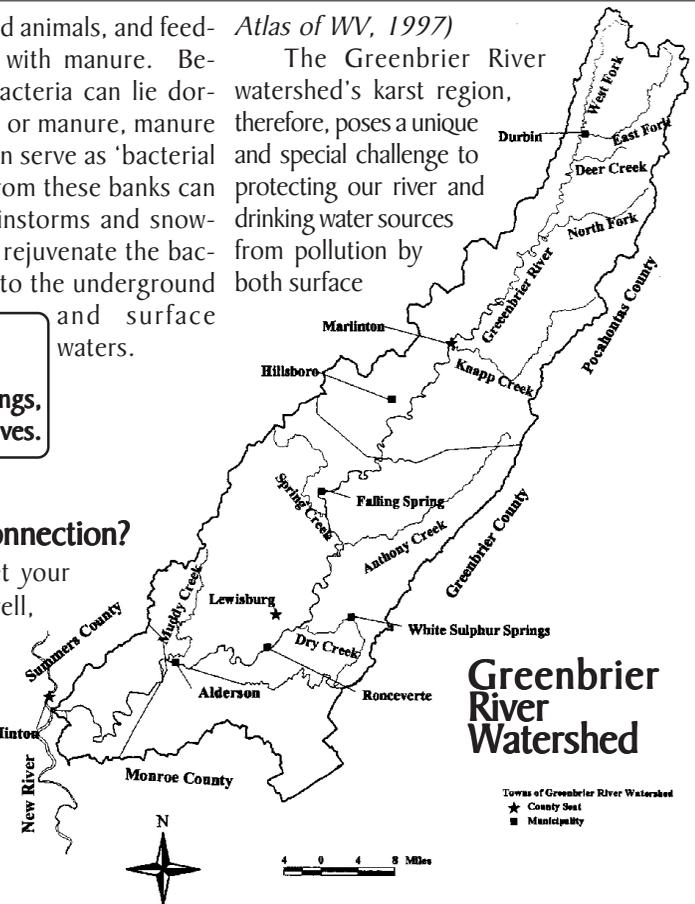


# What's all the fuss about karst?

## Part III — The Karst Watershed by L. Terek Ball

mestic livestock and wild animals, and feedlots or land fertilized with manure. Because fecal coliform bacteria can lie dormant for months in soil or manure, manure piles and farm fields can serve as 'bacterial banks'. Withdrawals from these banks can occur during heavy rainstorms and snowmelts, when water can rejuvenate the bacteria and wash them into the underground and surface waters.

*Atlas of WV, 1997*) The Greenbrier River watershed's karst region, therefore, poses a unique and special challenge to protecting our river and drinking water sources from pollution by both surface



During a recent Greenbrier River watershed education program, middle school students were asked: "Where does the water from your faucet come from?" Student responses ranged from the astute "the river" or "a well pumping up water from the ground" to the more prevalent "I don't have a clue". One response, in particular, struck my fancy when one youngster exclaimed enthusiastically: "The city makes it." Now wouldn't that be grand, I thought! If only that were true, then there would be little cause for concern regarding the status of the quality and quantity of our source waters.

Unfortunately for all of us, that is not the case. Clean water, as inexpensive and plentiful as it may seem now, may not be that way in the future if this valuable resource is not conserved and protected. The truth of the matter is —

**fresh water exists on earth in finite quantities. When it is polluted or wasted, "new" water cannot be created to replenish our supplies.** (See "Facts about the Earth's Water")

### What is a watershed?

No matter where you live, you live within a watershed. Even if your home is miles away from the nearest stream or river, you are still within a watershed. A watershed is the land area that catches and drains rainfall or snowmelt into a stream channel, river, lake, or other body of water. A watershed usually takes the name of the major stream that flows through it.

While the Greenbrier River watershed is only one of thirty-two major watersheds in West Virginia, the Greenbrier River holds the proud distinction of being the longest free-flowing or untamed river (without any dams) in the state.

"From its headwater forests above Durbin to its confluence with the New River at Hinton, the Greenbrier River flows for 173 miles. The river and its tributary streams drain

1,600 square miles of land in Pocahontas, Greenbrier, Monroe, and Summers counties." (*Greenbrier River Watershed — A Protection Guide, Sept. 2005*)

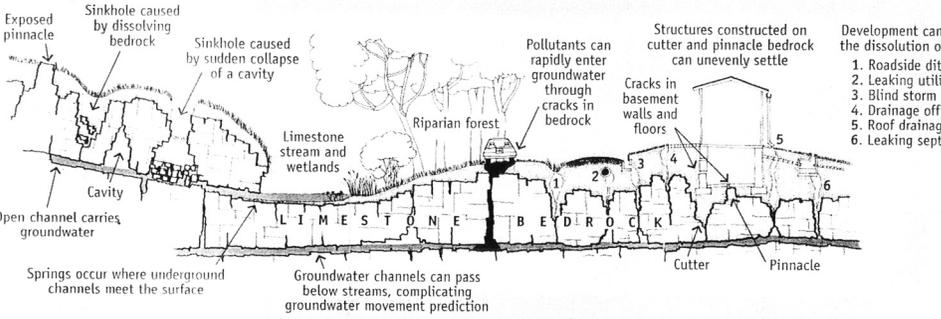
Even though the Greenbrier River flows through some of the healthiest, most beautiful and productive lands in the eastern United States, the Greenbrier River and 38 other streams along its watershed have been declared "impaired streams" by the WV Department of Environmental Protection due to high bacte-

ria contamination from fecal coliform. According to the WV DEP, *the contact recreation and public water supply uses are affected in all waters listed as impaired relative to fecal coliform.* For more information consult WV DEP's website: [www.wvdep.org](http://www.wvdep.org) (303(d)/Impaired Streams Listing— March 22, 2006).

In the text, *Greenbrier—A Scientific Portrait of a WV River (1998)*, it states: "Researchers use the presence of fecal coliform bacteria as an indication that water is contaminated with fecal matter. The presence of this indicator bacteria warns that more dangerous organisms may be present. Fecal coliform bacteria can enter rivers from a variety of sources, including malfunctioning or inadequate sewage systems (municipal and private septic), manure from do-

the land to our source waters via bedrock fractures, sinkholes, sinking streams, and cave streams without percolating slowly through the soil and underlying bedrock. Slow percolation is nature's way of helping to purify the water.

All major land uses on the surface of a watershed can dramatically affect the groundwater of the watershed. For the karst areas within our watershed, this could not be more evident as the presence of numerous sinking streams and a sinkhole-ridden terrain make surface water and groundwater essentially one and the same! *Any contaminant that enters a sinkhole or sinking stream will enter the aquifer and emerge at a spring or well. The close interconnection between surface and groundwater in karst landscapes makes groundwater resources as contamination prone as surface streams.* (*Karst Hydrology*



**In karst terrains, land-use practices are sooner or later translated into impacts on water quality directly underground or further downstream.** *Geomorphology and Hydrology of Karst Terrains*, W. Whitt, Oxford press, 1988 and *Limestone Bedrock*, Peter Williamson, adapted from *Karst*, J.N. Jennings, MIT Press, 1971

**KARST**  
A land area that includes sinkholes, springs, sinking streams, and caves.

### What is the karst-watershed connection?

Whether you get your water from a private well, spring, or municipal water system drawing water from the Greenbrier River,

**The Register-Herald**  
Friday, June 23, 2006  
The West Virginia Department of Environmental Protection has placed the Greenbrier River Watershed on its "impaired streams" list because of high fecal coliform content. The Greenbrier River Watershed is located in Monroe, Summers, Greenbrier, and Pocahontas, counties.

Here are the streams affected: Greenbrier River, Big Creek, Hungard Creek, Kelly Creek, Flint Hollow, Wolf Creek, Laurel Creek, Broad Run, Muddy Creek, Mill Creek, Kitchen Creek, UNT/Muddy Creek, Sinking Creek, Hughart Creek, Milligan Creek, Second Creek, Back Creek, Kitchen Creek, Monroe Draft, Little Creek, Whites Draft, UNT/White's Draft, Meadow Creek, Spring Creek, Beaver Creek, Swago Creek, Knapp Creek, Browns Creek, Possum Hollow, Douthat Creek, Stoney Creek, Indian Draft, Thorny Creek, UNT/Thorny Creek, Clover Creek, Shock Creek, Galford Run, Deer Creek, Buffalo Creek, Bufalo Run and Alleghany Run.  
— Source: West Virginia Dept. of Environmental Protection

these water resources are particularly vulnerable to pollution because ground and surface waters pass through a large area of karst limestone bedrock that underlies much of the Greenbrier River watershed region. As previously mentioned in Parts I and II of this public education series, the relationship between the actions of the land and groundwater in karst terrains is more intimately connected because precipitation and snowmelt can travel directly and rapidly from the surface of

contaminants and subsurface sources such as defective underground storage tanks, malfunctioning septic systems, faulty sewer lines, and landfills to mention a few.

Careful, collaborative, and environmentally balanced community planning and development are critical components in restoring and maintaining the water quality of our streams and aquifers (groundwater reservoirs) especially within the karst regions of the Greenbrier River watershed. If growth and development are not responsibly planned, executed, and managed for instance — neglecting to recognize and implement best management practices for karst — development projects will continue to adversely impact and threaten our water quality and supply.

The recent citing of the Greenbrier River as an "impaired stream" will hopefully serve as a wake-up call for local government officials, planning commissioners, and the citizens of our watershed community. Its current impaired status beckons us to open our eyes not only to the vulnerability of this precious and finite water source, but to the interconnectedness of our land use and development practices as well.

L. Terek Ball is a member of the City of Lewisburg Planning Commission and an educator with Greenbrier County Schools.

**For more information, consult the following references:**  
— Greenbrier: A Scientific Portrait of a West Virginia River (1998), *Cacapon Institute*, High View, WV  
— *Greenbrier River Watershed: A Protection Guide* (Sept. 2005) & *The GRWA Water Quality Manual (2005)*, Greenbrier River Watershed Association, Lewisburg, WV [[www.greenbrierriver.org](http://www.greenbrierriver.org)]  
— *Living on Karst* (1997), Cave Conservancy of the Virginias  
— *Karst: The Movie* [[www.watersheds.org](http://www.watersheds.org)]  
— *Karst Hydrology Atlas of WV* (1997) William K. Jones, Karst Waters Institute, Charles Town, WV