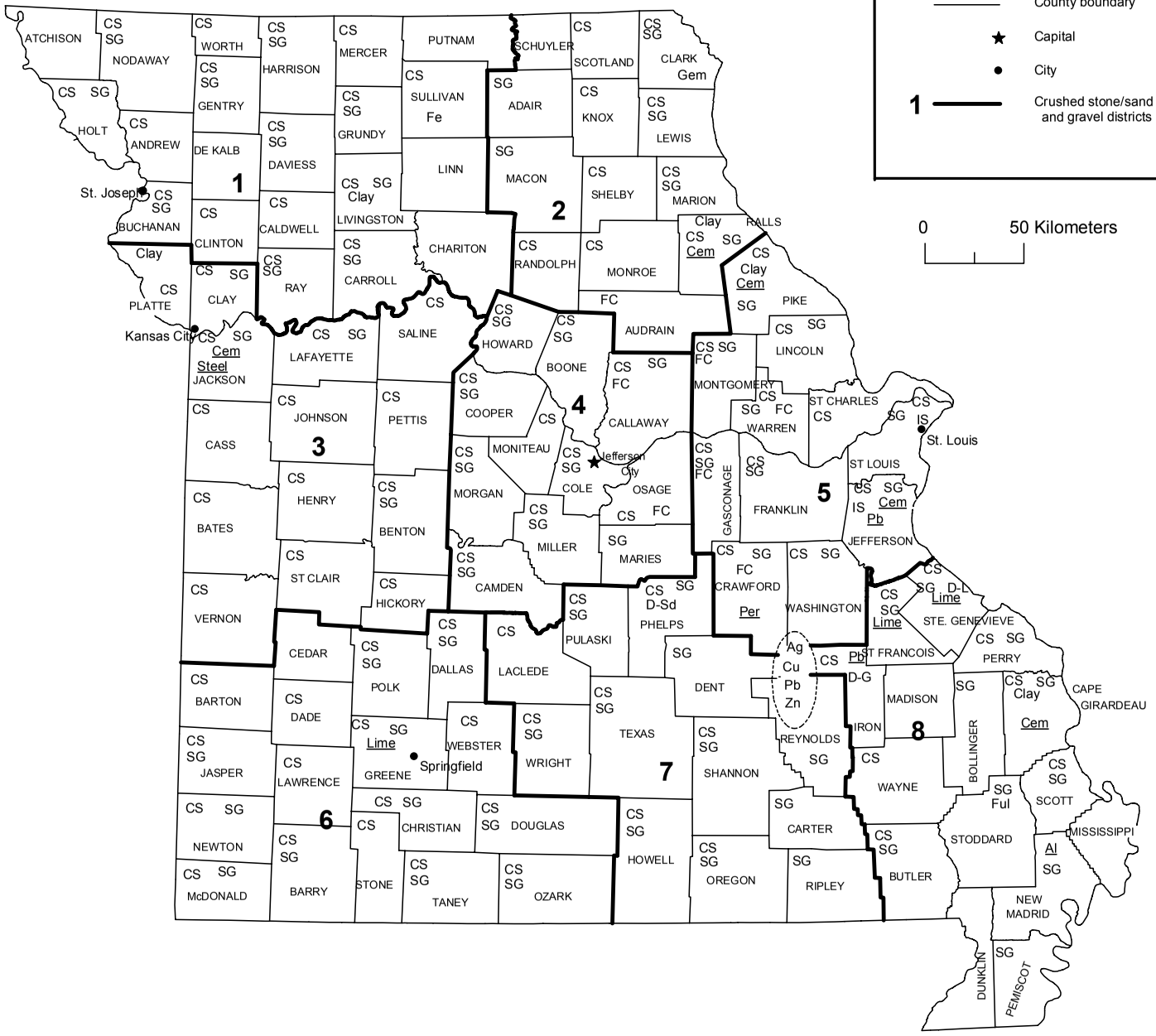
MISSOURI



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS

(Major producing areas)

Ag	Silver
Al	Aluminum plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
D-G	Dimension granite
D-L	Dimension limestone
D-Sd	Dimension sandstone
FC	Fire clay
Fe	Iron
Ful	Fuller's earth
Gem	Gemstones
IS	Industrial sand
Lime	Lime plant
Pb	Lead
Pb	Lead plant
Per	Perlite plant
SG	Construction sand and gravel
Steel	Steel plant
Zn	Zinc
◌	Concentration of mineral operations

Source: Missouri Department of Natural Resources, Division of Geology and Land Survey/U.S. Geological Survey (2002)

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 2002, the estimated value[1] of nonfuel mineral production for Missouri was $1.29 billion, based upon preliminary U.S. Geological Survey (USGS) data. This was about a 2% decrease from that of 2001[2] and followed a 1.5% increase from 2000 to 2001. The State rose to eighth from ninth in rank among the 50 States in total nonfuel mineral production value, of which Missouri accounted for nearly 3.5% of the U.S. total.

Crushed stone, cement (portland and masonry), lead, and lime, in descending order of value, accounted for about 90% of Missouri's total nonfuel mineral production value in 2002. Missouri continued to be the top lead-producing State in the Nation, producing significantly more than one-half of the Nation's output. Both crushed stone and portland cement, by value, remained the State's leading nonfuel minerals in 2002, having surpassed lead in 1997 and 1999, respectively. Prior to this, 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 2001, the State's increased values of crushed stone (up $46 million), silver, construction sand and gravel (up more than $4 million), plus smaller increases in fuller's earth, lead, and masonry cement more than offset decreases in portland cement (down $26 million), zinc, and fire clay, resulting in a $20 million increase overall for the year (table 1). All other changes in value in 2000 were small relative to these. Although having only a small effect on the State's overall change in value, gemstones production and value significantly increased.

Based upon preliminary USGS production estimates in the 50 States in 2002, Missouri remained first in lead and lime and first of 2 fire-clay-producing States, third in zinc, fourth in crushed stone, fifth in portland cement, and ninth in gemstones (in descending order of value). While the State was third in fuller's earth, it decreased to sixth from fourth in silver and to ninth from seventh in common clays. Additionally, Missouri was a significant producer of construction sand and gravel, industrial sand and gravel, and masonry cement.

The Missouri Department of Natural Resources, Geological Survey and Resource Assessment Division[3] (GSRAD), provided the following narrative information. Some data or information as reported by the GSRAD may differ from USGS preliminary estimates and production figures as reported to and estimated by the USGS.

Commodity Review

Industrial Minerals

The crushed stone industry experienced a leveling off during 2002, after nearly a decade of continued growth that was sparked in 1993 by the flooding on the Missouri River and Mississippi River. The industry anticipated a decline during 2003 and 2004 because of fewer road and bridge building projects planned by the Missouri Department of Transportation. The St. Louis market, however, was expected to remain strong as work progresses on a major expansion of St. Louis' Lambert Field airport. ISP Minerals Inc. tried to develop a market for the waste fines that are generated through the crushing of rhyolite at its roofing granule facility in Annapolis. The material was predominantly sand-sized with lesser amounts in the silt-sized and clay-sized fractions. There were indications that one of the producers of crushed rhyolite was attempting to increase its reserves by purchasing additional property in either Iron County or Wayne County.

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[1]The 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 2002 USGS mineral production data published in this chapter are preliminary estimates as of July 2003 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. Specialist contact information may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html; alternatively, specialists' names and telephone numbers may be obtained by calling USGS information at (703) 648-4000 or by calling the USGS Earth Science Information Center at 1-888-ASK-USGS (275-8747). All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2001 may differ from the Minerals Yearbook, Area Reports: Domestic 2001, Volume II, owing to the revision of preliminary 2001 to final 2001 data. Data for 2002 are preliminary and are expected to change; related rankings may also change.

[3]Patrick S. Mulvany, Geologist and Chief, Geologic Data Acquisition and Management Section, authored the text of the State mineral industry information provided by the Missouri Geological Survey and Resource Assessment Division.

The Cambrian and Ordovician dolomites that crop out in the southern one-half of Missouri have traditionally been used for high-volume, low-value purposes, mainly construction aggregates. Recent investigations suggest that, locally, some of the dolomites are low enough in silica and iron oxide to be used for low-volume, high-value purposes, such as in the glass, refractory, and mineral filler markets.

During the year, Lafarge North America Inc. dedicated its combination underground limestone mine and cement plant at Sugar Creek east of Kansas City. The mine is 200 meters deep and in the Mississippian St. Louis Limestone. The new facility was capable of producing 900,000 metric tons (t) of finished cement per year.

Metals

The lead mining, milling, and smelting industry in southeastern Missouri continued to experience challenging times in 2002. Prices for lead and zinc sank to historic lows largely because of increased foreign competition and weak markets. The Doe Run Co. successfully restructured its existing debt and found it necessary to reduce the workforce in its SEMO Mining and Milling Division. The safety record at Doe Run's Glover Smelter improved, with that facility celebrating its 24th consecutive quarter of compliance with the National Ambient Air Quality Standards. Doe Run continued to deal with the environmental controversy over lead contamination in the vicinity of its smelter at Herculaneum. Early in 2002, Doe Run applied for permits to drill 19 exploration holes on national forest land in Iron and Reynolds Counties. Exploratory drilling done during the year did not result in any significant discoveries. Development drilling around existing mines resulted in minor additions to reserves. A land swap was finalized with the U.S. Forest Service at the Brushy Creek Mine, thus providing increased tailings capacity and more space for pollution control facilities. An irrigation system was installed at the Viburnum tailings facility to suppress dust and promote the growth of vegetation. During fiscal year 2002, Doe Run mined about 4.5 million metric dry tons of ore, from which it produced about 270,000 t of lead.

Government Programs

In late July 2002, the Missouri Minerals Education Foundation hosted the third annual "Missouri is a State of Mines—Rocks, Minerals and Our Environment" workshop in Springfield, MO. The annual workshop, which was free to kindergarten through grade eight teachers and administrators in Missouri schools, provided information about earth science, rock and mineral resources, and the mining industry. Teachers could receive college credits for participating in this workshop, which was supported by the Mining Industry Council of Missouri and the Missouri Limestone Producers Association.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN MISSOURI[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2000		2001		2002[p]	
		Quantity	Value	Quantity	Value	Quantity	Value
Cement:							
Masonry		W	W	111	9,680 [e]	90 [e]	8,000 [e]
Portland		4,880	372,000 [e]	4,720	346,000 [e]	4,600 [e]	337,000 [e]
Clays:							
Common		1,050	3,240	1,030	3,420	1,020	2,190
Fire		351	4,630	289	3,610	311	4,390
Copper[3]		W	W	4	7,490	W	W
Lead[3]	metric tons	W	W	281,000	270,000	W	W
Sand and gravel, construction		10,700	41,700	10,900	45,800	9,800	42,100
Silver[3]	metric tons	W	W	144	20,300	W	W
Stone, crushed		75,600 [r]	365,000 [r]	82,000	411,000	79,500	406,000
Zinc[3]	metric tons	W	W	43,600	42,300	W	W
Combined values of clays (fuller's earth), gemstones, iron oxide pigments [crude (2000-2001)], lime, sand and gravel (industrial), stone (dimension granite), and values indicated by symbol W		XX	516,000	XX	165,000	XX	489,000
Total		XX	1,300,000 [r]	XX	1,320,000	XX	1,290,000

[e]Estimated. [p]Preliminary. [r]Revised. 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]

	2000				2001			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	178 r	70,200	$337,000	$4.79	173	76,500	$380,000	$4.97
Dolomite	26 r	4,000 r	19,100 r	4.77 r	23	3,950	19,200	4.87
Granite	2	W	W	6.38	2	W	W	7.22
Traprock	2	W	W	8.38	2	W	W	8.17
Total or average	XX	75,600 r	365,000 r	4.83 r	XX	82,000	411,000	5.01

rRevised. 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, except unit value; 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 2001, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1 1/2 inch):			
Macadam	287	$1,680	$5.87
Riprap and jetty stone	2,960	15,200	5.13
Filter stone	104	537	5.16
Other coarse aggregates	1,220	7,010	5.74
Total or average	4,570	24,400	5.34
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,420	7,780	5.47
Bituminous aggregate, coarse	737	4,300	5.83
Bituminous surface-treatment aggregate	574	3,380	5.88
Railroad ballast	964	4,690	4.86
Other graded coarse aggregates	4,550	29,300	6.44
Total or average	8,250	49,500	6.00
Fine aggregate (-3/8 inch):			
Stone sand, concrete	241	1,520	6.3
Stone sand, bituminous mix or seal	80	619	7.74
Screening, undesignated	241	1,120	4.65
Other fine aggregates	1,350	6,220	4.62
Total or average	1,910	9,480	4.97
Coarse and fine aggregates:			
Graded road base or subbase	3,810	17,700	4.65
Unpaved road surfacing	1,150	6,090	5.28
Terrazzo and exposed aggregate	W	W	6.43
Crusher run or fill or waste	187	1,150	6.17
Roofing granules	W	W	6.61
Other coarse and fine aggregates	4,170	22,000	5.27
Total or average	9,320	47,000	5.04
Other construction materials	48	430	8.96
Agricultural, limestone	935	3,980	4.26
Chemical and metallurgical:			
Cement manufacture	2,960	10,600	3.58
Lime manufacture	(2)	(2)	3.76
Flux stone	(2)	(2)	5.68
Sulfur oxide removal	(2)	(2)	5.13
Miscellaneous used, refractory stone (including ganister)	(2)	(2)	5.07
Unspecified:[3]			
Reported	24,200	123,000	5.06
Estimated	28,000	140,000	4.87
Total or average	52,300	260,000	4.96
Grand total or average	82,000	411,000	5.01

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

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

[2]Withheld to avoid disclosing company proprietary data; included in "Grand total."

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

TABLE 4

MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2001, 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]	89	520	109	622	23	117	191	1,030
Coarse aggregate, graded[3]	143	747	99	545	846	3,360	855	5,030
Fine aggregate (-3/8 inch)[4]	15	54	31	113	9	48	--	--
Coarse and fine aggregates[5]	550	3,290	W	W	W	W	625	2,630
Other construction materials	3	12	--	--	--	--	--	--
Agricultural[6]	67	291	76	251	8	30	88	305
Chemical and metallurgical[7]	--	--	W	W	W	W	--	--
Special[8]	--	--	--	--	--	--	--	--
Unspecified:[9]								
Reported	4,150	20,800	198	939	8,430	43,000	1,120	5,680
Estimated	610	3,000	3,000	15,000	3,500	17,000	1,600	7,880
Total	5,630	28,700	4,940	23,300	13,600	67,200	4,450	22,600

	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1 1/2 inch)[2]	1,410	8,050	114	785	5	23	2,630	13,200
Coarse aggregate, graded[3]	3,080	20,600	1,250	8,960	399	2,350	1,580	7,900
Fine aggregate (-3/8 inch)[4]	1,400	6,370	298	2,150	--	--	155	739
Coarse and fine aggregates[5]	W	W	W	W	168	866	3,070	16,900
Other construction materials	--	--	1	11	12	66	31	341
Agricultural[6]	73	247	101	600	68	347	454	1,910
Chemical and metallurgical[7]	W	W	W	W	--	--	W	W
Special[8]	--	--	--	--	--	--	W	W
Unspecified:[9]								
Reported	3,920	18,900	4,340	25,000	--	--	2,070	8,400
Estimated	6,600	32,000	3,900	18,000	1,100	5,200	7,900	38,000
Total	21,000	104,000	11,200	62,500	1,740	8,810	19,500	93,800

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 aggregates.

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

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

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

[6]Includes agricultural limestone.

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

[8]Includes asphalt fillers or extenders.

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

TABLE 5

MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2001, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregates (including concrete sand)	5,740	$24,100	$4.20
Plaster and gunite sands	152	753	4.95
Concrete products (blocks, bricks, pipe, decorative, etc.)	519	2,680	5.16
Asphalt concrete aggregates and other bituminous mixtures	515	1,640	3.19
Road base and coverings[2]	329	1,620	4.91
Road stabilization (cement)	8	33	4.13
Fill	433	1,170	2.71
Snow and ice control	87	363	4.17
Railroad ballast	3	15	5.00
Other miscellaneous uses[3]	154	1,400	9.08
Unspecified:[4]			
Reported	59	426	7.22
Estimated	2,900	12,000	4.03
Total or average	10,900	45,800	4.21

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

[2]Includes road and other stabilization.

[3]Includes filtration 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 2001, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2 and 4		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	W	W	W	W	--	--
Asphaltic concrete aggregates and road base materials	W	W	175	700	--	--
Fill	14	64	76	299	--	--
Other miscellaneous uses[3]	67	336	1,500	6,540	--	--
Unspecified:[4]						
Reported	--	--	55	410	--	--
Estimated	500	1,900	200	870	400	1,600
Total	578	2,310	2,010	8,820	400	1,600

	District 5 and 8		District 6 and 7	
	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	4,810	20,600	173	923
Asphaltic concrete aggregates and road base materials	W	W	112	520
Fill	319	684	25	127
Other miscellaneous uses[3]	649	2,750	29	237
Unspecified:[4]				
Reported	--	--	4	16
Estimated	1,300	5,300	460	1,900
Total	7,080	29,400	803	3,670

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

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

[2]Includes plaster and gunite sands.

[3]Includes filtration, roofing granules, and snow and ice control.

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