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 1998, the preliminary estimated value[1] of nonfuel mineral production for Arkansas was $598 million, according to the U.S. Geological Survey (USGS). This was a 23% increase from that of 1997,[2] following a 12% increase from 1996 to 1997. The State climbed in rank in 1998 to 24th from 29th among the 50 States in total nonfuel mineral production value, of which Arkansas accounted for more than 1% of the U.S. total.

In 1998, the rise in Arkansas' nonfuel mineral value was mainly attributable to substantial increases in the production and value of crushed stone (table 1) and the value of bromine, although there was a small drop in bromine production. Increases in construction sand and gravel and portland cement also contributed to the State's increase in value. Only kaolin with a $3 million decrease and gypsum with a much smaller drop had reduced values, while industrial sand and gravel remained the same. In 1997, the largest portion of Arkansas' value increase occurred as a result of rising values for bromine and crushed stone. Construction sand and gravel and kaolin also moderately contributed to the State's increase for the year.

Based on USGS estimates of quantities produced in the 50 States during 1998, Arkansas continued to be the leading[2] 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 of three States that produce silica stone; third of four tripoli-producing States; fourth in kaolin; eighth in common clay; and ninth in crude gypsum. By value, Arkansas rose from seventh to sixth in the Nation in the production of gemstones. Gemstone production must be measured in dollars because of the lack of a physical unit common to all gemstones produced. Additionally, significant quantities of crushed stone and construction and industrial sand and gravel were produced in the State. The State's metal production, mostly that of raw steel, resulted from materials received from other domestic and foreign sources.

The Arkansas Geological Commission[3] (AGC) provided the following narrative information. Custom mining of bauxite continued on a sporadic basis by McGeorge Construction Co. on Alcoa property in Saline County. Alcoa continued mining of bauxite in Saline County 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. Albemarle finalized plans to build a 50,000-metric-ton-per-year production facility for tetrabromobisphenol-A (TBBPA), a flame retardant. The plant project is to be located near Magnolia, AR. Construction began in August 1998, and the plant is scheduled to begin commercial production in the third quarter of 1999. The plant will use new, continuous process technology to produce TBBPA. On April 1, 1998, Albemarle completed a major expansion of its SAYTEX 8010 Flame Retardant production capacity at its Magnolia, AR, facility in early 1998. According to company sources, the expansion adds more than 3,000 metric tons to capacity, enabling continuing supply for global needs.

Ash Grove Cement Co.operates the Rocky Point plant in Little River County. Source materials include chalk from the Annona Chalk and silica from the Marlbrook Marl, both formations are Late Cretaceous in age.

On June 9, 1998, the new Federal Transportation Equity Act for the 21st Century (TEA-21) was signed into law. TEA-21 authorizes $217.3 billion for federal highway and transit programs ($175 billion for the highway program, with at least $165 billion guaranteed spending nationwide). This has dramatically increased exploration and acquisitions activity in Arkansas' aggregate industry.

Arkhola Sand and Gravel Co. continued exploration for additional quarry sites in several formations in the western portion of the Arkansas River Valley. Bennett Brothers Stone Co., Inc. obtains rough fieldstone, dimension stone, and other building stone materials from deposits in Garland County and nearby counties. Bobby Plant Asphalt Company, based in Murfreesboro, Pike County, continues the development and production phase efforts of a major quarry in the Jackfork Sandstone (Pennsylvanian) south of Kirby in central Pike County. Duffield Stone and Gravel Co. opened their new Gumlog quarry in upper Atoka sandstone (Pennsylvanian) in Pope County and also are proceeding with further exploration in the region. McClinton-Anchor, Inc. proceeded with exploration for new aggregate quarry sites, mostly examining limestones (Mississippian) in the Ozarks Plateau region of northwest Arkansas. McGeorge Construction Co.'s Granite Mountain quarries operations recovered fully from the effects of major damage from a tornado on March 1, 1997. Granite Mountain

[1]The 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.

[2]Values, 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.

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

quarries also acquired some potential aggregate-producing property in the western portion of the Arkansas Valley. Martin-Marietta Co. acquired Meredian Co.'s quarry and operations at the Hatton quarry in southern Polk County. Mid-State Materials, Inc. also was acquired by Martin Marietta Aggregates and continues the crushed stone operation at the 51 Quarry site near Magnet Cove in Hot Spring County. Martin Marietta Aggregates acquired interest in Meridian Aggregates Co. with an option to purchase the balance of Meridian's holdings in Arkansas in the future. Minnesota Mining and Manufacturing Company continue production of rock from its Big Rock Arch Street Pike quarry to supply its roofing granule plant in Sweet Home, Pulaski County. Provo Co., based in east Texas, began sporadic processing of dump material from the HMB quarry in the Jackfork Sandstone in Sevier County. Pyramid Stone Company began quarrying and crushing stone from sandstone quarries near Greenbriar, Faulkner County, and near Centerville, Yell County. Rock Products, Inc. continues to explore the potential of rock aggregate resources in Morrowan- and Atokan-age (Pennsylvanian) sandstones in Cleburne and White Counties.

Rogers Group, Inc. proceeded with exploration quarries of sandstones of the upper and middle Atoka at Toad Suck in eastern Perry County, north of Greenbriar, and at Beryl in Faulkner County. Rogers Group is currently producing crushed stone for aggregates and fill material from the Tidwell quarry in the Arkansas Novaculite formation (Mississippian-Devonian) in Hot Spring County, and is also investigating its potential as a high-silica resource for ferrosilicon use. Rogers Group also acquired the DeRoche quarry and is producing aggregates from the Jackfork Sandstone.

Schwartz Stone Co. quarries sandstone from the Hartshorne Sandstone (Pennsylvanian) both as crushed aggregate and dimension stone north of Midway in Logan County. Texas Industries Group continues the evaluation of tuff from leased property in southern Polk County.

Vulcan Materials Co. of Birmingham, AL, acquired Searcy Asphalt and Material, Inc. and is continuing to test the upper Morrowan sandstone (Pennsylvanian) for crushed stone at a quarry operation at Judsonia in White County. Vulcan is continuing dolomitic limestone production from lower Ordovician age rocks near Black Rock in Lawrence County. They also are actively processing rock from the L & R quarry in middle Atoka Sandstone near Floyd in White County. Charles Weaver Co. began development of 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 (Weyerhauser and International Paper). The crushed rock is used in the numerous company-constructed timber access roads on their lands. Most counties in the Paleozoic region (northwestern half of the State) have their own county quarries. The materials from these quarry operations are used by the counties as aggregates and road fill. Several major communities also have large quarry operations that supply crushed stone and fill material.

James Hardie Gypsum Co. began construction of a $60 million expansion of its Nashville plant (formerly known as Briar plant). The expansion will double the facility's wall board production capacity to 130 million square meters per year and will result in an additional 75 to 80 jobs at the plant, which presently employs about 370 people. The company has seen its U.S. gypsum business nearly quadruple in the past year. Production for 1998 was about 590,000 metric tons of raw gypsum ore from which 65 million square meters of wallboard was produced. The plant has proven 30-year reserves on-site through exploration and land acquisitions. Principal markets for the company's wallboard products are Alabama, Kentucky, Mississippi, and Indiana. James Hardie has announced plans to move their corporate offices to San Diego, CA, and base operations out of the United States by midyear 1999.

C.W. (Bill) Harrison Gypsum Co. of Oklahoma continued gypsum-mining operations north of Highland, Pike County. Gypsum from this operation is consumed as a cement additive by Ashgrove Cement Co. in Little River County.

The Butterfield quarry in Hot Spring County, recently operated by Harbison-Walker Refractories Co., is now managed and operated by the Clovis Wallis Whetstones, Inc. for high-purity silica applications. Clovis Wallis Whetstones, Inc., also continues to crush novaculite for high-silica demands at a site south of Lonsdale near the Saline-Hot Spring County line. Lascas Products, Inc., ceased operations at its facility near Jessieville, Garland County, and have the plant for sale. The company trucked its plant feedstock from mines northeast of the plant site in northern Saline County in 1997. A private citizen of Jessieville, Garland County, continues to produce an undisclosed amount of lascas. The Rogers Group continues to evaluate high-silica novaculite in the Ouachita Mountains for potential use in the ferrosilicon and silicon markets.

Arkansas' only lime production facility, near Batesville, is owned by Arkansas Lime Co. The company continue production of calcined product from the Boone Formation (Lower Mississippian). The quarry is about 3 kilometers east of its secondary crusher and kiln operation. The ore is hand sorted after primary crushing and transported to the calcining plant by narrow-gauge rail.

The four largest whetstone operators in the State continue active manufacturing with Norton Abrasive Co. and Smith's Abrasives, Inc., leading the way. The relatively new Norton plant in southern Garland County affords them better continuity of operations than the previous procedure of shipping the raw rock out-of-State. Hall's Whetstones Inc. is also expanding activities and markets, principally for novaculite products.

Peyton Creek Minerals, based in Dallas, TX, was permitted for phosphate operations and conducted investigations in northern Van Buren County.

There were approximately 100 active sand and gravel operations in Arkansas in 1998, the greatest number of these being in the southeastern one-half of the State (the Gulf Coastal Plain). For 1998, three new sand and gravel permits were issued by the Arkansas Department of Pollution Control and Ecology. The companies are Whitehall Gravel Co., Poinsett County; North Little Rock Materials, Inc. in Pulaski County; and Martin Sand and Gravel, Newton County.

Malvern Minerals Co. continues actively mining tripoli from a deposit in the upper Arkansas Novaculite (Mississippian) in eastern Garland County. Some tripoli is obtained from the Big Fork Chert (Ordovician) in a county-operated quarry in western Saline County.

Umetco, Inc. initiated reclamation of the Wilson Springs mines area in Garland County in late 1997 and has continued

this effort through 1998. The last production of vanadium ore from Arkansas was in 1990.

Very limited exploration was conducted in Arkansas in 1998 for metals. Midwest Mining Supplies, Inc., Nashville, AR, continues limited prospecting for base-metals in Polk and Montgomery Counties.

A new publication by the AGC was completed and published in 1998 entitled Information Circular 36, *Stratigraphic Summary of Arkansas.* The publication is intended to be a companion document to the *Geologic Map of Arkansas* (1976, 1993).

In 1998, six geologic maps on 7.5-minute topographic base of southwest Arkansas were digitized: Murfreesboro, Locksburg, Geneva, Silver Ridge, Ben Lomond, and Falls Chapel. The AGC accomplished this work as a cooperative effort with the USGS. The USGS STATEMAP program partially funds the project.

A paper and two poster sessions relating to testing at the Crater of Diamonds State Park near Murfreesboro in Pike County, celestine deposits in southwest Arkansas, and rock aggregate resources, were presented at the Industrial Minerals Forum at Norman, OK. Two of these presentations are scheduled to be published in the annual Industrial Minerals Forum papers compendium by the Oklahoma Geological Survey in 1999. A poster session, which presented information about the STATEMAP cooperative project, was presented at the South-Central GSA Meeting in Norman, OK.

The AGC web site (www.state.ar.us/agc/agc.htm) hosted over 2,000 visitors during its first year on-line. Information posted on the web pages includes resource data, maps, and publications available along with ordering information, stratigraphic data, agency service information, and other items concerning the geology of the Arkansas.

A researcher at The Center for Energy, Natural Resources, & Environmental Studies (CENRES) at Arkansas Tech University, Russellville, completed a study of the relation between the various geologic units being quarried in the Paleozoic region of Arkansas and certain engineering properties of rock (principally the Los Angeles abrasion and sodium sulfate soundness tests). The Arkansas Geological Commission, the Arkansas Highway and Transportation Department, and the U.S. Corps of Engineers are cooperating in this study by supplying base maps and engineering test data to CENRES. A report is scheduled for publication in 1999.

The U.S. Forest Service had 136 contracts from which operators produced about 899,000 metric tons of building stone, rip-rap, and aggregate related materials (shale and chert), generating about $40,000 in revenue for the Federal Government from the three National Forests in Arkansas--the Ouachita, the Ozark, and the St. Francis.

Operators of 40 quartz contracts with the U.S. Forest Service on the Ouachita National Forest in Arkansas generated around $22,400 in revenue. About 150 metric tons of quartz were removed from quartz mines on the National Forest. Annual hard-rock lease payments on the Ouachita National Forest is estimated at $10,000.

In cooperation with the U.S. Forest Service and the State Geological Surveys of Oklahoma and Missouri, the Arkansas Geological Commission continued to participate in a fact-finding effort for the U.S. Forest Service's Ouachita-Ozark Highlands Assessment study. Every 10 to 15 years, the U.S. Forest Service is required to establish planning guidelines for forest and land use for the next decade. The major product will be a report on various aspects of the National Forests in this region (the Ozark National Forest, the Ouachita Forest, and the Mark Twain National Forest). The three National Forests coordinated efforts to study the regional assessment area. Present in this report is 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 on which policy decisions will be made for the next 10 to 15 years. The actual policy report for the three National Forests must be completed by year 2001.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1996 Quantity	1996 Value	1997 Quantit	1997 Value	1998 p/ Quantity	1998 p/ Value
Clays:						
Common	939	2,390	979	1,400	999	1,430
Kaolin	161	W	W	W	W	W
Gemstones	NA	3,050	NA	980	NA	1,090
Sand and gravel: Construction	11,000	43,500	10,600	48,100	11,300	52,800
Silica stone 3/ metric tons	398	4,040 r/	424	2,540	NA	NA
Stone: Crushed	26,400	158,000	28,100	167,000	38,600	241,000
Combined values of bromine, cement, clays (fire, 1996), gypsum (crude), lime, sand and gravel (industrial), stone (dimension limestone, marble, and sandstone), tripoli, and values indicated by symbol W	XX	225,000	XX	267,000	XX	301,000
Total	XX	435,000 r/	XX	487,000	XX	598,000

p/ Preliminary. r/ Revised. 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/ Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

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

Kind	1996 Number of quarries	1996 Quantity (thousand metric tons)	1996 Value (thousands)	1996 Unit value	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value
Limestone	22 r/	6,990 r/	$34,900 r/	$4.99 r/	24	8,370	$41,900	$5.00
Dolomite	2 r/	W	W	4.66 r/	2	W	W	4.02
Granite	6	9,720	75,100	7.72	6	10,000	77,200	7.69
Sandstone	20 r/	6,920 r/	34,300 r/	4.95 r/	17	6,710	34,500	5.15
Quartzite	2	W	W	5.01 r/	1	W	W	5.25
Sandstone-quartzite	1	(2/)	(2/)	(2/)	--	--	--	--
Miscellaneous stone	1	(2/)	(2/)	(2/)	1	W	W	4.71
Total	XX	26,400	158,000	5.96	XX	28,100	167,000	5.94

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/ Revised to zero.

TABLE 3
ARKANSAS: CRUSHED STONE SOLD OR USED
BY PRODUCERS IN 1997, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	214	$896	$4.19
Filter stone	24	147	6.13
Other coarse aggregate	(3/)	(3/)	4.79
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,000	4,930	4.92
Bituminous aggregate, coarse	223	1,480	6.62
Bituminous surface-treatment aggregate	94	594	6.32
Railroad ballast	54	278	5.15
Other graded coarse aggregate	(3/)	(3/)	4.89
Fine aggregate (-3/8 inch):			
Stone sand, concrete	(3/)	(3/)	5.56
Screening, undesignated	202	1,050	5.19
Other fine aggregate	(3/)	(3/)	4.40
Coarse and fine aggregates:			
Graded road base or subbase	3,330	15,300	4.61
Unpaved road surfacing	W	W	2.87
Crusher run or fill or waste	130	719	5.53
Other coarse and fine aggregates	W	W	4.55
Other construction materials	773	3,340	4.32
Agricultural:			
Agricultural limestone	181	1,120	6.20
Poultry grit and mineral food	50	680	13.60
Other agricultural uses	25	243	9.72
Chemical and metallurgical:			
Cement manufacture	(3/)	(3/)	2.92
Lime manufacture	(3/)	(3/)	4.73
Special:			
Mine dusting or acid water treatment	15	80	5.33
Asphalt fillers or extenders	1	18	18.00
Other fillers or extenders	(3/)	(3/)	12.58
Roofing granules	(3/)	(3/)	5.00
Unspecified: 4/			
Actual	13,500	88,000	6.51
Estimated	5,880	38,000	6.47
Total	28,100	167,000	5.94

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, miscellaneous stone, quartzite, and sandstone.
3/ Withheld to avoid disclosing company proprietary data; included in "Total."
4/ Includes reported and estimated production without a breakdown by end use.

TABLE 4
ARKANSAS: 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		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	205	1,010	W	W	W	W	136	571
Coarse aggregate, graded 3/	W	W	W	W	W	W	197	824
Fine aggregate (-3/8 inch) 4/	W	W	--	--	--	--	91	380
Coarse and fine aggregate 5/	3,640	16,100	W	W	W	W	80	337
Other construction materials	1,900 6/	10,000 6/	514	2,750	55	499	--	--
Agricultural 7/	256	2,050	--	--	--	--	--	--
Chemical and metallurgical 8/	(9/)	(9/)	(9/)	(9/)	--	--	--	--
Special 10/	(9/)	(9/)	(9/)	(9/)	--	--	--	--
Unspecified: 11/								
Actual	6,360	30,500	7,150	57,500	--	--	--	--
Estimated	1,340	9,020	(9/)	(9/)	--	--	--	--
Total	14,000	71,200	13,600	93,100	55	499	504	2,110

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 and riprap and jetty stone.
3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface treatment aggregate, railroad ballast, and other graded coarse aggregates.
4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated).
5/ Includes graded road base or subbase, unpaved road surfacing, and crusher run (select material or fill).
6/ Includes other coarse aggregate.
7/ Includes agricultural limestone, and other agricultural uses.
8/ Includes cement and lime manufacture, flux stone, and chemical stone for alkali works.
9/ Withheld to avoid disclosing company proprietary data; included in "Total."
10/ Includes mine dusting or acid water treatment, asphalt fillers or extenders, whiting or whiting substitute, and other fillers or extenders.
11/ Includes reported and estimated production without a breakdown by end use.

TABLE 5
ARKANSAS: 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/	2,740	$13,400	$4.87
Asphaltic concrete aggregates and other bituminous mixtures	962	6,200	6.44
Road base and coverings	460	1,480	3.21
Fill	121	417	3.45
Other miscellaneous uses 3/	50	244	4.88
Unspecified: 4/			
Actual	5,060	22,100	4.36
Estimated	1,190	4,290	3.61
Total or average	10,600	48,100	4.54

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes concrete products.
3/ Includes filtration, and snow and ice control.
4/ Includes reported and estimated production without a breakdown by end use.

TABLE 6
ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1997,
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 aggregates and concrete products	408	2,160	W	W	W	W
Asphaltic concrete aggregates and road base	200	682	816	3,870	465	3,310
Other miscellaneous uses 2/	2,270	7,030	4,290	21,400	1,350	6,520
Unspecified: 3/						
Actual	W	W	W	W	--	--
Estimated	W	W	793	3,070	W	W
Total	2,880	9,870	5,900	28,400	1,810	9,830

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes fill, filtration, and snow and ice control.
3/ Includes reported and estimated production without a breakdown by end use.