

The Karst Geology of Monroe County

Monroe County sinkholes off Stringtown Road, November 2010 by Rocky Parsons

...a land of sinkholes and caves.



W Survey Canyon, Scott Hollow Cave by Mike McFall

The limestone under us was laid down in two periods when the area that is now the eastern United States was covered by shallow, tropical seas. Limestone near Peter's Mountain was laid down between 570 and 450 million years ago. The Greenbrier Group was formed between 350 and 335 million years ago. Calcium-rich shells and skeletons collected and solidified into limestone. Additional sediments accumulated and turned to rock on top of the limestone. As tectonic plates collided, creating the Appalachian mountains 260 million years ago, the limestone was alternately buried, uplifted, faulted, folded and fractured.

Limestone is relatively impermeable. Water cannot flow through it like it flows through sandstone. Over millions of years groundwater, slightly acidified by organic material in the soil, seeped into cracks in the limestone dissolving it and carving caves, conduits, pipes and channels. Highly eroded limestone is called karst. Water flows through the dissolved openings in the rock.

Surface streams from overlying formations can "sink" into the limestone cracks and conduits.

We are all connected by our water.

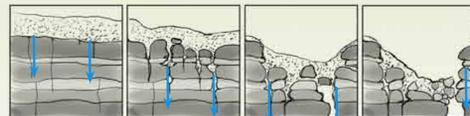
Anticlines (structural hills) and synclines (structural hollows) are formed when the limestone is wrinkled during tectonic plate collisions. They are structures in the underlying rock that effect how water flows through it, but are not always visible from the surface.

Springs occur when underground water resurfaces.

Water wells often draw from shale layers found in the limestone formation.

Water and pollutants flowing into sinkholes dump directly into the karst.

Caves carved by acidic, moving water often form at seams in the rock. Contact caves that form where the limestone meets a shale layer below it are often quite large.



Sinkholes form over time as water seeping into cracks dissolves the limestone. Cave entrances and direct conduits into the karst aquifer are often found in sinkholes.

In other areas water is filtered as it seeps through soil and sandstone, moving only a few feet in a week. In karst areas the water and any pollutants in it can dump directly into the limestone cracks and conduits and move miles in days. Most water wells in this area draw their water from layers of shale found within the Greenbrier limestone formation or from the MacCraday shale below it. Because it is so vulnerable to pollutants, much of the water flowing through open karst is not suitable for drinking. Drilling wells through karst areas can create new pathways for polluted water to seep into potable water aquifers.

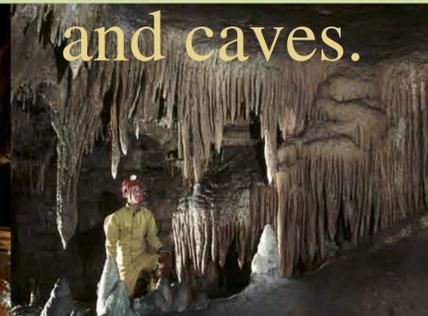


Mystic River just above the double waterfall by Ed McCarthy

The Monitor Lineament, visible from space, is a seven mile long, straight line of sinkholes that probably formed on a fracture in the limestone.



Craig's Creek in Scott Hollow Cave by Mike McFall

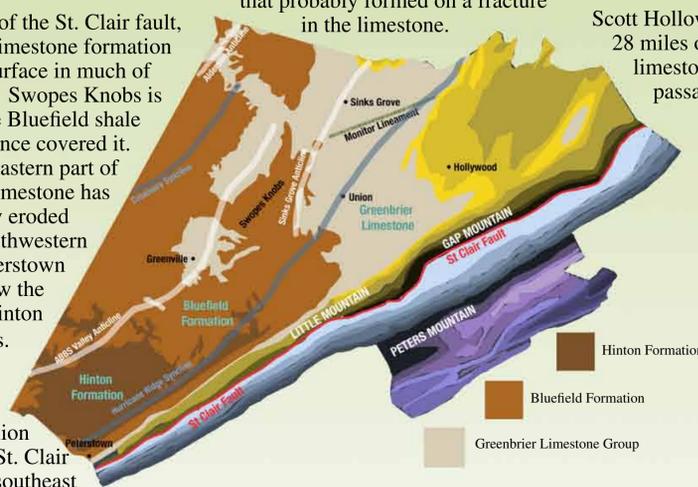


Flowstone stalactites in the Chess Room, Scott Hollow Cave by Ed McCarthy

Scott Hollow cave was discovered in 1984 in the Sinks Grove area. It has a network of over 28 miles of passages mapped so far. It is a contact cave, having formed in the Greenbrier limestone where it meets the MacCraday shale formation below it. Through its main stream passage, Mystic River, it drains an area of 14 square miles or more.

North and west of the St. Clair fault, the Greenbrier limestone formation is close to the surface in much of Monroe county. Swopes Knobs is a remnant of the Bluefield shale formation that once covered it. In the far northeastern part of the county the limestone has been completely eroded away. In the southwestern area around Peterstown it is buried below the Bluefield and Hinton shale formations.

Two tectonic plates collided around 260 million years ago. The St. Clair Fault, near the southeast boundary of the county, is the western limit of a broad collision zone that extends out to the middle of the piedmont of Virginia. That impact fractured the Greenbrier limestone and wrinkled it creating synclines (structural hollows) and anticlines (structural hills) that are not always visible on the surface. These affect how caves form and how water flows through the karst formation today.



Ways to Protect Our Water

- Maintain woodlands along streams and rivers.
- Keep streams free from trash and pollutants.
- Avoid dumping in sinkholes.
- Clean out sinkholes that have been used for dumping.
- Create natural buffers around caves and sinkholes.
- Limit logging along streams, wetlands and steep slopes.
- Keep livestock away from streams, wetlands and sinkholes.
- Maintain septic systems every 2 years.
- Replace lawns with meadows and woods.
- Learn about your own watershed and water source.