

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 1998, the preliminary estimated value¹ of nonfuel mineral production for Missouri was \$1.36 billion, according to the U.S. Geological Survey (USGS). This was nearly a 4% increase from that of 1997,² following a 4.8% increase from 1996 to 1997. The State climbed in rank to 9th from 10th among the 50 States in total nonfuel mineral production value, of which Missouri accounted for more than 3% of the U.S. total.

Missouri, by a large measure, remained the top producer of lead in the Nation. The State produced more than three times the quantity of lead as that of the next highest producing State in 1998. However, crushed stone, by value, has been the State's foremost nonfuel mineral commodity since 1997, having traded places with lead, which was first in 1996. Except for several years in the mid-1980's and 1993-95, lead had been Missouri's leading nonfuel mineral since 1969. Crushed stone surpassed lead and portland cement in 1993 and ranked first through 1995. In 1998, the value of portland cement also surpassed that of lead.

In 1998, crushed stone, portland cement, and third- and fourth-ranked lead and lime combined to account for 88% of the State's total nonfuel mineral production value. Significantly increased values for crushed stone and portland cement plus a smaller increase in fuller's earth more than balanced decreases in lead, zinc, copper, and construction sand and gravel values (in descending magnitude of change), resulting in the State's net increase (table 1). All other changes in value in 1998 were small relative to these. In 1997, the State's increase in value mainly resulted from the increased values of portland cement, crushed stone, and lime

plus a smaller rise in zinc. Decreases in lead and copper somewhat offset the year's gains.

Based on USGS preliminary estimates of the quantities produced in the 50 States in 1998, Missouri remained first² in lime; second in fire clays and iron oxide pigments; third in iron ore; fourth in zinc; fifth in portland cement and ball clay; and seventh in silver. The State rose to fifth from sixth in the production of crushed stone, to fourth from fifth in fuller's earth, and dropped from sixth to seventh in common clays. Additionally, the State was a significant producer of industrial sand and gravel and masonry cement.

The Missouri Department of Natural Resources, Division of Geology and Land Survey³ (DGLS) provided the narrative information that follows:

Industrial Minerals

The crushed stone industry increased production an estimated 8% in 1998 from that of 1997 to reach a new alltime high for the State of 74.3 million metric tons; demand was expected to continue to be high in 1999. All urban areas had strong markets although some rural areas reported steady to weak markets. In the St. Louis and Kansas City markets, commercial work was exceptionally strong. Several producers reported difficulty in keeping up with demand. In contrast to this, a major issue facing the Missouri aggregate industry continued to be the status of the State highway program. The Missouri Department of Highways and Transportation withdrew its previously submitted 15-year program because of funding problems. The Department replaced it with a 5-year program, and discussions continued in the Missouri Legislature regarding potential solutions for the lack of funding to meet the State's transportation needs.

Consolidation continued in the aggregate industry with the continued purchases of small or regional producers by major national stone companies. APAC, Inc. purchased Lake Ozark Construction Industry, Inc. from Clarkson Construction. Lake Ozark had many crushed stone, sand and gravel, and ready-mix plants in the central Missouri area. APAC also bought City-Wide Asphalt Co., Inc. in Jackson County and a quarry near Gallatin in Daviess County. Capitol Quarries, Inc. purchased Smith Quarries near Salem in Dent County; Central Stone Co. purchased the Greensburg Quarry in Scotland; and Carthage Crushed Limestone Co. was sold to AMERICOLD in midyear.

Although the estimated overall construction sand and gravel production was down somewhat (table 1), according to the DGLS, the industry also had a good year in 1998. Many producers reported to the DGLS to have had excellent years in

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on 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 1998 USGS mineral production data published in this chapter are preliminary estimates as of February 1999 and are expected to change. For some mineral commodities (for example, 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 for the specialists may be retrieved over the Internet at <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 <http://minerals.usgs.gov/minerals>; facsimile copies may be obtained from MINES FaxBack.

²Values, percentage calculations, and rankings for 1997 may vary from the *Minerals Yearbook, Area Reports: Domestic 1997, Volume II*, owing to the revision of preliminary 1997 to final 1997 data. Data for 1998 are preliminary and expected to change, while related rankings may also be subject to change.

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

their businesses. Havin Material Service of St. Clair, Franklin County, purchased Virginia Mines Sand and Gravel Co., also of St. Clair. St. Charles Sand Co. of Bridgeton, St. Louis County, purchased a German-made air jig to remove lignite, a common deleterious material in Missouri River sand. The yet-to-be-settled U.S. Army Corps of Engineers' management plan for the Missouri River remained a concern to dredge operators along that river. Industry feels that high spring water flows will limit dredging, increase floating debris, and may restrict barge movement. Final management plans for the river have not been announced by yearend.

The cement industry also shared in the active construction market; several plants reported selling all of 1998 production. These trends were expected to continue into 1999. Shaft sinking continued at the Lafarge Cement Corp. plant at Sugar Creek, Jackson County, and plant-site preparation started with completion scheduled for the year 2000. Lone Star Cement Co. began preliminary planning for an expansion project at its Cape Girardeau County plant. The company completed evaluation of a large tract of nearby reserves in adjacent Scott County and tentative plans call for limestone to be moved from the proposed quarry by conveyor to the existing cement manufacturing facility.

With regard to fire clays, Global Industrial Technology (GIT) purchased the A. P. Green Industries Inc. in July 1998. It was later merged with GIT's Harbison-Walker Refractories Co. subsidiary. As a result of this, Harbinson Walker's manufacturing plant near Fulton, Callaway County, was closed although operations at the rotary kiln continued. The mining and exploration departments were combined.

Markets for structural clay products continued strong in 1998 following a year of significantly increased production in 1997; a similar demand for these raw materials was expected to continue on into 1999. A sound economy and low interest rates led the way for strong demand for brick in the housing market. Additionally, low fuel prices also helped the industry, both at the kiln and in transportation.

Metals

Because of low metal prices, 1998 was a difficult operating year for the base-metal industry. In April 1998, the Doe Run Co. announced its intention to purchase the assets of ASARCO, Incorporation's Missouri Lead Division. The deal was completed in September 1998 and consisted of the acquisition of two lead-zinc mines, Sweetwater and West Fork, and the Glover lead smelter and refinery, all located in southeast Missouri. Asarco retained royalty interests in the properties (Giancola, 1999, p. 93). During 1997, Asarco completed a modernization of the Glover plant, meeting all Federal ambient air standards as of that year (Giancola, 1999, p. 33). In the fall of 1998, Doe Run withdrew its application for prospecting permits for several tracts in the Winona (Shannon County) area. According to the company, special stipulations placed on the permits by the U.S. Department of the Interior were too restrictive and might set a precedent affecting the industry on a national basis.

The Doe Run Co. began refurbishing the Higdon Mine (lead-zinc deposit) in Perry County with plans to collect bulk samples for metallurgical testing. During the 1950's, the National Lead Co. discovered the Higdon ore body with assistance from the Defense Minerals Exploration Administration. Development of the ore body was started in 1965 but suspended in 1967 after two shafts were sunk. The ore reportedly is similar to that found in the Mine La Motte and Fredericktown, Madison County area, which contains lead, zinc, copper, nickel and cobalt and is an area of former mining activity. The Mine La Motte (Mine La Motte Corp.) and Madison (National Lead Co.) mines closed in the late 1950's and 1961, respectively, owing to a combination of reasons—depressed metal prices, progressively lower grades of remaining ores, and depletion of some of the remaining proven ore bodies.

Reference Cited

Giancola, Diane, ed., 1999, *American Mines Handbook 1999*: Don Mills, Ontario, Canada, Southam Mining Publications Group, p. 33, 93.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1996		1997		1998 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement : Portland	4,530	293,000 e/	4,730	321,000 e/	4,900	340,000
Clays:						
Ball	13	W	W	W	W	W
Common	849	3,250	1,050	4,140	1,070	4,220
Fire	223	3,220	291	4,270	259	3,970
Fuller's earth	283	W	W	W	W	W
Copper 3/	W	W	8	19,300	7	12,300
Gemstones	NA	108	NA	W	NA	W
Sand and gravel: Construction	9,820	35,600	9,530	35,600	8,360	32,100
Stone: Crushed	67,000	325,000	68,500	350,000	74,300	409,000
Combined values of barite (1996), cement iron ore (usable), iron oxide pigments (crude), lime, sand and gravel (industrial), silver, stone (dimension granite), zinc, and values indicated by symbol W	XX	591,000	XX	573,000	XX	555,000
Total	XX	1,250,000	XX	1,310,000	XX	1,360,000

e/ Estimated. p/ Preliminary. NA Not available. 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 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	1996				1997			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	191 r/	62,800 r/	\$302,000 r/	\$4.81 r/	176	64,700	\$330,000	\$5.10
Dolomite	27 r/	3,090 r/	15,500 r/	5.01 r/	23	2,580	12,900	5.01
Granite	2	W	W	7.31	2	W	W	6.77
Sandstone	1	W	W	2.26	1	W	W	2.32
Traprock	1	W	W	4.36	1	W	W	4.96
Total	XX	67,000	325,000	4.85	XX	68,500	350,000	5.11

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

1/ Data are rounded to 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 1997, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
<u>Coarse aggregate (+1 1/2 inch):</u>			
Macadam	222	\$1.180	\$5.31
Riprap and jettv stone	2,600	9.610	3.69
Filter stone	191	892	4.67
Other coarse aggregate	626	2.970	4.74
<u>Coarse aggregate, graded:</u>			
Concrete aggregate, coarse	2,210	12.000	5.46
Bituminous aggregate, coarse	1,880	10.300	5.50
Bituminous surface-treatment aggregate	291	1.810	6.23
Other graded coarse aggregate 3/	3,290	27.300	8.31
<u>Fine aggregate (-3/8 inch):</u>			
Stone sand, concrete	W	W	6.03
Stone sand, bituminous mix or seal	131	710	5.42
Screening, undesignated	946	3.410	3.61
Other fine aggregate	101	583	5.77
<u>Coarse and fine aggregates:</u>			
Graded road base or subbase	9,150	41.500	4.53
Unpaved road surfacing	2,350	12.200	5.18
Terrazzo and exposed aggregate	W	W	10.11
Crusher run or fill or waste	607	2.670	4.39
Other coarse and fine aggregates	1,740	8.220	4.72
Other construction materials 4/	393	2.190	5.56
<u>Agricultural:</u>			
Agricultural limestone	985	4.910	4.98
Poultry grit and mineral food	(5/)	(5/)	6.53
<u>Chemical and metallurgical:</u>			
Cement manufacture	4,350	14.800	3.41
Lime manufacture	2,410	11.300	4.70
Dead-burned dolomite manufacture	(5/)	(5/)	7.59
Flux stone	(5/)	(5/)	6.47
Chemical stone	(5/)	(5/)	4.96
<u>Special:</u>			
Asphalt fillers or extenders	28	125	4.46
Roofing granules	(5/)	(5/)	11.03
Other miscellaneous uses: Other specified uses not listed 6/	208	1.010	4.88
<u>Unspecified: 7/</u>			
Actual	14,900	84.600	5.67
Estimated	18,100	89.500	4.94
Total	68,500	350.000	5.11

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data are rounded to three significant digits, except unit value; may not add to totals shown.

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

3/ Includes railroad ballast.

4/ Includes stone sand (concrete) and terrazzo and exposed aggregate.

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

6/ Includes waste material.

7/ Includes reported and estimated production without a breakdown by end use.

TABLE 4
MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1997,
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 aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	(3/)	(3/)	W	W	W	W	133	572
Coarse aggregate, graded 4/	155	1,080	W	W	W	W	585	2,780
Fine aggregate (-3/8 inch) 5/	(3/)	(3/)	W	W	W	W	--	--
Coarse and fine aggregate 6/	(3/)	(3/)	623	3,030	614	2,940	617	2,910
Other construction materials 7/	--	--	185	1,130	1,430	16,800	--	--
Agricultural 8/	(3/)	(3/)	(3/)	(3/)	(3/)	(3/)	(3/)	(3/)
Chemical and metallurgical 9/	--	--	(3/)	(3/)	(3/)	(3/)	--	--
Special 10/	--	--	--	--	--	--	--	--
Other miscellaneous use	--	--	--	--	(3/)	(3/)	--	--
Unspecified: 11/								
Actual	1,200	9,160	(3/)	(3/)	4,670	32,800	(3/)	(3/)
Estimated	1,500	7,440	2,500	13,500	2,110	11,000	2,680	12,900
Total	3,990	24,400	4,270	21,000	9,630	69,200	4,160	20,100
	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	560	2,830	222	1,350	(3/)	(3/)	W	W
Coarse aggregate, graded 4/	1,840	11,100	1,780	11,200	(3/)	(3/)	1,910	8,580
Fine aggregate (-3/8 inch) 5/	863	2,970	W	W	(3/)	(3/)	W	W
Coarse and fine aggregate 6/	4,620	24,600	1,470	7,800	(3/)	(3/)	4,830	19,200
Other construction materials 7/	(3/)	(3/)	(3/)	(3/)	--	--	2,160	6,920
Agricultural 8/	(3/)	(3/)	323	1,990	(3/)	(3/)	(3/)	(3/)
Chemical and metallurgical 9/	(3/)	(3/)	(3/)	(3/)	--	--	4,090	16,100
Special 10/	--	--	--	--	--	--	(3/)	(3/)
Other miscellaneous use	(3/)	(3/)	(3/)	(3/)	--	--	--	--
Unspecified: 11/								
Actual	6,370	28,400	1,280	7,240	--	--	(3/)	(3/)
Estimated	5,590	25,600	2,720	14,400	716	3,360	299	1,330
Total	21,700	100,000	8,440	48,100	1,660	7,700	14,600	59,400

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data are rounded to three significant digits; may not add to totals shown.

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

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

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

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

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

7/ Includes roofing granules and waste material.

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

9/ Includes cement manufacture, chemical stone for alkali works, dead-burned dolomite, flux stone, and lime manufacture.

10/ Includes asphalt fillers or extenders.

11/ Includes reported and estimated production without a breakdown by end use.

TABLE 5
 MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1997,
 BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand) 2/	5,070	\$17,800	\$3.51
Concrete products (blocks, bricks, pipe, decorative, etc.)	103	470	4.56
Asphaltic concrete aggregates and other bituminous mixtures	236	993	4.21
Road base and coverings	538	1,820	3.38
Fill	209	929	4.44
Snow and ice control	110	459	4.17
Other miscellaneous uses 3/	119	1,020	8.55
Unspecified: 4/			
Actual	1	6	6.00
Estimated	3,140	12,100	3.84
Total or average	9,530	35,600	3.73

1/ Data are rounded to three significant digits; may not add to totals shown.
 2/ Includes plaster and gunite sands.
 3/ Includes filtration and roofing granules.
 4/ Includes reported and estimated production without a breakdown by end use.

TABLE 6
 MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1997, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 4		District 5	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	61	361	W	W	W	W	3,460	11,700
Asphaltic concrete aggregates and road base materials 4/	62	281	W	W	W	W	W	W
Other miscellaneous uses 5/	--	--	--	--	W	W	W	W
Unspecified: 6/								
Actual	1	6	--	--	--	--	--	--
Estimated	359	1,360	162	692	1,060	3,760	887	3,940
Total	483	2,010	256	1,060	2,320	8,320	4,610	17,300
Use	District 6		District 7		District 8			
	Quantity	Value	Quantity	Value	Quantity	Value		
Concrete aggregate and concrete products 3/	W	W	114	365	529	2,320		
Asphaltic concrete aggregates and road base materials 4/	W	W	73	222	432	1,360		
Other miscellaneous uses 5/	W	W	--	--	--	--		
Unspecified: 6/								
Actual	--	--	(7/)	(7/)	(7/)	1		
Estimated	27	231	208	778	444	1,310		
Total	62	506	395	1,370	1,410	5,000		

W Withheld to avoid disclosing company proprietary data; included in "Total."
 1/ Production reported in District 3 was included with District 4 to avoid disclosing company proprietary data.
 2/ Data are rounded to three significant digits; may not add to totals shown.
 3/ Includes plaster and gunite sands.
 4/ Includes fill and snow and ice control.
 5/ Includes filtration and roofing granules.
 6/ Includes reported and estimated production without a breakdown by end use.
 7/ Less than 1/2 unit.