

Groundwater Quality

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Groundwater is an important water source for activities such as drinking, bathing, cooking, and crop irrigation. Keeping our groundwater sources clean is becoming more challenging with an ever growing population. In watersheds underlain with karst, such as many of those in Kentucky, the groundwater is more susceptible to contamination. This is because surface waters, such as runoff and in some cases streamflow, travel into the subsurface of karst by way of fractures, sinkholes, swallow holes, conduits and caves (Figure 1). Such direct paths into the groundwater mean that pollutants reach the aquifer much more quickly with little to no filtration (Figure 2). Thus, while waters from springs and wells may look clean, they may actually contain unsafe levels of pollutants such as bacteria and nitrogen.



Figure 1. Flow from a small stream enters into the ground by way of a large swallow hole.

Sources of Pollution

Pollution is classified as either point source or nonpoint source. Point source pollution is defined as pollution that originates from a specific location and is discharged through a pipe. Nonpoint source pollution (NPS) is pollution generated from many diffuse or widespread sources. Examples of NPS include sediments from agriculture, construction or timber harvesting operations; oils and grease from urban areas; and pathogens and nutrients from livestock, human and pet wastes (Figure 3).

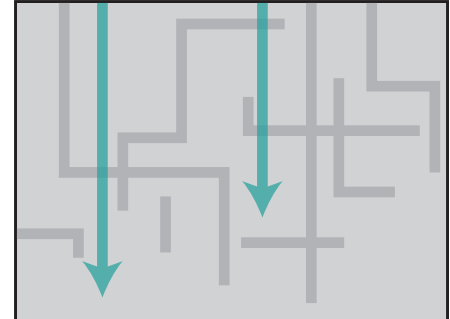
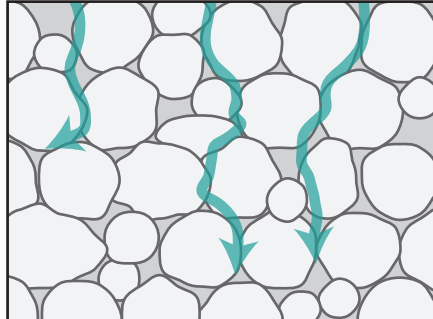


Figure 2. In granular aquifers (left), water is filtered by flowing through tortuous paths around sand and gravel. In karst aquifers (right), water is not filtered because of direct flow paths through fractures or sinkholes.

Karst Watersheds

Karst is prominent in Kentucky with 55 percent of the Commonwealth underlain by karst-prone rocks (Figure 4). Karst landscapes are characterized by springs, caves, sinkholes and sinking streams (Figure 5). Although typically found in regions underlain by limestone, karst can originate in other types of soluble rock such as evaporites, dolomites, and



Figure 3. Uncontrolled livestock grazing adds pathogens and nutrients to water bodies, such as streams, ponds, lakes, and groundwater.

marble (Table 1). These soluble rocks are dissolved when acidic water, such as rain, flows through fractures and other openings, dissolving the rock and widening void spaces into larger conduits and caves. Rainwater becomes slightly acidic (pH of 5.5 to 6.0) when it interacts with carbon dioxide in the atmosphere and soil.

Protecting Groundwater Quality

There are a number of ways to protect the quality of our groundwater. At home, be sure to properly dispose of all household waste. Trash and other debris should not be placed in sinkholes. If you have a septic system, inspect it regularly to ensure it is working properly. Be sure to pick up after your pet.

In rural areas, protect sinkholes from runoff from livestock or crop operations. Fence-off sinkholes so that livestock cannot enter. Doing so will not only protect the livestock from injury, but will help protect groundwater quality. Vegetated buffers, which are areas of thick vegetation such as grasses, shrubs or trees, can be established around sinkholes. These buffers help filter sediments, pathogens, nutrients and other pollutants from runoff before it enters the sinkhole.

Additional Information

Refer to the following Kentucky Cooperative Extension Service publications for more information:

- AEN-106 Reducing Stormwater Pollution
- AEN-109 Sinkhole Management for Agricultural Producers
- FOR-67 BMP No. 4: Sinkholes
- AGR-166 Maintaining Conventional Septic Systems

Table 1. Types of soluble rocks in which karst is formed.

Limestone (calcite). Many types of limestone exist. In Kentucky, limestone is gray or tan and has interlocking crystals. It may contain fossils.



Dolostone (dolomite) is granular (like sugar) or crystalline (interlocking crystals) and comes in a variety of colors. Gray and tan/yellow are the most common colors.



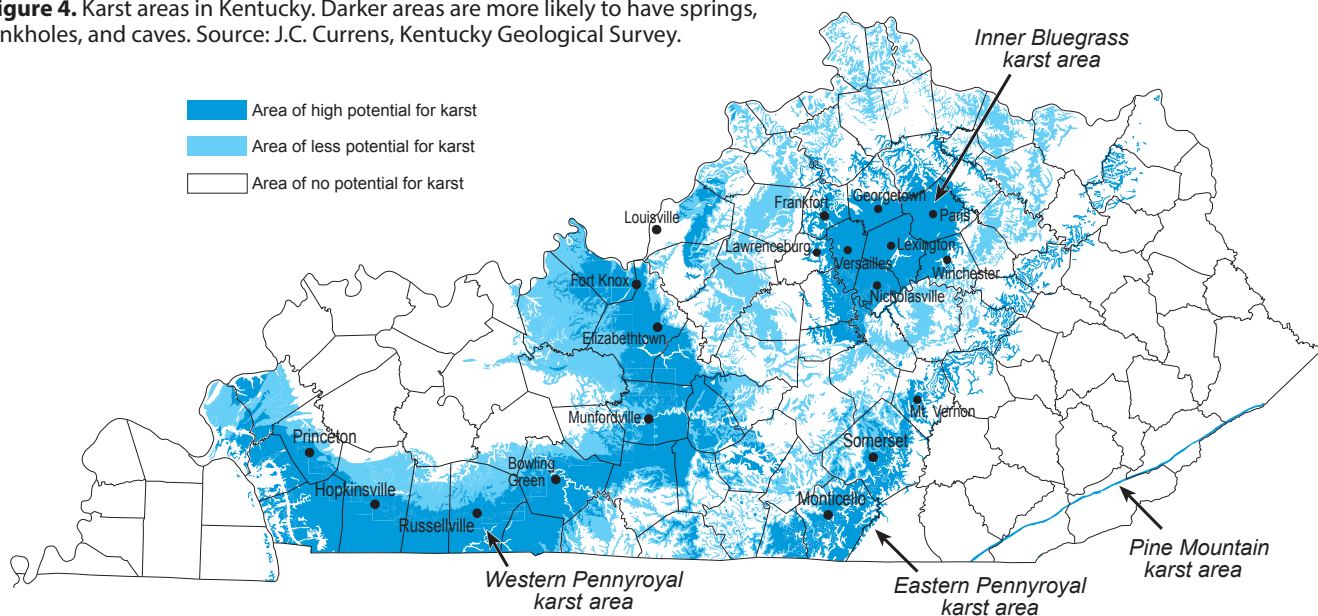
Gypsum (gypsum) is soft and can be scratched by your fingernail. It is usually white or colorless.



Rock Salt (halite). Although salt can have color, it is typically colorless. Rock salt breaks into cubes, and as the name implies, it tastes salty.



Figure 4. Karst areas in Kentucky. Darker areas are more likely to have springs, sinkholes, and caves. Source: J.C. Currens, Kentucky Geological Survey.



References

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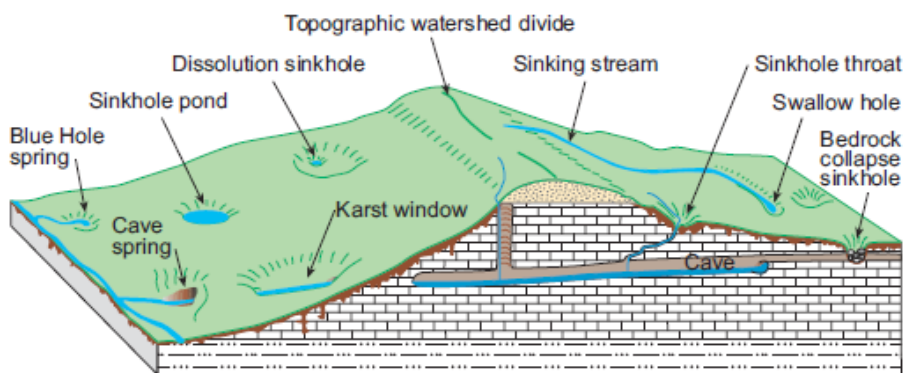


Figure 5. Common features found in karst landscapes. Source: J.C. Currens, Kentucky Geological Survey.

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