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Geologic Map of Kentucky

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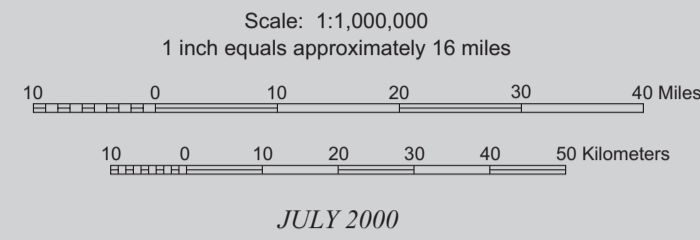
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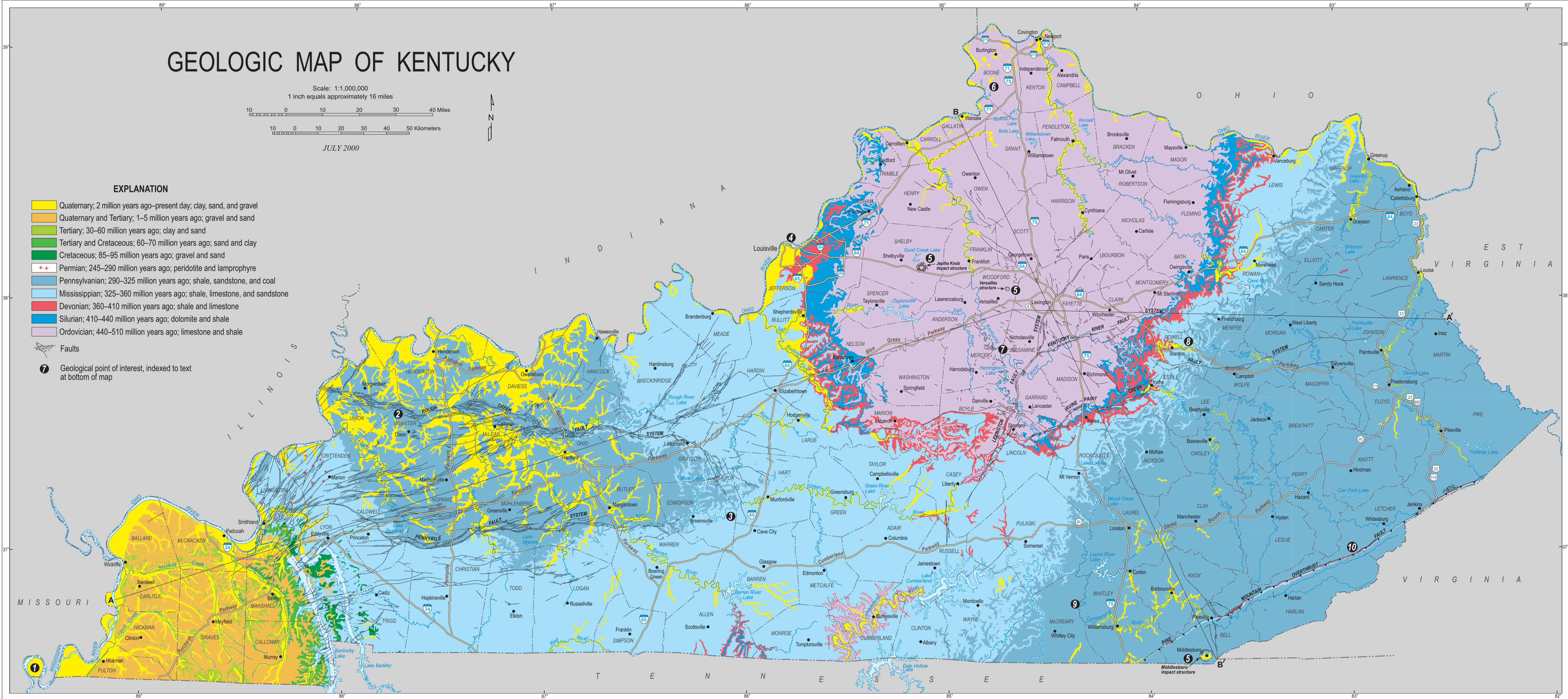
GEOLOGIC MAP OF KENTUCKY



EXPLANATION

- Quaternary; 2 million years ago–present day; clay, sand, and gravel
- Quaternary and Tertiary; 1–5 million years ago; gravel and sand
- Tertiary; 30–60 million years ago; clay and sand
- Tertiary and Cretaceous; 60–70 million years ago; sand and clay
- Cretaceous; 85–95 million years ago; gravel and sand
- Permian; 245–290 million years ago; peridotite and lamprophyre
- Pennsylvanian; 290–325 million years ago; shale, sandstone, and coal
- Mississippian; 325–360 million years ago; shale, limestone, and sandstone
- Devonian; 360–410 million years ago; shale and limestone
- Silurian; 410–440 million years ago; dolomite and shale
- Ordovician; 440–510 million years ago; limestone and shale

- Faults**
- Geological point of interest, indexed to text at bottom of map



EXPLANATION

This map shows the geologic age of rocks and sediments at the surface in Kentucky. Sedimentary rocks, deposited from about 465 to 290 million years ago during the Ordovician, Silurian, Devonian, Mississippian, and Pennsylvanian Periods, crop out across the state. The rocks mainly consist of shale, limestone, sandstone, and siltstone. As shown in the cross sections, these surface rocks are underlain by older unexposed rocks of Precambrian, Cambrian, and Ordovician age.

Small bodies of igneous rocks were intruded into the state's bedrock about 270 million years ago during the Permian Period. They crop out in Elliott County of northeastern Kentucky, and in Crittenden and Livingston Counties of western Kentucky.

Younger unconsolidated sediments were deposited during the Cretaceous, Tertiary, and Quaternary Periods, from about 95 million years ago to the present time. They cover far western Kentucky and occur across the state in stream valleys and, locally, on uplands. The sediments commonly are composed of clay, silt, sand, and gravel. In northern Kentucky, Quaternary sediments include glacial deposits laid down within the last million years during the Ice Age.

The present distribution of rocks and sediments at the surface in Kentucky mainly reflects uplift and downwarping of major structural features and subsequent episodes of erosion. Subsidence in the Appalachian Basin and Illinois Basin has preserved younger coal-bearing rocks of Pennsylvanian age in eastern and western Kentucky, respectively. These younger rocks were eroded from the uplifted Cincinnati Arch in central Kentucky, a process that eventually uncovered Ordovician deposits, the oldest exposed rocks in the state. Vertical and lateral movements along faults have displaced strata in parts of Kentucky. Much younger Cretaceous, Tertiary, and Quaternary sediments were deposited in the downwarped Mississippi Embayment of far western Kentucky, a northern extension of the Gulf Coastal Plain.

SELECTED FEATURES

1 New Madrid Earthquakes. During the winter of 1811–1812, a series of great earthquakes, with estimated magnitudes of 7.8 to 8.3, originated in southeastern Missouri along the New Madrid Seismic Zone. Their magnitudes are considered the largest for recorded earthquakes in the conterminous United States. Quakes of lesser magnitude continue to occur in the seismic zone, which remains a potential source of damaging earthquakes for Kentucky and other states in the region.

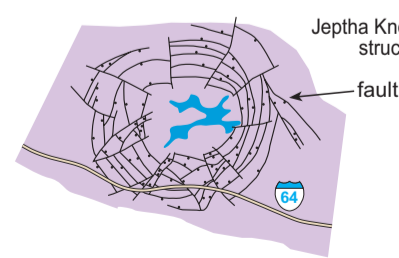
2 Deepest Well. Thousands of wells have been drilled in Kentucky in the search for oil and gas, some successfully. The deepest well in the state was drilled by the Exxon Corporation in 1977 on the Duncan farm in Webster County. It had a total depth of 15,200 feet and bottomed in the Eau Claire Formation of Cambrian age, which is about 520 million years old. The well, which was not commercially productive, has been plugged and abandoned.

3 Mammoth Cave National Park. The Mammoth Cave–Flint Ridge Cave System within the national park is the longest cave system in the world, with more than 360 miles of explored and mapped passages. Caves, sinkholes, and underground streams in the park and across south-central Kentucky were formed by the dissolution of Mississippian limestones.

4 Falls of the Ohio. Resistant fossil-rich limestones of Devonian and Silurian age formed a series of rapids in the Ohio River at the present site of Louisville. The rapids interrupted early boat travel along the river and led to the establishment of communities on adjacent river banks in Kentucky and Indiana. Abundant remains

of corals and other marine animals in the limestones have made the Falls a world-famous fossil site. Outcrops along the north bank of the river are now part of an Indiana state park.

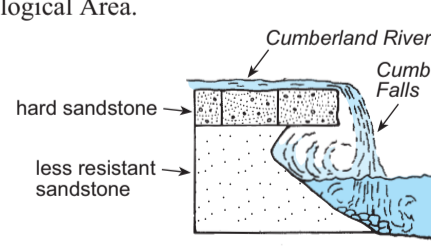
5 Impact Structures. Circular structures consisting of an intensely deformed central core ringed by concentric faults occur at the surface in central and southeastern Kentucky. Jephtha Knob in Shelby County and the Middlesboro Basin in Bell County probably were formed by the impact of meteorites. The origin of the Versailles Structure in Woodford County is more problematic. The Jephtha Knob structure was formed about 440 million years ago, and the Middlesboro Basin was formed at some time since 300 million years ago.



6 Big Bone Lick State Park. Early European explorers found the bones of many large mammals around salty springs in northern Kentucky. In 1807, President Thomas Jefferson commissioned Captain William Clark to excavate bones from the site for scientific study. Skeletal remains of both modern and Ice Age mammals, including mammoths and mastodons, were recovered from Big

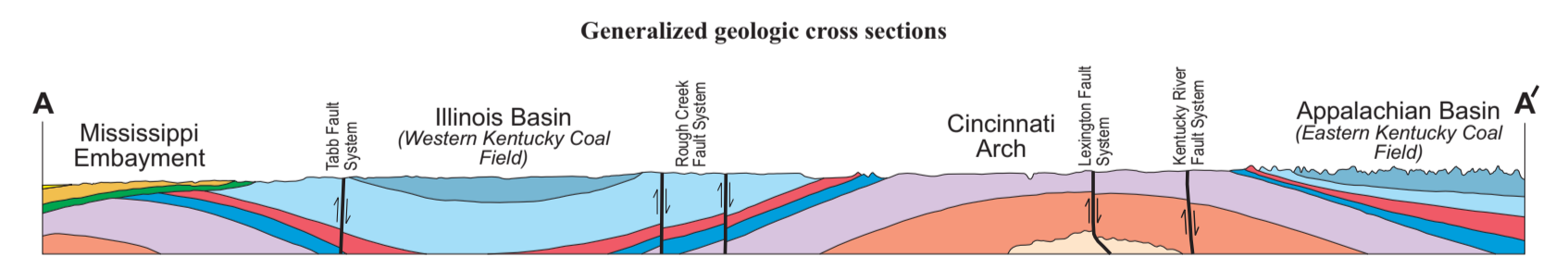
Bone Lick and currently are in museum collections throughout the world and at Jefferson's home, Monticello.

7 Palisades of the Kentucky River. Following regional uplifts during the late Tertiary and Quaternary Periods, less than 5 million years ago, the meandering Kentucky River entrenched its course into the bedrock of central Kentucky. The river cut downward into resistant limestone and dolomite of the High Bridge Group, forming palisades, the picturesque rock cliffs along most of the river's course between Boonesborough and Frankfort. The Middle Ordovician High Bridge limestone and dolomite, about 465 million years old, are the oldest rocks at the surface in Kentucky and are well exposed along U.S. Highway 68, where it crosses the river.

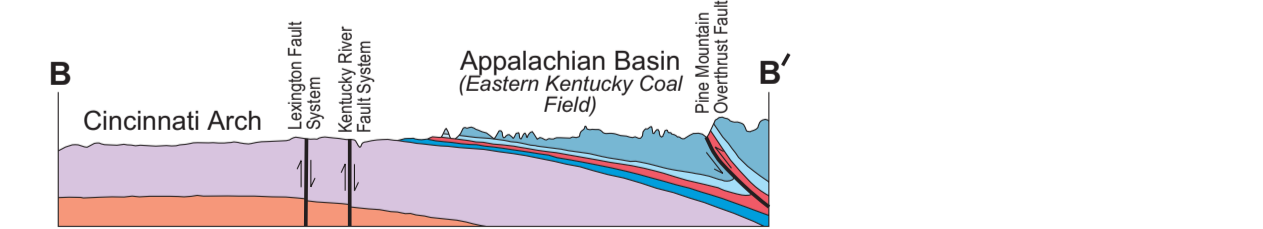


8 Red River Gorge Geological Area and Natural Bridge State Resort Park. The concentration of natural arches in the Red River Gorge Geological Area of the Daniel Boone National Forest and the adjoining Natural Bridge State Resort Park is unique in the eastern United States. More than 150 arches have been catalogued by the U.S. Forest Service. The geological area and state park are in the intricately dissected Cumberland (Pottsville) Escarpment where the effects of weathering, erosion, and mass wasting (downslope transport of rock material by gravity) have created geomorphic conditions, principally narrow sandstone ridges, particularly suitable for the formation of arches. They are mainly developed in resistant sandstones of Pennsylvanian age, about 320 million years old.

9 Cumberland Falls State Resort Park. Cumberland Falls is one of the largest waterfalls in the eastern United States south of Niagara Falls. The drop ranges from 55 to 65 feet. Water in the Cumberland River flows across a hard, well-cemented, conglomeratic sandstone that overhangs a softer, less resistant sandstone, which is more easily eroded. Cumberland Falls apparently has retreated upstream about 45 miles from the border of the Cumberland Escarpment. Sandstones in the falls are of Pennsylvanian age, but are older than the Pennsylvanian sandstone in the Red River Gorge Geological Area.



Cross sections are diagrammatic; not to scale



- ### EXPLANATION
- Quaternary
 - Tertiary
 - Cretaceous
 - Pennsylvanian
 - Mississippian
 - Devonian
 - Silurian
 - Ordovician
 - Cambrian
 - Precambrian

Compiled from Noger, M.C., 1988, Geologic map of Kentucky: U.S. Geological Survey, scale 1:500,000.
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