Kentucky Geological Survey
James C. Cobb, State Geologist and Director
UNIVERSITY OF KENTUCKY, LEXINGTON

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

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MAP AND CHART 48
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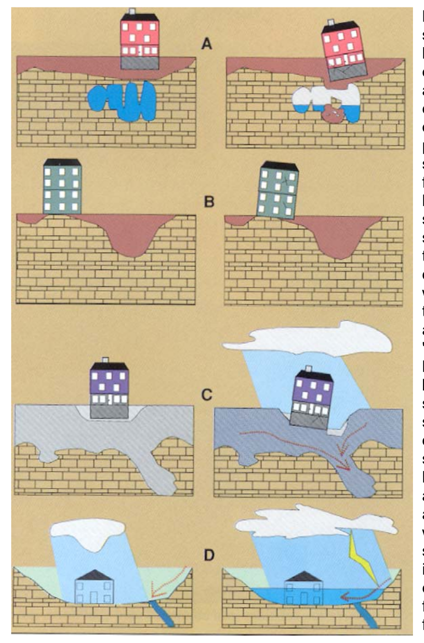
For Planning Use Only

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 kgsmap.uky.edu/website/kyluplan/viewer.htm.

Karst Subsidence



Limestone terrain can be subject to subsidence hazards, which usually can be overcome by prior planning and site evaluation. "A" shows construction above an open cavern, which later collapses. This is one of the most difficult situations to detect, and the possibility of this situation beneath a structure warrants insurance protection for homes built on karst terrain. In "B," a heavy structure presumed to lie above solid bedrock actually is partially supported on soft, residual clay soils that subside gradually, resulting in damage to the structure. This occurs where inadequate site evaluation can be traced to lack of geophysical studies and inadequate core sampling. "C" and "D" show the close relationship between hydrology and subsidence hazards in limestone terrain. In "C," the house is situated on porous fill (light shading) at a site where surface- and groundwater drainage move supporting soil (darker shading) into voids in limestone (blocks) below. The natural process is then accelerated by infiltration through fill around the home. "D" shows a karst site where normal rainfall is absorbed by subsurface conduits, but water from infrequent heavy storms cannot be carried away quickly enough to prevent flooding of low-lying areas. Adapted from AIPG (1993).

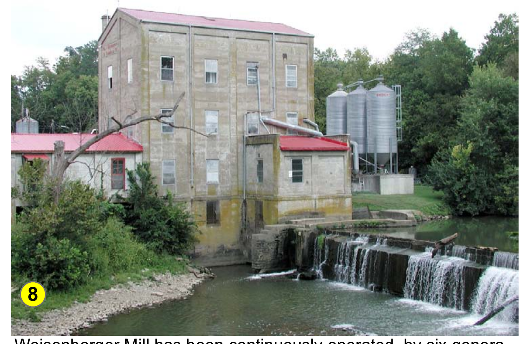
Scott County Courthouse

Scott County, an area of 285 square miles in the Inner Bluegrass Region, was established in 1792. The lowest point in the county, 690 feet, is where North Elkhorn Creek leaves the county. The highest point, 1,060 feet, is on a ridge on the Scott-Harrison County line at the head of the East Fork of Eagle Creek. Photo by Bart Davidson, Kentucky Geological Survey.

Lakeside Development

Victoria Estates, a private lakeside community, is one of several lakeside developments of several hundred homes in the county. Lots are one acre or larger. Proper management of private wastewater treatment systems is essential to maintain water quality, particularly in the karst areas of southern Scott County. Photo by Dan Carey, Kentucky Geological Survey.

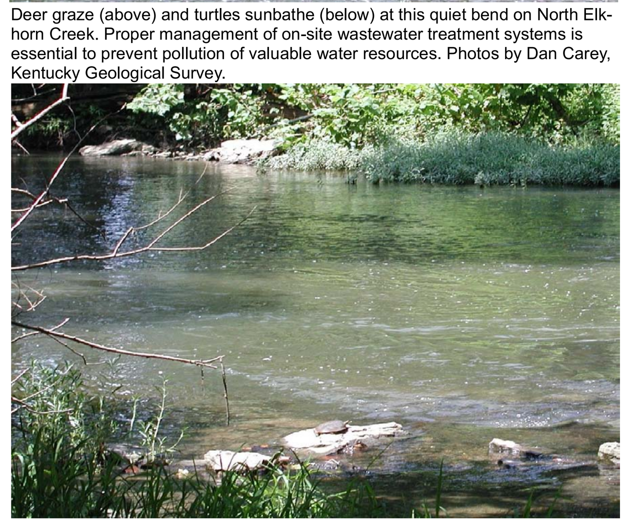
Weisenberger Mill



Weisenberger Mill has been continuously operated by six generations of Weisenbergers since 1865. South Elkhorn Creek has provided power to the mill. The mill produces flours, corn meal, and a wide variety of specialty mixes. Photo by Dan Carey, Kentucky Geological Survey.

North Elkhorn Creek

Deer graze (above) and turtles sunbathe (below) at this quiet bend on North Elkhorn Creek. Proper management of on-site wastewater treatment systems is essential to prevent pollution of valuable water resources. Photos by Dan Carey, Kentucky Geological Survey.



Royal Springs

Royal Springs has provided drinking water to residents for over 225 years. The groundwater basin for the spring extends into northern Fayette County, and is susceptible to contamination from development, agriculture, and transportation on I-75. Photo by Bart Davidson, Kentucky Geological Survey.

Groundwater

In the North and South Forks of Elkhorn Creek and their major tributaries, most drilled wells in the valleys will produce enough water for a domestic supply at depths of less than 100 feet. Wells located in the creek valleys of the northern half of the county, and in the upper reaches of the creek valleys and some of the upland areas in the southern half, will produce enough water for a domestic supply, except during dry weather. In the upland areas of the northern two-thirds of Scott 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.

Throughout the county groundwater 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)

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.

Planning Guidance by Rock Unit Type

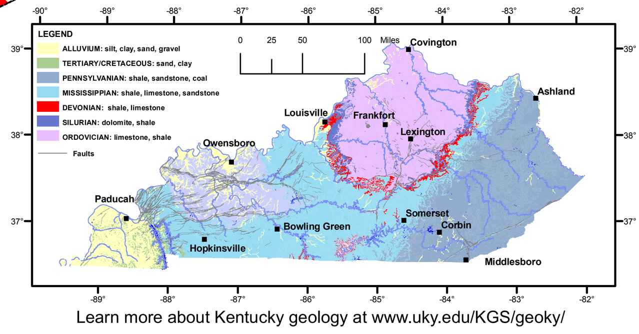
Rock Unit	Karst Potential Rating	Foundation and Excavation	Septic System	Residence with Basement	Highways and Streets	Access Roads	Light Industry and Malls	Intensive Recreation	Extensive Recreation	Reservoir Areas	Reservoir Embankments	Underground Utilities
1. Clay, silt, sand, and gravel	None, but on-site 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 (Odor and others, 1968).	Water in alluvium may be in direct contact with basements. Refer to soil report (Odor and others, 1968).	Slight limitations. Refer to soil report (Odor and others, 1968).	Slight to moderate limitations. Refer to soil report (Odor and others, 1968).	Slight to moderate limitations. Avoid construction in flood-plain. Refer to soil report (Odor and others, 1968).	Refer to soil report (Odor and others, 1968).	Refer to soil report (Odor and others, 1968).	Refer to soil report (Odor and others, 1968).	Not recommended. Refer to soil report (Odor and others, 1968).	Not recommended. Refer to soil report (Odor and others, 1968).
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.	Moderate to severe limitations. Possible rock excavation. Susceptible to landslides.
3. Limestone, shale*	High to medium.	Good to excellent foundation material; difficult to excavate.	Slight to severe limitations, depending on amount of soil cover and depth to impermeable rock.	Severe to moderate limitations. Rock excavation may be required.	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.	Moderate to slight limitations, depending on activity and topography. Possible wooded slopes.	Severe 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.	Slight to severe limitations. Reservoir may leak where rocks are fractured. Sinks possible.	Severe to moderate limitations. Possible 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.

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)

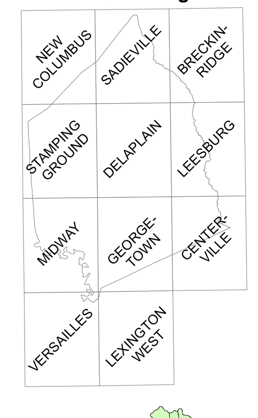
View the KGS World Wide Web site at: www.uky.edu/kgs

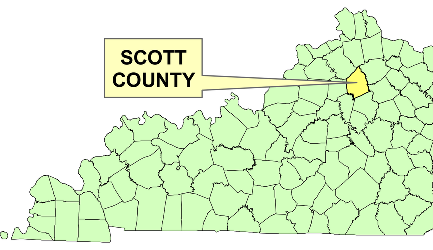
Geology of Kentucky



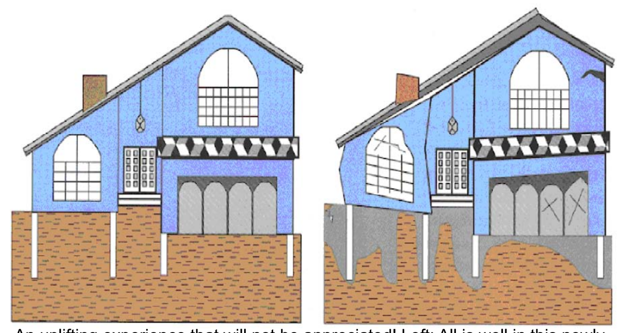
Learn more about Kentucky geology at www.uky.edu/KGS/geoky/

7.5-Minute Quadrangle Index





Residential Drainage



An uplifting experience that will not be appreciated! Left: All is well in this newly built home until water from percolation, drains, lawn sprinklers, leaking sewers, or water mains soaks swelling soil beneath the foundation. Right: With time, expanding soils exert several tons per square foot of pressure on the foundation and shallow pilings. Without remedial measures, the house will actually become deformed, and shatter masonry and windows. Remedies vary from mere maintenance that keeps drainage away from the house to expensive reconstruction of foundations. Prior site planning that takes geology into account is always preferable to dealing with problems after a structure is built. From AIPG (1993).

Shale and Limestone — Unit 4

Areas underlain by the shales and limestones of unit 4 are characterized by a topography of rolling hills. Photo by Bart Davidson, Kentucky Geological Survey.

Toyota Georgetown

Toyota Motor Manufacturing, Kentucky lies on 1,300 acres north of Georgetown. The plant has 7.5 million square feet under roof. The 7,000 team members have built 6,622,114 vehicles since 1988. Photo by Dan Carey, Kentucky Geological Survey.

EXPLANATION

- School
- Water wells
  - Domestic
  - Monitoring
  - Public
  - Agricultural
  - Commercial/Industrial
- Sinkhole
- Wet area
- Spring
- Geologic fault
- Concealed geologic fault
- Railroad
- County line
- Incorporated city boundary
- Watershed boundary
- Designated flood zone* (FEMA, 2005)
- Wetlands > 1 acre (U.S. Fish and Wildlife Service, 2003)
- Source-water protection area, zone 1
- Quarry
- Mapped sinkholes
- Artificial fill
- 4 Photo location

20-foot contour interval

*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.

Mineral Resources

Nally and Gibson, Georgetown LLC, have been mining limestone for aggregate at the Georgetown Quarry for over 50 years. Photo by Richard Smath, Kentucky Geological Survey.

Mapped Surface Faults

Faults are common geologic structures across Kentucky, and have been mapped in many of the Commonwealth's counties. The faults shown on this map represent seismic activity that occurred several million years ago at the latest. There has been no activity along these faults in recorded history. Seismic risk associated with these faults is very low. Faults may be associated with increased fracturing of bedrock in the immediately adjacent area. This fracturing may influence slope stability and groundwater flow in these limited areas.

Acknowledgments

Geology adapted from Nelson (2001a-i), Patton (2001), and Zhang (2001). Sinkhole data from Paylor and others (2004). Pond construction illustration courtesy of Paul Howell, U.S. Department of Agriculture, Natural Resources Conservation Service. Thanks to Kim and Kent Anness, Kentucky Division of Geographic Information, for digital basemap data.

Residential Development

The population of Scott County increased 63 percent in 15 years, from 23,900 in 1990 to 39,000 in 2005, resulting in a significant increase in residential construction. Photo by Dan Carey, Kentucky Geological Survey.

Radon

Radon gas can be a local problem, in some areas exceeding the U.S. Environmental Protection Agency's maximum recommended limit of 4 picocuries per liter. The shales of unit 5 and limestones of unit 3 may contain high levels of uranium or radium, parent materials for radon gas. Homes in these areas should be tested for radon, but the homeowner should keep in mind that the threat to health results from relatively high levels of exposure over long periods, and the remedy may simply be additional ventilation of the home.

Radon Risk If You've Never Smoked

Radon Level	If 1,000 people who never smoked were exposed to this level over a lifetime*...	The risk of cancer from radon exposure compares to**...	WHAT TO DO:
20 pCi/L	About 36 people could get lung cancer	35 times the risk of drowning	Fix your home
10 pCi/L	About 18 people could get lung cancer	20 times the risk of dying in a home fire	Fix your home
8 pCi/L	About 15 people could get lung cancer	4 times the risk of dying in a fall	Fix your home
4 pCi/L	About 7 people could get lung cancer	The risk of dying in a car crash	Fix your home
2 pCi/L	About 4 people could get lung cancer	The risk of dying from poison	Consider fixing between 2 and 4 pCi/L
1.3 pCi/L	About 2 people could get lung cancer	(Average indoor radon level)	(Reducing radon levels below 2 pCi/L is difficult.)
0.4 pCi/L		(Average outdoor radon level)	

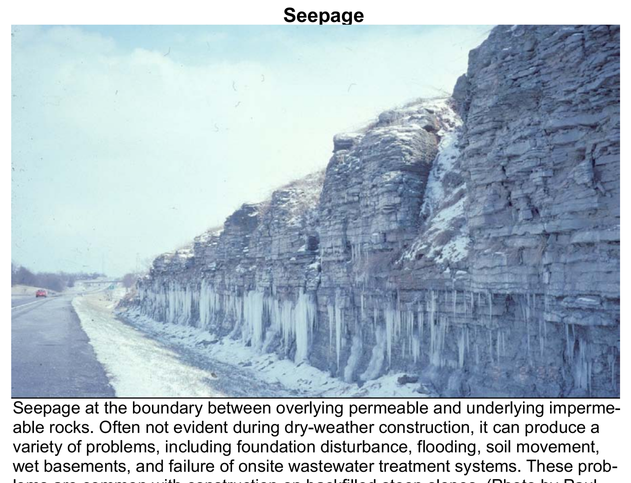
Note: If you are a former smoker, your risk may be higher.
* Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003).
** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.

Additional Resources

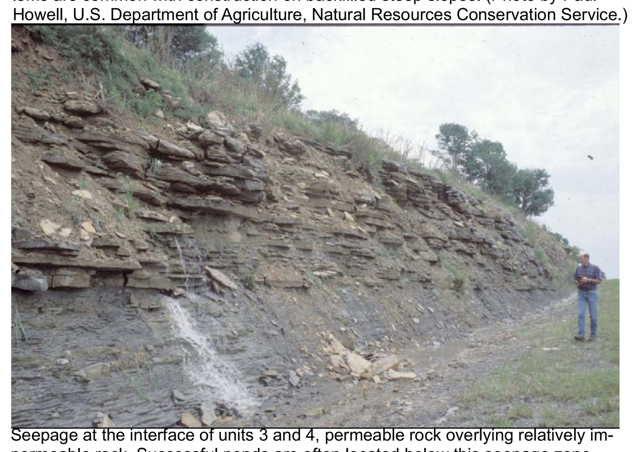
Listed below are Web sites for several agencies and organizations that may be of assistance with land-use planning issues in Scott County:

www.gscplanning.com Georgetown/Scott County Planning Commission
www.georgetownky.com Georgetown/Scott County, Kentucky
www.gtown.org Georgetown–Scott County Chamber of Commerce
www.thepavilionky.com Georgetown/Scott County Parks and Recreation
www.georgetowncollege.edu Georgetown College
ces.ca.uky.edu/Scott/ University of Kentucky Cooperative Extension Service
www.bgadd.org/ Bluegrass Area Development District
www.thinkkentucky.com/edis/cmnty/cw054/ Kentucky Economic Development Information System
www.uky.edu/KentuckyAtlas/21209.html Kentucky Atlas and Gazetteer, Scott County
quickfacts.census.gov/qfd/states/21/21209.html U.S. Census data
kgsweb.uky.edu/download/kgsplanning.htm Planning information from the Kentucky Geological Survey

Seepage

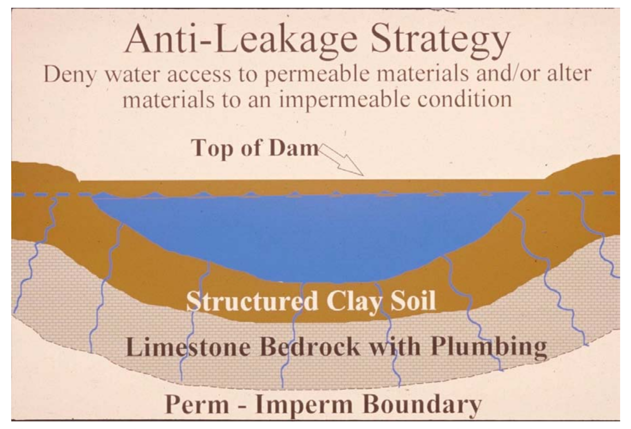


Seepage at the boundary between overlying permeable and underlying impermeable rocks. Often not evident during dry-weather construction, it can produce a variety of problems, including foundation disturbance, flooding, soil movement, wet basements, and failure of onsite wastewater treatment systems. These problems are common with construction on backfilled steep slopes. (Photo by Paul Howell, U.S. Department of Agriculture, Natural Resources Conservation Service.)



Seepage at the interface of units 3 and 4, permeable rock overlying relatively impermeable rock. Successful ponds are often located below this seepage zone. Ponds should be constructed so that the springs or seeps will always be above the level of the pond surface. (Photo by Paul Howell, U.S. Department of Agriculture, Natural Resources Conservation Service.)

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.

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