

Ohio's Fuel and Non-Fuel Mineral Industries

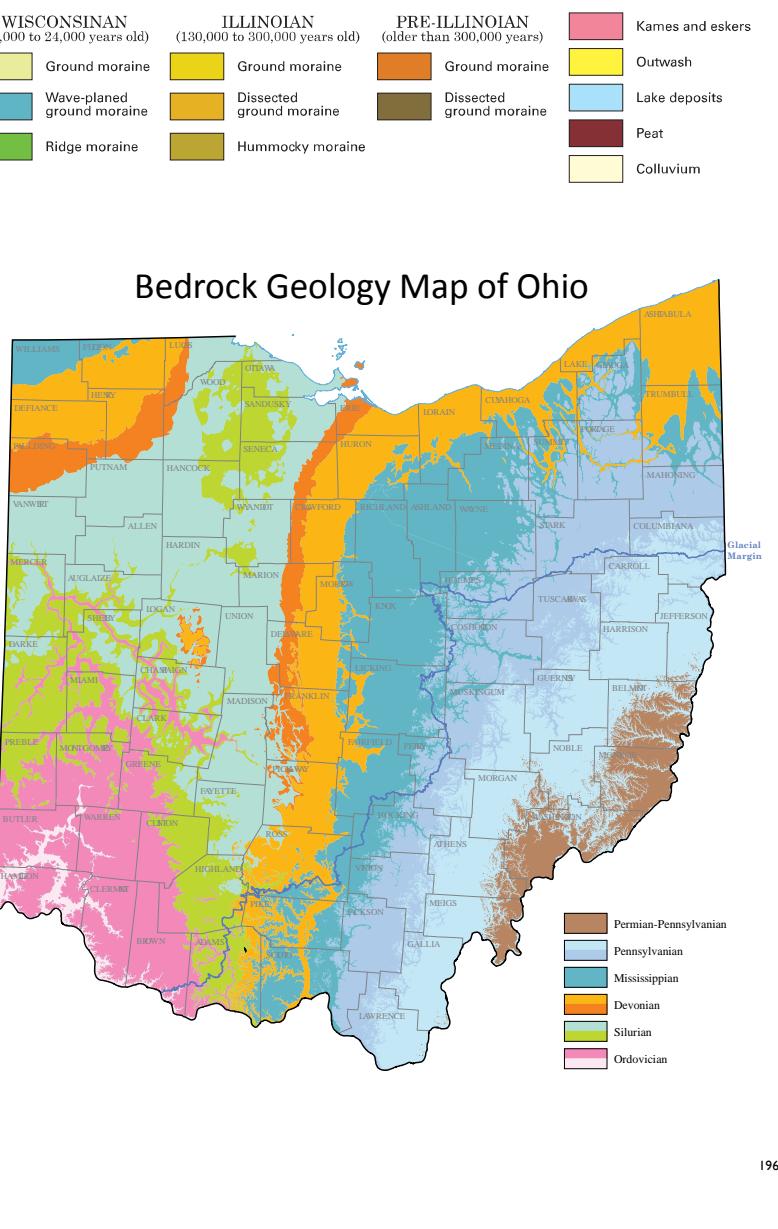
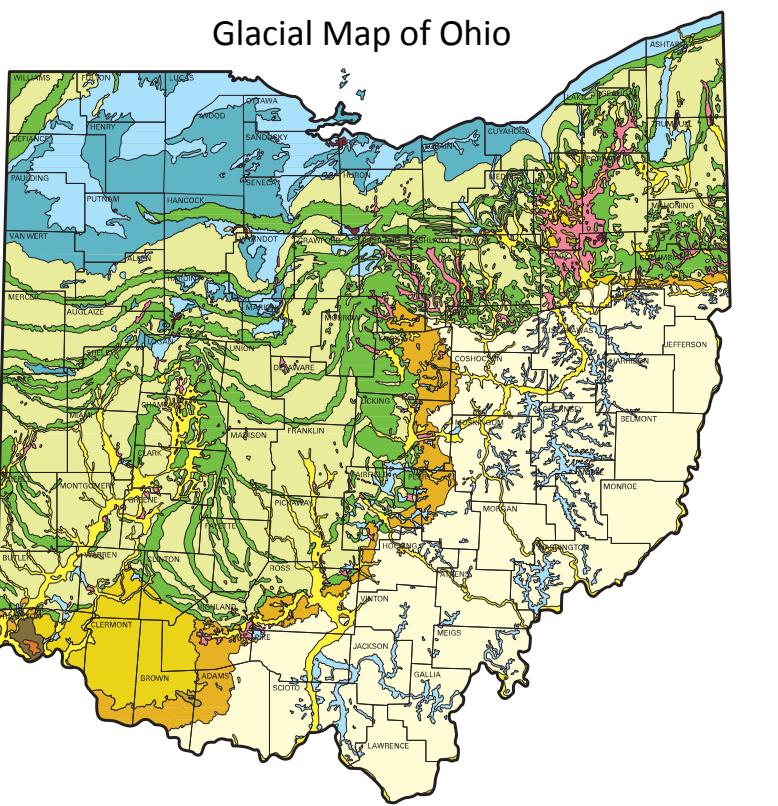
J.D. Stucker
james.stucker@dnr.state.oh.us

Ohio Geological Survey
2045 Morse Rd., Bldg. C, Columbus, Ohio 43229
www.OhioGeology.com

Abstract

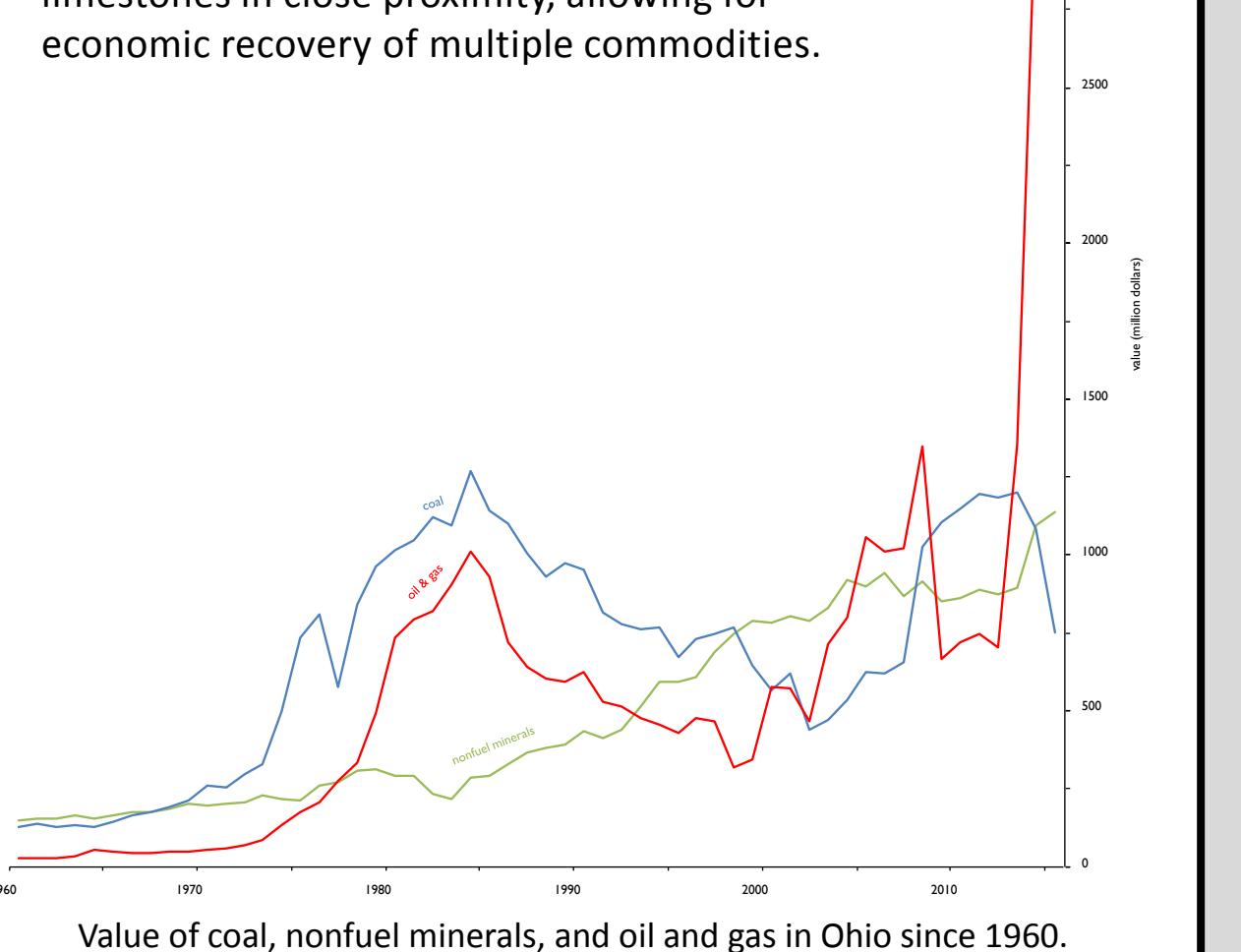
The value of industrial-mineral production in Ohio is at an all-time high, exceeding \$1 billion in 2015 for the second consecutive year. Production of construction aggregates, such as sand, gravel, limestone, and dolomite, have continued to increase during the past six years. Ohio continues to rank consistently in the top five states for crushed limestone production and rank in the top ten states for sand-and-gravel production in the United States. Devonian- and Silurian-age carbonates located in western Ohio are principal sources of crushed stone, and Wisconsinan-age glacial outwash and kame terraces in major river valleys provide plentiful sand-and-gravel deposits. Other major geologic commodities, such as clay, shale, and salt, have remained steady or increased production in recent years. Numerous factors have contributed to the downward trend of coal production and rising industrial-mineral production in Ohio during the past several years. Some of these influences are the substantial increase in oil-and-gas production in eastern Ohio and increased demand for road construction aggregate. Additionally, Ohio is in the midst of a substantial shift in fuel sources for electric power generation, from a heavily coal-dominated fuel supply to one that includes a larger percentage of natural gas. Coal production is expected to continue to decline, albeit at a less dramatic rate than the 34% drop from 2013 to 2015. Non-fuel mineral production, largely construction aggregates, is anticipated to maintain growth. Sandstone and conglomerate production is expected to slowly decrease in the immediate future owing to several individual quarries altering their production capacities. Salt sales are a function primarily of projected winter demand for road de-icing material, pre-existing sales contracts, or fluctuating spot prices. The above-normal temperatures and below-normal snowfall in Ohio for the 2015–2016 winter likely will curtail salt sales in the near future as many government stockpiles were not depleted.

Ohio's Economic Geology in Brief

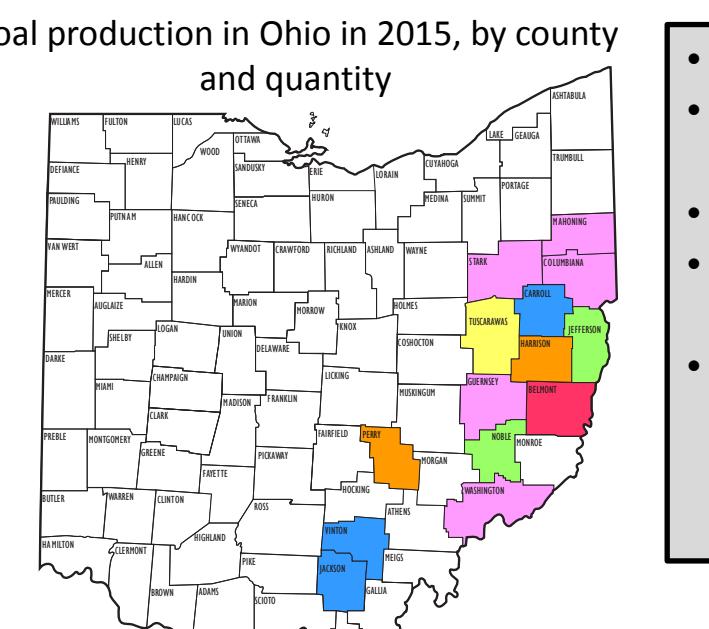


The total tonnage of coal and industrial minerals produced in Ohio during 2015 was 122,244,014 tons or approximately 10.5 tons per capita. The total value of coal was \$752,894,580 in 2015; the value of oil and gas was \$2,968,428,667; and the total value of all industrial minerals was \$1,139,237,282 in 2015. The combined total value of fuel and nonfuel minerals produced in Ohio during 2015 was \$4,860,560,529 or approximately \$423 per capita. Reported and estimated total direct employment in the extractive industries of Ohio in 2015 was more than 11,000 people.

The production of multiple commodities, including coal and/or one or more industrial minerals, is important to successful mine operations in many areas of Ohio. The most common multiple operations are sand and gravel with clay; coal along with clay, shale, or limestone; and limestone with associated clay or shale. The production of sand and gravel along with clay is often located in glaciated portions of northern and western Ohio, where deposits of sand and gravel can occur with clay-rich glacial tills. The Pennsylvanian-age cyclic sedimentation in eastern Ohio includes coals, clays, shales, and limestones in close proximity, allowing for economic recovery of multiple commodities.



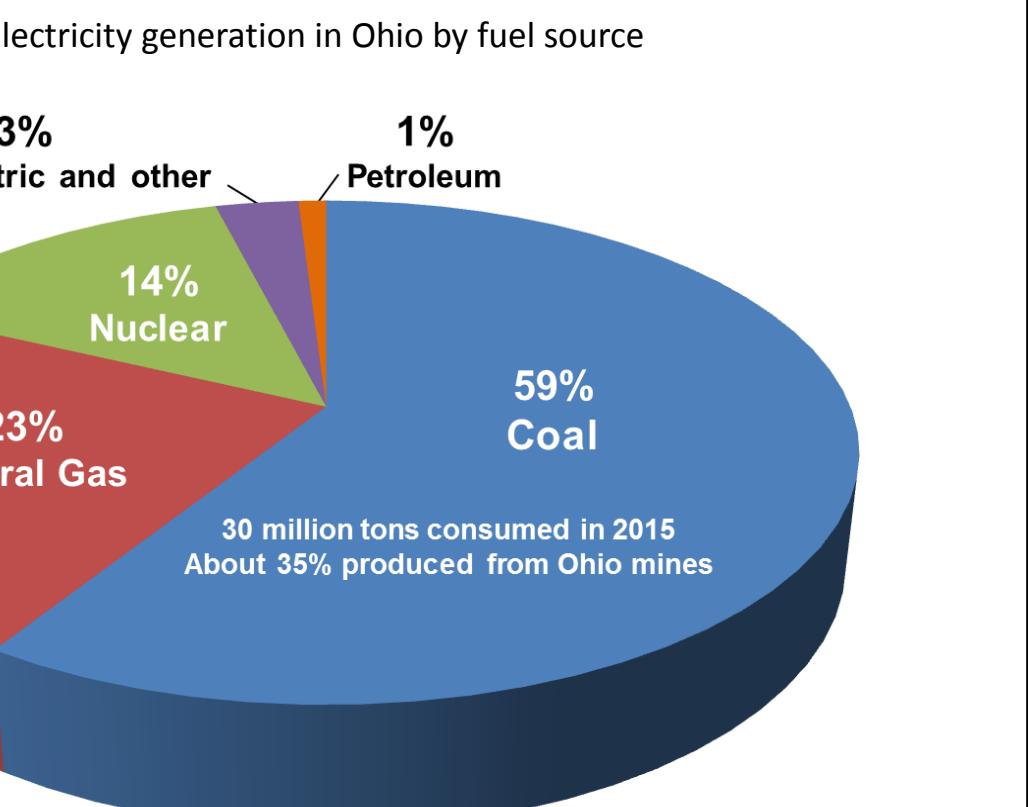
Coal



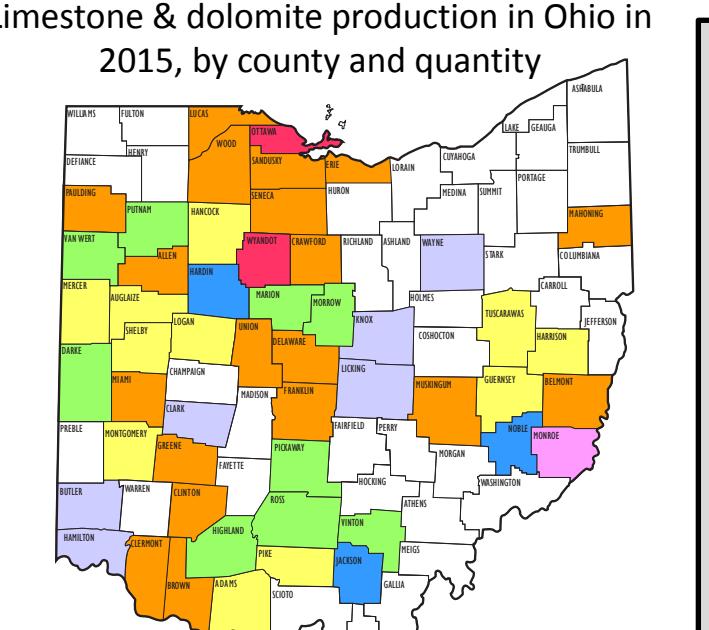
- Production: 16,922,616 tons
- Ohio ranks 12th of 25 coal producing states
- Sales: 16,437,398 tons
- Value: \$752,894,580
- Top Producing Seams:
 - Pittsburgh (No. 8)
 - Middle Kittanning (No. 6)
 - Meigs Creek (No. 9)



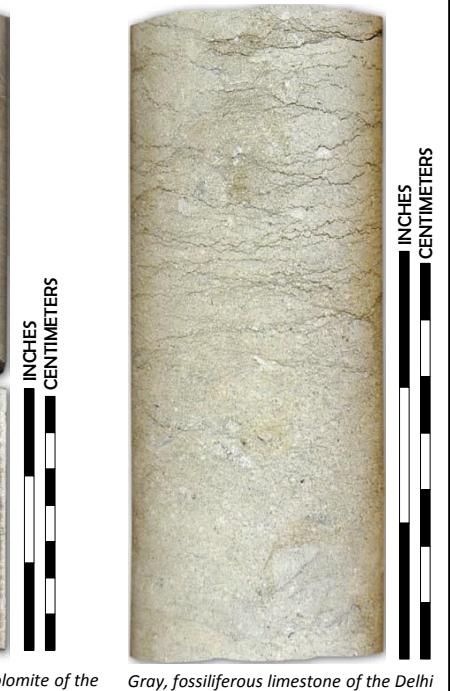
Coal conveyor, Harrison County, Ohio.



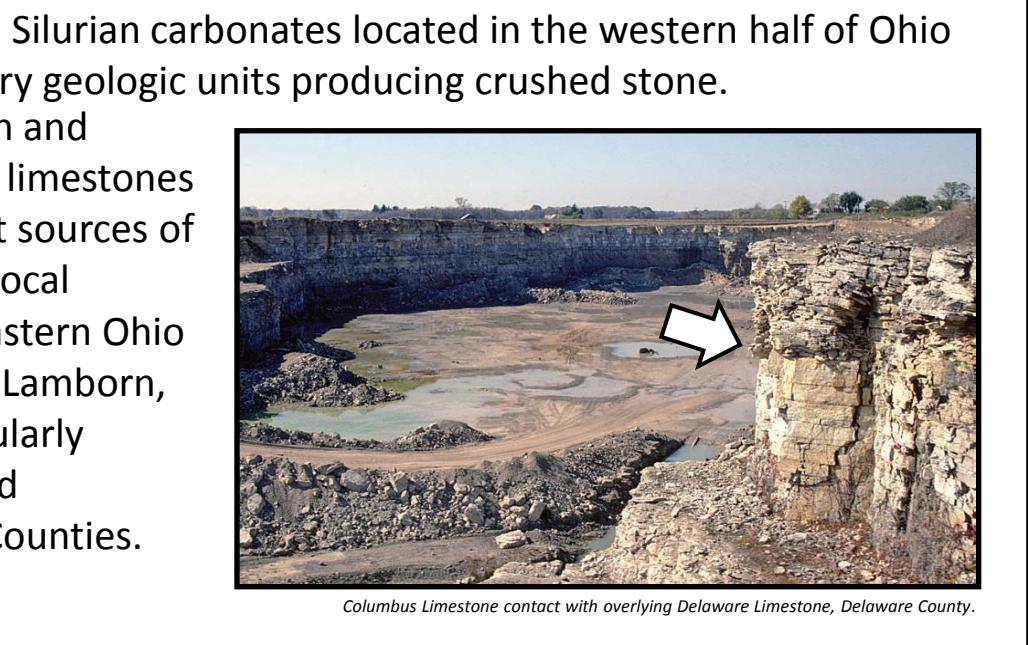
Limestone & Dolomite



- Production: 65,654,995 tons
- Ohio ranks 4th of 29 producing states
- Sales: 66,019,352 tons
- Value: \$623,810,033
- Top Producing Geologic Units:
 - Columbus Limestone (Devonian)
 - Lockport Dolomite (Silurian)
 - Detroit River Group (Devonian)
 - Greenfield/Tymochtee Dolomites (Silurian)



Brown, finely crystalline dolomite of the Bellepointe Mbr. of Columbus Limestone and Gray, fossiliferous limestone of the Delhi Mbr. of Columbus Limestone

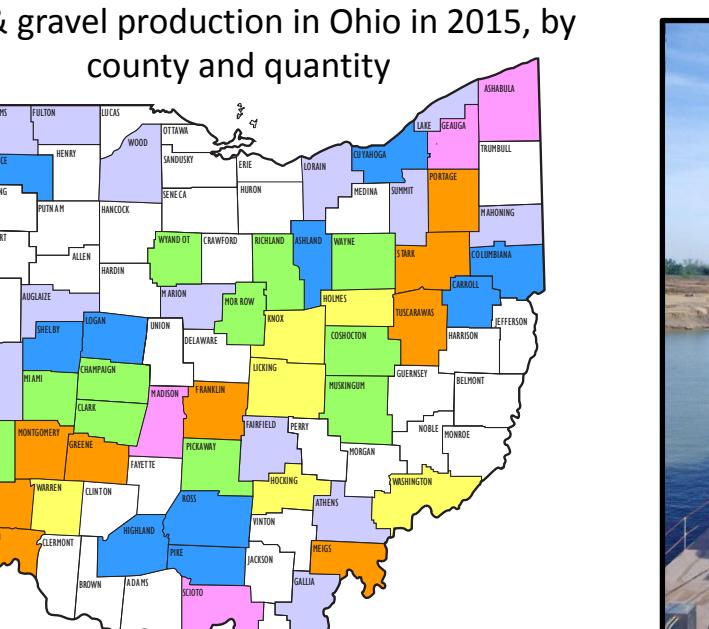


Devonian and Silurian carbonates located in the western half of Ohio are the primary geologic units producing crushed stone. Pennsylvanian and Mississippian limestones are important sources of aggregate in local markets of eastern Ohio (Stout, 1941; Lamborn, 1951), particularly Mahoning and Muskingum Counties.

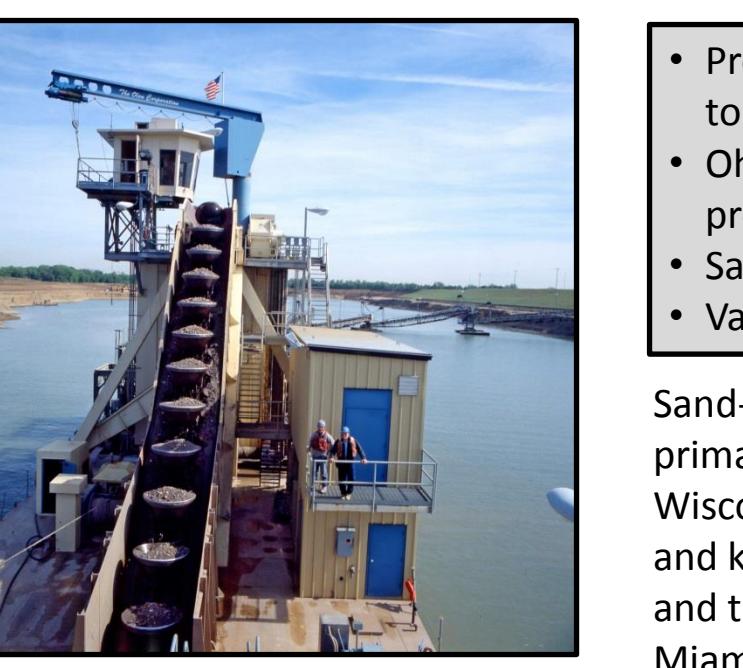


Columbus Limestone contact with overlying Delaware Limestone, Delaware County, Ohio.

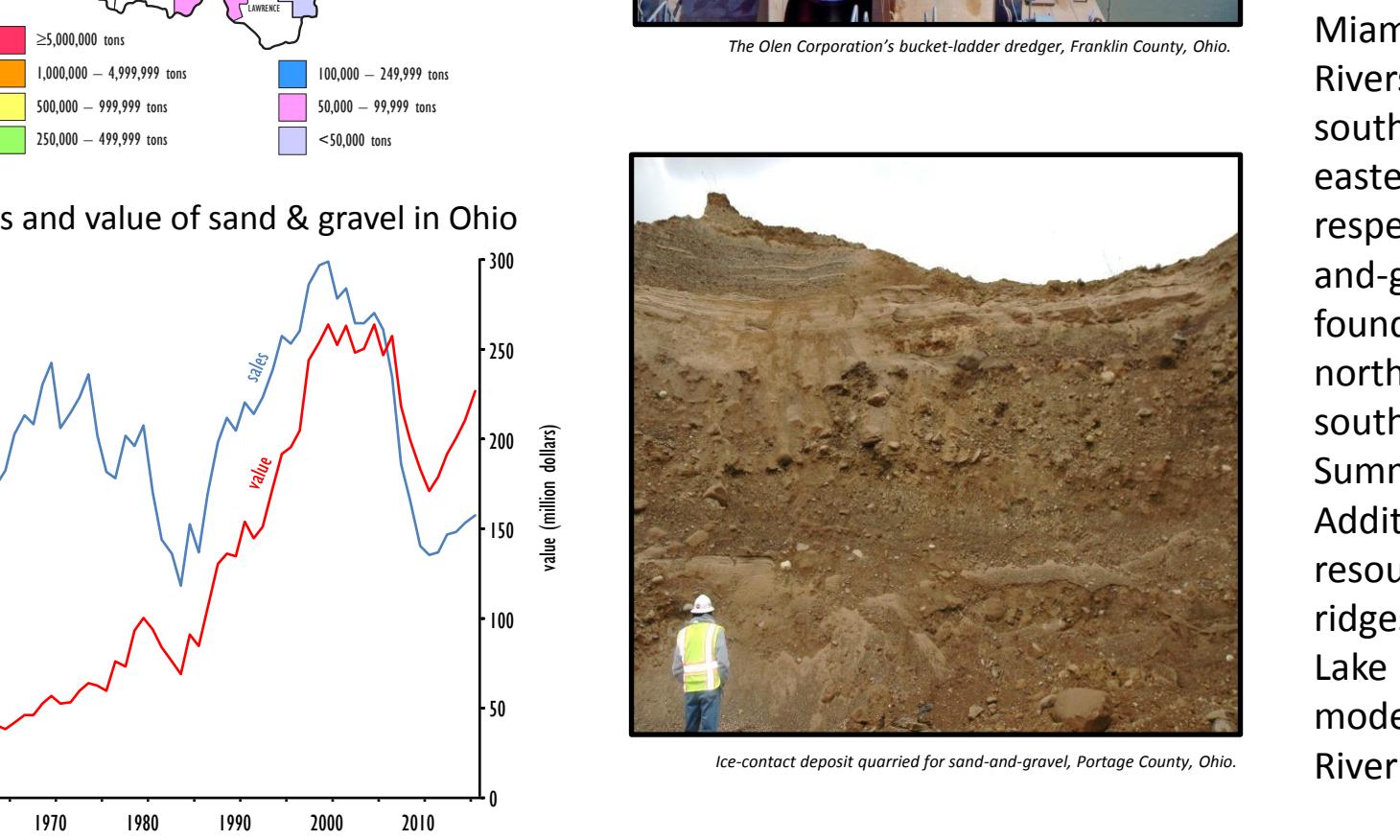
Sand & Gravel



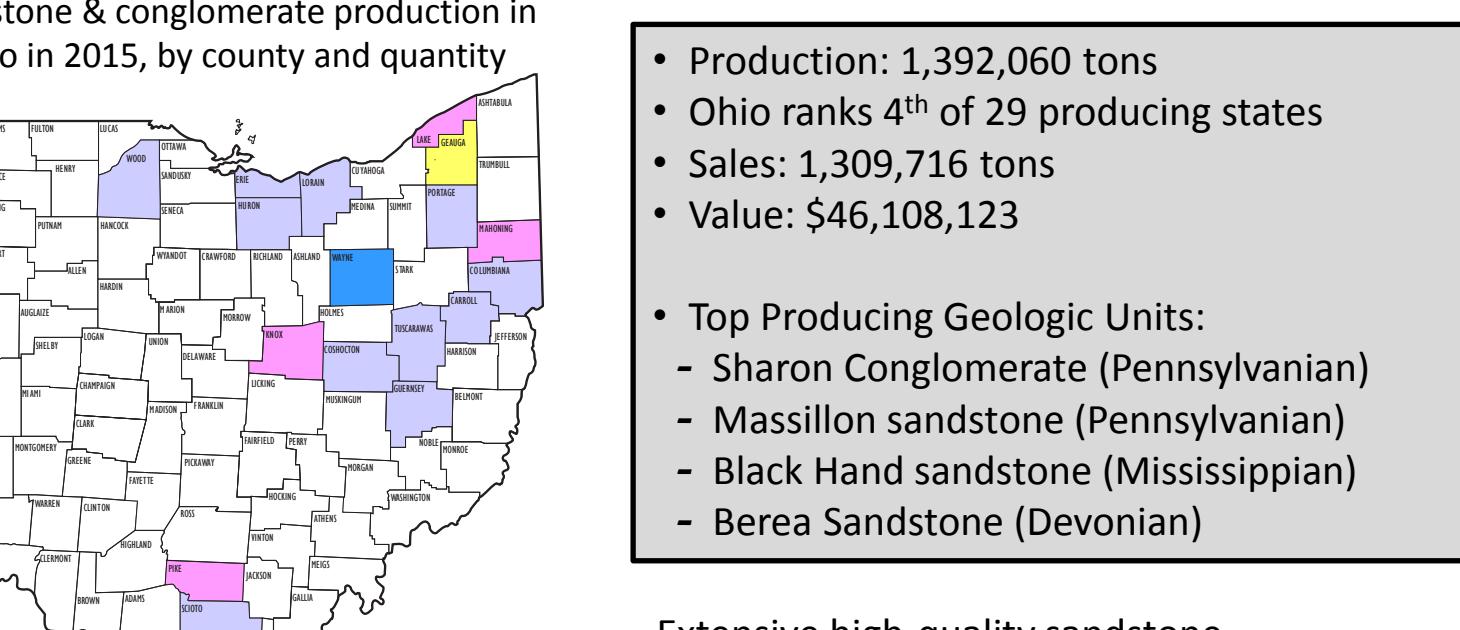
- Production: 31,515,972 tons
- Ohio ranks 10th of 50 producing states
- Sales: 31,488,652 tons
- Value: \$227,099,840



The Olen Corporation's bucket-ladder dredger, Franklin County, Ohio.



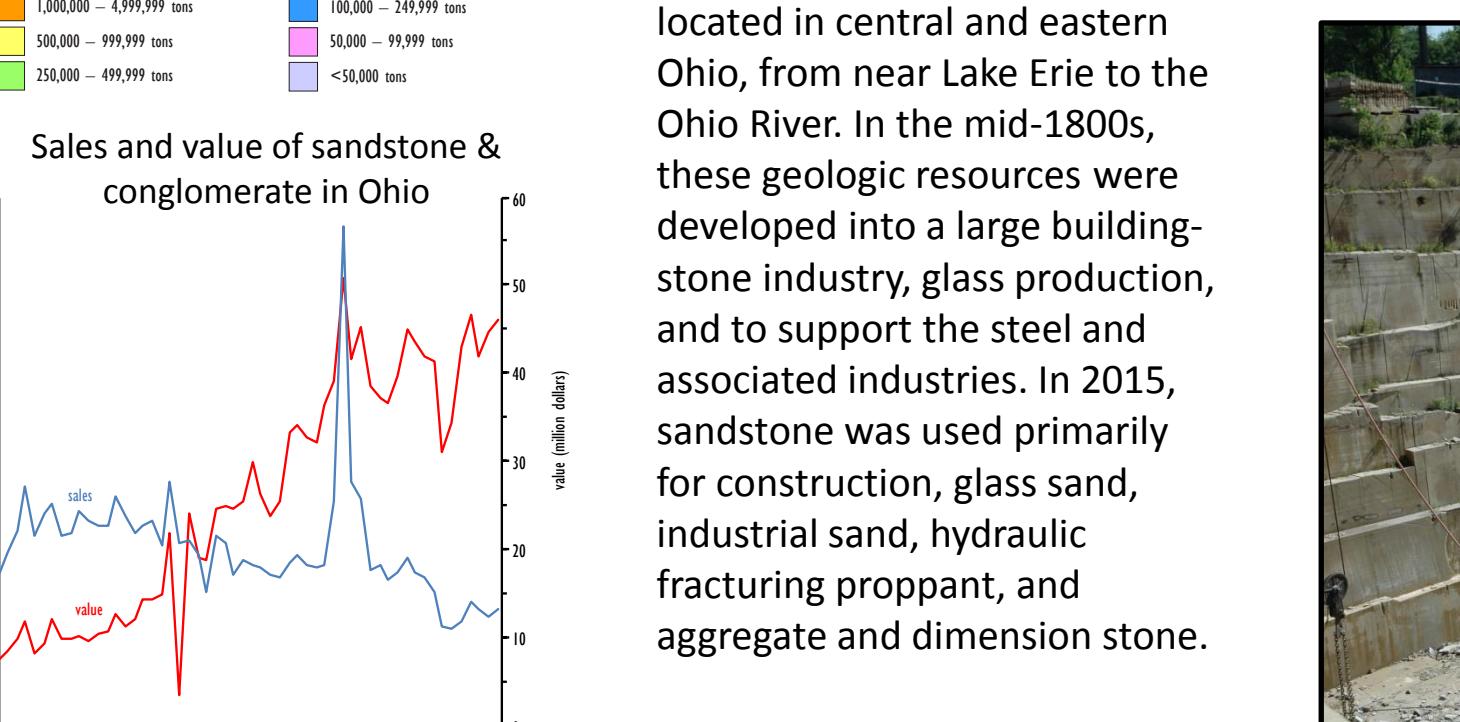
Sandstone & Conglomerate



- Production: 1,392,060 tons
- Ohio ranks 4th of 29 producing states
- Sales: 1,309,716 tons
- Value: \$46,108,123
- Top Producing Geologic Units:
 - Sharon Conglomerate (Pennsylvanian)
 - Massillon sandstone (Pennsylvanian)
 - Black Hand sandstone (Mississippian)
 - Berea Sandstone (Devonian)



Sandstone with rounded quartz pebbles

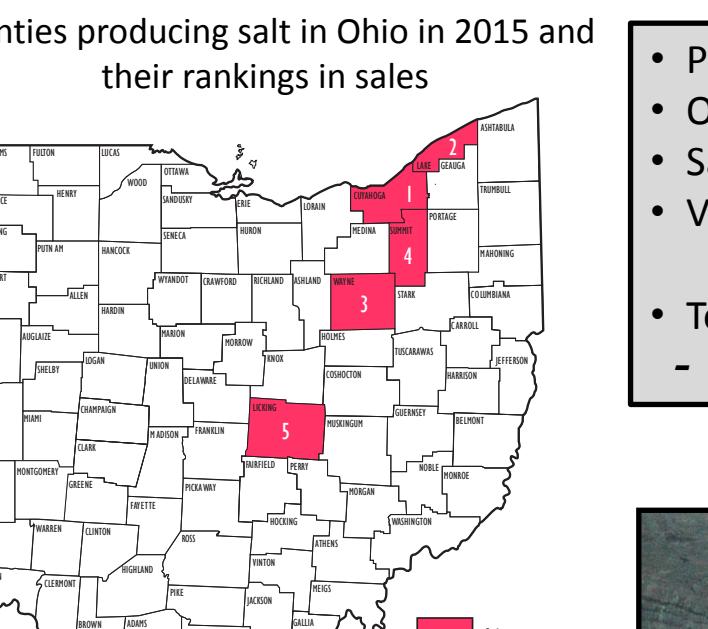


Extensive high-quality sandstone and conglomerate deposits are located in central and eastern Ohio, from near Lake Erie to the Ohio River. In the mid-1800s, these geologic resources were developed into a large building-stone industry, glass production, and to support the steel and associated industries. In 2015, sandstone was used primarily for construction, glass sand, industrial sand, hydraulic fracturing proppant, and aggregate and dimension stone.

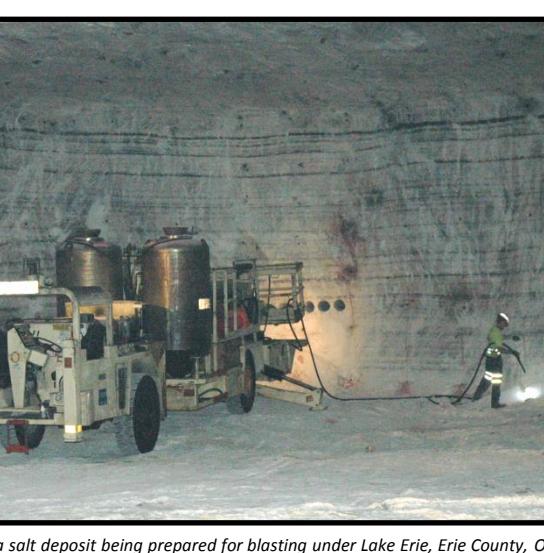


Berea Sandstone dimension stone quarry in Erie County, Ohio.

Salt



- Production: 5,620,128 tons
- Ohio ranks 5th of 16 producing states
- Sales: 4,819,038 tons
- Value: \$225,201,833
- Top Producing Geologic Units:
 - Salina Group (Silurian)



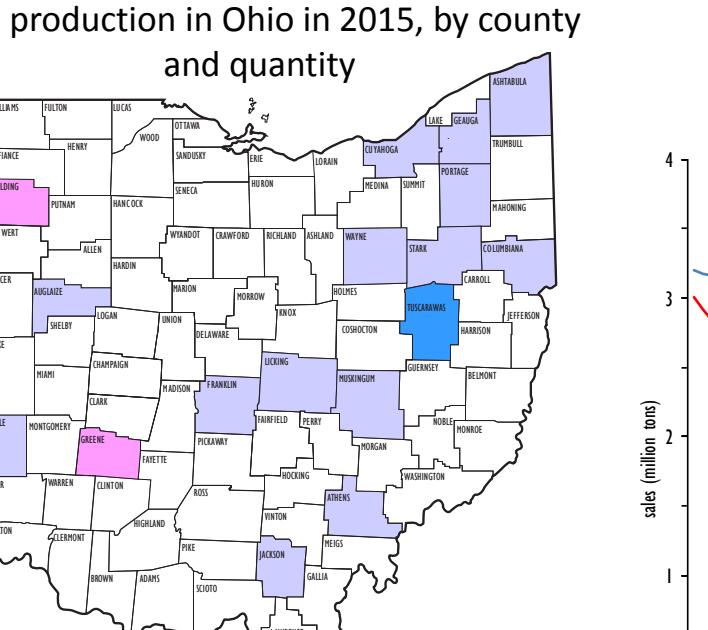
Salt deposit being prepared for blasting under Lake Erie, Erie County, Ohio.



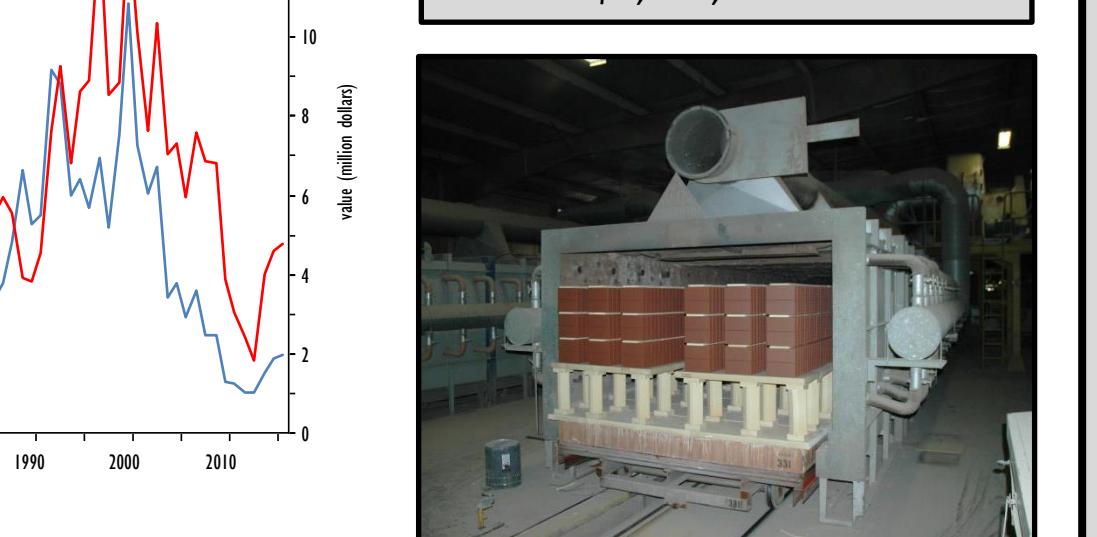
Salt stockpile at the Cargill salt mine near downtown Cleveland, Ohio.

Both solution-mined and rock salt in Ohio is produced from bedded deposits in the Silurian Salina Group. The Salina salt beds are restricted to the subsurface in eastern Ohio. The Salina Group in eastern Ohio is subdivided into seven units, A through G, from lowest to highest. The salt produced in Ohio comes from the F unit, which is further subdivided into four beds. Individual salt beds are less than 100 feet thick and may contain thin interbeds of siltstone and dolomite. Depth to the F unit varies from 1,900 feet in the Cleveland mine to over 2,000 feet at the Fairport Harbor mine (Tomastik, 2002; Liiford, 1973).

Clay



- Production: 567,573 tons
- Ohio ranks 6th of 87 producing states
- Sales: 567,253 tons
- Value: \$4,784,502



Clifford, M.J., 1973, Silurian rock salt of Ohio: Columbus, Ohio Department of Natural Resources, Division of Geological Survey Report of Investigations 90, 42 p.

Lamborn, R.E., 1941, Coal and economic geology of western Ohio: Columbus, Ohio Geological Survey, Fourth Series, Bulletin 40, 377 p.

Schumer, G.A., Mort, B.E., and Engle, M.P., 2016, Ohio's Geologic Survey—A field guide for citizens and environmental and geotechnical investigators: Columbus, Ohio Department of Natural Resources, Division of Geological Survey, Ohio Geological Survey Information Circular 63, 191 p.

Stout, Witter, 1941, Coal and economic geology of eastern Ohio: Columbus, Ohio Geological Survey, Fourth Series, Bulletin 42, 468 p.

Tomastik, T.E., 2002, Salt in Ohio: Columbus, Ohio Department of Natural Resources, Division of Geological Survey, Ohio Geological Survey Information Circular 66, 16 p.

U.S. Energy Information Administration (EIA), 2016, Ohio state profile and energy estimates: U.S. Energy Information Administration, last accessed August 8, 2016, at <<http://www.eia.gov/state/?id=OH#facts>>.

U.S. Geological Survey (USGS), 2016a, Crushed stone: U.S. Geological Survey, Mineral Commodity Summaries, p. 156, last accessed August 8, 2016, at <http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed_stone/2016-stone_crushed_stone.pdf>.

U.S. Geological Survey (USGS), 2016b, Sand: U.S. Geological Survey, Mineral Commodity Summaries, p. 142, last accessed August 8, 2016, at <http://minerals.usgs.gov/minerals/pubs/commodity/sand_raw_crude/2016-sand.pdf>.

U.S. Geological Survey (USGS), 2016c, Salt: U.S. Geological Survey, Mineral Commodity Summaries, p. 140, last accessed August 8, 2016, at <<http://minerals.usgs.gov/minerals/pubs/commodity/salt/mcs-2016-salt.pdf>>.

References