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

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Acknowledgments

Geology adapted from Thompson (2002a-d), Tyra (2002a, b), Zhang (2002). Sinkhole data from Paylor and others (2004). Thanks to Paul Howell, U.S. Department of Agriculture, Natural Resources Conservation Service, for pond construction illustrations.

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 supercede 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, and to make custom maps of your local area, visit our Land-Use Planning Internet Mapping Web Site at kgsmap.uky.edu/website/kyluplan/viewer.htm.

Earthquake Hazard

Ground shaking (peak particle accelerations) caused by an earthquake in or near the county is minimal for structures situated on or tied into the bedrock foundation. In areas underlain by poorly consolidated soils, site-specific investigations should be conducted to assure that the building codes will conform to any ground deformation such as liquefication, landslides, or surface fault ruptures. See www.uky.edu/KGS/geologichazards/eqhazards.htm for more information.

Groundwater

The Ohio River alluvium is the best source of groundwater. Many drilled wells will produce several hundred gallons per minute from the alluvium; most wells produce enough for a domestic supply at depths of less than 100 feet. Water is hard or very hard, but otherwise of good quality.

In the lower sections of the larger creek valleys, most drilled wells will produce enough water for a domestic supply at depths of less than 100 feet. Some wells located in the smaller creek valleys will produce enough water for a domestic supply, except during dry weather.

In upland areas (60 percent of the county), most drilled wells will not produce enough water for a dependable domestic supply, unless they are drilled along drainage lines, in which case they may produce enough water except during dry weather.

Groundwater in these areas is hard or very hard and may contain salt or hydrogen sulfide, especially at depths greater than 100 feet.

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

Alluvial Water Wells

Public water wells in the Ohio River alluvium (unit 1). This aquifer can meet water needs for communities, industry, and power generation. Photo by Dan Carey, Kentucky Geological Survey.

Wetlands

In wetlands along the river, wildlife lives in harmony with industry. Photo by Dan Carey, Kentucky Geological Survey.

Ohio River

The Ohio River borders Trimble County on the west and north and provides inexpensive bulk transportation for power and manufacturing industries. Photo by Dan Carey Kentucky Geological Survey.

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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.

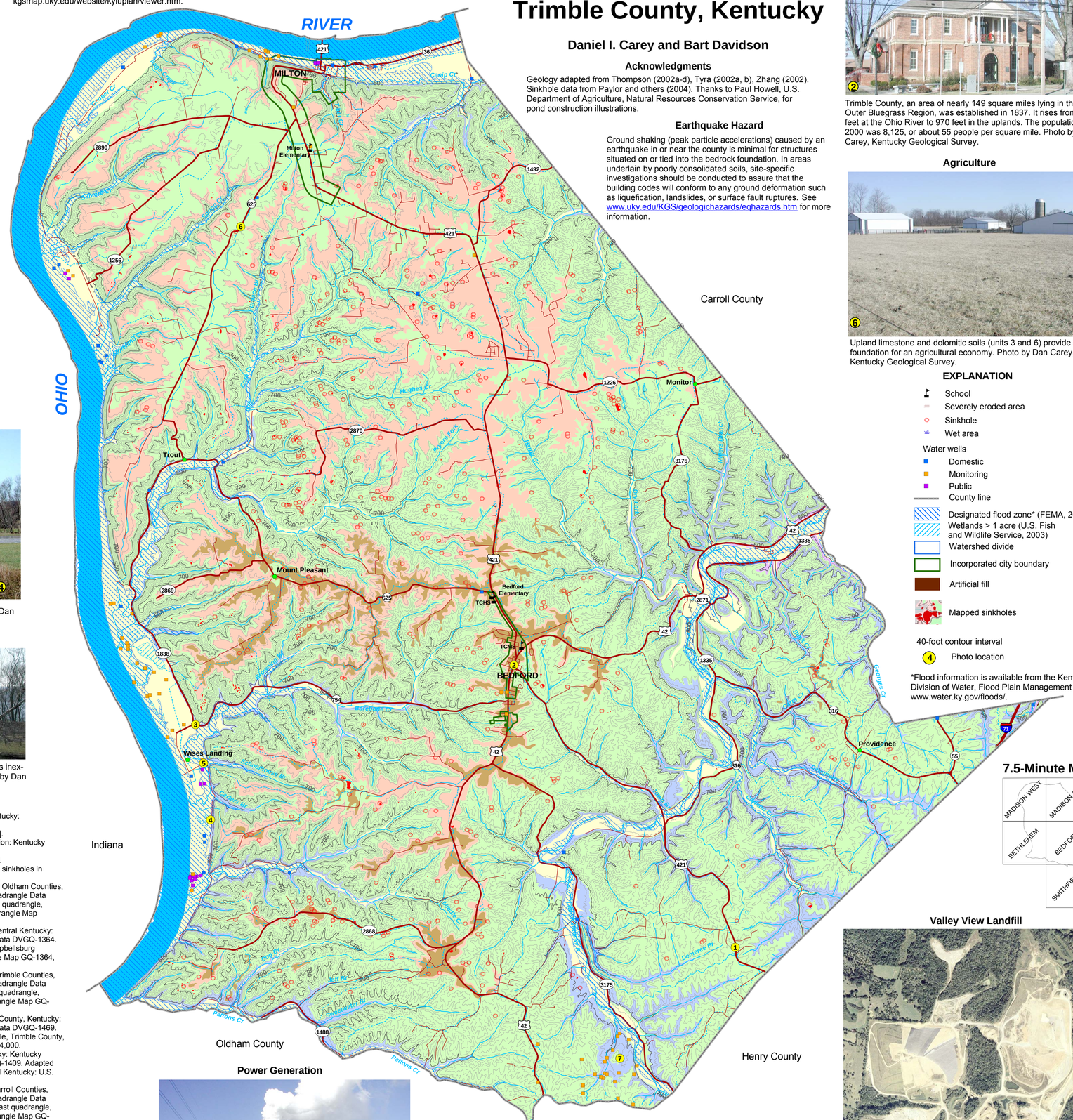
Intensive recreation—Athletic fields, stadiums, etc.

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.



7.5-Minute Map Index

Trimble County Courthouse at Bedford

Trimble County, an area of nearly 149 square miles lying in the Outer Bluegrass Region, was established in 1837. It rises from 420 feet at the Ohio River to 970 feet in the uplands. The population in 2000 was 8,125, or about 55 people per square mile. Photo by Dan Carey, Kentucky Geological Survey.

Agriculture

Upland limestone and dolomitic soils (units 3 and 6) provide the foundation for an agricultural economy. Photo by Dan Carey, Kentucky Geological Survey.

EXPLANATION

- School
- Severely eroded area
- Sinkhole
- Wet area

Water wells
- Domestic
- Monitoring
- Public

- County line
- Designated flood zone* (FEMA, 2005)
- Wetlands > 1 acre (U.S. Fish and Wildlife Service, 2003)
- Watershed divide
- Incorporated city boundary
- Artificial fill
- Mapped sinkholes

40-foot contour interval

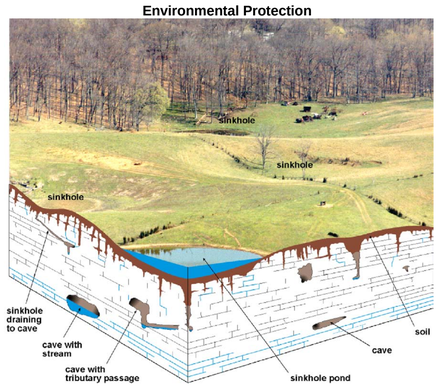
4 Photo location

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

Karst Geology

The term "karst" refers to a landscape characterized by sinkholes, springs, sinking streams (streams that disappear underground), and underground drainage through solution-enlarged conduits or caves. Karst landscapes form when slightly acidic water from rain and snowmelt seeps through soil cover into fractured and soluble bedrock (usually limestone, dolomite, or gypsum). Sinkholes are depressions on the land surface into which water drains underground. Usually circular and often funnel-shaped, they range in size from a few feet to hundreds of feet in diameter. Springs occur when water emerges from underground to become surface water. Caves are solution-enlarged fractures or conduits large enough for a person to enter.

Environmental Protection



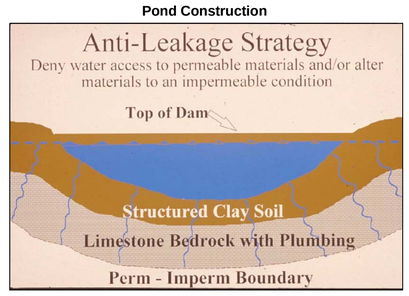
- Never use sinkholes as dumps. All waste, but especially pesticides, paints, household chemicals, automobile batteries, and used motor oil, should be taken to an appropriate recycling center or landfill.
- Make sure runoff from parking lots, streets, and other urban areas is routed through a detention basin and sediment trap to filter it before it flows into a sinkhole.
- Make sure your home septic system is working properly and that it's not discharging sewage into a crevice or sinkhole.
- Keep cattle and other livestock out of sinkholes and sinking streams. There are other methods of providing water to livestock.
- See to it that sinkholes near or in crop fields are bordered with trees, shrubs, or grass buffer strips. This will filter runoff flowing into sinkholes and also keep tilled areas away from sinkholes.
- Construct waste-holding lagoons in karst areas carefully, to prevent the bottom of the lagoon from collapsing, which would result in a catastrophic emptying of waste into the groundwater.
- If required, develop a groundwater protection plan (410KAR5:037) or an agricultural water-quality plan (KRS224.71) for your land use.

(From Currens, 2001)

Rural Residential Development

Rural residential development in southern Trimble County. Note sinkholes in foreground. Photo by Dan Carey, Kentucky Geological Survey.

Pond Construction



Successful pond construction must prevent water from seeping through structured soils into limestone solution channels below. A compacted clay liner or artificial liner may prevent pond failure. Getting the basin filled with water as soon as possible after construction prevents drying and cracking, and possible leakage, of the clayey soil liner. Ponds constructed in dry weather are more apt to leak than ponds constructed in wet weather. A geotechnical engineer or geologist should be consulted regarding the requirements of a specific site. Other leakage prevention measures include synthetic liners, bentonite, and asphaltic emulsions. The U.S. Department of Agriculture–Natural Resources Conservation Service can provide guidance on the application of these liners to new construction, and for treatment of existing leaking ponds.

Dams should be constructed of compacted clayey soils at slopes flatter than 3 units horizontal to 1 unit vertical. Ponds with dam heights exceeding 25 feet, or pond volumes exceeding 50 acre-feet, require permits. Contact the Kentucky Division of Water, 14 Reilly Rd., Frankfort, KY 40601, telephone: 502.564.3410. Illustration by Paul Howell, U.S. Department of Agriculture–Natural Resources Conservation Service.

Valley View Landfill

Republic Services Inc.'s Valley View landfill in southern Trimble County has been in operation since 1986 and is scheduled for closure in 2030. It currently contains about 4.7 million tons of nonhazardous municipal waste. This imagery was taken in 2004 by the U.S. Department of Agriculture, Farm Services Administration, National Agricultural Imagery Program.

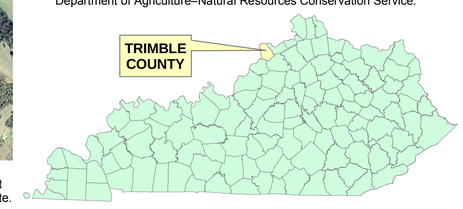
Power Generation

LG&E operates this 566 megawatt coal-fired power plant along the Ohio River just north of Wises Landing in southeastern Trimble County. Photo by Dan Carey, Kentucky Geological Survey.

Additional Planning Resources

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

ces.ca.uky.edu/trimble/ University of Kentucky Cooperative Extension Service
www.kineticnet.net/kyrcd/eagle.html Eagle Resource Conservation and Development Council Inc.
www.kipda.org/ Kentuckiana Regional Planning and Development Agency
www.thinkkentucky.com/edis/cmnty/cw123/ Detailed county statistics
www.uky.edu/KentuckyAtlas/21223.html Kentucky Atlas and Gazetteer
quickfacts.census.gov/qfd/states/21/21223.html U.S. census data
www.trimblecounty.com/tcgov.htm Trimble County government site
kgsweb.uky.edu/download/kgsplanning.htm Planning information from the Kentucky Geological Survey

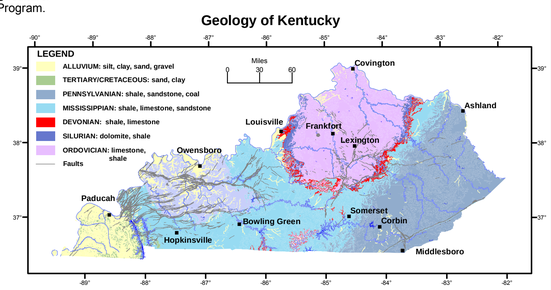


Planning Guidance by Rock Unit Type

Rock Unit	Karst Potential Rating	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. Silt, clay, sand, and gravel	None, but on-site karst investigation recommended where less than 25 feet thick over soluble rock.	Fair foundation material; easy to excavate.	Severe limitations. Failed septic systems can contaminate groundwater. Refer to soil report (Whitaker and Eigel, 1992).	Water in alluvium may be in direct contact with basements. Refer to soil report (Whitaker and Eigel, 1992).	Slight limitations. Refer to soil report (Whitaker and Eigel, 1992).	Slight to moderate limitations. Refer to soil report (Whitaker and Eigel, 1992).	Slight to moderate limitations. Avoid construction in flood-plain. Refer to soil report (Whitaker and Eigel, 1992).	Refer to soil report (Whitaker and Eigel, 1992).	Refer to soil report (Whitaker and Eigel, 1992).	Refer to soil report (Whitaker and Eigel, 1992).	Not recommended. Refer to soil report (Whitaker and Eigel, 1992).	Not recommended. Refer to soil report (Whitaker and Eigel, 1992).
2. Shale*, limestone	Medium to low.	Fair to good foundation material; difficult excavation. Slumps when wet. Avoid steep slopes.	Slight to severe limitations, depending on amount of soil cover and depth to impermeable rock.	Severe to moderate limitations. Rock excavation may be required. Slumps when wet. Avoid steep slopes.	Moderate to severe limitations. Rock excavation may be required. Possible steep slopes.	Moderate limitations. Rock excavation likely. Local drainage problems, especially on shale. Sinks common.	Slight to severe limitations, depending on topography. Rock excavation. Sinks common. Local drainage problems. Groundwater contamination possible.	Slight to moderate limitations, depending on activity and topography. Possible steep wooded slopes.	Slight limitations, depending on activity and topography. Possible steep wooded slopes. Slight limitations for forest or nature preserve.	Moderate to slight limitations. Reservoir may leak where rocks are fractured. Sinks possible.	Moderate to severe limitations. Reservoir may leak where rocks are fractured. Sinks possible.	Severe to moderate limitations. Rock excavation may be required. Slumps when wet. Avoid steep slopes.
3. Limestone, shale*	High to medium.	Good to excellent foundation material; difficult to excavate. Possible expansion of shales.	Slight to severe limitations, depending on amount of soil cover and depth to impermeable rock.	Severe to moderate limitations. Rock excavation; locally, upper few feet may be rippable. Possible expansion of shales.	Moderate limitations. Rock excavation possible. Local drainage problems, especially on shale. Sinks common and caves possible.	Moderate limitations. Rock excavation possible. Possible steep slopes. Slight limitations with suitable topography.	Slight to severe limitations, depending on topography. Rock excavation. Sinks common. Local drainage problems. Groundwater contamination possible.	Slight to moderate limitations. Rock excavation may be required.	Slight limitations, depending on activity and topography. Possible steep wooded slopes. No limitations for nature or forest preserve.	Moderate to slight limitations. Reservoir may leak where rocks are fractured. Sinks possible.	Moderate to severe limitations. Reservoir may leak where rocks are fractured. Sinks possible.	Severe to moderate limitations. Possible rock excavation.
4. Limestone	High.	Excellent foundation material; difficult to excavate.	Severe limitations. Impermeable rock. Locally fast drainage through fractures and sinks. Danger of groundwater contamination.	Severe to moderate limitations. Rock excavation may be required.	Severe limitations. Rock excavation. Possible steep slopes.	Severe to moderate limitations. Possible rock excavation. Possible steep slopes and narrow ravines.	Slight to moderate limitations, depending on topography. Rock excavation possible. Sinks common. Local drainage problems.	Severe to moderate limitations, depending on activity and topography. Rock excavation may be required. Possible wooded slopes.	Moderate to slight limitations, depending on activity and topography. Possible wooded slopes. Slight limitations for nature preserve.	Slight to severe limitations. Reservoir may leak where rocks are fractured. Sinks possible.	Severe limitations. Reservoir may leak where rocks are fractured. Sinks possible.	Severe to moderate limitations. Possible rock excavation.
5. Clay, silt, sand, and gravel (high-level terrace deposits)	None, but on-site karst investigation recommended where less than 25 feet thick over soluble rock.	Fair foundation material; easy to excavate.	Severe to slight limitations, depending on amount of soil cover.	Moderate to slight limitations, depending on slope.	Slight limitations.	Slight limitations, depending on degree of slope.	Slight limitations, depending on degree of slope.	Moderate to slight limitations, depending on activity and topography. Possible wooded slopes.	Slight limitations, depending on activity and topography. Possible wooded slopes. Slight limitations for nature preserve.	Pervious material. Not recommended.	Severe to slight limitations. Unstable steep slopes.	Slight limitations.
6. Dolomite	Medium.	Excellent foundation material; difficult to excavate.	Severe limitations. Impermeable rock. Locally fast drainage through fractures and sinks. Danger of groundwater contamination.	Severe limitations. Rock excavation may be required.	Severe limitations. Rock excavation. Possible steep slopes.	Moderate to severe limitations. Rock excavation. Possible steep slopes and narrow ravines.	Slight to moderate limitations, depending on topography. Rock excavation. Sinks common. Local drainage problems.	Slight to moderate limitations, depending on activity and topography. Possible steep wooded slopes.	Moderate to slight limitations, depending on activity and topography. Possible steep wooded slopes. Slight limitations for forest or nature preserve.	Slight to moderate limitations. Reservoir may leak where rocks are fractured. Sinks possible.	Slight to moderate limitations. Reservoir may leak where rocks are fractured. Sinks possible.	Severe limitations. Rock excavation.

*Some of these shales can shrink during dry periods, and swell during wet periods and cause cracking of foundations. On hillsides, especially where springs are present, they can also be susceptible to landslides.

Geology of Kentucky



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

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Scale 1:48,000 1 inch equals 3/4 mile

0 0.5 1 2 3 4 Miles

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).

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