

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

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Anderson County Courthouse at Lawrenceburg



Anderson County, an area of 203 square miles in the Bluegrass Region of Kentucky, was formed in 1827. The terrain ranges from rolling Inner Bluegrass in the east to hilly Outer Bluegrass in the west. Elevations range from 480 feet where the Kentucky River leaves the county, to 940 feet along the ridge adjacent to Ky. 749, about 2.5 miles south of Fox Creek. The 2005 population of 20,189 was 5.7 percent larger than the 2000 population. Photo by Dan Carey, Kentucky Geological Survey.

Shale and Limestone—Unit 7



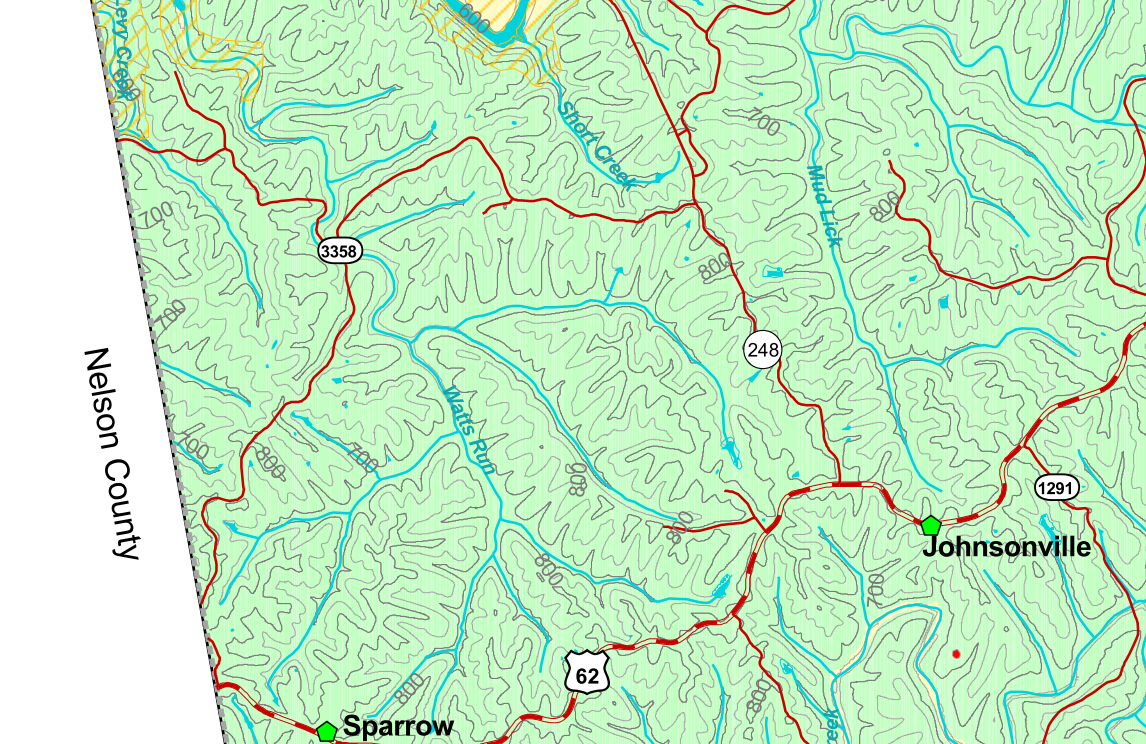
In general the shale content of the underlying bedrock is greater in western Anderson County, and produces a hillier, rolling topography. Photo by Dan Carey, Kentucky Geological Survey.

Groundwater

In karst areas, such as eastern Anderson County, stormwater runoff can flow underground through large solution channels. This groundwater flow does not follow the topography of the surface, and water from one watershed may flow underground and reappear in an adjacent watershed. A knowledge of the groundwater flow, gained through dye-trace studies, is required to manage stormwater and to protect water quality and drinking-water sources. For more about groundwater flow, see Currens and others (2002).

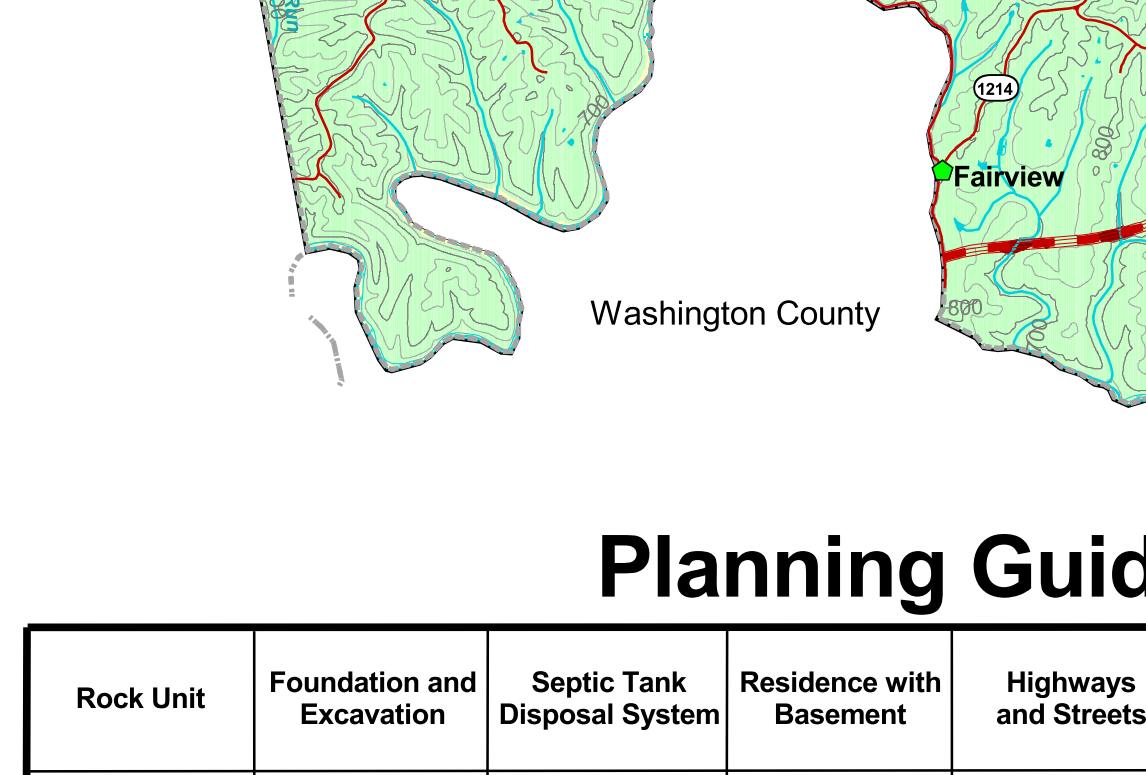
In the valley bottoms of the Kentucky and Salt Rivers and their major tributaries, most drilled wells will produce enough water for a domestic supply at depths of less than 100 feet. Wells located in the smaller creek valleys throughout the county will produce enough water for a domestic supply except during dry weather. In the areas above the stream valleys throughout Anderson County, which encompasses approximately 60 percent of the county, most drilled wells will not produce enough water for a dependable domestic supply, except along drainage lines, which 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 about the groundwater resources of the county, see Carey and Stickney (2002).

Recreation



Taylorsville Lake (above) and Beaver Lake provide recreational fishing, boating, and water sports. Photo by Dan Carey, Kentucky Geological Survey.

Limestone—Unit 4



Limestone (unit 4) forms the streambed of Gilbert Creek as it approaches the Kentucky River in southeastern Anderson County. Photo by Dan Carey, Kentucky Geological Survey.

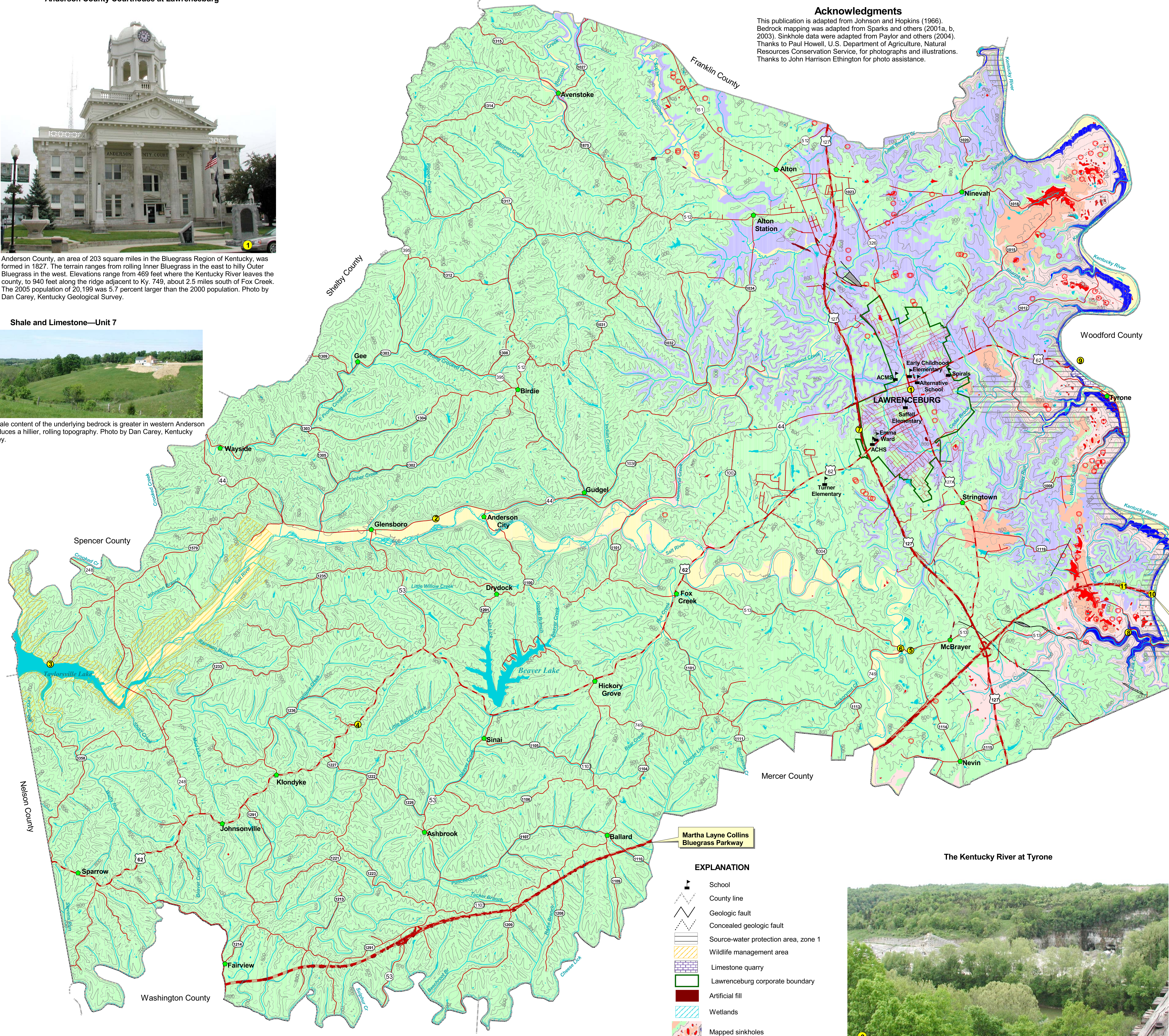
For Planning Use Only
This map is not intended to be used for selecting individual sites. Its purpose is to inform land-use planners, government officials, and the public in a general way about geologic bedrock conditions that affect the selection of sites for various purposes. The properties of thick soils may 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 kgsweb.uky.edu/webtools/planviewer.htm.



This new housing is typical of residential development along the U.S. 127 corridor and other areas adjacent to Lawrenceburg. Photo by Dan Carey, Kentucky Geological Survey.

Acknowledgments

This publication is adapted from Johnson and Hopkins (1966). Bedrock mapping was adapted from Sparks and others (2001a, b, 2003). Sinkhole data were adapted from Pavly and others (2004). Thanks to Paul Howell, U.S. Department of Agriculture, Natural Resources Conservation Service, for photographs and illustrations. Thanks to John Harrison Ehrington for photo assistance.



EXPLANATION

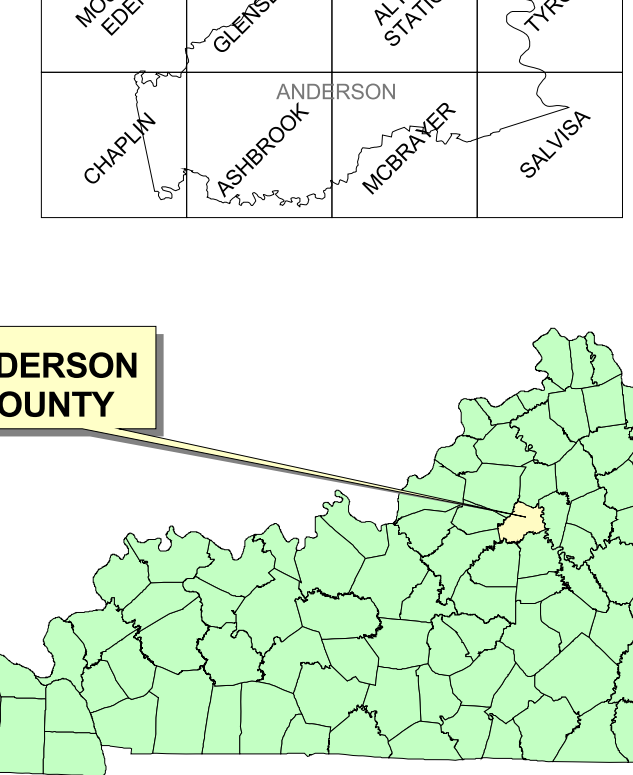
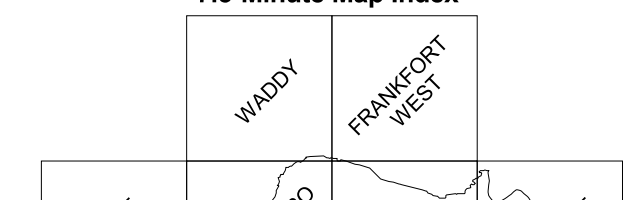
- School
- County line
- Geologic fault
- Concealed geologic fault
- Source-water protection area, zone 1
- Wildlife management area
- Limestone quarry
- Lawrenceburg corporate boundary
- Artificial fill
- Wetlands
- Mapped sinkholes
- Soil survey sinkholes

50-foot elevation contour interval

Photo location

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.



Residential Development



This new housing is typical of residential development along the U.S. 127 corridor and other areas adjacent to Lawrenceburg. Photo by Dan Carey, Kentucky Geological Survey.

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Limestone—Unit 5



Porous limestone of unit 5 is laced with solution channels, cracks, and crevices. Contaminated water and septic effluent can travel quickly through underground openings and pollute surface and groundwater. Photo by Dan Carey, Kentucky Geological Survey.

Environmental Protection



Using sinkholes for waste disposal, even in rural areas, can threaten valuable water resources. Photo by Dan Carey, Kentucky Geological Survey.

Alluvium—Unit 1



The Salt River alluvial valley (unit 1) provides soils for agriculture. Photo by Dan Carey, 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.

Limestone and Shale



Limestone units 5 and 6 may contain strata mixed with shale, which is more erodible, as seen in this road cut along the Martha Layne Collins Bluegrass Parkway. Photo by Dan Carey, Kentucky Geological Survey.

Radon

Radon gas can be a local problem, although it is not widely distributed in Kentucky in amounts above the U.S. Environmental Protection Agency's maximum recommended limit of 4 picocuries per liter. The average outdoor level. Some EPA representatives believe the action level should be lowered to 2 picocuries per liter. Note that this chart is only one estimate; it is not based upon any scientific result from a study of a large population meeting the listed criteria. (from the U.S. Environmental Protection Agency)

Radon Level (pCi/L)	Estimated Annual Lung Cancer Deaths (per 100,000)	Comparative Risk	Comparative Risk (per 100,000)
4	200	100 times average outdoor level	100 times average outdoor level
2	100	50 times average outdoor level	50 times average outdoor level
1	50	25 times average outdoor level	25 times average outdoor level
0.4	20	10 times average outdoor level	10 times average outdoor level
0.2	10	5 times average outdoor level	5 times average outdoor level
0.1	5	2.5 times average outdoor level	2.5 times average outdoor level
0.04	2	1 times average outdoor level	1 times average outdoor level

References Cited

- American Institute of Professional Geologists. 1993. The citizens' guide to geologic hazards: 134 p. Carey, D.I., and Stickney, J.F., 2002. Ground-water resources of Anderson County, Kentucky. Kentucky Geological Survey, ser. 12, Water Report 3.
- Kentucky Geological Survey. 1993. The citizens' guide to geologic hazards: 134 p. Carey, D.I., and Stickney, J.F., 2002. Ground-water resources of Anderson County, Kentucky. Kentucky Geological Survey, ser. 12, Water Report 3.
- Currens, J.C., Paylor, R.L., and Ray, J.A., 2002. Mapped karst pond basins in the Lexington 30 x 60 minute quadrangle. Kentucky Geological Survey, ser. 12, Map and Chart 35, scale 1:100,000.
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- U.S. Fish and Wildlife Service. 2003. National Wetlands Inventory. www.nwi.fws.gov [accessed 4/24/05].

Additional Resources

- Listed below are Web sites for several agencies and organizations that may be of assistance with land-use planning issues in Anderson County. www.kyhome.com/lawrenceburg—City of Lawrenceburg
- www.uky.edu/Anderson—University of Kentucky Cooperative Extension Service
- www.bigdick.org—Blue Grass Area Development District
- www.kentucky.com/directory/development—Kentucky Economic Development Information System
- www.uky.edu/KentuckyAtlas/21005.html—Kentucky Atlas and Gazetteer, Anderson County
- quicksats.census.gov/gflates/2121005.html—U.S. Census data
- kgsweb.uky.edu/download/planviewer.htm—Planning information from the Kentucky Geological Survey

Planning Guidance by Rock Unit Type

Rock Unit	Foundation and Excavation	Septic Tank Disposal System	Residence with Basement	Highways and Streets	Access Roads	Light Industry and Malls	Intensive Recreation	Extensive Recreation	Reservoir Areas	Reservoir Embankments	Underground Utilities
1. Alluvium	Fair to good foundation material. Easily excavated.	Refer to soil report (McDonald and others, 1983).	Refer to soil report (McDonald and others, 1983).	Refer to soil report (McDonald and others, 1983).	Refer to soil report (McDonald and others, 1983).	Refer to soil report (McDonald and others, 1983).	Refer to soil report (McDonald and others, 1983).	Refer to soil report (McDonald and others, 1983).	Refer to soil report (McDonald and others, 1983).	Refer to soil report (McDonald and others, 1983).	Refer to soil report (McDonald and others, 1983).
2. High-level (ancient) river deposits	Good foundation material. Easily excavated.	Slight to moderate limitations. Variable thickness and permeability. Underlain by impervious rock.	Slight limitations.	No limitations.	No limitations.	No limitations.	No limitations.	No limitations.	May leak if not keyed into underlying impervious rock.	Not applicable.	Slight limitations.
3. Dolomite and shale	Good foundation material. Difficult to excavate.	Severe limitations. Impervious rock. Locally fast drainage through fractures; dries and sinks to water table, possible groundwater contamination.	No limitations.	Moderate limitations. Rock excavation. Steep slopes.	Moderate limitations. Possible sinks.	Severe limitations. Possible sinks; drainage problems.	No limitations.	No limitations.	Severe limitations. Leaky reservoir rock. Possible sinks.	Slight to moderate limitations.	Severe limitations. Rock excavation.
4. Limestone	Excellent foundation material. Difficult to excavate.	Impervious rock. Locally fast drainage through fractures; danger of groundwater contamination.	Not applicable.	Severe limitations. Rock excavation. Steep slopes.	Moderate limitations. Local drainage problems from seeps or springs; possible sinks common, local drainage problems.	Not applicable. Potential for forest fires, or natural history park.	Not applicable.	Moderate to slight limitations. Steep wooded slopes. Reservoir might leak where rocks are faulted.	Severe limitations. Leaky reservoir rock. Local drainage problems.	Severe limitations. Rock excavation.	Severe limitations. Rock excavation.
5. Limestone, irregularly bedded	Excellent foundation material. Difficult to excavate.	Severe limitations. Impervious rock. Locally fast drainage through fractures; danger of groundwater contamination.	Severe to moderate limitations. Rock excavation; locally upper few feet may be repeatable. Sinks common; drainage problems.	Slight to moderate limitations. Rock excavation; locally upper few feet may be repeatable. Sinks common; local drainage problems.	Slight limitations. Local drainage problems.	Slight to moderate limitations. Depending on topography, Rock excavation; locally upper few feet may be repeatable. Sinks common; local drainage problems.	No limitations.	No limitations.	Severe limitations. Leaky reservoir rock. Local drainage problems.	Severe limitations. Rock excavation.	Severe limitations. Rock excavation.
6. Limestone, evenly bedded	Excellent foundation material. Difficult to excavate.	Severe limitations. Impervious rock. Locally fast drainage through fractures; danger of groundwater contamination.	Severe to moderate limitations. Rock excavation; locally upper few feet may be repeatable. Sinks common; local drainage problems.	Slight to moderate limitations. Rock excavation; locally upper few feet may be repeatable. Sinks common; local drainage problems.	Slight limitations. Local drainage problems.	Slight to moderate limitations. Depending on topography, Rock excavation; locally upper few feet may be repeatable. Sinks common; local drainage problems.	No limitations.	No limitations.	Severe to moderate limitations. Leaky reservoir rock. Local drainage problems.	Severe limitations. Rock excavation.	Severe limitations. Rock excavation.
7. Shale and limestone	Good to excellent foundation material. Moderately difficult to excavate.	Severe limitations. Impervious rock.	Slight to moderate limitations. Earth and rock excavation. Poor drainage.	Slight to moderate limitations. Rock excavation; locally upper few feet may be repeatable. Sinks common; local drainage problems.	Slight limitations. Local seeps.	Slight limitations. Rock generally fissile in shallow cuts. Local seeps.	No limitations.	No limitations.	Slight limitations. Leaky reservoir rock. Local drainage problems.	Slight limitations. Rock excavation.	Moderate limitations. Highly variable amount of rock and earth excavation.

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. The term "spigot" means excavation by a ripper attachment on a bulldozer.

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 soil system in such a way that effluent from the septic tank is distributed with reasonable uniformity into the natural soil.

Residences—Ratings are made for residences with and without 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 bedrock. 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 presence of caverns, cracks, etc.

Intensive recreation—Athletic fields, stadiums, 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 deep trenches.

Anti-Leakage Strategy
Deny water access to permeable materials and/or alter materials to an impermeable condition

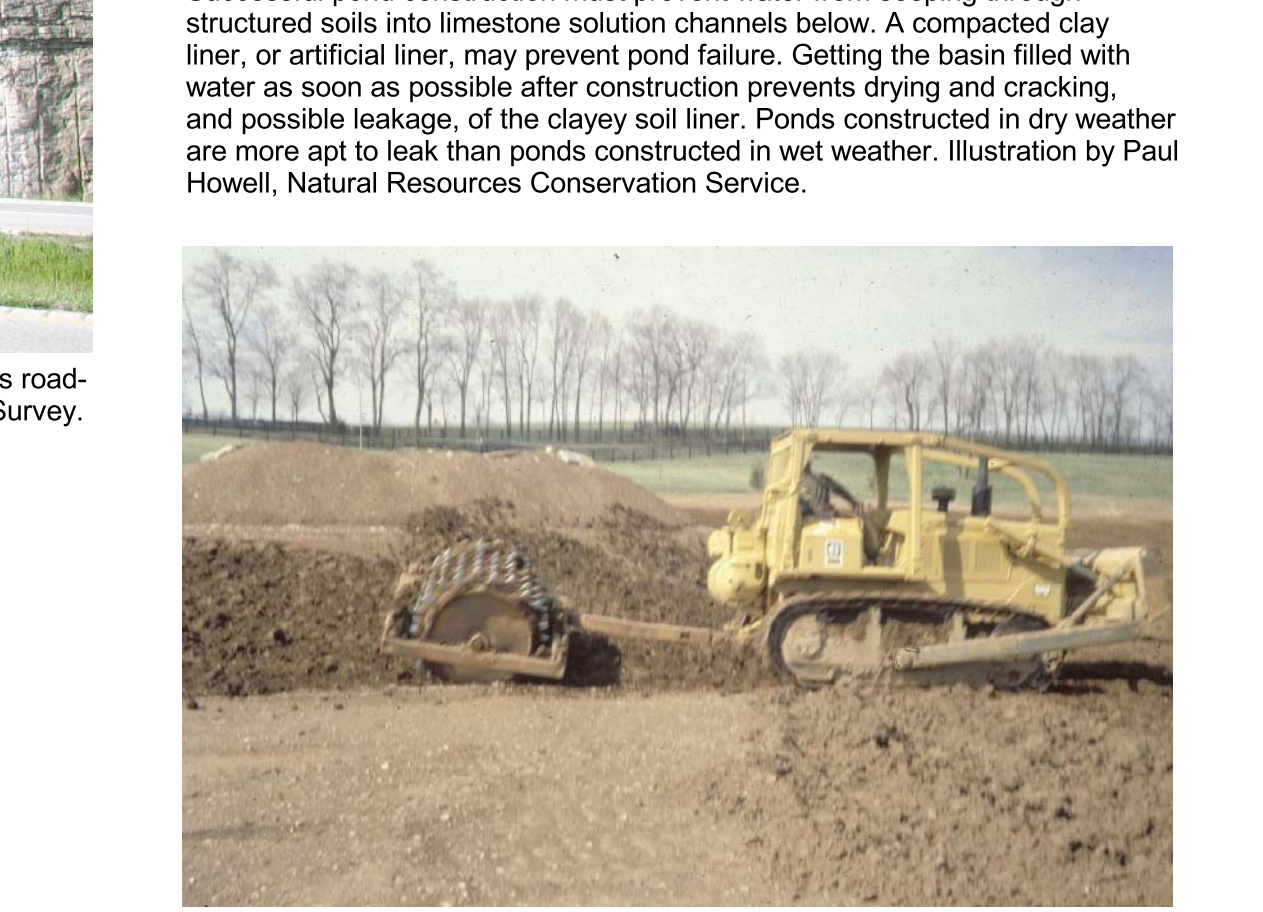
Top of Dam

Structured Clay Soil

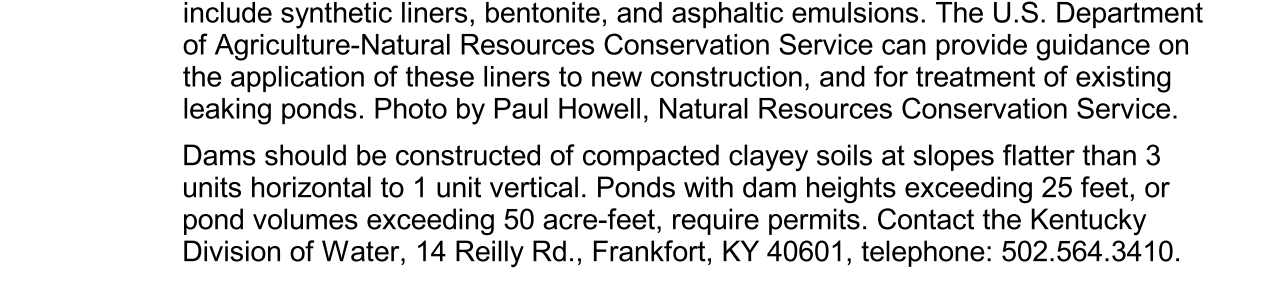
Limestone Bedrock with Plumbing

Perm - Imperm Boundary

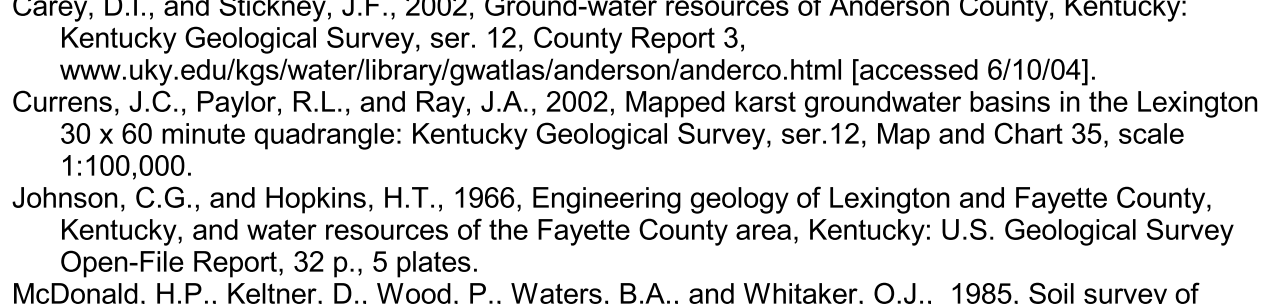
Successful pond construction must prevent water from seeping through structured soils into limestone solution channels below. A compacted clay liner, or artificial liner, may prevent pond failure. Getting the basin filled with water as soon as possible after construction prevents drying and cracking and possible leakage of the clayey soil liner. Ponds constructed in dry weather are more apt to leak than ponds constructed in wet weather. Illustration by Paul Howell, Natural Resources Conservation Service.



Limestone units 5 and 6 may contain strata mixed with shale, which is more erodible, as seen in this road cut along the Martha Layne Collins Bluegrass Parkway. Photo by Dan Carey, Kentucky Geological Survey.



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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/kgsw