

Generalized Geologic Map for Land-Use Planning: Breckinridge County, Kentucky

Daniel I. Carey, Daniel L. Kottler, and E. Glynn Beck
Kentucky Geological Survey

Joseph D. Buckles
University of Kentucky

EXPLANATION

- School
- Gas well
- Oil well
- Enhanced recovery well
- Water wells
 - Domestic
 - Monitoring
 - Public
 - Industrial
 - Agricultural
- Severely eroded area
- Well area
- Mine or quarry
- Spring
- County line
- Watershed boundary
- Railroad
- Geologic fault
- Consolidated geologic fault
- Designated flood zone* (FEMA, 2005)
- Wetlands > 1 acre (U.S. Fish and Wildlife Service, 2003)
- Incorporated city boundaries
- Source-water protection area, zone 1
- Wildlife management area
- Mapped sinkhole
- Quarry
- 40-foot contour interval

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

Tar-Sands in Western Kentucky

Investigations by the Kentucky Geological Survey have confirmed that major tar-sand resources are present in western Kentucky (Noger, 1989). In place resources are believed to be in excess of 3 billion barrels. The principal formations that contain tar-sand deposits (also referred to as asphaltic sandstones, heavy-oil deposits, or bitumen-impregnated sandstones) are the Kyrock, Bee Springs, Tar Springs, Hardinsburg, and Big City Sandstones. Some of these may occur in Logan, Warren, Butler, Edmonson, Hart, Grayson, Breckinridge, and Harlan counties. In Breckinridge County, tar sands may be present in unit 3. Photo by Randy Bruner.

Agriculture

Agriculture is an important part of the Breckinridge County economy. The Kentucky Agricultural Statistics Service (2004-2005) reported that 31,400 acres (18 percent) of the 174,720 acres available were planted in corn, soybeans and tobacco. Photo by Dan Kottler, Kentucky Geological Survey.

Recreation

Rough River Dam Resort Park has a 5,000-acre lake located in both Breckinridge and Grayson Counties. The dam, completed in 1981, provides reduction of flood stages downstream and public recreation on the impounded Rough River Lake. Photo by Dan Kottler, Kentucky Geological Survey.

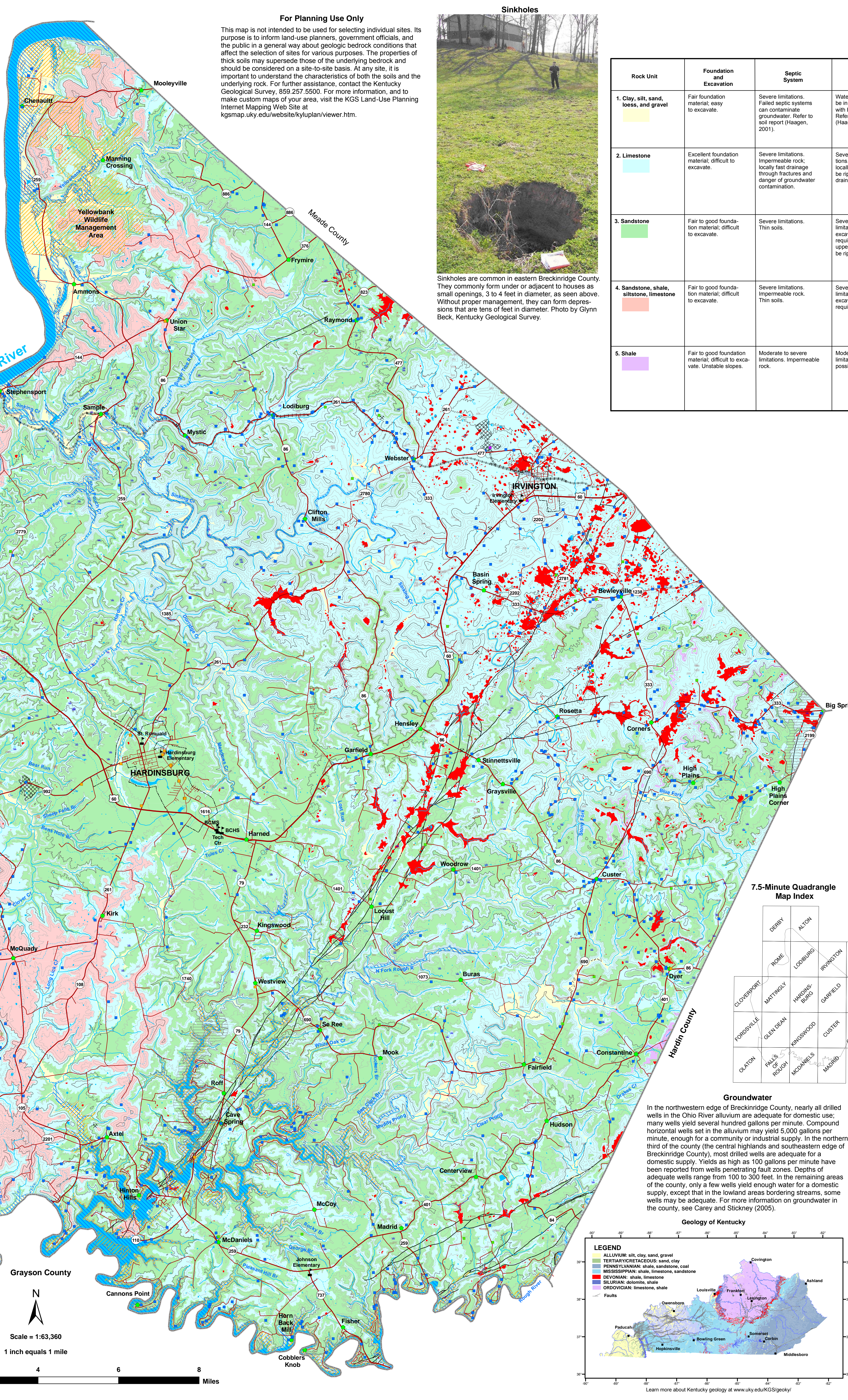
Road Construction

Because of thin soil cover in certain areas of the county, rock excavation is required during road and other types of construction. An example is this roadcut on U.S. 60 just west of Hardinsburg. Photo by Dan Kottler, Kentucky Geological Survey.

Breckinridge County Courthouse at Hardinsburg



Breckinridge County, an area of 572 square miles, was formed in 1800 and named after John Breckinridge (1786-1806), Kentucky Attorney General, U.S. Senator, and U.S. Attorney General. The present Breckinridge County courthouse, said to be completely fireproof, is the fourth; three earlier courthouses were destroyed by fire. The county population in 2005 was 19,300, 3.5 percent greater than in 2000. Photo by Dan Kottler, Kentucky Geological Survey.



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, and to make custom maps of your area, visit the KGS Land-Use Planning Internet Mapping Web Site at kgmap.uky.edu/website/ky/plan/viewer.htm.



Sinkholes are common in eastern Breckinridge County. They commonly form under or adjacent to houses as small openings, 3 to 4 feet in diameter, as seen above. Without proper management, they can form depressions that are tens of feet in diameter. Photo by Glynn Beck, Kentucky Geological Survey.

Planning Guidance by Rock Unit Type

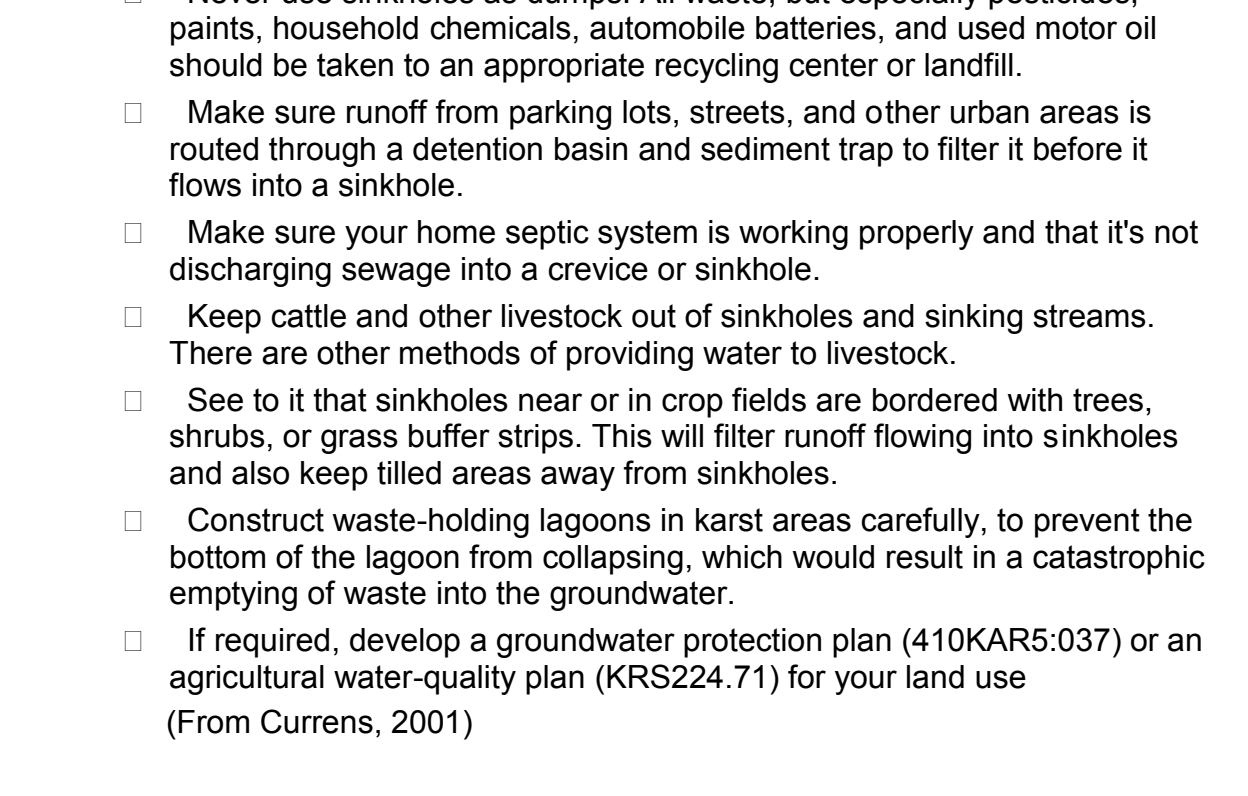
Rock Unit	Foundation and Excavation	Septic System	Residence with Basement	Highways and Streets	Access Roads	Light Industry and Malls	Intensive Recreation	Extensive Recreation	Reservoir Areas	Reservoir Embankments	Underground Utilities
1. Clay, silt, sand, loess, and gravel	Fair foundation material; easy to excavate.	Severe limitations. Failed septic systems can contaminate groundwater. Refer to soil report (Haagen, 2001).	Water in alluvium may be in direct contact with basements. Refer to soil report (Haagen, 2001).	Slight limitations. Refer to soil report (Haagen, 2001).	Slight to moderate limitations. Refer to soil report (Haagen, 2001).	Slight to moderate limitations. Avoid construction in floodplain. Refer to soil report (Haagen, 2001).	Refer to soil report (Haagen, 2001).	Refer to soil report (Haagen, 2001).	Refer to soil report (Haagen, 2001).	Not recommended. Refer to soil report (Haagen, 2001).	Not recommended. Refer to soil report (Haagen, 2001).
2. Limestone	Excellent foundation material; difficult to excavate.	Severe limitations. Impermeable rock; locally fast drainage through fractures and danger of groundwater contamination.	Severe to moderate limitations. Rock excavation may be required; locally, upper few feet may be riprapable. Steep slopes.	Slight to moderate limitations. Rock excavation may be required; locally, upper few feet may be riprapable. Steep slopes.	Slight to moderate limitations. Local drainage problems from seeps or springs; sinks common and caves possible.	Slight to moderate limitations. Rock excavation may be required. Refer to soil report (Haagen, 2001).	Moderate to severe limitations, depending on activity and topography.	Slight limitations, depending on activity and topography.	Severe limitations. Leaky reservoir. Localities may be favorable. Sinks possible.	Severe limitations. Possible leaky reservoir rock.	Severe limitations. Rock excavation.
3. Sandstone	Fair to good foundation material; difficult to excavate.	Severe limitations. Thin soils.	Severe to moderate limitations. Rock excavation may be required; locally, upper few feet may be riprapable.	Severe to moderate limitations. Rock excavation may be required; locally, upper few feet may be riprapable.	Moderate limitations. Rock excavation possible. Possible steep slopes.	Moderate limitations. Rock excavation possible. Possible steep slopes.	Moderate to severe limitations, depending on activity and topography.	Slight to moderate limitations, depending on activity and topography.	Slight limitations. Reservoir may leak where rocks are fractured.	Severe limitations. Leaky rock.	Moderate limitations. Highly variable amount of rock and earth excavation.
4. Sandstone, shale, limestone, limestone	Fair to good foundation material; difficult to excavate.	Severe limitations. Impermeable rock. Thin soils.	Severe to moderate limitations. Rock excavation may be required.	Severe limitations. Rock excavation locally, upper few feet may be riprapable. Possible steep slopes.	Moderate limitations. Rock excavation locally, upper few feet may be riprapable. Possible steep slopes.	Severe limitations. Rock excavation locally, upper few feet may be riprapable. Possible steep slopes.	Moderate to severe limitations, depending on activity and topography.	Moderate to slight limitations, depending on activity and topography.	Slight limitations. Reservoir may leak where rocks are fractured.	Severe limitations. Leaky rock.	Moderate limitations. Highly variable amount of rock and earth excavation.
5. Shale	Fair to good foundation material; difficult to excavate. Unstable slopes.	Moderate to severe limitations. Impermeable rock.	Moderate to slight limitations. Rock excavation possible. Poor drainage.	Slight to moderate limitations. Possible rock excavation. Slopes tend to be unstable when wet.	Slight limitations. Slopes tend to be unstable when wet.	Slight limitations. Rock generally riprapable in shallow cuts.	No limitations.	No limitations.	No limitations. Impermeable rock.	Slight to moderate limitations. Slopes may be unstable when wet.	Moderate limitations. Highly variable amount of rock and earth excavation.

Karst Geology

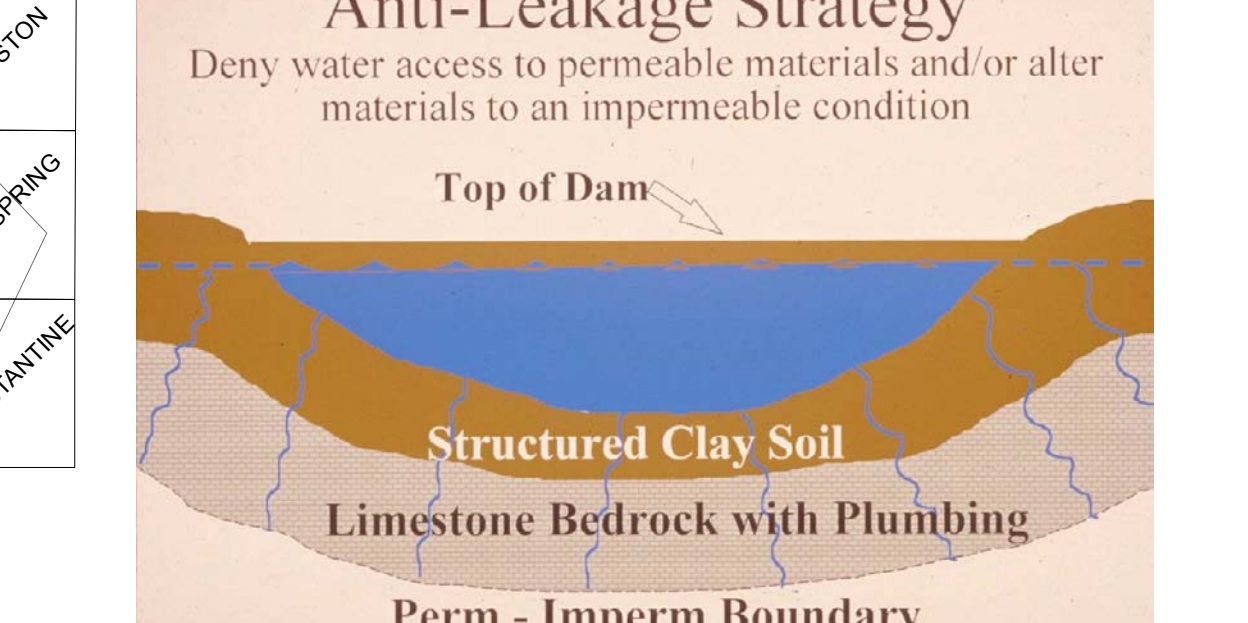
The term "karst" refers to a landscape characterized by sinkholes, springs, sinking streams (streams that disappear underground), and underground drainage through solution-enlarged conduits or caves. Karst landscapes form when slightly acidic water from rain and snowmelt seeps through soil cover into 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 tiled 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 (410KARS.037) or an agricultural water-quality plan (KRS224.71) for your land use. (From Currens, 2001)



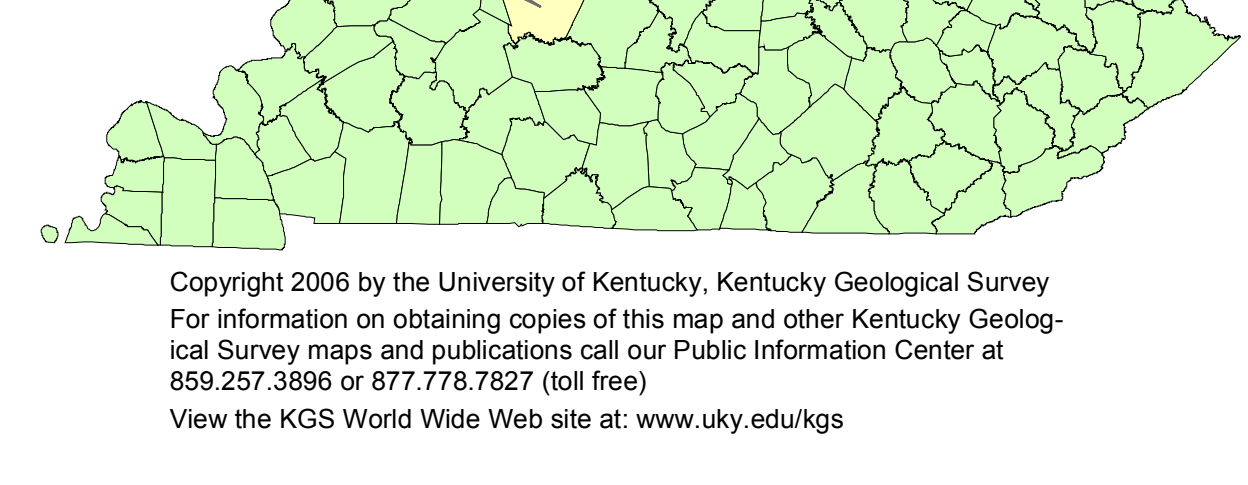
Pond Construction



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.

Geology of Kentucky



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 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 an 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.

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Additional Resources

- Listed below are Web sites for several agencies and organizations that may be of assistance with land-use planning issues in Breckinridge County.
- ces.ca.uky.edu/breckinridge/ University of Kentucky Cooperative Extension Service
- www.tadtd.org/ Lincoln Trail Area Development District
- www.thinkkentucky.com/idea/cmmty/cow/00/ Kentucky Economic Development Information System
- www.uky.edu/kygeology/ Kentucky Geological Survey
- www.uky.edu/KentuckyAtlas21027.html Kentucky Atlas and Gazetteer
- quickfacts.census.gov/qfacts/21027.html U.S. Census data
- www.breckinridgecounty.gov/ Local government site
- www.breckinridgeco.com/ Breckinridge County Chamber of Commerce