

THE MINERAL INDUSTRY OF ARKANSAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arkansas Geological Commission for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value¹ of nonfuel mineral production for Arkansas was \$520 million, according to the U.S. Geological Survey (USGS). This was a more than 7% increase from that of 1998,² following a marginal decrease from 1997 to 1998. The State climbed in rank in 1999 to 28th from 30th among the 50 States in total nonfuel mineral production value, of which Arkansas accounted for more than 1% of the U.S. total.

In 1999, the rise in Arkansas' nonfuel mineral value was mainly attributable to a substantial increase in the value of bromine, the State's leading nonfuel mineral, based on value. All other mineral commodities had relatively small increases, except for construction sand and gravel and common clay, which showed similarly small decreases (table 1). In 1998, the largest portion of Arkansas' decrease in value resulted from a significant drop in the value of bromine. Much of this decrease was made up by increases in crushed stone and construction sand and gravel values (table 1).

Based upon USGS estimates of quantities produced during 1999, Arkansas continued to be the leading bromine-producing State, accounting for most U.S. production. Michigan was the only other State that produced bromine. Mining operations in both States extracted subsurface, bromine-rich natural brines by submersible pump for subsequent processing. Arkansas also remained first among three States that produce silica stone; third of four tripoli-producing States; fourth in kaolin; and eighth in common clay. By value, Arkansas rose to fourth from sixth in the Nation in the production of gemstones. Additionally, significant quantities of crude gypsum, construction and industrial sand and gravel, crushed stone, and dimension stone were produced in the State. The State's metal production,

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 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, 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 for 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 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

mostly that of raw steel, resulted from materials received from other domestic and foreign sources.

The Arkansas Geological Commission³ (AGC) provided the following narrative information. No bauxite was mined, but Alcoa Inc.'s plant in Saline County used previously mined and stockpiled bauxite for the production of propants used by the oil industry in formation fracturing procedures.

Brominated flame retardants are used in epoxies, phenolics, acrylonitrile-butadiene-styrene, polystyrene, polycarbonates, and unsaturated polyesters. In September 1999, Albemarle Corp. announced the completion and startup of a 50,000-metric-ton-per-year production facility for tetrabromobisphenol-A (TBBPA), a flame retardant. The plant is located near Magnolia in Columbia County. The plant uses new, continuous-process technology to produce TBBPA (SAYTEX CP-2000). Great Lakes Chemical Co. remained active at its plant and bromine extraction operations in Union County near El Dorado.

Umetco, Inc. initiated reclamation of the Wilson Springs mines area in Garland County in late 1997, and continued this effort throughout 1998 and 1999. Strategic Minerals Corp. continues operation of the mill facility based on out-of-State vanadium-bearing feed.

Ash Grove Cement Co. operates the Rocky Point plant in Little River County. Both chalk from the Annona Chalk and silica from the Marlbrook Marl are used as source materials.

Star Resources Corp. of Houston, TX, leased potential diamond-bearing properties immediately northeast of the Crater of Diamonds State Park in Pike County. It announced that it recovered 10 carats of diamonds per metric ton of material sampled in a 100-metric-ton (t) test in 1999, and planned to continue exploration efforts, including large-bore drilling during 2000.

On June 9, 1998, the new Federal Transportation Equity Act for the 21st Century (TEA -21) was signed into law. TEA -21 has dramatically increased exploration and acquisitions activity in Arkansas' aggregate industry in both 1998 and 1999.

Arkholia Sand and Gravel Co. explored for additional quarry sites in several formations in the western portion of the Arkansas River Valley. Bennett Brothers Stone Co., Inc., obtained rough fieldstone, dimension stone, and other building stone materials from deposits in Garland County and nearby counties. Bobby Plant Asphalt Co., based in Murfreesboro, Pike County, is in the development and early production phase of a major quarry in the Jackfork Sandstone south of Kirby in central Pike County.

Chrisman Construction Co. is actively quarrying and crushing aggregate in Johnson and Logan Counties. Duffield Stone and Gravel Co. completed its first full year of operation of the Gumlog Quarry in upper Atoka Sandstone in Pope County, and is proceeding with further exploration in the region. McClinton-Anchor, Inc. explored for new aggregate quarry sites; it

³J. Michael Howard, Geology Supervisor, authored the text of State minerals information provided by the Arkansas Geological Commission.

examined limestones in the Ozarks Plateau region of northwest Arkansas.

Granite Mountain quarries is producing aggregate from the Atoka Formation in southern Scott County and from nepheline syenite at its two quarries in Pulaski County. It also acquired potential aggregate-producing property in Saline County, Hot Spring County, and in the western portion of the Arkansas Valley. Martin Marietta Co. operated at the Hatton Quarry in southern Polk County and at its 270 Quarry near Magnet Cove in Hot Spring County. During 1999, on property adjacent to the 270 Quarry, the company built a new asphalt hot-mix plant.

Minnesota Mining and Manufacturing Co. mined rock (nepheline syenite) from the Big Rock Arch Street Pike Quarry to supply its roofing granule plant in Sweet Home, Pulaski County. Additional rock was being taken from this quarry by Martin Marietta Co. for aggregate. Provo Co., TX, was sporadically processing dump material from the HMB Quarry in the Jackfork Sandstone in Sevier County. Pyramid Stone Co. quarried and crushed stone from sandstone quarries near Greenbrier, Faulkner County, and near Centerville, Yell County.

Rogers Group, Inc. continued with exploration of sandstone quarries in the upper and middle Atoka at Toad Suck in eastern Perry County, north of Greenbrier, and at Beryl in Faulkner County. Rogers Group was producing crushed stone for aggregates and fill material from the Tidwell Quarry in the Arkansas Novaculite formation in northeast Hot Spring County, and was investigating its potential as a high-silica resource for ferrosilicon use. It also produced aggregate from the Jackfork Sandstone of the DeRoche Quarry, but moved its asphalt plant from this site to the Tidwell Quarry at Glen Rose.

Schwartz Stone Co. was quarrying sandstone from the Hartshorne Sandstone for use as crushed aggregate and dimension stone from a site north of Midway in Logan County. The Souter Construction Co. produced riprap from the Hollywood Quarry in Clark County. The Hollywood Quarry is owned by Pine Bluff Sand and Gravel Co. Texas Industries Group evaluated deposits of tuff on leased property in southern Polk County.

Vulcan Materials Co. of Birmingham, AL, tested aggregate from the upper Morrowan Sandstone at a quarry operation at Judsonia in White County. Vulcan was also producing dolomitic limestone from lower Ordovician-age rocks near Black Rock in Lawrence County. The company actively processed rock from the L & R Quarry in middle Atoka Sandstone near Floyd in White County. Vulcan acquired Rock Products, Inc. and has been exploring the potential of rock aggregate resources in Morrowan- and Atokan-age sandstones in Cleburne and White Counties. Charles Weaver Co. was developing a quarry and crushing facility in the middle Atoka Formation near El Paso in White County.

There continues to be a major use of rock from about 30 privately operated quarries on paper company lands (Weyerhaeuser Corp. and International Paper Co.). The crushed rock is used in the numerous company-constructed timber access roads on their lands. Most counties in the Paleozoic region (northwestern portion of the State) have their own county quarries. The materials from these quarry operations are used by the counties as aggregate and road fill. Several major communities also have large quarry operations that supply crushed stone and fill material.

The James Hardie Gypsum Co. became the world's largest wallboard producer (from gypsum) in the fall of 1999 with the completion of a \$60 million expansion to the former Briar Plant operation near Nashville in Howard County. Annual production is expected to be 130 million square meters (Mm²) of wallboard. Production in 1999 was 895,000 t of raw gypsum from which 97 Mm² of wallboard was manufactured. The plant and mine employ about 450 people. Principal markets for the company's product are in Alabama, Kentucky, Mississippi, and Indiana.

C.W. (Bill) Harrison Gypsum Co. of Oklahoma ceased gypsum-mining operations north of Highland, Pike County, in the summer of 1999. Reclamation of the mine began in 1999 and continued through the end of the year.

Arkansas' only lime plant, near Batesville in Independence County, is owned by Arkansas Lime Co. The company was producing high-calcium quicklime and high-calcium hydrated lime, from the Boone Formation. The quarry is about three kilometers east of its secondary crusher and kiln operation. After primary crushing, the ore is hand sorted and transported to the calcining plant by narrow-gauge rail.

The Butterfield Quarry in Hot Spring County is managed and operated by the Clovis Wallis Whetstones, Inc. for high-purity silica applications. Clovis Wallis Whetstones, Inc., also sporadically crushed novaculite for high-silica demands at a site south of Lonsdale near the Saline-Hot Spring County line. The Rogers Group evaluated high-silica novaculite in the Ouachita Mountains for potential use in the ferrosilicon and silicon markets.

The four largest whetstone operators in the State actively manufactured novaculite-based products. Norton Abrasive Co. and Smith's Abrasives, Inc. lead the way. The relatively new Norton plant in southern Garland County affords better continuity of operations than the previous procedure of shipping the raw rock out-of-State. Hall's Whetstones Inc. expanded activities and markets, principally for novaculite products. Dan's Whetstone Co., Inc. produced whetstone-grade novaculite from its mine in Garland County. Sales increased somewhat for whetstone products in 1999 over 1998. Dan's Whetstone produces four grades of honestones: soft or medium, hard, translucent, and black.

Peyton Creek Minerals, based in Dallas, TX, conducted investigations for phosphate at one site in northern Van Buren County.

There were approximately 100 active sand and gravel operations in Arkansas in 1999, the greatest number of these being in the southeastern portion of the State (the Gulf Coastal Plain). For 1999, 15 sand and gravel permits were issued by the Arkansas Department of Environmental Quality (ADEQ). The permits were issued to: Guy King and Sons (2 sites), Mountain Home Concrete (2 sites), D & D Hauling, all in Marion County; Lindsey Construction, Charlton Construction, Rogers Sand and Gravel, and Riverview Farms, in Washington County; Carter Sand and Gravel in Craighead County; Ouachita Builders, Inc. in Montgomery County; C.J. Horner Co. in Clark County; J.T. Dozer, Inc., in Sevier County; APAC Tennessee Inc. in Cross County; Hanson Aggregates in Nevada County; Meridian Aggregates Co. in Calhoun County; and Carroll County Stone. One clay permit was issued to Acme Brick Co., formerly Eureka Brick and

Tile Co., in Johnson County. Five notifications of Intent to Quarry were received by ADEQ: McGeorge Contracting Co., Inc. in Sebastian County; Journagan Construction Company in Madison County; Vulcan Materials in Newton County; APAC Arkansas, Inc. in Benton County; and Jet Materials in Randolph County.

Lascas Products, Inc., ceased silica operations at its facility near Jessieville, Garland County in 1998, and has put its plant up for sale. A private citizen of Jessieville, Garland County, produced an undisclosed amount of lascas.

Malvern Minerals Co. actively mined tripoli from a deposit in the upper Arkansas No vaculite in eastern Garland County. Some tripoli was obtained from the Bigfork Chert in a county-operated quarry in western Saline County.

The AGC published the fourth in the agency's series on geology. Articles pertaining to rock aggregate, exploration at the Crater of Diamonds State Park, and a bibliographic listing of all geologic literature published by the State since 1856 are included in this publication. The study of the relationship between the various geologic units being quarried in the Paleozoic region of Arkansas and certain engineering properties of the rock (principally the Los Angeles abrasion and sodium sulfate soundness tests) has been in great demand by the rock aggregate industry within the State.

In 1999, five geologic maps on a 7.5-minute topographic base of southwestern Arkansas were digitized: Delight, Antoine, Pisgah, Piney Grove, and Blevins. The AGC accomplished this work as part of a cooperative effort with the USGS; the USGS STATEMAP program partly funds the project.

The AGC web site (www.state.ar.us/agc/agc.htm) hosted approximately 4,900 visitors during 1999. Information posted on the web pages includes resource data, publications and ordering information, stratigraphic data, geology of Arkansas, Arkansas Board of Registration for Professional Geologists, and agency services. The AGC links page provides a complete link listing of all State Geological Surveys, along with many Federal and Arkansas Government links. There is also an extensive list of links to active geological web sites, organizations, and universities.

The ADEQ issued two partial and two full land releases during 1999 to the following companies: Baker Hughes INTEQ, partial release of 21 hectares (ha) in Montgomery County; James Hardie Gypsum, partial release of 26 ha in Hempstead County; Holland Gravel Company, full release of 11 ha in Saline County; and Harshaw Chemical Company, full release of 5 ha in Pulaski County.

The U.S. Forest Service had 105 contracts from which

operators produced about 121,000 t of building stone, rip-rap, and aggregate-related materials (shale and chert), generating about \$32,000 in revenue for the Federal Government from the three National Forests in Arkansas—the Ouachita, the Ozark, and the St. Francis. Annual hard-rock lease payments on the Ouachita National Forest are estimated at \$10,000.

Operators of 24 quartz contracts and 5 leases with the U.S. Forest Service on the Ouachita National Forest in Arkansas generated about \$21,000 in revenue. About 50 t of quartz was removed from quartz mines on the National Forest. Gas lease revenues were approximately \$500,000 for the Ozark National Forest and \$170,000 for the Ouachita National Forest in 1999.

Work was progressing in 1999 towards publication of the U.S. Forest Service's Ouachita-Ozark Highlands Assessment study that is scheduled for release in early 2000. The major product will be a report on various aspects of the national forests in this region (the Ozark National Forest, the Ouachita National Forest, and the Mark Twain National Forest). The report will include a summary of the mineral data for the assessment region. The individual State-based data reports will be on an accompanying CD-ROM. This is the fact-finding report upon which to base policy decisions for the next 10 to 15 years.

During the 1999 legislative session several changes were made to the Arkansas Open-Cut Land Reclamation Act (Arkansas Code Annotated 15-57-301 to 15-57-321). The major change involved the removal of the term overburden from the definition of open-cut mining. This will allow the Surface Mining and Reclamation Division of the ADEQ to regulate several surface mining operations that were exempt from the law previously. Another change lowered the civil penalty amount that the Department could assess for violations of the law and regulations.

During 1999, the Arkansas Pollution Control and Ecology Commission initiated changes to Regulation No. 15 of the Arkansas Open-Cut Mining and Land Reclamation Code. The changes proposed by the commission were based on recommendations by a special subcommittee that looked into the mining practices on Crooked Creek, which is located in the north-central part of the State. Crooked Creek had been extensively mined for gravel over the past 25 years at the same time that it has become known nationwide as an excellent small-mouth bass fishery. The commission evoked its emergency rulemaking authority twice to make draft versions of the new regulation effective. The last emergency rulemaking was passed on December 3, 1999, and will be in effect for 180 days, after which the commission must have fully promulgated the new regulation, otherwise the original 1996 version will be reinstated.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997		1998		1999 p/		
	Quantity	Value	Quantity	Value	Quantity	Value	
Clays: Common	979	1,400	995	1,370	1,000	1,340	
Gemstones	NA	980	NA	912	NA	950	
Sand and gravel: Construction	10,600	48,100	12,100	55,400	11,500	53,900	
Silica stone 3/	metric tons	424	2,540	404	3,400	NA	NA
Stone: Crushed	28,100	167,000	35,700	180,000	34,900	181,000	
Combined values of bromine, cement, clays (kaolin), gypsum (crude), lime, sand and gravel (industrial), stone (dimension limestone, marble, and sandstone), tripoli	XX	267,000	XX	242,000	XX	283,000	
Total	XX	487,000	XX	484,000	XX	520,000	

p/ Preliminary. NA Not available. 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/ Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

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

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	25	8,560 r/	\$42,700 r/	\$5.00	24	13,300	\$61,900	\$4.67
Dolomite	2	W	W	4.02	2	W	W	4.54
Granite	6	10,000	77,200	7.69	6	12,300	64,100	5.21
Sandstone	16	6,520 r/	33,600 r/	5.16 r/	16	6,530	36,500	5.59
Quartzite and quartz	1	W	W	5.25 r/	4	W	W	5.51
Slate	--	--	--	--	1	W	W	4.88
Miscellaneous stone	1	W	W	4.71	8	107	583	5.45
Total or average	XX	28,100	167,000	5.94	XX	35,700	180,000	5.05

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

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

TABLE 3
 ARKANSAS: CRUSHED STONE SOLD OR USED
 BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	1,080	\$4,940	\$4.58
Filter stone	79	375	4.75
Other coarse aggregate	953	4,530	4.76
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,310	6,240	4.78
Bituminous aggregate, coarse	1,180	6,900	5.82
Bituminous surface-treatment aggregate	296	1,670	5.64
Railroad ballast	310	2,200	7.08
Other graded coarse aggregate	W	W	5.59
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	3	29	9.79
Screening, undesignated	632	2,620	4.14
Other fine aggregate	W	W	4.83
Coarse and fine aggregates:			
Graded road base or subbase	4,750	21,100	4.44
Unpaved road surfacing	82	272	3.32
Crusher run or fill or waste	250	1,140	4.54
Other coarse and fine aggregates	W	W	4.81
Other construction materials	W	W	4.82
Agricultural:			
Agricultural limestone	145	918	6.33
Other agricultural uses	W	W	14.30
Chemical and metallurgical:			
Cement manufacture	W	W	3.31
Lime manufacture	W	W	W
Special:			
Other fillers or extenders	W	W	6.09
Roofing granules	W	W	3.31
Other miscellaneous uses: Abrasives	W	W	4.16
Unspecified: 3/			
Actual	9,020	49,700	5.51
Estimated	7,170	39,500	5.51
Total or average	35,700	180,000	5.05

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, miscellaneous stone, quartzite and quartz, sandstone, and slate.

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

TABLE 4
 ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998,
 BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	351	1,720	W	W	W	W	--	--
Coarse aggregate, graded 4/	2,900	14,600	W	W	W	W	--	--
Fine aggregate (-3/8 inch) 5/	509	2,190	W	W	W	W	--	--
Coarse and fine aggregate 6/	4,720	19,700	W	W	W	W	--	--
Other construction materials	(7/)	(7/)	4,610	21,700	127	1,130	--	--
Agricultural 8/	160	1,130	--	--	--	--	--	--
Chemical and metallurgical 9/	(7/)	(7/)	(7/)	(7/)	(7/)	(7/)	--	--
Special 10/	--	--	(7/)	(7/)	(7/)	(7/)	--	--
Other miscellaneous uses	(7/)	(7/)	1	4	--	--	--	--
Unspecified: 11/								
Actual	4,170	23,000	4,860	26,800	(7/)	(7/)	--	--
Estimated	2,300	12,600	4,870	26,800	--	--	4,660	23,600
Total	15,200	75,500	15,700	79,900	127	1,130	4,660	23,600

W Withheld to avoid disclosing company proprietary data, included with "Other construction materials." -- Zero.

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

2/ Includes dolomite, granite, limestone, miscellaneous stone, quartzite and quartz, sandstone, and slate.

3/ Includes riprap and jetty stone, and filter stone.

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

5/ Includes stone sand (bituminous mix or seal) and screening (undesignated).

6/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and roofing granules.

7/ Withheld to avoid disclosing company proprietary data, included in "Total."

8/ Includes agricultural limestone and other agricultural uses.

9/ Includes cement manufacture and lime manufacture.

10/ Includes other fillers or extenders.

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

TABLE 5
 ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998,
 BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate 2/	4,730	\$25,000	\$5.27
Asphaltic concrete aggregates and other bituminous mixtures	1,700	9,400	5.55
Road base and coverings	433	990	2.29
Other miscellaneous uses 3/	589	2,570	4.36
Unspecified: 4/			
Actual	2,480	8,130	3.28
Estimated	2,150	9,330	4.33
Total or average	12,100	55,400	4.58

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

2/ Includes plaster and gunite.

3/ Includes fill, and snow and ice control.

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

TABLE 6
 ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998,
 BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	498	2,780	3,220	16,600	1,010	5,530
Asphaltic concrete aggregates and road base materials	120	315	1,720	8,080	290	2,000
Other miscellaneous uses 3/	64	323	487	2,180	39	70
Unspecified: 4/						
Actual	2,170	6,750	122	541	181	837
Estimated	365	1,520	1,130	4,740	662	3,070
Total	3,220	11,700	6,670	32,200	2,190	11,500

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 fill, and snow and ice control.

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