Kentucky Geological Survey
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UNIVERSITY OF KENTUCKY

KGS MAP AND CHART 98
Series XII, 2005

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

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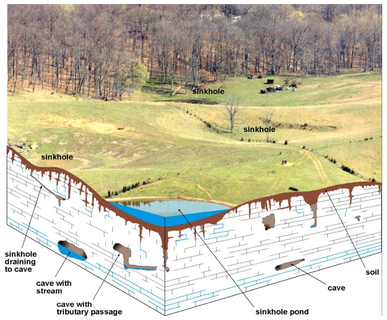
Acknowledgments

Geology adapted from Conley (2004), Johnson (2004 a-c), Lambert (2004 a-b), and Zhang (2004). Sinkholes are from Paylor and others (2004). Karst diagram from Currens (2001).

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)

Karst

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 where 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 that are large enough for a person to enter.

Groundwater Availability

In the central and southeastern half of the county, about three-quarters of the drilled wells yield enough water for domestic use. In low-lying areas, a few wells yield adequate amounts of water for a domestic supply, except in the northwestern corner of the county close to the Cumberland River. In the northwestern corner, most wells are adequate for a domestic supply, especially from wells that penetrate small solution openings within the limestone bedrock.

Springs are present throughout the county, with flow rates ranging from several gallons per minute to 670 gallons per minute. Some springs are sufficient to supply domestic needs, but most go dry during extended dry periods in late summer and fall.

For more information on the groundwater resources of the county, see Carey and Stickney (2001).

PLANNING GUIDANCE 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 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 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 upon 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.

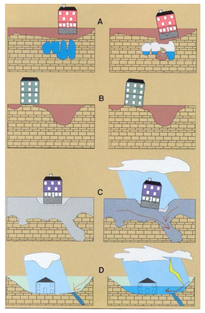
Extensive recreation -- Camp sites, picnic areas, parks, etc.

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.

Residential Construction



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).

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 both the soils and the underlying rock. For further assistance, contact Bart Davidson, Kentucky Geological Survey, 859-257-5500 x162. 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.

Energy Resources

Oil and gas development in Clinton County has been substantial in the past few years. Here an oil well with a storage tank is located adjacent to a sink-hole pond in which cattle are cooling off. It is important to consider measures that prevent releases when developing oil and gas wells. Openings to the subsurface, such as sinkholes and swallow holes, are often direct conduits to groundwater. Releases in these areas may contaminate groundwater re-sources. Photo by Jeff Adams, Don Molden Multiple Services Inc.

Clinton County is one of Kentucky's leading producers of oil and gas. This is a typical oil well with an off-gas flare. Photo by Jeff Adams, Don Molden Multiple Services Inc.

Mineral Resources

Limestone is a major product of Clinton County. This local quarry is a good example of land usage that requires an adequate infrastructure to handle the increased traffic of hauling vehicles. Photo by Bart Davidson, Kentucky Geological Survey.

Natural Resources

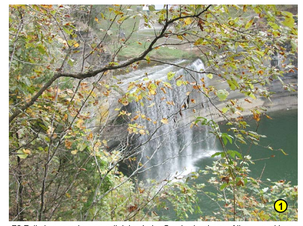
The lumber industry is a common land-use feature of Clinton County. Photo by Jeff Adams, Don Molden Multiple Services Inc.

Additional Planning Resources

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

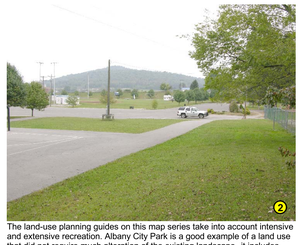
www.albanyclintonco.com Albany/Clinton County
http://clintonnews.net Clinton County News
ces.ca.uky.edu/clinton/ University of Kentucky Cooperative Extension Service
www.lcadd.org/ Lake Cumberland Area Development District
www.thinkkentucky.com/edis/cmnty/cw072/ Kentucky Economic Development Information System
www.uky.edu/KentuckyAtlas/21053.html Kentucky Atlas and Gazetteer, Clinton County
quickfacts.census.gov/qfd/states/21/21053.html U.S. census data
kgsweb.uky.edu/download/kgsplanning.htm Planning information from the Kentucky Geological Survey

Tourism

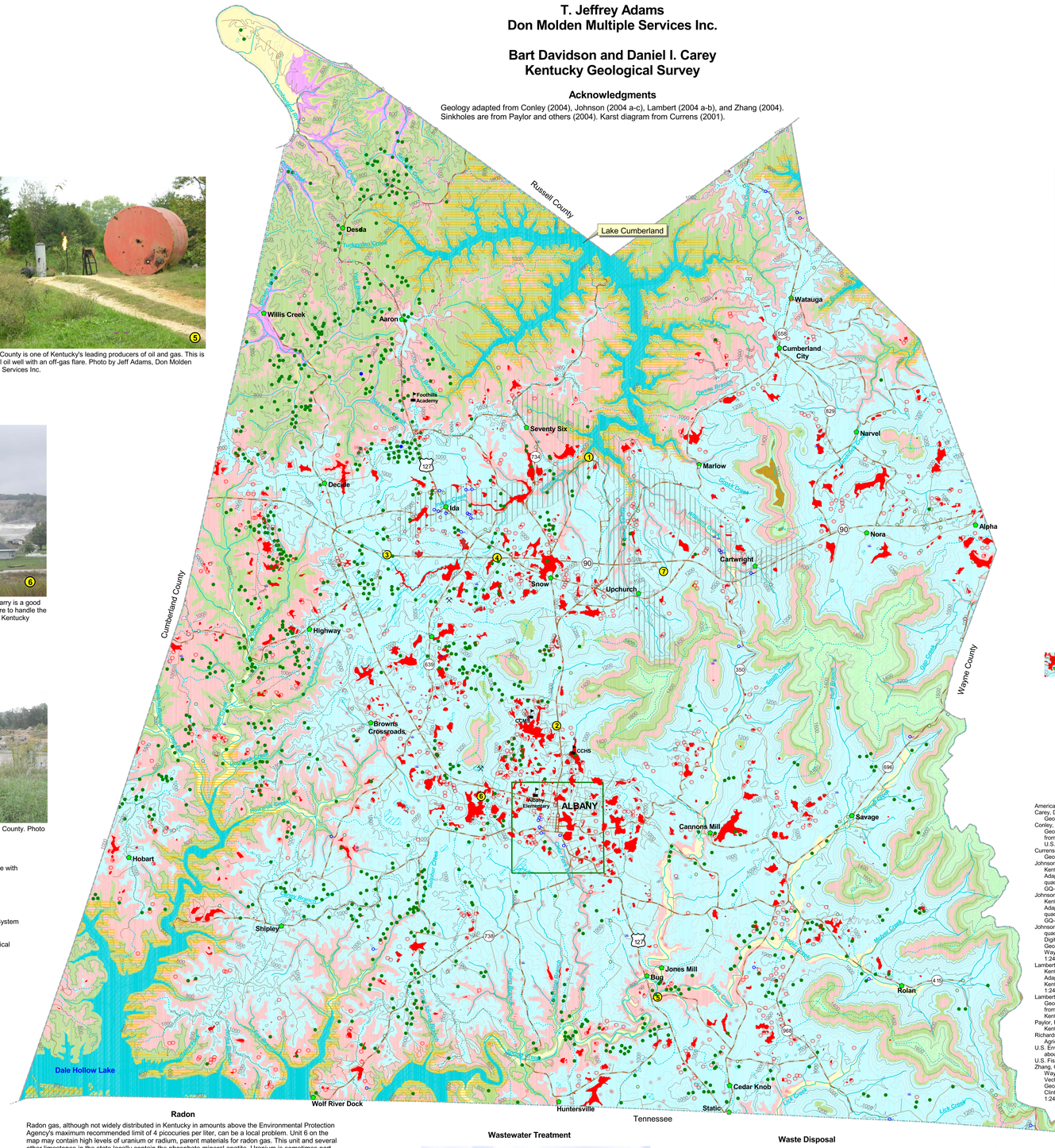


76 Falls is a scenic area adjoining Lake Cumberland near Albany, and is a popular location for both tourists and boaters. Photo by Bart Davidson, Kentucky Geological Survey.

Recreation



The land-use planning guides on this map series take into account intensive and extensive recreation. Albany City Park is a good example of a land use that did not require much alteration of the existing landscape--it includes ball fields and playgrounds. Photo by Jeff Adams, Don Molden Multiple Services Inc.


Russell County
Lake Cumberland
Cumberland County
Wayne County
Tennessee
Albany
ALBANY
Desda
Willis Creek
Aaron
Watauga
Cumberland City
Foothills Academy
Seventy Six
Narvel
Marlow
Decide
Ida
Alpha
Nora
Cartwright
Snow
Upchurch
Highway
Browns Crossroads
CCHS
CCMS
Cannons Mill
Savage
Hobart
Shipley
Jones Mill
Bun
Rolan
Dale Hollow Lake
Wolf River Dock
Huntersville
Cedar Knob
Static
Lick Creek
Indian Creek
Otter Creek
Spring Creek
Mother Creek
Turkeyden Creek
Beaver Branch
Dixie Branch
Dennis Branch
Bull Creek
Small Creek
Hurt Branch
Shelton Creek
Bear Branch
Bowling Branch
Cooley Branch
Cumberland River
Conley Branch
Jones Creek
Hickory Creek
Lick Creek
Wolf River
Wolf Creek
Dale Hollow Reservoir
Obey River
Roaring River
Spring Creek
Mill Creek
Big Creek
Sulphur Creek
Flat Lick Creek
Rock Lick Creek
Sinking Creek
Indian Creek
Cub Run
Dry Fork
Rock Creek
Big Creek
Lick Creek
Mill