

## CHAPTER 3.

# WHAT ARE OUR NATURAL RESOURCES?

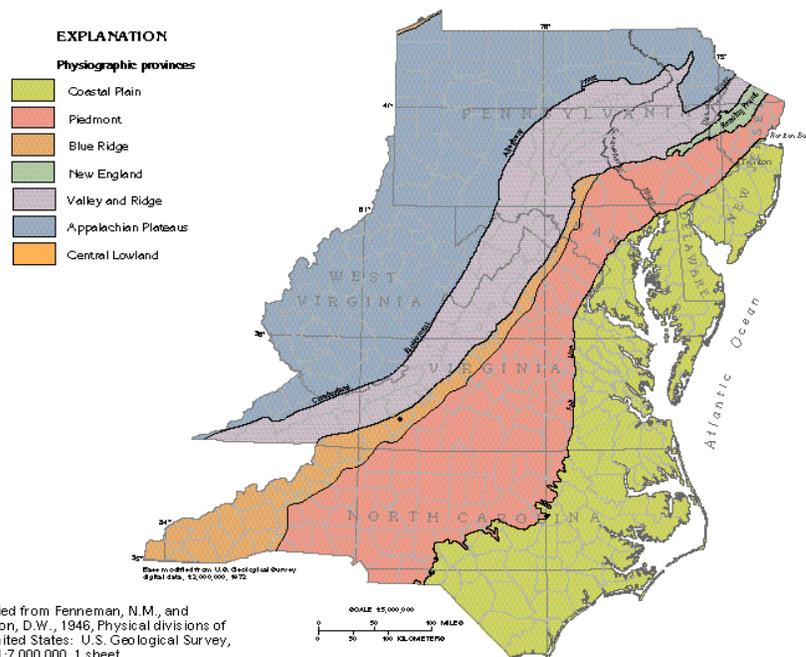
Technology allows for a high degree of change to the natural environment, yet smart development recognizes existing soils, geology, slope, water resources and climate as important determinants of carrying capacity and best uses. The following environmental and natural resource information thus help establish the basis for future land use planning: what land is ideal for agriculture and forests, how to protect ground water resources, and where development can best be supported.

### General Physiographic Features

Floyd County consists of 382 square miles; 143,873 acres of forest land and 100,108 acres of non-forest land (Virginia Statistical Abstract). There is one municipality, the Town of Floyd. The Town of Floyd is 0.6 square mile in area, or about 384 acres (Virginia Review Directory of State and Local Government). The town is rectangle-shaped and is located in the central section of the County, at the crossroads of the main thoroughfares.

Floyd County is situated in the Blue Ridge Uplands, a part of the Blue Ridge Physiographic Province which extends from New York to northwestern Georgia (Map 1). The County is bordered on the southeast by the Blue Ridge Escarpment, the boundary between the Blue Ridge and Piedmont Physiographic Provinces. The change in elevation between the provinces may be as much as 1,300 feet.

**Map 1 Physiographic Provinces**



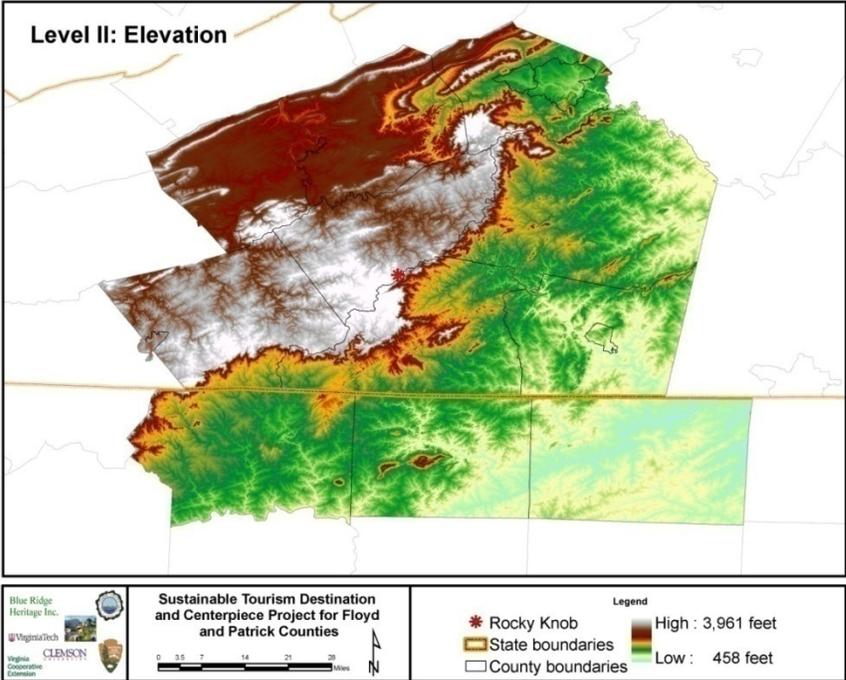
Elevations in the County generally range from 2,000 to 3,000 feet (see Map 2), significantly higher neighboring counties to the north, south, and east. This results in long distance views from ridge tops in Floyd County and especially from certain vantage points along the Blue Ridge Parkway.

*From atop Buffalo Mountain, Indian Valley is visible on the left and Wills Ridge on the right.*



*Photo by Charlie Martin*

**Map 2**



Source: U.S. Geological Survey, EROS Data Center, Sioux Falls, SD



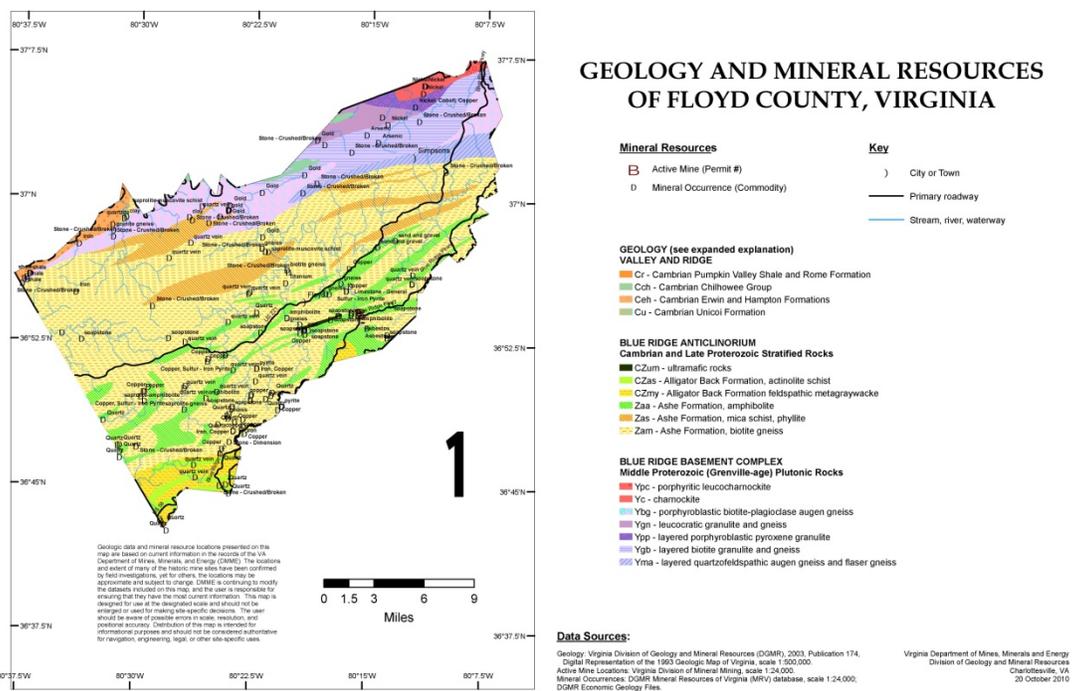
Buffalo Mountain is a monadnock, which rises nearly 1,000 feet above the surrounding upland. See photo at left. Its summit is 3,961 feet. Buffalo Mountain and approximately a thousand surrounding acres are now protected as a state Natural Area Preserve. Wills Ridge, a lesser monadnock, reaches 3,380 feet at its highest point.

The physiography of the County is characterized by gently rolling land. Most of the land is more suited to grazing and forestry than to large-scale cultivation and urban types of development. Nearly half of the County's total acreage is forested; however, there are no National Forest holdings. With the exception of a small number of acres in federal ownership along the Blue Ridge Parkway, all forest land is in private ownership.

## Geology and Minerals

Almost all of Floyd County is underlain by Pre-Cambrian igneous and metamorphic rocks. They are complex, vary in age, and include the granites, gneisses and schists of the Leatherwood granite and Wissachickon and Lynchburg gneiss formations (see Map 3). A small portion of northwestern Floyd County is underlain by sedimentary materials, the quartzites, sandstones and shales of the Unicoi, Erwin and Hampton formations. The rock substrate of the County generally possesses load bearing capacities acceptable for development.

Map 3

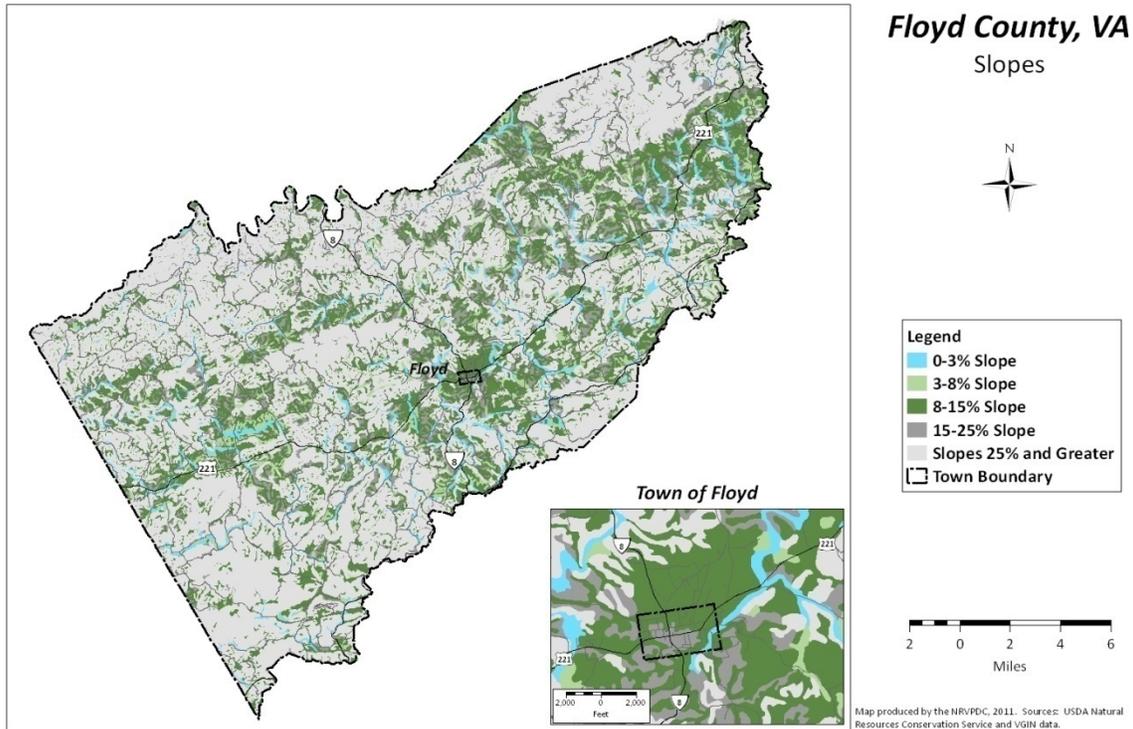


Currently, the only mineral being extracted in Floyd County is amphibolite (a rock quarry). Historically a variety of mineral extraction and processing sites and mineral occurrences have been reported in Floyd County to the Virginia Department of Mines, Minerals and Energy, including: quartz, sand and gravel, soapstone, biotite gneiss, sapolite-muscovite schist, gneiss, copper, iron, clay, gold, pyrite, shale, pig iron, nickel, cobalt, arsenic, stone-crushed/broken, asbestos, and titanium. Places like Copper Hill were named for minerals.

Old mines as well as abandoned wells pose considerable threats for groundwater contamination, with all drinking water coming from groundwater in the County. Essentially these sites can provide direct routes for any contaminants to reach groundwater unless they are properly closed off.

The Floyd County Slope Map (Map 4) highlights the effect of rock formations and the attributing slope conditions. This information is important when determining future growth locations as development is better suited to areas with limited slopes.

**Map 4**

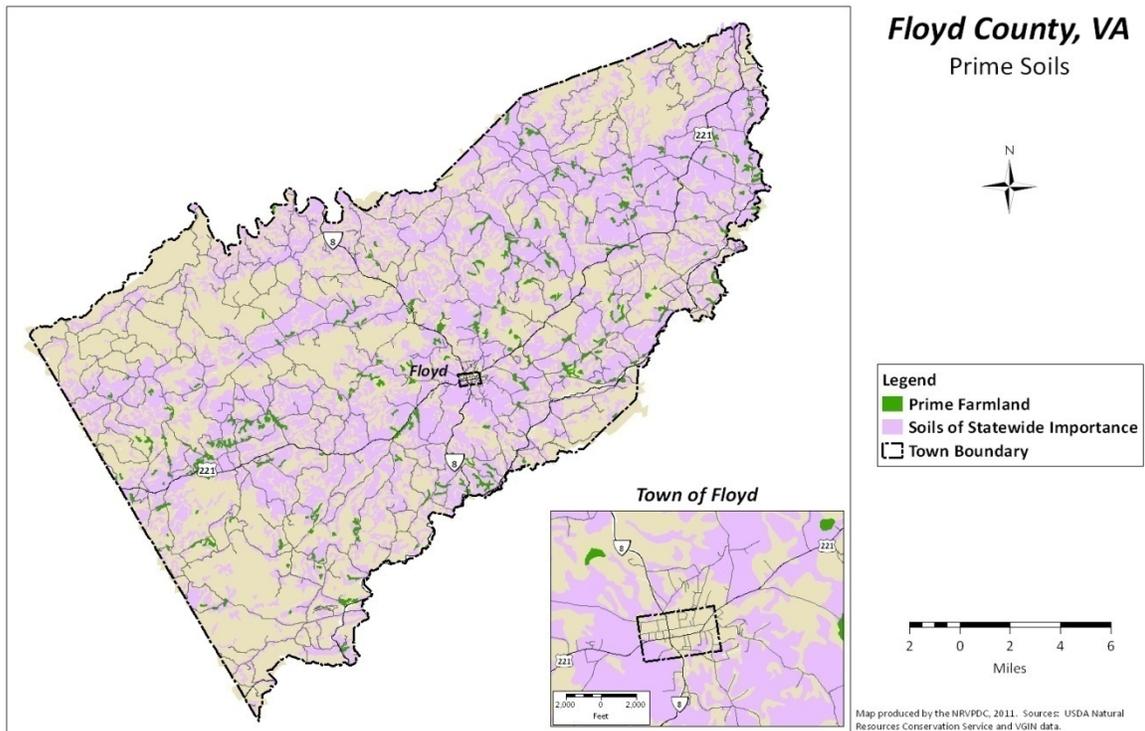


## Soils

A detailed soil survey of Floyd County was completed by the USDA around 2008. Appendix A includes tables of soils in the County. Additionally, Appendix A includes soils that are broken down into two main categories when dealing with areas that would benefit from agricultural uses; these are Prime Farmland and Farmland of Statewide Importance. The Floyd County Agricultural Soils Map, Map 2, shows the soils in the County per the following categories:

- **Prime Farmland:** Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops.
- **Farmland of Statewide Importance:** Land in addition to prime that is of statewide significance for production and identified as such by state agencies (USDA-SCS and Extension Service).

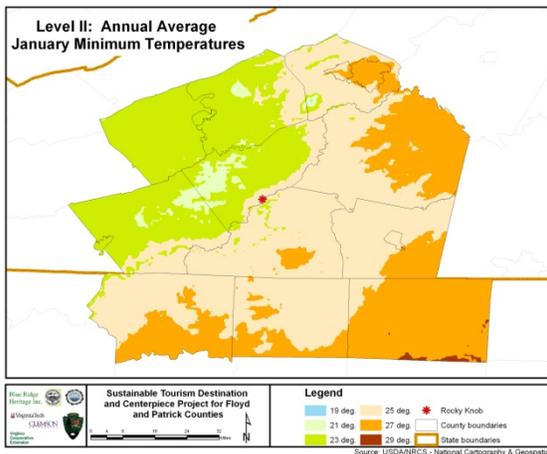
### Map 5: Floyd County Agricultural Soils



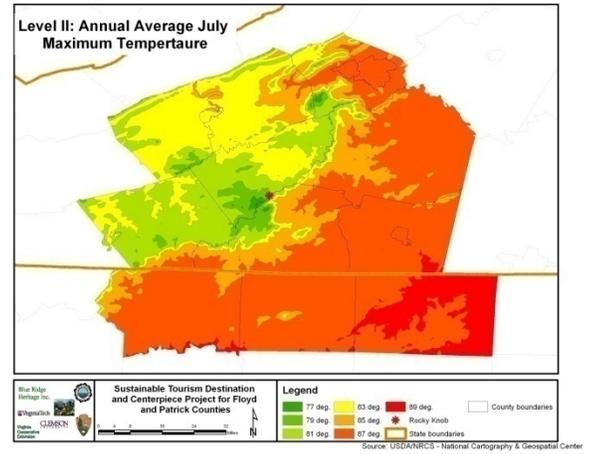
### Climate

Floyd County's climate is characterized by moderately mild winters and warm summers. Average low temperatures range from 19 degrees Fahrenheit in January to 58 degrees Fahrenheit in July. Average high temperatures range from 41 degrees Fahrenheit in January to 83 degrees Fahrenheit in July. See average minimum and maximum temperature maps below (Maps 6 and 7). Note that summers tend to be somewhat cooler here than neighboring counties to the east, north and south.

Map 6



Map 7

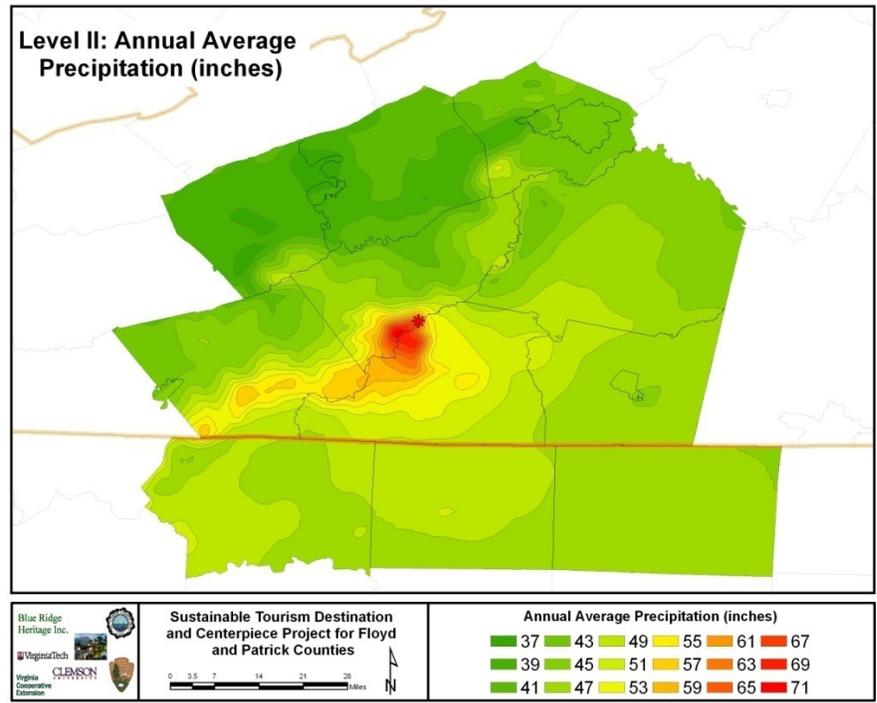




Precipitation patterns in Floyd County are determined generally by prevailing westerly winds which have a southerly component during fall and winter. Most moisture comes from storms spawned over the Atlantic Ocean. The average annual rainfall is 40.79 inches, though this varies within the County (see Map 8 below). Snowfall averages 15 inches annually, an amount which, due to road gradients, may impact on transportation and school operations in the County.

*Snowmelt atop Buffalo Mountain.  
Photo by Charlie Martin.*

**Map 8**



Source: USDA/NRCS - National Cartography & Geospatial Center

## General Hydrologic Features

### Surface Water

A number of streams originate in the County. These include major tributaries of the New River (Big Reed Island Creek and Little River) and headwater streams of the Dan, Smith, Pigg, Backwater and Roanoke Rivers. Most of the drainage ultimately



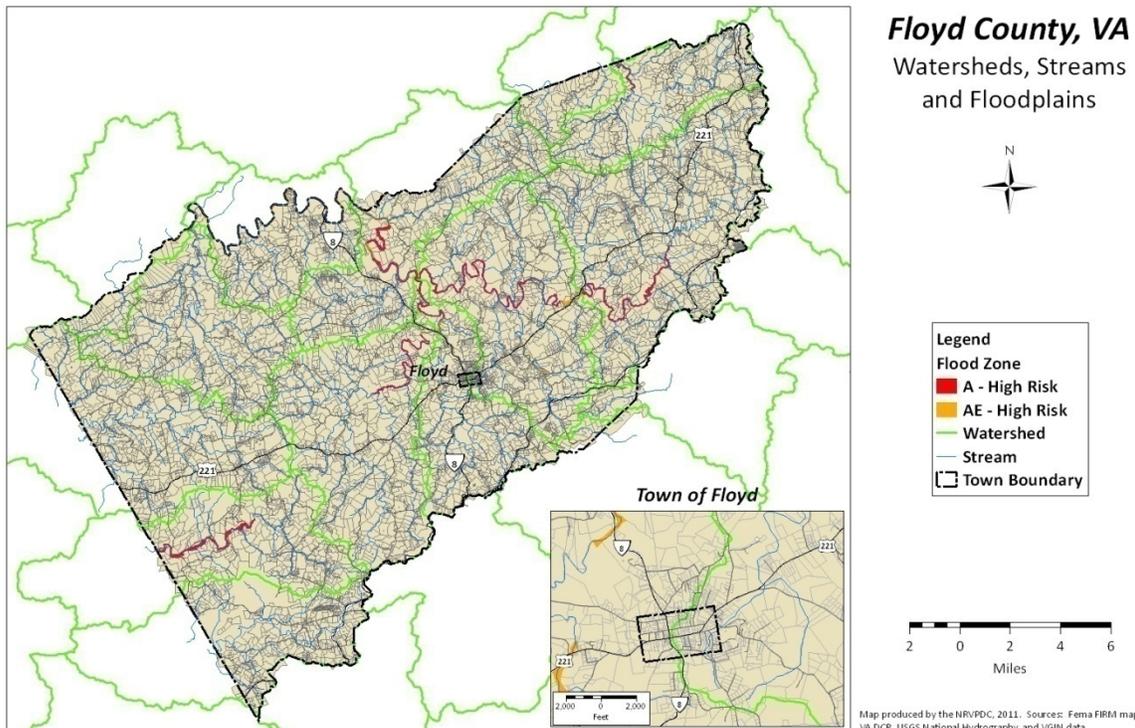
**Creek beside Sawmill Road,  
Indian Valley**

goes to the Gulf of Mexico via the New River, Kanawha and Ohio into the Mississippi River system. The Eastern Continental Divide transects the northeastern part of the County, so tributaries there are of the Roanoke River and flow ultimately to the Atlantic Ocean. Watersheds, streams and floodplains are identified in Map 9.



Frozen Little River.  
Photo by Joshua Sowers

### Map 9: Floyd County Watersheds, Stream and Floodplains



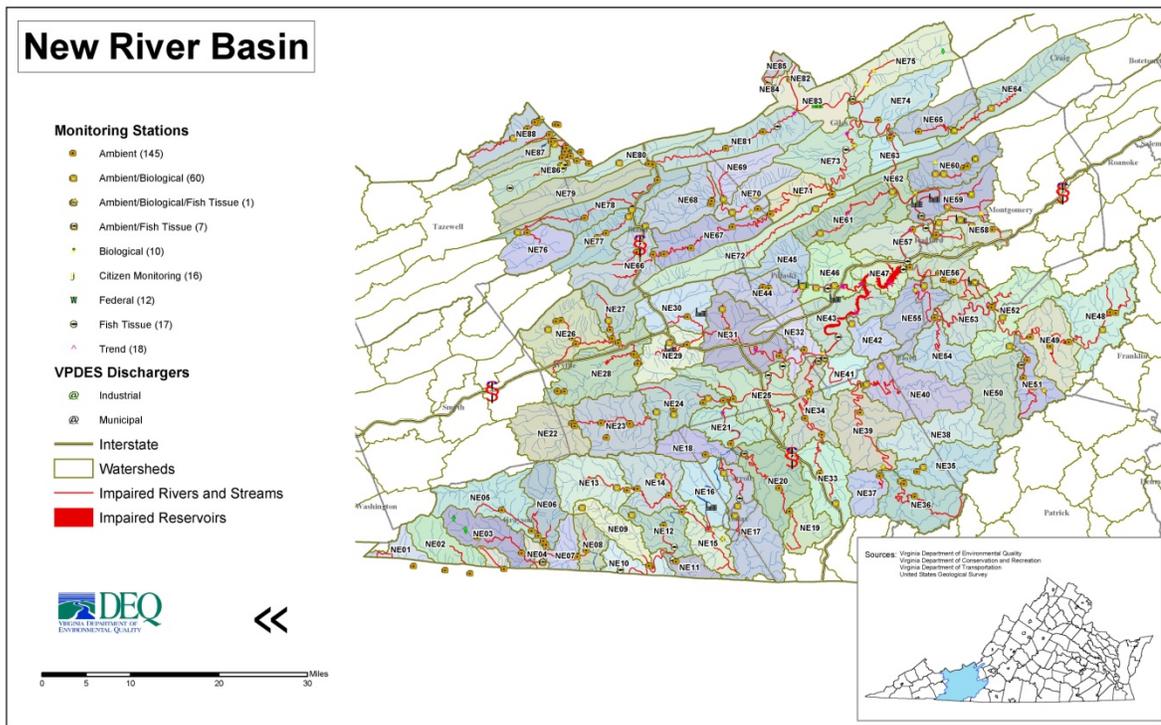
Portions of several streams in the County are now listed as impaired according to the Virginia Department of Environmental Quality (see streams in orange on Map 10). The streams, the impaired length in the County, and the impairment type/s are:

- Rennet Bag Creek, 9.04 miles, Water Temperature
- Shooting Creek, 6.94 miles, Water Temperature
- Little River (Upper), 33.55 miles, Escherichia Coli and Water Temperature
- Meadow Run, 3.7 miles, Escherichia Coli and Benthic-Macroinvertebrate Bioassessments
- Pine Creek, 3.66 miles, Escherichia Coli and Water Temperature
- Dodd Creek and West Fork of Dodd Creek, about 8 miles, though varies by impairment, Escherichia Coli, Fecal Coliform, and Water Temperature
- Little River (Lower), up to 33.56 miles, though varies by impairment, Escherichia Coli, Fecal Coliform, and Benthic-Macroinvertebrate Bioassessments
- Laurel Creek, 3.26 miles, Fecal Coliform
- Big Indian Creek, 7.56 miles, Escherichia Coli
- Greasy Creek, 13.12 miles, Escherichia Coli

Dodd Creek was the first stream identified as impaired, and an Implementation Plan was completed in 2006. The following were recommended to reduce the bacteria to eliminate all violations: exclusion of all livestock from streams, all straight pipes and failing septic systems need to be corrected, direct deposition of wildlife waste into streams needs to be reduced; and all other bacteria sources should be kept below current levels. The fencing of livestock out of streams and other best management practices (BMP's) , as well as residential septic BMP's and additional technical assistance needed were estimated to require \$2,192,272 in funding, according to the Implementation Plan (December 2006). According to the Skyline Soil and Water Conservation District, as of October 2011, they have distributed over \$237,000 in cost-share funds for 13 agricultural and 59 residential BMP's, across the Dodd and Mill Creek areas; this includes 50 septic tank pump outs, 6 septic repairs and 3 septic system replacements as well as 5 stream exclusion and grazing management, 2 loafing management, 1 permanent vegetative cover on critical area and 5 livestock exclusion with riparian buffer practices.

Likewise, the Water Quality Implementation Plan for the Little River and its Tributaries (May 2011) puts forth proposed actions to reduce bacteria, sediment and temperature in the water. The anticipated costs of Agricultural Control Measures (such as Livestock Exclusion with Riparian Buffers, Stream Protection Systems, Improved Pasture Management, Conservation Tillage, and Streamside Fencing Maintenance); Residential Control Measures (Sewer Connection, Alternative Waste Treatment System Installation/Replacement, and Erosion and Sediment Control), as well as Forestry best management practices and technical assistance are over \$29 million and anticipated to take many years.

**Map 10 Impaired Streams**



A wastewater treatment plant is located (downstream from aforementioned area) on Dodd Creek. This plant is operated by the Floyd-Floyd County Public Service Authority and serves the Town of Floyd and surrounding Floyd County. Additionally, there is a sewage treatment plant on Greasy Creek which served Camp 5; there is no longer a permitted facility.

See Figure 6 on hydrogeology, which relates to groundwater, to be discussed next.

### Ground Water

Ground water is the source for all public water supplies serving Floyd County residents. 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 seventy-five to one hundred feet in depth. Historically, wells terminating in this weathered zone or in the first one hundred feet of bedrock yielded about fifteen gallons per minute, but the risks of contamination in any shallow wells are significant. Yield from depths greater than two hundred feet tend to be less, unless substantial water-filled fractures are penetrated.

The southeastern section is underlain by gneisses and schists that are generally weathered to depths of twenty five to fifty feet. Historically, wells terminating in this zone and the upper seventy-five feet of bedrock averaged about eleven gallons per minute in yield, though again, these are at significant risk of contamination. Small increases were sometimes encountered at depths between one hundred and two hundred 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 twenty-five feet. Historically, wells no greater than seventy-five feet deep in this one to three mile-wide area yielded an average of approximately seven gallons per minute, but below that depth the granite has been virtually non-productive.

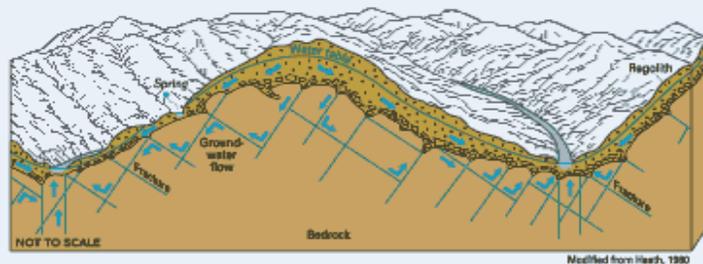
As became apparent in the drought of 1998 to 2002, when 500 replacement wells were drilled here, groundwater in Floyd County is very vulnerable to drought. These replacement wells were not clustered, but rather dispersed around the County, indicating widespread vulnerability to drought, and the importance of water conservation particularly during dry times. The young age of the groundwater here is another indication of drought vulnerability, since there is not long-term storage. Due to the complexity of the hydro-geology, it appears impossible to determine the carrying capacity of the groundwater—that is, how much development the groundwater in Floyd County can support and where. It is known that new wells punched in the ground can affect surrounding wells, particularly in drought conditions. Due to the limited flow of most private wells, it seems apparent that greater housing density can best be accommodated only through small central systems located near very good wells.

**Figure 6**

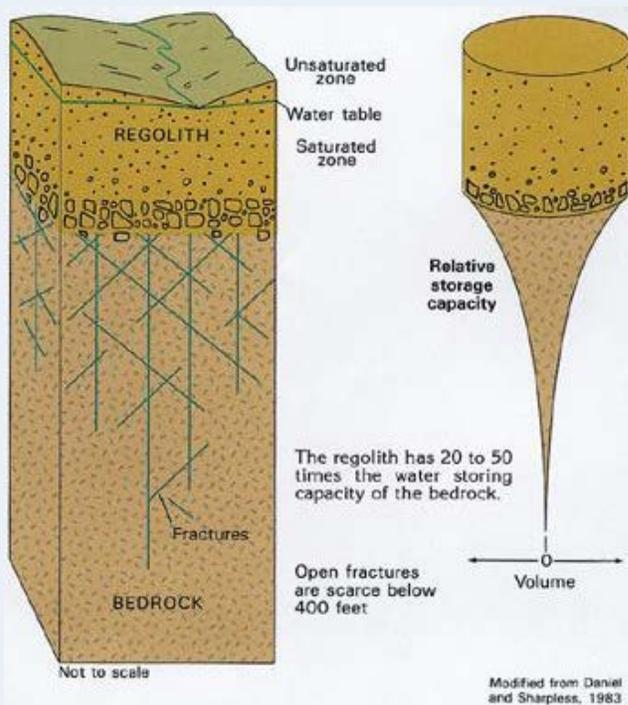
**Floyd County Hydro-geology**

*Adapted from the Floyd Source Water Protection Plan (Gannon, 2010)*

As Floyd County is located in the Blue Ridge physiographic province, groundwater is from fractured bedrock (Figure 1). Filtration of recharge water in this system is provided by the overburden, or top soil. This layer varies greatly in thickness. With this variation comes a variation in filtration capability. Generally in the Blue Ridge this layer of overburden is underlain by weathered bedrock called saprolite. This zone is made up of the same bulk rock as the bedrock below but has been weathered into a highly fractured material capable of storing and transmitting water. This layer of broken up rock does not have the filtration properties of the soil above it. Therefore, areas where this rock is exposed are extremely susceptible to contamination. Drainage such as storm water that can have high levels of contaminants should be kept away from these areas as much as possible.



*Figure 1: Typical fractured bedrock hydrogeology*



Below the saprolite water exists in fractures in the bedrock (Figures 1 and 2). These fractures vary in both size and connectivity. Depending on their size and the size of the fracture network they belong to, they will produce greatly varying quantities of water. The extensively folded rocks in Floyd likely limit large scale connectivity of ground water systems in Floyd. This means it is likely that the Floyd-Floyd County Public Service Authority well draw groundwater from a number of isolated fracture networks rather than just one “aquifer”.

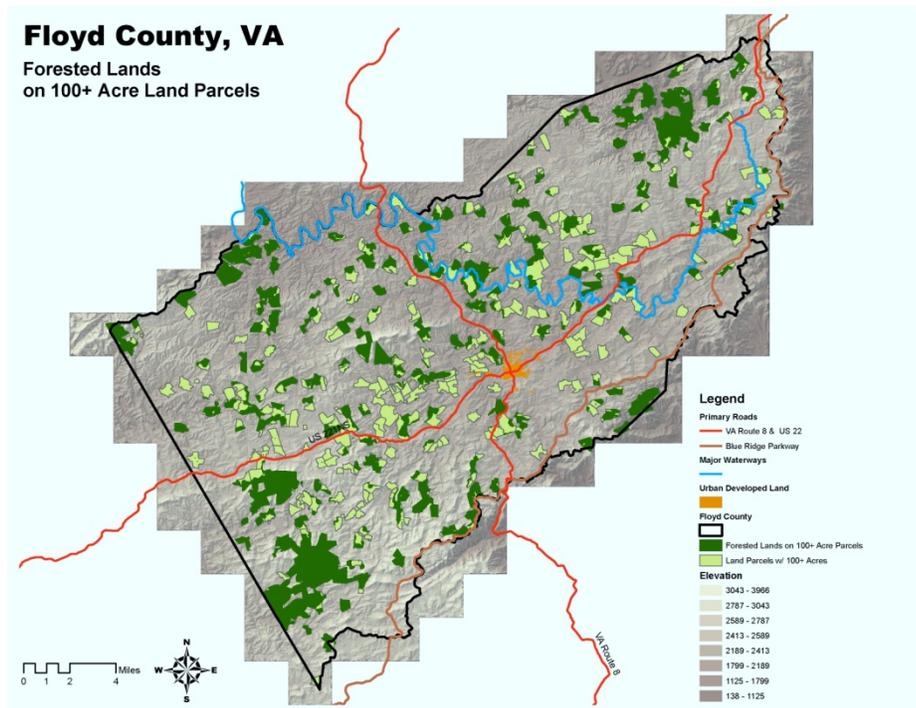
*Figure 2: Available storage in fractured rock environments.*



In addition, the forests provide many intangible benefits which combine to make Floyd an attractive place to live and work. Moreover, forests recharge groundwater and prevent runoff. This is especially important given the County's dependence on groundwater and its location at the top of the watershed. Forest beauty, hunting, hiking, erosion control and wildlife are all benefits enjoyed by the residents and visitors to Floyd County.

Larger forest parcels are less susceptible to natural damage. The map below, provided by the New River Land Trust (2010), shows forested land on 100+ acre parcels (Map 12).

**Map 12**



## Wetlands and Critical Habitats

Wetlands also help with groundwater recharge, as well as provide natural filtering. Wetlands are also home to some threatened or endangered species in the County. Many wetlands are not yet documented in the County (Courtois 2010), but some inventoried wetlands are shown in Map 13 below. Buffalo Mountain is now a state Natural Area Preserve, in part because of the presence of threatened or endangered species.



*Photo by Charlie Martin*

### Map 13

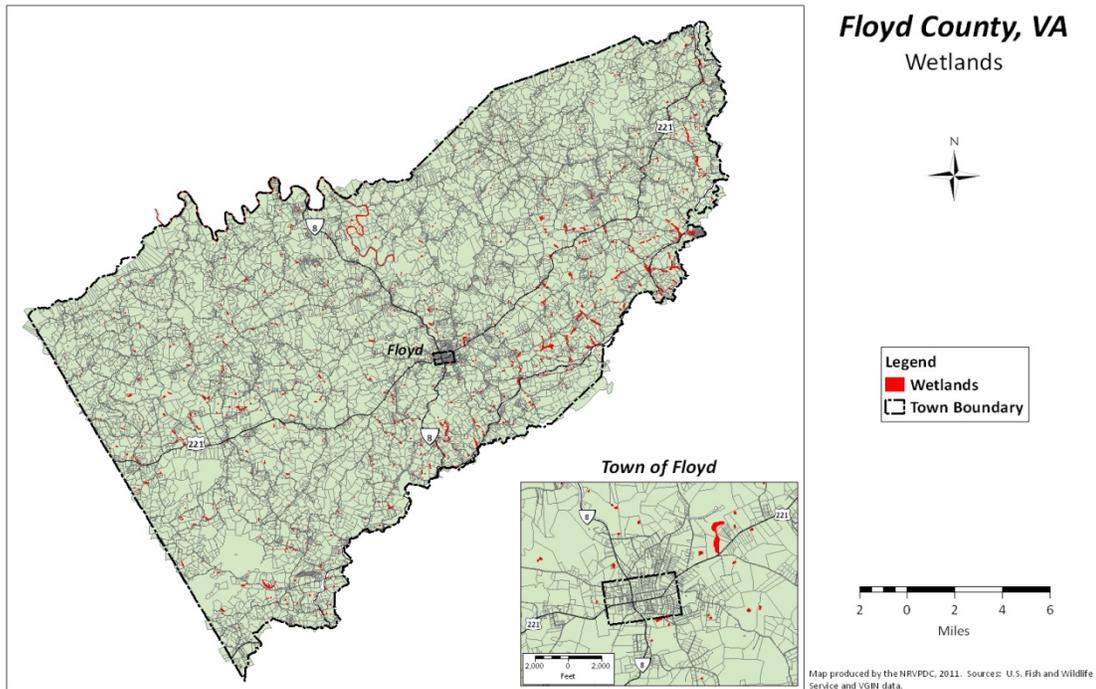


Table 1 lists species within 10 miles of Floyd which are federally endangered or threatened. For a complete list of all threatened, endangered or special concern species, see Appendix B.

**Table 1 Federally Endangered or Threatened Species of the Floyd Area**

<u><a href="#">BOVA Code</a></u>	<u><a href="#">Status*</a></u>	<u><a href="#">Tier**</a></u>	<u><a href="#">Common Name</a></u>	<u><a href="#">Scientific Name</a></u>
010214	FESE	I	<u><a href="#">Logperch, Roanoke</a></u>	Percina rex
050023	FESE	I	<u><a href="#">Bat, Indiana</a></u>	Myotis sodalis
100780	FESE	I	<u><a href="#">Butterfly, Mitchell's satyr</a></u>	Neonympha mitchellii
050035	FESE	II	<u><a href="#">Bat, Virginia big-eared</a></u>	Corynorhinus townsendii virginianus
030061	FTSE	I	<u><a href="#">Turtle, bog (= Muhlenberg)</a></u>	Clemmys muhlenbergii

\* FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; FS=Federal Species of Concern; SC=State Candidate; CC=Collection Concern; SS=State Special Concern

\*\* I=VA Wildlife Action Plan - Tier I - Critical Conservation Need; II=VA Wildlife Action Plan - Tier II - Very High Conservation Need; III=VA Wildlife Action Plan - Tier III - High Conservation Need; IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need

Source: Virginia Department of Game and Inland Fisheries, 2011

**Land Suitability**

The traditional agricultural economy of Floyd County is well-adapted to the local topography. The valleys have been cultivated for crops or cleared for grazing; the steeper slopes have been maintained in forest. Many areas are suitable for residences, from the standpoint of soil and geology. There is land containing both adequate soils and tolerant slopes to accommodate moderate growth, but care needs to be given to protect important farms and forests. In recent years, thousands of acres of important farmland have been converted to residential uses (very often narrow gravel roads far removed from schools, emergency services, and alternative water supplies.) A review of the geography reveals that existing structures are widely dispersed throughout the county along state roads. The few areas where structures are concentrated are in the Town of Floyd, plus the communities of Check and Willis.

Tables 2 and 3 below describe areas not suited for development and areas well suited for development. Note the areas not suited for development are generally defined by natural features. Land suitability will be further analyzed in the Property Use section.

**Table 2  
Lands Not Suitable for Residential, Commercial, or Industrial Development**

<b>Land Suitable for Agriculture</b>	
	Currently used for agriculture
	Lands identified as prime and statewide importance farmland
<b>Land with High Impact on Water</b>	
	Lands with or near wetlands
	Large forest tracts (greater than 40 acres)
	Groundwater recharge areas
<b>Land with High Hazard Risk</b>	
	Lands in 100-year floodplain
	Lands with Wildfire Risk
	Lands with steep slope (greater than 25%)
	Lands with soils not suitable
<b>Lands already Conserved</b>	
	Lands with Natural Area Preserve or other parkland designation
	Lands within half-mile of Blue Ridge Parkway
	Lands in conservation easements

**Table 3**

## Lands Suitable for Residential, Commercial and/or Light Industrial Development

<b>Land near Infrastructure (and not on list above)</b>	
	Lands within half-mile of municipality
	Lands within 2-4 miles of fire station
	Lands within 2 miles of school
	Lands proximal to road with adequate level of service
	Lands with economic development potential
	Lands near current or planned public water
	Lands near current or planned public sewer
	Lands near current or planned trails

### **Chapter 3.**

#### **What are Our Natural Resources?**

##### Summary and Conclusion

Floyd County's natural resources are unique in the region. Located atop the Blue Ridge, all water flows out. Geology is complex, but generally supportive of structures. Groundwater is very young (20 years or less) and limited to fractures in rocks. Consequently, springs and wells are very vulnerable to drought here. About half of the County is forested, aiding groundwater recharge. Because some fracture systems are interconnected at the neighborhood level, a new well can substantially affect an existing well. Because of the special importance of water in Floyd County, it is important that good public well sites be identified and utilized for major development.

Groundwater is also very susceptible to contamination here. It is especially important that public source water areas be protected from potential contamination and that agencies be trained in proper response (See Floyd Source Water Protection Plan.)

Soils including important agricultural soils have now been mapped. Portions of Dodd Creek and Little River are impaired. It is important to use these natural factors (now available in electronic map form) to set future land use policies, including lands that should be protected as farms and forests.