland County, including the Town of Monterey, 2006 Census population estimates were compared with 2006 community water systems data for the population and households served. In 2006, the estimated population for Highland County was 2,586. Of the total population, 675 were served by Community Water Systems.

To determine the number of self-supplied users on individual wells less than 300,000 the population served by community water systems is subtracted from the total population. A population per household factor (2.43 persons per household) is then applied to determine the number of residences.

Highland County - 2006	
Estimated Population Served by Individual Wells	1,911
Estimated Number of Residences served by Wells	853
Estimated Number of Businesses served by Wells	1

Section 2.7 Source Water Assessment Plans and Wellhead Protection Programs for Municipal Community Water Systems

As required by the DEQ regulations this section provides a summary of findings and recommendations from all source water assessment plans and wellhead protection programs. The following information was obtained from Virginia Department of Health Source Water Assessment Reports.

2.7.1 Bath County Service Authority

Susceptibility to contamination is moderate at the well. Groundwater source constructed in an area that promotes migration of contaminants with no land use activities of concern or potential conduits to groundwater in the Zone 1 assessment area nor potential sources of contamination in the Zone 1 or Zone 2 assessment areas. (Virginia Department of Health, Source Water Assessment Report, April 18, 2002.)

2.7.2 Bath County Service Authority – Regional Water

Susceptibility to contamination is moderate at the well. Groundwater source constructed in an area that promotes migration of contaminants with no land use activities of concern or potential conduits to groundwater in the Zone 1 assessment area nor potential sources of contamination in the Zone 1 or Zone 2 assessment areas. (Virginia Department of Health, Source Water Assessment Report, April 18, 2002.)

2.7.3 Bath County Service Authority – Cedar Creek

Susceptibility to contamination is high in Cedar Creek well. Groundwater source constructed in an area that promotes migration of contaminants with land use activities of concern in the Zone 1 assessment area. (Virginia Department of Health, Source Water Assessment Report, April 18, 2002.)

2.7.4 Bath County Service Authority – Clifton Forge Mountain

Susceptibility to contamination is high in Well #1. Groundwater source constructed in an area that promotes migration of contaminants with land use activities of concern in the Zone 1 assessment area. (Virginia Department of Health, Source Water Assessment Report, April 18, 2002.)

2.7.5 City of Buena Vista – Dickenson Well, French Post Well, Laurel Park Well and Halls Spring

Susceptibility to contamination is high at Dickenson Well, French Post Well, Laurel Park Well, and Halls Spring. Groundwater source constructed in an area that promotes migration of contaminants with land use activities of concern and potential conduits to groundwater in the Zone 1 assessment area and potential sources of contamination in the Zone 1 or Zone 2 assessment areas. (Virginia Department of Health, Source Water Assessment Report, June 5, 2002.)

2.7.6 City of Buena Vista – Park Avenue Well

Susceptibility to contamination is high at Park Avenue Well. Groundwater source constructed in an area that promotes migration of contaminants with potential sources of contamination in the Zone 1 and Zone 2 assessment areas. (Virginia Department of Health, Source Water Assessment Report, February 13, 2003.)

2.7.7 Town of Clifton Forge

Susceptibility to contamination is high at Smith Creek. Surface water exposed to an inconsistent array of contaminants at varying concentrations due to changing hydrologic, hydraulic and atmospheric conditions with no land use activities of concern in Zone 1 assessment area. Susceptibility due to contamination is minimal in Smith Creek whose water source is located in the George Washington National Forest (Virginia Department of Health, Source Water Assessment Report, April 9, 2002.). However, the portion of Smith Creek providing the Clifton Forge water supply has no upstream industry, agriculture or population therefore risk factors are lower than most systems.

2.7.8 City of Covington

Susceptibility to contamination is high at Jackson River. Surface water exposed to an inconsistent array of contaminants at varying concentrations due to changing hydrologic, hydraulic and atmospheric conditions with land use activities of concern in Zone 1 assessment area. (Virginia Department of Health, Source Water Assessment Report, May 22, 2002.)

2.7.9 Town of Glasgow

Wells #2 and #3 are in forest area. Land clearing and housing development are presently occurring topographically up gradient of both wells. The Town and County should work together to develop controls on logging and development designed to protect the integrity of the public wells and existing private wells on Sallings and Miller Mountains. Well #4 should educate homeowners and businesses about fuel and chemical storage tanks, commercial automobile maintenance and repair operations. Residential use of pesticides and fertilizers. (Virginia Department of Health, Source Water Assessment Report, July 29, 2005.)

2.7.10 Town of Goshen

Susceptibility to contamination is high at Goshen Spring. Groundwater exposed to an inconsistent array of contaminants at varying concentrations due to changing hydrologic, hydraulic and atmospheric conditions with land use activities of concern in Zone 1 assessment area. (Virginia Department of Health, Source Water Assessment Report, April 18, 2002.)

2.7.11 Highland County – McDowell System

Susceptibility to contamination is high at Well #1 and Well #2. Groundwater source constructed in an area that promotes migration of contaminants with potential sources of contamination in the Zone 1 or Zone 2 assessment areas. (Virginia Department of Health, Source Water Assessment Report, May 23, 2002.)

2.7.12 Maury Service Authority

Susceptibility to contamination is high at Maury River. Surface water exposed to an inconsistent array of contaminants at varying concentrations due to changing hydrologic, hydraulic and atmospheric conditions with land use activities of concern in Zone 1 assessment area. (Virginia Department of Health, Source Water Assessment Report, May 22, 2002.)

2.7.13 Town of Monterey

Susceptibility to contamination is high at Well #3. Groundwater source constructed in an area that promotes migration of contaminants with land use activities of concern and potential conduits to groundwater in the Zone 1 assessment area and a potential sources of contamination in the Zone 1 and Zone 2 assessment areas. (Virginia Department of Health, Source Water Assessment Program, May 30, 2003.)

2.7.14 Town of Monterey

Well #1: High Risk - No Recommendations, Well #2: High Risk - No Recommendations (Virginia Department of Health, Source Water Assessment Report, May 23, 2002.)

2.7.15 Rockbridge County – Long Hollow Development

Susceptibility to contamination is high at LHWDC Well #1 and at Well #2. Groundwater source constructed in an area that promotes migration of contaminants with land use activities of concern and potential conduits to groundwater in the Zone 1 assessment area and potential sources of contamination in the Zone 1 or Zone 2 assessment areas. (Virginia Department of Health, Source Water Assessment Report, May 28, 2002.)

2.7.16 Rockbridge County – Natural Bridge Station/Arnold's Valley

Susceptibility to contamination is high at NB Station Well. Groundwater source constructed in an area that promotes migration of contaminants with land use activities of concern and potential conduits to groundwater in the Zone 1 assessment area and/or potential sources of contamination in the Zone 1 or Zone 2 assessment areas.

Three recommendations resulted from the Wellhead Protection Program, July 21, 2006. They include, educate public, put up signs and have an emergency plan. (Educate public; put up signs; have emergency plan.)

2.8 Source Water Assessment Plans and Wellhead Protection Programs for Private Community Water Systems

As required by the DEQ regulations this section provides and summary of findings and recommendations from all source water assessment plans and wellhead protection programs. The following information was obtained from Virginia Department of Health Source Water Assessment Reports.

2.8.1 Bath County – The Homestead Water Company, L.C. – Chaplin Springs, Old Dairy Springs, Cascades Springs and McAllister Springs

Susceptibility to contamination is moderate to Chaplin Springs, high in Old Dairy Springs, high in Cascade Springs, high in McCallister Springs. Groundwater source constructed in an area that promotes migration of contaminants with no land use activities of concern or potential conduits to groundwater in the Zone 1 assessment area nor potential sources of contamination in the Zone 1 or Zone 2 assessment areas. (Virginia Department of Health, Source Water Assessment Report, May 22, 2002.)

2.8.2 Bath County – The Homestead Water Company, L.C. – Piney Ridge

Susceptibility to contamination is moderate at Keyser/Jackson Spring #1, moderate at Keyser/Jackson Spring #2. Groundwater source constructed in an area that promotes migration of contaminants with no land use activities of concern or potential conduits to groundwater in the Zone 1 assessment area nor potential sources of contamination in the Zone 1 or Zone 2 assessment areas. (Virginia Department of Health, Source Water Assessment Report, May 22, 2002.)

2.8.3 Bath County – Millboro Water Association

Susceptibility to contamination is high at Big Spring, high at the Well. Groundwater source constructed in an area that promotes migration of contaminants with land use activities of concern in the Zone 1 assessment area. (Virginia Department of Health, Source Water Assessment Report, May 22, 2002.)

2.8.4 Bath County – Warm Springs Water Association

Susceptibility to contamination is high at Klondike Spring, high at Alvey Spring, and high at the well. Groundwater source constructed in an area that promotes migration of contaminants with land use activities of concern in the Zone 1 assessment area and/or potential sources of contamination in the Zone 1 or Zone 2 assessment areas. (Virginia Department of Health, Source Water Assessment Report, May 23, 2002.)

2.8.5 Rockbridge County – Brownsburg Water Company

Susceptibility to contamination is high at Well #1, Well #2 and Well #3. Groundwater source constructed in an area that promotes migration of contaminants with land use activities of concern and potential conduits to groundwater in the Zone 1 assessment area and/or potential sources of contamination in the Zone 1 or Zone 2 assessment areas. (Virginia Department of Health, Source Water Assessment Report, May 23, 2002.)

2.8.6 Rockbridge County – Johnson's Mobile Home Park

Susceptibility to contamination is high at Johnson's Well. Groundwater source constructed in an area that promotes migration of contaminants with land use activities of concern and potential conduits to groundwater in the Zone 1 assessment area and/or potential sources of contamination in the Zone 1 or Zone 2 assessment areas. (Virginia Department of Health, Source Water Assessment Report, May 28, 2002.)

2.8.7 Rockbridge County – The Manor at Natural Bridge

Susceptibility to contamination is high at Manor Well. Groundwater source constructed in an area that promotes migration of contaminants with land use activities of concern in the Zone 1 assessment area. (Virginia Department of Health, Source Water Assessment Report, May 24, 2002.)

2.8.8 Rockbridge County – Natural Bridge Juvenile Correctional Center

Susceptibility to contamination is high at NBJC Well. Groundwater source constructed in an area that promotes migration of contaminants with land use activities of concern and potential conduits to groundwater in the Zone 1 assessment area and potential sources of contamination in the Zone 1 or Zone 2 assessment areas. (Virginia Department of Health, Source Water Assessment Report, May 28, 2002.)

2.8.9 Rockbridge County – Shady Grove Mobile Home Park

Susceptibility to contamination is high at the Well. Groundwater source constructed in an area that promotes migration of contaminants with land use activities of concern in the Zone 1 assessment area. (Virginia Department of Health, Source Water Assessment Report, May 29, 2002.)

3.0 EXISTING WATER USAGE (9 VAC 25-780-80)

Section 80 of the regulation requires a description of existing water use. These data are compiled from the following sources: the Virginia Department of Health (VDH) and the Virginia Department of Environmental Quality (VDEQ) databases and information provided directly from the individual localities and water purveyors. Please note that all related spreadsheets for Section 80 are attached as Appendix A and included on a CD at the back of this report.

Data is presented for different years for the Central Shenandoah Planning District Commission (CSPDC) communities than for the Roanoke Valley-Alleghany Regional Commission (RVARC) communities. For the CSPDC communities, a detailed description of water usage within the planning area for Years 2002, 2003, and 2006 are included in the Section 80 spreadsheets included as Appendix A. Years 2002 and 2003 were chosen to indicate differences in usage and source water availability during a drought year followed directly by a wet water year. The Year 2006 was chosen to represent the most current data for all CSPDC systems. For the RVARC communities, data is presented for Year 2007 only.

3.1 Municipal Community Water Systems

There are 27 municipal community water systems within the planning area, as described in Section 2.0. Alleghany County has 7 independent systems, Bath County has 6, Rockbridge County has 4 and the remaining 10 localities each have their own individual systems. Water sources within the planning area include groundwater, surface water reservoirs, surface springs, and stream intakes.

3A Central Shenandoah Planning District Community Localities

3A.1.1 Bath County

Bath County served an estimated population of 2,036 in 2006. Table 3-1 reveals the average and maximum daily withdrawal by the County for the study years.

Table 3-1
Bath Municipal CWS Average and Maximum Daily Withdrawals

Year	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
2002	.024	NI
2003	.018	NI
2006	.023	NI

Source: DEQ Water Withdrawal Database.

Maximum daily withdrawals could not be calculated based on data from DEQ, because it was not available for all sources for all years.

Based on data provided by the Bath County Service Authority, Table 3-2 reveals Bath County's disaggregated use by category and percentage of total use by category for the Year 2007. It is assumed that unaccounted-for-water losses would be equal to an average of 13% of the total demand, which is the national average as defined by the American Water Works Association.

Table 3-2
Bath County Municipal CWS 2007 Disaggregated Use

Disaggregated Category	Water Use (MGD)	Percentage of Total Usage (%)
Residential	0.0506	60
Commercial	0.0228	27
Industrial	0	0
Military	0	0
Production Processes	0	0
Other	0	0
Lost and Unaccounted	0.0109	13
Sale to Other Communities	0	0
Total	**0.0843**	**100**

Source: Bath County Public Service Authority.

3A.1.2 City of Buena Vista

The City of Buena Vista served an estimated population of 6,400 in 2006. Table 3-3 reveals the average and maximum daily withdrawal by the City for the study years.

Table 3-3
Buena Vista Municipal CWS Average and Maximum Daily Withdrawals

Year	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
2002	.353	NI
2003	.529	.730
2006	.278	1.686

Table 3-4 reveals the City of Buena Vista's disaggregated use and the percentage of total use by category for the Year 2006.

Table 3-4
Buena Vista Municipal CWS 2006 Disaggregated Use

Disaggregated Category	Water Use (MGD)	Percentage of Total Usage (%)
Residential	0.6475	50
Commercial	0.130	10
Industrial	0	0
Military	0	0
Production Processes	0	0
Other	0	0
Lost and Unaccounted	0.518	40
Sale to Other Communities	0	0
Total	**1.295**	**100**

Source: City of Buena Vista.

The City has a high percentage of water that is lost or unaccounted for. Buena Vista is currently in the process of seeking funding to upgrade its water supply system. It is anticipated that the unaccounted-for water loss percentage will decrease and be more in line with the national average of 13%, once upgrades are made.

3A.1.3 Town of Glasgow

The Town of Glasgow served an estimated population of 1,040 in 2006. Table 3-5 reveals the average and maximum daily withdrawal by the Town for the study years.

Table 3-5
Glasgow Municipal CWS Average and Maximum Daily Withdrawals

Year	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
2002	.086	.169
2003	.076	.142
2006	.081	.682

Source: DEQ Water Withdrawal Database.

Table 3-6 reveals the Town of Glasgow's disaggregated use and the percentage of total use by category for the Year 2006. It is assumed that the lost and unaccounted-for water percentage for the system is equal to the national average of 13%, as defined by AWWA.

Table 3-6
Town of Glasgow Municipal CWS 2006 Disaggregated Use

Disaggregated Category	Water Use (MGD)	Percentage of Total Usage (%)
Residential	0.2025	83
Commercial	0.002	1
Industrial	0.007	3
Military	0	0
Production Processes	0	0
Other	0	0
Lost and Unaccounted	0.032	13
Sale to Other Communities	0	0
Total	**0.244**	**100**

Source: Town of Glasgow.

3A.1.4 Town of Goshen

The Town of Goshen served an estimated population of about 500 in 2006. Table 3-7 reveals the average and maximum daily withdrawal by the Town for the study years.

Table 3-7
Goshen Municipal CWS Average and Maximum Daily Withdrawals

Year	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
2002	0.15	NI
2003	0.18	NI
2006	0.33	NI

Source: DEQ Water Withdrawal Database.

The Town of Goshen had a massive waver failure of its water system in 2007. At that time, the main water line coming from its only water source to the Town failed, leaving the Town without water for several days. Since that time, a new water system was planned, and is currently being installed in the Town. It is estimated that water losses in the system prior to the beginning of construction may have exceeded 70%. For this reason, it is not possible to estimate with any degree of certainty what the disaggregation for the Town would have been in 2006. It is estimated that with the new system in place, water losses will not exceed the AWWA national average of 13% and that residential usage will make up the majority of water use at approximately 82% with commercial, light industrial making up approximately 5% of total usage.

3A.1.5 Highland County

Highland County served an estimated population of 200 in 2006. Table 3-8 reveals the average and maximum daily withdrawal by the County for the study years.

Table 3-8
Highland Municipal CWS Average and Maximum Daily Withdrawals

Year	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
2002	.012	NI
2003	.013	NI
2006	.016	NI

Source: DEQ Water Withdrawal Database.

Maximum daily withdrawals could not be calculated based on data from DEQ, because it was not available for all sources for all years.

Table 3-9 reveals Highland County's disaggregated use and percentage of total use by category for the Year 2006. It is assumed that the lost and unaccounted-for water percentage for the system is equal to the national average of 13%, as defined by AWWA.

Table 3-9
Highland County Municipal CWS 2006 Disaggregated Use

Disaggregated Category	Water Use (MGD)	Percentage of Total Usage (%)
Residential	0.0132	82
Commercial	0.0008	5
Industrial	0	0
Military	0	0
Production Processes	0	0
Other	0	0
Lost and Unaccounted	0.0021	13
Sale to Other Communities	0	0
Total	**0.01613**	

Source: Highland County.

3A.1.6 City of Lexington

The City of Lexington served an estimated population of 7,600 in 2006. Table 3-10 reveals the average and maximum daily withdrawal by the City for the study years.

Table 3-10
Lexington Municipal CWS Average and Maximum Daily Withdrawals

Year	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
2002	0.90	1.40
2003	0.83	1.38
2006	0.90	1.84

Source: DEQ Water Withdrawal Database.

Table 3-11 reveals the City of Lexington's disaggregated use and percentage of total use by category for the Year 2006. These data were provided by the City of Lexington.

Table 3-11
City of Lexington Municipal CWS 2006 Disaggregated Use

Disaggregated Category	Water Use (MGD)	Percentage of Total Usage (%)
Residential	0.489	55
Commercial	0.263	29
Industrial	0	0
Military	0	0
Production Processes	0	0
Other	0	0
Lost and Unaccounted	0.133	15
Sale to Other Communities	0.006	1
Total	**0.891**	**100**

Source: City of Lexington.

3A.1.7 Town of Monterey

Table 3-12 reveals the average and maximum daily withdrawal by the Town for the study years.

Table 3-12
Monterey Municipal CWS Average and Maximum Daily Withdrawals

Year	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
2002	0.038	NI
2003	0.038	NI
2006	0.046	NI

Source: DEQ Water Withdrawal Database.

Maximum daily withdrawals could not be calculated based on data from DEQ, because it was not available for all sources for all years.

Table 3-13 reveals the Town of Monterey's disaggregated use and percentage of total use by category for the Year 2006. It is assumed that the lost and unaccounted-for water percentage for the system is equal to the national average of 13%, as defined by AWWA.

Table 3-13
Town of Monterey Municipal CWS 2006 Disaggregated Use

Disaggregated Category	Water Use (MGD)	Percentage of Total Usage (%)
Residential	0.059	85
Commercial	0.001	2
Industrial	0	0
Military	0	0
Production Processes	0	0
Other	0	0
Lost and Unaccounted	0.009	13
Sale to Other Communities	0	0
Total	**0.069**	**100**

Source: Town of Monterey.

3A.1.8 Rockbridge County

Rockbridge County served an estimated population of 3,427 in 2006. Table 3-14 reveals the average and maximum daily withdrawal by the County for the study years. All Rockbridge County tables and figures include the four individual water systems of Natural Bridge/Arnold's Valley, North Lexington/Fairfield/Raphine, Rivermont Heights and Route 251. The current Rockbridge PSA system (2011) also includes the Longhollow Development. This development was not owned by the County in 2006 and was not included in any withdrawal or usage figures.

Table 3-14
Rockbridge County PSA Average and Maximum Daily Withdrawals

Year	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
2002	0.04	0.13
2003	0.05	0.20
2006	0.04	0.20

Source: DEQ Water Withdrawal Database.

Table 3-15 reveals Rockbridge County's disaggregated use and percentage of total use by category for the Year 2006 for the four water systems: Natural Bridge/Arnold's Valley, North Lexington/Fairfield/Raphine, Rivermont Heights and Route 251.

Table 3-15
Rockbridge Municipal CWS 2006 Disaggregated Use

Disaggregated Category	Water Use (MGD)	Percentage of Total Usage (%)
Residential	0.216694	35
Commercial	0.078235	12
Industrial	0.208260	33
Military	0	0
Production Processes	0	0
Other	0.000713	0
Lost and Unaccounted	0.104491	17
Sale to Other Communities	0.020292	3
Total	0.6287	**100**

Source: Rockbridge County Public Service Authority.

3A.2 Private Community Water Systems on Groundwater

There are 12 other community water systems on Groundwater within the planning area, as described in Section 2.0. Usage data for these systems is presented in the Section 80 spreadsheet in Appendix A.

3A.3 Private Community Systems Using Reservoirs, Streams, or Springs

There are no other community systems using surface water beyond the municipal water systems described above.

3A.3.1 Maury Service Authority

The Maury Service Authority served an estimated population 25 in 2006. Table 3-16 reveals the average and maximum daily withdrawal for the study years.

Table 3-16
Maury Service Authority Average and Maximum Daily Withdrawals

Year	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
2002	1.343	2.652
2003	1.256	1.984
2006	1.443	2.327

Source: DEQ Water Withdrawal Database.

3A.3.2 The Homestead Water Company

The Homestead Water Company served an estimated population of 1,500 in 2006. Table 3-17 reveals the average and maximum daily withdrawal for the study years.

Table 3-17
The Homestead Water Company Average and Maximum Daily Withdrawals

Year	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
2002	1.282	2.631
2003	.908	2.6
2006	.973	N.I.

Source: DEQ Water Withdrawal Database.

3A.3.3 Millboro Water Association

The Millboro Water Association served an estimated population of 399 in 2006. Table 3-18 reveals the average and maximum daily withdrawal for the study years.

Table 3-18
The Millboro Water Association Average and Maximum Daily Withdrawals

Year	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
2002	1.282	2.631
2003	.908	2.6
2006	.973	N.I.

Source: DEQ Water Withdrawal Database.

3A.3.4 The Warm Springs Water Association

The Warm Springs Water Association served an unknown population in 2006. Table 3-19 reveals the average and maximum daily withdrawal for the study years.

Table 3-19
The Warm Springs Water Association Average and Maximum Daily Withdrawals

Year	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
2002	1.282	2.631
2003	.908	2.6
2006	.973	N.I.

Source: DEQ Water Withdrawal Database.

3A.4 Large Self-Supplied Users of More Than 300,000 Gallons Per Month of Surface Water for Non-Agricultural Uses

As required by the DEQ regulations this section provides a summary of the average annual water used for large self-supplied, non-agricultural users of more than 300,000 gallons per month of surface water within the service area of each municipal community water system.

3A.4.1 Bath County

There is one large, non-agricultural self-supplied user of more than 300,000 gallons per month for surface water within Bath County 2006.

User	Annual Withdrawal (MGD)
Cascades Golf Course	.029

3A.4.2 City of Buena Vista

There are two large, non-agricultural self-supplied user of more than 300,000 gallons per month for surface water within the City of Buena Vista in 2006.

User	Annual Withdrawal (MGD)
Modine Manufacturing	.064
Bontex, Inc.	.167

3A.4.3 Town of Goshen

There is one large, non-agricultural self-supplied user of more than 300,000 gallons per month for surface water within the Town of Goshen in 2006.

User	Annual Withdrawal (MG)
Stillwater, Inc.	NI

3A.4.4 Rockbridge County

There is one large, non-agricultural self-supplied user of more than 300,000 gallons per month for surface water within the service area of Rockbridge County in 2006.

User	Annual Withdrawal (MG)
Lexington Golf and Country Club	.025

3A.5 Large Self-Supplied Users of More Than 300,000 Gallons Per Month of Groundwater for Non-Agricultural Uses

As required by the DEQ regulations, this section provides a summary of the average annual water used for large self-supplied, non-agricultural users of more than 300,000 gallons per month of groundwater within or outside the service area of each municipal community water system.

3A.5.1 Bath County

There is one large, non-agricultural self-supplied users of more than 300,000 gallons per month for groundwater in 2006. None of these users are within the service area of Bath County.

User	Annual Withdrawal (MGD)
Virginia Power	.016

3A.5.2 City of Buena Vista

There are two large, non-agricultural self-supplied users of more than 300,000 gallons per month for groundwater in 2006. These users are within the service area of the City of Buena Vista.

User	Annual Withdrawal (MGD)
Golf Course	.096
Painter's	NI

3A.5.3 Rockbridge County

There are two large, non-agricultural self-supplied users of more than 300,000 gallons per month for groundwater within the service area of Rockbridge County in 2006.

User	Annual Withdrawal (MGD)
Lees Carpets – Mohawk Industries	.692
Natural Bridge of Virginia, Inc.	.079

3A.6 Large Agricultural Users of More Than 300,000 Gallons Per Month

As required by the DEQ regulations this section provides a summary of the average annual water used for large self-supplied, agricultural users of more than 300,000 gallons per month of ground and surface water within or outside the service area of each municipal community water system.

3A.6.1 Bath County

There is one large, agricultural self-supplied user of more than 300,000 gallons per month. Both use surface water. None of these users are within the service area for the Bath County Service Authority. This large agricultural user withdraws water for non-irrigation purposes.

	Surface Water Annual MGD	Groundwater Annual MGD
Commonwealth of Virginia, Coursey Spring Fish Hatchery	11.916	0
Total Annual Use (MGD)	11.916	0

3A.6.2 Highland County

There are two large, agricultural self-supplied users of more than 300,000 gallons per month. Both use surface water. None of these users are within the service area for Highland County. These large agricultural users withdraw water for non-irrigation purposes.

	Surface Water Annual MGD	Groundwater Annual MGD
Virginia Trout Company, Inc. Monterey Plant	2.058	0
Virginia Trout Company, Inc. Terry Place Plan	3.722	0
Total Annual Use (MG)	5.78	0

3A.6.3 City of Lexington

There is one large, agricultural self-supplied users of more than 300,000 gallons per month. This user withdraws surface water for irrigation purposes.

	Surface Water Annual MGD	Groundwater Annual MGD
David J. Tardy	.000	0
Total Annual Use (MG)	.000	0

3A.7 Self-Supplied Users of Groundwater on Individual Wells

As required by the DEQ regulations this section provides a summary of the average annual water used for small self-supplied users of less than 300,000 gallons per month of groundwater outside the service area of each municipal community water system. It is assumed that all users are located outside of the service area of any community water systems.

3A.7.1 Bath County

Assuming there are no self-supplied users within the service area of the Bath County, there are 974 individual wells using groundwater. The estimated population served by wells is 2,280. Information on self-supplied users on individual wells is presented in Appendix A, Section J and Section 2.9.

To capture the total annual residential use, the population served by individual wells (2,280) is multiplied by a per capital water use factor (75 gallons/person/day). The total estimated average annual use in Bath County is .171 MGD.

3A.7.2 Highland County (Including Monterey)

Assuming there are no self-supplied users within the service area of the Highland County, there are 853 individual wells using groundwater. The estimated population served by wells is 1,911. Information on self-supplied users on individual wells is presented in Appendix A, Section J and Section 2.9.

To capture the total annual residential use, the population served by individual wells (1,911) is multiplied by a per capital water use factor (75 gallons/person/day). The total estimated average annual use in Highland County is .143 MGD.

3A.7.3 Rockbridge County (Including Goshen and Glasgow)

Assuming there are no self-supplied users within the service area of the Rockbridge County, there are 7,399 individual wells using groundwater. The estimated population served by wells is 17,979. Information on self-supplied users on individual wells is presented in Appendix A, Section J and Section 2.9.

To capture the total annual residential use, the population served by individual wells (17,979) is multiplied by a per capital water use factor (75 gallons/person/day). The total estimated average annual use in Rockbridge County is 1.348 MGD.

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3B Roanoke Valley – Alleghany Regional Commission Localities

3B.1 Regional Source Water Withdrawal and Water Use

Regional Source Water Withdrawal and Water Use

As noted in the water source data, water for all municipal community water systems in the study area is provided by the City of Covington Water Filtration Plant (Jackson River) and the Town of Clifton Forge Water Treatment Plant (Smith Creek). DEQ provides water withdrawal totals from the respective sources which represent the total amount of water withdrawn for all municipal "water uses" in the region including service to residents and businesses, local government use, sale to other municipal water systems, fire protection, water used in water production processes, and unaccounted for use/ water system losses. As such, withdrawal totals provided by DEQ from these two sources will serve as the total aggregated water use for the region. In 2007 the City of Covington WTP and the Town of Clifton Forge WTP withdrew approximately 780 and 545 million gallons of water, respectively, for a regional (RVARC localities) total of 1,325 million gallons (1.325 billion gallons) or 3.6 MGD.

3B.2 Alleghany County

As noted in the water source information, Alleghany County owns and operates seven municipal community water systems serving a total population of 7,924 with 2,899 connections. Alleghany County purchases treated water for all seven (7) municipal community water systems from the City of Covington and the Town of Clifton Forge (Table 3-20). Alleghany County also sells water to the Town of Iron Gate and Douthat State Park in Bath County.

Table 3-20
Alleghany County
Municipal Community Water Systems

Municipal Community Water System	Connections	Population Served	Water Source
Cherokee/Indian Valley	164	486	City of Covington
Cliftondale/Wilson Creek/Wesgate	641	1,629	Town of Clifton Forge
Intervale/ Clearwater Park	470	1,179	City of Covington
Pounding Mill	640	1,775	City of Covington
Rosedale/ Callaghan	278	800	City of Covington
Selma/Low Moor/Valley Ridge	633	1,767	Town of Clifton Forge
Wesgate	73	288	Town of Clifton Forge
Total	**2,899**	**7,924**	

Source: Locality staff.

3B.2.2 Purchased Water - City of Covington Water Filtration Plant

As noted in the source information, by governmental agreement, the City of Covington agrees to provide Alleghany County up to 1.0 million gallon of treated water per day (MGD). Alleghany County in turn supplies purchased water to four of its municipal water systems - Cherokee / Indian Valley / Oneida Trail; Intervale/Clearwater Park; Rosedale/Callaghan; and Pounding Mill.

In 2007, Alleghany County purchased approximately119 million gallons (0.3 MGD) of treated water from the City of Covington, which represents approximately 32% of the total allotted in the governmental agreement (Table 3-21). As previously noted in March 2009, the City of Covington began supplying the Pounding Mill municipal community water system in Alleghany County. Prior to 2009, the Pounding Mill Spring (groundwater) was the source for the municipal system. Additionally, based on information from the City of Covington water sales to Alleghany have increased since 2007.

Table 3-21
Alleghany County
Municipal Community Water Systems
Purchased Treated Water from City of Covington
2002-2007

Year	Indian Valley/ Cherokee	Intervale/ Clearwater Park Service Area	Pounding Mill Service Area	Rosedale/ Callaghan Service Area	Total Annual Water Purchased (MG)	Total Annual Water Purchased (MGD)	Percent Governmental Agreement Allotted Used
2007	11.00	31.86	54.60	21.68	119.14	0.326	32.6
2006	11.00	29.33	54.75	20.51	115.59	0.317	31.7
2005	11.00	30.00	54.75	27.81	123.56	0.339	33.9
2004	11.00	31.04	54.90	22.002	118.94	0.326	32.6
2003	11.00	34.81	54.75	21.03	121.59	0.333	33.3
2002	11.00	37.57	54.75	17.93	121.25	0.332	33.2

Source: DEQ Water Withdrawal Database and Alleghany County staff.

3B.2.3 Purchased Water - Town of Clifton Forge Water Treatment Plant

Alleghany County purchases treated water from the Town of Clifton Forge and in turns supplies water to three of its municipal water system - Cliftondale Park/Wilson Creek/Sharon; Selma/Low Moor/Valley Ridge; and Westgate. By governmental agreement, Alleghany County is allotted a reserved capacity of 0.6 MGD of treated water from the Town of Clifton Forge WTP (additional surplus water can be purchased on a "non-reserved," short term basis.) Additionally, Alleghany County agrees to supply water to the Town of Iron Gate which in turn supplies the Wesgate system in Alleghany County. In 2007, Alleghany County purchased approximately 160 million gallons (0.44 MGD) from the Town of Clifton Forge. This total represents approximately 73% of the 0.6 MGD reserved amount allotted to Alleghany County from the Clifton Forge WTP by the

existing governmental agreement (Table 3-22). Table 3-23 provides average and maximum daily use for 2007.

Table 3-22
Alleghany County
Municipal Community Water Systems
Purchased Treated Water from Town of Clifton Forge

Year	Cliftondale Park/Wilson Creek/Sharon System* (MG)	Selma/Low Moor/Valley Ridge System (MG)	Total Annual Water Purchased (MG)	Total Annual Water Purchased (MGD)	Percent Governmental Agreement Allotted Used*
2007	75.12	84.70	159.81	0.44	73.0
2006	79.97	82.04	162.01	0.44	74.0
2005	76.94	85.52	162.46	0.45	74.2
2004	40.83	73.08	113.92	0.31	52.0
2003	45.52	90.38	135.91	0.37	62.1
2002	47.82	N/A	N/A	N/A	N/A

Source: DEQ Withdrawal Data.
*Percent allotted used represents percent of 0.6 MGD "reserved" capacity used; additional surplus water can be purchased on a "non-reserved" basis.

Table 3-23
Alleghany County Municipal Community Water Systems
Average and Maximum Daily Water Use - 2007

Community Water System	Source	Total Water Use 2007 (million gallons)	Average Daily Water Use 2007 (MGD)	Maximum Daily Withdrawal (MGD)
Cherokee / Indian Valley / Oneida Trail	Purchased - City of Covington (Jackson River)	11.00	0.030	NI
Intervale / Clearwater Park	Purchased - City of Covington (Jackson River)	31.86	0.087	NI
Rosedale / Callaghan	Purchased - City of Covington (Jackson River)	21.68	0.059	NI
Pounding Mill*	Purchased - City of Covington (Jackson River)	54.60	0.150	0.20
Total Water Purchased from City of Covington WTP		119.14	0.326	NI
Cliftondale Park /Wilson Creek / Sharon	Purchased - Clifton Forge (Smith Creek)	75.12	0.206	0.26
Selma / Low Moor/ Valley Ridge Subdivision	Purchased - Clifton Forge (Smith Creek)	84.69	0.232	
Total Water Purchased from Town of Clifton Forge WTP		159.81	0.438	NI
Total Water Purchased by Alleghany County		278.95	0.764	NI

Source: DEQ Withdrawal Data.

3B.2.4 Disaggregated Water Use

Disaggregated water use data were provided by Alleghany County public works staff. Table 3-20 shows disaggregated water use for all Alleghany County municipal community water systems.

3B.2.4.1 Residential and Commercial

Residential use is the largest use category in Alleghany County. Table 3-20 shows residential and commercial water use for all Alleghany County municipal community water systems.

3B.2.4.2 Heavy Industrial

There is no water use associated with heavy industry in Alleghany County.

3B.2.4.3 Military

There is no water use associated with military structures, operations or activities in Alleghany County.

3B.2.4.4 Water Production Processes

Alleghany County purchased treated water for all Alleghany municipal community water systems.

3B.2.4.5 Sales to Other Community Water Systems

Alleghany County sells treated, purchased water (from the Clifton Forge WTP) to the Town of Iron Gate via the Clifton Dale Park/Wilson Creek/Sharon municipal community water system. Additionally, Alleghany County provides treated water to Douthat State Park (Bath County) through extension of the Clifton Dale Park/Wilson Creek/Sharon community water system along Route 618.

3B.2.4.6 Lost and Unaccounted

Unaccounted for water data was provided by Alleghany County staff. As shown in Table 3-24, several Alleghany County municipal water systems have relatively high unaccounted for water uses and system losses.

3B.2.4.7 Self-Supplied, Non-Agricultural Users > 300,000 Gallons per Month

There are no known self-supplied, non-agricultural users using more than 300,000 gallons per month of surface and/or groundwater in Alleghany County.

Table 3-24
Alleghany County
Municipal Community Water Systems
Disaggregated Use - 2007

Disaggregated Category	Cliftondale/ Wilson Creek/ Wesgate		Selma/ Low Moor/Valley Ridge		Cherokee/ Indian Valley		Rosedale/ Callaghan		Intervale/ Clearwater Park		Pounding Mill	
	Water Use (MGD)	Percentage of Total Usage (%)	Water Use (MGD)	Percentage of Total Usage (%)	Water Use (MGD)	Percentage of Total Usage (%)	Water Use (MGD)	Percentage of Total Usage (%)	Water Use (MGD)	Percentage of Total Usage (%)	Water Use (MGD)	Percentage of Total Usage (%)
Residential	0.05	22.75	0.054	23.65	0.022	73.4	0.034	57.90	0.051	54.12	0.066	43.96
Commercial	0.02	11.70	0.084	36.52	0.000	0	0.024	41.07	0.002	1.8	0.045	29.83
Industrial	0.00	0.00	0.011	4.78	0.000	0	0.000	0.00	0.000	0	0.000	0
Military	0.00	0.00	0.000	0	0.000	0	0.000	0.00	0.000	0	0.000	0
Production Processes	0.00	0.00	0.000	0	0.000	0	0.000	0.00	0.000	0	0.000	0
Other	0.00	0.00	0.000	0	0.000	0	0.000	0.00	0.000	0	0.000	0
Lost and Unaccounted	0.07	34.55	0.081	35.06	0.013	26.6	0.000	1.03	0.041	44.08	0.039	26.21
Sale to Other Communities	0.06	31.00	0.000	0	0.000	0	0.001	0.00	0.000	0	0.000	0
Total	0.21	100.00	0.230	100.00	0.035	100	0.059	100.00	0.094	100	0.150	100

Source: Source: DEQ Water Withdrawal Database and Alleghany County staff.

3B.2.4.8 Self-Supplied, Non-Agricultural Users < 300,000 Gallons per Month

Alleghany County owns and operates seven municipal community water systems with a total of 2,899 connections serving an estimated total population of 7,924. Additionally, the Longdale Furnace (private water system) serves approximately ninety-two (92) residents on the original 49 parcels of Longdale Furnace. Private wells are the primary water source for residents in areas of Alleghany County not served by a municipal community water system. Based on Census 2010 data, Alleghany County's population was 11,978 (excluding the towns of Clifton Forge and Iron Gate) with an average household size of 2.32 persons. As such, it is estimated that approximately 4,054 people (1,747 households) in Alleghany County rely on private wells as a primary water source. Using the American Water Works Association daily indoor per capita water use average of 69.3 gallons it is estimated that private wells supply approximately 280,942 gallons per day (0.2809 MGD) in areas not served by a county owned municipal community water system.

3B.2.4.9 Self-Supplied, Agricultural Users > 300,000 Gallons per Month

There are no known self-supplied, agricultural users using more than 300,000 gallons per month of surface and/or groundwater in Alleghany County.

3B.3 City of Covington

The City of Covington Water Treatment Plant provided treated water to all homes, business, industry, and public buildings within its corporate limits, as well as portions of Alleghany County. The City of Covington Water Filtration Plant serves a total population of 5,961 (2010) in the City of Covington plus an additional 4,200 residents in portions of Alleghany County. The City of Covington Water Filtration Plant permitted surface water withdrawal from the Jackson River is 4.0 MGD. The water system design capacity is 6.0 MGD, and a safe yield (pumping capacity) of 5.7 MGD.

Based on DEQ Withdrawal Data, in 2007 the City of Covington Water Filtration Plant withdrew approximately 780.339 million gallons of water from the Jackson River or a daily average of 2.14 MG. The difference between average daily withdrawal and safe yield was approximately 3.56 MG with the difference between permitted daily withdrawal and average daily withdrawal being 1.51 MG. The maximum daily withdrawal in 2007 was 3.3 MG (Table 3-25).

Table 3-25
Surface Water Withdrawal from Jackson River
City of Covington
2002-2007

Year	Annual Withdrawal from Source (MG)	Average Monthly Withdrawal (MG)	Average Daily Withdrawal (MG)	Maximum Daily Withdrawal (MG)	Permitted Withdrawal minus Average Daily Withdrawal MGD	Safe Yield minus Average Daily Withdrawal MGD
2007	780.339	65.028	2.138	3.335	1.862	3.562
2006	752.259	62.688	2.061	3.105	1.939	3.639
2005	903.021	75.252	2.474	3.68	1.526	3.226
2004	870.900	72.575	2.386	3.500	1.614	3.314
2003	814.280	67.857	2.231	4.032	1.769	3.469
2002	888.455	74.038	2.434	3.780	1.566	3.266

Source: DEQ Water Withdrawal Database and City of Covington staff.

3B.3.1 Disaggregated Water Use

The withdrawal totals in Table 3-25 represent all water withdrawn by the City of Covington Water Filtration Plant (from the Jackson River) and includes water used by City residents, businesses, industry, and local government, as well as water sales to Alleghany County. Several challenges exist in accurately estimating disaggregated water use for the City of Covington. Primary among these is the lack of metered residential water connections in the City of Covington, unaccounted for water loss, and sales to other community water systems.

In estimating the water use specifically for the City of Covington, all treated water released to areas outside of the corporate limits was subtracted from the annual total source water withdrawal, with the resulting difference being the estimated total water use for the City of Covington.

City of Covington Water Use = Total Source Water Withdrawal – Sales and/or Use Outside of Corporate Limits

In 2007, the City of Covington Water Filtration Plant withdrew approximately 780.3 million gallons (2.14 MGD) of water from the Jackson River and released (i.e., sold) approximately 119 million gallons (0.33 MGD) of treated water to municipal community water systems in Alleghany County. The resulting difference of 661 million gallons (1.8 MGD) represents total estimated water use for the City of Covington and includes all water used in the residential, commercial, and industrial uses, water production process, fire protection, and system losses (Table 3-26). Table 3-27 shows disaggregated use for the City of Covington.

Table 3-26
City of Covington
Estimated Total Water Use - 2007

Year	Annual Withdrawal from Source (MG)	Annual Sales to Other Municipal Systems (MG)	City of Covington Estimated Annual Water Use (MG)*	City of Covington Estimated Water Use (MGD)
2007	780.339	119.14	661.199	1.81150411
2006	752.259	115.59	636.669	1.74429863
2005	903.021	123.56	779.461	2.135509589
2004	870.9	118.94	751.96	2.060164384
2003	814.28	121.59	692.69	1.897780822
2002	888.455	121.25	767.205	2.101931507

*Annual source withdrawal minus total water released outside corporate limits .
Source: DEQ Water Withdrawal Database.

Table 3-27
City of Covington 2007 Disaggregated Use

Disaggregated Category	Water Use (MGD)	Percentage of Total Usage (%)
Residential	0.74	30.4
Commercial	0.09	4.6
Industrial	0.29	13.7
Military	0.00	0.0
Production Processes	0.02	1.0
Other	0.00	0.0
Lost and Unaccounted	0.75	35.0
Sale to Other Communities	0.33	15.3
Total	2.22	100.0

Source: DEQ Water Withdrawal Database and City of Covington staff.

3B.3.1.1 Residential and Commercial

There are approximately 2,591 residential connections, and 335 residential connections in the City of Covington. Residential connections represent 88.5% of connections, while commercial represents 11.5% of connections. As previously noted, residential water connections in the City of Covington are not metered. To estimate residential and commercial disaggregated the residential and commercial percentages (of total connections) were applied to the estimated total City of Covington annual water use (Table 3-28).

3B.3.1.2 Heavy Industry

MeadVestVaco is the only remaining heavy industrial type activity in the City of Covington (AET plant closed in 2007). In 2007, the City of Covington sold approximately 107 million gallons (0.29 MGD) of finished water to MeadWestVaco. The total amount of water sold to MeadWestVaco has generally trended upward (Table 3-28).

Table 3-28
City of Covington
Water Sales to MeadWestVaco (Heavy Industry)

Year	Annual Sales MG	Annual Sales (MGD)
2007	106.898	0.292871233
2006	102.334	0.280367123
2005	104.022	0.284991781
2004	91.133	0.249679452
2003	66.874	0.183216438
2002	73.751	0.202057534

Source: DEQ Water Withdrawal Database.

3B.3.1.3 Military

There is no water use associated with military structures, operations or activities in the City of Covington.

3B.3.1.4 Unaccounted for Water

Data for system losses and other unaccounted for water use are generally not available for the City of Covington. Unaccounted for water estimates for the City of Covington are based on best estimates by locality staff and other known disaggregated water uses.

3B.3.1.5 Water Sales to Other Community Water Systems

As previously noted, the City of Covington sells treated water to municipal community water systems in Alleghany County (Table 3-29). By governmental agreement, currently Alleghany County is allocated 1.0 MGD from the City of Covington municipal water system. Based on more recent (after 2007) information from the City of Covington and Alleghany County indicate increased water sales to Alleghany County municipal community water systems. See Alleghany County for treated water totals sold to Alleghany County.

Table 3-29
City of Covington
Water Sales to Alleghany County Municipal Community Water Systems
2002-2007

Year	Annual Sales to Alleghany County Municipal Water Systems (MG)	Annual Sales to Alleghany County Municipal Water Systems (MGD)	Percent Governmental Agreement Allotted Used
2007	119.14	0.33	32.64
2006	115.59	0.32	31.67
2005	123.56	0.34	33.85
2004	118.94	0.33	32.59
2003	121.59	0.33	33.31
2002	121.25	0.33	33.22

Source: DEQ Water Withdrawal Database and City of Covington staff.

3B.3.1.6 Self-Supplied, Non-Agricultural Users >300,000 Gallons per Month

There is currently one (1) known self-supplied, non-agricultural user using more than 300,000 gallons per month of surface water and groundwater in the City of Covington - the MeadWestVaco Covington plant. The MeadWestVaco Covington plant, in addition to purchasing treated water from the City of Covington, withdraws significant amounts of water from the Jackson River for industrial processes. Based on DEQ water withdrawal data in 2007 the MeadWestVaco Covington plant withdrew a total of 13,848.44 million gallons (13.8 billion) of surface water from the Jackson River or approximately 37.9 million gallons per day (Table 3-30). MeadVestVaco also withdrawals significant groundwater from two wells (Table 3-31). Note: Prior to March 2008 when the plant ceased operation, the Applied Extrusions Technologies (AET) Covington Plant withdrew significant amounts of water (181 million gallons in 2007) from Potts Creek, a tributary of the Jackson River (Table 3-32).

Table 3-30
MeadWestVaco Surface Water Withdrawals
2002-2007

Year	Annual Withdrawal from Source (MG)	Average Monthly Withdrawal (MG)	Average Daily Withdrawal (MGD)
2007	13848.44	1154.04	37.9409
2006	14073.96	1172.83	38.5588
2005	14667.05	1222.25	40.1837
2004	14151.58	1179.30	38.7714
2003	13880.81	1156.73	38.0296
2002	14340.34	1195.03	39.2886

Source: DEQ Water Withdrawal Database.

Table 3-31
MeadWestVaco Groundwater Withdrawals
2002-2007

Year	Annual Withdrawal from Source (MG)	Average Monthly Withdrawal (MG)	Average Daily Withdrawal (MG)	Annual Withdrawal from Source (MG)	Average Monthly Withdrawal (MG)	Average Daily Withdrawal (MG)
	Deep Well # 1			Deep Well # 2		
2007	168.848	14.0707	0.4626	131.534	10.9612	0.3604
2006	161.069	13.4224	0.4413	131.894	10.9912	0.3614
2005	183.374	15.2812	0.5024	123.99	10.3325	0.3397
2004	195.248	16.2707	0.5349	107.8	8.9833	0.2953
2003	178.521	14.8768	0.4891	938.161	78.1801	2.5703
2002	190.388	15.8657	0.5216	940.823	78.4019	2.5776

Source: DEQ Water Withdrawal Database.

Table 3-32
Applied Extrusions Technologies
Surface Water Withdrawal

Year	Annual Withdrawal from Source (MG)	Average Monthly Withdrawal (MG)	Average Daily Withdrawal (MG)
2007	181.45	15.12083333	0.497123287671233
2006	170.23	14.18583333	0.466383561643836
2005	241.766	20.14716667	0.662372602739726
2004	238.54	19.87833333	0.653534246575342
2003	198.05	16.50416667	0.542602739726027
2002	276.4	23.03333333	0.757260273972603

Source: DEQ Water Withdrawal Database.

3B.3.1.7 Self-Supplied, Non-Agricultural Users < 300,000 Gallons per Month

There are no known self-supplied, agricultural users using less than 300,000 gallons per month of surface and/or groundwater in the City of Covington.

3B.3.1.8 Self-Supplied, Agricultural Users > 300,000 Gallons per Month

There are no known self-supplied, agricultural users using more than 300,000 gallons per month of surface and/or groundwater in the City of Covington.

3B.4 Town of Clifton Forge

The Town of Clifton Forge Water Treatment provides treated water to all homes, business, industry, and other public buildings within the Town, as well as portions of Alleghany County. The Town of Clifton Forge municipal water system serves an estimated population of 3,884 with approximately 1,900 connections. The Town of Clifton Forge Water Filtration Plant has a permitted withdrawal of 3.0 MGD, design capacity of 3.0 MGD, and a safe yield of 2.2 MGD.

Based on DEQ withdrawal data, the Clifton Forge Water Treatment Plant withdrew approximately 545 million gallons of water in 2007 or a daily average of 1.49 MGD. The difference between average daily withdrawal and safe yield was approximately 0.71 MG with the difference between permitted daily withdrawal and average daily withdrawal being 1.51 MG. The maximum daily withdrawal in 2007 was 1.82 MG (Table 3-33).

Table 3-33
Surface Water Withdrawals from Smith Creek
Town of Clifton Forge
2002-2007

Year	Annual Withdrawal from Source (MG)	Average Monthly Withdrawal (MG)	Average Daily Withdrawal (MG)	Maximum Daily Withdrawal (MG)	Permitted Daily Withdrawal minus Average Daily Withdrawal (MG)	Safe Yield minus Average Daily Withdrawal (MG)
2007	544.971	45.414	1.493	1.822	1.507	0.707
2006	536.832	44.736	1.471	1.772	1.529	0.729
2005	642.847	53.571	1.761	2.09	1.239	0.439
2004	588.464	49.039	1.612	1.939	1.388	0.588
2003	567.307	47.276	1.554	2.585	1.446	0.646
2002	552.086	46.007	1.513	2.155	1.487	0.687

Source: DEQ Water Withdrawal Database and Town of Clifton Forge staff.

3B.4.1 Disaggregated Water Use

As with the City of Covington, several challenges exist in accurately estimating disaggregated water use for the Town of Clifton Forge. With the exception of master meters to record sales to Alleghany County, historically water connections within the Town of Clifton Forge are not metered, with residents and businesses paying a flat monthly rate. The Town has now installed water meters on all connections and began metering and billing at much higher rates on July 1, 2011 resulting in a dramatic decrease in consumption. In estimating total water use specifically for the Town of Clifton Forge a similar methodology was employed as for the City of Covington.

Town of Clifton Forge Water Use = Total Source Water Withdrawal – Sales and/or Use Outside of Corporate Limits

In 2007, the Town of Clifton Forge Water Filtration Plant withdrew approximately 545 million gallons (1.05 MGD) of water from the Smith Creek and released (i.e., sold) approximately 160 million gallons (0.43 MGD) of treated water to municipal community water systems in Alleghany County. The resulting difference of 385 million gallons represents total estimated water use for the Town of Clifton Forge (Table 3-34). Table 3-35 shows disaggregated water use for the Town of Clifton Forge.

Table 3-34
Town of Clifton Forge
Estimated Water Use
2002-2007

Year	Total Annual Withdrawal from Source (MG)	Total Annual Water Sales to Other Municipal Systems (MG)	Town of Clifton Forge Estimated Total Annual Water Use (MG)*	Town of Clifton Forge Estimated Average Daily Water Use (MGD)
2007	544.971	159.813	385.158	1.0552
2006	536.832	162.010	374.822	1.0269
2005	642.847	162.459	480.388	1.3161
2004	588.464	113.917	474.547	1.3001
2003	567.307	135.905	431.402	1.1819
2002	552.086	N/A	N/A	N/A

*Annual source withdrawal minus total water released outside corporate limits.
Source: DEQ Water Withdrawal Database.

Table 3-35
Town of Clifton Forge 2007 Disaggregated Use

Disaggregated Category	Water Use (MGD)	Percentage of Total Usage (%)
Residential	0.34	22.8
Commercial	0.18	11.8
Industrial	0.00	0.0
Military	0.00	0.0
Production Processes	0.01	1.0
Other	0.00	0.0
Lost and Unaccounted	0.52	35.0
Sale to Other Communities	0.44	29.4
Total	1.49	100.0

Source: DEQ Water Withdrawal Database and Town of Clifton Forge staff.

3B.4.1.1 Residential and Commercial

The Town of Clifton Forge WTP has approximately 1,800 service connections. Residential connections represent approximately 80% of connections, while commercial represents the remaining 20% of connections. To estimate residential and commercial disaggregated use the residential and commercial percentages were applied to the estimated total Town of Clifton Forge annual water use (Table 3-34).

3B.4.1.2 Heavy Industry

Since the closing of the Power Train Plant in the Town of Iron Gate in 2008, there is currently no water use associated with heavy industrial type activities in the Town of Clifton Forge or areas that receive water from the Clifton Forge WTP.

3B.4.1.3 Military

There is no water use associated with military structures, operations or activities in the Town of Clifton Forge or areas that receive water from the Clifton Forge WTP.

3B.4.1.4 Lost and Unaccounted

Data for system losses and other unaccounted for water use are generally not available for the Town of Clifton Forge. Unaccounted for water estimates are based on best estimates by Town of Clifton Forge staff and other known disaggregated water uses.

3B.4.1.5 Water Sales to Other Community Water Systems

As previously noted, in addition to serving Town residents, the Town of Clifton Forge, by governmental agreement, provides treated water to municipal community water systems in Alleghany County (up to 0.6 MGD). Table 3-36 shows total annual water sales to Alleghany County municipal community water systems, which shows a general increase between 2002 and 2007. Based on more recent (after 2007) information from the City of Covington and Alleghany County indicate increased water sales to Alleghany County municipal community water systems. See Alleghany County for treated water totals sold to Alleghany County.

3B.4.1.6 Self-Supplied, Non-Agricultural Users > 300,000 Gallons per Month

There are no known self-supplied, non-agricultural users using more than 300,000 gallons per month of surface and/or groundwater in the Town of Clifton Forge.

3B.4.1.7 Self-Supplied, Non-Agricultural Users < 300,000 Gallons per Month

There are no known self-supplied, agricultural users using less than 300,000 gallons per month of surface and/or groundwater in the Town of Clifton Forge.

Table 3-36
Town of Clifton Forge
Water Sales to Alleghany County Municipal Community Water Systems
2002-2007

Year	To Cliftondale Park/Wilson Creek/Sharon Service Area (MG)	To Selma/Low Moor/Valley Ridge Service Area (MG)	Total Annual Water Sales to Other Systems (MG)	Total Water Sales to Other Systems (MGD)	Percent Allotted Used
2007	75.12	84.70	159.81	0.44	73.0
2006	79.97	82.04	162.01	0.44	74.0
2005	76.94	85.52	162.46	0.45	74.2
2004	40.83	73.08	113.92	0.31	52.0
2003	45.52	90.38	135.91	0.37	62.1
2002	47.82	N/A	N/A	N/A	N/A

Source: DEQ Water Withdrawal Database.

3B.4.1.8 Self-Supplied, Agricultural Users > 300,000 Gallons per Month

There are no known self-supplied, agricultural users using more than 300,000 gallons per month of groundwater in the Town of Clifton Forge.

3B.5 Town of Iron Gate

The Town of Iron Gate municipal community water system has approximately 235 connections and serves a total population of approximately 388 in the Town of Iron Gate and portions of Alleghany and Botetourt counties. Based on DEQ withdrawal data, the Town of Iron Gate received approximately 28.61 million gallons of water from Alleghany County in 2007 or a daily average 0.0784 MGD (Table 3-37).

3B.5.1 Disaggregated Water Use

Disaggregated water use totals were provided by Town of Iron Gate staff and are provided in Table 3-38.

3B.5.1.1 Residential and Commercial

Residential use is by far the largest disaggregated use category accounting for approximately 70% of disaggregated water use in the Town of Iron Gate.

3B.5.1.2 Heavy Industrial

There is no water use associated with heavy industry in the Town of Iron Gate.

Table 3-37
Town of Iron Gate
Municipal Community Water Systems
Average and Maximum Daily Water Use - 2007

Year	Total Water Use	Average Daily Water Use 2007 (MGD)	Maximum Daily Withdrawal (MGD)
2007	28.61	0.078	NI
2006	42.442	0.116	NI
2005	NI	NI	NI
2004	NI	NI	NI
2003	NI	NI	NI
2002	NI	NI	NI

Source: DEQ Water Withdrawal Database.

Table 3-38
Town of Iron Gate 2007 Disaggregated Use

Disaggregated Category	Water Use (MGD)	Percentage of Total Usage (%)
Residential	0.06	71.9
Commercial	0.00	3.7
Industrial	0.00	0.0
Military	0.00	0.0
Production Processes	0.00	0.0
Other	0.00	0.0
Lost and Unaccounted	0.01	11.9
Sale to Other Communities	0.01	12.5
Total	0.08	100.0

Source: DEQ Water Withdrawal Database and Town of Iron Gate staff.

4.0 EXISTING RESOURCE INFORMATION (9 VAC 25-780-90)

4.1. Geology

The study area is located in the Ridge and Valley physiologic/geologic province of Virginia, characterized by long linear ridges separated by linear valleys with elevations ranging from 1,000 – 4,500 feet above sea level. The region is characterized by the trellis drainage pattern in which streams and rivers run parallel to mountain ridges. Due to the mountainous topography, most population and associated development is located in these long linear valleys. Figure 4-1 shows physiologic/geologic provinces in the study area and Virginia. Sedimentary rock is the most common rock type in the area and includes limestone, dolomite, and shale. Karst topography, associated with limestone, is common in the region. While karst areas provide suitable geologic conditions for the formation of productive aquifers, it also pose significant pollution potential for wells and springs in which may be subject to surface water influence.

4.2 Hydrology

The study area lies primarily within the Upper James River watershed, a subwatershed of the James River (Figure 4-2 and 4-3). Rivers within the Upper James River basin include the Bullpasture, Calfpasture, Cowpasture, Jackson, and the Maury. There are 18 USGS water gauges and 3 groundwater gauges in the study area (Tables 4-1 and 4-2).

4.3 Meteorology and Climate

The study area is located at approximately 37° north latitude and 80° west latitude and is located at the transition between Humid Subtropical (Cfa) and the Moist Continental Mid-latitude (Dfa) climatic zones (Figure 4-4). The humid subtropical climate is found on the east coast of continents between approximately 20^{o} and 40^{o} N and S latitude and is the primary climate type of the Southeastern United States. Cfa climatic zones are characterized by warm and humid summer and mild winters. Rainfall is generally distributed evenly throughout the year with annual precipitation ranging from 100 inches near the coast to 25 inches as you move inland. Summer precipitation is often late afternoon thunderstorms caused by conventional currents, whereas winter precipitation is associated with mid-latitude cyclones. Dfa climates have warm to cool summers and cold winters with precipitation evenly distributed throughout the year.

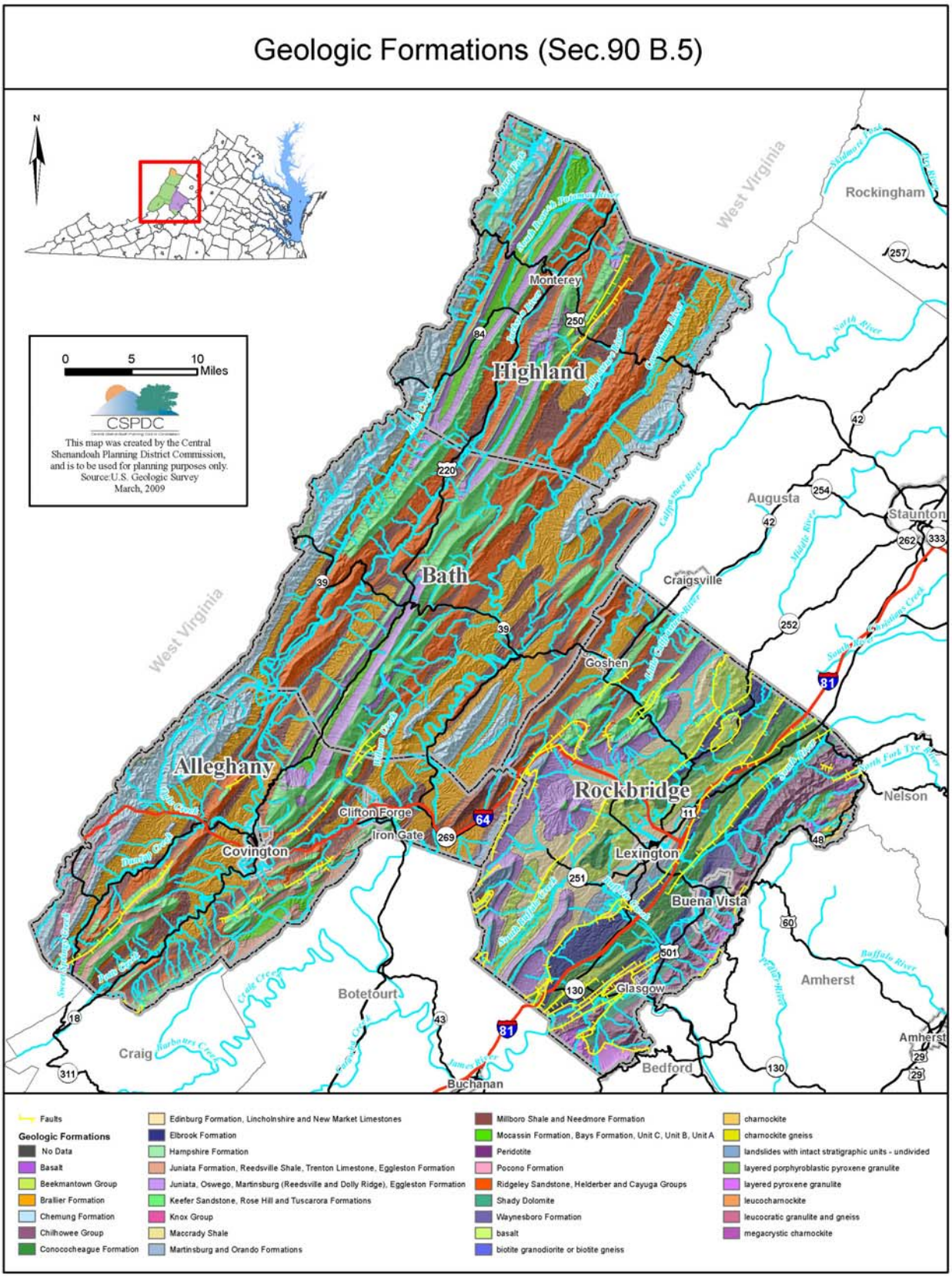

Figure 4.1: Geologic Formations

Table 4-1
USGS Stream Gauges in Study Area

Agency	Site Number	Site Name
USGS	2011400	JACKSON RIVER NEAR BACOVA, VA
USGS	2011460	BACK CREEK NEAR SUNRISE, VA
USGS	2011470	BACK CREEK AT SUNRISE, VA
USGS	2011490	LITTLE BACK CREEK NEAR SUNRISE, VA
USGS	2011500	BACK CREEK NEAR MOUNTAIN GROVE, VA
USGS	2011800	JACKSON RIVER BL GATHRIGHT DAM NR HOT SPGS, VA
USGS	2012800	JACKSON RIV AT FILTRATION PLANT AT COVINGTON, VA
USGS	2013000	DUNLAP CREEK NEAR COVINGTON, VA
USGS	2013100	JACKSON RIVER BL DUNLAP CREEK AT COVINGTON, VA
USGS	2014000	POTTS CREEK NEAR COVINGTON, VA
USGS	2015700	BULLPASTURE RIVER AT WILLIAMSVILLE, VA
USGS	2016000	COWPASTURE RIVER NEAR CLIFTON FORGE, VA
USGS	2020500	CALFPASTURE RIVER ABOVE MILL CREEK AT GOSHEN, VA
USGS	2021500	MAURY RIVER AT ROCKBRIDGE BATHS, VA
USGS	2022500	KERRS CREEK NEAR LEXINGTON, VA
USGS	2024000	MAURY RIVER NEAR BUENA VISTA, VA
USGS		35K 1 SOW 063
USGS		32N 2 SOW 217

Source: USGS Real-Time Water Data for Virginia.

Table 4-2
USGS Groundwater Gauges in Study Area

County	Station Number	Operator
Bath County	USGS 380252079472801 32N 2 SOW 217	VDEQ
Rockbridge County	USGS 373758079271601 35K 1 SOW 063	VDEQ

Source: USGS Real-Time Water Data for Virginia.

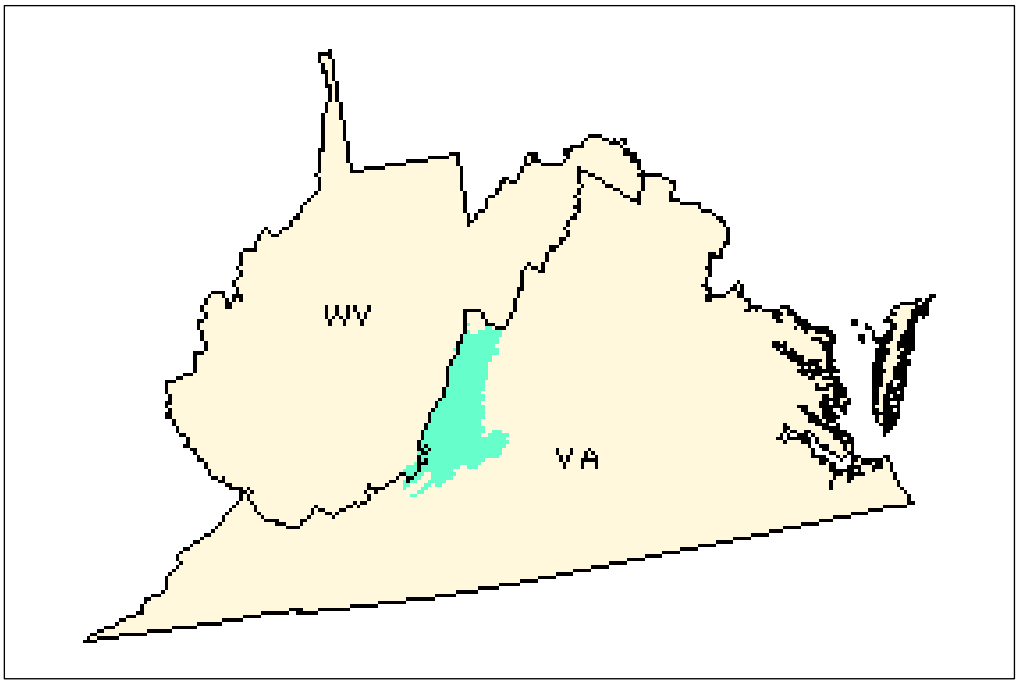

Figure 4-2: Upper James River Watershed
Source: U.S. EPA Surf Your Watershed

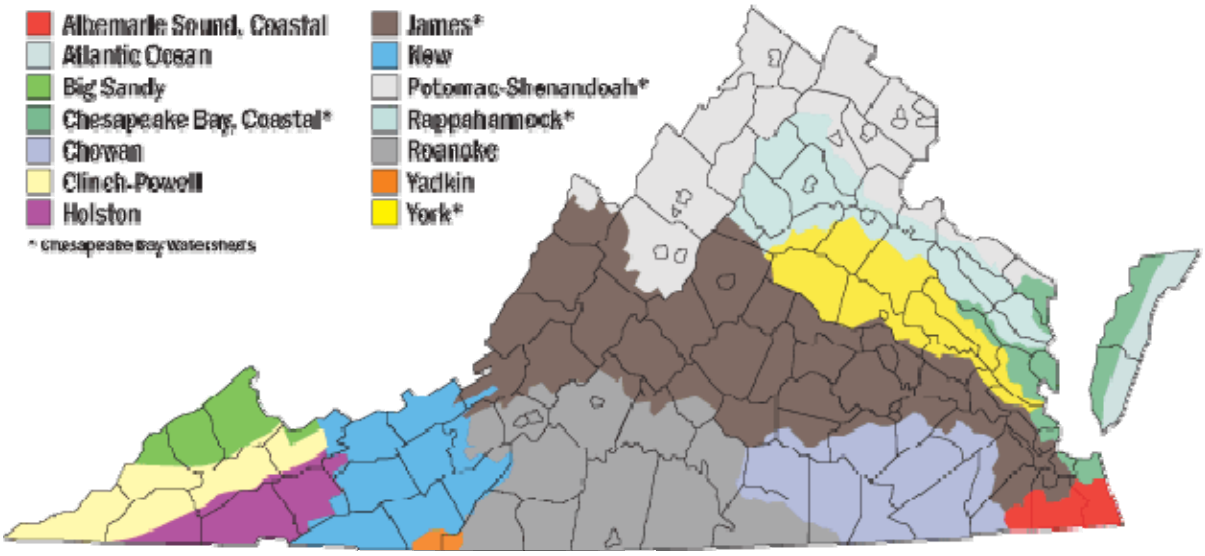

Figure 4-3: Virginia Watersheds
Source: Virginia DCR
*Note: The Town of Monterey is located on the boarder of two watersheds, the Potomac-Shenandoah and the Upper James and more specifically the South Branch Potomac Sub-Basin. All surface water flows directly into the Potomac River.

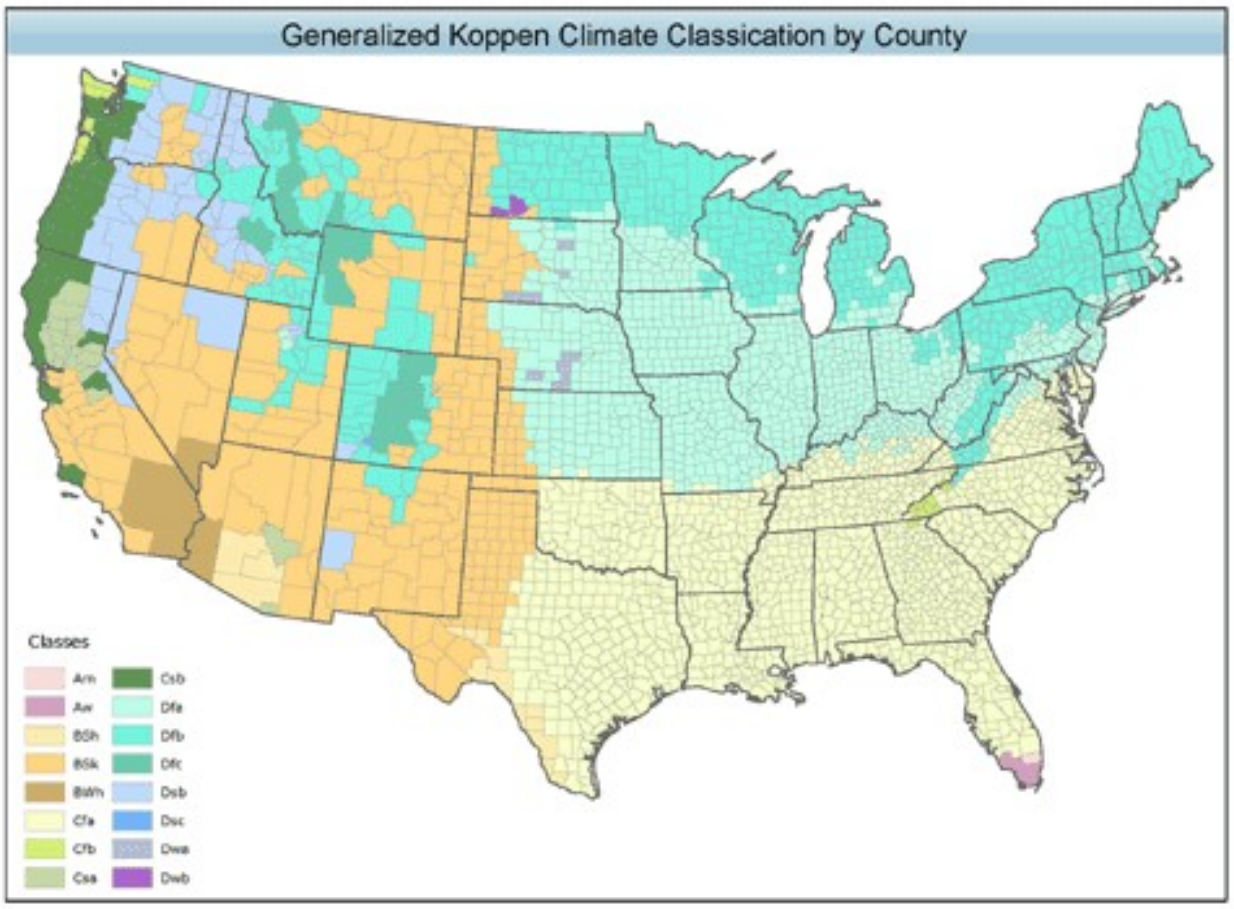

Figure 4-4: United States Climate Classifications
Source: Physical Geography.net

4.4 State or Federal Listed Threatened or Endangered Species or Habitats of Concern

The Virginia Fish and Wildlife Information Service (VaFWIS) of the Virginia Department of Game and Inland Fisheries (DGIF) identified 40 species in the study area designated as federally and/or state endangered, threatened or of special concern. Of these, 8 species were listed as federally threatened or endangered and 15 were listed as threatened or endangered in Virginia. Table 4-3 and Figure 4-5 provide a summary of identified endangered species in the study area.

Table 4-3
Threatened and Endangered Species

Taxonomic Group	Genus and Species	Common Name	Federal Status	Virginia State Status
amphibian	Plethodon punctatus	Cow Knob Salamander	FSC	SC
bird	Thryomanes bewickii	Bewick's Wren	FSC	E
bird		Winter Wren		SC
bird	Asio otus	Long-eared Owl	FT	T
bird	Empidonax alnorum	Alder Flycatcher		SC
bird	Catharus guttatus	Hermit Thrush		SC
bird	Certhia americana	Brown Creeper		SC
bird	Dendroica magnolia	Magnolia Warbler		SC
bird	Haliaeetus leucocephalus	Bald Eagle	FT	T
bird	Lanius ludovicianus	Loggerhead Shrike		T
bird	Loxia curvirostra	Red Crossbill		SC
bird	Nyctanassa violacea	Yellow-crowned Night-heron		SC
bird	Oporornis philadelphia	Mourning Warbler		SC
bird	Regulus satrapa	Golden-crowned Kinglet		SC
bird	Sitta canadensis	Red-breasted Nuthatch		SC
bird	Spiza americana	Dickcissel		SC
bird	Tyto alba	Barn Owl		SC
bird	Vermivora chrysoptera	Golden-winged Warbler		SC
fish	Noturus gilberti	Orangefin Madtom	FSC	T
fish	Notropis semperasper	Roughhead Shiner	FSC	SC

Table 4-3 (continued)
Threatened and Endangered Species

Taxonomic Group	Genus and Species	Common Name	Federal Status	Virginia State Status
mammal	Sorex palustris	Water Shrew	FSC	E
mammal	Glaucomys sabrinus	Virginia Northern Flying Squirrel	FE	E
mammal	Lepus Americanus	Snowshoe Hare		E
mammal	Corynorhinus (= Plecotus) townsendii	Virginia big-eared Bat	FE	E
mammal	Lontra canadensis	Northern River Otter		SC
mammal	Microtus chrotorrhinus	Rock Vole	FSC	E
mammal	Myotis grisescens	Gray Bat	FE	E
mammal	Myotis leibii	Eastern small-footed Myotis	FSC	
mammal	Myotis sodalis	Indiana Bat	FE	E
mammal	Neotoma magister	Allegheny Woodrat	FSC	
mammal	Sylvilagus obscurus	Appalachian Cottontail	FSC	
mollusc	Pleurobema (=F Collina)	James (=Virginia) Spinymussel	FE	E
mollusc	Fusconaia masoni	Atlantic Pigtoe	FSC	T
mollusc	Elliptio lanceolata	Yellow Lance	FSC	SC
other terrestrial	Helicodiscus lirellus	Rubble Coil	FSC	E
other terrestrial	Helicodiscus diadema	Shaggy Coil	FSC	SC
plant	Scirpus ancistrochaetus	Northeastern Bulrush	FE	E
reptile	Crotalus horridus	Timber Rattlesnake		CC
reptile	Pituophis melanoleucus	Northern Pinesnake	FSC	
reptile	Virginia Valeriae	Mountain Earthsnake		SC

Federal Status Key: FSC = Federal Species of Concern; FE = Federal Endangered; FT = Federal Threatened
Virginia State Status Key: SC = Special Concern; CC = Collection Concern; E = Endangered; T = Threatened

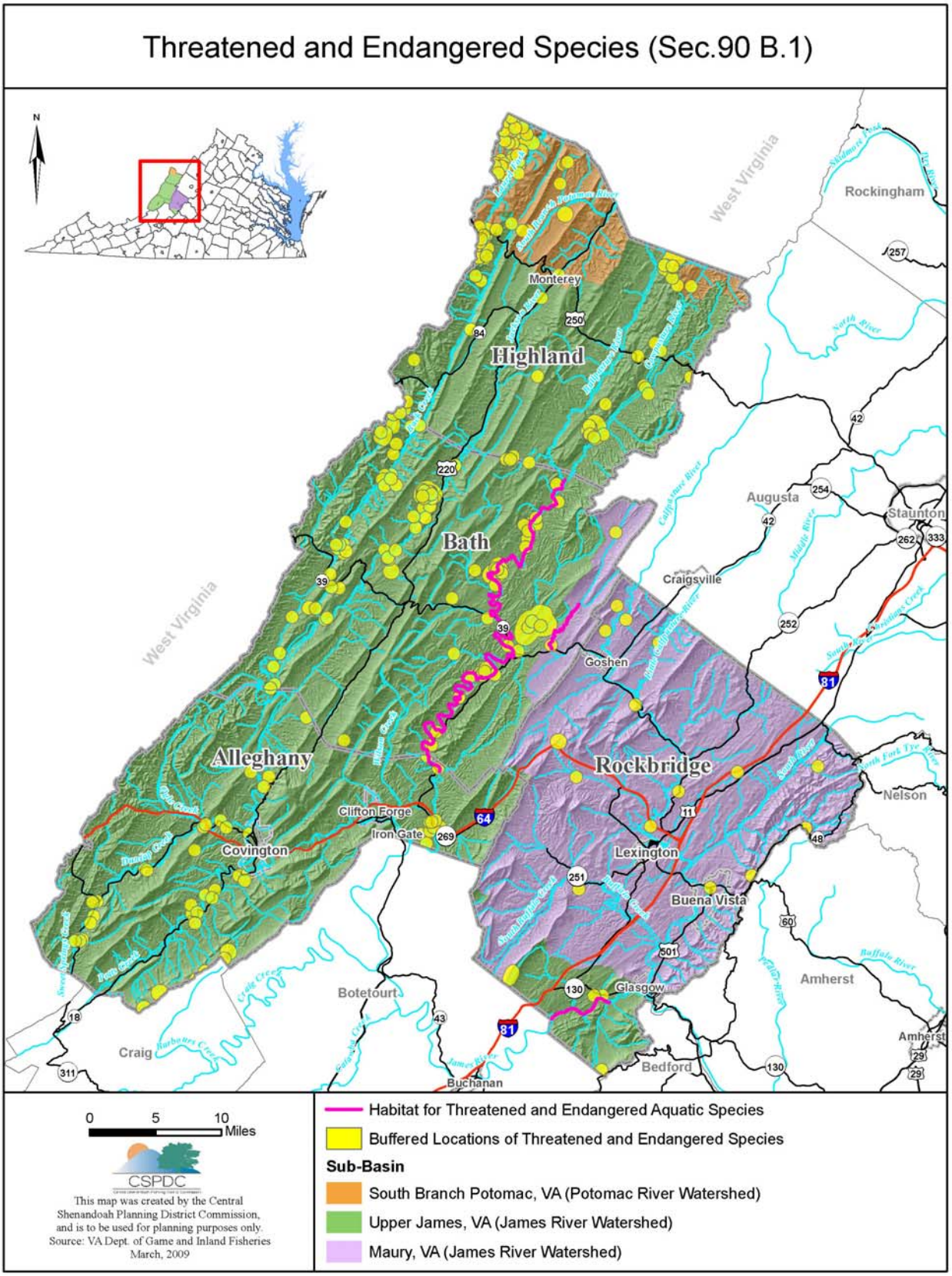

Figure 4-5: Threatened and Endangered Species

4.5 Anadromous, Trout, and Other Significant Fisheries

The VaFWIS did not identify any anadromous fish use streams in the study area. Common species in the study area include smallmouth bass, rock bass, brook trout, rainbow trout, brown trout, and redbreast sunfish. The Cold Water Stream Survey (CWSS) is a trout stream survey containing biological and physiochemical data about each classified stream reach or specific collection location. Trout species include brown and rainbow trout species. The VaFWIS has identified approximately 195 stream sections in the study area as a CWSS stream. Currently, there are 10 dams in the study area (Table 4-4). Additionally, there is one fish hatchery in the study area (Coursey Springs).

Table 4-4
Dams

Dam Name	County	Dam Owner
MOORE S CREEK DAM	ROCKBRIDGE	CITY OF LEXINGTON
ROBERTSON DAM	ROCKBRIDGE	DEPT. OF GAME & INLAND FISHERIES
WESTVACO #2 FLYASH LAGOON DAM	ALLEGHANY	WESTVACO, BLEACHED BOARD DIVISION
CLIFTON FORGE DAM	ALLEGHANY	TOWN OF CLIFTON FORGE
DOUTHAT LAKE DAM	BATH	DCR, DIV OF STATE PARKS
GATHRIGHT DAM	ALLEGHANY	CENAO
BATH CO. PUMPED STORAGE - LOWER DAM	BATH	VEPCO / ALLEGHENY GENERATING CO.
BATH COUNTY P S UPPER RESERVOIR - UPPER DAM	BATH	VIRGINIA ELECTRIC & POWER CO/ALLEGHENY GEN. CO
BATH CO. PUMPED STORAGE - UPPER DAM	BATH	VEPCO / ALLEGHENY GENERATING CO.
BATH COUNTY P S LOWER RESEVOIR - LOWER DAM	BATH	VIRGINIA ELECTRIC & POWER CO/ALLEGHENY GEN. CO

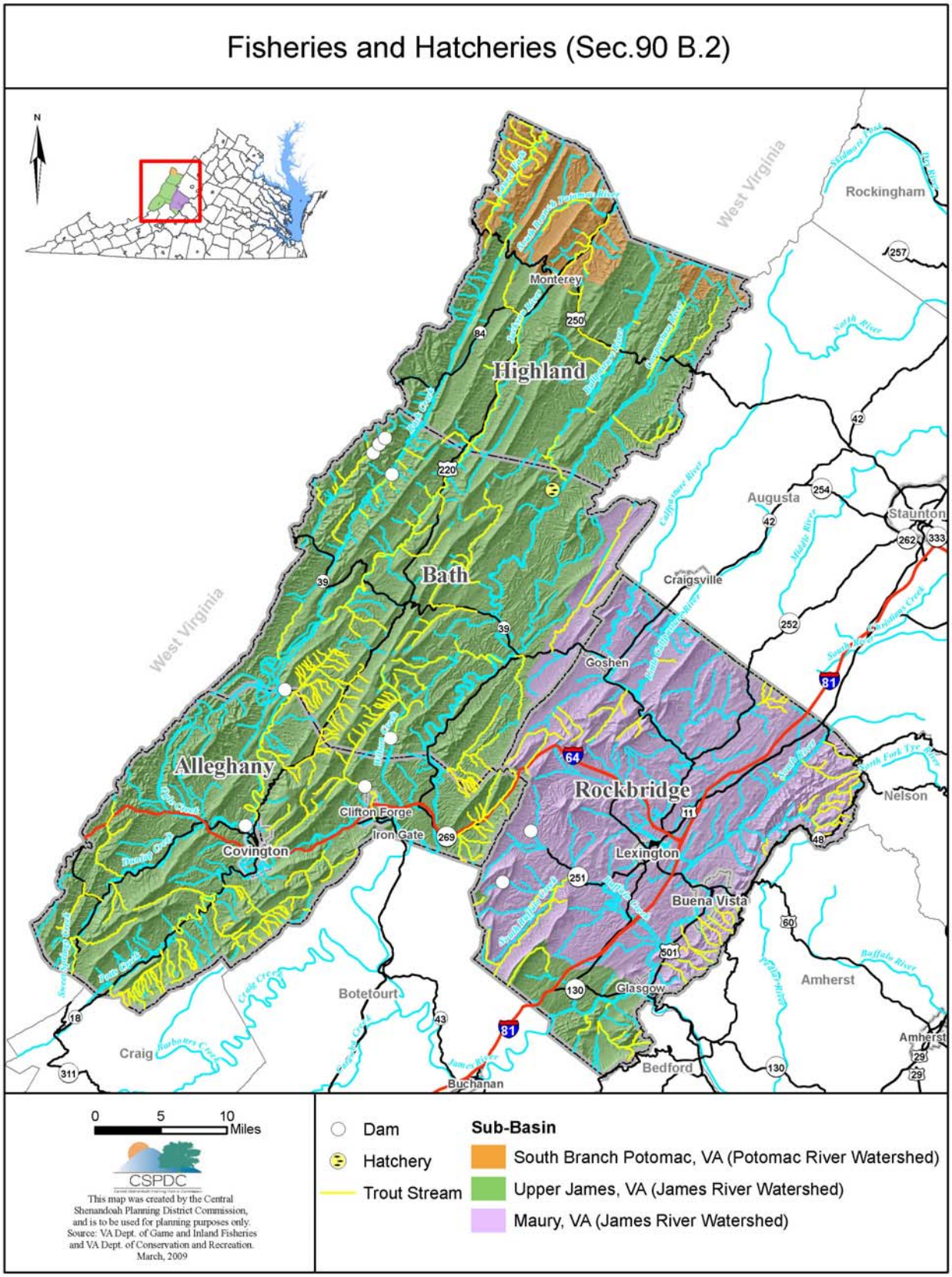

Figure 4-6: Fisheries and Hatcheries

4.6 River Segments that have Recreational Significance

Currently, there are no river sections with state scenic river status in the study area. The Virginia DCR identified four stream segments in the study area as "worthy of future study" related to scenic river status (Table 4-5). Additionally, another five segments have “qualifier” status. The Virginia Outdoor Plan (DCR 2007) outlines the criteria and process involved in state scenic river designation. Additionally, a section of the James River in Botetourt County, just downstream and outside of the study area does have state scenic river status (Figure 4-7).

The 2007 Virginia Outdoor Plan references the proposed Jackson River Blueway in Alleghany, Bath, and Highland counties. The proposed Jackson River Blueway would connect to the upper portion of the proposed James River Heritage Trail. Currently, there are nine Virginia Department of Game and Inland Fisheries boating access locations within the study area (Table 4-6 and Figure 4-7).

Table 4-5
River Segments that have Recreational Significance

River/Stream	Status	Description
Jackson River	Qualifier	Route 623 to Lake Moomaw
Calfpasture River	Qualifier	Maury River to Marble Valley
James River	Qualifier	Glasgow to Springwood
Back Creek	Qualifier	Blowing Springs to Lake Moomaw
Maury River	Qualifier	Limekiln Bridge to Lexington
Laurel Fork	Worthy	Headwaters to the West Virginia line
Cowpasture River	Worthy	Route 614 near Patma to Route 42 in Bath County
Back Creek	Worthy	Dam Hollow at Sunrise to Blowing Springs
Maury River	Worthy	Entire River

Table 4-6
Virginia Department of Game and Inland Fisheries
Boating Access Locations

Access	Water Body	Water Body	County	Location
Island Ford II	Jackson River	Jackson River	Alleghany	From Covington, E. on Rt. 1104 (2 mi. on right)
Low Moor	Jackson River	Jackson River	Alleghany	From Low Moor exit (I64), N. 100 yds, E., on Rt. 1101, Follow Signs to Access
Petticoat Junction	Jackson River	Jackson River	Alleghany	From Covington, N. Rt 220, left Rt. 687 at Clear.Pk -1 mi on left
Indian Draft	Jackson River	Jackson River	Alleghany	From Covington, N. Rt.220, left Rt. 687 @ Clear.Pk, (3 mi. on E.side)
Johnson Spring	Jackson River	Jackson River	Alleghany	From Covington, N Rt 220, left Rt. 687, Clear.Pk, S.Rt 638 Nat.Well 1/2m)
Lake Moomaw (Coles Point)	Lake Moomaw	Lake Moomaw	Alleghany	From Covington, Rt 60 West (4); R on Rt 600 (9.5)
Locker Landing	Maury River	Maury River	Rockbridge	Town of Glasgow on Rt 130
VMI Route 60 Bridge	Maury River	Maury River	Rockbridge	West of Bueno Vista off Route 60 (.5)
Lake Robertson	Robertson Lake	Robertson Lake	Rockbridge	Rt 770 West (1) of Collierstown

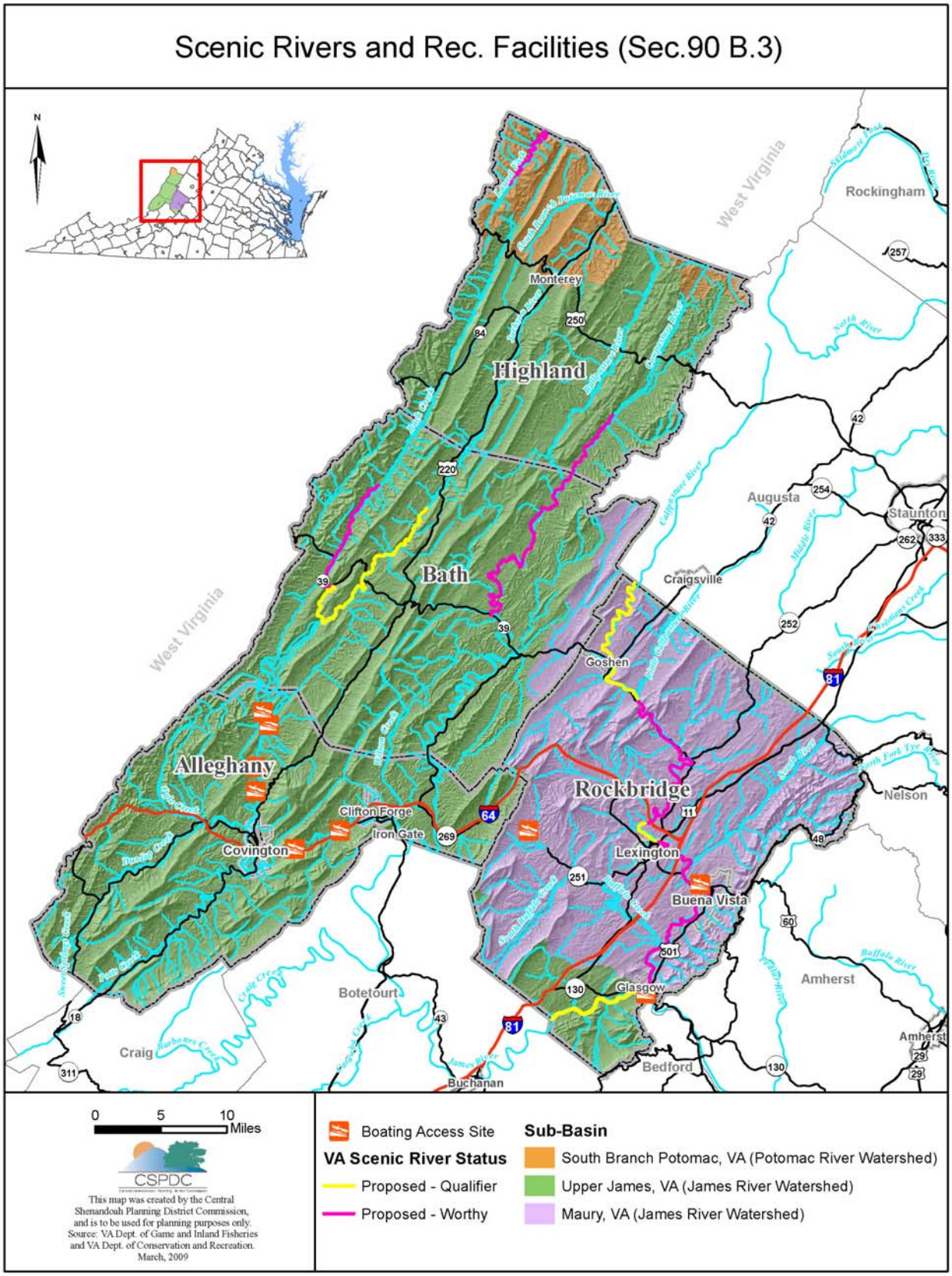

Figure: 4-7: Scenic Rivers and Recreational Facilities

4.7 Sites of Historic or Archaeological Significance

Based on information from the Virginia Department of Historical Resources there are approximately 2,038 identified archaeological sites in the study area. Temporally, the sites vary considerably and include the prehistoric, late and middle archaic, historic, Woodland, and 19th and 20th Century sites. Additionally, the archaeological sites include a range of features including camps, mines, cemeteries, farmsteads, agricultural fields, dwellings and outbuildings, fords, and other cultural features. Additionally, the Virginia Department of Historic Resources has identified approximately 4,439 historic architectural structures in the study area (Figure 4-8).

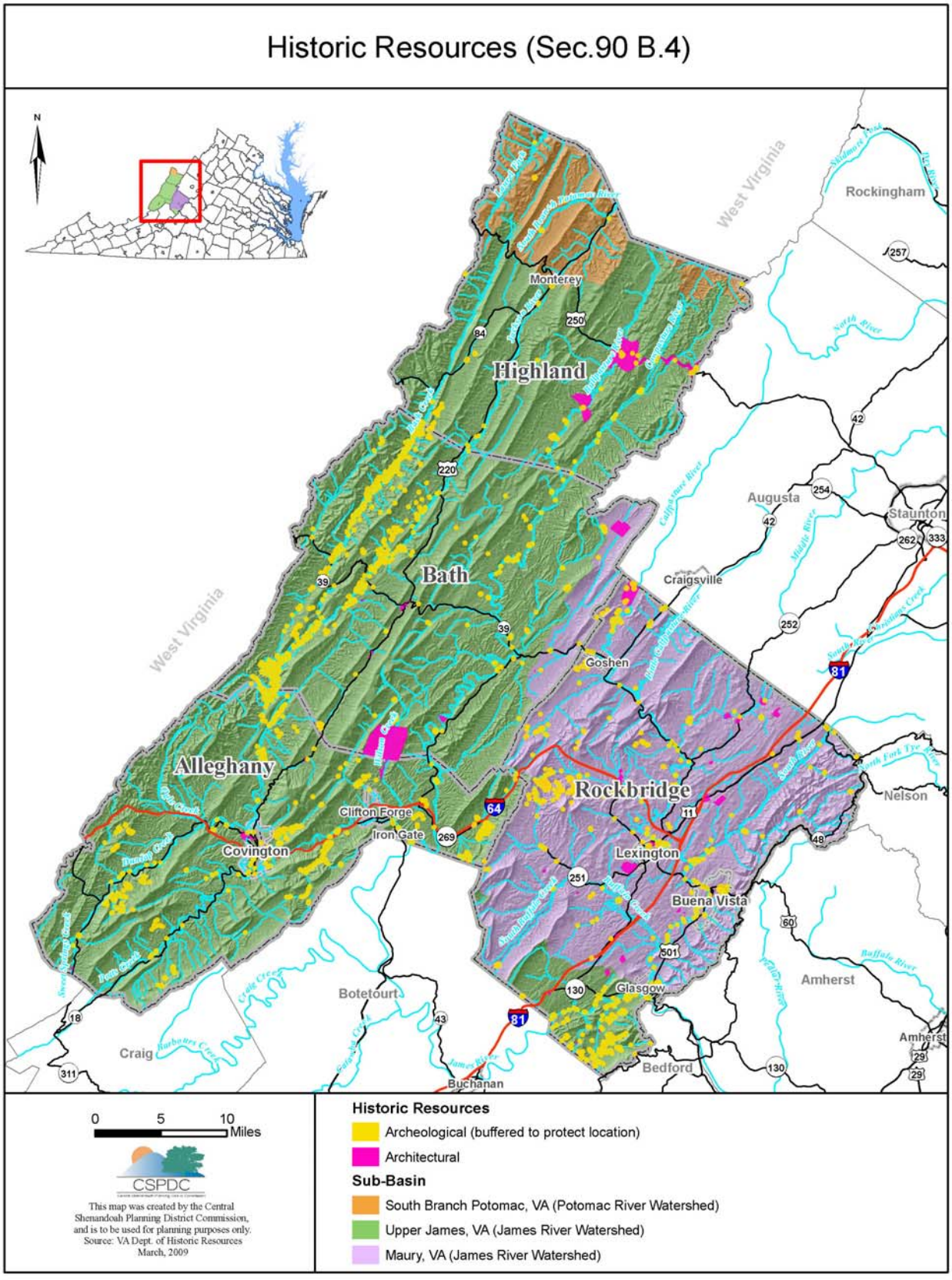

Figure 4-8: Historic Resources

4.8 Unusual Geologic Formations or Special Soil Types

Figure 4-1 provides an overview of the major geologic formations in the study area. Additionally, the Virginia Department of Mines, Minerals and Energy has identified 158 faults in the study area.

4.9 Wetlands

The United States Fish and Wildlife Service National Wetlands Inventory identified 2,909 wetland parcels in the study area, totaling approximately 20,407 acres (Figure 4-9). The identified wetlands were classified by type as freshwater emergent wetland; freshwater forested/shrub wetland; riverine; and freshwater pond.

4.10 Riparian Buffers and Conservation Easements

A conservation easement is a voluntary legal agreement between a landowner and a qualified conservation organization in which the landowner continues to own and manage the land, while promising to preserve its environmental value. The Virginia Outdoors Foundation (VOF) is the primary easement holder in the study area with 60 open spaces easements totaling approximately 17,719 acres. The Natural Conservancy (TNC) also holds 10 conservation easements totaling approximately 3,000 acres in the study area. TNC also manages 4 preserves totaling more than 8,000 acres in the study area. (Figure 4-10). Additionally, Valley Conservation Council holds one riparian easement.

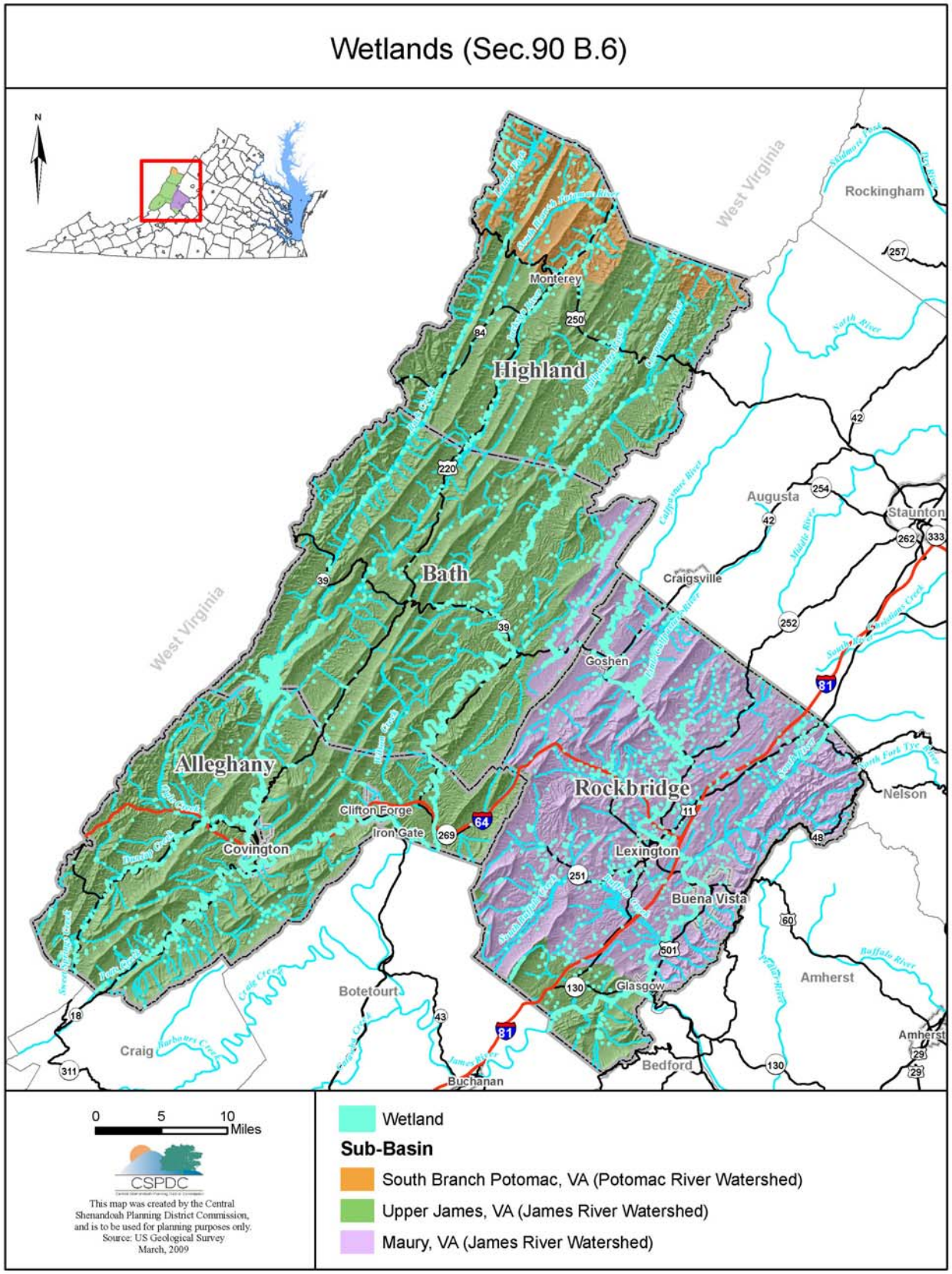

Figure 4-9: Wetlands

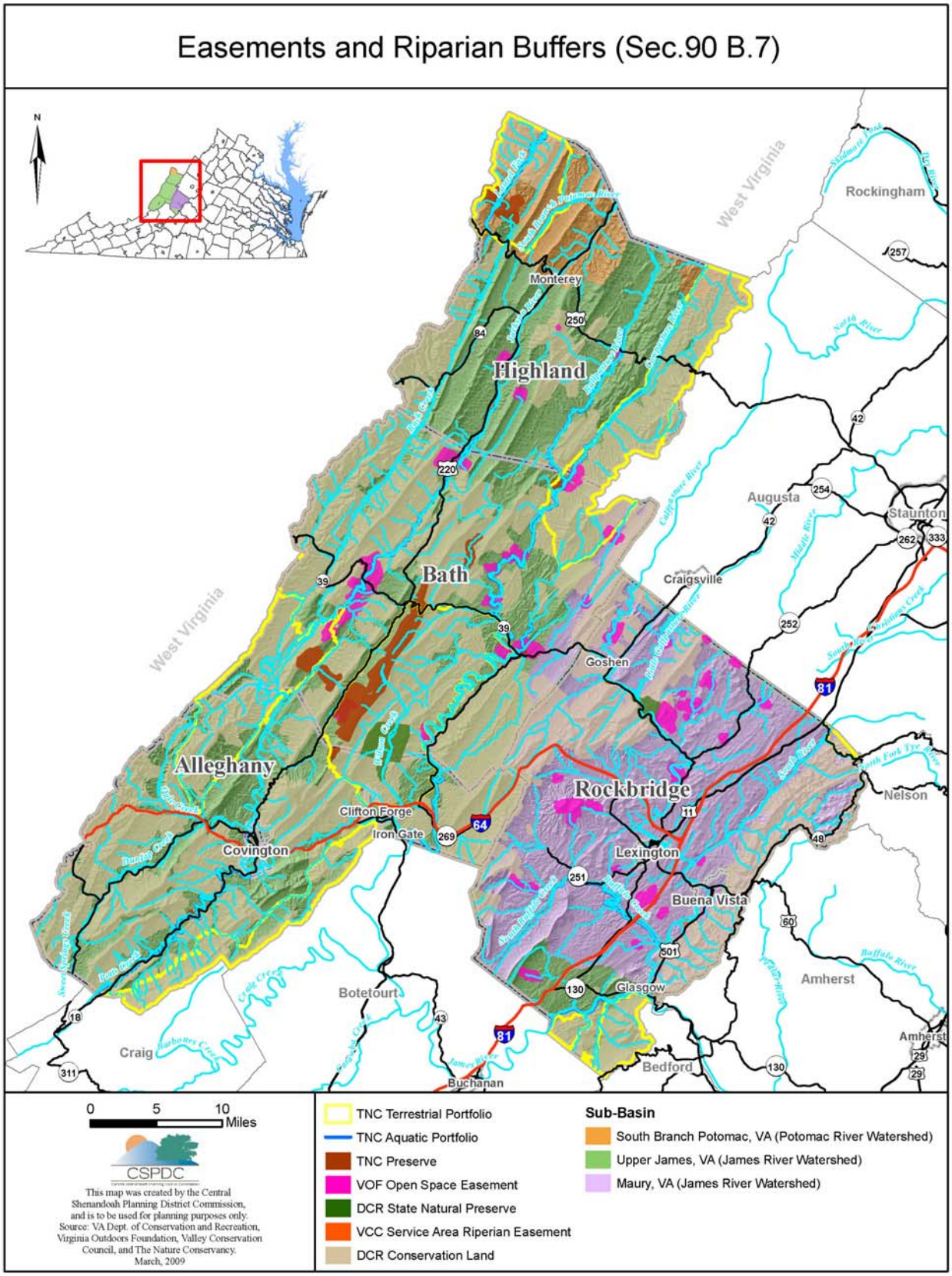

Figure 4-10: Easements and Riparian Buffers

4.11 Federal Land

Much of the study area is within federal conservation lands including National Forests and National Parks. The largest of these is the George Washington and Jefferson National Forest (US Forest Service) which covers approximately 1,069,196 acres in Alleghany County, Bath, Highland, and Rockbridge counties. Other federal land in the study area includes the Blue Ridge Parkway (National Park Service).

4.12 State Land

State landholdings in the study area include one state park, three state natural area preserves, eight state wildlife management areas, two state public fishing lakes, and one fish hatchery. Managing agencies include the Virginia Department of Conservation and the Virginia Department of Game and Inland Fisheries manages.

4.13 Land Use and Land Coverage

Table 4-7 and Figure 4-11 provides land coverage based on 2001 National Land Cover Data from the USGS. The most common land cover in the Water Supply Plan Study Area is deciduous forest, covering 908,092 acres, followed by pasture/hay covering 160,665 acres. Developed land (open space, low intensity, medium intensity, and high intensity) represents 71,552 acres. Other land cover includes evergreen forest, mixed forest, open water, and cultivated crops. Figure 4-12 shows impervious surface in the study area.

Table 4-7
Land Cover

Land Cover Type	Acres	Sq. Miles
Open Water	7,669	11.98
Developed, Open Space	54,729	85.51
Developed, Low Intensity	13,166	20.57
Developed, Medium Intensity	2,878	4.49
Developed, High Intensity	779	1.21
Barren Land (Rock/Sand/Clay)	478	0.74
Deciduous Forest	908,092	1418.89
Evergreen Forest	94,336	147.39
Mixed Forest	40,996	64.05
Pasture/Hay	160,665	251.03
Cultivated Crops	5,806	9.07
Woody Wetlands	71	0.11
Emergent Herbaceous Wetlands	87	0.13
Total	**1,289,752**	**2015.17**

Source: 2001 National Land Cover Data, United States Geological Survey.

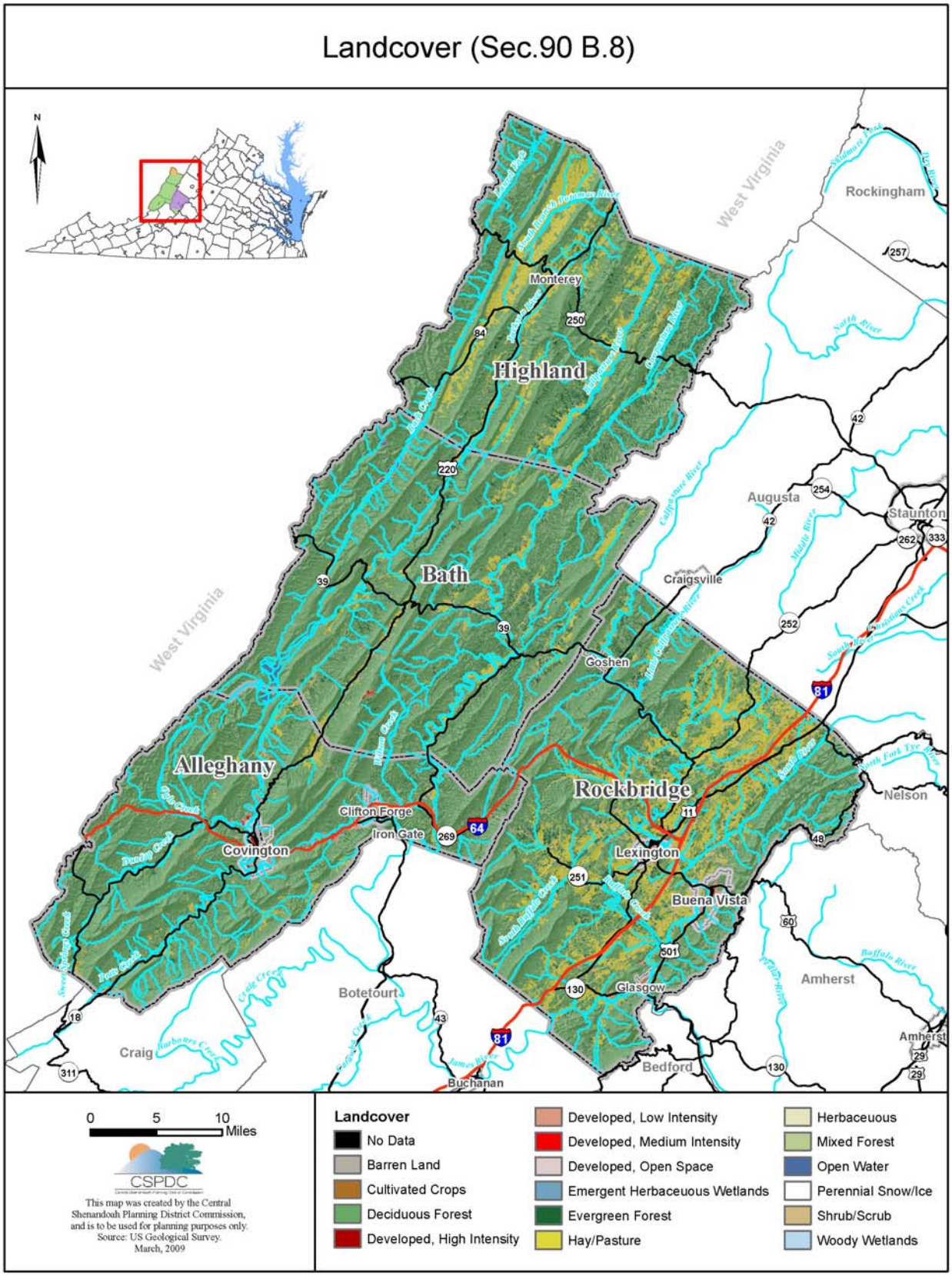

Figure 4-11: Landcover and Land Use

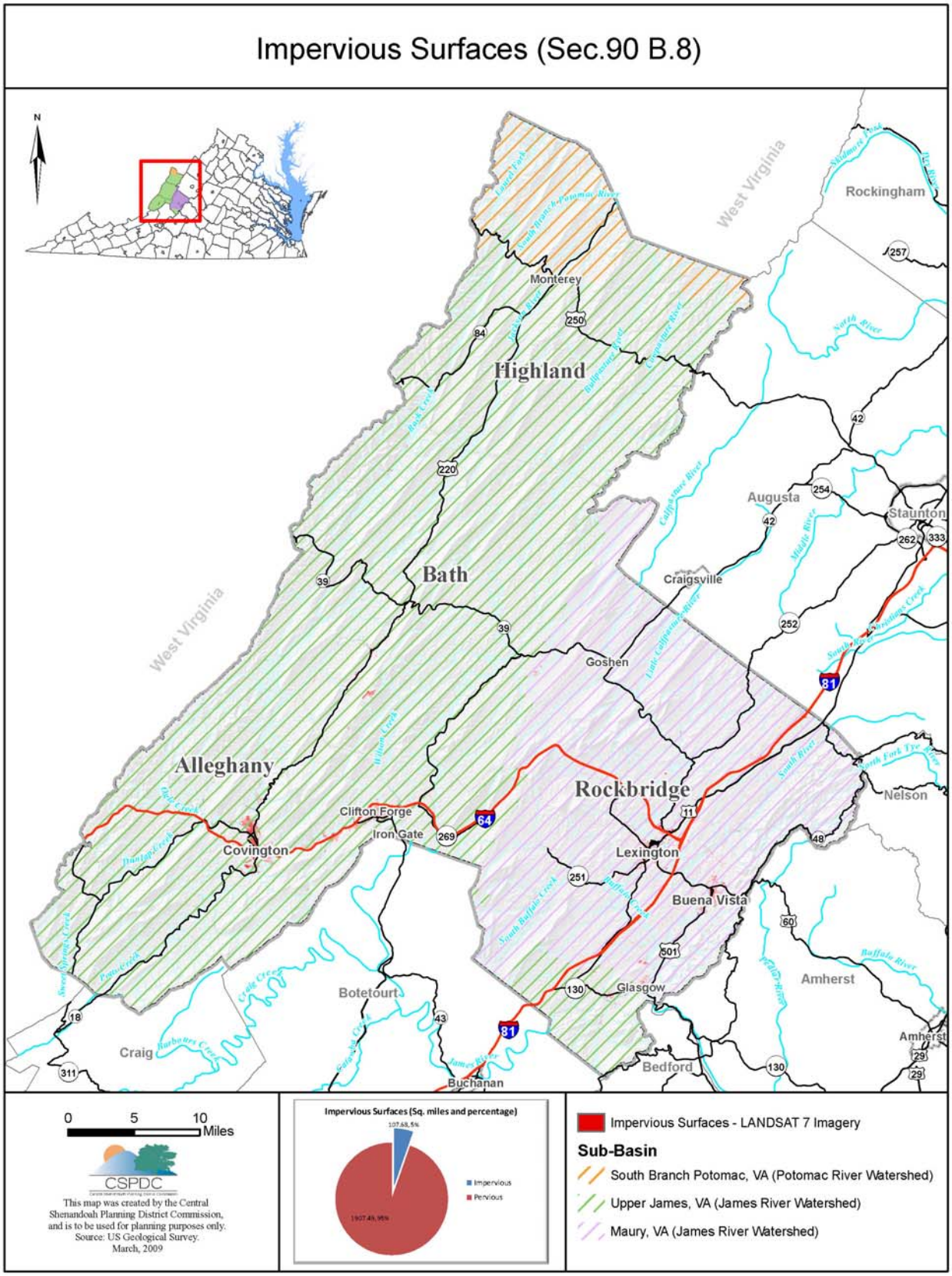

Figure 4-12: Impervious Surfaces

4.14 Impaired Streams and Type of Impairment

There are 48 impaired stream segments in the study area (Table 4-8 and Figure 4-13 and 4-14). Common impairments include escherichia coli, fecal coliform, and temperature. Impairment sources include point and non-point sources, natural conditions, on-site treatment systems, cattle, waterfowl, and other wildlife. The 2008 Final 305(b)/303(d) Water Quality Assessment Integrated Report and additional information on water quality in Virginia is available from the DEQ (Water Quality Assessments homepage http://www.deq.virginia.gov/wqa/homepage.html).

4.15 Locations of Point Source Discharges

Section 402 of the Clean Water Act established the National Pollutant Discharge Elimination System (NPDES) to limit pollutant discharges into streams, rivers, and bays. In the Commonwealth of Virginia, DEQ administers the program as the Virginia Pollutant Discharge Elimination System (VPDES). VPDES permits are required to discharge any pollutant into surface waters of the Commonwealth from a point source, including stormwater discharges from certain industrial facilities. Additional information on the VPDES program is available at http://www.deq.state.va.us/vpdes/homepage.html.

The EPA Permit Compliance System (PCS) provides information on companies which have been issued permits to discharge waste water into rivers. Based on information from the PCS and VDEQ, ten facilities in the study area have VPDES point source discharge permits (Table 4-9). Of these individual permit holders, ten are for municipal facilities and two are for industrial facilities. The location of point source discharges is provided in Figure 4-15. The Permit Compliance System (PCS) is available at http://www.epa.gov/enviro/html/pcs/pcs_query.html.

Table 4-8
Impaired Stream Segments

Stream/River	Location	Category	Impairment Cause	Impairment Source
Bolar Run	Bolar Run from the headwaters downstream to its confluence with the Jackson River.	5A	Temperature, water	Natural Conditions - Water Quality Standards Use Attainability Analyses Needed
Buffalo Creek	Buffalo Creek from its confluence with Moore Creek downstream to its confluence with an unnamed tributary near Buffalo Bend.	5A	Fecal Coliform	Wildlife Other than Waterfowl, Non-Point Source, Agriculture
Buffalo Creek	Buffalo Creek from its confluence with an unnamed tributary near Buffalo Bend downstream to its confluence with the Maury River.	5A	Escherichia coli, Fecal Coliform	Wildlife Other than Waterfowl, Non-Point Source, Agriculture
Bullpasture River	Bullpasture River from the headwaters downstream to its confluence with the Cowpasture River.	5A	Escherichia coli	Wildlife Other than Waterfowl, Non-Point Source, Agriculture
Calfpasture River	Calfpasture River from its confluence with Tizzle Branch downstream to its confluence with Brattons Run.	5A	Escherichia coli	Wildlife Other than Waterfowl, Non-Point Source, Agriculture
Cedar Creek	Cedar Creek from the headwaters downstream to its confluence with the James River.	5A	Fecal Coliform	Wildlife Other than Waterfowl, Non-Point Source

Table 4-8 (continued)
Impaired Stream Segments

Stream/River	Location	Category	Impairment Cause	Impairment Source
Cedar Creek Lower	Cedar Creek mainstem from its mouth on the Jackson R. upstream to a series of springs.	5A	Escherichia coli, Temperature, water, Fecal Coliform	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Wildlife Other than Waterfowl, Livestock (Grazing or Feeding Operations), Natural Conditions - Water Quality Standards Use Attainability Analyses Needed, Unspecified Domestic W
Cedar Grove Branch	Cedar Grove Branch from the headwaters downstream to its confluence with the Maury River.	5A	Escherichia coli, Fecal Coliform	Wildlife Other than Waterfowl, Non-Point Source, Agriculture
Colliers Creek	Colliers Creek from the headwaters downstream to its confluence with Buffalo Creek.	5A	Fecal Coliform	Wildlife Other than Waterfowl, Non-Point Source, Agriculture
Dunlap Creek Lower	Dunlap Creek mainstem from its mouth on the Jackson River upstream to the Boys Home water intake.	5A	Escherichia coli	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Wildlife Other than Waterfowl, Livestock (Grazing or Feeding Operations), Unspecified Domestic Waste
Dunlap Creek Lower 2 PWS	Dunlap Creek from the Boys Home water intake upstream to the mouth of Ogle Creek, a WQS public water supply designated section.	5A	Escherichia coli	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Wildlife Other than Waterfowl, Livestock (Grazing or Feeding Operations), Unspecified Domestic Waste
Falling Spring Creek	Falling Spring Creek mainstem from its mouth to confluence of an unnamed tributary located at 37 52'48" / 79 54'52".	5A	Escherichia coli	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Livestock (Grazing or Feeding Operations), Unspecified Domestic Waste
Hays Creek	Hays Creek from its confluence with Moffatts Creek downstream to its confluence with the Maury River.	5A	Escherichia coli, Temperature, water, Fecal Coliform	Wildlife Other than Waterfowl, Source Unknown, Non-Point Source, Agriculture

Table 4-8 (continued)
Impaired Stream Segments

Stream/River	Location	Category	Impairment Cause	Impairment Source
Jackson River	Jackson River from its confluence with Dry Branch downstream to its confluence with Muddy Run.	5A	Escherichia coli	Wildlife Other than Waterfowl, Non-Point Source
Jackson River	Jackson River from the headwaters downstream to its confluence with Dry Branch.	5A	Escherichia coli	Wildlife Other than Waterfowl, Non-Point Source
Jackson River	Jackson River from its confluence with Muddy Run downstream to the upper end of Lake Moomaw.	5C	Temperature, water	Natural Conditions - Water Quality Standards Use Attainability Analyses Needed
Jackson River Lower 1	Jackson River mainstem from the Westvaco main processing outfall downstream to Dunlap Creek mouth at the watershed boundary with I09R.	5A	Benthic-Macroinvertebrate Bioassessments, Escherichia coli, Oxygen, Dissolved, PCB in Fish Tissue	Industrial Point Source Discharge, Municipal (Urbanized High Density Area), Sanitary Sewer Overflows (Collection System Failures), Source Unknown, Urban Runoff/Storm Sewers
Jackson River Lower 1	Jackson River mainstem from the Clifton Forge STP outfall downstream to the Jackson River confluence with the Cowpasture River.	5A	Benthic-Macroinvertebrate Bioassessments	Industrial Point Source Discharge, Municipal (Urbanized High Density Area), Municipal Point Source Discharges
Jackson River Lower 2	Jackson River mainstem from the US 60 crossing downstream to the Clifton Forge STP outfall.	5A	Benthic-Macroinvertebrate Bioassessments	Industrial Point Source Discharge, Municipal (Urbanized High Density Area), Municipal Point Source Discharges

Table 4-8 (continued)
Impaired Stream Segments

Stream/River	Location	Category	Impairment Cause	Impairment Source
Little Calfpasture River	Little Calfpasture River from the Lake Merriweather Dam downstream to its confluence with the Calfpasture River.	5A	Benthic-Macroinvertebrate Bioassessments	Upstream Impoundments (e.g., Pl-566 NRCS Structures)
Maury River	Maury River from its confluence with Taylor Branch downstream to its confluence with Kerrs Creek.	5A	Escherichia coli	Wildlife Other than Waterfowl, Non-Point Source, Agriculture
Maury River	Maury River from its confluence with the Calfpasture River/Little Calfpasture River downstream to its confluence with Taylor Branch.	5A	Escherichia coli	Wildlife Other than Waterfowl, Non-Point Source, Agriculture
Maury River	Maury River from its confluence with Buffalo Creek downstream to its confluence with the James River.	5A	Benthic-Macroinvertebrate Bioassessments, Escherichia coli, PCB in Fish Tissue	Municipal (Urbanized High Density Area), Wildlife Other than Waterfowl, Source Unknown, Non-Point Source
Maury River	Maury River from its confluence with Indian Gap Run downstream to its confluence with Buffalo Creek.	5A	Benthic-Macroinvertebrate Bioassessments, Escherichia coli, PCB in Fish Tissue	Municipal (Urbanized High Density Area), Wildlife Other than Waterfowl, Source Unknown, Non-Point Source
Maury River	Maury River from its confluence with South River downstream to its confluence with Indian Gap Run.	5A	Escherichia coli, PCB in Fish Tissue	Municipal (Urbanized High Density Area), Wildlife Other than Waterfowl, Source Unknown, Non-Point Source
Mill Creek	Mill Creek from the headwaters downstream to its confluence with the Calfpasture River.	5A	Escherichia coli, Fecal Coliform	Wildlife Other than Waterfowl, Non-Point Source, Agriculture

Table 4-8 (continued)
Impaired Stream Segments

Stream/River	Location	Category	Impairment Cause	Impairment Source
Mill Creek	Mill Creek from the headwaters downstream to its confluence with the Maury River.	5A	Escherichia coli, Temperature, water, Fecal Coliform	Wildlife Other than Waterfowl, Non-Point Source, Natural Conditions - Water Quality Standards Use Attainability Analyses Needed, Agriculture
Moffatts Creek	Moffatts Creek from the headwaters downstream to its confluence with Hays Creek.	5A	Escherichia coli, Temperature, water, Fecal Coliform	Wildlife Other than Waterfowl, Source Unknown, Non-Point Source
Moores Creek	Moores Creek and tributaries from the headwaters downstream to its confluence with the South River.	5A	Benthic-Macroinvertebrate Bioassessments	Wildlife Other than Waterfowl, Non-Point Source
Otts Creek	Otts Creek from its confluence with an unnamed tributary at the Route 726 bridge crossing downstream to its confluence with Moffatts Creek.	5A	Escherichia coli, Temperature, water	Wildlife Other than Waterfowl, Non-Point Source
Panther Run	Panther Run from the headwaters downstream to its confluence with Mare Run.	4C	Benthic-Macroinvertebrate Bioassessments	Drought-related Impacts
Pheasanty Run	Pheasanty Run from the Coursey Springs Fish Farm discharge downstream to its confluence with the Cowpasture River.	4A	Benthic-Macroinvertebrate Bioassessments	Aquaculture (Permitted)
Piney Branch	Piney Branch from the headwaters downstream to its confluence with Guys Run.	5A	pH	Atmospheric Deposition - Acidity
Porters Mill Creek	Porters Mill Creek and tributary from the headwaters downstream to its confluence with Mill Creek.	5A	pH	Atmospheric Deposition - Acidity

Table 4-8 (continued)
Impaired Stream Segments

Stream/River	Location	Category	Impairment Cause	Impairment Source
Potts Creek Lower 2	Potts Creek mainstem from the mouth of Hamilton Branch upstream to the Alleghany / Craig County Line.	5A	Escherichia coli, pH	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Wildlife Other than Waterfowl, Source Unknown, Livestock (Grazing or Feeding Operations), Unspecified Domestic Waste
Potts Creek Lower Class V	Potts Creek from the Alleghany / Craig County Line upstream to the confluence of Paint Bank Branch.	5A	Escherichia coli, Temperature, water, pH	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Wildlife Other than Waterfowl, Source Unknown, Livestock (Grazing or Feeding Operations), Unspecified Domestic Waste
S.F. Pads Creek	S. F. Pads Creek from the headwaters (excluding tributaries) downstream to its confluence with Pads Creek.	4C	Benthic-Macroinvertebrate Bioassessments	Drought-related Impacts
Smith Creek Lower	Smith Creek mainstem from its mouth on the Jackson River upstream 1.20 miles; the beginning of the WQS natural trout section.	5A	Fecal Coliform	Municipal (Urbanized High Density Area), Sanitary Sewer Overflows (Collection System Failures), Wastes from Pets, Wildlife Other than Waterfowl, Unspecified Domestic Waste
South Branch Potomac River	South Branch Potomac River from the headwaters downstream to the VA/WVA state line.	5A	Escherichia coli	Non-Point Source
Strait Creek	Strait Creek from its confluence with West Strait Creek downstream to the confluence with the South Branch Potomac River.	5A	Benthic-Macroinvertebrate Bioassessments, Escherichia coli	Channelization, Non-Point Source, Agriculture

Table 4-8 (continued)
Impaired Stream Segments

Stream/River	Location	Category	Impairment Cause	Impairment Source
Strait Creek	Strait Creek from the headwaters downstream to its confluence with West Strait Creek.	5A	Escherichia coli	Non-Point Source, Agriculture
Sweet Springs Creek	Sweet Springs Creek mainstem from its confluence with Dunlap Creek to its headwaters.	5C	Temperature, water	Source Unknown
Walker Creek	Walker Creek and headwater tributaries from the headwaters downstream to its confluence with Dutch Hollow Branch.	5A	Escherichia coli	Wildlife Other than Waterfowl, Non-Point Source, Agriculture
West Strait Creek	West Strait Creek from the Monterey STP downstream to its confluence with an unnamed tributary originating on Miracle Ridge.	5A	Benthic-Macroinvertebrate Bioassessments	Municipal Point Source Discharges
West Strait Creek	West Strait Creek from the headwaters downstream to the Monterey STP.	5A	Benthic-Macroinvertebrate Bioassessments	Non-Point Source
Wilson Creek Upper	Wilson Creek mainstem from the backwaters of Douthat Lake upstream to its headwaters.	5C	Temperature, water	Drought-related Impacts, Source Unknown
Woods Creek	Woods Creek and tributary from the headwaters downstream to its confluence with the Maury River.	5A	Benthic-Macroinvertebrate Bioassessments	Municipal (Urbanized High Density Area), Non-Point Source

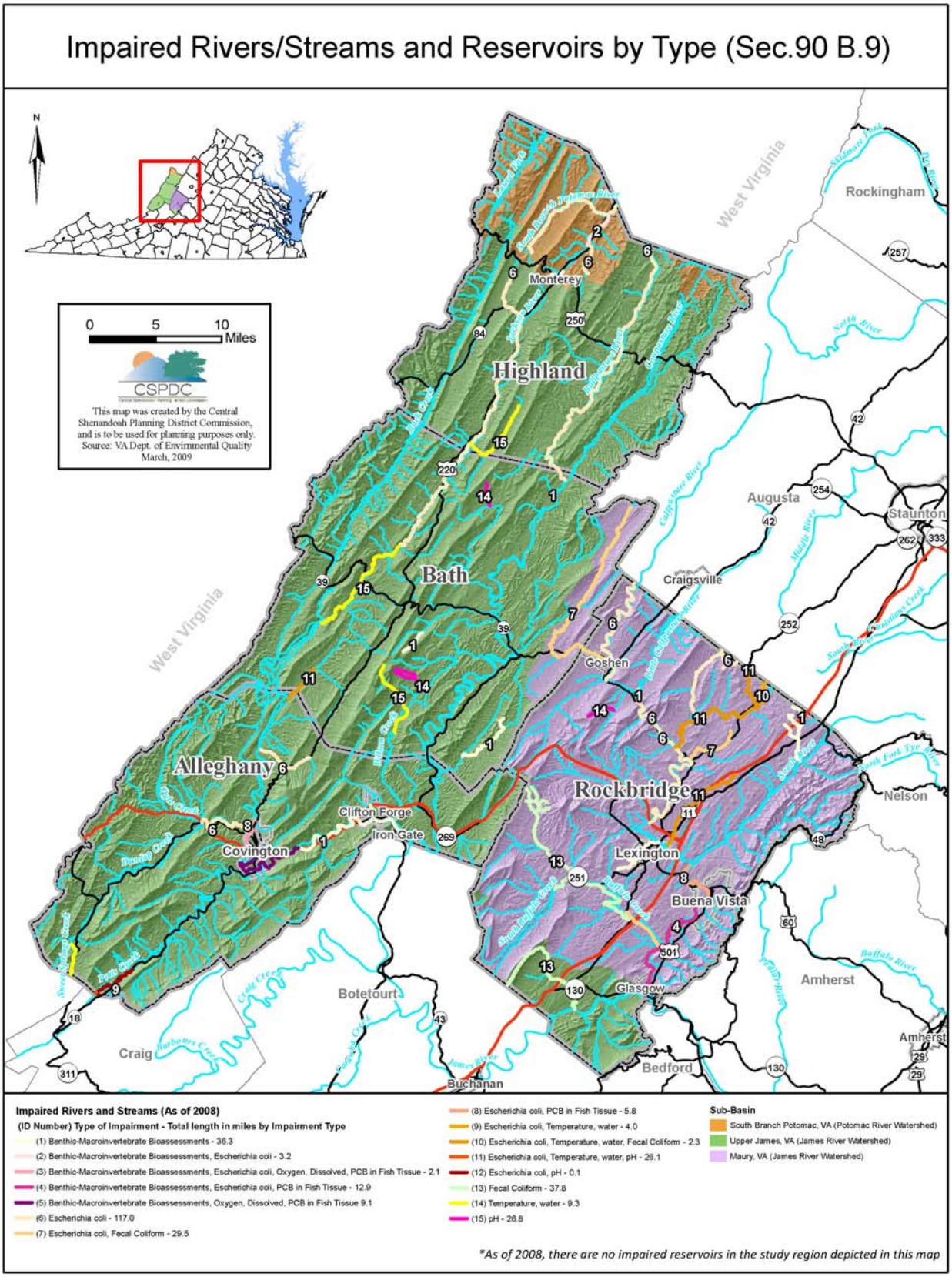

Figure 4-13: Impaired Waters by Impairment Type

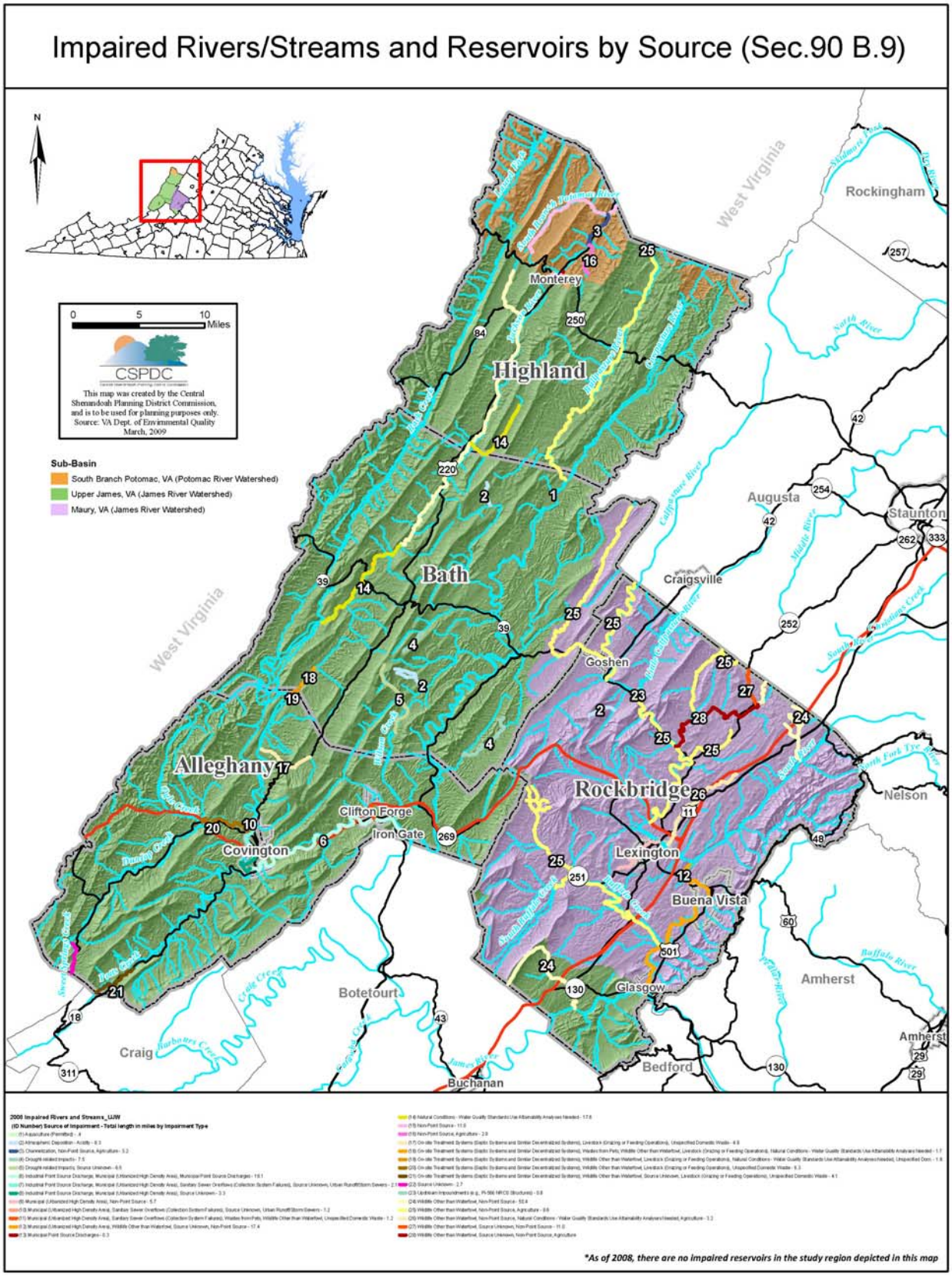

Figure 4-14: Impaired Waters by Type of Impairment Source

Table 4-9
Point Source Discharges

VPDES	Facility	Stream/River	Type	Category	River Basin
VA0020991	Buena Vista City of STP	Maury River	Major	Municipal	Upper James River
VA0090972	Cedar Creek STP (formerly Bath County Trailer	Cedar Creek, U.T.	Minor	Municipal	James River Basin
VA0022772	Clifton Forge STP	Jackson River	Major	Municipal	Upper James River
VA0025542	Covington City STP	Jackson River	Major	Municipal	Upper James River
VA0088960	Kerrs Creek STP (formerly Canaan Valley Estate	Linkswiler Branch	Minor	Municipal	James River Basin
VA0004677	Lees Carpets formerly Burlington Ind.-Glasgow	Maury River	Major	Industrial	Upper James River
VA0088161	Lexington-Rockbridge Regional STP	Maury River	Major	Municipal	Upper James River
VA0073156	Millboro STP (formerly Millboro Industrial Par	Cabin Creek	Minor	Municipal	James River Basin
VA0023281	Monterey STP	West Strait Creek	Minor	Municipal	Potomac River & Shenandoah River Basins
VA0058734	Smiley's Fuel City formerly Circle K #5362	Moores Creek X-Trib	Minor	Industrial	James River Basin

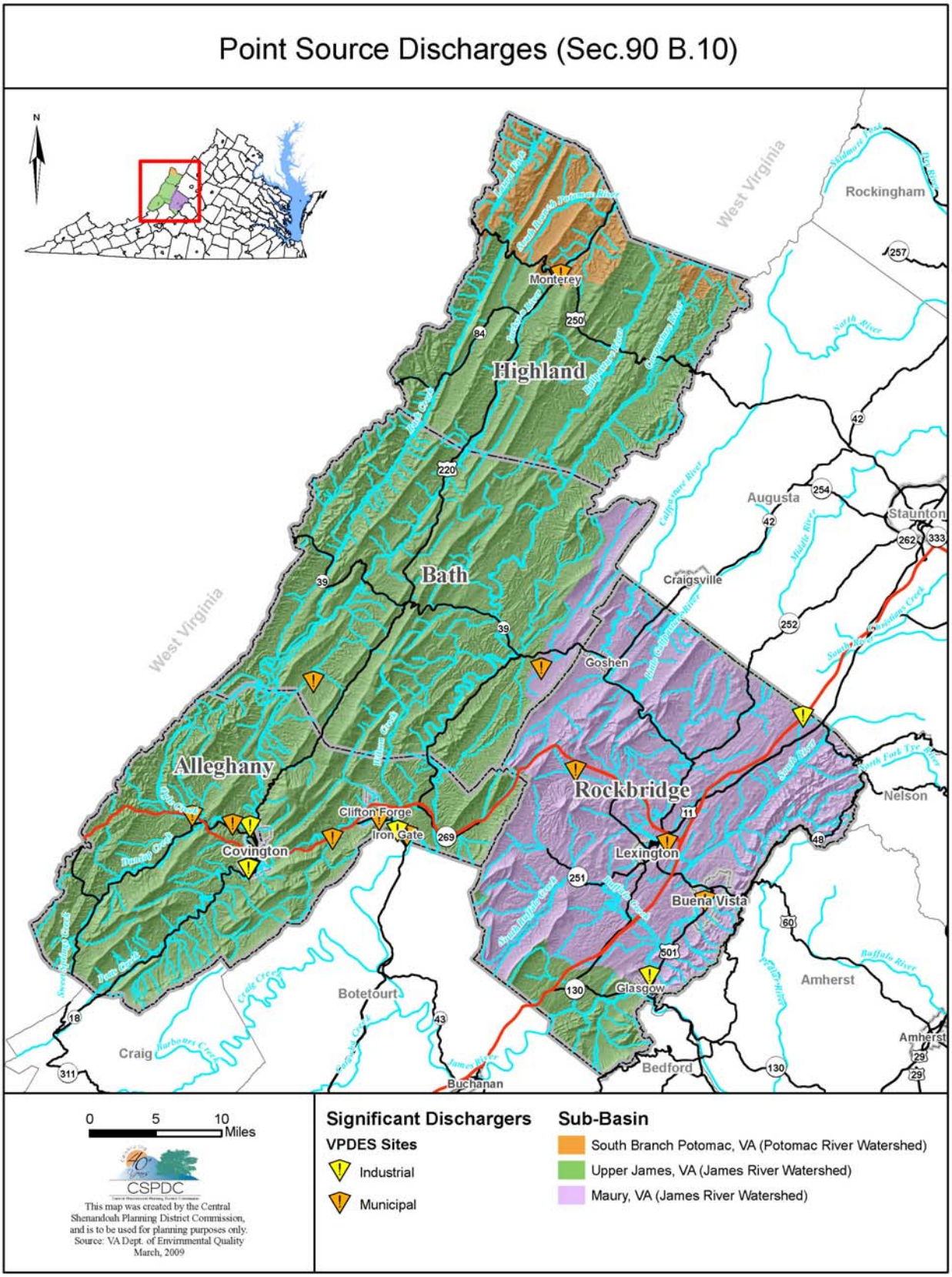

Figure 4-15: Point Source Discharges

4.16 Potential Threats to the Existing Water Quantity and Quality

Landfills and solid waste collection sites represent potential threats to existing water quality. Currently there are 67 landfills and solid waste collection sites in the study area (Tables 4-10, 4-11, and 4-12). Figure 4-16 shows the location of these solid waste facilities.

Table 4-10
Alleghany County, Covington, Clifton Forge, and Iron Gate
Landfills and Solid Waste Collection Sites

Facility	Facility Status	Facility Type	Facility Location	Location
Alleghany County Transfer Station	Active	Transfer Station [SW]	Valley Ridge Rd	Covington
Westvaco Asbestos Lf	Active	Industrial Landfill [SW]	104 E Riverside St	Covington
Westvaco Fly Ash #1	Active	Industrial Landfill [SW]	104 E Riverside St	Covington
Westvaco Fly Ash #2	Active	Industrial Landfill [SW]	104 E Riverside St	Covington
Westvaco Fly Ash #3	Active	Industrial Landfill [SW]	104 E Riverside St	Covington
Peters Mountain Sanitary Landfill #2	Active	Sanitary Landfill [SW]	Rte 600 at intersection with 658	Covington
Westvaco No. 5 ILF	Active	Industrial Landfill [SW]	104 E Riverside St	Covington

Table 4-11
Bath County
Landfills and Solid Waste Collection Sites

Millboro Springs Site	Cowpasture River Hwy
Nimrod Hall Site	Cowpasture River Hwy
Old Rock Quarry Site	Cowpasture River Hwy
Ridge Rd. &Kiser Ln. Site	Intersection of Ridge Rd. & Kiser Ln.
Industrial Park Site	Millboro Industrial Park Rd. (CONFIRM LOCATION)
Douthat Site	Douthat State Park Rd.
Dry Run Site	Dry Run Rd.
Deerfield Site	Deerfield Rd.
Green Valley Site	Deerfield Rd.
Williamsville/Scotchtown Draft Site	Indian Draft Rd.
Muddy Run Rd. Site	Muddy Run Rd.
Valley Elementary Site	off of Panther Dr.
Virginia Hill Site	Virginia Ave.
Rocky Ridge Site	Sam Snead Hwy.
West Warm Springs Site	Mountain Valley Rd.
Mountain Grove Site	Mountain Valley Rd.
Little Back Creek Site	Little Back Creek Rd.

Table 4-12
Highland County
Landfills and Solid Waste Collection Sites

Facility	Facility Type and Location
Former Landfill	Collection Site @ Former Landfill Location
Blue Grass	Collection Site @ Ruritan Building
Vanderpool	Collection Site on Mill Gap Rd., 1/4 mile west from Jackson River Rd.
McDowell	Collection Site on Highland Turnpike across from battfield area
Headwatersl	Collection Site on Lower Fork Rd., 1/8 mile past intersection w/ Highland Turnpike

Table 4-13
Rockbridge County - Landfills and Solid Waste Collection Sites

Facility	Facility Type
Back Run	Trash Collection Site
Barger's	Trash Collection Site
Boat Locks	Trash Collection Site
Buck Hill	Trash Collection Site
Buena Vista	Trash Collection Site
Buffalo Creek	Trash Collection Site
Bunker Hill Mill	Trash Collection Site
Bustleburg	Trash Collection Site
Cave Mtn Lake	Trash Collection Site
Cedar Grove (Hart Rd)	Trash Collection Site
Co. Landfill	Landfill
Collierstown	Trash Collection Site
Fairfield	Trash Collection Site
Goshen	Trash Collection Site
Green Hill Apts	Trash Collection Site
Greenhouse Rd	Trash Collection Site
Johnsons MHP	Trash Collection Site
Kerrs Creek	Trash Collection Site
Landfill Gate	Trash Collection Site
Marl Ridge	Trash Collection Site
Midvale(swinging bridge)	Trash Collection Site
Murat Collection	Trash Collection Site
Natural Bridge	Trash Collection Site
Natural Bridge Station	Trash Collection Site
Petites Gap	Trash Collection Site
Rapps Mill	Trash Collection Site
Riverside	Trash Collection Site
Rural Valley	Trash Collection Site
Sallings	Trash Collection Site
Timber Ridge	Trash Collection Site
Turpin's Supply	Trash Collection Site
Valley View Apts	Trash Collection Site
Vesuvius	Trash Collection Site
Wade's Mill (Gibbs Run)	Trash Collection Site
Walkers Creek	Trash Collection Site
West 60	Trash Collection Site
Willow Springs Apts	Trash Collection Site
Zollman's	Trash Collection Site

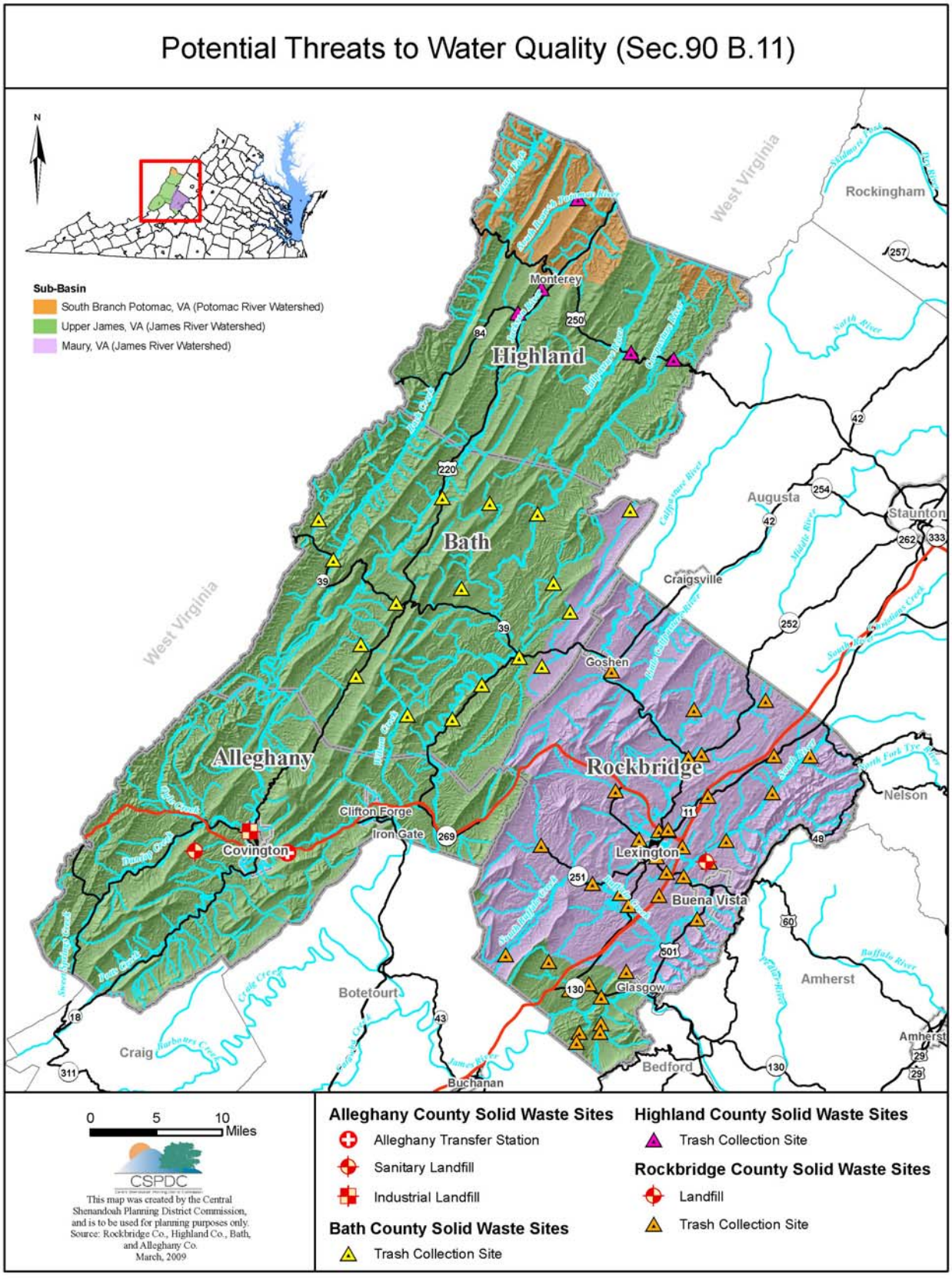

Figure 4-16: Solid Waste Facilities

4.16.1 Potential Threats - Alleghany Highlands Localities

Although serving all municipal community water systems throughout the study area, two primary water sources and treatment facilities provide the vast majority of water in the area. These include the City of Covington WTP on the Jackson River and the Clifton Forge WTP on Smith Creek. Given the current interconnection and existing water sharing agreements in place in the study area, any event – natural or cultural - that disrupts or limits withdrawal or treatment of water from either of these sources/facilities would impact community water systems throughout the study area.

For instance, portions of Route 606 parallel Smith Creek (Clifton Forge WTP water source) upstream from the WTP water supply reservoirs. Route 606 is a narrow, rural, winding road with a narrow shoulder that slopes precipitously down to Smith Creek, and limited sight distance. Due to adjacent topography, guardrails are limited or non-existent along sections of Route 606 that parallel Smith Creek. Based on locality staff input in recent years several vehicles have ran off the road, with one landing upside down in Smith Creek. Such accidents pose significant risks for potential contamination of one of the major water supply sources in the study area. Clifton Forge and VDOT staff have installed reflectors on this section to alert drivers to the narrowness of the road and proximity to the creek. VDO has also installed signage "GPS routing not recommended" to limit truck traffic on the road. As noted in the water supply source information, the Clifton Forge and other municipal water systems in the area have limited storage capacity. As such stored treated water supplies would be depleted in a matter of days at best should the water system cease operation for even brief period of time.

Alleghany County, the City of Covington, and the Town of Clifton Forge participated in development of the Pre-Disaster Mitigation Plan for the Roanoke Valley - Alleghany Regional Commission. The Pre-Disaster Mitigation Plan focuses on natural disasters and their potential impacts and provides localities within the Regional Commission's service area with the necessary information and strategies to make informed decisions concerning hazard mitigation activities. The Virginia Emergency Services and Disaster Laws of 2000 requires that state and local governments develop and maintain current Emergency Operations Plans in order to be prepared for a variety of natural and man-made hazards such as flash flooding, major river flooding, hurricanes, hazardous materials incidents, resource shortages and acts of terrorism. The purpose of the EOP is to describe the concepts and structures of response and recovery operation, identifies agencies with essential and support emergency management functions, and assigns emergency prevention, preparedness, response and recovery duties and responsibilities to departments and agencies.

Beyond natural and man-made disasters, as noted in the water supply source information, other potential threats to water quantity and quality do exist. As noted in the water source information,

the Clifton Forge WTP reservoirs on Smith Creek are experiencing significant sedimentation. Additionally, the Clifton Forge has limited finished water storage capacity. A preliminary engineering report (*PER Water Filtration Phase II Improvements, Town of Clifton Forge*) produced by Draper Aden Associates in February 2010 provided cost estimates and related information associated with dredging the reservoir. The PER also provides cost estimates on additional tanks to increase storage capacity and other needed improvements. In total, the PER reports identified more than $9 million in needed improvements with a water plant prioritized list of projects totaling $4-6 million.

Additionally, as noted in the water use information, several municipal community systems have considerably high rates of known or estimated unaccounted for water use/system losses which could pose potential threats to water quantity.

5.0 PROJECTED WATER DEMANDS (9 VAC 25-780-100)

As required in 9 VAC 25-780-100, future water demand has been projected for the Upper James River Basin Region. For the purposes of this Water Supply Plan, a 30-year planning period is used with projected water demand extending to the year 2040. Table 5-1 presents a summary of the projected water demand by sector for the Basin as a whole, includes the entire planning region. Individual locality demand projection information and methodgy can be found in Section 5A (CSPDC localities) and 5B (RVARC localities).

Table 5-1
Water Demand Projections – Upper James River Basin Region

Upper James River Basin Region				
	2010	**2020**	**2030**	**2040**
CWS-Residential	2.948	2.953	2.961	2.983
CWS-Commercial	0.813	0.817	0.821	0.828
CWS-Industrial	0.518	0.532	0.546	0.567
CWS-Production Processes	0.028	0.028	0.027	0.027
CWS-Lost and Unaccounted Water	1.998	1.990	1.984	1.994
CWS-Sales to Other Communities	1.021	1.018	1.016	1.018
Subtotal CWS Projected Demand (MGD)	**7.326**	**7.338**	**7.355**	**7.417**
Non-Ag SSU Demand	40.884	40.884	40.884	40.884
Ag SSU Demand	23.476	23.476	23.476	23.476
Small SSU Demand	1.943	1.943	1.943	1.943
Total Projected Water Demand (MGD)	**73.629**	**73.641**	**73.658**	**73.720**

5A Central Shenandoah Planning District Commission Localities (Counties of Bath, Highland, and Rockbridge; Cities of Buena Vista and Lexington; and Towns of Glasgow, Goshen, and Monterey)

Section 5A identifies water demand for each of the localities contained in the Upper James River Basin. Water demand projections are presented for each individual locality, as well as population projections and other relevant land use variables used to derive those forecasted demand projections.

Demand Projection Calculation Methodology

Locality water demand projections in the Upper James Water Supply Plan have been calculated for years 2010, 2020, 2030 and 2040. The locality demand projections for 2010, 2020 and 2030 were projected from percentage changes primarily based on projected population figures. Specifically, total locality population projections were obtained from the Virginia Employment Commission (VEC) for the same time periods, i.e. 2010, 2020 and 2030. Locality demand projections were also calculated for year 2040, however not based on projected population growth. VEC population projections are not available for year 2040, at the time of this report. All year 2040 calculations assumed no net population growth, either positive or negative from year 2030 to 2040, thusly all locality water demand projections followed this same zero percentage growth methodology. The percentage change between each decade (2010-2030) in the projected population figure was extracted and used to calculate the total water system population served beyond year 2006. Furthermore, this same percentage change was also used to calculate the total water demand beyond year 2006. This total water demand was further disaggregated into six demand sectors.

Six Water Demand Sectors

- Water usage required for residential land uses.
- Water usage expended towards commercial land uses.
- Water usage required for industrial land uses.
- Water usage specifically utilizing production processes.
- Lost and Unaccounted for water.
- Water sales to other communities.

This disaggregation was performed using locality data from year 2006 including the percentage of total water usage per each demand sector category. Each demand sector amount for years 2010, 2020, 2030 and 2040 were calculated using the same percentage breakdown for each category. For example, if 50% of the total water usage was expended for residential purposes in 2006, it is assumed that the same 50% can be extrapolated to calculate residential water usage in years 2010, 2020, 2030 and 2040.

For each locality, population projections are given for the population served by the municipal system only. These projections do not include those water users in the locality not served by the municipal system, nor the total population of the locality. In addition, water demand is disaggregated into the six demand sector categories for each locality.

5A.1 Bath County

5A.1.1 Population Projections

Population projections for Bath County municipal systems are presented in Table 5-2. There are six community water systems within Bath County owned and operated by the Bath County Service Authority. The populations presented in Table 5-2 represents the aggregate of the population served by all six of those individual systems. This municipal population served amount is projected to remain nearly constant over the next three decades with little to no population growth expected.

Table 5-2
Bath County Population Projections

Base Year	Year			
2006	**2010**	**2020**	**2030**	**2040**
2,840	2,662	2,662	2,662	2,662

Source: Bath County Service Authority

5A.1.2 Demand Projections

Projected disaggregated demand for Bath County municipal systems are presented in Table 5-3. The demand projections for Bath County were calculated based on a constant municipal water system population served figure presented in Table 5-2. Thusly, the forecasted water demand for the next three decades is constant within Bath County. Additionally, the total demand projections are shown within the six demand sectors through the year 2040.

Table 5-3
Bath County Demand Projections

		Base Year	**Year**			
Demand Sector	**Use Percentage**	**2006**	**2010**	**2020**	**2030**	**2040**
Residential	60	0.051	0.047	0.047	0.047	0.047
Commercial	27	0.023	0.021	0.021	0.021	0.021
Industrial	0	0.000	0.000	0.000	0.000	0.000
Production Processes	0	0.000	0.000	0.000	0.000	0.000
Lost and Unaccounted For Water	13	0.011	0.010	0.010	0.010	0.010
Sales to Other Communities	0	0.000	0.000	0.000	0.000	0.000
Total	**100**	**0.084**	**0.079**	**0.079**	**0.079**	**0.079**

5A.2 City of Buena Vista

5A.2.1 Population Projections

Population projections for the City of Buena Vista municipal system are presented in Table 5-4. Total Buena Vista population projections for the municipality as a whole were obtained from the Virginia Employment Commission (VEC) for the time periods through 2030. Year 2040 total municipality population projections assumed that the population would continue to increase by the same growth percentage trend experienced within the past decades. The percentage change between each of the decades for the total Buena Vista City population was extracted and used to project the population served by the Buena Vista municipal system.

Table 5-4
City of Buena Vista Municipal Water System Population Served Projections

Base Year	Year			
2006	**2010**	**2020**	**2030**	**2040**
6,400	6,703	7,052	7,363	7,715

5A.2.2 Demand Projections

Projected disaggregated demand for Buena Vista municipal systems are presented in Table 5-5. The demand projections for Buena Vista were calculated primarily based on the municipal water system population served figure presented in Table 5-4. Thusly, the forecasted water demand for the next three decades slightly increases at the same rate as the population served by the Buena Vista water system. Additionally, the total demand projections are shown within the six demand sectors through the year 2040.

Table 5-5
City of Buena Vista Community Water System Demand Projections

		Base Year	**Year**			
Demand Sector	**Use Percentage**	**2006**	**2010**	**2020**	**2030**	**2040**
Residential	50	0.648	0.648	0.648	0.648	0.648
Commercial	10	0.130	0.130	0.130	0.130	0.130
Industrial	0	0.000	0.000	0.000	0.000	0.000
Production Processes	0	0.000	0.000	0.000	0.000	0.000
Lost and Unaccounted For Water	40	0.518	0.518	0.518	0.518	0.518
Sales to Other Communities	0	0.000	0.000	0.000	0.000	0.000
Total	**100**	**1.296**	**1.296**	**1.296**	**1.296**	**1.296**

5A.3 Town of Glasgow

5A.3.1 Population Projections

Population estimates for the Town of Glasgow municipal systems are presented Table 5-6. Total Glasgow population projections for the municipality as a whole were obtained from the Virginia Employment Commission (VEC) for the time periods through 2030. Year 2040 total municipality population projections assumed that the population would continue to increase by the same growth percentage trend experienced within the past decades. The percentage change between each of the decades, 2010-2040, for the total Town of Glasgow population was extracted and used to project the population served by the Glasgow municipal system.

Table 5-6
Town of Glasgow Municipal Water System Population Served Projections

Base Year	Year			
2006	**2010**	**2020**	**2030**	**2040**
1,040	1,127	1,224	1,329	1,444

5A.3.2 Demand Projections

Projected disaggregated demand for the Town of Glasgow municipal systems are presented in Table 5-7. The demand projections for the Town of Glasgow were calculated primarily based on the municipal water system population served figure presented in Table 5-6. Thusly, the forecasted water demand for the next three decades slightly increases at the same rate as the population served by the Town of Glasgow water system. Additionally, the total demand projections are shown within the six demand sectors through the year 2040.

Table 5-7
Town of Glasgow Community Water System Demand Projections

		Base Year	**Year**			
Demand Sector	**Use Percentage**	**2006**	**2010**	**2020**	**2030**	**2040**
Residential	83	0.203	0.202	0.202	0.202	0.202
Commercial	1	0.002	0.002	0.002	0.002	0.002
Industrial	3	0.007	0.007	0.007	0.007	0.007
Production Processes	0	0.000	0.000	0.000	0.000	0.000
Lost and Unaccounted For Water	13	0.032	0.032	0.032	0.032	0.032
Sales to Other Communities	0	0.000	0.000	0.000	0.000	0.000
Total	**100**	**0.244**	**0.244**	**0.244**	**0.244**	**0.244**

5A.4 Town of Goshen

5A.4.1 Population Projections

Population projections for the Town of Goshen municipal system is presented in Table 5-8. Total Glasgow population projections for the municipality as a whole were obtained from the Virginia Employment Commission (VEC) for the time periods through 2030. Year 2040 total municipality population projections assumed that the population would continue to increase by the same growth percentage trend experienced within the past decades. The percentage change between each of the decades, 2010-2040, for the total Town of Goshen population was extracted and used to project the population served by the Goshen municipal system.

Table 5-8
Town of Goshen Population Projections

Base Year	Year			
2006	**2010**	**2020**	**2030**	**2040**
375	333	333	333	333

5A.4.2 Demand Projections

Projected disaggregated demand for the Town of Goshen municipal systems are presented in Table 5-9. The demand projections for the Town of Goshen were calculated primarily based on the municipal water system population served figure presented in Table 5-8. Thusly, the forecasted water demand for the next three decades slightly increases at the same rate as the population served by the Town of Goshen water system. Additionally, the total demand projections are shown within the six demand sectors through the year 2040.

Table 5-9
Town of Goshen Community Water System Demand Projections

		Base Year	**Year**			
Demand Sector	**Use Percentage**	**2006**	**2010**	**2020**	**2030**	**2040**
Residential	82	0.267	0.267	0.267	0.267	0.267
Commercial	0	0.000	0.000	0.000	0.000	0.000
Industrial	5	0.016	0.016	0.016	0.016	0.016
Production Processes	0	0.000	0.000	0.000	0.000	0.000
Lost and Unaccounted For Water	13	0.042	0.042	0.042	0.042	0.042
Sales to Other Communities	0	0.000	0.000	0.000	0.000	0.000
Total	**100**	**0.325**	**0.325**	**0.325**	**0.325**	**0.325**

5A.5 Highland County

5A.5.1 Population Projections

Population projections for Highland County municipal systems are presented in Table 5-10. The total Highland County population is not expected to change over the planning period of this study. Thusly, the municipal population served amount is projected to remain constant over the next three decades with little to no population growth expected.

Table 5-10
Highland County Population Projections

Base Year	Year			
2006	**2010**	**2020**	**2030**	**2040**
200	183	183	183	183

5A.5.2 Demand Projections

Projected disaggregated demand for the Highland County municipal system is presented in Table 5-11. The demand projections for Highland County were calculated primarily based on the municipal water system population served figure presented in Table 5-10. Thusly, the forecasted water demand for the next three decades slightly increases at the same rate as the population served by the Highland County water system. Additionally, the total demand projections are shown within the six demand sectors through the year 2040.

Table 5-11
Highland County Community Water System Demand Projections

		Base Year	**Year**			
Demand Sector	**Use Percentage**	**2006**	**2010**	**2020**	**2030**	**2040**
Residential	82	0.013	0.013	0.013	0.013	0.013
Commercial	5	0.001	0.001	0.001	0.001	0.001
Industrial	0	0.000	0.000	0.000	0.000	0.000
Production Processes	0	0.000	0.000	0.000	0.000	0.000
Lost and Unaccounted For Water	13	0.002	0.002	0.002	0.002	0.002
Sales to Other Communities	0	0.000	0.000	0.000	0.000	0.000
Total	**100**	**0.016**	**0.016**	**0.016**	**0.016**	**0.016**

5A.6 City of Lexington

5A.6.1 Population Projections

Population projections for the City of Lexington municipal systems are presented in Table 5-12. Total Lexington population projections for the municipality as a whole were obtained from the Virginia Employment Commission (VEC) for the time periods through 2030. Year 2040 total municipality population projections assumed that the population would continue to increase by the same growth percentage trend experienced within the past decades. The percentage change between each of the decades for the total Lexington City population was extracted and used to project the population served by the Lexington municipal system.

Table 5-12
City of Lexington Municipal Water System Population Served Projections

Base Year	Year			
2006	**2010**	**2020**	**2030**	**2040**
7,600	7,794	7,991	8,193	8,400

5A.6.2 Demand Projections

Projected disaggregated demand for The City of Lexington municipal systems are presented in Table 5-13. The demand projections for Lexington were calculated primarily based on the municipal water system population served figure presented in Table 5-12. Thusly, the forecasted water demand for the next three decades slightly increases at the same rate as the population served by the Lexington water system. Additionally, the total demand projections are shown within the six demand sectors through the year 2040.

Table 5-13
City of Lexington Community Water System Demand Projections

		Base Year	**Year**			
Demand Sector	**Use Percentage**	**2006**	**2010**	**2020**	**2030**	**2040**
Residential	55	0.489	0.490	0.490	0.490	0.490
Commercial	29	0.263	0.258	0.258	0.258	0.258
Industrial	0	0.000	0.000	0.000	0.000	0.000
Production Processes	0	0.000	0.000	0.000	0.000	0.000
Lost and Unaccounted For Water	15	0.133	0.134	0.134	0.134	0.134
Sales to Other Communities	1	0.006	0.009	0.009	0.009	0.009
Total	**100**	**0.891**	**0.891**	**0.891**	**0.891**	**0.891**

5A.7 Town of Monterey

5A.7.1 Population Projections

Population projections for the Town of Monterey municipal systems are presented in Table 5-14. The total Town of Monterey population is not expected to change over the planning period of this study. Thusly, the municipal population served amount is projected to remain constant over the next three decades with little to no population growth expected.

Table 5-14
Town of Monterey Municipal System Population Served Projections

Base Year	Year			
2006	**2010**	**2020**	**2030**	**2040**
150	147*	147	147	147

*The Town of Monterey conducts an annual count of its residents. In 2011, the town counted 215 residents rather than 147 residents counted in the 2010 Census.

5A.7.2 Demand Projections

Projected disaggregated demand for the Town of Monterey municipal system is presented in Table 5-15. The demand projections for the Town of Monterey were calculated primarily based on the municipal water system population served figure presented in Table 5-14. Thusly, the forecasted water demand for the next three decades slightly increases at the same rate as the population served by the Town of Monterey water system. Additionally, the total demand projections are shown within the six demand sectors through the year 2040.

Table 5-15
Town of Monterey Community Water System Demand Projections

		Base Year	**Year**			
Demand Sector	**Use Percentage**	**2006**	**2010**	**2020**	**2030**	**2040**
Residential	85	0.059	0.059	0.059	0.059	0.059
Commercial	2	0.001	0.001	0.001	0.001	0.001
Industrial	0	0.000	0.000	0.000	0.000	0.000
Production Processes	0	0.000	0.000	0.000	0.000	0.000
Lost and Unaccounted For Water	13	0.009	0.009	0.009	0.009	0.009
Sales to Other Communities	0	0.000	0.000	0.000	0.000	0.000
Total	**100**	**0.069**	**0.069**	**0.069**	**0.069**	**0.069**

5A.8 Rockbridge County

5A.8.1 Population Projections

Population projections for the Rockbridge County municipal systems, excluding the Towns of Goshen and Glasgow, are presented in Table 5-16. There are five community water systems within Rockbridge County owned and operated by the Rockbridge County Public Service Authority. The populations presented in Table 5-16 represents the aggregate of the population served by all five of those individual systems. Total Rockbridge County population projections for the municipality as a whole were obtained from the Virginia Employment Commission (VEC) for the time periods through 2030. Year 2040 total municipality population projections assumed that the population would continue to increase by the same growth percentage trend experienced within the past decades. The percentage change between each of the decades for the total Rockbridge County population was extracted and used to project the population served by the Rockbridge County Public Service Authority municipal system.

Table 5-16
Rockbridge County Public Service Authority Population Served Projections

Base Year	Year			
2006	**2010**	**2020**	**2030**	**2040**
3,425	3,672	3,945	4,238	4,553

5A.8.2 Demand Projections

Projected disaggregated demand for the Rockbridge County Public Service Authority systems are presented in Tables 5-17 through 5-21. Demand projections were calculated for each of four systems managed by the Rockbridge County Public Service Authority. All Rockbridge County population served and demand projections include the four individual water systems of Natural Bridge/Arnold's Valley, North Lexington/Fairfield/Raphine, Rivermont Heights and Route 251. The current (2011) Rockbridge PSA system also includes the Longhollow Development. This development was not owned by the County in 2006 and was not included in any demand projection figure.

The demand projections for individual Rockbridge County systems were calculated primarily based on the municipal water system population served figure presented in Table 5-16. Thusly, the forecasted water demand for the next three decades slightly increases at the same rate as the population served by the Rockbridge County water system. Additionally, the total demand projections are shown within the six demand sectors through the year 2040.

Table 5-17
Rockbridge County Community Water System Demand Projections

		Base Year	Year			
Demand Sector	Use Percentage	2006	2010	2020	2030	2040
Residential	35	0.234	0.251	0.270	0.290	0.311
Commercial	12	0.080	0.086	0.092	0.099	0.107
Industrial	33	0.221	0.237	0.254	0.273	0.294
Production Processes	0	0.000	0.000	0.000	0.000	0.000
Lost and Unaccounted For Water	17	0.114	0.122	0.131	0.141	0.151
Sales to Other Communities	3	0.020	0.022	0.023	0.025	0.027
Total	**100**	**0.669**	**0.717**	**0.771**	**0.828**	**0.889**

5A.9 Private Community Water Systems

5A.9.1 Bath County

Based on the information included in Appendix A, there are three private community water systems in Bath County. Two of these are served by surface water and one is served by groundwater surface water. The 2006 average daily demand for these three users is .150 mgd. It is assumed for purposes of this analysis that demand for this sector will remain the same throughout the planning period.

5A.9.2 Highland County

Based on the information included in Appendix A, there are no private community water systems in Highland County.

5A.9.3 Rockbridge County

Based on the information included in Appendix A, there are five private community water systems in Rockbridge County. All users are served by groundwater. No data was available for four of these users. As a result, this value cannot be determined.

5A.10 Large Self-Supplied Users of More Than 300,000 Gallons Per Month for Non-Agricultural Uses

5A.10.1 Bath County

Based on the information included in Section 3A there are two large self-supplied users of more than 300,000 gallons per month for non-agricultural uses in Bath County. One is served by groundwater (.016 mgd) and one is served by surface water (.029 mgd). The 2006 average daily demand for these two users is .049 mgd.

Given the available information, it is assumed for purposes of this analysis that demand for this sector will remain the same throughout the planning period.

5A.10.2 City of Buena Vista

Based on the information included in Section 3A, there are four large self-supplied users of more than 300,000 gallons per month for non-agricultural uses in the City of Buena Vista. Two are surface water users and the remaining two use groundwater. The 2006 average daily groundwater demand is .771 mgd and surface water demand is .231 mgd. It is assumed for purposes of this analysis that demand for this sector will remain the same throughout the planning period. Total usage in this category in the City of Buena Vista is 1.002 mgd.

5A.10.3 Town of Goshen

Based on the information included in Section 3A, there is one large self-supplied user of more than 300,000 gallons per month for non-agricultural uses in the Town of Goshen. The 2006 average daily surface water demand for these this user is unknown.

5A.10.4 Rockbridge County

Based on the information included in Section 3A, there are three large self-supplied users of more than 300,000 gallons per month for non-agricultural uses in Rockbridge County. One is a surface water user, and the remaining two use groundwater. Surface water demand is .025 mgd and groundwater demand is .771 mgd. Total usage in this category in Rockbridge County is .796 mgd. It is assumed for purposes of this analysis that demand for this sector will remain the same throughout the planning period.

5A.11 Large Agricultural Users of More Than 300,000 Gallons Per Month

5A.11.1 Bath County

Based on the information included in section 3A, there is one large agricultural user of more than 300,000 gallons per month in Bath County that report to DEQ. The 2006 average daily demand for these users is 11.916 mgd. It is assumed that demand for this sector will remain the same throughout the planning period.

5A.11.2 Highland County

Based on the information included in section 3A, there are two large agricultural users of more than 300,000 gallons per month in Highland County that report to DEQ. The 2006 average daily demand for these users is 5.78 mgd. It is assumed that demand for this sector will remain the same throughout the planning period.

5A.11.3 City of Lexington

Based on the information included in section 3A, there is one large agricultural user of more than 300,000 gallons per month in the City of Lexington that reports to DEQ. The 2006 average daily demand for this user is .000 mgd. It is assumed that demand for this sector will remain the same throughout the planning period.

5A.12 Small Self-Supplied Users of Groundwater

5A.12.1 Bath County

Based on the information included in section 3A, there are 974 individual residences and 5 businesses using groundwater in Bath County. The 2006 total estimated average annual use for these users is .171 mgd. It is assumed that demand for this sector will remain constant through the planning period.

5A.12.2 Highland County

Based on the information included in section 3A, there are 853 individual residences and 1 business using groundwater in Bath County. The 2006 total estimated average annual use for these users is .143 mgd. It is assumed that demand for this sector will remain constant through the planning period.

5A.12.3 Rockbridge County

Based on the information included in 3A, there are 7,399 individual residences and X businesses using groundwater in Rockbridge County. The 2006 total estimated average annual use for these users is 1.348 mgd. It is assumed that demand for this sector will remain constant through the planning period.

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5B Roanoke Valley Alleghany Regional Commission Localities (City of Covington and Towns of Clifton Forge and Iron Gate)

Section 5B identifies water demand for Alleghany County, the City of Covington and the Towns of Clifton Forge and Iron Gate. Water demand projections are presented for each individual locality, as well as population projections, population density and other relevant land use variables used to derive the water demand projections.

5B.1 Population Projections

Future water demand projections will be based on a combination of population projections and recent water use trends. Primary data source included:

- US Census population data
- DEQ withdrawal data (2002-2007)
- Countywide Water/Sewer/Drainage Study, Alleghany County, Virginia, (Anderson & Associates 2006)

Population Data

Population data are a key component in developing future water demand projections. These data examine current population, long-term population trends, and future population projections. Population data sources consulted include US Census Bureau, Virginia Employment Commission, Virginia State Data Center, and the Weldon Cooper Center for Public Service. Tables provide an overview of population characteristics in the study area and include:

- historical population and percent change - 1970 - 2010
- population and percent change – 2000-2010
- population projections 2010-2030

5B.1.2 Historical Population: 1970 – 2010

In 2010, the total population of the study area (Alleghany County, City of Covington, Town of Clifton Forge and Town of Iron Gate) was 22,211. Based on US Census data, between 1970 and 2010, collectively the study area experienced a 21% decrease in population. The City of Covington, Town of Clifton Forge, and the Town of Iron Gate all experienced significant population declines during this period. Alleghany County experienced a 1.77% increase in population during the same period (see Table 5-18). However, more recent data show a 4.9% decrease in population between 2000 and 2010. In 2010, the total population of Alleghany County was 16,250 including the towns of Clifton Forge and Iron Gate (11,978 without the towns). (Note: In 2000, the City of Clifton Forge reverted to a town within Alleghany County, resulting in a significant increase in population for Alleghany County.)

Table 5-18
Historical and Current Population

Locality	1970	1980	1990	2000	2010	% Change 1970-2010	% Change 2000 - 2010
Alleghany County*	11,769	13,713	12,398	12,522	11,978	1.78	-4.34
Covington City	10,060	9,063	7,352	6,303	5,961	-40.75	-5.43
Clifton Forge	5,501	5,046	4,679	4,289	3,884	-29.39	-9.44
Iron Gate	692	620	417	404	388	-43.93	-3.96
Water Supply Study Area	28,022	28,442	24,846	23,518	22,211	-20.74	-5.56

*Does not include towns of Clifton Forge or Iron Gate; Source: US Census 2010.

5B.1.3 Population Density

U.S. Census 2010 population estimates indicate the population of the water supply study area is approximately 22,322 with a population density of approximately 49 persons per square mile. While Alleghany County is the most populous jurisdiction in the RVARC study area, the City of Covington and the towns of Clifton Forge and Iron Gate are considerably more densely populated and a have larger number of residents served by a municipal community water system. The Town of Clifton Forge has the greatest density at 1,065 persons per square mile, followed by the City of Covington with 1,253 persons per square mile (Table 5-19). Although the overall population for Alleghany County is 27.1 person per square mile (without the towns of Clifton Forge and Iron Gate), there are areas within the county that have significantly higher population densities and are served by a municipal community water system.

Table 5-19
Population Density

Locality	2010 Population	Square Miles	Population Density (persons per square mile)
Alleghany County*	11,978	441.6	27.1
City of Covington	5,961	5.6	1,064.5
Town of Clifton Forge	3,884	3.1	1,252.9
Town of Iron Gate**	388	0.34	1,141.2
Water Supply Study Area	22,211	451	49.3

*Does not include the Town of Clifton Forge and Iron Gate.
Source: US Census 2010.

5B.1.4 Future Population Projections

Historical population data and trends, current population estimates, and future population projections suggest that the population of the water supply study area will likely experience limited population growth through the year 2040 and may actually experience continued, yet less pronounced, population decline. As previously noted, the study area population has declined over the past decades. Additionally, population projections from the Virginia State Data Center

indicate continued population decline in the study area over the coming decades. State Data Center projections estimate that the 2030 water supply plan study area population will be 21,866 (Tables 5-20 and 5-21) representing a 2.13% decrease per decade for the study area (2010-2040).

Table 5-20
State Data Center Population Projections
2010-2040

Locality	2010	2020	2030	2040
Alleghany County*	16,287	15,922	15,920	15,920
City of Covington	6,055	5,952	5,946	5,946
Study Area	22,342	21,874	21,866	21,866

* Includes the towns of Clifton Forge and Iron Gate.
Source: Virginia State Data Center.

Table 5-21
Regional Population Projections and Percent Change Per Decade
2010-2040

Locality	Projected Population 2010	Percent Change 2010-2020	Projected Population 2020	Percent Change 2020-2030	Projected Population 2030	Projected Population 2040
Alleghany County*	16,287	-2.241	15,922	-2.241	15,920	15,920
City of Covington	6,055	-1.701	5,952	-1.701	5,946	5,946
Study Area	22,342	-2.09	21,874	-2.09	21,866	21,866

*Includes Alleghany County and the towns of Clifton Forge and Iron Gate; Source: Virginia State Data Center

Population projections beyond 2030 are currently not available from the Virginia State Data Center. Additionally, State Data Center population projections have not been revised based on US Census 2010 data. Additionally, population projections are not available at the sub county level with the towns of Clifton Forge and Iron Gate being included with Alleghany County. Despite these limitations, comparison of Census 2010 data (22,211) and State Data Center 2010 population projections (22,342) indicate the regional population estimates and projection are fairly consistent.

While the regional population is likely to experience decreases over the coming decades, changes in the distribution of the population within the study area are likely. Such internal redistribution of population, may impact overall future regional water demand as well as the geographic distribution within the study area. Additionally, decreased overall population in the region does not automatically equate to decreased overall future regional water demand, as population declines may not be evenly distributed across the study area. Based on population projections,

the City of Covington and the towns Clifton Forge and Iron Gate, which are currently served by municipal community water systems, are expected to experience population declines and associated decreased future water demand. However, areas within Alleghany County may experience some population growth or development. Additionally, much of Alleghany County is currently not served by a community water system. As such, regional future water demands may not decrease at the same rate as overall population decrease should Alleghany extend community water system service areas into parts of the County currently not served by a county-owned water system.

Areas likely to experience increased future water demand include areas of Alleghany County that are adjacent or in close proximity to the interface between the City of Covington and the Town of Clifton Forge and along 1-64. These areas generally correlate geographically with the two (2) US Census-defined "urban clusters" in the study area (Covington UC and the Clifton Forge UC) (Figure 5-1). Based on Census 2000 data, all housing units in the City of Covington and the Town of Clifton Forge were located inside a Census defined urban cluster (Table 5-21) and are served by a municipal community water system. By comparison, in Alleghany County 1,686 of 5,812 housing units (29%) were located inside Census defined "urban clusters." Currently, urban clusters and most other higher density development in Alleghany County area are served by a municipal community water system.

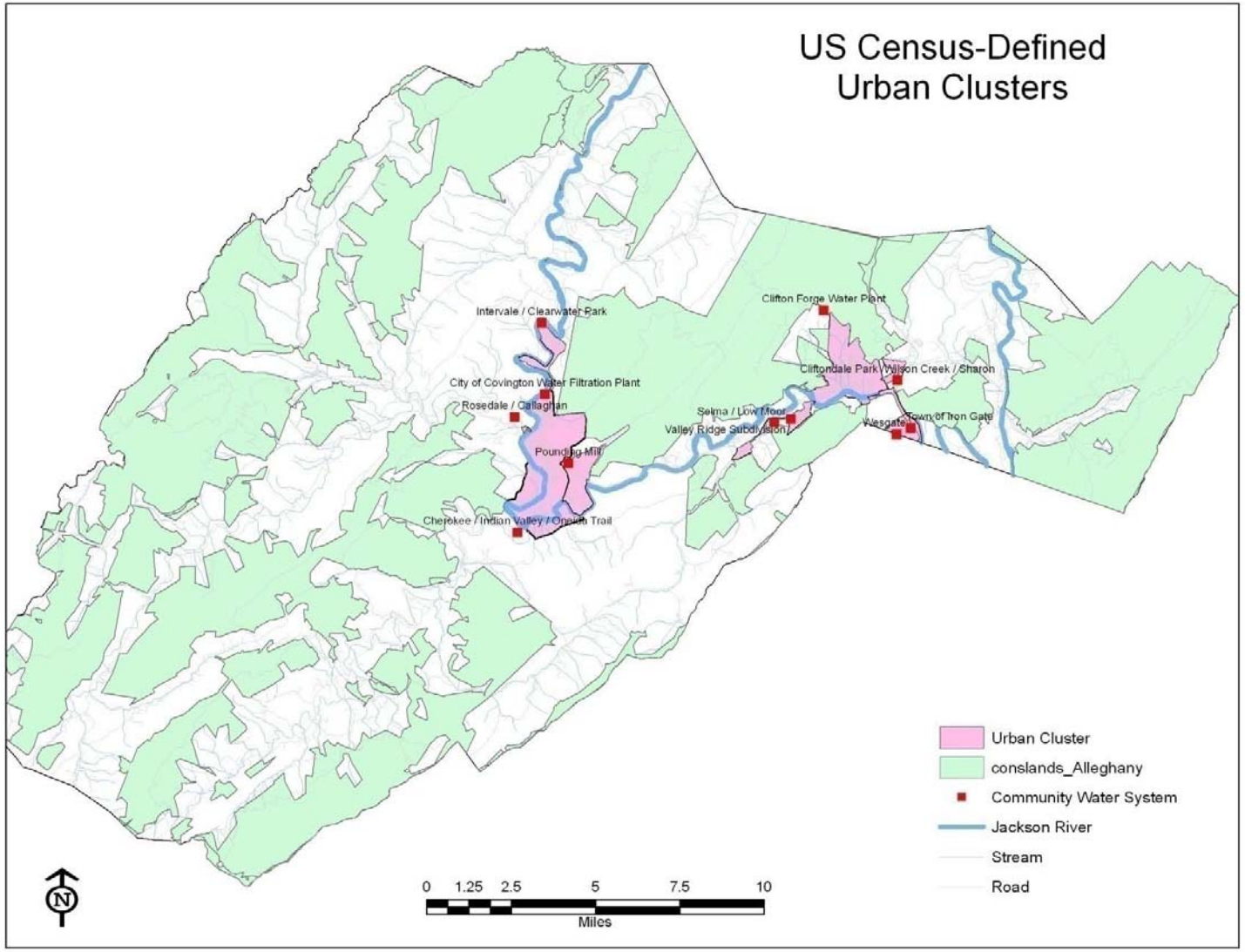
Table 5-22
Housing Units - Urban and Rural - 2000

Housing Units Urban / Rural	Alleghany County	City of Covington	City of Clifton Forge
Total:	5,812	3,195	2,069
Urban:	1,686	3,195	2,069
Inside urbanized areas	0	0	0
Inside urban clusters	1,686	3,195	2,069
Rural:	4,126	0	0
Farm	96	0	0
Nonfarm	4,030	0	0

Source: U.S. Census 2000.

The *Countywide Water/Sewer/Drainage Study, Alleghany County, Virginia*, completed in 2006 by Anderson and Associate, addresses future water demands in Alleghany County, including areas not currently served by a community water system. This study also provides possible service alternatives and other water system recommendations and considerations for community water systems in Alleghany County. While the study focuses on Alleghany County, demand projections for water systems in the City of Covington and the Town of Clifton Forge are addressed.

Figure 5-1



Source: US Census 2000

5B.2 Regional Future Water Demand Projections

Currently, all municipal community water systems in the study area are supplied with treated water from the City of Covington WTP or the Town of Clifton Forge WTP. The following data, assumptions, and methodologies were considered in developing future regional water demand projections (i.e., water from the Covington WTP and Clifton Forge WTP).

Population

- Using Virginia State Data Center population projections for Alleghany County (includes the towns of Clifton Forge and Iron Gate) and the City of Covington, calculate percent regional population change per decade (Table 5-21)

Future water demand estimates based on State Data Center population projections assumes applies the regional (study area) decennial projected population change to calculate estimated future water demand.

Note: As previously noted population projections are not available at the sub county level.

- Calculate projected future regional water demand for 2010, 2020, 2030 - by decreasing water use (2007) by the percent regional population change per decade, based on Virginia State Data Center population projections (Table 5-22).

current total annual regional municipal community water system withdrawals	**x**	percent regional population change per decade (-2.09%)	**=**	projected future regional water demand

Based on Virginia State Data Center population projections the study area population is projected to experience continued decrease through 2030 (Table 5-23). Estimated future regional water demand for the study area was determined by applying the decennial study area population change of -2.09% (2010-2020 and 2020-2030) from Table 5-21 to current (2007) water use. Using this methodology, the future cumulative regional water demand for all municipal community water systems is projected to be 1297.5 MG per year in 2020 and 1270.4 MG per year in 2030. Given the time horizon, the 2030 projected annual municipal community water system use was used for 2040.

Table 5-23
Projected Annual Future Regional Water Demand
Based on 2010-2030 Population Projections

Projected Study Area Population 2010	Projected Study Area Annual Water Use 2010 (MG)	Projected Study Area Population 2020	Projected Study Area Annual Water Use 2020 (MG)	Projected Study Area Population 2030	Projected Study Area Annual Water Use 2030 MG
22,342	1325.31	21,874	1297.6	21,866	1270.5

Locality and Municipal Community Water System Future Demand Projections

As previously noted, the City of Covington and the Town of Clifton Forge supply treated water to all municipal community water systems in the study area, including all municipal community systems owned and operated by Alleghany County.

5B.3 Alleghany County

Based on historical population data, when projected population declines in the towns of Clifton Forge and Iron Gate are factored out, Alleghany County experienced a slight increase in population from 1970 - 2010 (Table 5-18). As such, future municipal community water system demands in Alleghany County may increase (or due to factors such as opening of the new regional wastewater treatment facility), increased commercial/industrial activity adjacent to I-64, U.S. 220, and U.S. 60, or extension of existing municipal community water systems to areas not currently served by municipal water system.

In calculating future water demand for individual municipal community water systems in Alleghany County, the historical population change from 1970-2010, excluding the towns of Clifton Forge and Iron Gate (Table 5-18) were used in lieu of the State Data Center 2010-2030 population projections.

current annual municipal community water system use	x	percent Alleghany County population change per decade from 1970-2010 (1.78%)	=	Alleghany County municipal community water systems projected future demand

Table 5-24 shows the projected future water demand for all municipal community water systems owned and operated by Alleghany County. Based on this methodology, Alleghany County projected future water demand is estimated to be approximately 296.3 million gallons per year by 2030. Of this total approximately 133.2 million gallons is projected to be supplied by the City of Covington with the remainder of approximately 163.05 million gallons from the Town of

Clifton Forge WTP. Consistent with regional future water demand projections, given the time horizon the 2030 projected annual municipal community water system use was used for 2040.

Table 5-24
Alleghany County
Municipal Community Water Systems
Projected Future Water Demand

Municipal Community Water System	2010 (MG)	2020 (MG)	2030 (MG)	2040 (MG)
Intervale/Clearwater Park	37.61	38.28	38.96	38.96
Pounding Mill	57.21	58.23	59.27	59.27
Rosedale/ Callaghan	22.7	23.1	23.51	23.51
Indian Valley/Cherokee Forest	11.01	11.26	11.46	11.46
Total Alleghany Systems (from City of Covington)	**128.53**	**130.87**	**133.2**	**133.2**
Cliftondale/Wilson Creek/ Wesgate	68.87	70.09	71.34	71.34
Selma/Low Moor/Valley Ridge	88.53	90.11	91.71	91.71
Total Alleghany Systems (from Town of Clifton Forge)	**157.4**	**160.2**	**163.05**	**163.05**
Total All Alleghany Systems	**226.27**	**296.25**	**296.25**	**296.25**

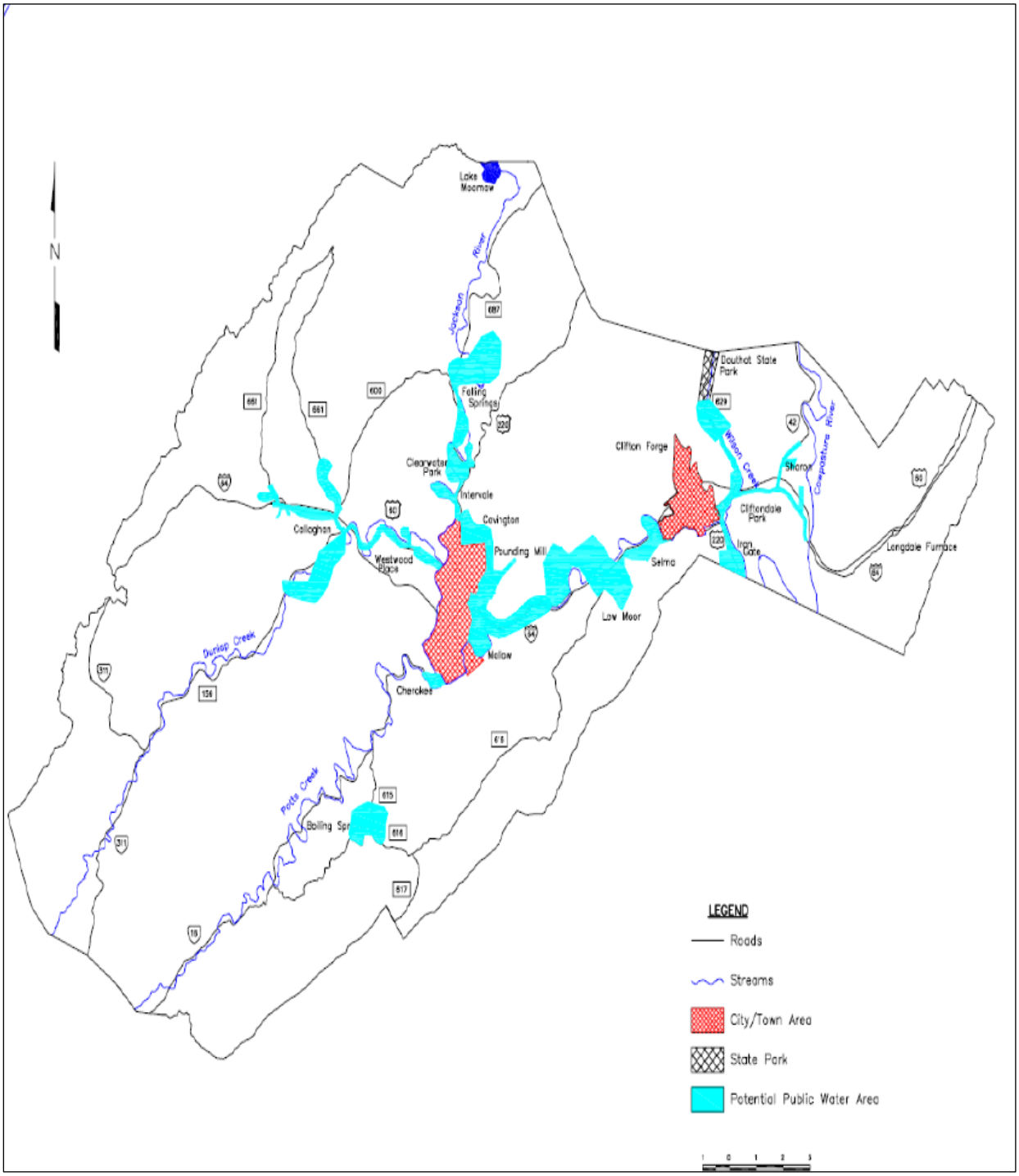
Table 5-25
Alleghany County
Municipal Community Water Systems
Projected Disaggregated Water Demand

		Base Year	Year			
Demand Sector	**Use Percentage**	**2007**	**2010**	**2020**	**2030**	**2040**
Residential	19	0.148	0.149	0.152	0.154	0.154
Commercial	12	0.093	0.094	0.096	0.097	0.097
Industrial	1	0.008	0.008	0.008	0.008	0.008
Production Processes	0	0.000	0.000	0.000	0.000	0.000
Lost and Unaccounted For Water	16	0.124	0.125	0.128	0.130	0.130
Sales to Other Communities	52	0.405	0.407	0.415	0.422	0.422
Total	**100**	**0.778**	**0.783**	**0.797**	**0.812**	**0.812**

The source water for any expansion of municipal community water systems and service in the study area would likely be the City of Covington WTP (Jackson River) or the Town of Clifton Forge (Smith Creek), both of which have sufficient capacity to meet Alleghany County's projected future municipal community water systems demands. However, extending water service to areas of Alleghany County currently not served by a municipal community water system is generally limited by terrain, low population densities, and infrastructure costs. The

Countywide Water/Sewer/Drainage Study, *Alleghany County, Virginia,* completed in 2006 by Anderson and Associate, addresses future water demands in Alleghany County, including areas not currently served by a community water system. This study also provides possible service alternatives and other water system recommendations and considerations for community water systems in Alleghany County. While the *Countywide* study focuses on Alleghany County, demand projections for water systems in the City of Covington and the Town of Clifton Forge are addressed.

Figure 5-2
Possible Future Municipal Water Areas



Source: Countywide Water/Sewer/Drainage Study, Alleghany County, Virginia (2006).

5B.4 City of Covington

Based on historical population estimates (1970-2010), the City of Covington has experienced significant population decline. Additionally, based on U.S. Census 2010, the City of Covington continued to experience population loss between 2000 and 2010. Moreover, based on 2010-2030 State Data Center population projections this decline is expected to continue in the coming decades and a rate of -1.7% per decade (Table 5-21). As previously noted, the City of Covington provides treated water to four municipal community water systems owned and operated by Alleghany County which are expected to experience increased future water demand, thus must be considered in future demand projections. City of Covington projected future water demand was estimated using the following methodology:

- Determining current City of Covington use (WTP source withdrawal – Alleghany County municipal community water systems demand (Table 5-23).
- Decrease estimated annual City of Covington use by the percent population change per decade (-1.7%) based on Virginia State Data Center population projections (Table 5-20).
- Add the City of Covington projected future demand to the Alleghany County projected to determine projected future WTP source withdrawal

Current Covington annual 2010 (annual WTP withdrawal less Alleghany County municipal community water system use (651 MG	x	projected demand change based on percent population change per decade (-1.7)	=	projected future Covington municipal community water systems demand
projected future Covington municipal community water system demand	+	projected Alleghany County municipal community water systems demand	=	Covington WTP projected future source withdrawal

Table 5-26 shows the projected water use (i.e., source withdrawal) for the City of Covington WTP and projected future water demand for the City of Covington Forge (WTP source withdrawal (MG) less Alleghany County projected future water systems demand). Based on this methodology, the City of Covington's future water demand is projected to be 629.84 MG in 2030. The projected future annual WTP source withdrawal demand is projected to be 763.04 MG. Consistent with regional future water demand projections, given the time horizon the 2030 projected annual municipal community water system use was used for 2040 (see Table 5-27).

Table 5-26
City of Covington Community Water System
Estimated Annual Water Demand

Municipal Community Water System	2010 (MG)
City of Covington WTP source withdrawal	780.339
Alleghany County municipal community water systems demand	128.53
City of Covington estimated water demand (WTP source withdrawal less Alleghany municipal community water systems demand)	651.81

Table 5-27
City of Covington Community Water System
Projected Annual Future Water Demand and Source Withdrawal

Municipal Community Water System	2010 (MG)	2020 (MG)	2030 (MG)	2040 (MG)
City of Covington projected future water demand	651.81	640.73	629.84	629.84
Alleghany County future projected water systems demand	128.53	130.87	133.2	133.2
City of Covington projected future WTP source withdrawal (Covington projected future demand + Alleghany County projected future demand)	780.34	771.60	763.04	763.04

5B.5 Town of Clifton Forge

Based on historical population estimates (1970-2010) the Town of Clifton Forge has experienced significant population decline. Additionally, based US Census 2010, the Town of Clifton Forge continued to experience population loss between 2000 and 2010. Moreover, based on 2010-2030 State Data Center population projections this decline is expected to continue in the coming decades.

As previously noted, the Town of Clifton Forge provides treated water to three municipal community water systems owned and operated by Alleghany County. As such, projected future water demand for the Town of Clifton (see Table 28) was estimated by decreasing the annual WTP source withdrawal by the percent population change per decade based on Virginia State Data Center population projections (Table 5-21), then subtracting the projected future demand for Alleghany County to this total. As previously noted State Data Center population projections are not available at the sub county level. As such, the 2010-2030 State Data Center population projections for Alleghany County were used for the Town of Clifton Forge. Town of Clifton Forge projected future water demand was estimated using the following methodology:

- Determine current Town of Clifton Forge water demand (WTP source withdrawal – Alleghany County municipal community water systems demand (Table 5-26).

- Decrease estimated Town of Clifton annual water demand by the percent population change per decade for Alleghany County (-2.24%) based on Virginia State Data Center population projections (Table 5-20).

- Add the Town of Clifton projected future demand to the Alleghany County projected demand to determine projected future WTP source withdrawal.

Current Clifton Forge annual 2010 (annual WTP withdrawal less Alleghany County municipal community water system use 387.57 MG (Table 5-26)	x	projected demand change based on percent population change per decade (-2.24%) (Table 5-20)	=	projected future Clifton Forge municipal community water systems demand

projected future Clifton Forge municipal community water system demand	+	projected Alleghany County municipal community water systems demand	=	Clifton Forge WTP projected future source withdrawal

Table 5-28
Town of Clifton Forge Community Water System
Estimated Annual Water Demand

Municipal Community Water System	2010 (MG)
Town of Clifton Forge WTP source withdrawal	544.97
Alleghany County municipal community water systems demand	157.4
Town of Clifton Forge estimated water demand (WTP source withdrawal less Alleghany municipal community water system demand)	387.57

Table 5-29 shows the projected water use (i.e., source withdrawal) for the Town of Clifton Forge WTP and projected future water demand for the Town of Clifton Forge (WTP source withdrawal (MG) less Alleghany County projected future water systems demand). Based on this methodology, the Town of Clifton Forge's future water demand is projected to be 370.40 MG in 2030. The projected future annual WTP source withdrawal demand is projected to be 533.45 MG in 2030. Consistent with regional future water demand projections, given the time horizon the 2030 projected annual municipal community water system demand was used for 2040.

Table 5-29
Town of Clifton Forge Community Water System
Projected Annual Future Water Demand and Source Withdrawal

Municipal Community Water System	2010 (MG)	2020 (MG)	2030 (MG)	2040 (MG)
Town of Clifton Forge estimated water demand (WTP source withdrawal less Alleghany municipal community water system use)	387.57	378.89	370.40	370.40
Alleghany County projected municipal community water systems demand	157.4	160.2	163.05	163.05
Town of Clifton Forge projected future WTP source withdrawal (Clifton Forge projected future demand + Alleghany County projected future demand)	544.97	539.09	533.45	533.45

Table 5-30 shows the disaggregated water demand for the Town of Clifton Forge for the years 2007, 2010, 2020, 2030 and 2040. From the table, it is presented that the total water demand usage is projected to decrease over the planning period to 2040. This decrease in water demand is attributed primarily to the forecasted decline of 2.24% over each decade.

Table 5-30
Town of Clifton Forge Municipal Community Water System
Projected Disaggregated Water Demand and Source Withdrawal

		Base Year	Year			
Demand Sector	**Use Percentage**	**2007**	**2010**	**2020**	**2030**	**2040**
Residential	23	0.340	0.244	0.239	0.233	0.233
Commercial	12	0.180	0.127	0.125	0.122	0.122
Industrial	0	0.000	0.000	0.000	0.000	0.000
Production Processes	1	0.010	0.011	0.010	0.010	0.010
Lost and Unaccounted For Water	35	0.520	0.372	0.363	0.355	0.355
Sales to Other Communities	29	0.440	0.308	0.301	0.294	0.294
Total	**100**	**1.490**	**1.062**	**1.038**	**1.015**	**1.015**

The Town of Clifton Forge has recently installed water meters on all residential and commercial connections and began metering customer use in the spring of 2011. With the installation of water meters residential water use is expected to decrease as customers begin paying for the amount of water used instead of a flat rate. Additionally, the Town of Clifton Forge has raised water rates for customers, which may also decrease future demand.

5B.6 Town of Iron Gate

The Town of Iron Gate purchases treated water from Alleghany County via the Cliftondale/Wilson Creek/ Wesgate municipal community water system. Based on historical and current population data, the Town of Iron Gate has experienced population decreases over the past decades. As previously noted State Data Center population projections are not available at the sub county level. As such, the 2010-2030 State Data Center population projections for Alleghany County were used for the Town of Iron Gate (-2.24%). The Town of Clifton Forge projected future water demand was estimated using the following methodology:

- Calculate projected water demand for 2010, 2020, 2030 - by decreasing water use by the percent regional population change per decade, based on Virginia State Data Center population projections (Table 5-20).

current annual municipal community water system use	x	percent Alleghany County population change per decade from 1970-2010 (-2.24)	=	Alleghany County municipal community water systems projected future demand

Table 5-31 shows the projected future water demand for the Town of Iron Gate. Based on this methodology, the Town of Iron Gate's future water demand is projected to be 20.40 MG in 2030. Consistent with regional future water demand projections, given the time horizon the 2030 projected annual municipal community water system use was used for 2040.

Table 5-31
Town of Iron Gate Community Water System
Projected Annual Future Water Demand and Source Withdrawal

Municipal Community Water System	2010 (MG)	2020 (MG)	2030 (MG)	2040 (MG)
Town of Iron Gate municipal community water system	21.35	20.87	20.40	20.40

Table 5-32 presents the disaggregated water demand for the Town of Iron Gate for the years 2007, 2010, 2020, 2030 and 2040. From the table, it is presented that the total water demand usage is forecasted to decrease over the planning period to 2040. This decrease in water demand is attributed primarily to the projected decline of 2.24% over each decade.

Table 5-32
Town of Iron Gate Community Water System
Projected Disaggregated Water Demand and Source Withdrawal

		Base Year	Year			
Demand Sector	**Use Percentage**	**2007**	**2010**	**2020**	**2030**	**2040**
Residential	72	0.060	0.042	0.041	0.040	0.040
Commercial	4	0.003	0.002	0.002	0.002	0.002
Industrial	0	0.000	0.000	0.000	0.000	0.000
Production Processes	0	0.000	0.000	0.000	0.000	0.000
Lost and Unaccounted For Water	12	0.010	0.007	0.007	0.007	0.007
Sales to Other Communities	13	0.010	0.008	0.007	0.007	0.007
Total	**100**	**0.081**	**0.058**	**0.057**	**0.056**	**0.056**

5B.7 Private Community Water Systems

5B.7.1 Alleghany County

Based on the information included in Appendix A, there are two private community water systems in Alleghany County. One is served by groundwater and one is served by surface water. No data was available for these users, and as a result, no value could be determined.

5B.8 Large Self-Supplied Users of More Than 300,000 Gallons Per Month for Non-Agricultural Uses

5B.8.1 Alleghany County

Based on the information included in Section 3B, there are four large self-supplied users of more than 300,000 gallons per month for non-agricultural uses in Alleghany County. One of these are served by groundwater and the 2007 usage was .802 mgd. Three are served by surface water and the 2007 usage was 38.5749 mgd. Total usage in this category in Alleghany County is 39.3769.

Given the available information, it is assumed for purposes of this analysis that demand for this sector will remain the same throughout the planning period. It is also assumed that this number is underrepresented because no data was available for one source.

5B.8.2 City of Covington

Based on the information included in Section 3B, there is one large self-supplied user of more than 300,000 gallons per month for non-agricultural uses in the City of Covington. This is a surface water user. The 2007 average daily surface water demand for this user is .466 mgd. It is assumed for purposes of this analysis that demand for this sector will remain the same throughout the planning period.

5B.9 Large Agricultural Users of More Than 300,000 Gallons Per Month

5B.9.1 Alleghany County

Based on the information included in Section 3B, there are no large, agricultural users of more than 300,000 gallons per month in Alleghany County.

5B.10 Small Self-Supplied Users of Groundwater

5B.10.1 Alleghany County

Based on the information included in Section 3B, there are 3,578 individual residences and 5 businesses using groundwater in Alleghany County. The 2007 total estimated average annual use for these users is .2809 mgd. It is assumed that demand for this sector will remain constant through the planning period.

6.0 Water Demand Management (9 VAC 25-780-110)

The following section addresses the water demand management and conservation measures for the Upper James Water Supply planning area, as specified in the Water Supply Regulations 9 VAC 25-780-110. According to the Regulations, the Water Supply Plan will describe practices for more efficient use of water within the planning area.

The types of measures described below include the adoption and enforcement of the Virginia Uniform Statewide Building Code that address low flow toilets and appliances and landscaping and irrigation restrictions. The Plan also includes information that describes water conservation and water reduction measures utilized within the planning area. These include technical, educational and financial programs.

The Water Supply Plan also includes and describes practices that address unaccounted water loss in the maintenance and operation of each water system. The types of programs described include leak detection and repair policies, as well as the projects that replace outdated and inefficient water distribution lines.

Finally, the Water Supply Plan describes current conservation practices, techniques and technologies utilized by each of the local governments, public service authorities, and regional conservation entities.

Each locality completed the Water Demand Management Information Form. This information was used to catalog and describe the water efficiency, water conservation, and water loss reduction practices used within the planning area as detailed below.

6.1 Water Use Efficiency

6.1.1 Adoption of the Virginia Uniform Building Code

Table 6-1 describes the localities that have adopted the Virginia Uniform Building Code and the responsible party for enforcement of the Code:

Table 6-1
Adoption of the Virginia Uniform Building Code by Locality

Locality	Year Adopted	Enforcement	Comments
Rockbridge	1973 Ordinance #7-1	County Building Official	
Bath	2003 Sec. 7.2 USBC	County Building Official	During inspections, fixtures must perform as listed in the USBC.
Highland	1993	Enforced by Building Code Department	
Allegany	1973 Ordinance #18-31	County Building Official	Inspections performed by County Building Official in accordance with state build and county codes.
Buena Vista	2003	City Building Office	The City follows the chart in the plumbing code which dictates pressure and maximum flow rates. The industry dictates what types of flow is available in appliances and appurtenances; which are commonly low flow.
Lexington	1970 – Ordinance # 05-3 of the1970 Code	City Dept. of Planning and Development	
Covington	1975 – City Code # 6-1	Enforced by Plumbing Inspector	
Glasgow			Follows Rockbridge County Building Inspection Code.
Goshen			Follows Rockbridge County Building Inspection Code.
Monterey			Follows Rockbridge County Building Inspection Code.
Clifton Forge			Follows state and town codes, enforced by the Building Official.
Iron Gate			Follows Rockbridge County Building Inspection Code.

6.1.2 Other Local Water-Use Ordinance or Plans

None of the localities have adopted ordinances and/or developed and implemented other plans and programs that address low-water use and water efficient landscaping. However, as part of the adoption of the Upper James River Basin Water Supply Plan, each locality will adopt the Upper James River Basin Drought Preparedness and Response Plan and the related ordinance that enacts the Drought Plan. Please see Appendix of the Plan for more information.

6.1.3 Homeowners' Associations

There is no data available to support that any homeowners' association groups have adopted landscaping plans or other plans to increase water efficiency or reduce water use. However, as part of the adoption of the Upper James River Basin Water Supply Plan, each locality will adopt the Upper James River Basin Drought Preparedness and Response Plan and the related ordinance that enacts the Drought Plan. As a result homeowners' association groups will be required to comply with the ordinance. Please see Appendix of the Plan for more information.

6.1.4 Wasteful Water Use

Alleghany County has adopted Ordinance # 62-77 that states upon the declaration of a drought emergency, a range of water uses and activities are limited or prohibited including fountains, landscaping, swimming pools and vehicle washing. The ordinance also limits water use at restaurants and golf courses. The ordinance also describes unlawful and wasteful uses during times of drought. None of the other localities have adopted ordinance declaring wasteful water use and/or running of water unlawful. However, as part of the adoption of the Upper James Water Supply Plan, each locality will adopt the Upper James River Basin Drought Preparedness and Response Plan and the related ordinance that enacts the Upper James River Basin Drought Preparedness and Response Plan.

6.1.5 Irrigation Efficiency

None of the localities in the Upper James Water Supply Planning area implement practices to increase irrigation efficiency such as requiring irrigators to invest in irrigation meters, water recycling, or withholding sewer credits during irrigation months. However, the Town of Clifton Forge encourages separate meters for irrigation, pools, and other water uses.

6.1.6 Municipal/Private Water Suppliers

No data available to support water use efficiency measures taken by municipal and/or private water suppliers with the exception of localities with metered water connections.

6.1.7 WaterSense Partners

The WaterSense Program, sponsored by the Environmental Protection Agency (EPA), partners with manufacturers, retailer and distributors, utilities, state and local governments, non-governmental organizations, trade associations, irrigation professionals, and other conservation

groups and organizations to promote the use of water-efficient products and the need for smart water use. EPA's website: www.epa.gov/watersense/partners/index.htm lists organizations that have agreed to partner with EPA to promote water conservation. None of the community water systems in the Upper James Watershed planning area are listed on the EPA's list of WaterSense Partners.

EPA's WaterSense website lists professional landscape and irrigation companies that have been certified through the WaterSense program. There are 58 listed on EPA's website. Of these, 19 provide services statewide and five (5) provide services in the area in and around the Upper James Watershed planning region, including one (1) in Rockbridge County and one (1) in Bath County.

6.1.8 Other Efficient Water Use Practices

Other than the plans, measures, and practices mentioned above; there are no other measures taken by the localities for more efficient use of water in the planning area. As stated previously, the adoption of the Upper James River Basin Water Supply Plan and the Upper James River Basin Drought Preparedness and Response Plan, along with the enacting ordinance, numerous water efficiency practices and measures, will be implemented.

6.2 Water Conservation

The following sections outlines and describes the efforts made by the localities and community water systems to reduce water consumption on a long-term basis.

6.2.1 Alleghany County

Alleghany County has adopted Ordinance #62-77 that states upon the declaration of a drought emergency, a range of water uses and activities are limited or prohibited including fountains, landscaping, swimming pools and vehicle washing. The Ordinance limits water use at restaurants and golf courses as well. The Ordinance also describes unlawful and wasteful uses during times of drought.

6.2.2 Town of Goshen

The Town of Goshen is currently making major improvements to its public water system with state and federal funds. This project is a result of a massive failure of its water system in 2007. Improvements to the system include new waterlines, a new water storage tank, and water meters for each connection. This will be the first time that the Town's water system will be metered since it was first installed in the 1930's.

6.2.3 Town of Monterey

Improvements have been made to the school facilities and the Highland County Courthouse to improve water savings. Monterey has a system in place to address water loss in the maintenance of its water system to reduce unaccounted for water loss and to repair water mains, service

connections, fire hydrants, valves, etc when such repairs are needed. In addition, the Town implements water restrictions in the event of dry conditions.

6.2.4 Town of Glasgow

The Town of Glasgow has implemented a public education program that addresses water conservation by distributing newsletters to its customers to let them know when voluntary water conservation is needed in the Town.

6.2.5 Bath County

Bath County has installed more efficient sinks and urinals in its public restrooms located in the local government buildings and facilities. The local golf course in Bath County uses reclaimed rainwater and runoff water for irrigation purposes. The Bath County Service Authority sponsors/participates in numerous workshops/functions that promote water conservation education for the general public. Through its ascending rate structure, the Bath County Service Authority encourages reduction of water use.

6.2.6 City of Lexington

The City of Lexington has installed low-flow fixtures in new buildings at the Lexington Police Department, Fire Department, and Public Works Department. The City's utility rate structure encourages water conservation by a graduated increase for water usage.

6.2.7 City of Buena Vista

The City of Buena Vista is currently in the process of trying to determine and measure water loss and unaccounted for water loss. This includes making repairs to line leaks and reducing and/or eliminating water storage tank overflows. The City also installs low-flow fixtures in public facilities for new construction. The City does not have an incentive program per se to encourage water conservation; however, the City has noticed a reduction in water usage by customers who are trying to reduce their overall household expenses because of the economy.

6.2.8 Town of Clifton Forge

The Town of Clifton Forge has utilized funding through the State's Clean Water and/or Drinking Water Revolving Loan Program to upgrade its Water Treatment Plant. The Town distributes notices to every water customer on ways to reduce water use. Information is also posted on the Town's website.

6.2.9 Rockbridge County

Rockbridge County has adjusted their standard operating procedures to improve water conservation by monitoring the power usage and pumping to detect excessive flows. The County also has a plan in place to install low-flow fixtures in newly constructed local government buildings and facilities. The County is financially unable to offer incentive

programs to its customer to retrofit or replace older fixtures/appliances due to a limited customer base and current debt obligations. The County's rate structure is a uniform rate that can, in part, act to discourage large usage.

6.2.10 Maury Water Service Authority

Although the Maury Water Service Authority is an exclusive water wholesaler, their standard operating procedures help improve water conservation. During extreme cold temperature, water plant staff add polymer to settling basin influent in order to aid settling and reduce filter loading. Polymer addition under these conditions bring settling performance up to warm temperature performance and thus decreases filter wash requirements.

6.3 Water Loss Reduction

This section describes the measures and practices taken to address water loss in the maintenance of water systems to reduce unaccounted for water loss within the locality and/or planning area.

6.3.1 Metering Usage

One of the best ways to identify and monitor water loss is through a metered water system. Table 6-2 depicts the communities in the planning area that have a system for meters, meter inventory, testing, maintenance, and replacement.

Table 6-2
Summary of Water Conservation Measures by Locality

Locality/Community Water System	Metered System	Service Meters Source Meters	Meter Reading Frequency	Comments
Rockbridge County	Yes	Source and Service Meters	Varies – Monthly and Bimonthly	Program being developed for meter inventory, testing, maintenance and replacement.
Clifton Forge	Yes	Source and Service Meters	Monthly	Water meters are installed as of July 2011;
Town of Iron Gate	Yes	Source and Service Meters	Monthly	
City of Buena Vista	Yes	Source and Service Meters	Monthly	All residential meters recently replaced. Customer can request meter testing; billing system flags high usage.

Town of Goshen	Yes, currently being installed	Source and Service Meters	Monthly	The Town is currently replacing its water system and meters will be installed for the first time.
City of Lexington	Yes	Service	Bimonthly	Meters replaced every 15-20 years or when they begin to fail.
City of Covington	No		N/A	
Bath County	Yes	Source and Service Meters	Monthly	Bath County Service Authority record date meters installed and replaced dates of repair and reason, and monthly comparisons. Water loss is recorded and reviewed monthly.
Town of Glasgow	Yes	Source and Service Meters	Monthly	Commercial accounts read each month, Town personnel checks source daily.
Highland County	Yes	Service	Bimonthly	Meters are routinely inspected by water operators and replaced as necessary.
Town of Monterey	Yes	Service and Source Meters	Bimonthly	
Alleghany County	Yes	Service and Source Meters	Monthly	Public Works keeps a ready supply of meters and repairs defective meters frequently. At the customers request meters are tested for accuracy. Master meters are also tested and calibrated as need.
Maury Service Authority			Quarterly	A leak test is performed quarterly to determine the leak rate of water loss for the Lexington City water system.

6.3.2 Ordinance or Policy to Require Customer to Repair Leaks

The following localities have a policy or an ordinance in place that requires a water user to repair leaking fixtures, appliances or plumbing:

- **Bath County** – No information available at this time.

- **City of Lexington** – In Section 403-29 of the City Code – Waste of Water, it is stated that the owner of occupant of premises having a connection with City water system shall not permit the water to be wasted as a result of leaks or other causes but shall have any leak promptly repaired or the condition resulting in waste corrected. Upon failure to repair leaks or correct condition resulting in waste of water, the water service to the premises involved may be discontinued.

- **Town of Glasgow** – Policy only. The Town will turn water off if running on the ground until owner makes repairs.

6.3.3 Use of State Revolving Funds

The following localities have reported that they received Clean Water State Revolving Loan Funds and/or Drinking Water State Revolving Funds. These funds can be used to install water meters in its distribution system and/or to develop and implement water audit and leak detection practices. These funds can also be used to promote water conservation education through development and implementation of water conservation plans, public education program, and/or ordinances or regulation to conserve water.

- Town of Clifton Forge – The Town received State Revolving Loan funds for Phase 1 WTP improvements and installation of water meters.

- Town of Glasgow – The Town has used VRWA funding for a leak detection program in the past.

- Town of Goshen – The Town of Goshen has received funding through the Virginia Department of Health to install water meters and make other critical repairs to its system that suffered a massive failure in 2007.

6.3.4 Water Use Enforcement

Practices and polices for tracking unauthorized connections and the enforcement of unauthorized connections vary among localities. With limited staff and resources, it is difficult for localities to monitor and police unauthorized connections. Localities must depend on reports of these instances. In most cases, there are monetary and criminal sanctions enforced for the unauthorized use of water and connections.

6.3.5 Capital Improvement Plans

The following localities/service authority have Capital Improvement Plans (CIP) which include dedicated funds to upgrade existing facility infrastructure, water mains, waterlines, fire hydrants, valves, etc. to reduce water loss:

- The City of Lexington's CIP includes funds to replace waterlines, individual water valves, and fire hydrants.
- The Town of Monterey has a CIP which has dedicated funds for water system improvements.
- The Maury Service Authority, a water wholesaler, has a CIP program for the water plant with replacement scheduled for all existing capital equipment.
- The Town of Clifton Forge's CIP which has dedicated funds for water system improvements.

In general, repairs and upgrades are made on an as-needed basis utilizing department maintenance funds.

6.3.6 Public Education Programs

One of the most cost-effective means of water conservation and reduction of water loss is through public education. There are numerous ways that a locality can establish an effective public education program. Some examples include, enhanced billing appliance/fixture rebate and other incentives, customer water audits, and other conservation outreach efforts. Below is a list of the localities that offer public education programs or incentives to help reduce customer-side water loss:

- The Town of Clifton Forge sends notices to all its water customers on ways to reduce water use. The information is also posted on the Town's website.
- The Bath County Service Authority offer customers, upon request, leak detection tablets and meter accuracy checks in order to detect leaks. Additionally, Bath County Service Authority participates/sponsors educational workshops for the general public on water conservation.
- Rockbridge County provides information to its customers through telephone, brochures, and direct communication.
- The Town of Glasgow provides water conservation information to its customers through the use of newsletters.

7.0 DROUGHT CONTINGENCY AND RESPONSE (9 VAC 25-780-120)

In accordance with the Local and Regional Water Supply Planning Regulations (9 VAC 25-780-120) (the Regulations), a Drought Preparedness and Response Plan (the Plan) has been drafted for the Upper James River Basin, and is included as Appendix B. The Plan was developed to guide communities in the Upper James River Basin through instances when water shortages lead to drought conditions. The Plan, developed by the Central Shenandoah Planning District Commission (CSPDC) staff, with input from the affected localities and the Virginia Department of Environmental Quality (DEQ), will complement localities' water conservation policies and ordinances, as well as water resource plans. During the early stages of the drought planning process, a Drought Task Force was formed and membership included representatives from each locality. This Drought Task Force has been the overseeing locality body during the development of the Upper James River Basin Drought Preparedness and Response Plan.

The Plan includes methods for localities, residential, commercial, and industrial customers to help reduce demand during times of an impending or actual shortage. In addition, the Regulations require that the Plan identify three graduated stages of response. The Plan is structured in accordance with this and other requirements of the Regulation.

Drought indicators that aid in the selection of drought response stage have been developed specifically with the individual characteristics of each water system in mind. These indicators are designed to help alert local decision-makers of the need to consider implementing additional water reduction measures as drought conditions worsen. Response measures specified in the Plan are intended to supplement ongoing conservation programs and are designed to rapidly reduce water demand. The Plan is intended to help the locality's staff implement these measures early to avoid the inevitable pitfalls of reactive, crisis-mode decision-making.

The Upper James River Basin Drought Preparedness and Response Plan provides guidelines for determining the current drought response stage, whether to raise or lower the drought response stage as the situation develops, and provides appropriate response measures for implementation at each stage. In general, the Plan provides both guidelines and "hard lines" to the locality when it becomes necessary to consider declaring a drought response stage and the implementation of drought response measures. Because individual locality system intakes include both local groundwater and surface waters, the approach of providing guidelines will better serve the community rather than establishing rigid criteria that may not adequately reflect water supply availability or water distribution system conditions.

The Plan includes the three drought response stages of drought watch, drought warning, and drought emergency. If a drought watch is declared, a locality will progress through the drought warning and emergency stages if and when threats to the locality's supplies warrant it.

Drought response measures in the Plan are meant to supplement rather than replace ongoing water conservation and education programs. One or more response actions may be implemented when a drought response stage is declared. Additional actions may be implemented if needed based on continual monitoring of local system indicators. Specific conservation measures included in the Plan were developed based on the following general principles:

1. Emphasize the need for visible leadership from locality-maintained facilities.

2. Reduce or restrict non-essential uses of water.

3. Avoid or minimize economic impacts to the community except under extreme conditions.

4. Work with large commercial water users to determine their own operational strategies for reducing water use well in advance of implementing advanced drought response stages.

5. Continue to proactively educate all customers on the importance of using water efficiently regardless of climatic conditions.

6. Ensure that any water restrictions do not impact community health and safety.

Specific drought indicators for each locality, as well as region-wide water conservation measures to be incorporated during period of declared drought are outlined in Appendix B. These region-wide conservation measures in the Plan may be implemented on an individual locality basis when local government declares a drought stage.

8.0 STATEMENT OF NEED AND ALTERNATIVES (9 VAC 25-780-130)

In accordance with the Water Supply Planning Regulations (9 VAC 25-780-130), a statement of need is required that clarifies the adequacy of existing water sources to meet current and projected demands. This section addresses the adequacies of existing water supplies to meet demands through the planning period, based on the data presented in previous sections of this report.

8.1 Adequacy of Existing Resources

In this section, the projected demands for the planning area are explored over the planning period of 30 years, from 2010 through 2040. These projected demands are broken down into the following categories:

- Municipal Community Water Systems
- Private Community Water Systems
- Non-Agricultural Self Supplied Users of More than 300,000 Gallons Per Month
- Agricultural Self Supplied Users of More than 300,000 Gallons Per Month
- Small, Self-Supplied Users of Groundwater

8.1.1 Adequacy of Municipal Community Water Systems

Projected Year 2040 water demands and current permitted capacities of all locality municipal community water systems are compared in Table 8-1. Year 2040 projected water demands for each system were calculated and presented in Chapter 5, Projected Water Demands. Each locality's projected water demand in year 2040 was compared to the VDH permitted capacity to determine the percentage of water capacity remaining in any respective water system.

It is noted that not all localities within the Upper James watershed are represented in this table. Locality water systems that are not projected to increase their water usage through the year 2040 are not represented in this table. Several locality systems such as Bath County, Town of Clifton Forge, Town of Covington, Town of Goshen, Highland County, Town of Iron Gate and the Town of Monterey were excluded as their water demand was either projected to year 2040 to remain constant or to actually decrease in demand, primarily due to a projected population loss. Additionally, in the specific instance concerning the Town of Goshen, a newly constructed water system has dramatically affected their water demand and usage, both present and future. Actual measured water usage amounts used to derive the year 2040 water demand projections for Goshen utilized figures prior to the completion of the new water system in 2011. For this reason, Goshen's year 2040 water demand was not projected until updated water usage amounts could be obtained in year 2012.

Table 8-1
Adequacy of Existing Municipal Water Systems

Locality	Projected Year 2040 Water Demand (mgd)	VDH Permitted Capacity (mgd)	Year 2040 demand as % of Permitted Capacity
Alleghany County	.228	NI*	
Bath County	.079	.300	26.33%
Buena Vista	1.561	1.692	92.26%
Clifton Forge	1.349	NI*	
Covington	.0942	NI*	
Glasgow	.338	.712	47.47%
Goshen	.288	.228	
Highland County	.014	NI*	
Iron Gate	.08	NI*	
Lexington	.984	4.0	24.60%
Monterey	.064	.096	66.67%
Rockbridge County**	.889	NI*	

* At the time of this report, no information was able to be obtained for these particular municipal community water systems. For these systems, the projected demand is actually less than the current demand due to projected population declines through 2040. Thusly, since these systems currently have adequate resources to meet current demand, it can be concluded that reasonable resources will be present in the future.
**Rockbridge County 2040 projected demand is a sum of all four systems analyzed: Natural Bridge/Arnold's Valley, Route 251, Rivermont Heights and North Lexington/Fairfield/Raphine.

Based on these data, it is projected that the Region as a whole will meet its projected 2040 water demand with the existing water supply. It should be emphasized that these 2040 demand numbers are based on several water usage assumptions, as defined in Section 5. Therefore, a change in projection methodology could alter the 2040 demand projections. Additionally, it is noted in Table 8-1 that the City of Buena Vista, by year 2040, will be utilizing a large portion of its permitted capacity. At the time of this report, the City of Buena Vista is investigating the remediation of the Dickinson Well as a viable source for municipal water needs. This well has been previously determined to be under the direct influence of surface water by the Virginia Department of Health. At this time, Dickinson Well is the City of Buena Vista's most productive water source and it has been determined that the installation of a membrane filtration system will allow the City to once again utilize Dickinson Well. The year 2040 percentage of permitted capacity amount of 92.26% assumes that Dickinson Well not be used as a water source by the City of Buena Vista.

8.1.2 Adequacy of Private Community Water Systems

Projected Year 2040 water demands and current permitted capacities of all private community water systems are compared in Table 8-2.

Table 8-2
Adequacy of Existing Private Community Water Systems

Locality	System	2040 Projected Average Daily Need (MGD)	VDH Permitted Capacity (MGD)
Alleghany County	Mountain Lake	NI*	.020
	Longdale Furnace	NI*	NI
Bath County	Millboro Water Association	.077	.200
	Warm Springs Water Association	.002	.044
	The Homestead Water Company	.972	.994
	The Homestead Water Company – Piney Ridge	.001	.012
Rockbridge	Brownsburg Water Company	NI*	.020
	The Manor of Natural Bridge	NI*	.006
	Johnsons Mobile Home Park	NI*	.012
	Shady Grove Mobile Home Park	NI*	.007
	Natural Bridge Juvenile Correctional Center	.010	.010
	Maury Service Authority	1.443	2.327

* At the time of this report, no information was able to be obtained for these particular community water systems. For these systems, the projected demand is actually less than the current demand due to projected population declines through 2040. Thusly, since these systems currently have adequate resources to meet current demand, it can be concluded that reasonable resources will be present in the future.

8.1.3 Adequacy of Large, Self-Supplied Users (Ag & Non-Ag)

Projected Year 2040 water demands and current permitted capacities of all locality municipal community water systems are compared in Table 8-3.

Table 8-3
Adequacy of Large Self-Supplied Users (Non-Ag)

Locality	Projected Year 2040 Water Demand (mgd)
Alleghany County	39.377
Bath County	.49
Buena Vista	1.002
Covington	.466
Goshen	NI
Rockbridge County	.796
Planning Region	**42.131***

*This number is underrepresented since data for the Town of Goshen is unknown due to the newly constructed water system in 2011 for the Town. Accurate Town data is not anticipated to be obtained until 2012.

Table 8-4
Adequacy of Large Self-Supplied Users (Ag)

Locality	Projected Year 2040 Water Demand (mgd)
Bath County	11.916
Highland County	5.78
Lexington	.000
Planning Region	**17.696**

8.1.4 Adequacy of Small, Self-Supplied Users

Projected Year 2040 water demands and current permitted capacities of all locality municipal community water systems are compared in Table 8-5.

Table 8-5
Adequacy of Small Self-Supplied Users

Locality	Projected Year 2040 Water Demand (mgd)
Alleghany County	.2809
Bath County	.171
Highland County	.143
Rockbridge	1.9429
Planning Region	**1.943**

8.2 Private Community Water System Alternatives

Based on the information provided in Chapter 5, it can be assumed that future demand among sector will be met since this demand for this sector is expected to remain constant throughout the planning period. However, without further study it can only be assumed that future demand will be met.

8.3 Large, Self-Supplied Users of More Than 300,000 Gallons Per Month Alternatives (Non-Ag & Ag)

Based on the information provided in Chapter 5, it can be assumed that future demand among sector will be met since this demand for this sector is expected to remain constant throughout the planning period. However, without further study it can only be assumed that future demand will be met.

8.4 Small, Self-Supplied Users on Groundwater

Based on the information provided in Chapter 5, it is unknown at this time as to whether the demand will be met among this sector. As projected demand increases and more individual wells are drilled to meet these demands, and as community water systems increase the water withdrawn through groundwater sources; individual self-supplied users may experience decreased capacity for increasing stress on aquifers.