

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 1997, Arkansas climbed in rank from 31st to 25th among the 50 States in total nonfuel mineral production value,¹ according to the U.S. Geological Survey (USGS). The estimated value for 1997 was \$535 million, a 23% increase from that of 1996. This followed an 11.6% decrease from 1995 to 1996 (based on final 1996 data). The State accounted for more than 1% of the U.S. total nonfuel mineral production value.

In 1996, Arkansas' increase in value was mainly attributable to a rise in bromine production and value. Increases in construction sand and gravel, crushed stone, and portland cement also contributed to the State's increased value. Common clays and gemstones showed decreases in value. These decreases were small compared to the changes in other commodities. In 1995, the largest portion of Arkansas' decrease in nonfuel mineral value came from bromine. Construction sand and gravel and crushed stone also contributed significantly to the State's drop in value.

Based on USGS estimates of quantities produced in the 50 States during 1997, 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 third in tripoli; fourth in kaolin; and ninth in common clay. Because of the difficulty in establishing a common physical unit that properly measures quantities of gemstones produced, gemstone production is measured in dollars. By value, Arkansas was fourth in the Nation in the production of gemstones. Additionally, significant quantities of crushed stone and crude gypsum were produced in the State. The State's mines exclusively produced industrial minerals; no metal mining has been reported in Arkansas since 1991, when bauxite and vanadium ore mining ceased following decades of production. The State's metal production, mostly raw steel, resulted from materials received from other domestic and foreign sources.

The following narrative information was provided by the

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 1997 USGS mineral production data published in this chapter are estimates as of January 1998. For some 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. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at <http://minerals.er.usgs.gov/minerals/contacts/comdir.html/>.

Arkansas Geological Commission² (AGC). In exploration activities, Midwest Mining Supplies, Nashville, AR, has begun prospecting for base-metals in Polk and Montgomery Counties. Phase II evaluation of the Crater of Diamonds State Park began in early October 1996 with the excavation of trenches. Fourteen trenches yielded approximately 8,000 metric tons of ore for processing. Rock removed was transported under tight security to Texas Star's testing plant northeast of the State property. Processing of rock from the trenches, along with the drilling of several additional core holes of the northern edge of the pipe, was completed in early 1997. Total diamond recovery from the processing operation consisted of 210 diamonds, weighing a total of 45.748 carats. No individual stones were recovered that weighed over 2 carats. The pipe was found to be some 32 hectares in area, with 3 hectares being covered by quaternary and recent alluvial sediments. The final Phase II report was presented to the Arkansas Department of Parks and Tourism in late October. Exploration of the Crater of Diamonds State Park is finished and will not be considered again for a period of 20 years.

In other exploration news, Arkola Sand and Gravel Co. continued exploration for additional quarry sites in several formations in the western portion of the Arkansas River Valley.

Gifford-Hill Co. explored a site for crushed stone in the Jackfork Sandstone (Pennsylvanian Age) near Delight in Pike County. McClinton-Anchor, Inc. proceeded with exploration for new aggregate quarry sites, mostly examining limestones (Mississippian) in the Ozarks Plateau region of northwest Arkansas. Mid-State Materials, Inc., continues to crush and explore a variety of igneous and contact metamorphosed Paleozoic rocks at its 51 quarry operations near Magnet Cove in Hot Spring County. Provo Co., based in east Texas, began sporadic processing of dump material from the HMB quarry in the Jackfork Sandstone (Pennsylvanian) in Sevier County. Rock Products Inc., continues to explore the potential of rock aggregate resources in Morrowan and Atokan (Pennsylvanian) sandstones in Cleburne and White Counties. Rogers Group Inc., has acquired the rights to three M & M Co. quarries in sandstones of the upper and middle Atoka (Pennsylvanian) at Toad Suck in eastern Perry County, north of Greenbriar, and at Beryl in Faulkner County. The company is actively crushing this rock and proceeding with explorations. The company also acquired the Tidwell quarry in the Arkansas Novaculite (Mississippian-Devonian) in Hot Spring County. They are currently crushing the rock for aggregate and fill material, and are also investigating its potential as a high-silica resource for ferrosilicon use. Searcy Asphalt and Material Inc. continues to test the upper Morrowan sandstone (Pennsylvanian) at its quarry operation at Judsonian in

²J. Michael Howard, Geologist Supervisor, authored the text of State minerals information provided by the Arkansas Geological Commission.

White County. Texas Industries Group continued the evaluation of tuff from its leased property in southern Polk County.

Albemarle Corp., a major bromine producer, began construction of a dedicated production facility at its Magnolia, AR, site. The facility is targeted to start up in February 1998. The new plant will have an initial capacity of 2,250 tons per year and is expandable to twice that production. Albemarle also announced plans to build a world-class production facility for the flame retardant tetrabromobisphenol-A. The plant project is to be located at Magnolia, AR, and is targeted to start up late in 1998 to early 1999. Brominated flame retardants are used in epoxies, phenolics, polystyrene, polycarbonates, and unsaturated polyesters.

Ash Grove Cement Co. is the only cement manufacturer in the State and maintains the Rocky Point plant operations 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.

Bennett Brothers Stone Co. Inc. obtains rough field stone, dimension stone, and other building stone materials from deposits in Garland County and nearby counties. Bobby Plant Asphalt Co., based in Murfreesboro, Pike County, has opened a major quarry in the Jackfork Sandstone (Pennsylvanian) south of Kirby in central Pike County. Duffield Stone and Gravel Co. opened its new Gumlog quarry in upper Atoka sandstone (Pennsylvanian) in Pope County and also are proceeding with further exploration in the region.

McGeorge Construction Co.'s Granite Mountain quarry operations, the State's largest, suffered major damage from a tornado on March 1, 1997. Quarry #2 was down for approximately 60 working days. Quarry #1 utilized all employees from both sites on a 24-hour, 7-day a week basis until both facilities were back up to original capacity. Out of 200 employees, 2 were seriously injured by the tornado, and 5 additional employees were taken to local hospitals for minor injuries, no deaths occurred. After 4 days of cleanup, portable crushers were brought into Quarry #2, but the usual variety of sizes of crushed stone were not producible from the portable equipment. Consequently, there was an anticipated shortfall of certain sizes of crushed stone available in central Arkansas, as the combined output of the two quarries was about 4.5 million tons per year before the damage. Of 40 buildings on the quarry sites, 30 were destroyed, and the remainder suffered some damage. At Quarry #1 minor damage occurred to the belt distribution system and was repaired in a few days. However, the belt distribution system at Quarry #2 for stacking crushed stone was 90% destroyed. A new belt system that was in the process of being built suffered only minor damage, apparently because the belts had not been installed. The wind resistance of the belts was the apparent cause of the destruction of the primary stacking system. A 54-metric-ton Komatsu trackloader was destroyed when a section of the conveyor system fell on it, crushing the cab and bending the front hydraulic arm system beyond repair. The primary crusher house was destroyed along with a large percentage of the electrical supply lines, making the primary crusher system inoperative at Quarry #2. The new computerized hot mix asphalt plant on the Granite Mountain #2 site was

slightly damaged and was quickly repaired.

Meridian Co. continued its production activities at the Hatton quarry in southern Polk County. Until this year, all the Hatton Tuff lentil of the Stanley Shale (Mississippian) produced by the company was being shipped to east Texas. However, in 1997, riprap and fill rock from this quarry was used on U.S. Highway 71 construction extending from south of Lockburg in Sevier County to Wilton in northern Little River County.

Schwartz Stone Co. quarried sandstone from the Hartshorne Sandstone (Pennsylvanian), north of Midway in Logan County, for use as crushed aggregate and dimension stone. Texas Industries Group continued the evaluation of tuff from its leased property in southern Polk County. Vulcan Materials Co. Birmingham, AL, has acquired the rights to the L & R quarry in middle Atoka sandstone (Pennsylvanian) near Floyd in White County. Vulcan is proceeding with dolomitic limestone production from lower Ordovician age rocks near Black Rock in Lawrence County.

There continues to be a major use of rock from about 30 privately operated quarries on paper company lands of Weyerhaeuser 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 half of the State) have their own county quarries. The materials from these quarry operations are used by the counties for aggregate and road fill purposes. Several major communities also have large quarry operations to supply public need for crushed stone and fill material.

Boral Ltd., an Australia-based company, sold the Briar Gypsum Co.'s properties for \$94.5 million to James Hardie Gypsum LTD. of Australia on February 1, 1997. In mid-November, James Hardie Gypsum announced a \$60 million expansion of its Nashville plant (formerly known as Briar plant). The expansion will double the facilities wallboard production capacity to 1.4 billion square feet 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 1997 was 590,000 tons of raw gypsum ore from which 65,000 square meters of wallboard was produced. The plant has proven 30-year reserves on the site. Principal markets for the company's wall board products are Alabama, Kentucky, Mississippi, and Indiana.

Bill Harrison Gypsum Co. of Oklahoma began stripping overburden north of Highland, Pike County, to expose massive gypsum beds immediately northeast of the previous mine site (Highland Gypsum Mine). Overburden from the new mine is being used to back fill the previous site. Gypsum from this operation is consumed as a cement additive by Ashgrove Cement in Little River County.

Harbison-Walker Refractories Co. quarried and crushed novaculite from the Butterfield quarry site in Hot Spring County for its high-purity silica applications. Lascas Products Inc. has ceased operations of its facility near Jessieville, Garland County, and reportedly have the plant for sale. The company had been trucking its plant feedstock from mines northeast of the plant site in northern Saline County earlier this year. The Rogers Group currently is evaluating high-silica novaculite in the Ouachita

Mountains for potential in the ferrosilicon and silicon markets. Wallis Whetstones Inc. continues to crush novaculite for high-silica demands at a site south of Lonsdale near the Saline-Hot Spring County line.

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

An undisclosed company is exploring gravel deposits near Mayflower in southern Faulkner County. Gifford-Hill Co. did considerable testing of gravel deposits at a site near Prescott in Clark and Nevada Counties.

Milwhite Co. has abandoned its crusher facilities at Bryant and talc and slate pits in Saline County. The company has reportedly moved operations to Corpus Christi, TX.

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 completed reclamation of the Christy vanadium pit near Magnet Cove in Hot Spring County in the spring of 1997. The last production of vanadium ore from this site was in 1990.

In other developments, three new publications by the AGC were completed and published in 1997. Information Circular (IC) 34 describes the ilmenite deposits drilled immediately northwest of Mineral Springs in Howard County. IC 35 presents the results of a regional geochemical survey of the distribution of arsenic, chromium, copper, lead, nickel, silver, and zinc in rocks of the Ouachita Mountains region of Arkansas. Bulletin 24 describes the mineral, fossil-fuel, and water resources of the entire State. The publication examines about 63 resources, including references. All of these publications are currently available from the Maps and Publications section of the AGC.

From 1995 through 1997, geologic mapping was completed and open-file copies of fifteen 7½-minute topographic quadrangles in southwest Arkansas were made available. The AGC has accomplished this work as a cooperative program with the USGS. The USGS STATEMAP program partially funds the project. Five quadrangles are presently being digitized using ARCVIEW 3.0 software and are scheduled for completion by summer 1998.

The Center for Energy, Natural Resources, and Environmental Studies (CENRES) at Arkansas Tech University, Russellville, is nearing completion of a study of the relationships 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). The AGC, the Arkansas Highway and Transportation Department, and the U.S. Army Corps of Engineers are cooperating in this study by supplying base maps and engineering test data to CENRES.

The U.S. Forest Service (USFS) had 83 mining contracts that produced 105,000 tons of building stone, rip-rap, and aggregate-related materials (shale and chert), which generated about \$43,000 in revenue for the Federal Government. Forty-five quartz mining contracts with the USFS on the Ouachita National Forest in Arkansas generated around \$22,000 in revenue. About 627 tons of quartz were removed from quartz mines on the National Forest. Annual nonfuels lease payments on Arkansas' National Forests (Ouachita, Ozark, and St. Francis National Forests) is estimated at \$80,000.

In cooperation with the USFS and the State Geological Surveys of Oklahoma and Missouri, the AGC participated in a fact-finding effort for the USFS Ouachita-Ozark Highlands Assessment study (OOHA). Every 10 years the USFS 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 (NF), the Ouachita NF, and the Mark Twain NF). The three NF's coordinated their 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 are on an accompanying CD-ROM. This is the fact-finding report on which policy decisions will be made for the next 10 years. The actual policy report for the three NF's must be completed by the year 2001.

During the 1997 legislative session, Senate bill 397 was introduced as an attempt to provide a framework for the State to be able to ensure the safe and environmentally sound operation and closure of new quarries. This bill was backed by industry. On April 8, 1997, Senate bill 397 was signed into law by the Governor as Act 1166 of 1997. Major points of the act include safety provisions during and after quarry operations as a site, as well as providing for reclamation of various areas disturbed during the life of the quarry. The Arkansas Department of Pollution Control and Ecology is responsible for the enforcement of the act.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1995		1996		1997 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	973	2,920	939	2,390	1,170	2,160
Kaolin	182	4,890	161	W	164	W
Gemstones	NA	4,890	NA	3,050	NA	2,800
Sand and gravel, construction	11,600	48,300	11,000	43,500	11,900	48,400
Silica stone 3/	W	W	398	3,800	NA	NA
Stone:						
Crushed	25,500	169,000	26,400	158,000	27,000	162,000
Dimension	22,000	2,010	W	W	W	W
Combined value of bromine, cement, clays (fire), gypsum (crude), lime, sand and gravel (industrial), stone [dimension limestone, marble, and sandstone (1996-97)], tripoli, and values indicated by symbol W	XX	260,000	XX	225,000	XX	320,000
Total	XX	492,000	XX	435,000	XX	535,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" 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	1995				1996			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	15	6,890	\$53,700	\$7.80	23	7,260	\$36,700	\$5.05
Dolomite	1	W	W	4.00	1	W	W	4.25
Granite	6 r/	10,100 r/	75,500 r/	7.49 r/	6	9,720	75,100	7.72
Sandstone	16	5,970	28,500	4.77	18	6,850	33,800	4.94
Quartzite	2	W	W	5.03	2	W	W	5.02
Sandstone-quartzite	--	--	--	--	1	W	W	6.17
Miscellaneous stone	1	W	W	2.20	1	35	W	W
Total	XX	25,500	169,000	6.64	XX	26,400	158,000	5.96

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.

TABLE 3
 ARKANSAS: CRUSHED STONE SOLD OR USED
 BY PRODUCERS IN 1996, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	352	\$1,520	\$4.30
Filter stone	116	732	6.31
Other coarse aggregate	W	W	6.64
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,230	6,250	5.07
Bituminous aggregate, coarse	962	5,110	5.31
Bituminous surface-treatment aggregate	335	2,130	6.36
Railroad ballast	419	3,400	8.11
Other graded coarse aggregate	W	W	4.50
Fine aggregate (-3/8 inch), screening, undesignated 3/	538	2,410	4.47
Coarse and fine aggregates:			
Graded road base or subbase	4,080	18,800	4.61
Unpaved road surfacing	281	1,860	6.60
Crusher run or fill or waste	356	1,670	4.70
Other construction materials	125	698	5.58
Agricultural limestone 4/	211	1,310	6.21
Chemical and metallurgical:			
Cement manufacture	(5/)	(5/)	2.73
Lime manufacture	(5/)	(5/)	3.00
Special, other fillers or extenders	(5/)	(5/)	7.28
Unspecified: 6/			
Actual	13,700	92,800	6.75
Estimated	2,260	15,100	6.69
Total	26,400	158,000	5.96

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

1/ Includes dolomite, granite, limestone, miscellaneous stone, quartzite, sandstone, and sand-stone/quartz.

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

3/ Includes stone sand (bituminous mix or seal).

4/ Includes other agricultural uses.

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

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 4
ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1996,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Construction aggregates:				
Coarse aggregate (+1 1/2 inch) 2/	295	1,580	173	665
Coarse aggregate, graded 3/	W	W	W	W
Fine aggregate (-3/8 inch) 4/	W	W	W	W
Coarse and fine aggregate 5/	3,680	17,300	1,030	4,990
Other construction materials	2,810 6/	14,500 6/	797	5,440
Agricultural 7/	211	1,310	--	--
Chemical and metallurgical 8/	(9/)	(9/)	(9/)	(9/)
Special 10/	--	--	(9/)	(9/)
Unspecified: 11/				
Actual	3,930	18,000	9,820	74,700
Estimated	(9/)	(9/)	--	--
Total	13,200	67,900	13,300	89,800

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 (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.

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

10/ Includes other fillers or extenders.

11/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1996,
BY MAJOR USE CATEGORY 1/

Use	Quantity	Value (thousands)	Value per ton
	(thousand metric tons)		
Concrete aggregate (including concrete sand)	4,360	\$20,800	\$4.78
Asphaltic concrete aggregates and other bituminous mixtures	1,050	5,180	4.95
Road base and coverings	487	1,190	2.45
Fill	103	319	3.10
Other miscellaneous uses 2/	9	34	3.78
Unspecified: 3/			
Actual	2,170	6,740	3.11
Estimated	2,790	9,250	3.31
Total or average	11,000	43,500	3.97

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

2/ Includes filtration and snow and ice control.

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
 ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1996,
 BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregate	397	2,010	3,960	18,800
Asphaltic concrete aggregates and road base materials 3/	216	687	1,420	6,000
Other miscellaneous uses 4/	3	13	6	21
Unspecified: 5/				
Actual	2,140	6,590	25	140
Estimated	96	298	2,700	8,950
Total	2,860	9,600	8,110	33,900

1/ Production reported in "District 3" was included with "District 2" to avoid disclosing company proprietary data.

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

3/ Includes fill.

4/ Includes filtration and snow and ice control.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.