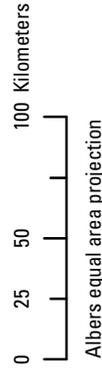
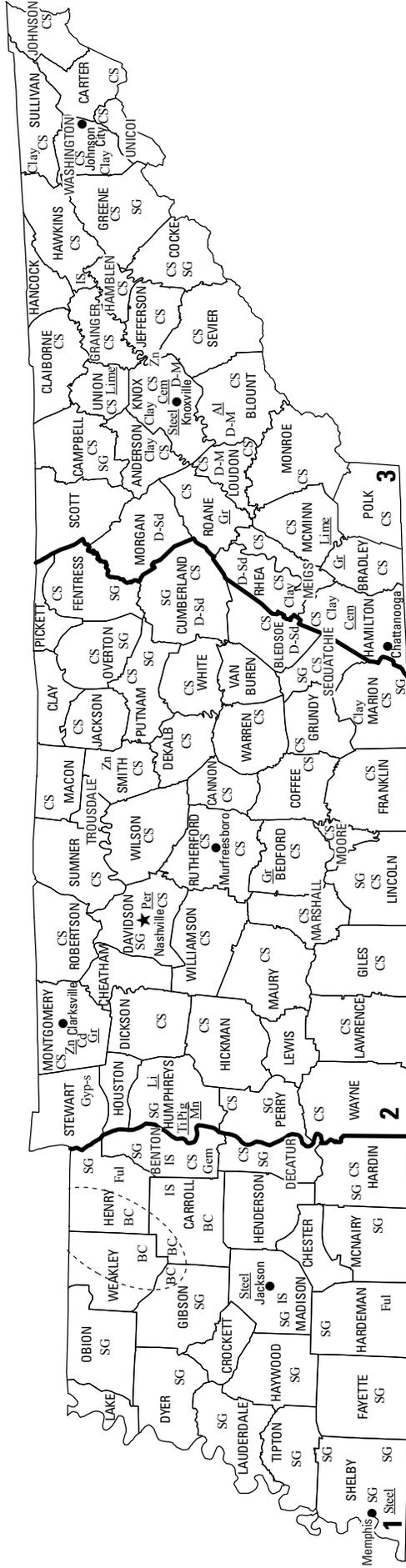




2008 Minerals Yearbook

TENNESSEE

TENNESSEE



LEGEND

- County boundary
 - ★ Capital
 - City
 - 1— Crushed stone/sand and gravel district boundary
- | | | | |
|--------------|-------------------------|--------------|------------------------------|
| <u>Cem</u> | Cement plant and quarry | <u>Lime</u> | Lime plant and quarry |
| <u>Clay</u> | Common clay or shale | <u>Mn</u> | Manganese plant |
| <u>CS</u> | Crushed stone | <u>Per</u> | Perlite |
| <u>D-M</u> | Dimension marble | <u>SG</u> | Construction sand and gravel |
| <u>D-Sd</u> | Dimension sandstone | <u>Steel</u> | Steel plant |
| <u>Ful</u> | Fuller's earth | <u>TiPig</u> | Titanium pigment plant |
| <u>Gem</u> | Gemstones | <u>Zn</u> | Zinc |
| <u>Gr</u> | Graphite plant | <u>Zn</u> | Zinc plant |
| <u>Gyp-s</u> | Synthetic gypsum | | |
| <u>IS</u> | Industrial sand | | |
| <u>Li</u> | Lithium plant | | |
- MINERAL SYMBOLS**
(Principal producing areas)
- Al Aluminum plant
 - BC Ball clay
 - Cd Cadmium (byproduct)
- Concentration of mineral operations

THE MINERAL INDUSTRY OF TENNESSEE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Tennessee Department of Environment and Conservation, Division of Geology, for collecting information on all nonfuel minerals.

In 2008, Tennessee's nonfuel raw mineral production¹ was valued at \$856 million, based upon annual U.S. Geological Survey (USGS) data. This was a \$134 million, or 13.5%, decrease from the State's total nonfuel mineral production value for 2007, following a \$126 million, or 14.5%, increase from 2006 to 2007. Tennessee ranked 26th among the 50 States in total nonfuel mineral production value and accounted for 1.2% of the U.S. total.

Crushed stone remained the leading nonfuel mineral commodity by production value in Tennessee's mineral industry, followed by portland cement, zinc, construction and industrial sand and gravel, and lime, in descending order of value. These six mineral commodities accounted for 95% of the State's total 2008 raw nonfuel mineral production value, with crushed stone alone making up nearly 54% of the total. The mineral commodities whose values increased were led by zinc, construction sand and gravel, and lime, in order of decreasing change. Construction sand and gravel increased by 1.57 million, with a 9.7% increase in unit value, despite a 6% decrease in quantity produced. Zinc and lime data were withheld—company proprietary data. Smaller increases took place in the values of cadmium in zinc concentrates and industrial sand and gravel.

Crushed stone, though it is the State's leading commodity by production value, experienced a decrease in value, down by \$98 million, despite a 13% increase in its unit price. With a 27% decrease in quantity produced, the quantity was equal to 17.1 million metric tons (Mt). In 2008, significant decreases in the production values took place in the mineral commodities of dimension stone, masonry cement, and natural gemstones, followed by the decreases in common clays, portland cement, and salt. Smaller, yet significant, decrease took place in ball clay, which declined by \$4.73 million.

Tennessee remained the Nation's leading producer of ball clay and natural gemstones (gemstones based upon value), as well as eighth in fuller's earth clay and 16th in lime production. In 2008, Tennessee produced 59% of the Nation's total ball clay production. The State rose in rank from fourth to second in both zinc and cadmium in zinc concentrate production. Additionally, Tennessee ranked second of three producing States in quantity of cadmium metal produced. The State dropped in rank from 15th to 16th in masonry cement production, from 14th to 15th in salt production, and from 10th to 11th in quantity of industrial sand and gravel produced. Furthermore, the State dropped from

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the 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 2008 USGS mineral production data published in this chapter are those available as of July 1, 2010. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>.

10th to 15th of 50 producing States in the production of crushed stone. Aluminum and raw steel were produced in Tennessee in 2008 but were processed from materials obtained from other domestic and foreign sources. The State continued to rank eighth in the production of primary aluminum.

The Tennessee Division of Geology² (TDG) provided the following narrative information. Data and information in the text are those reported by the TDG, based upon its own surveys and estimates.

Based on review of the Tennessee Division of Water Pollution Control, Mining Section, National Pollutant Discharge Elimination System Database, there were approximately 329 active permits for nonfuel mineral operations in 82 counties across the State. The active permits represent both quarry and plant sites, some of which may not have had any production during 2008. Overall, there was a small change in the State's nonfuel mineral industry compared with that of 2007, except for the start of production and subsequent temporary closing of the zinc mines located in middle and east Tennessee.

Commodity Review

Industrial Minerals

Clay and Shale.—Ball clay and kaolin were mined from the Eocene-age Claiborne and Wilcox Formations in Carroll, Gibson, Henry, and Weakly Counties, northwest Tennessee. Companies operating in the State were Boral Bricks Inc., H. C. Spinks Clay Company Inc. (owned by Franklin Minerals Inc.), Kentucky-Tennessee Clay Co. (a member of IMERYS Minerals Ltd.), Old Hickory Clay Co., and United Clays Inc. (owned by Unimin Corp.). Fuller's earth (montmorillonite) was mined in Hardeman County by Moltan Co. and in Henry County by American Colloid Co.

General Shale Brick Inc. (the U.S. subsidiary of Wienerberger AG located in Vienna, Austria), the nation's largest brick manufacturer, based in Johnson City, TN, operated nine shale mines in Anderson, Knox, Rhea, Sullivan, and Washington Counties in east Tennessee to supply its brick production plants. General Shale Brick Inc. closed a mine site in Carter County but opened the Kitty Hollow and Spring City shale mines in Rhea County. The new mines in Rhea County required a \$30 million investment and were expected to raise the county's tax base (Kirchner, 2008).

Gemstones.—The freshwater pearl was designated the official Tennessee State Gem in 1979. There were no changes in the industry in 2008. The American Pearl Co. in Benton County operated the only freshwater pearl farm in North America.

²Peter Lemiszki, Chief Geologist with the Tennessee Division of Geology in Knoxville authored the text of the State mineral industry information provided by that agency.

American Shell Co., Tennessee Shell Co., and The American Pearl Co. exported mollusk shells from the Tennessee River to pearl-producing countries. Approximately 90% of all cultured pearls begin with a mother-of-pearl nucleus taken from the shell of a Tennessee mussel.

Sand and Gravel, Construction.—There were 86 construction sand and gravel operations in 29 counties managed by 52 different companies and 2 county highway departments in Tennessee in 2008. Companies operating at least five sites were: Ford Construction Co., Memphis Stone and Gravel Co., and Standard Construction Co. located in District 1 (west Tennessee) and American Sand Company, LLC. located in District 2 (middle Tennessee).

Sand and Gravel, Industrial.—Industrial sand was mined in Hawkins County by Short Mountain Silica Co., and a new site was permitted by Berry Hills Corp. Unimin Corp. operated two industrial sand mines in Benton and Carroll Counties, and Teague Transports, LLC. operated one mine in Madison County.

Stone, Crushed, and Stone, Dimension.—There were 153 permitted crushed stone industry operations in 2008. Dolomite and limestone were produced at approximately 150 quarries and underground mines located primarily in District 2 (middle Tennessee) and District 3 (east Tennessee). Three quarries in Johnson County produced either crushed granite or quartzite. The top three producers were Vulcan Materials Co., Rogers Group Inc., and Aggregates USA, LLC. (formerly Rinker Materials).

The Ordovician-age Holston Limestone was quarried for dimension marble in Blount, Knox, and Loudon Counties by the Tennessee Marble Co. and Tennessee Marble Products Co. Six companies operated six dimension sandstone quarries in the Pennsylvanian-age Crab Orchard Sandstone in Bledsoe, Cumberland, Morgan, and Rhea Counties.

Other Industrial Minerals.—Synthetic gypsum was produced from Tennessee Valley Authority byproducts at the Allied Custom Gypsum plant in Stewart County. Lime plants operated by Abitibi Bowater Inc. in McMinn County produced high calcium quicklime, for captive consumption only. In February, Carmeuse North America and Oglebay Norton Co. finalized an agreement under which Carmeuse acquired Oglebay Norton (Carmeuse Lime & Stone, 2008). The new combined company was renamed Carmeuse Lime & Stone's. Carmeuse Lime & Stone's Tennessee-Luttrell plant located in Union County produced calcium quicklime and hydrated lime.

Metals

Zinc.—The zinc mining industry in Tennessee was just starting its revival under the ownership of Strategic Resource

Acquisition Corp. and East Tennessee Zinc Company (parent company Glencore International) when the economic recession forced the halt to production at mines located in the middle and east Tennessee zinc mining districts.

The East Tennessee Zinc Company in December 2008 announced plans to place on care-and-maintenance status the Coy and Young Mines in Jefferson County and the Immel Mine in Knox County, which led to the layoff of approximately 300 employees (Jost, 2008). In October 2008, Strategic Resource Acquisition Corp. announced that the credit crisis and falling zinc prices forced the company to reduce its Gordonsville zinc mine operation to temporary care-and-maintenance status and to stop the planned startup of the Cumberland and Elmwood Mines, all located in Smith County (Vaporean, 2008).

Nyrstar, the owner of the zinc smelting and alloying plant in Clarksville (Montgomery County) responded rapidly to the downturn in zinc demand toward the end of 2008 and announced a 40% reduction in refined zinc production at the plant (Nyrstar N.V., 2008, p.140).

Horsehead Holding Corp. (a leading U.S. producer of zinc metal and zinc oxide) announced in January that its wholly owned subsidiary (Horsehead Corp.) started up a second Waelz kiln at its Roane County location, which would double the plant's current electric arc furnace dust processing capacity at that location (Horsehead Corp., 2008).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN TENNESSEE^{1,2}

(Thousand metric tons and thousand dollars)

Mineral	2006		2007		2008	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Ball	713	30,800	677	30,600	568	25,900
Common	231	1,530	199	1,360	155	1,090
Kaolin	W	W	--	--	--	--
Sand and gravel:						
Construction	8,500	57,900	7,310 ^r	52,200 ^r	6,860	53,700
Industrial	1,010	29,300	1,070	32,400	983	32,800
Stone:						
Crushed	65,800 ^r	525,000 ^r	63,400 ^r	559,000 ^r	46,200	461,000
Dimension	W	W	W	W	6	1,820
Combined values of cadmium [byproduct from zinc concentrates (2007–08), cement, clays [fuller's earth, kaolin (2006)], gemstones (natural), lime, salt, stone (dimension marble), zinc (2007–08), and values indicated by symbol W	XX	220,000 ^r	XX	315,000 ^r	XX	280,000
Total	XX	864,000 ^r	XX	990,000 ^r	XX	856,000

^rRevised. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable. -- Zero.

¹Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

²Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
TENNESSEE: CRUSHED STONE SOLD OR USED, BY TYPE¹

Type	2007			2008		
	Number of quarries	Quantity (thousand metric tons) ^r	Value (thousands) ^r	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone ²	122 ^r	61,600	\$542,000	118	44,600	\$445,000
Granite	-- ^r	--	--	--	--	--
Sandstone & quartzite	7 ^r	1,430	14,600	7	1,150	13,500
Miscellaneous stone	1	368	1,730	1	454	2,380
Total	XX	63,400	559,000	XX	46,200	461,000

^rRevised. XX Not applicable. -- Zero.

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

²Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
 TENNESSEE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2008, BY USE¹

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	373	4,360
Filter stone	185	1,590
Other coarse aggregate	1,290	13,900
Coarse aggregate, graded:		
Concrete aggregate, coarse	403	3,070
Bituminous aggregate, coarse	1,110	11,300
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Other graded coarse aggregate	11,200	129,000
Fine aggregate (-¾ inch):		
Stone sand, concrete	694	8,880
Stone sand, bituminous mix or seal	W	W
Screening, undesignated	271	2,650
Other fine aggregate	2,570	31,900
Coarse and fine aggregates:		
Graded road base or subbase	1,220	8,420
Unpaved road surfacing	W	W
Crusher run or fill or waste	821	5,670
Other coarse and fine aggregates	12,000	107,000
Other construction materials	230	2,130
Agricultural:		
Limestone	431	5,750
Poultry grit and mineral food	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Flux stone	W	W
Glass manufacture	W	W
Sulfur oxide removal	W	W
Special, other fillers or extenders	W	W
Other miscellaneous uses and specified uses not listed	5	17
Unspecified:²		
Reported	6,790	66,600
Estimated	3,800	39,000
Total	46,200	461,000

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

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

²Reported and estimated production without a breakdown by end use.

TABLE 4
 TENNESSEE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2008, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch) ²	W	W	992	9,430	W	W
Coarse aggregate, graded ³	W	W	5,730	61,800	W	W
Fine aggregate (-¾ inch) ⁴	W	W	1,660	19,500	W	W
Coarse and fine aggregate ⁵	W	W	8,830	72,700	W	W
Other construction materials	--	--	228	2,130	2	6
Agricultural ⁶	W	W	452	6,580	W	W
Chemical and metallurgical ⁷	--	--	W	W	W	W
Special ⁸	--	--	W	W	--	--
Other miscellaneous uses	--	--	--	--	5	17
Unspecified: ⁹						
Reported	487	5,220	4,250	43,200	2,050	18,100
Estimated	--	--	3,100	31,000	772	7,800
Total	3,240	36,100	26,700	257,000	16,300	168,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

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

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

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

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

⁵Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

⁶Includes limestone and poultry grit and mineral food.

⁷Includes cement and glass manufacture, flux stone, and sulfur oxide removal.

⁸Includes other fillers or extenders.

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

TABLE 5
 TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2008,
 BY MAJOR USE CATEGORY¹

Use	Quantity	Value (thousands)	Unit value
	(thousand metric tons)		
Concrete aggregate and concrete products ²	1,360	\$12,300	\$9.07
Asphaltic concrete aggregates and road base materials	445	2,070	4.64
Fill	172	1,940	11.30
Other miscellaneous uses	81	1,370	16.85
Unspecified: ³			
Reported	1,690	11,600	6.89
Estimated	3,120	24,400	7.83
Total or average	6,860	53,700	7.83

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

²Includes plaster and gunite sands.

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

TABLE 6
 TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2008,
 BY USE AND DISTRICT^{1,2}

(Thousand metric tons and thousand dollars)

Use	District 1		Districts 2 and 3	
	Quantity	Value	Quantity	Value
Fill	109	812	63	1,130
Other miscellaneous uses ³	1,150	7,300	736	8,450
Unspecified: ⁴				
Reported	627	4,060	1,060	7,580
Estimated	1,670	13,000	1,450	11,400
Total or average	3,550	25,200	3,310	28,500

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

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

²Specified districts are combined to avoid disclosing company proprietary data.

³Includes asphaltic concrete aggregates, concrete aggregates, concrete products, plaster and gunite sands, and road base and coverings.

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