Kentucky Geological Survey
University of Kentucky, Lexington

Limestone

September 1999 Fact Sheet No. 03

General Information: Limestone is an important resource for Kentucky. It is the principal source of crushed stone for construction, agriculture, and industrial uses (Table 1). Limestone is a sedimentary rock, mainly composed of calcium carbonate ($CaCO_3$). Part of the state's limestone has been altered by magnesium-rich fluids to form dolomite, which is composed of calcium magnesium carbonate ($CaMg(CO_3)2$). Dolomite also is used for construction stone, particularly in the Louisville area.

Limestone and dolomite are at the surface in 25 percent of Kentucky, mainly in central and western parts of the state (Fig. 1). The principal limestone sequences were deposited in warm, shallow seas, from 330 million to 460 million years ago, during the Ordovician, Silurian, and Mississippian Periods. Most Silurian limestones in the state have been changed to dolomite.

Stone Production: In 1998, Kentucky produced 67.4 million short tons of limestone and dolomite. It was the eleventh-largest stone producer among the 50 states. Kentucky is not a highly urbanized or industrialized state that consumes exceptionally large amounts of stone, but it achieved its position among the Nation's major stone producers by supplying large quantities of limestone and lime to out-of-state markets in the Ohio River Valley and the Gulf Coast region. The state's 1996 production had a value of $282 million, and an average value of $4.18 per ton of stone.

Stone is produced at 70 open-pit quarries and 20 underground mines in 62 of the state's 120 counties. Kentucky has more underground limestone mines than any other state in the Nation (Fig. 2). The deepest mine, located in Mason County, recovers stone from a depth of 950 feet below the land surface. A new mine being opened in Jefferson County will produce limestone from as deep as 1,050 feet below the surface. The crushed stone industry in Kentucky employs more than 3,000 people.

Crushed limestone and dolomite generally are low-price, high-bulk commodities. Transportation or haulage charges form a major part of their cost. In places, the cost of transportation equals or exceeds the plant value of the stone.

The Reed Quarry in western Kentucky is one of the largest producers of crushed stone in the United States. It produces more than 10 million short tons each year. The quarry is located adjacent to navigable waterways of Kentucky Lake and the Tennessee River. It ships 80 percent of its stone by barge, 10 percent by rail, and 10 percent by truck. Chief markets are in the lower Mississippi Valley, principally in Louisiana and Mississippi, states with few local sources of construction stone. The present floor of the quarry, 35 feet below sea level, is the lowest place on the surface in Kentucky.

Principal Uses: Construction aggregate, the largest market for crushed limestone and dolomite in Kentucky, is essential for construction and maintenance of the state's transportation infrastructure, and for residential, commercial, and government construction. The term *aggregate* refers to the hard rock particles that are combined with binding materials to form cement and asphalt concretes, or are used alone (for example, as road base). Stone used for construction must meet specifications for hardness (resistance to abrasion and impact) and soundness (resistance to disintegration from weathering).

Limestone and dolomite aggregate are mixed with cement, sand, and water to make concrete, which is used for constructing highways and streets, sidewalks, bridges, airport runways, dams, foundations, concrete block, and buildings. Asphalt and sand are mixed with crushed-stone aggregate to pave highways and streets, parking lots, and driveways.

Tax dollars pay for more than half of all crushed stone used. About 10 tons of stone are used for each Kentucky resident annually. In a new subdivision, an average of 300 to 400 tons of crushed stone is required per home.

Quarries produce larger sizes of limestone for riprap and jetty stone to control erosion along waterways and shorelines. Crushed limestone is widely used as a filter medium in water and sewage treatment plants. Roadbed ballast for rail lines is produced from siliceous limestone in western Kentucky.

Table 1. Products and uses for Kentucky's limestone and dolomite.

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
	Mine dust, acid neutralization, poultry, grit, mineral food

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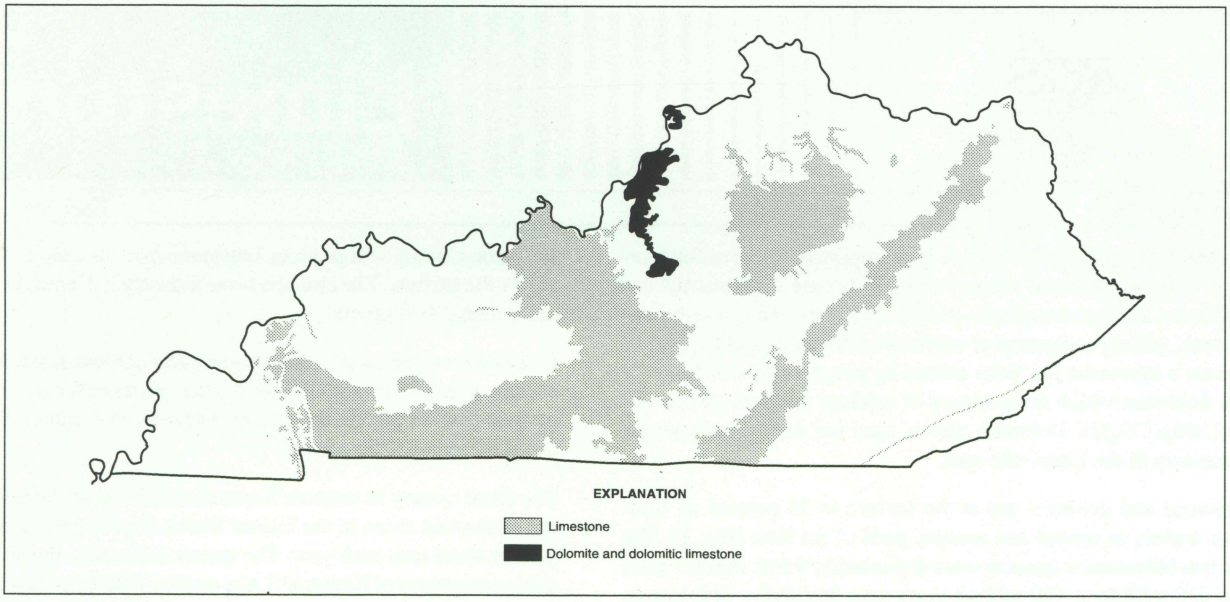

Figure 1. Principal outcrop of limestone and dolomite resources in Kentucky.

Chemically pure limestones, with a high calcium (Ca) content and low percentages of silica (SiO_2) and alumina (Al_2O_3), are raw material for the manufacture of lime and cement. They also furnish sorbent stone for removing SO_2 emissions from coal-burning power plants, rock dust for explosion abatement in underground coal mines, and reactive stone for acid neutralization.

For agriculture, limestone and dolomite are applied to fields and pastures to neutralize soil acidity and to provide plant nutrients. Limestone also is used for mineral feed and poultry grit. In mine reclamation, agricultural stone is applied to surface-mine spoils and replaced topsoil to adjust the pH for revegetation.

Lime. Lime production is an important industry in north-central Kentucky. The second- and third-largest lime plants in the United States are along the Ohio River in Pendleton and Mason Counties. In lime manufacture, limestone ($CaCO_3$) is heated to its dissociation temperature to produce the reactive chemical lime (CaO) and carbon dioxide (CO_2). Much of the lime produced in Kentucky is for flue-gas desulfurization to remove SO_2 emissions from coal-fired power plants. It is also used for steel-furnace flux, chemical industries, and water treatment.

Sources: Kentucky Geological Survey, U.S. Geological Survey, Kentucky Crushed Stone Association, and Kentucky Department of Highways (Division of Materials)

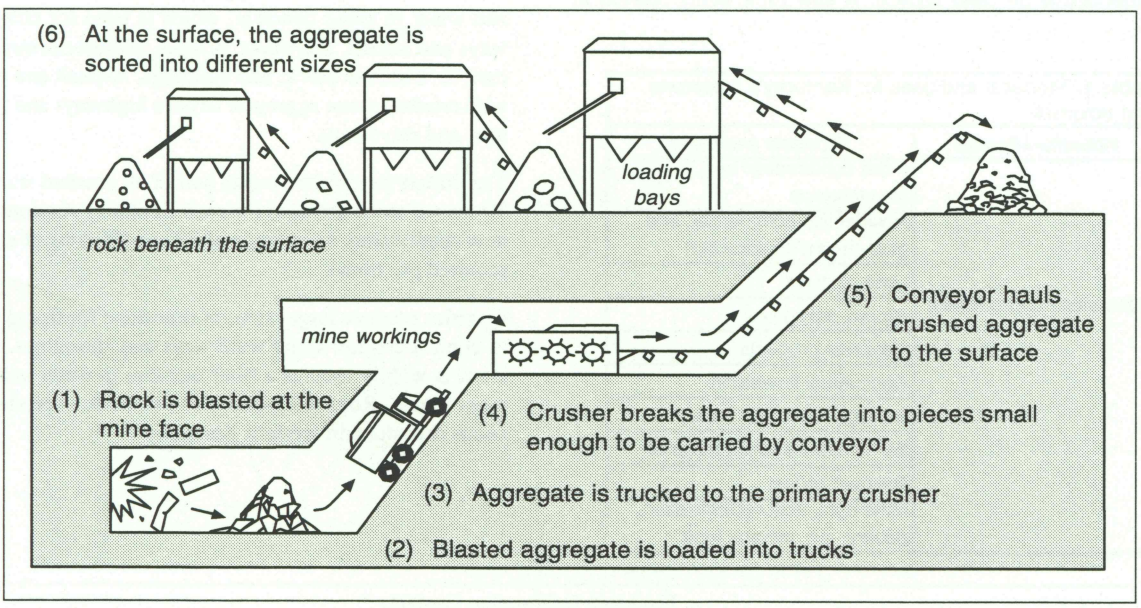

Figure 2. Schematic diagram showing how stone is transported, crushed, and sorted at a limestone mine. Modified from Greb, S.F., Dever, G.R., Jr., and Anderson, W.H., 1997, Economic geology of the Inner Blue Grass Region: 1997 annual field trip of the Kentucky Society of Professional Geologists in conjunction with the Eastern Section meeting of the American Association of Petroleum Geologists and The Society of Organic Petrologists, 47 p.