

Mineral resources in Kentucky fall into four broad categories: metals, gemstones, industrial and coal, and oil and natural gas. Metals include zinc, lead, iron, copper, titanium, and rare earth elements. Pearls, diamonds, and agates are examples of semiprecious or precious gemstones. All other minerals and rocks of economic significance, including fluorite, barite, limestone, clay, sand, gravel, and phosphate, are classified as industrial minerals.

Minerals are classified as metallic and industrial in Kentucky according to their physical and chemical properties, and these materials are essential for modern society. They furnish raw materials for heavy industries, construction and agriculture, and for ceramic, chemical, metallurgical, manufacturing, and energy-related industries

Minerals are an important part of Kentucky's economy (Table 1). Kentucky is the only state to have an active fluorite mine; it is located in western Kentucky, which was once a large mining district. Other metals, such as iron, phosphate, and zinc, have been mined in central and east-central Kentucky, and various parts of Kentucky have been explored for lead, zinc, fluorite, and barite (Fig. 1). Limestone, dolomite, sand, gravel, clay, and shale have been produced for many years at numerous sites in the state. Metallic minerals are not being mined in Kentucky at the present time, but they have been in the past.

Industrial minerals currently are being produced in all regions of Kentucky by more than 100 quarries, pits, underground mines, and dredges. With many deposits meeting specifications for hardness and soundness, limestone and dolomite are the state's principal source of crushed stone for construction. Chemically pure limestone, composed of more than 95 percent calcium carbonate, is being used as a sulfur sorbent and in reactive processes, such as capturing sulfur dioxide emissions from coal-burning power plants (Table 2). Most limestone and dolomite is surface-mined, but Kentucky also has 23 underground mines producing crushed stone, more than any other state in the nation. The Vulcan Materials Reed Quarry in western Kentucky is one of the largest producers of crushed stone in the United States. It produces more than 10 million

Table 1. Industrial mineral production in Kentucky, 2009

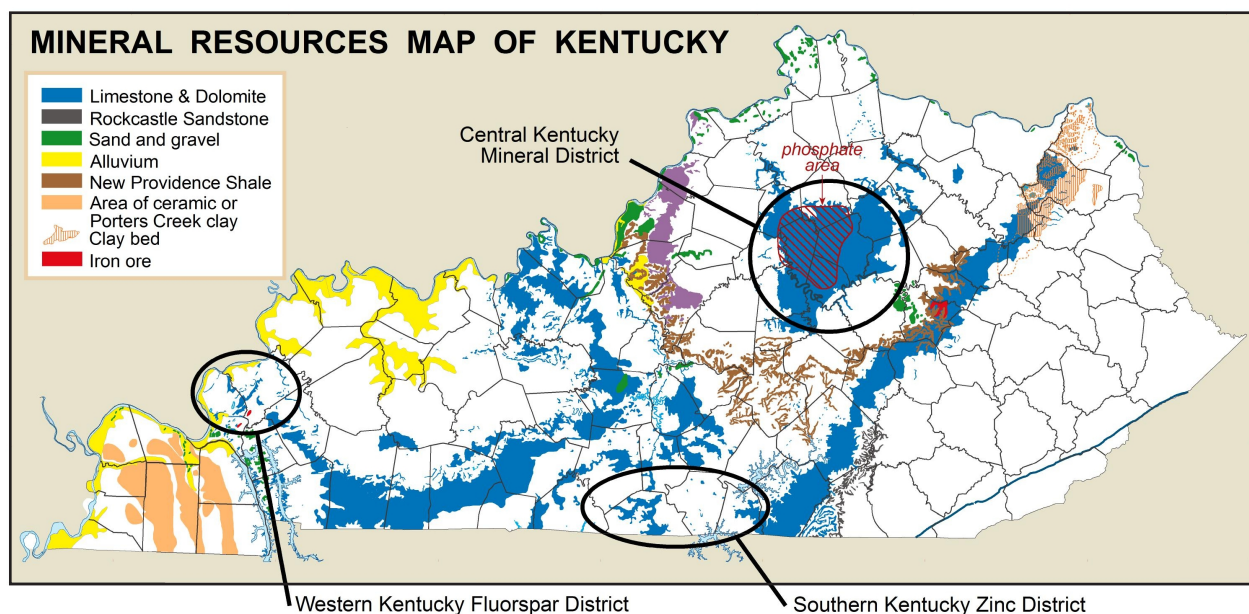
Industrial Minerals	Quantity (thousand short tons)	Value (thousand dollars)
Limestone and dolomite	44,200	389,000
Sand and gravel	7260	39,800
Clay and shale	288	5980
Combined value of ball clay, cement, and lime	Proprietary	233,000
Total	51,748	667,780

Source: U.S. Geological Survey, 2009, The mineral industry of Kentucky, in Minerals Yearbook, <http://minerals.usgs.gov/minerals/pubs/myb.html>

short tons each year. Chief markets for limestone are in power plants and heavy industry along the Ohio and Mississippi Rivers.

Sand and gravel are a source of construction material, and recent demand has been for fracturing sands using in horizontal drilling in shale formations for oil and natural gas. Principal deposits for construction material are recovered through dredging along the Ohio River, in northern Kentucky, and in the Jackson Purchase Region of western Kentucky. Meltwater from retreating glaciers carried large quantities

Figure 1.



of sand and gravel into the Ohio Valley in northern Kentucky. There are numerous silica sand deposits in eastern and western Kentucky, some of which have been exploited. With the increased demand for fracturing sands for oil and gas recovery, many of these high-quality deposits may serve that purpose if their iron and clay content is acceptable. High-silica sand from eastern and western Kentucky has been used in the past for the manufacture of glass and masonry sand.

Clay and shale are being produced from the Western and Eastern Kentucky Coal Fields, Jackson Purchase Region, Knobs Region, and Ohio River Valley. Current products and uses are outlined in Table 2. Of historic importance is Bybee Pottery, which used to mine Kentucky clay, and the formerly large fire-brick industry that developed around refractory clay deposits of northeastern Kentucky.

Vein minerals such as fluor spar, barite, and calcite, which are industrial minerals, and lead and zinc, which are metallic minerals, have been mined from vein deposits commonly occurring along faults in the Western Kentucky Fluorspar District and Central Kentucky Mineral District. For a number of years, Kentucky was the nation's largest producer of fluor spar and currently is the only producer.

The metallic minerals sphalerite and galena (ores of zinc and lead) also have been mined in the two mineral districts. Small quantities of cadmium, germanium, and silver were recovered as by-products during the processing of ores. Mining companies continue to look in each of the mining districts for new deposits. Economics and demand are the main factors in exploration for new deposits. In the past, mines closed because of competition from less expensive foreign imports and costs associated with mining Kentucky's relatively small deposits.

From the late 18th century into the early 20th century, iron ores, phosphates, and saltpeter were mined extensively and smelted or processed in local furnaces at sites across Kentucky. The ores were sufficient to support the state's early industry, but are now mainly of historic, rather than commercial, interest.

Freshwater pearls—considered precious stones--and polished Kentucky agate—considered semiprecious stone--are popular collecting items in the state. Kentucky agate was designated as the official state rock by an act of the General Assembly in 2000 and is highly regarded by mineral collectors. The freshwater pearl is the official state gemstone.

Active fluor spar mine in Livingston County and a sample of the fluor spar from the operation.



Table 2. Products and uses of Kentucky's industrial minerals	
Industrial Minerals	Products and Uses
Limestone and dolomite	Road construction and maintenance
	Residential, commercial, and government construction
	Lime, cement
	Riprap, jetty stone
	concrete products
	Agricultural limestone
	Sewage plant filter beds
	Sulfur dioxide (SO ₂) removal
	railroad ballast
Sand and gravel	Mine dust, acid neutralization, poultry, grit, mineral food
	Fracturing sand and silica sand
	Residential, commercial, and government construction
Clay and shale	Concrete products
	Brick, tile
	Sanitary ware
	Cement
	Pottery
	Fillers, extenders

The Kentucky Geological Survey investigates the chemical composition, physical properties, geographic distribution, and geologic setting of industrial and metallic minerals in order to provide information on potential resources for industry. KGS has numerous publications on minerals, including "Mineral and Fuel Resources Map of Kentucky," "Limestone and Dolomite Resources of Kentucky," and "Mines and Minerals of the Western Kentucky Fluorspar District." Other publications on the various mineral districts in the state are available from the KGS website, www.uky.edu/KGS. A new project is creating a minerals database, which will give the public access to extensive geologic information about mineral deposits in the state. The KGS website also has general information about minerals at www.uky.edu/KGS/im.

"Rocks and Minerals of Kentucky," published in 1994 by KGS, provides information about more than 100 different rocks and minerals, and over 50 full-color photographs of selected mineral specimens. Another popular book, "Kentucky Agate," published by the University of Kentucky Press, describes the geology of agate and has hundreds of beautiful photographs.