



## ROCKS AND MINERALS MINED IN OHIO AND THEIR USES

Rocks and minerals are very important in our everyday lives. Each of us will use over 2 million pounds (1,000 tons) of minerals in our lifetime. Although many Ohioans may be unaware of it, Ohio is an important producer of mineral resources, which are used on a daily basis by many industries and individuals. These mineral commodities contribute greatly to the economy of Ohio.

Ohio produces eight nonfuel minerals (also called industrial minerals) and three "mineral" fuels or fossil fuels. The three fossil fuels are coal, oil, and gas. The eight nonfuel minerals are primarily construction materials: limestone and dolomite, sand and gravel, sandstone and conglomerate, clay, shale, gypsum, salt, and peat. Most of the 88 counties in Ohio mine at least one of these mineral commodities. In 2003, nearly 340 companies mined these mineral resources from about 600 mines or quarries.

The economic value of Ohio's raw mineral commodities in 2003 totaled more than \$2.0 billion. The total value of the manufactured products made from these raw materials far exceeds this number. Direct employment in Ohio's mineral industries, excluding the oil and gas industry, totaled over 7,800 people, who earned total wages of \$338 million. Most of this money is recycled into Ohio's economy, along with the money paid by the mining companies in city, county, state, severance, and property taxes. Besides the 7,800 people directly employed by mining companies, another 54,000 people are employed indirectly by trucking companies, blasting companies, and repair shops and as drilling crews, electricians, plumbers, fuel suppliers, road maintenance crews, masons, architects, and sign makers. Mining employers and employees also help support businesses in their communities, such as office-supply companies, restaurants, grocery stores, clothing stores and, of course, the school system and teachers who teach the children of the mine employees.

Ohio mining companies are nationally renowned for excellence in reclamation of mined-out areas. Mining is compatible with environmental balance. Mined-out areas can be transformed into popular recreational areas such as parks and fishing, boating, and swimming areas, as well as attractive residential and commercial developments. Ohio's strict reclamation laws were enacted even before the federal reclamation laws.

The following paragraphs describe the mineral commodities produced in Ohio and list their various uses.

### LIMESTONE AND DOLOMITE

***Ohio ranks 4th nationally in the production of lime and 5th nationally in the production of crushed stone***

Limestone and dolomite are sedimentary rocks. Limestone is composed mostly of the mineral calcite (calcium carbonate). Dolomite is composed mostly of the mineral dolomite (calcium magnesium carbonate).

Limestone, including dolomite, has a wide variety of uses. Burned limestone (lime) is used in the steel industry as a fluxing agent (to get rid of impurities in the iron) and as a refractory product (to line steel furnaces) and in the chemical industry to manufacture such products as rubber. Limestone is used in sugar refining, agriculture (fertilizers, acidity control), water purification, construction (building stone, riprap, cement additive, and aggregate in concrete and asphalt), railroad ballast, soil stabilization, in toothpaste (except gels), lipstick, carpeting, chalk, china, vinyl flooring, paper (filler and whitener), ink, hair mousse, cleansers, caulking compounds, plastics (filler), tires, mag wheels, fiberglass, paint (filler and whitener), antacid medications, porcelain, and microwaveable containers. Most of the limestone and dolomite mined in Ohio is used as construction aggregate.

In 2003, 114 mines produced 78.2 million tons of limestone and dolomite from 50 Ohio counties. This commodity is mined

in every part of our state.

Limestone was first quarried in Ohio by European settlers in the early 1800's. Early uses for limestone included whitewashing and plastering, building stone for foundations, hearthstones, and window sills, flux stone in the manufacture of iron, in agriculture, and the making of cement.

### SAND AND GRAVEL

***Ohio ranks 6th nationally in the production of construction sand and gravel and 9th in the production of industrial sand***

Sand and gravel deposits in Ohio consist of sand-size and gravel-size grains of rock that were broken up, transported, and deposited by rivers and/or glaciers. Ohio's sand and gravel can be made up of any of the three major rock types: igneous, metamorphic, or sedimentary.

Sand and gravel are used mostly for construction purposes as aggregate in concrete, asphalt, cement, road-base material, and fill. Gravel is used for driveways and sand is used for ice control, in sand-blasting, as molding sands for casting iron and aluminum, in plaster, and in glass making.

In 2003, 294 operations produced 52.9 million tons of sand and gravel from 59 Ohio counties plus Lake Erie. Sand and gravel are produced in every part of the state.

Sand and gravel were the last of the industrial minerals in Ohio to be mined. Sand and gravel became widely used as a construction material when Ohio needed paved roads in the early 1900's.

### SANDSTONE AND CONGLOMERATE

***Ohio ranks 3rd nationally in the production of sandstone dimension stone***

Sandstone is a medium-grained sedimentary rock formed by the cementation of mostly quartz sand grains. A conglomerate is a coarse-grained sedimentary rock formed by the cementation of gravel.

Sandstone, including conglomerate, is used in construction as dimension stone (building stone). Many sandstones have beautiful coloring, making them valuable as decorative dimen-



*Diamond-tipped blade of a circular saw cuts sandstone into dimension stone*

sion stone. Some sandstones are composed of very pure silica or quartz. Silica (silicon dioxide) is used as a source of silicon for manufacture of computer chips (hence the source of the name Silicon Valley), transistors, other semiconductors, and in infrared instruments. Sandstone also is used for making glass bottles, drinking glasses, light bulbs, TV screens, pool-table tops, laboratory counter tops, as a glaze for ceramics, grindstones, lubricants, filtration, golf-course trap sand, aggregate, riprap, molding sand, in fiberglass, plastics (filler), paint, gel toothpaste, and cosmetics (helps the flow and fragrance).

In 2003, 26 quarries produced 1.7 million tons of sandstone and conglomerate from 18 Ohio counties, all in the eastern half of the state. Sandstone was used as early as 1788 in Ohio by European settlers as building stone for foundations and other architectural purposes and for grindstones and pulpstones.

## CLAY AND SHALE

### *Ohio ranks 5th nationally in the production of common clay and shale*

Clay is a sediment of soft plastic consistency composed mostly of extremely fine-grained minerals known as clay minerals. Shale is a fine-grained, laminated (layered) sedimentary rock composed mostly of clay.

Clay and shale have many uses. In Ohio, they are used in construction for cement, bricks, ceramics, tiles, landfill covers and linings (keeps fluids from seeping in or out), and pond linings. Clay and shale are used in the manufacture of paper (improves printability and water resistance and keeps ink from bleeding), tires, plastics, paint, pencils, makeup, antiperspirants, as drilling fluids to produce oil and gas, as lightweight aggregate (after firing), as shampoo and toothpaste thickener, for filtering vegetable oils, and in antacid medications.

In 2003, about 65 mines produced 2.1 million tons of clay and shale from 32 Ohio counties. Clay is mined in the eastern and western portions of Ohio. Shale is mined mostly in the eastern half of the state.

Prehistoric inhabitants of Ohio were the first to use clay and shale for their pottery, decorative jewelry, and pipes. European settlers began using clay and shale in the late 1700's for brick, tile, and china. Because of its abundant clay and shale resources, Ohio was a leader in the development of art pottery and other ceramic industries and the sewer tile industry.

## GYPSUM

### *Ohio ranks 17th nationally in the production of gypsum*

Gypsum is an evaporite mineral, and a sedimentary rock, composed of hydrous calcium sulfate. Evaporites form as crystals precipitate during evaporation of sea water.

Gypsum is used in wallboard, plaster-of-paris, caulking compounds, cement, as an additive to concrete to slow the setting rate, as a fertilizer in agriculture to regulate acidity, and as filler in prescription medication. It is also used as a stiffening agent in bakery products such as bread, cake, and cake frostings. Ohio's gypsum is used as fertilizer or in the production of cement.

In 2003, 117,000 tons of gypsum were produced from one mine in Ottawa County. Gypsum was first used in Ohio in the early 1800's as a soil conditioner.

## SALT

### *Ohio ranks 4th nationally in the production of salt*

Salt also is an evaporite mineral, as well as a sedimentary rock, and is composed of sodium chloride. Salt is used as a food additive and water-softening agent, and for ice control, in ice cream making, as a glaze for ceramics, in animal feed and cattle blocks, well-drilling muds, baking, paper manufacture, meatpacking, and hide tanning. Most salt mined in Ohio is used for ice control.

In 2003, Ohio produced 4.1 million tons of salt—3.3 million tons of rock salt and 810,000 tons of evaporated salt. Rock salt is mined from two mines in northern Ohio about 2,000 feet under

Lake Erie. Two brining operations in northeast Ohio produce salt by dissolving underground beds of rock salt, pumping the brine to the surface, and evaporating out the salt.

Ohio's prehistoric inhabitants used salt from naturally occurring salt-water springs as a food preservative and food additive. European settlers discovered Ohio's salt resources in the 1700's. Because salt is necessary to survive—our bodies contain about 8 oz of salt—the discovery of salt made Ohio a popular place to settle.

## PEAT

Peat is a brown, lightweight, unconsolidated deposit of plant remains and is the precursor to coal. When it is subjected to heat and pressure, 10 feet of peat makes 1 foot of coal.

Peat in Ohio is used mostly in agriculture as mulch and a soil conditioner. It is also used as bedding material to raise earthworms, to grow mushrooms, as a seed inoculant, and in planting mixes. Peat has good absorption, so it can be used for oil-spill cleanups. It is highly porous, so it can be used as a filtering agent to separate pollutants from contaminated water. Some peat is used for hog feed and to help cleanse the water in waste-water treatment plants.

In 2003, only 1 ton of peat was reported sold from previously mined stockpiles.

## COAL

### *Ohio ranks 14th nationally in the production of coal and 3rd in consumption*

Coal is a sedimentary rock formed from the consolidation of fossil plant material. It is black, rich in carbon, and burns readily.

Coal in Ohio is used primarily for the generation of electricity. Coal can also be coked for the smelting of ores and the manufacture of steel. Various components of coal are included in some medicines, dandruff shampoo, insecticides, dyes, perfumes, explosives, paints, insulation, varnish, mothballs, roofing shingles, and fuel gas.

In 2003, 101 mines produced 22.3 million tons of coal from 17 counties in the eastern portion of the state. Historically, coal was known in Ohio as early as 1755. It is probable that coal was first mined by early settlers for heat in the winter; however, record keeping did not begin until 1800, when the first mined coal production was reported.

## HYDROCARBONS (OIL AND GAS)

### *Ohio ranks 16th nationally in the volume of natural gas produced, 18th nationally in the volume of crude oil produced, and 10th nationally in the number of producing wells*

A hydrocarbon is a compound containing the two elements carbon and hydrogen. Crude oil (petroleum) is a liquid mixture of naturally occurring hydrocarbons. Natural gas is a gaseous mixture of naturally occurring hydrocarbons.

Crude oil is distilled into many types of fuels and lubricants. Oil also is used in the manufacture of many types of plastics. Oil also is used to make crayons, eye shadow, bubble bath, hand lotion, medicines (cough syrup, aspirin, antibiotics), soaps, paint, clothing, dyes, perfumes, candles, wax paper, deodorant, disposable diapers, laundry softeners, and antifreeze. Natural gas is used for fuel.

In 2003, an estimated 508 new oil and gas wells were drilled in 44 Ohio counties. Eighty-five percent of these wells were productive. The total reported crude oil production in Ohio in 2003 was 5.6 million barrels. Natural gas production in Ohio in 2003 was 93.6 million MCF (thousand cubic feet).

The presence of oil in Ohio was known by both Native Americans and European settlers. Oil accumulated on the surface of streams after seeping from the ground. Early settlers called it "Seneca Oil" and skimmed it off the surface of the water and used it for medicinal purposes. Natural gas was first used in the Findlay region in 1838, but it wasn't until 1860 that serious efforts were made to develop an oil and gas industry in Ohio.

