Kentucky Geological Survey
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Generalized Geologic Map for Land-Use Planning: Perry County, Kentucky

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MAP AND CHART 164

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Acknowledgments

Geology adapted from Sparks (2003), Andrews and others (2005a, b), Cordiviola and others (2005), Morris and others (2005a-h), and Sparks and others (2005a-e). Thanks to Kim and Kent Anness, Kentucky Division of Geographic Information, for base-map data.

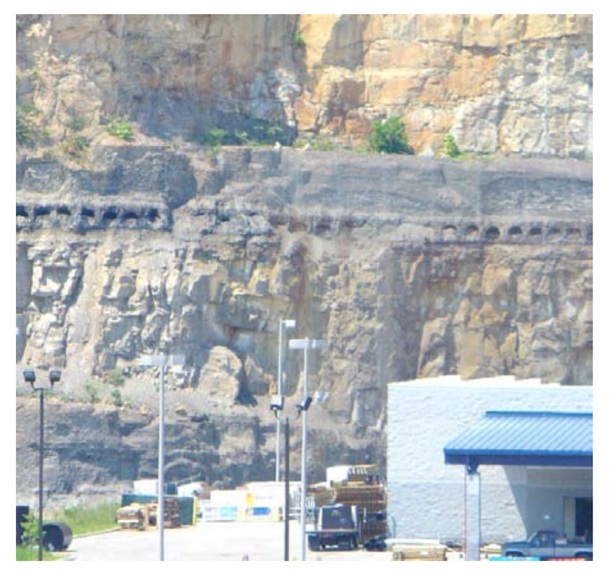
Perry County Courthouse at Hazard

Perry County, an area of 342 square miles in the Eastern Kentucky Coal Field, was formed in 1821. Hazard, the county seat, did not officially receive its name (after Oliver Hazard Perry) until 1854. The 2006 county population of 29,836 was 1.5 percent greater than that of 2000. The highest elevation, 2,520 feet, is about 1.5 miles southwest of Tilford near the Letcher County line. The lowest elevation, 750 feet, is where the Middle Fork of the Kentucky River leaves the county. Coal mining continues to be the major industry. The courthouse is at right center in front of the Justice Center. Photo by Bart Davidson, Kentucky Geological Survey.

Post-Mine Land Uses

The Perry County airport (right), built on a reclaimed mountaintop-removal mine near Ky. 15, is an excellent example of post-mining land use. Aerial photo (2004) from the U.S. Department of Agriculture, Farm Services Administration, National Agriculture Imagery Program.

Development on Reclaimed Mine Land



The new shopping mall along Ky. 80 in Hazard is directly in front of a surface coal mine. Many former coal-mine benches such as this are being developed in Perry County, some for residential use and others for commercial use. The inset (left) shows previous auger mining holes drilled into a coal bed behind the Lowe's building. Photos by Bart Davidson, Kentucky Geological Survey.

Groundwater

About 12,400 residents of Perry County rely on private domestic water supplies: 10,300 use wells, and 2,100 use other sources. Most people in rural Perry County have drilled wells. Iron and sulfur are common problems throughout the area. In eastern Perry County, more than three-quarters of the wells drilled in valley bottoms and on mountainsides are adequate for a domestic supply. Some wells on ridges and mountaintops are adequate for domestic supply. Wells more than 200 feet deep in valleys may yield enough water for small municipal or industrial supplies. In the western half of the county, most wells drilled in valley bottoms are adequate for domestic supply. Fewer than half the wells on hillsides are adequate for a modern domestic supply. Wells on mountaintops and ridges yield less water. Water obtained from most drilled wells in this area is moderately to extremely hard and contains noticeable amounts of iron. Salty water may be found from 50 to several hundred feet below the level of the principal valley bottoms, except in the eastern half of the county, where salty water probably will not be found shallower than 200 feet. A few springs supply enough water for domestic use, usually producing less than 5 gallons per minute.

For more information on groundwater in the county, see Carey and Stickney (2004).

LAND-USE PLANNING TABLE DEFINITIONS

FOUNDATION AND EXCAVATION

The terms "earth" and "rock" excavation are used in the engineering sense; earth can be excavated by hand tools, whereas rock requires heavy equipment or blasting to remove.

LIMITATIONS

Slight—A slight limitation is one that commonly requires some corrective measure but can be overcome without a great deal of difficulty or expense.

Moderate—A moderate limitation is one that can normally be overcome but the difficulty and expense are great enough that completing the project is commonly a question of feasibility.

Severe—A severe limitation is one that is difficult to overcome and commonly is not feasible because of the expense involved.

LAND USES

Septic tank disposal system—A septic tank disposal system consists of a septic tank and a filter field. The filter field is a subsurface tile system laid in such a way that effluent from the septic tank is distributed with reasonable uniformity into the soil.

Residences—Ratings are made for residences with basements because the degree of limitation is dependent upon ease and required depth of excavation. For example, excavation in limestone has greater limitation than excavation in shale for a house with a basement.

Highways and streets—Refers to paved roads in which cuts and fills are made in hilly topography, and considerable work is done preparing subgrades and bases before the surface is applied.

Access roads—These are low-cost roads, driveways, etc., usually surfaced with crushed stone or a thin layer of blacktop. A minimum of cuts and fills are made, little work is done preparing a subgrade, and generally only a thin base is used. The degree of limitation is based on year-around use and would be less severe if not used during the winter and early spring. Some types of recreation areas would not be used during these seasons.

Light industry and malls—Ratings are based on developments having structures or equivalent load limit requirements of three stories or less, and large paved areas for parking lots. Structures with greater load limit requirements would normally need footings in solid rock, and the rock would need to be core drilled to determine the presence of caverns, cracks, etc.

Intensive recreation—Athletic fields, stadiums, etc.

Extensive recreation—Camp sites, picnic areas, parks, etc.

Reservoir areas—The floor of the area where the water is impounded. Ratings are based on the permeability of the rock.

Reservoir embankments—The rocks are rated on limitations for embankment material.

Underground utilities—Included in this group are sanitary sewers, storm sewers, water mains, and other pipes that require fairly deep trenches.

Floodplain Development

Buckhorn Elementary School is located on Ky. 28 in Buckhorn. In many areas, the only available land for development lies in the floodplain of the forks of the Kentucky River or its tributaries. The school is near the confluence of Schoolhouse Branch with Squabble Creek, a tributary of the Middle Fork of the Kentucky River. Photo by Bart Davidson, Kentucky Geological Survey.

Buckhorn Lake Dam

Buckhorn Lake Dam, seen here from the lake, is near the town of Buckhorn, about 30 miles west of Hazard. The earthen dam is on the Middle Fork of the Kentucky River. The U.S. Army Corps of Engineers manages the dam and lake, in conjunction with the Commonwealth of Kentucky. Photo by Bart Davidson, Kentucky Geological Survey.

Buckhorn Lake

Buckhorn Lake State Park lies in the western part of Perry County, but the lake is in both Perry and Leslie Counties. Authorized by the Flook Control Act of 1938, the 1,230-acre lake offers a variety of recreational opportunities. It lies within the Daniel Boone National Forest, and provides flood control downstream and serves as a water supply. In 2005, the lake generated $8.7 million in visitor revenue. Photo by Bart Davidson, Kentucky Geological Survey.

Planning Guidance by Rock Unit Type

Rock Unit	Foundation and Excavation	Septic System	Residence with Basement	Highways and Streets	Access Roads	Light Industry and Malls	Intensive Recreation	Extensive Recreation	Reservoir Areas	Reservoir Embankments	Underground Utilities
1. Clay, silt, sand, and gravel (alluvium)	Fair foundation material; easy to excavate. Seasonal high water table. Subject to flooding. Refer to soil report (Hayes, 1982).	Severe limitations. Seasonal high water table. Subject to flooding. Refer to soil report (Hayes, 1982).	Severe limitations. Seasonal high water table. Subject to flooding. Refer to soil report (Hayes, 1982).	Severe limitations. Seasonal high water table. Subject to flooding. Refer to soil report (Hayes, 1982).	Severe limitations. Seasonal high water table. Subject to flooding. Refer to soil report (Hayes, 1982).	Severe limitations. Seasonal high water table. Subject to flooding. Refer to soil report (Hayes, 1982).	Slight to severe limitations, depending on type of activity and topography. Subject to flooding. Refer to soil report (Hayes, 1982).	Slight to severe limitations, depending on type of activity and topography. Subject to flooding. Refer to soil report (Hayes, 1982).	Pervious material. Seasonal high water table. Subject to flooding. Refer to soil report (Hayes, 1982).	Fair stability. Fair compaction characteristics. Piping hazard. Refer to soil report (Hayes, 1982).	Slight limitations, in general, except for seasonal high water table. Subject to flooding. Refer to soil report (Hayes, 1982).
2. Sandstone, siltstone, and coal	Fair to good foundation material; difficult to excavate. Possible low strength associated with coals and underclays. Possibility of underground coal-mine voids.	Severe limitations. Thin soils and impermeable rock.	Severe to moderate limitations. Rock excavation may be required. Possible steep slopes.	Moderate to severe limitations. Rock excavation may be required. Possible steep slopes.	Moderate to severe limitations. Rock excavation may be required. Possible steep slopes.	Moderate to severe limitations. Rock excavation may be required. Possible steep slopes.	Moderate to severe limitations. Rock excavation may be required.	Slight to severe limitations, depending on activity and topography. Possible steep wooded slopes. Slight limitations for forest or nature preserve.	Slight limitations. Reservoir may leak where rocks, including coal, are jointed or fractured.	Severe limitations. Reservoir may leak where rocks are fractured.	Severe to moderate limitations. Thin soils. Possible rock excavation.
3. Sandstone, siltstone, shale, and coal	Fair to good foundation material; difficult to excavate. Possible low strength associated with shales, sparse coals, and underclays. Possibility of underground coal-mine voids.	Severe limitations. Thin soils and impermeable rock associated with shales.	Severe to moderate limitations. Rock excavation may be required. Possible steep slopes.	Moderate to severe limitations. Rock excavation may be required. Possible steep slopes.	Moderate to severe limitations. Rock excavation may be required. Possible steep slopes.	Moderate to severe limitations. Rock excavation may be required. Possible steep slopes.	Moderate to severe limitations. Rock excavation may be required.	Slight to severe limitations, depending on activity and topography. Possible steep wooded slopes. Slight limitations for forest or nature preserve.	Slight limitations. Reservoir may leak where rocks, including coal, are jointed or fractured.	Severe limitations. Reservoir may leak where rocks are fractured.	Severe to moderate limitations. Thin soils. Possible rock excavation.
4. Sandstone, siltstone, shale (sparse coal)	Fair to good foundation material; difficult to excavate. Possible low strength associated with shales, sparse coals, and underclays.	Severe limitations. Thin soils and impermeable rock associated with shales.	Severe to moderate limitations. Rock excavation may be required.	Moderate to severe limitations. Rock excavation may be required.	Moderate to severe limitations. Rock excavation may be required.	Moderate to severe limitations. Rock excavation may be required.	Moderate to severe limitations. Rock excavation may be required.	Slight to severe limitations, depending on activity and topography. Possible steep wooded slopes. Slight limitations for forest or nature preserve.	Slight limitations. Reservoir may leak where rocks, including coal, are jointed or fractured.	Severe limitations. Reservoir may leak where rocks are fractured.	Severe to moderate limitations. Thin soils. Possible rock excavation.

For Planning Use Only

This map is not intended to be used for selecting individual sites. Its purpose is to inform land-use planners, government officials, and the public in a general way about geologic bedrock conditions that affect the selection of sites for various purposes. The properties of thick soils may supersede those of the underlying bedrock and should be considered on a site-to-site basis. At any site, it is important to understand the characteristics of both the soils and the underlying rock. For further assistance, contact the Kentucky Geological Survey, 859.257.5500. For more information, visit the KGS Community Development Planning Web Site at kgsweb.uky.edu/download/kgsplanning.htm.

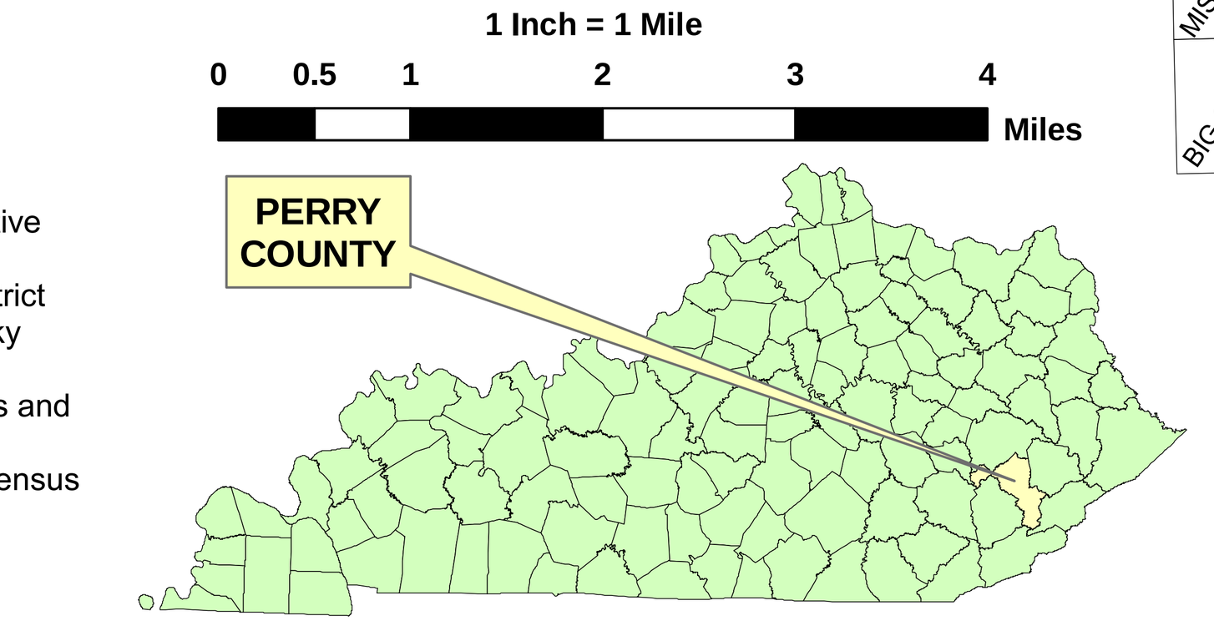
Additional Resources

Listed below are Web sites for several agencies and organizations that may be of assistance with land-use planning issues in Perry County:

www.kyhometown.com/hazard/ Hazard/Perry County
ces.ca.uky.edu/Perry/ University of Kentucky Cooperative Extension Service
www.kradd.org/ Kentucky River Area Development District
www.thinkkentucky.com/edis/cmnty/cw/cw104/ Kentucky Economic Development Information System
www.uky.edu/KentuckyAtlas/21193.html Kentucky Atlas and Gazetteer, Perry County
quickfacts.census.gov/qfd/states/21/21193.html U.S. Census data
kgsweb.uky.edu/download/kgsplanning.htm Planning information from the Kentucky Geological Survey

Scale = 1:63,360
1 Inch = 1 Mile

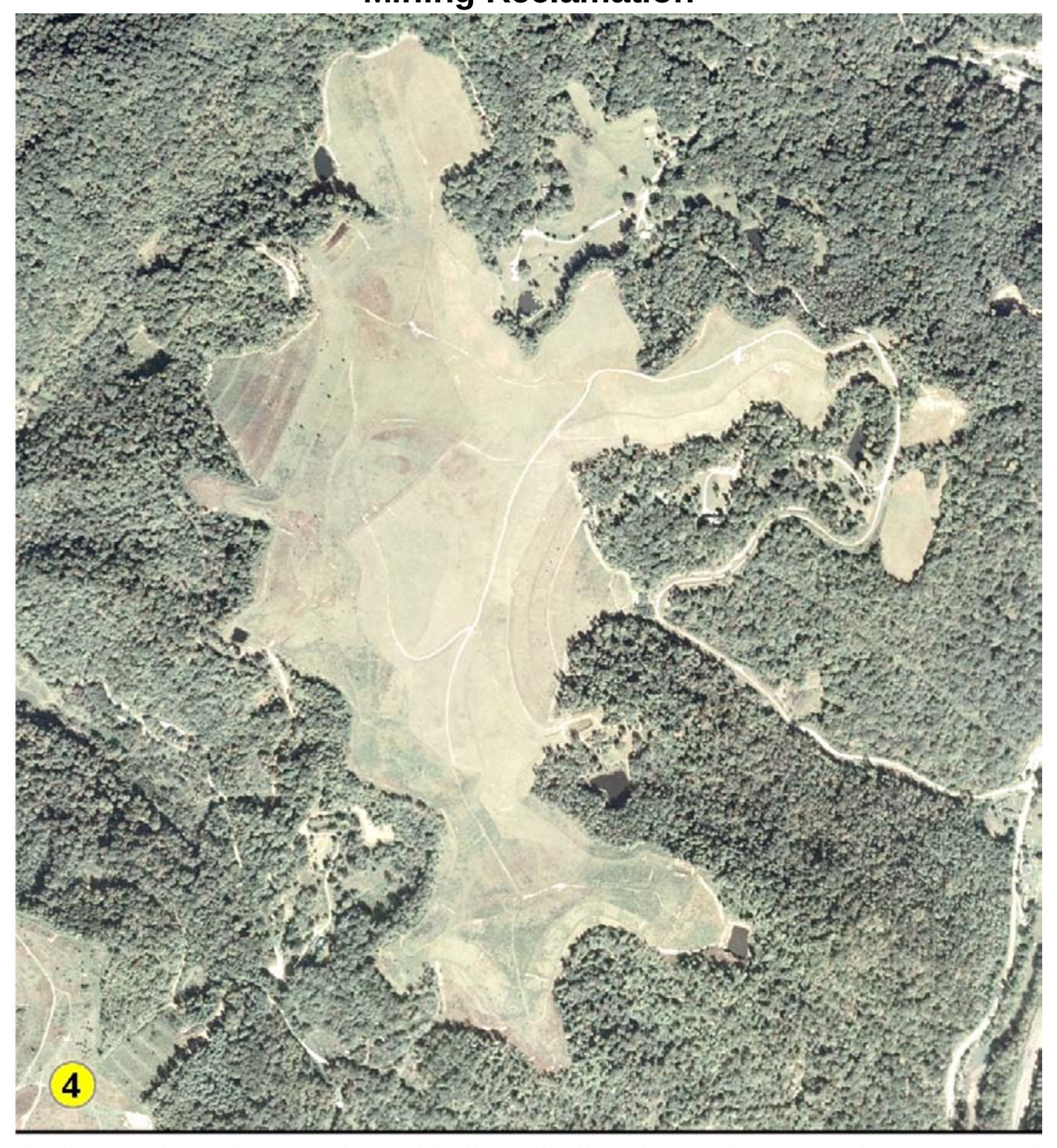
0 0.5 1 2 3 4 Miles



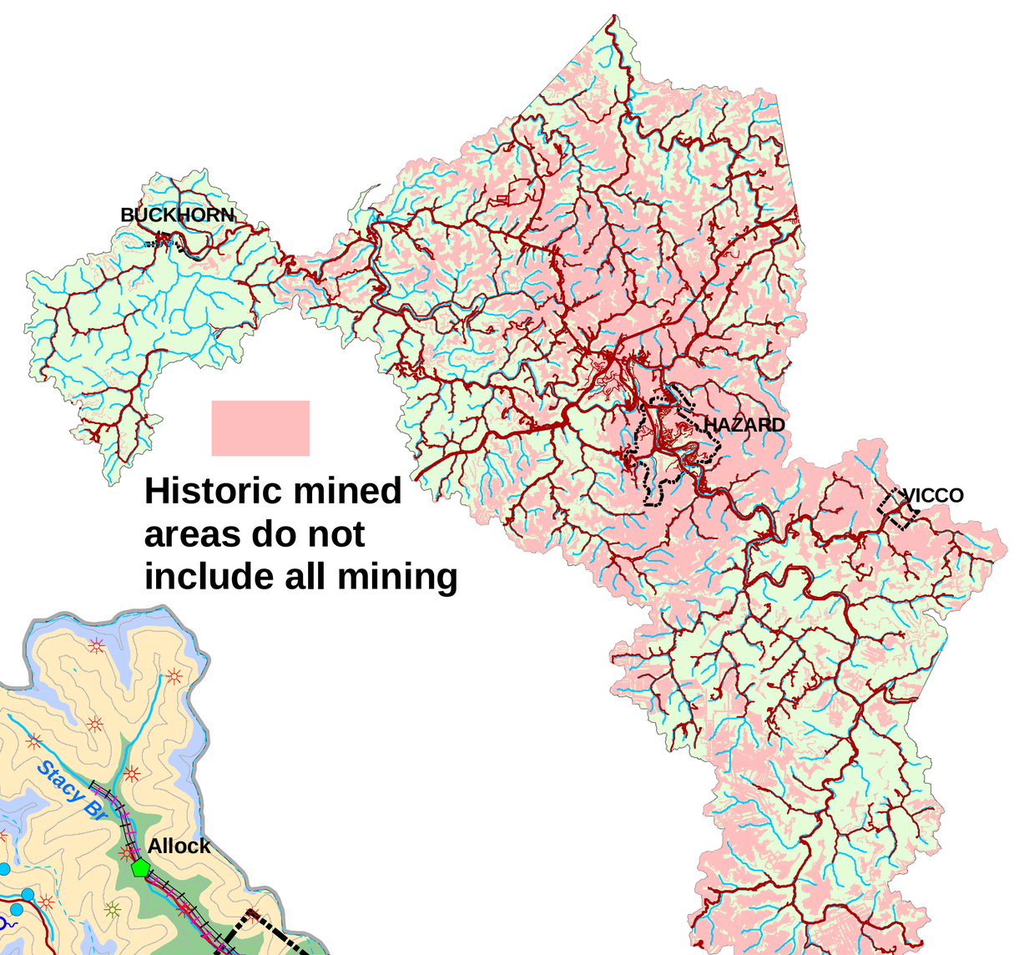
Industry

Coalfield Regional Industrial Park on Ky. 15 near Chavies accomodates an influx of commercial enterprises, particularly those dealing with timber. Photo by Bart Davidson, Kentucky Geological Survey.

Mining Reclamation



Sediment detention ponds and hollow fills line the perimeter of this reclaimed mountaintop area. Aerial photo (2004) by the U.S. Department of Agriculture, Farm Services Administration, National Agriculture Imagery Program.



What Are the Factors That Cause Landslides?

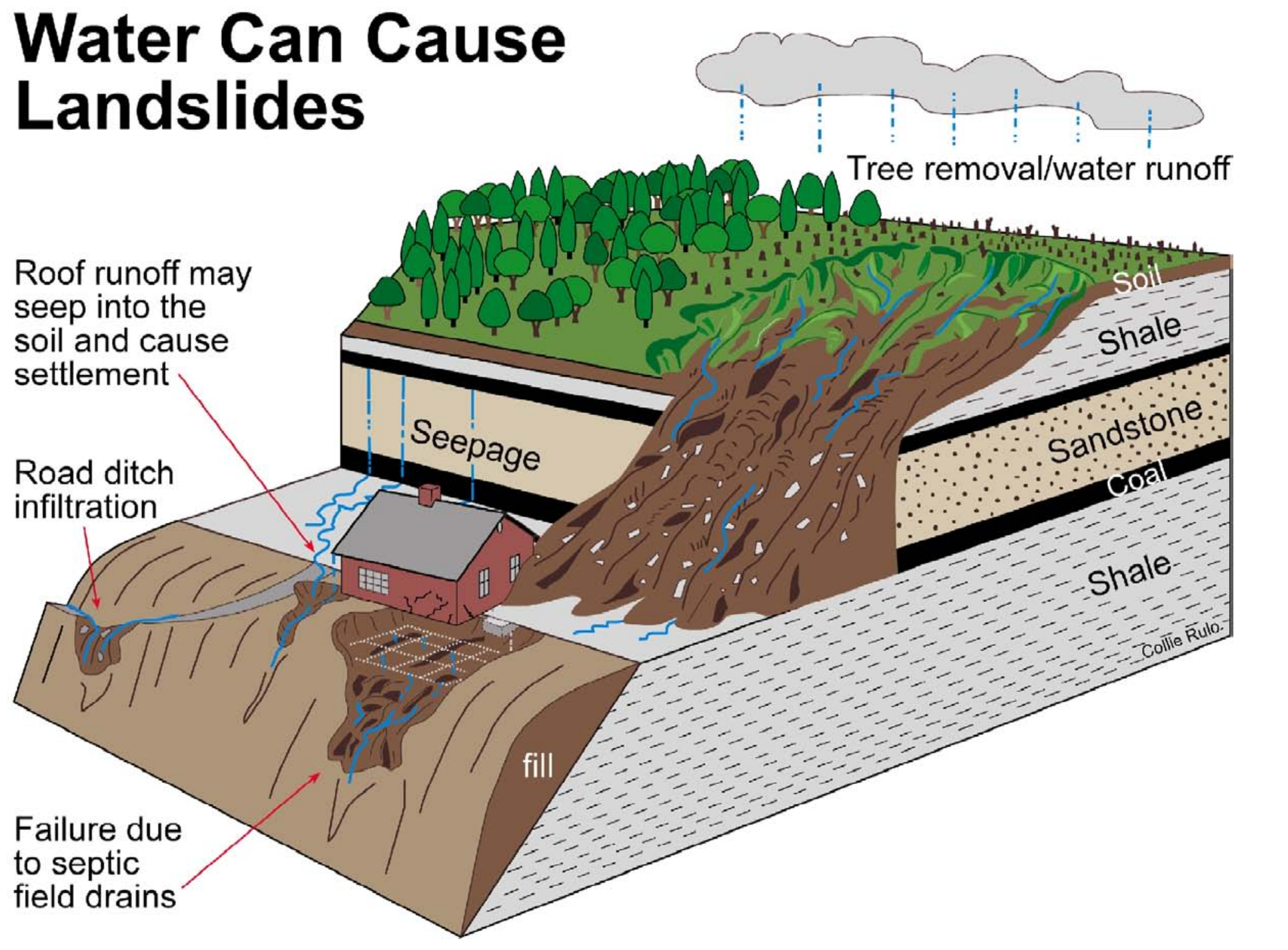
Many factors contribute to landslides. The most common in eastern Kentucky are listed below:

1. Steep slopes: Avoid when choosing a building site.
2. Water: Slope stability decreases as water moves into the soil. Springs, seeps, roof runoff, gutter downspouts, septic systems, and site grading that cause ponding or runoff are sources of water that often contribute to landslides.
3. Changing the natural slope by creating a level area where none previously existed.
4. Poor site selection for roads and driveways.
5. Improper placement of fill material.
6. Removal of trees and other vegetation: Site construction often results in the elimination of trees and other vegetation. Plants, especially trees, help remove water and stabilize the soil with their extensive root systems.

What Are Some Ways to Prevent Landslides?

1. Seek professional assistance prior to construction.
2. Proper site selection: Some sloping areas are naturally prone to landslides. Inspect the site for springs, seeps, and other wet areas that might indicate water problems. Take note of unusual cracks or bulges at the soil surface. These are typical signs of soil movement that may lead to slope failure. Also be aware of geologically sensitive areas where landslides are more likely to occur.
3. Alter the natural slope of the building site as little as possible during construction. Never remove soil from the toe or bottom of the slope or add soil to the top of the slope. Landslides are less likely to occur on sites where disturbance has been minimized. Seek professional assistance before earth moving begins.
4. Remove as few trees and other vegetation as possible. Trees develop extensive root systems that are very useful in slope stabilization. Trees also remove large amounts of groundwater. Trees and other permanent vegetative covers should be established as rapidly as possible and maintained to reduce soil erosion and landslide potential.
5. Household water disposal system: Seek professional assistance in selecting the appropriate type and location of your septic system. Septic systems located in fill material can saturate soil and contribute to landslides.
6. Proper water disposal: Allowing surface waters to saturate the sloping soil is the most common cause of landslides in eastern Kentucky. Properly located diversion channels are helpful in redirecting runoff away from areas disturbed during construction. Runoff should be channeled and water from roofs and downspouts piped to stable areas at the bottom of the slope.

(From U.S. Department of Agriculture, Natural Resources Conservation Service, no date)



Coal

Coal mining, both surface and underground, is abundant in Perry County. In 2005, the latest year for which statistics are available, the county produced 4.5 million tons of coal from underground mining and 8.1 million tons from surface mining. This surface mine is near Ky. 80 in Hazard. Photo by Bart Davidson, Kentucky Geological Survey.

EXPLANATION

- School
- Water wells
  - Commercial or industrial
  - Domestic
  - Monitoring
  - Public
  - Livestock
- Spring
- Gas well
- Oil well
- Secondary recovery injection well
- Railroad
- Abandoned railroad
- Watershed boundary
- Designated flood zone* (FEMA, 2005)
- Source-water protection area, zone 1
- Wetlands > 1 acre (U.S. Fish and Wildlife Service, 2003)
- Public lands
- Incorporated city boundaries
- Artificial fill
- Landslide

200-foot contour interval

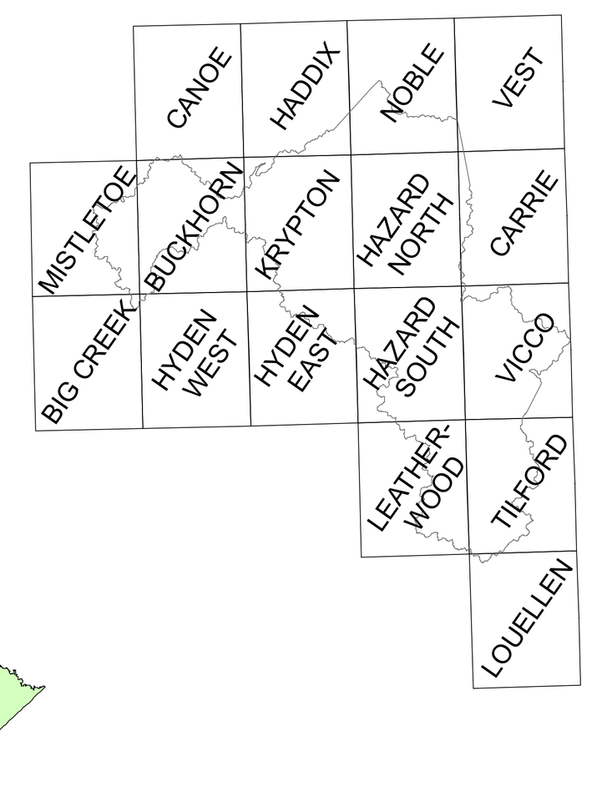
Photo location

*Flood information is available from the Kentucky Division of Water, Flood Plain Management Branch, www.water.ky.gov/floods/.

Source-Water Protection Areas

Source-water protection areas are those in which activities are likely to affect the quality of the drinking-water source. For more information, see kgsweb.uky.edu/download/water/swapp/swapp.htm.

7.5-Minute Quadrangle Map Index



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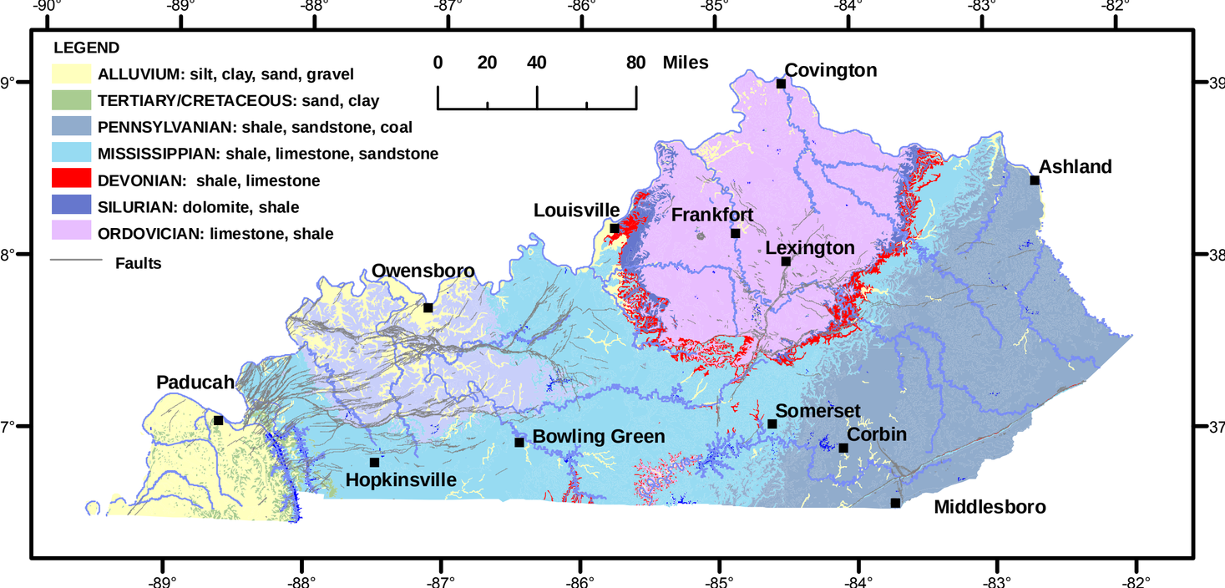
Geology of Kentucky



Learn more about Kentucky geology at www.uky.edu/KGS/geoky/

For information on obtaining copies of this map and other Kentucky Geological Survey maps and publications call our Public Information Center at 859.257.3896 or 877.778.7827 (toll free).

Visit the KGS World Wide Web site at: www.uky.edu/kgs