

THE MINERAL INDUSTRY OF MISSOURI

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Missouri Department of Natural Resources, Division of Geology and Land Survey, for collecting information on all nonfuel minerals.

In 2000, the estimated value¹ of nonfuel mineral production for Missouri was \$1.32 billion, based upon preliminary U.S. Geological Survey (USGS) data. This was a 2.2% decrease from that of 1999² and followed a 3.1% increase in 1999 from 1998. The State was 10th in rank (9th in 1999) among the 50 States in total nonfuel mineral production value, of which Missouri accounted for more than 3% of the U.S. total.

Crushed stone, cement (portland and masonry), lead, and lime, in descending order of value, accounted for close to 86% of Missouri's total nonfuel mineral production value in 2000. While producing about 12% less lead than in 1999, Missouri continued to be the top lead-producing State in the Nation. The State produced more than 2 times and almost 10 times as much lead as that of the 2 next highest producing States. However, both crushed stone and portland cement, by value, surpassed lead in 1997 and 1999, respectively, and remained the State's leading mineral commodities in 2000 (table 1). Lead had been Missouri's leading nonfuel mineral since 1969, except for several years in the mid-1980s and during 1993-95 (crushed stone was first).

In 2000, increases occurred in the values of crushed stone, up \$37 million; zinc, up almost \$10 million; and construction sand and gravel, up almost \$4 million. Copper and masonry cement were also up slightly. These were more than offset by a decrease in the value of lead of more than \$40 million plus smaller yet significant drops in the values of lime, iron ore, and portland cement (descending order of change), resulting in the net decrease for the year. All other changes in value in 2000 were small relative to these. In 1999, the State's increase in value mainly resulted from the increased values of portland cement, up \$31 million; construction sand and gravel, up \$11 million; and fuller's earth up almost \$4 million. Smaller increases also occurred in the values of zinc, masonry cement,

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2000 USGS mineral production data published in this chapter are preliminary estimates as of July 2001 and are expected to change. For some mineral commodities, such as construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing of the specialists may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals/contacts/comdir.html>, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>; facsimile copies may be obtained from MINES FaxBack.

²Values, percentage calculations, and rankings for 1999 may vary from the Minerals Yearbook, Area Reports: Domestic 1999, Volume II, owing to the revision of preliminary 1999 to final 1999 data. Data for 2000 are preliminary and are expected to change; related rankings may also change.

iron ore, silver, and gemstones. These gains were offset somewhat by decreases in the values of crushed stone and lead, down \$7 million and \$6 million, respectively, and smaller drops in the values of copper and common clay (table 1).

Based upon USGS preliminary estimates of the quantities produced in the 50 States in 2000, Missouri remained first in lime, fire clay, and iron oxide pigments; third in zinc and iron ore; fifth in portland cement; and seventh in silver and common clays (in descending order of value). The State rose to fifth from sixth in the production of crushed stone and dropped to fourth from third in fuller's earth. Additionally, the State was a significant producer of construction and industrial sand and gravel and masonry cement.

The Missouri Department of Natural Resources, Division of Geology and Land Survey³ (DGLS), provided the following narrative information. Some data or information as reported by the DGLS may differ from USGS preliminary estimates and production figures as reported to and estimated by the USGS. Information from the State Mine Inspector indicated that the production of lead concentrates increased slightly during 2000 from the previous year. According to representatives from the base metals industry, profitability decreased during 2000 and is expected to decrease even more during 2001. The Viburnum #28 and #29 Mines, along with the Brushy Creek, Buick, Casteel, Fletcher, Sweetwater, and West Fork mines, all owned by the Doe Run Resources Corp., were active at some time during calendar year 2000. All applications for exploration on the Winona Unit of the Mark Twain National Forest, formerly an area of intense exploration, were withdrawn several years ago. There is no metallic mineral exploration activity in that unit at present. The metals industry reports that Federal and State lands seem to be increasingly off limits for mineral exploration.

Production of iron increased in 2000 from 1999, and the expectation is for another production increase in 2001. Pea Ridge Iron Ore Co., with a mine in northwestern Washington County, operated the only underground iron mine in the continental United States. The company has spent more than 10 years building markets for specialty iron ore products. Its production has uses from heavy aggregate to coal cleaning.

According to a survey of crushed stone operators, aggregate markets were strong in 2000, although disparities existed between various areas in the State. Large urbanized areas exhibited strong markets, particularly in government and commercial work. Many operators reported a decline in private construction nearing yearend. Bad weather in Missouri during December 2000 essentially stopped construction for that month. The acquisition of aggregate operations by large corporations slowed during the year. APAC-Missouri, Inc. purchased Hall

³Ardel Rueff, Geologist, authored the text of State mineral industry information submitted by the Division of Geology and Land Survey.

and Riley Quarries in December 2000. Springfield Underground, Inc. began construction of a new crushing and screening plant at its Springfield quarry. The new plant is scheduled for completion during midyear 2002. Hunt Midwest Mining, Inc. started development of a slope entrance at its Stampler Quarry in Platte County. When completed, the slope will have an overall length of 460 meters (m) with a vertical depth of 73 m. The slope will allow access to the Bethany Falls Limestone, which is a source of high-quality concrete and asphalt aggregate. Easily available limestone resources, suitable for crushed stone aggregate, are becoming restricted in the Jackson and Clay County (Kansas City), Missouri area. Operators have considered opening mines to Mississippian or Devonian age limestone formations to augment reserves, and several drilling programs have been conducted to evaluate these deep targets. In addition, substantial amounts of limestone, especially for the concrete aggregate market, are being trucked into the Kansas City area. This stone is from surface mines well east of the urban area. The increasing number of "superpave" asphalt paving projects has forced many quarries to develop more complete testing facilities. Superpave is a new more stringent asphalt aggregate specification. In addition, the elimination of "fines" (very small material) in superpave aggregate has created a disposal and storage problem along with a marketing opportunity for the crushed stone industry. Two issues that have long-term implications for the crushed stone and other aggregate producers are increasing fuel costs and the lack of a comprehensive funding program for Missouri highways.

The year 2000 was another good year for the Missouri cement industry because most plants produced at full capacity. The year 2000 was a slight slowdown from 1999 when many plants oversold their production. The industry reported a slowdown in December because of the bad weather. According to most companies, sales expectations for 2001 are very promising. The new cement plant being constructed by Lafarge Corp. in Independence, Jackson County, is on schedule to begin operations in 2001. A deep underground mine developed by Lafarge in the Mississippian age St. Louis Limestone is presently producing stone for the old cement plant. Holnam, Inc. proceeded with its project to build a large cement plant on the Mississippi River in Ste. Genevieve County. The site, on a 1,600-hectare tract, is approximately 56 kilometers southeast of the city of St. Louis. According to a news release by the company, the new single-kiln plant will have an annual capacity of 4 million metric tons of cement. Permit applications have already been submitted, and the permitting process is expected to run into 2001. Holnam anticipates the plant to begin operation in late 2003 or early 2004.

The State's lime industry also reported a good year, especially in the sulfur removal market. Some operators are planning on a slight improvement in 2001 compared with 2000, while others are concerned about an "over capacity" problem in some areas.

The construction sand and gravel market was strong because of increased residential and small commercial construction. The summer-long ready-mix concrete strike in St. Louis did curtail production in that area. Several Missouri River dredge operators report having good results using a German-made air jig to remove lignite from the sand. Another operator reports using a combination of air jigs and rising current washers to remove lignite. Lignite is a common impurity in the Missouri River and to a lesser extent in the lower Mississippi River. It is considered a deleterious material in sand when used as an aggregate in portland cement concrete. The inability to use sand in the new superpave asphalt specification by the Missouri Department of Transportation has eliminated a potential market.

The demand for refractory clay declined in 2000, and the outlook for 2001 is not promising. As a result, several manufacturing facilities were closed. Several producers indicated that the refractory business is closely linked to the steel industry and that the intense competition from offshore steel suppliers has reduced the market for the domestic refractories industry. Global Industrial Technologies, Inc., which owned Harbison-Walker Refractories, Inc., the largest refractory clay producer in the State, was purchased at yearend 1999 by Radex Heraklith Industriebeteiligungs AG (RHI). RHI, one of the world's leading makers of heat-resistant refractory products, is headquartered in Vienna, Austria.

Sales of refractory clay for use as cement feed increased in 2000 compared with that of 1999 but are expected to remain stable for 2001.

Sales of absorbent clay products were higher in 2000 compared with that of 1999 and will likely be better in 2001, according to industry representatives. Ralston Purina Co., which acquired Golden Cat Corp. in 1995, was reportedly to be acquired by Nestle S.A., the Swiss-based conglomerate.

The production of shale for use in structural clay products showed significant improvement during 2000 as compared to 1999. This increase was related to the robust housing market. The expectation for 2001 is for sales to be good but not as good as 2000 because of large inventories and a wet and cold winter in the Midwest. One producer reported that its natural gas cost almost doubled during 2000 and that as a result, one kiln was shut down. Increasing fuel costs associated with kiln operation and transportation were expected to start increasing building brick costs.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MISSOURI 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1998		1999		2000 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, Portland	4,570	323,000 e/	4,910	354,000 e/	4,900	350,000 e/
Clays:						
Common	1,030	4,440	1,080	4,180	1,070	4,180
Fire	288	4,220	293	3,980	306	4,400
Copper 3/	5	9,090	W	W	W	W
Sand and gravel, construction	9,470	39,300	12,400	50,300	13,000	54,000
Stone, crushed	68,400	356,000	73,400	349,000	79,000	386,000
Combined values of cement (masonry), clay (fuller's earth), gemstones, iron ore (usable), iron oxide pigments (crude), lead, lime, sand and gravel (industrial), silver, stone (dimension granite), zinc, and values indicated by symbol W	XX	575,000	XX	584,000	XX	524,000
Total	XX	1,310,000	XX	1,350,000	XX	1,320,000

e/ Estimated. p/ Preliminary. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

TABLE 2
MISSOURI: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1998				1999			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	181	64,600 r/	\$336,000 r/	\$5.20	175	67,000	\$315,000	\$4.71
Dolomite	22	2,550 r/	12,300 r/	4.82 r/	22	4,250	20,000	4.71
Granite	2	W	W	6.95	2	W	W	6.69
Sandstone	1	W	W	2.39	1	W	W	4.96
Traprock	2	W	W	5.37	2	W	W	9.13
Total or average	XX	68,400	356,000	5.21	XX	73,400	349,000	4.76

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 1999, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	\$5.45
Riprap and jetty stone	2,480	\$9,670	3.90
Filter stone	162	732	4.52
Other coarse aggregate	695	3,750	5.39
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,050	18,600	6.09
Bituminous aggregate, coarse	1,620	12,600	7.75
Bituminous surface-treatment aggregate	964	5,220	5.42
Railroad ballast	1,050	5,200	4.96
Other graded coarse aggregate	2,870	14,600	5.11
Fine aggregate (-3/8 inch):			
Stone sand, concrete	189	1,450	7.66
Stone sand, bituminous mix or seal	216	1,320	6.13
Screening, undesignated	928	5,050	5.45
Other fine aggregate	23	87	3.78
Coarse and fine aggregates:			
Graded road base or subbase	8,030	38,500	4.80
Unpaved road surfacing	1,760	8,790	4.99
Terrazzo and exposed aggregate	W	W	13.05
Crusher run or fill or waste	394	1,810	4.60
Other coarse and fine aggregates	1,390	6,260	4.50
Other construction materials	211	1,130	5.35
Agricultural:			
Agricultural limestone	956	4,010	4.19
Poultry grit and mineral food	W	W	33.07
Chemical and metallurgical:			
Cement manufacture	6,300	19,500	3.09
Lime manufacture	W	W	4.02
Flux stone	W	W	5.68
Chemical stone	W	W	5.13
Special:			
Asphalt fillers or extenders	W	W	4.96
Roofing granules	W	W	9.45
Unspecified: 3/			
Reported	17,800	90,100	5.07
Estimated	20,000	87,000	4.41
Total or average	73,400	349,000	4.76

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, limestone-dolomite, sandstone, and traprock.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1999,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1 1/2 inch) 2/	135	721	116	644	33	200	172	877
Coarse aggregate, graded 3/	183	1,320	77	407	1,640	7,910	1,050	6,400
Fine aggregate (-3/8 inch) 4/	W	W	W	W	W	W	W	W
Coarse and fine aggregate 5/	1,040	5,370	527	2,550	W	W	1,110	4,480
Other construction materials	--	--	--	--	--	--	--	--
Agricultural 6/	164	752	72	211	125	481	54	175
Chemical and metallurgical 7/	--	--	W	W	W	W	--	--
Special 8/	--	--	--	--	--	--	--	--
Unspecified: 9/								
Reported	W	W	W	W	4,620	23,800	W	W
Estimated	920	4,100	2,200	9,800	2,800	12,000	1,300	5,700
Total	3,770	18,800	4,150	17,800	10,500	50,100	5,010	24,500
	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1 1/2 inch) 2/	913	4,920	W	W	W	W	2,140	7,660
Coarse aggregate, graded 3/	3,260	22,000	943	6,120	696	3,330	1,710	8,720
Fine aggregate (-3/8 inch) 4/	969	5,450	265	1,810	W	W	W	W
Coarse and fine aggregate 5/	3,670	20,600	954	5,000	W	W	4,000	18,300
Other construction materials	--	--	W	W	W	W	121	634
Agricultural 6/	W	W	98	648	60	209	W	W
Chemical and metallurgical 7/	W	W	6	27	--	--	3,370	12,800
Special 8/	--	--	--	--	--	--	5	27
Unspecified: 9/								
Reported	5,530	28,200	3,530	17,500	W	W	1,080	5,500
Estimated	2,600	12,000	4,700	21,000	920	4,000	4,400	19,000
Total	20,300	102,000	10,600	52,600	2,050	9,350	17,000	74,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

4/ Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

5/ Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregates, unpaved road surfacing, and other coarse and fine aggregates.

6/ Includes agricultural limestone and poultry grit and mineral food.

7/ Includes cement manufacture, chemical stone for alkali works, flux stone, and lime manufacture.

8/ Includes asphalt fillers or extenders and roofing granules.

9/ Reported and estimated production without a breakdown by end use.

TABLE 5
MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1999,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand) 2/	4,510	\$20,600	\$4.58
Concrete products (blocks, bricks, pipe, decorative, etc.)	489	2,700	5.53
Asphaltic concrete aggregates and other bituminous mixtures	603	2,460	4.09
Road base and coverings	353	1,090	3.09
Fill	319	970	3.04
Snow and ice control	65	295	4.54
Other miscellaneous uses 3/	120	889	7.41
Unspecified: 4/			
Reported	2,160	4,150	1.92
Estimated	3,800	17,000	4.49
Total or average	12,400	50,300	4.05

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes gunite and plaster sands.

3/ Includes railroad ballast and roofing granules.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1999, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	33	191	24	117	--	--	W	W
Asphaltic concrete aggregates and road base materials	W	W	W	W	--	--	325	1,200
Fill	16	64	3	10	--	--	54	175
Snow and ice control	W	W	18	70	--	--	W	W
Other miscellaneous uses 3/	32	150	53	282	--	--	1,160	4,880
Unspecified: 4/								
Reported	--	--	--	--	--	--	40	234
Estimated	430	1,700	150	710	1,500	5,800	220	2,300
Total	504	2,070	250	1,190	1,500	5,800	1,800	8,780
Use	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	3,190	15,800	W	W	265	978	330	1,400
Asphaltic concrete aggregates and road base materials	297	1,340	W	W	41	164	W	W
Fill	110	284	4	28	31	92	97	274
Snow and ice control	W	W	W	W	--	--	W	W
Other miscellaneous uses 3/	82	661	58	369	--	--	240	549
Unspecified: 4/								
Reported	2,000	3,310	--	--	119	601	--	--
Estimated	640	2,900	100	550	360	1,300	430	1,800
Total	6,330	24,300	165	950	813	3,180	1,090	4,060

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes gunite and plaster sands.

3/ Includes railroad ballast and roofing granules.

4/ Reported and estimated production without a breakdown by end use.