New River Valley Water Supply Plan

Prepared by: New River Valley Planning District Commission

September 2011

Prepared for:
Floyd County
Giles County
Montgomery County
Pulaski County
City of Radford
Town of Dublin
Town of Floyd
Town of Glen Lyn
Town of Narrows
Town of Pearisburg
Town of Pembroke
Town of Pulaski
Town of Rich Creek

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EXECUTIVE SUMMARY

The New River Valley Water Supply Plan began in 2006 to address the requirements of the Local and Regional Water Supply Planning regulation (9 VAC 25-780). This plan covers the New River Valley Planning District, except for the Towns of Blacksburg and Christiansburg in Montgomery County. The localities participating in this planning process include the Counties of Floyd, Giles, Montgomery, and Pulaski, the City of Radford, and the Towns of Dublin, Floyd, Glen Lyn, Narrows, Pearisburg, Pembroke, and Pulaski. A planning committee named the New River Valley Water Supply Plan Participation Committee met regularly to address the requirements set forth in the regulations. The plan includes water source and use information, existing resources information, projected water demand into the future, water demand management, drought response and system needs and alternatives.

The first section covers information pursuant to 9 VAC 25-780-70- Water Source Information. There are 55 Community Water Systems (CWS) in the region being studied. A CWS is defined as a system that regularly serves 25 or more people or has at least 15 year-round service connections. Of these 55 systems, 39 withdraw water from groundwater sources, including Floyd-Floyd County PSA, Giles County PSA, and Montgomery County PSA. In the region there are 16 surface water systems, including spring-fed systems. The Town of Pulaski, City of Radford, and Pulaski County PSA utilize surface water sources. Montgomery County PSA purchases surface water to sell to a portion of their users. Those users not served by the county PSAs or town public works departments are self-supplied users. These self-supplied users include; large, non-agricultural users, small agricultural users, and small non-agricultural users. Large, non-agricultural users include large industries such as power generation, as well as golf courses and country clubs. Small, agricultural users are primarily farms that use water for livestock. Small, non-agricultural users are either residences or businesses that have private wells. Approximately 21% of homes in the region utilize wells, as well as approximately 66 businesses.

The Water Use section, pursuant to 9 VAC 25-780-80, includes information on how much water is used in the region. Approximately 81,505 individuals were served by CWS in 2006, the last year that data is available. Across the region, the average monthly use is 738.51 MG, while the average daily use is 24.28 MG. These averages are readily available for public water supplies, but information on self-supplied users is lacking. Currently there is very limited information available for smaller community systems, and no information available for private wells.

The Existing Resources section, pursuant to 9 VAC 25-780-90, reveals the New River Valley as a unique region. This section outlines all environmental issues and qualities that can and do affect water quality. The NRV has unique and abundant water resources that provide drinking water to residents, but are also particularly vulnerable to development impacts. Three of the four participating counties and the city have surface and groundwater that are influenced by karst geology. Karst geology occurs in limestone bedrock where groundwater flows freely through a network of interconnected underground caves and streams. The area is characterized by sinkholes and “sinking streams” that run directly to this groundwater network and sometimes connect back into other surface water sources, such as the New River. These direct connections

between surface and groundwater with little to no natural filtration make these water sources particularly vulnerable to pollution. Floyd County, the fourth county participating in the plan, is a headwaters county and exists on a plateau where water flows primarily out of the county.

Pursuant to 9 VAC 25-780-100, water demand was projected on a 50-year timeframe, based on 2000 Census data. The population projections were produced by Virginia Tech's Institute for Policy and Governance utilizing Crystal Ball's CBpredictor Software combined with a Monte Carlo simulation. Over the projected timeframe, all localities in the region, with the exception of Radford and the Town of Pulaski, are expected to grow. Based on these population numbers and current billing estimates, this section includes information on projected water demand in the region. It is assumed that not all of the projected population growth will occur in areas served by public water providers; this section also includes a discussion of the increased water demand from self-supplied users.

In an effort to meet the demand projected in the previous section, the Water Demand Management section, pursuant to 9 VAC 25-780-110, contains a discussion on efforts to conserve water. Each PSA is engaged in various efforts to conserve water through reduced demand from customers, as well as improving system efficiency. Education and outreach are significant efforts in this region, as well as working to enforce new building codes that contain measures to reduce water use.

As impetus for this planning effort, the Drought Response section, pursuant to 9 VAC 25-780-120, outlines the participating localities proposed efforts should a severe drought occur in the region. During the planning process the New River Valley Water Supply Plan Participation Committee developed three graduated stages of drought preparation: Drought Watch, Warning, and Emergency. The Drought Watch phase is primarily information-based; getting information about conservation efforts out to customers and increasing monitoring efforts on the part of the water providers. In the Drought Warning phase, customers will be encouraged to voluntarily restrict their water use, especially on to be determined non-essential uses. The Drought Emergency phase is the point at which water use will be restricted by local mandate. Water providers will implement water conservation measures that could include re-structured rates and civil penalties for wasting water.

The final section, Statement of Needs and Alternatives, pursuant to 9 VAC 25-780-130, discusses the future needs and alternatives to address water provision in the future. Most systems in the NRV are well below capacity, and projections indicate that few will reach capacity in the 50-year planning timeframe. Regardless of this abundance in current water supply, the PSAs in the region are continually planning for and developing ways to provide safe, reliable drinking water to more residents.

INTRODUCTION

Regulation Background

As a result of the drought conditions during 1999-2002 and with an appreciation of the significance of water supply planning and water resource management, Governor Mark Warner commenced the Virginia Water Supply Initiative in 2002. This new initiative was aimed at local governments understanding their role in water supply management, along with the Department of Environmental Quality (DEQ) to support the means of healthy water supplies with an overall effort to examine the issue regionally. In March 2003 a stakeholder committee was formalized as the Water Policy Technical Advisory Committee (WPTAC) and was tasked to create a Water Supply Plan Regulation.

The WPTAC had 30 members representing local, regional, state, and federal government, along with representatives from conservation, agriculture, trade organizations, power generation, water production, recreation, and academia. Following a two year process based on consensus, the MPTAC provided a draft of the Local and Regional Water Supply Regulation to DEQ, whereby the regulation was forwarded to the State Water Commission. On June 28, 2005 the regulation was approved and became effective November 2, 2005.

The Local and Regional Water Supply Planning Regulations were developed to implement the mandates of Sections 62.1-44.15 and 62.1-44.38:1 of the Code of Virginia. The purpose of this regulation is to protect the health, safety and welfare of citizens by requiring local and regional water supply planning. The goal of the regulation is to establish a basic set of criteria that each local or regional water supply plan must contain so that they may plan for and provide adequate water to their citizens in a manner that balances the need for environmental protection and future growth. The criteria that must be contained in the Plan are established in the following sections of the Regulation:

- Existing Water Source Information (9 VAC 25-780-70)
- Existing Water Use Information (9 VAC 25-780-80)
- Existing Resource Information (9 VAC 25-780-90)
- Projected Water Demand Information (9 VAC 25-780-100)
- Water Demand Management Information (9 VAC 25-780-110)
- Drought Response and Contingency Plans (9 VAC 25-780-120)
- Statement of Need and Alternatives (9 VAC 25-780-130)

This Regional Water Supply Plan satisfies the mandate of the Virginia General Assembly under regulations promulgated by the Virginia Department of Environmental Quality (DEQ) for local governments in Virginia to undertake local or regional water supply planning and management. Regulations promulgated by DEQ require local governments to engage in a multi-part process of plan development, adoption, and implementation to ensure that long-term water supplies are adequate to meet the needs of citizens and businesses.

New River Valley Water Supply Plan Background

Shortly after the Local and Regional Water Supply Plan Regulation went into effect on November 2, 2005, the New River Valley Planning District Commission (NRVPDC) began meeting with localities across the region to discuss the potential of compiling a regional plan to meet the requirements on behalf of the localities. In December of 2005 the NRVPDC submitted a grant application to the Department of Environmental Quality-Office of Water Supply Planning (DEQ) to prepare a regional water supply plan for the New River Valley. In total, there are 13 local governments participating in the New River Valley Water Supply Plan. They are the Counties of Floyd, Giles, Montgomery, and Pulaski, the City of Radford, and the towns of Dublin, Floyd, Glen Lyn, Narrows, Pearisburg, Pembroke, Pulaski, and Rich Creek. Both Blacksburg and Christiansburg signed resolutions of support for the regional project; however, they elected to create their plan together at a later date.

Following a successful grant application to DEQ, the first meeting of the New River Valley Water Supply Plan Participation Committee was held on March 16, 2006. This Committee was comprised of administrators (County Administrators and Town and City Managers) and water suppliers (PSA Directors, Public Works Directors) from the participating localities. Though they chose to complete their own plan, the Towns of Blacksburg and Christiansburg and the BCVPI Water Authority sent representatives to many of the New River Valley Plan Participation Committee meetings.

The first grant application in December 2005 limited the scope of the work to data collection covering four sections, Existing Water Source Information (9 VAC 25-780-70), Existing Water Use Information (9 VAC 25-780-80), Existing Resource Information (9 VAC 25-780-90), and Projected Water Demand Information (9 VAC 25-780-100).

Data for the four sections was gathered primarily through local water treatment plant operators, the New River Health District, Virginia Department of Health-Office of Drinking Water, Department of Environmental Quality, and local industries. The data collected for these four chapters provides the foundation of the New River Valley Water Supply Plan. With an understanding of how much water is being consumed, and by what type of users, the region can make estimates on the quantities of water needed 40 to 50 years into the future.

Preliminary research indicates the majority of the New River Valley as a water rich region. With the New River flowing north through three of our four counties, water supply is consistently positive. However, during the drought conditions experienced during 1999-2002, the New River Valley had 337 replacement well applications with Floyd County representing the majority of the applications (Drought Reporting and Surveillance, New River Health District, 20 November 2002). The intention of the New River Valley Water Supply Plan is to quantify how much water is being consumed across the region, identify areas with limited water supply, and evaluate methods to address areas lacking future water supply while taking into account several variables such as the environment and increasing efficiency of operating systems.

The New River Valley Region, which serves as the project area for this study, is found in southwest Virginia between Roanoke and Wytheville. The New River essentially bisects the

region by flowing through the City of Radford and three of the four counties, excluding Floyd County. The City of Radford is in the geographic center of the region with Giles County to the north adjacent to the West Virginia counties of Monroe and Mercer. The Blue Ridge Parkway follows the southern Floyd County border with Patrick and Franklin counties. Further, Interstate 81 bisects the region in an east-west angle through Montgomery and Pulaski counties.

EXISTING WATER SOURCE INFORMATION
***Refer to 9 VAC 25-780-70**

This section consists of a collection of current data on existing water sources. Current information is provided for community water systems using ground water, surface water reservoirs, and stream intakes. Included are lists detailing current information on all self-supplied users of more than 300,000 gallons per month of surface water and 300,000 gallons per month of ground water for nonagricultural uses. Also included are details on the amount of ground water to be purchased from water supply systems outside the geographic boundaries of the localities, as well as the amount of water available for purchase outside the localities. Additional information includes a list of agricultural users who utilize more than 300,000 gallons per month, an estimate of the number of residences and businesses that are self-supplied by wells withdrawing less than 300,000 gallons of water per month, an estimate of the population served by individual wells, and a summary of findings and recommendations from source water assessment plans or wellhead protection programs.

The following table provides information regarding the planning area characteristics used in the development of this plan.

Table 1. Planning Area Characteristics

Locality	Population*	Population Per Household*	Number of Community Water Systems**
Floyd County	13,847	2.39	2
Giles County	16,657	2.37	17
Montgomery County***	27,109	2.4	20
Pulaski County	35,127	2.32	14
City of Radford	15,859	2.25	2
*Total****	*165,146*	*N/A*	*55*

* Based on 2000 Census Data
** Based on VA Department of Health 2009 Waterworks Listing
*** Excludes Towns of Blacksburg & Christiansburg
****Includes Towns of Blacksburg & Christiansburg

Community Water Systems Using Ground Water - 9 VAC 25-780-70.B

The communities utilizing ground water systems are Montgomery, Floyd, and Giles Counties, the Town of Floyd, and the Giles County towns of Glen Lyn, Narrows, Pearisburg, Pembroke, and Rich Creek. Montgomery County operates a Public Service Authority (PSA) and they supply county users via 10 water systems, of which two are ground water systems, while the remaining are supplied by water purchase agreements with the Towns of Blacksburg and Christiansburg, the City of Radford and the Radford Army Ammunition Plant (RFAAP) further described in Water Available for Purchase beyond Local Boundaries on page 17. The Town and County of Floyd receives their water from the Floyd-Floyd County (PSA). The towns within Giles County (Glen Lyn, Narrows, Pearisburg, Pembroke, and Rich Creek) all receive their water from the Giles County PSA. All three county PSA's (Montgomery, Floyd, and Giles) have systems which utilize groundwater from multiple wells in their service districts. The following tables provide ground water data for each system.

Table 2. Community Water Systems and Permitted Capacity

Locality	Community Water Systems Utilizing Groundwater Source	Permitted Capacity (MGD)
Floyd County	2	0.218964
Giles County	16	3.0056
Montgomery County*	11	0.28043
Pulaski County	8	0.08689
City of Radford	0	N/A
Total**	39	3.591884

* Excludes Towns of Blacksburg and Christiansburg
** Includes Towns of Blacksburg and Christiansburg
Source: Virginia Department of Health

Additional information is provided on several private community water systems operating both wells and stream intakes. Tables providing information on these systems are provided in the appropriate section.

None of the ground water systems in the New River Valley have data on Annual and Monthly Permitted Amounts in Withdrawal Permit because this criterion only applies to systems operating in Water Management Areas, primarily east of the Blue Ridge region (personal communication, Brian Blankenship, Virginia Department of Health, Office of Drinking Water District #4).

The City of Radford does not have any permitted community ground water systems.

Floyd-Floyd County PSA operates five wells, with a sixth well ready to commence operation when the demand requires. Well #4 was taken off line in the late-1980s or early-1990s. Table 3 illustrates the critical information for each well maintained by the PSA, while Table 4 illustrates comparable information regarding the other community water system in Floyd County.

Table 3. Floyd-Floyd County PSA Well Data

Name and ID Number of Wells:	Christie 1	Shortt 2	Howard 3	Rec. Park 5	Comm. Cntr 6
Well Depth:	345’	205’	350’	300’	400’
Casing Depth:	52’	59’	50’	77’	105’
Screen Depth:	NI	NI	NI	NI	NI
Well Diameter:	8”	8”	8”	7”	8”
Average Daily Withdrawal:	0.03 MGD (29,000 gpd)	0.03 MGD (27,800 gpd)	0.03 MGD (25,500 gpd)	0.03 MGD (25,700 gpd)	0.04 MGD (40,000 gpd)
Design Capacity-Max Daily:	0.07 MGD (68,400 gpd)	0.04 MGD (43,200 gpd)	0.04 MGD (36,000 gpd)	0.04 MGD (36,000 gpd)	0.12 MGD (115,200 gpd)
System Permitted Capacity:	0.07 MGD (68,400 gpd)	0.04 MGD (43,200 gpd)	0.04 MGD (36,000 gpd)	0.04 MGD (36,000 gpd)	0.12 MGD (115,200 gpd)

NI= No Information

Table 4. Big Rock Trailer Park

Name and ID Number of Wells:	Big Rock Trailer Park Well 1063047
Well Depth:	175
Casing Depth:	100
Screen Depth:	NI
Well Diameter:	8
Average Daily Withdrawal:	NI
Design Capacity-Max Daily:	.004MGD (3,765 gpd)
System Permitted Capacity:	.004MGD (3,765 gpd)

Giles County PSA operates three wells full time, with three wells serving as back-up. Table 5 illustrates the critical information for each well. Wells located in Rich Creek and Ram Wayside are no longer in service. A well located in North Narrows is maintained by Giles County PSA for emergency use only.

Table 5. Giles County PSA Well Data

Name and ID Number of Wells:	North Narrows 1071565	Narrows Orchard 1071565	GCPSA Well #4 1071455	GCPSA Well #1 1071455
Well Depth:	508’	289’	250’	320’ (backfill 297’)
Casing Depth:	16” (0-89’) 12” (89’-172’) 10” (172’-310’) 8” (310’-436.5’)	10” (0-103’) 8” (103’-289’)	20” (0-31’) 16” (32’-50’) 12” (50’-62’) 10” (62’-98’) 8” (98’-116’)	16” (168’)
Screen Depth:	NI	172.5’-288’ (6” Stainless)	119’	106’
Well Diameter:	8”	10”	20”	16”
Average Daily Withdrawal:	Emergency Use Only	0.10 MGD (100,000 gpd)	0.27 MGD (270,000 gpd)	.83 MGD (830,000 gpd)
Design Capacity-Max Daily:	0.18 MGD (176,000 gpd)	0.40 MGD (396,000 gpd)	0.45 MGD (453,600 gpd)	2.0 MGD (2,000,160 gpd)
System Permitted Capacity:	0.13 MGD (132,600 gpd)	0.15 MGD (148,200 gpd)	0.45 MGD (453,600 gpd)	2.0 MGD (2,232,000 gpd)

In Giles County, there are an additional 15 permitted community water systems. All of these systems purchase water from the Giles County PSA that utilizes the wells discussed above. The table below identifies each of these additional community water systems and their permitted capacity from VDH.

Table 6. Giles County Community Water Systems

PWSID	Water System Name	Permitted Capacity
1071120	Curve Road	NI
1071200	Fairview Acres Community Club	Based on Giles PSA
1071260	Town of Glen Lyn	Based on Giles PSA, not to exceed 101,052 gpd
1071300	Hoges Chapel	282,240
1071520	Lurich Road	NI
1071565	Town of Narrows	Based on Giles PSA, not to exceed 2.0 MGD
1071660	Town of Pearisburg	Based on Giles PSA
1071665	Town of Pembroke	Based on Giles PSA, not to exceed 350,000 gpd
1071675	Powell Mountain	NI
1071700	Town of Rich Creek	Based on Giles PSA, not to exceed 452,000 gpd
1071710	Route 100 Area	150,000 gpd
1071845	Shute Hollow	NI
1071850	Stoney Creek	Based on Giles PSA, not to exceed 450,000 gpd
1071920	Ram Wayside	Based on Giles PSA, not to exceed 100,000 gpd
1091970	Wolf Creek	Based on Giles PSA, not to exceed 152,640 gpd

Montgomery County PSA operates four wells; the three wells in Riner are one community system, and the one well in Woodview is another. Table 7 illustrates the critical information for each well.

Table 7. Montgomery County PSA Well Data

Name and ID Number of Wells:	Riner 1121655			Woodview 1121900
	Well #1	Well #2	Well #3	
Well Depth:	380’	720’	500’	490’
Casing Depth:	106’	115’	50’	63’
Screen Depth:	Unknown	Unknown	472’	275’
Well Diameter:	6.626”	8”	8”	8”
Average Daily Withdrawal:	0.02 MDG (19,772 gpd)	0.02 MGD (15,534 gpd)	0.03 MGD (25,609 gpd)	0.004 MGD (3,928 gpd)
Design Capacity-Max Daily:	0.21 MGD (208,800 gpd)			0.03 MGD (28,800 gpd)
System Permitted Capacity:	0.15 MGD (148,800 gpd)			0.02 MGD (16,000 gpd)

Additionally, there are nine private community water systems in Montgomery County. Critical information on each system can be found in Tables 8 and 9 below.

Table 8. Montgomery County Community Water Systems (Part 1)

Name and ID Number of Wells:	Riner Mobile Home Park 1121005	Bethel Woods Subdivision 1121048	Kings Court Trailer Park 1121065	Dry Valley Subdivision 1121150	Parker Trailer Park 1121565
Well Depth:	390’	345’	250’	225’	210’
Casing Depth:	63’	72’	100’	103’	65’
Screen Depth:	275’	NI	NI	NI	NI
Well Diameter:	6”	6”	6”	6”	6”
Average Daily Withdrawal:	0.004 MGD (3,928 gpd)	0.06 MGD (57,600 gpd)	0.01 MGD (12,825 gpd)	0.01 MGD (5,712 gpd)	0.04 MGD (36,000 gpd)
Design Capacity-Max Daily:	0.02 MGD (16,000 gpd)	0.06 MGD (57,600 gpd)	0.01 MGD (12,825 gpd)	0.01 MGD (5,712 gpd)	0.04 MGD (35,100 gpd)
System Permitted Capacity:	0.006 MGD (6,000 gpd)	0.02 MGD (20,100 gpd)	0.003 MGD (3,240 gpd)	0.003 MGD (2,880 gpd)	0.02 MGD (20,100 gpd)
System Permitted Capacity (connections):	20	49	18	16	67

Table 9. Montgomery County Community Water Systems (Part 2)

Name and ID Number of Wells:	Sowers Moblie Home Park 1121718	Twin Boulders Subdivision 1121755	Vicker Heights 1121820	Walton Farms Subdivision 1121842
Well Depth:	300’	NI	68’	275’
Casing Depth:	50’	50’	20’	91’
Screen Depth:	NI	NI	NI	NI
Well Diameter:	NI	NI	6”	6”
Average Daily Withdrawal:	0.01 MGD (12,000 gpd)	0.02 MGD (20,000 gpd)	0.002 MGD (2,880 gpd)	0.01 MGD (8,820 gpd)
Design Capacity-Max Daily:	0.03 MGD (28,800 gpd)	0.02 MGD (20,000 gpd)	0.002 MGD (2,880 gpd)	0.04 MGD (36,000 gpd)
System Permitted Capacity:	0.01 MGD (6,000 gpd)	0.02 MGD (20,000 gpd)	0.002 MGD (2,880 gpd)	0.04 MGD (36,000 gpd)
System Permitted Capacity (connections):	37	50	16	49

There is one community water system operated by the Pulaski County PSA that utilizes a groundwater source. Table 10 below describes that well.

Table 10. Pulaski County PSA Well Data

Name and ID Number of Wells:	Lakewood Estates 1155446
Well Depth:	485’
Casing Depth:	226’
Screen Depth:	NI
Well Diameter:	6
Average Daily Withdrawal:	NI
Design Capacity-Max Daily:	20 connections
System Permitted Capacity:	0.003 MGD (3,480 gpd)

There are eight additional community water systems utilizing groundwater sources in Pulaski County. Tables 11 and 12 describe these wells.

Table 11. Pulaski County Community Water Systems (Part 1)

Name and ID Number of Wells:	Bellavista Estates 1155050	Lakeview Waterworks 1155441	Eagleview Mobile Home Park 1155485
Well Depth:	348’	115’	NI
Casing Depth:	127’	65’	NI
Screen Depth:	NI	NI	NI
Well Diameter:	8”	6”	6”
Average Daily Withdrawal:	NI	NI	NI
Design Capacity-Max Daily:	0.003 MGD (2,958 gpd)	0.02 MGD (24,000 gpd)	NI
System Permitted Capacity:	0.003 MGD (2,958 gpd)	0.02 MGD (24,000 gpd)	0.01 MGD (14,700 gpd)

Table 12. Pulaski County Community Water Systems (Part 2)

Name and ID Number of Wells:	Riverbend Subdivision 1155700	Tiny Town Mobile Home Park 1155780	Tyson Hills Subdivision 1155800	Lee Highway Court 1155850
Well Depth:	NI	467’	335’	110’
Casing Depth:	60’	100’	NI	67’
Screen Depth:	NI	NI	NI	NI
Well Diameter:	6”	6”	NI	6”
Average Daily Withdrawal:	NI	0.004 MGD (3,600 gpd)	NI	NI
Design Capacity-Max Daily:	0.004 MGD (4,002 gpd)	0.01 MGD (7,200 gpd)	0.02 MGD (16,000 gpd)	0.02 MGD (15,486 gpd)
System Permitted Capacity:	0.004 MGD (4,002 gpd)	0.01 MGD (6,264 gpd)	0.02 MGD (16,000 gpd)	0.02 MGD (15,486 gpd)

Community Water Systems Using Surface Water Reservoirs - 9 VAC 25-780-70.C

Pulaski County is the only community water system that utilizes a withdrawal directly from a surface water reservoir. No other county, city, or town in the planning area uses direct withdrawals from surface water reservoirs. The Towns of Dublin and Pulaski make bulk purchases of finished water from the Pulaski County PSA while the Pulaski County PSA provides water to County users. Pulaski County PSA utilizes Claytor Lake for their water source. Table 13 below indicates the water source information for both Pulaski County and the Town of Dublin.

Table 13. Pulaski County Surface Water

Name of reservoir:	Claytor Lake
Sub-basin of reservoir:	Upper New
Drainage area of reservoir:	New River Basin
On-stream storage available:	Unknown
Design capacity for average withdrawal:	3.0 MGD
Design capacity for maximum withdrawal:	3.0 MGD
Permitted capacity of system:	3.0 MGD
Water treatment plant capacity:	3.0 MDG
Any limitations on withdrawal:	None
Safe Yield of reservoir:	No value*

* Claytor Lake has no value for safe yield because it is primarily a hydroelectric project owned by American Electric Power (AEP) with a drainage area of 2,380 square miles and a storage volume of 225,000 acre feet. Water supply from Claytor Lake is a secondary purpose. Pulaski County has permission from AEP and the Federal Energy Regulatory Commission (FERC) to withdraw a maximum of 6 MGD. A request to increase this amount would require approval from AEP, FERC, and possibly VDEQ.

Community Water Systems Using Stream Intake - 9 VAC 25-780-70D

There are no municipal or other community water systems utilizing a stream intake in Floyd County.

Chemical Lime is the only listed community water system in Giles County that utilizes a stream (spring) intake. Table 14 describes this source.

Table 14. Chemical Lime Kimballton Plant #1, Giles County

Name of spring:	Butt Mountain Spring
ID number of spring:	1071568
Name of water body:	Big Stony Creek/New River
Design capacity for average withdrawal:	0.17 MGD (173,754 gpd)
Design capacity for maximum withdrawal:	0.26 MGD (260,000 gpd)
Limitations on withdrawal:	Limited to 130 employees and 13 residential connections
Average daily withdrawal:	0.174 MGD

Montgomery County has 12 community water systems utilizing a surface water intake, though three of those are located within or serve the Towns of Blacksburg and Christiansburg. Since the Towns of Blacksburg and Christiansburg have chosen to produce their own plan, those systems will not be discussed in this plan.

The Montgomery County Public Service Authority has seven agreements to purchase water to provide to the public that ultimately utilize surface water intakes. Table 15 below describes these agreements.

Table 15. Surface Water Purchases by Montgomery County PSA

PWSID	Water System Name	Seller	Permitted Capacity
1121043	Belview	Town of Blacksburg	0.25 MGD (250,000 gpd)
1121045	Bethel Area	City of Radford	0.40 MGD (400,000 gpd)
1121175	Christiansburg Elliston Waterline	Town of Christiansburg	0.65 MGD (650,000 gpd)
1121503	Mudpike Road Waterline	Town of Christiansburg	0.265 MGD (265,000 gpd)
1121570	Plum Creek	City of Radford	0.25 MGD (250,000 gpd)
1121580	Prices Fork/Merrimac	Radford Army Ammunition Plant	0.36 MGD (360,000 gpd)
1121845	Warm Hearth	Town of Blacksburg	0.13 MGD (130,000 gpd)

Table 16 below describes the agreement to purchase water from the Montgomery County PSA to be provided by the New River Water Company.

Table 16. Water Purchased from Montgomery County PSA

PWSID	Water System Name	Permitted Capacity
1121825	Viewland Subdivision	0.265 MGD (265,000 gpd)

Also in Montgomery County, the RFAAP also utilizes a stream intake for its water production. Table 17 below describes the plant's various intakes.

Table 17. Radford Army Ammunition Plant

Water system name:	419	RFAAP Water Plant 4330	RFAAP Building 409
ID Number of system:	1121643	1155645	
Name of stream or river:	New River	New River	New River
Sub-basin of in-take:	Upper New (05050001)	Upper New (05050001)	Upper New (05050001)
Drainage area of sub-basin:	2767 sq mi*	2767 sq mi*	2767 sq mi*
Lowest daily flow of record:	568 cfs	568 cfs	568 cfs
Average daily withdrawal:	NI	NI	NI
Maximum daily withdrawal:	2.0 MGD (2,000,000 gpd)	1.5 MGD (1,506,240 gpd)	65.0 MGD (65,000,000 gpd)
Design capacity of treatment plant:	2.0 MGD (2,000,000 gpd)	N/A	N/A
Safe yield of the river:	400.0 MGD	400.0 MGD	400.0 MGD
Permitted capacity of system:	2.0 MGD (2,000,000 gpd)	Unknown	Unknown

* Information from USGS stream gage # 03171000 (New River at Radford, VA). Data from 10/1/1907 to 2/1/2009.

The City of Radford and the Town of Pulaski are the only two communities in the NRV covered by this plan that directly utilize stream intakes for public water supplies. The Town of Pulaski utilizes water from Peak Creek, which flows into the New River. Stream flow in Peak Creek is augmented by water from Hogan's Lake and Gatewood Reservoir. Currently, Hogan's Lake is owned by a private developer, but the Town maintains control of the management of Gatewood Reservoir. Below Tables 18 and 19 indicate water source information for the Town of Pulaski.

Table 18. Town of Pulaski Surface Water

Name of stream or river:	Peak Creek
Sub-basin of in-take:	Upper New (05050001)
Drainage area of sub-basin:	60.8 sq mi*
Lowest daily flow of record:	0.5 cfs (10/3/1930)*
Design capacity of pump station:	4.0 MGD
Design capacity of treatment plant:	4.0 MGD
Design capacity for average withdrawal:	4.0 MGD
Design capacity for maximum withdrawal:	4.0 MGD
Permitted capacity of system:	4.0 MGD
Safe yield of the river:	5.8 MGD**
Any limitations on withdrawal:	Flow by requirement: 1.8 MGD**

* Information from USGS stream gage #03168500 (Peak Creek at Pulaski, VA). Data from 10/1/1927 to 9/30/1957.
** Information from permit dated March 1992. Calculated by Virginia Water Control Board (designated as consultants for DEQ).

The Town of Pulaski utilizes Hogan's Dam and Gatewood Reservoir as storage facilities to ensure adequate flow for withdrawal from Peak Creek. Table 19 describes these two facilities.

Table 19. Town of Pulaski Surface Water Storage Facilities

Facility	Drainage Area	Storage Capacity (MG)
Hogan's Dam	2.66 sq mi	300.0
Gatewood Reservoir	9,860 sq mi	1,200.0

Additionally, Pulaski County PSA has two purchase agreements for surface water as described below.

Table 20. Surface Water Purchases by Pulaski County PSA

PWSID	Water System Name	Seller	Permitted Capacity
1155055	Brookmont Area	Town of Pulaski	Based on Town system capacity
1155505	Mt Olivet	NI	NI

The Pulaski County PSA sells water to the Town of Dublin as described in Table 21.

Table 21. Water Sold by Pulaski County PSA

PWSID	Water System Name	Permitted Capacity
1155150	Town of Dublin	Based on PSA system capacity

In Pulaski County, there is one privately owned community water system that utilizes a surface water source. The water system at Dulaney Trailer Park is described in Table 22.

Table 22. Dulaney Trailer Park, Pulaski County

Name of spring:	Dulaney Spring
ID number of spring:	1155152
Name of water body:	New River
Design capacity for average withdrawal:	NI
Design capacity for maximum withdrawal:	0.003 MGD (3,132 gpd)
Limitations on withdrawal:	18 connections
Average daily withdrawal:	NI

The City of Radford withdraws water from the New River, as indicated in Table 22 below.

Table 23. City of Radford Surface Water

Name of stream or river:	New River
Sub-basin of in-take:	Upper New (05050001)
Drainage area of sub-basin:	2767 sq mi*
Lowest daily flow of record:	550 cfs (8/22/1911)*
Design capacity of pump station:	12.0 MGD
Design capacity of treatment plant:	8.0 MGD

Design capacity for average withdrawal:	8.0 MGD
Design capacity for maximum withdrawal:	8.0 MGD
Permitted capacity of system:	5.5 MGD
Safe yield of the river:	400 MGD**
Any Limitations on withdrawal:	N/A

* Information from USGS stream gage # 03171000 (New River at Radford, VA). Data from 10/1/1907 to 2/1/2009.
** Best information currently available from the City of Radford (personal communication, Lawrence Rice, City of Radford Water Treatment Plant).

Self-supplied Nonagricultural Users >300,000 Gallons per Month from Surface Water Sources- 9 VAC 25-780-70E

Based on withdrawal reporting to DEQ, there are several water systems within the region utilizing a surface water source for nonagricultural purposes, located in Floyd and Giles Counties. There are no self-supplied nonagricultural users of more than 300,000 gallons per month of surface water in Montgomery or Pulaski Counties or the City of Radford. These systems are described below with additional engineering details provided in Appendix 1.

Table 24. Large Self-supplied Nonagricultural Users

Locality Water System Name	Source	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)	Limitations on Withdrawal
Floyd				
Great Oaks Country Club	Pond	0.0244	0.12	NI
Giles				
Celco Plant – Duke Energy	New River	56.043	NI	NI
Glen Lyn Plant – Appalachian Power (#2 Dust Control)	New River	0.011	NI	NI
Glen Lyn Plant – Appalachian Power #1	New River	256.24	NI	NI
Chemical Lime – Kimballton Plant 2	Stony Creek	1.728	NI	NI

Self-supplied Nonagricultural Users >300,000 Gallons per Month from Ground Water Sources- 9 VAC 25-780-70F

Several self-supplied users supplying over 300,000 gpm of ground water were identified in the New River Valley. Below are tables detailing the source information of identified users with data from 2006. Additional information about specific systems in the region is included in Appendix 1.

Table 25. Floyd County Large Self-supplied Nonagricultural Groundwater Users

Water System Name:	Great Oaks Country Club	
Well Name:	Well #1	Well #2
Well Depth:	NI	NI
Casing Depth:	NI	NI
Screen Depth:	NI	NI
Well Diameter:	NI	NI
Average Daily Withdrawal: (MGD)	0.001	0.002

Design Capacity-Avg. Daily: (MGD)	NI	NI
Design Capacity-Max Daily: (MGD)	NI	NI
Limitations on Withdrawal:	NI	NI

Table 26. Giles County Large Self-supplied Nonagricultural Groundwater Users

Water System Name:	Chemical Lime-Kimballton Plant 1	Chemical Lime-Kimballton Plant 2	Celco Plant- Duke Energy					Castle Rock Golf Course	Giles Country Club
Well Name:	Quarry Well Dewatering	Well	Well #8	Well #12	Well #9	Well #11	Well #7	NI	NI
Well Depth:	NI	NI	NI	NI	NI	NI	NI	NI	NI
Casing Depth:	NI	NI	NI	NI	NI	NI	NI	NI	NI
Screen Depth:	NI	NI	NI	NI	NI	NI	NI	NI	NI
Well Diameter:	NI	NI	NI	NI	NI	NI	NI	NI	NI
Average Daily Withdrawal: (MGD)	6.710	0.057	0.788	1.06	0.65	1.0	0.057	NI	NI
Design Capacity-Avg. Daily: (MGD)	NI	NI	NI	NI	NI	NI	NI	NI	NI
Design Capacity-Max Daily: (MGD)	NI	NI	NI	NI	NI	NI	NI	NI	NI
Limitations on Withdrawal:	NI	NI	NI	NI	NI	NI	NI	NI	NI

Table 27. Montgomery County Large Self-supplied Nonagricultural Groundwater Users

Water System Name:	Auburn Hills Golf Course
Well Name:	NI
Well Depth:	NI
Casing Depth:	NI
Screen Depth:	NI
Well Diameter:	NI
Average Daily Withdrawal: (MGD)	NI
Design Capacity-Avg. Daily: (MGD)	NI
Design Capacity-Max Daily: (MGD)	NI
Limitations on Withdrawal:	NI

Table 28. Pulaski County Large Self-supplied Nonagricultural Groundwater Users

Water System Name:	Draper Valley Golf Course	Thorn Springs Golf Course	Hoover Color Corp
Well Name:	NI	NI	Well 1155300
Well Depth:	NI	NI	113’

Casing Depth:	NI	NI	95’
Screen Depth:	NI	NI	NI
Well Diameter:	NI	NI	6”
Average Daily Withdrawal: (MGD)	NI	NI	0.02
Design Capacity-Avg. Daily: (MGD)	NI	NI	0.03
Design Capacity-Max Daily: (MGD)	NI	NI	0.02
Limitations on Withdrawal:	NI	NI	NI

Water Purchased Outside Local Boundaries - 9 VAC 25-780-70G

Water Agreements Between Participating Localities

Several localities in the New River Valley purchase water from each other. Primarily water purchases are made to provide services to customers who are closer to neighboring water service lines. For instance, the City of Radford has an agreement to provide up to 400,000 GPD of water to Montgomery County customers in the Rt. 177 corridor, adjacent to City limits. Currently, the Montgomery County users average 75,000 GPD.

Most recently, the City of Radford and Pulaski County PSA signed agreements with the NRVPDC to broker water. The agreement allows the NRVPDC to purchase up to 500,000 GPD from the City of Radford. The Pulaski County PSA may purchase water from the NRVPDC to provide water to customers on the eastern end of the county, particularly industrial customers who may locate in the Commerce Park north of the Town of Dublin. The framework for water brokering is established with the regional goal to distribute water from the City of Radford to multiple locations across the region. As this report indicates, the City has excess treatment capacity while other communities in proximity are nearing their treatment capacity.

The Town of Pulaski and Pulaski County PSA buy and sell water between each other to efficiently serve their customers. The town purchases water from the PSA for approximately 165 residential customers and one industrial user while the PSA purchases water from the town for 125 residential customers. In this instance, purchasing water is out of convenience to physical infrastructure, not lack of capacity to serve the customers.

Pulaski County PSA also has an agreement to purchase water from the RFAAP-New River Site in Montgomery County. The County PSA is currently purchasing an average of 200,000 GPD from RFAPP.

Pulaski County PSA provides the Town of Dublin with their water. Currently Dublin is averaging 24.2 million gallons per month, totaling 291 million gallons during fiscal year 2004-2005.

Giles County and the towns of Glen Lyn, Narrows, Pearisburg, Pembroke, and Rich Creek all purchase their water from the Giles County PSA.

Montgomery County purchases water from Christiansburg, Blacksburg, Radford, and RFAAP. During fiscal year 2004-2005 Montgomery County PSA purchased 131.5 million gallons of water from Radford and RFAAP (inside the planning area). All four water providers utilize the stream source of the New River. The average gallons purchased per day was 817,808. Table 29 below indicates the amounts of water purchased from each source.

Table 29. Montgomery County Water Purchases FY 2004-2005

Locality	Amount of Water*
Within Planning Area	
RFAAP	49.0
Radford	82.5
Outside Planning Area	
Christiansburg	130.3
Blacksburg	36.7

* in million gallons annually

Water Agreements Outside Participating Localities

Montgomery County purchases water from Christiansburg and Blacksburg. During fiscal year 2004-2005 Montgomery County PSA purchased 167.0 million gallons from these two providers. Table 29 above indicates the amounts of water purchased from each of the four sources of water purchased by Montgomery County PSA. The terms of the agreements held between Montgomery County and the Towns of Christiansburg and Blacksburg are summarized in Table 30.

Table 30. Montgomery County Water Purchase Agreements with Christiansburg and Blacksburg

Agreement Name	Date Signed	Agreement Expiration	Capacity	Limitations
Christiansburg				
Mudpike	Sept 27, 1994	Jan 15, 2011	0.265 MGD	Annual increase = average * 1.1
Midway/Merrimac	Feb 9, 1990	Jan 15, 2011	0.15 MGD	None
Boundary Adjustment Industrial Park-Price Mtn.	Jan 6, 1997	Jan 15, 2011	Portion of Merrimac volume	No connection to Blacksburg
Shawsville/Elliston	July 16, 1991	Jan 15, 2011	0.65 MGD	PSA build 250,000 gal tank Annual increase = average * 1.1
Blacksburg				
Route 114 Corridor	June 6, 1998	Dec 31, 2030	Max 625 connections Not to exceed 0.25 MGD	Taps must be min 400' apart
Jennell Rd. & Yellow Sulphur Rd.	1998	Dec 31, 2025	0.1 MGD + water required by VDOT (est. 0.15 MGD)	May renegotiate if VDOT requires > 0.15 MGD
Merrimac/Price Mtn.	Nov 6, 1980 Amended 1998	Dec 31, 2030	1133 connections or 0.34 MGD	If either is exceeded, 1 year connection moratorium or renegotiation

Agreement Name	Date Signed	Agreement Expiration	Capacity	Limitations
Warmhearth	Mar 2, 1981 Amended May 2006	Dec 31, 2056	650 single family connections or 0.13 MGD	If exceeded, renegotiate
Coal Bank Ridge	Jul 16, 2002	No date		Service area ± 193 acres

Water Available for Purchase beyond Local Boundaries - 9 VAC 25-780-70H

The primary locality with water available for purchase to jurisdictions beyond their boundaries is the City of Radford. The city has a withdrawal permit not to exceed 8.0 MGD. Currently the City is utilizing approximately 2.0 MGD. With a significant amount of excess treatment capacity and their proximity to neighboring population densities, Radford is well positioned to provide approximately 4.0 MGD water service beyond their boundaries. This is a significant resource for the entire region, which surrounding communities are actively researching and investing in methods to make interconnections.

Blacksburg-Christiansburg-VPI Water Authority withdraws from the New River and provides water to its three members, and the members sell water independently to users beyond their boundaries, mainly Montgomery County. Some capacity is available from Blacksburg, Christiansburg, VPI Water Authority, although not as significant as the City of Radford. The available capacities from Blacksburg-Christiansburg-VPI Water Authority were not analyzed as a part of the New River Valley Water Supply Plan because the towns of Blacksburg and Christiansburg elected to meet the regulations at a later date.

The RFAAP- New River Site, although not a local government, provides water to Montgomery County and Pulaski County. The facilities at RFAAP limit the dependability of water supply to these counties in some instances due to the aging of the system and periods of repair. RFAAP is permitted to withdrawal up to 82 MGD from the New River through two intakes; one is permitted for 52 MGD, the other 30 MGD. Pulaski County utilizes the most water from RFAAP, approximately 6.0 mg monthly while Montgomery County uses approximately 4.0 mg monthly.

With minor upgrades the City of Radford could receive water from Pulaski County in limited amounts, approximately 100,000 GPD. More information concerning interconnections of systems within the region can be found in the New River Valley Regional Water Source Plan which is on the New River Valley Planning District Commission website (www.nrvpdc.org).

Self-Supplied Agricultural Users <300,000 Gallons per Month - 9 VAC 25-780-70I

Agriculture employs approximately 1% of the work force in the New River Valley of Virginia, with farms for crops and livestock. Most farms in the New River Valley are relatively small, with average acreage between 142 acres (in Montgomery County) to 190 acres (in Giles County). Farms in Virginia average 171 acres, with the highest average in the state being 523 acres in Essex County.

Farms in the New River Valley produce a number of crops and livestock products, including but not limited to; corn, hay for forage, and beef. Approximately 3% of the farms in the New River Valley rely on irrigation systems to provide water for their crops. Table 31 below provides a basic description of the farms in the region.

Table 31. Farming in the New River Valley

	Floyd County	Giles County	Montgomery County	Pulaski County	New River Valley
Number of farms	864	344	628	415	2251
Acres in farming	128,872	65,487	89,411	75,457	359,227
Average farm size (acres)	149	190	142	182	160
Number of farms (irrigated)	40	8	21	8	77
Acres irrigated	5,856	580	4,319	780	11,534
Average size of irrigated farms (acres)	146	73	206	90	150

Livestock also contributes to the agricultural production in the New River Valley. Table 32 below describes the livestock produced throughout the region. Based on the water use factors developed by the USDA, none of the livestock operations in the New River Valley use more than 300,000 gallons per month of water.

Table 32. Livestock in the New River Valley

	Floyd County	Giles County	Montgomery County	Pulaski County	New River Valley
Cattle & Calves					
Farms	523	234	396	287	1440
Number of animals	38,353	10,017	21,882	29,501	99,773
Average animals per farm	73	43	55	103	69
Hogs & Pigs					
Farms	10	--	11	3	22
Number of animals	82	--	77	31	190
Average animals per farm	10	--	7	10	9
Poultry					
Farms	4	1	3	8	16
Number of animals	22	Unknown	45	60	127
Average animals per farm	6	--	15	8	8
Horses & Ponies					
Farms	187	96	206	131	620
Number of animals	1,169	493	1,517	869	4,048
Average animals per farm	6	5	7	7	7
Sheep & Lambs					
Farms	20	16	30	15	81
Number of animals	879	1,300	1,352	844	4,375
Average animals per farm	44	81	45	56	54
Goats					

	Floyd County	Giles County	Montgomery County	Pulaski County	New River Valley
Farms	49	27	52	41	169
Number of animals	446	548	767	416	2,177
Average animals per farm	9	20	15	10	13
Bees					
Farms	15	8	15	7	45
Number of colonies	27	44	81	21	173
Average colonies per farm	2	6	5	3	4

Information for this section came from the 2007 Census of Agriculture from USDA. More specific information on a farm-by-farm basis is currently unavailable (personal communication, Cynthia Hancock, District Manager, Skyline SWCD).

Self-Supplied Nonagricultural Users <300,000 Gallons per Month - 9 VAC 25-780-70J

Residential and businesses that utilize wells make up the largest proportion of small scale self-supplied nonagricultural users in the region. Table 33 below summarizes the residential and business populations that may be utilizing wells based on population numbers.

Table 33. Estimates of Small Self-supplied Nonagricultural Users

Locality	Total Population	Population Served by CWS	Est. Population Served by Wells	Percent Served by Wells	Est. Residences on Wells	Est. Businesses on Wells
Floyd County	13,874	2,347	11,527	83%	4,823	23
Giles County	16,657	10,309	6,348	38%	2,678	9
Montgomery County*	83,629	74,525	9,104	11%	3,793	15
Pulaski County	35,127	27,060	8,067	23%	3,477	19
Radford City	15,859	15,859	0	0%	0	0
Total	*165,146*	*130,100*	*35,046*	*21%*	*14,771*	*66*

* Includes population numbers for the Towns of Blacksburg and Christiansburg.

Additional waterworks listings were found in VDH-ODW's listings that could be considered small self-supplied nonagricultural users. These are not considered Community Water Systems, but rather are either a Nontrasient Noncommunity system or a Transient Noncommunity system. A Nontransient Noncommunity system provides service to at least 25 of the same persons at least 6 months a year (i.e., schools or factories). A Transient Noncommunity system provides water to at least 25 persons daily, but the individuals served varies daily (i.e., restaurants, campgrounds, hotels). Table 34 below summarizes the numbers of each of these types of systems in each locality, while specific system information on some of these systems is provided in Appendix 2.

Table 34. Noncommunity Water Systems

Locality	Nontransient Noncommunity Systems	Transient Noncommunity Systems
Floyd County	7	16
Giles County	2	6
Montgomery County	2	14
Pulaski County	4	15
Radford City	0	0
Total	*15*	*51*

Summary of Findings from Wellhead and Source Water Protection Programs - 9 VAC 25-780-70K

There are no known Wellhead Protection Programs in place in the planning area. According to the Department of Health, Office of Drinking Water (VDH ODW) website:

The Virginia Department of Health (VDH), as the Commonwealth's agency regulating public drinking water, was required by the 1996 Amendments to the Safe Drinking Water Act (SDWA) to develop a Source Water Assessment Program (SWAP).

The goal of the SWAP is to establish procedures and provide a foundation of support for protecting the Commonwealth's drinking water resources from degradation. This degradation can be the result of residential, industrial, commercial, agricultural, waste management, or transportation's: accidental introduction of contaminants; improper land use practices; illegal material handling practices; and other conditions. These conditions and practices can threaten the drinking water resources of the Commonwealth.

The SWAP includes delineating assessment boundaries of a drinking water source, performing an inventory of land use activities, and determining a relative susceptibility of the drinking water source to these activities. The assessment of public drinking water sources is available to waterworks owners and the public.

On November 13, 2008 there were 2,936 active public water systems in Virginia, serving safe drinking water to more than 80% of Virginia's population. Assessments indicate that some drinking water sources have high levels of protection. While other public water systems are not in control of the land use activities in their surrounding areas. The Office of Drinking Water (ODW) encourages public waterworks to purchase land and/or establish conservation easements to increase the protection of vital drinking water resources.

The SWAP has identified future land use development in source water protection areas as a predominant risk to the viability of public waterworks. The ODW has been working with a number of other state agencies to distribute and share SWAP data in an effort to bring more awareness to source water protection areas.

A full copy of the SWAP report can be found on the VDH ODW website. Table 35 summarizes the report findings for this region.

Table 35. SWAP Summary Findings for the NRV

Locality	High Susceptibility	Moderate Susceptibility	Low Susceptibility
Floyd County	27	4	0
Giles County	16	1	0
Montgomery County	30	0	0
Pulaski County	30	1	0
Radford City	1	0	0
Total	*104*	*6*	*0*

A group of Floyd County residents recently completed work on a Source Water Protection Plan. This effort was led by Virginia Rural Water Association's EPA Source Water Protection Specialist. The group identified potential contamination sources as well as strategies for mitigating impacts on water supply. It is anticipated that the steering committee will continue to meet to implement some of the identified strategies and to regularly review and update the plan. More information on the project and plan are available at http://floydwater.wordpress.com/.

EXISTING WATER USE INFORMATION
***Refer to 9 VAC 25-780-80**

This section consists of a collection of current data on existing water use. The following information is provided for community water systems throughout the region: (a) population within the planning area, (b) number of connections within the planning area, (c) average and maximum daily withdrawal, (d) amount of water used within the planning area on an annual and monthly average basis, (e) peak day water use by month, (f) estimate of the water used on an average annual basis by self-supplied nonagricultural users of more than 300,000 gallons per month of surface and groundwater, (g) estimate of the water used on an average annual basis by self-supplied agricultural users of more than 300,000 gallons of water per month of surface and groundwater, (h) estimate of the number of self-supplied users of less than 300,000 gallons per month of groundwater, as well as an estimate of their total water consumption on an average annual basis, (i) estimate of the disaggregated amounts of water used in categories appropriate for each system, and (j) qualitative description of existing in-stream beneficial uses within or outside the planning area that may be affected by the point of stream withdrawal.

Additional information provided in this section includes estimates of the water used on an average annual basis by self-supplied nonagricultural and agricultural users of more than 300,000 gallons per month of surface and groundwater outside the service areas of community water systems, and an estimate of the number of self-supplied users of less than 300,000 gallons per month of groundwater, as well as an estimate of their total water consumption on an average annual basis outside the service areas of community water systems.

Populations Served by Community Water Systems and Withdrawal Statistics – 9 VAC 25-780-80.B.1, B.2, B.3, and B.4

The table below shows information for the regions' water use. Information was derived from the most recent (June 2009) Virginia Department of Health Office of Drinking Water Listing of Waterworks and includes information for all the Community Water Systems as required. Information was also obtained from the Department of Environmental Quality Annual Water Use Reporting database.

Table 36. Existing Water Use Information for Community Water Systems

Community Water System	Population Served	Number of Connections	Avg. Daily Withdrawal (MGD)	Max. Daily Withdrawal (MGD)	Avg. Monthy Use (MG/mo)	Avg. Daily Use (MGD)
Floyd County						
Floyd-Floyd County PSA	2,300	427	0.106	0.15	3.23	0.106
Big Rock Trailer Park	47	21	0.004	0.004	NI	NI
Sub-Total	*2,347*	*448*	*0.110*	*0.154*	*3.23*	*0.106*
Giles County						
Curve Road	88	37	*	*	*	*

Community Water System	Population Served	Number of Connections	Avg. Daily Withdrawal (MGD)	Max. Daily Withdrawal (MGD)	Avg. Monthy Use (MG/mo)	Avg. Daily Use (MGD)
Fairview Acres Community Club	124	52	*	*	*	*
Town of Glen Lyn	193	87	*	*	*	*
Giles County PSA (see note-1)	0	6	1.1096	2.2113	33.73	1.0763
Hoges Chapel	1,114	470	*	*	*	*
Lurich Road	48	26	*	*	*	*
Town of Narrows	2,518	1,081	*	*	*	*
Town of Pearisburg	2,501	1,587	*	*	*	*
Town of Pembroke	1,387	738	*	*	*	*
Powell Mountain	48	20	*	*	*	*
Town of Rich Creek	950	446	*	*	*	*
Route 100 Area	276	92	*	*	*	*
Shute Hollow	95	38	*	*	*	*
Stoney Creek	410	166	*	*	*	*
Ram Wayside	185	78	*	*	*	*
Wolf Creek	212	92	*	*	*	*
Chemical Lime Corp.	160	14	0.186	NI	58.21	1.914
Sub-Total	*10,309*	*5,031*	*1.296*	*2.211*	*66.320*	*2.181*
Montgomery County						
Montgomery County PSA (see note-2)	11,527	2,510	0.074	NI	27.126	0.8918
Belview	830	133	**	**	**	**
Bethel Area	1,243	77	**	**	**	**
Christiansburg Elliston Waterline	3,500	898	**	**	**	**
Mudpike Road Waterline	100	72	**	**	**	**
Plum Creek	1,653	422	**	**	**	**
Prices Fork/ Merrimac	2,703	606	**	**	**	**
Riner Community	821	277	**	**	**	**
Viewland Subdivision	230	74	**	**	**	**
Warm Hearth	600	1	**	**	**	**

Community Water System	Population Served	Number of Connections	Avg. Daily Withdrawal (MGD)	Max. Daily Withdrawal (MGD)	Avg. Monthy Use (MG/mo)	Avg. Daily Use (MGD)
Woodview Subdivision (Non-PSA)	77	24	NI	NI	NI	NI
Riner Mobile Home Park (Non-PSA)	85	33	NI	NI	NI	NI
Kings Court Trailer Park (Non-PSA)	35	18	NI	NI	NI	NI
Parker Trailer Park (Non-PSA)	147	67	NI	NI	NI	NI
Radford Army Ammunition Plant (Non-PSA)	1,380	110	NI	NI	472.35	15.529
Sowers Mobile Home Park (Non-PSA)	73	32	NI	NI	NI	NI
Walton Farms Subdivision (Non-PSA)	135	42	NI	NI	NI	NI
Twin Boulders Subdivision (Non-PSA)	90	29	NI	NI	NI	NI
Vicker Heights (Non-PSA)	27	12	NI	NI	NI	NI
Dry Valley Subdivision (Non-PSA)	48	16	NI	NI	NI	NI
Bethel Woods Subdivision (Non-PSA)	109	45	NI	NI	NI	NI
Riner Mobile Home Park (Non-PSA)	85	33	NI	NI	NI	NI
Sub-Total	*13,971*	*3,122*	*0.074*	*0.201*	*475.670*	*15.638*
Pulaski County						
Lakewood Estates	65	20	NI	NI	NI	NI
Town of Pulaski	9,473	3,678	1.92	2.91	57.55	1.892
Pulaski County PSA	9,452	3,678	2.23	3.2	67.83	2.23
Brookmont Area	100	33	***	***	***	***
Town of Dublin	6,813	2,725	****	****	****	****
Mt. Olivet	345	122	****	****	****	****

Community Water System	Population Served	Number of Connections	Avg. Daily Withdrawal (MGD)	Max. Daily Withdrawal (MGD)	Avg. Monthy Use (MG/mo)	Avg. Daily Use (MGD)
Bellavista Estates	45	15	NI	NI	NI	NI
Dulaney Trailer Park	31	18	NI	NI	NI	NI
Lakeview Waterworks	120	34	NI	NI	NI	NI
Eagleview Mobile Home Park	144	50	NI	NI	NI	NI
Riverbend Subdivision	72	22	NI	NI	NI	NI
Tiny Town Mobile Home Park	70	36	NI	NI	NI	NI
Tyson Hills Subdivision	40	8	NI	NI	NI	NI
Lee Highway Court	240	89	NI	NI	NI	NI
Sub-Total	*27,010*	*10,528*	*4.150*	*6.110*	*125.380*	*4.122*
Radford City						
Radford	15,859	4,973	2.23	4.7	67.91	2.233
Sub-Total	*15,859*	*4,973*	*2.23*	*4.7*	*67.91*	*2.233*
TOTAL	***69,496***	***24,102***	***7.805***	***13.376***	***738.51***	***24.28***

NI – No Information

* Included in Giles County PSA Total

** Included in Montgomery County PSA Total

*** Included in Town of Pulaski Total

**** Included in Pulaski County PSA Total

1-Data provided by Roger Houck, PSA Director, 8/3/11

2-Data provided by Bob Fronk, PSA Director, 7/22/11

-Viewland Subdivision was supplied by groundwater wells until April 2006.

-Warm Hearth is a bulk water customer of Montgomery County PSA and is shown as a single connection.

Peak Day Water Use by Month – 9 VAC 25-780-80.B.5

Sufficient information is not available for this section.

Self-supplied Nonagricultural Users >300,000 Gallons per Month within Service Areas – 9 VAC 25-780-80.B.6

Table 37 describes the Average Annual Use of all the large non-agricultural users previously identified. Average Annual Use was recorded from the facility's reported withdrawals in 2006 (identified as an average year).

Table 37. Nonagricultural users >300,000 Average Annual Water Use

Locality	Facility	GW/SW	Average Annual Water Use (MGD)
Giles			
	Celco Plant – Duke Energy	SW	56.043
	Celco Plant Duke Energy - Well #8	GW	0.79
	Celco Plant Duke Energy - Well #12-	GW	1.44
	Celco Plant Duke Energy - Well #9	GW	0.43
	Celco Plant Duke Energy - Well #11	GW	1.0
	Celco Plant Duke Energy - Well #7	GW	0.058
	Glen Lyn Plant-Appalachian Power-#2 Dust Control	SW	0.012
	Glen Lyn Plant-Appalachian Power-#1	SW	0.256
	Giles Country Club	NI	NI
Montgomery			
	Auburn Hills Golf Course	NI	NI
Pulaski			
	Draper Valley Golf Course	NI	NI

Self-supplied Agricultural Users >300,000 Gallons per Month within Service Areas – 9 VAC 25-780-80.B.7

There were no self-supplied agricultural users within the service areas utilizing more than 300,000 gpm identified during the data collection phase of the New River Valley Water Supply Plan. The single identified irrigator in Floyd County is outside the public water service area. The remaining information on farms in the NRV indicates average consumption below 300,000 gallons per month (USDA-2007 Census of Agriculture, Skyline SWCD, Virginia Cooperative Extension).

Self-supplied Nonagricultural Users <300,000 Gallons per Month within Service Areas – 9 VAC 25-780-80.B.8

There were no self-supplied nonagricultural users within the service areas utilizing less than 300,000 gpm indentified during the data collection phase of the New River Valley Water Supply Plan. These self-supplied users identified via the VWUDS database that returned information are all outside current public water service boundaries. Based on discussions with each of the PSA directors in the region, it is relatively safe to assume that most residents within current service boundaries are on public water. The exceptions to that assumption are so few that it would not significantly skew the water use information derived. A discussion of known community water system water use and estimates of water use by residential wells will occur in the section entitled “Self-supplied Nonagricultural Users <300,000 Gallons per Month outside Service Areas – 9VAC 25-780-80.E”.

Estimate of the Disaggregated Amounts of Water Used – 9 VAC 25-780-80.B.9

Table 38 below indicates the amount of water used in each locality, categorized by type of use. Each locality has a total water used amount and each use type is subtotaled.

Table 38. Disaggregated Amounts of Water Used by Locality-Monthly

Community Water System	Residential Use MG (gallons)	CIL Use MG (gallons)	Heavy Industrial Use MG (gallons)	Unaccounted Water Loss	Water Sales		Total MG (gallons)
					Sold To	Amount (MG/mo)	
Floyd-Floyd County PSA	0.051 (51,100)	0.045 (45,422)	0.017 (17,033)	0.004 (3,600)	None		0.117
Giles Co.	0.030 (30,137)	0.000 (26)	0.000 (424)	0.011 (11,413)	NI		0.042
Glen Lyn, Town	0.001 (978)	0.000 (118)	0.000 (379)	0.000 (295)	NI		0.002
Narrows, Town	0.003 (3,321)	0.018 (18,314)	0.000 (0)	0.006 (6,490)	NI		0.028
Pearisburg, Town	0.016 (15,931)	0.088 (88,009)	0.000 (46)	0.011 (10,897)	NI		0.115
Pembroke, Town	0.007 (6,527)	0.000 (153)	0.000 (0)	0.003 (3,340)	NI		0.010
Rich Creek, Town	0.003 (3,288)	0.000 (219)	0.000 (0)	0.001 (1,052)	NI		0.005
Montgomery County	0.023 (23,369)	0.024 (24,184)	NI*	0.011 (11,412)	None		0.059
Pulaski Co.	0.042 (41,553)	0.024 (24,464)	0.015 (14,767)	0.015 (14,541)	NI		0.095
Pulaski, Town	0.002 (2,480)	0.000 (382)	0.001 (954)	0.001 (954)	NI		0.005
Dublin, Town	0.263 (263,326)	0.012 (12,323)	0.000 (214)	0.001 (1,166)	NI		0.277
City of Radford	0.076 (76,203)	0.034 (33,901)	0.056 (55,733)	NI	NI		0.166
Subtotals	*0.518 (518,213)*	*0.248 (247,515)*	*0.090 (89,550)*				*0.921*

* NI = None Indicated

Existing In-stream Beneficial Uses – 9 VAC 25-780-80.B.10

The most prevalent beneficial use across the New River Valley is closely linked with natural resources. Our region's wildlife thrives on the New River watershed and the supporting environment. Further, the outdoor recreation pertaining to hunting, fishing, boating, etc are based largely on the quality and supply of water resources.

As described in more detail in the section entitled "Locations of Point Source Dischargers – 9 VAC 25-780-90B.10" on page 67 of this plan there are several large point dischargers in the NRV. Most of the stream intakes from the New River are above the discharges listed in that section. There may be several intakes downstream from discharges, but either one or the other is property of localities not a part of this supply plan, and most are separated by at least 5 river miles. Any benefit of the discharges in this region would be realized downstream of the region, in West Virginia.

Claytor Lake in Pulaski County is a hydroelectric facility, with the primary function of providing an electricity source for AEP's operations in the area. This facility is currently undergoing a revision of their shoreline management plan. During this process, they will be

consulting with a group of stakeholders, including neighboring residents and local government officials, on the preferred conditions to be maintained.

Self-supplied Nonagricultural Users >300,000 Gallons per Month Outside Service Areas – 9 VAC 25-780-80.C

Several large self-supplied non-agricultural users have been identified, one in Floyd County and two each in Giles and Pulaski Counties. Table 39 below describes the reported withdrawal of each user in 2006.

Table 39. Average Annual Water Use of Large Nonagricultural Users

Locality	Facility	GW/SW	Average Annual Water Use (MGD)
Floyd County			
	Great Oaks Country Club	SW	0.024
	Great Oaks Country Club Well #1	GW	0.001
	Great Oaks Country Club Well #1	GW	0.002
Giles			
	Chemical Lime-Kimballton Plant #2	SW	1.728
	Chemical Lime-Kimballton Plant-#1	SW	0.186
	Chemical Lime-Kimballton Plant #1 (Quarry Well Dewatering)	GW	6.71
	Castle Rock Golf Course	NI	NI
Pulaski			
	Thorn Springs Golf Course	NI	NI
	Hoover Color Corp	NI	NI

Self-supplied Agricultural Users >300,000 Gallons per Month Outside Service Areas – 9 VAC 25-780-80.D

During the research period several agricultural water users were found to utilize more than 300,000 gallons per month in the New River Valley. The table below depicts these users and their estimated water use. There are no known irrigators in Giles or Pulaski Counties or the City of Radford.

Table 40. New River Valley Large Self-supplied Agricultural Users

Locality	Facility Name	Well Name & ID Or Stream Name	Irrigation or Nonirrigation	Estimated Annual Water Use (MGD)
Floyd				
	Riverbend Nursery	Little River	Irrigation	NI
Montgomery				
	Yagle Nursery	Well	Irrigation	0.004
	Yagle Nursery	South Fork Roanoke River	Irrigation	0.004
	Lavery's Sod Farm	Roanoke River	Irrigation	0.01
	Lavery's Sod Farm	South Fork Roanoke River #1	Irrigation	0.012
	Lavery's Sod Farm	South Fork Roanoke River #2	Irrigation	0.0075
	Lavery's Sod Farm	South Fork Roanoke River #3	Irrigation	0
	Lavery's Sod Farm	North Fork Roanoke River	Irrigation	0.01

No other agricultural users who do not irrigate their farms were identified as using more than 300,000 gallons per month. The primary data source for this information was the Agricultural Extension Agents of Montgomery, Pulaski, Floyd and Giles Counties. Independent interviews led to several farmers in each county to inquire about their water use; however, none of the farmers estimated their water use even close to the 300,000 gpm threshold. The independent interviews generally consisted of an Extension Agent hosting a field meeting and querying the attendees prior to completing the event. With limited crop production in our region, and beef cattle being the primary market, the water demand is not significant for farmers.

Self-supplied Nonagricultural and Agricultural Users <300,000 Gallons per Month of Ground Water Outside Service Areas – 9 VAC 25-780-80.E

The primary self-supplied non-agricultural water user outside service areas are residences that rely on wells for water. Table 41 below estimates the number of residents in each county that depend on well water and then uses 100 gpd per person to estimate each individual's water use. The figure of 100 gpd per person figure is utilized based on a Department of Health recommendation and the Water Supply Plan Advisory Committee. The population data is based on 2000 Census information, while the population served by CWS is based on data from 2006.

Table 41. Self-supplied Residential Users and Average Annual Use

Locality	Population	Population Served by CWS	Population Not Served	Persons per Household	Households Not Served	Average Annual Use (MGD)
Floyd County	13,874	2,347	11,527	2.39	4,823	1.153
Giles County	16,657	10,309	6,348	2.37	2,678	0.635
Montgomery County	83,629*	74,525*	9,104	2.40	3,793	0.910
Pulaski County	35,127	27,060	8,067	2.32	3,477	0.605
City of Radford	15,859	15,859	0	2.25	0	0

* Includes Population in Towns of Blacksburg and Christiansburg and Population served by CWS in Towns.

In addition to these self-supplied residential users, agricultural production exists outside the current service boundaries of public water suppliers. Approximately 3% of the farms in the NRV rely on irrigation systems for their crops. To estimate average annual water use on average irrigated farms in each county, several assumptions must be made: 1) the average irrigator will apply ~3" of water each week, and 2) irrigation will only occur during the prime growing season (late April to end of September = 24 weeks) (personal communication, Barry Robinson, Montgomery County Agricultural Extension Agent). Utilizing the equation (as provided by DEQ) WATER USE (MG) = (ACRES IRRIGATED * DEPTH APPLIED)/37 and then multiplying that by the average growing season (24 weeks), the resulting number is the average water used per irrigated farm annually. Multiplying that number by the number of irrigated farms in each county yields the total water used annually for irrigating crops in each county. Table 42 below shows the results of these calculations.

Table 42. Estimate of Water Use for Irrigation

	Floyd County	Giles County	Montgomery County	Pulaski County
Number of irrigated farms	40	8	21	8
Average size of irrigated farms (acres)	146	73	206	90
Water use per irrigated farm (MG)	284.1	142.1	400.9	175.1
Total water used for irrigation (MG)	11,364.3	1,136.4	8,418.2	1,401.1

Farms in the NRV produce a number of livestock types, ranging from cattle to goats and bees. Water use for each of these types of livestock differs. Based on USDA's livestock water use factors (in gpd) and average number of livestock per farm from the US Census of Agriculture, Table 43 below indicates the amounts of water used in each locality in the region for livestock production. The average number of animals per farm is multiplied by the water use factor then multiplied by 365 to get an average annual water use amount per farm. The per farm estimate is then multiplied by the number of farms producing that type of livestock in each county. Each livestock type is added together for a total amount of water used annually to produce livestock.

Table 43. Estimate of Water Use for Livestock Production

	Floyd County	Giles County	Montgomery County	Pulaski County
Cattle & Calves				
Farms	523	234	396	287
Average animals per farm	73	43	55	103
Water use per farm (MG)	0.63 (626,157)	0.37 (368,832)	0.47 (471,762)	0.88 (883,482)
Total water used (MG)	327.5 (327,480,373)	86.3 (86,306,805)	186.8 (186,817,950)	253.6 (253,559,478)
Hogs & Pigs				
Farms	10	--	11	3
Average animals per farm	10	--	7	10
Water use per farm (MG)	0.013 (12,775)	--	0.009 (8,943)	0.013 (12,775)
Total water used (MG)	0.13 (127,750)	--	0.1 (98,368)	0.04 (38,325)
Poultry				
Farms	4	1	3	8
Average animals per farm	6	--	15	8
Water use per farm (MG)*	0.0002 (175)	--	0.0004 (438)	0.0002 (234)
Total water used (MG)	0.0007 (700)	--	0.001 (1,314)	0.002 (1,868)
Horses & Ponies				
Farms	187	96	206	131
Average animals per farm	6	5	7	7
Water use per farm (MG)	0.03 (26,280)	0.02 (21,900)	0.03 (30,660)	0.03 (30,660)
Total water used (MG)	4.9 (4,914,360)	2.1 (2,102,400)	6.3 (6,315,960)	4.0 (4,016,460)
Sheep & Lambs				

	Floyd County	Giles County	Montgomery County	Pulaski County
Farms	20	16	30	15
Average animals per farm	44	81	45	56
Water use per farm (MG)	0.03 (32,120)	0.06 (59,130)	0.03 (32,850)	0.04 (40,880)
Total water used (MG)	0.64 (642,400)	0.95 (946,080)	0.99 (985,500)	0.61 (613,200)
Goats				
Farms	49	27	52	41
Average animals per farm	9	20	15	10
Water use per farm (MG)	0.007 (6,570)	0.01 (14,600)	0.01 (10,950)	0.007 (7,300)
Total water used (MG)	0.32 (321,930)	0.39 (394,200)	0.57 (569,400)	0.30 (299,300)
Bees **				
Farms	15	8	15	7
Number of colonies	27	44	81	21
Average colonies per farm	2	6	5	3
Totals	***333.5 (333,487,513)***	***89.7 (89,749,485)***	***194.8 (194,788,492)***	***258.5 (258,528,631)***

* An average water use factor of 0.08 between hens and broilers (0.06) and turkeys (0.1).
** No water use factor was available for bees.

Summary of Daily and Annual Water Withdrawals

Table 44. Summary of Withdrawals

Water Withdrawals	Floyd County	Giles County	Montgomery County	Pulaski County	Radford City	Total
Average Daily Withdrawals (MGD)						
Community Water Systems	0.106	2.181	15.638	4.122	2.233	24.28
Large Self-supplied Nonagricultural Users	0.0274	324.344	NI	0.03	None	324.4014
Large Self-supplied Agricultural Users	NI	NI	NI	NI	None	0.00
Small Self-Supplied Users	NI	NI	NI	NI	NI	0.00
Grand Total						***348.6814***
Average Annual Withdrawals (MG)						
Community Water Systems	38.69	796.065	5,707.87	1,504.53	815.045	8,862.2
Large Self-supplied Nonagricultural Users	0.027	68.653	NI	NI	None	68.68
Large Self-supplied Agricultural Users	NI	0.0475	NI	NI	None	0.0475
Small Self-Supplied Users	11,698.95	1,226.735	8,613.91	1,660.205	None	23,199.8
Grand Total						***32,130.73***

EXISTING RESOURCE INFORMATION

***Refer to 9 VAC 25-780-90**

This section includes information on the existing geologic, hydrologic, and meteorological conditions within the locality. Also included are descriptions of the existing environmental conditions pertaining to instream flow, instream uses, and sources that provide the current supply. The description of conditions includes the following items: (a) state or federal listed threatened or endangered species or habitats of concern, (b) significant fisheries, (c) river segments with recreational significance, (d) sites of historical or archaeological significance, (e) unusual geologic formations or special soil types, (f) wetlands, (g) riparian buffers and conservation easements, (h) land use and land coverage, (i) impaired streams, (j) point source discharges, and (k) any other potential threats to existing water quantity and quality.

Geologic, Hydrologic, and Meteorological Data – 9 VAC 25-780-90A

Geologic Data

The New River Valley falls within three distinct physiographic provinces: the Blue Ridge Province (Floyd County), the Valley and Ridge Province (Pulaski County, Montgomery County, most of Giles County, and the City of Radford), and the Appalachian Plateau (in a small part of Giles County). The Blue Ridge Province is characterized by irregular topography and is generally classified as moderately-sloped (i.e., slopes ranging from 5-20%). The Valley and Ridge Province exhibits parallel-running ridges with accompanying valleys and is considered to be steep-sloped (slopes greater than 20%). The small portion of Giles County lying within the Appalachian Plateau Province is also steep-sloped. Overall, the land area in the New River Valley is classified as 47.9% moderately sloped, and about 7.5% as level.

Each province has very different geological characteristics. Giles, Pulaski, and Montgomery counties are mainly located in the Valley and Ridge Province, which is characterized by sedimentary rocks such as limestone, shale, and sandstone. Historically, limestone has been mined for agriculture and sandstone for building purposes. Floyd County is located in the Blue Ridge Province that is characterized by metamorphic rocks such as gneiss and schist. Metamorphic rocks are generally harder rocks and have been mined for use in constructing roads.

Soils range from limestone and shale to alluvial along the streams. Colluvial soils, formed from weathering of limestone with some shale and sandstone, are found in the foothills paralleling the Valley. Soils are generally moderately deep to very deep, with a depth of bedrock to ten feet however 100 foot depths have been noted.

Source: New River Valley Data Book. Available at: http://www.nrvpdc.org/08Databook/08DataBook.html.

Hydrologic Data

The average elevation of the Valley is about 2,500 feet. Elevations range from 1,470 feet above mean sea level at Glen Lyn to 4,348 feet at Bald Knob on Salt Pond Mountain in Giles

County. Mountain Lake, also located on Salt Pond Mountain, is one of only two natural lakes in Virginia and is reportedly the highest natural lake east of the Rocky Mountains.

The New River Valley lies primarily in the New River watershed, its namesake. The New River flows northward from its headwaters in North Carolina, through Virgina and into West Virginia where it joins the Kanawha River. Eventually water from the New River finds its way into the Mississippi River and the Gulf of Mexico. Small portions of Giles and Montgomery County also lie within the Upper James River watershed, part of the Chesapeake Bay watershed. Another larger portion of Montgomery County and several very small sections of Floyd County lie within the Roanoke River watershed. The Roanoke River follows a south-easterly course out to the Atlantic Ocean, south of the Chesapeake Bay. Figure 1 below illustrates those larger watershed boundaries within the region.

The New River runs through the counties of Pulaski, Montgomery, and Giles, and the City of Radford, thus giving the region its name. Little River, Peak Creek, Big Walker Creek, and Dodd's Creek, tributaries of the New River, run through all localities in the region. Figure 2 (below) shows the major waterways of the region, Virginia's 6th order watershed boundaries and other water features (i.e., spring/seeps, waterfalls).

The US Geological Survey maintains stream and groundwater monitoring stations throughout the New River Valley. There are no stream gauges in Floyd County, three in Giles County, two in Montgomery County and four in Pulaski County. Table 45 below describes each of these stations. USGS also maintains a groundwater monitoring well in Christiansburg in Montgomery County and two monitoring wells in Pulaski County; one near Claytor Lake and one outside Dublin.

Table 45. NRV Stream Gauges

County	ID Number	Location
Giles	03173000	Walker Creek at Bane, VA
	03175500	Wolf Creek near Narrows, VA
	03176500	New River at Glen Lyn, VA
Montgomery	02053800	South fork of Roanoke River near Shawsville, VA
	02054500	Roanoke River at Lafayette, VA
Pulaski	03168000	New River at Allisonia, VA
	03170000	Little River at Graystontown, VA
	03171000	New River at Radford, VA

Figure 1. Watersheds of the New River Valley

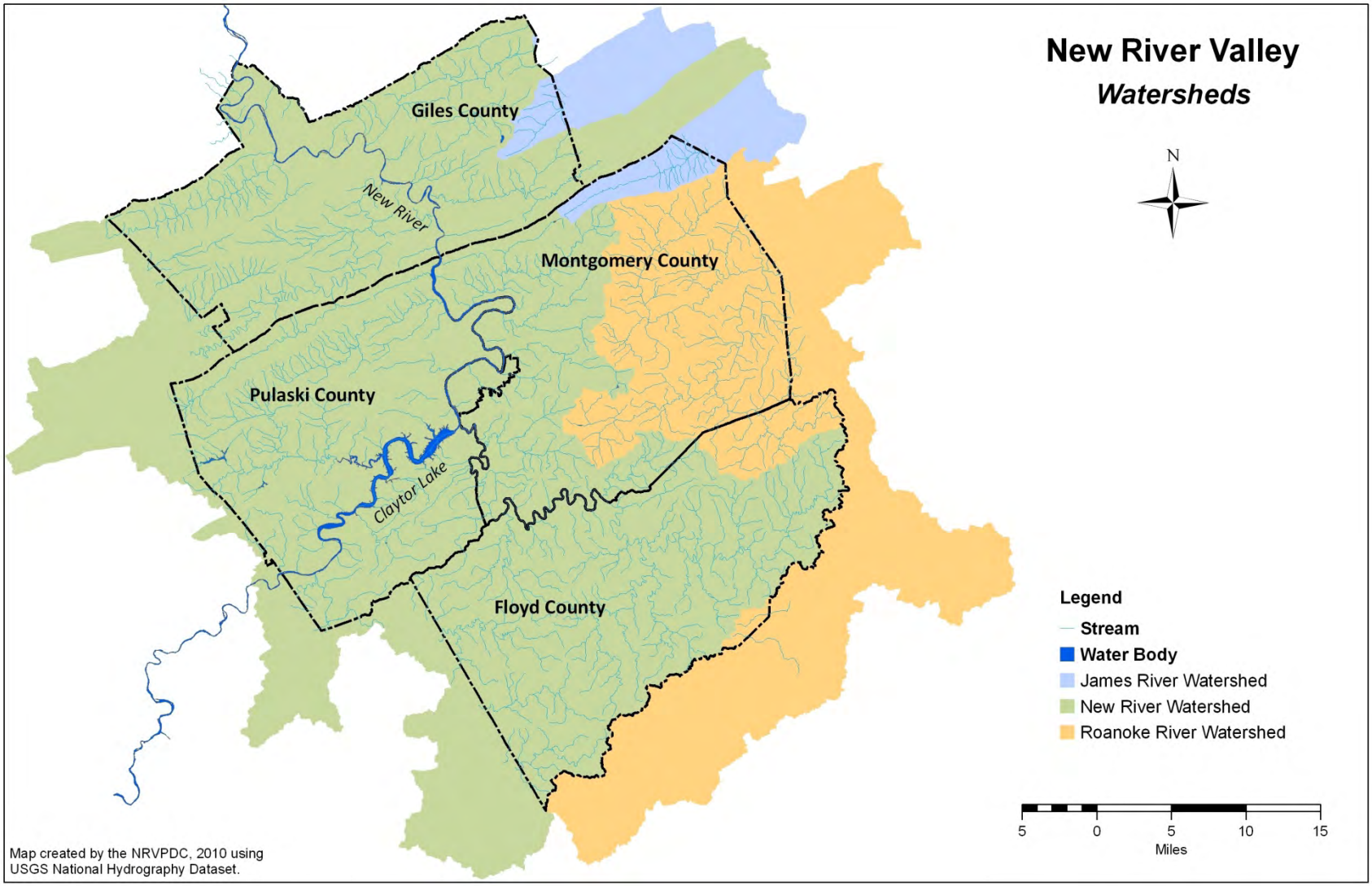
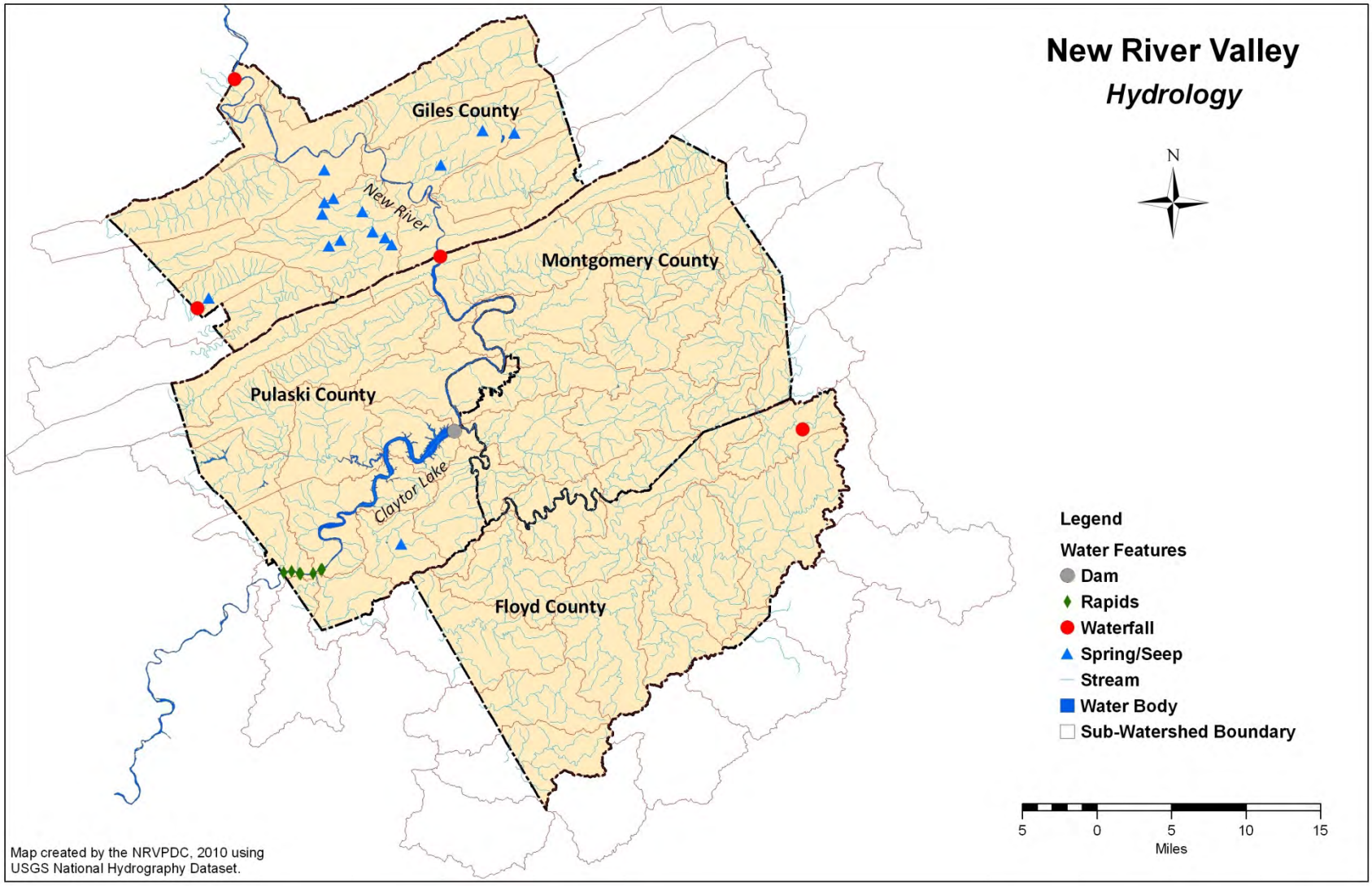


Figure 2. New River Valley Hydrology Map

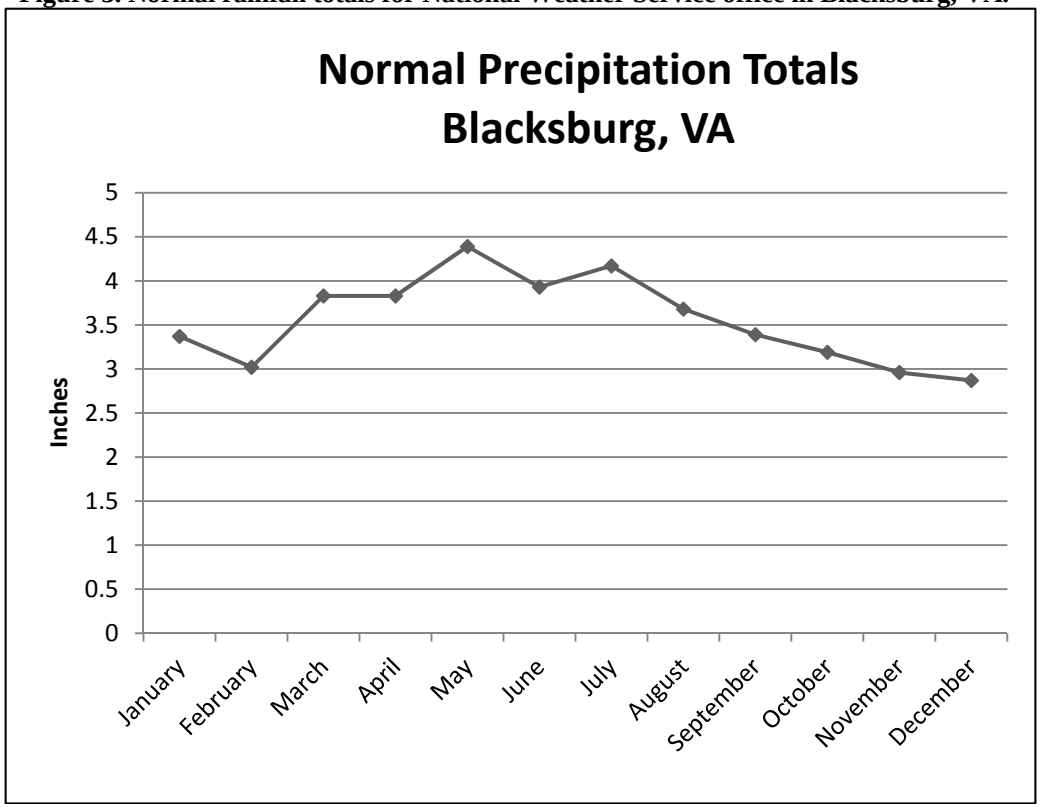


Sources: New River Valley Data Book. Available at: http://www.nrvpdc.org/08Databook/08DataBook.html.
USGS Water Data. Available at: http://waterdata.usgs.gov/nwis.
USGS Hydrography Dataset. Available at: http://nhd.usgs.gov/.

Meteorological Data

The climate of the New River Valley is classified as "moderate continental," characterized by moderately mild winters and warm summers. The average annual temperature is 56°F (spring: 54°F; summer: 72°F; fall: 55°F; winter: 36°F). The record high temperature is 103°F and the record low temperature is -27°F. The mean annual precipitation is 39 inches. Snowfall in the New River Valley averages 17 inches annually, with a range of 15-20 inches. Prevailing winds are usually from the southwest, at an average of 10 miles per hour.

Figure 3. Normal rainfall totals for National Weather Service office in Blacksburg, VA.



Sources: New River Valley Data Book. Available at: http://www.nrvpdc.org/08Databook/08DataBook.html.
National Weather Service, Blacksburg Office. Available at: http://www.weather.gov/climate/local_data.php?wfo=rnk.

State or Federal Listed Threatened or Endangered Species or Habitats of Concern - 9 VAC 25-780-90B.1

The Virginia Department of Conservation and Recreation's Natural Heritage Program maintains a database with species information by county, community, physiographic province, watershed, or sub-watershed. A search produces a species list based on global and state conservation status and federal and state legal status, which can be found in Table 46.

The table shows each county in the New River Valley region broken down by species or community group and its various rankings: critically imperiled, vulnerable, apparently secure, secure, listed threatened, imperiled, or listed endangered. These ratings and their corresponding notation given to each species are noted at the bottom of Table 46 and further explained in Table 48. Floyd, Giles, Montgomery, and Pulaski each have at least one endangered species. In addition, Floyd, Montgomery, and Pulaski each have threatened species present.

The Natural Heritage Program also documents habitats of concern, which are recorded in Table 47. In the New River Valley, these mainly include caves, threatened waters, and natural communities. Habitats are categorized by global, federal, and state ranks; however, most have not been assessed by the Natural Heritage Program. The counties of Giles, Montgomery, and Pulaski and the City of Radford are karst regions with threatened significant caves. Threatened and endangered waters are present in Floyd, Giles, and Montgomery counties. Natural communities are threatened or endangered in every county and the city (see Table 46).

Table 46. Federally Endangered, Threatened, and Species of Concern in the New River Valley

Locality GROUP *Scientific Name*	**Common Name**	**Global Rank**	**State Rank**	**Federal Status**	**State Status**	**Last Year Observed**
Floyd						
CHILOPODA (Centipedes)						
Escaryus cryptorobius	Montane centipede	G2	S2	SOC		1992
DIPLOPODA (Millipedes)						
Sigmoria whiteheadi	Laurel Creek xystodesmid millipede	G1	S1	SOC	LT	1990
HOMOPTERA (Cicadas & Leaf hoppers)						
Puto kosztarabi	Buffalo mountain mealybug	G1	S1	SOC	LE	2003
LEPDOPTERA (Butterflies & Moths)						
Neonympha mitchelli mitchelli	Mitchell's satyr	G1G2	S1	LE	LE	2007
ODONATA (Dragonflies & Damselflies)						
Ophiogomphus incurvatus alleghaniensis	Alleghany snaketail	G2G3T2T3	S1	SOC		1993
REPTILES						
Glyptemys muhlenbergii	Bog turtle	G3	S1S2	LT	LE	ND
VASCULAR PLANTS						
Isotria medeoloides	Small whorled pogonia	G2	S2	LT	LE	2007
Giles						
BIRDS						
Thryomanes bewickii altus	Appalachian Bewick's Wren	G5T2Q	S1B	SOC	LE	1993
BIVALVIA (Mussels)						

Locality GROUP *Scientific Name*	**Common Name**	**Global Rank**	**State Rank**	**Federal Status**	**State Status**	**Last Year Observed**
Pleurobema collina	James Spinymussel	G1	S1	LE	LE	1984
COLEOTERA (Beetles)						
Pseudanophthalmus egberti	New River Valley cave beetle	G1G2	S1	SOC		1958
Pseudanophthalmus gracilis	A cave beetle	G1G2	S1S2	SOC		1962
Pseudanophthalmus punctatus	Spotted cave beetle	G2G3	S1	SOC		Pre1
Pseudanophthalmus quadratus	Straley's cave beetle	G1	S1	SOC		1958
CRUSTACEA (Amphipods, Isopods, & Decapods)						
Caecidotea henroti	Henrot's cave isopod	G1G2	S1S2	SOC		1978
Stygobromus abditus	James cave amphipod	G2G3	S2	SOC		1996
Stygobromus ephemerus	Ephemeral cave amphipod	G1G2	S1	SOC	SC	1994
DIPLOPODA (Millipedes)						
Pseudotremia sublevis	A millipede	G1	S1	SOC		Pre1
Rudiloria trimaculata tortua	A millipede	G5T2	S2	SOC		1958
DIPLURA (Diplurans)						
Litocampa sp. 1	A cave dipluran	G1	S1	SOC		1992
LEPIDOPTERA (Butterflies & Moths)						
Phyciodes batesii batesii	Tawny crescent	G4T1	SH	SOC		1940
MAMMALS						
Myotis sodalis	Indiana bat	G2	S1	LE	LE	1939
MECOPTERA (Scorpionflies)						
Brachypanorpa jeffersoni	Jefferson's short-nosed scorpionfly	G2	S1S2	SOC		1993
ODONATA (Dragonflies & Damselflies)						
Ophiogomphus incurvatus alleghaniensis	Alleghany snaketail	G2G3T2T3	S1	SOC		1974
VASCULAR PLANTS						
Corallorhiza bentleyi	An orchid	G1G2	S1	SOC	LE	2005
Iliamna corei	Peter's mountain mallow	G1Q	S1	LE	LE	2007
Paxistima canbyi	Canby's mountain-lover	G2	S2	SOC		2003
Pycnanthemum torrei	Torrey's mountain-mint	G2	S2?	SOC		2003
Montgomery						
COLEOPTERA (Beetles)						
Pseudanophthalmus pusio	A cave beetle	G2G3	S1S2	SOC		Pre1

Locality GROUP *Scientific Name*	**Common Name**	**Global Rank**	**State Rank**	**Federal Status**	**State Status**	**Last Year Observed**
CRUSTACEA (Amphipods, Isopods, & Decapods)						
Stygobromus fergusoni	Montgomery county cave amphipod	G2G3	S1	SOC		1969
DIPLOPODA (Millipedes)						
Brachoria separanda calcaria	A millipede	G2T2	S2	SOC		1956
Pseudotremia cavernarum	Ellett Valley pseudotremia millipede	G2G3	S1	SOC	LT	Pre1
DIPLURA (Diplurans)						
Litcampa sp. 3	A cave dipluran	G2	S2	SOC		1971
FISH						
Noturus gilberti	Orangefin madtom	G2	S2	SOC	LT	2004
Percina rex	Roanoke logperch	G1G2	S1S2	LE	LE	2001
LEPIDOPTERA (Butterflies & Moths)						
Erynnis persius persius	Persius duskywing	G5T1T3	S1	SOC		1974
Pyrgus wyandot	Appalachian grizzled skipper	G1G2Q	S1S2	SOC	LT	1975
MAMMALS						
Myotis sodalis	Indiana bat	G2	S1	LE	LE	1947
VASCULAR PLANTS						
Buckleya distichophylla	Piratebush	G2	S2	SOC		2002
Clematis addisonii	Addison's leatherflower	G2	S2	SOC		2008
Echinacea laevigata	Smooth coneflower	G2G3	S2	LE	LT	2008
Paxistima canbyi	Canby's mountain-lover	G2	S2	SOC		2003
Phlox buckleyi	Sword-leaved phlox	G2	S2	SOC		1990
Pulaski						
COLEOPTERA (Beetles)						
Pseudanophthalmus sp. 7	A cave beetle	G1	S1	SOC		Pre1
CRUSTACEA (Amphipods, Isopods, & Decapods)						
Caecidotea henroti	Henrot's cave isopod	G1G2	S1S2	SOC		1978
Stygobromus abditus	James cave amphipod	G2G3	S2	SOC		1998
DIPLURA (Diplurans)						
Litocampa sp. 3	A cave dipluran	G2	S2	SOC		1979
GASTROPODA (Snails)						
Polygyriscus virginianus	Virginia fringed mountain snail	G1	S1	LE	LE	1989
VASCULAR PLANTS						

Locality GROUP *Scientific Name*	**Common Name**	**Global Rank**	**State Rank**	**Federal Status**	**State Status**	**Last Year Observed**
Buckleya distichophylla	Piratebush	G2	S2	SOC		1987
Echinacea laevigata	Smooth coneflower	G2G3	S2	LE	LT	2001
Paxistima canbyi	Canby's mountain-lover	G2	S2	SOC		1991
Phlox buckleyi	Sword-leaved phlox	G2	S2	SOC		1986
Radford						
VASCULAR PLANTS						
Paxistima canbyi	Canby's mountain-lover	G2	S2	SOC		1984

G1, S1 – Critically Imperiled
G2, S2 – Imperiled
G3 – Vulnerable
G4 – Apparently Secure
G5 – Secure

SH – Historic
LT – Listed Threatened
LE – Listed Endangered
SOC – Species of Concern

Source: Virginia Natural Heritage Program. Online. Available: http://192.206.31.46/cfprog/dnh/naturalheritage/select_counties.cfm. April 6, 2009.

Table 47. Habitats of Concern in the New River Valley

Locality *Type* Common Name	Global Rank	State Rank	Federal Rank	Last Year Observed
Floyd				
Communities				
Calcareous Fen	G1	SNR		2003
High-elevation Outcrop	G1	SNR		2001
Low-elevation Basic Outcrop Barren	G1	SNR		2004
Mafic Fen / Seep	G2	S1		2007
Mesic / Wet-Mesic Prairie	G2	SNR		1991
Montane Mixed Oak / Oak-Hickory Forest	G3	SNR		2003
Northern Hardwood Forest	G3G4	SNR		2000
Rich Cove / Slope Forest	G4	SNR		2007
Ultramafic Woodland / Barren	G1	SNR		2004
Threatened and Endangered Species Waters				
Rock Castle Creek		S	F	
Giles				
Communities				
Appalachian Bog	G2	SNR		2003
Calcareous Fen	G1	SNR		2007
High-elevation Cove Forest	G3G4Q	SNR		1999
High-elevation Seepage Swamp	G2	SNR		1999
Limestone / Dolomite Barren	G1G2	SNR		1997
Montane Depression Wetland	G2	SNR		1999
Montane Mixed Oak / Oak-Hickory Forest	G5	SNR		2004
Mountain / Piedmont Basic Seepage Swamp	G3	S2		2007
Mountain / Piedmont Basic Woodland	G2	SNR		1999
Northern Hardwood Forest	G3G4	SNR		1999

Locality *Type* Common Name	Global Rank	State Rank	Federal Rank	Last Year Observed
Northern White-Cedar Slope Forest	G1G2	S1		1998
Rich Cove / Slope Forest	G3G4	SNR		2007
Significant Caves				
Significant cave	G3	SNR		2004
Threatened and Endangered Species Waters				
Johns Creek		S	F	
Montgomery				
Communities				
Calcareous Fen	G2G3	SNR		2007
Calcareous Spring Marsh / Muck Fen	G2	SNR		2001
Central Appalachian Shale Barren	G3G4	SNR		1988
Limestone / Dolomite Barren	G1G2	SNR		1995
Montane Dry calcareous Forest / Woodland	G2	SNR		2008
Oak / Heath Forest	G5	SNR		1994
Significant Caves				
Significant cave	G3	SNR		1985
Threatened and Endangered Species Waters				
Roanoke River		S	F	
Roanoke River, North Fork		S	F	
Roanoke River, South Fork		S	F	
Elliott Creek		S	F	
Bottom Creek		S	F	
Craig Creek		S	F	
Pulaski				
Communities				
Montane Dry / Calcareous Forest / Woodland	G2	SNR		2001
Significant Caves				
Significant cave	G3	SNR		2004
Radford				
Communities				
Montane Dry / Calcareous Forest / Woodland	G4?	SNR		2007
Significant Caves				
Significant cave	G3	SNR		2004

G1, S1 – Critically Imperiled
G2, S2 – Imperiled
G3 – Vulnerable
G4 – Apparently Secure
G5 – Secure

SNR – Unranked
S – State Status
F – Federal Status

Source: Virginia Natural Heritage Program. Online. Available: http://192.206.31.46/cfprog/dnh/naturalheritage/select_counties.cfm. April 6, 2009.

Table 48. Explanation of Natural Heritage Ranking as Denoted by DCR

Notation	Explanation
S1/G1	Critically imperiled in the state or globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state. Typically 5 or fewer populations of occurrences; or very few remaining individuals (<1,000).
S2/G2	Imperiled in the state or globally because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state. Typically 6 to 20 populations or occurrences or few remaining individuals (1,000 to 3,000).
S3/G3	State or globally vulnerable either because rare and uncommon, or found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation. Typically 21 to 100 populations or occurrences (>3,000).
SNR/GNR	Unranked; state/global rank not yet assessed.
GQ	A "Q" in a rank indicated that a taxonomic questions concerning that species exists.
Note:	Global ranks are parallel to the state ranks, but refer to a species' rarity throughout its total range.
Note:	"GX" indicates the element is presumed extinct throughout its range, not relocated despite intensive searched of historical sites/appropriate habitat.

Source: Virginia Natural Heritage Program. Online. Available: http://www.dcr.virginia.gov/dnh/nhrinfo.htm. 23 June 2006.

Anadromous, Trout, and Other Significant Fisheries – 9 VAC 25-780-90B.2

There are a variety of trout and other significant fish species in the New River Valley identified and recorded by the Department of Game and Inland Fisheries. In the three watersheds of the New River Valley (James River, New River, and Roanoke River) there are 123 species of fish, 27 of which can be recreationally fished. In the James River watershed within the boundaries of this region, there are 36 fish species. There are 62 fish species in the Roanoke River watershed within this region. In the New River watershed, the primary focus of this plan, there are 104 fish species, 6 species of Federal Concern, 1 species of which is also a species of state concern. There is one state listed threatened fish species in the New River, the Greenfin Darter. The most common types of fish in the New River Valley are varieties of trout, bass, and shiner (see Table 49).

Table 49. Fish of the New River Valley

Status	Common Name	Scientific Name	Watershed	Game Fish
	Alewife	*Alosa pseudoharengus*	New River	*
FS, SS	Roanoke Bass	*Ambloplites cavifrons*	Roanoke River	*
	Rock Bass	*Ambloplites rupestris*	New River, Roanoke River	*
	Yellow Bullhead	*Ameiurus natalis*	Roanoke River	
	Brown Bullhead	*Ameiurus nebulosus*	New River, Roanoke River	
	Flat Bullhead	*Ameiurus platycephalus*	New River, Roanoke River	
	Bowfin	*Amia calva*	New River, Roanoke River	*
	American Eel	*Anguilla rostrata*	New River	
	Central Stoneroller	*Campostoma anomalum*	James River, New River, Roanoke River	
	Goldfish	*Carassius auratus*	New River	

Status	Common Name	Scientific Name	Watershed	Game Fish
	White Sucker	*Catostomus commersoni*	James River, New River, Roanoke River	
	Rosyside Dace	*Clinostomus fundloides*	James River, New River, Roanoke River	
	Atlantic Herring	*Culpea harengus*	New River	
	Black Sculpin	*Cottus baileyi*	New River	
	Mottled Sculpin	*Cottus bairdi*	James River, New River, Roanoke River	
	Banded Sculpin	*Cottus carolinae*	New River, Roanoke River	
	Carolinae Sculpin ssp.	*Cottus carolinae ssp.*	New River	
	Slimy Sculpin	*Cottus cognatus*	Roanoke River	
	Potomac Sculpin	*Cottus girardi*	James River	
	Sculpin, unknown	*Cottus spp.*	New River	
	Satinfin Shiner	*Cyprinella analostana*	Roanoke River	
	Whitetail Shiner	*Cyprinella galactura*	New River	
	Shiner, unknown	*Cyprinella spp.*	New River	
	Spotfin Shiner	*Cyprinella spiloptera*	James River, New River	
	Common Carp	*Cyprinus carpio*	New River, Roanoke River	*
	Gizzard Shad	*Dorosoma cepedianum*	New River	
	Threadfin Shad	*Dorosoma petenense*	New River	
	Creek Chubsucker	*Erimyson oblongus*	New River	
	Muskellunge	*Esox masquinongy*	New River	*
	Chain Pickerel	*Esox niger*	James River, New River, Roanoke River	*
	Greenside Darter	*Etheostoma blennioides*	New River, Roanoke River	
	Rainbow Darter	*Etheostoma caeruleum*	New River	
ST	Greenfin Darter	*Etheostoma chlorobranchium*	New River	
	Fantail Darter	*Etheostoma flabellare*	James River, New River, Roanoke River	
FS	Kanawha Darter	*Ethestoma kanawhae*	New River	
	Longfin Darter	*Ethestoma longimanum*	James River	
	Johnny Darter	*Etheostoma nigrum*	James River, New River, Roanoke River	
	Tesselated Darter	*Etheostoma olmstedi*	New River, Roanoke River	
FS, SS	Candy Darter	*Etheostoma osburni*	New River	
FS	Riverweed Darter	*Etheostoma podostemone*	James River, Roanoke River	
	Snubnose Darter	*Etheostoma simoterum*	New River	
	Darter, unknown	*Etheostoma spp.*	James River, New River	
	Tonguetied Minnow	*Exoglossum laurae*	New River	
	Cutlips Minnow	*Exoglossum maxillingua*	James River, New River, Roanoke River	
	Banded Killifish	*Fundulus diaphanous*	New River	
	Northern Hog Sucker	*Hypentelium nigricans*	New River, Roanoke River	

Status	Common Name	Scientific Name	Watershed	Game Fish
FS	Roanoke Hog Sucker	*Hypentelium roanokense*	New River, Roanoke River	
	Channel Catfish	*Ictalurus punctatus*	New River	*
	Redbreast Sunfish	*Lepomis auritus*	James River, New River, Roanoke River	*
	Green Sunfish	*Lepomis cyanellus*	James River, New River, Roanoke River	*
	Pumpkinseed	*Lepomis gibbosus*	James River, New River, Roanoke River	*
	Bluegill	*Lepomis macrochirus*	New River, Roanoke River	*
	Longear Sunfish	*Lepomis megalotis*	New River	
	Redear Sunfish	*Lepomis microlophus*	New River	*
	White Shiner	*Luxilus albeolus*	James River, New River, Roanoke River	
	Crescent Shiner	*Luxilus cerasinus*	James River, New River, Roanoke River	
	Striped Shiner	*Luxilus chrysocephalus*	New River	
	Warpaint Shiner	*Luxilus coccogenis*	New River	
	Common Shiner	*Luxilus cornutus*	James River, New River, Roanoke River	
	Shiner, unknown	*Luxilus spp.*	New River	
	Rosefin Shiner	*Lythrurus ardens*	James River, New River, Roanoke River	
	Smallmouth Bass	*Micropterus dolomieu*	James River, New River, Roanoke River	*
	Spotted Bass	*Micropterus punctulatus*	New River	*
	Largemouth Bass	*Micropterus salmoides*	New River, Roanoke River	*
	White Bass	*Micropterus chrysops*	New River	*
	Striped Bass hybrid	*Morone* hybrid	New River	*
	Striped Bass	*Morone saxatilis*	New River	*
	Silver Redhorse	*Moxostoma anisurum*	James River, Roanoke River	
FS	Bigeye Jumprock	*Moxostoma ariommum*	Roanoke River	
	Black Jumprock	*Moxostoma cervinum*	New River, Roanoke River	
	Golden Redhorse	*Moxostoma erythrurum*	New River, Roanoke River	
	Shorthead Redhorse	*Moxostoma macrolepidotum*	New River	
	V-lip Redhorse	*Moxostome pappillosum*	Roanoke River	
	Torrent Sucker	*Moxostoma rhothoecum*	James River, New River, Roanoke River	
	Robust Redhorse	*Moxostoma robustum*	Roanoke River	
	Bluehead Chub	*Nocomis leptocephalus*	James River, New River, Roanoke River	
	River Chub	*Nocomis micropogon*	James River, New River, Roanoke River	
	Bigmouth Chub	*Nocomis platyrhynchus*	New River	

Status	Common Name	Scientific Name	Watershed	Game Fish
	Bull Chub	*Nocomis raneyi*	James River, New River, Roanoke River	
	Chub, unknown	*Nocomis spp.*	New River	
	Golden Shiner	*Notemigonus crysoleucas*	New River	
	Comely Shiner	*Notropis amoenus*	New River	
	Redlip Shiner	*Notropis chiliticus*	New River	
	Spottail Shiner	*Notropis hudsonius*	James River, New River, Roanoke River	
	Highland Shiner	*Notropis micropteryx*	New River	
	Silver Shiner	*Notropis photogenis*	New River	
	Swallowtail Shiner	*Notropis procne*	New River, Roanoke River	
	Saffron Shiner	*Notropis rubricroceus*	New River	
	New River Shiner	*Notropis scabriceps*	New River	
	Minnow, unknown	*Notropis spp.*	New River	
	Telescope Shiner	*Notropis telescopus*	New River, Roanoke River	
	Mimic Shiner	*Notropis volucellus*	New River, Roanoke River	
FS, ST	Orangefin Madtom	*Noturus gilberti*	Roanoke River	
	Margined Madtom	*Noturus insignis*	James River, New River, Roanoke River	
FS	Spotted-margin Madtom	*Noturus insignis ssp. 1*	New River	
	Madtom, unknown	*Noturus spp.*	James River	
	Rainbow Trout	*Oncorhynchus mykiss*	James River, New River, Roanoke River	*
	Yellow Perch	*Perca flavescens*	New River	*
	Logperch	*Percina caprodes*	New River	
	Piedmont Darter	*Percina crassa*	New River, Roanoke River	
FS	Appalachia Darter	*Percina gymnocephala*	New River	
	Blackside Darter	*Percina maculata*	New River	
	Stripeback Darter	*Percina notogramma*	James River	
	Sharpnose Darter	*Percina oxyrhynchus*	New River	
	Shield Darter	*Percina peltata*	Roanoke River	
FE, SE	Roanoke Logperch	*Percina rex*	Roanoke River	
	Roanoke Darter	*Percina roanoka*	New River, Roanoke River	
FS	Kanawha Minnow	*Phenacobius teretulus*	New River	
	Redbelly Mountain Dace	*Phoxinus oreas*	James River, New River, Roanoke River	
	Bluntnose Minnow	*Pimephales notatus*	James River, New River, Roanoke River	
	Fathead Minnow	*Pimephales promelas*	New River, Roanoke River	
	White Crappie	*Pomoxis annularis*	New River	*
	Black Crappie	*Pomoxis nigromaculatus*	New River	*
	Flathead Catfish	*Pylodictis olvaris*	New River	*
	Blacknose Dace	*Rhinichthys atratulus*	James River, New River, Roanoke River	
	Longnose Dace	*Rhinichthys*	New River	

Status	Common Name	Scientific Name	Watershed	Game Fish
		cataractae		
	Brown Trout	*Salmo trutta*	New River, Roanoke River	*
	Brook Trout	*Salvelinus fontinalis*	James River, New River, Roanoke River	*
	Creek Chub	*Semotilus atromaculatus*	James River, New River, Roanoke River	
	Fallfish	*Semotilus corporalis*	James River	
	Walleye	*Stizostedio vitreum vitreum*	New River	*
FS, SS	Rustyside Sucker	*Thoburnia hamiltoni*	Roanoke River	

Source: Virginia Department of Game and Inland Fisheries. Personal Communication. 23 April 2009.

River Segments with Recreational Significance, Including State Scenic River Status - 9 VAC 25-780-90B.3

The New River Valley is largely characterized by and dependent upon its main surface water source, the New River. The Environmental Protection Agency designated the river an American Heritage River in 1998. The New River does not have state scenic river status, a designation granted by the Department of Conservation and Recreation's Recreational Planning Scenic Rivers Program. DCR has qualified two segments of streams in the New River Valley as worth of future study for scenic status and five others as worthy for the Scenic River designation (see Table 50).

Aside from the New River, the Valley is abundant in water resources for recreational use. Significant recreational rivers, available for boating and fishing, are present in all four counties (given in Table 51). Floyd County has ten recreational waterways: Goose Creek, Little River, West Fork Little River, Howell Creek, Rush Fork, Mira Fork, Little Indian Creek, Burkes Fork, Laurel Fork, and Greasy Creek. Nine of these ten waterways are stocked with trout, excluding Greasy Creek. Giles County has five waterways for recreational use, all of which are regularly stocked with trout. These include Big Stony Creek, Little Stony Creek, Johns Creek, Mill Creek, Wolf Creek and Dismal Creek. Seven waterways in Montgomery County are considered recreational: Toms Creek, Walker Creek, South Fork of the Roanoke River, North Fork of the Roanoke River, Craig Creek, Poverty Creek and Pandapas Pond. Trout are stocked in four of these waterways: Toms Creek, Craig Creek, Poverty Creek and Pandapas Pond. Pulaski County has one recreational waterway, Peak Creek, and it is also stocked with trout (see Table 51).

Table 50. Scenic Rivers: Qualified and Potential Components (as of 2009)*

Map ID	Name	Location	Status
131	Walker Creek	Point Pleasant to New River	Qualified
56	Little River	Route 8 to New River	Qualified
57	Little Stony Creek	Headwaters to New River	Potential
76	New River	Buck Dam to Reed Junction	Qualified
118	Sinking Creek	Rt. 680 to New River Confluence	Potential
75	New River	Claytor Lake to VA-WV state line	Qualified
10	Big Reed Island Creek	Route 693 to New River Confluence	Qualified

* Refer to Map VII-6. Scenic Rivers. 2007 Virginia Outdoors Plan. Available: http://www.dcr.virginia.gov/recreational_planning/documents/srmap.pdf. 13 May 2009.

Table 51. Significant DGIF Trout Rivers (as of 2009)*

Map ID	Name	Location	Stocked Trout
14	Goose Creek	Floyd County	*
15	Little River	Floyd County	*
16	West Fork Little River	Floyd County	*
17	Howell Creek	Floyd County	*
18	Rush Fork	Floyd County	*
19	Mira Fork	Floyd County	*
20	Little Indian Creek	Floyd County	*
21	Burkes Fork	Floyd County	
22	Laurel Fork	Floyd County	
5	Big Stony Creek	Giles County	*
6	Little Stony Creek	Giles County	
7	Johns Creek	Giles County	
8	Mill Creek	Giles County	
9	Dismal Creek	Giles County	*
33	Wolf Creek	Giles County	*
12	Toms Creek	Montgomery County	*
10	Craig Creek	Montgomery County	*
11	Poverty Creek	Montgomery County	*
11A	Pandapas Pond	Montgomery County	*
31	Peak Creek	Pulaski County	*

* Refer to Trout Guide; Area Maps – Area 4; Virginia Department of Game and Inland Fisheries. Available: http://www.dgif.virginia.gov/fishing/trout/map4.pdf. 13 May 2009.

Source: New River Valley Data Book. Available at: http://www.nrvpdc.org/08Databook/08DataBook.html.

Site of Historic or Archaeological Formations – 9 VAC 25-780-90B.4

The Virginia Department of Historic Resources (DHR) publishes and updates a National Register of Historic Places (NRHP), which includes a Virginia Landmarks Register (VLR) (see Table 52). The register includes detailed information on significant and popular sites within the New River Valley. Frequently visited sites were denoted by municipal representatives at water supply planning meetings hosted by the NRVPDC in 2006. In the City of Radford, eight sites are designated as historical or archaeological with two sites visited frequently: Glencoe Museum and Ingles Bottom. Floyd County has five historic sites, with the Town of Floyd's historic district being a significant attraction. Giles County is host to eight sites on the Register, while Giles County Courthouse and Pearisburg historic district are commonly visited. Montgomery County is home to the highest number of historic or archaeological sites, 71, while Smithfield, Christiansburg Depot, Solitude, and Kentland Farm are most visited. In Pulaski County, the Register designates 19 sites and visitors frequent Ingles Ferry Inn, Pulaski County Courthouse, Calfee Athletic Field, and Haven Howe House. The Landmarks Register also keeps a listing of sites that have been de-listed due to demolition or removal. In the New River Valley, four sites in Montgomery County and one in Pulaski County were de-listed (see Table 52).

Table 52. Historic Places in the New River Valley (as of 2006)

	Location Property	USGS Quad Map	Date Listed on VLR	Date Listed on NRHP
Radford				
	Harvey House	Radford North	4/20/76	7/30/76
*	Ingles Bottom Archaeological Sites	Radford South	6/15/76	12/5/78
	Riviere (La)	Radford South	6/15/94	8/16/94
	Halwyck	Radford North	7/2/97	8/29/97
*	Glencoe	Radford North	9/15/99	11/22/00
	East Radford Historic District	Radford North	3/15/00	5/11/00
	Arnheim	Radford North	3/13/02	5/30/02
	West Radford Commercial Historic District	Radford North	12/1/04	1/19/05
Floyd County				
	Floyd Presbyterian Church	Floyd	12/16/75	5/17/76
	Zion Lutheran Church and Cemetery	Floyd	6/16/81	--
	Glenanna	Floyd	6/13/01	5/16/02
	Phlegar House	Floyd	3/19/03	6/22/03
*	Floyd Historic District	Floyd	9/14/05	11/16/05
Giles County				
*	Giles County Courthouse	Pearisburg	7/20/82	9/9/82
*	Pearisburg Historic District	Pearisburg	12/11/91	1/30/92
	Johnston, Andrew, House	Pearisburg	12/9/92	2/11/94
	Newport Historic District	Newport	12/8/93	2/25/94
	Greater Newport Rural Historic District	Newport, Interior, Eggleston	3/15/00	12/14/00
	Walker's Creek Presbyterian Church	White Gate	6/18/03	10/22/03
	Walker's Creek Presbyterian Church/Cemetery	White Gate	12/7/05	2/1/06
	Shannon Cemetery	Staffordsville	3/8/06	5/4/06
Montgomery County				
	Fotheringay	Elliston	5/13/69	11/12/69
*	Smithfield	Blacksburg	11/5/68	11/12/69
	Christiansburg Presbyterian Church	Blacksburg	6/21/77	1/30/78
	Christiansburg Institute (and Schaeffer Memorial Baptist Church)	Blacksburg	5/16/78	4/6/79
	Yellow Sulphur Springs	Blacksburg	9/20/77	9/20/79
*	Christiansburg Depot – Cambria Historic District	Blacksburg	4/16/85	12/12/85
	Fort Vause Site	Ironto	12/2/69	--
*	Solitude	Blacksburg	6/21/88	5/5/89
	Prehistoric and Historic Resources in Montgomery County		6/20/89	11/13/89
	Alleghany Springs Springhouse	Ironto	6/20/89	11/13/89
	Amiss-Palmer House (Palmer House)	Blacksburg	6/20/89	11/13/89
	Barnett House	Elliston	6/20/89	11/13/89
	William Barnett House	Elliston	6/20/89	11/13/89
	Big Spring Baptist Church	Elliston	6/20/89	11/13/89
	Bishop House	Radford South	6/20/89	11/13/89
	Blacksburg Historic District	Blacksburg	6/20/89	1/31/91
	Blankenship Farm	Ironto	6/20/89	11/13/89
	Bowyer-Trollinger Farm	Radford South	6/20/89	2/1/91
	Pompey Callaway House	Elliston	6/20/89	11/13/89
	Cambria Historic District	Blacksburg	6/20/89	1/10/91
	James Charlton Farm	Riner	6/20/89	11/13/89

Location Property		USGS Quad Map	Date Listed on VLR	Date Listed on NRHP
	Crockett Springs Cottage	Pilot	6/20/89	11/13/89
	Cromer House (Hogan Farm)	Radford South	6/20/89	11/13/89
	Earhart House (Walters Farm)	Ironto	6/20/89	11/13/89
	George Earhart House (Arrington House)	Ironto	6/20/89	11/13/89
	East Main Street Historic District	Blacksburg	6/20/89	1/10/91
	Edgemont Church	Riner	6/20/89	11/13/89
	Evans House Number 2	Blacksburg	6/20/89	11/13/89
	Nealy Gordon Farm	Ironto	6/20/89	1/13/89
	John Grayson House	Radford South	6/20/89	11/13/89
	Grayson-Gravely House	Radford South	6/20/89	11/13/89
	Graysontown Methodist Church	Radford South	6/20/89	11/13/89
	Guerrant House	Pilot	6/20/89	11/13/89
	Thoams Hall House	Radford South	6/20/89	11/13/89
	Hornbarger Store	Blacksburg	6/20/89	11/13/89
	Howard-Bell-Feather House	Riner	6/20/89	11/13/89
	Keister House	Blacksburg	6/20/89	11/13/89
*	Kentland Farm Historic and Archaeological District	Radford North	4/17/91	7/3/91
	Kentland Farm Historic District Amendment	Radford North	6/8/06	Pending
	Michael Kinzer House	Blacksburg	6/20/89	11/13/89
	Lafayette Historic District	Elliston	6/20/89	1/10/91
	Frank Lawrence House	Pilot	6/20/89	11/13/89
	Linkous-Kipps House	Blacksburg	6/20/89	11/13/89
	Madison Farm Historic and Archaeological District	Elliston	6/20/89	1/25/91
	Joseph McDonald Farm	Blacksburg	6/20/89	2/1/91
	Miller-Southside Residential Historic District	Blacksburg	6/20/89	1/11/91
	Montgomery Primitive Baptist Church	Blacksburg	6/20/89	11/13/89
	North Fork Valley Rural Historic District	Ironto, McDonalds Mill	6/20/89	2/1/91
	Phillips-Ronald House (Carrinton Lybrook House; Five Chimneys)	Blacksburg	6/20/89	11/13/89
	Phlegar Building	Blacksburg	6/20/89	11/13/89
	Piedmont Camp Meeting Grounds Historic District	Check	6/20/89	1/10/91
	Preston House	Ironto	6/20/89	Pending
	Prices Fork Historic District	Blacksburg	6/20/89	1/10/91
	Rife House	Elliston	6/20/89	11/13/89
	Riner Historic District	Riner	6/20/89	1/10/91
	Shawsville Historic District	Ironto	6/20/89	1/10/91
	South Franklin Street Historic District	Blacksburg	6/20/89	1/10/91
	Surface House	Blacksburg	6/20/89	11/13/89
	Thomas-Conner House	Blacksburg	6/20/89	3/15/91
	Trinity United Methodist Church	Ironto	6/20/89	11/13/89
	United States Post Office-Christiansburg	Blacksburg	6/20/89	2/1/91
	Virginia Railway Underpass	Ironto	6/20/89	11/13/89
	Adam Wall House	Blacksburg	6/20/89	11/13/89
	Walnut Grove Farm	Elliston, Ironto	6/20/89	1/17/91
	Walnut Spring	Blacksburg	6/20/89	11/13/89
	Whitethorn	Blacksburg	6/20/89	11/13/89

	Location Property	USGS Quad Map	Date Listed on VLR	Date Listed on NRHP
	Currie House	Blacksburg	4/20/94	9/14/94
	The Oaks	Blacksburg	4/20/94	7/15/94
	Edgar A. Long Building	Blacksburg	12/6/01	3/5/01
	Stroubles Creek Site	Radford North	6/13/01	Pending
	Odd Fellows Hall	Blacksburg	6/1/05	7/27/05
Pulaski County				
*	Ingles Ferry Inn	Radford South	5/13/69	11/25/69
	Back Creek Farm	Staffordsville	2/18/75	5/21/75
	Daltron Theatre Building	Pulaski	11/15/77	5/7/79
	Newbern Historic District	Dublin	2/18/75	6/4/79
*	Pulaski County Courthouse	Pulaski	9/15/81	7/8/82
	Pulaski Historic Commercial District	Pulaski	12/17/85	3/13/86
	Snowville Historic District	Radford South	12/17/85	1/7/87
	Snowville Christian Church	Radford South	12/9/86	4/2/87
	Pulaski Historic Residential District	Pulaski	2/16/88	8/11/88
	Hoge House	Staffordsville	4/19/88	8/25/88
	Belle-Hampton	Staffordsville	4/18/89	11/13/89
	Pulaski South Historic Residential and Industrial District	Pulaski	8/21/91	10/29/91
	Dublin Historic District	Dublin	6/17/92	10/15/92
	Fairview District Home	Dublin	7/2/97	8/29/97
*	Calfee Athletic Field	Pulaski	9/13/00	11/22/00
	Spring Dale (44PU20)	Staffordsville	6/18/03	10/23/03
	New Dublin Presbyterian Church	Dublin	9/8/04	11/27/04
	Rockwood	Dublin	3/16/05	5/26/05
*	Haven Howe House at Claytor Lake State Park	Radford South	6/5/05	Pending
Sites Delisted as of June 2005:		**Status**	**Date**	
	North Fork – Roanoke River Bridge, Montgomery County	Bridge Removed	95-96	
	Harrison-Hancock Building, Montgomery County	Demolished for parking lot	95-96	
	Montgomery While Sulphur Spring Cottage, Montgomery County	Demolished	95-96	
	Murdock Farm, Montgomery County	Demolished and Delisted	3/19/01	
	Harvey House, Pulaski County	Demolished	No date	

* Indicates a popular, frequently visited site.

Source: National Register of Historic Places: Virginia Landmarks Register. Online. Available: http://www.dhr.virginia.gov/registers/RegisterMasterList. 22 June 2006.

Unusual Geologic Formations or Special Soil Types – 9 VAC 25-780-90B.5

Karst Resources

The New River Valley's most distinct geologic attribute is karst. The New River is based on metamorphic and igneous rocks and has sedimentary bedrock consisting of sandstone, shale, and carbonate rock. The sandstone forms ridges, as it is well cemented and resistant to

weathering. Shale and carbonate rock, which are more soft and soluble, underlie the valleys. Carbonate rocks weather easily by dissolution, and thus form karst.

Precipitation that does not saturate, erode, or evaporate enters the underlying soil and rock and becomes groundwater. In karst, groundwater moves relatively quickly through interconnected channels in the bedrock. Weakly acidic ground water dissolves such bedrock. The resulting features of karst include caves, sinking streams, sinkholes, karst springs, and a lack of surface streams. Sinking streams disappear into bedrock holes and flow underground, while karst springs produce large volumes of mineral-rich water.

Calcium-rich water seeping from karst springs can create small wetlands that provide habitat to rare plant species. The karst region of the New River watershed hosts 19 of Virginia's rare natural communities, as designated by the Department of Conservation and Recreation's Natural Heritage Program (refer back to Table 47). Caves are distributed throughout the region and at least 31 rare species have been identified within these caves. Cave organisms include bats, the Alleghany Wood Rat and dozens of specialized, cave-dwelling invertebrates. Aquatic cave species populations are sensitive to groundwater contamination, thereby providing scientists with an indicator to detect potentialgroundwater contamination.

The close connection between surface water and ground water in karst easily allows for contamination. In most non-karst settings, surface water more slowly infiltrates to groundwater ground, allowing time for some filtration of contaminants in the water. In karst, however, empty spaces and channels allow surface water to enter groundwater quickly, often without enough time for filtration or chemical breakdown. As a result, surface events largely determine the nature and proportions of contaminants that reach aquifers in karst areas.

Source: DCR Karst Program. Available at:
http://www.dcr.virginia.gov/natural_heritage/documents/NewRiver2008.pdf.

Mountain Lake

Another unusual geologic formation in the area is Mountain Lake, one of only two natural lakes in Virginia. Located on Salt Pond Mountain, approximately six miles northeast of the Town of Pembroke in Giles County, Mountain Lake naturally drains and refills. The basin includes four different rock substrates and their fault lines. This formation allows water to flow in and out, often at astounding rates. Sediments indicate that water flowed in the lake eight to ten thousand years ago, yet water did not start accumulating to create the lake until six thousand years ago, according to the Natural Heritage Resources Fact Sheet. At that time, earthquakes caused rocks at the north end of the lake to slide down the mountaintop, creating a semi-permeable dam. As a result of this unique water flow and the lake's spring and groundwater sources, the lake's level depends on seasonal rainfall patterns. The history and structure of the lake make it one of the area's most unique geologic formations.

Soils in the New River Valley

Soils are another defining geologic feature of the area. The Natural Resources Conservation Service (NRCS), under the U.S. Department of Agriculture (USDA), has published

detailed soil surveys for all the counties in the NRV. NRCS Soil scientists developed the surveys based on slope grade, length, shape, drainage patterns, native plant types, and rock types. NRCS has consequently created an online database, the Web Soil Survey, with detailed soils information and maps (http://websoilsurvey.nrcs.usda.gov/app/).

Along with climate, physiographic provinces, which include surface topography, elevation, and other major land features, influence the kinds of soils found in an area. Montgomery County is located in the Blue Ridge and Ridge and Valley physiographic provinces. Pulaski County is located in both the Southern Appalachian Ridge and Valley and the Blue Ridge. Giles County lies solely within the Southern Appalachian Ridge and Valley. Floyd County is in the Blue Ridge Province.

In Pulaski County, the soils' depth to bedrock and slope, respectively, limit crop cultivation and community development. Generally, area soil scientists contend that county soils are best suited for woodland, according to the Pulaski County Soil Survey. Eleven soil types dominate the county, all moderately deep to deep with a 20 to 60 inch depth to bedrock. The following soils are commonly found in Pulaski County:

- Nolichucky-Berks
- Berks-Gilpin
- Leck Kill-Rayne-Gilpin
- Klinesville-Berks
- Rayne-Berks-Klinesville-Groseclose
- Lily-Ramsey-Berks-Gilpin
- Groseclose-Poplimento-Frederick
- Carbo-Lowell-Groseclose
- Cotaco-Dunning-Groseclose
- Braddock/Braddock-Wheeling

*Further information on these soil types for any county can be found in the county's Soil Survey on the NRCS Web Soil Survey website previously mentioned.

In Giles County, stony surfaces, strong slopes, and deep bedrocks limit farming. The majority of the county is wooded. Eight major soil units, all found on strongly sloping or very steep topography, cover Giles. The following soils are commonly found in Giles County:

- Gilpin-Lehew-Wallen
- Jefferson Variant-Drall
- Gilpin-Berks
- Lily-Bailegap-Jefferson
- Nolichucky-Frederick-Carbo
- Braddock
- Faywood-Poplimento-Sequoia
- Frederick-Carbo

Montgomery County and the City of Radford cover 400 square miles of the New River Valley. The area is characterized by shallow to moderately deep drainage ways and gently sloping ridges surrounded by long side slopes. Most of the area is wooded and timber production potential is high. As noted above, karst bedrock is also abundant in this part of the Ridge and Valley province, characterized by sinkholes and limestone caves. The seven major

soils in the area are typically well-drained and deep with clay and loam sub soils. The following soils are commonly found in Montgomery County:

- Groseclose-Poplimento-Duffield
- Caneyville-Opequon-Rock outcrop
- Berks-Groseclose-Lowell
- Berks-Lowell-Rayne
- Berks-Weikert
- Glenelg-Parker
- Unison-Braddock

Floyd County differs from the rest of the region, as it is a headwater county in the Blue Ridge province, and rain water that lands in Floyd County runs out to a larger watershed. However, Floyd's soils share some characteristics to those of the rest of the New River Valley. Region soils are residual colluvial or alluvial with depths of six to 50 feet. Shallow to moderately deep clay and limestone are typical, along with karst. The residual soils in the region were derived from various types of gneiss, schist, sandstone, shale, or limestone.

Geology and Ground Water

Ground water supplies are divided into northwestern and southeastern sections according to the subsurface configuration and composition of the bedrock. Floyd County lacks true aquifers; it relies instead on water-filled fractures. The northwestern section is underlain by granite and granite gneiss that in most places have weathered to a sandy, granular soil 75-100 feet in depth. Historically, wells terminating in this weathered zone or in the first 100 feet of bedrock yielded approximately 15 gallons per minute. Increases in yield from depths greater than 200 feet are unlikely unless water-filled fractures are penetrated.

The southeastern section is underlain by gneisses and schists that are generally weathered to depths of 25-50 feet. Historically, wells terminating in this zone and the upper 75 feet of bedrock averaged about 11 gallons per minute in yield. Small increases were sometimes encountered at depths between 100 and 200 feet; however, unless water-filled openings were penetrated, significant increases are unlikely. A narrow zone of granitic bedrock bisects this section in a northeasterly direction and is weathered to a depth of less than 25 feet. Historically, wells no greater than 75 feet deep in this 1 to 3 mile-wide area yielded an average of approximately 7 gallons per minute, but below that depth the granite has been virtually non-productive.

Recently, significant numbers of wells and springs have been drying up in Floyd County. Health department records from the past couple of years revealed that more than 40% of well applications have been for wells to replace dried up wells or springs. New well-depths of 600 to 800 feet are not uncommon. Also, though Floyd County accounts for only one-third of all well permits in the New River Valley, it accounted for two-thirds of all replacement well permits. The prolonged drought, increased development, and Floyd County's geology are believed to be responsible.

The capacities of Floyd County's water fissures and their recharge rate have not yet been determined. Preliminary research was conducted in 2001 by Tom Burbey, Ph.D. and his graduate students from Virginia Tech on a farm in Floyd County in the Check area. Following a 6-day draw-down on a deep (800 ft.) well, the water level dropped 13 meters. The water level regained 10 meters fairly easily, but 6 months later, the water level still has not regained the 13 meters. Though additional research is essential, it appears that new policies may be needed, which recognize the inevitability of drought and provide for ample water supply in the short- and long-terms.

Sources: Natural Heritage Resources Fact Sheet: Karst Resources of the New River Watershed; http://www.mountainlakehotel.com/history.htm; Soil Survey of Giles; Soil Survey of Pulaski; Soil Survey of Montgomery; New River Basin Land and Water Resources Study For Hydrologic Units

Wetlands – 9 VAC 25-780-90B.6

The U.S. Fish and Wildlife Service (FWS) formally defines wetlands as, "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water." To identify, inventory and monitor such lands, the National Wetlands Inventory (NWI) program was established in the 1970's. The program produces wetland maps with supplemental Geographic Information Systems (GIS) data on the location, type, and attributes of wetlands in every state. The program also monitors wetland trends to inform the public on how wetlands are changing in response to natural activity such as fire and rising sea levels, along with human development such as agriculture and urban development.

NWI identifies wetlands by jurisdiction by considering vegetation, soil characteristics, and hydrology. To locate wetlands data for the New River Valley, a search was conducted of the U.S. FWS NWI 24,000 quad map data set. Wetlands in the NRV total 37,455 acres over 29 quad sheets. The Radford South quad has the largest wetland area, totaling 9770 acres. McDonalds Mill has the smallest wetland area at 12 acres. The average wetland acreage in a given New River Valley jurisdiction is approximately 1334 acres (see Table 53).

Source: U.S. Fish and Wildlife Service, National Wetlands Inventory, Northeast Region Ecological Services: http://www.fws.gov/northeast/Wetlands/

Figure 4. Wetlands in the NRV

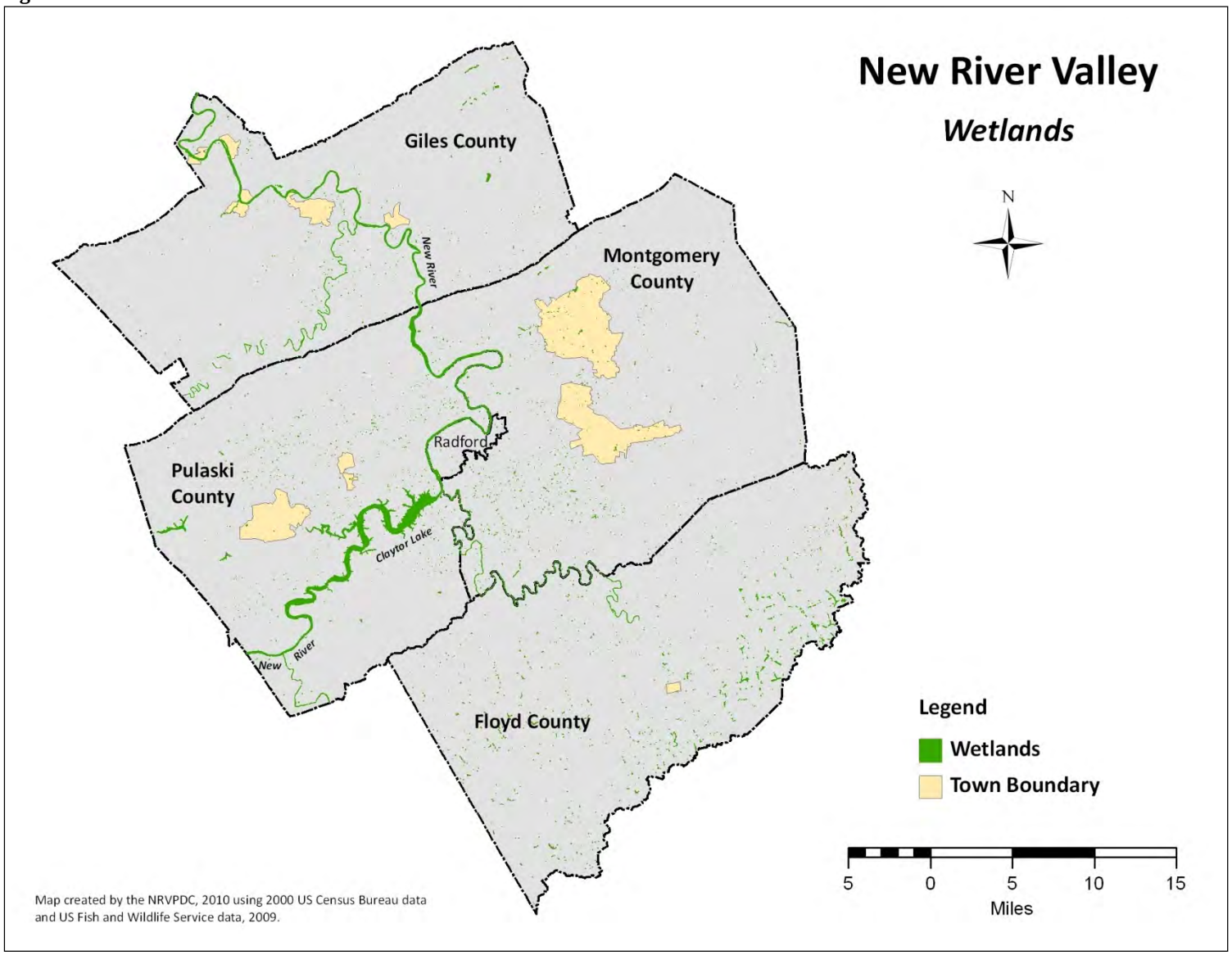


Table 53. National Wetlands Inventory of the NRV (as of 2006)

Locality USGS Quad Map	**Total Acres of Wetlands**
Floyd County	
Alum Ridge	399.87
Check	91.72
Floyd	400.31
Indian Valley	390.55
Meadows of Dan	230.87
Willis	96.17
Giles County	
Eggleston	4,792.4
Narrows	4,767.12
Newport	48.43
Pearisburg	4,991.9
McDonald's Mill	11.72
White Gate	335.52
Staffordsville	277.67
Montgomery County	
Blacksburg	57.22
Elliston	279.65
Ironto	26.97
Pilot	19.2
Riner	410.42
Pulaski County	
Dublin	4,395.24
Pulaski	241.36
City of Radford	
Radford North	4,781.91
Radford South	9,768.73
Others	
Callaway	84.0
Catawba	19.98
Glenvar	190.9
Interior	78.2
Looney	128.85
Mechanicsburg	33.7
Total Acres of Wetlands in the New River Valley	**37,350.58**

Source: U.S. Fish and Wildlife Service. National Wetlands Inventory. http://www.fws.gov/northeast/Wetlands/. Online. Available: 23 June 2006.

Riparian Buffers and Conservation Easements – 9 VAC 25-780-90B7

The Natural Resources Conservation Service (NRCS) and the Virginia Association of Soil and Water Conservation Districts offer several cost-share programs to farmers and landowners to protect their surrounding waterways and to employ best management practices (BMPs), such as the installation of riparian, or streamside, vegetative buffers on their land. NRCS manages the Conservation Reserve Enhancement Program (CREP) that supports landowners creating buffers along their streams and providing alternative watering systems to livestock as needed. In addition, Virginia Soil and Water Conservation Districts facilitate the

State Best Management Practices Program, which has program options for landowners to create riparian buffers. Each agency keeps an online database of total buffer acres, classified by project and county. Table 54 lists this information for each county in the NRV.

Pulaski County has a total of six CREP contracts covering over 200 acres and another eight acres in BMP buffers. Floyd County has 120 acres of buffers in 13 CREP contracts while there is no participation in the State BMP program. Giles County has less than one acre under one CREP contract, and 63 buffer acres under two BMP contracts. Montgomery County has nine CREP participants buffering 135 acres of land. The county also has one participant in the BMP program, which secures 158 acres. As a result of the CREP and BMP programs, there are over 700 acres of riparian buffer zones in the New River Valley (see Table 54).

Conservation easements are another popular tool utilized by area landowners to conserve and preserve their land. The New River Land Trust (NRLT) facilitates the contract process in the New River Basin while the Virginia Outdoors Foundation (VOF) retains the easements throughout the state. A significant amount of easements include miles of river frontage and stream banks, therefore providing significant buffer areas.

VOF publishes and updates a listing of easements held by county, acres covered, and year contracted. In 2005, Floyd County placed nine easements totaling more than 1000 acres. Giles County put nearly 1000 acres into contract under three easements. Montgomery County secured almost 1200 acres in conservation through nine easements. Pulaski County had two easements totaling over 160 acres (see Table 55).

Table 54. CREP and BMP Buffer Areas in the New River Valley (as of 2006)

Locality **Units of Extent**	**Virginia Hydrologic Unit**	**Acres Benefitted**
Floyd County		
Acres	N19	1.6
Acres	N19	1.8
Acres	N19	4.3
Acres	N20	3.1
Acres	N19	21.5
Acres	N19	1.8
Acres	N21	2.5
Acres	N21	35.0
Acres	N19	3.0
Acres	N20	4.0
Acres	N20	2.3
Acres	N20	4.6
Acres	N21	35.0
Total CREP Buffer Acreage		*120.5*
Giles County		
Acres	N25	0.8
Total CREP Buffer Acreage		*0.8*
Linear Feet	N25	3.0
Linear Feet	N25	60.0
Total BMP Buffer Acreage		63.0
Montgomery County		
Acres	N21	2.6

Locality Units of Extent	Virginia Hydrologic Unit	Acres Benefitted
Acres	N21	2.6
Acres	N22	23.7
Acres	N22	34.8
Acres	L02	19.6
Acres	N22	4.4
Acres	N21	4.0
Acres	N21	7.7
Acres	N22	36.2
Total CREP Buffer Acreage		*135.6*
Linear Feet	N21	158.0
Total BMP Buffer Acreage		*158.0*
Pulaski		
Acres	N22	3.6
Acres	N17	34.7
Acres	N17	0.2
Acres	N17	6.0
Acres	N18	3.7
Acres	N22	169.0
Total CREP Buffer Acreage		*217.2*
Linear Feet	N22	3.0
Linear Feet	N16	5.0
Total BMP Buffer Acreage		*8.0*
Total CREP Buffer Acreage		***703.1***

Sources: CREP Database Query, http://192.206.31.52/cfprog/dswc/crepprm.cfm.
Agricultural BMP Database Query, http://192.206.31.52/cfprog/dswc/bmpprm.cfm
Accessed 18 Jul 2006.

Table 55. VOF Easements & Acreage Total by Virginia County (for 2005)

County	Easement Projects	Acreage
Floyd	*9*	*1,047*
Giles	*3*	*988*
Montgomery	*9*	*1,175*
Pulaski	*2*	*163*
Albemarle	27	7,201
Alleghany	1	603
Amelia	1	149
Amherst	1	103
Augusta	10	1,393
Bath	4	977
Bedford	6	1,191
Botetourt	1	230
Campbell	2	395
Carroll	1	73
Charlotte	1	0
Chesapeake (City)	1	80
Clarke	7	1,012
Culpeper	5	1,104
Fauquier	20	4,091
Franklin	1	127
Grayson	7	740
Greene	3	393

County	Easement Projects	Acreage
Highland	1	125
Lee*	1	300
Loudoun	8	2,276
Louisa	6	1,776
Lynchburg (City)*	1	39
Madison	7	804
Nelson	2	169
Northumberland	2	164
Orange	13	2,109
Page	2	308
Rappahannock	22	2,683
Roanoke	3	244
Rockbridge	17	1,922
Rockingham	2	201
Scott	1	67
Shenandoah	7	617
Smyth*	2	671
Tazewell*	1	239
Warren	4	489
Westmoreland	4	1,674
Wythe	4	749
Total	**232**	**40,861**

* Denotes a locality with its first VOF easement.

Table 56. VOF Easement & Acreage Totals by Year for Virginia

Year	Easement Projects	Acreage
1968	5	385
1969	1	59
1973	1	150
1974	13	2,138
1975	12	1,513
1976	20	1,675
1977	23	4,689
1978	23	4,655
1979	32	5,241
1980	23	5,713
1981	1	215
1982	7	983
1983	1	305
1984	6	2,362
1985	4	2,331
1986	17	3,596
1987	16	2,471
1988	46	9,211
1989	50	10,273
1990	64	13,072
1991	50	8,186
1992	25	2,936
1993	30	4,884
1994	43	5,392
1995	37	5,453
1996	34	5,712

Year	Easement Projects	Acreage
1997	45	7,673
1998	75	13,529
1999	60	11,419
2000	188	28,726
2001	155	22,707
2002	211	36,976
2003	131	22,667
2004	203	41,587
2005	*233*	*41,004*
Total	**3,186**	**556,176**

Source: Virginia Outdoors Foundation. Online. Available: http://www.virginiaoutdoorsfoundation.org. 22 June 2006.

Land Use and Land Coverage – 9 VAC 25-780-90B.8

According to the 2004 New River Valley Regional Data Book (published by the New River Valley Planning District Commission; Available at: http://www.nrvpdc.org/08Databook/08DataBook.html), the New River Valley primarily consists of forest, agriculture, and urban land uses. Forests are concentrated along ridges and slopes, making up 58 percent of the region. Agricultural land covers 37 percent of the region, consisting primarily of crop, pasture, and orchard land. The remaining four percent of the area consists of urban and residential land uses. The percent of impervious cover varies by land use, with urban and residential land uses having the highest percentage of these types of surfaces. Impervious surfaces in residential areas can range from 12% in 2-acre subdivisions to 65% in 1/8-acre subdivisions[1]. Other urban land uses include industrial at 72% imperviousness, commercial and business at 85% imperviousness, and shopping centers with 95% impervious cover.

Urban and residential land uses are concentrated in or around the 10 towns and one city in the region[2]. As a result of the decennial census in 2000, Blacksburg, Christiansburg, and Radford were deemed a Metropolitan Statistical Area (MSA). To become a MSA there must be a core population of at least 50,000 with a surrounding population of 100,000. The Blacksburg/Christiansburg area serves as the MSA core while Radford and Montgomery County serve as surrounding/supporting population. The MSA designation is used by federal statistical agencies in collecting, tabulating, and publishing Federal statistics.

The majority of new development is expected to occur in areas outside the 10 towns. Areas such as Riner in Montgomery County, Eastern Giles County, Fairlawn in Pulaski County and Routes 8/221 in Floyd County will all have residential development and many of these could be underserved by public water systems. The bulk of industrial development across the region will occur in areas designated as industrial parks. Because of the conscientious development process involving industrial parks, threats to water quality are not evident.

[1] From Ferguson, B. 2005. Porous Pavements. Boca Raton, FL; Lewis Publishers. As cited in Frazer, L. 2005. "Paving Paradise: The Peril of Impervious Surfaces" *Environmental Health Perspectives*, Vol. 113, No. 7.

[2] The following land use information paragraphs were contributed by Kevin Byrd, Regional Planner, New River Valley Planning District Commission, in August of 2006

Additional residential growth should be encouraged at higher densities to protect water quality. While higher density residential development increases impervious cover per site, less land is converted from a natural state to accommodate the same number of homes. With the population contained in a smaller overall area, the percent of impervious cover throughout the watershed is decreased with higher density. This compact development pattern leaves more natural land available to perform natural stormwater management[3].

Across the region source water quality does not appear to be a significant concern due to rural development patterns. The Town of Pulaski recently sold the land surrounding Hogan's Lake. Depending upon the type of development, this water source could be threatened, although highly unlikely due to the amount of recharge area surrounding the lake that the Town retained in their ownership.

Sources: Natural Heritage Resources Fact Sheet: Karst Resources of the New River Watershed; New River Valley Regional Data Book, 2004.

Impaired Streams and the Type of Impairment – 9 VAC 52-780-90B.9

The Virginia Department of Environmental Quality publishes a listing of impaired streams categorized by county, basin, and type of impairment. The 2006 impaired waters report from DEQ cites 46 stretches of impaired waters in the New River Basin area of Floyd, Giles, Montgomery, and Pulaski counties, and the City of Radford (see Table 57). In Giles County, there are seven water segments with impairments, mostly from bacteria. Seven water segments in Floyd County are impaired because they do not meet the state standards for acceptable water temperature or bacteria**.** Montgomery County has six impaired streams mainly from bacteria. There are seven impaired waterways in Pulaski County with conditions ranging from contaminations in fish tissue from PCBs to bacteria. Radford City is home to two stretches of impaired streams, one with PCBs in fish tissue and the other with bacteria. In some cases, different segments of the same waterway have different impairments in different counties, such as the New River in Giles, Montgomery, Pulaski, and Radford. See Table 57 and Figure 5 (below) for locations of impairments and details about the water quality violation.

Table 57. 2006 Impaired Waters Fact Sheet for the New River Watershed

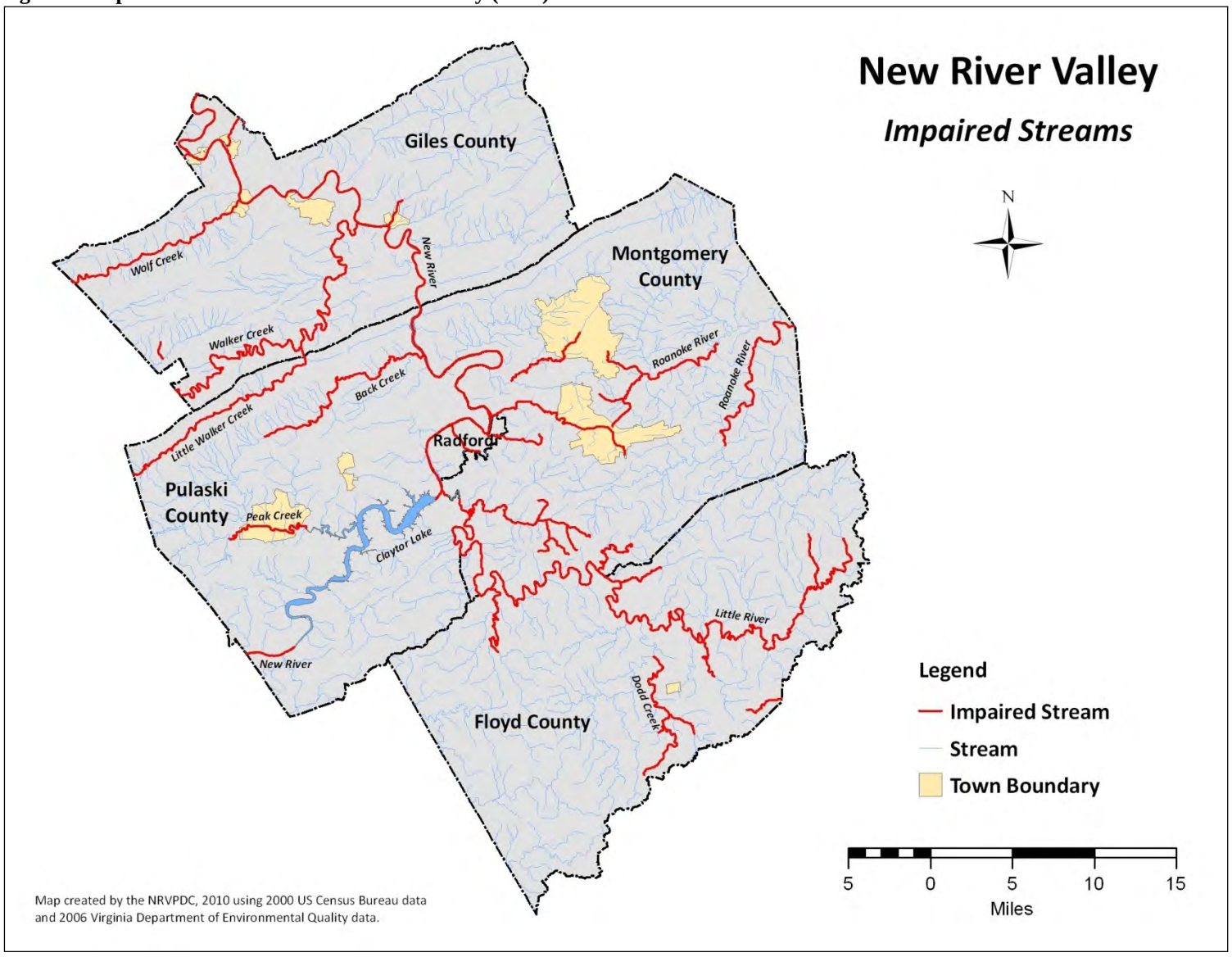
Stream Name	County	Impairment
Big Indian Creek Lower	Floyd	Water Temperature
West Fork Dodd Creek	Floyd	Fecal Coliform*
		Water Temperature
Laurel Creek	Floyd	Fecal Coliform
Little River	Floyd	*Escherichia coli**
		Fecal Coliform
		Water Temperature
Meadow Run	Floyd	*Escherichia coli*
Pine Creek	Floyd	*Escherichia coli*
Adair Run	Giles	Fecal Coliform
Kimberling Creek	Giles	Fecal Coliform
Little Stony Creek Lower	Giles	Fecal Coliform

[3] US EPA. 2006. Protecting Water Resources with Higher-Density Development. Washington, DC. EPA 231-R-06-001. Available at www.epa.gov/smartgrowth.

Stream Name	County	Impairment
New River	Giles	DDE
		DDT
		Heptachlor epoxide
		Escherichia coli
		PCB in fish tissue
Rich Creek	Giles	Fecal Coliform
Walker Creek	Giles	*Escherichia coli*
		Fecal Coliform
Wolf Creek	Giles	*Escherichia coli*
		Fecal Coliform
Brush Creek	Montgomery	Fecal Coliform
New River	Montgomery	PCB in fish tissue
Meadow Creek	Montgomery	Fecal Coliform
Plum Creek	Montgomery	Fecal Coliform
Little River	Montgomery	Fecal Coliform
Stroubles Creek	Montgomery	Benthic-Macroinvertebrate Bioassessments
		Escherichia coli
Claytor Lake-New River	Pulaski	pH level
Claytor Lake-Peak Creek Upper	Pulaski	*Escherichia coli*
Little Walker Creek Lower	Pulaski	*Escherichia coli*
Claytor Lake	Pulaski	PCB in fish tissue
New River Claytor Dam	Pulaski	PCB in fish tissue
New River	Pulaski	PCB in fish tissue
		Escherichia coli
		Benthic-Macroinvertebrate Bioassessments
		Fecal Coliform
Peak Creek	Pulaski	PCB in fish tissue
		Escherichia coli
		Benthic-Macroinvertebrate Bioassessments
		Copper
		Zinc
Connellys Run	Radford (City)	Fecal Coliform
New River	Radford (City)	PCB in fish tissue

Source: Virginia Department of Environmental Quality. Online. Available: http://www.deq.virginia.gov/wqa/pdf/2004ir/irch33ay04.pdf. 1 June 2006.

Figure 5. Impaired Streams of the New River Valley (2006)



Locations of Point Source Dischargers – 9 VAC 25-780-90B.10

The Environmental Protection Agency delegates the issuance of permits for municipal or commercial point source dischargers to individual states, in this case the Virginia Department of Environmental Quality. The permits are issued under the Virginia Pollution Discharge Elimination System (VPDES), Virginia's versions of the National Pollutant Discharge Elimination Systems, mandated by regulations implementing the federal Clean Water Act. The U.S. EPA has ultimate oversight over the state program. Permits are issued for five years, at which time they must be reviewed and reissued. EPA maintains an online database with the name, location, permit date, and facility description of each discharger.

Table 58 includes the discharge permit holders in the New River Valley jurisdictions. In Floyd County, the Town of Floyd Sewage Treatment Plant is permitted to discharge until 2008. In Giles County there are 10 permitted dischargers with facilities ranging from sewage systems to electrical services. Nine point source dischargers hold EPA permits in Montgomery County; sewage systems hold the majority of these permits, with other uses including vehicle parts and explosives. Pulaski County has five permitted dischargers, most of which are water or sewer plants. The City of Radford has five point source dischargers, with two commercial and two government facilities (see Table 58).

Most of the stream intakes from the New River are above the discharges listed in this section. There may be several intakes downstream from discharges, but either one or the other is property of localities not a part of this supply plan, and most are separated by at least 5 river miles. Any benefit of the discharges in this region would be realized downstream of the region, in West Virginia.

Table 58. Point Source Dischargers, as Permitted by the EPA (as of 2006)

Locality Facility Name	Address	Issued	Expired	Description
Floyd				
Floyd STP, Town of	Floyd, VA	08/19/03	08/18/08	Sewerage systems
Giles				
American Electric Power Plant Glen Lyn	Route 649 & Route 460 Glen Lyn, VA 24093	07/09/04	07/10/09	Electric services
Celanese Acetate CELCO Plant	3520 Virginia Ave. Narrows, VA 24124	06/27/03	06/27/08	Materials, synthetic resins, and nonvulcanizable elastomers
Chemical Lime Co of Virginia, Inc.-Ripplemead	2309 Big Stony Creek Rd.-Rt 635 Ripplemead, VA 24150	06/24/03	06/23/08	Lime
Giles County Regional Water Treatment Plant	State Route 100 Pearisburg, VA 24134	07/13/04	08/17/09	Water supply
Glen Lyn Town- Sewage Treatment	Rt 460 Glen Lyn, VA 24093	05/11/04	05/12/09	Sewerage systems
Narrows Town- Sewage Treatment	Narrows, VA	06/16/03	06/15/08	Sewerage systems
Pearisburg Town- Sewage Treatment	Rt 680 Pearisburg, VA 24134	04/30/01	04/30/06	Sewerage systems
Pembroke STP	Pembroke, VA	12/29/03	12/28/08	Sewerage systems

Locality Facility Name	Address	Issued	Expired	Description
Rich Creek, Town of	Rich Creek, VA	06/16/03	06/15/08	Sewerage systems
Steven Lawrence	Rt 1 105A Pembroke, VA 24136	05/13/03	05/12/08	Medical laboratories
Montgomery				
Blacksburg Country Club STP	1064 Clubhouse Rd Blacksburg, VA 24060	09/12/03	09/11/08	Physical fitness facilities
Blacksburg VPI Sanitation Authority	5277 Prices Fork Rd Blacksburg, VA 24063	06/04/04	06/06/09	Sewerage systems
Christiansburg, Town of	2557 Crab Creek Rd. Christiansburg, VA	09/26/05	09/25/10	Sewerage systems
Federal Mogul Corporation	300 Industrial park Rd. SE Blacksburg, VA 24060	04/27/04	04/27/09	Motor vehicle parts and accessories
Montgomery County PSA-Elliston	5229 Enterprise Dr Elliston, VA 24087	12/02/03	12/01/03	Sewerage systems
US Army Radford Army Ammunition	State Rt 114 Radford, VA 24141	06/10/05	06/09/10	Explosives
VPI and State University	112 Maintenance Complex Blacksburg, VA 24061	02/26/02	03/12/07	Water supply
Pulaski				
Days Inn- Pulaski	3063 Possum Hollow Rd. Pulaski, VA 24301	05/25/03	05/25/08	Sewerage systems
Magnox Pulaski, Inc.	4 Magnox Dr. Pulaski, VA 24301	05/04/05	07/09/09	Inorganic pigments
Pulaski County PSA WTP	Pulaski, VA	08/27/01	08/30/06	Water supply
Pulaski Water Treatment Plant	Pulaski, VA	11/18/03	11/17/08	Water supply
Virginia Wilbert Vault Co.	Pulaski, VA			Concrete products, except block and brick
Radford (City)				
American Electric Power Clay	Rt 1, Box 300A Snowville Rd Radford, VA 24141	06/23/04	06/22/09	Electric services
Intermet Radford Foundry	1605 First St. Radford, VA 24141	03/28/06	04/02/11	Gray and ductile iron foundries
Peppers Ferry Regional Wastewater Treatment Plant	7797 Mason St. Radford, VA 24143	10/22/04	10/21/09	Sewerage systems
Radford City- Water Treatment	20 Forest St. Radford, VA 24141	09/12/03	09/13/08	Water supply
US Army Radford Army Ammunition Plant	State Rt 114 Radford, VA 24141	06/10/05	06/09/10	Explosives

Source: United States Environmental Protection Agency. Envirofacts Data Warehouse. Online. Available: http://oaspub.epa.gov/enviro/ef_home2.water. 1 June 2006.

Other Potential Threats to Existing Water Quantity and Quality - 9 VAC 25-780-80B.11

During the course of research for the New River Valley Water Supply Plan no other threats to existing water quantity or quality were identified by the planning committee. At the

time this report was written, other potential threats to water quality in the NRV may include, but are not limited to: leaking landfills, leaking underground storage tanks (USTs), agricultural runoff, septic system failures, logging, and junkyards.

PROJECTED WATER DEMAND INFORMATION
***Refer to 9 VAC 25-780-100**

This section consists of projections for future water demand. Estimates are made for populations 30 to 50 years into the future (up to 2050) and the water that will be needed to serve those populations. The projections examine public water providers along with populations served by private sources. This section also contains maps illustrating service areas for the 13 localities.

Population Projections - 9 VAC 25-780-100A

Population projections for the New River Valley Water Supply Plan were completed by Virginia Tech's Institute for Policy and Governance (VT-IPG). The base year data for 1990 and 2000 was obtained from the United States Census. The projections for 2010, 2020, and 2030 were provided by the Virginia Employment Commission (VEC) utilizing the component cohort method. For the years 2040 and 2050, data was not available from the VEC; therefore VT-IPG executed a projection utilizing Crystal Ball's CBpredictor Software combined with a Monte Carlo simulation. This was a probabilistic approach where a range of certainty is given to predicted coefficients.

Table 59 below provides population projections for each locality that provides public water. For Montgomery County, the projection below does not include the towns of Blacksburg and Christiansburg because the towns do not receive water from the county PSA. Floyd County and Giles County have town populations included in the county numbers because the county PSA provides water to town residents. In Pulaski County, the Town of Dublin is included in the county projection because it purchases water from the county PSA while the Town of Pulaski produces their own water and is projected independently.

Table 59. Population Projections for Public Water Providers

County	1990	2000	2010	2020	2030	2040	2050
Floyd Co.	11,965	13,874	15,800	17,200	18,500	19,800	21,099
Giles Co.	16,366	16,657	16,800	17,100	17,400	17,700	18,010
Montgomery Co.*	24,319	27,109	29,436	31,737	34,040	36,341	38,643
Pulaski Co.**	24,511	25,654	24,977	24,830	24,830	25,191	25,191
Pulaski, Town**	9,985	9,472	9,223	9,170	9,170	9,304	9,304
City of Radford	15,940	15,859	15,700	15,700	15,700	15,675	15,650

* Montgomery County does not include Blacksburg/Christiansburg.
**Pulaski County and Town of Pulaski were separated.

One trend that is evident from the table above is the majority of the localities are projected to experience population growth. However, both the City of Radford and the Town of Pulaski are projected to decline slightly over the next several decades. These trends are very dynamic due to numerous variables. For instance, job creation typically results in significant in-migration and that variable is nearly impossible to predict.

Projected Water Demand - 9 VAC 25-780-100B, C, D.1, D.2, D.4, and D.5

Based on current water demand information provided by local PSA billing departments, and on the population projections above, projected water demand information for each PSA follows. Three tables are presented for each county; one describing the populations relying on varying water sources (i.e., PSA, other CWS, self-supplied; Tables 60, 63, 66, 69), one describing the water demands projected for each PSA (Tables 61, 64, 67, 70), and one describing the total water demands from each source (Tables 62, 65, 68, 71).

The tables describing water demand at the PSAs indicate disaggregated water demand by categories of use and the total projected demand for existing water systems. The demand projections do not indicate that the current community systems will reach or exceed capacity, so no new systems are included in this analysis. It is important to note that water loss cannot be calculated accurately utilizing the data in this section. An assumption could be made that the difference between GPD Produced and GPD Sold would yield a water loss figure. However, in every water system there are situations or users that are not billed by the PSA. For instance, when a fire hydrant is accessed the water used is not billed to the Fire Department, rather this is water not sold, illustrating the difference between authorized and unauthorized water losses. The tables are followed by a map illustrating the existing service areas (Figures 6-11).

The tables describing the total water demand presents information on other Community Water Systems (CWS), as well as estimates for self-supplies users (i.e., residential wells). To calculate the grand total water demand, it was assumed that the CWS, other than the PSA have already been built out and are withdrawing their total permitted capacity. It is also assumed that no new CWS will be built in the county, so the projection is linear. To estimate the water demand for self-supplied users, the number of households is multiplied by 230 gallons per day, based on an estimate from the Department of Health of 100 gallons of water used per day per person and 2.3 persons per household.

Commercial and industrial demand in 2000 is based on PSA billing records. The projections for 2010 – 2050 are based on the proportions of the demand in 2000. For example, in 2000 the residential demand in Giles County was ~32% and remained ~32% through 2050, while commercial demand was ~28% for all projection years.

The Town of Pulaski and the City of Radford only have tables describing the projections for their Public Works departments (Tables 72 & 73). The Town of Pulaski serves not only its own residents, but some residents of the county as well. Those county residents have been removed from the county estimates and are included in the Town's projections. The City of Radford has no other CWS and it is assumed that all residents currently and in the future are served by the Public Works department.

Table 60. Floyd County Water User Projections

	1990	2000	2010	2020	2030	2040	2050
Total Population	11,965	13,874	15,800	17,200	18,500	19,800	21,099
Population served by PSA	N/A	1,300	1,480	1,611	1,733	1,855	1,977
Population served by other CWS	N/A	47	47	47	47	47	47
Self-supplied Population	N/A	12,527	14,273	15,542	16,720	17,898	19,075
Self-supplied Households	N/A	5,447	6,226	6,778	7,290	7,802	8,314

Table 61. Floyd-Floyd County PSA Projected Water Demand (GPD)

	1990	2000	2010	2020	2030	2040	2050
GPD Produced	N/A	108,302	123,334	134,261	144,411	154,563	164,702
Residential Demand	N/A	20,158	22,956	24,990	26,879	28,769	30,656
Commercial Demand	N/A	17,918	20,405	22,213	23,892	25,572	27,250
Industrial Demand	N/A	6,719	7,652	8,330	8,960	9,590	10,219
Total Water Demand (daily)	N/A	44,800	51,018	55,538	59,737	63,937	68,131
% Capacity	N/A	36%	41%	45%	48%	52%	55%
Water Loss		4%					

Table 62. Floyd-Floyd County Projected Water Demand

	1990	2000	2010	2020	2030	2040	2050
Water Demand on PSA (MGD)	N/A	0.045	0.051	0.056	0.060	0.064	0.68
Water Demand on other CWS (MGD)	N/A	0.004	0.004	0.004	0.004	0.004	0.004
Water Demand from Self-supplied users (MGD)	N/A	1.25	1.43	1.55	1.67	1.79	1.91
Grand Total Water Demand (MGD)	**N/A**	**1.30**	**1.48**	**1.61**	**1.74**	**1.86**	**1.98**

Figure 6. Existing Floyd-Floyd County Water Lines (2006)

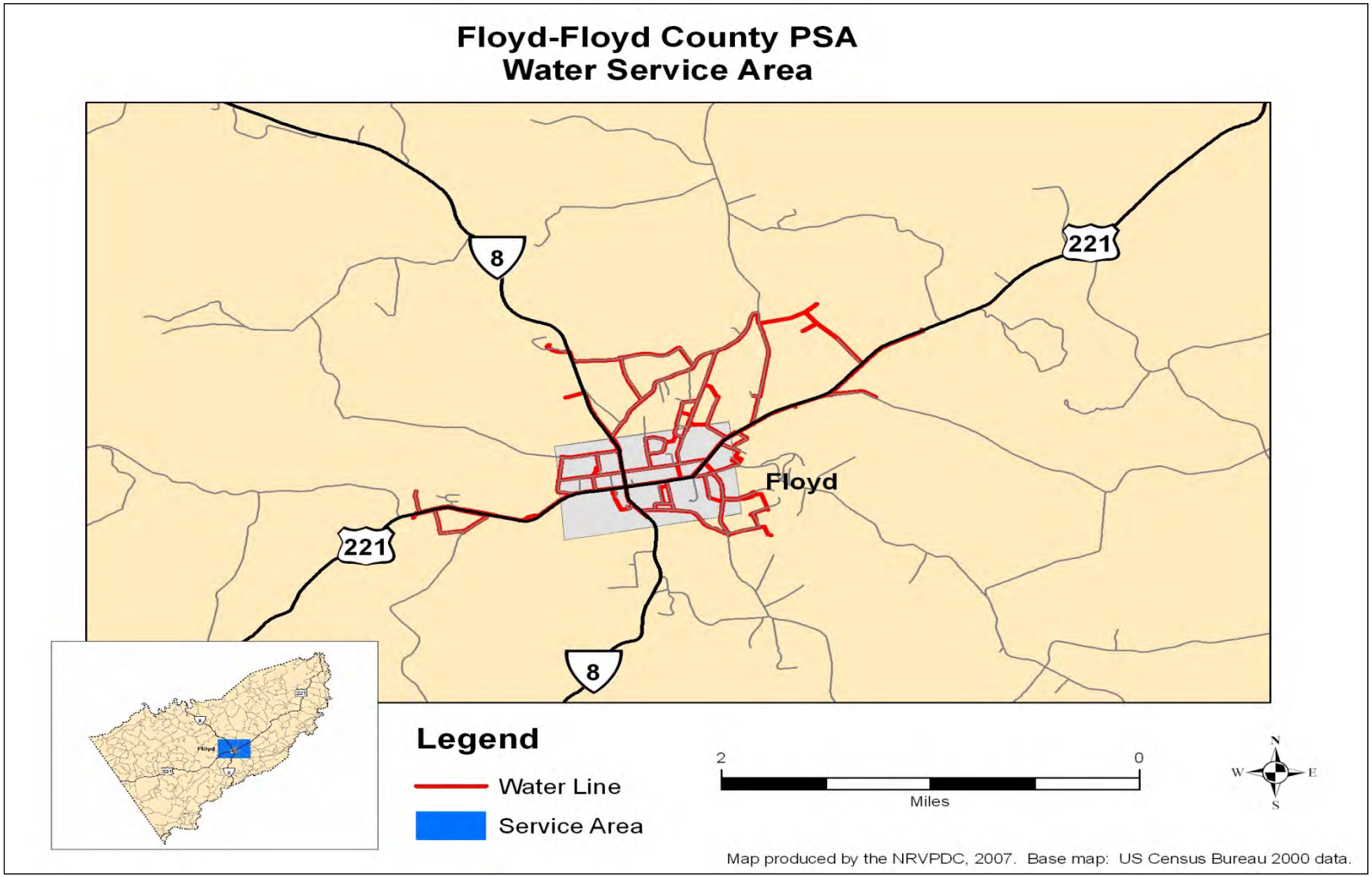


Table 63. Giles County Water User Projections

	1990	2000	2010	2020	2030	2040	2050
Total Population	16,366	16,657	16,800	17,100	17,400	17,700	18,010
Population served by PSA	N/A	8,760	8,835	8,993	9,150	9,307	9,470
Population served by other CWS	N/A	160	160	160	160	160	160
Self-supplied Population	N/A	7,737	7,805	7,947	8,090	8,233	8,380
Self-supplied Households	N/A	3,364	3,393	3,455	3,517	3,580	3,643

Table 64. Giles County PSA Projected Water Demand (GPD)

	1990	2000	2010	2020	2030	2040	2050
GPD Produced	N/A	1,132,692	1,142,433	1,162,883	1,183,233	1,203,585	1,224,648
Residential Demand	N/A	360,499	363,599	370,107	376,584	383,061	389,765
Commercial Demand	N/A	319,098	321,842	327,603	333,336	339,069	345,003
Industrial Demand	N/A	5,902	5,136	5,228	5,319	5,410	5,505
Total Water Demand (daily)	N/A	684,765	690,654	703,017	715,320	727,624	740,357
% Capacity	N/A	57%	57%	58%	59%	60%	61%
Water Loss		20%-50% Depending on locality					

Table 65. Giles County Projected Water Demand

	1990	2000	2010	2020	2030	2040	2050
Water Demand on PSA (MGD)	N/A	0.685	0.691	0.703	0.715	0.728	0.740
Water Demand on other CWS (MGD)	N/A	0.26	0.26	0.26	0.26	0.26	0.26
Water Demand from Self-supplied users (MGD)	N/A	0.774	0.781	0.795	0.809	0.823	0.838
Grand Total Water Demand (MGD)	**N/A**	**1.72**	**1.73**	**1.76**	**1.78**	**1.81**	**1.84**

Figure 7. Existing Giles County Water Lines (2006)

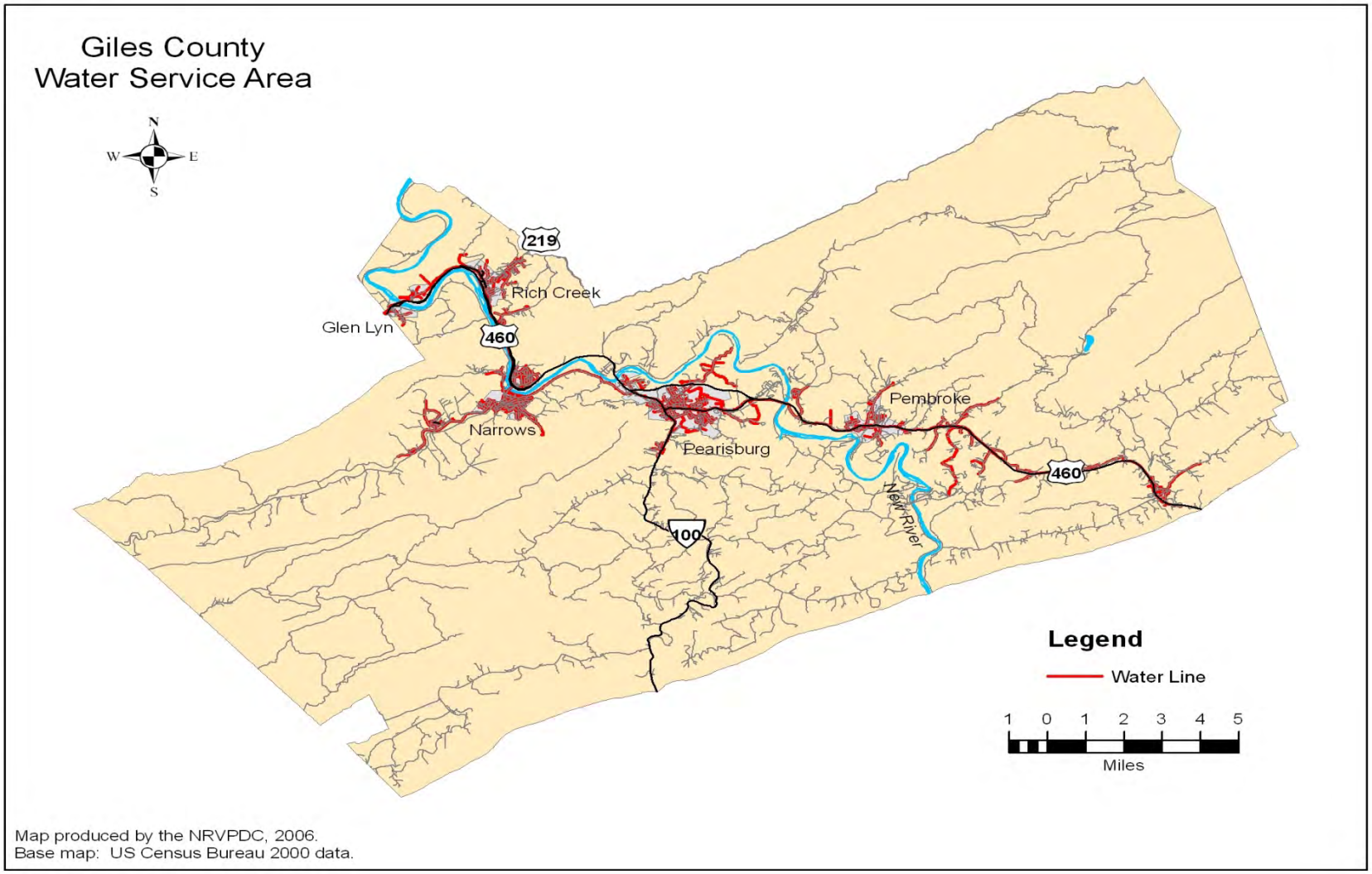


Table 66. Montgomery County Water User Projections

	1990	2000	2010	2020	2030	2040	2050
Total Population	24,319	27,109	29,436	31,737	34,040	36,341	38,643
Population served by PSA	N/A	11,300	12,239	13,196	14,153	15,111	16,069
Population served by other CWS	N/A	2,359	2,359	2,359	2,359	2,359	2,359
Self-supplied Population	N/A	13,450	14,838	16,182	17,528	18,871	20,215
Self-supplied Households	N/A	5,848	6,451	7,036	7,621	8,205	8,789

Table 67. Montgomery County PSA Projected Water Demand (GPD)

	1990	2000	2010	2020	2030	2040	2050
GPD Produced	N/A	825,000	892,657	962,463	1,032,242	1,102,125	1,172,000
Residential Demand	N/A	280,408	303,678	327,426	351,164	374,938	398,709
Commercial Demand	N/A	290,178	314,259	338,834	363,399	388,001	412,600
Industrial Demand*	N/A	0	0	0	0	0	0
Total Water Demand (daily)	N/A	570,586	617,936	666,259	714,563	762,939	811,309
% Capacity	N/A	34%	37%	40%	43%	46%	49%
Water Loss		24%					

* Montgomery County PSA does not break-out industrial users from commercial users.

Table 68. Montgomery County Projected Water Demand

	1990	2000	2010	2020	2030	2040	2050
Water Demand on PSA (MGD)	N/A	0.571	0.618	0.666	0.715	0.763	0.811
Water Demand on other CWS (MGD)	N/A	3.72	3.72	3.72	3.72	3.72	3.72
Water Demand from Self-supplied users (MGD)	N/A	1.345	1.484	1.618	1.753	1.887	2.022
Grand Total Water Demand (MGD)	**N/A**	**5.637**	**5.823**	**6.006**	**6.189**	**6.371**	**6.554**

Figure 8. Existing Montgomery County Water Lines (2006)

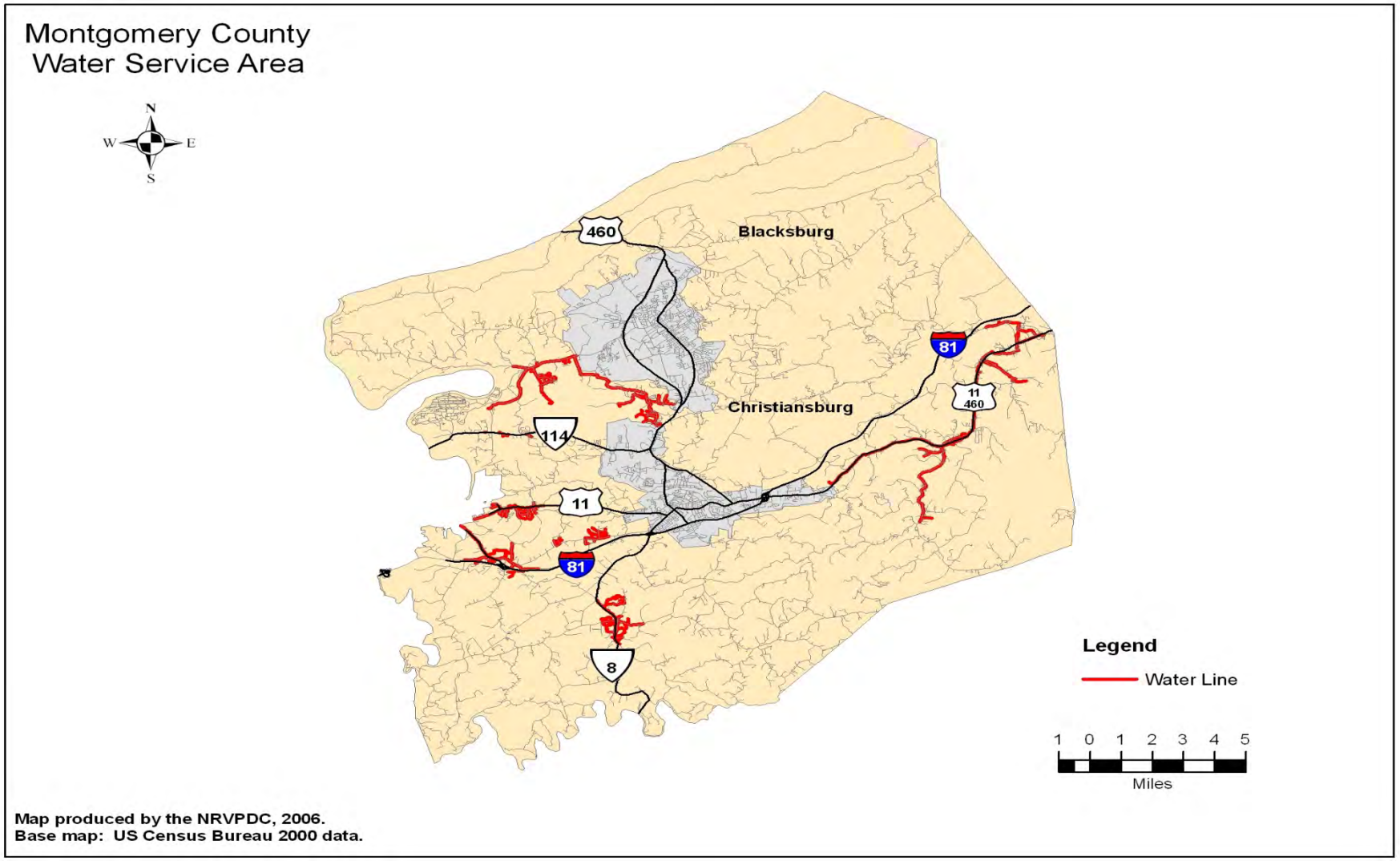


Table 69. Pulaski County Water User Projections

	1990	2000	2010	2020	2030	2040	2050
Total Population	24,511	25,654	24,977	24,830	24,830	25,191	25,191
Population served by PSA	N/A	21,027	20,427	20,353	20,353	20,650	20,650
Population served by Town of Pulaski	N/A	1,857	1,808	1,797	1,797	1,823	1,823
Population served by other CWS	N/A	762	762	762	762	762	762
Self-supplied Population	N/A	2,008	1,980	1,918	1,918	1,956	1,956
Self-supplied Households	N/A	873	861	834	834	850	850

Table 70. Pulaski County PSA Projected Water Demand (GPD)

	1990	2000	2010	2020	2030	2040	2050
GPD Produced	N/A	2,050,000	1,995,880	1,984,304	1,984,304	2,013,275	2,013,275
Residential Demand	N/A	814,537	793,033	788,433	788,433	799,944	799,944
Commercial Demand	N/A	441,396	429,743	427,250	427,250	433,488	433,488
Industrial Demand	N/A	179,751	175,006	173,991	173,991	176,531	176,531
Total Water Demand (daily)	N/A	1,435,684	1,397,782	1,389,675	1,389,675	1,409,964	1,409,964
% Capacity	N/A	61%	60%	59%	59%	60%	60%
Water Loss		3%*- 18%					

* Water loss for the Town of Dublin.

Table 71. Pulaski County Projected Water Demand

	1990	2000	2010	2020	2030	2040	2050
Water Demand on PSA (MGD)	N/A	1.436	1.398	1.390	1.390	1.410	1.410
Water Demand on other CWS (MGD)	N/A	0.087	0.087	0.087	0.087	0.087	0.087
Water Demand from Self-supplied users (MGD)	N/A	0.201	0.198	0.192	0.192	0.196	0.196
Grand Total Water Demand (MGD)*	**N/A**	**1.724**	**1.683**	**1.669**	**1.669**	**1.693**	**1.693**

* Does not include water demand for county residents served by the Town of Pulaski. Projected demand for those residents is included with the Town's projections.

Figure 9. Existing Pulaski County Water Lines (2006)

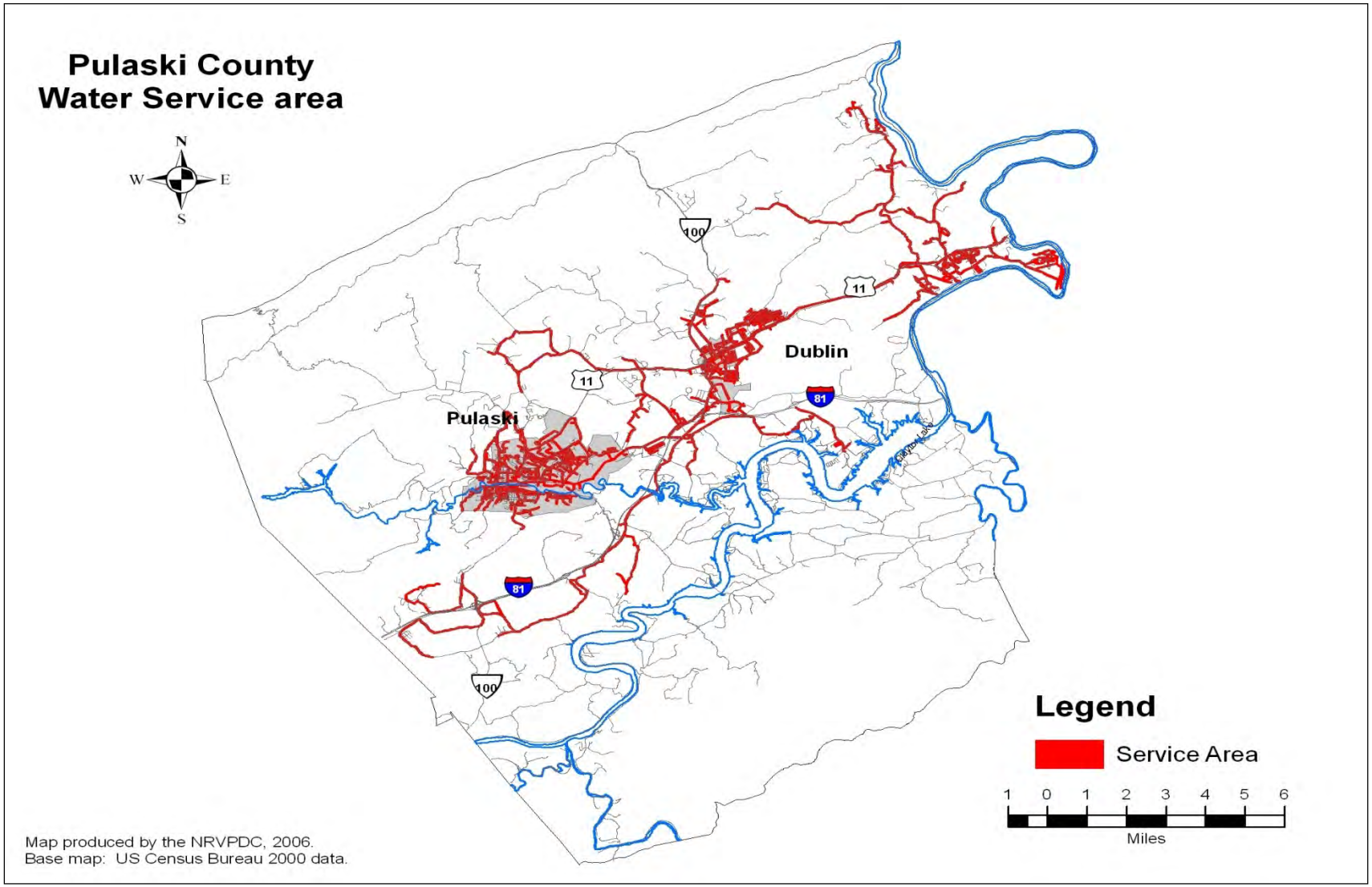


Table 72. Town of Pulaski Projected Water Demand (GPD)

	1990	2000	2010	2020	2030	2040	2050
Population	9,985	9,473	9,223	9,170	9,170	9,304	9,304
Population Served	N/A	11,330	11,031	10,967	10,967	11,127	11,127
GPD Produced	N/A	1,810,000	1,762,216	1,751,995	1,751,995	1,777,574	1,777,574
Residential Demand	N/A	905,255	881,356	876,244	876,244	889,037	889,037
Commercial Demand	N/A	139,270	135,593	134,807	134,807	136,775	136,775
Industrial Demand	N/A	348,175	338,983	337,017	337,017	341,937	341,937
Total Water Demand (daily)	N/A	1,392,700	1,355,933	1,348,069	1,348,069	1,367,751	1,367,751
% Capacity	N/A	45%	44%	44%	44%	44%	44%
Water Loss		25%					

Figure 10. Existing Town of Pulaski Water Lines (2006)

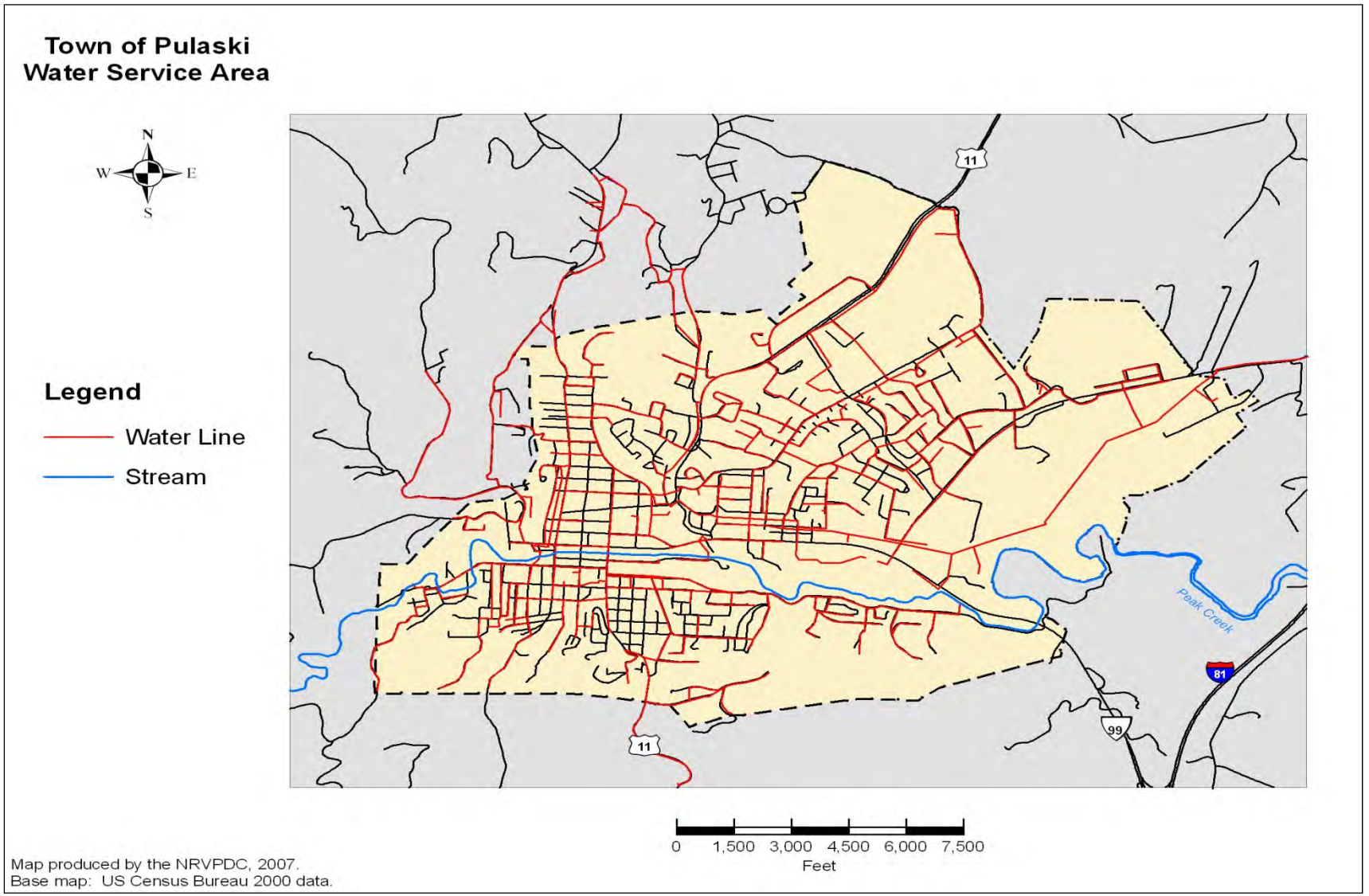
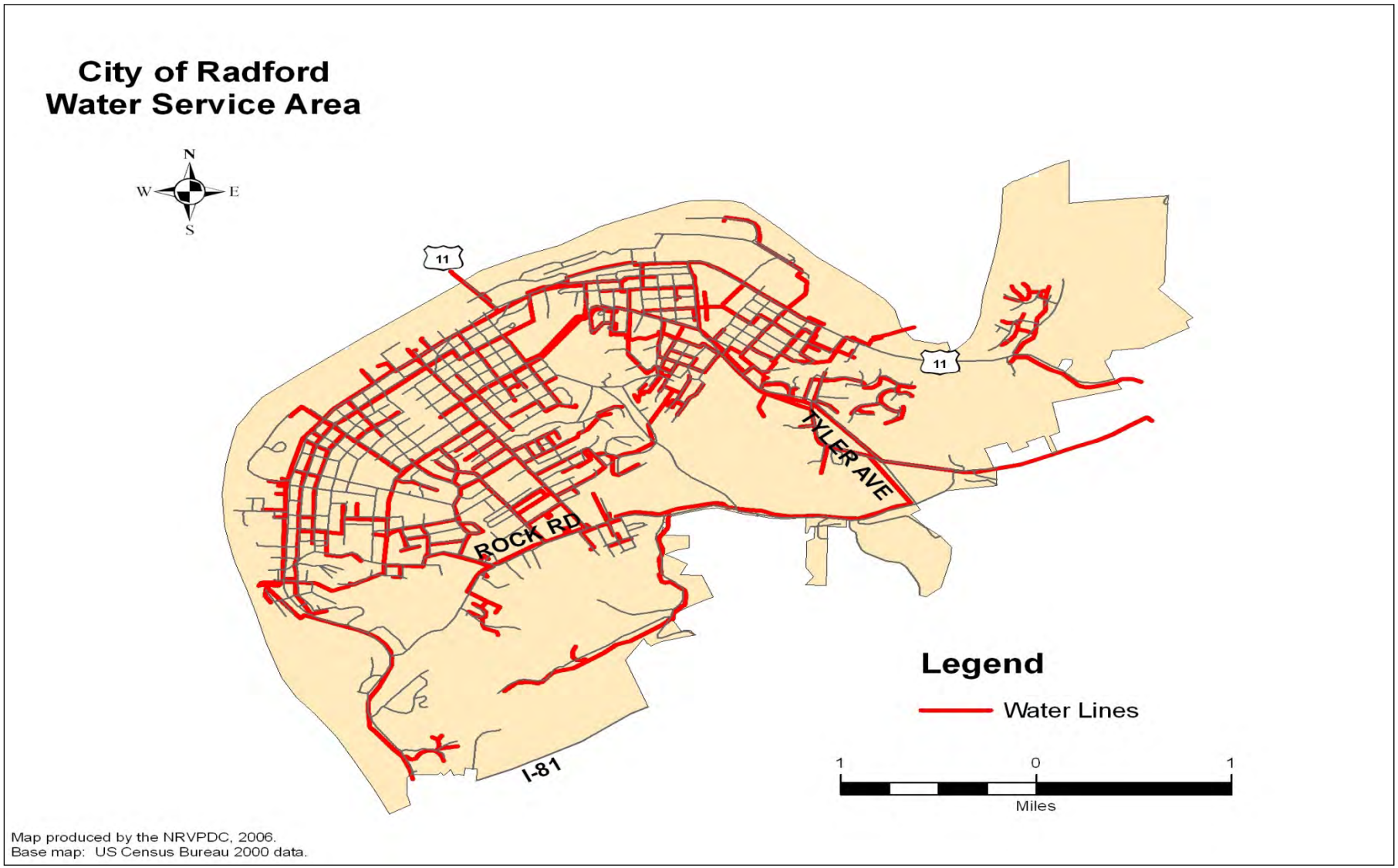


Table 73. City of Radford Projected Water Demand (GPD)

	1990	2000	2010	2020	2030	2040	2050
Population	15,940	15,859	15,700	15,700	15,700	15,675	15,650
Population Served	N/A	15,859	15,700	15,700	15,700	15,675	15,650
GPD Produced	N/A	2,645,458	2,380,903	2,380,903	2,380,903	2,377,094	2,373,291
Residential Demand	N/A	914,333	905,190	905,190	905,190	903,742	902,296
Commercial Demand	N/A	406,762	402,694	402,694	402,694	402,050	401,407
Industrial Demand	N/A	460,621	456,015	456,015	456,015	455,285	454,557
Total Water Demand (daily)	N/A	1,781,911	1,764,092	1,764,092	1,764,092	1,761,269	1,758,451
% Capacity	N/A	33%	30%	30%	30%	30%	30%
Water Loss		15%-20%					

Figure 11. Existing City of Radford Water Lines (2006)



Estimated Water Demand on an Average Monthly and Annual Basis - 9 VAC 25-780-100D.3

Average Monthly and Annual projections were not made in the original analysis, but can be estimated using the above projections for each category of water supplier (municipal, other CWS, self-supplied). Monthly estimates were reached by multiplying the projected daily demand by 30. Annual estimates were reached by multiplying the project daily demand by 365.

At the current time, there are no planned new community systems to be built by the PSAs, nor is it anticipated that any additional CWS will be built. Using these population projections, it does not appear that the demand on current water suppliers will exceed capacity until sometime after 2050.

Table 74. Average Monthly and Annual Demand Projections for PSAs

Water Supplier Water Usage	**2010**	**2020**	**2030**	**2040**	**2050**
Floyd- Floyd County PSA					
Average Monthly (MG)	1.53	1.67	1.79	1.92	2.04
Annual Average (MG)	18.62	20.27	21.80	23.34	24.87
Giles County PSA					
Average Monthly (MG)	20.72	21.09	21.46	21.83	22.21
Annual Average (MG)	252.09	256.60	261.09	265.58	270.23
Montgomery County PSA					
Average Monthly (MG)	18.54	19.99	21.44	22.89	24.34
Annual Average (MG)	225.55	243.18	260.82	278.47	296.13
Pulaski County PSA					
Average Monthly (MG)	41.93	41.69	41.69	42.30	42.30
Annual Average (MG)	510.19	507.23	507.23	514.64	514.64
City of Radford					
Average Monthly (MG)	52.92	52.92	52.92	52.84	52.75
Annual Average (MG)	643.89	643.89	643.89	642.86	641.83
Town of Pulaski					
Average Monthly (MG)	40.68	40.44	40.44	41.03	41.03
Annual Average (MG)	494.92	492.05	492.05	499.23	499.23

Table 75. Average Monthly and Annual Demand Projections for Other Suppliers

County *Water Supplier* Water Usage	**2010**	**2020**	**2030**	**2040**	**2050**
Floyd					
Other CWS					
Average Monthly (MG)	0.113	0.113	0.113	0.113	0.13
Average Annual (MG)	1.374	1.374	1.374	1.374	1.374
Self-supplied					
Average Monthly (MG)	42.819	46.626	50.160	53.694	57.225
Average Annual (MG)	520.965	567.283	610.280	653.277	696.238
Giles					
Other CWS					
Average Monthly (MG)	7.8	7.8	7.8	7.8	7.8
Average Annual (MG)	94.9	94.9	94.9	94.9	94.9
Self-supplied					
Average Monthly (MG)	23.415	23.841	24.270	24.699	25.140

County *Water Supplier* Water Usage	**2010**	**2020**	**2030**	**2040**	**2050**
Average Annual (MG)	284.883	290.066	295.285	300.505	305.870
Montgomery					
Other CWS					
Average Monthly (MG)	111.635	111.635	111.635	111.635	111.635
Average Annual (MG)	1,358.222	1,385.222	1,385.222	1,385.222	1,385.222
Self-supplied					
Average Monthly (MG)	44.514	48.546	52.584	56.613	60.645
Average Annual (MG)	541.587	590.643	639.772	688.792	737.848
Pulaski					
Other CWS					
Average Monthly (MG)	2.624	2.624	2.624	2.624	2.624
Average Annual (MG)	31.929	31.929	31.929	31.929	31.929
Self-supplied					
Average Monthly (MG)	5.94	5.754	5.754	5.868	5.868
Average Annual (MG)	72.27	70.007	70.007	71.394	71.394

Peak day estimates for each type of water supplier were obtained by multiplying the average daily projections by the peaking factor (1.5) previously established. Table 76 below shows the peak day projections in MGD.

Table 76. Peak Day Projections

County *Water Supplier*	**2010**	**2020**	**2030**	**2040**	**2050**
Floyd					
PSA	0.077	0.083	0.090	0.096	0.102
Other CWS	0.0056	0.0056	0.0056	0.0056	0.0056
Self-supplied	2.141	2.331	2.508	2.685	2.861
Giles					
PSA	1.036	1.055	1.073	1.091	1.111
Other CWS	0.39	0.39	0.39	0.39	0.39
Self-supplied	1.171	1.192	1.214	1.235	1.257
Montgomery					
PSA	0.927	0.999	1.072	1.144	1.217
Other CWS	5.582	5.582	5.582	5.582	5.582
Self-supplied	2.226	2.427	2.629	2.831	3.032
Pulaski					
PSA	2.097	2.085	2.085	2.115	2.115
Other CWS	0.131	0.131	0.131	0.131	0.131
Self-supplied	0.297	0.288	0.288	0.293	0.293
Town of Pulaski	2.034	2.022	2.022	2.052	2.052
City of Radford	2.646	2.646	2.646	2.642	2.638

Projection of Water Demand for Existing and Proposed Self-Supplied Nonagricultural Users >300,000 gallons per month - 9 VAC 25-780-100E

Several nonagricultural users have been identified region-wide that utilize an excess of 300,000 gallons of water per month. Data provided by these users reports current usage, but does not project use into the future.

Nonagricultural users in excess of 300,000 gallons per month tend to be industrial users, such as energy production. Current Land Use plans in the region identify areas of industrial growth either in existing industrial parks or areas suitable for such development. In each of the localities, these parks are located within PSA service boundaries to allow for adequate sewage treatment, as well as provide an adequate water source. It is assumed that any future industrial growth proposed outside service boundaries will not be approved by localities for this reason.

Projection of Water Use for Existing and Projected Self-Supplied Agricultural Users >300,000 gallons per month - 9 VAC 25-780-100F

Currently the New River Valley Region does not have Agricultural Land Uses which draw water in excess of 300,000 gallons per month from private wells with the exception of Riverbend Nursery of Floyd County. Data provided from this user reports current usage, but does not project use into the future.

Current Land Use plans for the region show a trend in which larger farm parcels are being broken into smaller farm parcels or even residential lots. This fracturing of agricultural lands is especially evident in the Southern areas of the New River Valley. In addition, with increased demands for housing in Montgomery County, and projected housing demands in Pulaski County, the two largest population areas in the region, it is envisioned that more land development will occur which will further reduce the viability of a large scale production agricultural use.

Projection of Water Use for Existing and Projecting Self-Supplied Nonagricultural and Agricultural Users <300,000 gallons per month - 9 VAC 25-780-100G

The primary small self-supplied users outside community water system boundaries are residences utilizing private wells. Estimates of these users' water demand have been provided in the Projected Water Demand section above. It is assumed that any small community water systems that fall into this category are currently built out and will not be increasing water usage from current levels. These systems and their current capacities are described in Appendix 2.

Small agricultural water use is estimated to fall in coming years. Over the past 5 years, over 25,000 acres of farmland in the region has been lost to development. There is no reason to believe this trend will change.

Information Developed Pursuant to 9 VAC 25-780-140G - 9 VAC 25-780-100H

At this time, no information has been provided by the state via the State Water Resources Plan. When such information is made available to the region, it will be included to facilitate continuous water resources planning efforts.

Explanation of Projected Needs for Domestic Consumption, In-Stream Uses, and Economic Development - 9 VAC 25-780-100I

As indicated in the above population and water demand projections, current water suppliers in the New River Valley will not exceed their current permitted water production capacities until sometime after 2050. It can be assumed that for the foreseeable planning horizon, in-stream uses will not be negatively affected by public water withdrawals.

Domestic consumption and economic development have been accounted for in the disaggregated water demand projections based on proportion of demand in the year 2000. For increased population numbers, it is assumed that residential, commercial and industrial demands will increase proportionally as well.

WATER DEMAND MANAGEMENT
***Refer to 9 VAC 25-780-110**

Conservation Management Review

This conservation management review was conducted by interviews with water providers and during regular committee meetings. The efficient use of water is a primary concern for all water providers in the New River Valley. However, the level of tools and programs utilized to implement efficient water use vary greatly across the region. Some localities have no programs in place while others mail educational materials to their customers as a bill insert.

All public water providers in the New River Valley publish and distribute an annual Consumer Confidence Report (CCR), a regulation established and required by the Environmental Protection Agency, to their customers. The typical CCR contains a brief overview of the public water system to include water source, system mechanics (pumps, etc), and connections beyond their jurisdiction. A technical explanation of terms follows in order for the customer to understand the water quality report. The water quality report informs customers about both the distribution system and the customer tap. In the distribution system Montgomery County reports on four contaminants, microbiological, radioactive, inorganic, and volatile organic compounds. At the tap end they report on microbiological and inorganic contaminants. The CCR is a required document that does not directly address conservation measures, but rather serves as water system education for their customers.

Information Describing More Efficient Water Use Practices - 9 VAC 25-780-110A.1

The efficient use of water is most commonly implemented through the Uniform Building Code, particularly in the International Plumbing Code. All building inspection departments across the region require low-flow plumbing fixtures be installed in new construction and remodel projects in the event that the fixture is detached. The retail market also aides in the implementation of water conservation by nearly eliminating the availability of greater than low-flow fixtures on store shelves. As new homes are built and more remodel jobs are completed, low-flow fixtures will become the norm in the New River Valley. The water suppliers participating on the plan development committee indicate a decrease in demand over the past 3 years. The water suppliers all agree the decrease is attributable to low-flow water fixtures such as toilets and shower heads. This decrease in demand directly conflicts with population figures for the region whereas several communities experience growth in the 5% range annually. The decrease also poses a problem for water providers on the financial side. The drop in demand causes a reduction in revenue that must be planned for during the budget process.

Typically irrigation is a water conservation obstacle, however, in the New River Valley irrigation for farming and landscape purposes is not very common. Considering the limited amount of water consumers irrigating, conservation efforts focusing on irrigation may be better spent on other conservation needs.

Information Describing Water through the Reduction of Use - 9 VAC 25-780-110A.2

Currently Montgomery County PSA and the City of Radford are the only public water providers participating in this plan that provide water conservation education materials to their customers. In 2006 the Montgomery Co PSA conservation education message was to reduce consumption by detecting leaks thereby reducing the cost of water. The educational material also provided a household water audit, a tool the consumer could use to understand and appreciate the amount of water used when performing normal tasks on a weekly basis. The City of Radford provided a "Top 10 List" to conserve the most water. Tips ranged from limiting lawn watering to sweeping hard surfaces with a broom as opposed to using a water hose.

Several public water providers expressed interest in starting a water conservation education program, although some explained the need was not pressing in our region due to the quantity of water available from the New River. In the majority of this region, to accomplish water conservation, the apparent impetus must be on stewardship of natural resources or on rate reduction. Floyd County is the only county in the region without the natural resource benefit of the New River. Their approach to water conservation management is likely to stem from lack of quantity which frequently is a more successful conservation impetus.

Information Describing Practices to Reduce Unaccounted for Water Loss - 9 VAC 25-780-110A.3

In terms of water conservation through unaccounted water loss detection, all participants in the plan address this goal on a daily basis. The public water providers routinely review water meter data to ensure efficient system operation. In the event that a meter indicates excessive water consumption, the public water system is promptly evaluated to determine the location of the water loss. Certain situations such as fire protection can cause a spike in the water meter and are treated as such, whereas leaks require prompt efforts to locate and repair. Across the region aging water lines in sometimes difficult terrain are frequently to blame for unaccounted water loss. Several communities have successfully acquired USDA-Rural Development (RD) grant/loan packages to update aging lines. While the water distribution system in these communities is performing better, the localities sometimes struggle with the financial burden of the loans. The entire region identifies the need to update aging water lines and believes having access to more grant funding to assist with the financial burden is imperative. Table 77 below outlines those projects funded by RD in the region in the past 5 years.

Table 77. Water Projects Funded by RD since 2004

Locality	Close Date	Project Type	Project Description
Town of Dublin	4/2006	Water System Improvement	Upgraded water lines (to 8" and 12") and hydrants for the town
Giles County	3/2008	Route 100 South Water Line Extension	Upgraded water lines, pumps, pump station, and water storage tank on Route 100 South to the Town of Pearisburg's water system
Town of Glen Lyn	2/2005	Water Distribution System	200,000 gallon water storage tank and ~3,600 linear feet of water line and associated appurtenances to eliminate inadequate system pressures within service areas

Locality	Close Date	Project Type	Project Description
Montgomery County PSA	8/2006	Shawsville Water Rehabilitation	Replacement of aging water lines in the Shawsville area. ~21,300 linear feet of 8, 6, and 4-inch water line and appurtenances
Town of Narrows	4/2007	Water System Improvement	Consisted of installation of ~10,700 linear feet replacement water line. Rehabilitation of 3 water storage tanks and upgrade of mechanical components
Pulaski County	5/2009	Water System Project	Installation of ~12,200 linear feet of water line and appurtenances

Several PSAs have identified line replacement projects for various reasons that may also assist in reducing unaccounted for water loss. The Floyd-Floyd County PSA would like to replace approximately 3000' of line to better serve the high school, but the project will not be completed until appropriate grant funding becomes available. Montgomery County PSA has identified some potential minor line replacements, but all projects have been put on hold for the foreseeable future due to budget constraints. The City of Radford has identified a line replacement project in their Capital Improvement Plan to be completed between 2012 and 2013. This 3225' line replacement will serve approximately 40 homes. Giles County just completed approximately 6000' of line replacement in Ripplement with another 6500' of line replacement planned for Broad Hollow. Most line replacement projects in Giles County are budgeted for annually, but the PSA utilizes loans and grants whenever possible.

Floyd-Floyd County PSA

Floyd-Floyd County PSA has instituted several measures in recent years to reduce unaccounted for water loss in their area. As is common practice, the Floyd Fire Department is metered, but not charged for its water use, though fire hydrants are not metered. Previously, county residents could call the Fire Department and have their swimming pools filled in exchange for a small donation. This practice was discontinued by the PSA due to limited water resources several years ago.

Additionally, the Floyd-Floyd County PSA wells are monitored daily for any additional water pumped above normal levels. At the end of each month, billing data and the daily monitoring data are compared for any major discrepancies. A leak detection program is scheduled for the summer of 2009 to find any leaks that may not be noticeable during normal monitoring practices.

Current Conservation Practices, Techniques, and Technologies - 9 VAC 25-780-110B

In making water demand projections, no new conservation practices, techniques, or technologies were considered. Water providers in the region remain relatively confident in their water distribution systems and no major improvement/upgrades were planned at the time projections were made. In the intervening time period, no major defects have been identified and no major projects are currently seeking funding, for planning or construction.

DROUGHT RESPONSE PLAN

***Refer to 9 VAC 25-780-120**

Drought Response and Contingency Plan - 9 VAC 25-780-120.1

The general drought response plan for the New River Valley Water Supply Plan is outlined below. The plan contains three graduated phases of drought response, Drought Watch, Drought Warning, and Drought Emergency. The three graduated phases also have designated levels of involvement: informative, voluntary, and mandatory.

Phase 1-Drought Watch (Informative)

- Increase monitoring of all surface and ground water sources within the region by utilizing drought indicators developed by water providers
- Monitor the permit requests for ground water replacement wells
- Monitor recharge for public wells on a daily basis by public water providers
- Monitor United States Geologic Survey data for in-stream flows
- Begin more intensive monitoring for and correction of system leaks
- Call a regional meeting to assess the severity of the situation on a regional scale
    - Called by the NRVPDC Executive Director and Chairperson
    - Attended by local government Chief Administrative Officers and Chief Elected Officials and Public Service Authority Directors and Chairpersons
- Inform general public via bill inserts, public information statements, websites, reverse 911, etc.
- Notify major water users of the situation
- Limit local government water use

Phase 2-Drought Warning (Voluntary)

- Implement voluntary water use restrictions for all non-essential outdoor water use on an even/odd day cycle (such as car washing and lawn watering)
- Limit water use for recreational activities (e.g. swimming pools, golf courses, etc.)
- Begin considering alternative water sources
- Continue informative measures described in Phase 1

Phase 3-Drought Emergency (Mandatory)

- Prohibit all non-essential outdoor water use
- Limit the construction of new water mains, taps, and well permits
- Require mandatory water use restrictions on major water users for non-essential functions
- Implement conservation water rate
- Implement and enforce civil penalties (surcharges) for wasting water to be determined by localities at the time of the emergency
- Continue informative measures described in Phase 1
- Voluntary measures described in Phase 2 now become mandatory
- Take steps necessary to implement alternative water sources previously identified, if needed

Drought Stages - 9 VAC 25-780-120.2

During the course of creating the drought response plan, the plan development committee felt a discussion of Drought Indicators was needed. Drought Indicators were provided for each water system in order to understand when drought conditions may exist for a given system. In the event an indicator is "triggered" the drought response plan should be implemented.

Floyd-Floyd County PSA

Floyd County utilizes 5 active ground water wells for their water source. Floyd-Floyd County monitors the static pressure of the wells and Table 78 below indicates at what static pressure drought conditions will occur.

Table 78. Floyd-Floyd County Drought Phase Indicators

Drought Phase	Drought Indicator
Watch	Static pressure drops 10% below normal
Warning	Static pressure drops 25% below normal
Emergency	Static pressure drops 50% below normal

Giles County PSA

Giles County relies on ground water wells for their water source. The early indicator for Giles County is decreasing well levels, particularly when the wells are not regenerating.

Table 79. Giles County Drought Phase Indicators (Well #1 only)

Drought Phase	Drought Indicator
Watch	70' of water remaining in well
Warning	50' of water remaining in well
Emergency	30' of water remaining in well

Montgomery County PSA

Montgomery County utilizes several sources of water for their customers. When analyzing indicators for the County's groundwater systems, Table 80 (below) describes the water levels to be used to determine drought phases.

Table 80. Montgomery County Drought Phase Indicators

Drought Phase	Drought Indicator
Watch	70' of water remaining in well
Warning	50' of water remaining in well
Emergency	30' of water remaining in well

Pulaski County PSA

Pulaski County utilizes the surface water of Claytor Lake as its primary source of public water. Claytor Lake is primarily a hydroelectric project, with pond levels being maintained at relatively stable levels to ensure proper functioning of the plant. Since the lake is supplied by water from the New River, flows in the river can affect pond levels as flow through the plant is maintained to ensure proper functioning. Table 81 below describes the elevation above sea level that would indicate drought conditions in Claytor Lake, if not being lowered intentionally for maintenance or other normal seasonal variations.

Table 81. Pulaski County Drought Phase Indicators

Drought Phase	Drought Indicator
Watch	Claytor Lake cannot be maintained at full pond with flow levels of the New River (1848' elevation)
Warning	Claytor Lake drops and continues below 1848' No drought relief in long-term forecast
Emergency	Claytor Lake drops to 1843'

Town of Dublin PSA

The Town of Dublin purchases water from Pulaski County and therefore will utilize the County indicators.

Town of Pulaski PSA

The Town of Pulaski utilizes surface water from Gatewood Reservoir, supplied with water from Peak Creek. Table 82 below describes the drought indicators to be used by the Town.

Table 82. Town of Pulaski Drought Phase Indicators

Drought Phase	Drought Indicator
Watch	Water level at Gatewood Reservoir down by 20' from full pond
Warning	Water level at Gatewood Reservoir down by 30' from full pond
Emergency	Water level at Gatewood Reservoir down by 40' from full pond

City of Radford

The City of Radford utilizes a stream intake in the New River as their water source. The USGS river flow data at the Radford Gauge Station is an important early indicator for the City. Table 83 indicates the levels at that gauging station which would indicate the various drought phases.

Table 83. City of Radford Drought Phase Indicators

Drought Phase	Drought Indicator
Watch	Representative daily stream flows between the 10th and 25th percentile for return flow frequencies
Warning	Representative daily stream flows between 5th and 10th percentile for return flow frequencies
Emergency	Representative daily stream flows below the 5th percentile for return flow frequencies

Drought Ordinances – 9 VAC 25-780-120.3

Drought ordinances will be included from participating localities upon final adoption and approval of this Plan.

STATEMENT OF NEEDS AND ALTERNATIVES
***Refer to 9 VAC 25-780-130**

This purpose of this section is to review the research generated by this plan to determine the adequacy of the existing water sources and whether they meet current demand. Further, this section will utilize the projected water demand data to determine which systems may need additional capacity to meet future demand. For areas where additional capacity is required the local government will review the alternatives available and the potential impacts associated with the alternatives.

Statement of Need - 9 VAC 25-780-130A

Generally the New River Valley region is "water rich", meaning that our primary stream source, the New River, provides significant amounts of water, and our groundwater sources have produced well historically. However, upon closer examination some specific areas within the region do not prosper with their water resources as much as others.

In the Projected Water Demand chapter the areas with significant water resources and the means to treat the water became evident, while the areas with limited water resources, and particularly limited water treatment capacity also were illuminated. The Virginia Department of Health regulations require water service providers to begin making plans for additional capacity when production reaches 80% of the systems' total rated capacity. Through the projected water demand model none of the localities are anticipated to exceed the 80% capacity threshold prior to the year 2050. Floyd County is scheduled to add well system #6 when the demand requires and this will increase their capacity by 115,000 GPD to a total of 298,000 GPD. Prior to well system #6 coming on line Floyd County was scheduled to reach 80% capacity by 2020. Floyd County should continue to explore water supply options as they have the highest growth rate across the region. Both Giles County and Pulaski County are in the 60% capacity range and recognize the need to expand capacity and have begun their planning process well in advance of the 80% capacity requirement.

Analysis of Alternatives - 9 VAC 25-780-130B

Regional Alternatives

The New River Valley Water Supply Plan Participation Committee (described in the Introduction) identified two water demand management actions that could be implemented across the region, first, reduce water pressure and second, educate. The first action, reduction of water pressure, was identified to decrease pressure at the faucet forcing the customer to consume less water. This action could be accomplished by installing pressure reducing valves (PRVs) to drop pressure to 60-80 psi based on Virginia Department of Health recommendations. However, given the topography of the New River Valley, this is a difficult task to accomplish considering the slopes involved in water system design.

The second action to reduce water demand is to educate consumers. This tactic is beginning to be implemented more widely across the region via PSA's distributing educational

materials. There are several messages that can be delivered to encourage water conservation. For example, leak detection can save a customer a significant amount of money monthly, while wise use of water can have similar impacts.

Another regional alternative for public service authorities to consider is the potential for interconnections of systems. As mentioned in previous chapters of this plan, the City of Radford has excess water treatment capacity while others in close proximity are reaching capacity limits. Over 4 years the New River Valley Source Water Committee has been researching methods to install regional transmission lines between public water systems for the local PSA to distribute water. Several routes for transmission lines have been identified and could potentially serve all four counties from the City's excess capacity. The costs associated with running a transmission line supported by pump stations can rival the cost of building new treatment facilities, especially considering the time and money required for permits to withdraw water. This alternative may not be feasible for everyone in the region because economy of scale is of critical importance. To deliver the water in a cost effective manner for the PSA and customer, numerous localities need to participate. Complete study findings can be found on the New River Valley Planning District Commission website (www.nrvpdc.org).

Floyd County Alternatives

Currently Floyd County has a new groundwater system (well #6) ready to operate, but is waiting for the demand to necessitate bring the system online. This represents a 62% increase in the Floyd-Floyd PSA capacity. While Floyd-Floyd County PSA is well suited to serve water to residents in town and close proximity, portions of the County are receiving residential development and methods to provide water to areas beyond the PSA reaches around town should be considered. Floyd-Floyd County PSA is currently looking for locations to site a new well (well #7) should it become necessary for future use.

Giles County Alternatives

Giles County PSA completed a water capacity expansion study in March 2008. The study identified four sources, New River withdrawal, Monroe County, WV purchase, groundwater withdrawal, and a spring in Pembroke. The New River withdrawal was determined to be the most economical and the county is pursuing a pilot study of this option with engineering services procured for the PER. In September 2010, the Giles County PSA has submitted an application to upgrade their water treatment plant capacity to 4.0 MGD, from 2.0 MGD. The application also includes a request to withdraw raw water from the New River for treatment and distribution. Additionally, a connection to Red Sulfur Utility in Peterstown, WV, will serve as an emergency water source for the Town of Rich Creek.

Montgomery County Alternatives

The Montgomery County PSA is actively engaged in the process to become a member of the Blacksburg-Christiansburg-VPI Water Authority. Should this be approved, the PSA will increase its capacity to serve residents and will be constructing a new transmission line, if appropriate grant funds can be identified, to provide additional service in the County

Pulaski County Alternatives

Pulaski County PSA while not approaching the 80% threshold for expansion is looking for additional water capacity due to projected development. Development is anticipated at the Commerce Park, an industrial park located north of the Town of Dublin, along with residential projects in the Fairlawn area. The three sources identified by the County are, purchase water from the City of Radford, withdrawal from Little/Big Reed Island Creek, or in emergency situations the County can purchase limited amounts of water from the Town of Pulaski. Pulaski County is highly involved in the regional source water committee to investigate regional transmission of water. Considering their water capacity, the proximity to the City's infrastructure, and the location for demand, the County is well positioned to work with the City in expanding the County's capacity. The County is currently engaged in a project to connect with the City of Radford to provide increased water capacity to the Commerce Park.

APPENDIX 1- LARGE SELF-SUPPLIED USERS SYSTEM INFORMATION

There are several self-supplied users of water in excess of 300,000 gpm for non-agricultural purposes operating surface water systems. Two industries in Giles County utilize more than 300,000 gpm of self-supplied water. One company, Chemical Lime, uses a spring. Table A-1 below represents Chemical Lime's water source information.

Table A-1. Chemical Lime, Giles County

Name of spring:	Butt Mountain Spring
ID number of spring:	1071568
Name of water body:	Big Stony Creek/New River
Design capacity for average withdrawal:	0.17 MGD (173,754 gpd)
Design capacity for maximum withdrawal:	0.26 MGD (260,000 gpd)
Limitations on withdrawal:	Limited to 130 employees and 13 residential connections
Average daily withdrawal:	0.174 MGD

The Cinergy Solutions of Narrows, also known as the CELCO Plant utilizes a stream intake from the New River in Giles County. Table A-2 below describes this water source for the plant. Cinergy Solutions was contacted to fill in missing information, but no response has been received.

Table A-2. CELCO Plant, Giles County

Water system name:	CELCO Plant
ID Number of system:	Unknown
Name of stream or river:	New River
Sub-basin of in-take:	Middle New (05050002)
Drainage area of sub-basin:	2961 sq mi*
Lowest daily flow of record:	635 cfs (7/20/1926)*
Average daily withdrawal:	56.11 MGD (56,114,970 gpd)
Maximum daily withdrawal:	Unknown
Design capacity of treatment plant:	Unknown
Safe yield of the river:	Unknown
Any limitations on withdrawal:	Unknown
Permitted capacity of system:	Unknown

* Information from USGS gage #03171500 (New River at Eggleston, VA). Data from 10/1/1914 to 9/30/1976.

The two responding industries were Hoover Color Corporation of Pulaski County and Parker Mobile Home Park of Montgomery County.

Table A-3. Parker Mobile Home Park, Montgomery County

Name and ID Number of Wells:	11121565 Well #1	 Well #2
Well Depth:	N.I.	N.I.
Casing Depth:	N.I.	N.I.
Screen Depth:	N.I.	N.I.
Well Diameter:	6”	8”
Average Daily Withdrawal:	0.003 MGD (3,200 gpd)	0.01MGD (6,800 gpd)
Design Capacity Max Daily:	Unknown	Unknown
System Permitted Capacity:	0.02 MGD (20,100 gpd)	
Annual and Monthly Permitted Amounts in Withdrawal Permit:	N/A	N/A

Table A-4. Hoover Color Corporation, Pulaski County

Name and ID Number of Wells:	1155300 Well
Well Depth:	113’
Casing Depth:	95’
Screen Depth:	Unknown
Well Diameter:	6”
Average Daily Withdrawal:	0.02 MGD (19,200 gpd)
Design Capacity Max Daily:	0.03 MGD (28,800 gpd)
System Permitted Capacity:	0.02 MGD (19,200 gpd)
Annual and Monthly Permitted Amounts in Withdrawal Permit:	N/A

A Giles County industry that uses more than 300,000 gpm of ground water is CELCO at the Celanese Plant in Narrows. In addition to their surface water withdrawals from the New River (described above), the CELCO plant utilizes water from 5 wells, described below.

Table A-5. CELCO Plant, Giles County

Name and ID Number of Wells:*	 Well #9	0010710900 Well #7	 Well #8	 Well #11	 Well #12
Well Depth:	Unknown	Unknown	Unknown	Unknown	Unknown
Casing Depth:	Unknown	Unknown	Unknown	Unknown	Unknown
Screen Depth:	Unknown	Unknown	Unknown	Unknown	Unknown
Well Diameter:	Unknown	Unknown	Unknown	Unknown	Unknown
Average Daily Withdrawal:	0.65 MGD (647,556 gpd)	0.53 MGD (530,917 gpd)	0.84 MGD (840,694 gpd)	1.00 MGD (1,004,056 gpd)	1.06 MGD (1,058,083 gpd)
Design Capacity Max Daily:	Unknown	Unknown	Unknown	Unknown	Unknown
System Permitted Capacity:	Unknown	Unknown	Unknown	Unknown	Unknown
Annual and Monthly Permitted Amounts in Withdrawal Permit:	Unknown	Unknown	Unknown	Unknown	Unknown

* Only Well #7 has an assigned PWSID. All wells at this location utilize the same Well ID number of 135.

APPENDIX 2- SMALL SELF-SUPPLIED USERS SYSTEM INFORMATION

Multiple self-supplied users utilizing less than 300,000 GPM provided data for this project. Tables below describe the ground water sources for these organizations.

Table A-6. Floyd County Recreation Association, Great Oaks Country Club, Floyd County

Name and ID Number of Wells:	1713 GOCC #1	 GOCC #2*
Well Depth:	127’	600’
Casing Depth:	110’	200’
Screen Depth:	Unknown	Unknown
Well Diameter:	8”	8”
Average Daily Withdrawal:	0.012 MDG (12,000 gpd)	N/A
Design Capacity Max Daily:	0.033 MGD (33,000 gpd)	N/A
System Permitted Capacity:	.046 MGD (46,000 gpd)	0.9 MG Annually (850,000 gpy)
Annual and Monthly Permitted Amounts in Withdrawal Permit:	N/A	N/A

* Well #2 is used only in the months of June, July, and August for the pool. Well is permitted for 850,000 gallons per year per DEQ permit.

Table A-7. Floyd County Public Schools, Floyd County

Name and ID Number of Wells:	Check Elementary School		Indian Valley Elementary	Willis Elementary
	Old Well	New Well		
Well Depth:	220’	300’	310’	180’ to 200’
Casing Depth:	Unknown	Unknown	Unknown	Unknown
Screen Depth:	Unknown	Unknown	Unknown	Unknown
Well Diameter:	6”	6”	6”	6”
Average Daily Withdrawal:	0.0003 MGD (251 gpd)		0.0001 MGD (100 gpd)	0.0001 MGD (133 gpd)
Design Capacity Max Daily:	Unknown	Unknown	Unknown	Unknown
System Permitted Capacity:	Unknown	Unknown	Unknown	Unknown
Annual and Monthly Permitted Amounts in Withdrawal Permit:	N/A	N/A	N/A	N/A

Table A-8. Apple Ridge Farms, Floyd County

Name and ID Number of Wells:	Apple Ridge Well #5
Well Depth:	425’
Casing Depth:	Unknown
Screen Depth:	Unknown
Well Diameter:	Unknown
Average Daily Withdrawal:	0.0008 (781 gpd)
Design Capacity Max Daily:	Unknown
System Permitted Capacity:	Unknown
Annual and Monthly Permitted Amounts in Withdrawal Permit:	N/A

Table A-9. Willis Village Mart, Floyd County

Name and ID Number of Wells:	1063764
Well Depth:	Unknown
Casing Depth:	Unknown
Screen Depth:	Unknown
Well Diameter:	Unknown
Average Daily Withdrawal:	0.0008 MGD (838 gpd)
Design Capacity Max Daily:	Unknown
System Permitted Capacity:	Unknown
Annual and Monthly Permitted Amounts in Withdrawal Permit:	N/A

Table A-10. Park Ridge Development Campground, Floyd County

Name and ID Number of Wells:	Park Ridge Well
Well Depth:	200’
Casing Depth:	Unknown
Screen Depth:	Unknown
Well Diameter:	Unknown
Average Daily Withdrawal:	0.0001 MGD (55 gpd)*
Design Capacity Max Daily:	Unknown
System Permitted Capacity:	Unknown
Annual and Monthly Permitted Amounts in Withdrawal Permit:	N/A

* Estimated use at ~20,000 gallons per year.

Table A-11. Copper Hill Child Care, Floyd County

Name and ID Number of Wells:	Copper Hill
Well Depth:	200’
Casing Depth:	Unknown
Screen Depth:	Unknown
Well Diameter:	6”
Average Daily Withdrawal:	0.0004 MGD (383 gpd)
Design Capacity Max Daily:	0.007 MGD (7,200 gpd)
System Permitted Capacity:	Unknown
Annual and Monthly Permitted Amounts in Withdrawal Permit:	N/A

Table A-12. New River Park Campground, Giles County

Name and ID Number of Wells:	1071576
Well Depth:	Unknown
Casing Depth:	Unknown
Screen Depth:	Unknown
Well Diameter:	Unknown
Average Daily Withdrawal:	0.0003 MGD (299 gpd)*
Design Capacity Max Daily:	Unknown
System Permitted Capacity:	Unknown
Annual and Monthly Permitted Amounts in Withdrawal Permit:	N/A

* Campground only open May 1st to Oct. 31st (6 months annually).

Table A-13. Sowers Mobile Home Park, Montgomery County

Name and ID Number of Wells:	1121718
Well Depth:	300’
Casing Depth:	50’
Screen Depth:	N.I.
Well Diameter:	6”
Average Daily Withdrawal:	N.I.
Design Capacity Max Daily:	N.I.
System Permitted Capacity:	(Limited to 32 lots)
Annual and Monthly Permitted Amounts in Withdrawal Permit:	N/A

Table A-14. New River Junction, Montgomery County

Name and ID Number of Wells:	New River Junction
Well Depth:	250’
Casing Depth:	N/A
Screen Depth:	N/A
Well Diameter:	N/A
Average Daily Withdrawal:	N/A
Design Capacity Max Daily:	N/A
System Permitted Capacity:	N/A
Annual and Monthly Permitted Amounts in Withdrawal Permit:	N/A

Table A-15. Camp Tuk-A-Way, Montgomery County

Name and ID Number of Wells:	1121751 WL001
Well Depth:	100’+
Casing Depth:	80’+
Screen Depth:	N/A
Well Diameter:	8”
Average Daily Withdrawal:	0.003 MGD (3,300 gpd)
Design Capacity Max Daily:	0.02 MGD (15,000 gpd)
System Permitted Capacity:	N/A
Annual and Monthly Permitted Amounts in Withdrawal Permit:	N/A

Table A-16. Blue Ridge Mountains Scout Reservation, Pulaski County

Name and ID Number of Wells:	1155089 Ottari Well	1155090 Powhatan Well #1	Powhatan Well #2	1155082 Ottari Well	1155056 Bowles Lodge Well
Well Depth:	500’	450” +	400’	475’	Unknown
Casing Depth:	294’	Unknown	63’	147’	Unknown
Screen Depth:	300’ to 301’ 370’ to 371’ 410’ to 411’	Unknown	120’ to 121’ 180’ to 181’ 332’ to 333’ 359’ to 360’	370’ to 371’ 420’ to 421’	Unknown
Well Diameter:	6 5/8”	6 5/8”	6 5/8”	6 5/8”	6 5/8”
Average Daily Withdrawal:	Unknown	Unknown	Unknown	Unknown	Unknown
Design Capacity Max Daily:	0.06 MGD (61,920 gpd)	0.04 MGD (36,000 gpd)	0.07 MGD (70,560 gpd)	0.06 MGD (61,920 gpd)	Unknown
System Permitted Capacity:	Unknown (new well)	0.04 MGD (36,000 gpd)	0.07 MGD (70,560 gpd)	0.06 MGD (64,000 gpd)	Limited to 5 connections
Annual and Monthly Permitted Amounts in Withdrawal Permit:	N/A	N/A	N/A	N/A	N/A
Notes:		Back-up well. Chlorination required.			Chlorination required.

GLOSSARY

Design capacity- capacity at which the system is engineered to operate

System permitted capacity- capacity at which system is permitted to operate at by Virginia Department of Health

SW- surface water

GW- ground water

CWS- community water system; a system that serves at least 15 residential connections or at least 25 residential consumers.

Average Daily Use (ADU) - is the amount the Community Water System (CWS) distributes/releases to their customers.

Average Daily Withdrawal (ADW) - is the amount of water the CWS pulls from a given source in 24 hours.