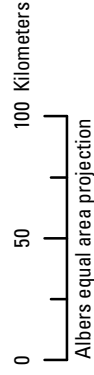
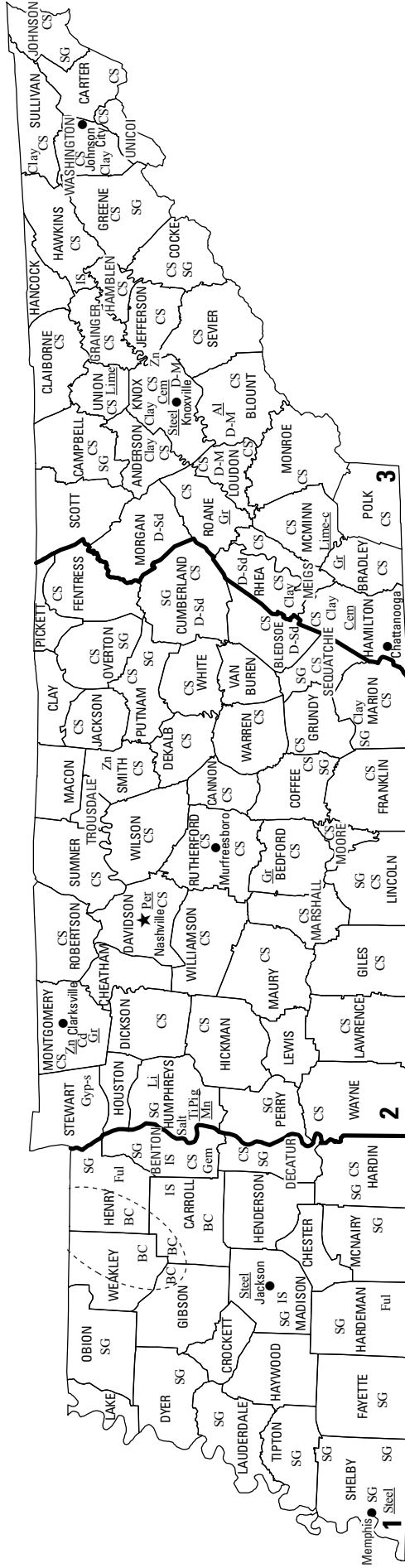




2009 Minerals Yearbook

TENNESSEE

TENNESSEE



LEGEND

- County boundary
- ★ Capital
- City
- Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS (Principal producing areas)

- Al Aluminum plant
- BC Ball clay
- Cd Cadmium (byproduct)
- Cem Cement plant
- Clay Common clay or shale
- CS Crushed stone
- D-M Dimension marble
- D-Sd Dimension sandstone
- Ful Fuller's earth
- Gem Gemstones
- Gr Graphite plant
- Gyp-s Synthetic gypsum
- IS Industrial sand
- Li Lithium plant
- Lime Lime plant
- Lime-c Lime plant - captive
- Mn Manganese plant
- Per Perlite
- Salt Salt
- SG Construction sand and gravel
- Steel Steel plant
- TiPig Titanium pigment plant
- Zn Zinc
- Zn 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 2009, Tennessee's nonfuel raw mineral production¹ was valued at \$675 million, based upon annual U.S. Geological Survey (USGS) data. This was a \$184 million, or 21%, decrease from the State's total nonfuel mineral production value for 2008, \$859 million, which followed a \$133 million, or 13%, decrease from the total \$992 million in 2007. Tennessee remained 26th in rank among the 50 States in total nonfuel mineral production value and accounted for 1.14% of the total U.S. nonfuel mineral production value of \$59 billion, down from 1.20% in 2008.

Crushed stone remained the leading nonfuel mineral commodity by production value in Tennessee, followed by portland cement, construction and industrial sand and gravel, and lime, in descending order of value. These five mineral commodities accounted for almost 94% of the State's total 2009 raw nonfuel mineral production value, with crushed stone alone making up nearly 64% of the total, an increase from 54% in 2008. The only increase in production value that took place in the State in 2009 took place with dimension stone, up by 82% from that of 2008 (actual production value data withheld—company proprietary data). However, this increase offset only a small fraction of the total \$184 million decrease in production value from 2008 to 2009.

The greatest decrease in production values took place with zinc, crushed stone, and portland cement. With the closure or idling of many of the State's zinc operations in 2008 and early 2009 owing to declining zinc prices and the economic recession, the production value of zinc was down almost 94% from that of 2008. Total U.S. mine production of recoverable zinc was down only 5% from that of 2008, with 93% of production coming from the State of Alaska (Tolcin, 2011, p. 84.1).

The production value of crushed stone, \$431 million, was down \$30 million from \$461 million in 2008, which in turn was down \$98 million from \$559 million in 2007—an almost 23% decline in 2 years. Similarly, the production value of portland cement decreased almost 20% from 2008 to 2009, which had been preceded by a 23% decline from 2007 to 2008 (production value data withheld—company proprietary data). Other mineral commodities saw significant declines, including: construction sand and gravel, down \$13.4 million; industrial sand and gravel, down \$5.7 million; and ball clays,

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 2009 USGS mineral production data published in this chapter are those available as of September 2011. 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>.

Peter Lemiszki, Chief Geologist with the Tennessee Department of Environment and Conservation, Division of Geology, authored the text of the State mineral industry information provided by that agency.

down \$3.1 million. Masonry cement, cadmium content of zinc concentrates, gemstones, lime, and salt were down a combined \$12 million in 2009.

Tennessee remained the Nation's leading producer of ball clay. In 2009, Tennessee produced 61% of the Nation's total ball clay production. The State remained 11th in industrial sand and gravel production, but declined from 16th to 17th in masonry cement production. After dropping from 10th in 2007 to 15th in 2008, the State rose to 12th in crushed stone production in 2009, accounting for 3% of all crushed stone produced in the United States.

Since at least 1994, Tennessee had ranked first in the Nation among all gemstone-producing States (gemstones based upon value). In 2009, the State declined in rank to 10th.

Aluminum, manganese, lithium, titanium pigments, graphite, and raw steel were produced in Tennessee in 2009 but were processed from materials obtained from other domestic and foreign sources. The State continued to rank eighth in the production of primary aluminum, due to the Alcoa Inc. facility south of Knoxville, in Blount County. Titanium pigments were produced by E.I. du Pont de Nemours and Company in New Johnsonville, Humphreys County.

The Tennessee Division of Geology (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 National Pollutant Discharge Elimination System Database managed by the Tennessee Division of Water Pollution Control, Mining Section, there were approximately 329 active permits for nonfuel mineral operations in 82 counties across the State in 2009. The active permits represent both quarry and plant sites, some of which may not have had any production during 2009.

Commodity Review

Industrial Minerals

Clays.—Ball clay and kaolin were mined from the Eocene-age Claiborne and Wilcox Formations in Carroll, Gibson, Henry, and Weakly Counties in 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 subsidiary 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. [Johnson City, TN (the U.S. subsidiary of Wienerberger AG, of Vienna, Austria)], the

Nation's largest brick manufacturer, operated nine shale mines in Anderson, Knox, Rhea, Sullivan, and Washington Counties in eastern Tennessee to supply its brick production plants. After closing a mine site in Carter County and opening the Kitty Hollow and Spring City shale mines in Rhea County in 2008, the company opened a new production facility in Spring City in 2009. At full capacity, the plant was estimated to produce about 2 million bricks per week. In December 2009, the company opened a new showroom and distribution facility near Knoxville by combining two older facilities that had been at two separate locations in the city (Kirchner, 2008).

Gemstones.—The freshwater pearl was designated the official Tennessee State Gem in 1979. The American Pearl Co. in Benton County operated the only freshwater pearl farm in North America. American Shell Co., Tennessee Shell Co., and The American Pearl Co. exported mollusk shells from the Tennessee River to pearl-producing countries.

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 2009. Companies operating at least five sites were Ford Construction Co., Memphis Stone and Gravel Co., and Standard Construction Co. located in District 1 (western 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., in Benton and Carroll Counties by Unimin Corp., and in Madison County by Teague Transports, LLC.

Stone, Crushed.—There were 153 permitted crushed stone industry operations in 2009. Dolomite and limestone were produced at approximately 150 quarries and underground mines located primarily in District 2 (middle Tennessee) and District 3 (eastern 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.

Stone, Dimension.—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. Carmeuse Lime & Stone, which had been created in 2008 through the acquisition of Oglebay Norton Co. by Carmeuse North America, produced high-calcium quicklime and hydrated lime at its Tennessee-Luttrell plant in Union County.

Metals

Zinc.—The zinc mining industry in Tennessee was just starting its revival when the economic recession forced

the halt to production at mines located in the middle and eastern Tennessee zinc mining districts in 2008 and in early 2009. The industry in the State saw steady production increases after restarting.

In May 2009, Nyrstar N.V. completed the acquisition of the Gordonsville, Cumberland, and Elmwood zinc mines in Smith County from Mid-Tennessee Zinc Corp. (subsidiary of Strategic Resource Acquisition Corp.) (Nyrstar N.V., 2009a). Subsequently, in December, the company completed the acquisition of the Coy and Young mines in Jefferson County and the Immel Mine in Knox County from the East Tennessee Zinc Company (a subsidiary of the Glencore Group) for \$126 million (Nyrstar N.V., 2009b).

Nyrstar intended to increase production at their newly acquired Tennessee mines to full production by the end of 2010. At full production, the Nyrstar mines will be capable of producing approximately 210,000 metric tons per year of zinc concentrate, grading approximately 62% zinc. Mine output was anticipated to be sufficient to fully supply Nyrstar's zinc smelting and alloying plant in Clarksville, Montgomery County, which was the only primary zinc producer in the U.S. The plant responded to the downturn in zinc demand rapidly at the end of 2008 by reducing production of refined zinc by 40% (Nyrstar N.V., 2008). Nyrstar estimated that the current reserves across all of its Tennessee mines indicated a mining lifespan of 15 years and have a record of one-for-one reserve replacement.

The Tennessee Department of Labor and Workforce Development announced that U.S. Zinc in Clarksville, Montgomery County, was chosen to receive the Governor's Award of Excellence for Workplace Safety. U.S. Zinc manufactured zinc-oxide and zinc-sulfide inorganics. The facility qualified for the Governor's Award by working more than 250,000 hours without a lost-time or restricted duty incident (Tennessee Department of Labor and Workforce Development, 2009).

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

(Thousand metric tons and thousand dollars)

Mineral	2007		2008		2009	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Ball	677	30,600	568	25,900	511	22,800
Common	199	1,360	155	1,090	113	816
Sand and gravel:						
Construction	7,640 ^r	54,500 ^r	7,180 ^r	56,200 ^r	5,360	42,800
Industrial	1,070	32,400	983 ^r	32,800	783	27,100
Stone, crushed	63,400	559,000	46,200	461,000	40,100	431,000
Combined values of cadmium (byproduct from zinc concentrates), cement, clays (fuller's earth), gemstones (natural), lime, salt, stone (dimension marble), zinc	XX	315,000	XX	281,000 ^r	XX	150,000
Total	XX	992,000 ^r	XX	859,000 ^r	XX	675,000

^rRevised. XX Not applicable.

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	2008			2009		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone ²	118	44,600	\$445,000	123	38,600	\$408,000
Sandstone and quartzite	7	1,150	13,500	6	1,070	18,100
Miscellaneous stone	1	454	2,380	1	454	4,920
Total	XX	46,200	461,000	XX	40,100	431,000

XX Not applicable.

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 2009, BY USE¹

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	228	3,140
Filter stone	101	959
Other coarse aggregate	1,120	13,200
Coarse aggregate, graded:		
Concrete aggregate, coarse	451	4,710
Bituminous aggregate, coarse	713	7,810
Bituminous surface-treatment aggregate	W	W
Railroad ballast	297	2,230
Other graded coarse aggregate	7,700	95,900
Fine aggregate (-¾ inch):		
Stone sand, concrete	178	1,850
Stone sand, bituminous mix or seal	W	W
Screening, undesignated	151	1,460
Other fine aggregate	2,310	33,300
Coarse and fine aggregates:		
Graded road base or subbase	1,280	10,100
Unpaved road surfacing	W	W
Crusher run or fill or waste	345	2,530
Other coarse and fine aggregates	7,690	75,500
Other construction materials	120	1,240
Agricultural, limestone	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Glass manufacture	W	W
Sulfur oxide removal	W	W
Unspecified: ²		
Reported	9,650	95,900
Estimated	6,210	62,400
Total	40,100	431,000

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 2009,
 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	529	5,470	W	W
Coarse aggregate, graded ³	W	W	4,170	44,300	W	W
Fine aggregate (-¾ inch) ⁴	W	W	917	11,300	W	W
Coarse and fine aggregate ⁵	W	W	3,470	28,600	W	W
Other construction materials	--	--	120	1,240	--	--
Agricultural ⁶	W	W	W	W	W	W
Chemical and metallurgical ⁷	--	--	W	W	W	W
Unspecified: ⁸						
Reported	--	--	8,190	80,400	1,460	15,500
Estimated	--	--	5,610	56,400	597	5,910
Total	2,950	34,700	23,400	233,000	13,800	164,000

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.

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

⁸Reported and estimated production without a breakdown by end use.

TABLE 5
 TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2009,
 BY MAJOR USE CATEGORY¹

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand) ²	1,300	\$11,400	\$8.78
Asphaltic concrete aggregates and road base materials ³	789	5,670	7.19
Other miscellaneous uses ⁴	85	1,210	14.21
Unspecified: ⁵			
Reported	404	2,730	6.76
Estimated	2,790	21,800	7.82
Total or average	5,360	42,800	7.98

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

²Includes plaster and gunite sands.

³Includes road and other stabilization (cement).

⁴Includes fill and golf course sand.

⁵Reported and estimated production without a breakdown by end use.

TABLE 6
 TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2009,
 BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand) ²	712	4,570	W	W	W	W
Asphaltic concrete aggregates and road base materials ³	650	3,490	--	--	140	2,180
Fill	20	105	--	--	--	--
Other miscellaneous uses ⁴	--	--	478	4,510	337	4,570
Unspecified: ⁵						
Reported	244	1,610	W	W	W	W
Estimated	1,140	9,360	1,420	10,600	225	1,850
Total or average	2,770	19,100	1,900	15,100	702	8,600

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

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

²Includes plaster and gunite sands.

³Includes road and other stabilization (cement).

⁴Includes fill and golf course sand.

⁵Reported and estimated production without a breakdown by end use.